

Federal Communications Commission
ET Docket No. 02-135

Chairman Powell, Director Kolodzy, and Spectrum Policy Task Force members:

I am writing to give comments on the "Spectrum Policy Task Force's tentative work plan" Public Notice. I appreciate your itemized appeal to the community for discussion. I hope that you may find my comments constructive and helpful.

I shall state first that my reason for writing is to urge you to maintain portions of the electromagnetic spectrum reserved for scientific study. Radio astronomy has made a very significant contribution to humanity by analyzing tremendously weak cosmic radio signals. Though radio astronomy's contributions to society are usually in the form of knowledge of fundamental physics and our place in the universe, a good deal of engineering has emerged from the radio astronomy community as well. However, all of radio astronomy's contributions could be trivially extinguished by filling the radio frequency spectrum with powerful telecommunication signals. Most importantly, the radio frequency universe often reveals itself to us through atomic and molecular spectral lines (such as the 1420.580MHz line of the hydrogen atom). Any interference near spectral line frequencies completely destroys the information available from their study.

It is the duty of the FCC to ensure that radio astronomy is not debilitated. To this end the FCC has maintained the "national radio quiet zone." The FCC also maintains various protected radio astronomy frequency bands throughout the spectrum. I hope that all continued FCC governance of the spectrum will proceed in continued cooperation with the radio astronomy community.

In response to your discussion questions, I will try to cast my remarks in terms of fiscally responsible "market-oriented" decisions; though please understand that it is difficult to place a price on the picturesque *electromagnetic wilderness* of which radio astronomy observatories are sanctuaries and conservatories. Congress has rightly established national facilities for radio astronomy studies. In much the same way that a river feeding a national wildlife refuge should not be dammed up; so, too, should the FCC protect the spectrum that is the charge of the radio observatories.

Following are answers to selected discussion questions from the Public Notice:

6. How can the Commission better facilitate the experimentation, innovation and development of new spectrum-based technologies and services...?

By protecting radio astronomy. Radio astronomy is not an industry that simply uses its allocated frequencies to provide the same simple communications services day in and day out. Instead, radio astronomy is a virile and Protean scientific endeavor that may be *counted on* to provide innovation. Indeed, the charters of radio observatories often require leadership in innovation. Radio observatories design and build their own world-class receivers and antennas. Furthermore, as science progresses, these facilities are used in increasingly creative and innovative ways. For example, the field of experimental quantum optics was begun by two radio astronomers building an intensity interferometer. More recently, Congress has

approved an electronics upgrade for the Very Large Array radio telescope of the National Science Foundation. This upgrade will include design and production of humanity's most sensitive receivers in the centimeter and millimeter radar bands. Also, the central processing computer of the upgraded Array will exemplify many advances in computing and printed circuitry. If the spectrum should ever crowd out radio astronomy studies, all of these innovations would cease.

7. Are new definitions of "interference" and "harmful interference" needed? If so, how should these terms be defined?

Harmful interference, when in the context of radio astronomy, should include the facts that (1) spectral lines cannot be interfered with at all or else all scientific information is lost and (2) the power limit definitions should reflect the very sensitive capabilities of radio astronomy receivers.

11. Does defining power limits and other measures in the Commission's rules designed to protect against harmful interference affect innovation?

Yes, if the rules do not recognize the needs of radio astronomy. The more the radio universe is obscured, the less return society can expect from its radio astronomy observatories. These lost innovations would include both (1) advances in the understanding of fundamental physics from the interpretation of radio astronomy data and (2) the remarkable and unique engineering routinely produced by the radio astronomy community.

16. Some parties assert that the Commission should adopt rules for interference that are based on economics, and not purely technical, in nature. They argue that efficient interference management should involve an economic balancing between the parties using the spectrum. Would greater use of these types of alternatives lead to more certain and expeditious resolution of interference issues?

No. Radio astronomy has no economic leverage (outside of its modest government funding) and cannot be expected to provide monetary returns as a claim on its portions of the spectrum.

26. How should the requirements for international coordination of satellite systems affect the U. S. assignment of satellite orbits and frequencies for domestic and international service?

Much of the harmful interference encountered by radio astronomy is in the form of airborne and spaceborne platforms that move through the sky. Many of these emitters are military and civilian aircraft transponders which are often deemed "critical infrastructure." However, telecommunication satellites are becoming increasingly damaging and must be managed on a world-wide scale.

PhD student in physics and active radio astronomer,
Ian Hoffman