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EMC TEST REPORT

Nr 3302-FCC

This test report applies only on equipment described hereafter.

Proposal number: 200502-2605

Date ..... : February 11th, 2005

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

Performed by ..... : Jacques LORQUIN

Customer **..... :** **TAGSYS S.A.**
180, Chemin de Saint Lambert
13821 La PENNE SUR HUVEAUNE
FRANCE

Product ..... : **Library Stack Antenna (L-SA3)**

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

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

Result of tests..... : **Radiated 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). A Tag ISO15693 is set on LSA3, and the Tag ID is read in loop.

1.2. HARDWARE IDENTIFICATION:

Equipment under test (EUT): **FCCID: QHKLSA2ANT**

➢ **LSA3 pn:SE11680A0 sn: proto 1**

- Input/output: RF input (coaxial cable with 6ferrites, length 3m)
- Size: 440x410x40mm

➢ **MEDIO L100 pn:SE10120B3 sn:BO431466B31A4**

- Input/output:
  - * 1x serial connector (DB9)
  - * 1x parallel connector (not used for this application)
  - * Ch1 BNC antenna connector
  - * Ch2 BNC antenna connector (not used for this application)
  - * Syn IN/OUT BNC connector (not used for this application)
  - * I/O ports (1,2,3,4, gnd, Vin, Vout, gnd)
  - * Power supply

- Size: 250x300x75mm
- Frequencies: Crystal 32.768 kHz and 14.7456 MHz
  Oscillator 27.12MHz; (no clock or signal higher than 108 MHz)
  Bit rate: 9600bauds.
- Output power: Ch1: 1W / Ch2: 0W.

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
LSA3 * (sn: proto 1)	**QHKLSA2ANT**		**Coaxial cable with 5 ferrites**
HEWLETT PACKARD pn:D7963A (sn:FR94020451)		Personnel computer	All data cables are shielded Power cord unshielded
HEWLETT PACKARD pn:C4736-60101 (sn:LZA94988942)	JNZ201213	Mouse	Shielded cable
HEWLETT PACKARD pn:C4734-60111 (sn:M971168931)	GYUR38SK	Keyboard	Shielded cable with ferrite
HEWLETT PACKARD pn:D2846 (sn:JP74001000)	D.o.C.	Monitor	Video cable with ferrite at each end. Power cord unshielded

1.4. Equipment modifications

No modifications are necessary for performed test.

1.5. EUT Exercise software

The EUT exercise program (Tagsyslibrary_test.exe, running under Windows 98) used during radiated and conducted testing was designed to exercise the L-SA3 in a manner similar to a typical use :

- Carrier on,
- Reading the tag's number,
- Display the number of the tag on the monitor.
- Write EAS bit onto tag

1.6. I/O cables

- Standards power cord Length:2m (PC)
- Standards power cord Length:2m (monitor)
- Standards power cord Length:2m (medio L100)
- Serial cable, schielded, length: 1m

2. Radiated emission data

2.1. SET-UP

The EUT is placed on a non-conducting table of 80cm height. A Tag is set on the LSA3.

Equipment configuration and running mode:

- EUT and PC are turned 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).

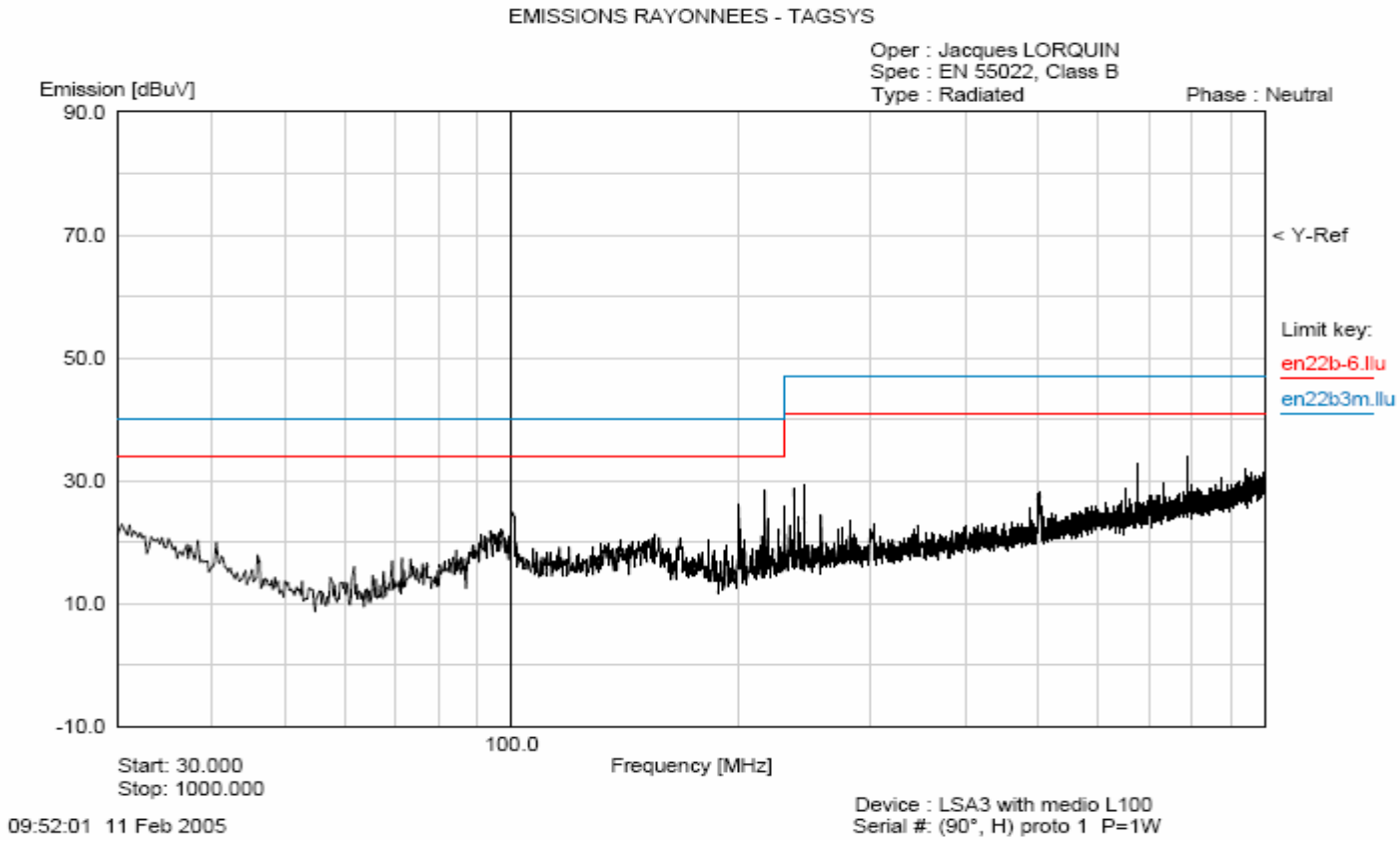
Pre-scan, test Equipment up to 1GHz:

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

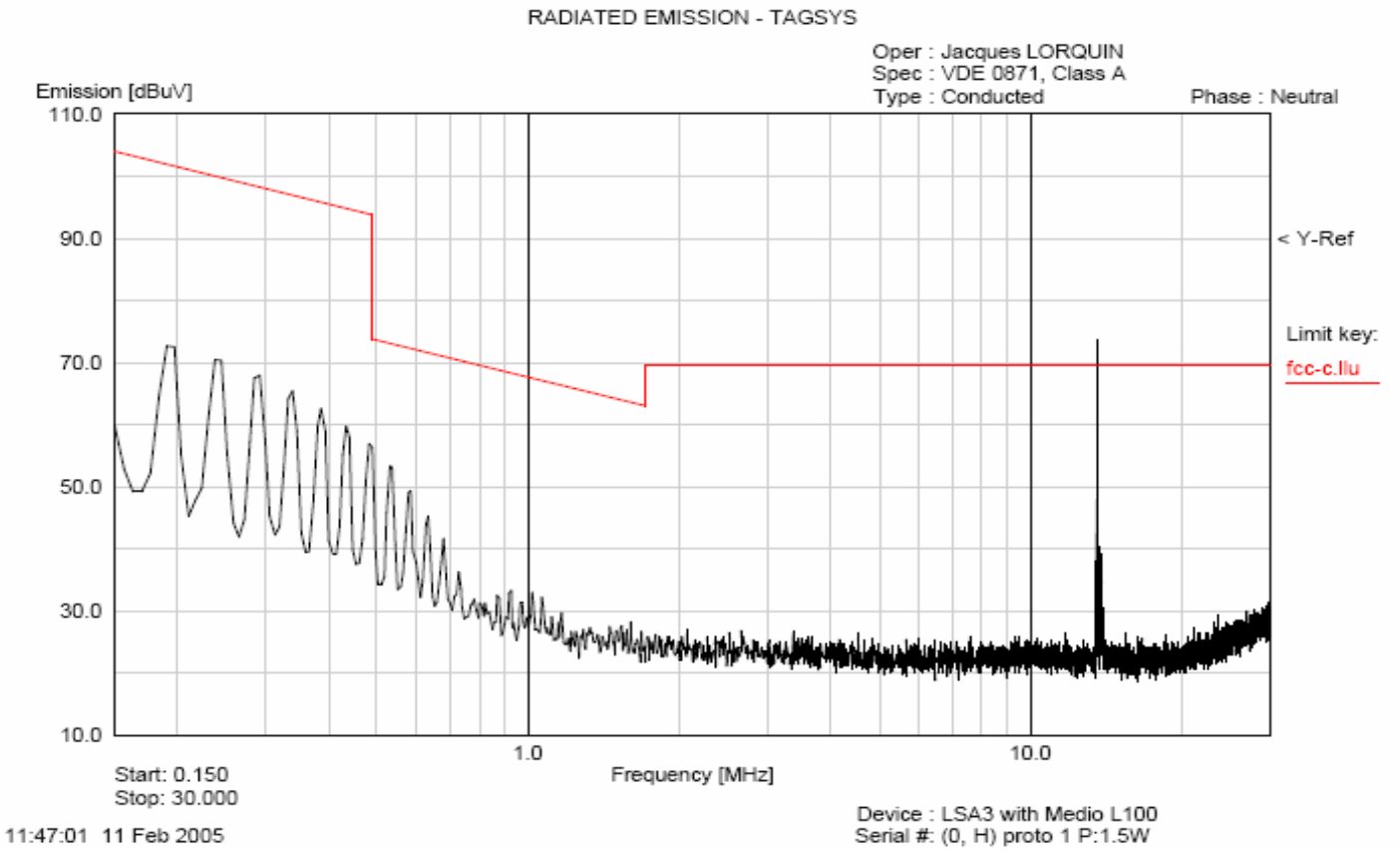
2.3.1.Pre-characterization at 3 meters from 30MHz to 1GHz

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

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	180.112	43.5	29.8	**-13.7**	348	V	105	18.1	*
2	216.962	46	42	**-4**	53	V	104	13.5	*
3	237.042	46	34	**-12**	56	V	103	14	*
4	244.086	46	44.9	**-1.1**	44	V	105	14.2	*
5	400.015	46	30.5	**-15.5**	213	V	257	18.4	*
6	677.986	46	45.9	**-0.1**	186	V	281	24.7	*
7	786.460	46	45.4	**-0.6**	202	V	262	25.9	*

*- 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	45.4	**-38.6**	180	vertical	0	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. 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	45.4	**-38.6**	180	vertical	0	35.4

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

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

4. Fundamental frequency tolerance (15.225.c)

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

4.1. Voltage fluctuation

Not performed, already realized, see test report N° 2686-FCC

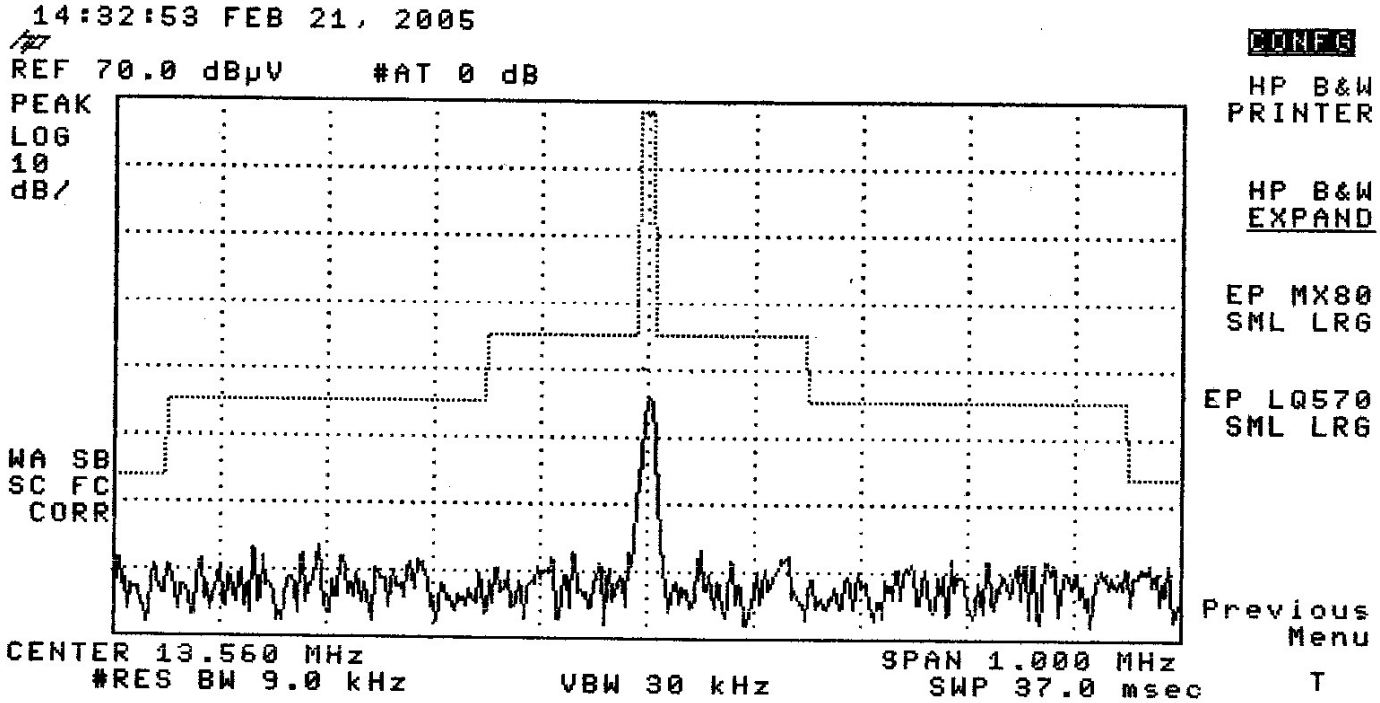
4.2. Temperature

Not performed, already realized, see test report N° 2686-FCC

5. Occupied bandwidth §15.205

Not performed, already realized, see test report N° 2686-FCC

6. Band-edge compliance §15.209



End of Tests