ROBERT BOSCH GMBH

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Your Reference	Our Reference	Direct Line	
ET Docket 98-153	K8-RU/PL Schmid	(07 11) 811-12 08	28.08.2000

Dear Mrs Salas,

In response to the FCC´s notice of proposed rulemaking (FCC 00-163) in the matter of revision of Part 15 of the Commissions´s rules regarding ultra-wideband transmission systems we want to file our comments to you.
Please find our comments in the enclosed appendix.

Yours sincerely,

Dr. Schmid

ROBERT BOSCH GMBH

ET Docket 98-153

In the matter of revision of Part 15 of the Commisions´s rules regarding ultrawideband transmissions systems

Comment on Notice of Proposed Rulemaking (FCC 00-163)

by
Robert Bosch GmbH
Division K8

Preamble:

Bosch is a worldwide automotive supplier producing and providing systems and solutions for generators, engine control , brakes, vehicle control and stability, and passenger safety and restraint systems.

As we are continuously developing new systems for making car driving more comfortable and safer, we see many new useful applications for UWB technology.

Therefore we do appreciate the FCC´s actions already taken for putting UWBs on a legal basis.

Comments:
(referring to the NPRM sections)

18./19. We also see UWB applications as low cost devices for the mass market and therefore their regulatory treatment should be based on Part 15 without individual licensing. Also, we see UWB devices as low power devices with a short range of several meters.

21. We believe, that the definition of an UWB device should be based only on the bandwidth that is used. We also think, that the -10 dB points are a better way to measure the bandwidth than the –20 dB points due to the near noise floor and the possible ambiguity between the –20 dB points. In a pulsed spectrum there can be two –20 dB points, one on the main lobe and one on a side lobe which has influence on the measured bandwidth.
We believe the value of the fractional bandwidth should be fitted when changing from –20 dB to –10 dB points. Sticking to 25 % fractional bandwidth and 1.5 GHz total bandwidth while using the –10 dB points could lead developers to design devices using more spectrum as necessary only to be classified as UWBs. This would be a waste of spectrum. We therefore propose to define UWB devices as

having a fractional bandwidth of 15-20% or a total bandwidth of 1-1.5 GHz for lower frequency devices.
We do not favor the use of a calculated bandwidth based on pulse width, as this is impractical, especially when using complex pulse shapes. This would mean direct measurement of the pulse form in the circuit for the FCC as verification for the manufacturers statement.
The measured bandwidth should be the only criterion for a device to be classified as “UWB”, because basing on pulse width could impede the development of novel pulse or modulation schemes though occupying the same bandwidth as “classical” pulse systems. This includes high speed data systems as to be treated as UWB devices in our opinion.

22. We believe, that UWB devices should be permitted in restricted bands, because the viability of UWBs as consumer products for everyone could be severely affected, if expensive separate notch filters for each of the restricted bands, a UWB falls in, would be necessary. This would impede marketing of automotive safety systems, especially if transmissions in restricted bands above 2 GHz would be prohibited.

26. Regarding UWB devices detecting objects inside or through walls, we believe the use of wall contact switches as well as an automatic power control feature is not necessary, because it is impossible to predict the exact attenuation of every wall without a trough wall measurement(S_{21}). If we consider a thin wall consisting of wood or gypsum, it will have relatively low attenuation. Therefore a wall contact switch will be useless, as a victim receiver on the other side of the wall receives nearly the same interference level than without it. The emission levels have to ensure, that there will not be any interference to GPS receivers caused by through-wall radars, if they work in contact to a wall or not.

27. We are pleased to see the FCC not proposing further restrictions for UWBs above 2 GHz. The higher the frequency, the lower the power level received through the antenna aperture of a victim receiver due to Friis´ Transmission equation. That means, even with the same power level of the UWB device the interference potential decreases with increasing frequency at a fixed distance.

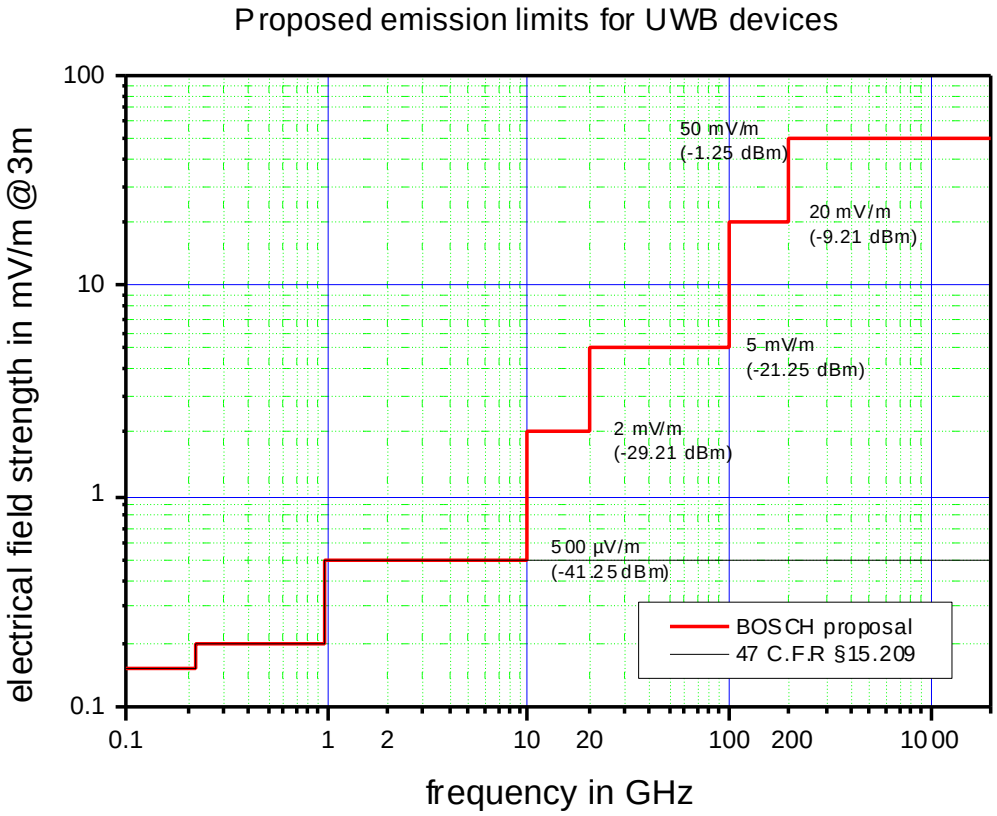
34. In our opinion the existing general emission limits are sufficient to protect other radio services. We do not see any cumulative impact from multiple UWB transmitters, as they have a low duty cycle and they do not work in phase, so their signals cannot be superponed to rise the interference potential.
We agree with the FCC to use spectral power density as the basis for emission limits, as we believe this to be a practicable way for measurements.

36. To avoid spurious emissions inside a GPS band, a pulse repetition frequency (PRF) higher than 20.46 MHz (21.74 MHz for

both L1 and L2) is required. This it too high for most radar systems, because this means ambiguities in range.

37. Scrambler technology could be a solution for interference problems, though it could rise costs for very cheap UWB devices. If there was a higher emission limit for a noise like spectrum than for an UWB device not using scrambler technology, developers could be encouraged to use scrambling techniques.

39. In principal we agree with the FCC, that the general emission limits contained in 47 C.F.R. §15.209 are an appropriate approach for UWBs working above 2 GHz. Though the FCC should consider higher limits with rising frequency, because the higher the frequency, the lower the power level and therefore the interference level received through an antenna of a victim receiver as mentioned under section 27. The interference level decreases with the square of the wavelength. We suggest the following extension of the §15.209 table for UWB emission limits:



We think, as a lot of UWB applications will be settled in the upper GHz region of the spectrum in the future due to lower semiconductor prices, further limits above 960 MHz should be established.

48. In general we believe, that a pulse desensitization correction factor PDCF is a suitable approach for calculating the peak power, though it should be taken into account, that with rising modulation complexity of an UWB device, it delivers not the correct value. The PDCF of HP application note 150-2 is based on a simple pulsed sinusoidal system.

50. We agree with the FCC on using average measurements for frequencies above 1 GHz with a 1 MHz resolution bandwidth (RBW). Also we agree, that the video bandwidth VBW set between 10 Hz and 10 kHz with peak hold is a practicable way.

52. We believe, that spectral measurements are sufficient for evaluating UWB peak levels in general. But we recognize, that the approach using a microwave receiver with 50 MHz bandwidth and a conventional oscilloscope is suitable as well. Using a bandwidth of 50 MHz is a practicable standard for a wide victim receiver.

54. For frequencies above 1 GHz we suggest the use of (corrugated) horn antennas, as they have a large bandwidth and a fixed phase centre.

58. The FCC should consider, that a lot of UWB systems will have a narrowband carrier exceeding the UWB emission limits: A simple pulse radar, where a CW carrier is switched on and off, consists of switches, that only have a finite isolation. This means this carrier cannot be totally suppressed. The FCC should allow the marketing of these UWB devices on a “mixedmode” basis. The frequency bands for the narrowband carrier could be the ISM bands (refer to 47 C.F.R. §18.301) or the european bands for short range devices (refer to CEPT/ERC-Recommendation 70-03). The rest of the transmitted spectrum (the UWB spectrum) would be allocated around the carrier. N.B. We do not want to establish rules for high power UWB devices, but the FCC should solve this technical problem juridically.