TEST REPORT — RADIO

Number	124182-649690B
Composition of document	29 pages
FCC Registration Number	166175 (FAR) or 888863 (Ecuelles)
Industry Canada Number	6230B(FAR) & 6230B-1(Ecuelles)
Standards	47 CFR Part 15.225 RSS-210, Issue 8 RSS-Gen, Issue 3
Issued to	SMARTWARE 11, avenue des Andes Le Carthagène ZA de Courtaboeuf 91940 Les Ulis
Apparatus under test	Smartcard Reader
Trade mark	SMARTWARE
Manufacturer	SMARTWARE
Type	USN3e & MX3e-3I3P
Serial number	USN3 #1338EA201_0035
IC	4783A-USN3D201
FCC ID	RPM-USN3D201
Test date	2013/11/20
Tests performed by	Armand MAHOUNGOU & Laurent DENEUX
Test site	Fontenay aux Roses/ Ecuelles
Date of issue	2013/12/09

Written by :
Armand MAHOUNGOU
Tests operator

Approved by :
Stéphane PHOUDIAH
Technical manager

SUMMARY

1. TEST PROGRAM

- **References**

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

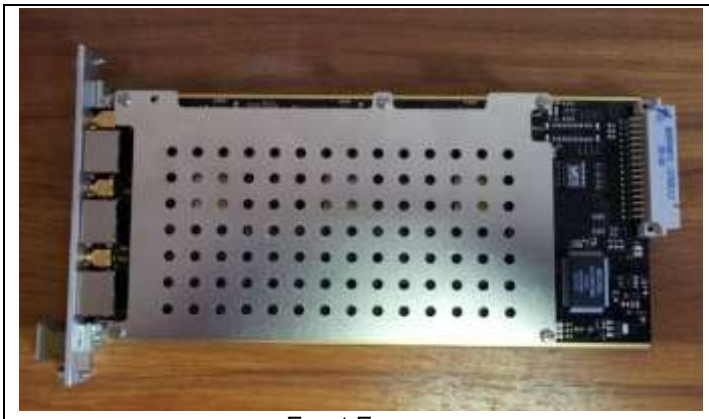
Standard Section	Test Description	TEST RESULT - Comments
RSS-Gen § 4.6.1	Occupied Bandwidth	PASS (No Limit applicable)
CFR 47 § 15.225 (e) RSS-210 § A2.6	Frequency tolerance	PASS
CFR 47 § 15.207 RSS-Gen § 7.2.4	AC Power Line Conducted Emissions	PASS
CFR 47 § 15.225 (a) (b) (c) RSS-210 § A2.6 (a) (b) (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

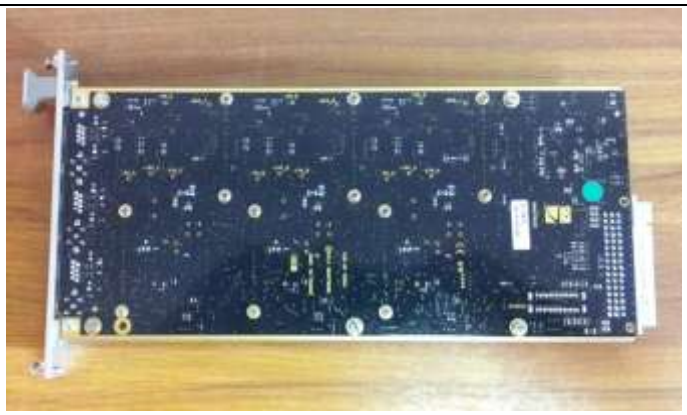
2. EQUIPMENT DESCRIPTION

2.1. HARDWARE & SOFTWARE IDENTIFICATION

- **Equipment under test (EUT):**



Front Face



Rear Face

Contactless Card

Photograph of EUT

- **Auxiliary equipment (AE) used for testing:**

Laptop Computor Test

Photograph of AE

- **Input/output:**

- Input Power
- Ethernet cable

- **Software identification:**

-Software version:

File Edit Load

Identifier	Program Name	Version	State	Address	Size	Run area	Run area size	Home Dir	INI Path
MLOSBOOT	BOOT_USNano	BOOT_USNano:V1r03c :V2...	Started	60000000	00003E...				
MLOSMONO	MONO_5445x	MONO_5445x:V2R26h_201...	Started	60010000	0001E3...				
MLOS	MLOS32	MLOS32:V2R26I_20130614	Started	60030000	0007C5...				
SWP:001	SWP	SWP:V1R02a_Jul 21 2011	Started	60180000	0000C4...	00E00000	0001FF80		
CARD:001	CARD	CARD:V2R20i_20130611	Started	60200000	0004B9...	00E80000	0007FF80		
NANOFPGA:001	NANOFPGA	NANOFPGA:V1R04a_20130...	Started	60700000	000443F8	01000000	0004FF00		

- **Equipment information:**

- External antenna connector: Yes
- Frequency band allocated: 13.553MHz to 13.567MHz
- Frequency band used: 13.56MHz
- Modulation:
- Number of channel: 1
- Antenna type: External
- Stand By mode: No
- Type of power source: External power supply reference PSU30A-3 of trade mark MEAN WELL
- Power supply: Vmin: 10.80 V
  Vnom: 12.0 V
  Vmax: 13.20 V
- Temperature range: Tmin: -30°C (IC)
  Tmin: -20°C (FCC)
  Tnom: 20°C
  Tmax: +55°C

2.2. RUNNING MODE

The EUT is set in the following modes during tests:
-Permanent emission-reception

2.3. EQUIPEMENT LABELLING

ID label v2r01b
Visible Top Side - For **USN3e**, **MX3e-3I3P**
Dimensions: 45 x 21 mm

2.4. EQUIPMENT MODIFICATIONS

Power setup for 13.56MHz: step 10

3. OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU
Date of test : 2013/11/20
Ambient temperature : 21°C
Relative humidity : 24%

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 conducted access. The product has been tested according to the RSS-GEN § 4.6.1 reference method.

Spectrum Analyzer Setting:
Center frequency= 13.56MHz
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

Modulation A

Temperature	Tnom
Voltage	**Vnom**
Frequency	Fnom
Occupied Bandwidth (kHz)	1083.83

Modulation B

Temperature	Tnom
Voltage	**Vnom**
Frequency	Fnom
Occupied Bandwidth (kHz)	1772.45

See graphics in annex

Result: PASS

Limit: → None

4. FREQUENCY TOLERANCE

4.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU
Date of test : 2013/11/20
Ambient temperature : 20°C
Relative humidity : 25%

4.2. TEST SETUP

The Equipment Under Test is installed on a table and set in permanent emission without modulation. Measurement is performed with a spectrum analyzer on the EUT conducted access.

Spectrum Analyzer Setting:
Center frequency= 13.56MHz
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

Photograph for Frequency tolerance

4.3. RESULTS

Temperature	Tmin (IC)	Tmin (FCC)	Tnom	Tmax
Voltage:	**Vmin**			
Frequency (MHz)	13.5615	13.5615	13.5615	13.5616
Frequency Drift (%)	0.000	0.000	0.000	0.0007
Voltage:	**Vnom**			
Frequency (MHz)	13.5615	13.5615	13.5615	13.5616
Frequency Drift (%)	0.000	0.000	**Reference**	0.0007
Voltage:	**Vmax**			
Frequency (MHz)	13.5615	13.5615	13.5615	13.5616
Frequency Drift (%)	0.000	0.000	0.000	0.0007

Result: PASS
Limit: → +/- 0.01%

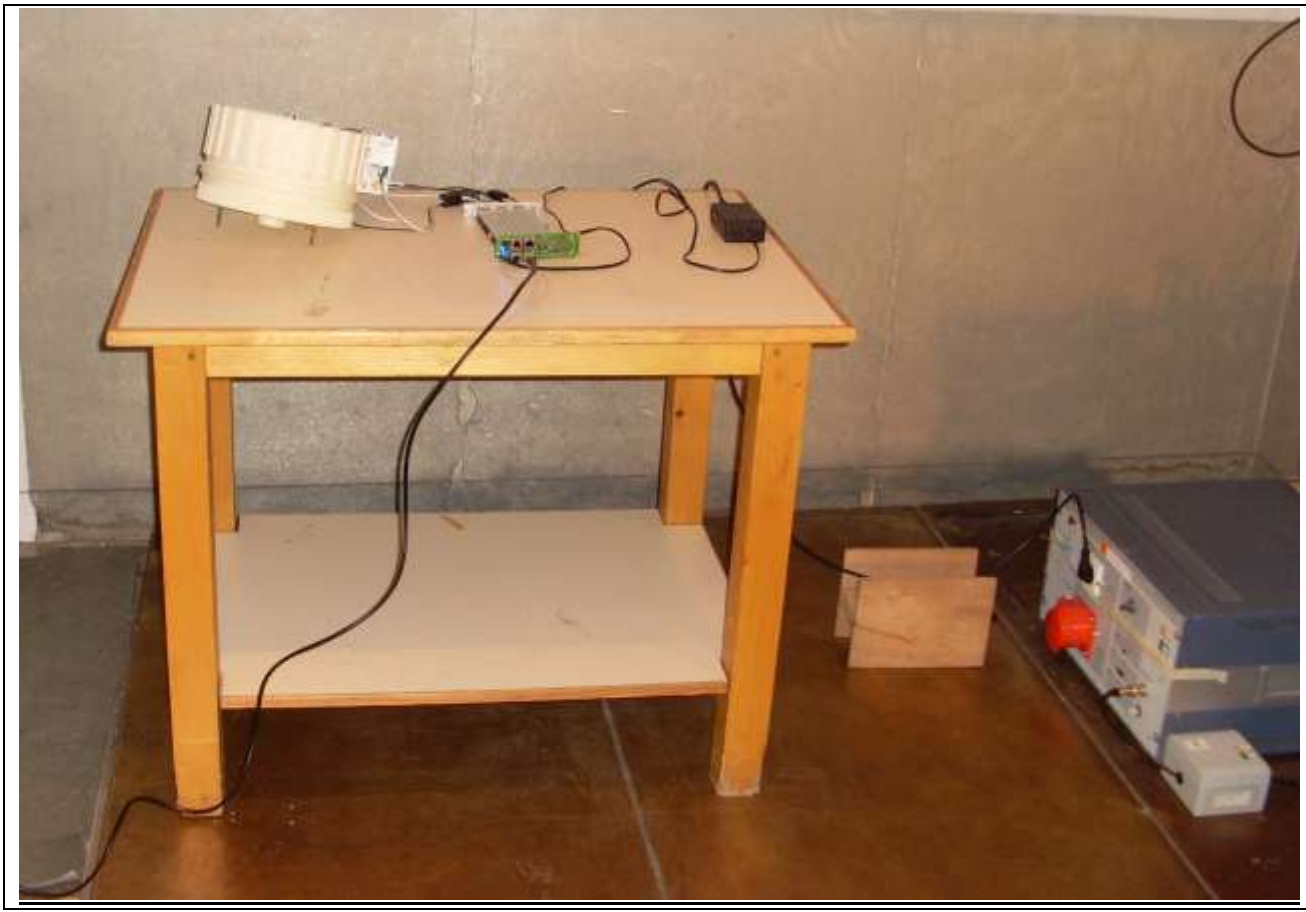
5. AC POWER LINE CONDUCTED EMISSIONS

5.1. TEST CONDITIONS

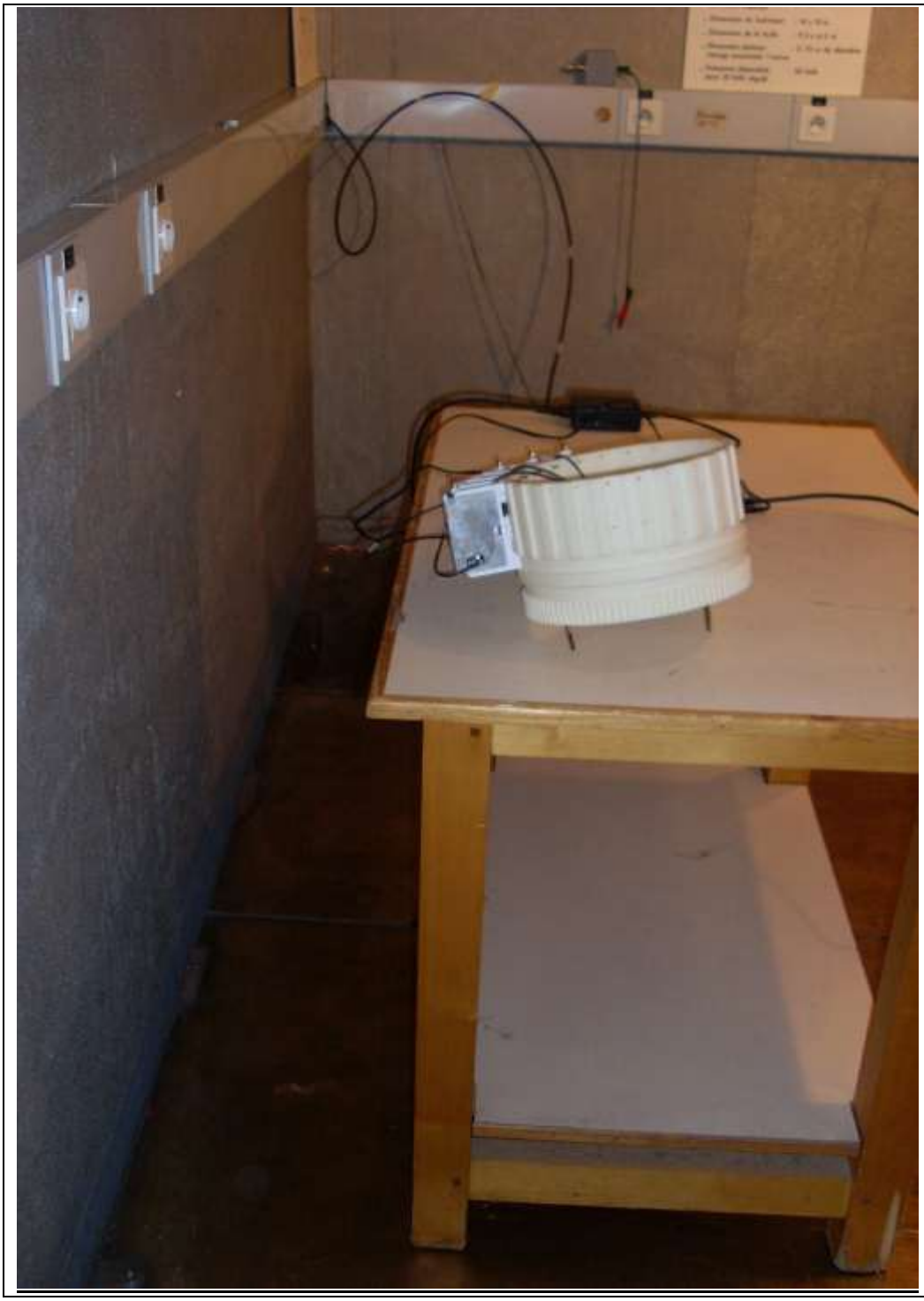
Test performed by : Laurent DENEUX
Date of test : 2013/11/13
Ambient temperature : 22 °c
Relative humidity : 59 %

5.2. TEST SETUP

The product has been tested according to ANSI C63.4-(2003) 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 50Ω / 50µH. Interconnecting cables and equipment's were moved to position that maximized emission.



Photograph Conducted Emissions (Front view)



Photograph for Line Conducted Emissions (Rear view)

5.3. RESULTS

Phase Line - with antenna

Frequency (MHz)	Peak Level (dBµV/m)	Quasi-Peak Level (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Average Level (dBµV/m)	Average Limit (dBµV/m)
0.200	60.4	-	63.6	50.8	53.6
0.301	49.5	-	60.2	38.8	50.2
0.402	43.5	-	57.8	33.2	47.8
13.56	45.4	-	60	-	50
27.12	46.8	-	60	-	50

Neutral Line - with antenna

Frequency (MHz)	Peak Level (dBµV/m)	Quasi-Peak Level (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Average Level (dBµV/m)	Average Limit (dBµV/m)
0.202	58.4	-	63.4	50.8	53.4
0.306	47.2	-	60	38.8	50
0.408	42.6	-	57.6	33.2	47.6
13.56	45.2	-	60	-	50
27.12	48.2	-	60	-	50

See annex for graphics

Result: PASS

Limit: → **Quasi-Peak**
0,15kHz to 0,5MHz: 66dBµV/m to 56dBµV/m*
0,5MHz to 5MHz: 56dBµV/m
5MHz to 30MHz: 60dBµV/m

Average
0,15kHz to 0,5MHz: 56dBµV/m to 46dBµV/m*
0,5MHz to 5MHz: 46dBµV/m
5MHz to 30MHz: 50dBµV/m

*Decreases with the logarithm of the frequency

6. FIELD STRENGTH WITHIN THE BAND 13.110-14.010MHZ

6.1. TEST CONDITIONS

Test performed by : Laurent DENEUX
Date of test : November 13th, 2013
Ambient temperature : 16 °C
Relative humidity : 47 %

6.2. TEST SETUP

The product has been tested according to ANSI C63.4 (2003). The EUT is placed on an open area test site. Distance between measuring antenna and the EUT is 3m. Test is performed in parrallel 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

Photograph for Field strength within the band 13.110-14.010MHz

6.3. RESULTS

- **Characterization on an open test site:**

Parallel Axis

Frequency (MHz)	QPeak Level (dBµV/m) (3m)	Limit (dBµV/m) (3m)
Below 13.110	<34	69.5
13.110 to 13.410	<34	80.5
13.410 to 13.553	48	90.5
13.553 to 13.567	63.8	124
13.567 to 13.710	50	90.5
13.710 to 14.010	47	80.5
Above 14.010	<34	69.5

Perpendicular Axis

Frequency (MHz)	QPeak Level (dBµV/m) (3m)	Limit (dBµV/m) (3m)
Below 13.110	34.7	69.5
13.110 to 13.410	51	80.5
13.410 to 13.553	37	90.5
13.553 to 13.567	57.8	124
13.567 to 13.710	40	90.5
13.710 to 14.010	46	80.5
Above 14.010	35	69.5

Result: PASS

Limit: → Below 13.110MHz: 69.5dBµV/m (3m))
13.110MHz to 13.410MHz: 80.5dBµV/m (3m)
13.410MHz to 13.553MHz: 90.5dBµV/m (3m)
13.553MHz to 13.567MHz: 124dBµV/m (3m)
13.567MHz to 13.710MHz: 90.5dBµV/m (3m)
13.710MHz to 14.010MHz: 80.5dBµV/m (3m)
Above 14.010MHz: 69.5dBµV/m (3m)

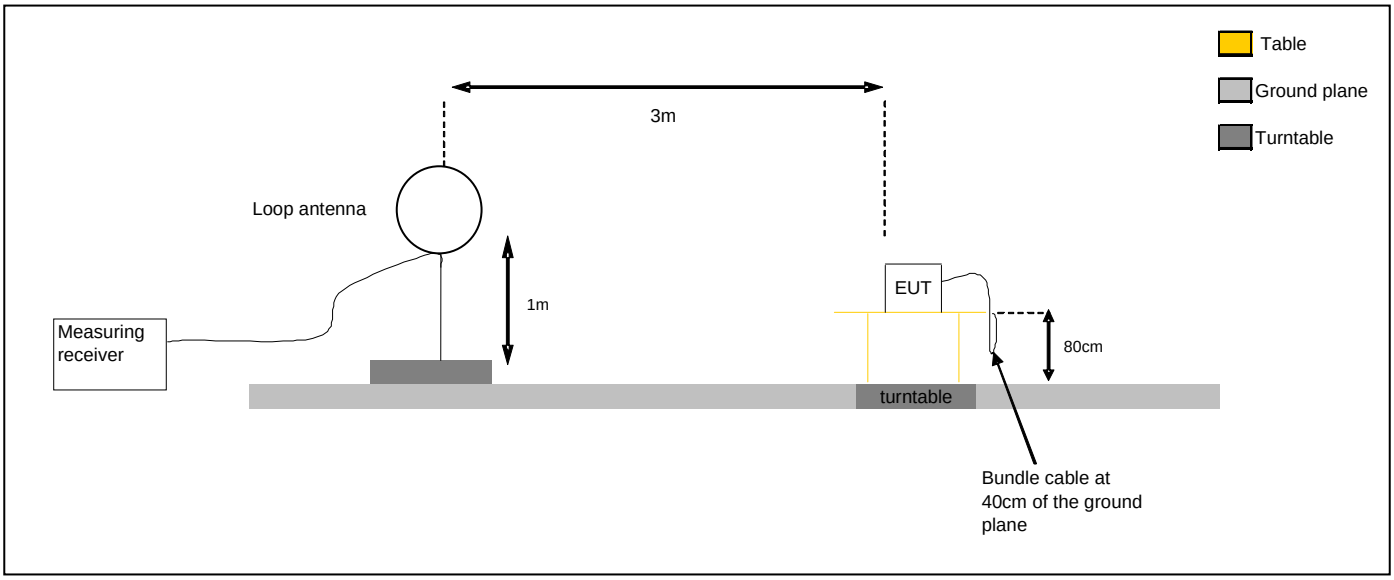
7. FIELD STRENGTH OUTSIDE OF THE BANDS 13.110-14.010 MHZ

7.1. TEST CONDITIONS

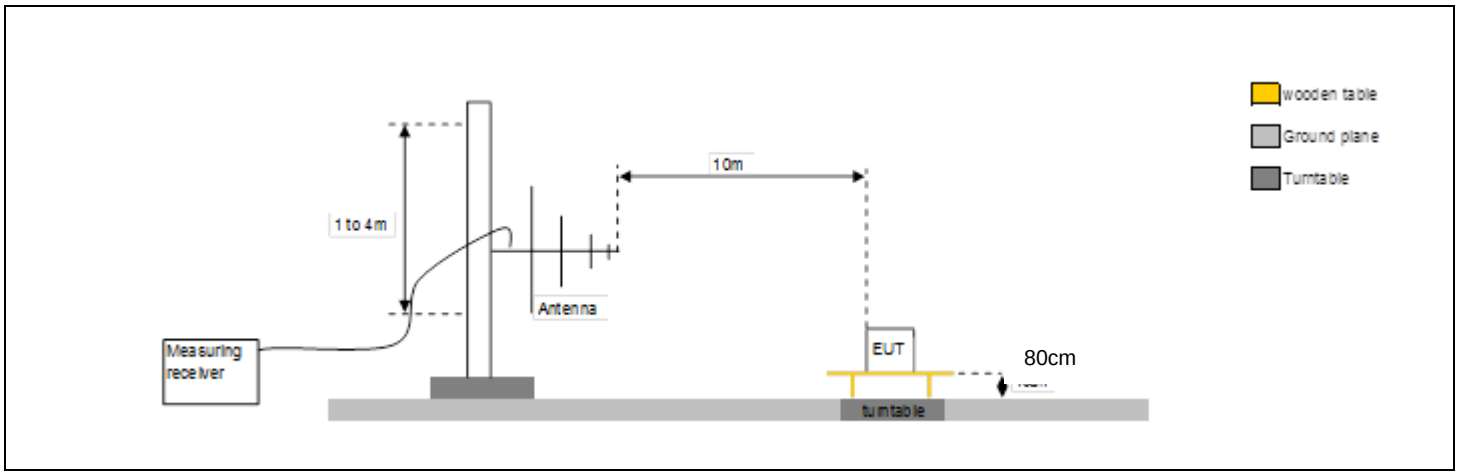
Test performed by : Laurent DENEUX
Date of test : November 13th, 2013
Ambient temperature : 16 °C
Relative humidity : 47 %

7.2. TEST SETUP

The EUT is placed at 3m distance of the loop antenna (0.009 to 30MHz) on a table 80cm height. The level has been maximised by turning the EUT with the rotating table and with the antenna at 0° and 90° around its vertical and horizontal axes. Antenna height was 1m. Pre scans were performed on the EUT put on its three axes to determine the position with maximum radiation.



The EUT is placed at 10m distance of the Bilog (30 to 1000MHz) or horn (above 1GHz) antenna on a table 80cm height. The level has been maximised by turning the EUT with the rotating table and with the antenna in horizontal and vertical polarity. Antenna height search was performed from 1 to 4m



Photograph for Field strength below 30MHz

Photograph for Field strength above 30MHz

7.3. RESULTS

- **Characterization on an open test site (9kHz to 30MHz):**

Perpendicular antenna

Below 30Mhz

Frequency (MHz)	QPeak Level (dBµV/m)	Limit (3m) (dBµV/m)
0.211	37.3	101.1
0.283	34	98.5
0.352	37	96.6
0.409	41	95.3
0.507	38.8	73.5
0.651	39	71.3
1.01	38	67.5
1.3	38.2	65.3
1.77	32.8	69.5
2.15	31	69.5
3.80	20	69.5
4.62	12	69.5
27.12	6	69.5

Parallel antenna

Below 30Mhz

Frequency (MHz)	QPeak Level (dBµV/m)	Limit (3m) (dBµV/m)
0.215	25	100.9
0.258	26	99.3
0.383	26	95.9
0.508	25	73.4
0.572	24	72.4
0662	24.7	71.1
0.810	21	69.4
1	24	67.6
1.33	24.7	65.3
2	14	69.5
2.6	14	69.5
27.12	8	69.5

Result: PASS

Limit: → 9kHz to 0,490MHz: 20log(2400/F(kHz))dBµV/m (3m) QPeak
0,490MHz to 1.705MHz: 20log(24000/F(kHz))dBµV/m (3m) QPeak
1.705MHz to 30MHz: 30µV/m (30m) or dBµV/m (3m) QPeak

Characterization on an open test site (30MHz to 1000MHz)

Worst frequencies		
Frequency MHz	Measured level dBµV/m	Limit level FCC Part.15 Class B
40.7	27	29.5
62.8	27.7	29.5
176.3	28.3	33
189.9	28.7	33
300	31.3	35.5
393.4	33.3	35.5

See annex for graphics

Characterization on an open test site (1GHz to 18GHz)

No significant spurious has been observed

Result: PASS

Limit: →

30MHz to 88MHz: 29.5 dBµV/m (10m) QPeak
88MHz to 216MHz: 33 dBµV/m (10m) QPeak
216MHz to 960MHz: 35.5 dBµV/m (10m) QPeak
960MHz to 1000MHz: 43.5 dBµV/m (10m) QPeak
Above 1000MHz: 43.5 dBµV/m (10m) Peak
63.5 dBµV/m (10m) Average

8. TEST EQUIPMENT LIST

Frequency Tolerance & Occupied Bandwidth					
Apparatus	**Trade Mark**	**Type**	**Registration number**	**Calibration date**	**Calibration due**
Spectrum Analyser	ROHDE & SCHWARZ	FSL	A4060032		
Climatic Chamber	SECASI Technologies	SLT-34	D1024029	-	-
Power Supply	KIKUSUI	PCR500M	A7040079	-	-
Multimeter	KEITHLEY	2000	A1241084	2013-10	2014-10
Thermometer	AOiP	TM6630	A4041042	-	-

Radiated emissions					
Apparatus	**Trade Mark**	**Type**	**Registration number**	**Calibration date**	**Calibration due**
Open test site	LCIE	-	F2000400	-	-
EMI Test Receiver	ROHDE & SCHWARZ	ESU	A2642018	2013-04	2014-04
Preamplifier	HEWLETT PACKARD	8449B	A4069002	2012-11	2013-11
Bilog antenna	CHASE	CBL 6112A	C2040040	2013-03	2014-03
Horn antenna	EMV	3115	C2040023	2013-04	2014-04
Loop Antenna	RHODE & SCHWARZ	HFH2-Z2	C2040007	2012-11	2013-11
Cable	-	-	A5329449	2013-09	2014-09
Cable	-	-	A5329365	2013-03	2014-03
Cable	-	-	A5329444	2013-09	2014-09

AC Power Line Conducted Emissions					
Apparatus	**Trade Mark**	**Type**	**Registration number**	**Calibration date**	**Calibration due**
EMI Test Receiver	ROHDE & SCHWARZ	ESU	A2642018	2013-04	2014-04
Pulse limiter	RHODE & SCHWARZ	ESH3-Z2	A2649008	2013-02	2014-02
V LISN	ROHDE & SCHWARZ	ESH2-Z5	C2322001	2013-06	2014-06
Ground plan	LCIE	-	-	-	-
Cable	-	-	A5329417	2013-09	2014-09

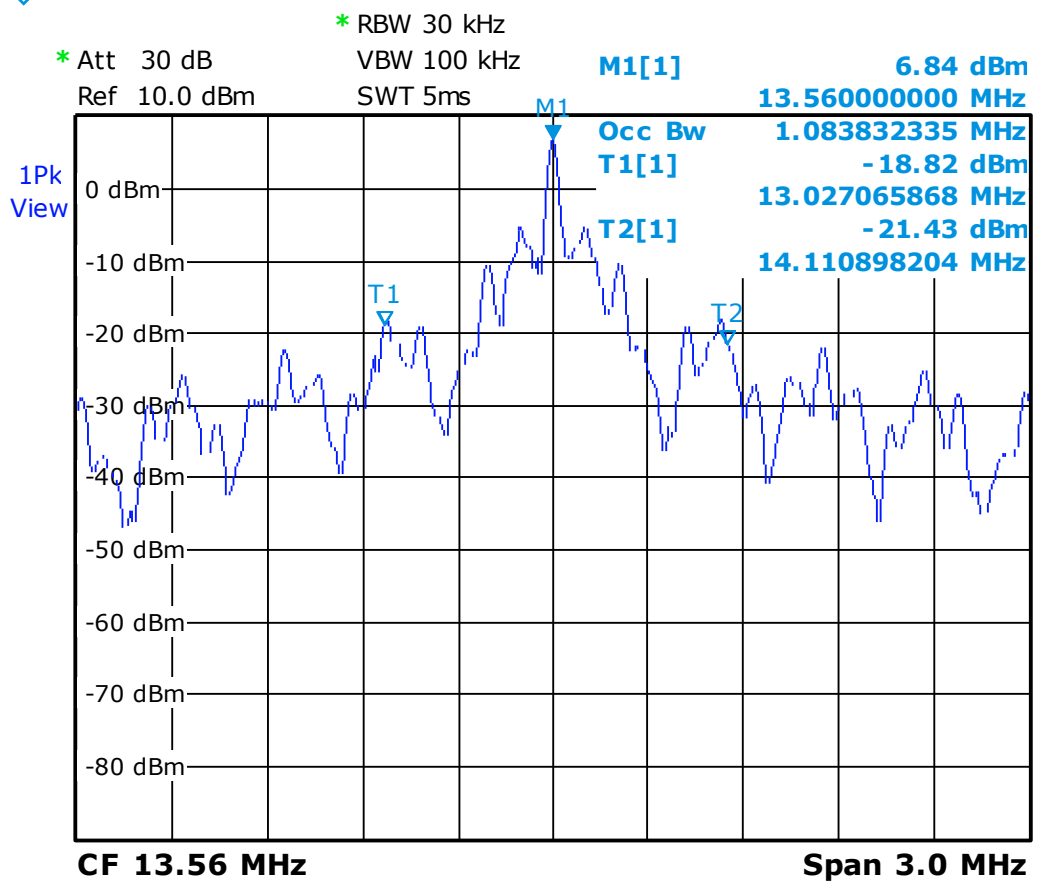
Note :In our Quality System, the Calibration due of our equipment is more or less 2 months.

9. UNCERTAINTIES CHART

Kind of test	Measurement uncertainties (k=2) ±x(dB) / (Hz)	Limit for uncertainties ±y(dB)
TRANSMITTER REQUIREMENTS		
Radio frequency	$\pm 2.10^{-8}$ Hz	$\pm 1.10^{-7}$ Hz
RF Conducted power	±0.6 dB	±1.5 dB
Spurious emissions • Frequency < 1000 MHz • Frequency > 1000 MHz	 ±3.9 dB ±3.1 dB	±6 dB
Spurious in conduction	±1.6 dB	±3 dB
Temperature	±0.5°C	±1°C
Humidity	±2.5 %	±10 %

10. ANNEX (GRAPHS)

Occupied Bandwidth
Temperature: Tnom
Voltage: Vnom
Modulation A



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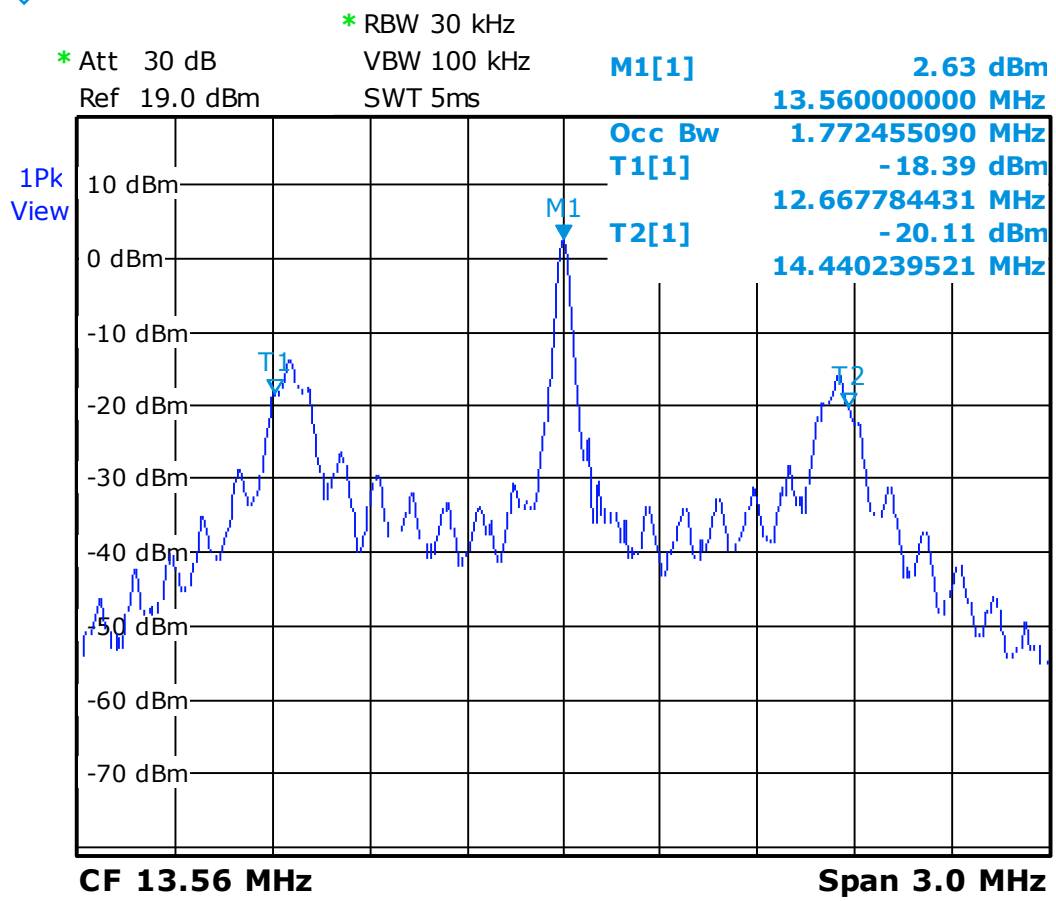
Occupied Bandwidth
Temperature: Tnom
Voltage: Vnom
Modulation B



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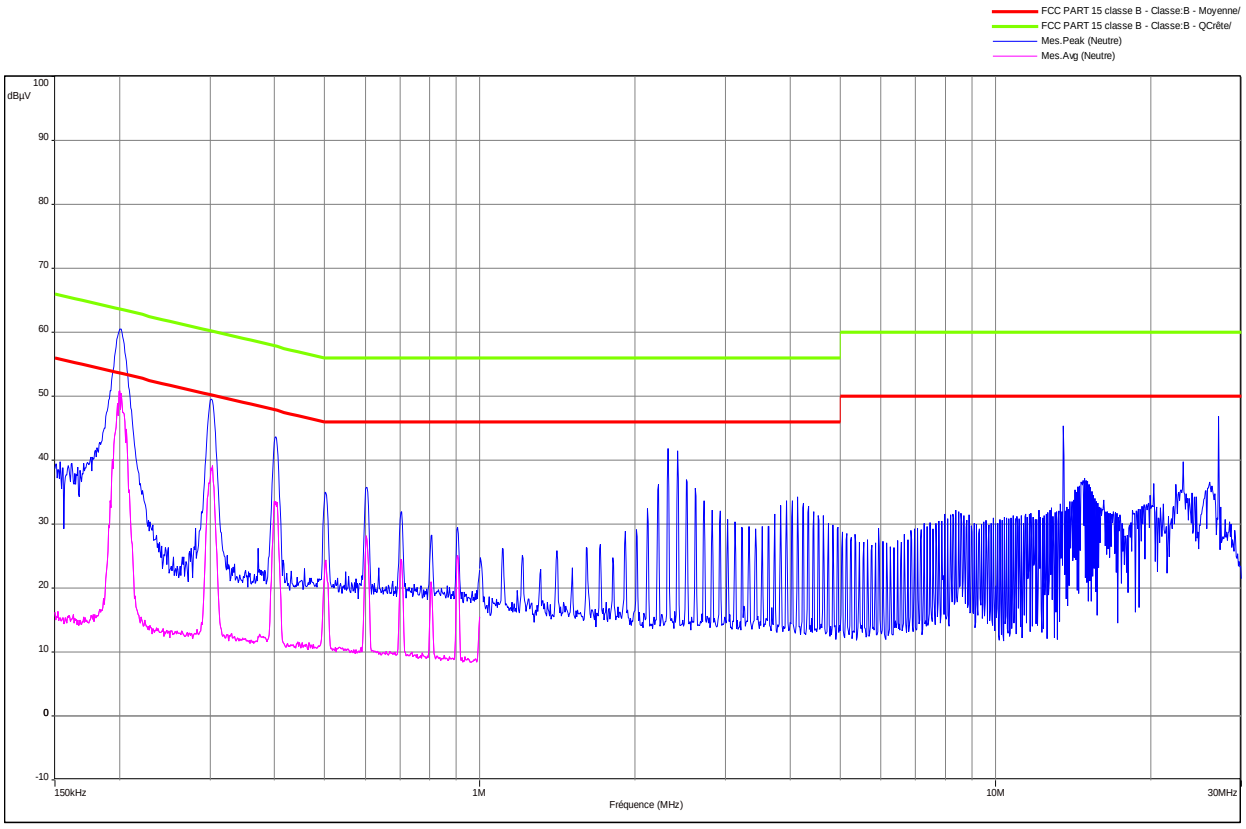
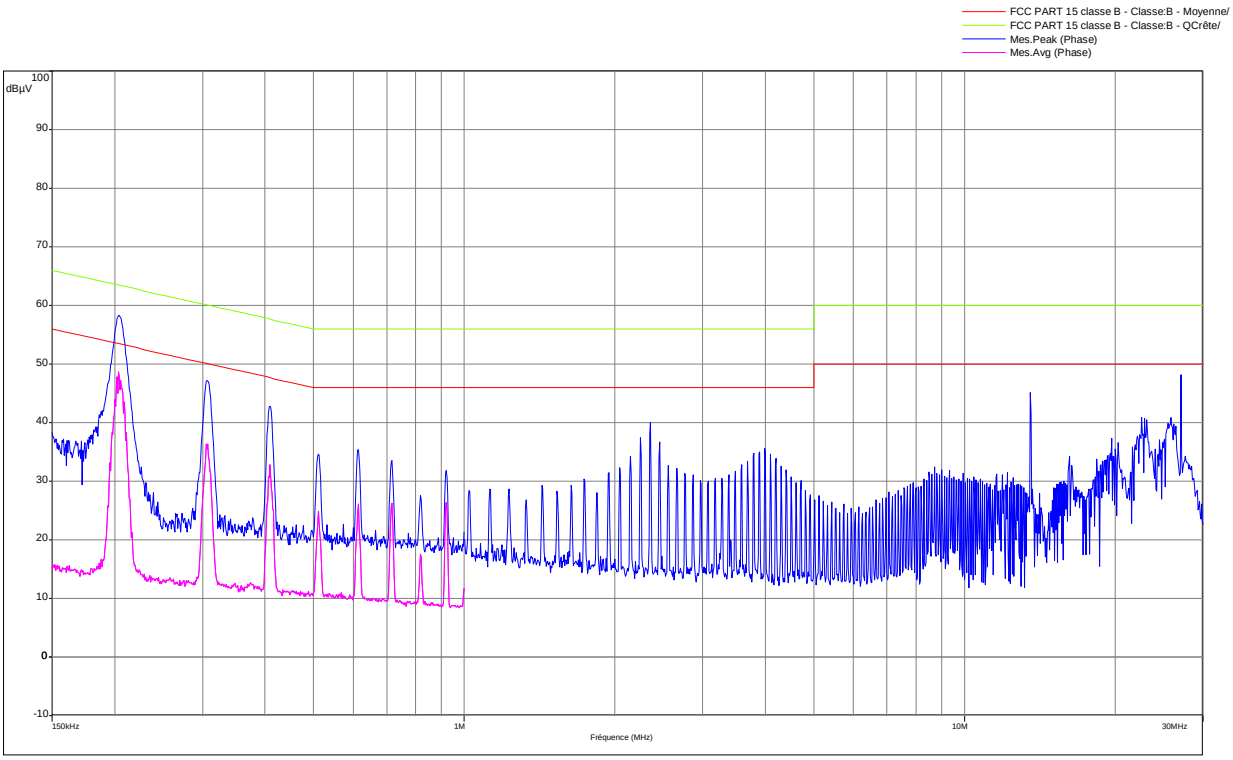
AC power line conducted emissions
Antenna Connected
FCC Part .15 class B
SMARTWAVE
CARD READER
TYPE : USN3e & MX3e-3I3P
CONDUCTOR 1 . 120V 50Hz
Peak and average value measurement



AC power line conducted emissions
Antenna Connected
FCC Part .15 class B
SMARTWAVE
CARD READER
TYPE : USN3e & MX3e-3I3P
CONDUCTOR 2 . 120V 50Hz
Peak and average value measurement



Radiated Emissions
FCC Part .15 class B
SMARTWAVE
CARD READER with 13.56MHz
TYPE : USN3e & MX3e-3I3P
Quasi Peak measurement