



EMC TEST REPORT

Nr 3393-FCC

This test report applies only on equipment described hereafter.

Proposal number : 200504-2663

Date of test..... : April 25th, 2005

Location : SMEE
Actions Mesures Laboratory - 38 VOIRON

Performed by : Jonathan PAUC

Customer : **DIGIGRAM SA**
430, rue Aristide Berges
F- 38330 MONTBONNOT SAINT MARTIN
FRANCE

Product..... : **UAX 220**

Type of test : **Radiated and Conducted Emission Test**

Applied standards or specification: EN55022 (1999) +/A1: (2000) +/A1: (2003)
CISPR22 (2003)
FCC part 15 subpart B

Level : Class B

Test objective : Qualification

Results : **Samples tested in configuration and description presented in this test report complies with prescriptions and limits of EN 55022, CISPR22 and FCC part 15 subpart B standard, in radiated and conducted emissions.**

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Written by : Jacques LORQUIN

Approved by..... : Jacques LORQUIN

Date: May 13th, 2005



1. System test configuration

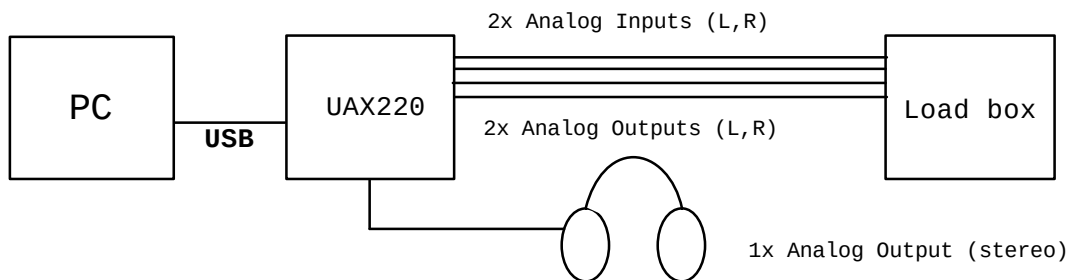
1.1. Justification

The system was configured for testing in a typical fashion (as a customer would normally use it). A typical PCX1222HR is set into a PC, and I/O ports are connected on typical load. The soft test play & record in loop a sound.

1.2. HARDWARE IDENTIFICATION:

- **Equipment Under Test (EUT):** UAX220 Sn : 00000001
- **Size** : 90x81x22mm
- **I/O** :
 - 2X Analog audio inputs (mono, XLR connectors)
 - 2X Analog audio outputs (mono, XLR connectors)
 - 1X Headset output (stereo)
 - 1X USB connection (Type A)
- **Frequencies** :
 - Crystal: 6MHz
 - PLL : 24MHz, 12MHz, 12.228MHz

1.3. Running mode:



For testing the UAX220, I/O are loaded by dummy loads (load box) in order to simulate typical load on each ports:

IN L, IN R → 110ohms

OUT L, OUT R → 100ohms

Soft: Windows media player under Windows XP professional:

- Windows media player played an audio sample in loop.



1.4. Auxiliaries

The FCC IDs for all equipment, plus description of all cables used in the tested system (including inserted cards, which have grants) are :

Trade Mark - Model Number (Serial number)	FCC ID	Description	Cable description
DIGIGRAM UAX220* (sn: 00000001)	IGTUAX220	USB Audio card	I/O cable, shielded
DELL Precision 670 pn:WHL (sn: 188X91J)	D.O.C.	Personnel computer	Standard power cable unshielded, All I/O cables are shielded.
HEWLETT PACKARD pn:D2846 (sn: JP74001000)	D.O.C.	monitor	Shielded cable
HEWLETT PACKARD pn:C4734-60111 (sn: M971168931)	GYUR38SK	Keyboard PS/2	Shielded cable
LOGITECH (sn:LZA6283121)	DZL211029	Mouse PS/2	Shielded cable
HEWLETT PACKARD - Deskjet 895CXI (sn: MY9761915S)	D.O.C.	Parallel Printer	Shielded cable
Telex (sn: 700373.000A)	None	Microphone	Unshielded cable
Labtec LT-100 pn:D8387A (sn: none)	None	Headset	Unshielded cable
Sennheiser HD 202 (sn: none)	None	Headset	Unshielded cable
HEWLETT PACKARD 48GX (sn:ID83802369)	None	Graphic calculator	Serial adapter shielded
Intel YC76 (sn: 0045143)	EDUYC76	WebCam	Shielded cable
DIGIGRAM	None	Load box	Standard power cable unshielded

* : Equipment under test

1.5. I/O cables

- 2x Power cord (PC & Monitor), unshielded, length: 2.5m
- 1x Video cable with ferrites at each end, shielded, length: 1.8m
- 1x USB cable, shielded, length: 2m
- 4x Analog audio cables (XLR), length: 3m
- 1x Serial adapter for graphic calculator, shielded, length: 1.5m
- 1x Parallel cable, shielded, length: 2m
- 1x LAN cable STP Cat5e (shielded) cable, length: 2m
- 1x Y cable adapter (From 1xDVI to 2xVGA (HD15) connectors), shielded, length: 0.2m

1.6. Equipment modifications

No modifications are necessary for achieved test.



2. Radiated emission data from 30MHz to 1GHz

2.1. SET-UP

Mains: 230V@50Hz

The equipment under test and auxiliaries are set on a non-conducted table of 80cm height, above the ground plane. The distance between equipment under test and auxiliaries is 10cm.

2.2. TEST EQUIPMENT



Test Equipment from 30MHz to 1GHz on 10 meters open site:

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

Test Equipment from 30MHz to 1GHz on 10 meters open site:

Equipment	Company	Model	Serial
Spectrum Analyzer	HP	8568B	2732A04140
Quasi-Peak adapter	HP	85650A	2811A01136
RF Pre-selector	HP	85685A	2833A00773
Biconical Antenna	EMCO	3104C	9401-4636
Log Periodic Antenna	EMCO	3146	2178
Absorbing clamp	LÜTHI	MDS21	194.0100.50
Tube ferrite	LÜTHI	FTC101	4485
Absorbing clamp	LÜTHI	MDS21	2826

EMCO-1050, 6 meters height antenna mast & EMC0-1060, 3 meters diameter Turntable.
A 10 meters Open site located in SMEE *Actions Mesures* - Voiron (FRANCE).



Pre-scan, test Equipment from 30MHz to 1GHz:

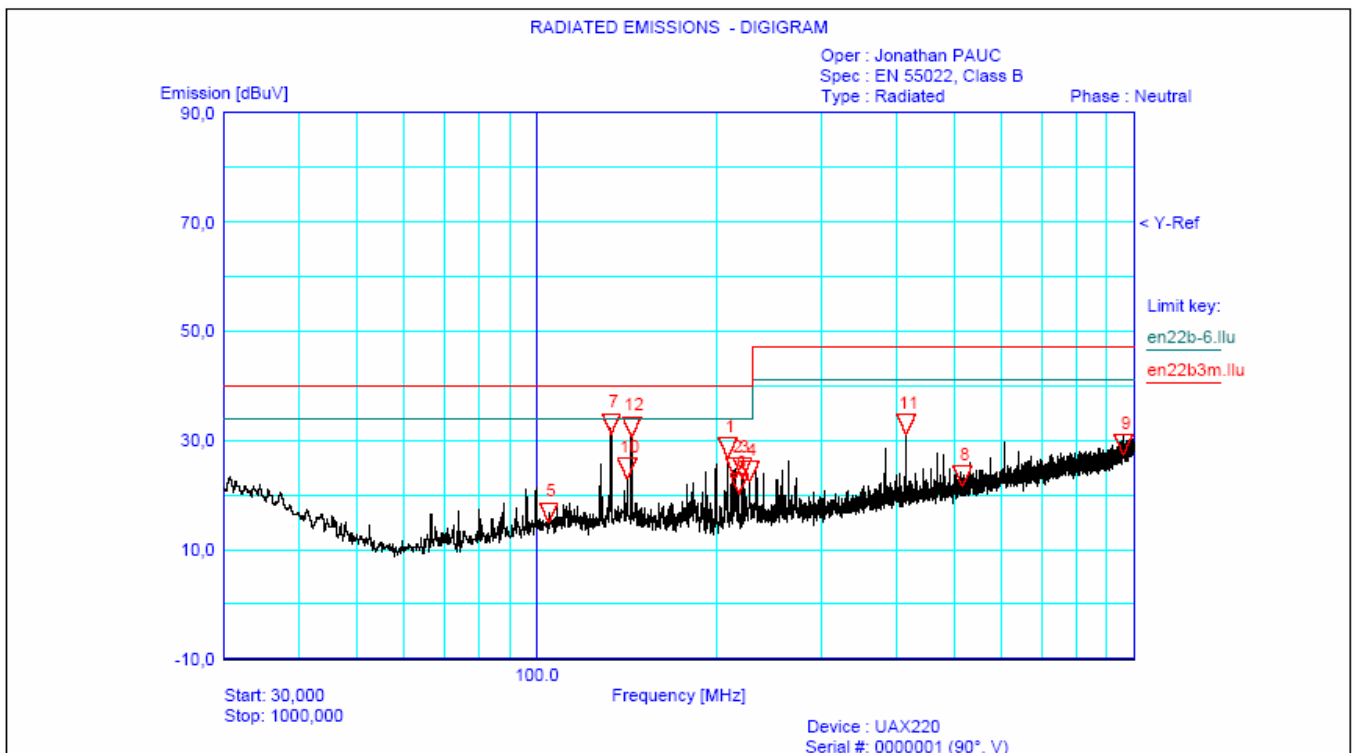
Equipment	Company	Model	Serial
EMC Analyzer	HP	8591EM	3536A00384
Amplifier	HP	8447F H64	3113A06394
Antenna (30MHz-1GHz)	CHASE	CBL6111A	1628
Absorbing clamp	LÜTHI	MDS21	194.0100.50
Tube ferrite	LÜTHI	FTC101	4485
Absorbing clamp	LÜTHI	MDS21	2826

2.3. TEST SEQUENCE AND RESULTS

2.3.1. Pre-characterization at 3 meters

A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber.

The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) polarization, and on 4 faces of the EUT. See below for graph examples.





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

The product has been tested according to ANSI C63.4-(2003), CISPR22-2003 and EN55022:1998/A1:2000/A1:2003. Radiated Emission was measured on an open area test site. A description of the facility is on file with the FCC.

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 clause 2.1.

Frequency list has been created with anechoic chamber pre-scan results.

No	Frequency (MHz)	QPeak Lmt (dBμV/m)	QPeak (dBμV/m)	QPeak-Lmt (dB)	Pol	Hgt (cm)	Angle (deg)	Tot Corr (dB)	Comments
1	33.731	30.0	16.2	-13.8	V	120	270	12	
2	133.194	30.0	20.5	-9.5	H	320	145	14.7	
3	141.769	30.0	23.8	-6.2	V	120	110	14.7	
4	144.034	30.0	21.5	-8.5	V	110	120	14.8	
5	218.141	30.0	17.9	-12.1	H	340	130	13.5	
6	221.250	30.0	22.4	-7.6	V	120	50	13.6	
7	227.368	30.0	21.1	-8.9	H	370	280	13.8	
8	515.974	37.0	36.0	-1.0	V	120	215	27.7	
9	528.117	37.0	25.1	-11.9	V	240	145	27.9	

2.4. 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 is added. The amplifier gain of 29dB is subtracted, giving a field strength of 32 dBμV/m.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dB}\mu\text{V/m}$$

The 32 dBμV/m value can be mathematically converted to its corresponding level in μV/m.

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32\text{dB}\mu\text{V/m})/20] = 39.8 \text{ } \mu\text{V/m}.$$



3. Conducted emission data

The product has been tested according to ANSI C63.4-(2003), CISPR22:2003 and EN55022:1998/A1:2000/A1:2003

The product has been tested with 110V@60Hz and 230V@50Hz power line voltage and compared to the CISPR22 Class B limits. Measurement bandwidth was 9kHz from 150kHz to 30MHz.

Measurement was initially made with an HP-8591EM Spectrum Analyzer in peak mode. This was followed by a Quasi-Peak, i.e. CISPR measurement with the Rohde & Schwarz ESH3 receiver 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 Peak data are shown on the following plots. 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.

3.1. SET-UP

Mains: 110V/60Hz & 230V/50Hz



The equipment under test with its auxiliaries are set 80cm above the ground reference plane on a non-conducting table. The distance between the EUT and the LISN is 80cm.

The distance between the EUT with its auxiliaries and the vertical plane is 40cm. The EUT is powered through a LISN (measure - 50Ω / $50\mu\text{H}$) and auxiliaries are powered by another LISN.

The distance between the EUT and each auxiliary is 10cm.



3.2. TEST EQUIPMENT

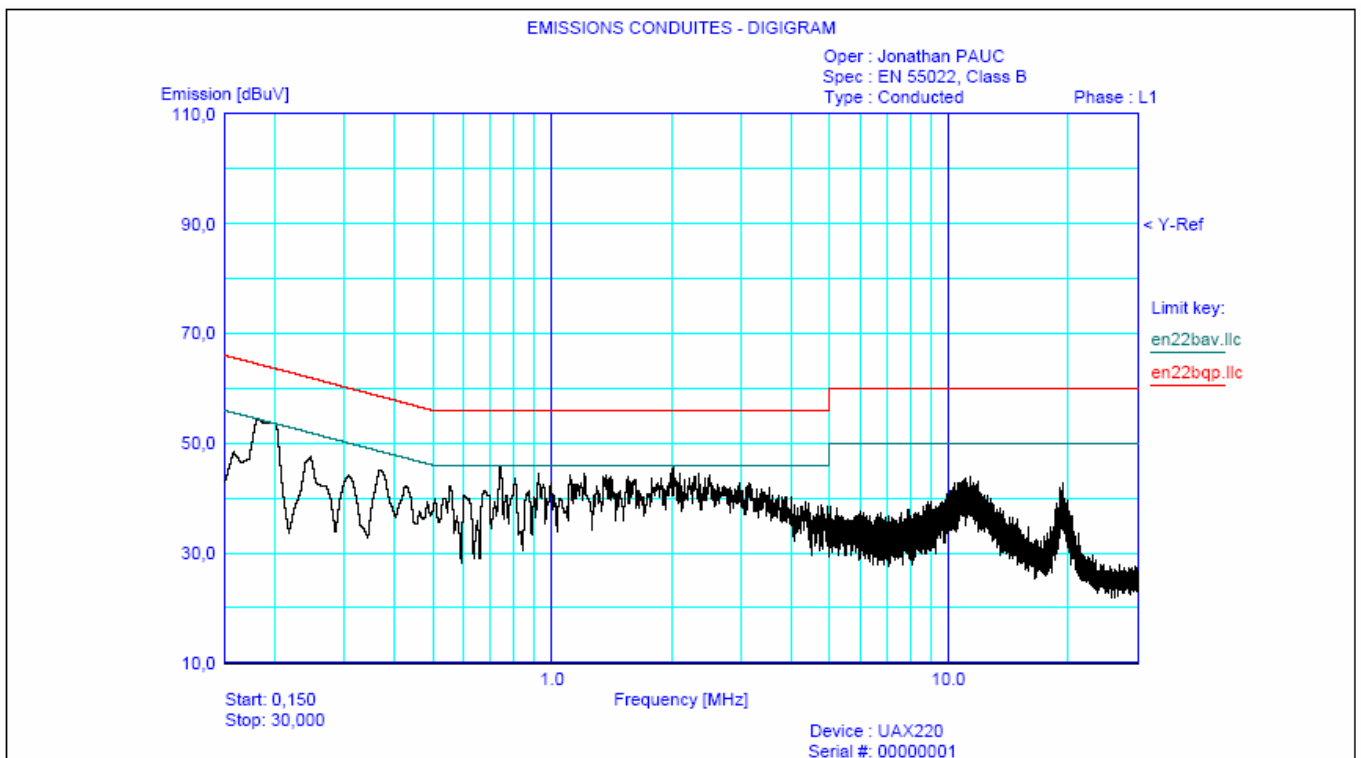
Equipment	Company	Model	Serial
EMC Analyzer	HP	8591EM	3536A00384
Test receiver	Rohde&Schwarz	ESH3	872079/117
Transient Limiter	HP	11947A	3107A01596
LISN(auxiliaries)	EMCO	3825/2	9309-2122
LISN(measure)	Telemeter	TGmbH	9511-11821628
50Ω / 50μH	Electronis	NNB 2/16	
Faraday room	Rayproof		4854



3.3. TEST SEQUENCE AND RESULTS

The measures are made on the two lines of the power supply of the EUT giving the alternative voltage of the UAX220.

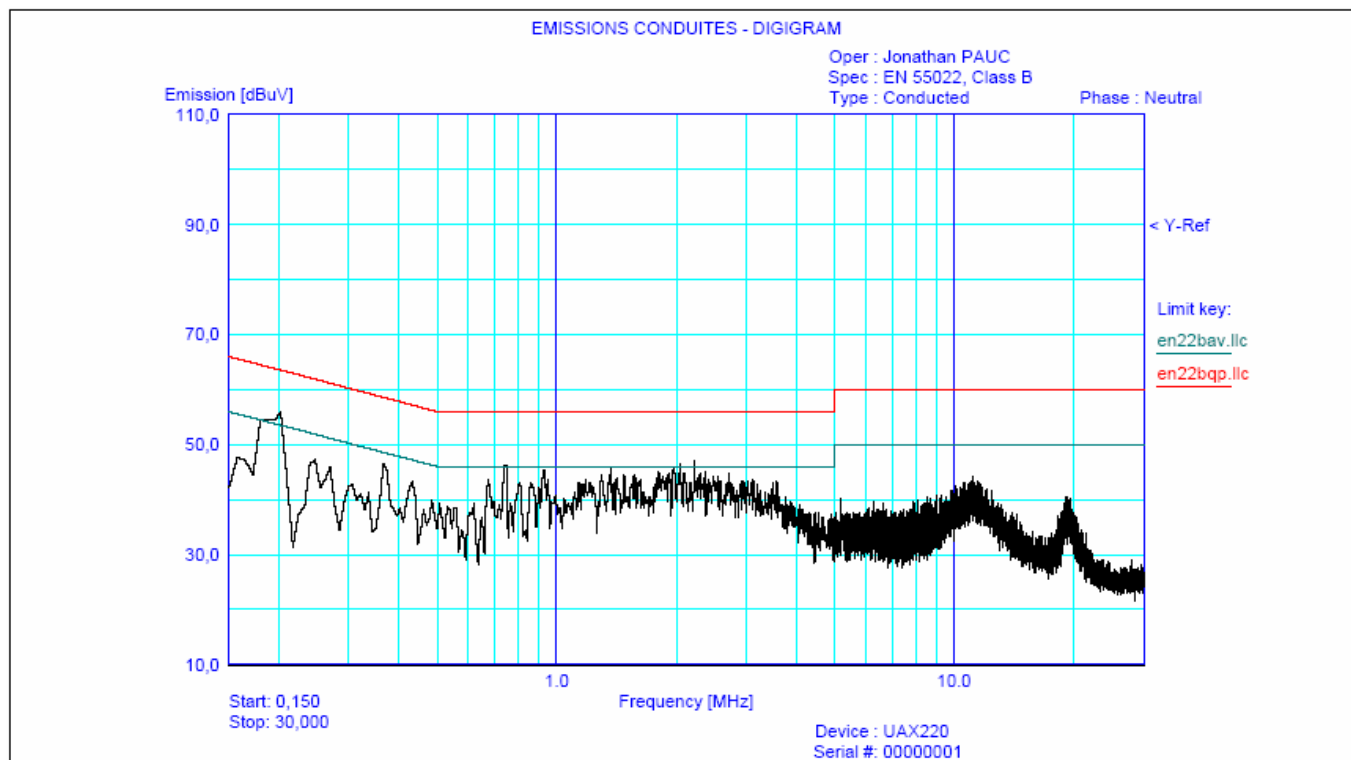
3.3.1. Line conducted emission data (110V@60Hz)



Marker ▽	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0,160	48,70	45,87	42,83	54,00
2	0,180	55,47	53,82	50,74	54,00
3	0,200	54,40	52,74	47,86	52,00
4	0,250	47,60	45,34	43,38	50,00
5	0,310	44,55	42,27	40,13	50,00
6	0,370	46,72	41,16	36,71	48,00
7	0,740	46,55	43,46	37,41	46,00
8	0,930	45,11	42,02	36,96	46,00
9	0,990	44,62	41,03	36,06	46,00
10	1,110	43,23	39,45	34,49	46,00
11	1,210	45,12	41,69	36,86	46,00
12	1,370	45,64	42,20	37,81	46,00
13	1,550	44,88	41,25	36,16	46,00
14	1,780	43,79	39,34	34,97	46,00
15	2,000	46,75	43,51	38,21	46,00
16	2,020	44,04	40,17	35,73	46,00
17	19,46	41,75	37,48	27,92	50,00
18	2,890	44,00	38,30	33,00	46,00



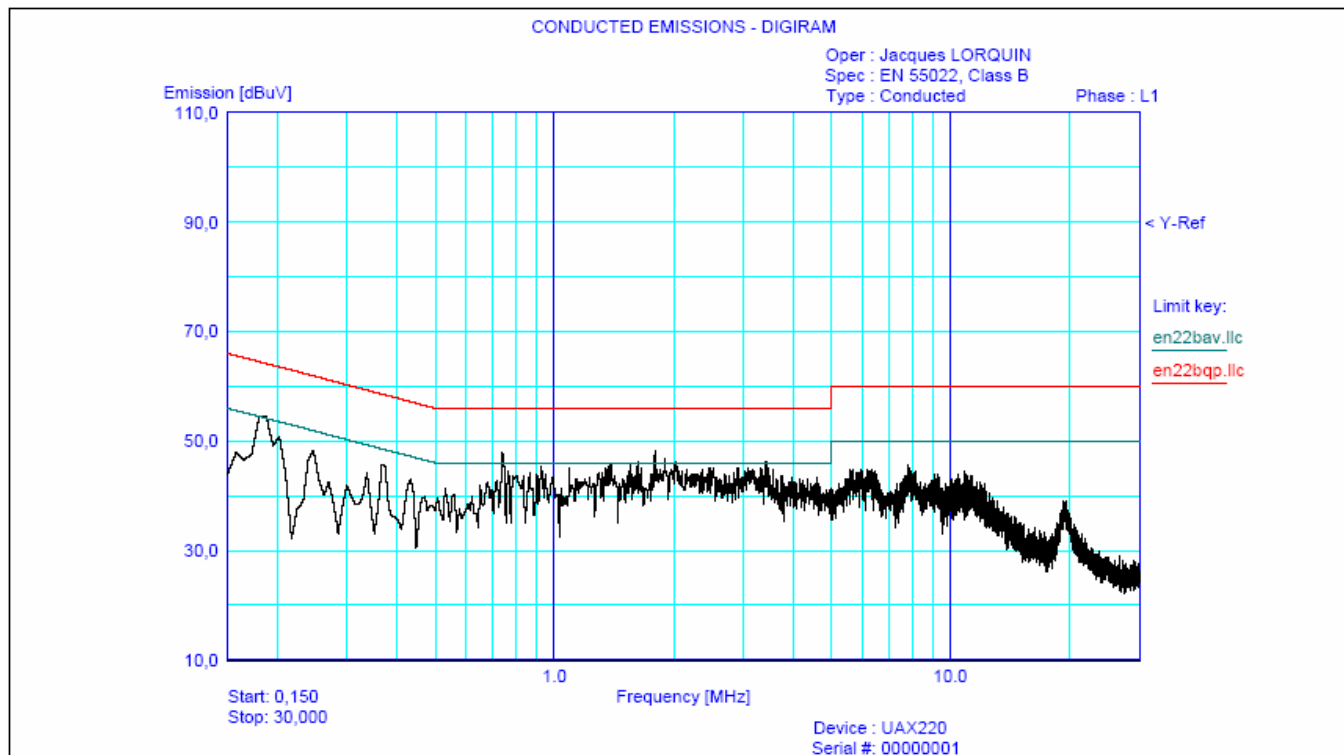
3.3.2. Neutral conducted emission data (110V@60Hz)



Marker ▽	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0,180	55,72 *	53,69	51,00	54,00
2	0,200	56,55 *	54,93 *	48,11	52,00
3	0,250	47,76	45,66	44,19	50,00
4	0,370	47,57	44,77	40,17	48,00
5	0,440	43,28	40,27	35,46	46,00
6	0,670	46,19 *	40,84	35,37	46,00
7	0,740	47,29 *	44,40	39,20	46,00
8	0,860	42,80	39,79	36,17	46,00
9	0,930	47,42 *	43,50	38,54	46,00
10	1,290	45,21	41,48	36,55	46,00
11	1,970	45,49	38,87	33,08	46,00
12	2,040	46,90 *	41,71	36,01	46,00
13	2,220	44,22	40,37	35,52	46,00
14	2,720	42,64	38,01	32,16	46,00



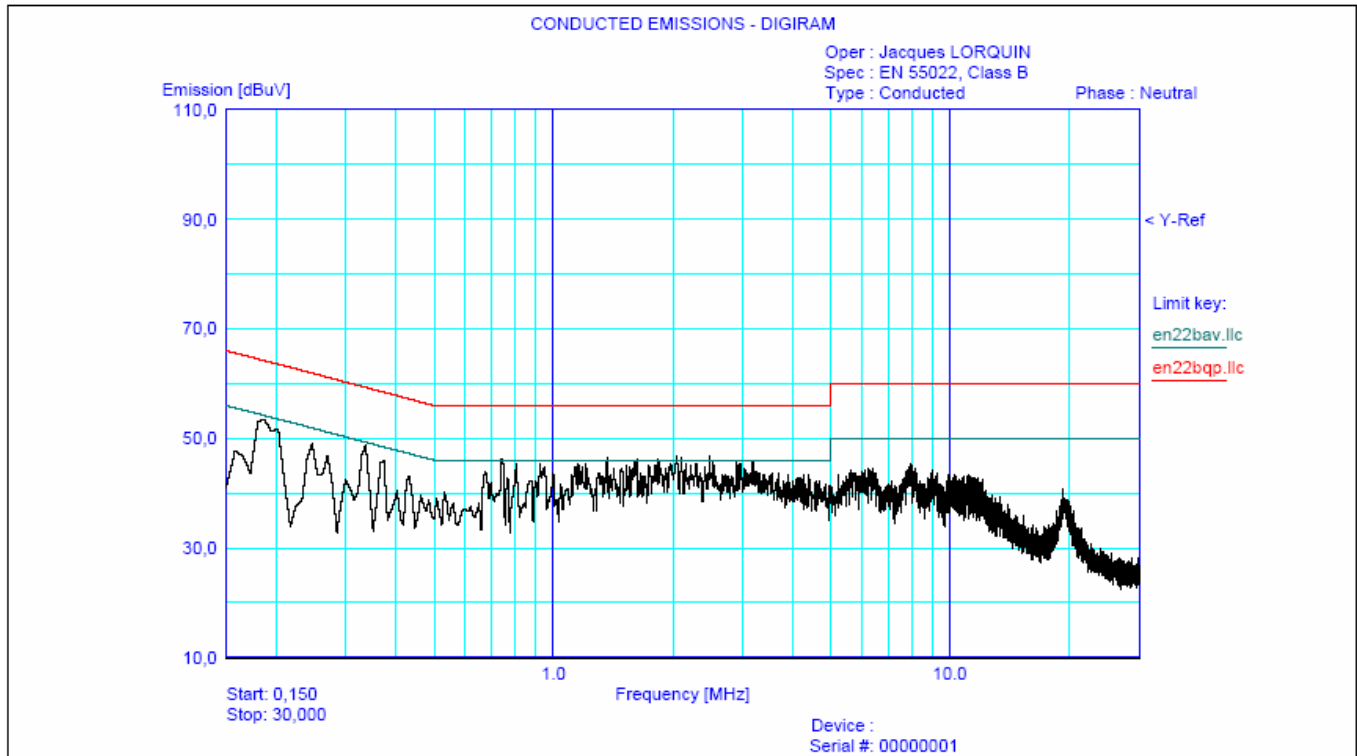
3.3.3. Line conducted emission data (230V@50Hz)



Marker ▽	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0,160	49,99	46,24	41,37	54,00
2	0,180	55,34 *	53,03	48,52	54,00
3	0,200	51,83	50,00	44,27	52,00
4	0,240	48,49	47,14	44,25	50,00
5	0,270	45,72	40,58	34,30	50,00
6	0,300	43,11	39,66	35,61	50,00
7	0,740	48,45 *	44,99	39,75	46,00
8	0,760	45,14	42,19	36,92	46,00
9	1,790	45,12	41,22	36,55	46,00
10	1,900	45,40	40,43	35,38	46,00
11	2,020	46,26 *	42,56	36,99	46,00
12	3,360	45,72	41,66	36,40	46,00
13	3,420	45,08	40,40	34,26	46,00



3.3.4. Neutral conducted emission data (230V@50Hz)



Marker ▽	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0,160	48,48	46,11	41,09	54,00
2	0,180	55,65 *	52,95	48,35	54,00
3	0,200	52,94 *	51,22	43,90	52,00
4	0,250	47,85	45,87	42,59	50,00
5	0,270	48,16	43,92	35,59	50,00
6	0,330	49,64 *	47,94	37,98	48,00
7	0,370	47,85	45,26	41,15	48,00
8	2,040	46,14 *	42,64	37,31	46,00
9	2,100	47,18 *	40,52	34,41	46,00
10	2,480	44,44	40,40	34,80	46,00
11	0,740	48,31 *	43,69	38,73	46,00
12	0,810	47,55 *	41,55	38,70	46,00
13	1,160	44,79	41,93	36,65	46,00
14	1,370	46,86 *	43,19	38,66	46,00
15	2,960	46,31 *	40,83	34,92	46,00

End of Tests