



**CE-Mesures**

## Rapport d'essais / Test Report

N° : 20933-FCC/IC-1

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### SMEE

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

IC Company Number: 9545A

|                                                  |                                              |
|--------------------------------------------------|----------------------------------------------|
| Matériel testé :<br><i>Equipment under test:</i> | <b>CMBBOX LV2</b><br><b>(Command BOX V2)</b> |
|--------------------------------------------------|----------------------------------------------|

|                                |                                                                         |
|--------------------------------|-------------------------------------------------------------------------|
| Constructeur:<br>Manufacturer: | <b>LASER GAME EQUIPEMENT</b><br>21, rue Colonel Dumont<br>3800 Grenoble |
|--------------------------------|-------------------------------------------------------------------------|

|                                          |                                                                         |
|------------------------------------------|-------------------------------------------------------------------------|
| Rapport délivré à :<br><i>Issued to:</i> | <b>LASER GAME EQUIPEMENT</b><br>21, rue Colonel Dumont<br>3800 Grenoble |
|------------------------------------------|-------------------------------------------------------------------------|

|                                                          |              |
|----------------------------------------------------------|--------------|
| Référence de la proposition :<br><i>Proposal number:</i> | 022014-20933 |
|----------------------------------------------------------|--------------|

|                                           |                                                  |
|-------------------------------------------|--------------------------------------------------|
| Date de l'essai :<br><i>Date of test:</i> | March 3 <sup>rd</sup> to 18 <sup>th</sup> , 2014 |
|-------------------------------------------|--------------------------------------------------|

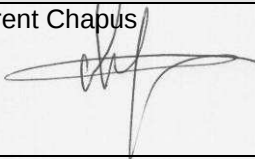
|                                               |                                                                                                                                                                                 |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Objectif des essais :<br><i>Test purpose:</i> | Qualification FCC suivant les normes :<br><i>FCC qualification according to standards:</i><br>CFR 47, Part 15C (chapter 15.231)<br>Industry Canada RSS-210, Issue 1 (Annex 1.1) |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|         |             |
|---------|-------------|
| FCC ID: | 2ABZ40001   |
| IC:     | 11833A-0001 |

|                                        |                                       |
|----------------------------------------|---------------------------------------|
| Lieu du test:<br><i>Test location:</i> | SMEE CE-Mesures<br>38 VOIRON - France |
|----------------------------------------|---------------------------------------|

|                                                |                                  |
|------------------------------------------------|----------------------------------|
| Test réalisé par :<br><i>Test realized by:</i> | Laurent CHAPUS – Jérémy BLANCHER |
|------------------------------------------------|----------------------------------|

|                                    |                                                                                                                                                           |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Conclusion :<br><i>Conclusion:</i> | L'équipement satisfait aux prescriptions des normes citées en référence.<br><i>The appliance complies with requirements of above mentioned standards.</i> |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|

| Ed. | Date                          | Modifications<br>Pages | Written by:<br>Visa | Approved by:<br>Visa                                                                                    |
|-----|-------------------------------|------------------------|---------------------|---------------------------------------------------------------------------------------------------------|
| 1   | April 25 <sup>th</sup> , 2014 | Initial Edition        | Jérémy Blancher     | Laurent Chapus<br> |

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### SUMMARY

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## 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<br>(FCC Part 15.231 /<br>IC RSS-210)   | Spec.<br>(FCC Part 15.231 /<br>IC RSS-210)                                                                                                                                                                                                                    | RESULTS<br>(comments)      |
|------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Conducted emissions test                 | 15.107 / 15.207 (a)<br>RSS GEN 7.2.4                    | Table 15.207 (a)<br>Table 4                                                                                                                                                                                                                                   | PASS                       |
| De-activation time                       | 15.231 (a) 1)<br>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)<br>RSS-210 A1.1.2 (c)                     | Maximum duration allowed 2s per hour                                                                                                                                                                                                                          | N/A<br>(No such operation) |
| Field strength of fundamental            | 15.231 (b)<br>RSS-210 A1.1.2 (1)                        | 10964µV/m max at 433MHz<br>(80.8dBµV/m, Average)<br>(100.8dBµV/m, Peak)                                                                                                                                                                                       | PASS                       |
| Spurious emissions                       | 15.231 (b)<br>RSS-210 A1.1.2 (3)                        | 1096.4µV/m max for fundamental at 433MHz<br>(60.8dBµV/m, Average)<br>(80.8dBµV/m, Peak)                                                                                                                                                                       | PASS                       |
| Unintentional radiations                 | 15.205 / 15.209<br>RSS-Gen 4.10 /<br>RSS-210 A1.1.2 (3) | Measure at 300m<br>9-490kHz: 2400µV/m/F(kHz)<br>Measure at 30m<br>0.490-1.705: 24000µV/m/F(kHz)<br>1.705-30MHz: 30µV/m<br>Measure at 3m<br>30MHz-88MHz : 40 dBµV/m<br>88MHz-216MHz : 43.5 dBµV/m<br>216MHz-960MHz : 46.0 dBµV/m<br>Above 960MHz : 54.0 dBµV/m | PASS                       |
| Maximum bandwidth                        | 15.231 (c)<br>RSS-210 A1.1.3                            | Shall be lower than 0.25% of center frequency<br>(-20dB bandwidth for FCC section /<br>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**.



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### 2. Equipment Under Test (EUT)

**Nom /**  
**Identification**

**CMBBOX LV2**  
**(Command BOX V2)**

Ref N°: 0000 CdBox00

**Auxiliaires /**  
**Auxiliaries**

Plastron V2 (LGE equipment, radio communication)  
Pc Eee PC 900 ASUS (Windows XP)

**Entrées-Sorties /**  
**Input / Output**

|                                  | Câbles pour essai /<br>Cables for test | Blindé /<br>Shielded | Prévu pour >3m /<br>Intended for >3m |
|----------------------------------|----------------------------------------|----------------------|--------------------------------------|
| Serial port DB9<br>with DC input | 2.50m, 4wires                          | No                   | No                                   |

**Version programme /**  
**Firmware version**

CMDBox 3.01m

**Alimentation /**  
**Power supply**

- 12V DC from power adapter  
(MASCOTT, type 9725, 100-250 50-60Hz / 12V DC - 600mA)

**Mode de fonctionnement /**  
**Running mode**

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 /**  
**Equipment information**

- 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.



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### 5. Conducted Emission Measurement

| TEST: Limits for conducted disturbance 150kHz – 30MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |                                      |         | Verdict              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------|---------|----------------------|
| <u>Method:</u> 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.<br>The EUT is 80cm above the ground reference plane and 40cm from the vertical ground plane.<br>The AC power cable is 1m length. |               |                                      |         | 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:<br>Test location: SMEE – CE Mesures / Test date: March 17 <sup>th</sup> , 2014<br>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   |



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### Tabulated Results for Mains Terminal Disturbance Voltage on AC port

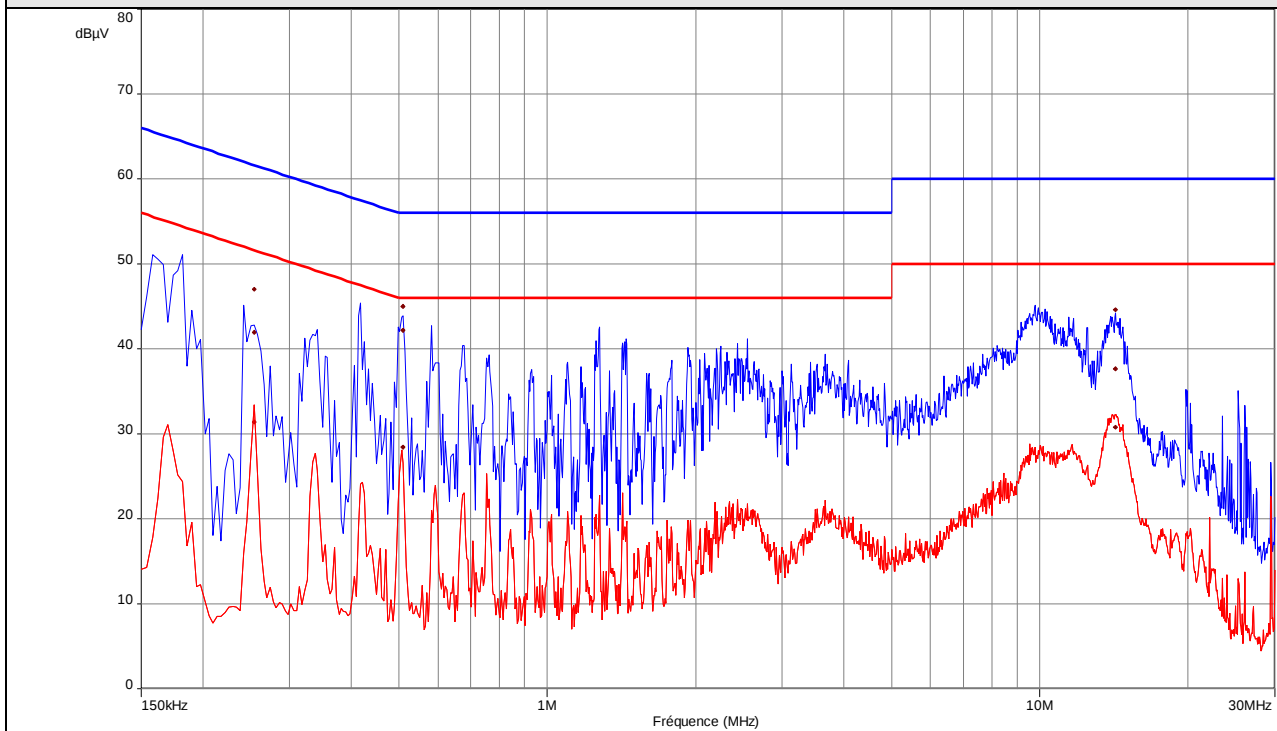
| FREQ<br>(MHz)                        | Meas. PK<br>(dBμV) | Mes. QP<br>(dBμV)      | LIMIT QP<br>(dBμV) | Margin QP<br>(dB) | Mes. AV<br>(dBμV) | LIMIT AV<br>(dBμV) | Margin AV<br>(dB) | Line    |
|--------------------------------------|--------------------|------------------------|--------------------|-------------------|-------------------|--------------------|-------------------|---------|
| 0.254                                | 47.1               | 41.9                   | 61.6               | <b>-19.7</b>      | 31.4              | 51.6               | <b>-20.2</b>      | L1      |
| 0.510                                | 45.0               | 42.2                   | 56.0               | <b>-13.8</b>      | 28.4              | 46.0               | <b>-17.6</b>      | L1      |
| 14.226                               | 44.6               | 37.7                   | 60.0               | <b>-22.3</b>      | 30.8              | 50.0               | <b>-19.2</b>      | L1      |
| 0.334                                | 49.1               | 43.5                   | 59.4               | <b>-15.9</b>      | 33.7              | 49.4               | <b>-15.7</b>      | Neutral |
| 0.502                                | 48.4               | 43.6                   | 56.0               | <b>-12.4</b>      | 34.0              | 46.0               | <b>-12.0</b>      | Neutral |
| 0.586                                | 45.1               | 40.0                   | 56.0               | <b>-16.1</b>      | 29.1              | 46.0               | <b>-16.9</b>      | Neutral |
| 13.838                               | 46.8               | 40.9                   | 60.0               | <b>-19.1</b>      | 33.2              | 50.0               | <b>-16.9</b>      | Neutral |
| <b>Frequency band investigated:</b>  |                    | 150kHz-30MHz           |                    |                   |                   |                    |                   |         |
| <b>RBW:</b>                          |                    | 9kHz                   |                    |                   |                   |                    |                   |         |
| <b>Voltage:</b>                      |                    | 110V / 60Hz            |                    |                   |                   |                    |                   |         |
| <b>Limit:</b>                        |                    | 15.207 a)              |                    |                   |                   |                    |                   |         |
| <b>Final measurement detector:</b>   |                    | Quasi-Peak and Average |                    |                   |                   |                    |                   |         |
| <b>Wide Measurement Uncertainty:</b> |                    | ± 5dB (k=2)            |                    |                   |                   |                    |                   |         |



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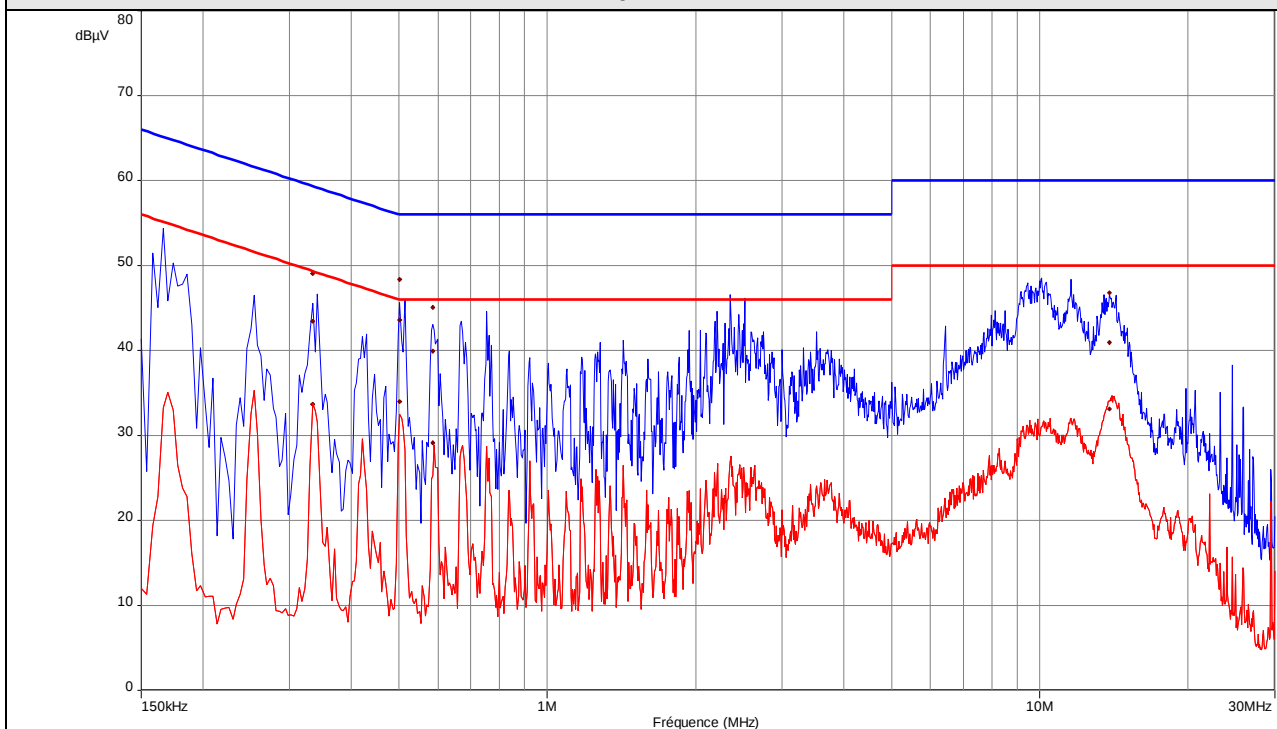
## Graphical representation of Conducted Disturbance Measurement (Peak and Average detection) AC port, Line L1



----: Peak

----: Average

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



----: Peak

----: Average



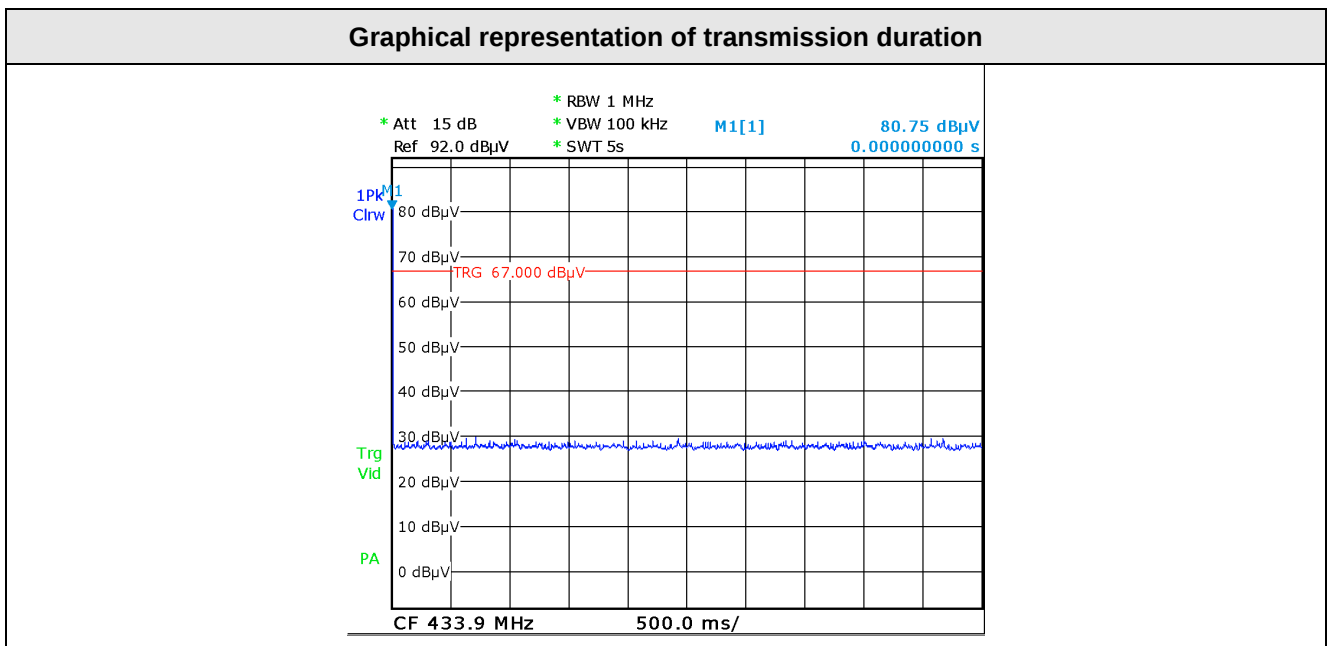
## Rapport d'essais / Test Report

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

| TEST: De-activate time and Periodic operations at regular intervals                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Verdict |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| <p><b>Method:</b> 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><b>Limits:</b> A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.</p> | Pass    |
| <p>Supplementary information:</p> <p>Test location: SMEE – CE Mesures / Test date: March 18<sup>th</sup>, 2014</p> <p>Power supply voltage: 12V from power adapter</p>                                                                                                                                                                                                                                                                                                                                                                                                                              |         |

| 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   |

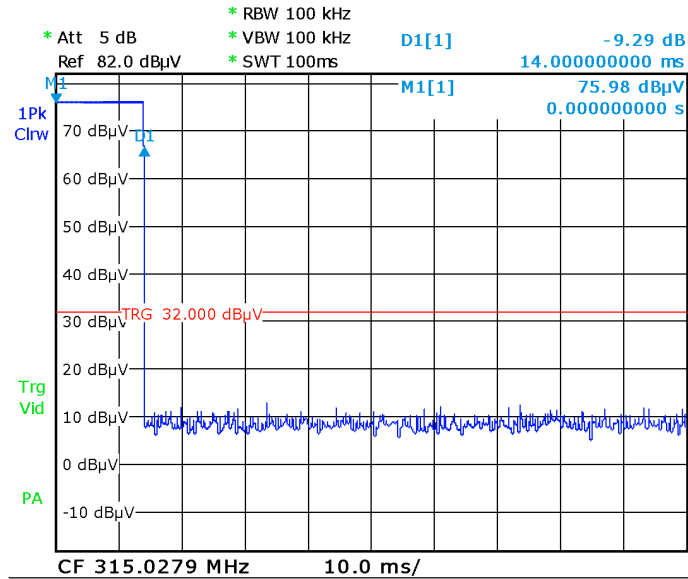




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## Graphical representation of transmission duration



## Tabulated Results for transmission duration

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



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## 7. Field strength of fundamental

| TEST: Field strength of fundamental                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                      |                          | 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 – 5GHz                          | 3 m measurement distance |         |
| Running mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Continuous Transmission mode         |                          |         |
| Limits – FCC Part 15.231 / RSS-210 Iss8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                      |                          |         |
| Frequency (MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Limit (dBµV/m)                       |                          |         |
| Fundamental frequency (MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | µV/meter                             | dBµV/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:<br>Test location: SMEE – CE Mesures / Test date: March 17 <sup>th</sup> , 2014<br>Power supply voltage: 12V from power adapter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                      |                          |         |
| Notes:<br>(1) Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strengths are as follows:<br>for the band 130-174 MHz, uV/m at 3 meters = 56.81818(F)-6136.3636;<br>for the band 260-470 MHz, uV/m at 3 meters = 41.6667(F)- 7083.3333.<br>(2): The above field strength limits are specified at a distance of 3meters. The tighter limits apply at the band edges.<br>(3) At 433MHz, the limit is 10964.8µV/m (80.8dBµV/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.                                                                                                                                                                                                                                                                     |                                      |                          |         |



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| 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   |

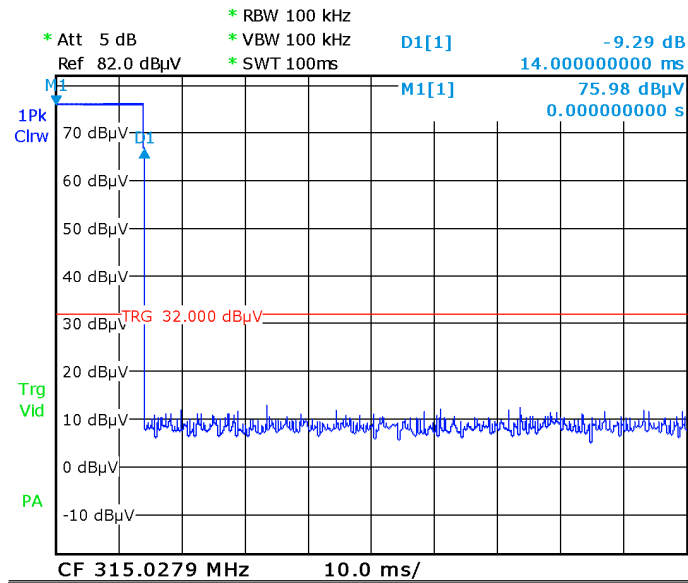
| Tabulated Results for Radiated Field Strength of fundamental<br>OATS measurement 3m                                                                                                                      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                   |                     |                   |                |                |             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------|---------------------|-------------------|----------------|----------------|-------------|
| 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          | <b>-9.4</b> |
| 433,919                                                                                                                                                                                                  | 55.0                 | Av                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | H              | 150               | 225                 | 20,5              | 75.5           | 80.8           | <b>-5.3</b> |
| Supplementary information:<br>Frequency list measured on the Open Area Test Site has been created with pre-scan results.<br>Worst case results for 3 axes position.<br>Equipment transmits continuously. |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                   |                     |                   |                |                |             |
| <b>RBW:</b>                                                                                                                                                                                              |                      | 120kHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                   |                     |                   |                |                |             |
| <b>Measurement distance:</b>                                                                                                                                                                             |                      | 3m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                   |                     |                   |                |                |             |
| <b>Limit:</b>                                                                                                                                                                                            |                      | 15.231                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                   |                     |                   |                |                |             |
| <b>Wide Measurement Uncertainty:</b>                                                                                                                                                                     |                      | ± 5.2dB (k=2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |                   |                     |                   |                |                |             |
| <b>Field Strength Calculation:</b>                                                                                                                                                                       |                      | <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 is as follow:</p> $FS = RA + AF + CF - AG$ <p>Where FS = Field Strength (Level dBμV/m)<br/> RA = Receiver Amplitude (Meter reading dBμV)<br/> AF = Antenna Factor<br/> CF = Cable Factor<br/> AG = Amplifier Gain</p> <p>Total factor (dB) is AF + CF – AG<br/> Margin value = Emission level – Limit value<br/> (1): The average value of fundamental frequency emission is:<br/> Average = Peak value + 20log(Duty Cycle)<br/> Where the duty factor (DC) is calculated from following formula:<br/> DC = Tx ON on a period of 100ms (16/100ms)<br/> 20log(DC)=-15.9dB</p> |                |                   |                     |                   |                |                |             |



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## Graphical representation for Duty Cycle corrector factor



Pulse width : 16ms (max value)

Number of pulse within 100ms: 1

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



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## 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 (dBµV/m)                       |                          |         |
| Fundamental frequency (MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | µV/meter                             | dBµV/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:<br>Test location: SMEE – CE Mesures / Test date: March 17 <sup>th</sup> , 2014<br>Power supply voltage: 12V from power adapter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                      |                          |         |
| Notes:<br>(1) The above field strength limits are specified at a distance of 3meters. The tighter limits apply at the band edges.<br>(2): The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.<br>(3) At 433MHz, the limit is 1096.648µV/m (60.8dBµV/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).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                      |                          |         |



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| Test Equipment Used  |                |          |             |           |          |
|----------------------|----------------|----------|-------------|-----------|----------|
| Description          | Manufacturer   | Model    | Identifier  | Cal. Date | Cal. Due |
| Log-periodic antenna | TDK            | PLP3003  | ANT-101-001 | 2013/5    | 2014/5   |
| Biconnic 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 | -         | -        |



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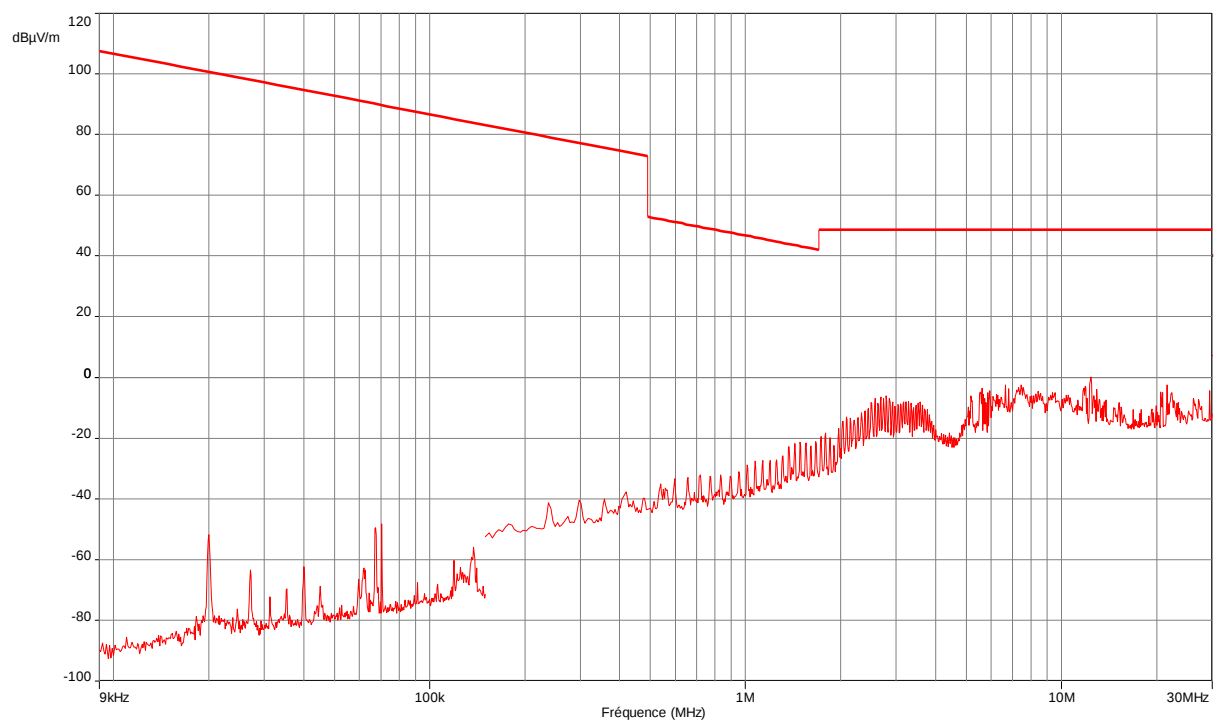
| Tabulated Results for Radiated Disturbance (3m measurement on Open Area Test Site)<br>30MHz-5GHz – Transmit mode                                                                                                        |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                   |                     |                   |                |                |              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------|---------------------|-------------------|----------------|----------------|--------------|
| 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           | <b>-24.5</b> |
| 867,848                                                                                                                                                                                                                 | 11.3                 | Av                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H              | 245               | 100                 | 29,1              | 40,4           | 60,8           | <b>-20.4</b> |
| Tabulated Results for Radiated Disturbance (3m measurement on Open Area Test Site)<br>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           | <b>-11.2</b> |
| 480.041                                                                                                                                                                                                                 | 17.8                 | QP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H              | 155               | 150                 | 22.0              | 39.8           | 46.0           | <b>-6.2</b>  |
| 840.058                                                                                                                                                                                                                 | 15.6                 | QP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | H              | 225               | 100                 | 28.5              | 44.1           | 46.0           | <b>-1.9</b>  |
| Supplementary information:<br>Frequency list measured on the Open Area Test Site has been created with pre-scan results.<br>Worst case results for 3 axes position.<br>All others spurious show at least 20dB of margin |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                   |                     |                   |                |                |              |
| <b>Frequency band investigated:</b>                                                                                                                                                                                     |                      | 30MHz-5GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                   |                     |                   |                |                |              |
| <b>RBW:</b>                                                                                                                                                                                                             |                      | 120kHz - Below 1GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                   |                     |                   |                |                |              |
|                                                                                                                                                                                                                         |                      | 1MHz – Above 1GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |                   |                     |                   |                |                |              |
| <b>Measurement distance:</b>                                                                                                                                                                                            |                      | 3m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |                   |                     |                   |                |                |              |
| <b>Limit:</b>                                                                                                                                                                                                           |                      | 15.109 / 15.209 / 15.231                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                   |                     |                   |                |                |              |
| <b>Wide Measurement Uncertainty:</b>                                                                                                                                                                                    |                      | ± 5.2dB (k=2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                   |                     |                   |                |                |              |
| <b>Field Strength Calculation:</b>                                                                                                                                                                                      |                      | <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)<br/> RA = Receiver Amplitude (Meter reading)<br/> AF = Antenna Factor<br/> CF = Cable Factor<br/> AG = Amplifier Gain</p> <p>Total factor (dB) is AF + CF – AG<br/> Margin value = Emission level – Limit value</p> |                |                   |                     |                   |                |                |              |
| <b>Average Field Strength Calculation:</b>                                                                                                                                                                              |                      | <p>The average value of spurious emission is:<br/> Average = Peak value + 20log(Duty Cycle)<br/> Where the duty factor (DC) is calculated from following formula:<br/> DC = Tx ON on a period of 100ms (16/100ms)<br/> 20log(DC)=-15.9dB</p>                                                                                                                                                                                                                                                                      |                |                   |                     |                   |                |                |              |



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



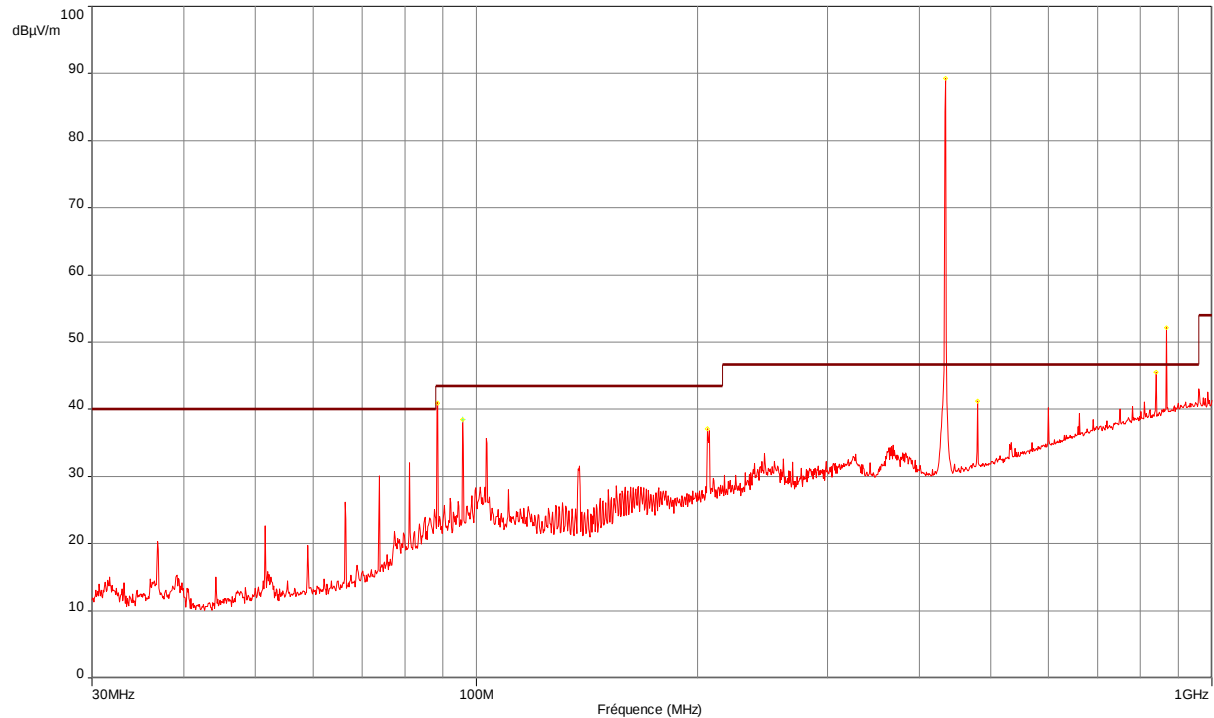
----- : Peak measure



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



| Frequency (MHz) | Level Peak (dBμV/m) | Limit AV (dBμV/m) | Limit Peak (dBμV/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.

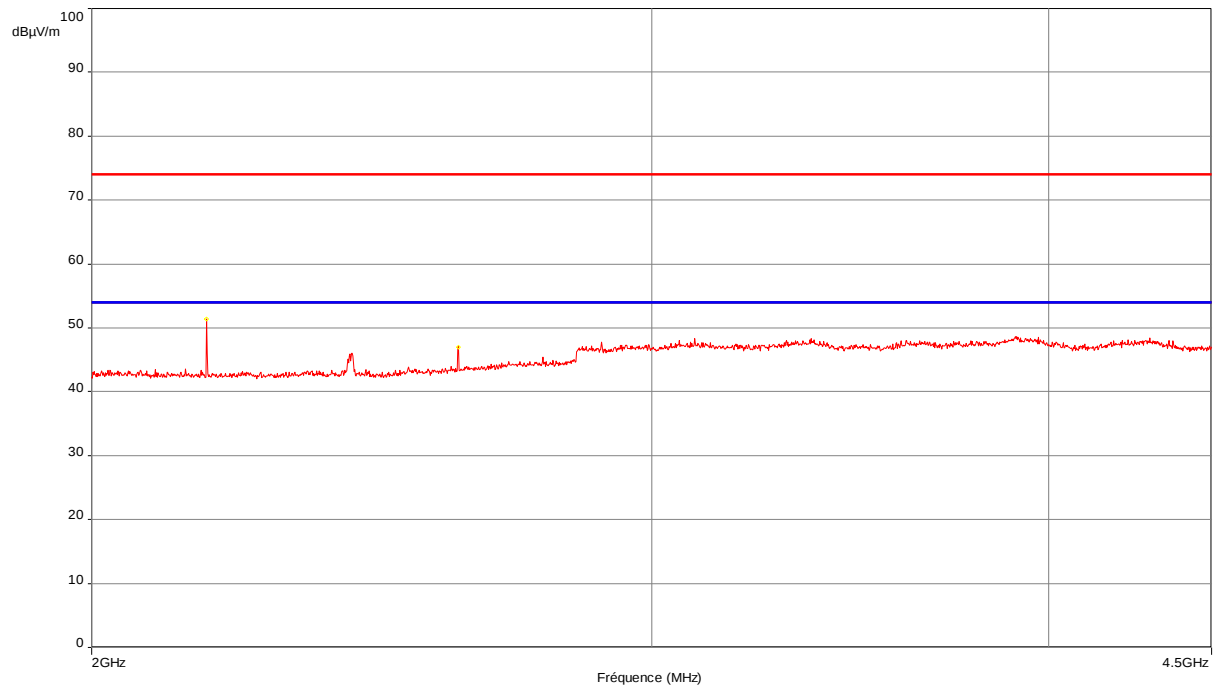
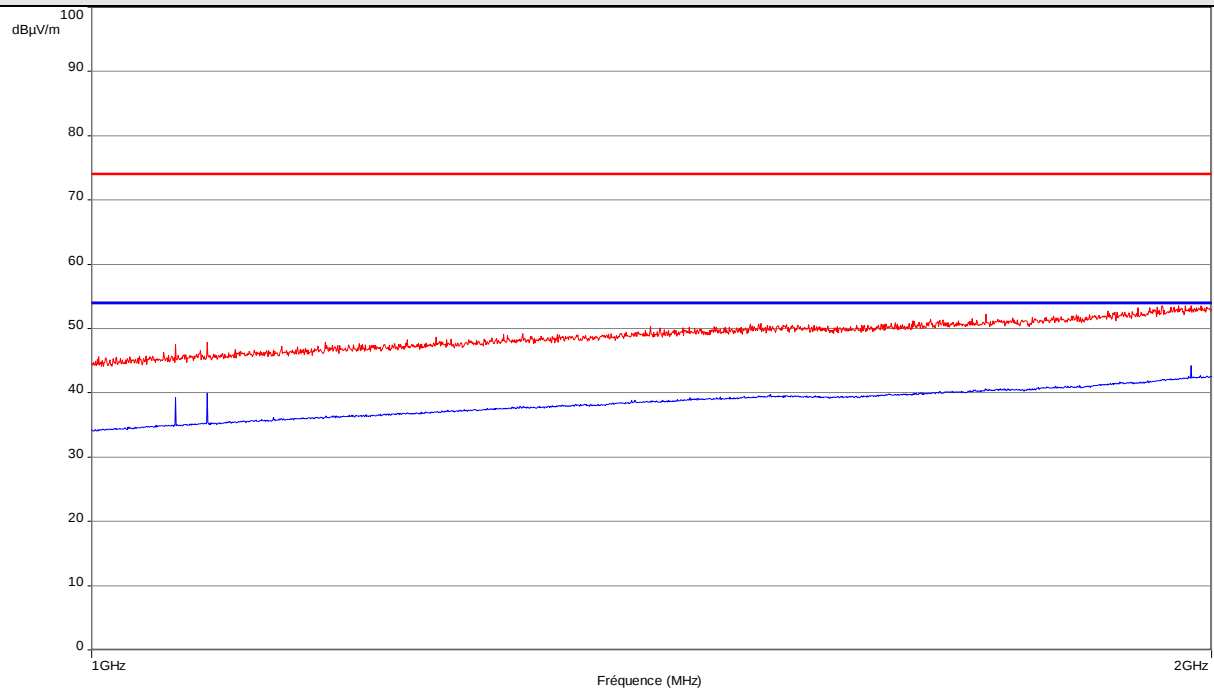
----- : Peak measure



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



| Frequency (MHz) | Level Peak (dBµV/m) | Limit Peak (dBµV/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.

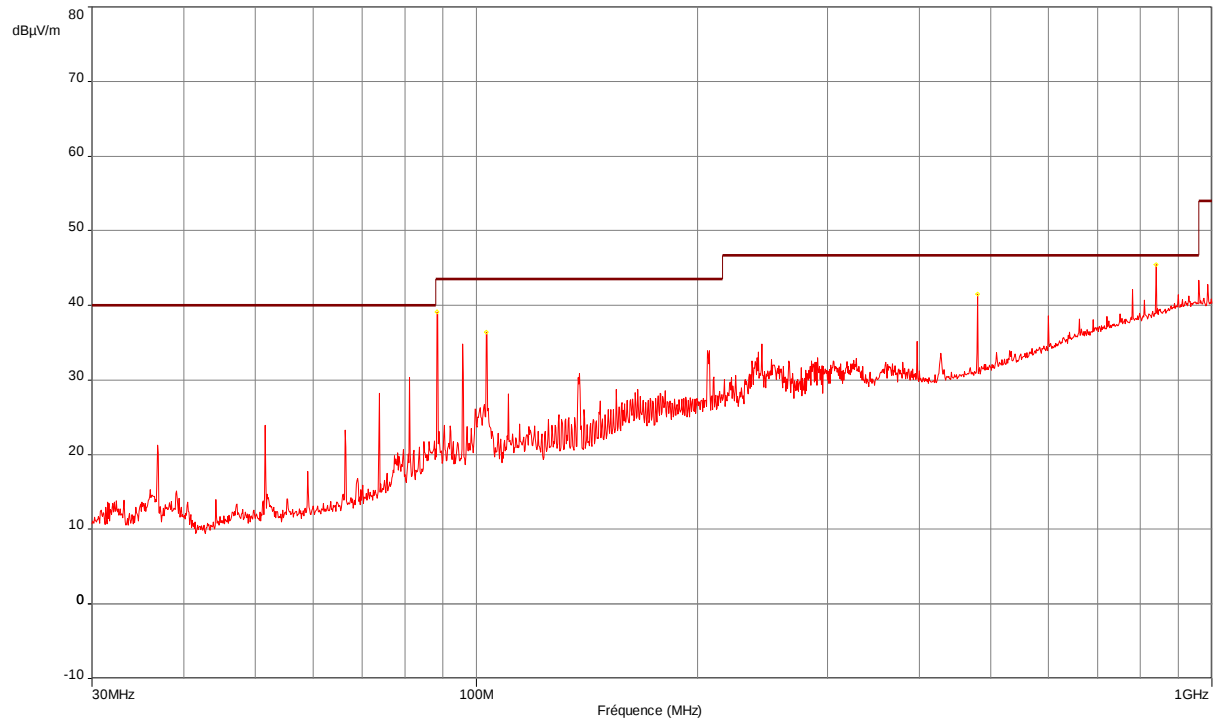
----- : Peak measure



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



| Frequency (MHz) | Level Peak (dBμV/m) | Limit Peak (dBμV/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.

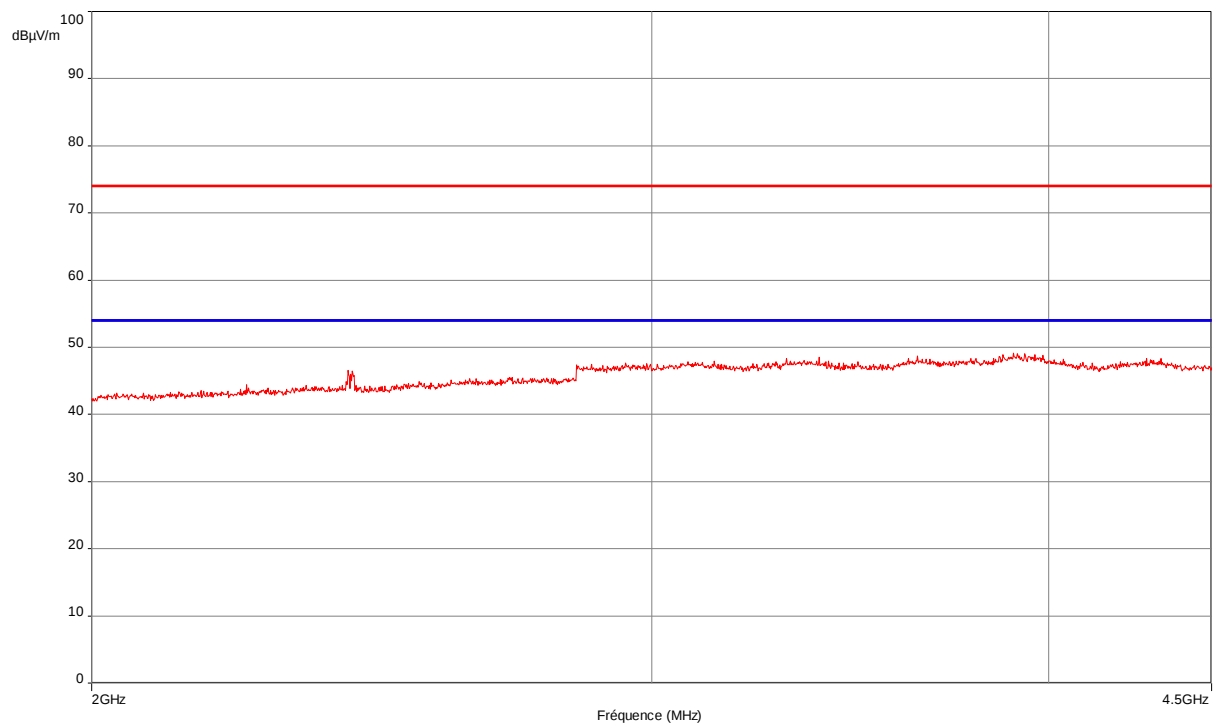
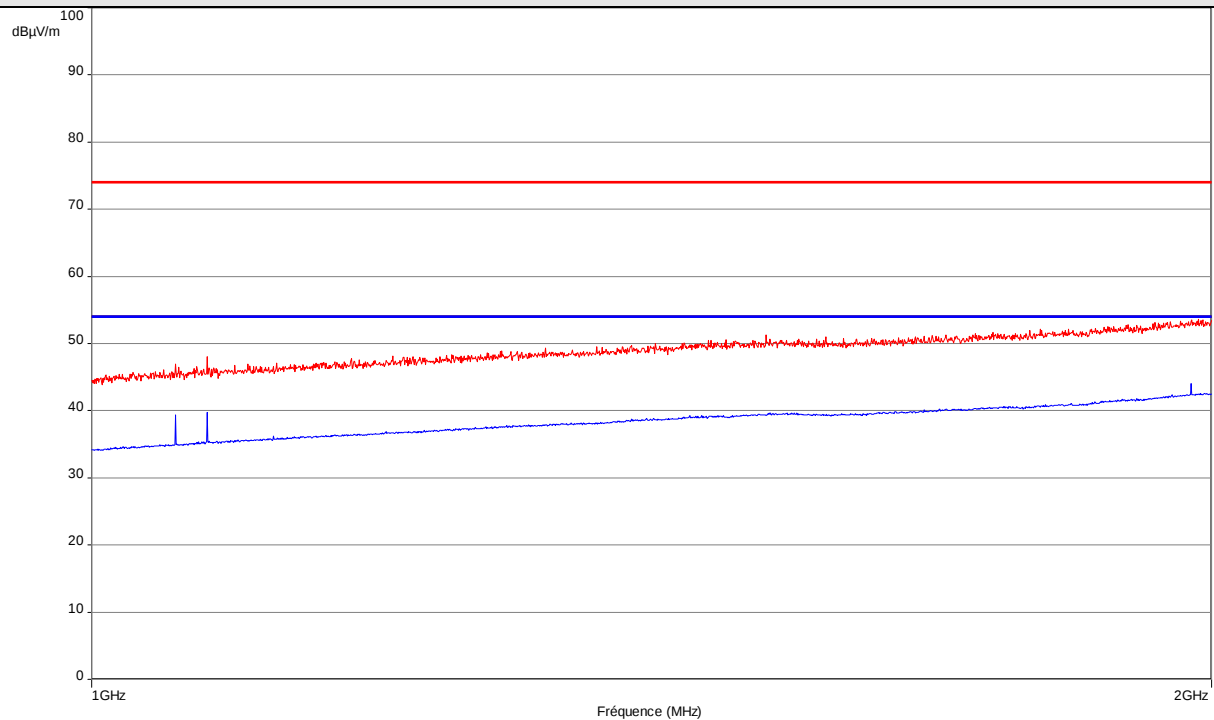
----- : Peak measure



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### 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



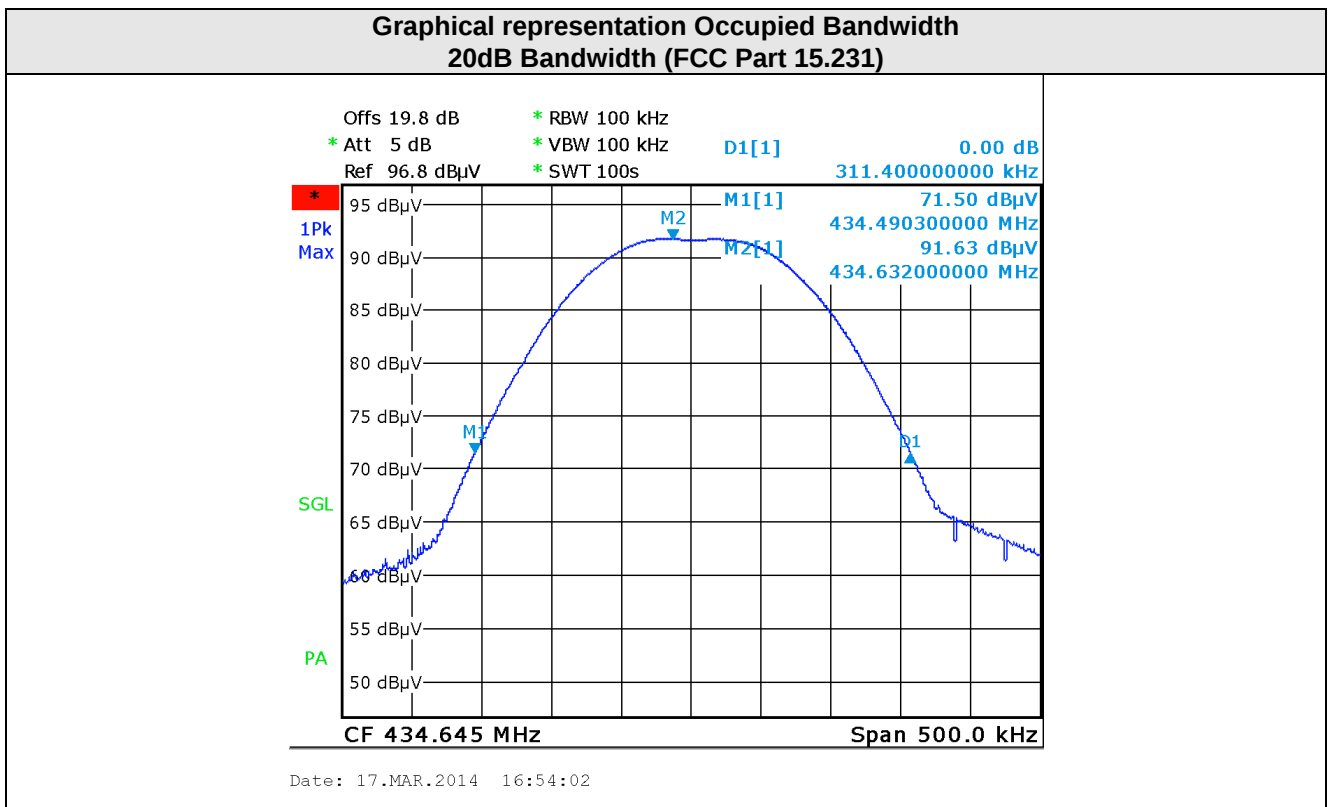
# Rapport d'essais / Test Report

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## 9. Occupied bandwidth

| TEST: Occupied bandwidth measurement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Verdict |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| <p><b>Method:</b> 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.</p> <p>The tested equipment is set to transmit operation.</p> <p><b>Limits:</b> The maximum 20 dB bandwidth and 99% bandwidth shall be lower than 0.25% of the center frequency</p> <p>Supplementary information:<br/> Test location: SMEE – CE Mesures / Test date: March 17<sup>th</sup>, 2014<br/> 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   |



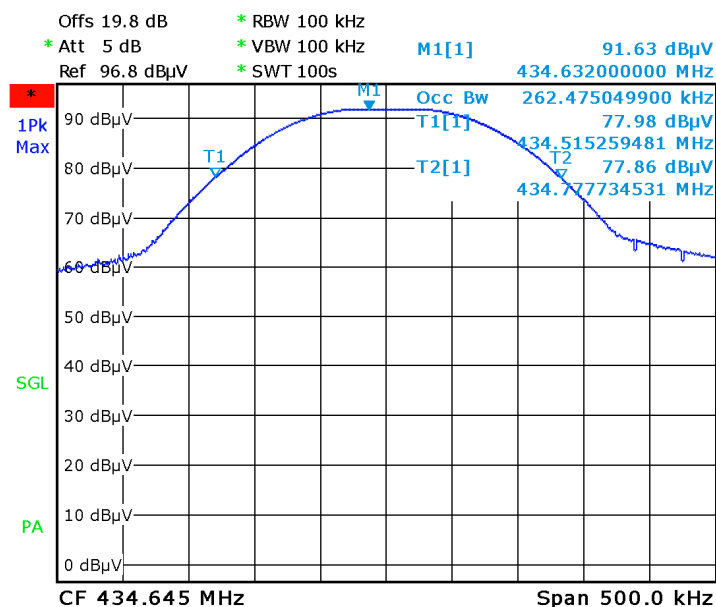
| Tabulated Results for Occupied Bandwidth<br>20dB Bandwidth (FCC Part 15.231 result) |                         |                      |        |
|-------------------------------------------------------------------------------------|-------------------------|----------------------|--------|
| FREQ<br>(MHz)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



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## Graphical representation Occupied Bandwidth 99% Bandwidth (RSS-210 Iss8)



Date: 17.MAR.2014 16:52:07

## Tabulated Results for Occupied Bandwidth 99% Bandwidth (RSS-210 Iss 1 result)

| FREQ<br>(MHz) | 20dB bandwidth<br>(kHz) | Limit                | Result |
|---------------|-------------------------|----------------------|--------|
| 434.65        | 262.475                 | Shall be < 1086.6kHz | PASS   |