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BEFORE THE

Federal Communications Commission

WASHINGTON, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

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

To: The Commission

COMMENTS OF GARMIN INTERNATIONAL, INC.

GARMIN International, Inc. ("GARMIN"), pursuant to Section 1.415 of the Commission's rules (47 C.F.R. § 1.415) submits these comments regarding the Commission's Notice of Proposed Rule Making ("NPRM") in the above-captioned docket. Through its NPRM, the Commission has solicited public comment concerning possible changes to its rules to facilitate the use of spectrum for a variety of applications employing ultra-wideband ("UWB") technology. As described in the NPRM, UWB systems "typically employ pulse modulation whereby extremely narrow pulses are modulated and emitted to convey or receive information," with emission bandwidths generally exceeding one gigahertz.[1]

I. BACKGROUND

A. Statement of Interest.

GARMIN has a keen interest in the outcome of this proceeding because, as a manufacturer of many different consumer-oriented devices that rely on the integrity of positioning information provided through the Global Positioning Service ("GPS"), it has concerns about the potential for deployment of UWB devices. As described below, GPS

[1] *NPRM*, FCC 00-163, slip op. at 2 (¶ 3).

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devices rely on their ability to receive transmissions from multiple satellites as a means of pinpointing accurately the location of the device, and therefore the user – and the accuracy of these determinations could be compromised by even a slight increase in interference.

GARMIN manufactures hand-held, portable and fixed-mount consumer GPS devices. The company's products serve a wide range of end users and offer many specific applications, from low-cost, hand-held navigation devices used by hikers and boaters to full, panel-mounted avionics instrument suites used in general aviation aircraft.

B. **GPS and Its Importance.**

As the Commission is aware, GPS is a satellite-based global navigation system developed by the U.S. Department of Defense. The orbits of the 24 low-Earth orbiting GPS satellites have been designed so that, at any given time, multiple satellites are visible from any spot on the earth's surface. GPS devices manufactured by GARMIN and others operate by receiving signals from these GPS satellites that contain a "pseudo-random code," ephemeris data and almanac data. The pseudo-random code identifies which satellite is transmitting. The ephemeris data contain important information such as status of the satellite and the current date and time. The almanac data tell the GPS receiver where each GPS satellite should be at any time throughout the day. By combining the data received from each satellite in view, the system allows the user of a GPS device to pinpoint his or her location. The basic architecture of the GPS system was established in 1973 and remains fixed, *i.e.,* there is no ability for end users of GPS equipment to modify their usage to accommodate interference above the level at which the system was designed to operate. This factor is a fundamental constraint on the addition of new in-band, out-of-band, or other unwanted emissions into frequency bands where the GPS system operates.

Within the United States, both the Administration and Congress have recognized the growing importance of civilian GPS applications and have made strong and unwavering commitments to protecting GPS. The Executive Branch, for example, has approved a comprehensive national policy to ensure the continued availability of GPS for "a broad range of military, civil, commercial, and scientific interests, both national and

international,"[2] and views GPS as a global information utility.[3] Similarly, Congress has enacted specific legislation requesting that the Department of Defense establish a national strategy to "protect the integrity of the Global Positioning System frequency spectrum against interference and disruption," to "achieve full and effective" use of the GPS radio frequency spectrum, and to ensure "GPS evolution."[4]

II. DISCUSSION

A. UWB Technology May Pose A Substantial Interference Threat To GPS.

UWB transmitters are characterized by short, high-energy pulses that make use of spectrum across many bands already allocated for widely-used and relied upon services. Any increase in the basic noise floor produced by these new emitters would significantly reduce the ability of existing receivers to acquire or maintain clear reception of a signal. As a result, UWB transmission signals have a potential to impact a broad range of existing services and communications equipment, including broadcast television receivers, cellular and mobile-satellite service transceivers and, of specific concern to GARMIN, the vast array of navigational, timing and positioning devices using GPS.

GARMIN is concerned that operation of UWB systems in bands that overlap with or are in proximity to the GPS frequency bands could cause interference impacting current GPS users. Any increase in overall interference would have particularly harmful consequences for GPS, where signal losses will, in turn, cause errors in position or time accuracy.

Indeed, the Commission itself expresses the belief "that it is vitally important that critical safety systems operating in the restricted frequency bands, including GPS

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[2] White House Fact Sheet: U.S. Global Positioning System Policy, at 1-3 (released March 29, 1996) (Reference: Presidential Decision Directive NSTC-6).

[3] *See* White House Press Release, Vice President Gore Announces New Global Positioning System Modernization Initiative, Initiative Would Make Global Positioning System More Accessible to Civilian Users, at 1 (released January 25, 1999).

[4] Department of Defense Appropriation Act, Pub. L. No. 105-262, ' 8137, 112 Stat. 2337 (1999). *See also* National Defense Authorization Act, Pub. L. No. 105-85, " 1074(a)(5) & 2281, 111 Stat. 1910 (1997).

operations, are protected against interference."[5] The Commission identifies in the *NPRM* a particular concern with potential interference to GPS in the "L1" band at 1559-1610 MHz and in the "L5" band that was established in the 1164-1215 MHz band at the 2000 World Radiocommunication Conference subsequent to the release of the *NPRM*.[6] The Commission conspicuously notes that its concern about the impact to GPS from UWB transmissions extends beyond the uses of GPS in aviation applications, to "all sorts of applications," including "navigation by automobiles, boats and other vehicles, surveying, hiking, and geologic measurements," and further observes that any harmful interference to GPS could "have a serious detrimental impact on public safety."[7] GARMIN firmly agrees that GPS, in all of its diverse applications, must be fully protected from the detrimental effects that could be produced by UWB pulses.

B. The Commission's Currently Contemplated Approach Appears Inadequate For The Considerable Task Before It, And Provides Cause For Concern Among Current Licensees and Spectrum Users.

Despite the Commission's general recognition of the need to protect existing users and the regulatory standards established over the last three-quarters of a century, as well as its specific identification of the need to protect GPS, the *NPRM* provides reasons for current FCC licensees and spectrum users to be concerned that the manner in which the Commission proposes to proceed may not allow for sufficient evaluation of the impact upon existing services of UWB technology in all its many forms. For example, in the very first paragraph of the *NPRM*, even while acknowledging that no comprehensive tests have yet been completed, the Commission reaches an abrupt conclusion that "UWB devices appear to be able to operate on spectrum already occupied by existing radio services without causing interference."[8] No basis is provided for this determination nor is any information offered

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5 *See NPRM* at 11 (¶ 24).

6 *See NPRM* at 13 (¶ 28).

7 *Id.*

8 *See NPRM* at 1 (¶ 1).

that would clarify the types of UWB applications that appear to the Commission to be capable of co-existence with current spectrum uses. This evident predisposition toward approving general UWB use is unsettling given the fact that the Commission recognizes that no definitive testing has been completed.

Elsewhere, the Commission also makes a tentative determination "that it is appropriate to regulate under Part 15 of the rules low power UWB devices intended to be mass marketed to businesses and consumers."[9] This statement is troubling in two respects. First, the Commission again appears to be reaching a conclusion about the acceptable technical characteristics of UWB without having test results to evaluate. There is not yet any evidence in the record before the Commission to demonstrate that power level by itself is determinative of whether UWB devices can operate on a non-interference basis. Second, the particular market segments to which UWB devices are directed should have no bearing on how they might be regulated.

Moreover, with respect to the very significant issue of cumulative interference from UWB emitters, the Commission observes that its Technical Advisory Counsel ("TAC") concluded that multiple co-located UWB devices would cause "no significant rise in the RF noise floor."[10] However, it is apparent from the Commission's discussion that the conclusion was based solely upon examination of technical papers from four firms that are prominent advocates of UWB technology, without any other evident input. The discussion that is part of the *NPRM* does not explain how the TAC defined "significant" with respect to an increase in the RF noise floor, nor does the record of this proceeding available online at the FCC's website appear to include a copy of this document.

These problems with the existing record and the apparently favorable disposition of the Commission toward approving UWB under Part 15 might be dismissed if the Commission set out in its *NPRM* an adequate timetable for full testing of the technology under a variety of settings, as well as for analysis and follow-up testing, as necessary. However, the Commission's plans in this regard reinforce the notion that the

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9 *See NPRM* at 8 (¶ 18).

10 *See NPRM* at 21 (¶46).

FCC is prepared to move with undue haste to adopt definitive rules. The NPRM contemplates only a single round of testing, with results to be presented no later than October 30, 2000 – less than six months after the issuance of the *NPRM*. While such a schedule may be adequate to perform initial testing, the Commission's evident intent to move quickly to establish rules based upon just one set of test results and with only limited time for public comment would not allow sufficient opportunity for analyzing and critiquing the initial results, or for performing appropriate follow-up trials.[11]

The Commission does acknowledge at some points in its *NPRM* the need to establish a regulatory approach that would provide protection for GPS and other safety services; by proposing, for example, to exclude all but a few types of UWB devices with extremely low interference potentials from operation in frequency bands below about 2 GHz.[12] However, GARMIN does not believe that the Commission has done enough either to explain or to explore the distinctions among the myriad UWB applications that are being considered. Nor has it provided adequate time for interested parties to participate in and to analyze various ongoing technical studies concerning the viability of UWB. Accordingly, the Commission should alter the course that it sets out for itself in the *NPRM*.

C. The Commission Should Proceed In A Deliberate And Scientific Manner In Order To Ensure That Implementation Of UWB Technology Does Not Damage Existing Services Relied Upon By The Public.

GARMIN believes that the Commission's undertaking in this proceeding should not be an attempt to establish a broad technical framework for UWB generally, but instead should be an effort to determine, in the first instance, whether UWB technology is compatible with the well-established regulatory approach that has historically been employed by the Commission for spectrum management. A comprehensive approach to this difficult question is required, as a complete understanding of the science underlying UWB "time domain" technology as it relates to existing "frequency domain" services is an

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11 *See NPRM* at 1 (¶ 1) & 14 (¶ 31).

12 *See NPRM* at 14 (¶ 30).

absolute prerequisite to further action by the Commission. Once such an approach is undertaken and a better understanding is gained, the Commission can move forward on a case-by-case basis to examine specific types of UWB technology, if and as appropriate.

Fundamentally, UWB is not itself a "service" but a broad technology with many not fully defined classes of emitters that have a variety of potential applications. A critical aspect of the Commission's examination of specific applications of UWB technology, therefore, is what sort of application is intended, *i.e.,* whether it has characteristics of a radiocommunication service, comparable to broadcasting or cellular telephony, or whether it can reasonably be considered an intentional emitter under Part 15 of the Commission's Rules, similar to a wireless speaker system or a cordless telephone. Some of the potential applications for UWB appear to be communications services that would require independent Commission service rules, either under an existing subpart of the Commission's Rules or, more appropriately, as a new set of regulations. These types of emitters appear to mandate a complete evaluation of factors that lie outside the scope of revisions to Part 15 of the Commission's rules, as contemplated in the *NPRM.*[13] Other applications of UWB technology, such as the types of ground-penetrating radars ("GPR") or through-the-wall imaging devices ("WID"), some of which are already in unregulated use, appear to fall within a distinct category of emitters, and may be appropriate for regulation under Part 15 of the Commission's Rules, albeit with new regulatory provisions geared specifically to UWB operation.

With respect to GPS, GARMIN believes that the Commission must determine the extent to which particular UWB applications could interfere with GPS signals. The variety of potential UWB applications and the complicated nature of testing emitters that operate in the time domain combine to preclude the Commission from making any generalizations from a single round of test results; instead, these factors dictate that rules adopted in this proceeding be very specific as to the types of UWB emitters permitted and the conditions under which those emitters may operate. The Commission should tread carefully, gathering as much information as possible, and proceeding based on the insight

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13 *See NPRM* at 8 (¶ 19).

gained from these findings in order to determine with safety and certainty just which, if any, applications of UWB technology should be permitted and under what circumstances.

Once comprehensive test results have been obtained, it may be concluded that certain types of UWB devices, such as GPRs and WIDs, can co-exist on a co-frequency basis with GPS receivers, if they are made subject to appropriate regulatory terms and conditions. Under any circumstances, operation of these devices would have to be subject to the types of limitations and conditions that the Commission has previously placed on temporary waivers of its Part 15 rules granted to Time Domain Corporation, U.S. Radar Inc., and Zircon Corporation.[14]

The Commission must not rush to make sweeping judgments on the important questions before it and must not draw unwarranted conclusions from the limited data it will receive at the end of next month – the deadline for the submission of test results in connection with the current phase of the FCC's proceedings. A single round of testing is not sufficient to bring to light all of the unknowns regarding UWB applications, much less to do so within the next seven weeks. The Commission cannot reasonably adopt comprehensive rules affecting a major portion of its licensees and regulatees based on such minimal testing. More time is necessary to analyze and reconcile the results and, based upon these initial findings, to conduct targeted follow-up testing.[15]

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[14] *See* Letters from Dale Hatfield, Chief, Office of Engineering and Technology, FCC, to Devid E. Hilliard, Counsel to Time Domain Corporation, Ronald C. LaBarca, President, U.S. Radar Inc., and Terry G. Mahn, Counsel to Zircon Corporation, each dated June 29, 1999.

[15] It is possible that a particular UWB application could be developed as a communications service, but the Commission does not have sufficient information on the possible characteristics of such a service, and therefore lacks a basis upon which to make informed judgments on related interference issues.

III. CONCLUSION

The Commission must proceed carefully to make informed decisions regarding UWB technology. GARMIN recommends that the Commission obtain test results, and then analyze and reconcile those results prior to establishment of provisional or permanent rules for any UWB devices. The lone exception to this approach might be for appropriately conditioned GPRs and WIDs. Beyond establishing ground rules for these devices, however, the FCC should limit the initial stage of this proceeding to establishing a regulatory framework to be used to set rules for UWB services on a case-by-case basis. With respect to other possible UWB applications, including communications services, it should issue a follow-up notice of proposed rulemaking once it has had an opportunity to evaluate the initial technical studies.

Respectfully submitted,

By: _____

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