



NATIONAL RADIO ASTRONOMY OBSERVATORY

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Response to the FCC Notice of Proposed Rule Making (NPRM), in the matter of Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands. WT Docket No. 02-146, released June 28, 2001.

The Commission raises many important issues in this NPRM. The National Radio Astronomy Observatory (NRAO) would like to comment on the following specific points, which are particularly important to the research conducted at NRAO's facilities, and at other Radio Astronomy Service (RAS) facilities in the United States.

[1] In paragraph 44, the Commission asks, "Is this quantity of spectrum necessary for RAS purposes ...?". The radio astronomy allocations above 71 GHz, as adopted at WRC-2000, were introduced and supported fully by the U.S. delegation. These allocations were established to satisfy two main requirements of the RAS:

(a) High sensitivity. Many types of natural millimeter-wave sources emit over a broad, continuous range of frequencies. While the intensity of these continuum sources is fixed by physical conditions in the emitting regions, the sensitivity with which RAS facilities can detect them is maximized by using the entire allocated bandwidth. The latest generation of RAS millimeter-wave receivers uses an 8 GHz IF bandwidth; for this reason, the latest revision of ITU-R RA.769 adopts a standard bandwidth of 8 GHz in calculating radio astronomy protection criteria in the portion of the spectrum above 71 GHz.

(b) Access to spectral lines. A wide variety of molecules in the inter-stellar medium emit spectral lines at many specific frequencies in the millimeter-wave spectral range. These natural molecular signatures provide essential information for the study of the interstellar medium, and particularly of star formation regions. They are emitted at frequencies determined by fundamental physics, and are received subject to a natural Doppler shift by RAS facilities. Both the frequencies of these spectral lines, and their Doppler shifts, are beyond the control of radio astronomers. To determine physical conditions such as the temperature, density, and molecular composition of the regions of interest, it is essential to sample spectral lines arising from multiple energy-level transitions in multiple molecular species. Thus, these scientific studies depend on access to a broad range of frequencies.

For these reasons, NRAO urges the Commission to adopt the WRC-2000 allocations to radio astronomy, in the entire frequency range above 71 GHz.

[2] NRAO is concerned that the Commission is suggesting, also in paragraph 44, that portions of the new allocations to the RAS might be established on other than a primary basis. It is our understanding that WRC-2000 adopted primary allocations to radio astronomy in these bands, as part of a complex, balanced exchange in which the RAS relinquished primary allocations at other frequencies. For RAS observations, the principal value of an allocation lies in the protection from interfering emissions afforded by a primary allocation. Thus, NRAO urges the Commission to retain the primary status included as part of the allocations adopted by WRC-2000.

[3] NRAO accepts the necessity of coordination arrangements to ensure optimal use of the allocated bands, and believes that practical approaches, such as that suggested by the Commission in paragraph 45, can be developed to limit unnecessary coordination exercises. However, the computations involved in these approaches should use realistic values for, among other factors, the atmospheric attenuation. NRAO is concerned that power limits imposed on unlicensed operation in the 57-64 GHz band, based on safety considerations, have been transferred to the higher frequencies considered in the NPRM in paragraph 62. In fact, the atmosphere is significantly more transparent at these higher frequencies. NRAO supports the consensus within the RAS, that atmospheric attenuation of no more than 0.4 dB/km is appropriate in these computations.

NRAO endorses strongly the prohibition, in the service rules described in paragraph 62, on unlicensed operation in these frequency bands in aircraft or satellites. Emissions from airborne and spaceborne sources have become the dominant source of interference experienced by NRAO's radio telescopes at most frequencies.

[4] The ten sites of NRAO's VLBA instrument have been upgraded recently with receivers covering the entirety of the 81-95 GHz range. These are the only RAS facilities that are dedicated to observations using the VLBI technique, and thus are appropriately singled out in the NPRM for smaller coordination radii. However, the proposed 25-km radius in paragraph 43, and in footnote USzzz on page 64, does not provide adequate protection even after taking into account the lower susceptibility of VLBI observations to interference. Based on the same 0.4 dB/km atmospheric attenuation recommended above, a radius of 60 km would be required for adequate path attenuation in the frequency bands that are the subject of the NPRM. This radius would also be with that specified in Part 101, Section 101.31 of the Commission's Rules. Consequently, NRAO requests that the 25-km coordination radius proposed by the Commission for these sites be increased to 60 km.

Sincerely,

Original signed by:

Fred K. Y. Lo
Director