



February 1, 2002

Magalie Roman Salas
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: ET Docket 98-153
Revision of Part 15 of the Commission's rules
regarding Ultra-Wideband Transmission Systems

Dear Ms. Salas:

Please replace our January 30, 2002 filing in its entirety with the attached filing. The January 30th filing contained a 9 dB error in the transmit power permitted below 960 MHz under Part 15 of the Commission's rules. This resulted in an error in the level of protection relative to Part 15 that the wireless industry has imposed on itself. Accordingly, instead of the level of protection being 16-20 dB below Part 15 levels, the protection is actually **20-29 dB** below Part 15 levels. The attached letter corrects these factual errors.

If you require any additional information please contact the undersigned at (202) 371-6953.

Sincerely,

/s/ Steve B. Sharkey

Steve B. Sharkey, Director
Director, Spectrum and Standards Strategy

Attachment



February 1, 2002

Honorable Michael Powell
Chairman
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: ET Docket 98-153
Revision of Part 15 of the Commission's rules
regarding Ultra-Wideband Transmission Systems

Dear Chairman Powell:

The Commission has been engaged in an active debate that impacts almost all wireless communications currently deployed, as well the deployment of a new, innovative technology – ultra wideband (UWB). Motorola supports and is engaged in development of UWB applications and encourages the Commission to move quickly to adopt rules allowing UWB deployment. However, in developing rules for deployment, the Commission must take care to protect existing services. This protection can only be adequately afforded by setting appropriate technical limits rather than trying to construct a complex and unenforceable regulatory structure that severely limits the operational abilities of UWB while still not ensuring adequate protection to existing services. In a recent letter, the Department of Defense proposed just such an approach.¹ Accordingly, Motorola supports the deployment of Ultra-Wideband with appropriate limits on emissions.

The Commission Must Protect Existing Services Consistent with Industry Standards

There has been wide ranging debate about what limits on UWB emissions are necessary to provide adequate protection to existing services, such as PCS, GPS, public safety, and systems operated by the Department of Defense. It is critical that the Commission weigh in favor of protecting these services when determining the outcome of this debate. Existing services have primary rights for use of the spectrum and operators have invested billions of dollars to build systems, and in many cases, pay for the spectrum at auction, based on these rights. More importantly, existing systems provide critical communications to the public and for the protection of the public. The Commission must ensure that UWB does not adversely impact the operation of these vital communication networks.

¹ Letter from John P. Stenbit, Assistant Secretary of Defense to Michael Gallagher, Deputy Assistant Secretary for Communications and Information, U.S. Department of Commerce, January 11, 2002. (“Stenbit letter”)

There has been considerable debate as to the correct interpretation of interference studies submitted into the record of this proceeding. One thing should be clear, however; the rights of a Part 15 user should not exceed the rights of the licensed primary user of the spectrum, nor should Part 15 operations be permitted to disrupt a carefully managed radio environment. Industry has adopted self-imposed standards, in excess of the Commission's rules, to carefully control the noise floor to ensure a high quality of service. While the Commission's rules allow out-of-band emissions from PCS devices at $43 + 10\log P$, or 50 microwatts,² industry has recognized that significantly lower levels are required in the band used for PCS handset reception in order to assure a high quality of service and to avoid increasing the noise floor to excessive levels. Consider for example the GSM standard³ for operation in 1850-1910 MHz, emission levels into the PCS receive band at 1930-1990 MHz have a minimum requirement to be at or below a level of 0.78 nW .⁴ These levels are significantly lower than the level permitted under the Commission's rules and are significantly lower than emissions permitted under Part 15 of the Commission's rules. Table 1 provides a comparison of the industry standards for protecting PCS services relative to the Part 15 emission limits. Table 2 shows the resulting localized rise in noise floor for both the industry-developed standards and the Part 15 rules from a single device based on the emission levels from Table 1.

**Table 1 - Comparison of Subscriber Unit Out-of-Band Emissions Limits
[Power Measured in 1 MHz BW at Antenna Connector (in dBm)]**

| SYSTEM | Subscriber Unit Rx Band Limit (dBm) | Level Relative to Part 15 (dB) | Source |
|---------------------|-------------------------------------|--------------------------------|---------------|
| FCC (216-960 MHz) | -40 | 0 | 47 CFR 15.209 |
| GSM900 | -69 | -29 | GSM 05.05 |
| TDMA - 900 MHz | -65 | -25 | ANSI 136-270 |
| iDEN - 800 MHz | -65 | -25 | iDEN Spec |
| FCC (above 960 MHz) | -41 | 0 | 47 CFR 15.209 |
| DCS1800 / GSM1900 | -61 | -20 | GSM 05.05 |
| TDMA - 1900 MHz | -65 | -24 | ANSI 136-270 |

² 47 CFR 24.238

³ 3GPP TS 05.05 v8.11 (2001-8), 3rd Generation Partnership Project; Technical Specification Group GSM/EDGE; Radio Access Network; Radio transmission and reception (Release 1999).

⁴ 3GPP TS 05.05 v8.11 (2001-8) calls for $-71 \text{ dBm}/100 \text{ kHz}$ in section 4.3.3.2, reflecting this to a 1 MHz measurement bandwidth equates to $-61 \text{ dBm} = -91 \text{ dBW} = 0.78 \text{ nW}$. This power level is equivalent to a field strength of 51 microvolt/meter at distance of 3 meters.

Table 2 - Noise Floor Degradations Due to Subscriber-to-Subscriber Interference⁵

| SYSTEM | Noise Floor Increase with 3 foot Separation (dB) | Separation Distance for Noise Floor Increase | |
|-------------------------|--|--|-----------|
| | | 1 dB (ft) | 3 dB (ft) |
| FCC Part 15 (216-960) | 18.1 | 47.8 | 23.9 |
| GSM900 | 2.1 | 4.8 | 2.4 |
| TDMA - 900 MHz | 4.2 | 7.6 | 3.8 |
| iDEN - 800 MHz | 4.2 | 7.6 | 3.8 |
| FCC Part 15 (above 960) | 19.6 | 56.7 | 28.4 |
| DCS1800 / GSM1900 | 2.7 | 5.6 | 2.8 |
| TDMA - 1900 MHz | 1.3 | 3.6 | 1.8 |

These tables clearly show that the industry finds it necessary to protect itself to a level significantly greater than what is required under the Commission's rules. Exactly how UWB devices will be deployed is unknown. However, we must assume that they will be ubiquitously deployed, much like cellular and PCS, and that the chance of UWB and other communications devices operating in close proximity is very high. Accordingly, it would be inappropriate for the Commission to allow UWB emissions in excess of levels that the industry has imposed on itself, which are **20-29 dB below Part 15 levels**.

In our April 25, 2001 filing in this proceeding we detailed our belief that, based on studies submitted to the record, the Commission should limit UWB emissions to 27-35 dB below Part 15 levels, depending on the characteristics of the particular UWB devices, in frequency bands used for GPS.⁶ Numerous other commenters have expressed similar and even greater concern with respect to the potential of UWB to interfere with GPS operations, particularly since GPS receivers will be included on PCS and cellular handsets to meet E911 requirements.⁷ The Department of Defense (DoD) recently emphasized its concern in a letter to Deputy Assistant Secretary of Commerce, Michael Gallagher.⁸ The Commission must heed these concerns and limit emissions in the GPS band to appropriate levels based on the reasonable assumption that UWB will operate in close proximity to GPS receivers. Given the level of uncertainty regarding actual deployment of unlicensed UWB devices, it is reasonable to significantly restrict emissions in the GPS band for the reasons described in our April 25th filing. As additional information is obtained on UWB deployment, operating environment, characteristics, or changes to the GPS system that make it more robust, it may be possible to increase UWB emissions in the future, or for certain limited, licensed applications. Until additional information is available however, for unlicensed UWB deployment, the Commission must err on the side of protecting GPS and limit emissions in the GPS

⁵ Based on emission levels from Table 1. Assumes a victim receiver antenna gain of -6 dBi, which is typical of the gain when a handset is held at the ear. If the gain is greater than -6 dBi, the noise rise and separation distance will be increased.

⁶ *Motorola Comments on Reports*, filed April 25, 2001.

⁷ See letter from AT&T Wireless, Cingular Wireless, Qualcomm, Sprint PCS and Verizon Wireless to the Honorable Donald L. Evans and the Honorable Michael K. Powell, dated December 4, 2001.

⁸ Stenbit letter

band to 27-35 dB below Part 15 levels, based on the type of UWB emission. If a single limit is adopted, the Commission must error to the 35 dB side of the equation.⁹

The public safety community has likewise expressed concern about potential interference from UWB into its communications and to GPS.¹⁰ There are many potential UWB applications, such as through wall sensing and location of emergency personnel on a disaster scene, that are very beneficial to public safety. However, the Commission must be certain that in authorizing UWB, it also protects other critical public safety communications systems. Accordingly, the unlicensed use of UWB in bands used for public safety should be limited to the emission levels discussed above.

The Commission Should Move Forward on UWB

While there are still many questions regarding the operation of UWB transmitters, a number of parties have proposed ways under which the Commission could move forward with authorizing use of this technology. DoD proposed in its recent letter that the Commission limit UWB operation to above 4.2 GHz.¹¹ A coalition of companies have called for UWB to be limited to above 6.0 GHz. Motorola agrees that allowing UWB to operate at the Part 15 limits above 5 GHz, while limiting UWB emissions below 5 GHz to levels that are in line with industry-developed standards for protection of services, is an equitable balance of interests and represents a viable way to proceed with authorization of UWB and the Commission should proceed accordingly.

UWB has the potential to satisfy a wide variety of communications, location and sensing needs. The above proposal will allow UWB developers to proceed with commercial development, bringing the benefits of UWB to fruition and providing additional experience with UWB under real world conditions, while ensuring protection of existing services. Given the amount of technical analysis that has already been submitted to the record of this proceeding, it is unlikely that the Commission will gain any significant new insight into the potential of UWB to interfere by further delaying a decision. The Commission should move forward with UWB with appropriate protection afforded existing services.

The Commission Should Not Rely on Artificial Regulatory Constraints for Protection

Reliance on artificial regulatory constraints, such as not allowing peer-to-peer communications or limiting use to indoor, as a way to limit the interference potential of UWB, does not serve existing licenses or UWB developers. Such limits are very difficult to enforce yet severely restrict UWB applications. Instead the Commission should adopt appropriate technical and emission limits as the best way to promote development of UWB while protecting existing services.

⁹ We note that some UWB development companies have stated that they can meet these emission levels. See January 23, 2002 filing by XtremeSpectrum and January 25, 2002 filing by Multispectral Solutions.

¹⁰ Letter from Glen Nash, President, APCO International to the Honorable Michael Powell, Chairman, FCC dated January 16, 2002 (“APCO letter”).

¹¹ Stenbit letter

Restricting peer-to-peer communications for UWB would severely restrict the services that could be provided and would be detrimental to UWB development. UWB holds the potential to be very useful in ad hoc networking between computers and communications devices. An artificial restriction on peer-to-peer communications would effectively eliminate this application; it could also impact the ability of UWB to provide life-saving services, such as fire ground location where it will be necessary for UWB devices to communicate. Restricting peer-to-peer communications to instances where the user takes some action, such as pushing a button, would decrease the usefulness of these devices and would not necessarily achieve the goal of protecting other services. A far better approach is for the Commission to adopt emission limits consistent with the protection of existing services.

Limiting use of UWB to indoor operation, or allowing higher emissions for indoor UWB operation does not protect services like PCS or adjunct services such as E911. A number of filings in this proceeding have set forth the argument that the attenuation provided by a building will provide additional protection to services from indoor UWB operations and that, therefore, higher power should be permitted for indoor UWB operation. However, this argument only applies if the service requiring protection is operating outdoors. At a time when an increasing number of consumers rely on their PCS and cellular phones as their primary phones, this argument does not apply. Far from being a means to communicate when none other exists, PCS and cellular are relied on in all environments, even indoors when a wired phone may also be available. In these cases, when building attenuation degrades the link between a hand-held PCS or cellular phone, there is an even greater potential for an indoor UWB transmitter to cause interference. APCO also notes particular concern on the potential for UWB to interference on public safety radio systems operating indoors and subject to building attenuation.¹² Accordingly, there is no justification for allowing higher power indoor UWB emissions.

As experience with UWB operation and applications is gained, it may be appropriate for the Commission to authorize higher power operations on a licensed basis or for certain limited applications. However, such special exemptions should only be authorized when the Commission can be confident that interference will not be caused to existing services. There is insufficient information to do so at this point.

Summary

The Commission should move forward with authorizing use of UWB consistent with the amount of information in the record of this proceeding. The currently available information requires the Commission to limit UWB emissions to above 5 GHz, with any emissions below 5 GHz limited to levels that are constant with industry adopted standards which are 20-29 dB below Part 15 emissions. As additional experience regarding the operation of UWB is gained, it may be possible to allow higher power uses for certain applications, but there is insufficient information to do so at this point. The Commission should not adopt general regulatory restrictions, such as a restriction on

¹² APCO Letter

peer-to-peer operation, which will not adequately protect existing services and will severely retard the development and usefulness of UWB.

Sincerely,

/s/ Steve B. Sharkey

Steve B. Sharkey
Director, Spectrum and Standards Strategy

CC: Commissioner Kathleen Abernathy
Commissioner Kevin Martin
Commissioner Michael Copps
Deputy Assistant Secretary of Commerce Michael Gallagher
Deputy Assistant Secretary of Defense Steven Price
Badri Younes, DoD
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