For discussion
on 16 May 2022

Legislative Council
Panel on Information Technology and Broadcasting

Updates on 5G Development in Hong Kong

Purpose

This paper briefs Members on the Government's measures to promote the development of 5G and its latest situation in Hong Kong.

Background

2. With characteristics of high speed, high capacity, reliability, massive connectivity and low latency communications, 5G technology not only revolutionises mobile users' experience, but also opens up vast potential for various innovative commercial services and smart city applications in Hong Kong.

Latest Overview of 5G Development

3. Notwithstanding the challenges to the overall economy brought by the epidemic, mobile network operators (MNOs) in Hong Kong successfully launched commercial 5G services in the second quarter of 2020, and have been making good progress in different aspects. Amidst the new normal during the epidemic, many businesses require their staff to work from home and interact through video conferencing. 5G services provide stable, speedy, reliable and cost-effective telecommunications services anytime and anywhere to members of the public and various trades and industries, which help sustain all sorts of normal economic activities and daily lives.

4. On network coverage, the coverage of 5G networks is over 90%, covering major locations in the urban areas and a total of 97

stations in all MTR lines. The coverage of 5G networks of some MNOs in core business districts even reached 99%, and the number of 5G users has exceeded 3 million, representing around 40% of the population. Hong Kong ranks second globally in terms of 5G coverage according to a recent report of an international survey organisation[1]. We will continue to follow up with MNOs on the latest market development of 5G.

5. Regarding the supply of 5G mobile phones, there are more than 110 models available in the market, with prices ranging from around $1,300 to over $10,000. Major brands have actively launched new basic or flagship models of 5G products, thereby increasing user's incentives for subscribing to 5G services. In terms of service fees, MNOs provide various 5G service plans. Depending on data usage[2], the monthly charge ranges from below $200 to over $1,000, and users can choose the suitable service plans according to their respective needs.

Government's Facilitative Measures

6. To promote the development of 5G in Hong Kong, the Government has implemented a series of measures to facilitate the extension of 5G networks and services -

Spectrum Supply

7. Radio spectrum is the cornerstone for the provision of mobile telecommunications services. 5G requires the use of spectrum in high, mid and low frequency bands to satisfy the need of various 5G services in terms of speed, capacity and coverage.

8. A total of about 2 100 MHz of spectrum (see **Annex 1** for details) in different frequency bands was assigned to the market in 2019 and 2021 to enable the early launch of 5G services by MNOs as well as to satisfy the future demand of the telecommunications market, supporting the continuous development of mobile telecommunications services in Hong Kong.

---

[1] The report released by Opensignal in March 2022

[2] From 8 GB to 500 GB

9. In accordance with the technology-neutral principle, MNOs may re-farm some of their existing spectrum flexibly for 2G/3G/4G/5G services according to their respective commercial strategies. We will continue to monitor technology and market developments to prepare for the future supply of spectrum and timely make more suitable spectrum available for the development of 5G and other innovative services.

Resolving the Problem of the 3.5GHz Restriction Zone

10. Among the various frequency bands for mobile communications, the 3.5 GHz band possesses good radio propagation characteristics and can support high-speed, stable and extensive mobile transmission. Considering that spectrum in the 3.5 GHz band was used for the provision of fixed satellite service, the Communications Authority (CA) restricted the operation of 5G radio base stations (RBSes) at the 3.5 GHz band by MNOs in areas with earth stations for telemetry, tracking and control (TT&C) of satellites (i.e. Tai Po and Stanley) to prevent interference when re-allocating the 3.5 GHz band to mobile services in April 2020.

11. To promote 5G development in Hong Kong, the Government proactively liaised with the relevant satellite operators the relocation of their TT&C facilities in Tai Po. At present, one operator has decided to relocate their facilities to the Chung Hom Kok Teleport and has been granted a land lot by the Lands Department, while the other operator has undertaken to install satellite band-pass filters at their facilities to prevent interference. The works are expected to be completed by 2024, when the "3.5 GHz restriction zone" problem in Tai Po will be completely resolved. Besides the 3.5 GHz band, MNOs are also making use of other 5G bands (e.g. 4.9 GHz) or re-farm their existing spectrum (e.g. 2.1 GHz) to provide 5G services in the 3.5 GHz restriction zone in Tai Po.

Facilitating the Rollout of 5G Networks

12. To provide territory-wide 5G services, MNOs need to establish a larger number of RBSes as compared with previous generations of mobile services. To facilitate MNOs' expeditious and effective rollout of 5G networks, we strive to assist them in installing

RBSes for extension of 5G network coverage.

13. The Office of the Communications Authority (OFCA) has approved the installation of more than 8 900 new 5G RBSes by MNOs since 2019. With existing RBSes also being upgraded by MNOs to provide 5G coverage, the progress of network rollout is satisfactory. To facilitate the continuous refinement of 5G network coverage by MNOs, on top of the about 1 000 suitable government premises opened up under a pilot scheme launched in 2019, we further opened up about 500 government premises under a "demand-led" model in January this year for MNOs to install RBSes with a streamlined application process and nominal rental ($1 per year). Besides, we have established mechanisms to facilitate the installation of RBSes by MNOs at sheltered bus stops, public payphone kiosks and smart lamp posts.

14. To further facilitate the installation of RBSes by MNOs, OFCA has worked with the Buildings Department to streamline the approval processes for installation of telecommunications facilities like antennas and transceivers of 5G small cell sites on external walls of buildings[3], with a view to ensuring building safety while expediting the approval for the relevant minor works.

15. On facilitating 5G indoor coverage, we set up a user-friendly web-based platform last year for low-power indoor RBSes[4] to facilitate MNOs' self-service registration, for which immediate approval will be given. This would expedite the installation of 5G indoor RBSes (e.g. those in shopping centres, conference venues, commercial buildings, etc.), extension of network coverage and enhancement of capacity by MNOs. More than 150 applications for indoor RBSes have been processed so far.

---

[3] To streamline the approval processes by including the metal supporting frames for antennas and transceivers for public telecommunication services projecting from the external walls of buildings as minor works (with certain limitations on the projection of the frame and the weight of the antenna/transceiver).

[4] i.e. indoor public mobile services RBSes with power not exceeding 2 watts (equivalent isotropically radiated power (EIRP)). As advised by the International Telecommunication Union, such low-power RBSes meet the radiation safety requirements of the International Commission on Non-ionizing Radiation Protection.

Extending Broadband Services in Remote Areas

16. For remote villages located in the New Territories and on outlying islands, the progress of extending network coverage by fixed network operators (FNOs) was slow due to the high costs of network rollout and the small number of subscribers. We have therefore launched a subsidy scheme to encourage FNOs to extend fibre-based networks to villages in remote areas.

17. Subsidised new fibre-based networks are being extended to a total of 235 villages in phases starting from last year, benefitting about 110 000 villagers. The extended networks will provide higher Internet access speed and more stable broadband services to people living in remote areas, and further promote the development of telecommunications services (including 5G) through extension of backbone infrastructure for telecommunications, which is in line with Hong Kong's smart city development. At present, the subsidy scheme has made interim achievements. Fibre-based networks have already reached 39 villages (and 31 of them can enjoy "fibre-to-the-home") with broadband speeds from 200 Mbps to 2 Gbps and a monthly service fee from about $200 (comparable to the prevailing market price). Fibre-based networks are expected to connect more than half (about 120) of the villages by the end of this year, and to all villages covered by the subsidy scheme by 2026.

Encouraging Wider Application of 5G

18. To encourage early deployment of 5G technology across trades and industries for improving efficiency, productivity and quality of service, we introduced the "Subsidy Scheme for Encouraging Early Deployment of 5G"[5] under the "Anti-epidemic Fund" in May 2020 which has been well-received. We have increased the total subsidy of the scheme to $100 million. It is expected to benefit around 200 eligible projects.

19. As at end-April this year, we have approved more than 130 applications, covering various innovative applications such as remote real-time healthcare system, construction site safety monitoring system,

---

[5] The scheme subsidises 50% of costs for projects deploying 5G technology, subject to a cap of $500,000 for each project. The application period ends on 31 July 2022.

remote mechanical maintenance, e-sports car racing system, 4K/8K live broadcast of musical performance or sports coaching, etc., demonstrating the wide applicability of 5G. Brief descriptions of the approved projects are at **Annex 2**.

20. We will also continue to strengthen the promotion and co-operation with various institutions (e.g. Hong Kong Science and Technology Park, Cyberport, Hong Kong Applied Science and Technology Research Institute, and the Hong Kong Productivity Council) to encourage more trades and industries to deploy 5G technology. We will facilitate the early introduction and application of 5G technology by government departments and public bodies to lead by example and exemplify Smart Government.

Way Forward

21. Like the previous generations of mobile telecommunications services, 5G services require time to achieve maturity and wide adoption. We will continue to closely monitor the market situation and actively implement appropriate measures to support the on-going development of 5G and smart city.

Advice Sought

22. Members are invited to note the content of this paper and provide comments.

Communications and Creative Industries Branch
Commerce and Economic Development Bureau
Office of the Communications Authority
May 2022

Annex 1

Details of 5G Spectrum Assignment[1]

Frequency Band	Successful Assignment of Spectrum						Spectrum to be Assigned in June 2022
	Mid-band				High-band		Low-band
	3.3 GHz	3.5 GHz	4.9 GHz		26 and 28 GHz		700 MHz
					Large scale public mobile services	Localised innovative wireless services	
Amount of Spectrum	100 MHz	200 MHz	80 MHz	80 MHz	1 200 MHz	400 MHz	70 MHz
Condition of Use	For indoor use only	For territory-wide use[2]	For territory-wide use			Specified areas of no more than 50 sq km	For territory-wide use
Assignment Method	Auction				Administrative assignment		Auction
Network and Service Rollout Obligation (within five years)	At least 400 indoor base stations	Minimum 45% population coverage	Minimum 50% population coverage		At least 2 500 radio installations[3]	Not applicable	Minimum 90% population coverage
Date of Auction	October 2019			October 2021	Not applicable		October 2021
Start Date of Use	December 2019	April 2020	December 2019	December 2021	April 2019	October 2019	June 2022 (anticipated)

[1] In addition to the newly added spectrum listed in the table, 15 MHz of spectrum in the 850 MHz low-band was re-assigned in December 2021 and 90 MHz of spectrum in the 2.5/2.6 GHz mid-band will be re-assigned in March 2024. In accordance with the technology-neutral assignment approach, such spectrum may also be used for the provision of 5G service.

[2] There are "3.5 GHz restriction zones" in Tai Po and Stanley. It is expected that the usage restrictions in Tai Po will be removed in or before 2024.

[3] Having considered the requests jointly submitted by spectrum assignees, the CA decided in November 2021 to postpone the deadline for fulfilling network and service rollout obligations by two years, i.e. assignees are required to provide at least 2 500 radio installations within seven years.

Annex 2

Projects Approved under the Subsidy Scheme for Encouraging Early Deployment of 5G (as at April 2022)

Project	**Details**
Construction	
Augmented reality (AR) based building information modelling (BIM) for construction sites	Engineers and relevant staff can apply and modify BIM at construction sites to obtain construction details on-site.
3D modelling for underground works	4K video shooting is performed at excavation sites to build 3D modelling for underground cable facilities.
Site management and safety system	Artificial intelligence (AI) based image analytic technology allows intelligent site management to monitor the situation on-site and sent out alerts automatically in the event of abnormalities, and real-time monitoring of the site by management staff.
Self-propelled robot for building material delivery	Remote control of robots to deliver building materials at construction sites
Property and building facility management	
Real-time monitoring of lift safety and remote technical support solution	Technicians on lift maintenance can be supported by a real-time remote support system and reinforced by round-the-clock devices to monitor lift operation.
Intelligent car parking management system	Use of AI based vehicle image analytic technology to record vehicles entering and leaving car parks and control the opening and closing of gates
Customer service/patrol robot	Deployment of 5G robots to provide services such as concierge, security patrol, disinfection and advertising at different venues (e.g. large shopping centres, exhibition venues, offices)
Crowd control and security system	Use of an AI based system for real-time calculation of number of customers, detection of intruders of restricted areas and sending out of security alerts in the event of abnormalities

Project	**Details**
Finance	
Virtual trading desk	With 5G mobile virtual reality (VR), dealers working remotely can engage in foreign exchange trading, etc.
Transport and logistics	
Management system for real-time detection of unauthorised access to tunnel	Use of an AI and cloud based video analytic system to detect unintentional intrusion into tunnels and alert management staff immediately for follow-up actions
Video monitoring of professional drivers and road conditions	Application of video analytic and AI based technology to detect drivers' and road conditions to send out alerts in time
Real-time container loading optimisation system	Use of mixed reality (MR) and AI based analytic technology to enable logistics workers to utilise container space more effectively when loading goods
Work safety	Use of real-time image and AI based analytic technology to help monitor the work safety of workers operating truck-mounted cranes
Medical, healthcare and public health	
Engineering design of remote surgical device	Use of AR/VR technologies to enable collaborative design of remote surgical devices
Remote advice and training for surgical operation	Application of a high definition (HD) video system to offer remote advice and training for surgical operations
Remote emergency service support	Remote emergency and diagnosis service support is offered.
Smart wearable safety device for high-risk workers and the elderly	Real-time detection and analysis of high-risk workers' or elders' physical conditions and positions to enable possible rescues through 4K videos
AI based device for the visually impaired	With HD images, AI based analytic and real-time audio alerts, assistance regarding text and object identification can be offered to the visually impaired.
Insecticide spraying robot	Use of insecticide spraying robots equipped with 5G technology to realise autopilot of robots and real-time monitoring of surroundings

Project	**Details**
Environmental protection	
Smart recycling machines	With real-time image and AI based recognition technology, recycling machines can identify recyclable items precisely, and engineering personnel can also offer remote technical support to on-site maintenance staff.
Remote environmental monitoring system	Application of AI based technology to allow real-time monitoring of surroundings (e.g. information on hill fire, slope and tunnel cracks and air quality) and send out alerts early
Education	
AR/VR based teaching	Use of AR/VR contents to support teaching during teaching process to make learning more interesting
Special education	Deployment of intelligent robots at the campuses of special schools to allow monitoring of students' physical conditions and positions and make learning more interesting so as to enhance the learning and communication skills of students with special needs
Culture, arts, sports and entertainment	
Remote e-sports car racing	Players are allowed to experience remote mini-car racing and enjoy the fun of e-sports.
Portable live streaming studio for fitness training	Coaches may conduct live streaming of fitness coaching anywhere to enhance the interaction between coaches and trainees.
HD live streaming system	Application of 5G at outdoor or temporary venues for HD live streaming (e.g. of music/dancing performances, news, sports events, real-time remote examination, AR based remote travel, training in film production, mini-four-wheel driven car racing)
Remote sports trainee training system	By wearing AR glasses, trainees may read instructions given by coaches and relevant data during training.
Repair, maintenance and monitoring	
Remote repair support system	Use of 5G connection to support repair of various machines. Frontline staff can wear smart glasses to seek experienced personnel's real-time remote assistance during repair.
Remote circuit board welding machine repair system	Remote control of repair machines by repair staff through 5G networks to repair the circuit board welding machines for their clients

Project	**Details**
Design	
AR/VR based design system	Application of AR/VR based technology to various design (e.g. exhibition booths, interior decoration, application of decoration materials and playgrounds) to facilitate discussion between designers and clients and design modification
Textile	
Video conferencing system for displaying fabric samples	Application of a portable video conferencing system equipped with lenses having 20x zoom capabilities to enable real-time display of fabric texture
Telecommunications	
Radio base station (RBS) inspection by drone	Use of high-resolution drones to conduct regular inspection of RBSes
Conference and exhibition	
AR/VR based business communications system	Portable AR/VR-based video conferencing system and a 4K/hologram live streaming system applicable to conferences, exhibitions and other temporary occasions
Professional service	
Photogrammetry	Application of 5G in provision of various kinds of on-site photogrammetry at outdoor or temporary venues
Sales and marketing	
Smart billboard	Use of real-time image and AI based recognition system to offer various kinds of advertisements and passenger flow analysis