Report to EC-Meeting IARU Region 1 Oman April 2001 respectfully submitted by K.E.Vogele, DK9HU, member of EC.

For further informations please send email to
KEVOEGELE@T-ONLINE.DE

Report

About my participation in the

CEPT workshop on regulatory issues regarding introduction of UWB in Europe

20. März 2001 - RegTP in Mainz

by Hans-Hellmuth Cuno, DL2CH

Introduction

Having been alerted by Wojziech Nytisk, SP5FM, I took part in the a.m. workshop, hosted by the german telecommunications authority RegTP. There were nearly 100 participants from interested parties ranging from representatives of authorities over companies and organisations to the military. These were generally highly qualified experts. Many of the participants had come in order to gain knowledge and stay informed about this new technology.

Especially important for amateur radio was Dr. Klaus Ruf of the Max-Planck Institute for Radioastronomy, whom I had contacted already before the meeting. In a short conversation before the openening we stated a conicidence of our interest in UWB as a possible new source of interference in our microwave bands.

The presentations

The workshop was opened by Mr. Matthias Kurth, president of RegTP. He pronounced his opinion, that UWB shall be accompanied from the beginning by the corresponding regulations. The american FCC (1) is far ahead of Europe in having already given out a Note of Proposed Rules (proposal 15.209), whose deadline is imminent. It contains the following parameters:

54 dBµV/m within a bandwidth of 1 MHz in a distance of 3 m
Peak / mean ratio of less than 20 dB
Reduction of level below 2 GHz of 12 dB min.

You can download documents on the compatibility (2) and containing general information about UWB (3).

In the following speeches the status of affairs, networking strategies, a 22 GHz radar, measurements of compatibility, and legal issues were dealt with.

The UWB-company Time Domain (4) provided a CDROM with a lot of papers and informations, which I can copy for people with a special interest in UWB. Another company active in UWB is Fantasma networks (5) .

Very important for our interests were the speeches of Dr. Klaus Ruf of the the Max-Planck Institute for Radioastronomy (6) and Christian Pelmoine of Eurocontrol (7), the European air traffic guidance authority. Both opposed UWB heavily because of its wideband nature and the resulting interference potential.
Their opinion is, that after the legalization and widespread intrduction of UWB a

noisefloor will cover the radio-spectrum which severely impairs radio-astronomy and the communication and radar operations of Eurocontrol. They would like best to kill UWB in the shell.

Time Domain Corporation presented an arrangement of 5 UWB stations in a room. It consisted of 4 fixed and 1 mobile node. The position of the mobile node was measured with very high precision in the cm-range. According to Paul Withington of Time Domain this is a side application to the main intent of wideband data transfer. The stations worked with 0.5 ns pulses, a repetition frequency of 5 MHz and a mean power of 1 mW (0 dBm). The next generation shall lower the power to -17 dBm (20 µW). The mean power of 1 mW with a duty cycle of 0,25 % in the demonstration corresponds to a peak power of more than 400 mW (26 dBm).

After all speeches one representative of each interest group was asked to give an opinion about UWB:
Nearly all parties issued a rather neutral opinion in believing to be able to live with UWB. There were the 2 exceptions of the radioastronomy and Eurocontrol, who heavily opposed UWB. Amateur radio was not inquired, but I had already stated earlier, that amateur radio is rather similar to radioastronomy.

Brief technical description of UWB

A short technical description shall be given here in order to give the reader a basic knowledge about UWB.

UWB is principally intended for short range communication within buildings. With its very short pulses and the special receivers it can live very well in this multipath environment.

An UWB transmitter sends a stream of ultrashort pulses with lengths of about 0.5 ns. This corresponds to an occupied bandwidth of 2 GHz. In order to avoid a line-spectrum of the rf-signal, the pauses between the pulses are varied according to a pseudorandom noise sequence, similar to spread spectrum methods. So the spectrum is essentially flat with a very low and smooth spectral density. The instantaneous power during the pulse can be considerable, similar to radar transmissions.

The antenna has to be wideband. The antennae of the Time Domain demo system were short dipoles with elements in the form of equilateral triangles with a sidelength of about 4 cm. The bases of the triangles were parallel in direct vicinity. The dipoles were fed in the centers of the baselines.

The receiver was of the Rake-principle with a correlator forming the incoming pulse before being downconverted to baseband. The receiver has 2 threads with more to come in the next generation. (The multithread only makes sense for data transfer).

The information is modulated to the pulses by modulation of the amplitude, the polarity, or the spacing between the pulses. Depending on the application, interference etc. one or more pulses can be used to encode an information bit.

In a victim non-UWB receiver the UWB signal behaves depending on the IF-bandwidth. When the IF-bandwidth is smaller than the mean pulse repetition frequency (prf), the signals is similar to white noise. When the bandwidth is larger than the prf, a pulsed interference results. For amateur receivers with their comparably small bandwidth a noisefloor in the entire frequency range of UWB results.

Conclusions

A widespread use of UWB can result in a significant noisefloor all over our bands. Due to its technical sophistication UWB will probably remain restricted to the commercial and industrial sector. Then its interference with amateur radio will be far below the interference of PLC, both from the strength of interference as well as the number of impaired amateurs. A widespread use in the public sector can severely impair operation on our bands in VHF and above.

Documents, websites etc.

1. http://www.fcc.gov/
2. ASSESSMENT OF COMPATIBILITY BETWEEN ULTRAWIDEBAND DEVICES AND SELECTED FEDERAL SYSTEMS
   from: http://www.ntia.doc.gov/osmhome/reports/uwb/uwb.pdf (2 MB)
3. The Temporal and Spectral Characteristics of Ultrawideband Signals
   from: http://www.its.bldrdoc.gov/pub/ntia-rpt/01-383/ (3,66 MB)
4. Time Domain: http://www.timedomain.com/
5. Fantasma Networks: http://www.fantasmanetworks.com/
6. Max-Planck Institute for Radioastronomy: http://www.mpifr-bonn.mpg.de/
7. Eurocontrol: http://www.eurocontrol.be/