

ITU-R Task Group 1/8

“Bush Administration’s Commitment to Responsible Development and Deployment of Ultra Wideband”

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UWB Signals Using Fixed Time-Base Dither

$$x(t) = \sum_{n=-\infty}^{\infty} \sum_{k=0}^1 \alpha_{kn} p_k(t - nT - \Theta_n)$$

$$\alpha_{kn} = 1 - a_n, k = 0$$

$$\alpha_{kn} = a_n, k = 1$$

$$\alpha_n = 0, \text{prob} = g_0$$

$$\alpha_n = 1, \text{prob} = g_1 = 1 - g_0$$

Administration's Commitment to Spectrum Innovation

- UWB
- Broadband over Power Line
- Third Generation Wireless
- Additional Spectrum for Wireless Device Applications (5 GHz U-NII)
- Expanding Opportunities for Spectrum Use at Higher Frequencies (70/80/90 GHz)
- President's Spectrum Initiative

Current State of Affairs

- Initial controversy giving way to thoughtful deployment
 - Difficult three and a half year domestic rulemaking process (1,154 public comments)
 - NTIA reports served as the technical basis for establishing the service rules for UWB devices
 - February '02 U.S. regulations authorizing ultra-wideband technologies on a non-interference, non-protected basis
- Increasing worldwide interest in UWB technologies
 - Imaging Systems, Vehicular Radar Systems, High Data Rate Communication Systems
 - Many other administrations looking to U.S. regulations when developing their own

Benefits of UWB Applications

- Avoiding automobile collisions or mitigating injuries using vehicular radars in conjunction with other safety features
- Providing very high bandwidth wireless home networking for multiple consumer electronics devices
- Supporting rescue efforts in collapsed buildings using through-wall imaging
- Ensuring integrity of airport runways using ground penetrating radars to detect runway cracks

U.S. Approach to Technical Assessment of UWB Compatibility

- **Characterization** of UWB emissions
- **Compatibility** studies assessing the interference potential of UWB emissions to authorized radiocommunication systems
- **Compliance** measurement procedures to accurately portray interference potential of emissions from UWB devices

Characterization of UWB Emissions

- Measured the temporal and spectral characteristics of various UWB signals
- Developed measurement methods using commercial off-the-shelf test equipment
- Determined that UWB signals fall within the known models for interfering signals
 - Continuous wave model
 - Noise model
 - Pulse model

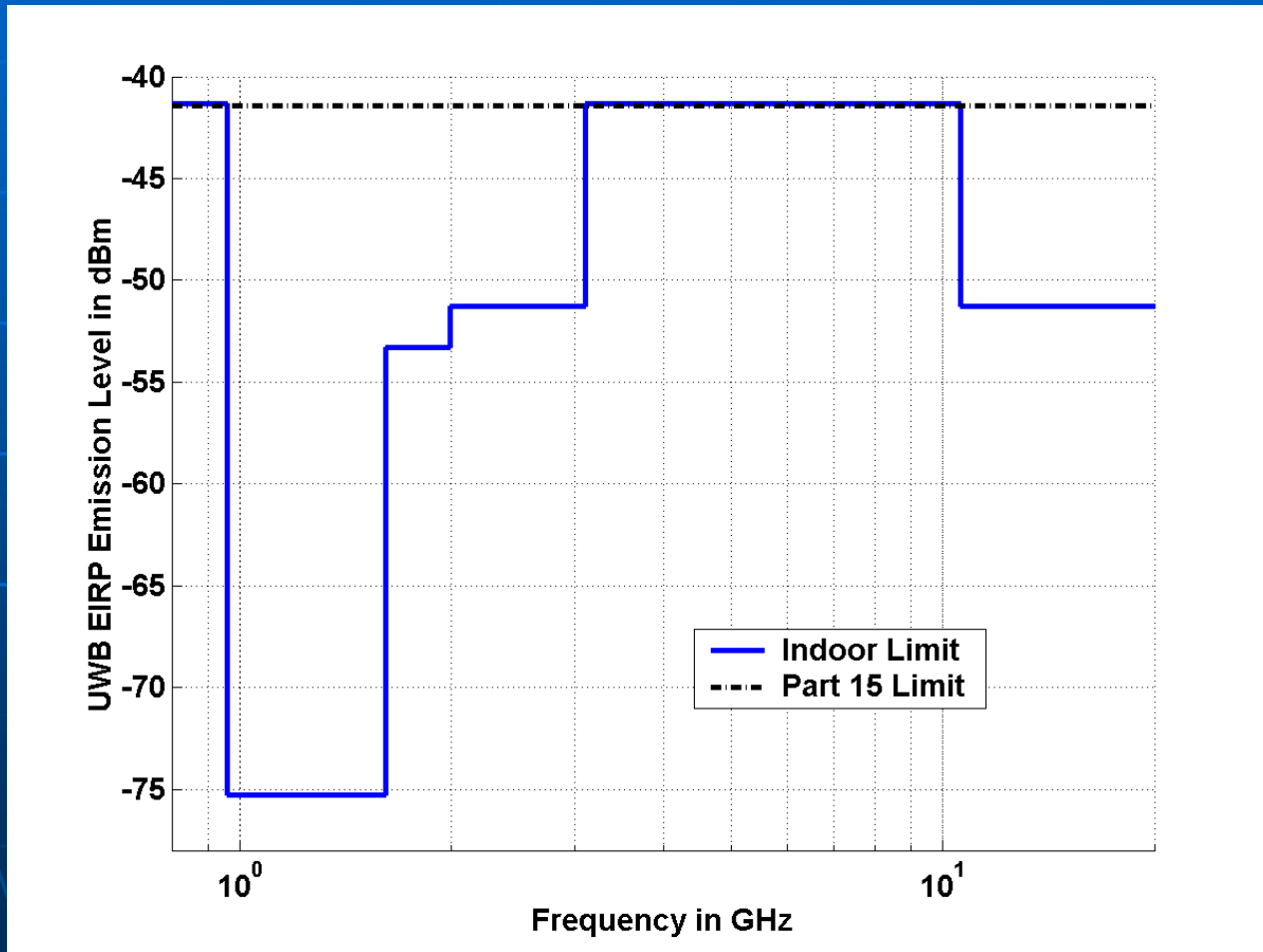
Compatibility with Authorized Radiocommunication Systems

- Susceptibility of receivers
 - Measurements (GPS)
 - ITU–R Recommendations
 - ICAO and RTCA standards
- Operational scenarios
 - Minimum separation distance
 - Antenna coupling
 - Propagation model
 - Other factors
- Acceptable emission levels

Development of Emission Masks

- Based on the interference potential of the UWB device application
- Six distinct emission masks
 - Ground penetrating radar systems
 - Other imaging systems (wall, through-wall, and medical)
 - Surveillance systems
 - Vehicular radar systems
 - Indoor communications systems
 - Outdoor (handheld) communications systems

Emission Mask for Indoor UWB Devices



Compliance Measurement Procedures

- Detector
 - Peak detector
 - RMS detector
 - CISPR detector (below 960 MHz)
- Measurement bandwidth
 - Varies with detector type and frequency
- Measurement interval (RMS averaging time)
- Application-based variations (e.g. GPR emissions radiated into sand pit)

Summary

- U.S has taken a responsible but aggressive approach to the development and deployment of UWB technology.
- The process was long and the arguments highly technical, but we worked hard to find answers.
- The NTIA technical studies served as the basis for the development of the emission masks that will permit the safe and effective authorization of UWB technology.
- NTIA measurement and analysis reports are available at: <http://www.ntia.doc.gov/osmhome/osmhome.html>
- U.S. rules successfully strike the balance of responsible deployment to harvest the benefits of UWB within our economic and homeland security environment.

Relationship to Task Group 1/8 Activities

- Development of ITU–R Recommendations to provide guidance to administrations
 - Characteristics of UWB systems
 - Compatibility with radiocommunication services
 - Framework for national UWB regulations
 - Measurement techniques
- ITU–R Report containing detailed compatibility studies