FCC LISTED,
REGISTRATION
NUMBER: 905266

IC LISTED,
REGISTRATION
NUMBER: IC 4621

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TEST REPORT

Report No.: 21702RET.101

TEST NAME: FCC PART 15.247 TESTING FOR BLUETOOTH RADIO DEVICE

Product	:	WIRELESS STEREO HEADSET
Trade Mark	:	NOKIA
Model/type Ref.	:	HS-12W
Manufacturer	:	NOKIA CORPORATION
Requested by	:	NOKIA CORPORATION
Other identification of the product	:	Industry Canada (IC): 661V-HS12W FCC ID: PYAHS-12W Prototype
Standard(s)	:	USA FCC Part 15.247, 15.205, 15.209, 15.109, 15.207 CANADA RSS-210

This test report includes 2 annexes and therefore the total number of pages is 76.

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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

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.

3.2 REQUIREMENTS AND METHOD

The test has been carried out according to FCC parts 15.33, 15.35, 15.109, 15.207, 15.205, 15.209, 15.247 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. 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.

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. Bilog antenna CHASE CBL6111.
7. Antenna tripod EMCO 11968C.
8. Double-ridge Guide Horn antenna 1-18 GHz HP 11966E.
9. Double-ridge Guide Horn antenna 18-40 GHz Agilent 119665J.
10. RF pre-amplifier Miteq JS4-12002600-30-5A.
11. Semianechoic Absorber Lined Chamber IR 11. BS.
12. RF pre-amplifier Miteq AFS5-04001300-15-10P-6.
13. Spectrum analyzer R&S ESIB 26.
14. Spectrum analyzer R&S FSM.
15. Transient limiter. HP 11947[a]
16. 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: NOKIA CORPORATION

V.A.T.: FI01120389

Address: Joensuunkatu 7E **City:** Salo

Postal code: 24100 **Country:** FINLAND

Telephone: +358718008000 **Fax:** +358718045220

4.2 REPRESENTATIVE

Name: Olli Pekka Ahokas (Product Program Manager)

4.3 TEST SAMPLES SUPPLIER

Name or Company: Same as indicated in point 4.1.

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

4.4 IDENTIFICATION OF ITEM/ITEMS TESTED

Product: WIRELESS STEREO HEADSET

Trade mark: NOKIA **Model:** HS-12W

HW Version: HW 0.D **SW Version:** SW 0.22

Manufacturer: NOKIA CORPORATION

Country of manufacture: ROMANIA

Manufacture site: Data not available

Description: The HS-12W, Bluetooth Stereo Headset will be used together with phones and other audio devices, which are supporting Bluetooth audio features and Handsfree/Headset profile. In addition, the HS-12W provides possibility to listen FM radio as an individual unit.

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
21702/03	Bluetooth headset with integral antenna	HS-12W	Prototype	28/03/05

Sample M/02 is formed by the following elements:

Control No.	Description	Model	Serial No.	Date of reception
21702/02	Bluetooth headset with antenna connector	HS-12W	Prototype	28/03/05

Sample S/01 is composed of the following elements:

Control No.	Description	Model	Serial No.	Date of reception
21702/04	Bluetooth with EMC antenna	HS-12W	Prototype	28/03/05
21702/06	Charger	ACP-12E	---	28/03/05

Sample S/02 is composed of the following elements:

Control No.	Description	Model	Serial No.	Date of reception
21702/04	Bluetooth with EMC antenna	HS-12W	Prototype	28/03/05
21702/08	Charger	AC1E	---	29/03/05

Sample S/03 s composed of the following elements:

Control No.	Description	Model	Serial No.	Date of reception
21702/04	Bluetooth with EMC antenna	HS-12W	Prototype	28/03/05
21702/07	Charger	LCH-12	---	29/03/05

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

   Radiated measurements indicated in annex A.

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

   All tests indicated in annex A, except radiated measurements and AC Line conducted emissions.

3. Samples S/01, S/02 and S/03 has undergone to the following test(s):

   AC Line continuous conducted emission, power leads in annex A.

5.2 PERIOD OF TESTING

The performed test started on 2005-03-28 and finished on 2005-03-30.

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. = 20 ºC Max. = 21 ºC
Relative humidity	Min. = 58 % Max. = 58 %
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. = 24 ºC Max. = 24 ºC
Relative humidity	Min. = 55 % Max. = 55 %
Air pressure	Min. = 1019 mbar Max. = 1019 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 no exceeded during the test:

Temperature	Min. = 21 ºC Max. = 22 ºC
Relative humidity	Min. = 47 % Max. = 47 %
Air pressure	Min. = 1020 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		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 (d). Band-edge of conducted emissions (Transmitter)		P		
15.247 Subclause (d). Emission limitations conducted (Transmitter)		P		
15.247 Subclause (d). Emission limitations radiated (Transmitter)		P		
15.109. Receiver spurious radiation		P		
15.207. Continuous Conducted Emissions		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

Report No: 21702RET.101

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TEST CONDITIONS

Power supply (V):

$V_{nominal}$ = 3.7 Vdc

Type of power supply = DC Voltage from rechargeable battery

Type of antenna = Integral antenna

Maximum Declared Gain for antenna= 0 dB

Operating Temperature Range (ºC):

T_n = -15 to + 55

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.

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is directly connected to the spectrum analyser via the antenna connector (sma type) provided with the test sample. No coaxial low-loss connecting cable was necessary for such connection so no cable attenuation correction was made.

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.

AC LINE CONDUCTED MEASUREMENTS

The conducted disturbance at mains ports measurements are performed in a screen room using a (50 Ω / 50 µH) Line Impedance Stabilization Network (LISN).

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.

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.

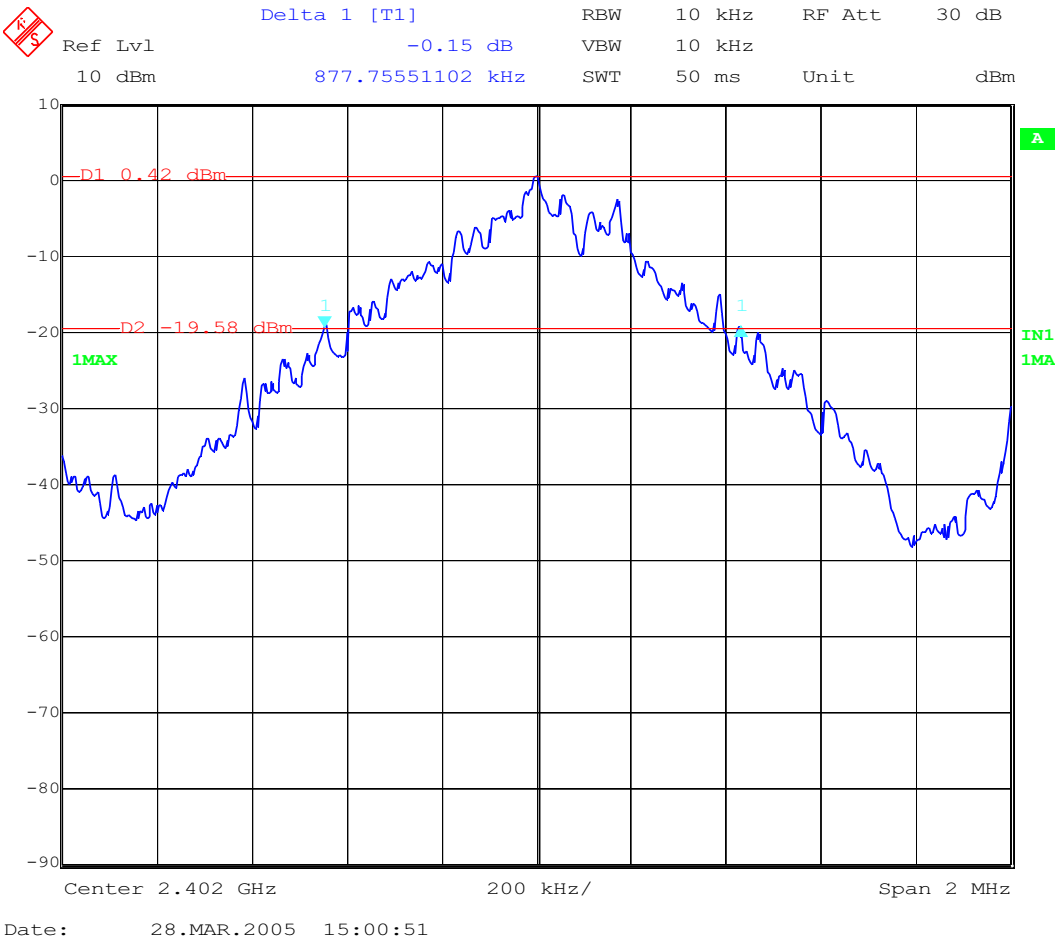
RESULTS

20 dB Bandwidth (see next 3 plots).

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20 dB Spectrum bandwidth (kHz)	877.75	917.83	877.75
Measurement uncertainty (kHz)	±11		

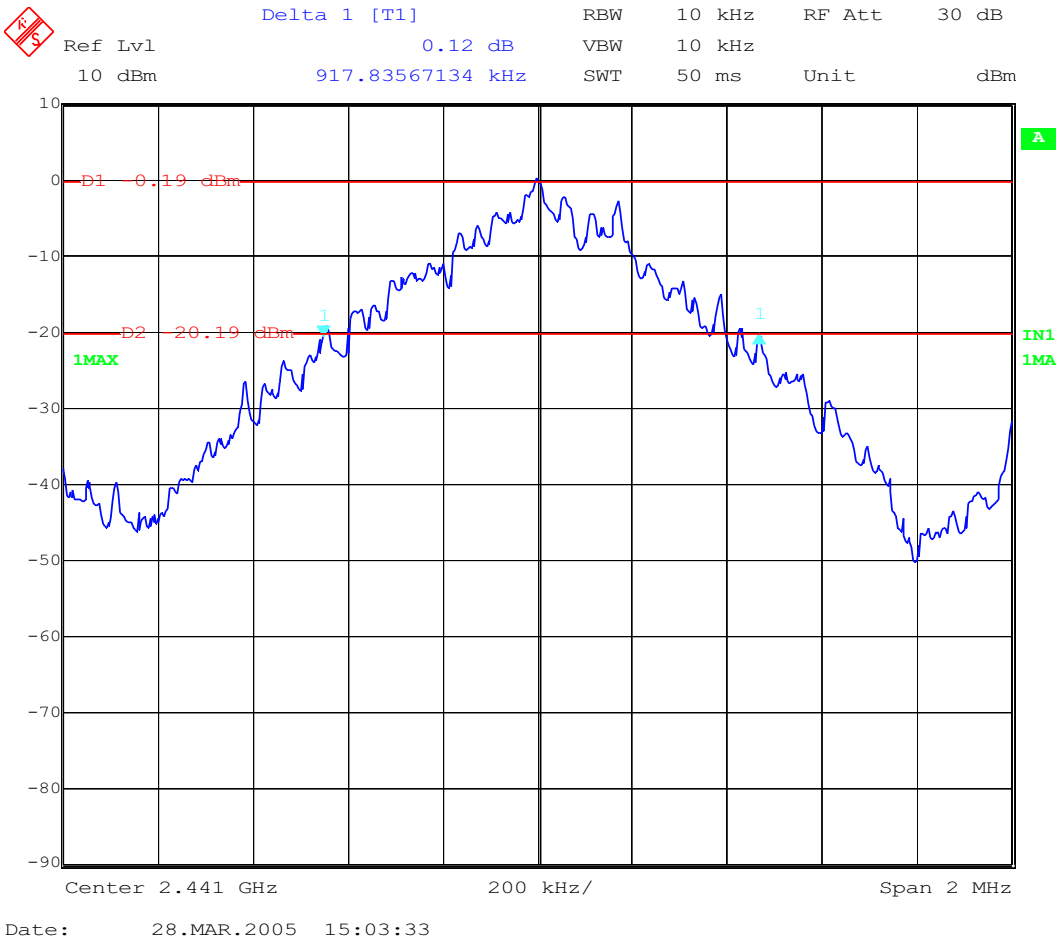
20 dB BANDWIDTH.

Lowest Channel: 2402 MHz.



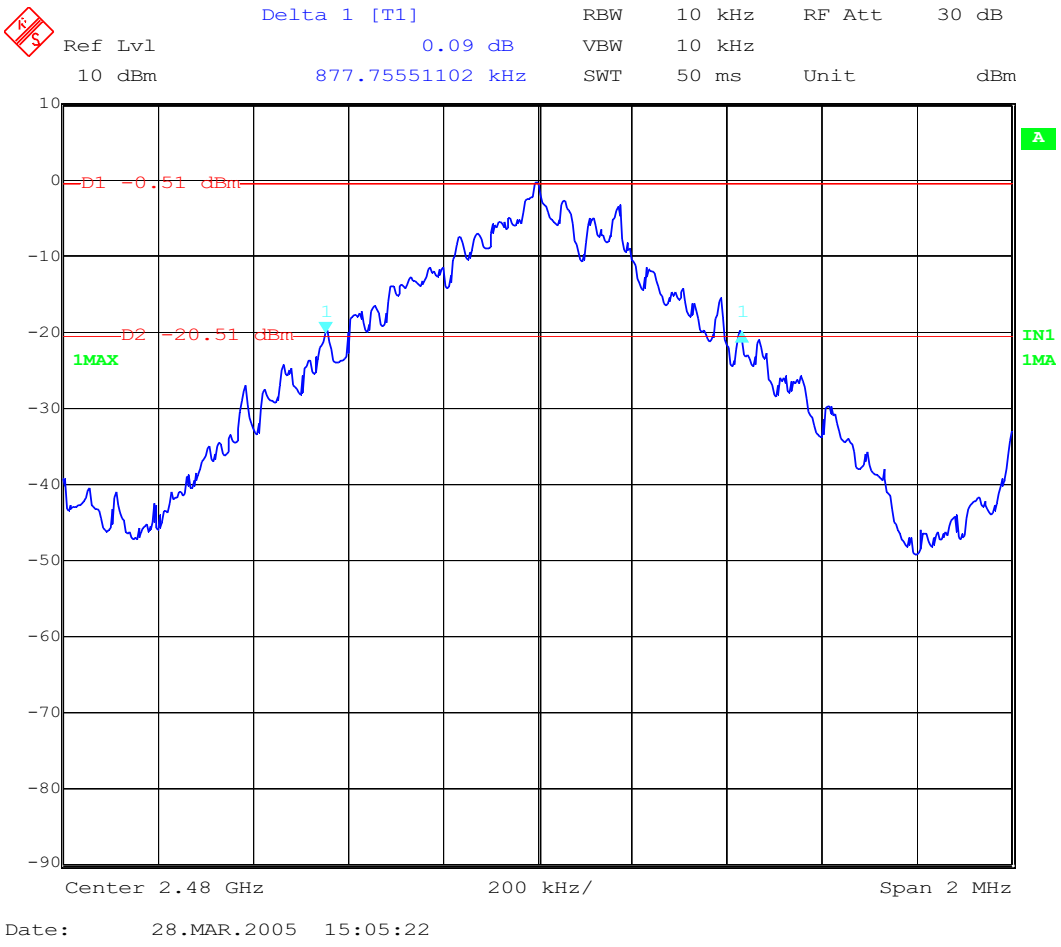
20 dB BANDWIDTH.

Middle Channel: 2441 MHz.

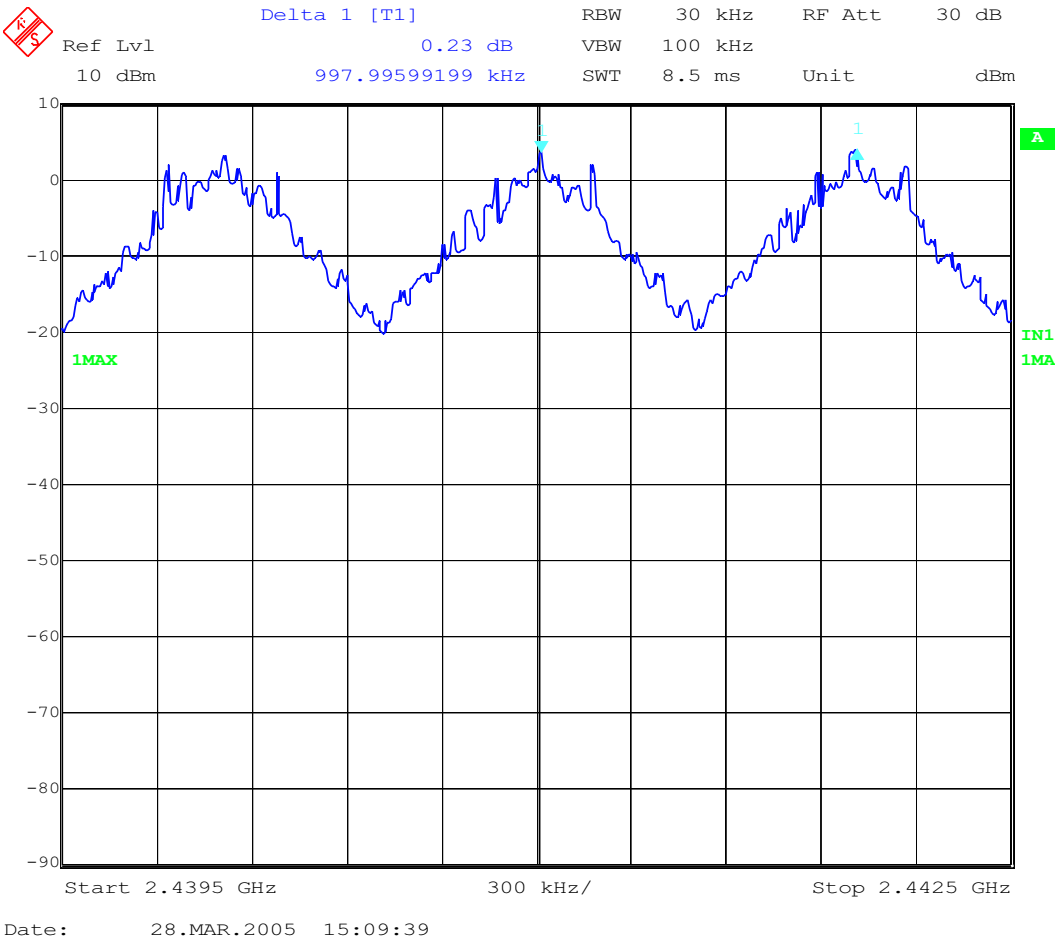


20 dB BANDWIDTH.

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

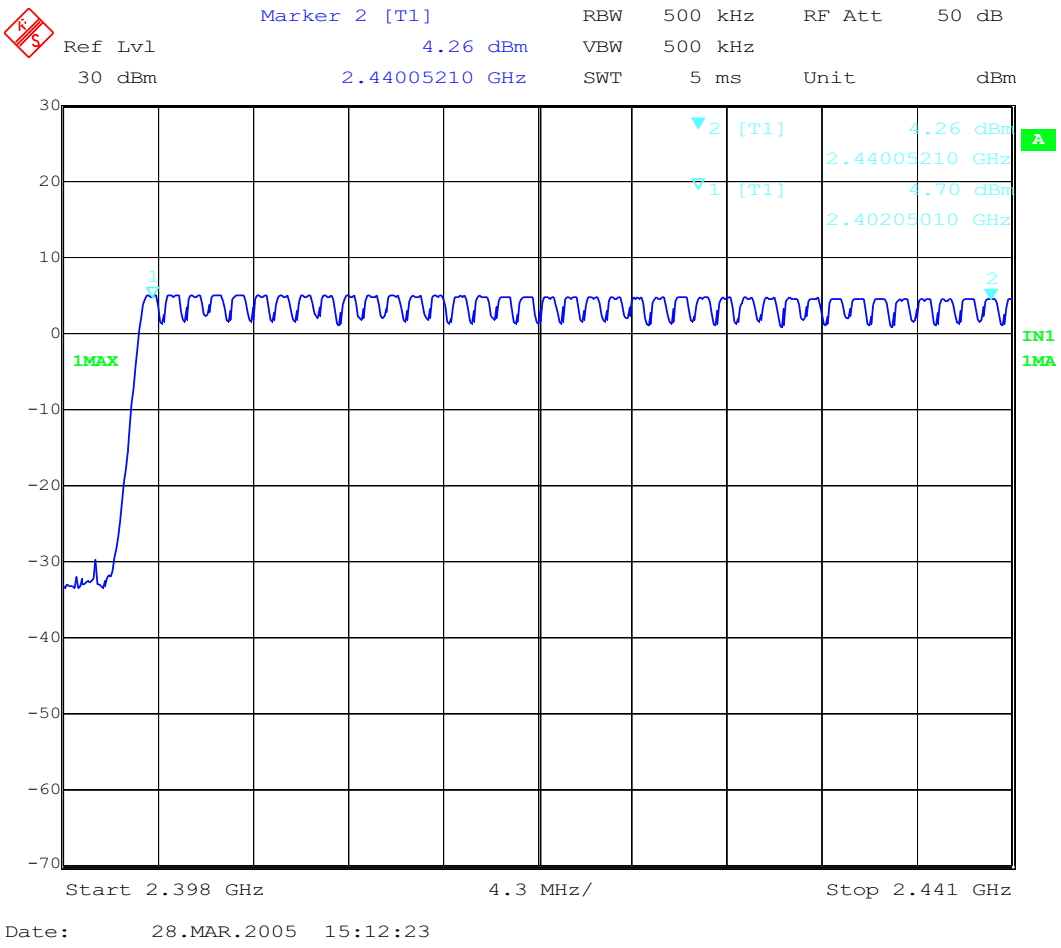
Section 15.247 Subclause (a) (1) (iii). Number of hopping channels

SPECIFICATION

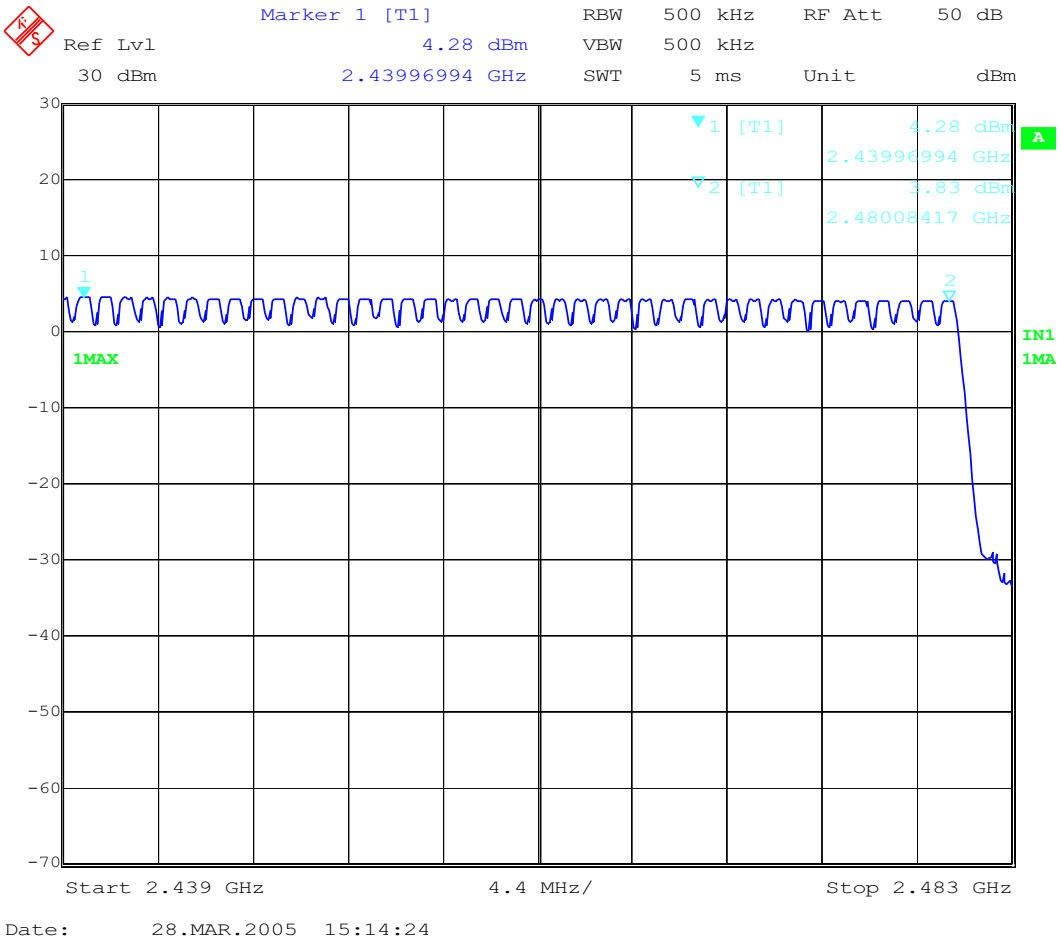
Frequency hopping system in the 2400-2483.5 MHz band shall use at least 15 non-overlapping channels.

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

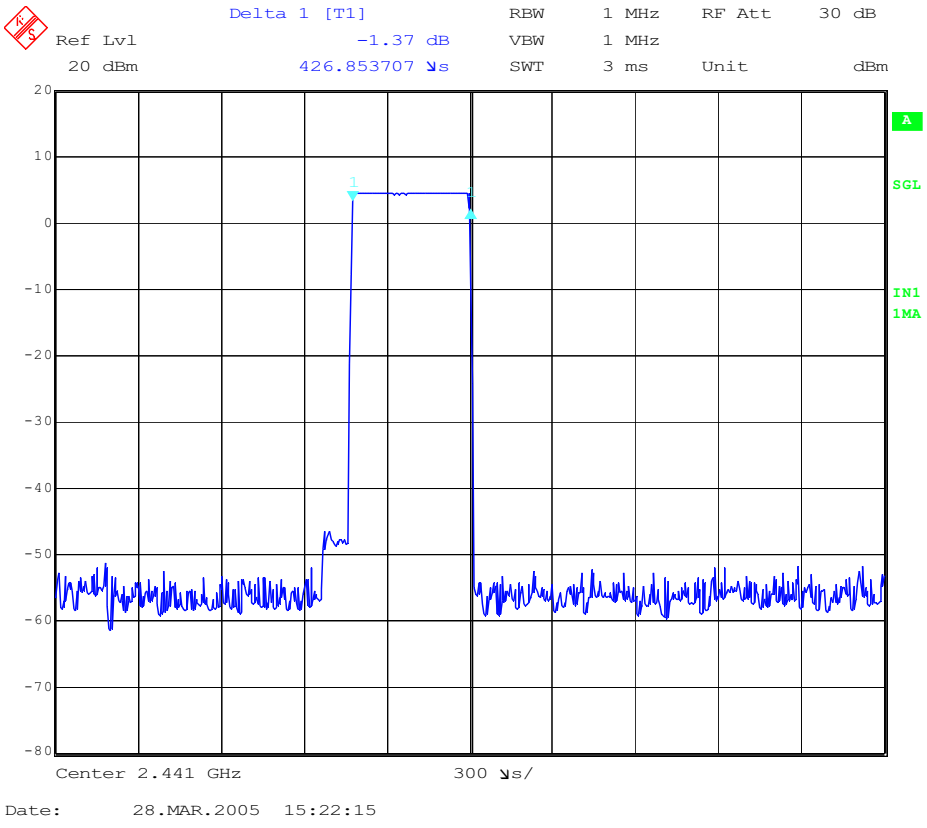
The average time of occupancy on any channel shall not be greater than 0.4 seconds (400 ms) within a period of 0.4 seconds multiplied by the number of hopping channels employed = 0.4 x 79= 31.6 seconds.

RESULTS

The equipment only supports 1 slot packet (DH1).

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

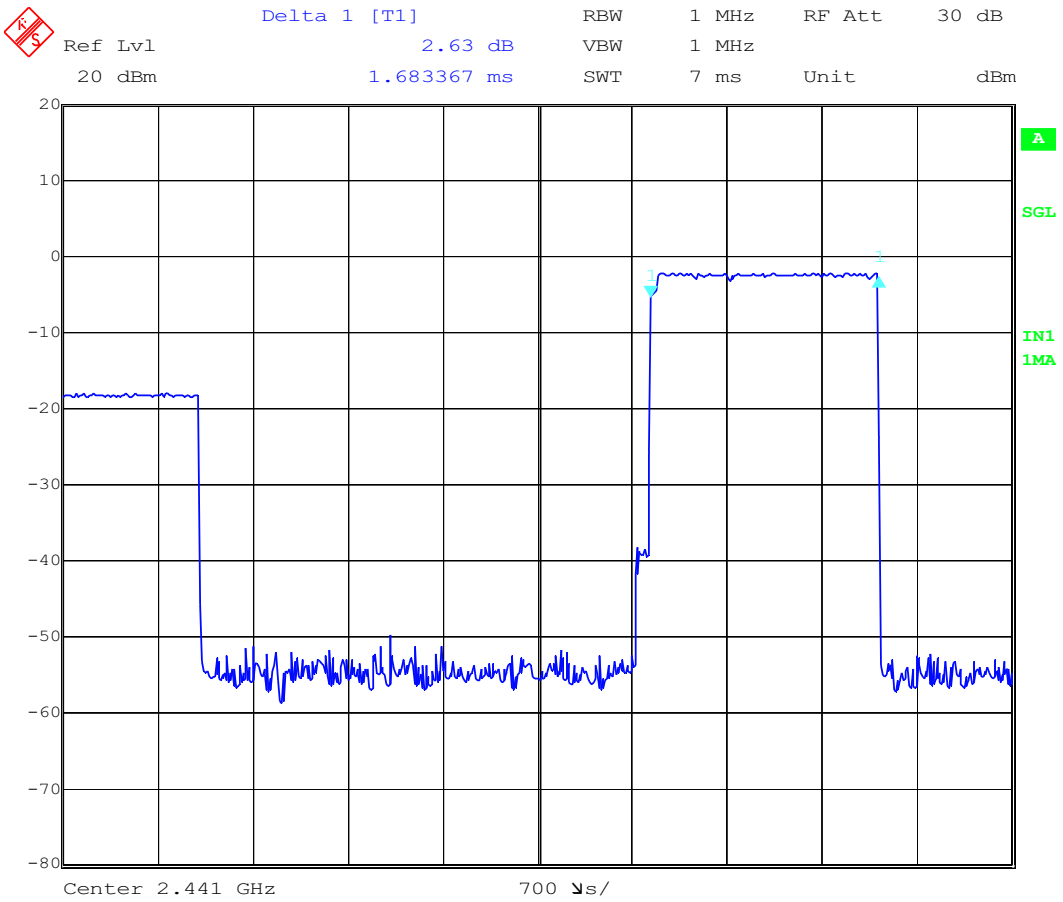
The system makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/2 = 800 hops per second with 79 channels. So you have each channel 800/79 = 10.13 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 426.85 µs (see next plot).
So we have 320.11 x 426.85 µs = 136.64 ms per 31.6 seconds.



Verdict: PASS

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

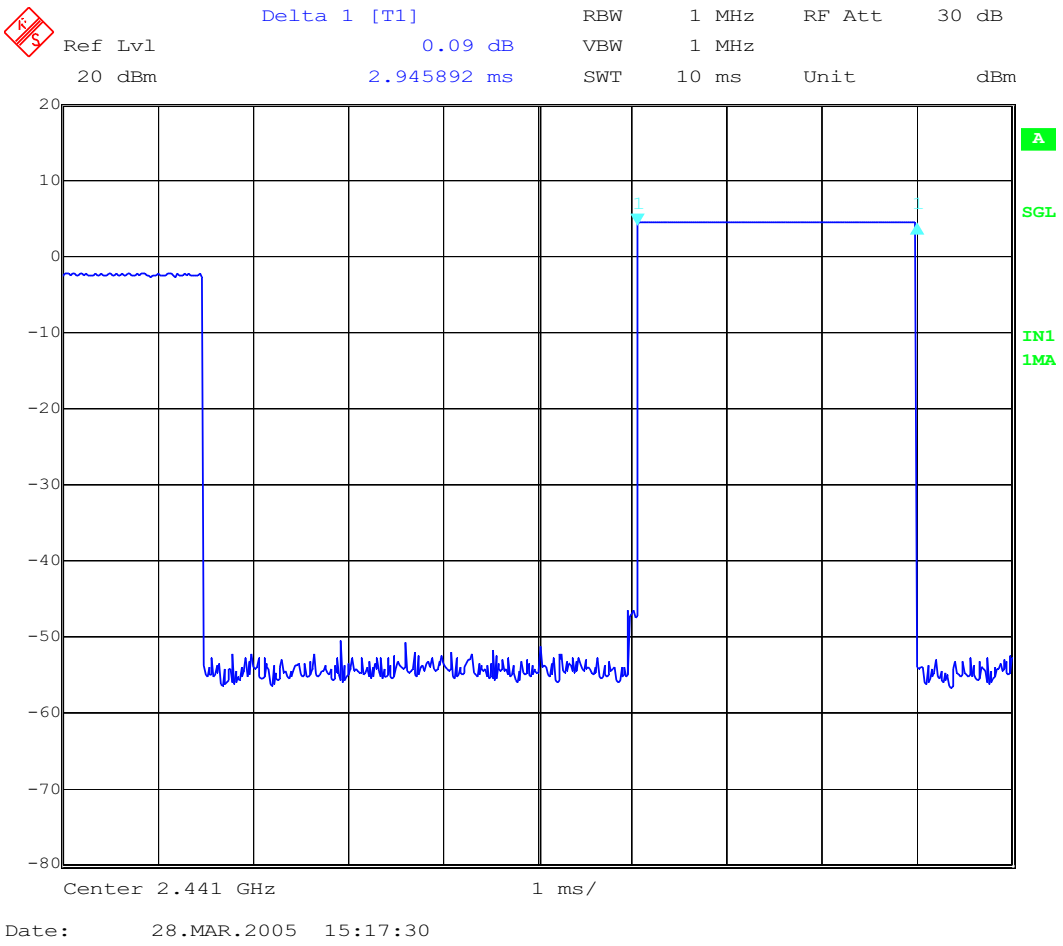
A DH3 Packet need 3 time slots for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/4 = 400 hops per second with 79 channels. So you have each channel 400/79 = 5.1 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 5.1 x 31.6 = 161.16 times of appearance .
Each Tx-time per appearance is 1.68 ms (see next plot).
So we have 161.16 x 1.68 ms = 270.75 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 2.94 ms (see next plot).
So we have 106.49 x 2.94 ms = 313.08 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)	4.63	4.07	3.60
Measurement uncertainty (dB)	±1.5		

The maximum declared antenna gain for this device is 0 dBi, therefore the maximum theoretical peak radiated power (EIRP) in the three measurement channels for this device is 4.63 dBm or 2.90 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)	34.96	35.10	35.24
Maximum EIRP peak power (dBm)	-5.23	-8.63	-9.72
Measurement uncertainty (dB)	+1.98 / -1.75		

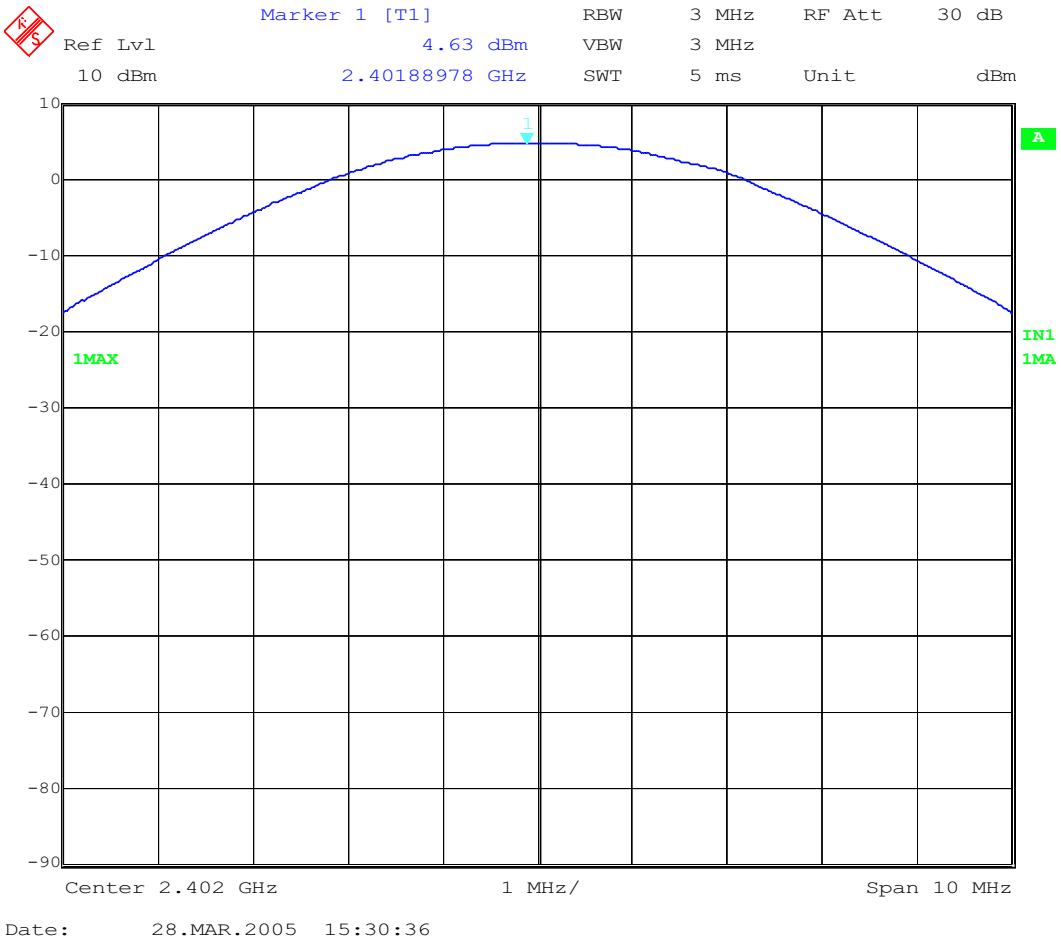
Declared peak gain: 0 dBi

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

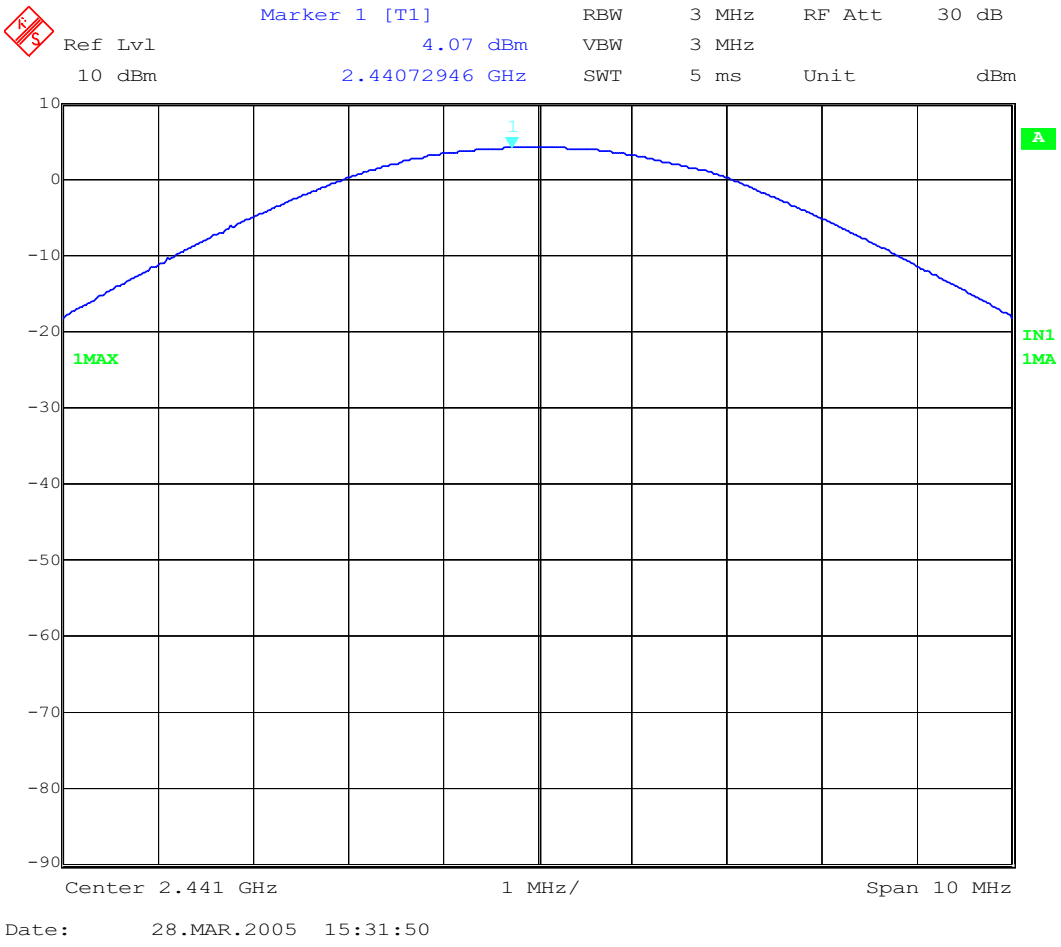
PEAK OUTPUT POWER (CONDUCTED).

Lowest Channel: 2402 MHz.



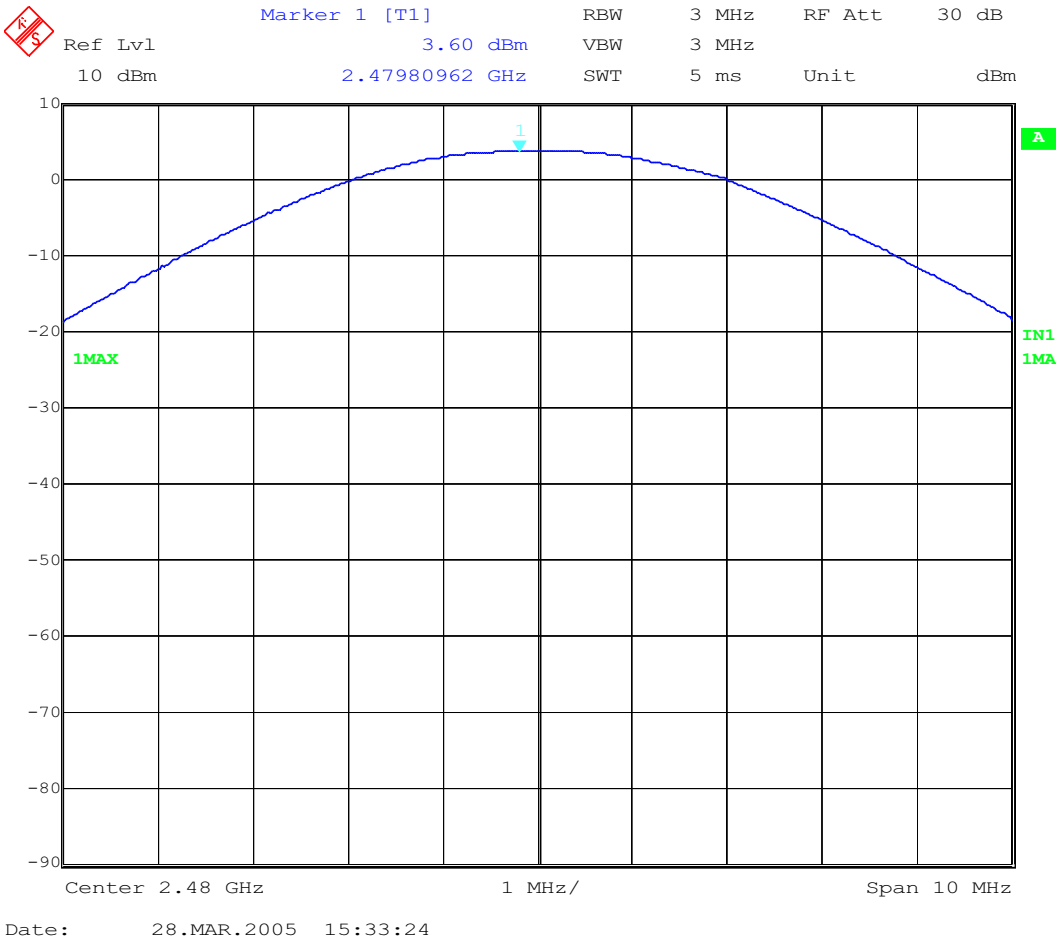
PEAK OUTPUT POWER (CONDUCTED).

Middle Channel: 2441 MHz.



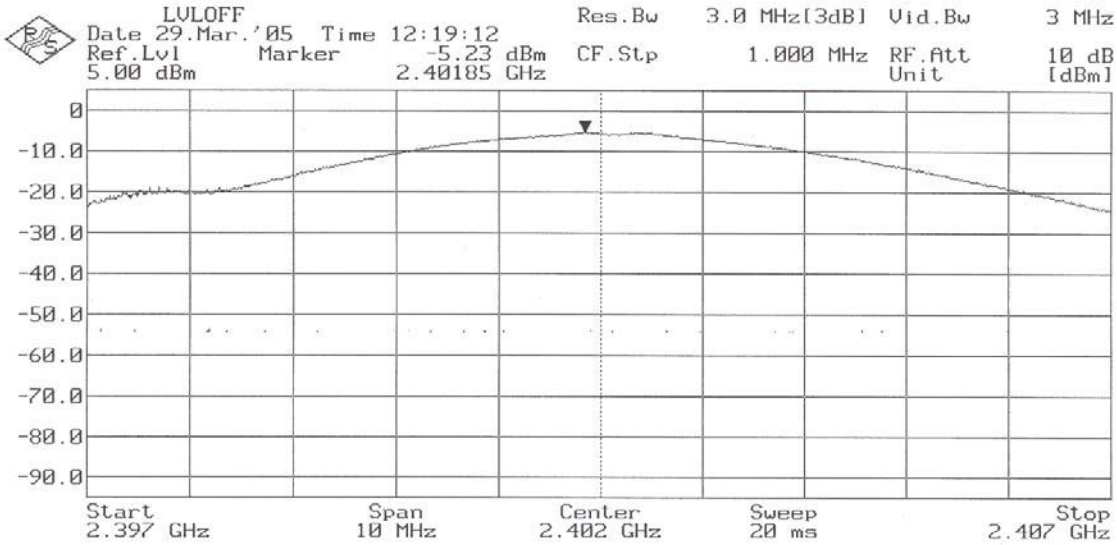
PEAK OUTPUT POWER (CONDUCTED).

Highest Channel: 2480 MHz.



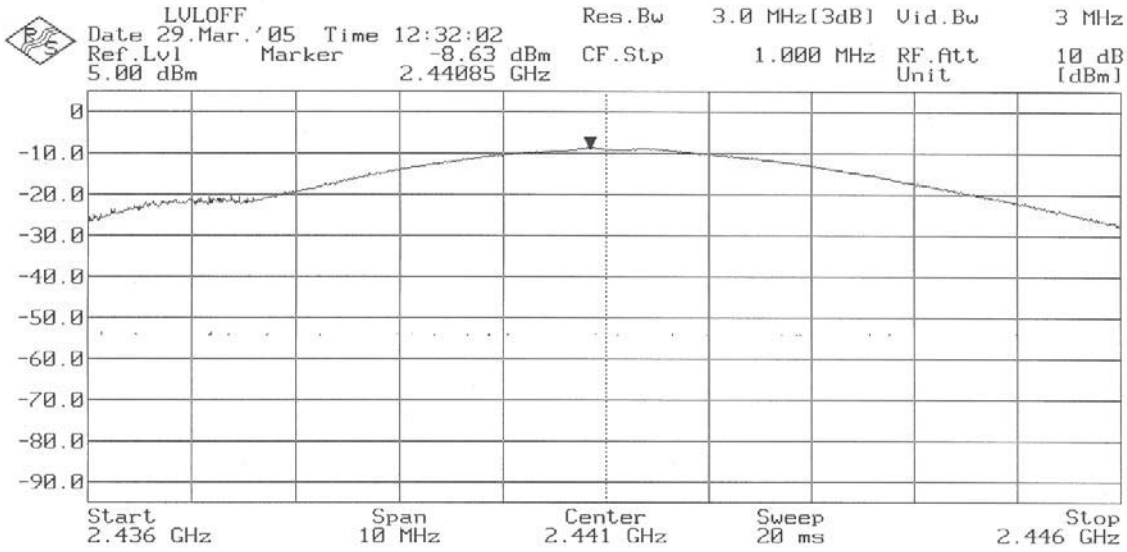
PEAK OUTPUT POWER (RADIATED).

Lowest Channel: 2402 MHz.



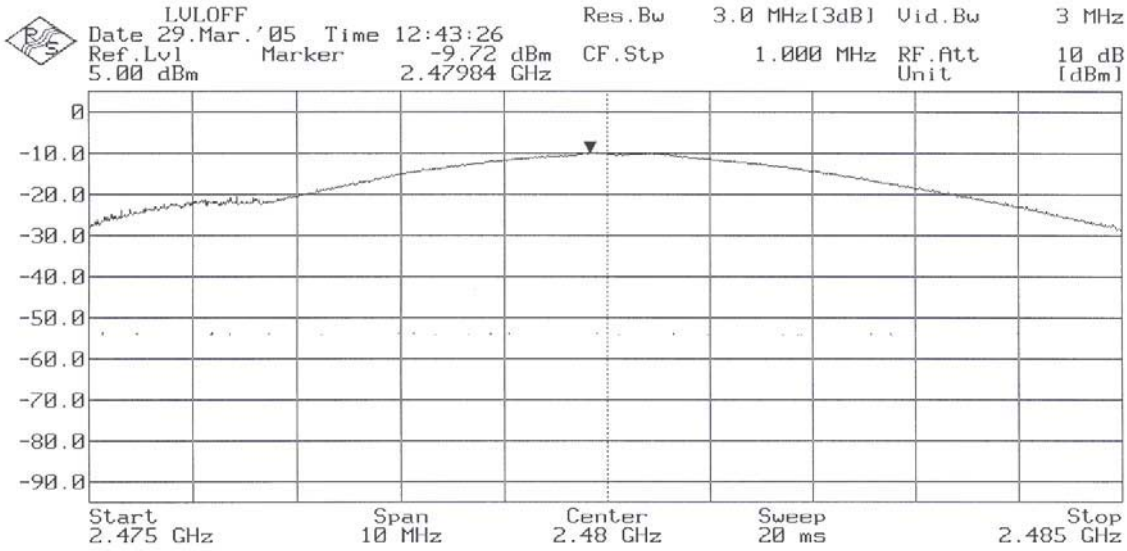
PEAK OUTPUT POWER (RADIATED).

Middle Channel: 2441 MHz.



PEAK OUTPUT POWER (RADIATED).

Highest Channel: 2480 MHz.



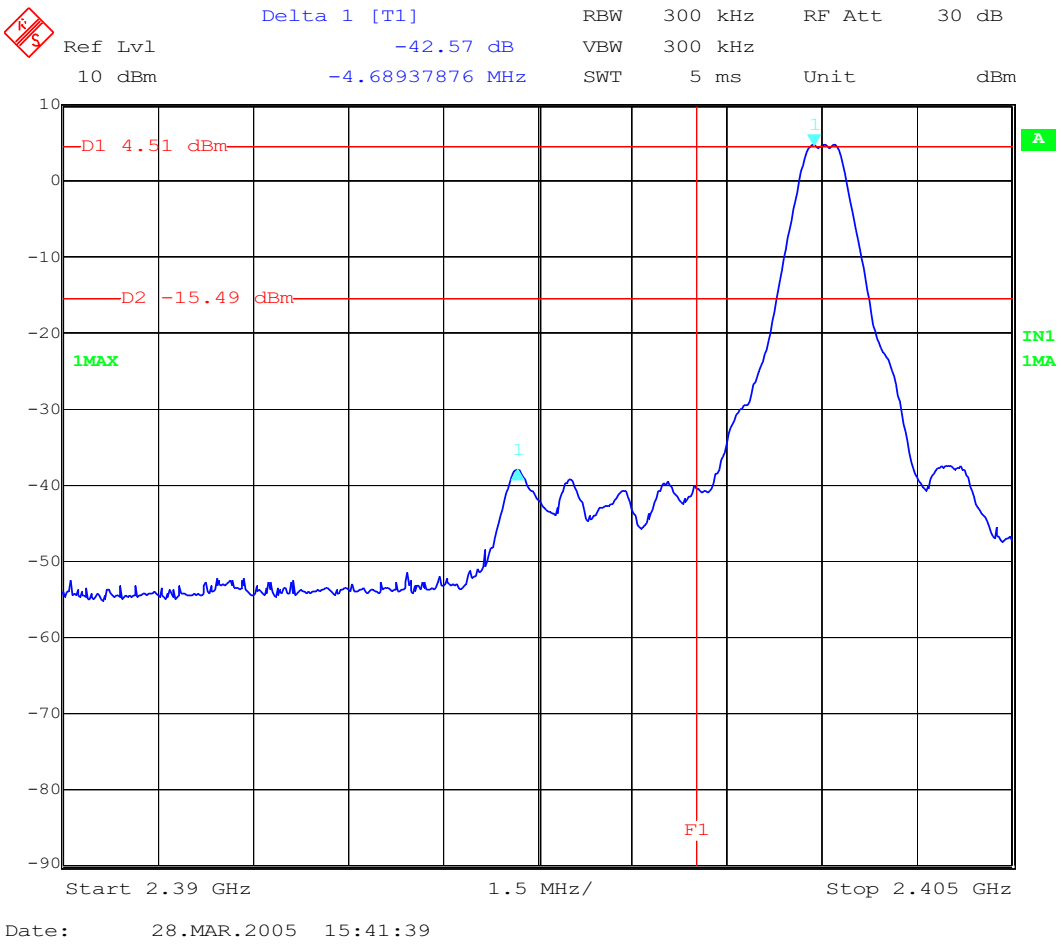
Section 15.247 Subclause (d). Band-edge of conducted emissions (Transmitter)

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.

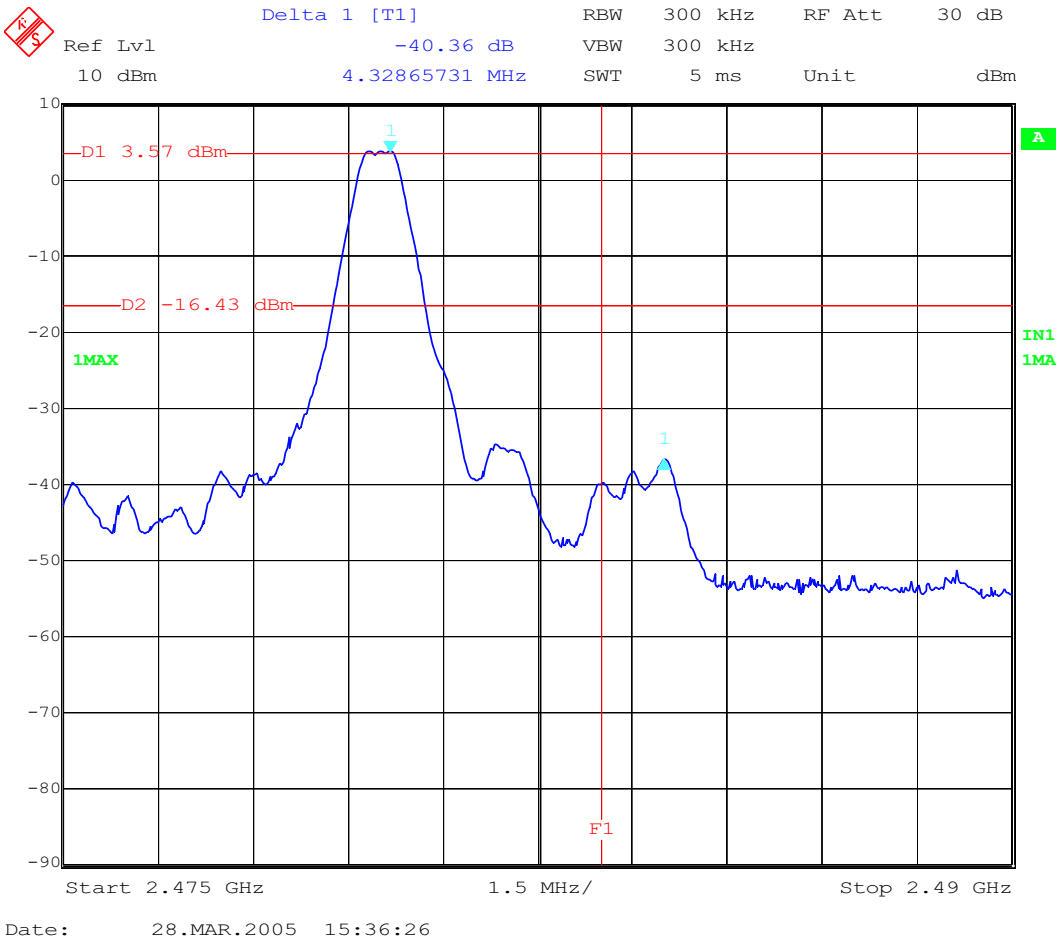
RESULTS:

1. LOW FREQUENCY SECTION 2402 MHz (HOPPING OFF). See next plot.



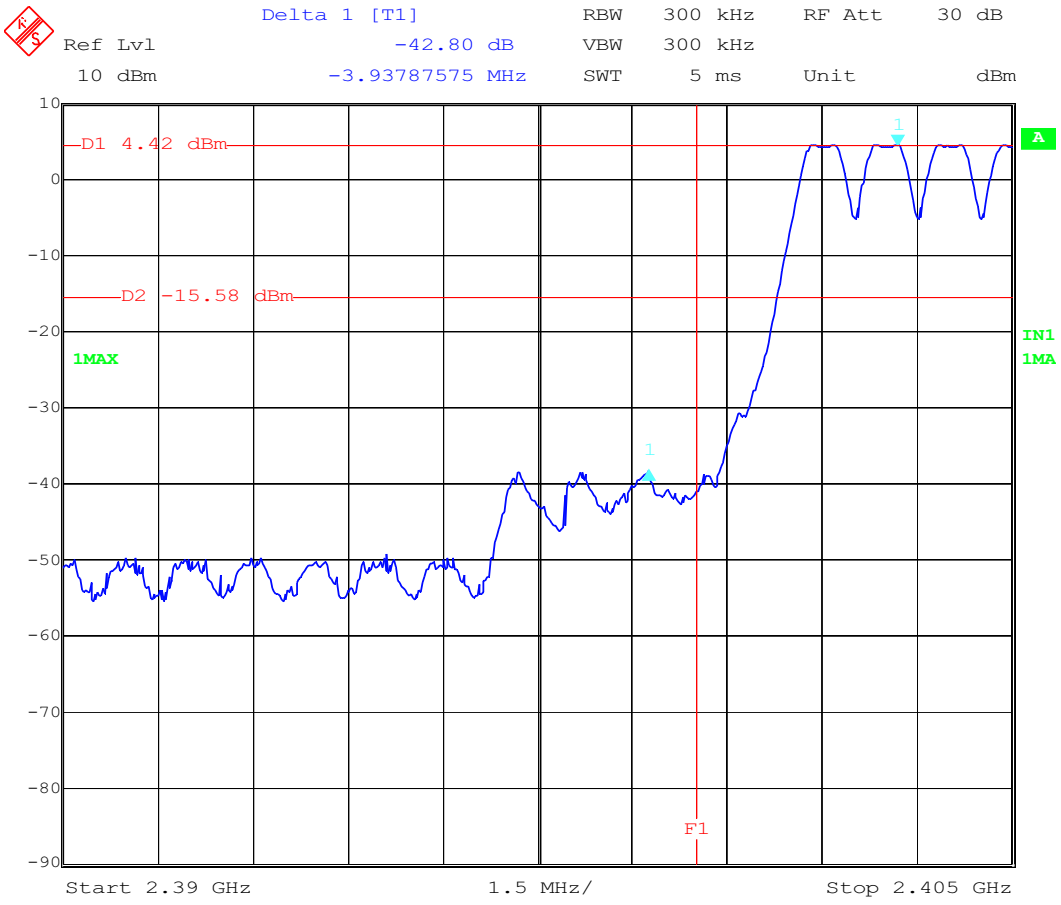
Verdict: PASS

2. HIGH FREQUENCY SECTION 2480 MHz (HOPPING OFF). See next plot.



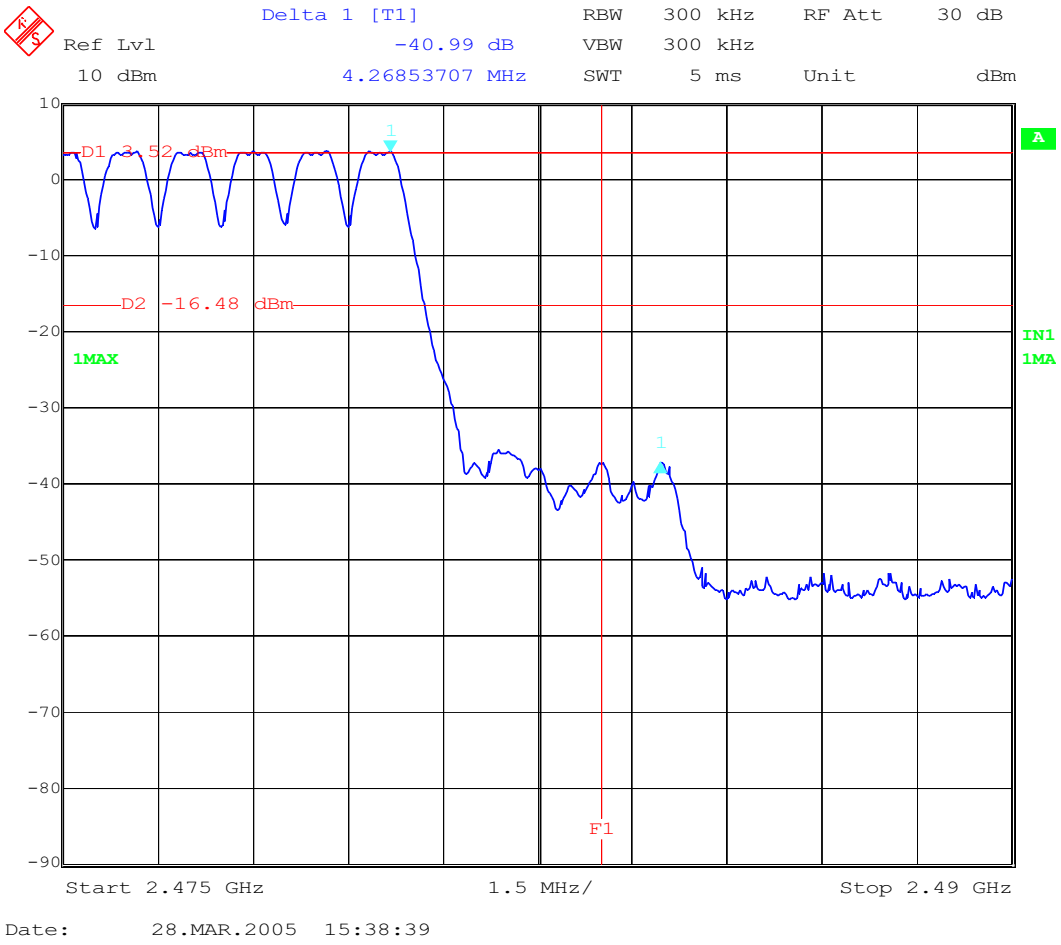
Verdict: PASS

3. LOW FREQUENCY SECTION (HOPPING ON). See next plot.



Verdict: PASS

4. HIGH FREQUENCY SECTION (HOPPING ON). See next plot.



Verdict: PASS

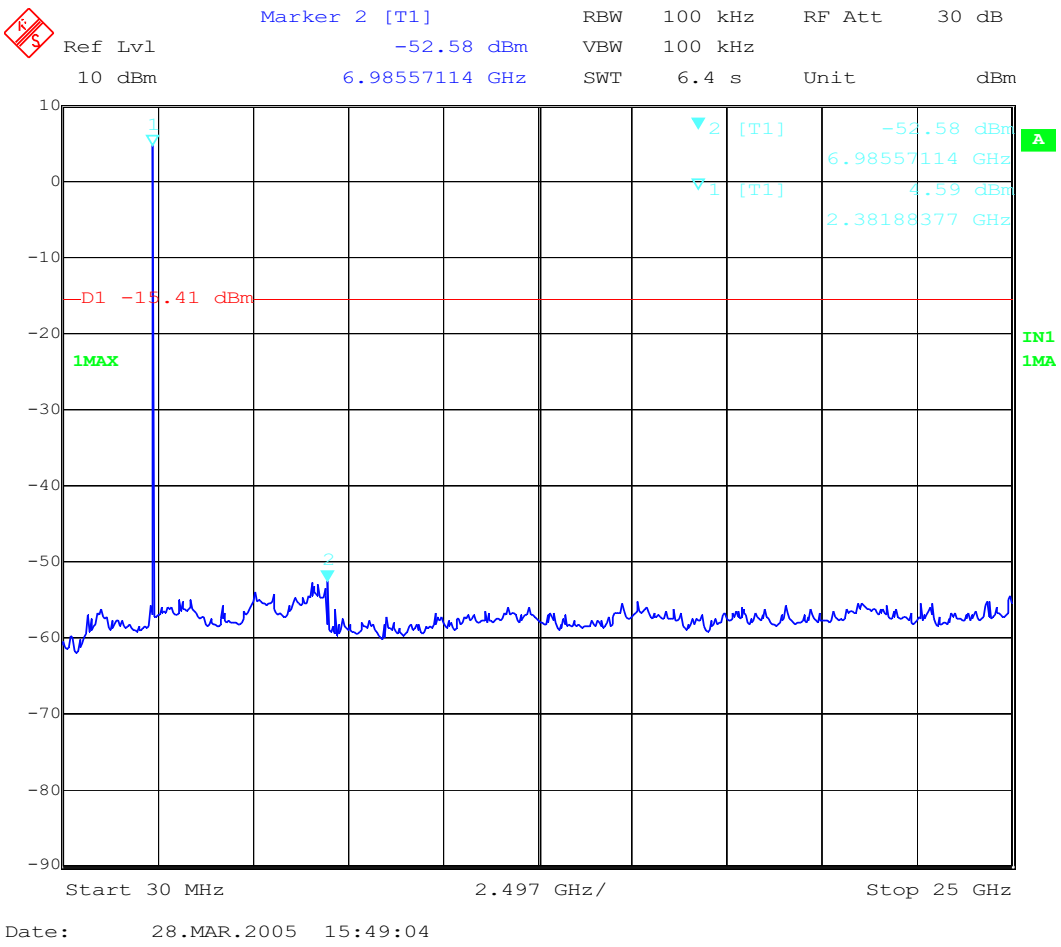
Section 15.247 Subclause (d). Emission limitations conducted (Transmitter)

SPECIFICATION

In any 100 kHz bandwidth 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:

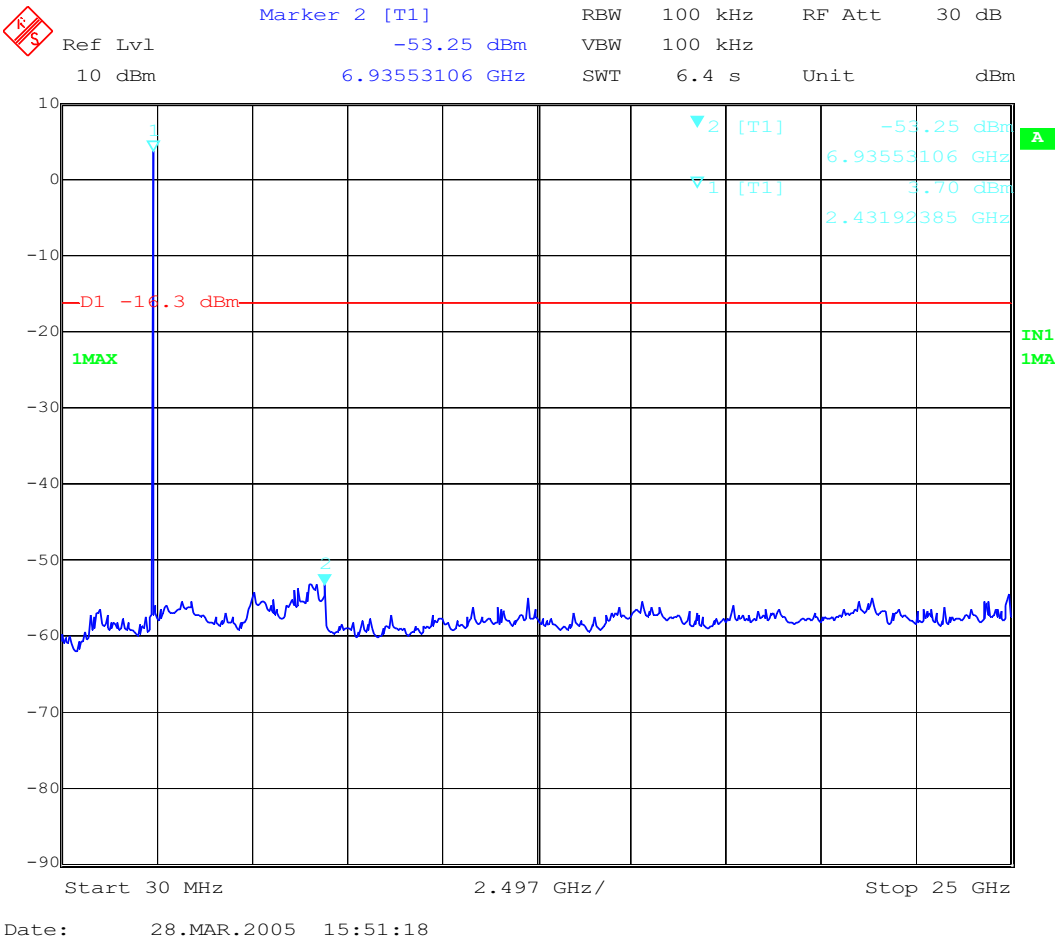
1. LOWEST CHANNEL (2402 MHz): 30 MHz-25 GHz (see next plot).



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

Verdict: PASS

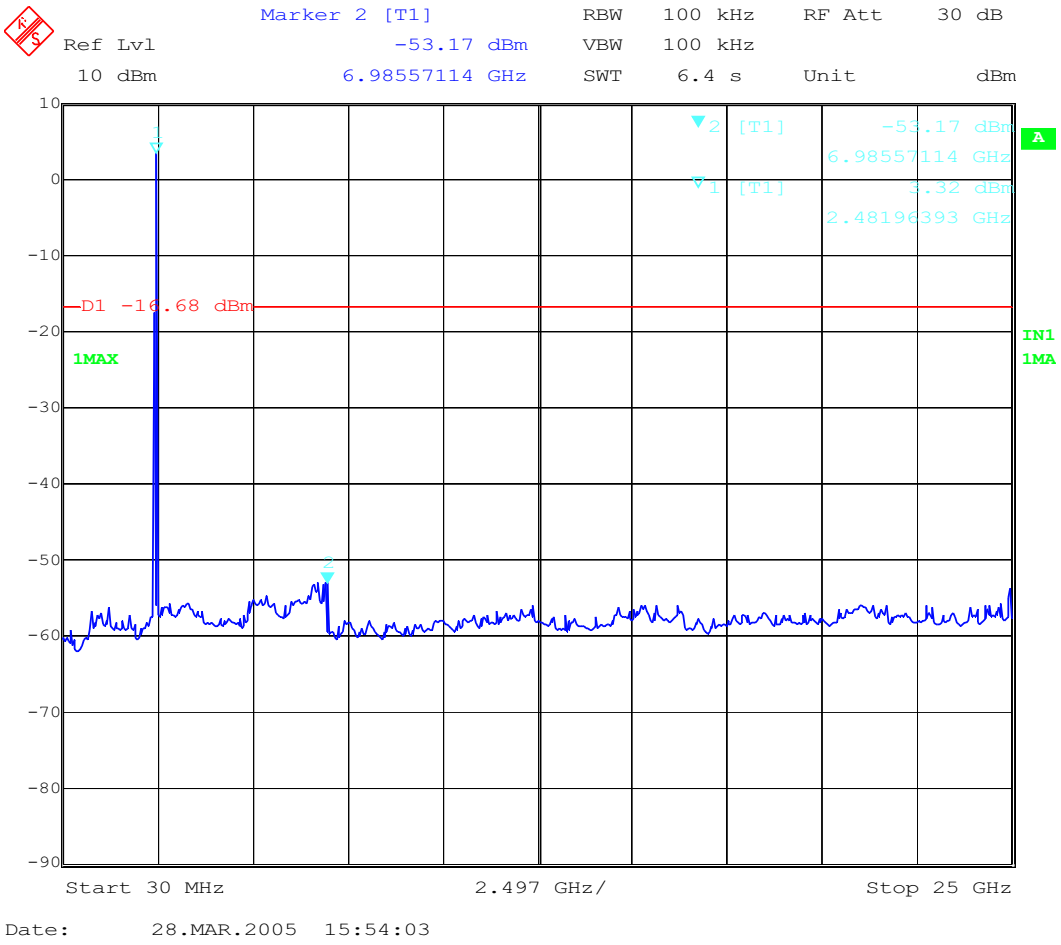
2. MIDDLE CHANNEL (2441 MHz): 30 MHz-25 GHz (see next plot).



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. Spurious levels (radiated) closest to limit.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Uncertainty (dB)
175.79158	V	Quasi-peak	23.91	±3.8 dB
206.89378	V	Quasi-peak	29.51	±3.8 dB
239.93988	V	Quasi-peak	32.25	±3.8 dB
271.04208	V	Quasi-peak	36.79	±3.8 dB
304.08817	V	Quasi-peak	36.10	±3.8 dB
335.19038	V	Quasi-peak	38.32	±3.8 dB
342.96593	V	Quasi-peak	36.79	±3.8 dB
364.34870	V	Quasi-peak	37.16	±3.8 dB
368.23647	V	Quasi-peak	37.50	±3.8 dB

Frequency range 1 GHz-25 GHz.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
4804.11330	V	Peak	45.90	± 4.0
4804.11330	V	Average	30.20	± 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. Spurious levels (radiated) closest to limit.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Uncertainty (dB)
175.79158	V	Quasi-peak	25.80	±3.8 dB
206.89378	V	Quasi-peak	31.92	±3.8 dB
239.93988	V	Quasi-peak	38.00	±3.8 dB
271.04208	V	Quasi-peak	37.56	±3.8 dB
304.08818	V	Quasi-peak	37.97	±3.8 dB
335.19038	V	Quasi-peak	39.03	±3.8 dB
342.96593	V	Quasi-peak	39.20	±3.8 dB

Frequency range 1 GHz-25 GHz.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
4882.00570	V	Peak	45.95	± 4.0
4882.00570	V	Average	31.09	± 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. Spurious levels (radiated) closest to limit.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Uncertainty (dB)
175.79158	V	Quasi-peak	24.31	±3.8 dB
206.89380	V	Quasi-peak	29.79	±3.8 dB
239.9399	V	Quasi-peak	35.52	±3.8 dB
271.04208	V	Quasi-peak	35.66	±3.8 dB
304.08818	V	Quasi-peak	33.66	±3.8 dB
335.19080	V	Quasi-peak	37.89	±3.8 dB
344.90982	V	Quasi-peak	36.59	±3.8 dB
368.23647	V	Quasi-peak	36.50	±3.8 dB

Frequency range 1 GHz-25 GHz.

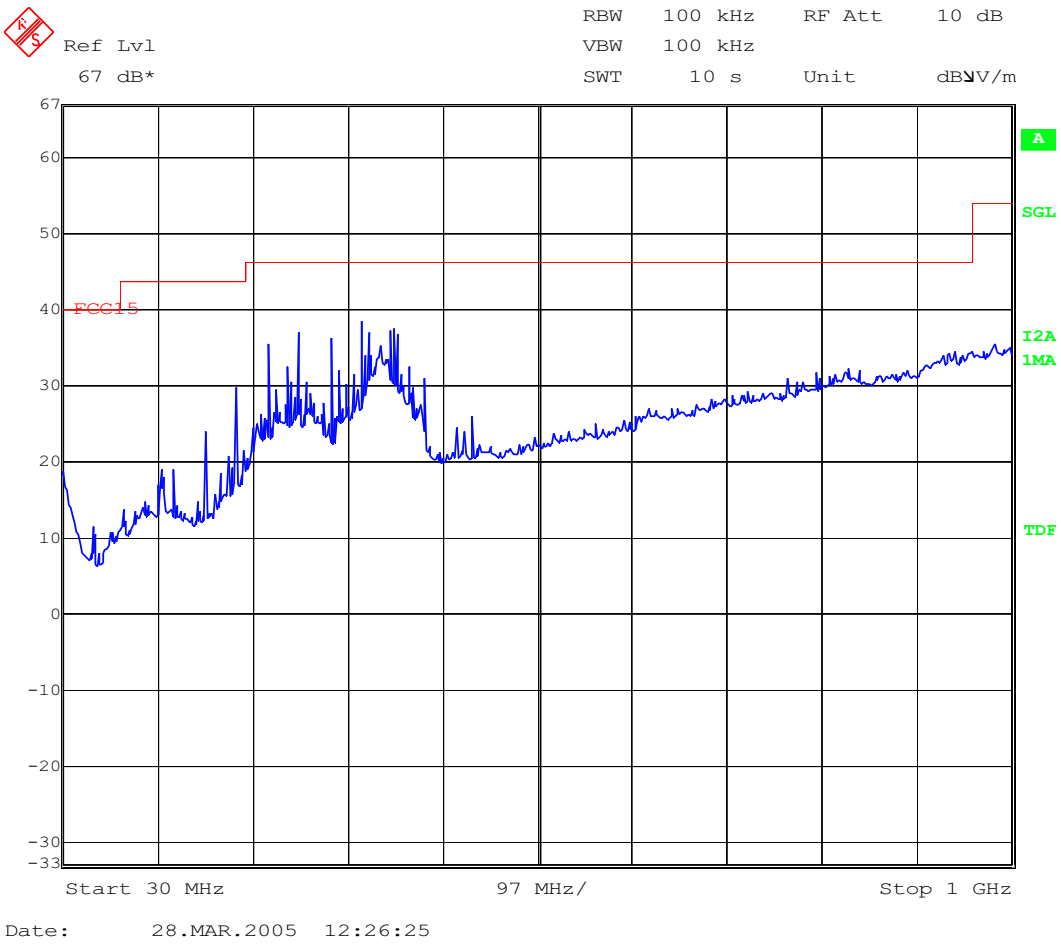
Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
4960.26550	V	Peak	47.32	± 4.0
4960.26550	V	Average	40.05	± 4.0

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

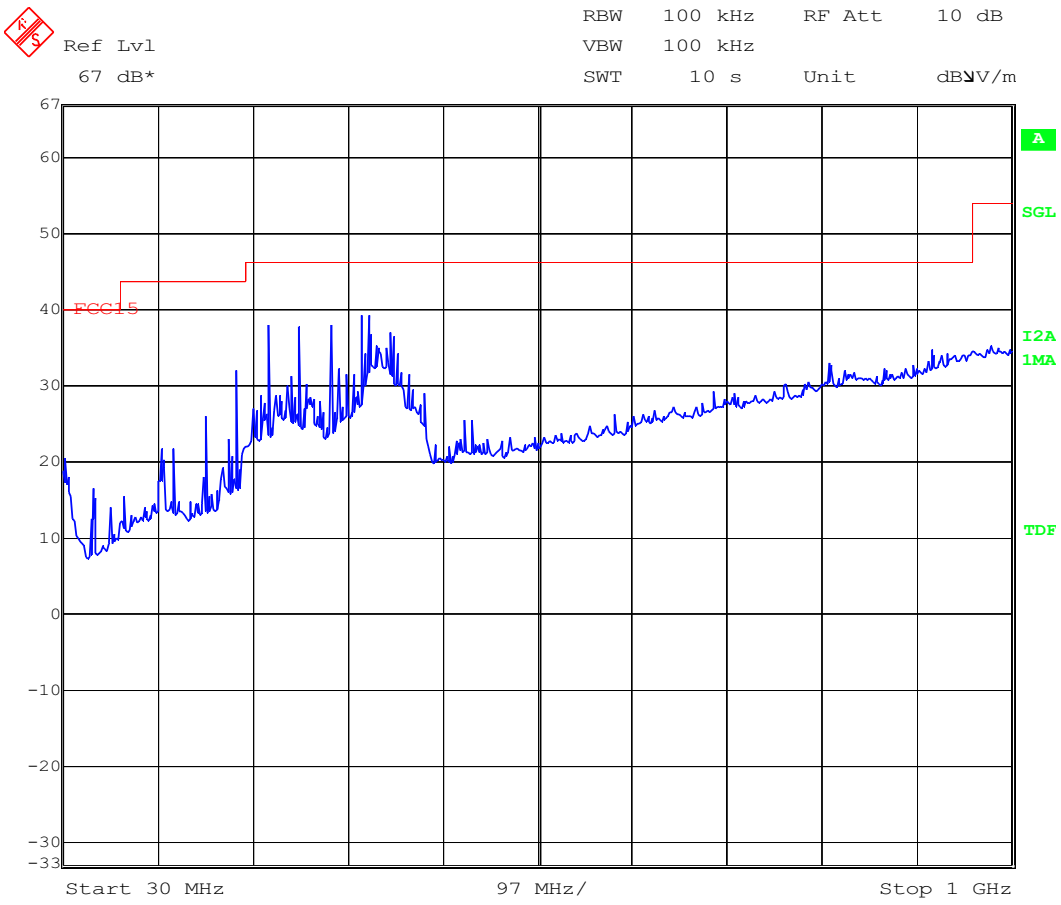
Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

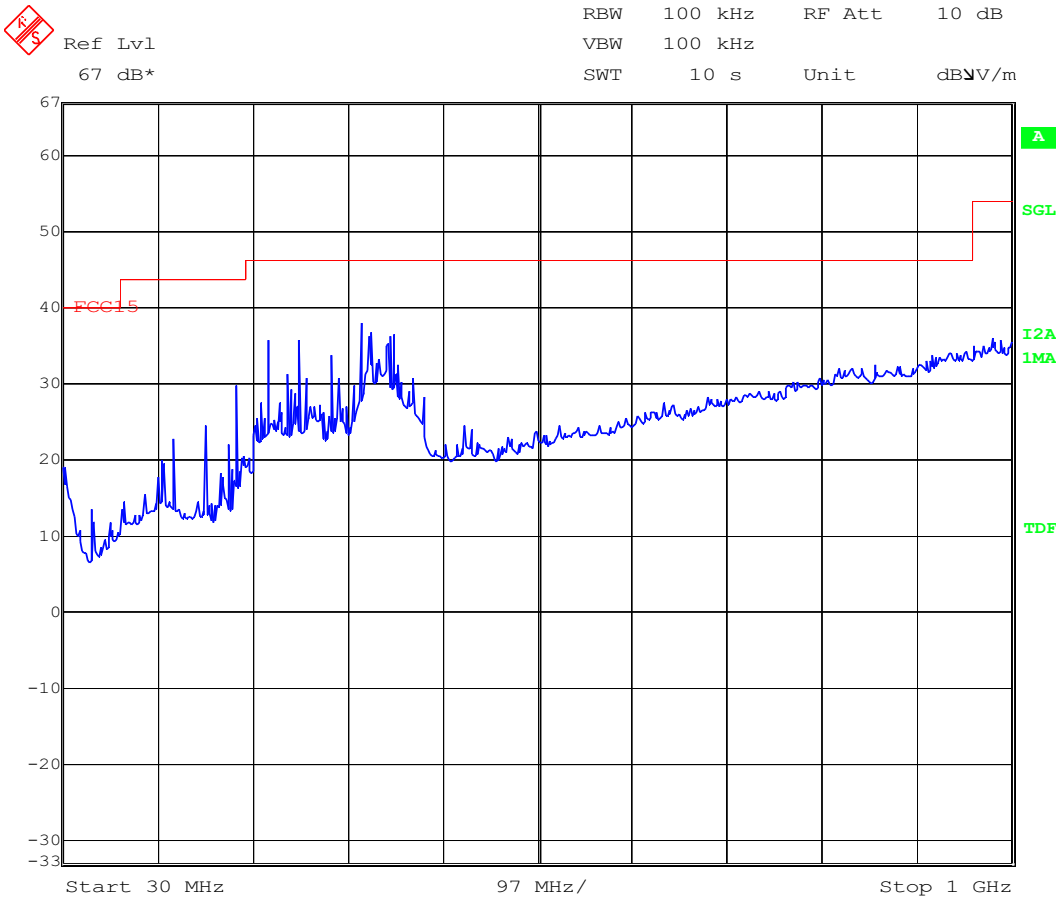
CHANNEL: LOWEST (2402 MHz).



CHANNEL: MIDDLE (2441 MHz).

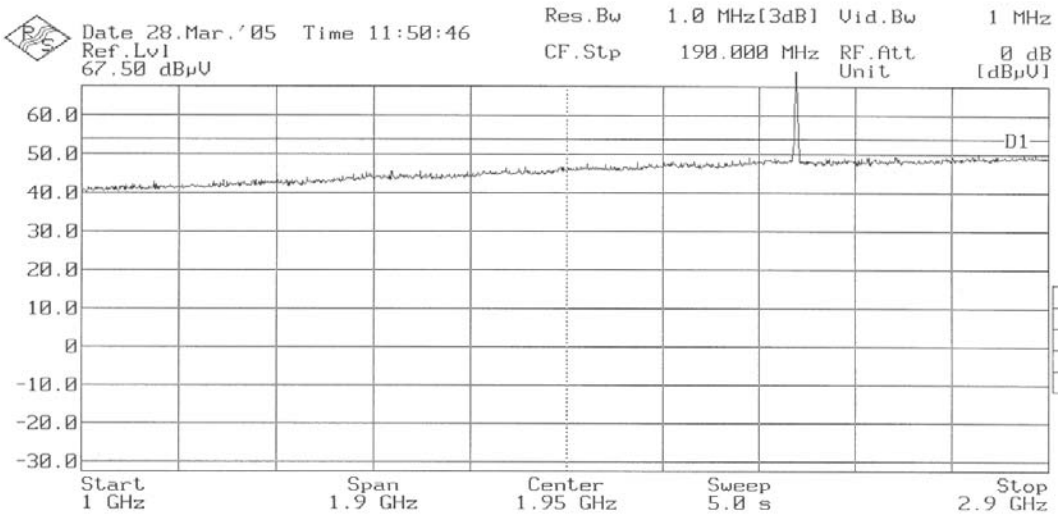


CHANNEL: HIGHEST (2480 MHz).



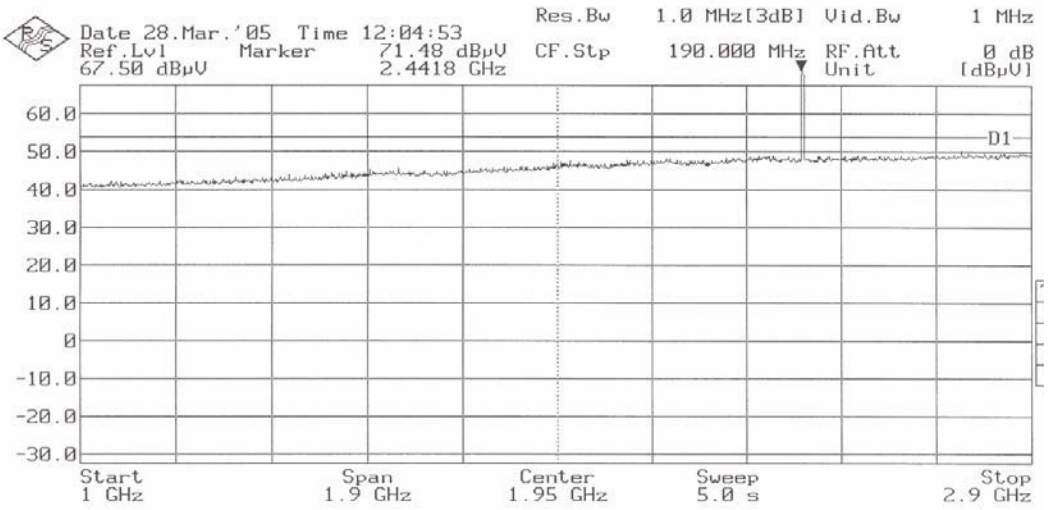
FREQUENCY RANGE 1 GHz to 2.9 GHz.

CHANNEL: Lowest (2402 MHz).



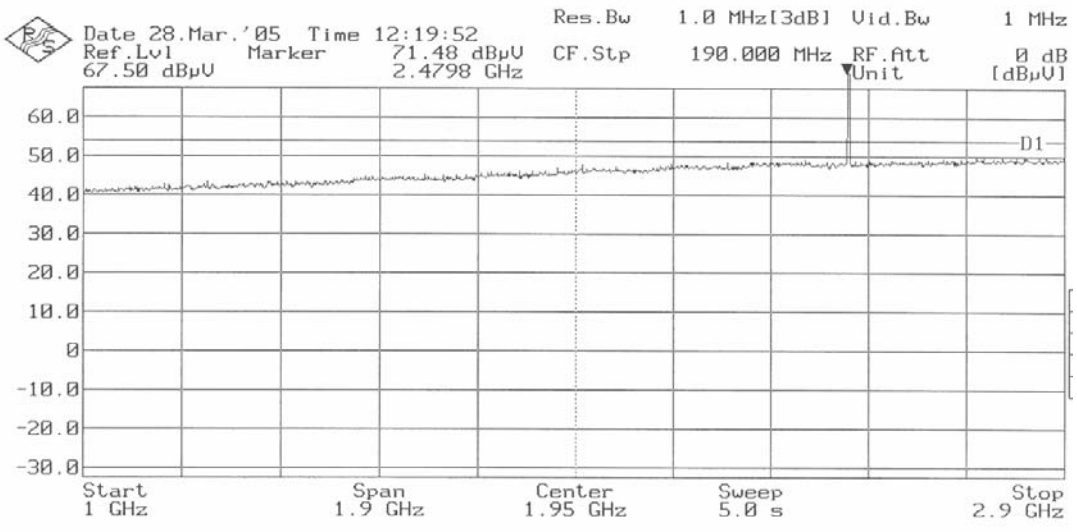
Note: The peak above the limit is the carrier frequency.

CHANNEL: Middle (2441 MHz).



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

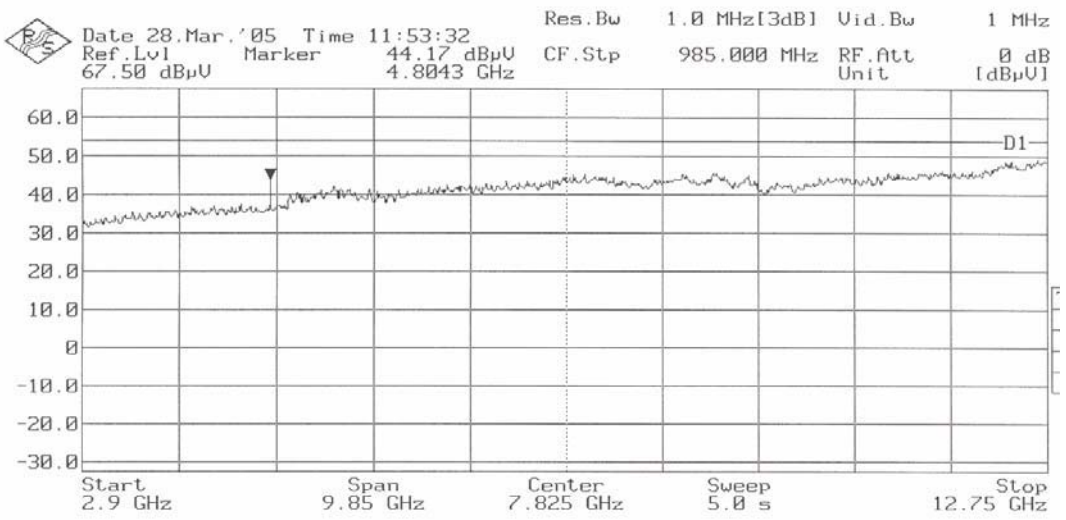
CHANNEL: Highest (2480 MHz).



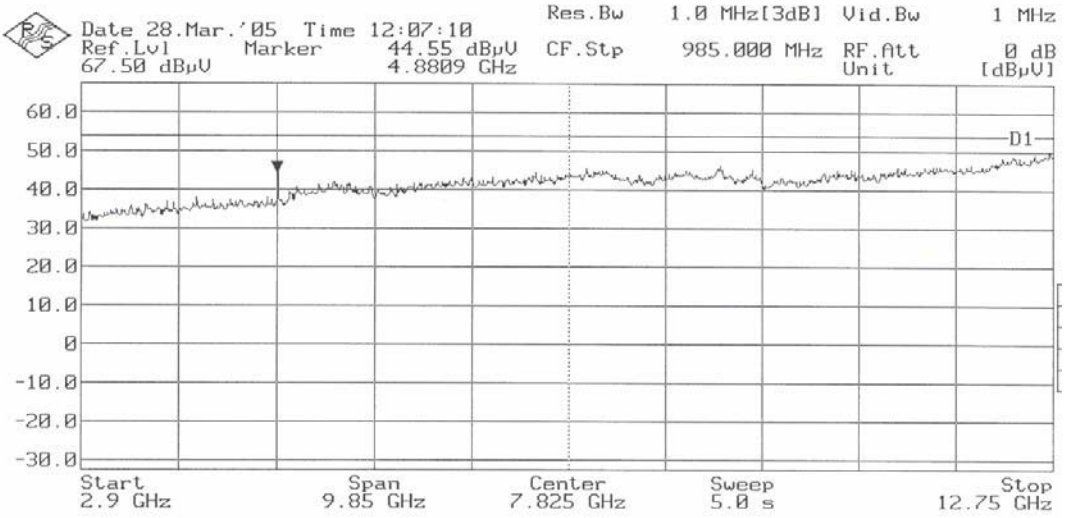
Note: The peak above the limit is the carrier frequency.

FREQUENCY RANGE 2.9 GHz to 12.75 GHz.

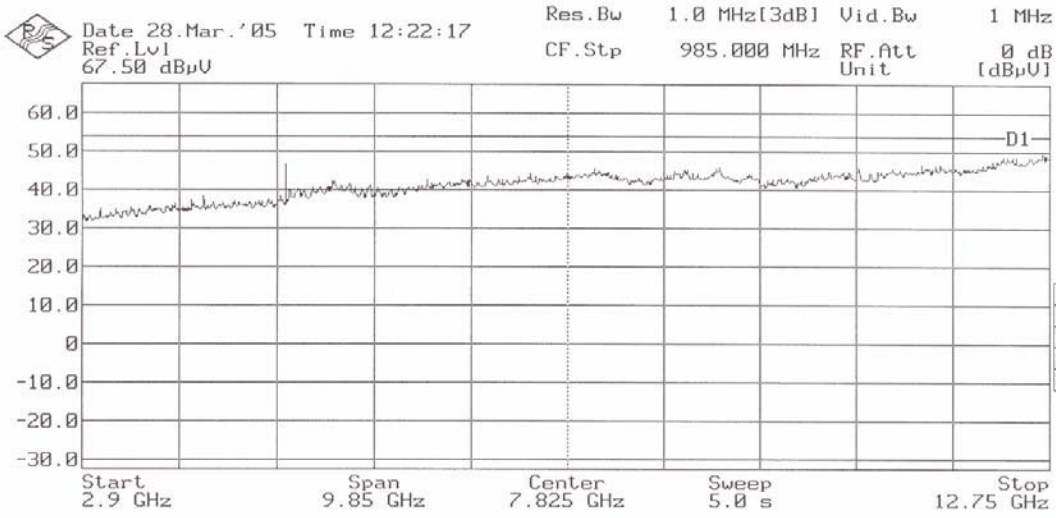
CHANNEL: Lowest (2402 MHz).



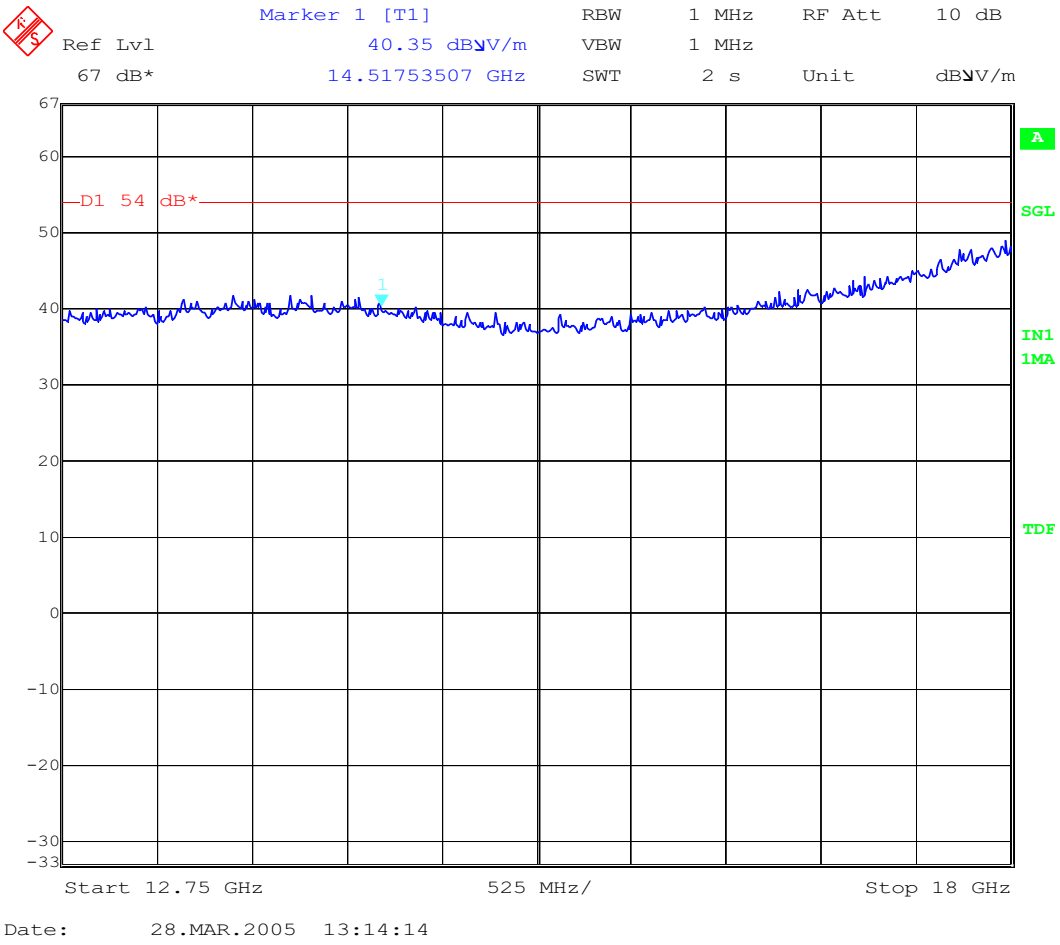
CHANNEL: Middle (2441 MHz).



CHANNEL: Highest (2480 MHz).

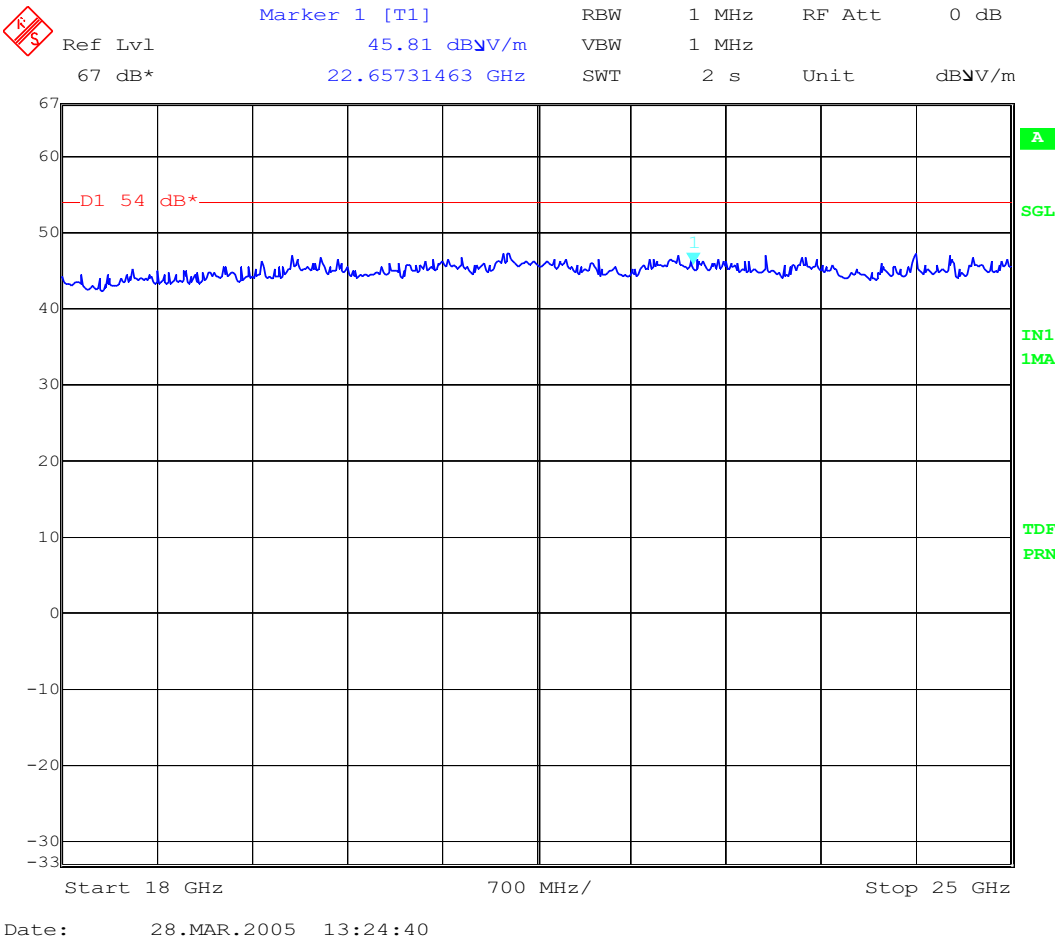


FREQUENCY RANGE 12.75 GHz to 18 GHz.



(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.

1. CHANNEL: LOWEST (2402 MHz).

Frequency range 30 MHz-1000 MHz.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Uncertainty (dB)
206.89378	V	Quasi-peak	19.41	±3.8 dB
259.37875	V	Quasi-peak	25.91	±3.8 dB
307.97595	V	Quasi-peak	26.21	±3.8 dB
356.57315	V	Quasi-peak	32.63	±3.8 dB

Frequency range 1 GHz-25 GHz.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
1602.43720	V	Peak	39.51	± 4.0
1602.43720	V	Average	37.10	± 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.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Uncertainty (dB)
218.55711	V	Quasi-peak	18.27	±3.8 dB
267.15430	V	Quasi-peak	30.73	±3.8 dB
364.34870	V	Quasi-peak	30.22	±3.8 dB
377.95591	V	Quasi-peak	29.22	±3.8 dB

Frequency range 1 GHz-25 GHz.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
1628.38650	V	Peak	37.25	± 4.0
1628.38650	V	Average	34.73	± 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.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Uncertainty (dB)
214.66933	V	Quasi-peak	18.52	±3.8 dB
263.26653	V	Quasi-peak	29.76	±3.8 dB
311.86372	V	Quasi-peak	28.53	±3.8 dB
337.13427	V	Quasi-peak	32.26	±3.8 dB
360.46092	V	Quasi-peak	33.70	±3.8 dB

Frequency range 1 GHz-25 GHz.

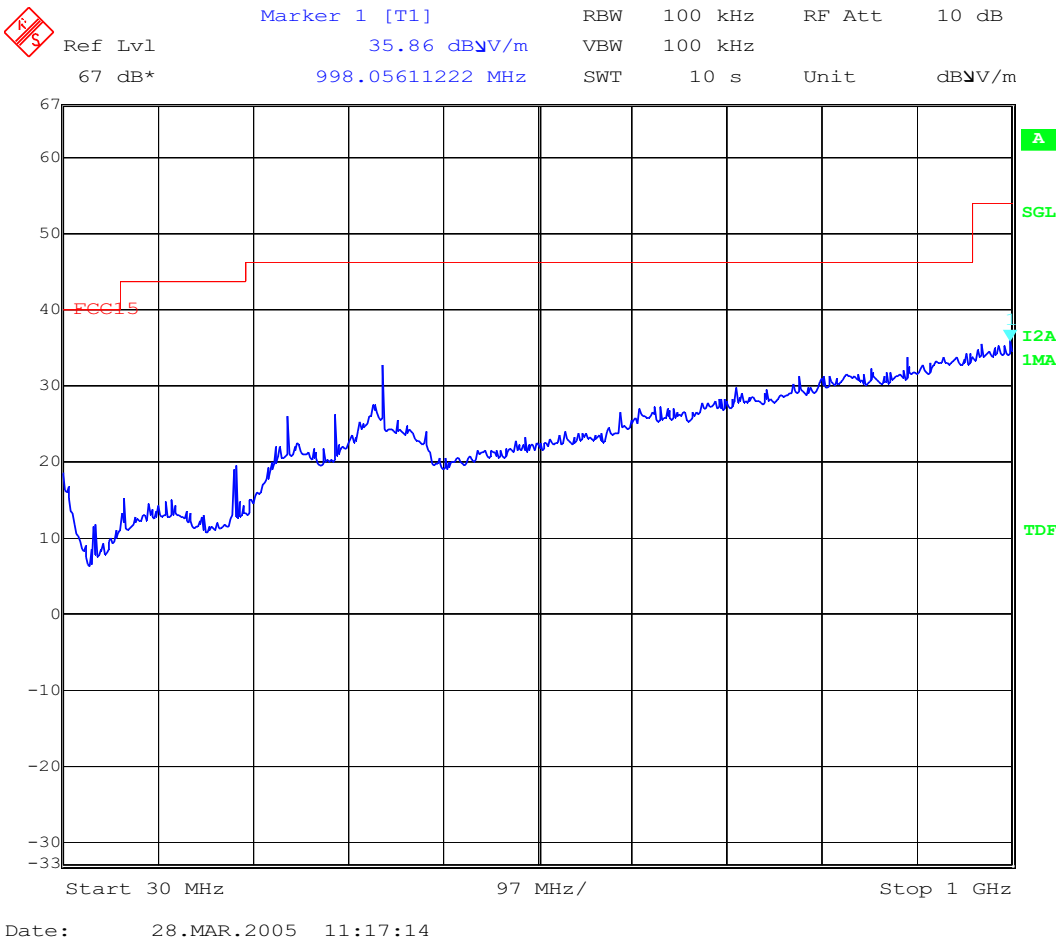
Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
1654.36530	V	Peak	37.42	± 4.0
1654.36530	V	Average	34.24	± 4.0

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

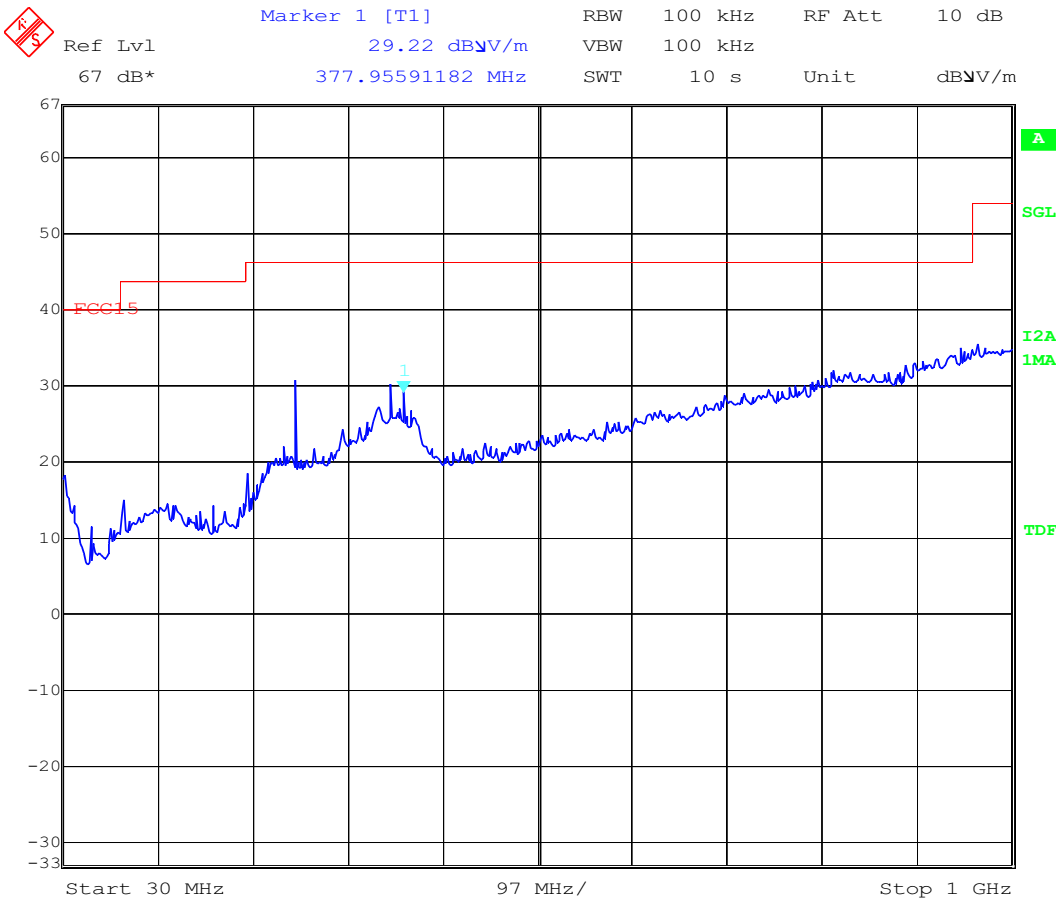
Verdict: PASS.

FREQUENCY RANGE 30 MHz-1000 MHz.

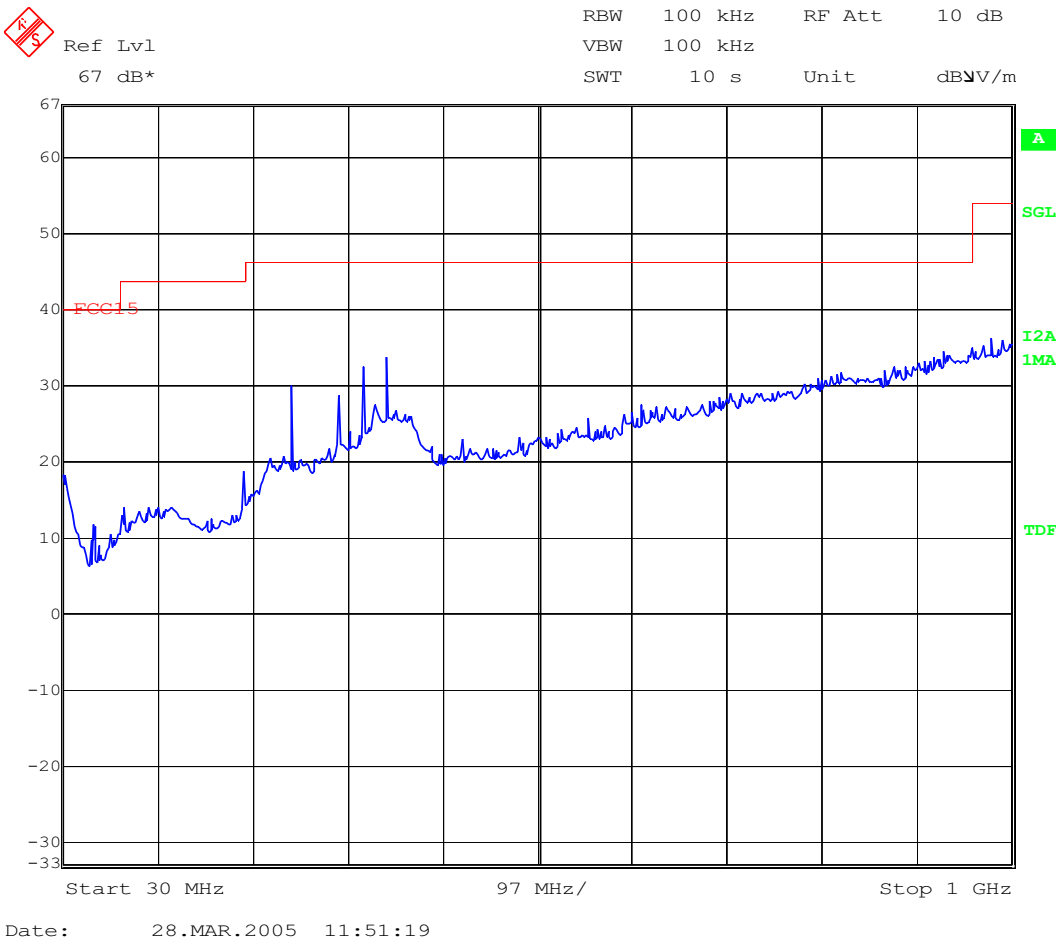
CHANNEL: LOWEST (2402 MHz).



CHANNEL: MIDDLE (2441 MHz).

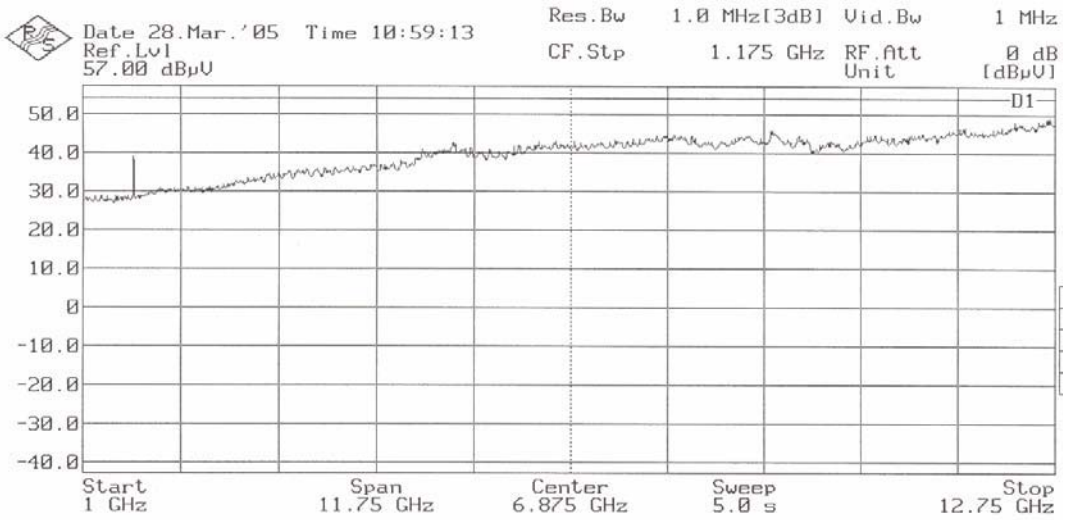


CHANNEL: HIGHEST (2480 MHz).

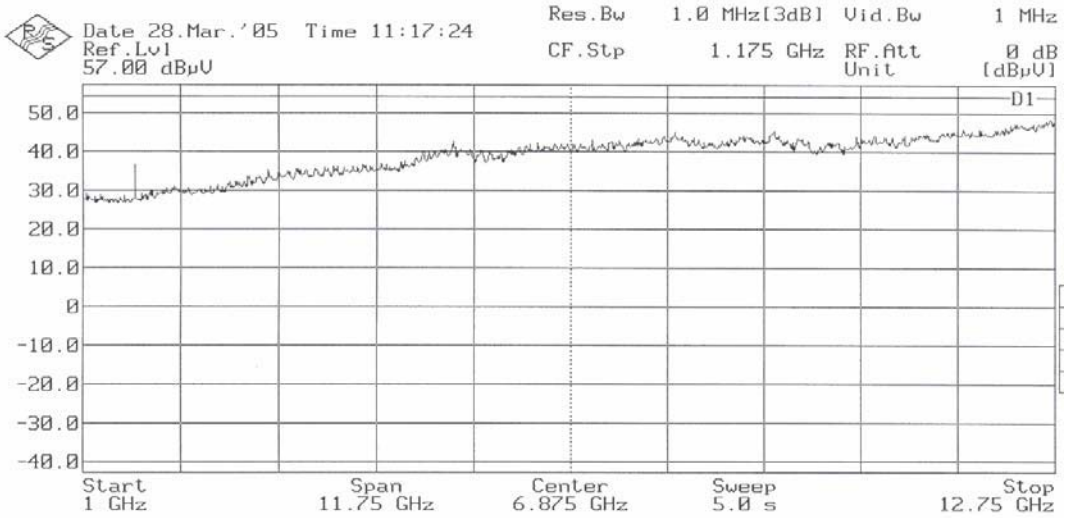


FREQUENCY RANGE 1 GHz-12.75 GHz.

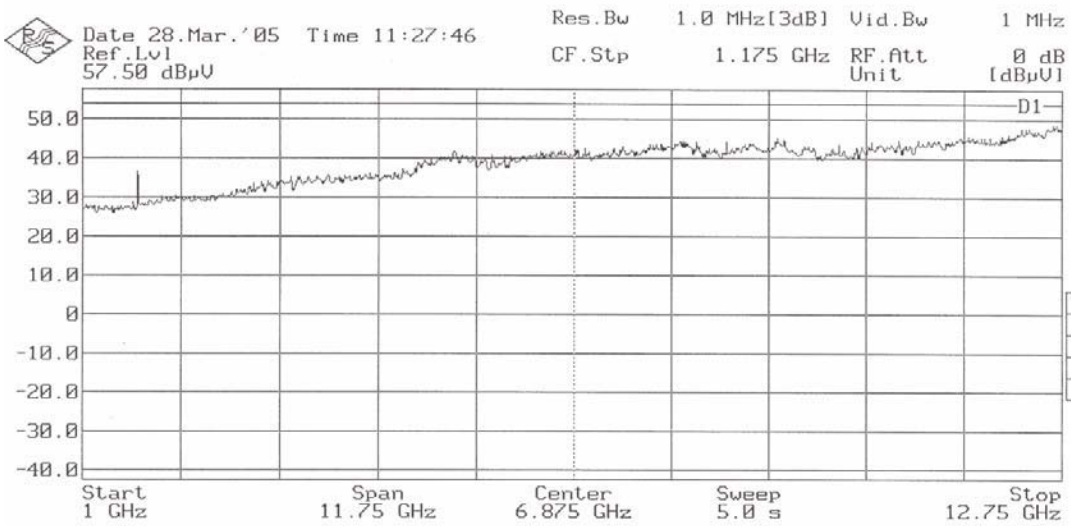
CHANNEL: LOWEST (2402 MHz).



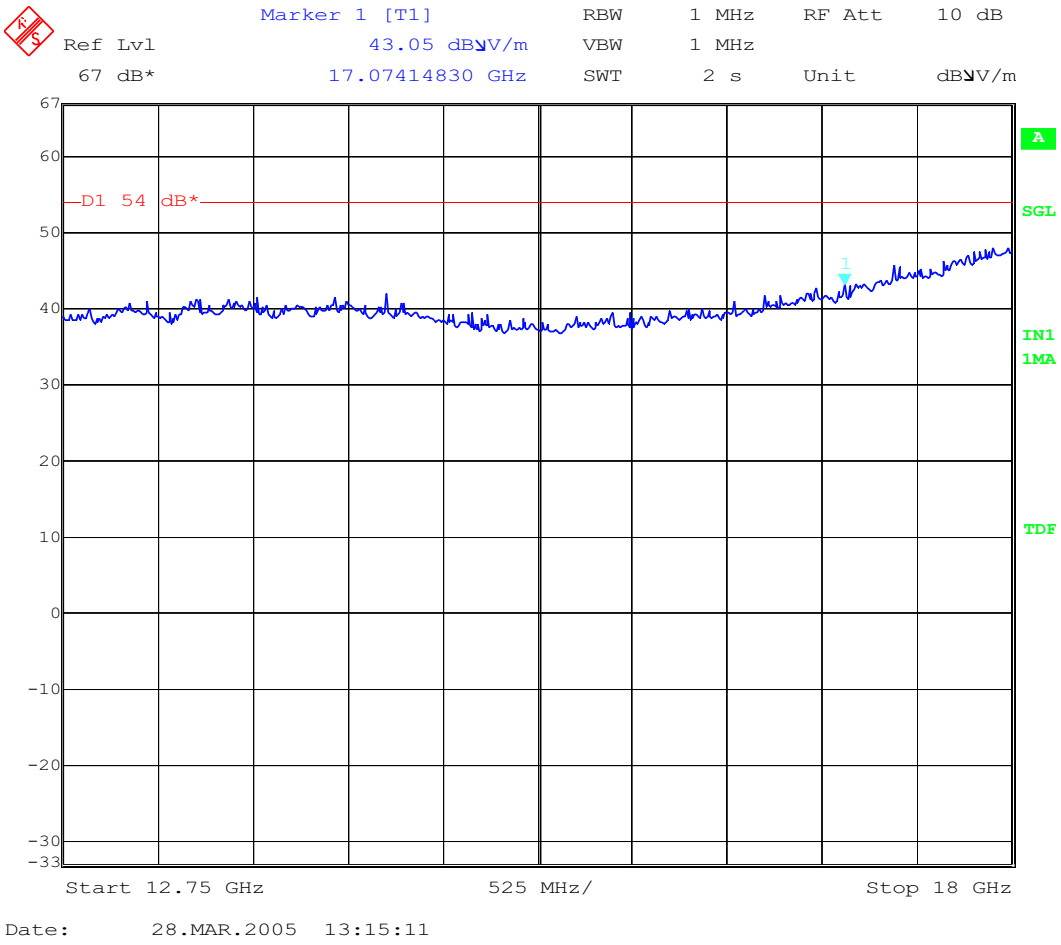
CHANNEL: MIDDLE (2441 MHz).



CHANNEL: HIGHEST (2480 MHz).

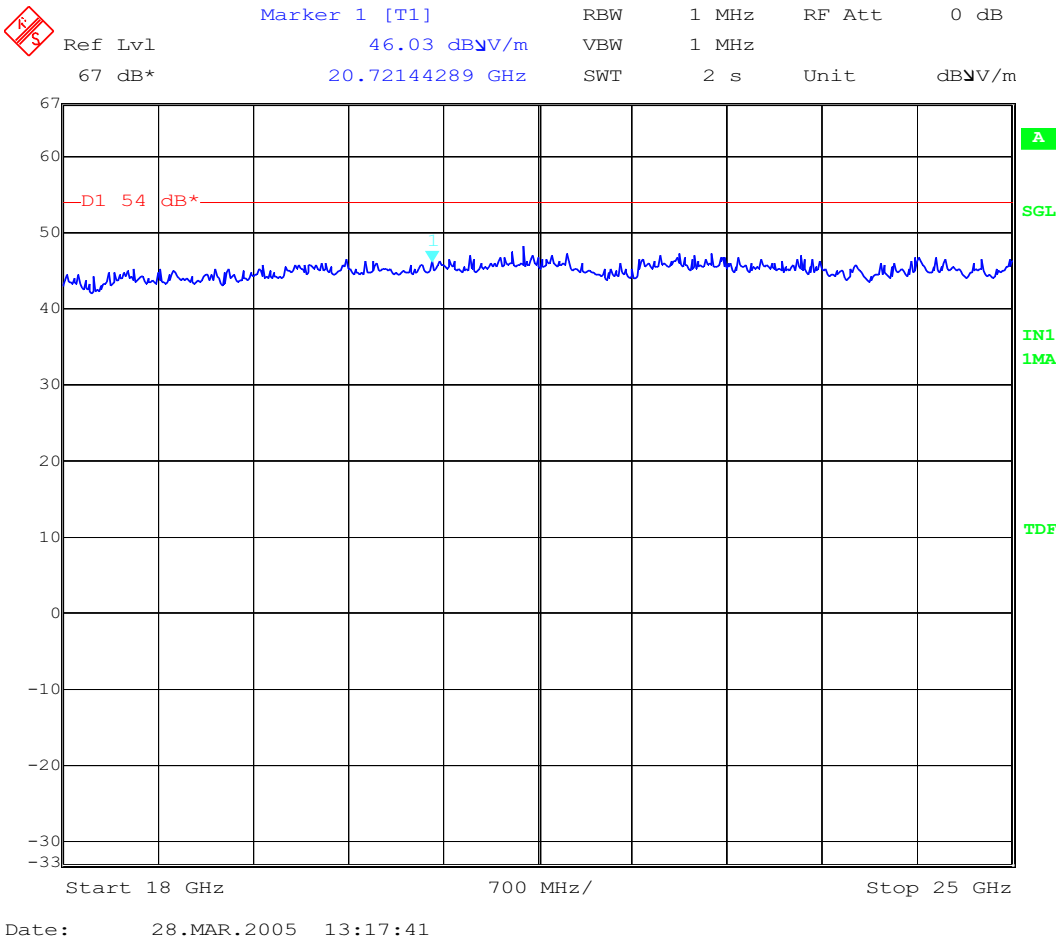


FREQUENCY RANGE 12.75 GHz-18 GHz.



(This plot is valid for all three channels).

FREQUENCY RANGE 18 GHz-25 GHz.



(This plot is valid for all three channels).

Section 15.207. Continuous Conducted Emission

SPECIFICATION

The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table:

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

OPERATING MODES OF EUT

Different tested operating modes (OM)

- OM#02: EUT ON. Bluetooth activated linked with auxiliary mobile phone.

TEST RESULTS

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

On the sample S/01:

- OM#02.

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

On the sample S/02:

- OM#02.

CDmmnnxx	Description	Result
CC02020N	Interference voltage on Neutral wire	PASS
CC0202L1	Interference voltage on Phase wire	PASS

On the sample S/03:

- OM#02.

CDmmnnxx	Description	Result
CC0302-	Interference voltage on Negative wire	PASS
CC0302+	Interference voltage on Positive wire	PASS

GRAPH RESULTS

See next pages.

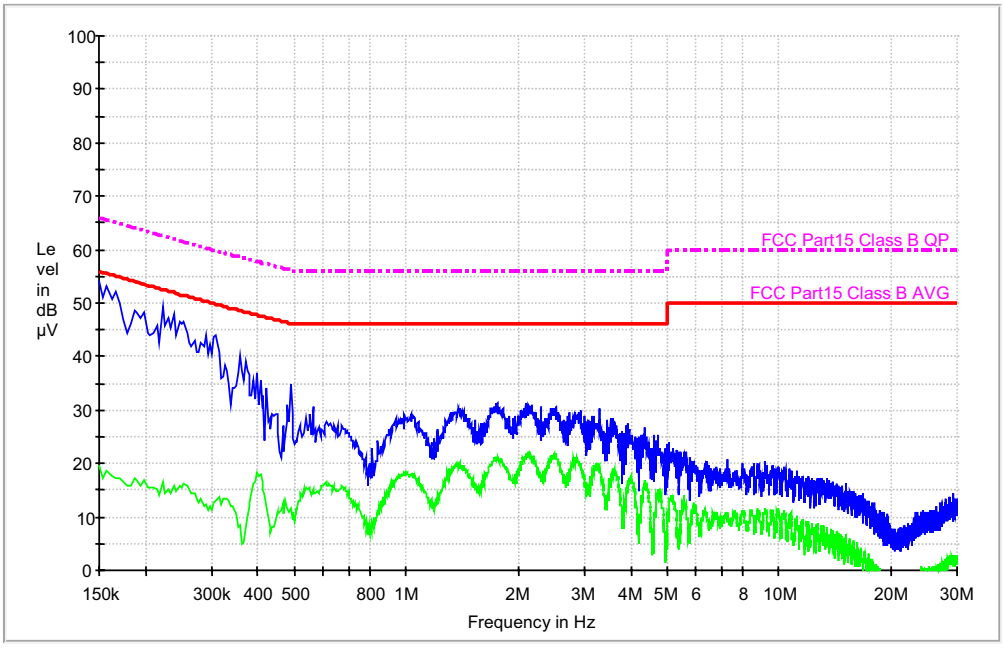
Continuous conducted emission: CC01020N (Peak and average)

EMC32 Report

Test Information

Proyecto:	21702IEM.001
Empresa:	PHILIPS
Muestra:	M/01
Modo operacion:	MO#02
Fecha:	2005-03-29 09:51
Setup:	EMI conducted
Description	EUT ON. Communication mode. Neutral noise.

EC EMI 55022 Clase B ESIB26 CC



Acceptance Analysis

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.150000	54.3	19.7
0.222000	49.5	16.5
0.358000	40.0	8.4

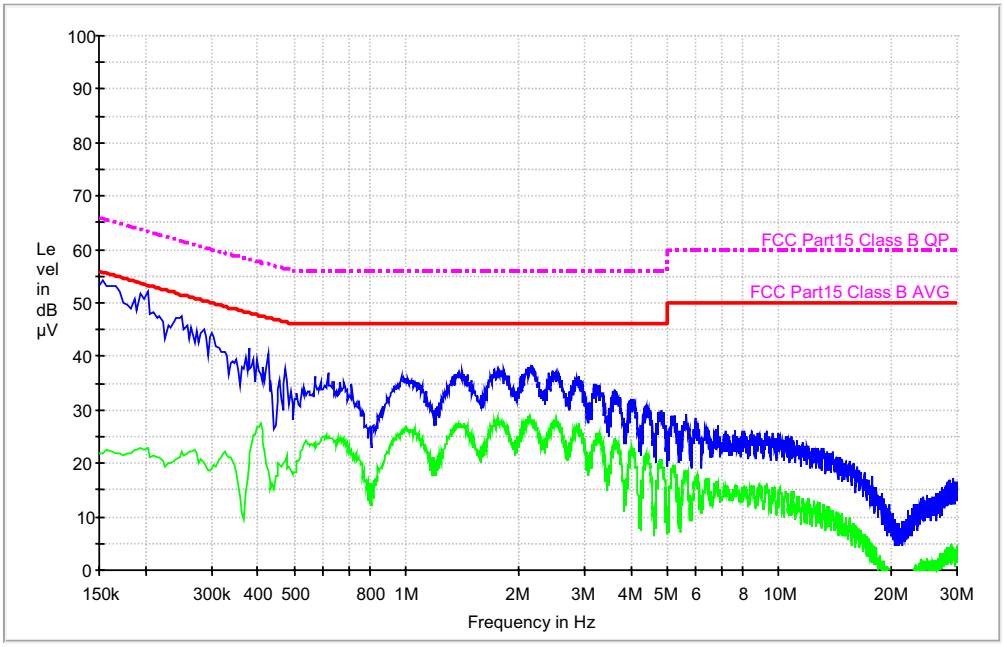
Continuous conducted emission: CC0102L1 (Peak and average)

EMC32 Report

Test Information

Proyecto:	21702IEM.001
Empresa:	PHILIPS
Muestra:	M/01
Modo operacion:	MO#02
Fecha:	2005-03-29 09:56
Setup:	EMI conducted
Description	EUT ON. Communications mode. Phase noise.

EC EMI 55022 Clase B ESIB26 CC



Acceptance Analysis

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.154000	54.1	21.9
0.378000	41.5	20.3
0.474000	37.7	20.3
0.618000	36.9	25.1
0.970000	36.1	25.9
1.418000	37.3	27.3
1.730000	37.7	28.1
2.174000	38.4	27.7
2.470000	37.3	27.7
2.918000	36.3	26.4

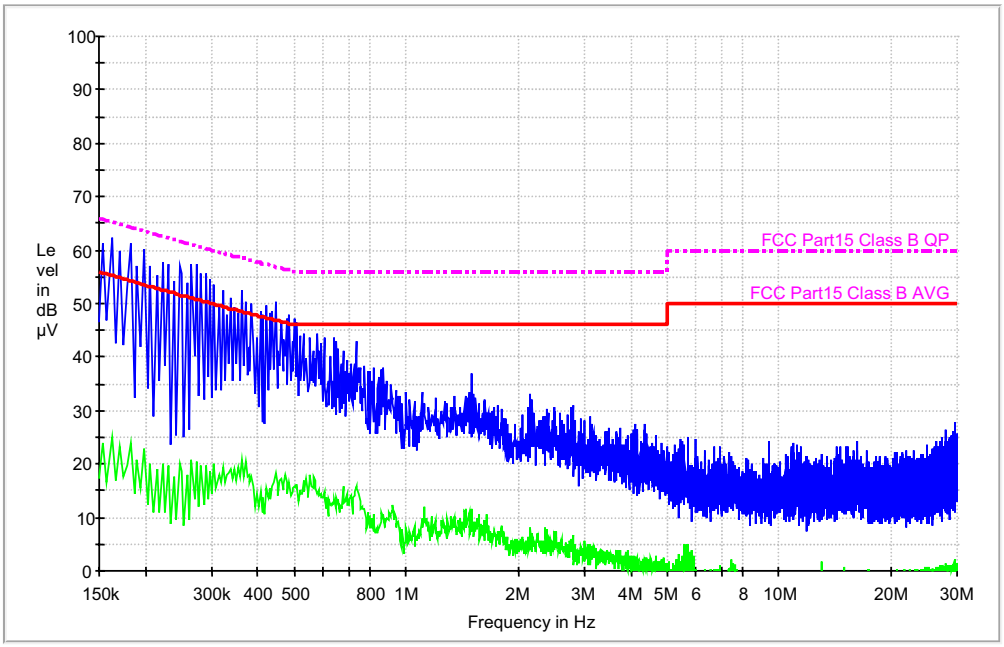
Continuous conducted emission: CC02020N (Peak and average)

EMC32 Report

Test Information

Proyecto:	21702IEM.001
Empresa:	PHILIPS
Muestra:	M/02
Modo operacion:	MO#02
Fecha:	2005-03-29 10:53
Setup:	EMI conducted
Description	EUT ON. Communication mode. Neutral noise.

EC EMI 55022 Clase B ESIB26 CC



Acceptance Analysis

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.154000	61.3	24.1
0.162000	62.2	25.2
0.170000	60.0	23.4
0.182000	61.1	24.1
0.190000	56.9	20.7
0.198000	60.1	22.8
0.206000	57.1	20.0
0.214000	55.3	19.1
0.222000	57.6	20.1
0.230000	57.3	19.9
0.238000	54.3	17.7
0.246000	57.1	20.0
0.258000	53.8	18.0
0.266000	57.3	20.7
0.274000	57.2	20.4
0.282000	55.7	19.8
0.290000	55.7	19.8
0.298000	54.6	18.7
0.306000	53.7	20.1
0.314000	49.7	18.0
0.322000	52.3	19.3
0.330000	48.0	18.1
0.338000	51.1	19.0
0.346000	49.3	19.1
0.354000	48.3	19.5
0.362000	52.4	20.8
0.370000	50.2	20.3
0.386000	50.0	17.7
0.398000	43.6	14.4
0.406000	48.6	14.8
0.414000	47.7	13.8
0.422000	49.6	15.3
0.430000	48.2	15.6
0.438000	48.6	15.9
0.446000	50.4	18.2
0.462000	46.7	17.2
0.478000	47.4	16.6
0.486000	47.8	16.6
0.502000	47.2	16.0
0.510000	46.5	16.4
0.518000	43.9	15.0
0.530000	44.4	17.0
0.554000	43.6	17.9
0.578000	44.5	14.4
0.594000	42.6	13.6
0.602000	43.7	14.8
0.626000	40.2	12.3
0.642000	43.7	13.2
0.650000	43.0	13.6
0.658000	41.5	13.3
0.670000	38.8	12.0
0.678000	41.3	15.9
0.694000	39.3	14.5

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.710000	38.6	14.1
0.726000	38.9	14.1
0.734000	42.9	15.9
0.774000	38.3	11.6
0.790000	37.2	11.1
0.798000	37.4	10.3
0.818000	38.1	10.5
0.846000	36.2	8.0
0.854000	37.2	9.1
0.862000	37.6	10.8
0.870000	37.9	10.5
1.494000	37.1	11.6

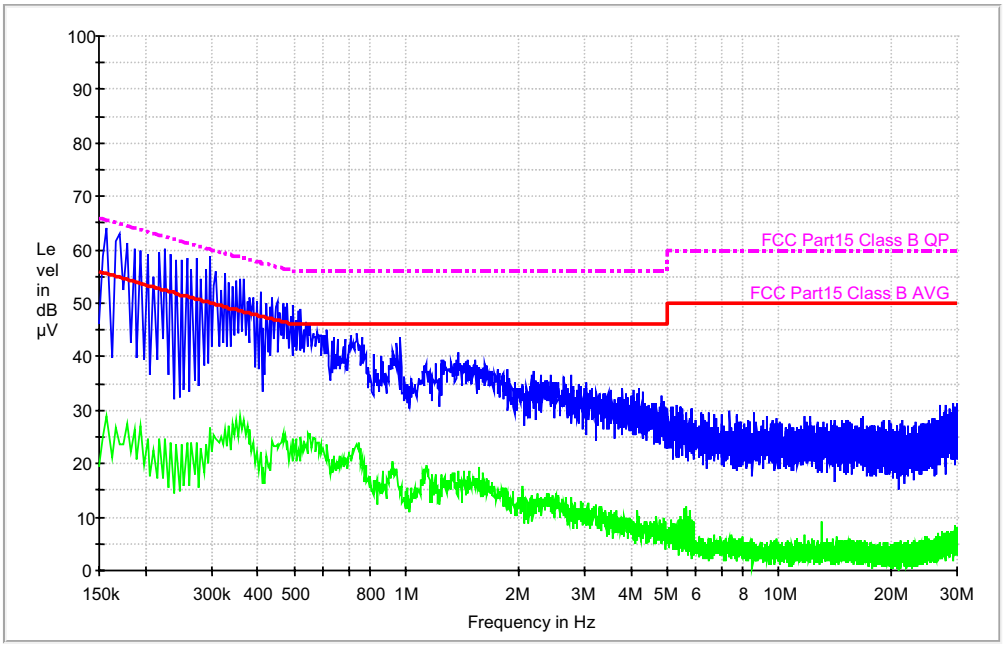
Continuous conducted emission: CC0202L1 (Peak and average)

EMC32 Report

Test Information

Proyecto:	21702IEM.001
Empresa:	PHILIPS
Muestra:	M/02
Modo operacion:	MO#02
Fecha:	2005-03-29 11:00
Setup:	EMI conducted
Description	EUT ON. Communication mode. Phase noise.

EC EMI 55022 Clase B ESIB26 CC



Acceptance Analysis

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
0.158000	64.2	28.7
0.170000	63.0	23.6
0.178000	61.3	27.4
0.186000	60.1	26.4
0.194000	59.7	26.9
0.202000	59.2	24.8
0.210000	55.1	22.4
0.218000	59.5	24.7
0.226000	60.2	24.6
0.234000	59.0	24.1
0.242000	58.2	23.7
0.250000	58.2	23.6
0.258000	58.5	23.9
0.266000	56.5	24.0
0.274000	58.4	24.1
0.282000	54.6	23.0
0.290000	56.2	23.6
0.298000	58.7	26.7
0.310000	56.0	24.7
0.318000	52.3	24.9
0.326000	55.6	26.5
0.334000	54.0	27.0
0.342000	53.3	27.4
0.350000	54.2	28.2
0.358000	54.7	28.8
0.366000	54.7	28.0
0.374000	50.2	26.9
0.382000	51.1	26.5
0.398000	50.2	22.3
0.406000	52.0	22.2
0.414000	45.6	19.3
0.422000	50.0	21.7
0.430000	49.3	19.9
0.438000	51.1	24.2
0.450000	50.4	23.6
0.466000	49.8	25.6
0.482000	50.0	24.2
0.490000	47.5	23.1
0.498000	49.6	24.5
0.514000	48.7	22.6
0.522000	48.9	24.9
0.638000	43.6	21.4
0.738000	44.4	23.7
0.818000	40.4	16.8
0.858000	40.2	16.2
0.946000	42.6	18.9
0.966000	43.7	14.5
1.130000	38.6	19.4
1.202000	38.8	18.0
1.378000	40.9	16.7
2.194000	37.2	13.5
2.290000	36.5	12.2

Frequency (MHz)	MaxPeak-ClearWrite (dBµV)	Average-ClearWrite (dBµV)
2.442000	36.5	12.9
2.650000	36.3	12.4
2.774000	36.5	13.6

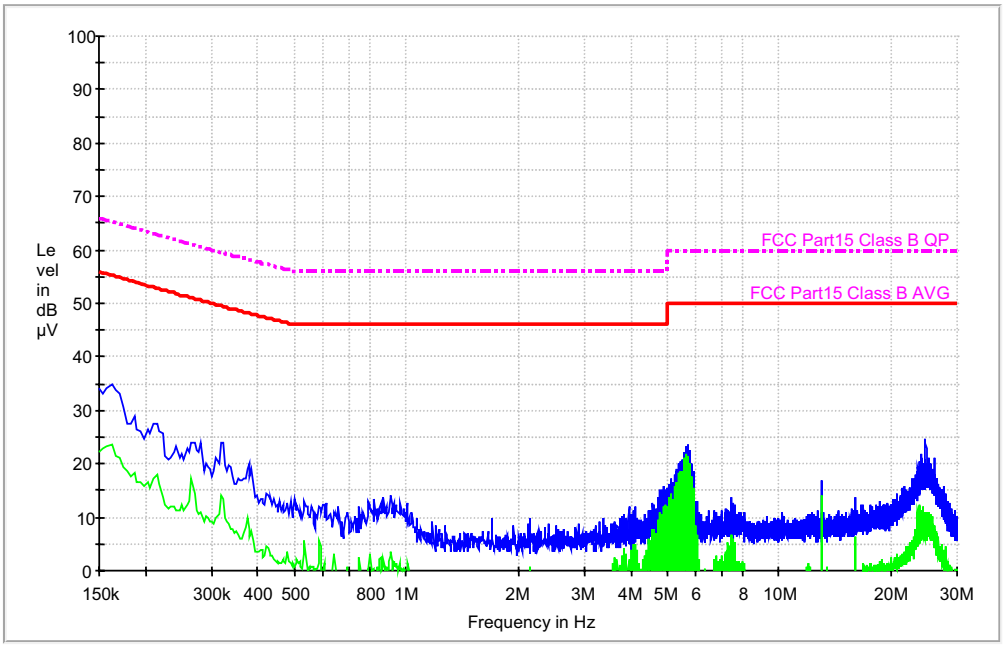
Continuous conducted emission: CC0302- (Peak and average)

EMC32 Report

Test Information

Proyecto:	21702IEM.001
Empresa:	PHILIPS
Muestra:	M/03
Modo operacion:	MO#02
Fecha:	2005-03-29 12:13
Setup:	EMI conducted
Description	EUT ON. Communication mode. Negative noise.

EC EMI 55022 Clase B ESIB26 CC



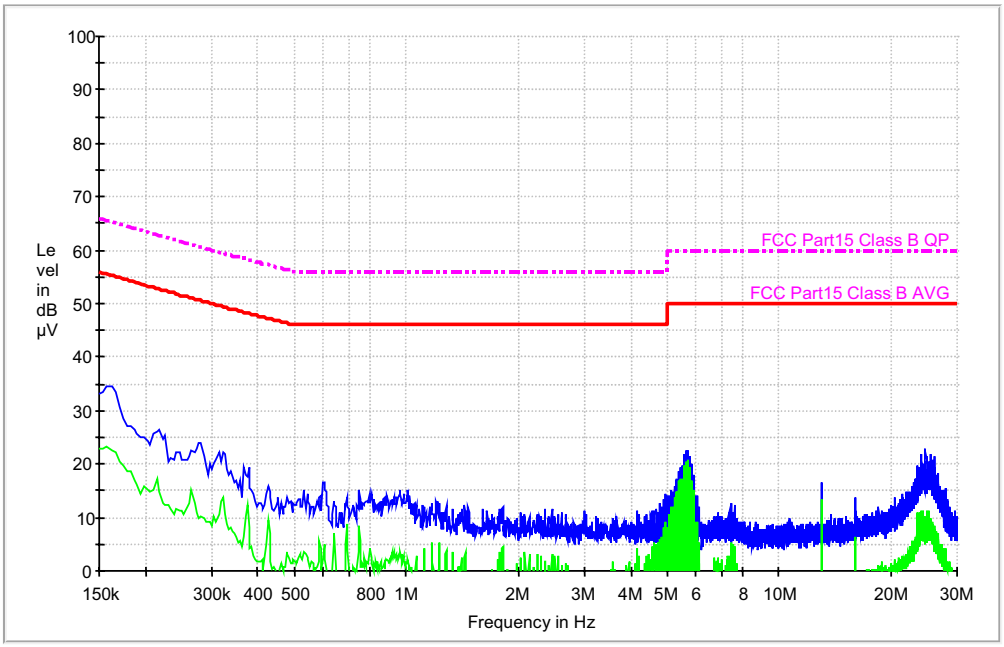
Continuous conducted emission: CC0302+ (Peak and average)

EMC32 Report

Test Information

Proyecto:	21702IEM.001
Empresa:	PHILIPS
Muestra:	M/03
Modo operacion:	MO#02
Fecha:	2005-03-29 12:18
Setup:	EMI conducted
Description	EUT ON. Communication mode. Positive noise.

EC EMI 55022 Clase B ESIB26 CC



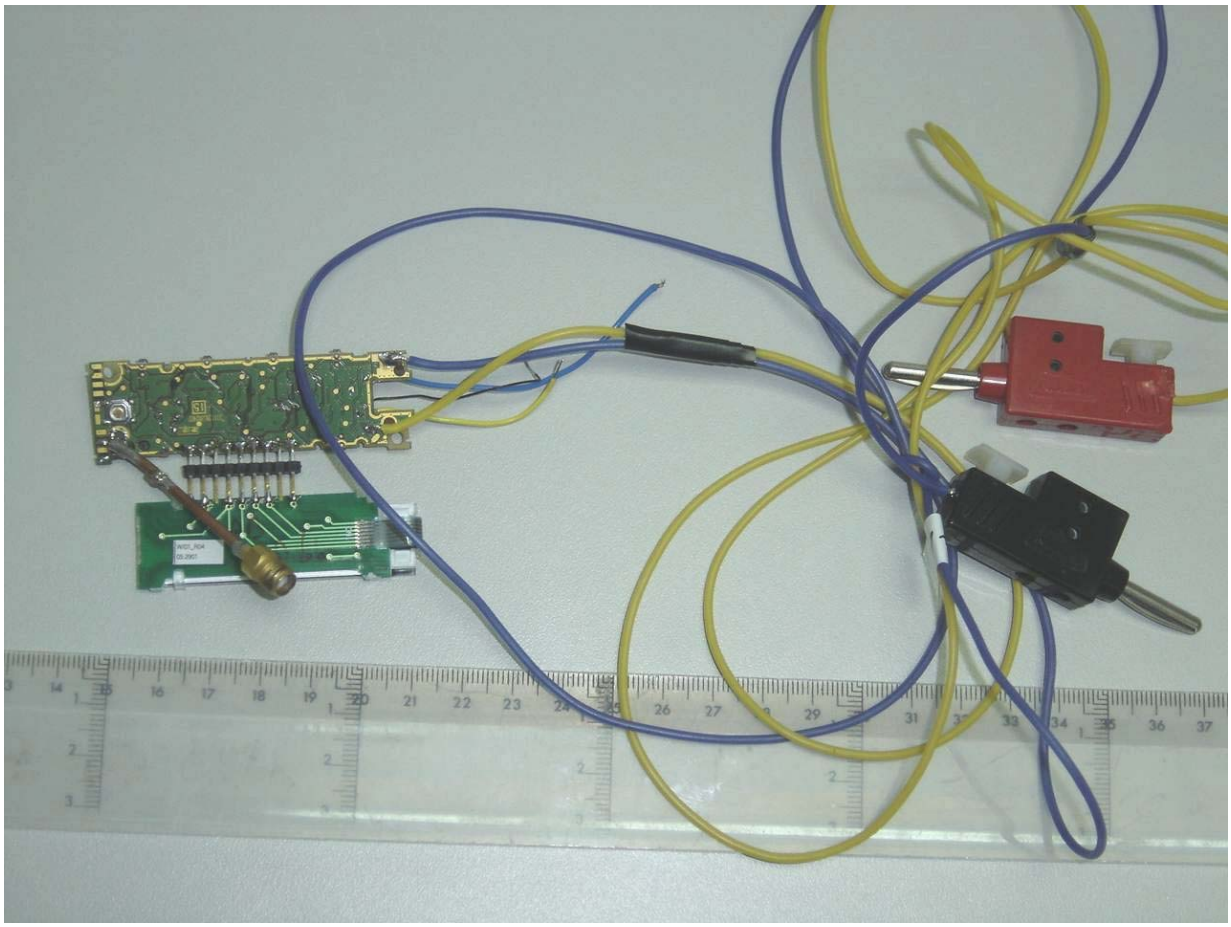
ANNEX B

PHOTOGRAPHS
(Number of photographs: 7)

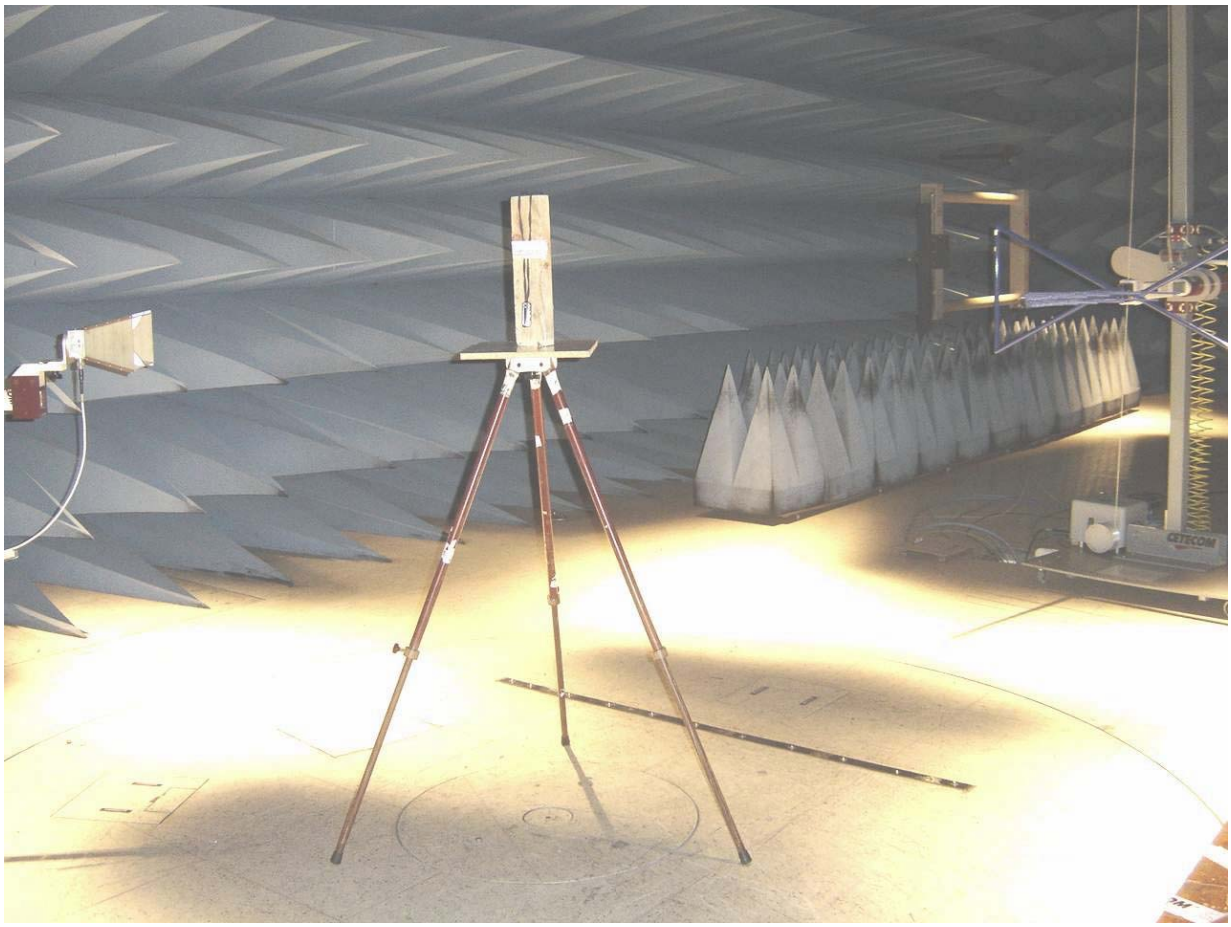
Report No.: 21702RET.101

1. Equipment (external view)

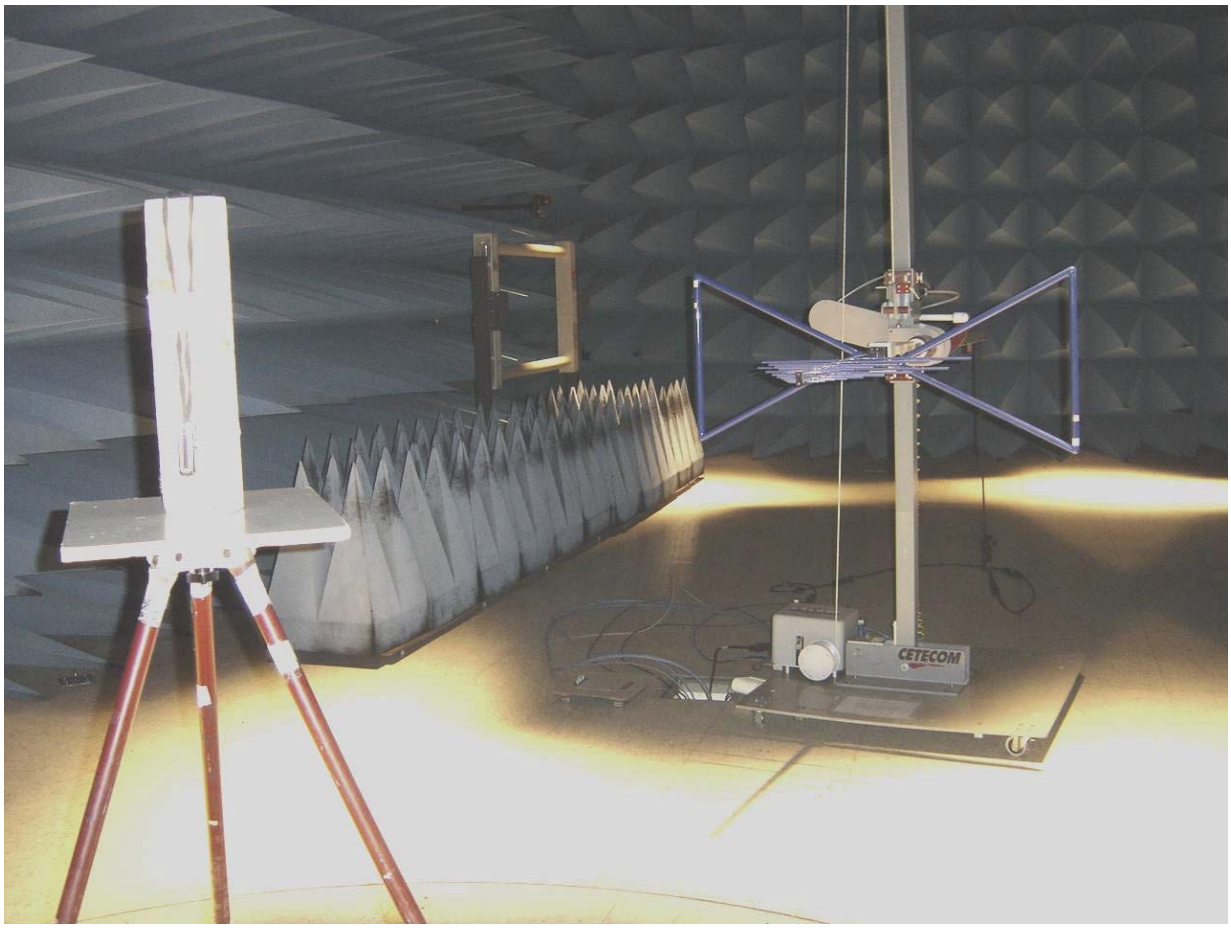
2. Equipment for conducted measurements.



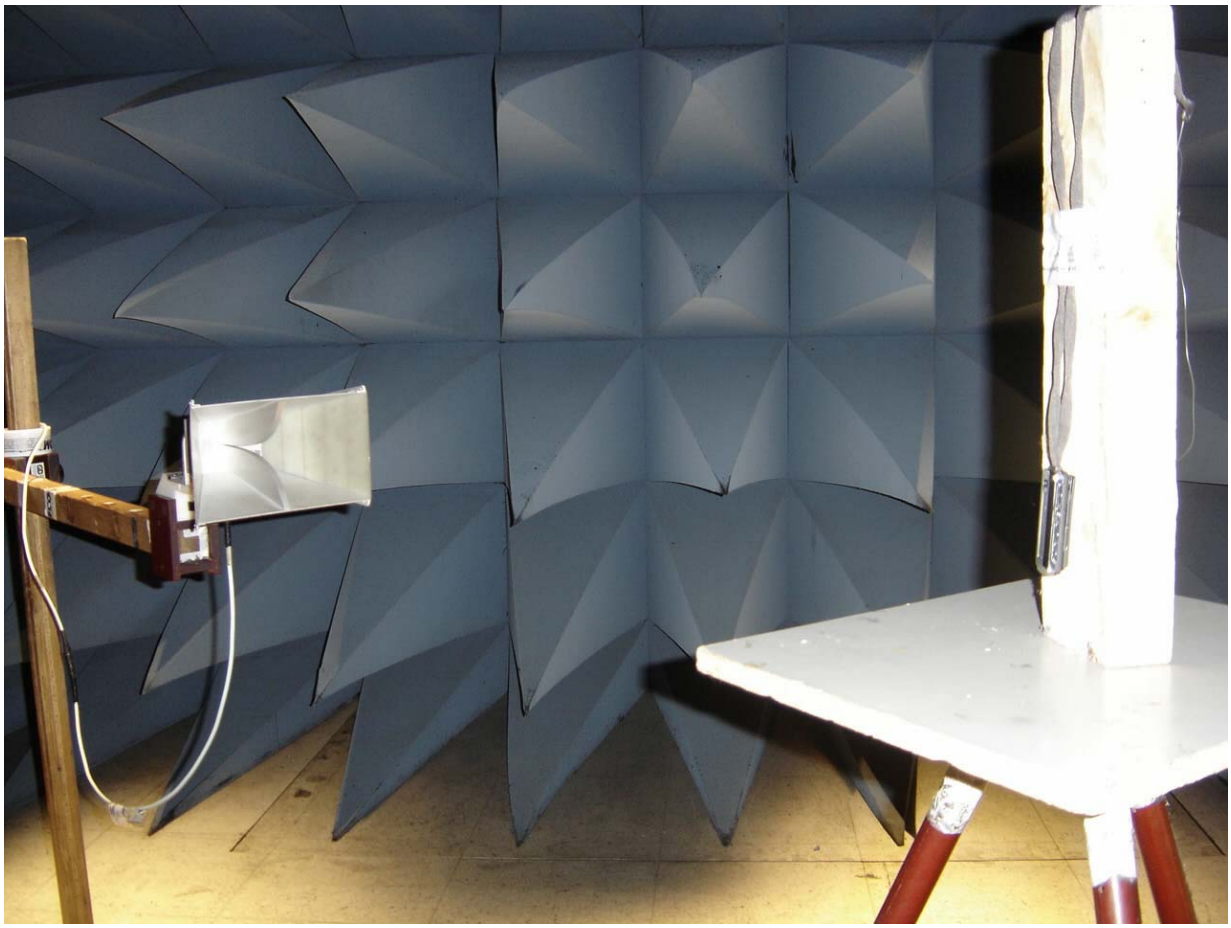
3. General test set-up for radiated measurements.



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



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



6. Test set-up for RF conducted measurements.