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

In the Matter of	)	
	)	
Amendment of the Commission's Rules to Establish a Radio Astronomy Coordination Zone in Puerto Rico	)	ET Docket No. 96-2

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

The National Academy of Sciences, through the National Research Council's Committee on Radio Frequencies (hereinafter, "CORF"), hereby submits its comments in response to the Commission's Notice of Proposed Rulemaking, FCC 96-12, released February 8, 1996, in the above-captioned proceeding (the "Notice"). In these Comments, CORF strongly supports the Commission's proposal to establish a Coordination Zone requiring applicants for new or modified facilities in various communications services to provide written notification of their proposed operations to the Arecibo Observatory in Arecibo, Puerto Rico.

I. Introduction

CORF has a substantial interest in this proceeding, as it represents the interests of users of the radio spectrum engaged in scientific research, including the Radio Astronomy Service, the Earth Exploration-Satellite Service, and the Space Research Service. CORF is pleased that the Commission has recognized the importance of the unique research performed at the Arecibo Observatory (the "Observatory"). Measurements of radio spectral line emissions taken at the Observatory have identified and characterized the birth sites of stars in our own galaxy, as well as the complex distribution and evolution of galaxies in the universe. The Observatory's planetary radar system has investigated potential landing sites on Mars, imaged the surface of Venus at 1-mile resolution, and investigated the surfaces of numerous asteroids and comets, precisely measuring distances and velocities used for predicting their future orbits. Indeed, subsequent to the filing of the Petition that initiated this proceeding, the Nobel Prize was awarded to two scientists for the detection of a binary pulsar, and for use of the data from that discovery in a manner that constitutes the most powerful validation to date of Einstein's theory of general relativity and gravitational radiation. The original discovery of the binary pulsar, and subsequent observations, were made at the Observatory and could not have been made anywhere else in the world.

The capability of performing radio astronomy at the Observatory, obtained through years of work and substantial federal investment, must be protected. Radio astronomers at the Observatory are passive users of

the spectrum and have no control over the character of the signals that they study. Such signals are extremely weak-typically in the range of one-trillionth of a watt from even the strongest cosmic source. The Observatory is therefore particularly vulnerable to interference from unwanted emissions from users of neighboring bands.

CORF believes that the coordination zone proposed in the Notice will greatly assist the task of making radio astronomy observations as free as possible from unwanted interference. The result will be greater efficiency in the use of Observatory facilities and, likely, more powerful and important scientific discoveries.

II. The Need for a Coordination Zone

CORF believes that a substantial case has been built in this proceeding demonstrating the need for and value of the proposed Coordination Zone. It is undisputed that the radio frequency (RF) environment in Puerto Rico has become tremendously congested in the last decade. As a result, observations in certain bands have been rendered impossible, and in other bands, scientists are required to perform multiple observations in order to eliminate the damaging impact of spurious and out-of-band emissions on data quality. Furthermore, an upgrade of the facilities at the Observatory, due to be completed this year, will substantially increase the sensitivity of the Observatory's facilities and the frequency ranges in which observations can be made. As more receivers and feeds are added, observations will be extended down to 50 MHz and up to 15 GHz and beyond. Thus the need to protect against interference is paramount.

The Observatory has taken steps on its own to prevent or reduce interference. First, as part of the upgrade to the telescope, the entire signal receiving system will be encased in a dome that will make the telescope's feed system invisible from the horizon, and thus increase protection against direct line-of-sight interference. Unfortunately, the use of the dome is not a sufficient solution to the RF interference problem, as the dome cannot protect against interfering signals that are scattered off the feed system platform. Additional steps taken by the Observatory include its active participation in the Puerto Rico Spectrum Users Group and its regular contact with the Puerto Rico Amateur Radio Club. Furthermore, the Observatory has worked with some local broadcasters to find solutions to interference problems. For example, the Observatory and WCCV-TV (Channel 54, Arecibo) recently cooperated to find a technical solution to limit the impact of the station's second harmonic emissions. Filters and case shielding were installed by the station at minimal cost, reducing the second harmonic emissions to 100 dB below the spurious emissions standard currently required by the Commission.

In sum, the Observatory has taken major steps to reduce the impact of interference to its passive use of the spectrum, but reduction of interference also requires participation by active users of radio frequencies. The proposed Coordination Zone procedures will provide a uniform and easily administered mechanism for spectrum users and applicants to work with the Observatory to resolve potential problems, while not imposing excessive burdens on those users.

III. Coordination Zone Procedures and Interference Evaluation

There are two equally important elements to the proposed Coordination Zone procedure: notification and coordination. These elements are addressed separately.

A. Notification

Notification to the Observatory by those applying for spectrum use is critical to preventing harmful interference: while the Observatory monitors the Commission's Public Notices, it is often difficult to evaluate, based on the limited information in those Notices, whether a particular application has the potential to create harmful interference to the Observatory. An affirmative requirement on applicants within the Coordination Zone to send technical information to the Observatory at the time of, or prior to, filing with the Commission will ensure that proposals for potentially interference-creating activities will be reviewed by the Observatory. Furthermore, the notification requirement imposes no substantial burden on applicants: at most, applicants will have to pay postage for sending a copy of their application to the Observatory.

The Commission asks, in paragraph 22 of the Notice, whether applicants should be required to notify the Observatory prior to filing with the Commission. While prior notification would be helpful and should be encouraged, CORF recognizes that it may not always be possible.

B. Coordination: Interference Evaluation, Comments, and Resolution Procedures

CORF agrees with the core principle of the Notice-that coordination between the Observatory and other users of the spectrum is a productive and cost-efficient way to prevent and resolve potential harmful interference to the Observatory. When technical proposals are reviewed prior to their being granted by the Commission, any required modifications can be performed prior to initial construction, and the costs of such modifications can thus be minimized.

In its Notice at paragraph 27, the Commission has proposed to forebear from establishing specific standards to be used in evaluating whether emissions constitute harmful interference to the Observatory. Rather, it demonstrates confidence that the Observatory will make a good faith effort to evaluate potential interference based on all relevant factors and will cooperate with licensees to ensure minimum disruption to all concerned. CORF commends the Commission for this proposal and notes that the Observatory's ongoing coordination with the Puerto Rico Radio Amateur Club and the resolution of interference from Channel 54 demonstrate that the Observatory has worked cooperatively with other users of the spectrum in the past and will continue to do so.

In evaluating the impact of potential interference from a proposed use of spectrum, it is important to recognize that a single standard is probably not useful. The harm posed by interference depends on actual

signal strength as well as where the signal and its harmonics fall in the spectrum. Of course, the International Telecommunication Union Radiocommunication Bureau (ITU-R) recommendation ITU-R RA.769 precisely defines the levels of interference that are harmful to continuum and spectral line observations, and the Observatory would use this standard for judging the impact of interference in bands where the Radio Astronomy Service holds primary or secondary allocations. In other bands, the Observatory would likely rely on guidelines formulated by the ITU Task Group 1/3, and any future revisions thereto.

Accordingly, given the number of bands at issue, the wide variety of circumstances in individual cases, and the fact that standards may be revised in the future, it is appropriate to forebear from establishing specific interference-evaluation standards in the rules and to allow the Observatory to use the best scientific standards and engineering facilities available at the time. The Observatory has demonstrated that it will do so in a reasonable manner.

The Notice proposes that if analysis of an application indicates harmful interference to Observatory operations, the Observatory will attempt to reach an agreement with the applicant to resolve such interference, and the applicant will be required to "make reasonable technical modifications to its proposal." CORF believes that this requirement is in the public interest and that the language used ("reasonable technical modifications") is appropriate.

IV. Conclusion

CORF commends the Commission for recognizing the unique value of the radio astronomy research performed at the Observatory. The proposed Coordination Zone will not place substantial burdens on applicants and should increase the ability of the Observatory to perform important research in an RF environment as free as possible from harmful interference. The Commission should thus adopt its Coordination Zone proposal, with clarification on a few issues, as discussed above.

Respectfully submitted,

NATIONAL ACADEMY OF SCIENCES'
COMMITTEE ON RADIO FREQUENCIES

By: __(signed)_____
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President

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