Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Procedures to Govern the Use of Satellite Earth	)	
Stations on Board Vessels in the 5925-6425 MHz/	)	IB Docket No. 02-10
3700-4200 MHz Bands and 14.0-14.5 GHZ/	)	
11.7-12.2 GHz Bands	)	
	)	

MOTION FOR A LEAVE TO FILE LATE AND THE COMMENTS OF THE NATIONAL ACADEMIES' COMMITTEE ON RADIO FREQUENCIES

The National Academy of Sciences, through the National Research Council's Committee on Radio Frequencies (hereinafter, CORF),[1] hereby submits its comments in response to the Commission's November 24, 2003, Notice of Proposed Rulemaking in the above-captioned docket (NPRM)[2]. In these Comments, CORF discusses the importance to the Radio Astronomy Service (RAS) of observations at 14.47-14.50 GHz and supports the Commission's proposal, as modified below, to protect RAS observations in this band with coordination requirements and with a footnote in the U.S. Table of Allocations.

[1] A roster of the committee is attached.

[2] CORF hereby moves for a leave to file these comments after the filing deadline. CORF believes this late filing will not prejudice any parties, since there is still significant time for such parties to review and comment on the matters set forth herein. Most importantly, CORF believes that these comments contain significant and substantial information that will contribute to reasoned decision making in this proceeding.

I. Introduction: The Role of Radio Astronomy, and the Unique Vulnerability of Passive Services to Interference.

CORF has a substantial interest in this proceeding, as it represents the interests of the passive scientific users of the radio spectrum, including users of the RAS bands. RAS observers perform extremely important yet vulnerable research.

As the Commission has long recognized, radio astronomy is a vitally important tool used by scientists to study our universe. It was through the use of radio astronomy that scientists discovered the first planets outside the solar system, circling a distant pulsar. Measurements of radio spectral line emission have identified and characterized the birth sites of stars in our own galaxy, and the complex distribution and evolution of galaxies in the universe. Radio astronomy measurements have discovered ripples in the cosmic microwave background, generated in the early universe, which later formed the stars and galaxies we know today. Observations of supernovas have allowed us to witness the creation and distribution of heavy elements essential to the formation of planets like Earth, and of life itself.

The emissions that radio astronomers study are extremely weak—a typical radio telescope receives less than one-trillionth of a watt from even the strongest cosmic source. Because radio astronomy receivers are designed to pick up such remarkably weak signals, such facilities are therefore particularly vulnerable to interference from in-band emissions, spurious and out-of-band emissions from

licensed and unlicensed users of neighboring bands, and transmissions that produce harmonic emissions that fall into the RAS bands.

In addition to the gains in scientific knowledge that result from radio astronomy, CORF notes that such research spawns technological developments that are of direct and tangible benefit to the public. For example, radio astronomy techniques have contributed significantly to major advances in the following areas:

- Image processing techniques for computerized tomography (CAT scans) as well as other technologies for studying and creating images of tissue inside the human body;
- Increasing abilities to forecast earthquakes through the use of very-long-baseline interferometric (VLBI) measurements of fault motions; and
- Use of VLBI techniques in the development of wireless telephone geographic location technologies, which can be used in connection with the Commission's E911 requirements.

Continued development of new critical technologies arising from passive scientific observation of the spectrum depends on scientists having continued access to interference-free spectrum. More directly, the underlying science cannot be performed unless observers have access to interference-free spectrum. Loss of such access constitutes a loss for the scientific and cultural heritage of all people, as well as a loss of the practical applications based on the knowledge gained and the technologies developed.

II. Significance of RAS Observations at 14.47 - 14.50 GHz.

Of particular importance in this proceeding are observations at 14.47-14.50 GHz. Radio astronomers make spectral line observations of formaldehyde in this

band. The formaldehyde line with a rest frequency of 14.488 GHz is included in Table 1 of Recommendation ITU-R RA. 314-8, which lists the radio frequency lines of greatest importance to radio astronomy. Formaldehyde is one of the primary molecules used in radio astronomy to study comets, star formation in our galaxy, the early stages of planet formation in disks around nearby stars, and the inner regions of distant galaxies where disks of molecular material form and serve as fuel for quasars and related activity. The relative populations of the ortho- and para- forms of this moderately complex molecule provide important evidence of the astrochemical processes at work in the interstellar regions where the molecule is observed. Observations of formaldehyde in this frequency band are particularly useful for determining the density of interstellar molecular clouds. The formaldehyde molecule is also on the path to prebiotic molecules of intense interest to those scientists attempting to characterize the origins of living organisms.

III. CORF Supports the Protection of RAS Observations at 14.47.-14.50 GHz, as Modified Herein.

In proposing rules for the operation of satellite Earth stations on ships and vessels (ESVs) at 14.0-14.50 GHz, the Commission in paragraph 38 of the NPRM notes the use of the 14.47-14.50 GHz band by the Radio Astronomy Service, and in paragraph 39 the Commission proposes the creation of a footnote for the U.S. Table of Allocations that would require ESV operators to avoid creating harmful interference to RAS observations made at the sites currently listed in Footnote

US 203. The Commission also proposes in the NPRM that ESV stations in the 14.0-14.50 GHz band be coordinated through the National Telecommunications and Information Administration's Interdepartment Radio Advisory Committee (IRAC).

CORF supports the need to provide protection for RAS observations at 14.47-14.50 GHz. As noted above, observations at these frequencies are important to radio astronomy. Furthermore, it appears that compliance with these protection requirements will not be difficult for ESV operators, primarily because RAS observatories are located at a considerable distance from large bodies of water, and terrain obstacles often stand between the locations of ESVs and observatories.[3]

Footnote US 203 states that observations at 14.47-14.50 GHz are made at RAS sites at Green Bank, West Virginia; Socorro, New Mexico; Hat Creek, California; Tyngsboro, Massachusetts; Big Pine, California; and Amherst, Massachusetts. CORF notes, however, that this list is somewhat out of date. Observations at 14 GHz are no longer made at Hat Creek, California; Tyngsboro, Massachusetts; and Amherst, Massachusetts; thus those sites need not be protected in this proceeding. Furthermore, while observations at 14.47-14.50 GHz are made at Green Bank, West Virginia, and Socorro, New Mexico, those sites are at such a distance from navigable waterways that compliance with protection requirements should not be burdensome for ESV operators.

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[3] For similar reasons, CORF also supports the Commission's proposals to require protection of Space Research Service operations at 14.0-14.2 GHz.

CORF also confirms the accuracy of the suggestion in footnote 79 of the NPRM that observations at 14 GHz might be made at other RAS sites, including Arecibo, Puerto Rico, and the 10 Very Long Baseline Array (VLBA) sites. CORF notes that observations of formaldehyde at 14 GHz can be and are made with the VLBA and that some protection for such observations is thus necessary. While most of the VLBA sites are at a sufficient distance from major bodies of water to limit the impact of ESV transmissions, which is not the case with the VLBA facilities at Mauna Kea, Hawaii, and at St. Croix, Virgin Islands.[4]

Thus CORF recommends that the proposed new footnote requiring ESV operators to avoid creating harmful interference to RAS observations at certain sites include at least the facilities at Mauna Kea, Hawaii, and St. Croix, Virgin Islands.[5] CORF also supports the proposal for coordination of ESVs through the IRAC.

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[4] In addition, while Footnote US 203 states that observations of formaldehyde are made at Arecibo, Puerto Rico, only at 4 GHz, CORF understands that the Arecibo Observatory is in the midst of a series of incremental upgrades that, upon completion in approximately 3 years, will enable observations up to 15 GHz. Accordingly, while the Arecibo Observatory does not currently observe at 14.47-14.50 GHz, the Commission should consider including Arecibo in the list of observatories protected at this frequency.

[5] While CORF supports footnote protection for certain observatories, it has concerns regarding the utility of the language in proposed Footnote U.S. xxx. Often, VLBA stations are remotely operated and run unattended, and, as a result, the data reduction often takes place several weeks after an observation has been made. If protected observatories experience interference, the source vessel would be difficult or impossible to identify, and the lost data could not be recovered. Thus, in addition to prohibiting harmful interference generally, the Commission should consider prohibiting transmissions in the 14.47-14.50 GHz range near the observatories of concern. The Mauna Kea, Hawaii, VLBA station is located at

Respectfully submitted,

NATIONAL ACADEMY OF SCIENCES'
COMMITTEE ON RADIO FREQUENCIES

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President

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longitude W 155°28′, N 19°48′, elevation 3720 m above mean sea level (amsl), and about 25 km from the closest point on the northeastern shore of the big island of Hawaii. Thus, the horizon distance to this station exceeds 125 km. The St. Croix, Virgin Islands station is located at longitude W 64°35′, latitude N 17°46′, elevation 16 m amsl, and near the coast, with a horizon distance exceeding 30 km if account is taken of the height of the radio telescope antenna.

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Terms expire at the end of the month and year indicated.
(Revised 1/12/04)

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