NATIONAL RADIO ASTRONOMY OBSERVATORY

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Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Service Rules and Procedures to Govern	)	
the Use of Aeronautical Mobile Satellite	)	IB Docket No. 05-20
Service Earth Stations in Frequency Bands	)	
Allocated to the Fixed Satellite Service	)	

Comments of the
National Radio Astronomy Observatory
Charlottesville, VA 22903

I. Introduction, Background and Summary of Concerns

1. The National Radio Astronomy Observatory (NRAO) is pleased to provide comments responding to the Commission's Notice of Proposed Rule Making FCC 05-14 "Service Rules and Procedures to Govern the Use of Aeronautical Mobile Satellite Service Earth Stations in Frequency Bands Allocated to the Fixed Satellite Service (IB Docket No. 05-20)" ("The NPRM").

2. NRAO (http://www.nrao.edu), operated by Associated Universities, Inc., (http://www.aui.edu) under a cooperative agreement with the National Science Foundation, is the largest radio astronomy observatory and one of the largest astronomical observatories of any kind in the world. It employs nearly 600 people in several of the United States as well as the US Virgin Islands and Chile, and is responsible for much of the basic research conducted by the radio astronomy service world-wide. NRAO currently operates the Very Large Array (VLA), headquartered in Socorro, New Mexico, the Robert C. Byrd Green Bank Telescope in Green Bank, West Virginia and the Very Long Baseline Array (VLBA), an array of ten antennas spread across the United States and from Hawaii to St. Croix. During 2003 these facilities were used by some 1100 astronomers and astronomy students from 245 institutions spanning the globe.

3. As a public institution, the NRAO is charged on behalf of the American people with the conduct and encouragement of the practice of radio astronomy. As the operator of a capital plant comprised of public property valued in excess of $275,000,000 at a variety of remote stations, all of which are subject to existing memoranda of understanding (MOU) with airborne mobile satellite service (AMSS) operators concerning use of the 14.47 – 14.5 GHz

band, and all of which will be affected by the proposed rulemaking, the NRAO is obliged to express concerns for the continued success of its operations. The Observatory recommends 1) that successful operations of both the radio astronomy service (RAS) and AMSS can be predicated most simply and directly on the existing MOU; 2) that imposing coordination requirements below 14.47 GHz is unnecessary; 3) that a new mechanism is needed to notify other operators and services (including but not limited to the AMSS) of the existence of radio astronomy stations deserving regulatory protection.

II. Coordination between RAS and AMSS, but in which bands?

4. Insofar as the present regulatory proceeding involves the RAS and NRAO, it is in part grounded in footnote **US203. US203** is subject to possible revision by the current rulemaking, but now reads, in part**:**

> **US203** Radio astronomy observations of the formaldehyde line frequencies 4825-4835 MHz and 14.470–14.500 GHz may be made at certain radio astronomy observatories as indicated below:

[*obsolete table omitted, see ¶11 – 14 and 19 here*]

> Every practicable effort will be made to avoid the assignment of frequencies to stations in the fixed or mobile services in these bands. Should such assignments result in harmful interference to these observations, the situation will be remedied to the extent practicable.

However, the spectrum region 14.0 – 14.5 GHz has been allocated to the mobile-satellite service (earth-space) in the US and internationally, and the upper 6% of that band at 14.47 – 14.5 GHz (hereafter, the "upper formaldehyde band") has indeed been assigned to stations of the AMSS by the Commission. That is, apparently, despite every such effort being made to the contrary, it did not prove to be practicable to avoid assignment of the upper formaldehyde band to stations of the AMSS and it is only the final sentence of **US203** concerning practicable remedial actions which is of practical current interest.

5. The present proceeding is also grounded in Recommendation ITU-R M.1643, which the Commission attached to the NPRM as Annex 1. Part C of Annex 1 of the NPRM and of Recommendation ITU-R M.1643 deals with "essential requirements related to sharing with the RAS" and it has two sub-sections dealing separately with AMSS channels in the bands 14.47 – 14.5 GHz and 14 – 14.47 GHz. The first of these sub-sections recognizes that protection of RAS observations at the levels of Recommendations ITU-R RA.769 and RA.1513 is not possible during AMSS use of the upper formaldehyde band within line of sight of an RAS station, and therefore that some agreement about the use of such in-band, in line-of-sight AMSS operations should be concluded between operators in the two services. As a practical matter, what is entailed is that the RAS operator informs the AMSS of periods of such observations, sufficiently in advance to the maximum practicable extent, in which case the AMSS operator forgoes use (only) of the upper 6% of the 14 – 14.5 GHz band while within line of sight of the RAS station, during that time. These arrangements are memorialized in the MOU mentioned by the Commission in footnote 87 of the NPRM.

6. The second sub-section of Annex 1, Part C of the NPRM notes that AES operating in the 14 – 14.47 GHz band will necessarily have unwanted emissions in the upper formaldehyde band, but that protection of RAS observations in the upper formaldehyde band may be effected during line-of-sight AMSS operation at 14.0 – 14.47 GHz *solely* through the use of "proper" hardware design.

7. Thus, given certain design practices regarding the AMSS stations, the only coordination activity needed to effect sharing between the RAS and AMSS is that associated with the upper formaldehyde band: the RAS operator notifies the AMSS operator (well in advance, to the maximum extent practicable) of observations in the upper formaldehyde band, triggering the understanding about mutual operation on the part of the AMSS operator. No coordination regarding the activities of either service in the region below 14.47 GHz is entailed, on the part of the AMSS operators because of the properties of their systems, and on the part of the RAS because there is no RAS allocation in the region 14 – 14.47 GHz.

8. Therefore (see the prior paragraph) it is the view of the NRAO that the Commission's concerns (NPRM at ¶28) regarding coordination and co-secondary status of the AMSS and RAS in the region 14 – 14.47 GHz are unwarranted and that no regulatory action need or should be taken in this regard.

III. A suggested rulemaking for sharing between RAS and AMSS

9. As recognized by the Commission in footnote 87 of the NPRM, memoranda of understanding (MOU) have been concluded between the NSF and (two) AMSS operators concerning sharing of the upper formaldehyde band and protection of operations of the RAS therein. To the best of its understanding, the NRAO believes that these MOU embody the principles and detailed considerations set forth in Recommendation ITU-R M.1643 (regarding sharing between the RAS and AMSS), and RA.769 and RA1513 (which specify levels of interference detrimental to the operations of the RAS), and translate them into practical, working agreements between the two services.

10. The NRAO suggests that these MOU be used as the basis for rulemaking regarding sharing of the upper formaldehyde band by the RAS and AMSS. Such rules would immediately be firmly grounded in agreed-upon actions of the ITU and the US communities within the RAS and AMSS. They would readily be recognizable to interested parties abroad, an important consideration given the international aspects of AMSS operations as discussed in many instances throughout the NPRM and at ¶15 here. Finally, note that such rules would also have the virtue of providing a level playing field for future entrants while to the greatest extent preserving the existing operations in both the RAS and AMSS.

IV. The future of US203 and similar footnotes

11. **US203** is intended to incorporate the totality of locations of domestic RAS stations observing the formaldehyde molecule at 4830 and 14470 MHz. The Commission asks (NPRM at ¶28) whether inclusion in **US203** is the proper mechanism for signifying which

RAS operations deserve protection in the upper formaldehyde band and whether **US203** should be updated as new sites are brought into service (NPRM at ¶29). Inclusion in **US203** is suggested in the new footnote **USxxx** proposed by the Commission (NPRM at ¶33).

12. Obsolescence of the contents of the Table in **US203** highlights a variety of problems with it and other footnotes having similar character and intent. In the particular case of **US203**, the attempt to single out and protect observations of one molecule, formaldehyde (H_2CO), also conflated RAS activities in two frequency bands which in fact are used (and, apparently, regulated) independently. Comparable problems of obsolescence apply to **US246** at 4890 MHz, **US257** at 4800 – 4940 MHz, **US311** at 1350 – 1400 MHz and 1718.8 – 1722.2 MHz, **US355** at 10.7 – 11.7 GHz and **US388** at 81 – 86 GHz and above. The site lists included in these footnotes include some stations which do not observe the relevant bands and lack others which do.

13. In one particular case involving the NRAO during this past year, a spectrum consultant engaged in coordination with the Observatory concerning airborne mobile use of the 4840 – 4890 MHz band by public safety officers stated that he had bid a job based on the contents of **US257**, which lacks any mention of NRAO's 10 VLBA stations.

14. The Observatory therefore suggests that the Commission consider the replacement of all the footnotes mentioned at ¶12 here by some mechanism referencing a single, comprehensive registry or database which would include all domestic stations of the RAS, the properties of such stations, the bands in which they observe, the regulatory provisions regarding such bands, and so forth. Such a mechanism could take various forms but, whichever form is chosen, it should advance the goals of being comprehensive, accurate, up-to-date, accessible, easily used, easily maintained, and with high visibility.

V. International regulatory aspects

15. The Observatory's stations in New Mexico and Texas are within line of sight of Mexican airspace; that in Brewster, Washington within line of sight of Canadian airspace, and those in Hawaii, St. Croix, California and West Virginia within line of sight of airspace over international waters. Fully protecting operations at all NRAO sites would require considerations of all possible combinations of nationality regarding craft registry, operator, hub, *etc.* Using Recommendation ITU-R M.1643 as the basis for Commission rulemaking, as suggested here at ¶10 would make US rules more readily recognizable to foreign interests.

VI. Summary of concerns and recommendations

16. Sharing between AMSS and RAS in the 14.0 – 14.5 GHz band does not require mutual coordination and co-secondary status in the spectrum region below 14.47 GHz.

17. Sharing can and should be effected by new rules very similar to those in the existing MOU between US radio astronomy observatories (i.e. NSF) and AMSS (Boeing and ARINC), referenced in the NPRM at footnote 87. These MOU directly implement Recommendation

ITU-R M.1643 (Annex 1 of the NPRM) and rules derived directly from them would have the variety of virtues described above at ¶10.

18. Footnote **US203** and several others of similar nature (enumerated at ¶12 here) are not effective means of notification and should not be perpetuated, except perhaps temporarily, by new rulemaking. The Commission should undertake to develop a new mechanism which references a single comprehensive registry or database as discussed at ¶14 here. In the meantime, NRAO confirms that all of its stations operating in the 14.47 – 14.5 GHz band are given in the table reproduced in the NPRM at ¶33.

Respectfully submitted,

National Radio Astronomy Observatory
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