

# 5G Technology Development and Technical Trial

Telecommunications Regulatory Affairs Advisory Committee  
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# Introduction

- Mobile industry worldwide is working actively developing 5G technologies with a view to launching commercial services in the timeframe of 2020
- International Telecommunication Union (ITU) and 3<sup>rd</sup> Generation Partnership Project (3GPP) have been speeding up the development of new standards for 5G technologies
- Equipment vendors and mobile network operators (MNOs) have actively conducted or made plans to conduct 5G technical trials in different frequency bands including:
  - **3.5 GHz band (3.4 – 3.6 GHz)**
  - **26 GHz band (24.25 – 27.5 GHz)**
  - **28 GHz band (27.5 – 28.35 GHz)**

*The CA plans to make available spectrum in these bands for the provision of 5G services and will consult the public and the industry*

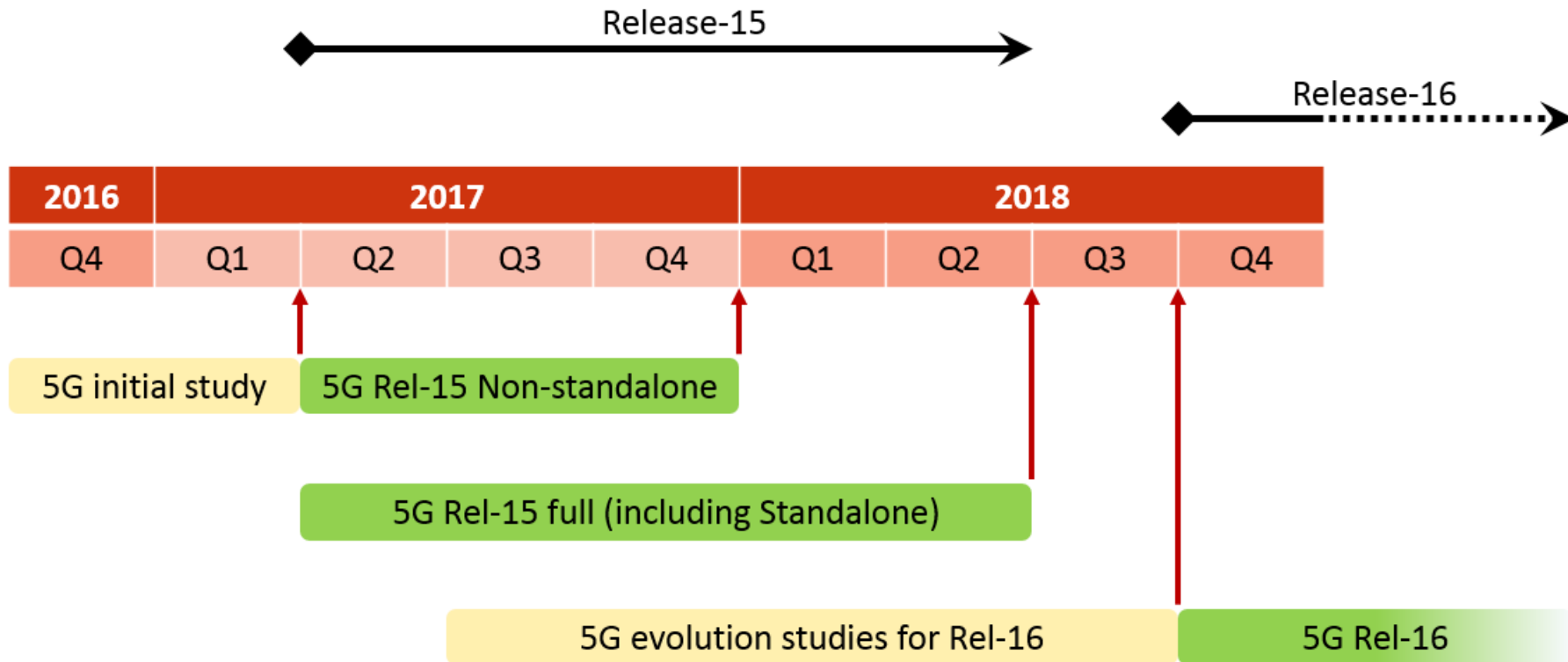
# Latest Development of 5G Technologies and Standards



# Latest Development

- On 21 December 2017, 3GPP approved non-standalone (NSA) 5G new radio (NR) specification (the first implementable 5G NR specification)
- 3GPP is currently working on Release 15 (targeted to be completed by 2018), which includes addition of support for standalone 5G NR operation and enables the first phase of 5G deployment by 2020 (in particular for enhanced mobile broadband use case)
- Major mobile equipment and devices manufacturers as well as MNOs around the world generally expect commercial supply and deployment of 5G equipment and devices based on 5G NR technology could take place as early as in 2019

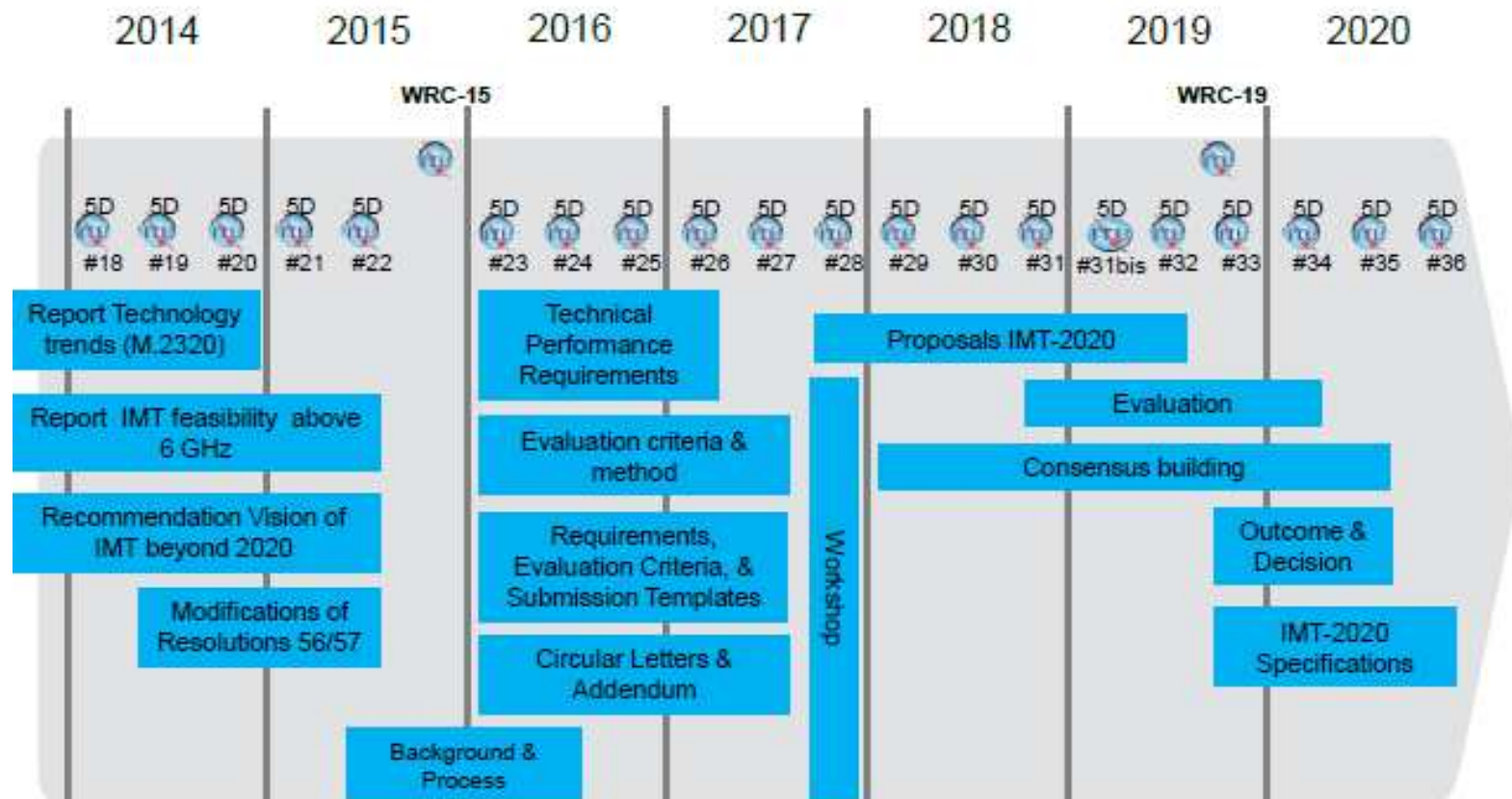
# 3GPP 5G NR Timeline



*Note: The above timeline is adapted from 3GPP*

Reference: The figure is adapted from <http://www.3gpp.org/release-15>

# ITU Work Plan on IMT-2020



Note: Meeting #31bis – if needed focus meeting towards WRC-19 (non-Technology), Meeting #33 – focus meeting on Evaluation (Technology)

Note: While not expected to change, details may be adjusted if warranted.

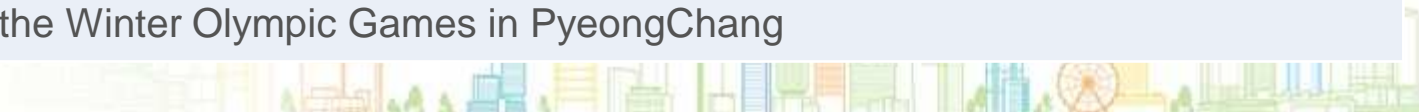
Reference: ITU's website at <https://www.itu.int/en/ITU-R/study-groups/rsg5/rwp5d/imt-2020/Pages/default.aspx>

# Technical Trials on 5G Technologies



# Trials in Asia Pacific

Country	Technical Trials on 5G Technologies
Australia	<p>In November 2017, Telstra and Ericsson completed a 5G trial data call over <b>26 GHz band</b> using its production core network</p> <p>In April 2018, Telstra and Optus to conduct 5G trials during Commonwealth Games</p>
Mainland China	<p>In January 2016, MIIT approved <b>3.4 – 3.6 GHz band</b> to be used for 5G trials</p> <p>In July 2017, MIIT further approved the spectrum <b>24.75 – 27.5 GHz</b> to be used for 5G trials</p> <p>In November 2017, China Mobile, Qualcomm and ZTE conducted an end-to-end 5G NR interoperability data test, demonstrating data connection utilising ZTE's base station and Qualcomm's user equipment operating in <b>3.5 GHz band</b></p>
Japan	<p>In December 2017, NTT DOCOMO and Huawei conducted 5G field trial at Tokyo Skytree (where base station was located) and Asakusa Station (where user equipment was placed) using <b>28 GHz band</b>, achieving 4.52 Gbps downlink throughput and 1.55 Gbps uplink throughput with coverage range of 1.2 km</p>
Korea	<p>In June 2017, SK Telecom demonstrated 5G communications successfully using <b>3.5 GHz band</b> for the first time in Korea through collaborations with Samsung Electronics and Nokia</p> <p>In February 2018, KT and Intel would deliver a 5G showcase using <b>28 GHz band</b> spectrum at the Winter Olympic Games in PyeongChang</p>





# Trials in Other Economies

Country	Technical Trials on 5G Technologies
United Kingdom	In December 2017, Vodafone UK and Ericsson (in partnership with academics at King's College London) successfully conducted a field trial of standalone pre-standard 5G with a prototype device operating in <b>3.5 GHz band</b> in Central London
United States	In August 2017, AT&T announced that it continued to conduct outdoor pre-standard mobile 5G testing and expanded its fixed wireless 5G trials to additional cities operating in <b>millimetre wave spectrum</b> In October 2017, Verizon, Qualcomm and Novatel Wireless announced plans to collaborate on 5G NR technology development and over-the-air field trials using <b>28 GHz band</b> and <b>39 GHz band</b>
Others	In December 2017, following the 3GPP's approval of the NSA 5G NR technical specification, Ericsson and Qualcomm demonstrated multi-vendor interoperability connection compliant with the new NSA 5G NR specification in both <b>3.5 GHz band</b> and <b>28 GHz band</b> , using 5G NR pre-commercial base stations and 5G NR user equipment prototypes

# Trials in Hong Kong

- In January 2017, an equipment vendor conducted a trial of 5G technologies using spectrum in 15 GHz band (the prototype comprised a 5G base station, a next-generation antenna and a test mobile station)
- In August 2017, an MNO performed an indoor test with the use of spectrum in the 3.5 GHz band



# Measures to Facilitate Deployment of 5G Technologies in Hong Kong



# Measures to Facilitate Deployment of 5G Technologies

## Making Available Additional Spectrum for Public Mobile Services

- On 21 March 2017, the CA promulgated its work plan for making available additional spectrum for the provision of public mobile services
- Spectrum Release Plan for 2018 – 2020 foreshadows the earliest release dates for additional spectrum to be made available in **3.5 GHz, 26 GHz and 28 GHz bands** after necessary consultation on proposed allocation and associated assignment arrangements
- The CA will continue to look for other suitable spectrum for release to the market at a later stage to support the continued developments of the public mobile services

# Measures to Facilitate Deployment of 5G Technologies (continued)

## Facilitating Rollout of 5G Infrastructure

- 5G services using higher frequency bands like **26 GHz and 28 GHz bands** is expected to require a significant increase in the number of small cells or low power radio base stations (RBSs) at street level
- OFCA will continue to facilitate and provide necessary assistance to MNOs to make use of government buildings and public facilities to install RBSs
- OFCA will also explore with the relevant government departments with a view to allowing the installation of small cells on external walls of buildings



# Measures to Facilitate Deployment of 5G Technologies (continued)

## Issuing Permits for 5G Trials

- OFCA encourages interested parties to conduct trials to try out technical capability and performance of 5G equipment, devices and services in Hong Kong environment for the design and planning of their 5G networks and services
- Interested parties are welcome to approach OFCA for application of trial permits and temporary assignment of relevant frequencies to conduct the trials

# Measures to Facilitate Deployment of 5G Technologies (continued)

## Facilitating Mobile Network Sharing

- Under the existing regulatory regime for mobile services, various forms of mobile network sharing by MNOs are allowed with a view to lowering capital and operational expenses and to expedite the rollout of mobile network infrastructure
- Future 5G infrastructure will involve building a large number of small cells and use of large bandwidth of spectrum to achieve localised, high speed connection
- MNOs are welcome to propose any innovative forms of mobile network sharing and OFCA is prepared to consider and facilitate within the existing statutory framework

# Thank You

