

RADIO TEST REPORT

No. 306531R1

EQUIPMENT UNDER TEST

Equipment:	Wireless Services Gateway
Type / model:	PX30
Manufacturer:	Possio AB
Tested by request of:	Possio AB

SUMMARY

The equipment complies with the requirements of the following standards:

FCC, Part 15, Subpart B (2002) and Subpart C (2002);

Date of issue: November 5, 2003

Tested by:


Jan Adolfsen

Approved by:

Björn Rosenquist

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1. CLIENT INFORMATION

The EUT has been tested by request of

Company: Possio AB
Polygonvägen 53
SE-187 12 Täby
Sweden

Name of contact: Johan Moberg

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

Equipment: Wireless Services Gateway
Type/Model: PX30
Serial number: PX30-TU4-001
FCC ID Number: Q7XQEU00065
Manufacturer: Possio AB
Rating/Supplying voltage: Input: 100 – 240 V AC 50/60Hz 380 mA
Output: 5 V DC 2,6 A

Rating RF output power: 12 dBm
Antenna gain: 2.5 dBi
External antenna connector: No
Operating temperature range: 0 to + 55 °C
Frequency range: 2400 – 2483,5 MHz
Number of channels: 79
Modulation characteristics: GFSK, FHSS
Stand by mode supported: Yes

2.3 Additional information of the EUT

The EUT is equipped with a Bluetooth circuit with an internal antenna.
The 802.11 card has 2 antennas mounted on the enclosure of the EUT.



Intertek Semko AB

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Registered in Sweden: No SE556024059901, Registered office: As address

3. TEST SPECIFICATIONS

3.1 Standards

FCC (2002): Subpart B – Unintentional radiators and Subpart C – Intentional Radiators; §15.247 for frequency hopping systems operating in the 2400 – 2483.5 MHz and 5725 – 5850 MHz; §15.205 for restricted bands; §15.207/CISPR 22 for conducted limits; §15.209 and §15.249 for radiated limits.

ANSI C63.4-1992

3.2 Additions, deviations and exclusions from standards and accreditation

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

3.3 Test set-up

The test results in this report apply only to the transmitting characteristics of the Bluetooth unit. The port inside the PX30 was populated by a wireless 802.11 PCMCIA card. A mouse was connected to the USB port. A cable was connected to the Ethernet port. The PX30 was supplied by 5 V DC from external power supply.

The Ericsson Starter kit was used to set the transmitting modes. The R&S, TS8960 test facility initiate the EUT to transmit DH5 packets.

The EUT is intended to have two orientations, standing, or laying. The worst orientation was investigated and found to be the standing orientation.

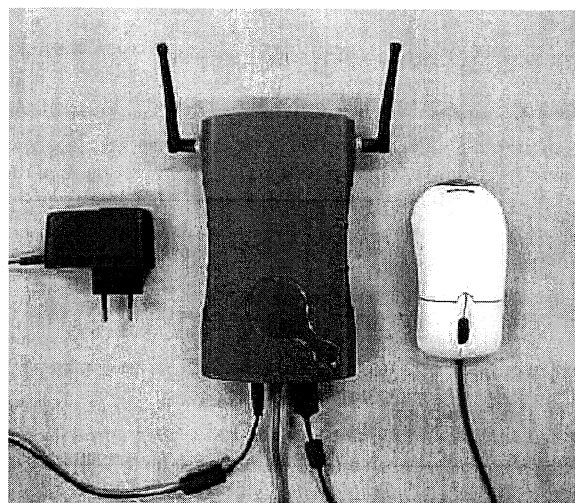


Photo showing the cable configuration

3.4 Operating environment

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

Air temperature: 21 - 23 °C
Relative humidity: 29 - 47 %

4. TEST SUMMARY

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

FCC reference	Test	Result	Note
15.247(b)	Peak output power	Pass	
15.247(a)	TX Output Spectrum – 20 dB Bandwidth	Pass	
15.247(a)	Carrier frequency separation	Pass	
15.247(a)	Number of hopping frequencies (channels)	Pass	
15.247(a)	Time of occupancy (dwell time)	Pass	
15.247(c)	Band edge compliance	Pass	
15.247 (d)	Peak power spectral density	Pass	
15.207 (a)/ CISPR 22	Conducted disturbance voltage in the frequency range 0,45 - 30 MHz	Pass	
15.209 (a)	Out of band spurious emissions, radiated	Pass	
15.249(c)	Out of band spurious emissions, radiated	Pass	



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5. PEAK OUTPUT POWER**5.1 Test protocol**

Date of test: June 10, 2003

EUT mode of operation: TX and hopping off.

Spectrum analyzer settings:

Span: 10 MHz

RBW: 3 MHz

VBW: 3 MHz

Sweep time: 1 s

Detector: Peak

Trace: Max Hold

Channel (MHz)	Peak Output Power (dBm)	Limit value (dBm)
2402	5.25	< 30
2441	7.45	
2480	9.45	

Measurement results are corrected for attenuation in the set-up configuration and antenna gain declared by the manufacturer.



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6. TX OUTPUT SPECTRUM – 20 DB BANDWIDTH**6.1 Test protocol**

Date of test: June 10, 2003

EUT mode of operation: TX and hopping off.

Spectrum analyzer settings:

Span: 1,5 MHz
RBW: 30 kHz
VBW: 30 kHz
Sweep time: 20 ms
Detector: Peak
Trace: Max Hold

Channel (MHz)	20 dB Bandwidth (MHz)	Limit value (kHz)
2402	0,8	< 1000
2441	0,8	
2480	0,8	



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7. CARRIER FREQUENCY SEPARATION

7.1 Test protocol

Date of test: June 10, 2003

EUT mode of operation: TX and hopping on.

Spectrum analyzer settings:

Span: 4 MHz

RBW: 100 kHz

VBW: 100 kHz

Sweep time: Auto

Detector: Peak

Trace: Max Hold

Channel (MHz)	Carrier frequency separation from the next channel		Limit value (MHz)
	To the right (MHz)	To the left (MHz)	
2402	1,0	-	0,8
2441	1,0	1,0	0,8
2480	-	1,0	0,8



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8. NUMBER OF HOPPING CHANNELS

8.1 Test protocol

Date of test: June 10, 2003

EUT mode of operation: TX and hopping on.

Spectrum analyzer settings:

Start frequency: 2400 MHz

Stop frequency: 2484 MHz

RBW: 100 kHz

VBW: 100 kHz

Sweep time: Auto

Detector: Peak

Trace: Max Hold

Number of hopping channels	Limit value
79	> 75



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9. TIME OF OCCUPANCY (DWELL TIME)

9.1 Test protocol

Date of test: June 23, 2003

EUT mode of operation: TX and hopping on.

Spectrum analyzer settings:

Determination of transmitting time T

Span: 0 Hz
 RBW: 1 MHz
 VBW: 1 MHz
 Sweep time: 4 ms
 Single sweep
 Detector: Peak
 Trace: Clear/Write
 Trigger: Video

*Determination of the number of times **n** the channel is active during the sweep time of 10 s*

RBW: 100 kHz
 VBW: 100 kHz
 Sweep time: 10 s

Test parameters	Channel (MHz)			Limit value (s)
	2402	2441	2480	
T (μs)	2754	2754	2754	-
n	22	22	22	-
Dwell time (s) = $T \cdot 10^{-6} \cdot 3 \cdot n$	0.18	0.18	0.18	< 0.4



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10. BAND EDGE COMPLIANCE

10.1 Measurement set-up

For measurement set-up see Section 13.4.2.

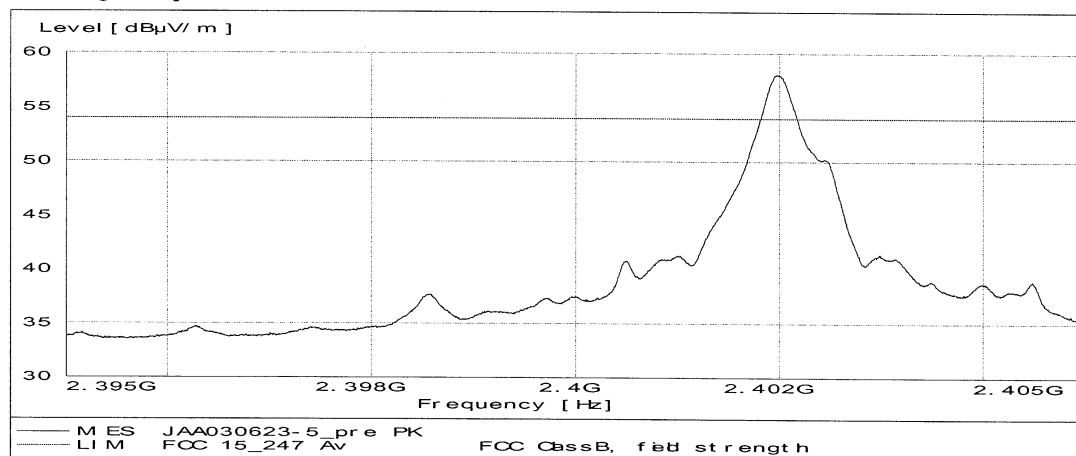
10.2 Test protocol

Date of test: June 23, 2003

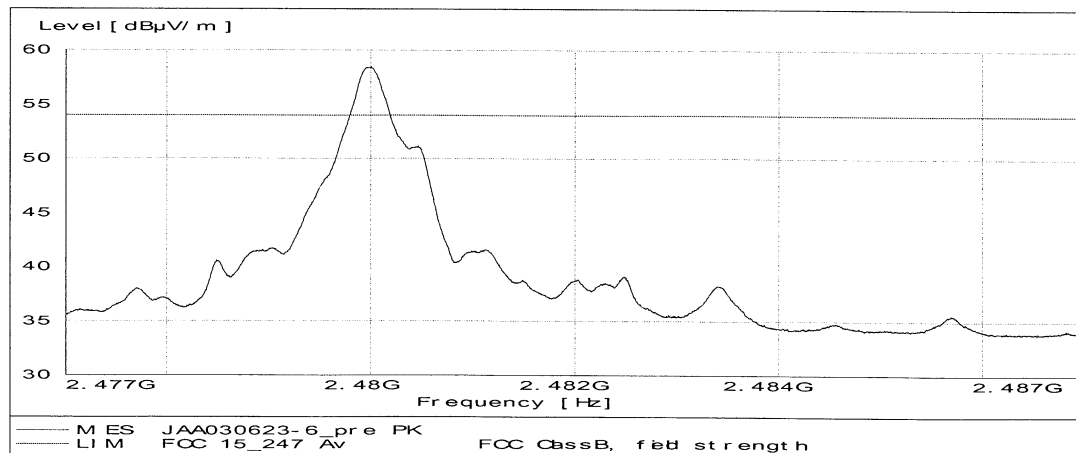
EUT mode of operation: TX and hopping off.

Parameter settings	Compliance at 2400 MHz	Compliance at 2483,5 MHz
Start frequency (MHz):	2395	2477
Stop frequency (MHz):	2405	2487
RBW (kHz):	100	100
VBW (kHz):	100	100
Sweep time (ms):	5	5
Detector:	Average	Average
Trace:	Max Hold	Max Hold

Band edge compliance at 2400 MHz



Band edge compliance at 2483.5 MHz



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11. PEAK POWER SPECTRAL DENSITY

11.1 Test protocol

Date of test: June 23, 2003

EUT mode of operation: TX, hopping on and maximum data rate.

Spectrum analyzer settings:

Span: 1 MHz

RBW: 3 kHz

VBW: 10 kHz

Sweep time: Auto

Detector: Peak

Trace: Max Hold

Channel (MHz)	Peak Power Spectral Density (dBm)	Limit value (dBm)
2402	-2.65	< 8
2441	-3.45	
2480	-4.05	

Measurement results are corrected for attenuation in the set-up configuration.



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12. CONDUCTED DISTURBANCE VOLTAGE IN THE FREQUENCY RANGE 0,45 - 30 MHZ

12.1 Operating environment

Temperature: 23 °C (15 - 35 °C)
Relative Humidity: 46 % (20 - 75 %)

12.2 Measurement uncertainty

Conducted disturbance voltage, quasi-peak detection: $\pm 2,0$ dB

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.

Measurement uncertainty is calculated in accordance with EA-4/02-1997.
The measurement uncertainty is given with a confidence of 95%.

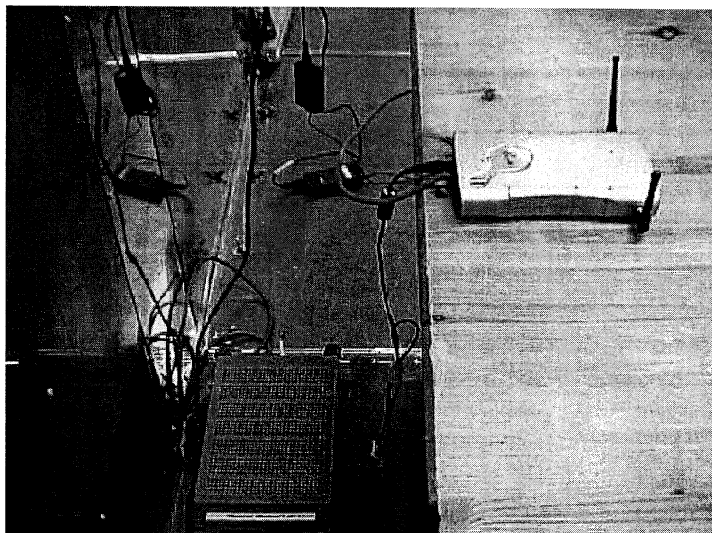
12.3 Test equipment

Test site: FCC

Equipment	Manufacturer	Type	SEMKO No.
Software:	Rohde & Schwarz	ES-K1 V1.60	
Measurement receiver:	Rohde & Schwarz	ESHS 30	4946
Artificial mains network:	Rohde & Schwarz	ESH3-Z5	2727
Transformer:	TUFVASSONS	AFM-1500	375

12.4 Measurement set-up

The mains terminal disturbance voltage was measured with the EUT located 0,8 m above the ground plane and 0,4 m from the vertical ground plane. The EUT was connected to an artificial mains network (AMN). The AMN was placed on a metallic, grounded floor. Amplitude measurements were performed with a quasi-peak detector. The test set-up photo is given below.



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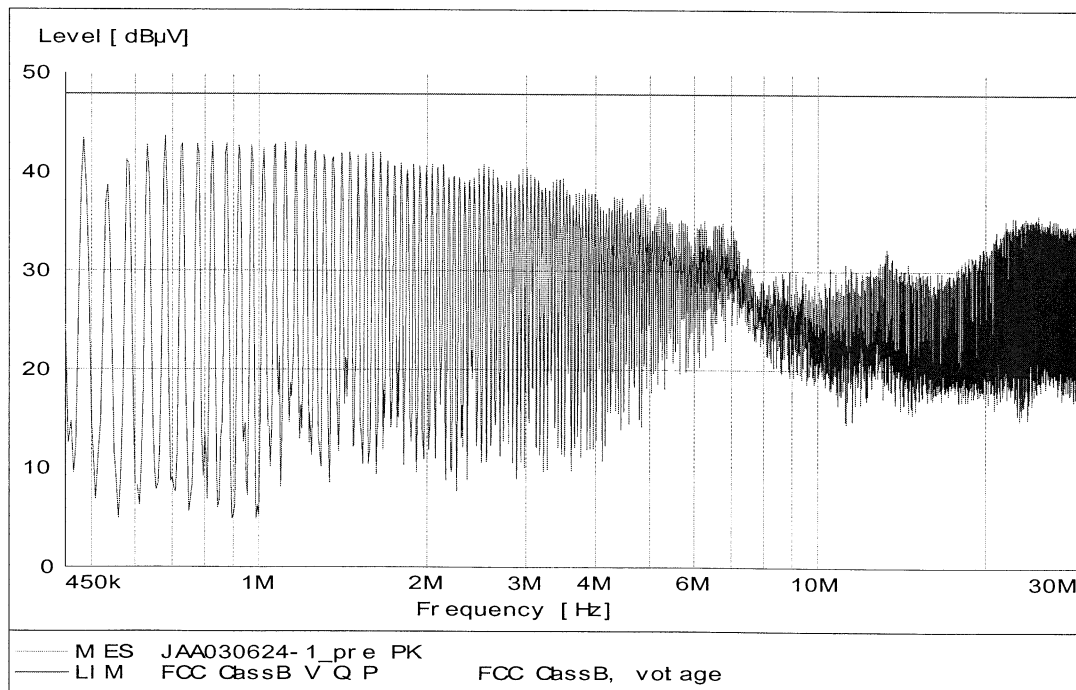
Test set-up photo:

12.5 Test protocol

Date of test: June 24, 2003

Frequency /MHz	Quasi-Peak	
	Disturbance Level /dB(μ V)	Permitted limit /dB(μ V)
0.680	43.0	48
0.725	41.6	48
0.730	42.0	48
0.770	33.0	48
0.775	42.0	48
0.820	38.2	48
0.825	42.1	48
0.870	41.0	48
0.875	42.0	48
1.065	40.8	48
1.210	40.0	48
1.215	41.7	48

An overview sweep performed with a peak detector is shown below.



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13. RADIATED SPURIOUS EMISSIONS

13.1 Operating environment

Temperature: 23 °C (15 - 35 °C)
 Relative Humidity: 47 % (20 - 75 %)

13.2 Measurement uncertainty

Radiated disturbance electric field intensity, 30 – 1000 MHz: $\pm 4,6$ dB
 Radiated disturbance electric field intensity, 1000 – 26000 MHz: $\pm 6,0$ dB

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.

Measurement uncertainty is calculated in accordance with EA-4/02-1997.
 The measurement uncertainty is given with a confidence of 95%.

13.3 Test equipment

Equipment	Manufacturer	Type	SEMKO No.
<i>Test site: Semi-anechoic shielded chamber, 10 x 20 x 8,5 m (W x L x H)</i>			30300
Software:	Rohde & Schwarz	ES-K1, V1.60	
Measurement receiver:	Rohde & Schwarz	ESAI	2973/2974
Antenna amplifier:	SEMKO		7992/7993
Antenna, bilog:	Chase	CBL6111B	971
<i>Test site: Bluetooth anechoic shielded chamber, 3,7 x 7,0 x 2,4 m (W x L x H)</i>			12285
Software:	Rohde & Schwarz	ES-K1, V1.60	
Signal analyser:	Rohde & Schwarz	FSIQ 40	9192
Preamplifier:	MITEQ	AFS6/AFS44	12335
Antennas:			
Double Ridge Guide Horn:	EMCO	3115	4936
Horn antenna:	EMCO	3160-08	30099
Horn antenna:	EMCO	3160-09	30101
Filter	K&L	4H10-X4500/18000-0/0	5133
Filter	K&L	6N45-2450/T100-0/0	12389



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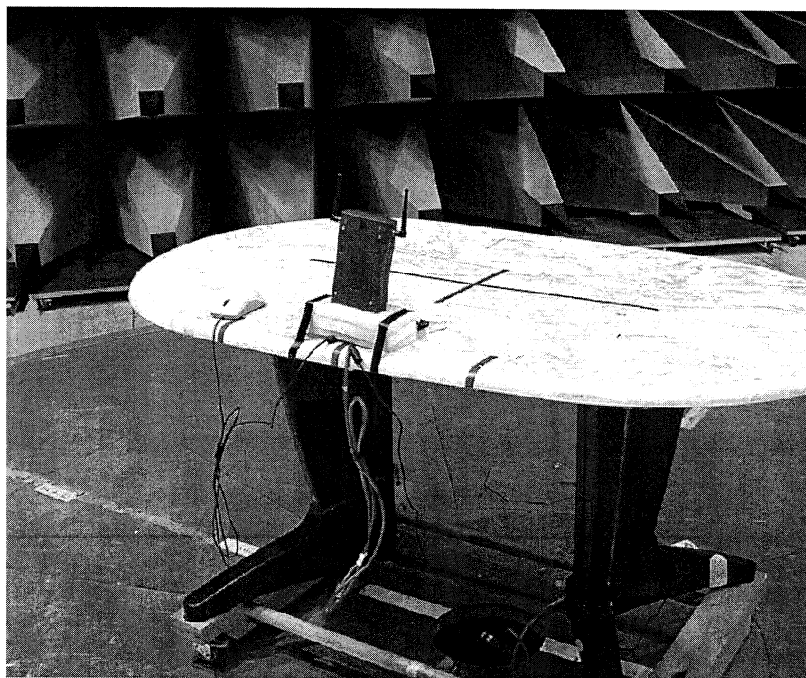
13.4 Measurement set-up

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

The radiated disturbance electric field intensity was measured in a semi-anechoic chamber at a distance of 3 m (stand by mode) and 10 m (TX mode). The EUT was placed on a non-metallic table, 0,8 m above the reference ground plane. The specified test mode was enabled.

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 quasi-peak measurements were carried out.



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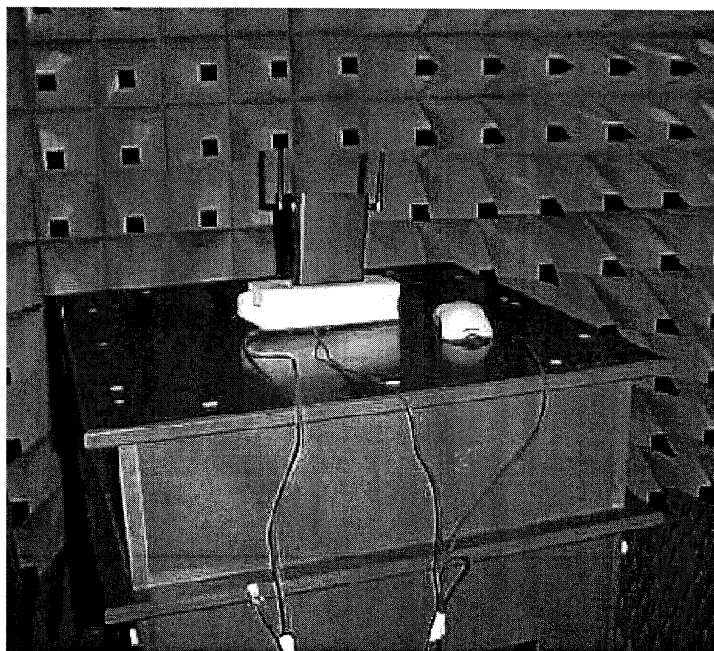
13.4.2 Test site: Bluetooth anechoic shielded chamber (1 – 26 GHz)

In the Bluetooth anechoic chamber the EUT was placed on a non-metallic table, 1,4 m above the floor. The radiated disturbance electric field intensity was measured at a distance of 3 m. The specified test mode was enabled.

An overview sweep with peak detection of the electric field intensity was performed with the spectrum analyser in max-hold and with the antenna placed 1,4 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps. If necessary, the sweep was repeated with average detection.

The measuring antenna output port was connected to a 2,4 GHz band rejection filter in order to avoid saturation to the input stage of the spectrum analyzer.

Test set-up photo is shown below.



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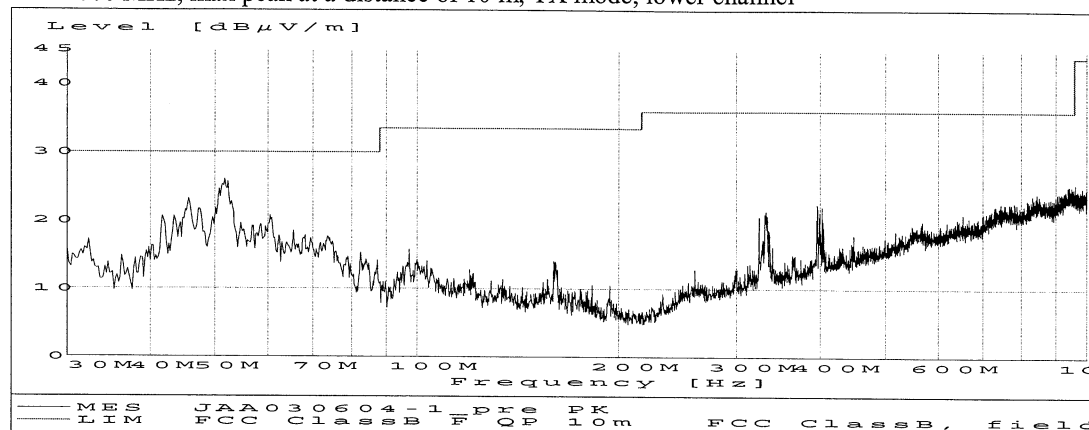
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13.5 Test protocol

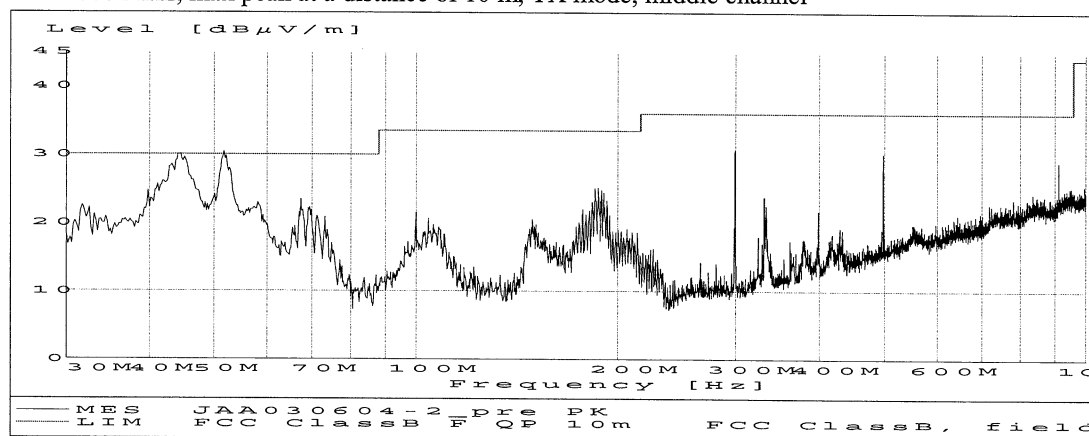
13.5.1 Semi-anechoic shielded chamber

Date of test: June 4, 2003

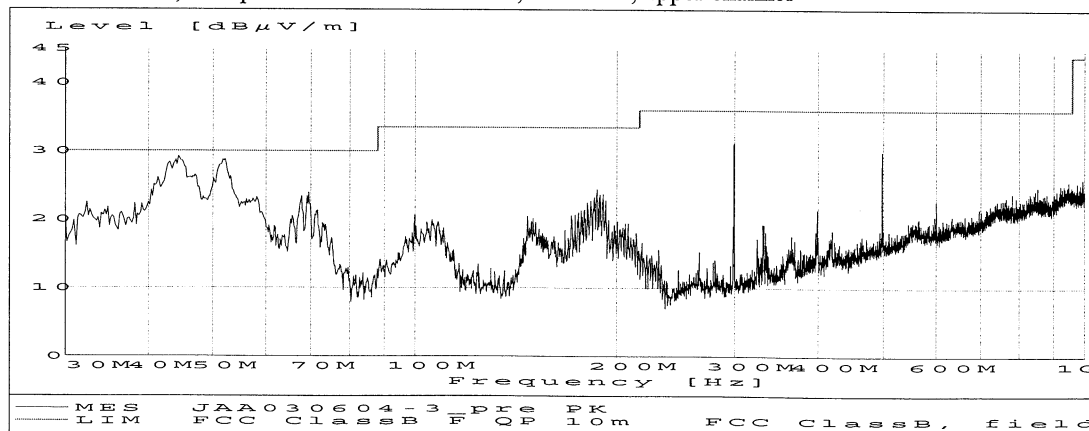
30 – 1000 MHz, max peak at a distance of 10 m, TX mode, lower channel



30 – 1000 MHz, max peak at a distance of 10 m, TX mode, middle channel



30 – 1000 MHz, max peak at a distance of 10 m, TX mode, upper channel



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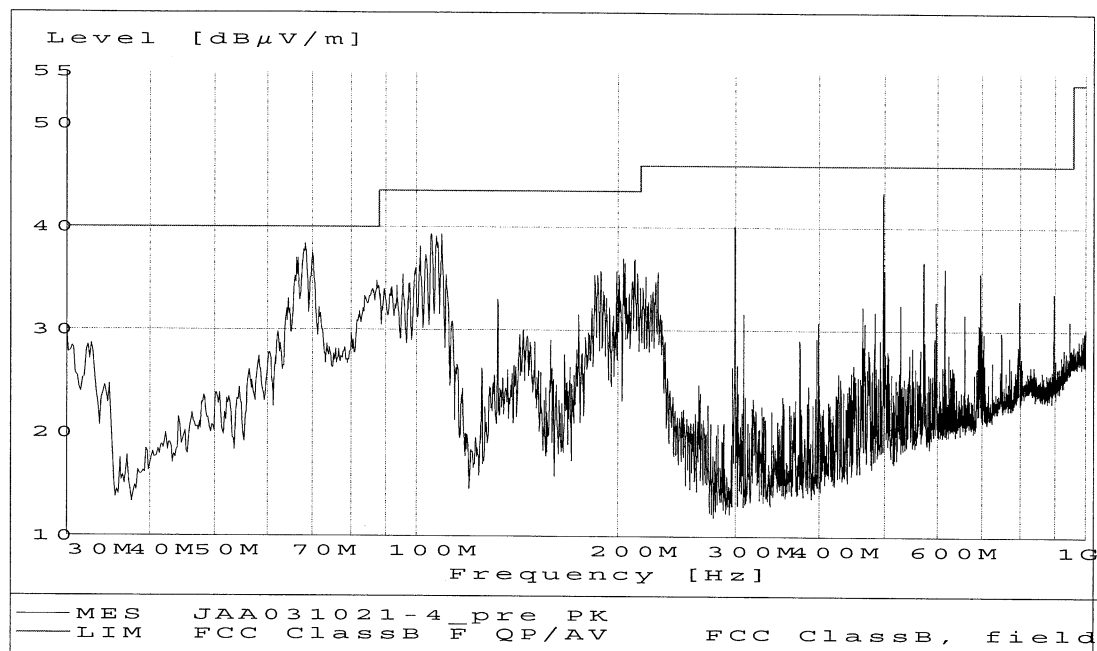
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Semi-anechoic shielded chamber

Date of test: October 21, 2003

Stand-by mode.

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



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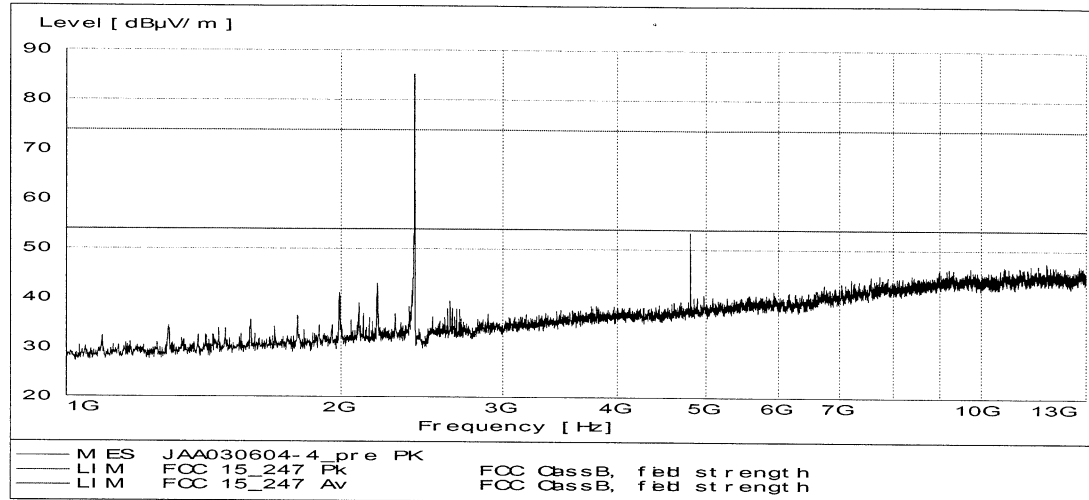
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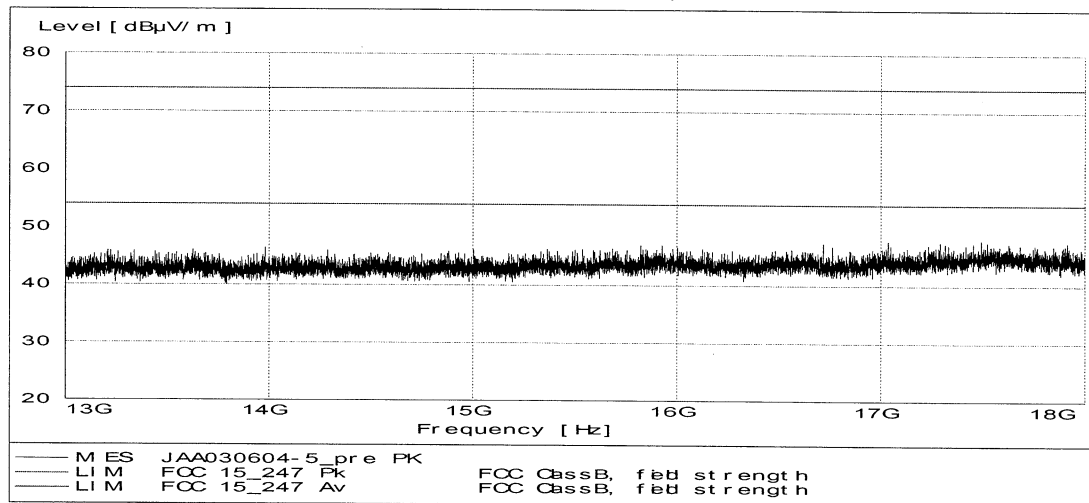
13.5.2 Bluetooth anechoic shielded chamber

Date of test: June 4, 2003

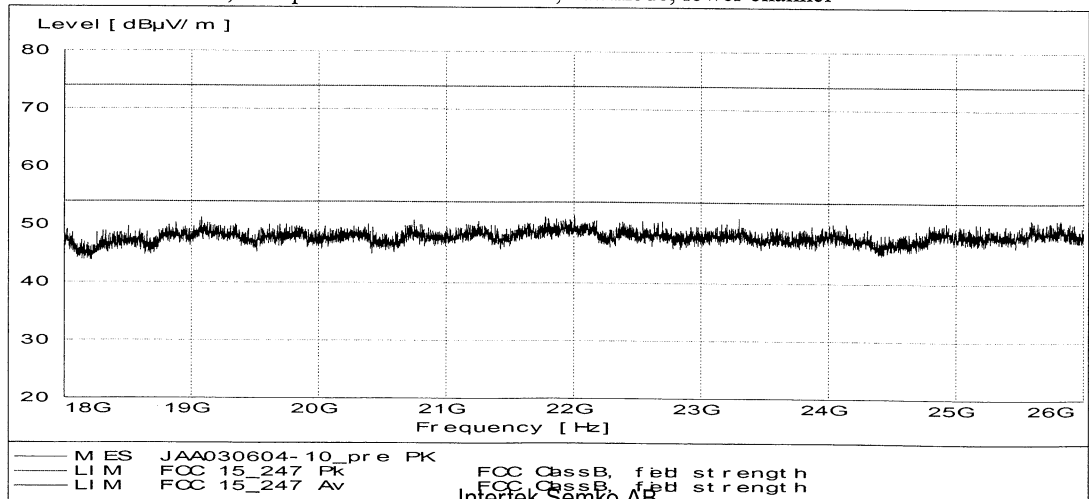
1000 – 13000 MHz, max peak at a distance of 3 m, TX mode, lower channel



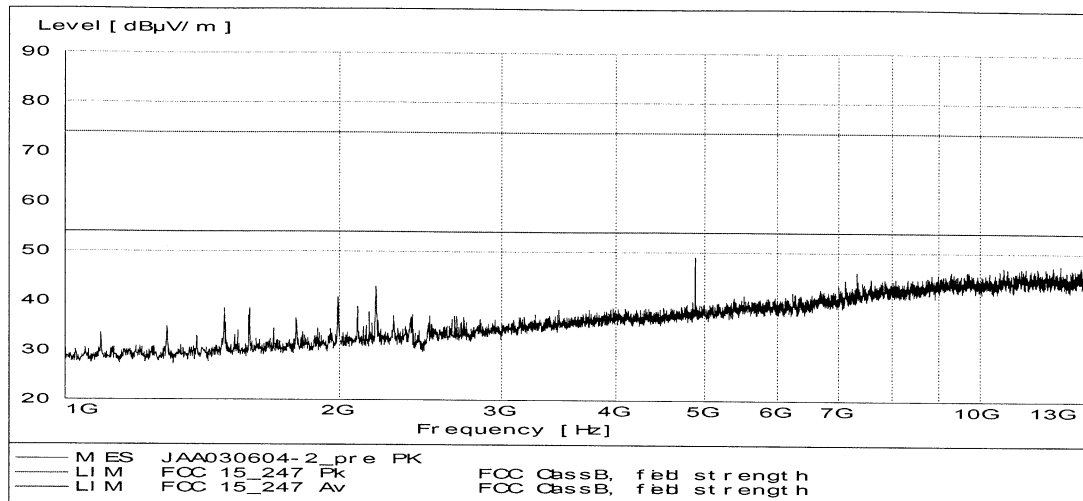
13000 – 18000 MHz, max peak at a distance of 3 m, TX mode, lower channel



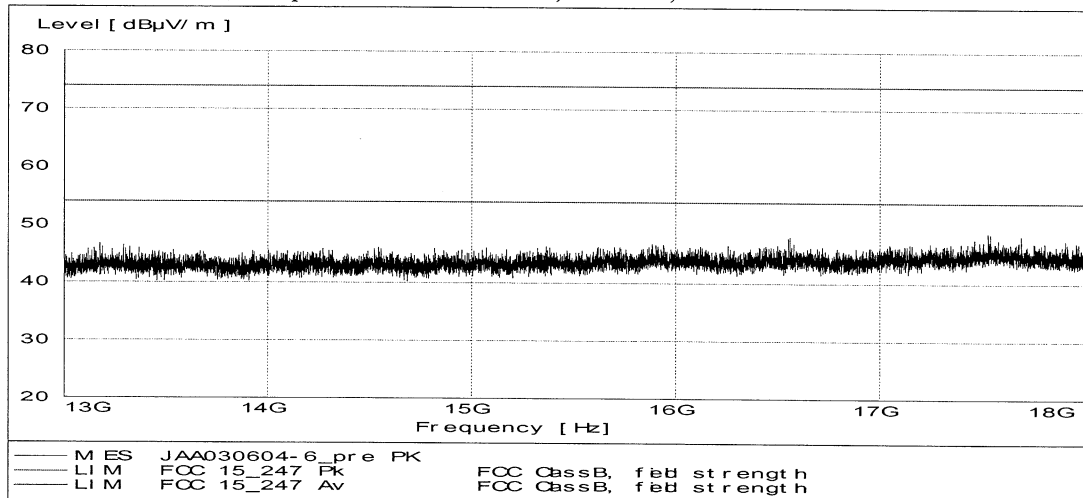
18000 – 26000 MHz, max peak at a distance of 3 m, TX mode, lower channel



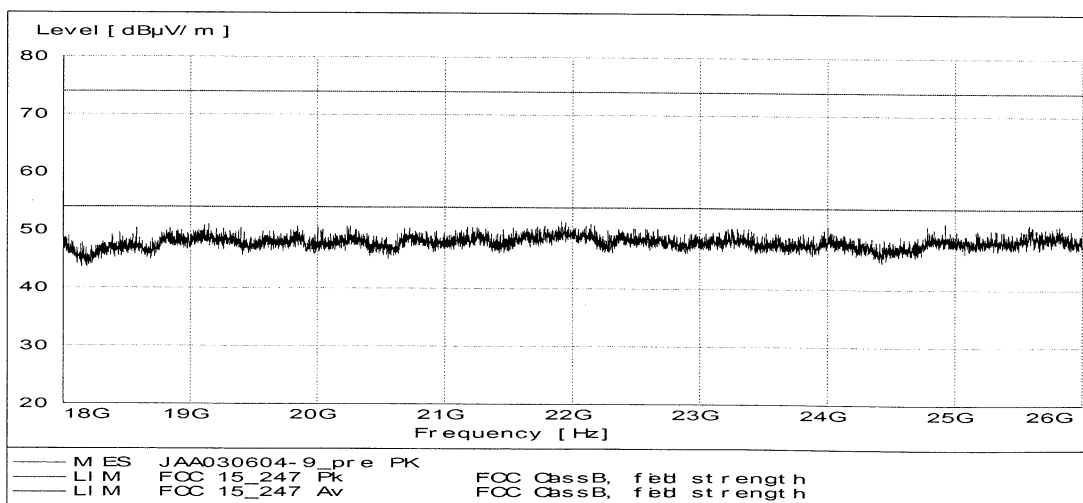
1000 – 13000 MHz, max peak at a distance of 3 m, TX mode, middle channel



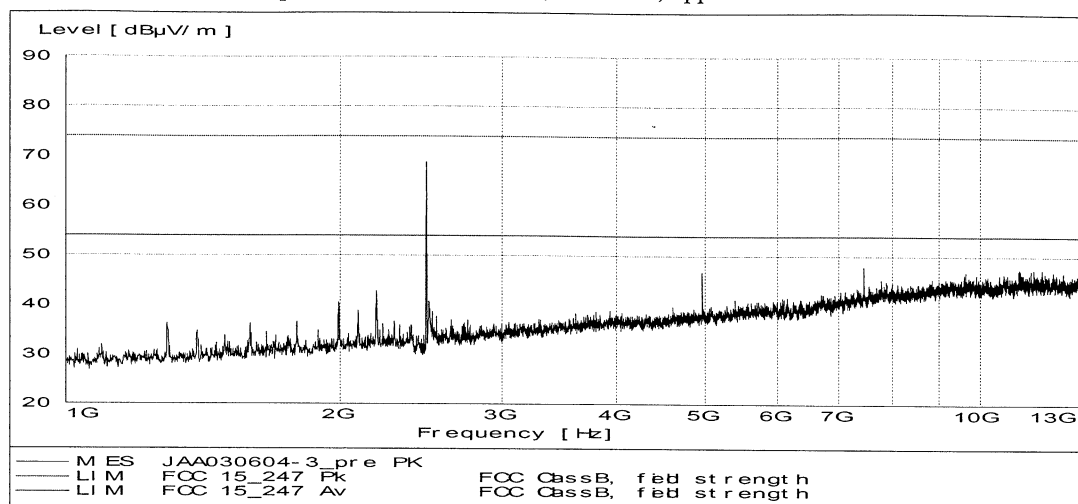
13000 – 18000 MHz, max peak at a distance of 3 m, TX mode, middle channel



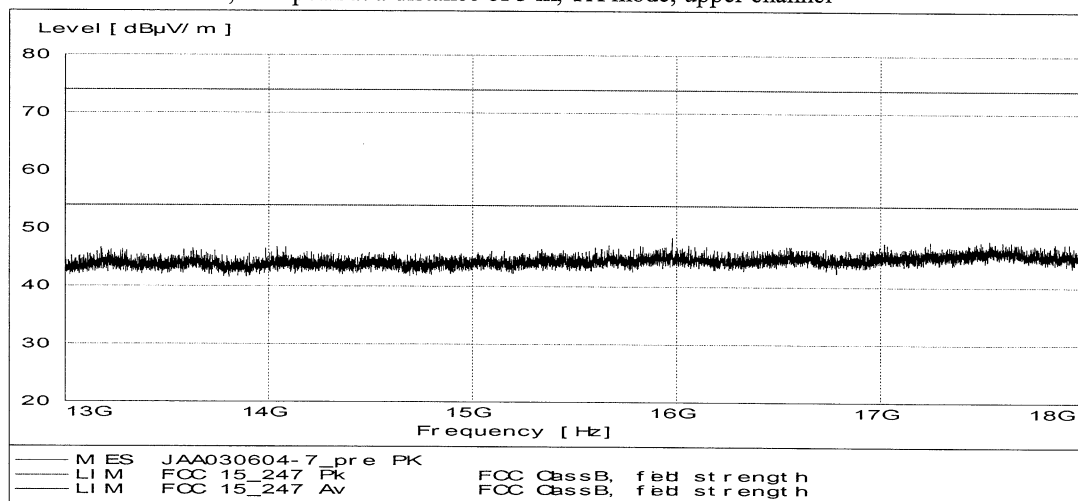
18000 – 26000 MHz, max peak at a distance of 3 m, TX mode, middle channel



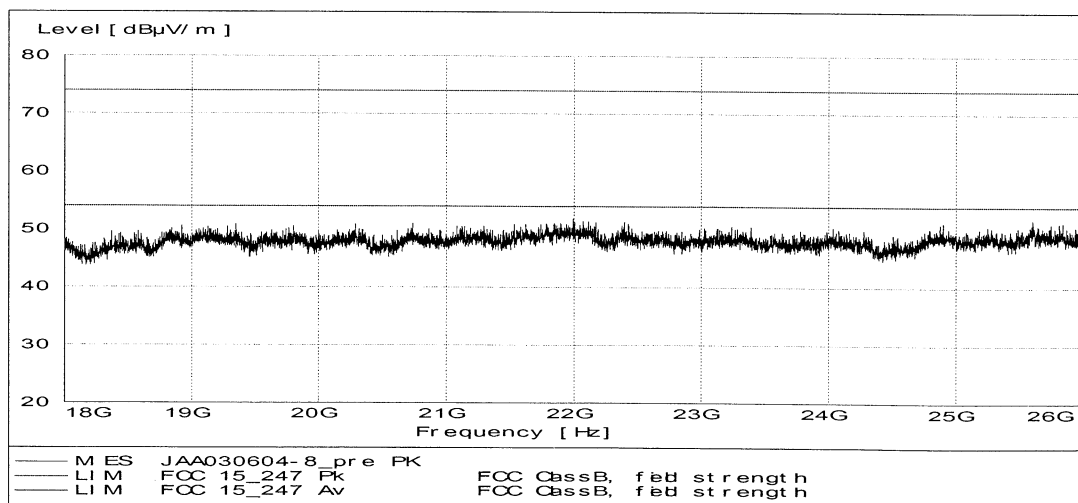
1000 – 13000 MHz, max peak at a distance of 3 m; TX mode, upper channel



13000 – 18000 MHz, max peak at a distance of 3 m, TX mode, upper channel



18000 – 26000 MHz, max peak at a distance of 3 m, TX mode, upper channel



13.5.3 Data summary

Field strength of spurious emissions						
Frequency [MHz]	RBW [kHz]	Measured level		Limit		Notes
		Peak [dB(μV/m)]	QP/AV [dB(μV/m)]	Peak [dB(μV/m)]	QP/AV [dB(μV/m)]	
44.08	120	--	24.8	--	30	1
51.44	120	--	27.6	--	30	1 2
67.36	120	--	21.2	--	30	1
67.84	120	--	35.9	--	40	2
68.16	120	--	35.3	--	40	
104.96	120	--	38.3	--	43.5	
107.04	120	--	39.0	--	43.5	2
186.80	120	--	23.7	--	33.5	1
298.56	120	--	33.3	--	36	1 2
497.60	120	--	29.8	--	36	1
497.69	120	--	41.1	--	46	
2188	1000	42.9	--	74	54	
4804	1000	53.4	--	74	54	
4881	1000	49.1	--	74	54	
4960	1000	46.8	--	74	54	
7440	1000	47.9	--	74	54	

The measured levels are calibrated levels.

For example: The measured uncalibrated value at 2188 MHz is 53.65dBμV/m

Measured value. Uncalibrated	Antenna factor	Preamplifier	Filter	Cable loss	Calibrated value
53.65 dBμV/m	27.8 dB	-40.2 dB	-0.09dB	1.74dB	42.9 dBμV/m

Note 1: Antenna distance 10 m

Note 2: Margin to the limit is less then the measurement uncertainty.



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