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ANNEX

ANNEX

to the

Commission Implementing Decision

on the harmonisation of radio spectrum for use by radiodetermination applications in the 116-260 GHz frequency band

ANNEX

PART I

TECHNICAL REQUIREMENTS FOR RADIODETERMINATION APPLICATIONS REFERRED TO IN ARTICLES 1 AND 3

1. GENERIC INDOOR SURVEILLANCE RADARS

Generic indoor surveillance radars are used to measure and determine physical characteristics like presence, velocity or material properties of, or the distance to, a target object. Generic indoor surveillance radars are intended for private indoor use and are classified into two categories: (a) handheld and mobile radars; and (b) fixed generic indoor surveillance radars. Devices falling under the first category are portable and moveable inside the building, whereas devices falling under the second category shall remain in a permanently fixed position.

Generic indoor surveillance radars shall not be subject to any individual right to use the designated parts of the 116-260 GHz frequency band if the following requirements are met:

(1) all generic indoor surveillance radars (handheld/mobile and fixed) shall only be operated indoors (that is to say inside a building) or inside similarly shielded environments;

(2) fixed generic indoor surveillance radars shall be installed at a permanent fixed position indoors (that is to say inside a building) or inside similarly shielded environments;

(3) users and installers shall ensure that fixed generic indoor surveillance radars, although installed inside a building, do not perform a function outside the building structure, such as the detection of people outside the building (for example, through-wall imaging);

(4) for fixed generic indoor surveillance radars, the mean e.i.r.p. for elevations above 0° shall be limited to 12 dBm (8 dB below the mean e.i.r.p. of 20 dBm);

(5) the provider shall inform the users and installers of fixed generic indoor surveillance radars about the installation requirements and additional special mounting instructions.

1.1. Handheld and mobile generic indoor surveillance radars

Technical requirements for handheld and mobile generic indoor surveillance radars					
Designated frequency band	**Mean e.i.r.p.** (Note 1)	**Mean e.i.r.p. spectral density** (Note 2)	**Peak e.i.r.p.** (Note 5)	**Spectrum access and mitigation requirements** (Note 3)	**Minimum unwanted emissions attenuation** (Note 4)
	A	**B**	**C**	**D**	**E**
122.25-130 GHz	10 dBm	-20 dBm/MHz	20 dBm	$\sum T_{meas} \leq 400$ ms within Tobs = 1 s is equivalent to a	20 dB

				maximum duty cycle of 40%	
134-148.5 GHz	10 dBm	-20 dBm/MHz	20 dBm	$\sum T_{meas} \leq 400$ ms within Tobs = 1 s is equivalent to a maximum duty cycle of 40%	20 dB

Note 1: Mean e.i.r.p. within the Operating Frequency Range (OFR) (see Note 4) and during T_{meas} (time when transmission is on).

Note 2: These limits should be measured with a Root Mean Square (RMS) detector and averaging time of 1 ms.

Note 3: The maximum duty cycle is not included in the mean e.i.r.p. and mean e.i.r.p. spectral density values. Consequently, these values must be reduced by 4 dB when averaging over the observation time T_{obs} = 1 s because of the inclusion of the maximum duty cycle of 40%.

Note 4: The OFR is defined over the 20 dB reduction of the intentional transmission ("20 dB bandwidth") radiated by the equipment into the air. The unwanted emissions attenuation applies to the frequencies outside the OFR and shall be applied to the mean e.i.r.p. spectral density and the peak e.i.r.p. The measurement bandwidth for the unwanted emissions domain is 1 MHz.

Note 5: The peak e.i.r.p. shall be measured/evaluated in 1 GHz bandwidth.

1.2. Fixed generic indoor surveillance radars

Technical requirements for fixed generic indoor surveillance radars					
Designated frequency band	**Mean e.i.r.p.** (Note 1)	**Mean e.i.r.p. spectral density** (Note 2)	**Peak e.i.r.p.** (Note 5)	**Spectrum access and mitigation requirements** (Note 3)	**Minimum unwanted emissions attenuation** (Note 4)
	A	**B**	**C**	**D**	**E**
122.25-130 GHz	20 dBm and 12 dBm > 0°elevation	-10 dBm/MHz and - 18 dBm/MHz > 0° elevation	30 dBm and 22 dBm > 0° elevation	$\sum T_{meas} \leq 100$ ms within Tobs = 1 s is equivalent to a maximum duty cycle of 10%	20 dB
134-148.5 GHz	20 dBm and 12 dBm > 0° elevation	-10 dBm/MHz and - 18 dBm/MHz > 0° elevation	30 dBm and 22 dBm > 0° elevation	$\sum T_{meas} \leq 100$ ms within Tobs = 1 s is equivalent to a maximum duty cycle of 10%	20 dB

Note 1: Mean e.i.r.p. within the OFR (see Note 4) and during T_{meas} (time when transmission is on).

Note 2: These limits should be measured with an RMS detector and averaging time of 1 ms.

Note 3: The maximum duty cycle is not included in the mean e.i.r.p. and mean e.i.r.p. spectral density values. Consequently, these values must be reduced by 10 dB when averaging over the observation time T_{obs} = 1 s because of the inclusion of the maximum duty cycle of 10%.

Note 4: The OFR is defined over the 20 dB reduction of the intentional transmission ("20 dB bandwidth") radiated

by the equipment into the air. The unwanted emissions attenuation applies to the frequencies outside the OFR and shall be applied to the mean e.i.r.p. spectral density and the peak e.i.r.p. The measurement bandwidth for the unwanted emissions domain is 1 MHz.

Note 5: The peak e.i.r.p. shall be measured/evaluated in 1 GHz bandwidth.

2. RADIODETERMINATION SYSTEMS FOR INDUSTRY AUTOMATION (RDI)

RDI systems are used to measure and determine physical characteristics like presence, velocity or material properties of, or the distance to, a target object located primarily in open-air areas. RDI systems are intended for industrial automation purposes and professional use only.

RDI systems shall not be subject to any individual right to use the designated parts of the 116-260 GHz frequency band if the following requirements are met:

(1) RDI sensors shall be operated for industrial purposes only;

(2) installation and maintenance of RDI systems shall be performed by professionally trained personnel only;

(3) RDI systems shall not be marketed to private end customers;

(4) installers shall ensure that there are no unwanted obstacles in the main beam of the antenna in order to minimise unintentional reflections and scattering;

(5) outdoor RDI sensors shall only be installed at heights from 0 m to 3 m above ground;

(6) the provider shall inform the users and installers of RDI systems about the installation requirements and additional special mounting instructions;

(7) for RDI systems using an antenna gain less than 20 dBi, the conducted peak output power shall be limited to 15 dBm.

Technical requirements for RDI				
Designated frequency band	**Maximum duty cycle**	**Mean e.i.r.p. spectral density** (Note 2)	**Peak e.i.r.p.** (Note 3)	**Minimum unwanted emissions attenuation** (Note 1)
	A	**B**	**C**	**D**
174.8-182 GHz	5%	-13.8 dBm/MHz	31 dBm	20 dB
185-190 GHz	5%	-13.8 dBm/MHz	31 dBm	20 dB
231.5-250 GHz	5%	-25.6 dBm/MHz	31 dBm	20 dB

Note 1: The OFR is defined over the 20 dB reduction of the intentional transmission (“20 dB bandwidth”) radiated by the equipment into the air. The unwanted emissions attenuation applies to the frequencies outside the OFR and shall be applied to the mean e.i.r.p. spectral density and the peak e.i.r.p. The measurement bandwidth for the unwanted emissions domain is 1 MHz.

Note 2: The maximum duty cycle of 5% is already included in this mean e.i.r.p. limit value. Consequently, the given mean e.i.r.p. spectral density limit is valid for averaging over the entire measurement cycle T_{meas_cycle} of the

device including any T_{off} times in 1 MHz resolution bandwidth of the measuring receiver.
Note 3: The peak e.i.r.p. shall be measured/evaluated in 1 GHz bandwidth.

3. LEVEL PROBING RADARS (LPR)

LPR are used to measure and determine the distance to the surface of a target material (for example, liquids and solids) located primarily in open-air areas or inside tanks with non-attenuating shells (for example, plastic tanks) and thus indirectly the amount or volume of the available material. LPR are also used to measure other physical characteristics such as the velocity of the surface or properties of the target material. LPR are intended for industrial and professional use only.

LPR shall not be subject to any individual right to use the designated parts of the 116-260 GHz frequency band if the following requirements are met:

(1) LPR shall be operated for industrial purposes only;

(2) installation and maintenance of LPR shall be performed by professionally trained individuals only;

(3) LPR shall not be marketed to private end customers;

(4) LPR shall be installed at a permanent fixed position pointing downwards towards the ground;

(5) LPR shall not operate while being moved, or while inside a moving container;

(6) installers shall ensure that there are no unwanted obstacles in the main beam of the antenna in order to minimise unintentional reflections and scattering;

(7) the provider shall inform the users and installers of LPR about the installation requirements and additional special mounting instructions;

(8) the peak e.i.r.p. for elevations above 0° shall be limited to 0 dBm;

(9) for LPR using an antenna gain less than 20 dBi, the conducted peak output power shall be limited to 15 dBm.

Technical requirements for LPR				
Designated frequency band	**Maximum duty cycle**	**Mean e.i.r.p. spectral density** (Note 2)	**Peak e.i.r.p.** (Note 3)	**Minimum unwanted emissions attenuation** (Note 1)
	A	**B**	**C**	**D**
116-148.5 GHz	5%	-8.0 dBm/MHz	37 dBm	20 dB
167-182 GHz	5%	-6.0 dBm/MHz	37 dBm	20 dB
231.5-250 GHz	5%	-6.0 dBm/MHz	37 dBm	20 dB
Note 1: The OFR is defined over the 20 dB reduction of the intentional transmission (“20 dB bandwidth”) radiated by the equipment into the air. The unwanted emissions attenuation applies to the frequencies outside the				

OFR and shall be applied to the mean e.i.r.p. spectral density and the peak e.i.r.p. The measurement bandwidth for the unwanted emissions domain is 1 MHz.

Note 2: The duty cycle of 5% is already included in this mean e.i.r.p. limit value. Consequently, the given mean e.i.r.p. spectral density is valid for averaging over the entire measurement cycle T_{meas_cycle} of the device including any T_{off} times in 1 MHz resolution bandwidth of the measuring receiver.

Note 3: The peak e.i.r.p. shall be measured/evaluated in 1 GHz bandwidth.

4. CONTOUR DETERMINATION AND ACQUISITION RADARS (CDR)

CDR are used to measure and determine a multiplicity of distance values to the surface of a target material located primarily in open-air areas or inside tanks with non-attenuating shells (for example, plastic tanks). The distance information is used to form a digital contour representation of the bulk material surface and can subsequently be used to precisely determine the amount or volume of the available material in the respective measurement scenario. CDR are also used to measure other physical characteristics of the target surface. CDR are intended for industrial and professional use only.

CDR are classified into two categories: (a) digital beamforming CDR (DBF-CDR); and (b) mechanical and phased-array CDR (M-CDR and PA-CDR). This classification is based on the acquisition of the angular direction information, which can be achieved by mechanical tilting of a single antenna (M-CDR) and/or by electronic beam steering using parallel operation of multiple antenna elements (PA-CDR). In case of a multiplexed operation of multiple antenna elements, a digital beamforming (DBF-CDR) receiver architecture is achieved.

Neither category of CDR shall be subject to any individual right to use the designated parts of the 116-260 GHz frequency band if the following requirements are met:

(1) CDR sensors shall be operated for industrial purposes only;

(2) installation and maintenance of CDR shall be performed by professionally trained individuals only;

(3) CDR shall not be marketed to private end customers;

(4) CDR shall be installed at a permanent fixed position;

(5) CDR shall not operate while being moved;

(6) installers shall ensure that there are no unwanted obstacles in the main beam of the antenna in order to minimise unintentional reflections and scattering;

(7) the provider shall inform the users and installers of CDR about the installation requirements and additional special mounting instructions;

(8) for CDR using an antenna gain less than 20 dBi, the conducted peak output power shall be limited to 15 dBm.

4.1. DBF-CDR

DBF-CDR shall be pointing vertically downwards towards the ground.

Technical requirements for DBF-CDR				
Designated	**Maximum**	**Mean e.i.r.p.**	**Peak e.i.r.p.**	**Minimum**

frequency band	**duty cycle**	**spectral density** (Note 2)	(Note 3)	**unwanted emissions attenuation** (Note 1)
	A	**B**	**C**	**D**
116-148.5 GHz	10%	-32.6 dBm/MHz	15 dBm	20 dB
167-182 GHz	10%	-29.0 dBm/MHz	15 dBm	20 dB
231.5-250 GHz	10%	-23.0 dBm/MHz	15 dBm	20 dB

Note 1: The OFR is defined over the 20 dB reduction of the intentional transmission ("20 dB bandwidth") radiated by the equipment into the air. The unwanted emissions attenuation applies to the frequencies outside the OFR and shall be applied to the mean e.i.r.p. spectral density and the peak e.i.r.p. The measurement bandwidth for the unwanted emissions domain is 1 MHz.

Note 2: The duty cycle of 10% is already included in this mean e.i.r.p. value. Consequently, the given mean e.i.r.p. spectral density is valid for averaging over the entire measurement cycle T_{meas_cycle} of the device including any T_{off} times in 1 MHz resolution bandwidth of the measuring receiver.

Note 3: The peak e.i.r.p. shall be measured/evaluated in 1 GHz bandwidth.

4.2. M-CDR and PA-CDR

Technical requirements for M-CDR and PA-CDR				
Designated frequency band	**Maximum duty cycle**	**Mean e.i.r.p. spectral density** (Note 2)	**Peak e.i.r.p.** (Note 3)	**Minimum unwanted emissions attenuation** (Note 1)
	A	**B**	**C**	**D**
116-148.5 GHz	10%	-12.0 dBm/MHz	28.6 dBm	20 dB
167-182 GHz	10%	-9.0 dBm/MHz	34.6 dBm	20 dB
231.5-250 GHz	10%	-6.0 dBm/MHz	37 dBm	20 dB

Note 1: The OFR is defined over the 20 dB reduction of the intentional transmission ("20 dB bandwidth") radiated by the equipment into the air. The unwanted emissions attenuation applies to the frequencies outside the OFR and shall be applied to the mean e.i.r.p. spectral density and the peak e.i.r.p. The measurement bandwidth for the unwanted emissions domain is 1 MHz.

Note 2: The duty cycle of 10% is already included in this mean e.i.r.p. value. Consequently, the given mean e.i.r.p. spectral density is valid for averaging over the entire measurement cycle T_{meas_cycle} of the device including any T_{off} times in 1 MHz resolution bandwidth of the measuring receiver.

Note 3: The peak e.i.r.p. shall be measured/evaluated in 1 GHz bandwidth.

The following additional requirements apply to M-CDR and PA-CDR:

(1) M-CDR and PA-CDR shall continuously maintain a spatially scanning behaviour of the antenna's main beam direction throughout operation;

(2) the maximum tilting angle of the antenna's main beam direction in relation to the vertical axis towards the ground shall never exceed 60°;

(3) the peak e.i.r.p. for elevations above 0° shall be limited to 0 dBm.

5. TANK LEVEL PROBING RADARS (TLPR)

TLPR are used to measure and determine the distance to the surface of a target material (for example, liquids and solids) inside shielded tanks and containers and thus indirectly the amount or volume of the available material. TLPR are also used to measure other physical characteristics such as velocity or properties of the target material. TLPR are intended for industrial and professional use only.

TLPR shall not be subject to any individual right to use the designated parts of the 116-260 GHz frequency band if the following requirements are met:

(1) TLPR sensors shall be operated for industrial purposes only;

(2) installation and maintenance of TLPR shall be performed by professionally trained individuals only;

(3) TLPR shall not be marketed to private end customers;

(4) TLPR shall be installed at a permanent fixed position at a closed metallic tank or concrete tank, or a similar enclosure structure made of comparable attenuating material;

(5) flanges and attachments to the TLPR equipment shall provide the necessary microwave sealing by design;

(6) when necessary, sight glasses shall be coated with a microwave-proof coating (that is to say electrically conductive or microwave absorbing coating);

(7) manholes or connection flanges attached to the tank shall be closed while the TLPR equipment is in operation to ensure a low level of leakage of the signal into the free space outside the tank;

(8) the provider shall inform the users and installers of TLPR about the installation requirements and additional special mounting instructions;

(9) for TLPR using an antenna gain less than 20 dBi, the conducted peak output power shall be limited to 15 dBm.

Technical requirements for TLPR				
Designated frequency band	**Maximum duty cycle**	**Mean e.i.r.p. spectral density** (Note 2)	**Peak e.i.r.p.** (Note 3)	**Minimum unwanted emissions attenuation** (Note 1)
	A	**B**	**C**	**D**
116-148.5 GHz	100%	12 dBm/MHz	42 dBm	20 dB
167-182 GHz	100%	12 dBm/MHz	42 dBm	20 dB

231.5-250 GHz	100%	12 dBm/MHz	42 dBm	20 dB

Note 1: The OFR is defined over the 20 dB reduction of the intentional transmission ("20 dB bandwidth") radiated by the equipment into the air. The unwanted emissions attenuation applies to the frequencies outside the OFR and shall be applied to the mean e.i.r.p. spectral density and the peak e.i.r.p. The measurement bandwidth for the unwanted emissions domain is 1 MHz.

Note 2: The given mean e.i.r.p. spectral density is valid for averaging over the entire measurement cycle T_{meas_cycle} of the device including any T_{off} times in 1 MHz resolution bandwidth of the measuring receiver.

Note 3: The peak e.i.r.p. shall be measured/evaluated in 1 GHz bandwidth.

6. RADIODETERMINATION SYSTEMS FOR INDUSTRY AUTOMATION IN SHIELDED ENVIRONMENTS (RDI-S)

RDI-S systems are used to sense unique frequency-dependent material properties and/or wideband frequency responses (for example, S-parameters to extract other physical properties) of target objects inside buildings (indoors) or inside similarly shielded environments. Examples of RDI-S systems are radar sensors for plastic extrusion thickness measurement or for non-destructive testing. RDI-S systems are intended for industrial and professional use only.

RDI-S systems shall not be subject to any individual right to use the designated parts of the 116-260 GHz frequency band if the following requirements are met:

(1) the OFR shall be equal to or higher than 35 GHz, including discontinuities for the passive bands;

(2) RDI-S sensors shall be operated for industrial purposes only;

(3) installation and maintenance of RDI-S systems shall be performed by professionally trained individuals only;

(4) RDI-S systems shall not be marketed to private end customers;

(5) RDI-S systems shall only be operated indoors (that is to say inside a building) or inside similarly shielded environments;

(6) installers shall ensure that the device's main beam is not pointing towards windows or other weak shielded parts of the shielded environment; the direction of main radiation shall be indicated on the specific radiodetermination device;

(7) installers shall ensure that there are no unwanted obstacles in the main beam of the antenna in order to minimise unintentional reflections and scattering;

(8) the provider shall inform the users and installers of RDI-S systems about the installation requirements and additional special mounting instructions;

(9) for RDI-S systems using an antenna gain less than 20 dBi, the conducted peak output power shall be limited to 15 dBm.

Technical requirements for RDI-S				
Designated frequency band	**Maximum duty cycle**	**Mean e.i.r.p. spectral density** (Note 2)	**Peak e.i.r.p.** (Note 4)	**Unwanted emission limits** (Notes 1 & 3)

	A	B	C	D
116-122.5 GHz	100%	-5 dBm/MHz	45 dBm	-15 dBm/MHz mean e.i.r.p. spectral density (Note 2) and 35 dBm peak e.i.r.p. (Note 4)
122.5-123 GHz	100%	-5 dBm/MHz	45 dBm	
123-130 GHz	100%	+10 dBm/MHz	60 dBm	
130-134 GHz	100%	-5 dBm/MHz	45 dBm	
134-141 GHz	100%	+10 dBm/MHz	60 dBm	
141-148.5 GHz	100%	-5 dBm/MHz	45 dBm	
151.5- 158.5 GHz	100%	-5 dBm/MHz	45 dBm	
158.5-164 GHz	100%	-5 dBm/MHz	45 dBm	
167-174.5 GHz	100%	-5 dBm/MHz	45 dBm	
174.5- 174.8 GHz	100%	-5 dBm/MHz	45 dBm	
174.8-182 GHz	100%	+10 dBm/MHz	60 dBm	
185-190 GHz	100%	-5 dBm/MHz	45 dBm	
191.8-200 GHz	100%	-5 dBm/MHz	45 dBm	
209-226 GHz	100%	-5 dBm/MHz	45 dBm	
231.5-235 GHz	100%	-5 dBm/MHz	45 dBm	
235-238 GHz	100%	-5 dBm/MHz	45 dBm	
238-241 GHz	100%	-5 dBm/MHz	45 dBm	
241-244 GHz	100%	-5 dBm/MHz	45 dBm	
244-246 GHz	100%	-5 dBm/MHz	45 dBm	
246-250 GHz	100%	-5 dBm/MHz	45 dBm	
252-260 GHz	100%	-5 dBm/MHz	45 dBm	

Note 1: The OFR is defined over the 10 dB reduction of the intentional transmission ("10 dB bandwidth") radiated by the equipment into the air. The unwanted emission limits apply to the frequencies outside the OFR. The measurement bandwidth for the unwanted emissions domain is 1 MHz.

Note 2: The given mean e.i.r.p. spectral density is valid for averaging over the entire measurement cycle T_{meas_cycle} of the device including any T_{off} times in 1 MHz resolution bandwidth of the measuring receiver.

Note 3: These limits also apply to emissions in passive bands subject to RR No. 5.340 within the frequency range 116-260 GHz.

Note 4: The peak e.i.r.p. shall be measured/evaluated in 1 GHz bandwidth.

7. EXTERIOR VEHICULAR RADARS (EVR)

EVR are classified into two categories: (a) front radars; and (b) corner radars and short-range/ultra-short-range radars. Front and corner radars are used for driving assistance applications requiring long- and medium-range measurement such as automatic cruise control, lane keep, lane change assist, automatic emergency braking, etc. Applications providing the vehicle with a higher degree of autonomy require short-range and ultra-short-range radars for front, side and rear view, to enable 360° sensing. These radars make it possible to obtain a wide field of view (elevation and azimuth) in the close proximity of the vehicle and enable features like automated parking assistance or autonomous valet parking.

EVR shall not be subject to any individual right to use the designated parts of the 116-260 GHz frequency band if the following requirements are met:

(1) unwanted emission limits in the 116-122.25 GHz band for any type of radar depend on the maximum duty cycle and elevation. For radars with a maximum duty cycle (measured over the signal repetition time of the radar) of up to 50%, for elevations up to 35°, the mean e.i.r.p. density shall stay below -50 dBm/MHz, and for elevations above 35°, below -76 dBm/MHz. For radars with a maximum duty cycle higher than 50%, for elevations up to 35°, the mean e.i.r.p. density shall stay below -53 dBm/MHz, and for elevations above 35°, below -79 dBm/MHz;

(2) unwanted emissions in the 130-134 GHz band shall stay below a mean power spectral density of -33 dBm/MHz e.i.r.p. for front radars and of -36 dBm/MHz e.i.r.p. for corner radars and short-range/ultra-short-range radars. Additionally, the peak e.i.r.p. within 1 GHz shall be below 2 dBm for front radars and below -1 dBm for corner radars and short-range/ultra-short-range radars;

(3) unwanted emission limits in the 148.5-151 GHz band for any type of radar depend on the maximum duty cycle and elevation. For radars with a maximum duty cycle (measured over the signal repetition time of the radar) of up to 50%, for elevations up to 35°, the mean e.i.r.p. density shall stay below -44 dBm/MHz, and for elevations above 35°, below -70 dBm/MHz. For radars with a maximum duty cycle higher than 50%, for elevations up to 35°, the mean e.i.r.p. density shall stay below -47 dBm/MHz, and for elevations above 35°, below -73 dBm/MHz;

(4) EVR applications shall implement an automatic deactivation mitigation technique to disable transmission within specified ‘exclusion zones’ around radio astronomy service (RAS) stations, or another mitigation technique providing equivalent protection for these stations without driver intervention;

(5) EVR applications supporting the use of the 122.25-130 GHz and 134-141 GHz bands shall implement a power reduction mitigation technique in ‘restriction zones’ around RAS stations, or another mitigation technique providing equivalent protection for these stations without driver intervention.

Technical requirements for EVR				
Designated frequency band	**Front radars**		**Corner and short/ultra-short range radars**	
	Mean e.i.r.p. (Note)	**Peak e.i.r.p.**	**Mean e.i.r.p. (Note)**	**Peak e.i.r.p.**

122.25-130 GHz	32 dBm		9 dBm	
134-141 GHz	32 dBm		9 dBm	
141-148.5 GHz	-6 dBm within 1 GHz	-1 dBm within 1 GHz	-6 dBm within 1 GHz	-1 dBm within 1 GHz
Note: Mean e.i.r.p. is the radiated mean power during transmitter signal repetition time as defined in ETSI EN 303 883-1, clause 5.3.1, meaning the effect of duty cycle is included.				

8. IN-CABIN VEHICULAR RADARS (IVR)

IVR applications include contactless gesture control, presence detection (including baby/child detection) and monitoring of vital signs, such as respiration rate, heart rate and heart rate variation. The use of higher frequency ranges further reduces the risk of interference with other automotive radars (for example, 77 GHz or 79 GHz radars) or wireless communication devices using the 60 GHz band. With the increasing miniaturisation, angular resolution offers the possibility to discriminate between multiple seats inside a car with a single radar sensor with beamforming or multiple input multiple output (MIMO) capability.

IVR shall not be subject to any individual right to use the designated parts of the 116-260 GHz frequency band if the following requirements are met:

(1) unwanted emissions in the 116-122.25 GHz band shall stay below a mean e.i.r.p. density of -45 dBm/MHz;

(2) unwanted emissions in the 130-134 GHz band shall stay below a mean e.i.r.p. density of 17 dBm/GHz and a peak e.i.r.p. of -4 dBm/GHz;

(3) unwanted emissions in the 148.5-151 GHz band shall stay below a mean e.i.r.p. density of -39 dBm/MHz;

(4) downwards antenna orientation;

(5) for convertible cars, emissions occurring outside the car at elevations above 0° shall be 15 dB lower than the power levels specified in the below table;

(6) minimum bandwidth of 1 GHz;

(7) IVR applications shall implement an automatic deactivation mitigation technique to disable transmission within specified ‘exclusion zones’ around radio astronomy service stations, or another mitigation technique providing equivalent protection for these stations without driver intervention.

Technical requirements for IVR			
Designated frequency band	**Mean e.i.r.p. spectral density**	**Mean e.i.r.p. over the bandwidth**	**Peak e.i.r.p. over the bandwidth**
122.25-130 GHz	-30 dBm/MHz	3 dBm	16 dBm

134-148.5 GHz	-30 dBm/MHz	3 dBm	16 dBm
Note: Mean e.i.r.p. is the radiated mean power during transmitter signal repetition time as defined in ETSI EN 303 883-1, clause 5.3.1, meaning the effect of duty cycle is included.			

PART II

PROTECTION OF RADIO ASTRONOMY SERVICE (RAS) SITES

The table in this Part lists the RAS stations in EU Member States operating in the 116-260 GHz range.

Country	**Observatory name and location**	**Geographic latitude**	**Geographic longitude**
France	NOEMA, Plateau de Bure	44°38'02" N	05°54'28" E
France	MAÏDO, La Réunion	21°04'46" S	55°23'01" E
Spain	IRAM 30 m, Pico Veleta	37°04'06" N	03°23'55" W
Spain	GROUNDBIRD, Tenerife	28°18'01.8" N	16°30'37.0" W

PART III

EXCLUSION ZONES AROUND RAS SITES IN WHICH AN AUTOMATIC DEACTIVATION MITIGATION TECHNIQUE SHALL BE IMPLEMENTED BY DIFFERENT CATEGORIES OF RADIODETERMINATION APPLICATIONS

Radiodetermination applications shall implement an automatic deactivation mitigation technique to disable transmission within exclusion zones around RAS sites. The table in this Part specifies the radius of the applicable exclusion zones for each specific radiodetermination application.

Categories of radiodetermination devices	**Exclusion zone around RAS site**
Handheld/mobile generic indoor surveillance radars	1.6 km
Fixed generic indoor surveillance radars	10.7 km
Radiodetermination systems for industry automation (RDI)	20.0 km
Level probing radars (LPR)	13.0 km
Contour determination and acquisition radars (CDR)	20.0 km
Radiodetermination systems for industry automation in shielded environments (RDI-S)	13.2 km
Exterior vehicular radars (EVR)	3.0 km

In-cabin vehicular radars (IVR)	3.0 km

PART IV

RESTRICTION ZONES AROUND RAS SITES IN WHICH EXTERIOR VEHICULAR RADARS (EVR) SHALL IMPLEMENT A POWER REDUCTION MITIGATION TECHNIQUE

EVR shall implement a power reduction mitigation technique in restriction zones around RAS sites.