Actions Mesures

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EMC TEST REPORT

Nr 2730-FCC

This test report applies only on equipment described hereafter.

Proposal number : 200304-2197

Date of test..... : April 18th and 23rd , 2003

Location ..... : SMEE *Actions Mesures* Laboratory - 38 VOIRON

Performed by ..... : Laurent CHAPUS

Customer ..... : **DIGIGRAM SA** (Represented by M. Rodolphe Archambault)
Parc Technologique Pré Milliet
F- 38330 MONTBONNOT SAINT MARTIN
FRANCE

Product ..... : **ES 8 IN / ES 8 OUT**

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

Applied standards or specification: EN55022 (1999) +/A1: (2000)
CISPR22 (1997) +/A1: (2000)
ANSI C63-4 (1992)

Level ..... : CISPR 22 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 and CISPR22 standards (class B), in radiated and conducted emissions.**

Written by ..... : Laurent CHAPUS

Date : May 20th , 2003

Approved by ..... : Jacques LORQUIN

1. System test configuration

1.1. Justification

The system was configured for testing in a typical fashion (as a customer would normally use it).
ES8 OUT and ES8 IN are tested individualy.
While testing the ES8 IN, an ES8 OUT equipment is necessaire and is being considered as an auxiliayry for the test.
While testing the ES8 OUT, an ES8 IN equipment is necessaire and is being considered as an auxiliayry for the test.
Ethersound ES8in and ES8out equipment are connected together in normal use in order to make a chain and to distribute audio channels with an Ethernet link.

1.2. HARDWARE IDENTIFICATION:

- **Equipment Under Test (EUT):** **ES8 OUT** **Sn : 0051**
  ES8 IN **Sn : 0053**
  XLR and Terminal Block models

- Input/output :

- 1x Mains power input 100V/230Vac 50Hz
- 1x Ethernet IN (100 Mbits/s)
- 1x Ethernet OUT (100 Mbits/s)
- 1x RS2332
- 2x GPIO 8-points terminal block connectors (General Purpose Input/Output) (4 optocoupled inputs and 4 relay outputs)
- 8x Analog audio outputs **on ES8 OUT** (XLR-3 or terminal block connectors)
- 8X Analog audio inputs **on ES8 IN** (XLR-3 or terminal block connectors)

- Frequencies : 50 MHz – 12.288 MHZ – 11.2896 MHz – 14.7456MHz

1.3. 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 ES8 OUT * (sn: 0051) **DIGIGRAM ES8 IN * (sn: 0051)** ***XLR and terminals block models***	**IGTES8**	**Ethernet Audio bridges**	Standard power cable unshielded, Ethernet FTP cables RS232 shielded cable Analog audio IN/OUT lines, shielded. GPIO cables, unshielded
DIGIGRAM (sn: none)	None	I/O Load box	Standard power cable (only for earth connection)

* : Equipment under test

1.4. Running mode :

ES8 OUT and ES8 IN are tested individualy.

ES8 OUT tested : For testing the **ES8 OUT**, its Ethernet IN port is receiving signal from the OUT port of an ES8 IN equipment. Its Ethernet OUT port is connected to an IN port of an ES8 OUT (not powered, used as an auxiliary) in order to simulate typical load on the port.
Analog outputs are connected to the load box (13k?).
See figure#1 for wiring diagram.

ES8 IN tested : For testing the **ES8 IN**, its Ethernet OUT port is sending signal to the IN port of an ES8 OUT equipment. Its Ethernet IN port is connected to an ES8 IN (not powered, used as an auxiliary) in order to simulate typical load on the port.
Analog inputs are connected to the load box (47?).
See figure#2 for wiring diagram.

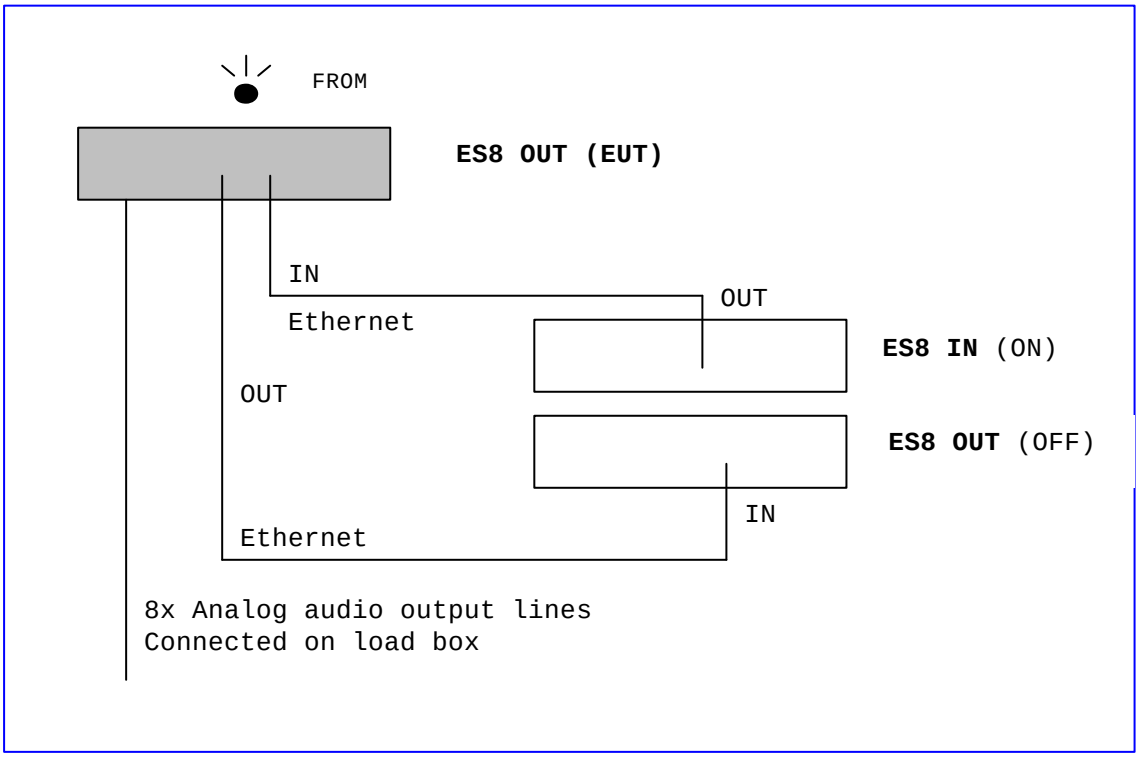


Figure #1

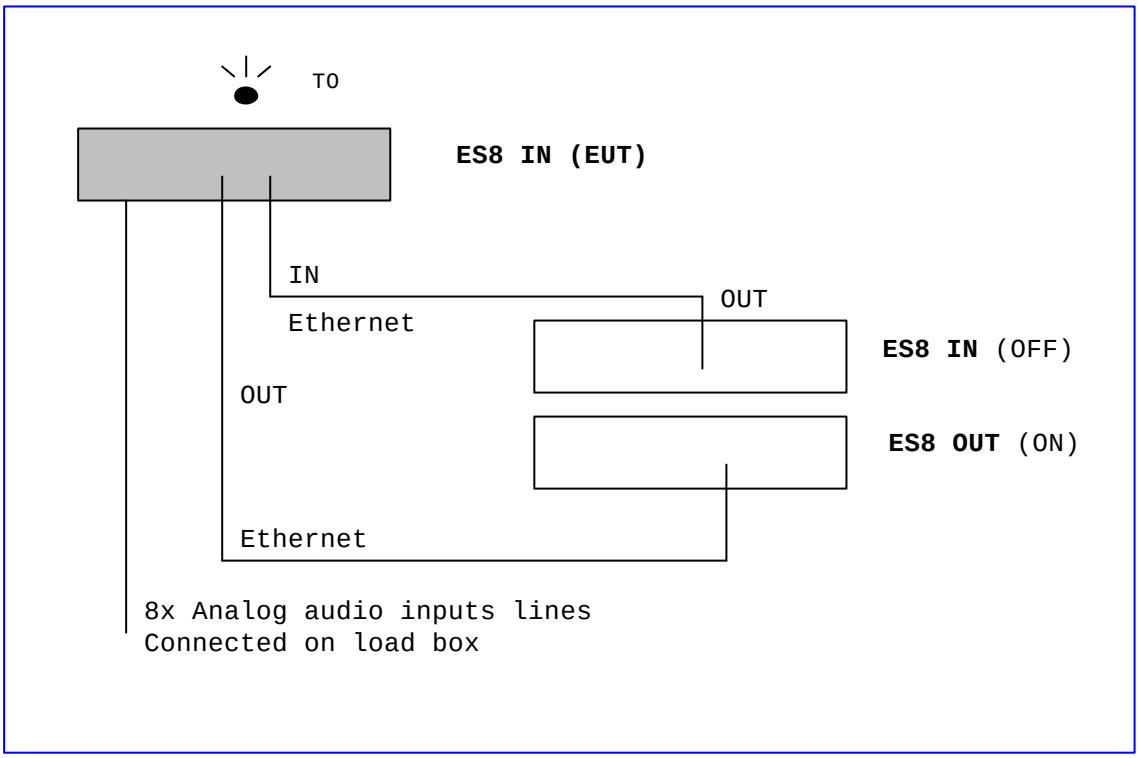


Figure #2

1.5. I/O cables

- 1x Power cord, unshielded : 1.5m
- 1x Shielded serial RS232 cable, SubD9 connector : 1.5m.
- 2x Ethernet FTP Cat5e (shielded) cable : 5m
- 8x XLR cords, shielded : 2m
- 8x GPIO wires, unshielded : 0.7m

1.6. Equipment modifications

No equipment modification has been necessary during testing to achieve compliance to Class B levels. The unit tested was representative to a production unit.

2. Radiated emission data

2.1. SET-UP

Mains: 230V@50Hz
The equipment under test is set on a non-conducted table of 80cm height, above the ground plane. Equipment used as an auxiliairy is set on the floor (in order to minimized its own radiated emission)

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.

2.2. TEST EQUIPMENT

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

Equipment	Company	Model	Serial	Calibration Due
Spectrum Analyzer	HP	8568B	2732A04140	May, 2005
Quasi-Peak adapter	HP	85650A	2811A01136	May, 2005
RF Pre-selector	HP	85685A	2833A00773	May, 2005
Biconical Antenna	EMCO	3104C	9401-4636	May, 2004
Log Periodic Antenna	EMCO	3146	2178	May, 2004
Absorbing clamp	LÜTHI	MDS21	2826	September, 2003
Absorbing clamp	R&S	85024A	194.0100.50	September, 2003
Tube ferrite	LÜTHI	MDS101	4485	September, 2003
OATS				May, 2004

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

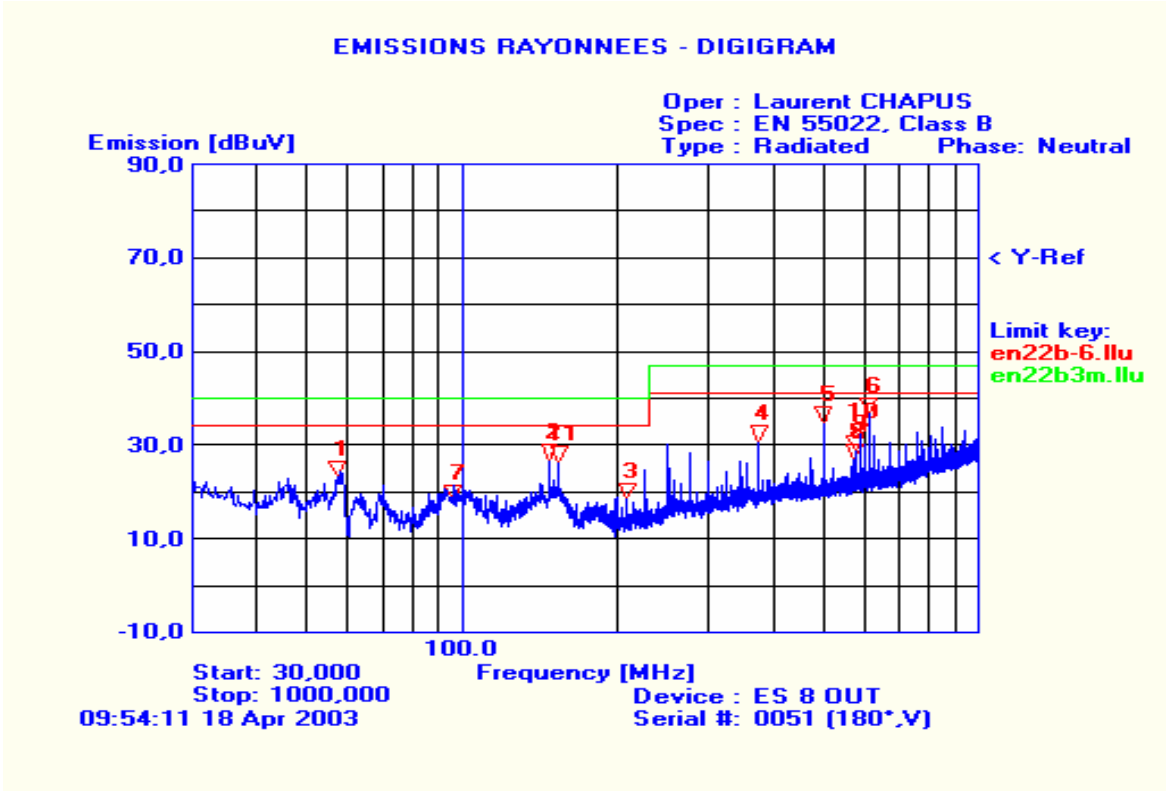
Pre-scan, test Equipment from 30MHz to 1GHz:

Equipment	Company	Model	Serial	Calibration Due
EMC Analyzer	HP	8591EM	3536A00384	March, 2004
Amplifier	HP	8447F H64	3113A06394	May, 2004
Antenna (30MHz-1GHz)	CHASE	CBL6111A	1628	May ,2004
Absorbing clamp	LÜTHI	MDS21	2826	September 25th ,2003
Absorbing clamp	R&S	85024A	194.0100.50	September 25th ,2003
Tube ferrite	LÜTHI	MDS101	4485	September 25th ,2003

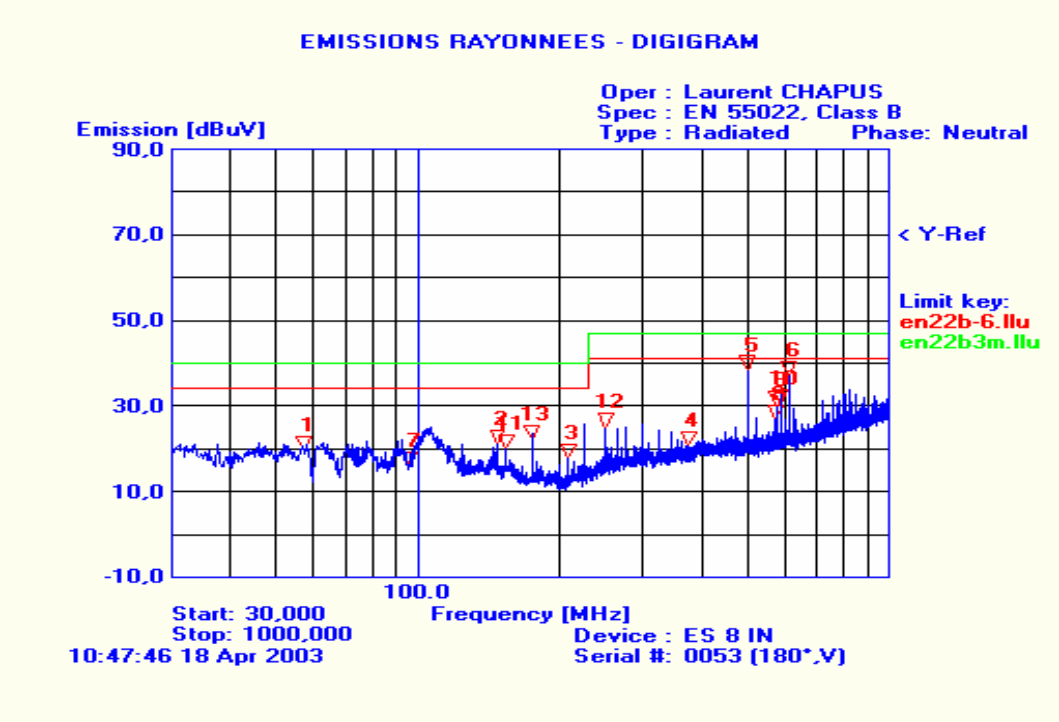
2.3. TEST SEQUENCE AND RESULTS

2.3.1.Pre-characterization at 3 meters

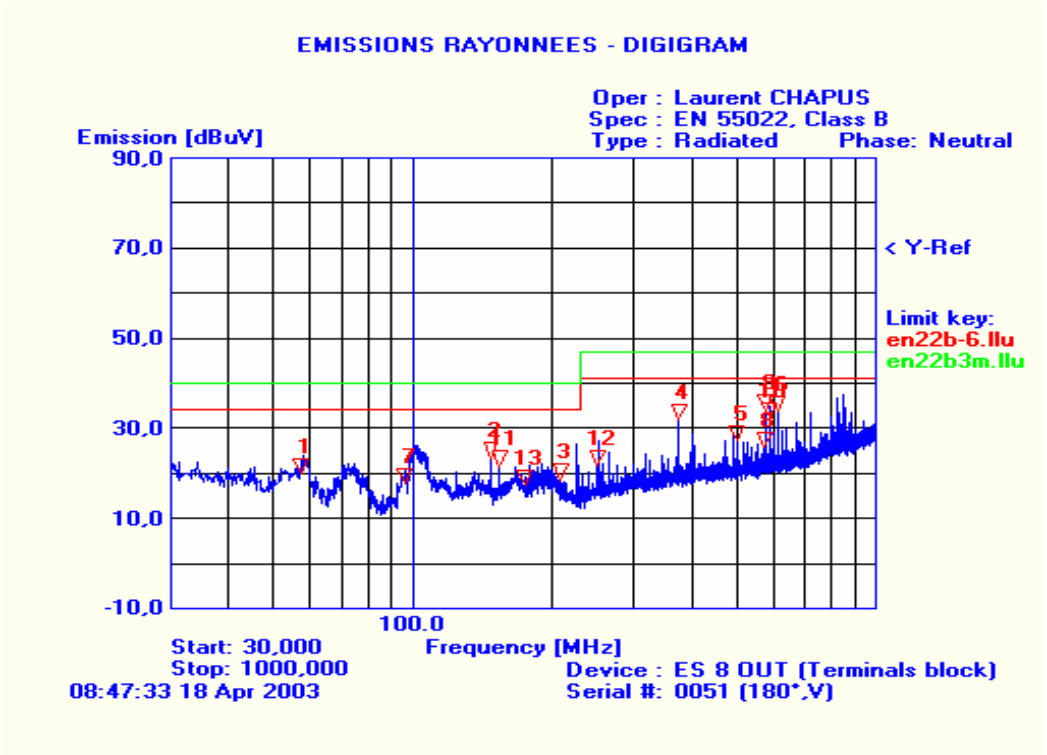
A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber. The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) polarization, and on 4 faces of the EUT. See below for graph examples.
ES8 IN and ES8 OUT models with XLR or Terminal block connectors are tested in the 3 meters anechoic chamber.



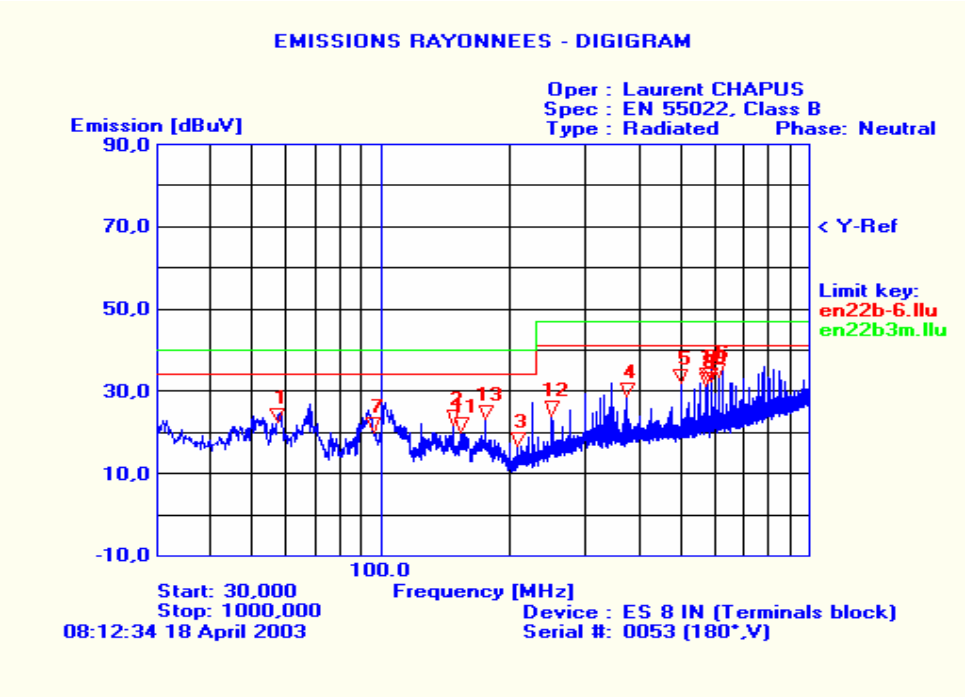
Graph [30MHz-1GHz] ES8 OUT – XLR connectors



Graph [30MHz-1GHz] ES8 IN – XLR connectors



Graph [30MHz-1GHz] ES8 OUT – Terminal block



Graph [30MHz-1GHz] ES8 IN – Terminal block

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

The product has been tested according to ANSI C63.4-(1992), CISPR22-1997/A1:2000 and EN55022:1998/A1:2000. Radiated Emission were measured on an open area test site. A description of the facility is on file with the FCC.

The product has been tested with 230V@50Hz power line voltage, at a distance of 10 meters from the antenna and compared to the CISPR 22 Class B limits. Measurement bandwidth was 120kHz from 30MHz 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.

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.

ES8 IN results

Frequency (MHz)	QPeak Lmt (dBµV/m)	QPeak (dBµV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)	Comments
147.464	30.0	21.8	**-8.2**	210	V	338	15.1	
175.023	30.0	25.4	**-4.6**	235	V	107	18.1	
225.026	30.0	25.8	**-4.2**	212	H	385	15.6	
250.031	37.0	25.0	**-12.0**	308	H	373	15.5	
500.036	37.0	34.5	**-2.5**	176	V	104	22.1	
577.543	37.0	31.8	**-5.2**	233	H	250	23.2	
589.812	37.0	29.4	**-7.6**	190	V	241	23.4	
614.410	37.0	35.5	**-1.5**	184	H	193	23.9	

ES8 OUT results

Frequency (MHz)	QPeak Lmt (dBµV/m)	QPeak (dBµV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)	Comments
174.986	30.0	23.6	**-6.4**	217	V	398	18.1	
225.027	30.0	23.6	**-6.4**	285	H	349	15.6	
500.035	37.0	33.8	**-3.2**	136	H	222	22.1	
614.410	37.0	35.4	**-1.6**	224	H	156	23.9	

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 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.

3. Conducted emission data

The product has been tested according to ANSI C63.4-(1992), CISPR22-1997/A1:2000 and EN55022:1998/A1:2000.

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

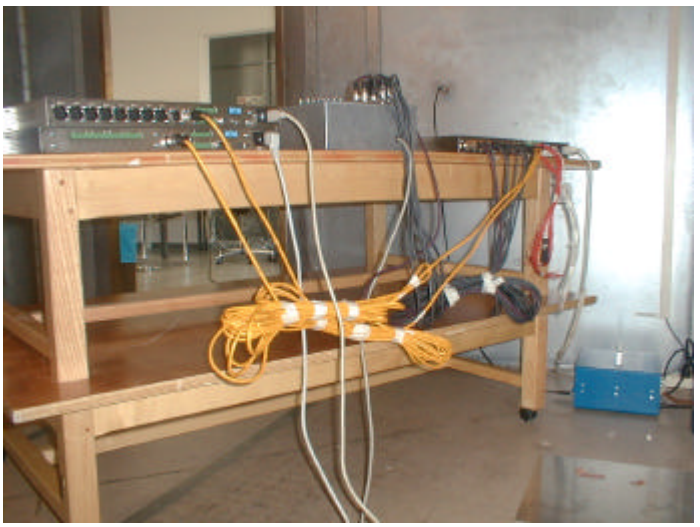
Measurement was initially made with an HP-8591EM Spectrum Analyzer in peak mode. This was followed by a Quasi-Peak, i.e. CISPR measurement with the Rohde & Schwarz ESH3 receiver for any strong signal. If the average limit is met when using a Quasi-Peak detector, the EUT shall be deemed to meet both limits 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



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 / 50µH) and auxiliaries are powered by another LISN.
The distance between the EUT and each auxiliary is 10cm.

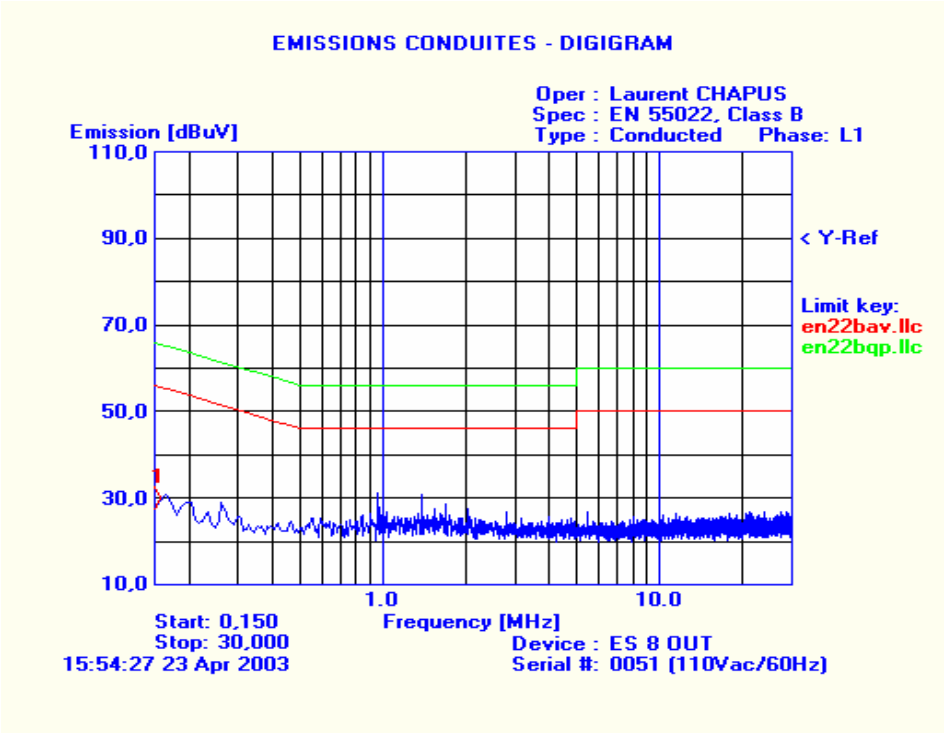
3.2. TEST EQUIPMENT

Equipment	Company	Model	Serial	Calibration Due
EMC Analyzer	HP	8591EM	3536A00384	March, 2004
Test receiver	Rohde&Schwarz	ESH3	872079/117	May, 2005
Transient Limiter	HP	11947A	3107A01596	May, 2004
LISN(auxiliary)	EMCO	3810/2SH	9511-11821628	December 12th ,2003
LISN(measure) 50Ω / 50µH	Telemeter Electronis	TGmbH NNB 2/16	9511-11821628	September 13th ,2003
Faraday room	Rayproof		4854	none

3.3. TEST SEQUENCE AND RESULTS

Measures are performed on line 1 and neutral of the power supply of each of the ES8 IN and ES8 out equipment.

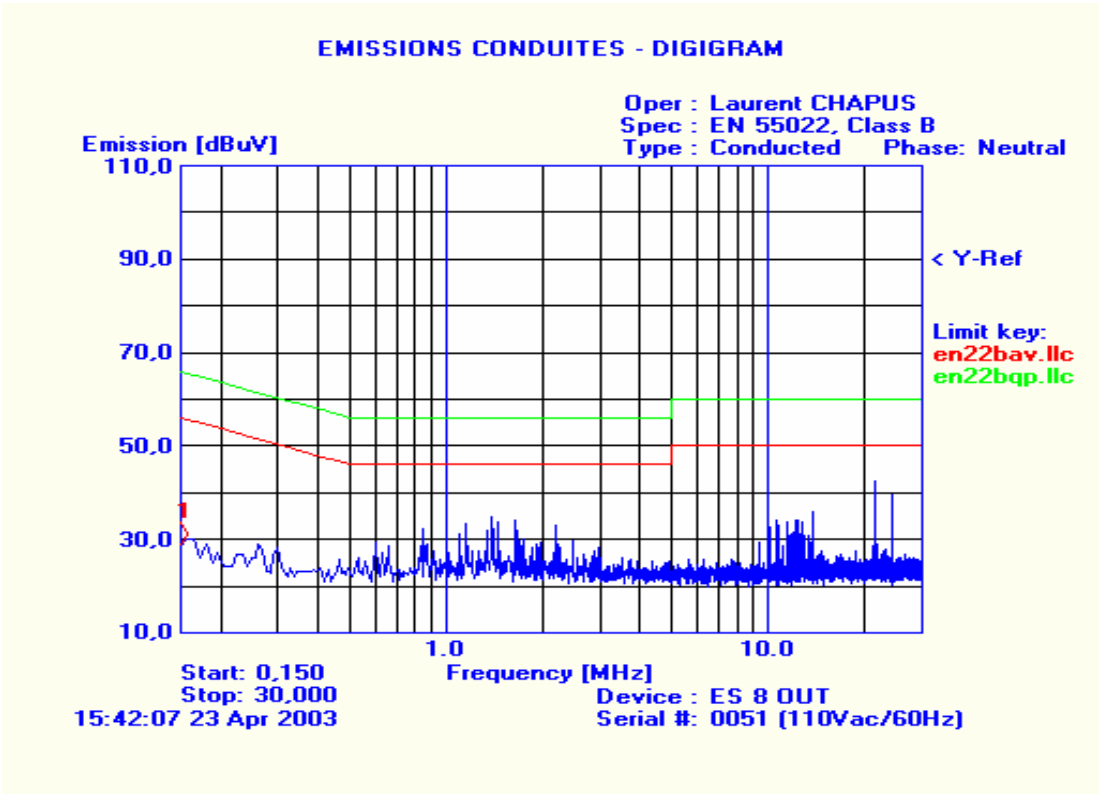
3.3.1.Line conducted emission data (110V@60Hz) on ES8 OUT



ES8 OUT – Line L1

Num.	Freq. [MHz]	Peak [dBµV]	Q-Peak [dBµV]	QP limit [dBµV]	QP delta [dBµV]	Average [dBµV]	AVG Limit [dBµV]	AVG Delta [dBµV]	Comment.
1	0.170	34.13	25.3	64.0	**-38.7**	16.25	54.0	**-37.75**	

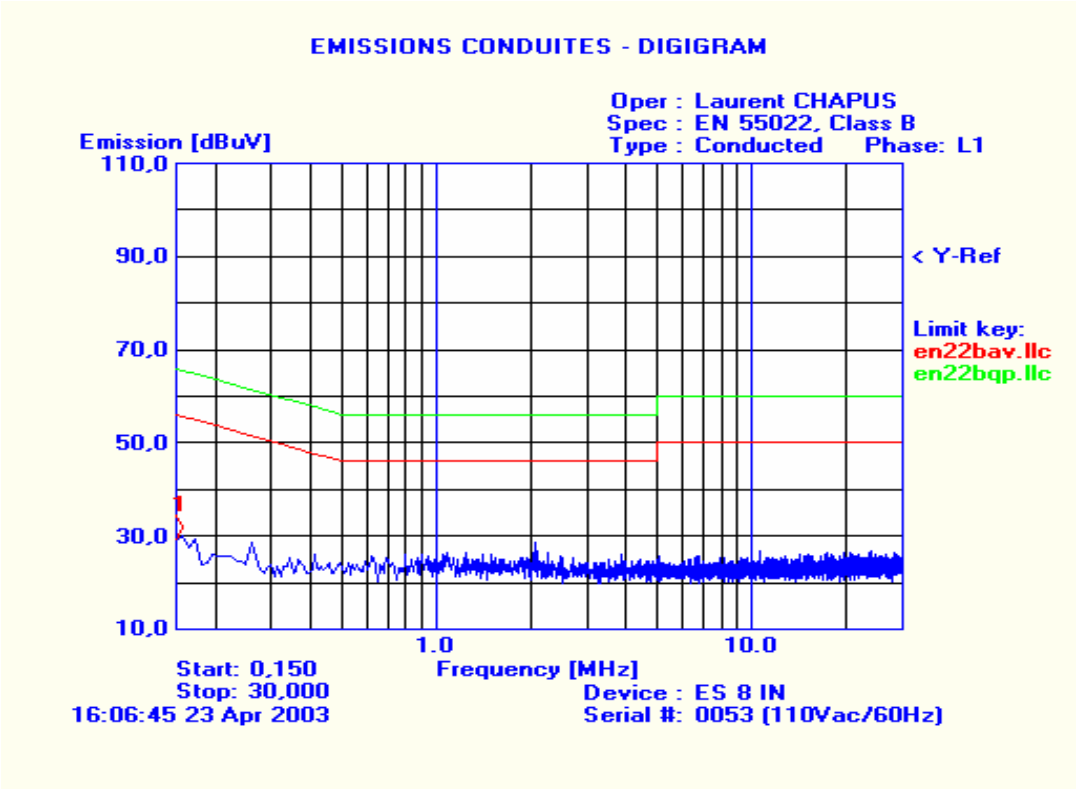
3.3.2.Neutral conducted emission data (110V@60Hz) on ES8 OUT



ES8 OUT – Neutral

Num.	Freq. [MHz]	Peak [dBµV]	Q-Peak [dBµV]	QP limit [dBµV]	QP delta [dBµV]	Average [dBµV]	AVG Limit [dBµV]	AVG Delta [dBµV]	Comment.
1	0.160	33.66	25.6	64.0	**-38.4**	17.24	54.0	**-36.76**	
All other frequencies shown are transients – No QP or avererage signal found.									

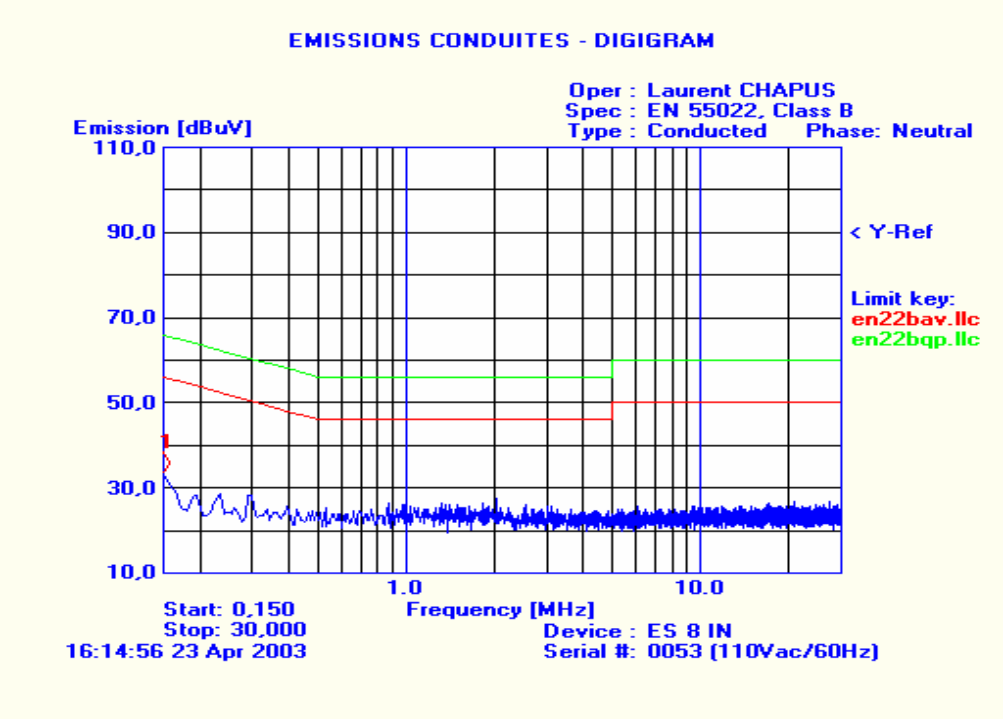
3.3.3.Line conducted emission data (110V@60Hz) on ES8 IN



ES8 IN – Line L1

Num.	Freq. [MHz]	Peak [dBµV]	Q-Peak [dBµV]	QP limit [dBµV]	QP delta [dBµV]	Average [dBµV]	AVG Limit [dBµV]	AVG Delta [dBµV]	Comment.
1	0.170	34.13	27.0	64.0	**-37.0**	16.62	54.0	**-37.38**	

3.3.4.Neutral conducted emission data (110V@60Hz) on ES8 IN



ES8 IN – Neutral

Num.	Freq. [MHz]	Peak [dBµV]	Q-Peak [dBµV]	QP limit [dBµV]	QP delta [dBµV]	Average [dBµV]	AVG Limit [dBµV]	AVG Delta [dBµV]	Comment.
1	0.170	33.8	26.1	64.0	**-37.9**	17.6	54.0	**-36.4**	

End of Tests