RFID 13,56MHz Template: Release October 10th, 2016

TEST REPORT

N°: 144241-692605-B **Version : 02**

Subject	**Radio spectrum matters** **tests according to standards:** **47 CFR Part 15.225 & RSS 210 Issue 9, RSS-Gen Issue 4 (Limited Program)**
Issued to	SMARTWARE 11, Avenue des Andes 91966-LES ULIS France
Apparatus under test	
↳ Product	**Smartcard reader**
↳ Trade mark	**SMARTWARE**
↳ Manufacturer	**SMARTWARE**
↳ Model under test	**USN3se V2R02**
↳ Serial number	**USN3#1638EA202_0150**
Conclusion	See Test Program chapter
Test date	: October 14, 2016 to October 21, 2016
Test location	Ecuelles
Composition of document	25 pages
Document issued on	January 6, 2017

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Approved by :
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Technical manager

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PUBLICATION HISTORY

Version	Date	Author	Modification
01	November 16, 2016	Laurent DENEUX	Creation of the document
02	January 13, 2017	Arnaud FAYETTE	Indicate on page 8 and 17 that no modification were made. Change value on page 24 from “467” to “46.7”

SUMMARY

1. TEST PROGRAM

References

- **47 CFR Part 15.225**
- **ANSI C63.10-2013**

Radio requirement:

Clause (47CFR Part 15.225 & RSS-210 Issue 9 & RSS-Gen Issue 4) Test Description	Test result - Comments			
Occupied Bandwidth	☐ PASS	☐ FAIL	☐ NA	☑ NP(1)
AC Power Line Conducted Emission	☑ PASS	☐ FAIL	☐ NA(2)	☐ NP(1)
Frequency Tolerance	☐ PASS	☐ FAIL	☐ NA	☑ NP(1)
Field strength within the band 13.110-14.010MHz	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Field strength outside of the bands 13.110-14.010 MHz	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Receiver Radiated Emissions	☑ PASS (3)	☐ FAIL	☐ NA	☐ NP(1)
This table is a summary of test report, see conclusion of each clause of this test report for detail.				

(1): Limited program
(2): EUT not directly or indirectly connected to the AC Power Public Network
(3)Testing covered the receive mode, and receiver spurious emissions are considered to be the same as transmitter.

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 UNDER TEST: CONFIGURATION (DECLARED BY PROVIDER)

2.1. INFORMATIONS

UltraSmart™ Triple Dual Interface is a family of assemblies which regroups models USN1se, USN2se, USN3se, and MX3se-3I3P.
Those models are assemblies made of 1 board named USN-3D V2R01, and 1 to 3 boards named US-NANO V1R04.
USN-3D boards are available in 2 versions: FAB USN3e, and FAB MX3e. Difference between versions is the pinout of the DIN41612 connector. A set of 0 ohms resistors are mounted or not to differentiate the 2 pinouts.

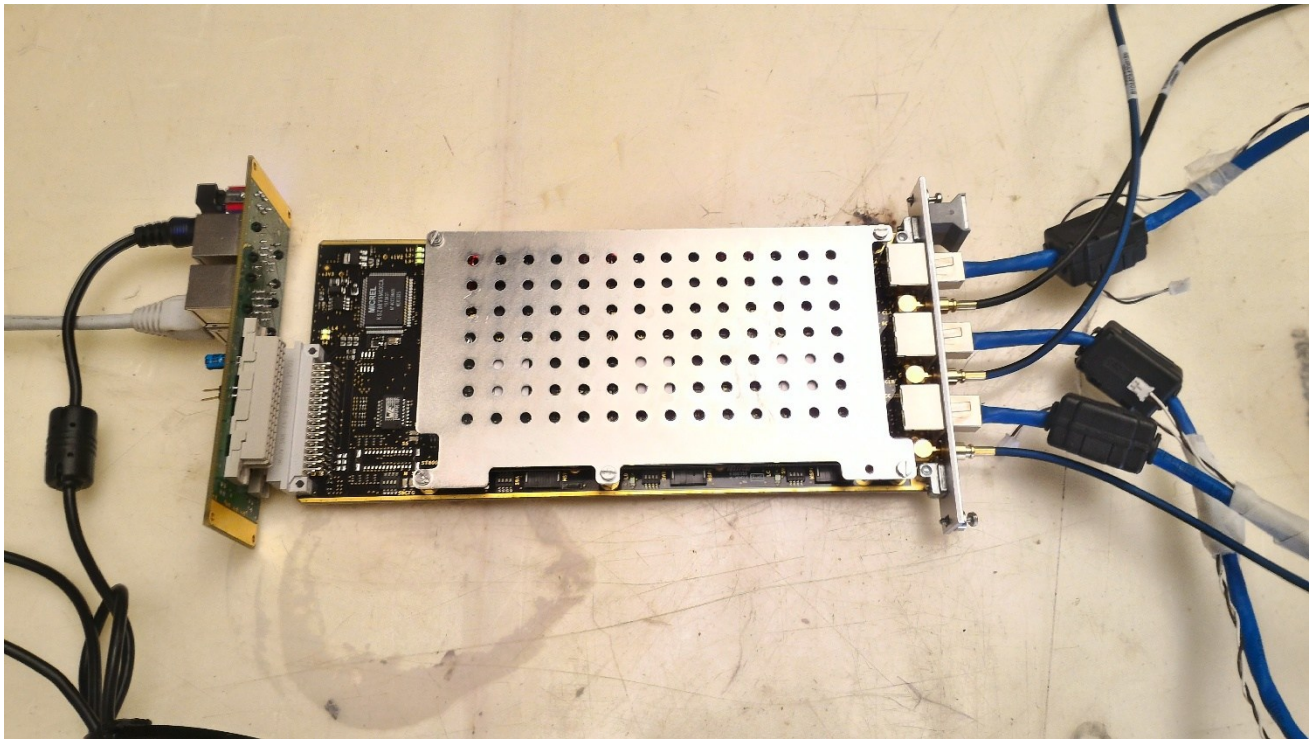
USN1se: 1 x USN-3D FAB USN3e + 1 x US-NANO V1R04 FAB A
USN2se: 1 x USN-3D FAB USN3e + 2 x US-NANO V1R04 FAB A
USN3se: 1 x USN-3D FAB USN3e + 3 x US-NANO V1R04 FAB A
MX3se-3I3P: 1 x USN-3D FAB MX3e + 3 x US-NANO V1R04 FAB A

A shielding is provided by copper plane on one side and metal plate over US-NANO boards
Tests have been performed on the worst case model USN3se

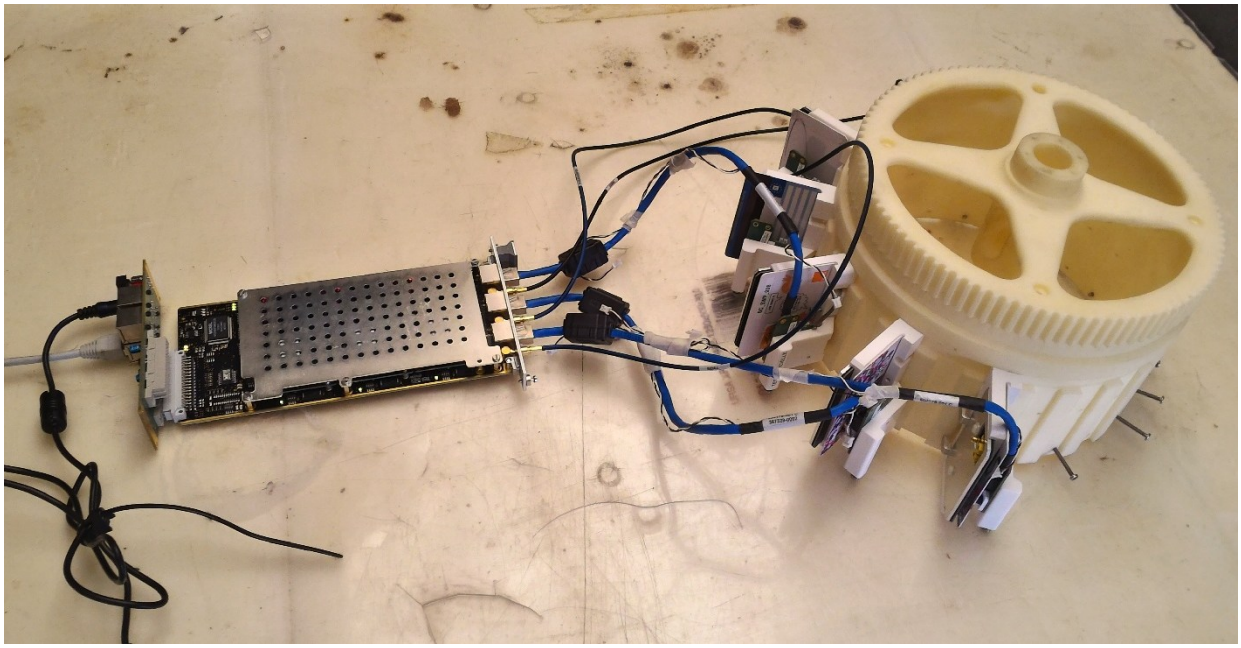
Test has been performed on the worst case **USN3se V2R02**

2.2. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):
SMARTWARE USN3se V2R02 **Serial Number: USN3#1638EA202_0150**



Equipment Under Test



Equipment Under Test

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
DC	Power supply	1	☑	☐	☐	
Internet	Cat. 6	10	☐	☑	☑	
I/O	RJ45 - DF11 cable S/FTP 4 pairs + ferrite würth 74271733	0.4	☑	☐	☐	
I/O	SMB	0.4	☑	☑	☐	

Auxiliary equipment used during test:

Type	Reference	Trade mark	Comments
Laptop	LATITUDE	DELL	Use to set the EUT
Power supply	GST60A12	MEANWELL	

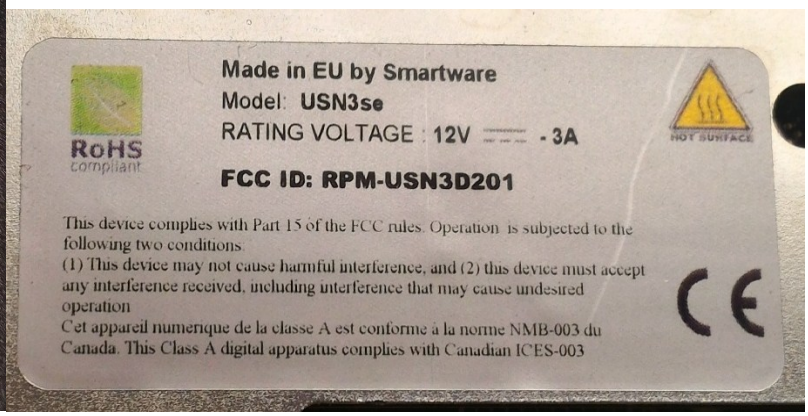
Equipment information:

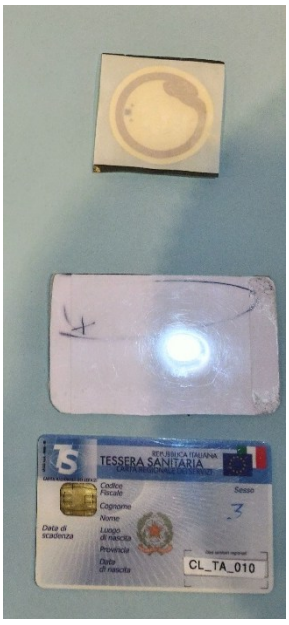
Type:	☐ **RFID**			
Frequency band:	[13.553 to 13.567] MHz			
Number of Channel:	1			
Antenna Type:	☐ Integral	☑ External	☐ Dedicated	
Transmit chains:	1			
Receiver chains	1			
Type of equipment:	☐ Stand-alone	☑ Plug-in	☐ Combined	
Equipment type:	☐ Production model		☐ Pre-production model	
Operating temperature range:	Tmin:	☐ -30°C IC ☑ -20°C FCC	☐ 0°C	☐ X°C
	Tnom:	20°C		
	Tmax:	☐ 35°C	☑ 50°C	☐ X°C
Type of power source:	☐ AC power supply	☑ DC power supply	☐ Battery	
Operating voltage range:	Vmin:	☐ 102V/60Hz	☐ XVdc	
	Vnom:	☐ 120V/60Hz	☑ 12Vdc	
	Vmax:	☐ 138V/60Hz	☐ XVdc	

2.3. RUNNING MODE

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

2.4. EQUIPMENT LABELLING





2.5. EQUIPMENT MODIFICATION

☑ None ☐ Modification:

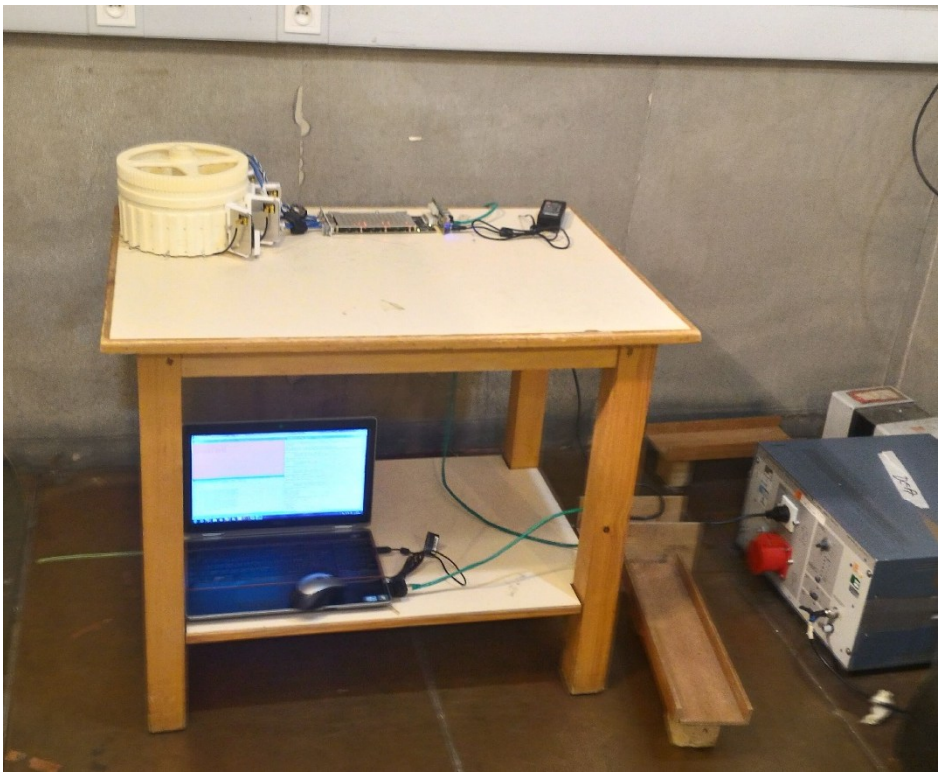
3. AC POWER LINE CONDUCTED EMISSIONS

3.1. TEST CONDITIONS

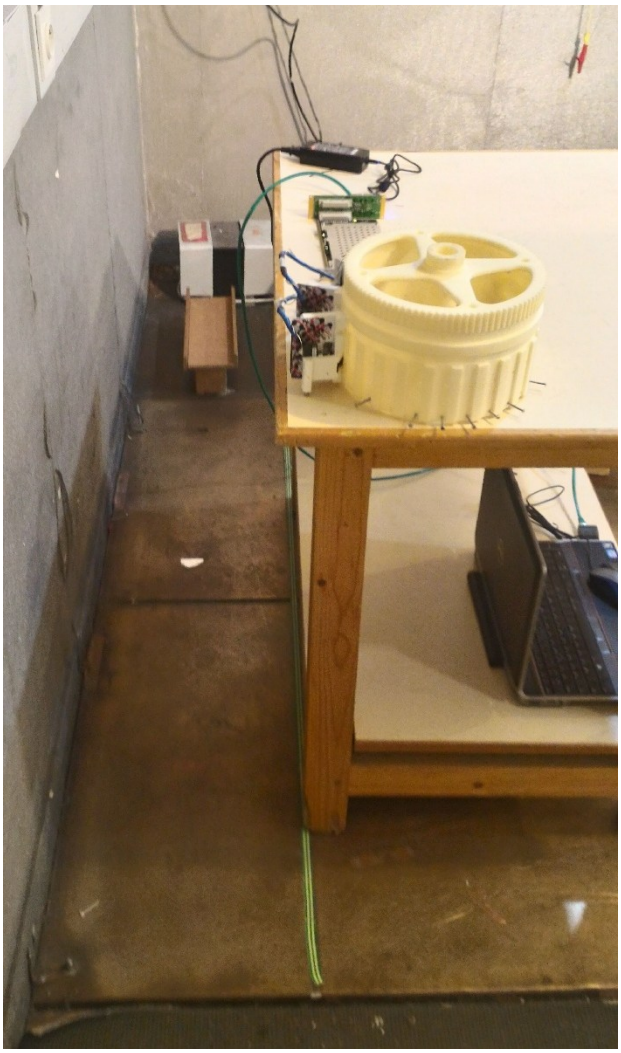
Test performed by	: Laurent DENEUX
Date of test	: October 14, 2016
Ambient temperature	: Temperature 21°C
Relative humidity	: Humidity 53%

3.2. 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 50Ω / 50µH. 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)

3.3. 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

3.4. TEST EQUIPMENT LIST

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	ROHDE & SCHWARZ	ESR	101403	2016-06	2017-06
V ISLN	ROHDE & SCHWARZ	ESH2-Z5	C2322001	2016-05	2017-05
Pulse limiter	ROHDE & SCHWARZ	ESH3-Z2	A2649008	2016-03	2017-03
Cable	-	-	A5329417	2015-10	2016-10
Ground plane	LCIE	-	-	-	

Note: In our quality system, the test equipment calibration due is more & less 2 months

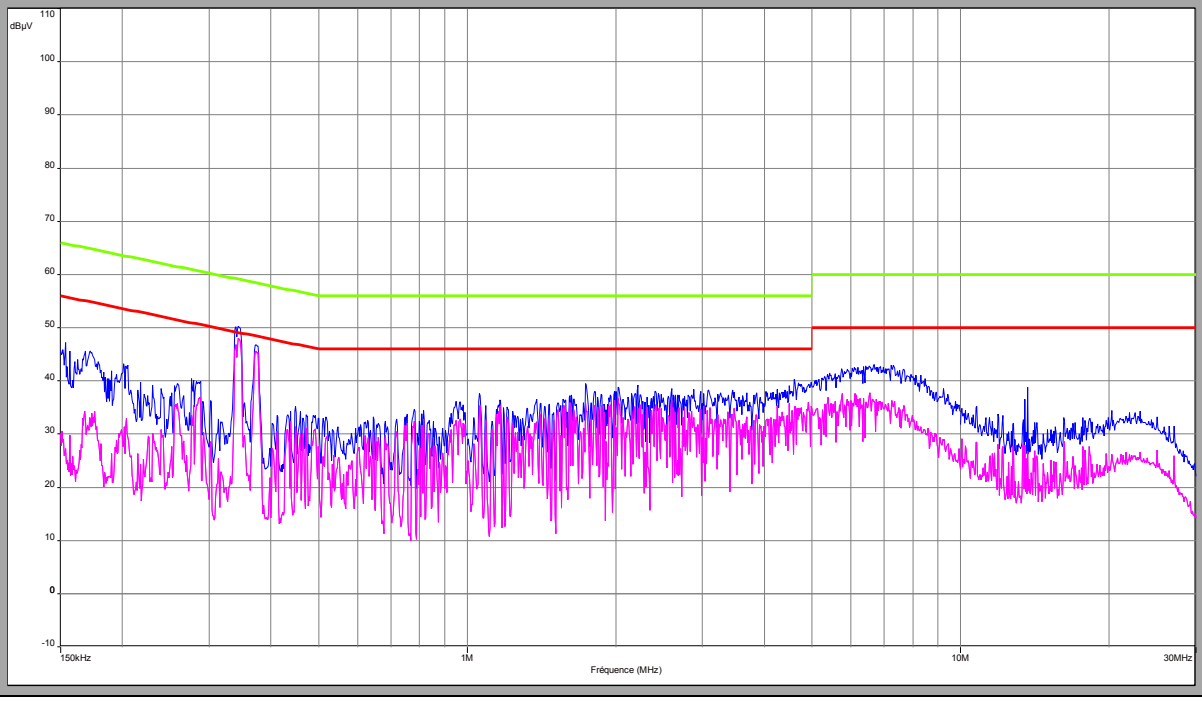
3.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

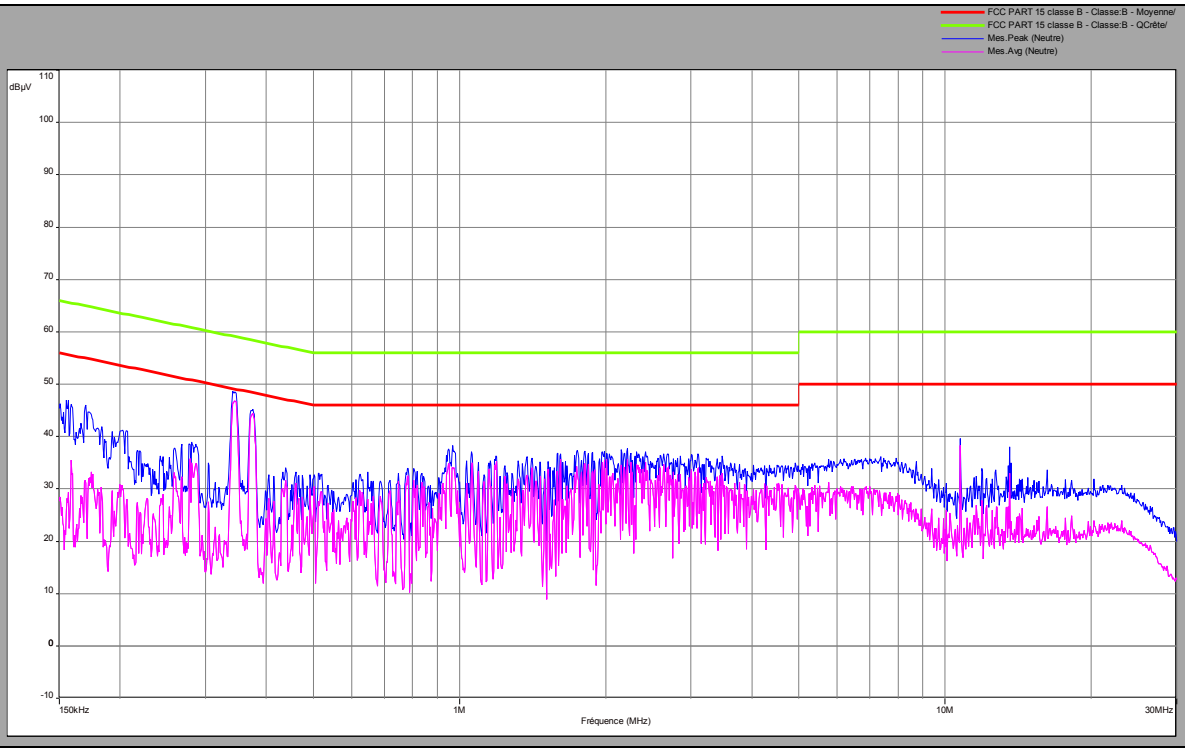
3.6. RESULTS

AC Power Line Conducted Emission

Phase



Line



Phase Line					
Frequency (MHz)	**Peak Level (dBµV)**	**Quasi-Peak Level (dBµV)**	**Quasi-Peak Limit (dBµV)**	**Average Level (dBµV)**	**Average Limit (dBµV)**
345	50	-	59	48	49
373	46.6	-	58.4	45.4	48.4
1740	39.4	-	56	35.4	46
10738	38.8	-	50	27	60
16260	33	-	50	27.2	60

Neutral Line					
Frequency (MHz)	**Peak Level (dBµV)**	**Quasi-Peak Level (dBµV)**	**Quasi-Peak Limit (dBµV)**	**Average Level (dBµV)**	**Average Limit (dBµV)**
345	48.5	-	59	46.8	49
376	45.2	-	58.4	44.3	48.4
1614	36.6	-	56	35.6	46
10738	39.3	-	50	38.3	60
13560	38	-	50	33	60

3.7. CONCLUSION

Ac Power Line Conducted Emission measurement performed on the sample of the product **SMARTWARE USN3se V2R02**, SN: **USN3#1638EA202_0150**, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.225 & RSS Gen ISSUE 4 limits.

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

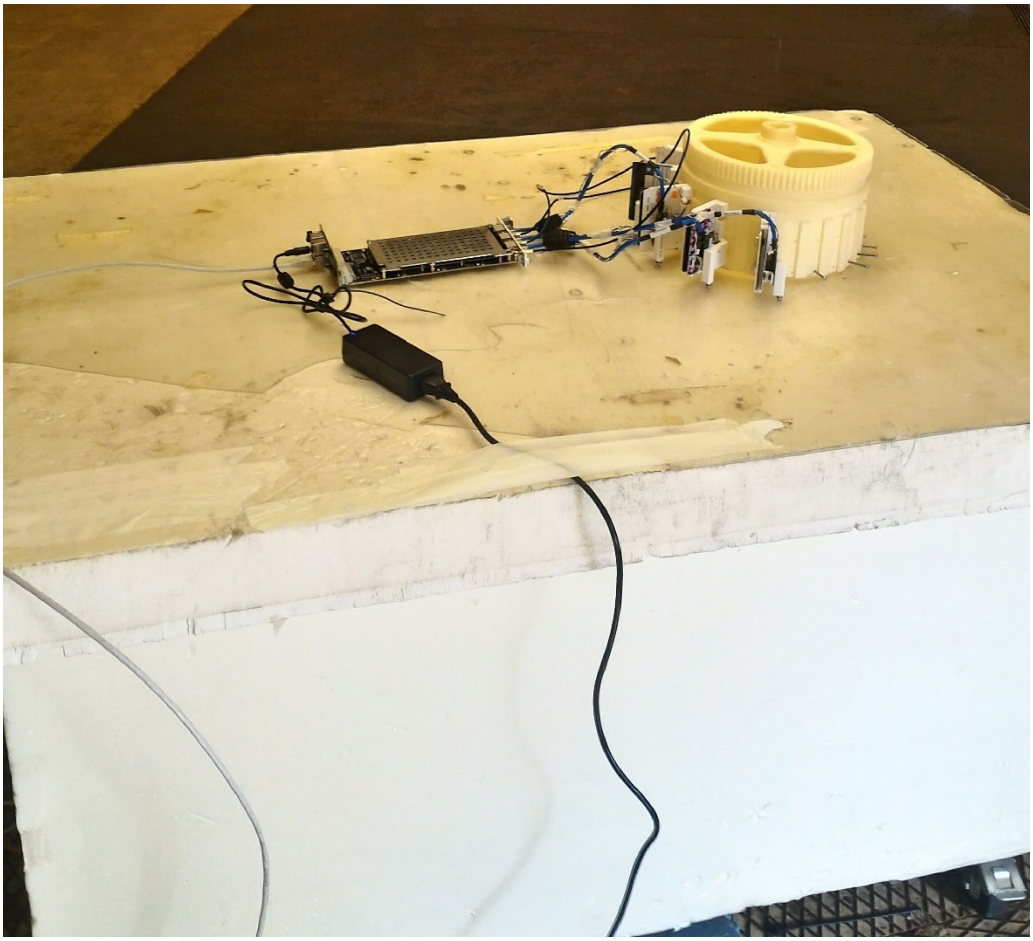
4.1. TEST CONDITIONS

Test performed by	: Laurent DENEUX
Date of test	: October 14, 2016 to October 21, 2016
Ambient temperature	: Temperature 18°C
Relative humidity	: Humidity 47%

4.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013). The EUT is placed **Select Test Site**. Distance between measuring antenna and the EUT is **Distance**.
Test is performed in parrallel 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 **Select Measurement 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. The EUT is place at 1.5m high above 1GHz and at 0.8m high under 1GHz.

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



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

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

4.3. LIMIT

Limit at 3m:
9kHz to 0,490MHz: 2400/F(kHz)µV/m (300m) or 20log(2400/F(kHz))dBµV/m (3m) QPeak
0,490MHz to 1.705MHz: 240000/F(kHz)µV/m (30m) or 20log(240000/F(kHz))dBµV/m (3m) QPeak
1.705MHz to 30MHz: 30µV/m (30m) or dBµV/m (3m) QPeak

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

4.4. TEST EQUIPMENT LIST

Apparatus	Trade Mark	Type	Registration number	Cal. Date	Cal. Due
Open test site	LCIE	-	F2000400	2016-05	2017-05
EMI Test Receiver	ROHDE & SCHWARZ	ESR	101403	2016-06	2017-06
Preamplifier	HELWETT PACKARD	8449B	A7080071	2016-01	2017-01
Bilog antenna	CHASE	CBL 6112A	C2040040	2016-01	2017-01
Loop antenna	RHODE & SCHWARZ	HFH2-Z2	C2040007	2015-11	2016-11
Horn	ETS	3115	C2042023	2016-01	2017-01
Cable	-	-	A5329542	2016-03	2017-03
Cable	-	-	A5329449	2015-10	2016-10
Cable	-	-	A5329368	2016-05	2017-05
Cable	-	-	A5329444	2015-10	2016-10

Note: In our quality system, the test equipment calibration due is more & less 2 months

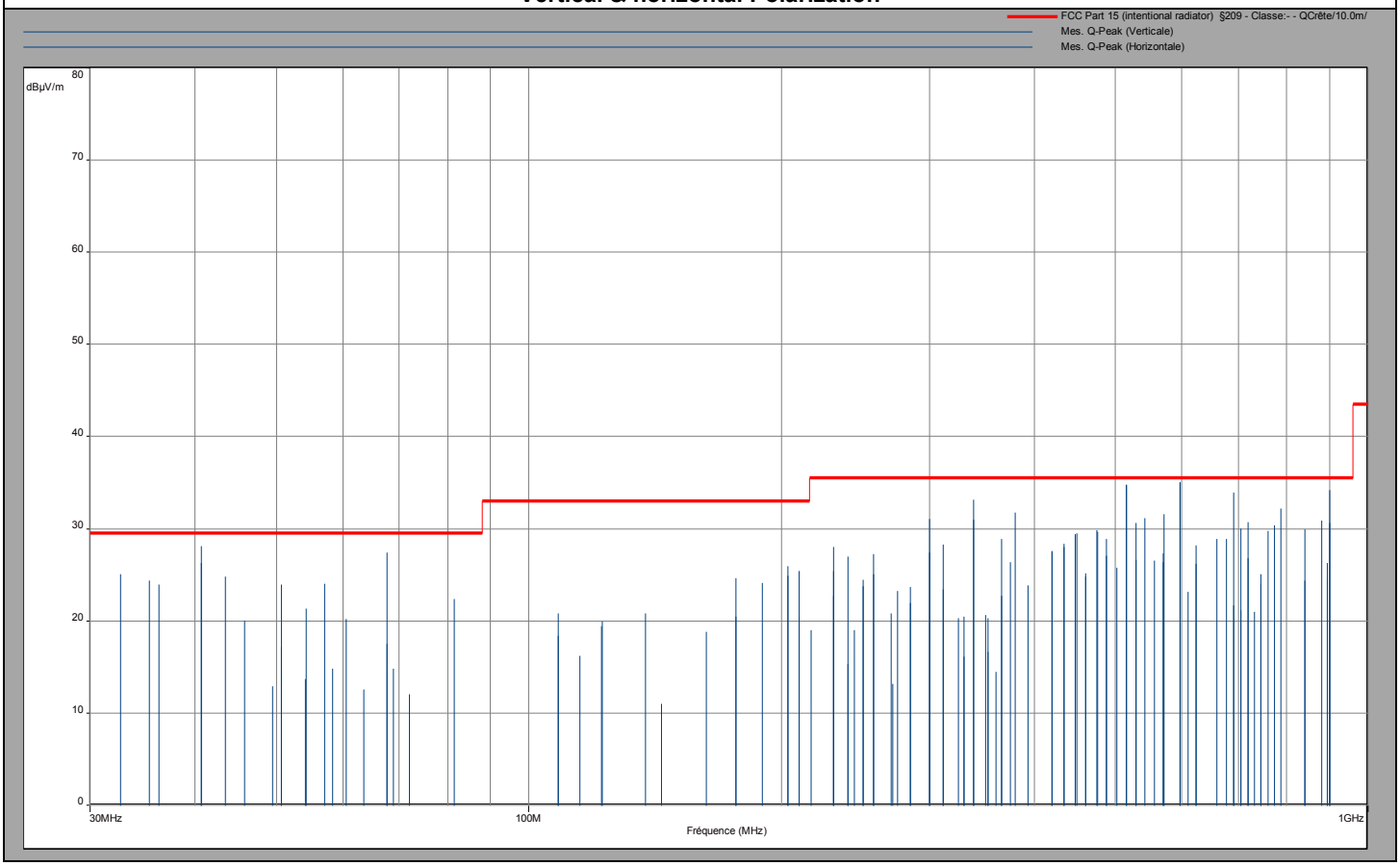
4.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

4.6. RESULTS

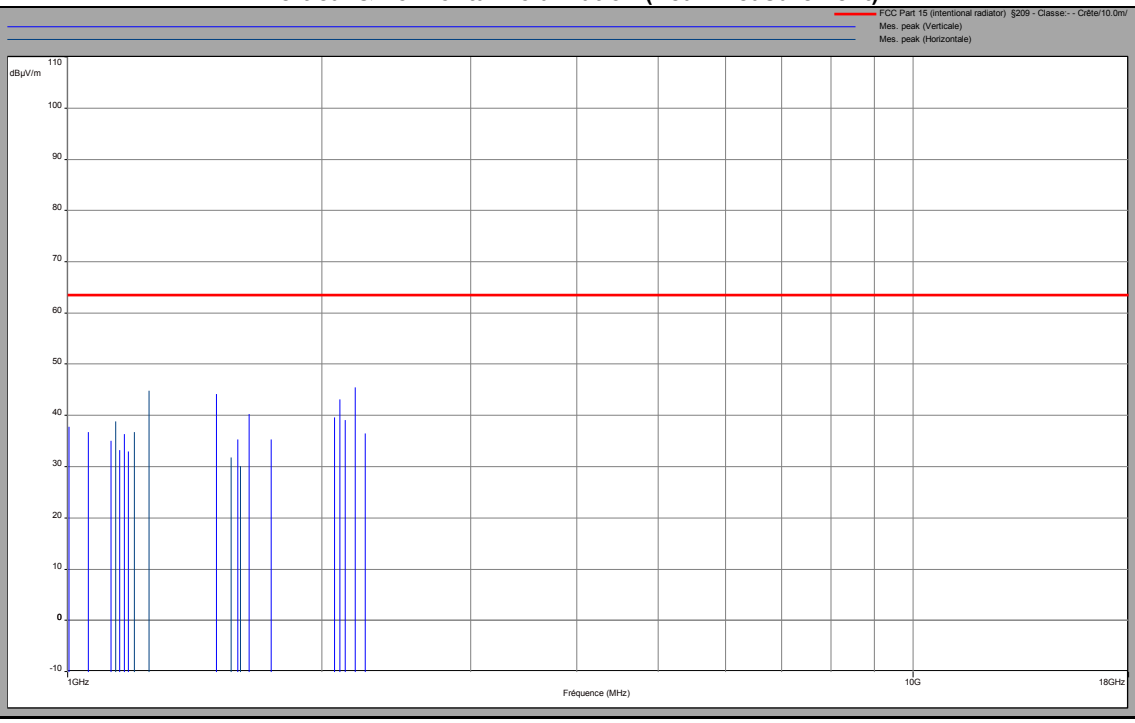
30MHz to 1GHz

Vertical & horizontal Polarization

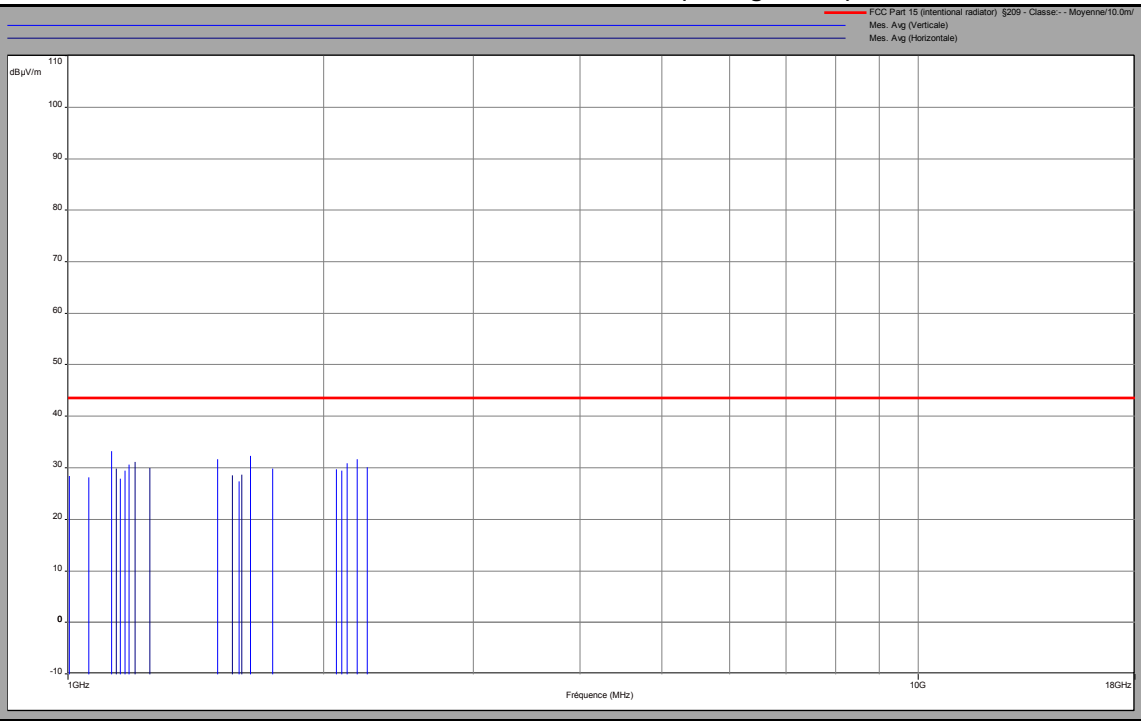


Above 1GHz

Vertical & horizontal Polarization (Peak measurement)



Vertical & horizontal Polarization (average value)



30MHz to 1GHz			
Polarization	**Frequency (MHz)**	**QPeak Level (dBµV/m)**	**Limit (dBµV/m)**
Vertical	40.7	28.16	29.5
Vertical	339	33.17	35.5
Vertical	515.3	34.86	35.5
Vertical	596.7	35.14	35.5
Horizontal	691.6	33.94	35.5
Horizontal	900.1	34.25	35.5

Above 1GHz						
Polarization	**Frequency (MHz)**	**Duty cycle correction (dB)**	**Average Level (dBµV/m)**	**Average Limit (dBµV/m)**	**Peak Level (dBµV/m)**	**Peak Limit (dBµV/m)**
Vertical	1003.5		28.5	54	37.8	74
Vertical	1057.7		28.2	54	36.7	74
Vertical	1125.5		33.3	54	35.1	74
Vertical	1152.6		27.9	54	33.2	74
Vertical	1166.2		29.5	54	36.4	74
Vertical	1179.7		30.6	54	33.0	74
Vertical	1500.1		31.7	54	44.1	74
Vertical	1590.1		27.4	54	35.4	74
Vertical	1640.7		32.4	54	40.2	74
Vertical	1740.1		29.9	54	35.3	74
Vertical	2070.2		29.7	54	39.6	74
Vertical	2100.2		29.4	54	43.2	74
Vertical	2130.2		30.9	54	39.1	74
Vertical	2190.2		31.7	54	45.5	74
Vertical	2250.2		30.2	54	36.6	74
Horizontal	1140.1		29.9	54	38.9	74
Horizontal	1200.1		31.2	54	36.8	74
Horizontal	1247.4		30.1	54	44.9	74
Horizontal	1560.1		28.6	54	31.8	74
Horizontal	1600.1		28.7	54	30.1	74

4.7. CONCLUSION

Field strength outside of the bands 13.110-14.010 MHz measurement performed on the sample of the product **SMARTWARE USN3se V2R02**, SN: **USN3#1638EA202_0150**, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.225 & RSS-Gen ISSUE 4 limits.

5. FIELD STRENGTH WITHIN THE BAND 13.110-14.010MHz

5.1. TEST CONDITIONS

Test performed by : Laurent DENEUX
Date of test : October 21, 2016
Ambient temperature : Temperature 18°C
Relative humidity : Humidity 47%

5.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013). The EUT is placed **Select Test Site**. Distance between measuring antenna and the EUT is **Distance**.
Test is performed in parrallel 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.
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. The EUT is place at 0.8m.

Photograph for Field strength within the band 13.110-14.010MHz

Photograph for Field strength within the band 13.110-14.010MHz

5.3. LIMIT

Limit:

Below 13.110MHz:	30µV/m (30m) or 69.5dBµV/m (3m) QPeak
13.110MHz to 13.410MHz:	106µV/m (30m) or 80.5dBµV/m (3m)
13.410MHz to 13.553MHz:	334µV/m (30m) or 90.5dBµV/m (3m)
13.553MHz to 13.567MHz:	15848µV/m (30m) or 124dBµV/m (3m)
13.567MHz to 13.710MHz:	334µV/m (30m) or 90.5dBµV/m (3m)
13.710MHz to 14.010MHz:	106µV/m (30m) or 80.5dBµV/m (3m)
Above 14.010MHz:	30µV/m (30m) or 69.5dBµV/m (3m) QPeak

5.4. TEST EQUIPMENT LIST

Apparatus	Trade Mark	Type	Registration number	**Cal. Date**	**Cal. Due**
Open test site	LCIE	-	F2000400	2016-05	2017-05
EMI Test Receiver	ROHDE & SCHWARZ	ESR	101403	2016-06	2017-06
Loop antenna	RHODE & SCHWARZ	HFH2-Z2	C2040007	2015-11	2016-11
Cable	-	-	A5329449	2015-10	2016-10
Cable	-	-	A5329368	2016-05	2017-05
Cable	-	-	A5329444	2015-10	2016-10

Note: In our quality system, the test equipment calibration due is more & less 2 months

5.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

5.6. RESULTS

Parallel Axis

Frequency (MHz)	QPeak Level (dBµV/m) (3m)	Limit (dBµV/m) (3m)
Below 13.110	32	69.5
13.110 to 13.410	33	80.5
13.410 to 13.553	45	90.5
13.553 to 13.567	62.3	124
13.567 to 13.710	50	90.5
13.710 to 14.010	46.7	80.5
Above 14.010	33	69.5

Perpendicular Axis

Frequency (MHz)	QPeak Level (dBµV/m) (3m)	Limit (dBµV/m) (3m)
Below 13.110	33	69.5
13.110 to 13.410	50	80.5
13.410 to 13.553	37	90.5
13.553 to 13.567	56.5	124
13.567 to 13.710	38	90.5
13.710 to 14.010	43	80.5
Above 14.010	33	69.5

5.7. CONCLUSION

Field strength within the band 13.110-14.010MHz measurement performed on the sample of the product **SMARTWARE USN3se V2R02**, SN: **USN3#1638EA202_0150**, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.225 & RSS 210 ISSUE 9 limits.

6. UNCERTAINTIES CHART

47 CFR Part 15.209 & 15.207 Kind of test	Wide uncertainty laboratory (k=2) ±x(dB) / (Hz)/ ms	Uncertainty limit
Measurement of conducted disturbances in voltage on the AC power port (9 kHz – 150 kHz)	2,67	3.8
Measurement of conducted disturbances in voltage on the AC power port (150 kHz – 30 MHz)	2,67	3.4
Measurement of conducted disturbances in voltage on the telecommunication port. (AAN)	3,67	5.0
Measurement of conducted disturbances in current (current clamp)	2,73	2.9
Measurement of disturbance power	2,67	4.5
Measurement of radiated magnetic field from 10kHz to 30MHz in SAC V01	4,48	/
Measurement of radiated magnetic field from 10kHz to 30MHz in SAC C01	4,48	/
Measurement of radiated electric field from 30 to 1000MHz in horizontal position on the OATS (Ecuelles)	4,88	6.3
Measurement of radiated electric field from 1 to 18GHz on the Ecuelles site	5.16	/
Measurement of radiated electric field from 30 to 1000MHz in vertical position on the OATS (Ecuelles)	4,99	6.3
Measurement of radiated electric field from 30 to 1000MHz in horizontal position in SAC C01	5,08	6.3
Measurement of radiated electric field from 30 to 1000MHz in vertical position in SAC C01	5,16	6.3
Measurement of radiated electric field from 30 to 1000MHz in horizontal position in SAC V01	5,08	6.3
Measurement of radiated electric field from 30 to 1000MHz in vertical position in SAC V01	5,15	6.3
Measurement of radiated electric field from 1 to 6 GHz C01	5,1	5.2
Measurement of radiated electric field from 1 to 6 GHz V01	4,85	5.2
Measurement of radiated magnetic field from 10kHz to 30MHz on the OATS (Ecuelles)	4,48	/

The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the CISPR. The conformity of the sample is directly established by the applicable limits values. This table includes all uncertainties maximum feasible for testing in the laboratory, whether or not made in this report