

Rapport d'essai / Test report

N° 201002-6070CR-A1-R2-E

JDE : 99678

DELIVRE A / ISSUED TO : **INGENICO**
1, Rue Claude Chappe
BP 348
07503 GUILHERAND-GRANGES - France

Objet / Subject : Essais de compatibilité électromagnétique conformément aux normes
FCC CFR 47 Part 15, Subpart B et C.
*Electromagnetic compatibility tests according to the standards
FCC CFR 47 Part 15, Subpart B and C*

Matériel testé / Apparatus under test :

- **Produit / Product** : Lecteur carte bancaire Sans Contact / *Bank payment terminal Contactless*
- **Marque / Trade mark** : **INGENICO**
- **Constructeur / Manufacturer** : **INGENICO**
- **Type / Model** : **EFT930B-wxyz0102+BAS930X-wxy202**
- **Type sous test / Model under test** : **EFT930B-3CXH0102+BAS930B-2BB202**
- **N° de série / serial number** : **10077PT60458108+10085PT60476288**
- **FCC ID** : **XKB-EFT930B**

Date des essais / Test date : Du 3 Mai au 8 Juin 2010 / *From May 3rd to June 8th, 2010*

Lieu d'essai / Test location : **BUREAU VERITAS LCIE SUD-EST**
ZI Centr'Alp – 170 rue de Chatagnon
38430 MOIRANS - France

Test réalisé par / Test performed by : Anthony MERLIN

Ce document comporte / Composition of document : 43 pages.

MOIRANS, LE 12 JUILLET 2010 / *JULY 12TH, 2010*

Ecrit par / *Written by*,
Anthony MERLIN

Approuvé par / *Approved by*,
Jacques LORQUIN

La reproduction de ce document n'est autorisée que sous sa forme intégrale. Toute reproduction partielle ou toute insertion de résultats dans un texte d'accompagnement en vue de leur diffusion doit recevoir un accord préalable et formel du LCIE. Ce document résulte d'essais effectués sur un spécimen, un échantillon ou une éprouvette. Il ne préjuge pas de la conformité de l'ensemble des produits fabriqués à l'objet essayé. Sauf indication contraire, la décision de conformité prend en compte l'incertitude de mesures. Il ne préjuge en aucun cas d'une décision de certification.

This document shall not be reproduced, except in full, without the written approval of the LCIE. This document contains results related only to the item tested. It does not imply the conformity of the whole production to the item tested. Unless otherwise specified, the decision of conformity takes into account the uncertainty of measures. This document does not anticipate any certification decision.



SUMMARY

1.	TEST PROGRAM	3
2.	SYSTEM TEST CONFIGURATION	4
3.	RADIATED EMISSION DATA	7
4.	MAXIMUM PEAK OUTPUT POWER (15.247)	13
5.	HOPPING CHANNEL SEPARATION (15.247).....	18
6.	NUMBER OF HOPPING FREQUENCIES (15.247).....	27
7.	TIME OF OCCUPANCY (DWEELL TIME) (15.247).....	32
8.	BAND EDGE MEASUREMENT (15.247)	35
9.	TEST EQUIPMENT LIST (MOIRANS SITE)	42
10.	UNCERTAINTIES CHART	43



1. TEST PROGRAM

Standard: - FCC Part 15, Subpart C 15.247
 - ANSI C63.4 (2009)

EMISSION TEST	LIMITS			RESULTS (Comments)
Limits for conducted disturbance at mains ports 150kHz-30MHz	Frequency	Quasi-peak value (dBµV)	Average value (dBµV)	See report 201002-6070CR-A1-R1-E*²
	150-500kHz	66 to 56	56 to 46	
	0.5-5MHz	56	46	
	5-30MHz	60	50	
Radiated emissions 9kHz-30MHz	Measure at 300m 9kHz-490kHz : 67.6dBµV/m /F(kHz) Measure at 30m 490kHz-1.705MHz : 87.6dBµV/m /F(kHz) 1.705MHz-30MHz : 29.5 dBµV/m			See report 201002-6070CR-A1-R1-E*²
Radiated emissions 30MHz-25GHz*	Measure at 3m 30MHz-88MHz : 40 dBµV/m 88MHz-216MHz : 43.5 dBµV/m 216MHz-960MHz : 46.0 dBµV/m Above 960MHz : 54.0 dBµV/m			PASS And see report 201002-6070CR-A1-R1-E*²
Maximum Peak Output Power 15.247 (b)	Limit: 21dBm Conducted or Radiated measurement			PASS
Hopping Channel Separation 15.247 (a) (1)	Minimum between: Two-third 20dB Bandwidth or 25kHz Whichever is greater			PASS
Number of Hopping Frequencies 15.247 (a) (1) (iii)	At least 15 channels used			PASS
Time of Occupancy (Dwell Time) 15.247 (a) (1) (iii)	Maximum 0.4 sec within 31.6sec			PASS
Band Edge Measurement 15.247 (d)	Limit: -20dBc			PASS

*§15.33: The highest internal source of a testing device is defined like more the highest frequency generated or used in the testing device or on which the testing device works or agrees.

- If the highest frequency of the internal sources of the testing device is lower than 108 MHz, measurement must be only performed until 1GHz.
- If the highest frequency of the internal sources of the testing device ranges between 108 MHz and 500 MHz, measurement must be only performed until 2GHz.
- If the highest frequency of the internal sources of the testing device ranges between 500 MHz and 1 GHz, measurement must be only performed until 5GHz.

If the highest frequency of the internal sources of the testing device is above 1 GHz, measurement must be only performed until 5 times the highest frequency or 40 GHz, while taking smallest of both.

*²: In report 201002-6070CR-A1-R1-E, tests are performed with Bluetooth module activated in typical use but the equipment is been considered with a RFID 13.56MHz module and so tested in compliance with 15.225. Complementary tests of 15.247 are performed in this test report.



2. SYSTEM TEST CONFIGURATION

2.1. JUSTIFICATION

The system was configured for testing in a typical fashion (as a customer would normally use it). The model option under test is the worst case.

2.2. HARDWARE IDENTIFICATION

- **Equipment under test (EUT):**

EFT930B-3CXH0102+BAS930B-2BB202

Serial number: 10077PT60458108+10085PT60476288
FCC ID: XKB-EFT930B

Power supply: FRIWO FW7601/151964, 100-240VAC, 50-60Hz, 5VDC 1A

Power supply: PHIHONG PSA105E-050/251360796, 100-240VAC, 50-60Hz, 5VDC 1A

Internal frequencies: < 500MHz

Dimensions: 180 x 80 x 80 mm

MagicBox: 295000703 50/09

- **Input/output:**

- 1 x DC power input (8Vdc) on base
- 1 x Serial link (COM0) on base
- 1 x Modem line (LINE IN) on base
- 1 x LAN port on base
- 1 x Serial link (COM1) on MagicBox connected to COM0 on base
- 1 x USB port on MagicBox connected to COM0 on base
- 2 x USB ports Mini A&B connectors on portable terminal
- 2 x SAM ports
- 1 x SD card port

- **Cables:**

- 1 x DC power supply cable (fixed on mains power unit), unshielded: 2m or 2.8m
- 2 x RS232 Com cable, RJ11, unshielded, 1.5m
- 2 x USB cables, Mini A&B connectors, shielded: 1m
- 1 x USB cable, shielded: 1m
- 1 x Telephone line cable, unshielded, length: 5m
- 1 x LAN cable, shielded, length: 2m

- **Auxiliaries equipment used during test:**

- Smartcards (EFT Contactless and EMV card)
- SAM cards (x2)
- TELTON Telephone line simulator TLS-5B-01

Sn: 014184



• **Equipment information:**

- External antenna connector: NO, for terminal GSC connector, for base PCB antenna.
- Radiated fundamental frequency band: 2400-2483.5MHz
- Antenna type: Internal
- Stand By mode: None
- Normal power source: Battery 3.6VDC (terminal) and 100-240VAC, 50-60Hz (base)
- Modulation Type: GFSK
- Modulation Technology: FHSS
- Transfert rate: 1Mbps
- Packet Type: EDR
- Maximum Antenna Gain: 1.6dBi (terminal) and 2.1dBi (base); manufacturer declaration.

2.3. EUT CONFIGURATION

The inboard software (EMC TEST) performed the followings tests and activates the followings functions:

- Printer ON
- Smartcards reading: CAM0, SAM1&2 (Power ON and reading)
- USB ON (Host to slave ports looped back)
- Backlight and display are ON
- Modem ON
- Contact less ON (ATR reading in loop)

For Bluetooth function on terminal and base, the parameters during the tests are the following:

- Carrier frequency 2402MHz – GFSK – EDR 1mbps
- Carrier frequency 2441MHz – GFSK – EDR 1mbps
- Carrier frequency 2480MHz – GFSK – EDR 1mbps
- Frequency Hopping mode – GFSK – EDR 1mbps – Searching to synchronize
- Frequency Hopping mode – GFSK – EDR 1mbps – Data transfer

2.4. EQUIPMENT MODIFICATIONS

Added ferrite clamps on following cable:

- Ferrite Würth Elektronik 742 711 12 2 ways near the input power supply port of base. (for both power supplies)
- Specification of LAN cable shielded
- Capacitor 3.6pF in parallel to balun output on Bluetooth amplification.



2.5. SPECIAL ACCESSORIES

None

3. RADIATED EMISSION DATA

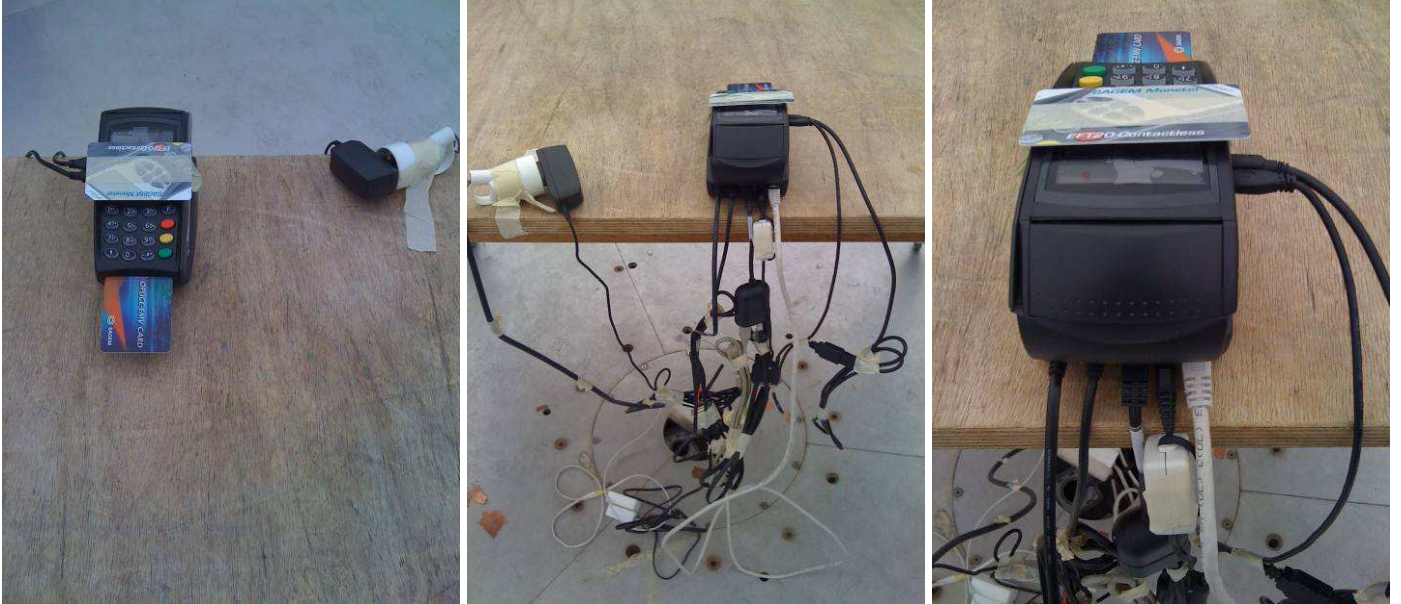
3.1. CLIMATIC CONDITIONS

Date of test : May 7th, 2010
Test performed by : A.MERLIN
Atmospheric pressure : 945mb
Relative humidity : 40%
Ambient temperature : 22°C

3.2. TEST SETUP

The installation of EUT is identical for pre-characterization measurement in a 3 meters semi anechoic chamber and for measures on a 10 meters Open site.





Radiated emission test setup



3.3. TEST SEQUENCE AND RESULTS

3.3.1. Pre-characterization at 3 meters [9kHz-30MHz]

A pre-scan of all the setup has been performed in a 3 meters semi anechoic chamber. The distance between EUT and antenna is 3 meters. For Pre-characterization, the loop antenna was rotated during the test for maximized the emission measurement. Measurement performed on 3 axis of EUT. Frequency band investigated is 9kHz to 30MHz.

The pre-characterization graphs are obtained in PEAK detection.

See graph and results in test report 201002-6070CR-A1-R1-E.

3.3.2. Pre-characterization [30MHz-25GHz]

For frequency band 30MHz to 1GHz, a pre-scan of all the setup has been performed in a 3 meters semi anechoic chamber.

The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) polarization with a log-periodic antenna. The EUT is being rotated on 360° and on 3 axis during the measurement. The pre-characterization graphs are obtained in PEAK detection.

See graph and results in test report 201002-6070CR-A1-R1-E.

For frequency band 1GHz to 25GHz, a search is performed in the semi-anechoic chamber in order to determine frequencies radiated by the EUT (Measuring distance reduced to 1m and 20cm for frequencies from 12GHz to 25GHz).

3.3.3. Characterization on 10 meters open site below 30 MHz

The product has been tested according to ANSI C63.4 (2003), FCC part 15 subpart C. Radiated Emissions were measured on an open area test site. A description of the facility is on file with the FCC.

The product has been tested at a distance of **10 meters** from the antenna and compared to the FCC part 15 subpart C §15.109 limits and C §15.209.

Antenna height was 1m for both horizontal and vertical polarization.

Antenna was rotated around its vertical axis.

Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on 3 axis of EUT. A summary of the worst case emissions found in all test configurations and modes is shown in **test report 201002-6070CR-A1-R1-E.**



3.3.4. Characterization on 10 meters open site from 30MHz to 25GHz

Frequency band 30MHz to 1GHz

The product has been tested at a distance of **10 meters** from the antenna and compared to the FCC part 15 subpart B §15.109 limits and C §15.209 limits. Measurement bandwidth was 120kHz from 30 MHz to 1GHz .

Antenna height search was performed from 1m to 4m for both horizontal and vertical polarization. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on 3 axis of EUT.

A summary of the worst case emissions found in all test configurations and modes is shown on clause 3.2

See results in test report 201002-6070CR-A1-R1-E.

Frequency band 1GHz to 25GHz

The product has been tested at a distance of 3 meters from the antenna and compared to the FCC part 15 subpart B §15.109 limits and C §15.209 limits. Measurement bandwidth was 1MHz.

Antenna height search was performed from 1m to 4m for both horizontal and vertical polarization. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on 3 axis of EUT.

A summary of the worst case emissions found in all test configurations and modes is shown on clause 3.2

Terminal alone:

Measurements are performed using a PEAK and Average detection. (RBW = 1MHz)

No	Frequency (GHz)	Limit Average (dBµV/m)	Measure Average (dBµV/m)	Margin (Mes-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. factor (dB)	Comments
1	4804	54	42.6	-11.4	60	H	100	34	With modifications
2	4882	54	42.7	-11.3	90	H	100	34.1	With modifications
3	4960	54	42.8	-11.2	90	H	100	34.2	With modifications
4	7206	54	42.8	-11.2	170	H	100	36.8	With modifications
5	7323	54	45.6	-8.4	170	H	100	37	With modifications
6	7440	54	47.1	-6.9	165	H	100	37.1	With modifications

No	Frequency (GHz)	Limit Peak (dBµV/m)	Measure Peak (dBµV/m)	Margin (Mes-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. factor (dB)	Comments
1	4804	74	57.5	-16.5	60	H	100	34	With modifications
2	4882	74	57.8	-16.2	90	H	100	34.1	With modifications
3	4960	74	56.9	-17.1	90	H	100	34.2	With modifications
4	7206	74	56.7	-17.3	170	H	100	36.8	With modifications
5	7323	74	58.4	-15.6	170	H	100	37	With modifications
6	7440	74	60.5	-13.5	165	H	100	37.1	With modifications

Note: Measures have been done at 3m distance.

RESULTS: PASS



Base alone:

Measurements are performed using a PEAK and Average detection. (RBW = 1MHz)

No	Frequency (GHz)	Limit Average (dBµV/m)	Measure Average (dBµV/m)	Margin (Mes-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. factor (dB)	Comments
1	4804	54	46.6	-7.4	75	H	100	34	None
2	4882	54	48.6	-5.4	95	V	100	34.1	None
3	4960	54	46.3	-7.7	80	H	100	34.2	None
4	7206	54	48.8	-5.2	60	H	100	36.8	None
5	7323	54	46.8	-7.2	60	V	100	37	None
6	7440	54	48.3	-5.7	65	H	100	37.1	None

No	Frequency (GHz)	Limit Peak (dBµV/m)	Measure Peak (dBµV/m)	Margin (Mes-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. factor (dB)	Comments
1	4804	74	59.8	-14.2	60	H	100	34	None
2	4882	74	61.4	-12.6	90	V	100	34.1	None
3	4960	74	59.6	-14.4	90	H	100	34.2	None
4	7206	74	61.7	-12.3	170	H	100	36.8	None
5	7323	74	59.7	-14.3	170	V	100	37	None
6	7440	74	61.5	-12.5	165	H	100	37.1	None

Note: Measures have been done at 3m distance.

RESULTS: PASS

Terminal on base:

Measurements are performed using a PEAK and Average detection. (RBW = 1MHz)

No	Frequency (GHz)	Limit Average (dBµV/m)	Measure Average (dBµV/m)	Margin (Mes-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. factor (dB)	Comments
1	4804	54	44.7	-9.3	90	H	100	34	With modifications
2	4882	54	43.9	-10.1	95	H	100	34.1	With modifications
3	4960	54	44.5	-9.5	90	H	100	34.2	With modifications
4	7206	54	48.9	-5.1	180	H	100	36.8	With modifications
5	7323	54	42.9	-11.1	185	H	100	37	With modifications
6	7440	54	49.3	-4.7	180	H	100	37.1	With modifications

No	Frequency (GHz)	Limit Peak (dBµV/m)	Measure Peak (dBµV/m)	Margin (Mes-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. factor (dB)	Comments
1	4804	74	60.3	-13.7	90	H	100	34	With modifications
2	4882	74	58.4	-15.6	95	H	100	34.1	With modifications
3	4960	74	59.9	-14.1	90	H	100	34.2	With modifications
4	7206	74	61.3	-12.7	180	H	100	36.8	With modifications
5	7323	74	59.8	-14.2	185	H	100	37	With modifications
6	7440	74	63.4	-10.6	180	H	100	37.1	With modifications

Note: Measures have been done at 3m distance.

RESULTS: PASS



3.4. FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follow:

$$FS = RA + AF + CF - AG$$

Where

- FS = Field Strength
- RA = Receiver Amplitude
- AF = Antenna Factor
- CF = Cable Factor
- AG = Amplifier Gain

Assume a receiver reading of 52.5dB μ V is obtained. The antenna factor of 7.4 and a cable factor of 1.1 are added. The amplifier gain of 29dB is subtracted, giving a field strength of 32 dB μ V/m.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dB}\mu\text{V/m}$$

The 32 dB μ V/m value can be mathematically converted to its corresponding level in μ V/m.

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32\text{dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}.$$

**4. MAXIMUM PEAK OUTPUT POWER (15.247)****4.1. TEST CONDITIONS**

Date of test : June 7th, 2010
Test performed by : A.MERLIN
Atmospheric pressure : 945mb
Relative humidity : 41%
Ambient temperature : 21°C

4.2. EQUIPMENT CONFIGURATION

Modulation: GFSK
Packet Type: EDR 1mbps

4.3. SETUP**Conducted measurement:**

The EUT is turned ON and connected to measurement instrument; the center frequency of the spectrum analyzer is set to the fundamental frequency and using 3MHz RBW and 10MHz VBW.

The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.

Radiated measurement:

The product has been tested at a distance of 3 meters from the antenna and using 3MHz RBW and 10MHz VBW. Antenna height search was performed from 1m to 4m for both horizontal and vertical polarization. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on 3 axis of EUT.

A summary of the worst case emissions found in all test configurations and modes is shown on following table.

The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.

To demonstrate compliance with peak output power requirement of section 15.247 (b), the transmitter's peak output power is calculated using the following equation:

$$E = \frac{\sqrt{30PG}}{d}$$

Where:

- E is the measured maximum fundamental field strength in V/m, utilizing a RBW \geq the 20 dB bandwidth of the emission, VBW > RBW, peak detector function. Follow the procedures in C63.4-1992 with respect to maximizing the emission.

- G is the numeric gain of the transmitting antenna with reference to an isotropic radiator.

- d is the distance in meters from which the field strength was measured.

- P is the power in watts for which you are solving:

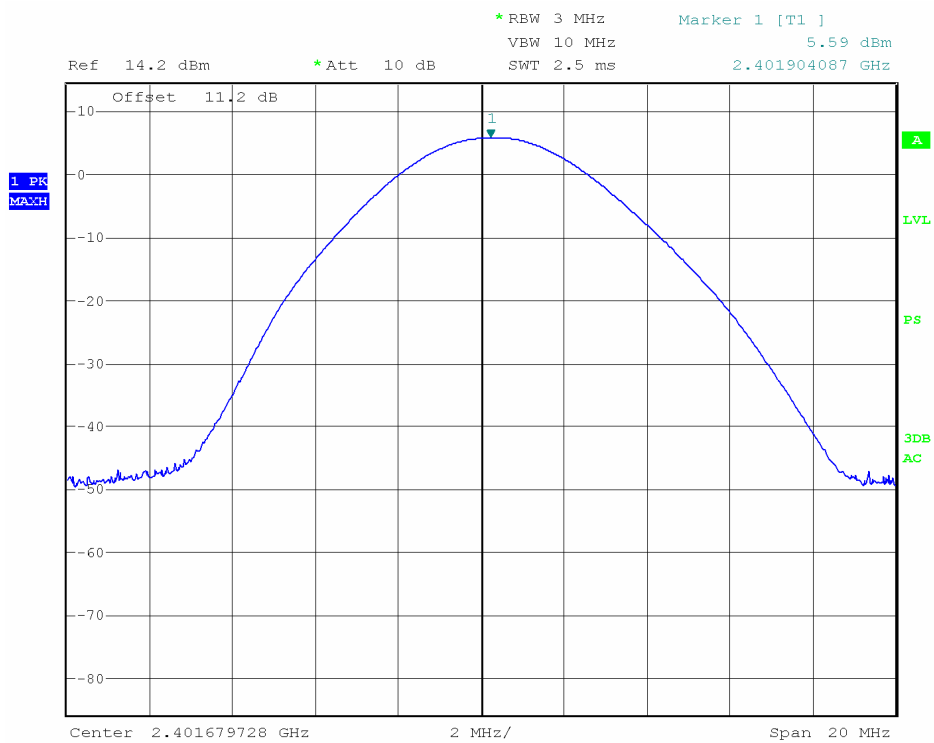
$$P = \frac{(Ed)^2}{30G}$$

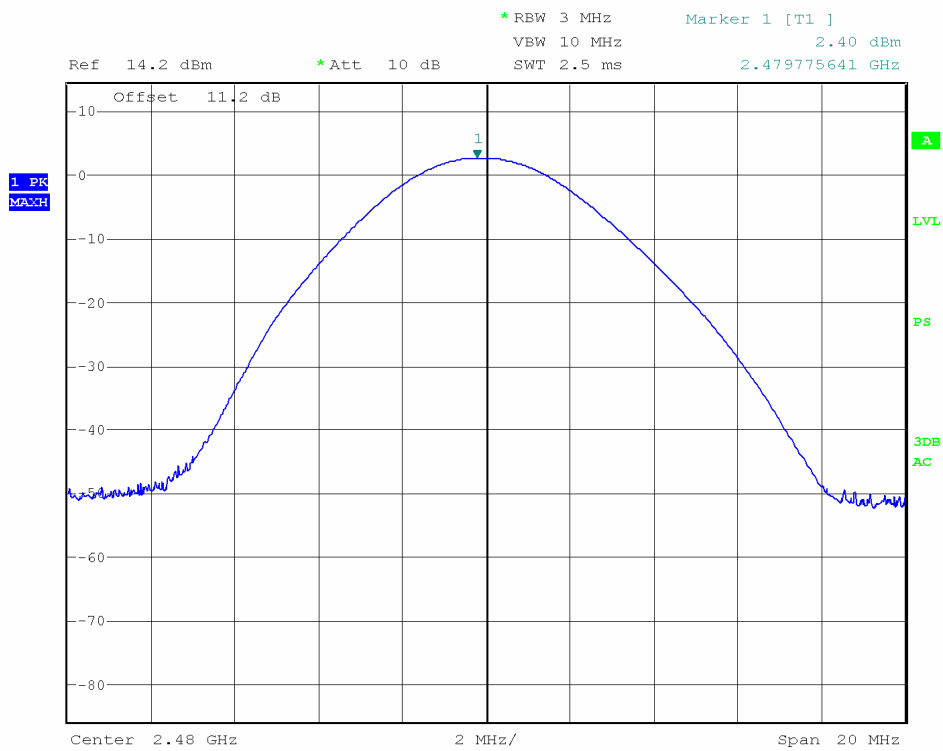
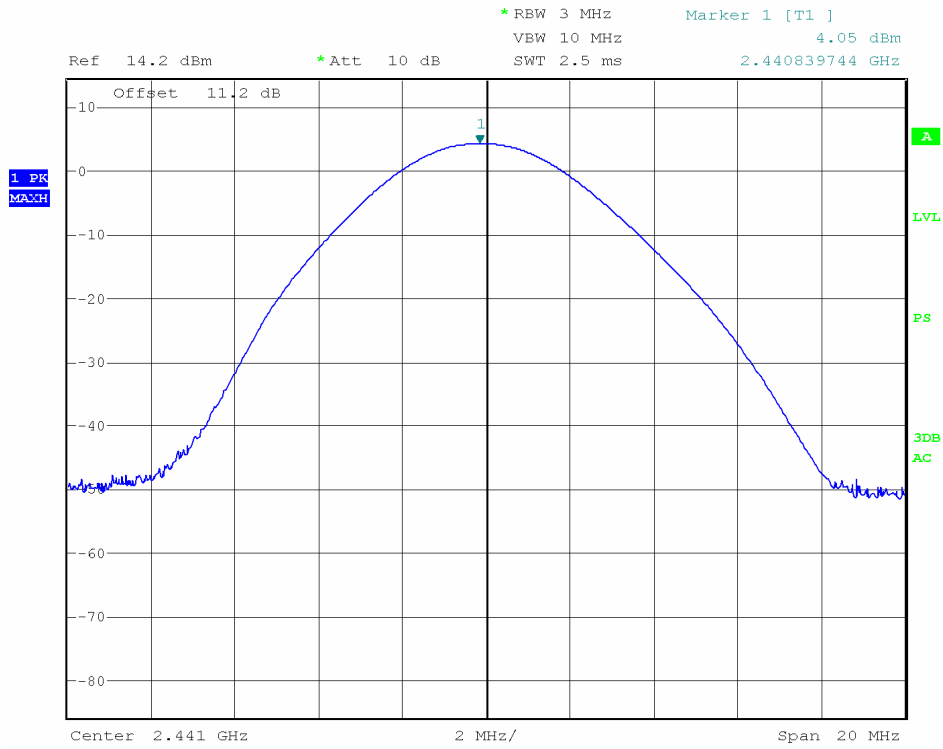


Conducted measurement – Terminal

Channel	Channel Frequency (MHz)	Peak Output Power (dBm)	Power Limit (dBm)	FC (dB)	PASS / FAIL
0	2402	5.6	21	11.2	P
39	2441	4.1	21	11.2	P
78	2480	2.4	21	11.2	P

Note: Attenuation cable of 11.2dB, included in the measurement.



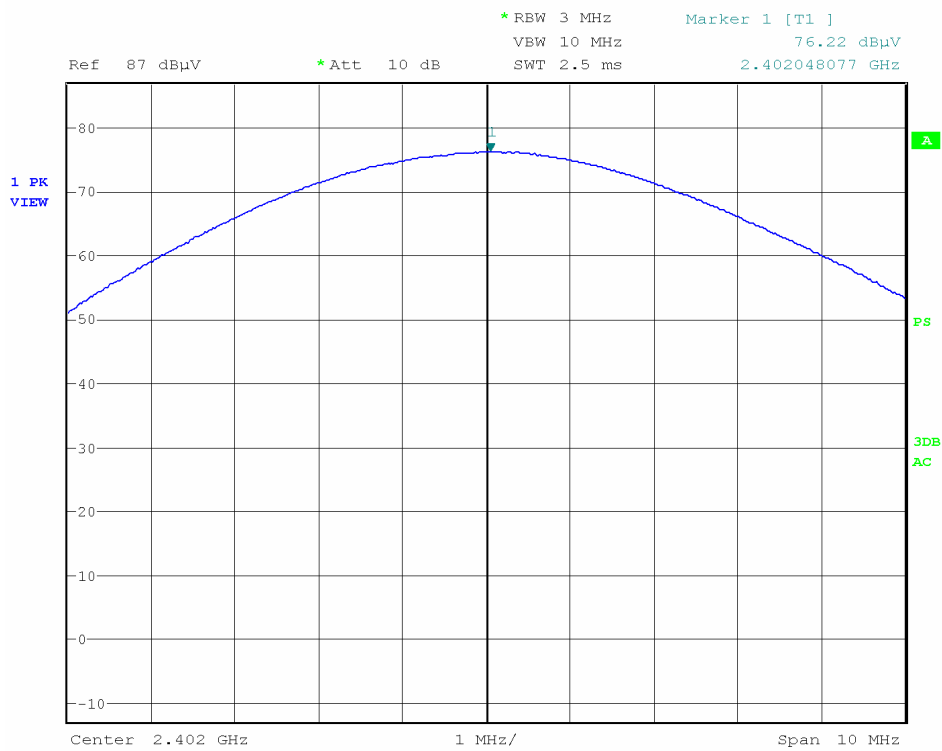


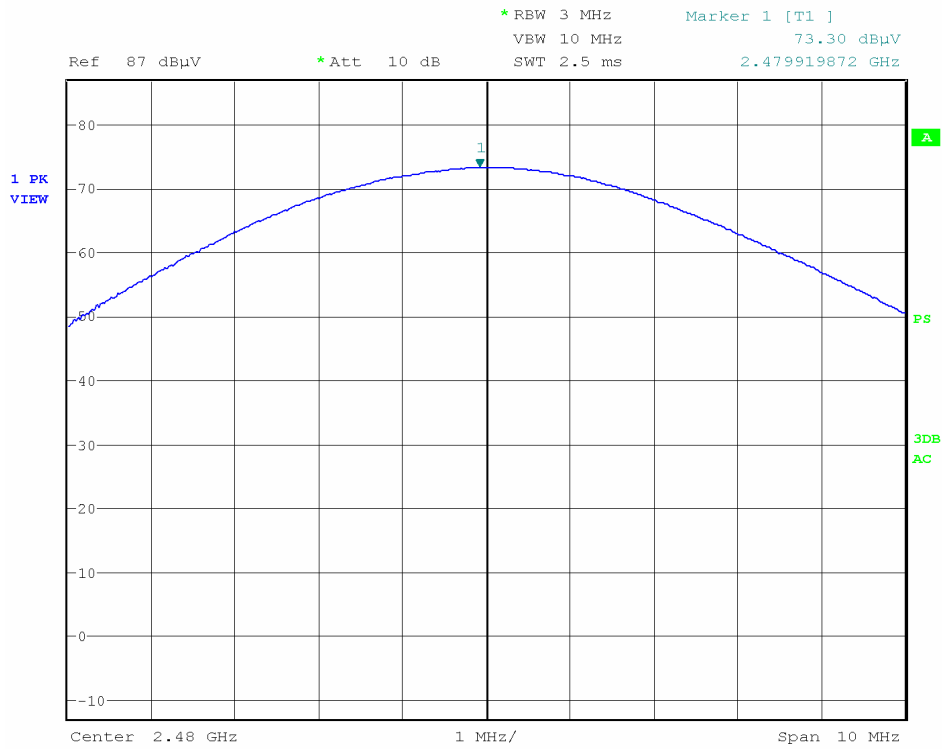
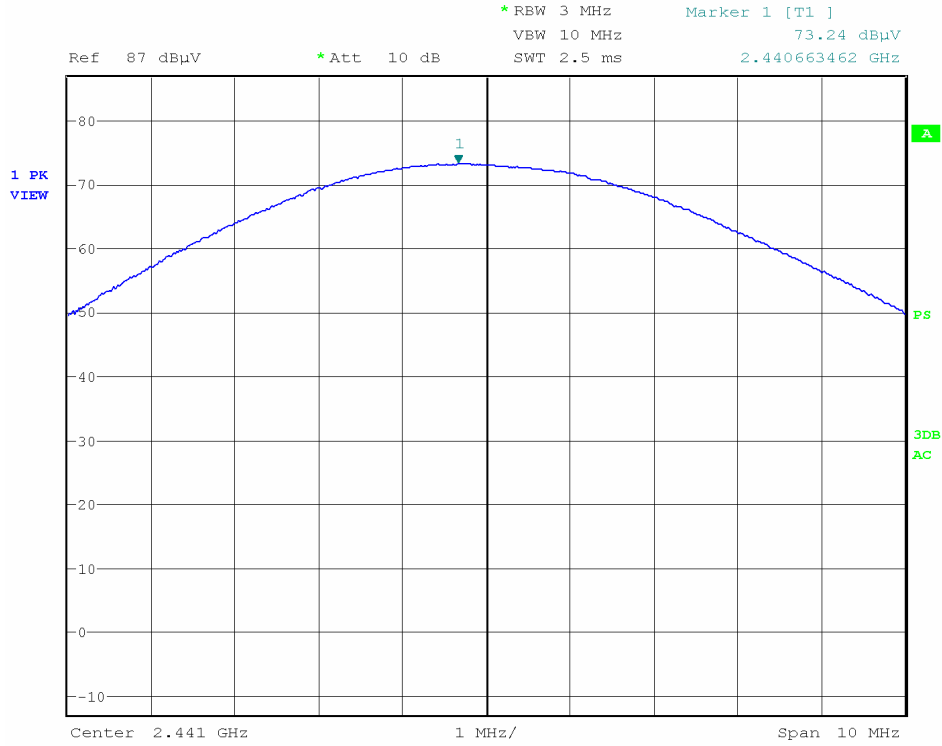


Radiated measurement – Base

Channel	Channel Frequency (MHz)	Maximum Field (dBµV/m)	Peak Output Power (dBm)	Power Limit (dBm)	FC (dB)	PASS / FAIL
0	2402	105.6	8.3	21	29.0	P
39	2441	102.4	5.1	21	29.1	P
78	2480	102.4	5.1	21	29.1	P

Note: Antenna gain is 2.1dbi (manufacturer declaration) with calculated factor (see 4.3), included in the measurement. The antenna is an integral antenna; the conducted measurement is not possible.





**5. HOPPING CHANNEL SEPARATION (15.247)****5.1. TEST CONDITIONS**

Date of test : June 8th, 2010
Test performed by : A.MERLIN
Atmospheric pressure : 975mb
Relative humidity : 40%
Ambient temperature : 21°C

5.2. LIMIT

For frequency hopping system operating in the 2400-2483.5MHz, if the 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dB Bandwidth of hopping channel shall be a minimum limit for the hopping channel separation.

5.3. EQUIPMENT CONFIGURATION

Modulation: GFSK
Packet Type: EDR 1mbps

5.4. SETUP – 20DB BANDWIDTH

The EUT is placed in an anechoic chamber; levels have been corrected to be in compliance with the Peak Output Power measured. The EUT is turned ON and using the MaxHold function, the frequency separation of two frequencies that were attenuated 20dB from the Peak Output Power level. A delta marker is used to measure the frequency difference as the emission bandwidth.

5.5. SETUP – ADJACENT CHANNEL SEPARATION

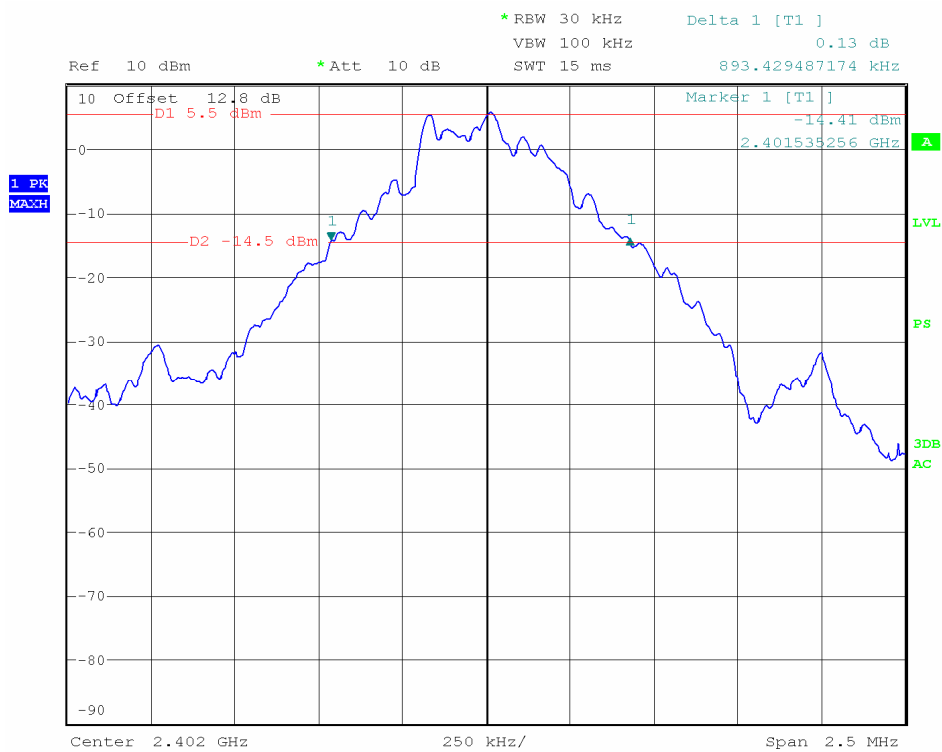
The EUT is placed in an anechoic chamber; levels have been corrected to be in compliance with the Peak Output Power measured. The EUT is turned ON and using the MaxHold function, the separation of two adjacent channels is recorded. A delta marker is used to measure the frequency difference.

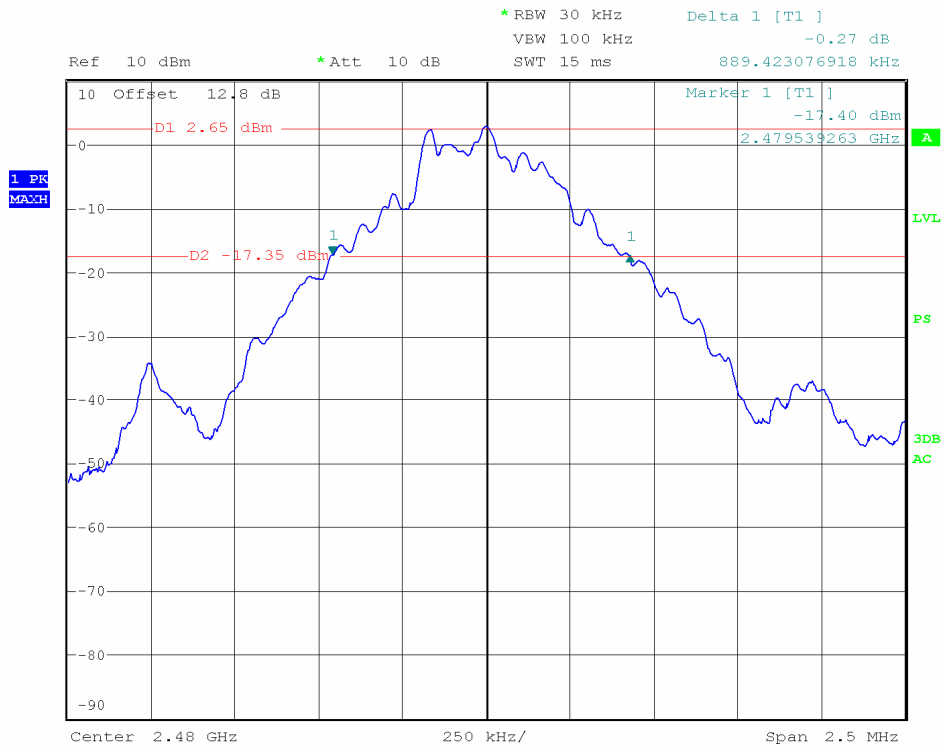
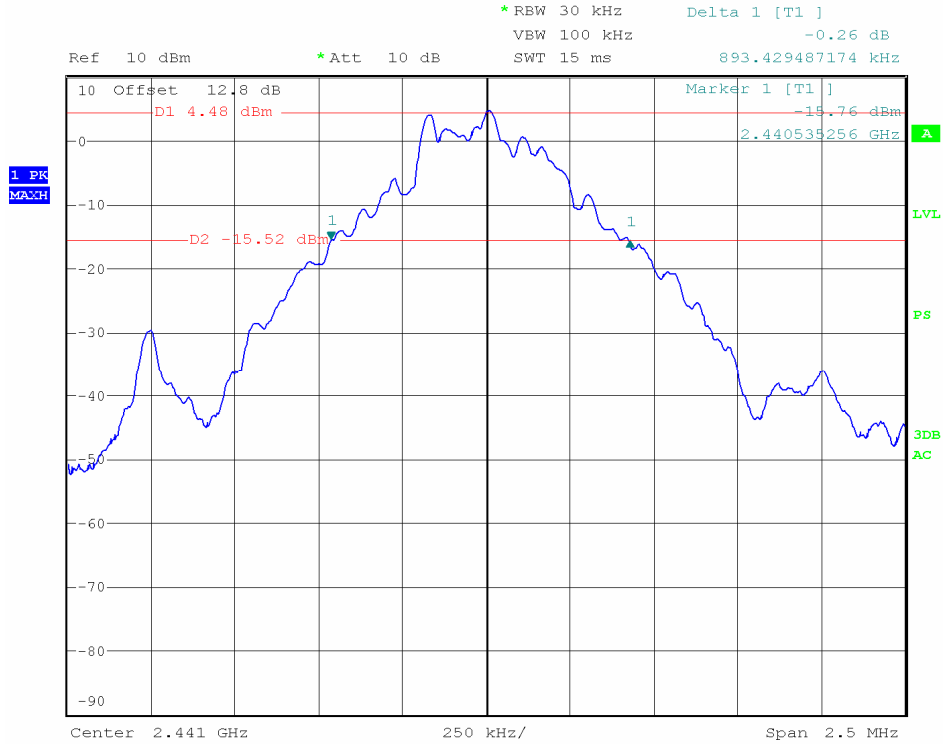


5.6. RESULTS – 20DB BANDWIDTH

Terminal:

Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)
0	2402	0.894
39	2441	0.894
78	2480	0.890



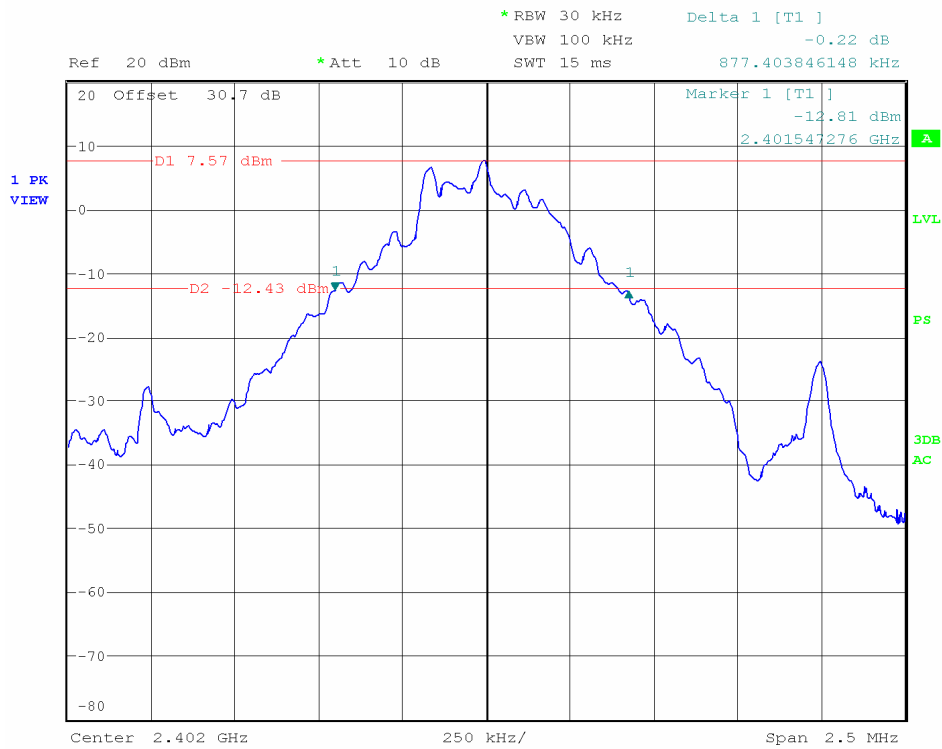


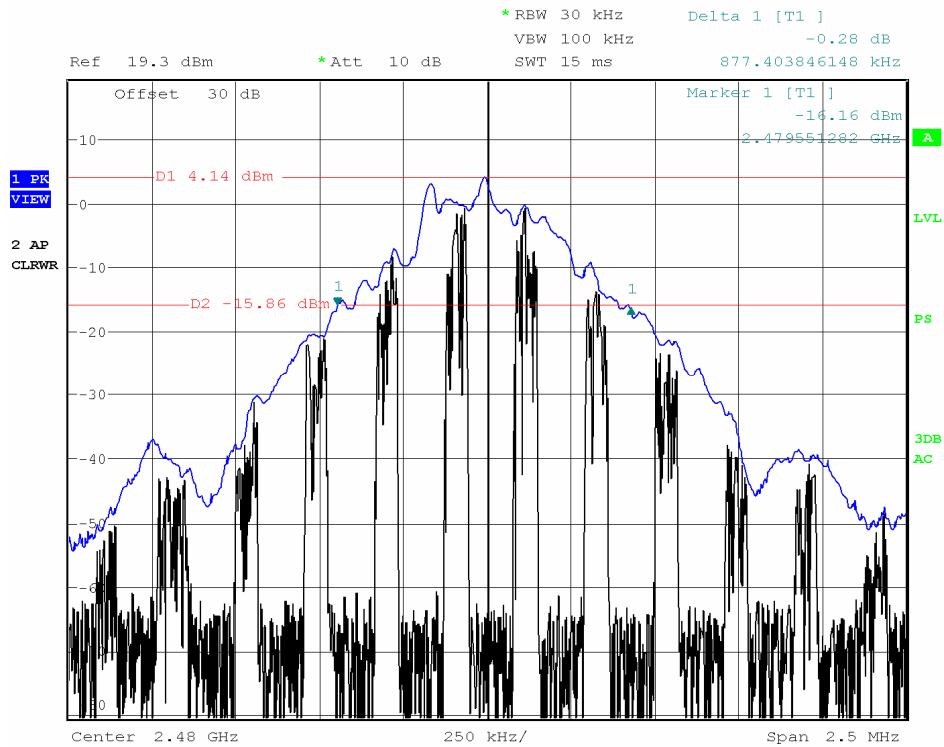
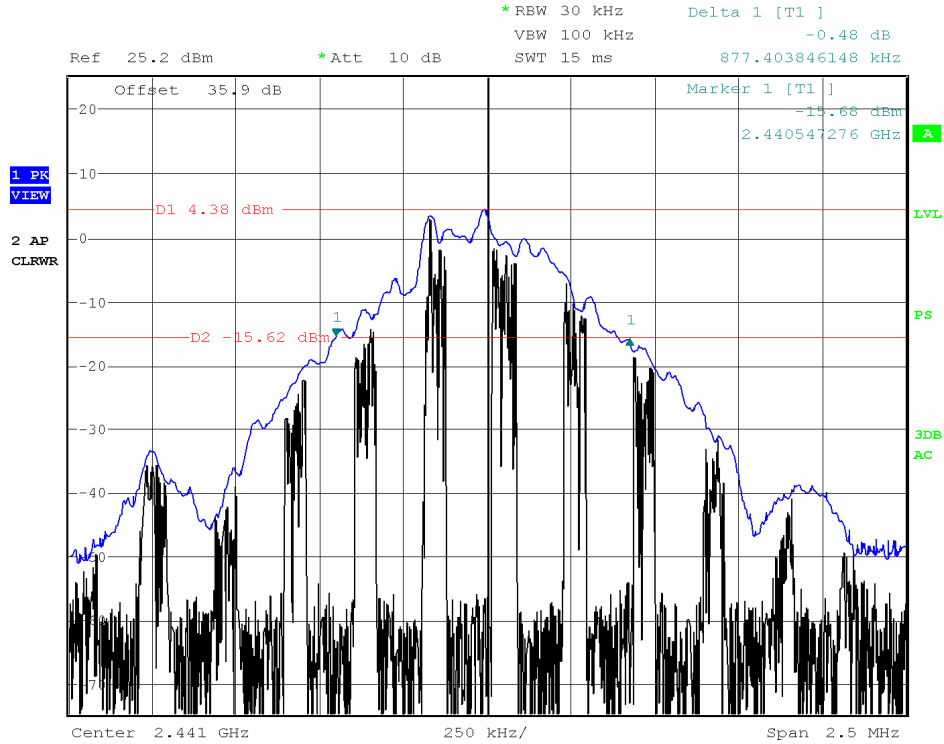


Base:

Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)
0	2402	0.877
39	2441	0.877
78	2480	0.877

Graph:







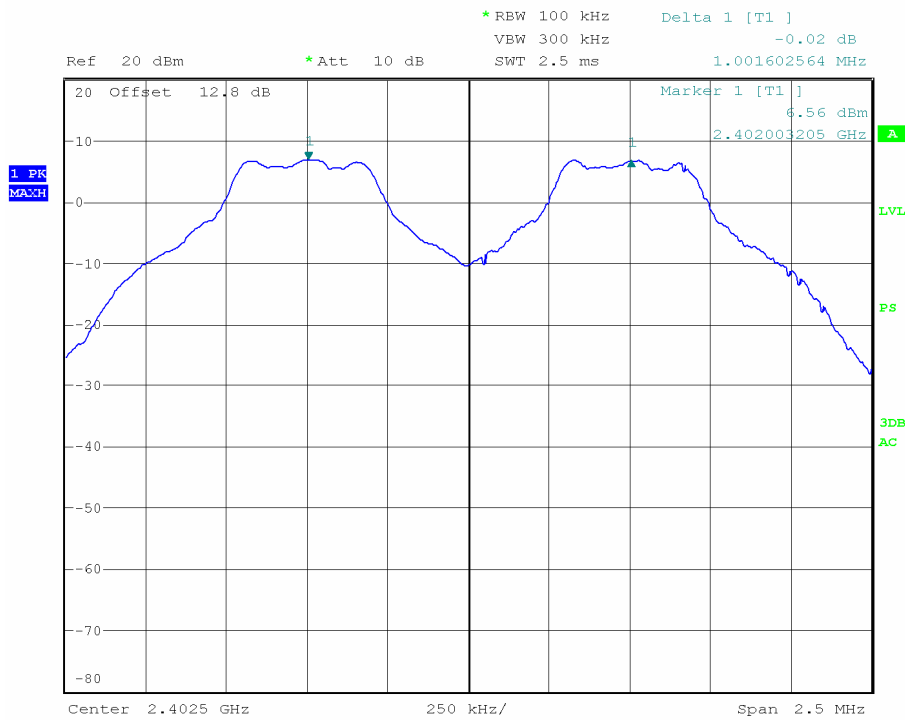
5.7. SETUP – ADJACENT CHANNEL SEPARATION

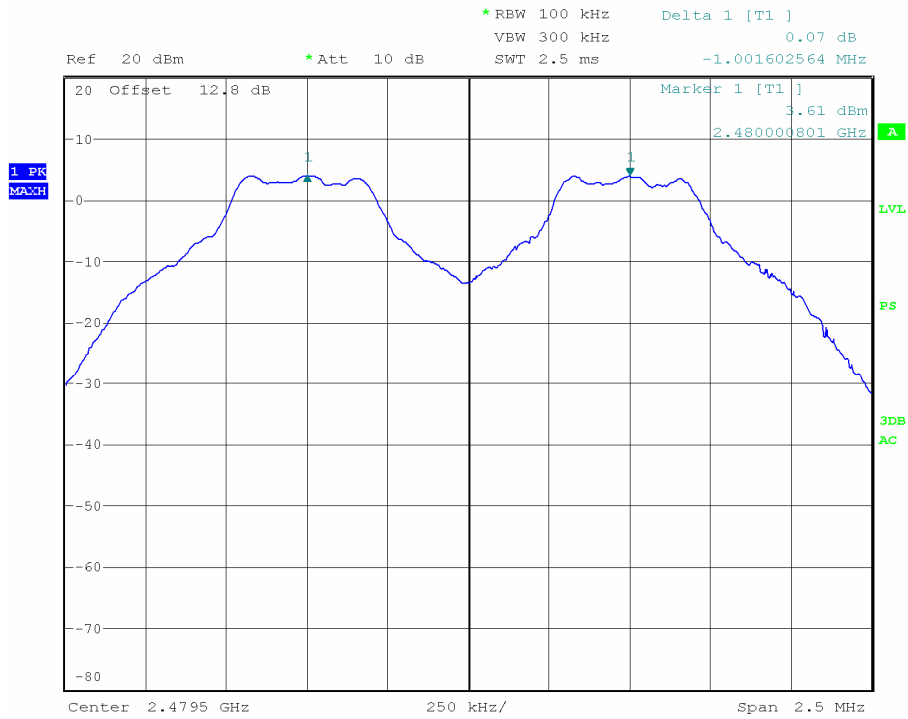
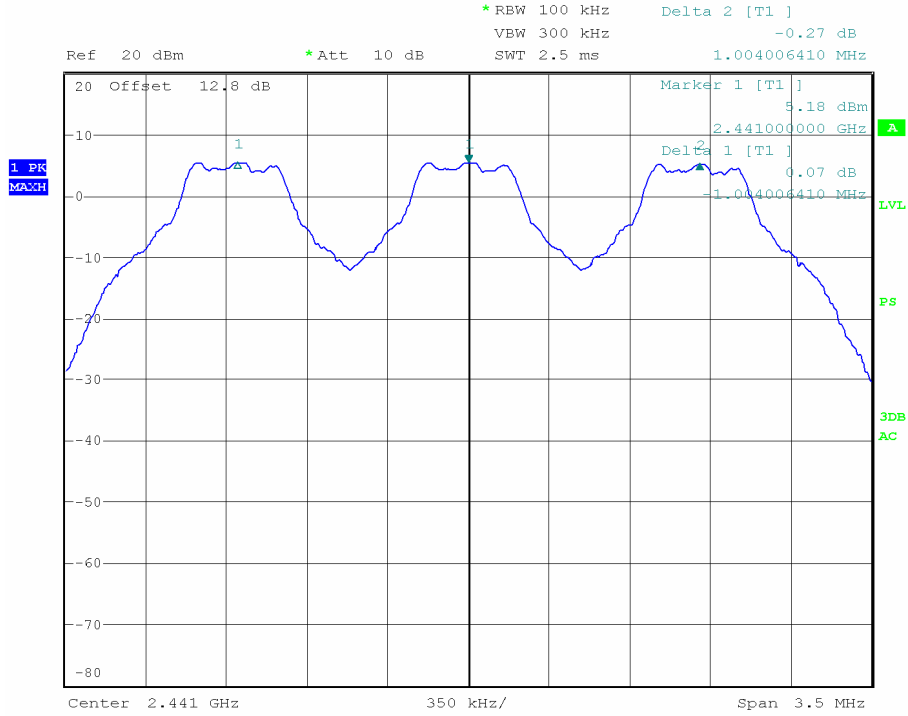
Terminal:

Channel	Channel Frequency (MHz)	Adjacent Channel Separation (MHz)	20dB Bandwidth (MHz)	Minimum Limit (MHz)	PASS / FAIL
0	2402	1.001	0.894	0.596	P
39	2441	1.004	0.894	0.596	P
78	2480	1.001	0.890	0.593	P

Limit used: Two-third 20dB Bandwidth

Graph:





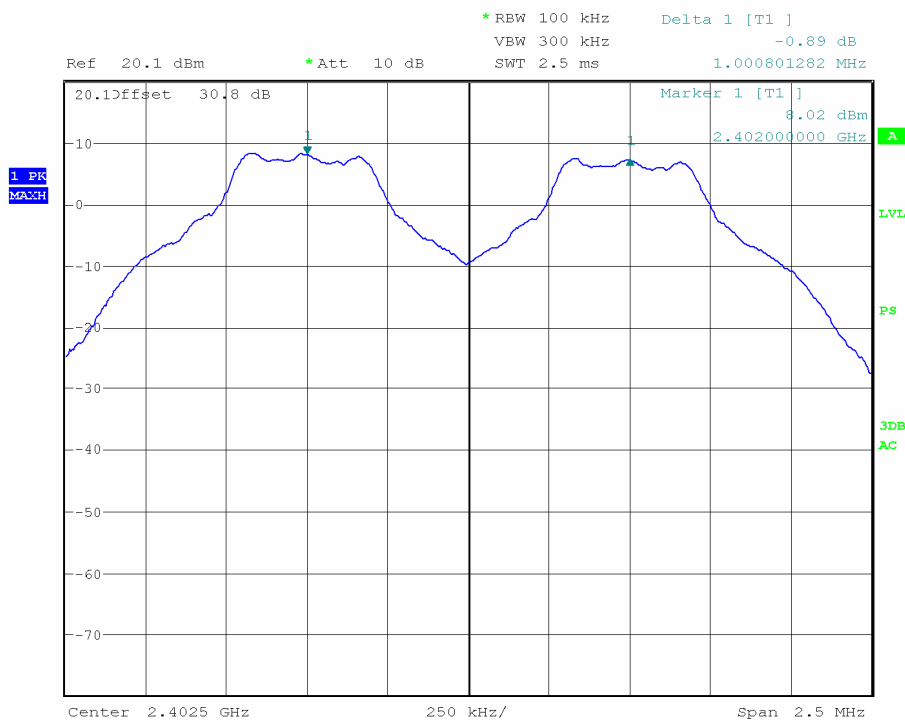


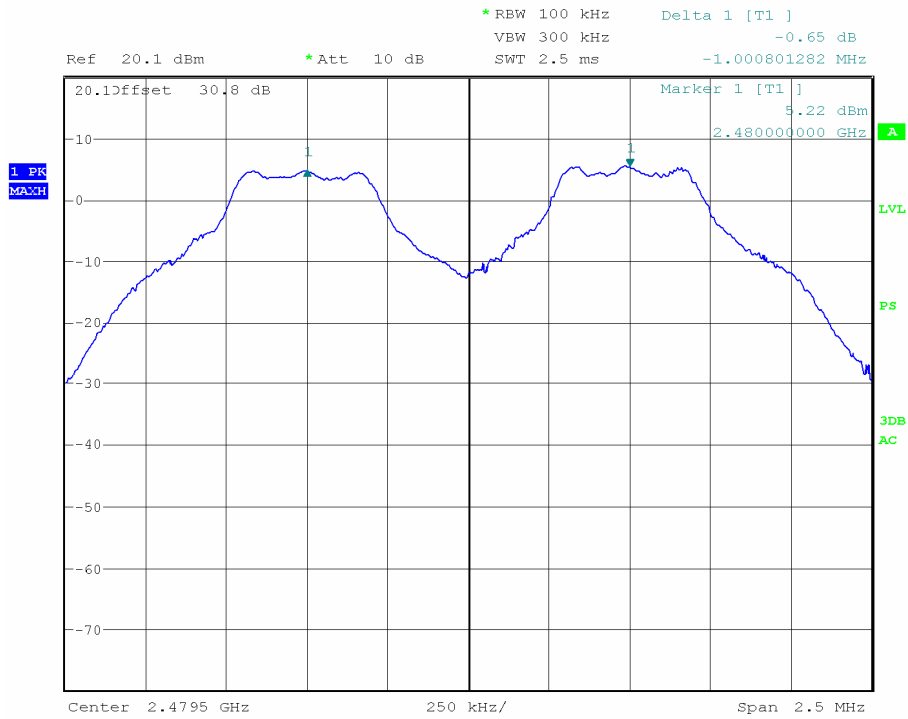
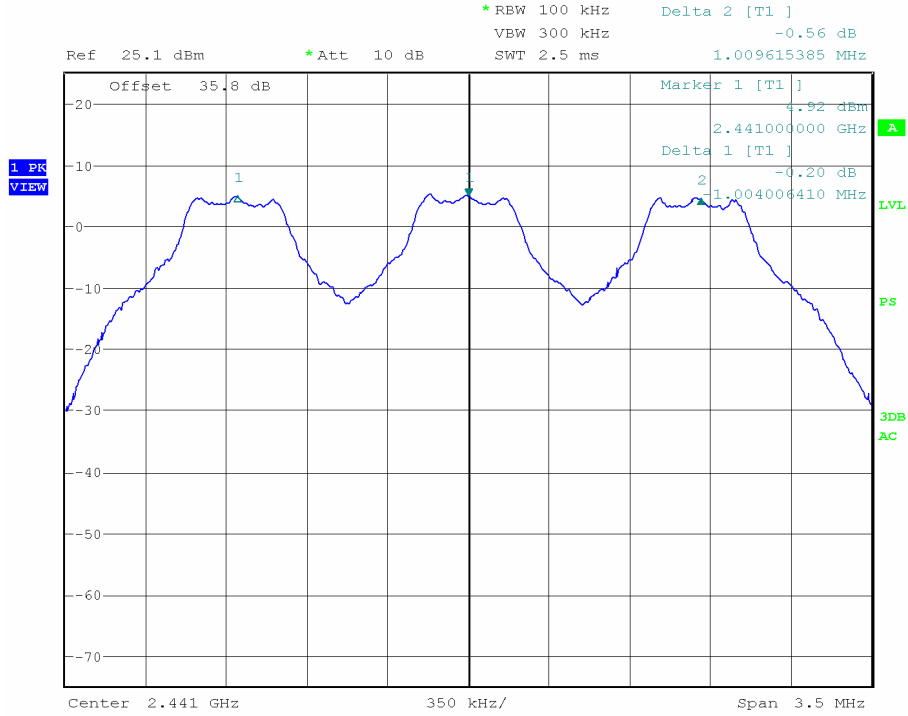
Base:

Channel	Channel Frequency (MHz)	Adjacent Channel Separation (MHz)	20dB Bandwidth (MHz)	Minimum Limit (MHz)	PASS / FAIL
0	2402	1.001	0.877	0.584	P
39	2441	1.009	0.877	0.584	P
78	2480	1.001	0.877	0.584	P

Limit used: Two-third 20dB Bandwidth

Graph:





**6. NUMBER OF HOPPING FREQUENCIES (15.247)****6.1. TEST CONDITIONS**

Date of test : June 8th, 2010
Test performed by : A.MERLIN
Atmospheric pressure : 975mb
Relative humidity : 40%

6.2. LIMIT

For frequency hopping system operating in the 2400-2483.5MHz, at least 15 channels frequencies must be used and should be equally spaced.

6.3. EQUIPMENT CONFIGURATION

Modulation: GFSK
Packet Type: EDR 1mbps
Hopping sequence: ON

6.4. SETUP

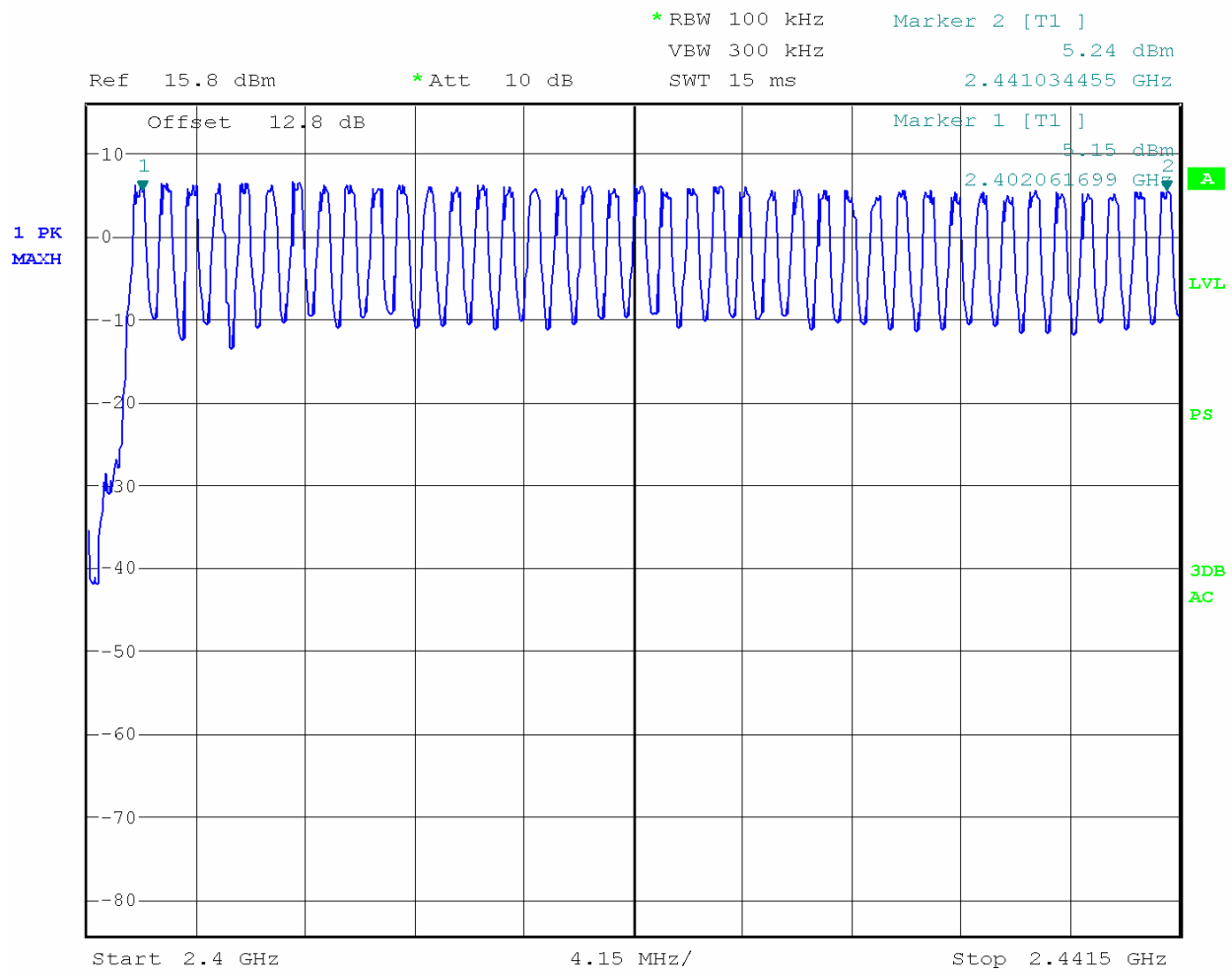
The EUT is placed in an anechoic chamber. The EUT is turn ON and using the MaxHold function and a delta marker the number of frequencies used for this FHSS system is recorded, see following graphs.

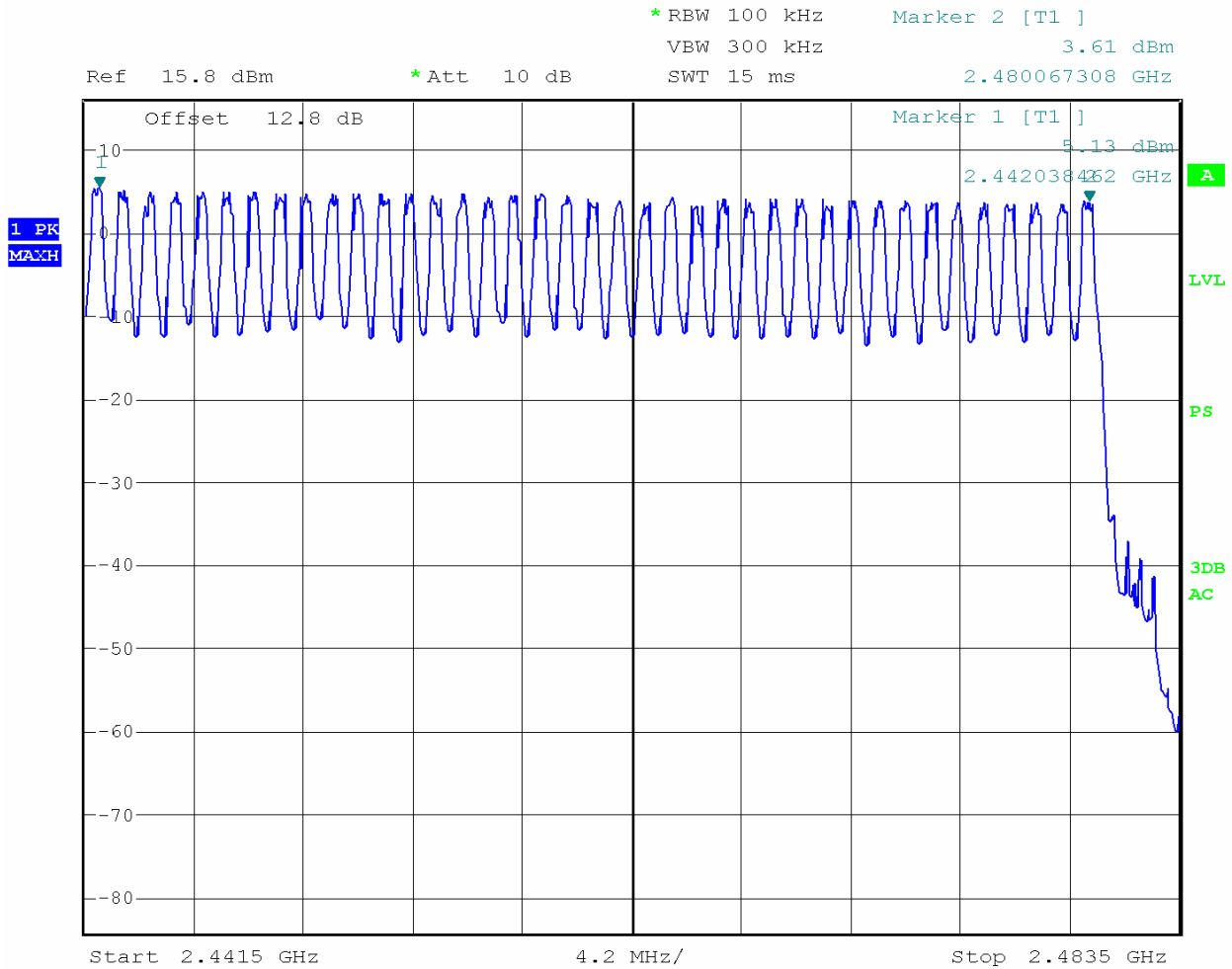
RBW: 100kHz
VBW: 300kHz



6.5. RESULTS

Terminal:

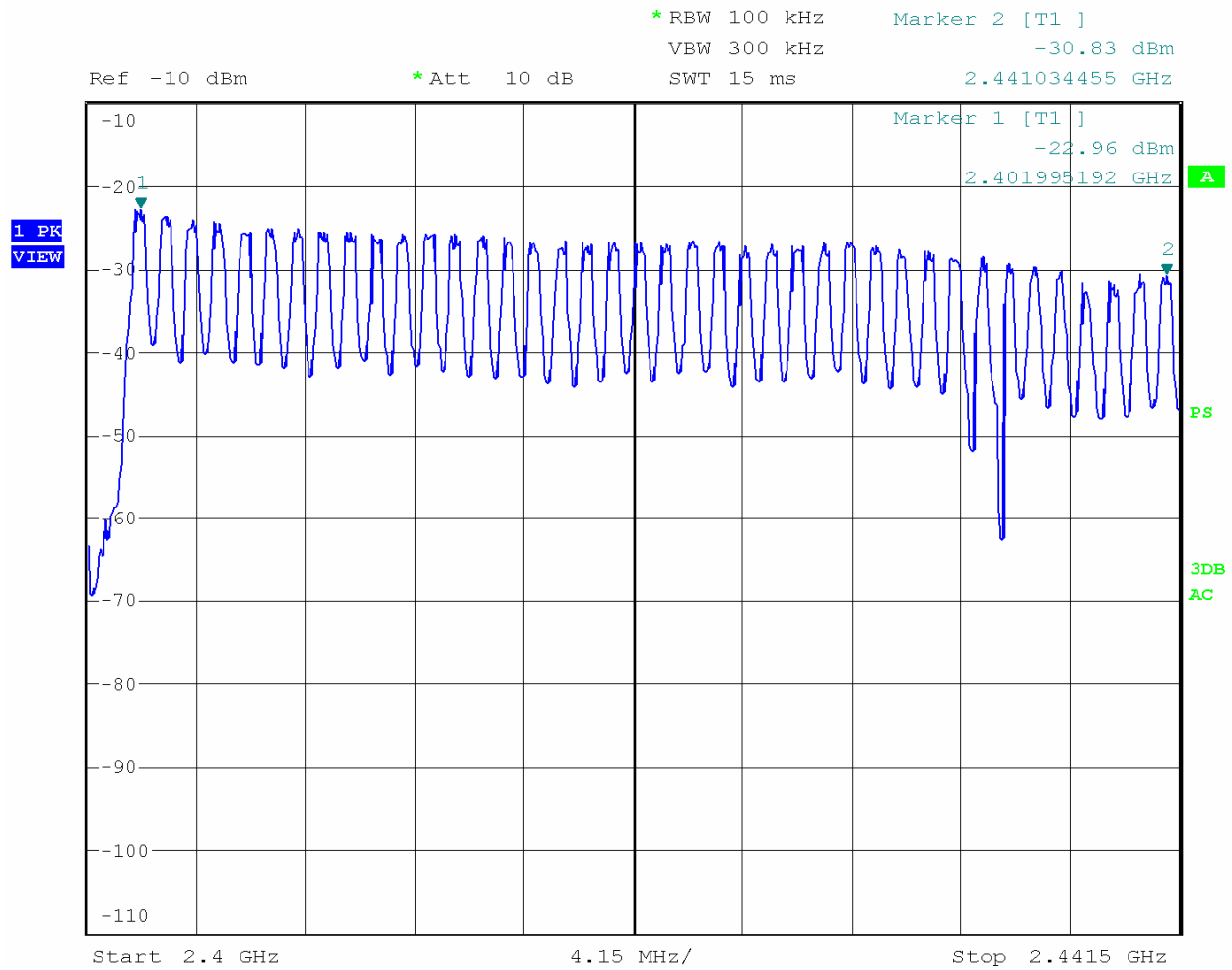


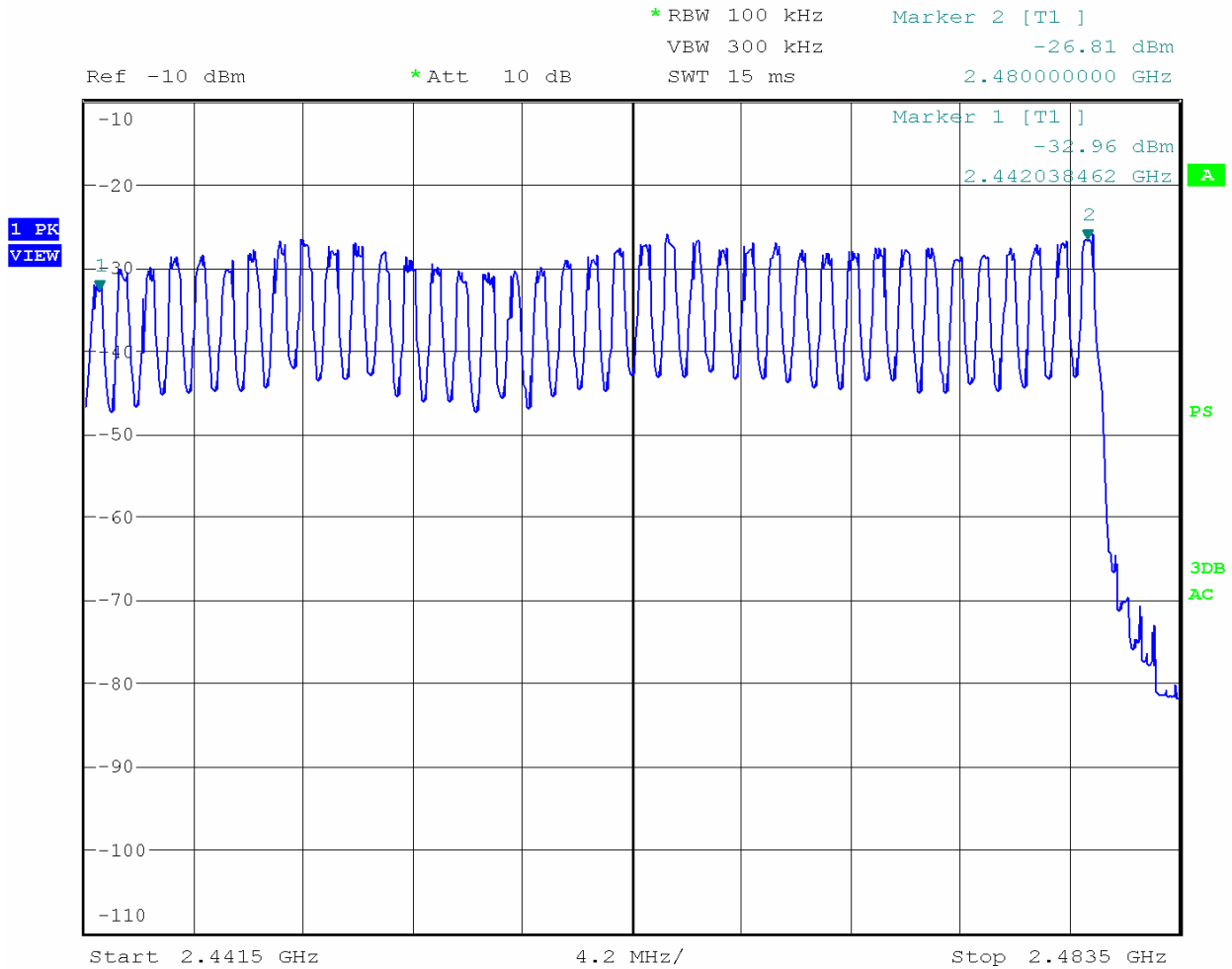


Number of frequency used in the hopping sequence: 79 channels



Base:





Number of frequency used in the hopping sequence: 79 channels

**7. TIME OF OCCUPANCY (DWELL TIME) (15.247)****7.1. TEST CONDITIONS**

Date of test : June 8th, 2010
Test performed by : A.MERLIN
Atmospheric pressure : 975mb
Relative humidity : 40%

7.2. LIMIT

The average time of occupancy on any channel shall not be greater than 0.4 seconds within period of 0.4 seconds multiplied by the number of hopping channels employed.

7.3. EQUIPMENT CONFIGURATION

Modulation: GFSK
Channel frequency: 2402MHz
Hopping sequence: ON

7.4. SETUP

The EUT is placed in an anechoic chamber. The EUT is turn ON; the Dwell Time is measured and calculated using the zero SPAN mode on a channel frequency and a SWEEP with an adapter value to measure the number of transmission within a period and the time of transmission

RBW: 1MHz
VBW: 3MHz

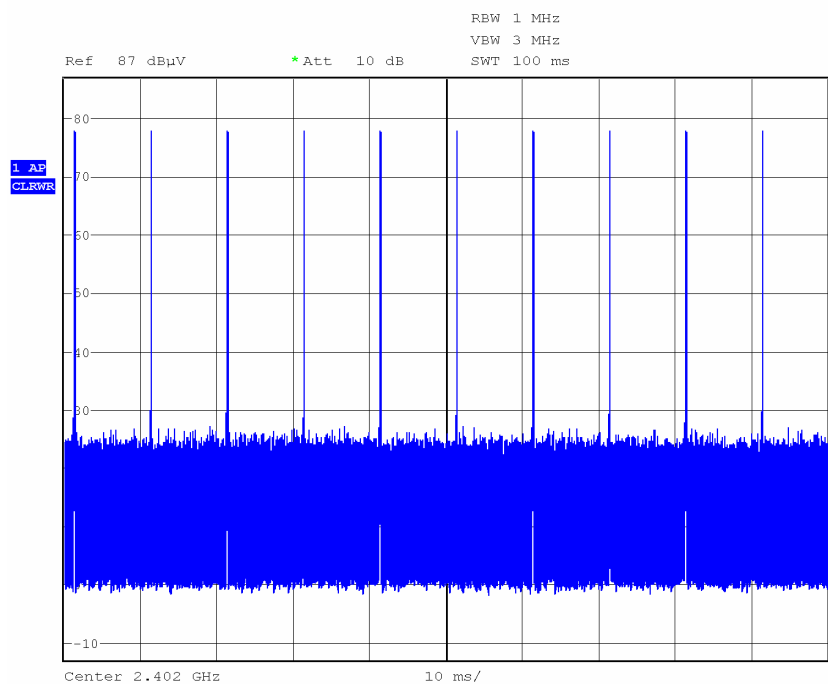
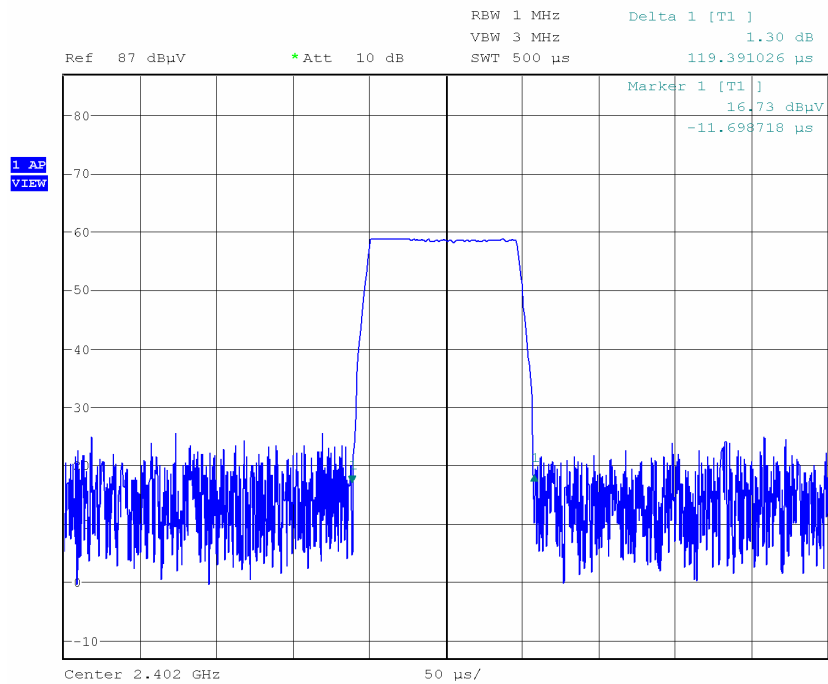


7.5. RESULTS

Terminal

Packet Mode	Number of transmission in the period	Length of transmission time (µs)	Result (ms)	Limit (ms)	PASS / FAIL
EDR	10 (times/ 100ms) * 316=3160 times	119.4	377.4	400	P

Note: Period of 31.6 seconds (79 channels x 0.4)

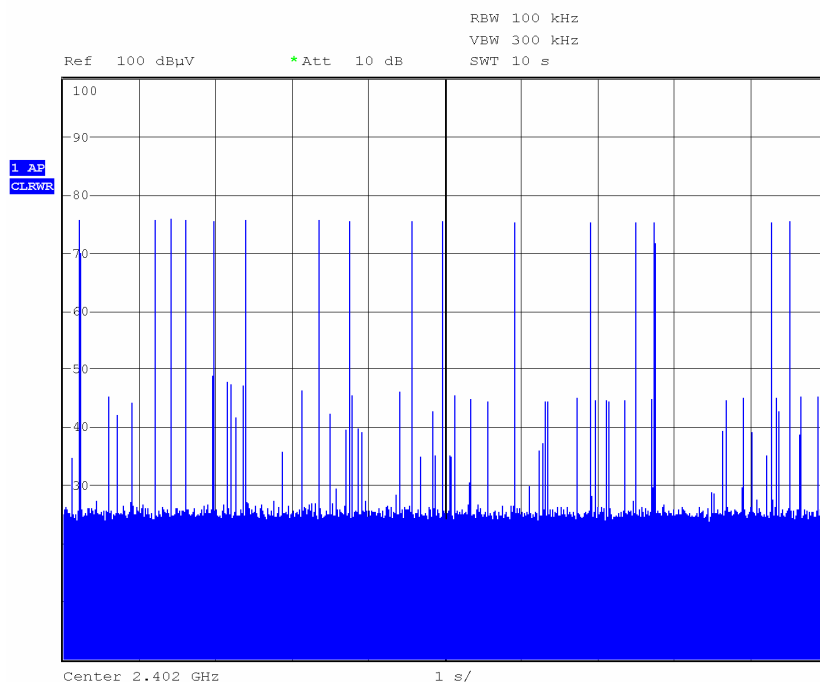
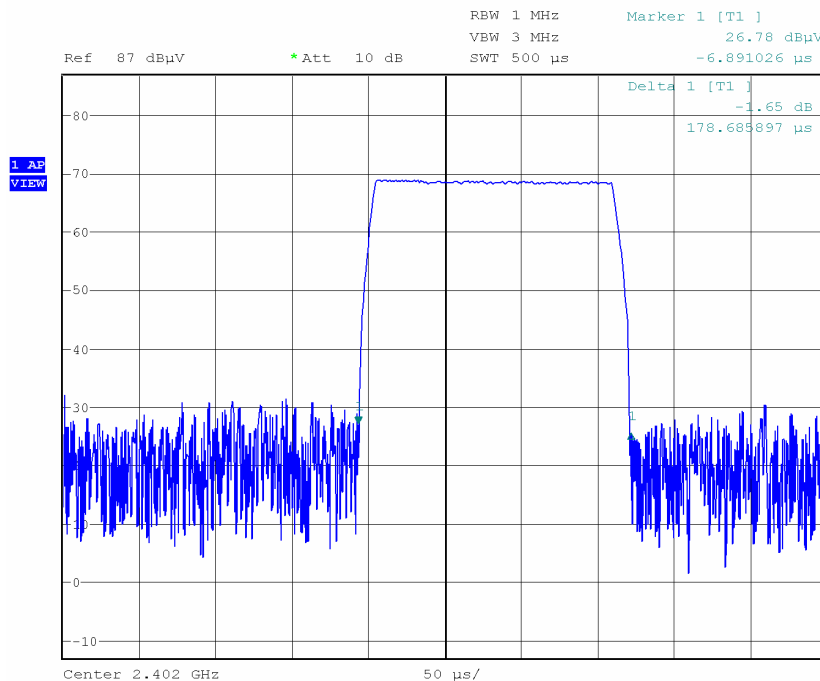




Base

Packet Mode	Number of transmission in the period	Length of transmission time (µs)	Result (ms)	Limit (ms)	PASS / FAIL
EDR	16 (times/ 10s) * 3.16=50.6 times	178.7	9.1	400	P

Note: Period of 31.6 seconds (79 channels x 0.4)



**8. BAND EDGE MEASUREMENT (15.247)****8.1. TEST CONDITIONS**

Date of test : June 8th, 2010
Test performed by : A.MERLIN
Atmospheric pressure : 975mb
Relative humidity : 40%

8.2. LIMIT

In Bandedge, the limit of spurious emissions are below -20dB of the highest emission level of operating band (in 100kHz RBW).

In the restrict band (2310-2390MHz) and (2483.5-2500MHz) including bandedge, the limit of spurious emissions are 15.209. (RBW:1MHz / VBW:1MHz)

8.3. EQUIPMENT CONFIGURATION

Modulation: GFSK
Channel frequency: 2402MHz and 2480MHz
Hopping sequence: ON and OFF, worst case reported

8.4. SETUP

The EUT is placed in an anechoic chamber; levels have been corrected to be in compliant with Peak Output Power measurement. The EUT is turn ON; the graphs of the restrict frequency band are recorded with a display line indicating the highest level and other the 20dB offset below to show compliance with 15.247 (d) and 15.205. The emissions in restricted bands are compared to 15.209 limits.

RBW: 100kHz
VBW: 300kHz

**8.5. RESULTS****TERMINAL :****Restricted Band (2310-2390) MHz**

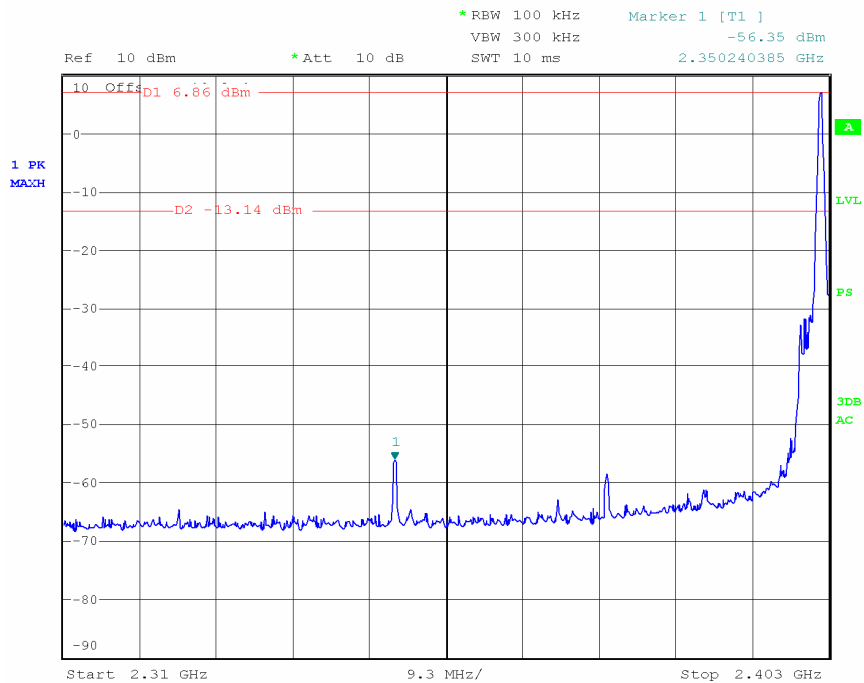
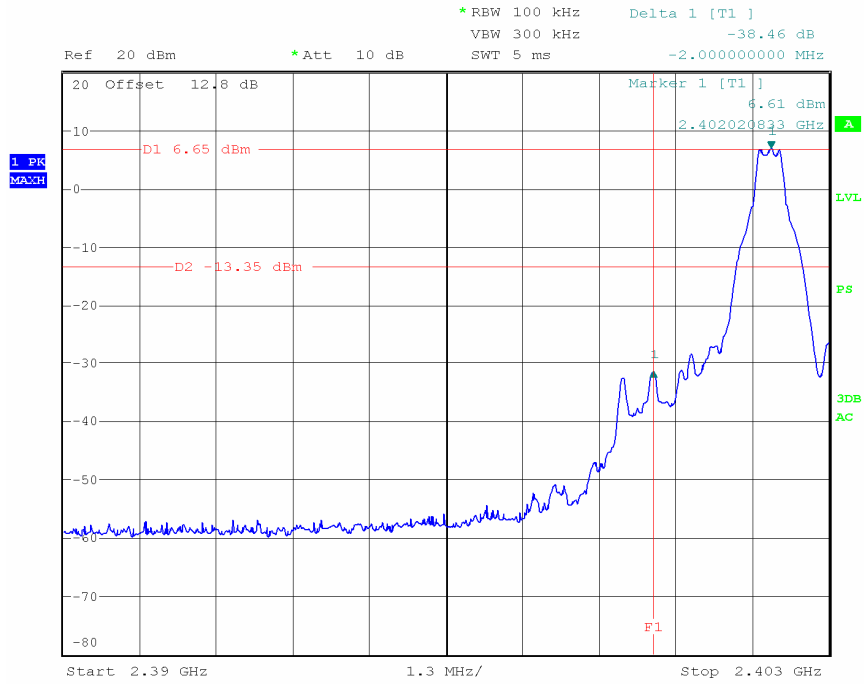
Frequency (MHz)	Maximum field strength in restrict band (dB μ V/m)	Limit (dB μ V/m)	Detector
2350.02	54.3	74	PK
2350.02	24.2	54	AV
2483.62	50.3	74	PK
2483.62	20.2	54	AV

NOTE:

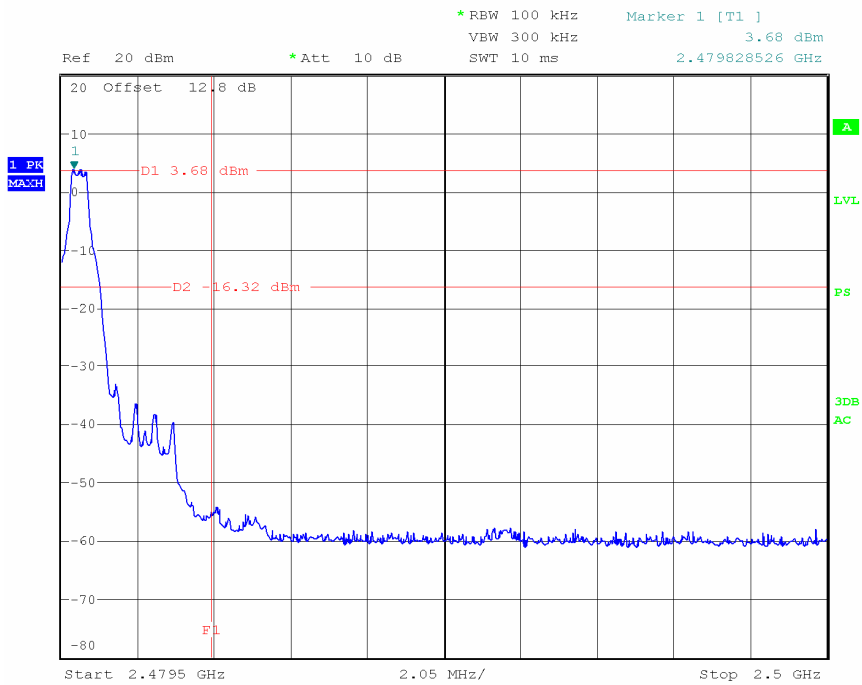
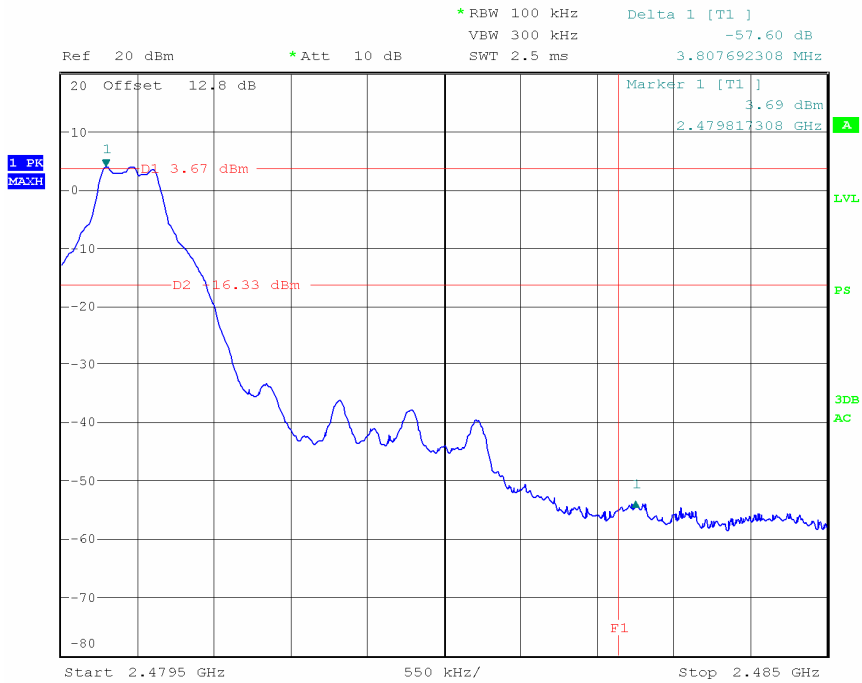
1. Average value = Peak value + 20 Log (duty cycle) = Peak value - 30.1dB.

2. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon Bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correction factor be equal to: 20log (3.125/100) = -30.1 dB.

Terminal – 2402MHz



Terminal – 2480MHz





BASE :

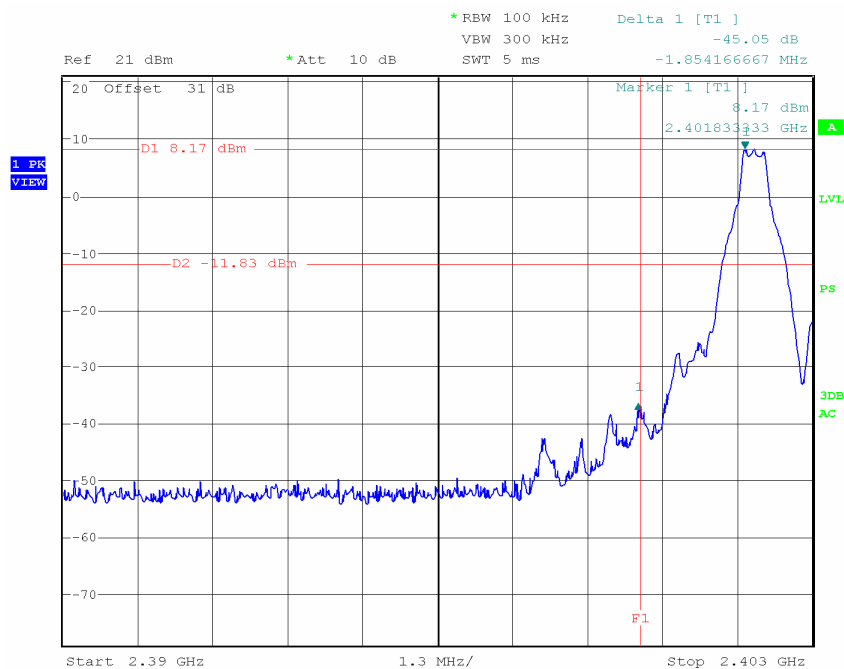
Restricted Band (2310-2390) MHz

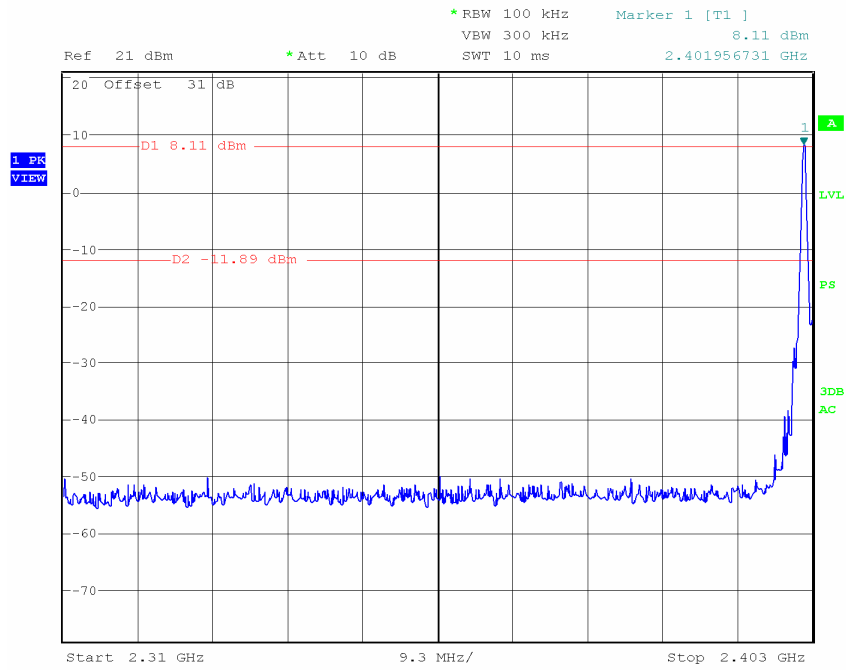
Frequency (MHz)	Maximum field strength in restrict band (dBµV/m)	Limit (dBµV/m)	Detector
2399.9791	62.3	74	PK
2399.9791	32.2	54	AV
2483.63	51.2	74	PK
2483.63	21.1	54	AV

NOTE:

1. Average value = Peak value + 20 Log (duty cycle) = Peak value – 30.1dB.
2. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon Bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correction factor be equal to: 20log (3.125/100) = -30.1 dB.

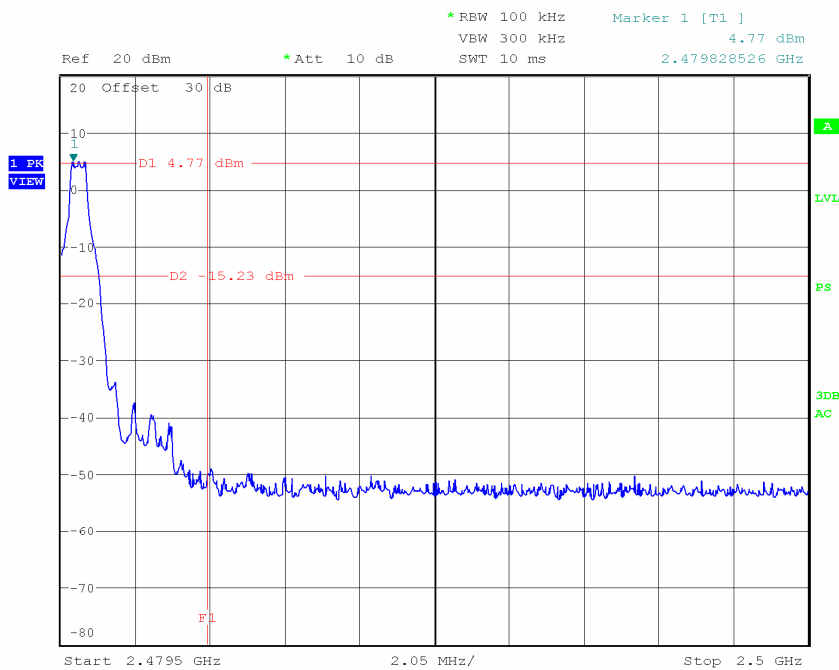
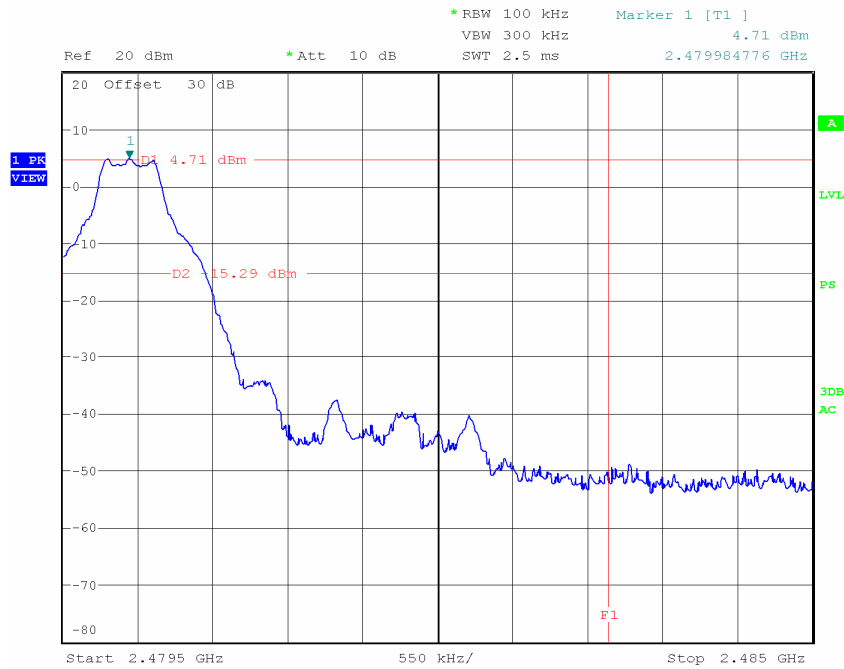
Base – 2402MHz







Base – 2480MHz





9. TEST EQUIPMENT LIST (MOIRANS SITE)

	N° LCIE	TYPE	COMPANY	REF	Comments
MAXIMUM PEAK OUTPUT POWER					
	C2042027VO	Antenna horn	EMCO	3115	
	A7122167	Attenuator 10dB 18GHz 2W	JFW		
	A5329041VO	Cable SMA			
	A5329206VO	Cable	UTIFLEX		
	A2642019VO	Measurement Receiver 20Hz – 8GHz	ROhde & Schwarz	ESU8	
	F2000409VO	OATS MOIRANS			
	F2000392VO	Antenna mast (OATS)	ETS Lindgren	2071-2	
	F2000403VO	Turntable (OATS)	ETS Lindgren	Model 2187	
	F2000372VO	Turntable / Mast controller (OATS)	ETS Lindgren	Model 2066	
HOPPING CHANNEL SEPARATION					
	C2042027VO	Antenna horn	EMCO	3115	
	A5329041VO	Cable SMA			
	A5329206VO	Cable	UTIFLEX		
	A2642019VO	Measurement Receiver 20Hz – 8GHz	ROhde & Schwarz	ESU8	
NUMBER OF HOPPING CHANNEL					
	C2042027VO	Antenna horn	EMCO	3115	
	A5329041VO	Cable SMA			
	A5329206VO	Cable	UTIFLEX		
	A2642019VO	Measurement Receiver 20Hz – 8GHz	ROhde & Schwarz	ESU8	
TIME OF OCCUPANCY					
	C2042027VO	Antenna horn	EMCO	3115	
	A5329041VO	Cable SMA			
	A5329206VO	Cable	UTIFLEX		
	A2642019VO	Measurement Receiver 20Hz – 8GHz	ROhde & Schwarz	ESU8	
BAND EDGE MEASUREMENT					
	C2042027VO	Antenna horn	EMCO	3115	
	A5329041VO	Cable SMA			
	A5329206VO	Cable	UTIFLEX		
	A2642019VO	Measurement Receiver 20Hz – 8GHz	ROhde & Schwarz	ESU8	

**10. UNCERTAINTIES CHART**

Type de mesure / Kind of measurement	Incertitude élargie laboratoire / Wide uncertainty laboratory (k=2) ± x	Incertitude limite du CISPR / CISPR uncertainty limit ± y
Mesure des perturbations conduites en tension sur le réseau d'énergie <i>Measurement of conducted disturbances in voltage on the power port</i>	3.57 dB	3.6 dB
Mesure des perturbations conduites en tension sur le réseau de télécommunication <i>Measurement of conducted disturbances in voltage on the telecommunication port.</i>	3.28 dB	A l'étude / Under consid.
Mesure des perturbations discontinues conduites en tension <i>Measurement of discontinuous conducted disturbances in voltage</i>	3.47 dB	3.6 dB
Mesure des perturbations conduites en courant <i>Measurement of conducted disturbances in current</i>	2.90 dB	A l'étude / Under consid.
Mesure du champ électrique rayonné sur le site en espace libre de Moirans <i>Measurement of radiated electric field on the Moirans open area test site</i>	5.07 dB	5.2 dB