

ELECTRONIC COMMUNICATIONS COMMITTEE

ECC Decision
of 1 December 2006
on supplementary regulatory
provisions to Decision ECC/DEC/(06)04 for
UWB devices using mitigation techniques

(ECC/DEC/(06)12)
amended 31 October 2008



EXPLANATORY MEMORANDUM

1 INTRODUCTION

This ECC Decision has been developed in response to an EC mandate to CEPT to identify the conditions relating to the harmonised introduction in the European Union of radio applications based on ultra-wideband (UWB) technology. CEPT was mandated to undertake all the necessary work to identify the most appropriate criteria for the timely and harmonised introduction of UWB applications in the European Union.

This ECC Decision supplements Decision ECC/DEC/(06)04 amended 6 July 2007 on the harmonised conditions for devices using UWB technology in bands below 10.6 GHz and defines conditions of use applicable to UWB devices implementing Low Duty Cycle (LDC) or Detect And Avoid (DAA) mitigation techniques.

2 BACKGROUND

The frequency band 6 - 8.5 GHz has been identified in Europe for long-term UWB operation with a maximum mean e.i.r.p. spectral density of -41.3 dBm/MHz and a maximum peak e.i.r.p. of 0 dBm measured in a 50MHz bandwidth without the requirement for additional mitigation.

In the frequency band 3.1 - 4.8 GHz and 8.5 – 9 GHz, ECC has investigated DAA (Detect And Avoid) and LDC (Low Duty Cycle) mitigation techniques in order to ensure the protection of BWA terminals and applications in the radiolocation services, with a view of allowing UWB devices in the band 3.1 - 4.8 GHz and 8.5 – 9 GHz with maximum mean e.i.r.p. spectral density of -41.3 dBm/MHz.

Particular attention was paid to Detect and Avoid (DAA) mechanisms, which detect the presence of signals from other radio systems (such as fixed broadband wireless access and mobile services) and reduce the transmitted power of the UWB device down to a level where it does not cause interference to indoor reception of these systems.

ECC Reports 94 and 120 developed in support of this Decision do not address the protection of outdoor stations of radio services such as FS and FSS in the bands 3.4 – 4.2 GHz and 4.5 - 4.8 GHz. Complementary technical studies presented in CEPT Report 9 (using different propagation models and assuming 100% of UWB devices operating indoor with an average 1% activity factor) in support of Decision ECC/DEC/(06)04 provide some level of confidence regarding their protection from UWB devices transmitting with a maximum mean e.i.r.p. spectral density of -41.3 dBm/MHz. However, as the strict prohibition of outdoor use cannot effectively be enforced in case of mobile or portable license-exempt devices, this regulation includes provisions aiming to minimise UWB being used outdoor.

During the development of this Decision, some countries underlined that they consider possible deployment in the future of passive radars operating in the band 8.5 – 9 GHz and that the effectiveness of DAA to protect these systems has not been studied.

3 REQUIREMENT FOR AN ECC DECISION

The allocation or designation of frequency bands under specified conditions in CEPT member countries is laid down by law, regulation or administrative action. ECC Decisions are required to deal with the carriage and use of equipment throughout Europe. The ECC also recognizes that for UWB devices to be introduced successfully throughout Europe, confidence must be given on the one hand to manufacturers to make the necessary investments and on the other hand to users of existing services that their protection will be ensured.

The harmonisation on a European basis would support the *Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity*.

A commitment by CEPT member countries to implement an ECC Decision will provide a clear indication that the required frequency range will be made available on time and on a Europe-wide basis and that the means to ensure protection of existing services will be applied.

**ECC Decision
of 1 December 2006
amended 31 October 2008**

on supplementary regulatory provisions to Decision ECC/DEC/(06)04 for UWB devices using mitigation techniques

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“The European Conference of Postal and Telecommunications Administrations,

considering

- a) Decision ECC/DEC/(06)04 amended 6 July 2007 on the harmonised conditions for devices using UWB technology in bands below 10.6 GHz;
- b) that the frequency range below 4.8 GHz has advantages for UWB, because of the lower path loss compared to the range above 6 GHz and the near term availability of technology;
- c) that UWB devices implementing mitigation techniques can be allowed to transmit at higher power than defined in Decision ECC/DEC(06)04 on the condition that these mitigation techniques provide at least an equivalent protection to those specified in ECC/DEC(06)04;
- d) that limitations on the duty cycle of UWB devices and the implementation of Detect and Avoid (DAA) mechanism can improve the coexistence with other radiocommunication systems;
- e) that technical requirements for LDC UWB devices to protect FWA terminals are presented in ECC Report 94;
- f) that based on studies and measurement campaigns on the impact of LDC UWB devices on military radars in the band 3.1 – 3.4 GHz, it was concluded that the probability of a single LDC UWB device to radiate into the main beam of the radar is low and hence the risk of interference is negligible;
- g) that technical requirements for DAA UWB devices to ensure the protection of radiolocation services in the bands 3.1 - 3.4 GHz and 8.5 - 9 GHz and BWA terminals in the band 3.4 – 4.2 GHz are presented in ECC report 120;
- h) that DAA technical requirements in the band 8.5 – 9 GHz are based on characteristics of monostatic radiolocation systems and may be revised subject to reported risk of interference to other classes of X-band radars considered to be deployed in the future, in particular passive radars;
- i) that DAA technical requirements given in Annex 2 of this ECC decision need to be supplemented by adequate guidance on DAA measurement procedures and test patterns as defined in relevant standards (e.g. relevant versions of ETSI EN 302 065 including Harmonised European Standards adopted under Directive 1999/5/EC);
- j) that DAA technical requirements should safeguard the protection of BWA terminal stations for more than 99.75% of the time;
- k) that DAA technical requirements will need to be reviewed as existing systems are subject to technological change and other systems may be deployed or developed in the future;
- l) that the band 3.4 - 3.6 GHz was identified for IMT applications at WRC-07;
- m) that the requirement of UWB DAA devices operating in the band 3.1 – 4.8 GHz to be capable of selecting an operating channel anywhere within the band 3.1 - 4.8 GHz band will provide additional mitigation to radio services operating in this band;
- n) that UWB DAA devices are expected to operate predominantly indoors with an average 1% activity factor;
- o) that the exclusion of fixed outdoor stations from the scope of this Decision will also limit the operation of mobile outdoor devices;

DECIDES

1. that this ECC Decision defines supplementary regulatory provisions to Decision ECC/DEC/(06)04 for UWB devices using mitigation techniques;
2. that, for the purpose of the Decision, the following **definitions** apply:
 - a. **LDC UWB** devices are defined as devices using UWB technology that meet the technical requirements for Low Duty Cycle (LDC) mitigation technique given in Annex 1 of this Decision;
 - b. **DAA UWB** devices are defined as devices using UWB technology that meet the technical requirements for Detect And Avoid (DAA) mitigation technique given in Annex 2 of this Decision;
3. that the devices permitted under this ECC Decision are exempt from individual licensing and operate on a non-interference, non-protected basis;
4. that this ECC Decision is not applicable to:
 - a. devices and infrastructure installed at a fixed outdoor location or devices connected to a fixed outdoor antenna;
 - b. devices installed in flying models, aircraft and other aviation;
5. that for devices permitted under this ECC Decision, the technical requirements detailed in Annex 1 of Decision ECC/DEC/(06)04 apply, and, alternatively:
 - a. within the band 3.1 – 4.8 GHz, **LDC UWB** devices are permitted to operate with a maximum mean e.i.r.p. spectral density of -41.3 dBm/MHz and a maximum peak e.i.r.p. of 0 dBm measured in 50MHz; notwithstanding that
 - i. in case of **LDC UWB** devices installed in road and rail vehicles, no additional mitigation is required as the LDC mitigation technique is recognised to offer a protection level that is at least equivalent to Transmit Power Control (TPC);
 - b. within the bands 3.1 – 4.8 GHz and 8.5 – 9 GHz, **DAA UWB** devices are permitted to operate with a maximum mean e.i.r.p. spectral density of -41.3 dBm/MHz and a maximum peak e.i.r.p. of 0 dBm measured in 50MHz; notwithstanding that,
 - i. in case of **DAA UWB** devices installed in road and rail vehicles, operation is subject to the implementation of Transmit Power Control (TPC) with a range of 12 dB with respect to the maximum permitted radiated power. If no TPC is implemented, the maximum mean e.i.r.p. spectral density is -53.3 dBm/MHz;
6. that this Decision enters into force on 31 October 2008;
7. that the preferred date for implementation of this Decision shall be 1 May 2009;
8. that CEPT administrations shall communicate the national measures implementing this Decision to the ECC Chairman and the Office when the Decision is nationally implemented.”

Note:

Please check the Office web site (<http://www.ero.dk>) for the up to date position on the implementation of this and other ECC Decisions.

ANNEX 1

Technical requirements for Low Duty Cycle (LDC) mitigation technique

<p>Ton max = 5 ms Toff mean \geq 38 ms (averaged over 1 sec) Σ Toff > 950 ms per second Σ Ton < 18 s per hour</p>
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Ton

Ton is defined as the duration of a burst irrespective of the number of pulses contained.

Toff

Toff is defined as the time interval between two consecutive bursts when the UWB emission is kept idle.

Limit definition

The mean e.i.r.p. spectral density and peak e.i.r.p. power limits are defined during Ton.

ANNEX 2¹**Technical requirements for Detect And Avoid (DAA) mitigation technique**

The flexible DAA proposal is based on the definition of different zones for which an appropriate UWB emission power level (maximum mean e.i.r.p. spectral density) is authorised. A zone is defined by a range of isolation between a device/system of a victim radio service and the UWB device. These zones and associated range of isolation correspond to the maximum mean e.i.r.p. spectral density levels specified in Table 1.

In the first zone, the UWB device shall operate at an emission level applied in the avoidance bandwidth as defined in table 1. In the last zone, the UWB device can operate without restriction up to the maximum permitted power level of -41.3 dBm/MHz or as defined in a future DAA regulation for the corresponding operational frequency range except in road and rail vehicles where additional restrictions apply. Between these extreme zones, a transition zone is defined for the band 3.4 – 4.8 GHz.

Before initiating UWB communications, the UWB device shall perform a monitoring of the RF environment during a minimum time to detect any actively operating victim signal (minimum initial channel availability check time value given in Table 1). Based on the result of this detection process, the UWB device has to determine the corresponding zone it occupies and react accordingly.

This function shall be able to detect victim systems signals and measure if this power level in a given bandwidth is above or below a detection threshold in any of the frequency bands denoted here after. This detection threshold is specified at the antenna connector assuming a 0dBi antenna gain for each detection operation and may be based on multiple levels. This detection threshold can alternatively be expressed as a field strength limit.

The DAA UWB devices shall be able to continuously detect any change of the RF configuration (e.g. modification of operating zone) and switch to corresponding emission level within a maximum detect and avoid time according to the victim service and procedural tests Harmonized European defined in relevant standards (e.g. relevant versions of ETSI EN 302 065, including Harmonised European Standards adopted under Directive 1999/5/EC).

	Operational frequency	3.1 - 3.4 GHz	3.4 - 3.8 GHz ¹	3.8 - 4.8 GHz ¹	8.5 - 9 GHz
	Minimum initial channel availability check time	14s	5.1s		14s
Zone 1 for Signal detection level S > A	Maximum mean e.i.r.p. spectral density	-70 dBm/MHz	-80 dBm/MHz	-70 dBm/MHz	-65 dBm/MHz
	Default Avoidance bandwidth	300 MHz	200 MHz		500 MHz
Signal Detection threshold A		-38 dBm	-38 dBm		-61 dBm
Zone 2 for Signal detection level A > S > B	Maximum mean e.i.r.p. spectral density	-41.3 dBm/MHz	-65 dBm/MHz		-41.3 dBm/MHz
	Default Avoidance bandwidth	-	200 MHz		-
Signal Detection threshold B			-61 dBm		
Zone 3 for Signal detection level S < B	Maximum mean e.i.r.p. spectral density	-	-41.3 dBm/MHz		-

Table 1: Technical parameters to be used by UWB DAA devices

⁰ Definitions of the parameters can be found in ECC Report 120

¹ Detection mechanism needs to be validated to protect existing operation of victim stations of radio services such as BWA terminals

Additional requirement for operation in the band 3.1 – 4.8 GHz

UWB DAA devices shall be capable of selecting an operating channel anywhere within the band 3.1 – 4.8 GHz.

¹ The content of this annex is meant to be respected by ETSI in the development of harmonised standards.