

Spectrum Management Issues Ocean Science Community

Summary prepared by Mike Prince, UNOLS Office

March 5, 2004

Definition of Spectrum Management

Frequency Spectrum Management on a national and international scale is the regulatory and perhaps co-operative process of allocating specific frequency bands for specific uses and users.

A current U.S. Frequency Allocation Chart shows this graphically and can be obtained in pdf form or as a wall chart by going to:

<http://www.ntia.doc.gov/osmhome/allochrt.html>

Who regulates and manages frequency spectrum allocation.

United States

Two agencies are primarily responsible for frequency spectrum management in the United States.

- ❖ National Telecommunications and Information Administration, Department of Conference (NTIA) Office of Spectrum Management.
 - <http://www.ntia.doc.gov/>
 - <http://www.ntia.doc.gov/osmhome/osmhome.html>
- ❖ Federal Communications Commission (FCC)
 - <http://www.fcc.gov/spectrum/>
- ❖ Interdepartmental Radio Advisory Committee (IRAC)
 - <http://www.ntia.doc.gov/osmhome/iracdefn.html>
- ❖ Overview from a tutorial on the NTIA website can be viewed at:
 - <http://www.ntia.doc.gov/osmhome/roosa4.html>

The NTIA Office of Spectrum Management (OSM) is responsible for managing the Federal Government's use of the radio frequency spectrum. To achieve this, OSM receives assistance and advice from the Interdepartment Radio Advisory Committee (IRAC). OSM carries out this responsibility by:

Establishing and issuing policy regarding allocations and regulations governing the Federal spectrum use; developing plans for the peacetime and wartime use

of the spectrum; preparing for, participating in, and implementing the results of international radio conferences; assigning frequencies; maintaining spectrum use databases; reviewing Federal agencies' new telecommunications systems and certifying that spectrum will be available; providing the technical engineering expertise needed to perform specific spectrum resources assessments and automated computer capabilities needed to carry out these investigations; participating in all aspects of the Federal Government's communications related emergency readiness activities; and, participating in Federal Government telecommunications and automated information systems security activities.

The FCC's strategic goal for spectrum is to encourage the highest and best use of spectrum domestically and internationally in order to encourage the growth and rapid deployment of innovative and efficient communications technologies and services.

The promise of emerging communications technologies could mean:

- ❖ Having the emergency dispatcher know exactly where your teenager is when he or she has to call for emergency help from a wireless phone (E911);
- ❖ Ubiquitous, mobile broadband connections via your Next Generation wireless phone that allow you to be part of a video conference with people around the world while you're traveling; or
- ❖ Using the cable modem that's upstairs or printing a document on the color printer that's in the basement – all while you're on the first floor – through wireless networking (Wi-Fi);

These and hundreds of other promising technologies are dependent on one resource – spectrum. Spectrum encompasses the entire range of electromagnetic radio frequencies used in the transmission of sound, data, and video. The FCC and the National Telecommunications and Information Administration (NTIA) share responsibility for managing the spectrum. NTIA manages spectrum used by the Federal government (e.g., air traffic control and national defense) and the FCC is responsible for spectrum used by others, including individuals (e.g., garage door openers and computer modems), private organizations (e.g., radio and television broadcasters), and public safety and health officials (e.g., police and emergency medical technicians).

Because there is a finite amount of spectrum and a growing demand for it, effectively managing the available spectrum is a strategic issue for the FCC and the NTIA.

FCC Objectives

- ❖ Advance spectrum reform by developing and implementing market-oriented allocation and assignment reform policies.
- ❖ Vigorously protect against harmful interference and enforce public safety-related rules.
- ❖ Conduct effective and timely licensing activities that encourage efficient use of the spectrum.
- ❖ Provide adequate spectrum and improve interoperability for better public safety and commercial purposes.

Industry

- ❖ National Spectrum Managers Association (NSMA)
 - <http://www.nsma.org/index.htm>
- ❖ Mostly made up of members from communications industry companies, such as ATT, Verizon, Harris, etc.
- ❖ One of the Directors is in AST at NSF, Andrew Clegg, program manager for the National Radio Astronomy Observatory (NRAO) (MPS/AST)
<http://www.nsf.gov/staff/subdiv.cfm?key=176>

International

- ❖ International Telecommunication Union (ITU)
 - <http://www.itu.int/home/index.html>
- ❖ World Radiocommunication Conferences (WRC)
 - <http://www.itu.int/ITU-R/conferences/wrc/index.asp>

What are the recent regulatory activities

There is an initiative by the Bush administration to revamp the two tiered spectrum management structure and make use of the spectrum by industry easier.

- ❖ Presidential Memorandum on Spectrum Policy for the 21st Century
 - <http://www.ntia.doc.gov/ntiahome/frnotices/2004/PresMemoonSpectrumPolicy.htm>
- ❖ NTIA Public Safety Spectrum Management Forum – February 10 – 11, 2004
 - http://www.ntia.doc.gov/ntiahome/frnotices/2004/publicsafetyforum_01082004.htm
 - Agenda:
 - http://www.ntia.doc.gov/ntiahome/ntiageneral/specinit/forum2/eventflyer_02032004.htm

- ❖ NTIA Request for comments on the development of the U.S. Spectrum Management Policy for the 21st century.
 - http://www.ntia.doc.gov/ntiahome/frnotices/2004/SpectrumInitiativeNOI_01282004.htm
- ❖ Comments are due by March 18, 2004
- ❖ Comments (4) have been posted at the spectrum reform website:
- ❖ <http://spectrumreform.ntia.doc.gov/index.htm>
- ❖ Mostly ask for an extension which was denied and one that felt the FCC was the best way to control frequency spectrum allocations and that the NTIA should stick to allocating Federal Agency Spectrum use.

What does it mean to the Ocean Science Community

There is a potential that some initiatives to allow use of certain frequency bands by commercial users and to prevent interference by others could result in ocean sciences being denied the ability to use certain frequencies or in having their systems interfered with.

There is a program manager responsible for representing the interests of science at NSF, but this position is in astronomical sciences and they would need input from ocean scientists on our requirements to effectively represent us.

Some issues of potential concern have been articulated, such as:

- ❖ A strong lobby among the "fixed wireless" (microwave industry) that is pushing to shut down such transmissions from vessels (buoys, etc) within 300 km of shore as they perceive (but have not demonstrated) there might be interference with their systems.
- ❖ An initiative to allow telecom companies and unlicensed users to broadcast broadband Internet as a modulation of the electric power transmission grid in the HF/VHF bands. This also would severely impact coastal observing systems along with amateur radio users and many others.
- ❖ The need and desire of the HF radar community to obtain some dedicated frequency allocations that would allow these instruments to operate as primary users rather than "not-to-interfere" users as is the case now.

There may well be others, but we don't, at the moment, have a unified way of identifying our requirements and where those might conflict with plans being considered by others and the regulating bodies.

What Activities and Frequencies are of concern in ocean sciences

- ❖ CODAR and other remote sensing transmitters and receivers.
- ❖ Satellite communications from buoys, tags, AUVs, drifters, etc.
- ❖ Satellite communications to and from research vessels
- ❖ Line of site and long-range communications from same facilities and instrumentation.
- ❖ Wave rider buoys that operate in 30 mhz range with analog systems
- ❖ 148 MHz band (VHF) used for line of site radio transmitters
- ❖ ARGOS frequencies around 401 MHz
- ❖ 420 – 425 MHz band for agricultural and medical instrumentation that have been used by ocean scientists.
- ❖ Other satellite frequencies
- ❖ Cell phone and Iridium frequencies
- ❖ INMARSAT frequencies, high power transmissions that are pointed at the wrong satellite could be a problem.
- ❖ C-band for data transmission from ships or huge buoys
- ❖ KU-band for data transmission from ships and/or buoys
- ❖ RF modems in the 900 MHz range that are unlicensed if under 1 watt on buoys, etc for line of site data transmissions.
- ❖ What else?
- ❖ What's new?
- ❖ How do we catalog frequencies?

Who represents the science community and associated agencies with regards to spectrum management?

- ❖ National Academy of Sciences
 - Committee on Radio Frequencies (CORF)
 - CORF represents the interests of U.S. scientists who use radio frequencies for research—for example, radio astronomers and remote sensing researchers. The committee deals with radio-frequency requirements and interference protection primarily through filing comments under the aegis of the National Academy of Sciences in public proceedings of the Federal Communications Commission. The committee acts as a channel for representing the interests of U.S. scientists in the work of the Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science (IUCAF) of the International Council of Scientific Unions and in working groups of the Radiocommunication Sector of the International Telecommunication Union (ITU).
 - http://www7.nationalacademies.org/bpa/committees_corf.html

❖ NSF

- Electromagnetic Spectrum Management (MPS/AST)
- Mathematical and Physical Sciences Directorate (MPS), Division of Astronomical Sciences (AST)
- The objective of Electromagnetic Spectrum Management (ESM) is to ensure the access of the scientific community to portions of the radio spectrum that are needed for research purposes. ESM does this by representing the interests of the NSF and the scientific community in the field of telecommunications management and regulation, involving in particular:
 - Establishment of [national radio regulations, and operating procedures and technical standards under those regulations](#) related to the use of the allocated frequency bands, through representing the NSF on the Interdepartment Radio Advisory Committee (IRAC) and its subcommittees and ad-hoc committees
 - Establishment of international radio regulations, by providing input into [U.S. Govt. preparations for World Radiocommunications Conferences](#) through the Radio Conference Subcommittee (RCS), and serving as technical advisor to U.S. delegations to World Radiocommunication Conferences, when appropriate.
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- Note from NSF Program Manager Tom Gergely in response to our recent interest in this issue:
 - I have been the NSF as spectrum manager nearly 18 years now, and had a few contacts with members of the oceanographic community regarding some issues in the beginning, but I don't believe that I received any requests for at least 15 years now. As the NSF IRAC Representative I will, of course, be more than happy to resume doing what I can (often not that much, as the spectrum management process has become much more complex, contentious and

political over the years) to represent and defend the interests of your community in the spectrum management process. Possibly the best way to begin doing so would be, as you suggest, through a meeting where I could learn a bit about the issues.

While I am not familiar with the details, I am not totally ignorant about some of the FCC proceedings of interest either, as I can't avoid hearing about them at my meetings. Moreover, some impact even on the radioastronomy community, e.g. the NPRM on Earth Stations on Vessels (Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands), almost as contentious a topic, I understand, as most of the astronomy related ones! I will be around the office most of the time (that is, don't expect to be on travel) until the middle of March, so let's try to set up something!

- ❖ ONR/Navy
 - [The Naval Electromagnetic Spectrum Center \(NAVEMSCEN\)](#)
 - <http://www.navemscen.navy.mil/pages/mission.htm>
- ❖ NOAA
 - Office of Frequency Management
 - <http://www.orfm.noaa.gov/>
- ❖ International
 - European Committee on Radio Astronomy Frequencies
 - On behalf of European radio astronomers, the Committee on Radio Astronomy Frequencies of the European Science Foundation (CRAF) coordinates activities to keep the frequency bands used by radio astronomers free from interference.
 - <http://www.astron.nl/craf/crafintr.htm>

Who is interested in this issue within Ocean Sciences

- ❖ NSF
 - Jim Yoder jyoder@nsf.gov
 - It would probably be a good idea for someone to watch developments on behalf of UNOLS. We're also looking into it at NSF, and I asked Ocean.US Office to consider it as well
 - Larry Clark <hclark@nsf.gov>
- ❖ ONR
 - Briscoe, Melbourne <BRISCOM@ONR.NAVY.MIL>
- ❖ NOAA
 - Charlie Challstrom, Director of National Geodetic Survey, NOS
- ❖ OCEAN.US
 - Larry Atkinson

- ❖ MTS/Industry
 - Dan Schwartz, U. W.
 - Dr. Andrew Clark, Harris Communications
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- ❖ CORE
- ❖ NORLC/FOFC
- ❖ OSB/NAS
 - Nancy Rabalais
 - Committee on Radio Frequencies
- ❖ UNOLS
 - Mike Prince
 - Dale Chayes - RVTEC
- ❖ HF RADAR (CODAR) & Remote Sensing community
 - Jeff Paduan, NPS, paduan@nps.navy.mil

Recent Correspondence regarding issues of concern

From: Andrew Clark
 To: Rabalais, Nancy
 Cc: Briscoe, Melbourne
 Dear Nancy,

As always, it was nice seeing you again at the ORAP meeting. At that meeting, I mentioned to you that there is currently afoot a move on to reapportion the radio spectrum that is worth taking notice. I am attaching a copy of the November 18, 2003 notice of NTIA concerning public meetings addressing President Bush's call for spectrum efficiency improvements. The first meetings have come and gone, but the next meeting will be held in mid February. As I mentioned, the meetings are being developed by NTIA in cooperation and partnership with the Department of Homeland Security and conducted by the National Academy of Sciences. The issues covered by these meetings are of importance to the oceanographic community insofar as many of the techniques employed for gathering/relaying data from near shore and far offshore (the HF radar we discussed as well as both Line-of Sight and satellite telemetry techniques) will be utilizing some of this spectrum that is being apportioned. There is, for example, a strong lobby among the "fixed wireless" (microwave industry) that is pushing to shut down such transmissions from vessels (buoys, etc) within 300 km of shore as they perceive (but have not demonstrated) there might be interference with their systems. There are few (other than those among our community) that this would negatively impact and so, few that would even think to raise this as a concern. In light of the involvement of the NAS, is this an area that the OSB might want to "weigh-in" on? If so, I'd be happy to help you prepare a position paper or some comments to be passed along through the OSB - It is doubtful that any/many in the NITA/FCC world would even realize (and therefore think to approach the OSB) that this issue will have an impact in our world. The pertinent links are attached:

From: Jeff Paduan, NPS

To: Mike Prince, UNOLS

This is a topic of particular concern, however, to the remote sensing community in general and the HF radar community especially. There are at least 3 issues that you might bring up or discuss if no one else does:

1) The very detrimental idea espoused below to limit transmissions from ships and buoys within 300 km of shore, which would decimate much of coastal oceanography.

2) A new crazy idea being espoused in D.C. to allow huge telecom companies to [broadcast broadband Internet as a modulation of the electric power transmission grid](http://www.ntia.doc.gov/osmhome/broadband/) in the HF/VHF bands. This also would severely impact coastal observing systems along with amateur radio users and many others. John Vesecky (UCSC) alerted me to this concern and promised to forward you more details if he can find them.

<http://www.ntia.doc.gov/osmhome/broadband/>

3) The need and desire of the HF radar community to obtain some dedicated frequency allocations that would allow these instruments to operate as primary users rather than "not-to-interfere" users as is the case now. This assumes that 1) or 2) above does not kill the entire field and that the community will become more organized as we move to a larger, national surface current mapping system.

Future meetings and regulatory activities

<http://www.fcc.gov/sptf/events2004.html#thismonth>

<http://www.ntia.doc.gov/osmhome/osmhome.html>

Action Plan for UNOLS/Ocean Science community

- ❖ Develop a comprehensive list of issues and concerns
- ❖ Compile a list of activities and associated frequencies that are used in ocean science research activities, including future needs
- ❖ Meet with and present these concerns to NSF (and other agency reps to regulatory bodies)
- ❖ Stay informed and engaged with the regulatory process
- ❖ Delegate responsibility to Standing Committee (RVTEC) and/or an ad-hoc committee to follow this issue.



NEWS

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This is an unofficial announcement of Commission action. Release of the full text of a Commission order constitutes official action. See MCI v. FCC, 515 F 2d 385 (D.C. Circ 1974).

FOR IMMEDIATE RELEASE
February 12, 2004

News Media Contact:
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FCC PROPOSES RULES FOR BROADBAND OVER POWER LINES TO PROMOTE BROADBAND SERVICE TO UNDERSERVED AREAS AND INCREASE COMPETITION

Washington, DC - As part of its ongoing efforts to promote access to broadband services for all Americans and to encourage new facilities-based broadband platforms, the Federal Communications Commission today proposed changes to certain technical rules that will foster broadband deployment using the significantly untapped capabilities of the nation's power grid, while safeguarding existing services against harmful interference.

The Part 15 rule changes, proposed in a Notice of Proposed Rulemaking (Notice), set forth procedures to measure the radiofrequency (RF) energy emitted by equipment used to provide broadband service over power lines and establish particularized interference mitigation requirements. By facilitating access to broadband over power lines (BPL), the Commission takes an important step toward increasing the availability of broadband in rural and underserved areas because power lines reach virtually every home and community in the country. In areas in which consumers already have broadband access, BPL enhances competition by providing another broadband alternative. These proposed changes will also facilitate the ability of electric utilities to dynamically manage the power grid itself, increasing network reliability.

Specifically, the Notice adopted by the Commission:

- proposes rules requiring BPL devices to employ adaptive interference mitigation techniques to prevent harmful interference to existing users, such as public safety and amateur radio operators. These techniques would enable BPL devices to cease operations altogether, dynamically reduce transmit power, and/or avoid operating on specific frequencies to prevent harmful interference;
- proposes developing a public database that would include such information as location, operational frequencies, and modulation type of BPL devices, which will facilitate the resolution of interference issues in a timely fashion;
- seeks comment on specific RF measurement guidelines for BPL devices and other carrier current systems. These guidelines will ensure that emission measurements for these systems are made in a consistent manner. While the Notice addresses RF measurement guidelines, it does not propose any changes to existing applicable emission limits.

- more -

Notably, some electric utilities already use a lower speed version of BPL technology to manage their internal networks. Widespread deployment of BPL devices will afford these same companies added benefits such as, remote power outage notification, load management to reduce peak power usage, improved load balancing, and remote meter reading capabilities.

Action by the Commission, February 12, 2004, by Notice of Proposed Rule Making (FCC 04-29). Chairman Powell, Commissioners Abernathy, Martin and Adelstein, with Commissioner Copps approving in part and dissenting in part. Separate statements issued by Chairman Powell, Commissioners Abernathy, Copps, Martin, and Adelstein.

ET Docket No. 04-37

Office of Engineering Technology Contact: Anh T. Wride, 202-418-0577.