



**Telecommunications & Telematics
for Transports Lab.**

TEST REPORT

Ref. No. ARSL00218

Date: 2012-05-16

Measurements performed in accordance with:



**FCC Rules : Code of Federal Regulations (CFR) no. 47
PART 15 – RADIO FREQUENCY DEVICES**

PRODUCT : Multiparameter ambulatory recorder system

TESTED MODEL : Bodyguardian type ref. SPMHBGW1

FCC ID : S9NMHBGW1

APPLICANT : STMicroelectronics S.r.l.- Via C. Olivetti, 2 - 20864 Agrate Brianza (MB) ITALY

MANUFACTURER : PREVENTICE - 1652 Greenview Dr SW Suite 200 - Rochester, MN 55902

TRADEMARK : PREVENTICE

OTHER INFORMATION : Testing dates : 2011-12-01 ÷ 2012-05-16 (IMQ BEM: 61970)

Tested samples No. : 1

Testing Laboratory : IMQ S.p.A. Via Quintiliano, 43 I-20138 MILANO

Tested by : R. Radice Signature: *Roberto Radice* Date : 2012-05-16

Checked by: M. De Angelis Signature: *M. De Angelis* Date : 2012-05-16

Revision Sheet

Release No.	Date	Revision Description
Rev. 0	2011-12-22	Test Results and Evaluation Report
Rev. 1	2012-05-16	Modify "Operating test condition" par.3.1 and "Measurements and tests data" par. 5

NOTICE: The results of tests and checks reported in this Test Report refer exclusively to the samples tested and described in the Report itself. This report shall not be reproduced partially or in its entirety without the written approval of IMQ S.p.A.

IMQ S.p.A. - Via Quintiliano, 43 – I-20138 MILANO

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1 GENERAL DESCRIPTION OF EQUIPMENT UNDER TEST

1.1 APPLICANT

NAME	STMicroelectronics S.r.l.
ADDRESS	Via C. Olivetti, 2 - 20864 Agrate Brianza (MB)
COUNTRY	ITALY

1.2 MANUFACTURER

NAME	PREVENTICE
ADDRESS	1652 Greenview Dr SW Suite 200 - Rochester, MN 55902
COUNTRY	Unites States

1.3 EQUIPMENT CLASSIFICATION

According to the definition 15.3 (o) EUT is a **Intentional Radiator operating within the bands 2400-2483,5 MHz** so it shall fulfil provisions of 47CFR Part 15 Subpart C – Intentional radiators – and Section 15.247.

1.4 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Parameters	Value
Type of equipment :	Multiparameter ambulatory recorder system
Model:	Bodyguardian type ref. SPMHBGW1
FCC ID. :	S9NMHBGW1
Trade Name:	PREVENTICE
Data cable :	/
Telecom cable :	/
Power supply type :	Internal rechargeable battery 3.7V
AC power input cable :	/
DC power input cable :	/

1.5 FEATURE OF EQUIPMENT UNDER TEST

Power specification	+3.7 V dc (internal rechargeable battery)
Operating frequency:	2402 ÷ 2480 MHz (79 Channels)
Maximum RF output power:	-6,97 dBm
Modulation:	FHSS with adaptive frequency hopping (GFSK, $\pi/4$ -DQPSK or 8DPSK)
Channel Spacing:	1 MHz
Antenna:	Integrated on PCB
RX sensitivity:	/
Main SW identification	/
Main HW Board identification	/
Peripherals included (for system application)	None
Interfaces :	None
Integrated interfaces :	None
AC adapter:	AC/DC adapter for battery recharging (model. FW7662M06 Input 100÷240V 50/60Hz 150mA – Output 5,9V 1A – for medical equipment)

CHANNEL CONFIGURATION

Channel (No.)	Frequency (MHz)	Channel (No.)	Frequency (MHz)	Channel (No.)	Frequency (MHz)
01	2402.00	29	2430.00	57	2458.00
02	2403.00	30	2431.00	58	2459.00
03	2404.00	31	2432.00	59	2460.00
04	2405.00	32	2433.00	60	2461.00
05	2406.00	33	2434.00	61	2462.00
06	2407.00	34	2435.00	62	2463.00
07	2408.00	35	2436.00	63	2464.00
08	2409.00	36	2437.00	64	2465.00
09	2410.00	37	2438.00	65	2466.00
10	2411.00	38	2439.00	66	2467.00
11	2412.00	39	2440.00	67	2468.00
12	2413.00	40	2441.00	68	2469.00
13	2414.00	41	2442.00	69	2470.00
14	2415.00	42	2443.00	70	2471.00
15	2416.00	43	2444.00	71	2472.00
16	2417.00	44	2445.00	72	2473.00
17	2418.00	45	2446.00	73	2474.00
18	2419.00	46	2447.00	74	2475.00
19	2420.00	47	2448.00	75	2476.00
20	2421.00	48	2449.00	76	2477.00
21	2422.00	49	2450.00	77	2478.00
22	2423.00	50	2451.00	78	2479.00
23	2424.00	51	2452.00	79	2480.00
24	2425.00	52	2453.00		
25	2426.00	53	2454.00		
26	2427.00	54	2455.00		
27	2428.00	55	2456.00		
28	2429.00	56	2457.00		

2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST

2.1 ENVIRONMENTAL CONDITIONS

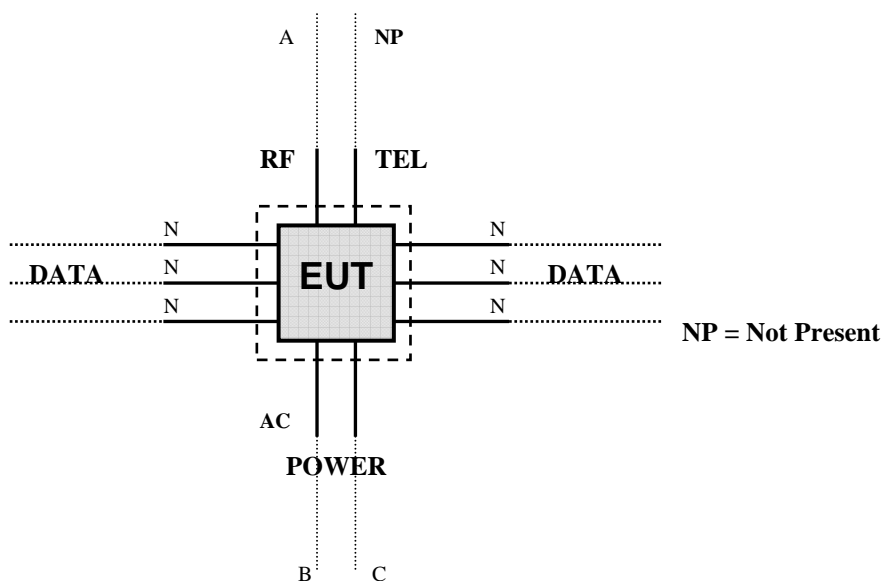
TEST CONDITIONS	MEASURED
Ambient Temperature	20 ÷ 25 °C
Relative Humidity	50 ÷ 60 %
Atmospheric Pressure	900 ÷ 1000 mbar

2.2 DESCRIPTION OF SUPPORT EQUIPMENT

Here following the details concerning equipment needed for correct operation or loading of the EUT:

EQUIPMENT	MANUFACTURER	MODEL
None	-----	-----

2.3 INTERFACE IDENTIFICATION AND CONNECTION DIAGRAM OF TEST SYSTEM

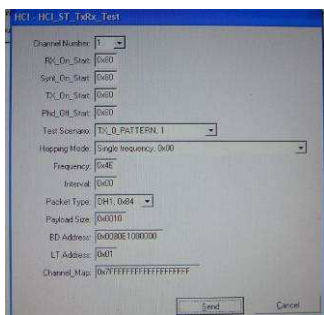
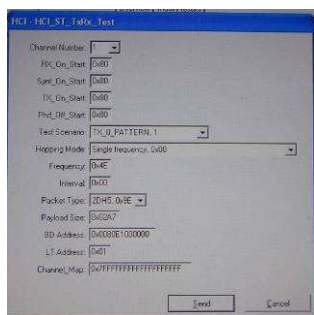
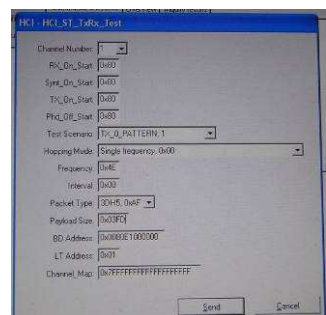


#	Interface	Description	Maximum length	Ref. Document
1	Enclosure	Plastic surface	/	/
2	AC mains power input/output port	Port not present	/	/
3	DC power port	+3,7V dc (Internal battery)	/	/
4	Signal / control port	Port not present	/	/
5	Antenna port (RF)	Integrated Antenna on PCB	/	/

3 OPERATION OF EQUIPMENT UNDER TEST

3.1 OPERATING TEST CONDITIONS

Ref.	Description
#1	Continuous transmission with the used hopping mode (sequential hopping transmission)
#2	Continuous transmission (single channel transmission)
MEASUREMENT SOFTWARE SETTING	
Software type	HCI TOOLBox
Command setting	HCI_ST _TxRx_Test
Power setting	Power step 0x04 (max power: 4dBm)
Modulation	Basic Rate (GFSK \Rightarrow DH1 command), 1Mb/s EDR ($\pi/4$ -DQPSK \Rightarrow 2DH5 command), 2Mb/s EDR (8DPSK \Rightarrow 3DH5 command), 3Mb/s
Frequency	2402 MHz: 0x00 2441 MHz: 0x27 2480 MHz: 0x4E

4 TESTS IDENTIFICATION AND RESULTS

TABLE 1 : SUMMARY OF TESTS

CFR47 Part 15 Section	Title	Operating condition	Result	Test No.
15.203 15.247 (b)(4)(i)	Antenna Requirements	/	PASS	1
15.207 (a)	Conducted Emission	#1	PASS	2
15.209 (a) (f)	Radiated Emission	#1	PASS	3
15.247 (a)	Frequency Hopping Spread Spectrum Specifications			
15.247(a)(1)(iii)	Number of Hopping Channels Used	#1	PASS	4
15.247(a)	20 dB Bandwidth	#1	PASS	5
15.247(a)(1)	Carrier frequency (Hopping Channel) Separation	#1	PASS	6
15.247(a)(1)(iii)	Time occupancy (Dwell Time) of Each Channel (ch) within a $0,4 \times N_{ch}$ (sec) Period	#1	PASS	7
15.247(a)(2)	6dB Minimum Bandwidth	Not applicable		
15.247(b)	Maximum Peak Output Power			
15.247(b) (1)	Peak Output Power (Conducted)	Not applicable		
15.247(b) (3)	RF power output, radiated (EIRP)	#1	PASS	8
15.247(b) (4)	Antenna gain	Not applicable		
15.247(c)	Operation with directional antenna gains greater than 6 dBi	Not applicable		

CFR47 Part 15 Section	Title	Operating condition	Result	Test No.
15.247 (d)	100 kHz Bandwidth of Frequency Band Edges	#1	PASS	9
15.247 (d)	Spurious Emission in restricted band near 2400-2483.5 MHz	#1	PASS	10
15.247 (d)	Conducted or Radiated Emission	#1	PASS	11
15.247 (e)	Power Spectral Density	Not applicable		
15.247 (f)	Hybrid systems	Not applicable		
15.247 (g)	FHSS Transmission characteristics	/	PASS	/
15.247 (h)	Recognition of occupied channel and multiple transmission system	Not applicable		
15.247(i) (§ 47CFR 1.1307(b)(1))	RF humane exposure	#1	PASS	12

4.1 METHODS OF MEASUREMENT

All compliance measurements have been carried out using the procedures described in the standard ANSI C63.4-2009, ANSI C63.10-2009 and Section 15.31 of CFR47 Part 15 – Subpart A (General).

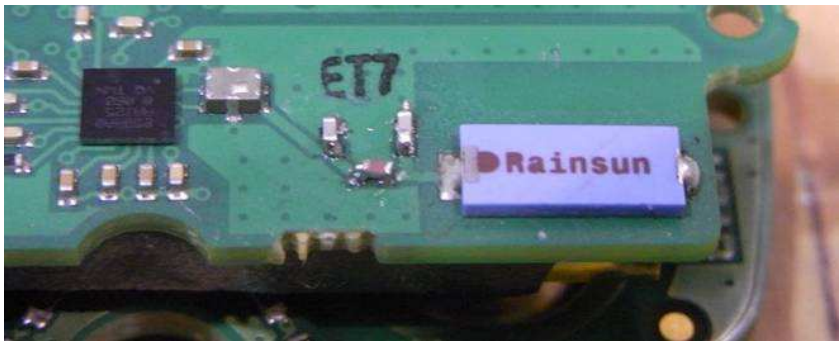
Additional test requirements have been adopted according to the reference Section indicated in the Test Table

4.2 FREQUENCY RANGE INVESTIGATED

- a. Conducted emission tests : from 150 kHz to 30 MHz.
- b. Radiated emission tests : from 9 kHz to tenth harmonic of fundamental

5 MEASUREMENTS AND TESTS DATA

TEST No. 1	Title "Antenna Requirements"	47CFR Part 15 Ref. Section
		15.203 / 15.204
TEST REQUIREMENTS	<p>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.</p>	

Antenna specifications	
N° of authorized antenna types	1 (on PCB)
Antenna type	Dedicated SMD antenna RAINSON p.n. AN0835 integrated on board
Maximum total gain	< 6dBi
External power amplifiers	Not present
Antenna Description	
	

Test Result:

The transmitter meets the requirements of section 15.203 and 15.204

TEST No. 2	Title “Conducted emission”	47CFR Part 15 Ref. Section
		15.207
TEST REQUIREMENTS	Test setup	ANSI C63.4
	Limits of mains terminal disturbance voltage	15.207 (a)
	Frequency range	150 kHz – 30 MHz
	IF bandwidth	9 kHz
	EMC class	B

TEST DATA	PORT UNDER TEST	OPERATING CONDITION	RESULT
	AC mains power input port	#1	Complies
	Note: In search of max noise (phase(s) and neutral) of AC/DC adapter		

- 1) The EUT was placed on a wooden table of size, 80 cm by 80 cm, raised 80 cm in which is located 40 cm away from the vertical wall the shielded room.
- 2) Each EUT power cord input cord was individually connected through a 50Ω/50μH LISN to the input power source.
- 3) Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
- 4) The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.
- 5) The measurements were made with the detector set to PEAK and AVAREGE amplitude within a bandwidth of 10 kHz during the measurements.
- 6) The measurements with Quasi-Peak detector are performed only for frequencies for which the Peak values are \geq (Q.P. limit - 6 dB).

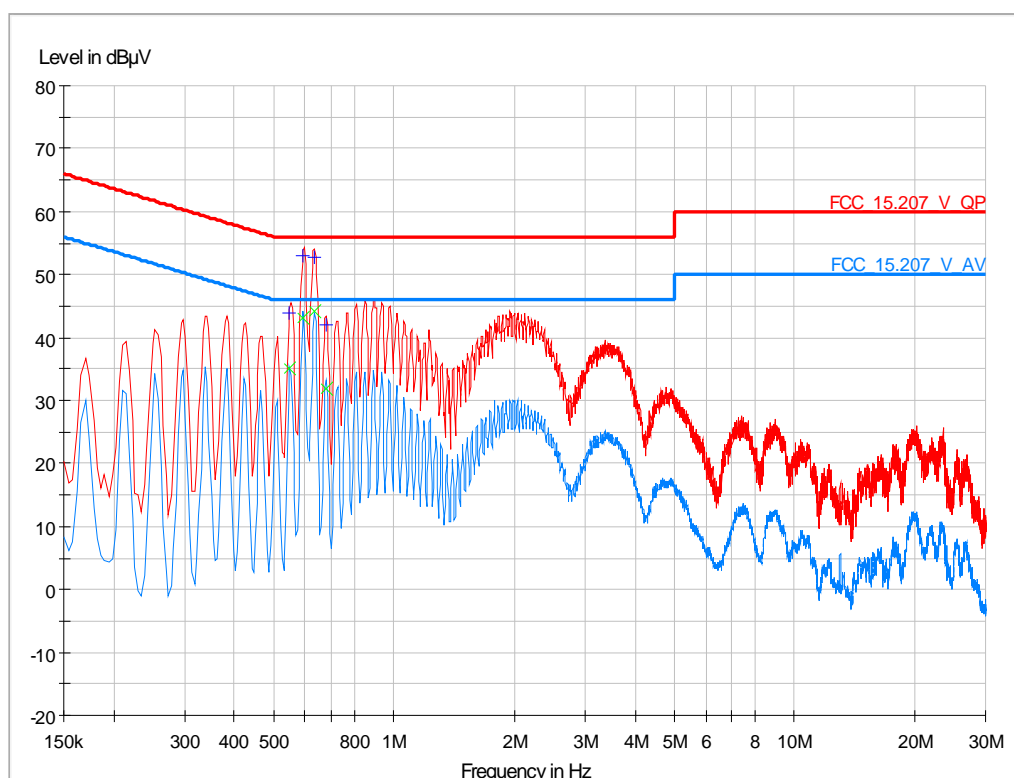
Test Result:

Within the specifications

MEASUREMENTS RESULTS

CONDUCTED DISTURBANCE ON AC MAINS POWER PORT OF AC/DC ADAPTER

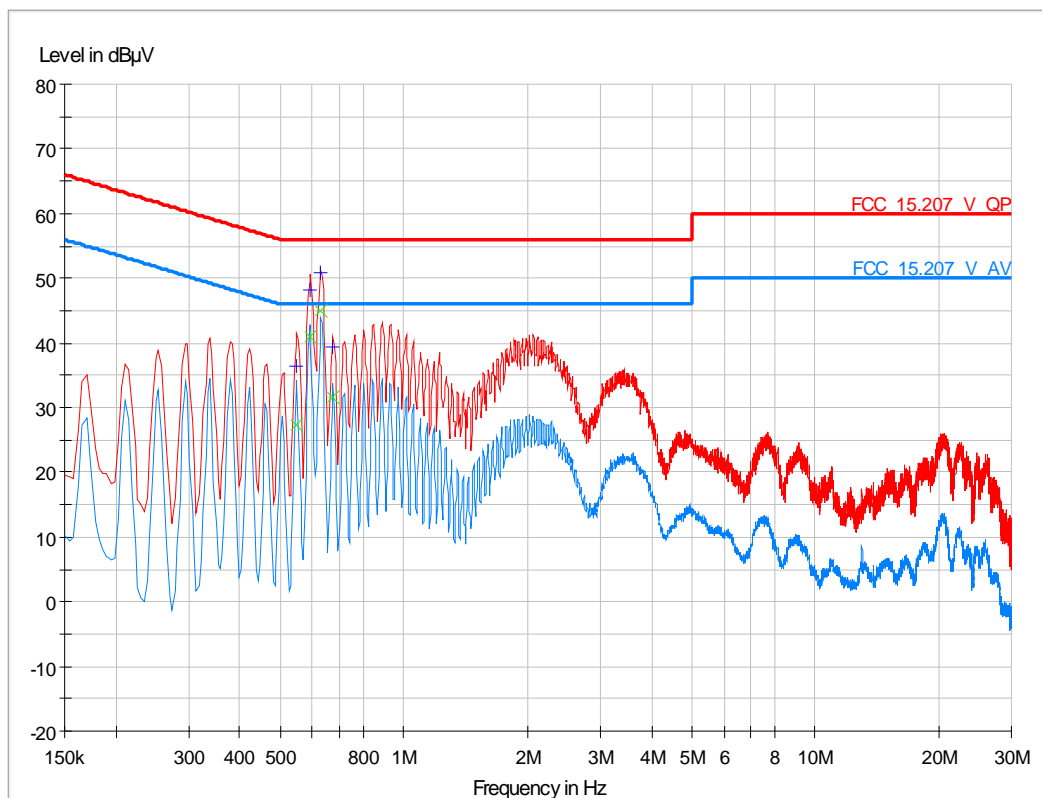
MEASURE LINE: PHASE



Frequency MHz	QuasiPea k dBμV	Average dBμV	Meas. Time ms	Bandwidth kHz	Line	QuasiPea k Limit dBμV	Average Limit dBμV
0,550000	44,0	35,0	1000,0	9,000	L1	56,0	46,0
0,594000	53,1	43,2	1000,0	9,000	L1	56,0	46,0
0,634000	52,7	44,0	1000,0	9,000	L1	56,0	46,0
0,678000	41,9	31,8	1000,0	9,000	L1	56,0	46,0

CONDUCTED DISTURBANCE ON AC MAINS POWER PORT OF AC/DC ADAPTER

MEASURE LINE: NEUTRAL



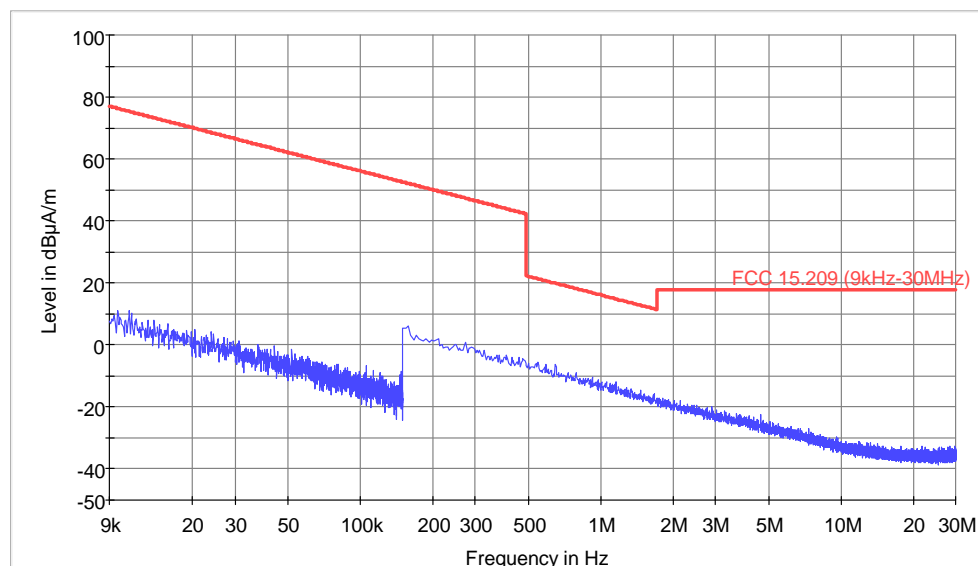
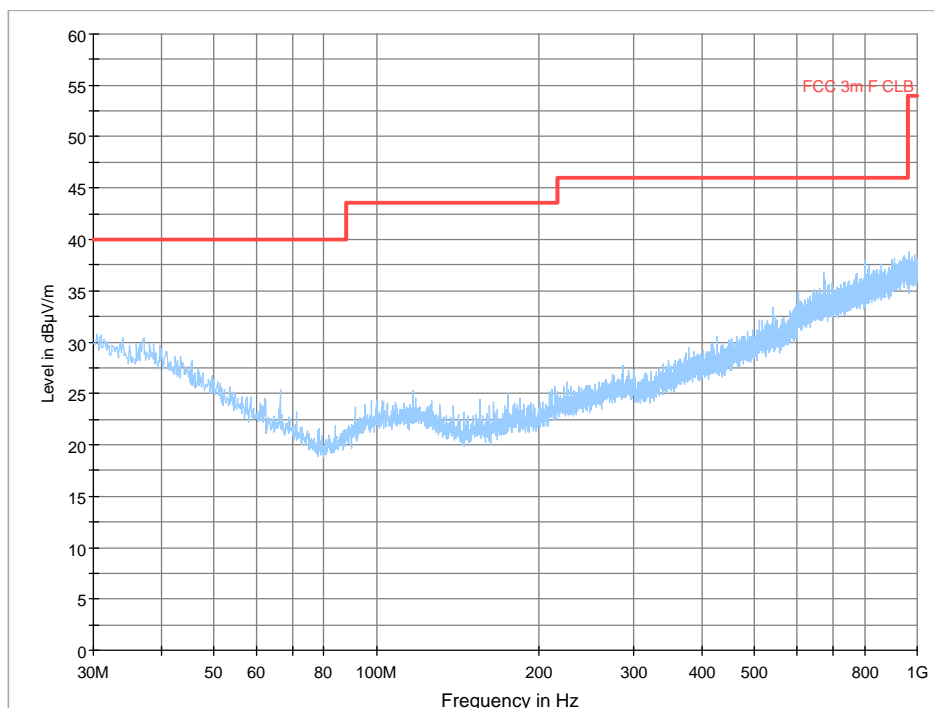
Frequency MHz	QuasiPea k dBμV	Average dBμV	Meas. Time ms	Bandwidth kHz	Line	QuasiPea k Limit dBμV	Average Limit dBμV
0,550000	36,5	27,4	1000,0	9,000	N	56,0	46,0
0,590000	48,3	41,0	1000,0	9,000	N	56,0	46,0
0,630000	50,8	44,9	1000,0	9,000	N	56,0	46,0
0,674000	39,4	31,6	1000,0	9,000	N	56,0	46,0

TEST No. 3	Title "Radiated disturbances"	47CFR Part 15 Ref. Section
		15.209
TEST REQUIREMENTS	Test setup	ANSI C63.4
	Test facility	Anechoic chamber
	Test distance	3 m
	Limits for radiated disturbances	15.209 (a)
	Frequency range	9 KHz to tenth harmonic of fundamental
	IF bandwidth (below 30 MHz)	9 kHz
	IF bandwidth (below 1000 MHz)	120 kHz
	IF bandwidth (above 1000 MHz)	1 MHz
	EMC class	B
	(*) In accordance with part 15.31 (f) (2), where the measurement distance was specified to be 30 or 300 meters, a correction factor was applied in order to permit measurement to be performed at a separation distance. The applied formula for limits at 3 meter is: Extrapolation (dB) = $40\log(300\text{meter} / 3\text{meter}) = +80\text{db}$ Extrapolation (dB) = $40\log(30\text{meter} / 3\text{meter}) = +40\text{db}$	

- 1) The EUT was placed on turntable which is 0.8 m above the ground plane
- 2) The turntable shall rotate from 0° to 360° degrees to determine the position of maximum emission level.
- 3) The EUT is positioned 3 m away from the receiving antenna which varied from 1 to 4 m to find the highest emission.
- 4) The measurements were made with the detector set to PEAK and AVERAGE amplitude within a bandwidth of 100 kHz below 1000 MHz and 1 MHz above 1000 MHz.
- 5) The receiving antenna was positioned in both horizontal and vertical polarization.
- 6) The measurements with Quasi-Peak detector, below 1000 MHz are performed only for frequencies for which the Peak values are $\geq (\text{Q.P. limit} - 6 \text{ dB})$.

LIMITS FOR SPURIOUS

Band of operations	Peak (dB μ V/m)	Average Limit (dB μ V/m)
Restricted bands (par. 15.205)	74,00	54,00
Other bands	According to 15.209 or fundamental –20dB (which is greater)	According to 15.209 or fundamental –20dB (which is greater)

MEASUREMENTS RESULTS (9kHz÷30 MHz)**MEASUREMENTS RESULTS (30÷1000 MHz)**

MEASUREMENTS RESULTS (1000 MHz to 24800 MHz)

Channel nº01: 2402,00 MHz)

PEAK RESULT (RBW=1MHz; VBW=1MHz)

Antenna Polarization: Horizontal								
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(dBµV/m)	(dB)
2402	92,56	27,40	3,55	-33,00	90,51	---	---	---
4804	43,09	31,54	5,44	-32,80	47,27	5.000	74,00	26,73
7206	54,42	36,06	6,90	-32,76	64,62	5.000	74,00	9,38
9608	33,15	38,08	9,36	-32,15	48,44	5.000	74,00	25,56
12010	30,77	39,10	11,55	-31,66	49,76	5.000	74,00	24,24
f>12010	not significant	---	---	---	---	---	---	---

Antenna Polarization: Vertical								
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(µV/m)	(dBµV/m)	(dB)
2402	91,33	27,40	3,55	-33,00	89,28	---	---	---
4804	44,15	31,54	5,44	-32,80	48,33	5.000	74,00	25,67
7206	54,31	36,06	6,90	-32,76	64,51	5.000	74,00	9,49
9608	33,38	38,08	9,36	-32,15	48,67	5.000	74,00	25,33
12010	30,36	39,10	11,55	-31,66	49,35	5.000	74,00	24,65
f>12025	not significant	---	---	---	---	---	---	---

Formula:

Calculated Level (dBµV/m) = Measured Level (dBµV) - Pre-amplifier Gain(dB) + Cable Loss(dB) + Antenna Factor (dBm⁻¹)

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

Antenna Polarization: Horizontal								
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Limit	Margin
(MHz)	(dBμV)	(dB1/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2402	78,59	27,40	3,55	-33,00	76,54	---	---	---
4804*	---	---	---	---	---	500	54,00	---
7206	39,69	36,06	6,90	-32,76	49,89	500	54,00	4,11
9608*	---	---	---	---	---	500	54,00	---
12010*	---	---	---	---	---	500	54,00	---
f>12010*	---	---	---	---	---	500	54,00	---

***Peak value under Average Limit; no measure executed (see previous page)**

Antenna Polarization: Vertical								
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Limit	Margin
(MHz)	(dBμV)	(dB1/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2402	77,75	27,40	3,55	-33,00	75,70	---	---	---
4804*	---	---	---	---	---	500	54,00	---
7206	39,50	36,06	6,90	-32,76	49,70	500	54,00	4,30
9608*	---	---	---	---	---	500	54,00	---
12010*	---	---	---	---	---	500	54,00	---
f>12010*	---	---	---	---	---	500	54,00	---

***Peak value under Average Limit; no measure executed (see previous page)**

Formula:

Calculated Level (dBμV/m) = Measured Level (dBμV) - Pre-amplifier Gain(dB) + Cable Loss(dB) + Antenna Factor (dBm⁻¹)

Channel n°40: 2441,00 MHz

PEAK RESULT (RBW=1MHz; VBW=1MHz)

Antenna Polarization: Horizontal								
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Limit	Margin
(MHz)	(dBμV)	(dB1/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2441	95,14	27,40	3,55	-33,00	93,09	---	---	---
4882	39,26	31,54	5,44	-32,80	43,44	5.000	74,00	30,56
7323	52,39	36,06	6,90	-32,76	62,59	5.000	74,00	11,41
9764	33,80	38,08	9,36	-32,15	49,09	5.000	74,00	24,91
12205	48,55	39,10	11,55	-31,66	48,55	5.000	74,00	25,45
f<12205	not significant	---	---	---	---	---	---	---

Antenna Polarization: Vertical								
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Limit	Margin
(MHz)	(dBμV)	(dB1/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2441	94,36	27,40	3,55	-33,00	92,31	---	---	---
4882	44,28	31,54	5,44	-32,80	48,46	5.000	74,00	25,54
7323	52,60	36,06	6,90	-32,76	62,80	5.000	74,00	11,20
9764	33,15	38,08	9,36	-32,15	48,44	5.000	74,00	25,56
12205	29,36	39,10	11,55	-31,66	48,35	5.000	74,00	25,65
f<12250	not significant	---	---	---	---	---	---	---

Formula:

Calculated Level (dBμV/m) = Measured Level (dBμV) - Pre-amplifier Gain(dB) + Cable Loss(dB) + Antenna Factor (dBm⁻¹)

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

Antenna Polarization: Horizontal								
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Limit	Margin
(MHz)	(dBμV)	(dB1/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2441	81,62	27,40	3,55	-33,00	79,57	---	---	---
4882*	---	---	---	---	---	500	54,00	---
7323	37,11	36,06	6,90	-32,76	47,31	500	54,00	6,69
9764*	---	---	---	---	---	500	54,00	---
12205*	---	---	---	---	---	500	54,00	---
f<12205*	---	---	---	---	---	500	54,00	---

***Peak value under Average Limit; no measure executed (see previous page)**

Antenna Polarization: Vertical								
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Limit	Margin
(MHz)	(dBμV)	(dB1/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2441	81,01	27,40	3,55	-33,00	78,96	---	---	---
4882*	---	---	---	---	---	500	54,00	---
7323	37,30	36,06	6,90	-32,76	47,50	500	54,00	6,50
9764*	---	---	---	---	---	500	54,00	---
12205*	---	---	---	---	---	500	54,00	---
f<12205*	---	---	---	---	---	500	54,00	---

***Peak value under Average Limit; no measure executed (see previous page)**

Formula:

Calculated Level (dBμV/m) = Measured Level (dBμV) - Pre-amplifier Gain(dB) + Cable Loss(dB) + Antenna Factor (dBm⁻¹)

Channel n°9: 2480,00 MHz

PEAK RESULT (RBW=1MHz; VBW=1MHz)

Antenna Polarization: Horizontal								
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Limit	Margin
(MHz)	(dBμV)	(dB1/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2480	93,66	27,40	3,55	-33,00	91,61	---	---	---
4960	41,32	31,54	5,44	-32,80	45,50	5.000	74,00	28,50
7440	58,27	36,06	6,90	-32,76	68,47	5.000	74,00	5,53
9920	32,45	38,08	9,36	-32,15	47,74	5.000	74,00	26,26
12400	29,37	39,10	11,55	-31,66	48,72	5.000	74,00	25,28
F<12400	not significant	---	---	---	---	---	---	---

Antenna Polarization: Vertical								
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Limit	Margin
(MHz)	(dBμV)	(dB1/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2480	94,65	27,40	3,55	-33,00	92,60	---	---	---
4960	46,54	31,54	5,44	-32,80	50,72	5.000	74,00	23,28
7440	59,00	36,06	6,90	-32,76	69,20	5.000	74,00	4,80
9920	32,58	38,08	9,36	-32,15	47,87	5.000	74,00	26,13
12400	28,97	39,10	11,55	-31,66	47,96	5.000	74,00	26,04
F<12400	not significant	---	---	---	---	---	---	---

Formula:

Calculated Level (dBμV/m) = Measured Level (dBμV) - Pre-amplifier Gain(dB) + Cable Loss(dB) + Antenna Factor (dBm⁻¹)

AVERAGE RESULT (RBW=1MHz; VBW=10Hz)

Antenna Polarization: Horizontal								
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Limit	Margin
(MHz)	(dBμV)	(dB1/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2480	77,90	27,40	3,55	-33,00	75,85	---	---	---
4960*	---	---	---	---	---	500	54,00	---
7440	41,90	36,06	6,90	-32,76	52,10	500	54,00	1,90
9920*	---	---	---	---	---	500	54,00	---
12400*	---	---	---	---	---	500	54,00	---
f<12400*	---	---	---	---	---	500	54,00	---

***Peak value under Average Limit; no measure executed (see previous page)**

Antenna Polarization: Vertical								
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Limit	Margin
(MHz)	(dBμV)	(dB1/m)	(dB)	(dB)	(dBμV/m)	(μV/m)	(dBμV/m)	(dB)
2480	78,65	27,40	3,55	-33,00	76,60	---	---	---
4960*	---	---	---	---	---	500	54,00	---
7440	42,50	36,06	6,90	-32,76	52,70	500	54,00	1,30
9920*	---	---	---	---	---	500	54,00	---
12400*	---	---	---	---	---	500	54,00	---
f<12400*	---	---	---	---	---	500	54,00	---

***Peak value under Average Limit; no measure executed (see previous page)**

Formula:

Calculated Level (dBμV/m) = Measured Level (dBμV) - Pre-amplifier Gain(dB) + Cable Loss(dB) + Antenna Factor (dBm⁻¹)

TEST No.4	Title “ Number of Hopping Frequencies”		47CFR Part 15 Ref. Section
			15.247 (a) (1) (iii)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings		
	Span	Assigned frequency band	
	Resolution (or IF) Bandwidth (RBW)	100 kHz	
	Video (or Average) Bandwidth (VBW)	100 kHz	
	Sweep time	20 ms	
	Detector function	Peak	
	Trace	max hold	
	Attenuator	/	
	LIMIT	> 15	

The transmitter output was connected to the spectrum analyzer through a test fixture (radio frequency coupling device associated with the dedicated antenna of the equipment under test)

Once the trace is stabilized, by the marker-delta function the separation between the peaks of the adjacent channels was determined detect all hopping frequencies

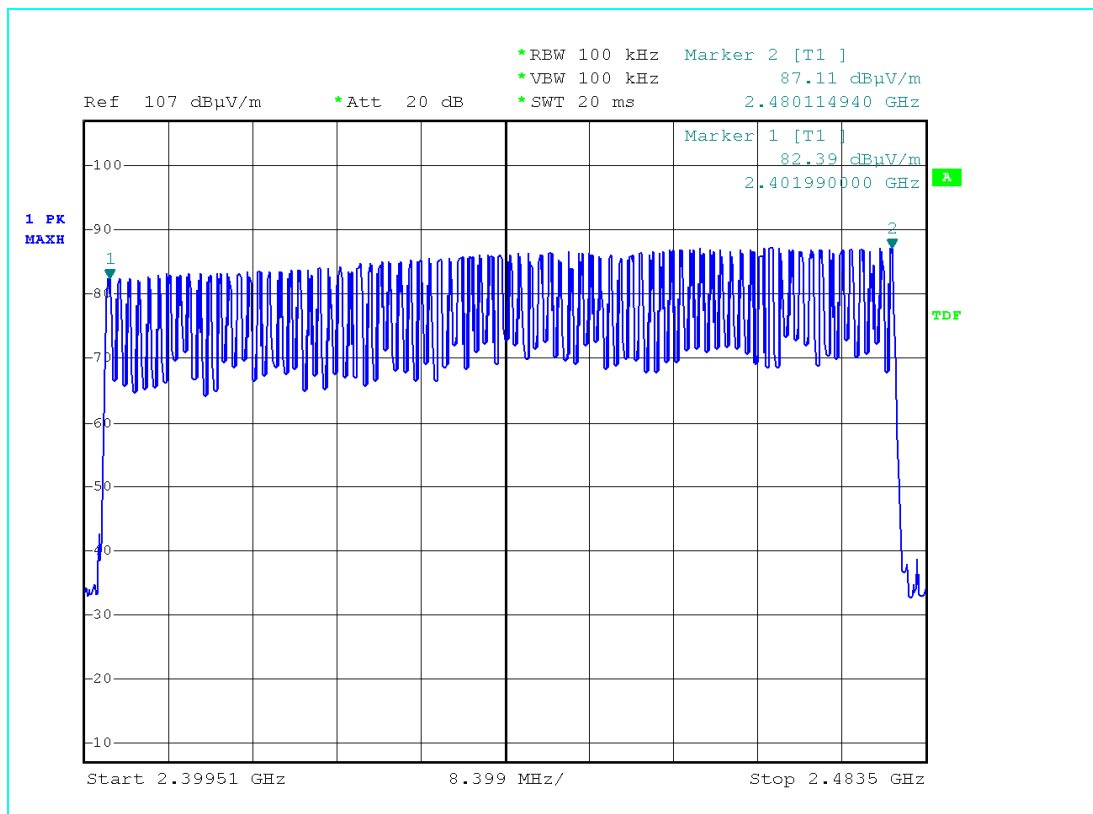
Test Result:

Number of measured Hopping Frequency channels (No.)	Plot (No.)
79	1

Modification during the test:

- none

Plot No. 1:



TEST No.5	Title "20 dB Bandwidth"	47CFR Part 15 Ref. Section
		15.247 (a) (1) (i)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings	
	Span	3 MHz
	Resolution (or IF) Bandwidth (RBW)	100 kHz
	Video (or Average) Bandwidth (VBW)	300 kHz
	Sweep time	Auto
	Detector function	Peak
	Trace	max hold
	Attenuator	/
	LIMIT	-----

The EUT is set to transmit has its maximum data rate.

The transmitter output was connected to the spectrum analyzer through a test fixture (radio frequency coupling device associated with the dedicated antenna of the equipment under test)

The Hopping Channel bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.

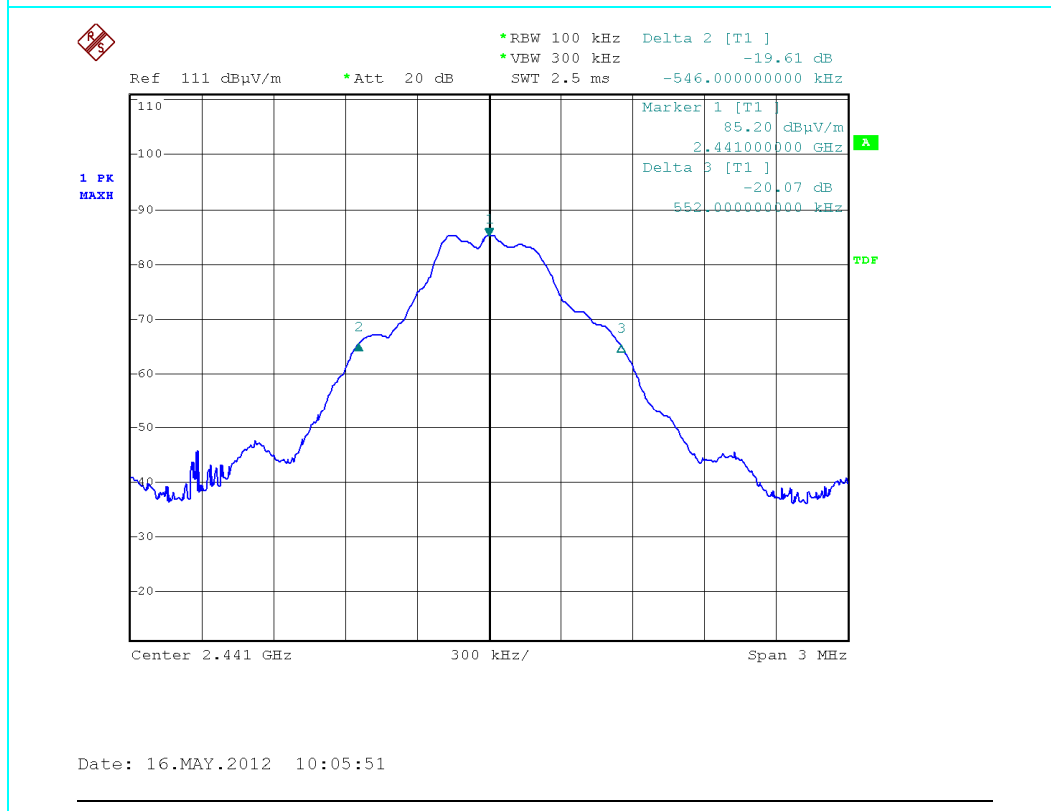
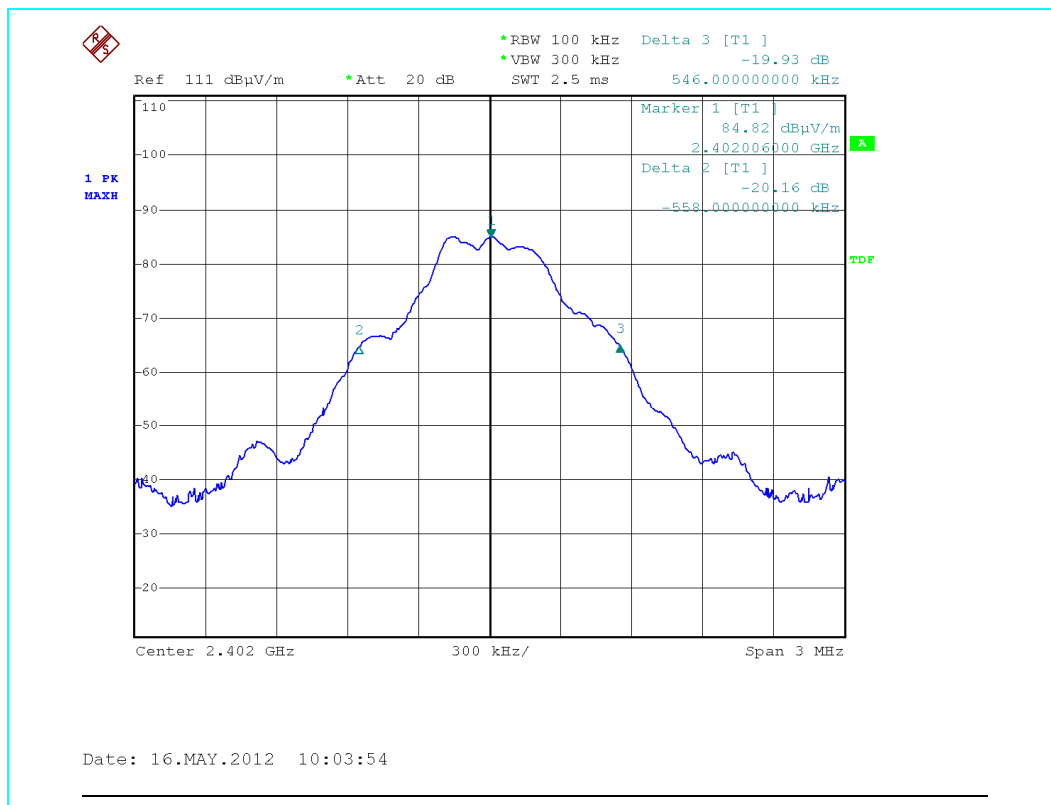
Test Result:

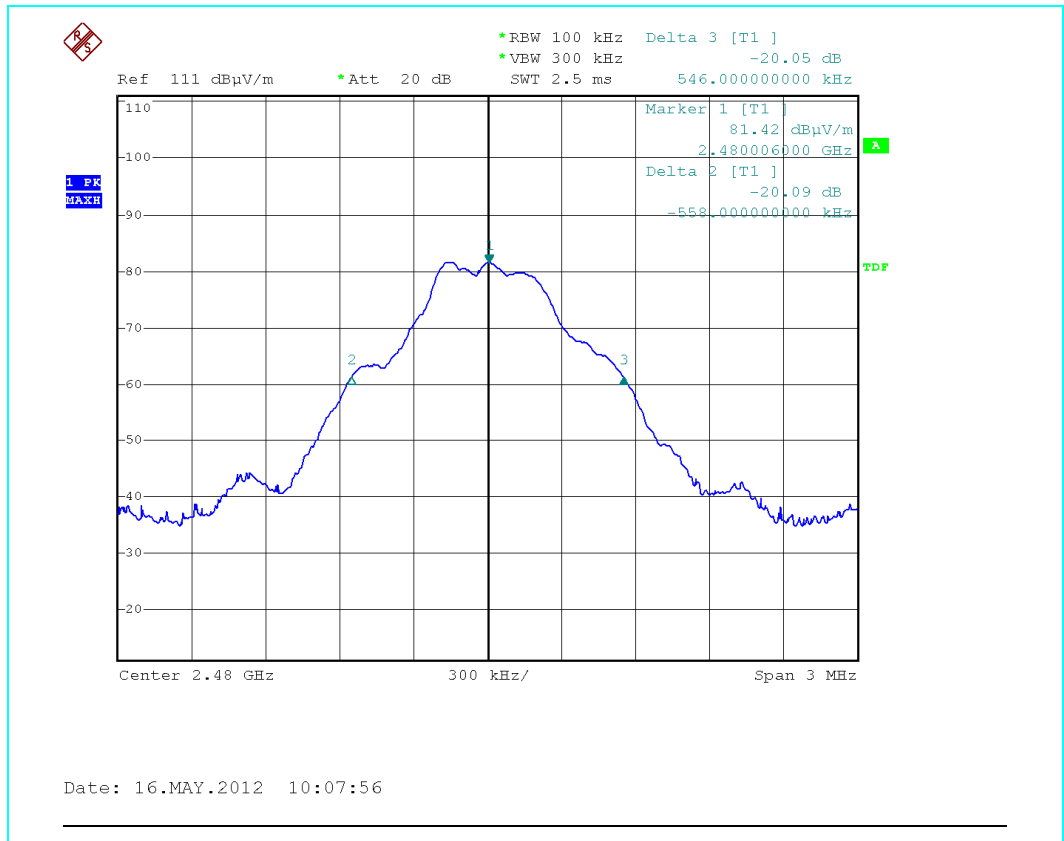
Channel (No.)	Frequency (MHz)	Modulation	Max. Channel Bandwidth (kHz)	Plot (No.)
01	2402,00	GSFK	1104	1
40	2441,00	GSFK	1098	2
79	2480,00	GSFK	1104	3
01	2402,00	EDR $\pi/4$ -DQPSK	1308	4
40	2441,00	EDR $\pi/4$ -DQPSK	1326	5
79	2480,00	EDR $\pi/4$ -DQPSK	1314	6
01	2402,00	EDR 8DPSK	1290	7
40	2441,00	EDR 8DPSK	1302	8
79	2480,00	EDR 8DPSK	1296	9

Modification during the test:

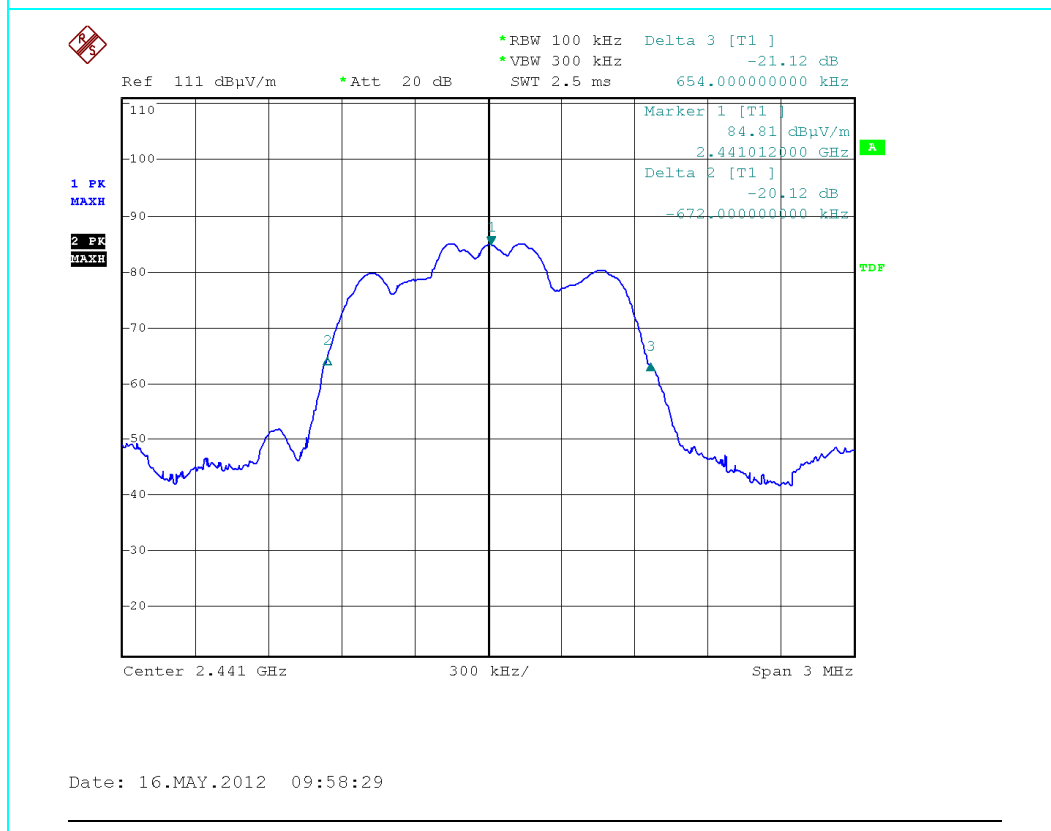
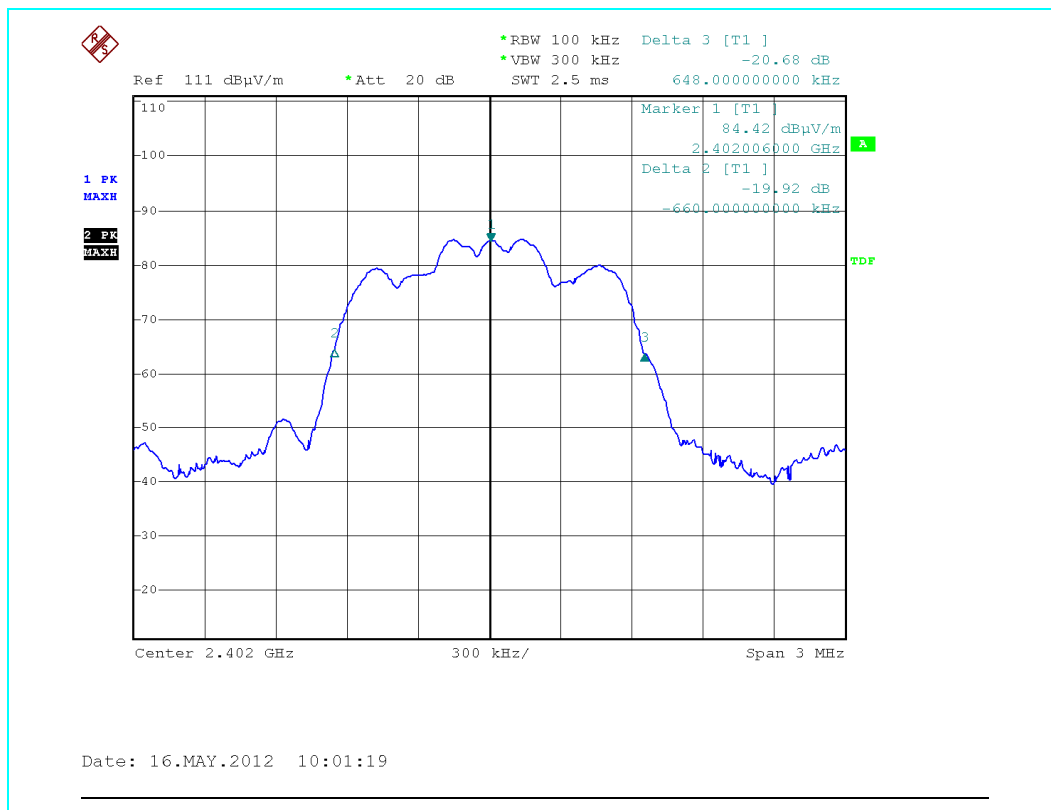
- none

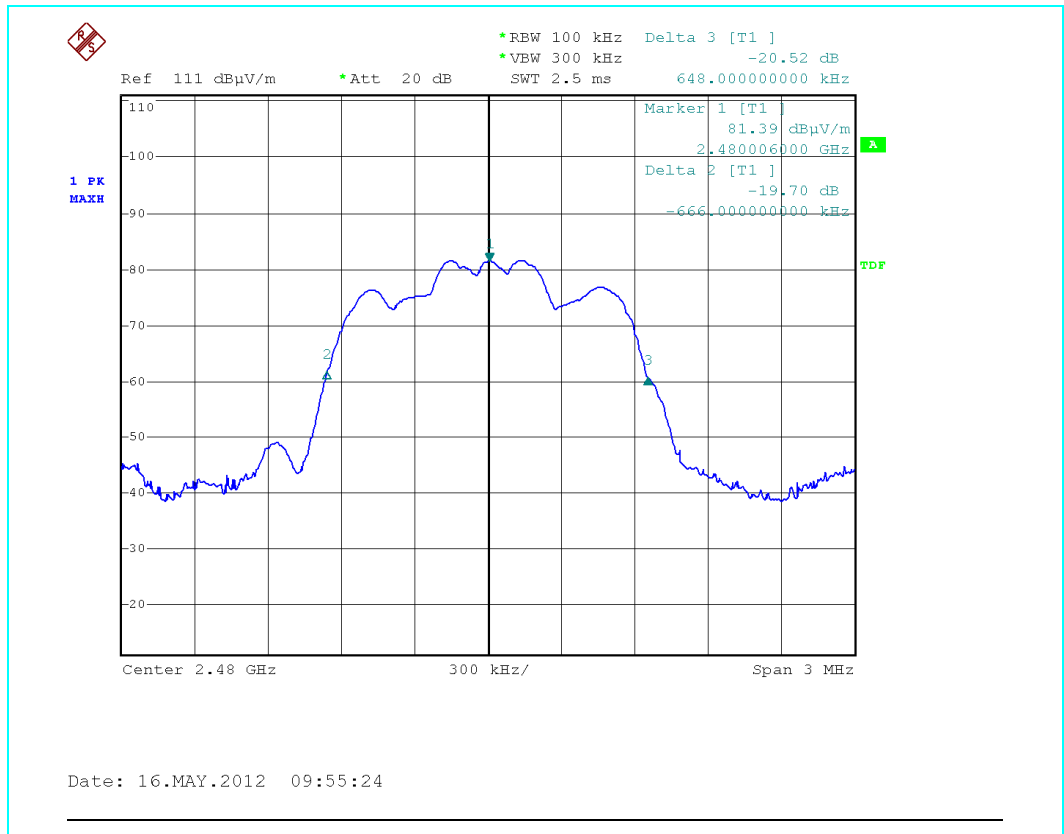
Plot No. 1÷3 (GFSK)



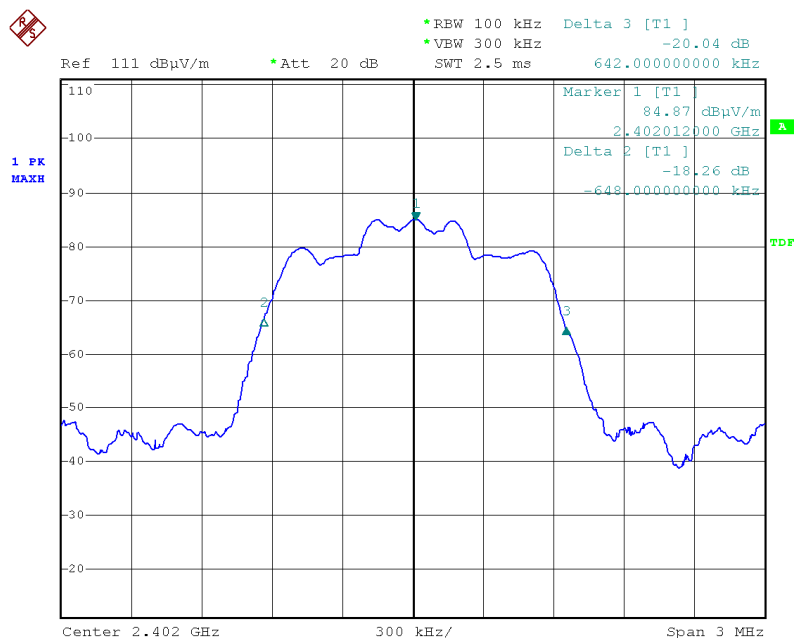


▪ Plot No. 4÷6 (EDR $\pi/4$ -DQPSK)

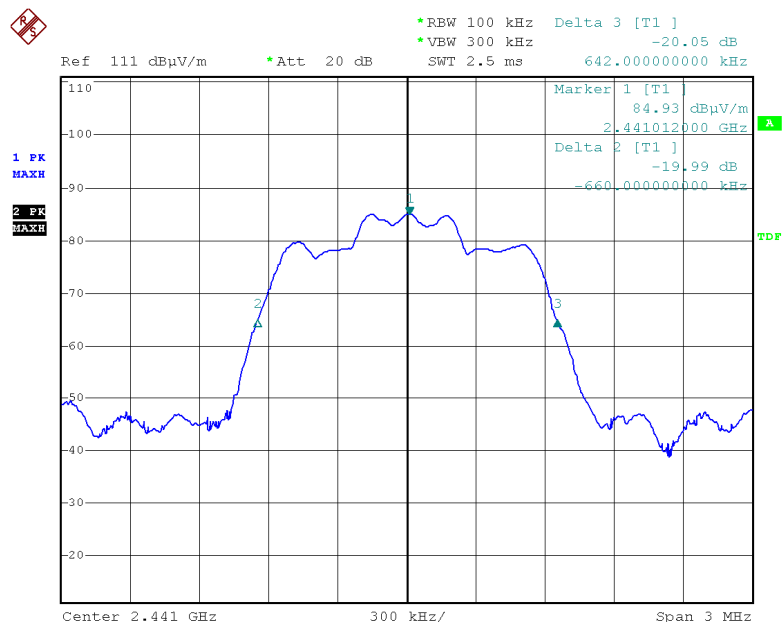




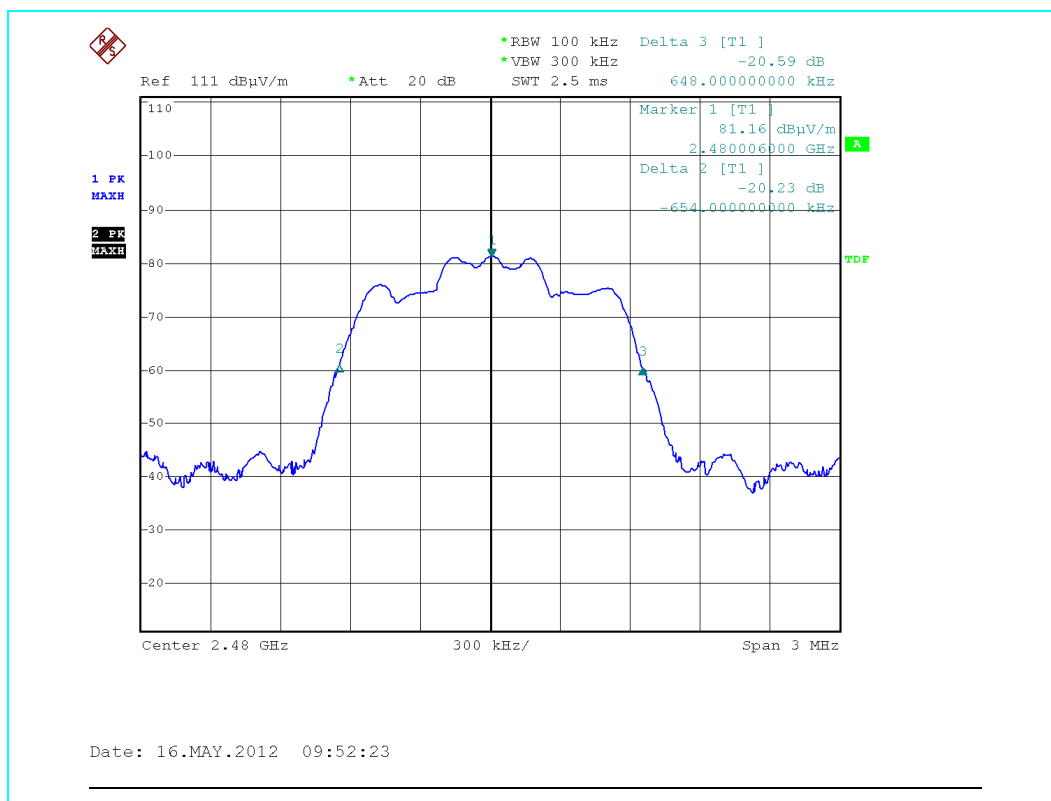
Plot No. 7÷9 (EDR 8DPSK)



Date: 16.MAY.2012 09:43:37



Date: 16.MAY.2012 09:49:30



TEST No.6	Title “ Carrier Frequency Separation & hopping system requirements”		47CFR Part 15 Ref. Section
			15.247 (a) (1)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings		
	Span	3 MHz (wide enough to capture the peaks of two adjacent channels)	
	Resolution (or IF) Bandwidth (RBW)	100 kHz	
	Video (or Average) Bandwidth (VBW)	100 kHz	
	Sweep time	Auto	
	Detector function	Peak	
	Trace	max hold	
	Attenuator	/	
	LIMIT	>25 kHz	

The transmitter output was connected to the spectrum analyzer through a test fixture (radio frequency coupling device associated with the dedicated antenna of the equipment under test)

The Hopping Channel Separation is defined as the channel is separated with the next channel.

Once the trace is stabilized, by the marker-delta function the separation between the peaks of the adjacent channels was determined

Test Result:

Channel (No.)	Frequency (MHz)	Hopping Channel Separation (KHz)	Plot (No.)
01	2402,00	1009	1
40	2441,00	1000	2
79	2480,00	1000	3

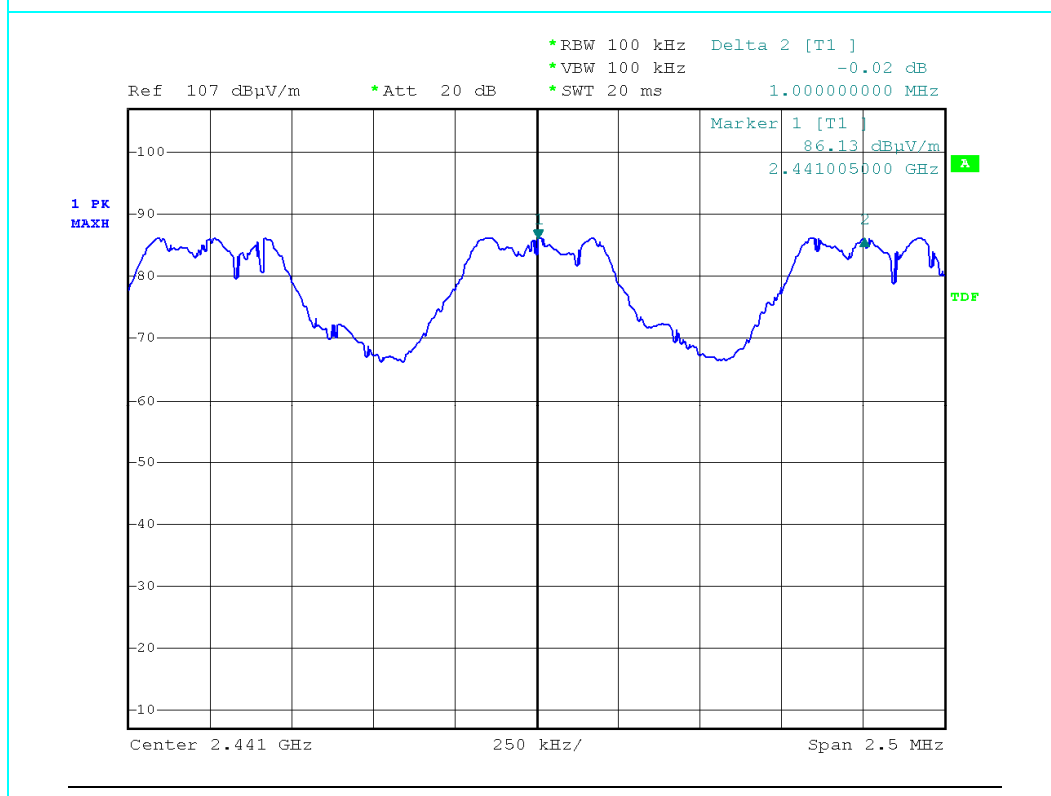
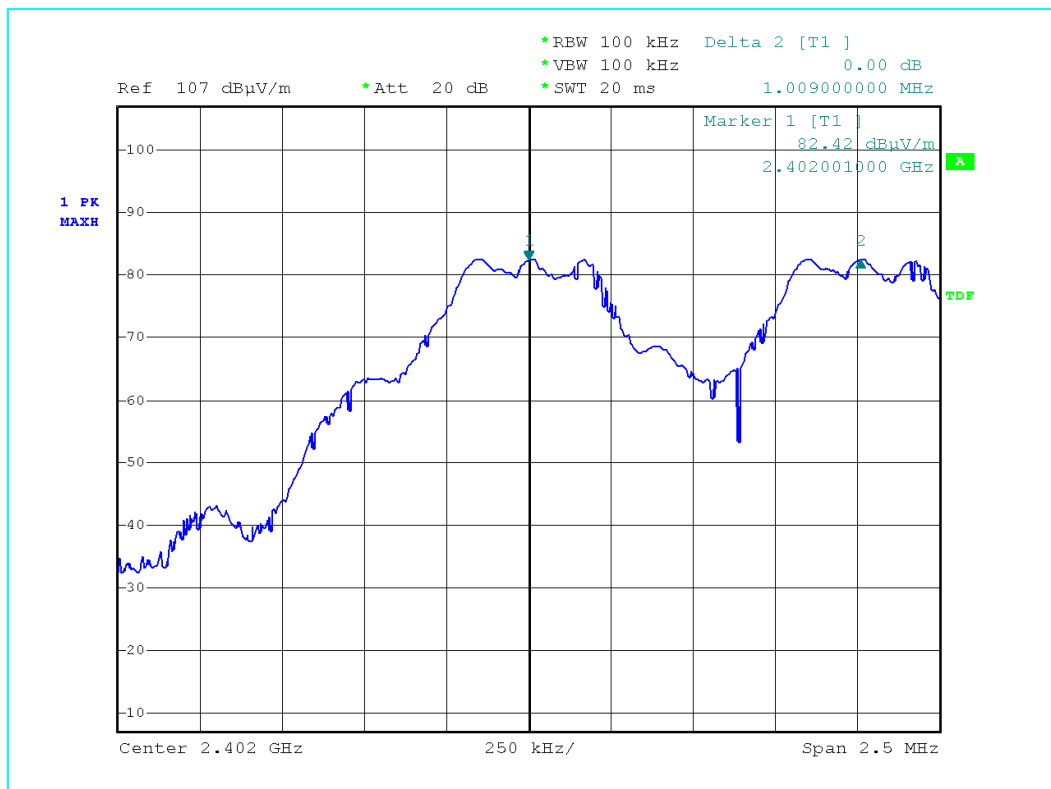
Hopping System Requirements:

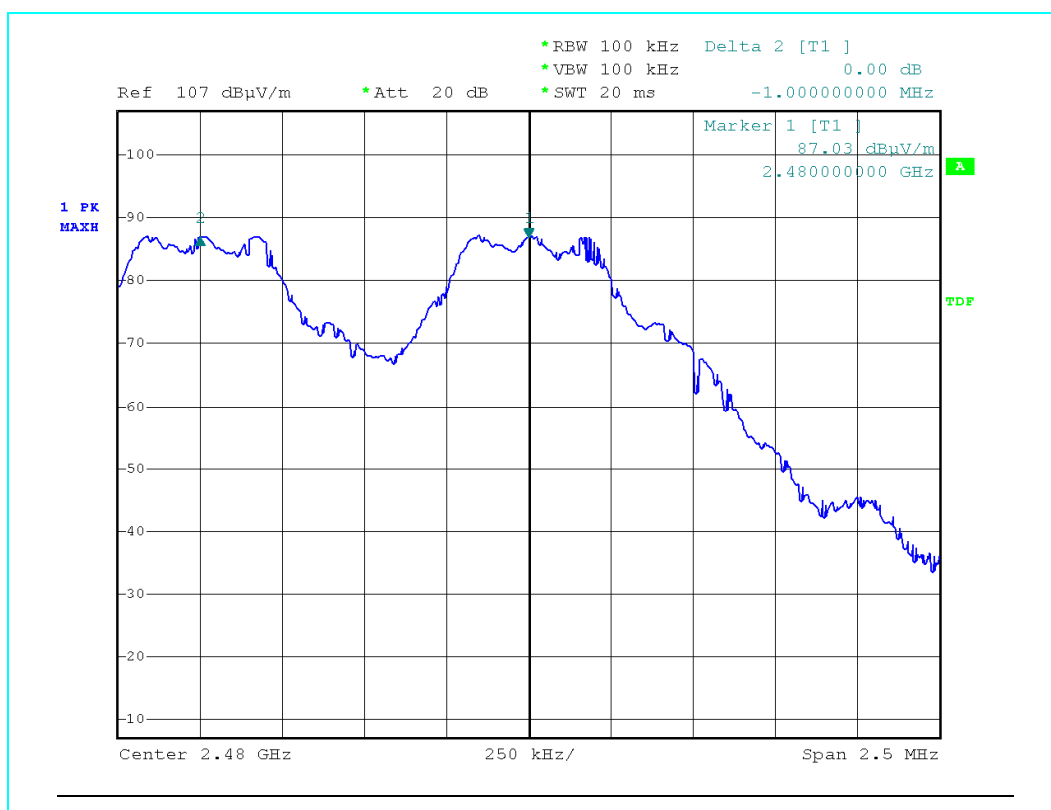
Requirements	Result
The system hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered listed of hopping frequencies.	COMPLY
Each system frequency is used equally on the average by the transmitter.	COMPLY
The system receivers have input bandwidths that match the hopping channel bandwidths of this transmitter and shift frequencies in synchronization with the transmitted signals.	COMPLY

Test Result:

Within the specifications

▪ Plot No. 1÷3:





TEST No.7	Title	47CFR Part 15 Ref. Section
	“ Time of Occupancy (Dwell Time)”	15.247 (a) (1) (iii)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings	
	Span	zero span, centered on a hopping channel
	Resolution (or IF) Bandwidth (RBW)	1 MHz
	Video (or Average) Bandwidth (VBW)	1 MHz
	Sweep time	Auto
	Detector function	Peak
	Trace	max hold
	Attenuator	/
	LIMIT	< 0.4 seconds within a 0,4 seconds period multiplied by the number of hopping channels employed.

The transmitter output was connected to the spectrum analyzer through a test fixture (radio frequency coupling device associated with the dedicated antenna of the equipment under test)

The video out of spectrum analyzer is connected to an Oscilloscope and a Counter to define the average time of occupancy on a selected frequency.

Once the trace is stabilized, by the marker-delta function determine the dwell time was determined

The Dwell time is calculated with the following formula:

Dwell time = (duration pulse x n°hops) / (number of channels x 31.6 sec.)

Duration pulse: measured pulse time (see plot of spectrum analyzer)

N°hops: n°of hops per second in the actual operating mode of the transmitter (for this equipment number of hops are 1600)

N°of channel: the system uses 79 channels

31,6 sec: 0,4sec multiplied by the number of hopping channel (79)

With the used hopping mode (DH1) a packet need 1 timeslot for transmitting and the next timeslot for receiving. So the system makes in worst case 800 hops per second in transmit mode.

With the used hopping mode (DH3) a packet need 3 timeslots for transmitting and the next timeslot for receiving. So the system makes in worst case 400 hops per second in transmit mode.

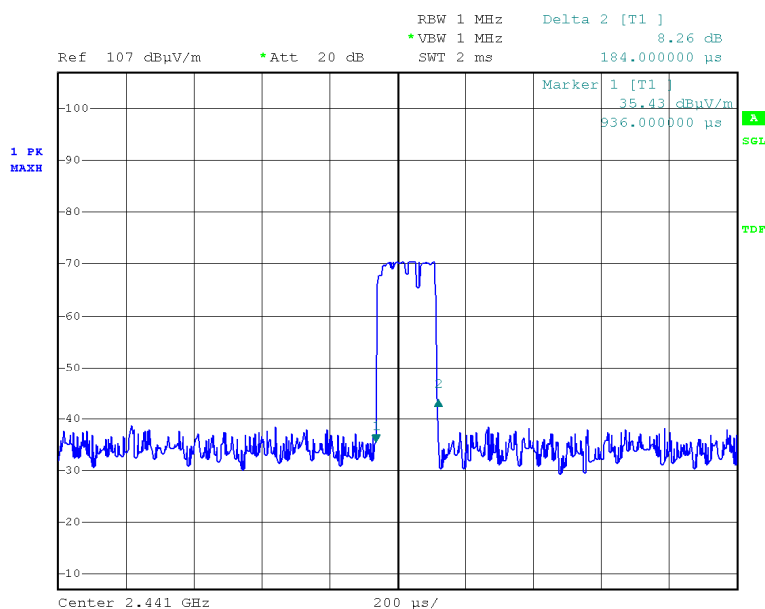
With the used hopping mode (DH5) a packet need 5 timeslots for transmitting and the next timeslot for receiving. So the system makes in worst case 266,67 hops per second in transmit mode.

Test Result

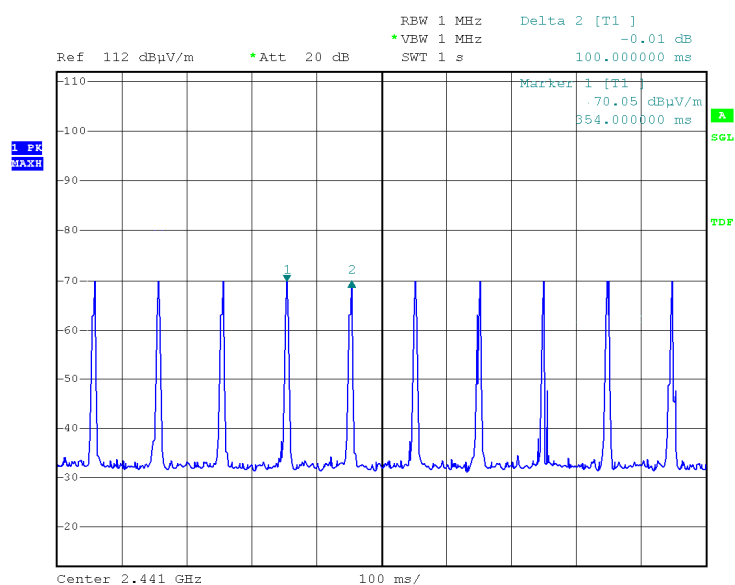
Dwell time = (duration pulse x n°hops) / (number of channels x 31.6 sec.)

Time Slot type	Frequency (MHz)	Pulse duration (ms)	Dwell Time (sec.)	Plot (No.)
DH1	2441,00	0,184	0,058	1
DH3	2441,00	1,260	0,201	2
DH5	2441,00	2,940	0,314	3

Plot 1 (DH1):

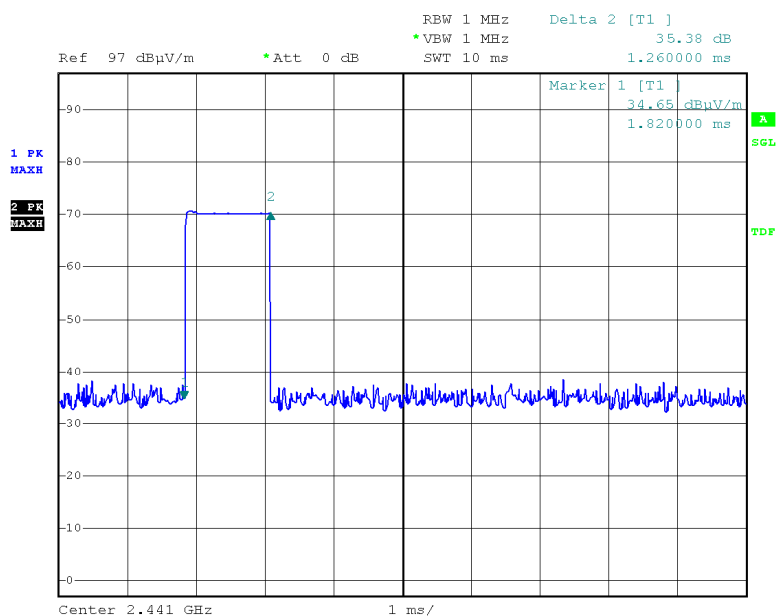


Date: 5.DEC.2011 14:44:59

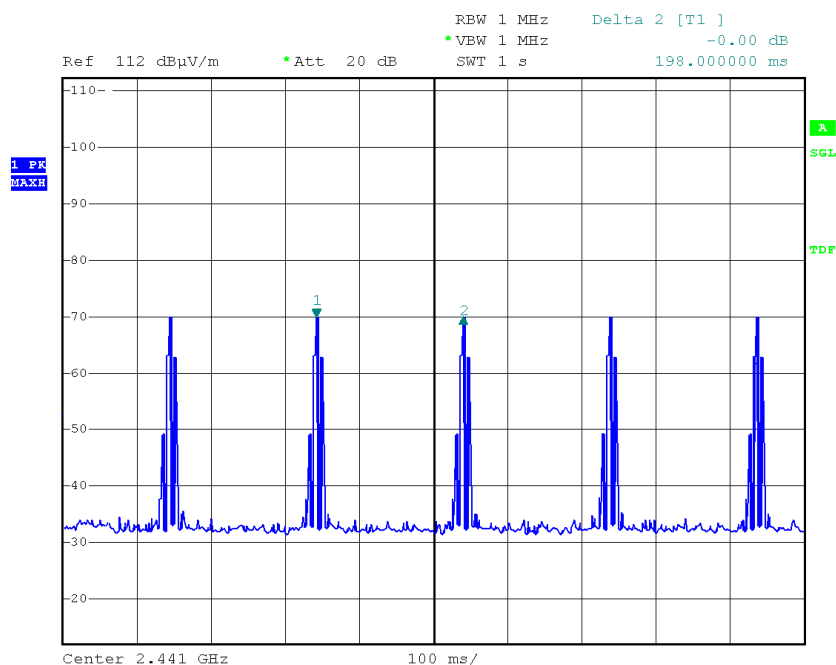


Date: 5.DEC.2011 17:05:25

Plot 2 (DH3):

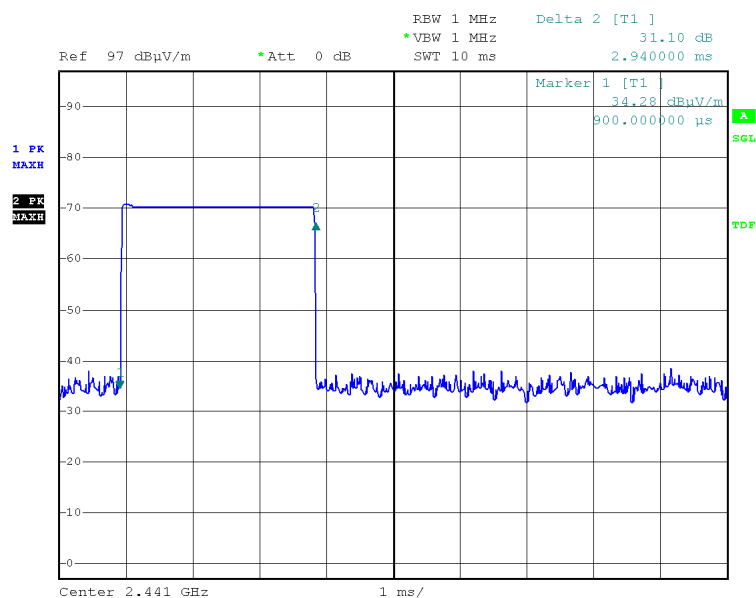


Date: 5.DEC.2011 15:07:11

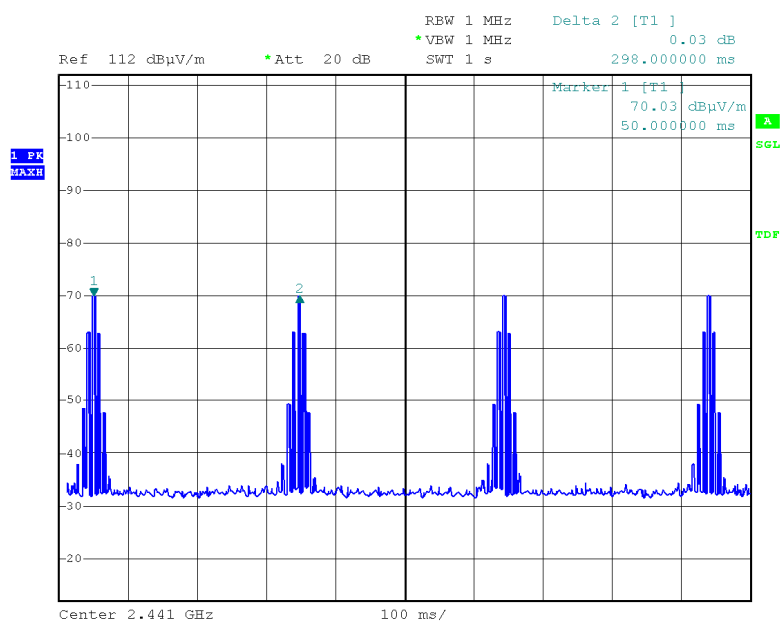


Date: 5.DEC.2011 17:07:21

Plot 3 (DH5):



Date: 5.DEC.2011 15:11:27



Date: 5.DEC.2011 17:09:02

TEST No.8	Title		47CFR Part 15 Ref. Section
	“ Maximum Peak Output Power with External Antenna (De Facto EIRP)”		15.247 (b) (1) (3)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings		
	Span	40 MHz	
	Resolution (or IF) Bandwidth (RBW)	10 MHz	
	Video (or Average) Bandwidth (VBW)	10 MHz	
	Sweep time	Auto	
	Detector function	Peak	
	Trace	max hold	
	Attenuator	/	
	LIMIT	1 Watt (30dBm)	

Conducted measurements:

The transmitter output was connected to the spectrum analyzer via a low loss cable.

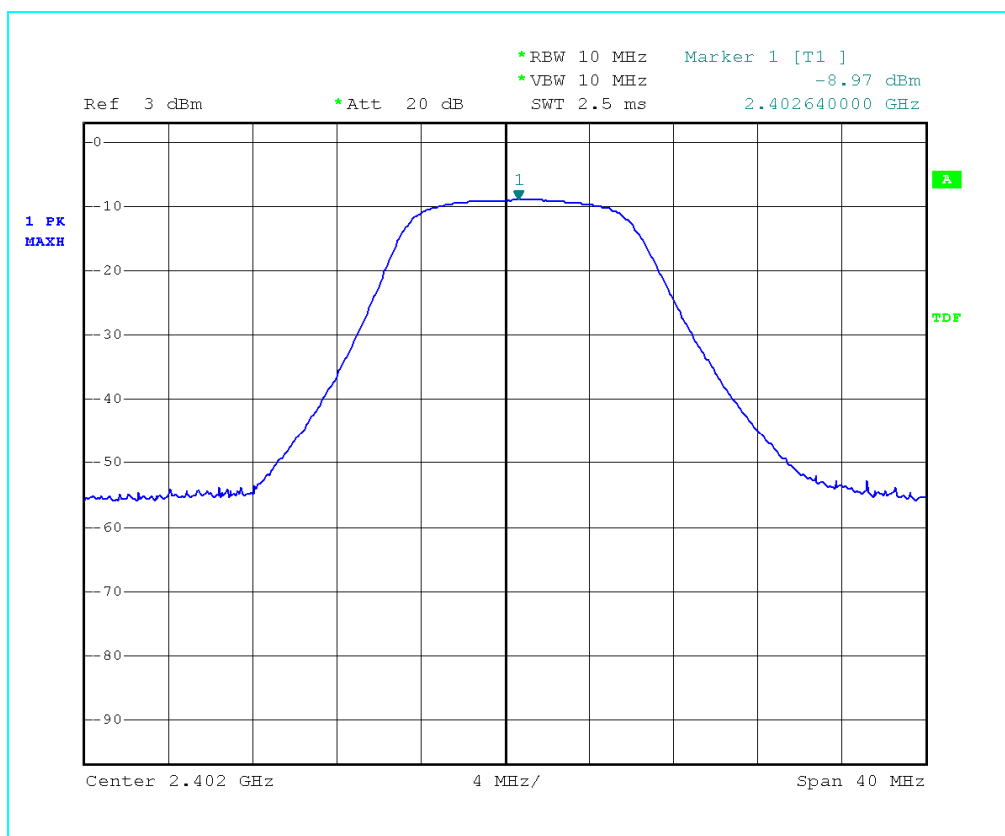
Radiated measurements:

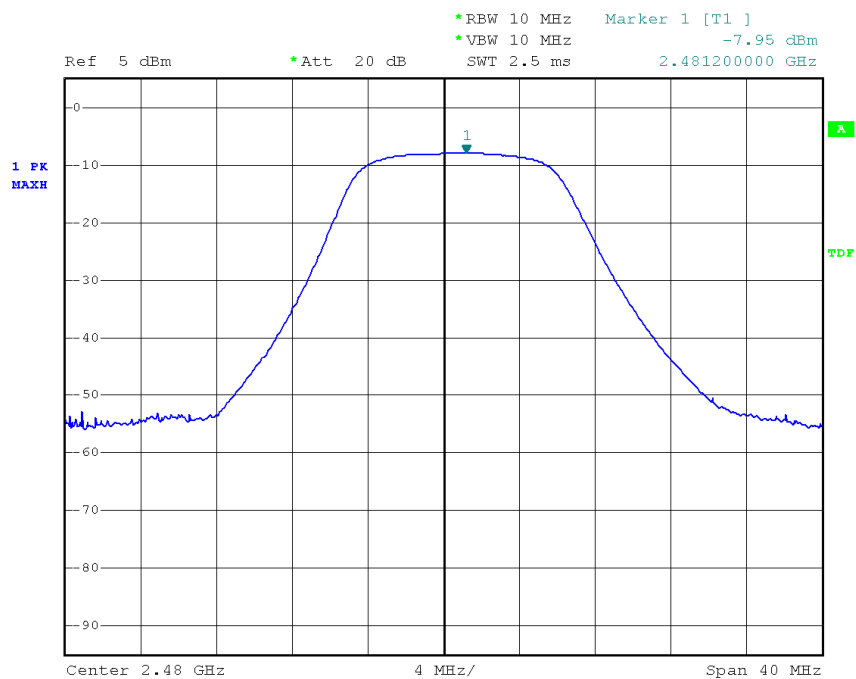
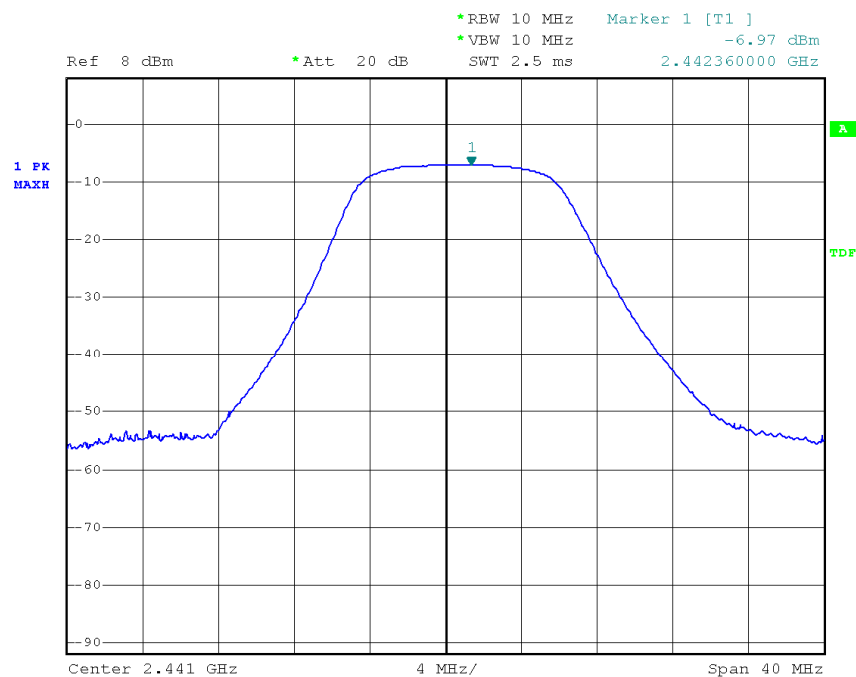
As the EUT is supplied with a dedicated antenna, the effective radiated power is measured in a 3 m anechoic chamber with the substitution antenna method.

Test Result

Radiated measure

Channel (No.)	Frequency (MHz)	Measured Output Power (dBm)
01	2402,00	-8,97
40	2441,00	-6,97
79	2480,00	-7,95





TEST No. 9	Title “Band-edge Compliance of RF Conducted Emissions “		47CFR Part 15 Ref. Section
			15.247 (d)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings		
	Span	Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation	
	Resolution (or IF) Bandwidth (RBW)	1 MHz (100 kHz band-edge)	
	Video (or Average) Bandwidth (VBW)	1 MHz (100 kHz band-edge)	
	Sweep time	Auto	
	Detector function	Peak	
	Trace	Max hold	
	Attenuator	/	
	LIMIT	> 20 dB below that in the 100 kHz bandwidth within the assigned band	

Only for measuring emissions up to 2 MHz removed from the band-edge the "delta" technique for Radiated emissions was used.

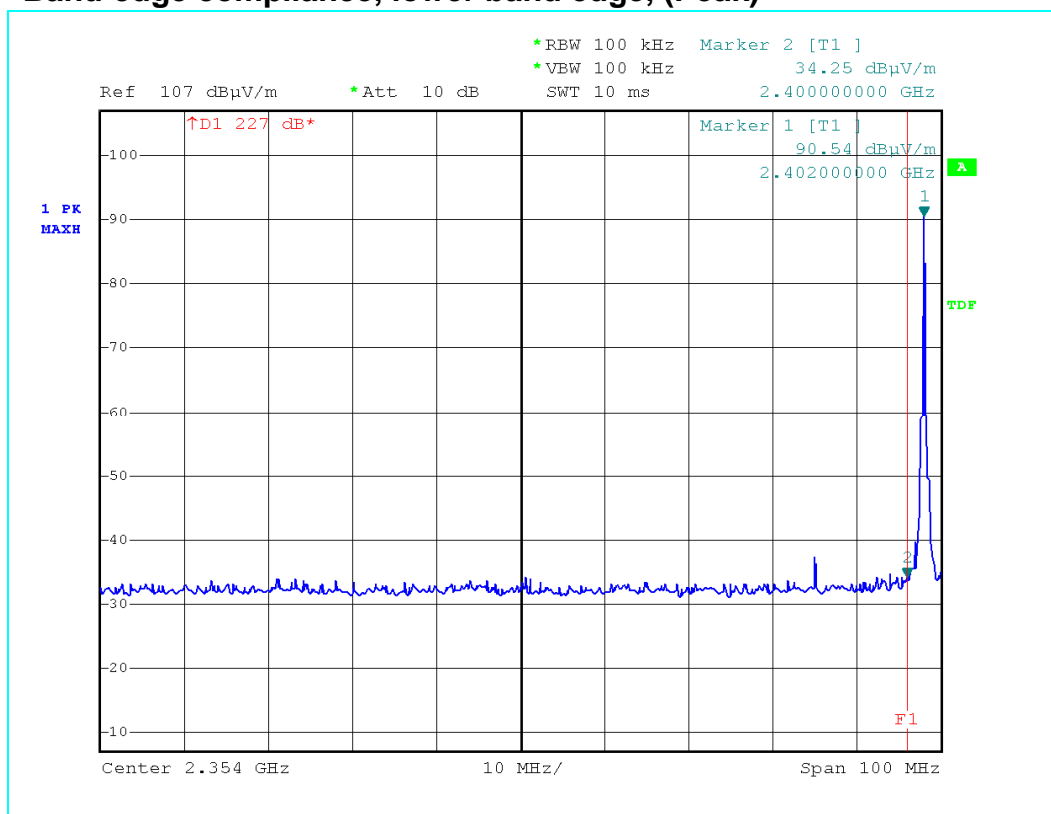
Delta technique: The transmitter output was connected to the spectrum analyzer through a test fixture (radio frequency coupling device associated with the dedicated antenna of the equipment under test)

Once the trace is stabilized, by the marker the emission at the band edge (or on the highest modulation product outside of the band, if this level is greater than that at the band edge) was set.

The “n” by the marker-delta function and the marker-to-peak function the peak of the in-band emission was selected. The marker-delta value displayed was compared with the limit specified in this Section.

Test Result:

Band-edge compliance, lower band edge, (Peak)

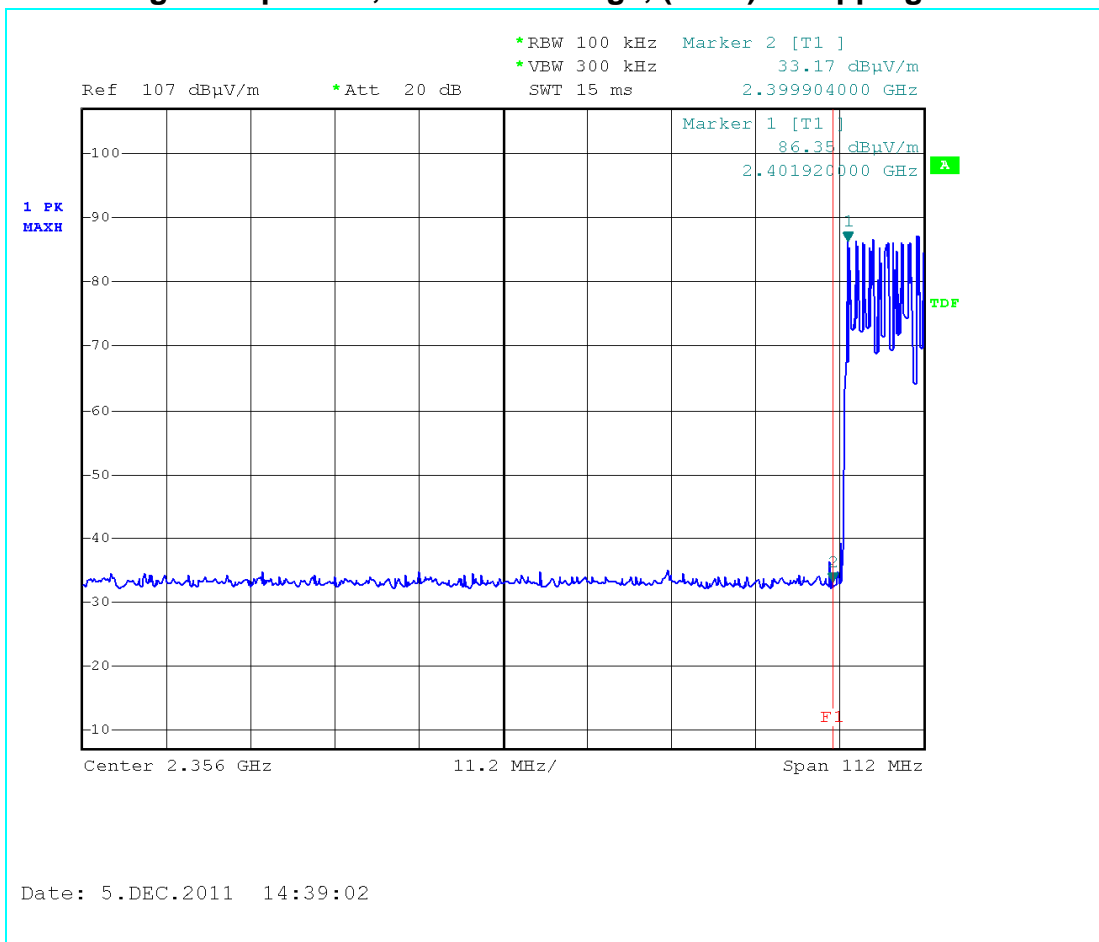


All out of band spurious emissions are more 20 dB below the in band power of the fundamental.

Band-edge compliance to radiated emission test – Lower 2.402 MHz

Mode	Measured Level (dBμV/m)	Measured Level at the band edge (dBμV/m)	Difference Peak – band edge (dB)	Peak Limit at PK power –20 dB (dBμV/m)	Margin (dB)
Peak	90,54	34,25	56,29	70,54	36,29
Within the limit					

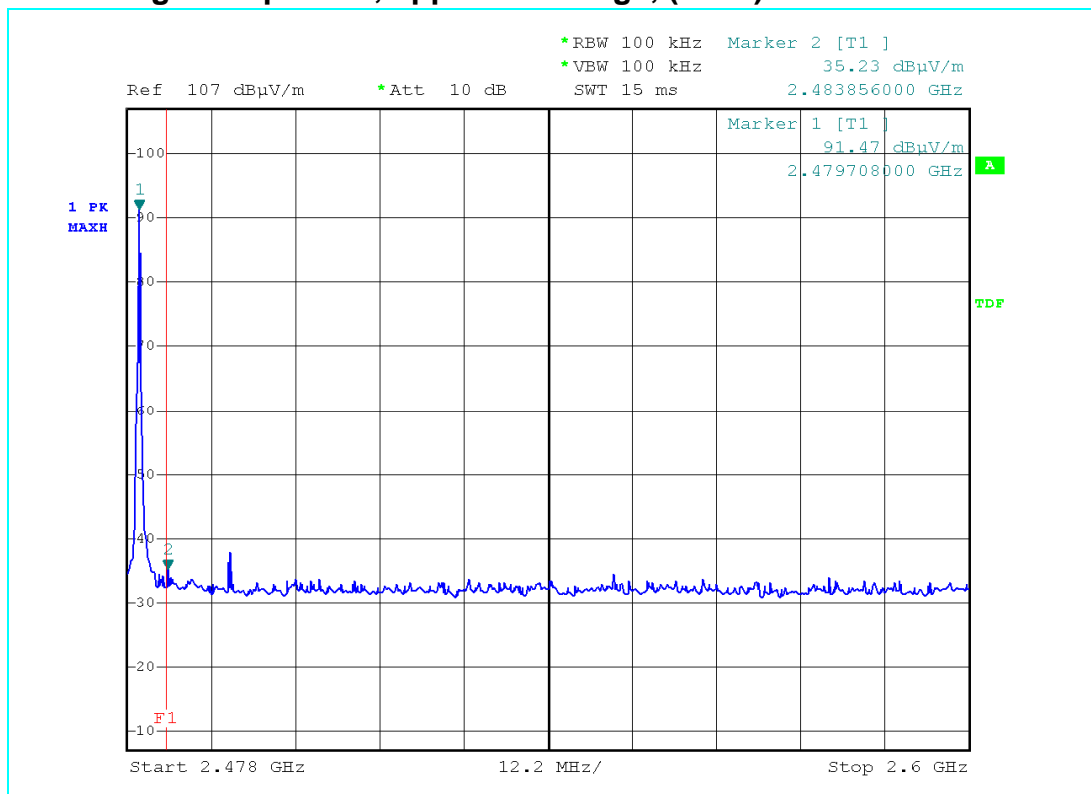
Band-edge compliance, lower band edge, (Peak) – Hopping mode



All out of band spurious emissions are more 20 dB below the in band power of the fundamental.

Band-edge compliance to radiated emission test – Lower 2.402 MHz

Mode	Measured Level (dBμV/m)	Measured Level at the band edge (dBμV/m)	Difference Peak – band edge (dB)	Peak Limit at PK power –20 dB (dBμV/m)	Margin (dB)
Peak	86,35	33,17	53,18	66,35	33,18
Within the limit					

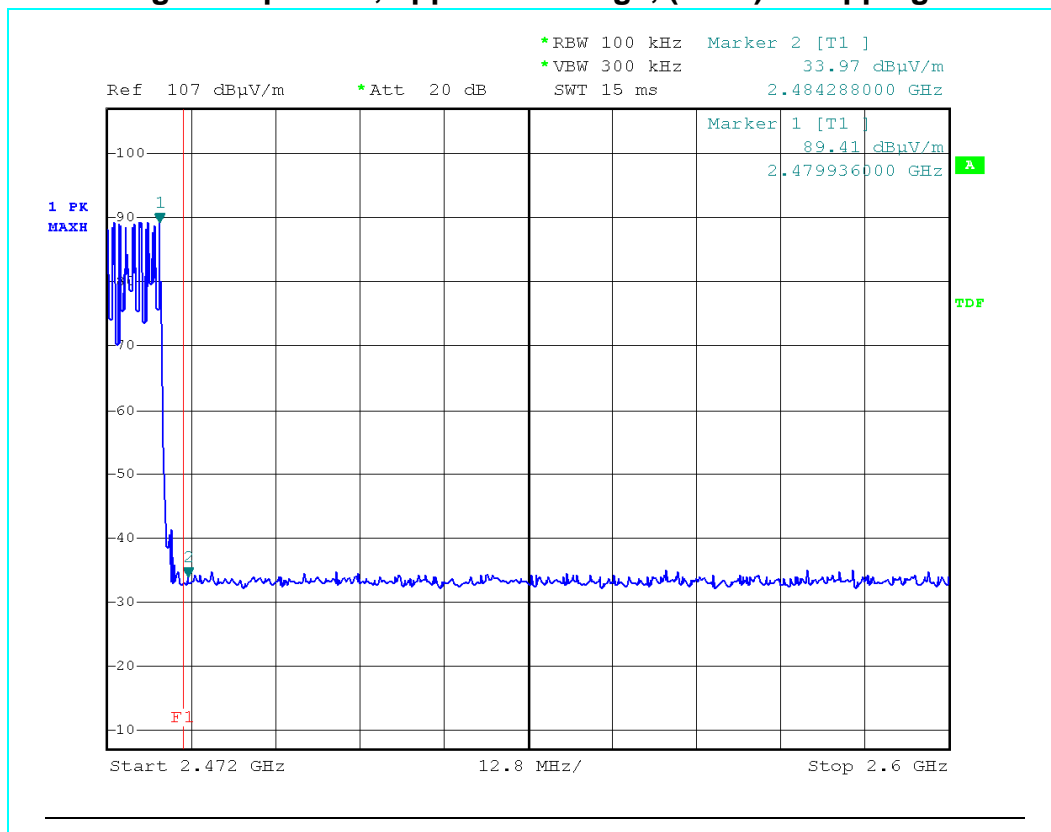
Band-edge compliance, upper band edge, (Peak)

All out of band spurious emissions are more 20 dB below the in band power of the fundamental.

Band-edge compliance to radiated emission test – Upper 2.480 MHz

Mode	Measured Level (dBμV/m)	Measured Level at the band edge (dBμV/m)	Difference Peak – band edge (dB)	Peak Limit at PK power –20 dB (dBμV/m)	Margin (dB)
Peak	91,47	35,23	56,24	71,47	36,24
Within the limit					

Band-edge compliance, upper band edge, (Peak) – Hopping mode



All out of band spurious emissions are more 20 dB below the in band power of the fundamental.

Band-edge compliance to radiated emission test – Upper 2.480 MHz

Mode	Measured Level (dBμV/m)	Measured Level at the band edge (dBμV/m)	Difference Peak – band edge (dB)	Peak Limit at PK power –20 dB (dBμV/m)	Margin (dB)
Peak	89,41	33,97	55,44	69,41	35,44

Within the limit

TEST No. 10	Title		47CFR Part 15 Ref. Section
	“Spurious Emission in restricted band near 2400-2483.5 MHz”		15.247 (d)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings		
	Span	Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation	
	Resolution (or IF) Bandwidth (RBW)	1 MHz with peak detector	
	Video (or Average) Bandwidth (VBW)	1 MHz with peak detector	
	Resolution (or IF) Bandwidth (RBW)	1 MHz with average detector	
	Video (or Average) Bandwidth (VBW)	10 Hz with average detector	
	Sweep time	Auto	
	Detector function	Peak and Average	
	Trace	Max hold	
	Attenuator	/	
	LIMIT	Peak = 5000 μV / m Average = 500 μV / m	

Spurious Emission in restricted band near 2400-2483.5 MHz

PEAK DETECTOR

Frequency (MHz)	Reading value (dBμV)	Antenna Factor (dB1/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Correcting reading (dBμV/m)	PK Limit (μV/m)	PK Limit (dBμV/m)	Margin (dB)
2389,10	42,72	27,40	3,55	-33,00	40,67	5.000	74,00	13,33
2492,88	43,47	27,65	3,95	-33,00	42,07	5.000	74,00	11,93

AVERAGE DETECTOR

Frequency (MHz)	Reading value (dBμV)	Antenna Factor (dB1/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Correcting reading (dBμV/m)	AV Limit (μV/m)	AV Limit (dBμV/m)	Margin (dB)
2389,10*	---	---	---	---	---	500	54,00	---
2492,88*	---	---	---	---	---	500	54,00	---

***Peak value under Average Limit; no measure executed**

Formula:

Calculated Level (dBμV/m) = Measured Level (dBμV) - Pre-amplifier Gain (dB) + Cable Loss (dB) + Antenna Factor (dBm⁻¹)

TEST No.11	Title “Conducted Emissions outside the band 2400-2483.5 MHz“		47CFR Part 15 Ref. Section
			15.247 (d)
TEST SET-UP & REQUIREMENTS	Spectrum analyzer settings		
	Span	/	
	Resolution (or IF) Bandwidth (RBW)	100 kHz	
	Video (or Average) Bandwidth (VBW)	300 kHz	
	Sweep time	as necessary to capture the entire dwell time per hopping channel	
	Detector function	Peak	
	Trace	max hold	
	Attenuator	/	
	LIMIT	20 dB below from Conducted peak of RF or limit specified in section 15.209 for Restricted Band.	

Conducted measurements:

The transmitter output was connected to the spectrum analyzer via a low loss cable.

Radiated measurements:

As the EUT is supplied with a integral antenna, the effective radiated power is measured in a 3 m anechoic chamber with the substitution antenna method.

The measure has been executed with the lowest transmit channel, the highest transmit channel and one located somewhere in the middle of the band.

Test Result: Radiated measure (channel 01)

Antenna Polarization: Horizontal							
Frequency	Reading Value in the 1 st measure	Antenna Gain	Cable Loss	Generator Level	Substitution Value calculated	Limit	Margin
(MHz)	(dBm)	(dB1/m)	(dB)	(dBm)	(dBm)	(dBm-20)	(dB)
2402	-3,47	10,40	0,62	-18,7	-8,92	---	---
4804	-51,14	11,40	1,01	-61,2	-50,81	-28,92	21,89
7206	-43,77	10,10	1,05	-43,8	-34,75	-28,92	5,83
9608	-65,72	10,90	1,40	-62,3	-52,80	-28,92	23,88
12010	<-60,00	12,30	1,52	-70	-60	-28,92	31,08
14412	<-50,00	12,50	2,13	-60	-50	-28,92	21,08
F<14500	not significant	---	---	---	---	---	---

Antenna Polarization: Vertical							
Frequency	Reading Value in the 1 st measure	Antenna Gain	Cable Loss	Generator Level	Substitution Value calculated	Limit	Margin
(MHz)	(dBm)	(dB1/m)	(dB)	(dBm)	(dBm)	(dBm-20)	(dB)
2402	-4,05	10,40	0,62	-19,3	-9,52	---	---
4804	-52,14	11,40	1,01	-62,5	-52,11	-29,52	22,59
7206	-43,41	10,10	1,05	-43,9	-34,85	-29,52	5,33
9608	-63,63	10,90	1,40	-60,5	-51,00	-29,52	21,48
12010	<-60,00	12,30	1,52	-70	-60	-29,52	30,48
14412	<-50,00	12,50	2,13	-60	-50	-29,52	20,48
F<14500	not significant	---	---	---	---	---	---

All out of band spurious emissions are more 20dB below the in band power of the fundamental.

Test Result: Radiated measure (channel 40)

Antenna Polarization: Horizontal							
Frequency	Reading Value in the 1 st measure	Antenna Gain	Cable Loss	Generator Level	Substitution Value calculated	Limit	Margin
(MHz)	(dBm)	(dB1/m)	(dB)	(dBm)	(dBm)	(dBm-20)	(dB)
2441	-1,42	10,40	0,62	-16,7	-6,92	---	---
4882	-51,83	11,40	1,01	-59,1	-48,71	-26,92	21,79
7323	-45,51	10,10	1,05	-45,5	-36,45	-26,92	9,53
9764	-67,90	10,90	1,40	-64,6	-55,10	-26,92	28,18
12205	<-60,00	12,30	1,52	-70	-60	-26,92	33,08
14646	<-50,00	12,50	2,13	-60	-50	-26,92	23,08
F<14700	not significant	---	---	---	---	---	---

Antenna Polarization: Vertical							
Frequency	Reading Value in the 1 st measure	Antenna Gain	Cable Loss	Generator Level	Substitution Value calculated	Limit	Margin
(MHz)	(dBm)	(dB1/m)	(dB)	(dBm)	(dBm)	(dBm-20)	(dB)
2441	-1,14	10,40	0,62	-17,0	-7,22	---	---
4882	-49,13	11,40	1,01	-59,5	-49,11	-27,22	21,89
7323	-44,60	10,10	1,05	-45,1	-36,05	-27,22	8,83
9764	-65,85	10,90	1,40	-62,7	-53,20	-27,22	25,98
12205	<-60,00	12,30	1,52	-70	-60	-27,22	32,78
14646	<-50,00	12,50	2,13	-60	-50	-27,22	22,78
F<14700	not significant	---	---	---	---	---	---

All out of band spurious emissions are more 20dB below the in band power of the fundamental.

Test Result: Radiated measure (channel 79)

Antenna Polarization: Horizontal							
Frequency	Reading Value in the 1 st measure	Antenna Gain	Cable Loss	Generator Level	Substitution Value calculated	Limit	Margin
(MHz)	(dBm)	(dB1/m)	(dB)	(dBm)	(dBm)	(dBm-20)	(dB)
2480	-2,42	10,40	0,62	-17,7	-7,92	---	---
4960	-50,43	11,40	1,01	-57,7	-47,31	-27,92	19,39
7440	-39,51	10,10	1,05	-39,5	-30,45	-27,92	2,53
9920	-67,79	10,90	1,40	-64,4	-54,90	-27,92	26,98
12400	<-60,00	12,30	1,52	-70	-60	-27,92	32,08
14880	<-50,00	12,50	2,13	-60	-50	-27,92	22,08
F<15000	not significant	---	---	---	---	---	---

Antenna Polarization: Vertical							
Frequency	Reading Value in the 1 st measure	Antenna Gain	Cable Loss	Generator Level	Substitution Value calculated	Limit	Margin
(MHz)	(dBm)	(dB1/m)	(dB)	(dBm)	(dBm)	(dBm-20)	(dB)
2480	-2,74	10,40	0,62	-18,6	-8,82	---	---
4960	-44,93	11,40	1,01	-55,3	-44,91	-28,82	16,09
7440	-38,70	10,10	1,05	-39,2	-30,15	-28,82	1,33
9920	-66,45	10,90	1,40	-63,3	-53,80	-28,82	24,98
12400	-67,15	12,30	1,52	-68,3	-57,52	-28,82	28,70
14880	<-50,00	12,50	2,13	-60	-50	-28,82	21,18
F<15000	not significant	---	---	---	---	---	---

All out of band spurious emissions are more 20dB below the in band power of the fundamental.

TEST No.12	Title “RF Exposure Evaluation“	47CFR Part 15 Ref. Section
		15.247 (i)
TEST SET-UP & REQUIREMENTS	Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this Chapter.	
	EUT classification (fixed, mobile or portable devices)	Portable according to § 2.1093(b) of this Chapter
	LIMITS	According to § 2.1093(b) of this Chapter, by means of the following guidelines: OET Bulletin 65 and Mobile Portable RF Exposure v.04 (KDB no. 447498)

Low threshold limit:

Exposure category	Limit
General population	$60/f_{\text{GHz}} = 24.2 \text{ mW}$

Where f_{GHz} is the highest frequency in the transmission band (2.480 GHz).

Radiated (EIRP) output power values must be compared to the threshold limit.

The highest output power (Radiated) is -6.97dBm (0.2mW)

Test Result:

This value is less than the low threshold limit corresponding to the general population exposure category and therefore no SAR test are not required.

6 ADDITIONAL TECHNICAL INFORMATION

6.1 ELECTROMAGNETICALLY RELEVANT COMPONENTS:

Components	N°	Manufacturer	Type – Technical data
Radio Module			
See Technical document			
Host Equipment			
None			

6.2 RFI SUPPRESSION DEVICES:

Components	N°	Manufacturer	Type – Technical data
None			

6.3 EMI PROTECTION DEVICES:

Components	N°	Manufacturer	Type – Technical data
None			

7 TECHNICAL DOCUMENTATION

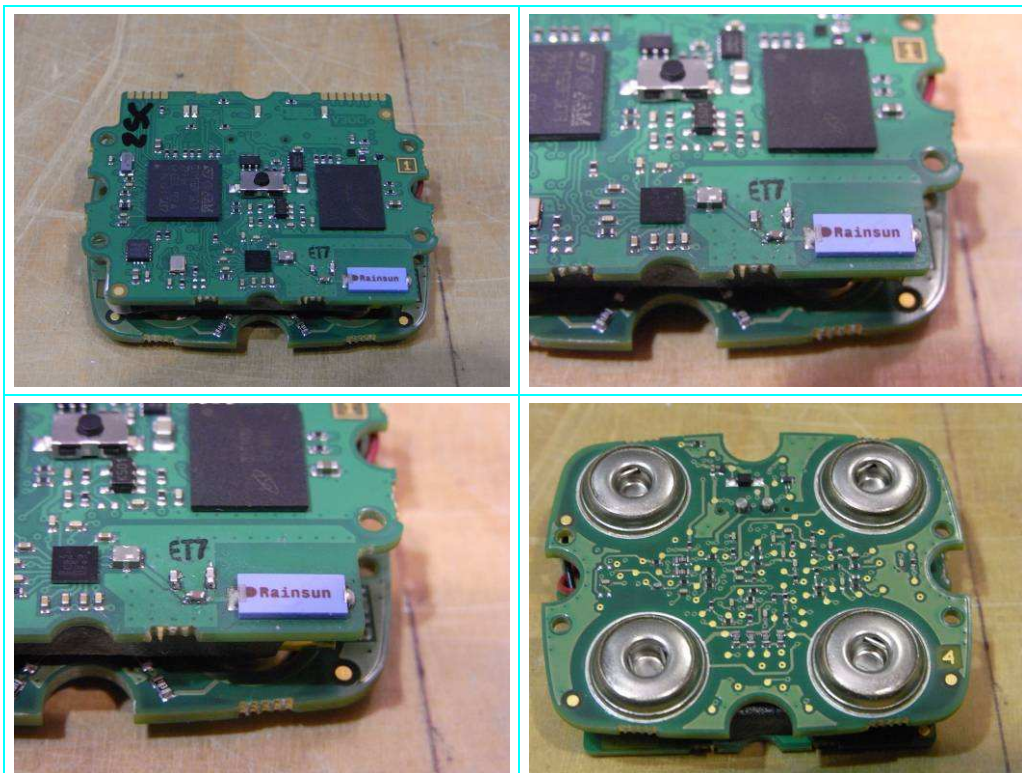
DOCUMENT	REFERENCE
/	

8 PHOTOGRAPHIC DOCUMENTATION

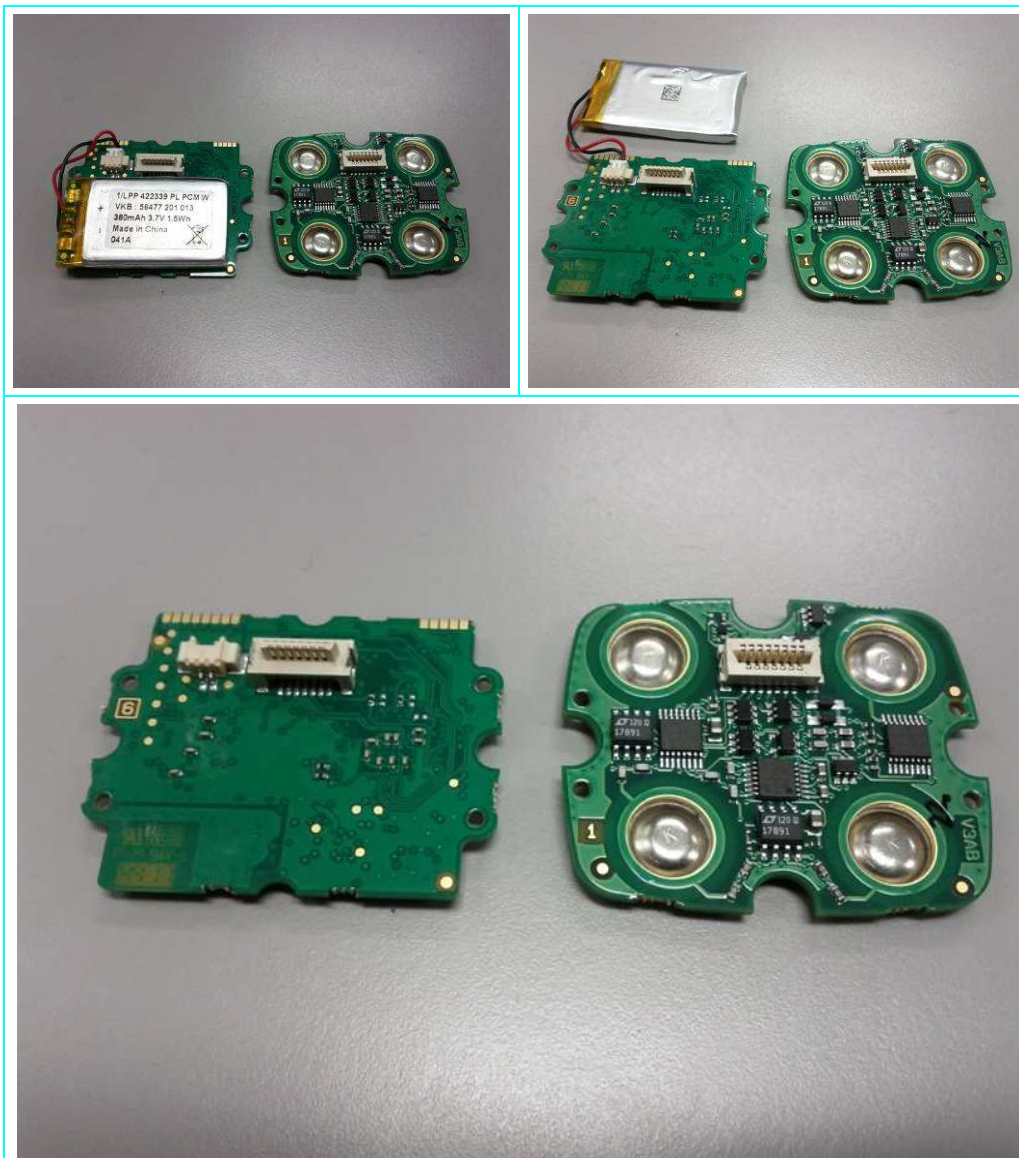
8.1 EUT IDENTIFICATION



Model SPMHBGW1

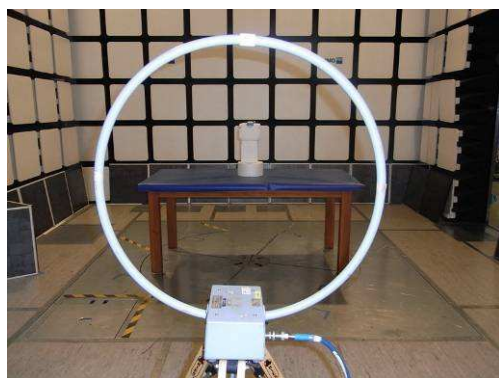


Internal view SPMHBGW1



Internal view SPMHBGW1

8.2 TEST SET-UP



Set up of Radiated emission test < 30MHz



Set up of Radiated emission test > 30MHz



Set up of Conducted emission test

9 MEASUREMENT AND TEST EQUIPMENT INSTRUMENTATION

Instruments	Manufacturer	Model	IMQ serial number	Calibration data	Calibration interval (Month)
Emi Receiver	Rohde & Schwarz	ESMI	S-02349	05/2011	12
Emi Receiver	Rohde & Schwarz	ESU8	S-05562	06/2011	12
Artificial Mains V-network	Rohde & Schwarz	ENV216	S-03631	06/2011	12
Spectrum Analyzer	Rohde & Schwarz	FSP40	S-03629	09/2011	12
Loop Antenna	Rohde & Schwarz	HFH2-Z2	S-02508	12/2008	36
Antenna Bilog	ARA	LPD-2513	S-02385	07/2011	36
Antenna ridged horn 1÷18 GHz	Schwarzbeck	BBHA9120D	S-03464	08/2011	36
Antenna ridged horn 15÷40 GHz	Schwarzbeck	BBHA9170	S-03668	05/2010	24
Pre-amplifier 1-26.5 GHz	HP	HP 8449 B	S-03542	02/2011	24
Pre-amplifier 30-1000 MHz	BONN ELEKTRONIK	BLNA	S-04193	02/2011	24
Digital Oscilloscope	Yokogawa	DL7200	S-03745	06/2011	12
Band Reject Filter 2400÷2483 MHz	Wainwright	WRCG2400 / 2483	S-04308	09/2011	12
Highpass Filter 3.4÷18 GHz	Wainwright	WHK3.4/18	S-04309	09/2011	12
Crystal Detector	Agilent	8472B	S-04467	/	/
Software for test automation	Rohde & Schwarz	ES-K1 V.1.60	/	/	/

The IMQ instruments are tested and calibrated according to UNI EN 45001, the IMQ procedure IP-037 "Calibration test equipment and measurement" and according to plans set on IMQ operating instruction IO-FT-034 "Criteria for the calibration of test equipment and measurement" which are an integral part of the Quality Manual of IMQ.