TEST REPORT

RADIO

Number	137032-675838Cr2016-03-30
Composition of document	17 pages
FCC Registration Number	166175 (FAR) or 888863 (Ecuelles)
Standards	47 CFR Part 15.249
Issued to	Etudes et Productions Schlumberger 1, Rue Henri Becquerel 92140 Clamart France
Apparatus under test	OED
Trade mark	Schlumberger
Manufacturer	SRETT
Type	TPWSB-AA, 101192273 AB
Serial number	030252
Test date	2015/10/02
Tests performed by	Laurent Deneux
Test site	Ecuelles
Date of issue	2015/10/28
Corrected on	2016/03/30

Written by :
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Tests operator

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SUMMARY

1. TEST PROGRAM

- **References**

Standards: - 47 CFR Part 15C
- CISPR 16-4-2
- ANSI C63.10 (2009)

Standard Section	Test Description	Test Result - Comment
CFR 47 § 15.207	AC power line conducted emissions	PASS
CFR 47 § 15.249 (a)	Field strength of fundamental & Field strength of harmonics	PASS
CFR 47 § 15.209 (a) CFR 47 § 15.249 (d)	Radiated emissions	PASS

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:**

-Personal Computer Lenovo T400

- **Input/output:**

- Usb

- **Equipment information:**

- External antenna connector: No
- Frequency band allocated: 900MHz to 930MHz
- Frequency band used:
- Modulation: GFSK
- Number of channel: 2
- Antenna type: Integral
- Spreading: No
- Stand By mode: No
- Type of power source: External power supply
- Power supply: Vnom: 5Vdc

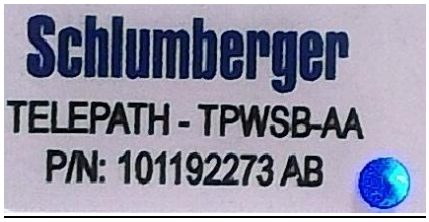
- Frequency plan:

Channel	Frequency (MHz)
Fmin	904MHz
Fmax	905MHz

2.2. RUNNING MODE

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

2.3. EQUIPEMENT LABELLING



2.4. EQUIPMENT MODIFICATIONS

No equipment modification has been necessary during testing.

3. AC POWER LINE CONDUCTED EMISSIONS

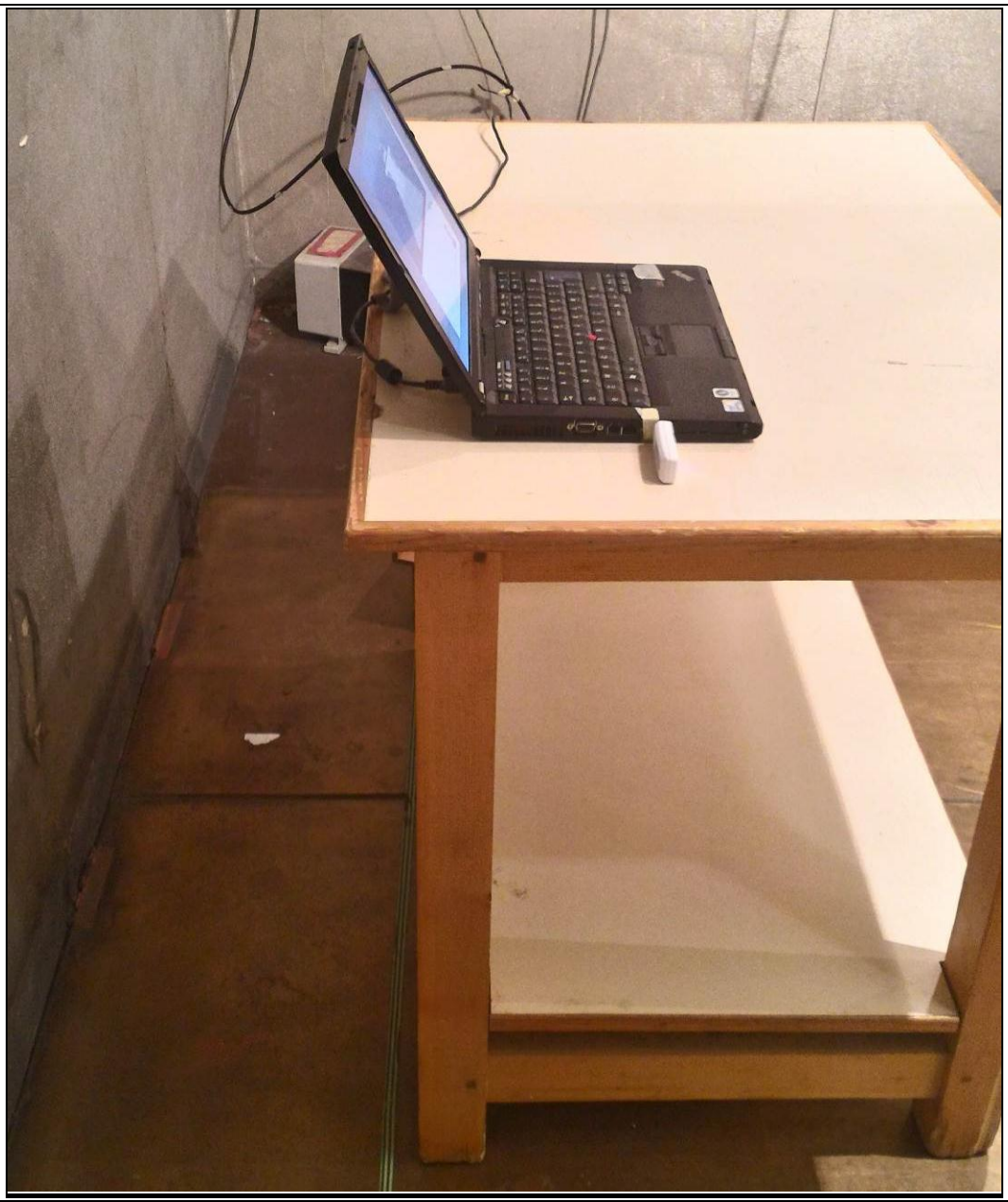
3.1. TEST CONDITIONS

Test performed by : Laurent Deneux
Date of test : 2015/10/02
Ambient temperature : 20°C
Relative humidity : 47%

3.2. 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 for AC Power Line Conducted Emissions (Front view)



Photograph for AC Power Line Conducted Emissions (Rear view)

3.3. RESULTS

Phase Line

Frequency (MHz)	Peak Level (dBµV)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.154	57	23.5	55.7	-	65.7
0.271	50	21	51	-	61
0.417	40.8	20	47.5	-	57.5
3.606	32.8	20	46	-	56
15.548	48	38	50	-	60

Neutral Line

Frequency (MHz)	Peak Level (dBµV)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.182	54.8	29	54.4	-	64.4
0.247	49.5	27	51.8	-	61.8
0.446	42.1	27	47	-	57
4.363	33.4	18.2	46	-	56
15.194	46.1	36.1	50	-	60

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

4. FIELD STRENGTH OF EMISSION & FIELD STRENGHT OF HARMONICS

4.1. TEST CONDITIONS

Test performed by : Laurent Deneux
Date of test : 2015/10/02
Ambient temperature : 20°C
Relative humidity : 47%

4.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2009). The EUT is placed on an open area test site. Distance between measuring antenna and the EUT is 10m. Test is performed in horizontal (H) and vertical (V) polarization with bilog antenna. Measurement bandwidth was 120kHz. 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 Radiated Emissions

4.3. RESULTS

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

Fundamental

Canal	Polarity	Frequency MHz	Level at 3m dBµV /m	Limit at 3m dBµV /m
1	vertical	904	92	93.98
1	Horizontal	904	90.4	93.98
2	vertical	905	92.3	93.98
2	Horizontal	905	91	93.98

Harmonics

Canal	Polarity	Frequency MHz	Level at 3m dBµV /m	Limit at 3m dBµV /m
1	vertical	1808	42.3	53.98
1	Horizontal	1808	38.4	53.98
2	vertical	1810	43.4	53.98
2	Horizontal	1810	39.1	53.98

Result: PASS
Field strength of fundamental limit: → 902MHz to 928MHz: 93.98dBµV/m at 3m
Field strength of harmonics limit: → 53.98dBµV/m at 3m

5. RADIATED EMISSIONS

5.1. TEST CONDITIONS

Test performed by : Laurent Deneux
Date of test : 2015/10/02
Ambient temperature : 20°C
Relative humidity : 47%

5.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2009). The EUT is placed on an open area test site. Distance between measuring antenna and the EUT is 10m. Test is performed in horizontal (H) and vertical (V) polarization with bilog antenna below 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 Radiated Emissions

5.3. RESULTS

- **Characterization on an open test site (30MHz to 10GHz):**

Below 1GHz

Polarity	Frequency MHz	Level at 3m dBµV /m	Limit at 3m dBµV/m §15.209	Limit at 3m dBµV/m 93.98 -50
vertical	36	27,0	40	43.98
vertical	48,1	27,4	40	43.98
vertical	72	29,1	40	43.98
vertical	84	17,0	40	43.98
vertical	120,1	29,8	43.5	43.98
vertical	138,9	16,8	43.5	43.98
vertical	146	19,0	43.5	43.98
vertical	154	20,2	43.5	43.98
vertical	159,2	20,0	43.5	43.98
vertical	162,5	24,4	43.5	43.98
vertical	172,6	25,4	43.5	43.98
vertical	182,2	25,5	43.5	43.98
vertical	190,2	23,2	43.5	43.98
vertical	198,4	18,5	43.5	43.98
vertical	206,3	21,2	43.5	43.98
vertical	218	19,0	46	43.98
vertical	231,5	21,0	46	43.98
vertical	416	26,1	46	43.98
vertical	432	29,2	46	43.98
vertical	444	26,2	46	43.98
vertical	468	25,7	46	43.98
vertical	479,9	28,9	46	43.98
Horizontal	286	23,3	46	43.98
Horizontal	300	31,1	46	43.98
Horizontal	336	26,4	46	43.98
Horizontal	360	30,0	46	43.98
Horizontal	378,6	28,1	46	43.98
Horizontal	590,1	29,3	46	43.98
Horizontal	600,1	26,5	46	43.98
Horizontal	620,1	29,1	46	43.98
Horizontal	630,3	29,3	46	43.98
Horizontal	650,4	29,5	46	43.98
Horizontal	662,5	24,6	46	43.98

Above 1GHz

Polarity	Frequency MHz	Level at 3m dBµV /m		Limit at 3m dBµV /m		Limit at 3m dBµV/m 93.98 -50
		Peak	Average	Peak	Average	
vertical	1200	39,8	32,6	74	54	43.98
vertical	1440,2	37,4	28,2	74	54	43.98
vertical	1560,2	43,7	31,3	74	54	43.98
vertical	1920,2	43,8	31,4	74	54	43.98
Horizontal	1600	36,2	29,8	74	54	43.98

Result: PASS

Limit: → 30MHz to 88MHz: 40dBµV/m QPeak
88MHz to 216MHz: 43,5dBµV/m QPeak
216MHz to 960MHz: 46dBµV/m QPeak
960MHz to 1000MHz: 54dBµV/m QPeak
Above 1000MHz: 74dBµV/m Peak
54dBµV/m Average

Limit: → Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental

6. TEST EQUIPMENT LIST

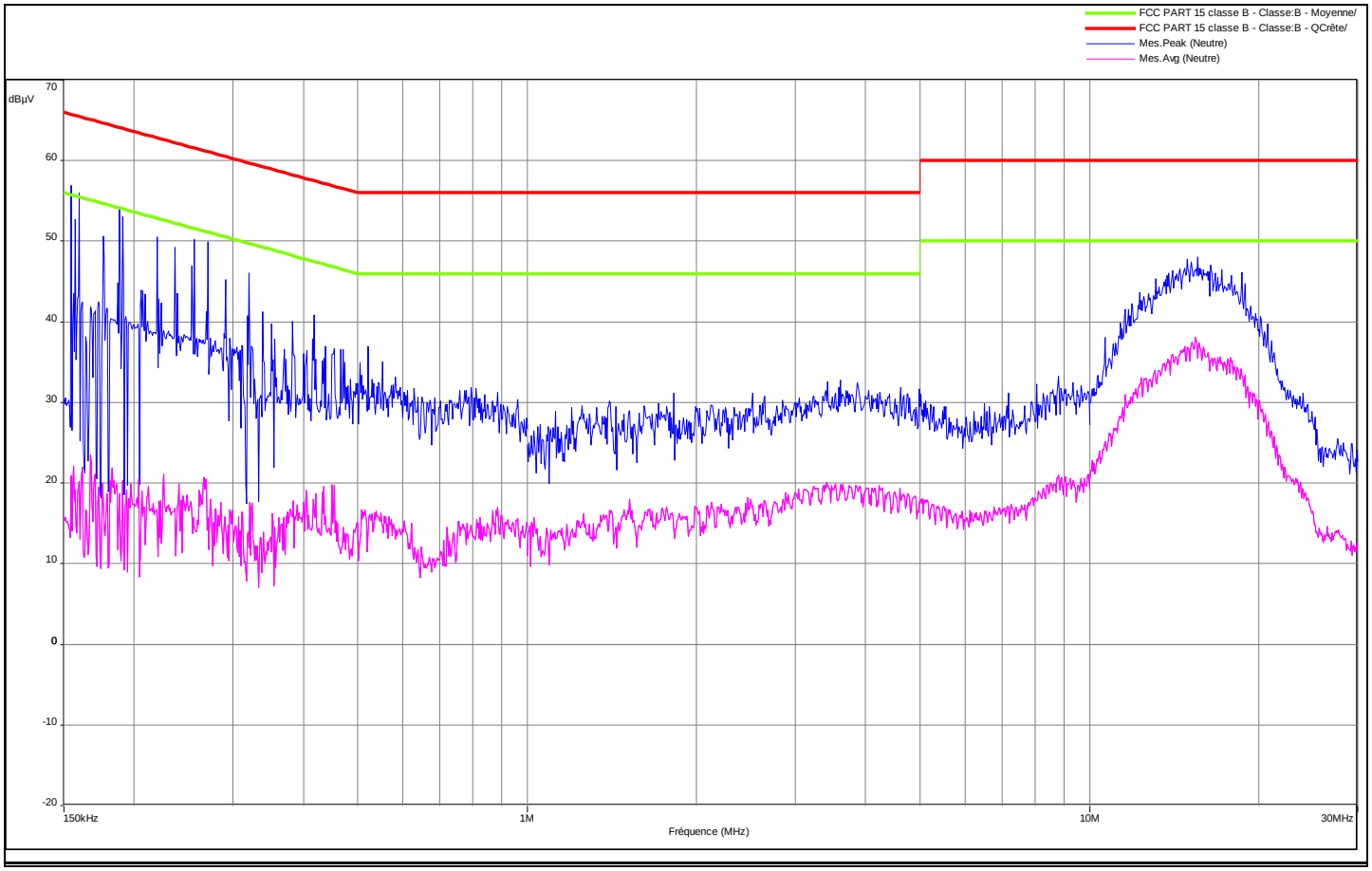
Radiated Emissions					
Apparatus	**Trade Mark**	**Type**	**Registration number**	**Calibration date**	**Calibration due**
Open test site	LCIE	-	F2000400	2015-06	2016-06
EMI Test Receiver	ROHDE & SCHWARZ	ESIB	A2642021	2015-01	2016-01
Preamplifier	HELWETT PACKARD	8449B	A7080071	2015-07	2016-07
Horn	ETS	3115	C2042023	2015-03	2016-03
Bilog antenna	CHASE	CBL 6112A	C2040040	2015-03	2016-03
Cable	-	-	A5329449	2015-10	2016-10
Cable	-	-	A5329542	2015-02	2016-02
Cable	-	-	A5329368	2015-03	2016-03
cable	-	-	A5329444	2015-10	2016-10
AC Power Line Conducted Emissions					
Apparatus	**Trade Mark**	**Type**	**Registration number**	**Calibration date**	**Calibration due**
EMI Test Receiver	ROHDE & SCHWARZ	ESU	A2642018	2015/01	2016/01
Pulse limiter	RHODE & SCHWARZ	ESH3-Z2	A2649008	2015/02	2016/02
V ISLN	ROHDE & SCHWARZ	ESH3-Z5	C2322002	2015/06	2016/06
Ground plan	LCIE	-	-	-	-
absorber	LCIE	-	A5329589	2015/07	2016/07
Cable	-	-	A5329417	2014/09	2015/09

7. 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 %
RECEIVER REQUIREMENTS		
Spurious emissions • Frequency < 1000 MHz • Frequency > 1000 MHz	 ±3.9 dB ±3.1 dB	±6 dB

8. ANNEX (GRAPHS)

AC power line conduted emissions
Frequency: Fnom
Temperature: Tnom
Voltage: Vnom
Neutral Line



AC power line conduted emissions
Frequency: Fnom
Temperature: Tnom
Voltage: Vnom
Phase Line