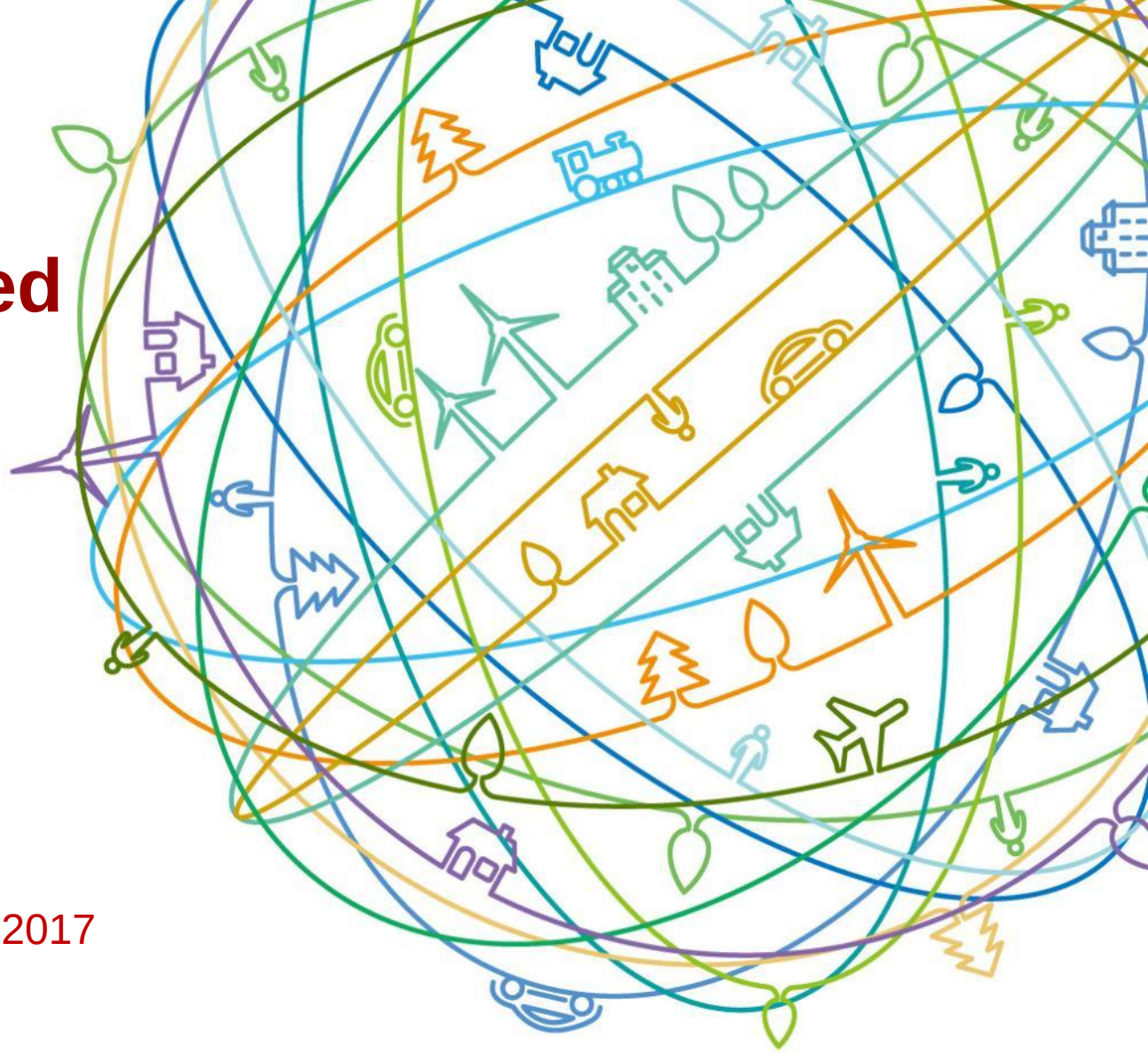
The Necessity of EMC Radiated Emission Requirement above 6GHz from the Development of ICT Equipment in future 5G implementations



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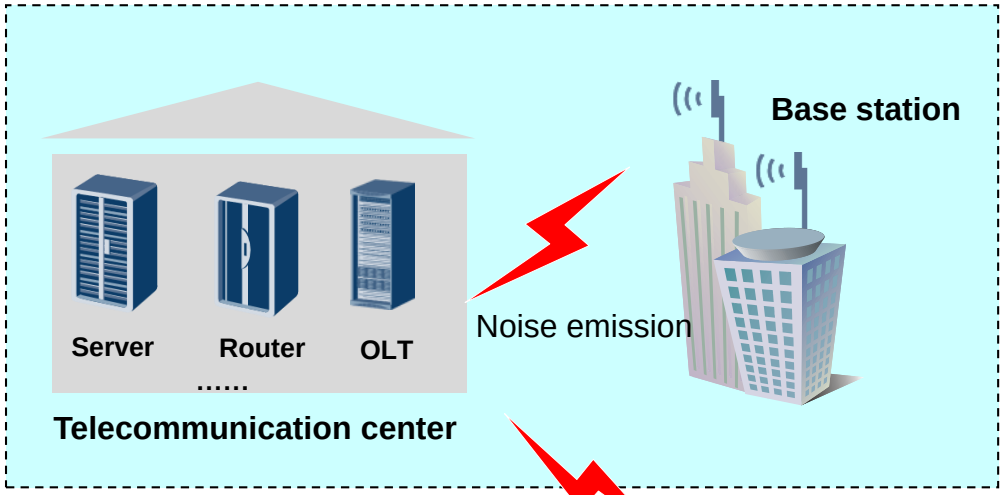
HUAWEI

Content

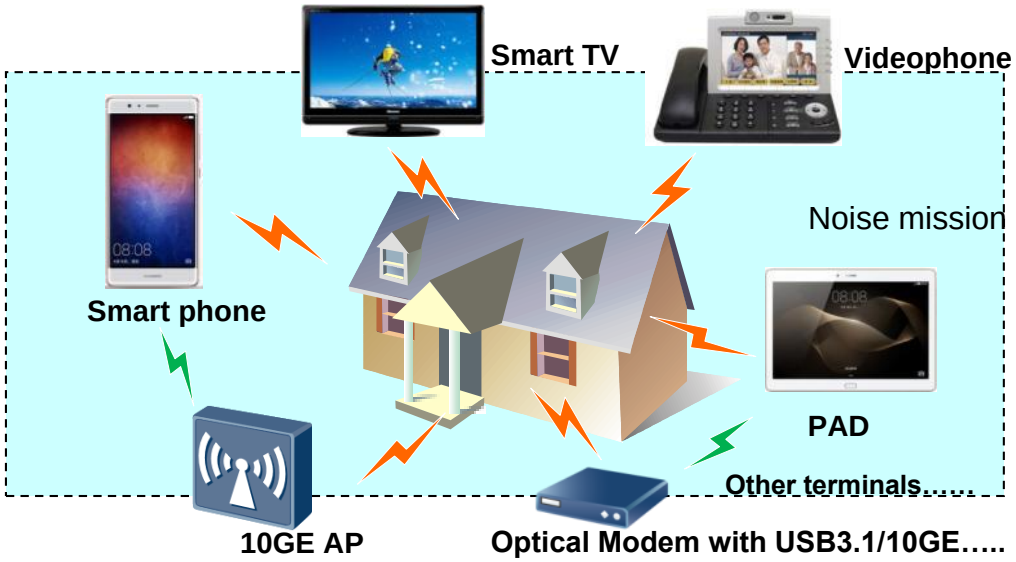
- High-speed data rate trend with Worse EM Environment
- New High frequency application: 5G mobile system and Full Connection World
- EMI Requirement Standard Suggestion

Disturbance or Interference case models in the communication systems

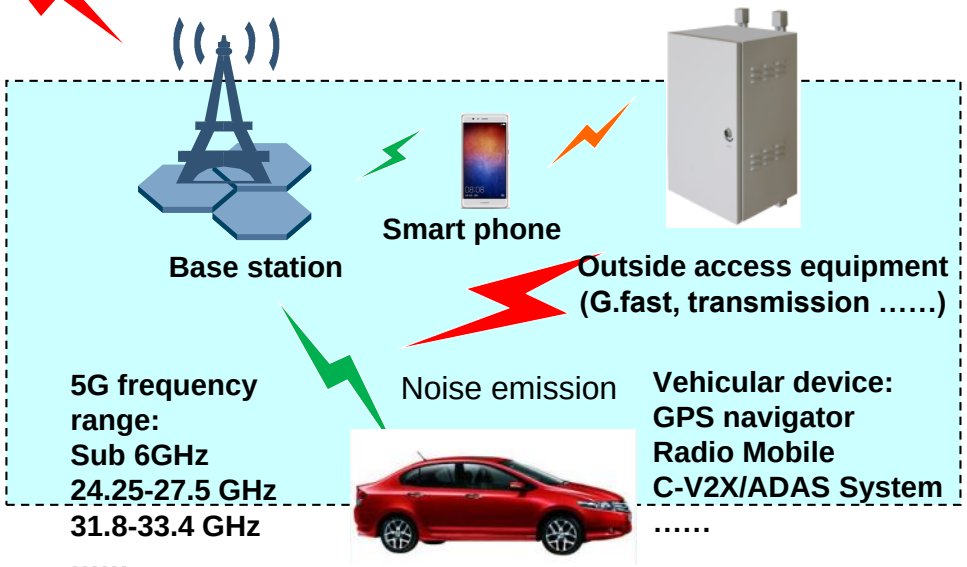


Telecommunication/DC Centers disturb to Base Station system

Terminals disturb to wireless system in home



Outside plants disturb to vehicle's equipment



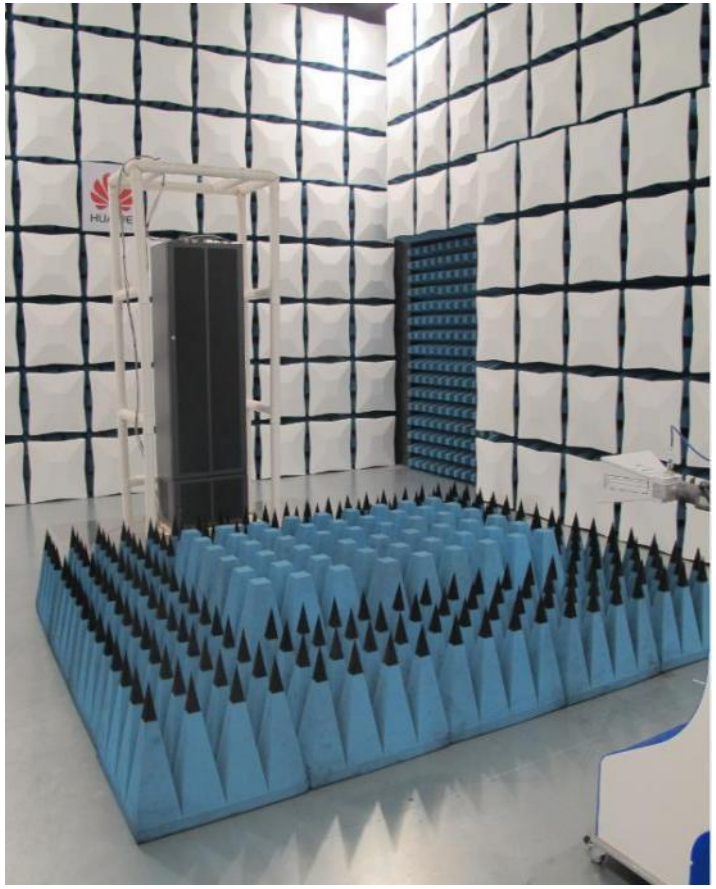
Note:

:wireless communication

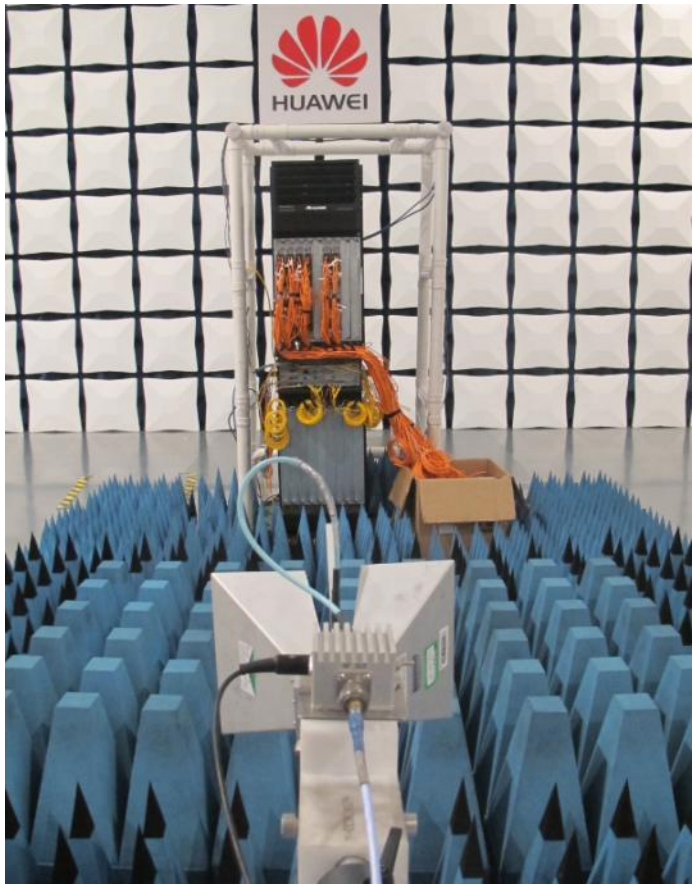
:disturbance signal

In the coming IMT2020-5G future, with more and more high speed network equipment and terminal used(Access, switch, sever, router…) , also more and more high frequency wireless equipments(5G, C-V2X, IOT, WiFi,…) used, if without EMI management, it is definite to see more and more interference among the systems.

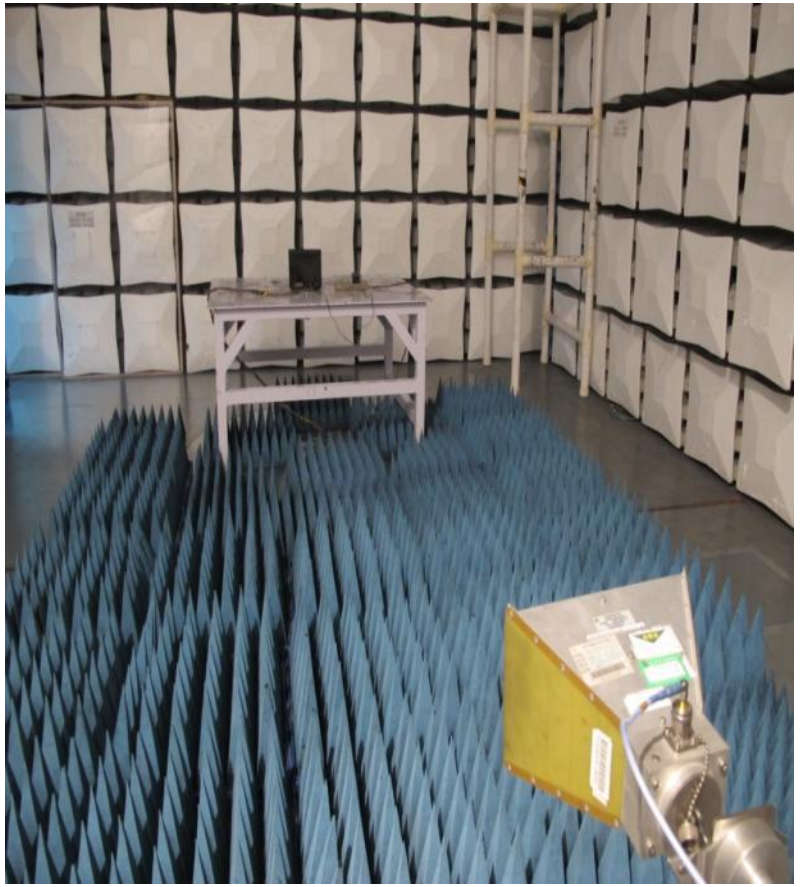
High frequency radiated test setup for high-speed data rate Equipment



Router On EMI Test



DC Switch On EMI Test

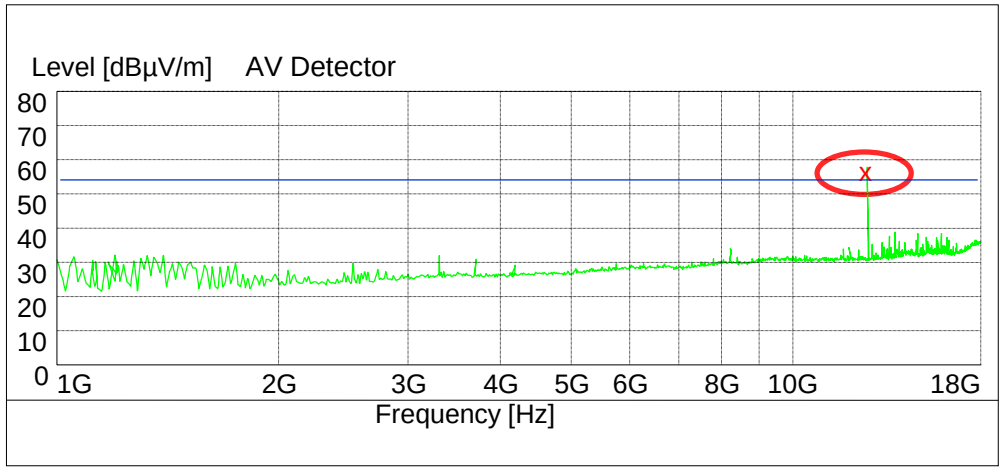


ONT（Optical network Terminal） On EMI Test

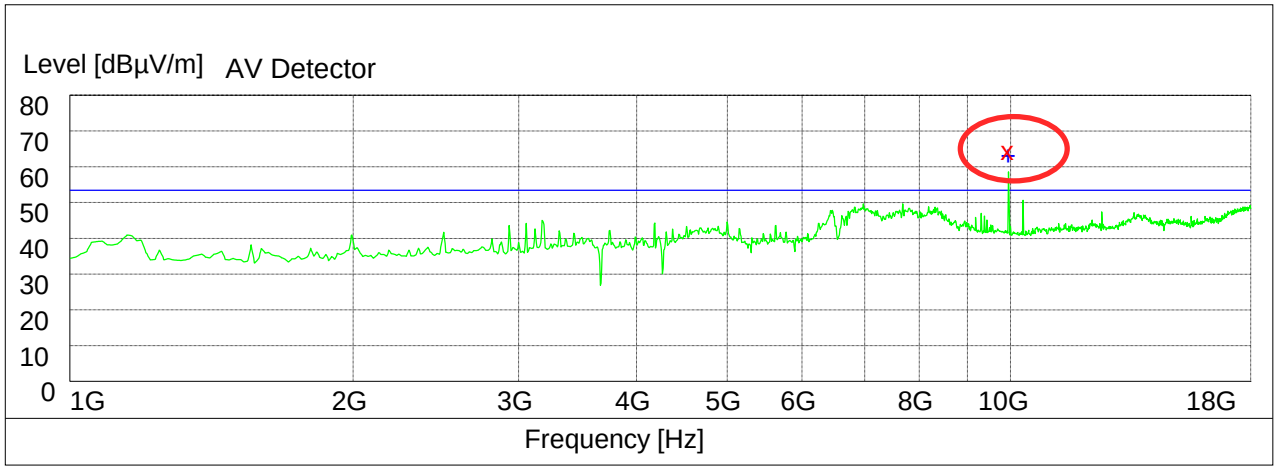
Examples of High data rate Product's Radiated emission Test Result

Global Compliance & Testing Center GCTC

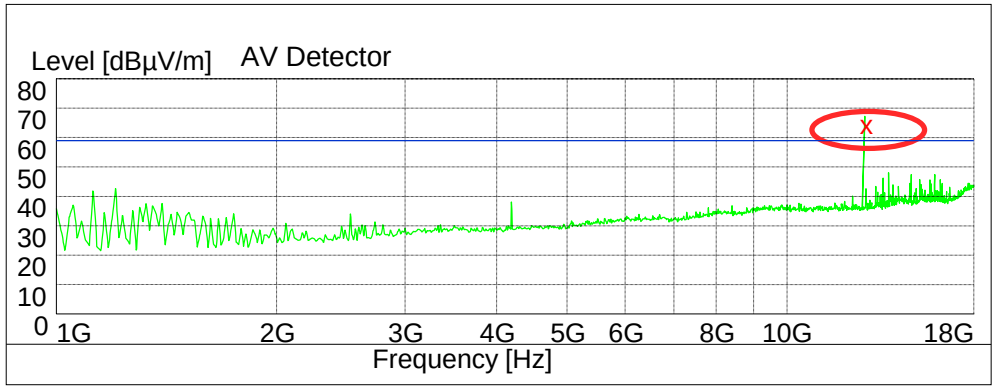
Homework router 's test result: 12.5GHz



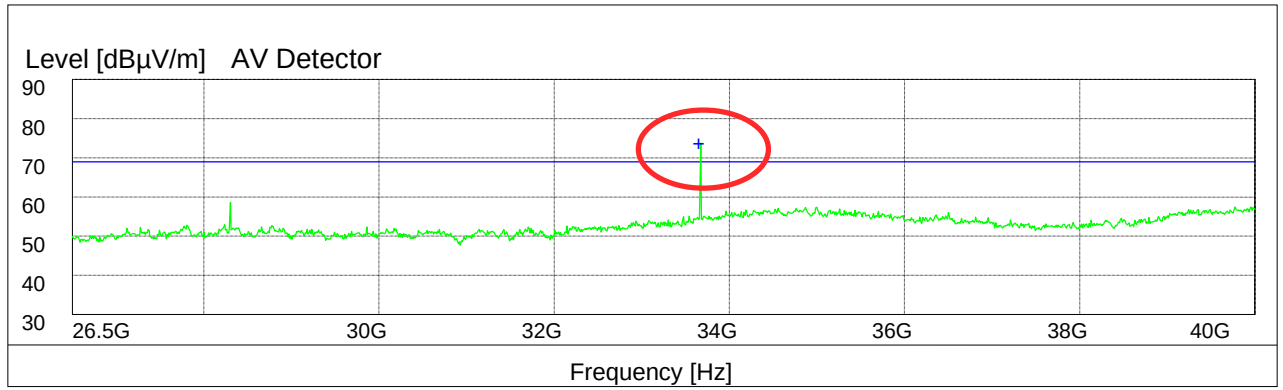
ONT terminal's test result: 10GHz



LAN Switch's test result: 12.6GHz

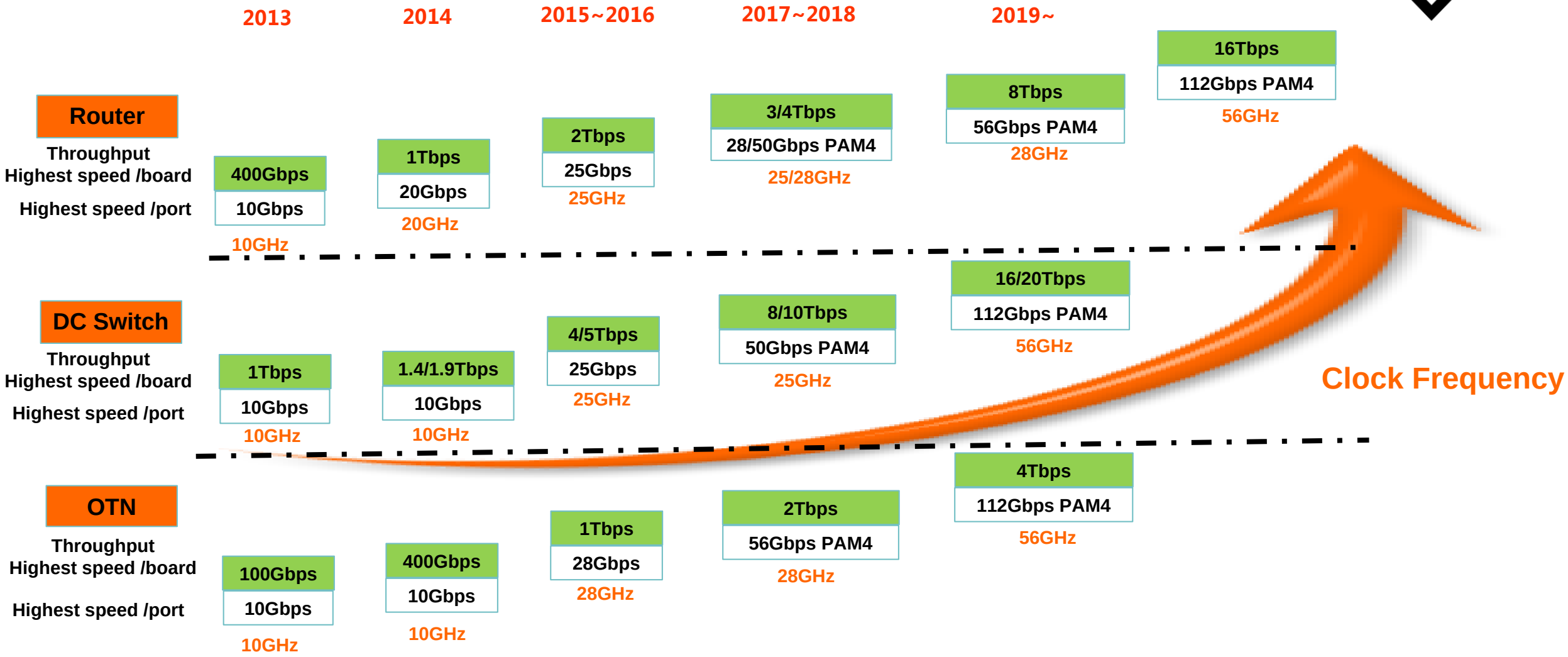


Core Router's test result: 33GHz



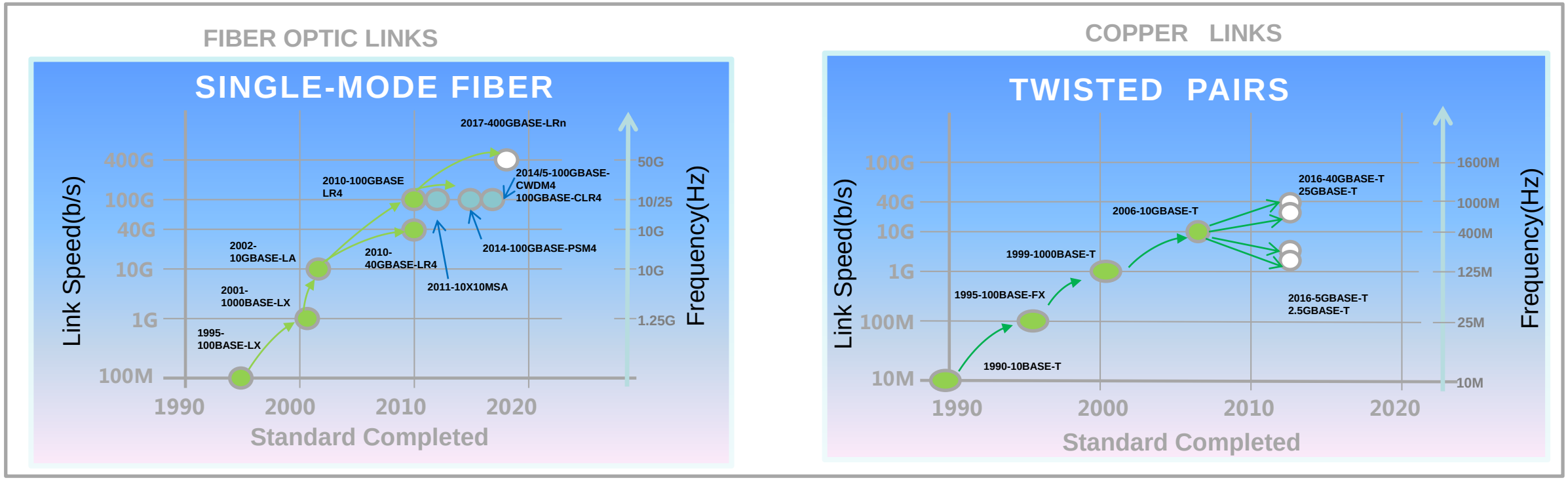
These emission from high speed equipments are tested as examples just extending the test requirement of CISPR32 from 6GHz to 40GHz with the same limit under 6GHz and using the same site and test facilities.

High Speed Roadmap of some kinds of communication products



The communication network equipment's interface rate evolution follows: 6G-10G-25G-50G-120Gbps. Even at the same time, the speed of PC , pad, or other terminals' CPU and interface such as USB 3.0 also raises very fast.

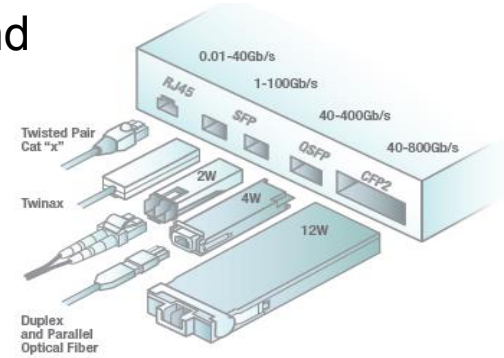
Ethernet Port‘s Speed and Work Clock Frequency ‘s Roadmap



Product’s rate become more and more fast, at the same time ,they work using higher and higher clock frequency. Here is the example of Ethernet port’s rate and clock frequency.

For twisted pair: 10M-25M-125M-400M-1000M-1.2GHz

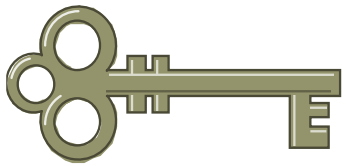
For fiber : 1.25G-10G-25G-50GHz



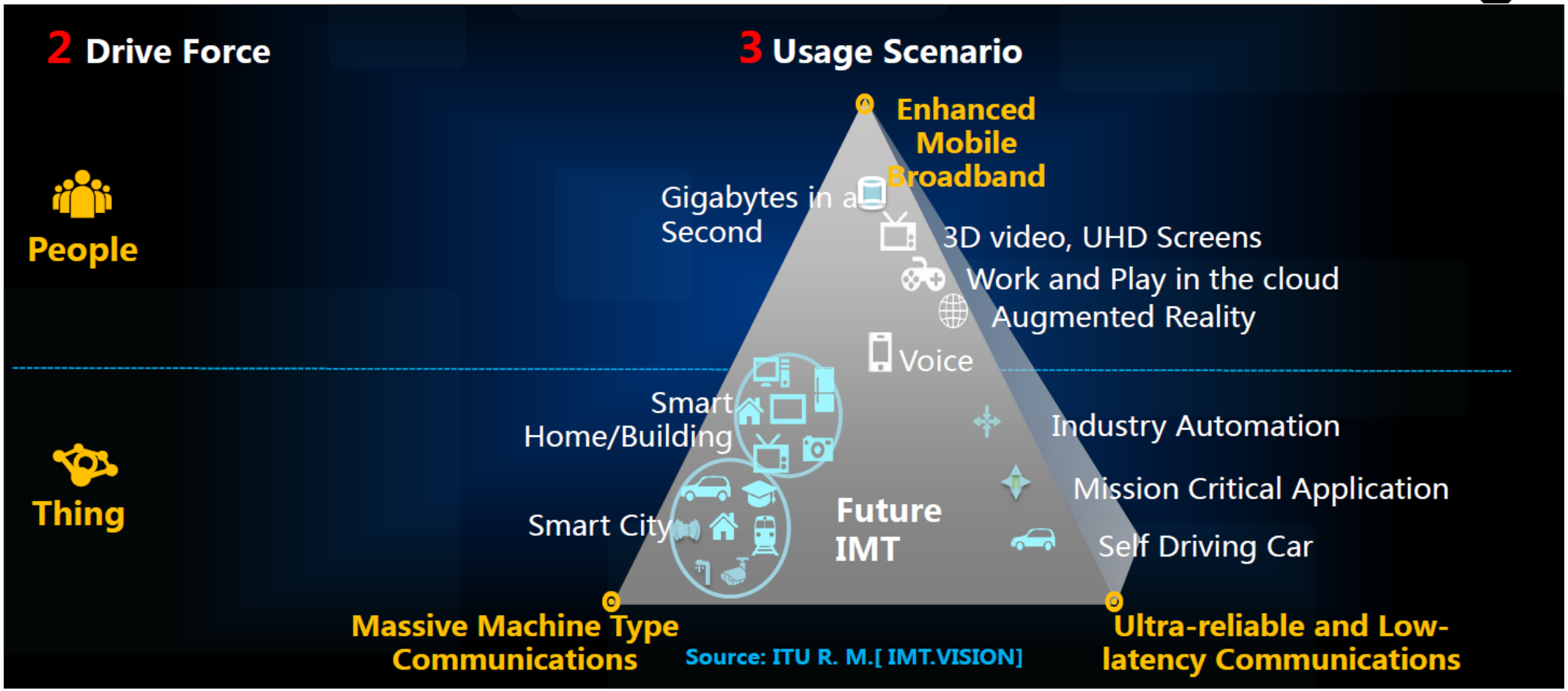
EMC Point of view for high-speed data rate equipment

◆ More and more high data rate equipments will be released in the coming years , some of them will up to 56Gbps per port and even more. The clock frequency also will up to 56GHz.

◆High frequency spectrum emission/noise will be emitted from the enclosure , cables, modules, and PCB layout of those high speed equipments and the risk of interference in such high frequency will become serious definitely.

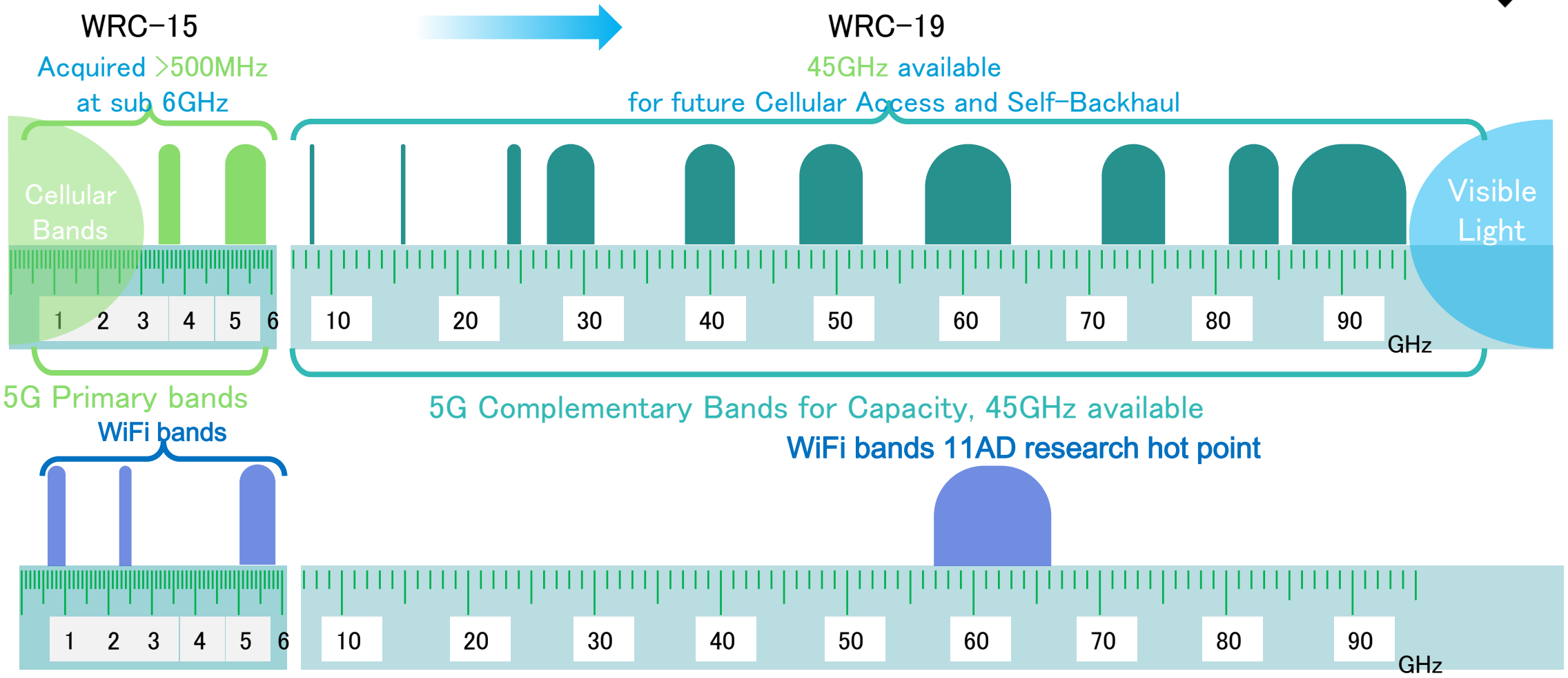


5G's Drive Force and Usage Scenario(ITU-R)



5G is coming with 3 usage scenario in more frequency band: Sub 6GHz and over 6GHz are both used in different scenario.

5G Mobile communication spectrum distribution



5G is a Full Spectrum Access, Sub 6GHz research focus on 700MHz~5GHz,high frequency focus on Group 20,30, 40, 50 and E/V band. The WiFi's frequency ranges, also have many overlap with the 5G 's ranges in different countries.

EMC Point of view for new applications

◆ High frequencies emission from high speed equipments will influence the performance of radio service system. The probability of risk will be high in the future.

◆Foreseeable sufferers maybe 5G system , or high frequency WiFi system or IOT system.

◆But the EMI emission requirement above 6GHz in CISPR or ETSI or CENELEC is not regulated.

Radiation Emission requirement above 6GHz standard status

Standard	Requirement with frequency range	Test Site Validation method	Test Site Type	Test procedure	Antenna Calibration method
CISPR22/32	**Only up to 6 GHz**	**Only up to 18 GHz** CISPR 16-1-4	Below 1GHz：OATS/SAC/FAR Over 1GHz：FSOATS/FAR	**Only up to 18 GHz** CISPR 16-2-3	**Only up to 18 GHz** CISPR 16-1-6
FCC part15	Up to 40 GHz	Up to 40 GHz ANSI C63.4	Below 1GHz：OATS/SAC Over 1GHz：FSOATS/FAR	Up to 40 GHz ANSI C63.4	Up to 40 GHz ANSI C63.5
ICES 003	Up to 40 GHz	Up to 40 GHz ANSI C63.4 CAN/CSA CISPR22	Below 1GHz：OATS/SAC Over 1GHz：FSOATS/FAR	Up to 40 GHz ANSI C63.4 CAN/CSA CISPR22	Up to 40 GHz ANSI C63.5

Above 6GHz, radiated emission requirement is necessary if we want to face the EMI challenge for future high speed data rate equipment and application.

Latest Action of CISPR

CIPSR/S decided at its 2017 meeting in Vladivostok that CISPR will start this above 6GHz requirement task using generic approach. CISPR/A will focus on test site , test method , test procedure and test facilities including calibration, and CISPR/H will focus on test limits .

The justification was that it is clear today that a number of frequency band above 6GHz will be used by the 5G mobile system or other wireless systems all over the world in the future. Therefore , it would not be advisable to wait to develop RF emission measurement methods and limits until the interference cases are reported.

Suggestion

To match the future application such 5G mobile system, relative organizations such as CISPR , ITU , ETSI should unite and collaborate to consider the high frequency radiated emission requirement above 6GHz at least up to 40GHz and start the study such as emission limit , test site and test facilities. It is best to raise the requirement parallel or in advance with the wireless system released to protect communication.

✓Extend intrinsic limit of CISPR32 now:

AV Detector	class A			class B		
	1-3GHz	3-6GHz	6-40GHz	1-3GHz	3-6GHz	6-40GHz
CISPR 32	56	60	60	50	54	54

✓Reference the FCC's Limit line;

AV	class A			class B		
	1-3GHz	3-6GHz	6-40GHz	1-3GHz	3-6GHz	6-40GHz
FCC Part15	59.5	59.5	59.5	53.9	53.9	53.9
CISPR 32	56	60	59.5	50	54	53.9

✓Start a new research

Thank you

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