

Federal Communications Commission

Washington, DC 20554

In the Matter of

Revision of Part 15 of the FCC's
Rules Regarding Ultra-wideband
Transmission Systems

ET Docket No. 98-153

Opposition of Time Domain Corporation

Paul Withington
Vice-President
Time Domain Corporation
Cummings Research Park
7057 Old Madison Pike
Huntsville, AL 35806

July 31, 2002

TABLE OF CONTENTS

EXECUTIVE SUMMARY ii

PART 15 UWB DOES NOT MODIFY PCS LICENSES..... 1

TECHNICAL DISCUSSION 7

 PCS Issues 7

 The SDAR Industry Petition to Reconsider 11

CONCLUSIONS 19

Executive Summary

The arguments advanced on reconsideration by Sprint PCS, Cingular, Qualcomm and XM and Sirius should be rejected. The PCS carriers incorrectly assert a contractual property right in their licenses. The law is clear. The carriers have licenses to provide PCS service within a given band, in a specified area, for a defined term. Their licenses are *exclusive* in the sense that no other carrier is to be allowed to provide PCS service in the same band, in the same area, at the same time. The Commission's UWB decision does not modify their licenses. Both the cited cases and the reference to the Commission's arguments in *Nextwave* are inapposite legally and factually.

On the technical side, the PCS interests provide information that undergirds rather than undercuts the Commission's conservative approach to UWB emissions from consumer devices. The real world experience taken from the joint Sprint PCS and Time Domain field test compares well to the theoretical analysis once realistic sensitivity and noise figures are considered. Sprint and Qualcomm claim rake receiving allows them to operate at or below -105 dBm because it eliminates Rayleigh fading. However, the real-world measured data already submitted to the record by TDC shows a variation of 4 dB that Sprint admits in its Petition was due to multipath. This data was obtained in an open field with a non-moving handset, which would minimize multipath. Therefore, the 5 dB that TDC was allocating for multipath in its analysis of the interference potential of UWB fits with this data (within 1 dB). In a higher multipath environment (*e.g.*, indoors) with a moving handset, the handset would perform less well because the receiver must be constantly adjusting the rake tap weights (required for combining the signals) and reallocating rake fingers when the signal being tracked is blocked altogether.

Additionally, Sprint PCS questioned the value TDC used for a critical parameter which is used to characterize the amount of multiple access noise. The parameter, F_{no} , used in the Telcordia model can vary from 0.0 to 1.0, where 0.0 represents no multiple access noise (perfect orthogonality) and 1.0 represents a total lack of orthogonality. Sprint questions TDC's usage of the value of 0.1 while noting in the same document that the typical real-world value is 0.5. Had TDC used the value Sprint cites as typical, it would have further emphasized that UWB signals at Part 15 Class B levels would be insignificant.

Moreover, the FCC requires UWB signals to be contained within the 3.1 GHz to 10.6 GHz band and to be 34 dB down at 1.6 GHz. Consequently, the natural roll-off of UWB signals means that PCS operators will see an additional protection of more than 10 dB.

SDARS operators will also benefit from the natural roll-off of UWB signals. In addition, the emissions levels for handheld devices of the sort that can be expected to be nearest to SDARS receivers must be limited to no more than -61 dBm at 1990 to 3100 MHz. These factors correlate quite closely with the -63 dBm that the Commission found appropriate for a portable device operating at under 250 mW in the Wireless Communications Service. As such, the Commission's treatment of SDARS in this proceeding also was conservative.

For the reasons cited in this Opposition, the Commission should reject the arguments of the PCS and SDARS interests.

**Before the
Federal Communications Commission
Washington, DC 20554**

In the Matter of

Revision of Part 15 of the FCC's
Rules Regarding Ultra-wideband
Transmission Systems

ET Docket No. 98-153

Opposition of Time Domain Corporation

Time Domain Corporation (TDC) respectfully submits its Opposition to the Petitions to Reconsider from Sprint PCS, Qualcomm, XM Radio and Sirius.

PART 15 UWB DOES NOT MODIFY PCS LICENSES

Sprint attempts to convert this rule making involving Part 15 devices into a proceeding that it claims unlawfully and adversely affects the PCS licenses it holds.¹ Sprint is simply mistaken. Its arguments overlook not only the Communications Act, but also the very license applications it has signed. Moreover, there is nothing in the Commission's position in the *Nextwave* proceeding that is at odds with the UWB rules.

¹ Sprint Petition at 4. Cingular raises similar arguments in its Petition at 16.

In 1993 Congress gave the FCC authority to institute competitive bidding procedures to resolve mutually exclusive license applications for initial spectrum usage authorizations.² Congress believed that the auction procedures would reduce the delay and inefficiencies inherent in the other methods used by the Commission to resolve mutually exclusive license applications, namely lotteries and comparative hearings. The theory behind this belief was that the initial authorization to use spectrum on a primary basis would be awarded to the party who places the highest value on the spectrum and would be able to deploy rapidly equipment for use within the spectrum.³ While the resolution of mutually exclusive applications via a lottery or comparative hearing presents lower initial costs to the applicant, competitive bidding procedures require an up-front payment to the government that allows the applicant to avoid the delay and uncertainties that accompany the other methods. Nonetheless, the rights that attach to a license grant are no different whether it occurs through competitive bidding, a comparative hearing, or lottery.⁴

Sprint overlooks these facts in its Petition for Reconsideration. Instead, Sprint argues that because the government received a monetary payment from Sprint in conjunction with the various PCS spectrum authorizations from the Commission, Sprint has available breach of contract remedies.⁵ As such, Sprint misses the point by implying that the license grant resulting from the

² The Commission currently has the legal authority to use competitive bidding in the selection of mutually exclusive applicants for initial licenses except in the case of public safety, DTV licenses that would replace analog licenses, and licenses for noncommercial educational broadcasting stations.. *See* 47 U.S.C. § 309(j)(1), (2).

³ *See* Improving Commission Processes, PP Docket No. 96-17, *Notice of Inquiry*, 11 FCC Rcd 14006, 14010 (1996). *See also* 47 U.S.C. § 309(j)(3)(D).

⁴ 47 U.S.C. § 309(j)(6)(D).

⁵ Sprint Petition at n. 13.

competitive bidding procedures is somehow different from a license grant that results from a comparative hearing or lottery.

The authorizations granted by the Commission are clear. Sprint does not own the spectrum in fee. Sprint does not have a lease. Sprint has a license, and a license does not convey any rights other than a permit to use.⁶

Every radio station license granted by the Commission clearly states that the license “is subject to the provisions of the Communications Act of 1934, as amended” and “all pertinent [FCC] rules and regulations.” Every applicant for an FCC radio station license signs a statement waiving any claim to the use of any particular frequency or the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of same, whether by license or otherwise. Indeed, Congress made clear in the Communications Act that “nothing ... in the use of competitive bidding shall ... diminish the authority of the Commission under the other provisions of

⁶ Black’s Law Dictionary makes clear that a “license is not a contract between the state and the licensee, but a mere personal permit,” and notes further that “neither is it property or a property right.” BLACKS LAW DICTIONARY 920, 6th ed. (1990).

The cases that Sprint cited initially and incorporated by reference at note 13 of its Petition to support its view that the licenses have effectively become a contract between the government and licensee are inapposite. See *Sprint ex parte* of February 21, 2001, at 8, n.27. One case involved payments by oil companies for lease contracts with the federal government to explore for and develop oil off of the coast of North Carolina that the federal government repudiated. See *Mobil Oil v. United States*, No. 99-244 (June 26, 2000). Sprint’s other case involved a dispute over contractual terms with a regulated industry (*i.e.*, banking) that assigned the risk of regulatory change to the federal government, which were held enforceable after Congress subsequently changed the relevant law, effectively barring the federal government from honoring the contracts. See *United States v. Winstar Corp.*, 518 U.S. 839 (1996). Neither case has any application to a permit or license authorized by the Federal Government or one of its agencies and particularly not to an FCC radio station license.

this Act to regulate or reclaim spectrum licenses.”⁷ Thus, Sprint cannot possibly own the PCS spectrum for which it has a license. Sprint simply has the Commission’s permission to use the spectrum on a primary basis for a particular purpose, PCS, for a finite duration., subject to the Commission’s Rules.⁸

Sprint suggests that the government is financially liable for allowing low level UWB signals within the PCS bands.⁹ Using Sprint’s logic, every computer and wireless phone manufacturer who makes equipment that places low-level emissions into the PCS bands would also be liable, or at least exacerbate the FCC’s alleged liability. In the UWB *Notice of Proposed Rulemaking*, the Commission proposed authorizing UWB operations at or below the exceedingly low-level Part 15 general limits. Part 15 places appropriate limits on low level emissions from all sorts of electronic devices (*e.g.*, computers, peripherals, telephones, radio receivers, TV interface devices, cable converters, carrier current systems and a host of other devices). Collectively, these devices radiate emissions throughout the spectrum, including the PCS bands, at levels up to those set forth in Section 15.209 of the FCC Rules. Under the Rules adopted in the *First Report and*

⁷ 47 U.S.C. § 309(j)(6)(C). Title III of the Communications Act clearly states that “[i]t is the purpose of this Act, among other things, to maintain the control of the United States over all the channels of radio transmission; and to provide for the use of such channels, but not the ownership thereof, by persons for limited periods of time, under licenses granted by Federal authority, and no such license shall be construed to create any right, beyond the terms, conditions, and periods of the license.” 47 U.S.C. § 301.

⁸ Section 309 (h)(1) of the Communications Act, as amended, 47 U.S.C. § 309(h)(1), states that the “license shall not vest in the licensee any right ... in the use of the frequencies designated in the license beyond the term thereof nor in any manner than authorized therein.” The license grant also comes with some unique restrictions. Section 309(h)(2) of the Act, 47 U.S.C. § 309(h)(2), states “neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of this Act,” as the licensee must apply to the Commission for approval of any assignment or transfer. *See also* 47 U.S.C. § 310(d).

⁹ Sprint Petition at n. 13.

Order, however, UWB devices will radiate at power levels more than ten times lower than the Part 15 general limits when emitting within the PCS bands. Thus, the signal levels that Sprint is opposed to for UWB equipment are already being generated by literally millions of electronic devices, often at higher levels since the Commission opted for a very conservative approach to UWB emissions falling within the PCS bands.

Moreover, for more than a decade (and long before Sprint even contemplated placing bids on the PCS spectrum licenses), the Commission adopted similar provisions stipulating that spurious emissions and out-of-band emissions — the useless signals that are generated by innumerable licensed communications devices, such as two-way pagers and cell phones — do not require attenuation to more than these same Section 15.209 levels. These levels effectively establish a floor below which these devices are not required to suppress their emissions. These levels are permitted to be higher than those the Commission authorized for UWB signals falling within the PCS band.¹⁰ The relevant inquiry is not whether other signals are allowed within the PCS bands. Rather, it is whether UWB will cause harmful interference to licensed operations. To TDC's knowledge, the Commission has never found a device that has been certified and is being operated in accordance with the general emissions limits specified in Part 15 to cause harmful interference.

¹⁰ Under the definitions adopted in the First Report and Order, the UWB emissions that fall into the PCS band would either be “spurious” or “out-of-band” and as such not even “intentional emissions.” But even if one were to consider these emissions as intentional, the fact remains that the levels are far below what the Part 15 rules now permit in the PCS bands.

The FCC's *Nextwave* brief cited by Sprint offers no support for Sprint's arguments.¹¹ The issue in *Nextwave* was whether the Commission could authorize another exclusive licensee to provide PCS services in spectrum for which the Commission had already issued a PCS license using auctions to resolve mutually exclusive applications and had not successfully reclaimed the first PCS license after the payment default and bankruptcy of the initial licensee. In *Nextwave* the exclusivity involves that of one PCS licensee versus another PCS licensee for the same spectrum. The Commission's arguments in *Nextwave* in no way undercut the authority of the Commission to modify its Part 15 Rules to authorize UWB. By misconstruing "exclusivity" as applied to PCS licenses, Sprint is making not so much an "apples and oranges" argument as it is one involving a comparison of a Sequoia tree to grain of wheat. Both a PCS license and a UWB device equipment authorization involve authority to emit radio frequency energy, but the comparison does not go much further. One involves a license to offer PCS services in a geographic area to the exclusion of any other would-be PCS licensee in the same band in the specified area. The other permits the use of an unlicensed device at less than 10 *billionths* of a watt in the same spectrum provided that the operation of the device does not cause harmful interference.

Arguments that UWB is so different from what could heretofore be authorized in the PCS bands are similarly misplaced. Indeed, there was absolutely no prohibition on the Commission's authorizing, for example, a broadband direct sequence unlicensed device to operate at the Section 15.209 levels within the PCS band occupying all of the spectrum for which Sprint holds a license that allows Sprint to provide PCS services at millions of times more power and to the

¹¹ Sprint Petition at n. 14.

exclusion of another PCS licensee.¹² Similarly, there is no prohibition on broadband RF noise from digital devices falling into the PCS bands at power levels that are at least ten times greater than the levels specified in the UWB Rules.¹³ In short, Sprint's claim that the Commission unlawfully permitted UWB energy to fall within the PCS bands runs counter both to the law and to a reasoned assessment of the facts. Once more, the Commission should reject Sprint's argument that whatever degree of exclusivity it has to use the PCS spectrum must foreclose the authorization of UWB.

TECHNICAL DISCUSSION

PCS Issues

Sprint PCS and Qualcomm, in their petitions, claim that the FCC misunderstands the operation and performance of IS-95 PCS networks. However, the theoretical analyses submitted by Sprint PCS and Qualcomm do not contradict the findings of the FCC.

¹² Accordingly, arguments such as those made by Cingular in its Petition at 18 that recognize that the prior – and current – rules permit non-UWB unlicensed operation in the PCS bands while asserting that UWB is radically different and so deleterious as to render inapposite any reference to the operations authorized by Part 15 before PCS are simply unfounded. There was no prior requirement that all such Part 15 emissions be “narrowband.” The general Part 15 rules on intentional radiators specify neither bandwidth nor modulation type. If one wants to operate at higher power such as 4 watts eirp, however, then Section 15.247, for example allows spread spectrum operation but only within certain specified bands.

¹³ Digital devices marketed for use in commercial and industrial environments are subject to the so-called Class A limits, which are 6 to 10 dB less stringent than the Class B limits that apply to personal computers and other digital devices marketed for use on an unrestricted basis. The digital device limits predated the PCS service by well over a decade. As such it is certainly reasonable for standards bodies, carriers, and equipment manufacturers to develop system specifications that would address these emissions, which can be either narrowband or broadband.

In Attachment 1, Sprint discusses the impact of rake receiving on the fading characteristics of a PCS communications channel. Sprint's argument implies that rake receiving sufficiently negates the impact of Rayleigh fading that no fading margin is required and, thus, a PCS handset can operate closer to its thermal noise floor. Sprint presents two figures to support this contention. Sprint's Figure 12 appears to have been derived from Figure 11 by assuming that a PCS CDMA handset would be summing three statistically equivalent, but independent, samples from the data presented in Figure 11.¹⁴ While it is well known that rake receiver architectures can reduce the impact of fading, it is unclear what gain is achieved in practice, i.e., in the real world¹⁵. The value of real-world measurements is emphasized by Sprint in its Attachment 2, in which they state that "the RSSI (total received forward link power) varied between -96 and -92 dBm. This variation presumably due to multipath fading." Thus, in a test conducted in an open field with a line-of-site path to the PCS base station with a stationary handset – a very benign operational environment – there was a 4 dB multipath induced variance. This is close to the 5 dB variance assumed by TDC in its earlier filings. Indoors, with a moving handset, the environment is much less benign. The receiver must be constantly adapting to the more widely varying multipath. In order to combine the signals from the three rake fingers properly, the receiver must recalculate numerical weights. The faster the signals vary, the more difficult it is to accurately estimate these weights. Additionally, the rake fingers are more likely to lose their signals altogether further reducing the value of rake receiving. During this period of loss, there

¹⁴ Sprint PCS Petition, Attachment 1, pp 19 – 20.

¹⁵ In the real world, for example, rake tap weights (used for coherent combining of different multipath components) must be constantly re-calculated to compensate for signal level variations. Incorrect values reduce performance. Moreover, if any of the three signals being tracked disappears altogether, then a new path must be acquired; during the time it takes to accomplish this reacquisition, there is no performance enhancement from the rake combining.

is no gain from the rake finger. Thus, real-world data suggests that a 5 dB fading margin is reasonable and conservative.

In Attachment 2, Sprint questions the use by TDC of the value 0.1 for F_{no} ¹⁶. TDC chose this value because it is a conservative value. Sprint states “[i]f perfect orthogonality is preserved over the propagation channel, then $F_{no} = 0$ and there is no in-cell interference. For system-level calculations, a typical value of F_{no} that is used is on the order of 0.5.”¹⁷ If TDC had chosen a value 0.5, which Sprint states is typical, our analysis would have shown that UWB was even more negligible than TDC stated in its NPRM submission.¹⁸

Additionally, we note that in practice, the PCS industry will likely have substantially more than 12 dB of protection. A signal that conforms to the FCC requirement that 10 dB down bandwidth of indoor and handheld systems be contained within the 3.1 to 10.6 GHz band and be 34 dB down at all frequencies below 1.61 GHz practically forces the intentional emissions to be at least 20 dB down from Part 15 as suggested by Figure 1.

¹⁶ Sprint PCS Petition, Attachment 2, p 5.

¹⁷ Sprint PCS Petition, Attachment 1, p 5.

¹⁸ A larger value of F_{no} means there would be more multiple access (self) noise. Increasing self-noise would have reduced the significance of other noise sources, including UWB.

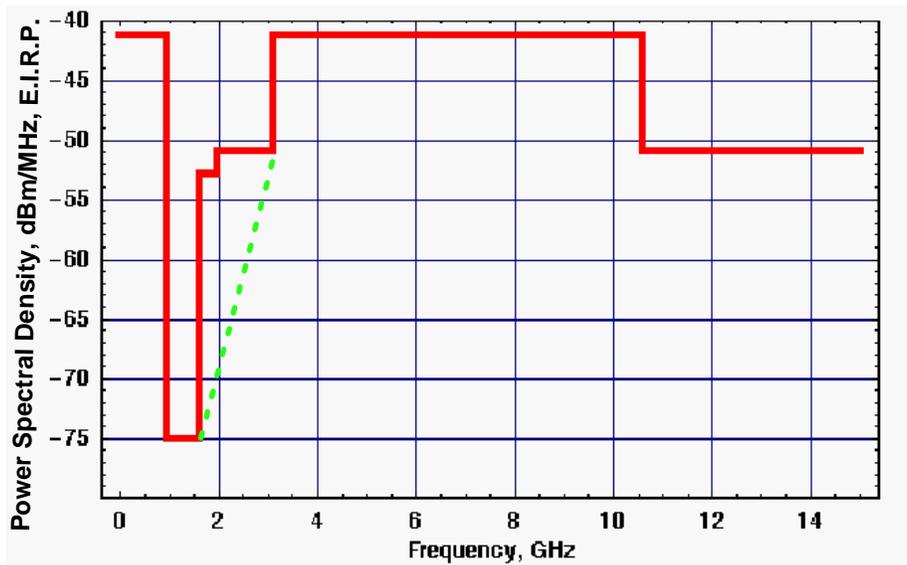


Figure 1. The FCC's indoor UWB mask. The dotted green line suggests how real UWB signals will roll off below 3.1 GHz.

The FCC's Part 15 Rules historically have allowed intentional emissions in the PCS band at an EIRP level of -41.25 dBm/MHz. For UWB technology the FCC took an extremely conservative approach and required an additional 12 dB reduction in the PCS band. In practice, PCS will have significantly better than a 20 dB reduction in emissions from UWB devices in the PCS band. To date, neither Sprint nor Qualcomm have presented a technically coherent argument that justifies any reduction from the -41.3 dBm EIRP level, let alone justification for levels below those which UWB devices will place in the PCS bands as a result of the *First Report and Order*. TDC, consequently, supports the findings of the FCC as a conservative approach to UWB for consumer devices and submits that the protection provided to PCS is more than adequate.

*The SDAR Industry Petition to Reconsider*¹⁹

In their joint petition for reconsideration, Sirius and XM radio raised several issues that they claim the Commission either ignored or otherwise failed to address in developing its rules for UWB devices. To support their claims they specifically referenced "surveillance" and "hand held" UWB devices stating that the adopted limits in the DARS band, 2320 to 2345 MHz, for these devices would not adequately protect the DARS service. In challenging the Commission, the petitioners made the following assertions, none of which presents a basis for the Commission to reconsider its decision:

1. The Commission erred in considering the link budget provided by Sirius to be excessive and the use of terrestrial repeaters provided additional signal margin.
2. The Commission erroneously concluded a separation distance of 8.8 meters was adequate to prevent harmful interference to DARS reception and that only one UWB device needed to be considered to determine the interference potential at a time.
3. The Commission failed to consider home listeners.
4. The Commission erred in assuming that UWB manufacturers will not build equipment to the limit permitted by the Rules.
5. The Commission ignored the effects of "transient interference".
6. The Commission ignored previous Commission national and international actions limiting interference in the SDARS band to acceptable values.

A careful analysis of the above issues raised by the petitioners will show, contrary to claims, that the Commission carefully addressed and analyzed the above issues. To address the

¹⁹ Joint Petition for Partial Reconsideration, Sirius Satellite Radio, Inc and XM Radio, Inc. Hereafter, the "SDAR Petition"

issues raised by the petitioners, TDC provides the following analysis of each of the points raised relative to the Commission decision.

Link budgets are used by service providers to establish statistical probabilities of establishing a successful link between a transmitter and an intended receiver. These budgets typically account for any number of factors that influence signal level by using approximations for those factors and then add an additional factor for "insurance" purposes. For example, the petitioners state their link budget, among other factors, provides for blockage, fading, and foliage attenuation. These three factors are essentially exclusive of each other in that the maximum allowance for each has essentially a zero probability of all occurring at the same instant in time. Taking this reality into account and recognizing that link budgets include an additional factor for an "insurance" margin, it is completely reasonable to conclude that a link budget has an excessive margin.

The SDARS petitioners further downplay the fact that they will rely extensively in major markets on terrestrial repeaters. The petitions make no mention of the fact that such repeaters will provide additional robustness against UWB and other noise, preferring instead to minimize the benefit of the repeaters. For example, they state that these repeaters only cover approximately 1% of the United States. Here again, the petitioners potentially provide misleading information to substantiate their contention. The issue is not what percentage of the United States has terrestrial coverage, rather it's what percentage of the population will be served by terrestrial augmentation of the satellite signal. Common sense would dictate that terrestrial augmentation systems would be used in locations in and around cities where the satellite signal would be subject to the "blockage, fading, and foliage attenuation" relative to the majority of

users that is part of their link budget. This is also the environment where UWB devices will be found.

In determining that 8.8 meters was a reasonable separation distance it must be put in context of a perimeter surveillance system operating as a field disturbance sensor at a level -41.3 dBm EIRP. The operating limit for "hand held" devices is 20 dB lower and this separation distance would be reduced to 0.9 meters. For a "mobile" receiver application such as DARS with a requirement for antenna gain directed upward, this is a very conservative separation specification and common sense dictates that hand held devices are not a concern relative to interference with DARS receivers.

For surveillance systems, the Commission required the operator to be eligible for a Part 90 license and to coordinate the system with the Federal Government. These systems are only available to law enforcement, fire, emergency rescue organizations, and specific entities eligible for licenses under Part 90, including such critical infrastructure sites as nuclear power plants and natural gas pumping facilities that would use these systems to detect unlawful entry as part of their stepped up security. In claiming 8.8 meters was not a sufficient separation distance, the petitioners used the example of cars driving alongside the perimeter of a property protected by the surveillance system with the implication the separation distance would be much less than 8.8 meters. In this scenario according to the petitioners, the pleasurable experience of a DARS subscriber listening to his favorite music would be momentarily disrupted as he cruises down the highway and passes within a few meters of a UWB surveillance system.

Field disturbance sensors are used to detect the motion of objects or people within a protected area. The placement of such a system in an area where there is frequent and allowable

motion of objects, people or animals (such as along streets having automobile or pedestrian traffic) would destroy the utility of the system. Such systems would be intended to detect motion in areas that are off limits. In fact, the probable location of such a system would be well behind a chain link fence or other obstacle much farther from a roadway than 8.8 meters. Here again, the judgment of the Commission and their expertise is apparent. The attenuation of the UWB signal with distance and other factors discussed by the Commission relative to UWB emission characteristics clearly support the levels adopted by the Commission as a "conservative" approach to emissions limits for UWB devices.

The SDARS Petitioners next state that the Commission did not consider home listeners to DARS systems. TDC calls attention to Paragraph 169 of the *First Report and Order* where the Commission specifically references DARS systems mounted on building roofs or side of a building. Microwave signals at the DARS frequency do not penetrate buildings very well and suffer considerable attenuation. While receivers with antennas mounted in homes may function, it would be due to the additional signal from a terrestrial repeater network. Thus, the Commission clearly did consider home listeners and concluded that relative to satellite reception, DARS receiver systems used in the home would by necessity employ external antennas.

In developing the conservative limits for UWB that were adopted in the First Report & Order, the Commission defined specific bands for various types of UWB devices. The regulations require the UWB bandwidth to be confined within a specific band of frequencies for each equipment category. Considering that UWB devices are pulse based, the emission characteristic is defined by a maximum level contained within the specified band according to the rules with a minimum attenuation of 10 dB at the edges of the defined UWB band. To have

systems operating at the maximum limit in the 2320 to 2345 MHz band would require pulsed UWB systems capable of "brick wall" emission characteristics, i.e., non-existent technology. The emission characteristic would have to spread uniformly across the UWB band and then drop to the specified level outside the UWB where it would remain at a uniform level until it reached the next band requiring a further decrease in its emission level. Actual UWB systems have emission characteristics that have peaks in the middle of the UWB band and gradually roll off to meet the band edge requirements.

For surveillance systems, the roll off of the UWB bandwidth emission characteristic in the DARS frequency band can be expected to be of the order of 10 dB relative to the maximum permitted level of -41.3 dBm. For hand held devices, with a UWB bandwidth within the 3.1 to 10.6 GHz band, the roll off characteristic can be expected to be of the order of 30 dB or more in the DARS frequency Band below the maximum permitted level of -41.3 dBm in the UWB band. The above statements are based on engineering judgment and a through knowledge of UWB technical requirements that have been expressed in the filings pursuant to the UWB proceedings. Thus, the Commission was clearly correct in its position that "[i]t also is likely that the UWB emissions would be somewhat below the maximum level permitted under the rules."²⁰

The Commission's mandate for Part 15 is to regulate devices operating under its provisions to prevent harmful interference. Harmful interference is defined as:

"Any emission, radiation or induction that endangers the functioning of a radio navigation

²⁰ UWB First Report and Order, ¶ 169.

service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radio communications service operating in accordance with this Chapter."²¹

What constitutes harmful interference to DARS systems and what is acceptable interference was addressed in Docket 96-228²². In Paragraph 25, the Commission clearly states that "a desire for an interference free radio service must be balanced with the need to provide reasonable operating parameters for adjacent services." Further, the Commission states "[a]ccordingly, our intention in determining out-of-band emission limits for WCS into the spectrum used by DARS has been to limit the potential for interference to a reasonable level -- not to provide a pure, interference-free environment." Having previously recognized in 1997 that the electromagnetic spectrum must be shared by all and that the DARS service should not expect to have a pure interference-free environment, it is totally unrealistic to expect the Commission to suddenly recognize "transient interference" as a form of interference the DARS service must be protected against. Transient interference is by its very nature brief, randomly occurring and transitory.

The petitioners stated that the Commission did not recognize its previous decisions limiting interference in the DARS band to the same level as it recognized in the WCS proceeding, i.e., to an EIRP level of -80 dBm. However, a review of that record indicates the DARS band was not necessarily afforded that level of protection. In Docket 96-228, the Commission analyzed the interference threat a system proposed by PPF/Digivox posed to the

²¹ 47 C.F.R. § 15.3(m) (2001).

²² Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service ("WCS"), Memorandum Opinion and Order, FCC 97-112, rel. April 2., 1997.

DARS service. Having the technical specifications of the proposed system and the DARS receiver system, the Commission analysis determined that the previously adopted emissions mask of -80 dBm EIRP could be significantly relaxed to permit an out-of-band emission level of $93 + 10\log P$ equivalent to a level of -63 dBm for portable devices. In reaching this determination, the Commission drew a distinction between mobile units and portable units based on their relative usage conditions.

In the UWB *First Report & Order*, the Commission used the same approach in determining appropriate limits for UWB devices. The technical specifications were those they would adopt for UWB operation. In the instant case, the DARS receiver performance specifications were those specified by XM Radio²³ in the UWB proceeding. As can be seen from the above, in both cases the Commission used, for each system, specific technical information as to the potentially interfering device and the victim receiver to analyze the risk of interference. The similarity of the results in both individual cases is striking, -63 dBm in the WCS analysis and -61 dBm in the UWB analysis for hand held devices that are defined by the Commission as portable devices. Clearly, the approach in both instances was quite similar and thus a claim that the Commission ignored previous policy is unfounded based on the record.

Finally, the SDAR Petition erroneously states that a recent NASA study “shows that UWB devices *operating at the Commission’s adopted limits* caused interference to aviation landing systems ‘knock[ing] out the ILS [Instrument Landing System] localizer.’” [Emphasis in original.]

²³ See UWB First Report and Order, ¶ 168.

This study does not, in fact, show this. The only documentation available from NASA²⁴. suggest that the emitted power levels used in the testing were probably significantly higher than the FCC Part 15.209 power levels. Additionally, the levels are perhaps 30 to 50 dB higher than would be encountered from consumer applications of UWB (unless ground penetrating radars are to be used aboard aircraft). For example, the ILS system cited in the SDAR Petition operates on frequencies between 108 and 111 MHz (just above the FM broadcast band). Since consumer UWB device must have their 10 dB bandwidth between 3.1 GHz and 10.6 GHz and they must be -75 dBm/MHz across the aeronautical bands, there will not be any UWB emissions in this band, which is 3 GHz lower in frequency, from these devices.

²⁴ *Ultrawideband (UWB) Electromagnetic Interference (EMI) to Aircraft Radios Results of Limited Functional Testing with United Airlines Airplanes in Victorville, California*, Presented to ATA, Washington D. C. by Jay Ely, NASA Langley Research Center, 5/22/2002. (This is a MS PowerPoint presentation and not a fully documented report.)

CONCLUSIONS

The Commission should deny the reconsideration petitions filed by Sprint PCS, Cingular, Qualcomm, and XM and Sirius. These petitions vastly overstate the potential of UWB devices operating under the limits adopted by the Commission to cause harmful interference. Implementation of the limits proposed in these petitions would undermine the Commission's goal of bringing the benefits of UWB technology to American consumers. Moreover, adoption of the views and limits proposed in these petitions would come back to haunt the Commission as it deals with the out-of-band limits and protection requirements that will inevitably confront the agency as it goes about adopting rules for other new services and reevaluating the rules for existing services. The emissions limits adopted in the First Report and Order are a very conservative step, but a step forward. To adopt even more restrictive limits would be a step backward.

Respectfully,
Time Domain Corporation

By submitted electronically
/s/ Paul Withington
Vice-President
Cummings Research Park
7057 Old Madison Pike
Huntsville, AL 35806

July 31, 2002

CERTIFICATE OF SERVICE

I, Paul Withington, Vice President of Time Domain Corporation, hereby certify that on this 31st day of July, 2002, a true and correct copy of the foregoing Opposition for Time Domain was sent by first class mail to the following:

Nicholas Allard
David M. Leive
Olivier P. Strauch
Latham & Watkins
555 11th Street NW
Washington, DC 20004
Counsel for Sirius Satellite Radio Inc.

Bruce D. Jacobs
David S. Konczal
Shaw Pittman LLP
2300 N Street NW
Washington, DC 20037
Counsel for XM Radio Inc.

Dr. Samir S. Soliman
Vice President – Technology
QUALCOMM Incorporated
5775 Morehouse Drive
San Diego, CA 92121-1714

Dean R. Brenner
Crispin & Brenner, P.L.L.C.
1156 15th Street, N.W.
Suite 1105
Washington, DC 20005
Attorney for QUALCOMM Incorporated

J.R. Carbonell
Carol L. Tacker
David G. Richards
Cingular Wireless LLC
5565 Glenridge Connector
Suite 1700
Atlanta, GA 30342
Its Attorneys

Luisa L. Lancetti
Vice President, PCS Regulatory Affairs
Sprint Corporation
401 9th Street, NW, Suite 400
Washington, DC 20004

Charles W. McKee, General Attorney
Scott Freiermuth, Attorney
Sprint Corporation
6450 Sprint Parkway
Mail Stop: KSOPHN0212-2A553
Overland Park, KS 66251

/s/ Paul Withington

Paul Withington