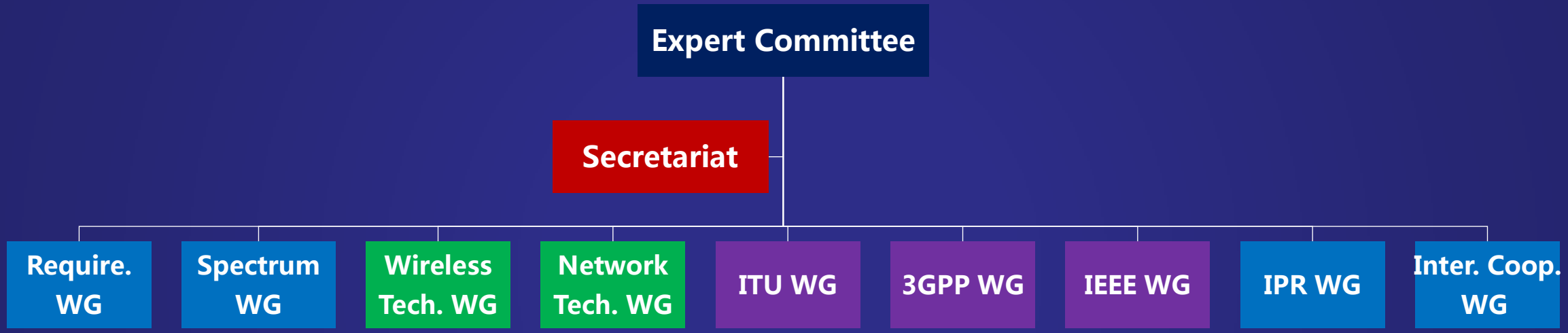
Activities of IMT-2020 (5G) Promotion Group

IMT-2020 (5G) Promotion Group

Nov. 9 , 2016

IMT-2020(5G) PG Structure



CAICT 中国信息通信研究院 China Academy of Information and Communications Technology

中国移动 China Mobile

中国电信 CHINA TELECOM 世界触手可及

China unicom 中国联通 创新·改变世界

NTT docomo

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ZTE

大唐电信科技产业集团 DATANG TELECOM TECHNOLOGY & INDUSTRY GROUP

NOKIA 上海贝尔

ERICSSON

QUALCOMM

SAMSUNG

SOUTHEAST UNIVERSITY 东南大学

TSINGHUA UNIVERSITY 清华大学

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International Cooperation

Multilateral Cooperation

IMT-2020 + 5G PPP + 5GMF (The Fifth Generation Mobile Communications Promotion Forum) + 5G Forum + 5G americas

Signed MoU in October 2015

Bilateral Cooperation

5G PPP	Signed MoU in September 29, 2015
5G Forum	Signed MoU in 2013 and Launched two research projects since 2015
5GMF	Signed MoU in June 2 , 2016
NGMN	Share the research progress

5G Summits & White Papers

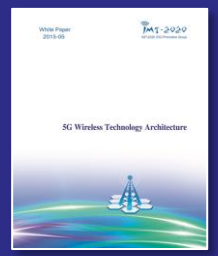
5G Summits & Events

- 2013: 5G Vision

- 2014: 5G Objective & Capability

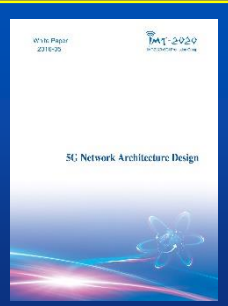
- 2015: 5G Technology Architecture

5G White Papers



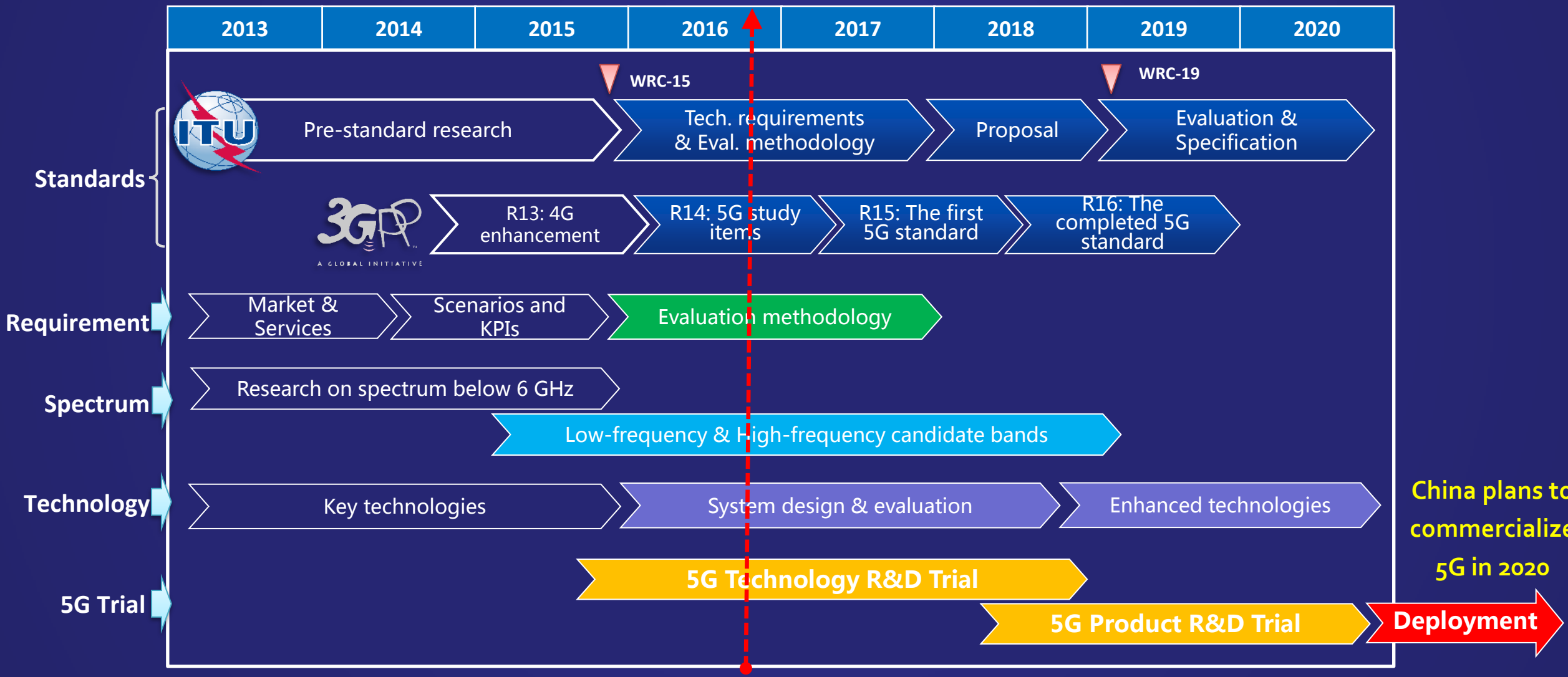
- May 2014: 5G Vision and Requirements
- Feb. 2015: 5G Concept
- May 2015: 5G Wireless Architecture
- May 2015: 5G Network Architecture

- Host the **1st Global 5G Event**,



- Published "**5G Network Architecture Design**"

5G Promotion Plan



5G spectrum research

- Spectrum needs estimation of 5G by IMT-2020(5G) PG

Deployment scenarios	Macro	Micro	Indoor
Spectrum needs for below 6GHz	802-1090MHz	—	—
Spectrum needs for 24.25-43.5 GHz*	—	5.3-7.58GHz	5.3-7.58GHz
Spectrum needs for 45.5-86 GHz	—	—	9.7-12.42GHz
Spectrum needs between 24.25 and 86GHz	—	15-20GHz	

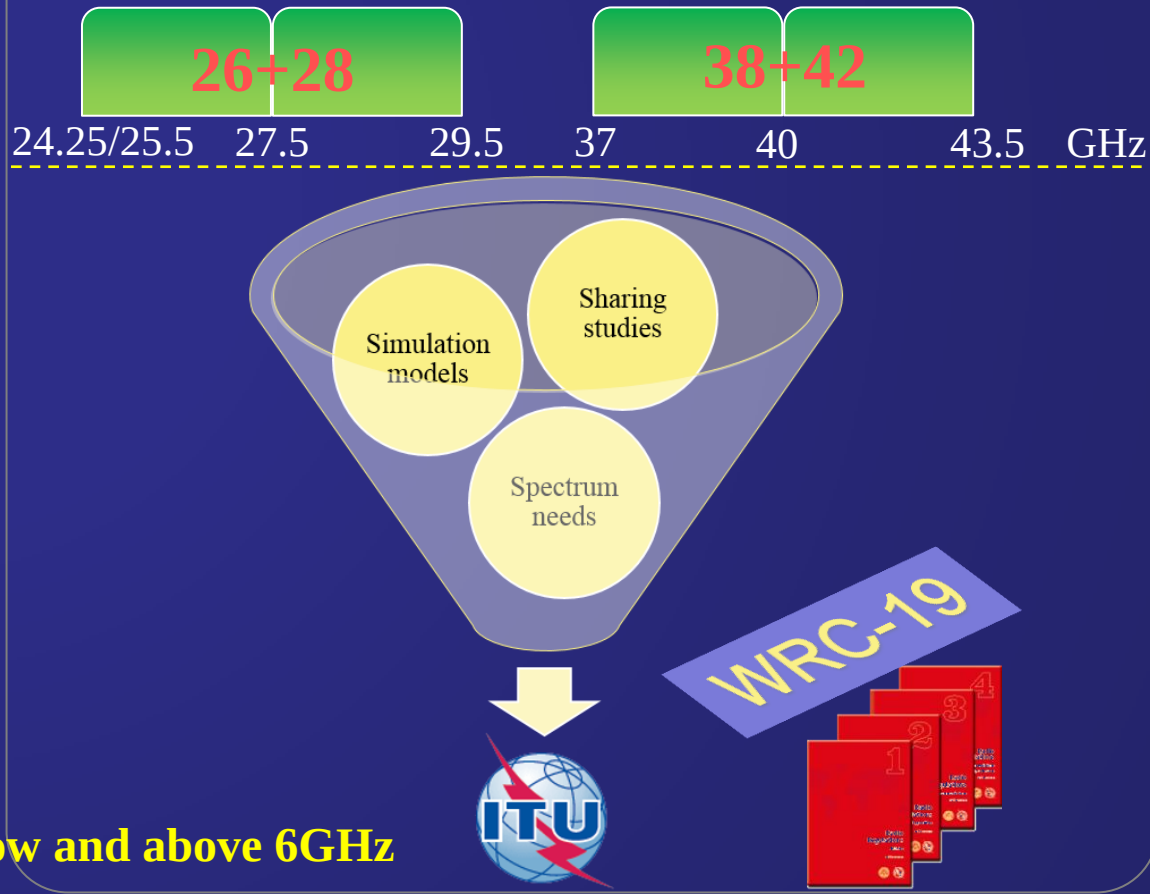
*24.25-43.5 GHz for Micro scenario can also be reused in indoor hotspot

Frequency bands below 6GHz for connectivity, coverage, mobility and capacity

- C band is the core band for 5G in China
- **3.4-3.6GHz** + (3.3-3.4GHz, 4.4-4.5GHz, 4.8-4.99GHz, under negotiation for IMT identification in China
- 5G compatibility trial to evaluate the compatibility and required measures of IMT vs. FSS in 3.4-3.6GHz, to be finished in the first half of 2017

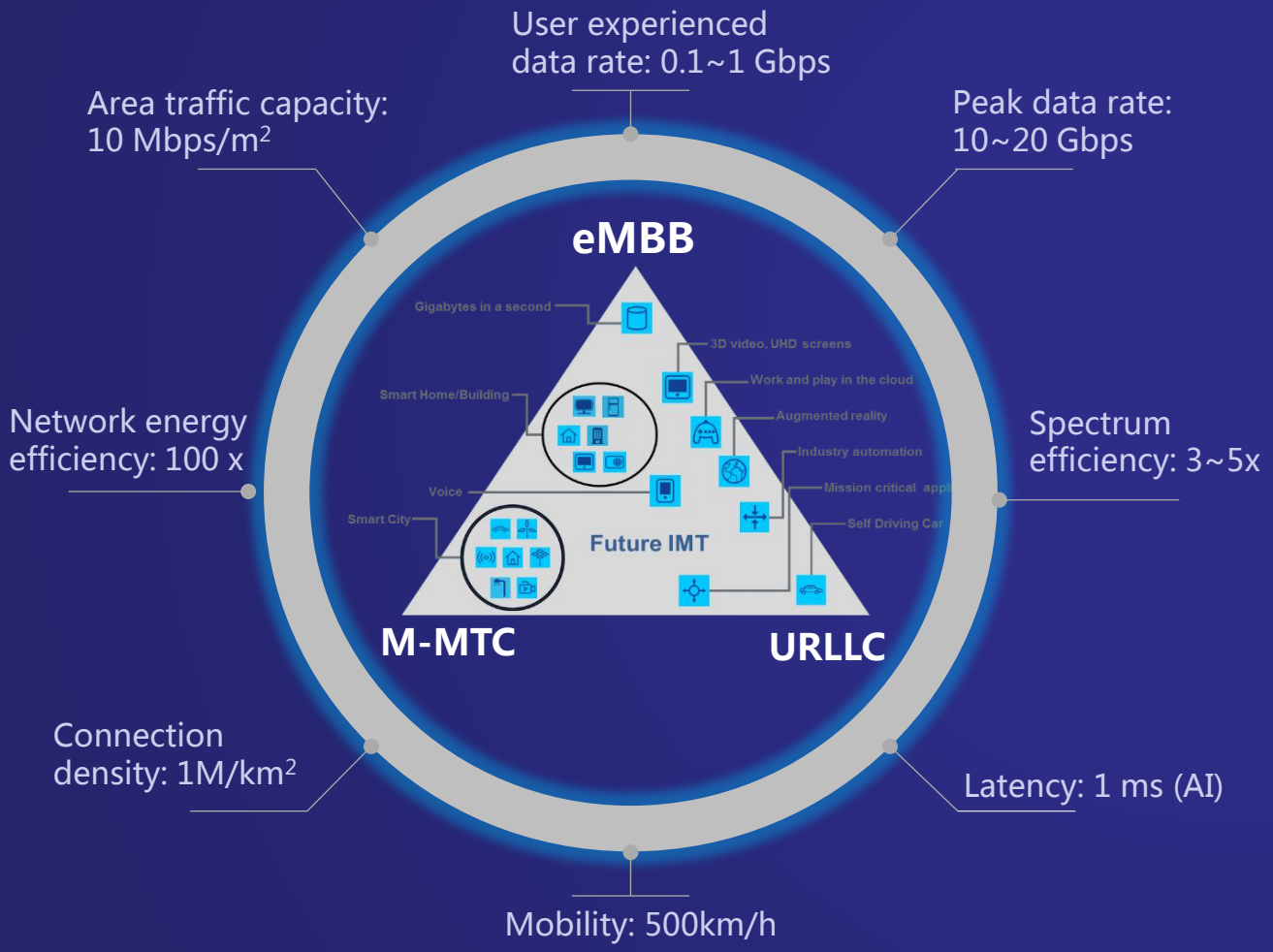
High bands for High traffic off-loading

- High priority of 24-40GHz for 5G early market
- Tuning range to enable global harmonization



5G will support aggregation of frequency bands below and above 6GHz

5G Innovative technologies



5G Innovative Technologies

Unified Framework for Radio Interface

- Flexible System Design
- New Radio Technologies
- Massive MIMO
- • •

+

Novel Network Architecture

- Network Slicing
- Mobile Edge Computing
- C/U Plane Separation
- Network Capabilities Exposure
- • •

China 5G R&D Trial Roadmap

2015 | 2016 | 2017 | 2018 | 2019 | 2020

Step 1: Key tech trial

Step 2: Tech scheme trial

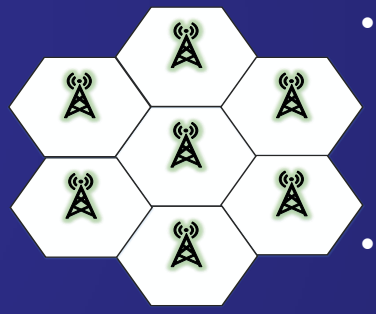
Step 3: System trial

Phase 1: Technology R&D Trial

Phase 2: Product R&D Trial

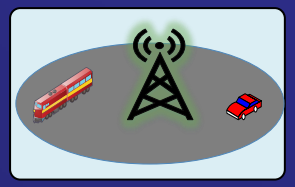
- Verify the performance of 5G key technologies
- Promote the R&D of 5G technologies
- Promote standard consensus building on 5G key technologies

- Single BS performance test to verify the performance of 5G technology schemes

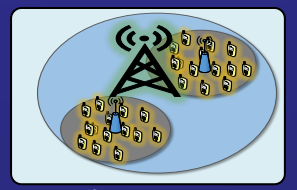


- Multi-BS performance of networking technology
- 5G typical service demo

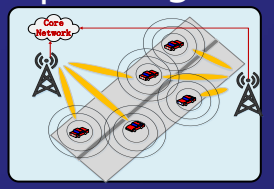
Test Scenarios for Steps 2 & 3



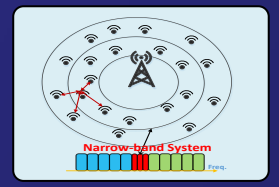
Seamless wide -area coverage



High-capacity hot-spot



Low-latency high-reliability



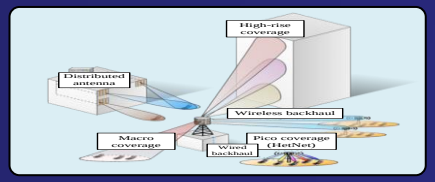
Low-power massive-connection

Step-1 of China 5G R&D Trial

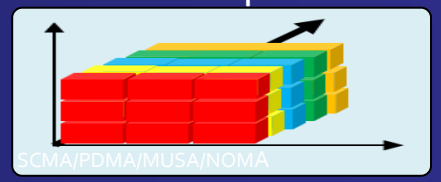
- **Objectives:** Test on 5G key enabling technologies, aim to promote the R&D progress and improve the technical performance.

Wireless Key Technologies

Massive MIMO

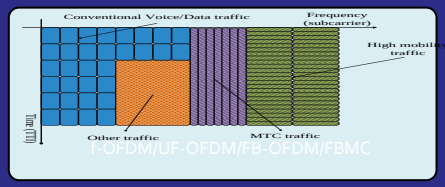


Novel Multiple Access



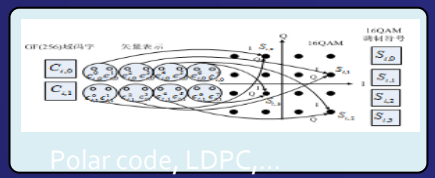
SCMA/PDMA/MUSA/NOMA

New Waveform



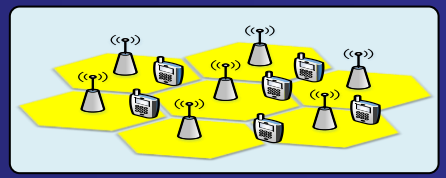
f-OFDM/UF-OFDM/FB-OFDM/FBMC

Advanced Codes

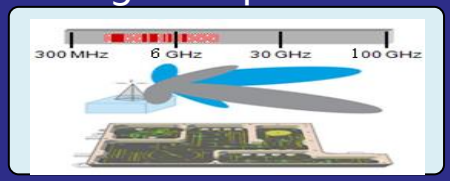


Polar code, LDPC,...

UDN

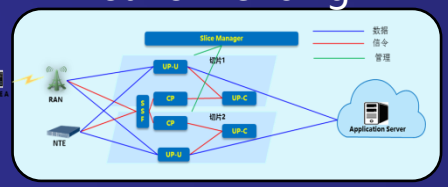


High-Freq Comm.

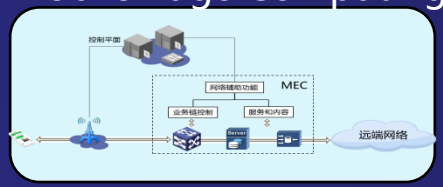


Network Key Technologies

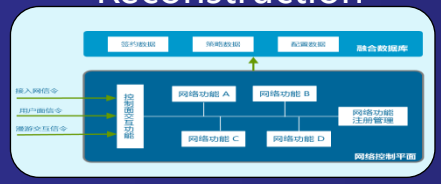
Network Slicing



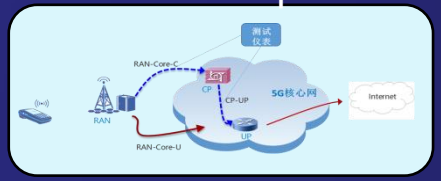
Mobile Edge Computing



Network Functions Reconstruction



Control Plane and User Plane Separation

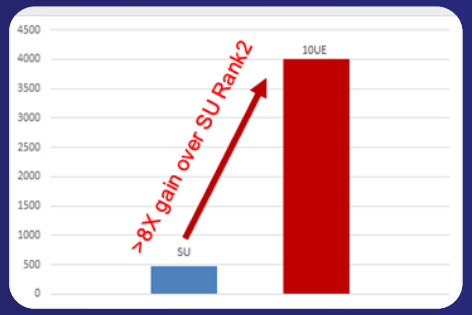


7 Enterprises

HUAWEI ERICSSON ZTE 大唐电信科技产业集团 DATANG TELECOM TECHNOLOGY & INDUSTRY GROUP NOKIA 上海贝尔 SAMSUNG intel

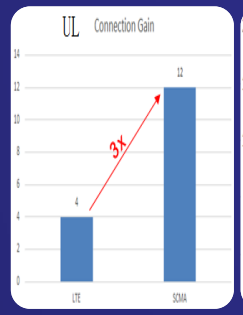
Step-1 Trial Results ：Wireless Technology

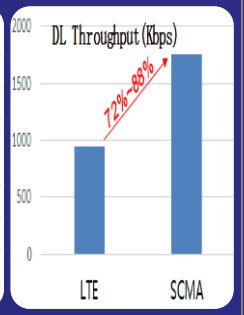
Massive MIMO



Maximum cell throughput of MU-MIMO is more than **8 times** to SU-MIMO with two streams

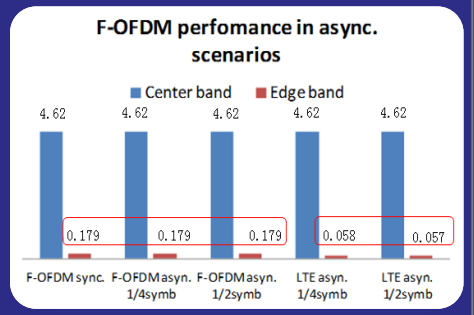
Novel Multiple Access





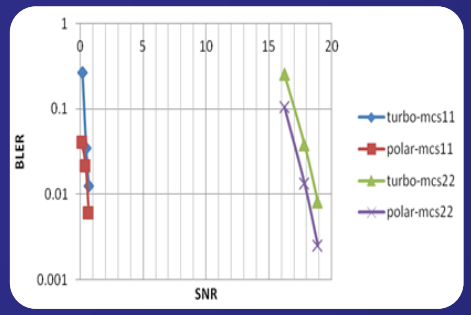
Novel multiple access can obtain **3 times** connection gain and **72% - 88%** average throughput gain

New Waveform



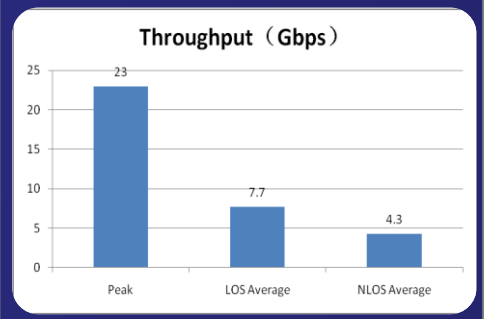
New Multi-Carrier is **more robust** than OFDM waveform in asynchronous transmission

Advanced Codes



Performance gain of polar coding could achieve **0.45 ~ 0.9 dB**

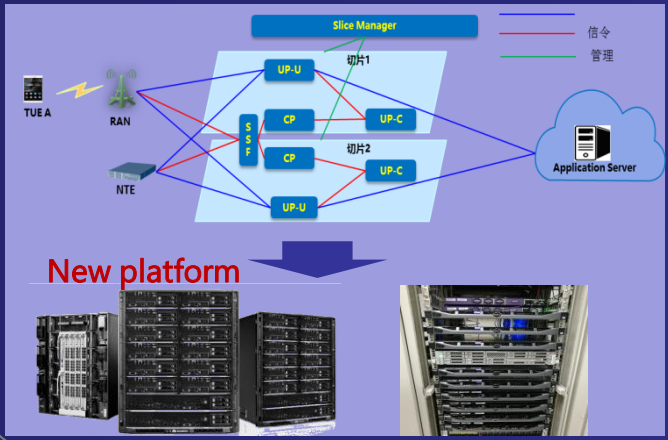
High-Freq Comm.



23Gbps of max throughput@800MHz, 2UEs. **7.7 /4.3 Gbps** of average throughput in LOS/NLOS(Indoor).

Step-1 Trial Results : Network Technology

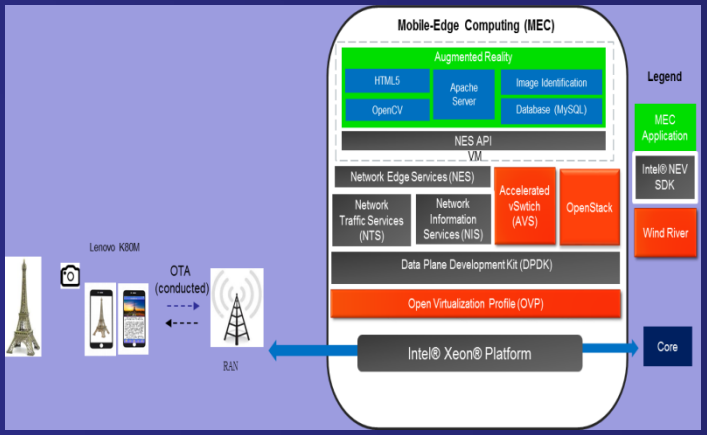
Network Slicing



- ✓ All the tested network infrastructures are deployed based on virtualization platform.
- ✓ The test result proves the feasibility of network slicing.

Mobile Edge Computing

- ✓ Many functions of MEC are verified.
- ✓ MEC can effectively reduce data latency, and improve the user experience of video services.



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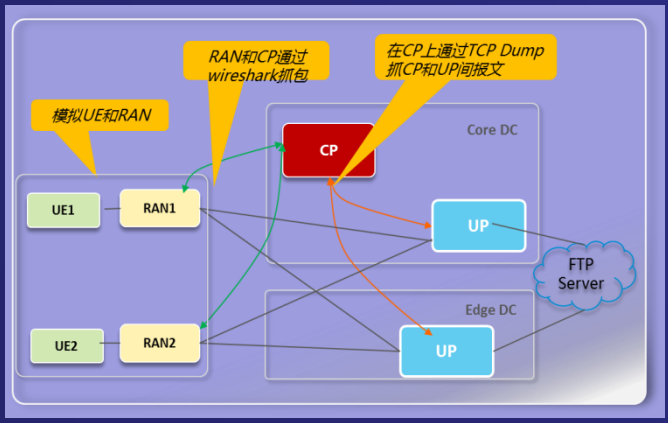
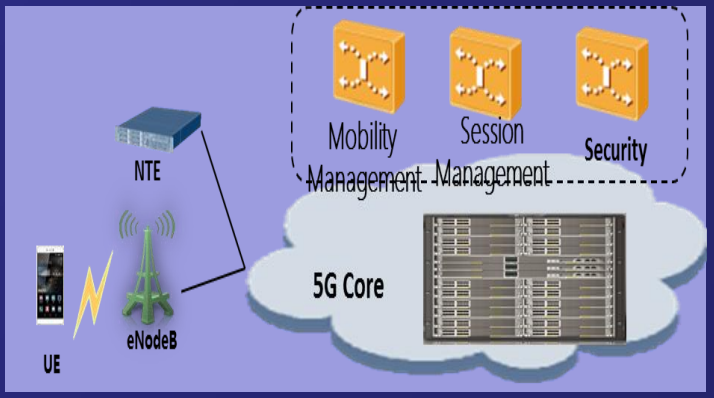


- ✓ The 5G new architecture based on control plane and user plane separation is verified, and new interfaces and protocols should be specified.

Network Function Reconstruction

- ✓ The 5G network functions can be reconstructed on-demand, and meet the diverse requirements of different scenarios .



Future Work Plan

- **Technology and Standard research**
  - Further study on 5G wireless, network & security technologies
  - 5G standardization in 3GPP and Evaluation methodology study in ITU
- **5G R&D Trial Step-2**
  - Launch China 5G R&D Trial Step-2 in the end of 2016
  - Based on unified test platform, requirements and spectrum
  - encourage the chipset and test equipment vendors to participate
- **Spectrum research**
  - Further study on 5G low, medium and high frequency bands
  - Conduct 5G Compatibility Trial on frequency

Joint research and trial will be effective ways to promote the global unified 5G standards and harmonized spectrum

Thanks for your attention

Nov. 9 , 2016