



**Comments on  
THE DRAFT FRAMEWORK FOR DYNAMIC AND  
OPPORTUNISTIC SPECTRUM MANAGEMENT 2015**

**Response to invitation to submit written representation on the  
discussion paper published by:  
Independent Communications Authority of South Africa (ICASA)  
(Gov. Gazette 39302, of 19 October 2015)**

**Submission prepared by Intel South Africa Corporation**

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## 1) INTRODUCTION

Intel South Africa Corporation, herein “Intel”, welcomes the opportunity to provide written comments on the “Draft Framework for Dynamic and Opportunistic Spectrum Allocation” (Government Gazette 39302 of 09 October 2015) as published by the Independent Communications Authority of South Africa, “the Authority” on 09 October 2015.

This document is Intel’s submission in response to the invitation to submit written representations on the above-mentioned discussion paper. Intel would welcome an opportunity to participate and make oral submissions, should the Authority decide to schedule such public hearings as part of this regulatory consultation process.

This submission is presented in two main sections.

- a) Section 2 presents general comments on Dynamic Spectrum Assignment (DSA) particularly as it relates to Television White Spaces (TVWS). The section covers broadly proposals on how the Authority should ideally approach the licensing regime for the UHF band and the regulatory framework for DSA, to ensure that the assigned spectrum preserves and can realise its future economic value. The section also highlights some of the key technical issues that the regulatory framework could consider as it contemplates allocating TVWS spectrum. Here, Intel also attempts to share our view on what we believe should be the Authority’s priorities in ensuring that spectrum is adequately assigned in a manner that does not destroy its intrinsic value.
- b) Section 3 offers Intel’s responses to the questions posed by the Authority in the discussion paper. Where Intel fundamentally disagrees with the proposed framework from which the question is modelled, we will strive to offer an appropriate response within the framework presented by the posed question. We find the consultation thorough and covering many different aspects; however we have focused our attention on a subset of the questions where we believe we have insights to offer.

## 2) GENERAL COMMENTS ON DSA AND TVWS

- 2.1. Considering the rising demand for mobile broadband usage and the need to increase existing capacity in mobile networks, Intel shares the view that there is a need to make more spectrum available for mobile broadband use. Intel's view that spectrum earmarked for commercial mobile broadband will continue to offer significant societal and economic benefits far in excess of the revenue derived from the auction proceeds. We believe that the greatest benefit from spectrum for mobile broadband is in its long-term sustained use, and not from the actual assignment via auction. It is therefore important that the assignment of spectrum by the Authority is done in a prudent manner that preserves its future socio-economic value.
- 2.2. Intel highlights that those who participate in any auction for spectrum will require the assurance that the assigned spectrum will be able to deliver the technical, social and economic benefits that it promises without that challenges of harmful interference to service. Dynamic and opportunistic spectrum management requires coordination with incumbent operations in order to minimize risk of interference, especially if implemented within a licensed-exempt regime.
- 2.3. It is Intel's view that the best chance to maximise economies of scale is through enabling access to spectrum bands for mobile broadband for use on an exclusive basis. This should receive the highest priority by the Authority. Where feasible, the Authority should implement voluntary mechanisms to encourage the clearing of commercially valuable spectrum for higher social and economic value on an exclusive licensed basis. Commercial licensees should be granted service flexibility and technology neutrality. The licensed operators should be encouraged to resolve interference problems through negotiations with the Authority playing a mediatory role where required.
- 2.4. Where the clearing of spectrum bands is not viable as proposed in 2.3, the Authority should explore sharing opportunities between a limited number of licensed users. This approach has been adopted by some European Administrations under the

auspices of “Licensed Shared Access (LSA)” where Mobile Operators have the opportunity through LSA to access spectrum under agreed criteria where the incumbent is not using the spectrum, but where the incumbent can still use the spectrum as required. LSA can improve spectrum efficiency and availability. This can incentivise high-quality services as well as infrastructure and technology investment, while at the same time retaining the incumbents’ right to use the spectrum where and/or when required, under agreed criteria.

- 2.5. The Authority should consider permitting license-exempt allocations of spectrum in bands where harmful interference to licensed users is unlikely. Intel sees value in permitting license-exempt use of spectrum where the opportunity costs of usage are low due to the use by other technologies that foreclose the use of the spectrum for long-range applications. A great example of this is today’s Wi-Fi.
- 2.6. In considering a licensing and regulatory framework for Dynamic and Opportunistic Spectrum Management, the Authority should carefully defines three key concepts within this context namely: *Dynamic Spectrum Assignment (DSA)*; *Licensed Shared Access (LSA)*; and *Television White Spaces (TVWS)*. Unfortunately, the meanings have been blurred and the concepts used interchangeably in different public forums. The Authority should make the deliberate effort to ensure that concepts are succinctly define these concepts to ensure that there is no overlap or confusion in meaning.
- 2.7. Within the ITU-R, several decisions were agreed at the World Radiocommunication Conference 2015: 1) finalisation of the regulatory conditions associated with the primary mobile allocation and IMT identification of the 694-790 MHz band in Region 1 of the ITU (2) a co-primary allocation to the mobile service and identification for IMT by county footnote for parts of the 470-698 MHz band in some countries and (3) a proposal review the UHF spectrum for broadcasting and mobile services in Region 1 at WRC-2023. Intel notes the high interest in the U.S. for “incentive auctions” dealing with portions of the 470-698 spectrum being repurposed for IMT services. In light of this, the Authority will need to take care to ensure that the decisions it makes now on the usage of this band do not jeopardize future license assignments should the outcome of the review process suggest that there is greater economic and social benefits from a more harmonised approach. Intel

believes that the outcome will indeed be that greater economic and social benefits would be gained from a licensed approach given the importance of access to lower frequencies (e.g. for future 5G systems to support applications requiring long range and reach including some massive-MTC or Ultra-Reliable, Low-Latency applications).

2.8. Intel suggests that the Authority considers carefully any decision to allow what are effectively proprietary solutions and services into what might become globally/regionally harmonised spectrum for mobile broadband in the future where the future usage would provide greater economic return to the country, for example in the way of increased GDP.

2.9. Intel understands that the limited current TVWS deployments are a means to provide backhaul / infrastructure to bring connectivity to more rural geographical areas that are difficult to serve when one considers today's business models. Since history shows bandwidth consumption increases dramatically over time, these TVWS deployments are likely to eventually become inadequate or obsolete, , especially in comparison to alternative technologies such as Wi-Fi and LTE. That said, relying on license-exempt spectrum for infrastructure where Quality of Service cannot be guaranteed, comes with certain disadvantages and should be avoided. Alternative regulatory measures could be considered to provide more favourable access to appropriate Fixed Service spectrum for backhaul.

### 3) SPECIFIC COMMENTS ON QUESTIONS POSED BY THE AUTHORITY

**Q1. Do you agree that ICASA has the appropriate legislative mandate to address the issues of dynamic and opportunistic spectrum management and TV White Spaces and to build a suitable framework? If answer is no, please elaborate**

Intel is of the view that ICASA, as the regulatory Authority for the telecommunications sector and the custodian of the Electronic Communications Act (36 of 2005) under which radio frequency spectrum is regulated within South Africa, has the appropriate mandate to address the issue of dynamic and opportunistic spectrum management and TV White Spaces. However, following the separation of mandate between the Ministry of Telecommunications and Postal Services (which crafts the spectrum policy and oversees network operators) and the Ministry of Communications (under-which ICASA reports), it is important that ICASA consults extensively with the Ministry of Telecommunications and Postal Services to ensure that its intended implementation of dynamic and opportunistic spectrum management aligns closely with the vision of the spectrum policy and policy directions, as well as the National Broadband Policy and associated strategies. Intel believes that decisions taken in isolation without considering the wider political, technical, and regulatory realities in other countries and regions could result in significant medium-to-long-term inability to embrace increased harmonised approaches to technological deployments which could benefit citizens and the country's overall economy.

**Q2. Are there any existing licensing models overlooked by the paper?**

Intel is of the view that the paper has adequately covered the existing licensing models.

**Q3. Do you have any comments about these four areas of spectrum reform?**

With respect to license-exempt spectrum, Intel advocates for license-exempt allocation of spectrum only in bands where the risk of harmful interference to licensed allocation is the lowest. Intel agrees that the 5GHz band offers opportunity for license-

exempt use for WLAN (IEEE 802.11ac standard). The 60 GHz band provides the next frontier of opportunity for license-exempt usage for high throughput WiGig access (IEEE 802.11ad standard).

**Q4. Do you favour making more license-exempt spectrum available in the 5GHz band?**

Yes. Intel supports opening up more spectrum in the 5GHz band on a license-exempt basis, in particular the 5350-5470 MHz band. The World Radiocommunication Conference 2015 approved a new Agenda Item addressing this issue.

**Q5. And in any other bands? Be specific, please, and support your recommendations.**

The 60 GHz band (57-66 GHz, V-band) provides an immediate opportunity for license-exempt allocation of spectrum as it aligns with Recommendation ITU-R M.2003 on “Multiple Gigabit Wireless Systems in frequencies around 60 GHz”. The following standards on 60GHz are incorporated into Recommendation ITU-R M.2003: ETSI (EN 302 567) and IEEE (802.11ad). Products based on the IEEE 802.11ad standard contained in M.2003 are already being shipped around the world in various form factors including laptops, notebooks, and tablets. In addition, the IEEE has established a new Study Group to look into the roadmap and future standard for extension of IEEE 802.11ad standard into 64-71 GHz band.

**Q6. Do you believe that the Dynamic Spectrum Assignment approach is viable and worthwhile**

The Authority should take care not to implement DSA in a manner that undermines the value of existing and possible future licensed spectrum allocations. One way of implementing a dynamic approach to spectrum management in a viable manner is to use it to accommodate spectrum sharing between commercial and non-commercial interests. Intel believes that there are significant benefits from the Authority carefully reviewing the European regulatory framework for Licensed Shared Access (LSA) for IMT/4G/Mobile Broadband.

**Q7. Do you have enough data about the TV broadcast transmitters to be able to model their propagation accurately?**

Intel does not plan to undertake studies.

**Q8. Does enabling the operation of TVWS contribute to the objective of ensuring efficient use of radio frequency spectrum?**

No, enabling the operation of TVWS could likely be at the detriment of higher future benefits from licensed use of UHF spectrum for IMT. Intel believes that the process needs to be appropriately managed, from a technical point of view to avoid interference, and from an economic point of view to preserve the future commercial value of high-demand spectrum. In any case, if any TVWS deployment is authorized by the Authority, it must be subject to device authorization with the possibility of shut-down via a database. No TVWS device should be allowed to transmit without the database first confirming the TVWS device in its current location will not cause harmful interference to licensees and their customers, and all TVWS devices must cease transmissions when commanded by the database operator, or when they lose contact with the database. Without these protective layers for strictly controlling TVWS device access to spectrum that the TVWS devices do not otherwise possess access rights to, TVWS could be disruptive with no mechanism to correct it. Because of these factors, TVWS is more complex to implement than traditional license-exempt bands where this authorization framework via database operator is not required, and is more costly to implement for the simple reason that implementing the framework requires infrastructure and hardware that is not required in traditional license-exempt bands.

**Q9. Do you believe that it will also further objectives of encouraging investment and innovation in the electronic communication sector?**

Intel does not believe TVWS will have a material, positive impact on encouraging investment and innovation in the electronic communications sector going forward. We note that the US FCC has a long history of policies designed to encourage investment and innovation. However, there has been little progress in the adoption of TVWS technology since U.S. regulatory efforts on TVWS began over a decade ago. Intel

encourages the Authority to conduct its own independent analysis of the history of TVWS.

In the event, TVWS deployments have fallen far short of expectations (see Robyn, Jackson, and Bazelon).<sup>1</sup> While many companies were initially supportive of TVWS efforts in the early 2000's, nearly all abandoned those efforts years ago. Other technologies such as Wi-Fi and LTE have advanced at a fast pace, through several generations of improvements, and have widespread industry support and consumer adoption.

**Q10. What are the benefits that could be expected from making TVWS available?**

Intel currently sees little benefit associated with making TVWS available. The deployment of TVWS has not been successful<sup>1</sup> and where deployments have occurred this has been with proprietary equipment which doesn't lead to economies of scale being realized.

**Q11. What are the disadvantages that could be expected from making TVWS available?**

Intel considers the disadvantages of making TVWS available are:

- TVWS may diminish the current and future value of licensed broadcasting and mobile broadband spectrum.
- TVWS deployments such as backhaul carry the inherent risk of interference with high power transmitters of broadcasting television networks and their customers' television receivers, and indeed vice-versa.
- Proliferation of equipment and sporadic networks that are outside the Authority's ability to switch-off if they chose to should there be greater

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<sup>1</sup> Robyn, Dorothy and Jackson, Charles and Bazelon, Coleman, Unlicensed Operations in the Lower Spectrum Bands: Why is No One Using the TV White Space and What Does That Mean for the FCC's Order on the 600 MHz Guard Bands? (March 30, 2015). TPRC 43: The 43rd Research Conference on Communication, Information and Internet Policy Paper. Available at SSRN: [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2587528](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2587528)

economic and social benefit from licensed use of the spectrum and standardized equipment at some point in the future.

**Q12. Do you foresee any risks?**

In addition to the risk of interference, the biggest risk by far from uncontrolled TVWS deployment is likely to be the inability to control their deployment to the detriment of future deployment of harmonised technology and solutions that would provide far greater economic and social benefits.

**Q13. Does it support SA Connect goals regarding the deployment and adoption of broadband?**

One of the objectives of the Digital Readiness pillar of SA Connect is to align the regulatory framework to ensure that the regulators “*protect consumer rights and privacy and to ensure user trust and confidence*”. The strategy aims to elevate quality of service regulations to ensure that user experience of the Internet and IP based services is optimized. It is Intel’s view that the risk associated with interference if TVWS are made available to end-user, will likely compromise the intended vision of the Digital Readiness pillar of SA Connect.

**Q14. What mechanism should be put in place for dynamic spectrum assignment in meeting future demand for spectrum?**

As noted above, the Authority must implement measures to be able to switch-off TVWS transmitters and networks easily.

However, other dynamic approaches to spectrum management such as LSA, should be considered. For example, in some bands where spectrum cannot be cleared, it may be possible to allow harmonious sharing between few licensed users or between a commercial user and a non-commercial user (military systems etc.). In this case, those who share otherwise underutilized spectrum will be encouraged to negotiate and resolve interference incidences..

**Q15. Could TVWS provide increased consumer value and/or improved social and economic inclusion**

Remote rural deployments seem to be the most appealing use for TVWS. However, it is well established that remote deployments are significantly more costly than urban deployments and that they return less per-capita due to low population density. This is the fundamental reason why the areas are under-served today. Intel's view is that TVWS will not be the magic wand that eradicates this problem. From this perspective, the value for social and economic inclusion is unclear to Intel.

***Q16. What impact is the digital switch-over expected to have on the use and availability of TVWS?***

The delays in the digital switch-over will make it difficult for the regulatory Authorities to determine the true amount of TVWS spectrum available before the regulations are developed to manage the assignments.

***Q17. Do you believe white spaces should be utilized without authorization or licensing?***

White spaces in "low value/demand" spectrum bands (which does not include UHF band) might be able to be utilized within a license-exempt" regime without diminishing the intrinsic value of the spectrum. For high-value spectrum such as sub 1 GHz bands, white spaces should only be considered within a licensed arrangement to preserve the value of the band and the current and future investments.

***Q18. Should there be rule for such usage?***

Intel support Licensed Shared Access (LSA) in a similar manner as adopted in Europe where commercial users share the spectrum with non-commercial users. There should be rules that prioritize the operations of primary users of the spectrum and protects them from interference.

***Q19. Does the advent of TVWS have the potential to remove the existing "spectrum scarcity", at least in some bands***

Intel's view is that TVWS is unlikely to alleviate the challenge of spectrum scarcity to any significant degree. Intel believes the Authority should be looking into a number of bands and implementing voluntary mechanisms to clear the bands and reconfigure them for high-value, commercial usage within a licensed framework as a top priority.

**Q21. Is there a space for license-exempt, unmanaged use of TVWS?**

Intel would strongly discourage any consideration of such an arrangement within the high-value UHF band based on the reasons already highlighted above.

**Q22. Is there a space for license-exempt, managed use of TVWS**

Intel believes that the sub 1 GHz spectrum should first be assigned for licensed use, before considering whether there is a possible space for license-exempt TVWS use.

**Q23. Is there a space for license use of TVWS?**

Intel is of the view that there is a space for licensed use of TVWS where commercial and non-commercial users are encouraged to share spectrum through a Licensed Shared Access (LSA) framework.

**Q24. If so, should license users pay the minimum annual fee, or a fee proportionate to use?**

No response offered by Intel.

**Q25. Does a combination give us the best of both worlds?**

It is Intel's view that a combination of models implemented within the same band will only serve to increase the complexity of managing the regulatory environment. This will be the case particularly in this era of convergence when the boundary between Electronic Communications Service and Broadcasting services is increasingly becoming blurry.

**Q26. Which of the licensing regimes do you favour? Why?**

Intel prefers a licensed regime where the Quality of Service of broadcasters, their customers, and any future licensed electronic communications service providers are protected.

**Q27. Rank the licensing regimes in the order of preference with reasons for your preferred order.**

Intel does not believe that the definitions of light-license regime and mixed regime are sufficiently clear to implement effectively. Intel therefore submits the following rankings for consideration by the Authority:

Rank	Regime type
1	Fully licensed regime
2	Licensed Shared Access
3	License-exempt, managed regime

***Q28. Do you see the automated licensing through a geo-location database being feasibly implemented?***

To clarify terminology, Intel sees a distinction between automated licensing (such as LSA), and automated, conditional assignment (such as TVWS). In the TVWS case, an entity never holds a license; they only hold a conditional authorization to use unused spectrum licensed to another party. There may be overlap in the framework used to implement automated licensing and automated assignment, but they are not identical. Both are technically feasible. Automated assignment for TVWS users through a geo-location database is the approach that other countries have implemented or are considering. The Authority should draw lessons from the US, UK, and Canada who have made great strides in implementing geolocation databases and have developed TVWS regulations.

***Q29. Does this provide a significant improvement to the status quo?***

Automated assignment through a geo-location database represents an improvement over having no such system at all, but it should be considered a mandatory element, not an option, if TVWS are implemented. Careful implementation needs to occur to ensure that the Authority retains control in circumstances where interference and / or spectrum management reasons prevail.

***Q30. If some form of this approach is adopted, how should TVWS database and TVWS database service providers be managed?***

If automated licensing through a geo-location database is adopted, the Authority will need to establish an agency that will manage the database and ensure that it is effectively operational. The TVWS database service providers will be accountable to the established agency.

**Q31. From a South African perspective what will be the socio-economic benefits of TVWS?**

Considering the history to-date of TVWS, it does not seem likely the intended socio-economic benefits in South Africa will materialize. Meanwhile, new Wi-Fi standards support wider channels for higher bandwidth use, and market deployment, manufacturing, and adoption continues to increase at a rapid pace.

**Q32. Will TVWS be of the most benefit to the rural or urban areas/ Please provide reasons – technical and socio-economic?**

Intel is not convinced that TVWS will yield the intended benefits. Even in rural locations, user bandwidth needs grow continuously, and the TVWS backhaul link will likely eventually be congested and outdated, with no growth path. At that point, the link would likely be swapped out for a different technology in a different band, which would make the deployment more costly in the long run.

**Q33. Please provide proposals on the regulatory framework (including none at all) for TVWS**

The FCC in the US and Ofcom in the UK have published TVWS rules with technical parameters and procedures to enable TVWS device conditional access to the available spectrum. Intel would encourage the Authority to study these regulatory frameworks and draw lessons from implementations in these jurisdictions.<sup>2</sup>

**Q34. What are the advantages and disadvantages of different methods?**

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<sup>2</sup> A listing of all the published FCC actions in the TVWS proceeding can be found at: <http://goo.gl/GYT6S>. The two most recent Orders are the Memorandum Opinion ([http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-12-36A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-12-36A1.pdf)) and Order(s) ([http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-10-174A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-10-174A1.pdf)).

Notice of proposals to make the wireless telegraphy (White Space Device) (Exemption) Regulations 2015, 6 November 2015

	Advantages	Disadvantages
<b>Cognitive Radio</b>	<ul style="list-style-type: none"> <li>• Improves spectrum use</li> <li>• Reduces engineering and planning time</li> <li>• Adapts to existing operating conditions</li> <li>• Is the future of DSA but technology still needs to evolve</li> </ul>	<ul style="list-style-type: none"> <li>• High level of implementation complexity</li> <li>• Carries the risk of sensing errors (false positives)</li> </ul>
<b>Database approach</b>	<ul style="list-style-type: none"> <li>• Implemented by early adopters of TVWS in major markets such as US, UK, Canada and Singapore. The Authority can leverage on experience of these regulators</li> <li>• Easier to implement rules, and changes to rules have minimum impact on operations</li> <li>• Restricts use of WSDs to within a defined geography</li> </ul>	<ul style="list-style-type: none"> <li>• Requires greater coordination between Regulator, industry, and broadcasters</li> </ul>

**Q35. How should South Africa define TVWS?**

TVWS can be defined as geographically-restricted frequency channels that are not used by the primary licensed user in the broadcast TV bands and are controlled / managed by a geolocation database accountable to the Authority.

**Q36. How will the rules for non-compliance apply?**

Please see the FCC and Ofcom rules for some of the key principles.

**Q37. On what basis should white space use in the 470-694 MHz band be authorized?**

As noted earlier, TVWS could be authorized under a Licensed Shared Access framework, or under a conditional license-exempt framework that follows closely the established norms (for example, the U.S. FCC rules), which require a database for access control, and with penalties for failing to comply with the protection rules.

In section 2.7, Intel noted the high interest in the U.S. for “incentive auctions” dealing with portions of the 470-698 spectrum being repurposed for IMT services and the decisions taken at WRC-15. We urge the Authority to ensure that the decisions it makes now on the usage of this band do not jeopardize future license assignments should the

outcome of the review process suggest that there is greater economic and social benefits from a more harmonised approach.

***Q38. Do the benefits of adopting a license-exempt managed assignment approach apply?***

Refer to earlier comments.

***Q39. If a license-exempt managed assignment approach is adopted, what registration requirements, if any, might apply?***

Although Intel prefers licensed approaches, we believe the rules proposed by Ofcom could minimize interference from white space devices into existing licensed services.

***Q40. Do you think that licensed use of TVWS requires the operator to have an ECNS license?***

Yes we believe that licensed operators of TVWS should be required to have an Electronic Communications Network Services license.

***Q41. Should the white spaces database approach be adopted and or is there an alternative system?***

The database approach to TVWS should not be considered optional. The database is required to protect the licensees and their customers. When necessary, the database will be able to switch-off white space devices in an effort to minimize interference.

***Q42. What additional measurements should be adopted for greater accuracy?***

Intel believes that for greater accuracy in pinpointing interference potential, TVWS devices would need to implement location-based technology.

***Q43. Should the Authority allow – or require – sensing as an option at this time?***

Intel believes that sensing should be seen as an option for TVWS deployments but sensing should not replace the geolocation database.

**Q44. What mechanism should be put in place to ensure that database providers obtain information required to protect incumbent operations (e.g. location of TV transmitters)**

Once the regulations have been published, the Authority will need to undertake a separate consultative process to define the operational processes that will be adhered to by all users of the spectrum, including incumbent operators, to ensure that the database operates effectively and efficiently.

**Q45. What mechanism should be put in place to ensure that broadcasters and/or signal distributors provide the Authority and database operators with accurate and updated information?**

A separate consultative process undertaken by the Authority to define information flow processes will be necessary in this regard.

**Q46. What parameters should the Authority set forth for TVWS databases?**

The FCC has defined some parameters for TVWS<sup>3</sup>. The following is a summary of the key requirements for the databases:

- The databases must be able to synchronise seamlessly with the Authority's database on a regular basis. The FCC specified once a week for the US application.
- The database must be capable of registering and protecting venue where white space devices are active.
- The database must be capable of synchronizing registration records with other databases

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<sup>3</sup> TVWS Database System Requirements and Tests,

[https://transition.fcc.gov/oet/whitespace/guides/TVWS\\_Database\\_Tests4.doc](https://transition.fcc.gov/oet/whitespace/guides/TVWS_Database_Tests4.doc)

- The databases must be capable of receiving requests for available channels from TVWS devices, identify the type and location of device making the request and provide accurate list of available channel to the device
- The databases must be able to verify the white space device serial number and geo-location and test if they are unique, and deny service if not unique.
- The databases must only provide channel availability service to certified TVWS devices and have active safety measure to protect the contents of the database from unauthorized access.
- The database must have a database administrator that will respond to the Authority's enquiries from time to time regarding the operation of the database.

***Q47. What criteria should be used to certify, recognize, or authorize TVWS databases?***

Intel proposes a panel of local and international experts to assist the Authority to evaluate database solutions as part of a procurement process.

***Q48. How should the Authority approach issues such as non-discrimination, security, and quality of service?***

The issues should be defined as part of the technical specification for the procurement process. The issues should also form part of the service level agreement with the preferred vendor when the contract is signed.

***Q49. Should the Authority require the registration of some or all devices? If only some, which devices?***

All TVWS devices that seek to use spectrum should be registered so that they can be identified and removed from service if they are a source of harmful interference.

***Q50. Should mobile devices be obliged to have geo-location determination capabilities? How should the regulatory framework differentiate among device types?***

Yes, Intel believes mobile TVWS devices should be obliged to have geo-location capabilities and there should be separate rules to regulate mobile TVWS devices.

**Q51. What rules should be attached to each type of device?**

The FCC provides a good summary of some of guiding principles in this regard<sup>4</sup>:

- Devices must include geo-location capability and capability to access database of radio protected services
- Device should provide their location to their database
- Device must complete the database access process before operating
- Fixed devices must register their locations
- Devices must have adaptable power control to use the minimum necessary power

Ofcom has included the following requirements for White Space Devices:

- Devices cannot be airborne
- Devices should not allow the user of the white space device to input, configure, reconfigure or alter any technical or operational settings in a way that affects the device parameters or other technical characteristics which are communicated to the designated database.

**Q52. Should operating parameters differ by device type or technology?**

The rules should prescribe the minimum and maximum thresholds for the white space devices and allow for 'technology neutral' deployments of TVWS devices.

**Q53. Should transmit power levels be different for different devices?**

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<sup>4</sup> Overview of FCC's New Rules for TV White Space Devices and database updates, Allen Yang, FCC  
<http://www.itu.int/en/ITU-R/study-groups/workshops/RWP1B-SMWSCRS-14/Presentations/USA%20-%20Overview%20of%20FCC%e2%80%99s%20New%20Rules%20for%20TV%20White%20Space%20Devices%20and%20database%20updates.pdf>

The rules should define minimum/maximum thresholds for power levels to allow communication with databases.

***Q54. Should the Authority consider a variable power limit which could increase the utility of spectrum for devices***

The rules should define minimum/maximum thresholds for power levels to allow communication with databases while reducing unnecessary transmissions.

***Q55. Should there be a maximum power output and what maximum power level should the Authority consider?***

Yes, there should be a maximum power limit to try to minimize the probability of incidents of harmful interference. The actual level should be determined as part of different consultative process to define technical specifications for TVWS devices. Inputs from device manufactures and manufacturers of databases will be helpful.

***Q56. Should licensed devices be allowed a higher a higher power limit than licensed-exempt devices***

Yes, licensed devices operating in a licensee-controlled environment should be allowed more relaxed power level thresholds than license-exempt devices.

***Q57. Recognizing that allowing adjacent channel use would significantly improve spectrum utilization and increase the amount of spectrum available for use TVWS devices, should the Authority permit TVWS devices to operate in channels adjacent to the incumbent operations? Please substantiate.***

Intel would discourage TVWS device use in channels adjacent to incumbent operations particularly within a license-exempt framework unless harmful interference can be avoided. If such operation is allowed, Intel notes the possibility of undue constraints on the operation of the licensed system in the form of added interference and raised noise floor. These effects could be mitigated with measures such as guard-band or geographic separation, but should not impose operational or financial burden on the licensees.

**Q58. Are there any substantiated concerns regarding the harmful interference associated with adjacent channel operation?**

High power transmitters such as those used by broadcasters are likely to have emissions that will spill over into adjacent channels. These latent emissions from higher order harmonics are likely to affect adjacent channels that, theoretically, should be vacant. TVWS could suffer performance degradation due to this unintended interference. There could also be the risk of interference from TVWS in the adjacent band into geographically close TV receivers. If South Africa intends to pursue TVWS deployments, Intel urges the Authority to undertake compatibility studies aiming at determining the extent of the problem and provide regulatory means for the adjacent systems to resolve interference issues.

**Q59. Should the Authority establish out of band emissions limits in order to improve spectral efficiency? If so, what are your recommendations to protect incumbent operators? What out-of-band emissions rules will be best to improve spectral efficiency and protect incumbent operations?**

No response offered by Intel.

**Q60. Should the Authority mandate a particular propagation model for database providers?**

No response offered by Intel.

**Q61. Which propagation model or models are most accurate for this application?**

No response offered by Intel.

**Q62. Which model or models maximize spectral efficiency?**

No response offered by Intel.

**Q63. Which model best protects incumbent operations?**

No response offered by Intel.

**Q64. Overall, what is the appropriate method of determining the required protection from the authorised users in the TV bands?**

No response offered by Intel.

**Q65. On balance, do the potential benefits of permitting license-exempt managed assignment TVWS devices outweigh any potential risks?**

There are still risks from harmful interference even in a managed license-exempt TVWS regime which could outweigh the potential benefits.

**Q66. Do the techniques discussed above adequately mitigate any interference potential?**

The proposed techniques will not eradicate the problem of harmful interference but will assist to limit its impact. Processes to resolve identified interference incidents will need to be established to supplement the technical efforts.

**Q67. Should we oblige every device to have a GPS location capability?**

Yes, each TVWS device should have GPS location capabilities.

**Q68. In the US model, only latitude and longitude was required of GPS location. Is there any reason why we shouldn't demand full 3D location?**

The 3D location information will offer more detail to the location, however latitudinal and longitudinal information should be adequate for identifying the geo-location of the device.

**Q69. What about the situation where a fixed device is professionally installed with an external antenna and an internal unit. Should we accept the location details provided by the installer? Using what mechanism?**

No response offered by Intel.

**Q70. Do you believe that Dynamic Spectrum Assignment should be applied to other bands, beyond the proposed TVWS operation? Please provide reasons?**

As a high-level principle, DSA should only be considered in low-demand bands where the current and future value of the spectrum band will not be diminished by the introduction. The Authority should not rely on DSA as a primary method of extracting spectral efficiency in license bands where incumbents have committed significant investment. The Authority should rather strive to clear the bands where the spectrum is not being used efficiently for assignment licensed users. The Authority should also encourage the sharing of spectrum on a licensed basis (e.g. LSA) in bands where clearing the spectrum is not possible.

***Q71. If so, which bands should be considered next?***

As noted above, the Authority is encouraged to review the European regulatory framework for Licensed Shared Access (LSA) for IMT/4G/Mobile Broadband. If spectrum in high-demand bands is unable to be cleared in South Africa, LSA could be considered.

***Q72. Are the study questions above the most relevant?***

Yes the study questions have been relevant.

***Q73. Are there additional study questions that you would propose/***

No, Intel has no further questions to propose.

***Q74. Are there any additional devices or services in the 470 – 698 MHz UHF DTT band that should be considered in authorizing use of TVWS?***

No, Intel is not aware of additional devices and services to be considered for authorizing TVWS.

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