

Before the Federal Communications Commission Washington, D.C. 20554

In the Matter of

Spectrum Policy Task Force Report

ET Docket No. 02-135

Comments by Timothy J. Shepard, Ph.D.

The report of the Spectrum Policy Task Force (November 2002) contains an impressive enumeration of the issues facing the FCC at this time, as well as some innovative ideas for improving the process of regulation of wireless communication (and other electromagnetic emissions). I expect the impact of this report will span many years, or perhaps many decades.

The most important bit of advice that I would like to emphasize is straightforward: Please allow for future flexibility.

I expect that ten years from now, we will have a view much different than we do today, and that it will be more significantly different than our view today is from our view ten years ago. The fundamentals governing the economics of wireless communication systems are changing rapidly as Moore's law enables increased flexibility and empowers system designers with previously unpracticable options.

The best path forward is one that permits as much as possible, allowing experimentation with all sorts of new technologies, new architectures, and crazy ideas. While we can not sort out today which of these are intrinsically the best, we do have the potential to do much harm by precluding those which are deemed to be incompatible with existing systems. We should seriously consider the possibility that it is the existing systems which should (eventually) go.

No rules would be fine

Over the past 10 years, I've come to believe that things would be just fine even if there was no government regulation of radio transmission. While I am not seriously advocating that we do away with all regulation of transmissions anytime soon, I would like you to consider with me what would happen.

A system designer has three main parameters to draw on to increase the amount of signal at the point of detection in a communication system: (1) Effective radiated power; (2) Receiver directional gain; and (3) Receiver processing gain. The first (1) can be broken into two components: (1a) Transmitter output power; and (1b) Transmitter directional gain. Of these four, only increases in (1a) would increase the overall level of interference to other arbitrary systems. Increases in (1b) would decrease the aggregate amount of interfering power delivered to other systems, and increases in (2) and (3) would not increase interference. An enlightened system designer in a world without regulations would

not abandon parameters (1b), (2), and (3) and would probably use them in combinations which amounted to a greater share of the gain than increases in (1a). Increases in (1a) in other systems (increasing the amount of interference) could be met by increases in any of the parameters. So it would not be a race to see who can transmit more power, and there would be an evolving natural point of balance.

So there would be no tragedy of the commons. The commons analogy is a poor one for electromagnetic communication because there is no analog of receiver processing gain and receiver directional gain in grazing animals.

While it is a fun engineer's fantasy to consider what kinds of systems might get built and deployed in a world with no rules governing electromagnetic emissions, we are going to have rules for years to come to protect already-deployed systems that are important to our society.

So we will have rules. But please allow new stuff as much as possible.

As much as possible, the FCC should allow increased flexibility to enable experimentation with the sorts of robust wide-band communication systems that could operate in a world without regulatory protection from interference. Such systems are likely to be important in the future as robustness from deliberate interference becomes increasingly important.

Don't repeat the big mistake of the past

The limitations of long-wave and medium-wave radio technologies in the early years of the 20th century were used as the basis for regulation of the rest of the radio spectrum, founded on a notion that interference is harmful and that transmitters must be regulated to prevent it. As VHF, UHF, and higher bands were made accessible by new technologies, I wonder what would have developed if they had been left unregulated. It certainly would have been different.

The worst thing we could do today would be to believe that we are designing a regulatory regime for wireless communication in the 21st century. We are designing a regulatory regime for the first decade of the 21st century. To pretend we have a clue what would be appropriate in the second decade is foolish.

Respectfully Submitted,

Timothy J. Shepard, Ph.D.
122 Beech Street
Belmont, MA 02478

Phone: +1 617 489 7135
E-mail: shep@alum.mit.edu

