



Digital Mega Trends in Thailand Context

Digital Thailand Big Bang 2019

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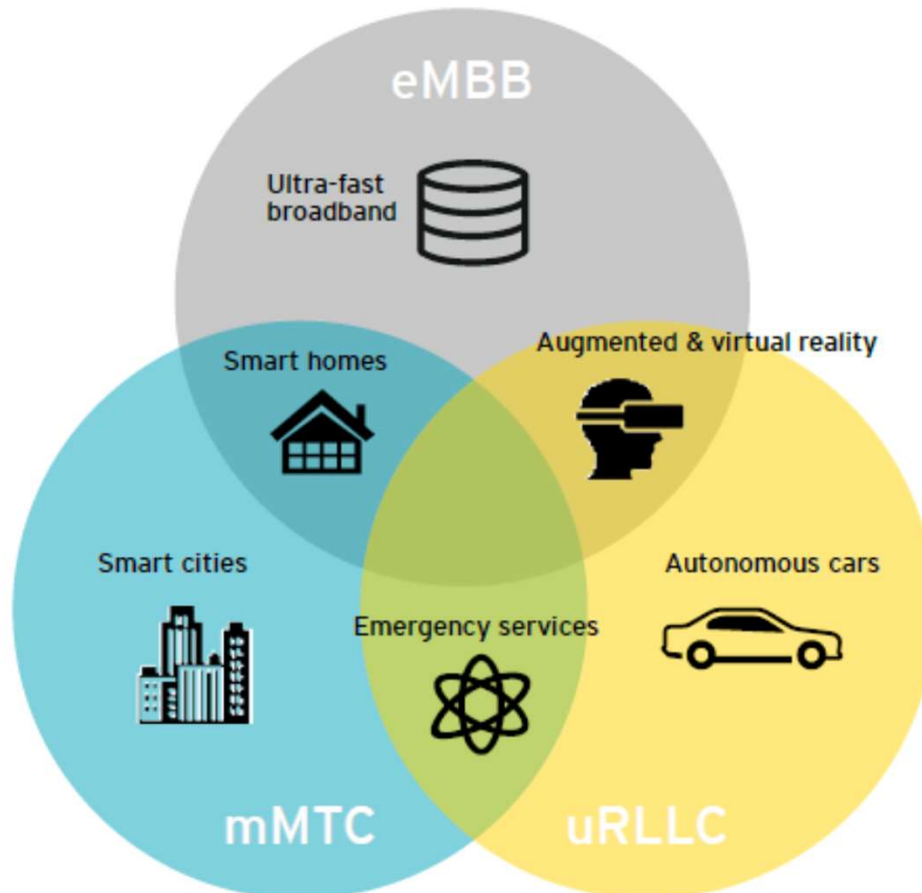
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#1 Overview of 5G

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5G use case scenarios



Enhanced mobile broadband (eMBB)

- ▶ Require high bandwidth, in some cases ultra-high reliability

Ultra-reliable, low-latency communications (uRLLC)

- ▶ Demand reliability and millisecond latency
- ▶ Not necessarily high bandwidth

Massive machine-type communications (mMTC)

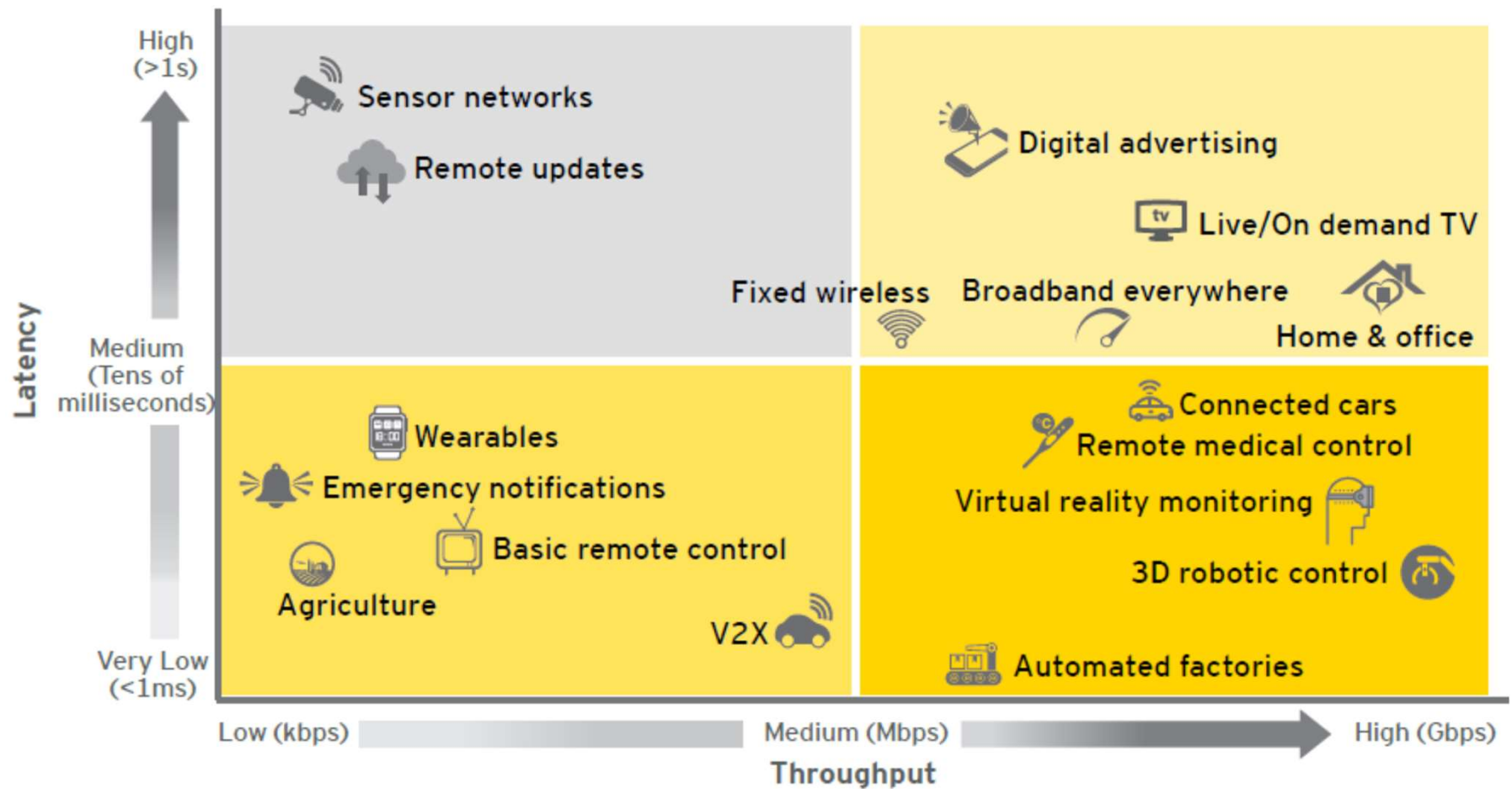
- ▶ Concerned with connecting millions or billions of low-power sensors with low data rates

Source: EY, ITU, TM Forum

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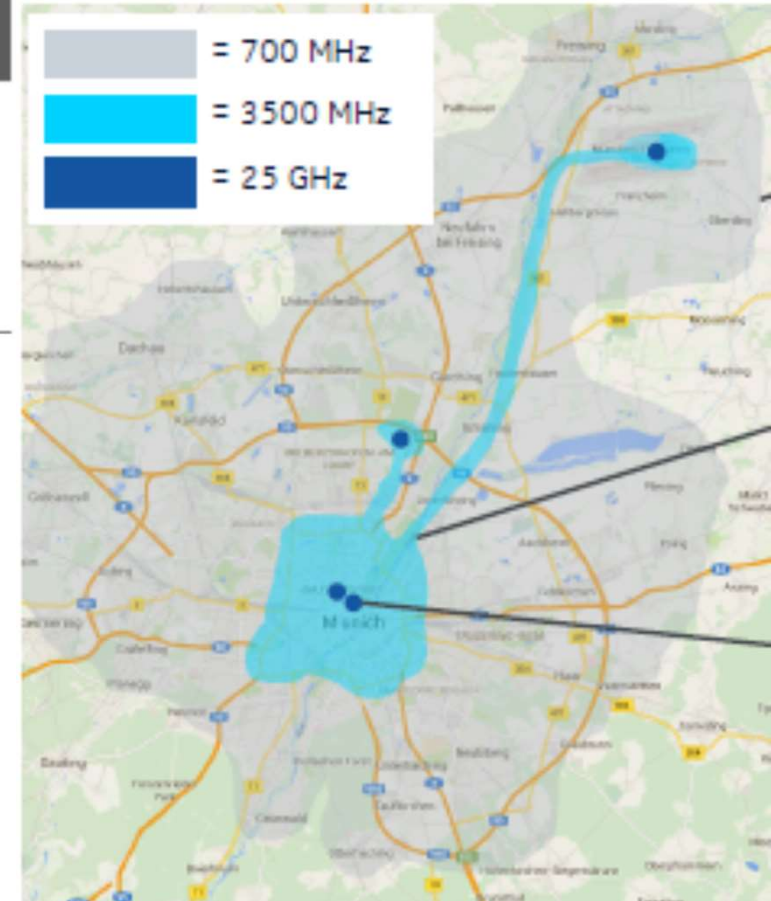
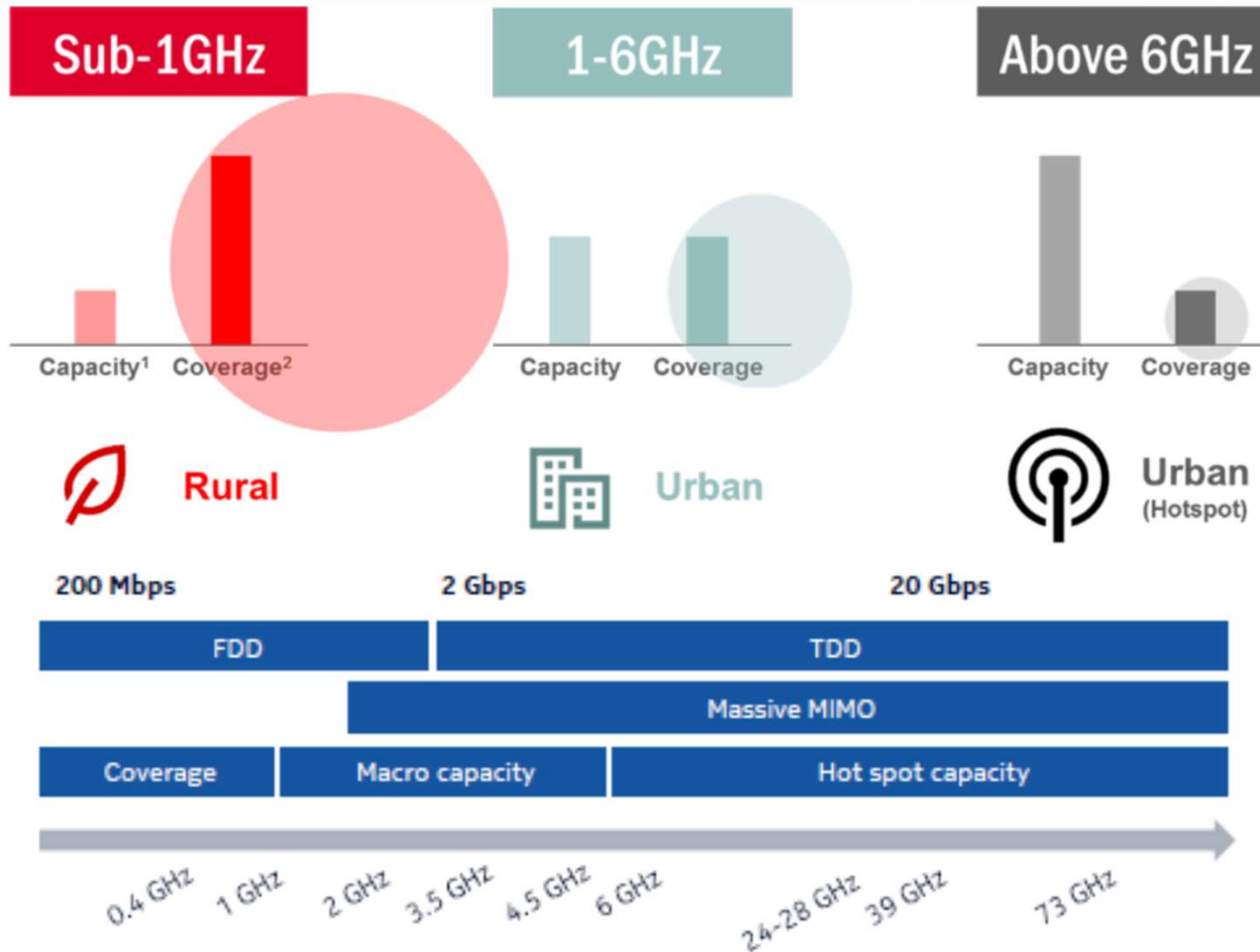
5G fuel demand of new services (in yellow areas)



Source: EY and GSMA

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Capacity and coverage considerations of spectrum categories

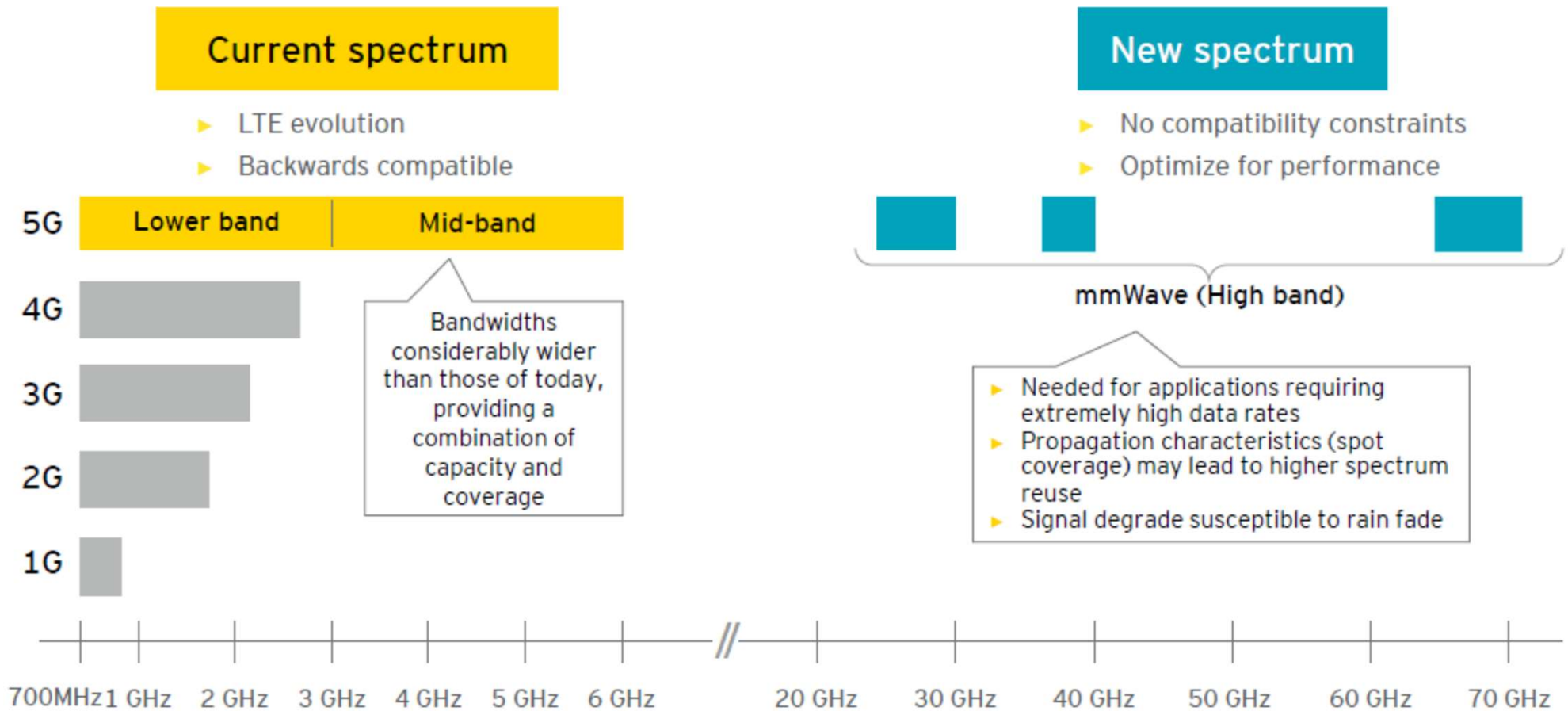


Source: GSMA and Nokia

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Spectrum expands width from 1G to 5G



Source: EY

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Key 5G bands

	<1GHz	3GHz	4GHz	5GHz	24-28GHz	37-40GHz	64-71GHz
	600MHz (2x35MHz) 2.5GHz (LTE B41)	3.45-3.55GHz 3.55-3.7GHz 3.7-4.2GHz		5.9-7.1GHz	24.25-24.45GHz 24.75-25.25GHz 27.5-28.35GHz	37-37.6GHz 37.6-40GHz 47.2-48.2GHz	64-71GHz
	600MHz (2x35MHz)	3.55-3.7GHz			26.5-27.5GHz 27.5-28.35GHz	37-37.6GHz 37.6-40GHz	64-71GHz
	700MHz (2x30 MHz)	3.4-3.8GHz		5.9-6.4GHz	24.5-27.5GHz		
	700MHz (2x30 MHz)	3.4-3.8GHz			26GHz		
	700MHz (2x30 MHz)	3.4-3.8GHz			26GHz		
	700MHz (2x30 MHz)	3.46-3.8GHz			26GHz		
	700MHz (2x30 MHz)	3.6-3.8GHz			26.5-27.5GHz		
	2.5GHz (LTE B41)	3.3-3.6GHz		4.8-5GHz	24.5-27.5GHz	37.5-42.5GHz	
		3.4-3.7GHz			26.5-29.5GHz		
		3.6-4.2GHz	4.4-4.9GHz		27-29.5GHz		
		3.4-3.7GHz			24.25-27.5GHz	39GHz	

Designed for diverse spectrum bands/types

Global snapshot of 5G spectrum bands allocated or targeted

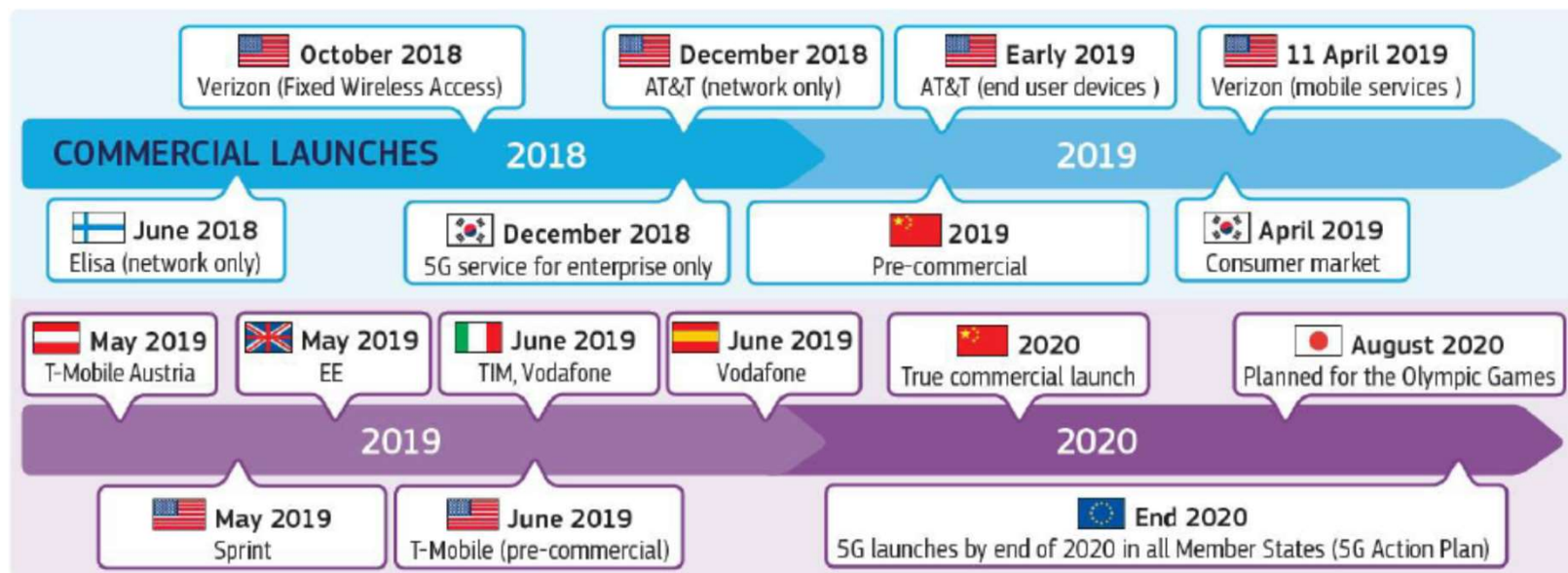
New 5G band

-  Licensed
-  Unlicensed / shared
-  Existing band

Source: Qualcomm

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5G scoreboard



5G SPECTRUM

<p>Europe</p> <p>2020 deadline for assignments of 5G pioneer bands in the EU. Spectrum assigned and usable in 2020 in 9 Member States: 13.1% in the 700 MHz band, 20.1% in the 3.4-3.8 GHz band and 3.6% in the 26 GHz band.</p>	<p>United States</p> <p>Spectrum plans disclosed in 2016: November 2018 auctions for the 28 and 24 GHz bands, 24 GHz in 2019. Options considered for 3.7-4.2 GHz. Commercial launch planned by Verizon: 28 & 39 GHz, T-Mobile: 600 MHz, AT&T: 39 GHz, Sprint: 2.5 GHz.</p>	<p>China</p> <p>Spectrum for 5G national trials until June 2020: 3.4-3.5 GHz for China Telecom, 3.5-3.6 GHz for China Unicom. China Mobile: 260 MHz in 2.6 GHz (2515-2675 MHz) and 4.8 GHz (4800-4900 MHz).</p>	<p>South Korea</p> <p>3.4-3.8 GHz (280 MHz in 2.6 available for 5G) and 28 GHz (2400 MHz available for 5G: 800 MHz for each operator).</p>	<p>Japan</p> <p>28 GHz (27.5-29.5 GHz) band for 5G. The Ministry of Internal Affairs and Communications has also approved the 3.6-4.2 GHz and the 4.4-4.9 GHz.</p>
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Source: IDATE DigiWorld

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#2 Overview of 5G in Thailand

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2G/3G/4G/5G on service: Global vs. Thailand

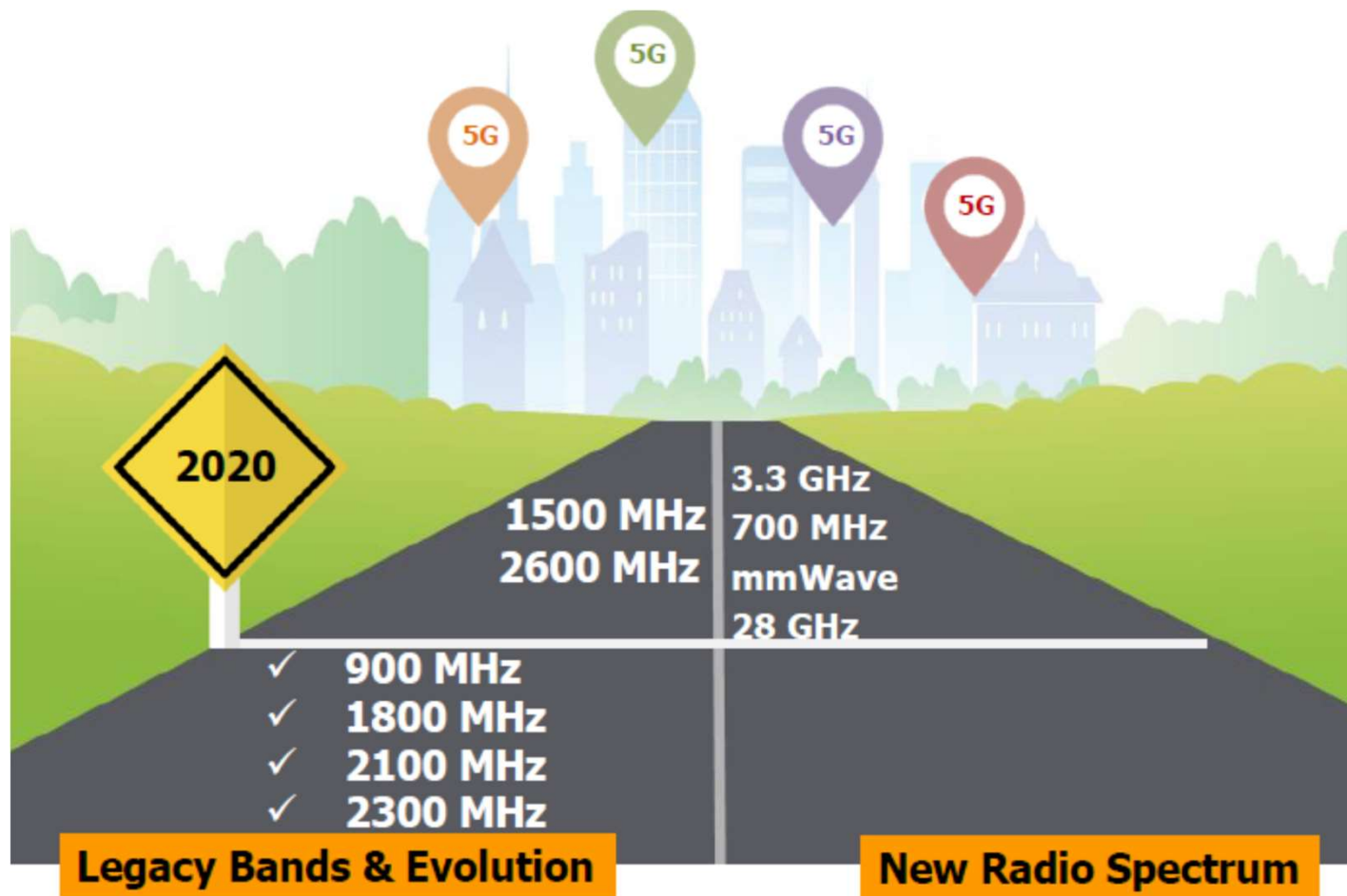


Source:: Huawei

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5G spectrum bands for Thailand

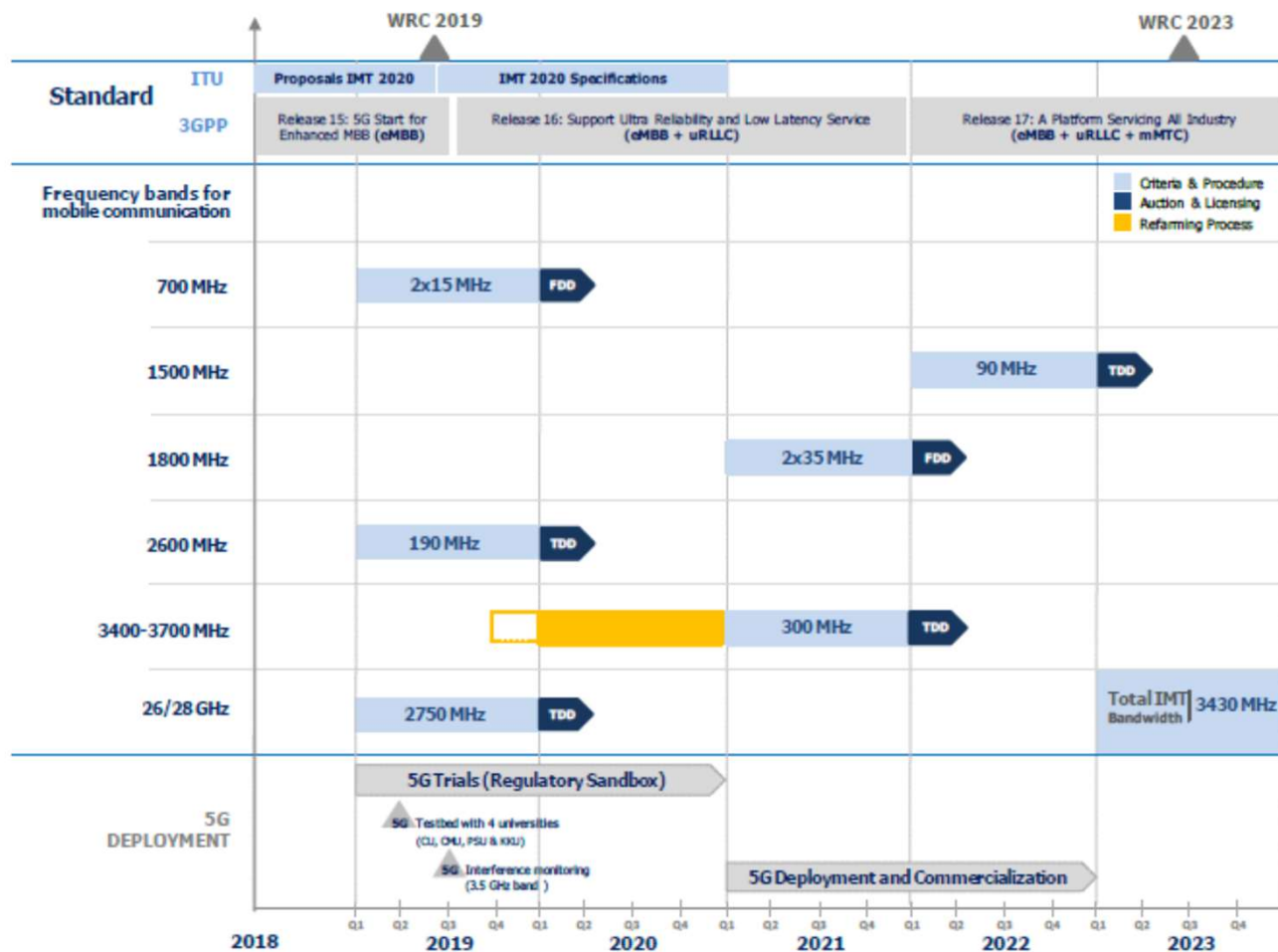


Source:: NBTC

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Preliminary timeframe for spectrum auctions



Source:: NBTC

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Proposed multiple band spectrum auction

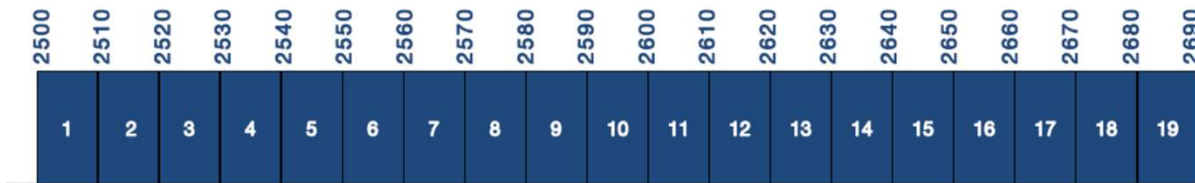
700 MHz band



700 MHz

- 3 lots of 2x5 MHz, *Nationwide*
- No spectrum cap

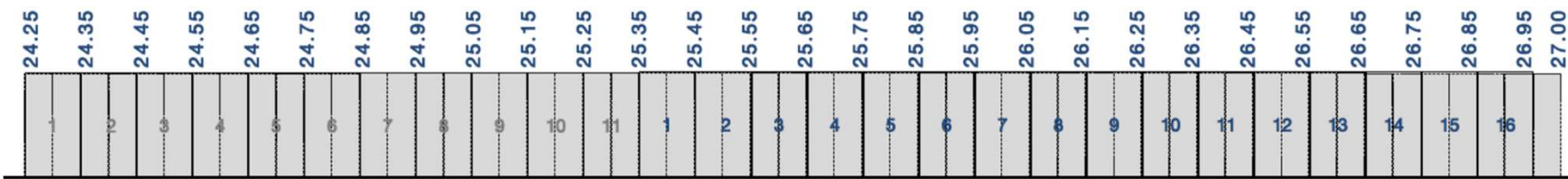
2600 MHz band



2600 MHz

- 19 lots of 10 MHz, *Nationwide*
- 100 MHz spectrum cap

26 GHz band



26 GHz

- 11 lots of 100 MHz, *Specific Area*
- 16 lots of 100 MHz, *Nationwide*
- 800 MHz spectrum cap

Source:: NBTC

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Expected 5G spectrum costs

Spectrum	Assigned telcos			Total bandwidth 1xMHz	Acquiring costs by telcos			Total proceeds Btmn	Acquiring costs per MHz		
	ADVANC	DTAC 1xMHz	TRUE		ADVANC	DTAC Btmn	TRUE		ADVANC	DTAC Btmn	TRUE
3G/4G											
By auctions											
900MHz	20	10	20	50	75,654	38,064	76,298	190,016	3,783	3,806	3,815
1800MHz	40	10	30	80	52,900	12,511	40,389	105,800	1,323	1,251	1,346
2100MHz	30	30	30	90	14,625	13,500	13,500	41,625	488	450	450
By roaming											
850MHz	0	0	30	30	0	0	21,840	21,840	0	0	728
2100MHz	30	0	0	30	31,200	0	0	31,200	1,040	0	0
2300MHz	0	60	0	60	0	31,570	0	31,570	0	526	0
Total	120	110	110	340	174,379	95,645	152,027	422,051	1,453	870	1,382
5G											
700MHz	20	20	20	60	17,584	17,584	17,584	52,752	879	879	879
2600MHz	70	60	60	190	16,570	14,202	14,202	44,974	237	237	237
3500MHz	100	100	100	300	17,584	17,584	17,584	52,752	176	176	176
26/28GHz	600	500	500	1,600	13,188	10,990	10,990	35,168	22	22	22
Total	790	680	680	2,150	64,926	60,360	60,360	185,646	82	89	89
5G vs 3G/4G	558.3%	518.2%	518.2%	532.4%	-62.8%	-36.9%	-60.3%	-56.0%	-94.3%	-89.8%	-93.6%

Source:: NBTC, Company, KS Research

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5G valuation under the best case scenario

Thailand mobile network operators

The story of 5G

Under the best case scenario, we assume Thai telcos to be able to generate a positive NPV from 5G project. We think it does not quite make sense for telcos to pursue 5G project seriously if telcos cannot verify reasonable revenue recovery. We expect 5G spectrum acquisition costs to be 3x cheaper than that of 4G. Additionally, we expect 5G spectrum payment term to be 3-year grace period and 10-year equally installment.

The assumptions

	Base year	Year 1-5	Year 6-10	In year 10	After year 10	Link to story
Revenue (a)	20,514	53.4%	7.8%	302,057	2.0%	2% of nominal GDP as a market size.
Operating margin (b)	-164.7%	-7.5%	37.6%	153,596	50.9%	Earn similar margin as 4G service.
Tax rate	0%	0%	20%		20%	Tax loss carried forward in 5 years.
Capex to sale (c)	414.3%	46.6%	9.6%	6.3%	7%	Front-loaded capex to be conservative.
Return on capital	-36.6%	1.4%	27.0%	35.9%	25%	Earn lower ROIC than 4G service.
Cost of capital (d)	9.50%	9.50%	9.50%	9.50%	9.50%	Average industry WACC.

The cash flows

Count	Revenue	Operating margin	EBIT	EBIT (1-t)	Reinvestment	FCFF
1	20,514	-164.7%	-33,794	-33,794	68,500	-102,294
2	63,998	-52.7%	-33,719	-33,719	57,000	-90,719
3	88,727	-6.2%	-5,522	-5,522	55,500	-61,022
4	115,311	8.7%	10,049	10,049	54,439	-44,390
5	143,853	21.1%	30,424	30,424	37,939	-7,514
6	174,458	32.2%	56,183	44,947	33,439	11,508
7	207,236	37.5%	77,631	62,105	28,939	33,166
8	242,303	42.0%	101,683	81,347	24,439	56,908
9	279,779	45.9%	128,360	102,688	19,939	82,750
10	290,719	48.5%	140,998	112,798	19,839	92,960
Terminal year	302,057	50.9%	153,596	122,877	19,739	103,038

The value

Terminal value	1,373,844
PV of terminal value	554,365
PV of CF over the next 10 years	-125,352
Value of operating assets	429,013

Adjustment

(-) Debt	259,036
Value of equity	169,977

Value breakdown by revenue market share	Mkt share	Value (Btmn)	No of share (m)	Value per share (Bt)
-ADVANC	48.0%	81,589	2,973	27.44
-DTAC	22.0%	37,395	2,368	15.79
-TRUE	30.0%	50,993	33,368	1.53

Source:: Aswath Damodaran, Company, KS Research

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Share price reactions on spectrum auction outcomes

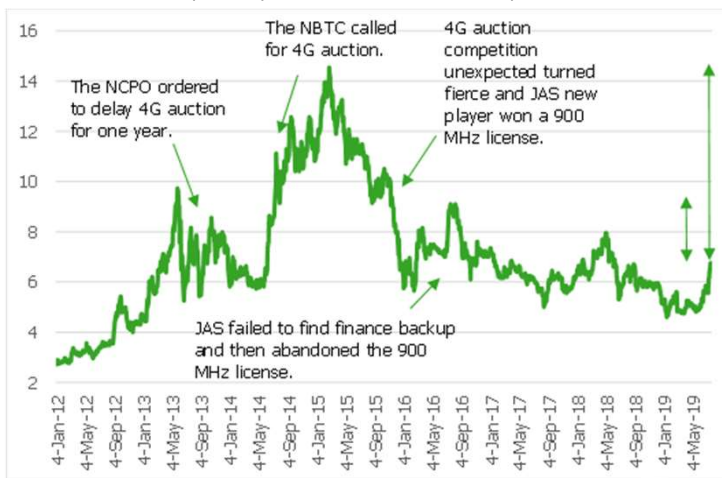
ADVANC – Share price performance and key events



DTAC – Share price performance and key events



TRUE – Share price performance and key events



Fair values based on different 5G financial scenarios

Scenario	Definition	New target price (Bt)		
		ADVANC	DTAC	TRUE
Best case	IRR > WACC	270.60	84.52	9.42
Base case	IRR = WACC	243.16	68.73	7.89
Worst case	IRR < WACC	231.80	55.22	6.94
Super worst case	Change in market structure	129.00	28.00	5.50

Source: Company, KS Research

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Neutral: Expected total return between -10% and 10% within a 12-month period

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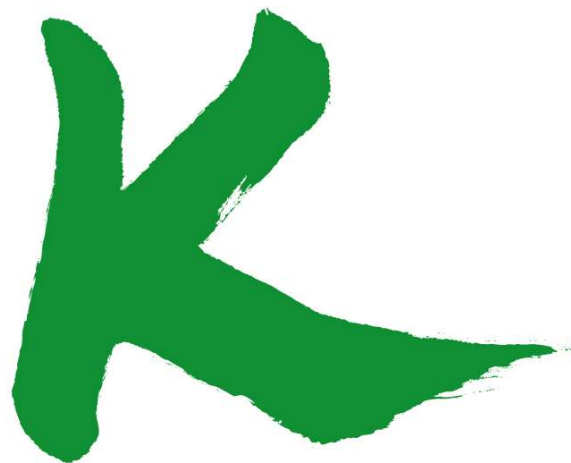
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