

Comments on Document SMSE-018-17, Titled

“Consultation on the Technical and Policy Framework for White Space Devices”

Specifically Regarding Canadian Operations in Radio Astronomy.

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1. Background on Relevance to Operations in the Radio Astronomy Service

Canada has one national (and fully nationally owned) radio astronomy facility operating within the country (the Dominion Radio Astrophysical Observatory [DRAO]), and participates in a number of international collaborations to implement and operate major instruments at the best sites globally. These facilities are aimed at the detection of cosmic radio emissions, which are usually noise-like and extremely weak compared with man-made emissions, or even compared with the unwanted emissions (as specified by the ITU as being the sum of “out-of-band emissions” and “spurious emissions”) from radio transmitters and other electronic equipment.

A major concern is the increasingly widespread use of low-power devices, such as those involved in the “Internet of Things” (IOT). Even when these devices are operating properly, their potential deployment is so widespread that we could be faced with the integrated unwanted emissions from a large number of these devices. These could degrade the RFI environment at Radio Astronomy Stations in ways that would be very hard or impossible to mitigate. This will be particularly the case when digital modulation methods such as “spread spectrum” are used, because these signals strongly resemble the character of cosmic radio emissions. These considerations form the basis of our position as operators of national and international radio astronomy facilities with respect to our discussion of the specific questions in the document.

2. Discussion of the Specific Questions

Q1: Harmonizing White Space Usage in Channels 3 and 4 (60-72 MHz) With the US

Harmonizing white space usage in these channels with the US is entirely appropriate. Even weak signals in this frequency range will penetrate significant distances; Canada and the US having different policies would have the potential to cause interference issues across the border. In addition there would be issues with equipment standardization, especially respecting the reality that most of the hardware will not be manufactured in either Canada or the US. It’s best to comply with one set of standards. The Dominion Radio Astrophysical Observatory is located within a hundred kilometres of the US border, and a major part of our observations require pointing our antennas southward; the result is that DRAO will be vulnerable to US as well as Canadian interference. Harmonizing policies in the two countries would allow us to treat this as one type of problem rather than two different ones.

Q2: Harmonizing White Space Usage in Channels 14 to 20 (470-512 MHz) With the US

The comments under Q1 apply here too, so these are only additional points.

Harmonic emissions from these devices could fall in the 1400-1427, 1610.6-1613.8 MHz radio astronomy bands, and in the frequency range 1660-1670 MHz, which also contains bands allocated for radio astronomical use.

An acceptable radio environment at the observatory is maintained by embedding the facility in an area enjoying various municipal, provincial, and federal protections, and if the deployment of white space devices this area were carefully coordinated, interference issues might be avoidable.

Q3: Limiting Initial Deployment of White Space Devices to Below 608 MHz

Deployment of white space devices has the potential to dramatically change the nature of spectrum usage, one issue being that the deployment of a large number of unlicensed devices from a wide range of manufacturers and highly variable quality could lead to an interference and service compatibility issue that would be hard or impossible to mitigate. We do not know what spectrum infilling with lots of unlicensed devices will do to spectrum usability by other services. Let's find out before we let the genii completely out of the bottle.

Q4: White Space and Channel 37 (608-614 MHz)

This is an important designated radio astronomy band, and devices operating in this band could render the band unusable for astronomy. Digital modulation techniques as widely used in low-power devices result in emissions almost indistinguishable from cosmic radio emissions, rendering mitigation impossible. It would be useful if white space emissions were kept out of channels 36 and 38 in addition, because the unwanted emissions from these (cheaply engineered) devices could also render the 608-613 MHz band unusable.

A consortium of Canadian universities and the National Research Council have recently completed construction of a major new radio telescope, called CHIME (Canadian Hydrogen Intensity Mapping Experiment), which depends critically on observing from 400 to 800 MHz. White space devices operating in Channel 37 have the potential to increase the spectrum utilization to the point where observations could become impossible.