

RADIO TEST REPORT

No. 802286-2

EQUIPMENT UNDER TEST

Equipment: Heart Rate Transmitter Belt
Type / model: Suunto Comfort Belt
Manufacturer: Suunto Oy
Tested by request of: Suunto Oy

SUMMARY

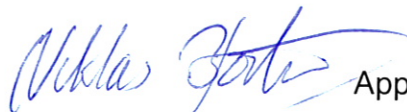
The equipment complies with the requirements of the following standards:

47CFR (2007) part 2	Frequency allocations and radio treaty matters; general rules and regulations
47CFR (2007) part 15B Class B	Unintentional radiators
47CFR (2007) part 15C	Intentional radiators
RSS-Gen Issue 2 (2007)	General Requirement and Information for the Certification of Radiocommunication Equipment
RSS-210 Issue 7 (2007)	Low-power Licence-exempt Radiocommunication Devices

Industry Canada listed test facility No. IC 3481A


Date of issue: 2008-03-04

Tested by:



Niklas Boström

Approved by:



Björn Utermöhl

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1. CLIENT INFORMATION

The EUT has been tested by request of

Company: Suunto Oy
Valimotie 7
FIN-01510 Vantaa
Finland
Name of contact: Heikki Puuri

2. EQUIPMENT UNDER TEST (EUT)**2.1 Identification of the EUT according to the manufacturer/client declaration**

Equipment: Heart Rate Transmitter Belt
Type/Model: Suunto Comfort Belt
Brand name: SUUNTO
Serial number: No visible serial number.
Manufacturer: Suunto Oy
Rating/Supplying voltage: 3V litium battery
Rating RF output power: 0 dBm
Antenna gain: 0 dBi
External antenna connector: No
Operating temperature range: -20 - +60 °C
Frequency range: 2465 MHz (fixed)
Number of channels: 1
Modulation characteristics: GFSK (+/- 156 kHz)

2.2 Additional hardware information about the EUT

The EUT consists of the following units:

Unit	Type and version
PCB Mechanical housing Strap	Version C



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2.3 Additional software information about the EUT

During the tests the EUT supported the following software:

Software	Version	Comment
Commercial		Deliverable SW

2.4 Peripheral equipment

Peripheral equipment is defined as equipment needed for correct operation of the EUT during the tests, but not included as a part of the testing and evaluation of the EUT.

Equipment	Manufacturer / Type	Semko Id. No
Function generator	Hewlett Packard 33120A	8702

2.5 Modifications during the test

No modifications have been made during the tests



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3. TEST SPECIFICATIONS

3.1 Standards

47CFR (2006) part 2	Frequency allocations and radio treaty matters; general rules and regulations
47CFR (2006) part 15B Class B	Unintentional radiators
47CFR (2006) part 15C	Intentional radiators
RSS-Gen Issue 2 (2007)	General Requirement and Information for the Certification of Radiocommunication Equipment
RSS-210 Issue 7 (2007)	Low-power Licence-exempt Radiocommunication Devices
Measurements methods according to ANSI C63.4-2003	

3.2 Additions, deviations and exclusions from standards

No additions, deviations or exclusions have been made from standards.

3.3 Test set-up

Measurement set-up for radiated measurements is described in Sections 5.

3.4 Operating environment

If not additionally specified, the tests were performed under the following environmental conditions:

Air temperature: 20-25 °C
Relative humidity: 20-30 %



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4. TEST SUMMARY

The results in this report apply only to the sample tested.

FCC reference	IC reference	Test	Result	Note
15.249 and 15.209	RSS 210 A2.9	Radiated spurious emission	PASS	
15.249	RSS 210 A2.9	Radiated Output power	PASS	
15.215	RSS 210 A2.9	Band-edge compliance	PASS	
15.207	RSS-Gen 7.2.2	Conducted emission at AC port	NA	

NT = Not Tested

NA = Not Applicable



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5. RADIATED SPURIOUS EMISSIONS

5.1 Test specification

47CFR 15.249
RSS 210 A2.9

Average field strength of harmonics must be less than 54 dB μ V/m (500 μ V/m).
Peak field strength of harmonics must be less than 74 dB μ V/m.

Other spurious emissions should be below the general radiated emission limit in §15.209.

5.2 Test equipment

Equipment	Manufacturer	Type	SEMKO No.
<i>Test site: "Björkhallen"</i> <i>Semi-anechoic shielded chamber, 6 x 9 x 6 m (W x L x H)</i>			30900, 30901
Software:	Rohde & Schwarz	EMC 32	
Measurement receiver:	Rohde & Schwarz	ESCI	12798
Antenna, bilog:	Rohde & Schwarz	HL-562	30711
<i>Test site: "Radiohallen"</i> <i>Anechoic shielded chamber, 3,7 x 7,0 x 2,4 m (W x L x H)</i>			12285
Software:	Rohde & Schwarz	ES-K1, V1.70	
Signal analyser:	Rohde & Schwarz	FSIQ 40	12793
Preamplifier:	MITEQ	AFS6/AFS44	12335
Antennas:			
Double Ridge Guide Horn (1-13GHz)	EMCO	3115	4936
Horn (13-18GHz)	EMCO	3160-08	30099
Horn (18-26GHz)	EMCO	3160-09	30101



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5.3 Measurement set-up

A function generator with a 2Hz sine was used to simulate the electric impulse from the heart to the heart rate belt.

Test site: Semi-anechoic shielded chamber "Björkhallen" (30 – 1000 MHz)

The radiated disturbance electric field intensity was measured in a semi-anechoic chamber at a distance of 3 m and the EUT was placed on a non-metallic table, 0,8 m above the reference ground plane. The specified test mode was enabled. set-up photo is given below.

An overview sweep with peak detection of the electric field intensity was performed with the measurement receiver in max-hold and with the antenna placed 1,5 m, 2,5 m and 3,5 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new peak measurements were carried out.

The measurement was repeated with the EUT in x, y and z position. No difference was found between the three positions (noise floor).

Test set-up photo:



x position



y position



z position



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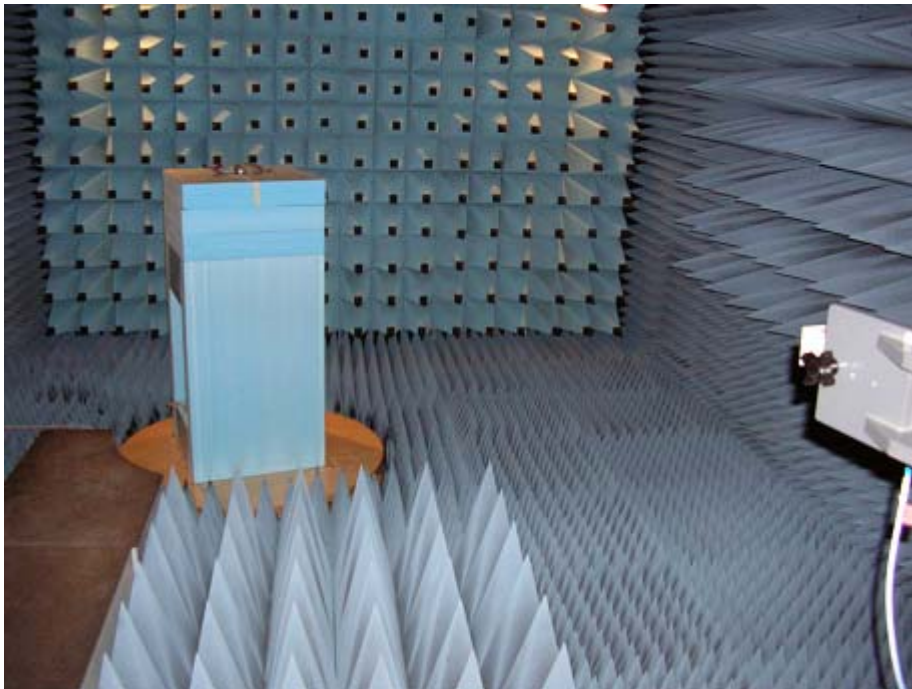
Test site: Radio anechoic shielded chamber (1 – 26 GHz)

In the Bluetooth anechoic shielded chamber the EUT was placed on a non-metallic table, 1,4 m above the floor. The radiated power was measured at a distance of 3 m. An overview sweep with peak detection was performed with the measurement receiver in max-hold and with the antenna placed 1,55 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps. The specified test mode was enabled.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new peak measurements were carried out.

The measurement was repeated with the EUT in x, y and z position. The x positions gave the highest emissions.

Test set-up photo:



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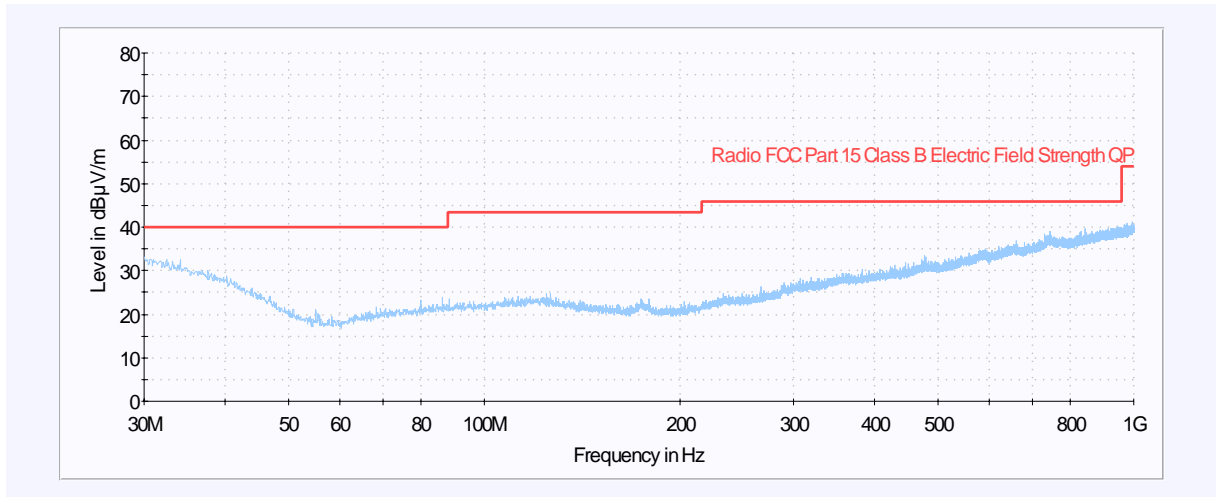
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5.4 Test results

Semi-anechoic shielded chamber "Björkhallen"

Date of test: 2008-02-25

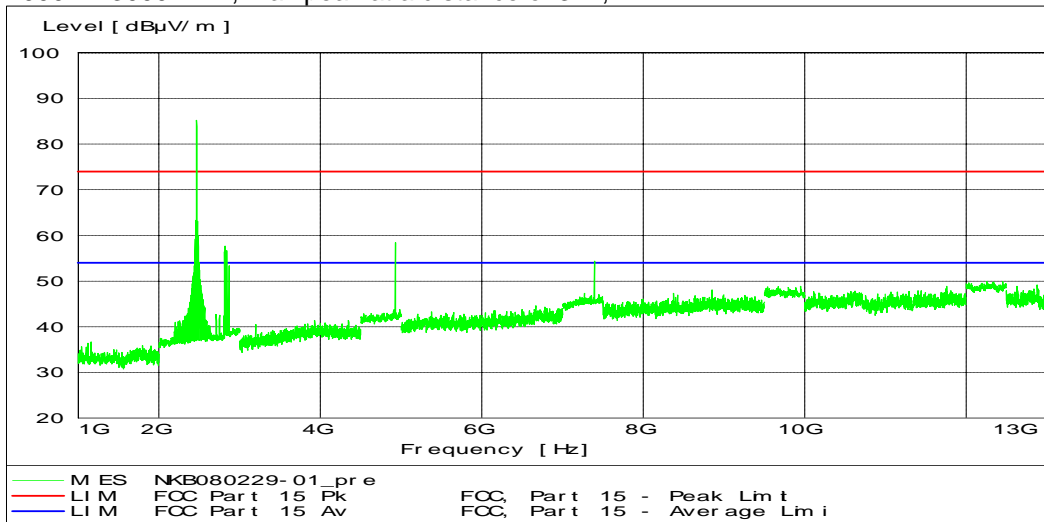
30 – 1000 MHz, max peak at a distance of 3 m, TX



Radio anechoic shielded chamber

Date of test: 2008-02-28 and 2008-02-29

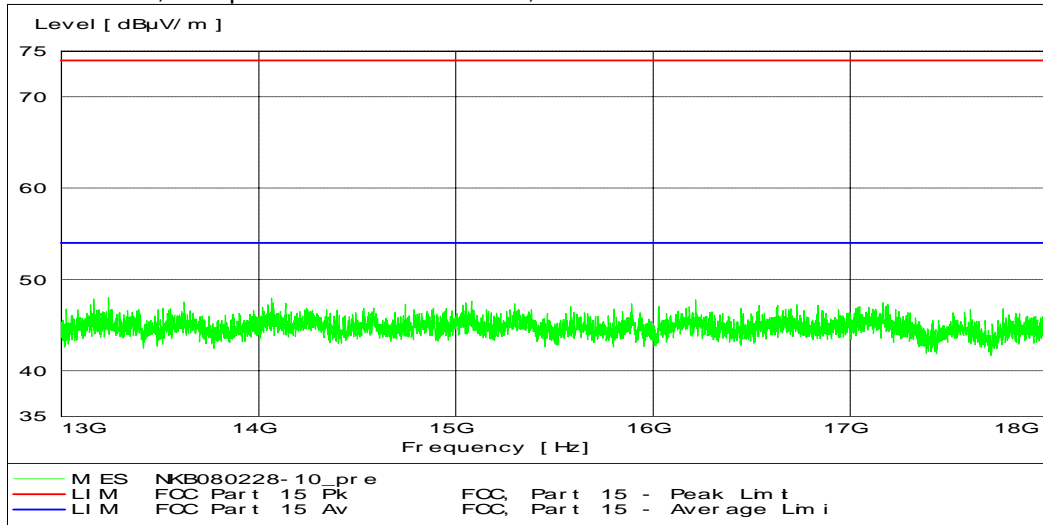
1000 – 13000 MHz, max peak at a distance of 3 m, TX



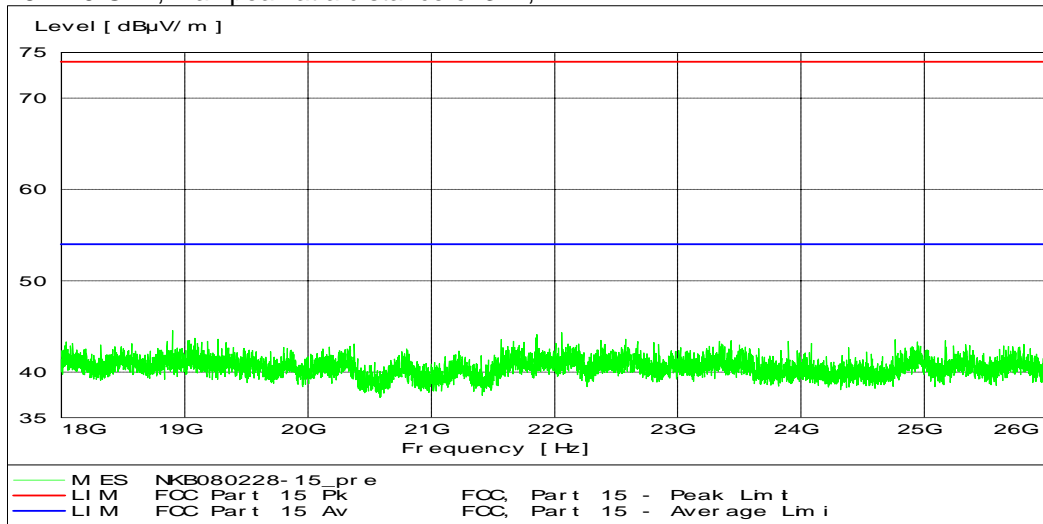
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13 – 18 GHz, max peak at a distance of 3 m, TX



18 – 26 GHz, max peak at a distance of 3 m, TX



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Data summary

Radiated spurious emissions, TX test data sequence								
Frequency (MHz)	Detector Pk / QP / AVG	Corrected amplitude (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable Position (deg)	Correction (dB)	Limit (dBµV/m)
30 - 1000	Pk	< 43	120	-	-	-	-	40 - 54
2820,641	Pk	59,3	1000	155	V	-	-9,1	74
2820,641	AVG	51,0	1000	155	V	-	-9,1	54
4930,000	Pk	60,2	1000	155	H	-	-5,2	74
4930,000	AVG	46,8	1000	155	H	-	-5,2	54
7395,000	Pk	61,9	1000	155	V	-	0,2	74
7395,000	AVG	47,9	1000	155	V	-	0,2	54

Example calculation:

Measured level [dBµV/m] = Analyser reading [dBµV] + cable loss [dB] – preamplifier gain [dB] + antenna factor [1/m]

Fulfil requirements: YES



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6. RADIATED OUTPUT POWER

Date of test: 2008-02-29

6.1 Test specification

47CFR 15.249(a)
RSS 210 A2.9

Average field strength of fundamental must be less than 94 dB μ V/m (50mV/m).
Peak field strength of fundamental must be less than 114 dB μ V/m

6.2 Test equipment

Same setup as for radiated spurious emission was used. See section 5.2 and 5.3

6.3 Test results

Frequency (MHz)	Detector Pk / AVG	Level (dB μ V/m)	Limit (dB μ V/m)
2465	Pk	95,1	114
2465	AVG	80,6	94

Example calculation:

Measured level [dB μ V/m] = Analyser reading [dB μ V] + cable loss [dB] – preamplifier gain [dB] + antenna factor [1/m]

Fulfil requirements: YES



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7. BAND EDGE COMPLIANCE

Date of test: 2008-02-28

7.1 Test specification

47CFR 15.249 and 15.215
RSS 210 A2.9

Occupied bandwidth should remain within the designated frequency band.

7.2 Test equipment

Same setup as for radiated spurious emission was used. See section 5.2 and 5.3

7.3 Test results

	Lowest frequency (MHz)	Highest frequency (MHz)
Intersection with 15.209 limit	2464,507	2465,589
20 dB bandwidth	2464,499	2465,597
99% bandwidth	2464,568	2465,520

Example calculation:

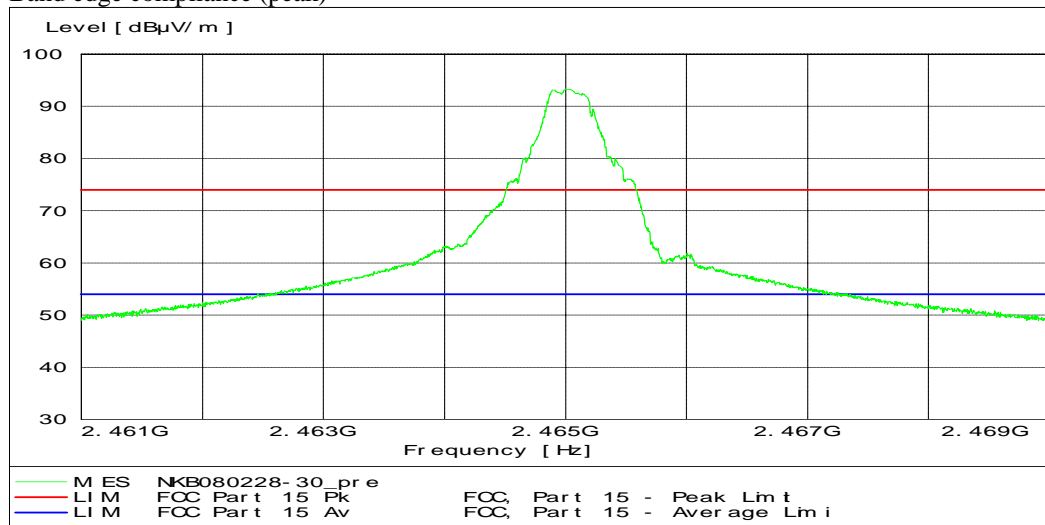
Measured level [dBµV/m] = Analyser reading [dBµV] + cable loss [dB] – preamplifier gain [dB] + antenna factor [1/m]

Fulfil requirements: YES

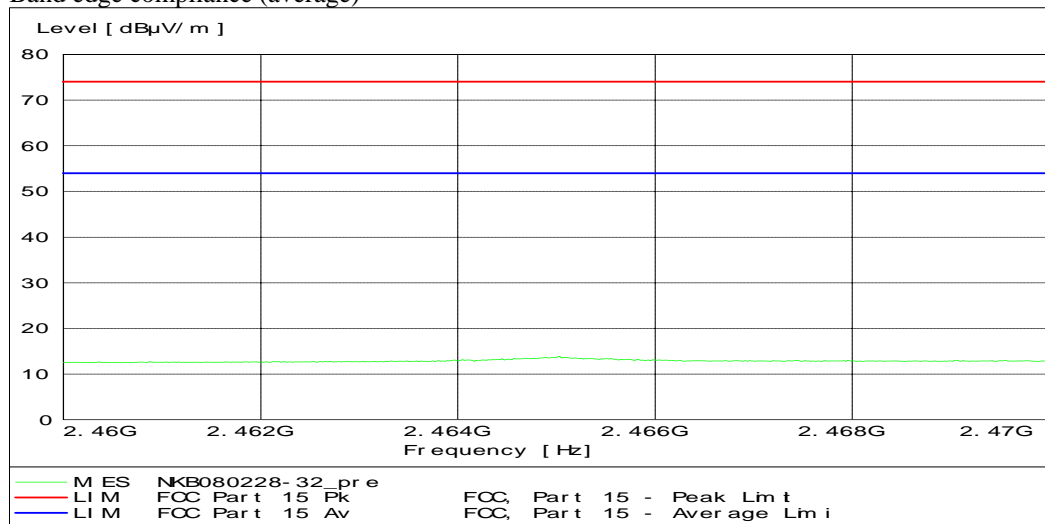


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Band edge compliance (peak)



Band edge compliance (average)



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9 INSTRUMENTATION LIST

Equipment	Manufacturer	Type	SEMKO No.	Last Cal. date	Cal. Due date
Antenna horn	EMCO	3115	4936	2007-08	2010-08
Antenna horn	EMCO	3160-08	30099	2007-08	2010-08
Antenna horn	EMCO	3160-09	30101	2007-08	2010-08
Preamplifier	MITEQ	AFS6/AFS44	12335	2007-07	2008-07
Spectrum analyser	Rohde & Schwarz	FSIQ40	12793	2007-06	2008-06
Measurement receiver	Rohde & Schwarz	ESCI	12798	2007-07	2009-07
Antenna, bilog	Rohde & Schwarz	HL-562	30711	2006-10	2009-10
Rubidium reference	DATUM	8040	40032	2007-07	2008-07

10 UNCERTAINTIES SUMMARY

Measurement uncertainty is calculated in accordance with EA-4/02-1997. All uncertainties are given with a level of confidence of approximately 95% (k=2).

Measurement uncertainty for radiated disturbance

Uncertainty for the frequency range 30 to 300 MHz using a biconical or a combination antenna at 3 m	± 4,6 dB
Uncertainty for the frequency range 200 to 1000 MHz using a logperiodic or a combination antenna at 3 m	± 4,8 dB
Uncertainty for the frequency range 1000 to 18000 MHz using a horn antenna at 3 m	± 6,0 dB

Measurement uncertainty for conducted disturbances at the antenna port on radio equipment ± 3,6 dB

Measurement uncertainty for Output power (Radio)

Digital signal, conducted	± 0,6 dB
Digital signals, radiated 1 - 18 GHz	± 3,3 dB

Measurement uncertainty for conducted disturbance voltage at AC port ± 2,0 dB



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