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Consultation on the Proposed Regulatory Framework for TV White Space Operations in the VHF/UHF Bands

Dear Ms Chia,

Please find attached our response to the consultation document as requested. LS telcom is pleased to have the opportunity to be part of this process and provide input from our experience with several regulators throughout the world including IDA in Singapore, as they implement whitespace spectrum management policies.

For contact regarding whitespace matters please address them to:

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We look forward to further discussion and opportunities to work with the IDA in this and other matters in the future.

Yours Sincerely,

Robert Thelen-Bartholomew
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LS Response to Questionnaire:

Question 1:

IDA invites views on adopting a licence-exempt approach for WSDs in Singapore, subject to the devices meeting the conditions set by IDA.

LS telcom: This is a sensible approach and is the general approach by regulators across the world for WSDs

Question 2:

IDA invites views on designating a restricted number of TVWS channels to support the deployment of services that require certainty of spectrum access.

LS telcom: The designation of certain channels as reserved for operation by WSDs may well be advantageous for commercial investment; however it presents a level of complexity in maintaining competition and assuring interference protection to primary users. In effect this solution would be a form of licensed access of licensed shared access rather than dynamic spectrum access.

Question 3:

In the event where IDA designates channels to support such services, IDA invites views on the appropriate regulatory approach in designating and managing these TVWS channels and the regulatory framework for the operations of prioritised WSDs.

LS telcom: If this approach were to be used a mechanism of either competition for access in the form of some sort of pre-qualification based on service supplied, or auction type process. Either way would require a degree of transparency and accountability so that those services deemed eligible to have access to the designated channels would be appropriate and also the density of users is managed otherwise there is little benefit in the approach. This could take the form of a fixed price for access based on geographic coverage and number of channels required, or a onetime auction for access for a fixed period of time.

In terms of the type of licensing an interference limited approach would be suitable for this type of allocation.

Question 4:

IDA invites views on allowing operation of WSDs in the 694 MHz – 806 MHz band until IDA allocates these frequencies for IMT deployment.

LS telcom: The beauty of a database approach to dynamic spectrum access is the ability to change policy and spectrum availability on the fly. Use of this band (and potentially others at times in the future) demonstrates the biggest advantage of DSA; temporal allocations within bands.

The residual risk is that should uptake of WSDs be high and networks rolled out, users will become accustomed to the availability of spectrum. When the allocations are reduced some congestion or increase in mutual interference may increase. Licensees need to know about this future change in allocations and the dynamism of the allocations available.

Question 5:

IDA invites views on adopting a database approach as the mandated method to access white space spectrum.

LS telcom: A database approach is the only mechanism at present to allow for dynamic spectrum access and regulatory control to be functional.

Question 6:

IDA invites views on the proposed general requirements for the database query and registration.

LS telcom: The requirements are in line with international standards that are emerging. IDA may want to consider the requirement of any database operator to provide a standard mechanism for IDA to interrogate the data to obtain information regarding devices for the purpose of interference management and enforcement.

Question 7:

IDA invites views on the three situations in which a WSD must query the database. In particular, IDA invites views on defining 50m as the maximum distance that WSDs are allowed to move from its original location, without contacting the geo location database.

LS telcom: The three situations are applicable. A fourth may be desirable that is when a device has any technical parameters changed such as power, bandwidth or modulation, which may not require a power re-cycling.

The 50m movement requirement appears sensible given GPS resolution, mapping resolution, clutter resolution and propagation prediction resolution.

Question 8:

IDA invites views on the output power transmission of WSDs as shown in Table 2.

LS telcom: This appears sensible and applicable

Question 9:

IDA invites views on allowing the Fixed Devices to have tune-able output power that is capped at a maximum of 4Watts EIRP.

LS telcom: Given the proximity of national borders, the geographical size of the country, this seems sensible.

Question 10:

IDA invites views on the requirement of a Unique WSD Identifier and for this identifier to be based on standards developed by recognised standards organisations.

LS telcom: If an ETSI based solution is available within the time frame of implementation then this is a sensible route to take. If the ETSI solution is delayed a National based regime should be developed as a unique WSD identifier.

Question 11:

IDA invites views on the proposed maximum transmission level of 100mW EIRP for WSDs operating in channels adjacent to a local broadcast channel.

LS telcom: The installation and quality of (the suffering) receiver of the wanted (primary) broadcaster is a governing factor in the adjacent channel operation of WSD's. In several real world trials of adjacent channel operation the 100mW EIRP power level has been shown to not cause undue interference to the suffering receiver under controlled situations (with respect to the receiver and its installation / operation).

Question 12:

IDA invites views on the proposed OOB emission limit of -56.8dBm, which will be imposed on WSDs operating in channels that are directly adjacent to a local broadcast service.

LS telcom: Within the European work on WSDs and OOB limits there have been several reports by the ECC and ERO and also within ETSI. These are ETSI EN 300 422, ECC decision (09) 03 and ECC recommendation 70-03. In general the proposed emission limit would be acceptable.

Question 13:

IDA invites views on defining the OOB emission limits for WSD to WSD operations.

LS telcom: There is a potential problem with this approach.

Any WSD can receive an allocation from a database within the available channels so an individual device would not know whether it is or can be allocated an adjacent channel to a local broadcast service. A WSD could be programmed with a logic which ensures it does not select (from a database offered list) an adjacent channel, however this is logically identifying that the WSD has poor adjacent channel performance, something which is not good to overall network design and mutual interference. Multiple WSDs of this nature would potentially increase the co-channel and adjacent channel interference (and noise floor) rendering less efficient use of the spectrum and "good neighbour" approaches. For these reasons a relaxation of the OOB limits would not be conducive to effective WSD deployment. A standard good OOB mask would be more desirable.

Question 14:

IDA invites views on the proposed approach to manage coexistence between a WSD and the other secondary services within the TVWS channels.

LS telcom: The use of dynamic power control will allow for the maximum re-utilisation of WSD's in any given area however there appears to be three issues with this approach at present;

- 1) PMSE utilisation may not be a point but also a region, for example a marathon race, sports event or similar, and consideration should be given as to how this will be represented in terms of exclusion zone and then buffer zone to a WS device.
- 2) PMSE or similar, may also have a temporal allocation for an event and it may be necessary of IDA to have some mechanism for temporary allocation / exclusion of WSDs. This also will bring in the question of whether a database should, or can, push channel changes to a WSD if the spectrum available changes on a temporal basis quicker than the WSD re-check period.

- 3) It is not clear how the “power reduction zones” would be calculated. A simple radius calculated approach would have to be overly cautious, a calculated approach would require specification of propagation model, clutter and so forth.

Question 15:

IDA invites views on the proposed propagation model and parameters used to determine the maximum transmission power level of a WSD.

LS telcom: Whilst the Hata model is the most pragmatic approach to calculating maximum power levels of WSDs it is not clear whether the application in these scenarios takes into account the operating environment. The Hata model is applicable to urban environment but normally considers the receiver to be in the street “canyon”. In this scenario the WSD devices and/or secondary users may be a street level or at significant height above ground level within a building at say 21st or higher floor levels. This significantly alters the propagation prediction. Given the volume of high rise buildings and the significant probability of users of either system being within them it may be necessary for the WSD to specifically report height AGL within this regulatory regime.

Question 16:

IDA invites views on its proposal for the protection of licence-exempt and licensed wireless microphones. IDA also invites views and comments on the optimal number of safe harbour channels required to ensure that licence-exempt wireless microphones can continue to be used once WSDs are deployed.

LS telcom: The approach is a sensible one and will satisfy both the PMSE community and the WS community.

Identifying the number of safe harbour channels can be evidence based by statistical analysis of the number of PMSE allocations over a year and taking a view on the statistical norm and excluding one off major events such as F1 as an anomaly requiring short term licensing. The balance would be the average safe number of channels required frequently through the year. This approach would satisfy the PMSE community and assure the available and efficiency of WS spectrum.

Question 17:

IDA invites views on the need to develop a registration process for users of licence-exempt wireless microphones that require additional channels beyond the safe harbour channels.

LS telcom: A registration process is a sensible approach and should be maintained, ideally by the IDA, to ensure impartiality and the ability to manage interference complaints effectively. Consideration should be given to the registration process in terms of time limit, who can apply, and how the system is managed to ensure spectrum is not block booked to prohibit WS use.

Time limits for application and use need to be considered in the context of how often a WSD “checks in” to a database of allocation of free channels. If a WSD checks in once every 24 hours it could take (worst case) 24 hours until the channel is free this could be a problem for some PMSE users.

Question 18:

IDA invites views on whether the proposed demarcation zone approach is sufficient in terms of managing cross border interference issue and if there are any other factors IDA should consider.

LS telcom: This approach seems a sensible one to maximise the availability of spectrum to WSDs given the proximity of national borders. There is, however, some areas of concern regarding the absolute level of power that can be calculated given the probability of sites being located at significant height AGL within the 7km demarcation area. Our rough calculations with available information would lead to an ERP of 0.01mW for a WSD device within the given channels within the 7km demarcation zone at say the 21st floor of a building. Consideration should be given to this approach in terms of calculating the probable ERP's expected and also possible policy considerations of restricting height AGL or HAAT within this region for the channels specified and still assure maximum spectrum availability / efficiency.

Question 19:

IDA invites views on the aggregate interference effect of WSD and whether any adjustment in terms of technical requirement is needed.

LS telcom: This has been a much discussed and considered issue within most regulatory regimes as well as at the ITU. CEPT ERO SE43 (11) 45 documents this issue. Some mitigation mechanisms are required and those proposed go some way to adopting a sensible regime.

Question 20:

IDA invites views on using GPS as the method to determine location accuracy, and on whether 50m is a sufficient location accuracy requirement for the operation of WSDs.

LS telcom: GPS location represents the most pragmatic and practical approach for location of WSD devices (other than manual input which can also be prone to user error). This degree of accuracy is, however, also a possible problem given the clutter and probability of height above ground level of devices within high rise buildings and the associated issues in regards to Question 18. It may well be necessary to require a user input (if not a 3d GPS fix) of height above ground in addition to location to maximise the spectrum available and dynamic power level setting if applicable.

Question 21:

IDA invites views on allowing the manual input and internal storage of geographic coordinates for indoor Fixed Devices.

LS telcom: This seems a sensible approach

Question 22:

IDA invites views on the requirement of an approval process for the installer of indoor Fixed Devices and the necessary conditions for approval.

LS telcom: This is essential given the issue of close national boundaries, the potential for interference and similar. However the process will require establishing and managing, and ultimately monitoring as to how this can be determined. Will a WSD device report whether its location is fixed by GPS or manually and if manually how will the database know if this is allowed?

Question 23:

IDA invites views on the possible types of TVWS network topologies and use case scenarios.

LS telcom: An additional possible network topology for consideration in terms of regulatory control and policy may be;

Geo-database <----> Master device1 <-- --> Master device2<-- --> client

This is where a network sets up (should this be permitted) with master device2 gaining its channel list from master device1 off air and a client connecting from Master device2. This requires a policy mechanism to ensure master device2 gains its own independent channel list and not utilising the channel list of master device1 as it is located in a different location.

Question 24:

IDA invites views on the payment of fees for the use of database services.

LS telcom: This is a commercial matter for operators should IDA opt for a multi database operator option.

Question 25:

IDA invites views on both approaches in managing the database (i.e. industry-managed or government-managed database).

LS telcom: An industry managed database solution will stimulate development, competition and a range of solutions that are quicker to market and consumer focused. The risk being the delegation of control from government to industry but this can be effectively mitigated.

If a government approach is used then control is assured, but flexibility, consumer choice and system functionality / added value services may suffer. These factors will be harder to implement for a government database only approach.

Question 26:

To better gauge the level of interest from the industry, IDA invites companies that are interested in developing and managing the database for Singapore to register its interest with us and share the following details:

- i) Funding for database development and management (i.e. self-funded, cost recovery, etc)*
- ii) Business models considered when providing database services*
- iii) Possible fees involved for TVWS users*

LS telcom: To follow

Question 27:

IDA invites views on the proposed preliminary conditions for the operation and administration of the databases

LS telcom: For an effective eco-system of operators it is essential to provide conditions suitable for an SME as well as larger multinationals to participate. Both bring value to the technology in Singapore. Preliminary conditions should focus on the company's technical capabilities and background and not totally necessary previous specific experience in WS database solutions as these are not common yet.

Any applicant should demonstrate financial viability and stability with an ability to support the project in country.

Question 28:

IDA invites views on the proposed approach and communications protocols between the following:

- i) WSD and IDA website containing the list of authorised database administrators*
- ii) WSD and the database*

LS telcom: Any protocols implement should either at the outset align no international standards (such as emerging IETF PAWs or IEEE standards) or where not yet available be able to migrate to these standards when available. This is to ensure compatibility and economy of manufacturing scale within devices and equipment.

Question 29:

IDA invites views on the proposed frequency of update for Time A validity and Time B validity.

LS telcom: Time A validity is a function of the frequency of change within temporary licenses. There are two approaches;

- 1) A database checks in for changes at minimum the period of change that is expected (or guaranteed) by temporary licensed users;
- 2) A client/server or other push mechanism is used where there is a periodic database update say once every 24 hours and in between temporary or emergency changes are pushed to the databases as required.

Time B validity has to align to the time A validity and specifically to the granularity of temporary licensed access timeframes. Therefore updates to WSDs has to be at the same interval and mechanism approach as time A validity.

Question 30:

IDA invites views on requiring the adjustment of the value for Time A validity and Time B validity, and for this to be within the range of 6 to 24 hours.

LS telcom: There should not be any extensive server resources required to serve channel availability lists to devices by utilising a variety of mitigating techniques. With this in mind the update period is flexible and should reflect the needs to the temporary licensed users. In other countries these temporary allocations (especially PMSE) can occur at very short notice and require adaptation of WSD

channel lists in sub 6 hour increments. However this also has to be considered in the context of the safe harbour allocation of PMSE (and similar) and through good analysis these safe harbour channels should account for normal operating regimes.

Question 31:

IDA invites views on the benefits and costs of a requirement for WSD to report its operational parameters to the database.

LS telcom: The additional complexity and storage issues are not that significant. The benefits to IDA are significant in terms of resolving interference or other enforcement issue and providing some statistical analysis of utilisation, effectiveness and uptake for future reports and may inform other band releases in the future.

Question 32:

IDA invites views on the benefits of including within the TVWS regulations a requirement for WSD to register its contact parameters to the database.

LS telcom: This information is essential to efficient effective WS operation and to minimise the needs to contact database administrators during enforcement enquiries or interference investigation matters. Clarity will be required to assure the data is accurate especially the differentiation between system operator, contact and equipment location contact as these may often be different. There is also a requirement for an updating process to ensure that contact details are accurate and kept up to date.