

ELECTRONIC COMMUNICATIONS COMMITTEE

ECC Decision
of 24 March 2006
on the harmonised conditions for devices using
Ultra-Wideband (UWB) technology
in bands below 10.6 GHz

(ECC/DEC/(06)04)



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 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 on one hand will encourage the development of economically-viable markets for UWB applications as commercial opportunities arise, and on the other hand will take 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 UWB devices below 10.6 GHz that are exempted from individual licensing and operating 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.

Technical studies confirmed the susceptibility of radars (aeronautical, maritime, meteorological and military) to both single entry and aggregate interference from UWB devices. Practical testing has confirmed that an e.i.r.p. density level in the order of -65/-70dBm/MHz, as originally proposed, may not provide adequate protection to radars and that a level of -85dBm/MHz as suggested by theoretical studies might be used until further studies have been completed.

It was agreed in particular that in the 6 - 8.5 GHz band, assuming 100% of UWB devices operating indoor with an average 1% activity factor, 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. If a significant number of devices appear on the market which transmits with higher activity factors, then this regulation will have to be reviewed.

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 24 March 2006**

**on the harmonised conditions for devices using Ultra-Wideband (UWB) technology
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“The European Conference of Postal and Telecommunications Administrations,

considering

- a) that UWB technology shall mean 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;
- b) that this Decision is applicable to technologies with bandwidth significantly wider than 50 MHz;
- c) that Short Range Devices (SRD) using UWB technology can be used for communications, measurement, location, imaging, surveillance and medical systems;
- d) 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;
- e) 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;
- f) that the devices using UWB technology shall operate on a non-interference, non-protected basis ;
- g) that the devices using UWB technology which are 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;
- h) that this ECC Decision is primarily intended to respond to the market demand for UWB indoor and handheld devices providing communication applications;
- i) that some categories of UWB devices characterized by predominantly outdoor usage are explicitly excluded from the scope of this Decision as they can present a significant risk of interference to radio services deployed outdoor and operating in frequency bands where maximum UWB emission levels would be allowed;
- j) that the frequency range below 5 GHz is being considered for the development of cellular networks such as IMT-Advanced discussed within the frame of Agenda Item 1.4 of WRC-07;
- k) that the higher maximum power densities in frequency band 6 – 8.5 GHz without requirement for additional mitigation will facilitate UWB operation;
- l) that the protection requirements of radiocommunication systems below 10.6 GHz from Generic UWB Applications have been studied in ECC Report 64 assuming in particular for aggregate interference analyses 80% of UWB devices operating indoor, 20% outdoor and an average 5% activity factor;
- m) that for some sensitive outdoor radio services e.g. aeronautical, meteorological and military radar, and radio services with indoor coverage e.g. FWA and mobile services, UWB emission levels in the order of -70 to -85 dBm/MHz would offer some protection to such primary or secondary users;
- n) that, for the Radio astronomy service, the protection levels given in ECC Report 64 are well below the maximum e.i.r.p. densities given in the Annex 1, but when taking into account mitigation factors specific to existing radio astronomy stations coexistence might be feasible;

- o) that ECC Report 64 has considered interference potential resulting from mean power and only limited consideration has been given to peak power interference, time gating and frequency hopping. ECC may review this Decision in the light of these possible implications;
- p) that complementary technical studies (using different propagation models and assuming 100% of UWB devices operating indoor with an average 1% activity factor) provide some level of confidence regarding the protection of outdoor stations from the Fixed Service and the Fixed Satellite Service with a maximum mean e.i.r.p. density level of -41.3 dBm/MHz;
- q) that the issue of compatibility of UWB devices operated on-board either an aircraft or a vessel is the responsibility of the relevant aeronautical and maritime regulatory authorities;
- r) that if actual UWB deployment significantly exceeds assumptions used in the complementary technical studies, in particular if a significant amount of devices appear on the market without efficient video coding, then this regulation will have to be reviewed;
- s) 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;
- t) 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;
- u) 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;
- v) 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;
- w) that CEPT can develop other Decisions for specific classes of UWB device (e.g. Ground and Wall Penetrating Radar imaging systems) which do not meet the technical requirements of this Decision for generic UWB devices;
- x) 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;
- y) that administrations are encouraged to conduct measurements on the characteristics of these devices;
- z) that administrations are encouraged to monitor the impact of UWB devices on incumbent users, including the rise in noise due to the aggregate effect;
- aa) that administrations are encouraged to collect evidence of any interference caused to incumbent services by UWB devices;
- bb) that, to reduce interference, it is important to minimise the outdoor activity of UWB;

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;
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 devices covered by the scope of this ECC Decision are not allowed to be used at a fixed outdoor location or connected to a fixed outdoor antenna;
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 24 March 2006;
7. that the preferred date for implementation of this Decision shall be 1 October 2006;
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 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) (Note 2)
Below 1.6 GHz	-90 dBm/MHz	-50 dBm/50MHz
1.6 to 3.8 GHz (Note 1)	-85 dBm/MHz	-45 dBm/50MHz
3.8 to 4.8 GHz (Note 1)	-70 dBm/MHz	-30 dBm/50MHz
4.8 to 6 GHz	-70 dBm/MHz	-30 dBm/50MHz
6 to 8.5 GHz	-41.3 dBm/MHz	0 dBm/50MHz
8.5 to 10.6 GHz	-65 dBm/MHz	-25 dBm/50MHz
Above 10.6 GHz	-85 dBm/MHz	-45 dBm/50MHz

Note 1: ECC is still considering whether or not to adopt a separate Decision covering the frequency band 3.1 – 4.8 GHz.

Note 2: The peak e.i.r.p. can be alternatively measured in a 3 MHz bandwidth. In this case, the maximum peak e.i.r.p. limits to be applied is scaled down by a factor of $20\log(50/3) = 24.4$ dB.

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.

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.

The peak e.i.r.p. can be alternatively measured in a 3 MHz bandwidth. In this case, the maximum peak e.i.r.p. limits to be applied is scaled down by a factor of $20\log(50/3) = 24.4$ dB.

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.
