

3GPP TSG-RAN5 Meeting #81

R5-187625

Spokane, United States, 12th Nov 2018 - 16th Nov 2018

Uncover the Veil of 5G S-Module

CMCC, Sprint

What is 5G S-Module?

“5G Superior Universal Module”

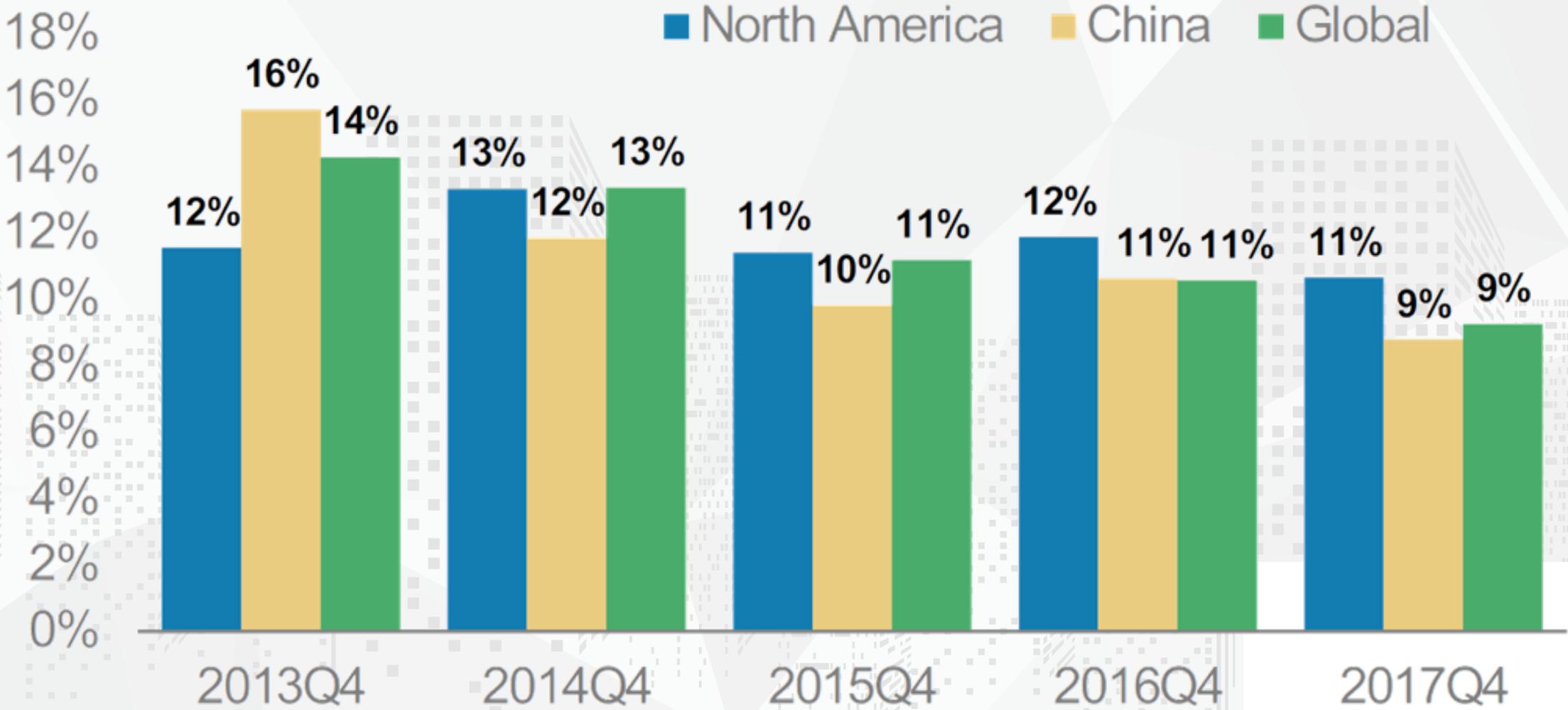
- Size
- Interface
- Performance (MOP, Power consumption, ...)
- Form Factor Applicability
-

To facilitate 5G's deep integration with the verticals and the mature of 5G S-Module through **standardization, product, application** and etc.

Why we need 5G S-Module?

Smartphone replacement cycles elongated in 2017Q4

Smartphone Industry Sales as % of Install Base (3-Yr)



Source: IDC, Morgan Stanley Research

Unlimited Communication Plans have been offered



How to stand to **Survive?**

$$\text{Revenue} \uparrow = \text{ARPU} * \text{Number of Users} \uparrow$$

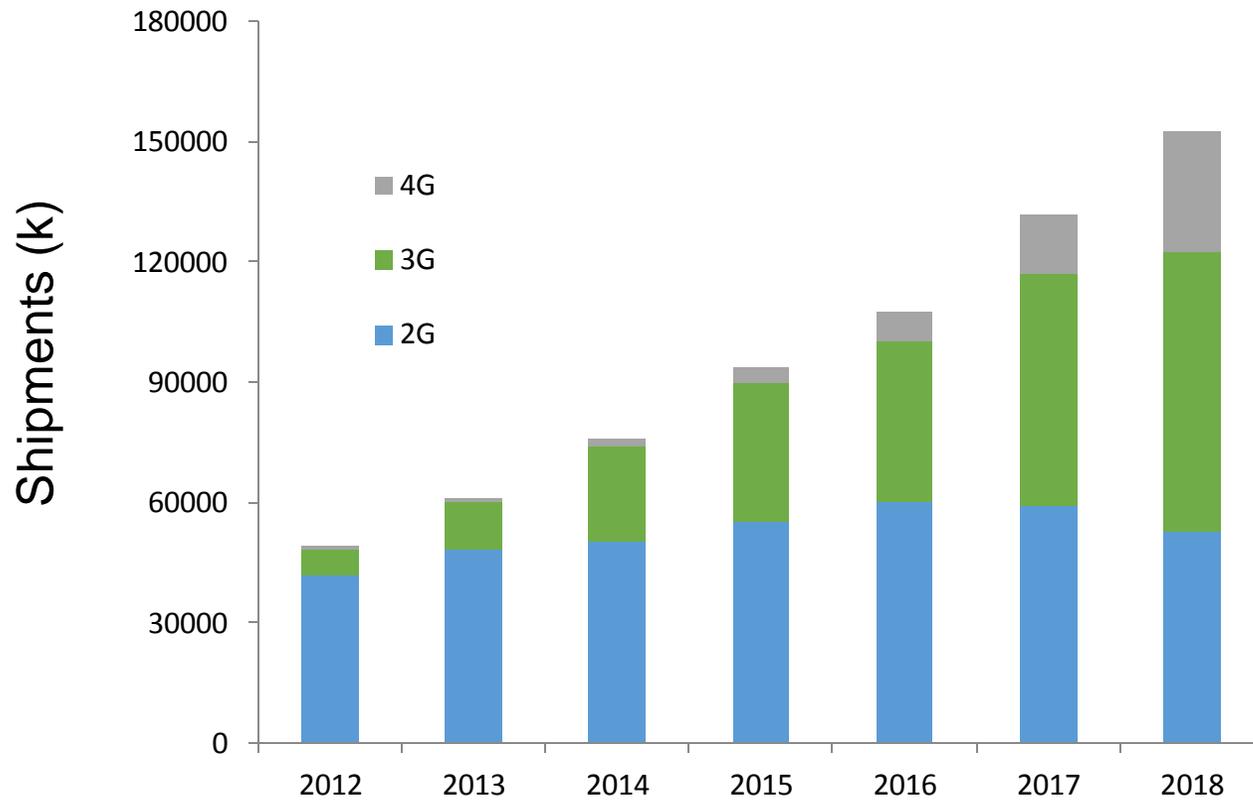
⋮

Connections

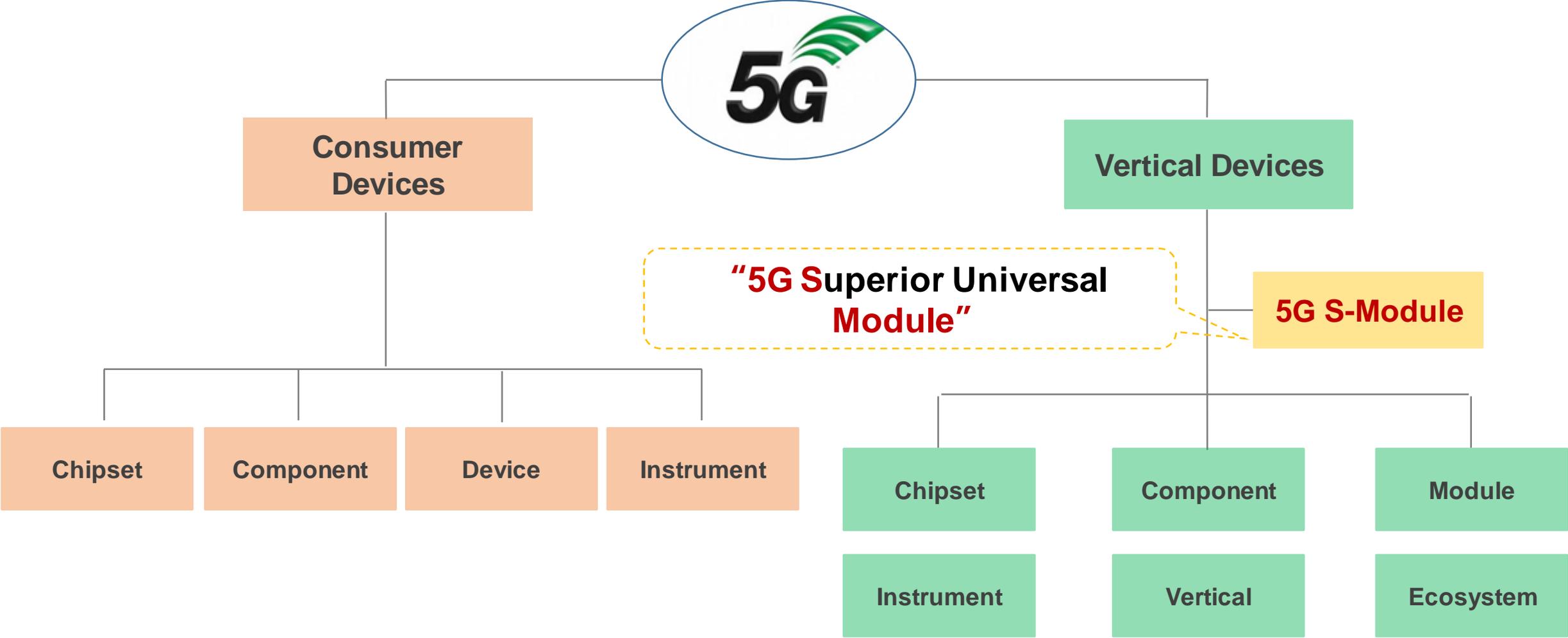
*ARPU: Average Revenue Per User

Mid-high Speed Cellular M2M Module Shipments Keep Growing

2012-2018 Global Cellular M2M Module Market



5G Devices' Two Development Paths



The background features a complex geometric pattern of overlapping triangles in various shades of light gray and white. Superimposed on this is a faint, stylized cityscape composed of vertical lines and small squares, suggesting a grid or architectural structure. The overall aesthetic is clean, modern, and technical.

How to pave the way to 5G S-Module?

GTI 5G S-Module Task



2018 Shanghai GTI SUMMIT “GTI 5G S-Module Task”

5G S-Module will **unify size, interface, form factor applicability and etc.** To facilitate 5G’s deep integration with the verticals and the mature of 5G S-Module through **standardization, product, application** and etc.



#22 GTIWS

2018.6.27

“GTI5G S-Module Initiative” has been kicked off

#23 GTIWS

2018.11



GTI Report on Vertical Requirements for 5G S-Module and Device



GTI5G S-Module White Paper (v 1.0)

#26 GTIWS

2019.11

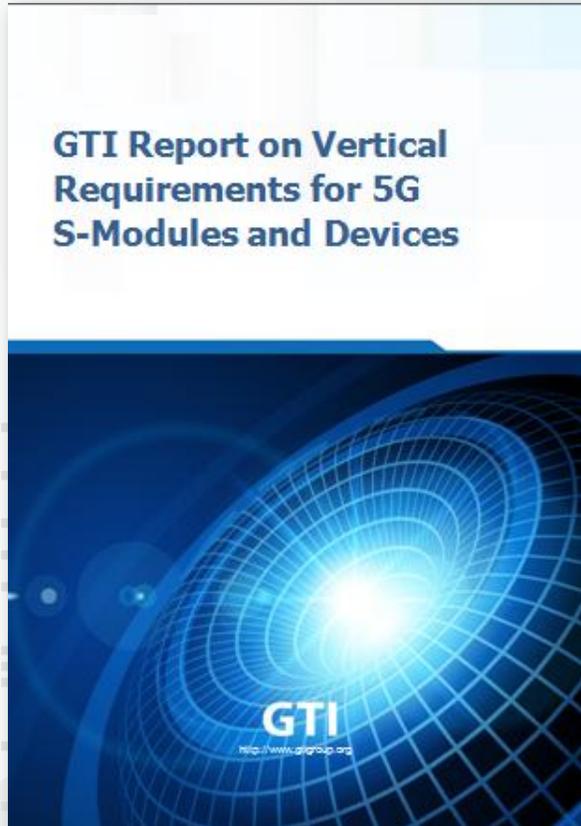


GTI5G S-Module White Paper (v 2.0) ¹⁰

29+ Contributors of GTI 5G S-Module



Vertical Requirements for 5G



5G Development Status

5G development status from global operator

2/3/4G Module Application

Vehicle Telematics, Energy Control and Meters, Monitoring, Payment, Industrial control, Consumer Electronics and Wearables, LED Control...

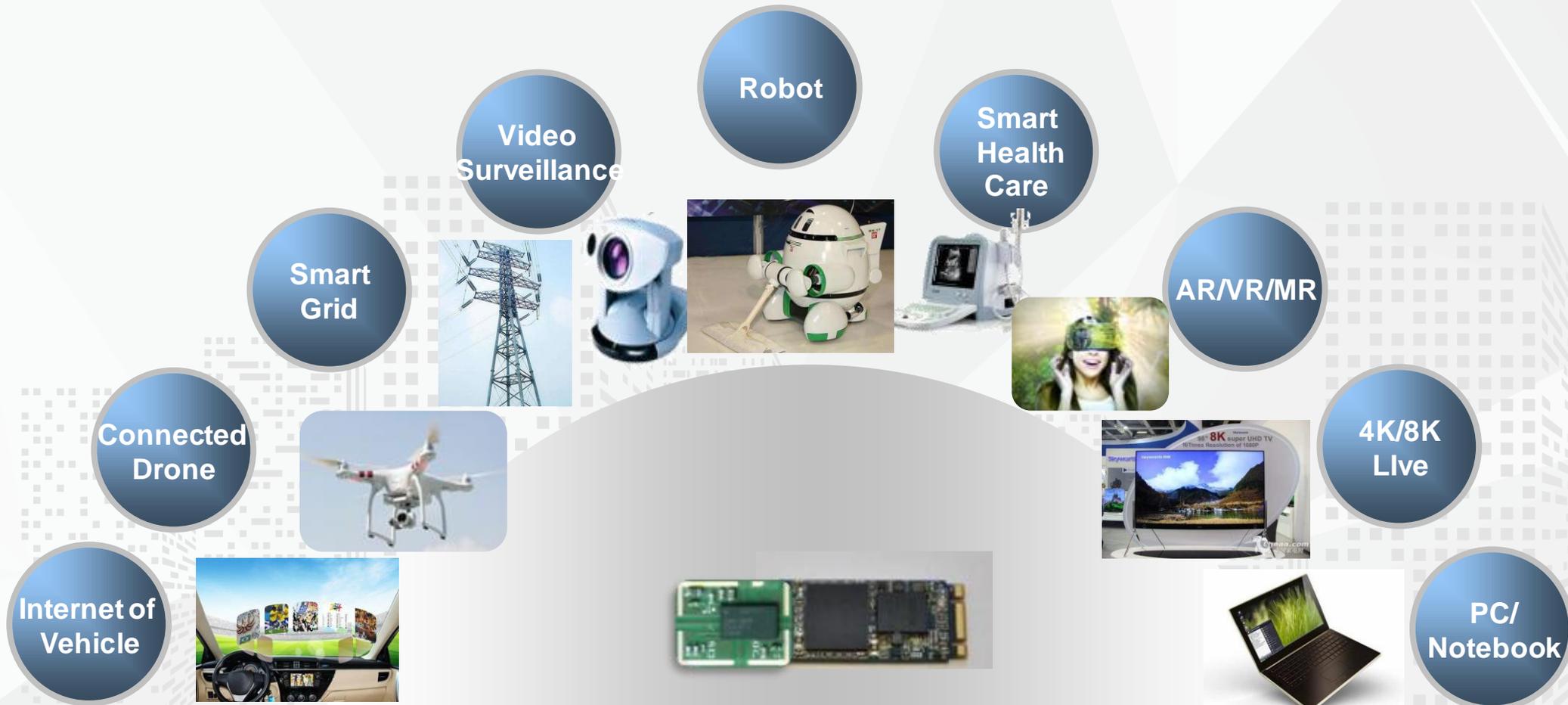
Vertical Requirements for 5G

Virtual & Augmented Reality, 4K/8K Live, Real-time UHD Video Surveillance, Connected Drones, PC/Notebook, Robot, Automatic Driving...

Recommendations for 5G S-Module

Basic Type, Smart Type, All-in-one Type

Vertical Applications for 5G



Requirements from Vertical Applications

□ Data Rate

- 2K**: 18~36Mbps
- 4K**: 40~80Mbps
- 8K**: 120~525Mbps

□ Delay

- Auto motive:1ms
- Video Surveillance:50ms
- Robot:1~500ms

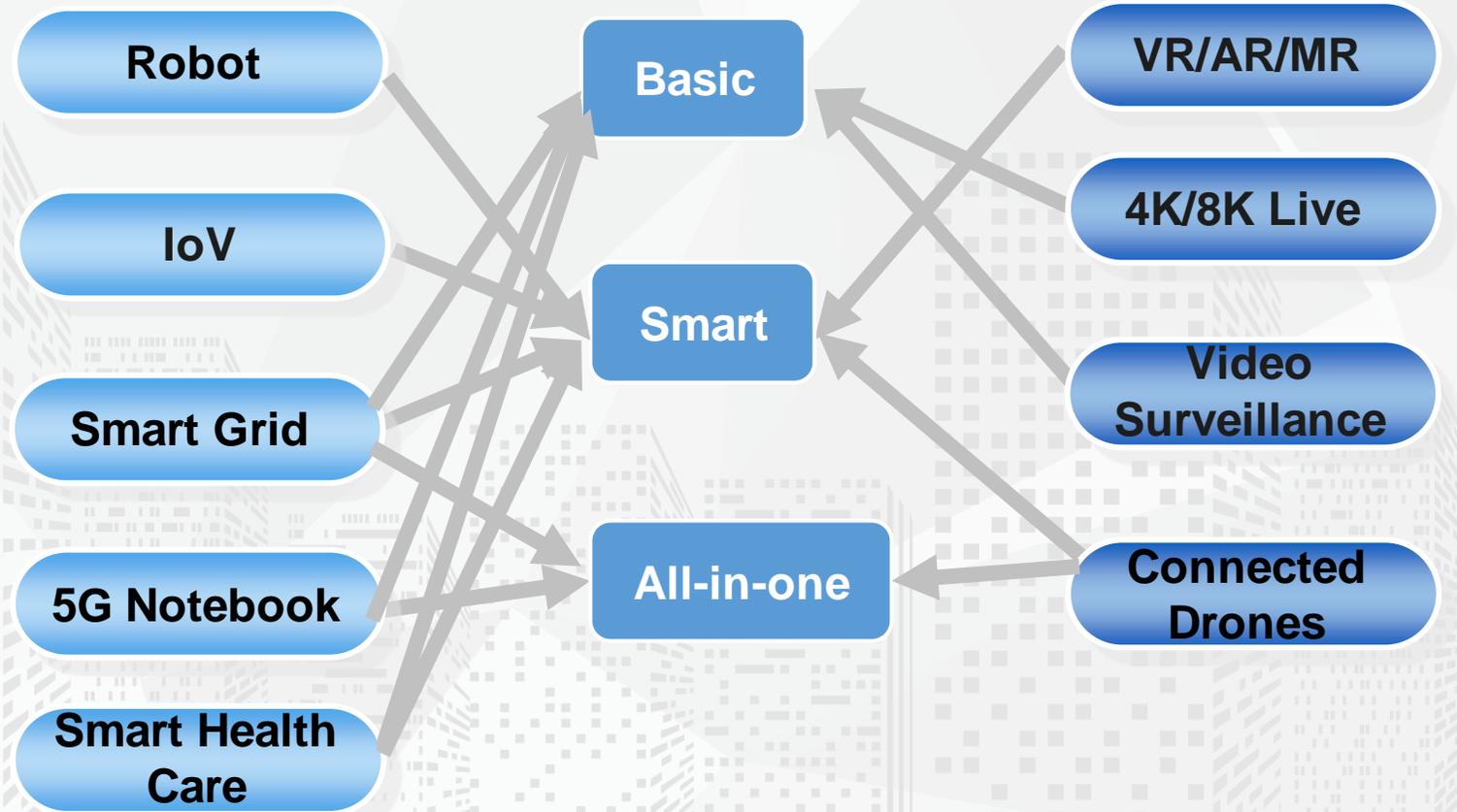
□ Hardware Requirement

- Size**: little as 4G module
- **Form**: PCIE/M.2/USB/LGA+LCC
- support GPS to clip and select

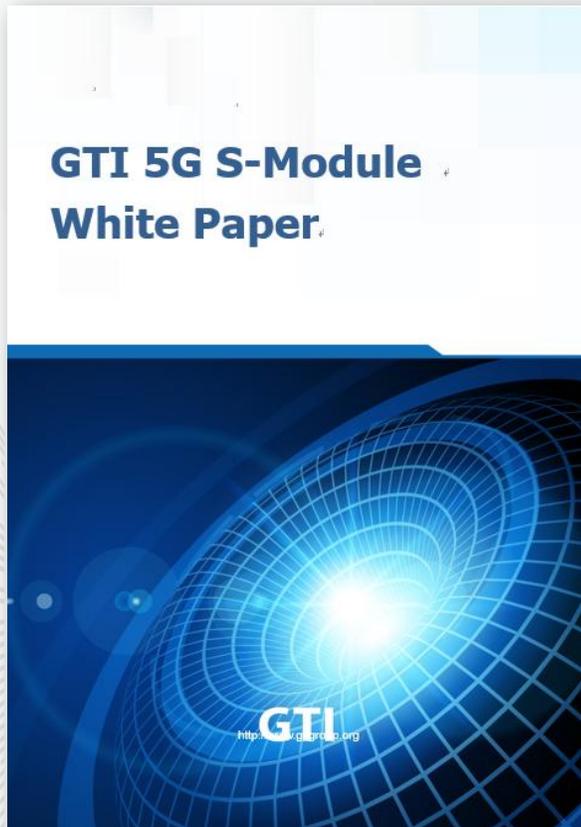
□ Software Requirement

- interfaces**: unified and clear parameters
- fall back to 4G/3G/2G;
- eSIM

□ Certification



5G S-Module White Paper



Basic Functions Requirements

Identity Management, Status Management, Firmware Upgrade Functions, Parameter Preset Management, SIM Functions, Debug Functions

Hardware Technical Requirements

Diagram, Pin Layout, Pin Size, Pin Definition

Electrical Interface Technical Requirements

Power Supply Interface, Module Control and Status Interface, RF Interface, SIM Interface, Data I/O Interface, Analog Interface, Audio Interface

Test and Certification

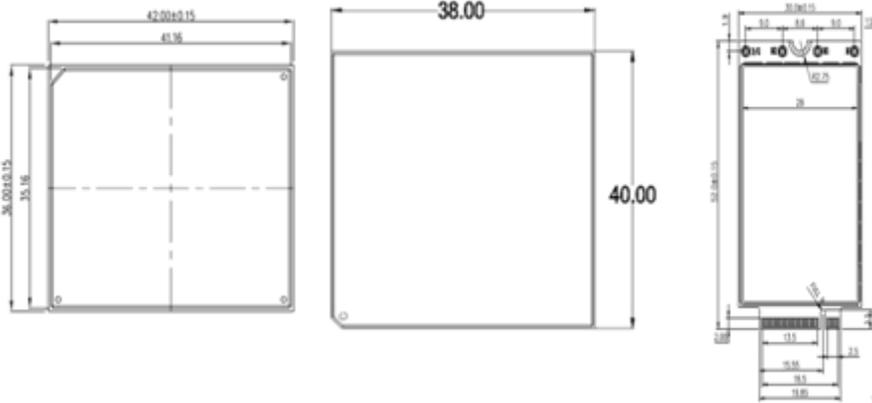
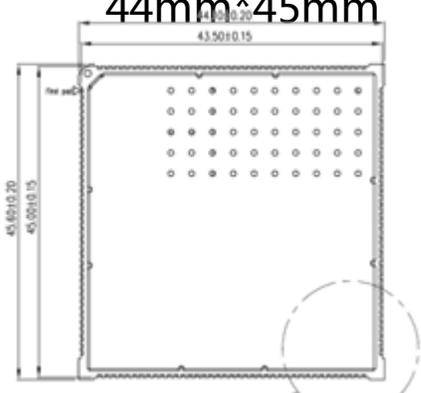
Lab Conformance Test, Field Test, Industry Regulatory Test, Carrier Acceptance Certification

5G RF Component, Antenna, and Sensor

RF FEM, LTCC/SAW/FBAR Filters, Antenna, Sensor

For the requirements of communication capabilities, please refer to the “GTI Sub-6GHz 5G Device Whitepaper (v3.0)”

5G S-Module Types

Type	Basic Type	Smart Type	All-in-one Type
Characteristics	Only Communication Capability	High Performance AP	Built-in Antenna
Form Factor	LGA, M.2	LCC+LGA	Dongle
Main Application	Real-time UHD Video Surveillance, Connected Automotive, ACPC, Online Video, and Industrial Router etc.	Artificial intelligence, Virtual & Augmented Reality etc.	Laptop, Connected Drones etc.
Size	<p>36mm*42mm 38mm*40mm 30mm*52mm</p> 	<p>44mm*45mm</p> 	Coming soon

Key Points of 5G S-Module

Form Factor & Size

- ❑ **Basic Type:**
LGA, 36mm*42mm & 38mm*40mm
M.2, 30mm*52mm
- ❑ **Smart Type:**
LCC+LGA, 44mm*45mm
- ❑ **All-in-One Type:** TBD

Data Rate & Interface

- ❑ (U)SIM
- ❑ PCIe, USB 3.1(Optional)/3.0/2.0
- ❑ UART, I2C, SPI
- ❑ I2S, Analog Audio, ADC
- ❑ **5G NR Peak Rate (100MHz, SA Mode):**
DL: 1.7Gbps
UL: 190 Mbps

MIMO & Antenna

- ❑ **MIMO:**
5G: Antenna 4*4 MIMO
4G: Antenna 2*2 MIMO
- ❑ **Built-in Antenna:**
Integrated in All-in-one Type

Modes & Bands

- ❑ **5G NR Bands:**
Mandatory: n41, n79
- ❑ **LTE FDD Bands:**
Mandatory: B7, B3, B8, B25
Optional: B1, B4, B12, B17, B20
- ❑ **TD-LTE Bands:**
Mandatory: B34, B39, B40, B41

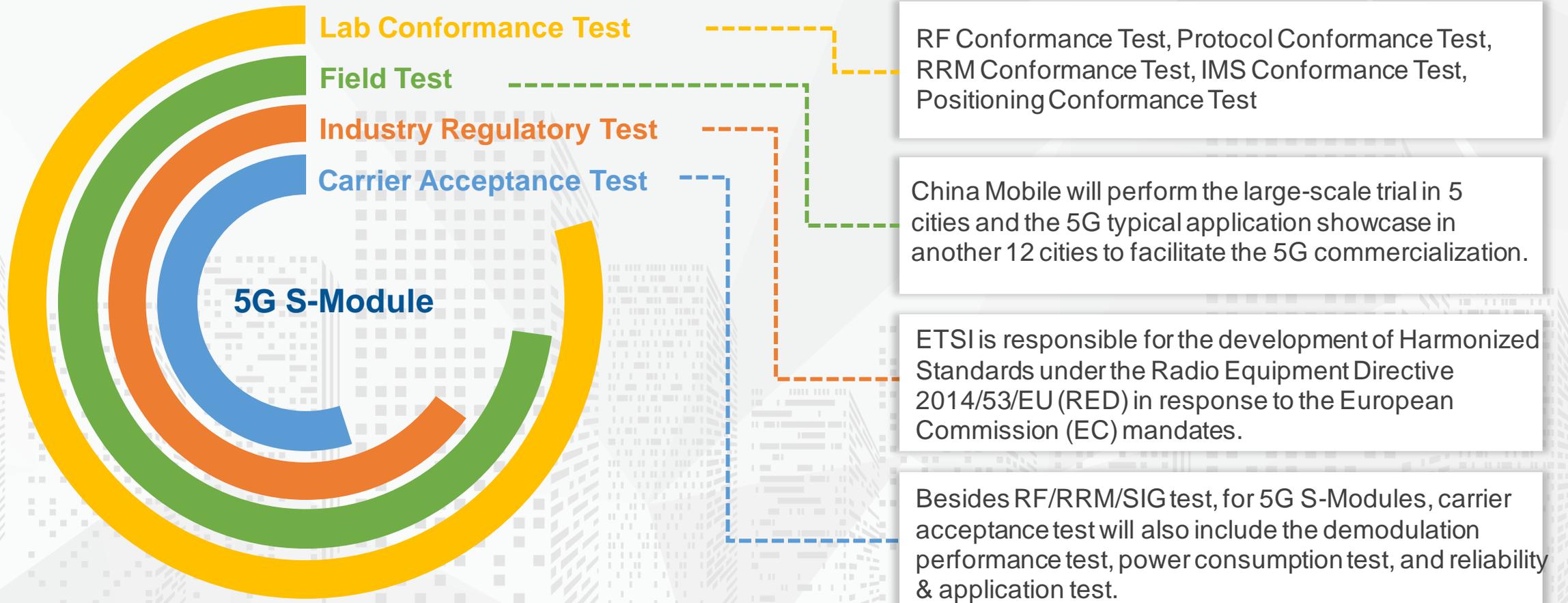
5G S-Module



AP/MCU

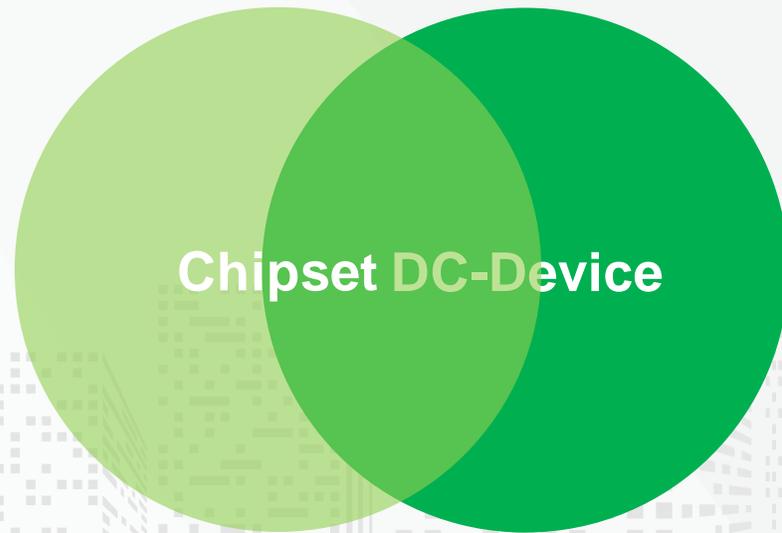
- ❑ **Smart Type:**
Processor @1.3GHz or higher
more than 2GB RAM & 8GB ROM

Test and Certification of 5G S-Module



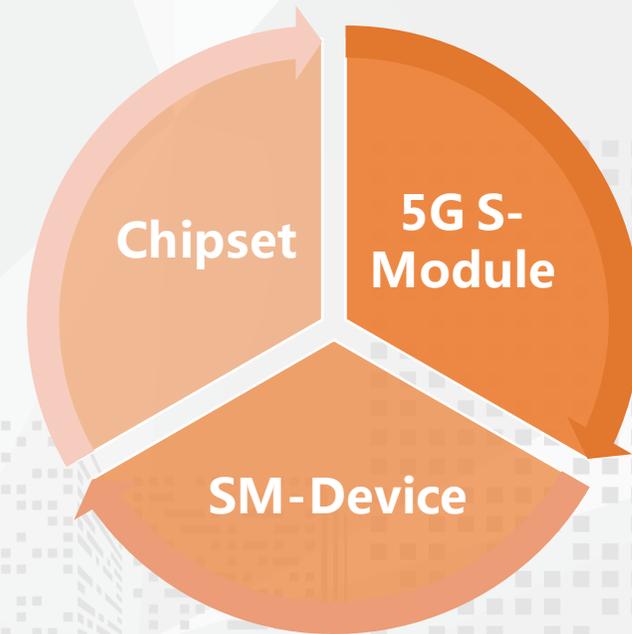
Discrete Component Device vs. 5G S-Module Device

DC-Device testing scheme



- Today Chipset and DC-Device test both happen and does overlap to great extent
- Each DC-Device (eg: smartphone) is tested
- The overlap between Chipset testing and DC-Device testing on cost and time should be improved

SM-Device testing scheme



- SM-Devices will not be tested rather 5G S-Module going into the SM-Device are tested
- Save the cost and time for the SM-Device testing

LS to RAN5 about 5G S-Module

According to the just-released "GTI 5G S-Module Whitepaper_v1.0", GTI has drafted a Liaison Statement (LS) intended for 3GPP RAN5's reference.

GTI kindly requests RAN5

1. To review this whitepaper, especially Chapter 10.1 and provide comments on the relevance and applicability of conformance tests developed by RAN5 for the 5G S-Modules.
2. To identify if there are features and functions of the 5G S-Modules that are not covered by the current 5G conformance test plan.

It would be highly appreciated if RAN5 could provide a response to this GTI request. We look forward to further progress of the conformance test work item in the coming months.

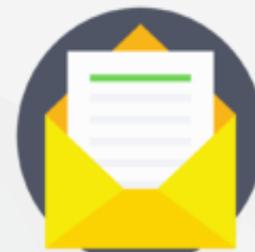


Proposals for RAN5 reply-LS to GTI

Proposal 1: The conformance tests developed by RAN5 could be used for 5G S-Modules, and could be chosen/simplified/supplemented as per the usage scenarios.

Proposal 2: All the communication functions of 5G S-Module which comply with 3GPP requirements could be covered by the 3GPP RAN5 conformance test plan.

GTI



3GPP

A GLOBAL INITIATIVE



Thank You!

5G S-Module

Sparkle your Tomorrow

