THE 2ND
GLOBAL 5G EVENT

中华人民共和国工业和信息化部
Ministry of Industry and Information Technology of the People's Republic of China

Consideration on spectrum for 5G

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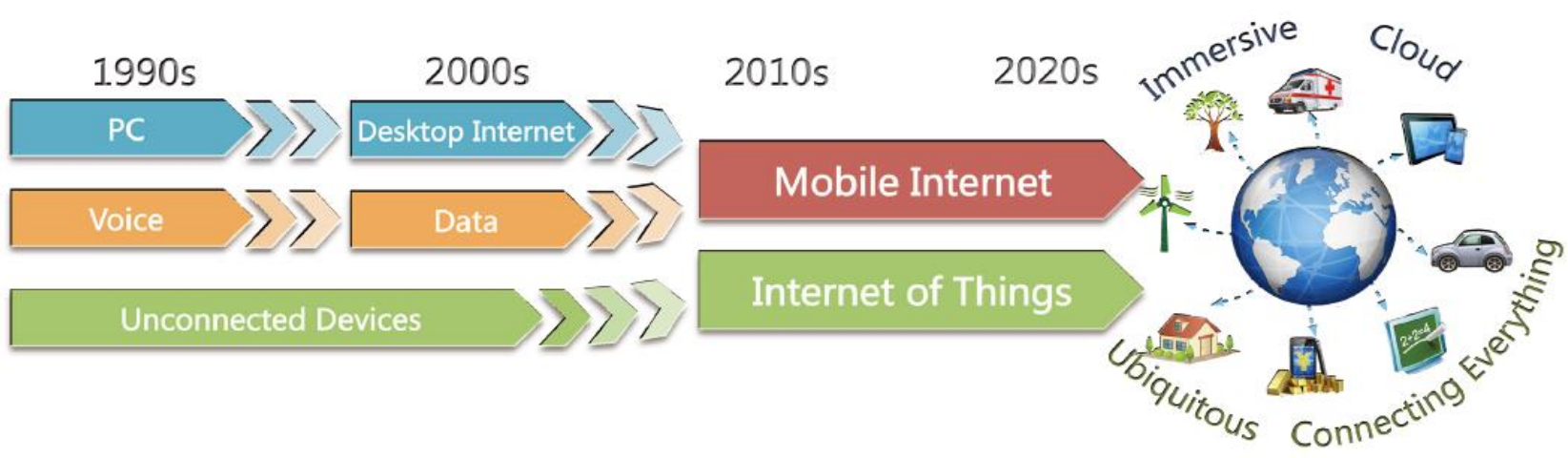
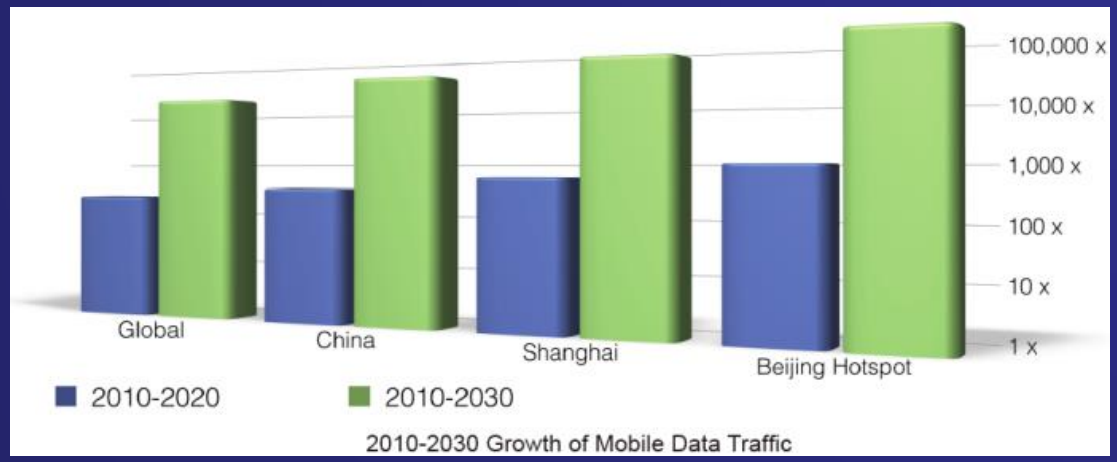
5G Main Drivers and Market Trends

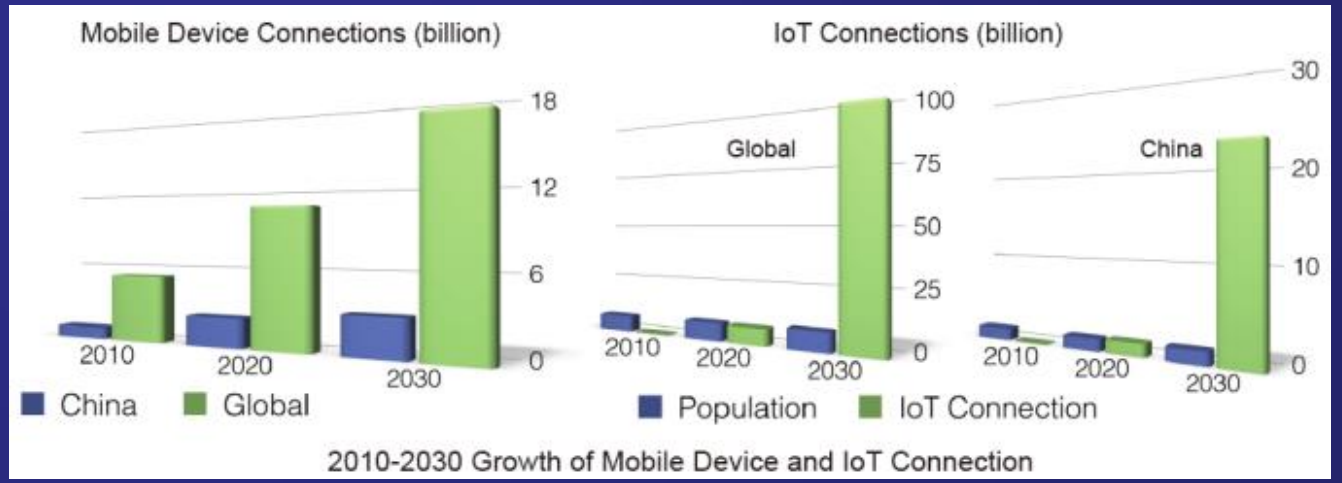


Mobile Internet and Internet of Things (IoT) are the main drivers of 5G

Mobile Data Traffic: Thousands of times growth



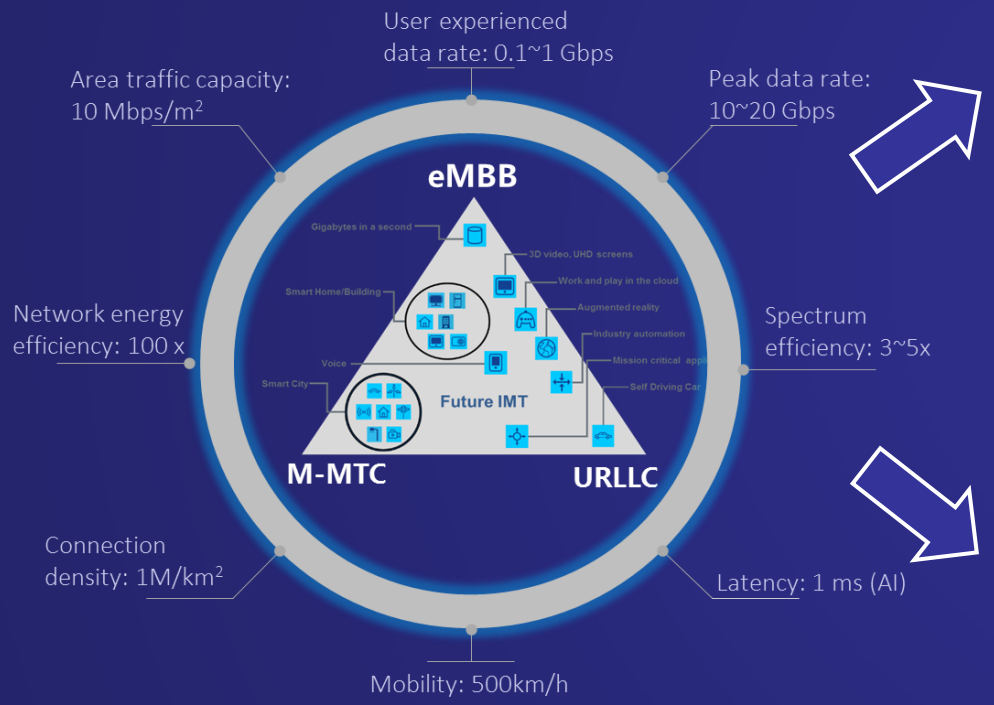
Mobile Internet & IoT Connections: Up to 100 billion



"Source: IMT-2020（5G） Promotion Group white paper"

Key features of 5G

ITU IMT-2020 Vision



"Source: ITU-R WP 5D"Source: ITU-R WP 5D

5 Test environments for Evaluation

eMBB			M-MTC	URLLC
Indoor hotspot	Dense urban	Rural coverage	Urban coverage	Urban coverage

14 KPIs

User experienced data rate
- User experienced data rate

Peak data rate
- Peak data rate
- Bandwidth

Area traffic capacity

Spectrum efficiency (SE)
- Peak spectral efficiency
- Average SE
- 5th percentile user SE

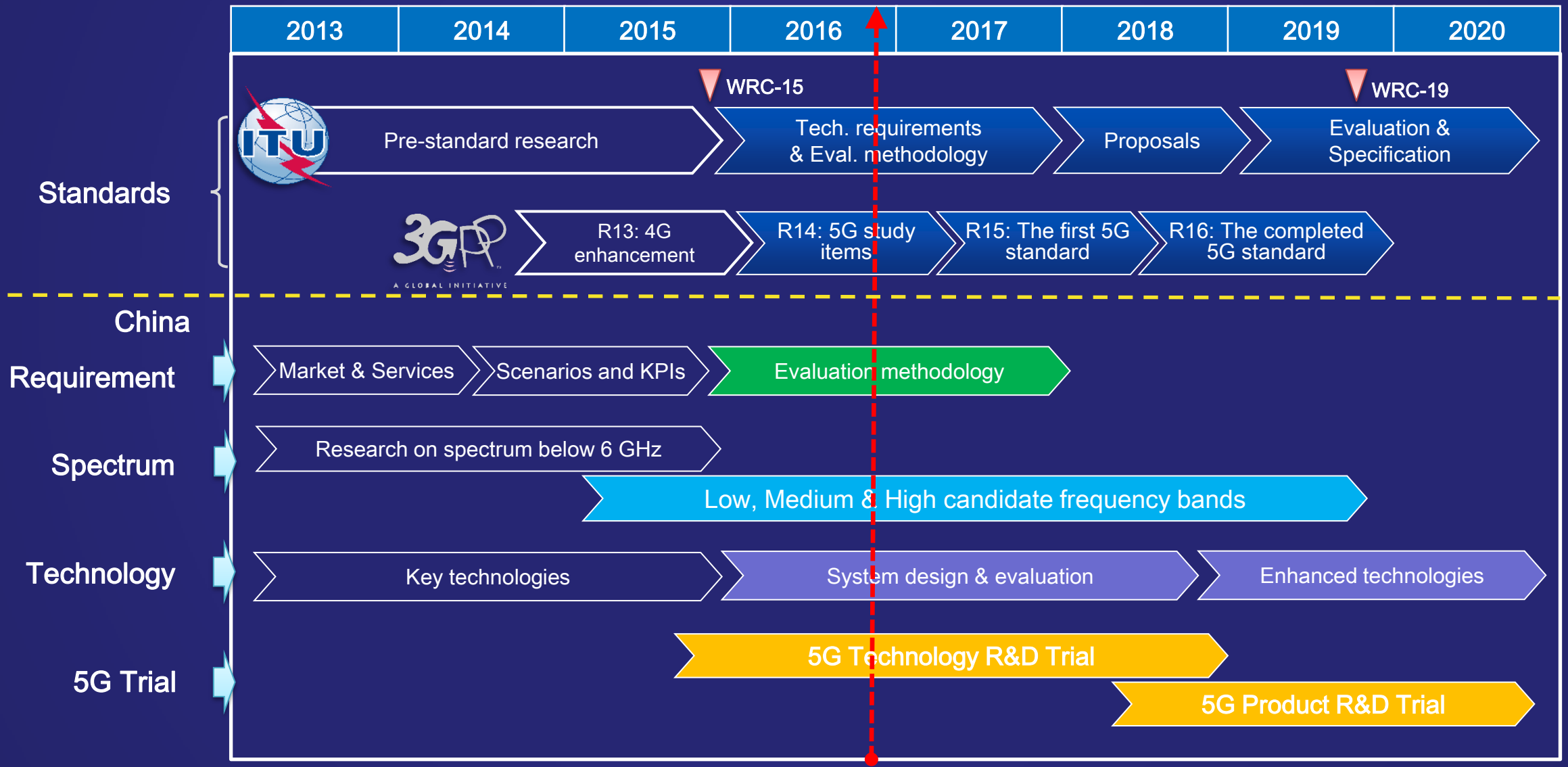
Energy efficiency (EE)
- Energy efficiency

Connection density

Mobility
- Mobility
- Mobility interruption time

Latency
- User plane Latency
- Control plane latency
- Reliability

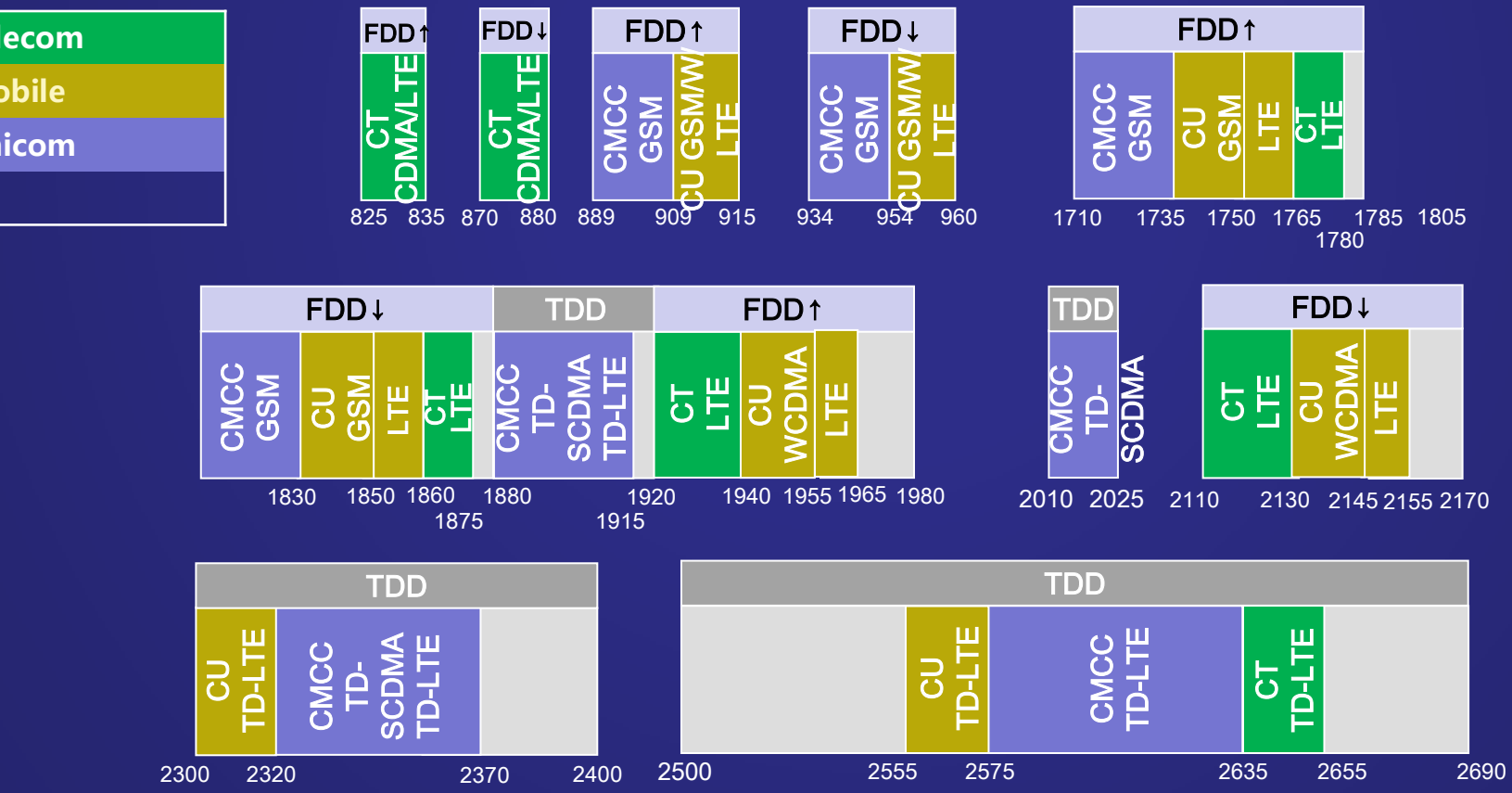
5G Promotion Plan



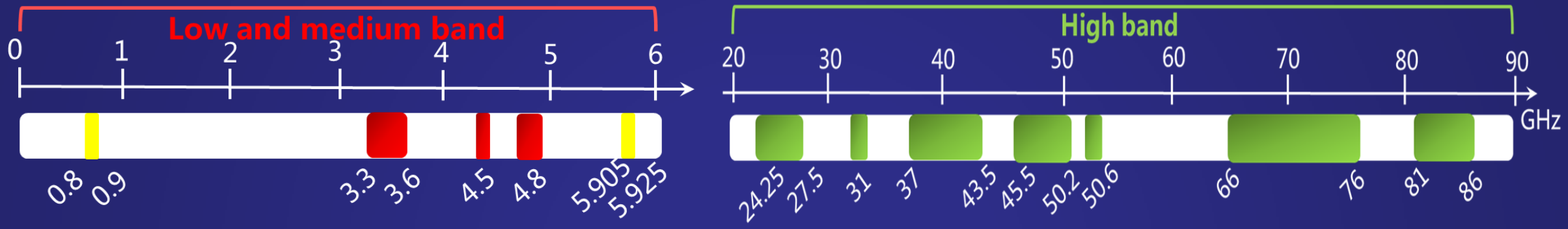
IMT Spectrum allocated in China

- A total of 687MHz bandwidth planned for IMT
- 522MHz been allotted to 3 operators for 8 networks

CT :	China Telecom
CMCC :	China Mobile
CU :	China Unicom
(Unit :	MHz)



5G Spectrum Development in China



Low band (below 3 GHz) & Medium band (3-6GHz)

- 3.4-3.6GHz: IMT vs. FSS compatibility trial is due to be finished by 2017
- 3.3-3.4, 4.4-4.5, 4.8-5.0GHz: domestic coordination in progress of IMT identification in Chinese Regulations on the Radio Frequency Allocation (new version)
- 5 905 - 5 925 MHz : assigned for LTE V2X trial
- Frequency bands planning for NB-IoT : encourage NB-IoT trial and further deployment
  - ➢Current available IMT bands used by operators
  - ➢Considering about 2 x 2.3 MHz in frequency band 800 MHz for private network

High band (above 6 GHz)

- Promoting global/regional harmonization under WRC-19 AI.1.13
- High priority for 20~40GHz for outdoor deployment
- Current focuses of compatibility studies: 26GHz and 40GHz

5G eMBB deployment scenarios

To enable business success of 5G eMBB deployment

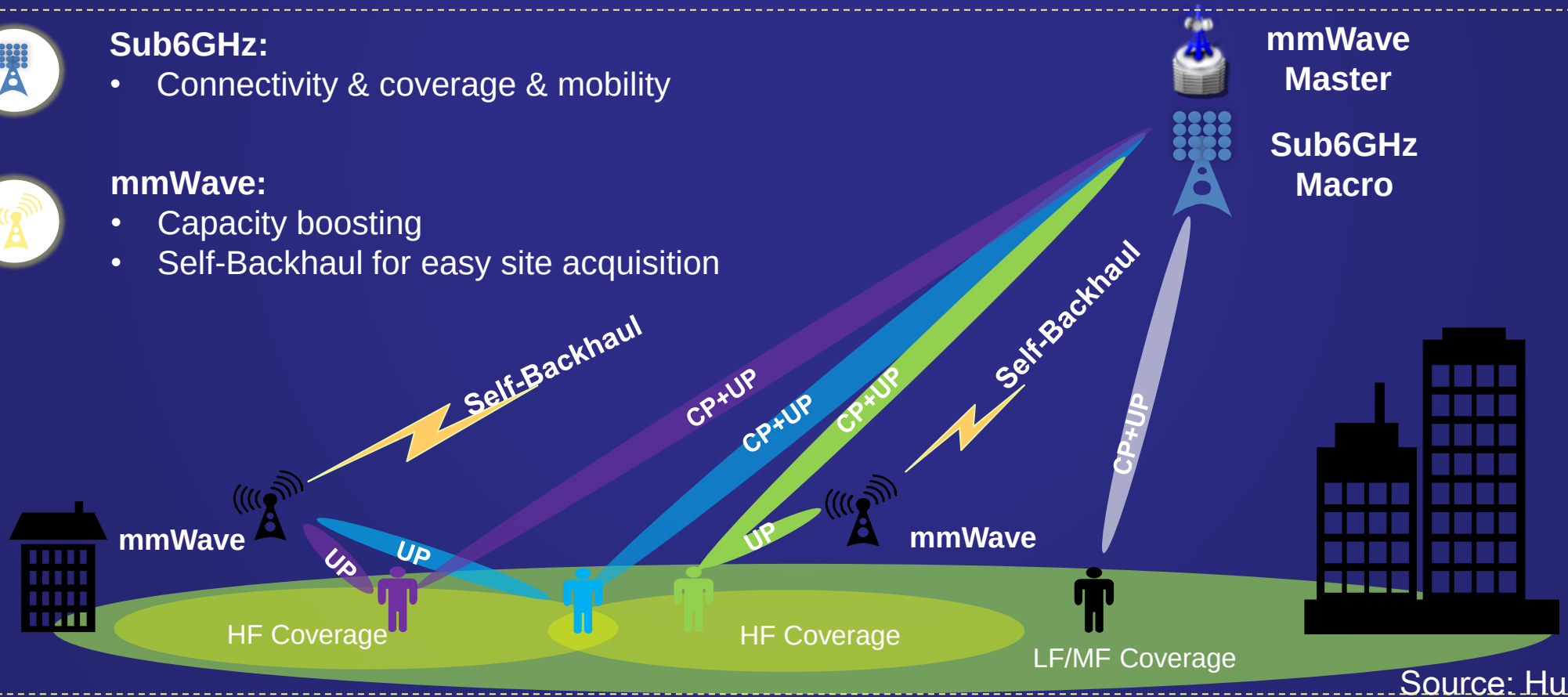
- ✓ Harmonized frequency bands and larger contiguous bandwidth
- ✓ Network need to support aggregation of frequency bands below and above 6GHz
- ✓ More than 100MHz per operator at Medium band, 2GHz per operator in the range of 24.25-43.5GHz

Sub6GHz:

- Connectivity & coverage & mobility

mmWave:

- Capacity boosting
- Self-Backhaul for easy site acquisition



Source: Huawei

5G compatibility trial in 3.4-3.6GHz band

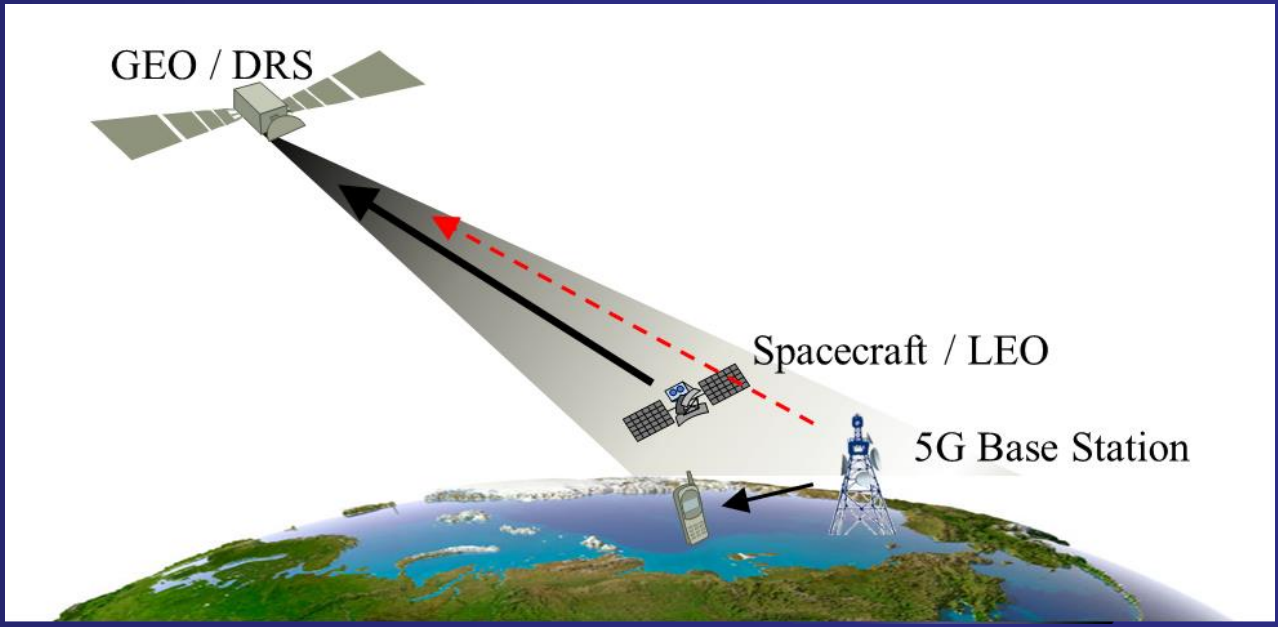
- On January 7th, 2016, MIIT launched 5G compatibility trial
- Evaluate compatibility between IMT @ 3.4-3.6GHz and FSS @ 3.6-4.2GHz

Lab test

Field test (no more than 20 BSs)

5G mmWave bands preliminary compatibility studies

- Conduct preliminary compatibility studies on certain frequency bands specified in WRC-19 AI 1.13, such as 25.25-27.5GHz (between IMT and ISS) ,37-42.5GHz .
- Uncertainty remains in several aspects and needs further studies



IMT and ISS @ 25.25-27.5GHz as an example

Channel model

- e.g. clutter loss

5G model

- e.g., densities / antenna patterns / eirp of 5G BSs and UEs

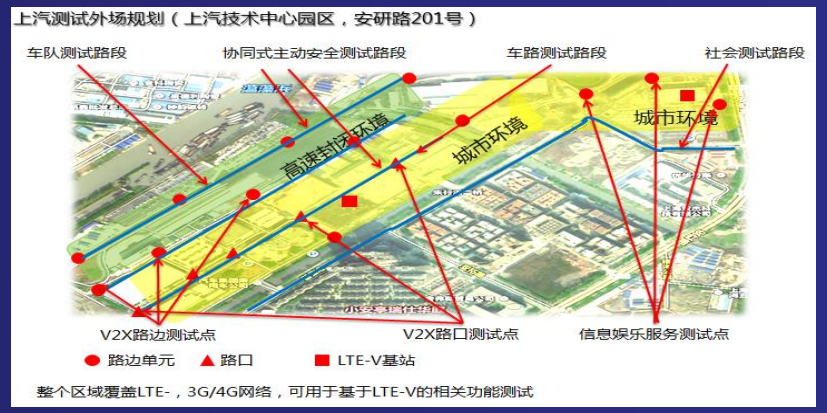
Overlaps of bands with other WRC-19 AI

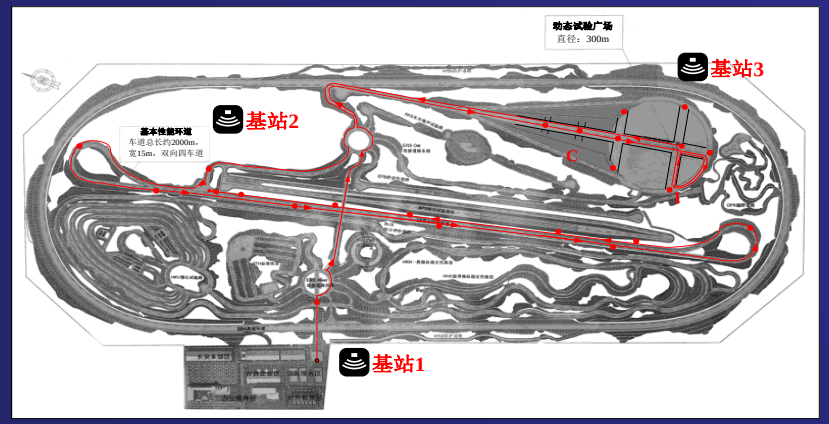
- 1.6 (NGSO FSS) / 1.14 (HAPS) / issue 9.1.9

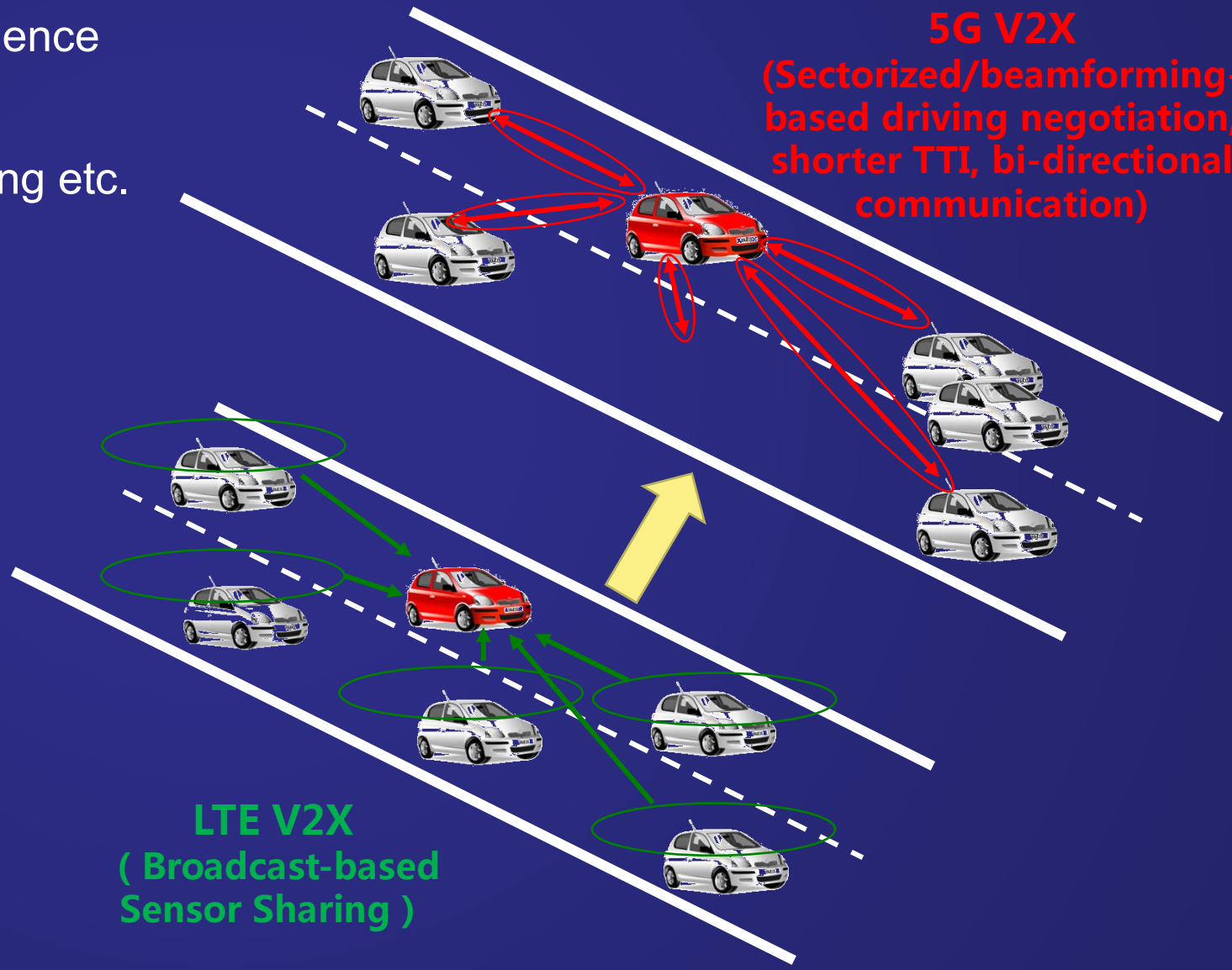
Uncertainties needs further studies

Cellular V2X -- important URLLC application

- Prototype supported by National Science and Technology Major Project
- LTE-V2X trial in Shanghai, Chongqing etc. @5905-5925 MHz







Key points for 5G spectrum

- Harmonization
- Satellite component
- Licensing mechanism

  exclusive licensing

  licensing(sharing with other service(s) or application(s))

  light licensing or tech neutral block licensing

  license-exempt
- Backhaul/front-hual

Remarks

- 5G system need to support aggregation of frequency bands: low and medium band for 5G coverage and capacity, high frequency band for 5G capacity and backhaul/fronthual.
- C band will be the key 5G band, particular for initial 5G deployment.
- Frequency band below 1GHz is preferable for MTC
- V2X will be a key application of 5G URLLC
- Cooperation in ITU-R is important to ensure global/ regional harmonization of 5G spectrum

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Thank you !