Telecommunications Regulatory Affairs Advisory Committee

Latest Progress in Preparing for the Launch of 5G Services

PURPOSE

This paper briefs Members on the latest progress of work to prepare for the launch of fifth generation ("5G") mobile services in Hong Kong, including release of radio spectrum, facilitating measures for the implementation of 5G networks and services, as well as the proposed issue of guidelines for the telecommunications industry to follow in using the term 5G in offering their 5G products and solutions.

RELEASE OF 5G SPECTRUM

2. In anticipation of the arrival of the 5G era, the Communications Authority ("CA") has made early preparation to provide sufficient radio spectrum for the launch of 5G networks and services. Back in March 2017, the CA promulgated its work plan for making available additional frequency spectrum to facilitate further development of public mobile services in Hong Kong particularly the 5G services. The spectrum release plan issued by the CA in July 2018 set out a total of about 4 500 MHz of spectrum in various bands including 3.3 GHz, 3.5 GHz, 4.9 GHz, and 26/28 GHz bands which will be made available for assignment starting from April 2019.

3. In December 2018, the CA invited applications for the assignment of spectrum in the 26/28 GHz bands for the provision of large scale territory-wide public mobile services. In response to applications received from three mobile network operators ("MNOs"), a total of 1 200 MHz of spectrum in the 26/28 GHz bands was administratively assigned to them effective from April 2019.

4. Starting from July 2019, the CA has invited applications for administrative assignment of up to 400 MHz of spectrum in the 26/28 GHz bands for use on a geographically sharing basis ("Shared Spectrum") to

facilitate the development of innovative wireless communications services based on 5G or other advanced mobile technologies on a more localised level. In end October 2019, the first assignment of Shared Spectrum was made to the Airport Authority under a new Localised Wireless Broadband Service ("LWBS") Licence for its advanced communications platform to support the provision of various smart airport initiatives at the Hong Kong International Airport.

5. Between October and November 2019, three auctions of a total of 380 MHz of spectrum in the 3.5 GHz, 4.9 GHz and 3.3 GHz bands were conducted one after another. All the four MNOs participated in the auctions and successfully bid for all the spectrum put out for auction at a total spectrum utilisation fee of HK$ 1.91 billion. Subject to the MNOs as provisional successful bidders in the relevant auctions fulfilling a number of requirements including payment of spectrum utilisation fees and submission of performance bonds to guarantee compliance with the network and service rollout requirements, assignment of the spectrum in the 4.9 GHz band and 3.3 GHz band will take effect in December 2019, and assignment of the spectrum in the 3.5 GHz band will take effect on 1 April 2020.

6. All in all, a total of 1 980 MHz of spectrum has already been assigned / auctioned off in 2019 to various licensees which are expected to have commercial launch of their 5G services in 2020.

FACILITATING MEASURES FOR 5G IMPLEMENTAITON

5G Trials

7. The telecommunications industry is encouraged to conduct technical trials on 5G technologies and applications for assessing the performance and characteristics of 5G equipment, devices and services in the Hong Kong environment[1]. Since 2017, the CA has issued around 50 trial permits to the four MNOs and some equipment vendors with free temporary frequency assignments in the 3.5 GHz band and 26/28 GHz bands. Results of relevant trials have also been made available for public information[2].

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[1] See TRAAC Paper No. 3/2018 on "5G Technology Development and Technical Trial".

[2] Some of the technical reports for 5G trial are available at – https://www.ofca.gov.hk/en/pub_report/technical_reports/index.html#01

5G Network Rollout

8. It is understood that the deployment of 5G networks may necessitate the installation of a larger number of radio base stations ("RBSs") compared with the previous generations of mobile technologies. To help MNOs launch 5G services as early as possible, the Chief Executive's 2018 Policy Address set out a policy initiative of opening up suitable government venues for the installation of RBSs. A pilot scheme was launched by OFCA in March 2019 for implementation of the policy initiative, providing about 1 000 government venues for operators to install RBSs under streamlined application and approval procedures. Since then, OFCA has been actively coordinating with the relevant departments to facilitate their processing of MNOs' applications for installation of RBSs at government venues under the pilot scheme, which was well received by the industry. In the Chief Executive's 2019 Policy Address, MNOs will be further assisted under a "demand-led" model to make use of more suitable government venues to extend 5G network coverage. In addition, OFCA will also work with relevant government departments to open up public facilities like suitable sheltered bus stops and public payphone kiosks and more government venues for serving the same purpose.

Technical Mitigation for 5G Implementation

9. For 5G services which will be operating in the 3.4 – 3.6 GHz band ("3.5 GHz band"), there will be a need for implementation of technical measures to enable their coexistence with the existing fixed satellite service systems ("FSS") operating in different parts of the 3.4 – 4.2 GHz band (commonly known as the "C-Band"). Affected FSS systems such as licensed systems of external fixed telecommunications network services, satellite master antenna television ("SMATV"), and self-provided external telecommunications systems operating in the 3.7 – 4.2 GHz band should implement necessary mitigating measures so that they will be able to reasonably withstand radio interference caused by RBSs operating in the 3.5 GHz band. Successful bidders for the 5G spectrum in the 3.5 GHz band would be required to set up and administer a fund for a subsidy scheme to support the upgrade of the eligible SMATV systems affected by use of the spectrum in the band for 5G services. Furthermore, additional safeguard for

protection of satellite earth stations for telemetry, tracking and control of satellites in orbit ("TT&C Stations") operating in the 3.4 – 3.7 GHz band will be made by delineating restriction zones in Tai Po and Stanley where these TT&C Stations are located to constrain the deployment of RBSs of public mobile services operating in the 3.5 GHz band[3]. With support of the Government, OFCA is now proactively exploring with the relevant satellite operators the feasibility of relocating the affected TT&C Stations in Tai Po so as to completely resolve the problems of using 5G spectrum in the 3.5 GHz band in the Tai Po restriction zone, thus facilitating the wide deployment of 5G services at 3.5 GHz band in Hong Kong in the long run.

GUIDELINES ON THE USE OF THE TERM "FIFTH GENERATION" OR "5G"

10. With the imminent launch of 5G services in Hong Kong and in anticipating the various approaches that mobile service providers may adopt in offering their 5G products and solutions, there may be a need for a harmonised practice on the use of the term "5G" by the mobile communications industry in Hong Kong. In this regard, OFCA is minded to issue guidelines for providing practical guidance to the industry including the MNOs and other members of the industry on how they may use the term "fifth generation" or "5G" when describing, promoting or marketing their networks, systems, services, devices, products or applications ("Guidelines"). Similar guidelines on the use of the term "fourth generation" or "4G" had also been prepared in 2011 by the former Office of the Telecommunications Authority when 4G mobile services were being launched by the industry. In consultation with the four MNOs, OFCA has prepared the draft Guidelines for 5G at the **Annex**.

PUBLIC EDUCATION ON 5G SERVICES

11. To help the general public better understand the latest development of 5G technologies and the benefits to be brought about by 5G services, the CA has launched a newly developed 5G thematic website in

[3] For further details, please refer to the "Guidelines for Installation of RBSs Operating in the 3.4 – 3.6 GHz Band within the Restriction Zones Delineated by the CA" issued in July 2019, which is available at https://www.coms-auth.hk/filemanager/statement/en/upload/514/gn142019e.pdf.

August 2019 at www.5g.gov.hk to provide the general public and mobile users with the latest educational information on 5G technologies and radiation safety of RBS[4] in multimedia format. Besides, OFCA has been organising a series of roving exhibitions, public seminars, community talks and school dramas to introduce the latest developments of telecommunications including 5G services to the general public. The Government's Information Services Department has also released a short video introducing 5G services[5].

VIEWS SOUGHT

12. Members are invited to note the latest progress on the preparatory work for the launch of 5G services in the above and to offer any views and comments on the content of the draft Guidelines. After taking into account the feedback of Members, OFCA will proceed to finalise and publish the Guidelines for reference by the industry.

Office of the Communications Authority
November 2019

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[4] The short videos are available at –

5G Network Get Ready to Go:
https://www.ofca.gov.hk/en/consumer_focus/education_corner/video/index_id_61.html

Radiation Safety of RBS:
https://www.ofca.gov.hk/en/consumer_focus/education_corner/video/index_id_60.html

[5] The video is available at –
https://www.news.gov.hk/eng/2019/08/20190808/20190808_161305_888.html?type=category&name=infrastructure&tl=t

Annex

[DRAFT]
Guidelines for Mobile Communications Industry on the Use of the Term "Fifth Generation" or "5G" (the "Guidelines")

Purpose

This document provides practical guidance to telecommunications licensees and other members of the telecommunications industry on how they may use the term "fifth generation" or "5G" when describing, promoting or marketing their networks, systems, services, devices, products or applications.

International Mobile Telecommunications - 2020 ("IMT-2020")

2. The term International Mobile Telecommunications ("IMT") is the generic term used by the International Telecommunications Union ("ITU") to designate broadband mobile systems. ITU has formulated international standards for the development of new generations of IMT mobile technologies. The initial set of IMT standards as approved by ITU was **IMT-2000** which has become the international standards for third generation ("3G") technology since 2000. In 2012, **IMT-Advanced** was developed and defined by ITU as the fourth generation ("4G") mobile technology and it is being deployed worldwide. **IMT-2020** will be the international standards for 5G mobile technology which enables new capabilities of IMT that go beyond those of IMT-Advanced.

3. In ITU-R Recommendation M.2083 published in 2015, ITU provides the guidelines on the framework, capabilities and the overall objectives for the future development of IMT for 2020 and beyond. The capabilities of IMT-2020 as identified by ITU in the Recommendation aims to make IMT-2020 more flexible, reliable and capable than previous IMT for provision of diverse services in three specific usage scenarios, including enhanced mobile broadband ("eMBB"), ultra-reliable and low-latency communications ("URLLC"), and massive machine type communications ("mMTC"), for which contiguous and broader channel

bandwidths than currently available for the existing IMT systems would be needed[1].

4. In the eMBB usage scenario, the peak data rate of IMT-2020 under ideal conditions is expected to reach 10 to 20 Gbps while the user experienced data rates may vary depending on the environments where the mobile devices are located (e.g. user experienced data rate of 100 Mbps and 1 Gbps for wide area coverage and indoor hotspot locations respectively). IMT-2020 is expected to provide 1 ms over-the-air latency to support services with very low latency requirements for URLLC usage scenario and a connection density of 1 million devices per km^2 in the mMTC usage scenario. Actual performance experienced by users depends on various factors, including but not limited to mobile network coverage, frequency bands of operation, available bandwidth and number of concurrent users at a particular location, etc.

5. To realise the key features defined by the ITU for IMT-2020 radio interface(s), ITU will evaluate the proposed radio interface technologies for IMT-2020 submitted by various organisations and finalise the detailed specifications by the end of 2020.

3GPP Releases for IMT-2020 Requirements

6. The Third Generation Partnership Project ("3GPP") is an industry standards organisation which has developed technical specifications on 3G, 4G and more advanced mobile technologies.

7. For standardisation of 5G technologies, 3GPP has released technical specifications for 5G core network ("5GC") and radio access network based on new radio interface technology called 5G New Radio ("NR"). The first phase of the 5G specification in Release 15 was completed in June 2019 and was designed to accommodate early commercial deployments while the second phase specification in Release 16 is targeted to be finalised in Q3 2020.

[1] The Communications Authority released a total of about 4 500 MHz of spectrum in 2019 to the market for the provision of 5G services. The related press release is available at https://www.coms-auth.hk/en/media_focus/press_releases/index_id_1824.html.

8. There are two network architectures defined by 3GPP for implementation of 5G networks, which are Standalone ("SA") and Non-standalone ("NSA") architectures. As specified in the 3GPP Release 15, NSA architecture enables dual connectivity for connection to radio base stations enabled with 5G NR radio access technology ("5G NR radio base stations") and 4G Long Term Evolution ("LTE") radio base stations to provide radio access and integrates the radio base stations with either new 5GC or existing Evolved Packet Core ("EPC") used in LTE networks. SA architecture refers to the use of new 5GC and 5G NR radio base stations only for signalling and user traffic. Both NSA and SA architectures adopt the 5G NR as the radio access technology. Mobile network operators ("MNOs") may adopt NSA or SA architecture for their 5G networks.

Need of Guidance on Description of "Fifth Generation" or "5G"

9. While IMT-2020 is the evolution of the IMT family of standards for 2020 and beyond, it is expected that the network infrastructures based on older generations of IMT family will continue to be used for providing 3G/4G services in the foreseeable future. Depending on the network architectures used for 5G deployment (see paragraph 8 above), some MNOs may make use of their 4G network infrastructures to provide 5G services in the initial stage of commercial deployment.

10. Having regard to the latest developments for 5G, OFCA considers that there is a need to provide the local mobile industry with clear guidance on how the term "Fifth Generation" or "5G" may be used in Hong Kong.

Guidance on Use of the Term "Fifth Generation" or "5G"

11. From a technical point of view, the difference between a 5G network and older generations of mobile networks can be discriminated by way of the technologies adopted in deploying the network systems. It is considered that any mobile network/system comprising of new 5GC(s) or EPC(s) that support 3GPP Release 15 or any later release and radio access network(s) built with 5G NR radio base station(s) can be regarded as ***"5G network / system"***. Any device that is equipped with the capability to support radio connection and interwork with the 5G NR radio base station(s) can be regarded as ***"5G device"***. A telecommunications service provided by radio connection between a 5G

network/system and a 5G device can be regarded as a ***"5G service"***. Those products and applications that are designed to implement the new usage scenarios, features and capabilities as defined in the IMT-2020 with the support of "5G network/system", "5G service" and "5G device" may be regarded as ***"5G products"*** and ***"5G applications"***.

12. In summary, no matter which network architecture is adopted, the connection to 5G NR radio base stations[2] is a prerequisite for the network, system, service, device, product or application to be regarded as "5G" capable. MNOs may utilise the new radio spectrum made available by OFCA and refarm the existing spectrum currently used for provision of 4G services for the provision of 5G services. They may also deploy techniques such as dynamic spectrum sharing for efficient use of the spectrum to provide 4G/5G services and adopt inter-band carrier aggregation to provide 5G services of higher speed and throughput.

13. For the avoidance of doubt, the use of the description of "5G" for specified network, system, service, device, product or application does not imply a certain level of performance (such as speed, latency, scale, coverage of connection) for the concerned network/system/device/service/product/application. Having said that, MNOs are expected to provide a satisfactory level of performance of their 5G networks/systems/services for interworking with 5G devices/products/applications so that users could enjoy the benefits of 5G.

14. Although radio spectrum in some designated frequency bands such as 3.3 GHz, 3.5 GHz, 4.9 GHz, 26 GHz and 28 GHz bands are expected to be used for the initial launch of 5G services in Hong Kong, MNOs may under the technology neutral principle refarm their existing radio spectrum at other frequency bands for provision of 5G services based on their commercial decisions.

15. In view that there are various approaches in implementing a 5G network, the performance of the same types of services developed for a particular usage scenario (i.e. eMBB, URLLC or mMTC) may vary from one network to another. MNOs, mobile virtual network operators and other mobile service providers should make it clear to the public the performance of their offers of 5G network, system, service, device, product or application in their marketing campaigns and advertising materials for promotion purpose.

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[2] This connection refers to user plane connection.

16. In view of the on-going technology and market developments for 5G, OFCA will closely monitor the concerned developments and update the Guidelines as and when necessary.

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[DATE]