



INFO-COMMUNICATIONS MEDIA DEVELOPMENT AUTHORITY

INFORMATION PAPER:

**FRAMEWORK FOR ASSIGNMENT OF FREQUENCIES ON NON-
INTERFERENCE AND NON-PROTECTION BASIS**

8 March 2010

(Revised on 17 March 2016 and 4 July 2019)

Important Notice

This paper is for informational purposes only and should be read together with the Radio Spectrum Master Plan and the Singapore Spectrum Management Handbook. The Radio Spectrum Master Plan serves to inform the industry and interested parties on the availability of spectrum in the coming years, the technological trends in the use of spectrum and IMDA's policy direction with regard to spectrum allocation and re-allocation for public communications networks. The Singapore Spectrum Management Handbook serves to provide information on Spectrum Management activities, assignment policies and the application procedures for the various radio-communication services including mobile, fixed, satellite, short-range devices and broadcasting services.

This paper seeks to provide clarity in IMDA's framework for assignment of frequencies on a non-interference and non-protection basis. Information contained in this paper may be updated or amended from time to time. IMDA does not make any representation or warranty, express or implied, in relation to the accuracy or completeness of the information contained in this paper.

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FREQUENCY COORDINATION

1 Radio waves propagate in space with no regard for national boundaries. In any border area between two countries, the allocation of frequency bands to new radio technologies requires close coordination between the two countries to pre-empt any harmful interference. This is particularly critical for high power and wide coverage systems. For Singapore, due to our small geographical area and close proximity to the neighbouring countries, frequency coordination is even more crucial, as it will ensure that the use of the available frequencies is optimised not just at the border areas but also the rest of the country, and that any harmful interference by foreign networks, and vice versa, is minimised.

2 In Singapore, frequency coordination with neighbouring countries is achieved via several fora, including the Frequency Assignment Committee of Singapore, Malaysia and Brunei (“**FACSMAB**”), and through border communication coordination meetings between Singapore and Indonesia as well as trilateral coordination meetings involving Singapore, Malaysia and Indonesia.

3 IMDA plays an important role in the planning, allocation and assignment of frequencies to ensure the efficient delivery of services such as mobile, broadcasting, fixed, satellite, and short-range devices. Advancements in technology and increasing demand for more wireless services have increased the risk of potential interference, including spurious emissions, among wireless networks. To ensure efficient use of spectrum within the country, operators are also expected to coordinate the use of spectrum so as to avoid harmful interference.

FREQUENCY ALLOCATION

4 Frequency coordination agreements with neighbouring countries may sometimes limit the amount of spectrum that is available for assignment by IMDA in Singapore. This is because different countries have different needs and their own unique considerations. Therefore, it may not always be possible to agree on the adoption of a common harmonised band plan. In such cases, the regulators will seek to achieve an effective and equitable allocation of frequencies by assigning parts of the frequency band for priority access by different countries in the border areas. This means that Singapore operators operating in the Singapore-assigned frequencies will have priority over the use of these frequencies and their networks operating in those frequencies would be protected from interference from foreign networks operating at the border areas. Correspondingly, those frequencies that have not been assigned for priority access by Singapore operators (“constrained” frequencies) would be susceptible to frequency interference to and from foreign networks at the border areas.

5 Within Singapore itself, there may be additional “constrained” frequencies where the primary use of these frequencies have been allocated for other purposes.

6 Notwithstanding that parts of the frequency bands may have been coordinated for priority access by neighbouring countries at the border areas, or assigned for priority access by spectrum right holders, it is still within IMDA’s prerogative to assign these frequency spectrum to interested operators. However, Singapore operators must be prepared to operate the networks on the understanding that their networks will not be protected from any interference. In addition, such frequency assignment will be accompanied with more stringent conditions to ensure that Singapore operators do

not interfere with priority networks. In other words, the frequency assignment is permitted under a non-interference and non-protection basis.

GENERAL FRAMEWORK FOR FREQUENCY ASSIGNMENT ON NON-INTERFERENCE, NON-PROTECTION BASIS FOR COMMERCIAL USE FOR THE PROVISION OF TELECOM SERVICES

7 As the agency responsible for the allocation and management of radio frequency in Singapore, IMDA has the responsibility to ensure that our scarce spectrum resource is utilised efficiently. As such, where there is industry demand for use of these “constrained” frequencies for the provision of telecommunication services in Singapore on a commercial basis, IMDA is prepared to consider making some or all of such frequencies available to Singapore operators for commercial use on an annual renewal basis pursuant to the grant of a network licence. Such grant shall be subject to the following additional conditions which IMDA may amend or add to at any time:

- a) The use of the radio frequencies is on a non-interference and non-protection basis;
- b) The operator acknowledges and accepts that its network may be subject to frequency interference from existing spectrum right holders, any other operators granted prior use of the frequencies and border area network operators;
- c) There will be no recourse to or against IMDA in the event that the operator’s network is being interfered with;
- d) The operator shall not cause interference to other radio-communication networks and/or services;
- e) The operator shall coordinate with border area network operators, existing spectrum right holders and any other operators granted prior use of the frequencies and take all appropriate measures to resolve interference problems if they occur;
- f) IMDA reserves the right to require the operator to suspend and/or cease operations in the event of interference and the operator shall comply immediately;
- g) The operator shall, where required by IMDA, share all or part of the radio frequencies allocated to it with any other operator for short term usage, or suspend and/or cease the use of such radio frequencies, during national events or where such use is in the public interest;
- h) The assignment of the radio frequencies under the network licence may be renewed on an annual basis subject to IMDA’s approval. For the avoidance of doubt, there is no commitment that IMDA will renew the use of the frequencies;
- i) The radio frequencies assigned must not be construed as being available or to be allocated for any future use;

- j) The operator shall manage its customers and ensure the smooth migration of all services in the event IMDA does not renew the use of the radio frequencies or suspends or withdraws the radio frequencies allocated to it under the network licence (including informing its customers that usage of the frequencies is on an annual renewal basis); and
- k) Any other conditions that IMDA may impose in relation to the said frequencies.

8 Where IMDA decides to make the “constrained” frequencies available on an annual renewal basis to Singapore operators for commercial use for the provision of telecommunication services in Singapore, IMDA will inform the industry that the frequencies would be available for application with effect from a specific date. Thereafter, the radio frequencies will be assigned administratively on a first-come-first-served basis (based on time-stamp on receipt of the application by IMDA).

9 Singapore operators interested in applying for use of the “constrained” frequencies to provide commercial telecommunication service in Singapore are required to submit their proposals to IMDA with the following information:

- a) Details of the applicant including its organisational structure and its financial capability and strength;
- b) Details of the applicant’s proposed use of the “constrained” frequencies including the telecommunication services it intends to provide and the timing as well as its network rollout plan;
- c) Details of the applicant’s track record and technical experience and capability in the relevant technical areas;
- d) Details of the applicant’s plans to prevent interference to foreign networks in border areas (or to networks of spectrum right holders) and its ability to coordinate with foreign network operators (or spectrum right holders) to resolve interference problems if they occur; and
- e) Any other relevant information which IMDA may require to assist IMDA in coming to a decision.

10 Operators whose applications for the use of the “constrained” frequencies are approved will be required to apply for and obtain the relevant network licence to install and operate the radio-communication equipment in relation to the use of the “constrained” frequencies. In addition, the applicant shall be required to apply for other relevant licences, such as dealer’s licence, where applicable.

11 For the avoidance of doubt, the grant of the network licence will be subject to additional conditions, as may be applicable, and applicants shall also be required to comply with all other licence conditions associated with such licence.

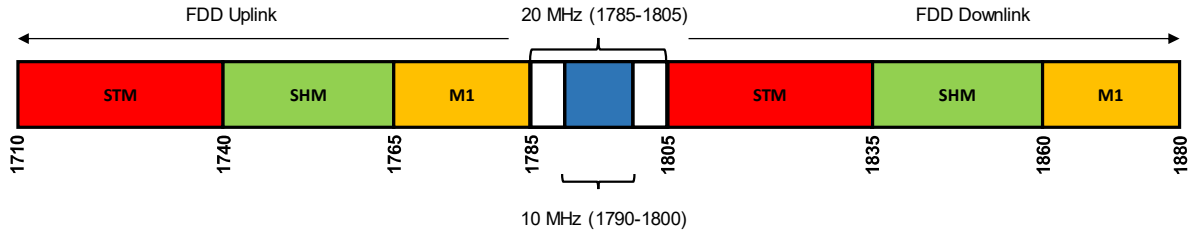
12 Successful applicants will be required to pay the relevant application and processing fees, as well as annual spectrum management fees for the use of the





“constrained” frequencies, and the relevant radio-communication licence fees, in accordance with the Telecommunications (Radio-communication) Regulations.

13 The “constrained” frequencies available for assignment to Singapore operators are set out in Annex A.

“CONSTRAINED” FREQUENCIES AVAILABLE FOR ASSIGNMENT

1800 MHz Centre Gap (1790 – 1800 MHz) – see Annex B



-  Available Constrained Frequencies
-  Frequencies presently assigned to Singtel Mobile Singapore Pte Ltd
-  Frequencies presently assigned to StarHub Mobile Pte Ltd
-  Frequencies presently assigned to M1 Limited

REQUIREMENTS AND CONDITIONS SPECIFIC TO THE ASSIGNMENT AND USE OF THE 1800 MHZ CENTRE GAP FREQUENCIES

1 The 1800 MHz centre gap frequencies, 1790 – 1800 MHz, are available for assignment to Singapore operators, on a technology-neutral basis, for commercial use to provide telecommunication services. Specifically, the frequencies shall not be used for the provision of nationwide public mobile services.

2 In addition to the conditions of use in the general framework, Singapore operators who have been granted the use of frequencies in the 1800 MHz centre gap will also be subject to the following additional conditions, which IMDA may revise or add to at any time:

- a) When requested by IMDA, the operator shall show proof of use of the frequencies, and IMDA reserves the right to terminate or not renew the use of the frequencies if such frequencies are not being utilised for their intended purpose;
- b) The operator shall ensure that the transmission output power of the equipment operating in the assigned frequencies is capped at the power limit of 1 W (ERP) for indoor deployments and 20 W (ERP) for outdoor deployments;
- c) The operator shall ensure that the base station is to be installed with a band pass filter (BPF) for transmission between 1790 to 1800 MHz. The BPF shall provide a minimum of 55 dB signal rejection for frequencies below 1785 MHz;
- d) The operator shall ensure that the minimum antenna separation distance(s) between the operator's base station and the adjacent 1800 MHz Spectrum Right Holders' base stations complies with the following:

For Indoor Deployment:

Minimum antenna separation distance	Required Isolation due to Antenna Configuration
Greater than 55 m	8 dB (with 3 dB margin for reflected signal path)
Greater than 100 m	Nil

For Outdoor Deployment:

Minimum antenna separation distance	Required Isolation due to Antenna Configuration
Greater than 200 m (for 1790 – 1800 MHz)	7 dB
Greater than 100 m (for 1795 – 1800 MHz)	3 dB

- e) When requested by IMDA, the operator shall provide the base station (including antenna) information with the adjacent 1800 MHz Spectrum Right Holders to ensure that the minimum antenna separation distance(s) are met, and for the

adjacent 1800 MHz Spectrum Right Holders to monitor interference to its network;

- f) The operator shall coordinate with other users in the same location on the use of the assigned frequencies;
- g) The operator shall take all necessary steps, at its own cost, to ensure that the deployed systems will not cause interference to, or receive interference from, other telecommunication systems operating within and/or outside of Singapore. Without limitation, below are some examples of steps to be taken by the operator:
 - (i) Base station antennas shall avoid face-to-face arrangement with 1800 MHz Spectrum Right Holders' base station antennas;
 - (ii) Base station antennas shall be able to tilt; and/or
 - (iii) Base station emission power shall be reduced (if necessary);
- h) The operator shall cease transmission in the event of valid interference complaints from the 1800 MHz Spectrum Right Holders; and
- i) The operator shall ensure that any future changes to the minimum antenna separation distance due to the re-location or installation of new sites by the 1800 MHz Spectrum Right Holders will not result in interference to the 1800 MHz Spectrum Right Holders' networks.

3 Applicants may apply for the use of any amount of the frequencies within the 1800 MHz centre gap in a specific location based on the requirements of the general framework. In addition, the applicant shall be required to:

- a) Submit proof of end-user demand in the specified location (e.g. an in-principle agreement between the operator and the end user, indicating the services to be provided); and
- b) Conduct technical trials at each requesting location and submit test reports to show proof of technical feasibility and co-existence,

before IMDA determines whether to assign the frequencies to the applicant and the amount of frequencies appropriate for the scope of the telecommunication services.

4 IMDA reserves the right to assign the frequencies in the 1800 MHz centre gap on a shared-use basis. In the event of competing demand (e.g. two or more applicants requesting the same spectrum), the applications will be assessed on a first-come-first-served basis (based on time-stamp on receipt of the application by IMDA). Nevertheless, the later application can still be approved if the applicant can show proof of co-existence with both the 1800 MHz Spectrum Right Holders and operator(s) who have already been granted prior use of the frequencies in the 1800 MHz centre gap at the specific location.