



## TEST REPORT

Number  
Composition of document

FCC Registration Number  
Industry Canada Number

### Standards

### Issued to

### Apparatus under test

Trade mark  
Manufacturer  
Type  
Serial number  
IC  
FCC ID

## RADIO

142714-687991  
24 pages

166175 (FAR)  
6230B

47 CFR Part 15.225  
RSS-210, Issue 8  
RSS-Gen, Issue 4

### BIORAD LABORATORIES

18 Avenue du Polygone  
42300 ROANNE  
FRANCE

RFID Tag Reader  
**BIORAD**  
Model DTE41027+1  
1303AD-0763  
11658A-DTE41027  
2ABUUDTE41027

### Test date

June 16, 2016 to June 24, 2016

### Tests performed by

Mathieu CERISIER

### Test site

Fontenay aux Roses

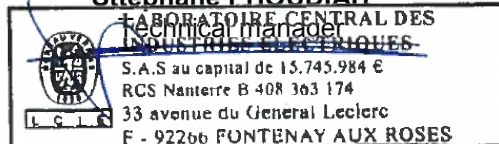
### Date of issue

November 10th, 2016

Written by :  
**Mathieu CERISIER**  
Tests operator

Approved by :

**Sttéphane PHOUDIAH**



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## 1. TEST PROGRAM

### • References

Standards:

- 47 CFR Part 15C
- RSS-210
- RSS-Gen
- CISPR 16-4-2
- ANSI C63.10

Standard Section	Test Description	TEST RESULT - Comments
RSS-Gen § 4.6.1	Occupied Bandwidth	PASS (No Limit applicable)
CFR 47 § 15.225 (e) RSS-210 § A2.6	Frequency tolerance	PASS
CFR 47 § 15.207 RSS-Gen § 7.2.4	AC Power Line Conducted Emissions	PASS
CFR 47 § 15.225 (a) (b) (c) RSS-210 § A2.6 (a) (b) (c)	Field strength within the band 13.110-14.010 MHz	PASS
CFR 47 § 15.209 (a) CFR 47 § 15.225 (d) RSS-210 § A2.6 (d)	Field strength outside of the bands 13.110-14.010 MHz	PASS
RSS-Gen § 4.10	Receiver Radiated emissions	NA (Transceiver equipment. Include in Field strength test)

PASS: EUT complies with standard's requirement

FAIL: EUT does not comply with standard's requirement

NA: Not Applicable

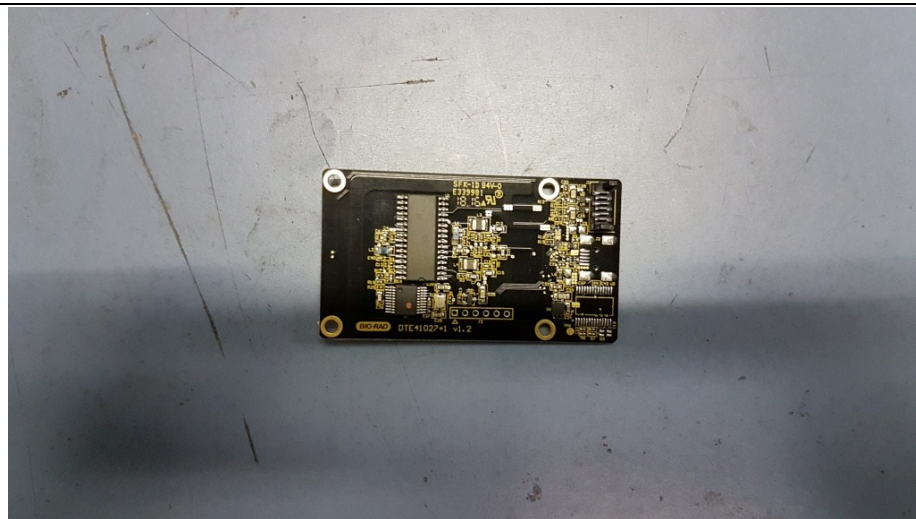
NP: Test Not Performed



## 2. EQUIPMENT DESCRIPTION

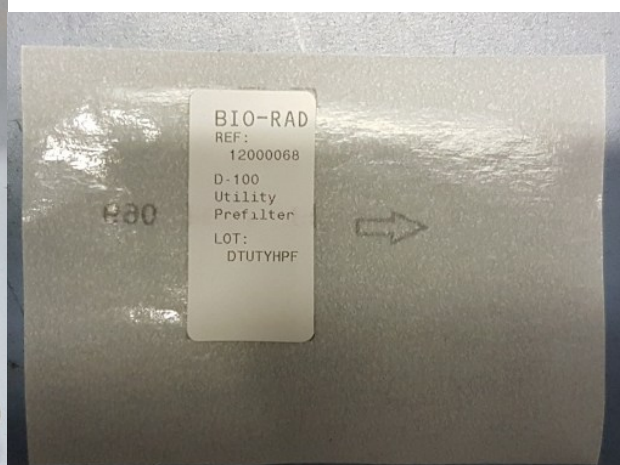
### 2.1. HARDWARE & SOFTWARE IDENTIFICATION

- Equipment under test (EUT):



Photograph of EUT

- Auxiliary equipment (AE) used for testing:



Photograph of AE



- **Input/output:**

- 5Vdc Input Power

- **Software identification:**

- Software version: Unknown

- **Equipment information:**

- External antenna connector: No
- Frequency band allocated: 13.553MHz to 13.567MHz
- Frequency band used: 13.56MHz
- Modulation:ASK100%
- Number of channel: 1
- Antenna type: Integral
- Stand By mode: No
- Type of power source: External power supply
- Power supply: Vmin : 4.95Vdc  
Vnom: 5Vdc  
Vmax : 5.25Vdc
- Temperature range: Tmin: -30°C (IC) -20°C (FCC)  
Tnom: 20°C  
Tmax: +50°C

## 2.2. RUNNING MODE

The EUT is set in the following modes during tests:

- Permanent emission-reception with modulation
- Communication with a tag

## 2.3. EQUIPEMENT LABELLING



## 2.4. EQUIPMENT MODIFICATIONS

No equipment modification has been necessary during testing.

### 3. OCCUPIED BANDWIDTH

#### 3.1. TEST CONDITIONS

Test performed by : Mathieu CERISIER  
Date of test : 2016/06/23  
Ambient temperature : 25°C  
Relative humidity : 40%

#### 3.2. TEST SETUP

The Equipment Under Test is installed on a table and set in permanent emission with modulation. Measurement is performed with a spectrum analyzer on the EUT with a test fixture. The product has been tested according to the RSS-GEN § 4.6.1 reference method.

##### **Spectrum Analyzer Setting:**

Center frequency= 13.50MHz  
Span= At least twice the emission spectrum  
Amplitude= Sufficient to observe the signal amplitude  
RBW= 1% of span  
VBW= 3\*RBW  
Sweep= Auto  
Trace= Max Hold  
Detector= Peak  
Occupied Bandwidth 99% activated



Photograph for Occupied Bandwidth



3.3. RESULTS

Temperature	Tnom
Voltage	Vnom
Frequency	Fnom
Occupied Bandwidth (MHz)	1,682634731

See graphics in annex

Result: **PASS**  
Limit: → None





## 4. FREQUENCY TOLERANCE

### 4.1. TEST CONDITIONS

Test performed by : Mathieu CERISIER  
Date of test : 2016/06/23  
Ambient temperature : 25°C  
Relative humidity : 40%

### 4.2. TEST SETUP

The Equipment Under Test is installed on a table and set in permanent emission with modulation. Measurement is performed with a spectrum analyzer on the EUT with a test fixture.

#### **Spectrum Analyzer Setting:**

Center frequency= 13.50MHz  
Span= At least twice the emission spectrum  
Amplitude= Sufficient to observe the signal amplitude  
RBW= 1% of span  
VBW= 3\*RBW  
Sweep= Auto  
Trace= Max Hold  
Detector= Peak



Photograph for Frequency tolerance





#### 4.3. RESULTS

Temperature	Tmin (IC)	Tmin (FCC)	Tnom	Tmax
<b>Voltage:</b>	<b>Vmin</b>			
Frequency (MHz)	13,50045	13,49925	13,49985	13,50075
Frequency Drift (%)	0,0000	-0,0089	-0,0044	0,0022
<b>Voltage:</b>	<b>Vnom</b>			
Frequency (MHz)	13,49955	13,49925	13,50045	13,49955
Frequency Drift (%)	-0,0067	-0,0089	Reference	-0,0067
<b>Voltage:</b>	<b>Vmax</b>			
Frequency (MHz)	13,49985	13,49925	13,49955	13,49955
Frequency Drift (%)	-0,0044	-0,0089	-0,0067	-0,0067

See graphics in annex

Result: **PASS**

Limit: → +/- 0.01%



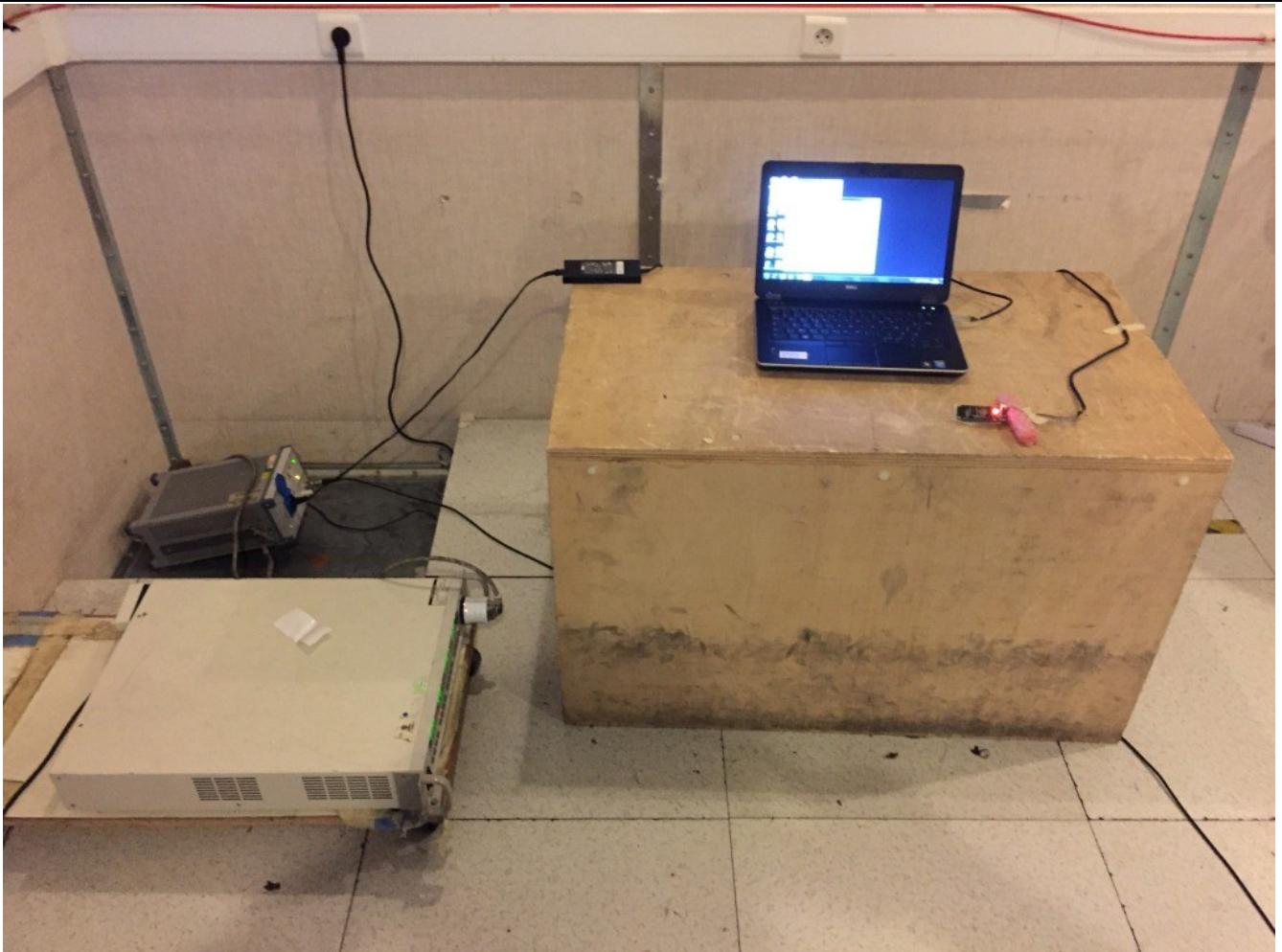
## 5. AC POWER LINE CONDUCTED EMISSIONS

### 5.1. TEST CONDITIONS

Test performed by : Fostoki MEDJOUDJ  
Date of test : 2016/06/16  
Ambient temperature : 20°C  
Relative humidity : 40%

### 5.2. TEST SETUP

The product has been tested according to ANSI C63.10-(2013) method. The EUT is placed on the ground reference plane, at 80cm from the LISN. The distance between the EUT and the vertical ground plane is 40cm. Auxiliaries are powered by another LISN. The cable has been shorted to 1meter length. The EUT is powered through the LISN. Measurement is made with a receiver in peak mode. This was followed by a Quasi-Peak, i.e. CISPR measurement for any strong signal. If the average limit is met when using a Quasi-Peak detector, the EUT shall be deemed to meet both limits and measurement with the average detector is unnecessary. The LISN (measure) is  $50\Omega / 50\mu\text{H}$ . Interconnecting cables and equipment's were moved to position that maximized emission.



Photograph for AC Power Line Conducted Emissions (Front view)



Photograph for AC Power Line Conducted Emissions (Rear view)



Photograph for AC Power Line Conducted Emissions (Global view)





### 5.3. RESULTS

#### Antenna Connected

##### Phase Line

Frequency (MHz)	Peak Level (dBμV)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.185	46.05	42.4	64.25	18.07	54.25
3.435	35.9	29.7	56	16.2	46
13.56	40.36	-	60	21.5	50

##### Neutral Line

Frequency (MHz)	Peak Level (dBμV)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.16	36.6	33.4	65.46	16	55.46
0.63	29.8	25.3	56	18.9	46
2.34	34.9	30.6	56	6.6	46
13.49	48.9	-	60	27.3	50

See annex for graphics

Result: **PASS**

Limit: →

##### Quasi-Peak

0,15kHz to 0,5MHz: 66dBμV to 56dBμV\*

0,5MHz to 5MHz: 56dBμV

5MHz to 30MHz: 60dBμV

##### Average

0,15kHz to 0,5MHz: 56dBμV to 46dBμV\*

0,5MHz to 5MHz: 46dBμV

5MHz to 30MHz: 50dBμV

\*Decreases with the logarithm of the frequency



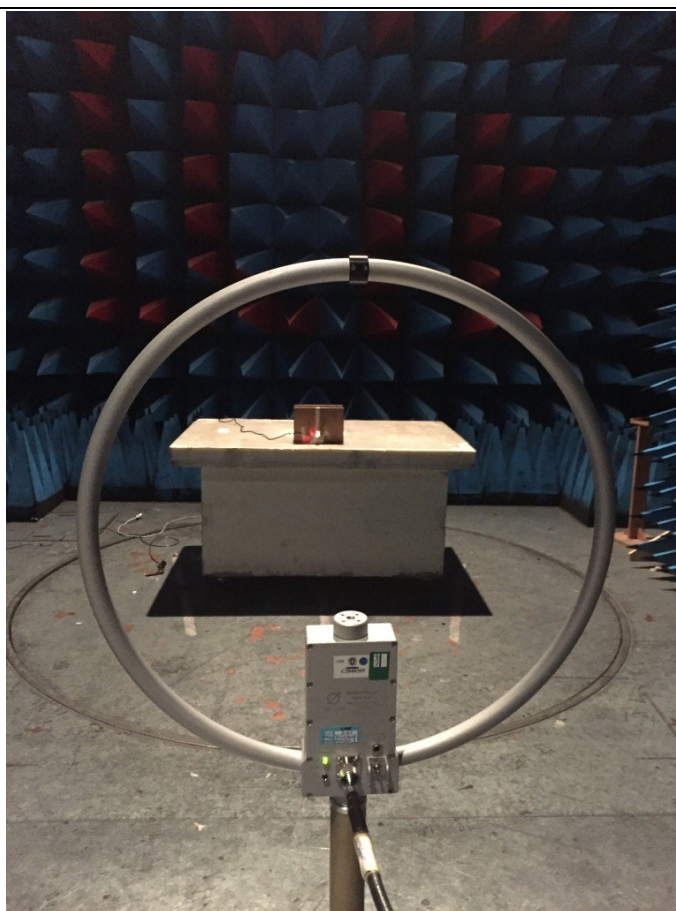
## 6. FIELD STRENGTH WITHIN THE BAND 13.110-14.010MHz

### 6.1. TEST CONDITIONS

Test performed by : Fostoki MEDJOUDJ  
Date of test : 2016/06/16  
Ambient temperature : 20°C  
Relative humidity : 40%

### 6.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013). The EUT is placed in a semi-anechoic chamber. Distance between measuring antenna and the EUT is 3m. Test is performed in parallel and perpendicular axis with a loop antenna. Measurement bandwidth was 9kHz. The level has been maximised by the turntable rotation of 360 degrees range on the 3 axis of EUT. Antenna height was 1m.



Photograph for Field strength within the band 13.110-14.010MHz





### 6.3. RESULTS

- Characterization in a semi anechoic chamber:**

#### Parallel Axis

Frequency (MHz)	Peak Level (dB $\mu$ V/m) (3m)	QPeak Level (dB $\mu$ V/m) (3m)	Limit (dB $\mu$ V/m) (3m)
Below 13.110	37.5	-	69.5
13.110 to 13.410	23.5	19.26	80.5
13.410 to 13.553	43.6	35.19	90.5
13.553 to 13.567	30.1	30.7	124
13.567 to 13.710	40.53	34.9	90.5
13.710 to 14.010	26.7	20.13	80.5
Above 14.010	30.04	-	69.5

#### Perpendicular Axis

Frequency (MHz)	Peak Level (dB $\mu$ V/m) (3m)	QPeak Level (dB $\mu$ V/m) (3m)	Limit (dB $\mu$ V/m) (3m)
Below 13.110	37.5	-	69.5
13.110 to 13.410	22.11	19.1	80.5
13.410 to 13.553	44.8	34.8	90.5
13.553 to 13.567	39.1	30.7	124
13.567 to 13.710	30.3	21.3	90.5
13.710 to 14.010	26.7	20.3	80.5
Above 14.010	30.05	-	69.5

See annex for graphics

Result: **PASS**

Limit: →

Below 13.110MHz:	69.5dB $\mu$ V/m (3m) or 29.5dB $\mu$ V/m (30m)
13.110MHz to 13.410MHz:	106 $\mu$ V/m (30m) or 80.5dB $\mu$ V/m (3m)
13.410MHz to 13.553MHz:	334 $\mu$ V/m (30m) or 90.5dB $\mu$ V/m (3m)
13.553MHz to 13.567MHz:	15848 $\mu$ V/m (30m) or 124dB $\mu$ V/m (3m)
13.567MHz to 13.710MHz:	334 $\mu$ V/m (30m) or 90.5dB $\mu$ V/m (3m)
13.710MHz to 14.010MHz:	106 $\mu$ V/m (30m) or 80.5dB $\mu$ V/m (3m)
Above 14.010MHz:	69.5dB $\mu$ V/m (3m) or 29.5dB $\mu$ V/m (30m)



## 7. FIELD STRENGTH OUTSIDE OF THE BANDS 13.110-14.010 MHz

### 7.1. TEST CONDITIONS

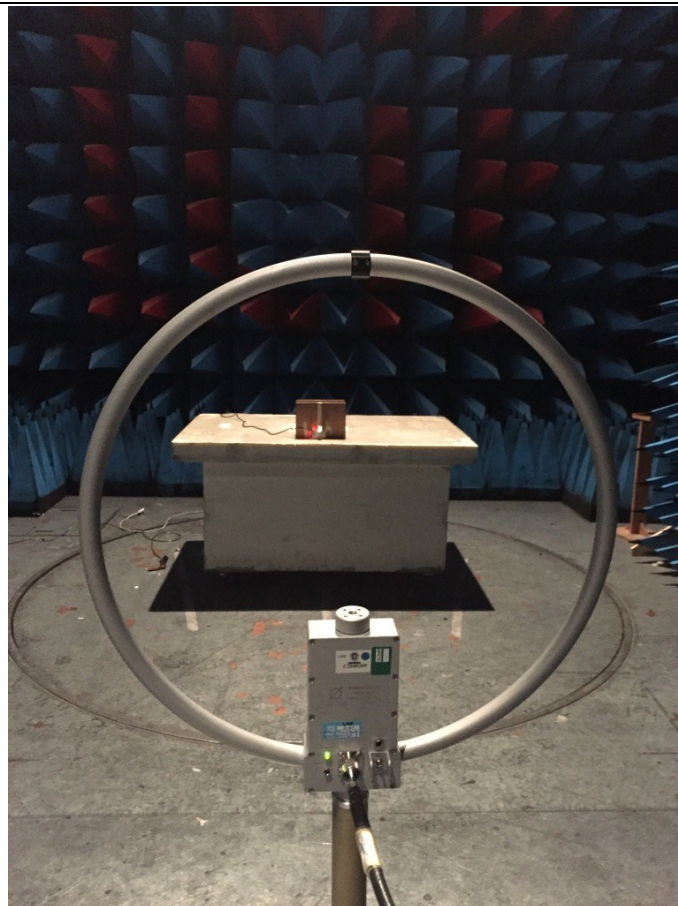
Test performed by : Fostoki MEDJOUDJ  
Date of test : 2016/06/16  
Ambient temperature : 20°C  
Relative humidity : 40%

### 7.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013). The EUT is placed in a semi-anechoic chamber. Distance between measuring antenna and the EUT is 3m.

Test is performed in parallel and perpendicular axis with a loop antenna below 30MHz. Measurement bandwidth was 200Hz below 150kHz and 9kHz between 150kHz & 30MHz. The level has been maximised by the turntable rotation of 360 degrees range on the 3 axis of EUT. Antenna height was 1m.

Test is performed in horizontal (H) and vertical (V) polarization with bilog antenna between 30MHz & 1GHz and with a horn antenna above 1GHz. Measurement bandwidth was 120kHz below 1GHz and 1MHz above 1GHz. The level has been maximised by the turntable rotation of 360 degrees range on the 3 axis of EUT. Antenna height search was performed from 1 to 4m.



Photograph for Field strength outside of the bands 13.110-14.010 MHz



### 7.3. RESULTS

- Characterization in a semi anechoic chamber (9kHz to 10GHz):

#### Vertical Polarization

Below 1Ghz

Frequency (MHz)	Peak Level (dBμV/m)	QPeak Level (dBμV/m)	Limit (dBμV/m)
51.45	29.2	-	40
108.3	29.5	-	43.5
175.55	33.8	-	43.5
243.02	31.5	-	46
688.52	33.8	-	46

#### Horizontal Polarization

Below 1GHz

Frequency (MHz)	Peak Level (dBμV/m)	QPeak Level (dBμV/m)	Limit (dBμV/m)
66.45	17.6	-	40
175.55	35.1	-	43.5
242.96	37.8	-	46
297.02	34.9	-	46
688.58	32.2	-	46

See annex for graphics

Result: **PASS**

Limit: → 9kHz to 0,490MHz:  $2400/F(\text{kHz})\mu\text{V/m}$  (300m) or  $20\log(2400/F(\text{kHz}))\text{dB}\mu\text{V/m}$  (3m) QPeak  
0,490MHz to 1.705MHz:  $240000/F(\text{kHz})\mu\text{V/m}$  (30m) or  $20\log(240000/F(\text{kHz}))\text{dB}\mu\text{V/m}$  (3m) QPeak  
1.705MHz to 30MHz:  $30\mu\text{V/m}$  (30m) or  $\text{dB}\mu\text{V/m}$  (3m) QPeak  
30MHz to 88MHz:  $100\mu\text{V/m}$  (3m) or  $40\text{dB}\mu\text{V/m}$  (3m) QPeak  
88MHz to 216MHz:  $150\mu\text{V/m}$  (3m) or  $43,5\text{dB}\mu\text{V/m}$  (3m) QPeak  
216MHz to 960MHz:  $200\mu\text{V/m}$  (3m) or  $46\text{dB}\mu\text{V/m}$  (3m) QPeak  
960MHz to 1000MHz:  $500\mu\text{V/m}$  (3m) or  $54\text{dB}\mu\text{V/m}$  (3m) QPeak  
Above 1000MHz:  $5012\mu\text{V/m}$  (3m) or  $74\text{dB}\mu\text{V/m}$  Peak  
 $500\mu\text{V/m}$  (3m) or  $54\text{dB}\mu\text{V/m}$  (3m) Average



## 8. TEST EQUIPMENT LIST

Frequency Tolerance & Occupied Bandwidth					
Apparatus	Trade Mark	Type	Registration number	Calibration date	Calibration due
Spectrum analyzer	ROHDE & SCHWARZ	FSL6	A4060032	2015/04	2017/04
Programmable AC/DC power supply	KIKUSUI	PCR500M	A7040079	2016/05	2018/05
Multi-meter	KEITHLEY	2000	A1241084	2016/05	2018/05
Climatic chamber	SECASI Technologies	SLT-34	D1024029	Verified with Calibrated multimeter	Verified with Calibrated multimeter
Thermometer	AOIP	TM 6630	B4041042	2014/12	2016/06
Field strength outside of the bands 13.110-14.010 MHz					
Apparatus	Trade Mark	Type	Registration number	Calibration date	Calibration due
Semi anechoic chamber	SIEPEL	C01	D3044008	2014/05	2017/05
EMI receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2015/12	2016/12
Bilog antenna	SCHWARZBECK	VULB9160	C2040150	2016/03	2017/03
Cable	CABLES & CONNECTIQUES	3.5MD/CSU528AA/3.5MD/4000	A5329374	2015/06	2016/06
Cable	CABLES & CONNECTIQUES	2.9MD/CSU440AA-TDINOX/2.9MD/12000	A5329431	2016/03	2017/03
Loop antenna	SCHWARZBECK	FMZB 1513	C2040209	2015/12	2016/12
Field strength within the band 13.110-14.010MHz					
Apparatus	Trade Mark	Type	Registration number	Calibration date	Calibration due
Semi anechoic chamber	SIEPEL	C01	D3044008	2014/05	2017/05
Loop antenna	SCHWARZBECK	FMZB 1513	C2040209	2015/12	2016/12
Cable	CABLES & CONNECTIQUES	3.5MD/CSU528AA/3.5MD/4000	A5329374	2015/06	2016/06
Cable	CABLES & CONNECTIQUES	2.9MD/CSU440AA-TDINOX/2.9MD/12000	A5329431	2016/03	2017/03
EMI receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2015/12	2016/12
AC Power Line Conducted Emissions					
Apparatus	Trade Mark	Type	Registration number	Calibration date	Calibration due
Semi anechoic chamber 11,8x8,1x9,5m	SIEPEL	C01	D3044008	2014/05	2017/05
EMI receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2015/12	2016/12
V LISN	RHODE & SCHWARZ	ESH3-Z5	C2322003	2015/12	2016/12



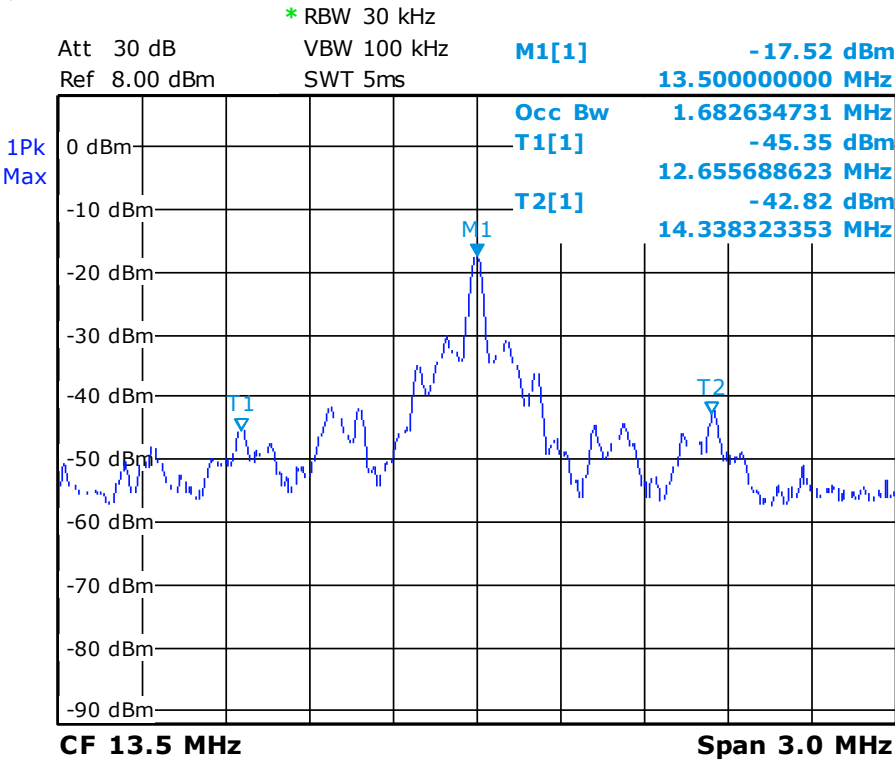
## 9. UNCERTAINTIES CHART

Kind of test	Measurement uncertainties (k=2) $\pm x(\text{dB})$ / (Hz)	Limit for uncertainties $\pm y(\text{dB})$
<b>TRANSMITTER REQUIREMENTS</b>		
Radio frequency	$\pm 2.10^{-8}$ Hz	$\pm 1.10^{-7}$ Hz
RF Conducted power	$\pm 0.6$ dB	$\pm 1.5$ dB
Spurious emissions <ul style="list-style-type: none"><li>Frequency &lt; 1000 MHz</li><li>Frequency &gt; 1000 MHz</li></ul>	$\pm 3.9$ dB $\pm 3.1$ dB	$\pm 6$ dB
Spurious in conduction	$\pm 1.6$ dB	$\pm 3$ dB
Temperature	$\pm 0.5^{\circ}\text{C}$	$\pm 1^{\circ}\text{C}$
Humidity	$\pm 2.5$ %	$\pm 10$ %



10. ANNEX (GRAPHS)

Occupied Bandwidth  
Temperature: Tnom  
Voltage: Vnom





## AC power line conducted emissions

Frequency: F<sub>nom</sub>

Temperature: T<sub>nom</sub>

Voltage: V<sub>nom</sub>

Neutral Line

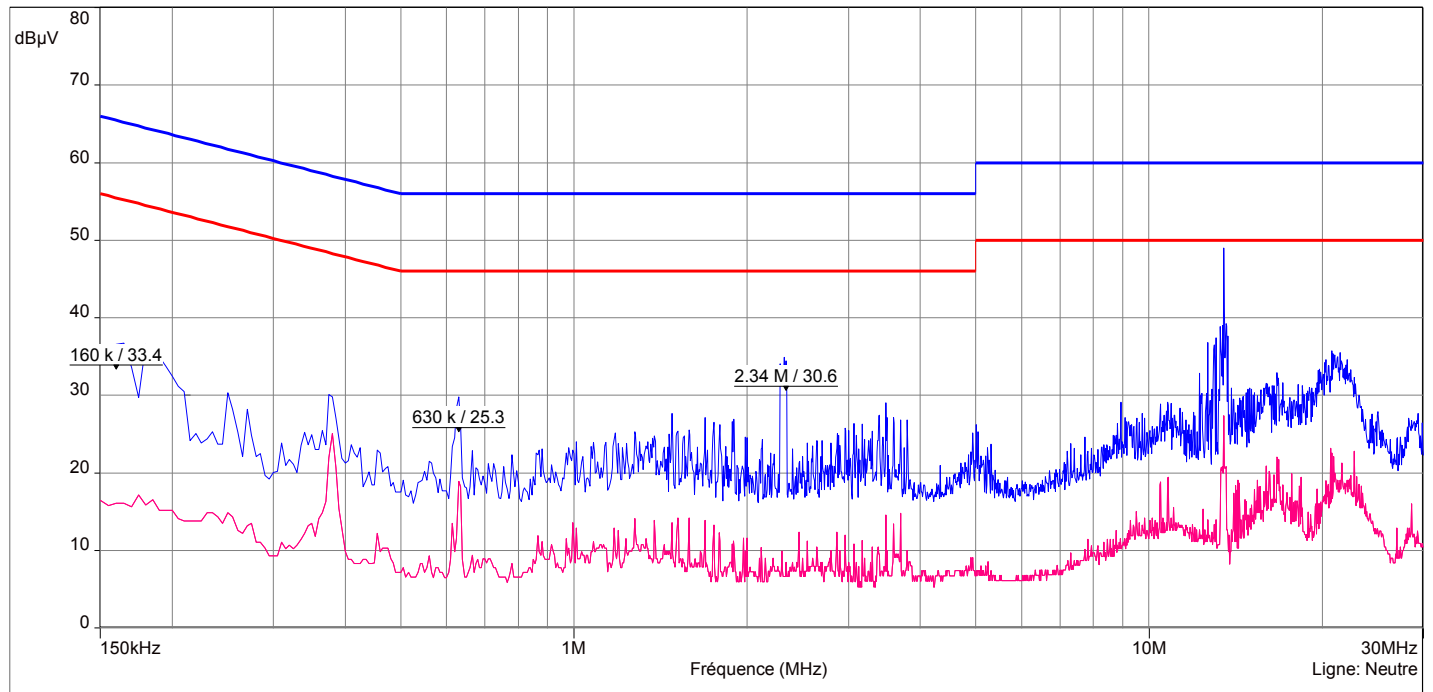
Description Sous-bande 2

Fréquences: 150 kHz - 30 MHz (Mode: Lin, Pas: 5 kHz)

Réglages: RBW: 9 kHz, VBW: Auto, Temps de mesure: 50 ms/Pts, Nombre de Balayages: 1, Preamp: Off, LN Preamp: Off, Preselecteur: On

Ligne: Neutre

— Civil 55022/EN 55022 Conduit Alim - Classe: B - Moyenne/  
— Civil 55022/EN 55022 Conduit Alim - Classe: B - QCrête/  
— Mes. Peak (Neutre)  
— Mes. Avg (Neutre)



## AC power line conducted emissions

Frequency: F<sub>nom</sub>

Temperature: T<sub>nom</sub>

Voltage: V<sub>nom</sub>

Phase Line

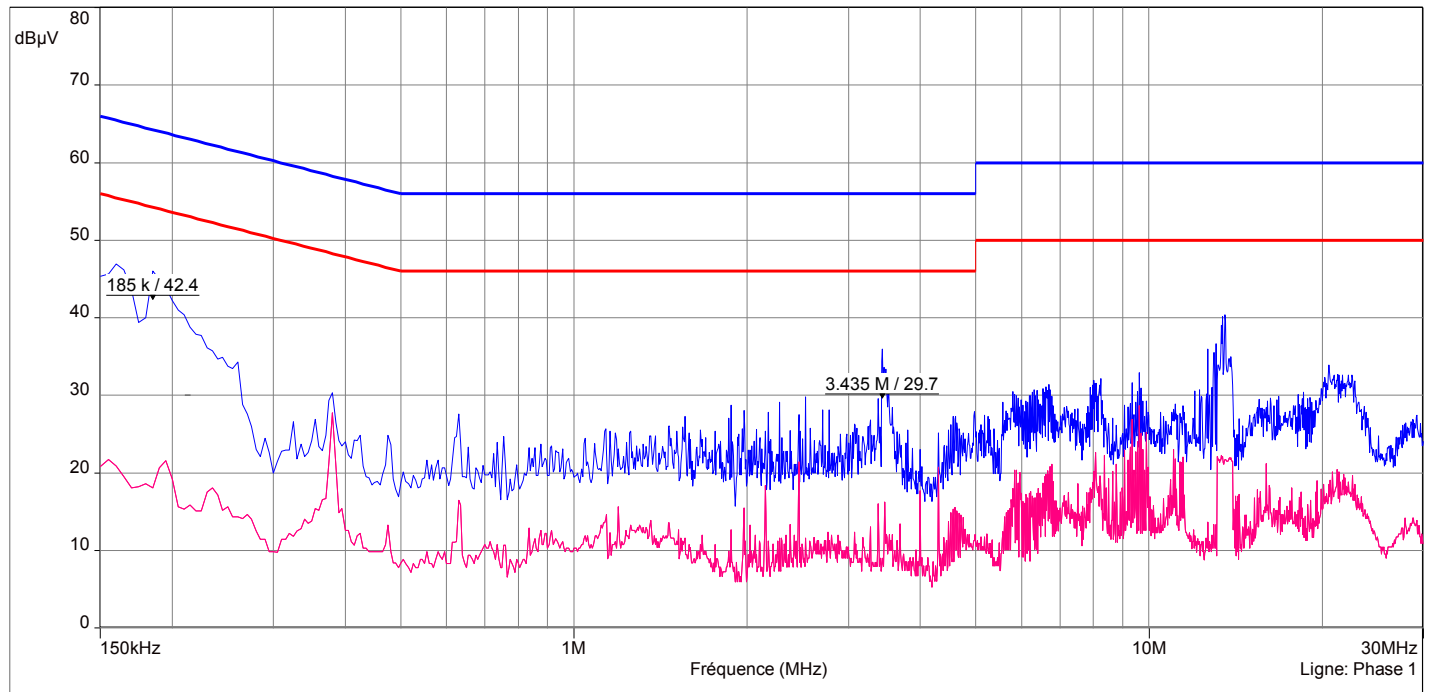
Description Sous-bande 1

Fréquences: 150 kHz - 30 MHz (Mode: Lin, Pas: 5 kHz)

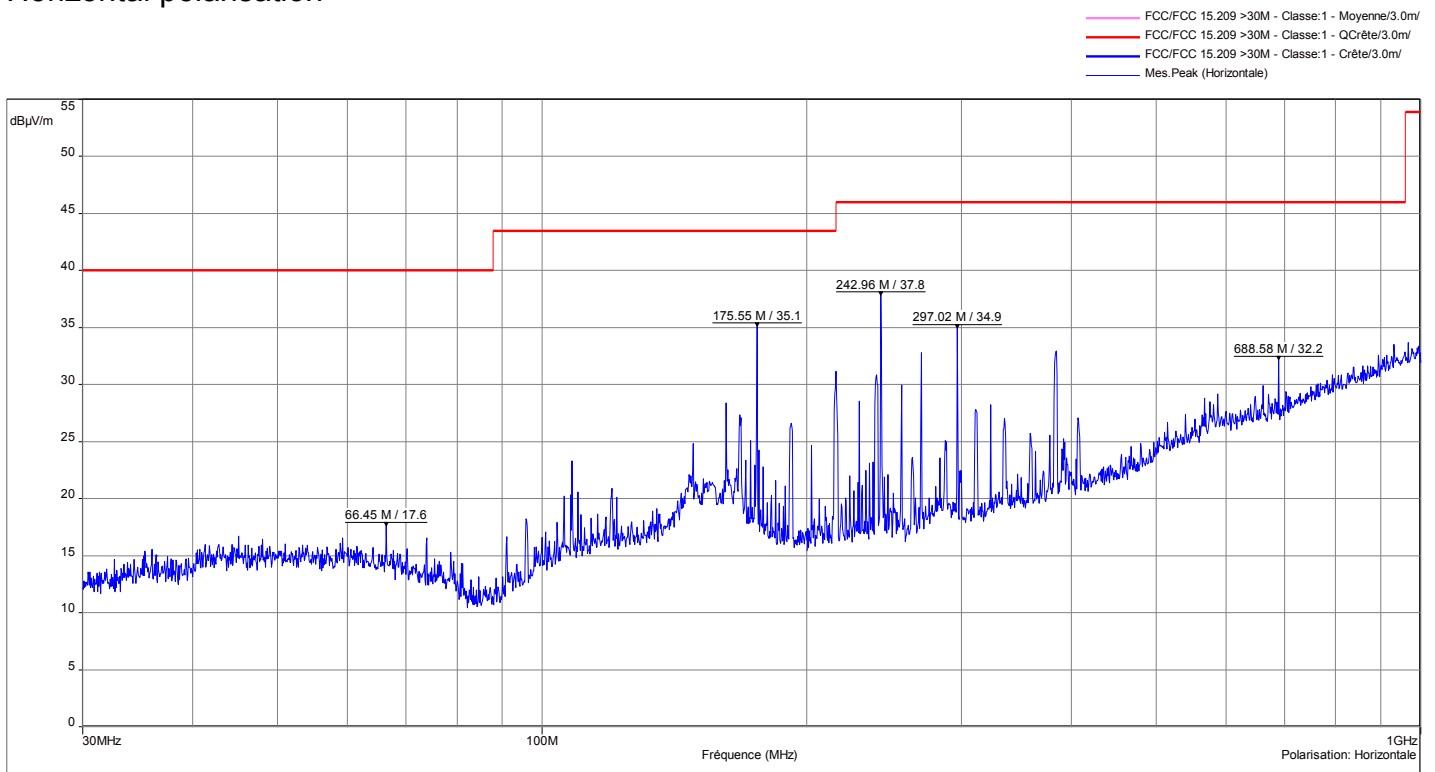
Réglages: RBW: 9 kHz, VBW: Auto, Temps de mesure: 50 ms/Pts, Nombre de Balayages: 1, Preamp: Off, LN Preamp: Off, Preselecteur: On

Ligne: Phase 1

— Civil 55022/EN 55022 Conduit Alim - Classe: B - Moyenne/  
— Civil 55022/EN 55022 Conduit Alim - Classe: B - QCrête/  
— Mes. Peak (Phase 1)  
— Mes. Avg (Phase 1)



Transmitter Radiated Emissions  
Frequency: F<sub>nom</sub>  
Temperature: T<sub>nom</sub>  
Voltage: V<sub>nom</sub>  
Horizontal polarisation



Transmitter Radiated Emissions  
Frequency: F<sub>nom</sub>  
Temperature: T<sub>nom</sub>  
Voltage: V<sub>nom</sub>  
Vertical polarisation

— FCC/FCC 15.209 >30M - Classe:1 - Moyenne/3.0m/  
— FCC/FCC 15.209 >30M - Classe:1 - QCrête/3.0m/  
— FCC/FCC 15.209 >30M - Classe:1 - Crête/3.0m/  
— Mes.Peak (Verticale)

