# Response to "TV White Spaces" Consultation from Neul

**General comments:**

Neul is developing an innovative new wireless standard for machine-to-machine communications called Weightless. It is envisaged that this will operate in white space delivering massive societal, productivity and growth benefits to the UK citizens, consumers and economy. With billions of connected machines worldwide envisaged by 2020 this is a market that could be of similar magnitude to that for cellular communications and recent reports have shown how M2M connectivity could lead to GDP growth of over 1% a year for decades to come.

Hence, it is vitally important for the UK that white space is made available as soon as possible, on the least restrictive terms commensurate with Ofcom's duties and previous decisions around white space availability. It also aligns well with Ofcom's duties to promote innovation.

Neul supports the publication of these three documents. These are very much in line with previous publications from Ofcom and with the output of the working groups that Ofcom is convening. What is critical now is to proceed as fast as possible. White space has been under discussion in Ofcom for around four years and has been allowed in the US since 2010. Any further delay in enabling access will result in a loss of consumer value and threaten the existence of innovative start-ups that are looking to exploit the spectrum. We urge Ofcom to work as quickly as possible, undertaking work in parallel wherever it can be done, with the objective of enabling white space access in the summer of 2013.

**Response to specific questions:**

Q1: Yes, we agree with the general approach to defining different device classes, although we note that there may be new classes needed over time as devices and applications mature and there should be a simple and clear process for doing this. In particular, the method of testing a new device and the list of TV receivers that it will be tested against, need to be defined and published as soon as possible to allow those developing equipment to test and modify their white space devices to minimise their impact.

We suggest that the requirement for an integral antenna for class B devices be removed. Such devices might be, for example, modules within vehicles where the antenna is part of the vehicle itself and hence not integral to the radio. See also the response to Q4 which is relevant to this point.

Q2: Yes, we agree with the proposed sequence of messages, although we note that there may be cases where information is already held by the master on behalf of the slave and other similar variations in the process. Ofcom should be flexible in implementing the rules in such cases, providing that the devices are adhering to the intent of the regulations rather than necessarily the specific message flows.

Q3: Yes, we agree in general with the approach proposed here. We suggest that the "spurious emissions" limit of -84dBm/100kHz is overly restrictive since this is much lower than the spurious

emissions limits allowed for ICT equipment under the CISPR22 regulations, resulting in the unusual situation where a device is allowed to radiate more out-of-band when in receive-only mode than when in transmission mode. Our recommendation is that this be modified to -57dBm/100kHz to align with the CISPR 22 regulation.

We also believe that the provisions relating to security need some attention to cover the case where a slave device is operating under the direct control of a network. We recommend that provision 5.70 be modified to:

“Slave devices must authenticate master devices as part of their initial white space signalling exchange and cease to communicate with masters where authentication fails. Where slaves download lists of frequencies for autonomous slave-to-slave operation these should be securely encrypted. We expect the details of this to be provided within the relevant standards.”

Q4: Yes, we agree with these provisions. In terms of slave antenna gain, as set out in 5.85 we note this relates to the issue of master coverage area. The mechanisms for how this will be determined have not been set out yet. Our preference is that professional network operators who may have, for example, deployed a large-area machine-to-machine network, be able to request certification for self-reporting of master coverage areas. This would then allow factors such as antenna gain, slave location, topography, base station parameters and much more to accurately be taken into account and would lift any requirement for maximum slave antenna gain. We also note that in general, mobile devices will not have directional antennas and so the gain will be limited to that of a dipole, whereas fixed slave devices could have directional antennas. Hence, there may be merit in treating fixed slaves with accurate geolocation reporting differently from mobile devices.

Q5: Yes, we agree. However, we note that in some cases the information may already be held by the master device and may not need to be sent by the slave. For example, the slave may be using a temporary identity that is linked by the master to its permanent identity or its channel usage may be controlled by the master itself and so not need to be sent by the slave. We suggest that as long as the information required is delivered by the master WSD to the white space database, flexibility is allowed in the manner in which this occurs.

We note that antenna directionality is not listed as one of the parameters that the master reports to the WSDB and suggest this be included for maximum flexibility and future-proofing.

Q6: We agree with the overall approach. We have some detailed comments on the VNS which we will provide separately.

## Detailed comments on the Voluntary National Specification

### 4.1

Slave WSD – We think the wording “which obtains slave operational parameters directly” could be changed to “which obtains slave operational parameters explicitly or implicitly”. This would account for implementations where the slave transmit frequency is included in the frame structure.

## 5.39

We believe the effective noise floor of -84dBm/100kHz is overly low and should be in the region -57dBm/100kHz (see Neul response to the Ofcom consultation).

Concerning the AFLR table

1. The limits in class 1 and class 2 may be overly restrictive. In practice the amount of power that a WSD can radiate in a channel adjacent to a WSD is limited by the TV protection ration and not the WS OOB emissions. A figure of 64dB for adjacent channel emissions would be appropriate.
2. The table sets a limit for n >= 3 and n<=-3. Given that WSD devices are necessarily broadband devices it will be difficult to meet this specification for the whole 470-790 MHz band. Given that we have observed that CW and narrowband emissions are less harmful to TV receivers we believe that up to 5 narrow band exceptions should be permitted. Each of these narrow band exceptions should not exceed the specification limit by more than 10dB.
3. More generally, once a technology has been standardised we believe it would be more appropriate for there to be an emissions class for that particular technology. This allows better alignment of the class with the actual technology characteristics and reduces the number of technology/class combinations that need pre-calculation. The classes provided in the document would then only apply to non-standardised / non-recognised technologies or those that did not wish to declare a bespoke class.

## 5.65

We believe that we could broaden the scope of network architectures by allowing the device parameters to be supplied by an intermediate agent whom is responsible for acting as a proxy for base stations or slaves.

## 5.68

A slave WSD shall provide either implicitly or explicitly its device parameters to its serving master. These parameters may be supplied through some out of band mechanism prior to association.

## 5.76

We think the reception may happen through an intermediate agent (for example the network managing the WSD).

## 5.77

As in 2§5.76 an intermediate agent could be responsible for communicating with the WSDB.

## 5.85

We don't see why there is a need for a WSD to communicate to the WSDB the channel usage parameters prior to initiating transmission. We think providing this information within reasonable time would make sense for logging purposes.

## 5.98

How does the database instruct a master WSD to shut down its transmissions? If the master WSD needs to poll the database it would generate unacceptable load on the databases. We think the notification mechanism should be clarified.

## 5.99

Does this means within 1sec of receiving the message from the master WSD?

## 5.100

In some Machine to Machine network definition of “lost communication” is rather vague. We suggest “when the slave can no longer decode the master’s transmission”.

## 5.105

The definition of a geo-location capable WSD precludes WSD that are geo-located by other means than automatically. For example nodes that are located by an installer.

## 5.118

We do not agree that class B devices must have an integral antenna (see the Neul response to the Ofcom consultation for more details). There are many devices, eg a M2M module installed in a car, where the antenna will not be integral to the radio device. Instead, class A devices should be considered “fixed” and class B considered “non-fixed” but without restrictions on antenna types.

## 5.122

See our response to the Ofcom consultation.

## 6.25

If the UUT is required to have a continuous transmissions mode it would simplify the testing of the radio characteristics.

## 6.29

We don’t think that requiring the master/slave UUT connected to the slave/master WSD via a non-radio link is required to perform the WSDB and UUT tests. Provision of a non-radio link may add cost, size and complexity to the most price-sensitive products.

## 6.65

1. Resolution bandwidth: Using a 100kHz resolution bandwidth maybe insufficient for some whitespace modulation schemes which maximise their usage of a 8MHz channel. We would suggest a RBW of 30kHz or 10kHz. We do not see the need to reduce the RBW if the operating bandwidth is less than 100kHz.
2. Detector: Since this this is interested in the energy distribution within the spectrum an RMS detector should be appropriate.
3. If our suggestion for 6.25 is adopted then an average trace mode should be adequate. It would avoid all uncertainties associated with burst transmissions.

In the second bullet we don’t see the need for the sentence “Find the peak value of the trace and place the analyser marker on this peak”.

## 6.77

As in 6.65 point 1,2,3 applies to this section.

## 6.78 and 6.79

We think the test should be performed by using the spectrum analyser channel power measurement facility to measure the power in each 100kHz channel in both the adjacent and next adjacent channels.

## 6.91

We think this test should be performed with a spectrum analyser since the WSDB limits the power spectral density per 8MHz.

## 6.128

Concerning point ii) see comment on 5.100.

## Transmitter unwanted emissions within the 470-790MHz band.

We think it would make sense to merge this paragraph with the measurement which measures the occupied channel bandwidth.

## Database discovery and database query

For some networks implementations the UUT might not communicate directly with the database but thought an agent or proxy which is part of the UUT network. In that case the DNS query and HTTPS query to the database is not going to be visible. One possibility would be for the UUT or its another network entity to provide a logging mechanism to show the database queries that it performs.