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EMC TEST REPORT

Nr 2757-FCC

This test report applies only on equipment described hereafter.

Proposal number: 200211-2096 & 200210-2058

Date..... :	November 27th, 2002 & October 17th & 18th, 2002
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 ..... :	**Conveyor Antenna with 200x200 & 140x140 Antennas**
Type of test ..... :	**Radiated and Conducted Emission Test**

Applied standards ..... :	ANSI C63-4 (1992+2000) 47 CFR Part 15 Subpart C

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

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Written by ..... :	Jacques LORQUIN
Approved by :	Jacques LORQUIN

CONVEYOR ANTENNA WITH 200X200 & 140X140 ANTENNAS

1. System test configuration

1.1. Justification

The system was configured for testing in a typical fashion (as a customer would normally use it). Antennas are connected to MEDIO-L100, which was connected to a Personnel computer. It has been tested with laptop Dell model latitude CPi PPL.

1.2. HARDWARE IDENTIFICATION:

*** Equipment under test (EUT): Conveyor antenna sn:proto FCCID: QHKCONVYRANT**

➢ **An antenna 200x200 sn: none**
- Input/output: 1x I/O BNC connector
- Size: 200x200x10mm

➢ **An antenna 140x140 sn: none**
- Input/output: 1x I/O BNC connector
- Size: 140x140x10mm

➢ **MEDIO-L100 pn: SE10120A0 sn:M029010009**
- Input/output:
  * 1x serial connector (DB9)
  * 1x parallel connector
  * Ch1 BNC antenna connector
  * Ch2 BNC antenna connector
  * Syn IN/OUT BNC connector
  * 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 & Ch2: 1.5W.

1.3. Auxiliaries for radiated test

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
Tag 210 (sn: none)	None	Smart label	
DELL latitude CPi model PPL (sn:0006692D-12800-031-2130)	Doc of Conf	laptop	All data cables are shielded
Dell model PA-6 pn:9364U (sn: 16291-01L-0335)	Doc of Conf	adapter	Power cable unshielded.
Tagsys model: none (sn: none)	None	Signal box	Shielded cable

1.4. Auxiliaries for conducted test

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
Tag 210 (sn: none)	None	Smart label	
HEWLETT PACKARD Vectra VLi8 (sn:FR94020451)		Personal computer	All data cables are shielded Power cable unshielded.
HEWLETT PACKARD pn:D2846 (sn: JP74001000)	Doc of Conf	Monitor	Power cable unshielded. Video cable with ferrite at each end.
HEWLETT PACKARD pn:C4734-60111 (sn: M971168931)	GYUR38SK	Keyboard	Shielded cable
HEWLETT PACKARD pn:C4736-60101 (sn: LZA93024031)	JNZ201213	Mouse	Shielded cable
Labtec pn: D8387A (sn: none)	none	headset	Shielded cable
Telex (sn:700 373.000A)	none	microphone	Shielded cable
Tagsys model: none (sn: none)	None	Signal box	Shielded cable

1.5. Equipment modifications

No equipment modification has been necessary during testing to achieve compliance to FCC part 15 Subpart C requirements. The unit tested was representative to a production unit.

1.6. EUT exercise software

The EUT exercise program used during radiated and conducted testing was designed to exercise the conveyor antenna in a manner similar to a typical use:

- On laptop: Hyperterminal.exe, running under Windows 95
- On MEDIO-L100: fcc1_210.hex [read I/O port, set the power on two channels at π phase shift, read tag's number and send it to laptop via RS232 serial link (9600bauds)]

1.7. Special accessories

The serial and parallel interfaces cables used for compliance testing is shielded as normally supplied; antenna cable (coaxial) with 6 ferrites set near MEDIO-L100 connector. All these cables are normally recommended to be used with the product.

1.8. I/O cables

Radiated setup:

- ✓ 2x Standard power cords Length: 1.8m (PC and MEDIO-L100);
- ✓ 1x serial cable #174-8545 (Shielded cable, length: 3m);
- ✓ 2x Coaxial cables with 6 ferrites (length: 3m) provided with conveyor antenna;
- ✓ 1x cable with 3 wires (Shielded cable, length: 3m).

Conducted setup

- ✓ 3x Standard power cords Length: 1.8m (PC, monitor and MEDIO-L100);
- ✓ 1x serial cable #174-8545 (Shielded cable, length: 3m);
- ✓ 2x Coaxial cables with 6 ferrites (length: 3m) provided with conveyor antenna;
- ✓ 1x cable with 3 wires (Shielded cable, length: 3m).
- ✓ 1x USB cable (length: 1m)
- ✓ 1x video cable shielded with ferrite at each end (length: 1.8)

2. Radiated emission data

2.1. SET-UP

The MEDIO-L100 and laptop is placed on a non-conducting table of 80cm height. A smart label is set on the conveyor antenna.

Equipment configuration and running mode:

- The MEDIO-L100 is plug on serial connectors;
- The MEDIO-L100 is powered by 230V/50Hz;
- The signal box is connected on I/O ports
- Power output of MEDIO-L100: Ch1=1.5W & Ch2=1.5W;
- Antennas are connected to the Ch1 & CH2 of the MEDIO-L100;
- PC and EUT are 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	Calibration Due
Spectrum Analyzer	HP	8568B	2732A04140	March 22nd ,2003
Quasi-Peak adapter	HP	85650A	2811A01136	March 22nd ,2003
RF Pre-selector	HP	85685A	2833A00773	March 22nd ,2003
Biconical Antenna	EMCO	3104C	9401-4636	April 4th ,2003
Log Periodic Antenna	EMCO	3146	2178	April 4th ,2003
Spectrum Analyzer	HP	8593E	3409u00537	June 29th ,2003
Loop antenna	Electro-metrics	EM-6879	690234	February 10th ,2004
Amplifier	HP	8447F H64	3113A06394	March 28th ,2003
OATS				April 9th ,2003

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).

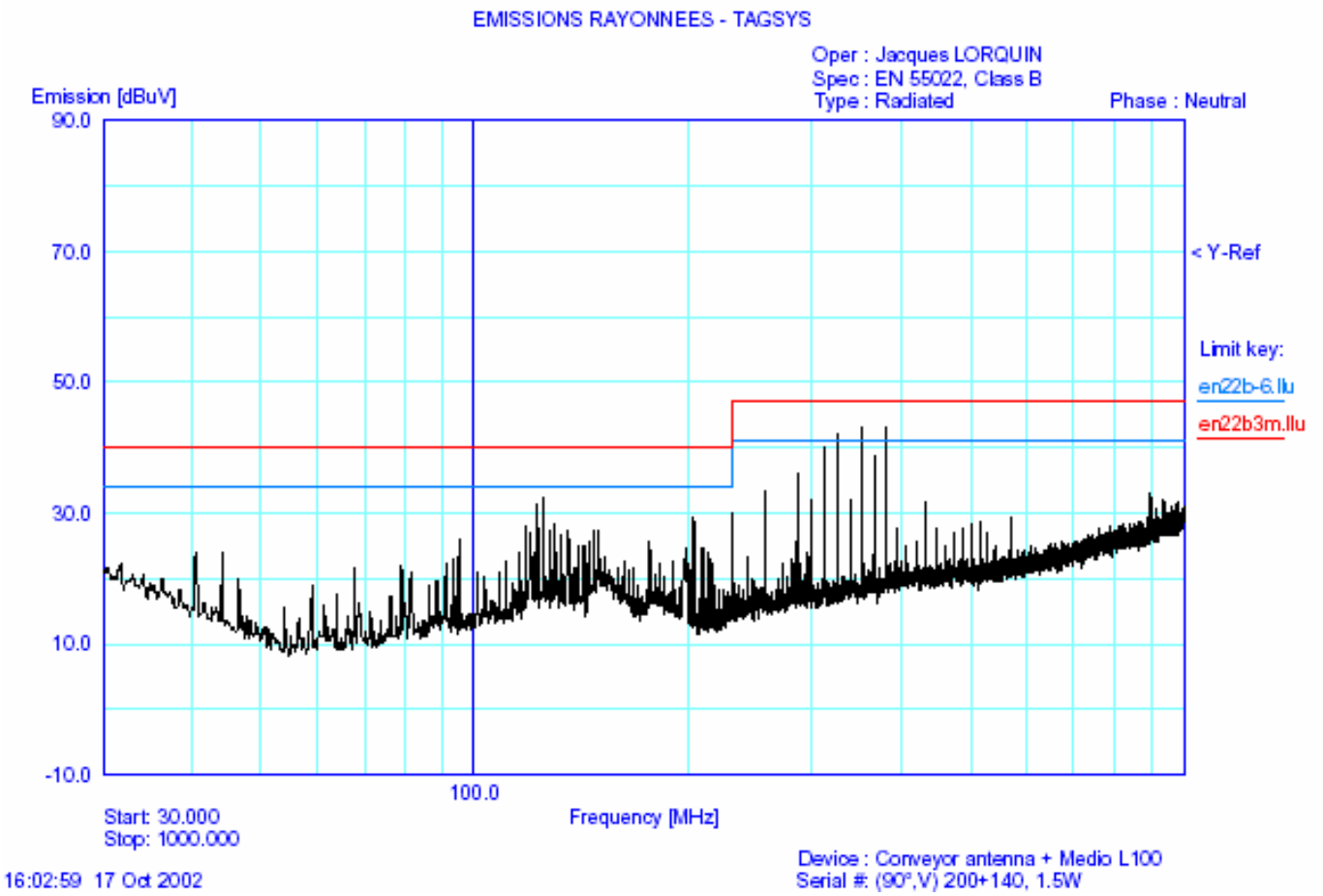
Pre-scan, test Equipment up to 1GHz:

Equipment	Company	Model	Serial	Calibration Due
EMC Analyzer	HP	8591EM	3536A00384	March 29th ,2003
Amplifier	HP	8447F H64	3113A06394	March 28th ,2003
Antenna (30MHz-1GHz)	CHASE	CBL6111A	1628	March 29th ,2003
Loop antenna	Electro-metrics	EM-6879	690234	February 10th,2004

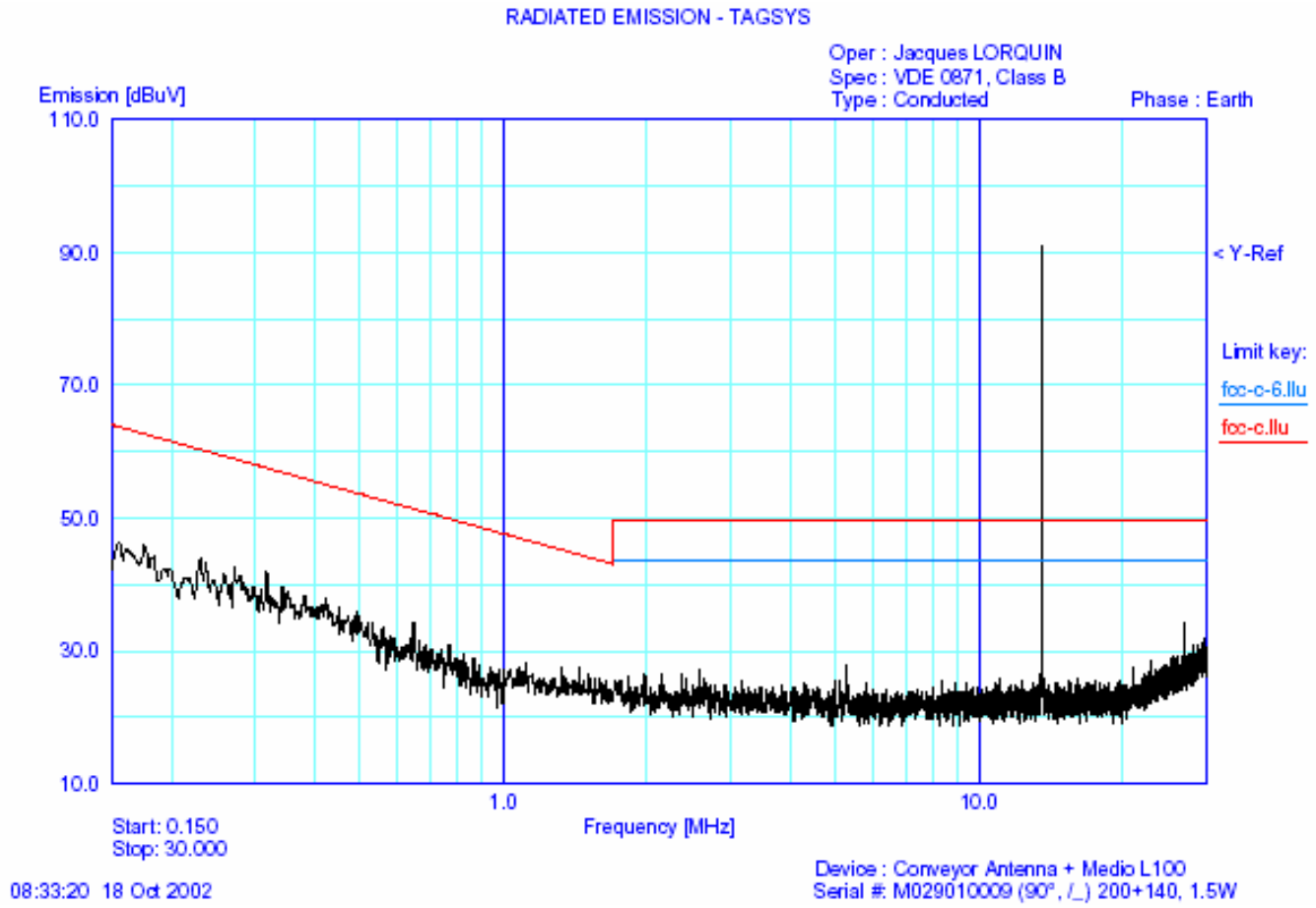
2.3. TEST SEQUENCE AND RESULTS

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 a graph example:



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

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

The product has been tested according to ANSI C63.4-(1992), FCC part 15 subpart C. Radiated Emissions 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 FCC part 15 subpart C §15.209 limits. Measurement bandwidth was 120 kHz 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	40.671	40.0	31.0	**-9**	289	V	101	11.6	*
2	125.360	43.5	33.1	**-10.4**	227	V	346	15.1	*
3	311.901	46.0	40.0	**-6**	140	H	206	18	*
4	325.465	46.0	35.8	**-10.2**	2	H	201	18.2	*
5	352.578	46.0	38.8	**-7.2**	14	H	240	18.5	*
6	379.706	46.0	38.0	**-8**	1	V	301	18.9	*

*: The results are extrapolated with §15.31 requirement.

2.3.3.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 9 kHz from 150 kHz 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*[1]	80	74.1	-5.9	70	vertical	90	35.5
27.12	Not traceable signal						

*[1]: Fundamental – 15.225 limits. 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-(1992) 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 9 kHz 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 MEDIO-L100 and PC are placed on a non-conducting table of 80cm height. The cable of the power supply (MEDIO-L100) has been shorted to 1 meter length. The MEDIO-L100 is powered trough the LISN.

Equipment configuration and running mode:

- The MEDIO-L100 is plug on serial connector;
- The MEDIO-L100 is powered by 110V/60Hz;
- The signal box is connected on I/O ports
- The Antenna is connected to the Ch1 & Ch2 of the MEDIO-L100;
- PC and EUT are ON;
- software is running;

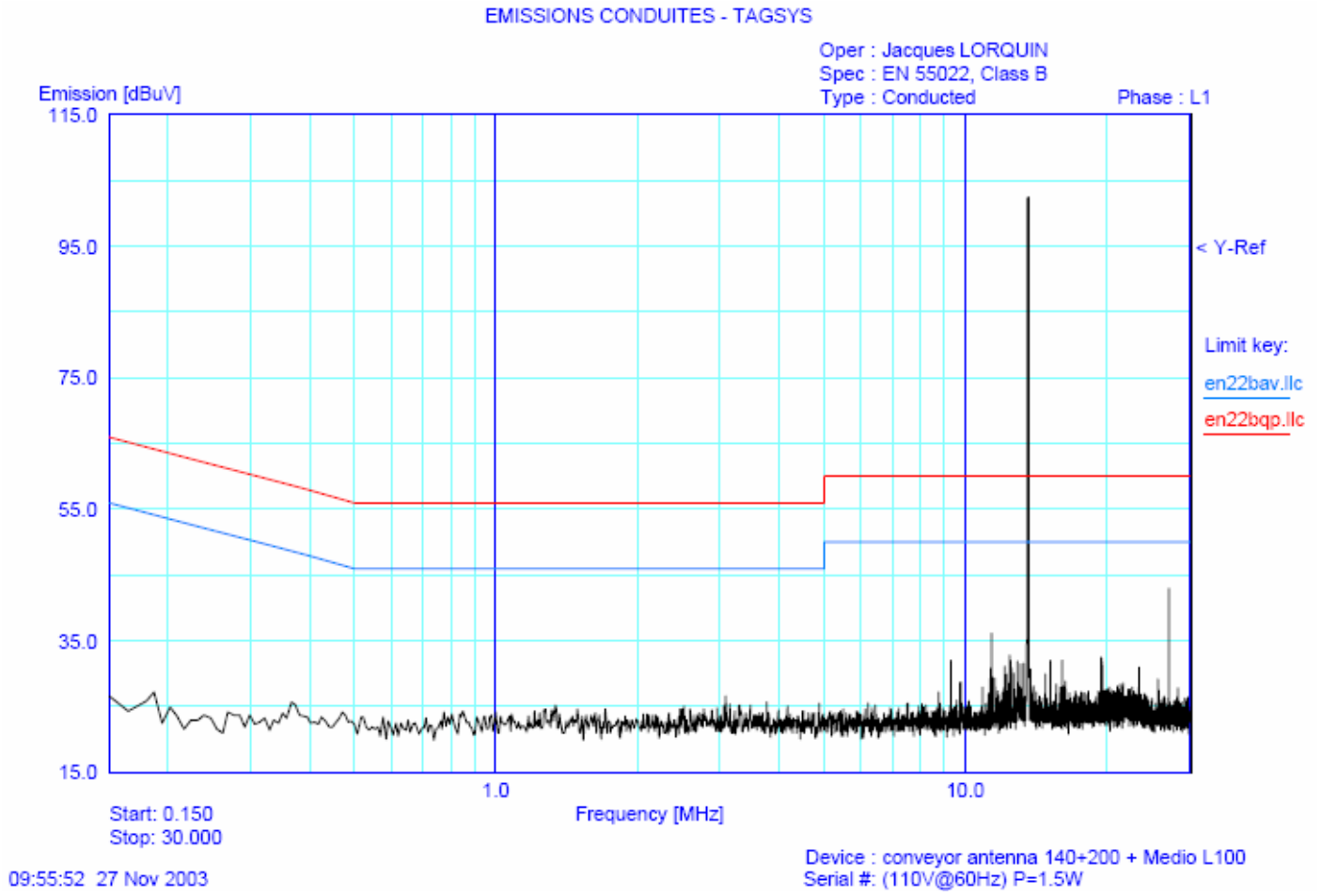
3.2. TEST EQUIPMENT

Equipment	Company	Model	Serial	Calibration Due
EMC Analyzer	HP	8591EM	3536A00384	March 29th ,2003
test receiver	Rohde&Schwarz	ESH3	872079/117	March 21st ,2003
Transient Limiter	HP	11947A	3107A01596	March 28th ,2003
LISN(auxiliary)	EMCO	3810/2SH	9511-11821628	December 12th ,2003
LISN(measure) 50Ω / 50µH	Telemeter Electronis	TGmbH NNB 2/16	0001300	September 13th ,2003
Faraday room	Rayproof		4854	none

3.3. TEST SEQUENCE AND RESULTS

Measures are performed on line 1 and line 2 of the power supply of the MEDIO-L100,

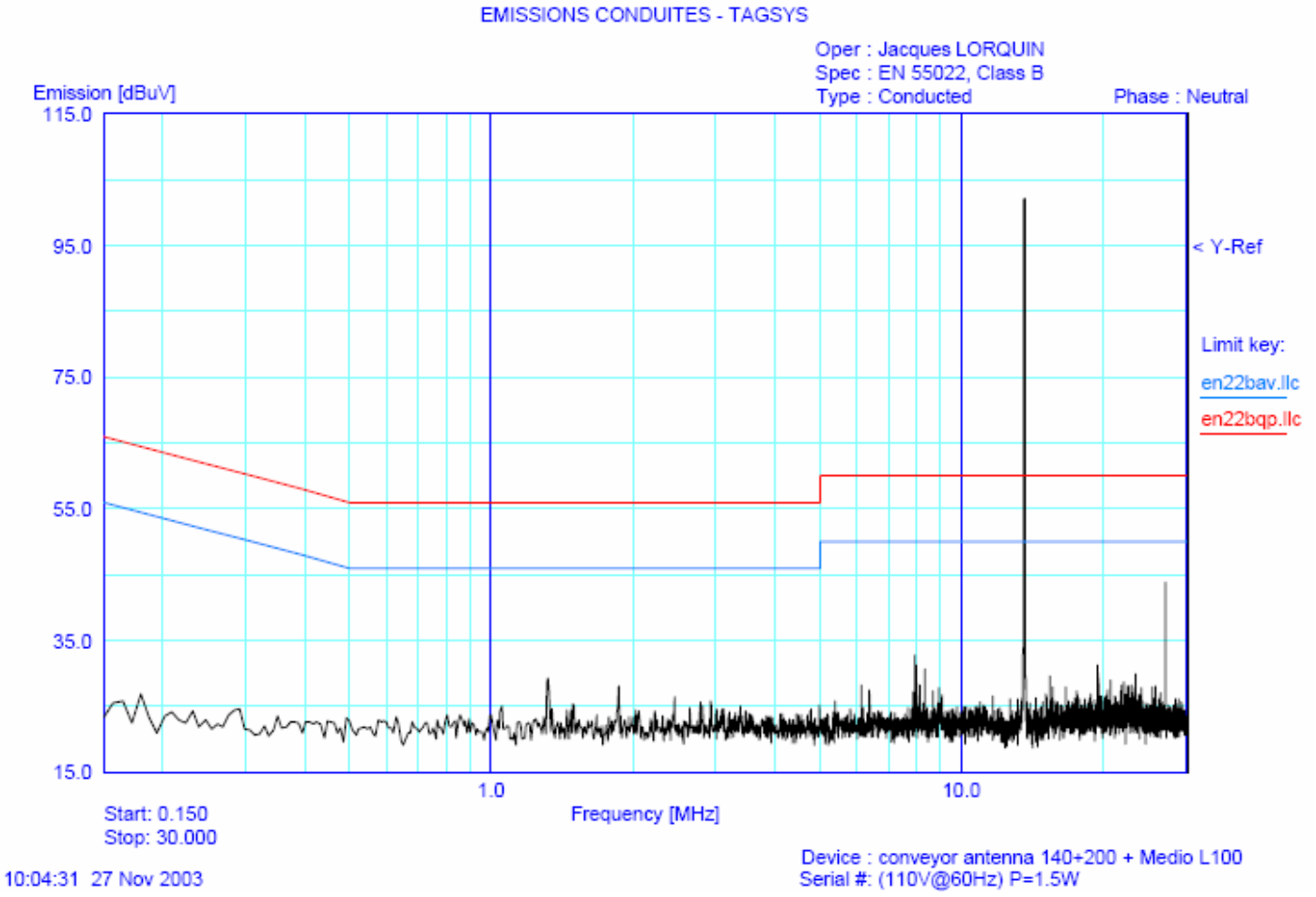
3.3.1.Line conducted emission data on MEDIO-L100



Num.	Freq. [MHz]	Peak [dBµV]	Q-Peak [dBµV]	QP limit [dBµV]	QP delta [dBµV]	Average [dBµV]	AVG Limit [dBµV]	AVG Delta [dBµV]	Comment.
1	11.36	25.59	21.84	60.0	**-38.16**	14.22	50.0	**-35.78**	
2	13.56	102.44	-	60.0	-	-	50.0	-	**See ***
3	27.12	43.39	42.66	60.0	**-17.34**	42.41	50.0	**-7.59**	

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

3.3.2.Neutral conducted emission data on MEDIO-L100

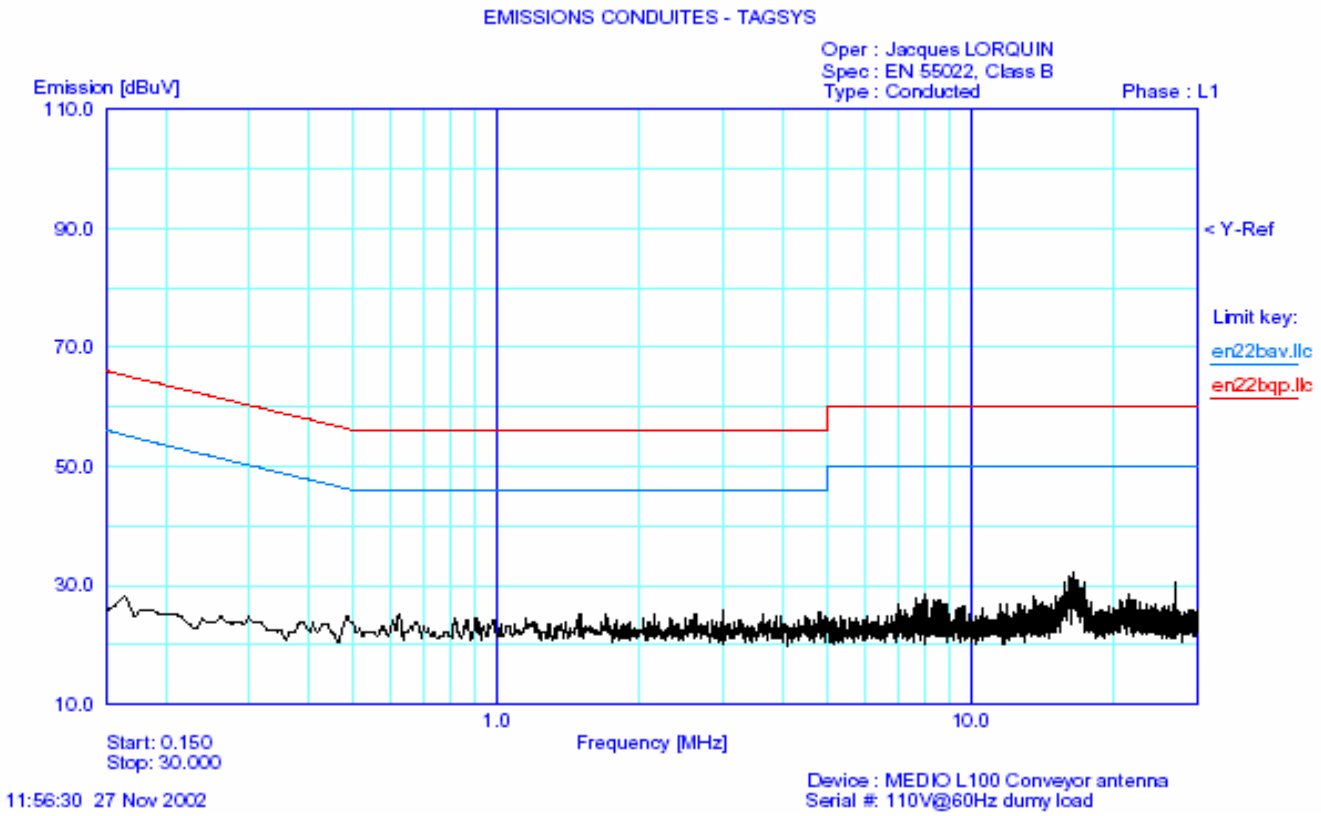


Num.	Freq. [MHz]	Peak [dBµV]	Q-Peak [dBµV]	QP limit [dBµV]	QP delta [dBµV]	Average [dBµV]	AVG Limit [dBµV]	AVG Delta [dBµV]	Comment.
1	8.00	36.45	23.97	60.0	**-36.03**	12.44	50.0	**-37.56**	
2	13.56	102.09	-	60.0	**-**	-	50.0	**-**	**See ***
3	27.12	44.45	43.77	60.0	**-16.23**	43.56	50.0	**-6.44**	

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

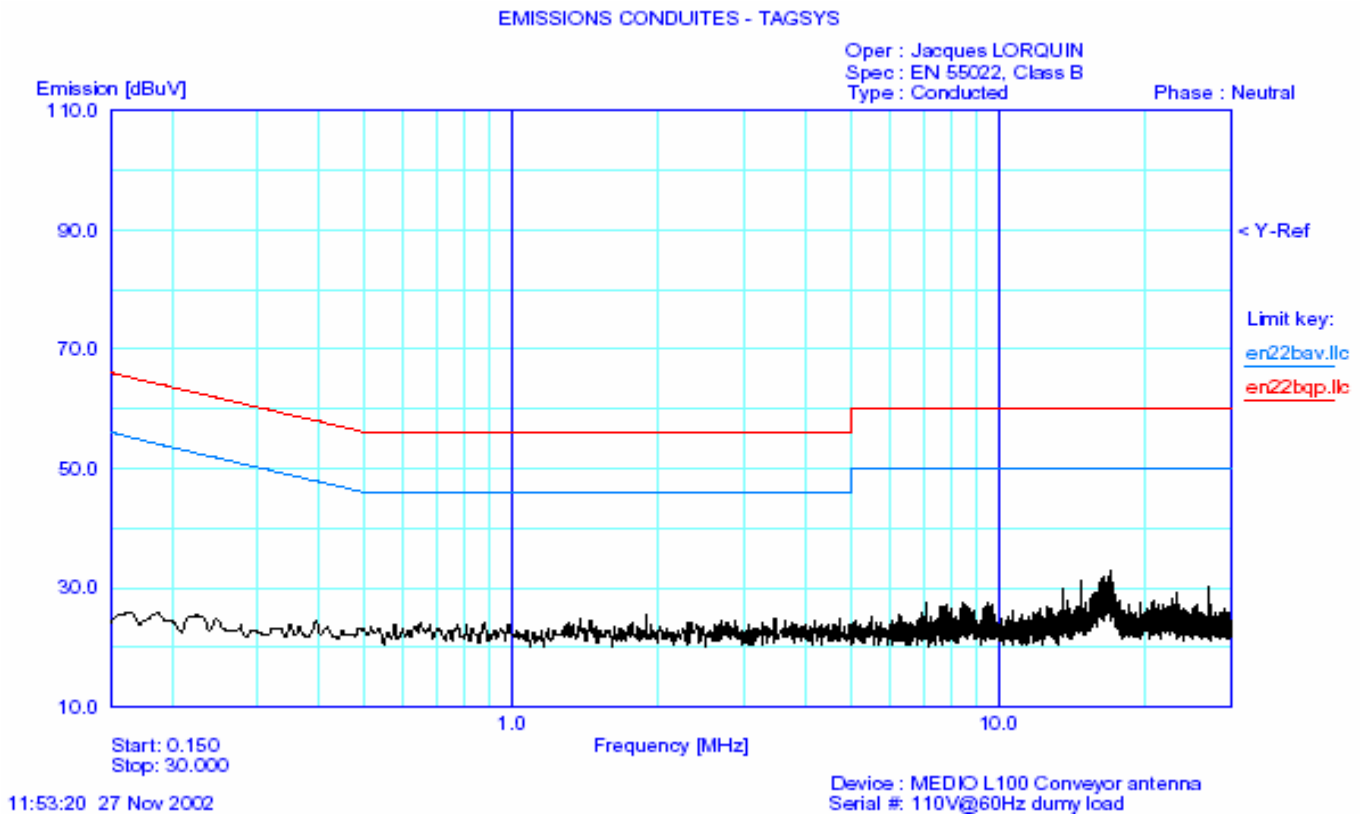
3.3.3.Line conducted emission data on MEDIO-L100 with dummy load

Antennas are replaced by dummy loads.



3.3.4.Neutral conducted emission data on MEDIO-L100 with dummy load

Antennas are replaced by dummy loads.



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. Tot Corr (deg)	(dB)
13.56	80	74.1	**-5.9**	70	vertical	90	35.5

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%): 0.4dBc

Limits Subclause §15.225(a)

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
13.56	10 000 80dBµV/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: 110-230V/60Hz
Frequency of carrier: 13.56 MHz
Upper limit: 13.561356 MHz
Lower limit: 13.558644 MHz

Voltage	85V	230V	276V
Frequency (MHz)	13.560000	13.559960	13.560025
Result	Pass	-	Pass

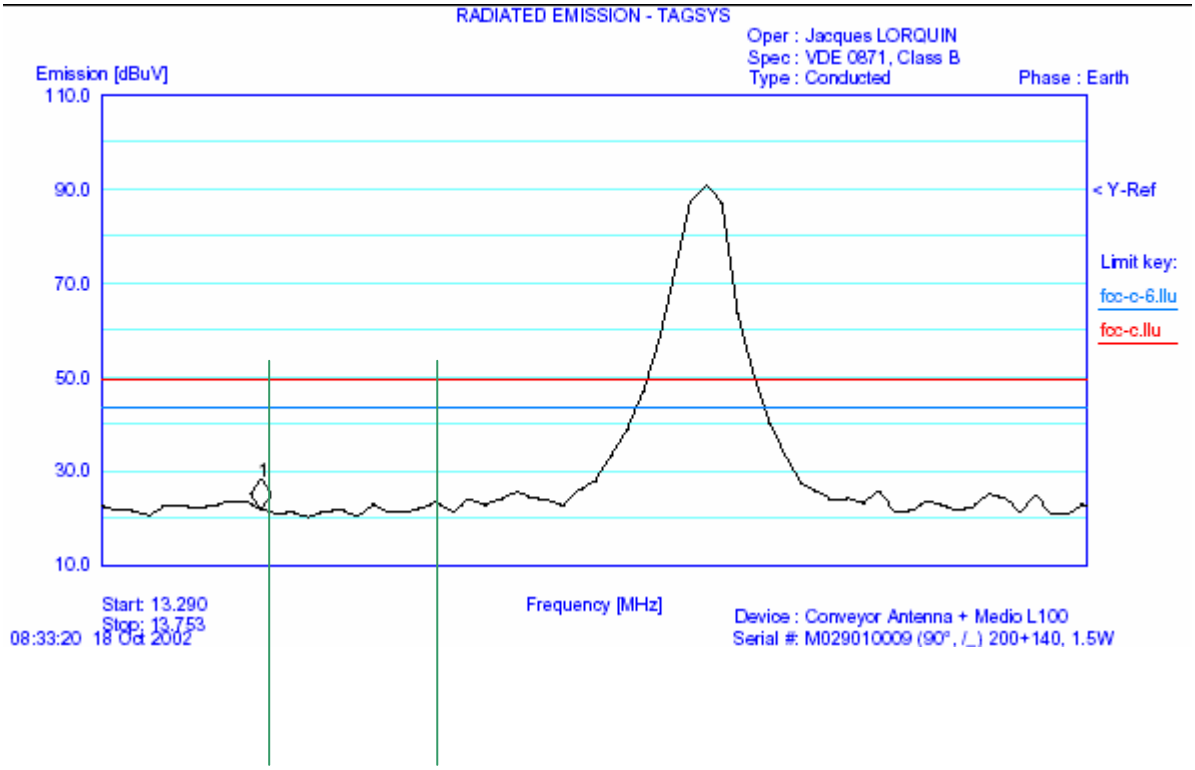
5.2. temperature

Temperature has been set at –20°C and +50°C at nominal voltage 230V/50Hz.
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)	13.559925	13.559960	13.560015
Result	Pass	-	Pass

6. Occupied bandwidth

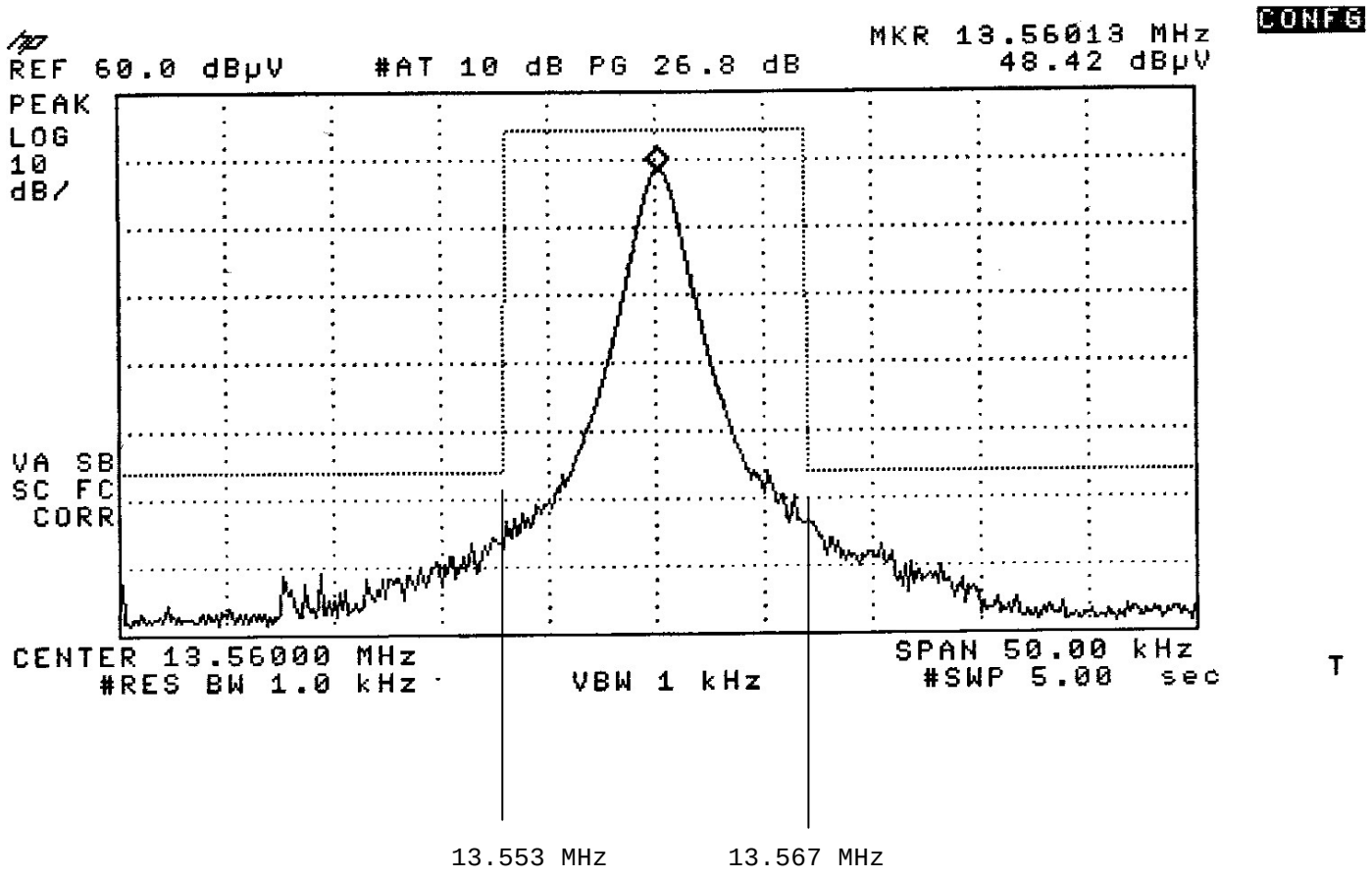
Here is a plot of the occupied bandwidth, which show that, 13.36MHz - 13.41MHz restricted band is free of spurious emission.



13.36MHz 13.41MHz

7. Band-edge compliance §15.209

Write time: 770ms



End of Tests