

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

In the Matter of)	
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)	
Revision of Part 15 of the)	ET Docket No. 98-153
Commission's Rules Regarding)	
Ultra-Wideband Transmission)	
Systems)	
)	

REPLY COMMENTS OF MOTOROLA, INC.

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October 27, 2000

SUMMARY

In response to the Commission's *NPRM*, over 165 parties submitted comments. Many of these commenters support Motorola's concern that UWB emissions will cause harmful interference to a variety of existing and future radio services unless UWB emissions are limited to appropriate levels. Commenters agree with Motorola's recommendation that UWB emissions must be limited to a level below the current Part 15 Class B limits and that the 2 GHz cutoff frequency must be reassessed. Motorola continues to study these issues and will provide further analyses to the Commission soon. Preliminary indications are that a UWB emission limit of more than 18 dB may be necessary to adequately protect other services from harmful interference. However, given the wide range of conditions under which UWB devices may operate, a range of factors must be taken into account in finally determining the appropriate level of protection needed.

Commenters also support Motorola's recommendation that the Commission must wait until test data have been taken and analyzed before making any decisions with regard to UWB and its potential to cause harmful interference to existing and future services.

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To the Commission:

REPLY COMMENTS OF MOTOROLA, INC.

Motorola, Inc. ("Motorola") hereby submits its reply comments to the Notice of Proposed Rulemaking in the above-captioned proceeding,¹ where the Commission has set out to determine, among other issues, the extent to which existing and future services must be protected against harmful interference from Ultra Wide Band ("UWB") systems. Many of the comments support Motorola's concern that UWB emissions are likely to cause harmful interference to a variety of services unless emissions from these devices are limited appropriately. Commenters also support Motorola's conclusion that UWB emissions must be limited to a level below the current Part 15 Class B limits, and that the 12 dB emission limit suggested by the Commission may not be sufficient. Commenters further agree with Motorola that the Commission's

¹ *In the Matter of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems*, ET Docket No. 98-153, Notice of Proposed Rulemaking, 65 Fed. Reg. 37332 (June 14, 2000) ("*NPRM*").

proposal to limit the UWB emissions only below 2 GHz will not protect radio services above 2 GHz and therefore must be changed. They further agree with Motorola that UWB transmissions must be carefully evaluated to ensure that they can co-exist with other licensed and unlicensed radio services. Accordingly, the Commission must wait until UWB interference test data have been taken and carefully analyzed before it makes any decisions with regard to UWB rules and its potential to cause harmful interference to existing and future services.

I. MANY COMMENTERS SUPPORT MOTOROLA'S CONCLUSION THAT THE POTENTIAL FOR HARMFUL INTERFERENCE FROM UWB IS HIGH AND ADDITIONAL PROTECTIONS ARE NEEDED

In its Comments, Motorola analyzed UWB transmissions in a variety of typical radio environments. Several methods of assessing interference potential were considered, and the likely effects on generic receivers were examined. Based on these detailed analyses, Motorola concluded that the Commission's tentative decision to require that UWB emissions be attenuated substantially below the general Part 15 emissions limits for Class B devices is both appropriate and necessary. However, Motorola's analyses showed that the Commission's proposed 12 dB reduction in UWB emissions may not be sufficient to protect many communications services. Moreover, such protection must be afforded all communications services, not just those operating below 2 GHz.²

² Motorola Comments at 38. Lucent Technologies, Inc. ("Lucent") generally concurs with Motorola's analysis with regard to the protection distance required. See Comments of Lucent at 12-15. *See also* Comments of Nortel Networks, Inc. ("Nortel") at 3 (agreeing with Motorola that 12 meters of separation is necessary).

Other commenters have also provided detailed analyses demonstrating that UWB emissions will cause harmful interference to other services. For example, Cisco Systems, Inc. (“Cisco”) states that existing general emission limits for Part 15 Class B devices are inadequate to protect wideband receivers (such as those used in MMDS networks in the 2150-2162 MHz and 2500-2690 MHz bands) from harmful interference caused by UWB transmitters. It includes technical studies demonstrating the interference potential of UWB.³ For its part, Metricom, Inc. (“Metricom”) concludes that “a licensed receiver within approximately 100 feet of an operating UWB device will suffer some amount of reduction in receiver sensitivity.”⁴ Further, Nortel states that its preliminary analyses show “that the UWB emission limits should be set considerably (as much as 30 dB) below the broadband emissions limits for intentional radiators in order to have some assurance of non-interference to existing systems based on past product experience.”⁵ This finding exceeds Motorola’s 12 dB conclusion and suggests that Motorola’s analysis may be too lenient. The analyses offered by these commenters underscore the need for the Commission to examine carefully the test data and analyses that will be submitted in the next phase of this proceeding.⁶

Many commenters particularly note the potential risk UWB poses to safety of life, navigational and other safety systems.⁷ Nortel, for example, worries that

³ Comments of Cisco at 6, and Attachments.

⁴ Comments of Metricom, Technical Appendix at 2.

⁵ *Id.* at 8.

⁶ *See* discussion, *supra* at III.

⁷ *See, e.g.*, Comments of Charles Alton Forsberg (stating that many UWB

unlicensed use of UWB devices could cause harmful interference to critical existing and proposed services, and it finds “unconvincing” UWB proponents’ analyses of UWB interference because they did not take into account situations involving more than a single UWB device at one meter from the victim receiver.⁸ For its part, Saab Marine Electronics AB argues that even a 12 dB decrease in the general limits below 2 GHz may be insufficient to protect GPS and wireless services.⁹ Further, Wireless Communications Association (“WCA”) expresses concern that UWB technology has the potential to cause interference to licensed fixed wireless services in any frequency band, including the MDS, ITFS, WCS, POFS, DEMS, and LMDS bands.¹⁰

Manufacturers and Commission licensees generally voice serious concern about the potential for UWB emissions causing harmful interference, and the risk of allowing UWB transmissions to pollute the radio environment. AT&T Wireless Services, Inc. (“AT&T Wireless”), for example, suggests that it may not be possible to

transmitters could disable GPS); Comments of Garmin International, Inc. (claiming that UWB transmissions could adversely impact broadcast television, cellular, navigational and GPS systems); Comments of the American Radio Relay League (warning that potentially disastrous results to Amateur Radio licensed services could occur as a result of UWB emissions); Qualcomm Incorporated (“Qualcomm”) (expressing concern about the potential for interference from UWB devices into wireless phones using CDMA technology, including chipsets incorporating GPS receiving capability); Comments of the U.S. GPS Industry Council (stating that the net effect of numerous UWB devices is to raise the noise floor, compromising safety service devices); Comments of United States Department of Transportation (declaring that unfettered use of UWB devices presents a risk of interference to various services).

⁸ Comments of Nortel at 3.

⁹ Comments of Saab Marine Electronics AB at 2.

¹⁰ Comments of WCA at 1-2 (arguing that UWB has the potential to cause harmful interference to licensed fixed wireless services in any frequency band, even as high as 38 GHz).

predict what aggregate effect the operation of a large number of mass-marketed UWB devices might have on existing communications systems, especially those that are mobile, nor the impact of more geographically widespread use of such services.¹¹

Even parties that have supported the concept of UWB express strong reservations and concerns about the potential for harmful interference to existing and future services arising out of UWB implementation. Sprint Spectrum, L.P. (“Sprint PCS”), for example, states that its joint test summary and model filed with Time Domain Corporation (“Time Domain”) “demonstrate that even the -53.2 dBm/MHz emission level proposal is not adequate to protect Sprint PCS’ network from harmful interference.”¹² Both the test results and the theoretical model that Sprint PCS and Time Domain conducted through Telecordia Technologies confirm that a single UWB device “causes harmful interference when it is within a certain distance of a CDMA PCS handset.”¹³ With multiple, collocated UWB emitters “the loss of system capacity and number of blocked calls could increase dramatically.”¹⁴ Of particular interest is Sprint PCS’ conclusion that “there is no basis in the current record to justify a Commission decision authorizing mass marketed UWB devices in the 1-2 GHz band.”¹⁵ At the very least, Sprint PCS states, “[a]dditional evaluation is necessary to understand the full

¹¹ AT&T Wireless Comments at 4.

¹² Sprint PCS Supplemental Comments at 2.

¹³ *Id.* at 3.

¹⁴ *Id.* at 6.

¹⁵ *Id.* at 7.

impact of UWB devices....”¹⁶ While Sprint PCS says that it does not oppose UWB technology *per se*, it is quite clear that it has serious reservations: “Sprint [PCS] must also protect, and is legally entitled to protect, its existing licensed services....”¹⁷

Multispectral, a supporter of UWB technology, has also expressed its concerns, stating that “to introduce such ‘UWB’ technologies without a complete understanding of the potential consequences for interference may irreparably damage our nation’s safety and security, potentially destroy the viability of the new technology itself, and create a precedent which will have a chilling effect on the development of future wireless technologies.”¹⁸ Multispectral also states that, “[u]nfortunately, while some UWB advocates have claimed that UWB operates in the ‘garbage band’ and can superimpose its emissions on existing services without interference thereby ‘creating spectrum,’ such statements are without basis in fact and, in fact, have been shown to be false.”¹⁹ Further, Multispectral concludes that “[i]t is obvious that bandwidth and output power controls need to be applied to UWB systems so as to protect existing spectrum users without unduly restricting the commercialization of UWB technology.”²⁰ Thus,

¹⁶ *Id.*

¹⁷ *Id.* at 14.

¹⁸ *See* Comments of Multispectral Solutions, Inc. (“Multispectral”) at 11.

¹⁹ *Id.* at 12.

²⁰ *Id.* at 17. Multispectral indicates that a number technical restrictions should be applied to the use of UWB systems. For example, it states, “[u]nfiltered UWB systems (i.e., those utilizing direct impulse or step excitation of an antenna) should not be permitted under Part 15. *Id.* at 2. Also, “[f]iltered UWB systems should initially be allowed above 3.1 GHz with UWB power limits based upon measured instantaneous peak power (1 Watt with +6 dBi antenna gain). *Id.* Moreover, “UWB ground penetrating Radars (GPR) should be considered on a licensed basis.” *Id.* Multispectral also raises

even commenters supporting UWB technology recognize that caution and further study are necessary to avoid causing unnecessary risk to current licensees and users in the affected spectrum.

It is clear, therefore, that many commenters in this proceeding agree with Motorola that there is a significant risk of harmful interference to existing and future radio services from UWB transmissions, and that protections far stricter than those proposed by the Commission are needed. Motorola is continuing to examine these issues and will soon provide the Commission with a detailed technical analysis regarding the UWB emission limit necessary to protect other services. Preliminary indications are that a UWB emission limit of at least 18 dB may be required to assure adequate protection. However, given the wide range of conditions under which UWB devices may operate, a range of factors must be taken into account in finally determining the appropriate level of protection needed.

II. ADEQUATE UWB PROTECTION LIMITS MUST BE APLIED ABOVE AND BELOW 2 GHz

In its Comments, Motorola demonstrated that UWB emissions must be at least 12 dB below current Part 15 limits for Class B devices, both below and above 2 GHz. The rationale offered in the Commission's NPRM for a cutoff at 2 GHz was based

the issue of antenna modification, damage and positioning as it relates to increased power densities in unintended regions of the spectrum. This issue warrants further study by industry and evaluation by the Commission. *Id.* at 3-10. For its part, Fantasma Networks, Inc. ("Fantasma"), a developer of UWB products for wireless networking, provides no technical support for its general claims that UWB can operate above 2 GHz without causing harmful interference to other radio services. Comments of Fantasma at 3.

on the desire to protect the high concentration of wireless services below 2 GHz from harmful interference.²¹ However, as Motorola showed in its Comments, there are many wireless services that need to be protected from harmful interference above 2 GHz, including MMDS, WCS, LMDS, and GWCS.²²

Other commenters agree with Motorola that limiting the cutoff to 2 GHz is incorrect. AT&T, for example, urges the Commission to move the cutoff to 2600 MHz, and Lucent suggests 3 GHz.²³ Nortel suggests that the lower frequency limit should be moved above 5.9 GHz “in order to avoid interference to PCS, mobile, UNII and fixed wireless access systems.”²⁴

In view of these comments, and the indisputable fact that the potential for harmful interference to current and future radio services exists both above and below 2 GHz, it is appropriate and necessary that the Commission limit UWB emissions above 2 GHz to levels that will protect those other services.

III. THE COMMISSION MUST ALLOW TIME FOR PARTIES TO FULLY EVALUATE AND ANALYZE UWB EMISSION TEST DATA BEFORE ADOPTING ANY RULES OR STANDARDS

A number of commenters recommend that the Commission not promulgate final rules for UWB at this time. Instead, they propose that tests currently underway under the auspices of NTIA and other organizations be conducted and fully

²¹ *NPRM* at ¶ 28. *See also* Motorola Comments at 35.

²² Motorola Comments at 35, Table V.

²³ Comments of AT&T at 7; Comments of Lucent at 6-7.

²⁴ Comments of Nortel at 6.

analyzed to assess the potential for harmful interference from UWB emissions. AT&T, for example, is conducting its own first-order tests but states that “[c]ompletion of these studies will take time – it is unlikely that anything but gross effects will be investigated by October 30, 2000, the date by which the Commission has asked parties to submit their results. AT&T urges that this proposed date be extended by at least nine months, and that no final rules be adopted by the Commission until tests are complete and fully analyzed.”²⁵ So too, Metricom recommends that the Commission provide parties with adequate time to both complete testing and review and comment on test results before it proceeds to adopt final rules.²⁶ Nortel also argues that the Commission should not amend its rules until the public and the Commission have both had a chance to review thoroughly the interference studies underway.²⁷ And Qualcomm urges the Commission “not to act in this proceeding until it has a complete record containing reliable, suitable, and sufficient testing and analysis of the potential for interference from UWB devices.”²⁸

²⁵ Comments of AT&T at 9. Indeed, the Commission stated in its NPRM that “UWB technology is relatively new. Further testing and analysis is needed before the risks of interference are completely understood. Such testing is already being planned by a number of organizations. We will provide ample opportunity to complete these tests and ensure that analyses of the test results are submitted in the record for public comment before adopting any final rules in this proceeding.” *NPRM* at ¶ 1; *see also id.* at ¶ 31.

²⁶ Comments of Metricom at 3. Metricom further notes that its own testing will not be complete until November 30, 2000. *Id.* at 7.

²⁷ Comments of Nortel at 1. Nortel emphasizes that any rule changes should be designed to minimize the risk of harmful interference to present communications services. *Id.*

²⁸ Comments of Qualcomm at 2; *see also* Comments of Rockwell Collins at 2 (asking that the Commission allow at least 120 days more for comprehensive testing).

Motorola urges the Commission to allow sufficient time for all interested parties to fully evaluate the results of current and forthcoming tests of UWB transmissions. The Applied Research Laboratory at the University of Texas at Austin, conducting tests for Time Domain, submitted a preliminary test overview to the Commission on October 6, 2000. Among other things, it reports that approximately 6.4 Gigabytes of data are currently available, and cautions that interested parties should “NOT try to download it all at once.”²⁹ It is apparent that even these preliminary data will be massively difficult and time-consuming to manage, not only in terms of volume but also to interpret and organize. At the outset, the Commission should require a standardized format to facilitate review and analysis of the data by interested parties. It must also provide adequate time for parties to assemble and analyze the data once they are available from the various testing laboratories.³⁰

IV. CONCLUSION

With support from many other commenters in this proceeding, Motorola reiterates its concerns regarding the potential for harmful interference to existing and future radio services from UWB emissions, and recommends that such emissions should be attenuated by substantially more than the Commission has proposed. Appropriate limitations must be applied to UWB emissions to protect services operating throughout

²⁹ *Ex Parte* Notification of Applied Research Laboratories at 1.

³⁰ Motorola also intends to submit additional information regarding limitations on pulse amplitude, duration, duty cycle and other matters for UWB transmissions. This information, unlike the data compiled by Applied Research Laboratories, will be readily amenable to analysis by interested parties and the Commission.

the radio spectrum. Motorola continues to study this issue and will provide further analyses to the Commission soon. Preliminary indications are that a UWB emission limit of more than 18 dB may be necessary to adequately protect other services from harmful interference. However, given the wide range of conditions under which UWB devices may operate, a range of factors must be taken into account in finally determining the appropriate level of protection needed.

Motorola supports commenters' recommendation that the Commission wait until all test data have been fully analyzed before making any decisions with regard to UWB. If the data from these tests are to provide any guidance to the Commission and other parties, they must be presented in a format that facilitates review and analysis.

Respectfully submitted,

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