

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

<b>In the Matter of</b>	)	
	)	
<b>Commission Seeks Comment on</b>	)	<b>GC Docket No. 11-199</b>
<b>Preliminary Plan for Retrospective Analysis</b>	)	
<b>of Existing Rules</b>	)	
	)	
	)	
	)	

**To the Commission:**

**Comments from Nickolaus E. Leggett**

I am a certified electronics technician (ISCET and iNARTE) and an Extra Class amateur radio operator (call sign N3NL). I hold an FCC General Radiotelephone Operator License with a Ship Radar Endorsement. I am an inventor holding three U.S. Patents. My latest patent is a wireless bus for digital devices and computers (U.S. Patent # 6,771,935). I have a Master of Arts degree in Political Science from the Johns Hopkins University.

I am one of the original petitioners for the establishment of the Low Power FM (LPFM) radio broadcasting service (RM-9208 July 7, 1997 subsequently included in MM Docket 99-25). I am also one of the petitioners in the docket to establish a low power radio service on the AM broadcast band (RM-11287). I have filed a total of over 200 formal comments with the FCC over the years since the 1970s. I have filed comments with other Federal agencies as well including the FAA, EPA, and the TSA.

## **Subject of My Comments**

My comments are focused on the Commission's second question on the first page of the Notice (DA 11-2002):

“2) How can the Commission further reduce burdens on industry and consumers while fostering competition, diversity and innovation?”

In addition, my comments are in support of the Commission' request:

“In addition, commenters are encouraged to submit other suggestions that may help the Commission develop better regulations and processes.”

I am writing from the viewpoint of a licensed radio operator and as an inventor with several patented and unpatented inventions.

### **The Commission's Rules, Innovation, and Invention**

The Commission's rules can have a quite negative impact on the process of invention and innovation in the marketplace. This happens because the rules specify the exact emission types used and in many services the actual engineering designs of the communication devices must be approved by the Commission's engineering staff.

While there are reasons that the FCC rules have been established this way, they create considerable havoc for the inventor and for the inventive process. Invention is an iterative and rather playful process where specific devices are conceived, prototyped, tested, modified, and often recycled into different devices. Invention is a tentative and experimental process where numerous concepts and designs are processed and played with until a potentially marketable technology is developed. This is the opposite of the regulatory world where very specific engineering designs are approved for the radio and wireless communications markets.

## **How to Accommodate Invention in the FCC's Regulatory Structure**

It is likely that the FCC will not abandon its current regulatory structure for radio communication. So how do we accommodate the free wheeling nature of invention in the FCC's regulatory system?

My suggestion is to establish some lightly regulated radio frequency bands where experimenters, both individual and corporate, can experiment with unusual and even "way out" communications technologies. These special radio frequency bands would be called Freedom Bands indicating that the users of these bands would be free to experiment with whatever communications technologies they could invent and get on the air.

The Freedom Bands would create an inventing environment similar to that in the early 20<sup>th</sup> Century where radio experimenters could do virtually anything that they could invent and actually get on the air. The environment was open and there were few regulatory inhibitions on the experimenters both amateur and commercial.

We need to create some spectrum bands where this type of inventive freedom can exist once again. This freedom will allow numerous new technologies to be born, prototyped, and tried on the air. One can imagine some of these new experimental technologies such as the following:

1. Parallel transmission of numerous channels of data for the ultra-rapid transfer of data, audio, and video
2. Transmitter, receivers, and antennas using liquid-state components including components that can be made domestically during extended

emergency situations (such as after an intense solar geomagnetic storm event)

3. Ultra narrow band transmissions using low keying rates for long distance interplanetary communications and eventually for interstellar signaling to Earth-like planets
4. Power broadcasting using continuous waves (CW) or another mode to rectifying antennas (rectennas) on remote repeaters and on airborne repeaters flying “permanently” on station.
5. Multiple channel holographic three-dimensional still image and video transmissions
6. High-resolution synthetic vision radar for blind people and other visually impaired people (This technology could also be applied to robot-driven automobiles and other vehicles as well as to military purposes.)
7. Prototype natural vacuum electronics technology for eventual application to space vehicles and space stations. (Initial tests of these open structures would be conducted in glass bell jars establishing the requisite vacuum on Earth.)
8. Wireless bus extended-chassis super computer systems (Refer to U.S. Patent # 6,771,935 for an example of this type of technology)
9. High-power air ionization systems for the electric propulsion of aircraft.
10. 360-degree view radar for flying vehicles
11. Backup radio navigation system for GPS in case the GPS system is incapacitated.

12. Direct brain-to-brain communication via wireless links and suitable biological-to-radio interfaces
13. RF-driven illumination devices and systems
14. Modernized spark-gap communications devices for 21<sup>st</sup> Century applications
15. Direct wind power integrated into antenna structures powering radio transmissions and aircraft warning lights and bird-warning sounders (You will get lots of wind power from a 1000-foot tower.)

The new technologies listed above will be useful, but the even more exciting ones are the ones that we cannot conceive of yet. We need to encourage the creation of these not-yet-visible new inventions that will allow our economy to grow and thrive in the future.

### **Regulations for the Freedom Bands**

The whole idea of the Freedom Bands is an inventors' park where one can go wild in trying out new and different communications inventions and innovations. However, a few basic rules will allow these bands to operate as we want them to without causing problems for other users of the busy radio spectrum.

The users of the Freedom Bands should be required to keep their radio emissions within the band. Some sort of filtering or suppression of spurious emissions outside of the Freedom Bands is needed. My suggestion is that 60 dB of suppression is probably adequate for most users. However some high-power emissions such as power broadcasting may require an even cleaner signal with a higher level of suppression.

In addition, we probably need a rule stating that all of the experimental devices set up on the Freedom Bands be established so they don't expose the public to dangerously high levels of radiofrequency (RF) exposure. This protection should also be applied to various animals that are likely to be exposed to the RF emissions.

Access to the Freedom Bands should be allowed to any licensed individual radio operator as well as to small companies, non-profit organizations (such as universities), large corporations, and government organizations (such as NASA, NIST, and DOD). The intention is to open this spectrum to technical pioneers of all kinds allowing the ideas to be developed to grow new industries in the radio marketplace. This system would essentially be a license-free band where many types of competitors can enter the competition. Indeed, it may be preferable to open these Freedom Bands to any U.S. citizen. We do not know who or where the next Edisons will be. They may be hidden somewhere in the ghettos or barrios of urban America or out on the tribal reservations of the American West.

The bands would also have a basic rule that they exist for experimenting, not for the routine transfer of traffic or the broadcasting of program material. The bands are strictly for technical experimentation only. The only exception would be for communication during a major emergency.

### **Where to Establish the Freedom Bands**

As the Commission and the radio interests know well, the electromagnetic spectrum is a very busy and heavily used place. For this reason, I recommend that most of the Freedom Bands be established within radio frontiers such as the millimeter waves. Doing this would serve two major goals: encouraging and enabling invention and

encouraging new uses for the millimeter waves. An additional advantage to this strategy is that there is much more frequency space in the millimeter waves as compared with lower frequency parts of the spectrum.

An additional approach is to establish smaller Freedom Bands restricted to amateur radio operators that would be set up within carefully selected sub-bands within the Amateur Radio service allocations. The Commission would need to consult in detail with the American Radio Relay League (ARRL) and other elements of the amateur radio community to explore this possibility. Amateur radio operators have the technical background to put the Freedom Bands to constructive use very rapidly. Indeed, approximately 18 percent of the amateur radio operators hold the FCC's Extra Class license which is the highly demanding technical license. (Reference One) Many amateur radio operators would welcome the wide freedom to experiment with technology. You would see many favorable new inventions from them.

**Requested Action**

The Commission should act to set a Notice of Inquiry (NOI) to investigate the possibility of establishing Freedom Bands to encourage the invention and development of substantially new radio communications technologies as well as additional new applications of radio waves. The Freedom Bands would increase the invention and innovation occurring in the radio communications field.

**Respectfully submitted,**

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Reference One: "US Amateurs Now 700,000 Strong!", QST magazine, ARRL,  
Newington Ct, December 2011, Page 65

### **Appendix A – My Patents and Document References**

Some of my document references are listed below:

**United States Patent 6,771,935, Wireless Bus August 3, 2004**

**United States Patent 3,280,929 Ground-Effect Machine October 25, 1966**

**United States Patent 3,280,930 Ground-Effect Vehicle October 25, 1966**

**"Demonstration and Development of Amateur Radio Applications of Natural Vacuum Electronics"; Nickolaus E. Leggett, N3NL - 22nd AMSAT Space Symposium and Annual Meeting October 8-10, 2004 in Arlington, Virginia**

**"A 'Lighthouse' Protocol for Random Microwave Contacts", Nickolaus E. Leggett, N3NL, QEX The Experimenter's Exchange – Technical Notes July/August 2004 – American Radio Relay League, Newington, CT.**

Wireless bus invention – U.S. Patent # **6,771,935**

#### **Abstract**

In order to avoid mechanical assembly problems and transmission of undesired electrical currents among circuit cards or boards in a telecommunications switch or similar digital device, a conventional hard-wired midplane bus is replaced by a wireless bus. The wireless bus includes a radio frequency or light wave transceiver on each card. Antennas on respective cards can either be oriented within direct line-of-sight of each other, or can project into a waveguide which directs the transmitted signals past all the other antennas. For example, the waveguide may be a metal enclosure which surrounds all the cards. Alternatively, respective aligned apertures in the cards can define a continuous transmission path. A data rate exceeding 1 megabit per second and a transmission power on the order of 1 milliWatt are preferred, since the bus is intended for use within a single switch housing. Radio frequencies in the middle to high microwave range or light frequencies in the visible range are preferred for providing sufficient bandwidth and to facilitate servicing.