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Ofcom perspective on the challenges for TVWS radio systems using geo-location databases

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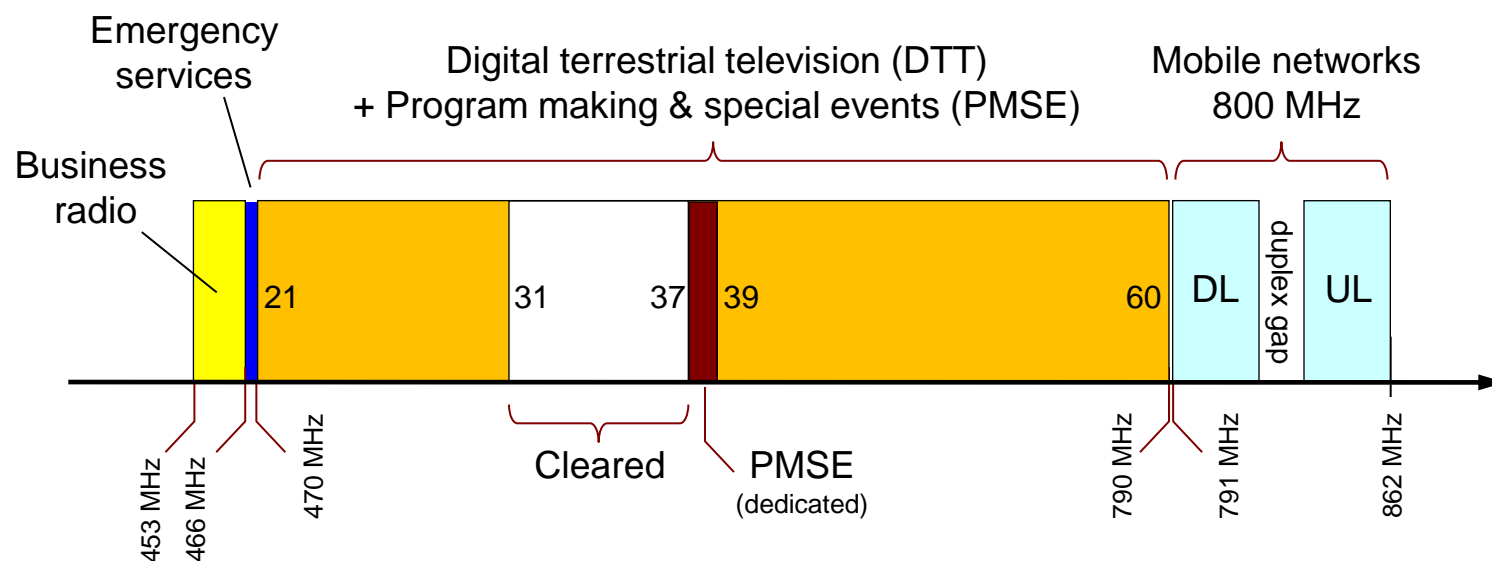
29 November 2011

Outline

- Where are TV white spaces in the UK?
- Enabling access to TV White Space
- Regulation and standardisation
- The UK approach to WSD
- Conclusions and next steps

The UHF TV band and licensed services in the UK

- Access to the UHF TV band by white space devices (WSDs) would be subject to the protection of incumbent licensees.



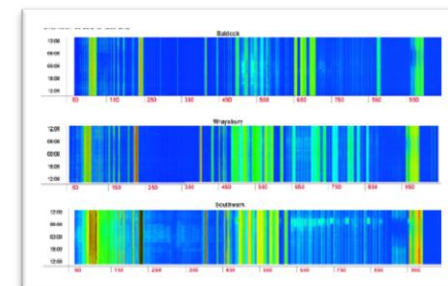
- We should not forget cross-border obligations.

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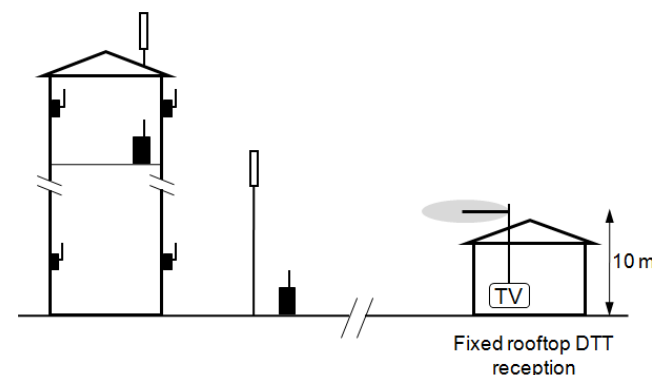
Enabling access to TV white spaces

- We have decided to proceed with enabling access to TV white spaces for the following reasons:
 - We have a **duty** to secure **optimum** use of the spectrum. Spectrum in white spaces is (by definition) **unused**.
 - We have a **duty** to **remove barriers** to innovation.
 - Access to TV white spaces is a **stepping stone** for future access to white spaces in **other bands**. This may satisfy some of the huge demand for spectrum for wireless data applications.
 - Internet and computing **technologies** have advanced to the extent that **dynamic** and **opportunistic** spectrum sharing is becoming technically **viable**. This can result in increased efficiencies in spectrum use. Access to TV white spaces is a good **test-case**.

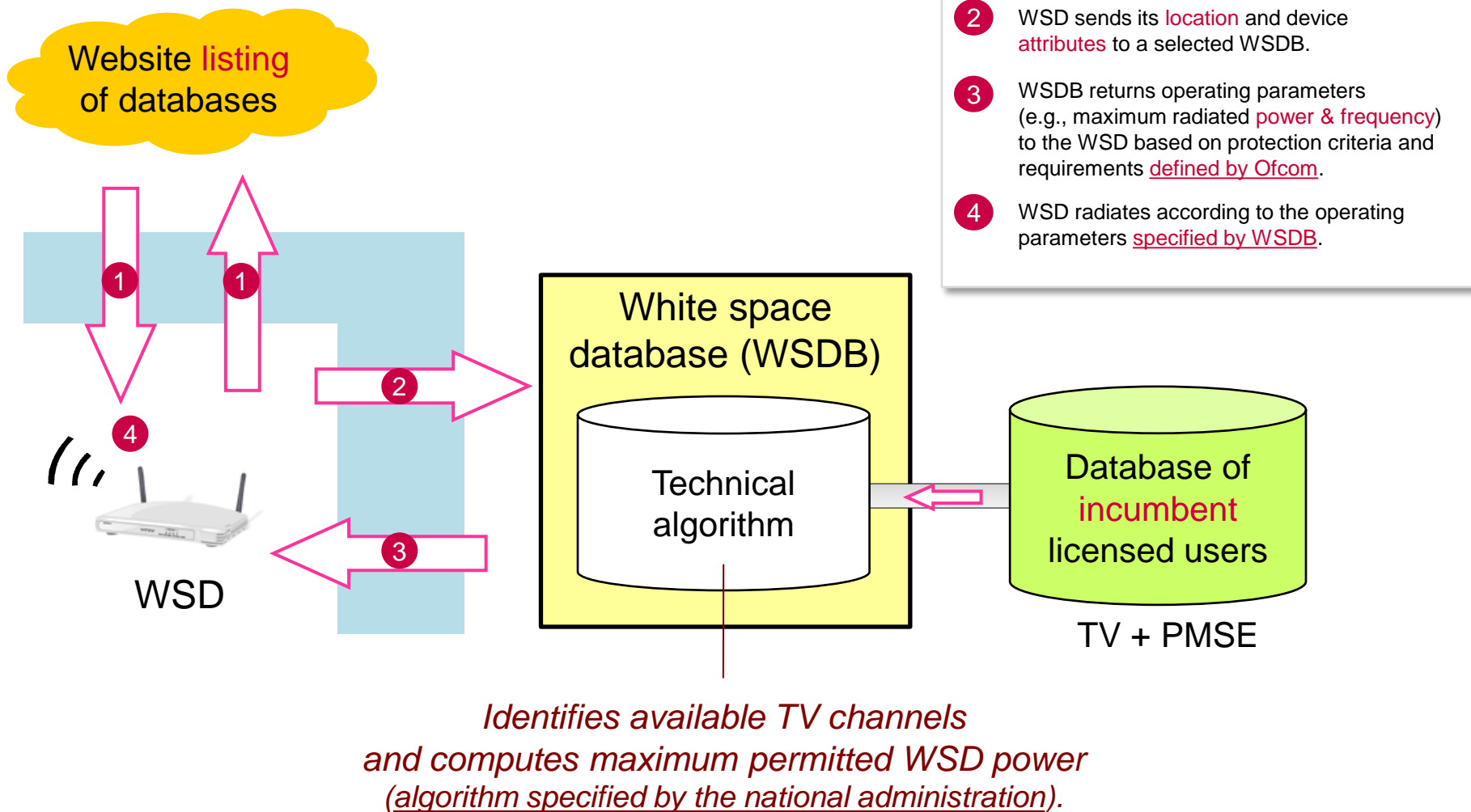


But there are challenges

- The **protection** of incumbent licensees is paramount. We are confident that this can be achieved via white space databases (**WSDBs**).
- No-one currently knows the precise **amount** and **quality** of white space spectrum. These depend on the **degree** of protection afforded to the incumbent licensees.
- Harmonised **standards** for the realisation of **regulatory requirements** for WSDs are crucial. Some aspects of standardisation will not have been encountered before.
- Will access to TV white spaces be a **success** story?
Only time will tell.
Industry appears keen to proceed despite uncertainties.



Database-assisted access to white spaces

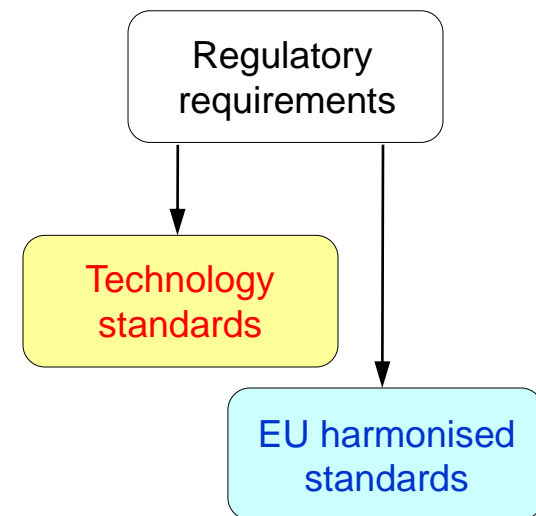


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Standardisation is key

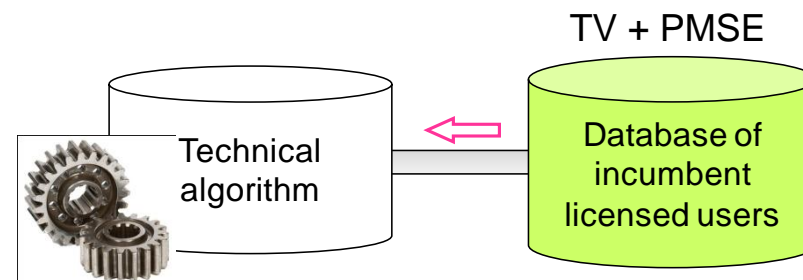
- Standardisation is important for three reasons:
 - To achieve **economies** of scale.
 - To allow for the **roaming** of WSDs across borders.
 - To enable a common **European/Worldwide** market.
- But **what** is it exactly that needs to be standardised?
- And **where** should these be standardised?
- Important to draw clear **distinction** between:
 - European harmonised standards
Defined by organisations such as **ETSI**, required as a reference for compliance with the essential requirements of the **R&TTE Directive**, for placing products on the European market.
 - Technology standards
Defined by organisations such as IEEE, 3GPP, Weightless SIG, IETF.



What does not need to be standardised

The following do not need to be standardised:

- The WSDB **technical algorithm** which specifies the available TV channels and the maximum permitted WSD power.
 - The algorithm and its parameter values can be **country-specific** in order to reflect the national **administrations'** (often widely different) **circumstances**. The afforded **flexibility** is a key benefit of WSDBs.
- The **interface** between the WSDB and **incumbent licensees' databases**.
 - The interface can be **country-specific**. This will be inevitable given that **TV** and **PMSE** are **planned** and managed differently in different countries, and access to their databases is subject to different constraints.



What does not need to be standardised

The following do not need to be standardised:

- The **accreditation** of the data base provider
 - This can be **country-specific** and consists of the technical and legal **requirements** that a **WSDB** provider must **adhere** to in order to be **approved** by administrations to provide services to WSDs.



White space
database (WSDB)

Technical
algorithm

Technology standardisation (1)

The following needs to be standardised:

- WSD **radio interface** (over the UHF TV spectrum).
 - **Technology** standards may be specified by organisations such as IEEE, 3GPP, Weightless SIG, and others (including ETSI itself).
 - Examples:
 - ❑ PHY layer modulation and coding.
 - ❑ MAC layer management and sharing protocols (e.g., CSMA/CA , etc).

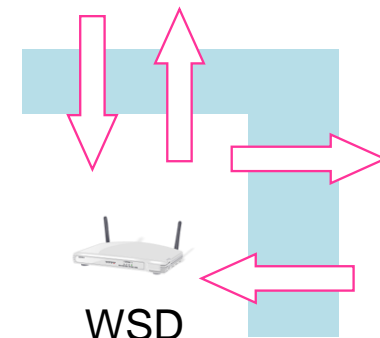


WSD

Technology standardisation (2)

The following needs to be standardised:

- The communication **protocols** between the **WSD** – **WSDB** and **WSD** – **WSDB-listing**.
 - **Technology** standards may be specified by organisations such as IETF PAWS. These should include some regulatory requirements (as recommended by regulators).
 - Examples:
 - ❑ Parameters exchanged between WSD and WSDB or WSDB-listing.
 - ❑ Format of the parameters.
 - ❑ Internet protocol stack for the communication of the parameters.
 - ❑ Security protocols.



European harmonised standardisation (1)

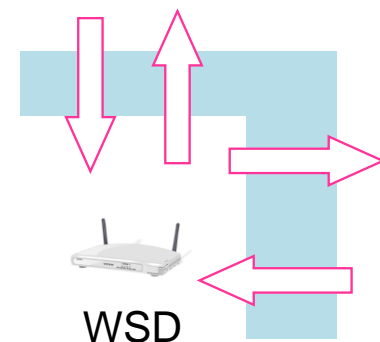
- Baseline parameters would be similar to those in other **ETSI** harmonised standards (EN) e.g. **EN 300 328** for in the 2.4 GHz band (WiFi, Bluetooth etc.)
- This would include **radio** technical specifications and related **conformance** tests that product standards developed by (IEEE 802, ETSI etc.) would have to take cognisance of in their development.
- Examples of what baseline parameters the EN would specify:
 - ❑ WSD frequency accuracy and stability.
 - ❑ WSD spectrum emission mask.
 - ❑ WSD spurious emission levels (transmitter and receiver).
 - ❑ Any politeness rules (not to be confused with polite protocols).



WSD

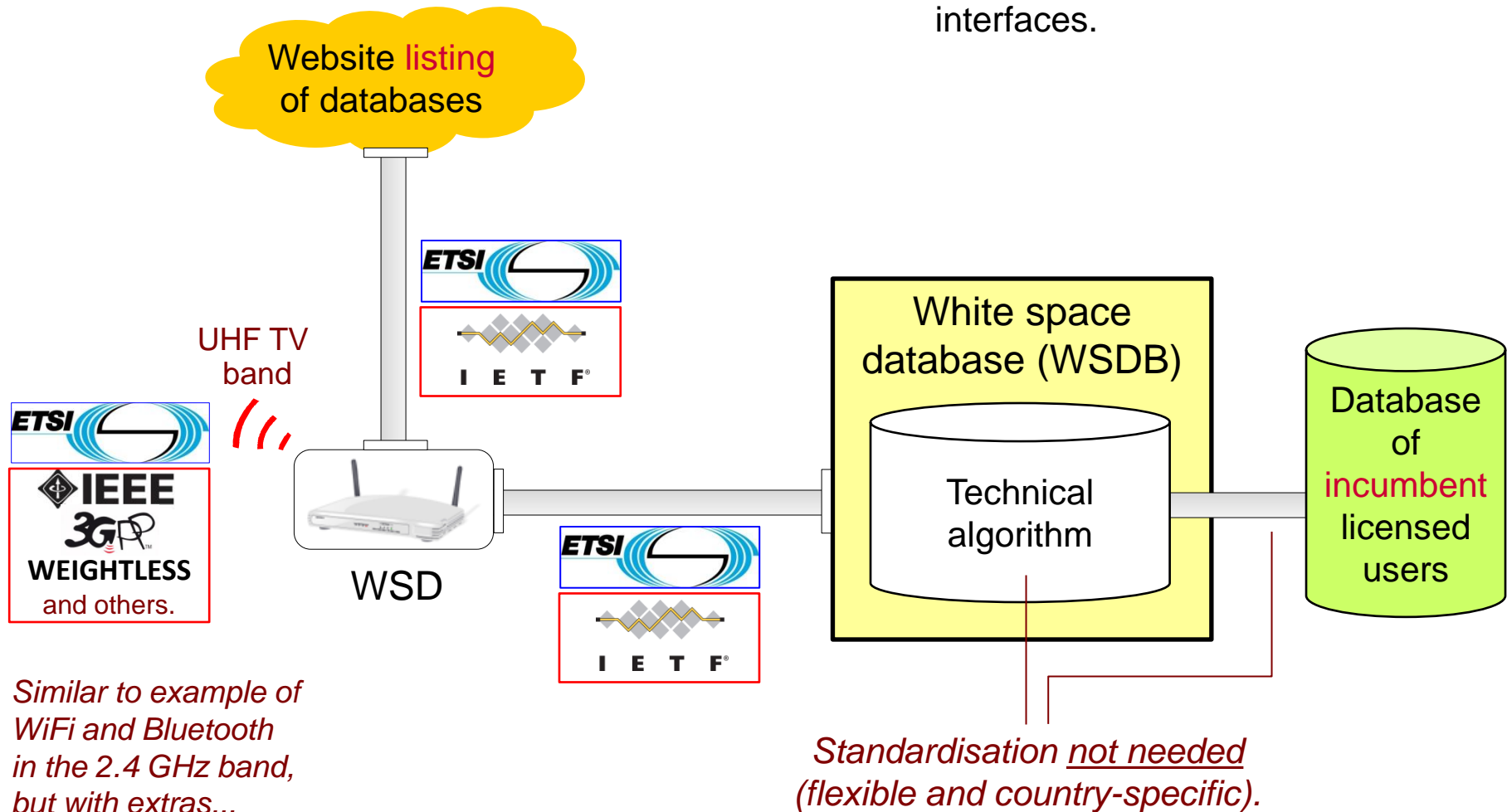
European harmonised standardisation (2)

- In addition, in addressing the WSD-WSDB interface, the **ETSI** harmonised standard (EN) would be required to specify
 - a) minimum set of **parameters** to be exchanged between WSD, WSDB and WSDB-listing (as recommended by regulators, **e.g.**, CEPT),
 - b) how a WSD must **generate** (and **respond** to) the exchanged parameters,
 - c) **conformance** tests in relation to (a) and (b).
- Examples of items that the EN would need to address:
 - ☐ WSD location,
 - ☐ WSD location accuracy,
 - ☐ WSD maximum permitted EIRP,
 - ☐ WSD available TV channels...
- These are parameters and tests that technology standards (developed by IETF, IEEE 802, ETSI etc.) will have to be cognisant of in their development.



Summary

IETF PAWS appears to be the most suitable forum for standardisation of WSD-WSDB and WSD-listing interfaces.



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The UK approach for regulation of WSDs

- WSDs need to meet the *essential requirements* of the R&TTE¹ Directive. Compliance with the essential requirements is typically achieved via *conformance* with *European harmonised standards* or norms (ENs).
- In the absence of ENs, we propose to create UK-specific *voluntary national specifications (VNSs)* for the regulation of WSDs.
- The VNSs will include:
 - a) Specification of procedures for WSDs to *select* and *consult*, and interpret *instructions* from a WSDB.
 - b) Conformance *tests* to ensure compliance with the specifications in (a).
- The VNS will *not* specify the *underlying technology* or detailed communications protocols. These will be specified by *technology standardisation* organisations (e.g., IETF PAWS).
- In due course, we will *submit* concepts from our *VNSs* for consideration by *ETSI* for the creation of appropriate ENs.



The UK approach for regulation of WSDBs

- We are currently **not sure** whether the framework of the **R&TTE Directive** applies to **WSDBs** (as it does to WSDs).
- This is because it is not clear whether a WSDB can be interpreted as a “telecommunications terminal equipment”. Consequently, it is not clear whether a EN will eventually be created for WSDBs.
- Given the above **ambiguity**, we do not propose to create a VNS for WSDBs. The **regulatory** requirements for WSDBs in the UK will instead be specified in the form of a “**specifications document**”.
- Operators of WSDBs will be required to comply with these specifications.
- We are also involved in WSD trials in the UK and the results of these trials will help us understand:
 - Potentially how much of the white space can be utilised through co-operation between incumbents and WSD operators
 - How our assumptions, methodologies and algorithms compare to the real life results
 - How important the manual provision of information on antenna characteristics can be in gaining access for certain uses (e.g. Fixed Pt to Pt use)



Important issues for regulatory requirements

- Measurements have shown that the different temporal characteristics of WSD technologies (e.g. burst duration) can have an effect on DTT receiver protection requirements. We will have to think very carefully how to model these effects in the WSDB algorithms and take account of this when developing the appropriate conformance tests for WSD.
- How to take account of slave WSD parameters or characteristics when supplying information to the WSDB through a master WSD.
- What we allow to be input manually by users/professional installers into the WSDB calculation process.
- How we take account of :
 - indoor/outdoor usage
 - fixed/mobile usage
 - antenna height and characteristics
- Reference and non-reference geometries chosen for interference analysis in the database.

THE ANSWERS TO THESE ISSUES WILL HAVE A MAJOR EFFECT ON THE FLEXIBILITY AND REQUIREMENTS ASSOCIATED WITH WSD USE!

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Conclusions

- We have outlined our current **views** on access to TV white spaces, and issues of **regulation** and **standardisation** of white space devices (WSDs) and white space databases (WSDBs).
- We have indicated the **need for standardisation** of the **interface** between a WSD and a WSDB. We have emphasised that the **internal operation** of WSDBs **need not** be standardised.
- We propose to use UK-specific **voluntary national specifications** (VNSs) as a short-term instrument for the regulation of WSDs.
- The UK regulatory requirements for WSDBs will be defined in **separate specifications**.
- We have outlined (at a high level) the **contents** and **scope** of our WSD and WSDB **regulatory requirement** specifications. These will be **technology-agnostic** (do not specify detailed communication protocols).
- We have indicated the need for **measurements** and **real life trials** to give more **confidence** in some of the decisions we will have to make .

Regulatory effort

- We believe that access to TV white spaces is a **critical test case**
 - in enabling **dynamic** and **opportunistic** spectrum sharing, and
 - for future access to white spaces in **other bands**.
- It is **imperative** that regulators **focus** efforts in solving the **specific** and **well-defined** problems presented by access to TV white spaces.
- Progress in this area will allow increased **technical** and **economic** efficiencies in the use of the radio spectrum.

Thank you!

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