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NUMBER: 905266

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NUMBER IC 4621

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TEST REPORT

Report No.: 22855RET.101

TEST NAME: FCC PART 15.247 TESTING FOR BLUETOOTH RADIO DEVICE

Product	:	Bluetooth transceiver
Trade Mark	:	Logitech
Model/type Ref.	:	C-RF49
Manufacturer	:	LOGITECH TECHNOLOGY Co, Ltd.
Requested by	:	LOGITECH INC.
Other identification of the product	:	P/N: 865427-0000 FCC ID: DZL202186 IC: 1807B-202186
Standard(s)	:	USA FCC Part 15.247, 15.205, 15.209, 15.109, 15.207

This test report includes 3 annexes and therefore the total number of pages is 40.

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ANNEX A. TEST RESULTS

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1. COMPETENCE AND GUARANTEES

Centro de Tecnología de las Comunicaciones (CETECOM), S.A. is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjuction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 905266.

Centro de Tecnología de las Comunicaciones (CETECOM), S.A. is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: IC 4621.

In order to assure the traceability to other national and international laboratories, CETECOM has a calibration and maintenance programme for its measuring equipment.

CETECOM guarantees the reliability of the data presented in this report, which is the result of measurements and tests performed to the item under test on the date and under the conditions stated on the report and is based on the knowledge and technical facilities available at CETECOM at the time of execution of the test.

CETECOM is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the item under test and the results of the test.

2. GENERAL CONDITIONS

1. This report only refers to the item that has undergone the test.
2. This report does not constitute or imply by its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without written approval of CETECOM.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of CETECOM and the Accreditation Bodies.

3. CHARACTERISTICS OF THE TEST

3.1 TEST REQUESTED

1. Radiated measurements (Transmitter power, Emission limitations for transmitter and radiated emissions limits for receiver) for frequency hopping spread spectrum equipment (Bluetooth) operating in the 2400 MHz -2483.5 MHz band, according to FCC Part 15.247.

   The equipment incorporates the same RF Bluetooth module as the Bluetooth transceiver Logitech model C-UAF48 (RECEIVER) which results are shown in report number 22855RET.102 dated 2006-06-21.

2. Continuous conducted emission, power leads:

   Standard: FCC Rules and Regulations 47 CFR Part 15

   Limit: Class B

   Method: FCC Rules and Regulations 47 CFR Part 15, Subpart B y C

3.2 REQUIREMENTS AND METHOD

1. FCC parts 15.33, 15.35, 15.247, 15.109, 15.205, 15.209, 15.207 and the document DA 00-705:"Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems".

   The testing was performed according to the procedure in ANSI C63.4: 2003. Radiated testing was performed in Cetecom's semi-anechoic chamber. This site has been fully described in a report submitted to the FCC and was accepted in a letter dated July 25, 2002.

2. FCC Rules and Regulations 47 CFR Part 15, Subpart C: Limits and methods of measurements for radio frequency devices. Intentional radiators.

The instrumentation used to perform the testing is listed below:

1. Semianechoic Absorber Lined Chamber IR 11. BS.
2. Control Chamber IR 12.BC.
3. Antenna mast EM 1072 NMT.
4. Rotating table EM 1084-4. ON.
5. Multi device controller ETS 2090.
6. Bluetooth test set Anritsu MT8852A.
7. Bilog antenna CHASE CBL6111.
8. Antenna tripod EMCO 11968C.
9. Double-ridge Guide Horn antenna 1-18 GHz HP 11966E.
10. Double-ridge Guide Horn antenna 18-40 GHz Agilent 119665J.
11. RF pre-amplifier Miteq JS4-12002600-30-5A.
12. Semianechoic Absorber Lined Chamber IR 11. BS.
13. RF pre-amplifier Miteq AFS5-04001300-15-10P-6.
14. Spectrum analyzer R&S ESIB 26.
15. Spectrum analyzer Agilent E4440A.
16. RF pre-amplifier Schaffner CPA 9231.
17. DC power supply R&S NGPE 40/40.
18. Transient limiter. HP 11947A.
19. Line Impedance Stabilization Network (L.I.S.N.) R&S. ESH2-Z5.

4. IDENTIFICATION DATA SUPPLIED BY THE APPLICANT

Identification data in this section has been supplied by the client.

4.1 APPLICANT

Name or Company: Logitech INC.

V.A.T.: -----

Address: 6505 kaiser Drive **City:** Fremont (California)

Postal code: CA94555 **Country:** USA

Telephone: +1 510 7958500 **Fax:** +1 510 7928901

4.2 REPRESENTATIVE

Name: Bharat Shah

4.3 TEST SAMPLES SUPPLIER

Name or Company: Logitech Europe, S.A.

V.A.T.: -----

Address: ZI Moulin du Choc **City:** Romanel Sur Morges

Postal code: 1122 **Country:** Switzerland

Telephone: +41 (0)21 863 50 67 **Fax:** +41 (0)21 863 53 11

Samples undergoing test have been selected by: **the client.**

4.4 IDENTIFICATION OF ITEM/ITEMS TESTED

Product: Bluetooth transceiver

Trade mark: Logitech **Model:** C-RF49

Manufacturer: LOGITECH TECHNOLOGY Co, Ltd.

Country of manufacture: CHINA

Description: Class I Bluetooth transceiver which receives the streamed audio from the Logitech transceiver C-UAF48, converts this digital audio to analog, and outputs to the user's stereo or powered multimedia speakers through a connection with RCA or Jack plugs. This device also incorporates a recharger dock for the Logitech Media Remote R-RF11.

5. USAGE OF SAMPLES, PERIOD OF TESTING AND ENVIRONMENTAL CONDITIONS

5.1 USAGE OF SAMPLES

Sample M/01 is formed by the following elements:

Control No.	Description	Model	Serial No.	Date of reception
22855/03	Bluetooth transceiver	C-RF49	----	04/05/2006
22855/06	AC adaptor	PSC11R-050	----	04/05/2006

Sample M/02 is formed by the following elements:

Control No.	Description	Model	Serial No.	Date of reception
22855/04	Bluetooth transceiver with antenna connector	C-RF49	----	04/05/2006
22855/06	AC adaptor	PSC11R-050	----	04/05/2006
22855/07	Test board	----	----	04/05/2006

Sample S/01 is composed of the following elements:

Control No.	Description	Model	Serial No.	Date of reception
22855/23	Bluetooth EMC transceiver	C-RF49	---	29/05/06

During the tests were used next ancillary equipment:

Internal Control Nr.	Description	Model	Serial No.	Date of arrival
22855/22	Remote control EMC Bluetooth	C-RF11	---	29/05/06
22855/33	Headphones	865138-0000	ALC00101842	29/05/06
22855/35	RCA-RCA cable, property of CETECOM	---	---	---

1. Sample M/01 has undergone following test(s).

   Radiated spurious emissions tests indicated in annex A.

2. Sample M/02 has undergone following test(s).

   All tests indicated in annex A except radiated spurious emissions.

3. Sample S/**01** has undergone to the following test(s):

   Continuous conducted emission, power leads in annex B.

5.2 PERIOD OF TESTING

The performed test started on 2006-05-11 and finished on 2006-06-02.

The tests as detailed in this report have been performed at CETECOM.

5.3 ENVIROMENTAL CONDITIONS

In the control chamber the following limits were not exceeded during the test:

Temperature	Min. = 24 ºC Max. = 25 ºC
Relative humidity	Min. = 56 % Max. = 56 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω

In the semianechoic chamber (21 meters x 11 meters x 8 meters) the following limits were no exceeded during the test.

Temperature	Min. = 26 ºC Max. = 26 ºC
Relative humidity	Min. = 56 % Max. = 56 %
Air pressure	Min. = 1016 mbar Max. = 1016 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Field homogenousity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).

In the chamber for conducted measurements the following limits were not exceeded during the test:

Temperature	Min. = 15 ºC Max. = 30 ºC
Relative humidity	Min. = 45 % Max. = 60 %
Air pressure	Min. = 860 mbar Max. = 1020 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω

6. TEST RESULTS

Abbreviations used in the VERDICT column of the following tables are:

P Pass

F Fail

NA not applicable

NM not measured

FCC PART 15 PARAGRAPH	VERDICT			
	NA	P	F	NM
15.247 Subclause (a) (1). 20 dB Bandwidth and Carrier frequency separation				NM[1]
15.247 Subclause (a) (1) (iii). Number of hopping channels				NM[1]
15.247 Subclause (a) (1) (iii). Time of occupancy (Dwell Time)				NM[1]
15.247 Subclause (b). Maximum peak output power and antenna gain				NM[1]
15.247 Subclause (c). Band-edge of conducted emissions (Transmitter)				NM[1]
15.247 Subclause (c). Emission limitations conducted (Transmitter)				NM[1]
15.247 Subclause (c). Emission limitations radiated (Transmitter)		P		
15.109. Receiver spurious radiation		P		
15.207. Conducted limits		P		

7. REMARKS AND COMMENTS

1: Test not requested (see point 3.1 “Test requested”).

8. SUMMARY

Based on the results of the performed test, stated in annex A the item under test is **IN COMPLIANCE** with the specifications listed in section 3.1 “TEST REQUESTED”.

NOTE: The results presented in this Test Report apply only to the particular item under test declared in section 4.4 “IDENTIFICATION OF ITEM/ITEMS TESTED” of this document, as presented for test on the date(s) declared in section 5, “USAGE OF SAMPLES, PERIOD OF TESTING AND ENVIRONMENTAL CONDITIONS”.

ANNEX A

TEST RESULTS

Report No: 22855RET.101

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TEST CONDITIONS 3

Section 15.247 Subclause (b). Maximum peak output power (radiated) 4

Section 15.247 Subclause (c). Emission limitations radiated (Transmitter) 7

Section 15.109. Receiver spurious radiation 16

TEST CONDITIONS

Power supply (V):

$V_{nominal}$ = 230 Vac

Type of power supply = AC/DC Adaptor

Type of antenna = Integral antenna

The test set-up was made in accordance to the general provisions of ANSI C63.4: 2003.

RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-25 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-25 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive (wooden) platform one meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

An additional horn antenna is used to control the equipment under test with the Bluetooth signalling unit (Bluetooth test set).

Section 15.247 Subclause (b). Maximum peak output power (radiated)

SPECIFICATION

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels: 1 watt (30 dBm).

RESULTS

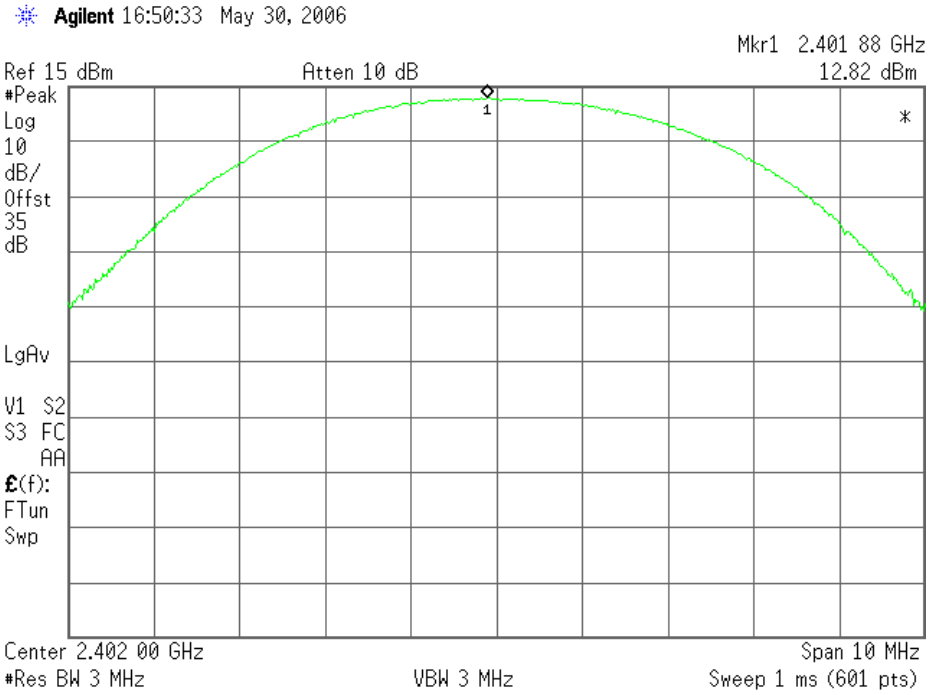
MAXIMUM PEAK OUTPUT POWER (RADIATED).

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Correction Factor (dB)	35.0	35.1	35.2
Maximum EIRP peak power (dBm)	12.82	12.47	10.43
Measurement uncertainty (dB)	± 4.0		

Verdict: PASS

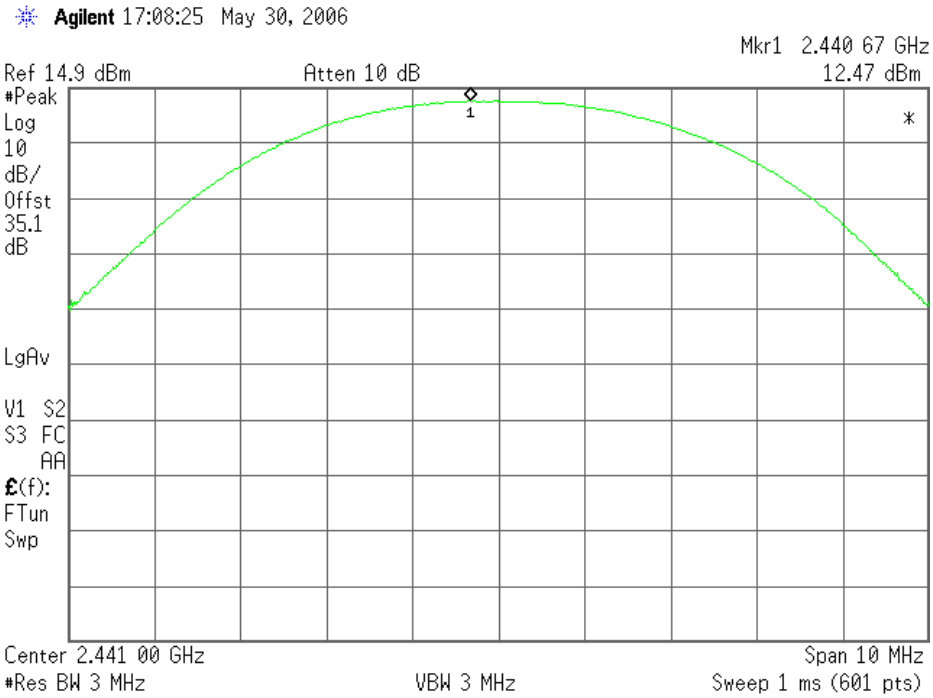
PEAK OUTPUT POWER (RADIATED).

Lowest Channel: 2402 MHz.



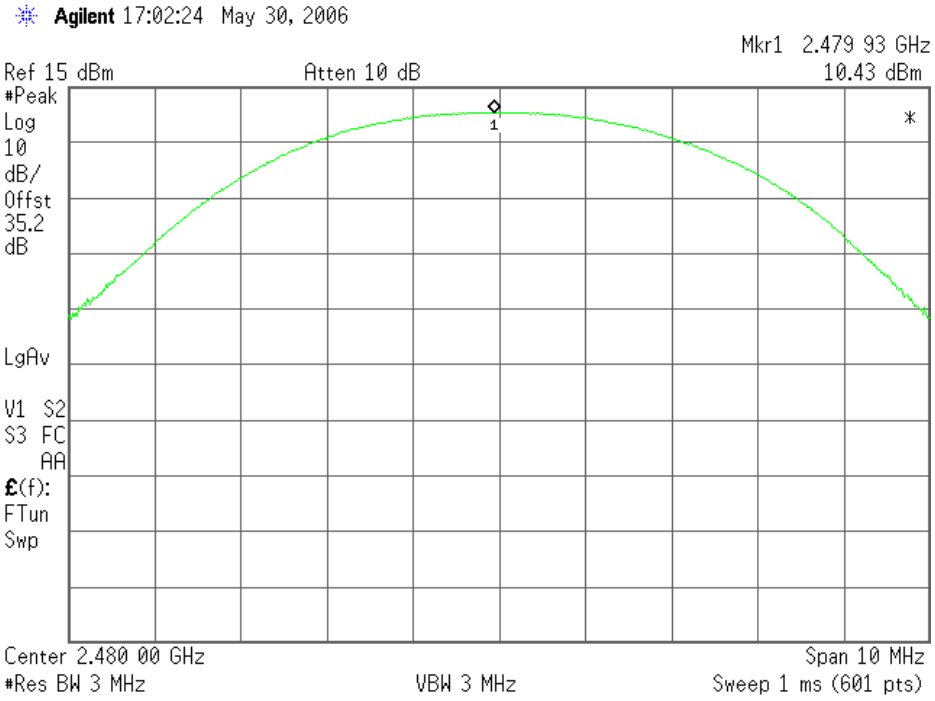
PEAK OUTPUT POWER (RADIATED).

Middle Channel: 2441 MHz.



PEAK OUTPUT POWER (RADIATED).

Highest Channel: 2480 MHz.



Section 15.247 Subclause (c). Emission limitations radiated (Transmitter)

SPECIFICATION

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)):

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

The field strength is calculated by adding correction factor to the measured level from the spectrum analyser. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

The equipment transmits continuously in the selected channel so it is not necessary a duty cycle correction factor.

Frequency range 30 MHz-1000 MHz.

The emissions detected in this range do not depend on the operating frequency of the E.U.T.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
45.5511	V	Quasi-peak	25.36	± 3.8
70.8216	V	Quasi-peak	20.74	± 3.8
119.4188	V	Quasi-peak	20.60	± 3.8

Frequency range 1 GHz-25 GHz.

1. TRANSMITTER OPERATING IN CHANNEL: LOWEST (2402 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
4804.28	V	Peak	51.69	± 4.0
4804.28	V	Average	49.59	± 4.0
7206.42	V	Peak	55.35	± 4.0
7206.42	V	Average	52.68	± 4.0

Additionally, no spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz.

2. TRANSMITTER OPERATING IN CHANNEL: MIDDLE (2441 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
4881.65	V	Peak	49.75	± 4.0
4881.65	V	Average	46.36	± 4.0
7323.37	V	Peak	54.65	± 4.0
7323.37	V	Average	49.69	± 4.0

Additionally, no spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz.

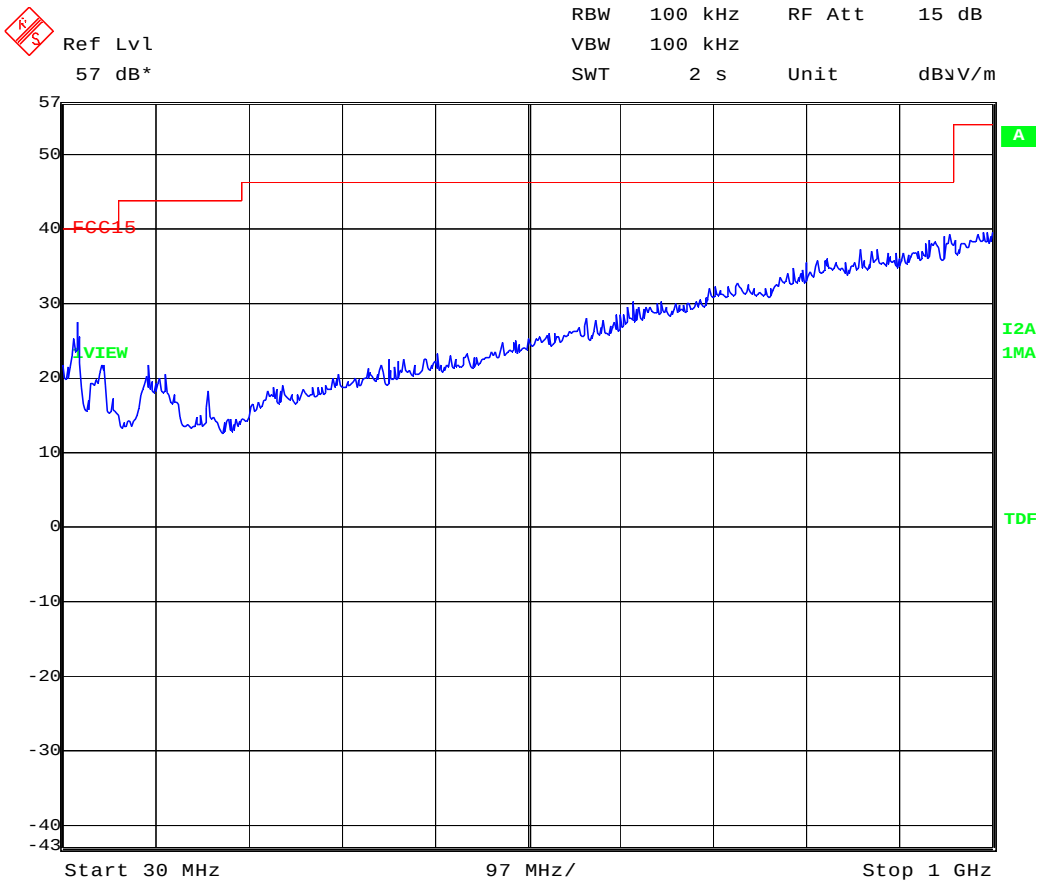
2. TRANSMITTER OPERATING IN CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
4960.27	V	Peak	43.27	± 4.0
4960.27	V	Average	36.26	± 4.0
7439.96	V	Peak	46.63	± 4.0
7439.96	V	Average	38.70	± 4.0

Additionally, no spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz.

Verdict: PASS.

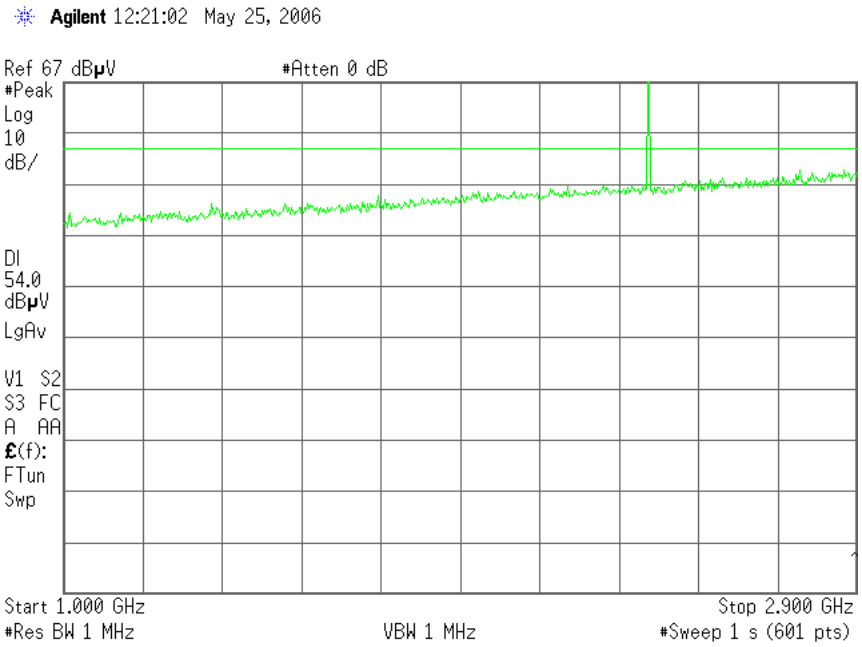
FREQUENCY RANGE 30 MHz-1000 MHz.



(This plot is valid for all three channels).

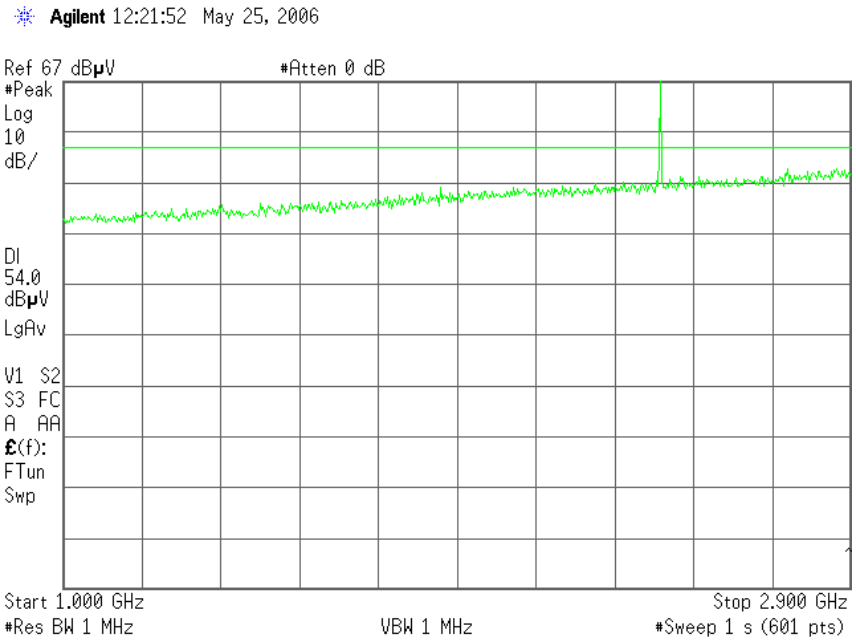
FREQUENCY RANGE 1 GHz to 2.9 GHz.

CHANNEL: Lowest (2402 MHz).



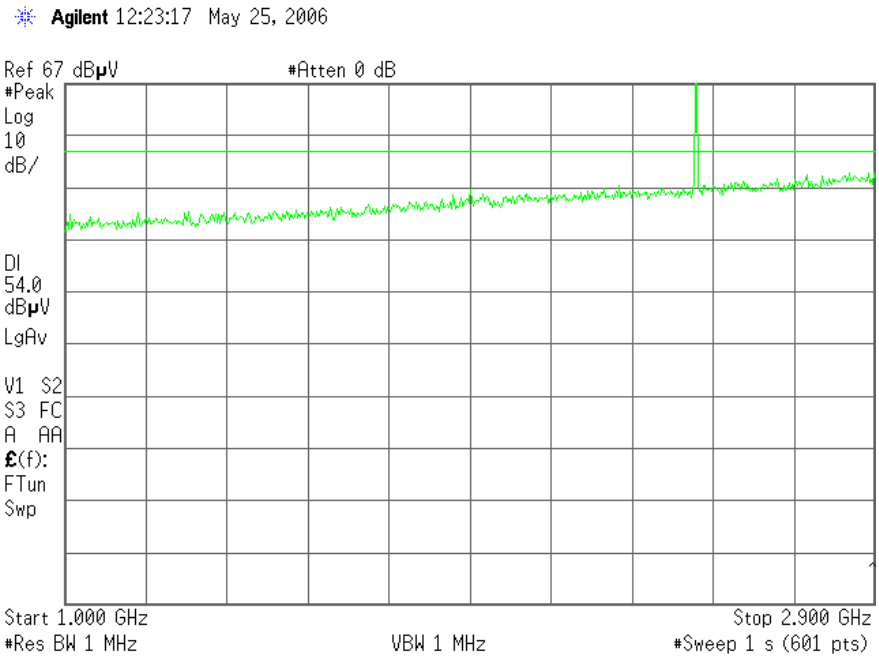
Note: The peak above the limit is the carrier frequency.

CHANNEL: Middle (2441 MHz).



Note: The peak above the limit is the carrier frequency.

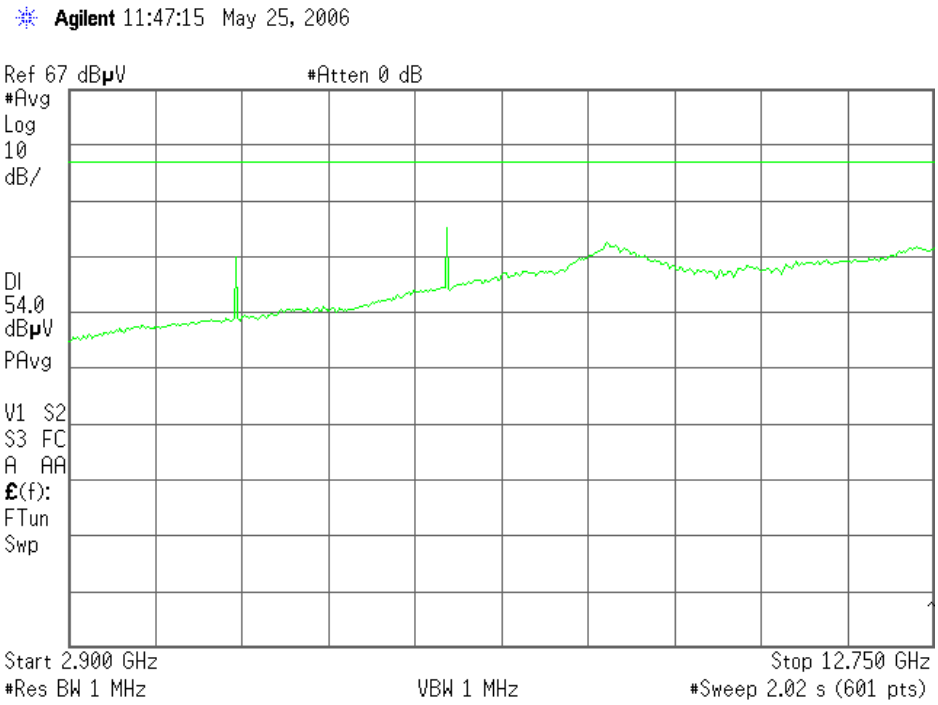
CHANNEL: Highest (2480 MHz).



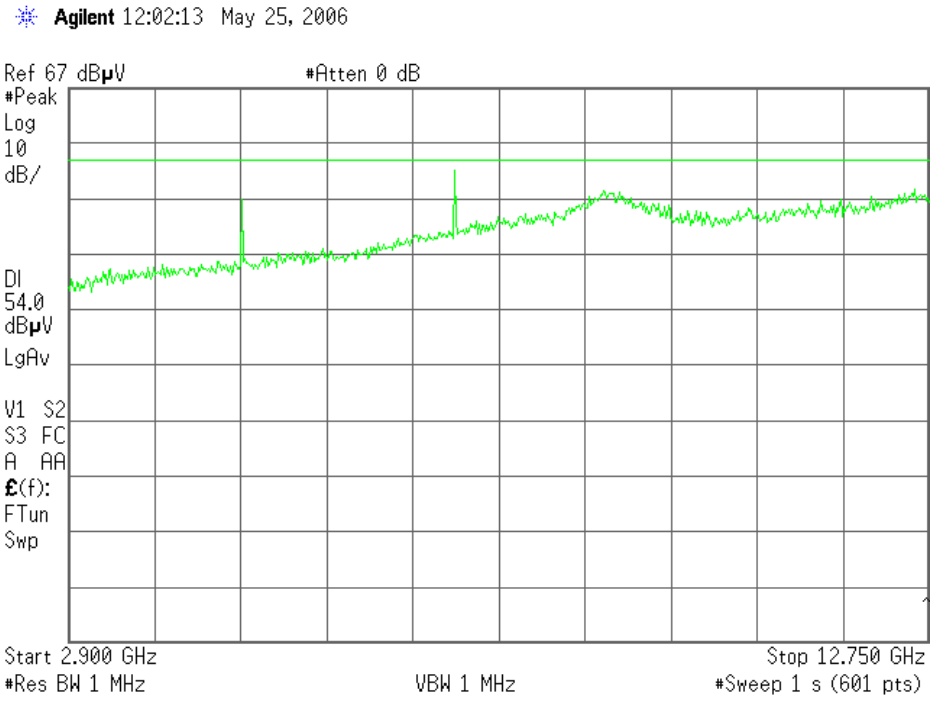
Note: The peak above the limit is the carrier frequency.

FREQUENCY RANGE 2.9 GHz to 12.75 GHz.

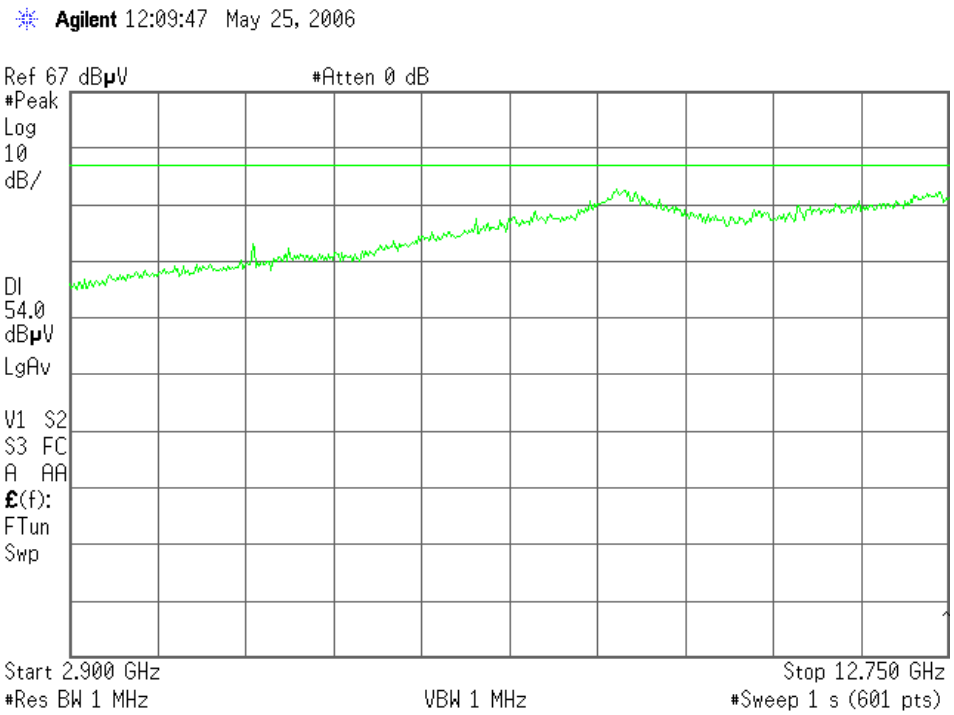
CHANNEL: Lowest (2402 MHz).



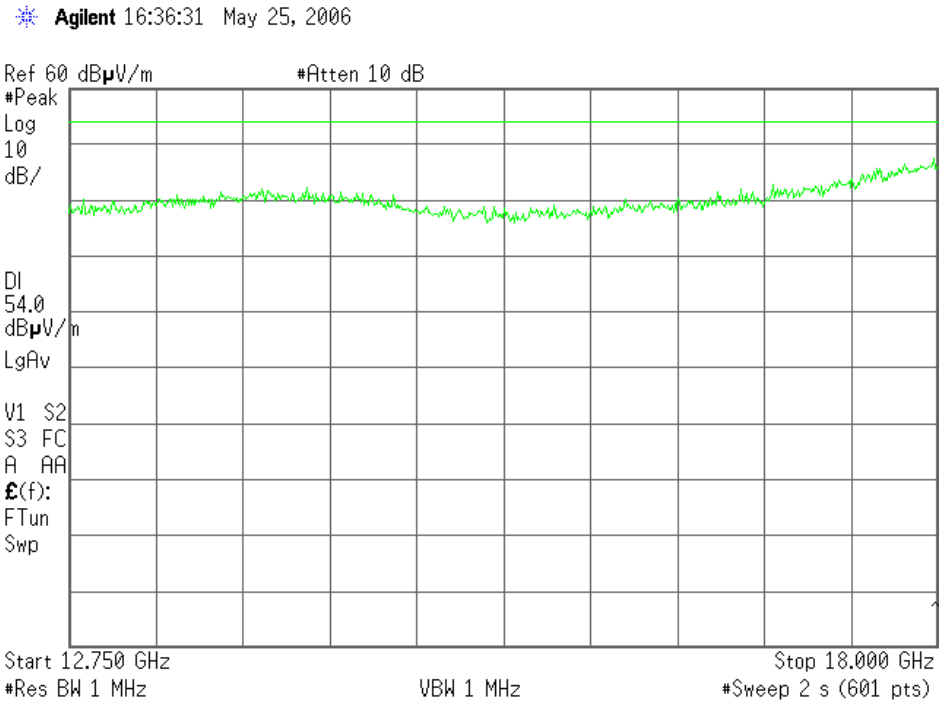
CHANNEL: Middle (2441 MHz).



CHANNEL: Highest (2480 MHz).

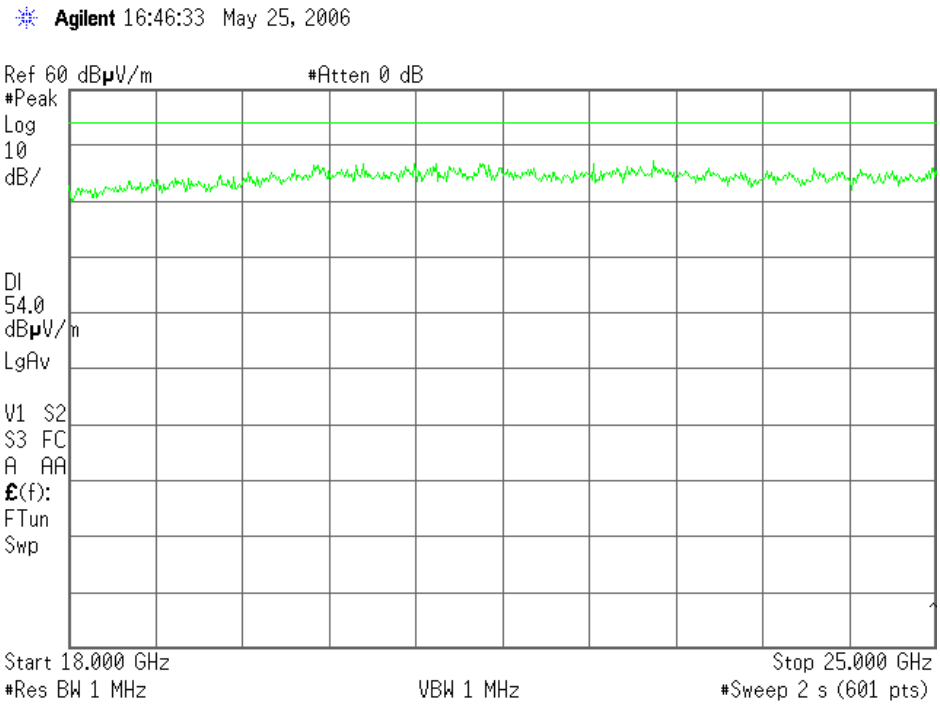


FREQUENCY RANGE 12.75 GHz to 18 GHz.



(This plot is valid for all three channels).

FREQUENCY RANGE 18 GHz to 25 GHz.



(This plot is valid for all three channels).

Section 15.109. Receiver spurious radiation

SPECIFICATION

The field strength shall not exceed the following values:

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

The field strength is calculated by adding correction factor to the measured level from the spectrum analyser. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

It is not possible to select individual receiving channels in the equipment under test. The equipment under test is set in inquiry scan mode with the receiver open and scanning through receiving channels.

Frequency range 30 MHz-1000 MHz.

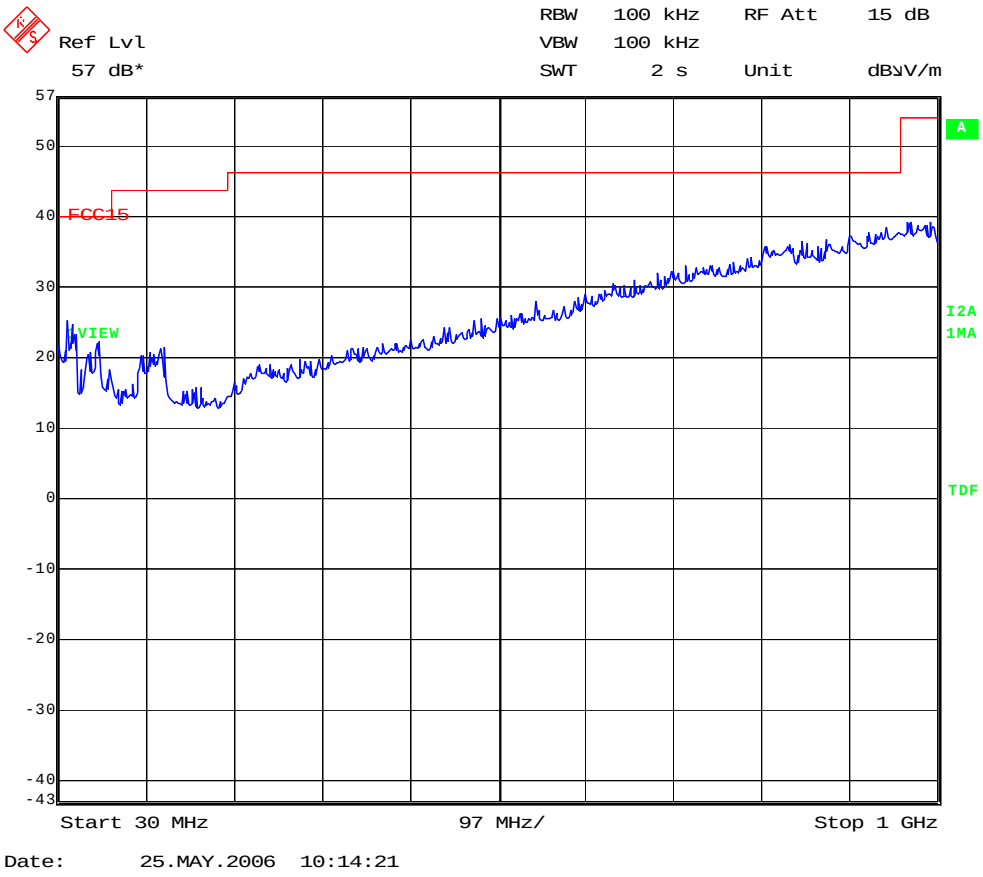
Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
39.7194	V	Quasi-peak	22.01	± 3.8
74.7094	V	Quasi-peak	20.07	± 3.8
146.6333	V	Quasi-peak	20.72	± 3.8

Frequency range 1 GHz-25 GHz.
No spurious signals were found in all the range

Additionally, no spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz.

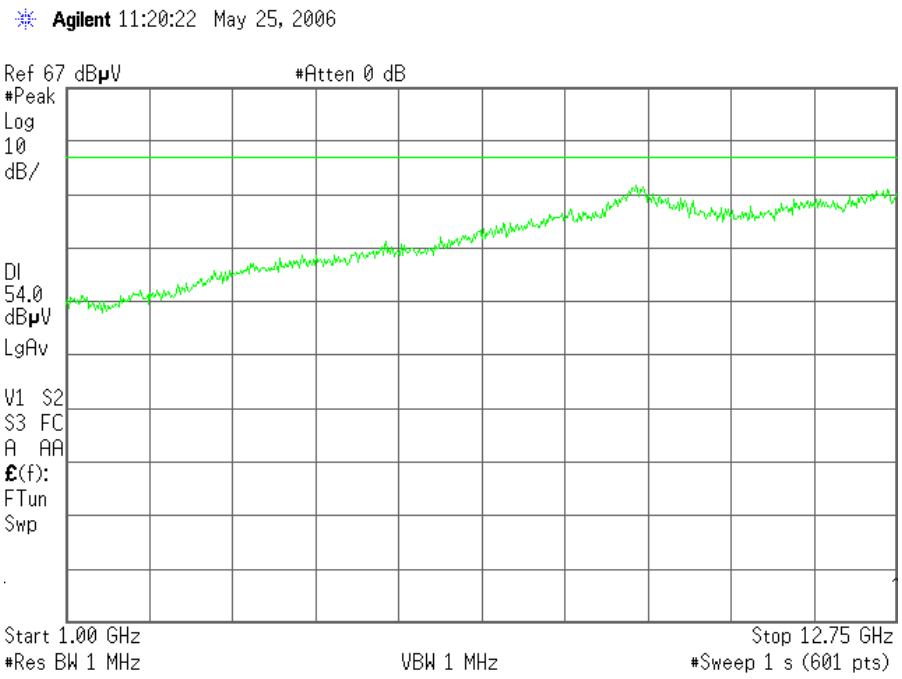
Verdict: PASS.

FREQUENCY RANGE 30 MHz-1000 MHz.



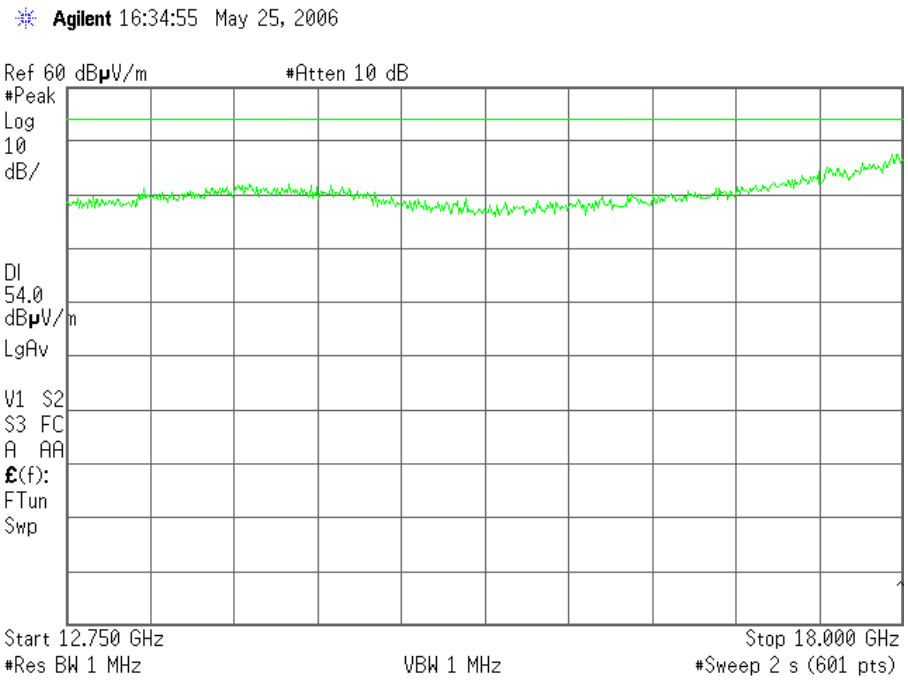
(This plot is valid for all three channels).

FREQUENCY RANGE 1 GHz-12.75 GHz.



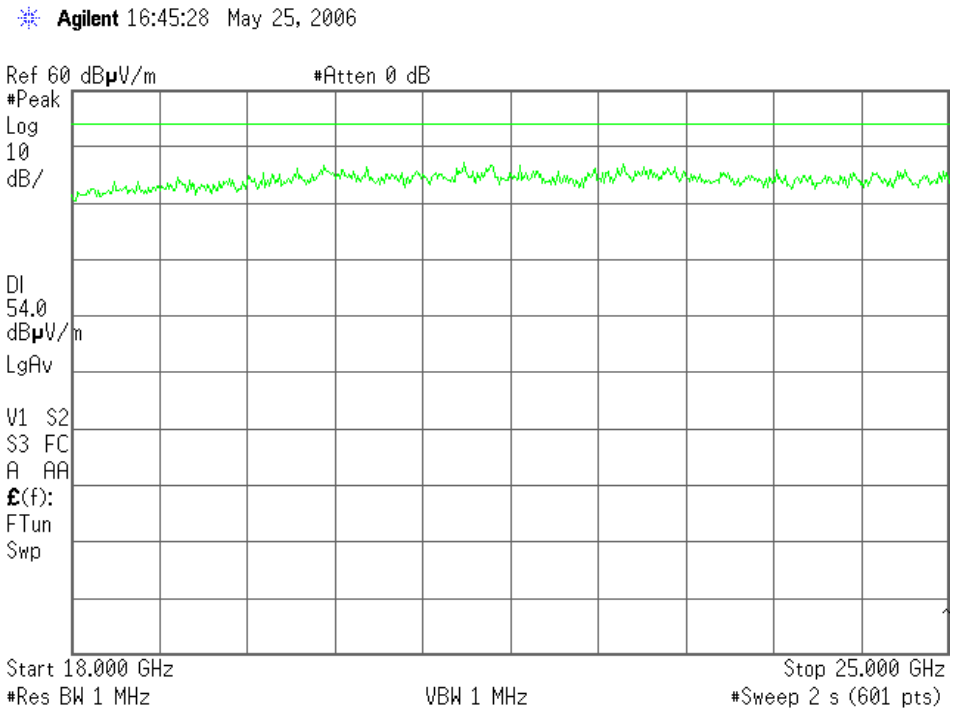
(This plot is valid for all three channels).

FREQUENCY RANGE 12.75 GHz-18 GHz.



(This plot is valid for all three channels).

FREQUENCY RANGE 18 GHz-25 GHz.



(This plot is valid for all three channels).

ANNEX B

MEASURING RESULTS FOR

ELECTROMAGNETIC EMISSION

Report No: 22855RET.101

For the sample under test, named S/01, and that was formed by the elements described in the clause “Identification of the tested item/items” of this test report.

INDEX:

1. - CONTINUOUS CONDUCTED EMISSION, POWER LEADS ON THE SAMPLE S/01 3

2. - GRAPH RESULTS 3

* * *

1. - CONTINUOUS CONDUCTED EMISSION, POWER LEADS ON THE SAMPLE S/01

LIMITS OF INTERFERENCE

The applied limit for continuous conducted emissions in power leads, according with the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B in the frequency range 0,15 to 30 MHz, for Class B equipment was:

Frequency range (MHz)	Limit (dBµV)	
	Quasi-peak	Average
0,15 to 0,5	66-56	56-46
0,5 to 5	56	46
5 to 30	60	50

TEST METHOD

According to Part 15, Subpart B of FCC Rules.

OPERATING MODES OF EUT

Different tested operating modes (OM)

- OM#02: EUT ON. Normal mode. Reproducing music. Linked bluetooth.

TEST RESULTS

CCmmnnxx: CC, Conduction condition°; mm: sample number; nn: operation mode; xx: wire.

- OM#02.

CDmmnnxx	Description	Result
CC01020N	Interference voltage on Neutral wire	PASS
CC0102L1	Interference voltage on phase wire	PASS

2. - GRAPH RESULTS

See next pages.

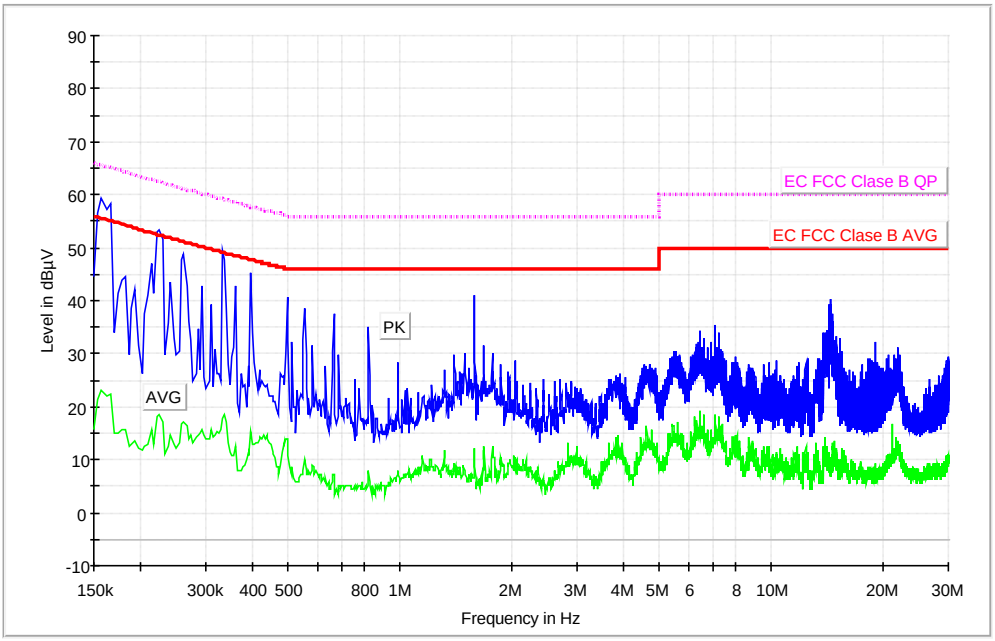
Continuous conducted emission: CC01020N (Peak and Average)

EMC32 Report

Test Information

Proyecto:	22855iem.004
Empresa:	LOGITECH
Muestra:	M/01
Modo operacion:	MO#02
Fecha:	2006-06-02 19:14
Setup:	EMI conducted
Mode:	EUT ON. Comunication mode. Neutral noise.

EC FCC Clase B ESIB26 CC



Maximo PK

Frequency (MHz)	MaxPeak-MaxHold (dBµV)	Average-MaxHold (dBµV)
0.158000	59.2	23.0
0.182000	44.7	15.5
0.194000	42.1	13.7
0.226000	53.2	18.4
0.242000	43.5	14.5
0.262000	48.9	17.3
0.294000	42.9	15.8
0.334000	49.5	17.9
0.362000	42.6	12.4
0.398000	45.3	15.3
0.498000	40.8	14.0
1.590000	41.1	12.0
14.422000	40.3	10.1
14.474000	39.2	10.1

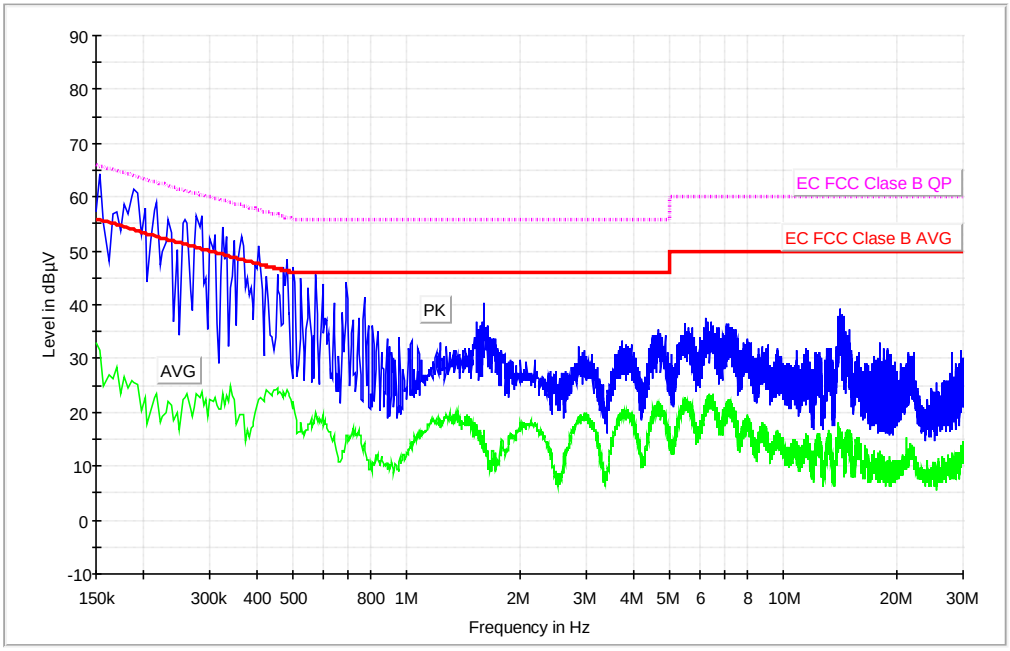
Continuous conducted emission: CC0102L1 (Peak and Average)

EMC32 Report

Test Information

Proyecto:	22855iem.004
Empresa:	LOGITECH
Muestra:	M/01
Modo operacion:	MO#02
Fecha:	2006-06-02 19:17
Setup:	EMI conducted
Mode:	EUT ON. Comunication mode. Phase noise.

EC FCC Clase B ESIB26 CC



Maximo PK

Frequency (MHz)	MaxPeak-MaxHold (dBµV)	Average-MaxHold (dBµV)
0.154000	64.3	31.7
0.190000	61.6	25.6
0.218000	59.1	23.3
0.234000	55.8	21.9
0.246000	50.1	20.0
0.258000	55.9	22.9
0.278000	56.7	23.6
0.310000	53.1	22.9
0.326000	54.3	23.3
0.350000	52.0	22.3
0.366000	52.8	19.7
0.406000	50.8	22.3
0.482000	48.5	24.2
0.502000	47.1	22.0

ANNEX C

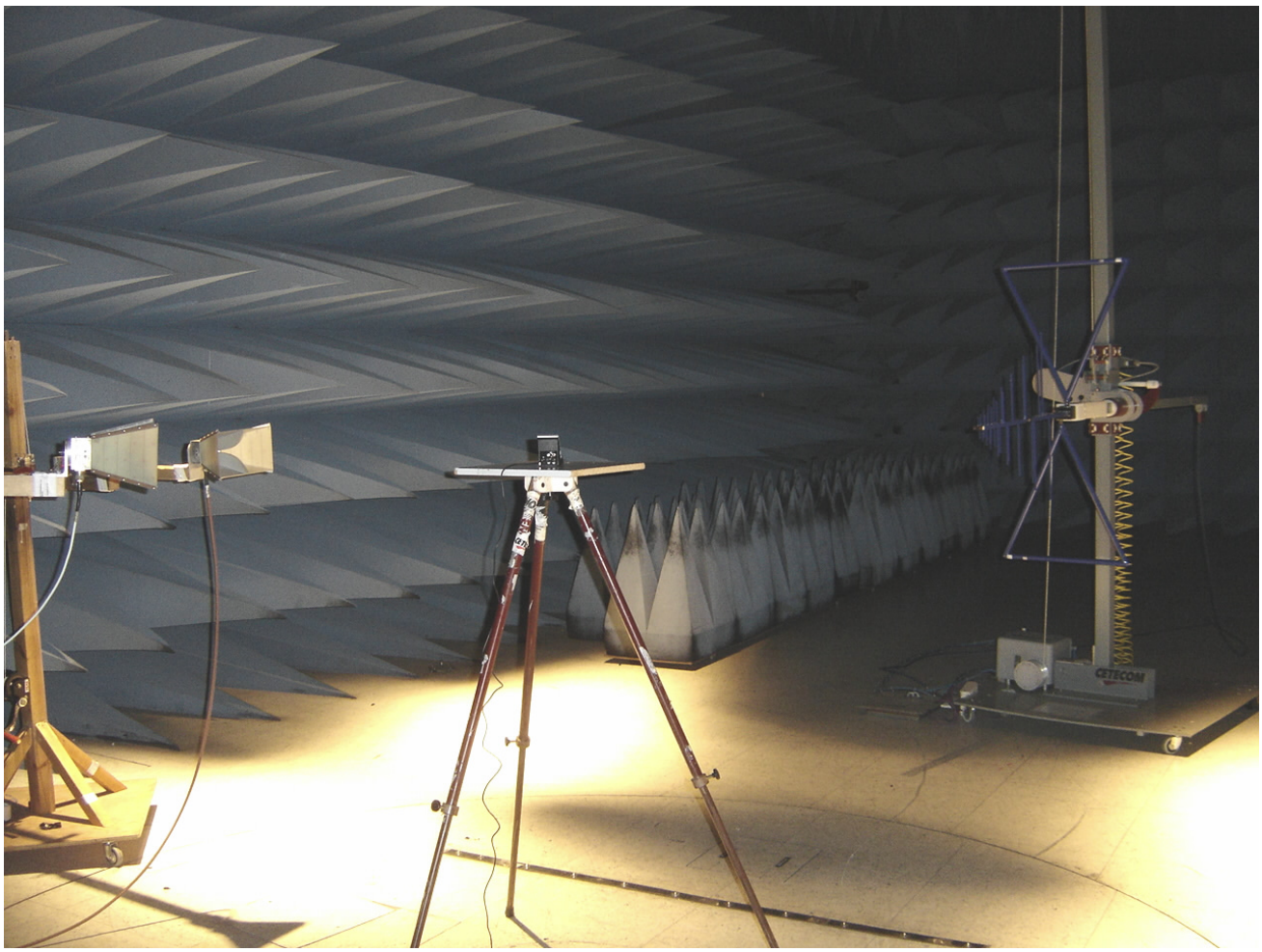
PHOTOGRAPHS
(Number of photographs: 5)

Report No.: 22855RET.101

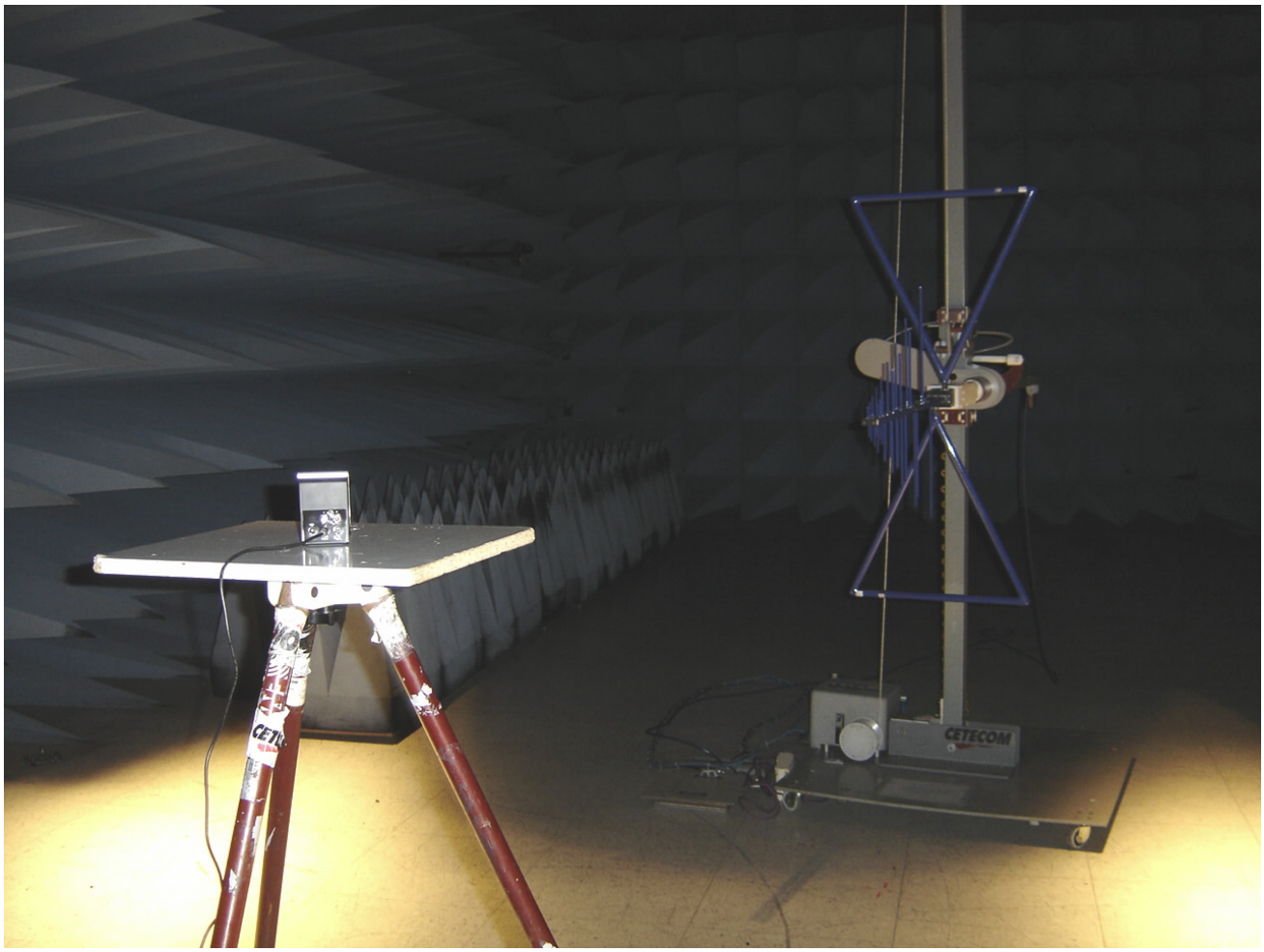
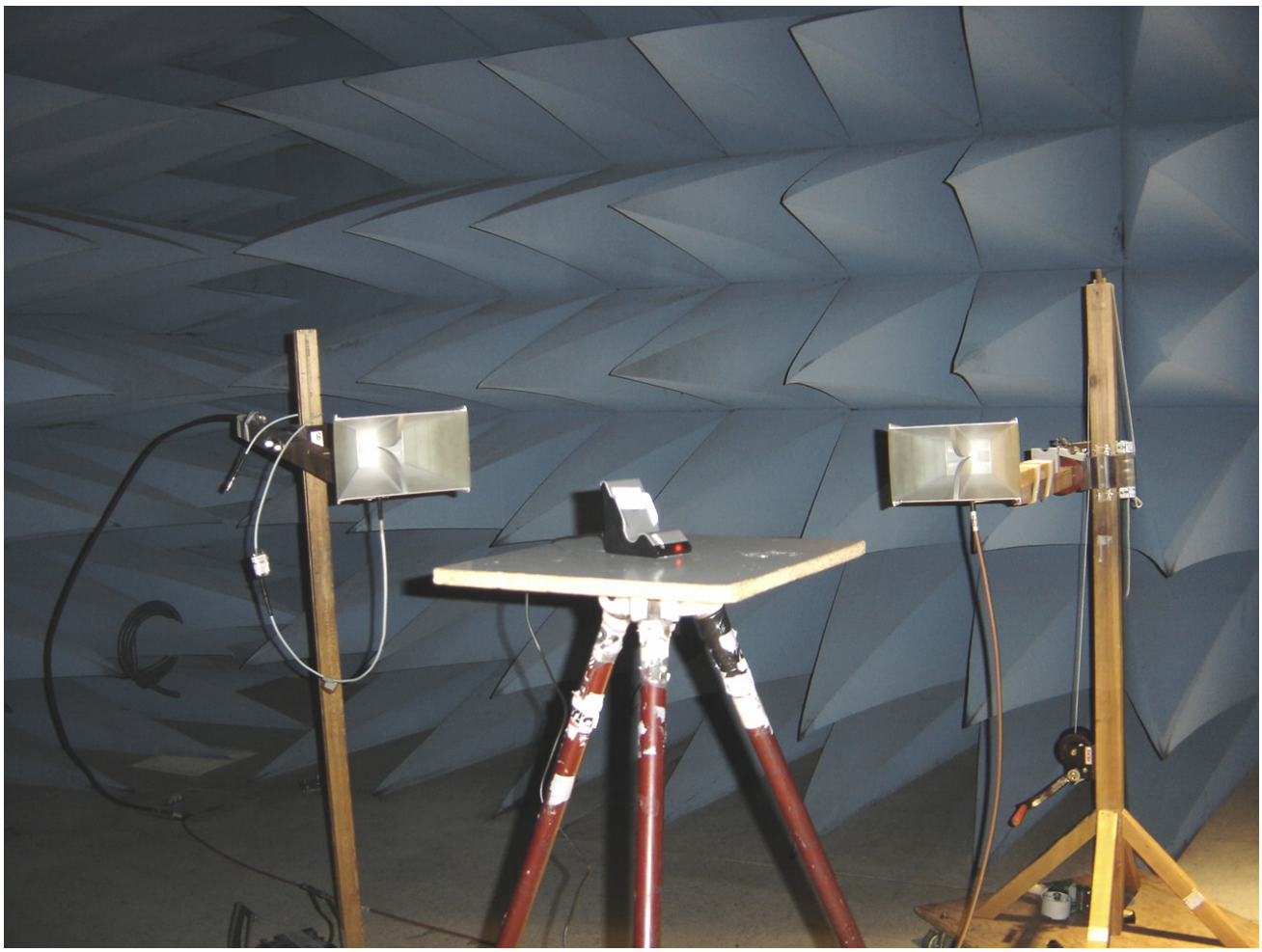
1. Equipment (front view)

2. Equipment (back view).

3. General test set-up for radiated measurements.



4. Test set-up for radiated measurements below 1 GHz.



5. Test set-up for radiated measurements above 1 GHz.