

Ready for 5G Commercialization

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2018. 6. 21

Samsung Electronics

Agenda

1. 5G Technology & Verification

2. Samsung's 5G Products

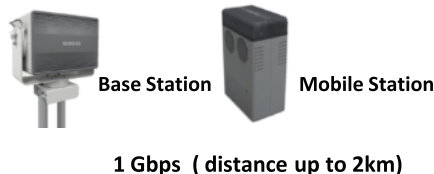


5G Technology & Verification

5G Technology Leadership

- Introduced mmWave Cellular Concept with Technology Feasibility Results
- Series of World's 1st on 5G and Led Industry on 5G Spectrums and Standardization
- Successful Collaborations with Leading Operators for Live 5G Field Trials

2013 World's 1st mmWave Testbed System



2014 World's 1st mmWave High Speed Test



2015 World's 1st mmWave Multi-Cell Handover Test



2016 5G Handover Demo in Dense Urban with Korean operator

Seamless 5G service in a vehicle



2017 5G Field Test with UK Operator

UHD Streaming & Multi-Gbps Throughput



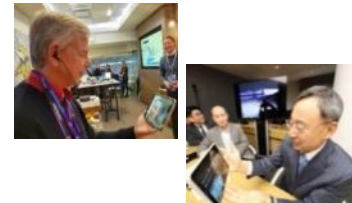
2017 World's Fastest Handover with Japan Operator

5G mmWave Handover at 192 km/h



2018 World's 1st 5G E2E demo between Overseas Operators

Live Video Conference with World's 1st 5G Tablets

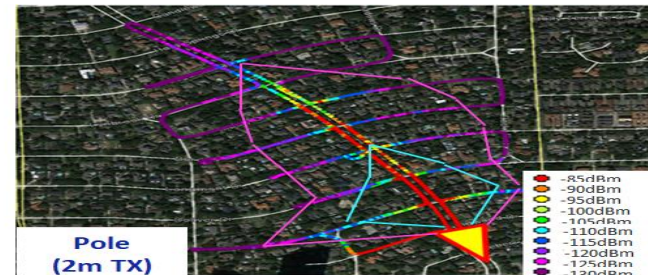
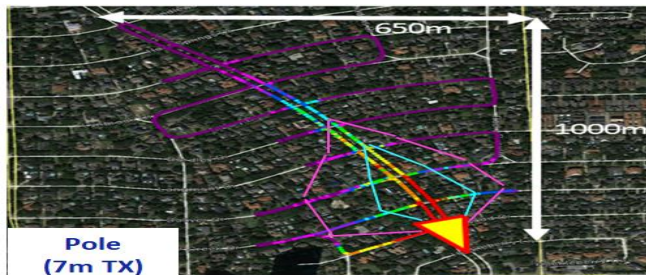


Above 6GHz 5G Coverage Test

Coverage Test Results of Rooftop and Pole Transmission in Residential Areas



Coverage Test Results with Different Pole Heights (7m vs. 2m)



5G Outdoor Coverage in Dense Urban Area

Co-site Installation with LTE to Provide Similar Outdoor 5G Coverage

Dense Area

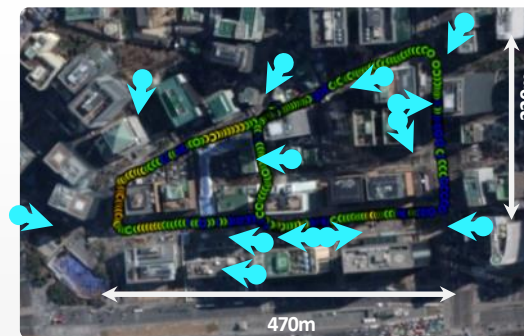
(GwangHwaMun, Feb 2018)



5G & LTE 1:1 Co-Location

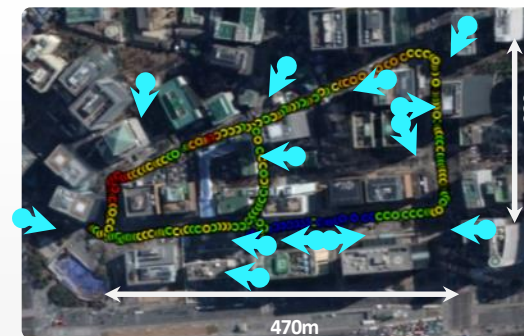
(Ave. ISD of 13 Sites : 90m)

LTE 1.8GHz

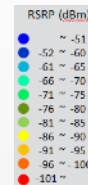


Coverage : $\geq 99\%$ of area (Uplink **1Mbps**)
Downlink Throughput **20Mbps** : $\geq 98\%$ of area
(eNB EIRP: 65dBm, UE EIRP: 23dBm)

5G 28GHz



Coverage : $\geq 99\%$ of area (Uplink **40Mbps**)
Downlink Throughput **800Mbps** : $\geq 97\%$ of area
(AU EIRP: 60dBm, CPE EIRP: 33dBm)
※ NR BS EIRP: 59dBm, 5G Tablet EIRP: 29.5dBm



Above 6GHz 5G FWA Trials in US and UK

Samsung Completed FWA Trials in 7 Cities across US (~Q1 2018)

- 0.75 ~ 1.5Gbps Throughputs Measured in Distances at 200 ~ 1400ft

Offered New and Compelling Connected Service Opportunities in UK, Europe



Above 6GHz 5G Mobility Test :

Driving Car: World's Fastest Multi-cell Handover at Speedway in Korea, 2017

- 5G mmWave Handover at 192 km/h, and stable 5G Service at Over 200 km/h



High Speed Train: World's 1st 5G UL & DL on Train over 100km/h in Japan, 2017

- 1.7Gbps on a high-speed train traveling over 100km/h



Above 6GHz 5G Multi-Device Trial in Japan

World's 1st 5G Tablet Outdoor Multi-Device Trial in Japan (Mar 2018)

- Simultaneous streaming of 4K video contents on 5G tablets using 28GHz
- Redefines entertainment in sports venues, live concerts and exhibitions

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KDDI and Samsung Successfully Complete 5G Multi-Device Trial at a Professional Baseball Stadium in Okinawa, Japan

Korea on March 26, 2018

SHARE  

Sports users' experience is taken to new heights as the two companies use Samsung's end-to-end 5G solutions

Trial includes prototype 5G tablets used in 5G hot zone in a way that redefines entertainment in sports venues, live concerts and exhibitions



Below 6GHz 5G Trial in Korea

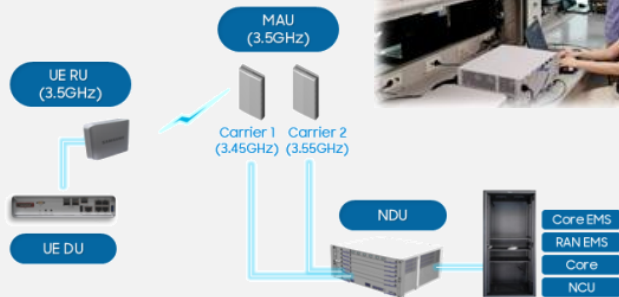
World's 1st LTE/3.5GHz/28GHz Interworking Trial in Downtown Seoul

June, 2017

Demonstration, 1 Gbps Throughput at 3.5GHz

NR Key Features : 60kHz Subcarrier Spacing, LDPC and Self-contained Subframe

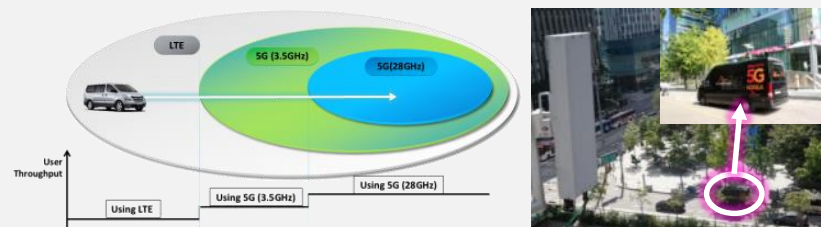
Subframe	0.25ms
Frame	12.5ms
Subcarrier Spacing	60 kHz
Bandwidth	80 MHz x 2



Sep, 2017

4G-5G (3.5GHz, 28GHz) Interworking in Seoul

Higher Performance by selecting a Better RAT among Connected RANs

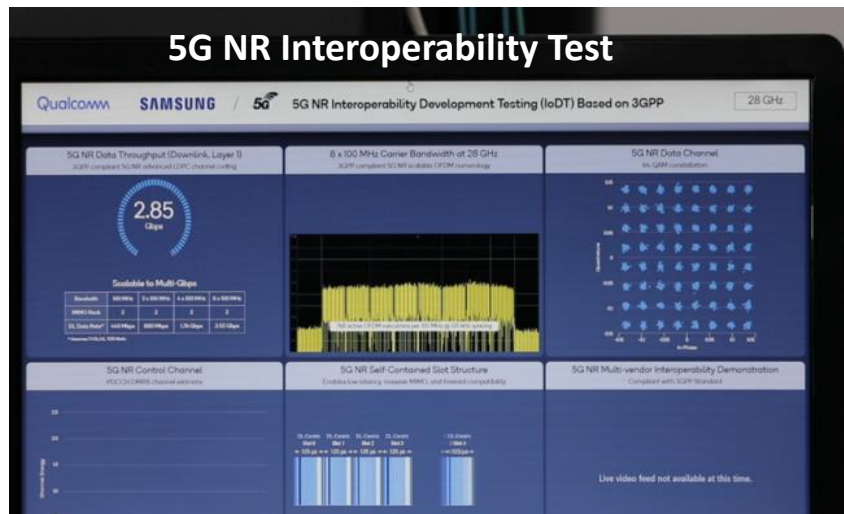


MAU : Massive MIMO Active Antenna Unit, NDU : Next-generation Digital Unit, NCU: Network Control Unit, LDPC : Low-density Parity Check

Successful NR IODT Tests at MWC 2018

World Leading NR IODT (L1) Results with Key Industry Partners

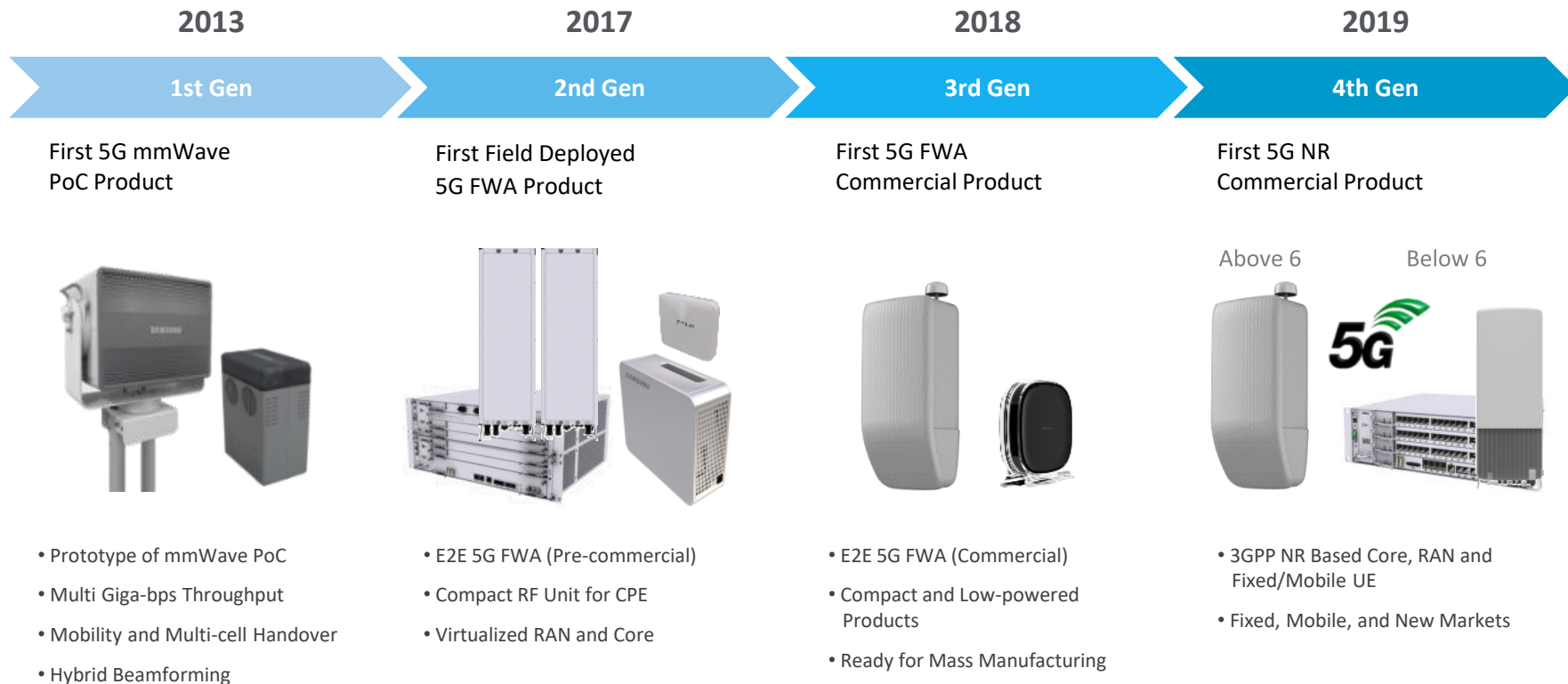
- with **Qualcomm**: 1.17 Gbps (3.5GHz), 4.301 Gbps (28GHz)
- with **NI** : 4.233 Gbps (28GHz) , **Keysight** : 1.501 Gbps (3.5GHz)





Samsung's 5G Products

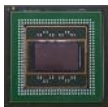
Samsung 5G Products Evolution



Complete 5G E2E Solution

Chips

28GHz RF



Modem



Low Power &
Small Form Factor

Devices



Self-installable CPE
Mobile UE (Tablet)

Access



Above 6 Below 6

Simple Installation &
3GPP 5G NR Ready

Core



COTS Server

Virtualized RAN
Virtualized Core
Virtualized
Management

Cloud Friendly &
Flexible Architecture

3D RF Planning



Real 3D Map Modeling
& Accurate RF Analysis

Summary

- Samsung has pioneered breakthrough technologies for 5G
- has been actively collaborating with key partners to achieve key milestones.
- will continue our efforts for the commercial success of 5G and deliver a new level of mobile experience to everyone's life.

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Networks Business