Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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

SPRINT PCS SUPPLEMENTAL COMMENTS

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Executive Summary

Some UWB proponents acknowledge that (a) UWB will interfere with existing licensees and other authorized usage below 2 GHz and (b) in any event, this frequency band is not needed to provide communications-based UWB applications. Other UWB proponents contend that UWB use of the 1-2 GHz band is necessary and will not cause interference, even at the existing Part 15 emission limits. These assertions are incompatible with the results of the tests and modeling Time Domain, a UWB proponent, performed with Sprint PCS. These tests and models, summarized in a previous joint filing before the Commission, document that UWB devices *will* cause harmful interference to PCS CDMA networks — even at the more stringent –53.2 dBm/MHz average power level suggested in its *Notice*.

Additional UWB evaluation is needed in at least two other areas before the Commission can consider authorizing mass-marketed UWB applications in frequencies below 3 GHz. First, additional study is needed to assess the interference impact of multiple collocated UWB transmitters. Common sense and elementary RF engineering principles, coupled with the very design of CDMA technology, suggest that two UWB devices transmitting simultaneously next to each other will cause greater interference than only one UWB transmitter. Sprint PCS could not study the impacts of multiple collocated UWB emitters because only one device was available for the tests, but it is clear that this is an area requiring further research to ensure that the interference impacts of UWB devices are not underestimated. The Commission should therefore recognize that the inter-

ference data contained in these comments represents the ***minimal*** interference impacts of UWB devices on PCS handsets.

Second, if and when UWB devices are introduced in the market, Sprint PCS and other CMRS licensees will be operating third generation networks rather than their current "2G" networks. It is reasonable to expect that new 3G technologies, most of which will be CDMA based (*e.g.,* Wideband-CDMA, cdma2000), will be impacted by UWB interference as much as, if not more than, 2G networks. Thus, if the Commission is to make decisions based on marketplace realities, it must consider the interference impact of UWB devices on the 3G systems that will soon be operational.

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Sprint Spectrum, L.P., d/b/a Sprint PCS ("Sprint PCS"), submits these supplemental comments to further explain the joint test summary and model Sprint PCS filed in conjunction with Time Domain and to quantify the effects of ultra-wideband ("UWB") devices on code-division multiple access ("CDMA") systems operating in the 1850-1990 MHz PCS spectrum band.[1]

I. The Test Summary and Model Jointly Filed by Sprint PCS and Time Domain Confirm That UWB Devices Can Cause Harmful Interference with CDMA PCS Systems — Even If UWB Devices Are Operating Within the Average Power Levels Discussed in the Notice

Some UWB proponents contend that the Commission should permit UWB devices in the 1-2 GHz band under current Part 15 emission levels.[2] In stark contrast, other UWB proponents acknowledge that UWB would likely cause "significant" interference with licensed systems in this band and that as a result, UWB should *not* be permitted in this band until additional study can be completed:

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[1] Sprint PCS alternatively submits this document pursuant to the Commission's *ex parte* rules. *See* 47 C.F.R. §§ 1.1201 *et seq.*

> Unfortunately, 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 shown to be false.[3]

The Commission, perhaps as a compromise "strawman," has sought comment on a proposal to attenuate current Part 15 limits (-41.2 dBm/MHz) by an additional 12 dB for an overall UWB emission limit of –53.2 dBm/MHz.[4]

The joint test summary and model Sprint PCS filed with Time Domain and which was prepared by Telcordia Technologies demonstrate that even the -53.2 dBm/MHz emission level proposal is <u>not</u> adequate to protect Sprint PCS' network from harmful interference.

Earlier this year, Sprint and Time Domain performed a series of tests on one of Time Domain's UWB transmitters in order to determine whether such transmitters might affect Sprint PCS' IS-95 (or CDMA) PCS network. Although additional analysis is necessary (*see* Part II below), the tests and modeling performed to date document that UWB devices can cause harmful interference to CDMA networks and services. The test methodology and test results are summarized in the paper prepared by Dr. Padgett of Telcordia Technologies, which Sprint PCS and Time Domain submitted to the Commission on

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2 *See, e.g.,* Time Domain at 29 ("The Part 15 general limits have shown to be adequate to protect against harmful interference.").

3 *See* Multispectral Solutions ("MSSI") at 10-12. *See also id.* at 12 ("[T]he argument from portions of the UWB community that frequencies below 2 GHz are necessary for in-building communications have no basis in fact."); Fantasma Networks at 3 ("UWB communications systems do not require frequencies below 2 GHz."). In fact, only penetrating or long distance radar and communications applications require spectrum below 2 GHz, and so long as these are niche applications that are not mass marketed, Sprint does not necessarily oppose these applications.

4 *UWB NPRM* at ¶ 39.

September 12, 2000.[5] In addition to this testing, Dr. Padgett has prepared a theoretical model demonstrating the likely effects of UWB devices on CDMA networks.[6]

Both the test results and the theoretical model confirm that a single UWB device causes harmful interference when it is within a certain distance of a CDMA PCS handset. Specifically, the tests showed that UWB emissions can affect the forward link of an IS-95 system because they increase the noise floor of the handset receiver.[7] Interference increases as a handset and UWB device are placed closer together. As the noise level increases, the handset requires more power to maintain forward link transmissions to compensate, or offset, the additional noise. Thus, the closer a handset is placed to a UWB device, the more power the handset needs to maintain continued transmission.

The interference generated by a UWB device can have two adverse effects on CDMA-based PCS service. First, UWB interference can cause PCS calls to drop, or prevent the PCS customer from making or receiving calls altogether. This condition will occur if the forward link power required to overcome the UWB interference exceeds the maximum allowed for the handset. However, in addition to this direct blocking, UWB devices can also cause indirect blocking. Specifically, even in situations where the base

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5 *See* Dr. Jay Padgett, Senior Research Scientist, Telcordia Technologies, *Summary of Testing Performed by Sprint PCS and Time Domain to Characterize the Effect of Ultra Wideband (UWB) Devices on an IS-95 PCS System* (Sept. 12, 2000), Attachment 2 to the Sprint PCS/Time Domain filing.

6 *See* Dr. Jay Padgett, *A Model for Calculating the Effect of UWB Interference on a CDMA PCS System* (Sept. 12, 2000), Attachment 1 to the Sprint PCS/Time Domain filing.

7 Forward links are the transmissions generated by a base station and sent to and received by the mobile unit, or handset. The noise floor is the received power when there is no desired signal present, and the noise floor consists of thermal noise, receiver noise, and environmental noise (including that caused by interfering signals). *See* C. J. Hall, *Evaluating Noise,* available at <www.wirelessreview.com/issues/1998/81115/tm.htm>.

station can forward the additional power the PCS handset requires to maintain a communications link in order to offset the UWB interference, the base station will correspondingly have less forward link capacity to assign to other PCS customers wanting service from the base station. Thus, UWB interference can reduce the capacity of Sprint PCS' network because a base station will be able support fewer customers than it was designed to serve.[8]

The Sprint/Time Domain tests were performed shortly before the Commission released its *UWB Notice* and support the validity of the model prepared by Dr. Padgett. Although the Time Domain device did not operate at the –53.2dBm/MHz emission level discussed in the *Notice*, the Telcordia model, which the tests validated, allows one to draw conclusions regarding UWB devices that have an average power emission output level of –53.2 dBm/MHz.

As noted, one of the effects of increased noise is that the PCS handset will demand more power from the base station to overcome the interference. The Telcordia model permits one to calculate the loss of system capacity (indirect blocking) resulting from demands for increased forward link power. At the –53.2 dBm/MHz emissions level discussed in the *Notice,* a fair signal (-90 dBm RSSI) PCS handset will ask for 8% more power when exposed to a UWB device two meters away. A weaker signal (-100 dBm RSSI) PCS handset will demand 50% more power. The network capacity loss could thus

8 The Commission should not, therefore, be mislead by UWB proponent demonstrations showing that a PCS handset is capable of operating within inches of a UWB device. Even if service to this particular handset is not negatively impacted, service to other customers (indirect blocking) can be impaired depending on the demand for service at the base station at a particular point in time.

be considerable if several PCS customers served from a base station are near an active UWB device.

A second effect of interference is direct blocking, a PCS call will be dropped or a call attempt blocked if the handset is too close to an active UWB device. This condition will occur when the base station cannot supply the power the handset needs to overcome the interference, because the power the handset demands exceeds the designed limits. The number of blocked calls will vary depending on the number of customers served by a particular base station that are also located near an active UWB device. At the –53.2 dBm/MHz emission level suggested in the *Notice,* and assuming that between one in twenty and one in five PCS customers are within three meters of an active UWB device, the model demonstrates that the resulting additional blocking percentages are from 1.2% to 4.8% respectively. At two meters, the additional blocking rates increase to 2.0% and 7.9% respectively.[9] These blocking estimates for a single UWB device are conservative.[10]

These direct and indirect blocking conditions are the result of an increased noise floor generated by UWB devices. Based on the model, it appears that a PCS handset exposed to a single UWB transmitter at two meters will see its noise floor rise by nearly 4

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9 The blocking percentage increases dramatically if the UWB devices were instead operating at current Part 15 (-41.2 dBm/MHz) emission levels. At three meters, the additional blocking percentage would range from 3.7% to 14.8%, and at two meters it would further increase from 4.2% to 16.7%.

10 The Telcordia model uses a 7.5 dB loss through the antenna and handset, the approximate measurement obtained during the anechoic test. For handsets with less loss, the blocking percentages would most likely increase.

dB. Even if the distance is at four meters, the noise floor rises by 1.3 dB.[11] The results of the UWB impact on PCS handsets are summarized in the table appended as Attachment A.

It is important to emphasize that the results above assume that only one UWB transmitter impacts the PCS handset. If, as Sprint PCS believes is likely (*see* Part II.A below), multiple collocated UWB emitters will further intensify the UWB interference, the loss of system capacity and the number of blocked calls could increase dramatically.

Time Domain has told the Commission that it should "allow UWB devices to operate with signal levels up to the [current] Part 15 general limits":

> The signals that TDC is proposing to use are at or below the well-established Part 15 limits, and TDC firmly believes that UWB will not cause harmful interference. * * * The proposed 12 dB decrease in field strength below 2 GHz — beyond the already incredibly low power levels being proposed — would force TDC . . . to use a higher frequency signal with different and *potentially* unsatisfactory propagation characteristics.[12]

These assertions are inconsistent with the Sprint/Time Domain joint filing which documents that even a –53.2 dBm/MHz emission level is not sufficient to protect Sprint PCS' sophisticated CDMA network from harmful interference. It is also noteworthy that Time Domain's views — relative to both the need for UWB to use the 1-2 GHz band and the interference impact UWB will have on existing licensees — are not shared by other UWB proponents.[13] Given that the harmful UWB impacts are real, while according to

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11 In the case without handset loss, the noise floor rises by 4 dB at four meters and 8.5 dB at two meters.

12 Time Domain Ex Parte at 2 (Sept. 20, 2000)(emphasis added).

13 *See* note 3 and accompanying text.

Time Domain its avoidance of the PCS band is at most "potentially unsatisfactory", there is no basis in the current record to justify a Commission decision authorizing mass marketed UWB devices in the 1-2 GHz band.

II. Additional Evaluation Is Necessary to Understand the Full Impact of UWB Devices on Evolving CDMA Systems

The Sprint PCS/Time Domain tests described in the joint filing are admittedly limited in scope. Nevertheless, the test results and modeling demonstrate that the power limits discussed in the *Notice* — whether the current Part 15 (-41.2 dBm/MHz) limits favored by a handful of UWB proponents or the more rigorous –53.2 dBm/MHz proposal mentioned by the Commission — are not sufficient to protect Sprint PCS' sophisticated CDMA network from harmful interference. Additional analysis is still necessary, however. As discussed below, Sprint PCS is particularly concerned by the potential UWB interference impact caused by multiple, collocated UWB transmitters and the impacts UWB devices may have on next generation (and even more efficient) CDMA technologies.[14]

Sprint PCS paid approximately $3 billion for its PCS radio licenses. The burden obviously is on the UWB industry to demonstrate convincingly that their proposed use of

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14 Further understanding is also needed about UWB peak emission levels and the impacts such levels have on licensed services. The particular UWB device tested by Sprint appeared to affect the PCS handset in the same way as a Gaussian noise signal, hence Telcordia's analysis and these comments have focused on average power only. However, as many commenters have noted, peak power is a concern when a UWB's pulse repetition frequency ("PRF") does not greatly exceed the victim receiver's bandwidth. This is a subject that Sprint intends to address in its reply comments.

Sprint PCS' licensed spectrum will entail "no potential for interference."[15] As the Commission stated long ago:

> The burden of proof is on the applicants and unless it has been shown affirmatively that either or both of the proposed antenna systems will function without the hazard of interference, the burden has not been sustained.[16]

Those UWB proponents wanting to use the 1850-1900 MHz PCS spectrum band have not yet satisfied their burden of proof to demonstrate that their use of this band will not cause harmful interference.

A. The Commission Is Correct That Further Analysis Is Necessary to Determine the Interference Impacts of Multiple, Collocated UWB Transmitters

With several of the proposed UWB applications (*e.g.*, wireless LANs), it is likely that multiple UWB transmitters will be collocated in the same area (within one or two meters of each other).[17] Unfortunately, Sprint PCS was unable to test the impacts of multiple, collocated UWB transmitters because only one UWB device was available for the test. The Commission's Technological Advisory Council apparently has concluded

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15 *See New Channels Communications,* 57 R.R.2d 1600 ¶ 6 (1985)("The burden of demonstrating that there is no potential for interference rests with the applicant.").

16 *Cosmopolitan Enterprises,* 15 F.C.C.2d 659, 674 No. 4 (1967). *See also Waynesboro Broadcasting,* 1 F.C.C.2d 431, 432-33 ¶ 3 (1965)("[T]he burden of proof is upon the applicants to show that interference will not be caused to the [existing] installation by their proposals."); *Industrial Communications,* 6 FCC Rcd 264, 265 ¶ 12 (1990)("It is the burden of the applicant to demonstrate interference-free operation."); *Eastern Michigan University,* 45 F.C.C.2d 456, 460 ¶ 11 (1974).

17 *See, e.g.,* XtremeSpectrum at 2 ("In the office, PCs communicate not only with the Internet, but also with other PCs, printers, scanners, and network servers. In the home, a DVD player or Internet computer may serve a TV or game-playing station in another room."). Indeed, in the office environment there could be dozens of UWB transmitters collocated in a very small area.

that the existence of multiple UWB transmitters collocated in the same vicinity should not likely result in a significant rise in the RF noise floor and that the noise floor would rather likely be "set by the closest UWB transmitters."[18] It is notable that all four papers on cumulative effect reviewed in this white paper, as well as the review and its conclusion just quoted, were prepared by UWB proponents. Obviously, Commission decisions should be based on independent tests using real world assumptions rather than based solely on the papers of firms with a vested interest. The Commission has thus appropriately concluded that "further testing and analysis is desirable on this issue."[19]

It is important that the issue of impact from multiple nearby UWB transmitters, which is real and unquestionable given simultaneous noise-like transmission, not be confused with the issue of cumulative impact of millions of devices, a more complex issue that has been the subject of much research and debate. Common sense and elementary RF engineering principles, together with the very nature of CDMA technology, suggest that if one UWB device causes harmful noise-like interference at three meters, a second or third device located at 3.1 meters will cause additive harmful interference if transmitting simultaneously. By analogy, a pedestrian who happens to be very near to a street lamp will mostly be illuminated by that lamp, but if the pedestrian is somewhere between two lamps then both sources contribute. The same holds with UWB interference impact, hence the assumption of nearest impact only is quite conservative.

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18 *See UWB NPRM* at ¶ 46.

19 *Id.* at ¶ 47.

CDMA technology, the most spectrally efficient technology currently available in the market, is susceptible to the signals generated by multiple, collocated UWB transmitters.[20] Current CDMA technology (IS-95) achieves its efficiency in part through the use of low power and wideband channels. As a result, CDMA is also an interference limited technology. Any undesired signal such as UWB emissions will add to the noise floor, and it is likely that multiple collocated UWB devices will increase the noise floor in an additive manner. Depending upon the circumstances, the result could be a loss of system capacity.

Sprint PCS agrees with the GPS Council that "[t]he important point is that this aggregate interference cannot be predicted by testing individual UWB transmitters."[21] The Commission should not, therefore, authorize any UWB devices that will likely be collocated with other UWB transmitters until UWB proponents can adequately document that multiple UWB emitters will not cause harmful interference to existing authorized services.[22]

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20 The superiority of CDMA is confirmed by the fact that GSM and TDMA carriers have decided to use CDMA for their 3G solution.

21 U.S. GPS Industry Council at 34. *See also* Department of Transportation at 13 ("Only additional testing of this aggregate effect will provide the necessary data to determine whether this is the case" [*i.e.*, multiple UWB transmitters cause interference when one does not].). The Commission should draw no conclusions from the fact that the Sprint-sponsored Telcordia model assumed that only the nearest UWB device will affect the PCS handset. This conservative assumption was made for analytical simplicity and given the uncertainty of future UWB deployments cannot be said to reflect all or even most of potential UWB device configurations enabled by the proposed ruling.

22 UWB proponents have not yet satisfied their burden. What is needed are tests of multiple, collocated UWB devices.

UWB proponents acknowledge that their proposed devices will add to the noise floor. The Technological Advisory Committee has expressed concern that noise floor levels could be "a very serious emerging problem caused by the explosive growth of both intentional and unintentional radio sources," a development that could compromise the continued reliability of existing communications systems:[23]

> The TAC foresees that we could potentially be entering a period of rapid degradation of the noise environment. Such degradation would reduce our ability to meet the communications needs of the country. The principal negative impacts are likely to be reductions in the performance or reliability of wireless systems or increases in their costs.[24]

The Council has recommended that this noise floor issue be examined and in this regard, has further recommended that UWB proponents perform additional study of how their devices would impact the noise floor at various distances.[25] Sprint PCS concurs in these recommendations, and suggests that the impacts of multiple collocated UWB devices be considered as part of a broader UWB/noise floor study.

B. UWB Interference Impacts Must be Evaluated with New, Next Generation CDMA Technologies

The Sprint PCS/Time Domain tests were conducted using Sprint PCS' existing IS-95 (second-generation) CDMA network. If and when UWB devices are introduced in the market, Sprint PCS and other CMRS licensees will be operating next, third generation networks rather than their current "2G" networks. Thus, if the Commission is to make

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23 TAC Report: Third Meeting of the FCC Technological Advisory Council, at 1 and 8.

24 Letter from Dr. Robert W. Lucky, TAC Chairman, to the Hon. William E. Kennard, FCC Chairman, at 3 (Jan. 7, 2000).

25 *See* TAC Report, Fourth Meeting of the FCC Technological Advisory Council, at 10.

decisions based on marketplace realities, it must consider the interference impact of UWB devices on the 3G systems that will soon be operational.[26]

The market for commercial mobile radio services ("CMRS") is undergoing a revolution that is changing the entire structure of the telecommunications sector. In the past two years alone, the number of CMRS customers has increased by 56% (from 55 to 86 million), and the number of mobile minutes of use ("MOU") as a percent of total MOU has tripled— from 2.3% in 1997 to 7.1% in 1999.[27] During the same two-year period, prices for CMRS service have fallen by over 30% — while the overall consumer price index and prices for landline services have increased.[28] Consumers no longer view mobile service as a convenience; it rather has become an integral component of our daily lives. Mobile service has also become one of the driving forces in the nation's economy.[29]

The CMRS industry is about to undergo an even larger revolution. Today, only 2% of all mobile usage is data (*e.g.*, Internet access).[30] This is due in part to the rather limited data rates that can be supported with today's 2G technology (9.6 to 19.2 kbps).[31] CMRS providers, however, are poised to begin deploying "3G" technologies that will

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26 Some UWB proponents acknowledge that the Commission must be sensitive to the developments of new wireless technologies. *See, e.g.*, Multispectral Solutions at 11.

27 *See Fifth Annual CMRS Report to Congress* FCC 00-289, at 76 and Appendix B, Table 1 (Aug. 18, 2000). Although it is often said that Europe leads the U.S. in the mobile sector, in fact Americans use their mobile service more than 50% more often than Europeans (221 vs. 145 minutes/monthly). *See id.* at 25.

28 *See id.* at 4-5 and 20.

29 *See id.* at 25-26.

30 *Id.* at 33.

transport data at rates that are comparable to (or better than) the rates that many landline carriers offer to their residential customers. One analyst has predicted that the number of mobile data subscribers will outnumber landline data subscribers by 2002, and another analyst forecasts that this new "m-commerce" will generate revenues of $23 billion by 2004.[32]

This revolutionary change is made possible by CMRS providers deploying "3G" technologies. For example, next year Sprint PCS will begin installing 1XRTT in its network. 1XRTT uses the same 1.25 MHz channel utilized with current 2G CDMA, but *doubles* voice capacity and promises data rate increases *by up to 10 times* (from today's 14.4 kbps to 144 kbps).[33] Newer 3G CDMA technologies such as IxEV and 1XTREME promise even greater voice capacity in the existing 1.25 MHz channel and data rates of 2 Mbps or more.[34] TDMA and GSM carriers have their separate evolution to 3G, but ultimately they will also be utilizing CDMA technology, whether Wideband-CDMA or cdma2000.[35]

The precise impact of UWB devices on these 3G technologies is not known. However, reasonable predictions can be made because the underlying technology in 2G and 3G CDMA systems is the same. For example, it is reasonable to assume that to the extent that UWB transmitters interfere with 2G systems, their interference impacts on 3G

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31 *Fifth Annual CMRS Report* at 36 and 45-47.

32 *Id.* at 34 and 53.

33 *See id.* at 38-39.

34 *See id.* at 40.

35 *See id.* at 37 and 41-44.

systems will be similar. In addition, 3G technologies achieve greater spectral efficiency through the use of higher order modulations and other techniques that could render 3G systems more susceptible to UWB noise transmissions. Finally, 3G systems that use a wider bandwidth, whether 3.75 MHz channel (3XRTT) or 5 MHz (W-CDMA), may be affected differently than 2G CDMA systems by pulsed UWB interference, depending on the pulse rate. Obviously, the interference impacts of UWB devices must be understood in this 3G environment because it will be these advanced CMRS technologies that will be operational when UWB devices may be introduced in the market.

III. Conclusion

The Commission must understand that Sprint does *not* oppose UWB technology *per se*. To the contrary, it believes that UWB is a promising technology that may play an important role in our society generally and in the telecommunications sector specifically — including, perhaps, as an extension of PCS and/or MMDS networks. But Sprint must also protect, and is legally entitled to protect, its existing licensed services — including its massive PCS investment (for which it paid the U.S. Treasury approximately $3 billion for the spectrum rights alone, plus billions more for constructing its nationwide, state-of-the-art CDMA network), as well as its sizable investment in MMDS (for which it paid the U.S. Treasury approximately $1 billion).

Multispectral Solutions, a UWB proponent, has it right when it says that "[t]o 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."[36] Caution is especially appropriate given the major concerns that the Technological Advisory Counsel has expressed about the noise floor generally.

Three conclusions can be drawn from the Sprint PCS/Time Domain study and the Telcordia model discussed above. First, the claims of certain UWB proponents that existing Part 15 emission levels are adequate to prevent harmful interference are patently contradicted by the Sprint PCS/Time Domain joint filing. Second, the Commission's proposal to attenuate Part 15 emission levels by an additional 12 dB (for a total of –53.2 dBm/MHz) would also not be adequate to protect Sprint PCS from harmful interference. Third, additional analysis is imperative to understand both the interference impacts of multiple, collocated UWB transmitters and the interference impacts of UWB on new, next generation CDMA systems. This last point is especially important because as PCS licensees deploy more advanced technologies to improve the efficiency in which they use their spectrum, technologies that require increased receiver sensitivity and more precise system optimization, less and less spectrum is left over for noise, whether caused by existing Part 15 devices or newer UWB devices.

Given the views of several UWB proponents — "UWB communications systems do not require frequencies below 2 GHz"[37] and UWB use of this frequency band will

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36 Multispectral Solutions at 11.

37 Fantasma Networks at 3. *See also* Multispectral Solutions (unfiltered UWB systems should not be permitted at all under Part 15, and filtered systems should initially be allowed only above 3.1 GHz).

cause "significant interference" to existing licensees[38] — the Commission must proceed with utmost care. All licensees, including licensees in bands not deemed "restricted," are entitled to protection from harmful interference — whether the interference results in dropped/blocked calls or reduces the capacity of existing networks. The very viability of "m-commerce" and location-based E911 services could be at stake. The American public will never view mobile wireless as a substitute for fixed landline services and may be reluctant to use their handsets for new applications (*e.g.,* purchase or sell stocks) if interference prevents CMRS carriers from offering a quality and reliable product.

Respectfully submitted

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38 Multispectral Solutions at 11-12.

CERTIFICATE OF SERVICE

I, Anthony Traini, hereby certify on that on this 6th day of October 2000, I served a copy of the foregoing Sprint PCS Supplemental Comments by U.S. first-class mail, or by hand delivery as indicated with an *, to the following persons:

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ATTACHMENT A

Attachment A

UWB Impacts on PCS Handset Noise Floor, Demand for Capacity, and Blocking

	Increase in Receiver Noise Floor Due to UWB		Add'l PCS Power Demand @ 2 Meter UWB Distance Given RSSI (dBm)		Chg. in Users Supportable @ 2 Meter UWB Distance Given RSSI (dBm)	
	@4 meters	@2 meters	@ -90	@-100	@ -90	@-100
Handset Loss=7.5 dB						
UWB PSD = -41dBm/MHz	8.1 dB	13.6 dB	130%	Blocked	-57%	Blocked
-53	1.3 dB	3.8 dB	8%	53%	-8%	-35%
Handset Loss=0(*)			@ -80	@-90	@ -80	@-90
UWB PSD = -41	15.0 dB	20.9 dB	77%	Blocked	-43%	Blocked
-53	4.7 dB	9.4 dB	5%	46%	-5%	-32%

Source: Telcordia 9/12 model equations 1-4, 13 with Fn0 = .5

	Blocking Rates Due to UWB if 1/X Calls Are Exposed					
	@4 meters		@3 meters		@2 meters	
	1/20	1/5	1/20	1/5	1/20	1/5
Handset Loss=7.5						
UWB PSD = -41	3.3%	13.1%	3.7%	14.8%	4.2%	16.7%
-53	0.8%	3.1%	1.2%	4.8%	2.0%	7.9%
Handset Loss=0(*)						
UWB PSD = -41	4.3%	17.2%	4.5%	18.0%	4.7%	18.7%
-53	2.3%	9.2%	2.9%	11.5%	3.5%	14.2%

Source: Telcordia 9/12 model equations 1-4, 23, 28 with gamma=3.5.

(*)Typical handset loss may be lower than 7.5 dB, case with no loss is shown to suggest sensitivity of results.