

Cover note to draft ECC/DEC/(06)AA on UWB

UWB public consultation – Introductory text

For the purpose of the public consultation on the draft ECC Decision on Devices using UWB technologies in the bands below 10.6 GHz, comments will be appreciated in particular on the issues listed below.

It should be noted that the ECC Decision intends to deliver a clear message that the band 6 to 9 GHz is identified in Europe for long-term UWB operation without additional mitigation techniques.

Definition

UWB technology is not defined in the draft ECC Decision and ECC will consider proposals for a definition which may be included in the Decision. However, the definition should not restrict the type of technology permitted and should be as general as possible.

It is noted in particular that compatibility studies conducted within CEPT do not assume any *minimum bandwidth* for UWB and offer therefore no technical justification for setting one in the regulation.

The definition quoted below has been developed by ITU-R Task Group 1/8:

“*Ultra-wideband technology*: technology for short-range radiocommunication, involving the intentional generation and transmission of radio-frequency energy that spreads over a very large frequency range, which may overlap several frequency bands allocated to radiocommunication services. Devices using UWB technology typically have intentional radiation from the antenna with either a –10 dB bandwidth of at least 500 MHz or a –10 dB fractional bandwidth greater than 0.2.”

Indoor use

Technical studies were made on the basis of indoor use only. The ECC Decision lists detailed restrictions for certain outdoor applications but does not restrict use to indoor only because a certain level of outdoor use cannot be prevented due to the fact that UWB devices will be integrated in portable and mobile equipment. ECC invites comments on whether the Decision should restrict the use to indoor only and if so how this can be enforced?

Use on board ships and aircrafts

The restriction on use on board ships and aircrafts in the draft ECC Decision may be deleted if the issue is covered by maritime and aeronautical regulations. Comments are especially invited from the maritime and aeronautical communities.

Mitigation techniques

Mitigation techniques are treated in a technological neutral way.

Technical requirements for the Low Duty Cycle (LDC) mitigation may be solved before the final adoption of the Decision and therefore may be incorporated as a separate note to the table of the Annex.

The initial proposal for double-limitation (5% over one second, 0.5% over one hour) considered within ECC TG3 needs to be reviewed by the next ECC TG3 meeting in order to take into account BFWA and other systems' characteristics. It was also noted that maximum burst duration and a minimum 'off' period would also be needed.

CEPT will work in close cooperation with ETSI so as to facilitate the development of relevant harmonised ETSI standards in a timely manner.

Phased approach in the band 4.2 – 4.8 GHz without mitigation techniques.

The phased approach is proposed to provide solutions for manufacturers which have started to develop UWB devices in the bands below 5 GHz, taking into account the future development of mobile services. The absence of this phased approach may lead to a situation where legal UWB products would not be available on the European market for a number of years and with a risk that European consumers would buy illegal UWB products on the grey market that have been approved to the FCC limits.

Concerns were expressed against the phased approach as this band is discussed for introduction for systems beyond IMT-2000 and because it may lead to a situation where UWB industry would mainly focus on this band rather than the permanent solution in the 6 – 9 GHz.

The sunset date given in the draft ECC Decision for the phased approach is 2010. It has been suggested to extend this date to 2012, taking into account the extended product development cycles necessary to comply with European regulation requirements, and considering the market dynamics. The sunset date is intended to combine the above considerations, expected lifetime of UWB devices, and possible implementation of mobile systems in this band.

There are regulatory issues to be addressed regarding the need to ensure that equipment will not be placed on the market after the sunset date.

ECC invites comments on whether the ECC Decision should include this phased approach and if so, on the appropriate sunset date.

Maximum mean e.i.r.p. density in the band 3.1 – 4.8 GHz with DAA

Complementary technical studies performed within ECC TG3 on the impact of UWB on FSS and FS outdoor victim receivers provide support for the provisional adoption of maximum mean e.i.r.p. density of -41.3 dBm/MHz in the band 3.1 – 4.8 GHz if an adequate Detect and Avoid (DAA) mechanism can be implemented, subject to the definition of its requirements and the demonstration of its effectiveness.

ECC/TG3 is continuing its studies concerning UWB emission levels in the frequency band 3.1 – 3.4 GHz, which is allocated to the radiolocation service on a primary basis. Comments are invited on the suitability of this level.

Maximum mean e.i.r.p. density in the band 6 – 9 GHz

Complementary technical studies performed within ECC TG3 on the impact of UWB on FSS and FS outdoor victim receivers provide support for the provisional adoption of maximum mean e.i.r.p. density of -41.3 dBm/MHz in the band 7 GHz without requirements for specific mitigation techniques. Comments are invited on the suitability of this level particularly with regard to the protection of earth stations operating in the 7.25 – 7.75 GHz band.

Concerning UWB emission levels in the frequency band 8.5 – 9 GHz, which is allocated to the radiolocation service on a primary basis and taking into account considering m) of the ECC Decision comments are invited on the suitability of the -41.3 dBm level to protect radiolocation services in this band.

ELECTRONIC COMMUNICATIONS COMMITTEE

ECC Decision
of dd mm 2006
on the harmonised conditions for devices using UWB
technology in bands below 10.6 GHz

(ECC/DEC/(06)AA)



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.

The underlying objective of the mandate was to provide ECC and the European Commission with the necessary information to develop one or more technical implementing measures harmonising the use of the radio spectrum to enable the timely introduction of UWB technology within Europe. To support the development and deployment of UWB technology it is essential that common spectrum, with the associated regulatory framework and harmonised standards, becomes available throughout Europe as soon as possible.

This Decision is intended to assist Europe to enhance competitiveness in the ICT sector by using the regulatory framework to foster competition and the introduction of new communication technologies. This is one of the leading policy goals defined in the Lisbon Agenda, on the basis that that stronger ICT uptake will lead to greater economic competitiveness, growth and employment.

In this context, it is important that this decision establishes regulatory conditions which will encourage the development of economically-viable markets for UWB applications as commercial opportunities arise, taking into account the need of protection for the existing services.

Harmonising spectrum usage rules across CEPT helps to establish an effective single market for these applications, with consequent economies of scale and benefits to the consumer, as well as avoiding the expected difficulties in enforcing divergent national regulations for highly-portable UWB-enabled products.

UWB technology holds potential for a wide variety of new Short Range Devices (SRD) for communications, measurement, location tracking, imaging, surveillance and medical systems. This decision identifies the conditions required for the use of the radio spectrum by UWB devices. This decision has also identified the technical parameters as well as the appropriate mitigation techniques and review mechanisms that will be required to ensure protection of radio services.

It should be noted that this ECC decision is designed to be part of a “regulatory package”, with regulatory and legal provisions to be adopted by both the CEPT and the European Union, with assistance from ETSI.

2 BACKGROUND

Pursuant to the first mandate issued by the European Commission to CEPT on March 11th, 2004 to develop technical implementing measures for the harmonised use of radio spectrum for UWB applications in the European Union, ECC established a Task Group to develop the ECC responses and complete the technical studies already initiated within CEPT. This ECC Decision applies to generic radio devices below 10.6 GHz that are exempt from individual licensing and operate on a non-interference, non-protected basis.

ECC Report 64 on the protection requirements of radiocommunication systems below 10.6 GHz from Generic Ultra-wide Band (UWB) Applications was adopted February 2005. ECC Report 64 generally assumes an activity factor of 5% and that 80% of the generic UWB devices would be deployed indoor and 20% outdoor;

Based on the deployment scenarios and protection distances assumed in the studies in Report 64, the majority of the radiocommunication services considered require up to 20-30 dB more stringent generic UWB PSD limits than the FCC e.i.r.p. density limits. If the victim radiocommunication service is operated in an outdoor environment, as is the case for e.g. FS, FSS, RAS, EESS etc, then the increase of noise due to the aggregate UWB interference, generally determines the generic UWB PSD limit. If the victim radiocommunication service is operated in the indoor environment, e.g. DVB-T, IMT-2000, RLAN etc., then the closest UWB interferer becomes the dominant interference factor due to small spatial separation (small path loss).

It was recognized that regulatory solutions based on the maximum generic UWB PSD limits calculated in ECC Report 64, while protecting existing services with a high degree of confidence, would not facilitate UWB operation in Europe.

Further analysis has been performed within the frame of a second mandate issued by the European Commission to CEPT in June 2005, including in particular:

- complementary technical studies focused on three selected coexistence scenarios (Fixed Satellite Services, outdoor Fixed Services and indoor FWA scenarios);
- an impact analysis, structured per frequency range, initially considering a e.i.r.p. density limit of -55 dBm/MHz in the 3.1-10.6 GHz frequency range, taking into account possible mitigation factors in particular restriction to indoor UWB applications.

The impact of different PSD limits has been studied on both radiocommunication services and UWB devices. The technical requirements contained in this ECC Decision have been considered in the following frequency ranges:

- below 3.1 GHz,
- 3.1-5 GHz
- 5-6 GHz
- 6-10.6 GHz
- above 10.6 GHz.

For the bands below 3.1 GHz and above 10.6 GHz, the generic limits of ECC Report 64 are the basis for limitation of emissions of UWB applications.

During the elaboration of the ECC decision, several mitigation techniques were considered in order to increase of maximum e.i.r.p. in the band 3.1-4.8 GHz to a level sufficient to enable viable UWB operation in this band. Low duty cycle (LDC) mitigation implemented on UWB devices has been identified as one possibility allowing sharing with radiocommunication services.

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. The reliable implementation of such DAA mechanisms, based on requirements that are to be defined, is not trivial and their feasibility has not yet been validated. Therefore, further research and investigation of DAA is encouraged. Once the effectiveness of DAA mechanism is validated, UWB devices incorporating it will be permitted.

Studies have shown that the band 4.2-4.8 GHz is not currently used by systems operating in the indoor environment although WRC-07 may envisage identification of part of this spectrum for systems beyond IMT-2000 for real deployment after 2015. Taking into account the predicted lifetime of consumer devices, this may allow operation of new UWB devices in this frequency band until at least 2010 without DAA mechanisms. If this band is identified for systems beyond IMT-2000 under WRC-07 agenda item 1.4, then, from 2010, new products would have either to operate in other bands or to implement DAA, once validated.

Technical studies also confirmed the susceptibility of radars (aeronautical, maritime, meteorological and military) to both single entry and aggregate interference from UWB devices and for which an EIRP density level in the order of -65/-70dBm/MHz may provide adequate protection to radars although theoretical studies suggest the need for tighter figures.

It was agreed that in the 6-9 GHz band, an e.i.r.p. density level of -41.3 dBm/MHz would provide some level of confidence for the protection of incumbent services that are operating outdoor.

It should be noted that maximum mean e.i.r.p. limit for UWB has been based on compatibility analysis using an activity factor which assumes that video will be transmitted only using high efficiency coding, such as MPEG2 and MPEG4. If a significant number of devices appear on the market which transmits with higher activity factors, then this regulation will have to be reviewed in order to consider the introduction of duty cycle restriction.

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 investment in the new pan European Radiocommunications systems and services 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 dd mm 2006**

on the harmonised conditions for devices using UWB technology in bands below 10.6 GHz

(ECC/DEC/(06)AA)

“The European Conference of Postal and Telecommunications Administrations,

considering

- a) that UWB technology holds potential for a wide variety of uses for new Short Range Device (SRD) technology;
- b) that UWB SRD can be used for communications, measurement, location, imaging, surveillance and medical systems;
- c) that harmonised conditions across CEPT/EU help to establish an effective single market for these applications, with consequent economies of scale and benefits to the consumer, and avoid difficulties in enforcing divergent national regulations;
- d) that a suitable CEPT/EU harmonized solution would encourage the global convergence of products by the UWB industry which would lead to greater economies of scale and the associated benefits;
- e) that transmissions of ultra-wideband (UWB) devices generally extend over a large frequency range;
- f) that by their nature UWB devices will operate in bands that have been allocated to radio services;
- g) that UWB devices shall not cause harmful interference to those radio Services;
- h) that UWB devices can not claim protection from those radio Services;
- i) that UWB devices permitted to operate under this Decision present the potential to transmit in bands allocated to passive services that are covered in the RR footnote 5.340 which prohibits all emissions;
- j) that some categories of UWB devices are excluded from the scope of the Decision as they can present a significant risk of interference to radio services;
- k) that the frequency range of 3.1 to 5 GHz has advantages for UWB, because of the lower path loss compared to the range above 5 GHz and the availability of technology;
- l) that the protection requirements of radiocommunication systems below 10.6 GHz from Generic UWB Applications have been studied in ECC Report 64;
- m) that for some sensitive outdoor radio services e.g. aeronautical, meteorological and military radar, and indoor radio services e.g. FWA and mobile services, UWB emission levels in the order of -70 to -85 dBm/MHz are necessary for protection;
- n) that due to the interference potential of UWB devices on aeronautical onboard receivers and maritime onboard receivers, adequate regulatory measures are required to restrict the use of devices permitted to operate under this Decision aboard an aircraft or a ship;
- o) that UWB devices are able to implement mitigation techniques in order to provide additional protection for radio Services;
- p) that limitations on the duty cycle of UWB devices can improve the coexistence with other radiocommunication systems;
- q) that, if the DAA mechanism is defined and its effectiveness is validated, UWB will be permitted to operate indoor at a level of -41.3 dBm/MHz in the band 3.1-4.8 GHz;

- r) that if a significant amount of devices appear on the market without efficient video coding, then this regulation will have to be reviewed in order to consider the introduction of duty cycle restriction;
- s) that studies have shown that coexistence is possible with current outdoor systems operating in the band 4.2-4.8 GHz;
- t) that the EC has issued Mandate M/329 to ETSI, to develop a set of Harmonised Standards for Short Range Devices using UWB technology, which should be consistent with the technical provisions of this Decision;
- u) that CEPT can continue to study other mitigation techniques;
- v) that in EU/EFTA countries, UWB devices must fulfil the requirements of 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;
- w) that, in accordance with this Directive, EU Member States must ensure that the manufacturer or the person responsible for placing the UWB device on the market provides information for the user on its intended use;
- x) that future World Radiocommunication Conferences may make revisions to the Radio Regulations that change the impact of UWB on Radiocommunication Services operating in accordance with the Table of Allocations;
- y) that CEPT can develop other Decisions for specific classes of UWB device (e.g. Ground and Wall Penetrating Radar) which do not meet the technical requirements of this Decision for generic UWB devices;
- z) that, in order to support procedures of review of ECC Decisions, administrations are encouraged to collect market data on the numbers and types of UWB devices being placed on national markets;
- aa) that administrations are encouraged to conduct measurements on the characteristics of these devices;
- bb) that administrations are encouraged to monitor the impact of UWB devices on incumbent users, including the rise in noise due to the aggregate effect;
- cc) that administrations are encouraged to collect evidence of any interference caused to incumbent services by UWB devices;
- dd) that, to avoid harmful interference, it is important to minimise the outdoor activity of UWB, but it is impractical to prevent the incidental outdoor use of handheld UWB devices;

DECIDES

1. that this ECC Decision defines general harmonised conditions for the use in Europe of devices using UWB technology in bands below 10.6 GHz. In EU/EFTA countries the use of such devices shall comply with the R&TTE Directive. Conformity with the essential requirements in its Article 3(2) may be demonstrated by compliance with harmonised ETSI standards or equivalent technical specifications;
2. that the devices permitted under this ECC Decision are exempt from individual licensing and operate on a non-interference, non-protected basis;
3. that this ECC Decision is not applicable to:
 - a) flying models,
 - b) outdoor installations and infrastructure, including those with externally mounted antennas,
 - c) devices installed in road and rail vehicles, aircraft and other aviation;
4. that the following restrictions on use apply to devices permitted under this ECC Decision:
 - a) operation not allowed aboard an aircraft,
 - b) operation not allowed aboard a ship,
 - c) operation not allowed at a fixed outdoor location;

5. that the technical requirements detailed in Annex 1 apply to devices permitted under this ECC Decision;
6. that this Decision enters into force on [date];
7. that the [preferred/definitive*] date for implementation of this Decision shall be [date];
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.”

Notes:

- 1 The following Members have a derogation to implement this Decision until xx yy zzzz:
- 2* 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.

DRAFT

Annex 1

Technical requirements for devices using UWB technology in bands below 10.6 GHz

Maximum e.i.r.p. limits

Frequency range	Maximum mean e.i.r.p. density (dBm/MHz)	Maximum peak e.i.r.p. density (dBm/50MHz)
Below 1.6 GHz	-90 dBm/MHz	-50 dBm/50MHz
1.6 to 2.7 GHz	-85 dBm/MHz	-45 dBm/50MHz
2.7 to 3.1 GHz	-70 dBm/MHz	-30 dBm/50MHz
3.1 to 4.8 GHz Note 1 Note 2	-70 dBm/MHz	-30 dBm/50MHz
4.8 to 6 GHz	-70 dBm/MHz	-30 dBm/50MHz
6 to 9 GHz	-41.3 dBm/MHz	0 dBm/50MHz
9 to 10.6 GHz	-65 dBm/MHz	-25 dBm/50MHz
Above 10.6 GHz	-85 dBm/MHz	-45 dBm/50MHz

Note 1: In the frequency band 3.1 to 4.8 GHz, ECC has decided to investigate efficient mitigation techniques, such as amongst others DAA (Detect And Avoid) mechanisms in order to ensure compatibility of UWB devices with radio services in the band with a view of allowing UWB devices in this band with maximum mean e.i.r.p. density of -41.3 dBm/MHz and a maximum peak e.i.r.p. density of 0dBm/50MHz. Duty-cycle limitation has also been identified as a possible mitigation technique. ECC will review this decision in the light of the results of these investigations.

[Note for public consultation: Technical requirements for the Low Duty Cycle (LDC) mitigation may be solved before the final adoption of the Decision and therefore be incorporated as a separate note to the table of this Annex.]

Note 2: In the frequency band 4.2 to 4.8 GHz, UWB devices are permitted until 30 June 2010 with a maximum mean e.i.r.p. density of -41.3 dBm/MHz and a maximum peak e.i.r.p. density of 0dBm/50MHz

OTHER REQUIREMENTS

Pulse Repetition Frequency (PRF)

The pulse repetition frequency (PRF) for UWB devices shall not be less than 1MHz. This restriction does not apply to burst repetition frequency.

[Note for public consultation: the necessity to maintain a restriction on the PRF in addition to the peak e.i.r.p. limit measured in a 50 MHz bandwidth needs to be assessed before final adoption of this Decision].

Transmission activity

A communications system shall transmit only when it is sending information to an associated receiver or attempting to acquire or maintain association. The device shall cease transmission within ten seconds unless it receives an acknowledgement from an associated receiver that its transmission is being received. An acknowledgement of transmission must continue to be received by the UWB device at least every ten seconds, or it must cease transmitting. A device operating as a communication system is characterised by transmission between at least two devices.

Non-communication systems such as imaging systems shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator. In lieu of a switch located on the imaging system, it is permissible to operate an imaging system by remote control provided the imaging system ceases transmission within 10 seconds of the remote switch being released by the operator.

DEFINITIONS

Maximum PSD

The highest signal strength measured in any direction at any frequency within the defined range.

Mean Power

The power is measured with a 1MHz resolution bandwidth, an RMS detector and an averaging time of 1ms or less.

Peak Power

The peak level of transmission contained within a 50MHz bandwidth centred on the frequency at which the highest mean radiated power occurs.

Duty cycle

For the purpose of this Decision the duty cycle is defined as the ratio, expressed as a percentage, of the transmitter "on" relative to a given period as specified in the technical requirements.

Impulse, Pulse and Burst

Impulse: a surge of unidirectional polarity that is often used to excite a UWB band limiting filter whose output, when radiated, is a UWB pulse.

Pulse: a radiated short transient UWB signal whose time duration is nominally the reciprocal of its UWB -10 dB bandwidth.

Burst: an emitted signal whose time duration is not related to its bandwidth.