



# **The Fifth Generation (5G) Services and Making Available Radio Spectrum for its Development**

Telecommunications Users and Consumers Advisory Committee  
30 March 2017

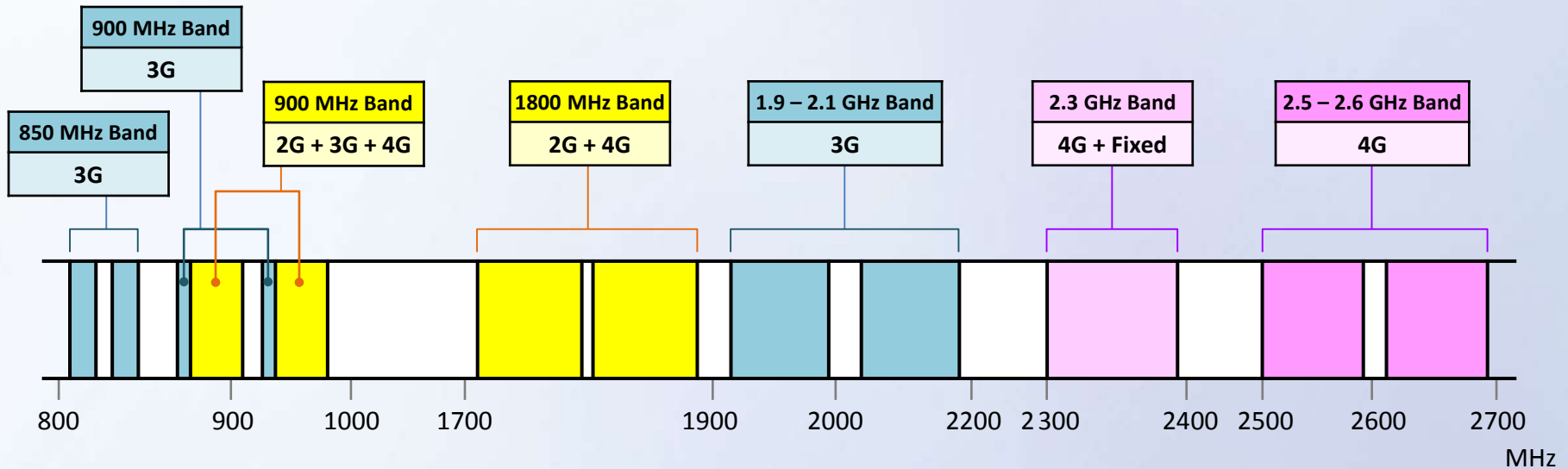
# Radio Waves and Spectrum

- Wireless communications can be achieved using radio waves
- Radio frequencies in different frequency bands are being used for different services including fixed, mobile, broadcasting, satellite, radar, aeronautical, maritime, etc.



- Radio spectrum as a collection of frequency bands is a limited public resource. In particular, there are competing demands on frequency bands for use by public mobile services

# Frequency Bands for Public Mobile Services



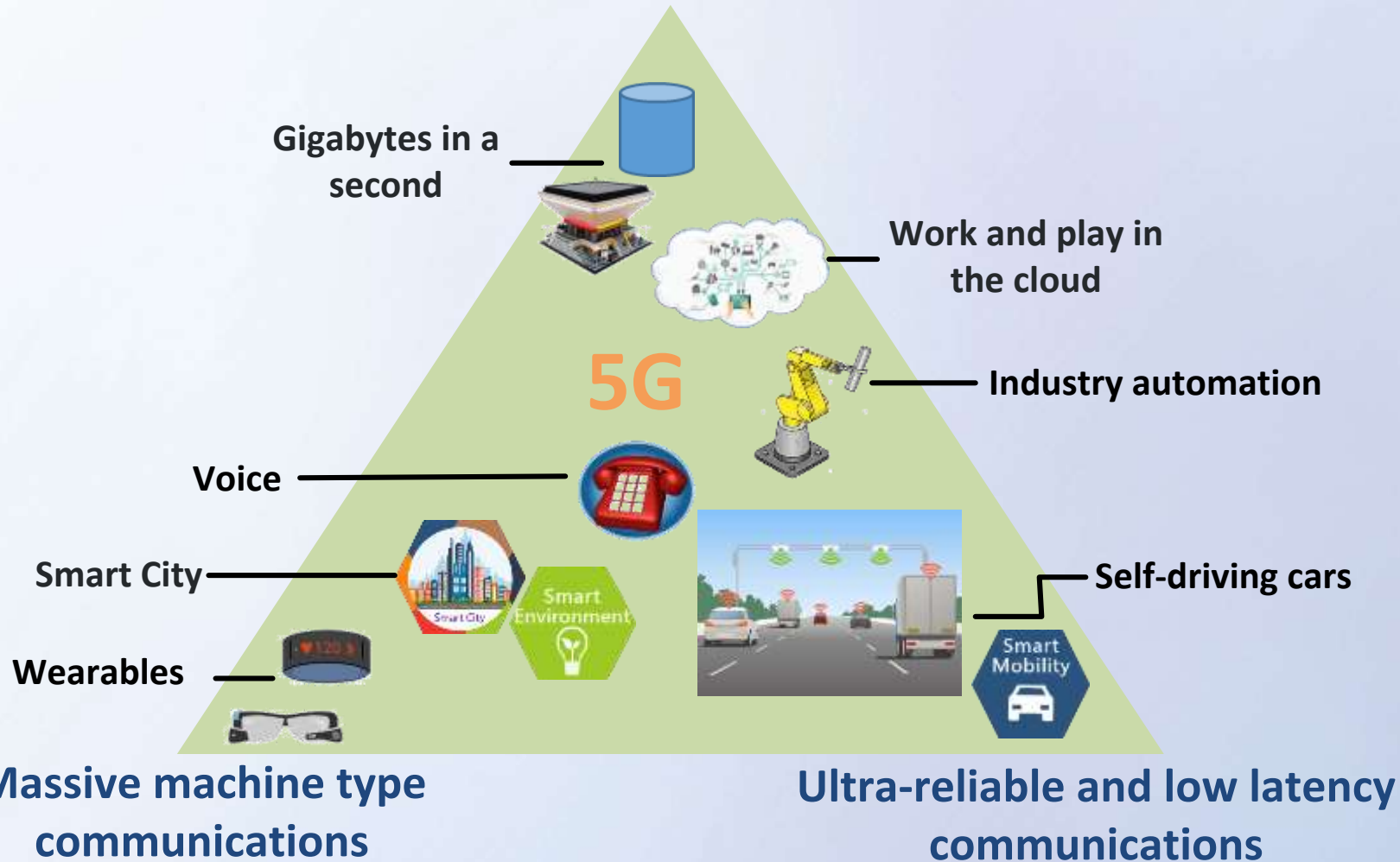
- Currently, public mobile services are operating below sub-6 GHz bands (1 GHz = 1000 MHz). Given the favourable radio propagation characteristics, territory-wide coverage with high network capacity can be achieved by transmitting at relatively lower power and reusing frequencies

# 5G Service Types (1)

- Public mobile services are indispensable to our daily lives. Currently, the second generation (2G), third generation (3G) and fourth generation (4G) services are available in Hong Kong
- 2G was designed predominantly for voice services and text messaging (data rate up to 384 kbps); 3G data rate is higher (about 110 times higher than 2G); 4G data rate is even higher (about 15 times higher than 3G)
- The upcoming fifth generation (5G) further provides
  - **Enhanced mobile broadband** (about 15 times higher than 4G)
  - **Massive machine type communications** (used in smart city, wearables, etc.)
  - **Ultra-reliable and low latency communications** (used in self-driving cars, industry automation, etc.)
- 5G posts unprecedented demand on spectrum

# 5G Service Types (2)

## Enhanced mobile broadband

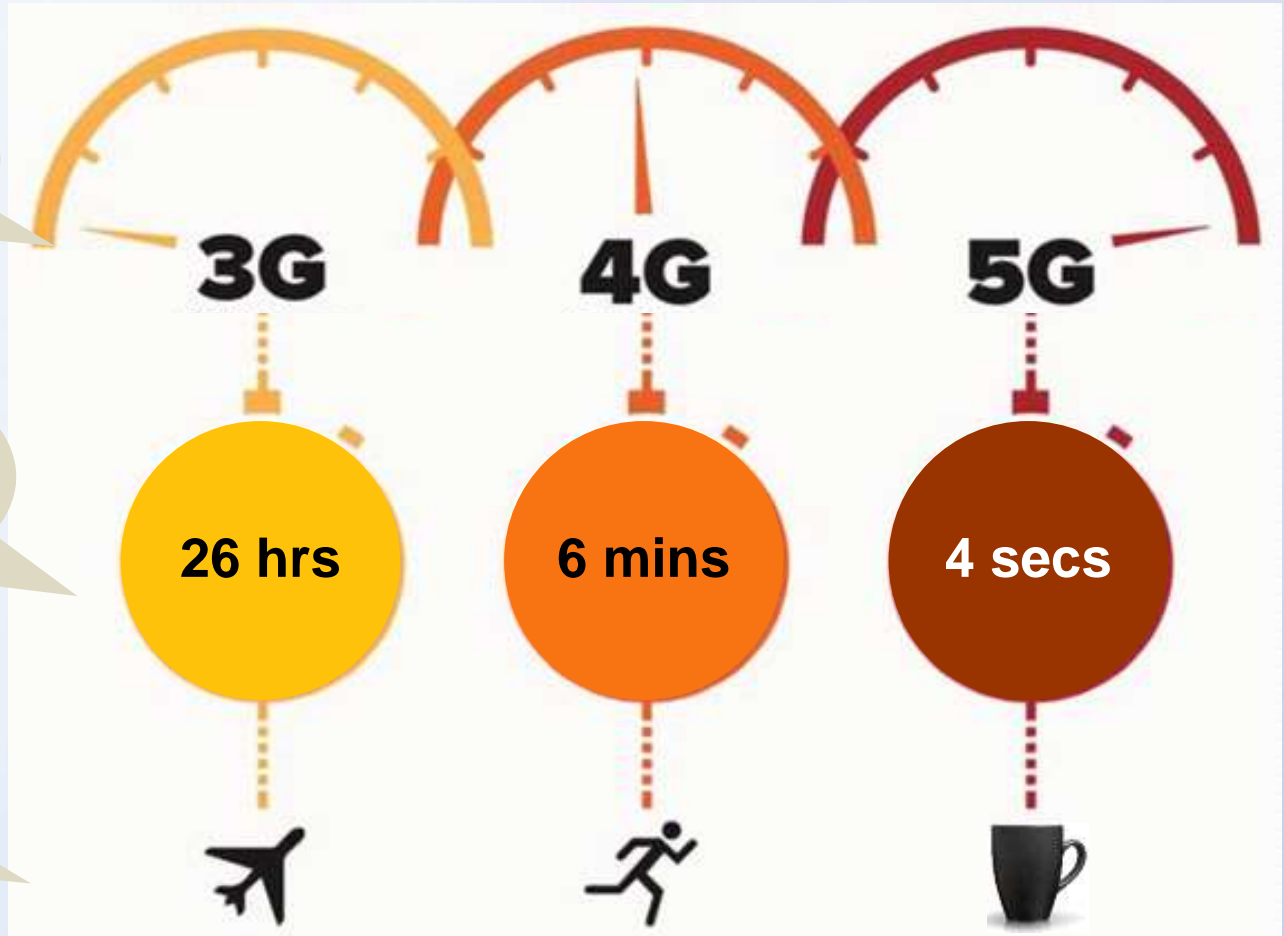


# 5G – Enhanced Mobile Broadband

Technology

Downloading a high-resolution movie (8GB) takes

Time equivalent to



Long-haul flight

Exercise

Sip a drink

# Wide Bandwidth Spectrum above 6 GHz

- 552 MHz of spectrum in the sub-6GHz bands has been assigned for public mobile services. Mobile network operators may deploy their assigned spectrum for 5G at their own discretion
- International Telecommunication Union (ITU) estimated that 5G would require at least 1,340 MHz of spectrum. Due to the different 5G services, consideration may be given to the use of spectrum at high frequencies

reference : Rep. ITU-R M.2290-0

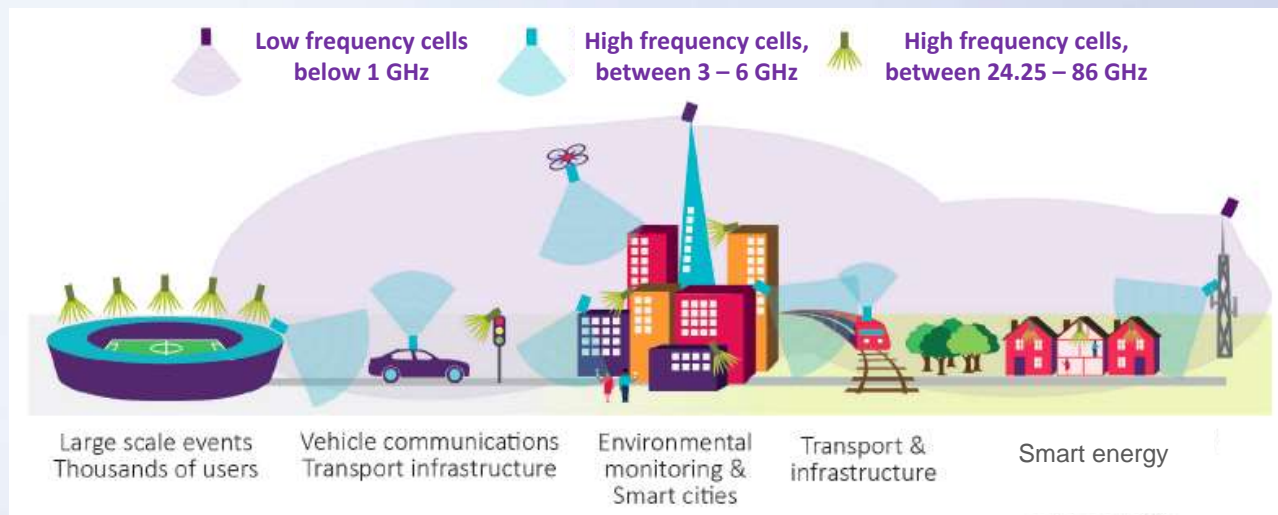
Candidate Bands As Per ITU	
Band (GHz)	
24.25	– 27.5
31.8	– 33.4
37	– 40.5
40.5	– 42.5
42.5	– 43.5
45.5	– 47
47	– 47.2
47.2	– 50.2
50.4	– 52.6
66	– 76
81	– 86

Total Bandwidth: 33.25 GHz (or 33,250 MHz)



# Spectrum Deployment for Mobile Services

- Different Propagation Characteristics in High and Low Frequency Bands
  - **sub-6GHz spectrum** for territory-wide coverage, including the existing mobile services, upcoming Internet of Things (IoT) and ultra-reliable and low latency communications, etc.
  - **Spectrum ranging from 24.25GHz to 86GHz** for enhanced mobile broadband services, boosting the network capacity at densely populated areas, e.g. shopping malls, central business districts, etc.





# Roadmap for Making Available Spectrum for Mobile Services (1)

- Looking for new spectrum at high frequency bands and re-farming existing spectrum at low frequency bands
- 5G spectrum at high frequency bands
  - Among the 11 candidate bands of ITU, nine of them are currently vacant. These nine bands could be allocated for 5G in a timely manner
  - For the remaining two bands, i.e. the 24.25 – 27.5 GHz band (the 26 GHz band) and the 37 – 40.5 GHz band, they are currently used for fixed links in Hong Kong with low utilisation rates
  - The Communications Authority (CA) will take into account international and regional development and timely vacate the 26 GHz band so as to facilitate 5G development

# Roadmap for Making Available Spectrum for Mobile Services (2)

- **Low frequency bands**

- Many places in the world have allocated the 700 MHz and 3.5 GHz bands for public mobile services, and even for 5G. In Hong Kong, these two bands are used for TV broadcasting and fixed satellite services (FSS) respectively
- **700 MHz Band:** The working target of the Government is to switch off analogue TV broadcasting by end 2020, with a review of the target date to be conducted in 2017–18. OFCA is coordinating with the Mainland authority on the use of the spectrum concerned
- **3.5 GHz Band:** CA will launch a public consultation on the proposed allocation to mobile services. In respect of the adverse effect of public mobile services to the existing FSS in this band, OFCA will engage a technical consultant to look for measures for the co-existence of the two services

Thank you!  
~The End~