
Ultrawideband Regulatory Support

Outputs

- Comments to NTIA on many proposed changes in UWB regulations.
- Monitoring ITU-R activities in UWB Task Group 1/8.
- Measurements to better understand new mixed-mode UWB devices.

In May 2000, the Federal Communications Commission (FCC) released a Notice of Proposed Rule Making on ultrawideband (UWB) systems, asking for a wide range of information on these systems, interference from these systems, and proposals for how to regulate them. At that time, technical opinion differed widely on how UWB systems interact with traditional radio systems, and how they should be regulated. In FY 2000 and 2001, ITS staff made extensive measurements to characterize UWB device emissions. ITS staff also made extensive measurements on UWB interference to various types of GPS receivers. This work was summarized in NTIA Reports 01-383, 01-384, and 01-389.¹ Closely following this work, engineers at NTIA's Office of Spectrum Management (OSM) used ITS measurements to predict how UWB devices would interfere with Federal systems and GPS. These predictions were summarized in NTIA Special Publications 01-43, 01-45, and 01-47.²

¹W.A. Kissick, Ed., "The temporal and spectral characteristics of ultrawideband signals," NTIA Report 01-383, Jan. 2001.

J. R. Hoffman, M.G. Cotton, R.J. Achatz, R.N. Statz, and R.A. Dalke, "Measurements to determine potential interference to GPS receivers from ultrawideband transmission systems," NTIA Report 01-384, Feb. 2001.

J.R. Hoffman, M.G. Cotton, R.J. Achatz, and R.N. Statz, "Addendum to NTIA Report 01-384: Measurements to determine potential interference to GPS receivers from ultrawideband transmission systems," NTIA Report 01-389, Sep. 2001.

²P.C. Roosa, Jr., et al., "Assessment of compatibility between ultrawideband devices and selected Federal systems," NTIA Special Publication 01-43, Jan. 2001.

D.S. Anderson, E.F. Drocella, S.K. Jones, and M.A. Settle, "Assessment of compatibility between ultrawideband (UWB) systems and Global Positioning System (GPS) receivers," NTIA Special Publication 01-45, Feb. 2001.

D.S. Anderson, E.F. Drocella, S.K. Jones, and M.A. Settle, "Assessment of compatibility between ultrawideband (UWB) systems and Global Positioning System (GPS) receivers (Report Addendum)," NTIA Special Publication 01-47, Nov. 2001.

The technical and commercial communities continue with many activities needed to more exactly (and often more broadly) define the operational parameters for UWB devices. Although few actual commercial UWB devices have been sold to the public yet, many devices have been under intensive technical review. These include proposed 802.11 devices operating near the 5-GHz band and short-range automotive radars operating near 24 GHz. Since many of the proposed UWB devices will use UWB modulation mixed with frequency hopping (FH) or other modulations, there has been much activity in clarifying how these "mixed modes" should be characterized and regulated. The FCC released a Memorandum Opinion and Order and a Further Notice of Proposed Rule Making on March 12, 2003. This document proposed many significant changes in the details of how various mixed-mode devices should be categorized and measured. ITS has continued monitoring these proposed changes for technical implications and providing comments to NTIA for possible policy changes.

ITS also participated in the activities of ITU-R Task Group 1/8, dealing with issues of defining and regulating UWB devices on an international basis. Although UWB devices are typically very short range and would not normally require international regulation, such devices are also very transportable and devices manufactured for use in one country could easily find their way into many other countries. Therefore, TG 1/8 is studying UWB devices to understand their operation and to discuss ways to develop compatible standards for such devices.

ITS has also made additional measurements on several types of UWB devices in FY 2003 to help clarify NTIA's understanding of UWB devices. One series of measurements provided information on how measurement readings change when the pulse repetition frequency (PRF) of a UWB device approaches the bandwidth of the measurement system. This information was needed to more precisely analyze possible UWB interference.

A series of measurements were also made by ITS on a short-range 24-GHz automotive radar that incorporated short pulses and frequency hopping. The measurement test set-up is shown in Figure 1. Although the tested device included many possible operational modes, a typical pulse lasted 0.3 microseconds and had a bandwidth of about 4 MHz. The remainder of the 500-MHz minimum bandwidth needed to allow the device to be included under the UWB rules was obtained by frequency-hopping the pulse over a 500-MHz range. This UWB device is an example of several new devices that meet some UWB characteristics, but operate somewhat differently from a pure UWB device. The need to make correct decisions about how such devices should be measured, and what limits should be applied to them, furnishes the motivation to undertake these measurements of various prototype devices.

Figure 2 shows an emission spectrum of the automotive radar when measured with an RMS detector having various integration times. It is typical of such measurements that “arcane details” like measurement integration time can significantly affect the numeric readings of procedures intended to set limits on the level of signals produced by these devices. Therefore, it is necessary to carefully note proposed regulatory changes in measurement details along with the specification of numerical limits on device emissions.

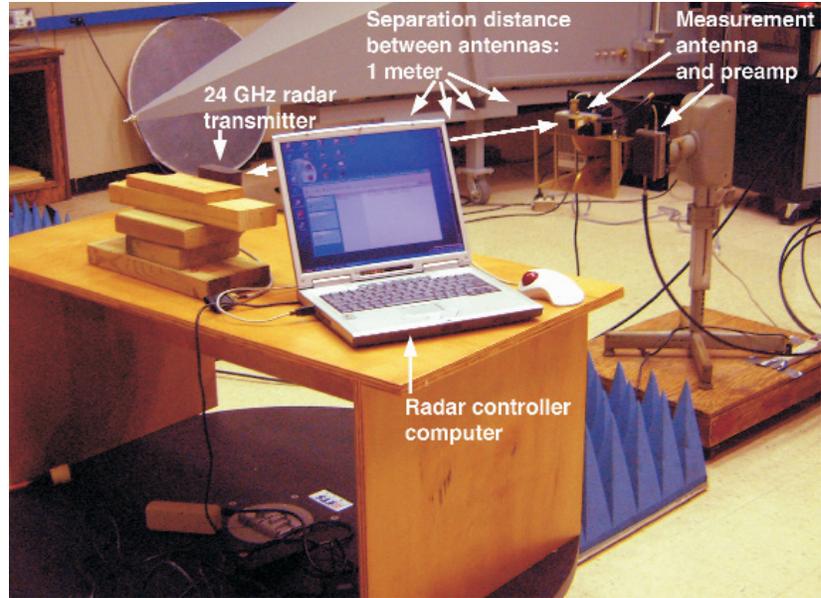


Figure 1. 24-GHz radar setup (photograph by F.H. Sanders).

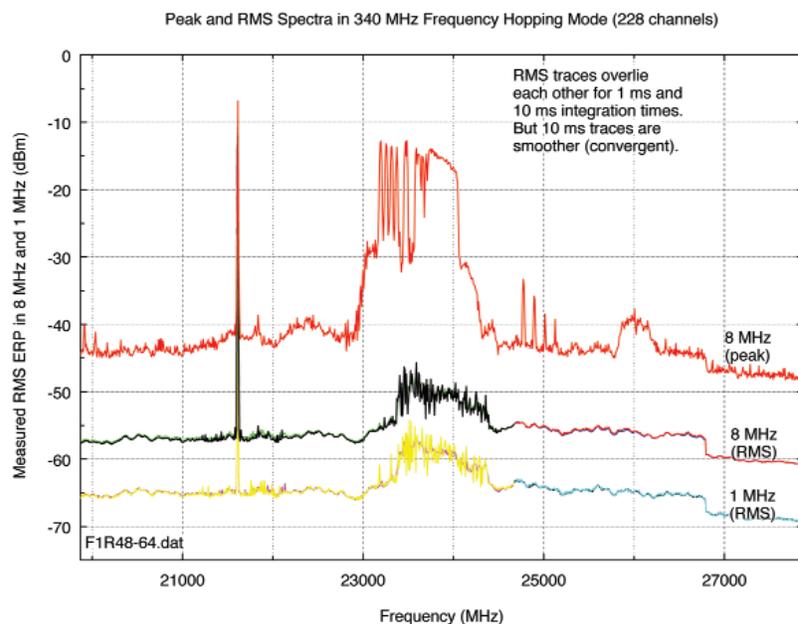


Figure 2. Emission spectrum of 24-GHz radar.

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