

RC-030-PTC-15-102889-2-A

**E.M.C Test Report**

**According to the standards:**  
 FCC 47 CFR PART 15 : 2015 (§15.247)  
 RSS-247 issue 1 : 2015  
 RSS-Gen Issue 4 : 2014

**Equipment under test:**  
 USB Dongle JN5169-001-U00  
 With connection ZIGBEE  
 (FCC ID: XXMJN5169U0)  
 (IC NUMBER: 8764A-JN5169U0)

**Company:**  
 NXP SEMICONDUCTORS

FCC accredited: FR0004  
 IC accredited: 4379A

DISTRIBUTION: Mr. LE TOUSEY

(Company: NXP SEMICONDUCTORS)

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**TEST CERTIFICATION FOR:** FCC Certification and CANADA certification

**NAME OF THE EQUIPMENT UNDER TEST:** USB Dongle JN5169-001-U00 with connection Zigbee

**Serial number:** -

**Reference / model (P/N):** DR1198 JN5169-001-U00

**Software version:** -

**NAME OF THE MANUFACTURER:** NXP SEMICONDUCTORS

**ADDRESS OF THE APPLICANT:**

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**Person in charge:** Mr. LE TOUSEY

**DATE OF TESTS:** 27/05/2015

**TESTS LOCATION:** EMITECH laboratory in Montigny Le Bretonneux (78)  
FRANCE.

**TESTS OPERATOR:** F. LHEUREUX / A.BERNARD

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## 1. INTRODUCTION

This document presents the results of Electromagnetic Compatibility tests performed on the equipment «USB Dongle JN5169-001-U00 with connection Zigbee» according to reference documents listed below.

## 2. REFERENCE DOCUMENTS

### ***FCC 47 CFR Part 15: 2015***

Code of Federal Regulations. Title 47- Telecommunication  
Chapter 1- Federal Communication Commission  
Part 15- Radio frequency devices

### ***RSS-247 issue 1: 2015***

Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

### ***RSS-Gen Issue 4 : November 2014***

General Requirements and Information for the Certification of Radio Apparatus

### ***ANSI C63.4: 2014***

Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronics Equipment in the range of 9 kHz to 40 GHz.

### ***KDB 558074 D01 DTS Meas Guidance V03r03***

Guidance for performing compliance measurement on Digital Transmission Systems (DTS) operating under § 15.247

### ***ANSI C63.10 : 2013***

American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

## 3. PRODUCT DESCRIPTION

Class:	B (residential environment)
Antenna type and gain:	Integral antenna: Not communicated
Operating frequency range:	from 2405 MHz to 2480 MHz
Number of channels:	16
Channel spacing:	5 MHz
Modulation:	O-QPSK
Power source:	5 Vdc
Software power setting:	Teraterm

Modification of the equipment during the tests: No.

**4. TESTS AND CONCLUSION**

The following table summarizes test results of the EUT.

Subpart B of the standard FCC part 15 – Unintentional radiators

Test procedure	Designation of test	Test results				Comments
		Pass	Fail	N.A.	N.P.	
15.107	Measurement of conducted emission on AC mains ports	X				
15.109	Radiated emission limits	X				

Subpart C of the standard FCC part 15 – Intentional radiators

Test procedure	Designation of test	Test results				Comments
		Pass	Fail	N.A.	N.P.	
15.205	Restricted bands of operation	X				
15.207	Measurement of conducted emission on AC mains ports	X				
15.209	Radiated emission limits; general requirements	X				
15.215	Additional provisions to the general radiated emission limitations					
	(a) Alternative to general radiated emission limits	X				
	(b) Unwanted emissions outside of § 15.247 frequency bands	X				
	(c) 20 dB bandwidth and band-edge compliance	X				
15.247	Intentional radiated emissions					
	a) frequency hopping and digitally modulated					
	a) (1) hopping mode			X		
	a) (1) (i) frequency hopping in the band 902-928 MHz			X		
	a) (1) (ii) frequency hopping in the band 5725-5850 MHz			X		
	a) (1) (iii) frequency hopping in the band 2400-2483.5 MHz			X		
	a) (2) systems using digital modulation in the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz (6 dB bandwidth)	X				
	b) maximum peak conducted					
	b) (1) frequency hopping in the bands 2400-2483.5 MHz or 5725-5850 MHz			X		
	b) (2) frequency hopping in the band 902-928 MHz			X		

Test procedure	Designation of test	Test results				Comments
		Pass	Fail	N.A.	N.P.	
	b) (3) systems using digital modulation in the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz	X				
	b) (4) maximum peak conducted > 6 dBi					
	b) (4) (i) frequency hopping in the band 2400–2483.5 MHz			X		
	b) (4) (ii) frequency hopping in the band 5725–5850 MHz			X		
	b) (4) (iii) fixed, point-to-point			X		
	c) directional antenna > 6 dBi					
	c) (1) fixed, point-to-point operation					
	c) (1) (i) in the band 2400–2483.5 MHz			X		
	c) (1) (ii) in the band 5725–5850 MHz			X		
	c) (1) (iii) fixed, point-to-point			X		
	c) (2) multiple directional beams in the band 2400–2483.5 MHz					
	c) (2) (i) information			X		
	c) (2) (ii) sum of the power supplied to all antennas			X		
	c) (2) (iii) one antenna for multiple directional beams			X		
	c) (2) (iv) single directional beam			X		
	d) intentional radiator	X				
	e) peak power spectral density	X				
	f) hybrid system			X		
	g) continuous data stream during the test					
	h) to avoid hopping on occupied channels					
	i) RF exposure compliance			X		P < 500 mW

N.A.: Not Applicable

N.P.: Not Performed

## Standard RSS-247 Issue 1 : 2015

Designation of test	Test results				Comments
	Pass	Fail	N.A.	N.P.	
1. Scope					
3. Certification Requirements					
3.1 RSS-gen compliance			X		See RSS-Gen Issue 4
			X		See RSS-Gen Issue 4
			X		See RSS-Gen Issue 4
			X		See CS-03
			X		See RSS-Gen Issue 4
5.2 Digital Modulation Systems					
(1) -6 dB bandwidth			X		
(2) transmitter power spectral density			X		
5.4 Transmitter Output Power and e.i.r.p. Requirements					
1) 902-928 MHz frequency hopping systems output power / e.i.r.p.			X		
2) 2400-2483.5 MHz frequency hopping systems output power / e.i.r.p.			X		
3) 5725-5850 MHz frequency hopping systems output power / e.i.r.p.			X		
4) Digital modulation systems output power / e.i.r.p.	X				
5) point-to-point systems (2400-2483.5 and 5725-5850 MHz)			X		
6) Multiple directional beams antenna systems (2400-2483.5 MHz)			X		
5.5 Unwanted emission	X				

## Standard RSS-Gen Issue 4 : November 2014

Designation of test	Test results				Comments
	Pass	Fail	N.A.	N.P.	
<b>1. Scope</b>					
<b>2. Purpose and application</b>					
2.1 Certification of Radio Apparatus			X		
2.2 Categories of radio Equipment					Category 1
2.3 Exclusions			X		
2.4 Determination of Interference			X		
<b>3. Normative Reference Publications</b>					
<b>4. application for an Exemption</b>					
<b>5. Receivers</b>					
5.1 Scanner Receivers			X		
5.2 Stand-Alone Receivers Operating in the Band 30-960 MHz (Category II)			X		
5.3 Receivers Exempted From Industry Canada Requirement (Category II)			X		
<b>6. Technical Requirements</b>					
6.1 Test Site Facilities					See ANSI C63.4-2014
6.2 Test report					
6.3 External control			X		
6.4 Near Field Measurement Method Below 30 MHz			X		
6.5 Measurement Distance Above 30 MHz					
6.6 Occupied Bandwidth	X				See RSS 247
6.7 Transmitter Antenna for Licensed Radio Apparatus			X		
6.8 Operating Bands and Selection of Test Frequencies			X		
6.9 CISPR Quasi-peak Detector	X				
6.10 Pulsed Operation			X		
6.11 Transmitter Frequency Stability			X		
6.12 Transmitter Output Power	X				See RSS 247
6.13 Transmitter unwanted Emissions	X				
<b>7. Receiver limit</b>					
<b>8. Licence-Exempt radio Apparatus</b>					
8.1 Measurement Bandwidths and Detector Functions	X				
8.2 Amplifiers			X		
8.3 Transmitter Antenna for Licence-Exempt Radio Apparatus			X		
8.4 User Manual notice for Licence-Exempt Radio Apparatus			X		
8.5 Measurement of Licence-Exempt Devices On-Site (in-situ)			X		
8.6 Operating frequency Range of Device in Master/Slave networks			X		
8.7 Radio Frequency identification (RFID) Devices			X		
8.8 AC Power Line Conducted Emission Limits for licence-Exempt Radio Apparatus	X				
8.9 Transmitter Emission limits for Licence-Exempt Radio Apparatus			X		
8.10 Restricted Frequency bands			X		
8.11 Frequency Stability for Licence-Exempt transmitters			X		



Designation of test	Test results				Comments
	Pass	Fail	N.A.	N.P.	
<b>7. Licence-exempt Radio Apparatus</b>					
7.1 General Informations					
7.1.1 External Amplifiers			X		
7.1.2 Transmitter Antenna			X		
7.1.3 User manual Notice			X		User manual shall include the required statements
7.1.4 Radio Apparatus Containing Digital Circuits			X		See ICES-003
7.1.5 Measurement After Installation			X		
7.1.6 operating Frequency range of Devices in Master/Slave Networks			X		
7.1.7 Home-built Devices			X		
7.1.8 RFID Devices			X		
7.2 Measurement Methods and Standard Specifications					
7.2.1 Measurement Bandwidths and Detector Functions	X				
7.2.2 Emissions Falling Within Restricted Frequency Bands			X		
7.2.3 Devices Employing Pulsed Operation			X		
7.2.4 AC Power Line Conducted Emissions Limits	X				
7.2.5 Transmitter Spurious Emission Limits	X				
7.2.6 Transmitter Frequency Stability	X				
7.2.7 Measurement Distance			X		

Note 1: *Single / Split / limited modular transmitter.*

The host devices of the certified module(s) shall be properly labeled to identify the module(s) within.

Note 2: Spectrum investigated from 30 MHz or the lowest radio frequency signal generated in the equipment, whichever is lower, without going below 9 kHz to the 10<sup>th</sup> harmonic of the highest fundamental frequency or 40 GHz, whichever is lower (F<10 GHz) or to the 5<sup>th</sup> harmonic of the highest fundamental frequency or 100 GHz, whichever is lower (F≥10 GHz).

Note 3: Spectrum investigated from the lowest frequency internally generated or used in the receiver or 30 MHz, whichever is higher to at least 3 times the highest tuneable or local oscillator frequency, whichever is higher without exceeding 40 GHz.

Note 4: *The certificate holder shall be able to demonstrate a quality control process used for production. Inspection and testing in accordance with good engineering practices.*

Note 5: *The device must be properly identified and labeled.*

Note 6: *Suppliers of radio apparatus shall provide notices and user information in both English and French.*

Note 7: *The device shall not have any external controls accessible to the user.*

Note 8: *When transitioning between bands, the equipment shall not actively transmit*

**Conclusion:**

The tested sample «USB DONGLE JN5169-001-U00 with connection Zigbee» submitted to the tests complies with the requirements of the standard:

- FCC 47 CFR PART 15 : 2015
- RSS-247 issue 1: 2015
- RSS-Gen Issue 4 : November 2014

According to the limits specified in this report.

**5. DIGITAL MODULATION SYSTEMS**

**Standards:** FCC 47 CFR PART 15 : 2015  
RSS-247 Issue 1 : 2015

**Section:** §15.247 a) (2)  
§6.6 of RSS-247 issue 1 : 2015  
§4.6 of CNR-Gen issue3 : 2010

**Test configuration:**

The system is tested in normalized test site.

The test unit is placed on a rotating table, 0.8 m from a ground plane. Zero degree azimuth corresponds to the front of the equipment under test.

The level was maximised in antenna height, azimuth and polarization. The maximum level measured on the spectrum analyser was recorded.

**Distance of antenna:** 3 meters

**Instrumentation test list:**

CATEGORY	BRAND	TYPE	N° EMITECH
Antenna	Emco	Emco	3374
Antenna mast	Maturo	Maturo	8410
Antenna mast	Maturo	Maturo	8411
Cable	C&C	C&C	11136
Cable	C&C	C&C	11172
Cable	C&C	C&C	11177
Shielded enclosure	SIDT	SIDT	0549
Spectrum analyzer	Rohde & Schwarz	Rohde & Schwarz	5175

**Equipment under test operating condition:**

EUT is in continuous transmission mode.

**Measure conditions:**

Ambient temperature (°C): 22

Relative humidity (%): 50

Resolution bandwidth: 100 kHz

**Results:**

Power source: 5 Vdc

**6 dB bandwidth**

Frequency	Mode	Results	Comments
2405 MHz	802.15.4	1.52 MHz	See annex n°4
2440 MHz		1.99 MHz	See annex n°4
2480 MHz		1.66 MHz	See annex n°4

**20 dB bandwidth**

Frequency	Mode	Results	Comments
2405 MHz	802.15.4	2.51 MHz	See annex n°4
2440 MHz		2.58 MHz	See annex n°4
2480 MHz		2.52 MHz	See annex n°4

**Test conclusion:** Complies with the requirements of the standard.

**6. TRANSMITTER OUTPUT POWER**

**Standards:** FCC 47 CFR PART 15 : 2015  
RSS-247 Issue 1 : 2015

**Section:** §15.247 b) (3)  
§5.4

**Test configuration:**

The system is tested in normalized test site.

The test unit is placed on a rotating table, 0.8 m from a ground plane. Zero degree azimuth corresponds to the front of the equipment under test.

The level was maximised in antenna height, azimuth and polarization. The maximum level measured on the spectrum analyser was recorded.

**Distance of antenna:** 3 meters

**Instrumentation test list:**

CATEGORY	BRAND	TYPE	N° EMITECH
Antenna	Emco	Cornet 3115	3374
Antenna mast	Maturo	MCU	8410
Cable	C&C	N-10m	8411
Cable	C&C	N-6m	11136
Cable	C&C	N-2m	11172
Shielded enclosure	SIDT	C.4	0549
Shielded enclosure	SIDT	C.4	11177
Spectrum analyzer	Rohde & Schwarz	R&S FSP40	5175

**Equipment under test operating condition:**

EUT is in continuous transmission mode.

**Measure conditions:**

Ambient temperature (°C): 22

Relative humidity (%): 50

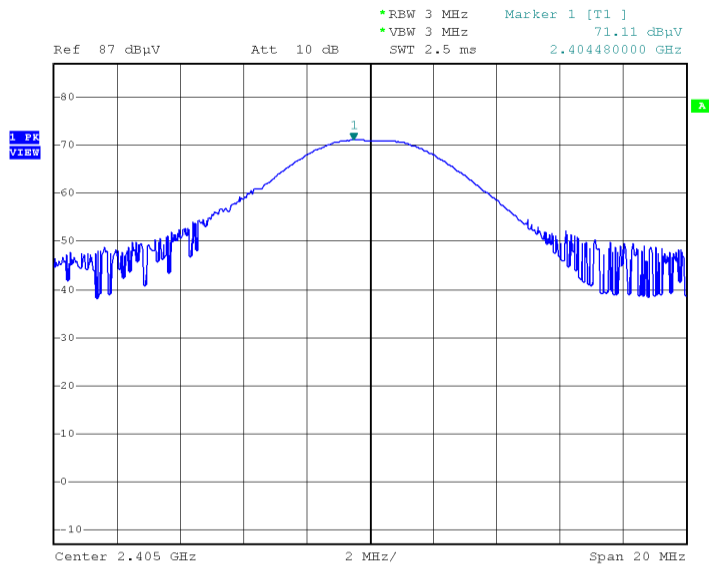
Resolution bandwidth: 3 MHz

**Results:**

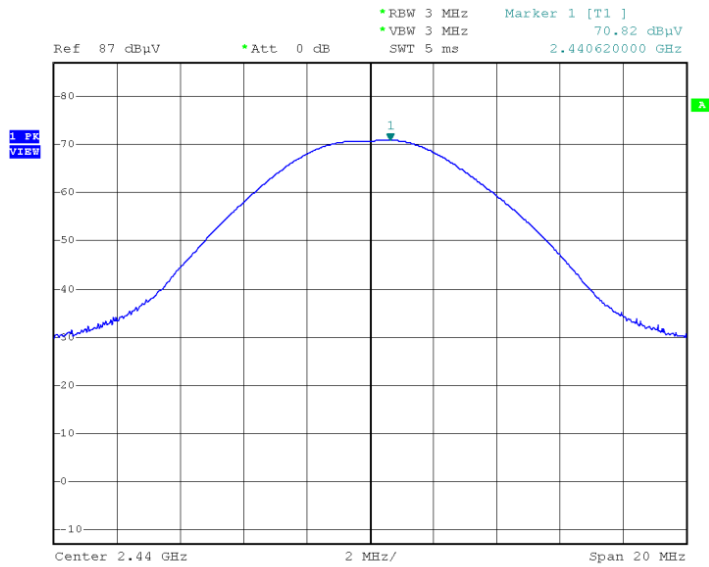
Power source: 5 Vdc by USB port

Frequency	Mode	Electro-magnetic field (dBµV/m)	TP* (dBm)	Limit (dBm)
2405 MHz	802.15.4	71.11	3.72	+ 30
2440 MHz		70.82	3.44	+ 30
2480 MHz		69.89	2.51	+ 30

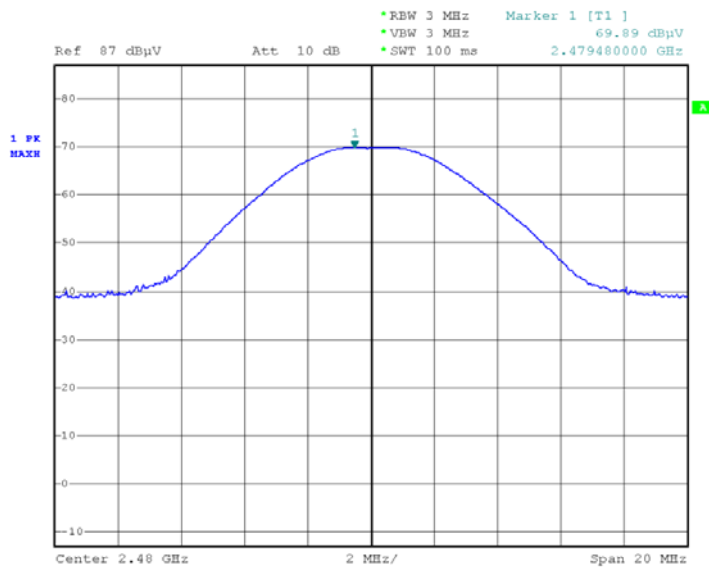
\* TP = (E x d)<sup>2</sup> / (30 x 1.64) for d = 3 m



Date: 27.MAY.2015 15:26:34



Date: 27.MAY.2015 17:14:37



Date: 27.MAY.2015 16:29:15

Test conclusion: Complies with the requirements of the standard.

**7. PEAK POWER SPECTRAL DENSITY**

**Standards:** FCC 47 CFR PART 15 : 2015  
RSS-247 Issue 1 : 2015

**Section:** §15.247 e)  
§5.2

**Test configuration:**

The system is tested in normalized test site.

The test unit is placed on a rotating table, 0.8 m from a ground plane. Zero degree azimuth corresponds to the front of the equipment under test.

The level was maximised in antenna height, azimuth and polarization. The maximum level measured on the spectrum analyser was recorded.

**Distance of antenna:** 3 meters

**Instrumentation test list:**

CATEGORY	BRAND	TYPE	N° EMITECH
Antenna	Emco	Cornet 3115	3374
Antenna mast	Maturo	MCU	8410
Antenna mast	Maturo	AM 4.0-O	8411
Cable	C&C	N-10m	11136
Cable	C&C	N-6m	11172
Cable	C&C	N-2m	11177
Shielded enclosure	SIDT	C.4	0549
Spectrum analyzer	Rohde & Schwarz	R&S FSP40	5175

**Equipment under test operating condition:**

EUT is in continuous transmission mode.

**Measure conditions:**

Ambient temperature (°C): 22

Relative humidity (%): 50

Resolution bandwidth: 3 kHz

Video bandwidth: 3 kHz

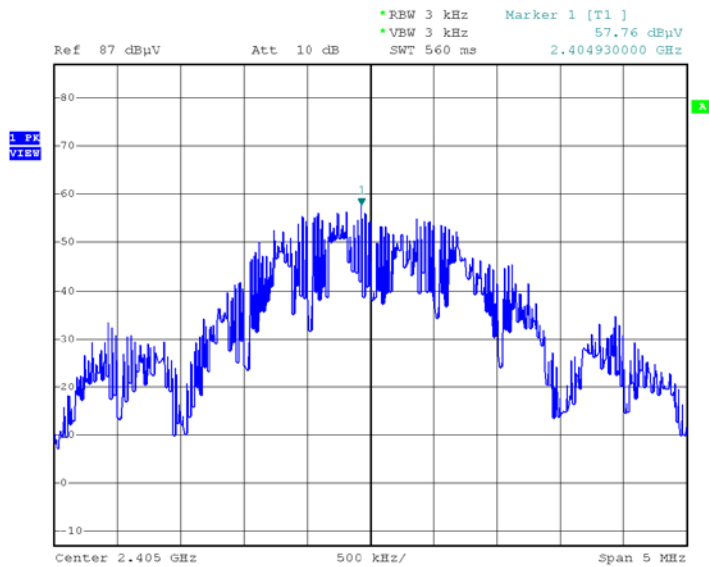


**Results:**

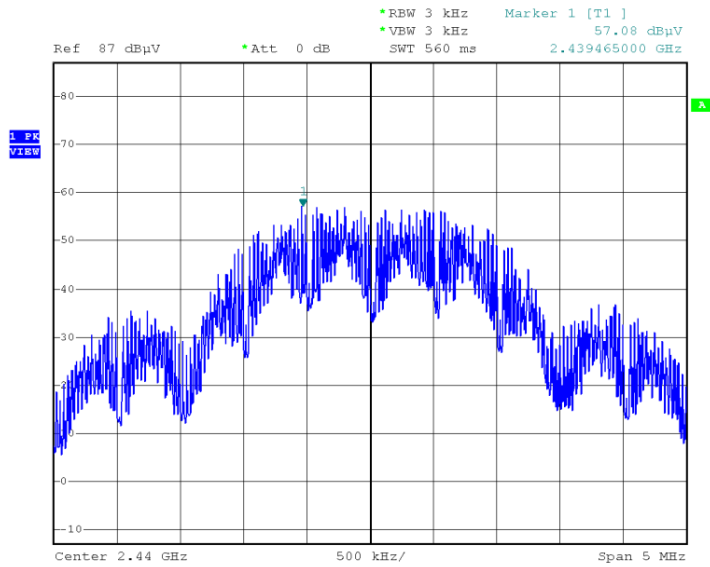
Power source: 5 Vdc by USB port

Frequency	Mode	Electro-magnetic field (dBµV/m)	PPSD* (dBm)	Limit (dBm)
2405 MHz	802.15.4	57.76	-9.61	+ 8.0
2440 MHz		57.08	-10.29	
2480 MHz		57.46	-9.91	

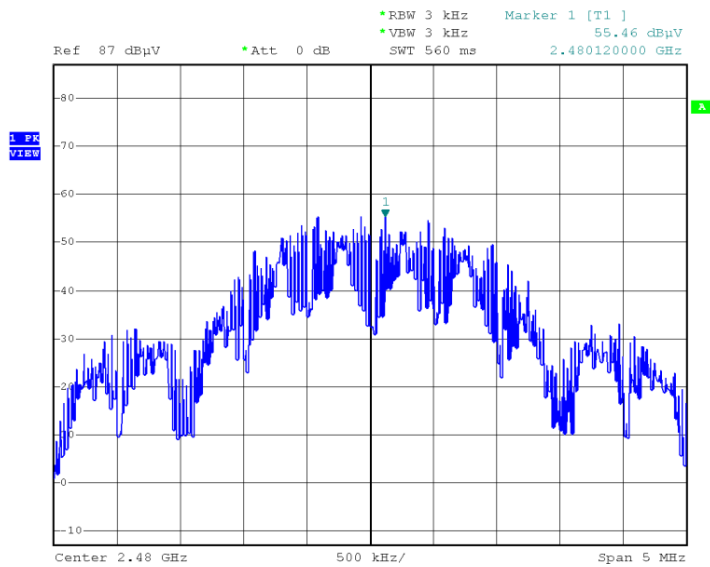
\* PPSD = (E x d)<sup>2</sup> / (30 x 1.64) for d = 3 m



Date: 27.MAY.2015 15:35:05



Date: 27.MAY.2015 17:20:52



Date: 27.MAY.2015 16:41:01

Test conclusion: Complies with the requirements of the standard.

**8. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSIONS LIMITATION**

**Standard:** FCC 47 CFR PART 15 : 2015

**Sections:** §15.215 (b) and §15.247 (d)

**Instrumentation test list:**

CATEGORY	BRAND	TYPE	N° EMITECH
Antenna	Emco	Cornet 3115	3374
Antenna mast	Maturo	MCU	8410
Antenna mast	Maturo	AM 4.0-O	8411
Cable	C&C	N-10m	11136
Cable	C&C	N-6m	11172
Cable	C&C	N-2m	11177
Shielded enclosure	SIDT	C.4	0549
Spectrum analyzer	Rohde & Schwarz	R&S FSP40	5175

**Equipment under test arrangement:**

The system is tested in normalized test site.

The test unit is placed on a rotating table, 0.8 m from a ground plane. Zero degree azimuth corresponds to the front of the equipment under test.

The level was maximised in antenna height, azimuth and polarization. The maximum level measured on the spectrum analyser was recorded.

**Results:**

Ambient temperature (°C): 22

Relative humidity (%): 50

Lower Band Edge: from 2310 MHz to 2390 MHz  
 Upper Band Edge: from 2483.5 MHz to 2500 MHz

- Mode 802.15.4

Fundamental frequency (MHz)	Field Strength Level of fundamental (dB $\mu$ V/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) *	Calculated Max Out of Band Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
2405.6	100.8	Average	2372.93	50.4	50.4	54.0	3.6
2479.4	98.85	Average	2483.88	36.7	62.1(**)	54.0	11.9

The band edge readings were performed with a peak detector and with the E.U.T. set in a constant 100 % transmit state.

\* According to step 2 of Marker-Delta Method DA 00-705.

\*\* The limit is 54 dB $\mu$ V/m for average emissions. According to 15.35 (c): when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. For a 10 % duty cycle, the power measured would be reduced by  $20 \log(0.1) = -20$  dB. According to the declared duty cycle, therefore, the emissions observed are below the limit after averaging for pulse rate.

Band-edge curves are given in annex 5.

**9. UNINTENTIONAL RADIATED EMISSIONS AND TRANSMITTER UNWANTED EMISSION IN THE BAND 9 KHz – 25 GHz**

**Standards:** FCC 47 CFR PART 15 : 2015  
RSS-Gen Issue 4 : November 2014

**Sections:** §15.205; 15.209 and §5.247  
§6.13 of RSS-Gen

**Equipment under test arrangement:**

The equipment under test (EUT) is placed on a non-conductive test table at 0.8 m above the horizontal metal ground plane.

For maximum meter reading at each frequency, the antenna height is adjusted between 1 m and 4 m above the ground plane. A 360 degrees rotation of the EUT is performed in vertical and horizontal polarization. The frequency azimuth and antenna height are presented in the table on the next pages.

The E.U.T. is blocked in continuous transmission.

**Frequencies range:** 9 kHz – 30 MHz  
30 MHz - 1 GHz  
1 GHz – 25 GHz

**Detection mode:** Quasi-peak for 9 kHz – 30 MHz  
Quasi-peak for 30 MHz - 1 GHz  
Average for 1 GHz – 25 GHz

**Resolution bandwidth:** 200 Hz for 9 kHz – 150 kHz  
9 kHz for 150 kHz – 30 MHz  
120 kHz for 30 MHz - 1 GHz  
1 MHz for 1 GHz – 25 GHz

**Measurement distance:** 3 meters from 9 kHz to 30 MHz  
3 meters from 30 MHz to 25 GHz

- Limit for emission radiated outside the frequency band, except the harmonics, shall be attenuated by at least 20 dB below the level of fundamental or the general radiated emission limits.

From 9 kHz to 30 MHz

Frequencies range	Limit ( $\mu\text{V/m}$ )
9 – 490 kHz	$2400/F$ (F in kHz) *
490 – 1705 kHz	$24000/F$ (F in kHz) **
1.705 – 30 MHz	30 **

\* Limits in  $\mu\text{V/m}$  can be extrapolated to 3 m using 40 dB / decade.

\*\* Limits in  $\mu\text{V/m}$  can be extrapolated to 3 m using 20 dB / decade.

From 30 MHz to 25 GHz

Frequencies range (MHz)	Limit	
	( $\text{dB}\mu\text{V/m}$ )	( $\mu\text{V/m}$ )
30 to 88	40.0	100
88 to 216	43.5	150
216 to 960	46.0	200
Above 960	54.0	500

**Instrumentation test list:**

CATEGORY	BRAND	TYPE	N° EMITECH
Antenna	Emco	Emco	0941
Antenna	Oritel	Oritel	1045
Antenna	Emco	Emco	4211
Antenna	Schaffner	Bilog CBL6143A	5647
Antenna	Schwarzbeck	Biconique VHA9103	0317
Antenna mast	Maturo	Maturo	8410
Antenna mast	Maturo	Maturo	8411
Cable	-	-	2881
Cable	Telegartner	Telegartner	7405
Cable	C&C	C&C	11132
Cable	C&C	C&C	11133
Cable	C&C	C&C	11136
Cable	C&C	C&C	11172
Cable	C&C	C&C	11176
Cable	C&C	C&C	11177
Cable	C&C	N-2m	11181
Cable	C&C	N-2m	11182
Filter	Trilithic	Trilithic	1097
Filter	Micro-tronics	Micro-tronics	4691
Preamplifier	MITEQ	MITEQ	3229
Preamplifier	Mini-Circuits	Mini-Circuits	6368
Receiver	Rohde & Schwarz	Rohde & Schwarz	10517
Shielded enclosure	SIDT	SIDT	0549
Spectrum analyzer	Rohde & Schwarz	Rohde & Schwarz	5175
Synthesizer	Rohde & Schwarz	R&S SMX	3166

**Results:**

Ambient temperature (°C): 21  
 Relative humidity (%): 50  
 Power source: 5 Vdc by USB port

Frequency 2405 MHz

FREQUENCY (MHz)	Detector	Antenna height (cm)	Azimuth (degree)	Resolution bandwidth	Polarization H: Horizontal V: Vertical	Field strength (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
51.70	Quasi-peak	100	50	120 kHz	V	31.0	40.0	9.0
68.90	Quasi-peak	100	140	120 kHz	V	30.1	40.0	9.9
80.25	Quasi-peak	100	0	120 kHz	V	26.6	40.0	13.4
448.00	Quasi-peak	100	80	120 kHz	V	28.4	46.0	17.6
4808.99	Average	110	0	1 MHz	V	53.0	54.0	1.0
4809.05	Average	145	0	1 MHz	H	46.1	54.0	7.9
7216.49	Average	119	333	1 MHz	V	47.8	54.0	6.2
7213.42	Average	173	56	1 MHz	H	41.0	54.0	13.0

## Frequency 2440 MHz

FREQUENCY (MHz)	Detector	Antenna height (cm)	Azimuth (degree)	Resolution bandwidth	Polarization H: Horizontal V: Vertical	Field strength (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
51.70	Quasi-peak	100	50	120 kHz	V	31.0	40.0	9.0
68.90	Quasi-peak	100	140	120 kHz	V	30.1	40.0	9.9
80.25	Quasi-peak	100	0	120 kHz	V	26.6	40.0	13.4
448.00	Quasi-peak	100	80	120 kHz	V	28.4	46.0	17.6
4878.99	Average	120	0	1 MHz	V	51.2	54.0	1.0
4879.05	Average	140	0	1 MHz	H	46.3	54.0	7.9
7319.49	Average	115	325	1 MHz	V	48.8	54.0	5.2
7319.42	Average	178	65	1 MHz	H	44.0	54.0	10.0

## Frequency 2480 MHz

FREQUENCY (MHz)	Detector	Antenna height (cm)	Azimuth (degree)	Resolution bandwidth	Polarization H: Horizontal V: Vertical	Field strength (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
51.70	Quasi-peak	100	50	120 kHz	V	31.0	40.0	9.0
68.90	Quasi-peak	100	140	120 kHz	V	30.1	40.0	9.9
80.25	Quasi-peak	100	0	120 kHz	V	26.6	40.0	13.4
448.00	Quasi-peak	100	80	120 kHz	V	28.4	46.0	17.6
4961.06	Average	130	0	1 MHz	V	48.1	54.0	5.9
4961.15	Average	100	0	1 MHz	H	42.7	54.0	7.3
7441.71	Average	170	0	1 MHz	V	43.5	** 54.0	10.5
7441.31	Average	150	30	1 MHz	H	18.8	** 54.0	35.2

No significant frequency has been found other than those given above between 9 kHz to 30 MHz and 8 GHz to 25 GHz.

\*\* The limit is 54 dB $\mu$ V/m for average emissions. According to 15.35 (c): when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. For a 10 % duty cycle, the power measured would be reduced by  $20 \log(0.1) = -20$  dB. According to the declared duty cycle, therefore, the emissions observed are below the limit after averaging for pulse rate.

### Test conclusion:

The equipment complies with the requirements of the standard.



**10. CONDUCTED EMISSION**

**Standards:** FCC 47 CFR PART 15: 2015  
RSS-Gen Issue 4 : 2014

**Test methods:** §15.107 and 15.207  
§8.8

**Test configuration:**

Tested cable	Measure with	E.U.T. height
Power Supply (PC alone)	L.I.S.N.	80 cm
Power Supply (PC with USB Dongle JN5169-001-U00)	L.I.S.N.	80 cm

Frequencies band	Tested cable	Resolution bandwidth	Video bandwidth
150 kHz - 1 MHz	Power Supply (PC alone)	10 kHz	30 kHz
1 MHz - 30 MHz	Power Supply (PC alone)	10 kHz	30 kHz
150 kHz - 1 MHz	Power Supply (PC with USB Dongle JN5169-001-U00)	10 kHz	30 kHz
1 MHz - 30 MHz	Power Supply (PC with USB Dongle JN5169-001-U00)	10 kHz	30 kHz

**Test method deviation:** No

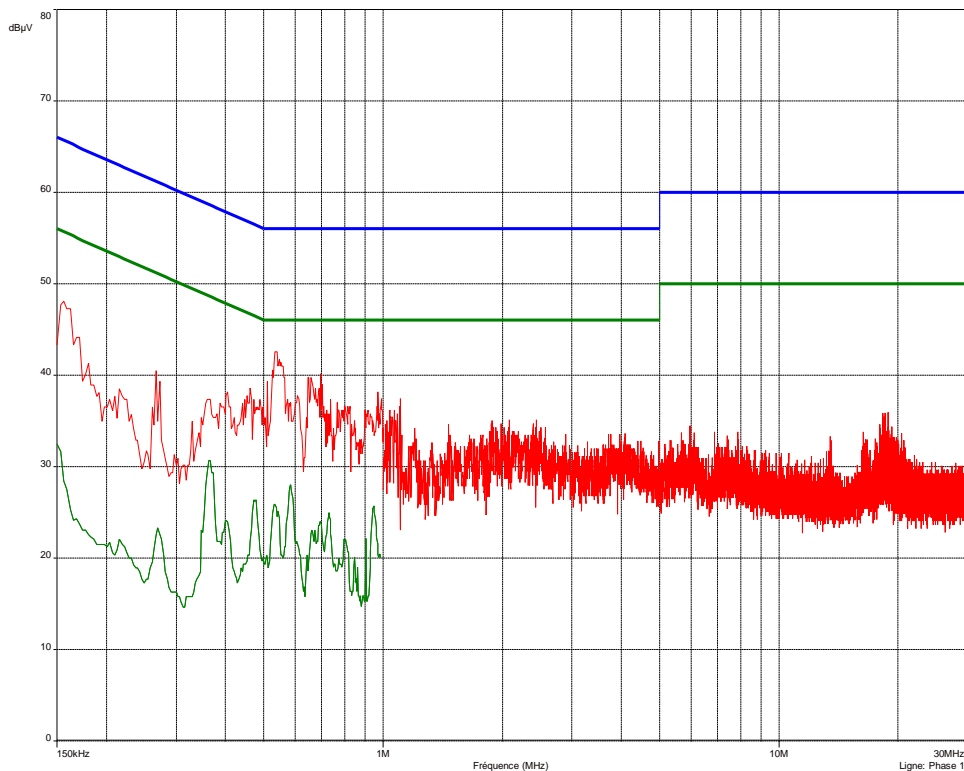
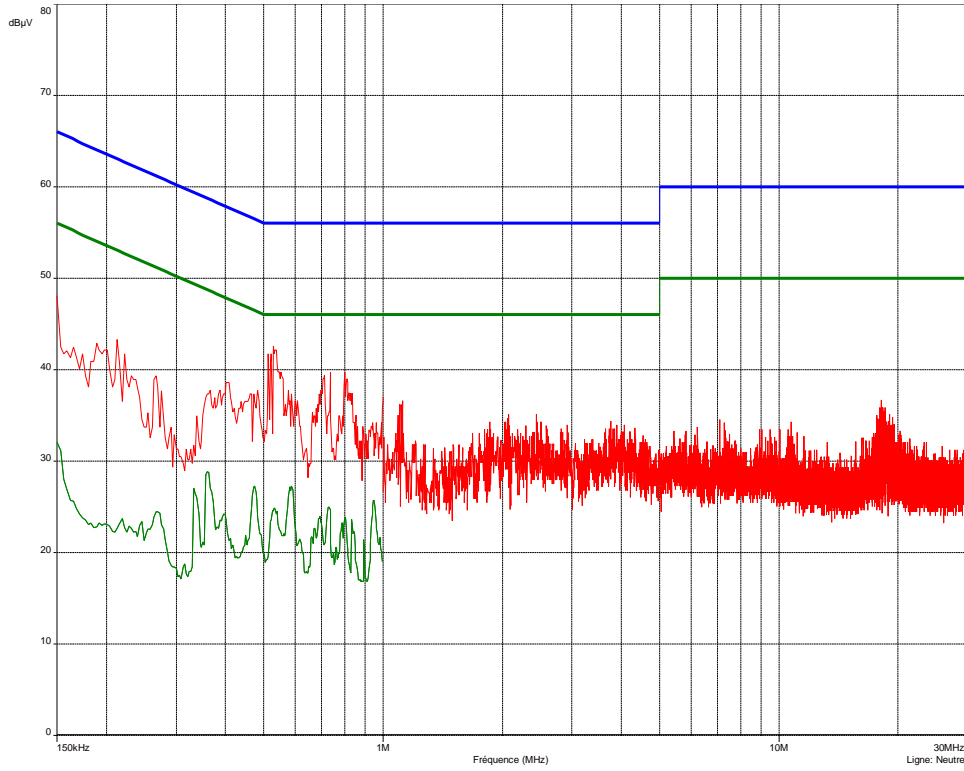
**Test equipment list:**

CATEGORY	BRAND	TYPE	N° EMITECH
Cable	-	N-4m	2808
Cable	C&C	BNC	9952
Cable	Emitech	Absorbeur courant de gaine	12366
Limiter	Hewlett Packard	HP11947A	1061
LISN	Rohde & Schwarz	ESH2-Z5	0326
Power supply	Schaffner	NSG 1007-5-400	4637
QP Adaptater	Hewlett Packard	HP 85650A	0491
Receiver	Hewlett Packard	HP 8568B Voie 2	0019
Software	Nexio	BAT EMC v3.6.0.32	0000

**Results:** See curves below including detections and limits in peak (red), average (green)

Curves 1 and 2

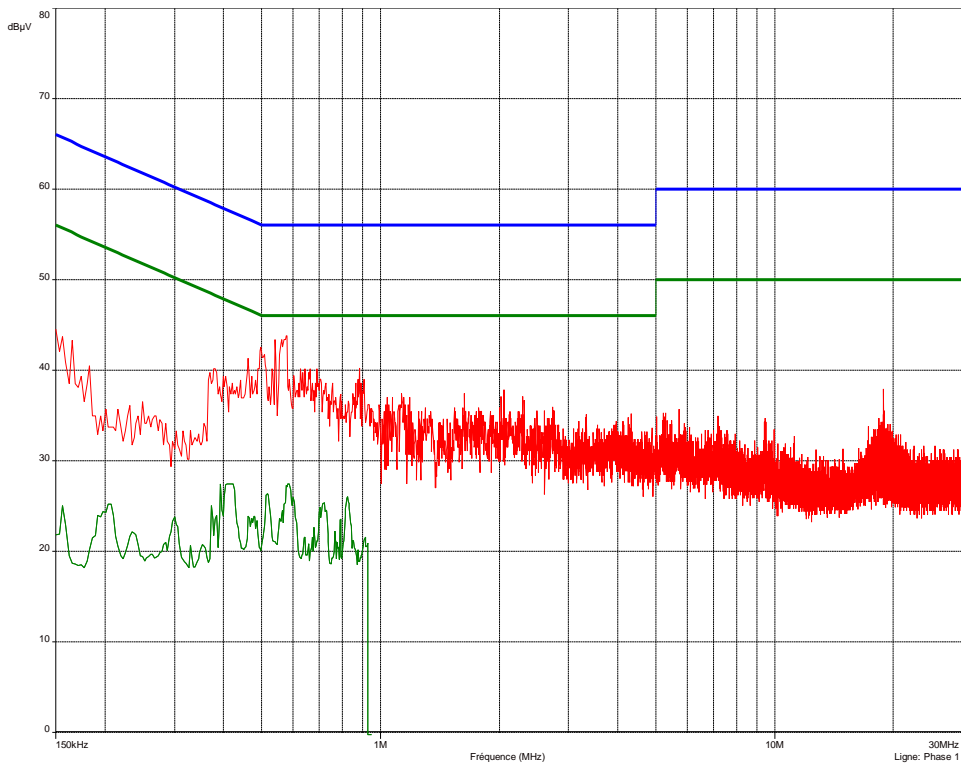
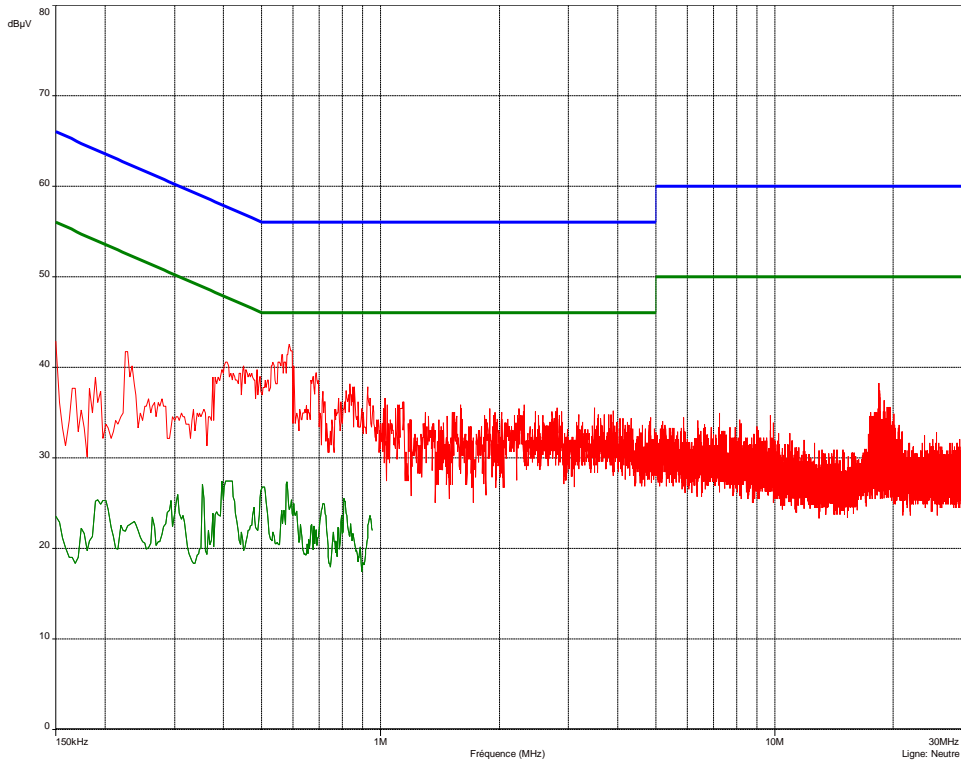
**Power Supply (PC with USB Dongle JN5169-001-U00)**  
Conducted voltage emission (measurement): Power Supply in peak and average detection  
PC alone



Curves 3 and 4

**Power Supply (PC with USB Dongle JN5169-001-U00)**

Conducted voltage emission (measurement): Power Supply in peak and average detection  
PC with USB Dongle JN5169-001-U00



« □□□ End of report, 6 annexes to be forwarded □□□ »

# ANNEX 1

## *ANTENNA FACTORS, INSERTION LOSSES AND AMPLIFIER VALUES*

### BILL OF MATERIAL

The test antenna used for the radiated emission between 9 kHz and 30 MHz is the active loop antenna n°4211. Antenna factors are given in table 1.

The test antenna used for the radiated emission between 30 MHz and 1 GHz is the biclog antenna n°5647. Antenna factors are given in table 2.

The measuring receiver n°10517 used in the frequency range 30 MHz to 1 GHz has an integrated preamplifier.

The spectrum analyzer n°5175 is used in the frequency range 1 GHz to 25 GHz.

The test cable used between 9 kHz and 30 MHz to connect the antennas to the receiver for measurements at a distance of 30 meters has losses given in table 3.

The test cable used between 30 MHz and 1 GHz to connect the antennas to the receiver for measurements at a distance of 3 meters has losses given in table 4a, 4b and 4c.

The test antenna used for the radiated emission between 1 GHz and 18 GHz is the horn antenna n°3374. Factors are given in table 5.

The test antenna used for the radiated emission between 18 GHz and 25 GHz is the horn antenna n°1045. Factors are given in table 6.

The amplifier n°3229 used to connect the spectrum analyzer to the test cable has gain values given in the table 7.

The test cable used between 1 GHz and 18 GHz to connect the horn antenna to the amplifier for measurements at distance of 3 meters has losses given in table 8.

The test cable used between 18 GHz and 26 GHz to connect the horn antenna to the amplifier for measurements at distance of 3 meters has losses given in table 9a and 9b.

Frequency (MHz)	Antenna factor (dB/m)	Frequency (MHz)	Antenna factor (dB/m)
0.009	-22.5	0.8	-33.1
0.01	-23.4	1	-33.2
0.015	-26.6	1.5	-33.3
0.02	-28.0	2	-33.3
0.03	-30.2	3	-33.3
0.05	-32.0	5	-33.3
0.08	-32.8	8	-33.3
0.1	-33.0	10	-33.3
0.15	-33.3	15	-33.4
0.2	-33.3	20	-33.8
0.3	-33.4	25	-34.4
0.5	-33.3	30	-35.5

TABLE 1 : ACTIVE LOOP ANTENNA

Frequency (MHz)	Antenna factor (dB/m)	Frequency (MHz)	Antenna factor (dB/m)
30	23.5	180	10.3
35	20.5	200	11.6
40	17.9	250	13.4
45	15.4	300	14.1
50	13.0	400	16.4
60	10.7	500	17.2
70	8.9	600	18.5
80	7.4	700	19.1
90	8.3	800	19.9
100	10.9	900	20.1
120	13.8	1000	20.6
140	12.7	-	-
160	10.8	-	-

TABLE 2 : BILOG ANTENNA

Frequency (MHz)	Loss (dB)	Frequency (MHz)	Loss (dB)
0.009	0.0	6.000	0.5
0.020	0.0	7.000	0.5
0.050	0.0	8.000	0.5
0.100	0.1	9.000	0.6
0.500	0.1	10.00	0.6
1.000	0.2	15.00	0.8
2.000	0.3	20.00	0.9
3.000	0.3	25.00	1.0
4.000	0.4	30.00	1.1
5.000	0.4	-	-

**TABLE 3 : TEST CABLE FOR 30M MEASUREMENT INTO 9 kHz AND 30 MHz**

Frequency (MHz)	Loss (dB)	Frequency (MHz)	Loss (dB)
30	0.1	250	0.2
40	0.1	300	0.3
50	0.1	400	0.3
60	0.1	500	0.4
70	0.1	600	0.4
80	0.1	700	0.5
90	0.1	800	0.5
100	0.1	900	0.6
150	0.2	1000	0.6
200	0.2	-	-

**TABLE 4a : TEST CABLE FOR 3M MEASUREMENT INTO 30 MHz AND 1 GHz**

Frequency (MHz)	Loss (dB)	Frequency (MHz)	Loss (dB)
30	0.3	250	0.8
40	0.3	300	0.8
50	0.4	400	1.0
60	0.4	500	1.1
70	0.4	600	1.2
80	0.4	700	1.3
90	0.5	800	1.4
100	0.5	900	1.5
150	0.6	1000	1.5
200	0.7	-	-

**TABLE 4b : TEST CABLE FOR 3M MEASUREMENT INTO 30 MHz AND 1 GHz**

Frequency (MHz)	Loss (dB)	Frequency (MHz)	Loss (dB)
30	0.3	250	1.1
40	0.4	300	1.2
50	0.5	400	1.4
60	0.5	500	1.7
70	0.5	600	1.8
80	0.6	700	2.0
90	0.6	800	2.1
100	0.7	900	2.3
150	0.8	1000	2.4
200	1.0	-	-

**TABLE 4c : TEST CABLE FOR 3M MEASUREMENT INTO 30 MHz AND 1 GHz**



Frequency (GHz)	Antenna factor (dB/m)	Frequency (GHz)	Antenna factor (dB/m)
1.0	23.7	10.0	37.6
1.5	25.0	10.5	37.8
2.0	27.5	11.0	38.1
2.5	28.8	11.5	38.3
3.0	29.8	12.0	38.8
3.5	31.2	12.5	38.8
4.0	32.5	13.0	39.4
4.5	32.5	13.5	40.0
5.0	33.5	14.0	40.1
5.5	34.1	14.5	40.6
6.0	34.1	15.0	40.6
6.5	34.4	15.5	39.7
7.0	35.4	16.0	39.3
7.5	36.6	16.5	39.9
8.0	36.6	17.0	41.4
8.5	37.0	17.5	45.1
9.0	37.1	18.0	46.3
9.5	37.2	-	-

TABLE 5 : HORN ANTENNA

Frequency (GHz)	Antenna factor (dB/m)	Frequency (GHz)	Antenna factor (dB/m)
18.0	30.7	22.5	30.9
18.5	30.7	23.0	31.2
19.0	30.5	23.5	31.1
19.5	30.7	24.0	31.3
20.0	30.7	24.5	31.5
20.5	30.8	25.0	31.0
21.0	30.9	25.5	31.0
21.5	30.5	26.0	31.4
22.0	30.6	-	-

TABLE 6 : HORN ANTENNA

Frequency (GHz)	Gain value (dB)	Frequency (GHz)	Gain value (dB)
1.0	33.4	13.0	32.5
1.5	33.7	14.0	31.6
2.0	33.9	15.0	33.0
2.5	34.0	16.0	33.5
3.0	33.9	17.0	33.9
4.0	34.3	18.0	34.3
5.0	35.2	19.0	34.4
6.0	34.7	20.0	32.9
7.0	34.0	21.0	33.2
8.0	33.7	22.0	34.3
9.0	31.8	23.0	34.6
9.5	31.1	24.0	34.4
10.0	30.5	25.0	34.5
10.5	30.7	26.0	32.5
11.0	31.1	-	-
12.0	32.4	-	-

TABLE 7 : AMPLIFIER GAIN VALUE

Frequency (GHz)	Gain value (dB)	Frequency (GHz)	Gain value (dB)
1.0	1.6	13.0	6.4
1.5	2.0	14.0	6.6
2.0	2.4	15.0	7.1
2.5	2.7	16.0	7.3
3.0	3.0	17.0	7.6
4.0	3.4	18.0	7.8
5.0	3.8	-	-
6.0	4.1	-	-
7.0	4.6	-	-
8.0	5.1	-	-
9.0	5.5	-	-
9.5	5.6	-	-
10.0	5.7	-	-
10.5	5.8	-	-
11.0	5.9	-	-
12.0	6.2	-	-

TABLE 8 : TEST CABLE FOR 3M MEASUREMENT INTO 1 TO 18 GHz

Frequency (GHz)	Loss (dB)
18.0	3.8
19.0	3.8
20.0	3.9
21.0	4.0
22.0	4.1
23.0	4.2
24.0	4.3
25.0	4.4
26.0	4.5

**TABLE 9a: TEST CABLE FOR 3M  
MEASUREMENT INTO 18 TO 26 GHz**

Frequency (GHz)	Loss (dB)
18.0	3.8
19.0	3.8
20.0	3.9
21.0	4.0
22.0	4.1
23.0	4.2
24.0	4.3
25.0	4.4
26.0	4.5

**TABLE 9b: TEST CABLE FOR 3M  
MEASUREMENT INTO 18 TO 26 GHz**

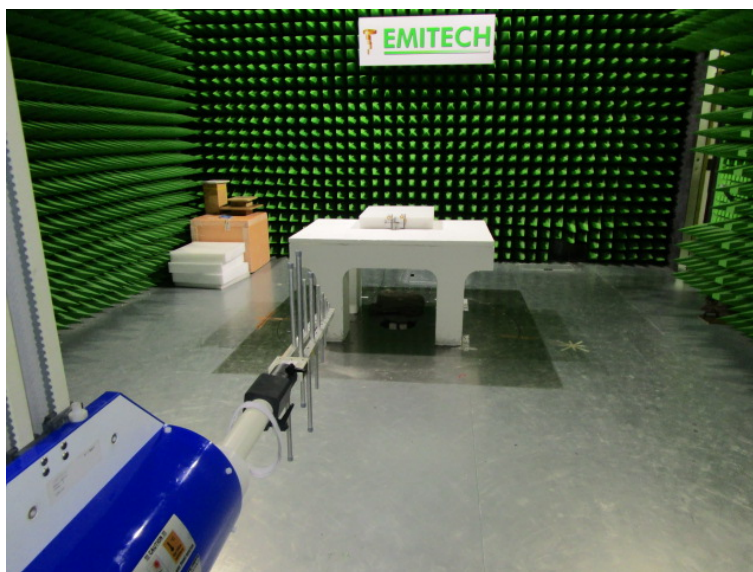
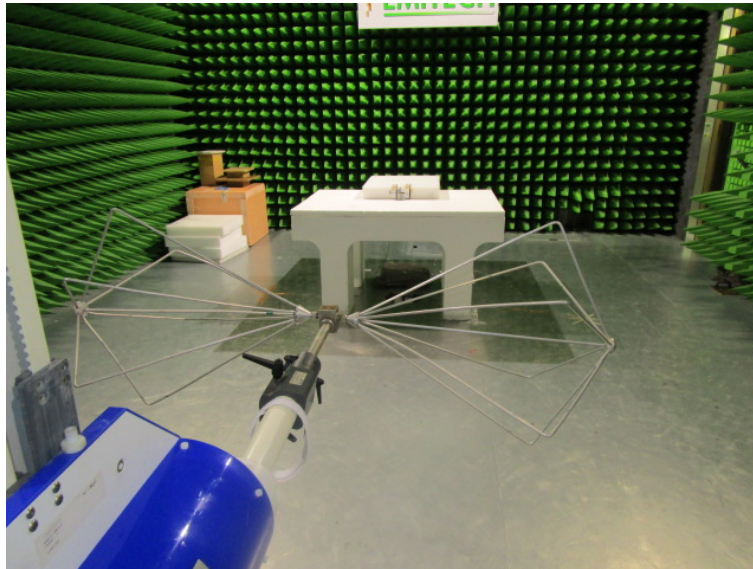
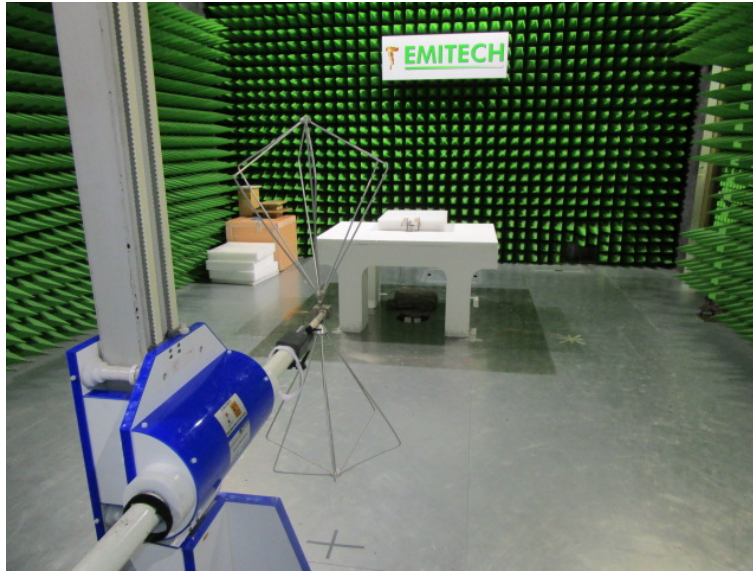
# ANNEX 2

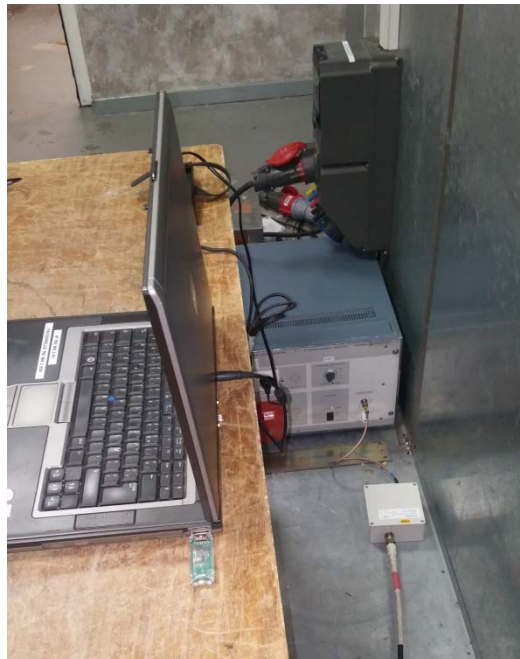
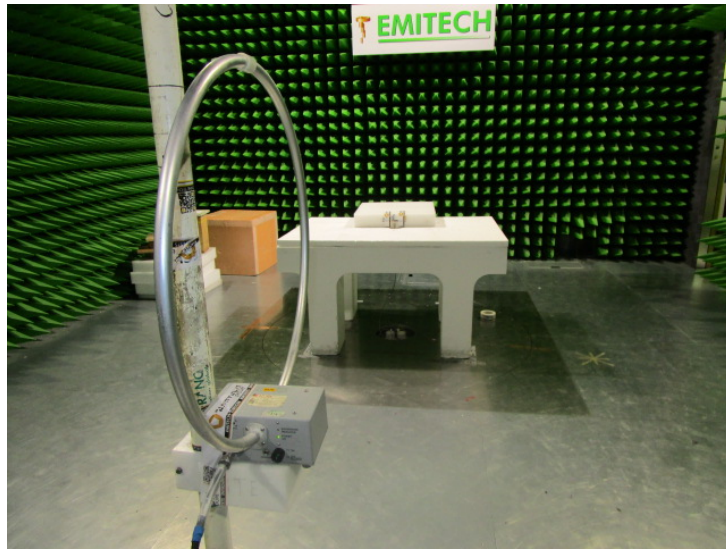
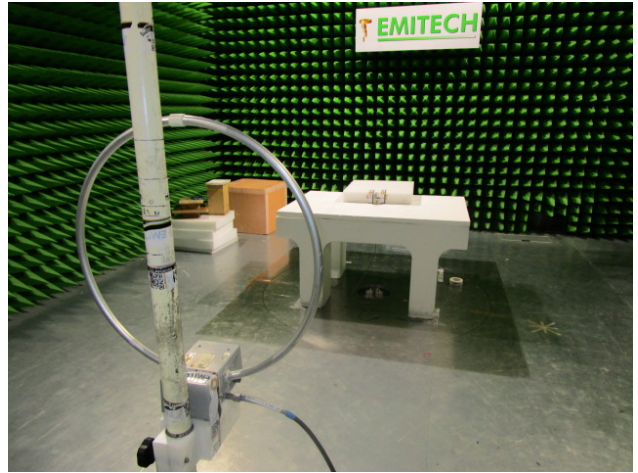
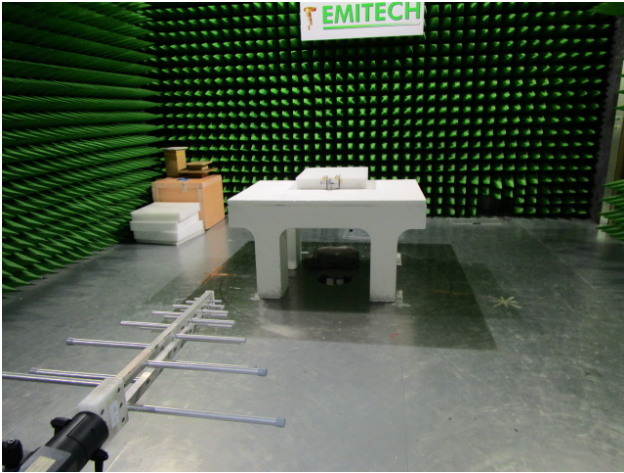
## *EXTERNAL PHOTOGRAPH*



# ANNEX 3

## *TEST SETUP PHOTOGRAPHS*





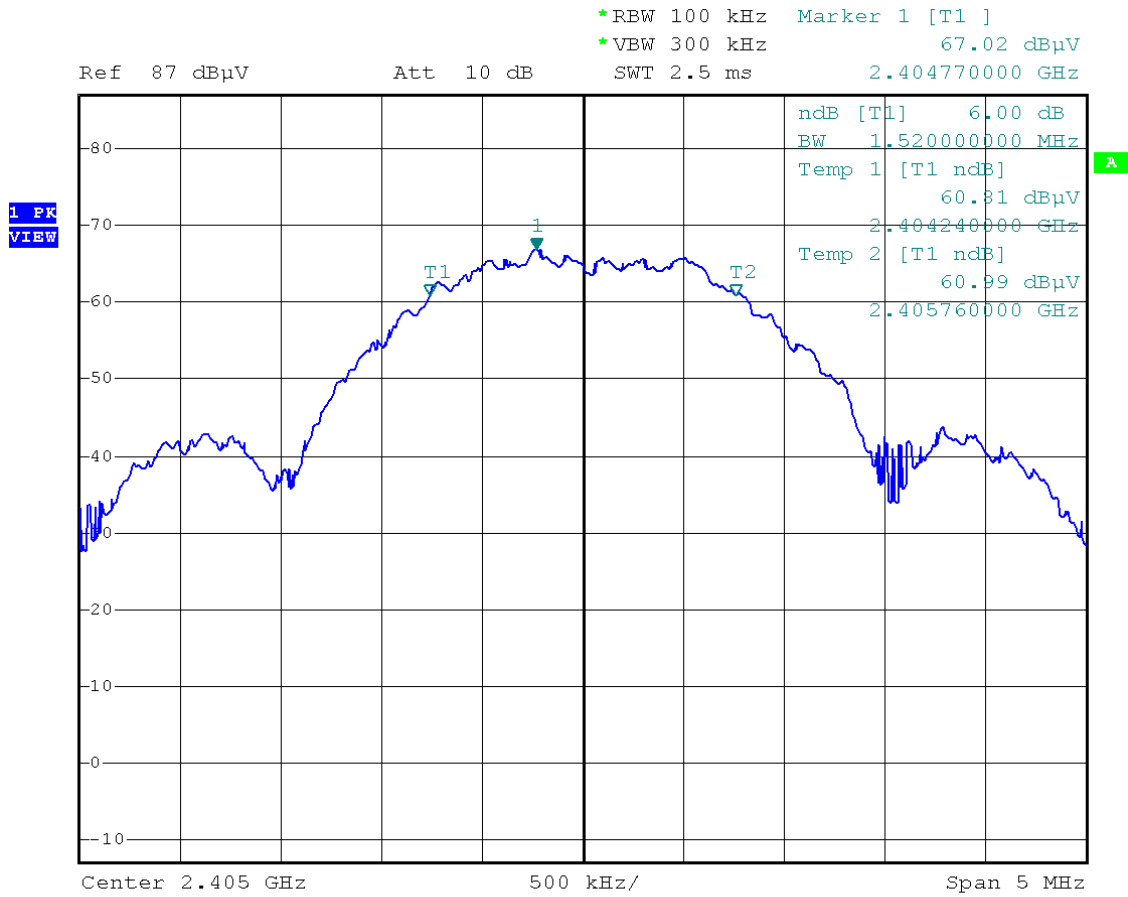


## ANNEX 4

*6 dB BANDWIDTH*  
*20 dB BANDWIDTH*

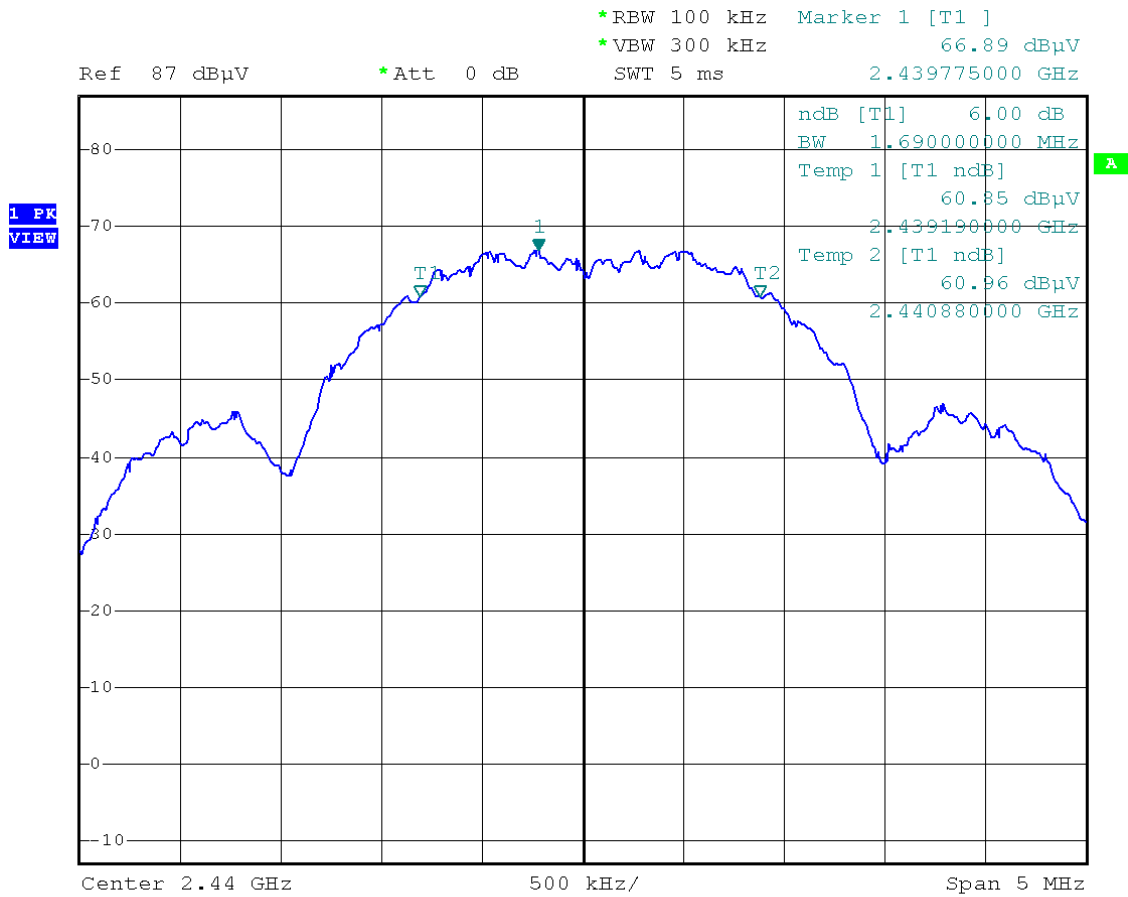
## 6 dB BANDWIDTH

Frequency 2405 MHz



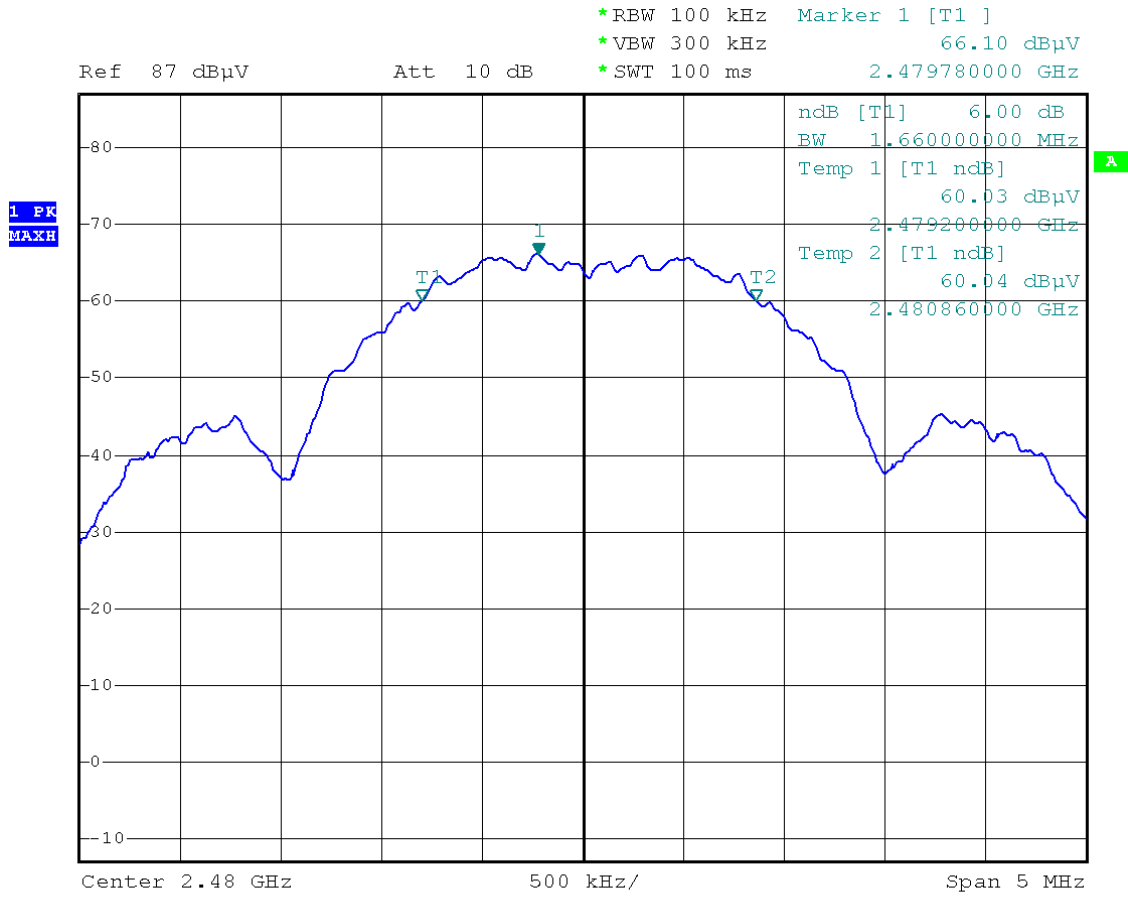
Date: 27.MAY.2015 15:30:25

Frequency 2440 MHz



Date: 27.MAY.2015 17:17:36

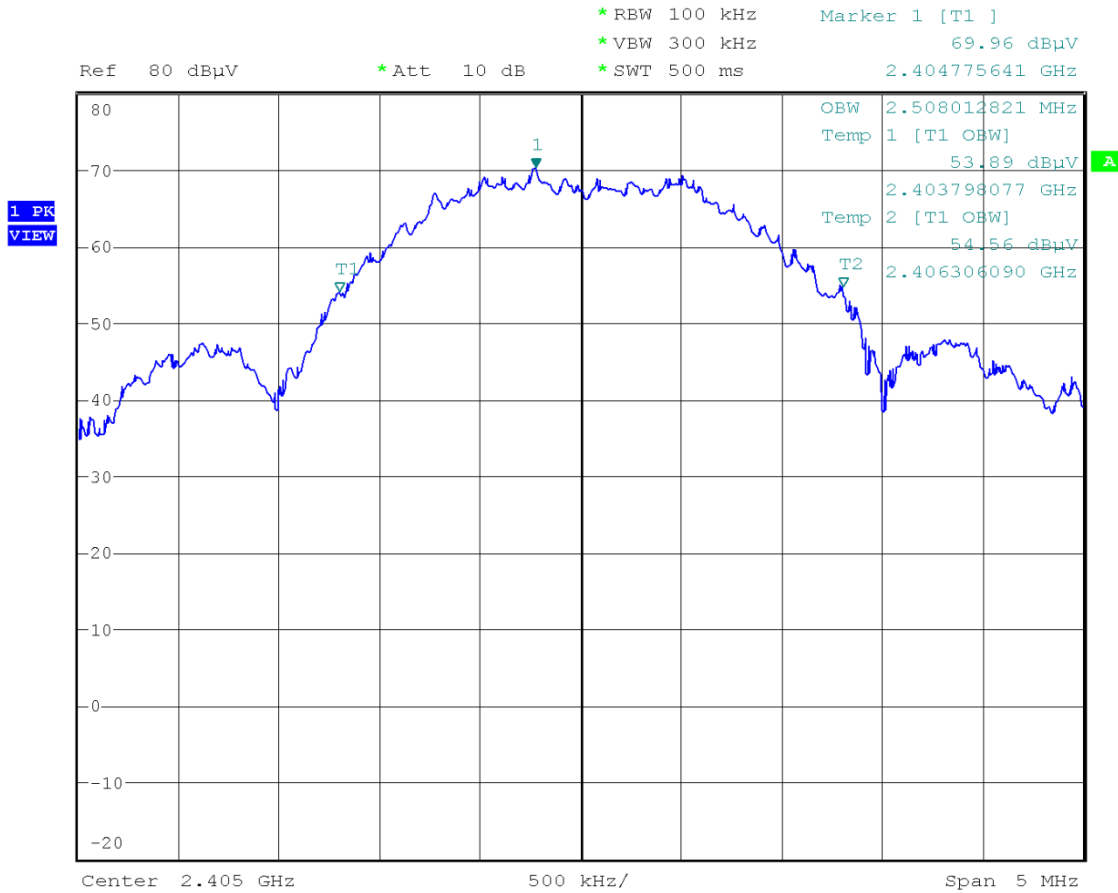
Frequency 2480 MHz



Date: 27.MAY.2015 16:35:12

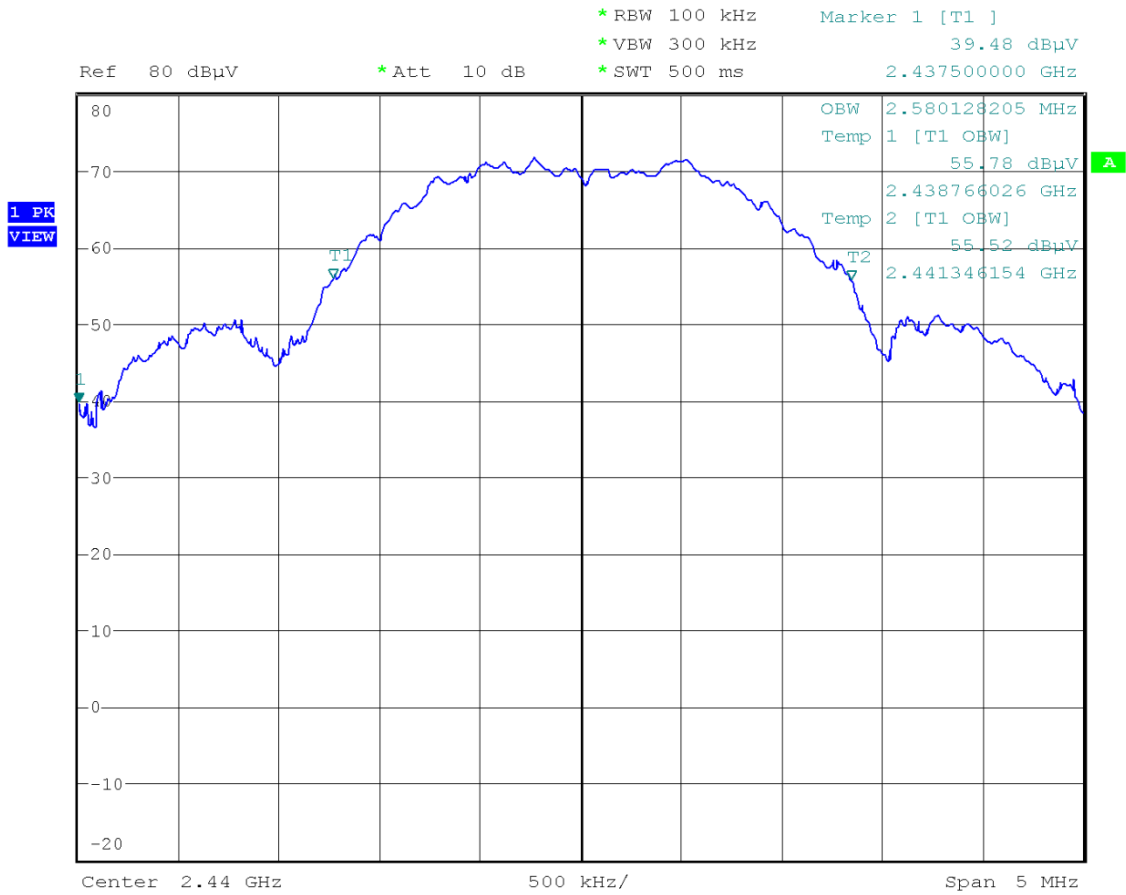
## 20 dB BANDWIDTH

Frequency 2405 MHz



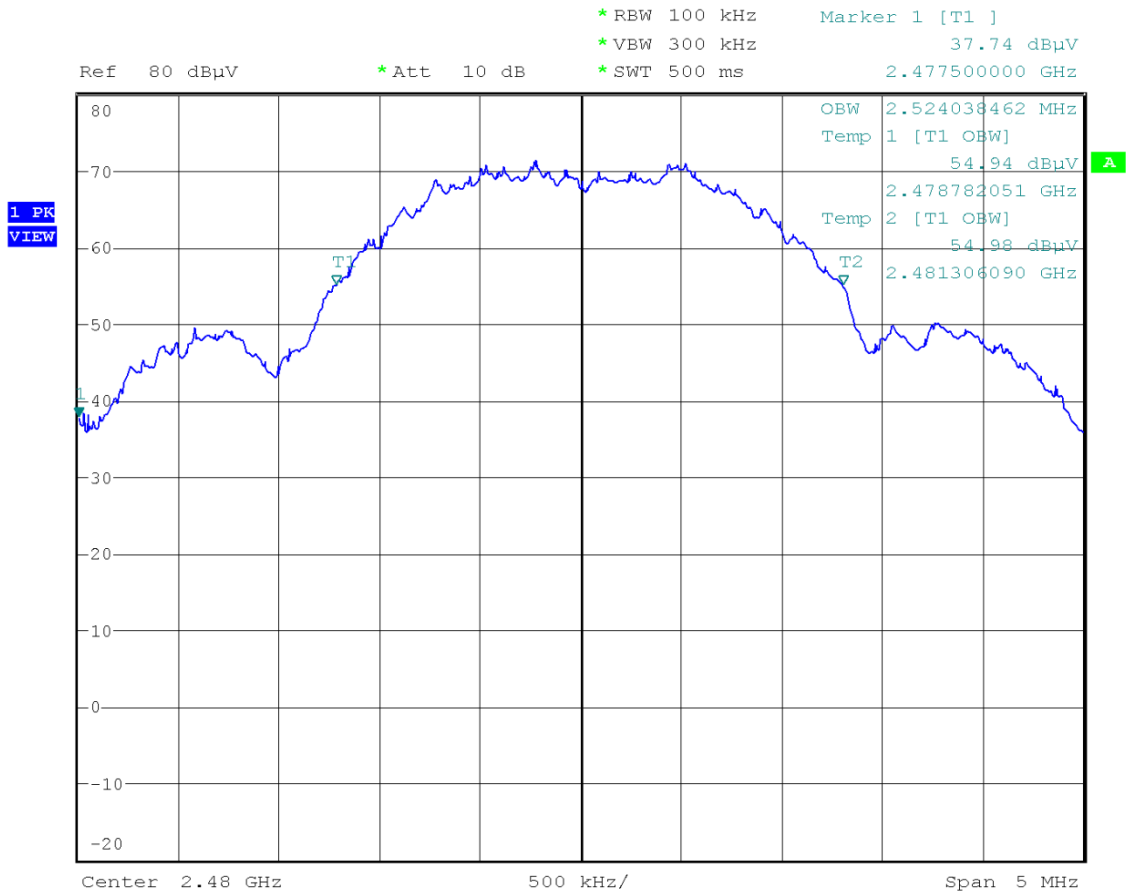
Date: 19.NOV.2015 14:20:08

Frequency 2440 MHz



Date: 19.NOV.2015 14:21:10

Frequency 2480 MHz

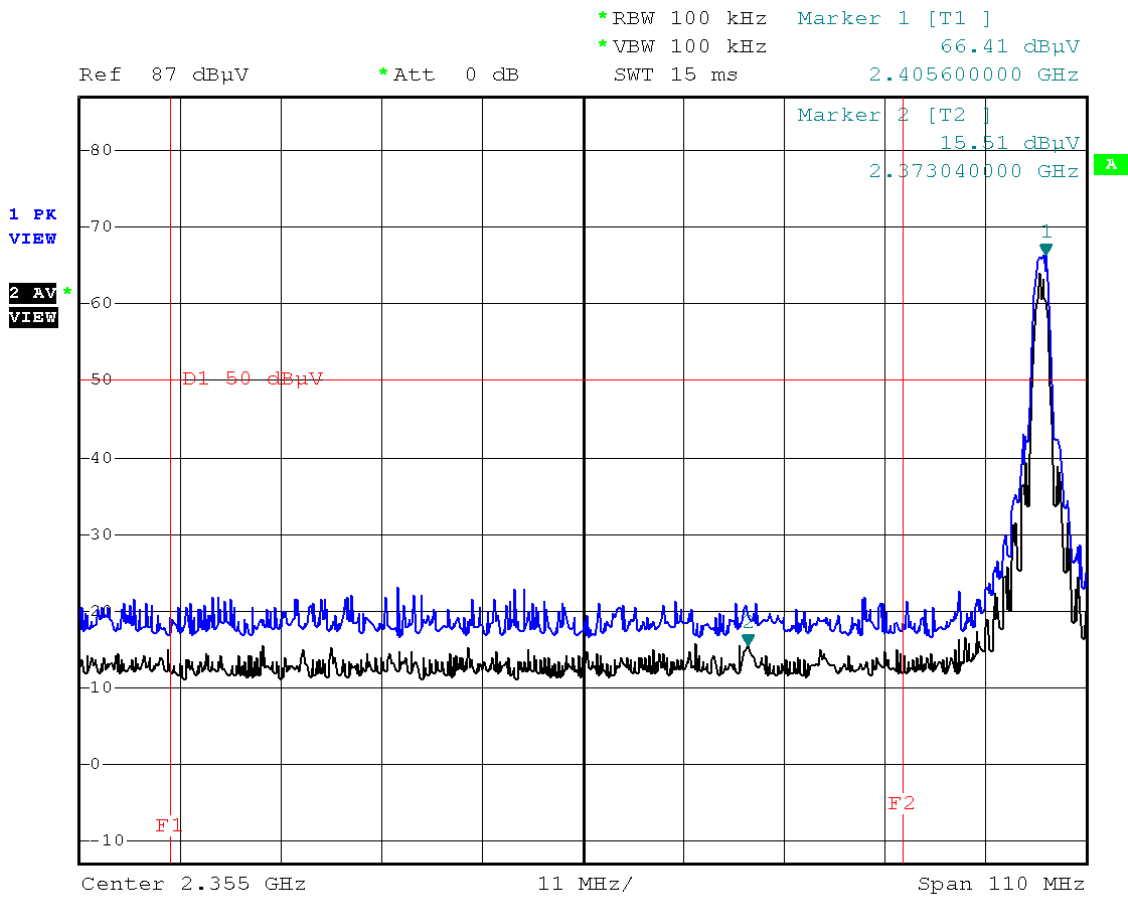


Date: 19.NOV.2015 14:23:42

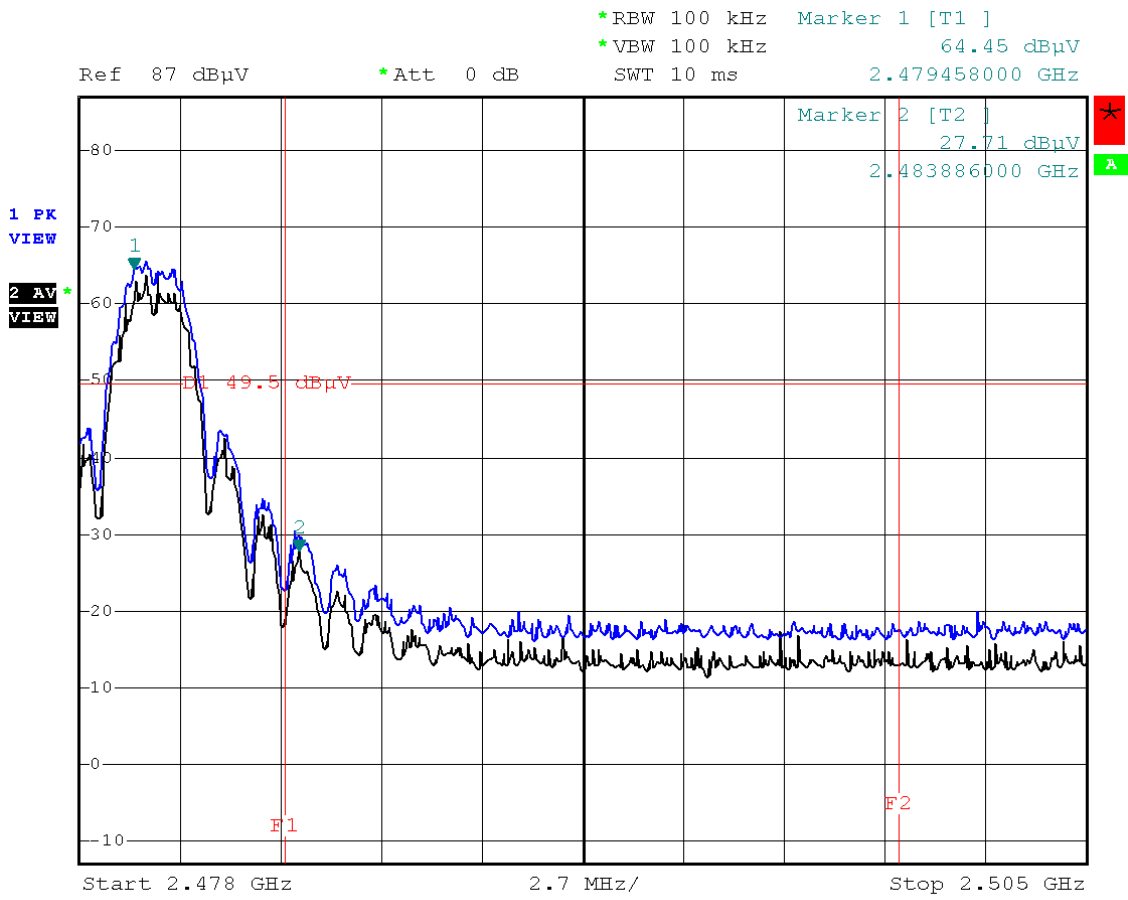
# ANNEX 5

## *BAND EDGE*





Date: 27.MAY.2015 16:04:11



Date: 27.MAY.2015 16:49:56

# ANNEX 6

## *CALIBRATION DATES*

N° EMITECH	LAST CALIBRATION	CALIBRATION DUE DATE
10517	18/09/2014	18/09/2016
0549	15/10/2012	15/10/2015
5647	25/02/2013	25/02/2017
2881	24/05/2014	24/05/2016
11136	10/03/2014	10/03/2016
7405	06/01/2014	06/01/2016
5175	23/06/2014	23/06/2016
3374	08/02/2012	08/02/2016
1045	21/03/2015	21/03/2019
11132	10/03/2014	10/03/2016
11133	10/03/2014	10/03/2016
11172	28/03/2014	28/03/2016
4211	27/01/2015	27/01/2017
0019	19/11/2013	19/11/2015
0491	19/11/2013	19/11/2015
1061	22/11/2014	22/12/2016
0326	09/04/2014	09/04/2016