Addendum to Sky's response to Ofcom's consultation:
Securing long term benefits from scarce spectrum resources

Sky understands that, in the light of developments at WRC-12, Ofcom has decided to re-consider its plans for UHF and, in particular, the 600 MHz and 700 MHz bands. The most likely outcome appears to be policy decisions ordering clearance of the 700 MHz band and re-allocation of some of the 600 MHz band to DTT in order to allow PSB requirements to be fulfilled and commitments given by Ofcom to commercial Multiplex licensees to be maintained. Based on this premise, Sky would like to elaborate on aspects of our main response.

As additions to the policy assumptions previously mentioned, Sky believes Ofcom should take this unique opportunity to maximise the value of UHF to the UK by drawing up and implementing two further policy measures:-

1. More efficient use of UHF spectrum

DTT broadcasters and multiplex licence holders should be obliged to make more efficient use of UHF spectrum. Research carried out for the BBC Trust[1] indicates that the replacement cycle for integrated TVs is 7 to 8 years, and for STBs 5 to 6 years. This information has been incorporated into the table below to provide an indication of when newer technologies can be expected to be available in DTT receivers in sufficient quantities to allow a switchover, along with the gains that could be made. In the case of PSB channels, it may be prudent to offer a modest extension to these timescales to ensure that vulnerable groups do not lose the service. Conversely, incentives could be offered to reward those broadcasters and multiplex licence holders who comply substantially earlier than required (and early consideration of what those incentives could be should be explored).

Technology	Efficiency gain (approximate)	Year of introduction to DTT receivers	Newer technology reaching substantial numbers in the market – earliest date for switchover	Conservative timescale for phasing out older technology / technologies
AVC / H264 (2nd generation technology)	50% (over MPEG2 – 1st generation technology)	2010	2018	2022
DVB-T2 (2nd generation technology)	45 to 66% (over DVB-T – 1st generation technology)	2010	2018	2022
HEVC (3rd generation technology)	50% (over AVC/H264)	2013 [estimated]	2021 [dependent on introduction]	2025 [dependent on introduction]

Sky has consulted acknowledged industry experts about the potential benefits of these technologies and their calculations show that the use of 2nd generation technologies

1 "*Report for the BBC Trust on the Model to Assess the Impact of Canvas on the TV Market*", Value Partners, December 2009

could reduce the number of multiplexes required for DTT to 4 by 2022, even if PSB multiplexes continued to use 1st generation technologies.

Consideration should also be given by Ofcom to the introduction of SFN operation which could provide c.70% efficiency saving over the MFN mode that is currently used for all the UK's DTT multiplexes. Sky recognises that such a move would not be without difficulties and that it will not be possible to introduce SFN operation on PSB multiplexes with regional broadcasting obligations, nor on multiplexes that would suffer commercially unacceptable falls in coverage due to international planning considerations. Nevertheless, there is at least one UHF frequency (channel 36) that is currently suitable for SFN operation and it is possible that others will be found, if this becomes an aim of the next UHF re-planning exercise.

Continued use of outdated and obsolete technologies will place the UK at a competitive disadvantage compared with other nations which adopt the newer technologies before the UK. Ofcom should factor these achievable efficiency gains into its proposed re-allocation of the 600 MHz spectrum to ensure that UK consumers and businesses enjoys the maximum benefits available from the allocation of more of the scarce resource of its UHF spectrum for licensed and unlicensed data usage.

2. Authorise the 600 MHz band exclusively for TVWS until it is re-allocated

In the interim period until the 600 MHz band is re-allocated and exploited, Sky believes that authorisation should be given for its exclusive use by TVWS technologies. There are several TVWS applications which could be market tested, refined and kick started into the market, including urban and public hotspots, in-home video, machine to machine applications and rural broadband. Ofcom will be aware that the standard being developed to enable the use of TVWS (IEEE 802.22) can support approximately 20 Mbit/s in a single UHF channel over long distances: this may not be enough for some applications. However, thanks to the channel bonding feature, contiguous UHF channels can be used together to provide increased bandwidth within a single logical channel.

With only 8 channels available (including Channel 36), attempting to mix "temporary" DTT use with TVWS would result in very inefficient arrangements having to be made in order to provide protection and would make it much more difficult to trial the channel bonding feature. For example, *CEPT Report 30*[2] concludes that 7 MHz separation is needed to protect DTT reception via rooftop antenna from mobile devices, meaning that 3 channels may be needed to provide one usable UHF channel for TVWS. The same report also mentions that providing protection for DTT reception via portable antennas would require guard bands of 14 MHz. Sky strongly opposes the protection of DTT reception by portable antennas and this data serves to reinforce the vastly increased inefficiency such protection might entail.[3]

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2 "*The identification of common and minimal (least restrictive) technical conditions for 790 – 862 MHz for the digital dividend in the European Union*": available from www.ero.dk

3 Ofcom is referred back to [**CONFIDENTIAL**]

The business case for investing in the development of TVWS Wi-Fi is greatly enhanced if, in the short-to-medium term, the 600MHz band can be made available in total for TVWS Wi-Fi (or similar unlicensed uses). There would be a number of positive effects:

a) It would allow the elimination of any risk of harmful interference to existing licensed services whilst also allowing new innovative services and technologies to be developed as quickly as possible. The 600 MHz band can provide a test bed to develop TVWS Wi-Fi services and spectrum access protocols; this will reduce the time pressure on the creation of efficient and workable geo-location database rules for accessing the interleaved spectrum. Progressive improvements to database rules can be more easily tested, refined and implemented as TVWS Wi-Fi technology develops and the knowledge about its effects is better understood.

b) It makes it quicker and easier to introduce TVWS Wi-Fi services:

    (i) Early generation technology is likely to be available sooner if it doesn't need to support more advanced features such as the use of aggregated spectrum across channels. As technology develops, these more advanced capabilities can be trialled and introduced.

    (ii) A band of contiguous spectrum will make it possible to develop innovative services that require more than one channel and / or operate at higher power levels in the earliest timescale possible.

    (iii) The 600 MHz band is available nationwide whereas there may be little or no interleaved spectrum available in significant areas of the UK, particularly in urban areas, due to cautious introductory geo-location database access rules. It will be much easier to develop services with certainty of spectrum availability.

As TVWS Wi-Fi technology develops (in particular the capability to use aggregated spectrum in multiple channels and bands) and access to interleaved spectrum is available under more progressive rules, TVWS can be migrated to interleaved spectrum as a much more efficient and effective deployment. It would clearly be beneficial if DTT efficiency gains will allow some of the 600 MHz band (or similar spectrum) to be available on an unlicensed basis exclusively to TVWS technology and / or other data services.

We would also mention that work carried out under the auspices of the Cambridge TVWS Trial revealed co-channel and adjacent channel co-existence issues between mobile TVWS devices and PMSE equipment which would lead to further inefficiencies if PMSE were to be authorised alongside DTT in the 600 MHz band.

Allocating the full amount of spectrum available in the 600 MHz band to TVWS in the short to medium term would provide significant advantages in terms of enabling the widest range of applications to be fully tested and launched, without risk to licensed services, whilst also allowing the geolocation database functionality to be trialled more easily (including for allocations near the edge of the 600 MHz band). Sky strongly believes that this is the right course of action to provide the maximum economic

benefit for the UK (including for consumers) and encourages Ofcom to investigate and implement this proposal.

Sky **June 2012**