



Actions Mesures

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EMC TEST REPORT

Nr 2606-FCC

This test report applies only on equipment described hereafter.

Proposal number: 200210-2059

Date..... : November 14th, 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..... : **Library Programming Station**
Type of test : **Radiated and Conducted Emission Test**

Applied standards : ANSI C63-4 (1992)
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 : QHKPRGMSTATN

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 programming station was connected to a Personnel computer. It has been tested with a laptop DELL Latitude CPi model PPL.

1.2. HARDWARE IDENTIFICATION:

- **Equipment under test (EUT):** Library Programming station sn: pre-serie
FCCID: QHKPRGMSTATN
- Input/output: 1x serial connector (DB9)
1x 5V power supply input
- Size : 220x200x20mm
- Frequencies: crystal 13.56MHz and 20MHz (no clock or signal higher than 108Mhz)

1.3. Auxiliaries

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

Trade Mark - Model Number (Serial number)	FCC ID	Description	Cable description
FOLIO 20 D5 (sn: 0600111001E30010110)	None	Smart label	
FOLIO 20 D5 (sn: 0000000000000CAFEFDA)	None	Smart label	
FOLIO 20 D5 (sn: 055AA55AAFDA666242)	None	Smart label	
DELL Latitude CPi Model PPL (sn: 0009321C-12800-95N-2319) with adaptater PA.2 (sn: 12851-86C-2045)	Doc of Conf	Laptop	All data cables are shielded Power cable unshielded
HEWLETT PACKARD pn:D2846 (sn JP74001000)	Doc of Conf	21" color monitor	Shielded video cable with ferrite at each end. Power cable unshielded.
HEWLETT PACKARD pn:C4734-60111 (sn: M971168931)	GYUR38SK	Keyboard	Shielded cable
HEWLETT PACKARD pn:C6410A Deskjet 895Cxi (sn: MY9761915T)	Doc of Conf	Parallel printer	Shielded cable #C2950A

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.



1.5. EUT Exercise software

The EUT exercise program (Tagsys_library_test.EXE, running under Windows 95) used during radiated and conducted testing was designed to exercise the Programming Station in a manner similar to a typical use :

- Carrier on,
- Reading the tag's number,
- Carrier off,
- Display the number of the tag on the monitor.

1.6. Special accessories

The serial interfaces cables used for compliance testing is shielded as normally supplied. The keyboard power adaptater is unshielded. All these cables are normally recommended to be used with the product.

1.7. I/O cables

- 1x Standard power cord Length:1.8m (Monitor)
- 1x video cable with 2 integrated ferrite (shielded cable, length: 1.8m)
- 1x Parallel cable HP #C2950A (shielded cable, length: 2m)
- 1x serial cable provided with EUT (Shielded cable, length: 1.5m)
- 1x keyboard adapter provided with EUT (unshielded cable, length:0.6m)



2. Radiated emission data

2.1. SET-UP

The EUT is placed on a non-conducting table of 80cm height. three book (with tag) are set on the programming station.



Equipment configuration and running mode:

- The programming station is plug on serial connector;
- The programming is powered by 5Vdc of the keyboard connector;
- All other device is connected at each relevant ports of the PC
- 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 from 30MHz to 1GHz on 10 meters open site:

Equipment	Company	Model	Serial	Calibration Due
Spectrum Analyzer	HP	8568B	2732A04140	March 22 nd ,2003
Quasi-Peak adapter	HP	85650A	2811A01136	March 22 nd ,2003
RF Pre-selector	HP	85685A	2833A00773	March 22 nd ,2003
Biconical Antenna	EMCO	3104C	9401-4636	April 4 th ,2003
Log Periodic Antenna	EMCO	3146	2178	April 4 th ,2003
Spectrum Analyzer	HP	8593E	3409u00537	June 29 th ,2003
Loop antenna	Electro-metrics	EM-6879	690234	February 10 th ,2004
Amplifier	HP	8447F H64	3113A06394	March 28 th ,2003
OATS				April 9 th ,2003



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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).

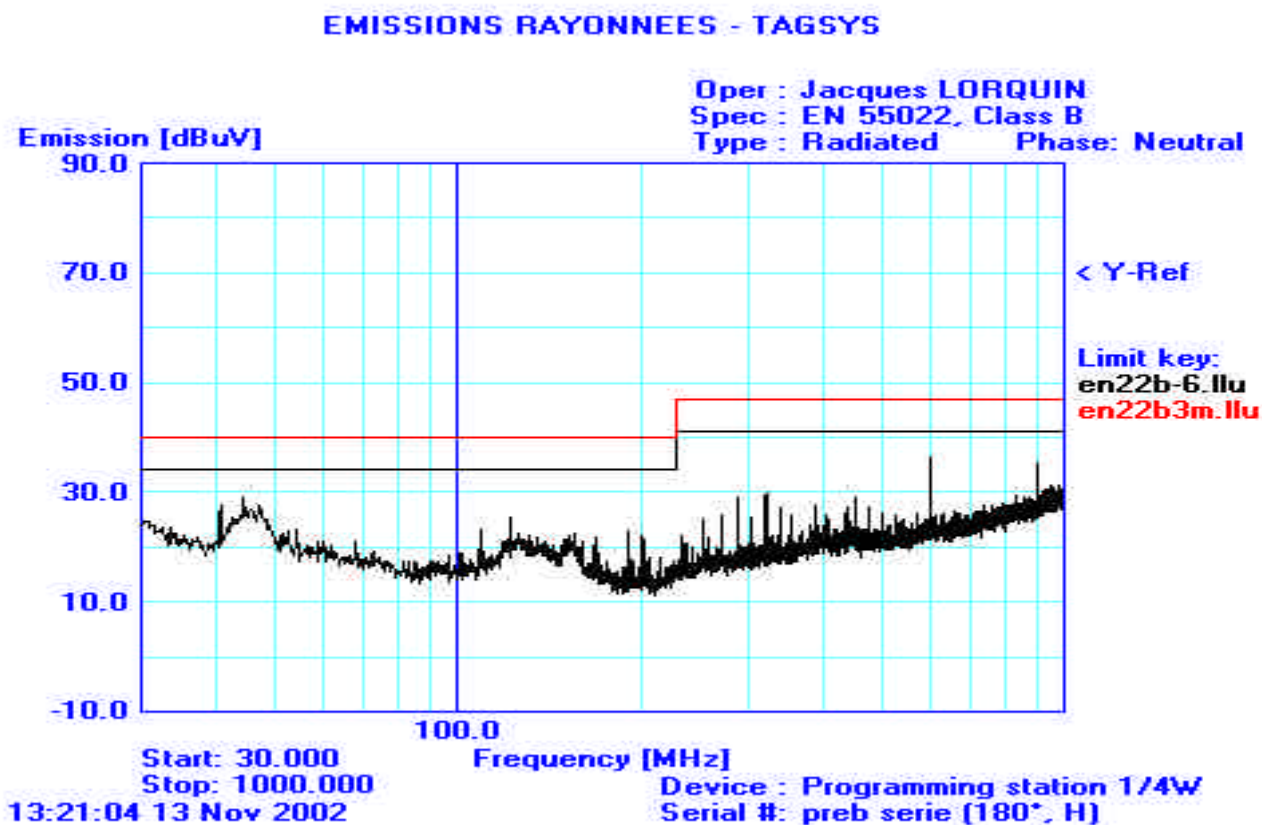
Pre-scan, test Equipment from 30MHz to 1GHz:

Equipment	Company	Model	Serial	Calibration Due
EMC Analyzer	HP	8591EM	3536A00384	March 29 th , 2003
Amplifier	HP	8447F H64	3113A06394	March 28 th , 2003
Antenna (30MHz-1GHz)	CHASE	CBL6111A	1628	March 29 th , 2003
Loop antenna (9kHz-30MHz)	Electro-metrics	EM-6879	690234	February 10 th , 2004

2.3. TEST SEQUENCE AND RESULTS

2.3.1. Pre-characterization at 3 meters

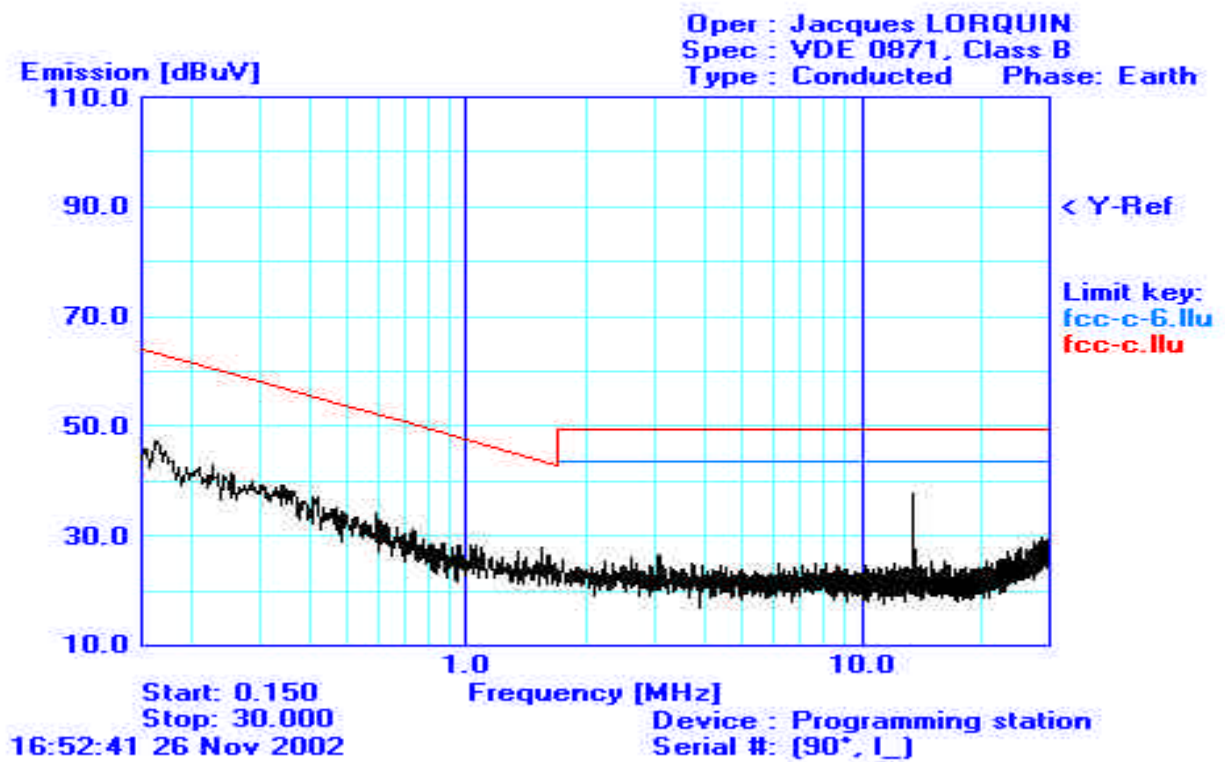
A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber. The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) polarization, and on 4 faces of the EUT. See below for a graph result:





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RADIATED EMISSION - TAGSYS



Result below 30 MHz



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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 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 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	40.624	40	37.8	-2.2	65	V	102	11.6	*
2	108.470	43.5	28.5	-15.0	18	H	394	15.8	*
3	122.031	43.5	33.0	-10.5	223	V	100	16.3	*
4	154.985	43.5	26.1	-17.4	24	H	187	16.4	*
5	167.010	43.5	36.4	-7.1	56	V	101	17.8	*
6	601.090	46	41.9	-4.1	44	H	216	23.5	*
7	901.569	46	43.8	-2.2	139	H	208	27.8	*

*: The results are extrapolated with §15.31 requirement.

Final result below 30 MHz

Frequency (MHz)	QPeak Lmt (dBµV/m)	QPeak (dBµV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Tot Corr (dB)
13.56 ^{*1}	80	41.2	-38.8	90	vertical	8.7
27.12	39.5	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) 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 non-conducting table of 80cm height. The cable of the power supply has been shorted to 1meter length. The PC is powered through the LISN. The programming station is powered via keyboard connector.





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Equipment configuration and running mode:

- The programming station is plug on serial connector;
- The programming is powered by 5Vdc of the keyboard connector;
- All other device is connected at each relevant ports of the PC
- PC and EUT are ON;
- software is running;

3.2. TEST EQUIPMENT

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

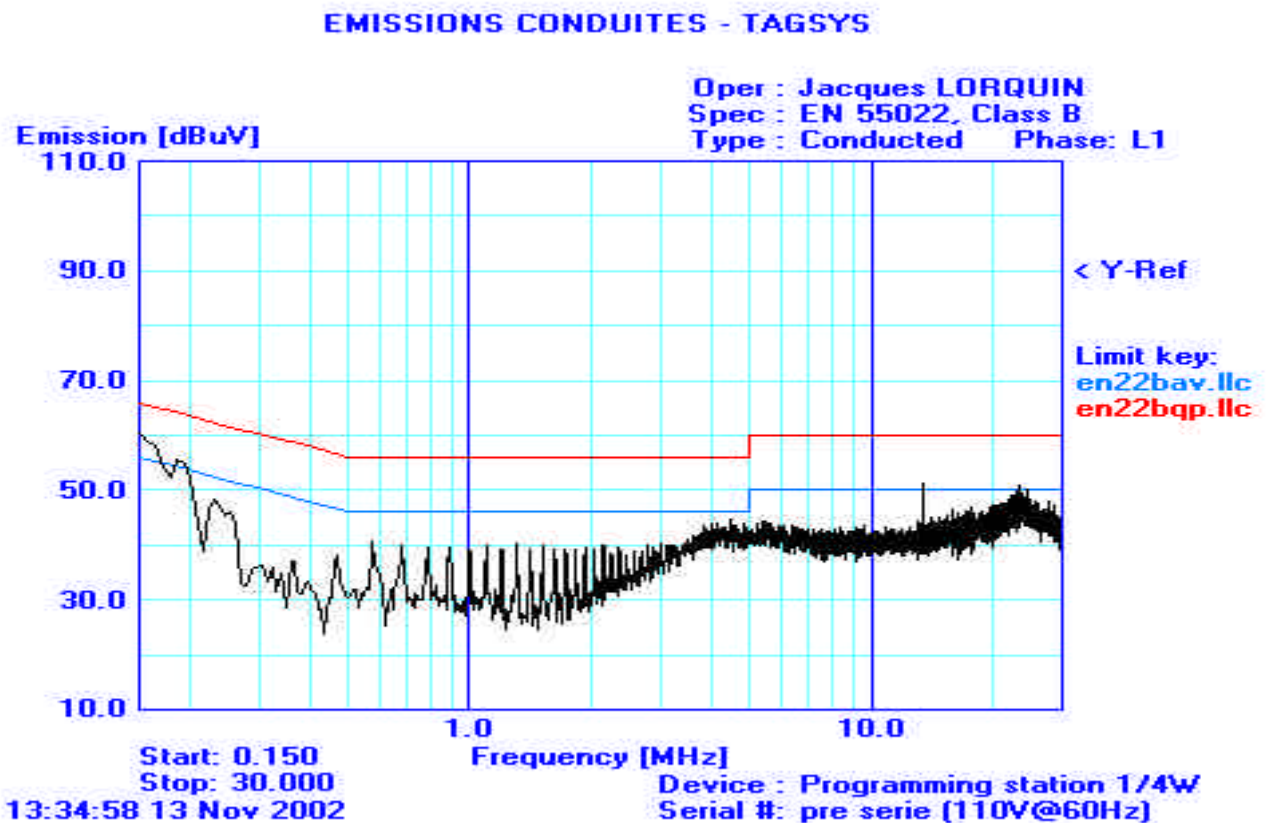


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3.3. TEST SEQUENCE AND RESULTS

Measures are performed on line 1 and line 2 of the power supply of the PC,

3.3.1. Line conducted emission data on laptop with programming station

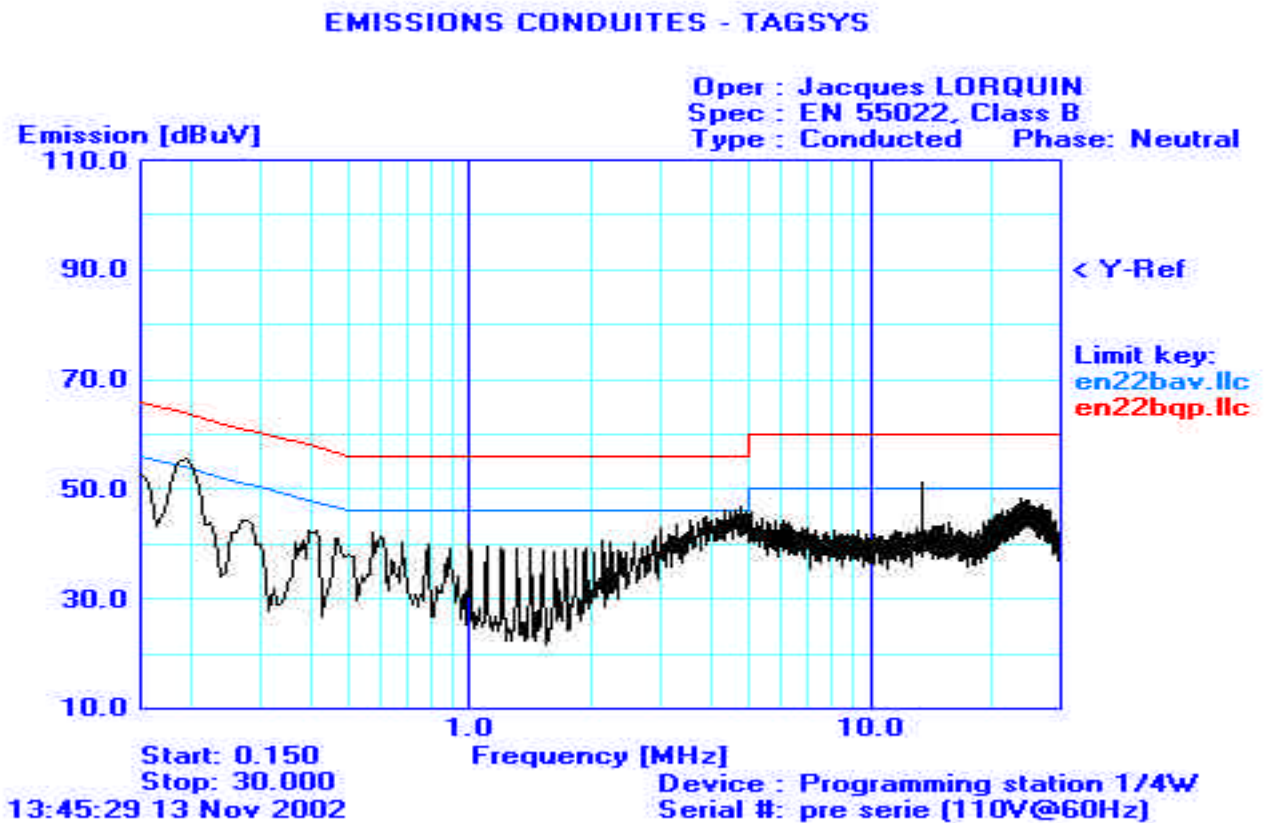


Num.	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	QP limit [dBuV]	QP delta [dBuV]	Average [dBuV]	AVG Limit [dBuV]	AVG Delta [dBuV]	Comment
1	0.150	53.20	50.87	66.0	-15.13	46.4	56.0	-9.6	
2	0.190	54.36	50.77	64.0	-13.23	46.2	54.0	-7.8	
3	0.230	42.17	37.17	62.4	-25.23	23.14	52.4	-29.26	
4	0.580	43.04	40.82	56.0	-15.18	36.95	46.0	-9.5	
5	0.680	40.99	38.43	56.0	-17.57	37.30	46.0	-8.7	
6	4.45	44.73	39.20	56.0	-16.8	31.10	46.0	-14.9	
7	13.56	53.21	51.05	60.0	-8.95	49.76	50.0	-0.24	Carrier
8	23.28	46.67	41.67	60.0	-18.33	32.45	50.0	-17.55	
9	23.34	47.09	42.04	60.0	-17.96	32.70	50.0	-17.3	
10	23.47	47.70	42.17	60.0	-17.83	32.82	50.0	-17.18	



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3.3.2. Neutral conducted emission data on laptop with programming station



Num.	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	QP limit [dBuV]	QP delta [dBuV]	Average [dBuV]	AVG Limit [dBuV]	AVG Delta [dBuV]	Comment.
1	0.150	-	61.1	66.0	-4.90	46.9	56.0	-9.1	
2	0.190	56.38	54.07	64.0	-9.93	47.7	54.0	-6.3	
3	0.270	45.25	41.90	61.1	-19.20	29.30	51.1	-21.8	
4	0.470	40.75	36.56	56.5	-19.94	33.13	46.5	-13.37	
5	0.580	45.30	42.24	56.0	-13.76	35.69	46.0	-10.31	
6	4.74	47.76	42.06	56.0	-13.94	33.35	46.0	-12.65	
7	13.56	52.97	50.83	60.0	-9.17	49.45	50.0	-0.55	Carrier
8	23.90	47.30	42.39	60.0	-17.61	33.42	50.0	-16.58	



4. Field strength of fundamental §15.225(a)

The polarization of the measurements for the larger power level is vertical (the test is performed in vertical and horizontal polarization)
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 Angle (dB)	Angle (deg)	Pol	Tot Corr (dB)
13.56	80	41.2	-38.8	90	Vertical	8.7

Maximum deviation under extreme test condition(dBc): 1.3dBc

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. TEST EQUIPMENT

Equipment	Company	Model	Serial	Calibration Due
EMC Analyzer	HP	8591EM	3536A00384	March 29 th , 2003
Power supply	HP	6842A	3531A00109	March 22 nd , 2003
Amplifier	HP	8447F H64	3113A06394	March 28 th , 2003
Antenna (30MHz-1GHz)	CHASE	CBL6111A	1628	March 29 th , 2003
Loop antenna (9kHz-30MHz)	Electro-metrics	EM-6879	690234	February 10 th , 2004

5.2. Voltage fluctuation

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



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Voltage	85%	5Vdc	115%
Frequency (MHz)	13.559950	13.560000	13.559963
Result	Pass	-	Pass

5.2.1.temperature

Temperature has been set at -20°C and +50°C at nominal voltage (5Vdc).

Frequency of carrier: 13.56 MHz

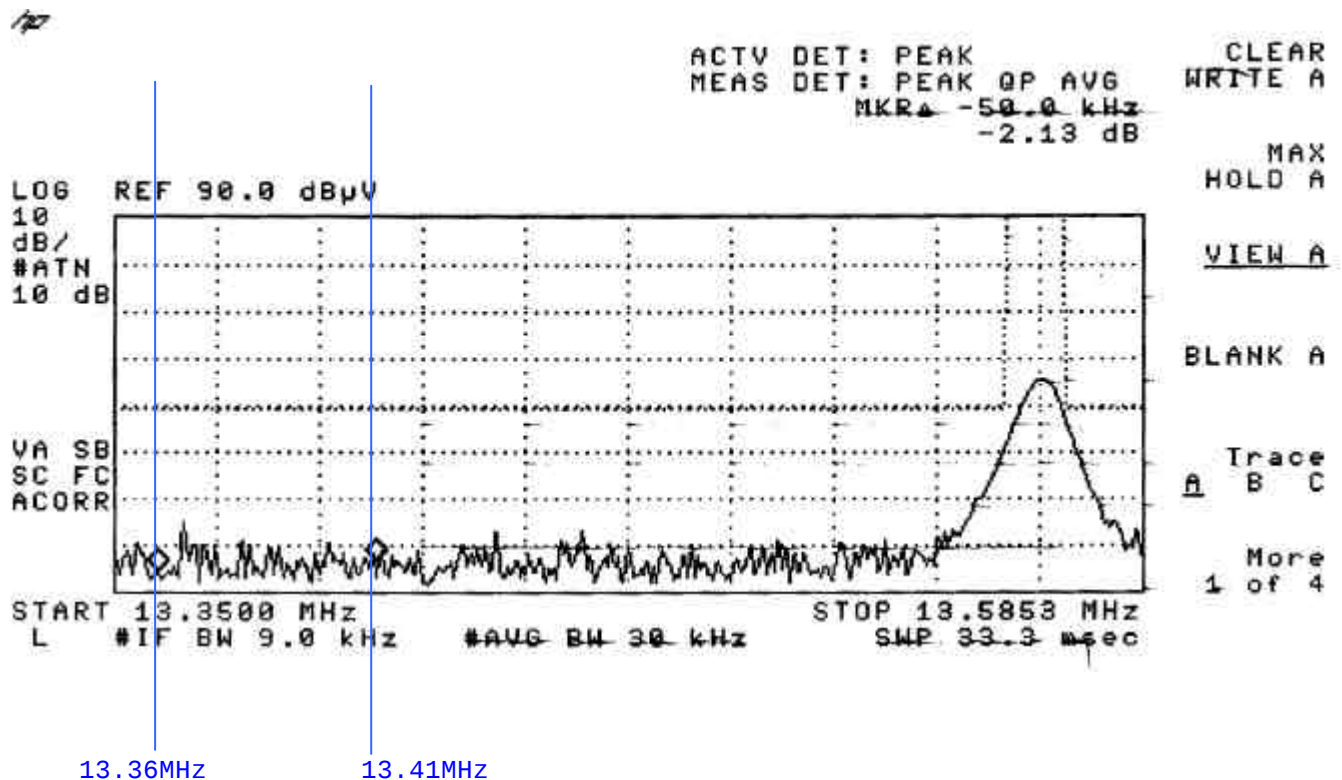
Upper limit: 13.561356 MHz

Lower limit: 13.558644 MHz

Voltage	-20°C	20°C	+50°C
Frequency (MHz)	13.559963	13.560000	13.559875
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.

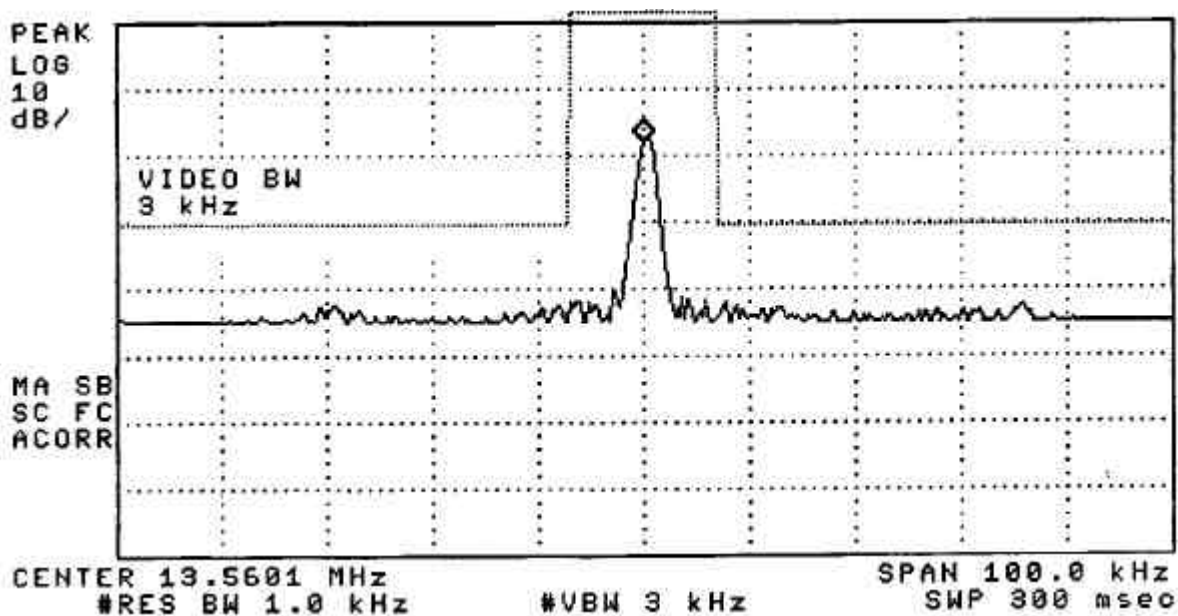




FCCID : QHKPRGMSTATN

Equipment	Company	Model	Serial	Calibration Due
EMC Analyzer	HP	8591EM	3536A00384	March 29 th , 2003
Amplifier	HP	8447F H64	3113A06394	March 28 th , 2003
Power supply	HP	6842A	3531A00109	March 22 nd , 2003
Loop antenna (9kHz-30MHz)	Electro-metrics	EM-6879	690234	February 10 th , 2004

7. Band-edge compliance \$15.209



Equipment	Company	Model	Serial	Calibration Due
EMC Analyzer	HP	8591EM	3536A00384	March 29 th , 2003
Amplifier	HP	8447F H64	3113A06394	March 28 th , 2003
Power supply	HP	6842A	3531A00109	March 22 nd , 2003
Loop antenna (9kHz-30MHz)	Electro-metrics	EM-6879	690234	February 10 th , 2004

End of Tests