

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Shared Use of the 42-42.5 GHz Band	)	WT Docket No. 23-158
	)	
Use of the Spectrum Bands Above 24 GHz for	)	GN Docket No. 14-177
Mobile Radio Services	)	

**COMMENTS OF THE
NATIONAL ACADEMY OF SCIENCES'
COMMITTEE ON RADIO FREQUENCIES**

The National Academy of Sciences, through its Committee on Radio Frequencies (hereinafter, CORF),¹ hereby submits its comments in response to the Commission's June 8, 2023, *Notice of Proposed Rulemaking* (NPRM) in the above-captioned dockets. In prior Orders in Docket 14-177, the Commission took a number of steps to protect important passive scientific observations. Such protections serve the public interest, and CORF appreciates the Commission's recognition of the importance of such observations in those Orders, and in the NPRM. In these comments, CORF responds to questions regarding important protections for passive scientific use of the 42.5-43.5 GHz band.

I. Background.

As set forth in CORF Comments previously filed in Docket 14-177 on September 7, 2018, November 16, 2016, and September 29, 2016, CORF has a substantial interest in this proceeding because it represents the interests of the users of the passive

¹ See the Appendix for the membership of the Committee on Radio Frequencies.

scientific bands of the radio spectrum, including users of the Radio Astronomy Service (“RAS”) bands.² As the Commission has recognized throughout Docket 14-177, radio astronomy is a vitally important tool used by scientists to study the universe. CORF appreciates the Commission’s continued recognition of the importance of RAS observations in the 42.5-43.5 GHz band.³

II. Comments.

CORF fully supports the proposal in paras. 38-39 of the NPRM that the parameters established by ITU-R.RA.769 be used as the criteria for protecting radio astronomy facilities from interference. ITU-R.RA.769 is a long-standing, internationally agreed upon, and recognized standard.⁴ The Commission has previously used this standard as a basis for calculating protection of radio astronomy observations from interference.⁵

CORF also concurs with the Commission’s comments in paragraph 10 on the limited benefits of potential unlicensed use of the 42 GHz band, and on the greater likelihood of harmful interference to RAS were unlicensed use to be permitted.

CORF is concerned, however, that while the Commission proposes that RAS observations be protected consistent with the requirements of ITU-R.RA.769, it does not propose a means for doing so. For example, in paragraph 36, the NPRM notes that

² The data and arguments set forth in those prior CORF Comments and Reply Comments are incorporated herein by reference.

³ Spectral lines at 42.519, 42.821, 43.122, and 43.424 GHz (for observations of silicon monoxide) are among those of greatest importance to radio astronomy. *See, Handbook on Radio Astronomy* (ITU Radiocommunication Bureau, 2013), at page 37, Table 3.2. The 42.5-43.5 GHz band is also one of the preferred RAS bands for continuum observations. *Id.* at page 35, Table 3.1.

⁴ The full text is available from the ITU at <https://www.itu.int/rec/R-REC-RA.769-2-200305-l/en>

⁵ *See, e.g., In the Matter of Amendment of Part 15 of the Commission’s Rules for Unlicensed Operations in the Televisions Bands, Report and Order*, 30 FCC Rcd. 9551, 9645-46 (2015).

while “[p]roponents of using the 42 GHz band for flexible terrestrial wireless use have generally agreed that various practical methods may be effective at protecting RAS, including use of exclusion zones, coordination zones, and aggregate emissions limits—particularly because RAS sites are remotely located... [n]one provide detailed information or examples showing how these proposed methods would work in practice.” However, the NPRM suggests that more stringent out-of-band emission limits are not necessary, because “geographic separation of 42 GHz licensed operations and RAS facilities will provide sufficient protection of RAS facilities” *Id.* at paragraph 37. CORF agrees that geographic separation may indeed be sufficient to protect RAS facilities. However, the NPRM goes on to state that it does not propose specific coordination zones because “[t]he record to date does not contain sufficient information to determine whether, and if so, at what distances, coordination zones would be appropriate....” *Id.* Nevertheless, the NPRM invites submission of such information from commenters.

In response, CORF herein provides information on the appropriate parameters of the geographic separation that should be used to protect the relevant RAS facilities, in the context of coordination zones.⁶ In the absence of some specific methodology for protecting RAS facilities, CORF believes that it will be much more difficult to enforce a protection requirement, and even to identify operators who are not complying with the protection requirement.

⁶ The Commission already uses coordination zones to protect specific RAS facilities. *See., e.g.,* 47 C.F.R. § 2.106 at Footnote US161 (protection of RAS facilities making observations at 81-86 GHz, 92-94 GHz, and 94.1-95 GHz).

III. Coordination Distances for RAS Observatories.

At 42 GHz, terrain shielding can provide effective protection to an RAS observatory. However, this shielding is highly dependent on the details of the surrounding topography and the nature of a prospective active service deployment. Thus, as described below, coordination requires the use of terrain elevation data combined with an irregular terrain propagation model.

In paragraph 39 of the NPRM, the Commission proposes to include a new footnote to the United States Table of Frequency Allocations, listing RAS observatories with 42 GHz deployments which would require coordination to achieve protection consistent with ITU-R RA.769. CORF proposes that this table include, for each listed observatory, a maximum coordination distance corresponding to the maximum line-of-sight (LOS) distance from the observatory to any surrounding terrain, typically a locally prominent ridge, hill, or mountain top. Much of the lower-lying terrain within this radius will be shielded from the observatory's view by intervening higher ground and thus not within its "viewshed," and coordination would be simple in such cases. Nevertheless, CORF proposes that any prospective 42 GHz active deployment lying within the maximum coordination distance tabulated in the footnote be required to perform a viewshed and propagation analysis using suitable Geographic Information System (GIS) and irregular terrain propagation modeling⁷ tools to map the 42 GHz path loss within the RAS observatory's viewshed. Within the observatory viewshed, an analysis would be

⁷ The standard model that has been used by the Commission for such purposes is Longley-Rice (A.G. Longley and P.L. Rice, 1968, *Prediction of Tropospheric Radio Transmission Loss over Irregular Terrain: A Computer Method*, ESSA technical report ESSA-TR-ERL79-ITS67, Institute for Telecommunication Sciences: Boulder, CO). CORF notes that the stated range of applicability for Longley-Rice is 20 MHz to 40 GHz, but the approximations therein are likely to be suitable for this purpose at 42 GHz.

required to ensure that aggregate⁸ base station and mobile user equipment emissions associated with the proposed deployment would not exceed ITU-R RA.769 thresholds at the RAS observatory, including mobile equipment emissions expected to occur when the mobile equipment is out of range of any base station.

Table 1 gives maximum coordination distances for each of the RAS facilities listed in paragraph 39 of the NPRM, computed using a publicly available tool.⁹

TABLE 1 Maximum Coordination Distances for Radio Astronomy Service Facilities Listed in Paragraph 39 of the June 8, 2023, *Notice of Proposed Rulemaking*

RAS Observatory	Latitude (N)	Longitude (W)	Altitude (m)	Maximum Coordination Distance (km)
<i>Single-Dish Observatories</i>				
Haystack Observatory (Westford, MA)	42° 37' 23"	71° 29' 18"	142	150
Green Bank Telescope (Green Bank, WV) ^a	38° 25' 59"	79° 50' 23"	904	49
<i>Connected-Element Interferometer^b</i>				
Very Large Array (Socorro, NM)	34° 4' 46"	107° 37' 7"	2,159	93
<i>Very Long Baseline Array (VLBA) Stations</i>				
Kitt Peak, AZ	31° 57' 22"	111° 36' 45"	1,937	286
Owens Valley, CA	37° 13' 53"	118° 16' 37"	1,234	89
Mauna Kea, HI	19° 48' 4"	155° 27' 20"	3,744	52
North Liberty, IA	41° 46' 17"	91° 34' 27"	254	24
Hancock, NH	42° 55' 60"	71° 59' 12"	328	51
Los Alamos, NM	35° 46' 30"	106° 14' 44"	1,983	216
Pie Town, NM	34° 18' 4"	108° 7' 9"	2,385	117
Fort Davis, TX	30° 38' 6"	103° 56' 41"	1,645	22
Saint Croix, VI	17° 45' 23"	64° 34' 60"	35	78
Brewster, WA	48° 7' 52"	119° 40' 60"	267	38

^a The Green Bank Telescope is listed for sake of completeness, but as noted in paragraph 39 of the NPRM, it would remain subject to the existing requirements for coordination in the National Radio Quiet Zone in Section 1.924 of the Commission's rules.

^b The future ngVLA upgrade (<https://ngvla.nrao.edu>) will expand beyond the core site in Socorro, NM, likely requiring an update to this table

SOURCE: Data from heywhatsthat.com, accessed June 13, 2023. Viewshed and horizon computations are based on the NASA Shuttle Radar Topography Mission (SRTM) data set and assume dry air refractivity.

⁸ See, e.g., *Amendment of Parts 2 and 25 of the Commission's Rules to Enable GSO Fixed-Satellite Service (Space-to-Earth) Operations in the 17.3-17.8 GHz Band, to Modernize Certain Rules Applicable to 17/24 GHz BSS Space Stations, and to Establish Off-Axis Uplink Power Limits for Extended Ka-Band FSS Operations*, Report and Order, FCC 22-63, August 3, 2022, at paras. 26 and 35. Regarding calculation of the aggregate impact from multiple operators, see, e.g., *In the Matter of Space X Services, Inc. and Kepler Communications, Inc.*, DA 22-695, June 30, 2022, at para. 34.

⁹ See the HeyWhatsThat website at <http://heywhatsthat.com>, accessed June 13, 2023.

IV. Conclusion.

In prior Orders in this Docket, the Commission took a number of steps to protect important passive scientific observations. Such protections serve the public interest, and CORF appreciates the Commission's recognition of the importance of such observations in those Orders, and in the NPRM. CORF supports the Commission's proposal in paras. 38-39 of the NPRM that the parameters established by ITU-R.RA.769 be used as the criteria for protecting radio astronomy facilities from interference. ITU-R.RA.769 is a long-standing, internationally agreed upon, and recognized standard, which the Commission has previously used as a basis for calculating protection of radio astronomy observations from interference. If the Commission adopts its proposal for shared use of the 42-42.5 GHz band, then it should include provisions for coordination with impacted radio astronomy facilities, as discussed above.

Respectfully submitted,
NATIONAL ACADEMY OF SCIENCES'
COMMITTEE ON RADIO FREQUENCIES

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August 1, 2023

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