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FCC Registration Number: 0020356952 (FRN) Test Firm Registration Number: 171131
Industry Canada Test Firm Number: 9545A-1

Matériel testé : *Equipment under test*:	**IP AUDIO NETWORK Multichannel Sound Card** **(LX-IP RAVENNA, LX 1616ESe, LX 6464ESe)**

Constructeur:
Manufacturer:
DIGIGRAM
82/84 allée Galilée
38330 MONTBONNOT SAINT MARTIN – FRANCE

Rapport délivré à :
Issued to:
DIGIGRAM
82/84 allée Galilée
38330 MONTBONNOT SAINT MARTIN – FRANCE

Référence de la proposition :
Proposal number:
012014-20898

Date de l'essai :
Date of test:
March 19th to 20th, 2014

Objectif des essais :
Test purpose:
EMC qualification accordingly to standard CFR 47, FCC Part 15, Subpart B
(Class B Personal Computer Peripheral)
ICES-003 (Issue 5/2012)
FCC ID: IGTLXIP

Lieu du test:
Test location:
SMEE CE-Mesures
38 VOIRON - France

Test réalisé par :
Test realized by:
Laurent CHAPUS – Jérémy BLANCHER

Conclusion :
Conclusion:
L'équipement satisfait aux prescriptions des normes citées en référence.
The appliance complies with requirements of above mentioned standards.

Ed.	Date	Modifications / Pages	Written by:	Approved by: Visa
1	August 25th, 2014	Initial Edition	Jérémy Blancher	Laurent Chapus

Sommaire / *Contents*

1. Normative references

Standard: FCC CFR 47, PART 15, Subpart B
ANSI C63-4 (2009).
Requirements for unintentional radiators, class B Personal Computer Peripheral.
ICES-003 (Information Technology Equipment (ITE) — Limits and methods of measurement. Issue 5 (2012)

2. Test synthesis

ESSAI D'EMISSION / *EMISSION TEST*	**LIMITES / *LIMITS***			**RESULTATS / *RESULTS***
Emissions conduites sur les bornes d'alimentation AC / *Conducted emissions at AC power supply ports* 150kHz-30MHz	**Freq**	**Quasi-Peak (dBµV)**	**Average (dBµV)**	**PASS**
	150-500kHz	66 to 56	56 to 46	
	0.5-5MHz	56	46	
	5-30MHz	60	50	
Emissions rayonnées / *Radiated emissions* 30MHz-12.5GHz *FCC Part 15B*	**Measure at 3m** 30MHz-88MHz : 40 dBµV/m 88MHz-216MHz : 43.5 dBµV/m 216MHz-960MHz : 46 dBµV/m Above 960MHz : 54 dBµV/m			**PASS**

3. Equipment Under Test (EUT)

Nom /
Identification

LX-IP RAVENNA (1)
IP AUDIO NETWORK Multichannel Sound Card

Tested sample:
N°: 14022 28191

Alimentation /
Power supply

From PCI Express bus

Auxiliaires /
Auxiliaries

- PC DELL VOSTRO 220 (Model: DCSCMF)	Sn: 6L2374J
- D.O.TEC PRODUCER.COM (DirectOut Technologies product, multi functional MADI)	Sn: 23567849
- EtherSound AQONDA 16 (DIGIGRAM product) (x2)	Sn: N.C (#1) Sn: 2444.00020009 (#3)
- Keyboard DELL (Model: SK-8115)	
- Mouse DELL (Model: ODJ301)	
- Video Monitor PHILIPS (Model: 190S6FS/00)	Sn: BZ000551116501

Entrées-Sorties /
Input / Output

	Câbles pour essai / *Cables for test*	Blindé / *Shielded*	Prévu pour >3m / *Intended for >3m*
Ethernet	10.0m (x2) Cat 5e	Yes	Yes
BNC	3.5m	Yes	Yes
Optic fibre	5.5m (x2)	No	No
AC mains (Aux.)	2P+PE (x4, 1.5m)	No	-
SVGA (Aux.)	1.2m	Yes	-

Version programme /
Firmware version

N.C

Dimensions (cm)

PCI Express board

Mode de fonctionnement /
Running mode

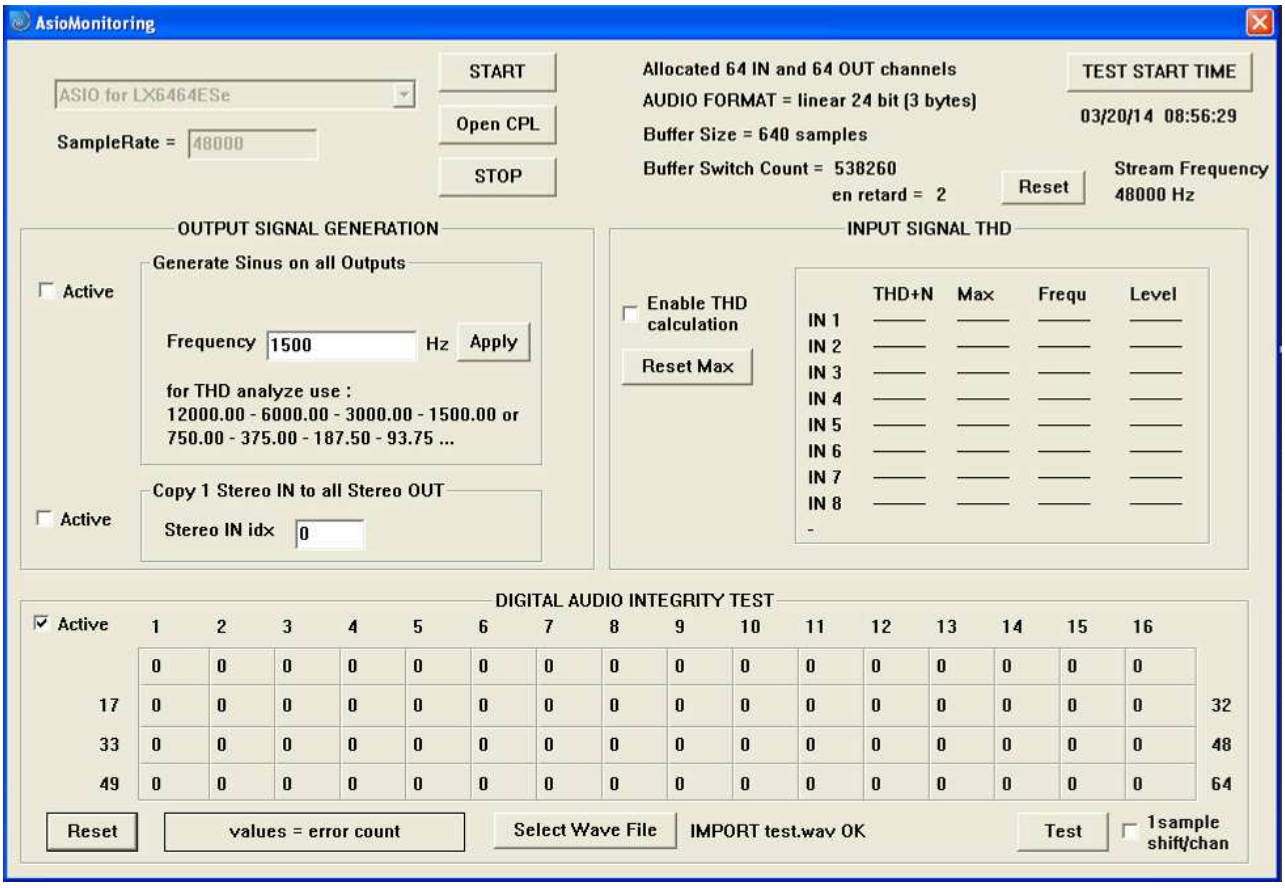
Ethernet Input/Output of the LX-IP board are wired respectively on Ethernet Output of AQONDA #3 and Ethernet Input of AQONDA #1. Coaxial cable is wired on the WORDLOCK Output and optic fibre is on MADI1, of the D.O.TEC equipment.
A test signal is generated and is analysed on inputs with test programs AsioMonitoring and EScontrol.

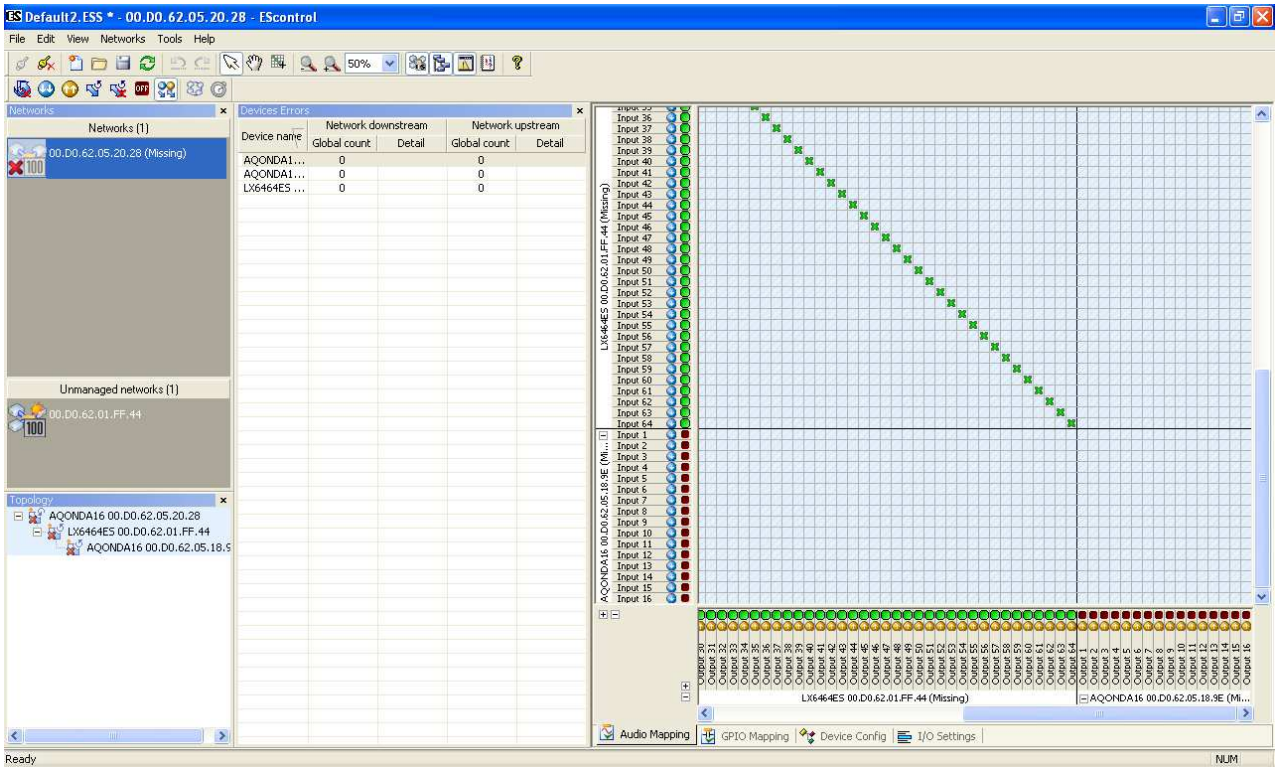
Fréquence max interne EST /
Max internal EUT frequency

PCI Express data rate: 2.5 GHz

(1) The LX-IP RAVENNA board is representative of the product range:
LX-IP RAVENNA, LX 1616ESe/LX 6464ESe, LX-MADI products.
The board under tests is the complete version of the range of above products.

Tested equipment (LX-IP RAVENA with MADI option)





Audio analyser tests program

4. Test conditions

Humidité relative / *Relative Humidity* : 50%
Température / *Temperature* : 20°C

Tension d'alimentation / *Power supply voltage*:
Equipment sous test / *Equipment under test* : From PCI Express port
Auxiliaires / *Auxiliaries* : 230V/50Hz (±2%) for radiated emission and 110V/60Hz (±2%) for conducted emission

5. Modifications of the equipment under test

None

6. Special accessories

Shielded Ethernet, Coaxial cable (BNC connectors)

7. Conducted Emission Measurement (150kHz-30MHz)

ANSI C63.4	**TEST: Limits for conducted disturbance 150kHz – 30MHz**	**Verdict**
Method: The LISN (Line Impedance Stabilization Network) 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 LISN 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 EUT is 80cm above the ground reference plane and 40cm from the vertical ground plane. 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 %	50%
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)

Limits for AC power port (Class B)

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:
Test location: SMEE – CE Mesures
Test date: March 19th, 2014 by J. Blancher
Power supply voltage: 230V for AC mains

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Attenuator / limiter	SMEE	ATT#1	ATT-101-004	2014/3	2015/3
Cable RF	Div	2m	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
Measuring receiver	Rohde & Schwarz	ESL3	REC-101-001	2012/6	2014/6
Ref. Comb generator	SMEE	EMC-250K	REF-111-001	-	-

Photo of test setup for Conducted Emission measurement

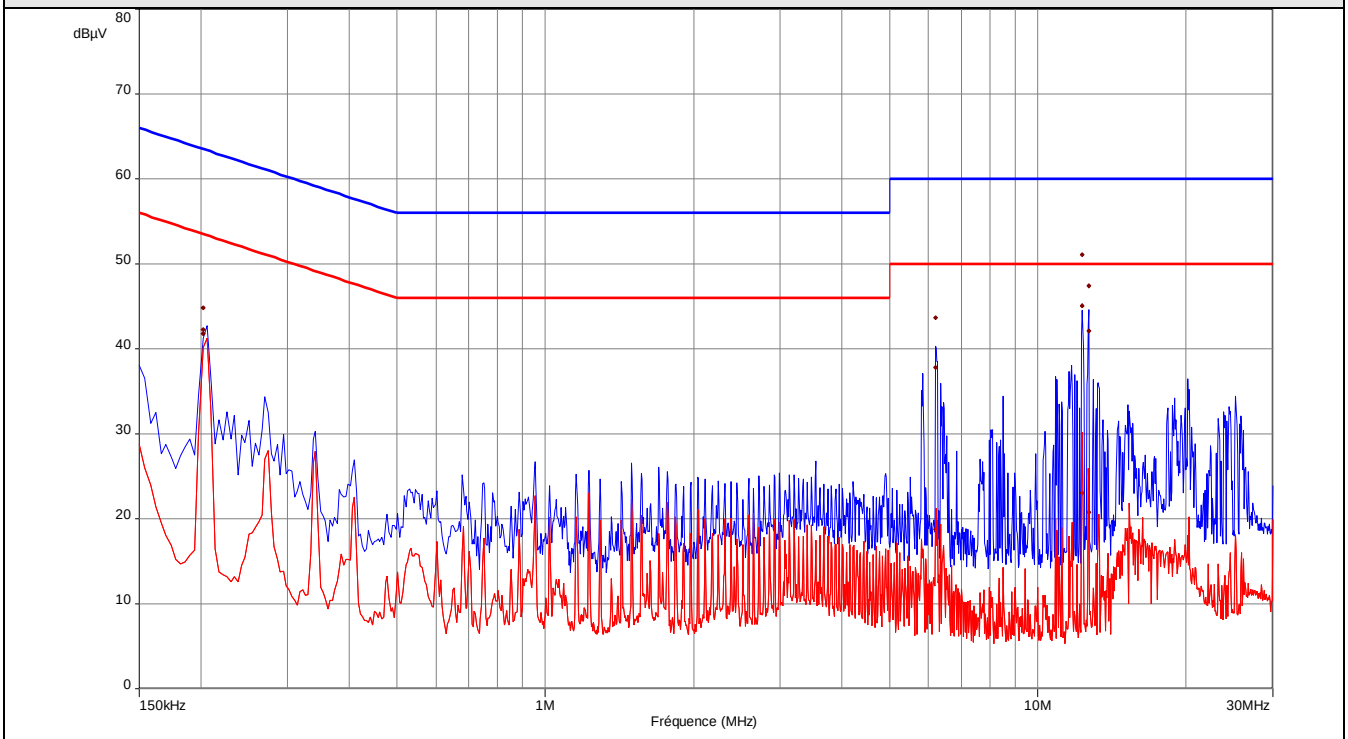
Measurement on AC mains

Tabulated Results for Mains Terminal Disturbance Voltage on AC port

FREQ (MHz)	Meas. PK (dBµV)	Mes. QP (dBµV)	LIMIT QP (dBµV)	Margin QP (dB)	Mes. AV (dBµV)	LIMIT AV (dBµV)	Margin AV (dB)	Line
0.2038	44.9	42.3	63.4	**-21.1**	41.8	53.4	**-11.6**	L1
6.2003	43.7	37.8	60.0	**-22.2**	18.7	50.0	**-31.3**	L1
12.3110	51.1	45.1	60.0	**-14.9**	23.0	50.0	**-27.0**	L1
12.6860	47.4	42.1	60.0	**-17.9**	20.8	50.0	**-29.2**	L1
0.2060	41.2	37.7	63.4	**-25.7**	37.3	53.4	**-16.0**	Neutral
6.0580	43.9	40.7	60.0	**-19.3**	8.4	50.0	**-41.6**	Neutral
6.8260	40.9	29.6	60.0	**-30.4**	9.8	50.0	**-40.2**	Neutral
12.4220	17.7	29.2	60.0	**-30.8**	5.8	50.0	**-44.2**	Neutral
12.4660	39.7	28.6	60.0	**-31.4**	7.6	50.0	**-42.4**	Neutral
12.8900	37.8	30.7	60.0	**-29.3**	9.3	50.0	**-40.8**	Neutral

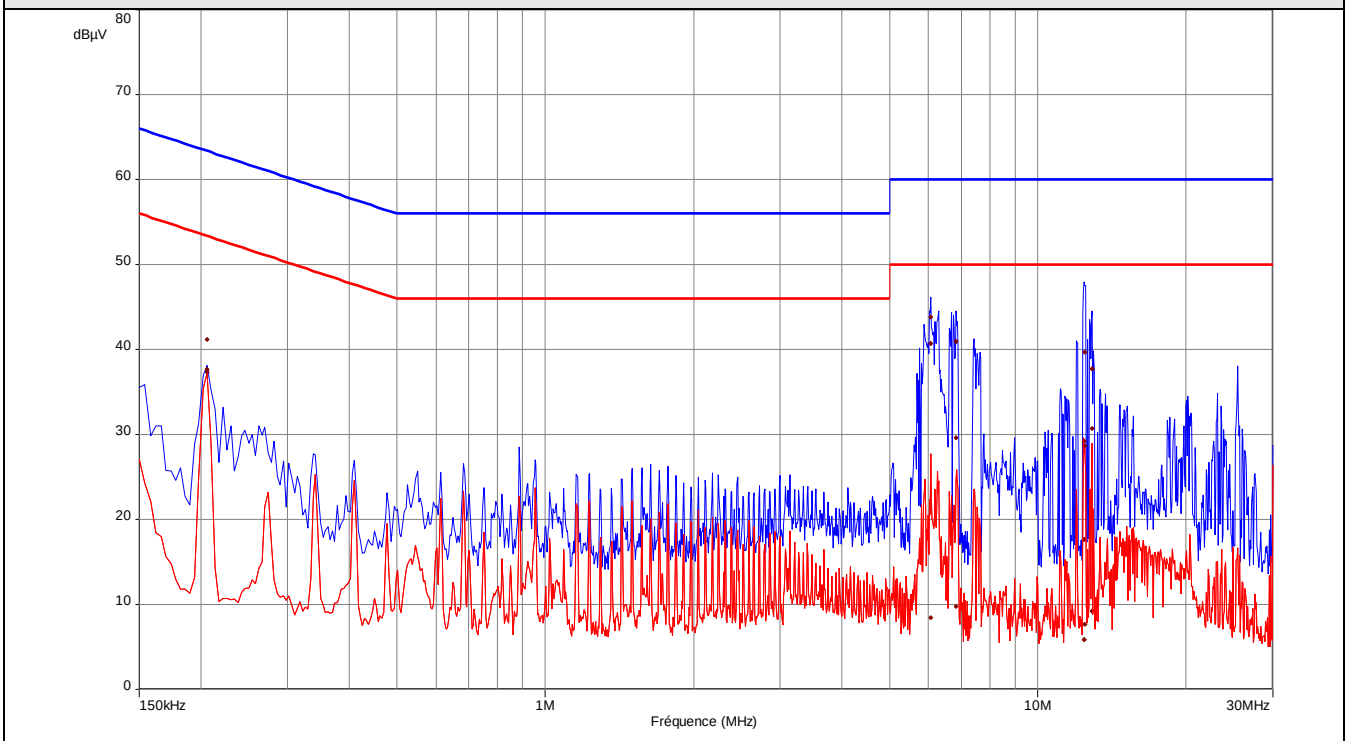
Frequency band investigated:	150kHz-30MHz
RBW:	9kHz
Voltage:	110V / 50Hz
Limit:	FCC Part 15, Clause 15.107 (Class B)
Final measurement detector:	Quasi-Peak and Average
Wide Measurement Uncertainty:	± 3.0 dB (k=2)
RESULT:	PASS

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



----: Peak | ----: Average

Graphical representation of Conducted Disturbance Measurement (Peak detection)
AC port, Line Neutral



----: Peak | ----: Average

8. Radiated Emission Measurement (30MHz-12.5GHz)

ANSI C63.4	**TEST: Limits for radiated disturbance 30 MHz –12.5 GHz**	**Verdict**
Method: Measurements were made in a 10 & 3-meter Open Area Test Site (OATS) that complies to CISPR 16 and ANSI C63.4 Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10 & 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 (quasi-peak, peak and average) 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. 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 a measurement distance of 3m. (3-axis algorithm) The pre-characterization graphs are obtained in PEAK detection.		**Pass**

Laboratory Parameters:	Required prior to the test	During the test
Ambient Temperature	10 to 40 °C	20°C
Relative Humidity	10 to 90 %	50%
Fully configured sample scanned over the following frequency range	Frequency range on each side of line	Measurement Point
	30MHz – 12.5GHz	3m measurement distance

Limits

Frequency (MHz)	Limit (dBµV/m)	
	Level / Detector / Distance	Results
30-88 MHz	40.0 / QP / 3m	Pass
88-216 MHz	43.5 / QP / 3m	Pass
216-960 MHz	46.0 / QP / 3m	Pass
960-1000 MHz	54.0 / QP / 3m	Pass
Above 1GHz	54.0 / AV / 3m 74.0 / PK / 3m	Pass

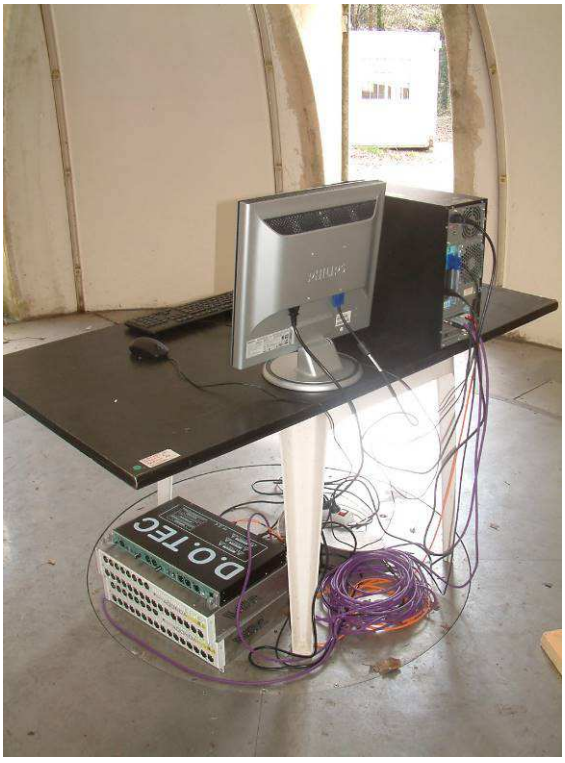
Supplementary information:
Test location: SMEE – CE Mesures
Test date: March 19th, 2014 by L. Chapus / J. Blancher
Power supply voltage: 230V for AC mains

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-101-019	2014/3	2015/3
RF cable	Div	OATS/10m	CAB-101-020	2014/3	2015/3
GTEM cell	TESEQ	750	GTE-101-001	2014/3	2015/3
OATS	Div	10m	SIT-101-001	2013/5	2014/5
Antenna mast	Innco- Systems	MA4000EP	MAT-101-001	-	-

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
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
Pre-amplifier	PE	PE1524	PRE-101-002	2014/3	2015/3
Ref. Comb generator	SMEE	EMC-250K	REF-111-001	-	-

Photo of test setup for Radiated Disturbance (OATS)



Tabulated Results for Radiated Disturbance
(3m measurement on Open Area Test Site, 30MHz-1GHz)

FREQ	Meter reading	Meter reading	CF total	Field level	Field level	Pol	Antenna height	Table angle	Limit	Margin
MHz	(QP) dBµV	(Pk) dBµV	dB	(QP) dBµV/m	(Pk) dBµV/m		cm	Degré	(QP) dBµV/m	dB
425,000	2,8	7,1	20,3	**23,1**	27,4	V	200	135	37	**-13,9**

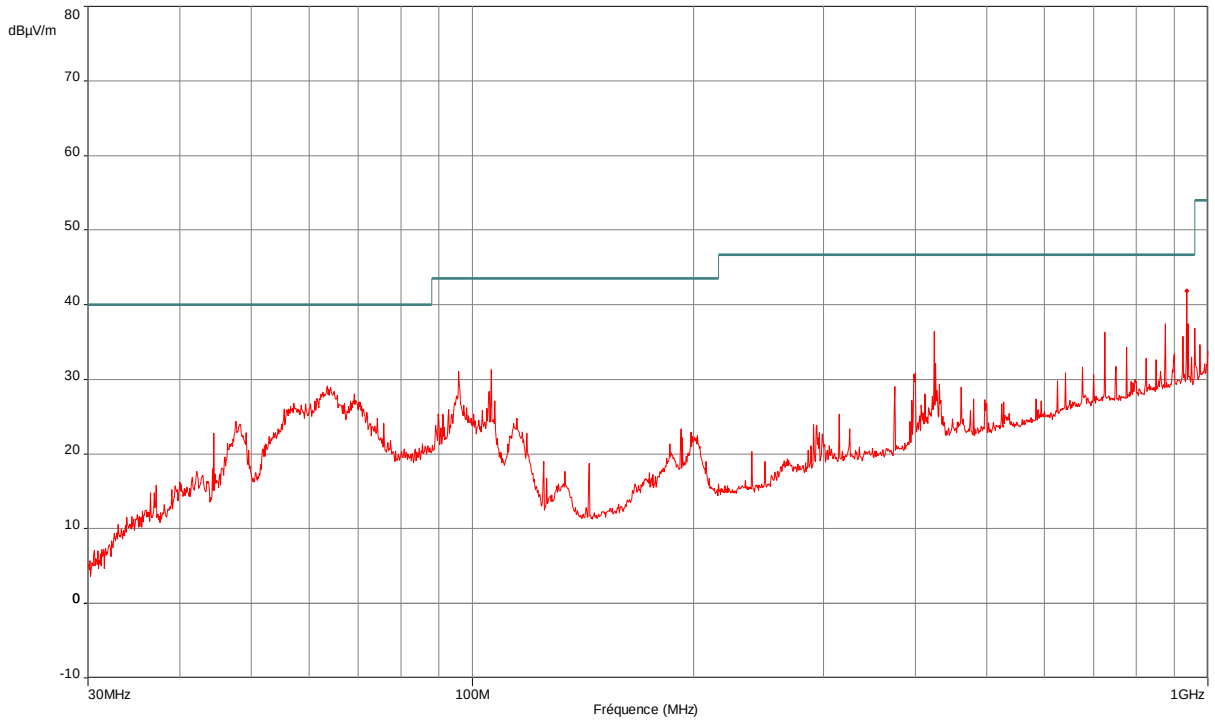
Supplementary information:
Frequency list measured on the Open Area Test Site has been created with pre-scan results.
Measure have been done at 10m distance and corrected according to requirements of 15.209.e)
(M@3m = M@10m+10.5dB)

Frequency band investigated:	30MHz-1GHz
RBW:	120kHz
Measurement distance:	3m
Limit:	15.109 (Class B)
Final measurement detector:	Quasi-Peak
Wide Measurement Uncertainty:	± 5.2dB (k=2)

Tabulated Results for Radiated Disturbance (3m measurement on Open Area Test Site, 1GHz-12.5GHz)												
FREQ	**Meter reading**	**Meter reading**	**CF total**	**Field level**	**Field level**	**Pol**	**Antenna height**	**Table angle**	**Limit**	**Limit**	**Margin**	**Margin**
MHz	(PK) dBµV	(AV) dBµV	dB	(Pk) dBµV/m	(AV) dBµV/m		cm	Degré	(Pk) dBµV/m	(AV) dBµV/m	(Pk) dB	(AV) dB
No frequency observed												
Informations supplémentaires : La liste des fréquences mesurées sur le site en champ libre est établie à partir des résultats obtenus lors du pré-scan.												

Frequency band investigated:	1GHz-12.5GHz
RBW:	1MHz
Measurement distance:	3m
Limit:	15.109 (Class B)
Final measurement detector:	Peak and Average
Wide Measurement Uncertainty:	± 5.2dB (k=2)
Field Strength Calculation:	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: FS = RA + AF + CF – AG Where FS = Field Strength RA = Receiver Amplitude AF = Antenna Factor CF = Cable Factor AG = Amplifier Gain

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

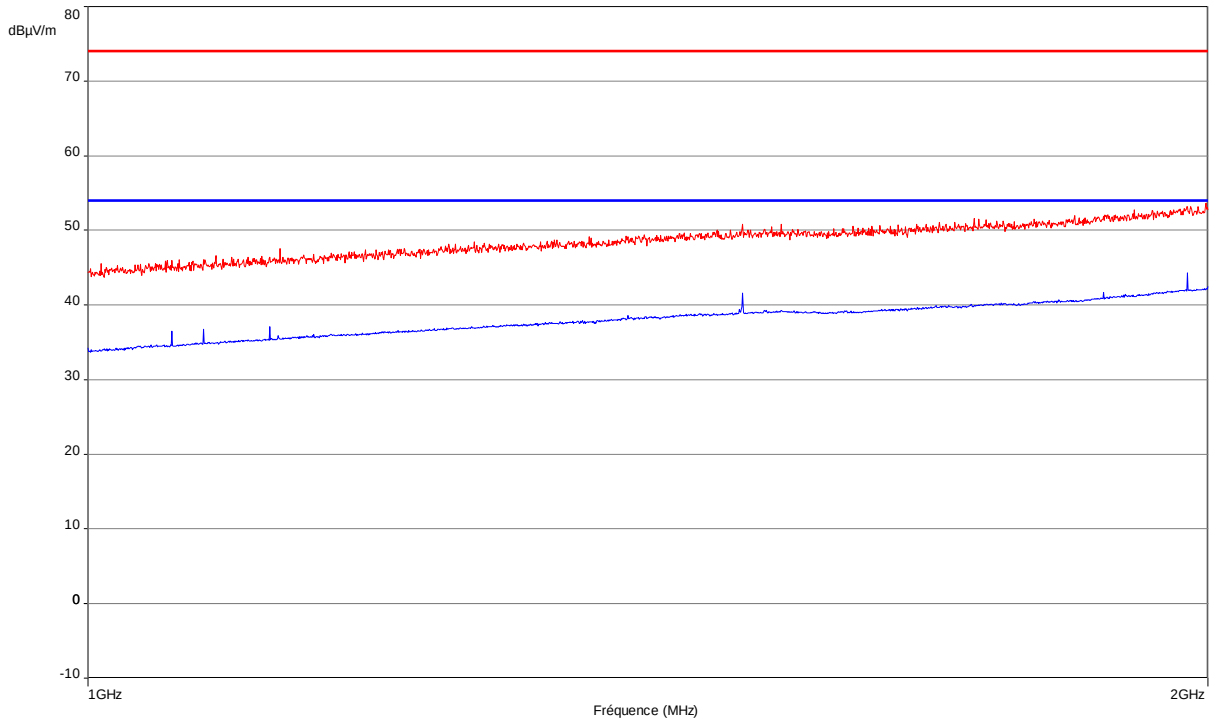


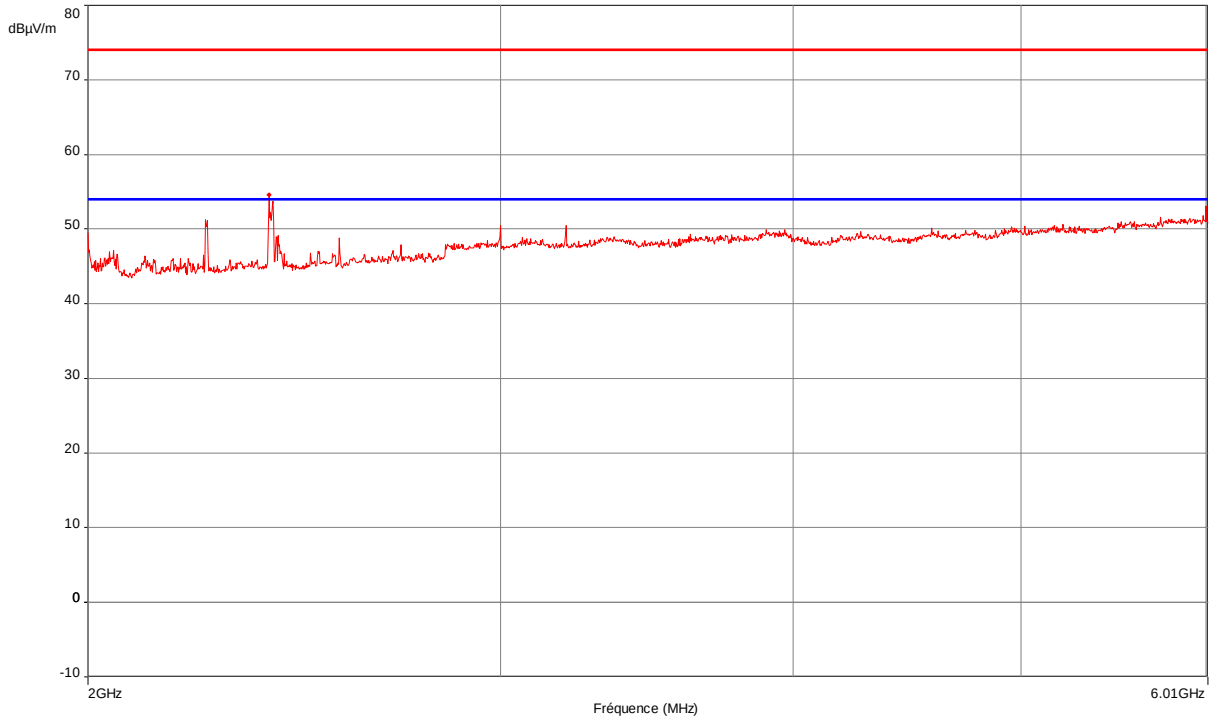
Frequency (MHz)	Peak level (dBµV/m)	Limit (dBµV/m)
95.800	30.1	43.5
106.100	30.3	43.5
425.000	36.4	46.0
936.650	41.8	46.0

Note: Pre-scan graph only for identification purpose.

------ : Peak measure

Graphical representation of Radiated Disturbance Measurement (Peak detection, GTEM pre-scan, 1GHz-6GHz / 3m)





Note: Pre-scan graph only for identification purpose.

------ : Peak measure / limit	------ : Average measure / limit