

China 5G Technology

Picking structural winners amid uncertainties

We initiate coverage on China 5G supply chain with a positive view, as we believe technology localization, multi-year 5G investment cycle, policy support and robust data traffic growth will bode well for domestic leaders during 5G upcycle. In this report, we conducted an in-depth analysis on 5G technology trends, competitive landscape, near-term growth drivers and structural beneficiaries. We believe pessimistic sentiment on slower 5G rollout and US-China tensions in 2H20 have been reflected in stock prices. Sector valuation now come to a reasonable level of 33.8x FY21E P/E from 40.1x in recent peak, and we recommend to accumulate sector leaders with high growth visibility, strong positioning and technology leadership. Our top picks are ZTE-H, Innolight, Sunway and Shengyi Tech.

- **Global tech decoupling to accelerate domestic substitution.** We believe US-China tensions will continue in medium term and Chinese companies are poised to accelerate supply chain localization in next few years. In near term, we expect China 5G network players such as Huawei and ZTE will gradually diversify their supply chains, which will boost R&D and product launches from domestic leaders, and strengthen their competitiveness in the long term.
- **China 5G and new infrastructure initiative to fuel new chapter of growth.** We expect recent US restrictions will have limited impact on China 5G rollout roadmap thanks to Huawei's inventory build-up, accelerated semi localization and ZTE share pick-up. We forecast China 5G BTS net-adds to reach 600k/800k/1.0mn in FY20/21/22E, and domestic leaders are well placed to capture this multi-year opportunities. We expect upcoming 3rd phase of 5G BTS tenders and new infrastructure policy will be positive catalysts in near term.
- **Structural opportunities in equipment, PCB, optical transceivers and antenna.** 5G networks require new architecture and advanced technology to support faster data speed and rising internet traffic. These structural changes will drive volume growth and content upgrade in key segments including network equipment, PCB, optical transceivers and antenna.
- **Near-term re-rating on easing US-China tension; Our top picks are ZTE, Innolight, Sunway and Shengyi.** Most 5G plays retreated 40-50% since 3Q20 due to slower 5G rollout and trade tensions, and sector valuation is now reasonable at 33.8x FY21E P/E. Our BUY calls are ZTE-H/A and Innolight for 5G rollout, share gain and robust data growth, and Shengyi on localization and content growth. We like Sunway for antenna/RF/wireless charging upgrade. We have HOLD on China Tower for telco opex pressure and limited near-term catalysts, and Shennan Circuits for ASP pressure and earnings downside.

Valuation Table

Name	Ticker	Rating	Mkt Cap (USD mn)	Price (LC)	TP (LC)	Up/Down-side	P/E (x) FY20E	P/E (x) FY21E	P/B (x) FY20E	P/B (x) FY21E	ROE
ZTE – H	763 HK	Buy	21,220	19.12	26.3	38%	17.8	12.7	1.8	9.0	
ZTE – A	000063 CH	Buy	21,220	32.81	41.2	26%	34.9	24.8	3.5	9.0	
Innolight	300308 CH	Buy	5,745	54.11	73.5	36%	44.4	30.9	4.9	9.3	
Sunway	300136 CH	Buy	5,709	39.65	64.3	62%	31.3	19.3	6.8	21.6	
Shengyi Tech	600183 CH	Buy	9,451	26.85	33.7	25%	32.7	23.9	6.1	17.5	
Shennan C.	002916 CH	Hold	8,308	116.80	129.1	10%	38.7	29.4	7.5	19.4	
China Tower	788 HK	Hold	27,242	1.20	1.31	9%	28.6	22.2	1.0	3.5	

Source: Bloomberg, CMBIS estimates

OUTPERFORM
(Initiation)

China 5G Technology Sector

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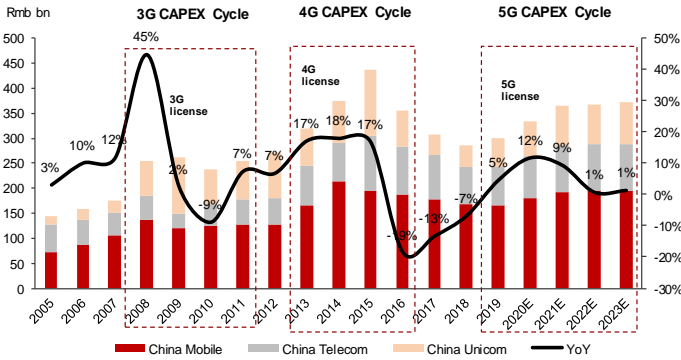
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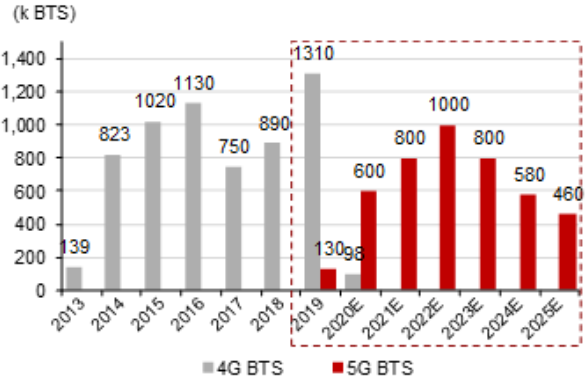
Focus Charts

Figure 1: China 3G/4G/5G capex cycle



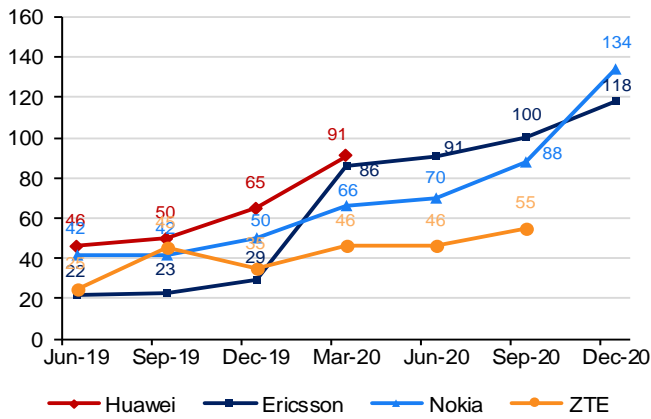
Source: CM, CT, CU, Bloomberg, CMBIS

Figure 2: China 4G/5G BTS net-add forecasts



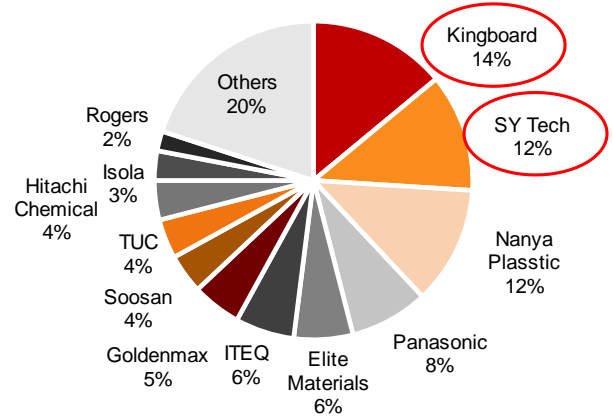
Source: CM, CT, CU, CMBIS

Figure 3: Increasing no. of 5G commercial contracts



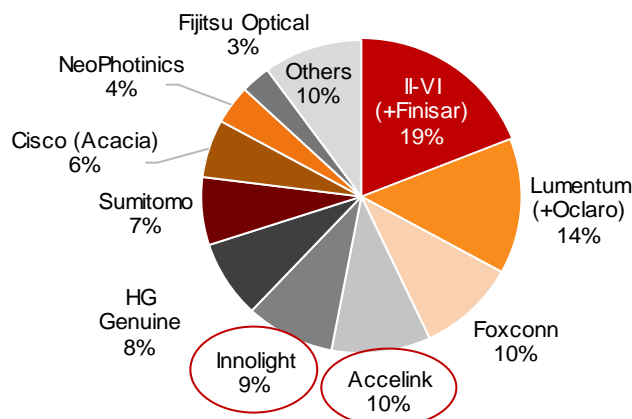
Source: Company data, CMBIS, As of 17 Dec

Figure 4: Global rigid CCL market in 2018



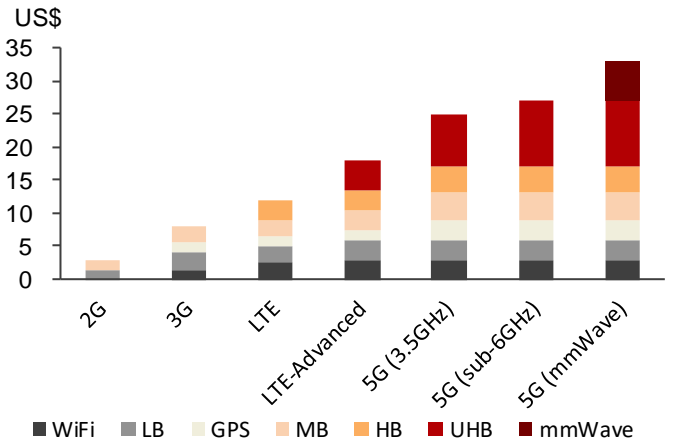
Source: Prismark, CMBIS

Figure 5: Global optical module market in FY19



Source: Yole, CMBIS

Figure 6: Increasing content value of 5G antenna



Source: Qovro, CMBIS

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Investment Summary

Initiate on China 5G supply chain with a positive view

We initiate coverage on China 5G supply chain with a positive view, as we believe technology localization, multi-year 5G investment cycle, policy support and robust data traffic growth will bode well for domestic leaders. In this report, we conducted an in-depth analysis on 5G technology trends, competitive landscape, near-term growth drivers and structural beneficiaries. We believe pessimistic sentiment on slower 5G rollout and US-China tensions in 2H20 should have been reflected in stock prices. Sector valuation now come to a reasonable level of 33.8x FY21E P/E from 40.1x in recent peak, and we recommend to accumulate sector leaders with high growth visibility, solid positioning and technology leadership. Our top picks are ZTE-H, Innolight, Sunway and Shengyi Tech.

Global tech decoupling to accelerate domestic substitution.

We believe US-China tensions will continue in medium term and Chinese companies are poised to accelerate supply chain localization in a fully global ecosystem. In near term, we believe China major 5G network players such as Huawei and ZTE will gradually diversify their supply chains, which will help boost R&D capability and product launch from domestic leaders, and strengthen their global competitiveness in the long term.

China 5G rollout and new infrastructure initiative to fuel new chapter of growth

Despite recent US restrictions, we expect limited impact on China 5G BTS roadmap thanks to Huawei's aggressive inventory build-up, accelerated semi localization and ZTE share pick-up. We forecast China 5G BTS net-adds to reach 600k/800k/1.0mn in FY20/21/22E, and domestic leaders are well placed to capture this multi-year opportunities. We expect upcoming 3rd phase of 5G BTS tenders and new infrastructure policy will be major catalysts in near term.

Structural opportunities in network equipment, CCL/PCB, optical transceiver and antenna.

5G networks require new architecture and advanced technology to support faster data speed and rising internet traffic. These structural changes will be positive to volume/content growth in key segments such as network equipment, PCB, optical transceivers and antenna.

Initiate BUY on ZTE-H/A, Innolight, Shengyi and Sunway; HOLD on China Tower and Shennan Circuits

Most 5G plays retreated 40-50% since 3Q due to slower 5G rollout and trade tensions, and valuation is now reasonable at 33.8x FY21E P/E. Our BUY calls are ZTE-H/A and Innolight for global 5G rollout, share gain and robust data growth, and Shengyi Tech on CCL/PCB localization and value growth. We also like Sunway for antenna/RF/wireless charging upgrade. We have HOLD on China Tower for telco opex pressure and lack of near-term catalysts, and Shennan Circuits for ASP pressure and earnings downside.

Valuation Summary

Figure 7: China 5G Supply Chain – Comparison

Company	Ticker	Rating	Mkt Cap (US\$ mn)	Price (LC)	TP (LC)	Up/Down -side	P/E (x)		P/B (x)		ROE (%)	
							FY20E	FY21E	FY20E	FY21E	FY20E	FY21E
Equipment												
ZTE (H)	763 HK	Buy	21,220	19.12	26.3	38%	17.8	12.7	1.8	1.6	9.0	12.0
ZTE (A)	000063 CH	Buy	21,220	32.81	41.2	26%	34.9	24.8	3.5	3.1	9.0	12.0
Fiberhome	600498 CH	NR	4,171	23.44	NA	NA	32.3	24.1	2.3	2.1	7.7	9.2
Nokia	NOK US	NR	22,955	4.06	NA	NA	15.3	16.7	1.1	1.0	6.2	5.0
Ericsson	ERIC US	NR	40,467	12.06	NA	NA	19.2	16.2	3.7	3.3	17.5	18.1
Average							23.9	18.9	2.5	2.2	9.9	11.3
Optical component/transceiver												
Innolight	300308 CH	Buy	5,745	54.11	73.45	36%	44.4	30.9	4.9	4.2	9.3	13.7
Accelink Tech	002281 CH	NR	3,138	29.45	NA	NA	41.8	34.5	4.1	3.7	9.7	10.7
Eoptolink Tech	300502 CH	NR	2,711	55.02	NA	NA	39.4	28.3	8.9	7.0	24.8	26.3
HG Genuine	000988 CH	NR	3,589	24.13	NA	NA	34.9	29.2	3.5	3.1	9.8	10.5
FIT	6088 HK	NR	2,329	2.66	NA	NA	14.1	10.6	1.0	1.0	7.6	9.5
Lumentum	LITE US	NR	7,003	92.75	NA	NA	18.3	15.1	4.0	3.7	24.0	25.1
Finisar	IIVI US	NR	7,608	73.35	NA	NA	33.6	21.8	3.3	2.6	11.8	15.1
Sumitomo	8053 JT	NR	16,260	1341.00	NA	NA	8.5	-	0.6	0.7	8.7	(4.6)
NeoPhotonics	NPTN US	NR	455	9.08	NA	NA	33.3	-	2.6	2.7	8.9	(4.3)
Csico	CSCO US	NR	189,388	44.82	NA	NA	14.3	14.2	5.2	4.6	37.8	33.1
Average							28.3	23.1	3.8	3.3	15.2	13.5
Antenna												
Sunway	300136 CH	Buy	5,709	39.65	64.3	62%	31.3	19.3	6.8	5.1	21.6	26.2
Speed	300322 CH	NR	820	13.51	NA	NA	52.7	32.1	7.2	6.0	13.4	18.5
Amphenol	APH US	NR	39,539	132.17	NA	NA	36.6	31.4	7.8	7.2	23.3	24.3
Average							40.2	27.6	7.3	6.1	19.4	23.0
Wireless charging												
Sunway	300136 CH	Buy	5,709	39.65	64.3	62%	31.3	19.3	6.8	5.1	21.6	26.2
Luxshare	002475 CH	NR	55,060	52.39	NA	NA	49.7	34.8	9.4	9.5	27.1	28.4
Lingyi iTech	002600 CH	NR	13,919	12.93	NA	NA	37.4	25.8	3.7	3.0	15.8	18.5
Anjie Tech	002635 CH	NR	1,745	18.34	NA	NA	21.1	18.7	1.9	1.7	9.1	9.5
Amphenol	APH US	NR	39,539	132.17	NA	NA	36.6	31.4	7.8	7.2	23.3	24.3
Average							35.2	26.0	5.9	5.3	19.4	21.4
CCL												
Shengyi Tech	600183 CH	Buy	9,451	26.85	33.7	25%	32.7	23.9	6.1	5.3	17.5	20.8
Nanya	1303 TT	NR	19,018	68.60	NA	NA	29.3	18.9	1.5	1.5	5.3	8.2
ITEQ	6213 TT	NR	1,621	135.50	NA	NA	17.5	13.5	4.1	3.5	25.4	28.8
Kingboard	148 HK	NR	4,286	30.15	NA	NA	8.1	7.6	-	-	-	-
Sumitomo	4203 JT	NR	1,679	3495.00	NA	NA	15.5	19.5	0.9	0.9	6.2	4.9
Rogers	ROG US	NR	2,880	154.20	NA	NA	31.4	24.7	-	-	-	-
Average							22.4	18.0	3.2	2.8	13.6	15.7
PCB												
Shengyi Tech	600183 CH	Buy	9,451	26.85	33.7	25%	32.7	23.9	6.1	5.3	17.5	20.8
Shennan Circuits	002916 CH	Hold	8,308	116.80	129.1	10%	38.7	29.4	7.5	6.3	19.4	21.4
WUS	002463 CH	NR	4,948	18.71	NA	NA	22.2	18.0	5.0	4.1	22.9	23.0
Kinwon	603228 CH	NR	3,755	29.42	NA	NA	21.9	16.9	3.9	3.3	17.4	18.6
DSBJ	002384 CH	NR	6,757	26.12	NA	NA	29.0	21.8	4.1	3.6	14.4	16.8
Zhen Ding	4958 TT	NR	3,894	119.50	NA	NA	12.9	10.4	1.5	1.4	11.0	13.1
TTM	TTMI US	NR	1,445	13.54	NA	NA	13.3	10.8	1.0	1.0	8.8	8.9
UMTC	3037 TT	NR	4,576	86.00	NA	NA	28.9	21.0	2.7	2.5	9.1	12.3
Tripod	3044 TT	NR	2,250	121.50	NA	NA	11.0	10.1	1.7	1.6	16.1	16.2
Comped	2313 TT	NR	1,869	44.50	NA	NA	10.9	9.4	1.8	1.6	18.3	18.8
SEMCO	009150 KS	NR	11,438	171000.00	NA	NA	22.1	17.0	2.2	2.0	10.6	12.3
Average							22.1	17.2	3.4	3.0	15.0	16.6
Tower												
China Tower	788 HK	Hold	27,242	1.20	1.31	9%	28.6	22.2	1.0	1.0	3.5	4.4
Tower Bersama	TBIG IJ	NR	2,379	1500.00	NA	NA	30.6	25.9	5.6	5.1	20.8	21.8
Crown Castle	CCI US	NR	67,175	155.75	NA	NA	84.0	65.2	7.1	8.1	7.9	11.7
American Tower	AMT US	NR	98,931	222.71	NA	NA	51.8	40.0	35.4	47.5	40.4	74.7
China Comm	552 HK	NR	3,314	3.75	NA	NA	7.0	6.1	0.6	0.6	8.5	9.2
Average							40.4	31.9	9.9	12.5	16.2	24.4

Source: Bloomberg, CMBIS

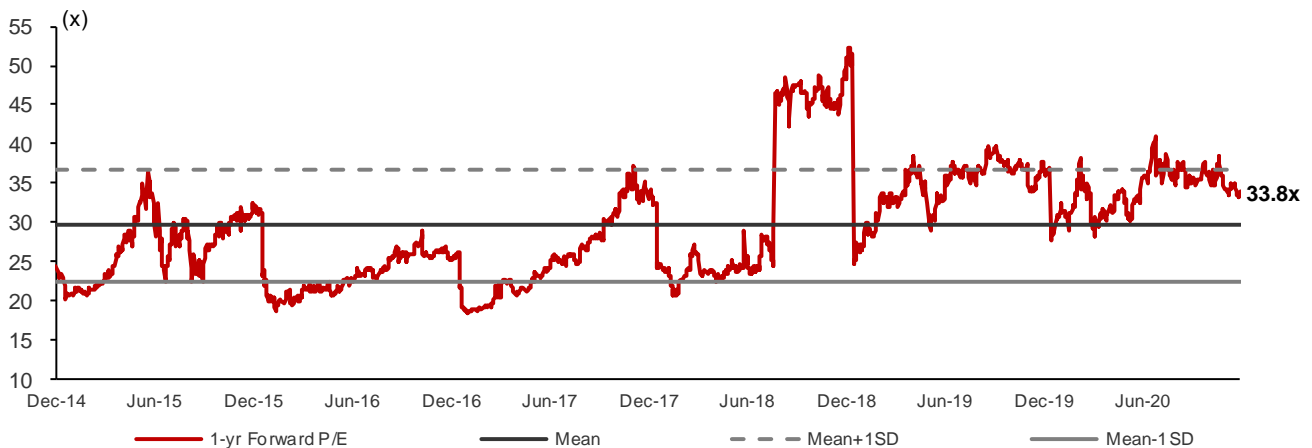
Sector valuation returns to a reasonable level

China 5G technology stocks have experienced a sharp correction of 40-50% since 3Q20 given escalating US-China tensions, slower 5G rollout and macro uncertainties. Overall sector valuation now returns to 33.8x P/E, 9% discount to 1-sd above 10-yr historical P/E of 37x and 13% premium to historical 10-yr average P/E of 30x.

As we believe most pessimistic sentiment on slower 5G rollout and US-China tensions in 2H20 have been priced in, we think recent correction offer good opportunity to accumulate quality companies with high earnings visibility and solid growth outlook. We think upcoming 3rd phase of 5G BTS tenders and new infrastructure policy will be positive catalysts in near term.

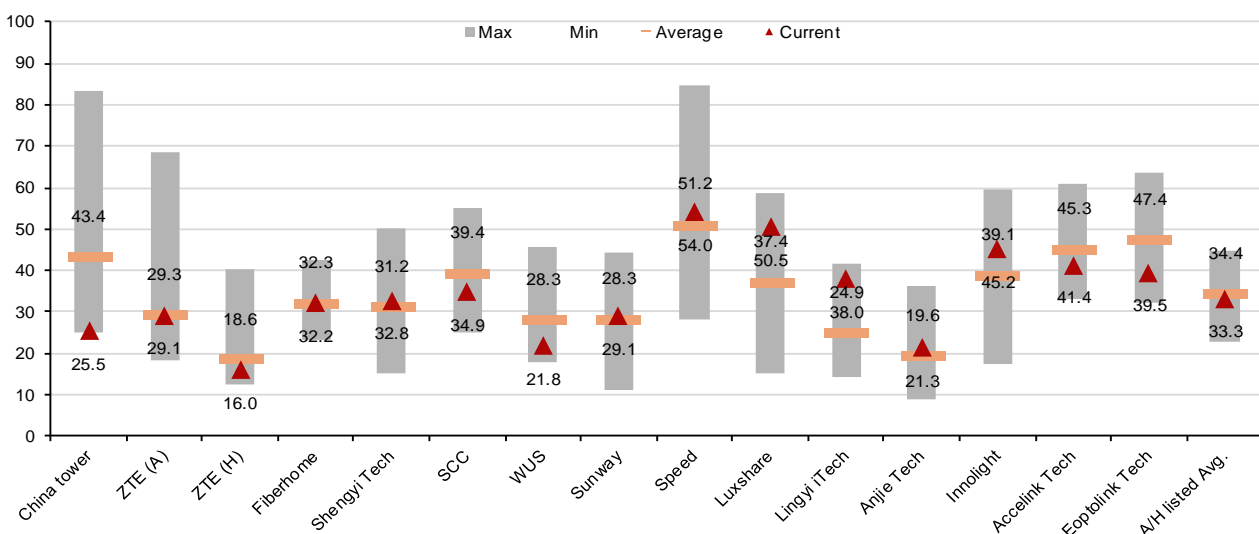
Overall, we prefer ZTE-H/A and Innolight for global 5G rollout, market share gain and robust data growth, and Shengyi Tech on CCL/PCB localization and value growth. We also like Sunway for antenna/RF/wireless charging upgrade. We have a HOLD on China Tower for telco opex pressure and lack of near-term catalysts, and Shennan Circuits for ASP pressure and earnings downside.

Figure 8: 5G supply chain forward P/E



Source: Bloomberg, CMBIS

Figure 9: Current vs 5-year historical P/E range (x)



Source: Bloomberg, CMBIS

Top picks and avoids

ZTE-H (763 HK, BUY, TP HK\$27.26)/ ZTE-A (000063 CH, BUY, TP RMB40.77)

We initiate coverage on ZTE-H with Buy and TP of HK\$27.26 and ZTE-A with Buy and TP of RMB40.77. We believe global 5G deployment will accelerate in FY21-22E following COVID-19 delay, and ZTE is well leveraged to benefit from multi-year 5G investment cycle. We are positive on ZTE's outlook in FY21-22E backed by 5G product portfolio, global share gain, solid R&D capability and improving profitability. We estimate 13%/29% revenue/NP FY20-22E CAGR, and our 12m TP of HK\$27.26 is based on 17.5x FY21E P/E, in-line with 2-year historical forward P/E.

Innolight (300308 CH, BUY, TP RMB73.45)

We initiate coverage on Innolight with Buy and TP of RMB73.45, as we expect Innolight to become major beneficiary of 400G upgrade in datacom and 5G deployment in telecom. We are positive on its global leadership in datacom optical modules (#1 in 100G/400G) and expansion into 5G telecom market (#1 in 50G/200G, Top 3 in 25G). We believe recent pull-back due to inventory correction provides a good entry point to accumulate. We estimate 29%/36% revenue/NP FY20-22E CAGR, and our 12m TP of RMB73.45 is based on 41.9x FY21E P/E, in-line with 3-year avg. P/E.

Sunway (300136 CH, BUY, TP RMB64.31)

We initiate on Sunway with Buy and TP RMB\$64.31. We are positive on its successful transformation from a antenna supplier to a comprehensive RF solution provider, riding on wireless connectivity trend in 5G era. We believe Sunway is poised to capture growth opportunities in wireless connectivity and localization of RF components, and we estimate 45%/50% revenue/NP FY20-22E CAGR, driven by 37%/78% sales CAGR. Our 12m TP of RMB64.31 is based on 31x FY21E P/E, in line with 5-year historical avg. P/E.

Shengyi Technology (600183 CH, BUY, TP RMB33.69)

We initiate on Shengyi Tech with Buy and TP RMB33.69. As global No.2 and China No.1 largest CCL vendor, Shengyi Tech is poised to benefit from multi-year 5G/datacom upcycle and CCL/PCB localization. We expect Shengyi's CCL/PCB to deliver 17%/57% revenue CAGR during FY20-22E, driven by rising demand from 5G telecom/ datacom, material upgrade, CCL ASP hike and operating efficiency. We estimate 28%/30% revenue/NP FY20-22E CAGR, and our 12m TP RMB33.69 is based on upcycle 30x FY21E P/E.

Shennan Circuits (002916 CH, HOLD, TP RMB129.05)

We initiate on the stock with HOLD and TP of RMB129.05. We believe Shennan Circuit is poised to benefit from China's localization and consolidation in PCB/IC substrate during 5G era. We are positive on SCC's share gain given rising demand and content growth for 5G/datacom PCBs and IC substrate localization, driving 19%/22% revenue /NP FY20-22E CAGR. While we like its leadership in PCB and fast-growing IC substrate, we think near-term PCB ASP pressure amid 5G BTS de-spec and intense competition will be an overhang for the stock. Our 12m TP RMB129.05 (10.5% upside) is based on 32x FY21E P/E.

China Tower (788 HK, HOLD, TP HK\$1.31)

We initiate on China Tower with HOLD and TP of HK\$1.31. We believe China Tower is well positioned to benefit from China 5G network upgrade and site expansion backed by robust data demand in China. Following a slower 2020 due to COVID-19 and telco's cost control, we expect earnings growth to pick up given tower business recovery, rising tenancy ratio and better operating leverage. We believe slower 5G revenue and telco opex pressure will be a major overhang. Our TP of HK\$1.31 is based on 4.9x FY21E EV/EBITDA, with 21% discount below 2-yr hist. average.

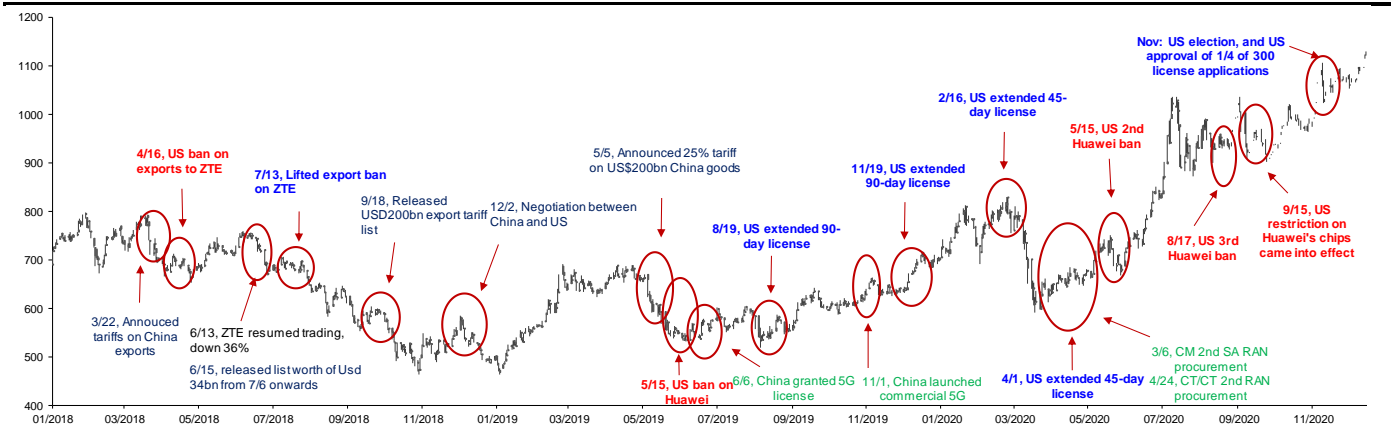
Global tech decoupling to boost supply chain localization

Domestic leaders to benefit as global technology tensions continues

We believe US-China technology decoupling will continue in medium term but at moderate pace following US elections, and Chinese companies are poised to shift their supply chain strategy and accelerate localization in next few years. Most recently, US announced another round of restriction in Aug 2020 to tighten export control on Huawei's access to US technology/software to design and produce semiconductors, and require all US/non-US firms to obtain US license for supplying to Huawei.

Given Huawei's reliance on TSMC and US equipment/EDA tools for 5G handset/ infra chips, we believe the restriction will impact Huawei's HiSilicon products (e.g. SoC, FPGA, AI chips, ASICs) and also block its access to all third-party semiconductors. As Huawei has leading market share in China telco equipment (c.60%) and smartphone (c.40%) markets, we expect this restriction will reshuffle supply chain and boost localization in next few years.

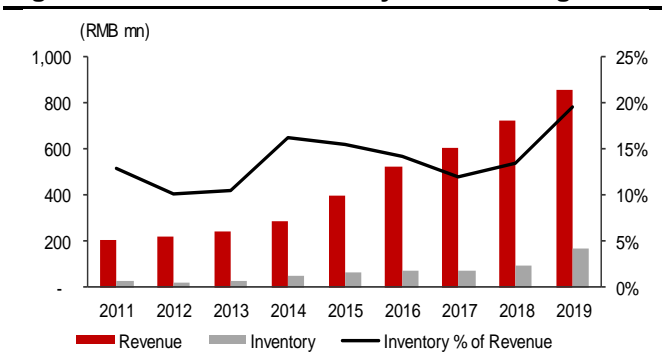
Figure 10: US-China dispute timeline and performance of MSCI China IT Index



Source: Bloomberg, CMBIS

Limited impact on China 5G network rollout in 2021. Despite the US bans, we are less concerned on 5G base station supply thanks to Huawei's aggressive semi inventory build-up in past two years. We believe Huawei has enough inventory of critical semi (e.g. FPGA, RF) to fulfill China 5G BTS demand in 2021, and China 5G rollout will launch at a moderate pace onwards. In addition, we believe Huawei is switching to alternative non-US chips or lower-performance domestic chips, and other equipment vendors like ZTE will also pick up Huawei's market shares in China and overseas. Most recently, US restriction is loosening with several firms obtaining US licenses (Fig 12) and we are positive on gradual relaxation of existing restrictions on Huawei ahead.

Figure 11: Huawei's inventory level is rising



Source: Huawei, CMBIS

Figure 12: Recent US approvals for supply to Huawei

Date	Supplier	Related products
19 Sep 2020	AMD	PC/NB/server processors
23 Sep 2020	Intel	PC/NB/server processors
27 Oct 2020	Samsung Display	Display panels
4 Nov 2020	Skyworks	RF/PA mobile/network chips
14 Nov 2020	Qualcomm	Mobile SoC/modem chips
20 Nov 2020	US Commerce Department	Approved 1/4 of 300 license applications
22 Nov 2020	Microsoft	OS, software

Source: Company data, CMBIS

Technology decoupling and import replacement taking center stage

COVID-19 revealed the vulnerabilities of global supply chain. Besides ongoing US-China's tension since 1H19, COVID-19 outbreak has sparked widespread concerns of China technology self-sufficiency and global companies' dependence on Chinese supply chain. For instance, while COVID-19 impact in China led to production disruptions to overseas customers in 1Q20, Chinese companies such as optical transceiver vendors also faced challenges to source semi components from overseas suppliers during the outbreak.

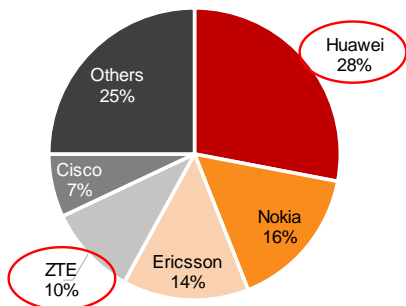
As a result, we expect global companies to diversify supply chain locations from China, and Chinese companies will expand localization to mid/downstream supply chain, such as semiconductors and core components. In particular, we believe domestic leaders in antenna, CCL/PCB and optical modules will accelerate market share gain in next few years.

Figure 13: 5G equipment supply chain self-sufficiency by component

Components	Foreign suppliers	Domestic suppliers	Self-sufficiency
FPGA	Xilinx, Intel/Altera, Lattice	Guoxin Micro, Fudan Micro, Hisilicon, Sanechips	Low
CPU/ ASIC	Intel, AMD	Zhaoxin, Hygon	Low
RF	Qorvo, Skyworks, Broadcom, Murata	Hisilicon, DSBJ	Low
ADC, DAC, DSP	TI, ADI, ST	Hisilicon, SG micro	Low
PA, LNA	NXP, Sumitomo, Qorvo, Ampleon	Hisilicon	Low
Optical module	Mitsubishi, Lumentum, Oclaro, Finisar	Accelink, Innolight, HGTECH, Eoptolink	Medium
Optical fiber	Sumitomo, Fujikura, Corning	YOFC, Hengtong, Fiberhome	High
PCB, CCL	Rogers, Panasonic, TTM	Shennan Circuits, Shengyi Tech, WUS	High
BTS Antenna	Kathrein, Commscope	Huawei, Tongyu, Comba	High
Filter	Comscope	Fingu, DSBJ, C&Q Tech	High

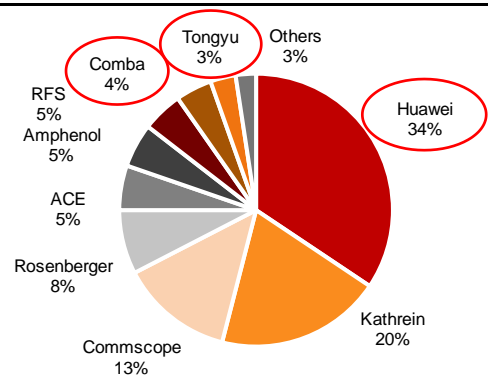
Source: CMBIS

Figure 14: Global telecom equipment market (2019)



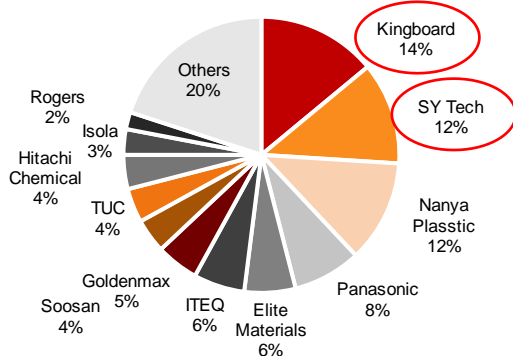
Source: Dell'Oro, CMBIS

Figure 15: Global BTS antenna market (2018)



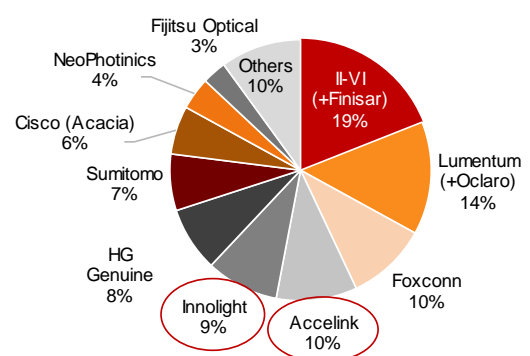
Source: ABI Research, CMBIS

Figure 16: Global rigid CCL market (2018)



Source: Prismark, CMBIS

Figure 17: Global optical module market (2019)



Source: Ovum, CMBIS

Figure 18: China semi localization to benefit domestic players

Industry	Overseas players (shr %)	Region	Leading technologies	Mainland China players
Semi manufacturing				
Foundries	TSMC (51%)	TW	Planned MP of 5nm in 2020E	SMIC 中芯国际 (6%)
	Samsung (19%)	KR	Planned MP of 5nm in 2020E	
	UMC (12%)	TW	MP of 14nm	
	Global Foundries (11%)	US	MP of 12nm	
Packaging	ASE (23%)	TW		JCET 长电科技 (17%) SMIC and JCET established joint venture
	Amkor (19%)	US		
	SPIIL (13%)	TW		
IC design				
Baseband chip	Qualcomm	US	Snapdragon X55	Hisilicon 海思
CMOS chip	Sony (50%)	JP		OmniVision (10%) acquired by 韦尔股份 launched 64MP with 0.7 micron pixels
	Samsung (20%)	KR		
Power mgt. chip	TI (20%), ADI, Maxim, Infineon	US		SGMicro 圣邦股份
RF chip	Broadcom, Skyworks, Qorvo	US		Maxscend 卓盛微, Vanchip 唯捷创芯
	Murata	JP		
Flash memory IDM				
DRAM	Samsung	KR	1.3mn+ capacity/month	CXMT 合肥长鑫 to reach 125k capacity/month
	SK Hynix	KR		GigaDevice 兆易创新
	Micron	US		
Nand Flash	Samsung	KR	MP of 96-layer 3D NAND	YMTC 长江存储 launched 128-layer NAND in Apr 2020
	Toshiba	JP		Tsinghua Unigroup 紫光集团
	Micron	US		

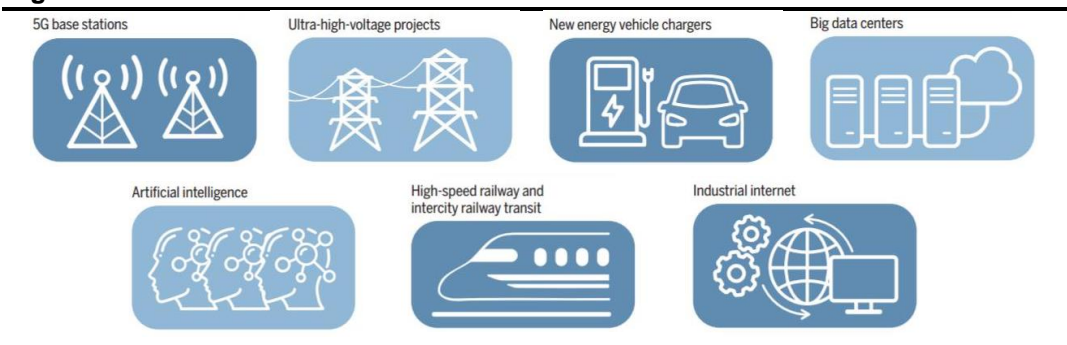
Source: Trendforce, IC Insights, Qianzhan, CMBIS

New Infrastructure Initiative to drive 5G investment

China to accelerate digital infrastructure upgrade. To support economic growth and make strategic investments for post-pandemic recovery, the Standing Committee of the Political Bureau of CPC Central Committee announced on 4 Mar 2020 to accelerate construction of new infrastructure such as 5G networks and data centers. On 20 Apr 2020, NDRC addressed the scope of the initiative to include 1) information infrastructure (5G, IoT, AI, cloud computing, data center, etc.), 2) integration infrastructure (smart transportation, smart energy), and 3) innovation infrastructure (scientific research, science education, etc.)

As the core national digital infrastructure, 5G network will be the key foundation to drive long-term competitiveness of the economy, which will support emerging applications in industrial internet, AI, autonomous driving and Smart City. We believe China will lead global post-epidemic 5G network deployment. Total investment in China 5G network construction will reach RMB1.2tn by 2025, and investment in 5G supply chain will exceed RMB3.5tn in next five years, according to CAICT.

Figure 19: 7 sectors of new infrastructure initiative



Source: CCTV, CMBIS

Figure 20: 5G to facilitate innovation in vertical industries

Vertical industries	
Medical	Medical network of 5G BTS (≥30), hospitals (≥20), ambulance (≥10)
	Smart medical platform of diagnostic scenarios (≥10), hospital and medical institutions (≥80)
	Intelligent medical imaging diagnosis
	Remote /collaborative consultation, VR/drone first aid
	Intelligent plant of 5G BTS (≥10), MEC (≥2)
	5G-capable terminals on 20 kinds and 1,000 deployments
Power system	5G power services (≥20)
	Smart power terminals with timing functions (≥200)
	Smart grid platform of 5G BTS (≥50), MEC (≥2), terminals (≥1,000), and application scenarios (≥20)
C-V2X	Installation of terminals on vehicle (≥200) and road test (≥200)
	Trial in 1 or 2 major cities
Education	5G BTS (≥100) and MEC (≥2), supporting network slicing
	5G HD live teaching/monitoring, AR/VR remote teaching, and 500 deployments
Logistic	Building 5G BTS (≥30) in more than 5 ports
	Intelligent loading system of remote-controlling gantry cranes and shore bridges
	5G+AI intelligent tally system of shore bridges (≥20)
Ultra HD video	Unmanned transport vehicles (≥15) in 5 ports
	Supporting source aggregation, signal scheduling, transcoding production, content broadcast control, and broadcast distribution capabilities for 4K / 8K oversized code streams

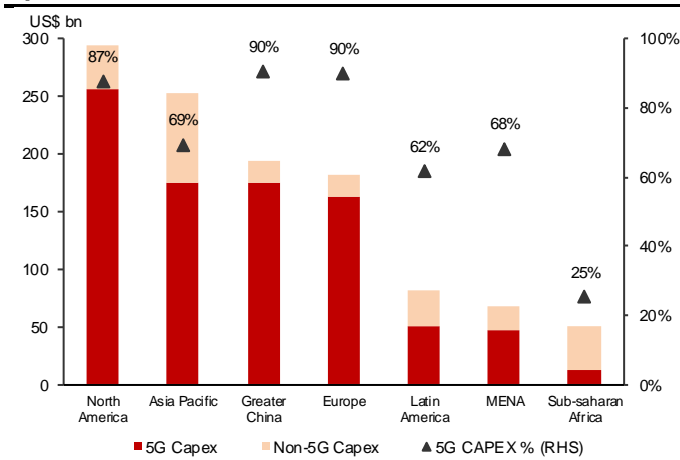
Source: NDRC, MIIT, CMBIS

China leads global 5G development post COVID-19

Global 5G network rollout slightly impacted by COVID-19. According to GSMA, global telecom operators will spend US\$900bn on 5G CAPEX during 2020-25E and global 5G subscription will reach 20% penetration by 2025E. US, China, Japan and South Korea are now leading 5G network deployment during 2018-20E, while Europe and MENA will start to ramp during 2021-23E.

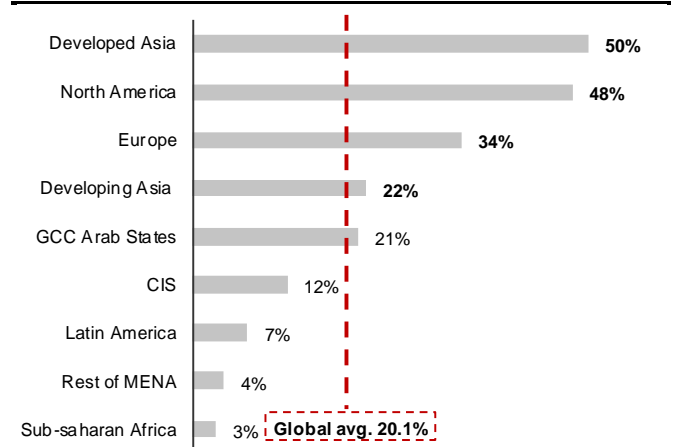
Given COVID-19 impact on spectrum auction delays and supply chain disruption in Europe, we believe 5G deployment in Europe will be postponed by one to two quarters to 1H21E. Compared to overseas 5G deployment, we are more positive on China 5G network progress given operators' accelerated 5G rollout and rapid supply chain recovery after COVID-19 in 1H20.

Figure 21: 5G capex accounts for 80% of US\$ 1.1tr operator investments in 2025E



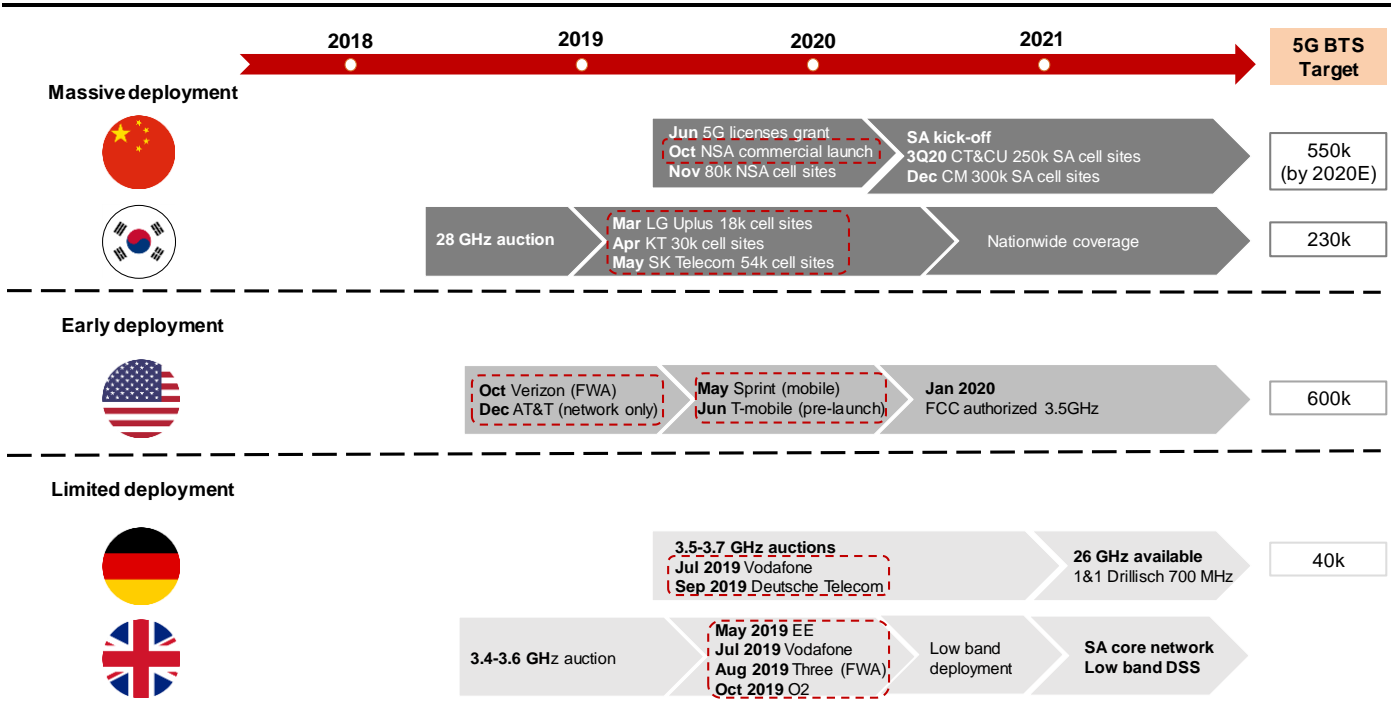
Source: GSMA, CMBIS

Figure 22: Global 5G subscription increases to 20% in 2025E



Source: GSMA, CMBIS

Figure 23: 5G implementation timeline in major markets



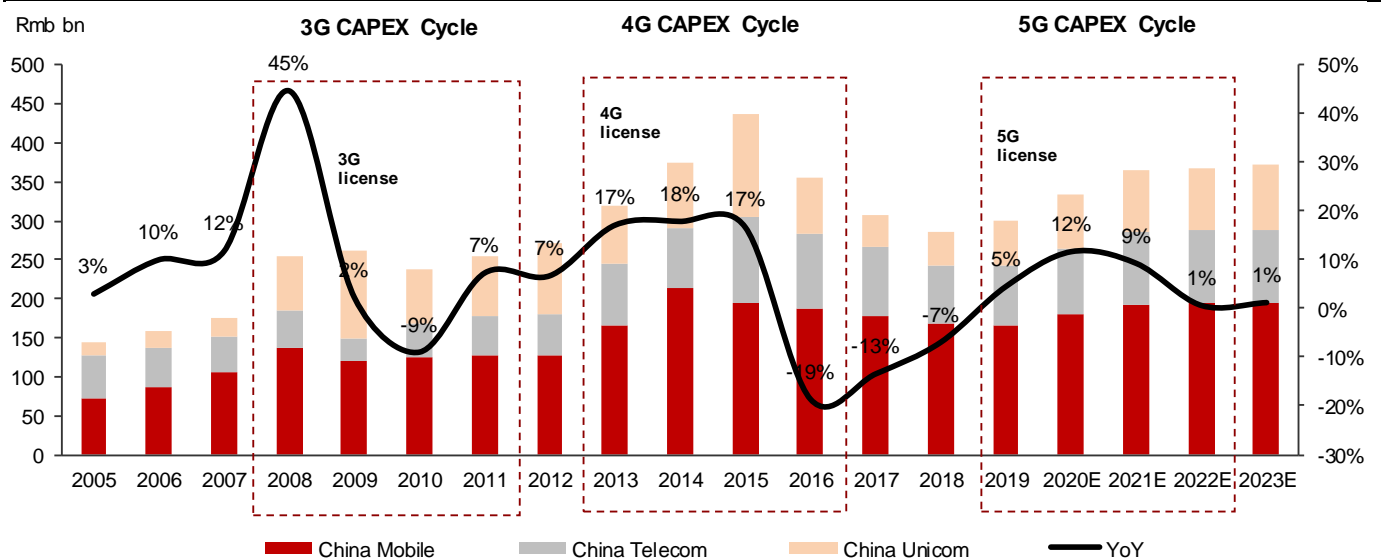
Source: CCID, 5G observatory, Samsung, CMBIS

China to establish the world's most extensive 5G SA deployment. While global 5G deployment is expediting in 2020E with three-fold increase in 5G BTS (1.5mn vs 500k in 2019) and multifold increase in 5G subscribers (250mn vs 10mn in 2019), we believe China is leading the frontier of 5G development, accounting for 50% of global capex spending and 70% of 5G users. During 2020-25E, China plans to invest RMB 900bn-1.5tn in 5G network development, based on CAICT.

Following China 5G service launch with NSA network in Nov 2019, China Mobile (CM) has deployed large-scale 5G SA network in 4Q20E, while China Telecom (CT) and China Unicom (CU) also launched 5G SA network in 3Q20.

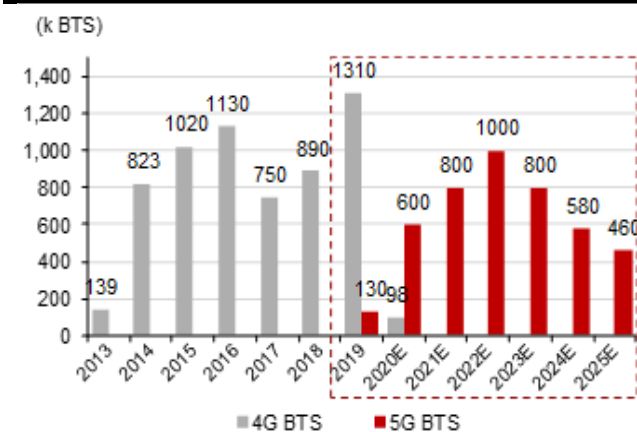
China 5G BTS net adds estimates to reach 600k/800k/1.0mn in FY20-22E. With 3.5GHz and 2.6GHz being allocated for 5G network in China, we estimate China will deploy 6.64mn 5G BTS in 5G era, ~1.1 times of 4G BTS, considering that 1) 3.5GHz will require double 5G BTS for same coverage in 4G network, 2) legacy 2.6GHz can save more than half of BTS needed, and 3) 700MHz for wide area coverage will require less than one-fifth 5G BTS compared to 3.5GHz. Thus, we estimate China 5G BTS will reach 730k/1.53mn/2.53mn in FY20/21/22E, implying 600k/800k/1.0mn 5G BTS net adds respectively.

Figure 24: 3G/4G/5G capex cycle of Chinese telecom operators during 2005-2023E



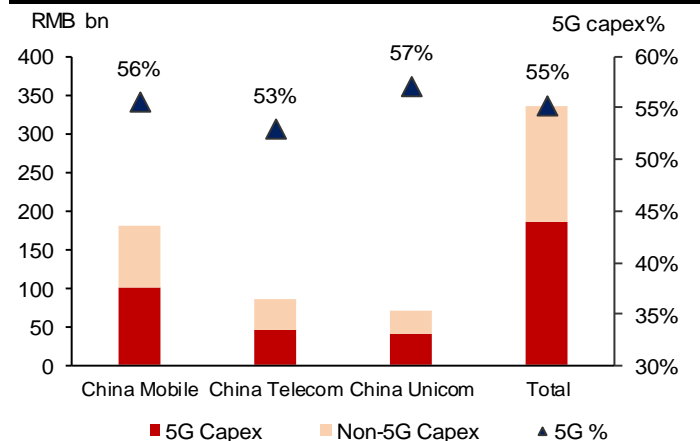
Source: CM, CT, CU, Bloomberg, CMBIS

Figure 25: China 4G/5G BTS net-add forecasts



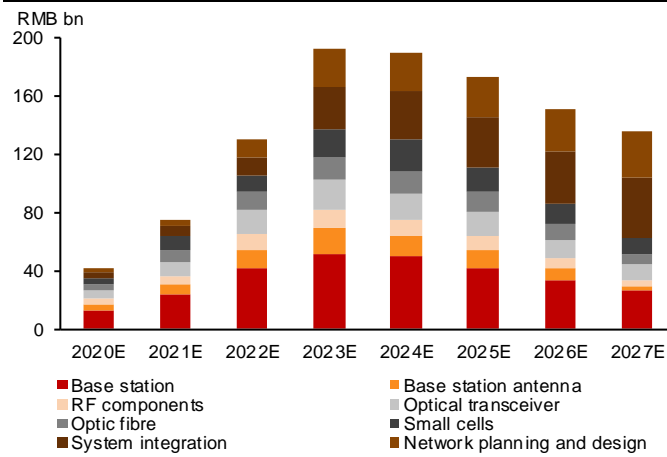
Source: China Mobile, China Unicom, China Telecom, CMBIS

Figure 26: 5G accounts for 50%+ of telco FY20E capex



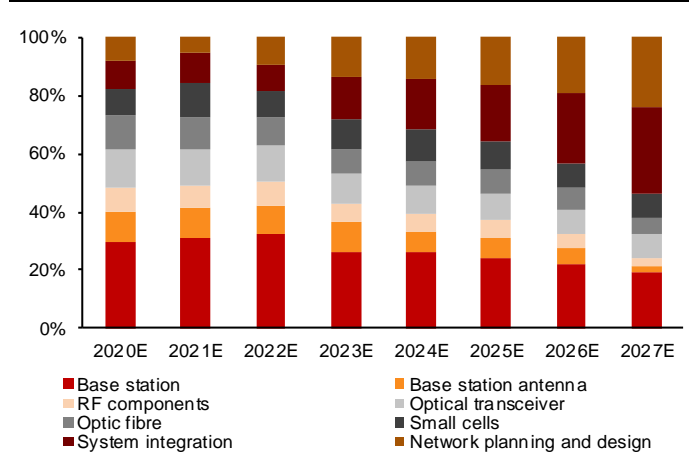
Source: CM, CT, CU, CMBIS

Figure 27: China 5G CAPEX forecast



Source: CCID, CMBIS

Figure 28: China 5G CAPEX breakdown



Source: CCID, CMBIS

Figure 29: Chinese operators' 5G development strategy and timeline

	China Mobile		China Unicom		China Telecom	
	2019	2020E	2019	2020E	2019	2020E
5G capex (RMB bn)	24.0	105.0	7.9	35.0	9.3	45.3
Total capex (RMB bn)	165.9	179.8	56.4	70.0	77.6	85.0
5G capex %	14%	73%	14%	50%	12%	53%
Target 5G BTS Add	1H20/ 2020E		1H20/ 3Q20E			
	138k/ 300k		150k (CU/CT 60k/90k) / 250k (CU/CT 110k/140k)			
Target 5G Sub Add	2020E		2020E		2020E	
	100mn		50mn		80mn	
Strategy	<ul style="list-style-type: none"> • “Customer” market: Ultra HD interactive live broadcasts, VR/AR • “Home” market: “Speedy Broadband + 5G”, smart families • “Business” market: 100 classic 5G demonstrative projects 		<ul style="list-style-type: none"> • ST: consumer market: HD/4K/8K video, AR/VR, cloud gaming; 5G pan-smart device ecosystem; 5G touchpoint & O2O multi-dimensional scenario • LT: enterprise market: key industries applications (new media, industrial Internet, transportation, education, medical care & cultural tourism) 		<ul style="list-style-type: none"> • 2C: “5G + privileges + applications” service model for individuals; ultra HD VR • 2H: “5G + Gbps broadband + Smart Family applications” for family informatization • 2B: 5G + digital government / smart cities / industrial Internet by integrating edge computing, industrial PON and other new technologies 	

Source: CM, CT, CU, CMBIS

New use cases to trigger investment across network domains

Spurring innovation of new 5G use cases: eMBB, mMTC, uRLLC

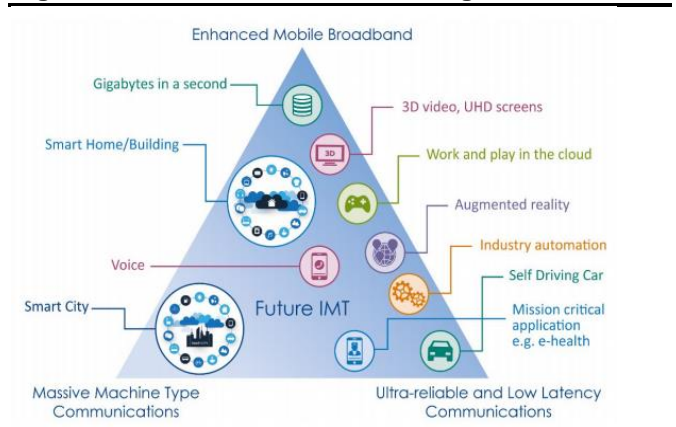
- **eMBB (Enhanced Mobile Broadband) for faster data speeds (10Gbps+ peak).** A wide array of available spectrum bands from low bands (below 1GHz), mid bands (1 GHz to 6 GHz) to high bands (millimeter-wave) will allow for higher traffic capacity, upgrading smartphone usage and facilitating new applications, such as VR/AR, 3D/UHD video, HD voice, cloud game, and cloud offices.
- **mMTC (Massive Machine Type Communications) for increased connectivity (1mn device connections per km²),** which can serve vast sensor networks and bring the Internet of Things (IoT) to real life, such as smart city, smart agriculture, smart home and remote monitoring.
- **uRLLC (Ultra Reliable & Low Latency Communications) for lower latency (1ms),** which will enable mission-critical services and transform industries with ultra-reliable/available and low latency links, such as industry automation, autonomous driving, smart grids and intelligent transportation.

Figure 30: KPI for 4G LTE vs. 5G

KPI	4G LTE	5G	Use case
Area traffic capacity	0.1 Mbit/s/m ²	10 Mbit/s/m ²	eMBB
User experienced data rate	10 Mbit/s	100 Mbit/s	eMBB
Peak data rate	1 Gbit/s	20 Gbit/s	eMBB
Spectrum efficiency	1x	3x	eMBB
Network energy efficiency	1x	100x	eMBB
Connection density	100k devices/km ²	1000k devices/km ²	mMTC
Mobility	350 km/h	500 km/h	uRLLC
Latency	10 ms	1 ms	uRLLC

Source: IMT-2020, CMBIS

Figure 31: 5G addresses a wide range of use cases



Source: ITU, CMBIS

Necessary technology breakthroughs to propel 5G. To increase throughput of 5G networks, innovative technologies are deployed for RAN infrastructure, including: 1) RF architecture to support intensive new air interfaces (e.g. mass-scale MIMO), 2) network slicing/ cloudification for flexible usage of spectrum, and 3) integrated transmission design to enable highly-dense network of access and backhauling.

Figure 32: Key characteristics across spectrum bands

Characteristic	Sub-6GHz		High band 24-40 GHz
	<1 GHz	1-6 GHz	
Characteristic	Ubiquitous coverage	High capacity Low latency Wide coverage	Ultra high speed Extremely low latency
Area	Rural	Urban and sub-urban	Dense urban
Use case	mMTC eMBB	mMTC eMBB uRLLC	eMBB
	TV broadcasting, Multimedia services, Voice services	Environmental monitoring, Smart cities, Mission critical services – security, Critical IoT	Industrial IoT/ Fixed wireless access/ High-definition cloud gaming/ Real-time AR

Source: Deloitte, CMBIS

Figure 33: New technologies enabling 5G features

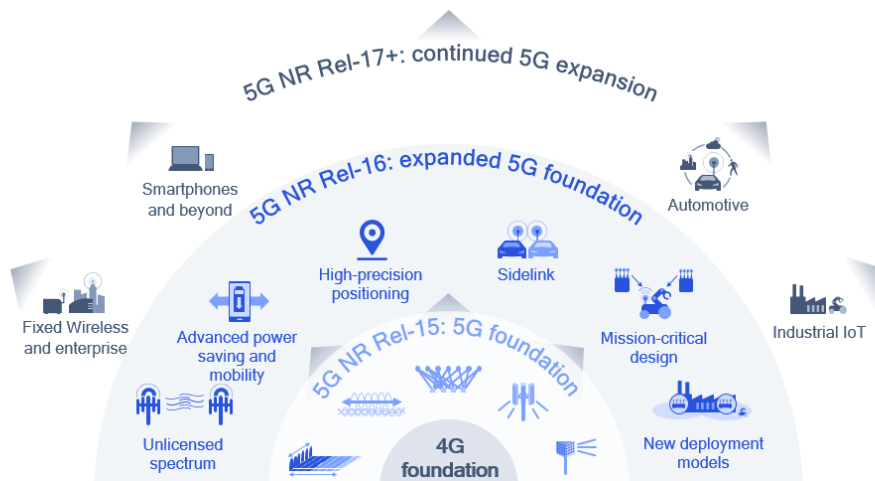
	Wide coverage (eMBB)	High traffic (eMBB)	uRLLC	mMTC and power efficiency
Massive MIMO	✓	✓		
Multiple Access	✓	✓	✓	✓
Carrier Aggregation				
LDPC coding	✓	✓	✓	✓
Spectrum access			✓	
Ultra dense network			✓	

Source: CMBIS

R15 (eMBB) and R16 (uRLLC) completed; R17 (mMTC) delayed to Dec 2020. While Release 15 (R15) for eMBB and Release 16 (R16) for uRLLC were completed in Jun 2019 and July 2020, 3GPP announced to delay the freeze date of Release 17 (mMTC) to Dec 2021 due to COVID-19. R16 brings in a lot of new concepts to 5G, and further improves and optimizes many of the features introduced in R15. New features include the following.

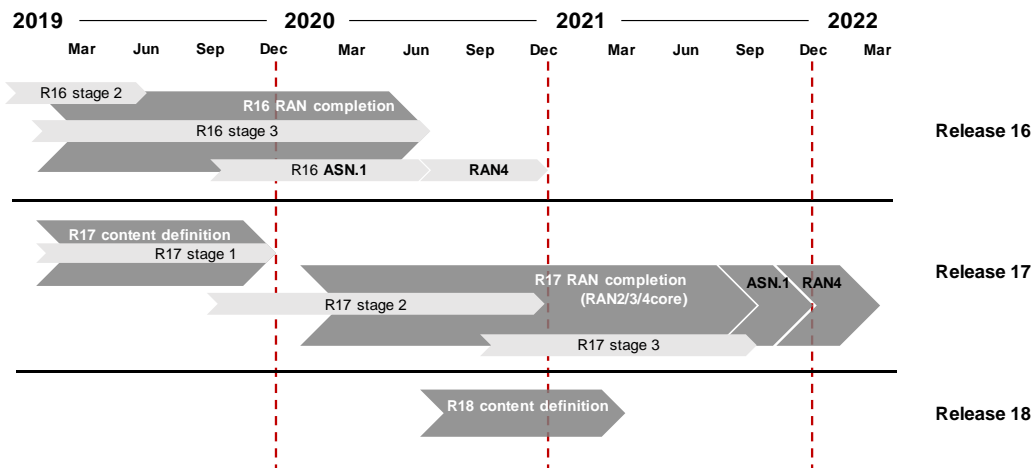
- **Unlicensed Spectrum (NR-U)** that allows operators to utilize unlicensed spectrum and expand their coverage and capacity of 5G network.
- **Integrated Access Backhaul (IAB)** that enables cost-effective and efficient 5G deployments by using wireless for both access and backhaul networks.
- **Sidelink (C-V2X)** to expand device-to-device connectivity in new applications such as public safety and emergency services.
- **Time Sensitive Networking (TSN)** that enables 5G Industrial IoT (IIoT) in factories for industry 4.0 transformation.
- **High-precision Positioning** that provides sub-meter level accuracy through cellular network and enables applications such as public safety and indoor navigation.

Figure 34: Release 16 to deliver enhancements to 5G technology foundations



Source: Qualcomm, CMBIS

Figure 35: New 3GPP Release timeline

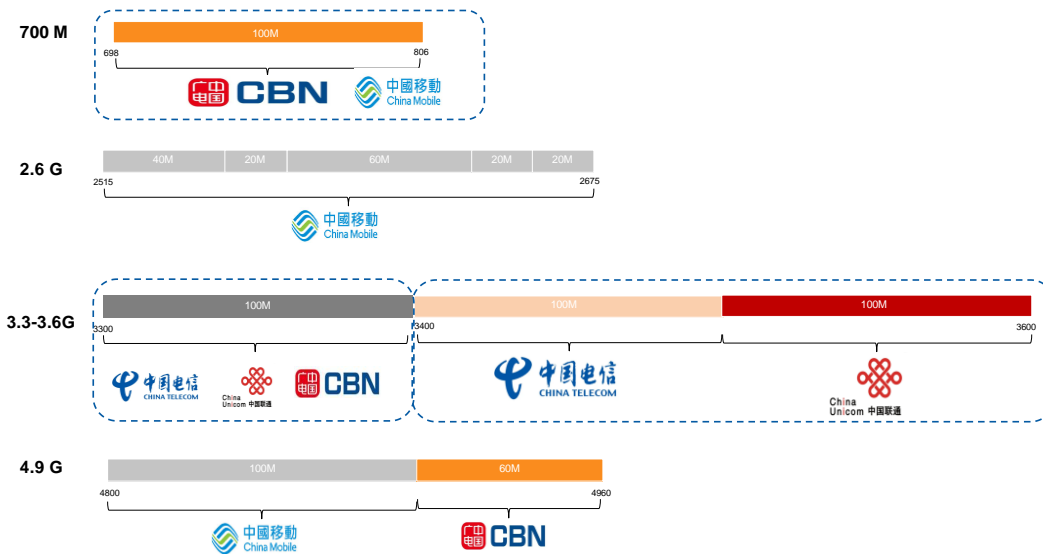


Source: 3GPP, CMBIS

Co-build Co-share: spectrum sharing to accelerate 5G rollout

Upon receiving 5G licenses in 2019, Chinese operators announced to co-build 5G RAN network and co-share 5G spectrum resources: 1) China Unicom (CU) and China Telecom (CT) to share 3.4-3.6GHz, 2) China Mobile (CM) and China Broadcasting Network (CBN) to share 700MHz, 3) CBN, CT and CU to share 3.3-3.4GHz indoor coverage. Multi-Operator Core Networks (MOCN) will be adopted, where operators will share baseband, frequencies, service deployment and license, while 5G core networks will be constructed by each operator respectively.

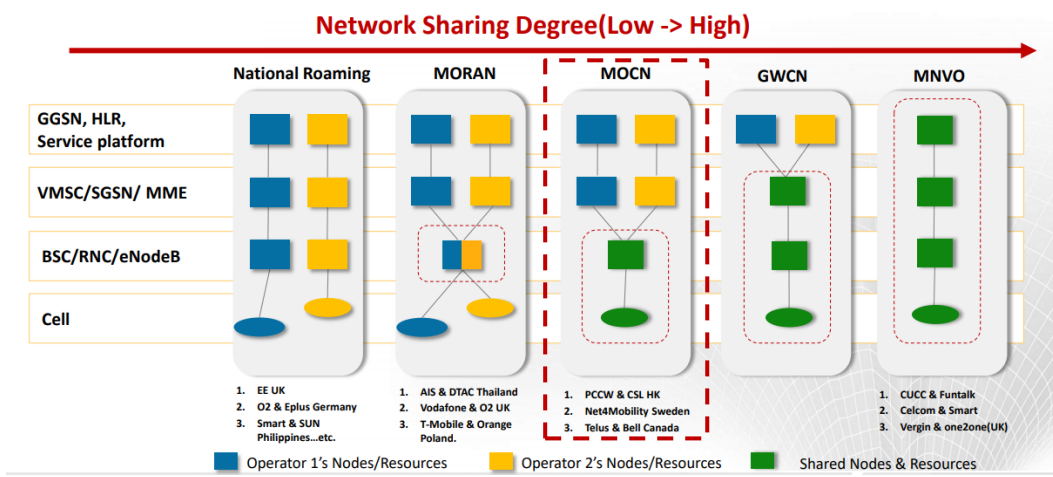
Figure 36: 5G spectrum allocation for 4 telco operators in China



Source: CU, CT, CBN, CMBIS

We believe major benefits include: 1) CU/CT's network sharing can improve the quality and coverage for their high-band 3.4-3.6GHz spectrum, which has inferior network coverage to CM's 2.6GHz spectrum, and 2) CM can leverage CBN's 700MHz spectrum to expand network coverage and save capex with less BTS density, which can complement CM's 2.6GHz spectrum. Overall, we believe this co-build/co-share initiative will improve spectrum utilization, promote 5G construction, and reduce capex to a great extent.

Figure 37: Infrastructure sharing types



Source: GSMA, Huawei, CMBIS

CT/CU: Co-build 5G BTS by Southern/Northern region

CT and CU announced to launch NSA services in 1H20 and achieved co-build 250k 5G BTS by 3Q20. According to the agreement, CU and CT will co-build 5G networks in 15 major cities – CU as main operator in 5 northern cities and CT in 10 southern cities, with the aim of rationalizing legacy networks.

Figure 38: 5G co-build/co-share mode between CT and CU

Regions	Cities	CT	CU
Northern regions	Beijing, Tianjin, Zhengzhou, Qingdao, Shijiazhuang	40%	60%
Southern regions	Shanghai, Chongqing, Guangzhou, Shenzhen, Hangzhou, Nanjing, Suzhou, Changsha, Wuhan, Chengdu	60%	40%
Others	9 cities in Guangdong 5 cities in Zhejiang 8 northern provinces	-	100%
	9 cities in Guangdong 5 cities in Zhejiang 17 northern provinces	100%	-

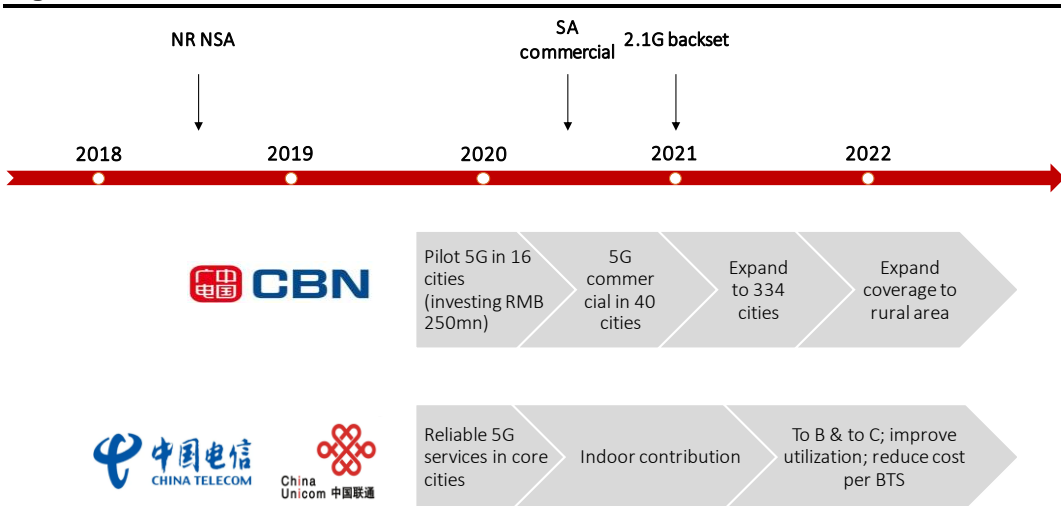
Source: China Telecom, CMBIS

CBN: 700MHz spectrum sharing with China Mobile

CBN was granted with commercial 5G license in 4.9GHz and 700MHz band, and planned to roll out SA in 2021. 700MHz spectrum was capable of providing 5G to an area five times that of 3.5GHz, and we estimate 450k BTS for 700MHz to satisfy nationwide coverage (vs 3+mn BTS for 2.6G/3.5GHz).

In May 2020, CM and CBN announced to jointly construct 700MHz network with shared right-of-use and investment and CM will provide transmission network and 2.6GHz network to CBN on a paid basis. We expect CM/CBN will start first phase of 700MHz 5G BTS tender (200-250k size) in 1Q21E, and total number of 700MHz 5G BTS will reach 450-500k in 2021E.

Figure 39: 5G launch schedule of CU/CT and CBN co-share timeline



Source: CU, CT, CBN, CMBIS

Improved spectrum utilization; substantial CAPEX/OPEX savings

We identified three major benefits from leveraging sites for dual network operation.

First, user data speeds will be increased from access to a wider bandwidth when at high traffic loads. Second, significant capex/opex savings in both construction and maintenance costs, such as tower usage fee, network maintenance expense, and power charges. Lastly, spectrum sharing can enable network slicing to achieve low latency.

Figure 40: Economics of RAN sharing benefits

Type of sharing	Total savings	CAPEX savings	OPEX savings
Passive infra. Sharing	32%	16-35%	16-35%
Active infra. Sharing (excl. spectrum)	58%	33-35%	25-35%
Active infra. Sharing (incl. spectrum)	63%	33-45%	30-33%

Sharing stage for active sharing		CAPEX synergy	OPEX synergy
Initial roll-out	Bulk of sites and nodes to be deployed	<ul style="list-style-type: none"> • Spectrum • Electronics • Fiber 	<ul style="list-style-type: none"> • Site lease • Electricity • Telco services
Steady state	Mainly capacity additions and coverage maintenance	Medium	Low given to reduced site locations
Upgrade	Active element/node replacement, technology migration, site consolidation	Substantial	Low given to reduced site locations

Source: IEEE, CMBIS

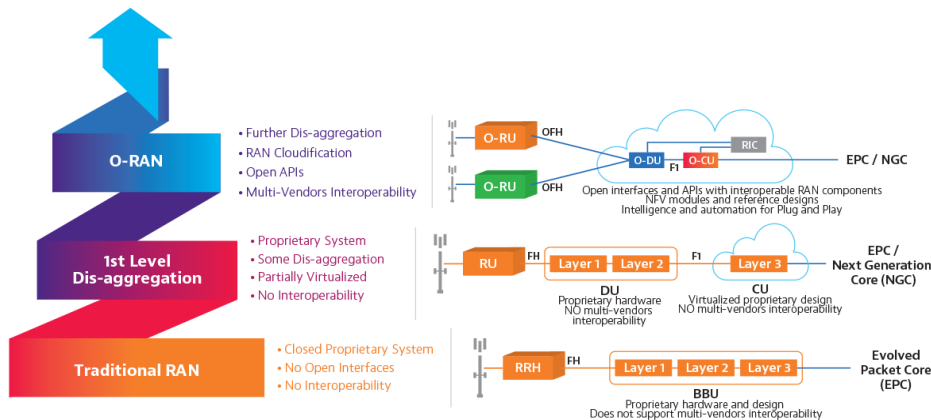
Open-RAN: Potential game changer

O-RAN to enable a more competitive and vibrant RAN supplier ecosystem. An Open Radio Access Network (O-RAN) is a concept that encompasses interoperability and standardization of RAN elements including a unified interconnection standard for white-box hardware and open source software elements from different vendors. The primary goal of O-RAN is to switch from expensive, proprietary RAN solution to an open, competitive model where RANs become multi-vendor environments featuring commodity hardware with standardized interfaces running virtualized network elements in the cloud.

O-RAN to solve “vendor lock-in” problem with CAPEX/OPEX savings. Major benefits of O-RAN include 1) CAPEX reduction through multi-vendor ecosystem with scale economics, 2) OPEX savings through machine learning technologies to automate network functions, 3) Improvement of network efficiency and performance with RAN automation, and 4) Capability of importing new network capability via easy software upgrade.

Some major markets to accelerate O-RAN adoption. O-RAN ALLIANCE was founded in February 2018 by AT&T, China Mobile, Deutsche Telekom, NTT DOCOMO and Orange. Vodafone started O-RAN live traffic on its network in Turkey since 2019, and launched O-RAN deployment in UK in 2020. Telefonica is also trialing O-RAN in Germany, Spain, UK and Brazil. AT&T is running a commercial O-RAN site in Dallas, Texas. Orange announced deployment in Central African Republic, and Deutsche Telekom is working with German government to mandate the use of O-RAN in new legislation.

Figure 41: Open RAN vs. Traditional RAN



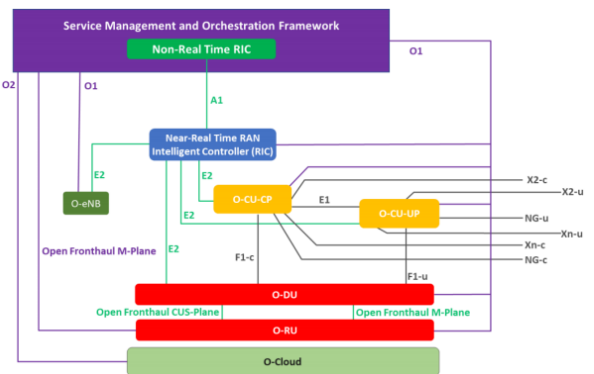
Source: Viavi, CMBIS

Figure 42: O-RAN Alliance operators



Source: O-RAN Alliance, CMBIS

Figure 43: Open RAN logical architecture



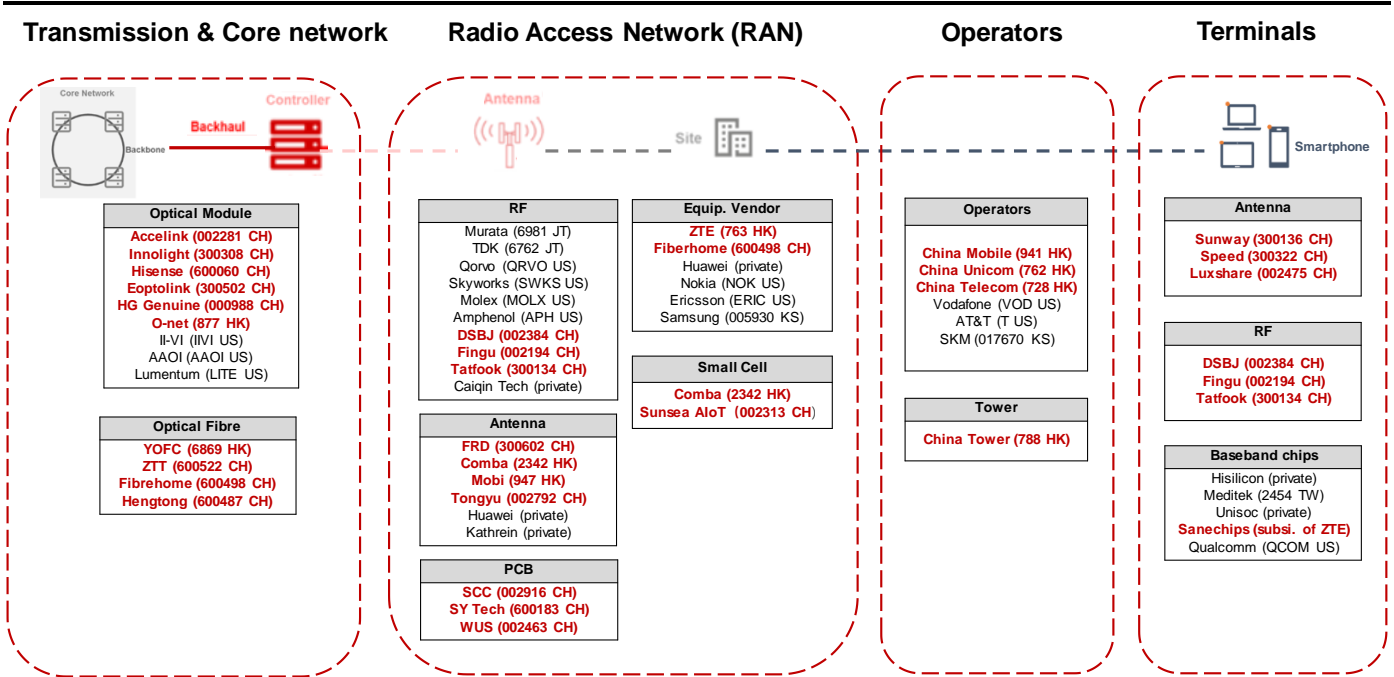
Source: O-RAN Alliance, CMBIS

Capturing opportunities along 5G value chain

We believe 5G is set to unleash a wave of investment opportunities along the supply chain, and the following areas will benefit from 5G/IDC CAPEX and innovation cycle.

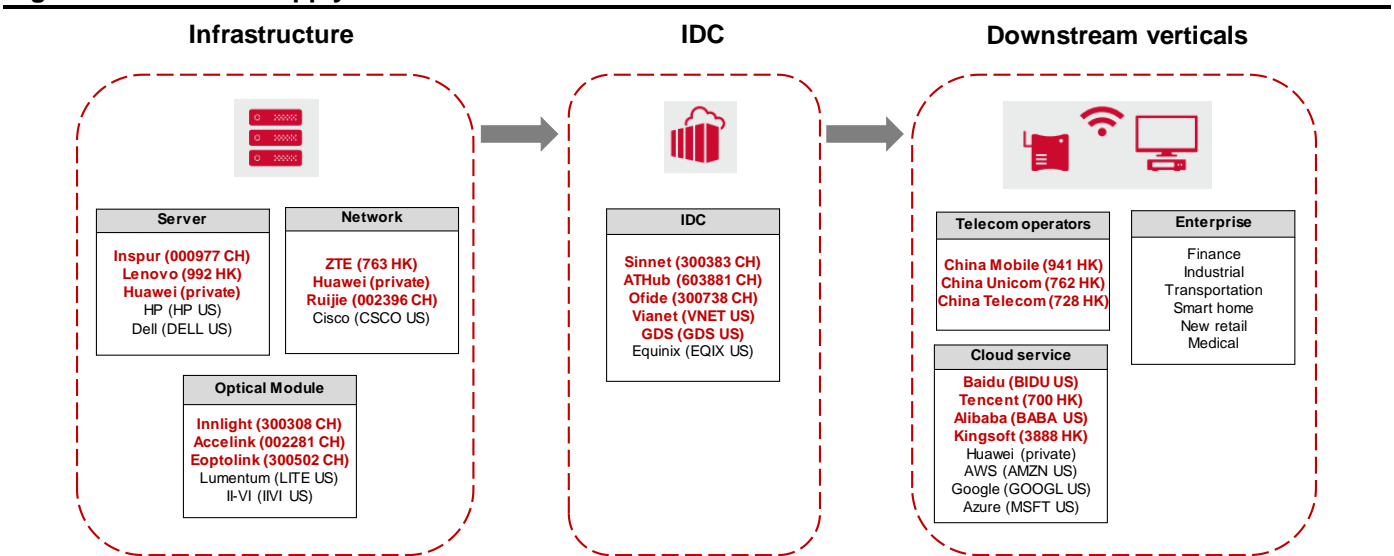
- 1) Large-scale deployment of 5G base stations and tower services
- 2) Upgrades in 5G BTS components, especially RF modules and antenna
- 3) Increasing demand for high-end PCB/CCL and substrates in 5G wireless network
- 4) Higher demand for optical transceivers and optical fiber in 5G transmission network
- 5) Rapid adoption of cloud computing and 5G applications to boost IDC market

Figure 44: 5G network supply chain



Source: CMBIS

Figure 45: Datacom supply chain



Source: CMBIS

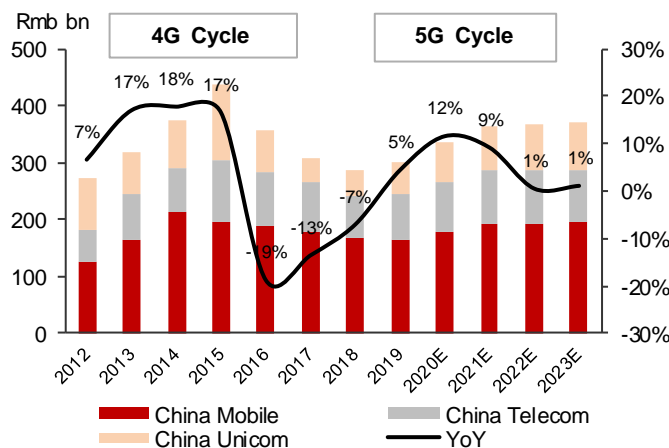
Network equipment: China 5G BTS to re-accelerate in 1H21E

5G wireless network can be divided into radio access network (RAN) and transmission/core network. The RAN comprises of base transceiver stations (BTS) with antennas to transmit wireless signals between user terminals and the core network, while transmission/core network provides coordination between different parts of the RAN and provides connectivity to the internet. RAN equipment takes up the largest portion of total 5G CAPEX. We expect China 5G RAN equipment market to reach RMB26bn/104bn/143bn/130bn/96bn in FY19/20/21/22E, implying 39% CAGR 2019-23E.

China 5G BTS net add to reach 600k/800k/1.0mn in 2020/21/22E. We believe over 50% of Chinese telcos' capex will be invested into radio access network during 5G cycle. Overall, three Chinese telcos have achieved 5G BTS net-add target of 550k by early Oct 2020, and we estimate China 5G BTS net-add will reach 600k/800k/1.0mn units in 2020/21/22E. In near term, we expect China Mobile to kick off 3rd phase of 5G BTS tender (200-250k size) in late Dec, and CM/CBN will start 1st phase of 700MHz 5G BTS tender in 1Q21E.

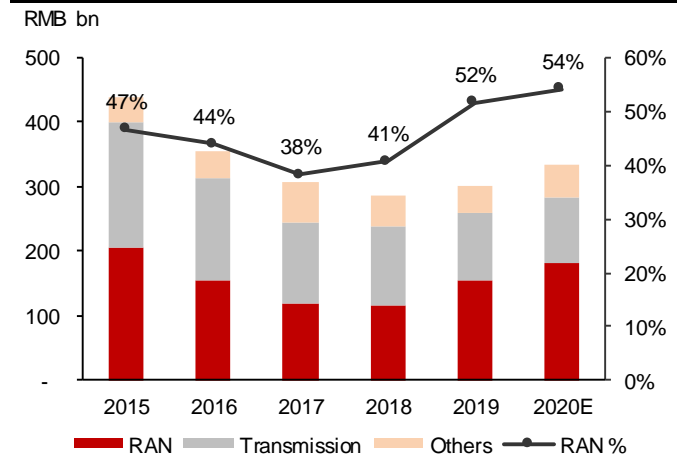
5G BTS price to decline to RMB 146k/125k in 2020/21E. In CT/CU's 2nd 5G tender (Apr 2020) and CM's 2nd 5G tender (Mar 2020), we noticed 5G BTS price was RMB 132k and RMB 160k, respectively, compared to ~RMB 200k in CM's 1st 5G tender in Oct 2019. We forecast that as 5G deployment scales up, 5G BTS price will come close to RMB 146k/125k in 2020/21E, compared to RMB 65-80k for 4G BTS.

Figure 46: China 5G capex cycle during 2019-23E



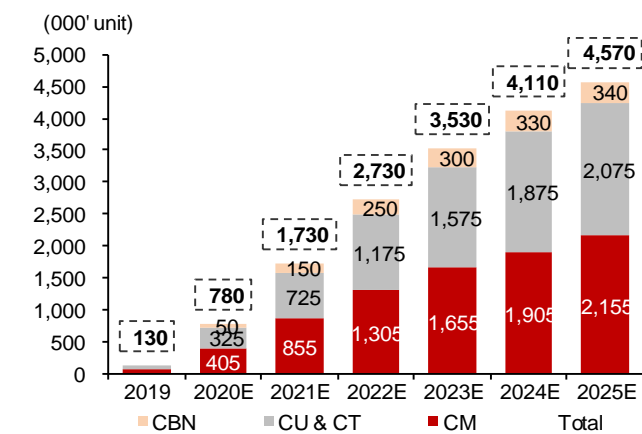
Source: CMBIS

Figure 47: RAN to 54% of China telco capex in 2020E



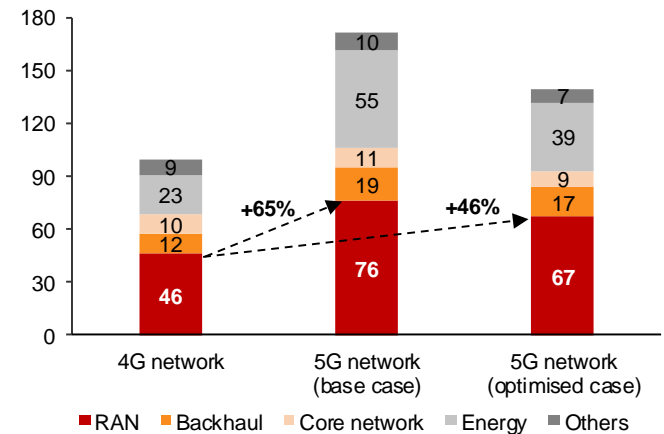
Source: CM, CU, CT, CMBIS

Figure 48: China 5G BTS forecast (2019-23E)



Source: CMBIS estimate

Figure 49: 5G network will cost much higher than 4G



Source: GSMA, CMBIS *4G indexed to 100

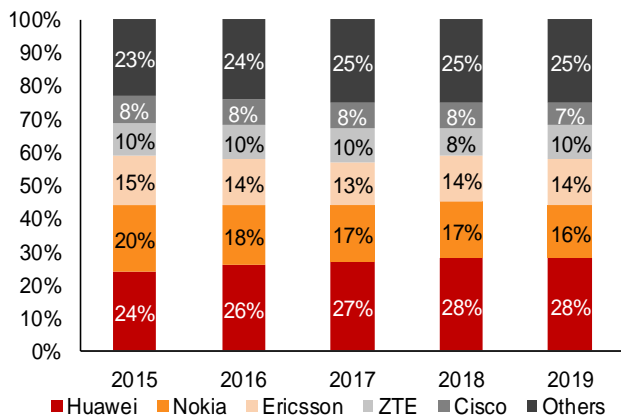
Huawei/ ZTE: China 5G demand intact despite overseas uncertainties

US ban weighing on semi procurement. Based on Dell’Oro, Huawei is the global largest telecom equipment vendor with 28% market share in 2019, while Nokia/Ericsson came after with 16%/14% share and ZTE captured 10% share (vs 8% in 2018 with US sanction). Since US placed Huawei on “Entity List” in May 2019, global trade tension escalated as more countries, such as Canada, Japan and Australia, announced to keep Huawei out of their 5G construction. Most recently, US imposed tighter export control on Huawei in Aug 2020 to bar its access to US technology or software for chip development.

Huawei/ZTE to maintain dominant position in China. Backed by Huawei’s semi inventory and ZTE’s share gain, we expect US ban on Huawei will have no impact on China 5G rollout in 2021E. We believe domestic players, Huawei and ZTE, will continue to dominate China market at the expense of Nokia/Ericsson. In recent 2nd phase of 5G BTS tenders in 2Q20, Huawei and ZTE captured 85%+ share allocation, while Ericsson snagged 10% and Nokia lost out due to unfavorable bids.

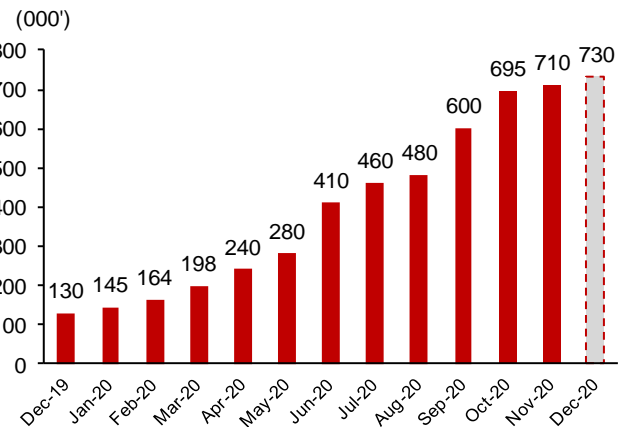
Expect 3rd phase of 5G tenders to kick off in Dec. In order to reduce supply chain risks and optimize cost structure, we believe Huawei and ZTE have redesigned their 5G products in FY20 to reduce reliance on US technology. Following 5G BTS buildout slowdown in 3Q20, we expect China Mobile will start 3rd phase of 2.6G 5G BTS tenders (200-250k size) in late Dec, and CM/CBN will also start 1st phase of 700MHz 5G BTS tender in 1Q21E.

Figure 50: Global telecom equipment market share



Source: Dell’Oro, CMBIS

Figure 51: China 5G BTS deployment progress

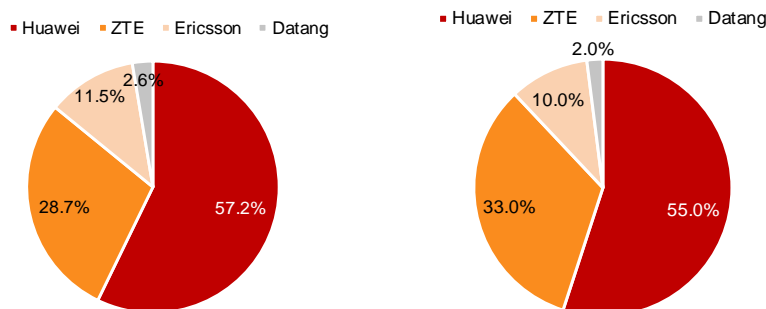


Source: China Mobile, China Unicom, China Telecom, CMBIS

Figure 52: 5G BTS tender results from CM and CU/CT in 2Q20

	CM 2 nd Phase tender (Mar 2020)	CT/CU 2 nd Phase tender (Apr 2020)
5G BTS Volume	232k (RMB 37.1bn)	250k (RMB 32.3bn)
5G BTS ASP	RMB 160k	RMB 132k

Share Allocation (%)



Source: Company data, CMBIS

Overseas uncertainties remain for Huawei/ZTE. Given US’s “Clean Network Initiatives” announced in Aug 2020 and “EU toolbox on 5G Cybersecurity” published in Jan 2020, we believe Chinese equipment players will see near-term pressure in securing overseas 5G contracts, while Ericsson/Nokia/Samsung have been gaining 5G client orders since 1Q20.

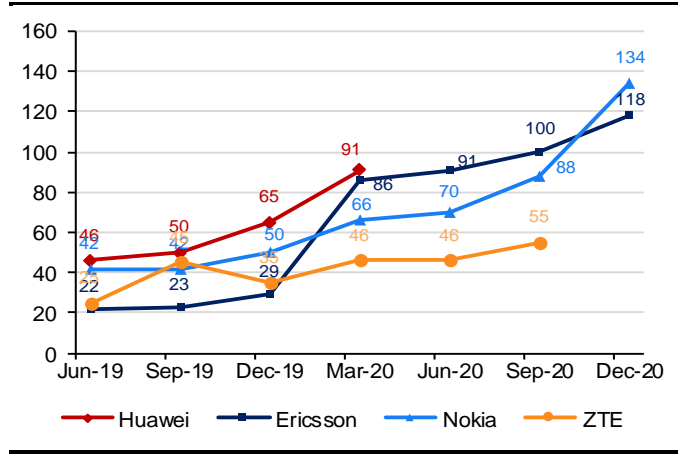
As of Dec 2020, Ericsson and Nokia won 134 and 118 5G commercial contracts respectively, while ZTE reported to have 55 5G contracts as of Sep 2020 and Huawei announced to have signed 91 5G contracts as of Feb 2020.

Figure 53: US 5G Clean Network Initiatives



Source: US Department of State, CMBIS

Figure 54: Numbers of 5G commercial contracts



Source: Company data, CMBIS, As of 17 Dec

Figure 55: 5G progress summary of major equipment vendors

Vendor	2019 Revenue Breakdown			# of 5G Contracts	5G Operator Clients	5G Strategy
	Region	% of Sales	YoY			
Huawei	China	59%	36%	91 commercial 5G contracts*	China Mobile, China Telecom, China Unicom	More self-sufficient consumer business, Kunpeng-based software solutions
	EMEA	24%	1%		Bouygues (France), Altice (Netherlands)	
	Asia (excl. China)	8%	-14%		LG Uplus (South Korea)	
	Americas	6%	10%		-	
	Others	3%	57%		-	
Nokia	North America	30%	6%	134 commercial 5G contracts	AT&T, Verizon (US), Shaw (Canada), Bell (Canada)	Collaborate with Ericsson to win orders from North America and Japan
	Europe	28%	2%		BT, O2 Germany, O2 UK, Orange France, Telefonica Spain	
	Asia-Pacific	20%	12%		Docomo, KDDI, LG U+, SK Telecom, Spark New Zealand	
	Middle East & Africa	8%	0%	44 Live 5G network	Du UAE, Zain KSA, Mobily Saudi Arabia	
	Greater China	8%	-15%		China Mobile, China Unicom, China Telecom, Taiwan Mobile	
	Latin America	6%	7%		Antel Uruguay	
Ericsson	North America	33%	20%	118 commercial 5G contracts	AT&A, Sprint, T-Mobile, Verizon, Bell (Canada), Telus (Canada)	Partnered with 30+ companies, AI-powered network services
	Europe & LATAM	28%	-2%		Vodafone UK, Organ France, Vodafone Germany	
	SEA, Oceania & India	14%	1%		NBN (Australia), Bharti (India), Telstra, Optus, True Thailand	
	North East Asia	13%	18%		China Mobile, SK Telecom, LG U+, SoftBank, KDDI, SmartTone	
	Middle East & Africa	12%	8%		MTN Africa, Zain, Omantel	
ZTE	China	64%	7%	55 commercial 5G contracts#	China Mobile, China Telecom, China Unicom	RAN, core network, transmission, chips, devices
	EU, Americas & Oceania	15%	-7%		NetCologne (Germany), Wind Tre (Italy), Orange (UK)	
	Asia (excl. China)	15%	11%		True (Thailand)	
	Africa	6%	30%		South Africa MTN, Algeria ATM and AT	
Samsung	South Korea, Japan, US, New Zealand	-	-	-	SK Telecom/U+ (South Korea), Deutsche Telekom, KDDI (Japan), Verizon (US), Spark (New Zealand), Telus (Canada)	RAN, core network, chips, devices, VR/AR/cloud gaming

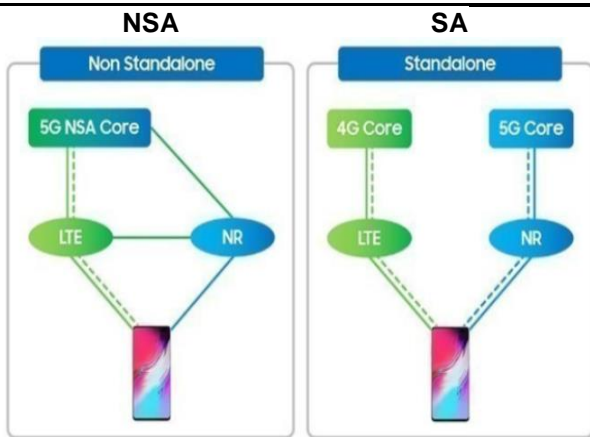
Source: Company, CMBIS, * as of Feb 2020, # as of Sep 2020

Standalone (SA) BTS deployment on track in 2H20

NSA for initial deployment in 2019; SA kick-off in 2H20. 5G deployment has two architecture – non-standalone (NSA) and standalone (SA). NSA builds 5G on legacy LTE network and utilizes dual connectivity with 4G and 5G radios, accelerating the availability of 5G services and reducing initial investment. SA implements 5G end-to-end from core network to radio access and features eMBB, URLLC, and mMTC to empower new business models in areas such as massive IoT and mission-critical control.

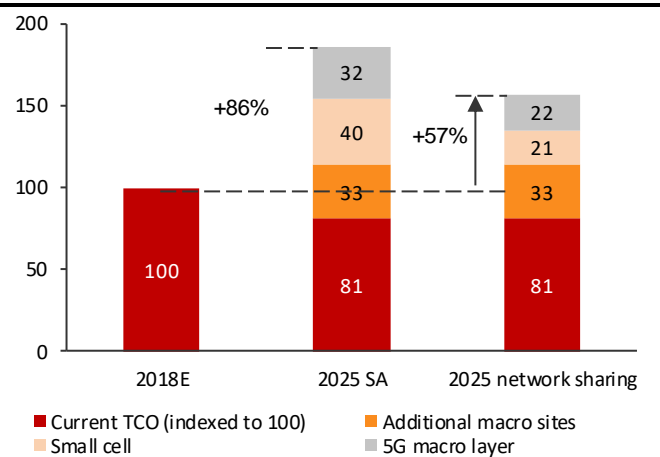
Starting from 2H19, carriers have been leveraging 4G BTS and transmission facilities for initial stage of NSA. Given that NSA is only applicable to eMBB services, we believe SA, enabling mMTC and uRLLC, will gain traction from 2021.

Figure 56: 5G NSA vs SA architecture



Source: cnbeta, CMBIS

Figure 57: 5G RAN TCO evolution



Source: Mckinsey, CMBIS

NT challenges: 5G BTS cost, power consumption, uncertain business cases. We see SA deployment accelerates since March 2020 and 5G BTS implementation has become cost-effective in terms of declining cost and improving energy efficiency. For a typical 2.6GHz BTS, the cost of 64TR/32TR BTS declined to RMB160k/145k in 1H20 from ~RMB200k in 2H19 (vs RMB80-100k for 4G BTS) due to adoption to plastic antenna vibrators, fewer-layered PCB and lower cost of optical module.

In addition, we believe power consumption cost remains a key concern for rapid 5G BTS deployment of Chinese operators, given 5G BTS consumption of ~3,500 watts/month (vs 1,300 watts/month for 4G). Besides government subsidy for electricity charges, vendors are required to come up with better solutions, such as uptick of advanced processor chips, energy-efficient components, and optimising power saving mode.

We believe that capex intensity will increase substantially in next few years with the introduction of new forms of 5G antenna. However, incremental ARPU for operators is expected to minimal, implying modest revenue growth for best case. Net effect is that network investment will take a long time to recoup until operators manage to capture value from other layers of the value chain, such as To-B enterprises applications.

Trend #1: BTS becoming miniaturization and lightweight

Compared with existing 4G BTS mostly with metal material, 5G network required smaller base stations for increased density and higher spectrum bands. These changes include 1) plastic antenna vibrators for smaller size and increasing numbers, 2) ceramic dielectric filters of 20% less weight, 3) diverse BTS types from integrated BTS to small cells deployed on poles or streets,

Figure 58: Comparison of 5G BTS and 4G BTS

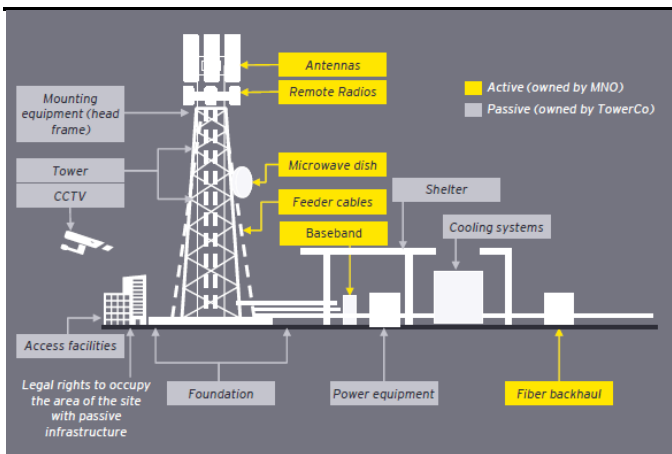
Type of antenna on BTS	4G BTS		5G BTS	
	8TR	16TR	32TR	64TR
Capability				
Downlink peak rate	600Mbps	1.2Gbps	2.4Gbps	4.8Gbps
Data traffic	1x	1.9x	2.2x	2.5x
Cost				
Total cost of ownership	1x	1.5x	2x	3x
Power consumption	1x	1.4x	1.8x	2.4x
Size				
BTS size (mm)	320*1300*130	480*1300*130	520*1000*300	520*1000*520
BTS weight (kg)	40	51	68	57
RRU weight (kg)	25	33	54	47
Antenna array weight (kg)	15	18	14	10

Source: CMBIS

Trend #2: Rising adoption of tower sharing

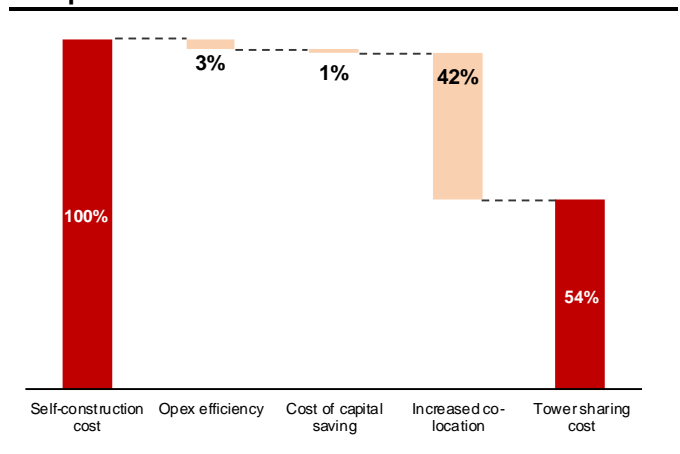
Independent tower companies lease space and sites (e.g. ground-based/rooftop towers) to operators to co-locate equipment, including antennas, remote radios, and baseband. By sharing towers with multiple tenants, telecom operators reduce cost by 46%, on back of 1) fixed cost savings of 42% self-construction cost, and 2) opex efficiency associated with maintenance costs.

Figure 59: Tower company provides passive infrastructure



Source: EY, CMBIS

Figure 60: Tower sharing saves 46% of cost compared to self-construction



Source: EY, CMBIS

Beneficiaries: ZTE and China Tower to benefit from 5G BTS deployment

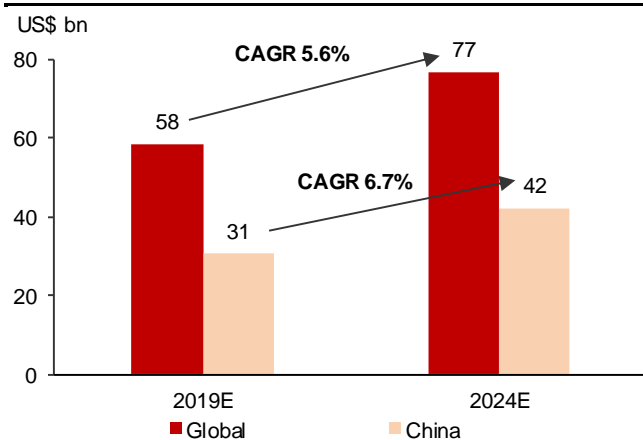
- **ZTE (000063 CH/ 763 HK, BUY)** is a leading telecom operator and provides integrated end-to-end products, for carriers, government and enterprise, and consumers. We expect a robust recovery since the US's ban in 1H18 and market share expansion, as a sub-scaler contender, to 10% in FY19 (vs 8% in FY18). Additionally, we are positive on ZTE's stepped-up efforts to tap B2B market by leveraging expertise in big data to empower financial/government/energy industries.
- **China Tower (788 HK, HOLD)** is the world's largest telecom tower service provider and dominated the domestic market on cemented collaboration with China Mobile/China Unicom/China Telecom. We believe China Tower is poised to benefit from large-scale 5G deployment in China with increasing tenants and improving profitability.
- **Fiberhome (600498 CH, NR)** is a leading communication networking product and solution provider in China. It offers a variety of products including equipment for transmission network, broadband access network, optical fibres and cables.

PCB: Robust demand from 5G large-scale rollout

Printed Circuit Board (PCB) is one of the fundamental components in all electronic devices, which mechanically supports and electrically connects electrical components. According to Prismark, global PCB market will grow 5.6% revenue CAGR during 2019-24E, reaching US\$77bn in 2024E. We attribute major growth drivers to 1) volume/ASP growth in 5G BTS and core/transmission network, 2) strong demand of high-performance computing in data centres (server, storage), and 3) more radar sensors for ADAS on cars.

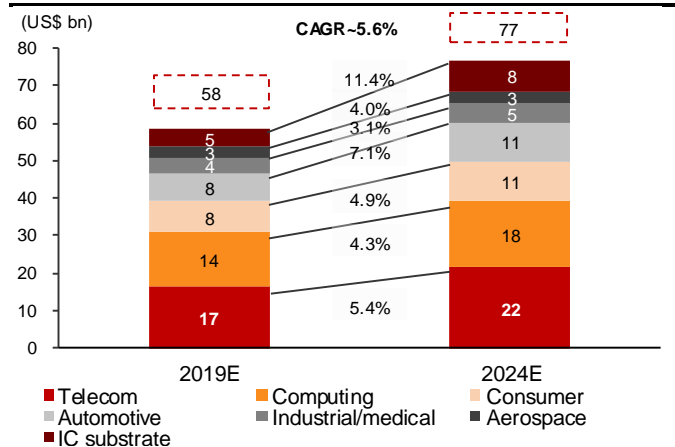
China is global largest and fastest-growing PCB market, accounting for 55% sales in 2019 with 6.7% CAGR 2019-24E. We are positive on Chinese PCB/CCL leaders, SCC (002916 CH) and SY Tech (600183 CH), which will benefit from strong PCB volume growth, ASP expansion and global share gain amid consolidation. We estimate SSC/SY Tech to deliver 22%/30% net profit CAGR during FY20-22E.

Figure 61: Global PCB TAM of CAGR 5.6% 2019-24E



Source: Prismark, CMBIS estimates

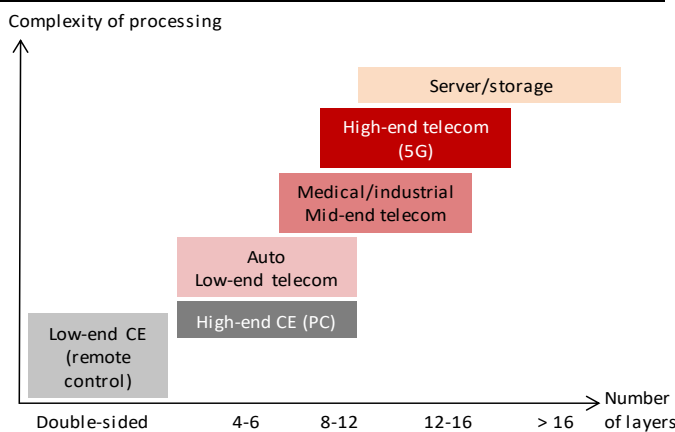
Figure 62: Global TAM by applications (2019-24E)



Source: Prismark, Yole, CMBIS estimates

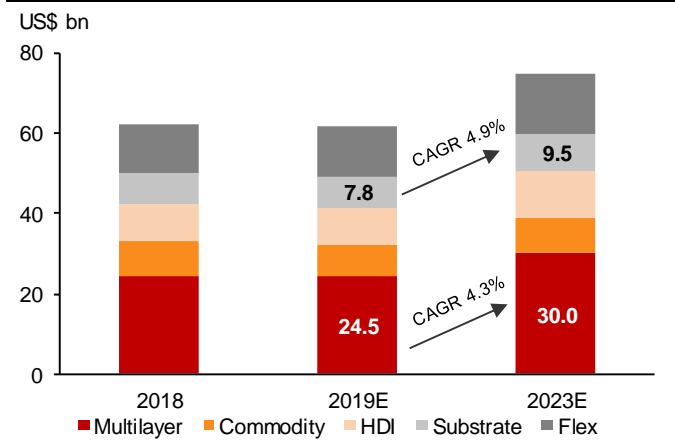
Multi-layer PCB and IC substrate to gain traction in telecom market. Backed by global 5G network rollout, multi-layer PCB (mostly 8-16 layers) and IC substrate are the two fastest-growing segments with 4.3% and 4.9% revenue CAGR during FY19-23E, according to Prismark. By end-market, telecom market is the largest PCB segment and is expected to grow at 5.4% revenue CAGR during FY19-24E, driven by global 5G BTS deployment and material upgrade.

Figure 63: 5G telecom/server to drive multi-layer PCB



Source: Yole, CMBIS

Figure 64: Multi-layer/substrate PCB growth trend

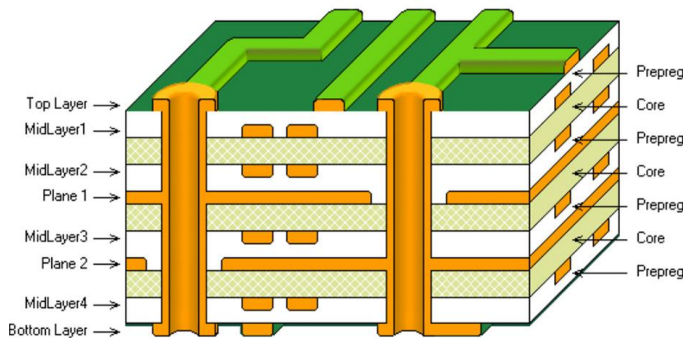


Source: Prismark, CMBIS

PCB: volume growth and material upgrade in 5G base stations

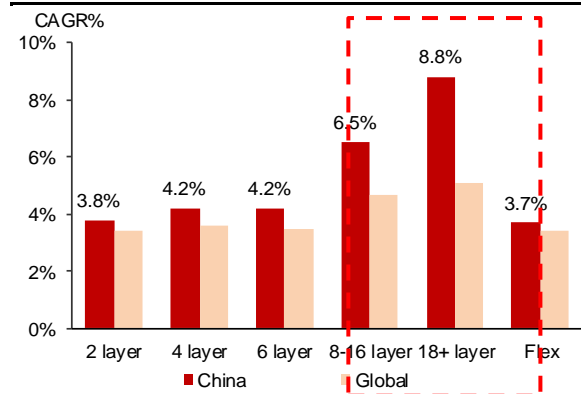
PCB demand boosted by massive MIMO, multi-layer and 5G BTS density. Given structural change in 5G base stations, we estimate PCB volume per 5G BTS will increase by 2-3 times, thanks to 1) larger PCB area (mainly AAU) for massive MIMO antennas, and 2) higher PCB layer count for each 5G BTS (e.g. 8-16 layer for 5G antenna vs 2-layer for 4G). In addition, we expect more macro BTS (1.1-1.3x of 4G BTS) and small cells will be deployed in 5G network compared to 4G network. As such, we expect strong demand for multi-layer PCB in China, especially 8-16/18+ layer PCBs, which will grow 6.5%/8.8% sales CAGR in China during 2019-24E, based on Prismark.

Figure 65: Multi-layer PCB featuring smaller size, lighter weight and higher speed



Source: SDY-PCB, CMBIS

Figure 66: Multilayer PCB sales CAGR forecast



Source: Prismark, CMBIS

Figure 67: 5G BTS to require multi-layer PCB and high-speed/high-frequency material

4G Base Station		PCB Materials	Layer Count	5G Base Station		PCB Materials	Layer Count
Antenna		PTFE	2	AAU	Antenna	PPO, Hydrocarbon	2-6
RRU		Hydrocarbon	2-6		PA	Hydrocarbon	2-6
					TRX board	PPO, Hydrocarbon	12-16
BBU	Line-card	FR-4	8-16	BBU (DU, CU)	Line-card	High-speed	8-16
	Backplane	FR-4	8-16		Backplane	High-speed	18-20

Source: CMBIS

Higher PCB content per 5G BTS boosted by material upgrade. As 5G network standard targets “high speed and high frequency” features through massive MIMO technology, PCB for 5G BTS will be upgraded to use high-speed high-frequency materials, which will cost 1.5-2 times higher than FR4 materials on 4G BTS. We also expect higher adoption of specialty PCB with low dielectric constant (Dk) and low dielectric loss tangent (Df), such as high-frequency material for BBU/IDC/routers and high-speed material for BTS antenna.

Figure 68: 5G network to boost demand of high-frequency high-speed PCB materials

5G network equipment		PCB Type	PCB Materials				
			High-frequency	High-speed	Large area	High layer count	Rigid-flex
Radio access network (RAN)	Base station	Multi-layer, HDI, substrate, multifunctional board	•		•	•	
Transmission/ Core network	OTN, microwave, router, switches	Multi-layer, HDI, substrate, microwave board	•	•	•	•	•
Data communication	Server/storage	Multi-layer, HDI, substrate		•	•	•	•
Fixed broadband	OLT, ONU	Multi-layer, HDI, substrate				•	•

Source: Shennan Circuits, CMBIS

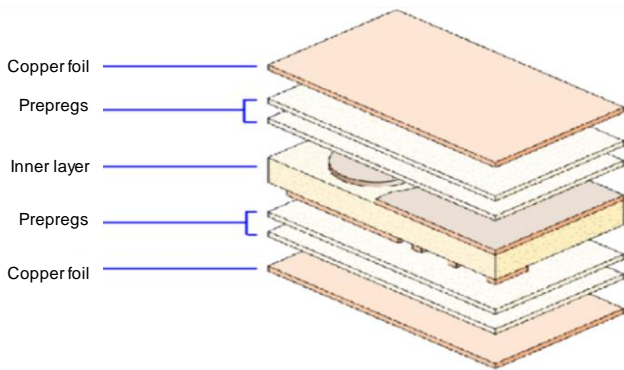
CCL: high-frequency material upgrade for 5G upcycle

Copper Clad Laminate (CCL) is the key base material of PCB (20-40% of total cost), which consists of prepreg (usually glass fibre impregnated with resin) and copper foil. For 5G communication network, high-speed high-frequency transmission feature will require CCL material upgrade to smaller size, heat endurance, higher thermal dissipation and lower signal loss.

Among all CCL materials, epoxy laminate materials (FR-4) is the most common type with ~40% market share. In order to meet 5G requirements, we expect CCL material will be upgraded to PTFE or hydrocarbon materials, which feature low Dk/Df and low coefficient of thermal expansion.

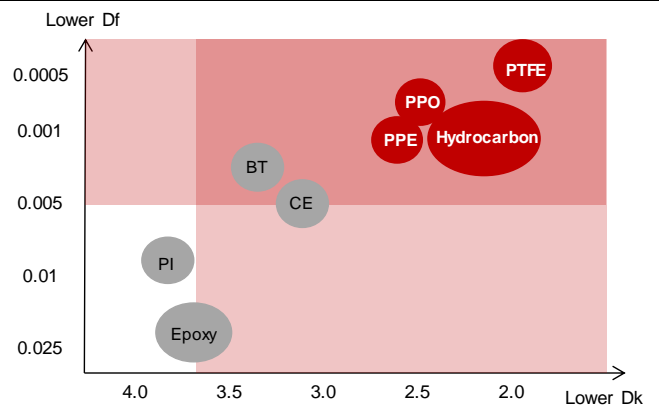
Specifically, we believe PTFE is mainly adopted for mmWave, hydrocarbon for sub-6GHz, and PPO/PPE for high-speed multi-layer PCB. We believe SY Tech, global second largest rigid CCL supplier, stands to benefit from robust demand for high-speed high-frequency CCL in 5G base stations.

Figure 69: Structure of CCL for multi-layer board



Source: AEE Intec, CMBIS

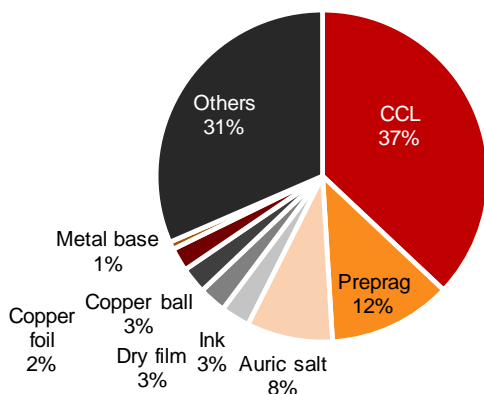
Figure 70: PTFE/hydrocarbon CCL is used for 5G



Source: CMBIS
PTFE (Polytetrafluoroethylene), PI (Polyimide), PPO/PPE (Polyphenylene oxide/ether), BT (Bismaleimide triazine)

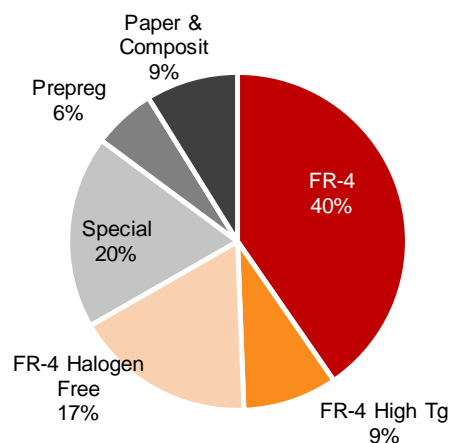
Figure 71: CCL is key material of PCB (2017)

Material cost breakdown of PCB



Source: Shennan Circuits, CMBIS

Figure 72: CCL market share by material type (2017)



Source: Prismark, CMBIS

Beneficiaries: SCC/WUS/SY Tech with share gain and capacity ramp

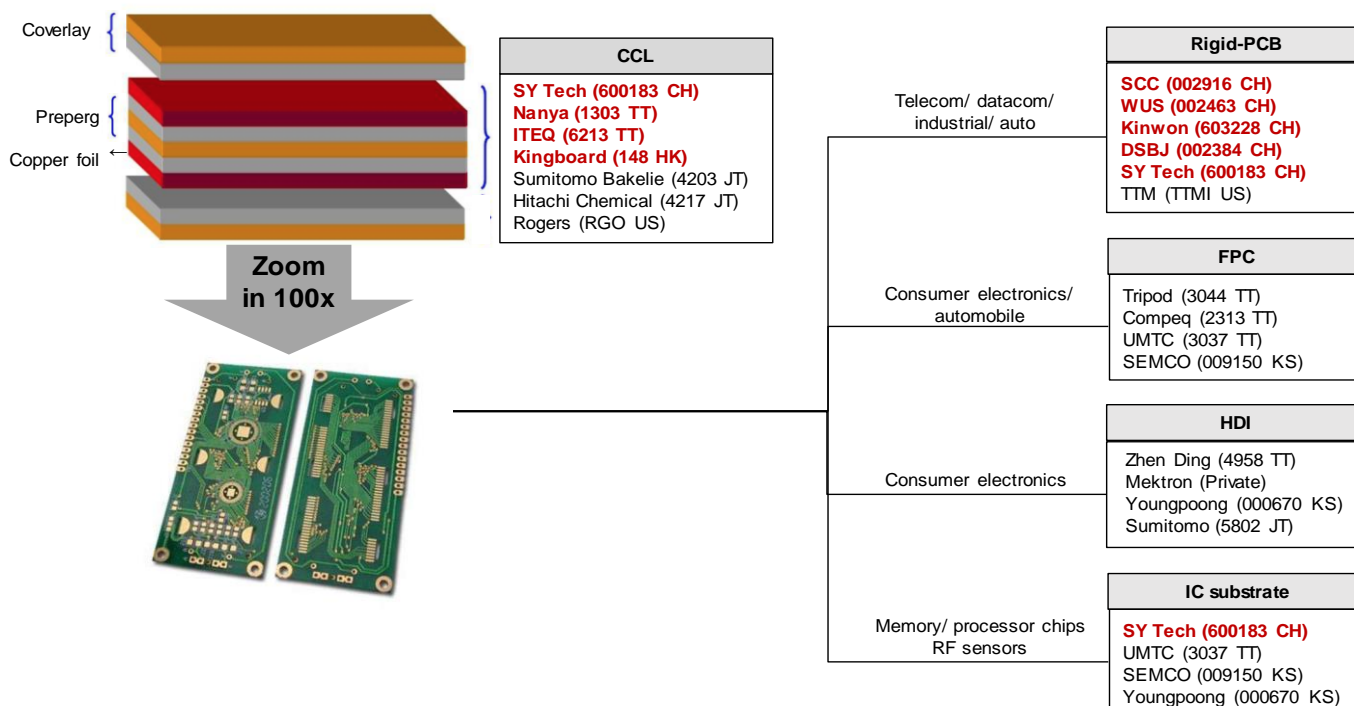
- **Shennan Circuits (002916 CH, HOLD)** is China 2nd largest PCB maker and provides “3-in-one” business of PCB, package substrate and PCB assembly to telecom, automobile, industrial & medical and aerospace industries. SSC generated 60% of revenue from telecom, and SSC is No.1 PCB supplier for Huawei (30-40% of sales). In FY19, SCC achieved 38.4% YoY revenue growth to RMB 10.5bn. We are positive on SCC to strengthen No.1 leadership and gain share in the wave of 5G construction.
- **SY Tech (600183 CH, BUY)** is global 2nd largest rigid CCL supplier in terms of capacity, focusing on telecom, IDC, consumer electronics and automobile sectors. In FY19, SY Tech delivered revenue/net profit growth of 11%/47% YoY to RMB 13,241mn/1,451mn. SY Tech is poised for import substitution opportunities for high-frequency/high-speed CCL and vertical integration as penetrates into PCB supply chain.
- **WUS Printed Circuit (002463 CH, NR)** provides PCB for telecom/electronics/auto. On back of surging demand from 5G/server/ADAS. In FY19, WUS recorded RMB 7.1bn/1.2 bn revenue/net profit, implying 29.7%/122 % YoY.

Figure 73: Major PCB players and their telecom customers

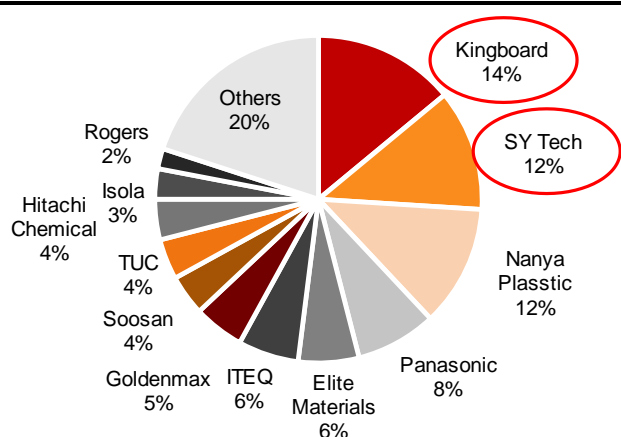
PCB suppliers	% sales in telecom	Major telecom equipment clients
Shennan Circuits	~60%	Huawei, ZTE, Nokia, Ericsson, Samsung
Shengyi Technology	~30%	Huawei, ZTE, Samsung
WUS Printed Circuits	~60%	Huawei, ZTE, Nokia, Ericsson

Source: CMBIS

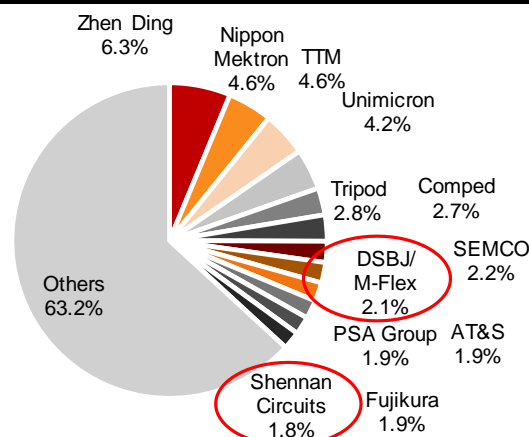
Figure 74: PCB supply chain



Source: CMBIS

Figure 75: Global rigid CCL market in 2018

Source: Prismark, CMBIS

Figure 76: Global PCB market in 2018

Source: Prismark, CMBIS

Figure 77: Global Top 15 PCB suppliers in 2018

Rank	Company	Ticker	FY18 Sales (US\$ mn)	Products	End markets	Major clients
1	Zhen Ding (Foxconn PCB)	4958 TT	3,911	FPC	Smartphone, PC, NB	Apple, HOVX
2	Nippon Mektron	-	2,856	FPC, IC substrate	Auto, consumer electronics	Apple
3	TTM	TTMI US	2,847	Multi-layer PCB, FPC, IC substrate	Aerospace, medical, industrial	Compaq, Solectron
4	Unimicron	3037 TT	2,620	IC substrate, HDI	Consumer electronics, telecom	Samsung, Apple, Sony, Nokia, Huawei, AMD, NVIDIA, Qualcomm, Broadcom, Media Tek
5	Tripod	3044 TT	1,727	Multi-layer PCB, HDI	Auto, smartphone, server, telecom	Continental, BOSCH, Xiaomi, Huawei, Samsung, Apple (tablet/NB)
6	Comped	2313 TT	1,681	HDI	Smartphone, PC, telecom	Apple, Nokia, HOVX, ZTE
7	SEMCO	009150 KS	1,346	IC substrate, HDI, Rigid-flex	Consumer electronics (handsets, PC, digital camera)	Samsung
8	DSBJ / M-Flex	002384 CH	1,308	Multi-layer, FPC, Rigid-flex	Consumer electronics (smartphone, wearables), IoT, auto, industrial, medical, telecom	IBM, Dell, HP, Motorola, Microsoft, Siemens, Phillips, Alcatel, Cisco
9	AT&S	ATS AV	1,202	Multi-layer PCB, HDI, IC substrate	Mobile, automotive, industrial, medical	Apple, Fairphone, Sony
10	PSA PCB (Hannstar, GBM ELNA)	-	1,186	Multi-layer PCB, HDI, IC substrate	Computer, mobile, communications, automobile	Quanta, Pentagon, Wistron, Microsoft, HP, Samsung
11	Fujikura	5803 JP	1,155	FPC, HDI, Multi-layer PCB	Automotive, mobile, telecom, industrial	Apple
12	Shennan Circuit	002916 CH	1,145	Multi-layer PCB, IC substrate	Telecom, industrial, consumer, auto	Huawei, ZTE, Nokia, Honeywell, GE, BOSCH, BYD, Lenovo, ASE
13	Ibiden	4062 JP	1,083	FPC, HDI, IC substrate	Smartphone, PC	Apple
14	Meiko	6787 JP	1,074	FPC, HDI, multi-layer PCB	Automobile, smartphone	Samsung
15	WUS Group	002463 CH	999	Multi-layer PCB	Telecom, automotive (investment in Schweizer), industrial	Huawei, ZTE, Nokia, Ericsson, BOSCH, Continental, Tesla

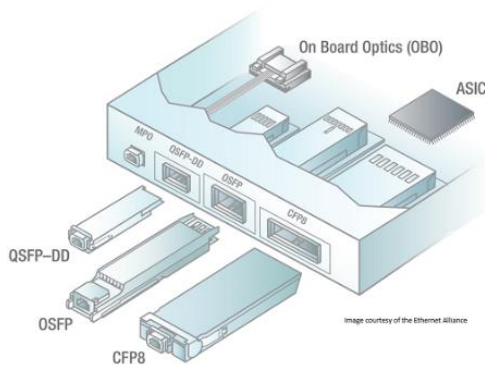
Source: Zhen Ding, Prismark, CMBIS

Optical Transceiver: Riding on 5G rollout and datacom upgrade

Optical components/modules are extensively deployed in telecom market (transmission and core networks) and datacom market (servers, storage and switches) to support signal amplification, transmission and conversion. After two years of muted growth in 2018-19 due to inventory digestion, global optical component and transceiver market is expected to resume growth with 12% CAGR during 2020-25E, according to Lightcounting.

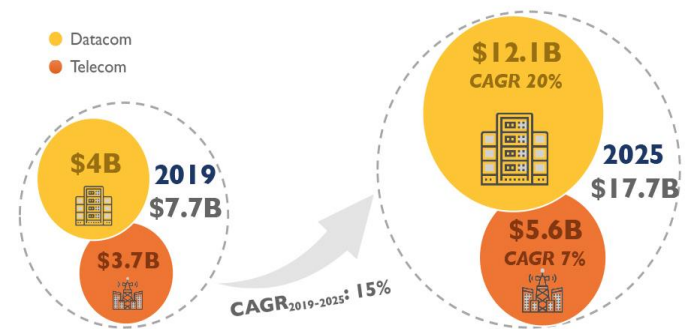
Looking ahead, we are positive on multi-year upgrade cycle in optical transceivers, thanks to 1) telecom market (7% CAGR): global 5G deployment to drive 25G demand in front-haul network and 50G/100G in mid/back-haul network, and 2) datacom market (20% CAGR): 400G upgrade for cloud computing in router, switch, server and Internet Data Centers (IDC).

Figure 78: Different types of optical components



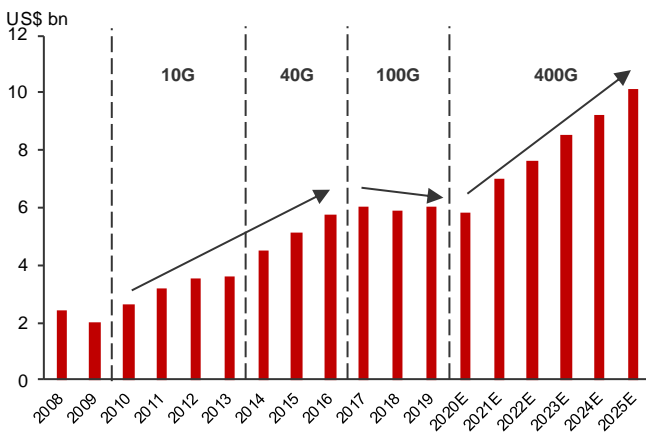
Source: Ethernet Alliance, CMBIS

Figure 79: Telecom/datacom optical transceiver market to grow at 7%/20% revenue FY19-25E CAGR



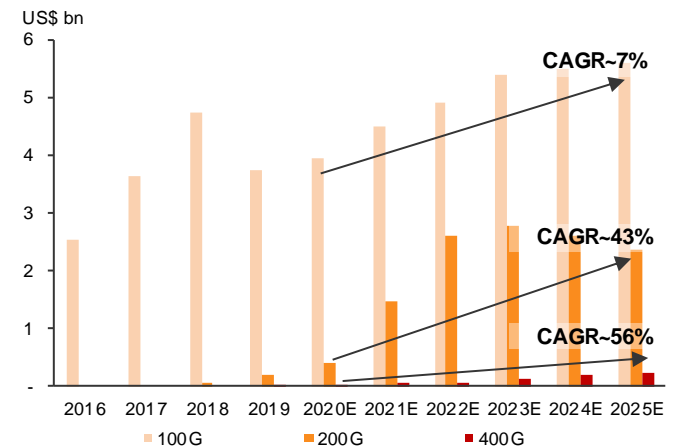
Source: Lightcounting, CMBIS

Figure 80: Global optical component mkt is growing



Source: Lightcounting, CMBIS

Figure 81: 400G/200G/100G optical component mkt to grow at 56%/ 43%/ 7% CAGR during 2020-25E

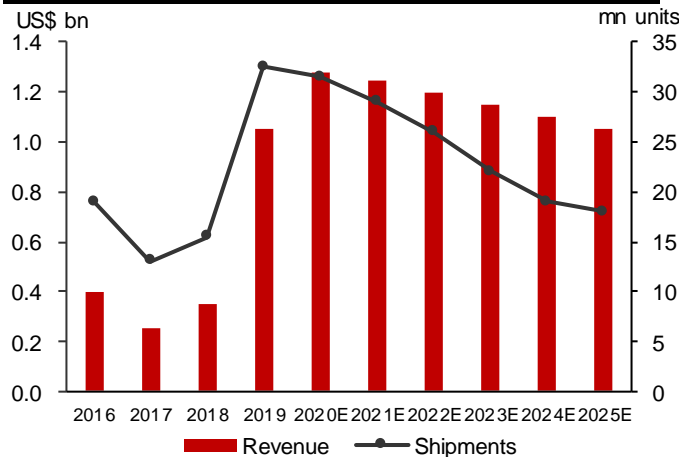


Source: Lightcounting, CMBIS

Telecom market: China 5G rollout to fuel front/mid-haul demand

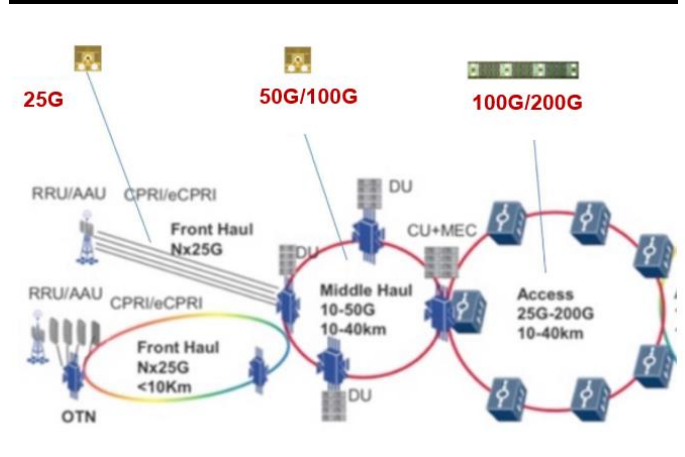
As China 5G deployment to remain on track and overseas rollout will resume in 2021, we believe demand for front/mid-haul optical module will remain strong in 2021-22E, driven by growing 5G BTS density, CU/DU separation, and spec upgrade from 10G/25G to 25G/100G. In particular, we estimate 5G optical module shipment will reach 10mn/18mn in China in FY20/21E (vs 2.5mn in FY19), and Chinese optical module leader, Innolight, can capture 15-20% of front-haul market share in China.

Figure 82: Front-haul optical module TAM forecast



Source: Lightcounting, CMBIS

Figure 83: Overview of optical network

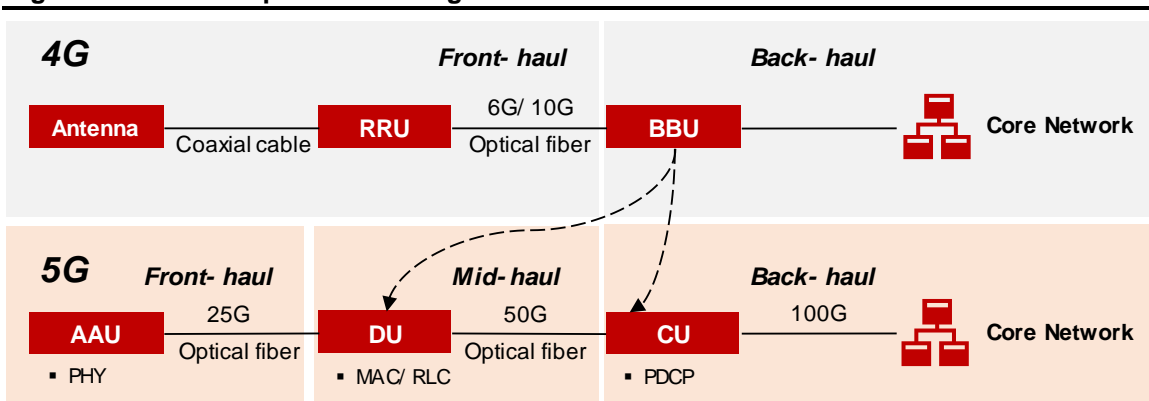


Source: CMBIS

Stronger shipment on higher BTS density and CU/DU separation. We are positive on strong demand for 25G/50G/100G optical modules during 5G rollout, backed by higher 5G BTS density and increasing number of mid-haul modules per BTS due to CU/DU separation.

The traditional RAN architecture consists of a Base Band Unit (BBU) and a Radio Remote Unit (RRU) in each cell site. In 5G NR RAN architecture, each BBU is split into two parts—CU and DU—and a RRU is combined with antennas to become an AAU. Thus, separation of CU/DU will add one more transmission mode (mid-haul). Based on our estimates, each 5G BTS requires 8 modules (vs. 6 for 4G BTS) for front/mid-haul, assuming 3 AAUs per BTS and 1 DU connected to 1 CU.

Figure 84: CU/DU separation adding mid-haul to 5G RAN architecture



Source: ITU, CMBIS

Stabilizing ASP as spec upgrade to 25G/100G. 5G requires optical modules featuring higher speed and longer distance -- front-haul will adopt 25G (vs 6G/10G in 4G), mid-haul of 50G, and back-haul of 100G/400G (vs 10G/25G in 4G). We expect blended ASP decline to decelerate thanks to spec upgrade to 25G/100G in initial stage and 400G at later stage. Currently, Accelink and Innolight are the two largest telecom optical module suppliers in China, which will benefit from 5G optical module upgrade during China 5G deployment

Figure 85: Major optical module suppliers for 5G telecom network

		Access layer		Aggregation layer	Core layer
		Front-haul	Mid & Back-haul	Back-haul & DCI (Data-center interconnect)	
Transmission distance		10/20km	40km	40-80km	40-80km, 100km
Speed	Initial stage (2020E)	25Gbps	10G/ 25Gbps	10/ 25Gbps	25G/ 50G/ 100Gbps
	Commercial Stage (2021-24E)		N*25G/ 50Gbps	N*25G/ 50G/ 100Gbps	N*100G/ 400Gbps
Equipment Vendor		Front-haul Optical Module Supplier	Mid/Back-haul Optical Module Supplier		
Huawei		Accelink, Innolight, Hisense Broadband, HGTech, CIG	Accelink, Hisense Broadband, Source Photonics, CIG		
ZTE		Accelink, Innolight, Eoptolink, HGTech	Accelink, Eoptolink, Innolight, CIG		
Ericson		Accelink, HGTech, Finisar	NA		
Nokia		Accelink, HGTech, Finisar	NA		
Fiberhome		NA	Accelink, HGTech, Innolight, Eoptolink, CIG		

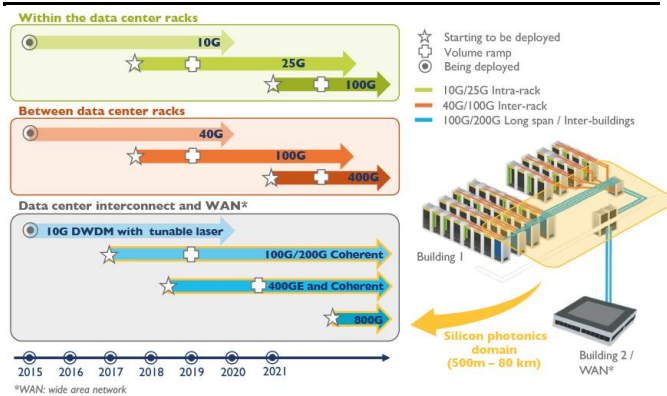
Source: IMT-2020 (5G) Promotion Group, CMBIS

Datacom market: 400G upgrade and hyperscale capex recovery

Backed by robust internet traffic and 400G upgrade cycle, global ethernet optical component market is expected to deliver 20% CAGR 2020-25E, according to Lightcounting. We believe rising cloud adoption will drive IDC growth and widespread datacom upgrade as 1) enterprise and government will move mission-critical workloads into the cloud, and 2) consumers continue to increase consumption of content and services on multiple devices anytime and anywhere. During COVID-19 pandemic, working from home and studying from home will also increase bandwidth demand and accelerate cloud adoption.

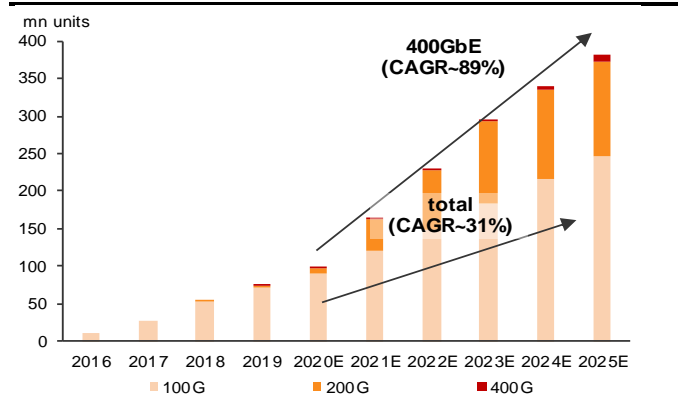
Rapid migration to 400G optical infrastructure during 2020-25E. To support substantial increase in data consumption, we expect cloud operators and datacenters to adopt higher speed optical communication network. 100G transceiver is currently the mainstream technology, and 400G transceiver started adoption since Dec 2019. Total volume of 400G module is expected to reach 800k/3mn in FY20/21E (vs 200k in FY19), and deliver 89% shipment CAGR during 2020-25E (vs industry 31% CAGR).

Figure 86: Datacom optical transceiver migration



Source: Yole Développement, CMBIS

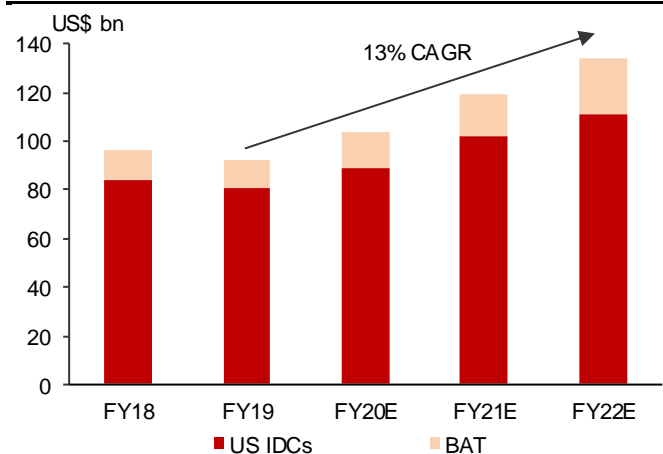
Figure 87: 400G modules at 89% CAGR 2020-25E



Source: Lightcounting, CMBIS

Global hyperscale capex on a rising trajectory. After inventory digestion during 2018-1H19, we see major global hyperscale capex (Amazon, Google, Microsoft, Facebook) started to recover since 3Q19, and we expect 13% CAGR during FY19-22E. Google and Amazon started mass adoption of 2x200G and 4x100G modules in 2020, while Facebook announced to shift 200G plan to 2021 and Chinese hyperscales are also upgrading to 100G.

Figure 88: Global hyperscale capex rebounding



Source: Bloomberg, CMBIS

*US hyperscales includes Google/Amazon/Facebook/Microsoft/Apple

Figure 89: Optical module suppliers & 400G offerings

Modules	CFP8	OSFP	QSFP-DD
Port speed	400G (16x25G /8x50G)	400G(8x50G) 800G	200G(8x25G) 400G(8x50G)
Size mm (H*L*T)	41.5*107.5*9.5	18.35*89.4*8.5	22.58*107.8*13
Thermal capacity	12-18W	12-15W	7-12W
Companies with 400G capability			
Innolight		•	•
Accelink	•		•
Eoptolink		•	•
CIG	•	•	•
Finisar/ II-VI	•		•
Oclaro/ Lumentum	•	•	•

Source: Arista, CMBIS

Figure 90: Hyperscalers' 400G deployment roadmap and supplier mapping

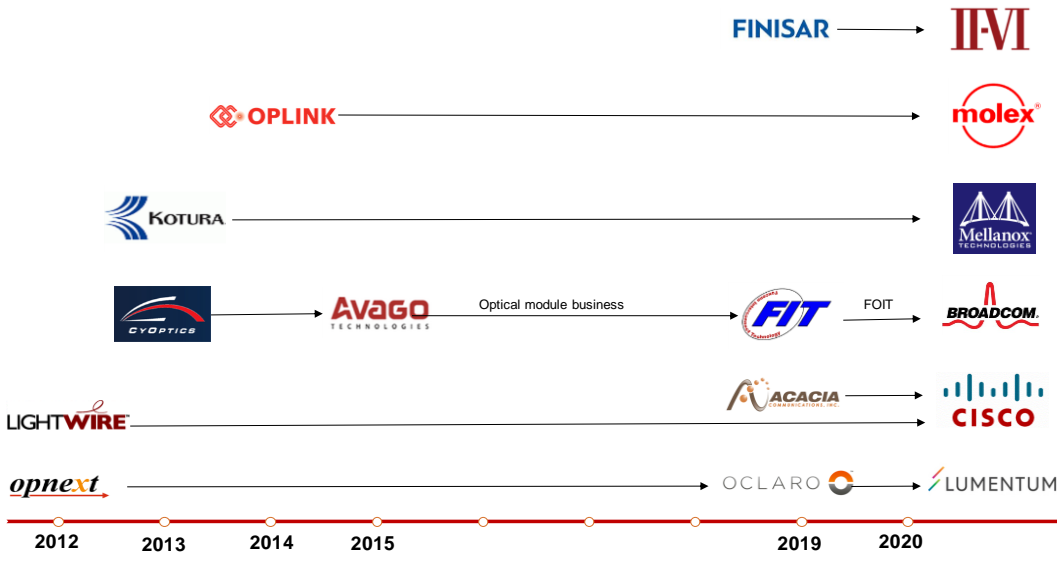
Hyperscaler	2020	2021-22E	Optical Module Suppliers (FY21E)
Amazon	Leading 400G migration, started mass adoption of 2x200G and 4x100G modules	Expect to continue adoption of 400G modules	Innolight (50%), Finisar (20%), AAOI (10%), Eoptolink (10%)
Google	Continue to adopt 2x200G modules since 2019	Continue 2x200G deployment	Innolight (50%), Finisar (20%), Eoptolink (10%)
Facebook	Focus on 100G	Expect mass adoption of 200G	Innolight (30%), Finisar (30%), AAOI (10%)
Microsoft	Focus on 100G	Expect to start 400G deployment	Finisar (30%), AAOI (30%)

Source: IMT-2020 (5G) Promotion Group, CMBIS

Landscape: Chinese players are gaining share amid consolidation

Global optical communication industry started to consolidate with industry leaders gaining share since 2012, and this trend continued in recent years as 1) Lumentum’s acquisition of Oclaro in Dec 2018, 2) MACOM discontinued optical component business in Jun 2019, 3) II-VI’s acquisition of Finisar in Sep 2019, and 4) Cisco’s acquisition of Acacia in Jul 2019.

Figure 91: Condensing industry driven by spurring M&A

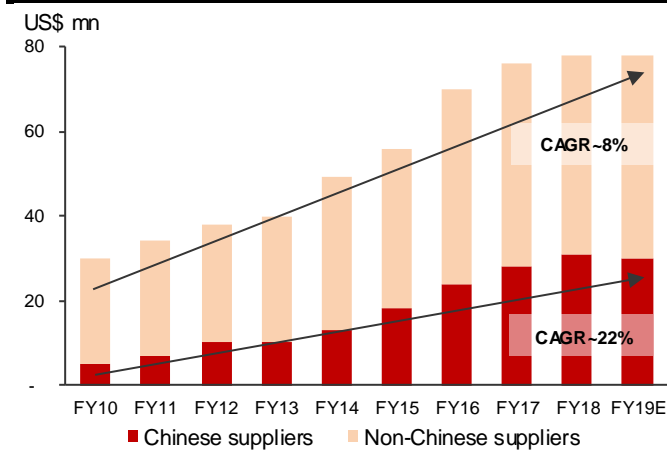


Source: CMBIS

Chinese vendors continue to gain share. The largest two Chinese optical module players, Innolight/ Accelink, were ranked global No.5/ No.4 with 9%/10% market share in 2019, while Finisar/Lumentum were No.1/No.2 with 19%/14% share, according to Yole.

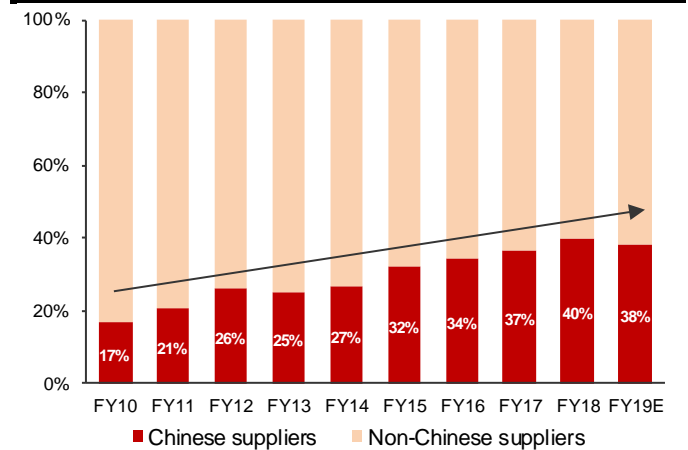
According to LightCounting, Chinese suppliers will continue climbing up the ranking in 2020: 1) Innolight (300308 CH) to take over Finisar as global No.1, 2) Accelink (002281 CH) and Hisense (600060 CH) to maintain high rankings, 3) Eoptolink (300502 CH) and HG Genuine, a subsidiary of HGTech (000988 CH) to set new records on front-haul optics sales and become global top 10 suppliers for the first time.

Figure 92: Domestic suppliers outgrow at 22% CAGR (FY10-19E)



Source: Lightcounting, CMBIS

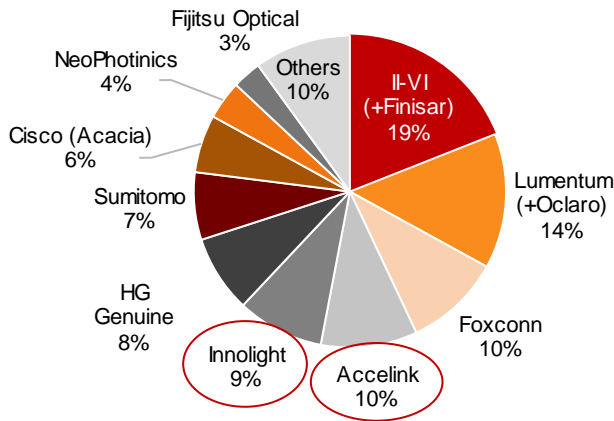
Figure 93: Domestic suppliers keep share gain to approx. 40%



Source: Lightcounting, CMBIS

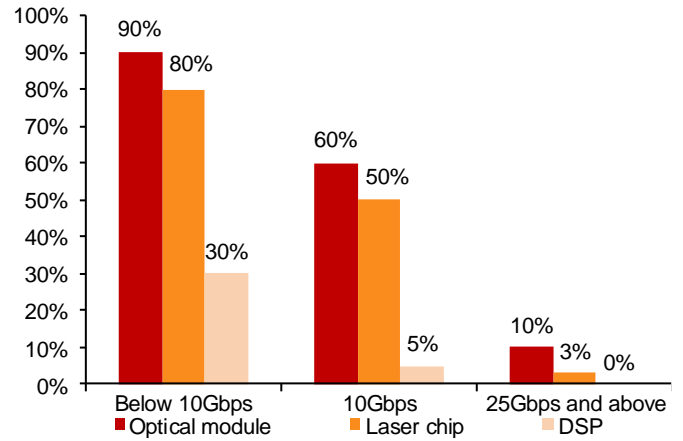
Chinese suppliers paving path to chip self-sufficiency. Most domestic suppliers primarily played in the mid/down-stream battlefield (e.g. components and modules) but of limited presence in high-end chips of 50-70% of optical component cost. However, we observed emergence of domestic 25G chips from Accelink/Hisense/HiSilicon, and we are positive on domestic suppliers with self-supply capability in chips to expand margin.

Figure 94: Global optical module market in FY19



Source: Yole, CMBIS

Figure 95: Low domestic-sufficiency of optical chips

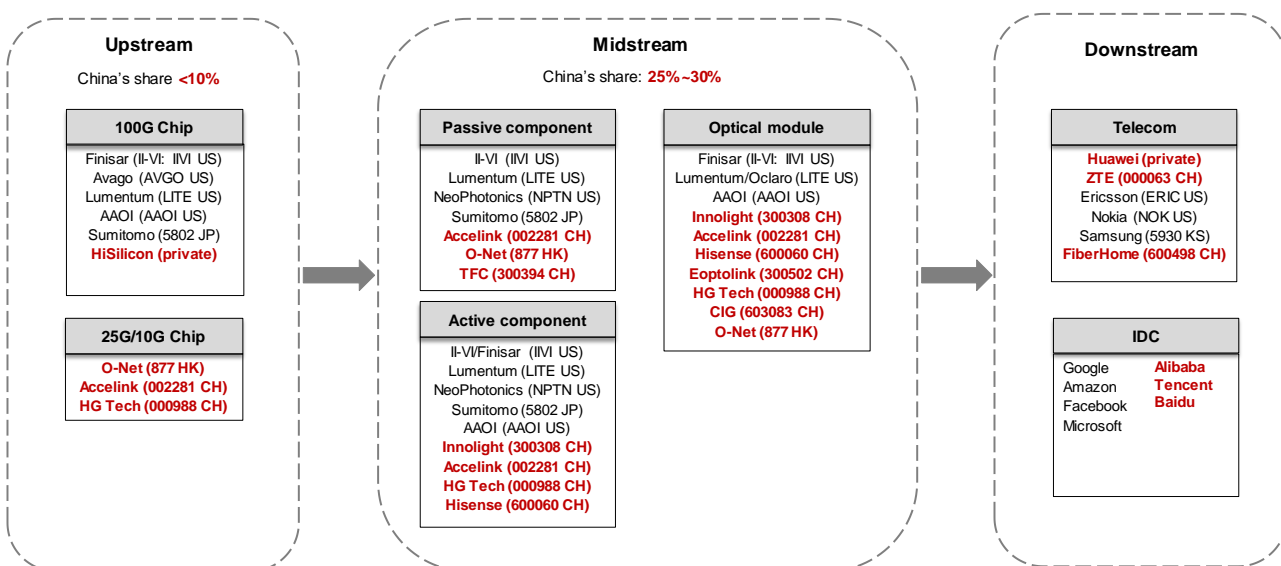


Source: MIIT, CMBIS

Beneficiary:

- **Innolight (300308 CH, BUY)** is the global leader in datacom market (20-30% share in 2018) with most cutting-edge 400G modules and Google as major client (50%+ share). By acquiring Chengdu Tsuhan, Innolight significantly enhances its product offerings in telecom market. We are positive on Innolight's growth opportunities in both telecom and IDC markets.
- **Accelink (002281 CH, NR)** enjoys large exposure to telecom market (61% of FY19 revenue) with Huawei/Fiberhome/ZTE as major clients. It has also developed 10G laser chips (MP) and 25G chips (sampling) to strengthen vertical integration.
- **HG Genuine, a subsidiary of HG Tech (000988 CH, NR)** gears up for 5G front-haul with a comprehensive portfolio of 25G modules, and is expected to reach 500k shipment in March 2021 (vs 300k in Jan/Feb), with Huawei as major client (40%+ share). HG also launched 400G product for IDC and commenced MP of 25G chips.
- **Eoptolink (300502 CH, NR)** is mainly engaged in access network for ZTE/ Ericsson /Nokia, and P2P/PON segments accounted for 94.5%/3.7% of FY19 sales. Eoptolink has launched high-speed products in 100G, and integrated Broadcom's 7nm PAM-4 Platform to enhance its 400G offerings (sampling with Amazon).
- **Cambridge Industries Group/CIG (603083 CH, NR)** is aggressively expanding offerings in 25G/100G/400G by acquiring LR4 100G long-range products from MACOM in 2018 and IDC transceiver business from Oclaro Japan in 2019.
- **Oclaro/Lumentum (LITE US, NR)** Lumentum acquired Oclaro in 2018 for its leading capabilities in photonic chip and 3D sensing, which can enhance revenue mix and benefit from R&D synergy.
- **Finisar/II-VI (IIVIUS, NR)** Acquisition of Finisar in 2019 could enhance II-VI's portfolio from passive components to active components and makes II-VI global largest player.

Figure 96: Global optical component value chain



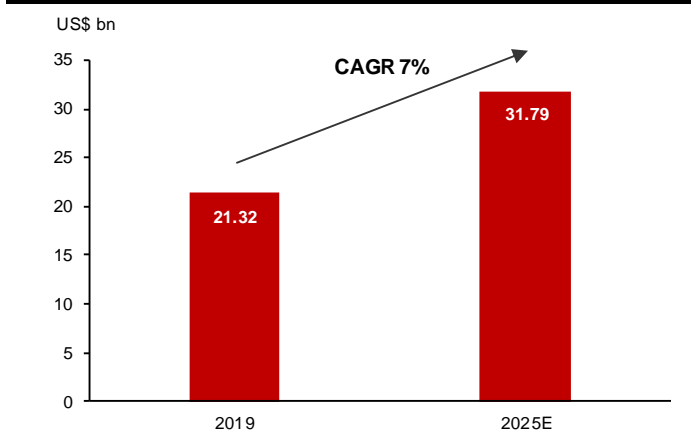
Source: CMBIS

Antenna: Smaller design, massive MIMO to drive content growth

According to Modor Intelligence, global antenna market is estimated to grow at 7% CAGR 2020-25E and reach US\$31.8bn by 2025, mainly driven by large-scale deployment of radio antennas for telecommunication and consumer electronics as well as RADAR for auto.

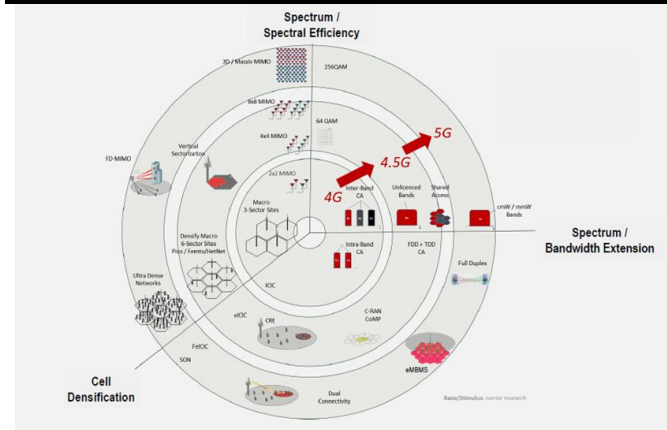
With increasing 5G handset penetration, we see antenna and RFFE design will trend into miniaturization with high flexibility and integrated functionalities: 1) LCP/MPI will substitute traditional PI for better signal transmission, 2) LDS will gain popularity across industries (e.g. electronics, auto), and 3) RFFE module content value will grow on multi-functionalities.

Figure 97: Antenna market to deliver CAGR 7% growth



Source: Modor Intelligence, CMBIS

Figure 98: RF trends towards 5G



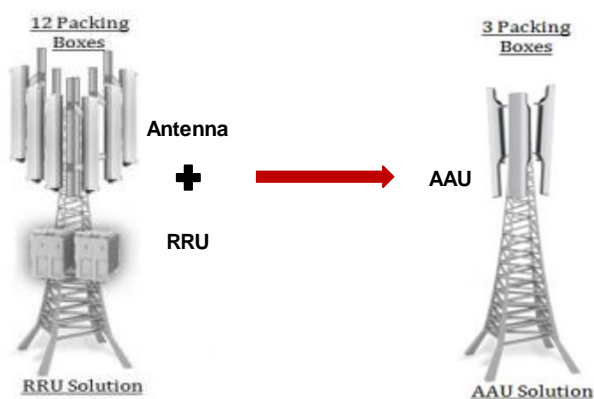
Source: Kathrein, CMBIS

Base station antenna: small cell & massive MIMO boosting demand

We believe BTS antenna will benefit from rapid volume growth in 5G era. For capacity and coverage enhancement, 5G passive antenna and RRU are combined into AAU, a compact design which can 1) enable flexible network and speed up 5G service time with 70% space savings, and 2) support better connections with massive MIMO and beamforming to transmit multiple data streams to different users under same time and frequency resources.

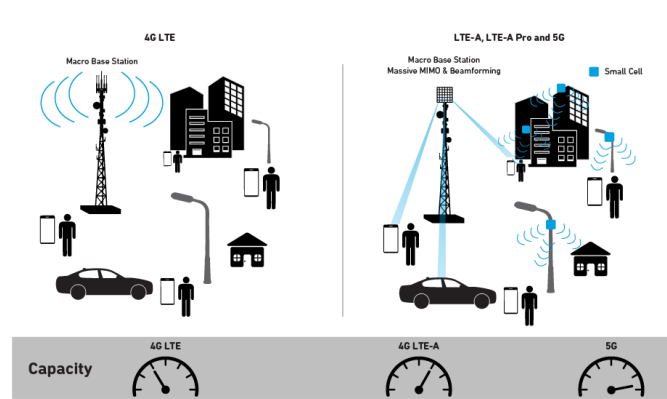
We expect growth drivers of BTS antenna to stem from 1) larger-scale small cell rollout with 10% 2020-25E CAGR, and 2) massive MIMO, a 64x64 configuration for 5G antenna array vs 2x2/ 2x4 for LTE. For supply chain, we believe Comba (2342 HK), Mobi (947 HK), and Tongyu (002792 CH) are well-positioned for small cell and massive MIMO antennas.

Figure 99: 5G BTS: AAU integrates antenna and RRU



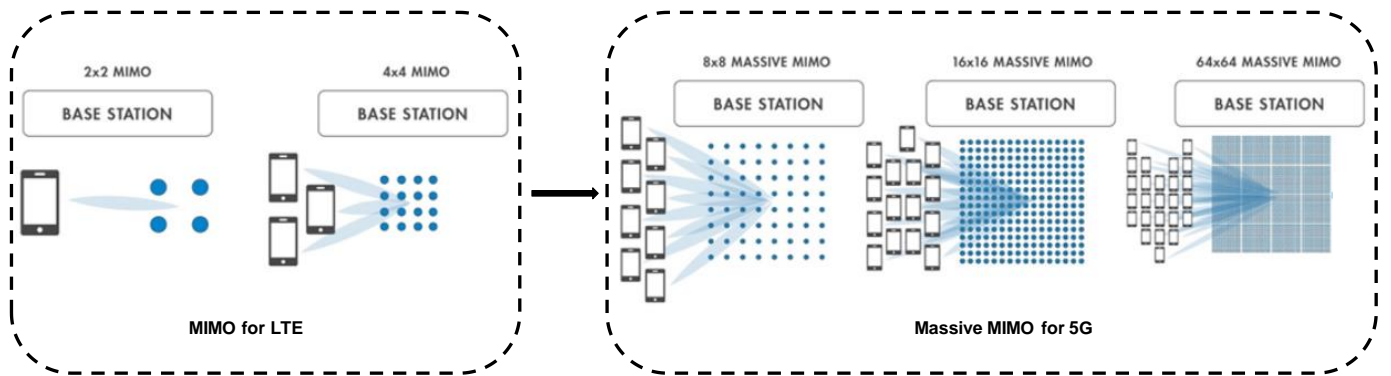
Source: Huawei, CMBIS

Figure 100: 5G network: massive MIMO & small cell



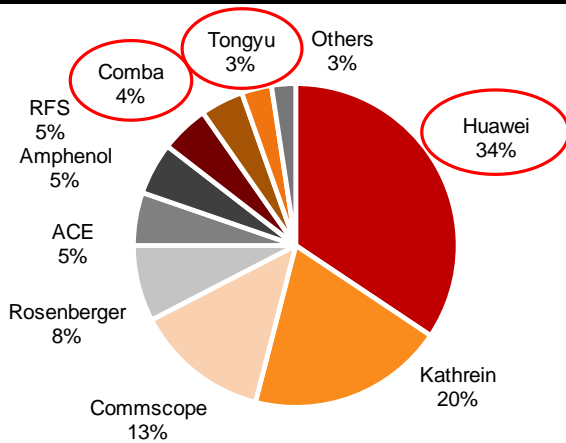
Source: Qorvo, CMBIS

Figure 101: MIMO to Massive MIMO increased antenna demand



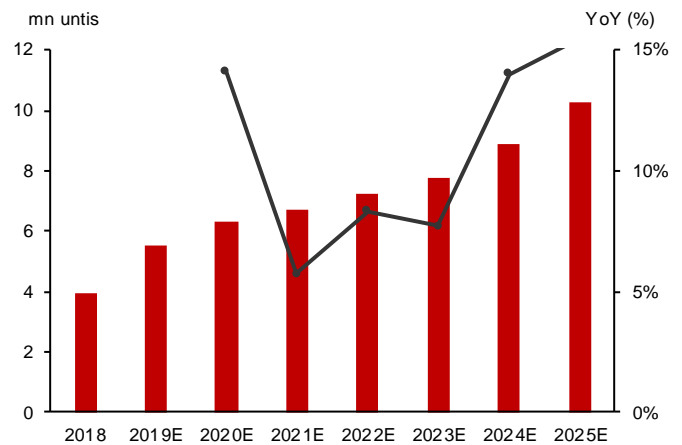
Source: Mathworks, CMBIS

Figure 102: Global BTS antenna market in 2018



Source: ABI Research, CMBIS

Figure 103: Small cell deployment forecast



Source: Qorvo, CMBIS

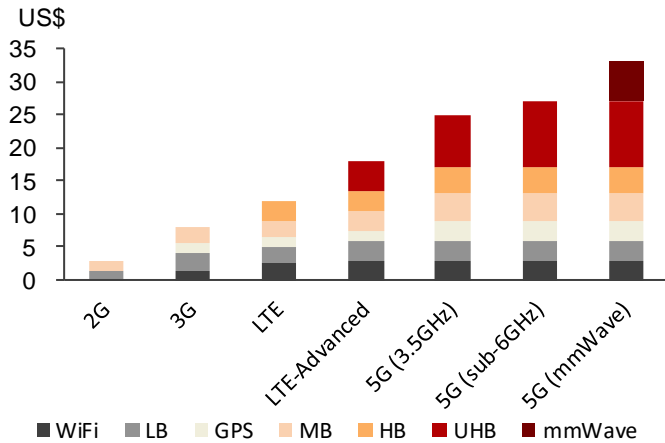
Handset antenna: LDS for Androids and LCP/MPI for iPhone

We identified two major design changes for 5G smartphone antenna: 1) multiple antennas to address demand from massive MIMO, and 2) more space-efficient and flexible design shifting from traditional PI to LCP (Liquid Crystal Polymer)/ MPI (Modified Polyimide) or LDS (Laser Direct Structuring). Given poor performance of traditional PI – substantial signal loss under high frequency, 5G antenna will adopt either 1) LCP/MPI, which exhibit stable electrical properties and replace micro coaxial cable for space saving, or 2) LDS, which applies conductive surface directly on metal mid-frame/back cover with laser beam.

While Apple pioneered in LCP/MPI as early as 2017 on iPhone X, we see uptick of LDS for Androids handset, on account of more mature techniques and short lead time. Additionally, we see wider application from portable electronics to automotive and IoT products.

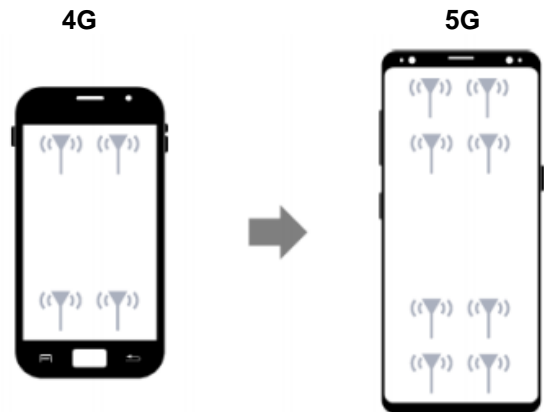
Regarding the competition landscape, 1) Luxshare (002475 CH) will strengthen its leadership as one of core LCP module suppliers for iPhone and disrupt the domination of Japan/US rivalries; 2) DSJB (002384 CH) acquired MFLEX, which was a leader in MPI manufacturing; 3) Sunway (300136 CH) and Speed (300322 CH) are well-positioned to capture rising opportunities as LDS gains popularity amongst Androids camp and IoT/auto.

Figure 104: Increasing content value



Source: Qovro, CMBIS

Figure 105: Number of antenna to double on 5G phone



Source: Qovro, CMBIS

Figure 106: LCP antenna on iPhone



Source: Company data, CMBIS

Figure 107: LDS antenna on Samsung



Source: Company data, CMBIS

Figure 108: Antenna design comparison

	Laser Direct Structuring (LDS)	Liquid Crystal Polymer (LCP)	Modified Polyimide (MPI)	Polyimide (PI)
Signal loss		Least	Less	More
Temperature range		Narrow	Less wide	Wide
Moisture absorption		Low	Lower	High
Cost		High	Moderate	Low
Latest model	Galaxy S10+ 5G/ Huawei Mate30 Pro 5G	iPhone 11	iPhone 7	
ASP	US\$ 3-4	US\$ 6-8	US\$ 2-3	US\$ 0.5
Features	<ul style="list-style-type: none"> • High-reliability • Less interference • Ease and flexibility of modification 	<ul style="list-style-type: none"> • Low electric loss under high-frequency • Flexible design to allow miniaturization • Complex, low yield, high cost 	<ul style="list-style-type: none"> • Competent on par with LCP under 10-15GHz 	<ul style="list-style-type: none"> • signal loss, moisture absorption under high-frequency
Suppliers	Sunway, Speed	Luxshare, Amphenol, Sunway, Dianlian Tech	Avary, DSBJ	

Source: CMBIS

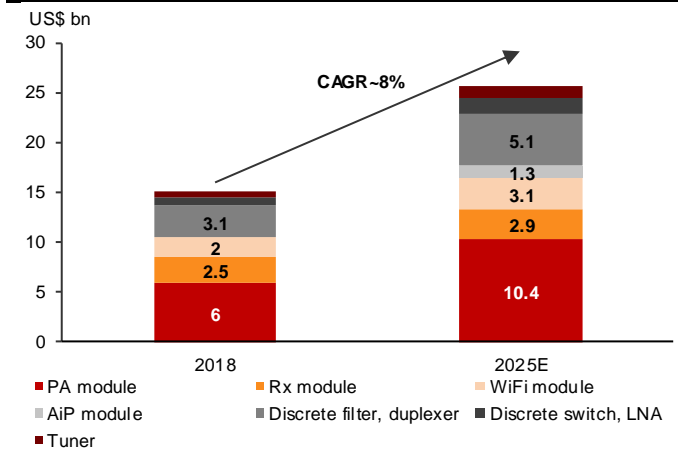
RFFE: becoming more integrated system

Radio Frequency Front End (RFFE) converts digital signals from modem to analog signals, which will be further converted to RF waves by antenna. RFFE composes of PA (Power Amplifier), LNA (Low-noise Amplifier), filter, switch, duplexer and antenna tuner. According to Yole, RFFE market will see 8% CAGR 2018-25E, mainly driven by additional frequency bands, dual connectivity implementation, and transition to 4x4/2x2 MIMO for the downlink and uplink.

By component, we believe 1) filter (65% of BoM cost) will see significant increase in amounts and upgrade to BAW, 2) Power Amplifier (PA), 20% of BoM cost, will upgrade from GaAs to GaN, 3) switch (10% of BoM cost) will see amounts increase manifold.

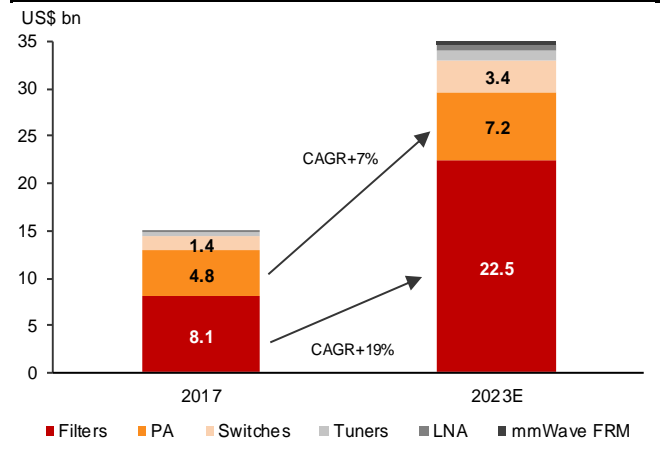
Considering that 5G adds more complexity to RFFE, we foresee integrated design will drive up BoM cost of RFFE—if we compare P20 Pro (45 discrete components+4 integrated modules) and S10 (17 discrete components+8 integrated modules), BoM of RF board on S10 doubles that of P20 Pro. Looking ahead, we expect more integration to incorporate functions of modem, RFFE and antenna.

Figure 109: RFFE trending into integration in-module



Source: Yole, CMBIS

Figure 110: Filters of fastest growth in 2017-23E



Source: Yole, CMBIS

Figure 111: 5G to transform RF Front End

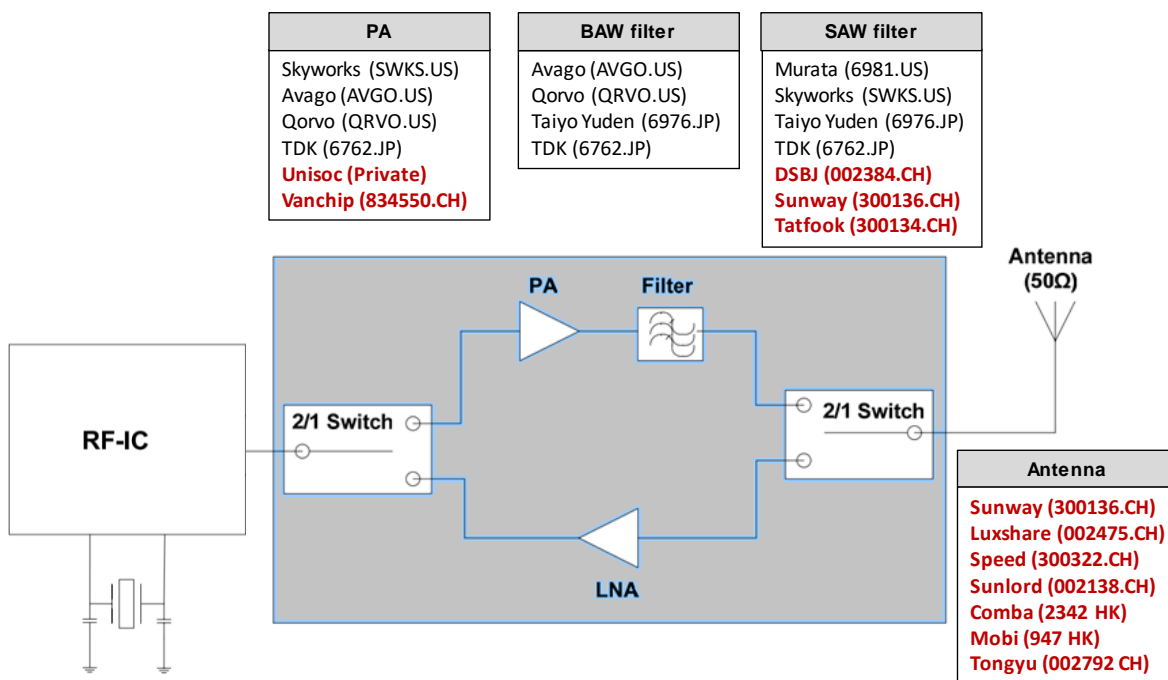
Component	4G	5G	Improvement
Antenna	• 2T2R MIMO DL	• 4T4R MIMO DL/UL	<ul style="list-style-type: none"> • Increased amounts of antennas as MIMO requires more data stream layers • More tuners to improve radiation efficiency required by MIMO and to empower more spectrum bands under high-order CA
Filter	<ul style="list-style-type: none"> • 40 per handset • SAW 	<ul style="list-style-type: none"> • 70 per handset • BAW/FBAR/LTCC 	<ul style="list-style-type: none"> • More filters in response to more bands under high-order CA (e.g. 2-3 more filters to each additional band) • BAW/FBAR/ LTCC (low temperature co-fired ceramic) for multiple bands communication
PA	• GaAs	• GaN	<ul style="list-style-type: none"> • Increasing adoption of GaN for wider bandwidth • Less impact on PA/LNA amounts due to their broader-band compatibility
Switch	• 10 per handset	• 30 per handset	<ul style="list-style-type: none"> • Advanced switches to maximize the connections per antenna to facilitate MIMO

Source: CMBIS

Beneficiaries

- **Sunway (300136 CH, BUY)** is a leading antenna system solution provider, which will benefit from growing antenna in 5G smartphone in next few years. In addition, we expect Sunway to expand market share in wireless charging in near future.
- **Luxshare (002475 CH, BUY)** We maintain positive on Luxshare to be the major beneficiary of 5G/wireless secular trend with solid product roadmap and strengthened relationship with Apple for LCP antenna (iPhone), wireless charging (Apple Watch) and AirPods assembly.
- **Speed (300322 CH, NR)** cumulates broad expertise on antenna (52% of FY19 rev), from smartphone/notebook (LDS/FPC) to base station/small cell/auto. Meanwhile, Speed expanded client base by active M&A – acquiring Skycross to enter Huawei (2017) and Polytech for Apple (2018).
- **Tongyu (002792 CH, NR)** as major supplier for ZTE/Ericsson, offers a full range of wireless products for RAN, including base station antenna (80% of FY19 rev), microwave antenna, optical network units, and RF components. Tongyu remained positive on 5G antenna and announced MP in Feb 2020.
- **Comba (2342 HK, NR)** offers small cell, CPE, and base station antenna with leading technologies in TDD+FDD-compatible and 5G massive MIMO.

Figure 112: Antenna and RFFE supply chain



Source: CMBIS

ZTE - H (763 HK)

Best proxy of global 5G momentum

Initiate at BUY. We believe global 5G deployment will accelerate in FY21-22E following COVID-19 delay, and ZTE is well leveraged to benefit from multi-year 5G investment cycle. We are positive on ZTE's outlook in FY21-22E backed by strong 5G product portfolio, global share gain, solid R&D capability and improving profitability. We estimate 13%/29% revenue/NP FY20-22E CAGR, and our 12m TP of HK\$26.32 is based on 17.5x FY21E P/E, in-line with 2-year historical forward P/E. Upcoming catalyst is China 3rd phase of 5G BTS tender.

- Key beneficiary of China 5G take-off.** We believe Chinese operators' will kick off next 5G BTS tender in late Dec, and 5G equipment growth will improve with better profitability in 1H21E. We expect Chinese telcos to maintain stable capex growth in FY21E, and ZTE is set to benefit from capturing 35% domestic market share in FY21-22E.
- Multi-year market share gain amid Huawei uncertainties.** We expect overseas sales to recover with 15%/16% YoY in FY21/22E, thanks to: 1) rising demand of 4G/5G equipment in Asian countries following COVID-19, and 2) optical network upgrade in Europe to replace traditional copper cable network. Although the US-China tension is likely to persist, we expect ZTE to pick up market share in overseas markets following US technology restriction on Huawei and Fiberhome.
- Sanechips: Strong competitive position and LT opportunities.** As global tech decoupling sparked a new wave of import substitution in China, we are positive on Sanechips (中兴微电子), ZTE's IC design subsidiary, which recently achieved breakthroughs on multi-mode 5G baseband chip and digital intermediate-frequency chip. We expect Sanechip's self-developed chips to help improve technology sufficiency and further optimize cost structure in the long term.
- Valuation/Key risks.** We derived our 12m TP of HK\$26.32 by applying 17.5x FY21E P/E, in line with 2-year historical forward P/E. We estimate 29% EPS FY20-22E CAGR, backed by 13% revenue CAGR and improving GPM as 5G scales up. Risks include US-China disputes, component restriction and overseas 5G deployment delays.

Earnings Summary

(YE 31 Dec)	FY18A	FY19A	FY20E	FY21E	FY22E
Turnover (RMB mn)	85,513	90,737	103,273	117,384	132,909
YoY growth (%)	(21.4)	6.1	13.8	13.7	13.2
Net profit (RMB mn)	(6,984)	5,148	4,422	6,210	7,386
EPS (RMB)	(1.67)	1.22	0.94	1.32	1.57
YoY growth (%)	NA	NA	(23.1)	40.4	18.9
Consensus EPS (RMB)	NA	NA	0.99	1.31	1.61
PE (x)	(10.0)	13.7	17.8	12.7	10.7
PB (x)	2.4	2.0	1.8	1.6	1.4
Yield (%)	0.0	0.9	0.7	1.0	1.2
ROE (%)	(21)	14	9	12	13
Net gearing (%)	45	50	49	48	46

Source: Company data, Bloomberg, CMBIS estimates

BUY (Initiation)

Target Price	HK\$ 26.32
Up/Downside	+37.6%
Current Price	HK\$ 19.12

China Technology Sector

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Stock Data

Mkt. Cap. (HK\$ mn)	164,646
Avg. 3mths t/o (HK\$ mn)	234
52W High/Low (HK\$)	36.7/16.5
Total Issued Shares (mn)	755.5

Source: Bloomberg

Shareholding Structure

BlackRock	5.93%
Capital Group	5.08%
Schroders	4.93%

Source: Bloomberg

Share Performance

	Absolute	Relative
1-mth	-6.4%	-6.7%
3-mth	-0.4%	-6.9%
6-mth	-18.6%	-25.3%

Source: Bloomberg

12-mth Price Performance

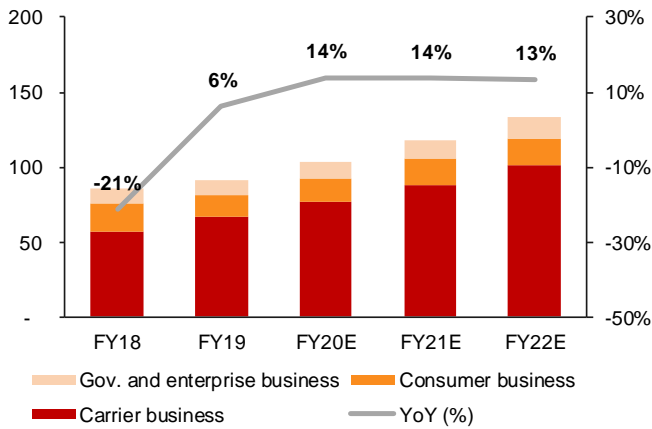


Source: Bloomberg

Auditor: Ernst & Young

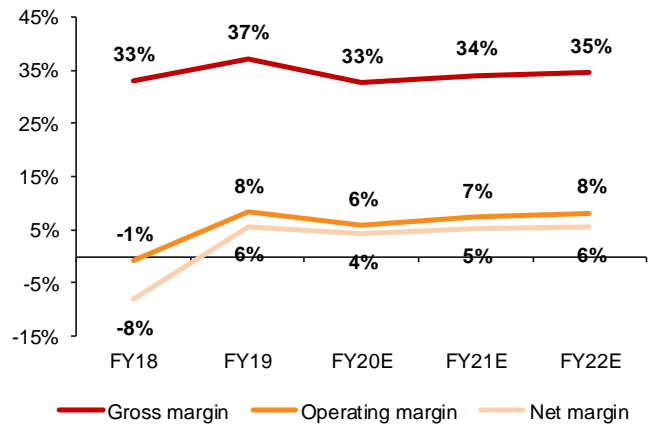
Focus Charts

Figure 113: ZTE revenue trend (FY18A-22E)



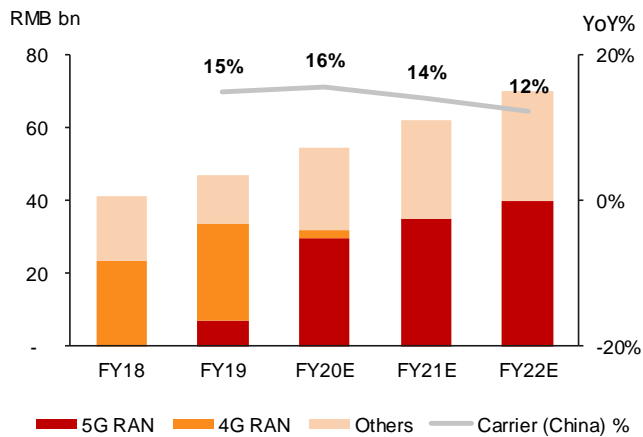
Source: Company data, CMBIS estimates

Figure 114: ZTE margin trend (FY18A-22E)



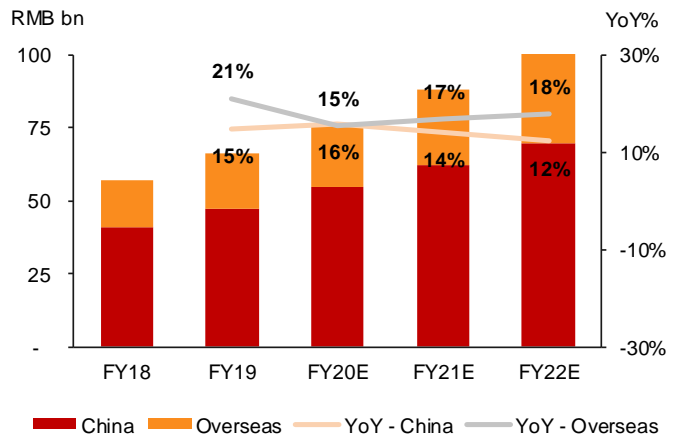
Source: Company data, CMBIS estimates

Figure 115: 5G driving carrier business in China



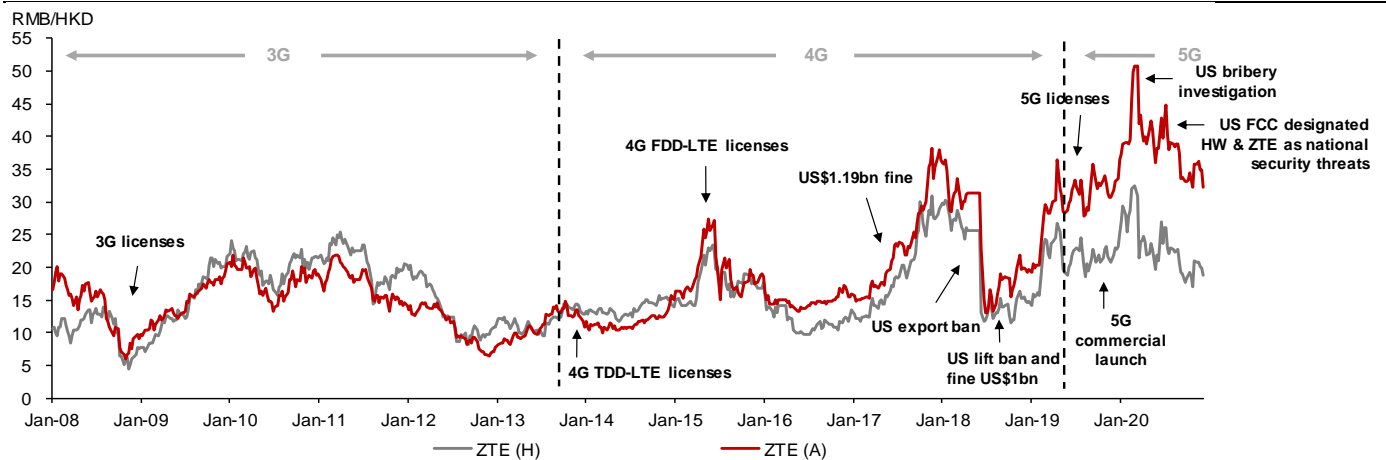
Source: Company data, CMBIS estimates

Figure 116: Carrier business in China/overseas



Source: Company data, CMBIS estimates

Figure 117: ZTE stock price trend throughout 3G/4G/5G era from 2008 to 2020 (YTD)



Source: Bloomberg, CMBIS

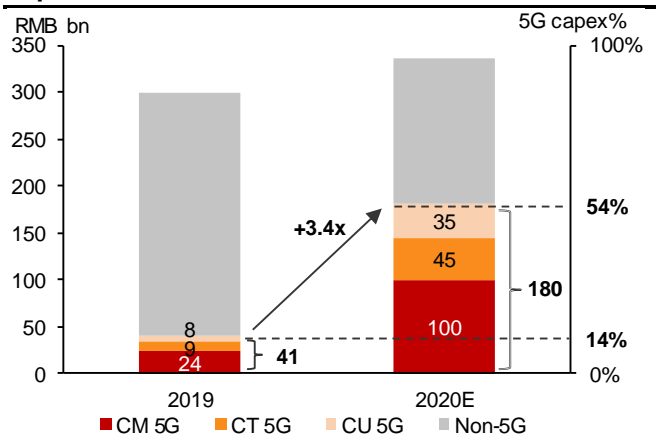
Investment Thesis

Riding on global 5G infrastructure upgrade cycle

Strong 5G momentum to drive 13% revenue CAGR during FY20-22E. ZTE leads in telecommunication equipment industry with comprehensive product portfolio and integrated solutions. Carrier business accounted for 73% of ZTE's total revenue in FY19. We expect ZTE will benefit from the tailwinds of 5G infrastructure investment globally.

We expect ZTE to deliver 13% revenue CAGR FY20-22E, driven by carrier network business (14% CAGR), government & enterprise business (15% CAGR), and consumer business (8% CAGR) given strategic shift and sluggish overseas smartphone sales.

Figure 118: 5G takes up 54% of total Chinese telcos' capex for 2020



Source: CM, CT, CU, CMBIS

Figure 119: ZTE provides all scenario 5G products

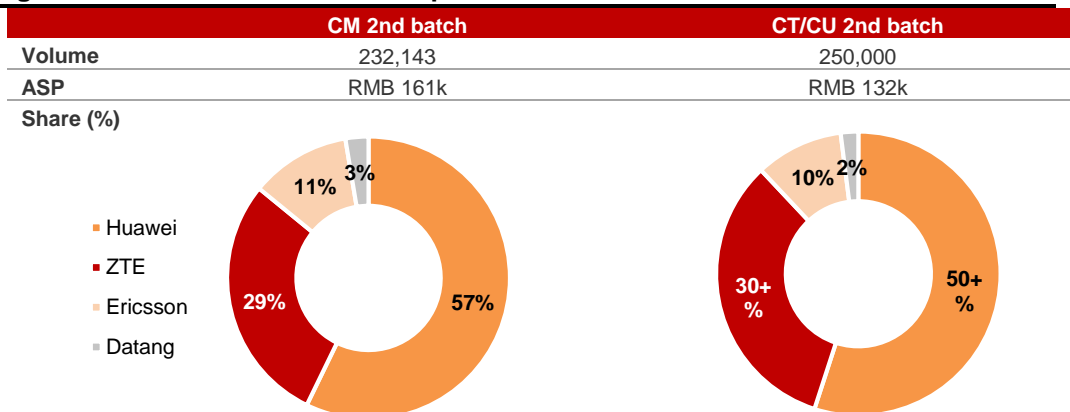


Source: Company data, CMBIS

China: Leading market share in 5G cycle. ZTE derived 71% of revenue from domestic market in FY19, and it captured ~30% of share allocation in CM and CT/CU 2nd batch of 5G tenders in 2Q20E. As domestic vendors will continue gaining share from Nokia/Ericsson, we expect ZTE to gradually ramp its share to 35% in China 5G cycle (vs 30% in FY20E).

With 500k+ 5G BTS built in China (ahead of schedule), we believe Chinese operators will be prudent in 5G BTS rollout in 4Q20E, and we expect ZTE's 4Q revenue to grow 10% YoY thanks to postponed revenue recognition. Looking ahead, we expect China capex upcycle will drive ZTE's domestic carrier business to grow 16%/14% YoY in FY20/21.

Figure 120: 5G RAN infrastructure procurement results of CM and CT/CU in 2020

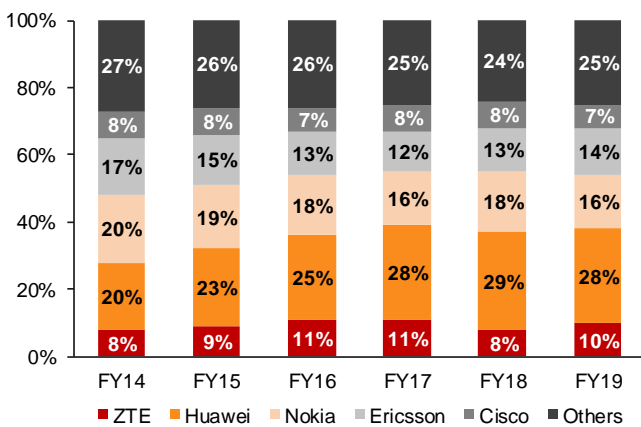


Source: C114, CMBIS

Overseas: market share gain and 5G deployment to pick up in FY21E. Following 5G delay due to pandemic in 2020, we believe global carriers will resume 5G deployment in FY21E especially in Asian countries. We expect overseas carrier business to grow 15%/17% YoY in FY20/21E, driven by 4G enhancement and 5G project wins with major countries and operators (e.g. Spain/Italy/ Austria).

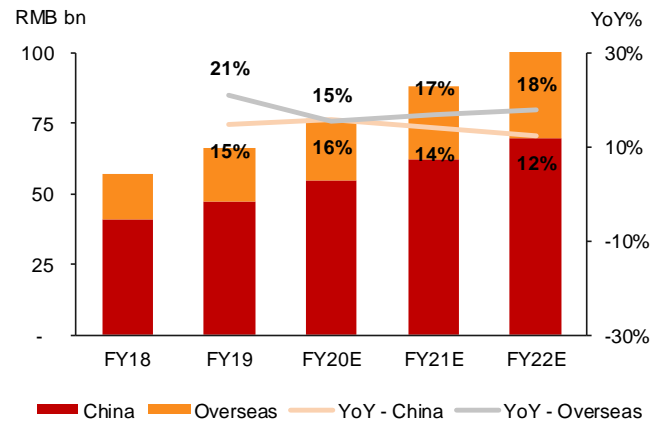
Overall, we expect ZTE's carrier business to grow at 15% CAGR FY20-22E, backed by 1) strong market share at 35% in China and 2) overseas expansion and share gain in 5G rollouts in Europe and Middle East as well as 4G extension in Asia Pacific.

Figure 121: ZTE's global market share rebound to 10% in 2019



Source: Dell'Oro, CMBIS

Figure 122: Carrier business will grow at 14% CAGR FY20-22E

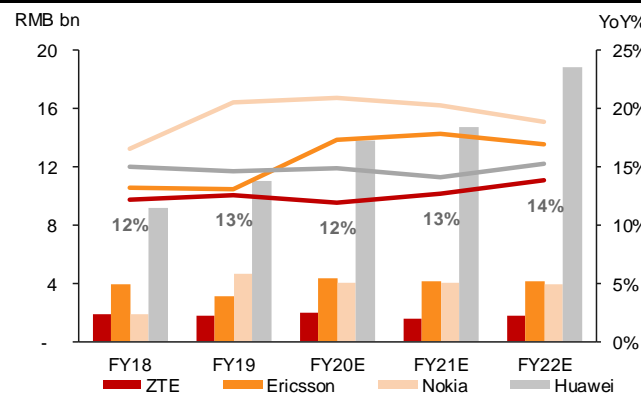


Source: Company data, CMBIS estimates

Stepped-up R&D efforts on 5G/self-developed chips

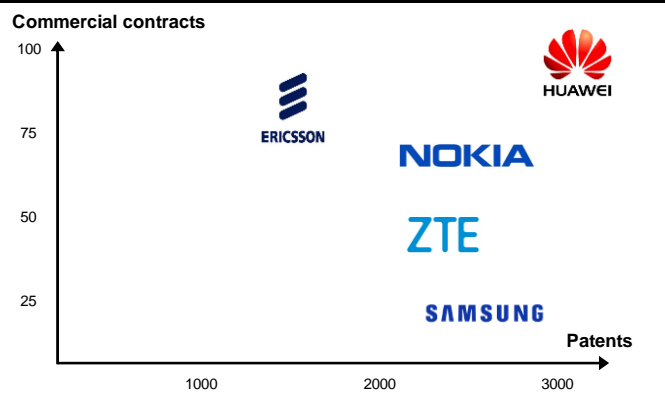
Increasing R&D investment with share placement. With 2500+ 5G patents, ZTE secured over 55 5G commercial contracts as of Sep 2020. We believe R&D expense will increase to 14.8% of FY20E sales (vs 13.8%/12.8% in FY19/18), which will significantly enhance its 5G product pipeline. ZTE also announced to invest RMB 42.9bn to enhance its competitiveness in 5G technology, and it raised RMB 13bn (RMB 9.1bn/3.9bn for 5G R&D/working capital) through share issuance (9% of share capital).

Figure 123: Climbing R&D expenses of ZTE



Source: Company data, CMBIS estimates

Figure 124: 5G competitiveness among top vendors



Source: Company data, CMBIS

Sanechips (中兴微电子) to enhance chip self-sufficiency. Sanechips is Top 5 IC design company in China, and 81.2% of stake is owned by ZTE. ZTE announced in Nov to acquire the remaining ownership by issuing new A shares.

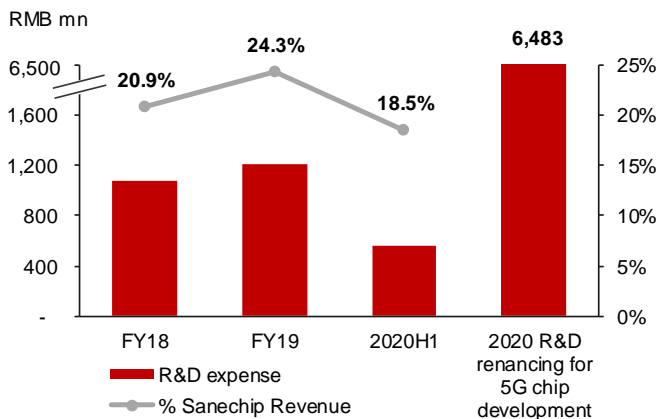
In view of US-China ongoing tensions, we believe Sanechips will accelerate development of its communication chips, such as modem, image processor, power chip, ethernet & connectivity chip, while processor/storage chips will still depend on US vendors. We are positive on ZTE's progress on multi-mode 5G baseband chip and digital intermediate-frequency chip, and ZTE started mass production of 7nm in 2019 and sampling of 5nm chips in 4Q20.

Figure 125: Sanechips as top 5 Chinese IC design companies

#	Company	Revenue		
		2018	2019	YoY%
1	Hisilicon (海思)	6,080	7,420	22%
2	Unisoc (紫光展锐)	2,275	2,230	-2%
3	OmniVision/Will (豪威/韦尔)	1,405	1,660	18%
4	Bitmain (比特大陆)	1,695	1,590	-6%
5	Sanechips (中兴微电子)	870	710	-18%
6	HDSC (华大集成电路)	585	570	-3%
7	Smartchip (智芯微电子)	570	550	-4%
8	ISSI/Ingenic (ISSI/北京君正)	645	490	-24%
9	GigaDevice (兆易创新)	338	470	39%
10	Datangic (大唐半导体)	392	375	-4%

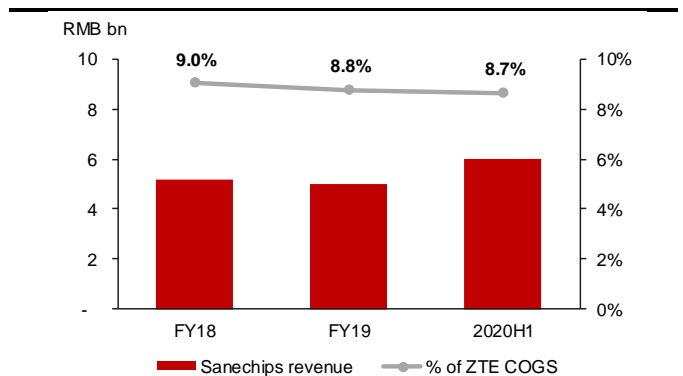
Source: IC Insights, CMBIS

Figure 127: Sanechips targets to achieve advanced chip technology with continued R&D investment



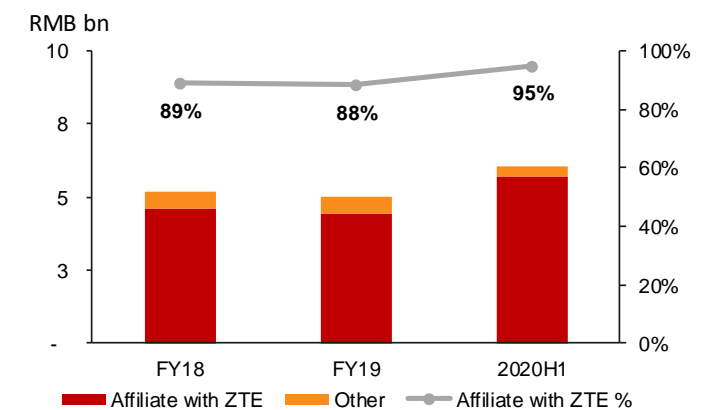
Source: Company data, CMBIS

Figure 126: Sanechips revenue estimate



Source: Company data, CMBIS

Figure 128: ZTE to expand into upstream chips

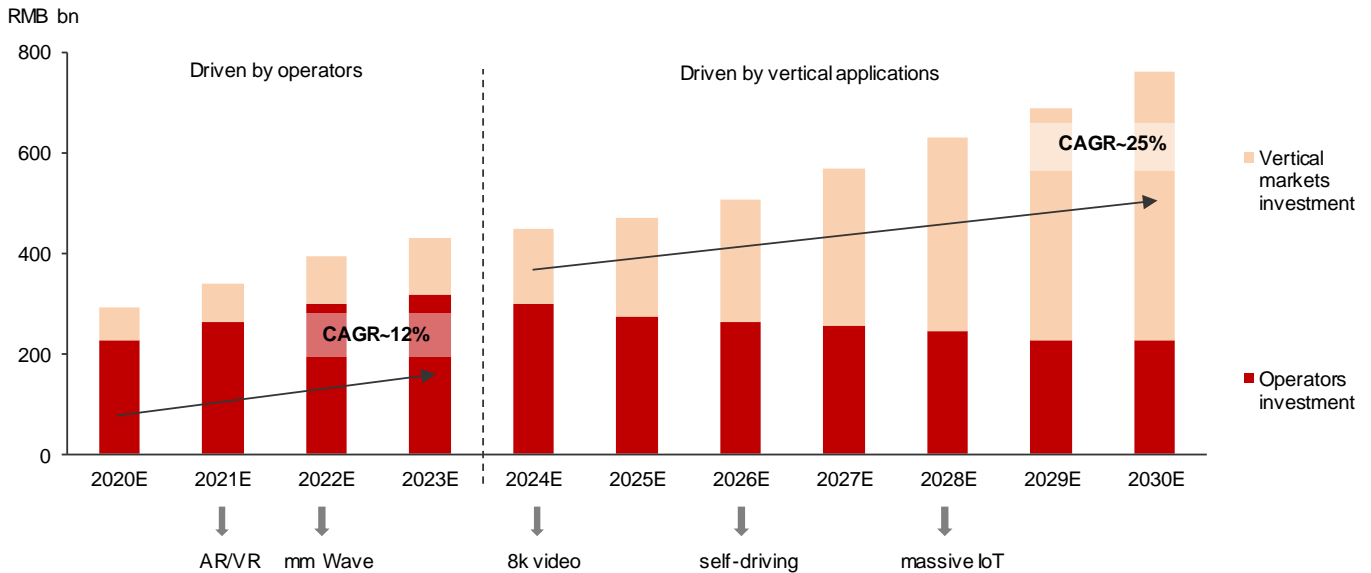


Source: Company data, CMBIS

New infrastructure” unleashing opportunities for vertical applications

Select vertical markets generating new revenue streams. As operators’ capex will drive 5G investment during FY19-23E, CAICT estimates vertical markets will spark the next wave of investment in China. As ZTE further taps into B2B market, such as financials, energy, transportation and government digitalization, we expect government & enterprise business to grow at 15% CAGR FY20-22E, contributing 16% of FY22E total revenue.

Figure 129: Vertical markets become major driver for investment growth in China



Source: CAICT, CMBIS

Poised to benefit from “new infrastructure”. By leveraging expertise in wireless, big data and cloud computing, ZTE is well-positioned to capture opportunities from “new infrastructure”, in terms of 1) 5G accelerating migration to cloud, 2) NewStart OS to empower industrial IoT in fields of telecom/power/industrial automation/high-speed railway, 3) GoldenDB database to facilitate online transaction processing, in collaboration with CITIC Bank, Bank of Jiangsu, Bank of Guizhou, etc.

Figure 130: 5G+ enabling industry innovation



Source: Company data, CMBIS

Figure 131: GoldenDB transforming CITIC Bank’s database service for cost reduction (equip./R&D down by 60%/30%)



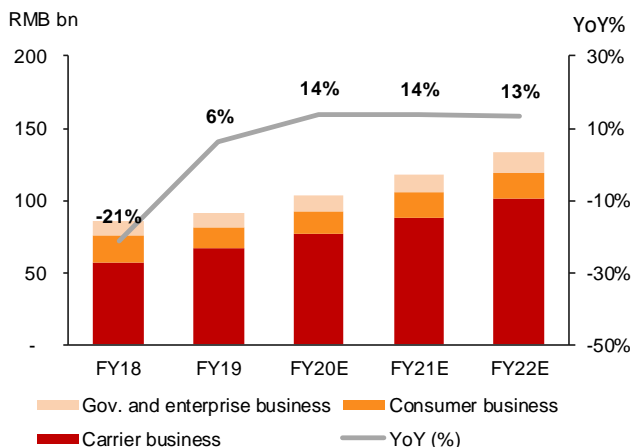
Source: Company data, CMBIS

Financial Analysis

Expect revenue/net profit to grow at 14%/30% CAGR FY20-22E

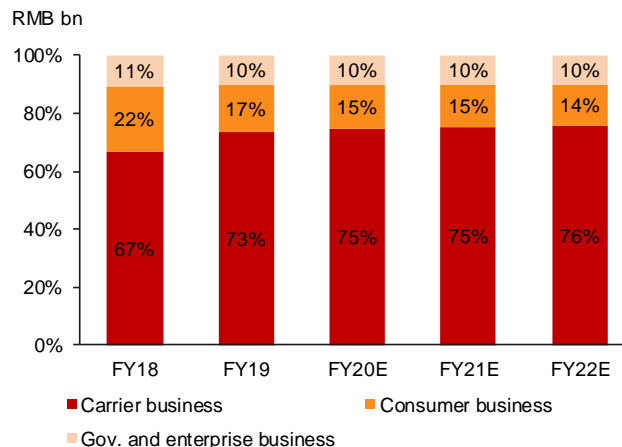
We estimate ZTE revenue to grow 14%/14%/13% YoY in FY20E/21E/22E, driven by 1) carriers network business (14% CAGR) gain share in both China and overseas market, 2) government & enterprise business (15% CAGR) riding on rapid cloud migration, and 3) consumer business (8% CAGR) on stable overseas sales growth. We expect GPM will gradually improve starting from 4Q20E as 5G BTS order is scaling up.

Figure 132: Revenue growth estimates



Source: Company data, CMBIS estimates

Figure 133: Revenue breakdown



Source: CMBIS estimates

Figure 134: Revenue breakdown

RMB mn	FY18	FY19	1H20	2H20E	FY20E	FY21E	FY22E
Carriers' network	57,076	66,584	34,970	42,016	76,986	88,497	100,808
...YoY	-11%	17%	8%	23%	16%	15%	14%
China	41,121	47,260	26,428	28,250	54,679	62,413	70,054
...YoY		15%	22%	10%	16%	14%	12%
Overseas	15,955	19,324	8,535	13,772	22,307	26,084	30,754
...YoY		21%	-21%	62%	15%	17%	18%
Consumer business	19,210	14,997	7,413	8,459	15,873	17,046	18,367
...YoY	-45%	-22%	0%	12%	6%	7%	8%
Gov. and corp. business	9,228	9,155	4,817	5,598	10,414	11,841	13,733
...YoY	-6%	-1%	2%	26%	14%	14%	16%
Total	85,513	90,737	47,199	56,073	103,273	117,384	132,909
...YoY	-21.4%	6.1%	5.8%	21.6%	13.8%	13.7%	13.2%
Gross Margin							
Carriers' network	40.4%	42.6%	36.3%	34.2%	35.2%	37.0%	37.5%
Consumer business	12.5%	17.9%	23.1%	22.9%	23.0%	22.5%	22.5%
Gov. and corp. business	29.2%	29.2%	28.3%	27.8%	28.0%	28.5%	29.0%
Total	32.9%	37.2%	33.4%	31.9%	32.6%	34.0%	34.5%

Source: Company data, CMBIS

Figure 135: P&L forecast

RMB mn	FY18	FY19	1Q20	2Q20	3Q20	4Q20E	FY20E	FY21E	FY22E
Revenue	85,513	90,737	21,484	25,715	26,930	29,143	103,273	117,384	132,909
...YoY	-21.4%	6.1%	-3.2%	14.8%	37.2%	10.0%	13.8%	13.7%	13.2%
Cost of sales	(57,368)	(57,008)	(13,033)	(18,385)	(18,887)	(19,302)	(69,607)	(77,430)	(86,990)
Gross profit	28,146	33,728	8,451	7,330	8,043	9,842	33,666	39,954	45,918
GPM (%)	32.9%	37.2%	39.3%	28.5%	29.9%	33.8%	32.6%	34.0%	34.5%
...YoY	-16.8%	19.8%	-4.8%	-14.9%	12.4%	8.4%	-0.2%	18.7%	14.9%
SG&A	(12,736)	(12,642)	(2,740)	(3,465)	(3,124)	(3,373)	(12,703)	(14,438)	(16,481)
...% of rev	-14.9%	-13.9%	-12.8%	-13.5%	-11.6%	-11.6%	-12.3%	-12.3%	-12.4%
R&D	(10,906)	(12,548)	(3,241)	(3,397)	(4,154)	(4,493)	(15,284)	(17,373)	(19,670)
...% of rev	-12.8%	-13.8%	-15.1%	-13.2%	-15.4%	-15.4%	-14.8%	-14.8%	-14.8%
Operating profit	(612)	7,552	1,051	1,790	1,098	2,134	6,073	8,606	10,847
OPM (%)	-0.7%	8.3%	4.9%	7.0%	4.1%	7.3%	5.9%	7.3%	8.2%
...YoY	-109.0%	-1334.1%	-28.2%	103.6%	-69.0%	27.9%	-19.6%	41.7%	26.0%
Net profit	(6,984)	5,148	780	1,077	855	1,710	4,422	6,210	7,386
NPM (%)	-8.2%	5.7%	3.6%	4.2%	3.2%	5.9%	4.3%	5.3%	5.6%
...YoY	-173.7%	-9.6%	77.2%	-67.8%	67.6%	-14.1%	-14.1%	40.4%	18.9%

Source: Company data, CMBIS

Our FY20/21E EPS is in-line with consensus

Our EPS estimates are in line with consensus.

Figure 136: CMBIS estimates vs consensus

RMB mn	CMBIS estimates			Consensus			Diff (%)		
	FY20E	FY21E	FY22E	FY20E	FY21E	FY22E	FY20E	FY21E	FY22E
Revenue	103,273	117,384	132,909	102,489	115,558	126,574	1%	2%	5%
Gross Profit	33,666	39,954	45,918	34,246	39,540	44,358	-2%	1%	4%
Operating Profit	6,073	8,606	10,847	6,271	8,595	10,805	-3%	0%	0%
Net profit	4,422	6,210	7,386	4,478	5,942	7,325	-1%	5%	1%
EPS (RMB)	0.94	1.32	1.57	0.99	1.31	1.61	-5%	1%	-2%
Gross Margin	32.6%	34.0%	34.5%	33.4%	34.2%	35.0%	-0.8 ppt	-0.2 ppt	-0.5 ppt
Operating Margin	5.9%	7.3%	8.2%	6.1%	7.4%	8.5%	-0.2 ppt	-0.1 ppt	-0.4 ppt
Net Margin	4.3%	5.3%	5.6%	4.4%	5.1%	5.8%	-0.1 ppt	0.1 ppt	-0.2 ppt

Source: Bloomberg, CMBIS estimates

Valuation

Initiate at BUY with TP HK\$26.32 (37.6% upside)

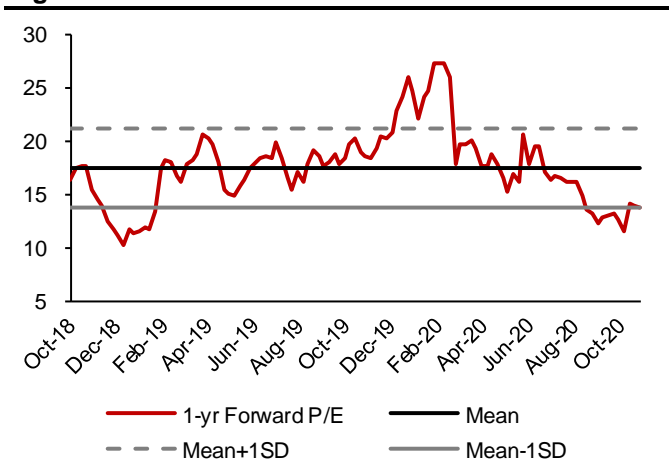
We derived our 12m TP of RMB26.32 based on 17.5x FY21E P/E, in line with its 2-year historical average. We believe this is justified as the stock has been mostly trading on 18-20x EPS, except the period during negative earnings in 2012, 2016 and 2018. We have a BUY rating.

Figure 137: Peers' valuation

Company	Ticker	Rating	Market Cap (US\$ mn)	Price (LC)	TP (LC)	Up/Down -side	P/E (x)		P/B (x)		ROE (%)		
							FY20E	FY21E	FY20E	FY21E	FY20E	FY21E	
ZTE (H)	763 HK	Buy	21,220	19.12	26.3	37.6%	17.8	12.7	1.8	1.6	9.0	12.0	
ZTE (A)	000063 CH	Buy	21,220	32.81	41.2	25.6%	34.9	24.8	3.5	3.1	9.0	12.0	
Fiberhome	600498 CH	NR	4,171	23.44	NA	NA	32.3	24.1	2.3	2.1	7.7	9.2	
Nokia	NOK US	NR	22,955	4.06	NA	NA	15.3	16.7	1.1	1.0	6.2	5.0	
Ericsson	ERIC US	NR	40,467	12.06	NA	NA	19.2	16.2	3.7	3.3	17.5	18.1	
Average								23.9	18.9	2.5	2.2	9.9	11.3

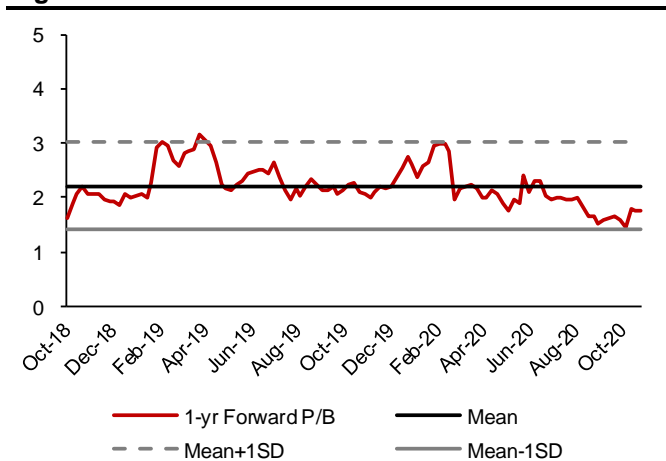
Source: Bloomberg, CMBIS estimates

Figure 138: 12M forward P/E band



Source: Company data, CMBIS estimates

Figure 139: 12M forward P/B band



Source: Company data, CMBIS estimates

Appendix

Company Background

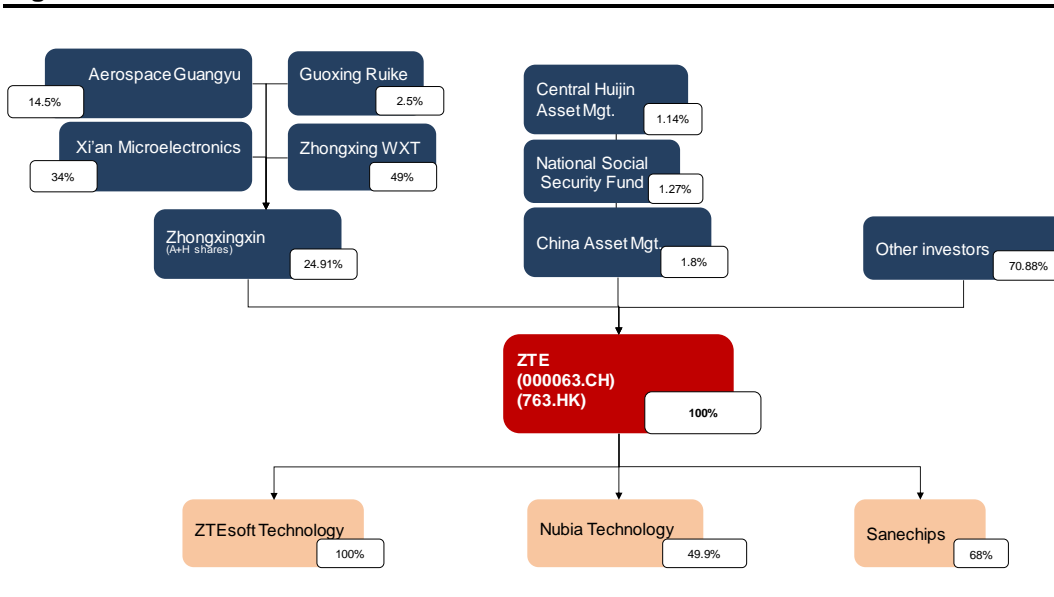
Established in 1985 and listed on SEE/HKEX board in 1997/2004, ZTE leads in high-performance, end-to-end networks and provides a comprehensive product line, which includes wireless networks, core networks, bearer networks, cloud computing and terminals markets. ZTE solidifies its global presence with established R&D centers in the US, Sweden and China and collaboration with public sector customers from over 160 countries.

Figure 140: Key milestones

Year	Event
1985	Founded Zhongxing Semiconductor Co., Ltd in Shenzhen
1993	Incorporated as "state-owned and private operating" entity
1997	Listed on Shenzhen Stock Exchange (stock code: 000063 CH)
2002	Established handset business unit
2004	Listed on Hong Kong Stock Exchange (stock code: 763 HK)
2009	Became the 3rd largest telecom vendors, according to GSM
2012	Started high-end smartphone brand "Nubia"
2017	Fined by US Department of Commerce of US\$1.19bn
2019	Launched 5G smartphone Axon 10 Pro

Source: Company data, CMBIS

Figure 141: Shareholders structure



Source: Company data, CMBIS
As at 31 March 2020.

Financial Summary

Income statement						Cash flow summary					
YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E	YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E
Revenue	85,513	90,737	103,273	117,384	132,909	Net profit	(6,949)	5,777	4,422	6,210	7,386
Cost of sales	(57,368)	(57,008)	(69,607)	(77,430)	(86,990)	Depreciation/amortization	2,472	3,062	4,844	5,590	6,466
Gross profit	28,146	33,728	33,666	39,954	45,918	Change in working capital	(11,132)	(4,177)	(10,254)	3,941	(17,590)
Selling exp	(9,084)	(7,869)	(7,539)	(8,452)	(9,569)	Others	6,394	2,785	(8,501)	(63)	1,113
Admin exp	(3,651)	(4,773)	(5,164)	(5,987)	(6,911)	Net cash from operating	(9,215)	7,447	(9,490)	15,678	(2,624)
R&D exp	(10,906)	(12,548)	(15,284)	(17,373)	(19,670)	Capex	4,882	6,551	5,834	6,688	7,696
Finance costs	(281)	(966)	(854)	(946)	(515)	Other	(6,168)	(12,574)	(6,648)	(11,375)	(13,893)
Other operating exp.	2,081	1,696	1,859	2,113	2,392	Net cash from investing	(1,286)	(6,023)	(813)	(4,688)	(6,196)
Operating profit	(612)	7,552	6,073	8,606	10,847	Net borrowings	5,886	9,019	6,365	3,178	1,629
Other non-oper exp.	(6,738)	(391)	52	(416)	(1,205)	Dividend paid	1,843	2,640	2,566	2,540	2,931
Pre-tax profit	(7,350)	7,162	6,125	8,190	9,642	Other	(6,521)	(5,938)	40	(5,080)	(5,862)
Income tax expense	401	(1,385)	(1,164)	(1,457)	(1,733)	Net cash from financing	1,208	5,722	8,971	638	(1,302)
Minority interests	383	(280)	(523)	(523)	(523)	Net change in cash	(8,975)	7,372	(1,467)	11,628	(10,123)
Perpetual capital	(417)	(349)	(16)	-	-	Cash at beginning of the year	30,109	21,134	33,309	31,842	43,470
Net profit to shareholders	(6,984)	5,148	4,422	6,210	7,386	Exchange difference	318	227	(135)	-	-
						Cash at the end of the year	21,134	28,506	31,842	43,470	33,348
Balance sheet						Key ratios					
YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E	YE 31 Dec	FY18A	FY19A	FY20E	FY21E	FY22E
Current assets	92,848	102,567	120,105	135,557	142,852	Revenue mix					
Cash & equivalents	24,290	33,309	31,842	43,470	33,348	Carrier business	57,076	66,584	76,986	88,497	100,808
Account receivables	21,592	19,778	23,252	26,698	31,088	Consumer business	19,210	14,997	15,873	17,046	18,367
Inventory	25,011	27,689	38,939	39,317	52,344	Gov. and enterprise	9,228	9,155	10,414	11,841	13,733
Prepayment	2,005	1,023	1,031	1,031	1,031	Growth (%)					
Other current assets	19,949	20,768	25,040	25,040	25,040	Revenue	(21.4)	6.1	13.8	13.7	13.2
Non-current assets	36,503	38,635	39,006	39,024	38,985	Gross profit	(16.8)	19.8	(0.2)	18.7	14.9
PPE	8,898	9,383	10,170	10,857	11,350	Operating profit	(109.0)	(1,334.1)	(19.6)	41.7	26.0
Intangible assets	8,558	7,719	8,008	7,825	7,614	Net profit	(252.9)	(173.7)	(14.1)	40.4	18.9
Other non-current assets	19,047	21,533	20,829	20,342	20,021	Profit & loss ratio (%)					
Total assets	129,351	141,202	159,111	174,581	181,837	Gross margin	32.9	37.2	32.6	34.0	34.5
Current liabilities	89,377	86,371	84,280	93,002	93,290	Operating margin	(0.7)	8.3	5.9	7.3	8.2
ST borrowings	24,983	27,258	22,204	23,820	24,648	Net profit margin	(8.2)	5.7	4.3	5.3	5.6
Account payables	19,527	18,356	16,448	23,260	22,525	Balance sheet ratio					
Tax payable	954	889	789	789	789	Gearing ratio (%)	45	50	49	48	46
Other current liabilities	43,912	39,868	44,838	45,133	45,327	Current ratio (x)	1.0	1.2	1.4	1.5	1.5
Non-current liabilities	7,013	16,877	28,172	29,734	30,534	Receivable turnover days	98	83	76	78	79
LT borrowings	2,367	10,045	21,464	23,026	23,826	Inventory turnover days	163	106	118	122	126
Deferred income	-	645	561	561	561	Payable turnover days	137	121	91	94	96
Other non-current	4,647	6,187	6,147	6,147	6,147	Profitability (%)					
Total liabilities	96,390	103,248	112,451	122,736	123,824	ROE	(21.2)	13.6	9.5	12.0	12.7
Shareholders' equity						ROA	(5.4)	3.6	2.8	3.6	4.1
Share capital	4,193	4,228	4,613	4,613	4,613	Per share data (RMB)					
Reserve	11,444	12,144	23,298	23,298	23,298	EPS (RMB)	(1.67)	1.22	0.94	1.32	1.57
Minority interest	3,811	2,875	2,851	2,851	2,851	DPS (RMB)	0.00	0.20	0.16	0.22	0.26
Total equity	32,961	37,954	46,660	51,845	58,013	BVPS (RMB)	5.48	6.85	9.32	10.43	11.74
Total liabilities and equity	129,351	141,202	159,111	174,581	181,837						

Source: Company data, CMBIS estimates

ZTE - A (000063 CH)

Best proxy of global 5G momentum

Initiate at BUY. We believe global 5G deployment will accelerate in FY21-22E following COVID-19 delay, and ZTE is well leveraged to benefit from multi-year 5G investment cycle. We are positive on ZTE's outlook in FY21-22E backed by strong 5G product portfolio, global share gain, solid R&D capability and improving profitability. We estimate 13%/29% revenue/NP FY20-22E CAGR, and our 12m TP of RMB\$41.20 is based on 31.2x FY21E P/E, in-line with 2-year historical forward P/E. Upcoming catalyst is China 3rd phase of 5G BTS tender.

- Key beneficiary of China 5G take-off.** We believe Chinese operators' will kick off next 5G BTS tender in late Dec, and 5G equipment growth will improve with better profitability in 1H21E. We expect Chinese telcos to maintain stable capex growth in FY21E, and ZTE is set to benefit from capture 35% domestic market share in FY21-22E.
- Multi-year market share gain amid Huawei uncertainties.** We expect overseas sales to recover with 15%/16% YoY in FY21/22E, thanks to: 1) rising demand of 4G/5G equipment in Asian countries following COVID-19, and 2) optical network upgrade in Europe to replace traditional copper cable network. Although the US-China tension is likely to persist, we expect ZTE to pick up market share in overseas markets following US technology restriction on Huawei and Fiberhome.
- Sanechips: Strong competitive position and LT opportunities.** As global tech decoupling sparked a new wave of import substitution in China, we are positive on Sanechips (中兴微电子), ZTE's IC design subsidiary, which recently achieved breakthroughs on multi-mode 5G baseband chip and digital intermediate-frequency chip. We expect Sanechip's self-developed chips to help improve technology sufficiency and further optimize cost structure in the long term.
- Valuation/Key risks.** We derived our 12m TP of RMB\$41.20 by applying 31.2x FY21E P/E, in line with 2-year historical forward P/E. We estimate 29% EPS FY20-22E CAGR, backed by 13% revenue CAGR and improving GPM as 5G scales up. Risks include US-China disputes, component restriction and overseas 5G deployment delays.

Earnings Summary

(YE 31 Dec)	FY18A	FY19A	FY20E	FY21E	FY22E
Turnover (RMB mn)	85,513	90,737	103,273	117,384	132,909
YoY growth (%)	(21.4)	6.1	13.8	13.7	13.2
Net profit (RMB mn)	(6,984)	5,148	4,422	6,210	7,386
EPS (RMB)	(1.67)	1.22	0.94	1.32	1.57
YoY growth (%)	NA	NA	(23.1)	40.4	18.9
Consensus EPS (RMB)	NA	NA	0.99	1.31	1.61
PE (x)	(19.6)	26.8	34.9	24.8	20.9
PB (x)	4.7	3.9	3.5	3.1	2.8
Yield (%)	0.0	0.6	0.5	0.7	0.8
ROE (%)	(21)	14	9	12	13
Net gearing (%)	45	50	49	48	46

Source: Company data, CMBIS estimates

BUY (Initiation)

Target Price	RMB 41.20
Up/Downside	+25.6%
Current Price	RMB 32.81

China Technology Sector

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Stock Data

Mkt. Cap. (RMB mn)	138,752
Avg. 3mths t/o (RMB mn)	1,852
52W High/Low (RMB)	56.7/30.16
Total Issued Shares (mn)	3,857.9

Source: Bloomberg

Shareholding Structure

ZTE Holdings	26.79%
China Asset Mgmt	1.89%
HKSCC	1.87%

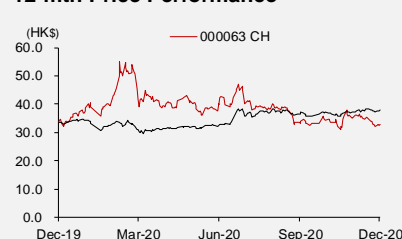
Source: Bloomberg

Share Performance

	Absolute	Relative
1-mth	-7.6%	-8.1%
3-mth	-3.4%	-5.7%
6-mth	-19.1%	-29.5%

Source: Bloomberg

12-mth Price Performance



Source: Bloomberg

Auditor: Ernst & Young

Valuation

Initiate at BUY with TP RMB\$41.20 (25.6% upside)

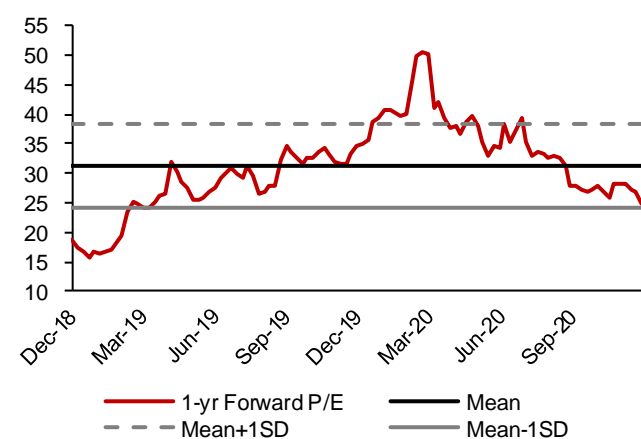
We derived our 12m TP of RMB41.20 based on 31.2x FY21E P/E, in line with its 2-year historical average P/E of 31.2x. We believe this is justified as the stock has been mostly trading on 18-20x EPS, except the period during negative earnings in 2012, 2016 and 2018. We have a BUY rating.

Figure 142: Peers' valuation

Company	Ticker	Rating	Market Cap (US\$ mn)	Price (LC)	TP (LC)	Up/Down -side	P/E (x)		P/B (x)		ROE (%)		
							FY20E	FY21E	FY20E	FY21E	FY20E	FY21E	
ZTE (H)	763 HK	Buy	21,220	19.12	26.3	37.6%	17.8	12.7	1.8	1.6	9.0	12.0	
ZTE (A)	000063 CH	Buy	21,220	32.81	41.2	25.6%	34.9	24.8	3.5	3.1	9.0	12.0	
Fiberhome	600498 CH	NR	4,171	23.44	NA	NA	32.3	24.1	2.3	2.1	7.7	9.2	
Nokia	NOK US	NR	22,955	4.06	NA	NA	15.3	16.7	1.1	1.0	6.2	5.0	
Ericsson	ERIC US	NR	40,467	12.06	NA	NA	19.2	16.2	3.7	3.3	17.5	18.1	
Average								23.9	18.9	2.5	2.2	9.9	11.3

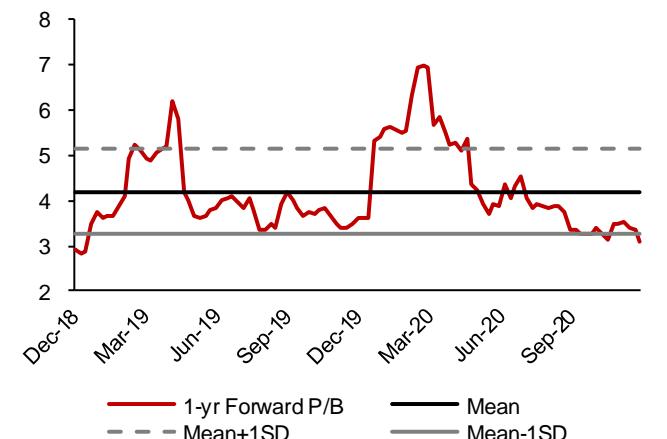
Source: Bloomberg, CMBIS estimates

Figure 143: 12M forward P/E band



Source: Company data, CMBIS estimates

Figure 144: 12M forward P/B band



Source: Company data, CMBIS estimates

Financial Summary

Income statement						Cash flow summary					
YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E	YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E
Revenue	85,513	90,737	103,27	117,38	132,90	Net profit	(6,949)	5,777	4,422	6,210	7,386
Cost of sales	(57,368)	(57,008)	(69,607)	(77,430)	(86,990)	Depreciation/amortization	2,472	3,062	4,844	5,590	6,466
Gross profit	28,146	33,728	33,666	39,954	45,918	Change in working capital	(11,132)	(4,177)	(10,254)	3,941	(17,590)
Selling exp	(9,084)	(7,869)	(7,539)	(8,452)	(9,569)	Others	6,394	2,785	(8,501)	(63)	1,113
Admin exp	(3,651)	(4,773)	(5,164)	(5,987)	(6,911)	Net cash from operating	(9,215)	7,447	(9,490)	15,678	(2,624)
R&D exp	(10,906)	(12,548)	(15,284)	(17,373)	(19,670)	Capex	4,882	6,551	5,834	6,688	7,696
Finance costs	(281)	(966)	(854)	(946)	(515)	Other	(6,168)	(12,574)	(6,648)	(11,375)	(13,893)
Other operating exp.	2,081	1,696	1,859	2,113	2,392	Net cash from investing	(1,286)	(6,023)	(813)	(4,688)	(6,196)
Operating profit	(612)	7,552	6,073	8,606	10,847	Net borrowings	5,886	9,019	6,365	3,178	1,629
Other non-oper exp.	(6,738)	(391)	52	(416)	(1,205)	Dividend paid	1,843	2,640	2,566	2,540	2,931
Pre-tax profit	(7,350)	7,162	6,125	8,190	9,642	Other	(6,521)	(5,938)	40	(5,080)	(5,862)
Income tax expense	401	(1,385)	(1,164)	(1,457)	(1,733)	Net cash from financing	1,208	5,722	8,971	638	(1,302)
Minority interests	383	(280)	(523)	(523)	(523)	Net change in cash	(8,975)	7,372	(1,467)	11,628	(10,123)
Perpetual capital	(417)	(349)	(16)	-	-	Cash at beginning of the	30,109	21,134	33,309	31,842	43,470
Net profit to shareholders	(6,984)	5,148	4,422	6,210	7,386	Exchange difference	318	227	(135)	-	-
						Cash at the end of the year	21,134	28,506	31,842	43,470	33,348

Balance sheet						Key ratios					
YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E	YE 31 Dec	FY18A	FY19A	FY20E	FY21E	FY22E
Current assets	92,848	102,56	120,10	135,55	142,85	Revenue mix					
Cash & equivalents	24,290	33,309	31,842	43,470	33,348	Carrier business	57,076	66,584	76,986	88,497	100,808
Account receivables	21,592	19,778	23,252	26,698	31,088	Consumer business	19,210	14,997	15,873	17,046	18,367
Inventory	25,011	27,689	38,939	39,317	52,344	Gov. and enterprise	9,228	9,155	10,414	11,841	13,733
Prepayment	2,005	1,023	1,031	1,031	1,031	Growth (%)					
Other current assets	19,949	20,768	25,040	25,040	25,040	Revenue	(21.4)	6.1	13.8	13.7	13.2
Non-current assets	36,503	38,635	39,006	39,024	38,985	Gross profit	(16.8)	19.8	(0.2)	18.7	14.9
PPE	8,898	9,383	10,170	10,857	11,350	Operating profit	(109.0)	(1,334.1)	(19.6)	41.7	26.0
Intangible assets	8,558	7,719	8,008	7,825	7,614	Net profit	(252.9)	(173.7)	(14.1)	40.4	18.9
Other non-current assets	19,047	21,533	20,829	20,342	20,021	Profit & loss ratio (%)					
Total assets	129,35	141,20	159,11	174,58	181,83	Gross margin	32.9	37.2	32.6	34.0	34.5
Current liabilities	89,377	86,371	84,280	93,002	93,290	Operating margin	(0.7)	8.3	5.9	7.3	8.2
ST borrowings	24,983	27,258	22,204	23,820	24,648	Net profit margin	(8.2)	5.7	4.3	5.3	5.6
Account payables	19,527	18,356	16,448	23,260	22,525	Balance sheet ratio					
Tax payable	954	889	789	789	789	Net debt/total equity (%)	45	50	49	48	46
Other current liabilities	43,912	39,868	44,838	45,133	45,327	Current ratio (x)	1.0	1.2	1.4	1.5	1.5
Non-current liabilities	7,013	16,877	28,172	29,734	30,534	Receivable turnover days	98	83	76	78	79
LT borrowings	2,367	10,045	21,464	23,026	23,826	Inventory turnover days	163	106	118	122	126
Deferred income	-	645	561	561	561	Payable turnover days	137	121	91	94	96
Other non-current	4,647	6,187	6,147	6,147	6,147	Profitability (%)					
Total liabilities	96,390	103,24	112,45	122,73	123,82	ROE	(21.2)	13.6	9.5	12.0	12.7
Shareholders' equity						ROA	(5.4)	3.6	2.8	3.6	4.1
Share capital	4,193	4,228	4,613	4,613	4,613	Per share data (RMB)					
Reserve	11,444	12,144	23,298	23,298	23,298	EPS (RMB)	(1.67)	1.22	0.94	1.32	1.57
Minority interest	3,811	2,875	2,851	2,851	2,851	DPS (RMB)	0.00	0.20	0.16	0.22	0.26
Total equity	32,961	37,954	46,660	51,845	58,013	BVPS (RMB)	5.48	6.85	9.32	10.43	11.74
Total liabilities and equity	129,35	141,20	159,11	174,58	181,83						

Source: Company data, CMBIS estimates

Innolight (300308 CH)

Dual engines from 400G upgrade and 5G rollout

Initiate at BUY. We expect Innolight to become the major beneficiary of 400G upgrade cycle in datacom and 5G deployment in telecom. We are positive on Innolight's global leadership in datacom optical modules (#1 in 100G/400G) and accelerated expansion into 5G telecom market (#1 in 50G/200G, Top 3 in 25G), backed by its leading packaging technology, automation capability and cost reduction ability. We believe recent share-price pullback due to inventory correction provides a good entry point to accumulate. We estimate 29%/36% revenue/NP FY20-22E CAGR, and our 12m TP of RMB73.45 is based on 41.9x FY21E P/E, in-line with 3-year avg. P/E. Catalysts include stronger cloud capex.

- Beneficiary of secular data growth and 400G upgrade in datacom.** With rapid increase in data traffic, we expect global hyperscale capex from cloud companies (e.g. Google, Amazon, Facebook, Microsoft) is set to maintain strong growth in FY21-22E driven by accelerating cloud demand, 400G upgrade and 100G restocking after inventory digestion. Leveraging its first-mover advantage in 400G products and strong relationship with major hyperscale clients, we expect Innolight to secure over 50% share in global 400G optical module market in FY20-21E, and 25G/100G/400G modules will deliver 31% revenue CAGR during FY20-22E.
- Tsuhuan acquisition to boost share gain in telecom market.** We are positive on Innolight's share expansion in telecom market thanks to China 5G rollout and its strong product offerings covering 25G fronthaul, 50G midhaul and 200G backhaul optical modules. Innolight started to ship 5G optical modules since 2018, and became a major 5G fronthaul supplier to Huawei and ZTE in 2019. We think Tsuhuan acquisition can boost Innolight's presence in telecom market by improving cost structure and leveraging Tsuhuan's component and production capability.
- Valuation/Key risks.** Our TP of RMB73.45 is based on 41.9x FY21E P/E, in line with its 2-year average P/E. Upcoming catalysts include increasing demand of 200G/400G/800G and share gain in China telecom market. Potential risks include weaker capex from cloud giants, slower deployment of 5G infrastructure and ASP pressure.

Earnings Summary

(YE 31 Dec)	FY18A	FY19A	FY20E	FY21E	FY21E
Turnover (RMB mn)	5,156	4,758	7,246	9,746	11,998
YoY growth (%)	118.8	(7.7)	52.3	34.5	23.1
Gross margin	27.3	27.1	25.8	26.3	27.2
Net profit (RMB mn)	623.1	513.5	870.0	1248.7	1618.6
EPS (RMB)	1.36	0.73	1.22	1.75	2.27
YoY growth (%)	122.2	(51.5)	72.5	68.7	29.6
PE (x)	39.8	74.1	44.4	30.9	23.8
PB (x)	5.4	5.6	4.9	4.2	3.6
Yield (%)	0.2	0.2	0.2	0.3	0.4
ROE (%)	12.4	6.2	9.3	13.7	15.2
Net gearing (%)	Net cash	2.3	18.0	9.2	16.5

Source: Company data, CMBIS estimates

BUY (Initiation)

Target Price	RMB 73.45
Up/Downside	+35.7%
Current Price	RMB 54.11

China Technology Sector

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Stock Data

Mkt. Cap. (RMB mn)	38,589
Avg. 3mths t/o (RMB mn)	279
52W High/Low (RMB)	73.45/46.66
Total Issued Shares (mn)	713.2

Source: Bloomberg

Shareholding Structure

Zhongji Investment	19.51%
SZ Yixingfu Ent Mgmt	7.04%
Xin Hong	4.42%

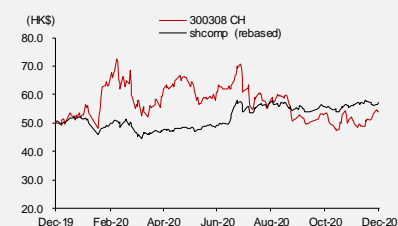
Source: Bloomberg

Share Performance

	Absolute	Relative
1-mth	3.6%	2.9%
3-mth	3.5%	0.9%
6-mth	-11.4%	-22.9%

Source: Bloomberg

12-mth Price Performance

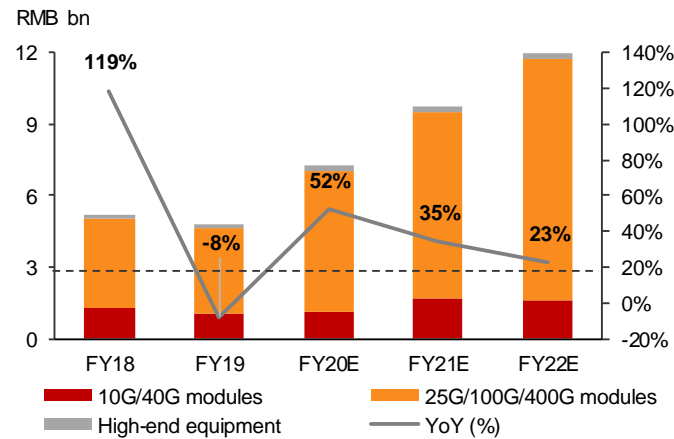


Source: Bloomberg

Auditor: BDO

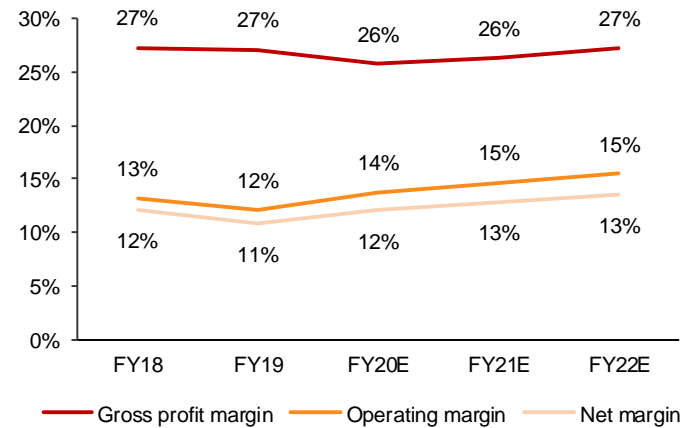
Focus Charts

Figure 145: Innolight revenue trend (FY18A-22E)



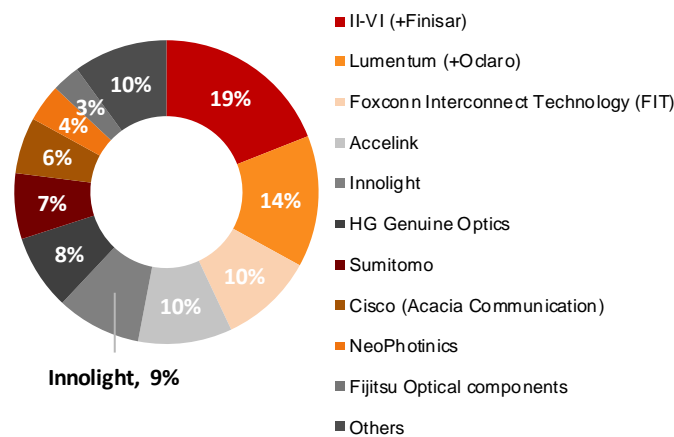
Source: Company data, CMBIS estimates

Figure 146: Innolight margin trend (FY18A-22E)



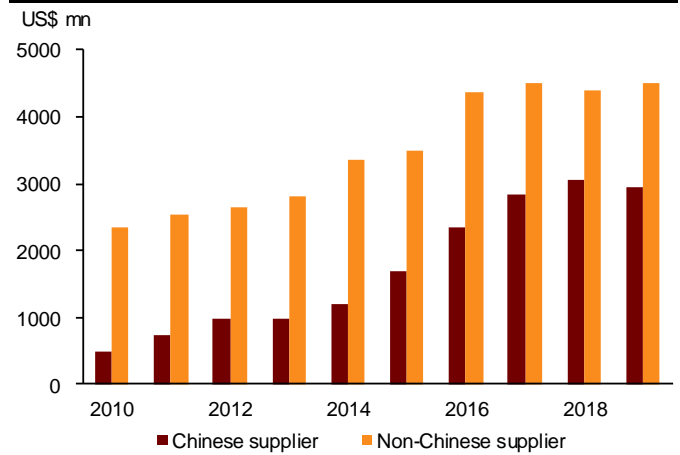
Source: Company data, CMBIS estimates

Figure 147: Innolight ranked global No.5 in optical module market in FY19









Source: Ovum, CMBIS

Figure 148: Sales of top 10 Chinese suppliers of optical components and modules are catching up quickly



Source: Lightcounting, CMBIS estimates

Figure 149: Comprehensive product portfolio for datacom and telecom markets

Product	Types	Reach range	Application
400G OSFP	 4x50Gx2 / 4X100G (architectural scheme)	100m/500m/2km/10km	400G Ethernet, Data center and Cloud networks
400G QSFP-DD	 8x50G (architectural scheme)	100m/500m/2km/10km	400G Ethernet, Data center and Cloud networks
100G QSFP28	 SR4, SR4 CPRI, AOC, AOC 100g-4x 25g, CWDM4, ECWDM4, ECWDM 4 ET PSM4, PSM4 PIGTAIL, LR4 Ethernet and ER4 Lite	100m-30km	100G data center internal network, Data center interconnection, Metropolitan area network and 5G wireless network
40G QSFP+	 SR4, ES R4, IR4, LR4, ER4, LX4, PSM IR4, PSM LR4, AOC and AOC Breakout	100m-40km	Large Data centers, Campus networks, Metropolitan area networks
25G SFP28	 SR, AOC, LR, ER	100m/10km/30km	Data Centers, 5G networks, 25G Ethernet, Fiber Channel
10G SFP+	 LR, ER, ZR and DWDM	10km/40km/80km	Data centers, Metropolitan area networks, Wireless networks, Transmission networks

Source: Company data, CMBIS

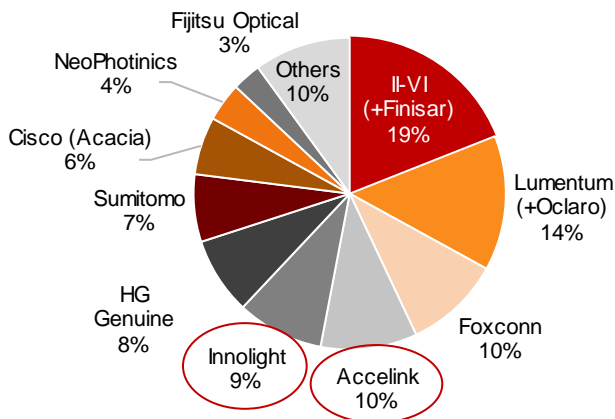
Investment Thesis

Global optical transceiver leader with promising growth outlook

Innolight is global leader in 25G/40G/100G/400G high-speed optical transceivers for data centers, wireless interconnect and next-generation network. We believe Innolight is well positioned to deliver strong growth in 2021/22E driven by surging internet traffic, 400G upgrade and 5G deployment in China. We are positive on 1) its leading presence in datacom market, 2) accelerated penetration in telecom market and 3) comprehensive high-end product portfolio to meet strong demand for rapid bandwidth expansion.

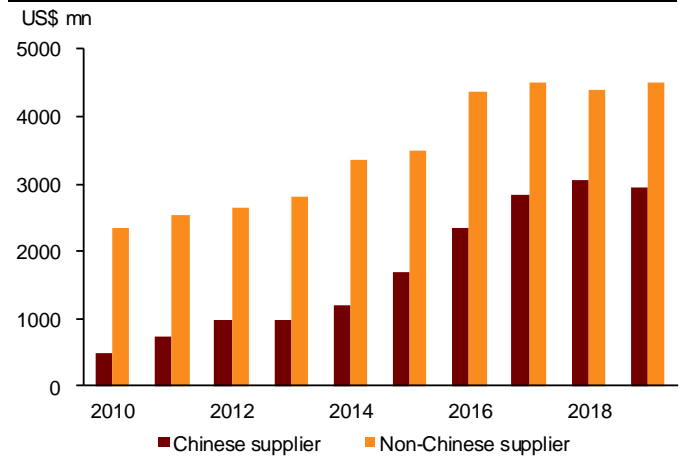
Backed by global hypercale 400G upgrade and fronthaul module for China 5G deployment, Innolight is poised to become global largest transceiver supplier in 2020, according to Lightcounting. In addition, Innolight recently announced global first 800G pluggable OSFP and QSFP-DD800 transceivers, which demonstrated Innolight's technology leadership in datacom transceiver market.

Figure 150: Innolight ranked global No.5 in optical module market in FY19



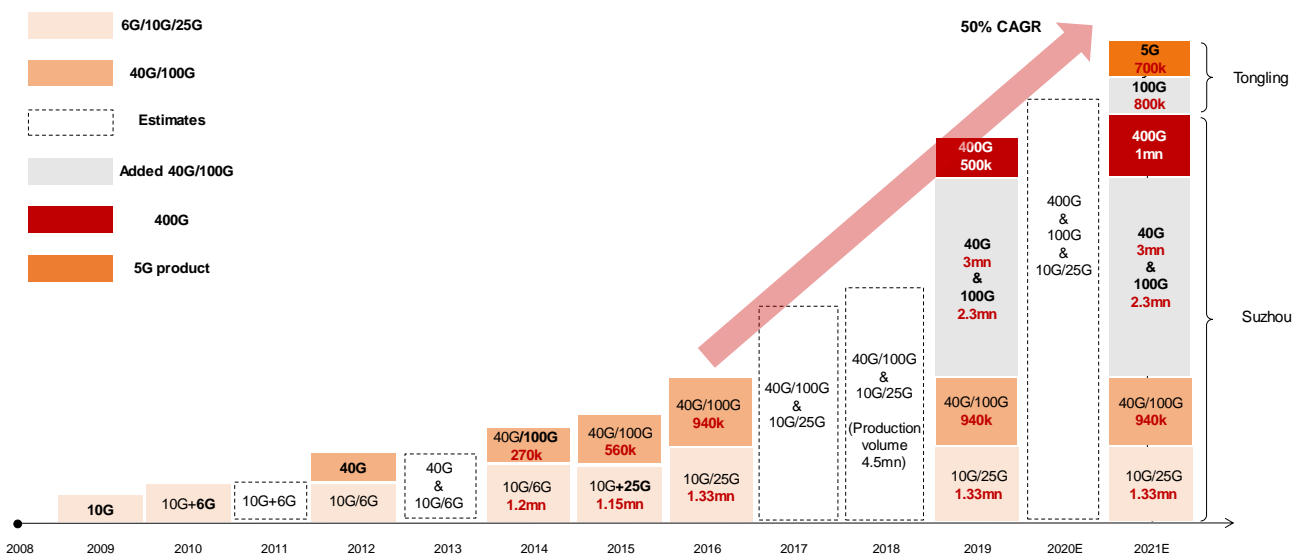
Source: Yole, CMBIS

Figure 151: Sales of top 10 Chinese suppliers of optical components and modules are catching up quickly



Source: Lightcounting, CMBIS

Figure 152: Innolight's Product roadmap and capacity development



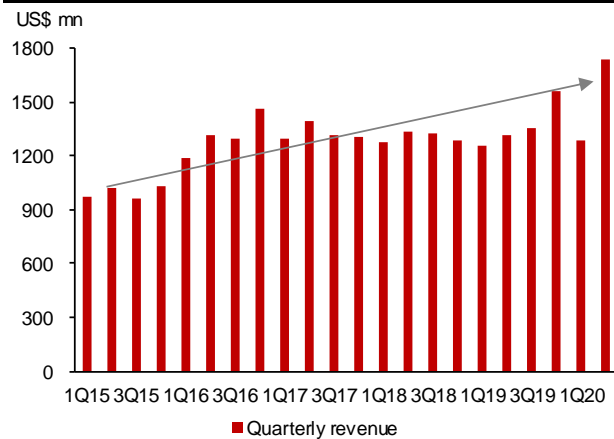
Source: CMBIS estimates

Resilient 100G demand and 400G upgrade cycle in datacom market

100G demand recovery in 2020 and 400G migration in 2020-25E. Innolight is the major 100G optical module vendor for global cloud companies, such as Google, Amazon and Facebook. 100G transceiver is currently the mainstream technology, and 400G transceiver started adoption since Dec 2019. Total volume of 400G module is expected to reach 800k/3mn in FY20/21E (vs 200k in FY19), and deliver 89% shipment CAGR during 2020-25E (vs industry 31% CAGR).

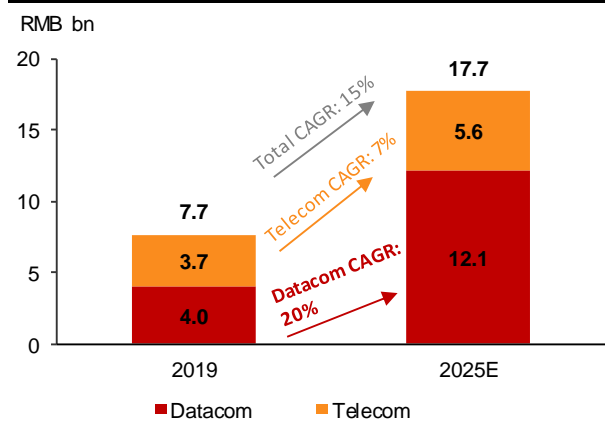
For 9M20, capex of top 5 hyperscalers (Google, Amazon, Apple, Facebook and Microsoft) increased by 21% YoY, while Innolight delivered strong revenue growth of 59% YoY driven by 100G recovery and 400G ramp-up. Following a solid 2020, we expect Innolight will continue to benefit from global 100G demand recovery in FY21E and gain further share in 400G optical module market as the major supplier for US hyperscalers.

Figure 153: Global market for optical transceivers



Source: Lightcounting, CMBIS

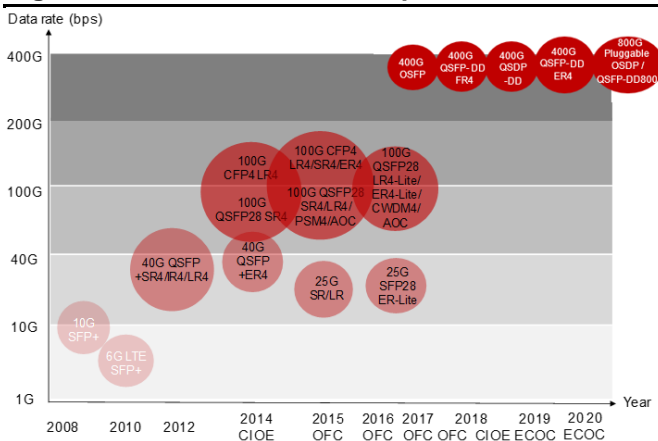
Figure 154: Optical transceiver market revenue growth at 20% CAGR for Datacom (2019-25E)



Source: Yole, CMBIS

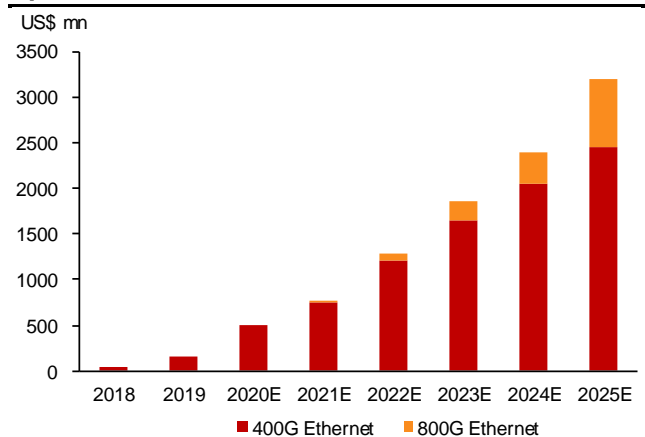
Pioneering in high-end 800G optical transceivers. With proven R&D capability in 100G/400G/800G optical modules, Innolight is leading the datacom optical module upgrade trend, as it showcased 100G QSFP28 in 2014 and 400G OSFP in 2017, almost one year ahead of its competitors. With recent announcement of availability of industry's first 800G pluggable OSFP and QSFP-DD800 transceivers in Dec. 2020, Innolight has maintained its leadership in high performance pluggable optics.

Figure 155: Global market for optical transceivers



Source: Company data, CMBIS

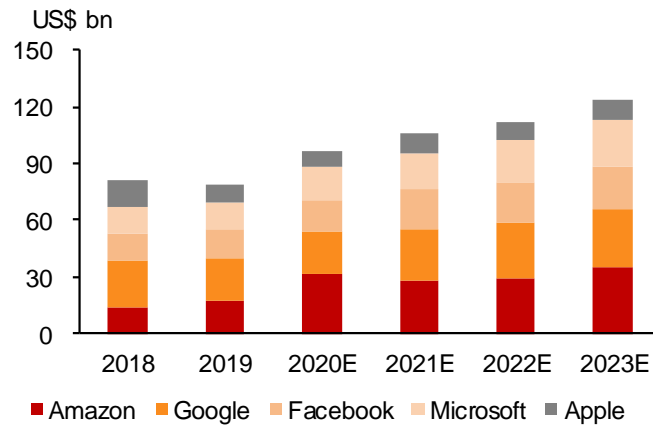
Figure 156: Forecast for sales of 400G/800G Ethernet optical transceivers



Source: Company data, Bloomberg and CMBIS

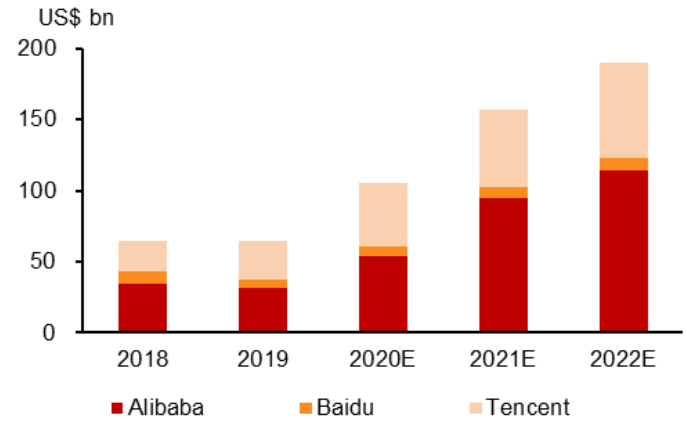
Global hyperscale capex on a rising trajectory. Looking ahead, US/Chinese hyperscale capex are expected to grow at 8%/34% CAGR during FY20-22E, and we believe strong hyperscale capex spending will boost rapid transition to high-speed 200G/400G modules. Specifically, we think Google and Amazon will lead the frontier of 400G adoption, and Facebook and Chinese players (e.g. Baidu, Tencent, Alibaba) are on a fast lane to adopt 200G. We estimate Innolight’s 100G/400G business to grow at 33% CAGR FY20-22E, backed by new capacity of 500k/800k pcs for 400G/100G in Apr 2021E and another 500k pcs for 400G in Jan 2022E.

Figure 157: Capex trend of global top 5 hyperscalers



Source: Company data, Bloomberg and CMBIS

Figure 158: Figure 12: BAT Capex spending of 34% CAGR FY20-22E









Source: Company data, Bloomberg and CMBIS

Emerging growth engine from 5G rollout in telecom market

Riding on 5G network buildout in China. Leveraging expertise on high-speed modules, Innolight expanded into 5G telecom market in 2019 and provided 25G modules for front-haul network. We expect Innolight will continue to expand its market share following ramp-up of 700k-pcs capacity in Tongling in FY21E, and we expect Innolight to benefit from 5G midhaul and backhaul demand in next two years.

Figure 159: Penetrating into telecom with comprehensive portfolio


Product	Types	Reach range	Application
400G OSFP	 4x50Gx2 / 4X100G (architectural scheme)	100m/500m/2km/10km	400G Ethernet, Data center and Cloud networks
400G QSFP-DD	 8x50G (architectural scheme)	100m/500m/2km/10km	400G Ethernet, Data center and Cloud networks
100G QSFP28	 SR4, SR4 CPRI, AOC, AOC 100g-4x 25g, CWDM4, ECWDM4, ECWDM 4 ET PSM4, PSM4 PIGTAIL, LR4 Ethernet and ER4 Lite	100m-30km	100G data center internal network, Data center interconnection, Metropolitan area network and 5G wireless network
40G QSFP+	 SR4, ES R4, IR4, LR4, ER4, LX4, PSM IR4, PSM LR4, AOC and AOC Breakout	100m-40km	Large Data centers, Campus networks, Metropolitan area networks
25G SFP28	 SR, AOC, LR, ER	100m/10km/30km	Data Centers, 5G networks , 25G Ethernet, Fiber Channel
10G SFP+	 LR, ER, ZR and DWDM	10km/40km/80km	Data centers, Metropolitan area networks, Wireless networks, Transmission networks

Source: Company data, CMBIS

Synergy from Chengdu Tsuhan acquisition in Apr 2020. Innolight acquired 67.19% of Chengdu Tsuhan (delisted from NEEQ in Oct 2019), a major supplier of optical components and transceivers for telecom market, for RMB 384mn. Tsuhan recorded revenue/NP of RMB 529mn/19mn in FY19, which accounted for 11%/4% of Innolight's FY19 revenue/NP. We are positive on cost reduction of optical modules by leveraging Tsuhan's lower-cost production line of Transistor Outline (TO-CAN) packaging technology for 25G modules and Bi-directional Optical Sub Assembly (BOSA).

In addition, Tsuhan has a product portfolio of PON components and it is ranked No.3 in domestic PON market. We believe Tsuhan's PON can complement Innolight's existing business for tapping into broadband access network and enhance its competitiveness in telecom market.

Figure 160: Tsuhan's established product line

Business segment		Progress	
OSA			
	1.25G/2.5G GPON/EPON	MP	Capacity reached 36kk/year in 2018; targeted at 50kk
	10G EPON/GPON BOSA, COMBO PON BOSA, RFOG	MP	
	4x10G ROSA/TOSA, 25G ROSA	R&D	
Module			
	Combo PON , 10G EPON ONU/OLT, 10G GPON ONU/OLT	MP	
	10G SFP+, 10G CWDM, 10G DT, 40G BOX	R&D, small MP	
Transistor package			
	Auto TO46/56 line	Completed	Produced 23.4kk TO in 2018
	Auto TO33/38 line	In progress	

Source: Company data, CMBIS

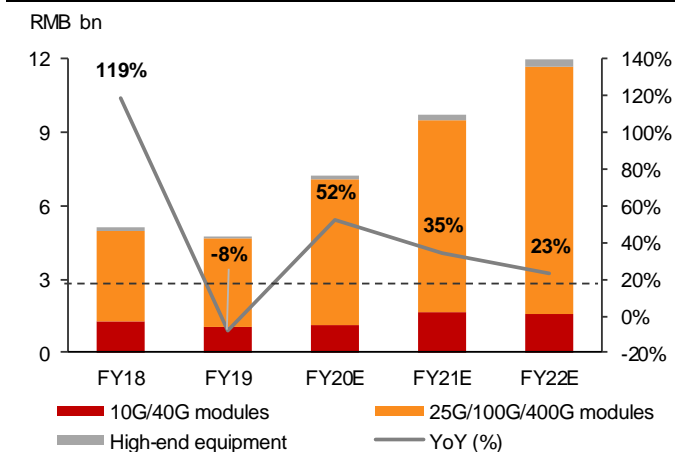
Financial Analysis

Expect revenue/net profit to grow at 29%/36% CAGR

We estimate Innolight revenue to grow 52%/35%/23% YoY in FY20E/21E/22E, driven by 1) 25G/100G/400G modules (31% CAGR): rapid growth in high-speed modules on IDC capex uptrend and 2) 10G/40G modules (18% CAGR): market share gain in telecom market and tap into access network on Tsuhan acquisition.

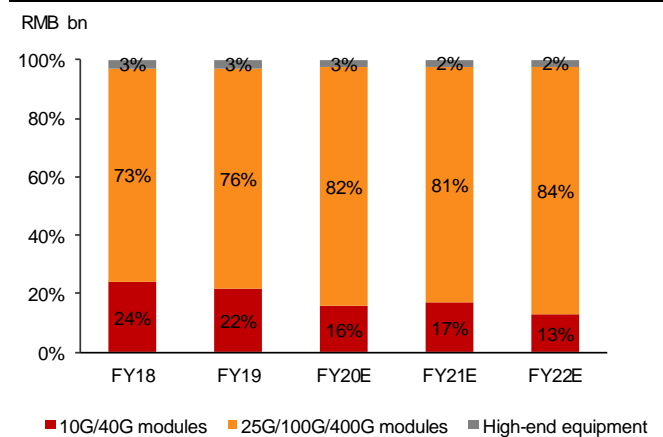
As for profitability, we forecast gross margin will gradually recover to 26%-27% in FY20-22E thanks to higher sales mix of higher-margin 200G/400G products.

Figure 161: Revenue growth estimates



Source: Company data, CMBIS estimates

Figure 162: Revenue breakdown



Source: CMBIS estimates

Figure 163: Revenue breakdown

RMB mn	FY18A	FY19A	FY20E	FY21E	FY22E
10G/40G modules	1,249	1,030	1,135	1,658	1,576
...YoY	36%	-18%	-14%	-1%	-13%
25G/100G/400G modules	3,749	3,601	5,921	7,851	10,138
...YoY	190%	-4%	64%	33%	29%
High-end equipment	159	127	190	238	285
...YoY	6%	-20%	50%	25%	20%
Total	5,156	4,758	7,246	9,746	11,998
...YoY	119%	-8%	52%	35%	23%
Gross Margin					
10G/40G modules	24.4%	29.2%	25.5%	23.6%	23.5%
25G/100G/400G modules	28.2%	26.7%	26.0%	27.0%	28.0%
High-end equipment	29.4%	20.5%	20.0%	20.0%	20.0%
Total	27.3%	27.1%	25.8%	26.3%	27.2%

Source: Company data, CMBIS estimates

Figure 164: P&L forecast

RMB mn	FY18A	FY19A	1Q20	2Q20	3Q20	4Q20E	FY20E	FY21E	FY22E
Revenue	5,156	4,758	1,326	1,919	1,960	2,041	7,246	9,746	11,998
...YoY	119%	-8%	51%	65%	57%	38%	52%	35%	23%
Cost of sales	(3,750)	(3,468)	(995)	(1,429)	(1,483)	(1,523)	(5,429)	(7,352)	(8,912)
Gross profit	1,406	1,290	331	490	477	518	1,866	2,559	3,265
GPM (%)	27.3%	27.1%	24.9%	25.5%	24.4%	25.4%	25.8%	26.3%	27.2%
...YoY	123%	-8%	34%	47%	36%	44%	45%	37%	28%
SG&A	(314)	(329)	(87)	(98)	(141)	(131)	(456)	(595)	(732)
...% of rev	-6.1%	-6.9%	-6.5%	-5.1%	-7.2%	-6.4%	-6.3%	-6.1%	-6.1%
R&D	(309)	(362)	(88)	(88)	(117)	(121)	(413)	(556)	(696)
...% of rev	-6.0%	-7.6%	-6.6%	-4.6%	-5.9%	-5.9%	-5.7%	-5.7%	-5.8%
Operating profit	682	576	173	257	269	250	999	1,432	1,855
OPM (%)	13.2%	12.1%	13.1%	13.4%	13.7%	12.2%	13.8%	14.7%	15.5%
...YoY	231%	-15%	48%	123%	72%	33%	73%	43%	30%
Net profit	623	513	154	211	235	220	870	1,249	1,619
NPM (%)	12.1%	10.8%	11.6%	11.0%	12.0%	10.8%	12.0%	12.8%	13.5%
...YoY	286%	-18%	54%	96%	56%	41%	295%	44%	30%

Source: Company data, CMBIS estimates

Our FY21/22E EPS is 8%/12% above consensus

Our FY21/22E EPS is 8%/12% above consensus. We believe the upside of Innolight is certain given the unstoppable trend of accelerated growth of Internet traffic and continued 5G deployment. We are positive in Innolight's future growth given its leading position in IDC and penetration into telecom market.

Figure 165: CMBIS estimates vs consensus

RMB mn	CMBIS			Consensus			Diff (%)		
	FY19E	FY20E	FY21E	FY19E	FY20E	FY21E	FY19E	FY20E	FY21E
Revenue	7,246	9,746	11,998	6,992	9,041	11,017	4%	8%	9%
Gross Profit	1,866	2,559	3,265	1,867	2,451	2,989	0%	4%	9%
Operating Profit	999	1,432	1,855	981	1,356	1,713	2%	6%	8%
Net profit	870	1,249	1,619	863	1,175	1,443	1%	6%	12%
EPS (RMB)	1.22	1.75	2.27	1.20	1.62	2.02	2%	8%	12%
Gross Margin	25.8%	26.3%	27.2%	26.7%	27.1%	27.1%	-0.9 ppt	-0.9 ppt	0.1 ppt
Operating Margin	13.8%	14.7%	15.5%	14.0%	15.0%	15.5%	-0.2 ppt	-0.3 ppt	-0.1 ppt
Net Margin	12.0%	12.8%	13.5%	12.3%	13.0%	13.1%	-0.3 ppt	-0.2 ppt	0.4 ppt

Source: Company data, CMBIS

Valuation

Initiate at BUY with TP Rmb73.45 (35.7% upside)

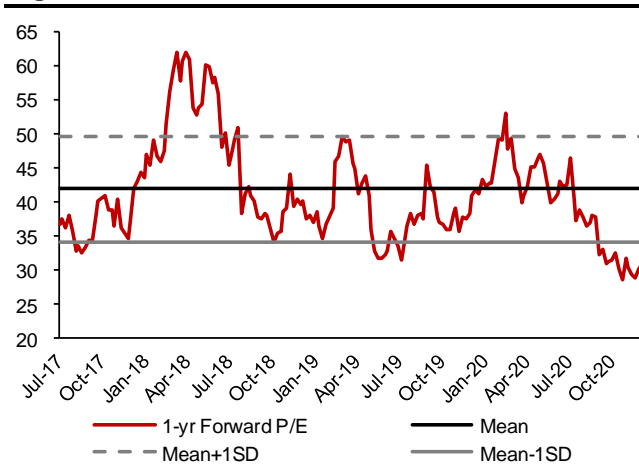
We derived our 12m TP of RMB73.45 based on 41.9x FY20E P/E, in line with its 2-year historical average. We believe this is justified as Innolight is the industry leader in the fast growing optical module market. Upcoming catalysts include increasing demand of 200G/400G/800G and share gain in China telecom market. Potential risks include weaker capex from cloud giants, slower deployment of 5G infrastructure and ASP pressure.

Figure 166: Peers' valuation

Company	Ticker	Rating	Mkt Cap US\$(mn)	Price (LC)	TP (LC)	Up/Down -side	P/E (x)		P/B (x)		ROE (%)		
							FY20E	FY21E	FY20E	FY21E	FY20E	FY21E	
Innolight	300308 CH	Buy	5,745	54.11	73.45	36%	44.4	30.9	4.9	4.2	9.3	13.7	
Accelink Tech	002281 CH	NR	3,138	29.45	NA	NA	41.8	34.5	4.1	3.7	9.7	10.7	
Eoptolink Tech	300502 CH	NR	2,711	55.02	NA	NA	39.4	28.3	8.9	7.0	24.8	26.3	
HG Genuine	000988 CH	NR	3,589	24.13	NA	NA	34.9	29.2	3.5	3.1	9.8	10.5	
FIT Hon Teng	6088 HK	NR	2,329	2.66	NA	NA	14.1	10.6	1.0	1.0	7.6	9.5	
Lumentum	LITE US	NR	7,003	92.75	NA	NA	18.3	15.1	4.0	3.7	24.0	25.1	
Finisar	IIVI US	NR	7,608	73.35	NA	NA	33.6	21.8	3.3	2.6	11.8	15.1	
Sumitomo	8053 JT	NR	16,260	1341.00	NA	NA	8.5	-	0.6	0.7	8.7	(4.6)	
NeoPhotonics	NPTN US	NR	455	9.08	NA	NA	33.3	-	2.6	2.7	8.9	(4.3)	
Csico	CSCO US	NR	189,388	44.82	NA	NA	14.3	14.2	5.2	4.6	37.8	33.1	
Average								28.3	23.1	3.8	3.3	15.2	13.5

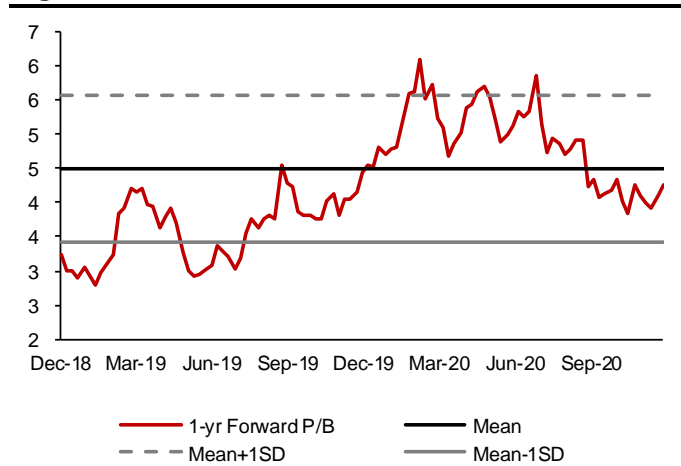
Source: Bloomberg, CMBIS estimates

Figure 167: 12M forward P/E band



Source: Company data, CMBIS estimates

Figure 168: 12M forward P/B band



Source: Company data, CMBIS estimates

Appendix

Company Background

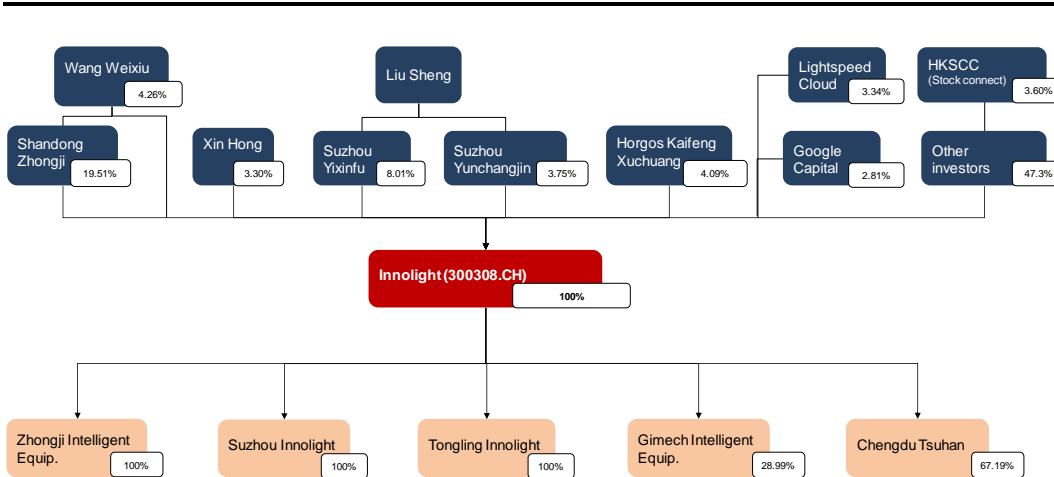
Zhongji Equipment was established in 2005 and was listed on SEE board in 2012. In 2017, Zhongji acquired Innolight Technology (Suzhou) and renamed to Zhongji Innolight, which devotes to optical transceivers and intelligent equipment manufacturing. Before the asset restructure, Innolight Technology (Suzhou) was established in 2008 and led the domestic optical component market with strengths such as optical packaging technology, high-speed circuit design, automatic manufacturing and testing capability system.

Figure 169: Key milestones

Year	Event
2008	Established InnoLight
2009	Debut 10G SFP+ series featuring low power consumption and high performance
2010	Rolled out 6G LTE SFP+ for China Mobile 3G network
2012	Launched 40G QSFP+SR4/LR4/IR4 for data centers, enterprise networks and metro networks
2015	Demonstrated 100G QSFP28 SR4/LR4 at OFC 2015
2017	Showcased 400G OSFP at OFC 2017, ranked 2nd in global optical module market by Acquired by Zhongji Equipment and restructured to Zhongji Innolight (stock code: 300308 CH)
2018	Launched the industry's first 400G QSFP-DD FR4 at OFC 2018
2019	Tongling Innolight (wholly-owned subsidiary) went into operation
2020	Acquire Chengdu Tsuhan

Source: Company data, CMBIS

Figure 170: Shareholders structure



Source: Company data, CMBIS

As at 31 March 2020

Financial Summary

Income statement

YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E
Revenue	5,156	4,758	7,246	9,746	11,998
Cost of sales	3,750	3,468	5,429	7,352	8,912
Gross profit	1,406	1,290	1,866	2,559	3,265
Tax and surcharges	10	17	18	24	30
Selling exp	60	55	109	136	168
Admin exp (excl. R&D)	253	275	348	458	564
R&D exp	309	362	413	556	696
Finance costs	79	17	80	122	128
Other operating exp.	22	5	(82)	(145)	(146)
Operating profit	682	576	999	1,432	1,855
Other non-oper exp.	13	0	-	-	(0)
Pre-tax profit	695	577	999	1,432	1,855
Income tax expense	72	63	125	179	232
Minority interests	-	-	4	4	4
Net profit	623	513	870	1,249	1,619
Adj. net profit	590	430	740	1,249	1,619

Cash flow summary

YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E
Net profit	623	513	874	1,253	1,623
Depreciation/amortization	201	241	386	519	670
Change in working capital	(441)	(360)	(1,992)	271	(2,128)
Others	277	175	103	191	206
Net cash from operating	660	569	(628)	2,234	370
Capex	(608)	(759)	(1,140)	(1,192)	(1,170)
Other	(65)	(1,180)	126	(14)	(105)
Net cash from investing	(673)	(1,939)	(1,014)	(1,206)	(1,274)
Share issuance	52	1,524	(0)	0	0
Net borrowing	151	159	6,068	(1,277)	1,759
Other	(66)	(126)	78	(211)	(266)
Net cash from financing	137	1,557	6,146	(1,488)	1,493
Net change in cash	139	195	4,486	(460)	589
Cash at beginning of year	902	1,041	1,236	5,722	5,262
Exchange difference	15	8	(17)	0	0
Cash at the end of year	1,041	1,236	5,755	5,295	5,883

Balance sheet

YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E
Current assets	4,158	5,991	13,357	13,159	16,143
Cash & equivalents	1,041	1,236	5,755	5,295	5,883
Account receivables	840	1,133	2,170	2,114	3,031
Inventory	2,119	2,504	4,148	4,386	5,626
Prepayment	55	65	31	31	31
Other current assets	103	1,054	1,253	1,334	1,571
Non-current assets	3,922	4,500	5,477	6,150	6,650
PPE	1,497	1,950	2,794	3,415	3,929
Goodwill	1,717	1,717	1,915	1,915	1,915
Intangible assets	384	311	446	625	833
Other non-current assets	325	522	324	196	-26
Total assets	8,080	10,491	18,834	19,309	22,793
Current liabilities	2,868	2,826	7,505	7,312	8,594
ST borrowings	390	933	4,513	3,747	4,802
Account payables	802	1,259	1,599	2,172	2,398
Other current liabilities	1,676	634	1,393	1,393	1,393
Non-current liabilities	436	739	3,380	2,869	3,573
LT borrowings	270	466	2,987	2,476	3,179
Deferred tax liability	69	109	164	164	164
Other non-current liabilities	98	164	229	229	229
Total liabilities	3,304	3,565	10,885	10,181	12,166
Share capital	475	713	713	713	713
Reserve	4,301	6,213	7,134	8,309	9,803
Minority interest	0	0	102	107	111
Total equity	4,776	6,926	7,949	9,129	10,627
Total liabilities and equity	8,080	10,491	18,834	19,309	22,793

Key ratios

YE 31 Dec	FY18A	FY19A	FY20E	FY21E	FY22E
Revenue mix					
10G/40G modules	25	22	13	9	7
25G/100G/400G modules	75	78	84	83	87
High-end equipment	3	3	3	2	2
Growth (%)					
Revenue	118.8	(7.7)	52.3	34.5	23.1
Gross profit	122.7	(8.3)	44.7	37.1	27.6
Operating profit	231.2	(15.5)	73.4	43.3	29.5
Adj. net profit	122.9	(27.2)	72.4	68.7	29.6
Profit & loss ratio (%)					
Gross margin	27.3	27.1	25.8	26.3	27.2
Operating margin	13.2	12.1	13.8	14.7	15.5
Net profit margin	12.1	10.8	12.0	12.8	13.5
Balance sheet ratio					
Net debt/total equity (%)	Net cash	2.3	18.0	9.2	16.5
Current ratio (x)	1.5	2.1	1.8	1.8	1.9
Receivable turnover days	66	76	84	81	79
Inventory turnover days	151	185	174	166	159
Payable turnover days	120	108	96	94	94
Profitability (%)					
ROE	12.4	6.2	9.3	13.7	15.2
ROA	7.3	4.1	3.9	6.5	7.1
Per share data (RMB)					
Adj. EPS	1.36	0.73	1.22	1.75	2.27
DPS	0.12	0.08	0.10	0.18	0.23
BVPS	10.05	9.70	11.00	12.65	14.75

Source: Company data, CMBIS estimates

Sunway (300136 CH)

Global RF leader gearing up for 5G

Initiate at BUY. We are positive on Sunway's successful transformation from a leading antenna supplier to a comprehensive RF solution provider, riding on the tailwinds of wireless connectivity trend in 5G era. We believe Sunway is well positioned to benefit from strong demand for more and better antenna, wireless charging and RFFE solutions to enable next-generation 5G products. Sunway is poised to capture growth opportunities in wireless connectivity and localization of RF components, and we estimate 45%/50% revenue/NP FY20-22E CAGR, driven by 37%/78% sales CAGR in antenna/wireless charging. Our 12m TP of RMB64.31 is based on 31x FY21E P/E, in line with 5-year historical avg. P/E.

- Enhancing leadership with broad RF portfolio and solid client base.**
 As global industry leader in antenna and wireless charging solutions, we expect Sunway to accelerate category expansion in both Apple/Android camps ranging from smartphones to tablets and AIoT (Watch/TWS/band). Looking ahead, we believe Sunway is well placed to emerge as a vertically-integrated RF solutions provider, backed by strong R&D strength and solid execution capability.
- Antenna to benefit from 5G content value upgrade.** We believe antenna business will grow at 37% FY20-22E CAGR, driven by 1) growing demand and share gain for LDS antenna, 2) 5G antenna upgrade with double content value, and 3) new capacity for LCP products in FY21E. We expect Sunway is on track to start mass production of LCP capacity in 4Q20E for new orders for wearable/tablet products in FY21E.
- Rapid adoption of wireless charging in consumer electronics.** Sunway is the global leader in wireless charging receiver for major handset brands including Apple, Samsung, OPPO and Vivo. We believe this segment will deliver 78% revenue CAGR during FY20-22E, driven by 1) share gain in iPhone and expansion into AirPods/Watch/iPad, 2) rising adoption of wireless charging in mid/high-end Android brands and 2) product launch of wireless charging transmitters such as Magsafe and Airpower.
- Valuation.** Our TP of RMB64.31 is based on 31x FY21E P/E, in line with its 5-year average, indicating PEG ratio of 0.56x. Upcoming catalysts include stronger iPhone 12 demand, higher wireless charging adoption and launch of Airpower.

Earnings Summary

(YE 31 Dec)	FY18A	FY19A	FY20E	FY21E	FY22E
Turnover (RMB mn)	4,707	5,134	7,008	10,935	14,789
YoY growth (%)	37.0	9.1	36.5	56.1	35.2
GPM	36.5	37.3	35.6	35.6	35.9
Net profit (RMB mn)	1,055	1,020	1,321	2,140	2,976
EPS (RMB)	1.01	1.05	1.27	2.05	2.85
YoY growth (%)	10.9	4.2	20.6	62.0	39.1
PE (x)	39.4	37.8	31.3	19.3	13.9
PB (x)	10.4	8.1	6.8	5.1	3.8
Yield (%)	0.0	0.1	0.2	0.3	0.4
ROE (%)	28.5	21.4	21.6	26.2	27.1
Net gearing (%)	33.4	38.1	21.6	28.5	18.1

Source: Company data, CMBIS estimates

BUY (Initiation)

Target Price	RMB 64.31
Up/Downside	+62.2%
Current Price	RMB 39.65

China Technology Sector

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Stock Data

Mkt. Cap. (RMB mn)	43,802
Avg. 3mths t/o (RMB mn)	1,016
52W High/Low (RMB)	66.28/34.00
Total Issued Shares (mn)	967.6

Source: Bloomberg

Shareholding Structure

Peng Hao	19.48%
HKSCC	2.49%
Foresight Fund Mgmt	2.06%

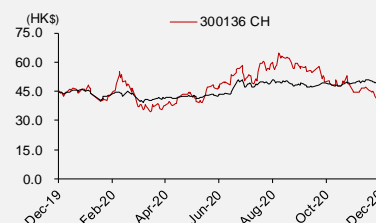
Source: Bloomberg

Share Performance

	Absolute	Relative
1-mth	-7.6%	-10.7%
3-mth	-26.2%	-28.1%
6-mth	-2.4%	-16.9%

Source: Bloomberg

12-mth Price Performance

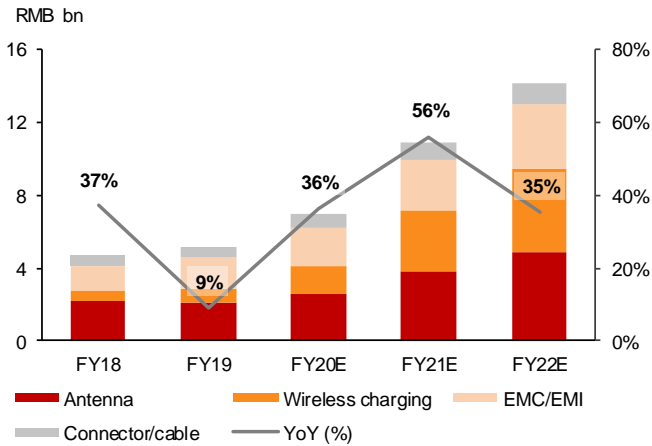


Source: Bloomberg

Auditor: BDO China

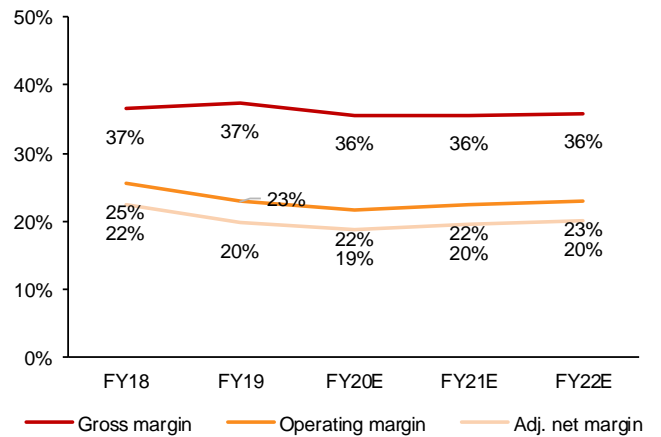
Focus Charts

Figure 171: Sunway revenue trend



Source: Company data, CMBIS estimates

Figure 172: Sunway margin trend



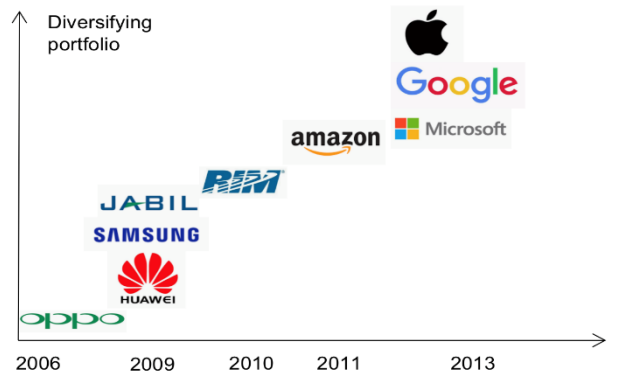
Source: Company data, CMBIS estimates

Figure 3: Prudent M&A to broaden product portfolio

Deal	Time	Business	% of control
Laird	2012	Antenna	100%
Alex (亚力盛)	2014	Cables and connectors	100%
Element (艾利门特)	2015	MIM (Metal Injection Molding)	100%
Lanpei (蓝沛)	2015	Wireless charging	51%
Huaying Elec. (德清华莹)	2017	SAW filters	19.54%
Ruiqiang Telecom. (瑞强通信)	2019	Power amplifier (PA)	51%

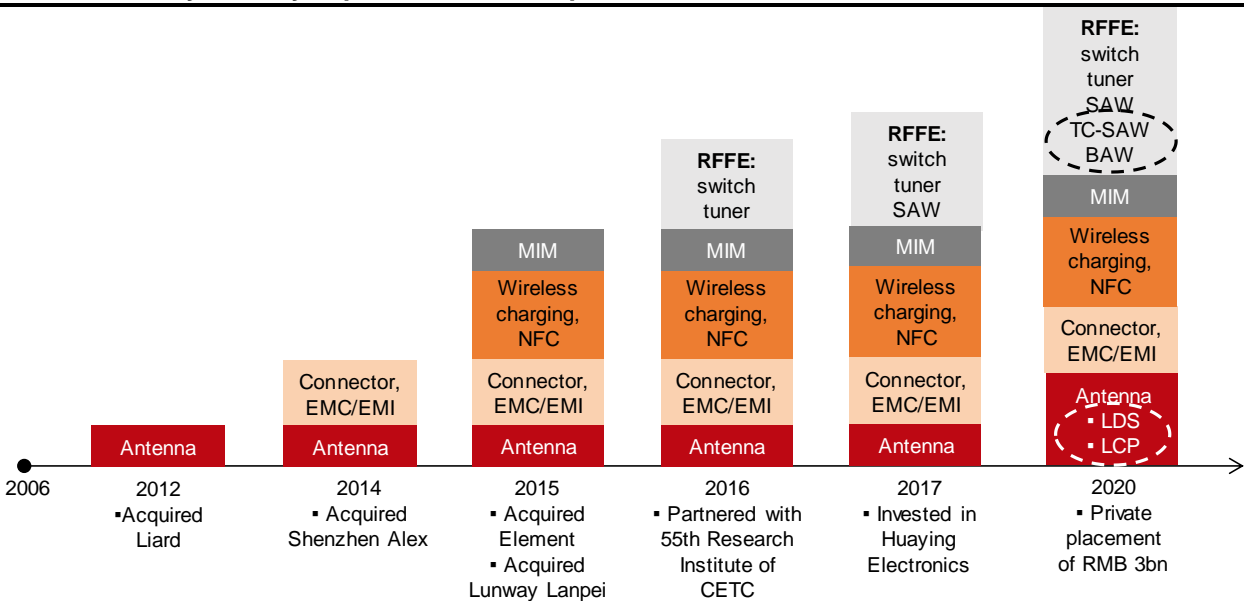
Source: Company data, CMBIS

Figure 173: Cultivating diversified customer base



Source: CMBIS

Figure 174: Sunway actively expands RF-related products



Source: Company data, CMBIS

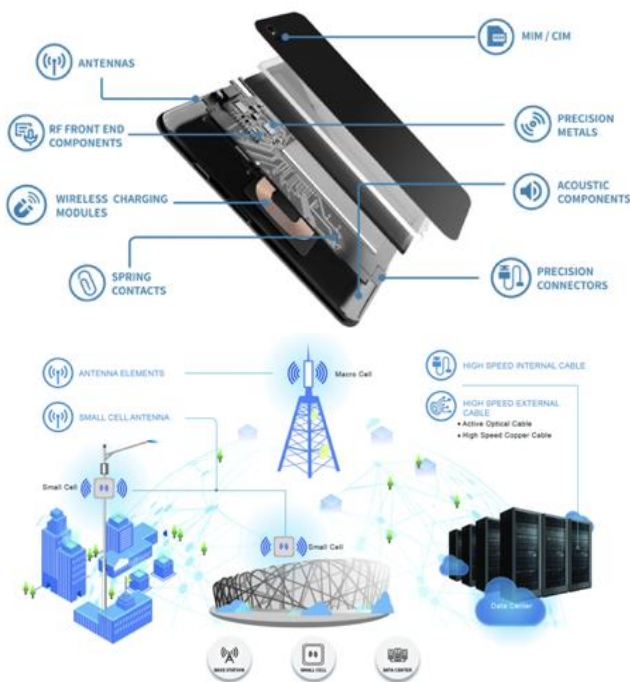
Investment Thesis

Enhancing leadership with broad RF portfolio and solid client base

Broadening RF offerings with leading global clients. Following a number of M&A and investments in RF industry, Sunway has established a strong product portfolio including antenna, wireless charging, EMC/EMI, connectors/cables, acoustic and RF front-end components. Over past few years, Sunway entered supply chain of major handset clients, including Apple, Samsung, Huawei, OPPO, Vivo and Microsoft. We think Sunway is well positioned to capture content upgrade opportunities during 5G cycle, and we expect Sunway to deliver 45%/50% revenue/NP CAGR during FY20-22E, driven by antenna (37% CAGR) and wireless charging (78% CAGR).

Expanding technology leadership into RFFE. Sunway has further strengthened its self-developed technologies on mmWave/ sub-6GHz/ advanced materials by investing into Huaying Elec. (德清华莹) for SAW filters and Ruiqiang Telecom (瑞强通信) for power amplifier. The company also announced a new private placement financing of RMB 3bn in March 2020 to accelerate penetration to RFFE. We are positive on its market potential and expect Sunway to benefit from increasing demand for technology localization.

Figure 175: Sunway provides comprehensive RF-related solutions for 5G



Source: Company data, CMBIS

Figure 176: Mapping of Sunway’s customers and products

Clients	Year	Existing Products			
		Antenna	Wireless charging	EMI/EMC	Cable/connector
OPPO	2006				
Samsung	2009	S-series	S/Note series	✓	
Huawei	2009	Mate/P (50% share)	Mate30	✓	✓
Jabil	2009	✓			
Amazon	2011	✓			
Apple	2012	iPhone (LCP), iPad,	iPhone11 (25% share)	✓	
Microsoft	2013	surface		✓	
Google	2013		✓	✓	

Source: CMBIS estimates

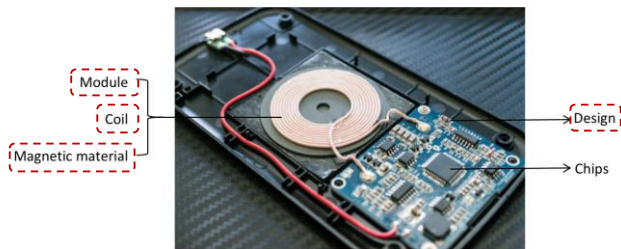
Antenna/wireless charging as major pillars to fuel future growth

Growth pillar #1 – Wireless charging (21% of FY20E revenue)

After acquiring 51% of Lanpei in 2015, Sunway expanded from magnetic materials (ferrite, nanocrystalline) to coil, and from design to module manufacturing. Backed by one-stop solution and tailor-made design expertise, Sunway entered into Samsung (NFC, MST payment, wireless charging) and iPhone 11 (Nanocrystalline, copper coil wire) in 2H19.

Sunway is a major supplier of wireless charging receivers for top smartphone brands and started to ramp capacity for transmitters in the meanwhile. We expect wireless charging business to deliver 78% CAGR FY20-22E, backed by 1) increasing penetration in mid/low-end Android and 2) share gain in iPhone and 3) new orders from top clients in other product categories (wearables, tablet). Looking forward, we also expect emerging growth drivers from Tx modules for Tier-1 auto OEM (SAIC/VW) and rising adoption of wireless charging on IoT products.

Figure 177: Sunway cultivates along the value chain



Source: CMBIS

Figure 178: Major players in wireless charging market

Supplier	Products			Smartphone Clients
	Magnetic	Coil	Module	
Sunway	•	•	•	Apple, Huawei, Samsung
Luxshare		•	•	Apple, Huawei
DSBJ				Apple
Speed				
Sunlord		•	•	Huawei
Anjie			•	
TDK	•	•		
Murata	•	•		




Source: CMBIS

Growth pillar #2 – Antenna (37% of FY20E revenue)

Sunway has established a diversified antenna portfolio of LDS antenna, NCP antenna, and LCP transmission line. We expect this business to grow at 37% CAGR during FY20-22E, as 1) LDS antenna, which Sunway ranks No.1 globally, will maintain its dominance among Android names, 2) strong demand for 5G antennas with higher ASP, and 3) Sunway will commence mass production of new capacity for LCP products in 4Q20E.

We expect LDS to gain traction in Android 5G phones, given its cost advantage and improved manufacturing capability. Compared with 4G antenna, we expect ASP for 5G LDS will double, and Sunway revenue will grow at 69% CAGR FY20-22E. Sunway is also actively catching up with LCP capacity and we expect it will begin to contribute from FY21E.

Figure 179: Major players in antenna market

Company	On smartphone		On base station
	LDS antenna	LCP flex	
			
Sunway	Samsung, HOVX	Apple	Small MP
Luxshare		Apple	MP
Speed	Samsung, HOVX		MP
Amphenol		Apple	Partner with AW25 on m-MIMO
Tongda			Developed m-MIMO (LDS, POP)

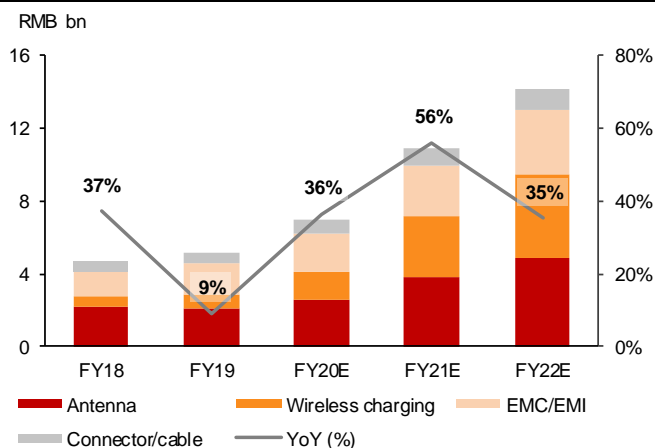
Source: Company data, CMBIS

Financial Analysis

Expect revenue/net profit to grow at 45%/50% CAGR

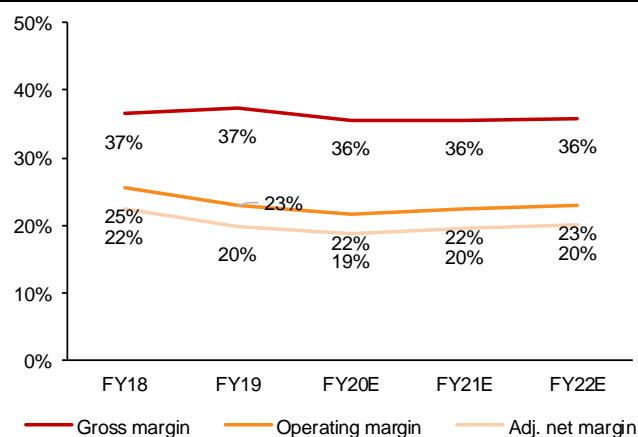
We estimate Sunway revenue to grow 37%/56%/35% YoY in FY20E/21E/22E, mainly driven by 1) Antenna (37% CAGR): rapid growth in LDS antenna for Androids and potential LCP order win for Apple, and 2) Wireless charging (78% CAGR): share gain for iPhone/Airpods and accelerated penetration into low/mid-end Androids.

Figure 180: Sunway revenue trend



Source: Company data, CMBIS estimates

Figure 181: Sunway margin trend



Source: Company data, CMBIS estimates

Figure 182: Revenue breakdown

RMB mn	FY18	FY19	FY20E	FY21E	FY22E
Antenna/RF modules	2,212	2,105	2,614	3,849	4,886
...YoY	-	-5%	24%	47%	27%
Wireless charging	565	719	1,447	3,335	4,581
...YoY	-	27%	101%	131%	37%
EMC/EMI	1,365	1,720	2,150	2,795	3,494
...YoY	-	26%	25%	30%	25%
Cables/connectors	565	590	797	956	1,196
...YoY	-	5%	35%	20%	25%
RFFE	-	-	-	-	633
...YoY	-	-	-	-	-
Total	4,707	5,134	7,008	10,935	14,789
...YoY	37%	9%	36%	56%	35%

Source: Company data, CMBIS

Figure 183: P&L forecast

RMB mn	FY18	FY19	1Q20E	2Q20	3Q20	4Q20E	FY20E	FY21E	FY22E
Revenue	4,707	5,134	1,045	1,513	1,783	2,668	7,008	10,935	14,789
...YoY	37%	9%	-5%	76%	10%	71%	36%	56%	35%
Cost of sales	(2,988)	(3,217)	(794)	(992)	(1,061)	(1,667)	(4,513)	(7,043)	(9,480)
Gross profit	1,719	1,917	251	521	722	1,001	2,494	3,893	5,309
GPM (%)	37%	37%	24%	34%	41%	38%	36%	36%	36%
...YoY	37%	12%	-37%	88%	0%	93%	30%	56%	36%
SG&A	(212)	(324)	(74)	(80)	(94)	(141)	(389)	(580)	(754)
...% of rev	-5%	-6%	-7%	-5%	-5%	-5%	-6%	-5%	-5%
R&D	(279)	(430)	(91)	(153)	(122)	(194)	(561)	(875)	(1,183)
...% of rev	-6%	-8%	-9%	-10%	-7%	-7%	-8%	-8%	-8%
Operating profit	1,200	1,174	70	295	482	664	1,512	2,449	3,405
OPM (%)	25%	23%	7%	20%	27%	25%	22%	22%	23%
...YoY	1%	-2%	-72%	85%	-9%	191%	29%	62%	39%
Net profit	1,055	1,020	63	266	417	575	1,321	2,140	2,976
NPM (%)	22%	20%	6%	18%	23%	22%	19%	20%	20%
...YoY	4%	-3%	-73%	99%	-9%	200%	30%	62%	39%

Source: Company data, CMBIS

Our FY21/22E EPS is 3%/16% above consensus

We are positive with Sunway future growth driven by its antenna/wireless charging business and its clear strategic plan in vertical integration of RF-related products. Riding the tailwind of 5G upgrades, we expect Sunway's FY21/22E EPS is 3%/16% above consensus, while FY20E EPS is largely in-line with consensus.

Figure 184: CMBIS estimates vs consensus

RMB mn	CMBIS			Consensus			Diff (%)		
	FY20E	FY21E	FY22E	FY20E	FY21E	FY22E	FY20E	FY21E	FY22E
Revenue	7,008	10,935	14,789	7,030	9,691	11,915	0%	13%	24%
Gross Profit	2,494	3,893	5,309	2,573	3,591	4,433	-3%	8%	20%
Operating Profit	1,512	2,449	3,405	1,536	2,235	2,826	-2%	10%	20%
Net profit	1,321	2,140	2,976	1,328	1,914	2,377	-1%	12%	25%
EPS (RMB)	1.27	2.05	2.85	1.38	1.98	2.46	-8%	3%	16%
Gross Margin	35.6%	35.6%	35.9%	36.6%	37.1%	37.2%	-1 ppt	-1.5 ppt	-1.3 ppt
Operating Margin	21.6%	22.4%	23.0%	21.9%	23.1%	23.7%	-0.3 ppt	-0.7 ppt	-0.7 ppt
Net Margin	18.8%	19.6%	20.1%	18.9%	19.8%	19.9%	0 ppt	-0.2 ppt	0.2 ppt

Source: Bloomberg, CMBIS estimates

Valuation/Key risks

Initiate at BUY with TP RMB64.31 (62.2% upside)

Our TP of RMB64.31 is based on 31x FY21E P/E, in line with its 5-year average. Upcoming catalysts include 1) further penetration of wireless charging into more Apple products and automobile/IoT and 2) LDS antenna into more Androids 5G models.

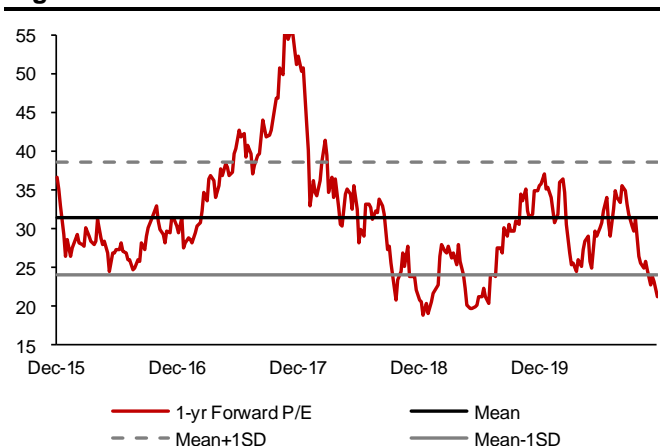
Key risks include 1) lower than expected adoption of wireless charging technology; 2) longer than expected negative impact due to Covid-19, such as further government lockdowns due to rebounded cases, especially considering the holiday season and 3) worsening US-Sino tension causes additional uncertainty in business operations.

Figure 185: Peers' valuation

Company	Ticker	Rating	Mkt Cap US\$(mn)	Price (LC)	TP (LC)	Up/Down -side	P/E (x)		P/B (x)		ROE (%)	
							FY20E	FY21E	FY20E	FY21E	FY20E	FY21E
Antenna												
Sunway	300136 CH	Buy	5,709	39.65	64.3	62%	31.3	19.3	6.8	5.1	21.6	26.2
Speed	300322 CH	NR	820	13.51	NA	NA	52.7	32.1	7.2	6.0	13.4	18.5
Amphenol	APH US	NR	39,539	132.17	NA	NA	36.6	31.4	7.8	7.2	23.3	24.3
			Average				40.2	27.6	7.3	6.1	19.4	23.0
Wireless charging												
Sunway	300136 CH	Buy	5,709	39.65	64.3	62%	31.3	19.3	6.8	5.1	21.6	26.2
Luxshare	002475 CH	NR	55,060	52.39	NA	NA	49.7	34.8	9.4	9.5	27.1	28.4
Lingyi iTech	002600 CH	NR	13,919	12.93	NA	NA	37.4	25.8	3.7	3.0	15.8	18.5
Anjie Tech	002635 CH	NR	1,745	18.34	NA	NA	21.1	18.7	1.9	1.7	9.1	9.5
Amphenol	APH US	NR	39,539	132.17	NA	NA	36.6	31.4	7.8	7.2	23.3	24.3
			Average				35.2	26.0	5.9	5.3	19.4	21.4
RFFE												
Sunway	300136 CH	Buy	5,709	39.65	64.3	62%	31.3	19.3	6.8	5.1	21.6	26.2
Skyworks	SWKS US	NR	24,170	145.53	NA	NA	25.0	19.3	6.1	5.5	23.0	29.4
Broadcom	AVGO US	NR	172,358	426.10	NA	NA	19.3	16.3	7.4	7.1	37.0	40.5
Qorvo	QRVO US	NR	18,203	159.60	NA	NA	26.3	18.6	4.5	3.9	17.5	22.7
Murata	6981 JP	NR	57,923	8978.00	NA	NA	32.4	29.1	3.3	3.1	10.6	11.0
			Average				26.9	20.5	5.6	4.9	21.9	26.0

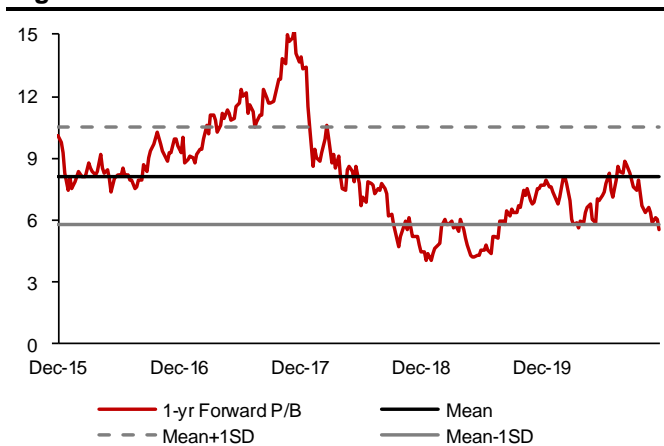
Source: Bloomberg, CMBIS

Figure 186: 12M forward P/E band



Source: Company data, CMBIS estimates

Figure 187: 12M forward P/B band



Source: Company data, CMBIS estimates

Appendix

Company Background

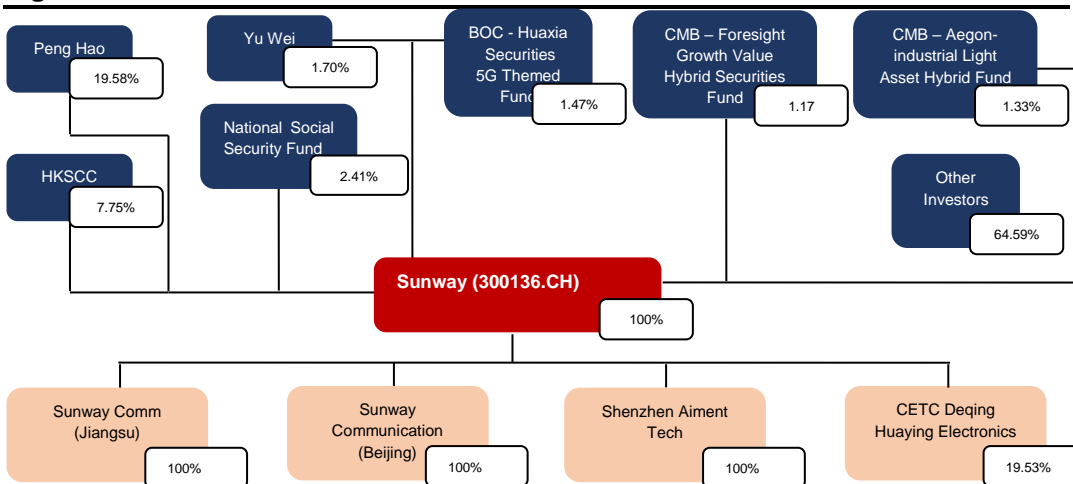
Established in 2006 and listed on SSE board in 2010, Sunway is a world leading provider of RF connectivity related components and modules, including antennas, wireless Charging modules and soft magnetic materials, RF front-end components, EMC/EMI solutions, cables and connectors, audio/RF module, across a wide range of applications - - consumer electronics (smartphones/tablets/PCs/smart wearables), automotive, IoT, smart Home and communication infrastructure. Sunway is devoted to cutting-edge technologies with three advanced research centers located in Shenzhen, Japan and Sweden and expands its global footprint with well-developed R&D and sales centers in Europe/US/EA.

Figure 188: Key milestones

Year	Event
2006	Founded in Changxing Industrial Park, Shenzhen
2010	Listed on Shanghai Stock Exchange (listing code: 300136)
2012	Acquired Laird Beijing to expand global footprint
2014	Acquired Shenzhen Alex for auto/industrial cables and connectors Acoustics BU on speakers/receivers and one-stop RF & Audio solutions
2015	Invested in Shenzhen Element (33% of share) to expand into metal injection molding (MIM).
2016	Microelectronics BU for RF front-end components
2017	Invested in Huaying Electronics (19% of share) for SAW filters First 5G mm-wave lab in the Greater Bay Area.
2019	Automotive subsidiary in Jiangsu Built subsidiary factory in Vietnam Opened North American Research Institute

Source: Company data, CMBIS

Figure 189: Shareholders structure



Source: Company data, CMBIS
As at 30 Sep 2020

Financial Summary

Income statement						Cash flow summary					
YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E	YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E
Revenue	4,707	5,134	7,008	10,935	14,789	Net profit	990	1,027	1,325	2,146	2,985
Cost of sales	2,988	3,217	4,513	7,043	9,480	Depreciation/amortization	100	182	185	256	358
Gross profit	1,719	1,917	2,494	3,893	5,309	Change in working capital	(570)	(665)	236	(1,499)	(427)
Selling exp	70	118	126	186	237	Others	89	133	138	468	647
Admin exp (excl. R&D)	142	206	263	394	518	Net cash from operating	609	677	1,884	1,371	3,562
R&D exp	279	430	561	875	1,183	Capex	(1,734)	(1,064)	(1,296)	(2,023)	(2,736)
Finance costs	46	64	68	77	85	Other	0	21	(81)	(210)	(299)
Other operating exp.	(18)	(74)	(35)	(87)	(118)	Net cash from investing	(1,734)	(1,043)	(1,378)	(2,233)	(3,035)
Operating profit	1,200	1,174	1,512	2,449	3,405	Share issuance	0	11	0	0	0
Other non-oper exp.	(5)	(3)	(6)	(10)	(14)	Dividend paid	(128)	(90)	(48)	(66)	(107)
Pre-tax profit	1,196	1,171	1,505	2,439	3,392	Other	997	(51)	23	1,034	1,031
Income tax expense	138	144	181	293	407	Net cash from financing	868	(129)	(25)	968	924
Minority interests	2	7	4	6	9	Net change in cash	(279)	(496)	505	105	1,451
Net profit to shareholders	1,055	1,020	1,321	2,140	2,976	Cash at beginning of year	1,214	935	444	950	1,055
						Exchange difference	(23)	(1)	24	0	0
						Cash at the end of year	937	444	950	1,055	2,506
Balance sheet						Key ratios					
YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E	YE 31 Dec	FY18A	FY19A	FY20E	FY21E	FY22E
Current assets	3,870	4,162	5,828	7,675	10,034	Revenue mix					
Cash & equivalents	937	444	950	1,055	2,506	Antenna/RF modules	2,212	2,105	2,614	3,849	4,886
Account receivables	2,197	2,785	3,444	4,657	5,203	Wireless charging	565	719	1,447	3,335	4,581
Inventories	535	609	1,143	1,524	1,956	EMC/EMI	1,365	1,720	2,150	2,795	3,494
Prepayment	7	9	36	36	36	Cables/connectors	565	590	797	956	1,196
Other current assets	195	315	256	403	334	RFFE	-	-	-	-	633
Non-current assets	3,346	4,208	5,344	6,931	9,046	Growth (%)					
PPE	776	1,543	1,947	2,832	4,052	Revenue	37.0	9.1	36.5	56.1	35.2
Deferred income tax	21	28	23	23	23	Gross profit	37.3	11.6	30.1	56.1	36.4
Other non-current assets	2,550	2,637	3,374	4,075	4,971	Operating profit	0.6	(2.2)	28.8	62.0	39.0
Total assets	7,217	8,370	11,172	14,606	19,080	Net profit	10.9	4.2	20.6	62.0	39.1
Current liabilities	2,112	2,746	3,857	4,549	5,585	Profit & loss ratio (%)					
Deferred income	815	1,444	1,147	1,556	2,069	Gross margin	36.5	37.3	35.6	35.6	35.9
Account payables	858	858	2,151	2,393	2,874	Operating margin	25.5	22.9	21.6	22.4	23.0
Tax payable	89	27	50	50	50	Net profit margin	22.4	19.9	18.8	19.6	20.1
Other current liabilities	350	417	509	550	592	Balance sheet ratio					
Non-current liabilities	1,400	862	1,190	1,892	2,494	Net debt/total equity (%)	33.4	38.1	21.6	28.5	18.1
Deferred income	1,357	817	1,124	1,826	2,429	Current ratio (x)	1.8	1.5	1.5	1.7	1.8
Deferred tax liability	0	1	1	1	1	Receivable turnover days	136	177	162	135	122
Other non-curr. liabilities	42	45	65	65	65	Inventory turnover days	34	41	46	45	43
Total liabilities	3,512	3,608	5,047	6,441	8,079	Payable turnover days	82	97	122	118	101
Share capital	976	969	1,044	1,044	1,044	Profitability (%)					
Reserves	281	214	152	152	152	ROE	28.5	21.4	21.6	26.2	27.1
Minority interest	23	46	50	56	65	ROA	14.6	12.2	11.8	14.7	15.6
Shareholders' equity	3,705	4,762	6,125	8,164	11,000	Per share data (RMB)					
Total equity and liabilities	7,217	8,369	11,172	14,605	19,080	EPS	1.01	1.05	1.27	2.05	2.85
						DPS	0.00	0.05	0.06	0.10	0.14

Source: Company data, CMBIS estimates

Shengyi Technology (600183 CH)

CCL leader riding on 5G/localization tailwinds

Initiate at BUY. As global No.2 and China No.1 largest CCL vendor, Shengyi Tech is poised to benefit from multi-year 5G/datacom upcycle and CCL/PCB localization. We expect Shengyi Tech's CCL/PCB to deliver 17%/57% revenue CAGR during FY20-22E, driven by rising demand of high-speed high-frequency products from telecom/datacom, content growth on material upgrade, CCL ASP hike on copper cost surge and improving operating efficiency. We estimate 28%/30% revenue/NP FY20-22E CAGR, and our 12m TP RMB33.69 (25.5% upside) is based on 30x FY21E P/E.

- **Global No.2 CCL player to benefit from 5G upgrade and localization.** As global 5G network rollout is driving CCL/PCB material upgrade and volume growth, we believe Shengyi Tech is well positioned to capture growth opportunities and gain share in high-speed/frequency CCL products from US peers (e.g. Rogers), especially PTFE (for mmWave), hydrocarbon (for sub-6GHz) and PPO/PPE (for high-speed multilayer PCB). We expect Shengyi's CCL ASP/volume to grow 7%/12% CAGR during FY20-22E.
- **Shengyi Electronics to capture fast-growing telecom PCB market.** SY Electronics, a subsidiary (78.67% of stake) of Shengyi Tech, mainly focused on mid/high-end PCB for telecom (74% of revenue). Shengyi Tech announced in Apr 2020 to spin off SYE to list on STAR, and IPO proceed will be used to fund capacity expansion to support growing PCB demand. We forecast Shengyi's PCB business to grow at 57% CAGR FY20-22E.
- **Recent copper price surge is positive to CCL ASP.** The price of copper (40-50% of CCL's COGS) surged by 30% since 3Q20, mainly due to global economic recovery and unexpected capacity disruption. Since we expect CCL leaders like Shengyi can transfer higher costs to downstream PCB clients, we expect CCL revenue to grow 23% YoY in 2H20E. We expect copper price hike to persist into 2021 given continued inflation and strong demand for high-end PCB for 5G upgrade and growing internet traffic.
- **Valuation/Key risks.** Our 12m TP of RMB33.69 is based on 30x FY21E P/E, 15% premium to upcycle 1sd- above historical average P/E. We think it's justified given 30% EPS FY20-22E CAGR and improving profitability on better product mix. Catalysts include copper price hike and 5G BTS tenders.

Earnings Summary

(YE 31 Dec)	FY18A	FY19A	FY20E	FY21E	FY22E
Turnover (RMB mn)	11,981	13,241	15,440	20,593	25,361
YoY growth (%)	11	11	17	33	23
Gross margin (%)	22.2	26.6	27.5	27.7	27.7
Net profit (RMB mn)	1,000	1,449	1,878	2,572	3,182
EPS (RMB)	0.47	0.64	0.82	1.12	1.39
YoY growth (%)	(36)	35	29	37	24
PE (x)	56.8	42.2	32.7	23.9	19.3
PB (x)	8.9	6.9	6.1	5.3	4.7
Yield (%)	1.3	1.5	1.8	2.5	3.1
ROE (%)	15	15	18	21	22
Net gearing (%)	3	13	16	21	17

Source: Company data, CMBIS estimates

BUY (Initiation)

Target Price	RMB 33.69
Up/Downside	+25.5%
Current Price	RMB 26.85

China Technology Sector

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Stock Data

Mkt. Cap. (RMB mn)	61,485
Avg. 3mths t/o (RMB mn)	741
52W High/Low (RMB)	36.80/19.86
Total Issued Shares (mn)	2,290.0

Source: Bloomberg

Shareholding Structure

Guangdong Guangxin Holdings	22.12%
Dongguan Guohong Invest.	15.02%
Weihua Electronics	14.25%

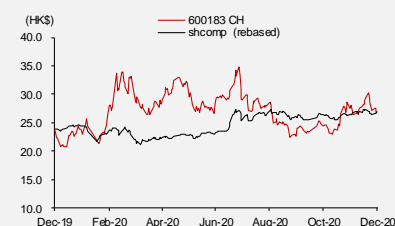
Source: Bloomberg

Share Performance

	Absolute	Relative
1-mth	-2.5%	-3.1%
3-mth	18.5%	15.5%
6-mth	-5.8%	-18.0%

Source: Bloomberg

12-mth Price Performance

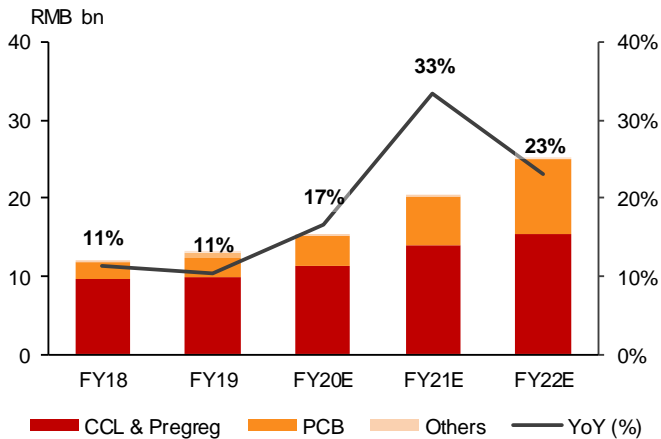


Source: Bloomberg

Auditor: GP CPA

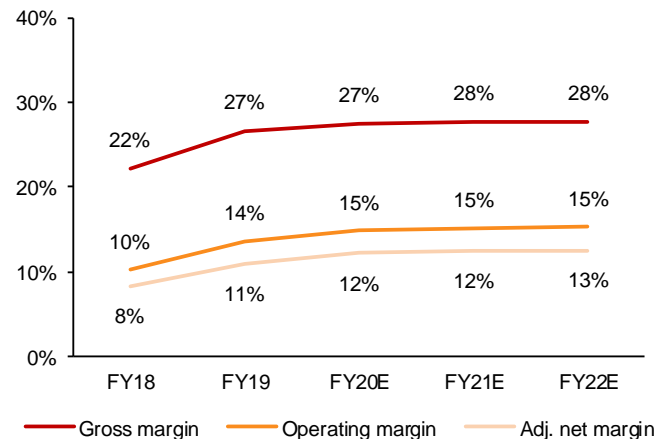
Focus Charts

Figure 190: Shengyi Tech revenue trend (FY18A-22E)



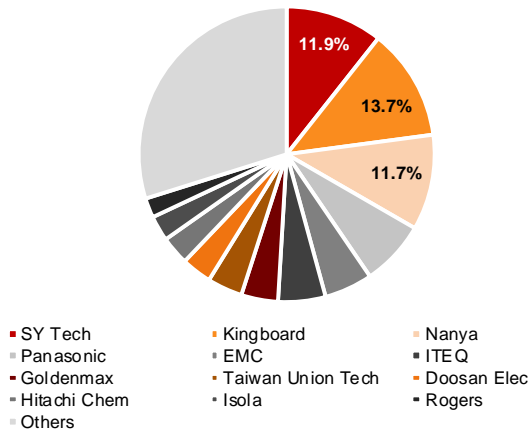
Source: Company data, CMBIS estimates

Figure 191: Shengyi Tech margin trend (FY18A-22E)



Source: Company data, CMBIS estimates

Figure 192: Shengyi Tech ranked 2nd in rigid CCL (2018)



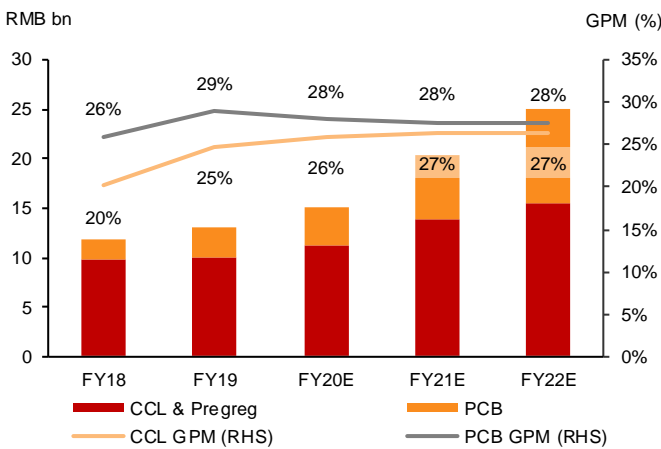
Source: Prismark, CMBIS

Figure 193: Recent copper cost hike to boost CCL ASP



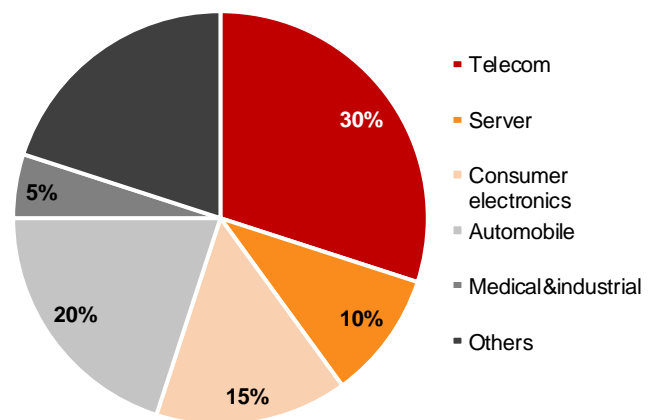
Source: Wind, CMBIS

Figure 194: Improving margin for CCL/PCB business



Source: Company data, CMBIS estimates

Figure 195: CCL volume contribution by application



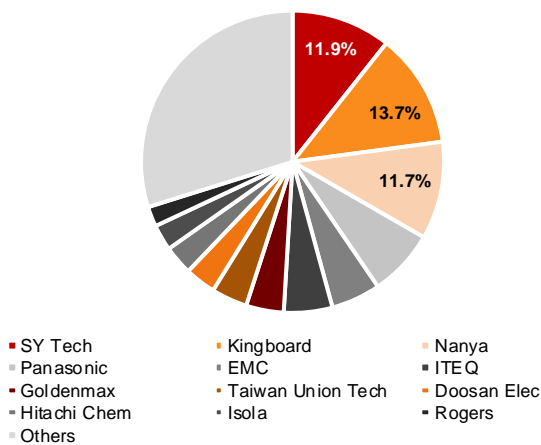
Source: CMBIS estimates

Investment Thesis

Promising outlook on high-end CCL/PCB demand and localisation

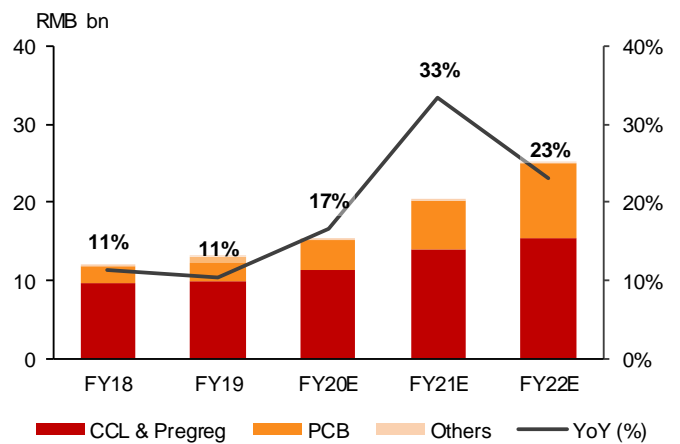
Global No.2 leader with strong rigid/flexible CCL portfolio. As China largest and global second largest rigid CCL supplier (12% market share), Shengyi Tech offers rigid CCL products for telecom/automobile/aerospace industries, as well as flexible CCL (FCCL) for consumer electronics market. Shengyi Tech currently provides comprehensive rigid CCL products ranging from traditional epoxy resin (FR-4) to PTFE/hydrocarbon in order to meet strong high-frequency CCL demand. In 2017, Shengyi Tech expanded into flexible CCL by acquiring patent and equipment from Chukoh Chemical, which added total capacity of 15mn sq m in Dongguan plant. The gross margin of Shengyi Tech’s CCL business is improving since 2H19, mainly due to increasing share of higher margin products.

Figure 196: Shengyi is global No.2 rigid CCL (2018)



Source: Prismark, CMBIS

Figure 197: Shengyi Tech revenue trend (FY18A-22E)



Source: Company, CMBIS

Emerging leadership in high-frequency/speed CCL. As 5G AAU continues to drive demand for high-speed/frequency CCL, we are positive on Shengyi’s market share gain from global leader, Rogers, by obtaining PTFE technology from Chukoh Chemical in 2017 and achieving further breakthroughs with hydrocarbon resin for better performance with low level of loss and ease of processing.

Figure 198: Comparison of high-end PTFE (Shengyi Tech vs Rogers)

	Shengyi Tech	Rogers
Model	S7136H	RO4350B
Dk*	✓3.42±0.05	3.48±0.05
Df*	✓0.0030	0.0037
CTE (ppm/°C)	12/14/45	14/16/35
Thermal conductivity (W/m*k)	0.66	✓0.62
Applications		
Communication	BTS antenna/PA/LNA	BTS antenna/PA
Aerospace	LNB/ satellite signal transmission	LNB
Automobile		Auto radar and sensors
Industrial		RFID tags

Source: Company data, Rogers, CMBIS

*under 10 GHz/23°C

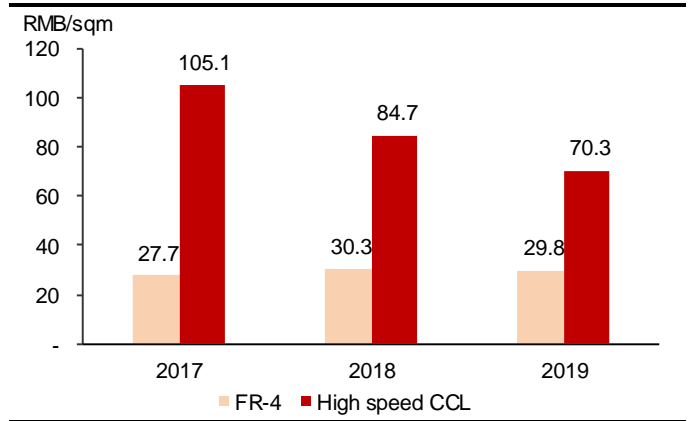
Market share expansion on import substitution trend. As domestic supply chain (e.g. Huawei/ZTE) is shifting to reduce reliance on US suppliers, we see a leeway for domestic suppliers to tap into high-frequency and high-speed CCL for multi-layer backboards for 5G AAU. We believe Shengyi can capture import substitution opportunities and gain share, thanks to capacity expansion (100mn sq m in FY20E) and extensive client coverage of 70% domestic market (SCC/WUS as major clients).

Figure 199: Shengyi penetrated in high-speed and specialty CCL to Shennan Circuits since 2017

SCC CCL suppliers	Products		
	FR-4	High-speed (PPO/PPE)	Specialty (PTFE/PI/BT)
ITEQ	•	•	
Rogers			•
Shengyi Tech	•	•	•
Panasonic	•	•	•

Source: SCC, CMBIS

Figure 200: ASP of high-speed CCL doubled ASP of FR-4



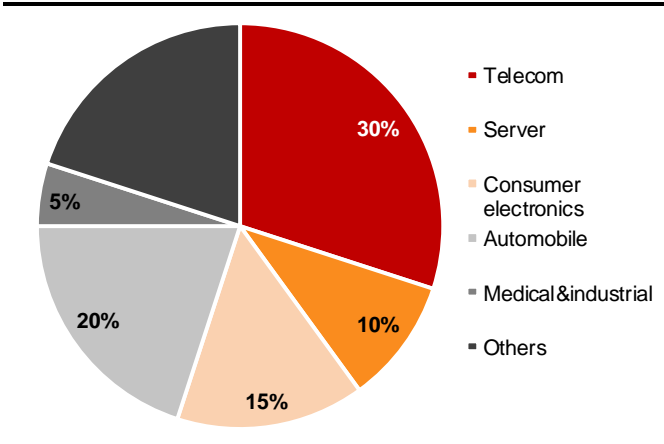
Source: Company data, CMBIS

CCL: well-positioned for 5G material upgrade (73% of revenue)

We forecast CCL segment to grow 17% CAGR FY20-22E, driven by 1) revenue mix shift to high-speed/high-frequency CCL, 2) capacity expansion in Shanxi and Jiangxi to add 4.2mn sq m of high-thermal conductive CCL and 12mn sq m CCL in 2020.

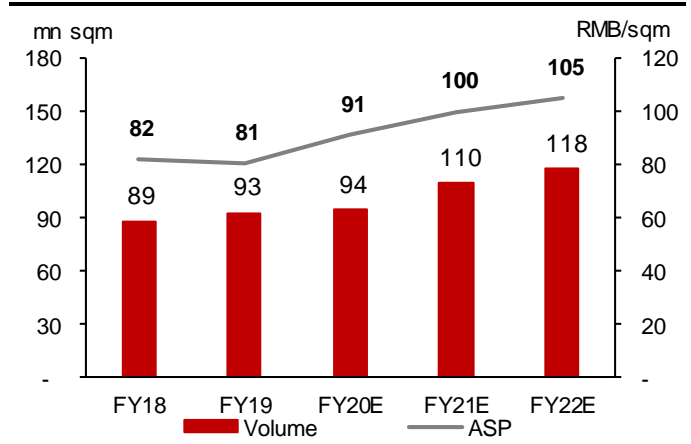
We expect telecom market will remain major growth driver in FY20-22E, while other markets (e.g. auto, server, consumer electronics) will maintain growth momentum. Specifically, given continued R&D efforts on advanced materials (e.g. PTFE, hydrocarbon, PPO), we expect CCL margin will continue to improve with better product mix of high-frequency CCL.

Figure 201: Shengyi's CCL shipment mix (2019)



Source: CMBIS estimates

Figure 202: CCL business of 8%/20% ASP/volume upside in FY20-22E



Source: Company data, CMBIS estimates

Figure 203: Rigid CCL capacity to reach 100mn sq m by FY20E

Location	Product	Current (mn sq m)	Expansion plan
Dongguan	<ul style="list-style-type: none"> •Flame-retardant epoxy glass fabric reinforced •Composite epoxy CCL •5G product of 60-80k sq m per month 	45	N/A
Xianyang (Shan'xi)	<ul style="list-style-type: none"> •Composite epoxy material •Flame-retardant epoxy glass fabric reinforced material, •Thick copper base and aluminum base high thermal conductive laminate 	20	Completed 4.2mn sq m for high thermal conductive CCL
Suzhou	<ul style="list-style-type: none"> •Epoxy glass fabric CCL 	10	N/A
Changshu	<ul style="list-style-type: none"> •Flame-retardant epoxy glass fabric reinforced laminate, •Composite epoxy material 	11	N/A
Nantong	<ul style="list-style-type: none"> •High-frequency RF base material 	1.5	Completed 1mn sq m and to complete 0.5mn sq m
Jiujiang (Jiangxi)	<ul style="list-style-type: none"> •Flame-retardant epoxy based glass fabric reinforced laminate 	-	Completed 12mn sq m in 2020 and 18mn to be completed

Source: Company data, CMBIS

Recent copper price surge is positive to CCL ASP. Copper is the major raw materials for making copper foil, which accounts for 40-50% of CCL's COGS. Since copper price is very transparent and CCL market is more concentrated than PCB market, we believe CCL suppliers have a stronger bargaining power to transfer cost pressure to downstream PCB suppliers. Therefore, we expect higher copper price to boost Shengyi's CCL margin and ASP in 2H20E.

Figure 204: LME Copper Price Chart

Source: Wind, CMBIS

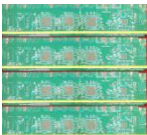
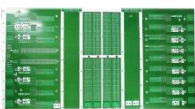
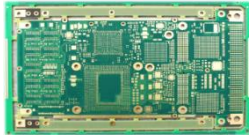
PCB: Shengyi Electronics focusing on mid/high-end products (27% of revenue)

Shengyi Electronics (SYE), a subsidiary (78.67% of stake) of Shengyi Tech, mainly focused on mid/high-end PCB for telecom, server and automobile markets. Its major clients include Huawei, ZTE, Samsung and Nokia.

Capacity expansion to meet growing 5G demand. In view of PCB's booming demand, we expect SYE to ramp up capacity to ~1mn sq m in FY20E, backed by 1) additional Dongcheng Phase III with 334k sq m in 2021, and 2) Ji'an Phase I with 700k sq m in 2022.

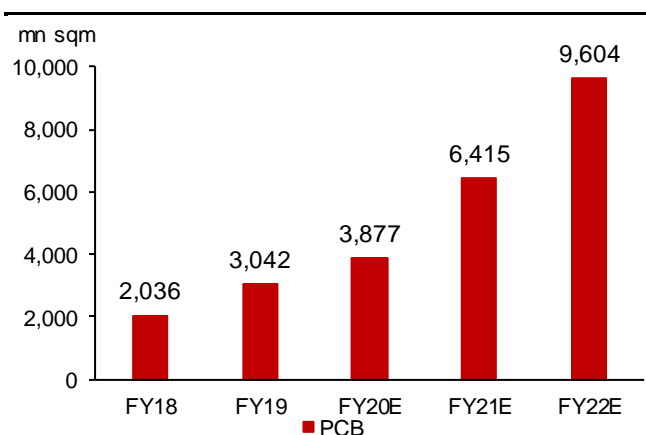
Possible spin-off to list on STAR. In Apr 2020, Shengyi Tech announced to spin off SYE to list on STAR. We forecast PCB business to grow at 57% CAGR FY20-22E. We expect gross margin of PCB business will remain stable at 28% in FY20E (vs 29% in 1H20), given recent price surge in upstream raw materials.

Figure 205: SYE's PCB product portfolio

Products	Line-card	Backplane	HDI
			
Layer count	2-38L	2-56L	4-28L
Thickness (mm)	0.4-5.0	1.0-7.0	0.4-4.0
Max. size (mm x mm)	575 x 900	575 x 1085	610 x 475
Min. line/space (mil)			
inner layer	2.5/3.0	3.0/3.5	2.5/3.0
outer layer	3.0/3.0	4.0/4.5	2.5/3.0
Min. drill hole diameter	0.15	0.25	0.15
Base material performance	High/mid/low-Tg, low-Dk, low-Df, halogen free, anti-CAF, lead free		

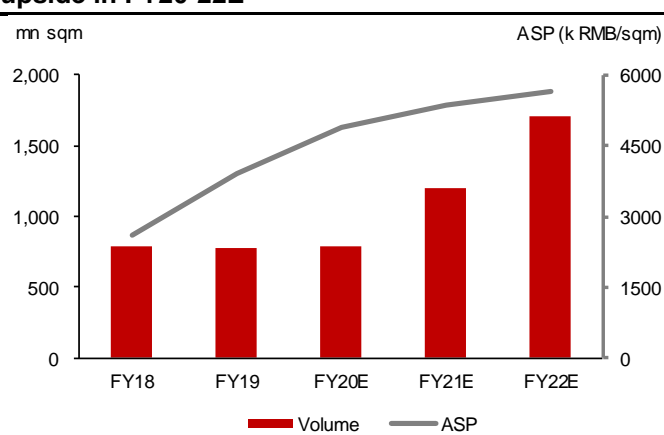
Source: Company data, CMBIS

Figure 206: PCB will grow at 57% CAGR FY20-22E



Source: Company data, CMBIS estimates

Figure 207: PCB business of 7%/46% ASP/volume upside in FY20-22E



Source: Company data, CMBIS estimates

Figure 208: Capacity Schedule

RMB mn	FY18	FY19	FY20E	FY21E	FY22E
Pregreg					
Guangdong (70mn sq m)	70.0	70.0	70.0	70.0	70.0
Shanxi (12mn sq m)	12.0	12.0	12.0	12.0	12.0
Suzhou (17mn sq m)	17.0	17.0	17.0	17.0	17.0
Changshu (24mn sq m)	18.6	18.6	18.6	18.6	18.6
New Jiangsu (0.5mn sq m)	-	0.2	0.2	0.2	0.2
New Jiangxi I (22mn sq m)	-	-	8.8	22.0	22.0
New Jiangxi II (34mn sq m)	-	-	-	-	13.6
Total capacity	117.6	117.8	126.6	139.8	153.4
...YoY		0%	7%	10%	10%
Rigid CCL					
Original capacity	72.8	72.8	72.8	72.8	72.8
New Jiangsu I (1mn sq m)	-	0.5	1.0	1.0	1.0
New Jiangsu II 0.5mn sq m	-	-	0.1	0.4	0.5
New Shanxi II (4.2mn sq m)	-	-	2.1	4.2	4.2
New Jiangxi I (12mn sq m)	-	-	4.2	12.0	12.0
New Jiangxi II (18mn sq m)	-	-	-	-	3.6
Total capacity	72.8	73.3	80.2	90.4	94.1
...YoY		1%	9%	13%	4%
Flex CCL					
Original capacity	18.2	18.2	18.2	18.2	18.2
New Guangdong (4.5mn sq m / FCCL)	-	2.9	4.5	4.5	4.5
Total Capacity	18.2	21.1	22.7	22.7	22.7
...YoY		16%	7%	0%	0%
PCB					
Dongcheng I + II (80w sq m)	80.3	80.8	80.8	80.8	80.8
Jian I (70w sq m)	-	-	2.8	37.8	70.0
Dongcheng III (33.44w sq m)	-	-	16.7	33.4	33.4
New Jian II (53.5w sq m)	-	-	-	-	13.4
New Dongcheng IV (34.8w sq m)	-	-	-	-	1.7
Total capacity	80.3	80.8	100.3	152.0	199.4
...YoY		1%	24%	52%	31%

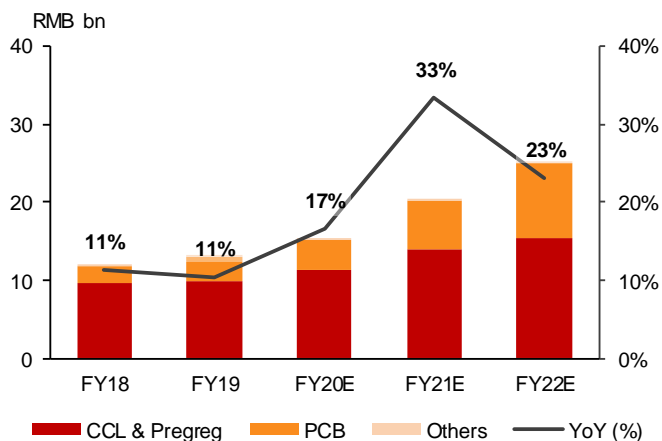
Source: Company data, CMBIS estimates

Financial Analysis

Expect revenue/net profit to grow at 28%/30% CAGR

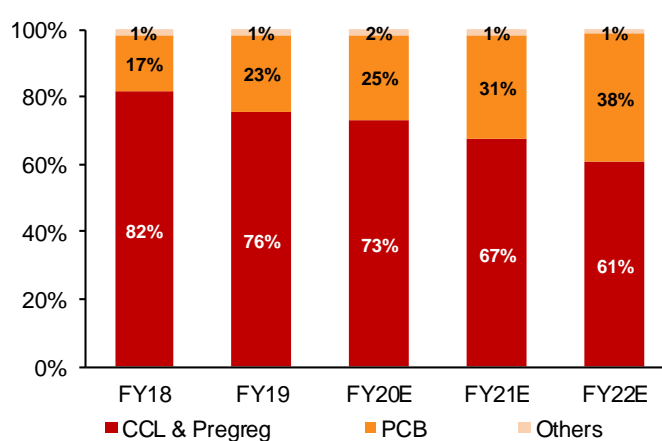
We estimate Shengyi Tech revenue to grow 17%/33%/23% YoY in FY20E/21E/22E, driven by 1) CCL & Prepreg (17% CAGR): continued share gain on import substitution, and 2) PCB (57% CAGR): rapid growth in high-end telecom board for 5G communication. We also expect stable GPM of 27.5%/27.7% in FY20E/21E (vs 26.6% in FY19) given better product mix.

Figure 209: Revenue growth estimates (FY18A-22E)



Source: Company data, CMBIS estimates

Figure 210: Revenue breakdown (FY18A-22E)



Source: Company data, CMBIS estimates

Figure 211: Revenue breakdown

RMB mn	FY18	FY19	FY20E	FY21E	FY22E
CCL & Prepreg	9,767	10,002	11,327	13,894	15,416
...YoY	9%	2%	13%	23%	11%
PCB	2,036	3,042	3,877	6,415	9,604
...YoY	22%	49%	27%	65%	50%
Others	178	197	237	284	341
...YoY	34%	11%	20%	20%	20%
Total	11,981	13,241	15,440	20,593	25,361
...YoY	11%	11%	17%	33%	23%
Volume					
Prepreg (mn m)	122	124	124	140	154
CCL (mn sqm)	89	93	94	110	118
PCB (k sqm)	787	780	795	1,196	1,705
ASP					
Prepreg (RMB/m)	21	20	22	21	20
CCL (RMB/sqm)	82	81	91	100	105
PCB (RMB/sqm)	2,587	3,902	4,878	5,365	5,634
Gross Margin					
CCL & Prepreg	20.2%	24.8%	26.0%	26.5%	26.5%
PCB	26.0%	28.9%	27.9%	27.7%	27.6%
Total	22.2%	26.6%	27.5%	27.7%	27.7%

Source: Company data, CMBIS estimates

Figure 212: P&L forecast

RMB mn	FY18	FY19	1Q20	2Q20	3Q20	4Q20	FY20E	FY21E	FY22E
Revenue	11,981	13,241	3,072	3,807	3,811	4,750	15,440	20,593	25,361
...YoY	11%	11%	12%	18%	9%	26%	17%	33%	23%
Cost of sales	(9,324)	(9,713)	(2,190)	(2,716)	(2,819)	(3,474)	(11,199)	(14,886)	(18,325)
Gross profit	2,657	3,528	882	1,091	992	1,276	4,241	5,708	7,037
GPM (%)	22%	27%	29%	29%	26%	27%	27%	28%	28%
...YoY	15%	33%	33%	24%	0%	29%	20%	35%	23%
SG&A	(728)	(932)	(224)	(210)	(221)	(294)	(950)	(1,246)	(1,534)
...% of rev	-6%	-7%	-7%	-6%	-6%	-6%	-6%	-6%	-6%
R&D	(529)	(605)	(154)	(190)	(187)	(242)	(772)	(1,030)	(1,268)
...% of rev	-4%	-5%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
Operating profit	1,229	1,805	432	602	575	675	2,283	3,125	3,867
OPM (%)	10%	14%	14%	16%	15%	14%	15%	15%	15%
...YoY	-6%	47%	36%	31%	8%	36%	26%	37%	24%
Net profit	1,000	1,449	339	487	477	575	1,878	2,572	3,182
NPM (%)	8%	11%	11%	13%	13%	12%	12%	12%	13%
...YoY	-7%	45%	36%	28%	15%	42%	30%	37%	24%

Source: Company data, CMBIS estimates

Our FY21/22E EPS is 1-18% above with consensus

Figure 213: CMBIS estimates vs consensus

RMB mn	CMBIS estimates			Consensus			Diff (%)		
	FY20E	FY21E	FY22E	FY20E	FY21E	FY22E	FY20E	FY21E	FY22E
Revenue	15,440	20,593	25,361	15,306	18,040	21,657	1%	14%	17%
Gross Profit	4,241	5,708	7,037	4,139	4,977	5,972	2%	15%	18%
Operating Profit	2,283	3,125	3,867	2,320	2,847	3,450	-2%	10%	12%
Net profit	1,878	2,572	3,182	1,857	2,281	2,702	1%	13%	18%
EPS (RMB)	0.82	1.12	1.39	0.82	1.00	1.18	1%	13%	18%
Gross Margin	27.5%	27.7%	27.7%	27.0%	27.6%	27.6%	0.4 ppt	0.1 ppt	0.2 ppt
Operating Margin	14.8%	15.2%	15.2%	15.2%	15.8%	15.9%	-0.4 ppt	-0.6 ppt	-0.7 ppt
Net Margin	12.2%	12.5%	12.5%	12.1%	12.6%	12.5%	0 ppt	-0.2 ppt	0.1 ppt

Source: Company data, CMBIS estimates

Valuation

Initiate at BUY with TP RMB33.69 (25.5% upside)

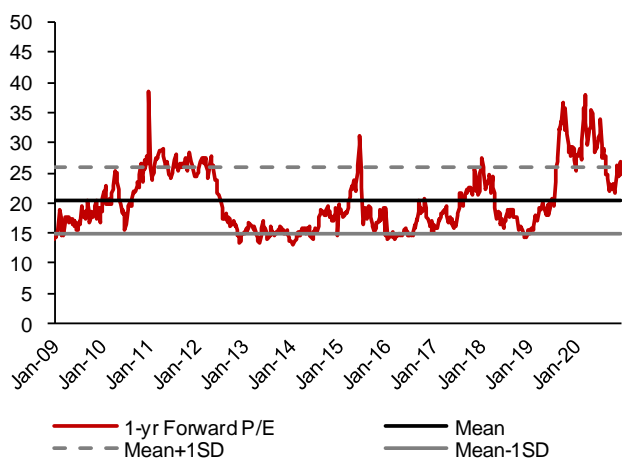
We derived our 12m TP of RMB33.69 by applying 30x FY21E P/E, which is 15% premium to upcycle 1sd- above historical average P/E. We think it's justified given 30% EPS FY20-22E CAGR and improving profitability on better product mix. We believe this is justified as Shengyi Tech continues to lead product upgrade trend and gain market share on import substitution opportunity.

Figure 214: Peers' valuation

Company	Ticker	Rating	Market Cap (US\$ mn)	Price (LC)	TP (LC)	Up/Down -side	P/E (x)		P/B (x)		ROE (%)	
							FY20E	FY21E	FY20E	FY21E	FY20E	FY21E
CCL												
Shengyi Tech	600183 CH	Buy	9,451	26.85	33.7	25%	32.7	23.9	6.1	5.3	17.5	20.8
Nanya	1303 TT	NR	19,018	68.60	NA	NA	29.3	18.9	1.5	1.5	5.3	8.2
ITEQ	6213 TT	NR	1,621	135.50	NA	NA	17.5	13.5	4.1	3.5	25.4	28.8
Kingboard	148 HK	NR	4,286	30.15	NA	NA	8.1	7.6	-	-	-	-
Sumitomo	4203 JT	NR	1,679	3495.00	NA	NA	15.5	19.5	0.9	0.9	6.2	4.9
Rogers	ROG US	NR	2,880	154.20	NA	NA	31.4	24.7	-	-	-	-
Average							22.4	18.0	3.2	2.8	13.6	15.7
PCB												
Shengyi Tech	600183 CH	Buy	9,451	26.85	33.7	25%	32.7	23.9	6.1	5.3	17.5	20.8
Shennan Circuits	002916 CH	Hold	8,308	116.80	129.1	10%	38.7	29.4	7.5	6.3	19.4	21.4
WUS	002463 CH	NR	4,948	18.71	NA	NA	22.2	18.0	5.0	4.1	22.9	23.0
Kinwon	603228 CH	NR	3,755	29.42	NA	NA	21.9	16.9	3.9	3.3	17.4	18.6
DSBJ	002384 CH	NR	6,757	26.12	NA	NA	29.0	21.8	4.1	3.6	14.4	16.8
Zhen Ding	4958 TT	NR	3,894	119.50	NA	NA	12.9	10.4	1.5	1.4	11.0	13.1
TTM	TTMI US	NR	1,445	13.54	NA	NA	13.3	10.8	1.0	1.0	8.8	8.9
UMTC	3037 TT	NR	4,576	86.00	NA	NA	28.9	21.0	2.7	2.5	9.1	12.3
Tripod	3044 TT	NR	2,250	121.50	NA	NA	11.0	10.1	1.7	1.6	16.1	16.2
Comped	2313 TT	NR	1,869	44.50	NA	NA	10.9	9.4	1.8	1.6	18.3	18.8
SEMCO	009150 KS	NR	11,438	171000.00	NA	NA	22.1	17.0	2.2	2.0	10.6	12.3
Average							22.1	17.2	3.4	3.0	15.0	16.6

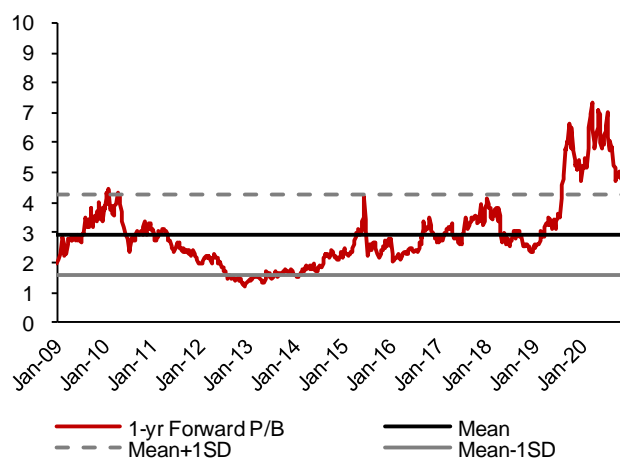
Source: Bloomberg, CMBIS

Figure 215: 12M forward P/E band



Source: Company data, CMBIS

Figure 216: 12M forward P/B band



Source: Company data, CMBIS

Appendix

Company Background

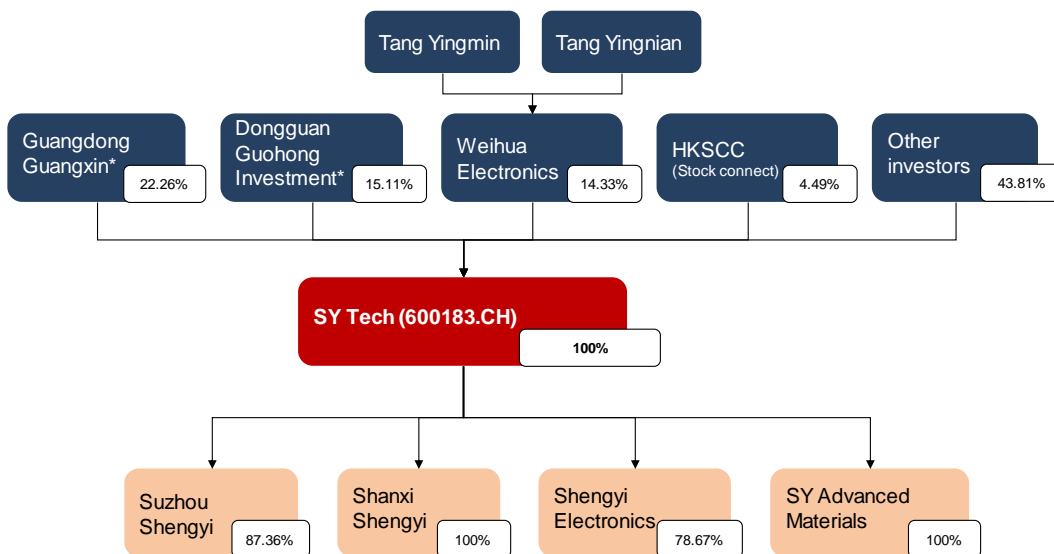
Established in 1985 and listed on SEE board in 1998, Shengyi Tech is a core supplier of electronic circuit base materials and ranked as the world's second largest CCL manufacturer in terms of sales volume, from 2013 to 2017 (Prismark). Shengyi Tech focuses on providing high-end electronic materials, including CCL, prepreg, insulation boards, metal-based CCL, resin-coated copper (RCC) and coverlay materials, which have been qualified by global tech leaders, such as Huawei, ZTE, Bosch, Lenovo, Sony, and Philips.

Figure 217: Key milestones

Year	Event
1985	Founded Shengyi Copper Clad Laminate Co., Ltd.
1998	Listed on Shanghai Stock Exchange (stock code: 600183 CH)
2004	Completed the first RCC precision coating production line in China
2006	MP of self-developed FCCL
2011	Established FCCL Research & Development Center
2013	Established iFlex Electronic Materials (Dongguan) Co., Ltd. with Nippon Steel & Sumikin
2016	Established Shengyi Advanced Material Co., Ltd. Entering high-frequency/speed PCB market
2017	Acquired PTFE technology from Chukoh Chemical Acquired FCCL technology (patent, equipment, etc) from LG Chemical
2020	Planned to spin off SY Electronics to list on STAR

Source: Company data, CMBIS

Figure 218: Shareholders structure



Source: Company data, CMBIS

As at 31 Mar 2020

*State-owned association

Financial Summary

Income statement

YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E
Revenue	11,981	13,241	15,440	20,593	25,361
Cost of sales	9,324	9,713	11,199	14,886	18,325
Gross profit	2,657	3,528	4,241	5,708	7,037
Selling exp	244	288	193	257	317
Admin exp	484	644	757	988	1,217
R&D exp	529	605	772	1,030	1,268
Finance costs	185	142	165	212	244
Other operating exp.	(13)	44	72	95	124
Operating profit	1,229	1,805	2,283	3,125	3,867
Other non-oper exp.	(6)	0	-	-	-
Pre-tax profit	1,223	1,805	2,283	3,125	3,867
Income tax expense	158	242	274	375	464
Minority interests	64	115	131	179	221
Net profit to shareholders	1,000	1,449	1,878	2,572	3,182

Cash flow summary

YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E
Net profit	1,065	1,563	2,009	2,750	3,403
Depreciation/amortization	366	409	406	449	505
Change in working capital	(249)	(479)	(998)	(1,516)	(295)
Others	155	198	12	212	244
Net cash from operating	1,337	1,692	1,429	1,894	3,857
Capex	(1,273)	(1,580)	(1,475)	(1,569)	(1,938)
Other	75	14	(7)	0	0
Net cash from investing	(1,198)	(1,566)	(1,482)	(1,569)	(1,938)
Share issuance	9	0	275	0	0
Dividend paid	(774)	(872)	(910)	(1,127)	(1,543)
Other	(485)	699	897	357	407
Net cash from financing	(1,250)	(173)	261	(770)	(1,136)
Net change in cash	(1,104)	(50)	205	(445)	784
Cash at beginning of the	2,202	1,100	1,050	1,254	809
Exchange difference	7	(3)	(4)	0	0
Cash at the end of the year	1,098	1,050	1,254	809	1,593

Balance sheet

YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E
Current assets	7,652	8,712	10,563	12,836	13,954
Cash & equivalents	1,125	1,062	1,291	846	1,629
Account receivables	3,816	4,598	4,760	6,681	6,667
Inventory	1,748	2,100	2,769	3,566	3,914
Prepayment	4	11	27	27	27
Other current assets	957	941	1,717	1,717	1,717
Non-current assets	5,234	6,823	8,040	9,161	10,593
PPE	3,456	5,003	5,404	6,115	7,056
Deferred tax assets	40	76	114	114	114
Other non-current assets	1,738	1,744	2,522	2,932	3,423
Total assets	12,886	15,535	18,603	21,997	24,547
Current liabilities	3,778	5,257	7,091	8,776	9,368
ST borrowings	824	1,519	2,439	2,809	3,232
Account payables	1,850	2,656	2,943	4,145	4,184
Tax payable	74	116	119	119	119
Other current liabilities	1,030	965	1,589	1,703	1,833
Non-current liabilities	2,267	925	789	875	972
LT borrowings	539	732	563	648	746
Deferred tax liability	45	13	28	28	28
Other non-current	1,683	179	199	199	199
Total liabilities	6,044	6,181	7,880	9,650	10,340
Share capital	2,117	2,276	2,290	2,290	2,290
Reserve	647	2,505	2,766	2,766	2,766
Minority interest	439	520	650	829	1,050
Total equity	6,842	9,354	10,723	12,347	14,207
Total liabilities and	12,886	15,535	18,603	21,997	24,547

Key ratios

YE 31 Dec	FY18A	FY19A	FY20E	FY21E	FY22E
Revenue mix					
CCL	82	76	73	67	61
PCB	17	23	25	31	38
Others	1	1	2	1	1
Growth (%)					
Revenue	11.4	10.5	16.6	33.4	23.2
Gross profit	15.1	32.8	20.2	34.6	23.3
Operating profit	(5.9)	46.9	26.5	36.9	23.7
Net profit	(35.9)	34.7	28.9	36.9	23.7
Profit & loss ratio (%)					
Gross margin	22.2	26.6	27.5	27.7	27.7
Operating margin	10.3	13.6	14.8	15.2	15.2
Net profit margin	8.4	10.9	12.2	12.5	12.5
Balance sheet ratio					
Net debt/total equity (%)	3.5	12.7	16.0	21.2	16.5
Current ratio (x)	2.0	1.7	1.5	1.5	1.5
Receivable turnover days	116	116	111	101	96
Inventory turnover days	66	72	79	78	74
Payable turnover days	75	85	91	87	83
Profitability (%)					
ROE	14.6	15.5	17.5	20.8	22.4
ROA	7.8	9.3	10.1	11.7	13.0
Per share data (RMB)					
EPS	0.47	0.64	0.82	1.12	1.39
DPS	0.35	0.40	0.49	0.67	0.83

Source: Company data, CMBIS estimates

Shennan Circuits (002916 CH)

Rising global PCB leader on expansion mode

Initiate at HOLD. We believe Shennan Circuit (SCC) is poised to benefit from China's localization and consolidation trends in PCB/IC substrate during 5G era. We are positive on SCC's share gain given rising demand and content growth for 5G/datacom PCBs and IC substrate localization, driving 19%/22% revenue /NP FY20-22E CAGR. While we like its leadership in PCB and fast-growing IC substrate, we think near-term PCB ASP pressure amid 5G BTS de-spec and intense competition will remain an overhang for the stock. Our 12m TP RMB129.05 (10.5% upside) is based on 32x FY21E P/E.

- **China largest PCB maker to benefit from 5G upcycle.** As the largest rigid PCB supplier in China and 12th largest vendor globally, we expect SCC to continue share gain on strong demand for high-speed/high-density PCB and IC substrate during 5G era. With ongoing 5G deployment and surging data traffic, we expect capacity expansion and ASP hike will drive SCC's PCB segment to deliver 19% revenue CAGR during FY20-22E.
- **Expansion into fast-growing IC substrate amid rapid localization.** SCC leads the frontier of IC substrate for MEMS with 30%+ market share. In 1H20, SCC's substrate revenue has grown 50% YoY, driven by strong domestic demand amid localization. Shennan will expand new IC substrate capacity in Wuxi, which will help expand into fast-growing semi market.
- **Limited impact from CCL price hike but PCB ASP pressure is an overhang.** Despite CCL price hike since 3Q20, we expect limited pressure to SSC given its strong bargaining power as industry leader and robust demand on economic recovery in 4Q20. However, with 65% of telecom sales exposure, we expect near-term PCB ASP pressure due to intense competition and 5G BTS de-spec will remain an overhang for the stock.
- **Valuation/Key risks.** We derived our 12m TP of RMB129.05 by applying 32x FY20E P/E, in line with 2-year historical forward P/E. Potential upside include faster developments with auto clients and stronger shipments for consumer electronics. Risks include continued price increase in upstream materials, de-spec of 5G BTS and less-than-expected demand from Telecom and Datacom operators.

Earnings Summary

(YE 31 Dec)	FY18A	FY19A	FY20E	FY21E	FY21E
Turnover (RMB mn)	7,602	10,524	11,948	15,521	17,045
YoY growth (%)	34	38	14	30	10
Net profit (RMB mn)	697	1,233	1,439	1,896	2,132
EPS (RMB)	2.49	3.63	3.02	3.97	4.47
YoY growth (%)	56	46	(17)	32	12
Consensus EPS (RMB)	NA	NA	3.35	4.31	5.35
PE (x)	46.9	32.2	38.7	29.4	26.1
PB (x)	8.8	7.9	7.5	6.3	5.4
Yield (%)	0.6	1.0	0.8	1.1	1.2
ROE (%)	19	25	19	21	21
Net gearing (%)	18	23	13	20	17

Source: Company data, Bloomberg, CMBIS estimates

HOLD (Initiation)

Target Price **HK\$129.05**
 Current Price **HK\$116.80**
 Up/Downside **+10.5%**

China Technology Sector

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Stock Data

Mkt Cap (RMB mn)	57,153
Avg 3 mths t/o (RMB mn)	601
52w High/Low (RMB)	198.00/97.26
Total Issued Shares (mn)	489.3

Source: Bloomberg

Shareholding Structure

AVID International	69.05%
HKSCC	2.26%
National Social Security Fund	1.01%

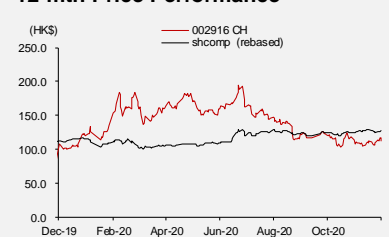
Source: Bloomberg

Share Performance

	Absolute	Relative
1-mth	1.5%	0.9%
3-mth	1.3%	-1.2%
6-mth	-27.0%	-36.4%

Source: Bloomberg

12-mth Price Performance

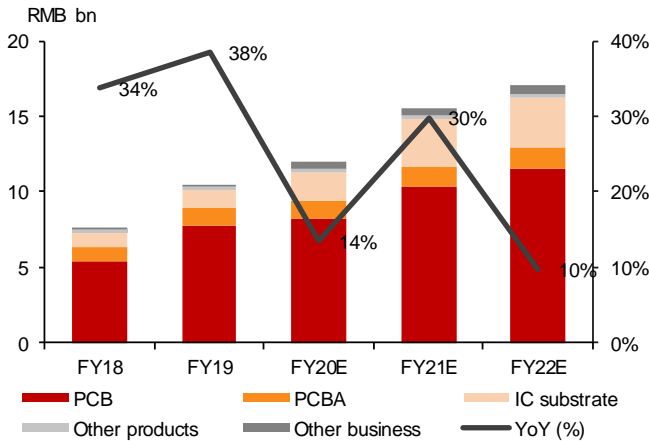


Source: Bloomberg

Auditor: Grant Thornton CPA

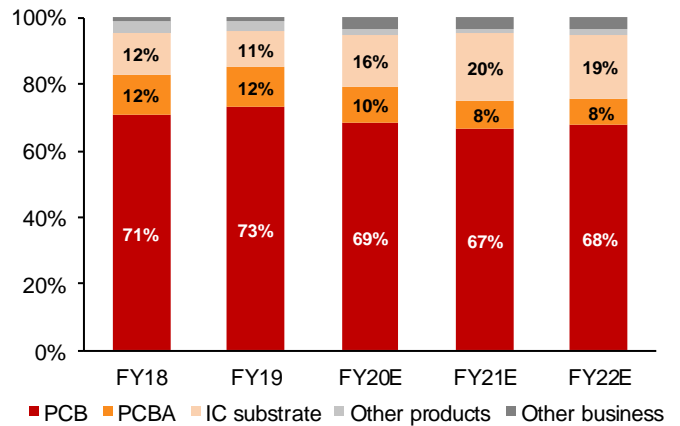
Focus Charts

Figure 219: SCC revenue growth trend (FY18A-22E)



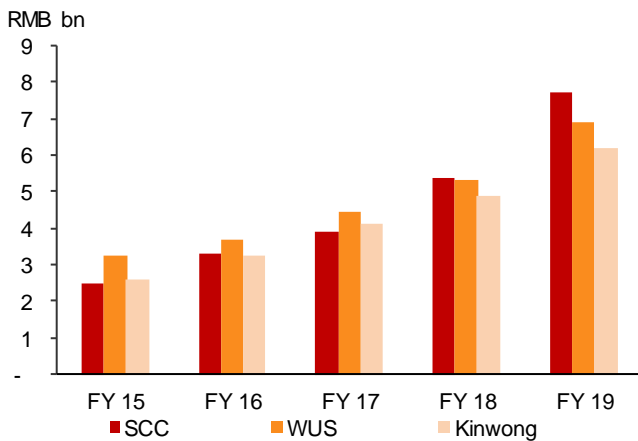
Source: Company data, CMBIS estimates

Figure 220: SCC revenue breakdown (FY18A-22E)



Source: Company data, CMBIS estimates

Figure 221: Top domestic PCB suppliers' PCB revenue trend (FY15-19)



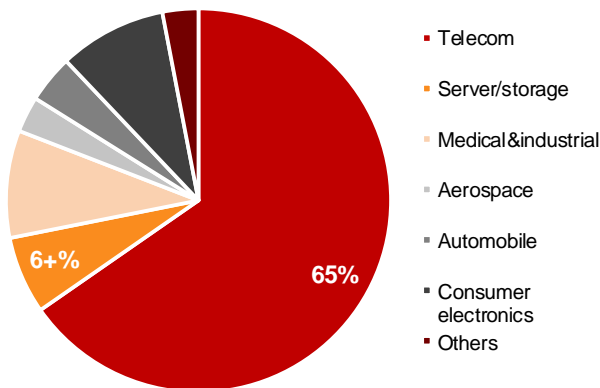
Source: Bloomberg, CMBIS

Figure 222: Downstream applications mapping for top domestic PCB suppliers

PCB Suppliers		SCC	WUS	Kinwon	DSBJ
Telecom clients	Huawei	✓	✓	✓	
	ZTE	✓	✓	✓	
	Ericsson	✓	✓		✓
	Nokia	✓	✓		✓
Other industries	Industrial/medical	•			•
	Consumer electronics			•	•
	Auto	•		•	•

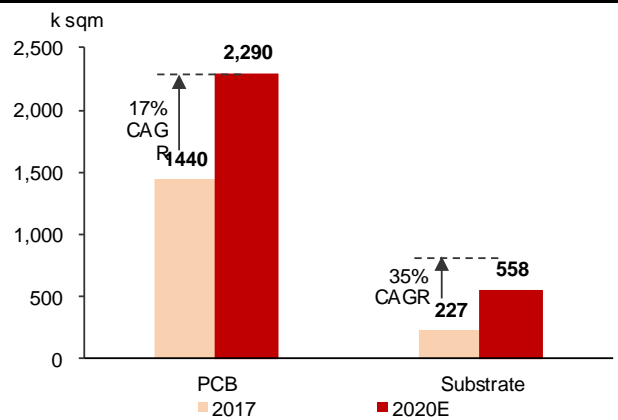
Source: Bloomberg, CMBIS

Figure 223: Telecom market accounted for 65% of FY19 revenue



Source: CMBIS estimates

Figure 224: SCC capacity expansion during 2017-20E



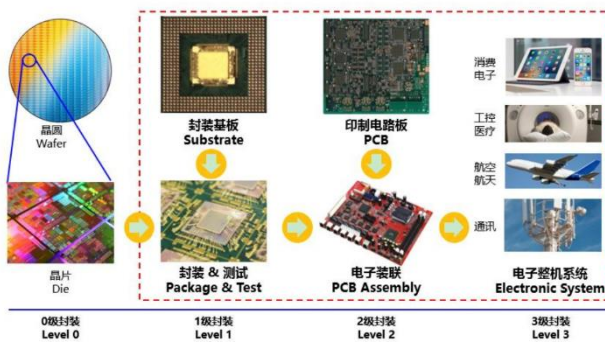
Source: Company data, CMBIS estimates

Investment Thesis

Chinese largest rigid PCB supplier with “3-in-one” strategy

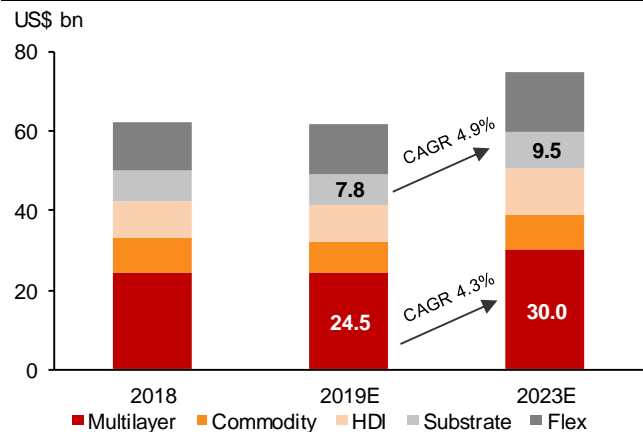
Promising multilayer-PCB and IC substrate to drive 19% CAGR FY20-22E. SCC is the largest rigid PCB supplier in China and provides “3-in-one” services, which covers PCB (69% of revenue), IC substrate (16%), and electronics assembly (10%) to markets such as telecom (65%), storage (6%), automobile and consumer electronics. In view of strong demand on 5G PCB and localization trend, we expect PCB/IC substrate segment to grow 19%/32% sales CAGR over FY20-22E (vs industry growth of 4.3%/4.9% CAGR).

Figure 225: SCC provides comprehensive “3-in-one” services



Source: Company data, CMBIS

Figure 226: Multilayer PCB/substrate gaining traction of 4.9%/4.3% CAGR 2019-23E



Source: Prismark, CMBIS

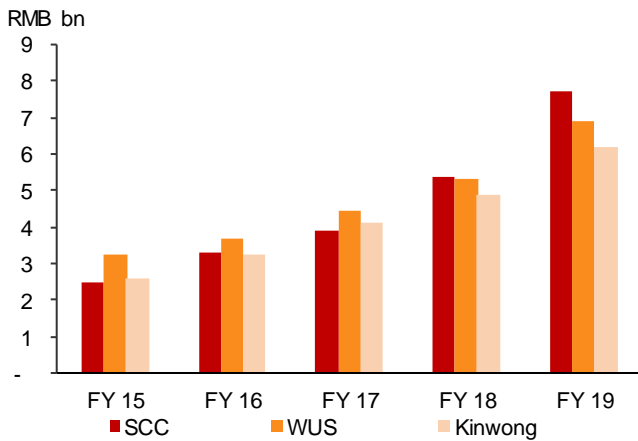
Figure 227: SCC’s products, downstream applications and clients mapping

Selected industries	% of FY19 sales	Products	Clients
Telecom	>60%	Multi-layer (8-16L)	Huawei, Nokia, ZTE, Samsung
Server/storage	6-7%	Multi-layer (6-16L), IC substrate	Lenovo, Seagate
Consumer	5-10%	HDI, IC substrate, flexible PCB	ASE, Amkor, JCET, Spreadtrum Comm.
Industrial/medical	5-10%	Double-sided, multi-layer (<16L)	GE, Siemens, Mindray, Analogic, Emerson
Aerospace	<5%	Multi-layer (8-16L), flexible PCB	Honeywell, Rockwell Collins
Automobile	<5%	Double-sided, multi-layer (4L/6L), HDI, flexible PCB	BOSCH, BYD, GreatWall Mobile

Source: Company data, CMBIS estimates

Expanding leadership amid industry consolidation. Despite COVID-19 impact in 1Q20, SCC achieved 15%/30% YoY of revenue growth in 1Q20/2Q20, mainly due to strong 5G telecom demand, high automation and production efficiency. Compared to major PCB suppliers (e.g. SCC, WUS, Kingwon), smaller-scale PCB fabricators suffered from delayed resumption and inventory shortage during COVID-19, which will benefit SCC for further market share gain in China.

Figure 228: Top domestic PCB suppliers' PCB revenue trend (FY15-19)



Source: Bloomberg, CMBIS

Figure 229: Downstream applications mapping for top domestic PCB suppliers

PCB Suppliers		SCC	WUS	Kinwon	DSBJ
1Q20 YoY%	Revenue	15.5%	16.0%	9.3%	14.2%
	Net profit	33.6%	31.7%	20.5	4.4%
Telecom clients	Huawei	✓	✓	✓	
	ZTE	✓	✓	✓	
	Ericsson	✓	✓		✓
	Nokia	✓	✓		✓
Other industries	Industrial/medical	•			•
	Consumer electronics			•	•
	Auto	•		•	•

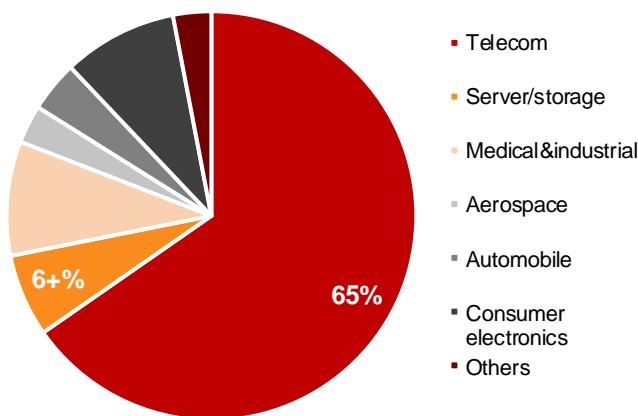
Source: Bloomberg, CMBIS

PCB/IC substrate to deliver rapid growth in FY21-22E

PCB (69% of FY20E sales) riding on ASP/volume hike. In view of telecom upgrade demand, we forecast 19% CAGR FY20-22E for PCB business driven by 5% ASP YoY growth and 23% volume expansion during FY20-22E. Meanwhile, we expect synergy of value-added assembly service to drive 5% CAGR FY20-22E for PCBA business.

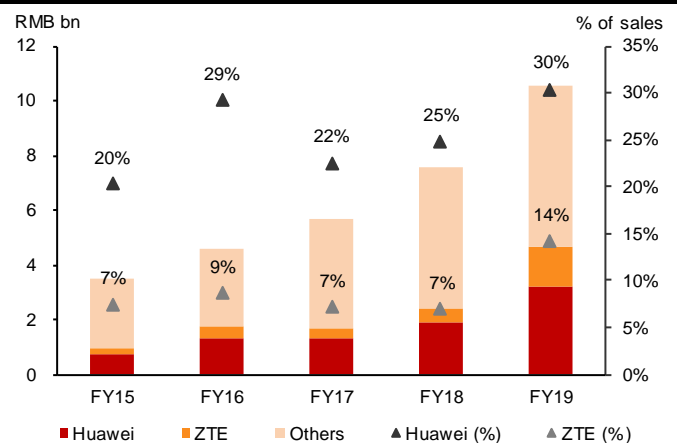
We expect demand for high-frequency/high-speed/multi-layer PCB from 5G deployment will continue to be the key driver of revenue growth, as evidenced by strong demand recovery and rapid 5G deployment in 2Q20. However, 5G construction slowdown and unexpected demand reduction from major client led to slower revenue growth of 7% YoY in 3Q20. Looking into 4Q20E, on the back of improving chip performance and further cost reduction by telco equipment vendors, we expect potential PCB de-spec in 5G BTS will drag SCC's PCB business to 3.5% YoY in 4Q20E.

Figure 230: SCC: telecom demand contributing 65% of FY19 revenue



Source: CMBIS estimates

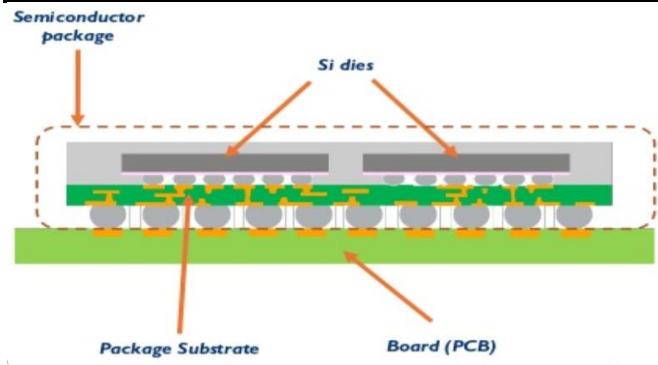
Figure 231: SCC: Huawei and ZTE are major growth drivers during FY15-19



Source: Company data, CMBIS estimates

Substrate (16% of FY20E sales) eyeing on fast-growing smart device/storage. SCC entered IC substrate industry in 2009 and provided substrates for MEMS (microphone/fingerprint), memory chips, processor chips, RF modules and telecom chipsets. Looking ahead, we are positive on SCC to benefit from 5G smartphone upgrade with IC substrate for MEMS-Mic (30%+ share of AAC/Goertek), fingerprint, RF, and storage. Riding the trend of domestic substitution, we expect SCC to continue share gain from overseas suppliers. We expect IC substrate to deliver 32% CAGR FY20-22E, accounting for 20% in FY21E.

Figure 232: How IC substrate works



Source: Yole, CMBIS

Figure 233: SCC's IC substrate portfolio

Products	End use case
MEMS	Smartphone/tablet/wearables
Memory (eMMC)	Smartphone/tablet
RF	Smartphone
Processor chip	Smartphone/tablet
Baseband chip	Datacom/telecom/broadband/FTTX

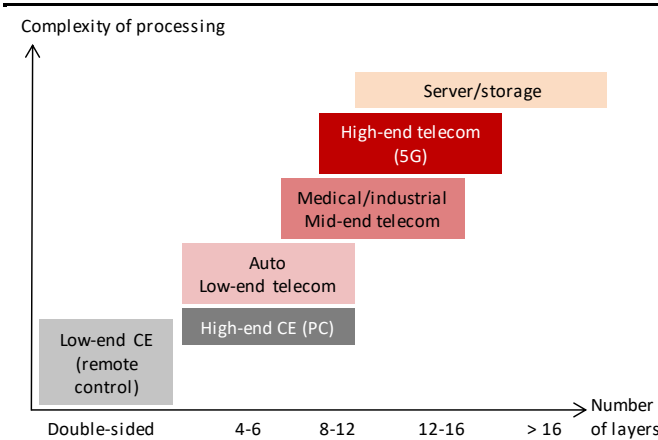
Source: Company data, CMBIS

Benefiting from 5G/datacom with expertise and capacity expansion

Building capability edges for multilayer PCB. With demanding requirements on drilling, pressing, alignment, multilayer PCB has higher threshold, given a significant commitment to specialized equipment and intensive operator training.

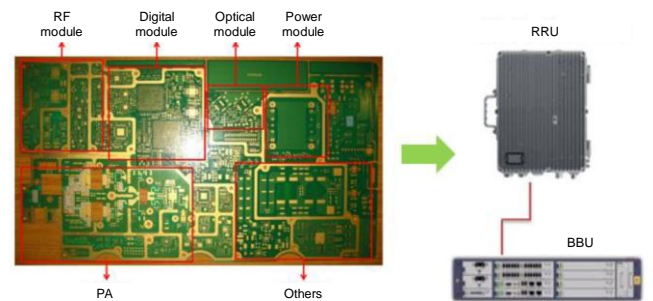
Amidst trend of reduced size of electronic components and higher-frequency/speed of signal transmission, we see demand for multilayer PCB featuring higher assembly density is on the rise, especially for 5G communication and server/storage. SCC is well-positioned to leverage expertise in multilayer PCB, while being able to design highly-customized and integrated PCB for multi-functionality on BTS.

Figure 234: 5G communication/server drive demand for multilayer PCB



Source: Yole, CMBIS

Figure 235: SCC integrates digital, power supply, PA and RF in one PCB on BTS



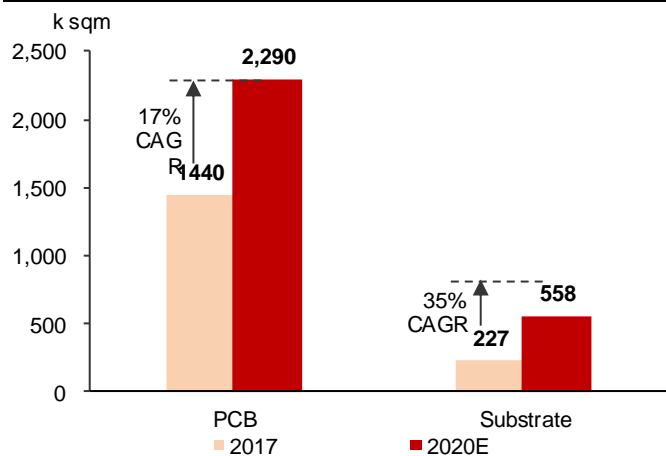
Source: Company data, CMBIS

Figure 236: SCC accumulating technology capabilities in PCB manufacturing

Features		Products available for MP	Products under sampling
Layers		2~68 layer	120 layer
Max. board thickness		10mm (394mil)	14mm (551mil)
Min. width/space	Inner	2.2mil/2.2mil	2.0mil/2.0mil
	Outer	2.5/2.5mil	2.2/2.2mil
Registration	Same core	±25um	±20um
	Layer to layer	±5mil	±4mil
Max. copper thickness		6Oz	30Oz
Min. drill hole diameter	Mechanical	≥0.15mm(6mil)	≥0.1mm(4mil)
	Laser	0.1mm (4mil)	0.050mm (2mil)
Max. size	Line-card	850mmX570mm	1000mmX600mm
	Backplane	1250mmX570mm	1320mmX600mm
Aspect ratio	Line-card	18:01	24:01:00
	Backplane	22:01	25:01:00
Material		FR4, High speed, High frequency, Polyimide, Tk, LCP	

Source: Company data, CMBIS

Capacity to ramp up in 2020-22E. To relieve tight-balance production, SCC is active on capacity expansion and ramped-up Phase I of Nantong PCB (high-speed multilayer PCB for IDC) in 2019, achieving 90+% yield rate in 1H19. Looking beyond, as SCC releases new capacity: 1) Phase II of Nantong PCB to test run in Mar 2020; 2) Wuxi substrate for storage ramping-up since trial production in Jun 2019, we believe new capacity will become major growth driver during FY20-22E.

Figure 237: SCC capacity expansion during 2017-20E

Source: Company data, CMBIS estimates

Figure 238: SCC capacity expansion timeline

Product	PCB	Substrate
Capacity in FY16	1,344k sqm (as of 2017)	206k sqm
Location	Wuxi, Shenzhen	
Capacity expansion during FY18-20E		
Capacity to add	340k sqm	600k sqm
Location	Nantong (I)	Nantong (II)
Completion Year	2H18	1Q20
Capacity Target by 2020E	2,284k sqm	806k sqm

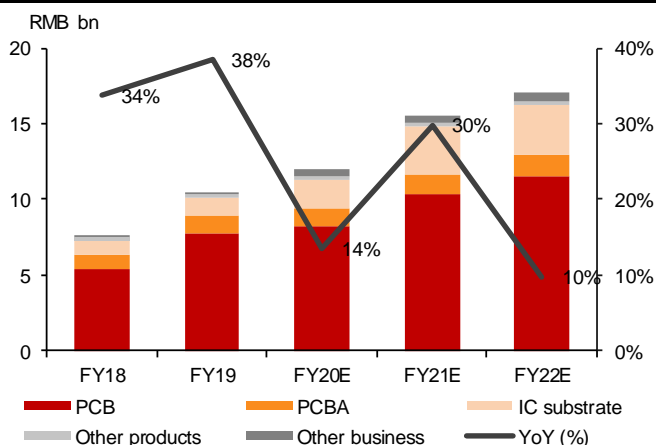
Source: Company data, CMBIS estimates

Financial Analysis

Expect revenue/net profit to grow at 19%/22% CAGR during FY20-22E

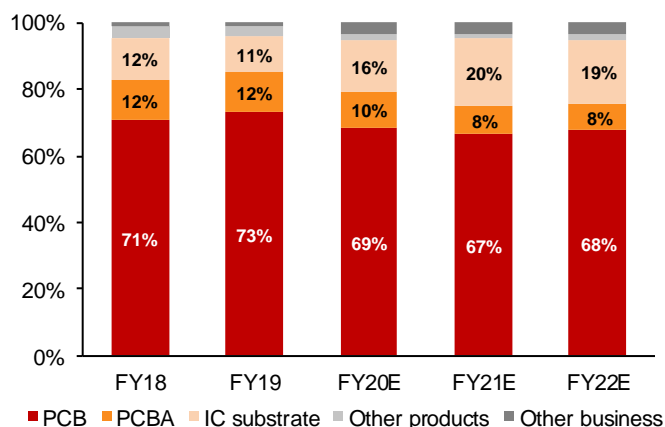
We forecast revenue/net profit will grow at 19%/22% CAGR FY20-22E, driven by 19%/5%/32% revenue CAGR in PCB/PCBA/IC. We expect stable margin in 2021E/22E, backed by 1) better product mix with more 5G products and 2) lifting utilisation rate with Nantong ramp-up.

Figure 239: SCC revenue growth estimates



Source: Company data, CMBIS estimates

Figure 240: SCC revenue breakdown (FY18A-22E)



Source: Company data, CMBIS estimates

Figure 241: Major assumptions

RMB mn	FY18	FY19	1H20	2H20E	FY20E	FY21E	FY22E
PCB	5,379	7,726	4,305	3,903	8,208	10,347	11,528
...YoY	38%	44%	22%	-7%	6%	26%	11%
PCBA	927	1,211	589	659	1,247	1,310	1,375
...YoY	27%	31%	3%	3%	3%	5%	5%
IC substrate	947	1,164	751	1,134	1,885	3,132	3,288
...YoY	26%	23%	50%	71%	62%	66%	5%
Other products	252	288	84	146	231	242	266
...YoY	7%	14%	-40%	-1%	-20%	5%	10%
Other business	97	135	186	191	377	490	588
...YoY	33%	38%	264%	129%	180%	30%	20%
Total	7,602	10,524	5,915	6,033	11,948	15,521	17,045
...YoY	34%	38%	23%	5%	14%	30%	10%
Volume							
PCB (k sqm)	1,742	2,037			2,061	2,451	2,528
Substrate (k sqm)	252	331			530	855	855
ASP							
PCB (RMB/sqm)	3,088	3,793			3,983	4,222	4,559
Substrate (RMB/sqm)	3,755	3,521			3,556	3,663	3,846
Gross Margin							
PCB	23.0%	28.0%	27.6%	28.1%	27.8%	27.6%	28.0%
PCBA	18.3%	19.5%	18.3%	18.6%	18.5%	18.5%	18.5%
IC substrate	29.7%	26.2%	28.5%	28.5%	28.5%	28.8%	29.0%
Other products	17.4%	19.7%	28.7%	28.4%	28.5%	28.0%	28.0%
Other business	25.1%	23.6%	9.2%	10.7%	10.0%	10.0%	10.0%
Total	23.1%	26.5%	26.2%	26.6%	26.4%	26.5%	26.8%

Source: Company data, CMBIS estimates

Figure 242: P&L forecast

RMB mn	FY18	FY19	1Q20	2Q20	3Q20	4Q20E	FY20E	FY21E	FY22E
Revenue	7,602	10,524	2,498	3,418	3,067	2,966	11,948	15,521	17,045
...YoY	34%	38%	15%	30%	7%	3%	14%	30%	10%
Cost of sales	(5,844)	(7,732)	(1,858)	(2,507)	(2,219)	(2,210)	(8,795)	(11,404)	(12,476)
Gross profit	1,758	2,792	639	911	848	755	3,153	4,117	4,569
GPM (%)	23%	27%	26%	27%	28%	25%	26%	27%	27%
...YoY	38%	59%	26%	44%	3%	-9%	13%	31%	11%
SG&A	(482)	(719)	(166)	(178)	(173)	(188)	(705)	(916)	(989)
...% of rev	-6%	-7%	-7%	-5%	-6%	-6%	-6%	-6%	-6%
R&D	(347)	(537)	(120)	(164)	(183)	(178)	(645)	(823)	(903)
...% of rev	-5%	-5%	-5%	-5%	-6%	-6%	-5%	-5%	-5%
Operating profit	784	1,417	336	514	442	413	1,705	2,247	2,526
OPM (%)	10%	13%	13%	15%	14%	14%	14%	14%	15%
...YoY	56%	81%	55%	56%	-5%	2%	20%	32%	12%
Net profit	697	1,233	277	448	374	341	1,439	1,896	2,132
NPM (%)	9%	12%	11%	13%	12%	11%	12%	12%	13%
...YoY	56%	77%	48%	57%	-6%	-7%	17%	32%	12%

Source: Company data, CMBIS estimates

Our FY20-22E EPS is 8-16% below consensus

Our EPS estimates are 8-16% below consensus in 2020E/21E, due to 1) lack of new capacity to drive growth, 2) possible slowdown of 5G investments and 3) de-spec of 5G BTS to reduce demand.

Figure 243: CMBIS estimates vs consensus

RMB mn	CMBIS estimates			Consensus			Diff (%)		
	FY20E	FY21E	FY22E	FY20E	FY21E	FY22E	FY20E	FY21E	FY22E
Revenue	11,948	15,521	17,045	13,072	16,304	19,341	-9%	-5%	-12%
Gross Profit	3,153	4,117	4,569	3,483	4,396	5,229	-9%	-6%	-13%
Operating Profit	1,705	2,247	2,526	1,916	2,460	2,971	-11%	-9%	-15%
Net profit	1,439	1,896	2,132	1,591	2,065	2,532	-10%	-8%	-16%
EPS (RMB)	3.02	3.97	4.47	3.35	4.31	5.35	-10%	-8%	-16%
Gross Margin	26.4%	26.5%	26.8%	26.6%	27.0%	27.0%	-0.3 ppt	-0.4 ppt	-0.2 ppt
Operating Margin	14.3%	14.5%	14.8%	14.7%	15.1%	15.4%	-0.4 ppt	-0.6 ppt	-0.5 ppt
Net Margin	12.0%	12.2%	12.5%	12.2%	12.7%	13.1%	-0.1 ppt	-0.4 ppt	-0.6 ppt

Source: Bloomberg, CMBIS estimates

Valuation

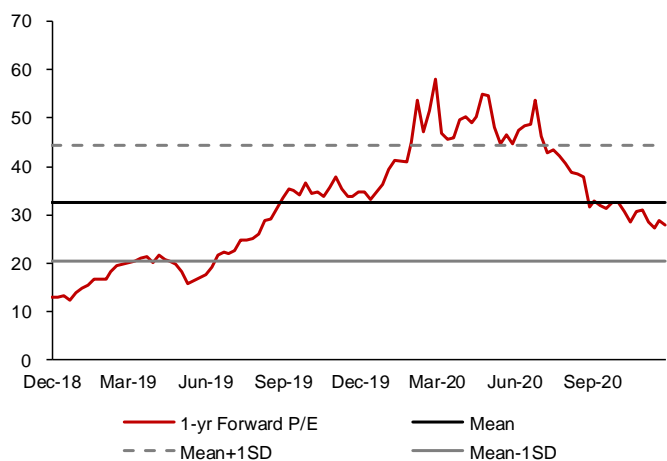
Initiate HOLD with TP HK\$129.05 (10.5% Upside)

We assign 32x P/E on FY21E EPS to derive our 12-month TP of RMB129.05, which is in line with its 2-year historical average. We think de-spec of 5G BTS will remain an overhang for the stock, and we recommend to stay on sideline until more visibility of 4Q20E earnings and next phase of 5G BTS deployment.

Figure 244: Peers' valuation

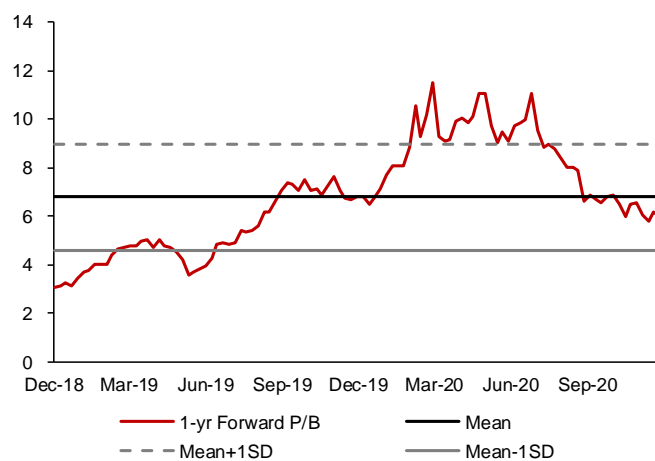
Company	Ticker	Rating	Market Cap (US\$ mn)	Price (LC)	TP (LC)	Up/Down -side	P/E (x)		P/B (x)		ROE (%)	
							FY20E	FY21E	FY20E	FY21E	FY20E	FY21E
CCL												
SCC	002916 CH	Hold	8,308	116.80	129.1	10%	32.7	23.9	6.1	5.3	17.5	20.8
SY Tech	600183 CH	Buy	9,451	26.85	33.7	25%	38.7	29.4	7.5	6.3	19.4	21.4
WUS	002463 CH	NR	4,948	18.71	NA	NA	22.2	18.0	5.0	4.1	22.9	23.0
Kinwon	603228 CH	NR	3,755	29.42	NA	NA	21.9	16.9	3.9	3.3	17.4	18.6
DSBJ	002384 CH	NR	6,757	26.12	NA	NA	29.0	21.8	4.1	3.6	14.4	16.8
Zhen Ding	4958 TT	NR	3,894	119.50	NA	NA	12.9	10.4	1.5	1.4	11.0	13.1
TTM	TTMI US	NR	1,445	13.54	NA	NA	13.3	10.8	1.0	1.0	8.8	8.9
UMTC	3037 TT	NR	4,576	86.00	NA	NA	28.9	21.0	2.7	2.5	9.1	12.3
Tripod	3044 TT	NR	2,250	121.50	NA	NA	11.0	10.1	1.7	1.6	16.1	16.2
Comped	2313 TT	NR	1,869	44.50	NA	NA	10.9	9.4	1.8	1.6	18.3	18.8
SEMCO	009150 KS	NR	11,438	171000.00	NA	NA	22.1	17.0	2.2	2.0	10.6	12.3
Average							22.1	17.2	3.4	3.0	15.0	16.6

Figure 245: 12M forward P/E band



Source: Company data, CMBIS

Figure 246: 12M forward P/B band



Source: Company data, CMBIS

Appendix

Company Background

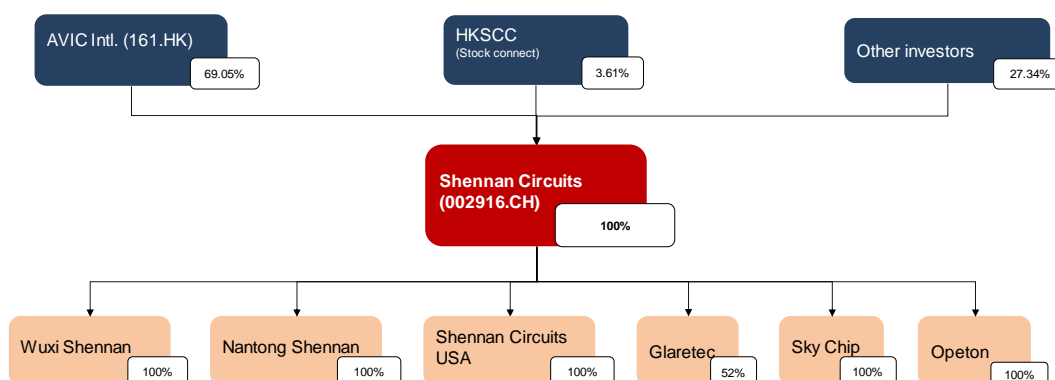
Established in 1984 and listed on SSE in 2017, SCC, as the first domestic PCB manufacturer, leads the industry with expertise in diverse PCB products and comprehensive one-stop solutions, including scheme design, manufacturing, assembly, and testing. SCC has multiple production bases in Shenzhen, Wuxi and Nantong, as well as subsidiaries in North America and R&D centers in Europe. SCC has built strategic cooperative relationship with world-leading telecommunications equipment suppliers, aeronautics and astronautics and medical equipment manufacturers.

Figure 247: Key milestones

Year	Event
1984	Founded as "Shennan Circuits Company Limited of Shenzhen City"
2005	Became the first PCB enterprise technology center in Shenzhen
2008	Started electronic assembly business
2009	Entered the industry of packaging substrate
2011	Flex-rigid PCB production line was officially wired
2014	Shennan (Wuxi) 's PCBA was wired and put into production
2017	Listed on SSE (stock code: 002916 CH)

Source: Company data, CMBIS

Figure 248: Shareholders structure



Source: Company data, CMBIS

As at 31 Mar 2020

*AVIC is abbr. for Aviation Industry Corporation of China

HKSCC is abbr. for Hong Kong Securities Clearing Company

Financial Summary

Income statement

YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E
Revenue	7,602	10,524	11,948	15,521	17,045
Cost of sales	5,844	7,732	8,795	11,404	12,476
Gross profit	1,758	2,792	3,153	4,117	4,569
Selling exp	157	218	227	310	341
Admin exp (excl. R&D)	325	501	478	605	648
R&D exp	347	537	645	823	903
Finance costs	57	73	69	81	91
Other operating exp.	88	47	29	51	60
Operating profit	784	1,417	1,705	2,247	2,526
Other non-oper exp.	(6)	(14)	(12)	(16)	(17)
Pre-tax profit	778	1,403	1,693	2,232	2,509
Income tax expense	79	170	254	335	376
Minority interests	1	1	1	1	1
Net profit	697	1,233	1,439	1,896	2,132

Cash flow summary

YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E
Net profit	698	1,234	1,439	1,897	2,133
Depreciation/amortization	366	448	490	628	781
Change in working capital	(348)	(650)	(125)	(405)	254
Others	163	232	(99)	70	83
Net cash from operating	879	1,263	1,706	2,190	3,250
Capex	(1,184)	(2,183)	(2,347)	(2,753)	(2,469)
Other	(159)	186	185	0	0
Net cash from investing	(1,344)	(1,997)	(2,163)	(2,753)	(2,469)
Share issuance	0	130	1,373	0	0
Dividend paid	(207)	(278)	(390)	(453)	(597)
Other	(284)	1,664	(836)	303	124
Net cash from financing	(491)	1,516	147	(150)	(473)
Net change in cash	(943)	791	(321)	(713)	308
Cash at beginning of the year	1,593	650	1,441	1,120	407
Exchange difference	12	9	(11)	0	0
Cash at the end of the year	650	1,441	1,120	407	715

Balance sheet

YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E
Current assets	4,176	5,977	6,683	7,107	6,842
Cash & equivalents	650	1,444	1,127	414	722
Account receivables	1,577	2,092	2,253	3,099	2,583
Inventory	1,327	1,504	2,010	2,301	2,244
Prepayment	4	3	4	4	4
Other current assets	618	934	1,289	1,289	1,289
Non-current assets	4,349	6,242	7,989	10,124	11,821
PPE	3,466	4,310	5,900	7,501	9,230
Deferred tax assets	65	68	67	67	67
Other non-current	818	1,865	2,022	2,556	2,524
Total assets	8,525	12,219	14,672	17,232	18,663
Current liabilities	3,461	4,670	5,374	6,259	6,026
ST borrowings	0	158	330	388	420
LT borrowings - ST	443	555	550	646	700
Account payables	1,274	1,555	1,827	2,559	2,240
Other current liabilities	1,744	2,401	2,666	2,666	2,666
Non-current liabilities	1,341	2,547	1,885	2,115	2,244
LT borrowings	1,041	945	1,320	1,551	1,680
Convertible bonds	0	1,305	0	0	0
Other non-current	300	297	564	564	564
Total liabilities	4,802	7,216	7,258	8,374	8,269
Share capital	280	339	489	489	489
Reserve	2,123	2,231	3,650	3,650	3,650
Minority interest	1	2	3	3	4
Total equity	3,724	5,003	7,414	8,858	10,393
Total liabilities and	8,525	12,219	14,672	17,232	18,663

Key ratios

YE 31 Dec	FY18A	FY19A	FY20E	FY21E	FY22E
Revenue mix					
PCB	71	73	69	67	68
PCBA	12	12	10	8	8
IC substrate	12	11	16	20	19
Growth (%)					
Revenue	33.7	38.4	13.5	29.9	9.8
Gross profit	38.0	58.8	12.9	30.6	11.0
Operating profit	56.4	80.8	20.3	31.8	12.4
Net profit	55.6	45.9	(17.0)	31.8	12.4
Profit & loss ratio (%)					
Gross margin	23.1	26.5	26.4	26.5	26.8
Operating margin	10.3	13.5	14.3	14.5	14.8
Net profit margin	9.2	11.7	12.0	12.2	12.5
Balance sheet ratio					
Net debt/total equity (%)	18.3	23.3	12.6	19.7	16.7
Current ratio (x)	1.2	1.3	1.2	1.1	1.1
Receivable turnover days	58	64	66	63	61
Inventory turnover days	57	49	54	51	49
Payable turnover days	67	67	70	70	70
Profitability (%)					
ROE	18.7	24.6	19.4	21.4	20.5
ROA	8.2	10.1	9.8	11.0	11.4
Per share data (RMB)					
EPS	2.49	3.63	3.02	3.97	4.47
DPS	0.75	1.15	0.95	1.25	1.41

Source: Company data, CMBIS estimates

China Tower (788 HK)

5G-driven growth to recover in 2021

Initiate at Hold. We believe China Tower is well positioned to benefit from China 5G network upgrade and site expansion backed by robust data demand in China. Following a slower 2020 due to COVID-19 and telco's cost control, we expect earnings growth to pick up at 39%/29% YoY in 4Q20E/2021E, driven by tower business recovery, rising tenancy ratio and better operating leverage. However, we believe slower 5G revenue and telco opex pressure will be a major overhang. Our TP of HK\$1.31 is based on 4.9x FY21E EV/EBITDA, with 21% discount below 2-yr hist. average. Upcoming catalysts include 5G BTS tender and faster buildout.

- China 5G network upgrade and stable outlook remains intact.** While the emergence of To-C "killer" app and To-B use cases will come in 2-3 years after 5G network is commercially available, we think China 5G network development will continue at a moderate pace to provide a solid foundation for new application development and commercialization. We expect China Tower revenue to grow steadily at 7% FY20-22E CAGR.
- Margin expansion on rising tenancy ratio and average revenue per site.** We expect China Tower to expand tower sharing among TSP tenants which can reduce capex and opex burden. Currently, 80% of new tenants were served through co-location in FY19 (vs 74% in FY18). As China Tower continues to add new tenants on existing tower sites, we expect tenancy ratio to increase to 1.66/1.70/1.74 and average revenue per site to grow at 3% CAGR during FY20-22E.
- Increasing synergies from cross-sector utilization and growing energy business.** By leveraging existing sites and social resources, China Tower will continue to add ancillary equipment for surveillance and data collection. It also developed a full-range power supply platform in 2019. We expect TSSAI and energy business to maintain strong momentum with 41% revenue CAGR during FY20-21E.
- Valuation/ risks.** We derived our 12m TP of HK\$1.31, based on FY21E EV/EBITDA of 4.9x, 21% discount to 2-year historical forward EV/EBITDA. We believe slower 5G revenue and telco opex pressure will be near-term overhang. We estimate 27% EPS FY20-22E CAGR, benefiting from enhanced cost control and reduced leverage. Risks include slowing down capex of Telcos and absence of new lead use case for 5G.

Earnings Summary

(YE 31 Dec)	FY18A	FY19A	FY20E	FY21E	FY22E
Revenue (RMB mn)	71,819	76,428	81,316	86,639	92,916
YoY growth (%)	4.6	6.4	6.4	6.5	7.2
Net income (RMB mn)	2,650	5,222	6,441	8,302	10,455
EPS (RMB)	0.02	0.03	0.04	0.05	0.06
YoY growth (%)	-	67	24	29	26
Consensus EPS	59.0	35.4	28.6	22.2	17.6
P/E (x)	1.0	1.0	1.0	1.0	0.9
P/B (x)	0.2	1.4	1.9	2.4	3.0
EV/EBITDA (x)	1.5	2.9	3.5	4.4	5.3
Dividend Yield (%)	51	48	42	41	37
ROE (%)	71,819	76,428	81,316	86,639	92,916
Net Gearing	4.6	6.4	6.4	6.5	7.2

Source: Company data, Bloomberg, CMBIS estimates

HOLD (Initiation)

Target Price **HK\$1.31**
 Up/Downside **+9%**
 Current Price **HK\$1.20**

China Technology Sector

Alex Ng
 (852) 3900 0881
 alexng@cmbi.com.hk

Lily Yang
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Stock Data

Mkt Cap (HK\$ mn)	211,210
Avg 3 mths t/o (HK\$ mn)	512
52w High/Low (HK\$)	2.03/1.14
Total Issued Shares (mn)	46,663.9

Source: Bloomberg

Shareholding Structure

Citigroup	8.99%
Hillhouse Capital	7.02%
GIC	6.79%

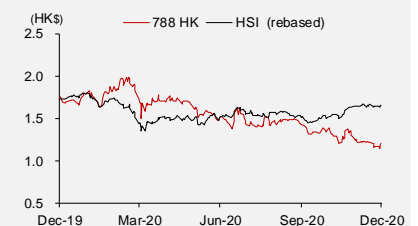
Source: Bloomberg

Share Performance

	Absolute	Relative
1-mth	-7.1%	-7.4%
3-mth	-18.1%	-23.4%
6-mth	-21.9%	-28.1%

Source: Bloomberg

12-mth Price Performance

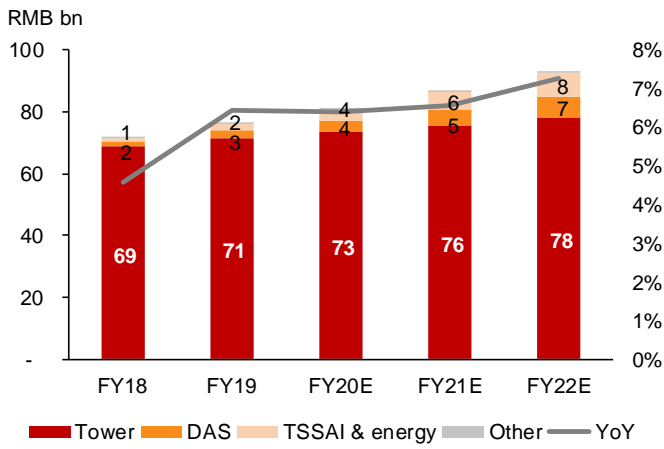


Source: Bloomberg

Auditor: PriceWaterHouse Coopers

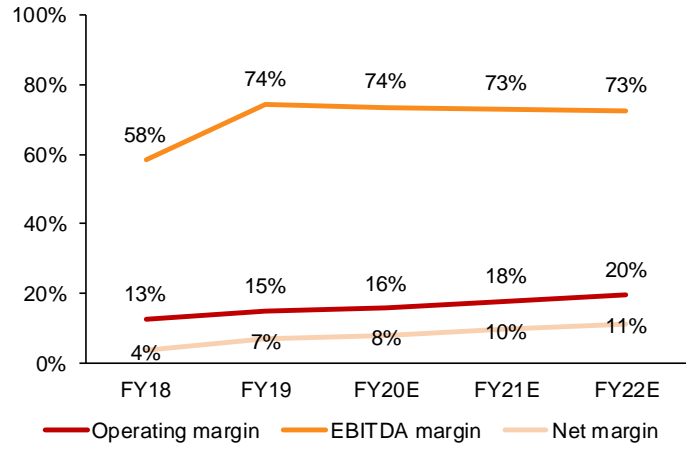
Focus Charts

Figure 249: Company growth estimates (FY18A-22E)



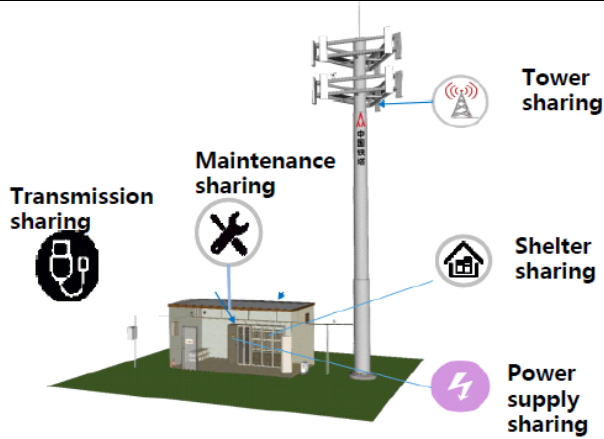
Source: Company data, CMBIS estimates

Figure 250: Company margin estimates (FY18A-22E)



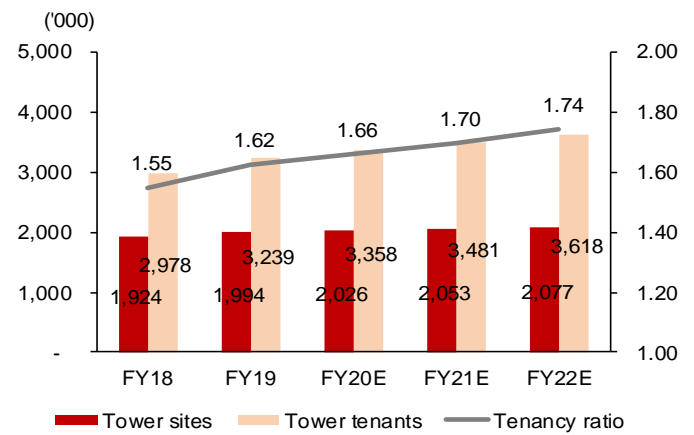
Source: Company data, CMBIS estimates

Figure 251: Developed integrated sharing



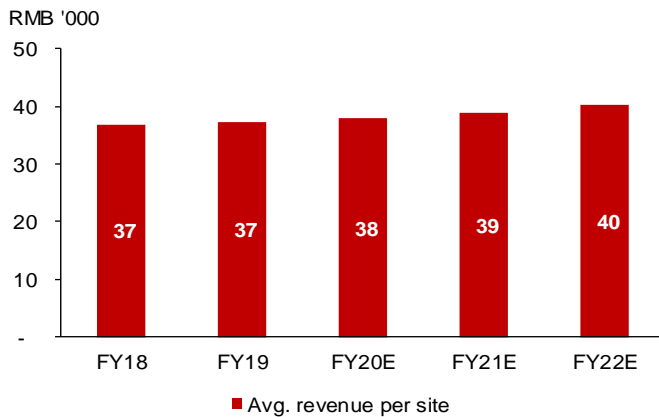
Source: Company data, CMBIS

Figure 252: Tenancy ratio escalating to 1.77 in FY22E



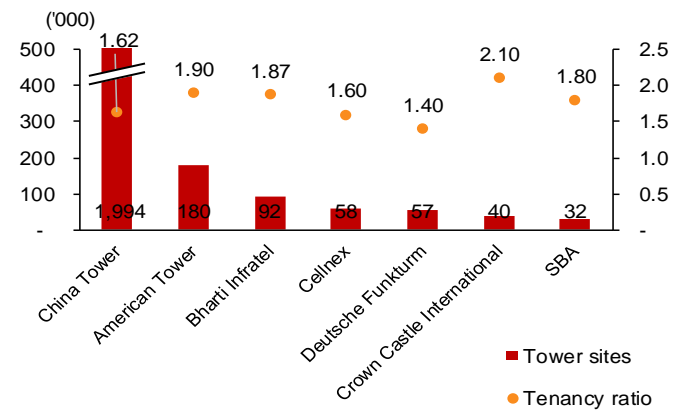
Source: Company data, CMBIS estimates
*Tenancy ratio= Tower tenants/Tower sites

Figure 253: Avg. revenue per site grow at 3% CAGR



Source: Company data, CMBIS estimates
*Average revenue per site = operating revenue of tower business & TSSAI business / average number of tower sites during the period.

Figure 254: Comparison of tower sites/tenancy ratio among global tower companies



Source: Bloomberg, CMBIS estimates

Investment Thesis

Share-oriented business model with “One core and two wings” strategy

Stable 7% revenue CAGR FY20-22E on diversified growth drivers. China Tower is the largest telecommunications tower infrastructure service provider globally, operating over 2,020 tower sites as of 3Q20. Based on “One Core and Two Wings” strategy, China Tower has developed a solid foundation of Telecommunication Service Provider (TSP) business (incl. tower and Distributed Antenna System (DAS)) as “one core” and achieved rapid development in Trans-sector Site Application and Information (TSSAI) and energy operation business as “two wings”.

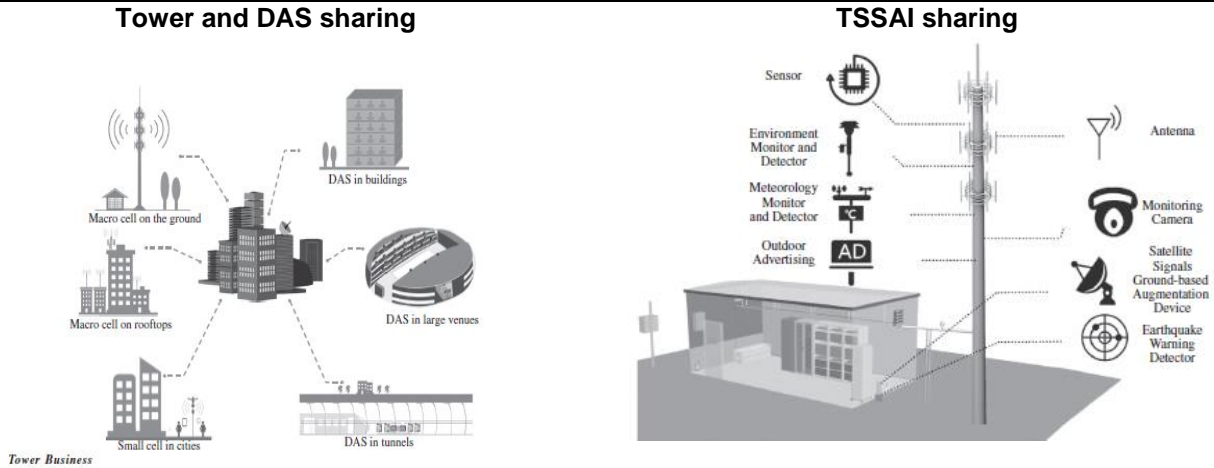
We expect China Tower to deliver 7% revenue CAGR FY20-22E, driven by 1) tower business (3% CAGR) with solid growth visibility, 2) DAS business (33% CAGR) with innovative solutions and broader scenarios, and 3) TSSAI/energy operations business (41% CAGR) with expanding client base and applications.

Improving resource synergies with cross-sector utilization and energy business. By leveraging existing tower sites, China Tower has developed a comprehensive power supply platform in 2019 to house ancillary equipment for surveillance and data collection. We believe China Tower will continue to expand client base and applications, backed by its extensive 2,020 tower sites as of 3Q20.

Tower sharing: social resources for tower site construction. Capturing 97% of tower sites in China, China Tower currently dominates domestic tower leasing market. In order to reduce 5G construction cost (RMB 20-30k per site, vs RMB 230k/100k for self-constructed ground-based/rooftop tower), we think China Tower will continue to leverage social resources (incl. 12mn reserved social pole resources) to build new sites in the future. In 2019, 84%/17% of new small cell and BTS sites were built on social resources.

TSSAI sharing: increasing synergies from cross-sector utilization. China Tower houses ancillary equipment for diverse areas other than telecommunication, such as surveillance and data collection. China Tower has also developed a full range of power supply platforms for power generation, charging, transmission and exchange. We are positive on growing demand for power safety from banks and hospitals, and battery charging services from delivery riders. We believe China Tower can continue to expand client base and applications.

Figure 255: How tower sites sharing empowers diverse scenarios



Source: Company data

China 5G network upgrade to drive steady growth

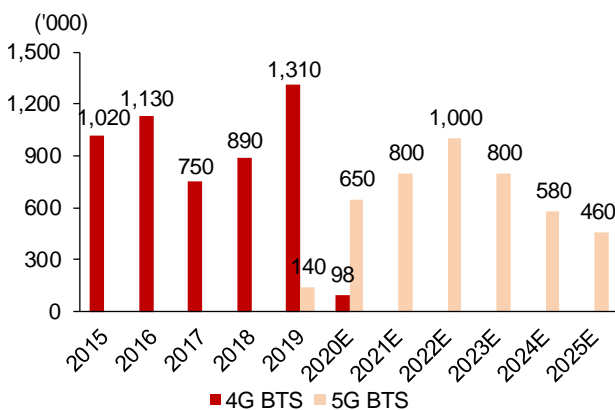
We believe China 5G network will continue to expand at moderate pace in next 2-3 years, driven by robust growth of data usage and digital infrastructure upgrade. We expect the emergence of new use cases will drive further 5G BTS demand at later stage, as 5G network will be the foundation for new applications and commercialization for next decade.

As major contributor of revenue, tower business (90% of FY20E revenue) provides site space (e.g. towers, shelters to host TSP's antenna) for BTS and small cell. For 5G network construction, China Tower will utilize existing tower sites to cater 5G demand at initial phase of 5G deployment (2020E) and introduction stage (2021-23E).

Early stage (2020E): new 5G equipment on existing towers. By 3Q20, 97% of 5G demand were fulfilled through existing site resources. We believe this trend will continue into 2021E backed by availability of sites resources, and upcoming 2G/3G BTS phase-out will free up tower sites for 5G BTS equipment.

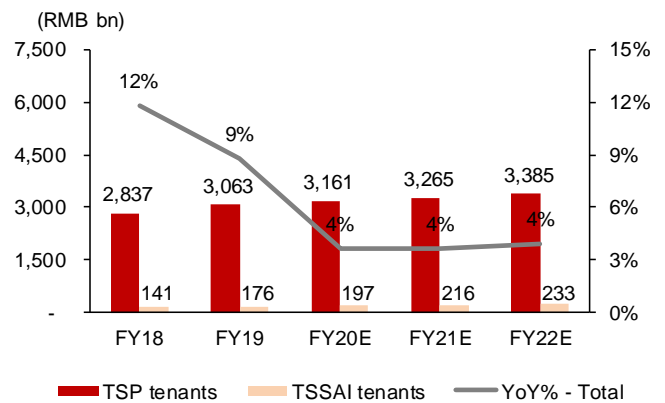
Introduction stage (2021-23E): We believe China 5G rollout will step into introduction stage in the next three years as an emerging driver of economic growth. Our conservative estimates suggest 800k/1,000k 5G BTS additions in FY21/22E. As we believe China Tower needs new sites for 5G massive construction, we forecast tower sites to reach 2,053/2,077 in FY21E/22E and number of tenants to grow at 3% CAGR FY20-22E. We expect the Company's revenue to grow at 7% CAGR during the introduction stage.

Figure 256: 5G BTS to drive tenant growth



Source: CMBIS estimate

Figure 257: # of tenants to grow 3% CAGR FY20-22E

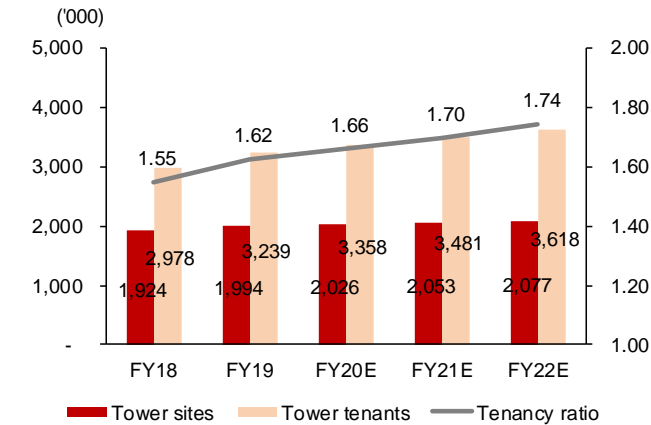


Source: Company data, CMBIS estimates

Improving tenancy ratio and potential upside in revenue per site.

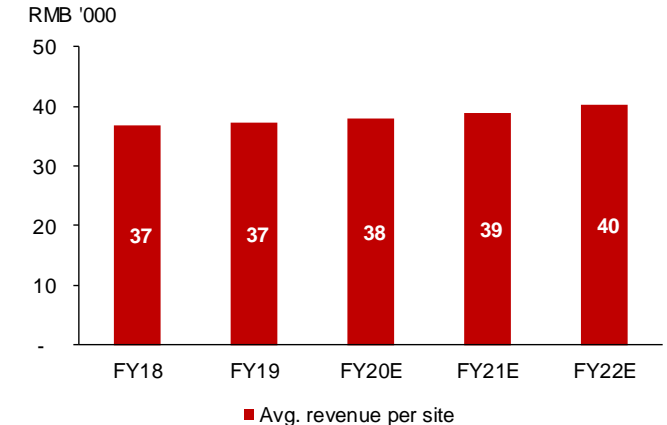
We expect China Tower to expand tower sharing among TSP tenants which can reduce capex burden and operating expense. 80% of new tenants were served through co-location in FY19 (vs 74% in FY18). As China Tower continues to add new tenants on existing tower sites, we expect tenancy ratio to increase to 1.66/1.70/1.74 and average revenue per site to grow at 3% CAGR FY20-22E.

Figure 258: Tenancy ratio escalating to 1.77 in FY22E



Source: Company data, CMBIS estimates
*Tenancy ratio=Tower tenants/Tower sites

Figure 259: Avg. revenue per site grow at 3% CAGR



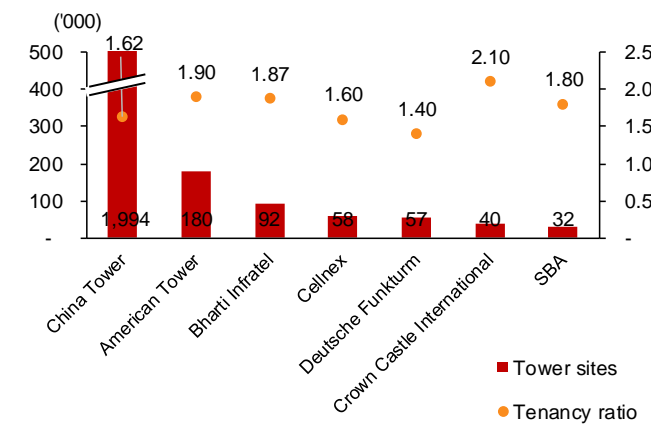
Source: Company data, CMBIS estimates
*Average revenue per site = operating revenue of tower business & TSSAI business / average number of tower sites during the period.

Margin upside potential vs global peers

American Tower (AMT US) with strong bargaining power. While China Tower is affiliated with Chinese telcos focusing on China market, AMT is an independent tower operator with global presence in 19 countries across India/Africa/Latin America/Europe and 180k tower sites (41k/139k in US/overseas) in FY19. By enforcing long-term leases with contractual rent escalation (3% annual price increase, no discount for new tenants), AMT charged US\$ 41.5k per site (vs RMB 37.4k per site of China Tower) in FY19.

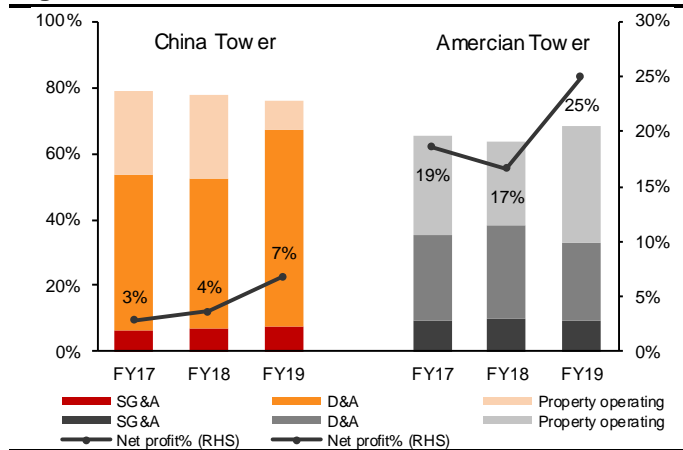
China Tower set to improve profitability. Compared to AMT's NPM of 25%, China Tower registered 7% NPM in FY19 due to higher D&A expenses (59% of FY19 revenue, vs 23% for AMT). Looking forward, as China Tower continues to enhance operating leverage with rising tenancy ratio, we expect NPM to reach 8%/10% in FY20/21E.

Figure 260: Comparison of tower sites/tenancy ratio among global tower companies



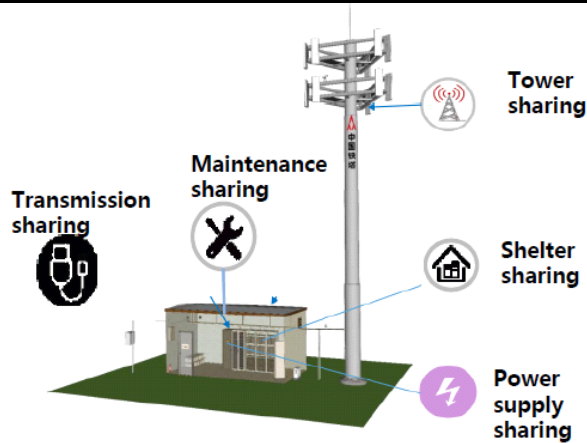
Source: Company, as of 4Q19. *AMT's tenancy ratio as of 4Q17

Figure 261: Cost structure vs AMT



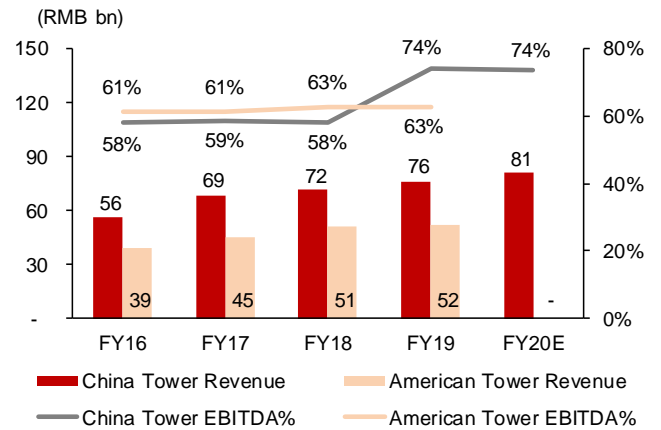
Source: Bloomberg, CMBIS

Figure 262: Developed integrated sharing



Source: Company data, CMBIS

Figure 263: Revenue and EBITDA margin vs AMT.US



Source: Company data, CMBIS estimates

Potential beneficiary of upcoming infrastructure REITS

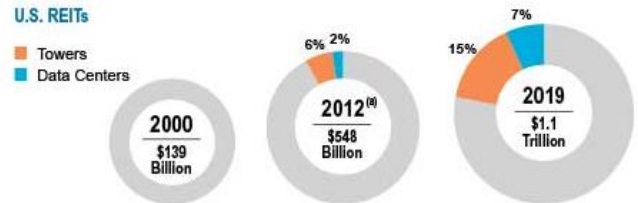
A Real Estate Investment Trust (REIT) is a company that owns or operates income-producing real estates. Compared to mature REITs in US, where tower companies account for 15% of market in 2019, REITs in China is still on-horizon. As China announced a series of documents to promote infrastructure REITs in 2020, including IDC, towers, IoT, industrial network, broadband network, cable TV network etc. We believe China Tower can benefit from infrastructure REIT, which can diversify funding sources and reduce financial leverage.

Figure 264: What is a REIT?



Source: Griffin Capital, CMBIS

Figure 265: REIT is popular among US Towers



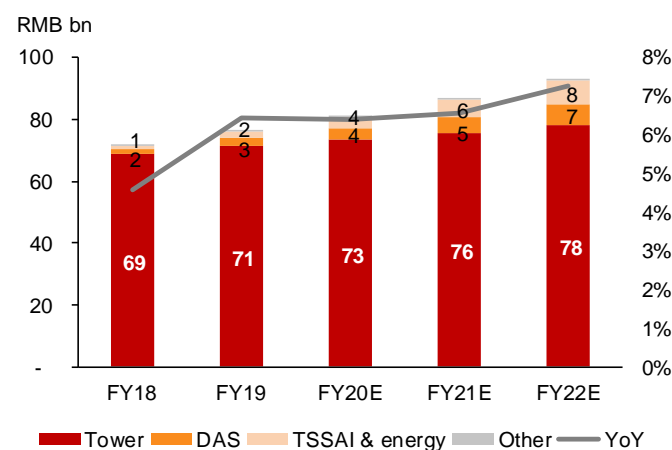
Source: Nareit, Cohen & Steers, CMBIS

Financial Analysis

Expect revenue/net profit to grow at 7%/27% CAGR during FY20-22E

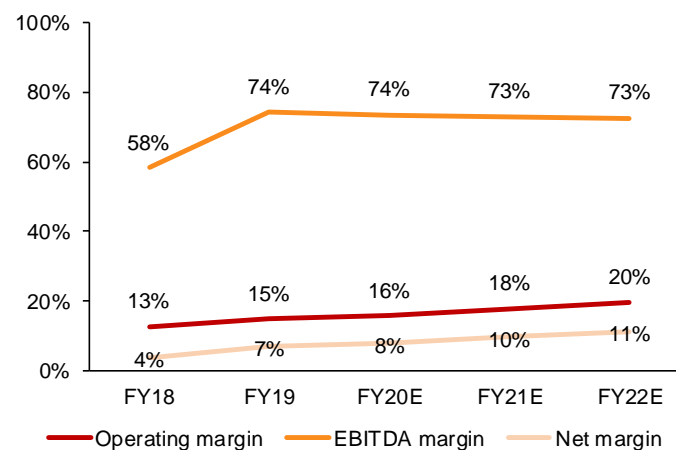
We project revenue growth to 7% CAGR FY20-22E while adjusted net profit margin expands to 8% (vs 7% in 2019) as China Tower will benefit from operating leverage on improving tenancy ratio, resource synergies from cross-sector utilization and reduced leverage through debt paydown.

Figure 266: Company growth estimates (FY18A-22E)



Source: Company data, CMBIS estimates

Figure 267: Company margin estimates (FY18A-22E)



Source: Company data, CMBIS estimates

Figure 268: Major assumptions

RMB mn	FY18	FY19	1Q20	2Q20	3Q20	4Q20E	FY20E	FY21E	FY22E
Tower business	68,597	71,406	18,129	18,242	18,427	18,591	73,389	75,577	78,198
...YoY	2%	4%	2%	2%	3%	5%	3%	3%	3%
Tower sites ('000)	1,924	1,994	2,006	2,015	2,020	2,026	2,026	2,053	2,077
...YoY	4%	4%	3%	3%	2%	2%	2%	1%	1%
TSP tenants ('000)	2,837	3,063	3,096	3,124	3,143	3,161	3,161	3,265	3,385
...YoY	7%	8%	7%	7%	5%	3%	3%	3%	4%
TSP tenancy ratio	1.47	1.54	1.54	1.55	1.56	1.56	1.56	1.59	1.63
Avg. revenue per TSP tenants	24.2	23.3	5.9	5.8	5.9	5.9	23.2	23.1	23.1
...YoY	-5%	-4%	-5%	-5%	-1%	1%	0%	0%	0%
Average revenue per site	36.9	37.4	9.5	9.5	9.6	9.7	38.0	39.0	40.3
...YoY	-2%	1%	-1%	0%	1%	4%	1%	3%	3%
DAS business	1,819	2,658	819	901	914	1,034	3,668	4,952	6,536
...YoY	42%	46%	39%	35%	36%	41%	38%	35%	32%
TSSAI & energy oper. Business	1,222	2,080	682	897	1,033	1,278	3,890	5,686	7,715
...YoY	623%	70%	62%	113%	102%	76%	87%	46%	36%
Others	181	284	176	(52)	52	193	369	425	467
...YoY	43%	57%	487%	-216%	2%	22%	30%	15%	10%
Total	71,819	76,428	19,690	20,104	20,426	21,096	81,316	86,639	92,916
...YoY	4.6%	6.4%	4.2%	5.4%	7.2%	8.8%	6.4%	6.5%	7.2%

Source: Company data, CMBIS estimates

Figure 269: P&L forecast

RMB mn	FY18	FY19	1Q20	2Q20	3Q20	4Q20E	FY20E	FY21E	FY22E
Revenue	71,819	76,428	19,690	20,104	20,426	21,096	81,316	86,639	92,916
...YoY	5%	6%	4%	5%	7%	9%	6%	7%	7%
Repairs & maintenance	(6,165)	(5,993)					(6,099)	(6,758)	(7,433)
% revenue	-8.6%	-7.8%					-7.5%	-7.8%	-8.0%
Employee expenses	(4,917)	(5,863)					(7,075)	(7,711)	(8,455)
% revenue	-6.8%	-7.7%					-8.7%	-8.9%	-9.1%
EBITDA	41,773	56,696	14,532	14,568	14,919	15,830	59,849	63,246	67,457
...YoY	4%	36%	7%	2%	7%	6%	6%	6%	7%
EBITDA margin (%)	58.2%	74.2%	73.8%	72.5%	73.0%	75.0%	73.6%	73.0%	72.6%
D&A	(32,692)	(45,415)					(47,165)	(47,797)	(49,248)
% revenue	-46%	-59%					-58%	-55%	-53%
Operating profit	9,081	11,281					12,684	15,450	18,210
...YoY	18%	24%					12%	22%	18%
Operating margin (%)	12.6%	14.8%					15.6%	17.8%	19.6%
Net profit	2,650	5,222	1,452	1,526	1,586	1,877	6,441	8,302	10,455
...YoY	36%	97%	13%	21%	20%	41%	23%	29%	26%
NPM (%)	3.7%	6.8%	7.4%	7.6%	7.8%	8.9%	7.9%	9.6%	11.3%

Source: Company data, CMBIS estimates

Our FY19-21E EPS is largely in line with consensus**Figure 270: CMBIS estimates vs consensus**

RMB mn	CMBIS			Consensus			Diff (%)		
	FY19E	FY20E	FY21E	FY19E	FY20E	FY21E	FY19E	FY20E	FY21E
Revenue	81,316	86,639	92,916	81,215	86,912	92,857	0%	0%	0%
Gross Profit	59,849	63,246	67,457	59,712	63,614	67,682	0%	-1%	0%
Operating Profit	12,684	15,450	18,210	12,815	15,373	18,175	-1%	0%	0%
Net profit	6,441	8,302	10,455	6,336	8,010	9,485	2%	4%	10%
EPS (RMB)	0.037	0.047	0.060	0.038	0.048	0.062	-3%	-1%	-3%
Gross Margin	73.6%	73.0%	72.6%	73.5%	73.2%	72.9%	0.1 ppt	-0.2 ppt	-0.3 ppt
Operating Margin	15.6%	17.8%	19.6%	15.8%	17.7%	19.6%	-0.2 ppt	0.1 ppt	0 ppt
Net Margin	7.9%	9.6%	11.3%	7.8%	9.2%	10.2%	0.1 ppt	0.4 ppt	1 ppt

Source: Company data, CMBIS estimates

Valuation

Initiate HOLD with TP HK\$1.31 (9% Upside)

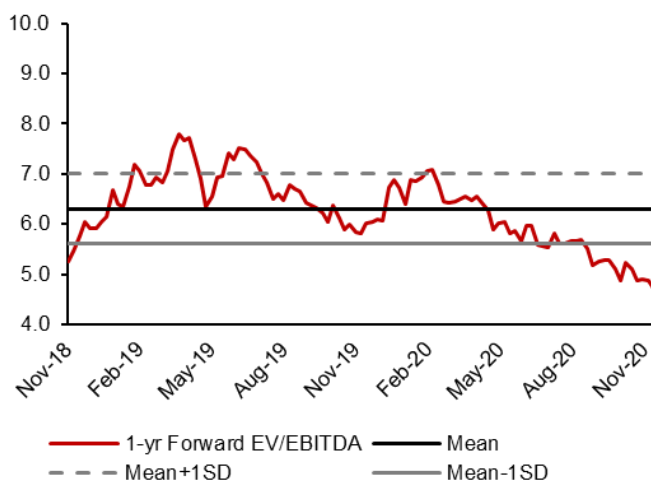
We derived our 12m TP of HK\$1.31, based on FY21E EV/EBITDA of 4.9x, 20% below 2-year historical forward EV/EBITDA. We also cross-checked with DCF valuation, which suggests NAV of HK\$1.32. We estimate 27% EPS FY20-22E CAGR, benefiting from enhanced cost control and reduced leverage. Risks include slowing down capex of Telcos and absence of new lead use case for 5G.

Figure 271: Peers' valuation

Company	Ticker	Mkt Cap US \$mn	Price (LC)	EV/EBITDA (x)		P/E (x)		P/B (x)		ROE (%)		Div. Yield (%)	
				FY20E	FY21E	FY20E	FY21E	FY20E	FY21E	FY20E	FY21E	FY20E	FY21E
China Tower	788 HK	27,242	1.20	4.93	4.66	28.6	22.2	1.0	1.0	3.5	4.4	1.4	1.9
Tower Bersama Infra.	TBIG IJ	2,379	1500.00	13.03	13.03	30.6	25.9	5.6	5.1	20.8	21.8	5.6	5.1
Cellnex Telecom	CLNX SM	29,798	49.97	24.81	24.81	-	263.0	3.5	3.5	(0.2)	4.1	3.5	3.5
Sba Communications	SBAC US	31,339	282.04	29.63	29.63	-	100.5	-	-	(0.7)	(7.2)	-	-
Infra. Wireless Ital	INW IM	11,835	10.06	23.24	23.24	54.4	47.7	2.8	2.9	5.8	5.5	2.8	2.9
SMN	TOWR IJ	3,516	980.00	10.75	10.75	18.5	16.8	4.7	4.2	27.4	26.2	4.7	4.2
Telesites	SITESB1 MM	3,662	22.07	14.51	14.51	149.1	96.4	2.6	2.6	3.6	3.5	2.6	2.6
Helios Towers	HTWS LN	1,935	142.80	11.40	11.40	-	96.8	19.4	24.2	(69.7)	(33.2)	19.4	24.2
Crown Castle	CCI US	67,175	155.75	26.96	26.96	84.0	65.2	7.1	8.1	7.9	11.7	7.1	8.1
American Tower	AMT US	98,931	222.71	25.48	25.48	51.8	40.0	35.4	47.5	40.4	74.7	35.4	47.5
Uniti Group	UNIT US	2,770	11.69	9.32	9.32	-	40.4	-	-	37.5	(5.1)	-	-
China Comm Service	552 HK	3,314	3.75	0.51	0.51	7.0	6.1	0.6	0.6	8.5	9.2	0.6	0.6
Average				16.2	16.2	53.0	68.4	8.3	10.0	7.1	9.6	8.3	10.1

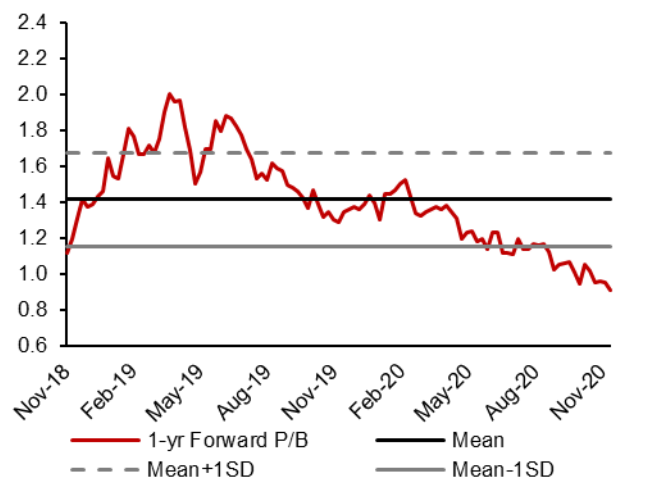
Source: Bloomberg, CMBIS

Figure 272: 12M forward EV/EBITDA band



Source: Company data, CMBIS

Figure 273: 12M forward P/B band



Source: Company data, CMBIS

DCF Model

Model Assumptions

Assumption	
Cost of equity	11.2%
Cost of debt	3.6%
Tax rate	25.0%
Risk-free rate	3.0%
Risk Premium	11.2%
Beta	0.73
Target D/(D+E)	30%
WACC	8.6%
Exchange Rate	1.14
Terminal growth rate	1.5%

RMB mn	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	Terminal Value
EBIT	12,928	15,450	18,210	20,031	21,633	22,715	23,396	23,864	24,103	24,344	
(-) Eff tax	(3,103)	(3,862)	(4,552)	(5,008)	(5,408)	(5,679)	(5,849)	(5,966)	(6,026)	(6,086)	
NOPLAT	9,825	11,587	13,657	15,023	16,225	17,036	17,547	17,898	18,077	18,258	
(+) D&A	(47,165)	(47,797)	(49,248)	(50,233)	(51,237)	(52,262)	(53,307)	(54,373)	(55,461)	(56,570)	
(+) Other non-cash items	4,530	4,454	4,393	4,481	4,570	4,662	4,755	4,850	4,947	5,046	
(-) WC	(3,426)	(563)	(940)	(1,410)	(1,974)	(2,566)	(3,336)	(4,337)	(5,639)	(7,330)	
(-) CAPEX	(28,094)	(30,012)	(32,060)	(33,663)	(35,346)	(37,114)	(38,969)	(40,918)	(42,964)	(45,112)	
FCF	20,940	24,355	25,511	25,701	25,571	24,956	23,793	22,166	19,988	17,340	246,946
PV	20,940	22,421	21,620	20,051	18,365	16,500	14,482	12,420	10,310	8,234	117,264

Valuation	RMB mn
Terminal Value	117,264
Enterprise Value	282,608
Net cash at year beginning	(79,156)
Minority Interest at year beginning	1
Equity Value (USDmn)	203,451
Number of shares	176,008
NAV per share (RMB)	1.16
NAV per share (HKD)	1.32

Source: Company data, CMBIS estimates

Appendix

Company Background

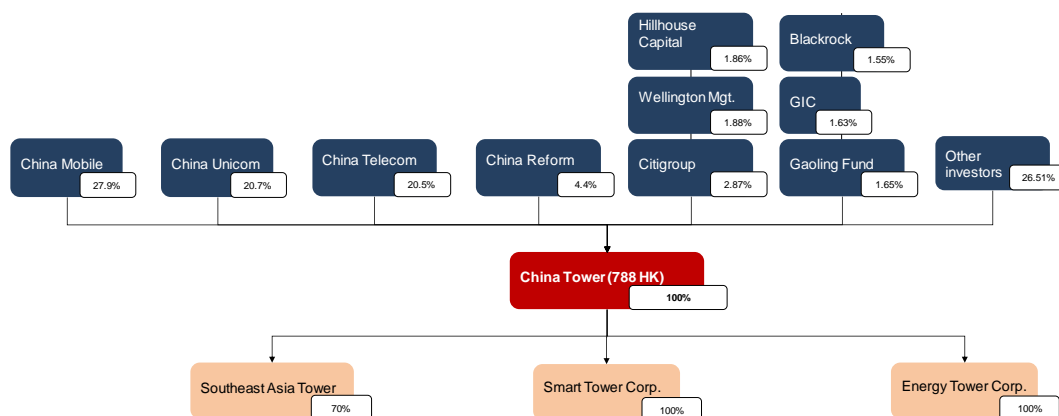
Incorporated in 2014 and listed on HKEX in 2018, China Tower is the world's largest telecommunications tower infrastructure service provider with 2,020 tower sites across 31 provinces, municipalities and autonomous regions in China. Driven by the "sharing" philosophy, China Tower promotes site co-location and leverages site resource to provide data information services to diverse vertical industries.

Figure 274: Key milestones

Year	Event
2014	Established and opened 31 provincial level branches by the end of the year
2015	Acquired existing telecom towers and related assets from telecom operators Commenced commercial operations Issued new shares to Telecom shareholders and China Reform
2016	Issued asset-backed notes of RMB 4.95bn Commercial Pricing Agreements with China Mobile, China Unicom and China Telecom
2017	Became a member of the International Telecommunication Union.
2018	Cooperated with State Grid, China Southern Power Grid, China Post, China Railway, Alibaba Listed on HKEX (stock code: 788 HK) Established Southeast Asia Tower Co., Ltd. in Laos to explore the international business. Became a constituent stock of Hang Seng China Enterprises Index and Hang Seng Stock Connect Hong Kong Index.
2019	Established two wholly-owned subsidiaries, Smart Tower Corp. and Energy Tower Corp. Completed site construction for over 160k 5G BTS
2020	Entered Hang Seng SCHK China Technology index.

Source: Company data, CMBIS

Figure 275: Shareholders structure



Source: Company data, CMBIS
As at 31 Dec 2019

Financial Summary

Income statement						Cash flow					
YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E	YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E
Revenue	71,819	76,428	81,316	86,639	92,916	Net profit	3,475	6,837	8,473	11,069	13,940
Depreciation & amortization	(32,692)	(45,415)	(47,165)	(47,797)	(49,248)	Depreciation/amortization	32,692	45,415	43,258	43,591	44,699
Site oper. lease charges	(12,196)	(639)	-	-	-	Change in working capital	2,987	(6,461)	(3,426)	(563)	(940)
Repairs & maintenance	(6,165)	(5,993)	(6,099)	(6,758)	(7,433)	Others	6,386	4,144	2,703	2,353	1,600
Employee expenses	(4,917)	(5,863)	(7,075)	(7,711)	(8,455)	Net cash from operating	45,540	49,935	51,009	56,451	59,299
Other oper expenses	(6,768)	(7,237)	(8,294)	(8,924)	(9,570)	Capex	(32,713)	(27,798)	(28,094)	(30,012)	(32,060)
Operating profit	9,081	11,281	12,684	15,450	18,210	Other	(210)	(338)	5,047	5,423	5,849
Other gains	153	154	244	-	-	Net cash from investing	(32,923)	(28,136)	(23,047)	(24,589)	(26,211)
Interest income	248	63	75	73	124	Share issuance	51,165	-	-	-	-
Finance costs	(6,007)	(4,661)	(4,530)	(4,454)	(4,393)	Dividend paid	-	(396)	(3,478)	(4,483)	(5,646)
Pre-tax profit	3,475	6,837	8,473	11,069	13,940	Other	(66,799)	(20,016)	(21,862)	(15,691)	(19,038)
Income tax expenses	(825)	(1,616)	(2,034)	(2,767)	(3,485)	Net cash from financing	(15,634)	(20,412)	(25,340)	(20,174)	(24,684)
Non-controlling interests	-	1	1	-	-	Net change in cash	(3,017)	3,374	2,621	11,688	8,404
Net profit to	2,650	5,222	6,441	8,302	10,455	Cash, beginning of the year	7,852	4,836	6,223	8,844	20,532
EBITDA	41,773	56,696	59,849	63,246	67,457	Exchange difference	1	-	-	-	-
						Cash, end of the year	4,836	6,223	8,844	20,532	28,936

Balance sheet						Key ratios					
YE 31 Dec (RMB mn)	FY18A	FY19A	FY20E	FY21E	FY22E	YE 31 Dec	FY18A	FY19A	FY20E	FY21E	FY22E
Current assets	31,799	40,995	51,264	65,021	75,863	Revenue mix					
Prepayments and others	7,805	8,514	9,107	9,530	10,221	Tower business	68,597	71,406	73,389	75,577	78,198
Account receivables	19,158	26,258	33,313	34,958	36,706	DAS business	1,819	2,658	3,668	4,952	6,536
Cash & equivalents	4,836	6,223	8,844	20,532	28,936	TSSAI & energy oper.	1,222	2,080	3,890	5,686	7,715
						Others	181	284	369	425	467
Non-current assets	283,565	297,072	282,829	272,539	263,584	Growth (%)					
PPE	249,055	239,925	230,433	222,321	214,955	Revenue	4.6	6.4	6.4	6.5	7.2
Right-of-use assets	-	36,140	32,121	29,943	28,354	Operating profit	41.7	46.1	38.0	35.0	32.0
Deferred tax assets	706	1,199	1,527	1,527	1,527	EBITDA	3.5	35.7	5.6	5.7	6.7
Other non-current assets	33,804	19,808	18,748	18,748	18,748	Net profit	36.4	97.1	23.3	28.9	25.9
Total assets	315,364	338,067	334,093	337,559	339,446	Profit & loss ratio (%)					
Current liabilities	114,759	128,364	116,451	112,995	106,375	Operating margin	12.6	14.8	15.6	17.8	19.6
ST borrowings	79,946	87,019	72,273	67,679	60,033	EBITDA margin	58.2	74.2	73.6	73.0	72.6
Lease liabilities	-	6,992	6,930	6,900	6,900	Net profit margin	3.7	6.8	7.9	9.6	11.3
Account payables	30,591	29,313	30,921	32,089	33,116	Balance sheet ratio					
Other current liabilities	4,222	5,040	6,327	6,327	6,327	Net debt/total equity (%)	50.5	47.6	42.5	40.7	37.0
Non-current liabilities	20,103	27,142	31,967	34,066	36,600	Current ratio (x)	0.3	0.3	0.4	0.6	0.7
LT borrowings	19,064	8,480	15,727	19,321	22,967	Receivable turnover days	62.2	82.2	110.7	122.0	118.2
Lease liabilities	-	17,862	15,554	14,060	12,948	Profitability (%)					
Other non-current liabilities	1,039	800	685	685	685	ROE	1.5	2.9	3.5	4.4	5.3
Total liabilities	134,862	155,506	148,418	147,060	142,976	ROA	0.8	1.5	1.9	2.5	3.1
Share capital	176,008	176,008	176,008	176,008	176,008	Per share data (RMB)					
Reserve	4,494	6,551	9,666	14,490	20,462	EPS	0.018	0.030	0.037	0.047	0.060
Minority interest	-	2	1	1	1	DPS	0.002	0.015	0.020	0.025	0.032
Total equity	180,502	182,561	185,675	190,499	196,471	EV/EBITDA	8.39	6.18	5.85	5.54	5.19
Total liabilities and equity	315,364	338,067	334,093	337,559	339,446						

Source: Company data, CMBIS estimates

Disclosures & Disclaimers

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MARKET-PERFORM : Industry expected to perform in-line with the relevant broad market benchmark over next 12 months
UNDERPERFORM : Industry expected to underperform the relevant broad market benchmark over next 12 months

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