Actions Mesures

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EMC TEST REPORT

Nr 3238-FCC

This test report applies only on equipment described hereafter.

Proposal number: 200412-2568

Date ..... :	November 30th, & December 1st & 10th, 2004
Location ..... :	SMEE ***Actions Mesures*** Laboratory - 38 VOIRON
Performed by ..... :	Jacques LORQUIN
Customer **..... :**	**TAGSYS S.A. (M. D'ANNUNZIO)** 180, Chemin de Saint Lambert 13821 La PENNE SUR HUVEAUNE FRANCE

Product..... :	**LIBRARY SECURITY PEDESTAL 2 (LSP2)**
Type of test ..... :	**Radiated and Conducted Emission Test**

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

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

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: QHKLIBSECPEDEST2**

- **LSP2 pn:SE11225A1 (Master) sn: B0439041A0**
  (Slave) Sn: B0439042A0

- Input/output: 100-240Vac 50/60Hz
- Size: 1750x540x50mm

- Frequencies: Crystal 32.768 kHz and 14.7456 MHz
  Oscillator 27.12MHz; (no clock or signal higher than 108 MHz)

- Output power: Ch1: 4W / Ch2: 4W / Ch3: 4W.
ASK 10%

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
LSP2 PNSE11225A1* (sn: B0439041A0)	QHKLIBSECPEDEST2	Library security pedestal	Power cord unshielded
LSP2 PNSE11225A1* (sn:)	QHKLIBSECPEDEST2	Library security pedestal	Power cord unshielded

1.4. Equipment modifications

The connection between GND of the PIR board and chassis of LSP2 is improved (see photo). A copper sticky tape is set for assumed the connection between GND of PIR board and ground of LSP2.

For production unit the sticky tape will be replaced by a copper plan on the PWB.

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 (scanning secures area for detecting tag):

ASK: 10%
Synchronization: middle output carrier power: 4w

1.6. I/O cables

- 2x Standards power cord Length:2.3m

2. Radiated emission data

2.1. SET-UP

The EUT is placed on the floor at 60mm under the ground plan.

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 3 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).

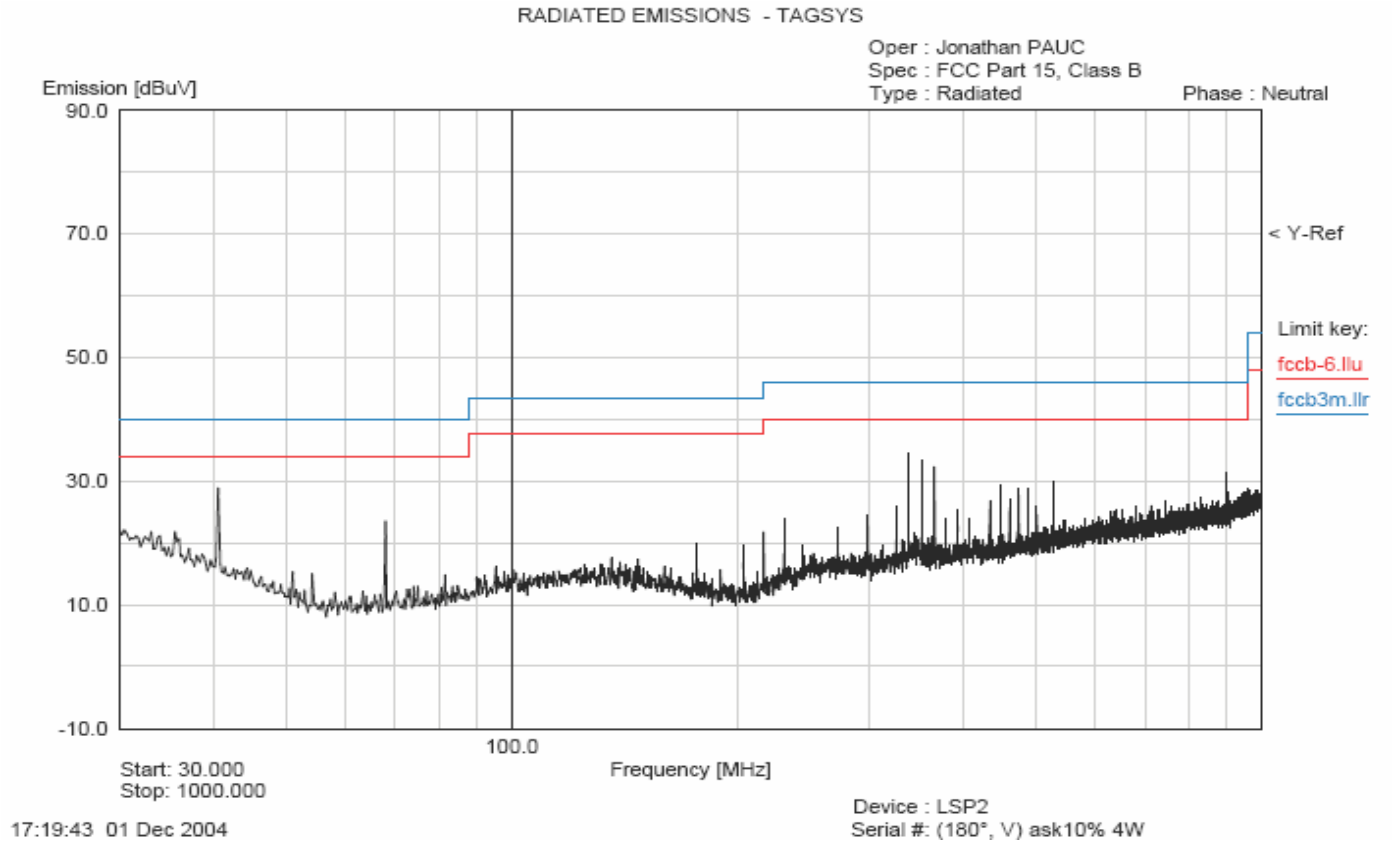
Pre-scan, test Equipment up to 1GHz:

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

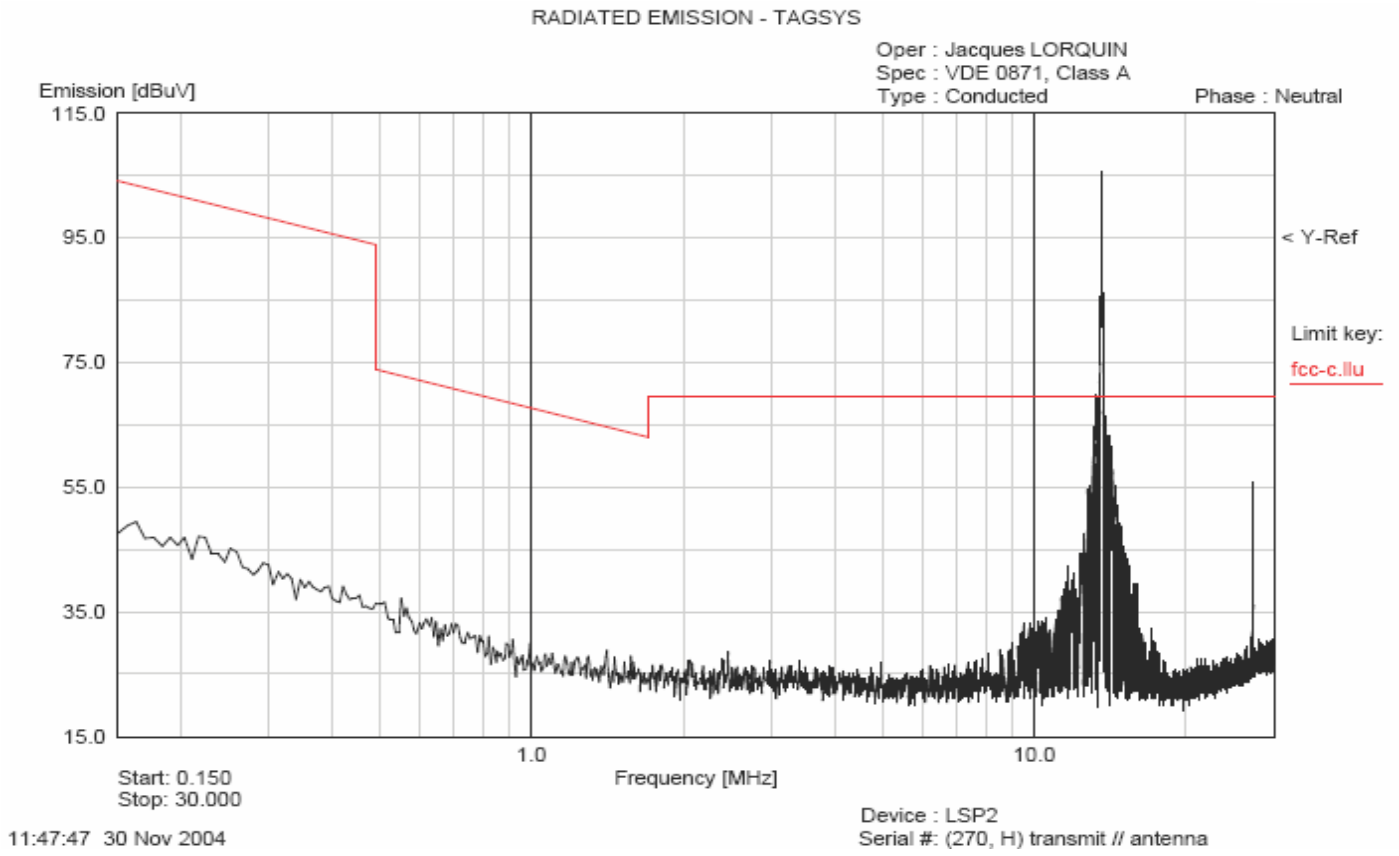
2.3.1.Pre-characterization at 3 meters from 30MHz to 1GHz

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:

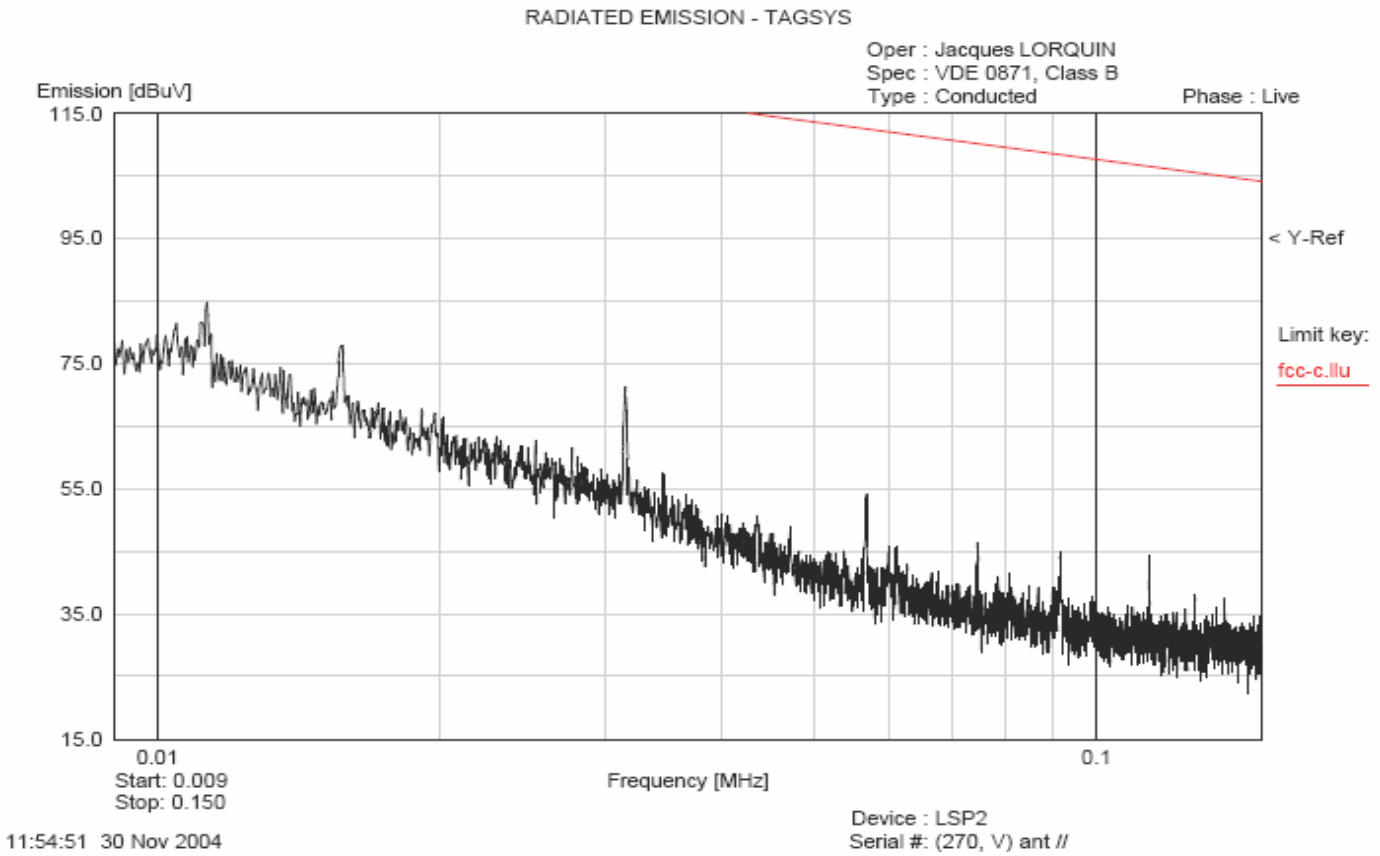


2.3.2.Pre-characterization at 3 meters below 30MHz

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 - TAGSYS
Oper : Jacques LORQUIN
Spec : VDE 0871, Class B
Type : Conducted
Phase : Live
Emission [dBuV]
115.0
95.0
75.0
55.0
35.0
15.0
< Y-Ref
Limit key:
fcc-c.llu
0.01
0.1
Start: 0.009
Stop: 0.150
Frequency [MHz]
11:54:51 30 Nov 2004
Device : LSP2
Serial #: (270, V) ant //

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	40.650	40	35.8	**-4.2**	47	V	126	11.4	
2	162.709	43.5	35.0	**-8.5**	46	H	299	17	
3	189.837	43.5	33.6	**-9.9**	8	H	266	18.6	
4	216.975	46	40.1	**-5.9**	192	H	225	13.5	
5	271.213	46	29.8	**-16.2**	1	H	02	15.6	
6	325.433	46	45.6	**-0.4**	336	H	02	17.6	
7	338.986	46	40.4	**-5.6**	44	H	195	17.7	
8	352.568	46	42.6	**-3.4**	137	V	277	17.9	
9	433.926	46	42.6	**(-3.4)**	214	H	305	19.4	Measure Peak
10	677.982	46	38.4	**-7.6**	43	V	232	24.7	
11	745.782	46	43.8	**-2.2**	61	H	279	25.6	
12	894.936	46	45.4	**-0.6**	55	H	213	27	

Note: Measures have been done at 10m distance and corrected following requirements of 15.209.e)

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	80.4	**-3.6**	90	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 150 kHz to 30 MHz.

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 the floor at 3cm height. The cable of the power supply of the LSP2 (sn: B0439041A0) has been shorted to 1meter length. The LSP2 is powered trough the LISN (measure). The peripherals equipments (second LSP2) is connected to a separate LISN.

Equipment configuration and running mode:

- The LSP2 under test (master) is powered by 110V/60Hz;
- The LSP2 slave is powered by 230V/50Hz;
- Power output of LSP2 Ch1&2&3=4W;
- LSP2 are ON;

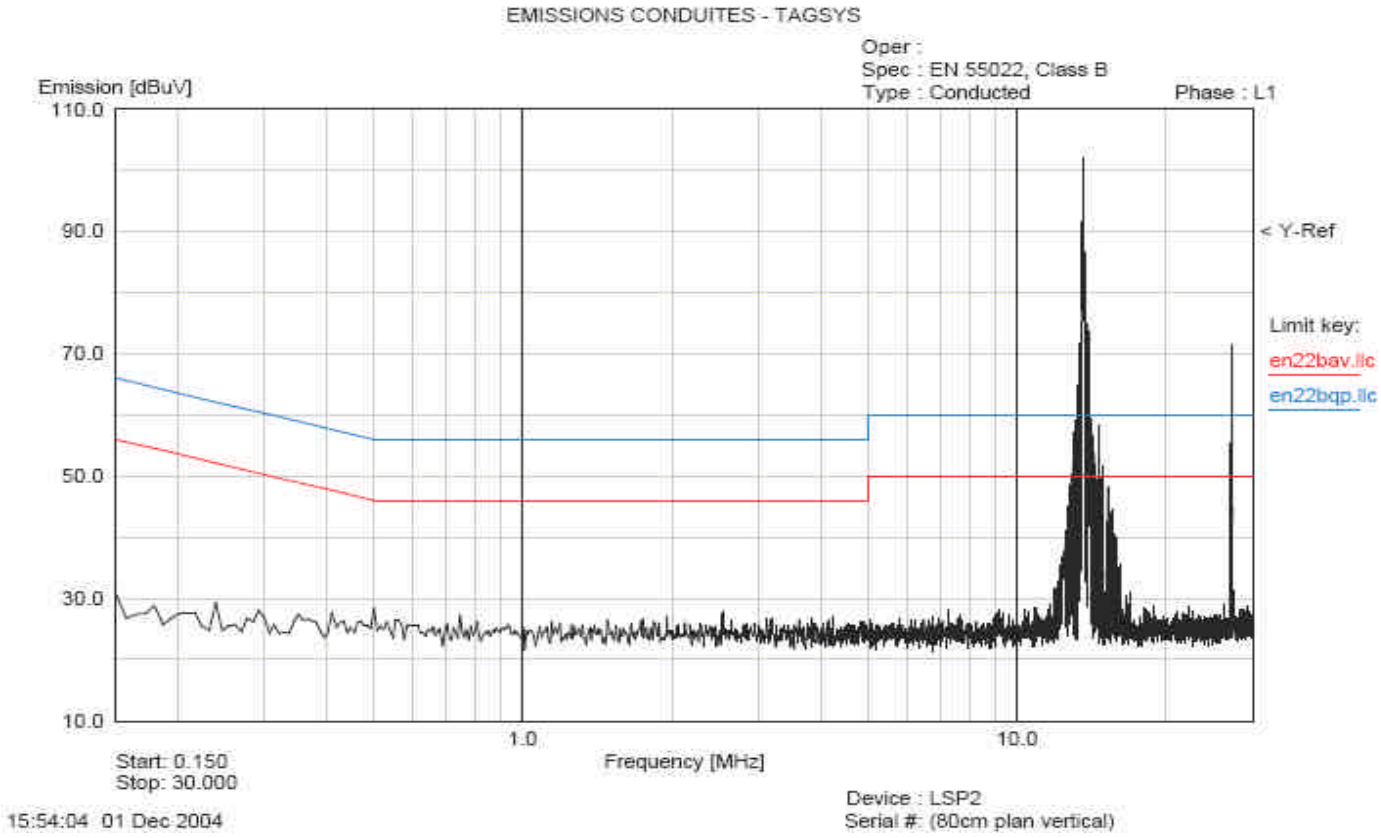
3.2. TEST EQUIPMENT

Equipment	Company	Model	Serial
EMC Analyzer	HP	8591EM	3536A00384
test receiver	Rohde&Schwarz	ESH3	872079/117
Transient Limiter	HP	11947A	3107A01596
LISN(auxiliary)	EMCO	3810/2SH	9511-11821628
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 power supply of the equipment under test.

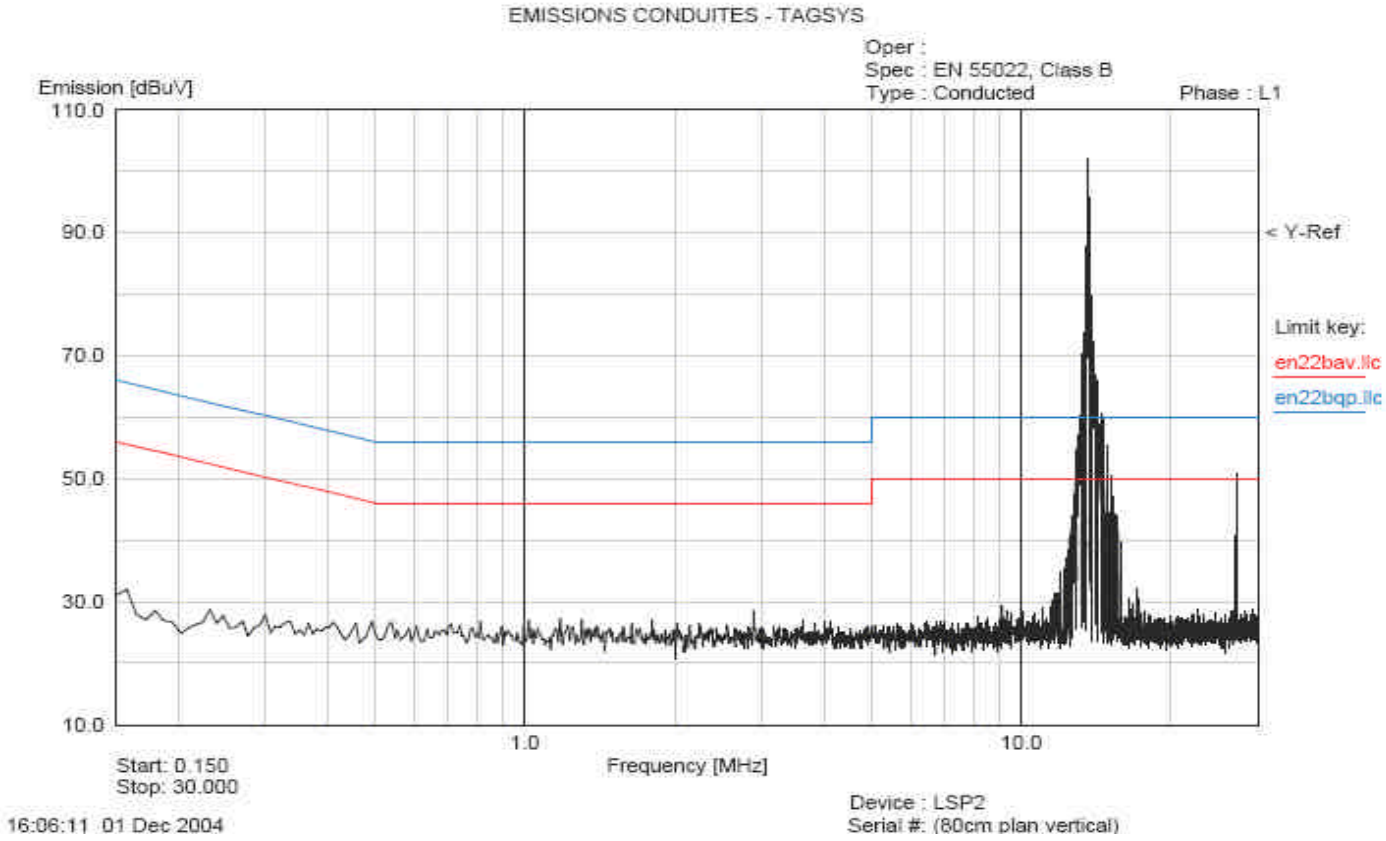
3.3.1.Line conducted emission data on LSP2



Num.	Freq. [MHz]	Peak [dBµV]	Q-Peak [dBµV]	QP limit [dBµV]	QP delta [dBµV]	Average [dBµV]	AVG Limit [dBµV]	AVG Delta [dBµV]	Comment.
1	27.04	52.8	44.8	60.0	**-15.2**	22.6	50.0	**-27.4**	
2	27.12	71.6	56.0	60.0	**-4**	25.9	50.0	**-24.1**	
3	27.16	54.6	40.0	60.0	**-20**	18.9	50.0	**-31.1**	
4	13.56	121.6	-	-	**-**	-	-	**-**	**Carrier***

***: 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 on LSP2

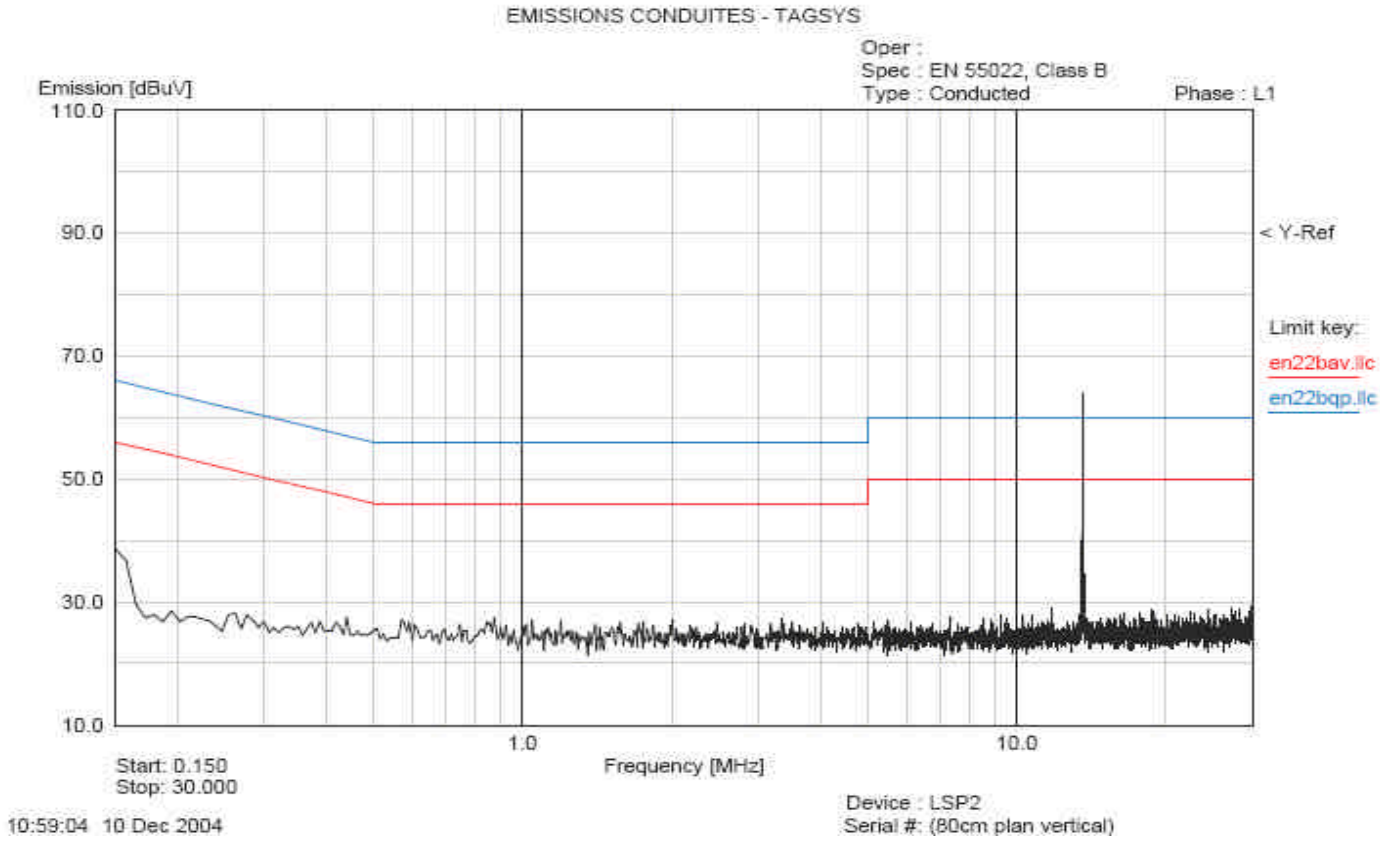


Num.	Freq. [MHz]	Peak [dBµV]	Q-Peak [dBµV]	QP limit [dBµV]	QP delta [dBµV]	Average [dBµV]	AVG Limit [dBµV]	AVG Delta [dBµV]	Comment.
1	27.04	54.34	42.8	60.0	**-17.2**	22.4	50.0	**-27.6**	
2	27.12	73.7	57.0	60.0	**-3**	26.2	50.0	**-23.8**	
3	27.16	54.27	41.36	60.0	**-18.64**	19.25	50.0	**-30.75**	
4	13.56	121.3	-	-	**-**	-	-	**-**	**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 on LSP2 with dummy load

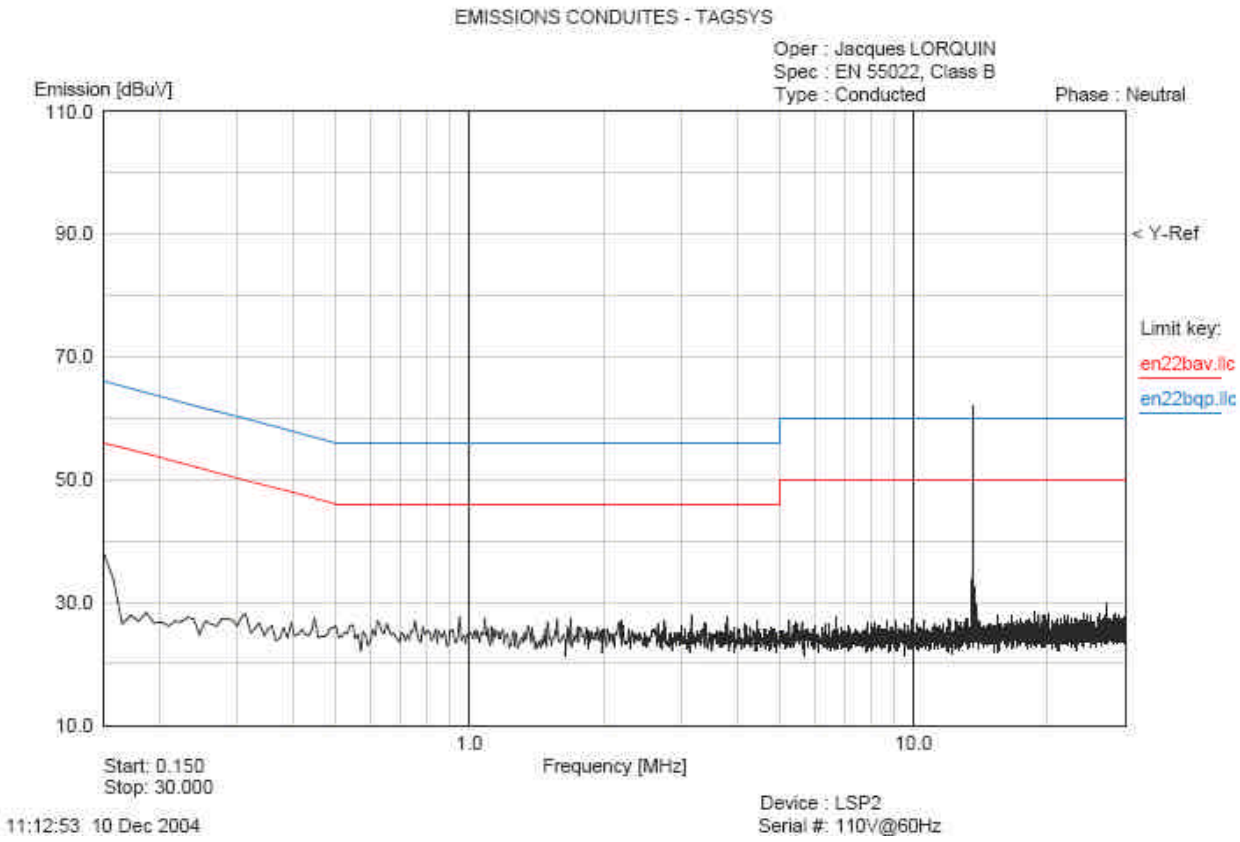
Antennas are replaced by dummy load.



Num.	Freq. [MHz]	Peak [dBµV]	Q-Peak [dBµV]	QP limit [dBµV]	QP delta [dBµV]	Average [dBµV]	AVG Limit [dBµV]	AVG Delta [dBµV]	Comment.
1	13.56	63.8	60.0	60.0	**0.0**	49.7	50.0	**-0.3**	

3.3.4.Neutral conducted emission data on LSP2 with dummy load

Antenna is replaced by dummy load.



Num.	Freq. [MHz]	Peak [dBµV]	Q-Peak [dBµV]	QP limit [dBµV]	QP delta [dBµV]	Average [dBµV]	AVG Limit [dBµV]	AVG Delta [dBµV]	Comment.
1	13.56	61.7	51.6	60.0	**-8.4**	43.3	50.0	**-6.7**	

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	80.4	**-3.6**	90	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%): **0.2dBc**

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: 110V-240V@50/60Hz
Frequency of carrier: 13.56 MHz
Upper limit: 13.561356 MHz
Lower limit: 13.558644 MHz

Voltage	85V/60Hz	230V(50Hz)	276V/50Hz
Frequency (MHz)	13.559940	13.559940	13.559950
Result	Pass	-	Pass

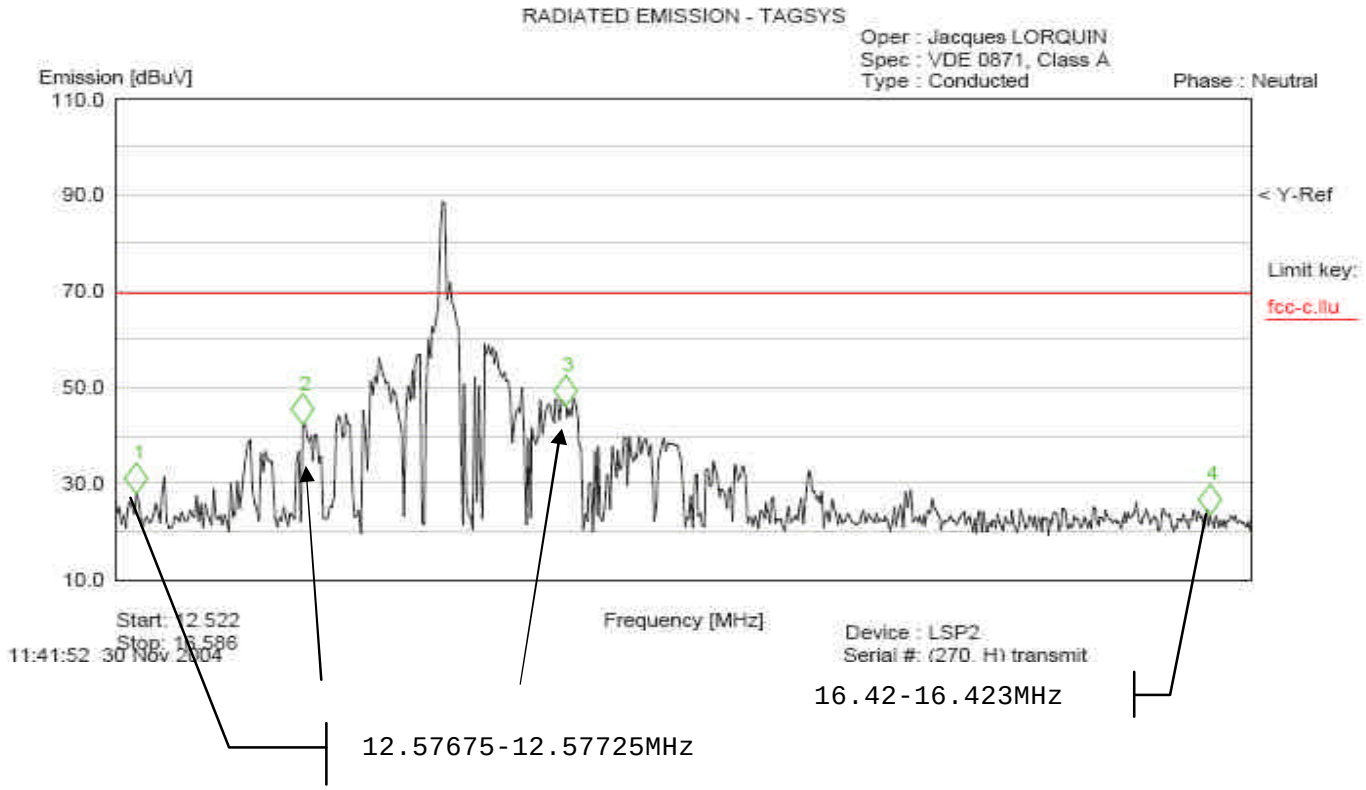
5.2. Temperature

Temperature has been set at –20°C and +50°C at nominal voltage 110V@60Hz.
Frequency of carrier: 13.56 MHz
Upper limit: 13.561356 MHz
Lower limit: 13.558644 MHz

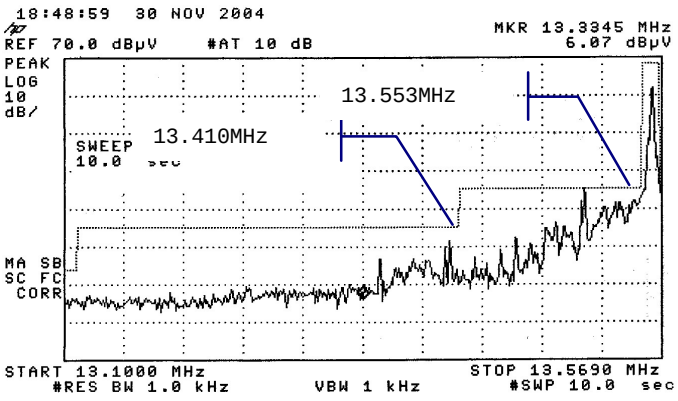
Voltage	-20°C	20°C	+50°C
Frequency (MHz)	13.559800	13.559940	13.559878
Result	Pass	-	Pass

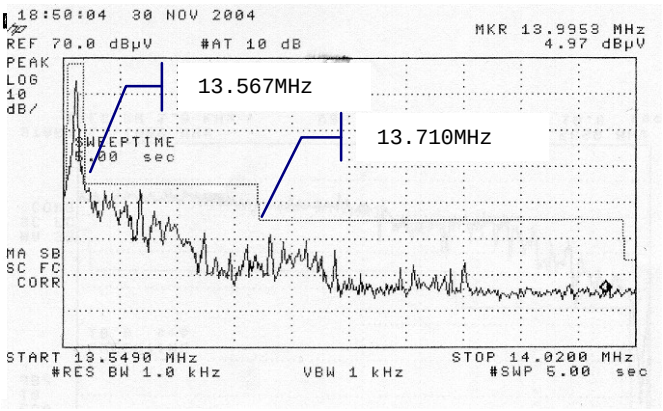
6. Occupied bandwidth §15.205

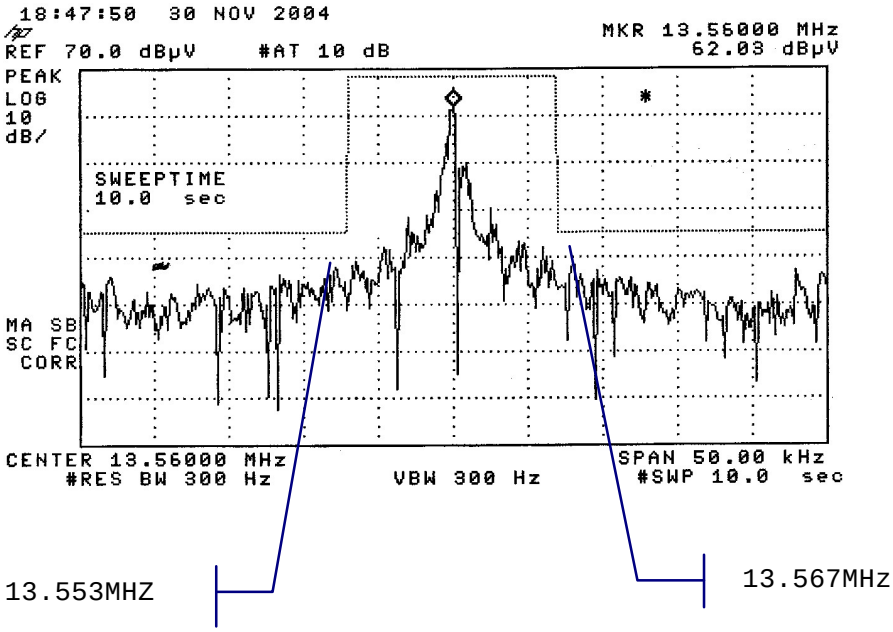
Here is a plot of the occupied bandwidth, which show that, 12.57MHz and 16.42MHz restricted bands are free of carrier signal.



7. Band-edge compliance §15.209







End of Tests