5G Update & MM-Wave RF/Signaling Test Challenges

GCF 5G MENA Workshop, Dubai

Vikas Chauhan
Business Development Manager,
Anritsu EMEA

November 2018

Anritsu
envision : ensure

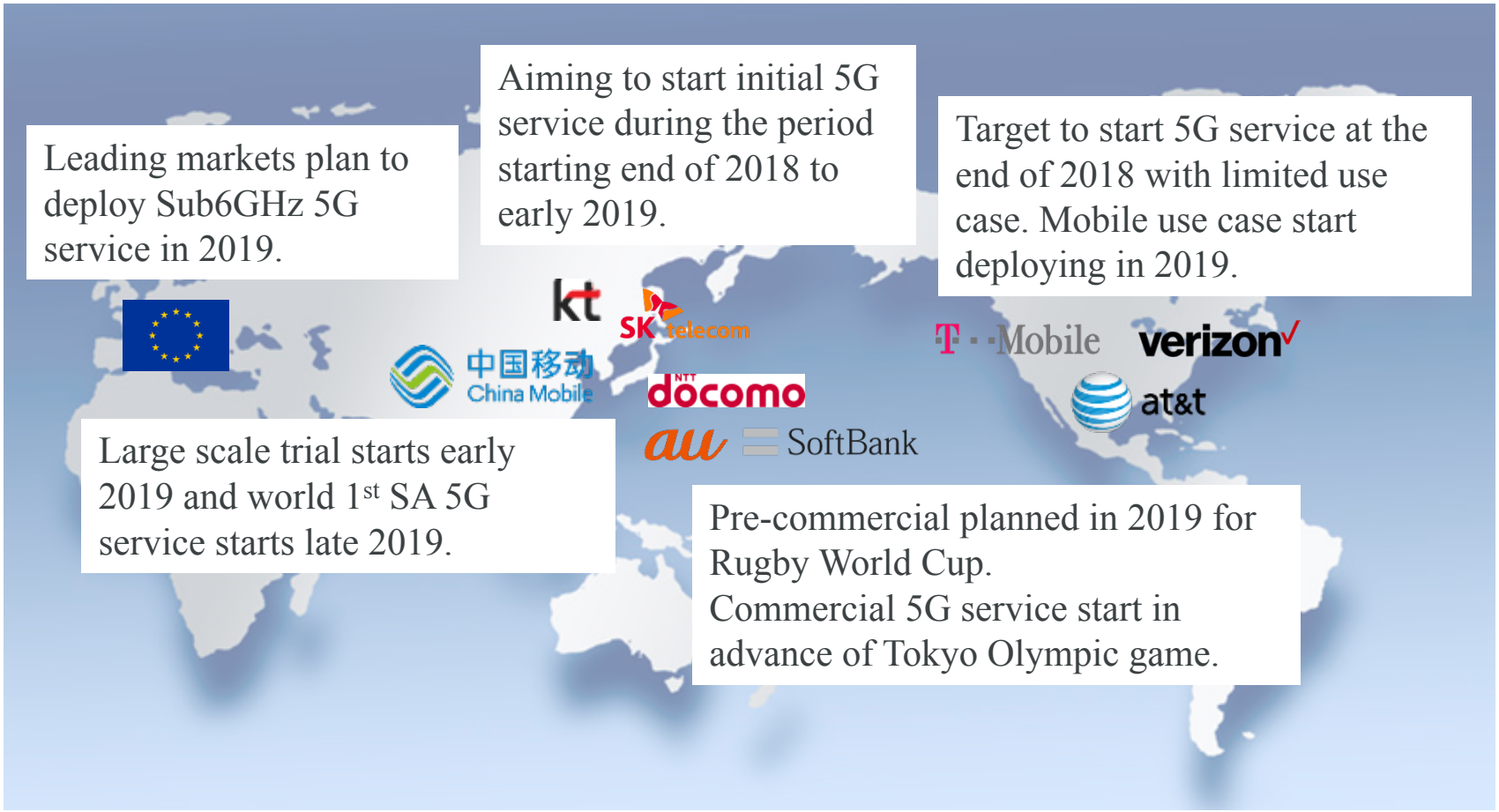
Contents

1. 5G Update
2. 5G device test challenges
3. Test Solutions Overview

Contents

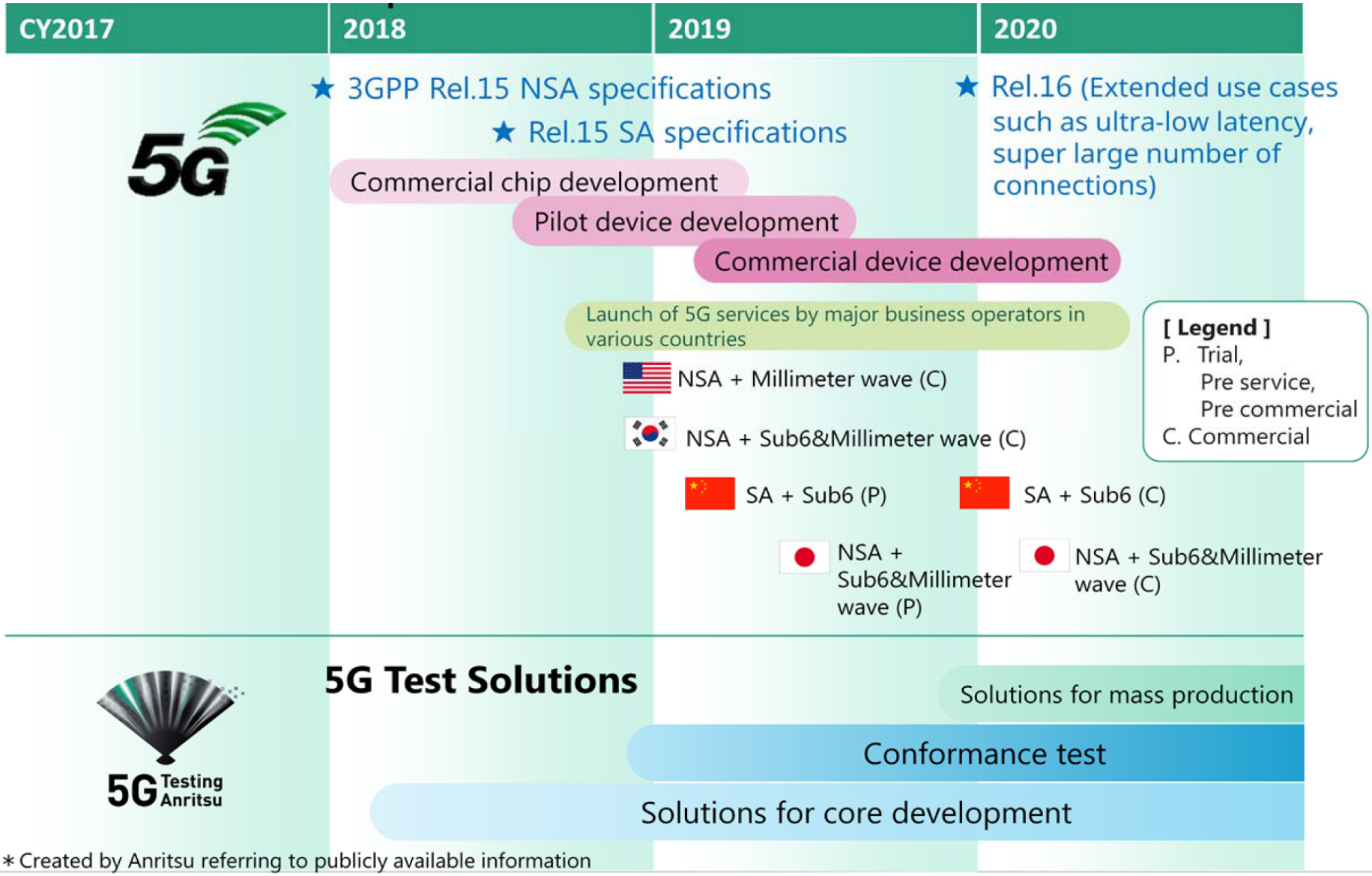
1. 5G Update
2. 5G device test challenges
3. Test Solutions Overview

Industry is Accelerating 5G Deployment



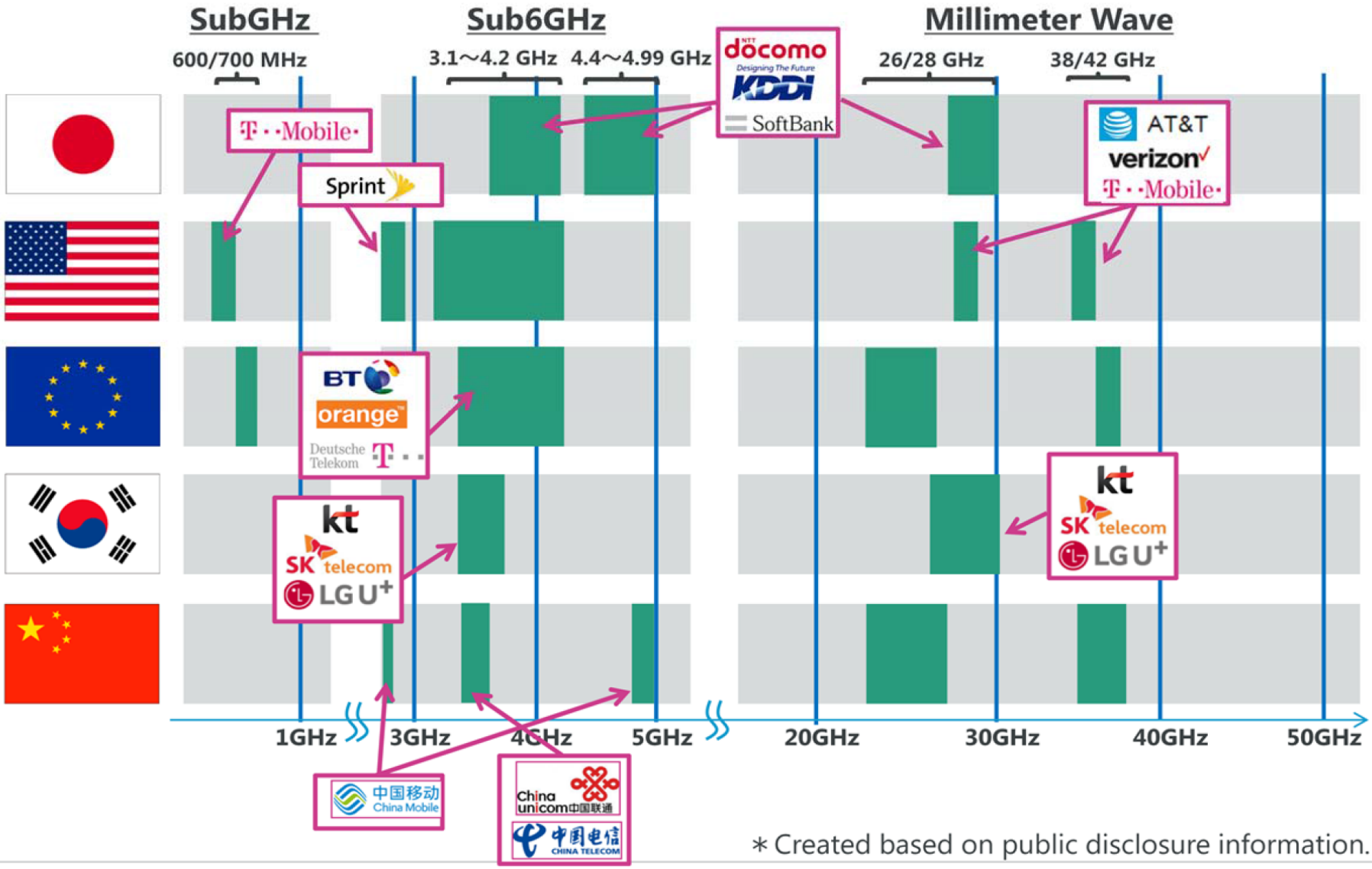
Anritsu is committed to contribute to successful commercial launch and deployment of 5G service in the leading markets.

Roadmap of 5G



∗ Created by Anritsu referring to publicly available information

5G Spectrum allocation globally



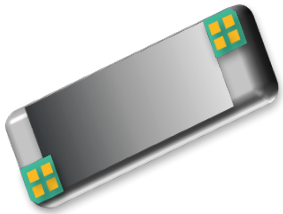
＊Created based on public disclosure information.

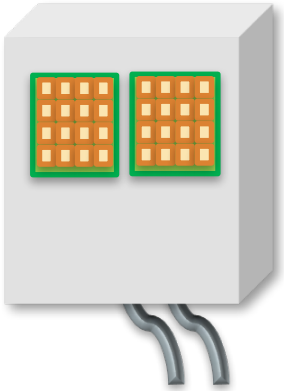
Contents

1. 5G Update
2. 5G device test challenges
3. Test Solutions Overview

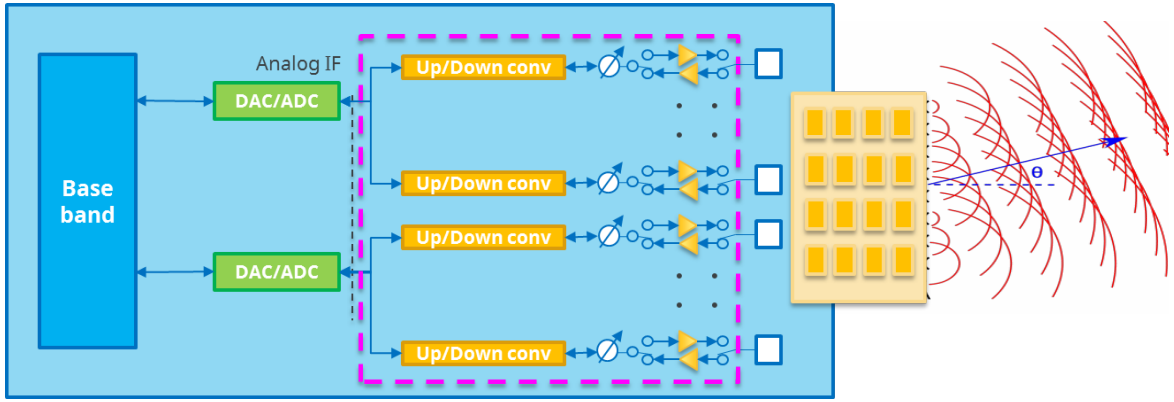
Changes in Smartphone/UE device

- mmWave and Sub-6GHz
- Broadband modulation
- 5G NR (New Radio)
- Massive MIMO



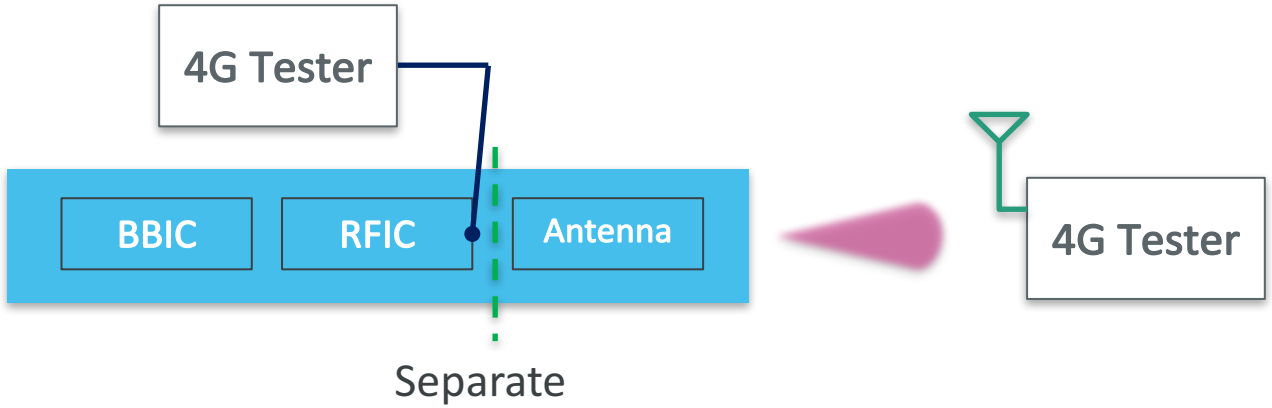


- Multiple Frequency bands
- Multiple RATs
- Multiple TRX Chains
- Massive Beamforming
- No RF Test Port

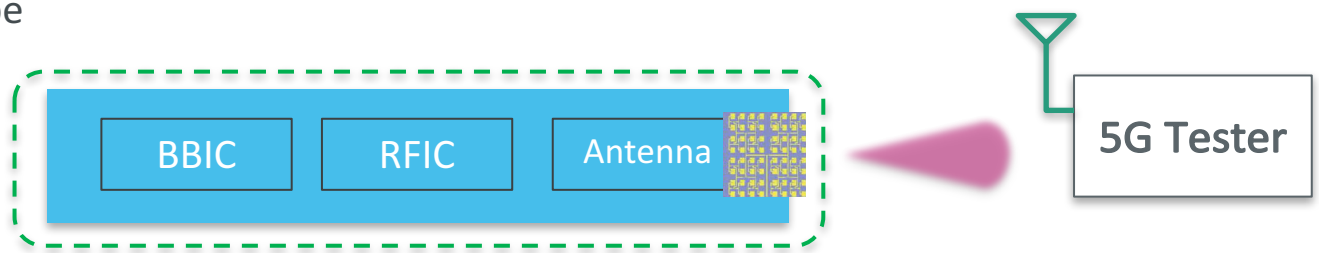


mmWave test challenges

UE can be connected by cable



UE with antenna shall be tested OTA



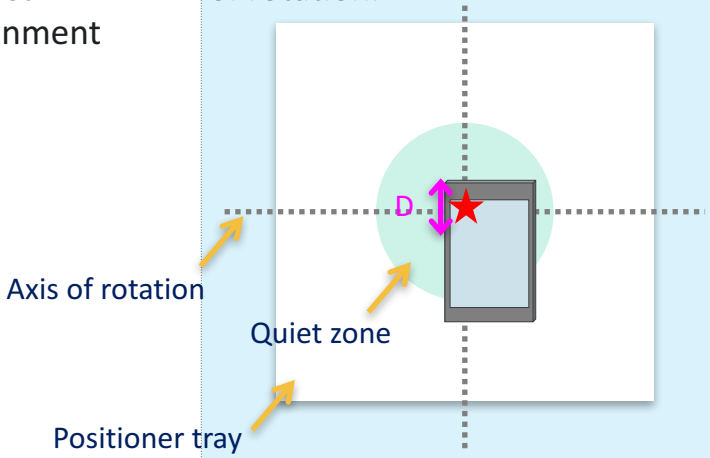
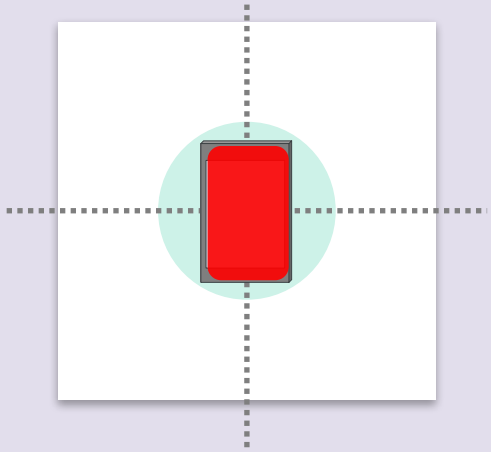
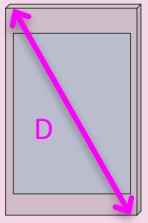
- Today, transceiver and antenna are separately evaluated.
- In 5G, due to the introduction of high frequency and Massive MIMO, transceiver and antenna will be tightly integrated and make it difficult to evaluate separately.
- Industry is expecting to perform evaluations over the air

Key Challenges for 5G device testing

Industry requires OTA-based new methodology to replace conventional test and measurement approaches.

- Modulation
  - Expand to 400MHz BW per carrier compared with 20MHz for LTE
  - Achieve toward 8 Component Carriers in mmWave, 2 Component carriers in Sub 6GHz
  - Both Downlink and Uplink adopt based on OFDM modulation
  - Expand radio of transmission bandwidth and channel width larger than 90%
  - Adopt single carrier (DFT-s-OFDM) focus on coverage for UL
- Data throughput
  - Initial target is 5Gbps by average, 10Gbps by peak rate
  - Achieve beamforming by using massive MIMO
  - End-to-End test by high data throughput and low latency
- Connection with DUT
  - OTA environment is required for mmWave testing
  - Evaluation for beamforming/searching/tracking function test
  - Signalling test over the air by mobility/beam switching
- RF performance test over the Air
  - Frequency accuracy, Max/Min Power, EVM, Spurious Emission RRM, Demodulation, Blocking
  - Channel model: Geometry-based stochastic channel mode, three-dimensional channel model, large antenna array, large bandwidth
- Antenna characterization and calibration
  - TRP, EIRP, EIS, Directivity, beam width
  - Phase/gain calibration for array antenna element

OTA Testing Methods: White box / Gray box / Black box

	White Box ✔	Gray Box ✔	Black Box
Antenna size	Known	Known	Unknown
Antenna position	Known	Unknown	Unknown
Setting image for OTA test environment	Put active antenna on the center of rotation.  ★ : activate antenna D : antenna size (= Actual antenna length)	Put active antenna in the Quiet zone.  ■ : antenna allocated area D : antenna size (= Actual antenna length)	 D : antenna size (= UE diagonal length)

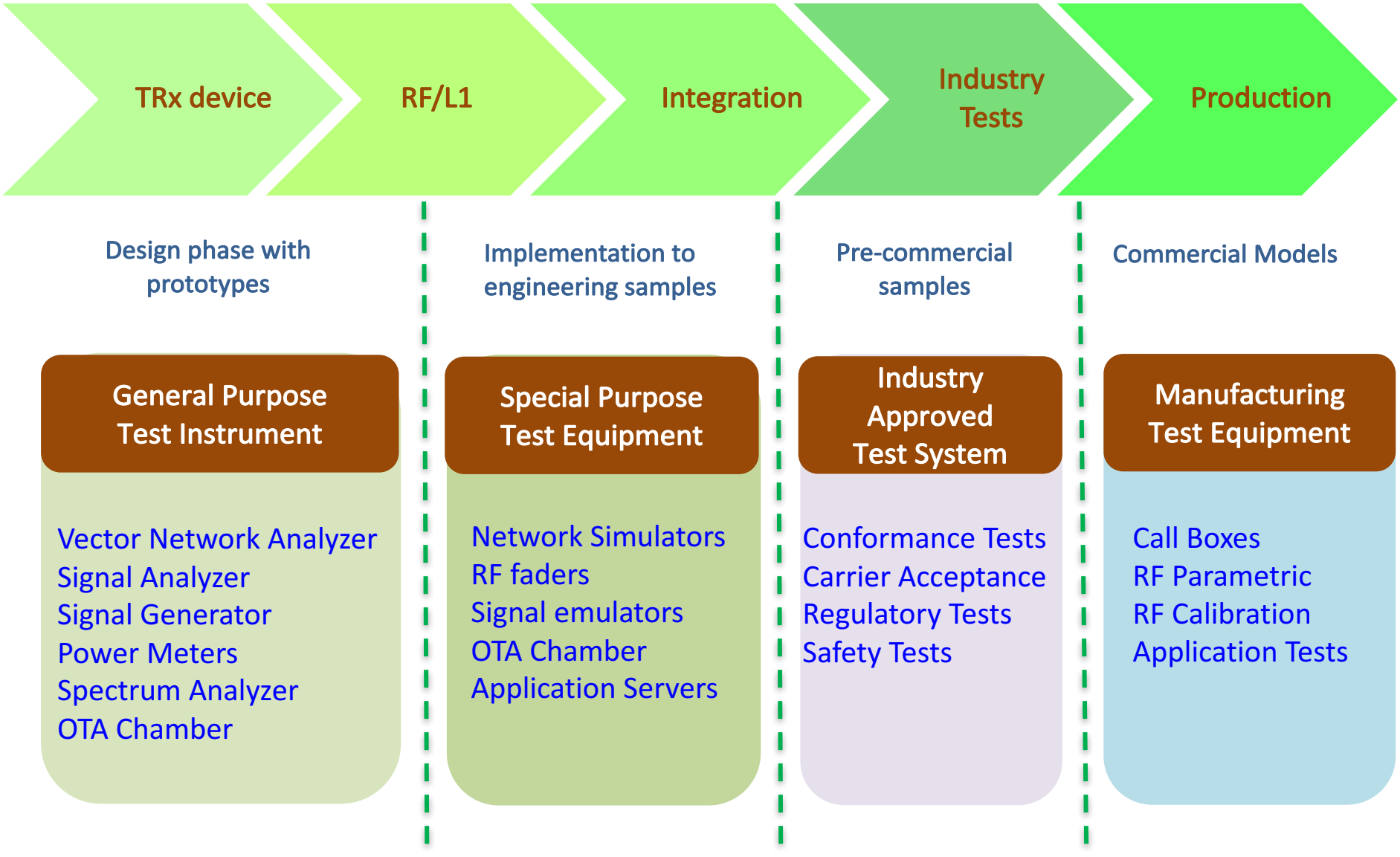
3GPP(under discussion)
- D ≦5 cm
- UE size ≦ 15 cm

Gray box topics at 3GPP:
At the 3GPP RAN 4 meeting in January,
If the vendor declares that the antenna array size is 5 cm or less,
It was agreed that the antenna size D can be measured as FFM with less than 5 cm.

Contents

1. 5G Update
2. 5G device test challenges
3. Test Solutions Overview

Key Test Stages and Typical Test Solutions



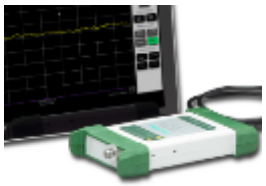
5G Test Solutions Portfolio

Components Transmitter → Chipset Device R&D → Certification Acceptance → Production

Vector Network Analyzer

Signal Analyzer

Spectrum Master



5G NR Device Protocol & RF Test

NSA-NR LTE Anchor

OTA Chamber

RF Conformance

Protocol Conformance Carrier Acceptance

Production Test

5G

Anritsu

envision : ensure