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

In the Matter of	**)**	
	)	
Promoting More Efficient Use of Spectrum	**)**	**ET Docket No. 10-237**
Through Dynamic Spectrum Use	**)**	
Technologies	**)**	
	)	
	)	

To the Commission:

Comments from Nickolaus E. Leggett

The following are my comments on the impacts of dynamic spectrum use technologies on some of the current users of radio spectrum above 38.6 GHz. These comments are in response to the Commission's questions in Paragraph 46 on Page 17 of this Notice of Inquiry (NOI).

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).

Radio Astronomy

Radio astronomy depends on the reception of very weak broadband radio emissions from astronomical sources. Radio astronomy is very vulnerable to interference. Dynamic spectrum access by numerous unlicensed and/or licensed devices would block radio astronomy use.

In addition, radio astronomers use lightly-used spectrum outside of formal allocations to radio astronomy. Thus some of the quiet bands are actually in use for this purpose. Filling the spectrum with dynamic unlicensed devices will inhibit radio astronomy use of the quieter parts of the radio spectrum. Coordination of quiet bands for radio astronomy progress is needed.

Amateur Radio

Amateur radio operators conduct experimental communications in the frequency range above 38.6 MHz. Amateur radio operators are assigned specific frequency bands:

47 – 47.2 GHz

76 – 81 GHz

122.25 – 123 GHz

134 - 141 GHz

241 – 250 GHz

All frequencies above 275 GHz

Amateur radio stations communicate using low-power radio signals directed by high-gain antennas. If there is a swarm of dynamic automated devices on the amateur radio frequency bands, the amateur operators will not be able to hear and communicate with the weak stations that they are attempting to contact. In effect, there would be a

situation of high noise pollution that would prohibit amateur radio weak-signal communication.

Because of this, unlicensed or licensed dynamic radio equipment should be prohibited in the radio spectrum that is allocated to amateur radio operation. The only exception to this would be experimental dynamic radio operation conducted by amateur radio operators themselves.

Local Broadcasting

The millimeter waves offer plentiful spectrum for local community broadcasting. In previous dockets, I proposed a “lighthouse protocol” that would assist the use of these frequencies for community broadcasting. Refer to Appendix A.

Since there is a high level of signal absorption at many of the frequencies in the millimeter waves, community broadcasting can have naturally-enforced frequency reuse where neighboring communities can be on the same or nearby broadcasting channels.

Some frequency bands should be allocated for community broadcasting. These bands should not be available for dynamic unlicensed or licensed devices.

Overall Impact

The overall impact of setting aside radio astronomy, amateur radio, and community broadcasting frequency bands would have very little impact on unlicensed or licensed dynamic radio devices. This is because the capacity of the radio spectrum above 38.6 GHz is truly immense and so the loss of some frequency bands will not limit the progress of dynamic communications devices.

Respectfully submitted,

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APPENDIX A

Using the Lighthouse Protocol for Local Broadcasting on the Millimeter Waves

Physical Aspects of Millimeter Wave Broadcasting

A millimeter wave installation is typically engaged in point-to-point communication using a narrow beam formed by very high gain antennas. This communication is often referred to as "pencil beam" communication.

Clearly, a fixed pencil beam is the opposite of the broad coverage desired for broadcasting service.

However, a pencil beam can be converted into an omni-directional broadcasting system by using a rotating beam. The high-gain transmitting antenna is mounted so that it can be continuously rotated in a similar manner to a plan position indicator (PPI) radar antenna. The transmitting millimeter wave beam would "paint" the surrounding geographic area like an electronic lighthouse.

Lighthouse Protocol for Broadcasting

The neighborhood broadcasting station would transmit packets of digital program material to the broadcast receivers. Each receiver would store the packets and play the

program material to the listener.

The station would use a protocol where the same set of packets would be repeated for each beam width around the points of the compass. For example, if the transmitter has a 10-degree beam width, it would transmit 36 repetitions of the packet set. Each repetition would be at a different compass direction to cover a full 360 degrees.

The radio receivers would put the packets together and play them out to the listeners. This would result in the program material being delayed somewhat from real time, but this would not be a major problem for most neighborhood broadcasting applications.

Millimeter wave transmissions are very much a line-of-sight process like light wave transmission. Leaves of trees can absorb the signals. As a result, outdoor receiving antennas above the roof line would be desirable for this radio service. This could conflict with the widespread prohibitions of external antennas by homeowner associations and condominiums. Any docket on millimeter wave broadcasting would have to address these private regulations and their negative impact on this new broadcasting opportunity.

A frequency range in the vicinity of 60 GHz is very desirable because the atmosphere strongly absorbs these transmitted signals. This will limit each broadcaster to a single neighborhood or modest sized community. The same channels can then be reused in a near by community with no problem of interference. This absorption of the signals is strong enough that you could have several reuses of the 1000-channel set within a single metropolitan area such as the New York City area. Here at last you have a neighborhood broadcasting system that can be used in dense urban areas. This is a

contrast to the existing low power FM (LPFM) broadcasting service that has been limited to largely rural areas by spectrum crowding concerns.

The State of the Art in Millimeter Wave Transmission

Current electronics technology includes equipment for transmission in the millimeter wave portion of the radio spectrum. FCC allocations and regulations are established for operations in this spectrum, and yet there is a lot of available room for innovations such as local radio broadcasting. Amateur radio operators have conducted two-way communications in this spectrum with transmissions up to frequencies over 400 GHz. There is an existing technology that can be adapted for neighborhood radio broadcasting that is available for the many urban areas where accommodating standard LPFM is difficult.