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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

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

Re: Ex Parte Presentation in ET Docket No. 98-153.

Dear Ms. Salas:

On February 22, 2001, Jeff Ross and Dr. Michal Freedhoff of Time Domain Corporation and I met with Peter Tenhula of Chairman Powell's staff to discuss the above-referenced rulemaking. The discussion is summarized in the attached material, a copy of which was left with Mr. Tenhula.

In accordance with the Commission's rules, an original and one copy of this notification are being filed. Should any questions arise concerning this matter, please let me know.

Sincerely,

Robert L. Pettit
Counsel for Time Domain Corporation

cc: Peter Tenhula, Esquire

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List A B C D E

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THE PULSE OF THE FUTURE℠

Regulatory Status of Ultra Wideband Technology

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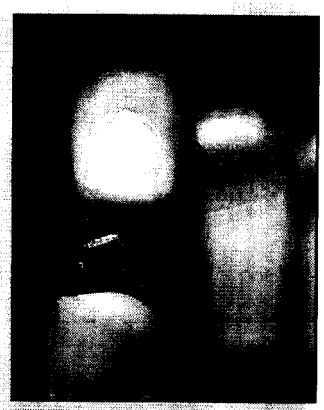
February 2001

What is Ultra Wideband?

Ultra Wideband is a new wireless technology that delivers megabits of data across a wide swath of spectrum using ultra low power so as not to interfere with existing users of the spectrum.

What is Time Domain?

- Developers of first and only UWB commercial chipset – "PulsON"
- Uses special form of UWB – Time Modulated (TM-UWB)
- 200 employees



PulsON,
A Chip Based Solution

- >200 patents – granted or pending
- Worked with FCC since 1989 to secure regulatory approval

UWB: An "Enabling" Technology

Enables Entirely New Products, Services & Industries

Supports "Break-through" Improvements in:

- Wireless Communication
- Precision Tracking
- Radar

Unique Benefits of UWB

Ready-To-Go As Soon As Regulatory Hurdles Removed

Save and Protect Lives

- Victims of crimes and disaster
- Police, fire, rescue personnel
- Workplace, environmental and highway safety
- Military and civilian security

Independent Living/Better Health Care

- Aged and disabled independence
- Diagnosis and treatment
- Lower costs

"Digital Divide" relief

- Lower cost indoor broadband

Complement and Extend Reach of GPS

- Aviation safety

Worldwide Race - Breakthrough Technology

- Jobs/Economic Development
- Global Technology Leadership
- Relieve "spectrum drought"

Next Generation Wireless: A Race for Technology Leadership

U.S. vs. Europe and Asia

- "Wireless Gap" - Europe and Asia currently ahead of U.S.
- Europe and Asia are moving aggressively to use UWB to:
  - Complement full power services (e.g. indoor LANs)
  - Save spectrum for services that need full power allocations
- Next Generation Options for Broadband Data
  - Full power – CMRS – Europe and Asia have the lead
    - New spectrum needed; will require reallocation and relocation
  - Very low power – UWB – New technology invented in the U.S.
    - Complementary to full power (e.g. indoor LANs)
    - Ready to go when rules modified
- If the U.S. does not move expeditiously, Europe and Asia will use UWB to further increase their dominance in wireless

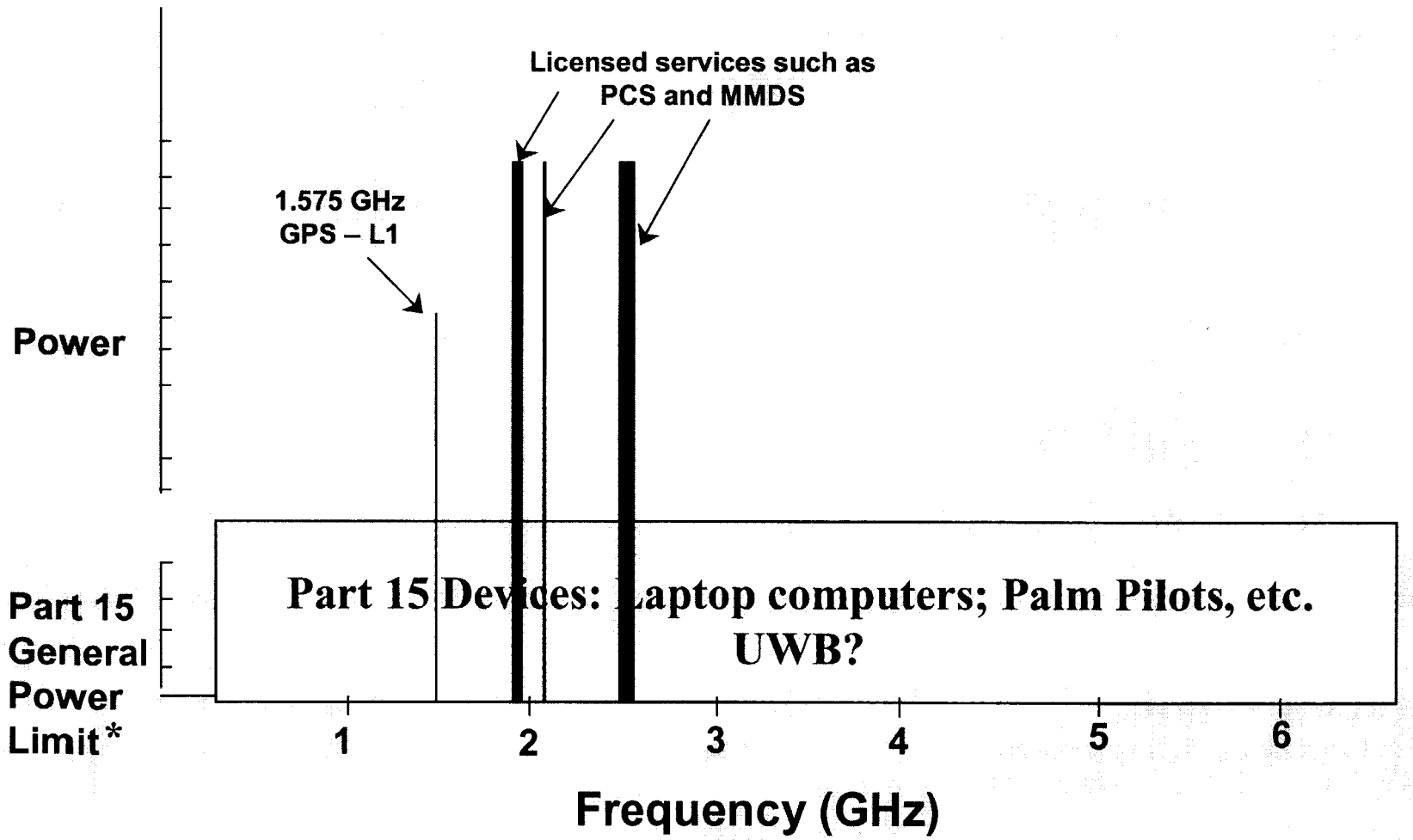
Part 15

- "Part 15" is an FCC rule section that allows low-powered wireless devices to operate on a shared or non-interfering basis with existing spectrum users.

- Characteristics of Part 15 operations:
  - Unlicensed operations
  - Low power devices - less than 50 billionths of a watt of power
  - Interference protection for licensed services
  - Strict power limits - e.g. -71 dBW/MHz (about 50 billionths of a watt) is most strict limit
  - FCC authorization, certification, enforcement

  Billions of Part 15 devices already in operation:
  - cordless phone receivers
  - personal computers
  - unlicensed PCS phone receivers
  - personal digital assistants
  - wireless modems
  - remote car door opener receivers
  - home security system receivers
  - spread spectrum network systems

Part 15 and Licensed Services



*This is not to scale. If the power levels were drawn to scale, both the Part 15 Limit and the UWB power level would not be viewable.

TIME DOMAIN ®

September 2000

Rule Change: "Noise is Noise"

Regardless of What Causes It

- **Radio-wave power (noise) causes interference**
  - Interference has nothing to do with whether the noise source is an "intentional" or "unintentional" emitter
  - Appropriate measure is <u>power level, not "intent"</u>

- **UWB power limits set by FCC should be:**
  - Equivalent to power limits for both *"unintentional"* and "*spurious*" emissions (-71dBW/MHz, the Part 15 power level)
  - Lower than out-of-band power limits allowed for licensed services
    - e.g., PCS and MSS are allowed to emit slightly more energy in restricted bands than all Part 15 devices

- **UWB power limits are no different than levels emitted by existing Part 15 devices. Therefore, UWB should be treated like other Part 15 devices:**
  - Intentional vs. unintentional distinction is unnecessary

Regulatory Timeline

Chronology of Time Domain Efforts to Obtain Regulatory Approval for UWB

1989 - 1998: Time Domain Corporation dialogue with the FCC regarding regulatory approval of UWB, including meetings and testing at FCC labs

February, 1998: Time Domain submits a request for a waiver of Part 15 rules to the FCC to allow for limited deployment of UWB technology

September, 1998: The FCC issues a Notice of Inquiry (NOI) asking questions about UWB technology

February, 1999: Time Domain (and other companies, public interest groups and individuals) submits comments on the NOI to the FCC

June, 1999: The FCC grants Time Domain's waiver request for a limited number of life-saving, through-wall Radarvision devices for use by the law enforcement and public safety communities

May, 2000: The FCC issues a Notice of Proposed Rulemaking (NPRM) for UWB, discussing the life-saving and other public benefits of the technology

September 12, 2000: Time Domain (and other companies, public interest groups and individuals) submits its responses on the NPRM to the FCC

October 27, 2000: Time Domain (and other companies, public interest groups and individuals) submits its replies to all the NPRM responses to the FCC

What is Harmful Interference?

FCC Rules: "Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with these [international] Radio Regulations." 47 CFR § 2.1

NTIA Definition: NTIA ITS website adds that harmful interference "must cause serious detrimental effects, such as circuit outages and message losses, as opposed to interference that is merely a nuisance or annoyance that can be overcome by appropriate measures."

The FCC must decide what constitutes "harmful interference." This is a critical spectrum management issue. Not all testing will yield this information.

UWB Testing
NTIA Non-GPS Testing

- Results released Jan. 18th – NTIA tested 3 government systems (by making 7 field measurements), and extended its conclusions using a theoretical model to an additional 12 systems.

- Even with conservative assumptions, NTIA still concluded that UWB deployment is feasible.

- **No harmful interference was observed – no reported occurrences of degradation, obstruction or repeated interruptions of the operations of the services tested.**

UWB Testing
NTIA Non-GPS Test

Real World Mitigating Factors

- No accounting for natural and man-made obstructions, such as hills, valleys, trees and buildings.
- No accounting for digital signal processing of receivers
- Receiver detection criteria not a metric of harmful interference
- Aggregate model?
- Physical configuration of radars?

Including these "real world" factors provides ***at least*** 30 -40 dB of margin not presented in NTIA's results (which equals a factor of up ten thousand difference)

Potentially sufficient to remove all NTIA-suggested constraints on UWB deployment.

UWB Testing
GPS Testing (Results due 2/28)

- **Stanford/DOT**
- Concern: use of loss of 1 satellite as interference metric
- Concern: use of white noise source/back-off technique
- Concern: no "real world" UWB devices
- Found that for certain UWB implementations, spectral lines are placed in GPS band
- The FCC can easily impose requirements on clock accuracy, duty cycle and modulation to ensure that this doesn't happen.

2) **NTIA**
- Concern: use of a white noise source/back-off technique
- Transition from 1 to 4 satellites helpful but not as realistic as a full constellation – is loss of 1 satellite the right metric?

- **University of Texas/Johns Hopkins University**
- Conducted tests – controlled, indoor environment with 18 UWB modes (PRF, duty cycle, etc. varied) and 7 GPS receivers tested
- Radiated tests – Outdoor "real-world" environment for comparison
- Aggregate tests – 16 simultaneous UWB transmitters with 7 GPS receivers
- Data analysis will relate UWB parameters (PRF, duty cycle, distance/power, etc.) to impact on GPS.

FCC Has Seen This Before - 1

Satellite PCS Phones Proceeding (PCSGEN Docket No. 98-68)

GPS Position: "Preliminary analysis of the potential interference into GPS receivers from GMPCS terminals operating at the power levels proposed in the NPRM *(see attached Declaration of Stanford University professor Per Enge)* shows that GPS receivers could be subject to unacceptable levels of interference from GMPCS terminals."

and from an affidavit provided in this filing by Stanford University Professor Per Enge: "Based on my theoretical evaluation of the interference situation, the FCC's proposal to permit mobile earth terminals to produce emissions in the GPS operating band at levels of –70 dBW/MHz, even on an interim basis, could subject certain GPS receivers to significant levels of interference."

FCC Decision: A report and order was issued December 23, 1998, affirming the –70 dBW/MHz standard proposed by the FCC.

FCC Has Seen This Before -2

Public Safety Communications in 700 MHz band (WT Docket No. 96-86)

GPS Position: In this filing, the GPSIC, the Air Travelers Association, American Airlines, the General Aviation Manufacturers Association, Outreach, *Stanford University (the GPS Research Program),* and United Airlines were collectively referred to as GPS Commenters. "The answer the GPS Commenters provided is that the proposed standard is not sufficient. They showed that the public safety service uses proposed by Motorola and other commenters at 794-806 MHz would endanger a GPS system that is dynamic, growing and critical (in both a public safety and an infrastructure context), and that the –70 dBW/MHz out-of-band emission level that is unidentified as sufficient to protect GPS operations is woefully deficient."

FCC Decision: The Third Memorandum Opinion and Order was issued October 10, 2000. The FCC adopted the out-of-band limits of –70 dBW/MHz for wideband emissions and the –80 dBW/MHz limit for narrowband emissions falling within the 1559 –1610 MHz band.

FCC Has Seen This Before - 3

700 MHz Public Safety Proceeding (WT Docket 99-168)

GPS Position: "In these Reply Comments, the Council emphasizes that it has demonstrated that the –70 dBW/MHz/-80 dBW/MHz standards do not adequately or universally protect GPS… The Council also emphasizes that, based on actual studies and demonstrations, the only default level that can safely be established at this point to protect GPS receivers is a wideband OOBE threshold limit of –100 dBW/MHz."

FCC Decision: In its First Report and Order issued January 7, 2000, the Commission adopted the –70 dBW/MHz (wideband) and –80 dBW/MHz (narrowband) out-of-band emissions limits for signals falling into the 1559 – 1610 MHz band. These limits were designed to protect against the second harmonics of certain 700 MHz transmitters. These limits are premised on protecting aviation GPS use at a distance of about 30 meters.

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