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Rapport d'essai / *Test report*

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cofrac ESSAIS *Laboratoire d'essai accrédité N°1-1633*

N° 201002-6052C-A1-R1-E **JDE :** 98617

DELIVRE A / *ISSUED TO* : **INGENICO**
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07503 GUILHERAND-GRANGES - France

Objet / *Subject* : Essais de compatibilité électromagnétique conformément aux normes **FCC CFR 47 Part 15, Subpart B et C.**
Electromagnetic compatibility tests according to the standards ***FCC CFR 47 Part 15, Subpart B and C***

Matériel testé / *Apparatus under test* :

- Produit / *Product* : Lecteur de carte bancaire / *Bank payment terminal*
- Marque / *Trade mark* : **INGENICO**
- Constructeur / *Manufacturer* : **INGENICO**
- Type / *Model* : **P30-320B-0102**
- N° de série / *serial number* : **10051PP110000300**
- FCC ID : **XKB-P30CL**

Date des essais / *Test date* : Du 15 au 16 Mars 2010 / *From March 15th to 16th, 2010*

Lieu d'essai / *Test location* : **BUREAU VERITAS LCIE SUD-EST**
ZI Centr'Alp – 170 rue de Chatagnon
38430 MOIRANS - France

Test réalisé par / *Test performed by* : Anthony MERLIN

Ce document comporte /*Composition of document :* 24 pages.

MOIRANS, LE 25 MARS 2010 / *MARCH 25TH, 2010*

Ecrit par / *Written by*,
Anthony MERLIN

Approuvé par / *Approved by*,
Jacques LORQUIN

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SUMMARY

1. TEST PROGRAM

Standard: **- FCC Part 15, Subpart B (Digital Devices)**
- ANSI C63.4 (2003)

EMISSION TEST	LIMITS			RESULTS (Comments)
Limits for conducted disturbance at mains ports 150kHz-30MHz	**Frequency**	**Quasi-peak value (dBµV)**	**Average value (dBµV)**	**PASS**
	150-500kHz	66 to 56	56 to 46	
	0.5-5MHz	56	46	
	5-30MHz	60	50	
Radiated emissions 30MHz-12.5GHz	**Measure at 3m** 30MHz-88MHz : 40 dBµV/m 88MHz-216MHz : 43.5 dBµV/m 216MHz-960MHz : 46.0 dBµV/m Above 960MHz : 54.0 dBµV/m			**PASS**

Standard: **- FCC Part 15, Subpart C**
- ANSI C63.4 (2003)

EMISSION TEST	LIMITS			RESULTS (Comments)
Limits for conducted disturbance at mains ports 150kHz-30MHz	**Frequency**	**Quasi-peak value (dBµV)**	**Average value (dBµV)**	**PASS**
	150-500kHz	66 to 56	56 to 46	
	0.5-5MHz	56	46	
	5-30MHz	60	50	
Radiated emissions 9kHz-30MHz	**Measure at 300m** 9kHz-490kHz : 67.6dBµV/m /F(kHz) **Measure at 30m** 490kHz-1.705MHz : 87.6dBµV/m /F(kHz) 1.705MHz-30MHz : 29.5 dBµV/m			**PASS**
Radiated emissions 30MHz-12.5GHz*	**Measure at 3m** 30MHz-88MHz : 40 dBµV/m 88MHz-216MHz : 43.5 dBµV/m 216MHz-960MHz : 46.0 dBµV/m Above 960MHz : 54.0 dBµV/m			**PASS**
Fundamental frequency tolerance	**Operation within the band** **13.110-14.010 MHz §15.225**			**PASS**
Bandedge compliance	**Operation within the band** **13.110-14.010 MHz §15.225**			**PASS**

***§15.33:** The highest internal source of a testing device is defined like more the highest frequency generated or used in the testing device or on which the testing device works or agrees.
- If the highest frequency of the internal sources of the testing device is lower than 108 MHz, measurement must be only performed until 1GHz.
- If the highest frequency of the internal sources of the testing device ranges between 108 MHz and 500 MHz, measurement must be only performed until 2GHz.
- If the highest frequency of the internal sources of the testing device ranges between 500 MHz and 1 GHz, measurement must be only performed until 5GHz.
If the highest frequency of the internal sources of the testing device is above 1 GHz, measurement must be only performed until 5 times the highest frequency or 40 GHz, while taking smallest of both.

2. SYSTEM TEST CONFIGURATION

2.1. JUSTIFICATION

The system was configured for testing in a typical fashion (as a customer would normally use it).

2.2. HARDWARE IDENTIFICATION

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

P30-320B-0102 **Serial number: 10051PP110000300**
FCC ID: **XKB-P30CL**

- Internal max frequencies: 57MHz

- **Input/output:**

- 1 x RJ45 port (Power supply / data), 5Vdc/USB

- **Cables:**

- 1 x USB cable, unshielded, length: 2m sn: 29500422 25/09

- **Auxiliaries equipment used during test:**

- 1 x Laptop TOSHIBA SATELITE S1410-704 (PS141E-04YCM-3V), sn: 13594938G
- 1 x Smartcard Opuce EMV card
- 1 x Contactless card

2.3. EUT CONFIGURATION

EUT powered by laptop USB port.
The parameters of test sequence software are the followings:

- Reading in loop CAM0
- Reading in loop Contactless

2.4. EQUIPMENT MODIFICATIONS

One ferrite Würth Elektronik 742 711 11 is fixed on the USB cable EUT side.

2.5. SPECIAL ACCESSORIES

None

3. RADIATED EMISSION DATA

3.1. CLIMATIC CONDITIONS

Date of test : March 15th, 2010
Test performed by : A.MERLIN
Atmospheric pressure : 866mb
Relative humidity : 31%
Ambient temperature : 21°C

3.2. TEST SETUP

The installation of EUT is identical for pre-characterization measurement in a 3 meters semi anechoic chamber and for measures on a 10 meters Open site.

Radiated emission test setup

3.3. TEST SEQUENCE AND RESULTS

3.3.1. Pre-characterization at 3 meters [9kHz-30MHz]

A pre-scan of all the setup has been performed in a 3 meters semi anechoic chamber.
The distance between EUT and antenna is 3 meters. For Pre-characterization, the loop antenna was rotated during the test for maximized the emission measurement. Measurement performed on 3 axis of EUT.
Frequency band investigated is 9kHz to 30MHz.

The pre-characterization graphs are obtained in PEAK detection.

See graph for 9kHz-30MHz band:	*USB Mode*	**Emr#1**	(See annex 1)

3.3.2. Pre-characterization [30MHz-1GHz]

For frequency band 30MHz to 1GHz, a pre-scan of all the setup has been performed in a 3 meters semi anechoic chamber.
The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) polarization with a log-periodic antenna. The EUT is being rotated on 360° and on 3 axis during the measurement. The pre-characterization graphs are obtained in PEAK detection.

See graphs for 30MHz-1GHz:

H polarization	*USB mode*	**Emr#2**	(See annex 1)
V polarization	*USB mode*	**Emr#3**	(See annex 1)

3.3.3. Characterization on 10 meters open site below 30 MHz

The product has been tested according to ANSI C63.4 (2003), FCC part 15 subpart C. Radiated Emissions were measured on an open area test site. A description of the facility is on file with the FCC.
The product has been tested at a distance of **10 meters** from the antenna and compared to the FCC part 15 subpart C §15.225 limits in the frequency range 13.553MHz 13.567MHz. Measurement bandwidth was 9kHz.
Antenna height was 1m for both horizontal and vertical polarization.
Antenna was rotated around its vertical axis.
Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on 3 axis of EUT. A summary of the worst case emissions found in all test configurations and modes is shown on clauses 3.2.

Frequency (MHz)	QPeak Limit (dBµV/m) @ 30m	Qpeak (dBµV/m)	Qpeak-Limit (Margin dB)	Turntable Angle (deg)	Ant. Pol./ Angle (deg)	Tot Corr (dB)
13.56*[1]	84	36.3	**-47.7**	275	0	35.3
27.12*[1]	29.5	No Frequency observed				39.3

*[1]: Measure have been done at 10m distance and corrected according to requirements of 15.209.e) (M@30m = M@10m-19.1dB)

Limits Sub clause §15.225

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
13.553-13.567	15 848 84 dBµV/m	30
13.410-13.553 13.567-13.710	334 50.5 dBµV/m	30
13.110-13.410 13.710-14.010	106 40.5 dBµV/m	30

See chapter 5 of this test report for band edge measurements.

3.3.4. Characterization on 10 meters open site from 30MHz to 1GHz

The product has been tested at a distance of **10 meters** from the antenna and compared to the FCC part 15 subpart B §15.109 limits and C §15.209 limits. Measurement bandwidth was 120kHz from 30 MHz to 1GHz.
Antenna height search was performed from 1m to 4m for both horizontal and vertical polarization. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on 3 axis of EUT.
A summary of the worst case emissions found in all test configurations and modes is shown on clause 3.2

Worst case final data result:

No	Frequency (MHz)	QPeak Limit (dBµV/m)	Qpeak * (dBµV/m)	Qpeak-Limit (Margin, dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)	Comments
1	33.199	40	34.4	**-5.6**	230	V	140	12.9	With modification (§ 2.4)
2	40.680	40	37.1	**-2.9**	0	V	100	12.5	With modification (§ 2.4)
3	216.959	46	38.9	**-7.1**	245	V	130	14.6	With modification (§ 2.4)
4	244.086	46	40.7	**-5.3**	85	H	375	14.5	With modification (§ 2.4)
5	257.638	46	42.3	**-3.7**	90	H	400	14.8	With modification (§ 2.4)
6	271.195	46	38.6	**-7.4**	90	H	350	15.7	With modification (§ 2.4)
7	284.755	46	39.3	**-6.7**	80	H	350	16.5	With modification (§ 2.4)
8	298.315	46	40.7	**-5.3**	85	H	290	17.3	With modification (§ 2.4)
9	366.114	46	41.	**-5.0**	0	V	100	18.3	With modification (§ 2.4)
10	610.190	46	37.1	**-8.9**	300	H	400	23.6	With modification (§ 2.4)
11	637.309	46	36.5	**-9.5**	320	H	210	24.2	With modification (§ 2.4)
12	813.586	46	39.3	**-6.7**	235	H	360	26.5	With modification (§ 2.4)

*: Measure have been done at 10m distance and corrected according to requirements of 15.209.e)
(M@3m = M@10m+10.5dB)

RESULTS: PASS

3.4. 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

Assume a receiver reading of 52.5dBµV is obtained. The antenna factor of 7.4 and a cable factor of 1.1 are added. The amplifier gain of 29dB is subtracted, giving a field strength of 32 dBµV/m.
FS = 52.5 + 7.4 + 1.1 – 29 = 32 dBµV/m
The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.
Level in µV/m = Common Antilogarithm [(32dBµV/m)/20] = 39.8 µV/m.

4. FUNDAMENTAL FREQUENCY TOLERANCE (15.225E)

4.1. TEST CONDITIONS

Date of test : March 16th, 2010
Test performed by : A.MERLIN

The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency when the temperature is varied from -20℃ to +50℃ at the no minal power voltage and the primary power voltage is varied from 85% to 115% of the rated supply voltage at 20℃.

4.2. Temperature and voltage fluctuation

Temperature has been set at +20℃, –20℃ and +50℃.
Voltage is varied from 102V/60Hz to 138V/60Hz (Laptop Power supply)
Frequency of carrier: 13.56 MHz
Upper limit: 13.561356 MHz
Lower limit: 13.558644 MHz
The equipment (RF box) is set in a climatic chamber. Measure is performed on one channel of RF module.

Temperature **Voltage**	**-20℃**	**20℃**	**+50℃**
Mains voltage: 120V/60Hz Frequency Drift (MHz) Carrier level (dBc)	 -0.000131 -0.440000	 **REF** **REF**	 -0.000079 -0.210000
Mains voltage: 102V/60Hz Frequency Drift (MHz) Carrier level (dBc)	 -0.000108 -0.360000	 -0.000102 -0.030000	 -0.000131 0.110000
Mains voltage: 138V/60Hz Frequency Drift (MHz) Carrier level (dBc)	 -0.000069 -0.660000	 -0.000066 -0.010000	 -0.000066 0.010000

Frequency drift measured is **131 Hz** when the temperature is varied from -20℃ to +50℃ and voltage is varied from 120V/60Hz ± 15%.

5. BAND-EDGE COMPLIANCE §15.209

5.1. CLIMATIC CONDITIONS

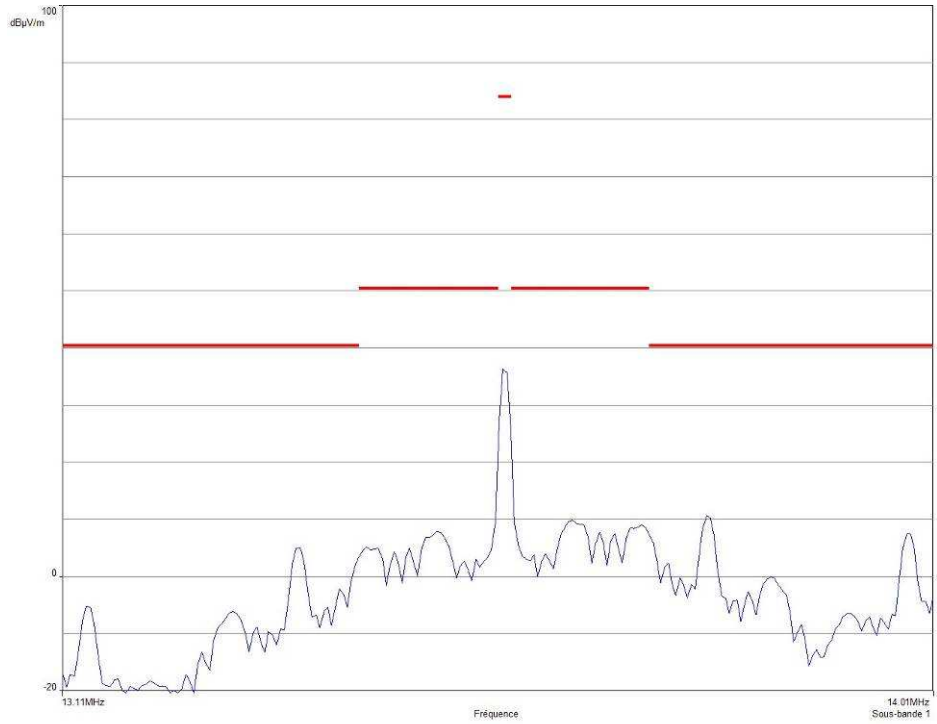
Date of test : March 16th, 2010
Test performed by : A.MERLIN
Atmospheric pressure : 980mb
Relative humidity : 34%
Ambient temperature : 21°C

5.2. EQUIPMENT CONFIGURATION

See § 2.3.

5.3. Frequency band 13.110-14.010MHz

Following plots show radiated emission level in the frequency band 13.110-14.010MHz with a RBW of 9kHz and a quasi-peak detector. The graphs are obtained with a measuring receiver ESU8.



6. CONDUCTED EMISSION DATA

6.1. CLIMATIC CONDITIONS

Date of test : March 16th, 2010
Test performed by : A.MERLIN
Atmospheric pressure : 980mb
Relative humidity : 34%
Ambient temperature : 21°C

6.2. SETUP FOR CONDUCTED EMISSIONS MEASUREMENT

The product has been tested according to ANSI C63.4-(2003) and FCC Part 15 subpart B and C.

The product has been tested with 120V/60Hz power line voltage and compared to the FCC Part 15 subpart B §15.107 and C §15.207 limits. Measurement bandwidth was 9kHz from 150 kHz to 30 MHz.

Measurement is made with a Rohde & Schwarz ESU8 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.

The Peak data are shown on plots in annex 1. Quasi-Peak and Average measurements are detailed in a table with frequencies and levels measured.

Interconnecting cables and equipment's were moved to position that maximized emission. A summary of the worst case emissions found in all test configurations and modes is shown on the following page.

6.3. TEST SETUP

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 trough the LISN (measure).

Conducted emission test setup

6.4. TEST SEQUENCE AND RESULTS

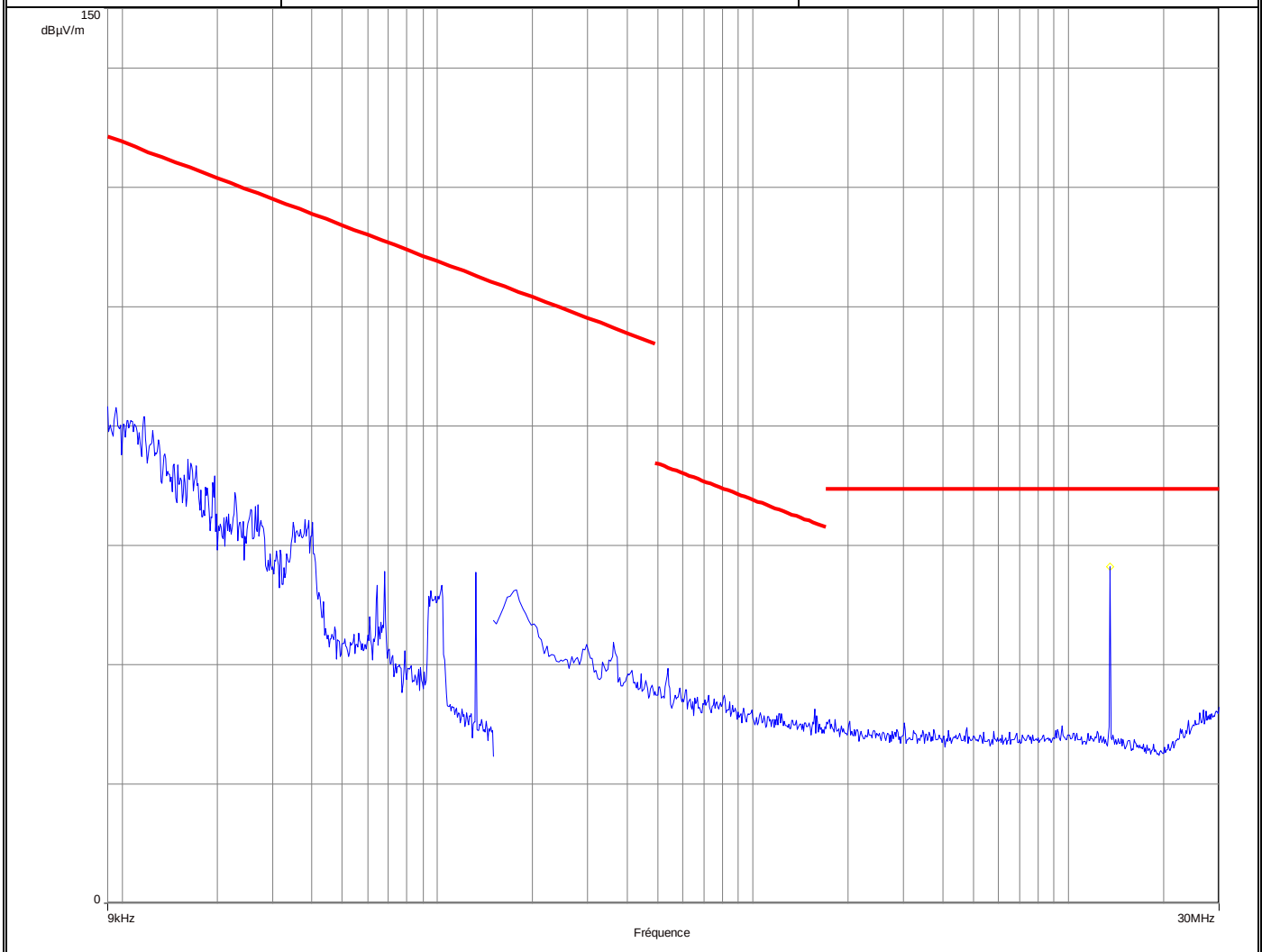
Measurements are performed on the phase (L1) and neutral (N) of power line voltage.
A measurement is also performed with a 50Ω dummy load replacing the transmitter antenna in order to demonstrate that some 13.56MHz may be cross-coupled to AC line connection.
Graphs are obtained in PEAK detection.
Measures are also performed in Quasi-Peak and Average for any strong signal.

Measure on L1:	graph Emc#1		(see annex 1)
Measure on N:	graph Emc#2		(see annex 1)
Measure on L1:	graph Emc#3	*With Dummy Load*	(see annex 1)
Measure on N:	graph Emc#4	*With Dummy Load*	(see annex 1)

RESULT: PASS

7. ANNEX 1 (GRAPHS)

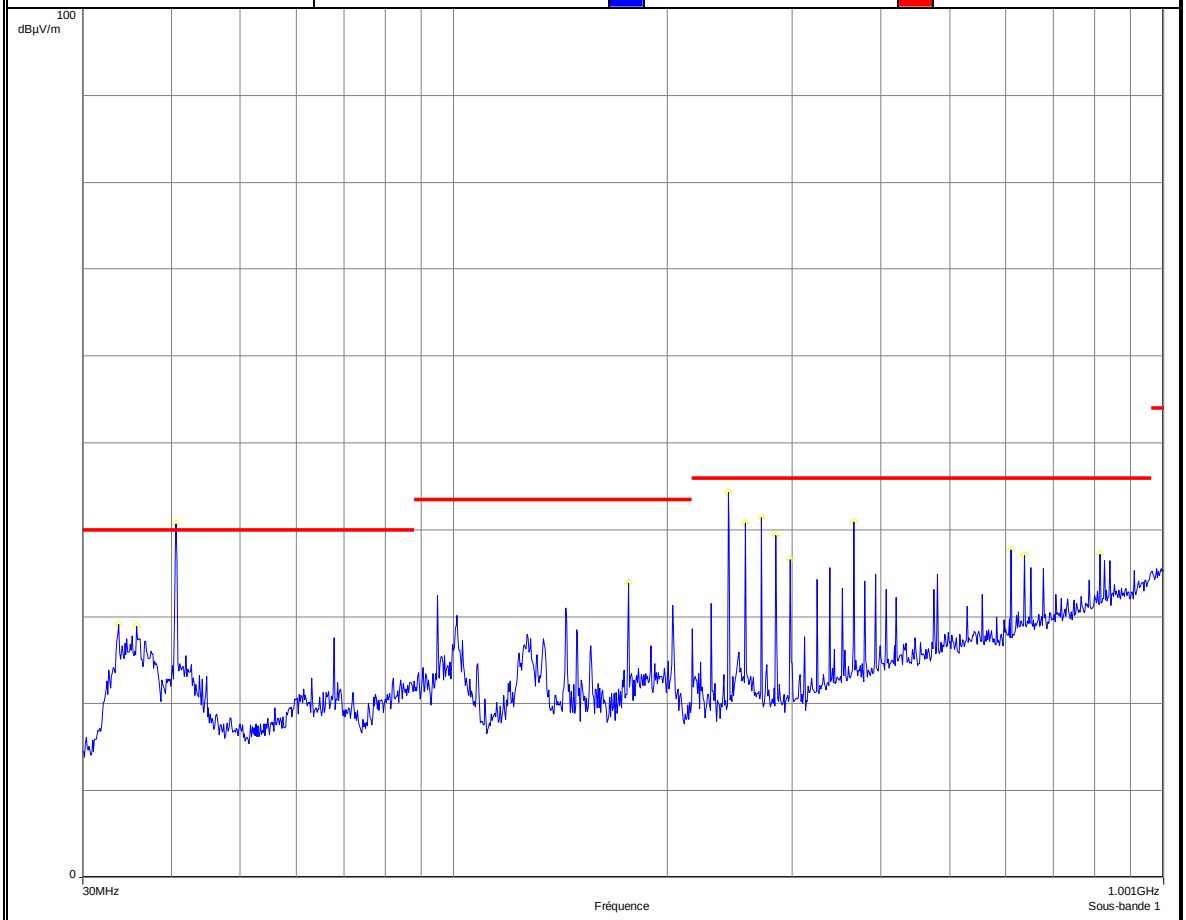
RADIATED EMISSIONS (Pre-characterization at 3meters)		**Test configuration:**
Graph name:	**Emr#1**	
Antenna polarization	**Parallel**	
Frequency band	**9kHz-30MHz**	
Azimuth:	**0-359°**	
RBW / VBW :	**9kHz / 30kHz**	



Frequency (MHz)	Peak (dBµV/m)
13.562*	56.33

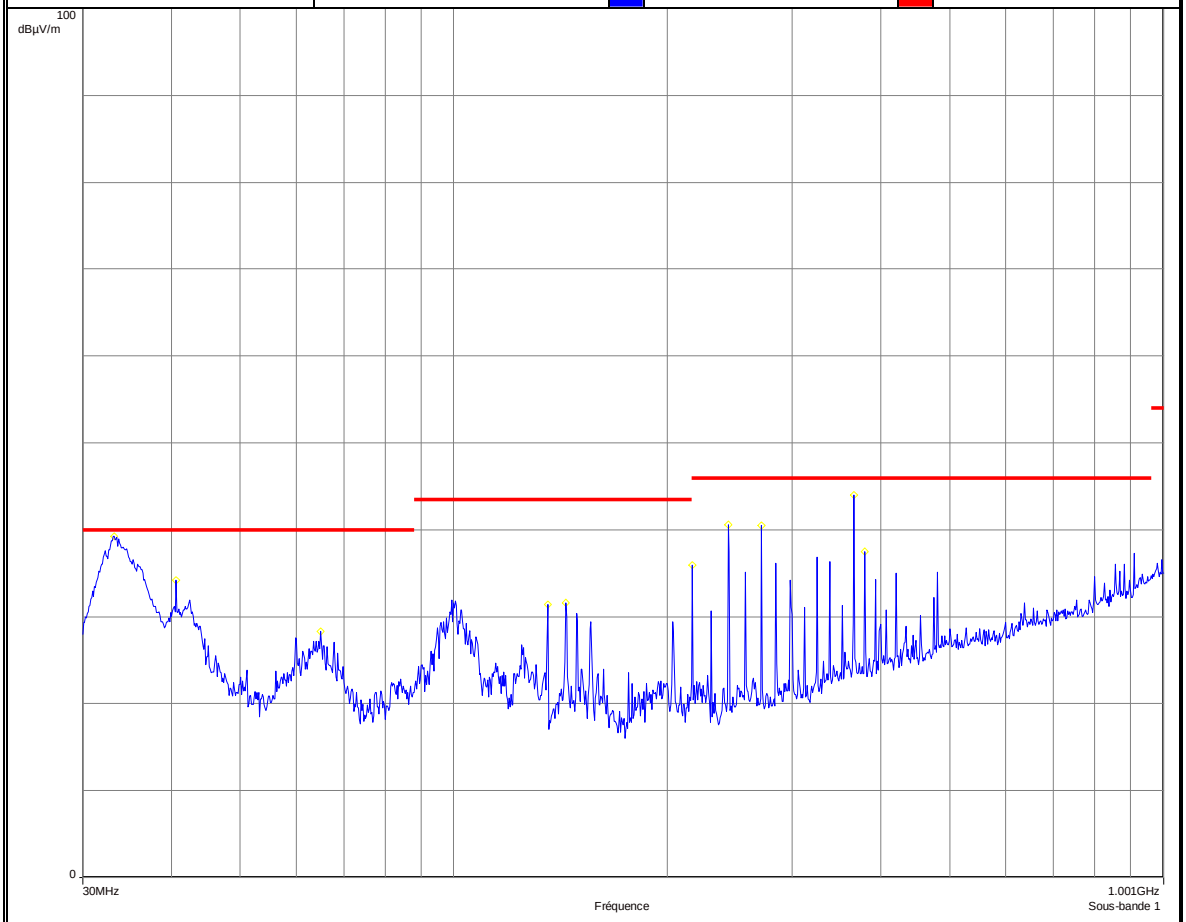
***Carrier Frequency**

RADIATED EMISSION		Test configuration:
Graph name:	**Emr#1**	**P30CL**
Antenna position:	**Horizontal**	
Azimuth:	**0°- 360°**	
RBW/VBW:	**120kHz / 300kHz**	**Peak Measure** / **QPeak Limit@3m**



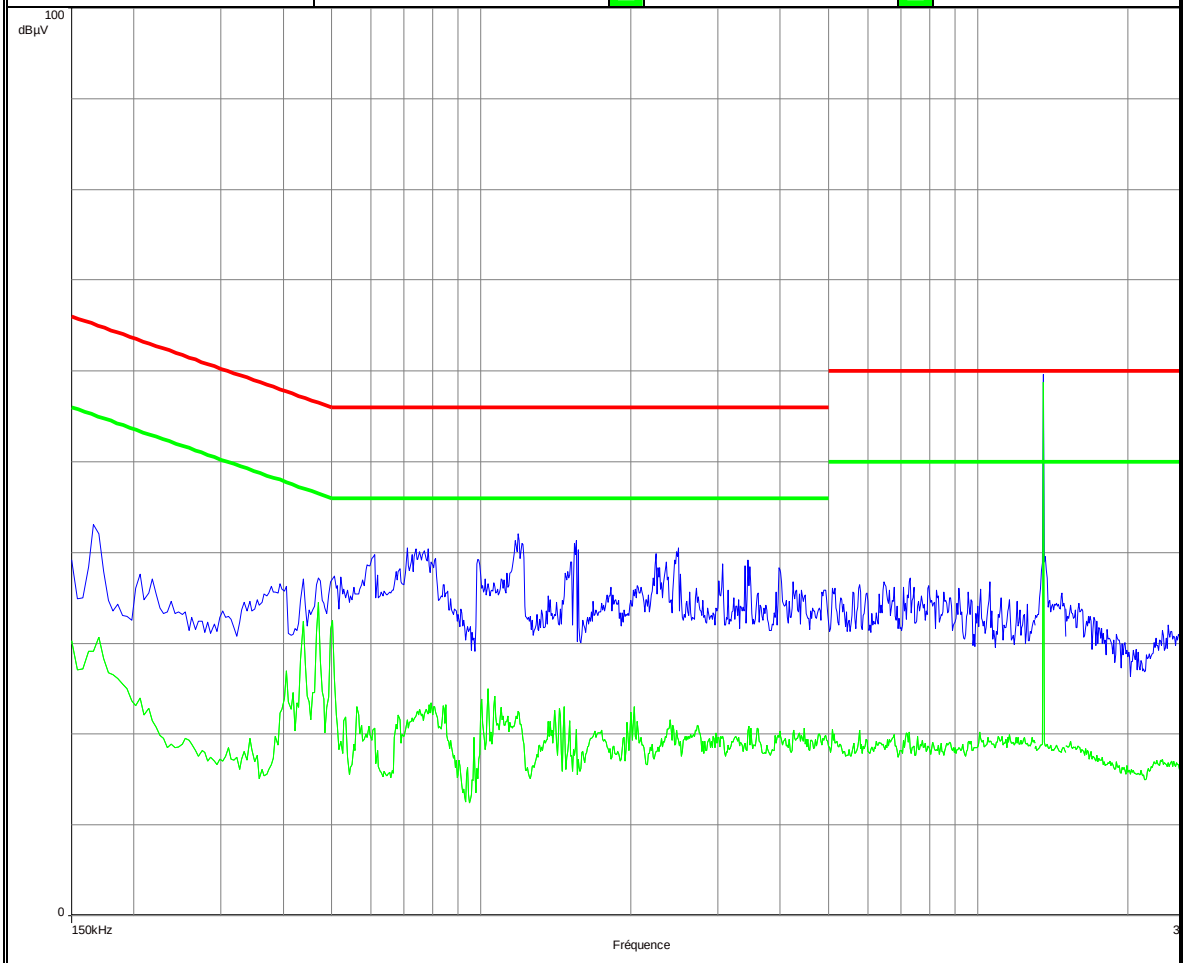
Frequency (MHz)	Peak (dBµV/m)
33.72	29.09
35.76	28.9
40.6	40.7
176.2	33.9
243.96	44.35
257.56	40.83
271.32	41.39
284.64	39.36
298.24	36.62
366	40.86
610.08	37.74
637.28	37.11
813.44	37.15

RADIATED EMISSION		Test configuration:
Graph name:	**Emr#2**	**P30CL**
Antenna position:	**Vertical**	
Azimuth:	**0° - 360°**	
RBW/VBW:	**120kHz / 300kHz**	**Peak Measure** / **QPeak Limit@3m**



Frequency (MHz)	Peak (dBµV/m)
33.2	39.24
40.6	34.2
64.96	28.29
135.52	31.37
143.96	31.57
216.84	35.99
243.96	40.65
271.28	40.5
366	44.06
379.6	37.46

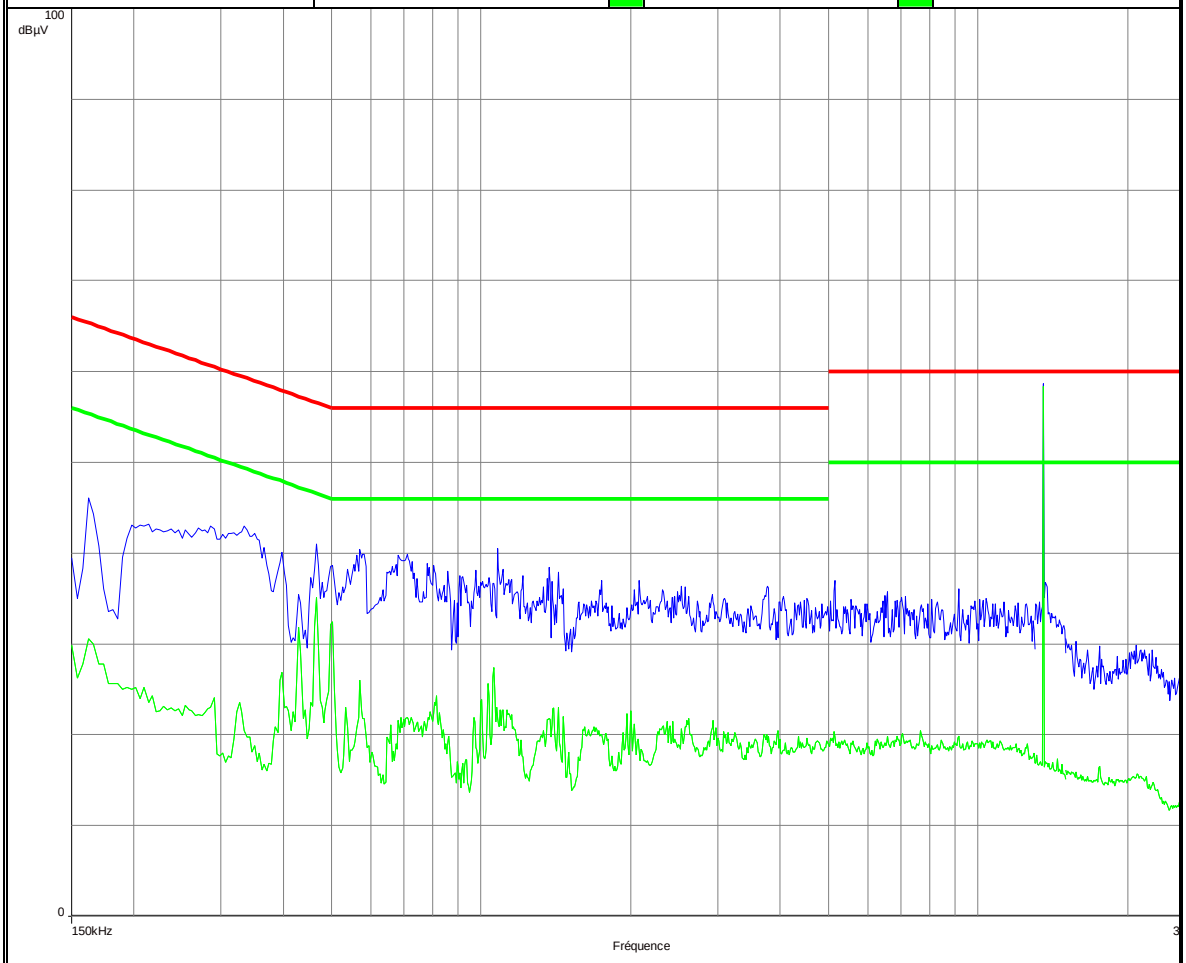
CONDUCTED EMISSIONS		Test configuration:			
Graph name:	**Emc#1**	**P30CL**			
Voltage / Frequency	**110Vac/60Hz**				
Line/Port	**Phase L1**	**Peak Measure**		**QPeak Limit**	
RBW / VBW :	**9kHz / 30kHz**	**Average Measure**		**Average Limit**	



Frequency (MHz)	Avg (dBµV)	Lim Avg (dBµV)	Avg-LimAvg (dBµV)	QPeak (dBµV)	LimQPeak (dBµV)	QPeak-LimQPeak (dBµV)
13.56*	57.93	50	**7.93**	58.12	60	**-1.88**
27.12	31.97	50	**-18.03**	33.83	60	**-26.17**

***Carrier frequency, see graphs with dummy load**

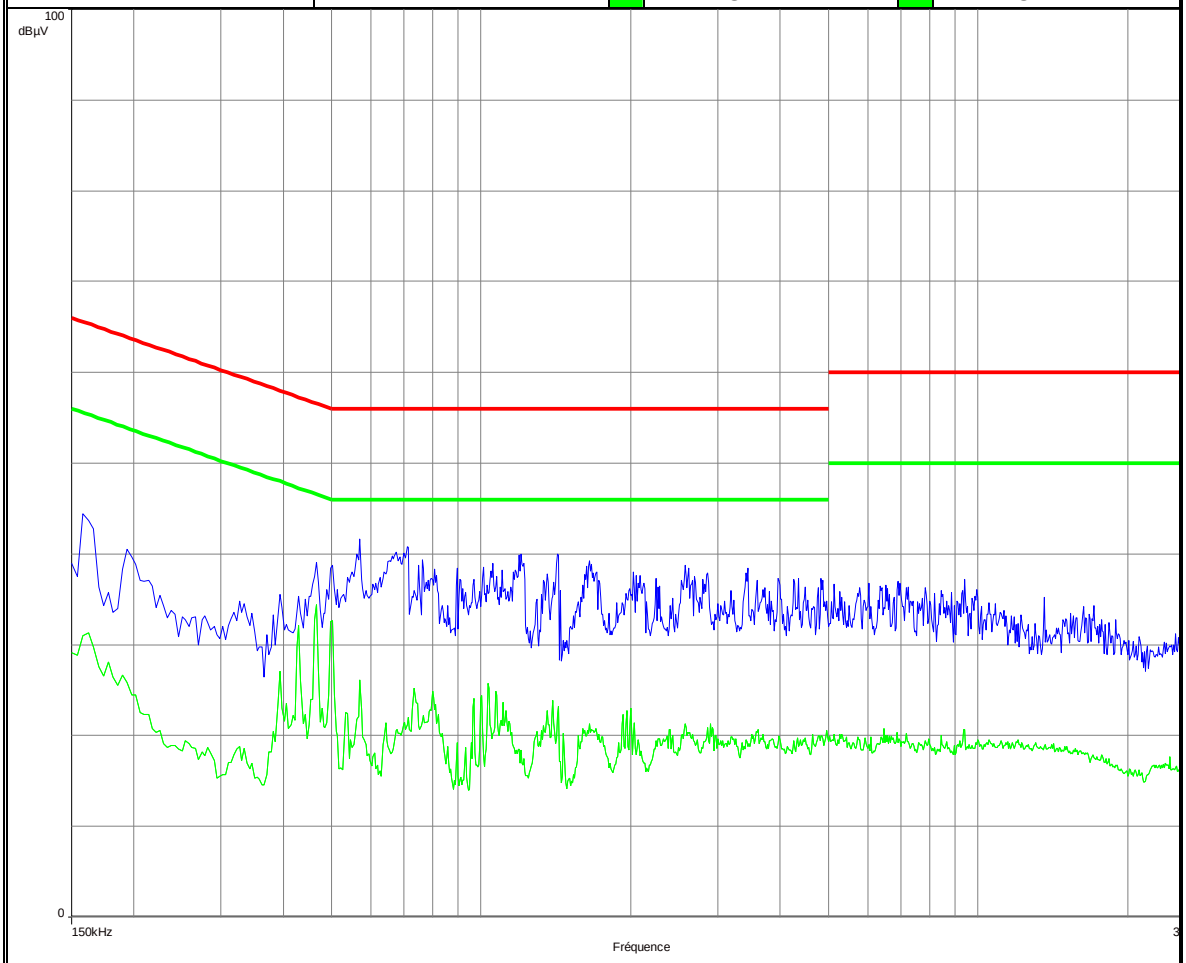
CONDUCTED EMISSIONS		Test configuration:			
Graph name:	**Emc#2**	**P30CL**			
Voltage / Frequency	**110Vac/60Hz**				
Line/Port	**Neutral N**	**Peak Measure**		**QPeak Limit**	
RBW / VBW :	**9kHz / 30kHz**	**Average Measure**		**Average Limit**	



Frequency (MHz)	Avg (dBµV)	Lim Avg (dBµV)	Avg-LimAvg (dBµV)	QPeak (dBµV)	LimQPeak (dBµV)	QPeak-LimQPeak (dBµV)
13.56*	58.33	50	**8.33**	58.54	60	**-1.46**

***Carrier frequency, see graphs with dummy load**

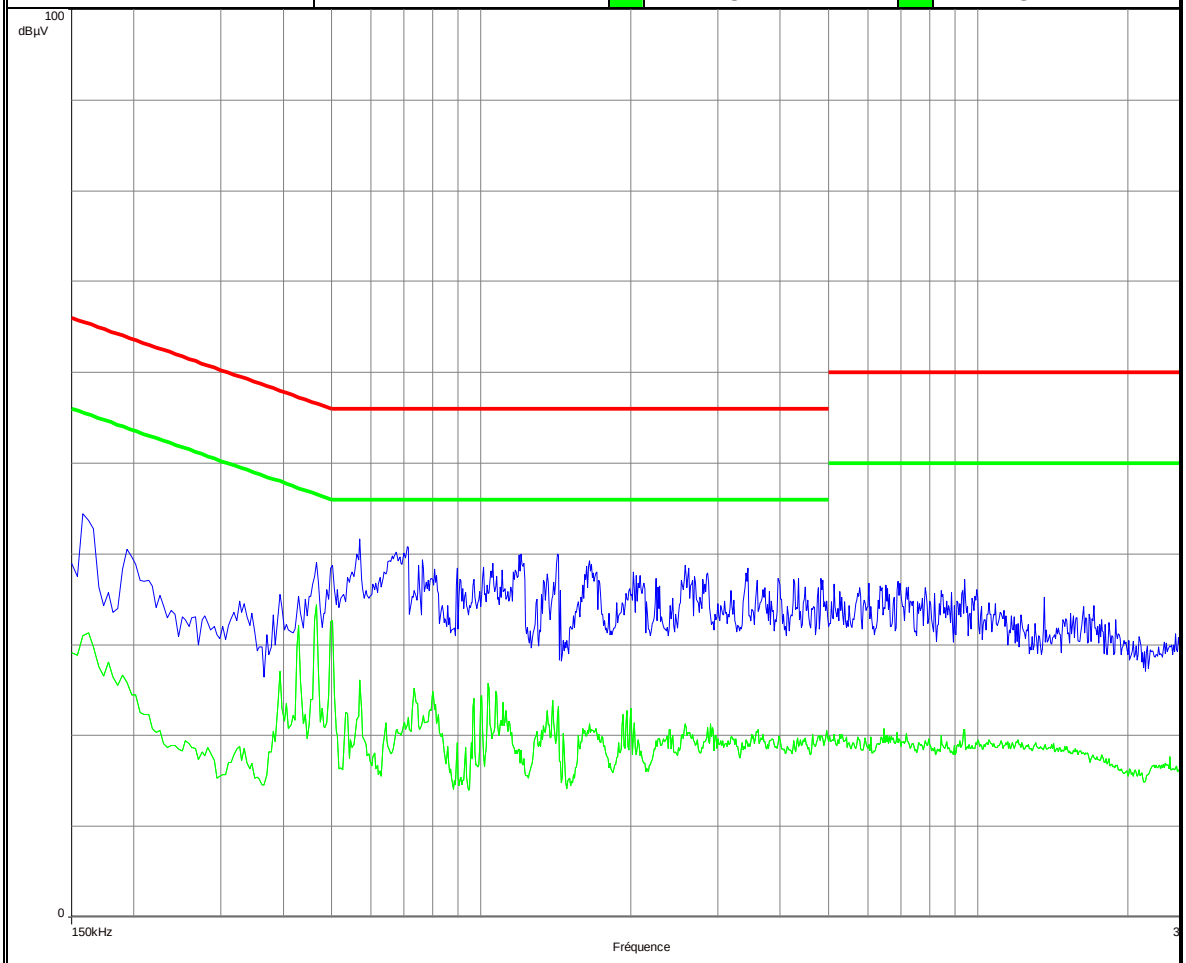
CONDUCTED EMISSIONS		Test configuration:			
Graph name:	**Emc#3**	**P30CL**			
Voltage / Frequency	**110Vac/60Hz**	**With dummy load**			
Line/Port	**Phase L1**	**Peak Measure**		**QPeak Limit**	
RBW / VBW :	**9kHz / 30kHz**	**Average Measure**		**Average Limit**	



Frequency (MHz)	Avg (dBµV)	Lim Avg (dBµV)	Avg-LimAvg (dBµV)	QPeak (dBµV)	LimQPeak (dBµV)	QPeak-LimQPeak (dBµV)

No Frequency Observed

CONDUCTED EMISSIONS		Test configuration:			
Graph name:	**Emc#4**	**P30CL**			
Voltage / Frequency	**110Vac/60Hz**	**With dummy load**			
Line/Port	**Neutral N**	**Peak Measure**		**QPeak Limit**	
RBW / VBW :	**9kHz / 30kHz**	**Average Measure**		**Average Limit**	



Frequency (MHz)	Avg (dBµV)	Lim Avg (dBµV)	Avg-LimAvg (dBµV)	QPeak (dBµV)	LimQPeak (dBµV)	QPeak-LimQPeak (dBµV)

No Frequency Observed

8. TEST EQUIPMENT LIST (MOIRANS SITE)

	N°LCIE	TYPE	COMPANY	REF	commentaire
RADIATED EMISSION MEASUREMENT (PRE-SCAN SEMI-ANECHOIC CHAMBER #2)					
	A5329032VO	Absorption clamp	LUTHI	MDS21	
	A5329044VO	Absorption clamp	RHODE ET SCHWARZ	85024A	
X	A4049060VO	Adapter quasi-peak	HEWLETT PACKARD	HP85650A	
	A7102024VO	Amplifier 8 GHz	HEROTEK	A1080304A	
X	A7486006VO	Amplifier 0.1MHz – 1300 MHz	HEWLETT PACKARD	8447F	
	A7085008VO	Amplifier 0.1MHz – 1300 MHz	HEWLETT PACKARD	8447D	
	A7085009VO	Amplifier 0.1MHz – 1300 MHz	HEWLETT PACKARD	8447D	
	A7085010VO	Amplifier 10MHz – 1300 MHz	A-INFO INC	JXWBLA-T	
X	C2040146VO	Antenna Bi-Log XWing	TESEQ	CBL6144	
	C2042027VO	Antenna horn	EMCO	3115	
	C2042028VO	Antenna horn 26GHz	SCHWARZBECK	BBHA 9170	
X	C2040052VO	Antenna Loop	ELECTRO-METRICS	EM-6879	
X	A5329045VO	Cable EMR (s-Anechoic chamber)			
X	A5329056VO	Cable Radiat EMI (Pre-amp/Analyzer)			
X	A5329057VO	Cable Radiat. EMI (Pre-amp/cage)			
X	A2642019	Measurement Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	
X	A4060030VO	Pre-selector RF	HEWLETT PACKARD	HP85685A	
X	A3169050VO	Radiated emission comb generator	BARDET		
X	D3044015VO	Semi-Anechoic chamber #2	SIEPEL		
X	A4060029VO	Spectrum analyzer	HEWLETT PACKARD	HP8568B	
X	A4060028VO	Spectrum analyzer display	HEWLETT PACKARD	HP85662A	
X	F2000404VO	Turntable chamber	ETS Lingren	Model 2165	
X	F2000393VO	Turntable controller chamber	ETS Lingren	Model 2066	
RADIATED EMISSION MEASUREMENT (OPEN AREA TEST SITE)					
	A5329032VO	Absorption clamp	LUTHI	MDS21	
	A5329044VO	Absorption clamp	RHODE ET SCHWARZ	85024A	
X	A4049059VO	Adapter quasi-peak	HEWLETT PACKARD	HP85650A	
	A7102024VO	Amplifier 8 GHz	HEROTEK	A1080304A	
	A7102026VO	Amplifier 8-26GHz	ALDETEC	ALS01452	
	A7085008VO	Amplifier 0.1MHz – 1300 MHz	HEWLETT PACKARD	8447D	
	A7085009VO	Amplifier 0.1MHz – 1300 MHz	HEWLETT PACKARD	8447D	
	A7085010VO	Amplifier 10MHz – 1300 MHz	A-INFO INC	JXWBLA-T	
X	C2040050VO	Antenna biconic	EMCO	3104C	
	C2040051VO	Antenna Bi-log	CHASE	CBL6111A	
	C2042027VO	Antenna horn	EMCO	3115	
	C2042028VO	Antenna horn 26GHz	SCHWARZBECK	BBHA 9170	
X	C2040056VO	Antenna log-periodic	EMCO	3146	
X	C2040052VO	Antenna Loop	ELECTRO-METRICS	EM-6879	
X	F2000288VO	Antenna mast	EMCO	1050	
X	A5329048VO	Cable EMR OATS	SUCOFLEX	106G	
X	A5329199VO	Cable OATS (Mast at 10m)	UTIFLEX		
X	A5329188VO	Cable OATS (Mast at 10m)	UTIFLEX		
	A5329076VO	Cable OATS (Mast at 3m)	UTIFLEX		
	A5329196VO	Cable OATS (Turntable)	UTIFLEX		
	A5329187VO	Cable OATS (Turntable)	UTIFLEX		
	A2640011VO	Measurement receiver 9kHz–30MHz	ROHDE ET SCHWARZ	ESH3	
X	A2642019	Measurement Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	
X	A4060027VO	Pre-selector RF	HEWLETT PACKARD	HP85685A	
X	A3169050VO	Radiated emission comb generator	BARDET		
X	A4060017VO	Spectrum analyzer	HEWLETT PACKARD	HP8568B	
	A4060018VO	Spectrum Analyzer 9KHz – 26.5GHz	HEWLETT PACKARD	8593E	
	A4060016VO	Spectrum analyzer 9kHz –1.8GHz	HEWLETT PACKARD	8591E	
X	A4060019VO	Spectrum analyzer display	HEWLETT PACKARD	HP85662A	
X	F2000403VO	Turntable	ETS LINDGREN	Model 2187	
X	F2000286VO	Turntable / Antenna mast controller	ETS LINDGREN	Model 2066	
CONDUCTED MEASUREMENT EMISSION					
	A5329061VO	Cable Conduct. EMI			
X	A5329060VO	Cable Conduct. EMI			

	N°LCIE	TYPE	COMPANY	REF	commentaire
X	A5329189VO	Shielded cable	UTIFLEX		
	A5329076VO	Shielded cable	UTIFLEX		
	A5329206VO	Shielded cable	UTIFLEX		
	A5329207VO	Shielded cable	UTIFLEX		
	A5329060VO	Shielded cable	UTIFLEX		
	A5329071VO	Shielded cable	UTIFLEX		
X	A3169049VO	Conducted emission comb generator	BARDET		
	A4040015	Clickmeter	SCHAFFNER	DIA1512D	
	A5329037VO	Current injection probe	SCHAFFNER	CIP8213	
	A1290017VO	Current probe	SCHAFFNER	CSP9160	
	A5329036VO	Direct Injection Module 100+50 Ohms	LCIE	MID01-100 ohms	
	A7156004VO	Direct Injection Module 100+50 Ohms	LUTHI	CR100A	
	A5329042VO	Ferrite Tube	LUTHI	FTC 101	
	A1092042VO	Ferrite Tube	LUTHI	FTC101	
	C2320059VO	LISN	EMCO	3810/2SH	
	C2320068VO	LISN	EMCO	3825/2	
	C2320061VO	LISN	TELEMETER ELECTRONIC	NNB-2/16Z	
	C2320062VO	LISN tri-phase ESH2-Z5	RHODE ET SCHWARZ	33852.19.53	
	C2320063VO	LISN tri-phase ESH2-Z5	RHODE ET SCHWARZ	33852.19.53	
X	C2320123VO	LISN	RHODE ET SCHWARZ	ENV216	
	A2640011VO	Measurement receiver 9kHz–30MHz	ROHDE ET SCHWARZ	ESH3	
X	A2642019VO	Measurement Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	
	C2320067VO	ISN 2 x 2 wires	RHODE ET SCHWARZ	ENY22	
	C2320066VO	ISN 4 wires	RHODE ET SCHWARZ	ENY41	
	C2320124VO	ISN 4 wires	TESEQ	T400A	
	D3044016VO	Semi-Anechoic chamber #1	SIEPEL		
	D3044017VO	Semi-Anechoic chamber #3	SIEPEL		
	D3044015VO	Semi-Anechoic chamber #2	SIEPEL		
X	D3044010VO	Faraday Cage	RAY PROOF		
X	A4049061VO	Transient limiter	HEWLETT PACKARD	11947A	
	A4089117VO	Voltage probe	LCIE		
FUNDAMENTAL FREQUENCY TOLERANCE					
X	D1022117VO	Climatic chamber	BIA CLIMATIC	CL 6-25	200 105 6
X	B2082009VO	Frequency Counter	Hewlett Packard	HP 5350B	
X	A2240015VO	Passive loop antenna	EMCO	7405-901	/
X		BNC cable 50Ω			
	A5329206VO	Shielded cable	UTIFLEX		
	C2040052VO	Antenna Loop	ELECTRO-METRICS	EM-6879	690234
	A4060018VO	Spectrum Analyzer 9KHz – 26.5GHz	HEWLETT PACKARD	8593E	3409u00537
X	A2642019	Measurement Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	100131
BAND-EDGE COMPLIANCE					
	A2240015VO	Passive loop antenna	EMCO	7405-901	/
		BNC cable 50Ω			
X	A5329198VO	Shielded cable	UTIFLEX		
X	C2040052VO	Antenna Loop	ELECTRO-METRICS	EM-6879	690234
	A4060018VO	Spectrum Analyzer 9KHz – 26.5GHz	HEWLETT PACKARD	8593E	3409u00537
X	A2642019	Measurement Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	100131

9. UNCERTAINTIES CHART

Type de mesure / *Kind of measurement*	**Incertitude élargie laboratoire / *Wide uncertainty laboratory* (k=2) ± x**	**Incertitude limite du CISPR / *CISPR uncertainty limit* ± y**
Mesure des perturbations conduites en tension sur le réseau d'énergie *Measurement of conducted disturbances in voltage on the power port*	3.57 dB	3.6 dB
Mesure des perturbations conduites en tension sur le réseau de télécommunication *Measurement of conducted disturbances in voltage on the telecommunication port.*	3.28 dB	A l'étude / Under consid.
Mesure des perturbations discontinues conduites en tension *Measurement of discontinuous conducted disturbances in voltage*	3.47 dB	3.6 dB
Mesure des perturbations conduites en courant *Measurement of conducted disturbances in current*	2.90 dB	A l'étude / Under consid.
Mesure du champ électrique rayonné sur le site en espace libre de Moirans *Measurement of radiated electric field on the Moirans open area test site*	5.07 dB	5.2 dB