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REGISTRATION
NUMBER: 905266

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REGISTRATION
NUMBER IC 4621

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TEST REPORT

Report No.: 22855RET.102

TEST NAME: FCC PART 15.247 TESTING FOR BLUETOOTH RADIO DEVICE

Product	:	Bluetooth transceiver
Trade Mark	:	Logitech
Model/type Ref.	:	C-UAF48
Manufacturer	:	LOGITECH TECHNOLOGY Co, Ltd.
Requested by	:	LOGITECH INC.
Other identification of the product	:	P/N: 866163-0000 FCC ID: DZL202184 IC: 1807B-202184
Standard(s)	:	USA FCC Part 15.247, 15.205, 15.209, 15.109, 15.207

This test report includes 4 annexes and therefore the total number of pages is 102.

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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. Measurements for frequency hopping spread spectrum equipment (Bluetooth) operating in the 2400 MHz -2483.5 MHz band and using, according to FCC Part 15.247.
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 C

3.2 REQUIREMENTS AND METHOD

1. FCC parts 15.33, 15.35, 15.247, 15.207, 15.205, 15.209, 15.109 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-UAF48

Manufacturer: LOGITECH TECHNOLOGY Co, Ltd.

Country of manufacture: CHINA

Description Class I Bluetooth USB transceiver which streams PC audio to the Logitech transceiver C-RF49 and communicates with the Logitech Media Remote R-RF11. The system enables to browse and control the streaming of a PC based music from the PC to an audio system through a connection with RCA or Jack plugs. It is formed by the C-UAF48 (RECEIVER) and C-UAF48 (MIDRCVR).

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
22855/17	Bluetooth transceiver	C-UAF48 (RECEIVER)	----	04/05/2006
22855/16	External power supply with batteries	----	----	04/05/2006

Sample M/02 is formed by the following elements:

Control No.	Description	Model	Serial No.	Date of reception
22855/08	Bluetooth transceiver with antenna connector	C-UAF48 (RECEIVER)	----	04/05/2006
22855/12	Test board	----	----	04/05/2006
22855/13	AC adaptor	PSC11R-050	-----	04/05/2006

Sample M/03 is formed by the following elements:

Control No.	Description	Model	Serial No.	Date of reception
22855/18	Bluetooth remote transceiver	C-UAF48 (MIDRCVR)	----	04/05/2006

Sample M/04 is formed by the following elements:

Control No.	Description	Model	Serial No.	Date of reception
22855/10	Bluetooth transceiver with antenna connector	C-UAF48 (MIDRCVR)	----	04/05/2006

Sample S/01 is composed of the following elements:

Control No.	Description	Model	Serial No.	Date of reception
22855/31	Bluetooth EMC transceiver	C-UAF48 (RECEIVER)	---	29/05/2006
22855/32	Bluetooth EMC transceiver	C-UAF48 (MIDRCVR)	---	29/05/2006

During the tests were used next ancillary equipment:

Internal Control Nr.	Description	Model	Serial No.	Date of arrival
22855/-	Portable PC, property of CETECOM	Toshiba	---	---

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 M/03 has undergone following test(s).
   Radiated spurious emissions tests indicated in annex B.

4. Sample M/04 has undergone following test(s).
   All tests indicated in annex B except radiated spurious emissions.

5. Sample S/01 has undergone to the following test(s):
   Continuous conducted emission, power leads, in Annex C.

5.2 PERIOD OF TESTING

The performed test started on 2006-05-04 and finished on 2006-05-30.

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. = 26 ºC
Relative humidity	Min. = 51 % 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 not exceeded during the test.

Temperature	Min. = 24 ºC Max. = 26 ºC
Relative humidity	Min. = 52 % Max. = 61 %
Air pressure	Min. = 1019 mbar Max. = 1020 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. = 1060 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

TEST RESULTS FOR C-UAF48 (RECEIVER)

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

TEST RESULTS FOR C-UAF48 (MIDRCVR)

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

7. REMARKS AND COMMENTS

None.

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
C-UAF48 (RECEIVER)

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TEST CONDITIONS

Power supply (V):

$V_{nominal}$ = 5.0 Vdc

Type of power supply = USB port

Type of antenna = Integral antenna

Maximum Declared Gain for antenna = 0.5 dBi

Operating Temperature Range (ºC):

T_n = 0 to + 40

TEST FREQUENCIES:

Lowest channel: 2402 MHz

Middle channel: 2441 MHz

Highest channel: 2480 MHz

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

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to a Bluetooth signalling unit (Bluetooth test set) and to the spectrum analyser using a 6 dB power splitter. The reading in the spectrum analyser is corrected taking into account the power splitter loss.

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 (a) (1). 20 dB Bandwidth and Carrier frequency separation

SPECIFICATION

Frequency hopping system shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

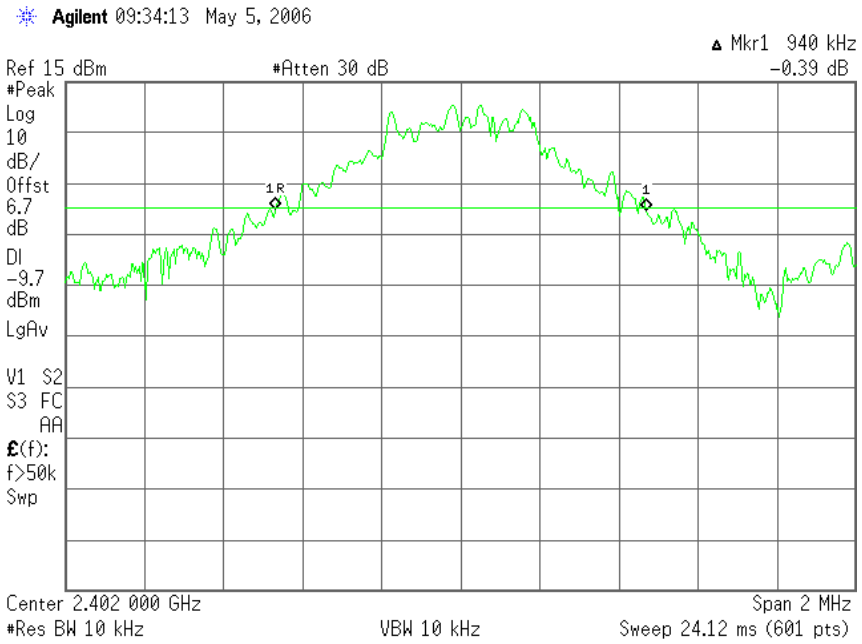
RESULTS

20 dB Bandwidth (see next 3 plots).

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20 dB Spectrum bandwidth (kHz)	940	937	937
Measurement uncertainty (kHz)	±11		

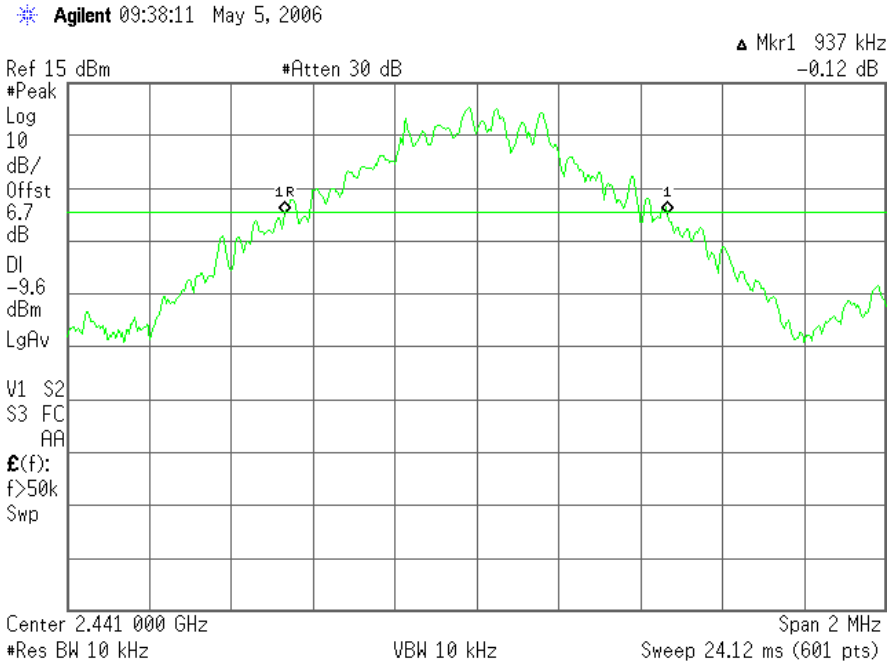
20 dB BANDWIDTH.

Lowest Channel: 2402 MHz.



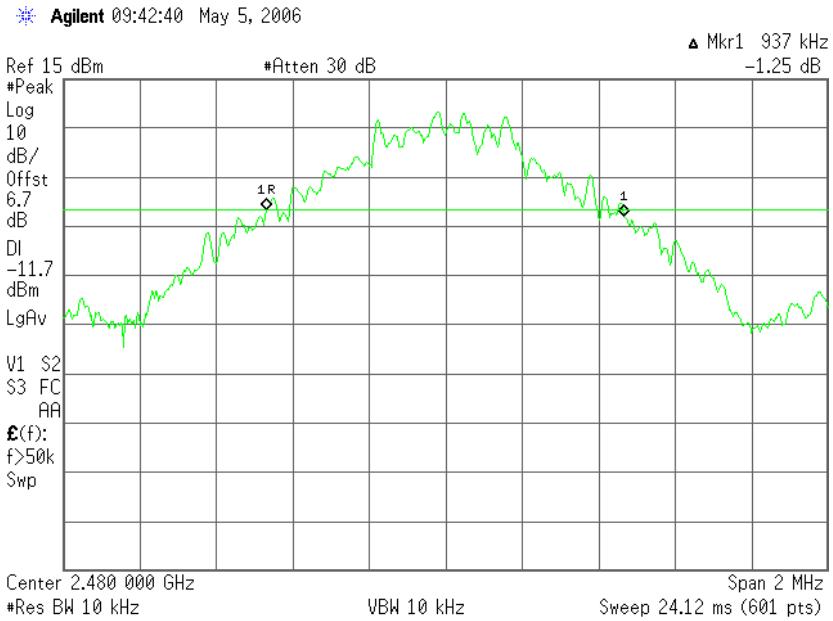
20 dB BANDWIDTH.

Middle Channel: 2441 MHz.

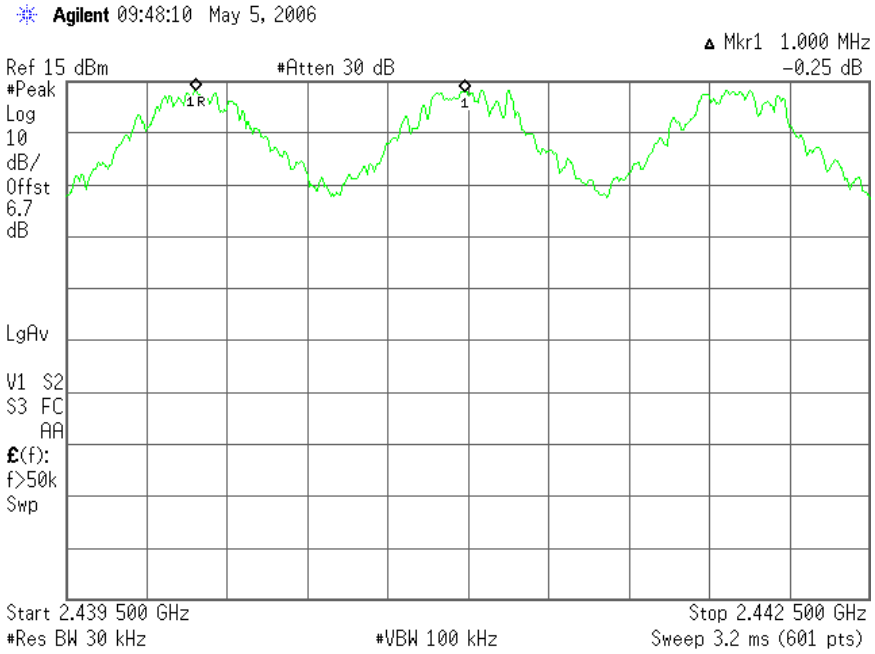


20 dB BANDWIDTH.

Highest Channel: 2480 MHz.



Carrier frequency separation (see next plot).



The hopping channel carrier frequencies are separated by a minimum of the 20 dB bandwidth of the hopping channel.

Verdict: PASS

Section 15.247 Subclause (a) (1) (iii). Number of hopping channels

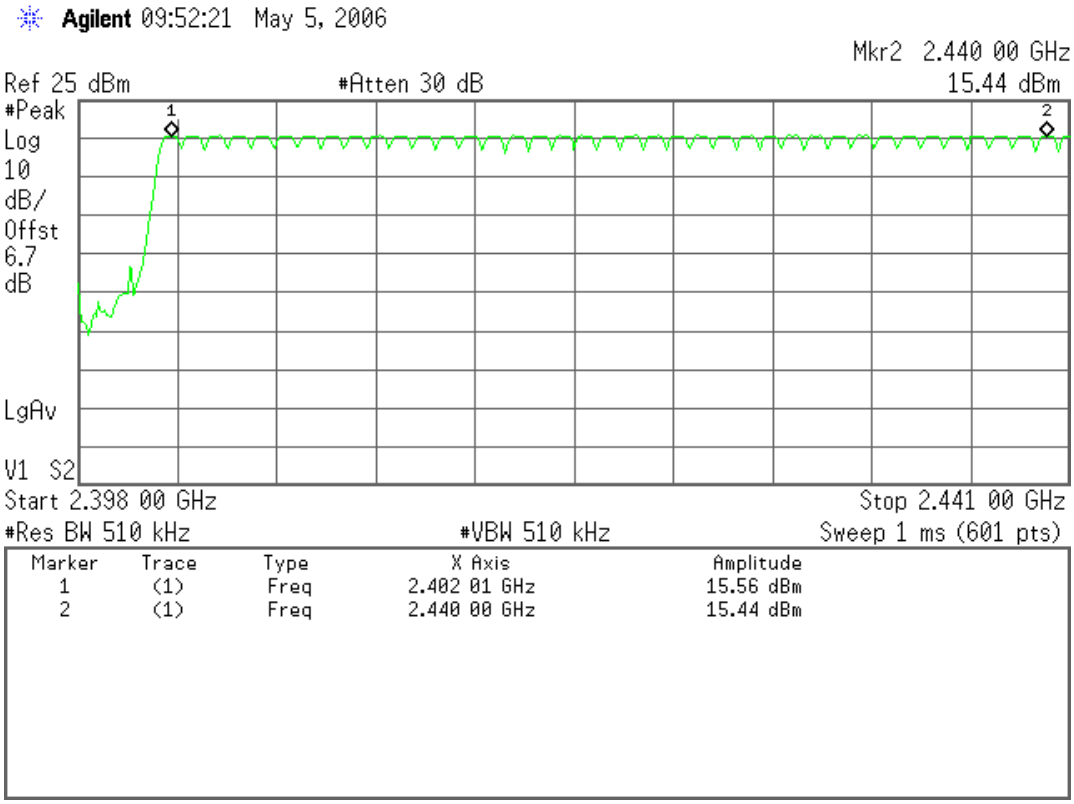
SPECIFICATION

Frequency hopping system in the 2400-2483.5 MHz band shall use at least 15 non-overlapping channels.

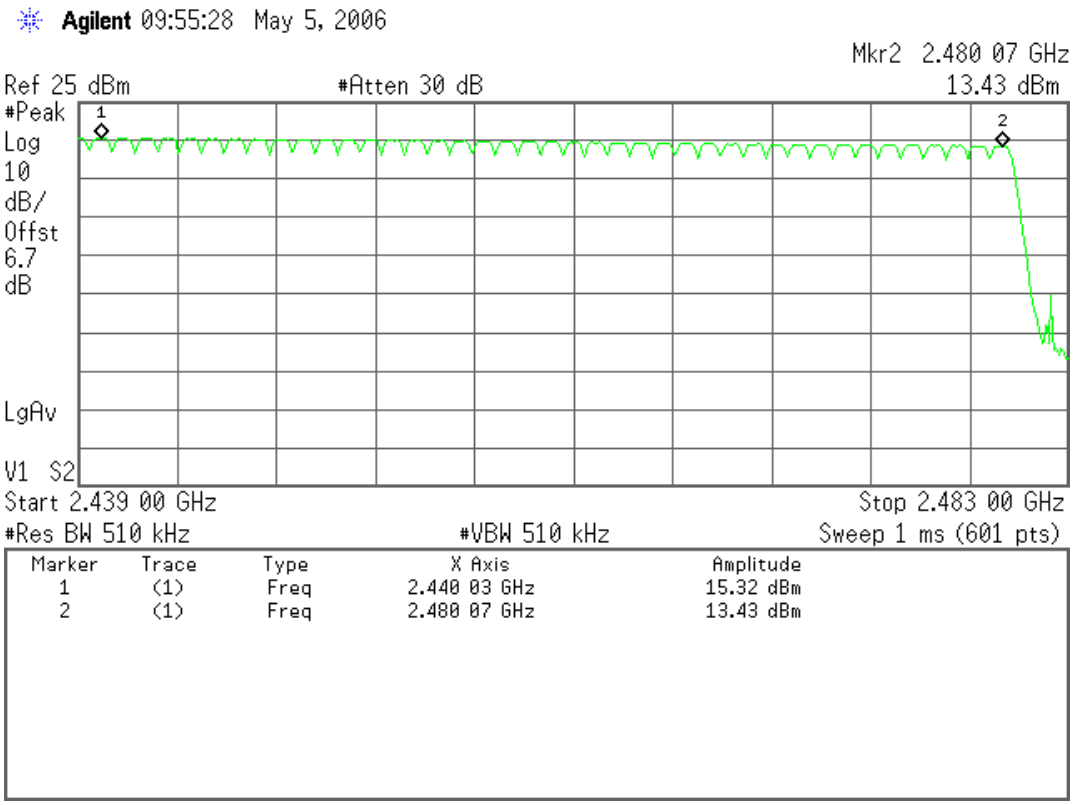
RESULTS

The number of hopping channels is 79 (see next two plots).

Number of hopping frequencies: 39



Number of hopping frequencies: 40



Total number of hopping frequencies: 79

Verdict: PASS

Section 15.247 Subclause (a) (1) (iii). Time of occupancy (Dwell Time)

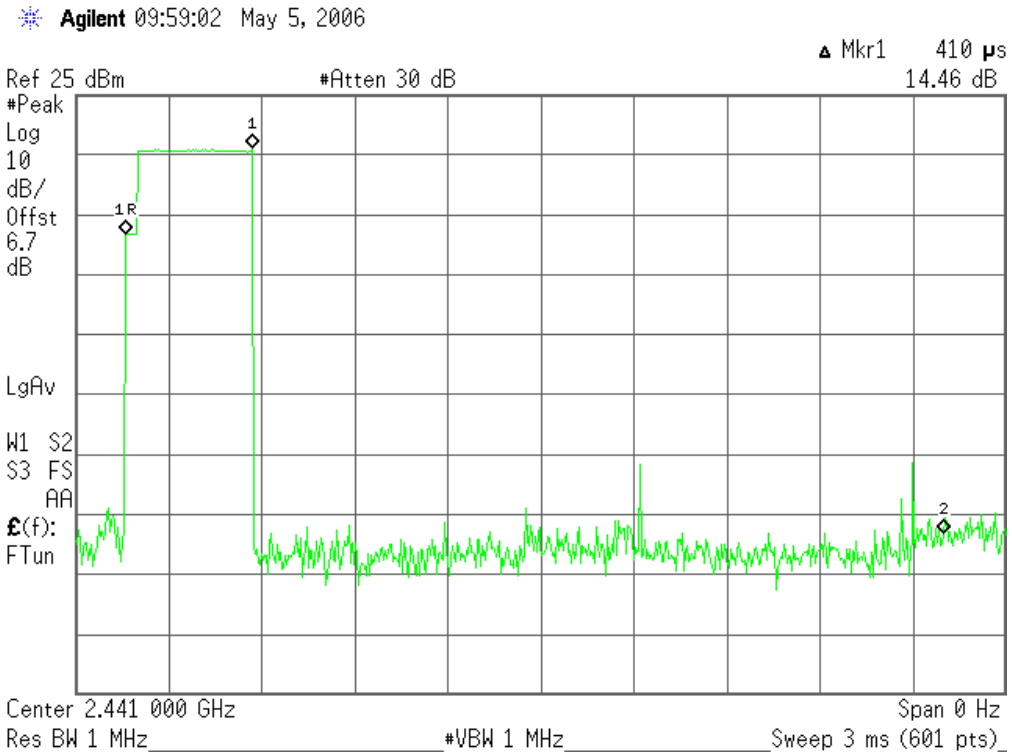
SPECIFICATION

The average time of occupancy on any channel shall not be greater than 0.4 seconds (400 ms) within a period of 0.4 seconds multiplied by the number of hopping channels employed = 0.4 x 79= 31.6 seconds.

RESULTS

TIME OF OCCUPANCY (DWELL TIME) FOR PACKET TYPE DH1.

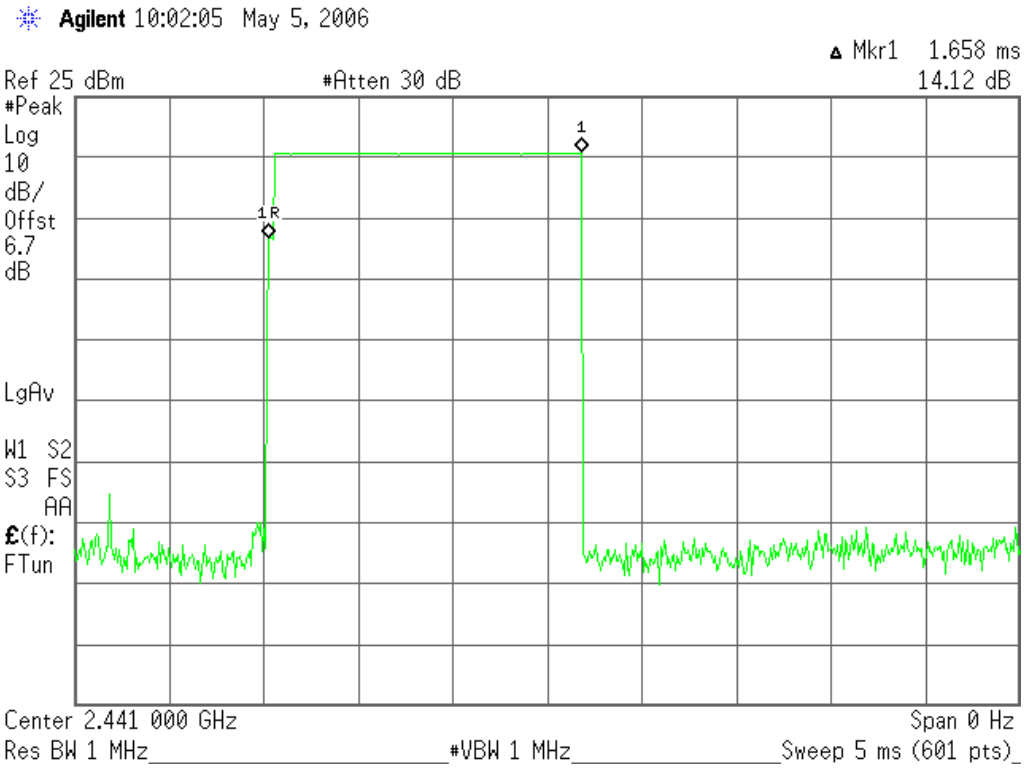
The system makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/2 = 800 hops per second with 79 channels. So you have each channel 800/79 = 10.13 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 10.13 x 31.6 = 320.11 times of appearance.
Each Tx-time per appearance is 410.00 µs (see next plot).
So we have 320.11 x 410.00 µs =131.24 ms per 31.6 seconds.



Verdict: PASS

2. TIME OF OCCUPANCY (DWELL TIME) FOR PACKET TYPE DH3.

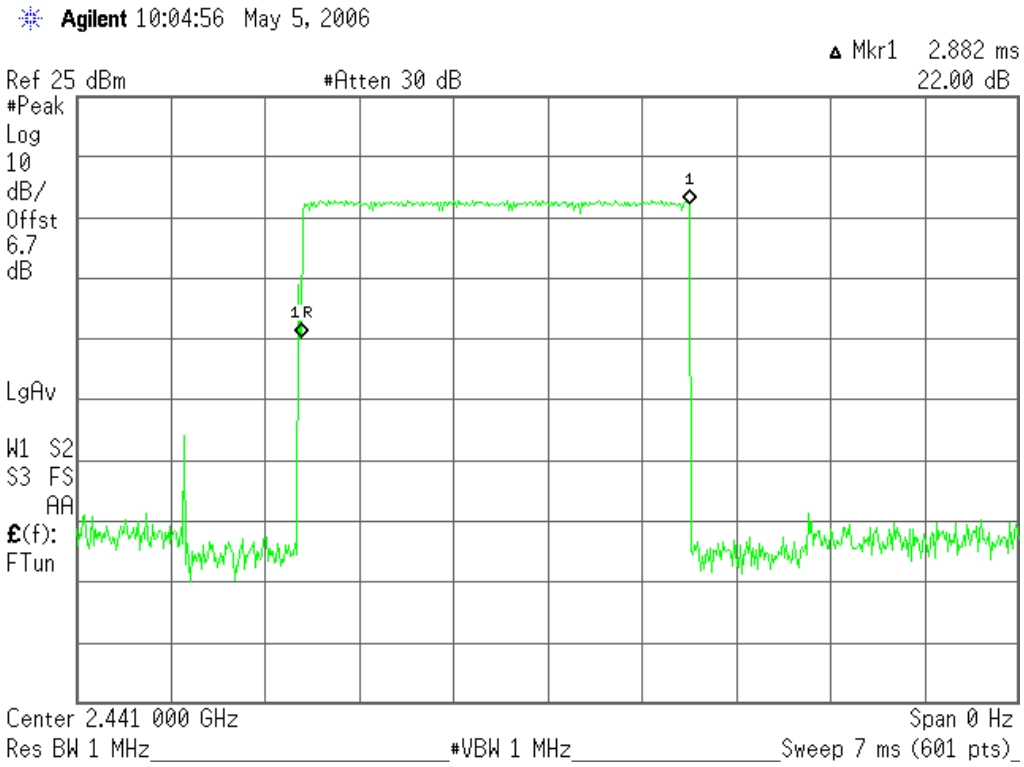
A DH3 Packet need 3 time slots for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/4 = 400 hops per second with 79 channels. So you have each channel 400/79 = 5.1 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 5.1 x 31.6 = 161.16 times of appearance.
Each Tx-time per appearance is 1.66 ms (see next plot).
So we have 161.16 x 1.66 ms = 267.53 ms per 31.6 seconds.



Verdict: PASS

3. TIME OF OCCUPANCY (DWELL TIME) FOR PACKET TYPE DH5.

A DH5 Packet need 5 time slots for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/6 = 266.67 hops per second with 79 channels. So you have each channel 266.67/79 = 3.37 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 3.37 x 31.6 = 106.49 times of appearance.
Each Tx-time per appearance is 2.88 ms (see next plot).
So we have 106.49 x 2.88 ms = 306.69 ms per 31.6 seconds.



Verdict: PASS

Section 15.247 Subclause (b). Maximum peak output power and antenna gain

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 (CONDUCTED). See next plots.

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Maximum peak power (dBm)	17.60	17.67	15.66
Measurement uncertainty (dB)	±1.5		

The maximum declared antenna gain for this device is 0.5 dBi, therefore the maximum theoretical peak radiated power (EIRP) in the three measurement channels for this device is 18.17 dBm or 65.61 mW.

The actual peak radiated power (EIRP) was measured for the lowest, middle and highest frequency (see next plots):

MAXIMUM PEAK OUTPUT POWER (RADIATED).

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Correction Factor (dB)	35.00	35.10	35.20
Maximum EIRP peak power (dBm)	16.87	16.81	16.61
Measurement uncertainty (dB)	±4.0		

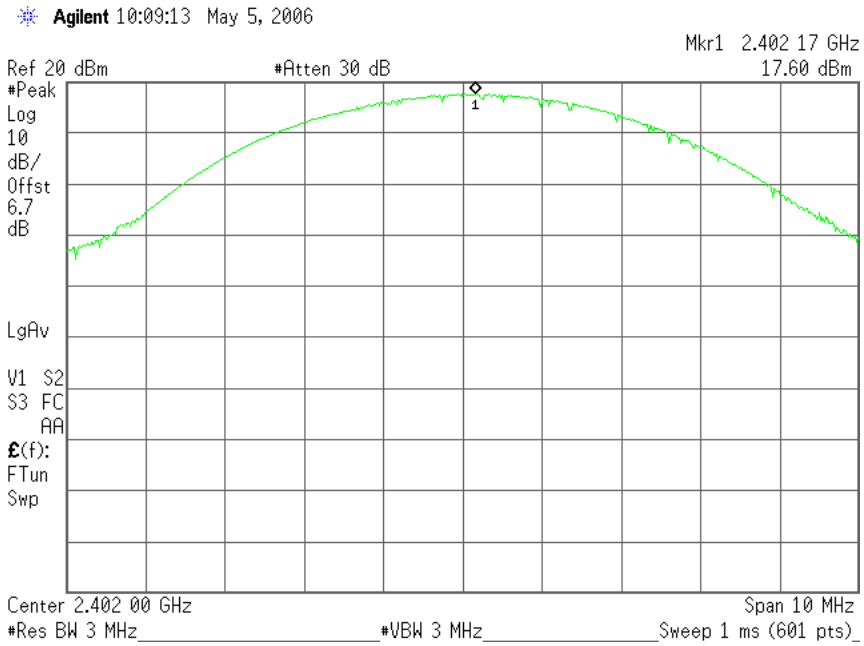
Declared peak gain: 0.5 dBi

The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

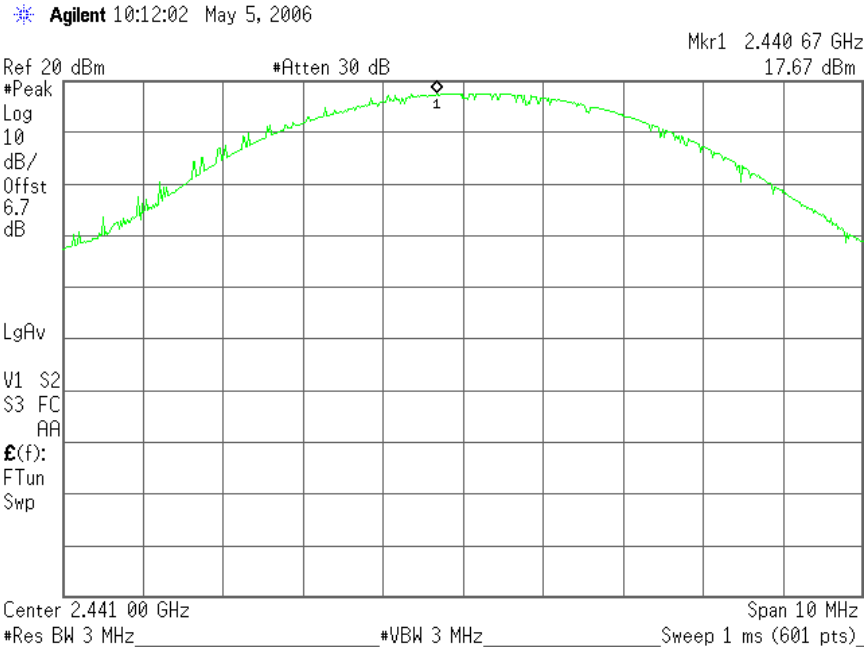
Verdict: PASS

PEAK OUTPUT POWER (CONDUCTED).

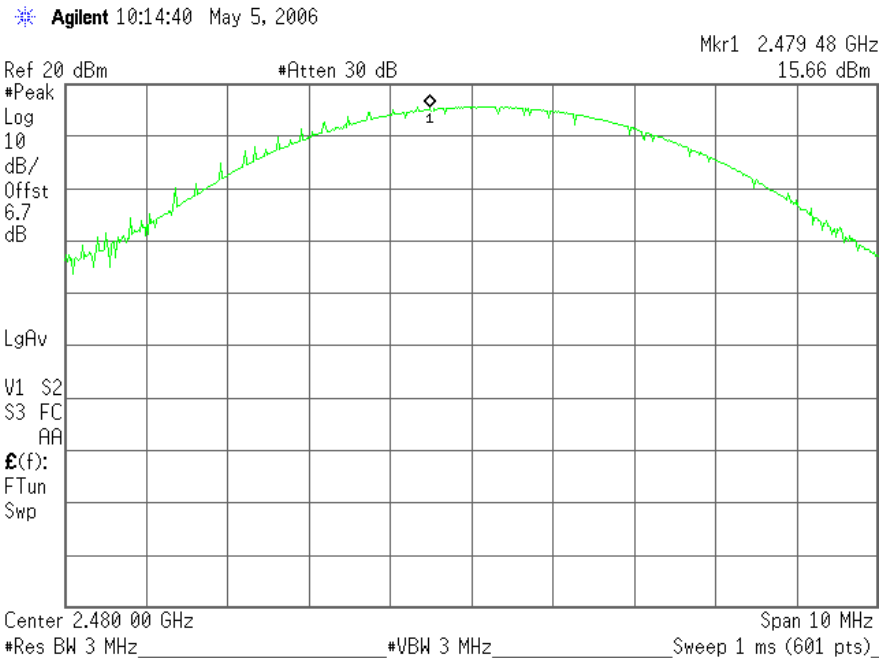
Lowest Channel: 2402 MHz.



Middle Channel: 2441 MHz.

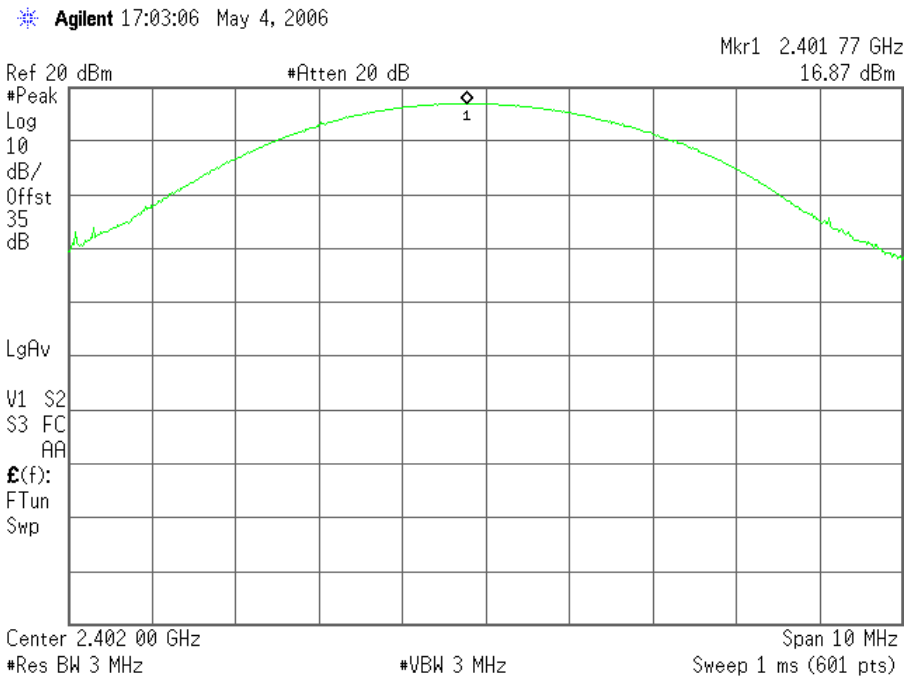


Highest Channel: 2480 MHz.

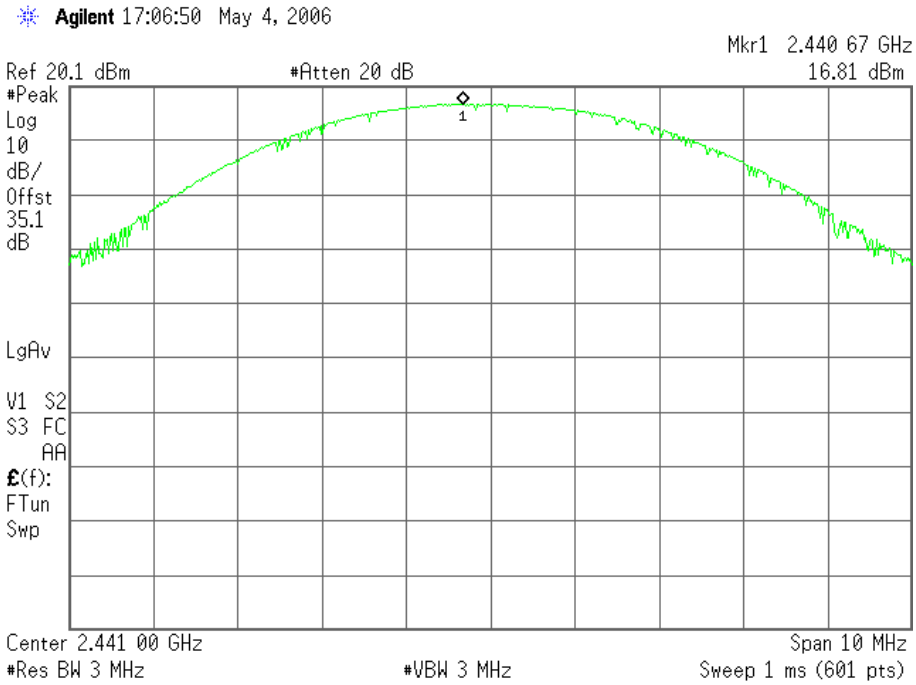


PEAK OUTPUT POWER (RADIATED).

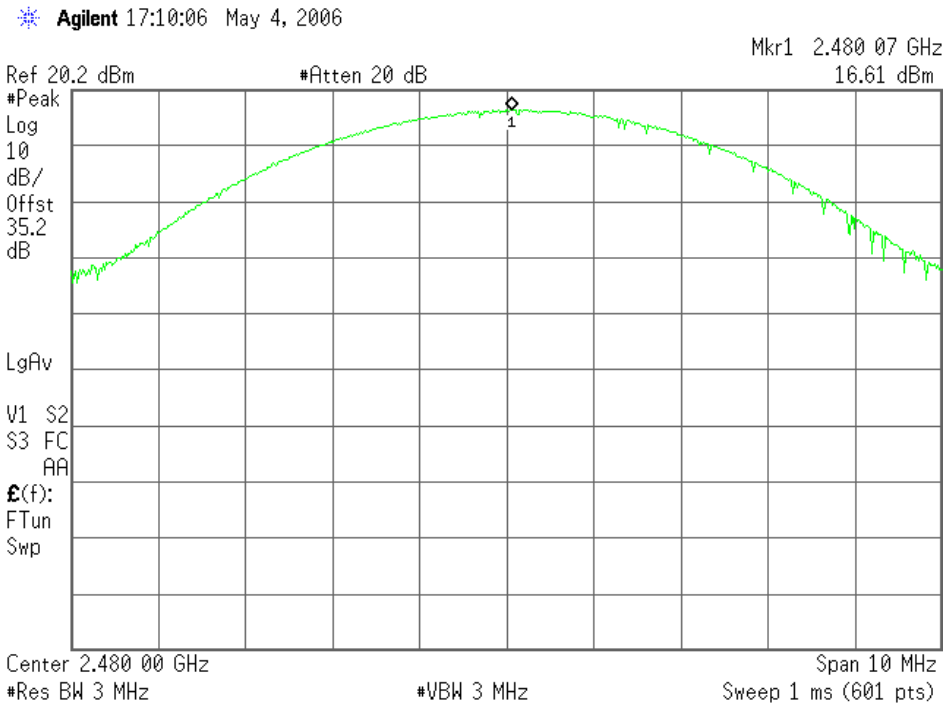
Lowest Channel: 2402 MHz.



Middle Channel: 2441 MHz.



Highest Channel: 2480 MHz.



Section 15.247 Subclause (d). Band-edge of conducted emissions (Transmitter)

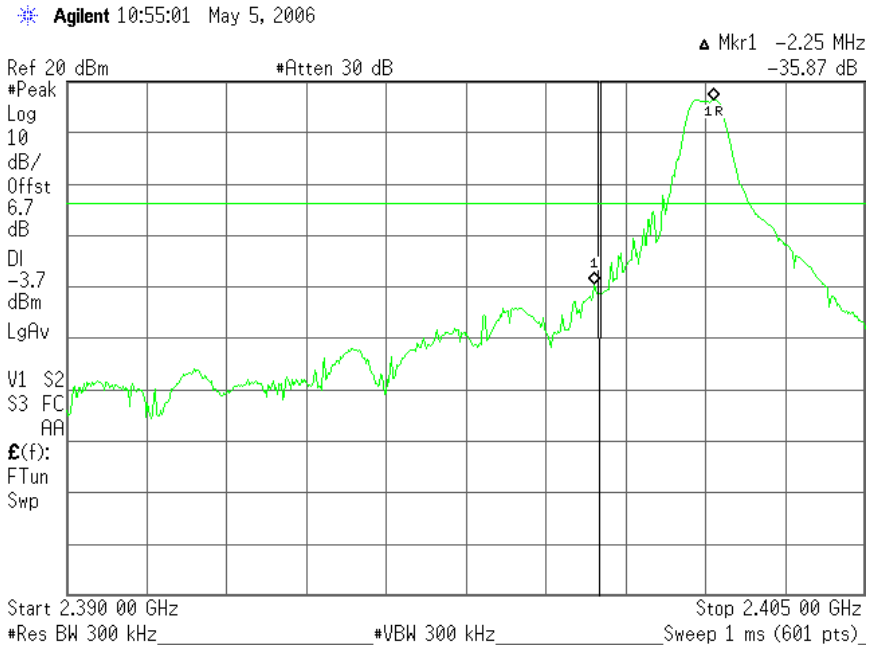
SPECIFICATION

Emissions outside the frequency band in which the intentional radiator is operating shall be at least 20dB below the highest level of the desired power.

RESULTS:

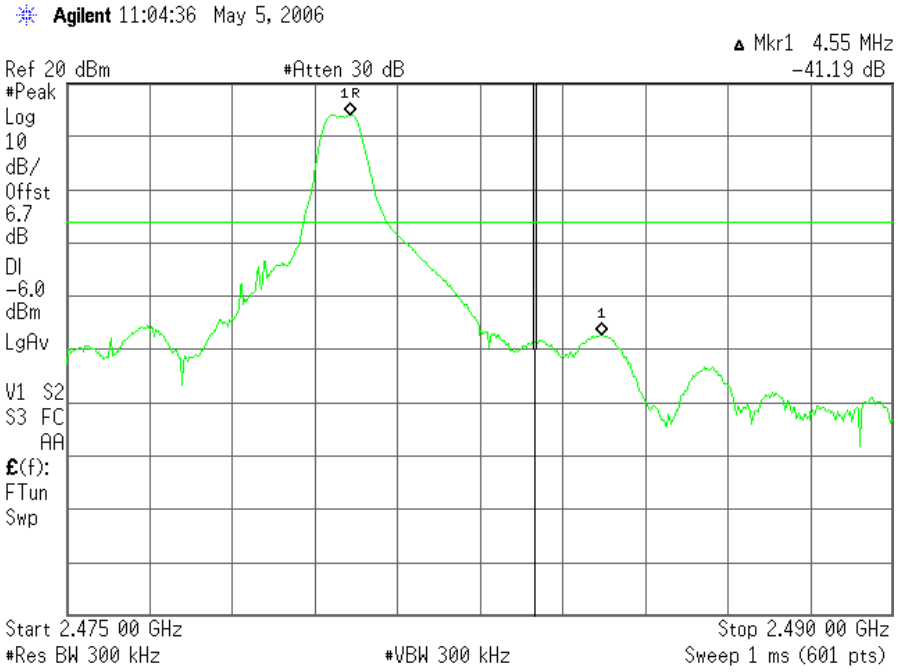
See next plots

1. LOW FREQUENCY SECTION 2402 MHz (HOPPING OFF). CONDUCTED



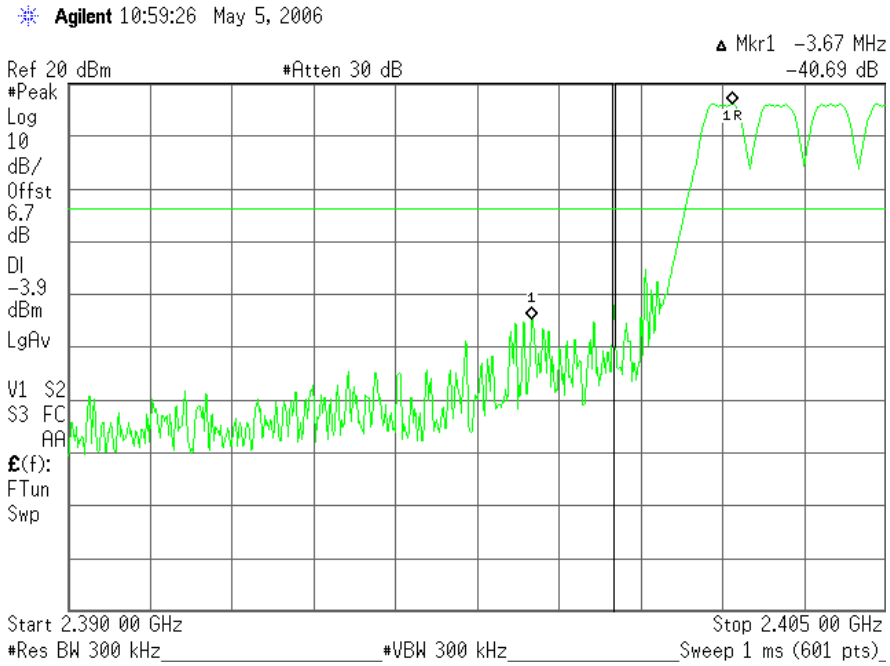
Verdict: PASS

2. HIGH FREQUENCY SECTION 2480 MHz (HOPPING OFF). CONDUCTED



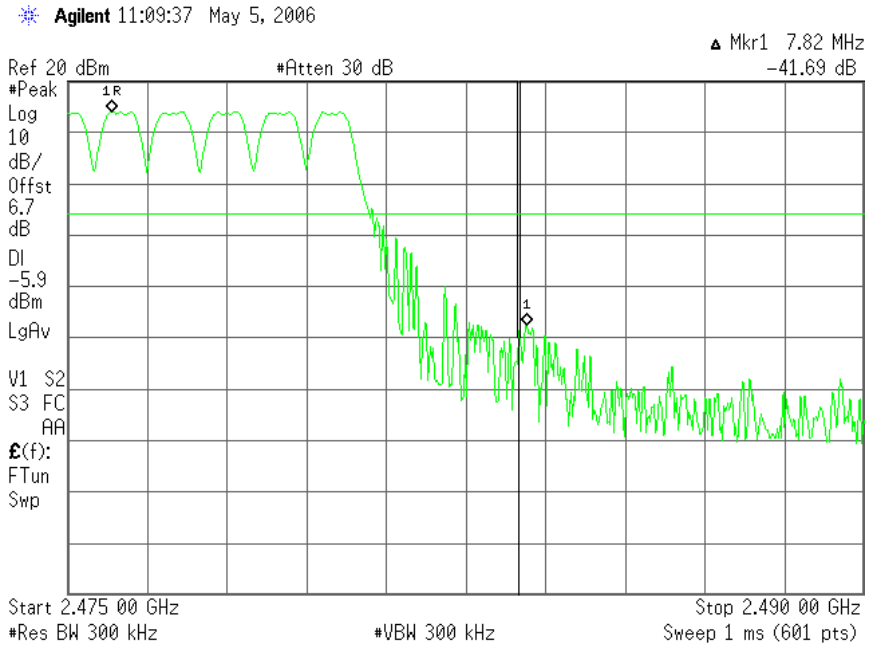
Verdict: PASS

3. LOW FREQUENCY SECTION (HOPPING ON). CONDUCTED



Verdict: PASS

4. HIGH FREQUENCY SECTION (HOPPING ON). CONDUCTED



Verdict: PASS

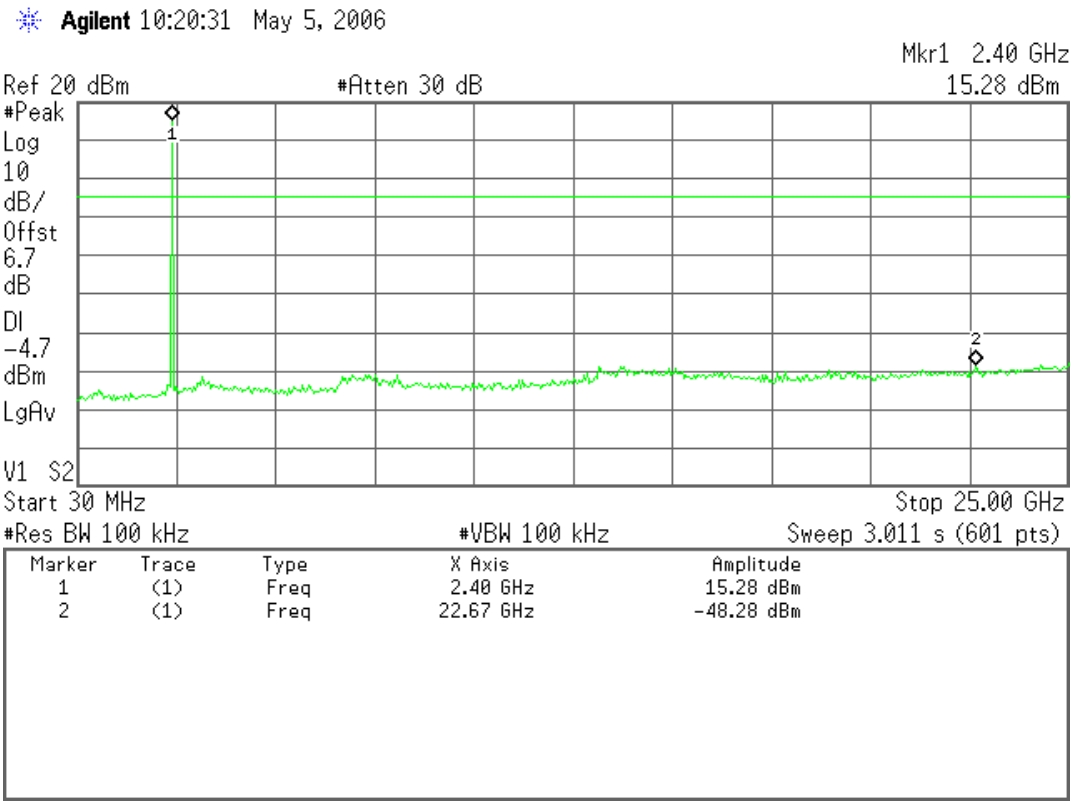
Section 15.247 Subclause (d). Emission limitations conducted (Transmitter)

SPECIFICATION

In any 100 kHz bandwidths outside the frequency band in which the intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

RESULTS:

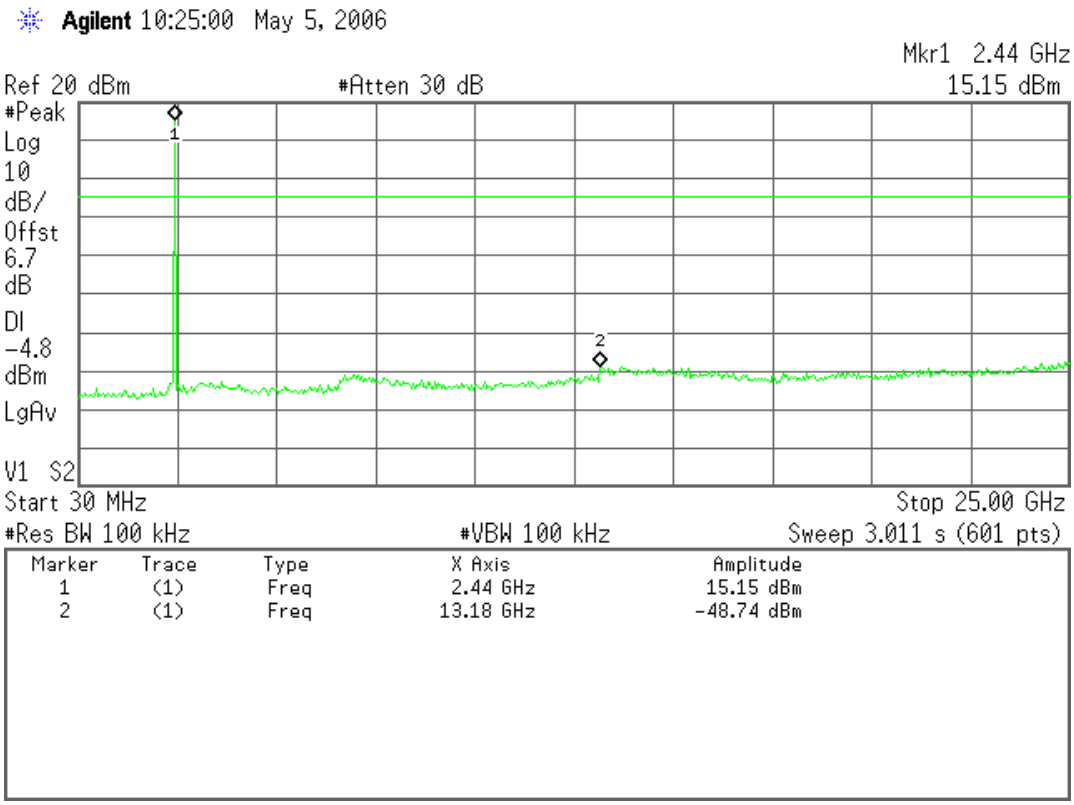
1. LOWEST CHANNEL (2402 MHz): 30 MHz-25 GHz (see next plot).



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

Verdict: PASS

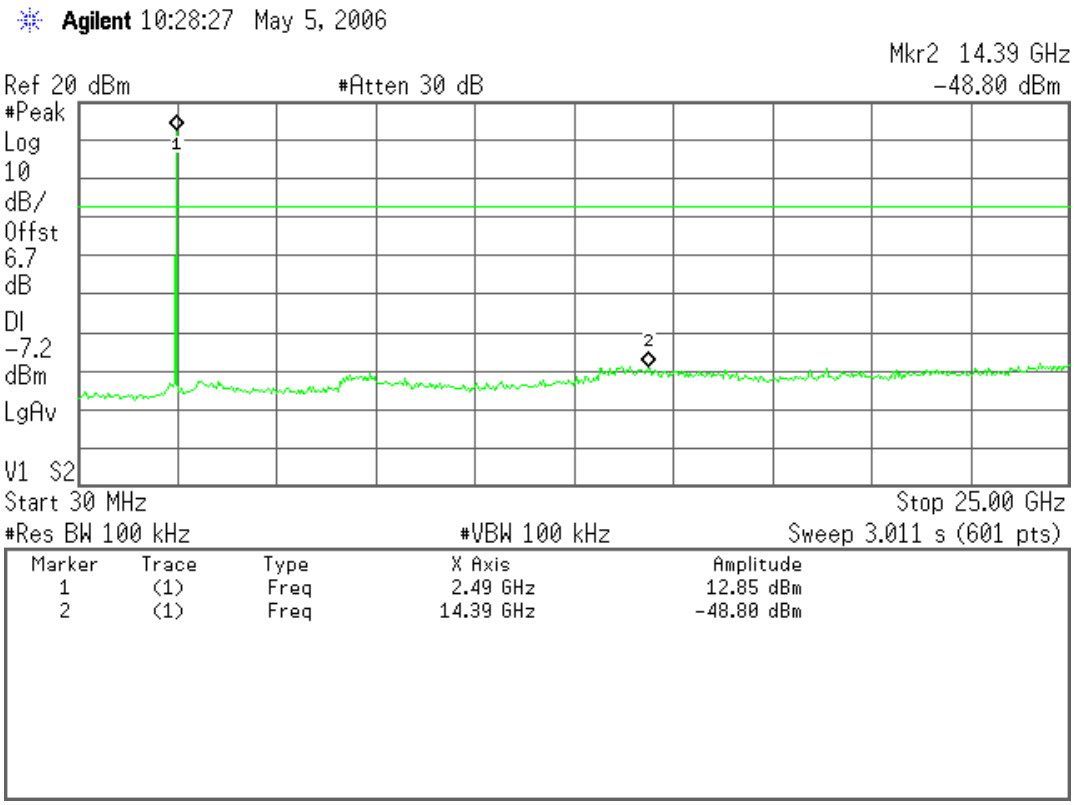
2. MIDDLE CHANNEL (2441 MHz): 30 MHz-25 GHz (see next plot).



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

Verdict: PASS

3. HIGH CHANNEL (2480 MHz): 30 MHz-25 GHz (see next plot).



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

Verdict: PASS

Section 15.247 Subclause (d). 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 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.

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-25 GHz.

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.

1. CHANNEL: LOWEST (2402 MHz).

Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

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, and at the harmonic frequencies.

2. CHANNEL: MIDDLE (2441 MHz).

Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

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, and at the harmonic frequencies.

3. CHANNEL: HIGHEST (2480 MHz).

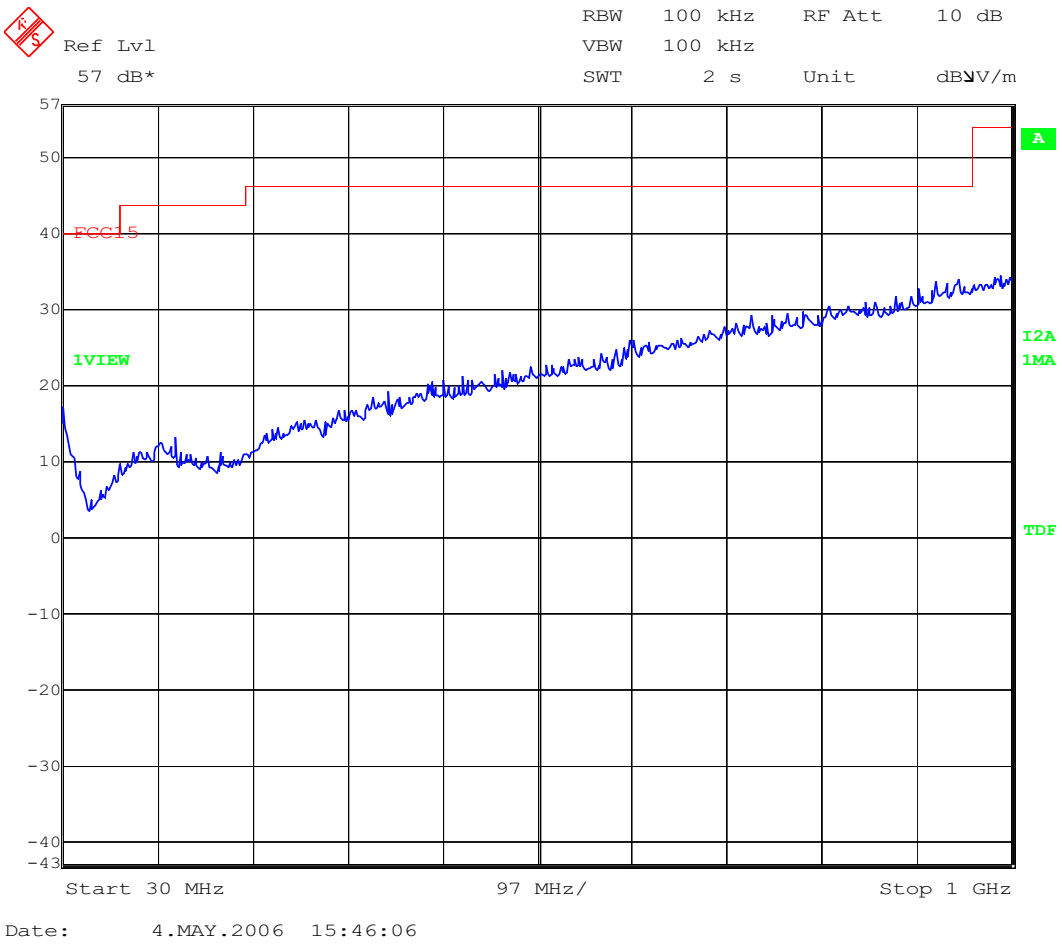
Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

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, and at the harmonic frequencies.

Verdict: PASS

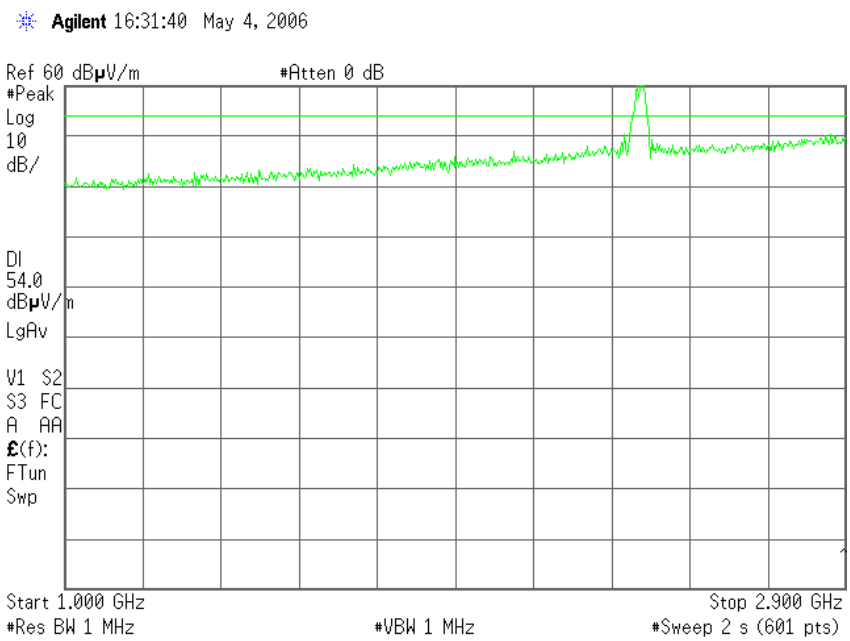
FREQUENCY RANGE 30 MHz-1000 MHz.



(This plot is valid for all three channels).

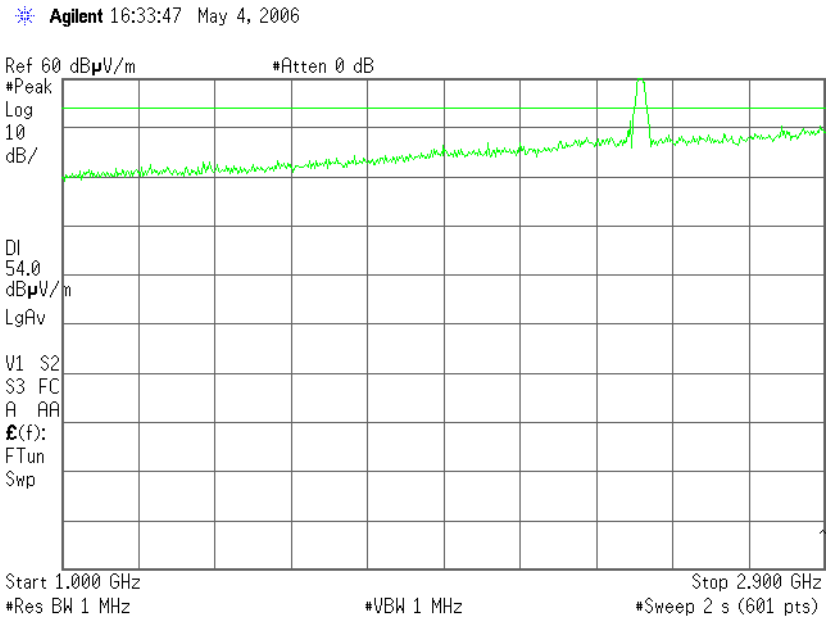
FREQUENCY RANGE 1 GHz to 2.9 GHz.

CHANNEL: Lowest (2402 MHz).



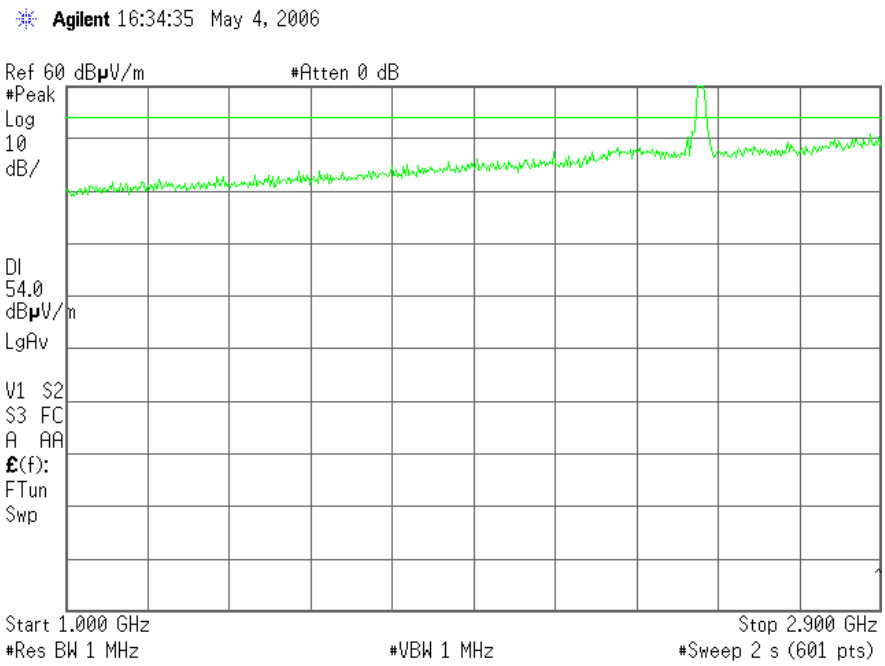
Note: The peak above the limit is the carrier frequency.

CHANNEL: Middle (2441 MHz).



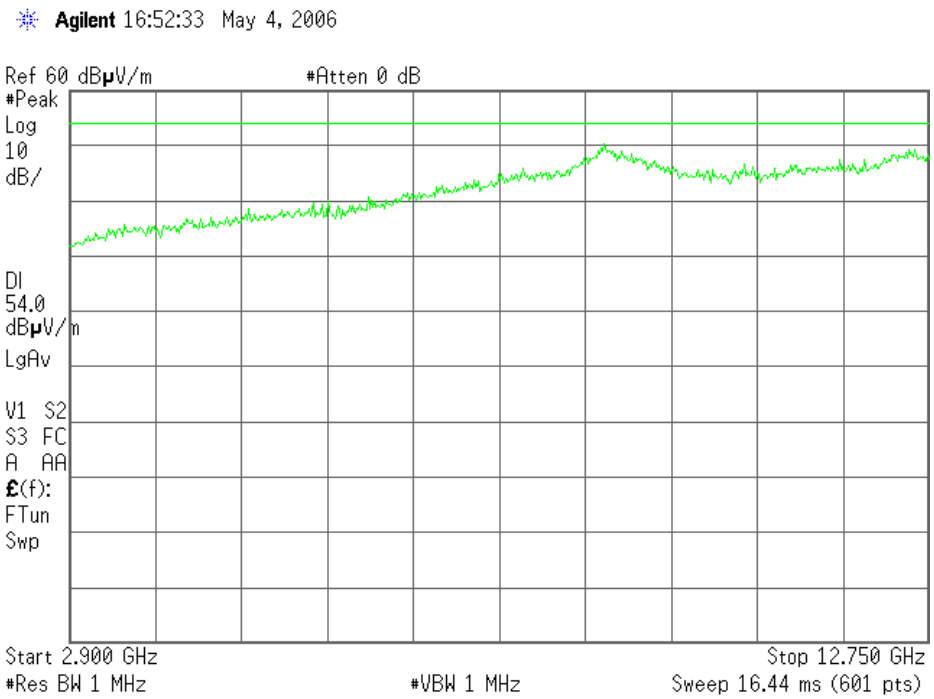
Note: The peak above the limit is the carrier frequency.

CHANNEL: Highest (2480 MHz).



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

FREQUENCY RANGE 2.9 GHz to 12.75 GHz.

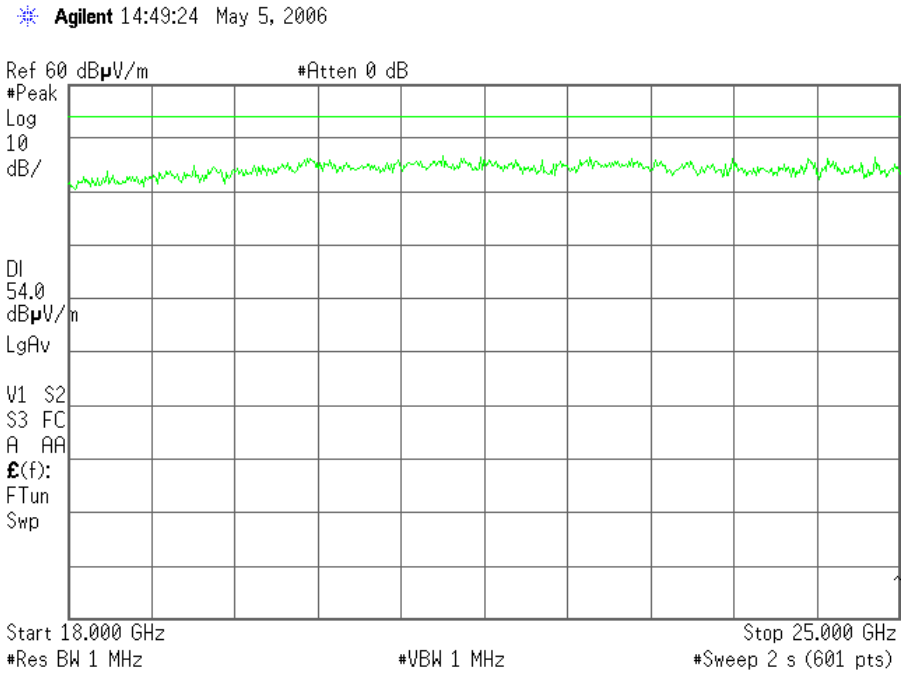


(This plot is valid for all three channels).

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 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.

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-25 GHz.

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.
No spurious signals were found in all the range

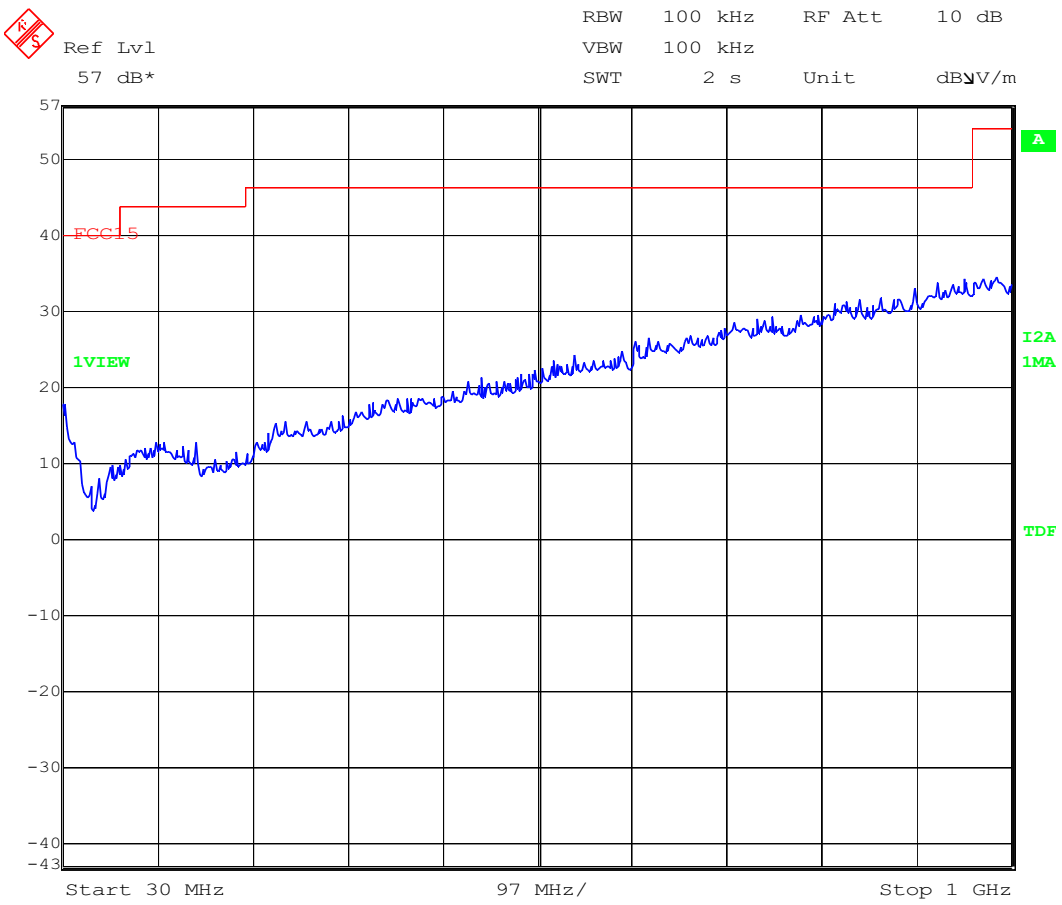
Frequency range 1 GHz-25 GHz.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
1720.420	V	Peak	39.51	± 4.0
1720.420	V	Average	39.08	± 4.0

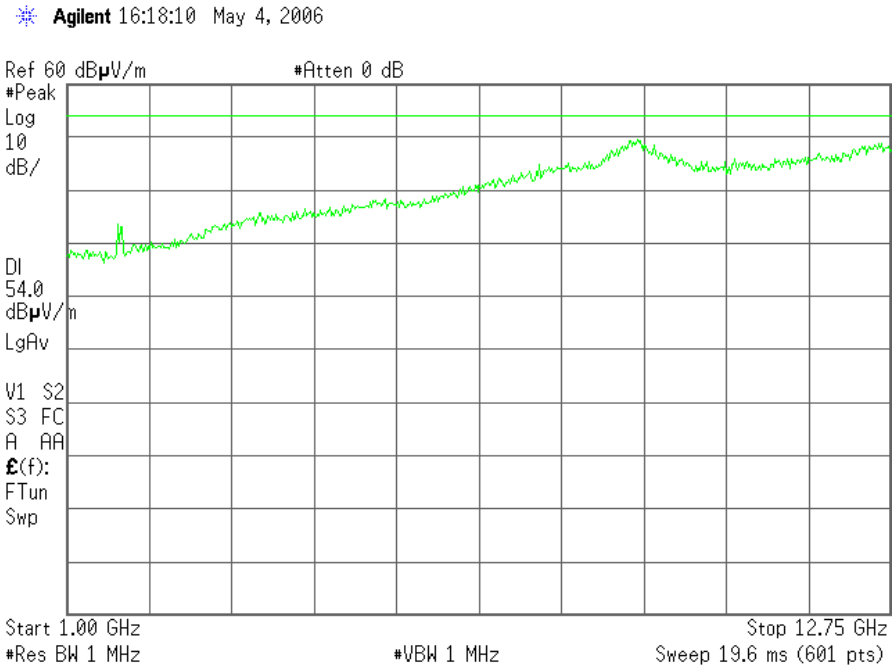
Additionally, no spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz.

Verdict: PASS.

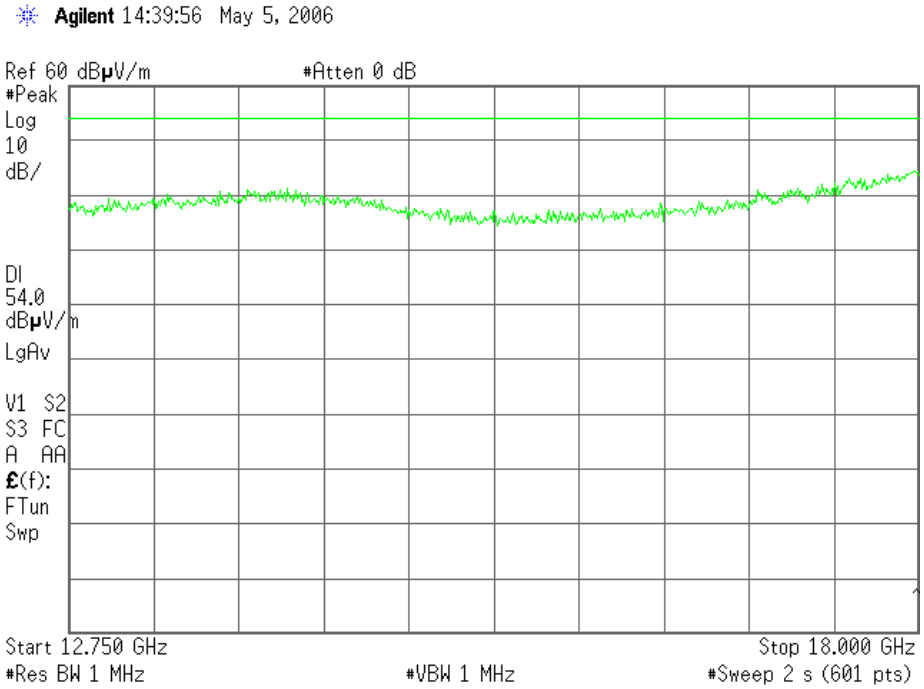
FREQUENCY RANGE 30 MHz-1000 MHz.



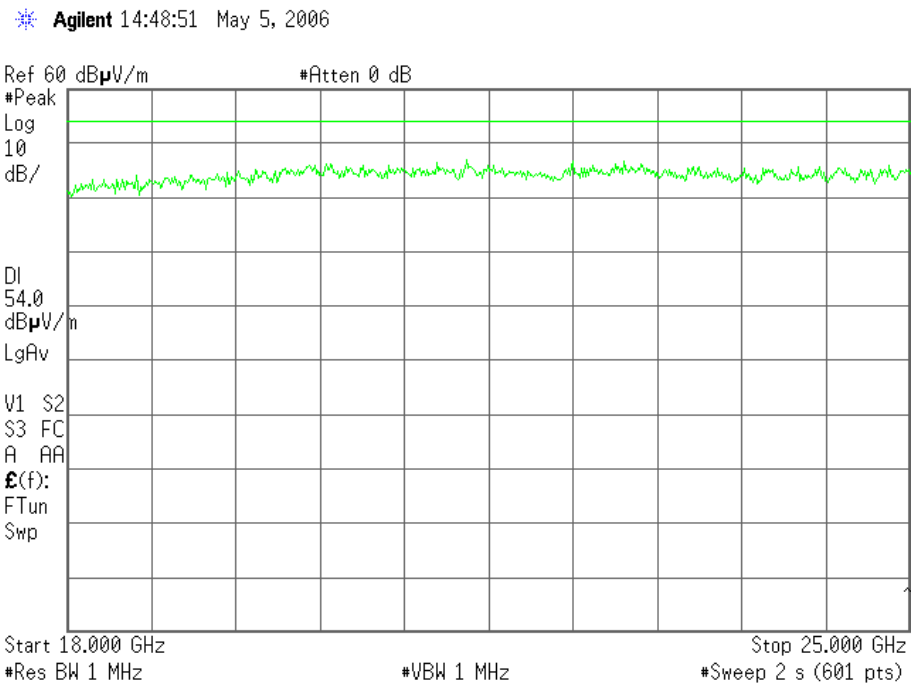
FREQUENCY RANGE 1 GHz-12.75 GHz.



FREQUENCY RANGE 12.75 GHz-18 GHz.



FREQUENCY RANGE 18 GHz-25 GHz.



ANNEX B
TEST RESULTS
C-UAF48 (MIDRCVR)

Report No: 22855RET.102

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TEST CONDITIONS

Power supply (V):

$V_{nominal}$ = 5.0 Vdc

Type of power supply = USB port

Type of antenna = Integral antenna

Maximum Declared Gain for antenna = -1 dBi

Operating Temperature Range (ºC):

T_n = 0 to + 40

TEST FREQUENCIES:

Lowest channel: 2402 MHz

Middle channel: 2441 MHz

Highest channel: 2480 MHz

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

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to a Bluetooth signalling unit (Bluetooth test set) and to the spectrum analyser using a 6 dB power splitter. The reading in the spectrum analyser is corrected taking into account the power splitter loss.

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 (a) (1). 20 dB Bandwidth and Carrier frequency separation

SPECIFICATION

Frequency hopping system shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

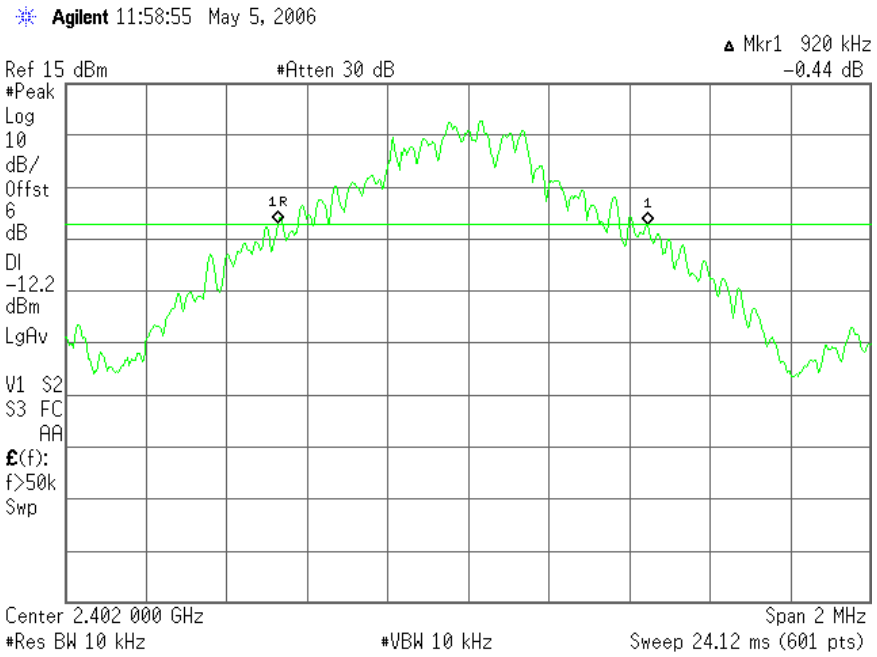
RESULTS

20 dB Bandwidth (see next 3 plots).

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20 dB Spectrum bandwidth (kHz)	920	923	927
Measurement uncertainty (kHz)	±11		

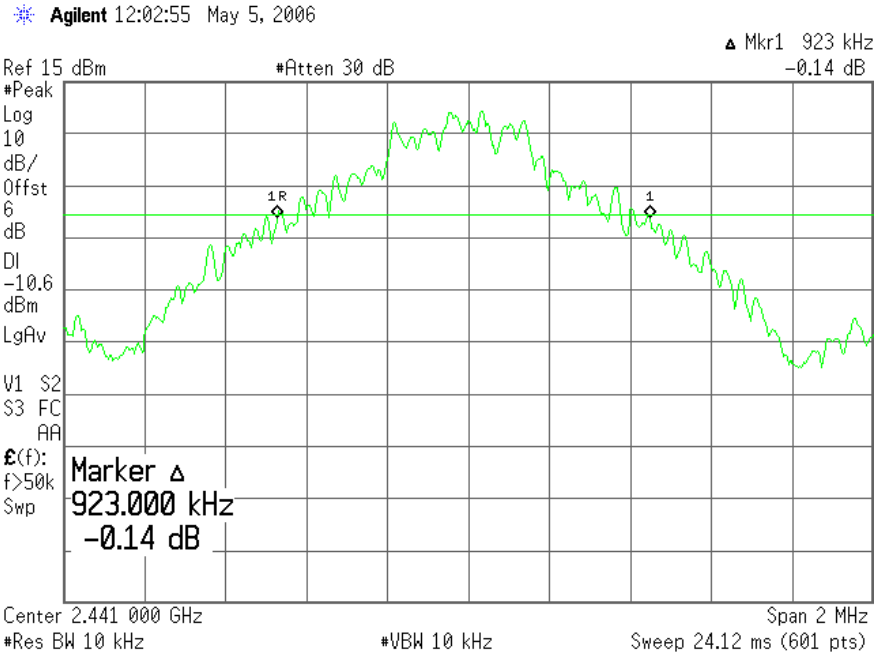
20 dB BANDWIDTH.

Lowest Channel: 2402 MHz.



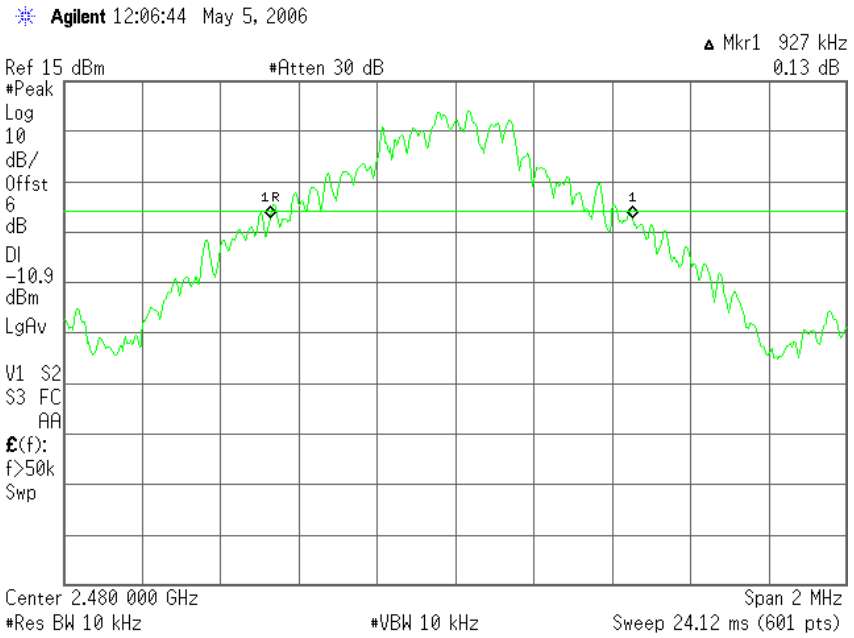
20 dB BANDWIDTH.

Middle Channel: 2441 MHz.

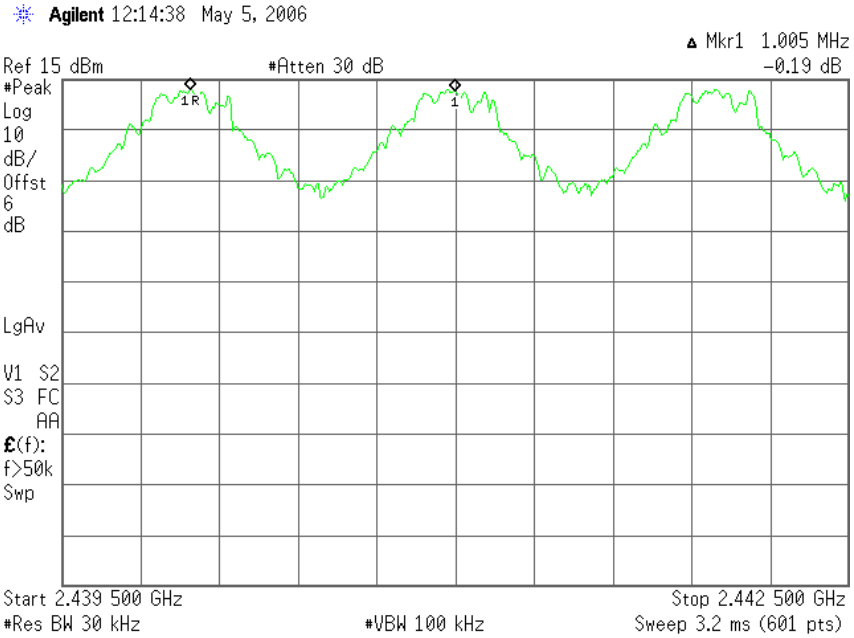


20 dB BANDWIDTH.

Highest Channel: 2480 MHz.



Carrier frequency separation (see next plot).



The hopping channel carrier frequencies are separated by a minimum of the 20 dB bandwidth of the hopping channel.

Verdict: PASS

Section 15.247 Subclause (a) (1) (iii). Number of hopping channels

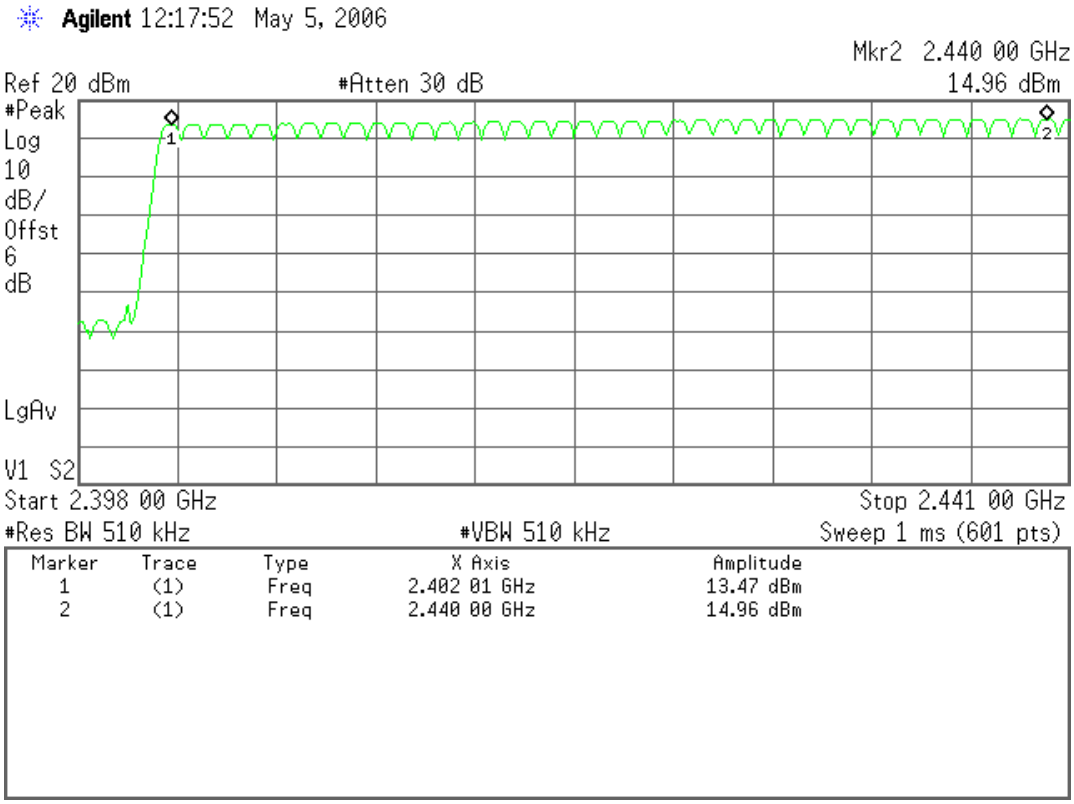
SPECIFICATION

Frequency hopping system in the 2400-2483.5 MHz band shall use at least 15 non-overlapping channels.

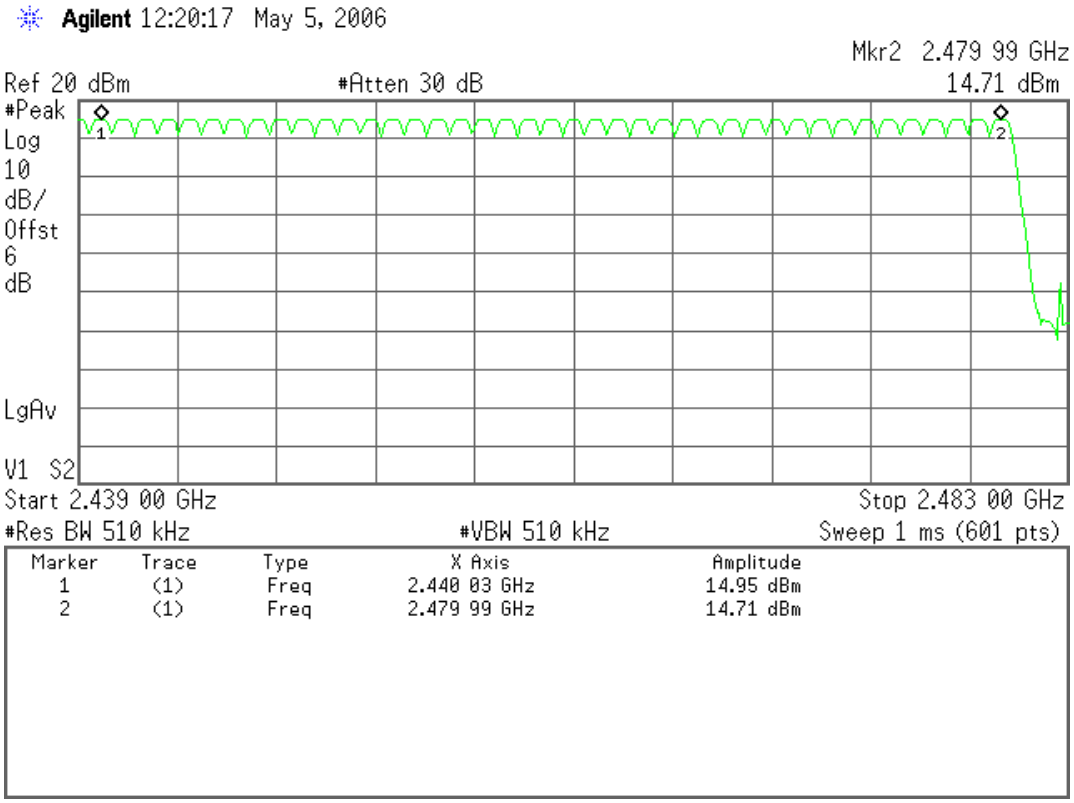
RESULTS

The number of hopping channels is 79 (see next two plots).

Number of hopping frequencies: 39



Number of hopping frequencies: 40



Total number of hopping frequencies: 79

Verdict: PASS

Section 15.247 Subclause (a) (1) (iii). Time of occupancy (Dwell Time)

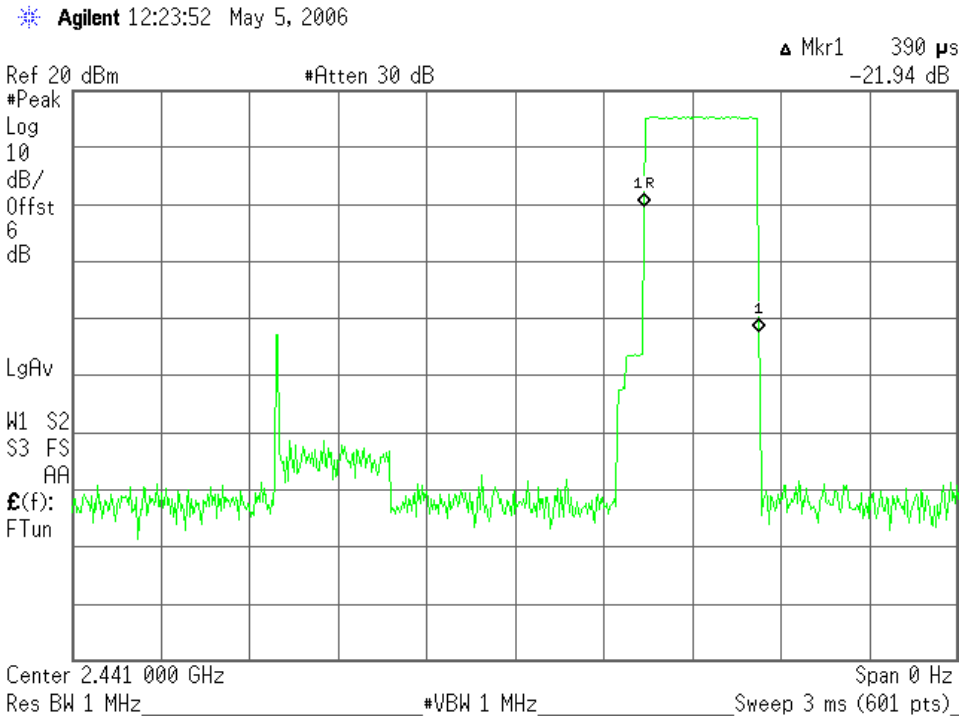
SPECIFICATION

The average time of occupancy on any channel shall not be greater than 0.4 seconds (400 ms) within a period of 0.4 seconds multiplied by the number of hopping channels employed = 0.4 x 79= 31.6 seconds.

RESULTS

TIME OF OCCUPANCY (DWELL TIME) FOR PACKET TYPE DH1.

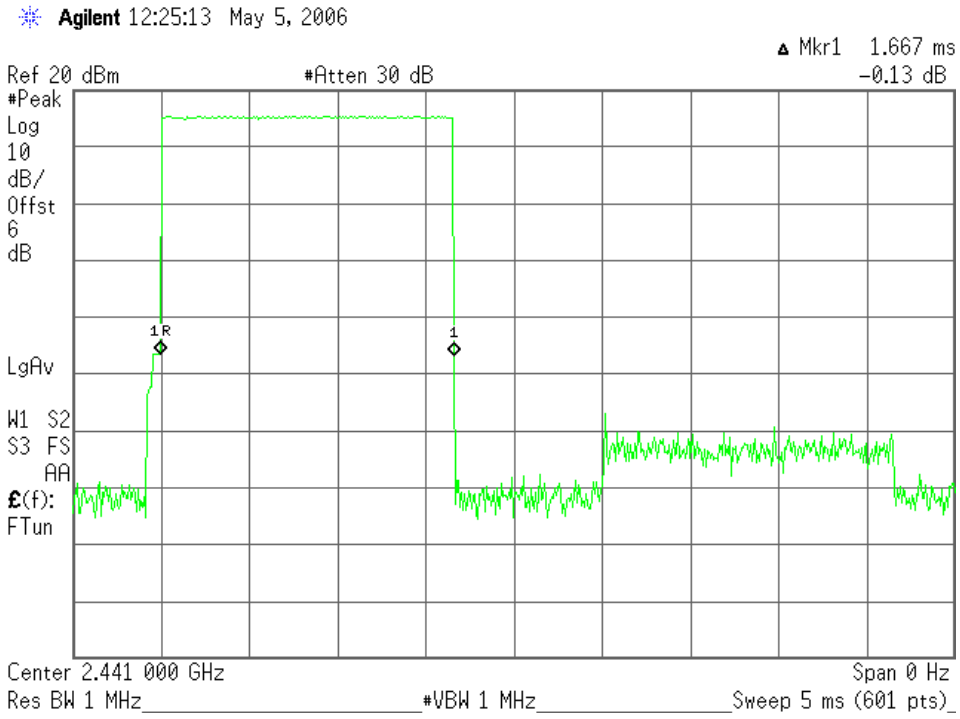
The system makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/2 = 800 hops per second with 79 channels. So you have each channel 800/79 = 10.13 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 10.13 x 31.6 = 320.11 times of appearance.
Each Tx-time per appearance is 390.00 µs (see next plot).
So we have 320.11 x 390.00 µs =124.84 ms per 31.6 seconds.



Verdict: PASS

2. TIME OF OCCUPANCY (DWELL TIME) FOR PACKET TYPE DH3.

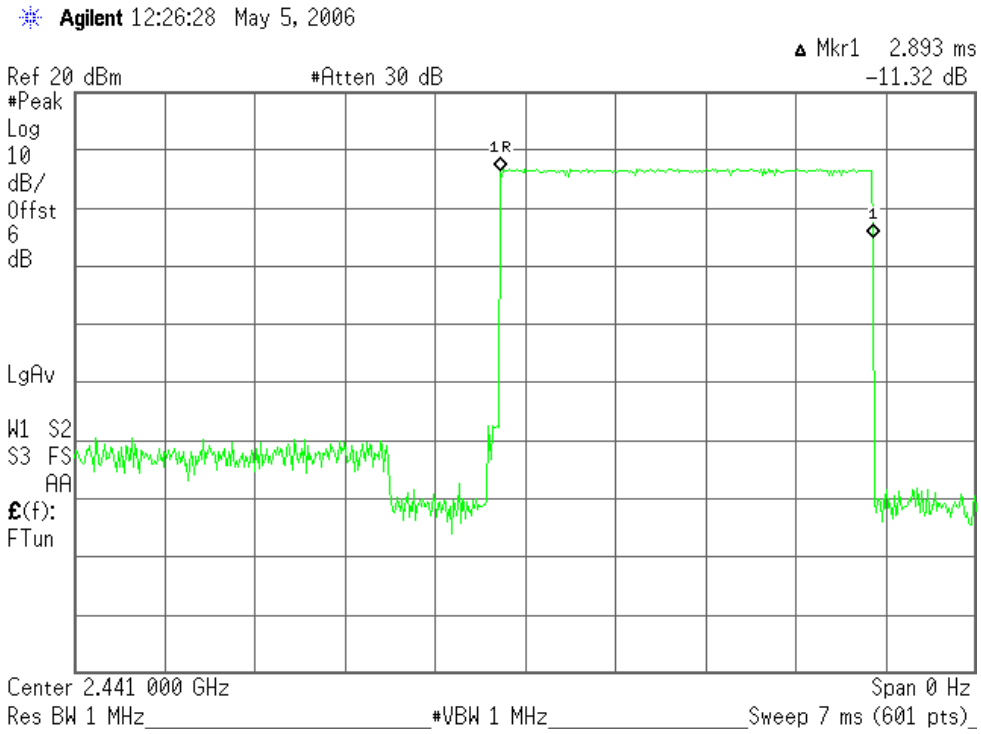
A DH3 Packet need 3 time slots for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/4 = 400 hops per second with 79 channels. So you have each channel 400/79 = 5.1 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 5.1 x 31.6 = 161.16 times of appearance.
Each Tx-time per appearance is 1.67 ms (see next plot).
So we have 161.16 x 1.67 ms = 269.14 ms per 31.6 seconds.



Verdict: PASS

3. TIME OF OCCUPANCY (DWELL TIME) FOR PACKET TYPE DH5.

A DH5 Packet need 5 time slots for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/6 = 266.67 hops per second with 79 channels. So you have each channel 266.67/79 = 3.37 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 3.37 x 31.6 = 106.49 times of appearance.
Each Tx-time per appearance is 2.89 ms (see next plot).
So we have 106.49 x 2.89 ms = 307.76 ms per 31.6 seconds.



Verdict: PASS

Section 15.247 Subclause (b). Maximum peak output power and antenna gain

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 (CONDUCTED). See next plots.

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Maximum peak power (dBm)	13.83	15.30	15.29
Measurement uncertainty (dB)	±1.5		

The maximum declared antenna gain for this device is -1 dBi, therefore the maximum theoretical peak radiated power (EIRP) in the three measurement channels for this device is 14.30 dBm or 26.91 mW.

The actual peak radiated power (EIRP) was measured for the lowest, middle and highest frequency (see next plots):

MAXIMUM PEAK OUTPUT POWER (RADIATED).

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Correction Factor (dB)	35.00	35.10	35.20
Maximum EIRP peak power (dBm)	11.89	12.56	14.79
Measurement uncertainty (dB)	±4.0		

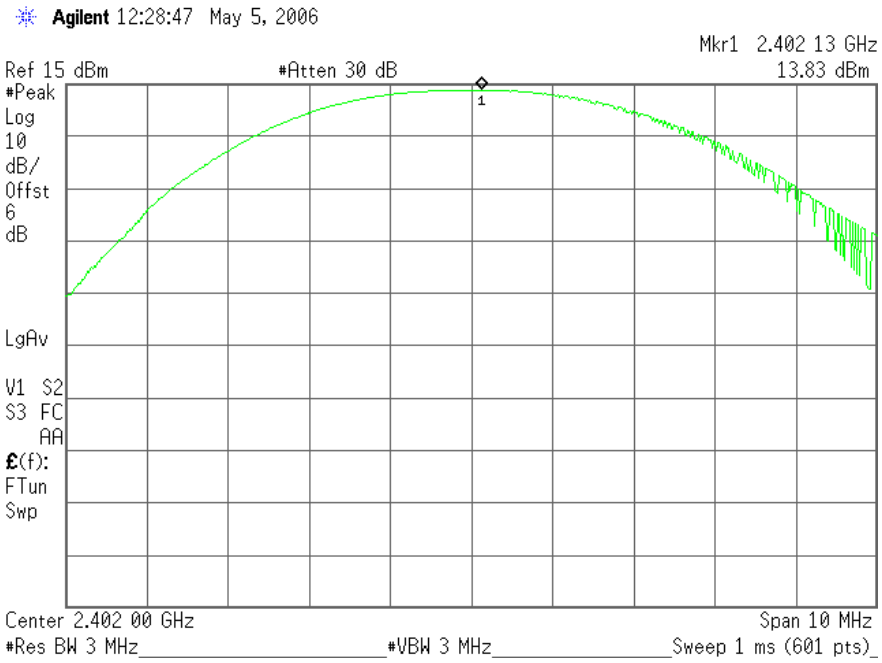
Declared peak gain: -1 dBi

The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

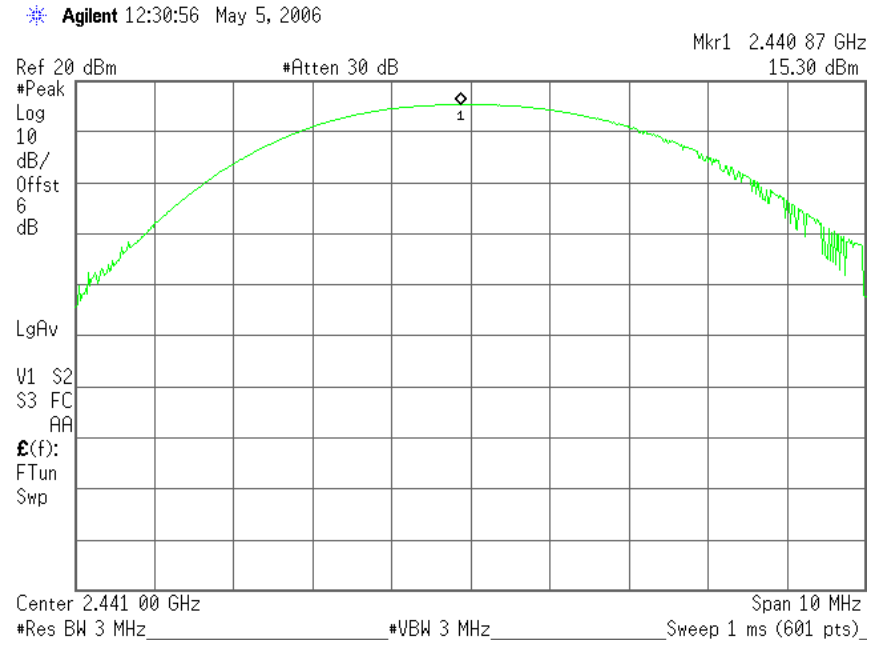
Verdict: PASS

PEAK OUTPUT POWER (CONDUCTED).

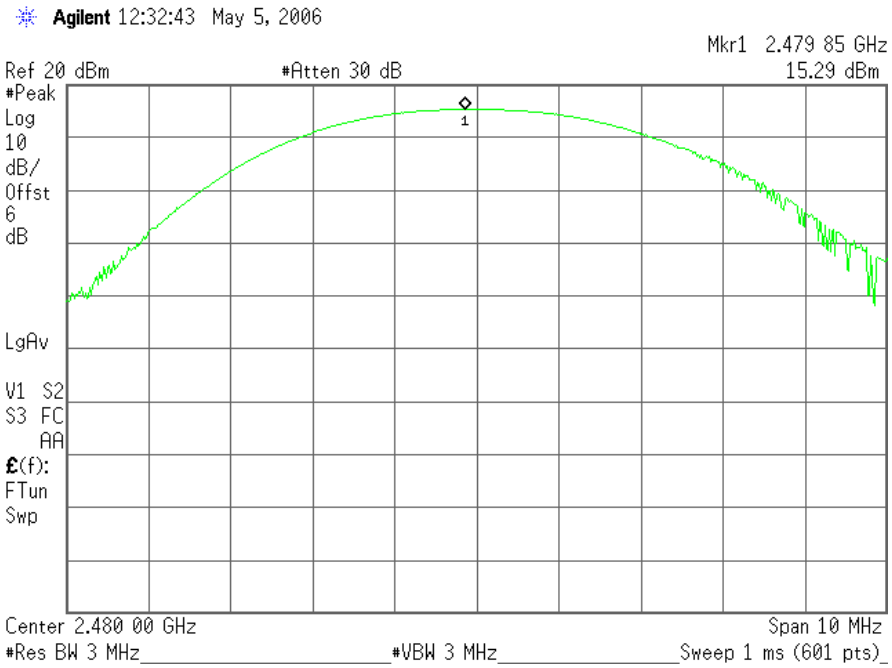
Lowest Channel: 2402 MHz.



Middle Channel: 2441 MHz.

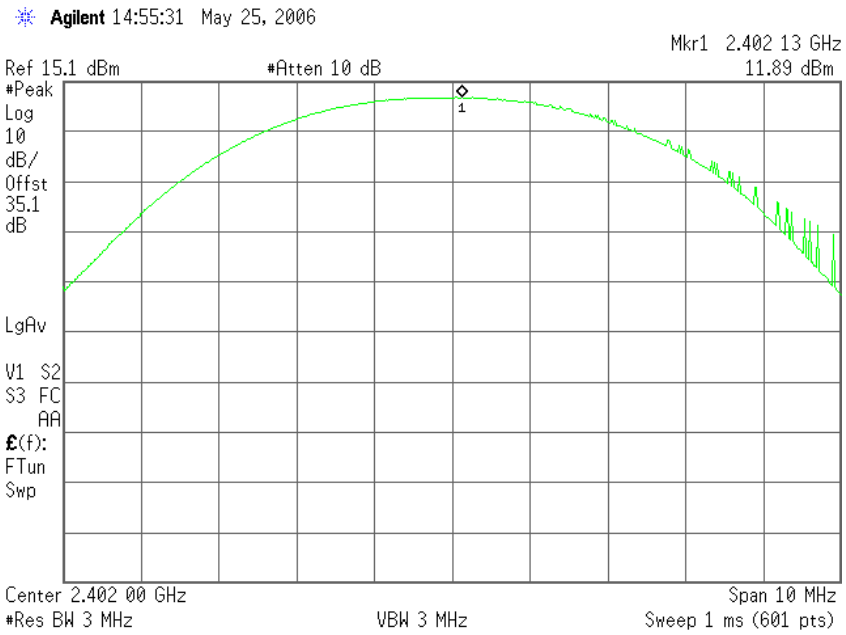


Highest Channel: 2480 MHz.

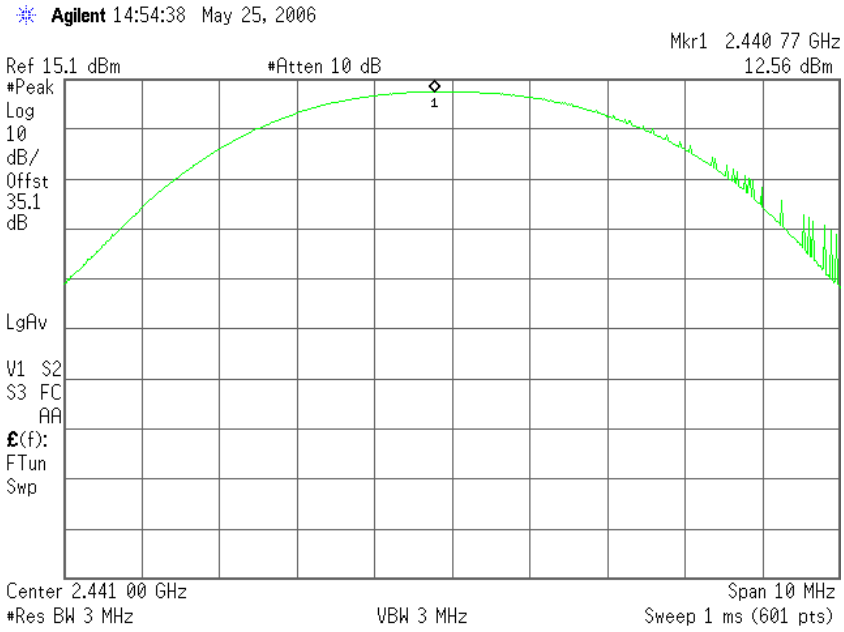


PEAK OUTPUT POWER (RADIATED).

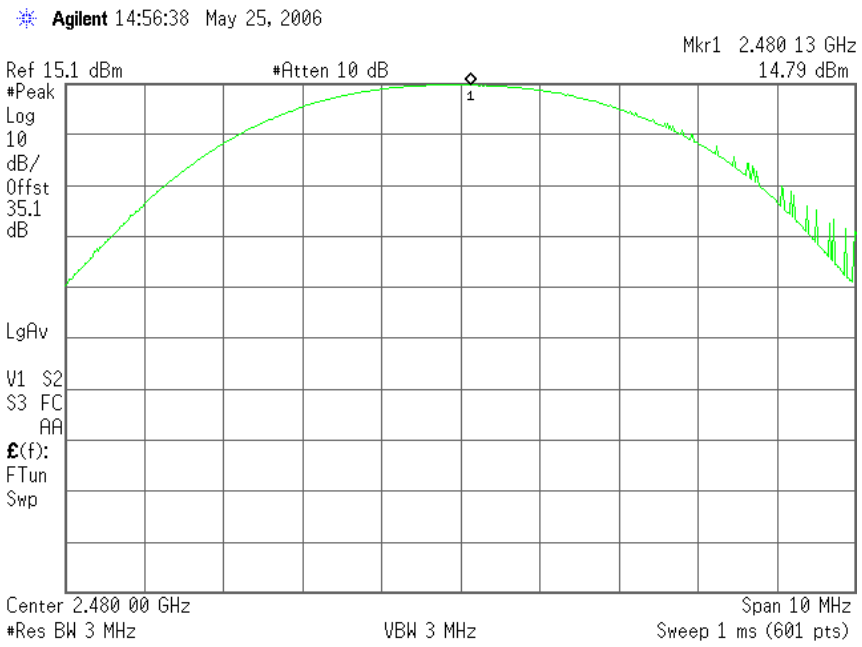
Lowest Channel: 2402 MHz.



Middle Channel: 2441 MHz.



Highest Channel: 2480 MHz.



Section 15.247 Subclause (d). Band-edge of conducted emissions (Transmitter)

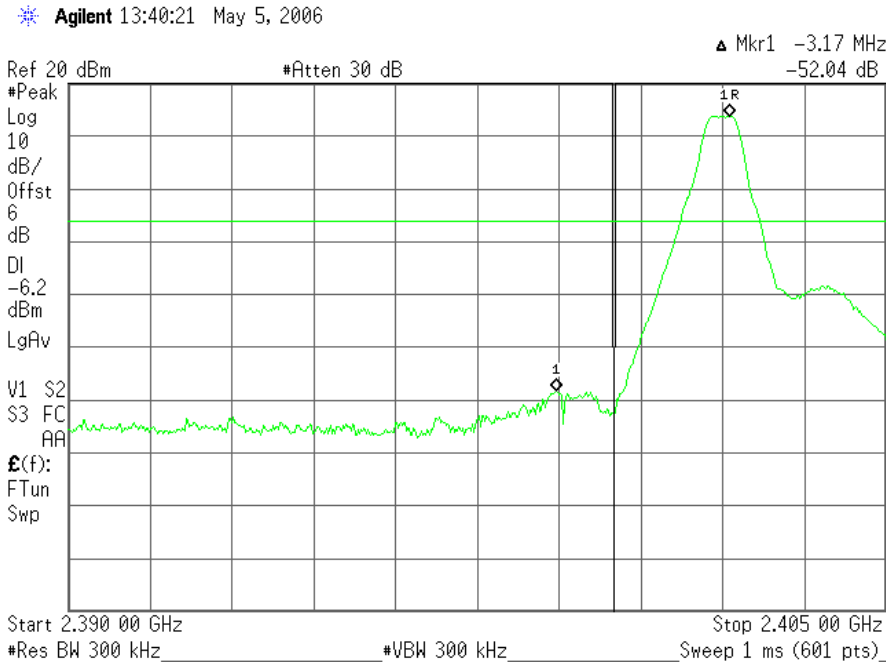
SPECIFICATION

Emissions outside the frequency band in which the intentional radiator is operating shall be at least 20dB below the highest level of the desired power.

RESULTS:

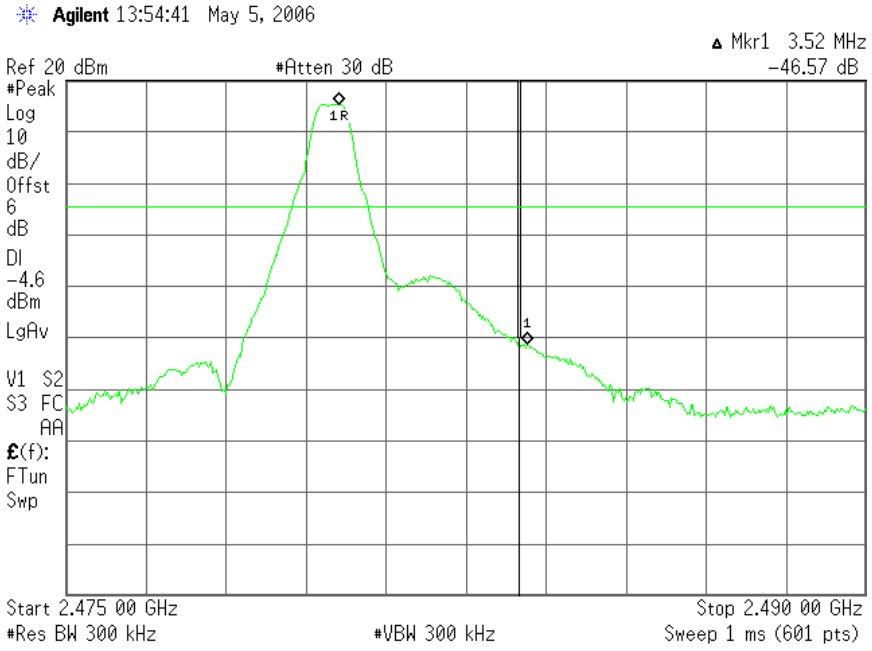
See next plots

1. LOW FREQUENCY SECTION 2402 MHz (HOPPING OFF). CONDUCTED



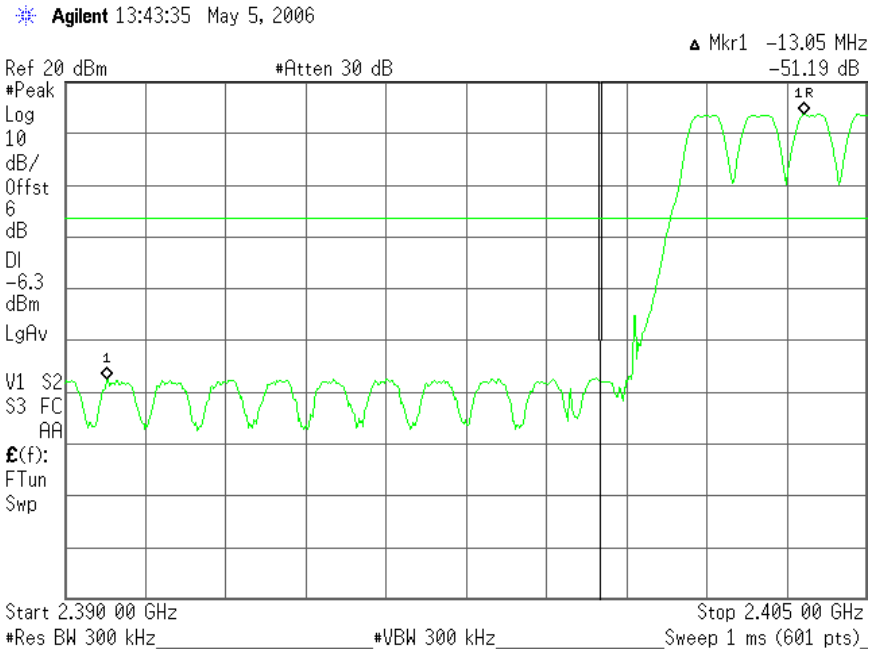
Verdict: PASS

2. HIGH FREQUENCY SECTION 2480 MHz (HOPPING OFF). CONDUCTED



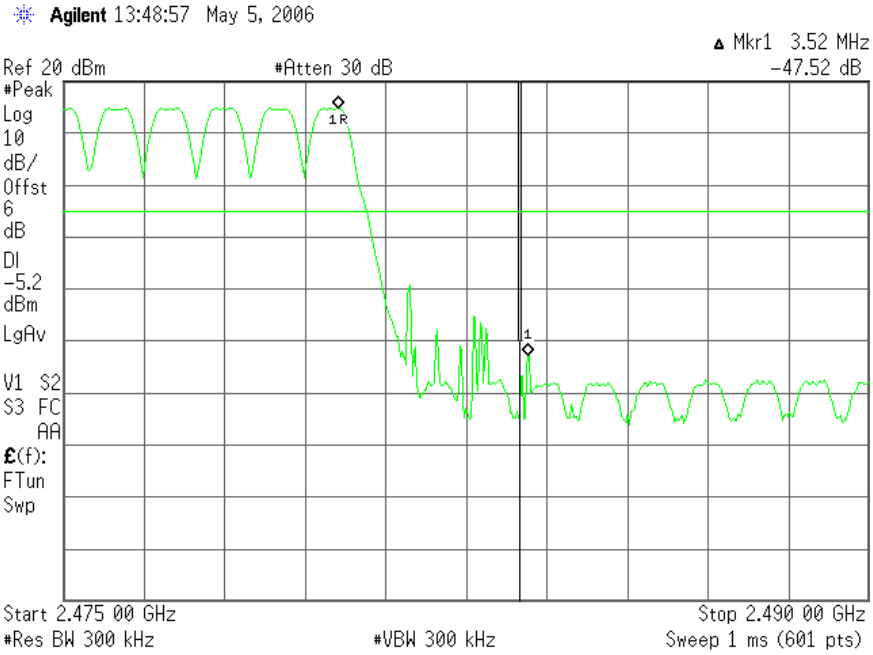
Verdict: PASS

3. LOW FREQUENCY SECTION (HOPPING ON). CONDUCTED



Verdict: PASS

4. HIGH FREQUENCY SECTION (HOPPING ON). CONDUCTED



Verdict: PASS

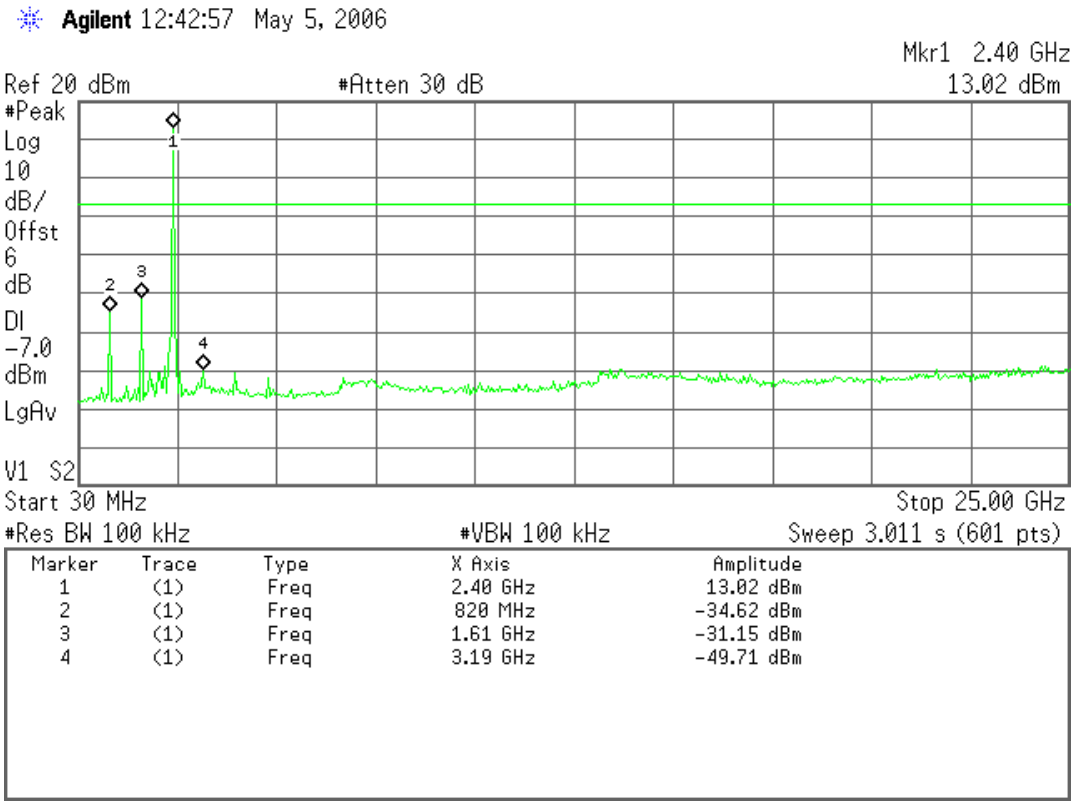
Section 15.247 Subclause (d). Emission limitations conducted (Transmitter)

SPECIFICATION

In any 100 kHz bandwidths outside the frequency band in which the intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

RESULTS:

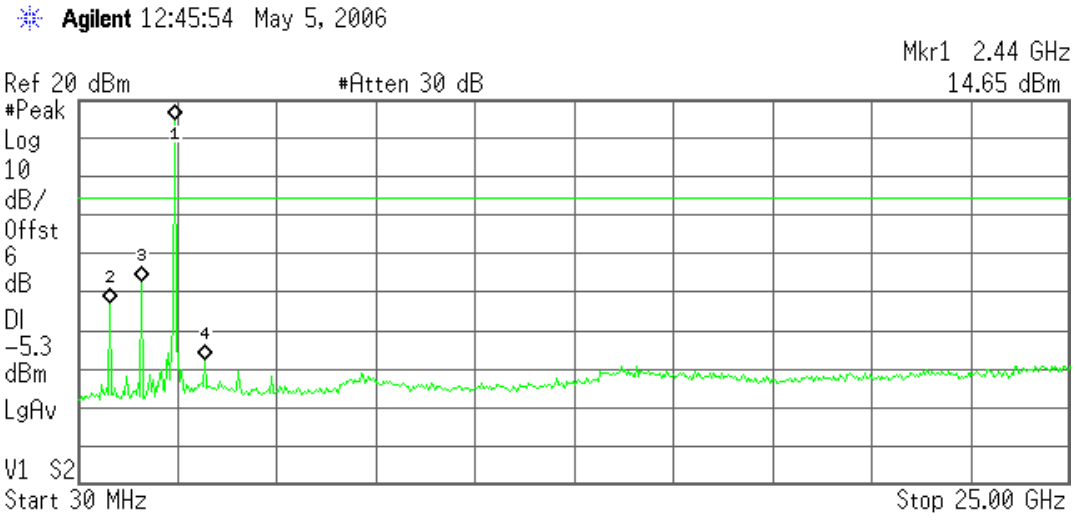
1. LOWEST CHANNEL (2402 MHz): 30 MHz-25 GHz (see next plot).



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

Verdict: PASS

2. MIDDLE CHANNEL (2441 MHz): 30 MHz-25 GHz (see next plot).

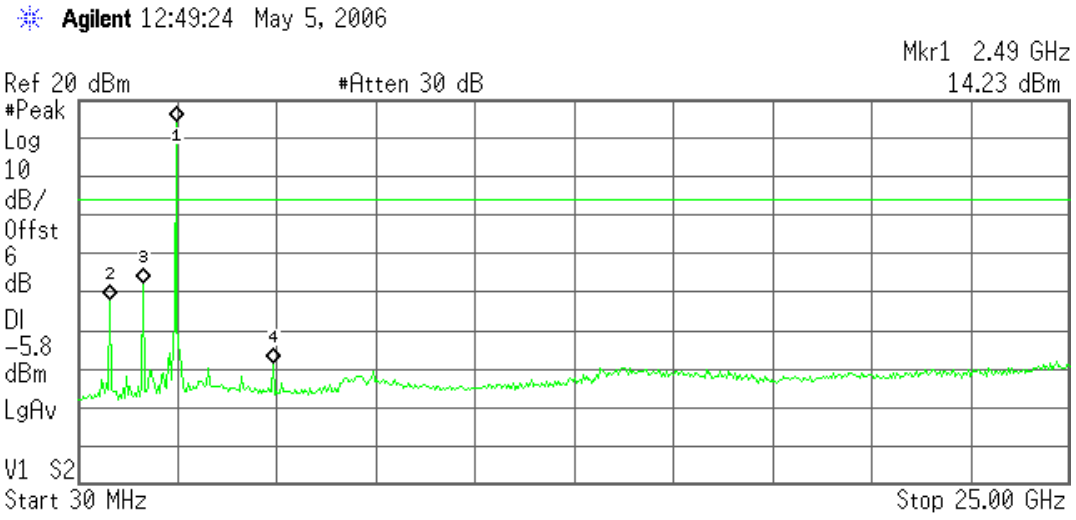


Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.44 GHz	14.65 dBm
2	(1)	Freq	820 MHz	-32.73 dBm
3	(1)	Freq	1.61 GHz	-26.98 dBm
4	(1)	Freq	3.23 GHz	-47.42 dBm

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

Verdict: PASS

3. HIGH CHANNEL (2480 MHz): 30 MHz-25 GHz (see next plot).



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.49 GHz	14.23 dBm
2	(1)	Freq	820 MHz	-31.86 dBm
3	(1)	Freq	1.65 GHz	-27.68 dBm
4	(1)	Freq	4.94 GHz	-48.50 dBm

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

Verdict: PASS

Section 15.247 Subclause (d). 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 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.

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-25 GHz.

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.

1. CHANNEL: LOWEST (2402 MHz).

Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

Frequency range 1 GHz-25 GHz.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
4804.08	H	Peak	45.19	± 4.0
4804.08	H	Average	37.97	± 4.0
7205.48	V	Peak	50.17	± 4.0
7205.48	V	Average	43.87	± 4.0

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

2. CHANNEL: MIDDLE (2441 MHz).

Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

Frequency range 1 GHz-25 GHz.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
4881.70	H	Peak	47.55	± 4.0
4881.70	H	Average	42.92	± 4.0
7322.52	V	Peak	50.73	± 4.0
7322.52	V	Average	43.93	± 4.0

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

3. CHANNEL: HIGHEST (2480 MHz).

Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

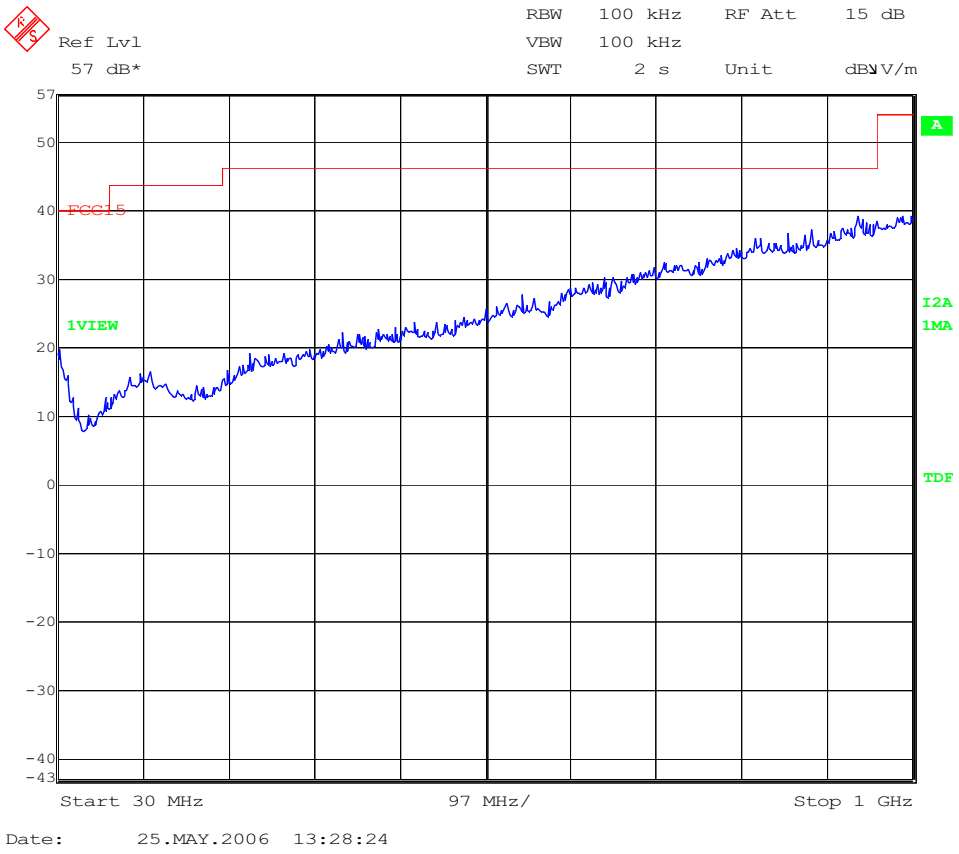
Frequency range 1 GHz-25 GHz.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
4959.95	H	Peak	46.69	± 4.0
4959.95	H	Average	42.35	± 4.0
7439.58	V	Peak	50.60	± 4.0
7439.58	V	Average	43.41	± 4.0

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

Verdict: PASS

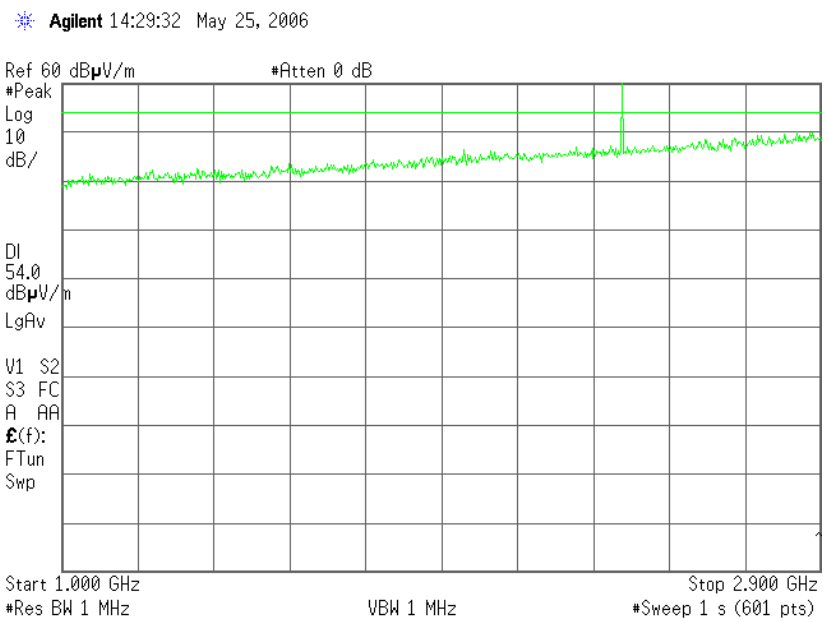
FREQUENCY RANGE 30 MHz-1000 MHz.



(This plot is valid for all three channels).

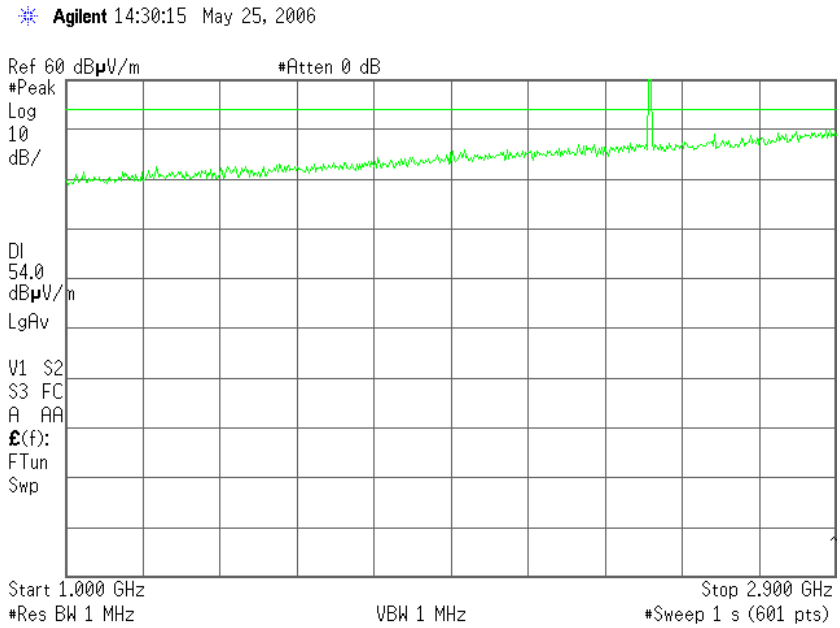
FREQUENCY RANGE 1 GHz to 2.9 GHz.

CHANNEL: Lowest (2402 MHz).



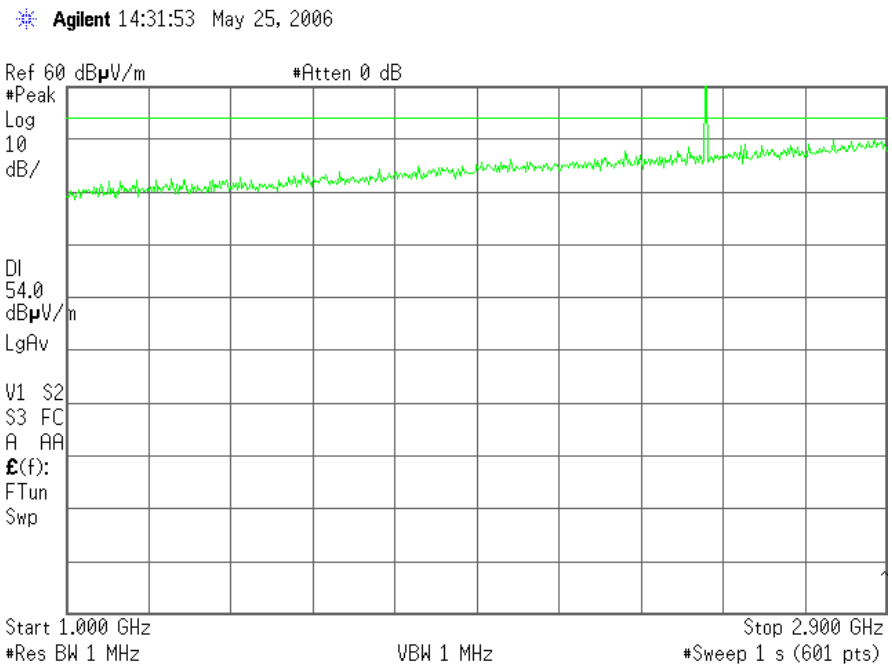
Note: The peak above the limit is the carrier frequency.

CHANNEL: Middle (2441 MHz).



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

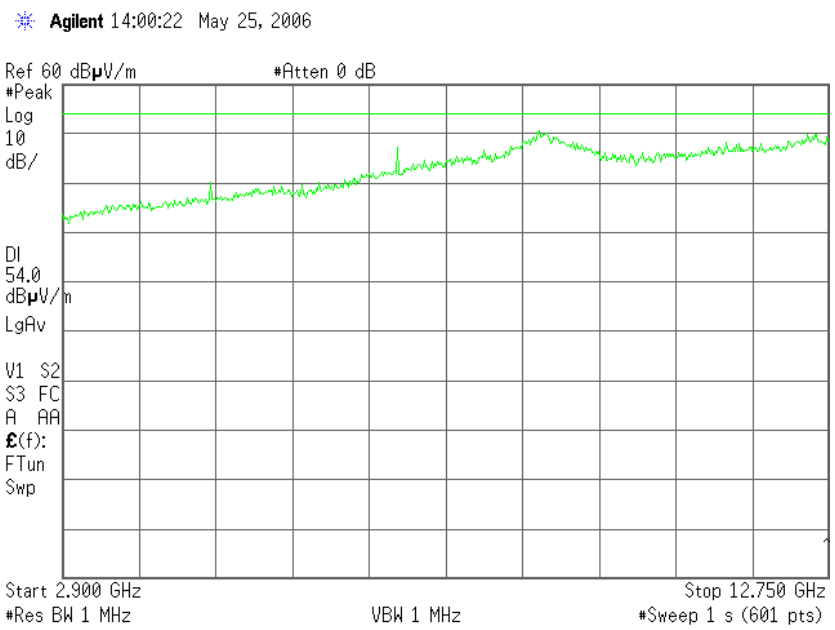
CHANNEL: Highest (2480 MHz).



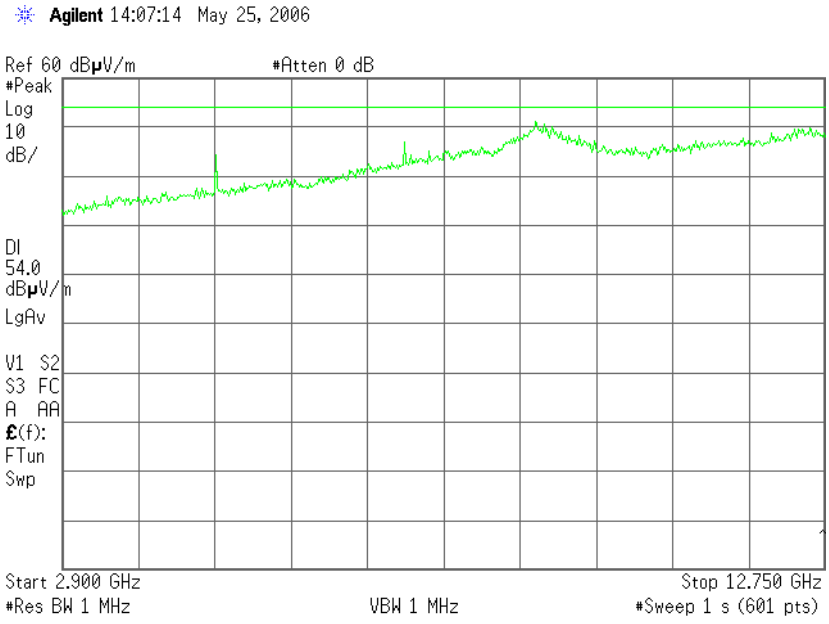
Note: The peak above the limit is the carrier frequency.

FREQUENCY RANGE 2.9 GHz to 12.75 GHz.

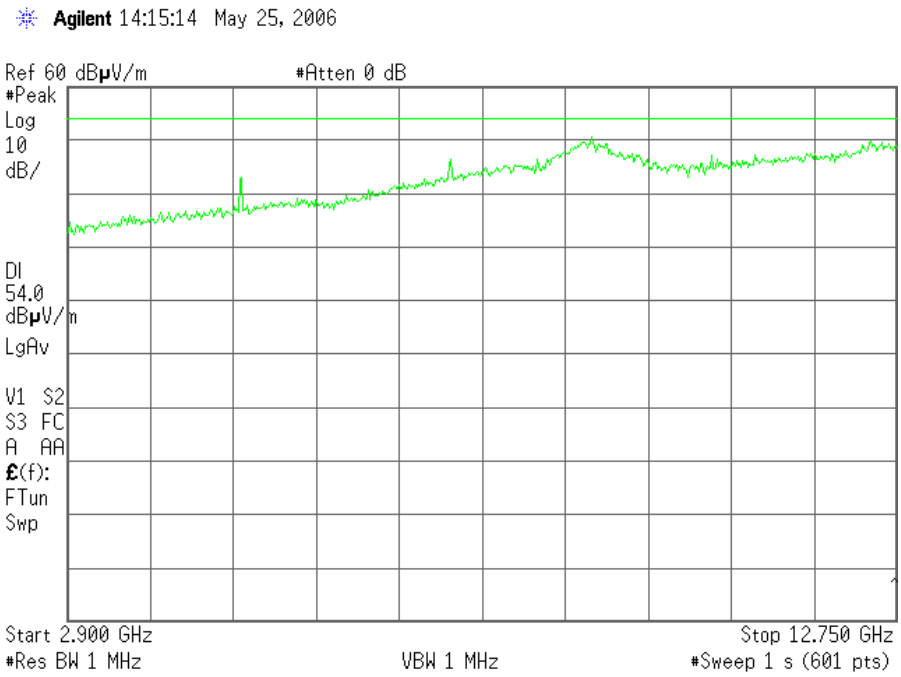
CHANNEL: Lowest (2402 MHz).



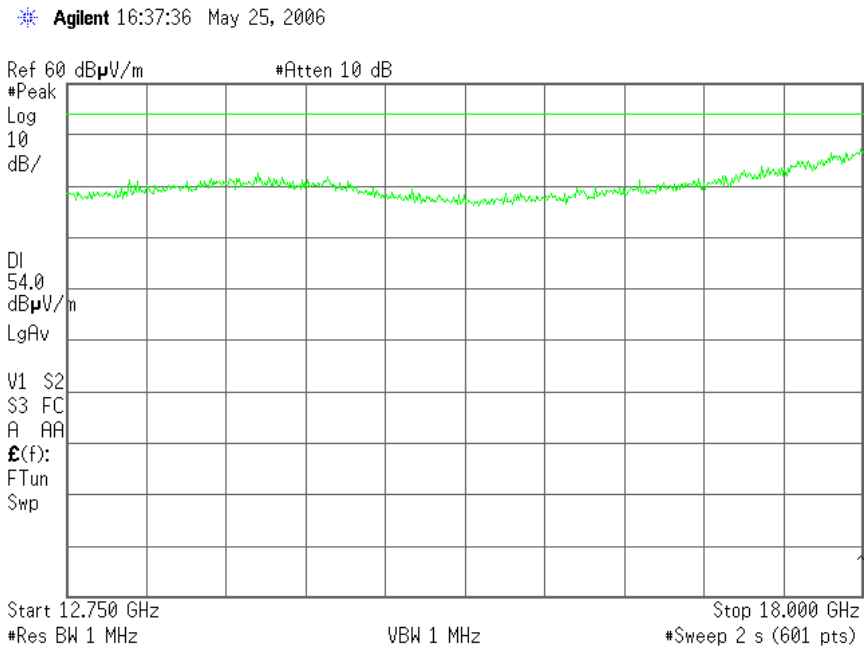
CHANNEL: Middle (2441 MHz).



CHANNEL: Highest (2480 MHz).

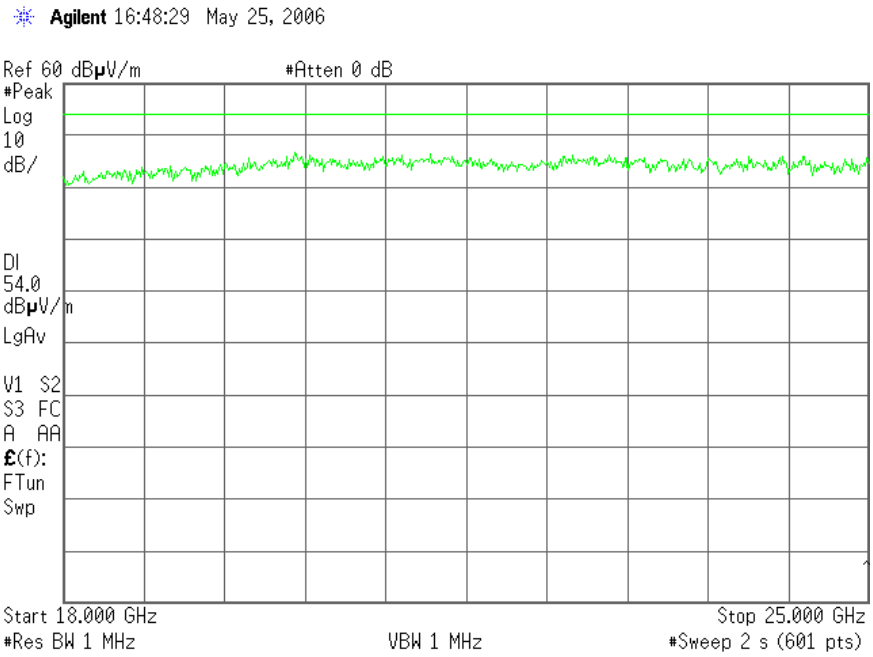


FREQUENCY RANGE 12.75 GHz to 18 GHz.



(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 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.

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-25 GHz.

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.

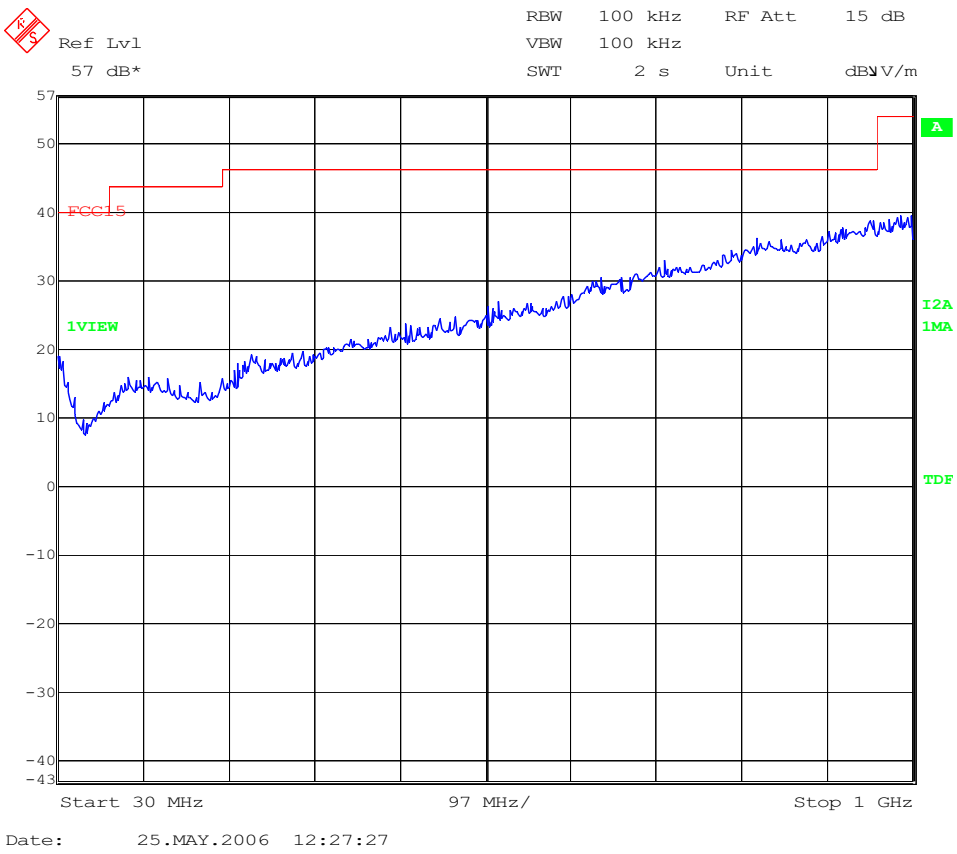
Frequency range 30 MHz-1000 MHz.
No spurious signals were found in all the range.

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

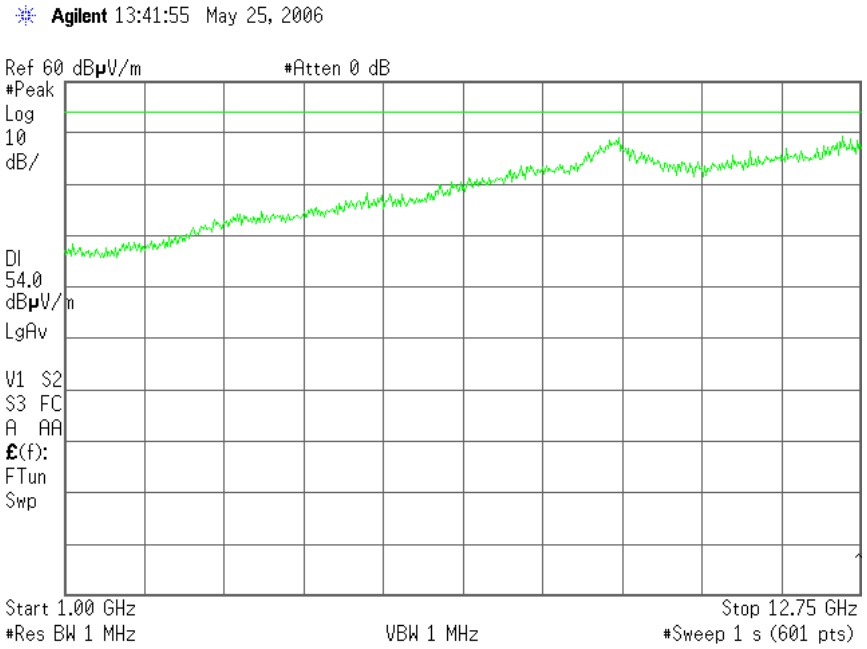
Additionally, no spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz.

Verdict: PASS.

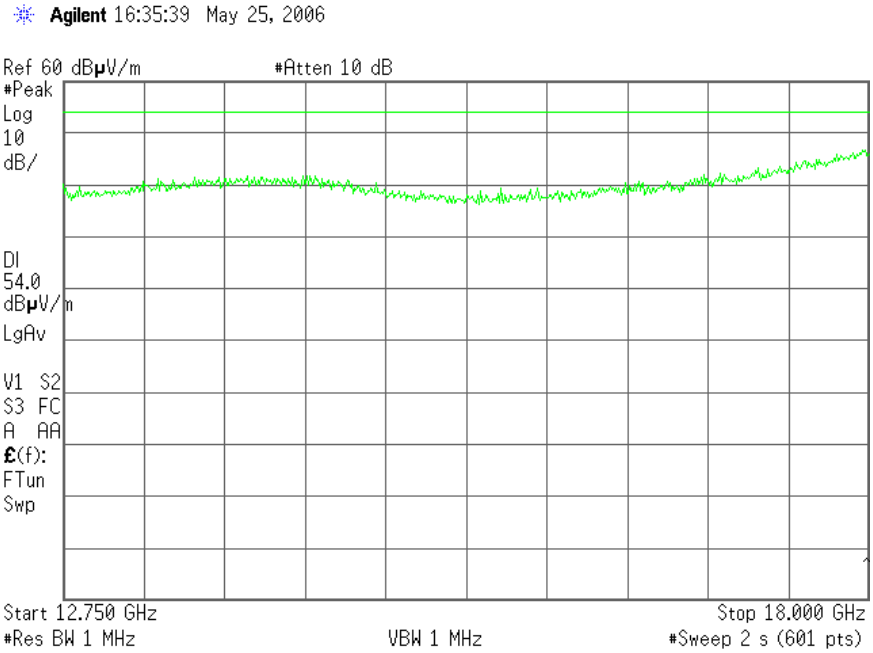
FREQUENCY RANGE 30 MHz-1000 MHz.



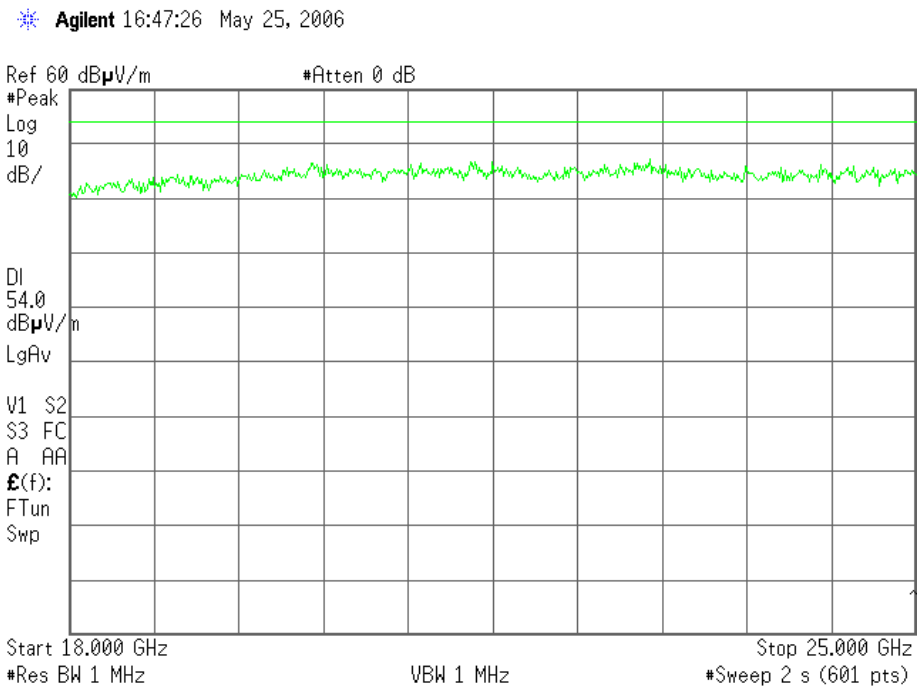
FREQUENCY RANGE 1 GHz-12.75 GHz.



FREQUENCY RANGE 12.75 GHz-18 GHz.



FREQUENCY RANGE 18 GHz-25 GHz.



ANNEX C
MEASURING RESULTS FOR
ELECTROMAGNETIC EMISSION

Report No: 22855RET.102

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.

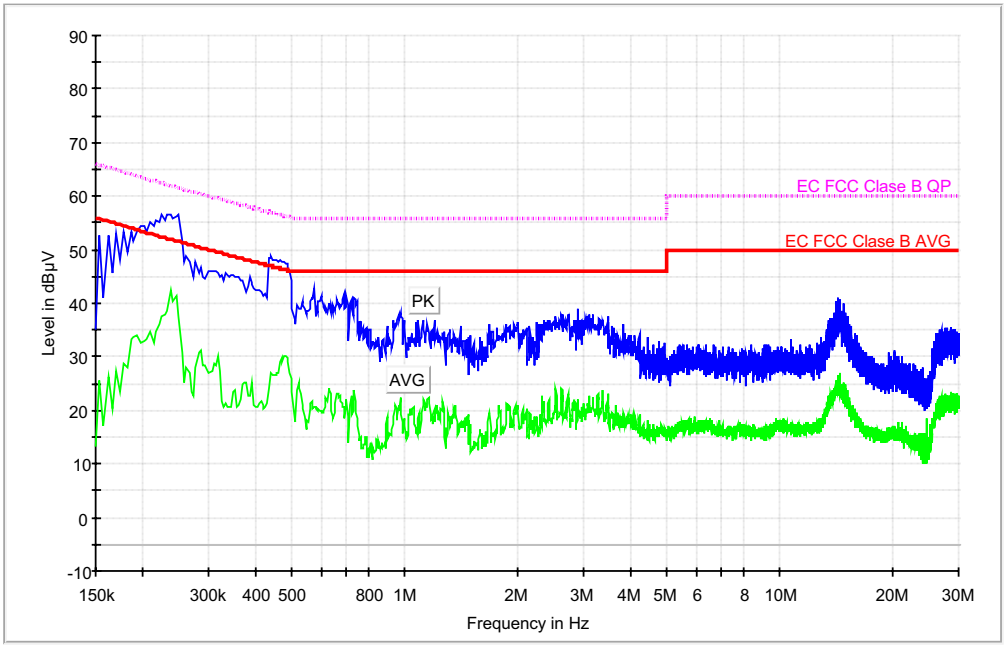
Continuous conducted emission: CC01020N (Peak and Average)

EMC32 Report

Test Information

Proyecto:	22855iem.001
Empresa:	LOGITECH
Muestra:	M/01
Modo operacion:	MO#02
Fecha:	2006-05-30 21:44
Setup:	EMI conducted
Mode:	EBP ON. Funcionamiento normal. Ruido en neutro.

EC FCC Clase B ESIB26 CC



DataReduction Detector1

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.154000	52.8	25.5
0.162000	52.7	26.3
0.234000	56.7	38.8
0.442000	48.6	27.0
0.574000	42.8	20.7
0.734000	41.1	23.7
0.974000	38.2	22.4
1.090000	37.0	18.6
1.410000	35.7	17.7
1.502000	34.0	17.3
2.002000	36.5	20.8
2.158000	35.7	19.6

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
2.250000	36.5	17.7
2.750000	37.8	21.2
2.902000	38.8	22.2
3.838000	36.1	19.1
4.442000	33.7	18.1
4.598000	32.4	17.3
4.746000	32.8	16.3
4.954000	32.6	16.5
5.654000	32.4	18.1
7.086000	32.0	17.2
7.314000	31.8	16.7
7.890000	31.6	17.4
8.362000	32.1	16.8
9.098000	32.3	16.3
9.242000	32.3	16.3
10.694000	33.3	17.6
12.062000	32.1	16.8
12.618000	32.7	17.0
12.882000	33.6	18.5
13.506000	36.7	22.6
14.078000	40.3	25.3
14.170000	40.4	24.8
14.270000	40.4	24.7
14.366000	41.0	25.6
14.546000	40.6	27.1
14.670000	38.6	24.0
14.826000	40.1	24.3
15.126000	37.4	23.7
15.578000	35.9	20.3
15.958000	34.5	19.4
16.046000	34.1	19.1
19.638000	30.7	15.8
20.170000	31.2	16.7
20.330000	31.0	16.2
20.834000	30.2	16.0
21.146000	30.0	16.0
22.234000	28.7	14.2
22.706000	28.8	15.3
23.098000	28.2	13.9
23.510000	27.4	13.0
23.706000	27.6	13.6
24.006000	28.0	15.0
25.578000	31.6	17.9
26.022000	34.5	20.8
26.734000	35.0	22.7
27.022000	35.1	22.2
28.586000	35.6	22.1
28.662000	35.4	22.2
29.434000	35.0	20.9

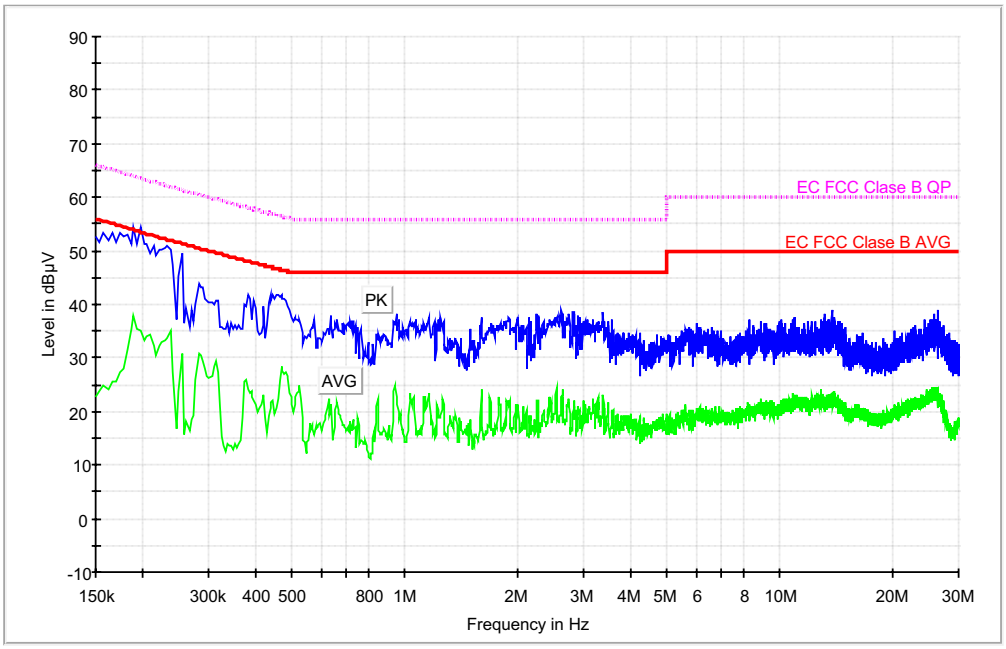
Continuous conducted emission: CC0102L1 (Peak and Average)

EMC32 Report

Test Information

Proyecto:	22855iem.001
Empresa:	LOGITECH
Muestra:	M/01
Modo operacion:	MO#02
Fecha:	2006-05-30 21:47
Setup:	EMI conducted
Mode:	EBP ON. Funcionamiento normal. Ruido en fase.

EC FCC Clase B ESIB26 CC



DataReduction Detector1

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.190000	54.5	38.0
0.254000	49.5	31.0
0.282000	43.9	30.9
0.382000	41.7	24.2
0.462000	41.8	22.4
0.950000	38.3	22.8
1.250000	37.6	19.4
1.502000	35.6	18.4
1.898000	37.7	21.0
2.154000	37.5	19.1
2.174000	36.7	17.3
2.246000	38.1	18.2
2.626000	39.0	22.7
2.818000	38.5	20.7
2.914000	37.7	19.6
3.386000	38.5	23.1
3.574000	37.2	20.0
4.694000	34.5	18.4
5.714000	35.6	19.1
5.982000	36.5	20.6
6.850000	35.0	18.8
6.946000	35.1	19.6
8.282000	37.2	21.4
8.934000	36.9	22.2
9.118000	36.5	21.5
9.262000	36.4	20.8
9.958000	36.8	21.3
10.142000	37.0	22.1
10.326000	36.4	21.9
10.918000	37.6	20.9
11.006000	37.7	23.1
11.606000	36.6	21.9
11.958000	36.9	22.2
12.122000	36.8	21.4
12.962000	37.2	24.2
13.166000	38.1	22.8
13.538000	37.4	22.9
13.742000	39.1	23.6
14.366000	37.0	22.1
14.922000	35.7	21.0
16.638000	34.7	20.3
17.018000	33.5	19.7
18.062000	33.1	18.9
18.818000	33.5	19.4
20.242000	35.2	20.3
22.642000	35.9	21.8
22.974000	36.2	21.3
24.466000	37.2	22.7
25.918000	38.2	23.9
26.454000	38.8	24.4
26.654000	36.9	22.2
28.278000	34.8	16.3
29.298000	33.1	16.9
29.482000	33.3	16.9

ANNEX D

PHOTOGRAPHS
(Number of photographs: 14)

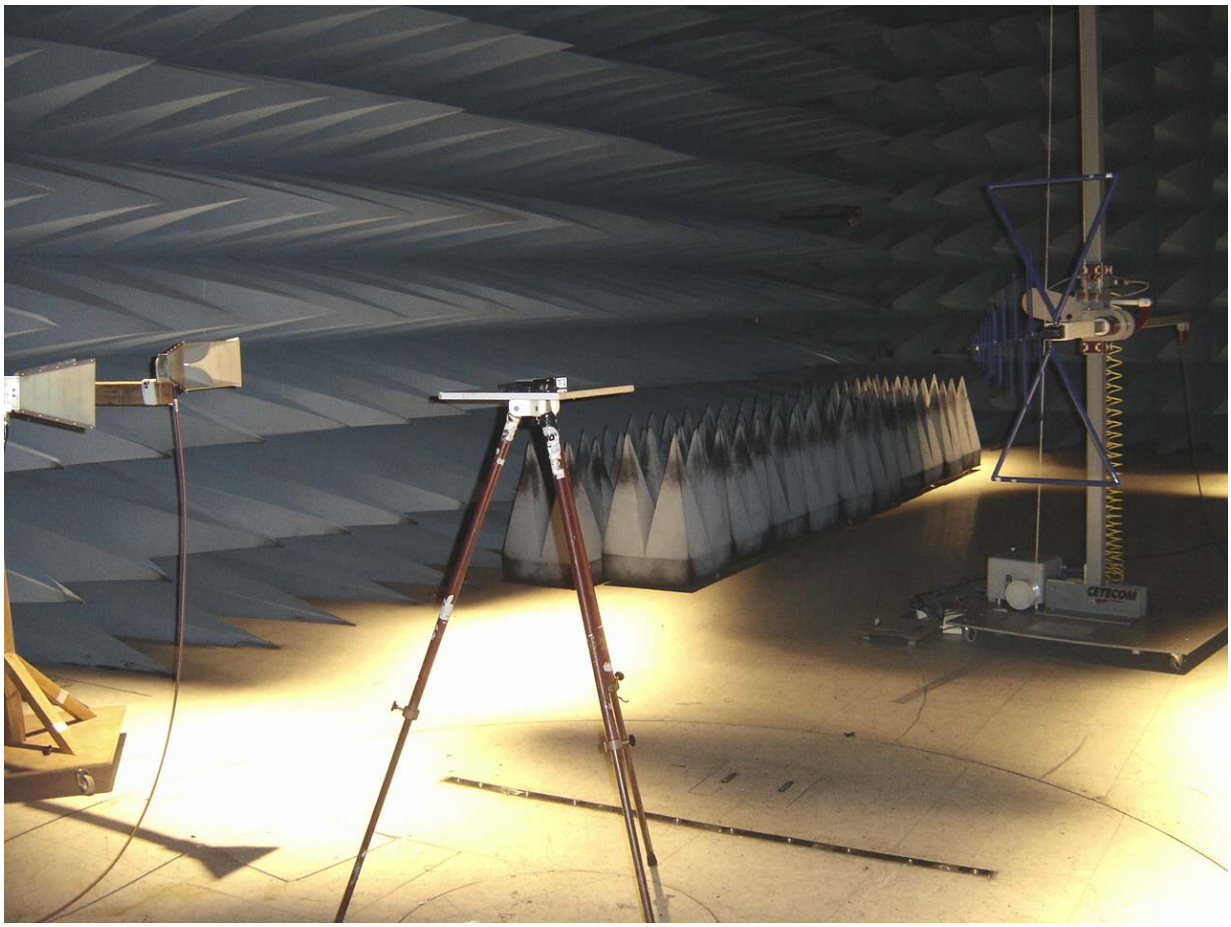
Report No.: 22855RET.102

1. Equipment C-UAF48 (RECEIVER) (front view).

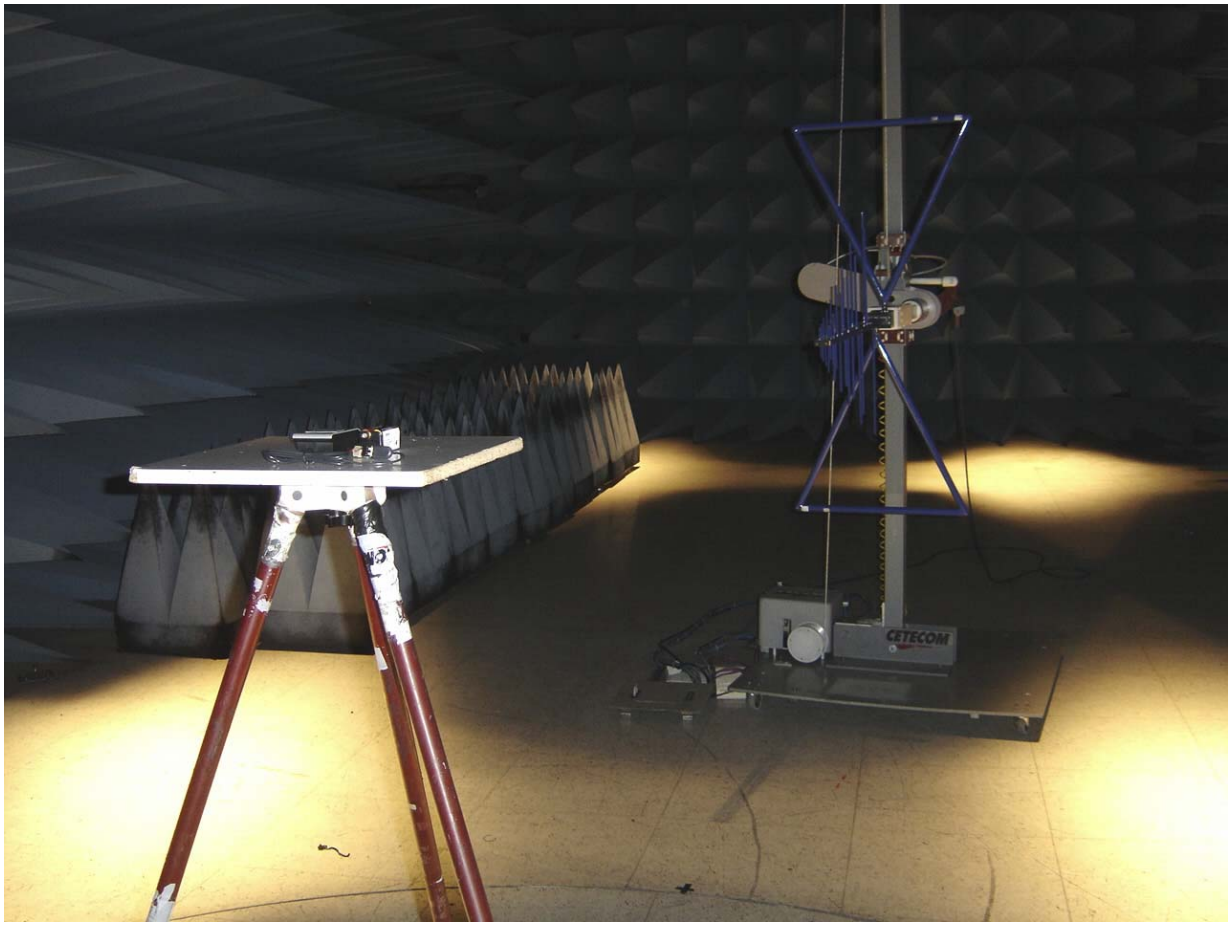
2. Equipment C-UAF48 (RECEIVER) (back view).

3. Equipment C-UAF48 (RECEIVER) for conducted measurements.

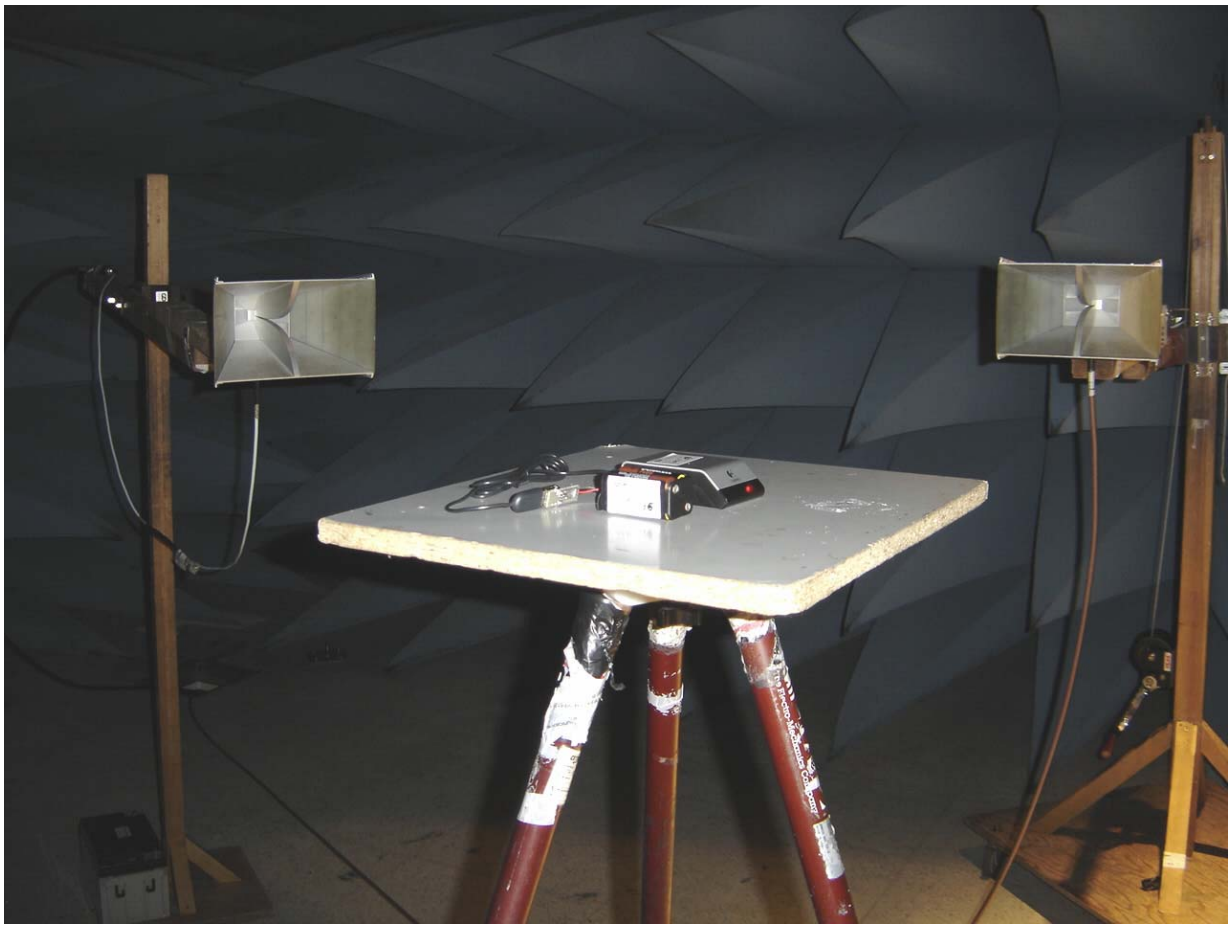
4. Equipment C-UAF48 (RECEIVER). General test set-up for radiated measurements.



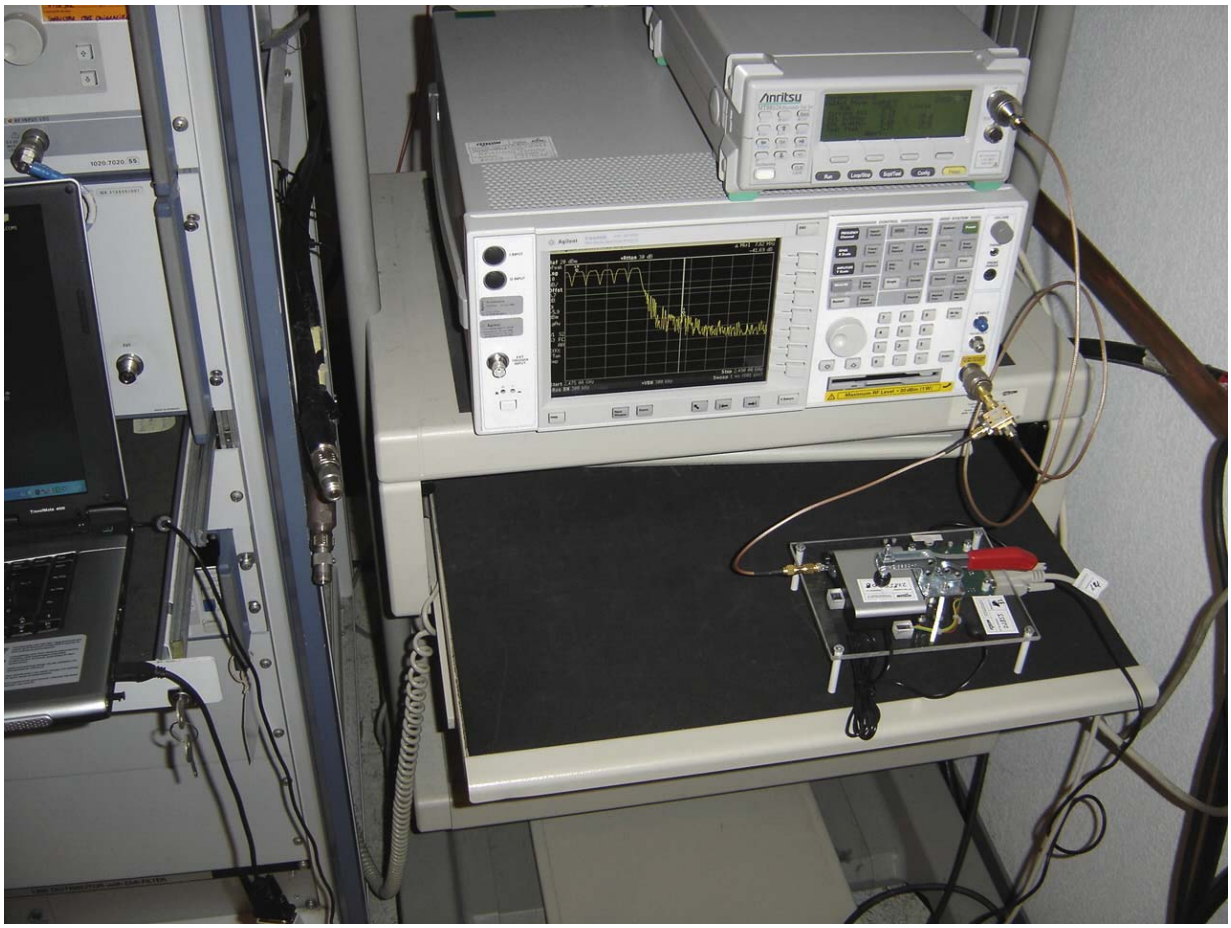
5. Equipment C-UAF48 (RECEIVER). Test set-up for radiated measurements below 1 GHz.



6. Equipment C-UAF48 (RECEIVER). Test set-up for radiated measurements above 1 GHz.



7. Equipment C-UAF48 (RECEIVER). Test set-up for conducted measurements.

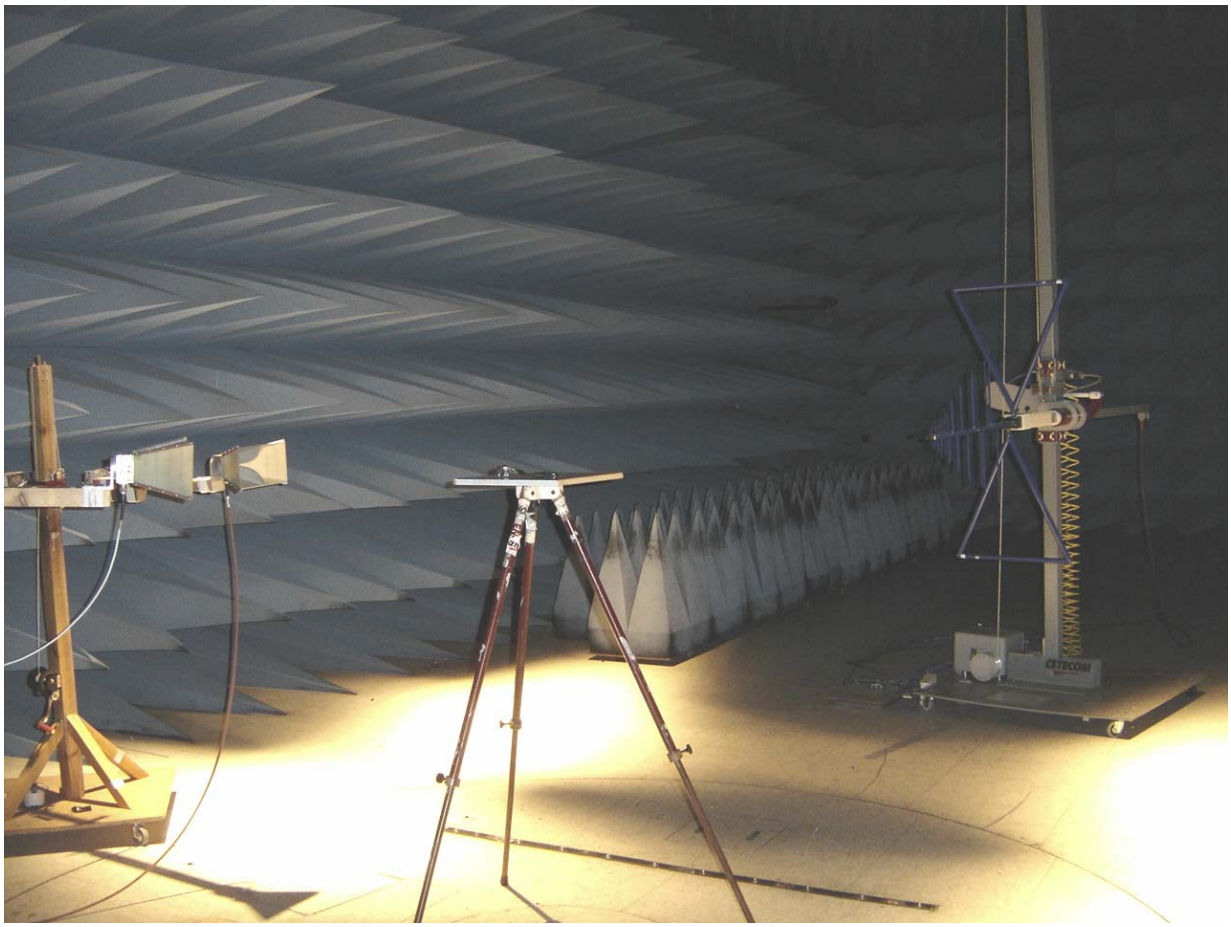


8. Equipment C-UAF48 (MIDRCVR) (front view).

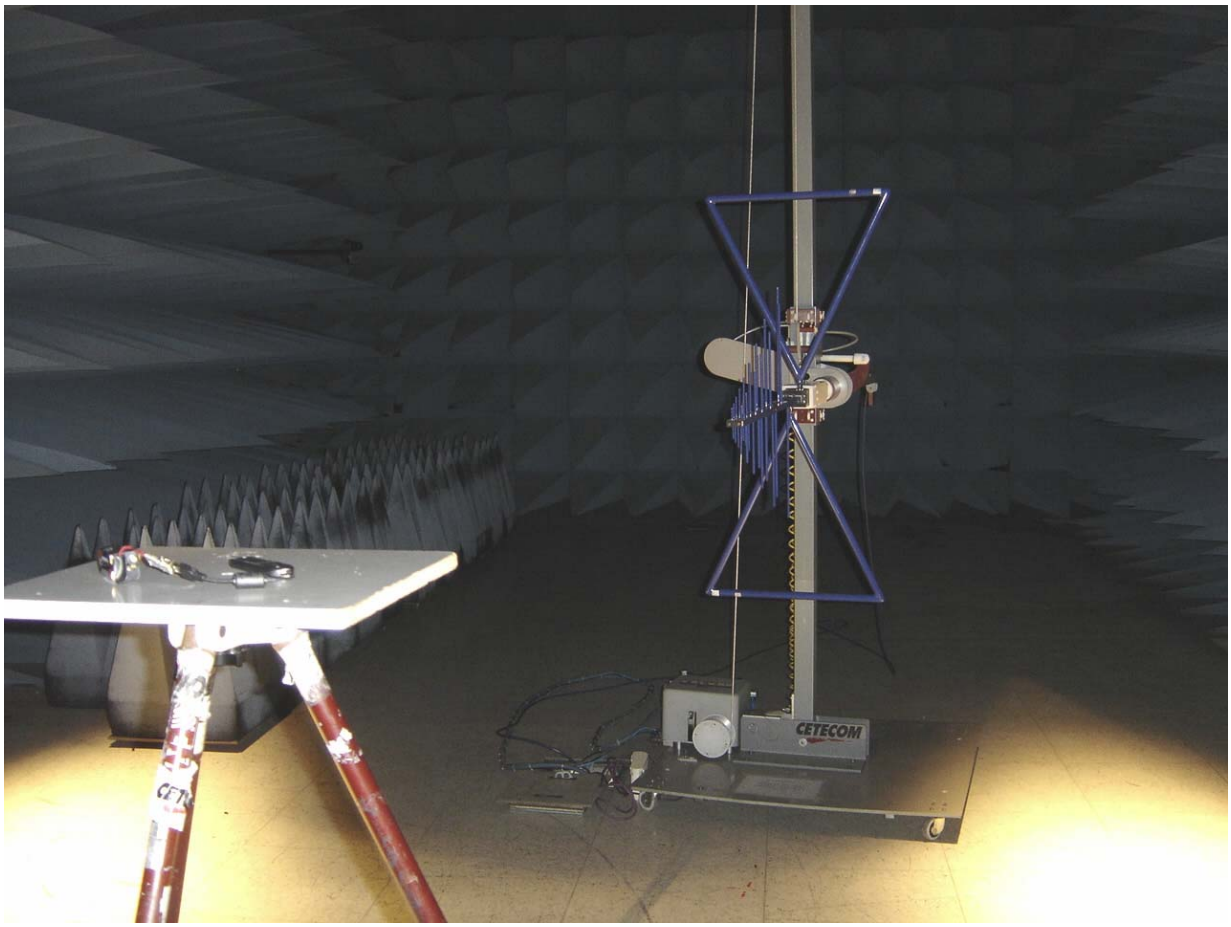
9. Equipment C-UAF48 (MIDRCVR) (back view).

10. Equipment C-UAF48 (MIDRCVR) for conducted measurements.

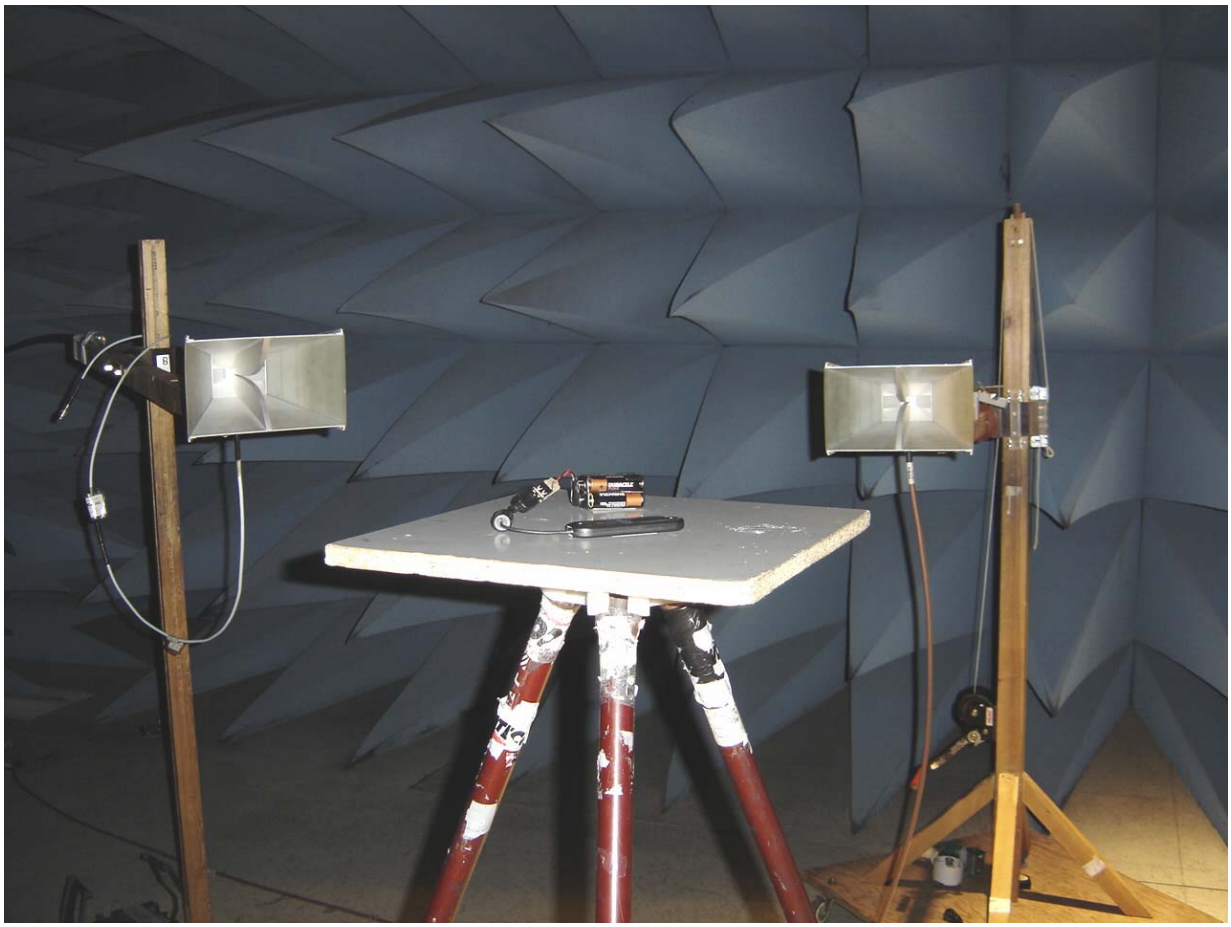
11. Equipment C-UAF48 (MIDRCVR). General test set-up for radiated measurements.



12. Equipment C-UAF48 (MIDRCVR). Test set-up for radiated measurements below 1 GHz.



13. Equipment C-UAF48 (MIDRCVR). Test set-up for radiated measurements above 1 GHz.



14. Equipment C-UAF48 (MIDRCVR). Test set-up for conducted measurements.