



CE-Mesures

Rapport d'essais / Test Report

N° : 20721-FCC-1

Page 1 / 33

SMEE

ZI des Blanchisseries – Rue de Taille

38500 VOIRON - France

Tél. 04 76 65 76 50 - FAX. 04 76 66 18 30

Email: labo@smee.fr – Web: www.smee.fr

FCC Registration Number: 0020356952 (FRN) Test Firm Registration Number: 171131

IC Company Number: 9545A

Matériel testé :
Equipment under test:

MUZIK Smart On Ear (Wireless headphones) / MZHP1

Constructeur:

Muzik LLC

Manufacturer:

404 Washington Ave. #700
Miami Beach, FL 33139 – USA

Rapport délivré à :

Muzik LLC

Issued to:

404 Washington Ave. #700
Miami Beach, FL 33139 – USA

Référence de la proposition :

092013-20721

Proposal number:

Date de l'essai :

September 4th to 6th, 2013

Date of test:

Objectif des essais :

Qualification FCC suivant les normes :

Test purpose:

FCC qualification according to standards:

CFR 47, Part 15 B, (Digital device) / Part 15 C (Chapter 15.247)

Industry Canada RSS-210, Iss 8 / RSS-GEN, Issue 3

Lieu du test:

SMEE CE-Mesures

Test location:

38 VOIRON - France

FCC ID :

2AASDMZHP1

IC :

11314A-MZHP1

Test réalisé par :

Jérémie BLANCHER

Test realized by:

Conclusion :

L'équipement satisfait aux prescriptions des normes citées en référence.

Conclusion:

The appliance complies with requirements of above mentioned standards.

Ed.	Date	Modifications / Pages	Written by: Visa	Approved by: Visa
1	October 24 th , 2013	Initial Edition	Jérémie Blancher	Laurent Chapus

La copie de ce document n'est permise que sous sa forme intégrale. Ce document est le résultat d'essais effectués sur un échantillon. Il ne préjuge pas de la conformité de l'ensemble des produits fabriqués à l'objet essayé.

This document shall not be reproduced, except in full. This document contains results related only to the item tested. It does not imply the conformity of the whole production to the item tested.



Rapport d'essais / Test Report

N° : 20721-FCC-1

SUMMARY

1. TEST PROGRAM.....	3
2. EQUIPMENT UNDER TEST (EUT)	5
3. TEST CONDITIONS.....	5
4. MODIFICATIONS OF THE EQUIPMENT UNDER TEST.....	5
5. CONDUCTED EMISSION MEASUREMENT	6
6. RADIATED EMISSION MEASUREMENT (UNINTENTIONAL RADIATION).....	10
7. MAXIMUM PEAK CONDUCTED OUTPUT POWER	18
8. CHANNEL SEPARATION.....	20
9. NUMBER OF HOPPING CHANNELS.....	24
10. TIME OF OCCUPANCY (DWELL TIME)	25
11. OUT-OF-BAND EMISSION / BAND EDGE COMPLIANCE	27
12. OCCUPIED BANDWIDTH (99%).....	32



Rapport d'essais / Test Report

N° : 20721-FCC-1

1. Test program

• References

FCC CFR 47, PART 15, Subpart B and C

ANSI C63.4 (2009). American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

Chapter 15.247 of Subpart C (Operation within the band 2400-2483.5 MHz). Digitally modulated radiators.

FCC Guidance "Measurement of Digital Transmission Systems operating under Section 15.247".

Industry Canada RSS-GEN (Issue 3/2010) - General Requirements and Information for the Certification of Radio Apparatus

Industry Canada RSS-210 (Issue 8/2010) - Licence-exempt Radio Apparatus (All Frequency Bands). Category I Equipment.

• Test Results

TEST	Paragraph number (FCC Part 15.247) / IC RSS-210	Spec. (FCC Part 15.247) / IC RSS-210	RESULTS (comments)
Conducted emissions test	15.107 / 15.207 (a)	Table 15.207 (a)	PASS
Unintentional radiations	15.109 / 15.209 15.247 (d) / 15.205 RSS-Gen 4.10	Measure at 300m 9-490kHz: 2400 μ V/m/F(kHz) Measure at 30m 0.490-1.705: 24000 μ V/m/F(kHz) 1.705-30MHz: 30 μ V/m Measure at 3m 30MHz-88MHz : 40 dB μ V/m 88MHz-216MHz : 43.5 dB μ V/m 216MHz-960MHz : 46.0 dB μ V/m Above 960MHz : 54.0 dB μ V/m	PASS
Hopping channel separation	15.247 (a) (1) / RSS-210 A8.1 (b)	Minimum separation 25kHz or the two-third 20dB bandwidth whichever is greater	PASS
Number of hopping frequencies	15.247 (a) (1) (iii) / RSS-210 A8.1 (d)	Minimum 15 channels used	PASS
Time of occupancy	15.247 (a) (1) (iii) / RSS-210 A8.1 (d)	Maximum 400ms per channel within 31.6s	PASS
Maximum Peak Output Power	15.247 (b) (1) (4) / RSS-210 A8.4 (2)	0.125W max / 21dBm (Conducted) 0.5W max / 27dBm (EIRP)	PASS
Spurious RF conducted / Band edge compliance	15.247 (d) / RSS-210 A8.5	-20dBc in any 100kHz outside frequency band.	PASS
Receiver spurious emission	RSS-Gen 4.10		PASS

PASS: EUT complies with standard's requirement

FAIL: EUT does not comply with standard's requirement

NA: Not Applicable

NP: Test Not Performed



Rapport d'essais / *Test Report*

N° : 20721-FCC-1

- **General conclusion:**

Measures and tests performed on the sample of the product MZHP1, in configuration and description presented in this test report, show compliance with standards FCC CFR 47, PART 15, Subpart B and C.

Measures and tests performed on the sample of the product MZHP1, in configuration and description presented in this test report, show compliance with standards Industry Canada RSS-Gen and RSS-210.



Rapport d'essais / Test Report

N° : 20721-FCC-1

2. Equipment Under Test (EUT)

Nom / Identification	MUZIK Smart On Ear (Wireless headphones) / MZHP1	Sn: Sample #1 Sn: Sample #2 Sn: Sample #3
Auxiliaires / Auxiliaries	Smart Cable (4 wires, 1.5m) Motorola XT890 (Android smartphone) USB charger PHIHONG PSM03A-050Q (100-240V 50-60Hz // 5V dc / 500mA)	
Entrées-Sorties / Input / Output	Câbles pour essai / Cables for test	Shielded
	DC input (5V/0.5A) Micro USB connector	Yes
	3.5mm INPUT JACK	No
Prévu pour >3m / Intended for >3m		
Version programme / Firmware version	N.C	
Alimentation / Power supply	3.7V from lithium-ion battery (Internal)	
Mode de fonctionnement / Running mode	The tested samples can be set in following modes: - Bluetooth transmit mode to a smartphone (Normal operation, sample #1) - Audio file listening on headphones with smart cable (Direct audio, sample #1) - Battery charging with 5VDC power adapter (Normal operation, sample #1) A special connection to sample #2 (radiated measurement) and sample #3 (conducted measurement) permits to set the EUT in following modes: - Transmit on selectable channel (low, mid, high) - Choice of modulation type, packet type, packet size - Output Tx power set at its maximum value (BlueTest 3 from CSR test program)	
Information sur l'équipement / Equipment information	- Frequency hopping from 2402 MHz to 2480 MHz - Antenna type: PIFA on PCB (Peak gain < 1dBi), single antenna - Modulations: GFSK (DH5) π/4DQPSK (2-DH5) 8DPSK (3-DH5) - Battery type Lithium-ion 3.7V-700mH - Bluetooth module BTM720 with CSR BlueCore5 - Low channel: 2402MHz / Mid channel: 2441MHz / High channel: 2480MHz	

3. Test conditions

Relative Humidity : 55%
Temperature : 21°C

Power supply voltage:
Equipment under test: 3V.7dc from battery (Fully charged)
110V/60Hz –AC mains for battering charging (Conducted emission)

4. Modifications of the equipment under test

No modification applied to the tested equipment during tests.



Rapport d'essais / Test Report

N° : 20721-FCC-1

5. Conducted Emission Measurement

TEST: Limits for conducted disturbance 150kHz – 30MHz (Clause 15.107 / 15.207)		Verdict		
Method: The LISN is placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane. This distance was between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment were at least 0,8 m from the AMN. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on lines were made at the output of the LISN. The LISN (measure) is 50Ω / 50µH. The EUT is 80cm above the ground reference plane and 40cm from the vertical ground plane. The AC power cable is 1m length.		Pass		
Laboratory Parameters:	Required prior to the test	During the test		
Ambient Temperature	10 to 40 °C	21°C		
Relative Humidity	10 to 90 %	55%		
Fully configured sample scanned over the following frequency range	Frequency range on each side of line 150kHz to 30MHz	Measurement Point AC input port (110V)		
Running mode	Battery charging : Wireless transmission & Wired direct audio			
Limits for AC power port				
Frequency (MHz)	Limit dB (µV)			
	Quasi-Peak	Result	Average	Result
0.15 – 0.50	66 à 56	Pass	56 à 46	Pass
0.50 – 5	56	Pass	46	Pass
5 – 30	60	Pass	50	Pass
Supplementary information: Test location: SMEE – CE Mesures / Test date: September 6 th , 2013 Power supply voltage: 110V / 60Hz				

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Attenuator	SMEE	ATT#1	ATT-101-004	2013/3	2014/3
Cable RF	Div	2m / BNC	CAB-101-005	2013/3	2014/3
LISN (50Ω / 50µH)	AFJ	LS16C	RSI-101-001	2013/3	2014/3
LISN (50Ω / 50µH)	AFJ	LS16C	RSI-101-002	2013/3	2014/3
Reference comb gen.	SMEE	EMC-250K	REF-111-001	-	-
Measuring receiver	Rohde & Schwarz	ESL3	REC-101-001	2012/6	2014/6



Rapport d'essais / Test Report

N° : 20721-FCC-1

Tabulated Results for Mains Terminal Disturbance Voltage on AC port (Wireless mode)								
FREQ (MHz)	Meas. PK (dB μ V)	Mes. QP (dB μ V)	LIMIT QP (dB μ V)	Margin QP (dB)	Mes. AV (dB μ V)	LIMIT AV (dB μ V)	Margin AV (dB)	Line
9.330	42.3	27.8	60.0	-32.2	19.9	50.0	-30.1	L1
22.950	34.5	23.0	60.0	-37.0	16.7	50.0	-33.3	L1
0.166	46.7	39.6	65.2	-25.5	26.8	55.2	-28.4	Neutral
0.454	41.0	34.9	56.8	-21.9	26.8	46.8	-20.0	Neutral
9.354	42.6	35.9	60.0	-24.1	26.1	50.0	-23.9	Neutral

Frequency band investigated: 150kHz-30MHz

RBW: 9kHz

Voltage: 110V / 60Hz

Limit: 15.207 a)

Final measurement detector: Quasi-Peak and Average

Wide Measurement Uncertainty: $\pm 5\text{dB}$ ($k=2$)

Tabulated Results for Mains Terminal Disturbance Voltage on AC port (Audio mode with smart cable)								
FREQ (MHz)	Meas. PK (dB μ V)	Mes. QP (dB μ V)	LIMIT QP (dB μ V)	Margin QP (dB)	Mes. AV (dB μ V)	LIMIT AV (dB μ V)	Margin AV (dB)	Line
10.194	41.0	26.3	60.0	-33.7	7.6	50.0	-42.4	L1
16.342	27.0	23.9	60.0	-36.1	14.3	50.0	-35.7	L1
9.318	42.3	29.0	60.0	-31.0	8.2	50.0	-41.8	Neutral
19.278	28.5	17.7	60.0	-42.3	2.5	50.0	-47.5	Neutral

Frequency band investigated: 150kHz-30MHz

RBW: 9kHz

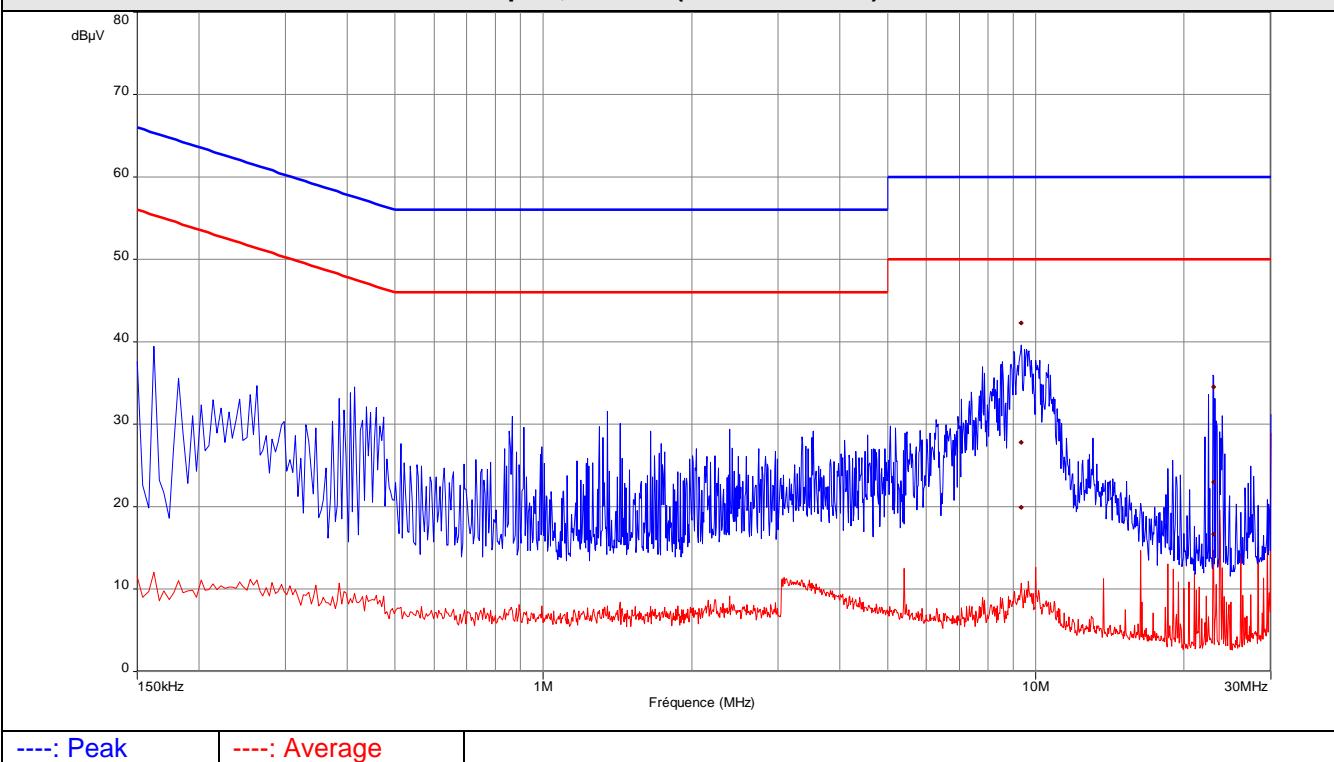
Voltage: 110V / 60Hz

Limit: 15.207 a)

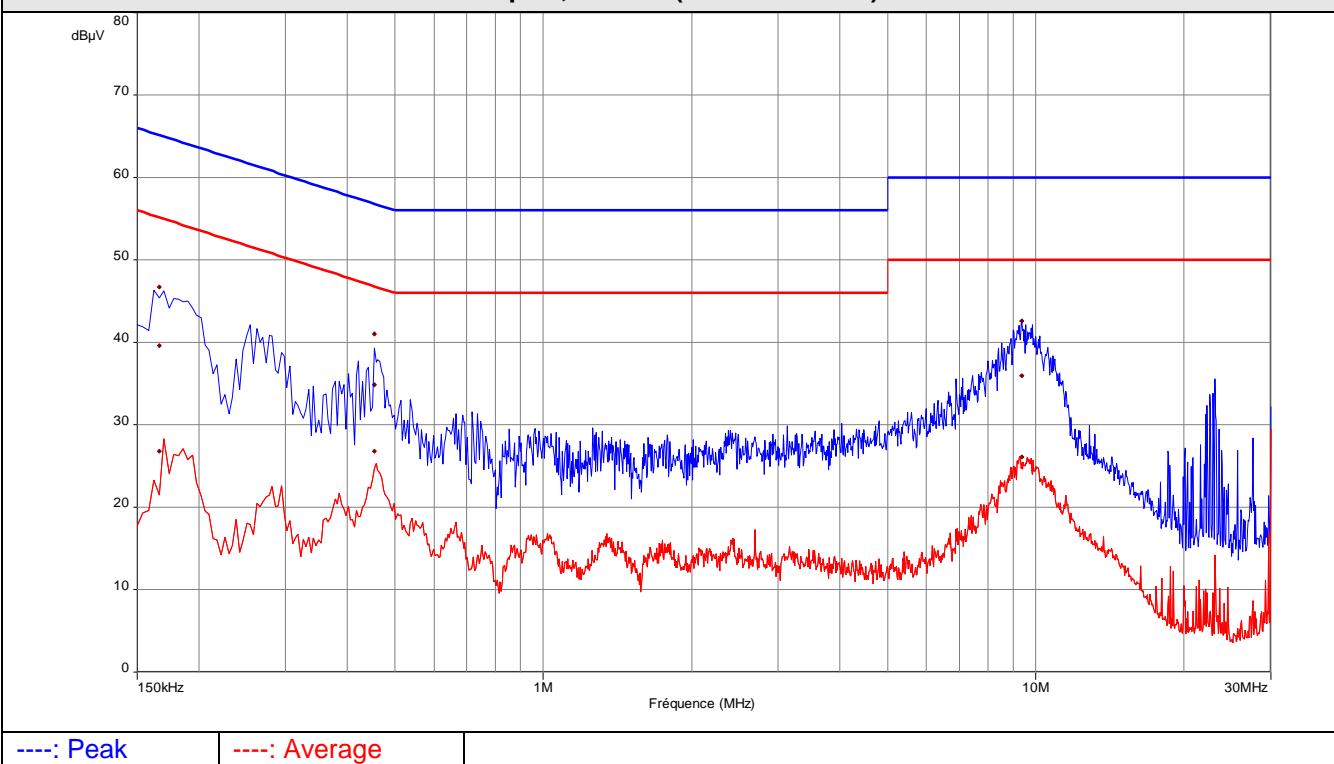
Final measurement detector: Quasi-Peak and Average

Wide Measurement Uncertainty: $\pm 5\text{dB}$ ($k=2$)

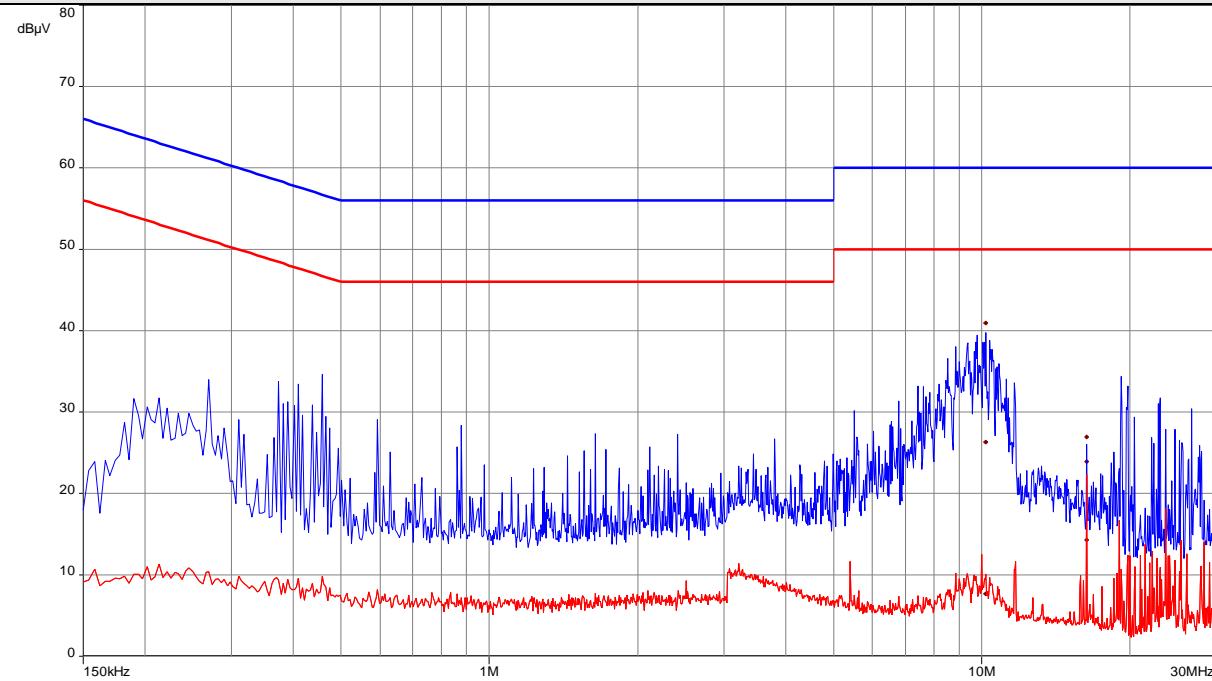
Graphical representation of Conducted Disturbance Measurement (Peak and Average detection)
AC port, Line L1 (Wireless mode)



Graphical representation of Conducted Disturbance Measurement (Peak and Average detection)
AC port, Neutral (Wireless mode)

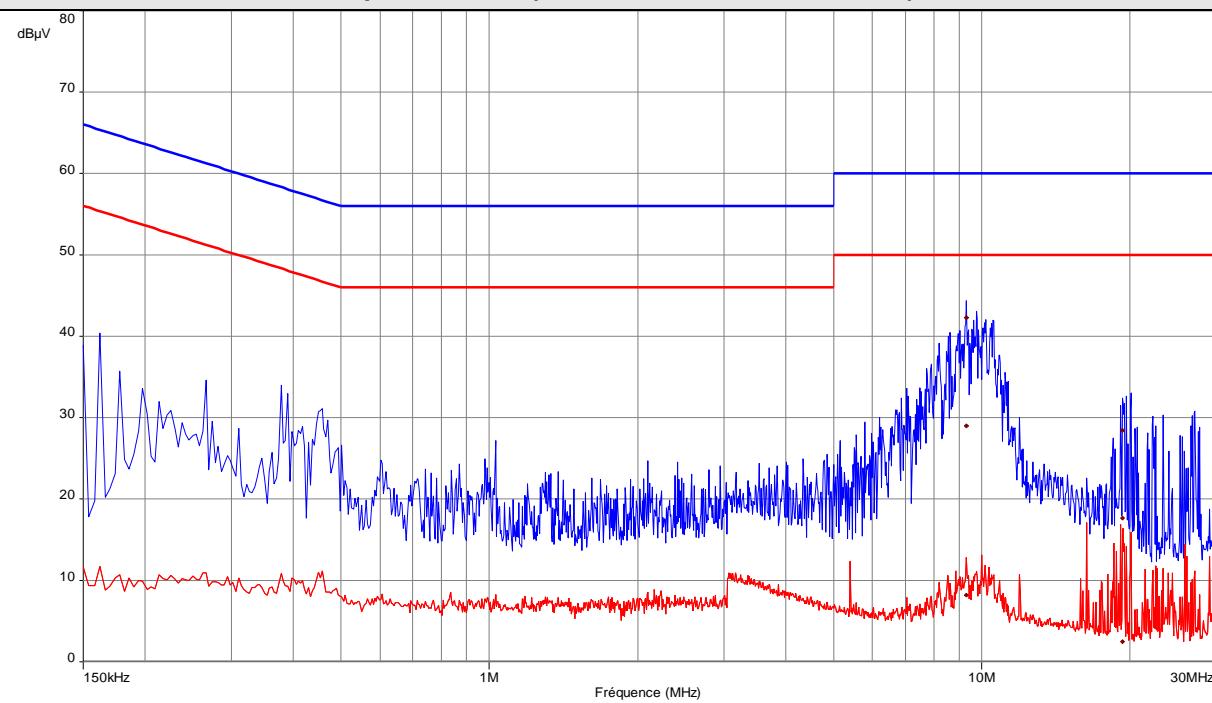


Graphical representation of Conducted Disturbance Measurement (Peak and Average detection)
AC port, Line L1 (Audio mode with smart cable)



----: Peak ----: Average

Graphical representation of Conducted Disturbance Measurement (Peak and Average detection)
AC port, Neutral (Audio mode with smart cable)



----: Peak ----: Average



Rapport d'essais / Test Report

N° : 20721-FCC-1

6. Radiated Emission Measurement (Unintentional Radiation)

TEST: Limits for radiated disturbance 9kHz – 25GHz (15.109 / 209)			Verdict		
<p><u>Method:</u> Measurements were made in a 3-meter Open Area Test Site (OATS) that complies to CISPR 16. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3 meter. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements (Peak, Quasi-peak) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 m. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.</p> <p>A pre-scan frequency identification of the EUT has been performed in a GTEM cell. The measured radiated field of the EUT is correlated to a measurement distance of 3m. (3-axis algorithm) The pre-characterization graphs are obtained in PEAK detection.</p>			Pass		
Laboratory Parameters:	Required prior to the test		During the test		
Ambient Temperature	10 to 40 °C		21°C		
Relative Humidity	10 to 90 %		55%		
Fully configured sample scanned over the following frequency range	Frequency range on each side of line	Measurement Point			
	9kHz – 25GHz	3 m measurement distance			
Running mode	Wireless mode / Receive mode / Battery charging				
Limits – FCC Part 15.109 / 15.209					
Frequency (MHz)	Limit (dB μ V/m)				
	Level / Detector	Distance (m)	Results		
0.009 to 0.490	2400 (μ V/m)/f (kHz) / QP	300	PASS		
0.490 to 1.705	24000 (μ V/m)/f (kHz) / QP	30	PASS		
1.705 to 30	30 (μ V/m) / QP	30	PASS		
30 to 88	40.0 (dB μ V/m) / QP	3	PASS		
88 to 216	43.5 (dB μ V/m) / QP	3	PASS		
216 to 960	46.0 (dB μ V/m) / QP	3	PASS		
Above 960	54.0 (dB μ V/m) / QP	3	PASS		
Above 1GHz	54 (dB μ V/m) / AV 74 (dB μ V/m) / Pk	3	PASS		
Supplementary information: Test location: SMEE – CE Mesures / Test date: September 5 th , 2013 Power supply voltage: 3.7V from battery					



Rapport d'essais / Test Report

N° : 20721-FCC-1

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Log-periodic antenna	TDK	PLP3003	ANT-101-001	2013/5	2014/5
Biconic antenna	COM-POWER	AB- 900	ANT-101-003	2013/5	2014/5
Horn antenna	COM-POWER	AH-118	ANT-101-004	2012/8	2014/8
RF cable	Div	2m	CAB-101-011	2013/3	2014/3
RF cable	Div	OATS/25m	CAB-101-019	2013/3	2014/3
RF cable	Div	OATS/10m	CAB-101-020	2013/3	2014/3
RF cable	PASTERNAK RF	PE302-120	CAB-131-023	2013/9	2014/9
RF cable	PASTERNAK RF	PE302-120	CAB-131-024	2013/9	2014/9
GTEM cell	TESEQ	750	GTE-101-001	2013/3	2014/3
OATS	Div	3 / 10m	SIT-101-001	2011/8	2012/8
Antenna mast	Innco- Systems	MA4000EP	MAT-101-001	-	-
Turntable	Innco- Systems	DS1200S	PLA-101-001	-	-
Measuring Rec	Rohde&Schwarz	ESL3	REC-101-001	2012/6	2014/6
Spectrum Analyzer	HP / Agilent	8563E	ASP-111-003	2012/9	2014/9
Pre-amplifier	PE	PE1524	PRE-101-002	2013/3	2014/3

Tabulated Results for Radiated Disturbance (10m measurement on Open Area Test Site) 9kHz-30MHz									
Test Frequency (MHz)	Meter Reading dB(µV)	Detector (Pk/QP/Av)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Total Factor (dB)	Level dB(µV/m)	Limit dB(µV/m)	Margin (dB)
No frequency observed									
Supplementary information: Frequency list measured on the Open Area Test Site has been created with pre-scan results.									
Frequency band investigated: 9kHz-30MHz									
RBW: 9kHz									
Measurement distance: 10m									
Limit: 15.209									
Final measurement detector: Quasi-Peak									
Wide Measurement Uncertainty: ± 5.2dB (k=2)									



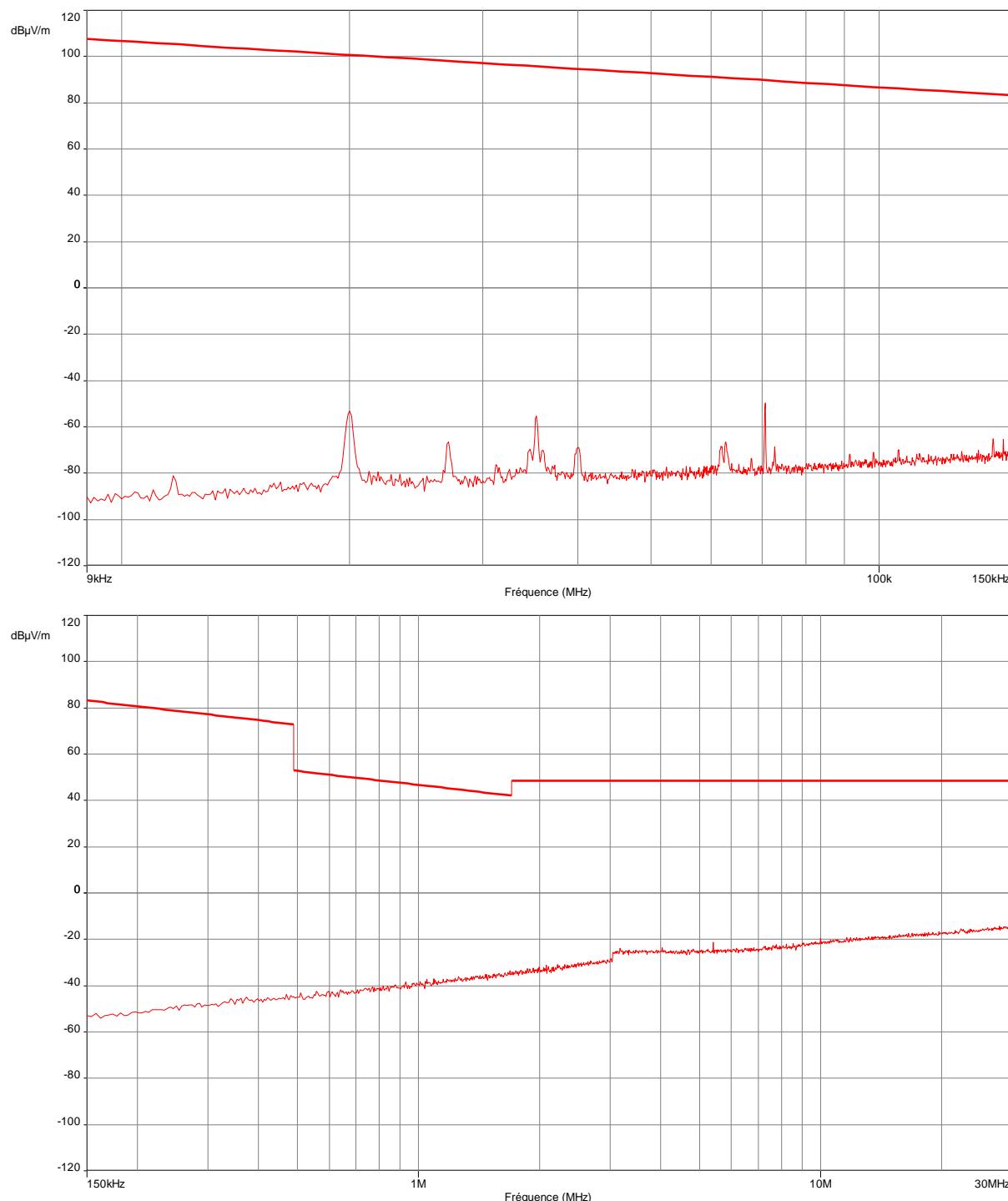
SMEE

Rapport d'essais / Test Report

N° : 20721-FCC-1

Tabulated Results for Radiated Disturbance (3m measurement on Open Area Test Site) 30MHz-1GHz									
Test Frequency (MHz)	Meter Reading dB(µV)	Detector (Pk/QP/Av)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Total Factor (dB)	Level dB(µV/m)	Limit dB(µV/m)	Margin (dB)
186.95	10.5	QP	V	75	100	18.6	29.1	43.5	-14.4
Supplementary information: Frequency list measured on the Open Area Test Site has been created with pre-scan results. Worst case results for receive mode or direct audio mode.									
Frequency band investigated: 30MHz-1GHz									
RBW: 120kHz									
Measurement distance: 3m									
Limit: 15.109 / 15.209									
Final measurement detector: Quasi-Peak									
Wide Measurement Uncertainty: ± 5.2dB (k=2)									
Field Strength Calculation: The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follow: FS = RA + AF + CF - AG Where FS = Field Strength RA = Receiver Amplitude AF = Antenna Factor CF = Cable Factor AG = Amplifier Gain Total factor (dB) is AF + CF - AG Margin value = Emission level - Limit value									

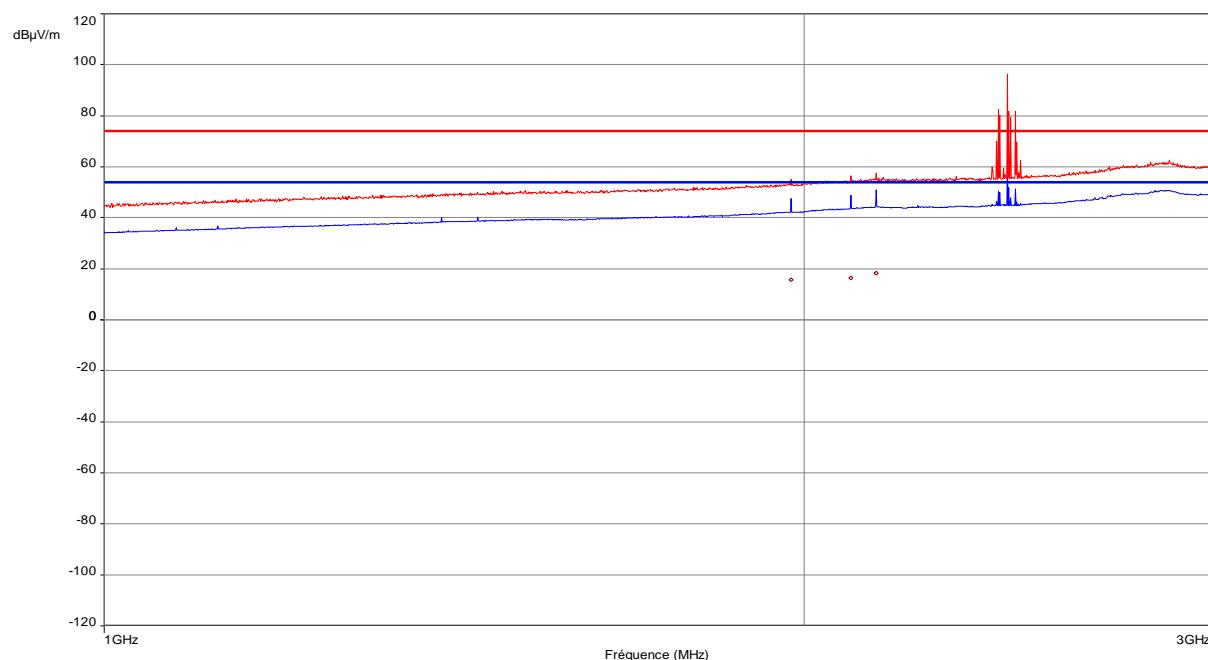
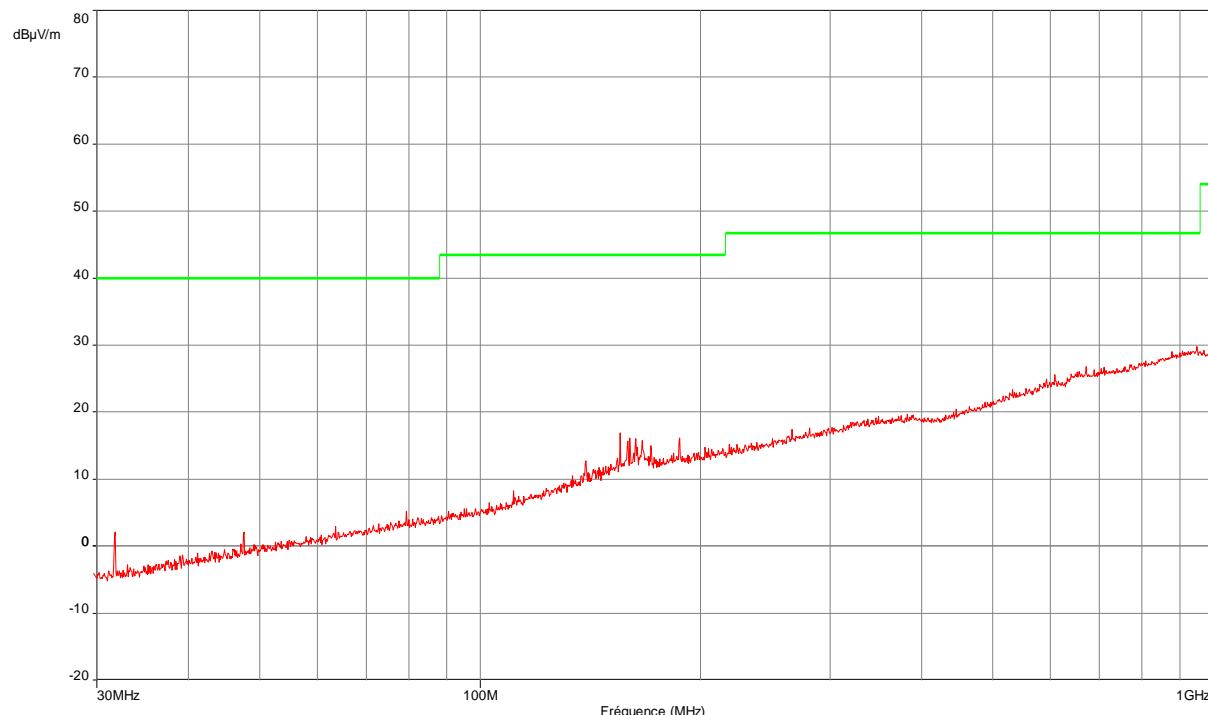
**Graphical representation of Radiated Disturbance Measurement / 9kHz – 30MHz
(Peak detection, GTEM pre-scan) – Transmit Mode (Worst case 1-DH5)**



Note: Pre-scan graph only for identification purpose

----- : Peak measure/limit

**Graphical representation of Radiated Disturbance Measurement / 30MHz – 3GHz
(Peak detection, GTEM pre-scan) - Transmit Mode (Worst case 1-DH5)**



Frequency (MHz)	Comment
1975.0	External noise
2095.1	External noise
2147.5	External noise
2441.0	Intentional radiation

Note: Pre-scan graph only for identification purpose

----- : Peak measure/limit

----- : Average measure/limit

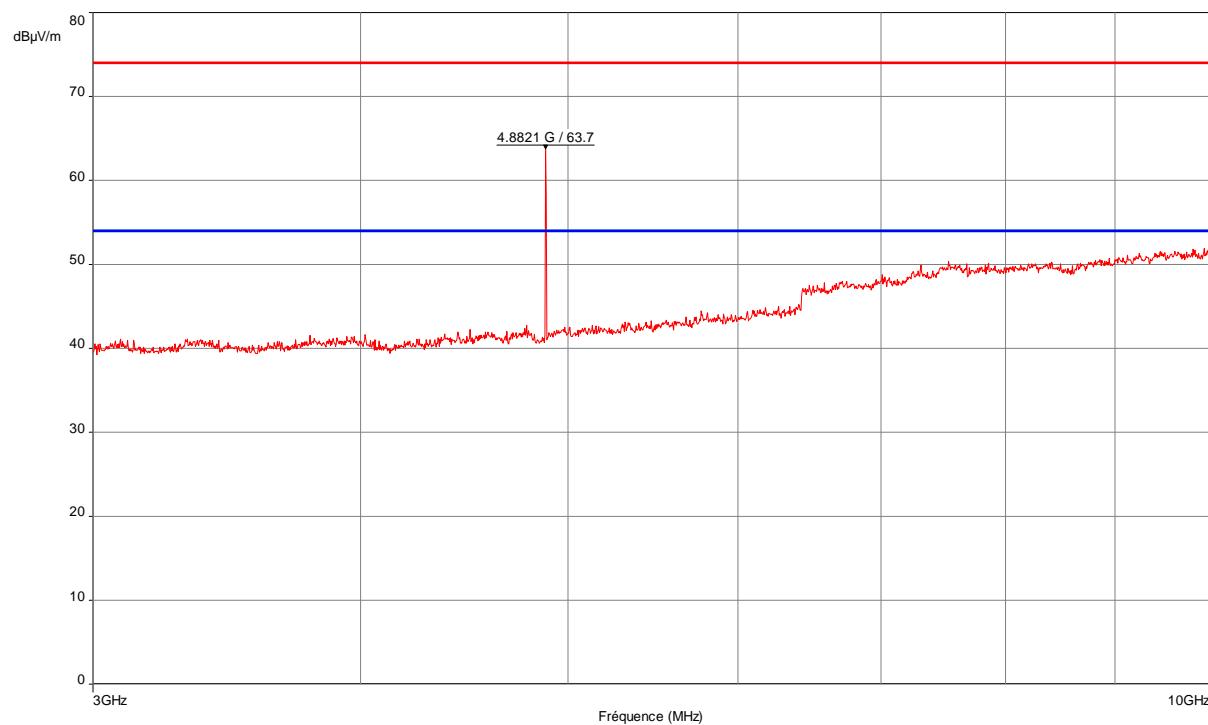
----- : Quasi-Peak limit



Rapport d'essais / Test Report

N° : 20721-FCC-1

Graphical representation of Radiated Disturbance Measurement / 3GHz – 10GHz
(Peak detection, GTEM pre-scan) - Transmit Mode (Worst case 1-DH5)

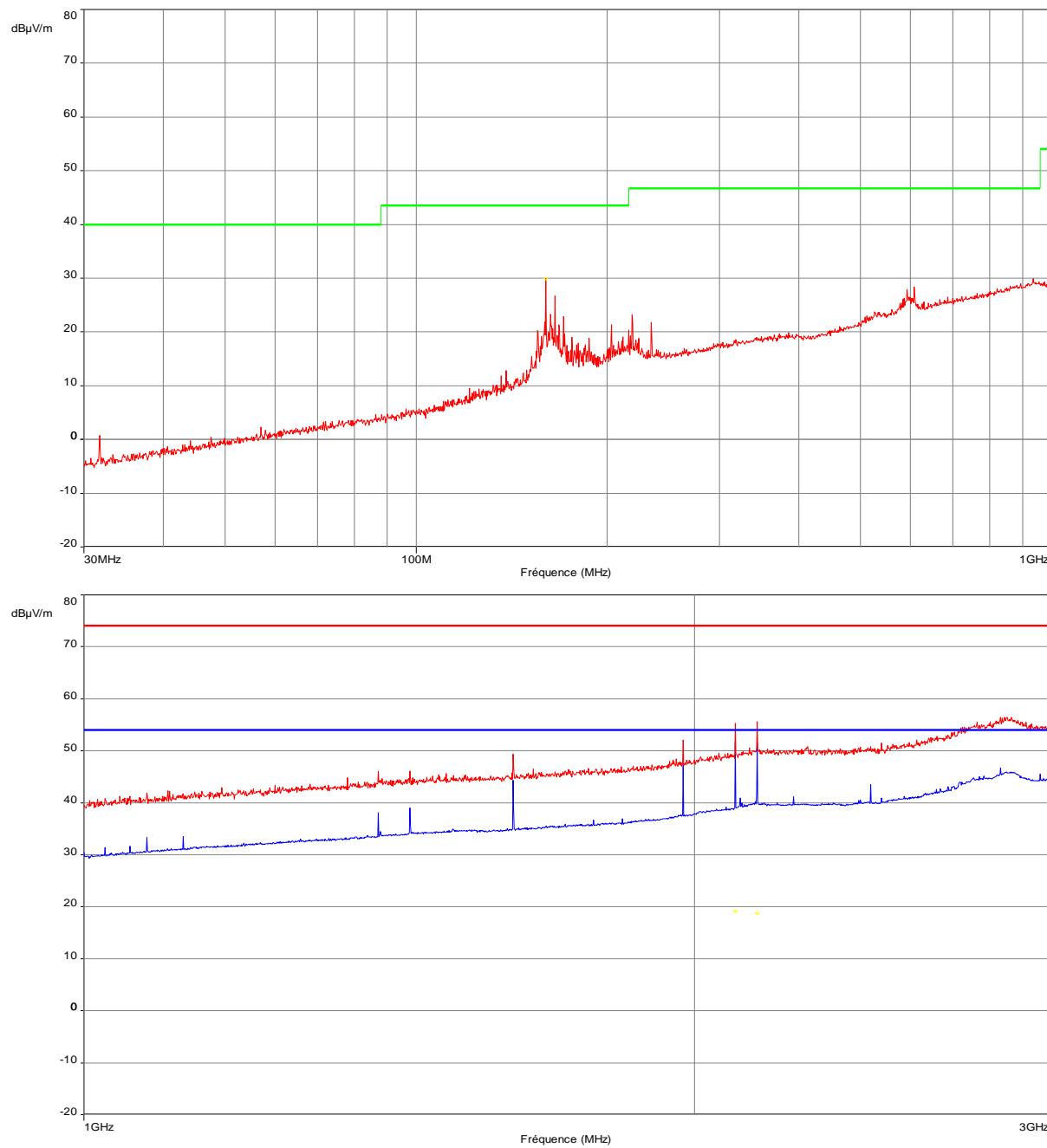


Frequency (MHz)	Comment
4882.1	Spurious

Note: Pre-scan graph only for identification purpose

Note: No frequency observed above 10GHz

----- : Peak measure/limit ----- : Average limit

**Graphical representation of Radiated Disturbance Measurement / 30MHz – 3GHz
(Peak detection, GTEM pre-scan) - Receive Mode**

Frequency (MHz) Comment

160.00	29.9 dB μ V/m Peak
2095.1	External noise
2147.5	External noise

Note: Pre-scan graph only for identification purpose

Note: No frequency observed above 3GHz

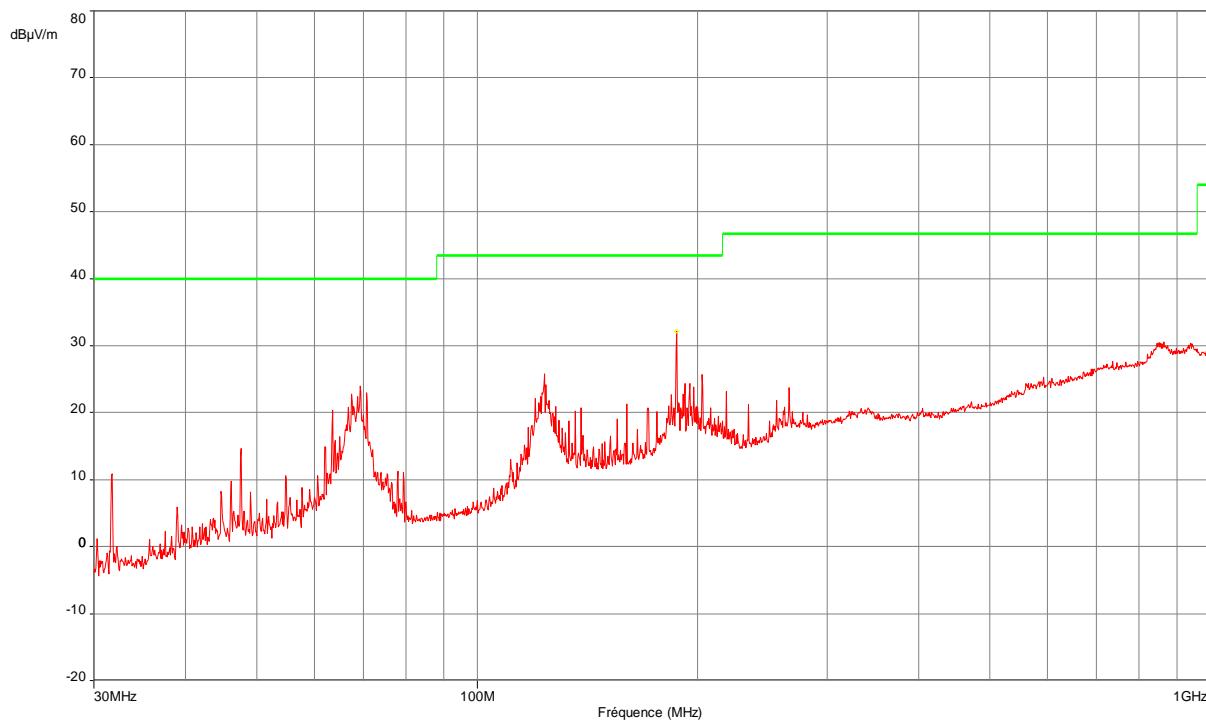
----- : Peak measure/limit ----- : Average measure/limit ----- : Quasi-Peak limit



Rapport d'essais / Test Report

N° : 20721-FCC-1

**Graphical representation of Radiated Disturbance Measurement / 30MHz – 1GHz
(Peak detection, GTEM pre-scan) – Audio mode with smart cable**



Frequency (MHz)	Comment
186.95	32.2 dB μ V/m Peak

Note: Pre-scan graph only for identification purpose

Note: No frequency observed above 1GHz

----- : Peak measure/limit ----- : Quasi-Peak limit



Rapport d'essais / Test Report

N° : 20721-FCC-1

7. Maximum Peak Conducted Output power

TEST: Maximum peak conducted output power (FCC part 15.247 (b) (1)/(4)) RSS-210 A8.4 (2)	Verdict
Method: Measurements were performed with peak detector using a 10MHz RBW. The VBW is set to 10MHz. The spectrum analyzer is connected via suitable means to the RF output of the tested equipment. (Conducted measurement). For field strength, the measure is performed on a 3m Open Area Test Site. The tested equipment is set to transmit operation with modulations on lowest, middle and highest channel. Limits: 0.125W or 21dBm (conducted) / 27dBm with antenna gain.	Pass
Supplementary information:	
Test location: SMEE – CE Mesures / Test date: September 4 th , 2013	
Power supply voltage: 3.7V from battery (fully charged)	

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Measuring Rec.	Rohde&Schwarz	ESL3	REC-101-001	2012/6	2014/6
Horn antenna	COM-POWER	AH-118	ANT-101-004	2012/8	2014/8
RF cable	Div	OATS/10m	CAB-101-020	2013/3	2014/3
OATS	Div	3 / 10m	SIT-101-001	2013/5	2014/5
Antenna mast	Innco- Systems	MA4000EP	MAT-101-001	-	-
Turntable	Innco- Systems	DS1200S	PLA-101-001	-	-

Tabulated Results for Maximum peak output power (Conducted measurement)			
Modulation DH5 / GFSK			
FREQ (MHz)	Peak Power conducted (dBm)	Limit (dBm)	Result
2402	5.4	21.0	PASS
2441	6.2	21.0	PASS
2480	6.2	21.0	PASS
Modulation 2-DH5 / π/4DQPSK			
FREQ (MHz)	Peak Power conducted (dBm)	Limit (dBm)	Result
2402	2.7	21.0	PASS
2441	3.1	21.0	PASS
2480	2.9	21.0	PASS
Modulation 3-DH5 / 8DPSK			
FREQ (MHz)	Peak Power conducted (dBm)	Limit (dBm)	Result
2402	2.7	21.0	PASS
2441	3.1	21.0	PASS
2480	2.9	21.0	PASS



Rapport d'essais / Test Report

N° : 20721-FCC-1

Tabulated Results for Maximum peak output power (Radiated measurement)

FREQ (MHz)	Field Strength 3m (dB μ V/m)	Calculated EIRP (dBm)	Limit (dBm)	Result
2402	99.9	4.7	27.0	PASS
2441	101.4	6.2	27.0	PASS
2480	100.7	5.5	27.0	PASS

Note 1: Radiated measurement is the worst case → Modulation DH5 / GFSK

Note 2: Field strength is measured on the Open Area Test Site at a distance of 3m. Three orthogonal axis measurement is performed for both horizontal and vertical antenna (measure) polarization in order to obtain the maximum peak field strength.

The power (EIRP) was calculated using the following equation:

$$\text{EIRP} = (E \times d)/30$$

Where D is the distance in meters from which the field strength was measured

E is the maximum field strength in V/m



Rapport d'essais / Test Report

N° : 20721-FCC-1

8. Channel Separation

TEST: Hopping channel measurement (15.247 (a) (1)) / RSS-210 A8.1 (b)		Verdict
Method: The Equipment under test is connected to the measuring receiver with suitable mean. The SPAN is adapted to see the frequency band of operation. The spectrum analyzer RBW was 100kHz and VBW was 100kHz. The channel separation is measured with the hopping function enable on the EUT. Limits: Minimum separation between channels shall be 25kHz or the two-third 20dB bandwidth, whichever is greater.		Pass
Supplementary information: Test location: SMEE – CE Mesures / Test date: September 5 st , 2013 Power supply voltage: 3.7V from battery		

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Measuring Rec.	Rohde&Schwarz	ESL3	REC-101-001	2012/6	2014/6
RF cable	PASTERNAK RF	PE354-150	CAB-131-025	2013/9	2014/9

Tabulated Results for Hopping Channel Separation (Conducted measurement)				
Modulation DH5 / GFSK				
Channel frequency	Adjacent channel separation	20dB Bandwidth	Minimum limit	Result
(MHz)	(MHz)	(MHz)	(MHz)	
2402	1.003	1.102	0.735	PASS
2441	0.994	1.102	0.735	PASS
2480	1.006	1.102	0.735	PASS
Modulation 2-DH5 / $\pi/4$ DQPSK				
Channel frequency	Adjacent channel separation	20dB Bandwidth	Minimum limit	Result
(MHz)	(MHz)	(MHz)	(MHz)	
2402	1.006	1.365	0.910	PASS
2441	1.000	1.365	0.910	PASS
2480	1.006	1.359	0.906	PASS
Modulation 3-DH5 / 8DPSK				
Channel frequency	Adjacent channel separation	20dB Bandwidth	Minimum limit	Result
(MHz)	(MHz)	(MHz)	(MHz)	
2402	1.000	1.371	0.914	PASS
2441	1.000	1.371	0.914	PASS
2480	1.000	1.365	0.910	PASS

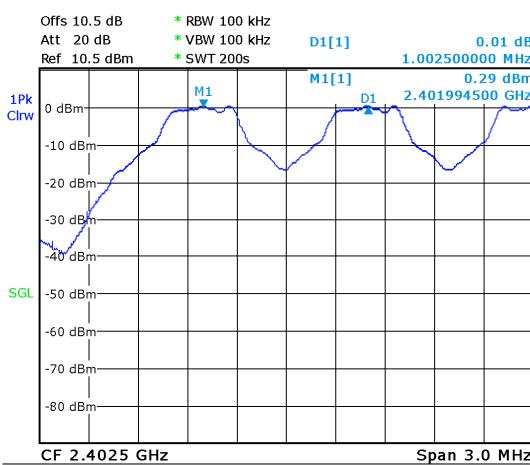


SMEE

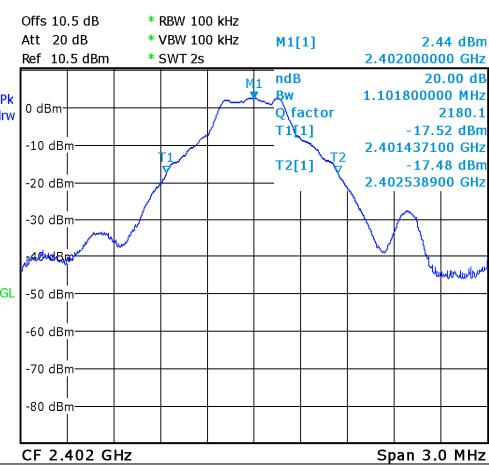
Rapport d'essais / Test Report

N° : 20721-FCC-1

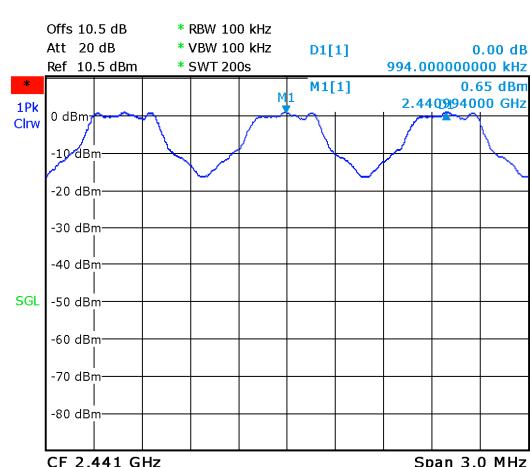
Graphical representation of Hopping channel separation (Modulation 1-DH5 / GFSK)



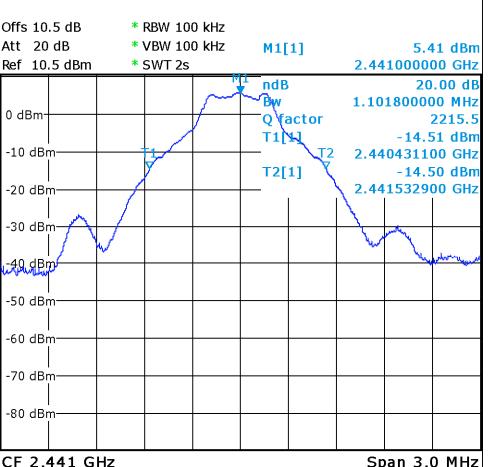
Date: 5.SEP.2013 11:06:41



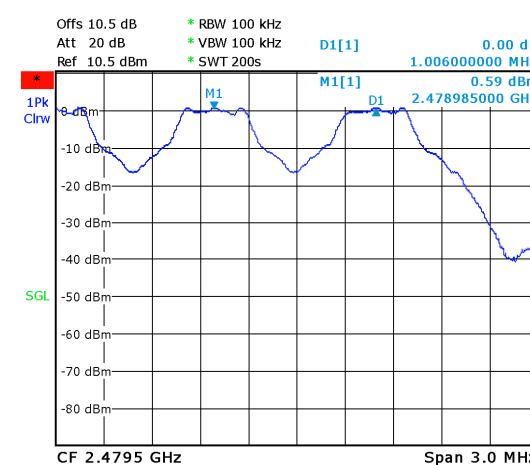
Date: 5.SEP.2013 12:22:19



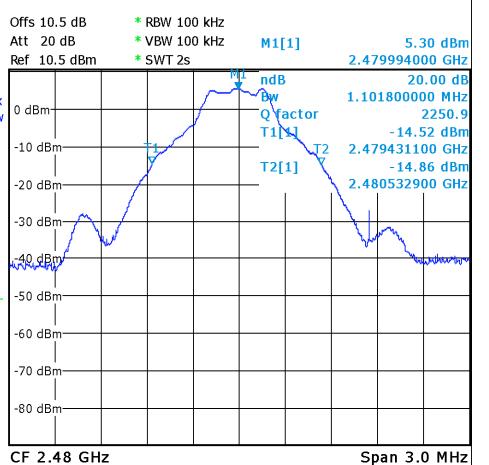
Date: 5.SEP.2013 11:51:05



Date: 5.SEP.2013 12:23:18

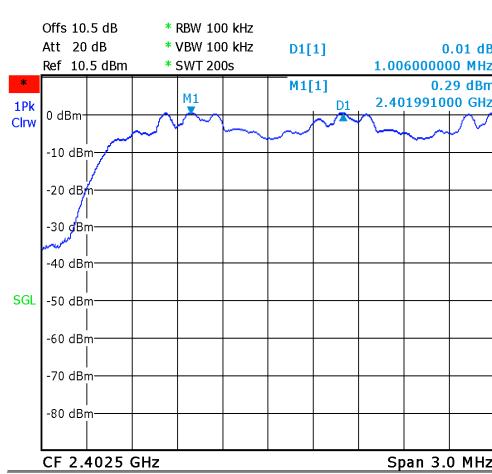


Date: 5.SEP.2013 11:55:04

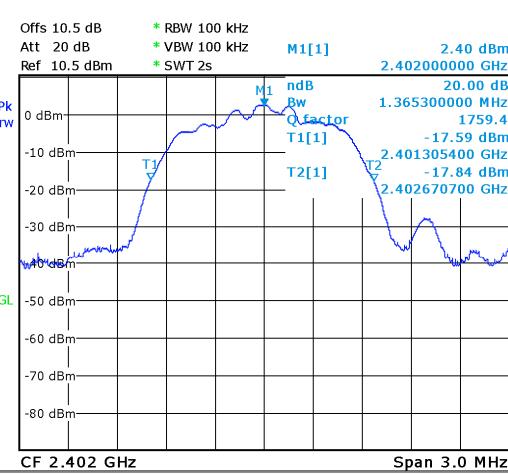


Date: 5.SEP.2013 12:24:10

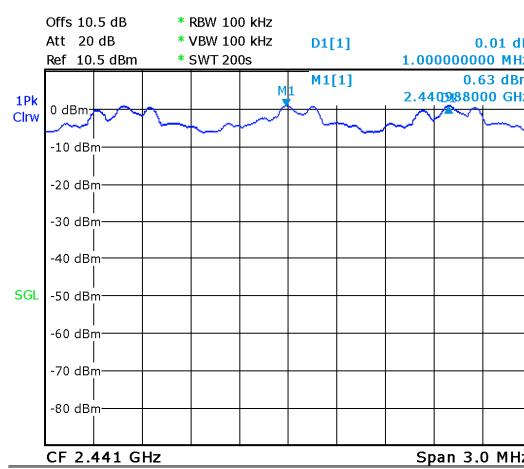
Graphical representation of Hopping channel separation (Modulation 2-DH5 / $\pi/4$ DQPSK)



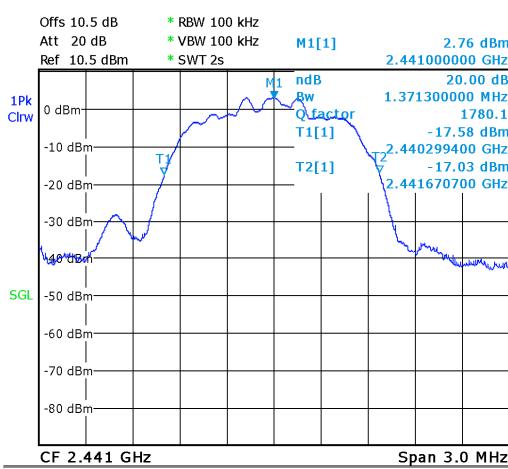
Date: 5.SEP.2013 11:11:20



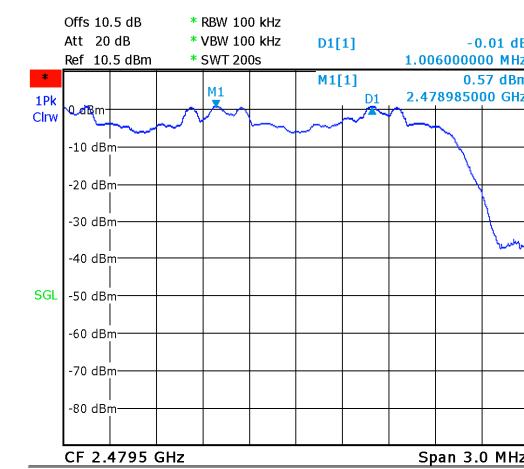
Date: 5.SEP.2013 12:25:20



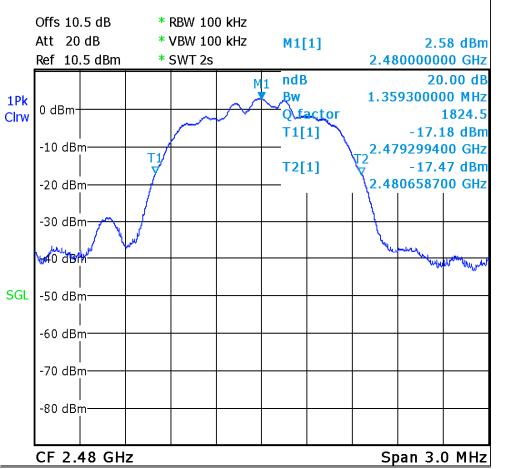
Date: 5.SEP.2013 11:45:19



Date: 5.SEP.2013 12:28:33

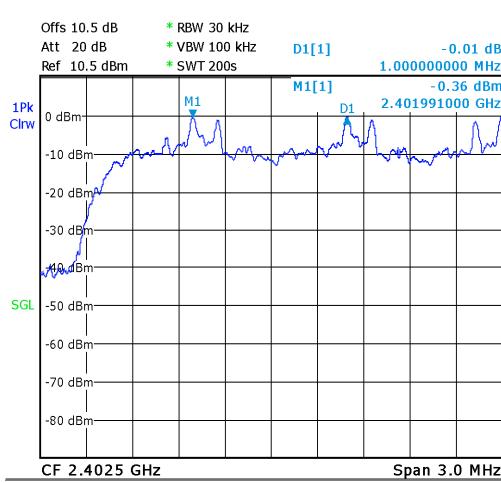


Date: 5.SEP.2013 11:40:45

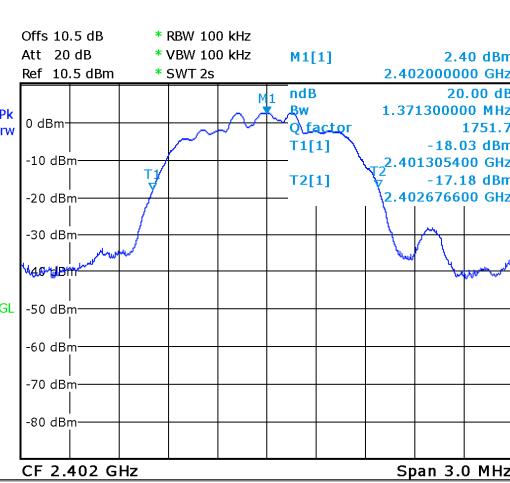


Date: 5.SEP.2013 12:26:42

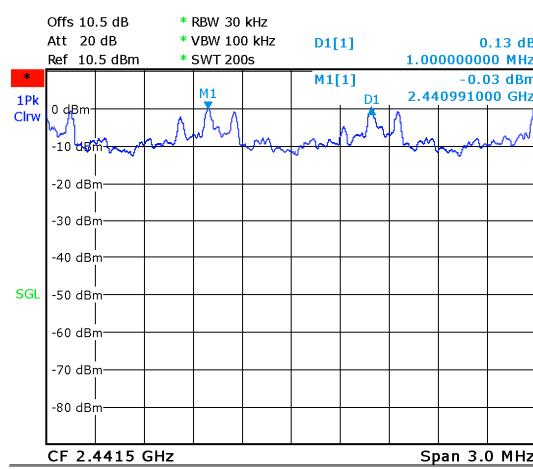
Graphical representation of Hopping channel separation (Modulation 3-DH5 / 8DPSK)



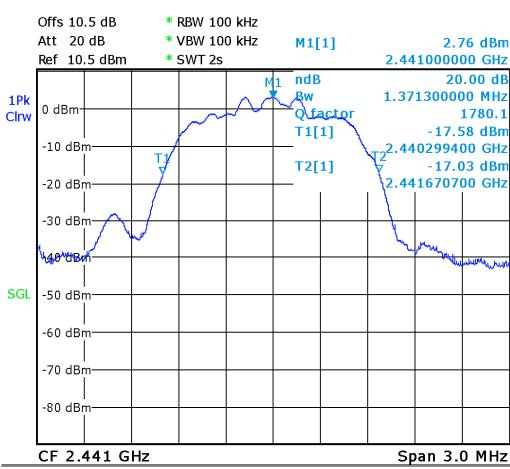
Date: 5.SEP.2013 11:24:02



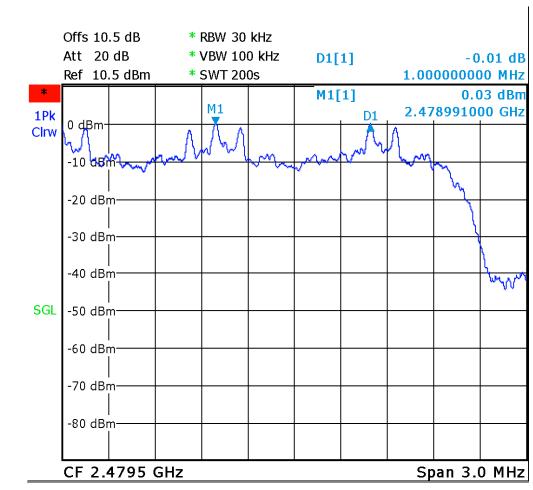
Date: 5.SEP.2013 12:28:04



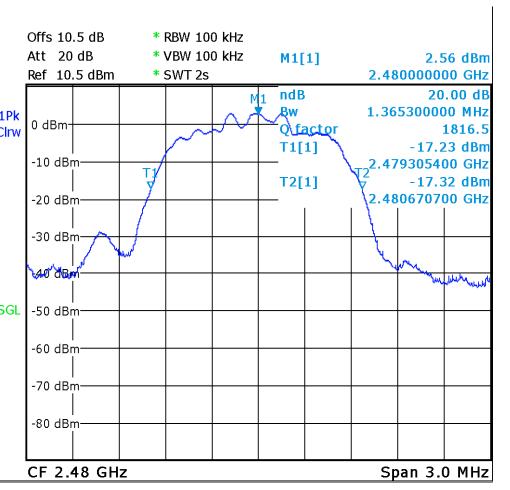
Date: 5.SEP.2013 11:28:55



Date: 5.SEP.2013 12:28:33



Date: 5.SEP.2013 11:35:47



Date: 5.SEP.2013 12:29:23



Rapport d'essais / Test Report

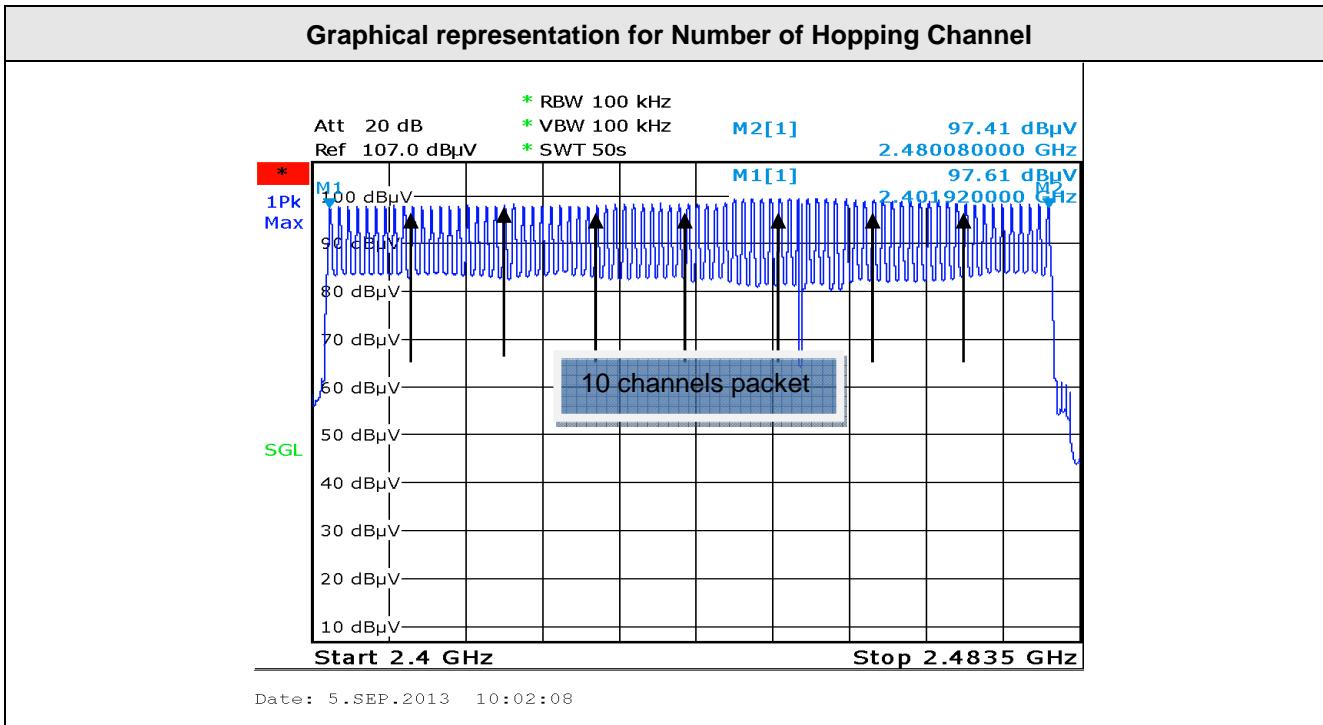
N° : 20721-FCC-1

9. Number of hopping channels

TEST: Number of hopping channels (15.247 (a))		Verdict
Method: The Equipment under test is connected to the measuring receiver with suitable mean. The SPAN is adapted to see the frequency band of operation. The spectrum analyzer RBW was 100kHz and VBW was 100kHz.		Pass
The EUT has its hopping function enable.		
Limits: At least 15 channels frequencies shall be used and equally spaced, in the band 2400-2483MHz.		
Supplementary information: Test location: SMEE – CE Mesures / Test date: September 5 st , 2013 Power supply voltage: 3.7V from battery		
Laboratory Parameters:	Required prior to the test	During the test
Ambient Temperature	10 to 40 °C	21°C
Relative Humidity	10 to 90 %	55%

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Measuring Rec.	Rohde&Schwarz	ESL3	REC-101-001	2012/6	2014/6
RF cable	PASTERNAK RF	PE354-150	CAB-131-025	2013/9	2014/9

Tabulated Results for Number of Hopping Channel		
Number of channels	Minimum number of channels	Result
79	15	PASS





Rapport d'essais / Test Report

N° : 20721-FCC-1

10. Time of occupancy (Dwell time)

TEST: Time of occupancy (15.247 (a) (1) (iii) / RSS-210 A8.1 (d))		Verdict
Method: The Equipment under test is connected to the measuring receiver with suitable mean. The spectrum analyser is set to zero-span. The EUT has its hopping function enable. Limits: 400ms of transmission by channel on a period 31.6s. (79 channels used)		Pass
Supplementary information: Test location: SMEC – CE Mesures / Test date: September 5 st , 2013 Power supply voltage: 3.7V from battery		
Laboratory Parameters:	Required prior to the test	During the test
Ambient Temperature	10 to 40 °C	21°C
Relative Humidity	10 to 90 %	55%

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Measuring Rec.	Rohde&Schwarz	ESL3	REC-101-001	2012/6	2014/6
RF cable	PASTERNAK RF	PE354-150	CAB-131-025	2013/9	2014/9

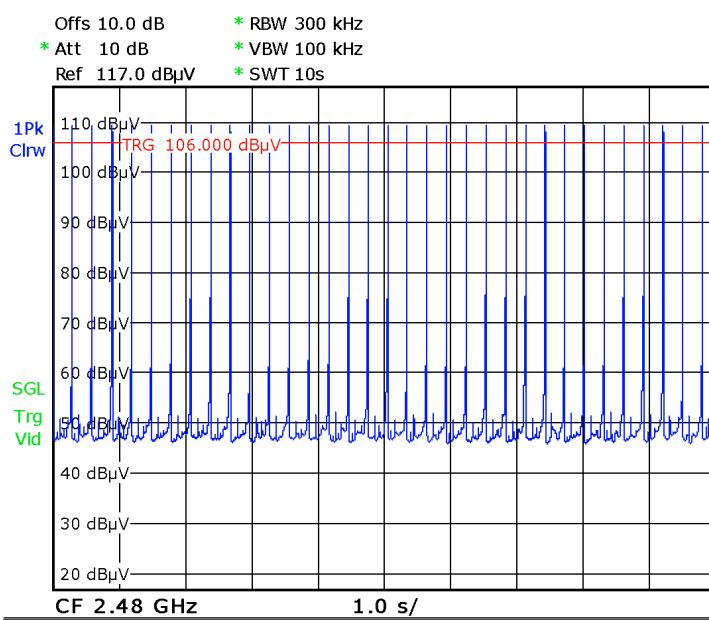
Tabulated Results for Dwell time					
Number of pulses per 10s	Number of pulses per 31.6s period	Length of 1 pulse (ms)	Time of occupancy (ms)	Limit (ms)	Result
34	108	2.96ms	320ms	400ms	PASS
Additional information: Results for the worst case → Modulation 3-DH5 (8DPSK) Period of 31.6s (0.4s x 79 channels)					



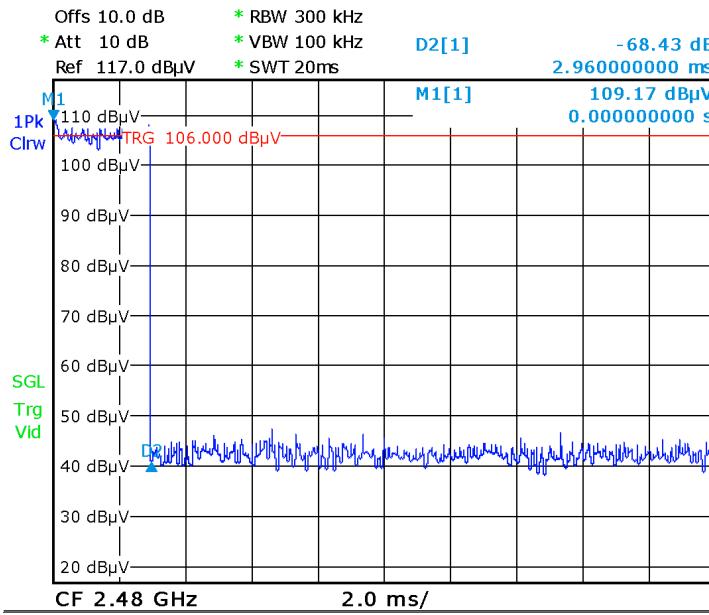
Rapport d'essais / Test Report

N° : 20721-FCC-1

Graphical representation for Dwell time (Modulation 8DPSK)



Date: 5.SEP.2013 15:49:47



Date: 5.SEP.2013 15:49:19



Rapport d'essais / Test Report

N° : 20721-FCC-1

11. Out-of-band emission / Band edge compliance

TEST: Spurious Emissions (15.247 (d)) / RSS-210 A8.5			Verdict											
<p>Method: Measurements were made in a 3-meter Open Area Test Site (OATS) that complies to CISPR 16 and ANSI C63.4 requirements. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3 meter. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements (quasi-peak) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 m. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.</p> <p>EUT is placed 80cm above the ground reference plane.</p> <p>A pre-scan frequency identification of the EUT has been performed in a GTEM cell. The measured radiated field of the EUT is correlated to the corresponding measurement distance.</p> <p>The algorithm used for calculation is 3 axes measurement.</p> <p>The pre-characterization graphs are obtained in PEAK detection.</p> <p>For conducted band-edge compliance, the Equipment under test is connected to the measuring receiver with suitable mean.</p>			Pass											
<p>Laboratory Parameters:</p> <table><tr><td>Ambient Temperature</td><td>10 to 40 °C</td><td>21°C</td></tr><tr><td>Relative Humidity</td><td>10 to 90 %</td><td>55%</td></tr><tr><td>Fully configured sample scanned over the following frequency range</td><td>Frequency range on each side of line</td><td>Measurement Point</td></tr><tr><td></td><td>30MHz – 25GHz</td><td>3m distance</td></tr></table>			Ambient Temperature	10 to 40 °C	21°C	Relative Humidity	10 to 90 %	55%	Fully configured sample scanned over the following frequency range	Frequency range on each side of line	Measurement Point		30MHz – 25GHz	3m distance
Ambient Temperature	10 to 40 °C	21°C												
Relative Humidity	10 to 90 %	55%												
Fully configured sample scanned over the following frequency range	Frequency range on each side of line	Measurement Point												
	30MHz – 25GHz	3m distance												
Limits – Part 15C, clause 15.247 (d) / RSS-210 A8.5														
<p>In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radiofrequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a).</p>														
<p>Supplementary information: Test location: SMEE – CE Mesures / Test date: September 9st, 2013 Power supply voltage: 3.7V from battery</p>														

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Log-periodic antenna	TDK	PLP3003	ANT-101-001	2013/5	2014/5
Biconic antenna	COM-POWER	AB- 900	ANT-101-003	2013/5	2014/5
Horn antenna	COM-POWER	AH-118	ANT-101-004	2012/8	2014/8
RF cable	Div	2m	CAB-101-011	2013/3	2014/3
RF cable	Div	OATS/25m	CAB-101-019	2013/3	2014/3
RF cable	Div	OATS/10m	CAB-101-020	2013/3	2014/3
RF cable	PASTERNAK RF	PE302-120	CAB-131-023	2013/9	2014/9
RF cable	PASTERNAK RF	PE302-120	CAB-131-024	2013/9	2014/9
GTEM cell	TESEQ	750	GTE-101-001	2013/3	2014/3
OATS	Div	3 / 10m	SIT-101-001	2011/8	2012/8
Antenna mast	Innco- Systems	MA4000EP	MAT-101-001	-	-
Turntable	Innco- Systems	DS1200S	PLA-101-001	-	-
Measuring Rec	Rohde&Schwarz	ESL3	REC-101-001	2012/6	2014/6



Rapport d'essais / Test Report

N° : 20721-FCC-1

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	HP / Agilent	8563E	ASP-111-003	2012/9	2014/9
Pre-amplifier	PE	PE1524	PRE-101-002	2013/3	2014/3

Tabulated Results for Spurious Emissions – EUT emitting on low channel (2402MHz) (1-DH5 / GFSK)						
No	Frequency (MHz)	Measured field (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Peak / Average	Comments
1	2402	99.2	-	-	PK	Fundamental (100kHz)
2	4804	62.1	74.0	-11.9	PK	Restricted band
3	4804	52.2	54.0	-1.8	AV	Restricted band

Tabulated Results for Spurious Emissions – EUT emitting on mid channel (2441MHz) (1-DH5 / GFSK)						
No	Frequency (MHz)	Measured field (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Peak / Average	Comments
1	2441	100.7	-	-	PK	Fundamental (100kHz)
2	4882	61.8	74.0	-12.2	PK	Restricted band
3	4876	51.9	54.0	-2.1	AV	Restricted band

Tabulated Results for Spurious Emissions – EUT emitting on high channel (2480MHz) (1-DH5 / GFSK)						
No	Frequency (MHz)	Measured field (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Peak / Average	Comments
1	2480	100.0	-	-	PK	Fundamental (100kHz)
2	4956	57.8	74.0	-16.2	PK	Restricted band
3	4956	47.9	54.0	-6.1	AV	Restricted band

Note 1: Peak measurement with 100 kHz RBW and VBW when frequency outside restricted bands.

Peak measurement with 1MHz RBW and VBW when frequency in restricted bands.

Average measurement with 1MHz RBW and 10Hz VBW when frequency in restricted bands

Note 2: All other frequencies are not traceable (20dB below limits)

Note 3: Worst case measurement for three orthogonal axis of EUT, with or without DC/audio cables.

Note 5: Worst case results for modulation type 1-DH5, 2-DH5 and 3-DH5

Note 4: The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follow:

FS = RA + AF + CF - AG

Where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Factor

AG = Amplifier Gain

Total factor (dB) is AF + CF - AG

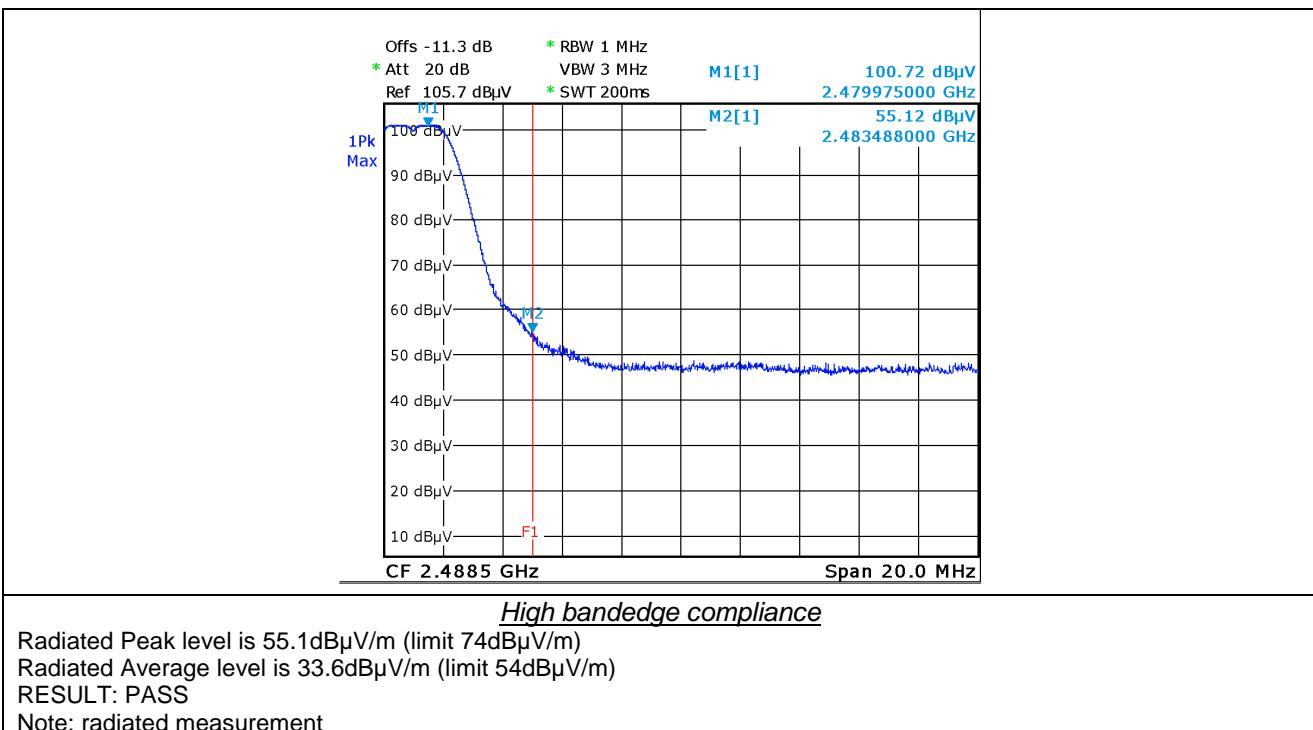
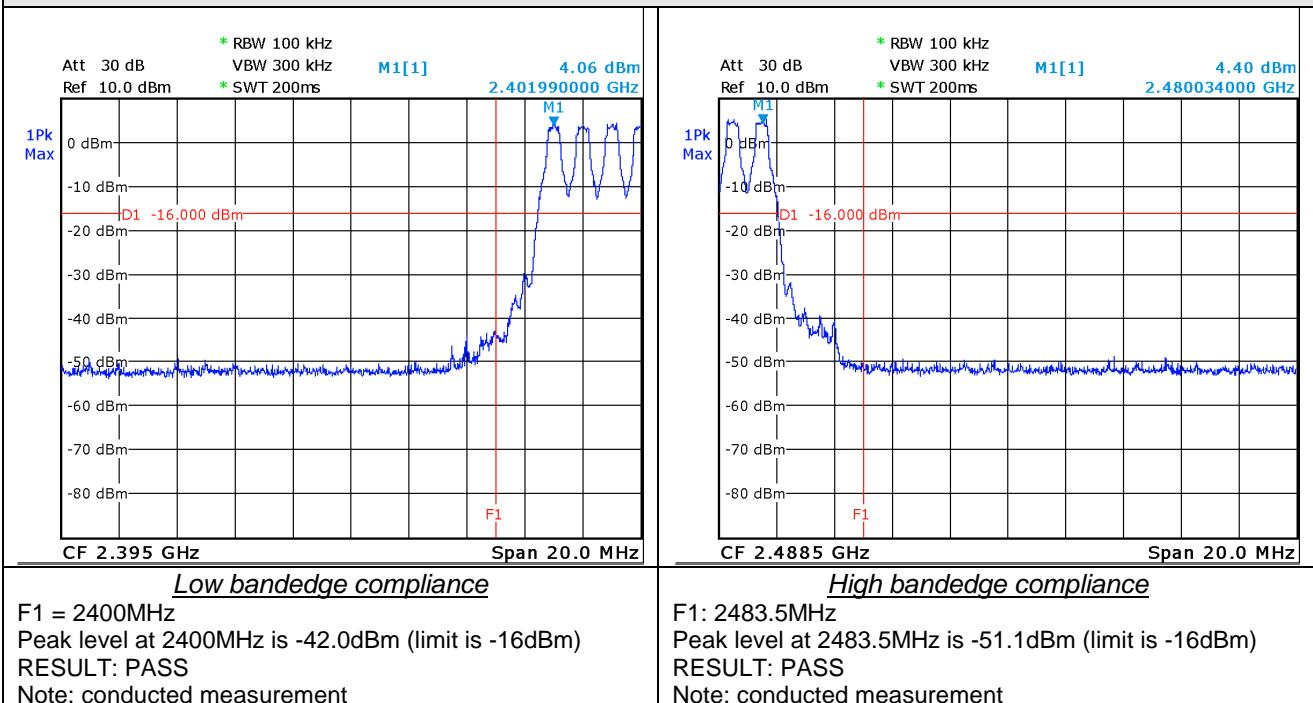
Margin value = Emission level - Limit value



Rapport d'essais / Test Report

N° : 20721-FCC-1

Graphical representation of Band-edge compliance (Modulation 1-DH5 / GFSK)

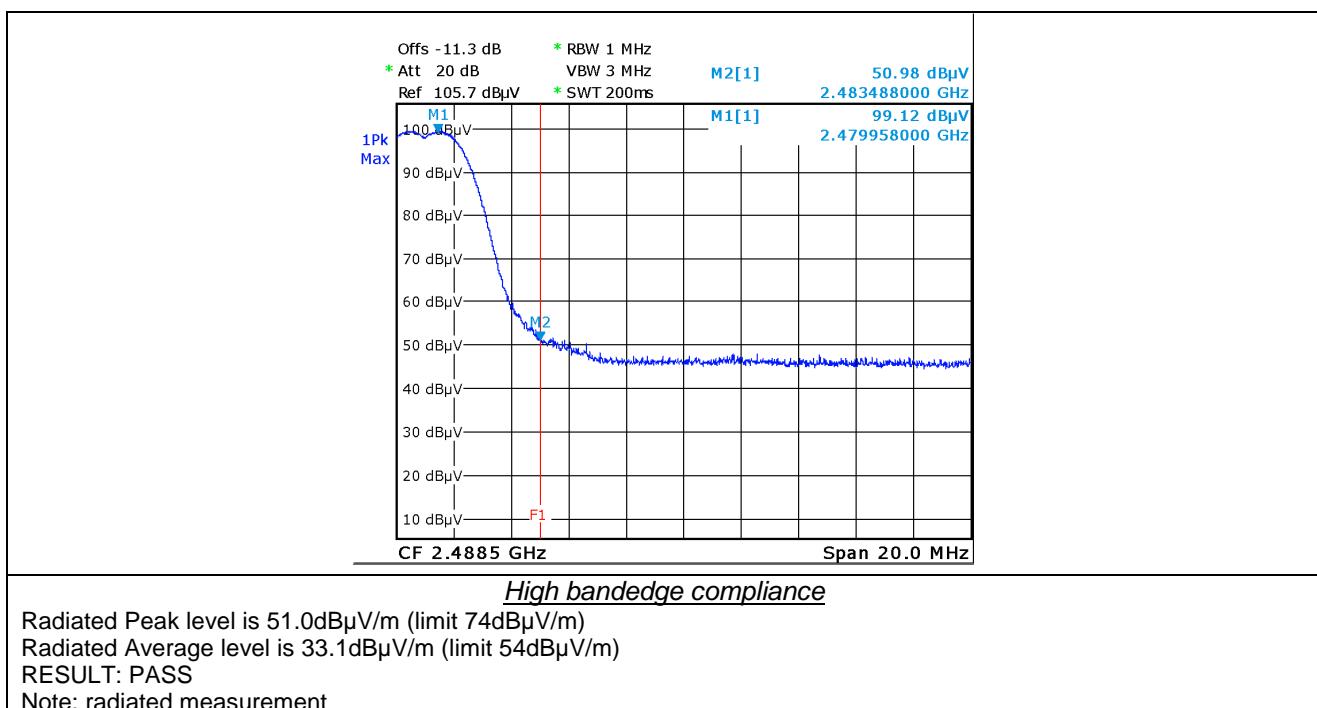
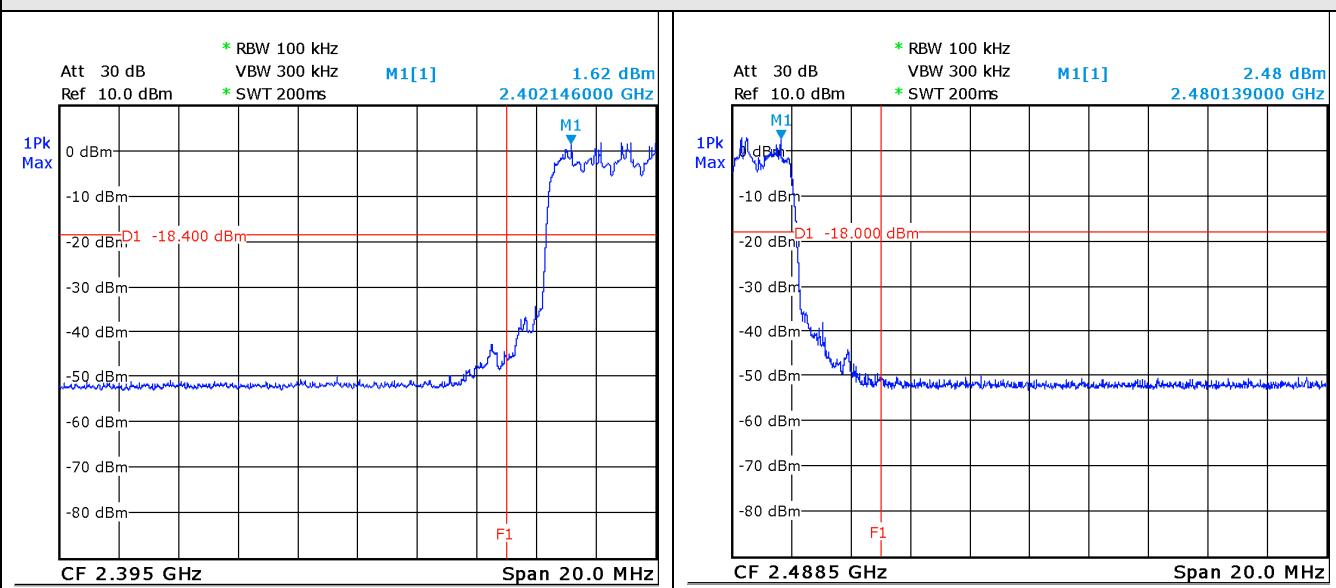




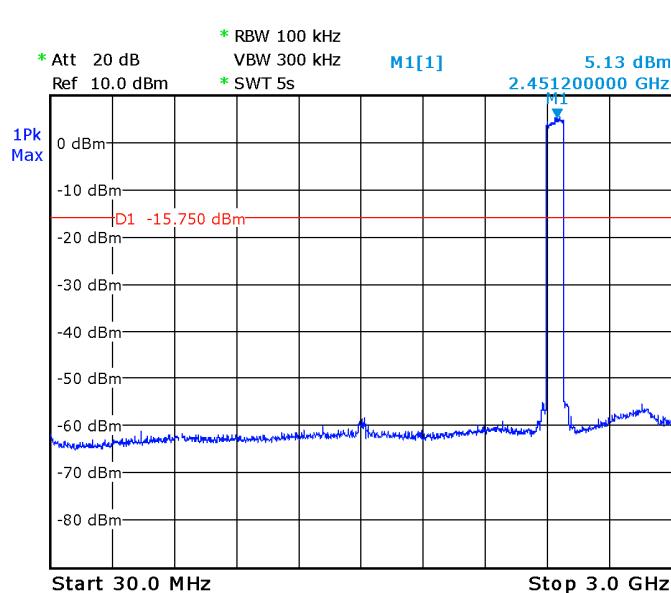
Rapport d'essais / Test Report

N° : 20721-FCC-1

Graphical representation of Band-edge compliance (Modulation 3-DH5 / 8DPSK)



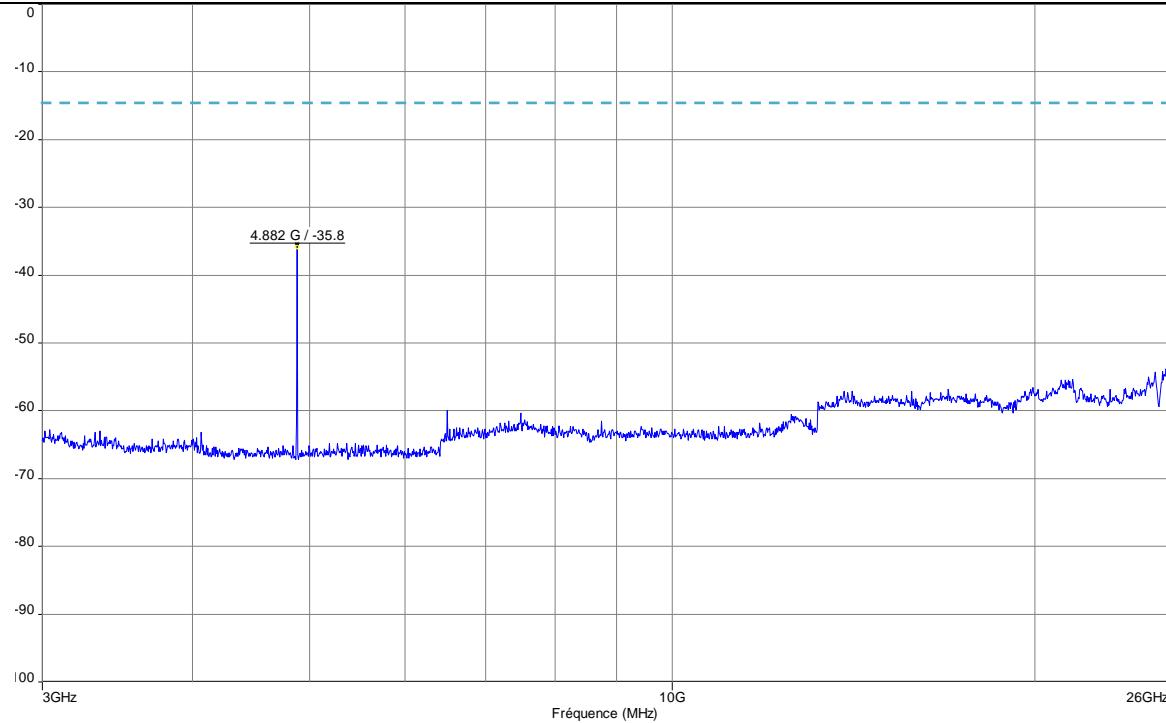
Graphical representation of Band-edge compliance (Worst case Modulation 1-DH5 / GPSK)



Low bandedge compliance

Frequency 30MHz to 3GHz

RESULT: PASS



High bandedge compliance

Frequency 3GHz to 26GHz

Marker 4.882GHz / -35.8dBm (Limit is -15dBm)

RESULT: PASS



Rapport d'essais / Test Report

N° : 20721-FCC-1

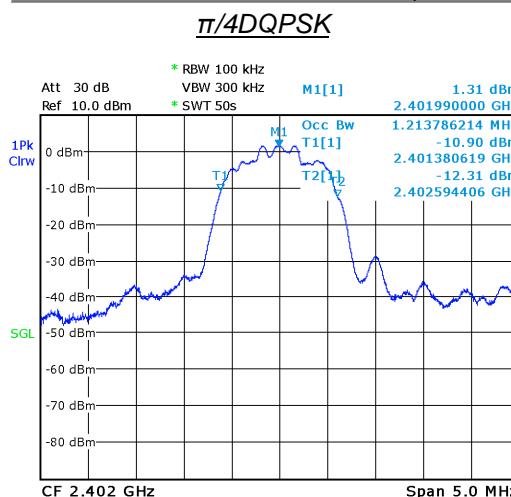
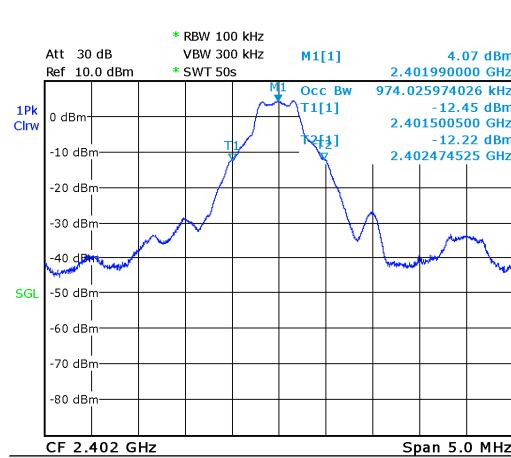
12. Occupied bandwidth (99%)

TEST: Occupied bandwidth (99%) / RSS-GEN	Verdict
Method: The Equipment under test is connected to the measuring receiver with suitable mean. The SPAN is adapted to see the frequency band of operation. The spectrum analyzer RBW was 100kHz and VBW was 100kHz. A special function on the spectrum analyser is used to measure the 99% OBW.	Pass
Supplementary information: Test location: SMEE – CE Mesures / Test date: September 6 st , 2013 Power supply voltage: 3.7V from battery	

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Measuring Rec.	Rohde&Schwarz	ESL3	REC-101-001	2012/6	2014/6
RF cable	PASTERNAK RF	PE354-150	CAB-131-025	2013/9	2014/9

Tabulated Results for Occupied Bandwidth	
Modulation type	99% Occupied Bandwidth
	(MHz)
GFSK	0.974026
$\pi/4$ DQPSK	1.203796
8DPSK	1.213786

Graphical representation of Occupied Bandwidth



$8DPSK$