Actions Mesures

Z.I. des Blanchisseries – 38500 VOIRON – Tél. +33(0)4 76 65 76 50 – Fax +33(0)4 76 66 18 30 – www.smee.fr

EMC TEST REPORT

Nr 3408-FCC

This test report applies only on equipment described hereafter.

Proposal number: 200504-2678

Date ..... :	May 7th, 2005
Location ..... :	SMEE *Actions Mesures* Laboratory - 38 VOIRON
Performed by ..... :	Jacques LORQUIN
Customer**..... :**	**ASK** 15, Traverse des Brucs 06560 SOPHIA ANTIPOLIS FRANCE

Product..... :	**LDB307**
Type of test ..... :	**Conducted and Radiated Emission Test**

Applied standards ..... :	ANSI C63-4 (2003) 47 CFR Part 15 Subpart C

Result of tests..... :	**Radiated Emission : Comply** **Conducted Emission : Comply**

The reproduction of this test report is authorized only under its entire form. This report contents 19 pages.

Written by ..... :	Jacques LORQUIN	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).

1.2. HARDWARE IDENTIFICATION:

Equipment under test (EUT): **FCCID: QYELDB3-RDDE05078**

➢ **LDB307 pn: DE-05078-11 sn: 05180005**

- Input/output:
  Power supply: 12Vdc
  USB connector
- Size: 190x135x60mm
- Frequencies: 847kHzMHz; 13.560MHz, 3.68MHz
  27.120MHz
  Bit rates: 460kB/s
  (no clock or signal higher than 108 MHz)

1.3. Auxiliaries

The FCC IDs for all equipment, more description of all cables used in the tested system are :

Trade Mark – Model Number (Serial number)	FCC ID	Description	Cable description
LDB307 pn:DE-05078-11* (sn: 05180005)	**QYELDB3-RDDE05078**	**RFID reader**	**Power cord unshielded. USB cable shielded**
Compit MPP15 model:FW75550/12 (sn: none)	none	AC/DC Power supply	Power cord unshielded.
DELL Latitude D600 (sn: CNOD2125-48643-4CH-1711)	D.O.C.	Laptop	Power cord unshielded. All other cable shielded.
DELL model: PA-1650-05D (sn: CN05U092-71615-4CG-5F65)	none	AC/DC power supply for laptop	Power cord unshielded
TELEX pn: none (sn: 700373-000A)	none	microphone	Shielded cable
Philips type A	none	TAG	
Compaq 2144EA ① (sn: CN31702610)	D.O.C.	Laptop	Power cord unshielded. All other cable shielded.
Hewlett Packard ① (sn: MTT0310051940)	none	AC/DC power supply for laptop	Power cord unshielded

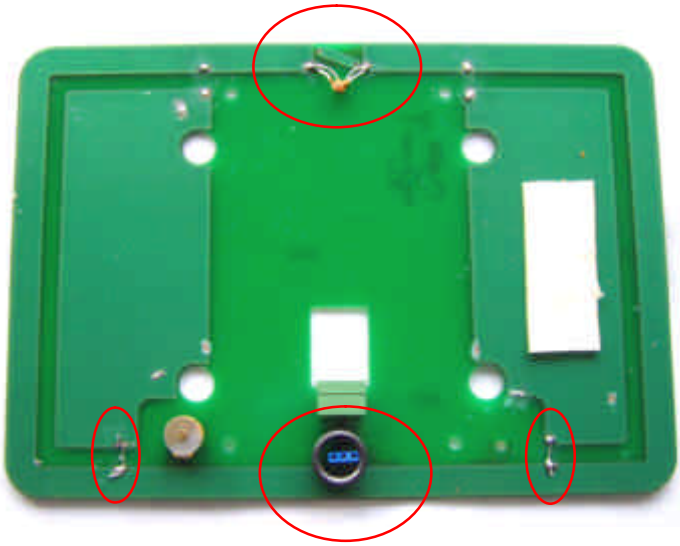
*** : Equipment under test.**
① : Auxiliaries equipement used for conducted measurements.

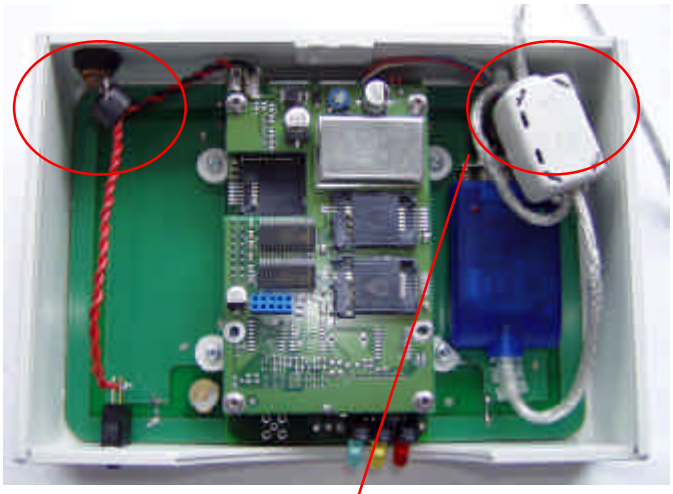
1.4. Equipment modifications

Modifications apply on product:

- A Ferrite Wurth N°742 711 32 is set inside the EUT on USB cable (2 turns).
- Ferrites Wurth N°742 711 17 are set inside the EUT on power supply (1 turn) cord and on the antenna connector (see photo for more details).
- A ferrite Wurth N°742 711 17 is set on the serial cable (2 turns).
- 10 pF is set on antenna shield.

- The two metallic plan of the antenna are connected on the shield of antenna via 2 points (see photo for more details).





Wurth N°742 701 17 on serial cable

1.5. EUT Exercise software

The EUT exercise program used during radiated and conducted testing was designed to exercise the equipment under test in a manner similar to a typical use (Read tag ID):

ASK polling V4.07d running under windows 2000 professionnel.

1.6. I/O cables

- Standards power cord Length:0.8m (power supply of laptop)
- LAN cable STP CAT 5e, length: 2m
- 1x serial cable HP#24542G, shielded, length:2.8m

2. Radiated emission data

2.1. SET-UP

The EUT is placed on a non-conducting table of 80cm height. A Tag type A is set on the EUT.

Equipment configuration and running mode:

- EUT is ON;
- software is running;

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

2.2. TEST EQUIPMENT

Test Equipment up 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
Spectrum Analyzer	HP	8593E	3409u00537
Loop antenna	Electro-metrics	EM-6879	690234
Amplifier	HP	8447F H64	3113A06394

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

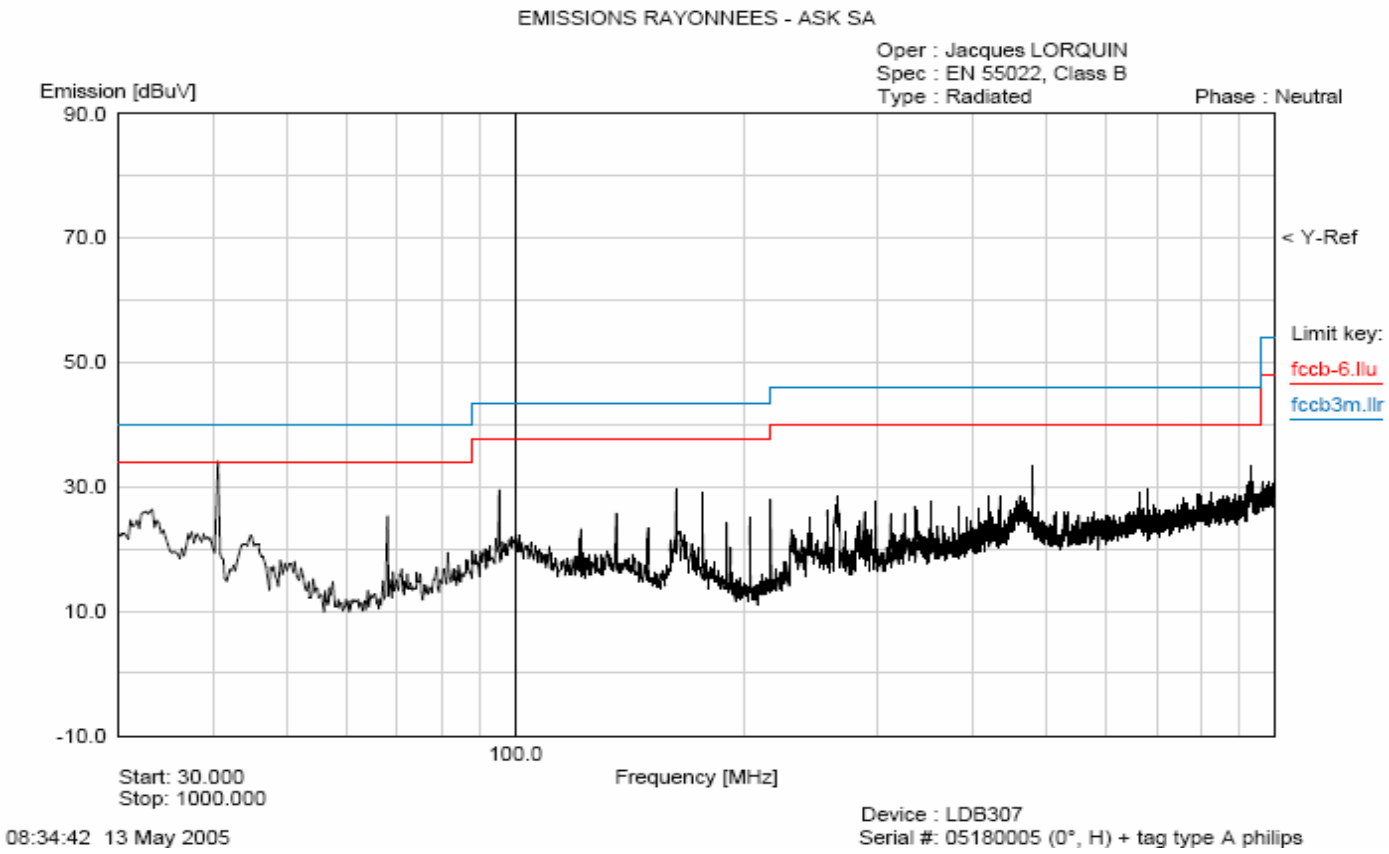
Pre-scan, test Equipment up to 1GHz:

Equipment	Company	Model	Serial
EMC Analyzer	HP	8591EM	3536A00384
Amplifier	HP	8447F H64	3113A06394
Antenna (30MHz-1GHz)	CHASE	CBL6111A	1628
Loop antenna	Electro-metrics	EM-6879	690234

2.3. TEST SEQUENCE AND RESULTS

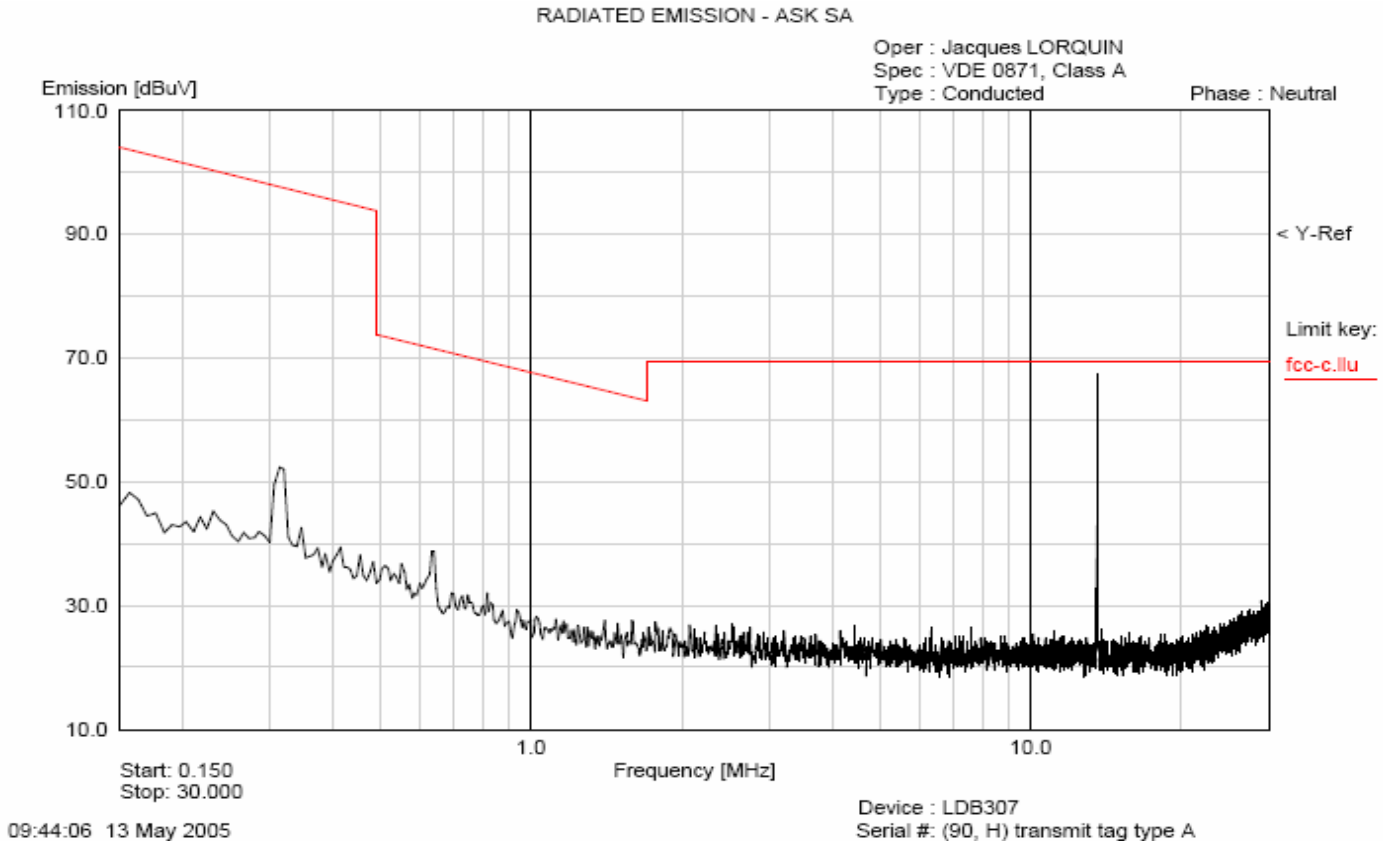
2.3.1.Pre-characterization at 3 meters from 30MHz to 1GHz

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 a graph example:

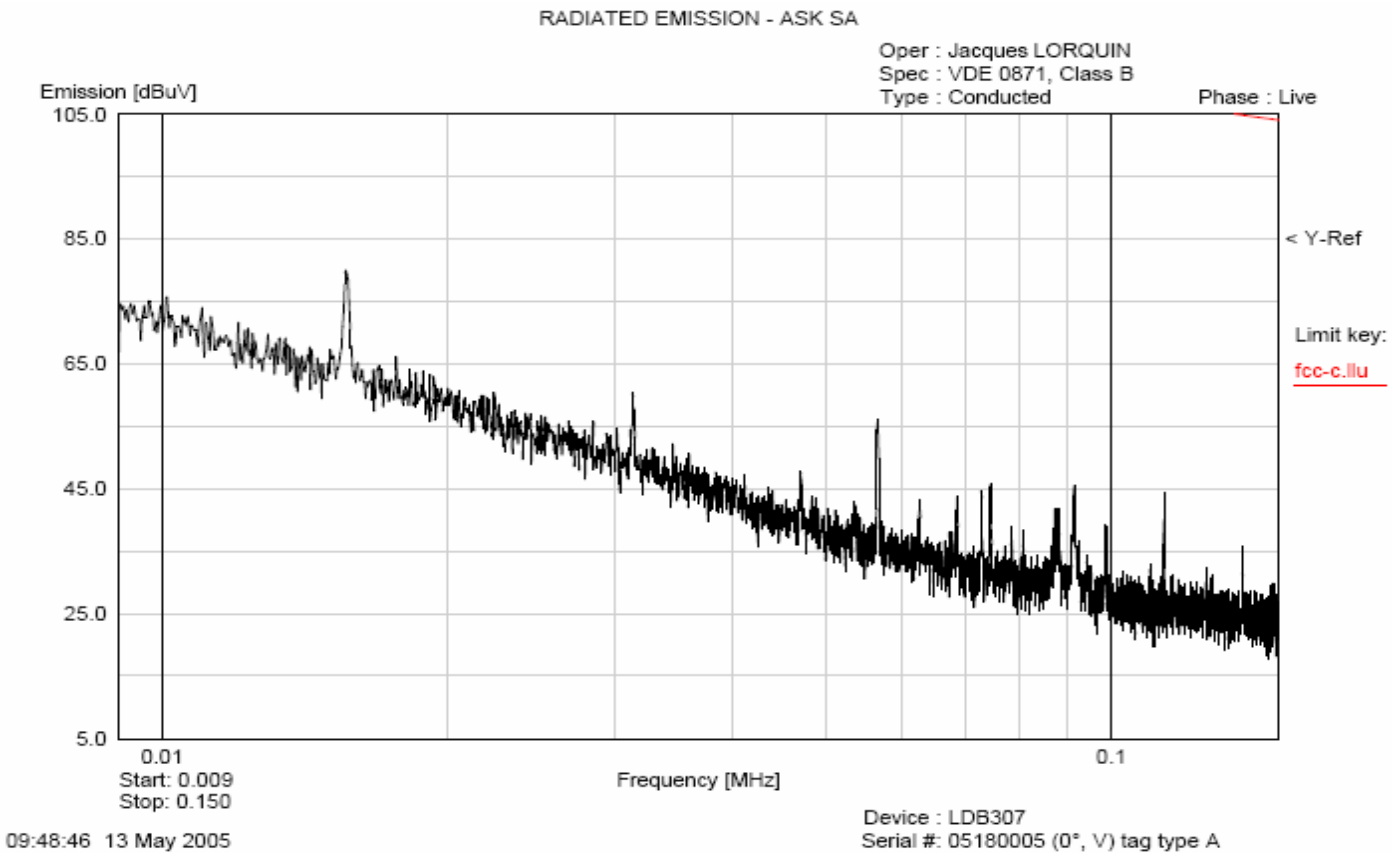


2.3.2.Pre-characterization at 3 meters below 30MHz

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) axis and the loop antenna position was rotated during the test for maximized the emission measurement. See below for a graph example:



Result below 30 MHz


RADIATED EMISSION - ASK SA
Oper : Jacques LORQUIN
Spec : VDE 0871, Class B
Type : Conducted
Phase : Live
Emission [dBuV]
105.0
85.0
65.0
45.0
25.0
5.0
< Y-Ref
Limit key:
fcc-c.lu
0.01
0.1
Start: 0.009
Stop: 0.150
Frequency [MHz]
Device : LDB307
Serial #: 05180005 (0°, V) tag type A
09:48:46 13 May 2005

2.3.3.Characterization on 3 meters open site from 30MHz to 1GHz

The product has been tested according to ANSI C63.4-(2003), FCC part 15 subpart C. Radiated Emission was 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 FCC part 15 subpart 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.

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.

No	Frequency (MHz)	QPeak Lmt (dBµV/m)	QPeak (dBµV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)	Comments
1	40.684	40.0	38.3	**-1.7**	330	V	370	11.4	*
2	68.264	40.0	29.7	**-10.3**	310	V	130	10.1	*
3	81.368	40.0	37.5	**-2.5**	325	V	220	9.0	*
4	122.075	43.5	36.4	**-7.1**	195	H	400	15.7	*
5	135.616	43.5	43.3	**-0.2**	335	V	150	14.6	*
6	149.207	43.5	35.4	**-8.1**	190	V	150	15.2	*
7	189.851	43.5	37.9	**-5.6**	220	V	160	18.6	*
8	216.946	46.0	34.9	**-11.1**	190	V	140	13.5	*
9	230.539	46.0	36.4	**-9.6**	185	V	150	13.8	*
10	257.628	46.0	36.1	**-9.9**	190	V	140	14.8	*
11	678.010	46.0	37.3	**-8.7**	15	H	190	24.7	*

*: Measures have been done at 10m distance and corrected following requirements of 15.31

2.3.4.Characterization on 10 meters open site below 30 MHz

The product has been tested with 230V / 50Hz power line voltage, at a distance of 10 meters from the antenna and compared to the FCC part 15 subpart C §15.209& §15.225 limits. Measurement bandwidth was 9kHz from 150kHz to 30 MHz and 100 Hz from 9 kHz to 150 kHz.

The loop antenna position was rotated to locate the orientation that maximized emission reception during testing. Antenna search was performed 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 (MHz)	QPeak Lmt (dBµV/m)	QPeak (dBµV/m)	QPeak-Lmt (dB)	Angle EUT (deg)	Pol	Angle Ant. (deg)	Tot Corr (dB)
13.56*	84	50.0	**-34**	0	vertical	90	35.4
27.12*	29.5			No traceable signal			

* Measure have been done at 10m distance and corrected following requirements of 15.209.e)

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-(2003) and FCC Part 15 subpart C.

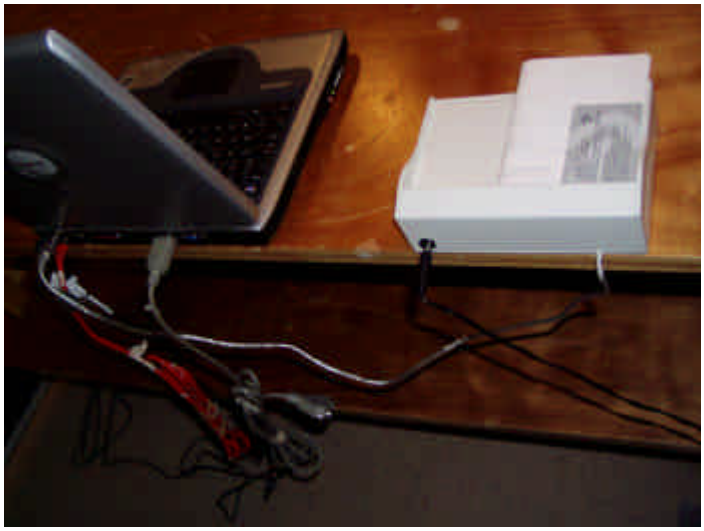
The product has been tested with 110V/60Hz power line voltage and compared to the FCC Part 15 subpart C §15.207 limits. Measurement bandwidth was 9kHz from 150kHz to 30MHz.

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



The EUT is placed on a table at 0.8m height. The EUT (LDB307 & AC/DC converter) is powered trough the LISN (measure). The peripheral equipment (PC) is connected to a separate LISN.

Equipment configuration and running mode:

- The equipement under test is powered by 110V/60Hz;
- Auxiliaries are powered by 230V/50Hz;
- LDB307 is ON;
- software is running;

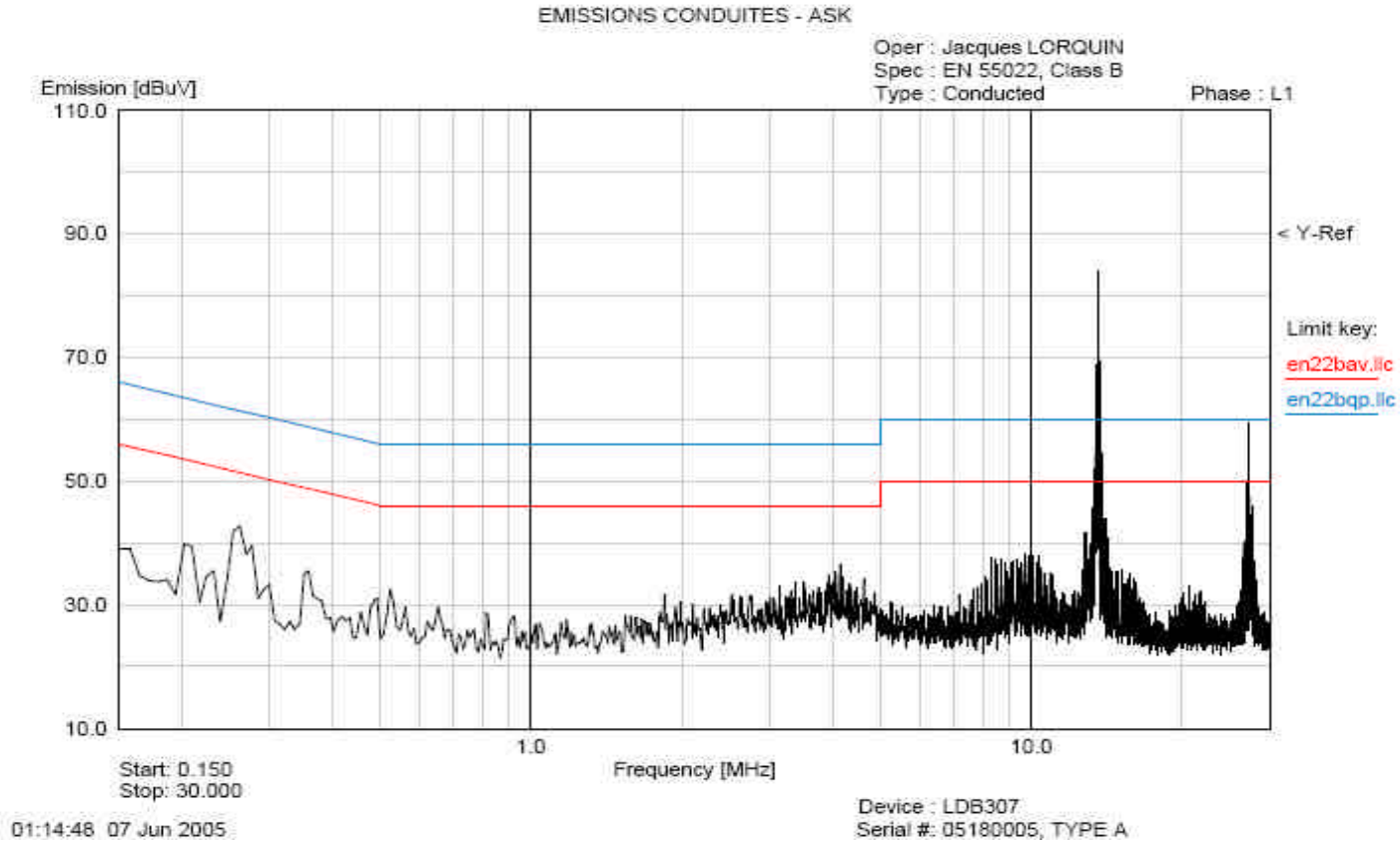
3.2. TEST EQUIPMENT

Equipment	Company	Model	Serial
EMC Analyzer	HP	8591EM	3536A00384
test receiver	Rohde&Schwarz	ESH3	872079/117
Transient Limiter	HP	11947A	3107A01596
LISN(auxiliary)	EMCO	3825/2	9309-2122
LISN(measure) 50Ω / 50µH	Telemeter Electronis	TGmbH NNB 2/16	0001300
Faraday room	Rayproof		4854

3.3. TEST SEQUENCE AND RESULTS

Measures are performed on line 1 and line 2 of the AC/DC power supply of the equipment under test.

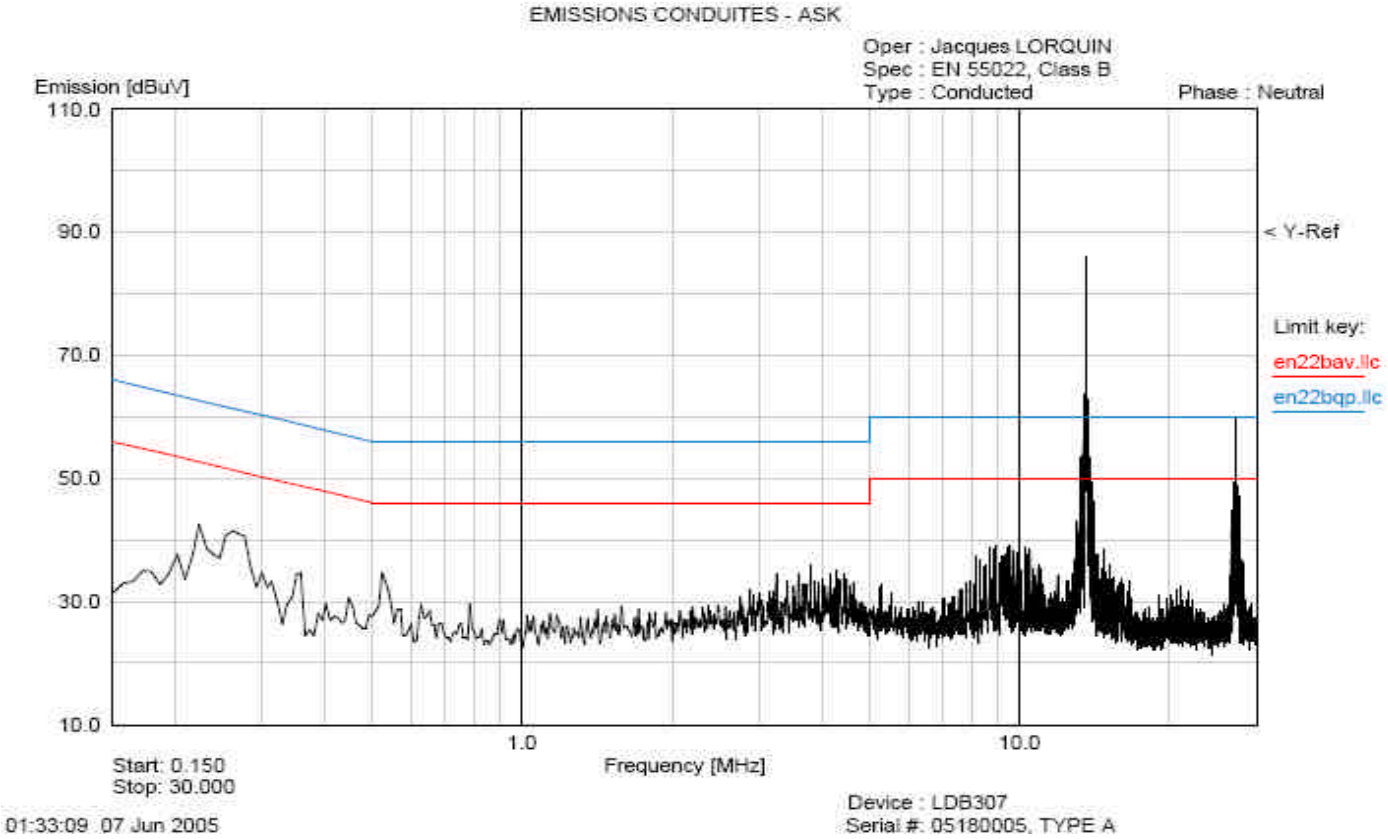
3.3.1.Line conducted emission data



Num.	Freq. [MHz]	Peak [dBµV]	Q-Peak [dBµV]	QP limit [dBµV]	QP delta [dBµV]	Average [dBµV]	AVG Limit [dBµV]	AVG Delta [dBµV]	Comment.
1	27.12	-	59.5	60.0	**-0.5**	43.2	50.0	**-6.8**	
2	27.01	40.15	28.89	60.0	**-31.11**	17.11	50.0	**-32.89**	
3	27.25	54.72	51.65	60.0	**-8.35**	36.31	50.0	**-13.69**	
4	13.56	72			**-**			**-**	**Carrier***
5	0.260	43.0	36.52	61.0	**-24.48**	23.69	51.0	**-27.31**	

***: Carrier - §15.207(b): Limits shall not apply to carrier current systems operating as intentional radiators on frequencies below 30MHz (from 13.110 to 14.010MHz).**

3.3.2.Neutral conducted emission data



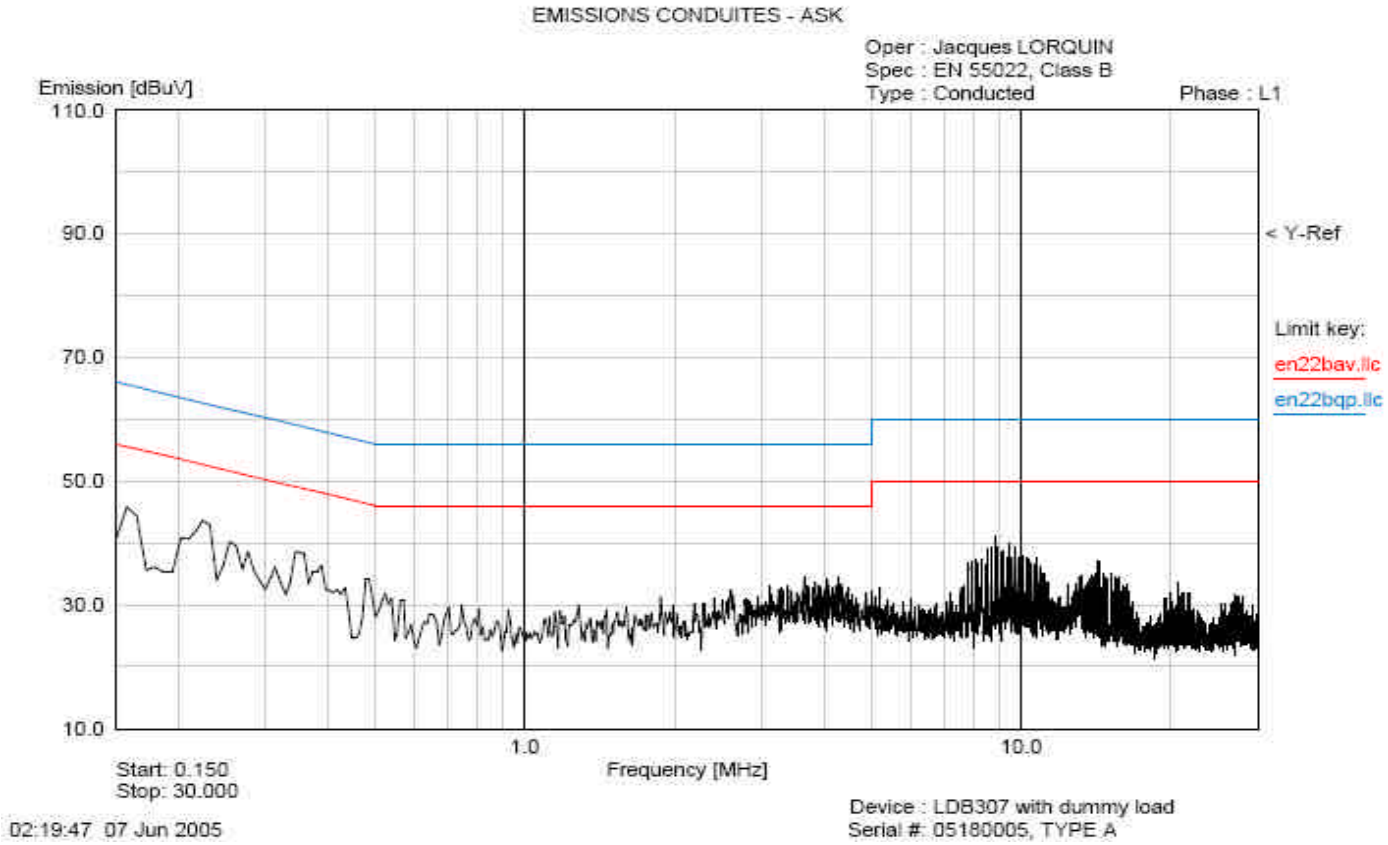
Marker ▽	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.260	41.56	37.37	19.08	50.00
2	26.94	27.41	31.28	19.25	50.00
3	27.01	41.01	30.37	21.29	50.00
4	27.12	59.92 *	52.14 *	38.75	50.00
5	27.26	54.89 *	49.59	31.37	50.00
6	27.39	51.08 *	44.75	23.66	50.00
7	13.42	67.94 *	58.33 *	49.24	50.00
8	13.57	36.84	80.99 *	80.26 *	50.00
9	13.72	25.49	47.67	29.89	50.00

Num.	Freq. [MHz]	Peak [dBµV]	Q-Peak [dBµV]	QP limit [dBµV]	QP delta [dBµV]	Average [dBµV]	AVG Limit [dBµV]	AVG Delta [dBµV]	Comment.
1	0.260	41.56	37.37	61.0	**-17.2**	19.08	51.0	**-27.6**	
2	27.01	41.01	30.37	60.0	**-3**	21.29	50.0	**-23.8**	
3	27.12	-	59.7	60.0	**-18.64**	32.7	50.0	**-30.75**	
4	27.26	54.89	49.59	60.0	**-10.41**	31.37	50.0	**-18.63**	
5	13.56	81	-	-	**-**	-	-	**-**	**Carrier***

***: Carrier - §15.207(b): Limits shall not apply to carrier current systems operating as intentional radiators on frequencies below 30MHz.**

3.3.3.Line conducted emission data with dummy load

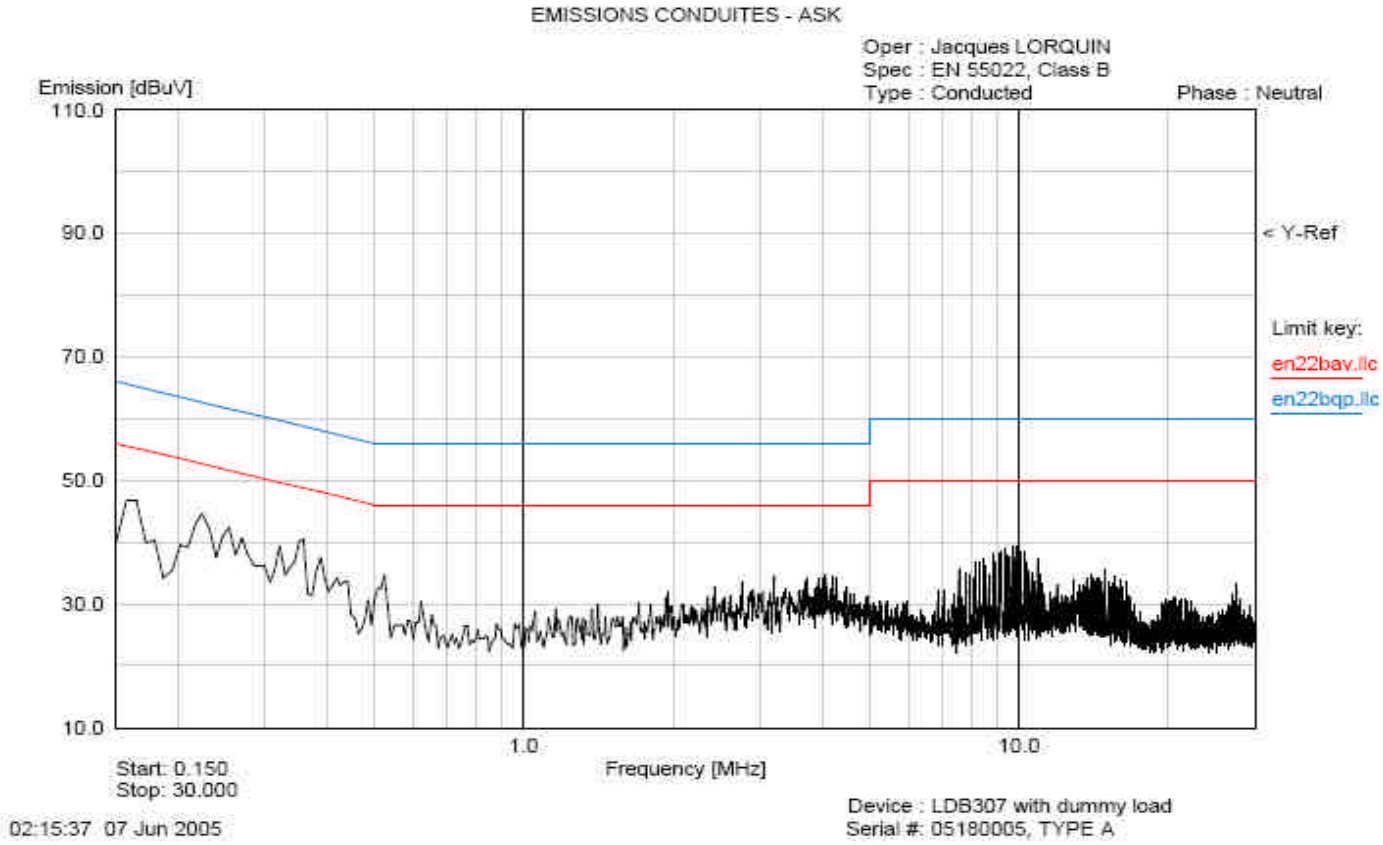
Antenna is replaced by dummy load (50ohms).



Marker ▽	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.160	44.77	40.87	23.14	54.00
2	0.220	42.75	41.65	26.23	52.00
3	0.350	38.74	31.35	20.10	48.00

3.3.4.Neutral conducted emission data with dummy load

Antenna is replaced by dummy load.



Marker ∇	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.160	47.49	40.56	29.10	54.00
2	0.230	46.38	43.06	29.83	52.00
3	0.360	40.33	35.37	20.51	48.00

4. Field strength of fundamental §15.225(a)

The polarization of the measurements for the larger power level is vertical (the test is perform for both vertical and horizontal axis, and the loop antenna position was rotated during the test for maximized the emission measurement.)
Measure have been done at 10m distance and corrected following requirements of 15.209.e)

Frequency (MHz)	QPeak Lmt (dBµV/m)	QPeak (dBµV/m)	QPeak-Lmt (dB)	Angle EUT (deg)	Pol	Angle Ant. (deg)	Tot Corr (dB)
13.56	84	50.0	**-34**	0	vertical	90	35.4

No significantly variation of the fundamental amplitude during voltage variation testing per 15.31(e). Maximum deviation under extreme test condition (voltage variation from 85% to 115%): **+3dBc**
-10dBc

Limits Subclause §15.225(a): Operation within the band 13.110-14.010MHz

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

5. Fundamental frequency tolerance (15.225.c)

The frequency tolerance of the carrier signal shall be maintained within +/-0.01% of the operating frequency.

5.1. Voltage fluctuation

Power supply has been set at 85% and 115% of nominal voltage, at 20°C.
Nominal voltage: 100-240V
Frequency of carrier: 13.56 MHz
Upper limit: 13.561356 MHz
Lower limit: 13.558644 MHz

Voltage	85V	230V	276V
Frequency (MHz)	13.559753	13.559765	13.559763
Result	Pass	-	Pass

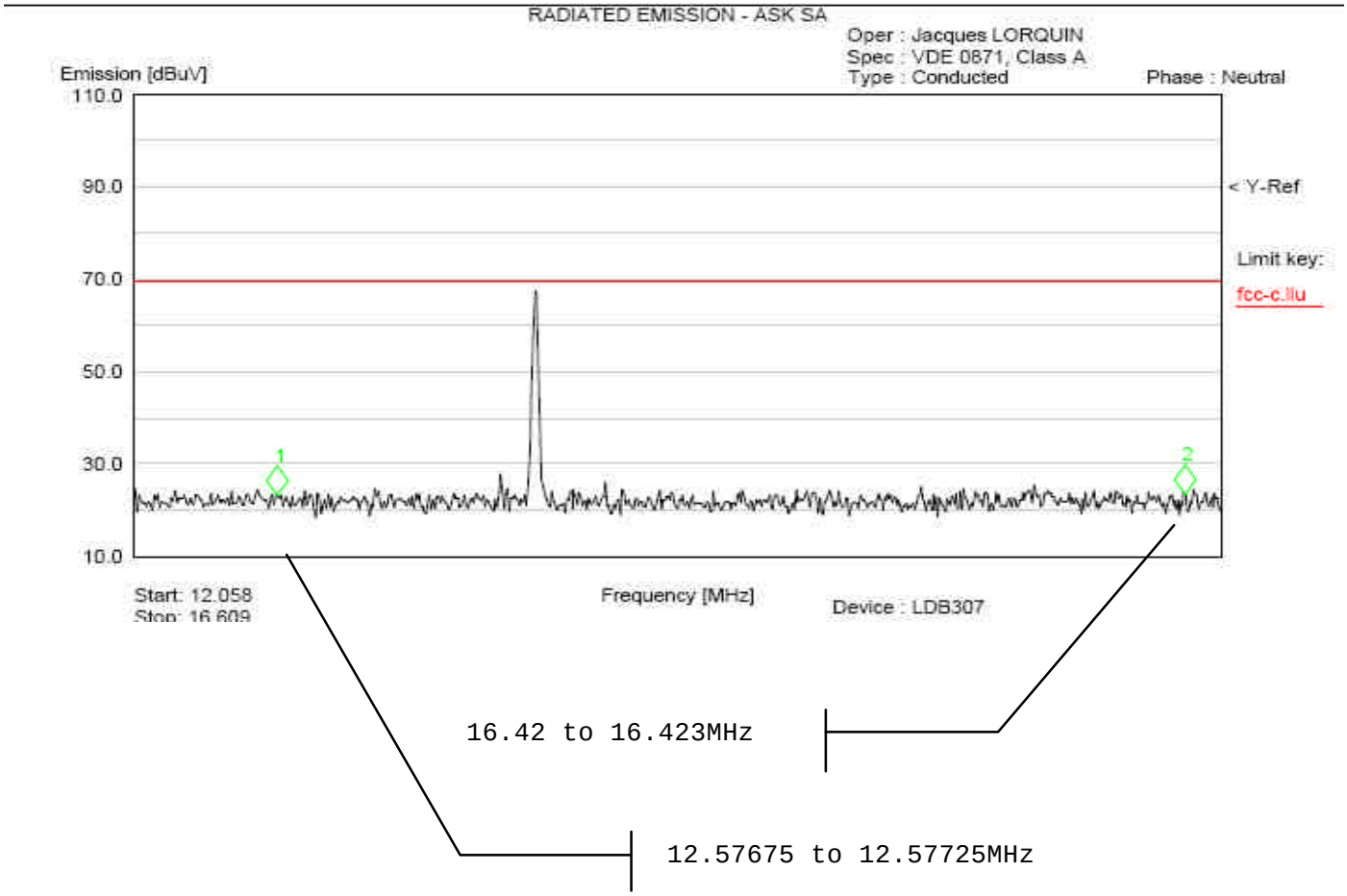
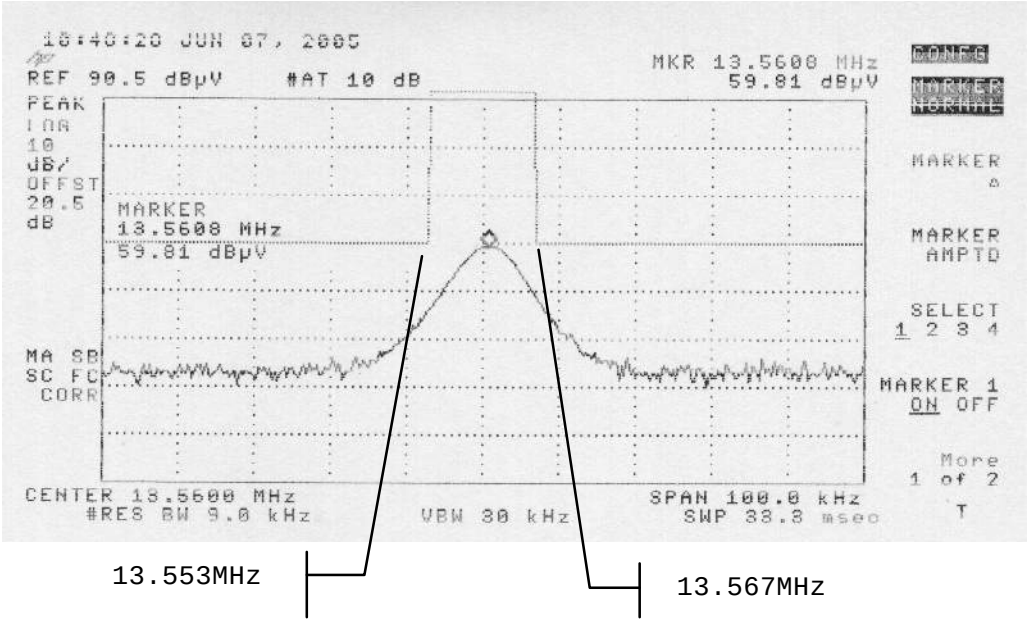
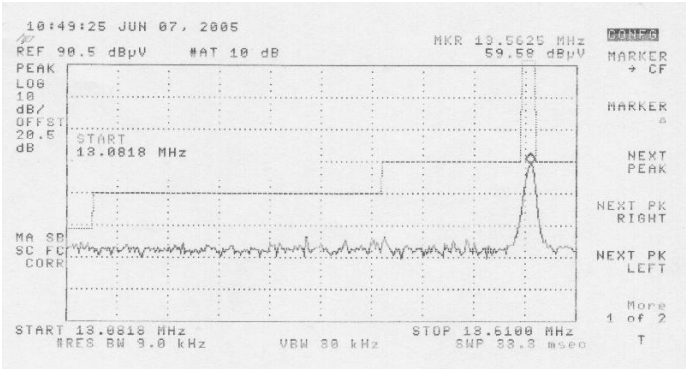
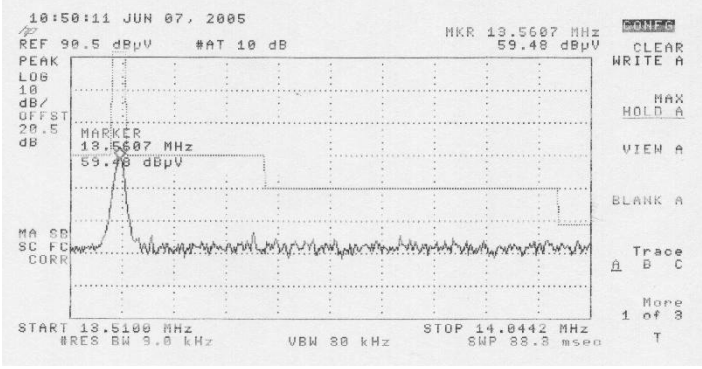
5.2. Temperature

Temperature has been set at –20°C and +50°C at nominal voltage 230Vdc.
Frequency of carrier: 13.56 MHz
Upper limit: 13.561356 MHz
Lower limit: 13.558644 MHz

Voltage	-20°C	25°C	+50°C
Frequency (MHz)	13.559803	13.559765	13.559751
Result	Pass	-	Pass

6. Occupied bandwidth §15.205

Here is a plot of the occupied bandwidth, which shows that, 12.57MHz and 16.42MHz restricted bands are free of carrier signal.



7. Band-edge compliance §15.209