

RC-032-GTC-14-100758-2-A

"This report cancels and replaces the test report N° RC-032-GTC-14-100758-2-A Edition 0"

E.M.C Test Report

According to the standards:

FCC 47 CFR PART 15 : 2014
RSS-210 Issue 8 : 2010
RSS-Gen Issue 3 : 2010

Equipment under test:

Locating tag with Bluetooth 4.0
Wistiki
FCC ID: 2AEBRWISTIKI-V1

Company:

WISTIKI S.A.S

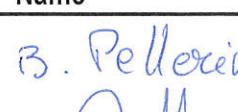
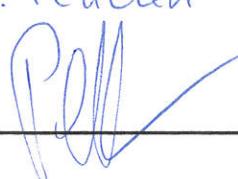
FCC accredited: FR0004

IC listed: 4379

DISTRIBUTION: Mr. LUSSATO

(Company: WISTIKI S.A.S)

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Ed.	Date	Modified pages	Written by		Technical Verification and Quality Approval	
			Name	Visa	Name	Visa
1	19/05/15	1 and 2	F. LHEUREUX 		 	

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TEST CERTIFICATION FOR: FCC Certification

NAME OF THE EQUIPMENT UNDER TEST: Locating tag with Bluetooth 4.0 Wistiki

Serial number: Wistiki 27340066761

NAME OF THE MANUFACTURER: BMS CIRCUITS

ADDRESS OF THE APPLICANT:

Company: WISTIKI S.A.S.

Address: 8 rue du Faubourg Poissonnière
75010 PARIS
FRANCE

Person in charge: Mr. LUSSATO

DATES OF TESTS: From 15th to 16th September 2014

TESTS LOCATIONS: EMITECH Laboratory in Montigny - le- Bretonneux (78) - France

TESTS OPERATOR: F. LHEUREUX

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ANNEX 5: BAND EDGE

ANNEX 6: CALIBRATION DATE

1. INTRODUCTION

This document presents the results of Electromagnetic Compatibility tests performed on the equipment «Locating tag with Bluetooth 4.0 Wistiki» according to reference document listed below.

2. REFERENCE DOCUMENT

FCC 47 CFR Part 15: 2014

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

ANSI C63.4: 2003

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

RSS-210 Issue 8: 2010

Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

RSS-Gen Issue 3: 2010

General Requirements and Information for the Certification of Radio Apparatus

3. PRODUCT DESCRIPTION

Locating a tag powered by a 3 Vdc battery CR2032 and is presented in a plastic housing.

Locating tag with
Bluetooth 4.0 Wistiki

E.U.T.

Operating frequency range: From 2402 MHz to 2480 MHz

Number of channels: 40

Channel spacing: 2 MHz

Power source: 3.0 Vdc

Firmware application: -

Power level, frequency range and channels characteristics are not user adjustable.
The details pictures of the product and the circuit boards are joined with this file.

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 47 CFR 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				
15.111	Antenna power conduction limits for receivers			X		

Subpart C of the standard FCC 47 CFR part 15 – Intentional radiators

Test procedure	Designation of test	Test results				Comments
		Pass	Fail	N.A.	N.P.	
15.203	Antenna requirement	X				
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				
15.212	Modular transmitters			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		

	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		X		
	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				Apply by manufacturer
	h) to avoid hopping on occupied channels				Apply by manufacturer
	i) RF exposure compliance		X		

N.A.: Not Applicable

N.P.: Not Performed

Standard RSS-210 Issue 8 : 2010

Designation of test	Test results				Comments
	Pass	Fail	N.A.	N.P.	
1. Scope					
2. General Certification Requirements and Specifications					
2.1 RSS-gen compliance			X		See RSS-Gen
2.2 Emissions Falling Within Restricted Frequency Bands			X		See RSS-Gen
2.3 Receivers			X		See RSS-Gen
2.4 Cordless Telephones (General Conditions)			X		See CS-03
2.5 General Field Strength Limits			X		See RSS-Gen
Annex 8 – Frequency Hopping and Digital Modulation Systems Operating in the Bands 902-928, 2400-2483.5 and 5725-5850 MHz					
A8.1 Frequency Hopping Systems					
a) -20 dB emission bandwidth and system RF bandwidth	X				
b) channel carrier frequencies separation	X				
c) 902-928 MHz frequency hopping systems			X		
d) 2400-2483.5 MHz frequency hopping systems	X				
A8.2 Digital Modulation Systems					
a) -6 dB bandwidth			X		
b) transmitter power spectral density			X		
A8.3 Hybrid systems			X		
A8.4 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		
A8.5 Out-of-band Emissions	X				

Standard RSS-Gen Issue 3 : 2010

Designation of test	Test results				Comments
	Pass	Fail	N.A.	N.P.	
1. Scope					
2. General Information					
2.1 Categories of radio Equipment	X				Category I II radio Equipment
2.2 Receivers	X				Category I II Receiver
2.3 Licence-exempt Radio Apparatus	X				See §7
2.4 Licensing of Radio Apparatus			X		
3. Equipment Certification of Radio Apparatus					
3.1 Application for equipment Certification			X		See RSP-100
3.2 Modular Approval			X		Note 1
3.3 Connection with the Public Switched Network			X		See CS-03 The device must be registered in accordance with DC-01.
4. Measurement Methods					
4.1 Methods, Instrumentation and Facilities for the Measurement of RF Signals and Noise Emitted from Radio Apparatus			X		See ANSI C63.4
4.2 Open Area Test Site and Alternative Site Registration	X				Emitech OATS registration number: 4379A/B/C
4.3 Compliance Testing and Reporting	X				
4.4 CISPR Quasi-peak Detector	X				
4.5 Pulsed Operation			X		
4.6 Bandwidth	X				
4.7 Transmitter Frequency Stability	X				See §7
4.8 Transmitter output Power	X				See §7
4.9 Transmitter Unwanted Emissions	X				See §7 ; Note 2
4.10 Receiver Spurious Emissions	X				See §6 ; Note 3
4.11 Near-field Measurement Method Below 30 MHz			X		
5. General Requirements					
5.1 Quality Control and Post-certification Investigation/Audits			X		Note 4
5.2 Equipment Certification Numbers and Labels			X		Note 5
5.3 required Notices to the User			X		Note 6
5.4 External Controls			X		Note 7
5.5 multiple Band Operation			X		Note 8
5.6 Exposure of Humans to RF Fields			X		See RSS-102
5.7 Radiocommunication Antenna Systems			X		See CPC-2-0-03
6. Receiver Spurious Emission Limits					
6.1 Radiated Limits	X				
6.2 Antenna Conducted Limits			X		

Designation of test	Test results				Comments
	Pass	Fail	N.A.	N.P.	
7. Licence-exempt Radio Apparatus					
7.1 General Informations					
7.1.1 External Amplifiers			X		
7.1.2 Transmitter Antenna			X		
7.1.3 User manual Notice			X		<i>User manual shall include the required statements</i>
7.1.4 Radio Apparatus Containing Digital Circuits			X		<i>See ICES-003</i>
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 10th harmonic of the highest fundamental frequency or 40 GHz, whichever is lower (F<10 GHz) or to the 5th 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 «Locating tag with bluetooth 4.0 Wistiki» submitted to the tests complies with the requirements of the standards:

- FCC 47 CFR PART 15: 2014
- RSS-210 Issue 8 : 2010
- RSS-Gen Issue 3 : 2010

according to the limits specified in this report.

5. TRANSMITTER OUTPUT POWER AND REQUIREMENT

Standards: FCC 47 CFR PART 15 : 2014
 RSS-210 Issue 8 : 2010
 RSS-Gen Issue 3 : 2010

Sections: 15.247 b) (1)
 Annex 8 ⇨ A8.4 (2) of RSS-210
 4.8 ⇨ of RSS-Gen

Test configuration:

The system is tested in test site normalized.

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	Nr 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
Receiver	Rohde & Schwarz	R&S FSU8	9129
Shielded enclosure	SIDT	C.4	0549

Equipment under test operating condition:

EUT is in continuous transmission mode.

Measure conditions:

Ambient temperature (°C): 22

Relative humidity (%): 50

Resolution bandwidth: 1 MHz

Results:

Power source: 3 Vdc

(2402.00 MHz)

Polarization of test antenna: Horizontal (height: 185 cm)

Position of equipment: Az: 170°

	Electro-magnetic field (dB μ V/m):	P* (mW)	Limit (mW)
Normal test conditions	100.5	3.0300	125.0

(2440.00 MHz)

Polarization of test antenna: Horizontal (height: 115 cm)

Position of equipment: Az: 153°

	Electro-magnetic field (dB μ V/m):	P* (mW)	Limit (mW)
Normal test conditions	98.9	2.9344	125.0

(2480.00 MHz)

Polarization of test antenna: Horizontal (height: 110 cm)

Position of equipment: Az: 153°

	Electro-magnetic field (dB μ V/m):	P* (mW)	Limit (mW)
Normal test conditions	98.4	2.9048	125.0

* P = (FS×d)² / (30×G) with d = 3 m, G = 1 and FS = V/m

Test conclusion: Complies with the requirements of the standards.

6. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSIONS LIMITATION

Standard: FCC 47 CFR PART 15 : 2014

Section: 15.215 (b) and 15.247 (d)

Instrumentation test list:

CATEGORY	BRAND	TYPE	Nr EMITECH
Shielded enclosure	SIDT	C.4	549
Pressure transducer	TRANSINTRUMENTS	4600B	1105
Preamplifier	MITEQ	HF	3229
Antenna	Emco	Cornet 3115	3374
Antenna	SCHAFFNER	Bilog CBL6143A	5647
Preamplifier	Mini-Circuits	RF	6368
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

Equipment under test arrangement:

The system is tested in test site normalized.

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.

Frequency range: from 30 MHz to harmonic 5 (highest frequency used = 2480 MHz).

Bandwidth: 120 kHz (F<1 GHz)
1 MHz (F>1 GHz)

Detection mode: Quasi-peak ($F < 1$ GHz)
Average ($F > 1$ GHz)

Distance of antenna: 3 meters.

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal, only the highest level is recorded.

Operating mode during the test:

The E.U.T. is blocked in standby / reception mode.

Results:

Ambient temperature (°C): 22
Relative humidity (%): 50

Power source: 3 Vdc

No frequencies are observed between 30 MHz to 13 GHz for both polarizations

Test conclusion: Complies with the requirements of the standard.

7. 20 dB BANDWIDTH AND BAND-EDGE COMPLIANCE

Standards: FCC 47 CFR PART 15 : 2014
 RSS-Gen Issue 3 : 2010

Sections: 15.215 (c) and 15.247 (d)
 4.6 of RSS-Gen

Instrumentation test list:

CATEGORY	BRAND	TYPE	Nr 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
Receiver	Rohde & Schwarz	R&S FSU8	9129
Shielded enclosure	SIDT	C.4	0549

Equipment under test arrangement:

The system is tested in test site normalized.

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

Operating mode during the test:

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

Results :

Lowest frequency limit: From 2310 MHz to 2390 MHz

Upper band edge: From 2483.5 MHz to 2500 MHz

Polarization of test antenna: Horizontal (height = 185 cm) } For 2402 MHz
 Position of equipment: azimuth = 170°

Polarization of test antenna: Horizontal (height = 110 cm) } For 2480 MHz
 Position of equipment: azimuth = 153°

Fundamental frequency (MHz)	Field Strength Level of fundamental (dB μ V/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) *	Calculated Max Out of Band Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
2402.00	97.5	Peak	2373.16	- 52.5	45.0	54.0	9.0
2480.00	94.8	Peak	2483.79	- 41.4	53.5	54.0	0.5
2480.00	94.8	Average	2483.79	-46.8	47.7	54.0	6.3

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

20 dB bandwidth curves are given in annex 4; band-edge curves are given in annex 5.

8. UNINTENTIONAL RADIATED EMISSIONS AND TRANSMITTER UNWANTED EMISSION IN THE BAND 9 KHz – 24 GHz

Standards: FCC 47 CFR PART 15 : 2014

RSS-Gen Issue 3 : 2010

Sections: 15.205; 15.209 and 15.247
4.9 of RSS-Gen

Equipment under test arrangement:

The system is tested in test site normalized.

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.

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

Frequency range: 9 kHz – 30 MHz
30 MHz - 1 GHz
1 GHz – 24 GHz

Detection mode: Quasi-peak for 9 kHz – 30 MHz
Quasi-peak for 30 MHz - 1 GHz
Average for 1 GHz – 24 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 – 24 GHz

Measurement distance: 30 meters from 9 kHz to 30 MHz
3 meters from 30 MHz to 24 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 in § 15.247 (see table).

From 9 kHz to 30 MHz

Frequency range	Limit µV/m
9 – 490 kHz	2400/F (F in kHz) *
490 – 1705 kHz	24000/F (F in kHz)
1.705 – 30 MHz	30

* Limits in µV/m can be extrapolated to 30 m using 20 dB / decade.

From 30 MHz to 24 GHz

Frequency range (MHz)	Limit (dBµV/m)	Limit µV/m
30 to 88	40.0	100
88 to 216	43.5	150
216 to 960	46.0	200
Above 960	54.0	500

- Limit for field strength of harmonic: 54 dBµV/m (500 µV/m)

Instrumentation test list:

CATEGORY	BRAND	TYPE	Nr EMITECH
1 input Power meter	Agilent Technologies	Agilent E7405A	2205
Antenna	Oritel	Cornet CM 42-25	1045
Antenna	Emco	Cornet 3115	3374
Antenna	EMCO	Cadre EMCO 6507	4211
Antenna	SCHAFFNER	Bilog CBL6143A	5647
Antenna mast	Maturo	MCU	8410
Antenna mast	Maturo	AM 4.0-O	8411
Cable	Câbles & Connectiques	N-13m	2452
Cable	-	N-2m	2805
Cable	-	N-30m	4359
Cable	C&C	K	11132
Cable	C&C	K	11133
Cable	C&C	N-10m	11136
Cable	C&C	N-6m	11172
Cable	C&C	N-2m	11177
Open area test site	Emitech	Site champ libre	0187
Preamplifier	MITEQ	HF	3229
Preamplifier	Mini-Circuits	RF	6368
Shielded enclosure	SIDT	C.4	549

Results:

Ambient temperature (°C): 22
 Relative humidity (%): 55

Power source: 3 Vdc

No frequencies are observed between 9 kHz to 24 GHz for both polarizations

Test conclusion:

The equipment complies with the requirements of the standards FCC and RSS-Gen.

9. RECEIVER SPURIOUS EMISSIONS

Standard: RSS-Gen Issue 3 : 2010

Section: 4.10 of RSS-Gen

Equipment under test arrangement:

The system is tested in test site normalized.

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.

The E.U.T. is blocked in standby / reception mode.

Frequency range: 30 MHz - 1 GHz
1 GHz – 24 GHz

Detection mode: Quasi-peak for 30 MHz - 1 GHz
Average for 1 GHz – 24 GHz

Resolution bandwidth: 120 kHz for 30 MHz - 1 GHz
1 MHz for 1 GHz – 24 GHz

Measurement distance: 3 meters from 30 MHz to 24 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 in § 15.247 (see table).

Frequency range (MHz)	Limit	
	(dB μ V/m)	μ 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

- Limit for field strength of harmonic: 54 dB μ V/m (500 μ V/m)

Instrumentation test list:

CATEGORY	BRAND	TYPE	Nr EMITECH
Antenna	Oritel	Cornet CM 42-25	1045
Antenna	Emco	Cornet 3115	3374
Antenna	SCHAFFNER	Bilog CBL6143A	5647
Cable	C&C	K	11132
Cable	C&C	K	11133
Cable	C&C	N-10m	11136
Cable	C&C	N-6m	11172
Cable	C&C	N-2m	11177
Shielded enclosure	SIDT	C.4	0549
Antenna mast	Maturo	MCU	8410
Antenna mast	Maturo	AM 4.0-O	8411
Preamplifier	MITEQ	HF	3229
Preamplifier	Mini-Circuits	RF	6368
1 input Power meter	Agilent Technologies	Agilent E7405A	2205

Results:

Ambient temperature (°C): 22
 Relative humidity (%): 55

Power source: 3 Vdc

No frequencies are observed between 30 MHz to 24 GHz for both polarizations.

Test conclusion:

The equipment complies with the requirements of the standard RSS-Gen.

10. TRANSMITTER FREQUENCY STABILITY

Standard: RSS-Gen Issue 3 : 2010

Section: 4.7 of RSS-Gen

Equipment under test arrangement:

Test realized in near field. All field strength measurements are correlated with the intentional radiated emissions.

Operating mode during the test:

The E.U.T. is blocked in continuous transmission without modulation.

Instrumentation test list:

CATEGORY	BRAND	TYPE	Nr EMITECH
Antenna	Emco	Cornet 3115	3374
Cable	Câbles & Connectiques	N-2m	2451
Climatic enclosure	Flonic Schlumberger	200P	2694
Filter	BL Microwave	passe bande	5624
Power supply	TTi	30V - 2A	4361
Receiver	Rohde & Schwarz	R&S ESU8	9403

Results:

F = 2402 MHz

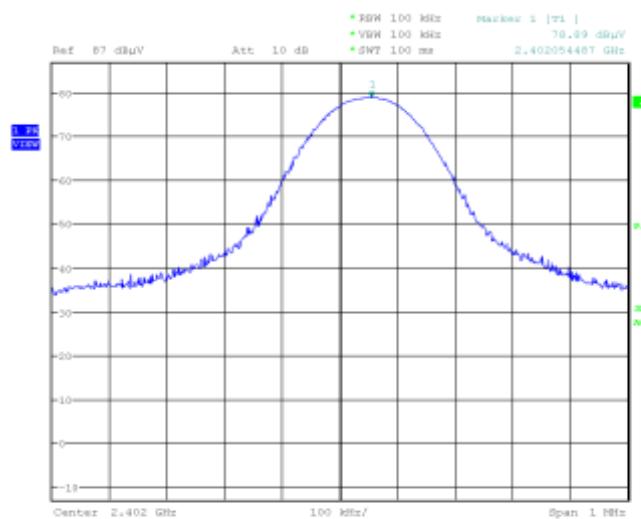
			F (MHz)	Deviation (kHz)	Curve	Limit
Normal test conditions	Nominal power source (3.00 V)	Temperature (+20°C) Humidity (50%)	2402.0545	-	01	2400 MHz to 2483.5 MHz
Extreme test conditions	Minimal temperature (-30°C)	Nominal power source (3.00 V)	2402.0320		02	
	Maximal temperature (+50°C)		2402.0512		03	

F = 2480 MHz

			F (MHz)	Deviation (kHz)	Curve	Limit
Normal test conditions	Nominal power source (3.00 V)	Temperature (+20°C) Humidity (50%)	2480.0513	-	04	2400 MHz to 2483.5 MHz
Extreme test conditions	Minimal temperature (-30°C)	Nominal power source (3.00 V)	2480.0400		05	
	Maximal temperature (+50°C)		2480.0496		06	

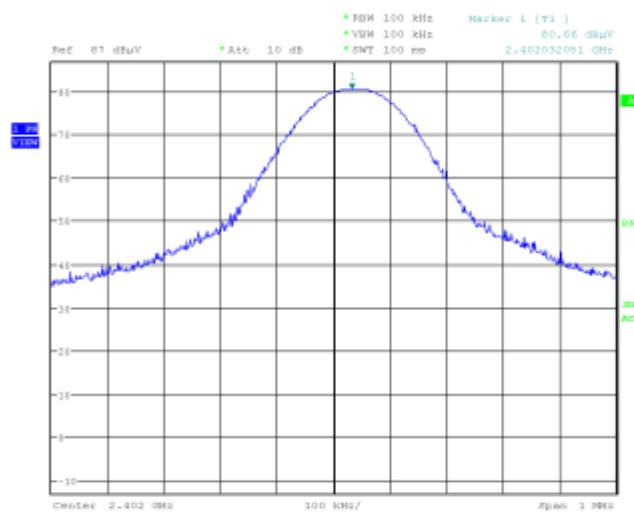
Curve:

01



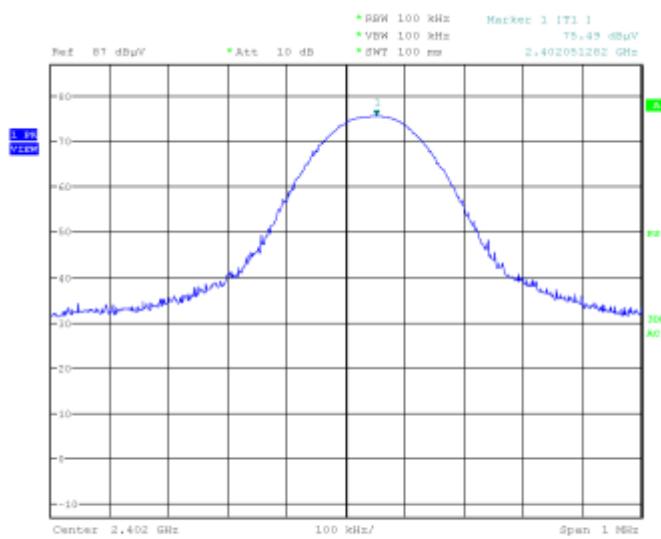
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02



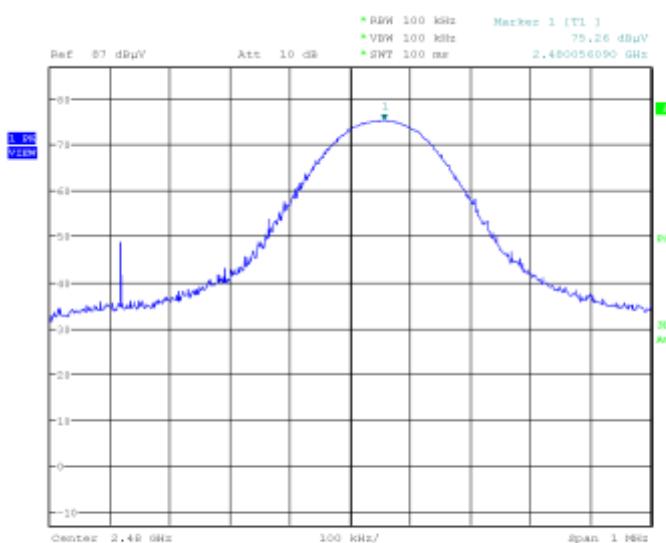
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03



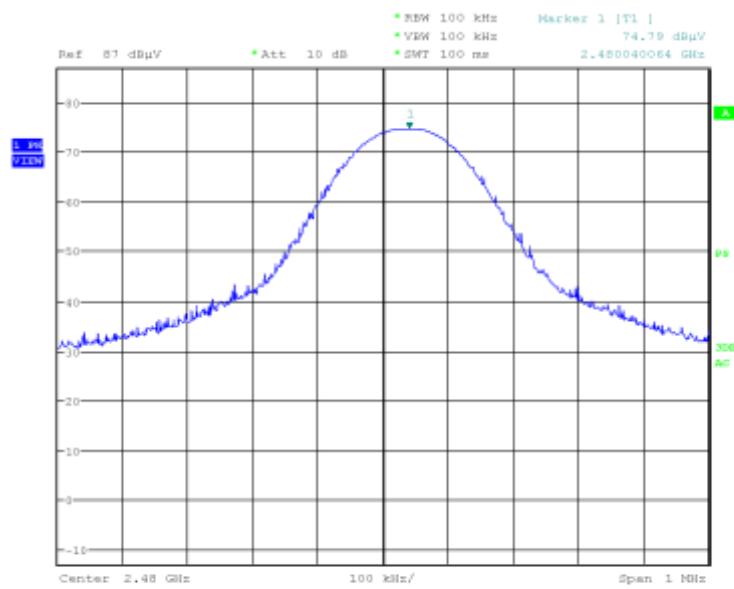
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04



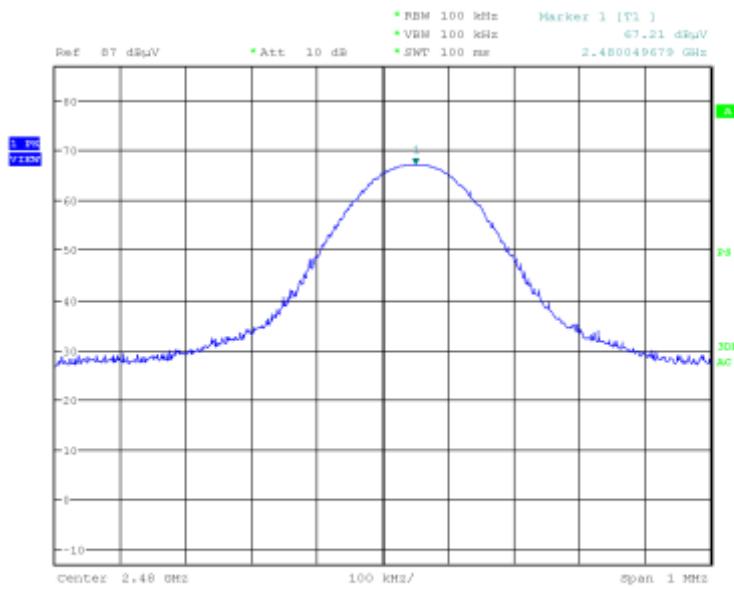
Date: 8.SEP.2003 21:23:00

05



Date: 8.SEP.2003 22:29:39

06



Date: 8.SEP.2003 23:16:06

Test conclusion: Standard respected

« □□□ 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 1000 MHz is the bilog antenna n°5647. Antenna factors are given in table 2.

The measuring receiver n°1216 used in the frequency range 30 MHz to 1 GHz has an integrated preamplifier.

The spectrum analyzer n°2205 is used in the frequency range 1 GHz to 24 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 4.

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 24 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 24 GHz to connect the horn antenna to the amplifier for measurements at a distance of 3 meters has losses given in table 8.

Frequency (MHz)	Antenna factor (dB/m)	Frequency (MHz)	Antenna factor (dB/m)
0.009	-22.0	0.8	-34.7
0.01	-23.2	1	-34.7
0.015	-26.0	1.5	-34.9
0.02	-27.9	2	-34.9
0.03	-30.3	3	-35.0
0.05	-32.6	5	-35.0
0.08	-34.0	8	-35.0
0.1	-34.4	10	-35.0
0.15	-34.8	15	-35.0
0.2	-35.0	20	-35.3
0.3	-35.1	25	-35.6
0.5	-35.0	30	-36.3

TABLE 1 : ACTIVE LOOP ANTENNA

Frequency (MHz)	Antenna factor (dB/m)	Frequency (MHz)	Antenna factor (dB/m)
30	23.5	160	10.8
35	20.5	180	10.3
40	17.9	200	11.6
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	-	-

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	0.0	9.000	0.6
0.500	0.1	10.00	0.6
1.000	0.2	15.00	0.7
2.000	0.2	20.00	0.8
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	0.6	250	1.9
40	0.7	300	2.1
50	0.9	400	2.5
60	0.9	500	2.7
70	1.0	600	3.0
80	1.1	700	3.2
90	1.2	800	3.5
100	1.2	900	3.7
150	1.5	1000	3.8
200	1.7	-	-

TABLE 4 : 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	8.0	36.6
1.5	25.0	8.5	37.0
2.0	27.5	9.0	37.1
2.5	28.8	9.5	37.2
3.0	29.8	10.0	37.6
3.5	31.2	12.0	38.8
4.0	32.5	14.0	40.1
4.5	32.5	16.0	39.3
5.0	33.5	18.0	46.3
5.5	34.1	-	-
6.0	34.1	-	-
6.5	34.4	-	-
7.0	35.4	-	-
7.5	36.6	-	-

TABLE 5 : HORN ANTENNA 1 GHz to 18 GHz

Frequency (GHz)	Antenna factor (dB/m)	Frequency (GHz)	Antenna factor (dB/m)
18.0	31.5	-	-
19.0	31.9	-	-
20.0	32.2	-	-
21.0	32.5	-	-
22.0	32.4	-	-
23.0	33.2	-	-
24.0	33.2	-	-

TABLE 6 : HORN ANTENNA 18 GHz to 24 GHz

Frequency (GHz)	Gain value (dB)	Frequency (GHz)	Gain value (dB)
1.0	33.4	9.0	31.8
1.5	33.7	9.5	31.1
2.0	33.9	10.0	30.5
2.5	34.0	12.0	32.4
3.0	33.9	14.0	31.6
4.0	34.3	16.0	33.5
5.0	35.2	18.0	34.3
6.0	34.7	20.0	32.9
7.0	34.0	22.0	34.3
8.0	33.7	24.0	34.4

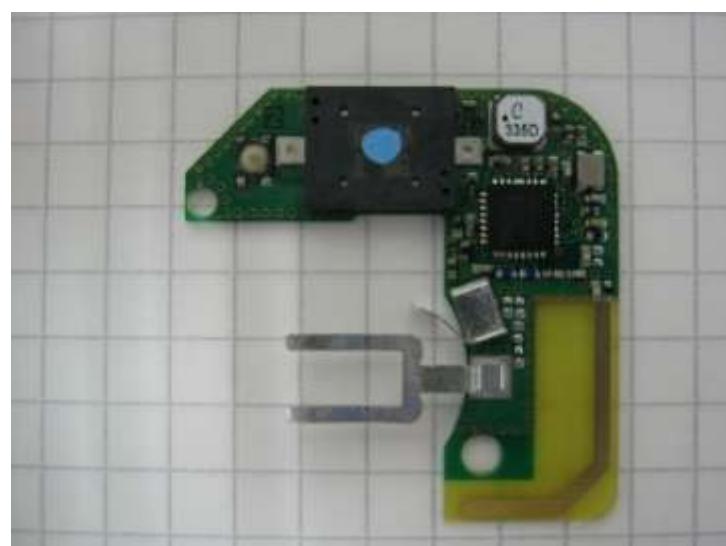
TABLE 7 : AMPLIFIER GAIN VALUE 1 GHz to 26 GHz

Frequency (GHz)	loss (dB)	Frequency (GHz)	loss (dB)
1.0	3.2	8.0	9.3
1.5	4.0	10.0	10.5
2.0	4.6	12.0	11.8
2.5	5.2	14.0	12.4
3.0	5.7	16.0	13.4
3.5	6.2	18.0	14.5
4.5	7.0	20.0	15.4
5.0	7.3	22.0	16.3
6.0	7.9	24.0	16.9

TABLE 8: TEST CABLE FOR 3M MEASUREMENT INTO 1 TO 24 GHz

ANNEX 2

External photographs





ANNEX 3

Test setup photographs

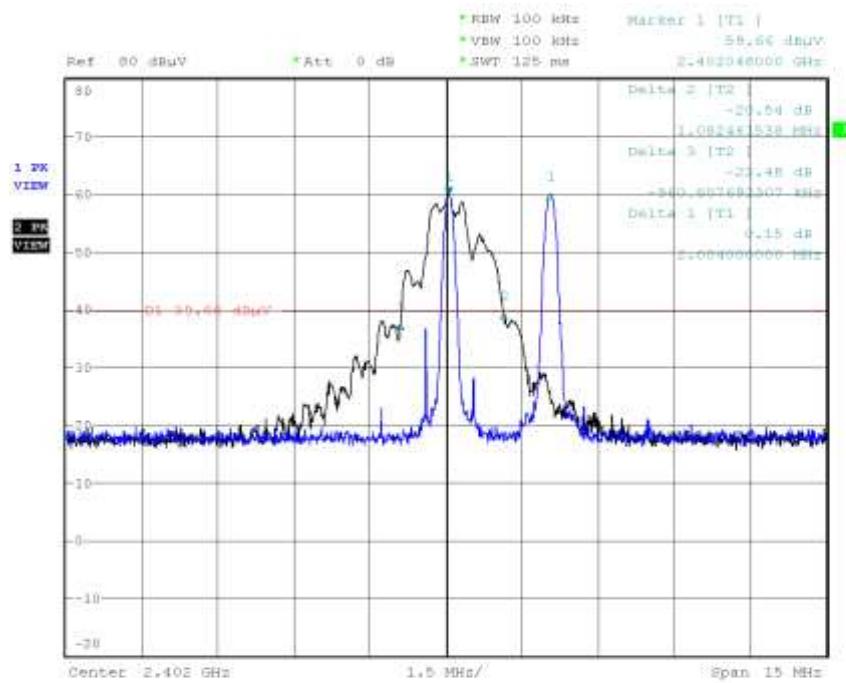




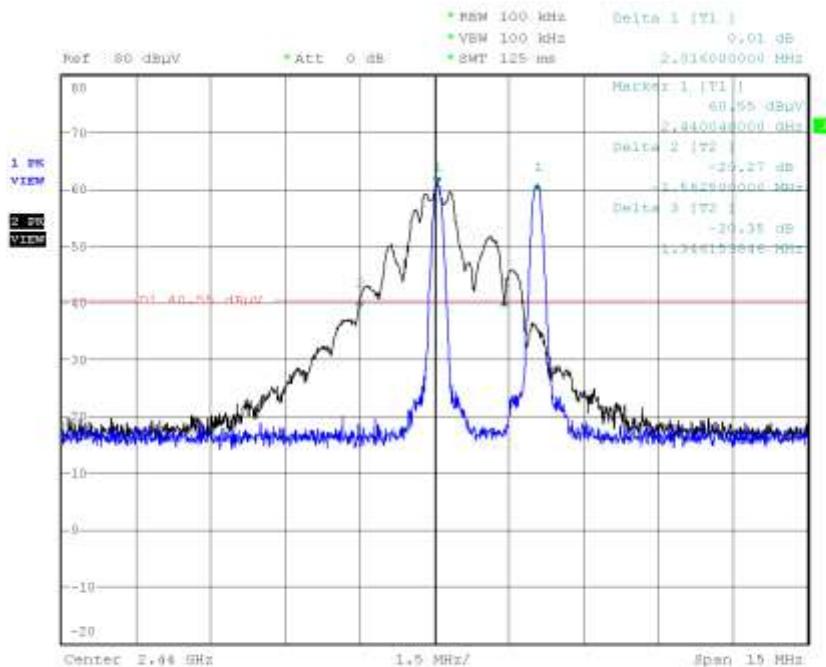


ANNEX 4

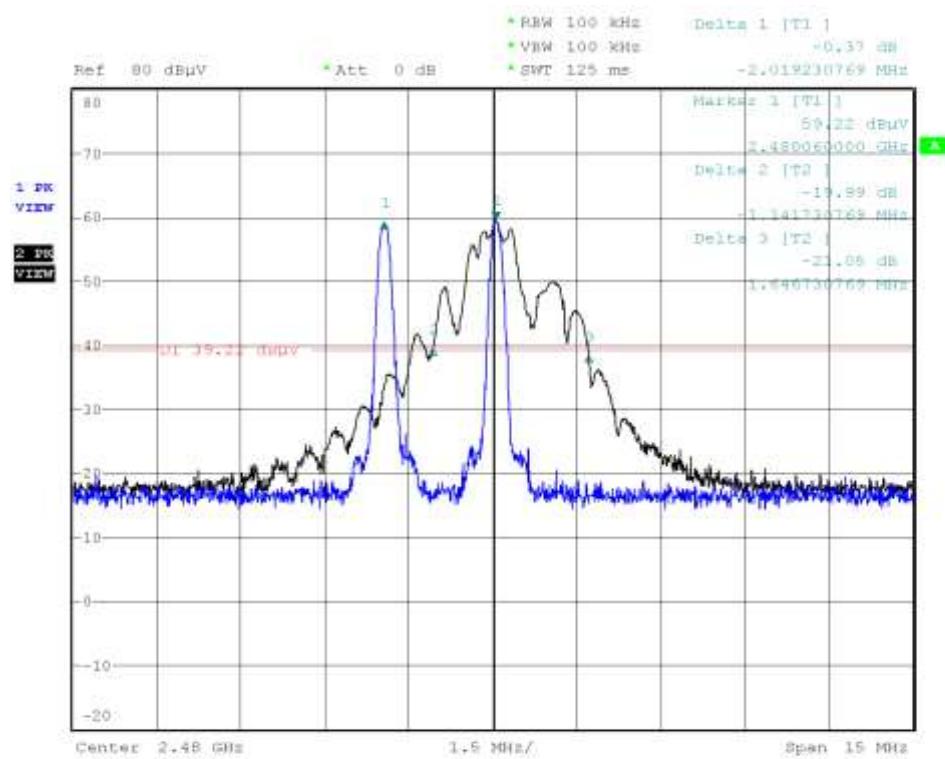
20 dB bandwidth



Date: 15.SEP.2014 16:44:08



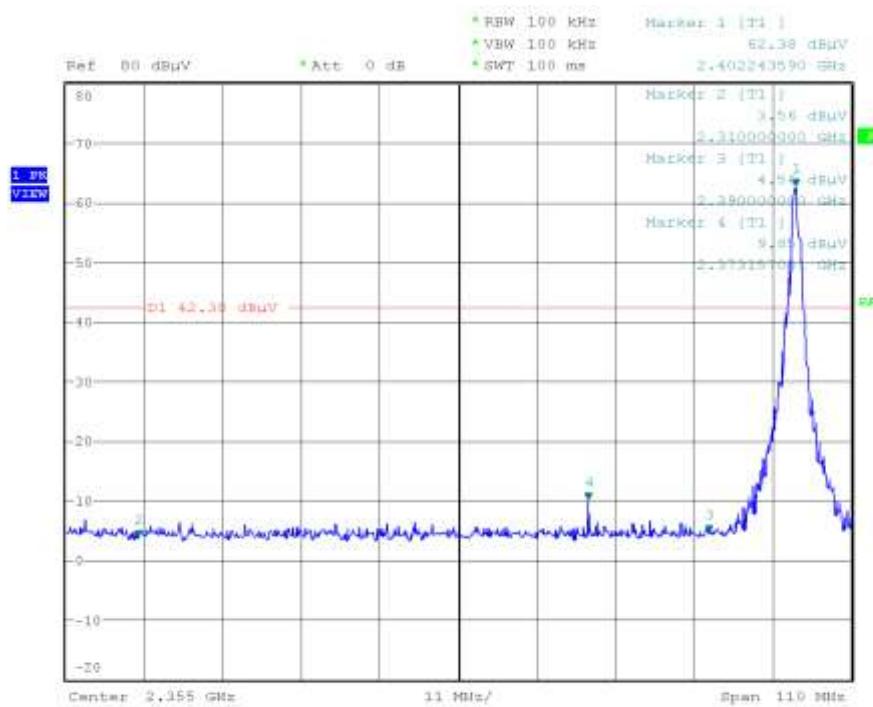
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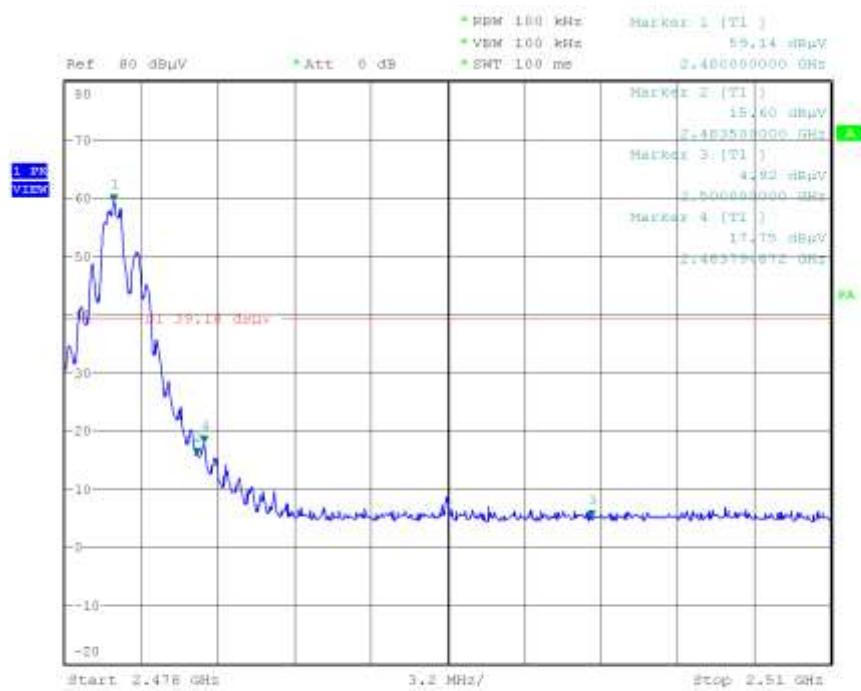
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ANNEX 5

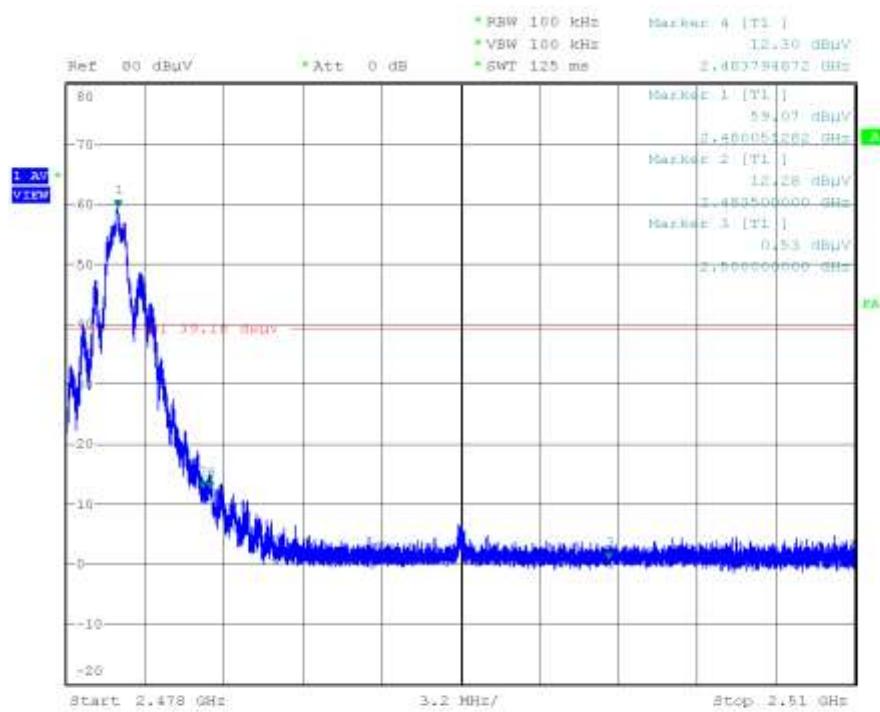
Band Edge



Date: 15.SEP.2014 14:18:06



Date: 15.SEP.2014 14:28:31



Date: 15.08.2014 14:38:38

ANNEX 6

Calibration dates

N° EMITECH	LAST CALIBRATION	CALIBRATION DUE DATE
0549	15/10/2012	15/10/2015
0187	15/03/2013	15/03/2016
5647	25/02/2013	25/02/2017
2452	24/10/2012	24/10/2014
2805	01/08/2013	01/08/2015
1045	13/12/2010	13/12/2014
11172	28/03/2014	28/03/2016
3374	08/02/2012	08/04/2016
11136	10/03/2014	10/03/2016
11177	06/08/2012	06/10/2014
1216	23/04/2014	23/04/2016
9129	23/04/2014	23/04/2016
11132	10/03/2014	10/03/2016
11133	10/03/2014	10/03/2016
4211	22/03/2013	22/03/2015
4359	27/06/2014	27/06/2016
2205	12/06/2013	12/06/2015