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# COMMISSION DECISION

**of 21 February 2007**

**on allowing the use of the radio spectrum for equipment using ultra-wideband technology in a harmonised manner in the Community**

*(notified under document number C(2007) 522)*

**(Text with EEA relevance)**

(2007/131/EC)

(OJ L 55, 23.2.2007, p. 33)

Amended by:

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| ►**M1** | Commission Decision 2009/343/EC of 21 April 2009 | L 105 | 9 | 25.4.2009 |
| ►**M2** | Commission Implementing Decision 2014/702/EU of 7 October 2014 | L 293 | 48 | 9.10.2014 |

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*(notified under document number C(2007) 522)*

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(2007/131/EC)

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Community,

Having regard to Decision No 676/2002/EC of the European Parliament and of the Council of 7 March 2002 on a regulatory framework for radio spectrum policy in the European Community (Radio Spectrum Decision) ([1]), and in particular Article 4(3) thereof,

Whereas:

(1) The European Council has recognised the significant contribution to growth and jobs by building a fully inclusive information society, based on widespread use of information and communication technologies (ICTs) in public services, SMEs and households ([2]). With the i2010 initiative, the Commission emphasised ICT as a major driver of competitiveness, growth and jobs ([3]).

(2) The creation of an open and competitive single market for information society equipment and media services within the Community is critical to ICT uptake. The Community regulatory framework for electronic communications services and equipment can enhance competitiveness and foster competition in the ICT sector, *inter alia* by ensuring the timely introduction of new technologies.

(3) Ultra-wideband technology, typically characterised by very low power radiation over a very large radio bandwidth, could provide a host of communications, measurement, location, medical, surveillance and imaging applications of benefit to various Community policies, including the information society and the internal market. In this context, it is important to establish regulatory conditions which will encourage the development of economically viable markets for applications of ultra-wideband technology as commercial opportunities arise.

(4) The timely deployment and uptake of applications using ultra-wideband technology within the Community will be assisted by harmonising radio spectrum use rules across the Community, thus establishing an effective single market for these applications, with consequent economies of scale and benefits to the consumer.

([1]) OJ L 108, 24.4.2002, p. 1.
([2]) European Council Conclusions 7619/1/05 Rev. 1 of 23.3.2005.
([3]) COM(2005) 229.

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(5) Although ultra-wideband signals are typically of extremely low power, the possibility of harmful interference with existing radiocommunication services exists and needs to be managed. Therefore, the regulatory framework for use of the radio spectrum for ultra-wideband technology must respect the rights to protection against harmful interference (including access to the radio spectrum by radio astronomy, earth exploration satellite and space research systems) and balance the incumbent services' interests against the overall policy objective of providing favourable conditions for the introduction of innovative technologies for the benefit of society.

(6) The use of spectrum is subject to the requirements of Community law for public health protection in particular Directive 2004/40/EC of the European Parliament and of the Council of 29 April 2004 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields), [1] and Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) [2]. Health protection for radio equipment is ensured by conformity of such equipment to the essential requirements pursuant to 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 (the R&TTE Directive) [3].

(7) Pursuant to Article 4(2) of the Radio Spectrum Decision, the Commission has given three mandates [4] to the European Conference of Postal and Telecommunications Administrations (hereinafter referred to as the CEPT) to undertake all necessary work to identify the most appropriate technical and operational criteria for the harmonised introduction of ultra-wideband-based applications in the European Union.

(8) This Decision is based on the technical studies undertaken by the CEPT under EC mandate. These compatibility studies include, *inter alia*, the presumption that equipment using ultra-wideband technology will be operated predominantly indoors and that it will cease transmission within 10 seconds unless it receives an acknowledgement from an associated receiver that its transmission is being received. Furthermore, video signals will be transmitted using predominantly high-efficiency coding.

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[1] OJ L 159, 30.4.2004, p. 1, as amended by OJ L 184, 24.5.2004, p. 1.
[2] OJ L 199, 30.7.1999, p. 59.
[3] OJ L 91, 7.4.1999, p. 10. Directive amended by Regulation (EC) No 1882/2003 (OJ L 284, 31.10.2003, p. 1).
[4] Mandate to the CEPT to harmonise radio spectrum use for ultra-wideband systems in the European Union (Mandate 1); mandate to the CEPT to identify the conditions necessary for harmonising radio spectrum use for ultra-wideband systems in the European Union (Mandate 2); mandate to CEPT to identify the conditions relating to the harmonised introduction in the European Union of radio spectrum applications based on Ultra-Wideband (UWB) technology (Mandate 3).

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(9) Outdoor use of equipment using ultra-wideband technology covered by this Decision should not include use at a fixed outdoor location or connected to a fixed outdoor antenna or in vehicles. The potential interference caused by such uses requires further study.

(10) Equipment using ultra-wideband technology covered by this Decision falls within the scope of the R&TTE Directive. Nevertheless, the use of frequency bands by equipment using ultra-wideband technology for air traffic management communications in aircraft and safety-of-life applications in ships does not fall under the R&TTE Directive and any use of such equipment in these safety-of-life environments should be determined by appropriate sector-specific regulation.

(11) Pursuant to the R&TTE Directive, the European Commission has given a mandate (M/329) to the European standardisation organisations to establish a set of Harmonised Standards covering ultra-wideband applications to be recognised under this Directive, and resulting in a presumption of conformity with its requirements.

(12) In response to mandate M/329 from the EC, the ETSI is developing European standards such as Harmonised Standard EN 302 065 for ultra-wideband technology which will take account of potential aggregate effects, if such effects could lead to harmful interference, and of the compatibility studies of the CEPT. Harmonised Standards should be maintained and evolve over time to ensure protection of emerging services for which bands as yet have not been designated.

(13) Furthermore, when a Member State considers that equipment using ultra-wideband technology within the scope of the R&TTE Directive and of any Harmonised Standards adopted pursuant thereto does not comply with the requirements of the abovementioned Directive, safeguard measures may be applied in accordance with Articles 9 and 5 of the Directive respectively.

(14) The use of radio spectrum by equipment using ultra-wideband technology under this Decision is to be allowed on a non-interference and non-protected basis and therefore should be subject to Article 5(1) of Directive 2002/20/EC of the European Parliament and of the Council of 7 March 2002 on the authorisation of electronic communications networks and services ([1]).

(15) For the purpose of ensuring the continued relevance of the conditions specified in this Decision and given the rapid changes in the radio spectrum environment, national administrations ought to monitor, where possible, use of the radio spectrum by equipment using ultra-wideband technology, so as to subject this Decision to active review. Such review should take into account technological development and changes in the market situation and verify that the initial assumptions concerning the operation of equipment using ultra-wideband technology in the frequency range specified in this Decision are still relevant.

([1]) OJ L 108, 24.4.2002, p. 21.

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(16) In order to ensure adequate protection of existing services, this Decision should lay down conditions that are deemed adequate to protect currently operating services.

(17) Appropriate mitigation techniques (including detect-and-avoid or low-duty-cycle approaches) studied and specified by CEPT and ETSI under the respective EC Mandates, should be included in Harmonised Standards under the R&TTE Directive once stable and proven to provide equivalent protection to the emission levels identified in this Decision.

(18) The conditions in the 4,2 to 4,8 GHz band for equipment using ultra-wideband technology without appropriate mitigation techniques should be time limited and be replaced by more restrictive conditions beyond the date of 31 December 2010, because there is an expectation that equipment of this type should operate exclusively above 6 GHz in the longer term.

(19) The measures provided for in this Decision are in accordance with the opinion of the Radio Spectrum Committee,

HAS ADOPTED THIS DECISION:

*Article 1*

The purpose of this Decision is to allow the use of the radio spectrum by equipment using ultra-wideband technology and to harmonise the conditions of such use in the Community.

This Decision shall apply without prejudice to Directive 1999/5/EC (the R&TTE Directive) and to any Community provisions allowing use of the radio spectrum by specific types of equipment using ultra-wideband technology.

*Article 2*

For the purposes of this Decision:

1. ‘equipment using ultra-wideband technology’ means equipment incorporating, as an integral part or as an accessory, technology for short-range radiocommunication, involving the intentional generation and transmission of radio-frequency energy that spreads over a frequency range wider than 50 MHz, which may overlap several frequency bands allocated to radiocommunication services;

2. ‘non-interference and non-protected basis’ means that no harmful interference may be caused to any radiocommunication service and that no claim may be made for protection of these devices against harmful interference originating from radiocommunication services;

3. ‘indoors’ means inside buildings or places in which the shielding will typically provide the necessary attenuation to protect radiocommunication services against harmful interference;

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4. ‘automotive vehicle’ means any vehicle as defined by Council Directive 70/156/EEC ([1]);

5. ‘railway vehicle’ means any vehicle as defined by Regulation (EC) No 91/2003 of the European Parliament and of the Council ([2]);

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6. ‘e.i.r.p’ means equivalent isotropically radiated power, which is the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain);

7. ‘maximum mean power spectral density’, specified as e.i.r.p. of the radio device under test at a particular frequency, is the average power per unit bandwidth (centred on that frequency) radiated in the direction of the maximum level under the specified conditions of measurement;

8. ‘peak power’, specified as e.i.r.p., contained within a 50 MHz bandwidth at the frequency at which the highest mean radiated power occurs, radiated in the direction of the maximum level under the specified conditions of measurement;

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10. ‘building material analysis’ (BMA) means a field disturbance sensor that is designed to detect the location of objects within a building structure or to determine the physical properties of a building material;

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11. ‘total radiated power spectral density’ means the average of the mean power spectral density values measured over a sphere around the measurement scenario with a resolution of at least 15 degree. The detailed measuring setup is contained within ETSI EN 302 435;

12. ‘onboard aircraft’ means the use of radio links for intra-aircraft communications purposes inside an aircraft;

13. ‘LT1’ are systems intended for general location tracking of people and objects that can be put into service on an unlicensed basis.

*Article 3*

The Member States shall allow the use of the radio spectrum on a non-interference and non-protected basis by equipment using ultra-wideband technology provided that such equipment meets the conditions set out in the Annex and it is used indoors or, if it is used outdoors, it is not attached to a fixed installation, a fixed infrastructure or a fixed outdoor antenna. Equipment using ultra-wideband technology which meets the conditions set in the Annex shall also be allowed in automotive and railway vehicles

([1]) OJ L 42, 23.2.1970, p. 1.
([2]) OJ L 14, 21.1.2003, p. 1.

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*Article 4*

Member States shall keep the use of the bands identified in the Annex by equipment using ultra-wideband technology under scrutiny, in particular with regard to the continued relevance of all the conditions specified in Article 3, and report their findings to the Commission to allow a timely review of this Decision.

*Article 5*

This Decision is addressed to the Member States.

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*ANNEX*

1. GENERIC UWB USAGE

| Technical requirements | | |
|---|---|---|
| Frequency range | Maximum mean power spectral density (e.i.r.p) | Maximum peak power (e.i.r.p) (defined in 50 MHz) |
| f ≤ 1,6 GHz | – 90 dBm/MHz | – 50 dBm |
| 1,6 < f ≤ 2,7 GHz | – 85 dBm/MHz | – 45 dBm |
| 2,7 < f ≤ 3,1 GHz | – 70 dBm/MHz | – 36 dBm |
| 3,1 < f ≤ 3,4 GHz | – 70 dBm/MHz<br>or<br>– 41,3 dBm/MHz using LDC (1) or DAA (2) | – 36 dBm<br>or<br>0 dBm |
| 3,4 < f ≤ 3,8 GHz | – 80 dBm/MHz<br>or<br>– 41,3 dBm/MHz using LDC (1) or DAA (2) | – 40 dBm<br>or<br>0 dBm |
| 3,8 < f ≤ 4,8 GHz | – 70 dBm/MHz<br>or<br>– 41,3 dBm/MHz using LDC (1) or DAA (2) | – 30 dBm<br>or<br>0 dBm |
| 4,8 < f ≤ 6 GHz | – 70 dBm/MHz | – 30 dBm |
| 6 < f ≤ 8,5 GHz | – 41,3 dBm/MHz | 0 dBm |
| 8,5 < f ≤ 9 GHz | – 65 dBm/MHz<br>or<br>– 41,3 dBm/MHz using DAA (2) | – 25 dBm<br>or<br>0 dBm |
| 9 < f ≤ 10,6 GHz | – 65 dBm/MHz | – 25 dBm |
| f > 10,6 GHz | – 85 dBm/MHz | – 45 dBm |

(1) Within the band 3,1 GHz to 4,8 GHz, The Low Duty Cycle mitigation technique and its limits are defined in ETSI Standard EN 302 065-1.
(2) Within the band 3,1 GHz to 4,8 GHz and 8,5G Hz to 9 GHz. The Detect and Avoid mitigation technique and its limits are defined in ETSI Standard EN 302 065-1.

2. LOCATION TRACKING SYSTEMS TYPE 1 (LT1)

| Technical requirements | | |
|---|---|---|
| Frequency range | Maximum mean power spectral density (e.i.r.p) | Maximum peak power (e.i.r.p) (defined in 50 MHz) |
| f ≤ 1,6 GHz | – 90 dBm/MHz | – 50 dBm |
| 1,6 < f ≤ 2,7 GHz | – 85 dBm/MHz | – 45 dBm |
| 2,7 < f ≤ 3,4 GHz | – 70 dBm/MHz | – 36 dBm |
| 3,4 < f ≤ 3,8 GHz | – 80 dBm/MHz | – 40 dBm |

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| Technical requirements | | |
|---|---|---|
| Frequency range | Maximum mean power spectral density (e.i.r.p) | Maximum peak power (e.i.r.p) (defined in 50 MHz) |
| 3,8 < f ≤ 6,0 GHz | – 70 dBm/MHz | – 30 dBm |
| 6 < f ≤ 8,5 GHz | – 41,3 dBm/MHz | 0 dBm |
| 8,5 < f ≤ 9 GHz | – 65 dBm/MHz<br>or<br>– 41,3 dBm/MHz using DAA (1) | – 25 dBm<br>or<br>0 dBm |
| 9 < f ≤ 10,6 GHz | – 65 dBm/MHz | – 25 dBm |
| f > 10,6 GHz | – 85 dBm/MHz | – 45 dBm |

(1) The Detect and Avoid mitigation technique and its limits are defined in ETSI Standard EN 302 065-2

3. UWB DEVICES INSTALLED IN ROAD AND RAIL VEHICLES

| Technical requirements | | |
|---|---|---|
| Frequency range | Maximum mean power spectral density (e.i.r.p) | Maximum peak power (e.i.r.p) (defined in 50 MHz) |
| f ≤ 1,6 GHz | – 90 dBm/MHz | – 50 dBm |
| 1,6 < f ≤ 2,7 GHz | – 85 dBm/MHz | – 45 dBm |
| 2,7 < f ≤ 3,1 GHz | – 70 dBm/MHz | – 36 dBm |
| 3,1 < f ≤ 3,4 GHz | – 70 dBm/MHz<br>or<br>– 41,3 dBm/MHz using LDC (1) + e,l, (4)<br>or<br>– 41,3 dBm/MHz using TPC (3) + DAA (2) + e,l, (4) | – 36 dBm<br>or<br>≤ 0 dBm<br>or<br>≤ 0 dBm |
| 3,4 < f ≤ 3,8 GHz | – 80 dBm/MHz<br>or<br>– 41,3 dBm/MHz using LDC (1) + e,l, (4)<br>or<br>– 41,3 dBm/MHz using TPC (3) + DAA (2) + e,l, (4) | – 40 dBm<br>or<br>≤ 0 dBm<br>or<br>≤ 0 dBm |
| 3,8 < f ≤ 4,8 GHz | – 70 dBm/MHz<br>or<br>– 41,3 dBm/MHz using LDC (1) + e,l, (4)<br>or<br>– 41,3 dBm/MHz using TPC (3) + DAA (2) + e,l, (4) | – 30 dBm<br>or<br>≤ 0 dBm<br>or<br>≤ 0 dBm |
| 4,8 < f ≤ 6 GHz | – 70 dBm/MHz | – 30 dBm |

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| Technical requirements | | |
|---|---|---|
| Frequency range | Maximum mean power spectral density (e.i.r.p) | Maximum peak power (e.i.r.p) (defined in 50 MHz) |
| 6 < f ≤ 8,5 GHz | – 53,3 dBm/MHz<br>or<br>– 41,3 dBm/MHz using LDC (1) + e,l, (4)<br>or<br>– 41,3 dBm/MHz using TPC (3) + e,l, (4) | – 13,3 dBm<br>or<br>≤ 0 dBm<br>or<br>≤ 0 dBm |
| 8,5 < f ≤ 9 GHz | – 65 dBm/MHz<br>or<br>– 41,3 dBm/MHz using TPC (3) + DAA (2) + e,l, (4) | – 25 dBm<br>or<br>≤ 0 dBm |
| 9 < f ≤ 10,6 GHz | – 65 dBm/MHz | – 25 dBm |
| f > 10,6 GHz | – 85 dBm/MHz | – 45 dBm |

(1) The Low Duty Cycle (LDC) mitigation technique and its limits are defined in ETSI Standard EN 302 065-3
(2) The Detect and Avoid (DAA) mitigation technique and its limits are defined in ETSI Standard EN 302 065-3
(3) The Transmit Power Control (TPC) mitigation technique and its limits are defined in ETSI Standard EN 302 065-3
(4) The exterior limit (e,l,) ≤ – 53,3 dBm/MHz is required. The exterior limit is defined in ETSI Standard EN 302 065-3

4. UWB ONBOARD AIRCRAFT

The values for maximum mean power spectral density (e.i.r.p) and maximum peak power (e.i.r.p) for Short Range Devices (SRD) using Ultra Wide Band technology (UWB), with or without use of mitigation techniques are listed in the table below.

| Technical requirements | | | |
|---|---|---|---|
| Frequency range | Maximum mean power spectral density (e.i.r.p) | Maximum peak power (e.i.r.p) (defined in 50 MHz) | Requirements for mitigation techniques |
| f ≤ 1,6 GHz | – 90 dBm/MHz | – 50 dBm | |
| 1,6 < f ≤ 2,7 GHz | – 85 dBm/MHz | – 45 dBm | |
| 2,7 < f ≤ 3,4 GHz | – 70 dBm/MHz | – 36 dBm | |
| 3,4 < f ≤ 3,8 GHz | – 80 dBm/MHz | – 40 dBm | |
| 3,8 < f ≤ 6,0 GHz | – 70 dBm/MHz | – 30 dBm | |
| 6,0 < f ≤ 6,650 GHz | – 41,3 dBm/MHz | 0 dBm | |
| 6,650 < f ≤ 6,6752 GHz | – 62,3 dBm/MHz | – 21 dBm | notch of 21 dB should be implemented to meet a level – 62,3 dBm/MHz (1) |

▼M2

| Technical requirements | | | |
|---|---|---|---|
| Frequency range | Maximum mean power spectral density (e.i.r.p) | Maximum peak power (e.i.r.p) (defined in 50 MHz) | Requirements for mitigation techniques |
| 6,6752 < f ≤ 8,5 GHz | – 41,3 dBm/MHz | 0 dBm | 7,25 to7,75 GHz (FSS and MetSat (7,45 to 7,55 GHz) protection) (1) (2)<br>7,75 to 7,9 GHz (MetSat protection) (1) (3) |
| 8,5 < f ≤ 10,6 GHz | – 65 dBm/MHz | – 25 dBm | |
| f > 10,6 GHz | – 85 dBm/MHz | – 45 dBm | |

(1) Alternative mitigation techniques offering equivalent protection such as the use of shielded portholes could be a solution,

(2) 7,25 to 7,75 GHz (Fixed Satellite Service) and 7,45 to 7,55 GHz (Meteorological Satellite) protection: – 51,3 – 20*$\log_{10}$ (10[km]/x[km])(dBm/MHz) for heights above ground above 1 000 m, where x is the aircraft height above ground in kilometres, – 71,3 dBm/MHz for heights above ground of 1 000 m and below,

(3) 7,75 to 7,9 GHz (Meteorological satellite) protection: – 44,3 – 20*$\log_{10}$ (10[km]/x[km]) (dBm/MHz) for heights above ground above 1 000 m, where x is the aircraft height above ground in kilometres, and – 64,3 dBm/MHz for heights above ground of 1 000 m and below.

5. MATERIAL SENSING DEVICES USING UWB TECHNOLOGY

5.1. **Material sensing devices**

Material sensing devices permitted under this Decision shall fulfil the following requirements:

— *Fixed installation (application A)*

— The transmitter has to switch off if the machine is not running, ‘running sensor’;

— The transmitter shall implement a TPC with a dynamic range of 10 dB, as described in the harmonised standard EN 302 498-2 for ODC (*Object Discrimination and Characterisation*) applications;

— The transmitter shall be attached to a fixed installation.

— *Non-fixed installation (application B)*

— Transmitter-on only if manually operated with a non-locking switch (e.g. it may be a sensor for the presence of the operators hand) plus being in contact or close proximity to the investigated material and the emissions being directed into the direction of the object (e.g. measured by a proximity sensor or imposed by the mechanical design);

— The transmitter has to switch off if the machine is not running, ‘running sensor’

Emissions radiating from material sensing devices permitted under this decision shall be kept to a minimum and in any case not exceed the e.i.r.p. density limits within the following Table. The compliance with the limits of the following Table for non-fixed installations (application B) has to be ensured with the device on a representative structure of the investigated material (e.g. representative wall as defined in ETSI EN 302 435-1 or ETSI EN 302 498-1).

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| Frequency range | Fixed installations (Application A) | | Non-fixed installations (Application B) Maximum mean power spectral density (e.i.r.p) |
|---|---|---|---|
| | Maximum mean power spectral density (e.i.r.p) | Maximum mean power spectral density (e.i.r.p) in the horizontal plane (– 20° to 30° elevation) | |
| Below 1,73 GHz | – 85 dBm/MHz | | – 85 dBm/MHz |
| 1,73 to 2,2 GHz | – 65 dBm/MHz | – 70 dBm/MHz | – 70 dBm/MHz |
| 2,2 to 2,5 GHz | – 50 dBm/MHz | | – 50 dBm/MHz |
| 2,5 to 2,69 GHz | – 65 dBm/MHz (1) | – 70dBm/MHz | – 65 dBm/MHz (1) (2) |
| 2,69 to 2,7 GHz | – 55 dBm/MHz | – 75 dBm/MHz | – 70 dBm/MHz (3) |
| 2,7 to 2,9 GHz | – 50 dBm/MHz | – 70 dBm/MHz | – 70 dBm/MHz |
| 2,9 to 3,4 GHz | – 50 dBm/MHz | – 70 dBm/MHz | – 70 dBm/MHz (1) |
| 3,4 to 3,8 GHz | – 50 dBm/MHz | – 70 dBm/MHz | – 50 dBm/MHz (2) (3) |
| 3,8 to 4,8 GHz | – 50 dBm/MHz | | – 50 dBm/MHz |
| 4,8 to 5 GHz | – 55 dBm/MHz | – 75 dBm/MHz | – 55 dBm/MHz (2) (3) |
| 5 to 5,25 GHz | – 50 dBm/MHz | | – 50 dBm/MHz |
| 5,25 to 5,35 GHz | – 50 dBm/MHz | – 60 dBm/MHz | – 60 dBm/MHz |
| 5,35 to 5,6 GHz | – 50 dBm/MHz | | – 50 dBm/MHz |
| 5,6 to 5,65 GHz | – 50 dBm/MHz | – 65 dBm/MHz | – 65 dBm/MHz |
| 5,65 to 5,725 GHz | – 50 dBm/MHz | – 60 dBm/MHz | – 60 dBm/MHz |
| 5,725 to 8,5 GHz | – 50 dBm/MHz | | – 50 dBm/MHz |
| 8,5 to 10,6 GHz | – 65 dBm/MHz | | – 65 dBm/MHz |
| Above 10,6 GHz | – 85 dBm/MHz | | – 85 dBm/MHz |

The peak power (in dBm) measured in a bandwidth of 50 MHz shall be less than a limit that is obtained by adding a conversion factor (25 dB) to the 'maximum mean power spectral density' (in dBm/MHz) limit.

(1) devices using a Listen Before Talk (LBT) mechanism, as described in the harmonised standard EN 302 498-2, are permitted to operate in frequency ranges 2,5 to 2,69 and 2,9 to 3,4 GHz with a maximum mean power spectral density of – 50 dBm/MHz,

(2) to protect the radio services, non-fixed installations (application B) must fulfil the following requirement for total radiated power spectral density:

a) In the frequency ranges 2,5 to 2,69 GHz and 4,8 to 5 GHz, the total radiated power spectral density has to be 10 dB below the maximum mean power spectral density;

b) In the frequency ranges 3,4 to 3,8 GHz, the total radiated power spectral density has to be 5dB below the maximum mean power spectral density.

(3) Limitation of the Duty Cycle to 10 % per second.

5.2. **Building material analysis devices (BMA)**

1. BMA Devices permitted under this Decision shall fulfil the following requirements:

(a) Transmitter-On only if manually operated with a non-locking switch plus being in contact or close proximity to the investigated material and the emissions being directed into the direction of the object;

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(b) The BMA transmitter has to switch-off after max 10s without movement;

(c) The total radiated power spectral density has to be 5 dB below the maximum mean power spectral density limits in the table below;

2. Emissions radiating from BMA devices shall be kept to a minimum and in any case not exceed the maximum power limits within the table below with the BMA device on a representative wall as defined within ETSI Standards EN 302 435-1 and EN 302 498-2.

| Technical requirements | | |
|---|---|---|
| Frequency range | Maximum mean power spectral density (e.i.r.p) | Maximum peak power (e.i.r.p) (defined in 50 MHz) |
| Below 1,73 GHz | – 85 dBm/MHz ([1]) | – 45 dBm |
| 1,73 to 2,2 GHz | – 65 dBm/MHz | – 25 dBm |
| 2,2 to 2,5 GHz | – 50 dBm/MHz | – 10 dBm |
| 2,5 to 2,69 GHz | – 65 dBm/MHz ([1]) | – 25 dBm |
| 2,69 to 2,7 GHz | – 55 dBm/MHz ([2]) | – 15 dBm |
| 2,7 to 3,4 GHz | – 70 dBm/MHz ([1]) | – 30 dBm |
| 3,4 to 4,8 GHz | – 50 dBm/MHz | – 10 dBm |
| 4,8 to 5 GHz | – 55 dBm/MHz ([2]) | – 15 dBm |
| 5 to 8,5 GHz | – 50 dBm/MHz | – 10 dBm |
| Above 8,5 GHz | – 85 dBm/MHz | – 45 dBm |

([1]) Devices using a Listen Before Talk (LBT) mechanism described in the harmonised standard EN 302 435-1 are permitted to operate in frequency range 1,215 to 1,73 GHz with a maximum mean power spectral density of – 70 dBm/MHz and in the frequency ranges 2,5 to 2,69 and 2,7 to 3,4 GHz with a maximum mean power spectral density of – 50 dBm/MHz.

([2]) To protect the Radio Astronomy Service (RAS) bands 2,69 to 2,7 GHz and 4,8 to 5 GHz, the total radiated power spectral density has to be below – 65 dBm/MHz.