



National Radio Astronomy Observatory

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24 July 2016

Ms. Marlene Dortch, Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: DAI 6-804, SATELLITE POLICY BRANCH INFORMATION, ONEWEB PETITION ACCEPTED FOR FILING IBFS FILE NO. SAT-LOI-20160428-00041 and CUT-OFF ESTABLISHED FOR ADDITIONAL NGSO-LIKE SATELLITE APPLICATIONS OR PETITIONS FOR OPERATIONS IN THE 10.7-12.7 GHz, 14.0-14.5 GHz, 17.8-18.6 GHz, 18.8-19.3 GHz, 27.5-28.35 GHz, 28.35-29.1 GHz, AND 29.5-30.0 GHz BANDS.

Dear Ms. Dortch:

Footnote US131 to the US table of frequency allocations states that “In the band 10.7-11.7 GHz Non-geostationary satellite orbit licensees in the fixed-satellite service (space-to-Earth), prior to commencing operations, shall coordinate with the following radio astronomy observatories to achieve a mutually acceptable agreement regarding the protection of the radio telescope facilities operating in the band 10.6-10.7 GHz.” The list of observatories that follows in US131 includes the GBT, VLA and VLBA that are operated by the National Radio Astronomy Observatory (NRAO or “the Observatory”), and the Arecibo Observatory.

Coordination is needed because the spectrum band at 10.68 GHz – 10.70 GHz is a passive service band, protected domestically by footnote US246 to the US Table of frequency allocations and by RR No. 5.340 worldwide. As such, the band is used by radio astronomy and other passive services to observe phenomena that are uniquely accessible in portions of the spectrum that are especially radio quiet. Radio telescopes are especially vulnerable to interference from airborne and satellite transmissions, and OneWeb and other systems should not operate in the band immediately above 10.70 GHz without a robust demonstration that they can, in the aggregate, fully protect radio astronomy from their unwanted emissions into the passive band.

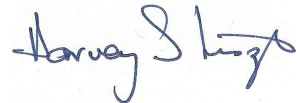
From the OneWeb filings one learns that the ground level power flux density will not exceed -146 dB W/m²/4 kHz, equivalent to -182 dB W/m²/Hz. However, from Table I of ITU-R Recommendation RA.769, one finds that the threshold for detrimental interference to radio astronomy operating at 10.65 GHz is -240 dB W/m²/Hz, some 58 dB smaller. Preventing data loss to radio astronomy at 10.68 – 10.7 GHz means that unwanted emissions into the band should remain below the threshold for detrimental interference. The -58 dB margin between the radio astronomy threshold and OneWeb’s in-band signal level poses obvious questions of compatibility, which are compounded by the visibility above the horizon of hundreds of satellites (in one or more networks) which may simultaneously impact radio astronomy observing. Only a detailed epfd calculation can tell whether the proposed systems, acting separately and simultaneously, can protect radio astronomy operations.

NRAO has individually had discussions with OneWeb and one of its competitors, hosted by the National Science Foundation, regarding their proposed systems. There are no generally-accepted international standards for allowing interference from unwanted emissions into passive service bands,

but during these discussions the Observatory explained the ITU-R criteria for protection of shared radio astronomy bands at a maximum level of 2% data loss from one network, or 5% from all networks in one system, as outlined in ITU-R Rec. RA. 1513 and other ITU-R Recommendations relating to efpd simulations of non-GSO systems. These criteria, which are generous from the point of view of radio astronomy in accepting data loss in passive bands where there should be none, have been used in compatibility studies at the ITU-R in regard to protection of passive service bands near 15 GHz. That said, allowing 5% data loss to radio astronomy from unwanted emissions into a passive service band would be a terrible precedent.

The Observatory is awaiting the results of compatibility studies by OneWeb and its competitor. Under no conditions should these or any other satellite operators be licensed without it having been shown that they will protect radio astronomy operations in the passive service band in accordance with US131 and the relevant international requirements.

Respectfully submitted

A handwritten signature in blue ink, appearing to read "Harvey S. Liszt".

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To whom correspondence should be addressed