

# Radio Spectrum and Technical Standards Advisory Committee

**SSAC Paper 4/2019 for Information:**

**Update on the Use of Sub-6 GHz Spectrum  
for Public Mobile Services in Hong Kong**

**Office of the Communications Authority  
30 September 2019**

# Introduction

- This paper aims to -
  - give an overview of spectrum assigned for public mobile services in Hong Kong
  - brief members on overseas developments in respect of spectrum supply for the fifth generation mobile (“5G”) services
  - update members on the use of sub-6 GHz spectrum for public mobile (including 5G) services in Hong Kong
  - explain the need for frequency co-ordination of public mobile services with the neighbouring areas of the Mainland



# Spectrum Assigned for Public Mobile Services in Hong Kong

- Over 1,700 MHz spectrum in various frequency bands has been assigned to mobile network operators (“MNOs”) for provision of public mobile services
  - spectrum below 6 GHz (i.e. sub-6 GHz spectrum) facilitates rollout of wide-area network coverage
    - ▶ 552 MHz spectrum has been assigned to incumbent MNOs
  - spectrum above 6 GHz, e.g. the 26 GHz and 28 GHz bands, facilitates hotspot coverage that demands high data throughput
- In line with the technology neutral policy, MNOs in general can deploy their preferred technologies in the assigned spectrum for provision of public mobile services conforming to their licences
- To support the on-going development of advanced public mobile services, the CA will continue to identify suitable spectrum for release to the mobile industry



# Summary of Spectrum Assigned for Public Mobile Services in Hong Kong

Uplink (MHz)	Downlink (MHz)	Duplex Mode
825 – 832.5	870 – 877.5	FDD
832.5 – 837.5	877.5 – 882.5	FDD
885 – 915	930 – 960	FDD
1710.5 – 1784.9	1805.5 – 1879.9	FDD
1920.3 – 1979.7	2110.3 – 2169.7	FDD
2330 – 2390		TDD
2500 – 2570	2620 – 2690	FDD
26550 – 27750		TDD

FDD: frequency division duplex

TDD: time division duplex

# Spectrum Supply for 5G Services

- While 5G services are more advanced and promise to provide new business opportunities and support innovative services, they require additional spectrum supply in both sub-6 GHz and millimetre wave (i.e. above 6 GHz) bands
- Harmonisation of millimetre wave bands between 24.25 GHz and 86 GHz for 5G services will be decided in the forthcoming World Radiocommunication Conference to be held in October / November 2019 (“WRC-19”)
  - Members will be updated on WRC-19 outcomes including its identification of millimetre wave bands for 5G services in due course
- The following presentation will focus on the use of sub-6 GHz spectrum for 5G services in Hong Kong



# Spectrum Supply for 5G Services in the US

- In the US, the Federal Communications Commission (“FCC”) has planned to supply spectrum in the following bands for 5G services -
  - sub-6 GHz spectrum: 600 MHz, 800 MHz, 900 MHz, 2496 - 2690 MHz, 3.55 - 3.7 GHz and 3.7 - 4.2 GHz bands
  - millimetre wave spectrum: 24 GHz, 28 GHz, 37 GHz, 39 GHz and 47 GHz bands
- FCC adopts technology neutral policy
- MNOs have launched 5G services in the US in the following bands -
  - 2496 - 2690 MHz, 28 GHz and 39 GHz bands
  - using TDD mode of operation



# Spectrum Supply for 5G Services in Europe

- In Europe, the European Commission (“EC”) has identified three “5G pioneer bands” -
  - sub-6 GHz spectrum: 700 MHz and 3.4 - 3.8 GHz bands
  - millimetre wave spectrum: 26 GHz band
  - envisaged availability of these bands across European countries for 5G services by 2020
- EC adopts technology and service neutral policy
- Several European countries, including UK, Germany, Italy, Spain and Finland, have launched 5G services in the 3.4 - 3.8 GHz band
  - using TDD mode of operation



# Spectrum Supply for 5G Services in Major Asia Pacific Economies

- In Japan, spectrum has been assigned to MNOs in the following bands for 5G services -
  - 3.6 - 4.1 GHz, 4.5 - 4.6 GHz and 28 GHz bands
  - using TDD mode of operation
- In South Korea, spectrum has been assigned to MNOs in the following bands for 5G services -
  - 3.42 - 3.7 GHz and 28 GHz bands
  - using TDD mode of operation
- In Australia, spectrum has been assigned to MNOs in the following band for 5G services -
  - 3.575 – 3.7 GHz band
  - using TDD mode of operation





# Spectrum Supply for 5G Services in the Mainland

- In 2018, the Mainland assigned the following bands to MNOs for trials of 5G services -
  - 2515 - 2675 MHz and 4.8 - 4.9 GHz to China Mobile
  - 3.4 – 3.5 GHz to China Telecom
  - 3.5 – 3.6 GHz to China Unicom
  - using TDD mode of operation
- In June 2019, the Ministry of Industry and Information Technology awarded licences to China Mobile, China Telecom, China Unicom and China Broadcasting Network for provision of 5G services
- Mainland's MNOs are actively rolling out their 5G networks in preparation for the upcoming service launch

# Spectrum Supply for 5G Services in Hong Kong

- OFCA monitors international development trends and assists the CA in identifying spectrum for 5G services for use in Hong Kong
- MNOs may also re-farm their assigned spectrum on hand to provide 5G services
- In 2017, the CA promulgated its plan and road map in making available additional spectrum for 5G services



# Sub-6 GHz Spectrum Supply for 5G Services in Hong Kong

- In implementing its plan and after a series of public consultations conducted in 2018, the CA will hold auctions of the following sub-6 GHz spectrum for 5G services -

Frequency Band (MHz)	Remark*
3400 – 3600	Auction to be held on 14 Oct 2019
4840 – 4920	Auction to be held after auctioning of the 3400 – 3600 MHz band
3300 - 3400 (restricted for indoor use)	Auction to be held after auctioning of the 4840 – 4920 MHz band

\* As promulgated in the Spectrum Release Plan for 2019 - 2021, a maximum of 160 MHz spectrum within the 617 – 698 MHz and 703 – 803 MHz bands will be released for public mobile services, after switching off analogue TV broadcasting services by end 2020.

# Re-assignment of Spectrum for Public Mobile Services in Hong Kong (1)

- Spectrum assignments for public mobile services due to expire in the coming 5 years –

Uplink (MHz)	Downlink (MHz)	Assignment Expiry Date*
825 – 832.5	870 – 877.5	Nov 2023
2500 – 2515	2620 – 2635	Mar 2024
2540 – 2570	2660 – 2690	Mar 2024
2515 – 2540	2635 – 2660	May 2028**

\* The current licence term for the assignments of 890 – 915 MHz, 935 – 960 MHz, 1710.5 – 1784.9 MHz and 1805.5 – 1879.9 MHz bands will expire in Jan 2021. These bands have been re-assigned in 2019 for the new licence term ending 2036.

\*\* This band is listed here for information, as some other assignments in the 2.5 - 2.69 GHz band (“2.6 GHz band”) will expire within the next 5 years.

# Re-assignment of Spectrum for Public Mobile Services in Hong Kong (2)

- Spectrum re-assignment exercise involves relevant consultations and legislative works
- In particular, there are specific issues related to the use of spectrum in the 2.6 GHz band
  - Noting the increasing trend of TDD mode of operation worldwide, OFCA might need to revisit the existing FDD channel plan
  - Subject to any change in mode of operation and/or condition of usage, OFCA might need to revisit the existing frequency co-ordination arrangement with the Mainland
- In view of the additional issues to be considered, it is timely for OFCA to consider the work plan for re-assignment of spectrum in the 2.6 GHz band that would expire in five years

# Re-assignment of Spectrum in the 2.6 GHz Band (1)

- In the Mainland, the 2555 - 2655 MHz band (100 MHz bandwidth) was assigned to the fourth generation mobile (“4G”) services (TDD mode of operation) that overlapped part of the spectrum for public mobile services of Hong Kong operating in the same band (FDD mode of operation)
- Due to operation mode mismatch, mutual interference in the overlapped sub-bands between TDD systems in the Mainland and FDD systems in Hong Kong is inevitable
- The situation might be worsened as the Mainland has allocated in Dec 2018 the 2515 – 2675 MHz band (160 MHz bandwidth) for 5G services using TDD mode of operation

# Re-assignment of Spectrum in the 2.6 GHz Band (2)

- OFCA and the Mainland counterpart work closely to control the level of overspill signals to the other side with a view to
  - avoiding false roaming
  - minimising any adverse impacts to the other side so as not to constrain the respective development of public mobile services
- In consultation with MNOs, OFCA has coordinated with the Mainland on the use of the 2.6 GHz band
  - both sides agree to control overspill signals to a specific level in the boundary areas so as to minimise mutual radio interference
  - such arrangement nevertheless impacts on the efficient use of spectrum in the boundary areas by MNOs of both sides
- Subject to any change in the use of the 2.6 GHz band in Hong Kong, the relevant control level of overspill signals would be revisited with a view to improving the efficient use of spectrum of both sides

# Conclusion

- **Members are invited to note the content of this paper for information**
- **OFCA will reach out to the incumbent MNOs to solicit their views and comments on the matter with a view to developing the way forward for discussion in SSAC**

