

**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 : <i>Equipment under test:</i>	CMBBOX LV2 (Command BOX V2)
--	--

Constructeur: **LASER GAME EQUIPEMENT**Manufacturer: 21, rue Colonel Dumont
3800 GrenobleRapport délivré à : **LASER GAME EQUIPEMENT**Issued to: 21, rue Colonel Dumont
3800 Grenoble

Référence de la proposition : 022014-20933

*Proposal number:*Date de l'essai : March 3rd to 18th, 2014*Date of test:*Objectif des essais : Qualification FCC suivant les normes :
Test purpose: *FCC qualification according to standards:*
CFR 47, Part 15C (chapter 15.231)
Industry Canada RSS-210, Issue 1 (Annex 1.1)

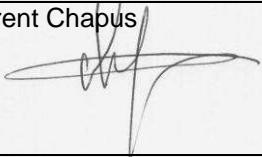
FCC ID: 2ABZ40001

IC: 11833A-0001

Lieu du test: SMEE CE-Mesures
Test location: 38 VOIRON - France

Test réalisé par : Laurent CHAPUS – 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	April 25 th , 2014	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° : 20933-FCC/IC-1

SUMMARY

1. TEST PROGRAM.....	3
2. EQUIPMENT UNDER TEST (EUT)	4
3. TEST CONDITIONS.....	4
4. MODIFICATIONS OF THE EQUIPMENT UNDER TEST.....	4
5. CONDUCTED EMISSION MEASUREMENT	5
6. DE-ACTIVATION TIME / PERIODIC OPERATIONS AT REGULAR INTERVALS	8
7. FIELD STRENGTH OF FUNDAMENTAL	10
8. SPURIOUS EMISSIONS	13
9. OCCUPIED BANDWIDTH	21



Rapport d'essais / Test Report

N° : 20933-FCC/IC-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 15.231 of Subpart C (Periodic operation in the band 40.66–40.70 MHz and above 70 MHz.).

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

Industry Canada RSS-210 (Issue 8/2010) - Momentarily Operated Devices and Remote Control

- Test Results

TEST	Paragraph number (FCC Part 15.231 / IC RSS-210)	Spec. (FCC Part 15.231 / IC RSS-210)	RESULTS (comments)
Conducted emissions test	15.107 / 15.207 (a) RSS GEN 7.2.4	Table 15.207 (a) Table 4	PASS
De-activation time	15.231 (a) 1) RSS-210 A1.1.1 (a)	Automatically deactivate the transmitter within not more than 5 seconds of being released.	PASS
Periodic operations at regular intervals	15.231 (a) 3) RSS-210 A1.1.2 (c)	Maximum duration allowed 2s per hour	N/A (No such operation)
Field strength of fundamental	15.231 (b) RSS-210 A1.1.2 (1)	10964 μ V/m max at 433MHz (80.8dB μ V/m, Average) (100.8dB μ V/m, Peak)	PASS
Spurious emissions	15.231 (b) RSS-210 A1.1.2 (3)	1096.4 μ V/m max for fundamental at 433MHz (60.8dB μ V/m, Average) (80.8dB μ V/m, Peak)	PASS
Unintentional radiations	15.205 / 15.209 RSS-Gen 4.10 / RSS-210 A1.1.2 (3)	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
Maximum bandwidth	15.231 (c) RSS-210 A1.1.3	Shall be lower than 0.25% of center frequency (-20dB bandwidth for FCC section / 99% bandwidth for RSS section)	PASS

PASS: EUT complies with standard's requirement

FAIL: EUT does not comply with standard's requirement

- General conclusion:

Measures and tests performed on the sample of the product CommandBox (CMDBOX LV2), in configuration and description presented in this test report, show compliance with standards FCC CFR 47, PART 15, Subpart C and Industry Canada RSS-Gen & RSS-210.



Rapport d'essais / Test Report

N° : 20933-FCC/IC-1

2. Equipment Under Test (EUT)

Nom / <i>Identification</i>	CMBBOX LV2 (Command BOX V2)			Ref N°: 0000 CdBox00								
Auxiliaires / <i>Auxiliaries</i>	Plastron V2 (LGE equipment, radio communication) Pc Eee PC 900 ASUS (Windows XP)											
Entrées-Sorties / <i>Input / Output</i>	<table border="1"><thead><tr><th></th><th>Câbles pour essai / <i>Cables for test</i></th><th>Blindé / <i>Shielded</i></th><th>Prévu pour >3m / <i>Intended for >3m</i></th></tr></thead><tbody><tr><td>Serial port DB9 with DC input</td><td>2.50m, 4wires</td><td>No</td><td>No</td></tr></tbody></table>					Câbles pour essai / <i>Cables for test</i>	Blindé / <i>Shielded</i>	Prévu pour >3m / <i>Intended for >3m</i>	Serial port DB9 with DC input	2.50m, 4wires	No	No
	Câbles pour essai / <i>Cables for test</i>	Blindé / <i>Shielded</i>	Prévu pour >3m / <i>Intended for >3m</i>									
Serial port DB9 with DC input	2.50m, 4wires	No	No									
Version programme / <i>Firmware version</i>	CMDBox 3.01m											
Alimentation / <i>Power supply</i>	- 12V DC from power adapter (MASCOTT, type 9725, 100-250 50-60Hz / 12V DC - 600mA)											
Mode de fonctionnement / <i>Running mode</i>	The tested sample is set in following modes: - Periodic transmission mode with modulation - Continuous transmit mode with modulation (Test mode) - Receive mode											
Information sur l'équipement / <i>Equipment information</i>	- Center frequency: 433.93MHz (Transmit) - Wideband equipment - Antenna type: Single wire antenna soldered on PCB - Modulation: FSK +/-50kHz - Transmit time: 16ms every 100ms (automatic operation, activated by control signal, as declared by manufacturer) - No periodic transmissions at regular intervals - Battery type NiMH 6V (5 cells)											

3. Test conditions

Relative Humidity : 55%
Temperature : 20°C

Power supply voltage:
Equipment under test: 12Vdc from power adapter
110V/60Hz – AC mains (Conducted emission)

4. Modifications of the equipment under test

No modification applied to the tested equipment during tests.



Rapport d'essais / Test Report

N° : 20933-FCC/IC-1

5. Conducted Emission Measurement

TEST: Limits for conducted disturbance 150kHz – 30MHz			Verdict	
<p>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.</p> <p>The EUT is 80cm above the ground reference plane and 40cm from the vertical ground plane.</p> <p>The AC power cable is 1m length.</p>			Pass	
Laboratory Parameters:	Required prior to the test		During the test	
Ambient Temperature	10 to 40 °C		20°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	
	150kHz to 30MHz		AC input port (110V)	
Running mode	Normal / Transmit mode			
Limits for AC power port				
Frequency (MHz)	Limit dB (µV)			
	Quasi-Peak	Result	Average	Result
0.15 – 0.50	66 \ 56	Pass	56 \ 46	Pass
0.50 – 5	56	Pass	46	Pass
5 – 30	60	Pass	50	Pass
Supplementary information: Test location: SMEE – CE Mesures / Test date: March 17 th , 2014 Power supply voltage: 110V / 60Hz				

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Attenuator	SMEE	ATT#1	ATT-101-004	2014/3	2015/3
Cable RF	Div	2m / BNC	CAB-101-005	2014/3	2015/3
LISN (50Ω / 50µH)	AFJ	LS16C	RSI-101-001	2014/3	2015/3
LISN (50Ω / 50µH)	AFJ	LS16C	RSI-101-002	2014/3	2015/3
Reference comb gen.	SMEE	EMC-250K	REF-111-001	-	-
Measuring receiver	Rohde & Schwarz	ESL3	REC-101-001	2012/6	2014/6



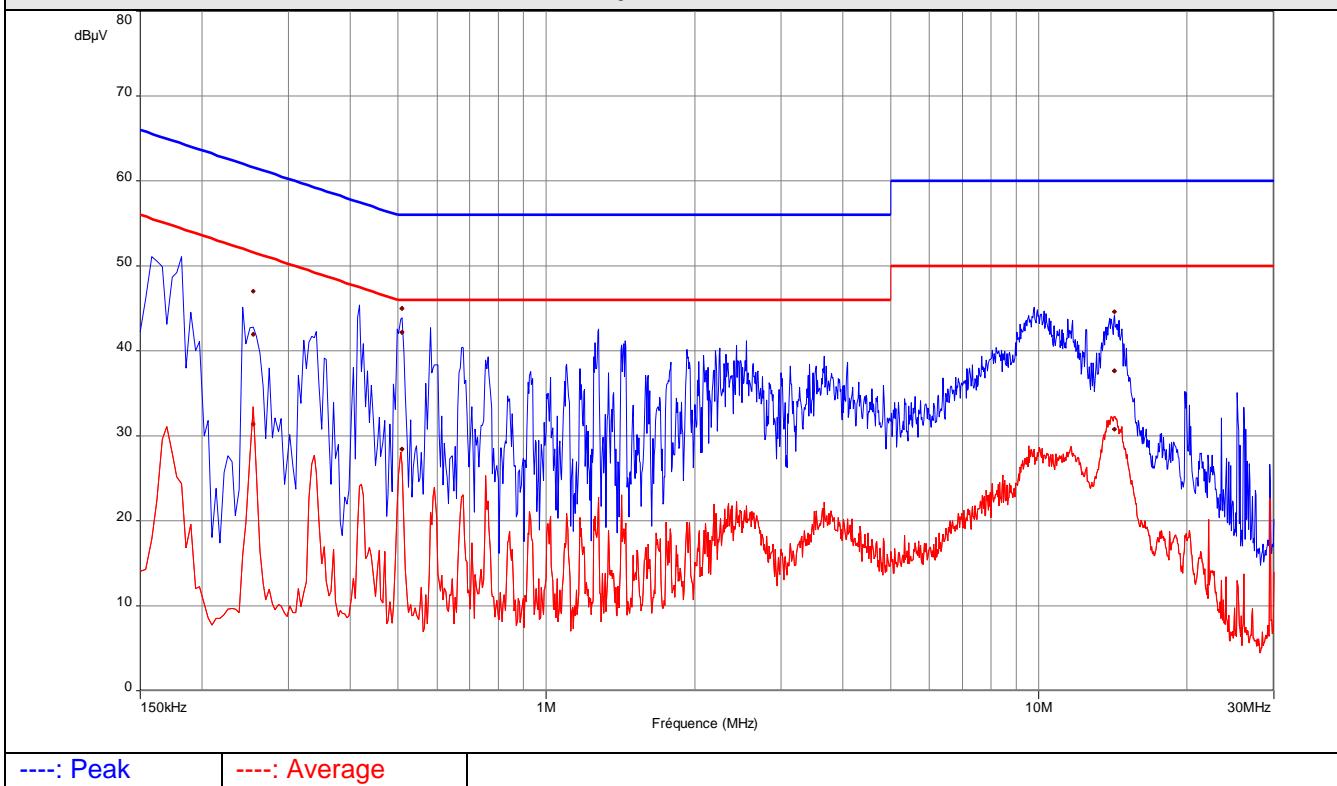
Rapport d'essais / Test Report

N° : 20933-FCC/IC-1

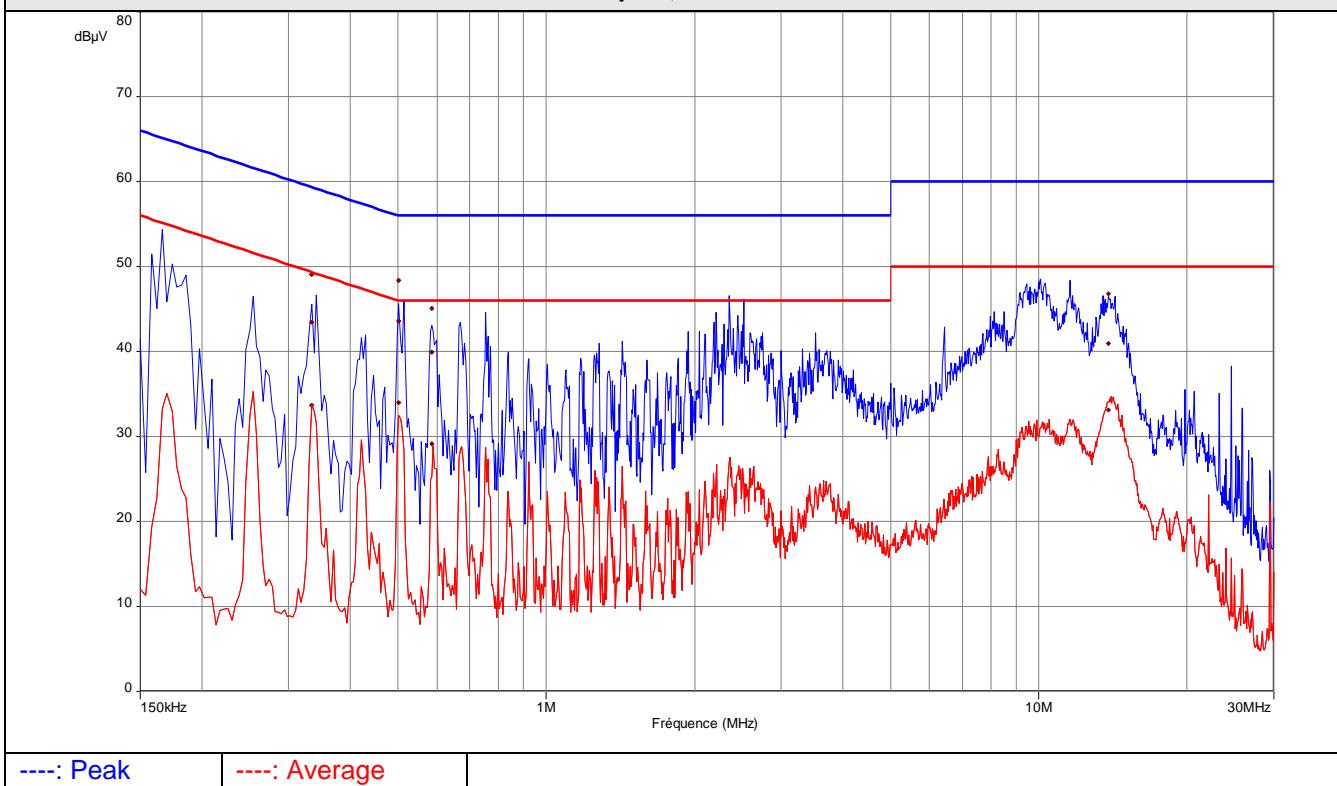
Tabulated Results for Mains Terminal Disturbance Voltage on AC port								
FREQ (MHz)	Meas. PK (dB μ V)	Mes. QP (dB μ V)	LIMIT QP (dB μ V)	Margin QP (dB)	Mes. AV (dB μ V)	LIMIT AV (dB μ V)	Margin AV (dB)	Line
0.254	47.1	41.9	61.6	-19.7	31.4	51.6	-20.2	L1
0.510	45.0	42.2	56.0	-13.8	28.4	46.0	-17.6	L1
14.226	44.6	37.7	60.0	-22.3	30.8	50.0	-19.2	L1
0.334	49.1	43.5	59.4	-15.9	33.7	49.4	-15.7	Neutral
0.502	48.4	43.6	56.0	-12.4	34.0	46.0	-12.0	Neutral
0.586	45.1	40.0	56.0	-16.1	29.1	46.0	-16.9	Neutral
13.838	46.8	40.9	60.0	-19.1	33.2	50.0	-16.9	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:	± 5dB (k=2)

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



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





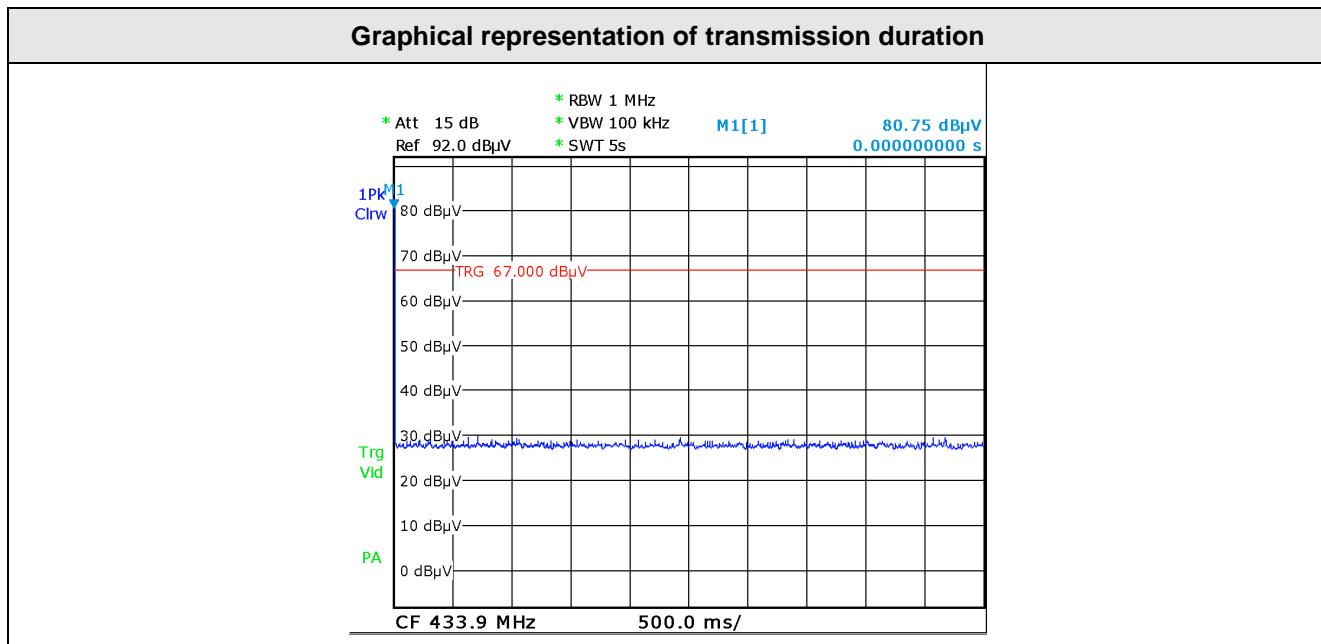
Rapport d'essais / Test Report

N° : 20933-FCC/IC-1

6. De-activation time / Periodic operations at regular intervals

TEST: De-activate time and Periodic operations at regular intervals	Verdict
<p>Method: Measurements were performed with peak detector using a 100kHz RBW. The VBW is set to 100kHz. The spectrum analyzer is connected via suitable means (GTEM cell) to the RF signal of the tested equipment.</p> <p>The tested equipment is set to transmit operation.</p> <p>Measurement is done with a zero span at fundamental frequency. The transmission duration was measured and recorded</p> <p>Limits: A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.</p> <p>Supplementary information: Test location: SMEE – CE Mesures / Test date: March 18th, 2014 Power supply voltage: 12V from power adapter</p>	Pass

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
GTEM cell	TESEQ	750	GTE-101-001	2014/3	2015/3
Measuring Rec.	Rohde&Schwarz	ESL3	REC-101-001	2012/6	2014/6

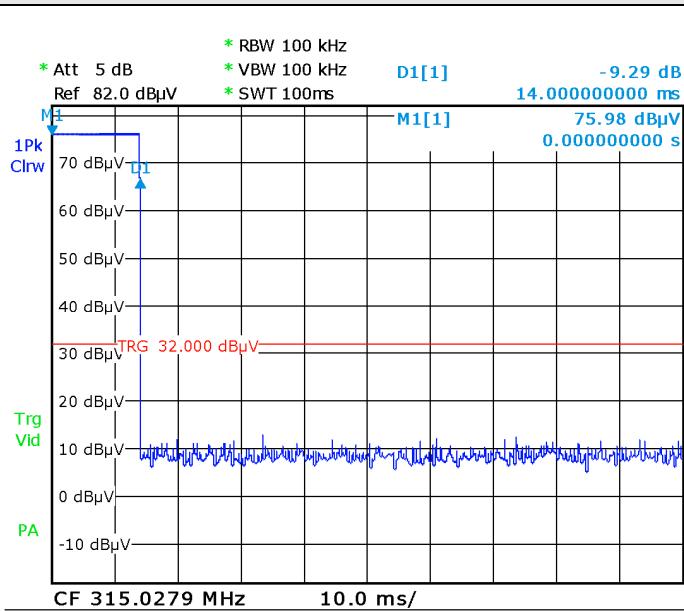




Rapport d'essais / Test Report

N° : 20933-FCC/IC-1

Graphical representation of transmission duration



Tabulated Results for transmission duration

FREQ (MHz)	Duration of pulse (s)	Limit	Result
434.65	< 0.016	Shall be < 5s	PASS



Rapport d'essais / Test Report

N° : 20933-FCC/IC-1

7. Field strength of fundamental

TEST: Field strength of fundamental			Verdict												
<p><u>Method:</u> 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 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>			Pass												
<p>Laboratory Parameters:</p> <table border="1"><thead><tr><th>Required prior to the test</th><th>During the test</th></tr></thead><tbody><tr><td>Ambient Temperature</td><td>10 to 40 °C</td></tr><tr><td>Relative Humidity</td><td>10 to 90 %</td></tr><tr><td>Fully configured sample scanned over the following frequency range</td><td>Frequency range on each side of line</td></tr><tr><td></td><td>9kHz – 5GHz</td></tr><tr><td>Running mode</td><td>Continuous Transmission mode</td></tr></tbody></table>			Required prior to the test	During the test	Ambient Temperature	10 to 40 °C	Relative Humidity	10 to 90 %	Fully configured sample scanned over the following frequency range	Frequency range on each side of line		9kHz – 5GHz	Running mode	Continuous Transmission mode	
Required prior to the test	During the test														
Ambient Temperature	10 to 40 °C														
Relative Humidity	10 to 90 %														
Fully configured sample scanned over the following frequency range	Frequency range on each side of line														
	9kHz – 5GHz														
Running mode	Continuous Transmission mode														
Limits – FCC Part 15.231 / RSS-210 Iss8															
Frequency (MHz)	Limit (dB μ V/m)														
Fundamental frequency (MHz)	μV/meter	dB μ V/m	Results												
40.66 – 40.70	2250	67.04	PASS												
70 – 130	1250	61.94	PASS												
130 – 174	1250 to 3750	61.94 to 71.48	PASS												
174 – 260	3750	71.48	PASS												
260 – 470	3750 to 12500	71.48 to 81.94	PASS												
Above 470	12500	81.94	PASS												
Supplementary information: Test location: SMEE – CE Mesures / Test date: March 17 th , 2014 Power supply voltage: 12V from power adapter															
Notes: (1) Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 56.81818(F)-6136.3636; for the band 260-470 MHz, uV/m at 3 meters = 41.6667(F)- 7083.3333. (2): The above field strength limits are specified at a distance of 3meters. The tighter limits apply at the band edges. (3) At 433MHz, the limit is 10964.8 μ V/m (80.8dB μ V/m). Intentional radiators shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. A peak limit shall be applied 20dB above the average limit.															



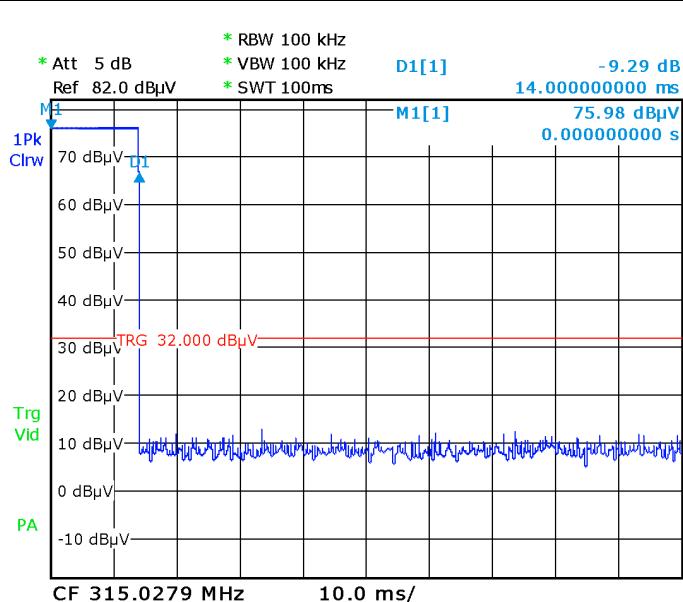
Rapport d'essais / Test Report

N° : 20933-FCC/IC-1

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Log-periodic antenna	TDK	PLP3003	ANT-101-001	2013/5	2014/5
RF cable	Div	2m	CAB-101-011	2014/3	2015/3
RF cable	Div	OATS/25m	CAB-101-017	2014/3	2015/3
GTEM cell	TESEQ	750	GTE-101-001	2014/3	2015/3
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	-	-
Measuring Rec	Rohde&Schwarz	ESL3	REC-101-001	2012/6	2014/6

Tabulated Results for Radiated Field Strength of fundamental OATS measurement 3m									
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)
433,919	70.9	Pk	H	150	225	20,5	91.4	100.8	-9.4
433,919	55.0	Av	H	150	225	20,5	75.5	80.8	-5.3
Supplementary information: Frequency list measured on the Open Area Test Site has been created with pre-scan results. Worst case results for 3 axes position. Equipment transmits continuously.									
RBW:		120kHz							
Measurement distance:		3m							
Limit:		15.231							
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 is as follow: $FS = RA + AF + CF - AG$ Where FS = Field Strength (Level dB μ V/m) RA = Receiver Amplitude (Meter reading dB μ V) AF = Antenna Factor CF = Cable Factor AG = Amplifier Gain Total factor (dB) is AF + CF - AG Margin value = Emission level - Limit value (1): The average value of fundamental frequency emission is: Average = Peak value + 20log(Duty Cycle) Where the duty factor (DC) is calculated from following formula: DC = Tx ON on a period of 100ms (16/100ms) 20log(DC)=-15.9dB							

Graphical representation for Duty Cycle corrector factor



Pulse width : 16ms (max value)

Number of pulse within 100ms: 1

Duty cycle average factor = $20\log(1 \times 16/100) = -15.9\text{dB}$



Rapport d'essais / Test Report

N° : 20933-FCC/IC-1

8. Spurious Emissions

TEST: Field strength of spurious emission			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 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>			Pass
Laboratory Parameters:	Required prior to the test		During the test
Ambient Temperature	10 to 40 °C		20°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	Transmission mode / Receive mode		
Limits – FCC Part 15.231 / RSS-210 Iss8			
Frequency (MHz)	Limit (dB μ V/m)		
Fundamental frequency (MHz)	μ V/meter	dB μ V/m	Results
40.66 – 40.70	225	47.04	PASS
70 – 130	125	41.94	PASS
130 – 174	125 to 375	41.94 to 51.48	PASS
174 – 260	375	51.48	PASS
260 – 470	375 to 1250	51.48 to 61.94	PASS
Above 470	1250	61.94	PASS
Supplementary information: Test location: SMEE – CE Mesures / Test date: March 17 th , 2014 Power supply voltage: 12V from power adapter			
Notes: (1) The above field strength limits are specified at a distance of 3meters. The tighter limits apply at the band edges. (2): The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level. (3) At 433MHz, the limit is 1096.648 μ V/m (60.8dB μ V/m). Intentional radiators shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. A peak limit shall be applied 20dB above the average limit.			
In addition, radiated emissions which fall in the restricted bands, as defined in FCC § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a).			



Rapport d'essais / Test Report

N° : 20933-FCC/IC-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	2013/5	2014/5
RF cable	Div	2m	CAB-101-011	2014/3	2015/3
RF cable	Div	OATS/25m	CAB-101-017	2014/3	2015/3
Pre-amplifier	PE	PE1524	PRE-101-002	2014/3	2015/3
GTEM cell	TESEQ	750	GTE-101-001	2014/3	2015/3
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	-	-
Measuring Rec	Rohde&Schwarz	ESL3	REC-101-001	2012/6	2014/6
Spectrum analyzer	AGILENT	HP 8563E	ASP-111-003	2013/9	2015/9
Ref. Comb generator	SMEE	EMR-10M	REF-111-002	-	-



SMEE

Rapport d'essais / Test Report

N° : 20933-FCC/IC-1

**Tabulated Results for Radiated Disturbance (3m measurement on Open Area Test Site)
30MHz-5GHz – Transmit mode**

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)
867,848	27,2	Pk	H	245	100	29,1	56.3	80,8	-24.5
867,848	11.3	Av	H	245	100	29,1	40,4	60,8	-20.4

**Tabulated Results for Radiated Disturbance (3m measurement on Open Area Test Site)
30MHz-5GHz – Receive mode**

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)
88.500	22.5	QP	H	145	100	9.8	32.3	43.5	-11.2
480.041	17.8	QP	H	155	150	22.0	39.8	46.0	-6.2
840.058	15.6	QP	H	225	100	28.5	44.1	46.0	-1.9

Supplementary information:

Frequency list measured on the Open Area Test Site has been created with pre-scan results.

Worst case results for 3 axes position.

All others spurious show at least 20dB of margin

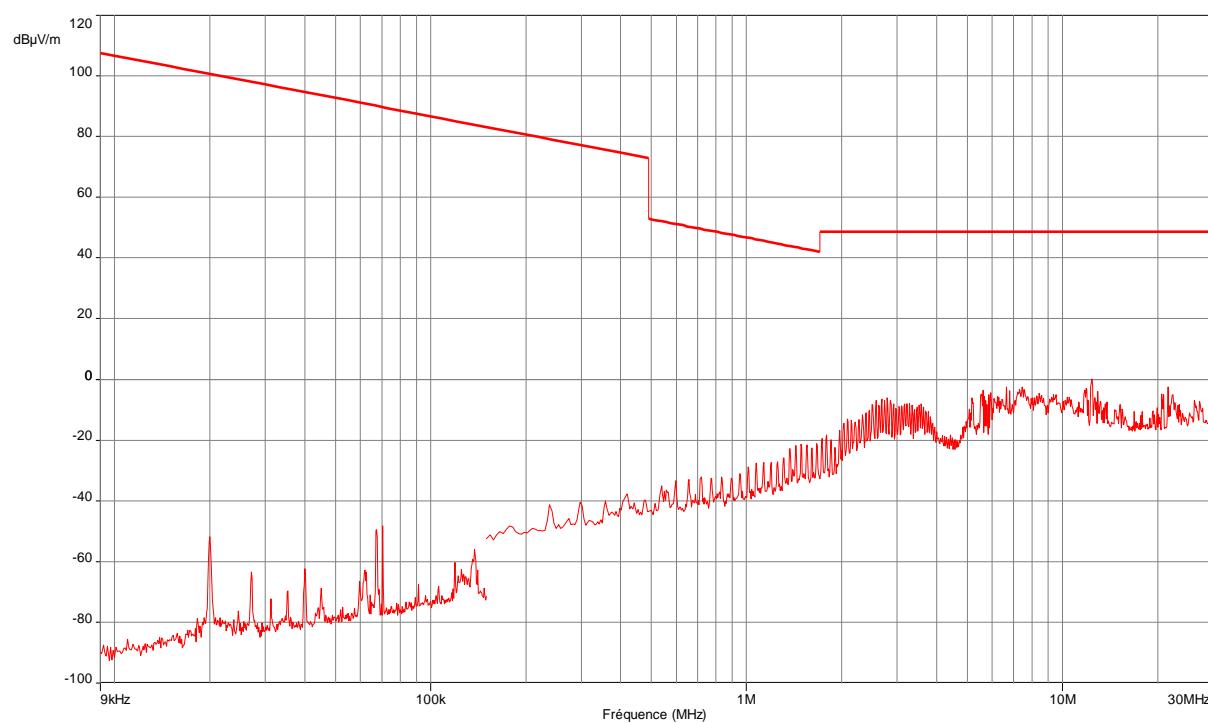
Frequency band investigated:	30MHz-5GHz
RBW:	120kHz - Below 1GHz 1MHz – Above 1GHz
Measurement distance:	3m
Limit:	15.109 / 15.209 / 15.231
Wide Measurement Uncertainty:	± 5.2dB (k=2)
Field Strength Calculation:	<p>The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follow:</p> $FS = RA + AF + CF - AG$ <p>Where FS = Field Strength (Level dBμV/m) RA = Receiver Amplitude (Meter reading) AF = Antenna Factor CF = Cable Factor AG = Amplifier Gain</p> <p>Total factor (dB) is AF + CF – AG Margin value = Emission level – Limit value</p>
Average Field Strength Calculation:	<p>The average value of spurious emission is: Average = Peak value + 20log(Duty Cycle)</p> <p>Where the duty factor (DC) is calculated from following formula: $DC = Tx \text{ ON on a period of } 100\text{ms (16/100ms)}$ $20\log(DC) = -15.9\text{dB}$</p>



Rapport d'essais / Test Report

N° : 20933-FCC/IC-1

Graphical representation of Radiated Disturbance Measurement (Peak detection, GTEM pre-scan) 9kHz-30MHz (10m)



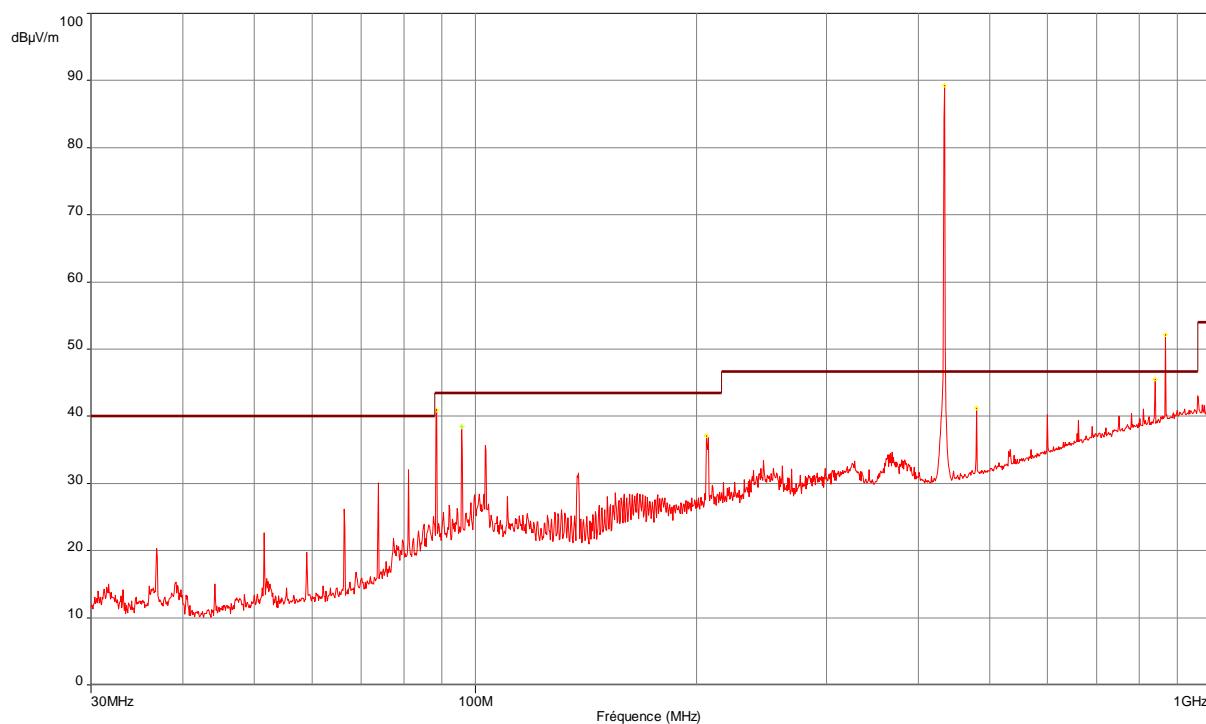
----- : Peak measure



Rapport d'essais / Test Report

N° : 20933-FCC/IC-1

Graphical representation of Radiated Disturbance Measurement (Peak detection, GTEM pre-scan) 30MHz-1GHz (3m) – Transmit mode



Frequency (MHz)	Level Peak (dB μ V/m)	Limit AV (dB μ V/m)	Limit Peak (dB μ V/m)	Note
88.500	41.0	60.8	80.8	Not in restricted band
95.850	38.4	60.8	80.8	Not in restricted band
206.050	37.1	60.8	80.8	Not in restricted band
433.950	89.2	80.8	100.8	Intentional radiation
480.050	41.2	60.8	80.8	Not in restricted band
840.050	45.5	60.8	80.8	Not in restricted band
867.650	52.2	60.8	60.8	Not in restricted band

Note: Pre-scan graph only for identification purpose.

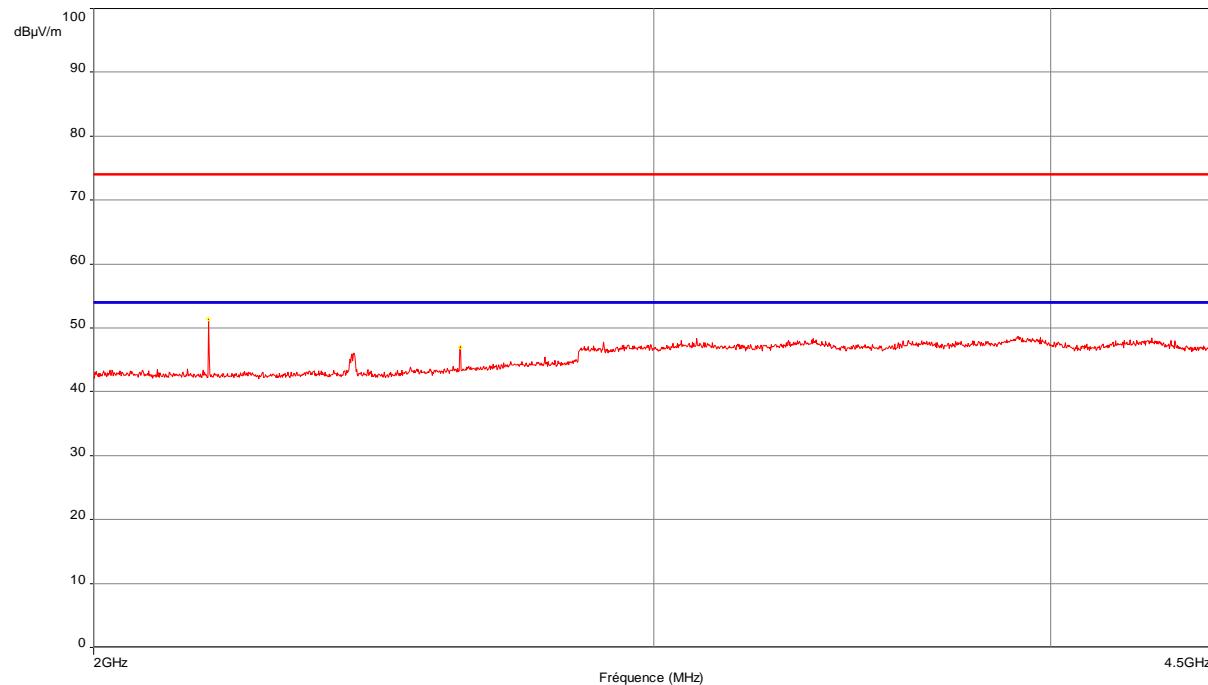
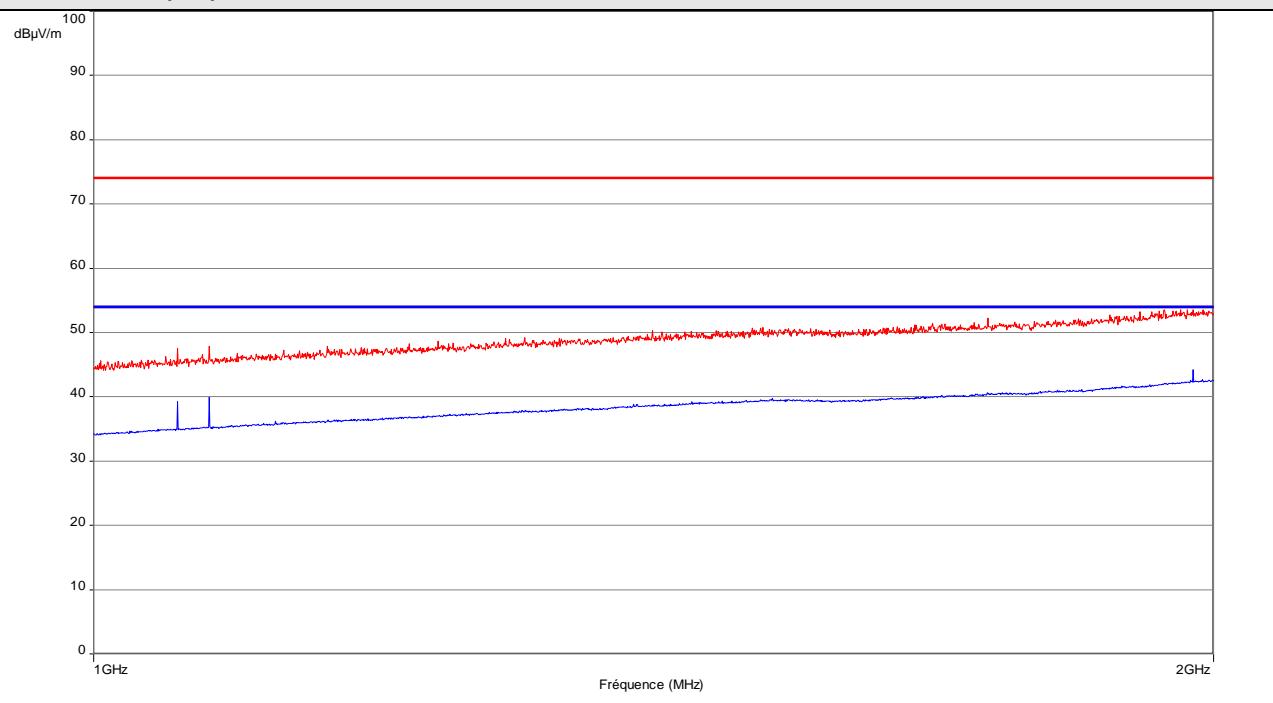
----- : Peak measure



Rapport d'essais / Test Report

N° : 20933-FCC/IC-1

Graphical representation of Radiated Disturbance Measurement (Peak detection, GTEM pre-scan) 1GHz-5GHz (3m) – Transmit mode



Frequency (MHz)	Level Peak (dB μ V/m)	Limit Peak (dB μ V/m)	Note
2173.50	51.4	60.8	Not in restricted band
2608.00	47.0	60.8	Not in restricted band

Note: Pre-scan graph only for identification purpose.

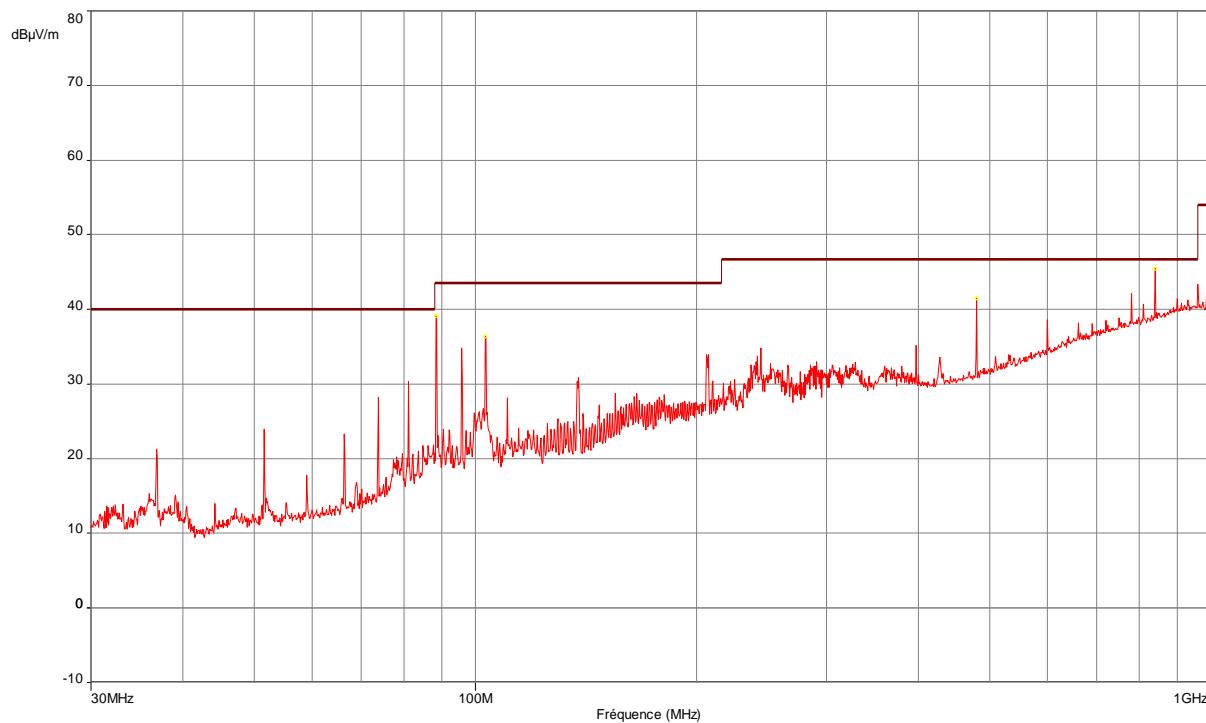
----- : Peak measure



Rapport d'essais / Test Report

N° : 20933-FCC/IC-1

Graphical representation of Radiated Disturbance Measurement (Peak detection, GTEM pre-scan) 30MHz-1GHz (3m) – Receive mode

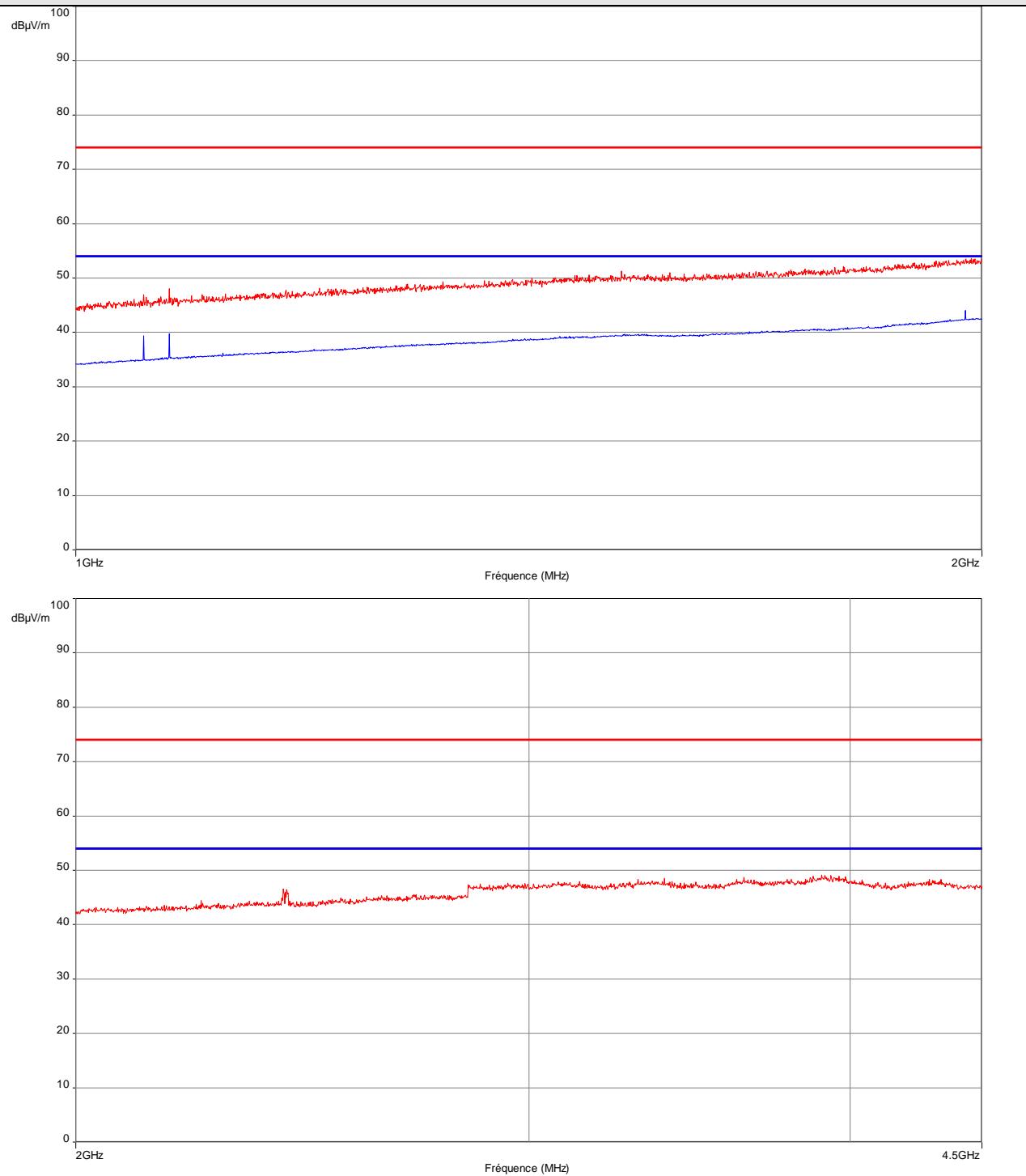


Frequency (MHz)	Level Peak (dB μ V/m)	Limit Peak (dB μ V/m)
88.450	39.1	43.5
103.200	36.4	43.5
480.050	41.5	46.0
840.050	45.4	46.0

Note: Pre-scan graph only for identification purpose.

----- : Peak measure

**Graphical representation of Radiated Disturbance Measurement (Peak detection, GTEM pre-scan)
1GHz-5GHz (3m) – Receive mode**



Note: Pre-scan graph only for identification purpose.

----- : Peak measure

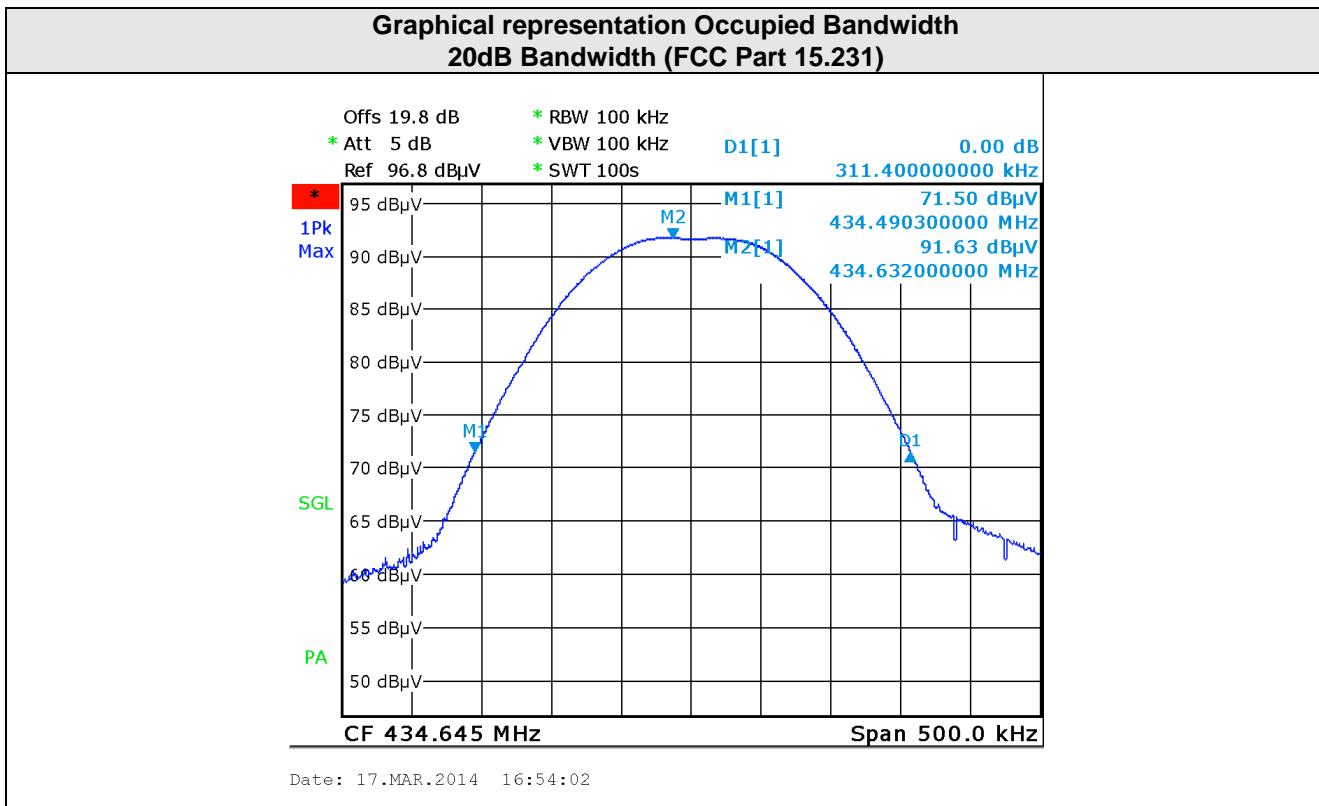
**SMEE****Rapport d'essais / Test Report**

N° : 20933-FCC/IC-1

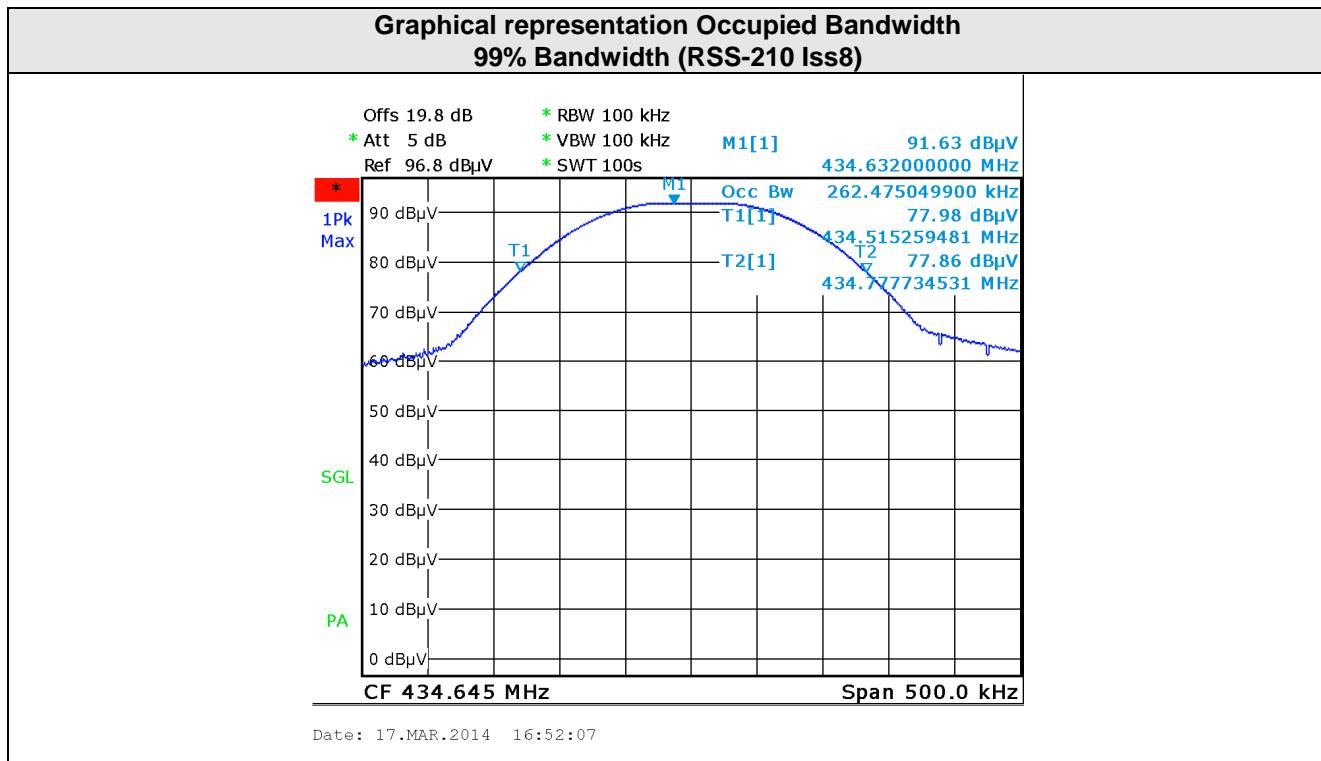
9. Occupied bandwidth

TEST: Occupied bandwidth measurement		Verdict
Method: Measurements were performed with peak detector using a 100kHz RBW. The VBW is set to 100kHz. The spectrum analyzer is connected to the GTEM cell. The tested equipment is placed in the GTEM cell at the maximum field strength of fundamental.		
The tested equipment is set to transmit operation.		Pass
<u>Limits:</u> The maximum 20 dB bandwidth and 99% bandwidth shall be lower than 0.25% of the center frequency		
Supplementary information: Test location: SMEE – CE Mesures / Test date: March 17 th , 2014 Power supply voltage: 12V from power adapter		

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
GTEM cell	TESEQ	750	GTE-101-001	2014/3	2015/3
Measuring Rec.	Rohde&Schwarz	ESL3	REC-101-001	2012/6	2014/6



Tabulated Results for Occupied Bandwidth 20dB Bandwidth (FCC Part 15.231 result)			
FREQ (MHz)	20dB bandwidth (kHz)	Limit	Result
434.65	311.400	Shall be < 1086.6kHz	PASS



Tabulated Results for Occupied Bandwidth 99% Bandwidth (RSS-210 Iss 1 result)			
FREQ (MHz)	20dB bandwidth (kHz)	Limit	Result
434.65	262.475	Shall be < 1086.6kHz	PASS