



Actions Mesures

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EMC TEST REPORT

Nr 2732-FCC

This test report applies only on equipment described hereafter.

Proposal number: 200304-2200

Date : May 20th & 22nd , 2003
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 : **Textile Rental Programming Station (TR-PS1)**
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



FCCID : QHKTRPRGMSTATN

1. System test configuration

1.1. Justification

The system was configured for testing in a typical fashion (as a customer would normally use it). The Textile Rental Programming Station is connected to a Personal Computer via the serial and keyboard port. It has been tested with a PC HP model Vectra VLi8.

1.2. HARDWARE IDENTIFICATION:

• Equipment under test (EUT):

➤ Textile Rental Programming Station (TR-PS1)sn: test series FCCID: QHKTRPRGMSTATN

- Input/output:
 - 1x serial connector
 - 1x power port (from 4.5V to 5.5Vdc)
- Size : 216x255x30
- Frequencies: clock : 20MHz, 4MHz crystal: 13.56MHz , bit rate: 38400bit/s (no clock or signal higher than 108MHz)
- RF power : 0.25W
- Cables:
 - Serial cable shielded with four ferrite Wurth N#742 7111, length:1.5m
 - Power supply cable shielded, length: 0.4m

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
ARI010SL (sn: none)	None	Smart label	
HP Vectra VLi8 pn:D7963A (sn: FR94020451)	Doc of Conf	Personal computer	All data cables are shielded Power cord unshielded
HP P1100 pn:D2846 (sn: JP74001000)	Doc of Conf	Color monitor	Video cable with ferrite Power cord unshielded
HEWLETT PACKARD pn: C4734-60111 (sn: M971168931)	GYUR38SK	Keyboard	Shielded cable
HEWLETT PACKARD pn: C4736-60101 (sn: LZA93024031)	JNZ201213	Mouse	Shielded cable
HP Deskjet 895CXI pn: C6410A (sn: MY9761915S)	Doc of Conf	Parallel printer	Parallel cable shielded Power cord unshielded
Telex (sn: 700 373.000A)	none	Microphone	

1.4. 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.



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1.5. EUT Exercise software

The EUT exercise program (Hyper terminal.exe, running under Windows 98) used during radiated and conducted testing was designed to exercise the TR-PS1 in a manner similar to a typical use (read TAG in loop):

Hyper terminal parameters:

- bits per second	: 38 400	- Stop bit	: 1
- Data bits	: 8	- Flow control	: none
- Parity	: none		

1.6. Special accessories

The serial cable (with ferrites) and power supply cable used for compliance testing are shielded as normally supplied. All these cables are supplied with the product.

1.7. I/O cables

- 2x Standard power cord Length:1.8m (PC and monitor)
- 1x video cable with 2 integrated ferrite (shielded cable, length: 1.8m)
- 1x Parallel cable #174-8747 (shielded cable, length: 2m)
- 1x USB cable shielded, length: 1m
- 1x serial cable with 4 ferrite Wurth N°742 7111(Shielded cable, length:1.5 m)
- 1x power supply cable (Shielded cable, length: 0.4m)

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 Textile Rental Programming Station TR-PS1.





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Equipment configuration and running mode:

- The TR-PS1 is plug on serial connectors;
- The PS/2 jumper connection is used to supply power to the TR-PS1 Programming Station.
- 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 3 meters Open site.

2.2. TEST EQUIPMENT

Test Equipment up to 1GHz on 3 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

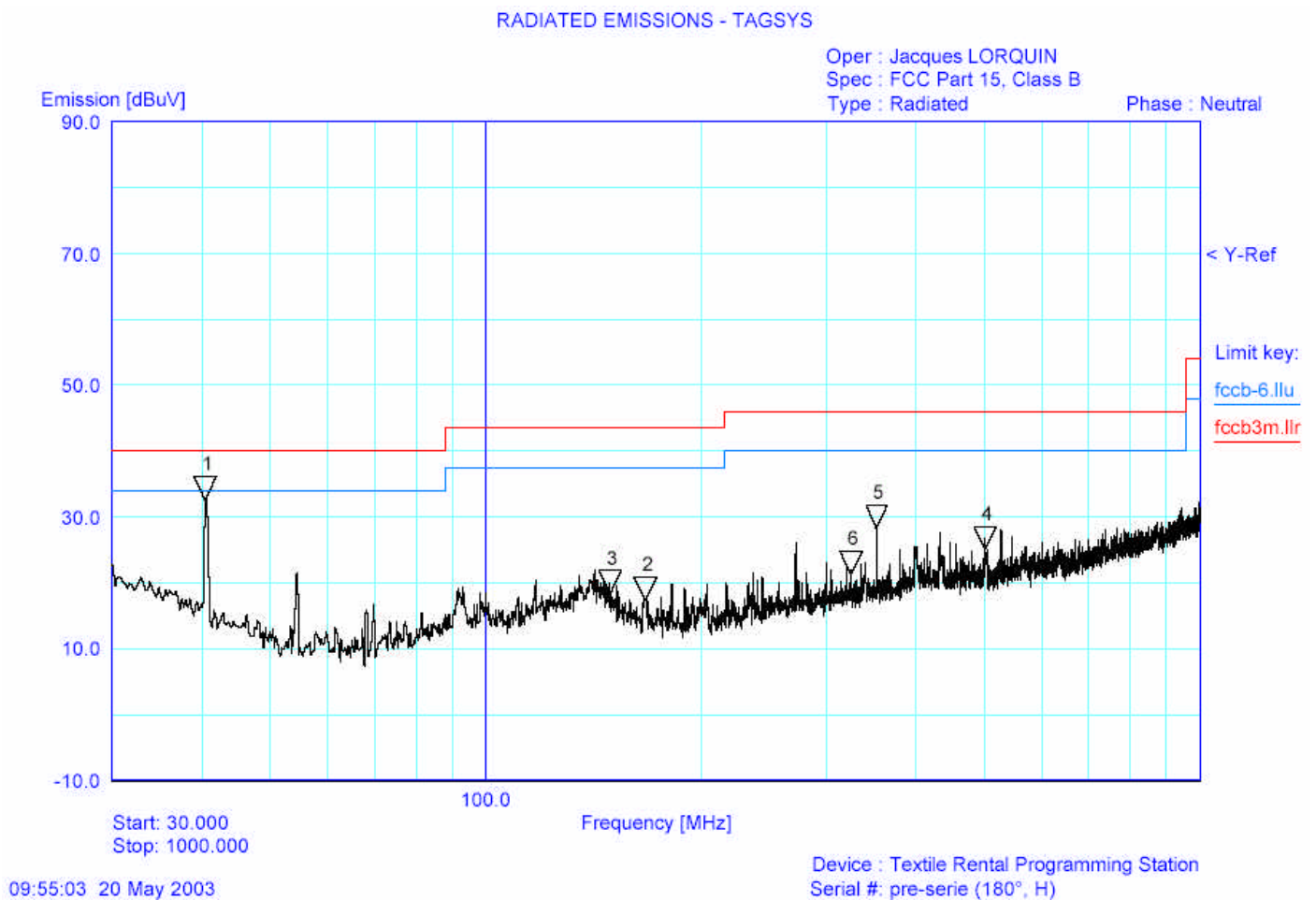


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2.3. TEST SEQUENCE AND RESULTS

2.3.1. Pre-characterization at 3 meters

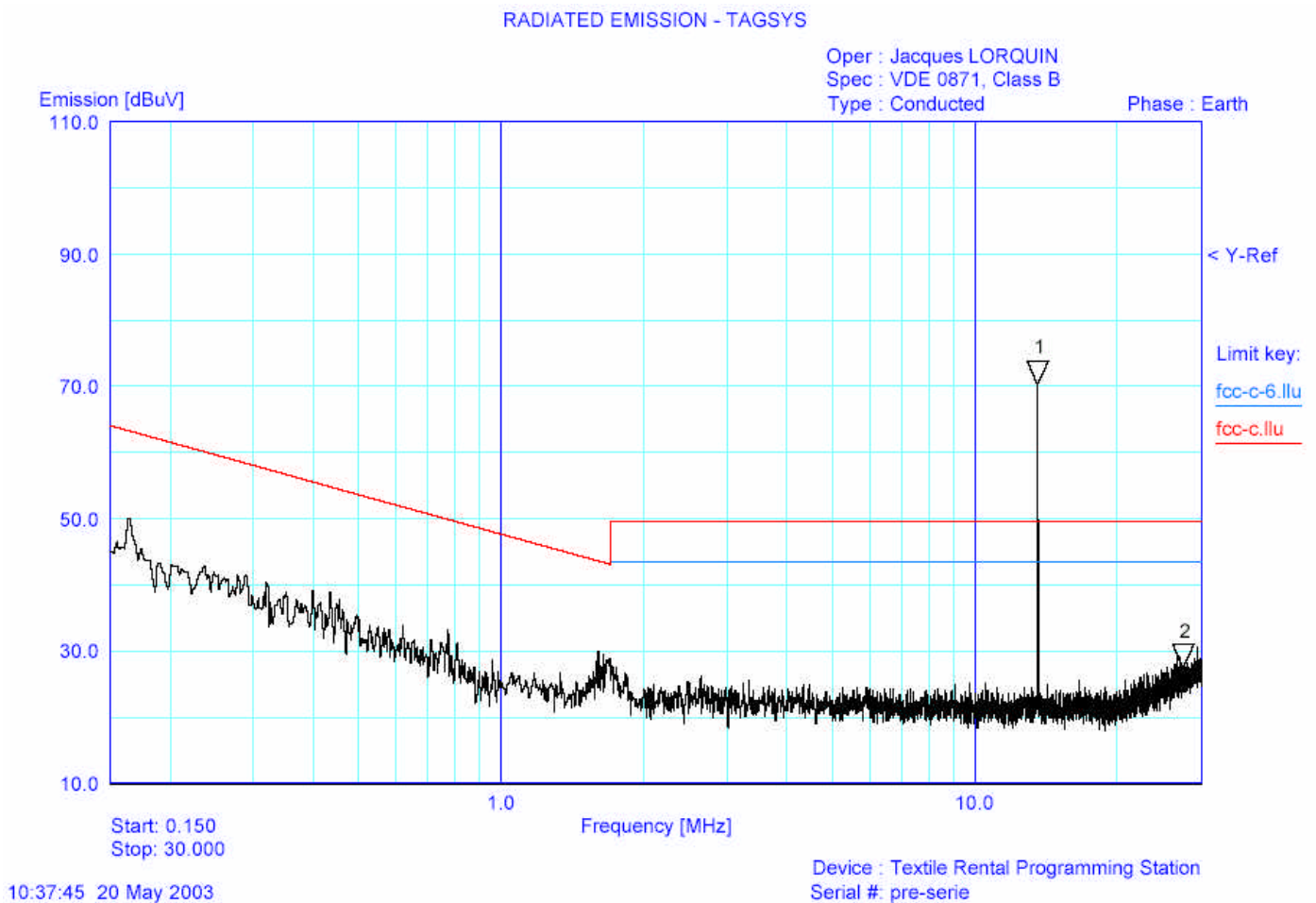
A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber. The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) polarization, and on 4 faces of the EUT. See below for a graph example:





FCCID : QHKTRPRGMSTATN

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



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

The product has been tested according to ANSI C63.4-(1992+2000), FCC part 15 subpart C. 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 3meters 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	40.664	40.0	39.9	-0.1	109	V	101	11.6	
2	149.157	43.5	20.9	-22.6	118	H	213	14.9	
3	167.349	43.5	29.3	-14.2	248	H	200	17.8	
4	325.429	46.0	34.4	-11.6	88	H	104	17.6	
5	352.582	46.0	38.6	-7.4	105	H	103	18.2	
6	500.835	46.0	27.6	-18.4	51	V	206	21.9	

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 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 ^{*1}	80	60.5	-19.5	120	vertical	90	35.4
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 52.5dB μ V 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 dB μ V/m.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dB}\mu\text{V/m}$$

The 32 dB μ V/m value can be mathematically converted to its corresponding level in μ V/m.

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32\text{dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}.$$



3. Conducted emission data

The product has been tested according to ANSI C63.4-(1992+2000) 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 a non-conducting table of 80cm height. The cable of the power supply has been shorted to 1meter length. The PC is powered trough the LISN (measure). The peripherals equipment are connected to a separate LISN (auxiliary).



Equipment configuration and running mode:

- The TR-PS1 is plug on serial connectors;
- The PS/2 jumper connection is used to supply power to the TR-PS1 Programming Station;
- PC and EUT are ON;
- software is running.



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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)	Telemeter	TGmbH NNB 2/16	0001300
50Ω / 50μH	Electronis		
Faraday room	Rayproof		4854



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3.3. TEST SEQUENCE AND RESULTS

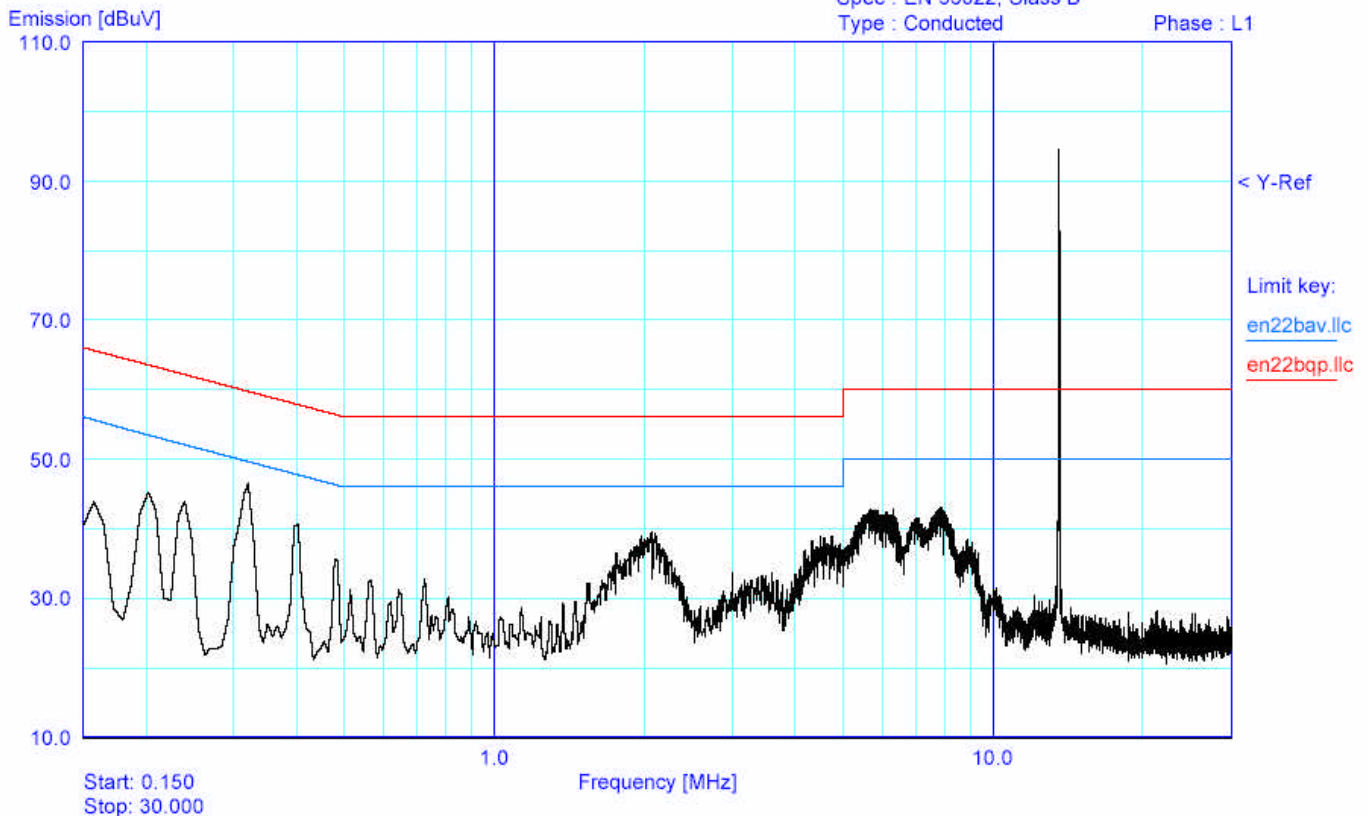
Measures are performed on line 1 and line 2 of the power supply of the TR-PS1,

3.3.1. Line conducted emission data on TR-PS1

CONDUCTED EMISSIONS - TAGSYS

Oper : Jacques LORQUIN
Spec : EN 55022, Class B
Type : Conducted

Phase : L1



11:53:27 20 May 2003

Device : TExtile Rental Programming Station
Serial #: pre-serie (110V@60Hz)

Num.	Freq. [MHz]	Peak [dBμV]	Q-Peak [dBμV]	QP limit [dBμV]	QP delta [dBμV]	Average [dBμV]	AVG Limit [dBμV]	AVG Delta [dBμV]	Comment.
1	0.16	44.70	43.60	64.00	-20.4	43.08	54.00	-10.92	
2	0.20	46.29	45.35	62.00	-16.65	44.84	52.00	-7.16	
3	0.24	45.16	44.04	62.00	-17.96	43.51	52.00	-8.49	
4	0.32	47.75	46.57	58.00	-11.43	45.60	48.00	-2.4	
5	0.40	41.68	40.43	56.00	-15.57	37.37	46.00	-8.63	
6	2.06	40.19	38.49	56.00	-17.51	37.11	46.00	-8.89	
7	5.89	43.22	41.57	60.00	-18.43	40.84	50.00	-9.16	
8	13.56	94.57	-	-	-	-	-	-	Carrier*

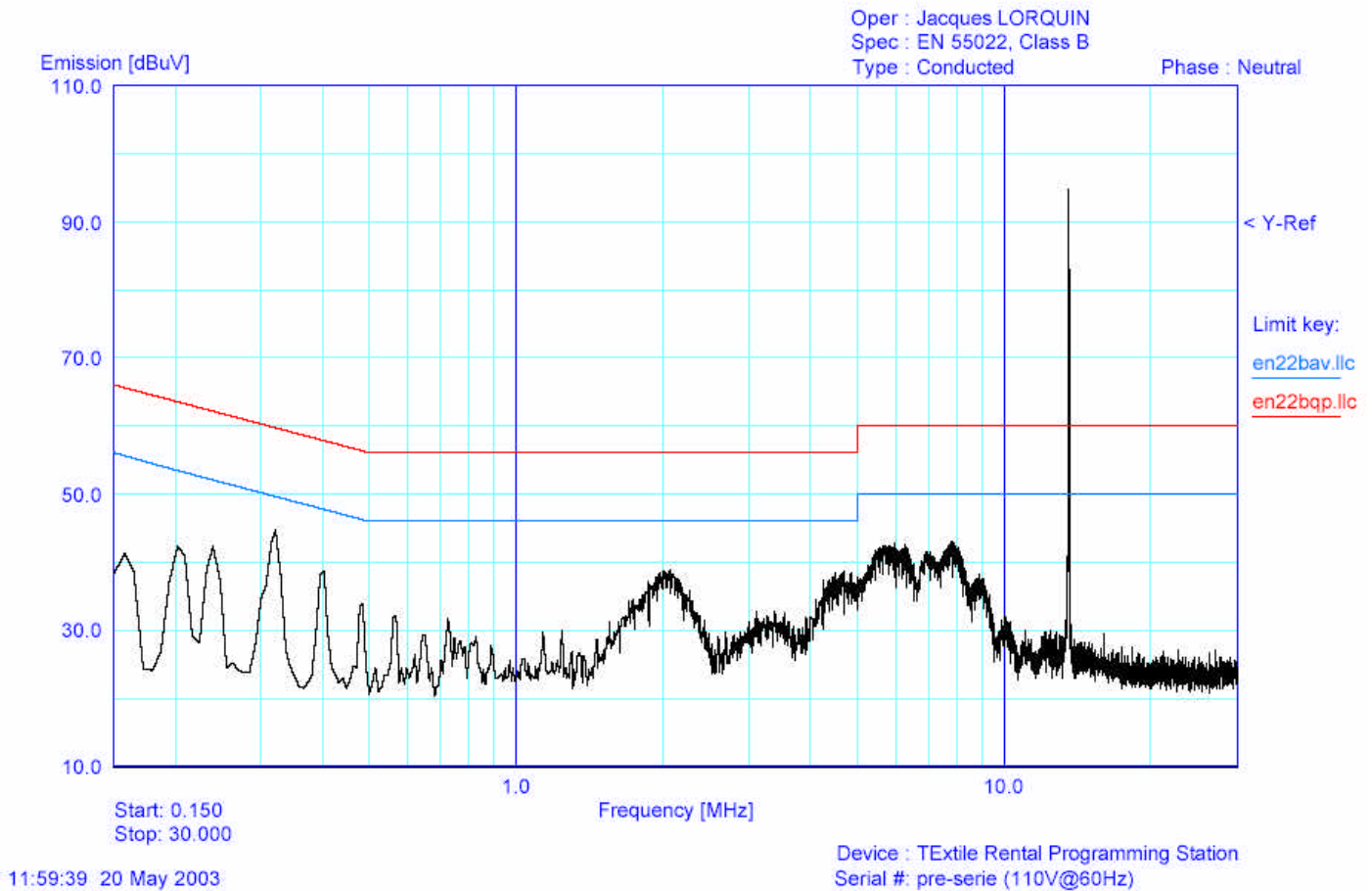
*: Carrier - S15.207(b): Limits shall not apply to carrier current systems operating as intentional radiators on frequencies below 30MHz.



FCCID : QHKTRPRGMSTATN

3.3.2. Neutral conducted emission data on TR-PS1

CONDUCTED EMISSIONS - TAGSYS



Num.	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	QP limit [dBuV]	QP delta [dBuV]	Average [dBuV]	AVG Limit [dBuV]	AVG Delta [dBuV]	Comment.
1	0.16	42.57	40.96	64.00	-23.04	40.54	54.00	-13.46	
2	0.20	43.07	42.18	62.00	-19.82	41.76	52.00	-10.24	
3	0.24	43.03	42.01	62.00	-19.99	41.58	52.00	-10.42	
4	0.32	46.01	44.77	58.00	-13.23	43.85	48.00	-4.15	
5	0.40	40.50	39.14	56.00	-16.86	35.50	46.00	-10.5	
6	2.07	39.45	37.79	56.00	-18.21	37.03	46.00	-8.97	
7	6.03	42.26	40.93	60.00	-19.07	38.14	50.00	-11.86	
8	13.56	94.66	-	-	-	-	-	-	Carrier*

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

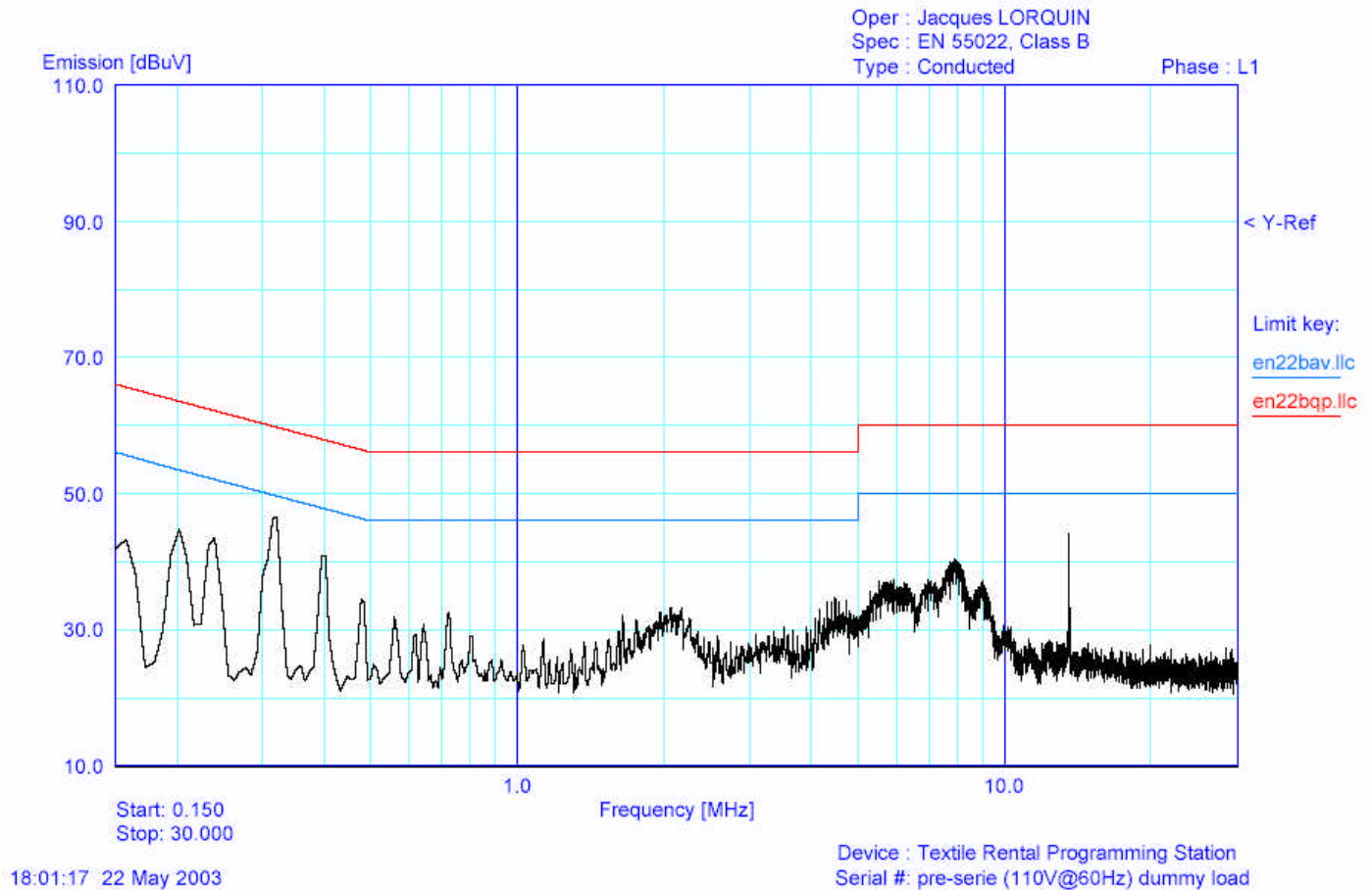


FCCID : QHKTRPRGMSTATN

3.3.3. Line conducted emission data on TR-PS1 with dummy load

Antenna is replaced by dummy load.

CONDUCTED EMISSIONS - TAGSYS



Num.	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	QP limit [dBuV]	QP delta [dBuV]	Average [dBuV]	AVG Limit [dBuV]	AVG Delta [dBuV]	Comment.
1	0.16	44.78	43.23	64.00	-20.77	42.69	54.00	-11.31	
2	0.20	45.72	44.99	62.00	-17.01	44.48	52.00	-7.52	
3	0.24	44.49	43.79	62.00	-18.21	43.25	52.00	-8.75	
4	0.32	47.32	46.39	58.00	-11.61	45.40	48.00	-2.6	
5	0.40	41.10	39.74	56.00	-16.26	36.69	46.00	-9.31	
8	13.56	44.33	43.38	60.00		43.01	50.00		Carrier*

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



FCCID : QHKTRPRGMSTATN

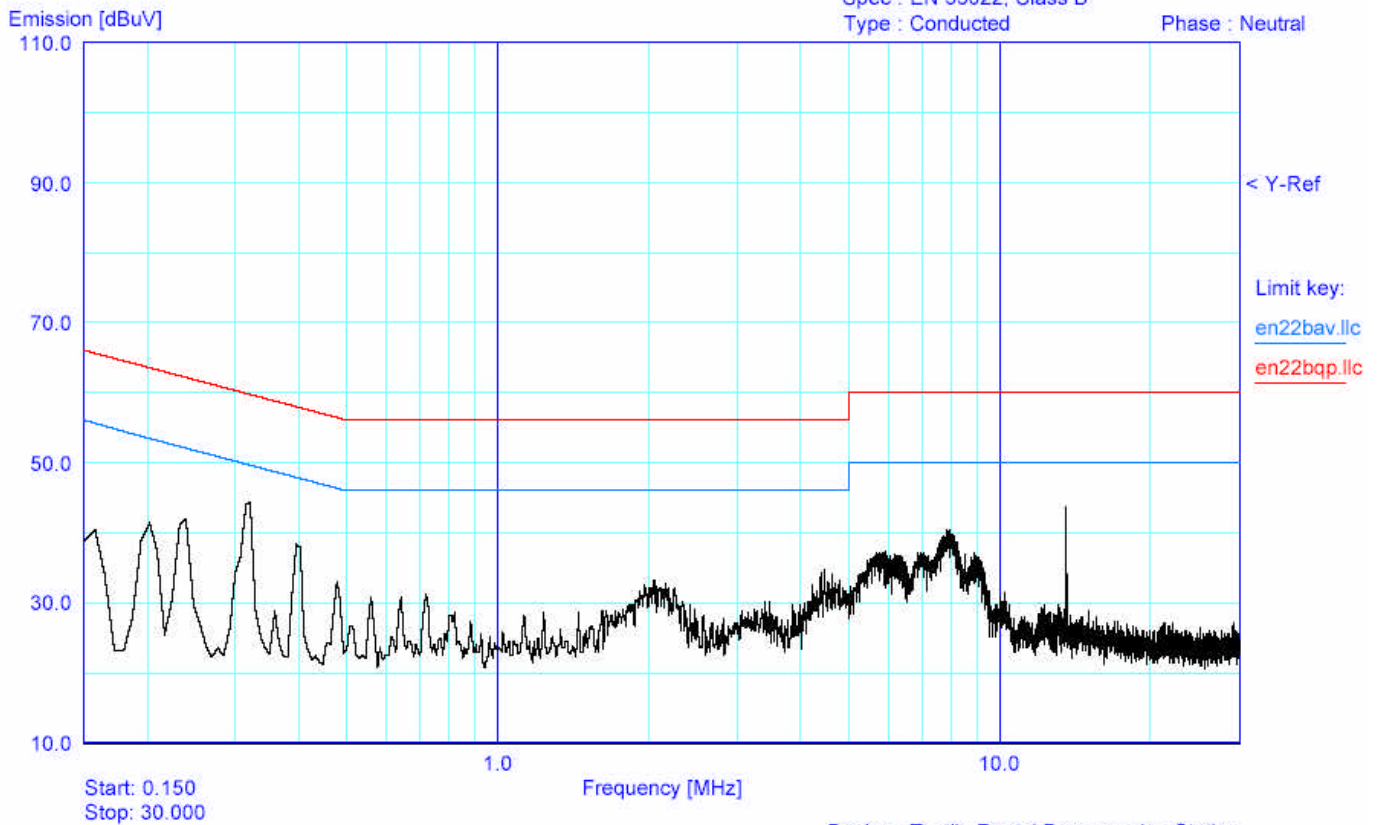
3.3.4. Neutral conducted emission data TR-PS1 with dummy load

Antenna is replaced by dummy load.

CONDUCTED EMISSIONS - TAGSYS

Oper : Jacques LORQUIN
Spec : EN 55022, Class B
Type : Conducted

Phase : Neutral



17:56:22 22 May 2003

Num.	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	QP limit [dBuV]	QP delta [dBuV]	Average [dBuV]	AVG Limit [dBuV]	AVG Delta [dBuV]	Comment.
1	0.16	42.15	40.22	64.00	-23.78	39.75	54.00	-14.25	
2	0.20	42.33	41.38	62.00	-20.62	40.95	52.00	-11.05	
3	0.24	42.53	41.56	62.00	-20.44	41.10	52.00	-10.9	
4	0.32	45.47	44.45	58.00	-13.55	43.53	48.00	-4.47	
5	0.40	39.50	38.07	56.00	-17.93	34.36	46.00	-11.64	
6	13.56	44.29	43.35	60.00		43.01	50.00		Carrier*

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



4. Field strength of fundamental §15.225(a)

The polarization of the measurements for the larger power level is vertical (the test is performed for both vertical and horizontal axis, and the loop antenna position was rotated during the test for maximized the emission measurement.)

Measurements 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	80	60.5	-19.5	120	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%): **0.4dBc**

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 : 4.5-5.5Vdc

Frequency of carrier: 13.56 MHz

Upper limit: 13.561356 MHz

Lower limit: 13.558644 MHz

Voltage	3.825V	5V	6.325V
Frequency (MHz)	13.559993	13.560001	13.559991
Result	Pass	-	Pass



FCCID : QHKTRPRGMSTATN

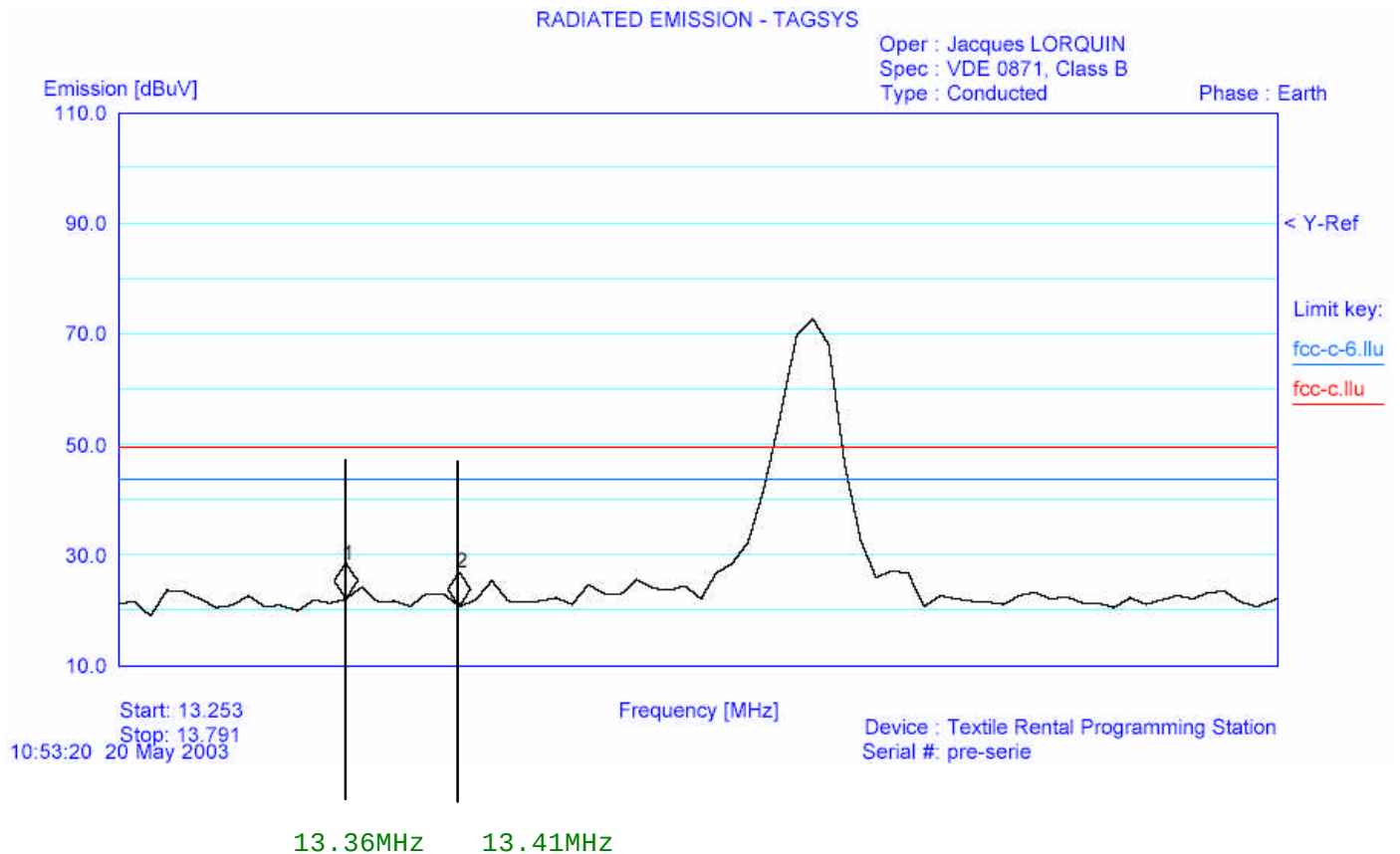
5.2. temperature

Temperature has been set at -20°C and $+50^{\circ}\text{C}$ at nominal voltage 4.5V-5.5Vdc.
 Frequency of carrier: 13.56 MHz
 Upper limit: 13.561356 MHz
 Lower limit: 13.558644 MHz

Voltage	-20°C	20°C	$+50^{\circ}\text{C}$
Frequency (MHz)	13.559991	13.560001	13.560001
Result	Pass	-	Pass

6. Occupied bandwidth

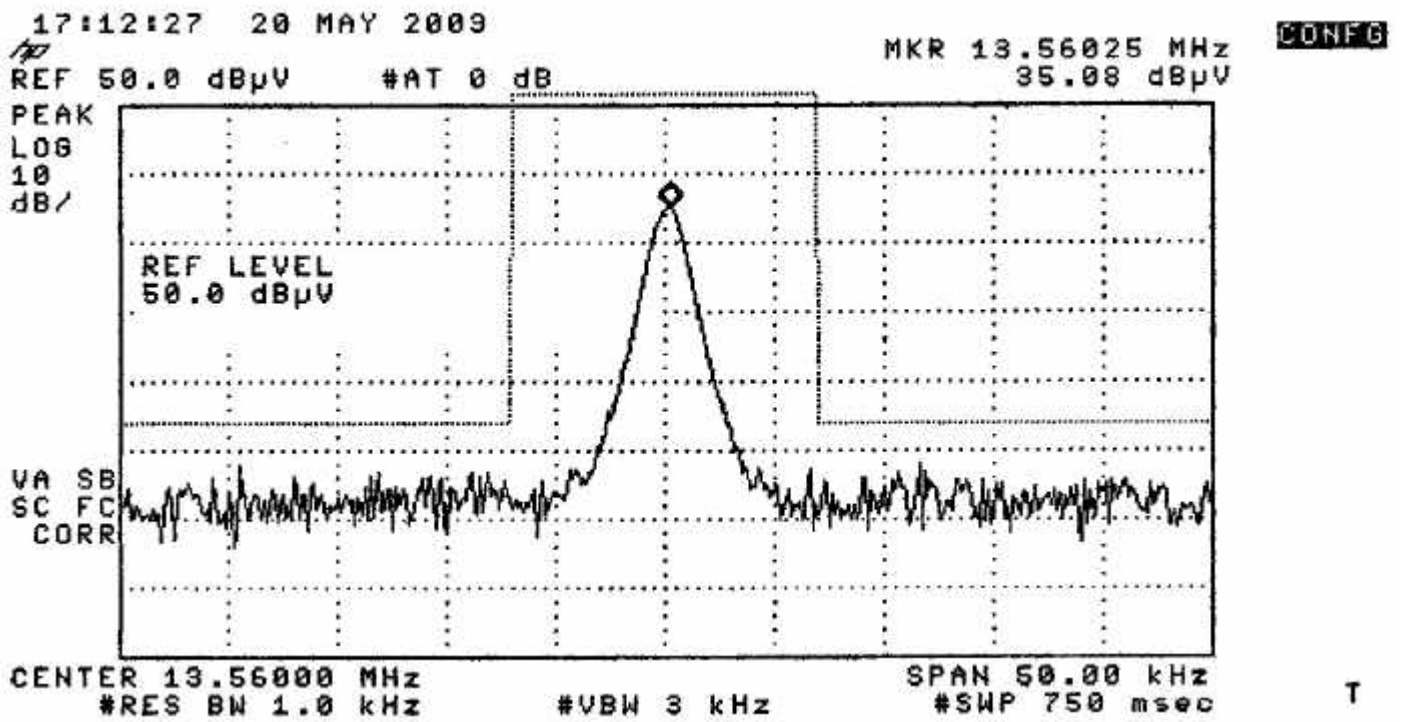
Here is a plot of the occupied bandwidth, which show that , 13.36MHz - 13.41MHz restricted band is free of spurious emission.





FCCID : QHKTRPRGMSTATN

7. Band-edge compliance §15.209



End of Tests