RADIO TEST REPORT

No. 520634R1-1

EQUIPMENT UNDER TEST

Equipment:	S1500 TagMaster Reader
Type / model:	S1500
Manufacturer:	TagMaster AB
Tested by request of:	TagMaster AB

SUMMARY

The equipment complies with the requirements of the following standards:

FCC, Part 15, Subpart B (2005) and Subpart C (2005);
RSS-210, Issue 6 (September 2005); RSS-Gen, Issue 1 (September 2005).

Industry Canada listed test facility No. IC 3481

Date of issue: January 18, 2006

Tested by: Vladimir Bazhanov

Approved by: Lars-Olov Johansson

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CONTENTS

1. CLIENT INFORMATION

The EUT has been tested by request of

Company:	TagMaster AB Kronborgsgränd 1 SE-164 87 Kista Sweden
Name of contact:	Mr. Per Selin

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT according to the manufacturer/client declaration

Equipment:	S1500 TagMaster Reader
Type/Model:	S1500
Brand name:	TagMaster AB
Serial number:	-
Manufacturer:	TagMaster AB
Rating/Supplying voltage:	12 V / 24 V DC
Rating RF output power:	75 mW e.i.r.p.
Antenna gain:	7 dBi
External antenna connector:	No
Operating temperature range:	-20 to +60 °C
Frequency range:	2435 - 2465 MHz
Number of channels:	99
Channel separation:	285 kHz
Stand by mode supported:	No

2.2 Additional hardware information about the EUT

The EUT consists of the following units:

Unit	Type and version
S1500 TagMaster Reader	S1500

2.3 Additional software information about the EUT

During the tests the EUT supported the following software:

Software	Version	Comment
Read Range	1.0.0	Frequency and output power control

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	Serial number
AC/DC adapter	FW7207/24	-
Laptop PC	Dell Inspiron 6000	-

2.5 Modifications during the test

No modifications have been made during the tests.

3. TEST SPECIFICATIONS

3.1 Standards

FCC 47 CFR part 15 (2005) Subpart C – Intentional Radiators; §15.245 Operation within the bands 902-928 MHz, 2435 – 2465 MHz, 5785 – 5815 MHz, 10500 – 10550 MHz, and 24075 – 24175 MHz.

Measurements methods according to ANSI C63.4-2003.

RSS-210, Issue 6 (September 2005): Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment.

RSS-Gen, Issue 1 (September 2005): General Requirements and Information for the Certification of Radiocommunication Equipment.

3.2 Additions, deviations and exclusions from standards

The test of conducted disturbance voltage in the frequency range 0,15-30 MHz has been performed earlier (see SEMKO Radio Test Report No. 500209R1-1).

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

3.3 Test set-up

Measurement set-up for the test of out-of-band spurious emissions is described in corresponding section.

3.4 Operating environment

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

Air temperature:	21 – 23	°C
Relative humidity:	19 – 23	%

4. TEST SUMMARY

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

FCC reference	Industry Canada reference	Test	Result	Note
15.245(b)	Annex 7	Peak output power	Pass	1, 3
15.245(b)	Annex 7, Table 2	Band edge compliance	Pass	1
15.245(b)	Annex 7, Table 2	Out of band spurious emissions, radiated	Pass	1
15.245(b)	Annex 7, Table 2	Out of band spurious emissions, conducted	NA	1
15B	6 (a)(Table1)	Out of band spurious emissions, radiated	NA	2
15B	7.2.2 (Table 2)	Conducted emission at AC port	NT	2, 4

NT = Not Tested
NA = Not Applicable

Notes:

1. Industry Canada reference: RSS-210, Issue 6 (September 2005)
2. Industry Canada reference: RSS-Gen, Issue 1 (September 2005)
3. Radiated test under normal conditions
4. The test has been performed earlier (see SEMKO Radio Test Report No. 500209R1-1).

5. PEAK OUTPUT POWER

5.1 Test set-up

See Section 7.3.

5.2 Test protocol

Date of test: December 28, 2005

Channel (MHz)	Field strength dB(μV/m)	Limit value mV/m	Limit value dB(μV/m)
1 50 99	109 110 110	500	114

Example calculation:

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

6. BAND EDGE COMPLIANCE

6.1. Test set-up

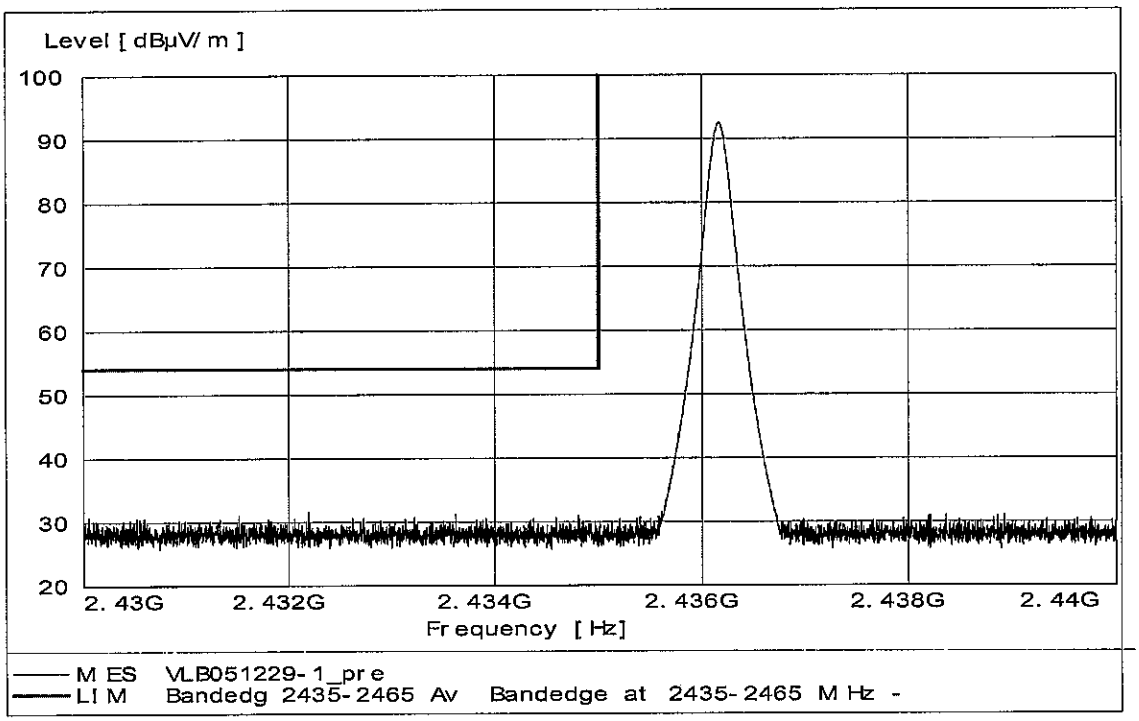
See Section 7.3.

6.2 Test protocol

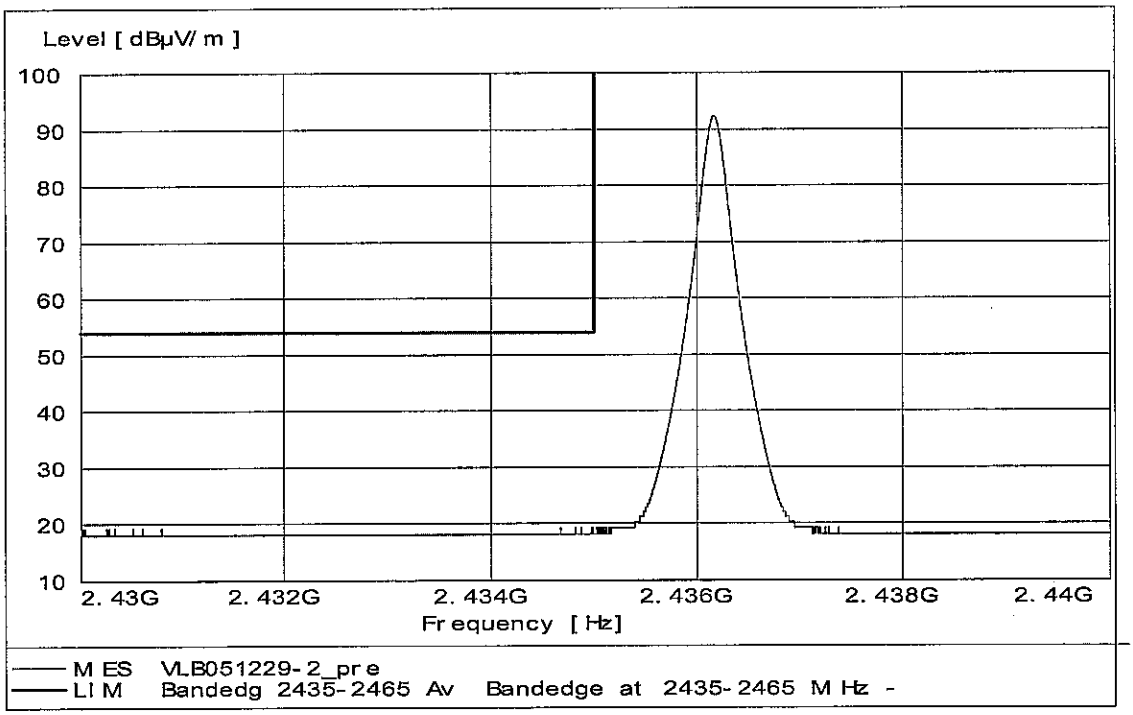
Date of test: December 29, 2005

Band edge compliance at 2435 MHz

Sweep with peak detector. The carrier is attenuated by 20 dB.

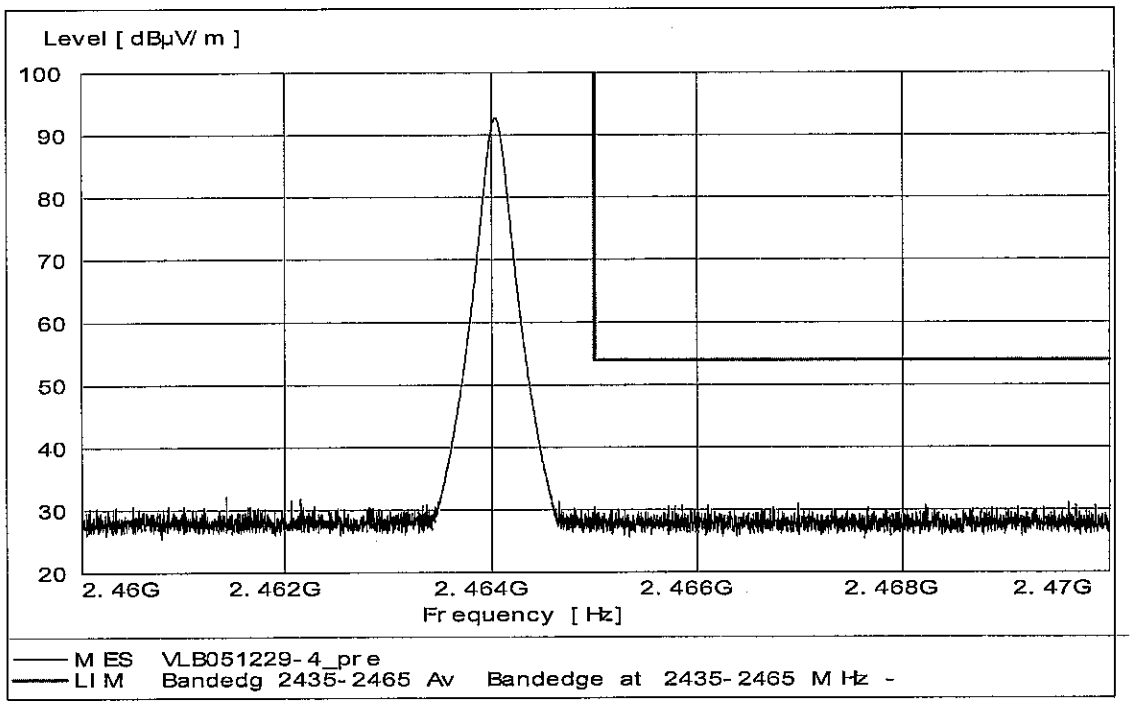


Sweep with average detector. The carrier is attenuated by 20 dB.

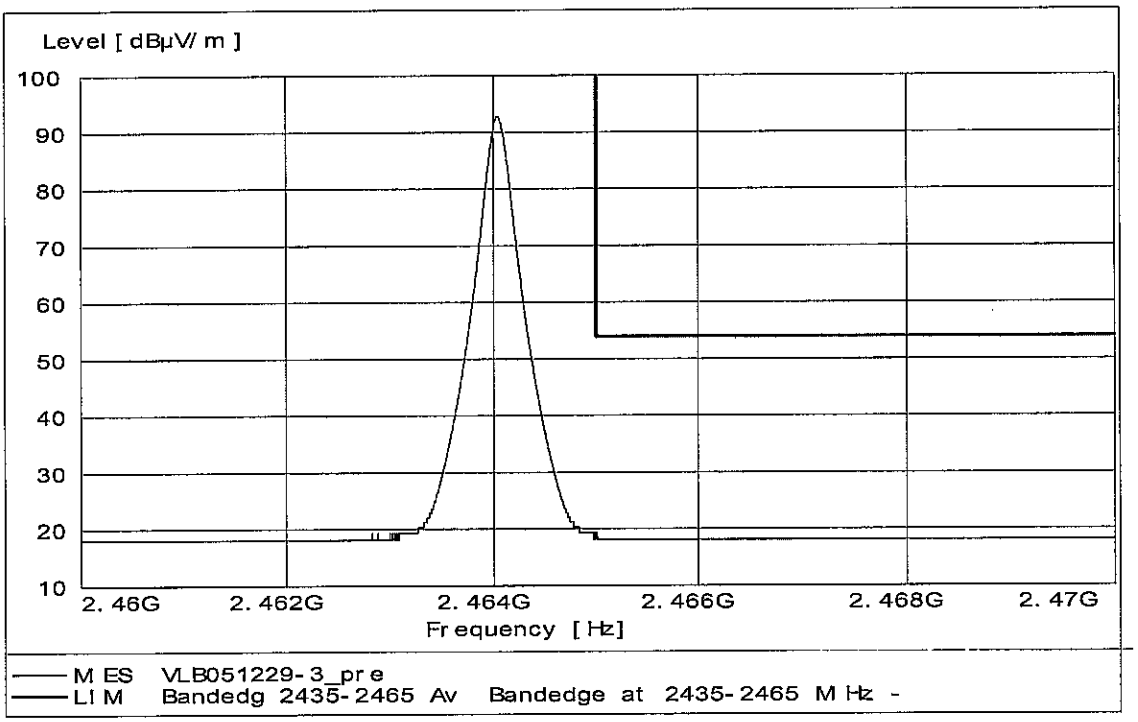


Band edge compliance at 2465 MHz

Sweep with peak detector. The carrier is attenuated by 20 dB.



Sweep with average detector. The carrier is attenuated by 20 dB.



7. RADIATED SPURIOUS EMISSIONS

7.1 Measurement uncertainty

Radiated disturbance electric field intensity, 30 – 1000 MHz: ± 4,6 dB
Radiated disturbance electric field intensity, 1000 – 18000 MHz: ± 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%.

7.2 Test equipment

Equipment	Manufacturer	Type	SEMKO No.
Test site: Semi-anechoic shielded chamber, 10 x 20 x 8,5 m (W x L x H)			30300
Software:	Rohde & Schwarz	ES-K1, V1.71	
Measurement receiver:	Rohde & Schwarz	ESAI	2973/2974
Antenna amplifier:	SEMKO		7992/7993
Antenna, bilog:	Chase	CBL6111A	971
Test site: Bluetooth anechoic shielded chamber, 3,7 x 7,0 x 2,4 m (W x L x H)			12285
Software:	Rohde & Schwarz	ES-K1, V1.70	
Signal analyser:	Rohde & Schwarz	FSIQ 40	40023
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
High pass filter	K & L	4410-X4500/18000-0	5133
Band rejection filter	K & L	6N45-2450/T 100-0/0	12389
Transformer	Tufvassons	AFM-1500	30317

7.3 Measurement set-up

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

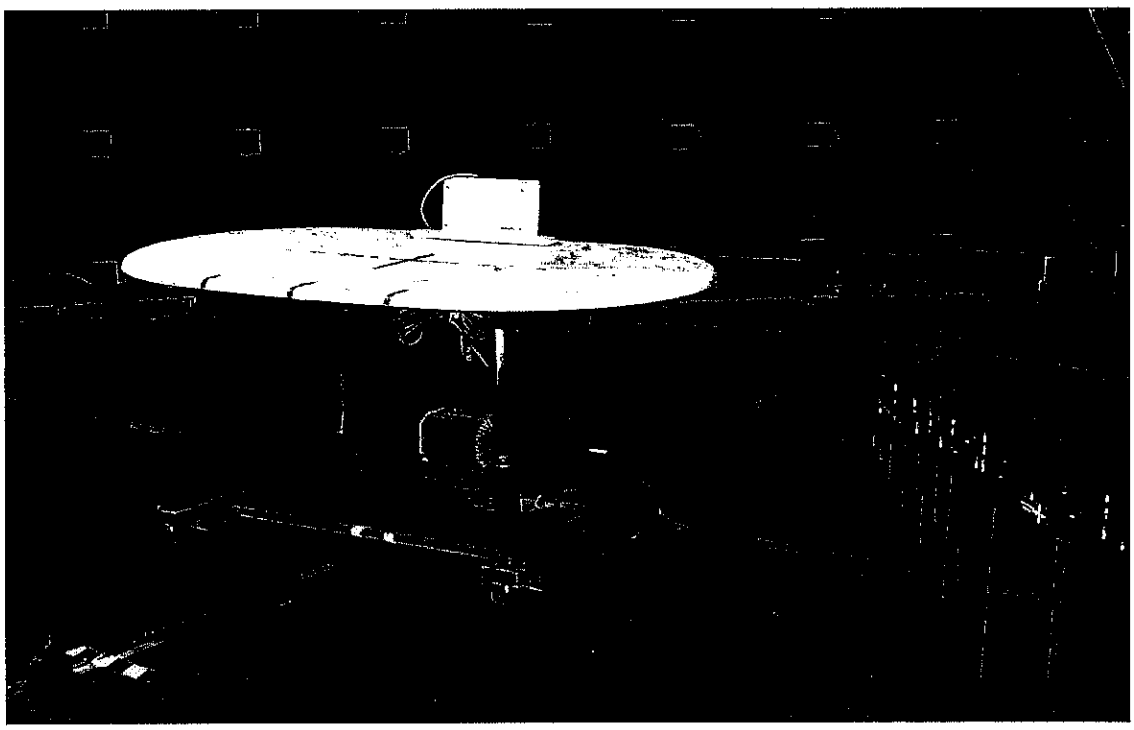
The radiated disturbance electric field intensity was measured in a semi-anechoic chamber at a distance of 3 m and the EUT was placed on a non-metallic table, 0,8 m above the reference ground plane. The specified test mode was enabled. Test set-up photos are given below.

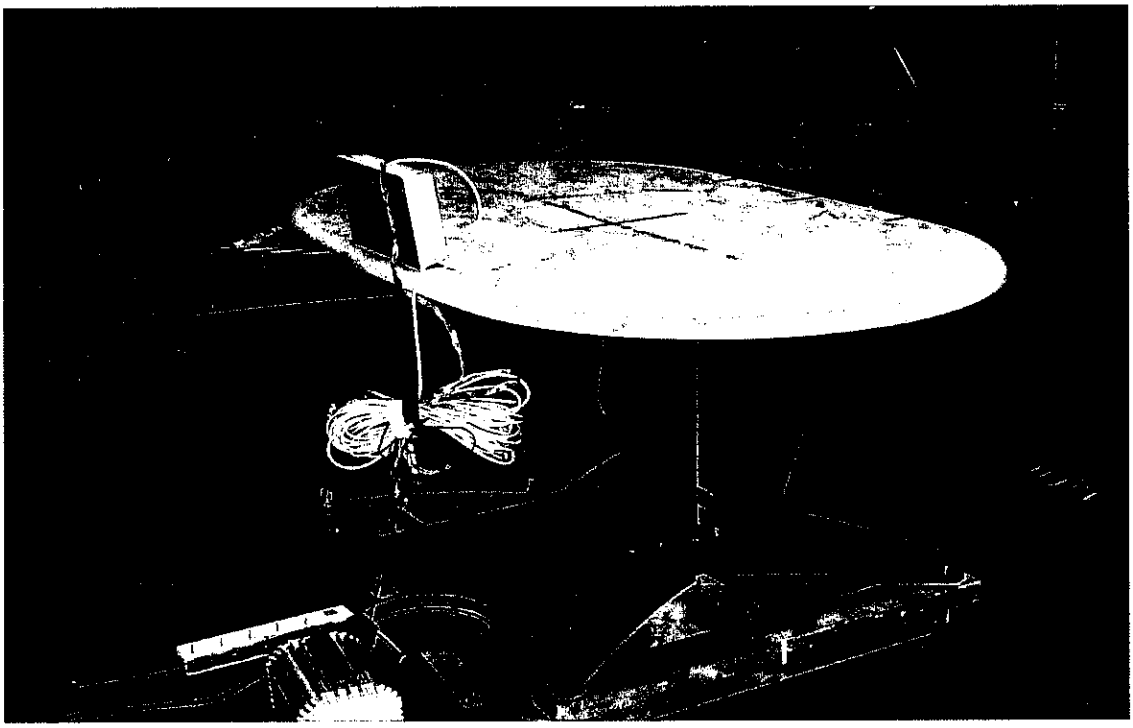
An overview sweep with peak detection of the electric field intensity was performed with the measurement receiver in max-hold and with the antenna placed 1,5 m, 2,5 m and 3,5 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree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

The EUT was supplied with 120 V AC (60 Hz) during the test.

Test set-up photos:





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

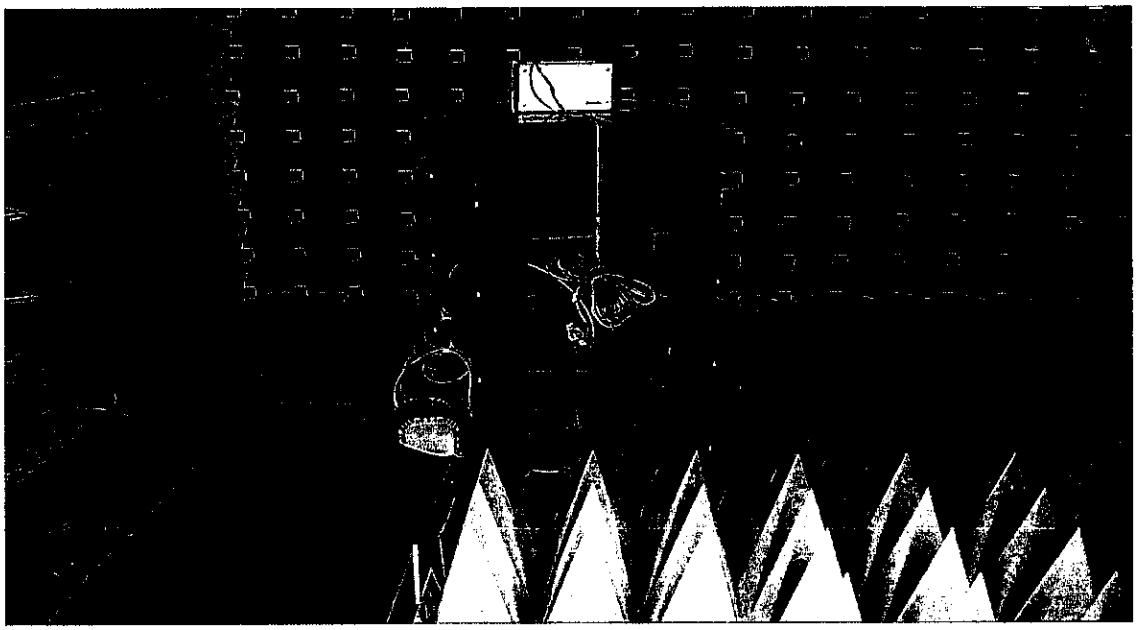
In the Bluetooth anechoic chamber the EUT was placed on a non-metallic table, 1,4 m above the floor. The radiated disturbance electric field intensity was measured at a distance of 3 m. The specified test mode was enabled.

An overview sweep with peak detection of the electric field intensity was performed with the spectrum analyser in max-hold and with the antenna height adjusted at the level of the EUT center. 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 measurements with peak and average detectors were carried out.

The EUT was supplied by 120 V AC (50 Hz) during the test.

Test set-up photo:



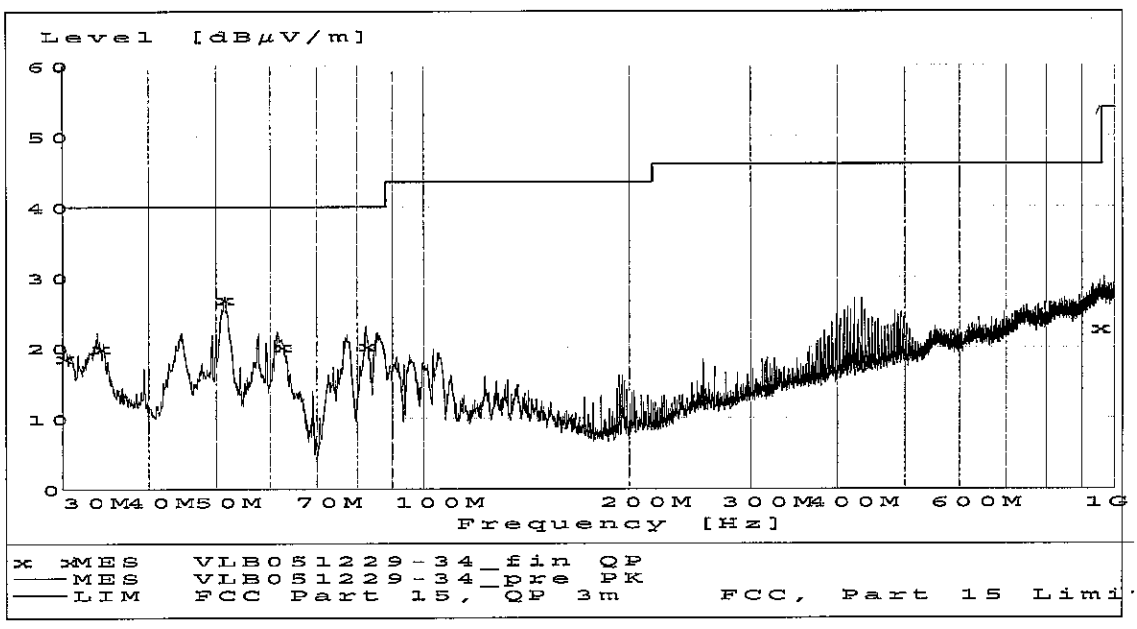
7.4 Test protocol

On all graphs radiated emission limits are shown according to FCC §15.209.

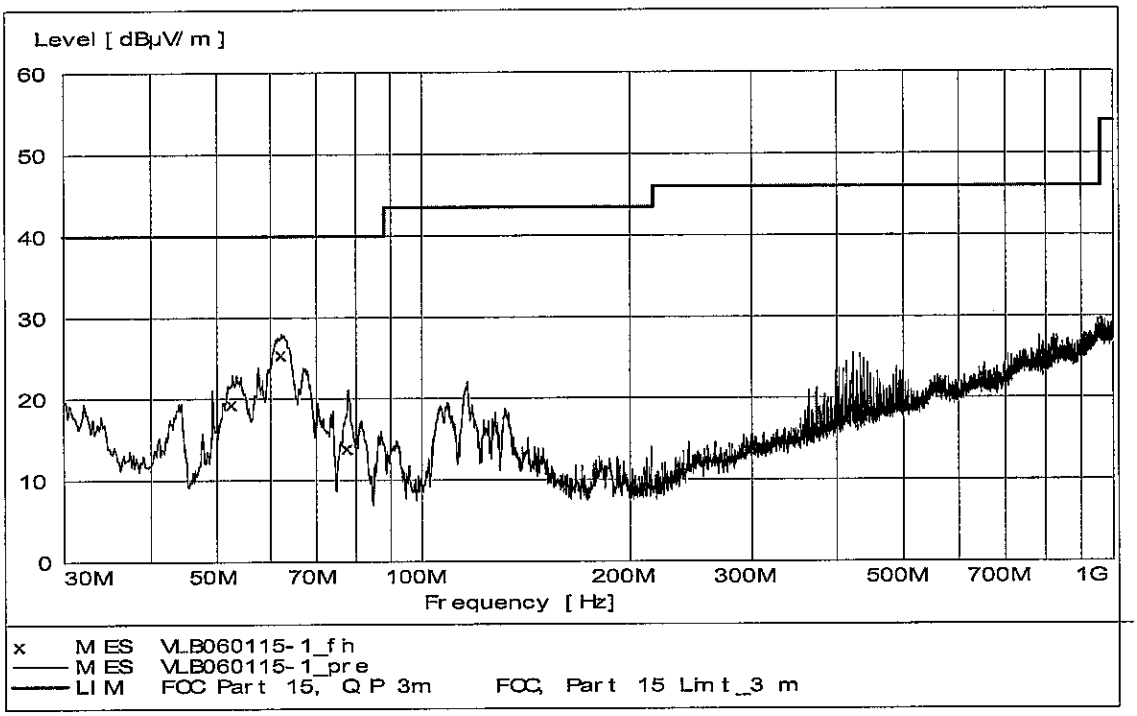
Semi-anechoic shielded chamber

Date of test: December 29, 2005 and January 15, 2006

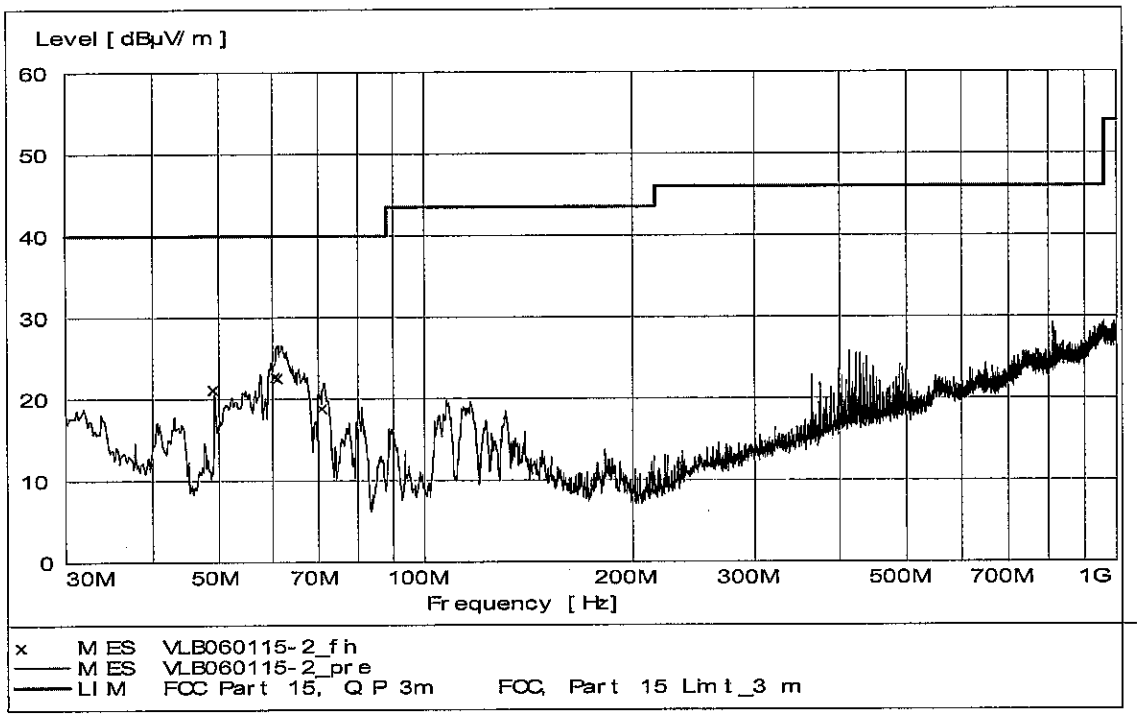
30 – 1000 MHz, max peak at a distance of 3 m on TX channel 1



30 – 1000 MHz, max peak at a distance of 3 m on TX channel 50



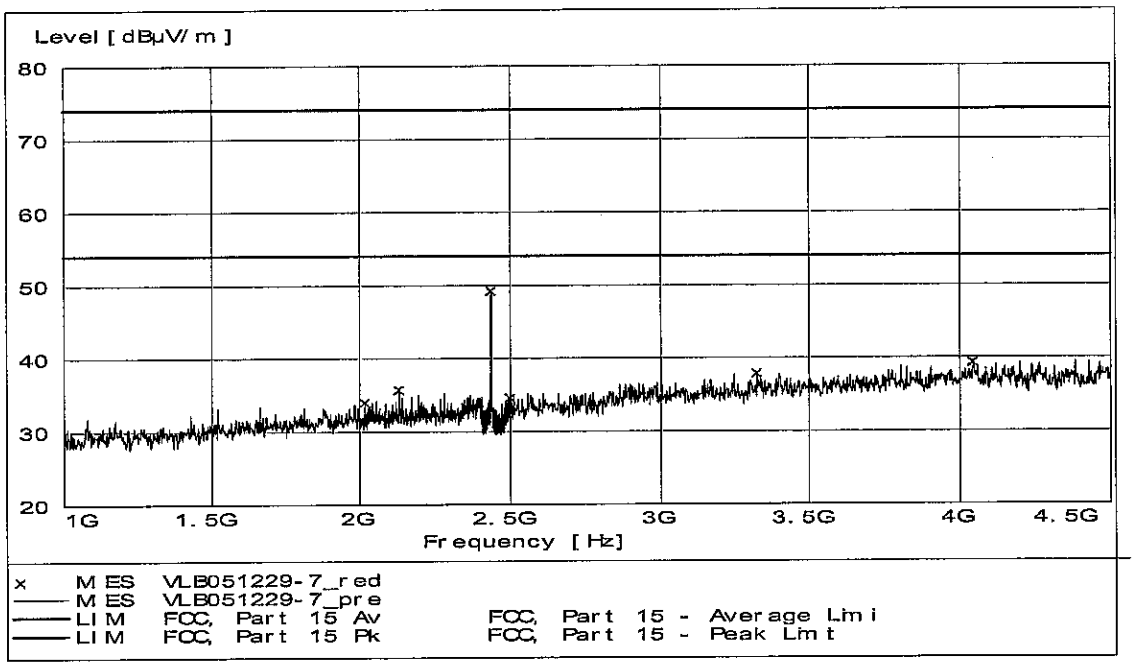
30 – 1000 MHz, max peak at a distance of 3 m on TX channel 99



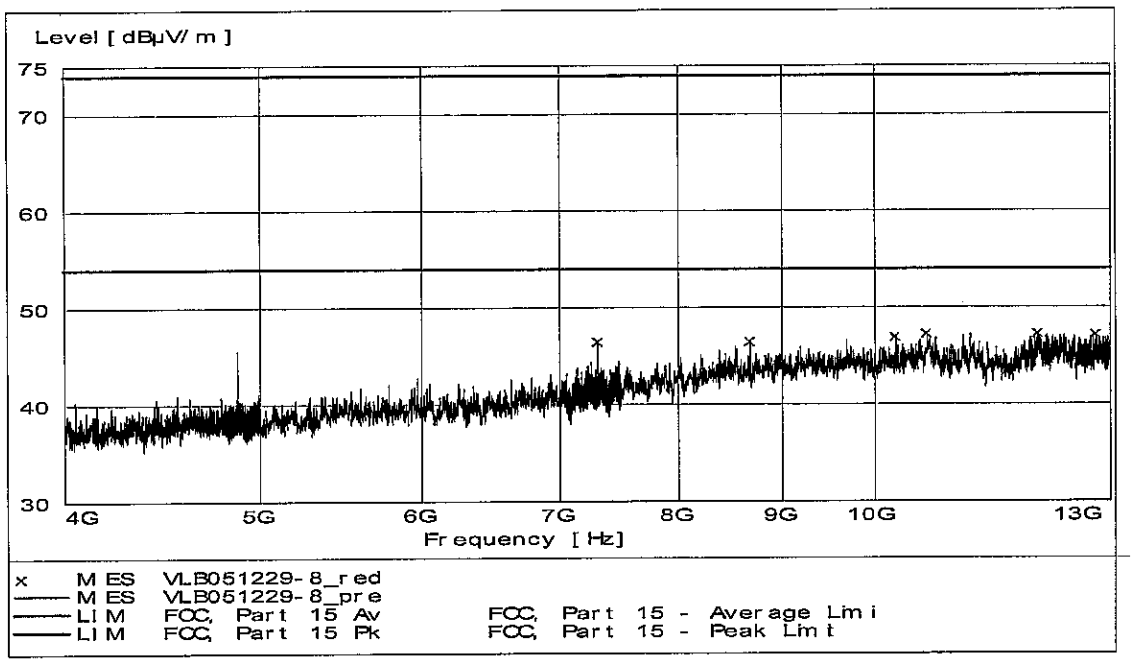
Bluetooth anechoic shielded chamber

Date of test: December 29 – 30, 2005

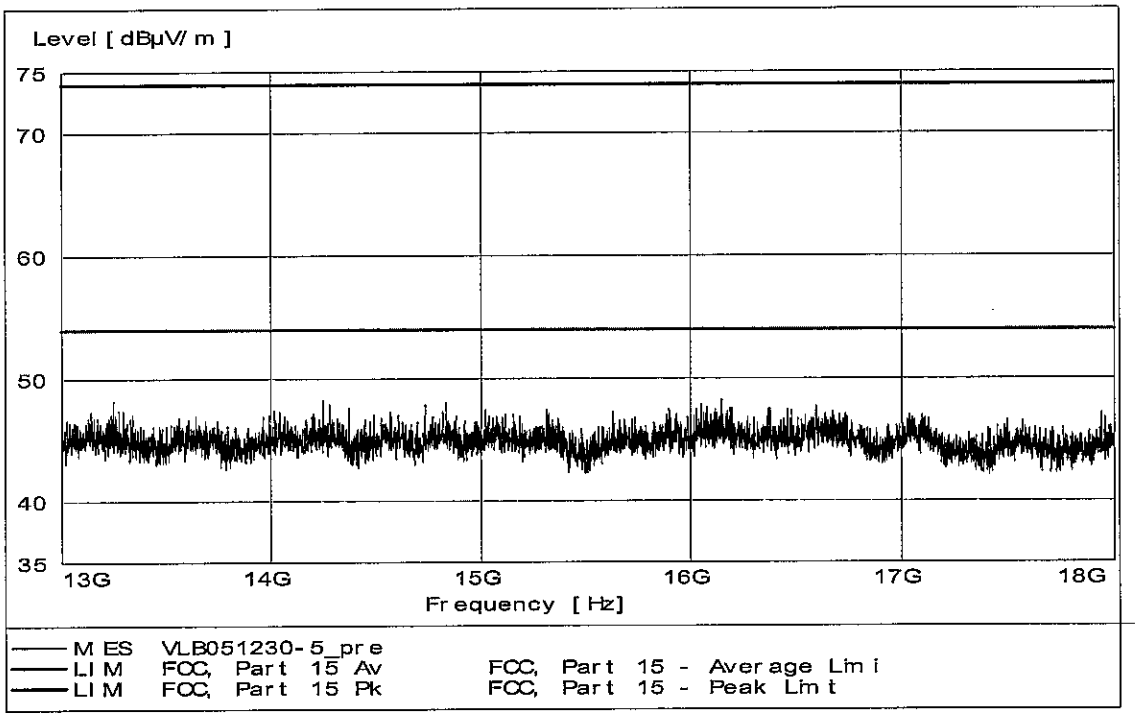
1000 – 4500 MHz, max peak at a distance of 3 m on TX channel 1.
Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0.



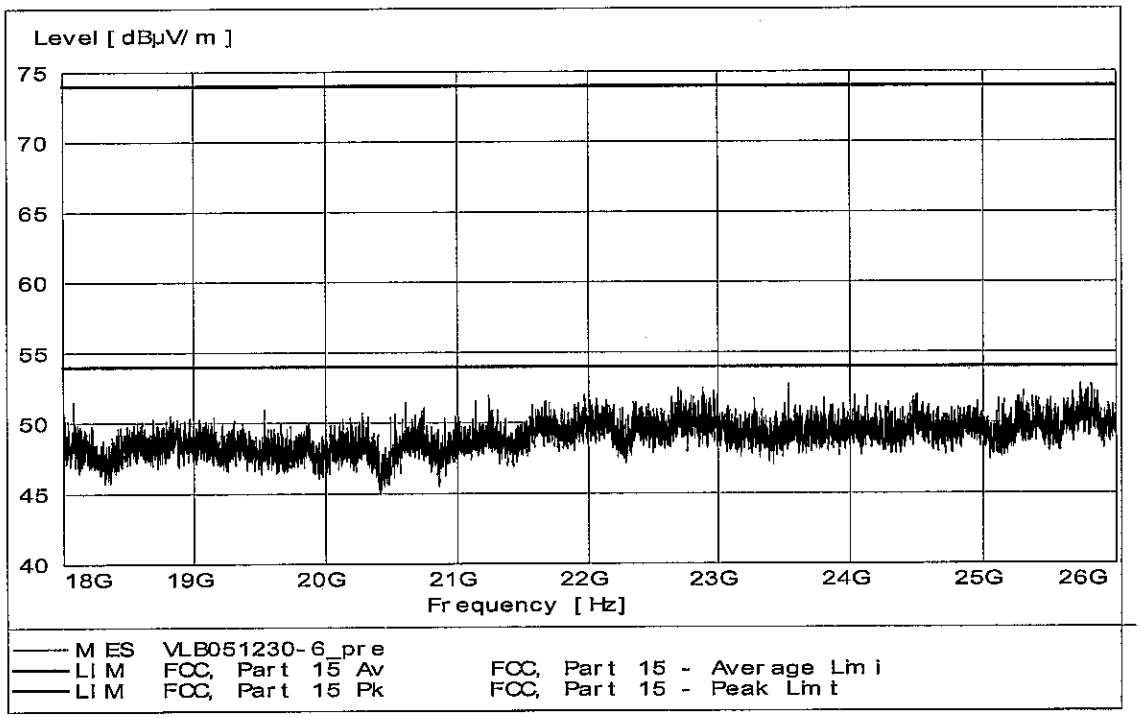
4000 – 13000 MHz, max peak at a distance of 3 m on TX channel 1.
Emissions below 4000 MHz are attenuated by high-pass filter K&L 4410-X4500/18000-0.



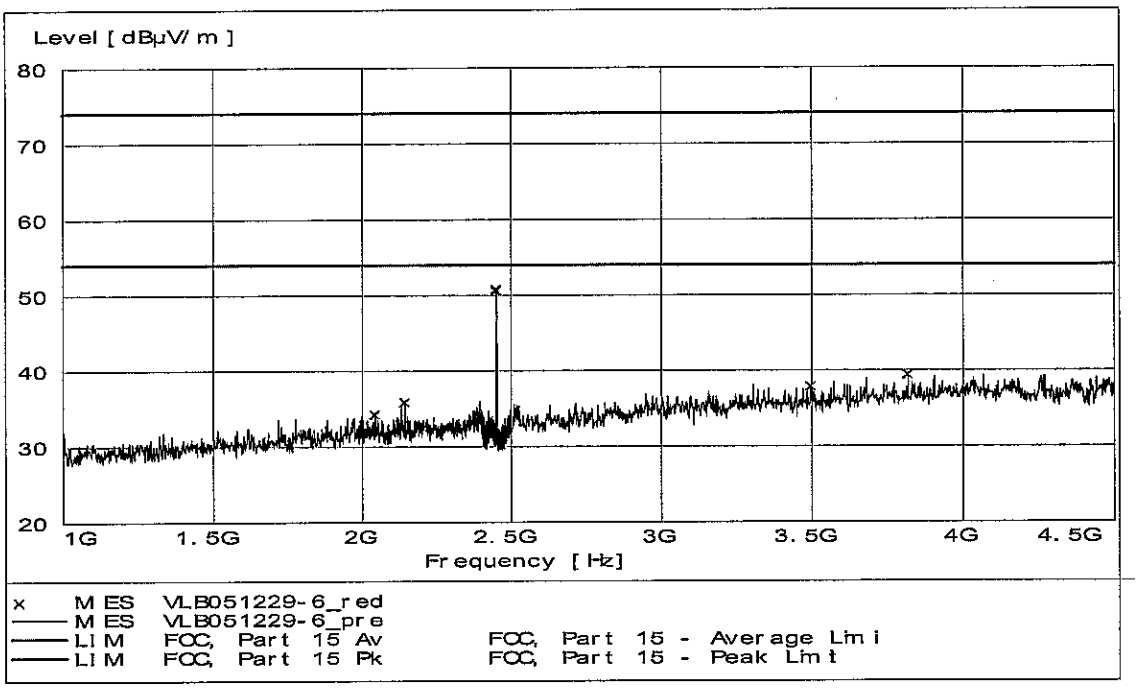
13 – 18 GHz, max peak at a distance of 3 m on TX channel 1



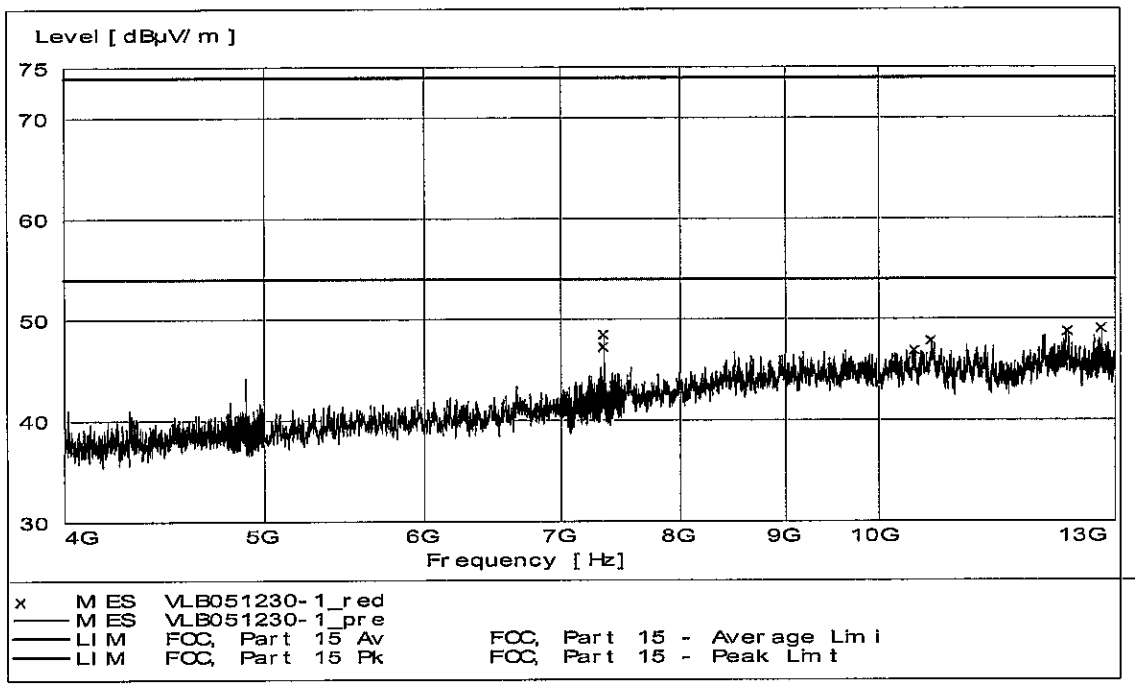
18 – 26 GHz, max peak at a distance of 3 m on TX channel 1



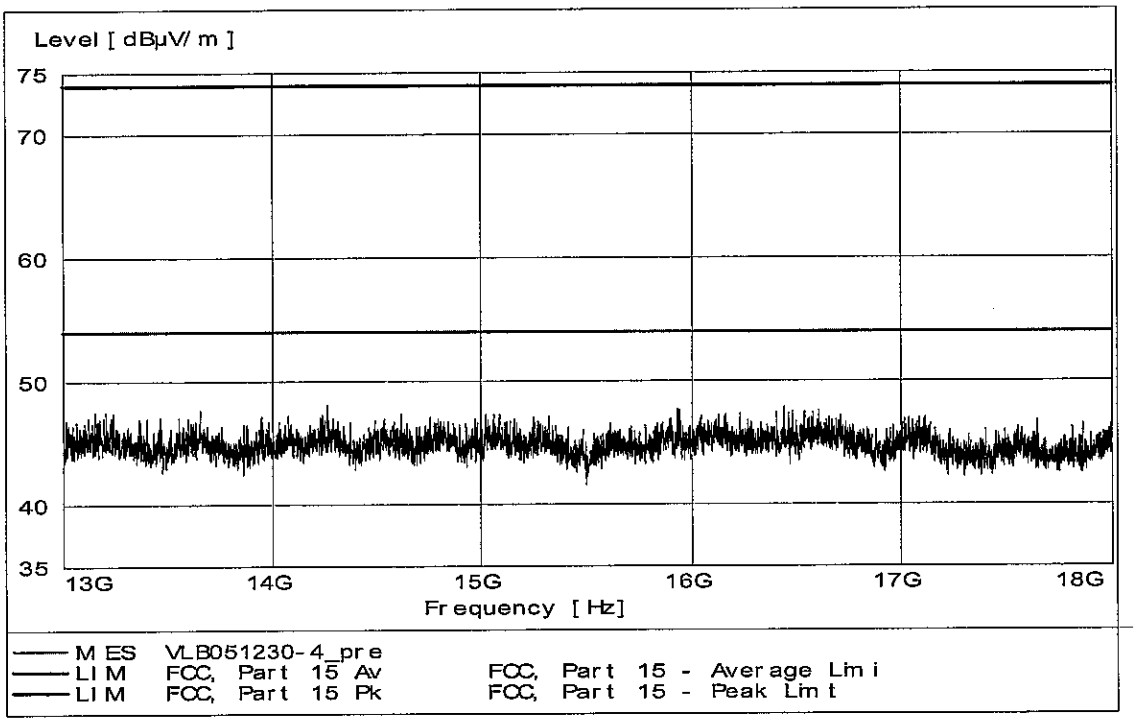
1000 – 4500 MHz, max peak at a distance of 3 m on TX channel 50.
Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0.



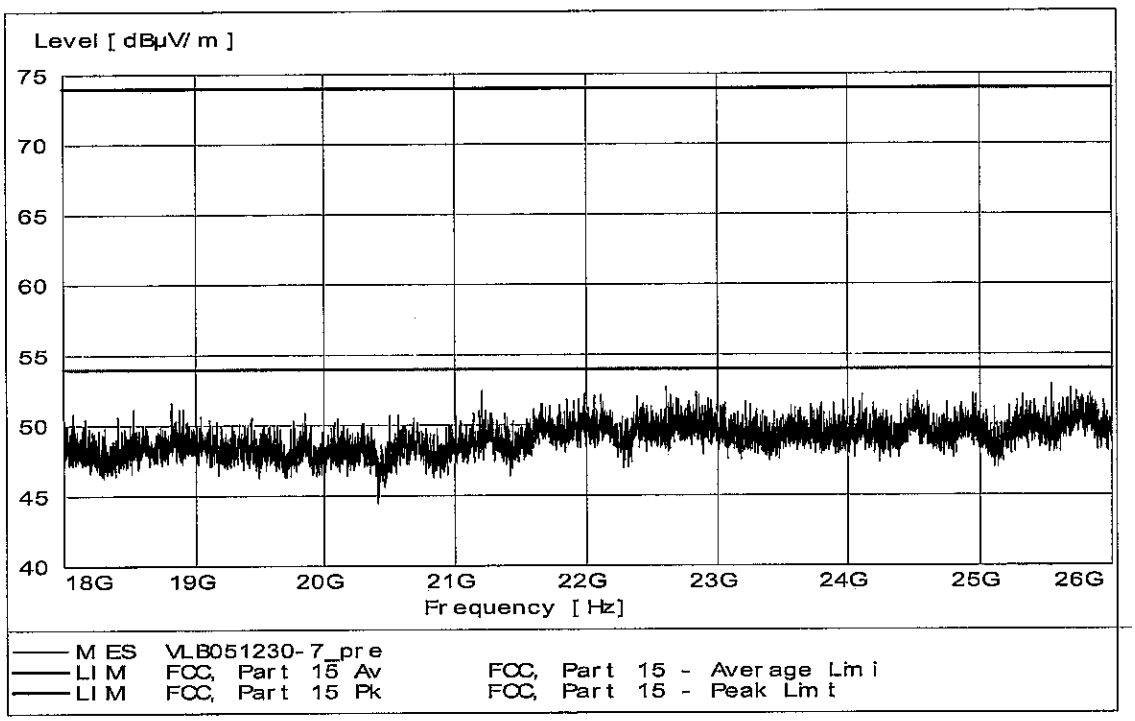
4000 – 13000 MHz, max peak at a distance of 3 m on TX channel 50.
Emissions below 4000 MHz are attenuated by high-pass filter K&L 4410-X4500/18000-0.



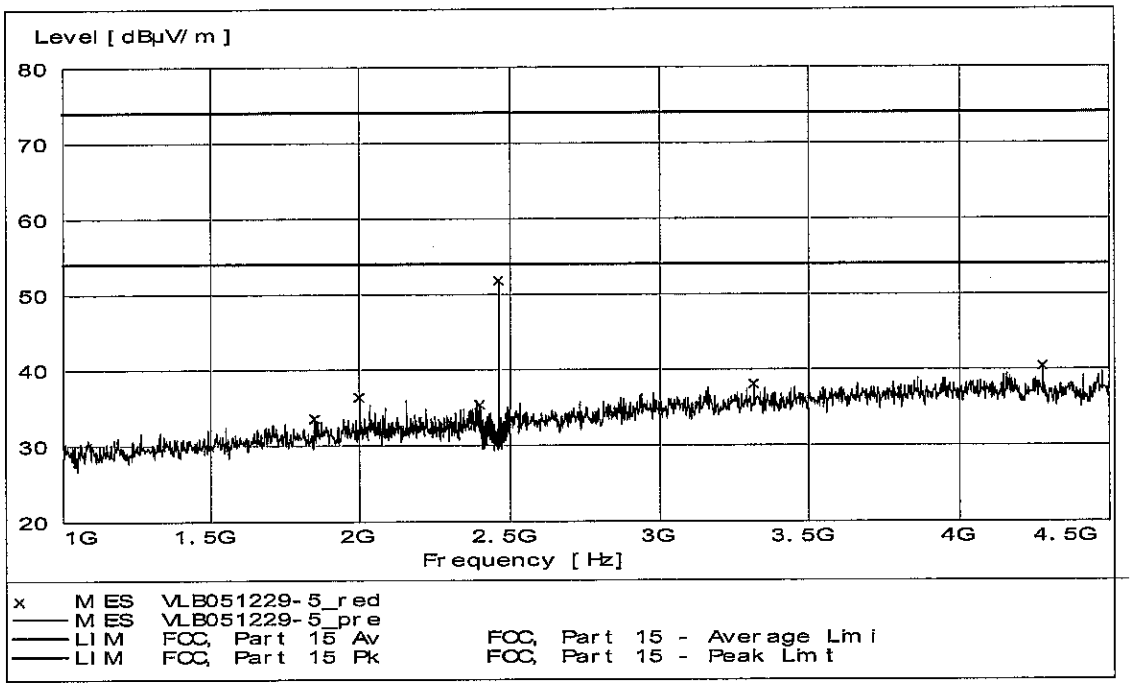
13 – 18 GHz, max peak at a distance of 3 m on TX channel 50



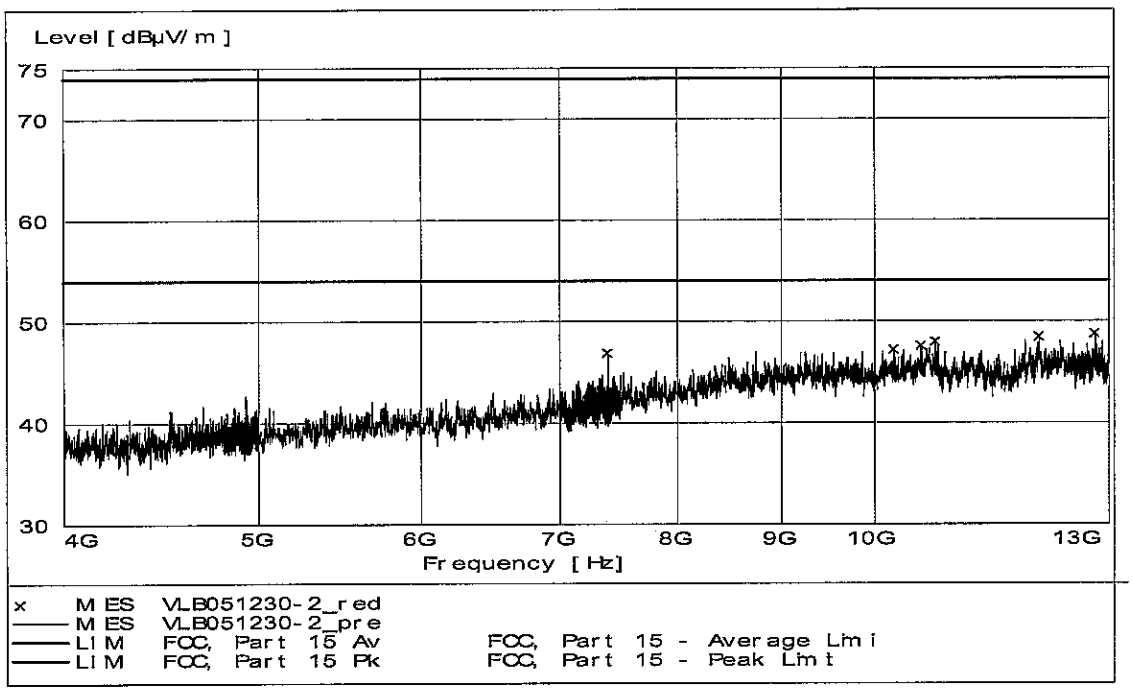
18 – 26 GHz, max peak at a distance of 3 m on TX channel 50



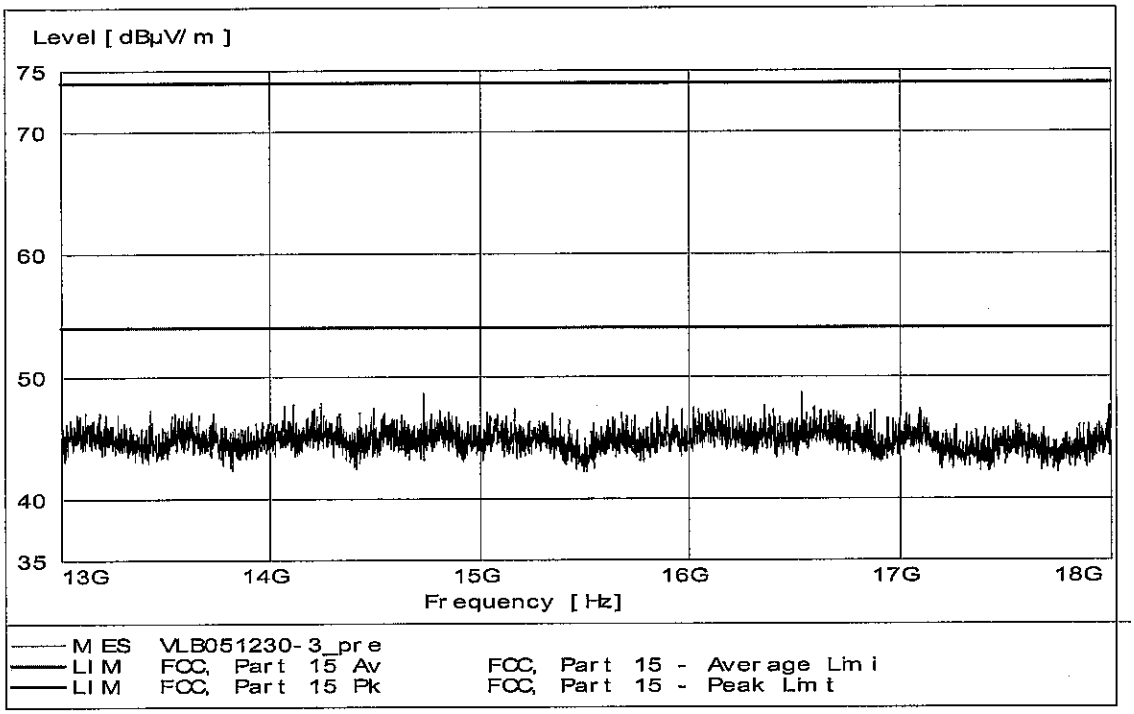
1000 – 4500 MHz, max peak at a distance of 3 m on TX channel 99.
Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0.



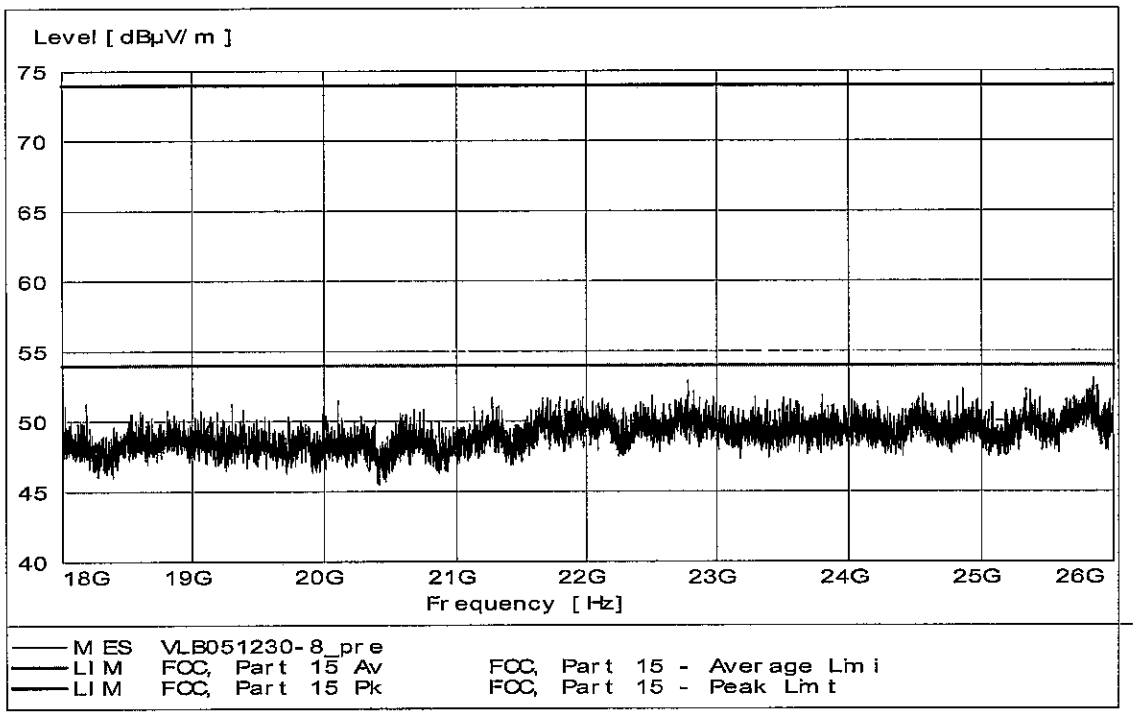
4000 – 13000 MHz, max peak at a distance of 3 m on TX channel 99.
Emissions below 4000 MHz are attenuated by high-pass filter K&L 4410-X4500/18000-0.



13 – 18 GHz, max peak at a distance of 3 m on TX channel 99



18 – 26 GHz, max peak at a distance of 3 m on TX channel 99



Data summary

Field strength of spurious emissions						
Frequency	RBW	Measured level		Limit		Note
		Peak	QP/AV	Peak	QP/AV	
[MHz]	[kHz]	[dB(µV/m)]	[dB(µV/m)]	[dB(µV/m)]	[dB(µV/m)]	
51,0	120	-	27	-	59	1)
62,3	120	-	26	-	59	1)
88 – 216	120	< 22	-	-	43,5	
216 – 960	120	< 30	-	-	46	
960 – 1000	120	< 30	-	-	54	
4872,4	1000	51	48	74	54	
4900,0	1000	50	45	74	54	
4928,0	1000	48	42	74	54	
7308,6	1000	44	39	74	54	
7350,0	1000	51	47	74	54	
7392,2	1000	50	44	74	54	
13000 – 18000	1000	< 48	-	74	54	Noise floor
18000 – 26000	1000	< 52	-	74	54	Noise floor

Note:

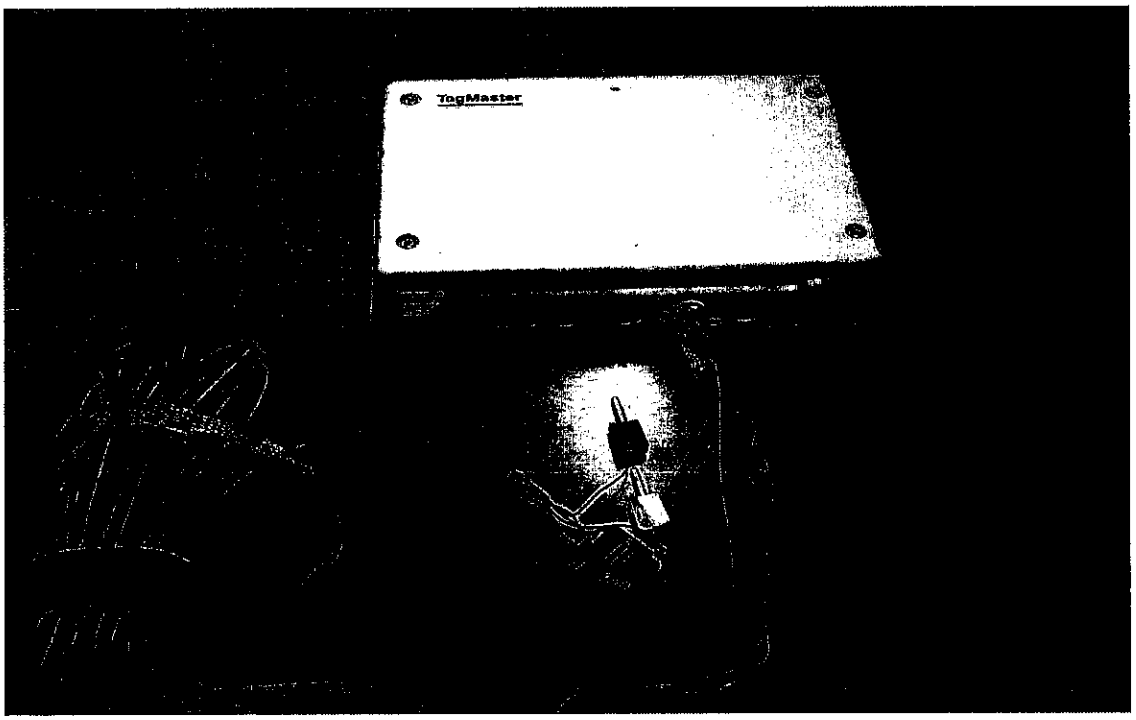
1) Peak field strength of fundamental has been measured at least up to 109 dB(µV/m). See Section 5.2 of this report.

Example calculation:

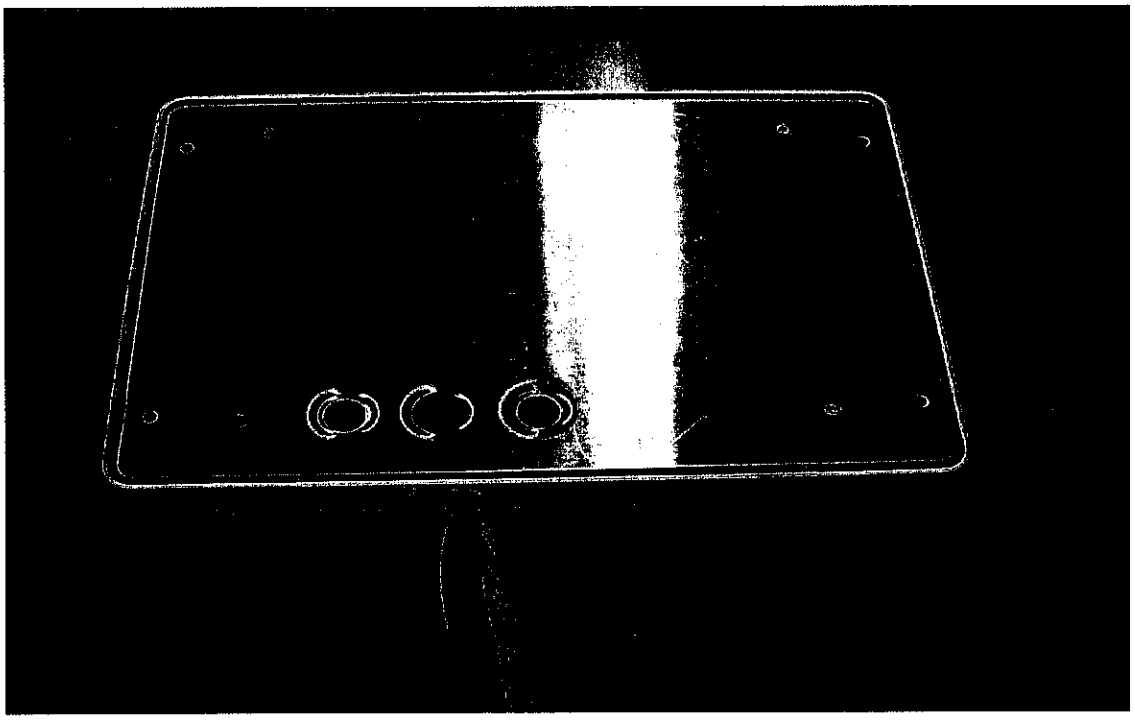
Measured level [dBµV/m] = Analyser reading [dBµV] + cable loss [dB] – preamplifier gain [dB] + antenna factor [1/m]

APPENDIX I – PHOTOS OF THE EUT

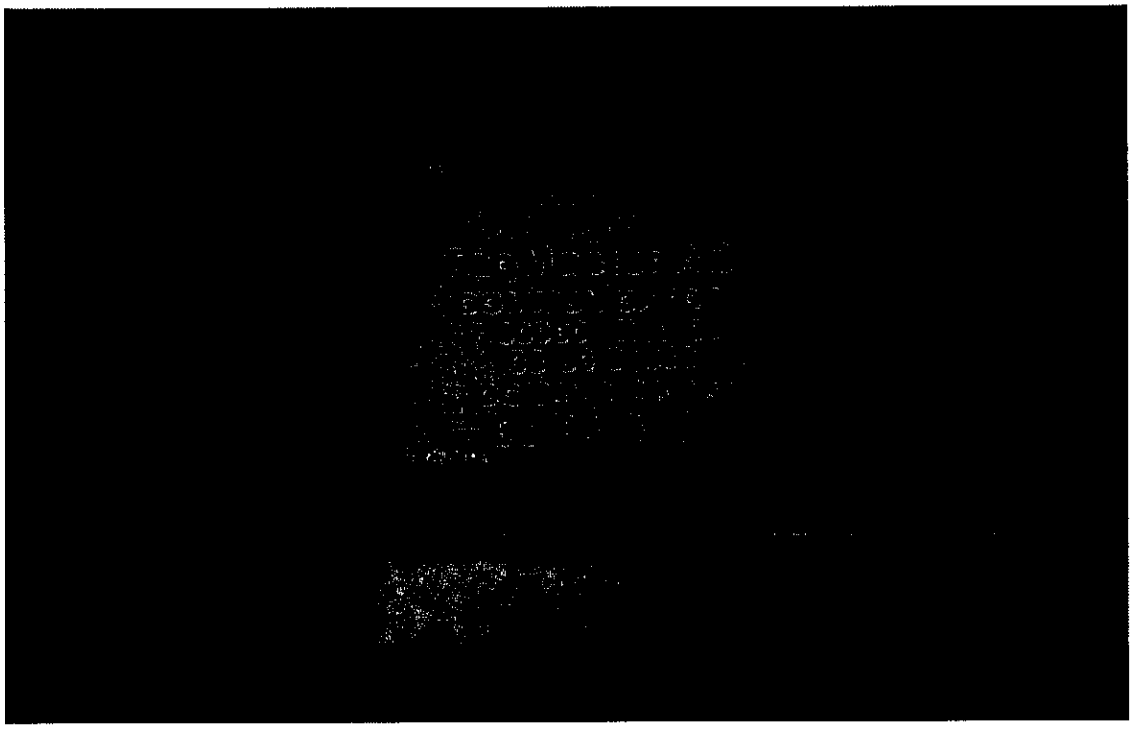
Front side



Rear side



Identification photo



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