Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Recommendations Approved by the	)	
Advisory Committee for the 2007 World	)	IB Docket No. 04-286
Radiocommunication Conference	)	
	)	

To: Chief, International Bureau

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 (CORF, see attachment), hereby submits its comments in response to the Federal Communication Commission's January 9, 2007, Public Notice in the above-captioned docket (DA 07-26). In these comments, CORF discusses the importance of the scientific observations performed only in the Earth Exploration Satellite Service (EESS) bands at 36.0-37.0 GHz and the need to protect such observations. CORF also urges the Commission to reinstate a mandatory power limit in Document WAC/151 in order to protect that EESS band.

I. The Importance of Remote Sensing Science, and the Spectrum Bands at Issue.

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 EESS bands.

EESS observers measure weather and climate information on both a research and an operational basis, and those measurements are extremely important, yet vulnerable to in-band and out-of-band interference.

The Commission has long recognized that Earth remote sensing is a critical and unique resource for monitoring the global atmospheric and surface state. Satellite-based microwave remote sensing represents the only practical method of obtaining uniform-quality atmospheric and surface data encompassing the most remote oceans as well as densely populated areas of Earth. EESS data have contributed substantially to the study of meteorology, atmospheric chemistry, oceanography, and global climate change. Currently, instruments operating in the EESS bands provide regular and reliable quantitative atmospheric, oceanic, and land measurements to support an extensive variety of scientific, commercial, and government (civil and military) data users. Major governmental users of the EESS data include the National Oceanic and Atmospheric Administration (NOAA), the National Science Foundation (NSF), the National Aeronautics and Space Administration (NASA), and the Department of Defense (DOD, especially the U.S. Navy). Applications of the data include weather forecasts for use in the energy industry;[1] military and civilian aviation and sailing; hurricane and severe storm warning and tracking;[2] tsunami prediction; flood monitoring;

[1] U.S. electricity providers save $166 million annually using 24-h temperature forecasts to improve the mix of generating units that are available to meet demand for electricity. This example and the examples given in footnotes 2 and 3 are taken from National Oceanic and Atmospheric Administration, *Economic Statistics for NOAA,* Fifth Edition, April 2006.

[2] NOAA's National Weather Service forecasts, warnings, and the associated emergency responses result in a $3 billion savings in a typical hurricane season. Two-thirds of this savings, $2 billion, is attributed to

seasonal and interannual climate forecasts and monitoring; observation and prediction of El Niño effects on agricultural production;[3] studies of the ocean surface and internal structure; and monitoring of changes in vegetation cover, snow cover, water resources, and ozone holes, as well as many other critical areas.

With regard specifically to the 36.0-37.0 GHz band, the following important research and observation are performed in this band:

> **36.0-37.0 GHz:** This band is used for passive sensing of Earth's surface and atmosphere. Retrievals (i.e., measurements) of many surface and atmospheric environmental parameters (including precipitation, precipitable water vapor, cloud liquid water, soil moisture, snow cover, sea-surface winds, sea ice, and ice surface temperature) are performed using a complementary set of channels, such as 6.6-6.9, 10.6-10.8, 18.6-18.8, either 22.2 or 23.8, and 36.0-37.0 GHz. The accuracy of these environmental parameters depends critically on precise measurements in the 36.0-37.0 GHz band. Interference in this band can make retrievals of these parameters impossible or degrade them so much that the product would be unusable for most applications. In addition, many meteorological and surface environmental data products are produced using multiple frequency bands. For example, values for sea-surface temperature, wind speed, water vapor, and cloud water are retrieved using measurements from observations made in multiple frequency bands, including 36.0-37.0 GHz, by NASA's Tropical Rainfall Measuring Mission (TRMM) Microwave Imager (TMI). Interference in this band (or other complementary channels) would prevent the measurement of these environmental parameters.
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> Several U.S. instruments currently make observations in the 36.0-37.0 GHz band: the Special Sensor Microwave Imager (SSM/I) and Sounder (SSMIS) aboard the Defense Meteorological Satellite Platform (DMSP) series satellites; the Advanced Microwave Scanning Radiometer aboard

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the reduction in hurricane-related deaths, and one-third of this savings, $1 billion, is attributed to a reduction in property-related damage because of preparedness actions.

[3] Benefits to U.S. agriculture by altering planting decisions have been estimated at $265 million to $300 million annually, throughout El Niño, normal, and La Niña years.

NASA's EOS Aqua satellite (AMSR-E); TRMM TMI; and WindSat aboard the U.S. Navy's Coriolis satellite. Planned U.S. satellites include NASA's Global Precipitation Measurement (GPM) core satellite and the National Polar-orbiting Operational Environmental Satellite System (a joint effort of NOAA, NASA, and DOD).

In sum, the 36.0-37.0 GHz band at issue here is widely used by scientists to make observations that are important for monitoring the global atmospheric and surface state.

II. CORF Generally Supports the Use of *Mandatory* Limits to Protect This EESS Band from Unwanted Emissions.

In order to allow remote sensing scientists to perform important missions involving observations in the 36.0-37.0 band at issue here, it is critical that these observations be protected from interference from active transmitters in the band. EESS observations are particularly vulnerable to interference, and interference to such observations could significantly degrade the accuracy of the measurements made by the EESS passive sensors, which would significantly compromise the missions relying on such data.

It should be noted that remote sensing scientists have little control over the frequencies at which they must observe in order to fulfill their research and operational missions. The specific frequencies of observed elements or molecules—that is, the absorption and emission of passive microwave radiation from Earth's surface and atmosphere—are established by the laws of physics and chemistry.

Furthermore, these remote sensing scientists observe transmissions as nothing more than extremely weak deviations in the noise floor that are only measurable by using wide bandwidths. EESS observations are made continuously (24 hours per day, 7 days per week), and for a typical location in the United States, EESS sensors will pass over that site approximately 20 times per day.

CORF generally supports the use of mandatory limits to protect passive services from interference.[4] Such limits not only impose protection requirements on active users, but also clearly bring to the attention of users and manufacturers the need to protect passive users in nearby bands. Mandatory limits on active services appear at this time to be the most practical and effective method of protecting passive services in adjacent and nearby bands. Accordingly, CORF is concerned about the proposal in Document WAC/151 to make the –10 dBW power limit voluntary rather than mandatory by changing "shall" to "should." CORF urges the Commission to reinstate the word "shall" in this proposal.

III. Conclusion.

The critical science undertaken by the EESS remote sensing scientists cannot be performed without access to interference-free spectrum. Loss of such access constitutes a loss of data important not only for critical applications for numerous users, but also for the scientific and cultural heritage of all people. Accordingly, CORF urges

[4] For example, in Comments filed in this Docket on December 6, 2006, in regard to other WRC-07 proposals that would impact EESS observations, CORF supported mandatory out-of-band emission limits.

the Commission to make the proposed power limit in Document WAC/151 mandatory rather than voluntary.

Respectfully submitted,

NATIONAL ACADEMY OF SCIENCES'
COMMITTEE ON RADIO FREQUENCIES

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Attachment

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