

Notification of the Office of the National Broadcasting and Telecommunications Commission**Re: Technical Standards for Telecommunications Equipment and Device for Radar System Radiocommunication Equipment used in Vehicles**

Whereas it is expedient to update the Notification of the National Broadcasting and Telecommunications Commission on Technical Standards for Telecommunications Equipment and Device for Radar System Radiocommunication Equipment used in Vehicles in conformity to current technologies and situations.

By virtue of provisions under Section 27 (10) and (24) of Organization to Assign Radio Frequency and to Regulate the Broadcasting and Telecommunications Services Act B.E. 2553 (2010) in accompany with Section 32 of Telecommunications Business Act B.E. 2544 (2001), and Section 29 (4) of Radio Communications Act B.E. 2498 (1955), the National Broadcasting and Telecommunication Commission therefore promulgates the following notification.

Clause 1 This Notification shall come into force as from the day following the date of its publication in the Government Gazette.

Clause 2 The Notification of the Office of the National Broadcasting and Telecommunications Commission on Technical Standard of Telecommunications Equipment and Device for Radar System Radiocommunication Equipment used in Vehicles dated 27 October 2014 shall be repealed.

Clause 3 This Notification shall apply instead in case where all notifications, rules, regulations, and any other orders have otherwise been specified herein, or in conflict or contradiction herewith.

Clause 4 Technical standards for telecommunications equipment and device for Radar System Radiocommunication Equipment used in Vehicles as per specification in accordance with Technical Standard of Telecommunications Equipment and Device NTBC TS 1011-2560 enclosed herewith.

Promulgated on 28 December 2017

General Sukit Khamasunthorn

The Commissioner of the National Broadcasting and Telecommunication Commission

Act as the Chairman of the National Broadcasting and Telecommunication Commission

(Official Emblem)

Technical Standards for Telecommunications Equipment and Device

NTBC TS 1011-2560

Radar System Radiocommunication Equipment used in Vehicles

Office of the National Broadcasting and Telecommunication Commission

87 Phahon Yothin Alley 8 Road, Samsen Nai Sub-district, Phaya Thai District, Bangkok 10400

Tel. 0 2670 8888, website: www.nbtcc.go.th

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Technical Standards for Telecommunications Equipment and Device

NBTC TS 1011-2560

Radar System Radiocommunication Equipment used in Vehicles

1. Scope

Minimum technical specification of Radar System Radiocommunication Equipment used in Vehicles both of Fixed antenna or Steerable antenna within the following frequency band is identified in this technical standard.

- 1) 22.00 – 26.65 GHz
- 2) 76 – 77 GHz
- 3) 77 – 81 GHz

However, the use of radio frequency must be in accordance with the Notification of the Office of the National Broadcasting and Telecommunications Commission on Rule of License for Use of Radar System Radiocommunication Equipment used in Vehicles.

2. Technical Standards

2.1 Technical Standard in Radio Frequency Requirements

2.1.1 The 22.00 – 26.65 GHz Band

Technical standard in radio frequency requirements of Radar System Radiocommunication Equipment used in Vehicles in the 22.00 – 26.65 GHz band shall be in line with the following requirements.

1) Transmitting Power

- 1.1) Radar System Radiocommunication Equipment used in Vehicles using Ultra Wide Band (UWB) technology in the 22.00 – 26.65 GHz band, not over 500 MHz band per channel must have maximum radiated average power density: e.i.r.p. not more than the requirement.

Frequency band (GHz)	Maximum radiated average power density : e.i.r.p. (dBm/MHz)
$22.00 < f < 22.65$	$-61.3 + 20 \times (f - 21.65 \text{ GHz}) / 1 \text{ GHz}$
$22.65 < f < 25.65$	-41.3
$25.65 < f < 26.65$	$-41.3 - 20 \times (f - 25.65 \text{ GHz}) / 1 \text{ GHz}$

- Reference :**
- 1) ETSI EN 302 288-1 (Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices; Road Transport and Traffic Telematics (RTTT); Short range radar equipment operating in the 24 GHz range, Part 1: Technical requirements and methods of measurement)
 - 2) ETSI EN 302 288; Short Range Devices; Transport and Traffic Telematics (TTT); Ultra-wideband radar equipment operating in the 24,25 GHz to 26,65 GHz range; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

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- 1.2) Radar System Radiocommunication Equipment used in Vehicles using the 22.00 – 26.65 GHz band must have equivalent isotropically radiated power density : e.i.r.p. not more than the requirement.

Frequency band (GHz)	Maximum transmitting power : e.i.r.p. (dBm/MHz)
$22.00 < f < 23.60$	-41.3
$23.60 < f < 24.00$	-61.3 or -41.3*
$24.00 < f < 26.65$	-41.3

Remark * Vertical plane wave emissions must be emitted more than 30 degree in installation of vertical plane transmitter and 30 dB value must be reduced from main line of beam.

- Reference**
- 1) Code of Federal Regulation (USA); Title 47 Telecommunication; Chapter 1 Federal Communications Commission; Part 15 Radio Frequency Devices; Subpart C – Intentional Radiations : §15.252 Operation of wideband vehicular radar system within the band 23.12-29.0 GHz.
 - 2) Code of Federal Regulation (USA); Title 47 Telecommunication; Chapter 1 Federal Communications Commission; Part 15 Radio Frequency Devices; Subpart F – Ultra-wideband Operation : §15.515 Technical requirements for vehicular radar systems.

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- 1.3) Radar System Radiocommunication Equipment used in Vehicles in the 24.05 – 24.25 GHz band must have maximum radiated peak power : e.i.r.p. not more than the requirement.

Frequency band (GHz)	Condition for access to use frequency shall comply with any of the following conditions	
	First Condition	Second Condition
24.050 – 24.075	20 dBm	20 dBm
24.075 – 24.150	-10 dBm	
	20 dBm Accumulated hold time at every 3 ms in the range of the same broadband not more than 40 kHz must not exceed 4 μ s/40 kHz).	13 dBm
	20 dBm Single hold time at every 40 ms in the range of the same broadband not more than 40 kHz must not exceed 1 μ s/40 kHz).	
24.150 – 24.250	20 dBm	20 dBm

- Reference :**
- 1) ETSI EN 302 858 (Short Range Devices; Transport and Traffic Telematics (TTT); Radar equipment operating in the 24,05 GHz to 24,25 GHz or 24,05 GHz to 24,50 GHz range; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU)
 - 2) ETSI EN 302 288 (Short Range Devices); Transport and Traffic Telematics (TTT); Ultra wideband radar equipment operating in the 24,05 GHz to 26,65 GHz range ; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU)
 - 3) Code of Federal Regulation (USA); Title 47 Telecommunication; Chapter 1 Federal Communications Commission; Part 15 Radio Frequency Devices; Subpart C – Intentional Radiations : §15.249 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5872 MHz, and 24.0-24.25 GHz.

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2) Radiated emissions in the non-operating frequency range

Any of the following requirements must be complied in radiated emissions in the non-operating-frequency range.

2.1) Radiated emissions in the non-operating frequency range from the transmitter of Radar System Radiocommunication Equipment used in Vehicles in the 22.00 – 26.65 GHz band must be in line with any of the following requirements.

2.1.1) Radiated emissions in the non-operating frequency range of the transmitter's Radar System Radiocommunication Equipment used in Vehicles must be in line with any of the following requirements.

Frequency band (GHz)	Limits of radiated emissions in the non-operating frequency range
30 – 1,000 MHz	-36 dBm -54 dBm (specific range of 47-74 / 87.5-118 / 174-230 / 470-862 MHz)
1 – 100 GHz	-30 dBm (except 24.25-26.65 GHz and 23.60-24.00 GHz)

2.1.2) Radiated emissions in the non-operating frequency range from the transmitter of Radar System Radiocommunication Equipment used in Vehicles using Ultra Wide Band (UWB) technology must be in line with the following standard requirement.

Frequency band (GHz)	Limits of radiated emissions in the non-operating frequency range
10.00 – 23.60 GHz	61.3 dBm
23.60 – 24.00 GHz	-74 dBm
26.65 – 40.00 GHz	-61.3 dBm

Reference : 1) EN 302 288-1 (Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices; Road Transport and Traffic Telematics (RTTT); Short range radar equipment operating in the 24 GHz range; Part 1: Technical requirements and methods of measurement)

2.1.3) Radiated emissions in the non-operating frequency range from transmitting Radar System Radiocommunication Equipment used in Vehicles using Ultra Wide Band (UWB) technology and single carrier wave transmission must be in line with the following standard requirement.

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2.1.3.1) Radiated emissions in the non-operating frequency range from Radar System Radiocommunication Equipment used in Vehicles for below 960 MHz radio frequency

Frequency range (GHz)	Spurious domain emission limits
9 kHz – 490 kHz	2400 $\mu\text{V/m/F(kMz)}$ at 300 m distance
490 kHz – 1.705 MHz	24000 $\mu\text{V/m/F(kMz)}$ at 30 m distance
1.705 MHz – 30 MHz	30 $\mu\text{V/m}$ at 30 m distance
30 MHz – 88 MHz	100 $\mu\text{V/m}$ at 3 m distance
88 MHz – 216 MHz	150 $\mu\text{V/m}$ at 3 m distance
216 MHz – 960 MHz	200 $\mu\text{V/m}$ at 3 m distance

Reference Code of Federal Regulation (USA); Title 47 Telecommunication; Chapter 1 Federal Communications Commission; Part 15 Radio Frequency Devices; Subpart C – Intentional Radiators : §15.209 Radiated emission limits; general requirements

2.1.3.2) Radiated emissions in the non-operating frequency range from Radar System Radiocommunication Equipment used in Vehicles for above 960 MHz radio frequency

Radio frequency (GHz)	dBm (e.i.r.p.)
960-1610 MHz	-75.3
1610-22.00 MHz	-61.3
26.650-31.000 MHz	-51.3
Above 31.000 MHz	-61.3

Reference 1) Code of Federal Regulation (USA); Title 47 Telecommunication; Chapter 1 Federal Communications Commission; Part 15 Radio Frequency Devices; Subpart C – Intentional Radiators : §15.252 Operation of wideband vehicular systems within the band 23.12-29.0 GHz.

2) Code of Federal Regulation (USA); Title 47 Telecommunication; Chapter 1 Federal Communications Commission; Part 15 Radio Frequency Devices; Subpart F Ultra-wideband Operation : §15.515 Technical requirements for vehicular radar systems.

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- 2.2) Radiated emissions in the non-operating frequency range from the transmitter of Radar System Radiocommunication Equipment used in Vehicles in the 24.25 – 26.65 GHz band using Ultra Wide Band (UWB) technology and single carrier wave transmission must be in line with any of the following standard requirements.

Frequency band	Limits of radiated emissions in the non-operating frequency range
30 – 1,000 MHz	-36 dBm -54 dBm (specific range of 47-74 / 87.5-118 / 174-230 / 470-862 MHz)
1 – 10 GHz 40 – 50 GHz	-30 dBm (e.i.r.p.)

Reference : ETSI EN 302 288 (Short Range Devices); Transport and Traffic Telematics (TTT); Ultra-wideband radar equipment operating in the 24.25 GHz to 26.65 GHz range ; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU)

- 2.3) Radiated emissions in the non-operating frequency range from the transmitter of Radar System Radiocommunication Equipment used in Vehicles in 24.05 – 24.25 GHz frequency range must be in line with the requirements in any of the following tables.

Frequency band	Limits of radiated emissions in the non-operating frequency range
30 – 1,000 MHz	-36 dBm -54 dBm Quasi-Peak (specific range of 47-74 / 87.5-118 / 174-230 / 470-862 MHz)
1 – 50 GHz	-30 dBm (e.i.r.p.) RMS

Reference : 1) ETSI EN 302 858 : (Short Range Devices; Transport and Traffic Telematics (TTT); Radar equipment operating in the 24.05 GHz to 24.25 GHz or 24.05 GHz to 24.50 GHz range; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU)

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- 2.3.2) The signal level of spurious domain emissions from the transmitter of Radar System Radiocommunication Equipment used in Vehicles in the 24.05 – 24.25 GHz band must be less than at least 50 dB from the following standard requirements or any signal level which is lower.

Frequency range (GHz)	Spurious domain emission limits
9 kHz – 490 kHz	2400 $\mu\text{V/m/F(kMz)}$ at 300 m distance
490 kHz – 1.705 MHz	24000 $\mu\text{V/m/F(kMz)}$ at 30 m distance
1.705 MHz – 30 MHz	30 $\mu\text{V/m}$ at 30 m distance
30 MHz – 88 MHz	100 $\mu\text{V/m}$ at 3 m distance
88 MHz – 216 MHz	150 $\mu\text{V/m}$ at 3 m distance
216 MHz – 960 MHz	200 $\mu\text{V/m}$ at 3 m distance
960 MHz – 40 GHz	500 $\mu\text{V/m}$ at 3 m distance

Reference Code of Federal Regulation (USA); Title 47 Telecommunication; Chapter 1 Federal Communications Commission; Part 15 Radio Frequency Devices; Subpart C – Intentional Radiators : §15.249 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz. (§15.249 (d))

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3) Vertical plane transmitter emissions in the 23.6 GHz to 24.0 GHz band

Vertical plane transmitter emissions in the 23.6 GHz to 24.0 GHz band except Radar System Radiocommunication Equipment used in Vehicles operating in the 24.05 – 24.25 GHz band only. Vertical plane transmitter antenna emissions of main line of wave beam from normal plane must be in line with the determined standards as follows.

3.1) Radiated emissions in the 23.6 – 24.0 GHz band

Frequency band	Limit of vertical plane transmitter emissions at angle of above 30° from main top beam crest
Operating in 23.6 – 24.0 GHz band	> 30 dB

- Reference :** 1) EN 302 288-1 (Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices; Road Transport and Traffic Telematics (RTTT); Short range radar equipment operating in the 24 GHz range; Part 1: Technical requirements and methods of measurement)
- 2) Code of Federal Regulation (USA); Title 47 Telecommunication; Chapter 1 Federal Communications Commission; Part 15 Radio Frequency Devices; Subpart F – Ultra-Wideband Operation : §15.515 Technical requirements for vehicular radar systems (§15.515 (c))

3.2) Radiated emissions in the non-operating frequency range (in the 23.6 – 24.0 GHz band)

Frequency band	Limit of vertical plane transmitter emissions at angle of above 30° from main top beam crest
Radiated emissions in the non-operating frequency range	> 20 dB

- Reference :** 1) EN 302 288 : Short Range Devices; Transport and Traffic Telematics (TTT); Ultra-wideband radar equipment operating in the 24,25 GHz to 26,65 GHz range; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU
- 2) ETSI EN 302 858 : (Short Range Devices; Transport and Traffic Telematics (TTT); Radar equipment operating in the 24,05 GHz to 24,25 GHz or 24,05 GHz to 24,50 GHz range; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU)
- 3) Code of Federal Regulation (USA); Title 47 Telecommunication; Chapter 1 Federal Communications Commission; Part 15 Radio Frequency Devices; Subpart C – Intentional Radiators : §15.515 Technical requirements for vehicular radar systems (§15.515 (c))

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2.1.2 The 76 – 77 GHz band

Technical standards in radio frequency of Radar System Radiocommunication Equipment used in Vehicles in the 76 – 77 GHz band must be in line with any of the following requirements.

1) Transmitting power

Radar System Radiocommunication Equipment used in Vehicles in the 76 – 77 GHz band must have peak power : e.i.r.p. not more than 55 dBm.

2) Radiated emissions in the non-operating frequency range

Radiated emissions in the non-operating frequency range of 76 – 77 GHz from Radar System Radiocommunication Equipment used in Vehicles in the 76 – 77 GHz band must be in line with any of the following standards.

2.1) Radiated emissions in the non-operating frequency range of 76 – 77 GHz (in the 0.009 MHz – 231 GHz band)

Frequency band	Radiated emission limits	Remark
0.009 – 0.490 MHz	$2400/f(\text{kHz})$ at 300 m distance	Referring limit of FCC § 15.209 15.209 Radiated emission limits; General requirements.
0.490 – 1.705 MHz	$2400/f(\text{kHz})$ at 30 m distance	
1.705 – 30 MHz	30 at 300 m distance	
30 – 88 MHz	100 at 3 m distance	
88 – 216 MHz	150 at 3 m distance	
216 – 960 MHz	$200 \mu\text{V/m}$ at 3 m distance	
960 MHz – 40 GHz	$500 \mu\text{V/m}$ at 3 m distance	
40 – 200 GHz	600pW/cm^2 at 3 m distance	Referring limit of FCC §15.253(e)
1000 – 231 GHz	1000pW/cm^2 at 3 m distance	

Reference : Code of Federal Regulation (USA); Title 47 Telecommunication; Chapter 1 Federal Communications Commission; Part 15 Radio Frequency Devices; Subpart C – Intentional Radiators : §15.253 Operation within the bands 46.7-46.9 GHz and 76.0-77.0 GHz (§15.515 (e))

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- 2.2) Radiated emissions in the non-operating frequency range of 76 – 77 GHz (in the 30 MHz – 100 GHz band)

Frequency band	Limits of radiated emissions in the non-operating frequency range
30 – 1,000 MHz	-36 dBm -54 dBm (specific range of 47-74 / 87.5-118 / 174-230 / 470-862 MHz)
1 – 100 GHz	-30 dBm

Reference : EN 301 091-1 Short Range Devices; Transport and Traffic Telematics (TTT); Radar equipment operating in the 76 GHz to 77 GHz range; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU; Part 1: Ground based vehicular radar

2.1.3 The 77 – 81 GHz band

Technical standard in radio frequency of Radar System Radiocommunication Equipment used in Vehicles in the 77 – 81 GHz band must be in line with the requirement.

1) Transmitting power

Radar System Radiocommunication Equipment used in Vehicles in the 77 – 81 GHz band must have peak power : e.i.r.p. not more than 55 dBm.

2) Radiated spurious or out-of-band emissions

Radiated spurious or out-of-band emissions of 77 – 81 GHz from Radar System Radiocommunication Equipment used in Vehicles (transmitter) in the 77 – 81 GHz band must be in line with the requirement.

Frequency band	Limits of radiated spurious or out-of-band emissions
30 – 1,000 MHz	-36 dBm -54 dBm (specific range of 47-74 / 87.5-118 / 174-230 / 470-862 MHz)
1 – 100 GHz	-30 dBm -61.3 dBm (specific range of 10-23.6 / 26.65-40 GHz) -74 dBm (specific range of 23.6 - 24 GHz)

Reference : EN 302 264-1 : Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices; Road Transport and Traffic Telematics (RTTT); Short Range Radar equipment operating in the 77 GHz to 81 GHz band; Part 1: Technical requirements and methods of measurement

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2.2 Technical Standard in Electrical Safety Requirements

Technical standard in electrical safety requirements of Radar System Radiocommunication Equipment used in Vehicles shall be in line with the requirements in any of the following standards.

2.2.1 IEC 60950-1 : Information Technology Equipment – Safety – Part 1: General requirements

2.2.2 TIS 1561 – 2556 : Information Technology Equipment – Safety : General requirements
or Updated Version

2.3 Technical Standard in Radiation Exposure Requirements on Human Health Safety from Use of Radiocommunication Equipment

The use of Radar System Radiocommunication Equipment used in Vehicles must conform to the radiation exposure requirements on human health safety from use of radiocommunication equipment, and rules and measures for supervision of human health safety from use of the radiocommunication equipment specified in the Notification of the National Telecommunications Commission.

3. Declaration of Standard Conformity

Radar system radiocommunication equipment using sound, national television broadcasting service, and telecommunications service on standard inspection and certification of telecommunications equipment and device as follows.

Operating frequency band (GHz)	Maximum transmitting power	Class of standard inspection and certification
22.00 – 26.65	Under Clause 2.1.1 1) transmitting power	Class A
24.05 – 24.25	Less than 10 dBm (e.i.r.p.)	SDoC
	More than 10 dBm (e.i.r.p) to 20 dBm (e.i.r.p.)	Class A
76 - 77	Not more than 55 dBm (e.i.r.p.)	Class A
77 - 81	Not more than 55 dBm (e.i.r.p.)	Class A

This translated version is prepared with the sole purpose of facilitating the comprehension of foreign participants in the telecommunication rules and regulations and shall not in any event or by any reason be construed or interpreted as having effect in substitution for supplementary to the Thai version thereof. If its translation to other languages is in contrary to Thai version, the latter shall prevail.

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