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Rapport d'essai / *Test report*

JDE : 60048268 N° 200606-3147C-R1-E

DELIVRE A / *ISSUED TO* : **RADIOMETER**
72 rue de l'Alsace
69200 VILLEURBANNE (France)

Objet / *Subject* : Essais de compatibilité électromagnétique conformément aux normes : *Electromagnetic compatibility tests according to the standard :*
47 CFR Part 15 Subpart C

Matériel testé / *Apparatus under test* :

- Produit / *Product* : Station de travail de titrage/ *Titration Workstation*
- Marque / *Trade mark* : Radiometer analytical
- Constructeur / *Manufacturer* : Radiometer analytical
- Type / *Model* : TIM 980 / TIM 960 / TIM 965 / ABU 62*
- N° de série / *serial number* : 702R001N002*

* : information donnée par le client / *information given by the customer*

Date des essais / *Test date* : 12 Juillet 2006 / July 12th, 2006

Lieu d'essai / *Test location* : **LCIE**
ZI des Blanchisseries
38500 VOIRON - France

Test réalisé par / Test p*erformed by* : Jacques LORQUIN

Ce document comporte /*Composition of document :* 20 pages.

VOIRON, LE 13 JUILLET 2006 / JULY 13TH, 2006

Ecrit par / *Written by*
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1. TEST PROGRAMME

Tests have been performed according to following standards:

Standard : 47 CFR Part 15 Subpart C

Title 47 – Telecommunication; Part 15- Radio Frequency Devices

JUSTIFICATION: It has been decided that it will be the TIM980 which will be tested, as it's the most complete configuration. Consequently, all test results contained in this test report are from the TIM980.

2. SETUP

2.1. Hardware identification:

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

TIM980 sn: 702R001N002

- Size: 380x230x450mm
- Firmware: TIM980 V.1.0.BN0005
- Inputs/Outputs:
  - PC/Printer port, RS232
  - Local port, RS232
  - Balance port, RS232
  - Sample changer 80/90 port, RS232
  - Auxiliary port, RS232
  - E1, E2, REF, and Pt/Pt electrode port, BNC
  - Temperature sensor, RCA port
  - GND port, 4mm terminal
  - Mains power supply
  - PS/2 port for PC keyboard
  - 2x TTL output, 2mm terminal
  - 1x TTL input, 2mm terminal

*** Cables :**

- Power supply cable EUT & PC, unshielded, length: 1.8m;
- 6x Serial cables shielded, length: 1.2m;
- 2x Coaxial cables, length: 1m;
- 4x cables one wire, unshielded, length:1m

2.2. Auxiliaries or control equipement used for test

The FCC IDs for all equipment, plus description of all cables used in the tested system (including inserted cards, which have grants) are :

Trade Mark – Model Number (Serial number)	FCC ID	Description	Cable description
TIM 980* (sn: 702R001N002**)**	**UHC-TTL090**	**Titration workstation**	
CHERRY pn:G84-4100PPAFR/02 (sn: C011352M44)	D.o.C.	Keyboard	Shielded cable with ferrite
Dell Latitute CPi	D.o.C.	laptop	Serial cable shielded, power cord unshielded
Dell ADP-70BB model PA-2 (sn: none)	none	Power supply	Unshielded cable

*** : Equipment under test**

2.3. Running mode

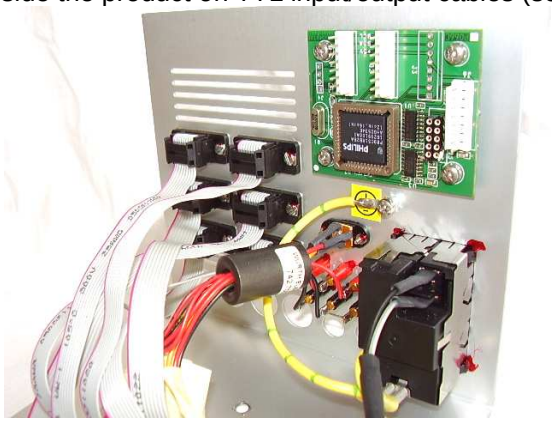
The system was configured for testing in a typical fashion (as a customer would normally use it).

The EUT exercise program (Soft EMC qualification) used during radiated and conducted testing was designed to exercise the TIM 980 in a manner similar to a typical use:

- Activated motors (stirrer, piston, stopcock).
- Measure the temperature and voltage.
- Reading the tag,
- Serial link activated.

2.4. Equipment modifications

A ferrite Wurth # 742 700 42 is set inside the product on TTL input/output cables (see photo for more detail).



3. RADIATED EMISSION DATA

3.1. Setup

Mains: 230V@50Hz

The EUT and auxiliaries are set on the no-conductive table of 80 cm height.

Equipment configuration and running mode:

- The TIM980 is connected on serial port of the laptop;

- software running in loop.

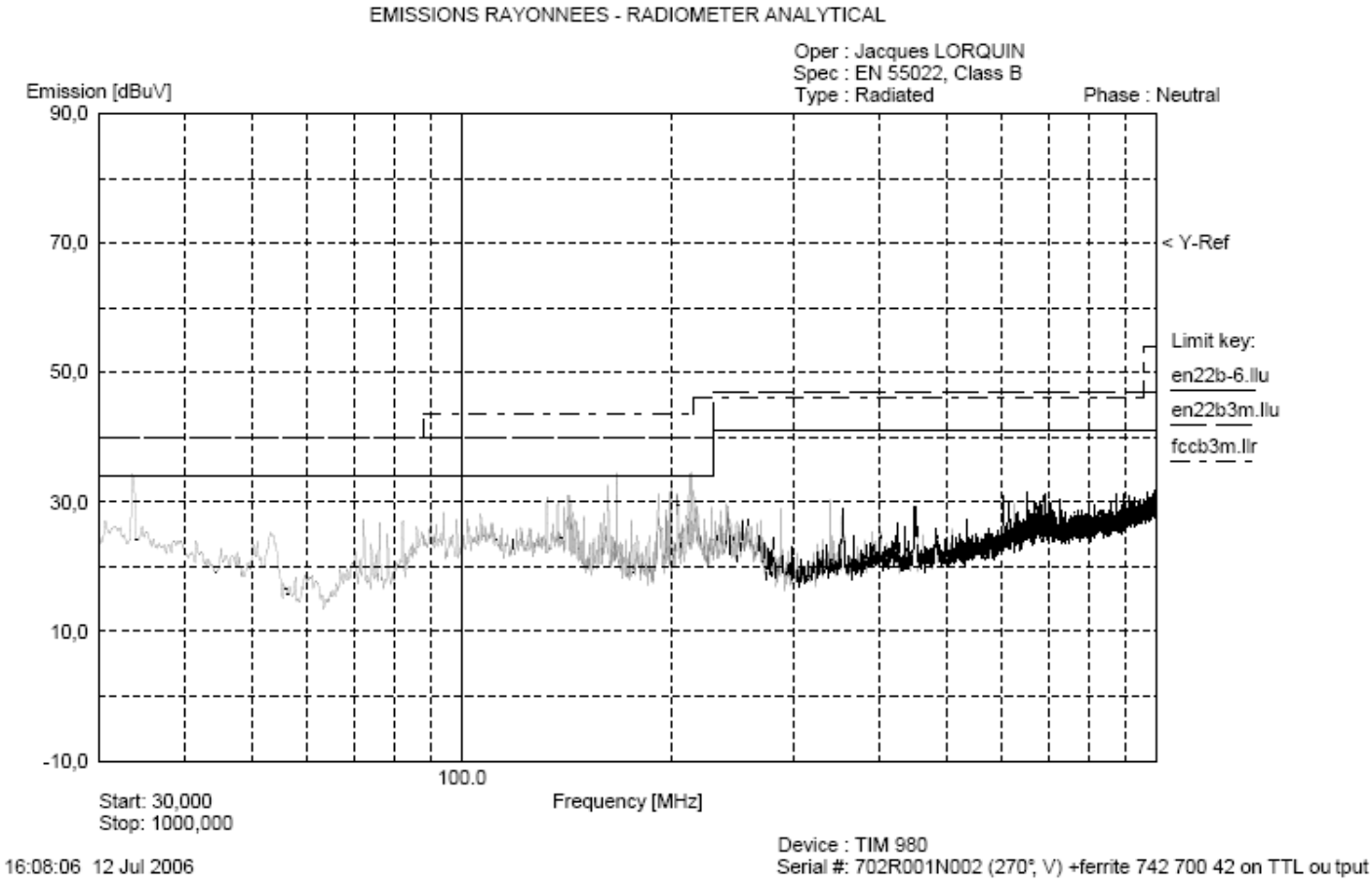
The installation of EUT is identical for pre-characterization measures in a 3 meters full anechoic chamber and for measures on a 10 meters Open site.

3.2. Test sequence and results

3.2.1. Pre-characterization at 3 meters

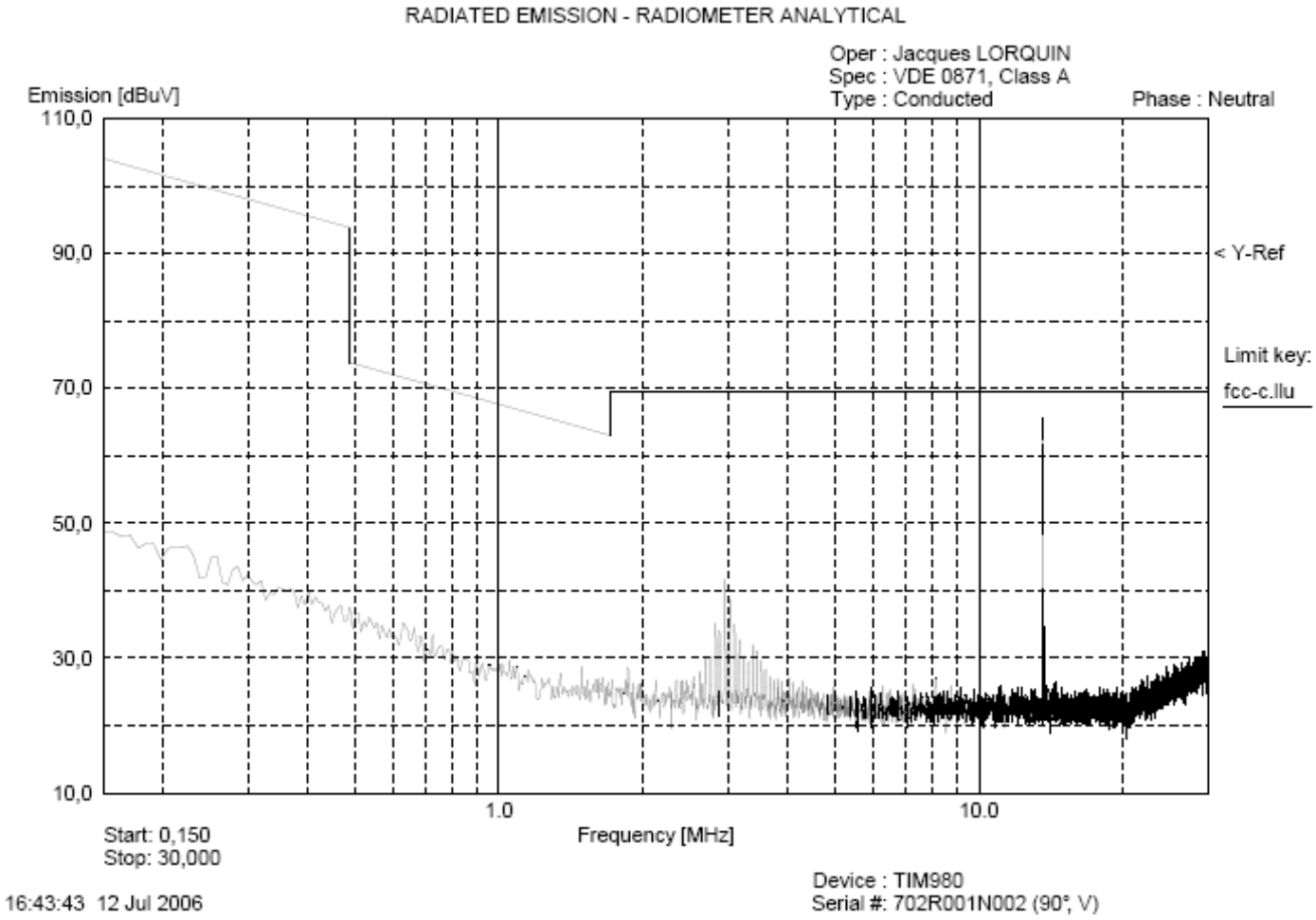
A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber. The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) polarization, and on 4 faces of the EUT. See below for a graph example:

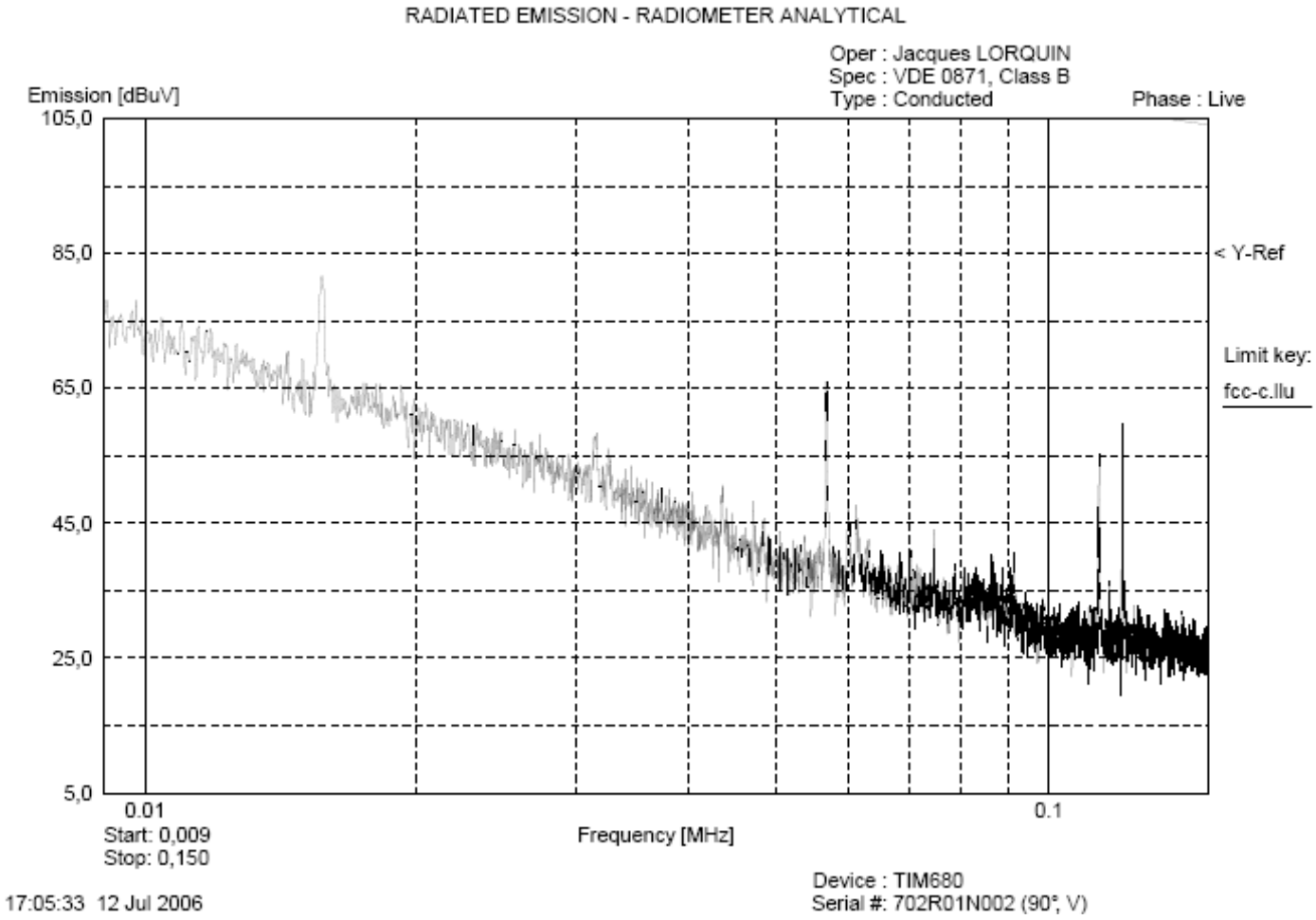
RBW: 120kHz - VBW: 300kHz



3.2.2. Pre-characterization at 3 meters below 30MHz of EUT

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

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

The product has been tested according to ANSI C63.4-(2003),. 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 limits. Measurement bandwidth was 120kHz from 30MHz 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 3.1.

Frequency list has been created with anechoic chamber pre-scan results.

No	Frequencies (MHz)	QPeak Lmt (dBµV/m)	QPeak (dBµV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Corr Factor (dB)	Comments
1	33.710	40.0	29.0	**-11**	245	V	120	11.9	
2	72.005	40.0	36.5	**-3.5**	295	V	120	9	
3	81.970	40.0	36.9	**-3.1**	260	V	160	9	
4	125.025	43.5	33.7	**-9.8**	95	H	370	14.7	
5	162.230	43.5	37.9	**-5.6**	195	V	250	16.9	
6	167.020	43.5	32.8	**-10.7**	65	H	370	17.1	
7	191.360	43.5	34.2	**-9.3**	255	H	310	18.5	
8	200.447	43.5	38.1	**-5.4**	290	V	120	15.3	
9	213.844	43.5	42.5	**-1**	270	V	120	15.2	
10	225.011	46	39.2	**-6.8**	35	H	360	15	
11	287.940	46	40.4	**-5.6**	245	H	320	16.7	
12	578.176	46	39.1	**-6.9**	80	H	110	22.5	

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

3.2.4. 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.

Test results:

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	39.4	**-44.6**	244	vertical	90	8.5
27.12*	29.5	No traceable signal					

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

3.3. 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.

4. CONDUCTED EMISSION DATA

The product has been tested according to ANSI C63.4-(2003).

The product has been tested with 110V@60Hz power line voltage and compared to the FCC part 15 Subpart C limits. Measurement bandwidth was 9kHz from 150kHz to 30MHz.

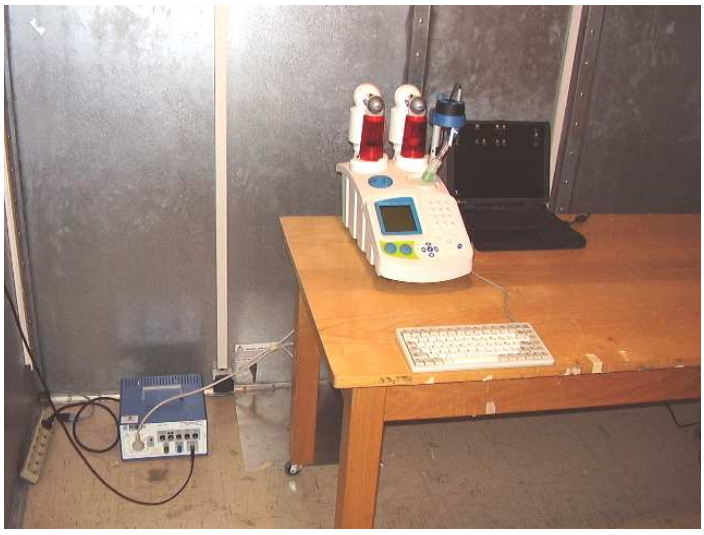
Measurement was initially made with an HP-8591EM Spectrum Analyzer in peak mode. This was followed by a Quasi-Peak, i.e. CISPR measurement with the Rohde & Schwarz ESH3 receiver for any strong signal. If the average limit is met when using a Quasi-Peak detector, the EUT shall be deemed to meet both limits and measurement with the average detector is unnecessary.

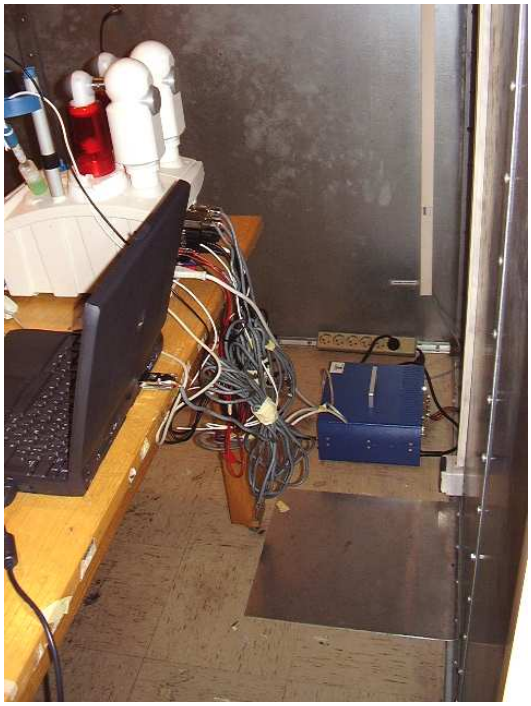
The Peak data are shown on the following plots. Quasi-Peak and Average measurements are detailed in a table with frequencies and levels measured.

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.

4.1. Setup

Mains: 110V@60Hz





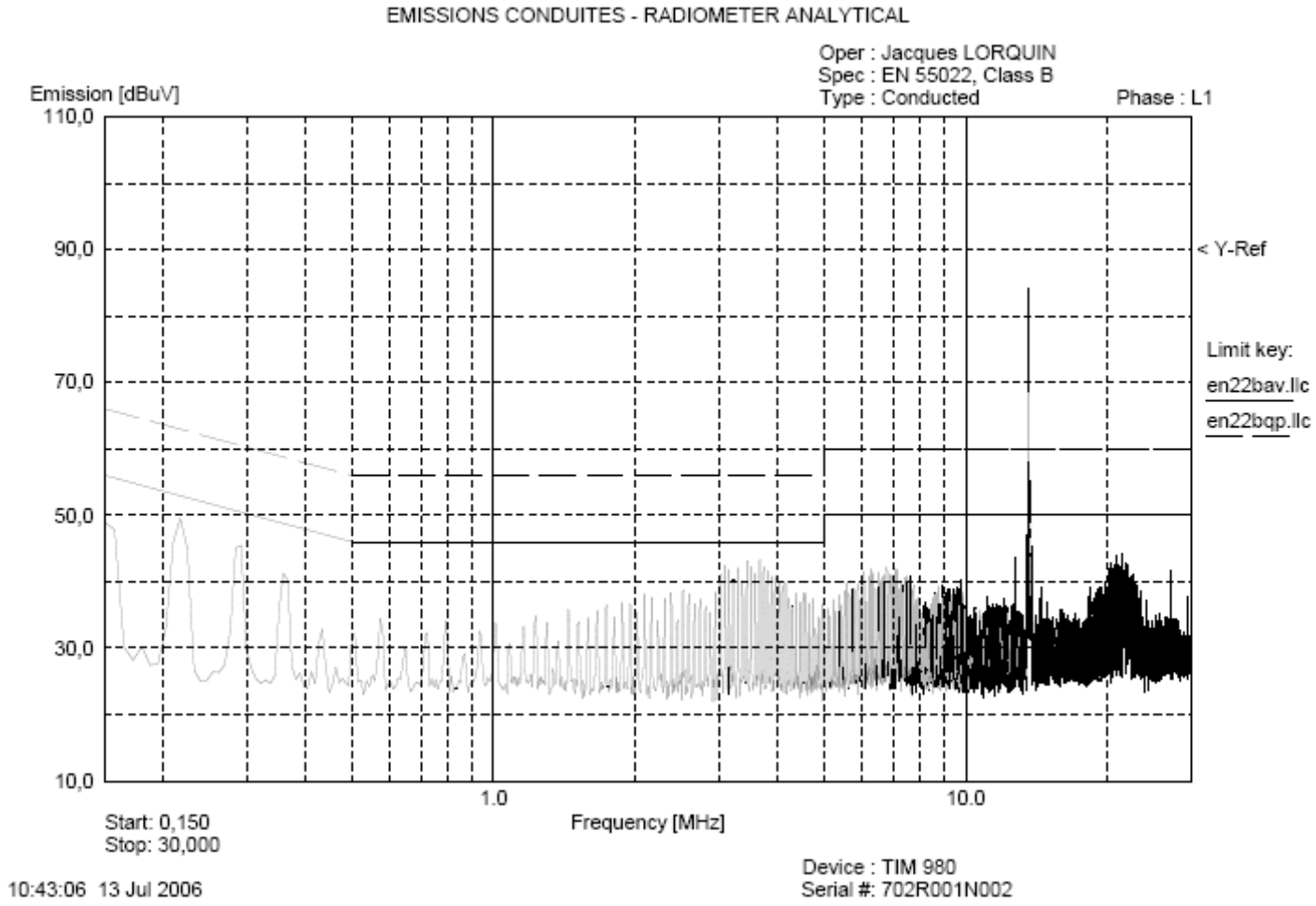
The EST and auxiliaries are set on the no-conductive table of 80 cm height. The equipment under test is powered via the LISN.

4.2. TEST SEQUENCE AND RESULTS

Measures are performed on line 1 and line 2 of the power supply of the TIM980.

4.2.1. Line conducted emission data (110V@60Hz)

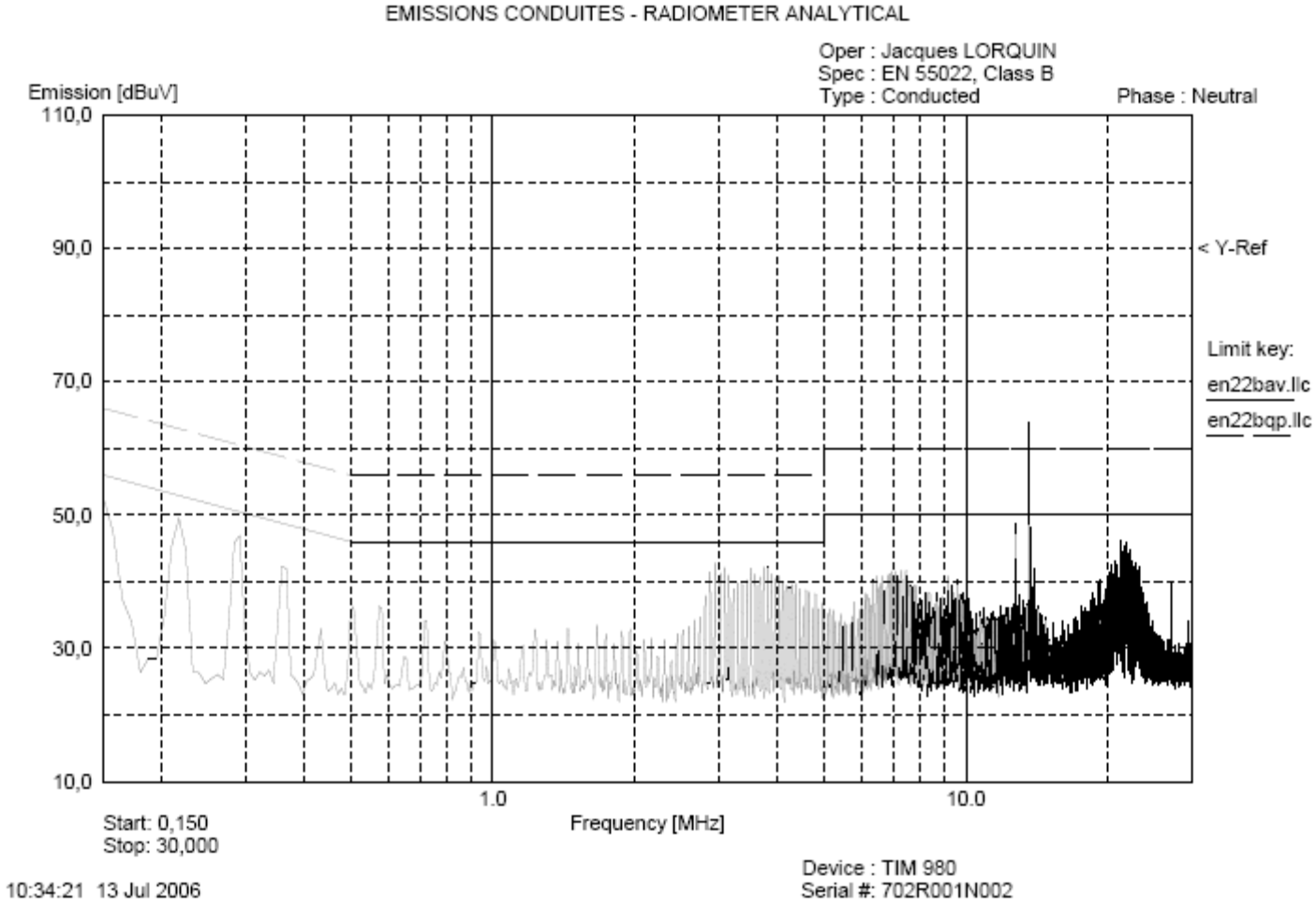
RBW: 9kHz - VBW: 30kHz



Marker ▽	Frequency [MHz]	Peak [dBuV]		Q-Peak [dBuV]		Average [dBuV]		Limit [dBuV]
1	0,150	64,14	*	63,30	*	48,92		54,00
2	0,220	49,76		48,64		35,86		52,00
3	0,290	45,96		44,39		31,83		50,00
4	0,360	41,83		41,56		29,77		48,00
5	3,440	43,33		41,43		37,50		46,00
6	3,510	43,44		41,96		37,25		46,00
7	3,580	42,61		41,11		36,10		46,00
8	3,660	43,02		41,50		37,23		46,00
9	3,730	42,35		40,52		36,76		46,00
10	13,57	63,65	*	76,81	*	56,13	*	50,00
11	20,76	41,04		35,81		23,48		50,00
12	20,91	41,21		34,07		22,08		50,00

4.2.2. Neutral conducted emission data (110V@60Hz)

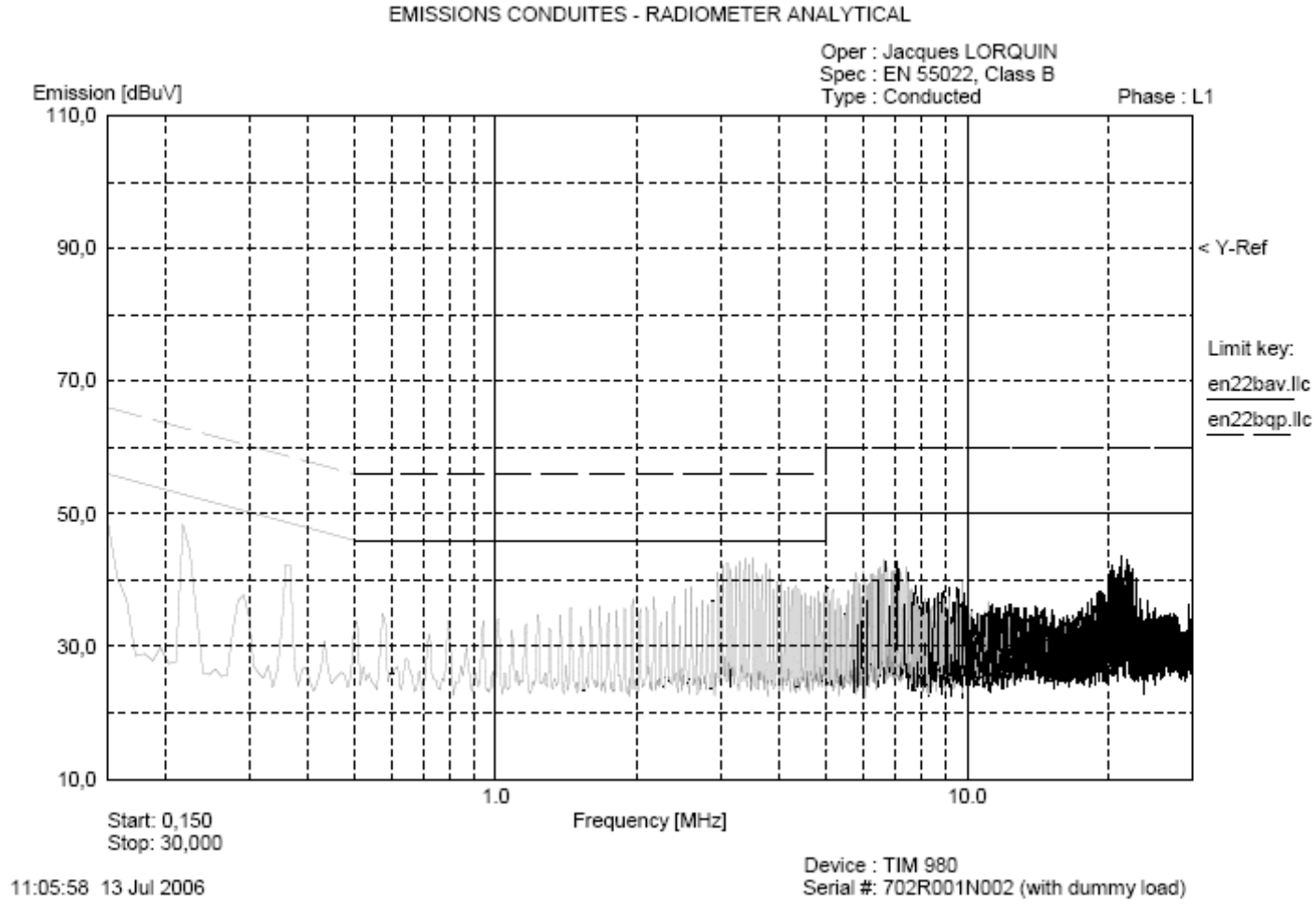
RBW: 9kHz - VBW: 30kHz



Marker ▽	Frequency [MHz]	Peak [dBuV]		Q-Peak [dBuV]		Average [dBuV]	Limit [dBuV]
1	0,150	64,05	*	62,61	*	50,54	54,00
2	0,220	49,82		48,83		36,32	52,00
3	0,290	46,70		45,62		31,98	50,00
4	0,360	43,39		41,97		27,08	48,00
5	2,880	38,30		35,63		29,25	46,00
6	2,950	42,02		39,70		34,56	46,00
7	3,020	42,95		41,27		38,53	46,00
8	3,100	41,23		38,22		32,82	46,00
9	3,730	42,48		40,84		37,18	46,00
10	3,800	43,04		40,86		36,54	46,00
11	3,870	41,50		40,31		37,11	46,00
12	12,74	44,74		30,13		18,42	50,00
13	13,57	55,67	*	42,43		18,93	50,00
14	21,19	46,73		40,93		26,03	50,00
15	21,34	44,43		38,70		24,06	50,00
16	21,63	45,91		38,51		23,52	50,00
17	21,77	45,44		39,81		24,96	50,00
18	27,13	35,72		33,78		20,57	50,00

4.2.3. Line conducted emission data (110V@60Hz) with dummy load

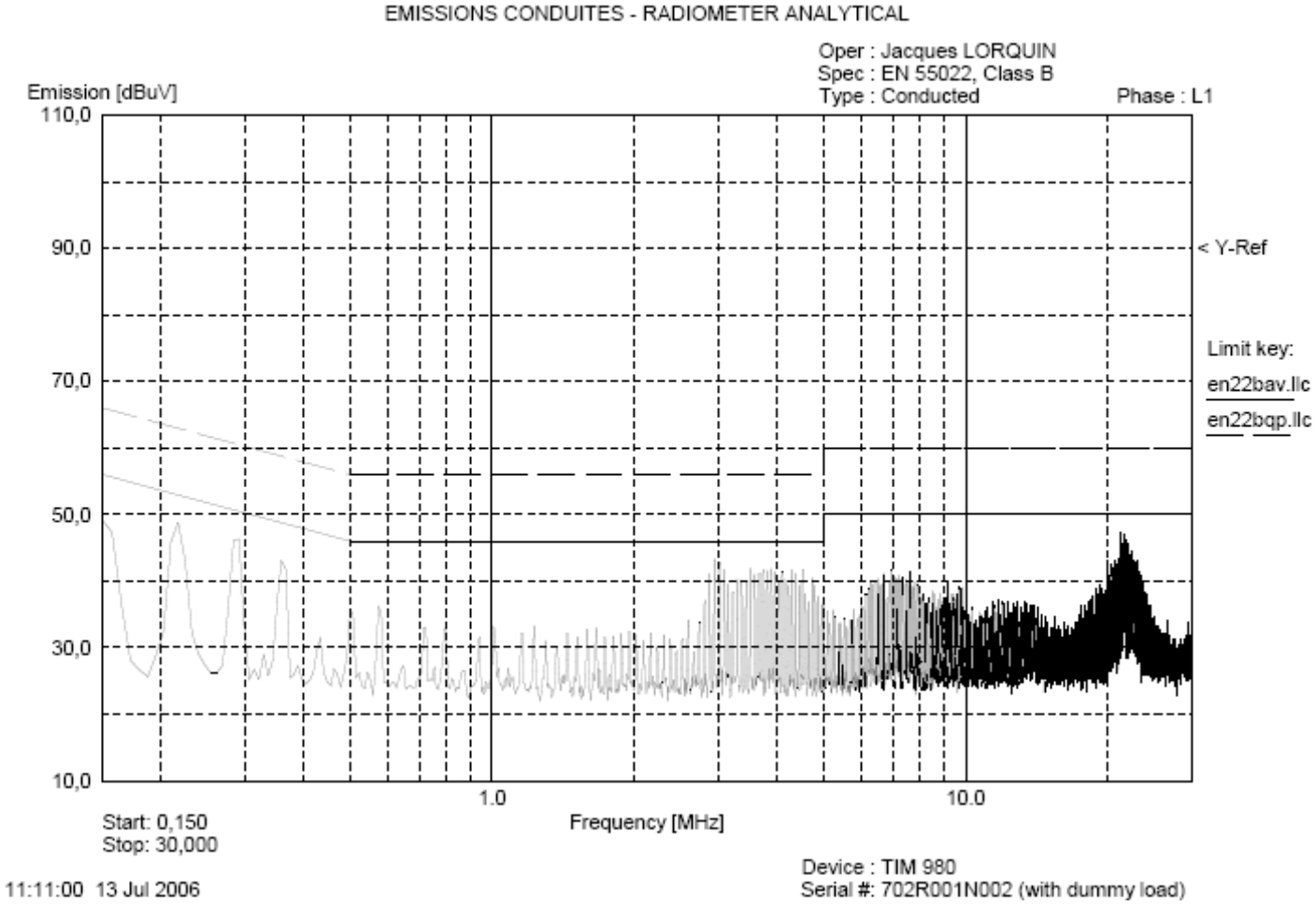
RBW: 9kHz - VBW: 30kHz



Marker ▽	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0,150	49,20	-	-	54,00
2	0,220	48,36	-	-	52,00
3	0,290	37,78	-	-	50,00
4	0,360	42,28	-	-	48,00
5	3,440	41,66	-	-	46,00
6	3,510	43,27	-	-	46,00
7	3,580	39,15	-	-	46,00
8	3,660	39,43	-	-	46,00
9	3,730	36,76	-	-	46,00
10	13,57	30,55	-	-	50,00
11	20,76	30,18	-	-	50,00
12	20,91	29,99	-	-	50,00

4.2.4. Neutral conducted emission data (110V@60Hz) with dummy load

RBW: 9kHz - VBW: 30kHz



Marker ▽	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0,150	49,22	-	-	54,00
2	0,220	48,83	-	-	52,00
3	0,290	46,32	-	-	50,00
4	0,360	43,07	-	-	48,00
5	3,440	39,83	-	-	46,00
6	3,510	41,34	-	-	46,00
7	3,580	40,95	-	-	46,00
8	3,660	41,18	-	-	46,00
9	3,730	41,74	-	-	46,00
10	13,57	29,69	-	-	50,00
11	20,76	42,34	-	-	50,00
12	20,91	39,63	-	-	50,00

5. 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	39.4	**-44.6**	244	vertical	90	8.5
27.12*	29.5	No traceable signal					

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

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%): +**1.dB**
-0dB

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 40.5dBµV/m	30

6. FUNDAMENTAL FREQUENCY TOLERANCE (15.225.C)

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

6.1. Voltage fluctuation

Power supply has been set at 85% and 115% of nominal voltage, at 20°C.
Nominal voltage: 115-230Vac (AC/CD power supply)
Operating frequency: 13.5614 MHz
Upper limit: 13.562756 MHz
Lower limit: 13.560044 MHz

Voltage	97V	230V	265V
Frequency (MHz)	13.561400	13.561400	13.561388
Result	Pass	Operating frequency	Pass

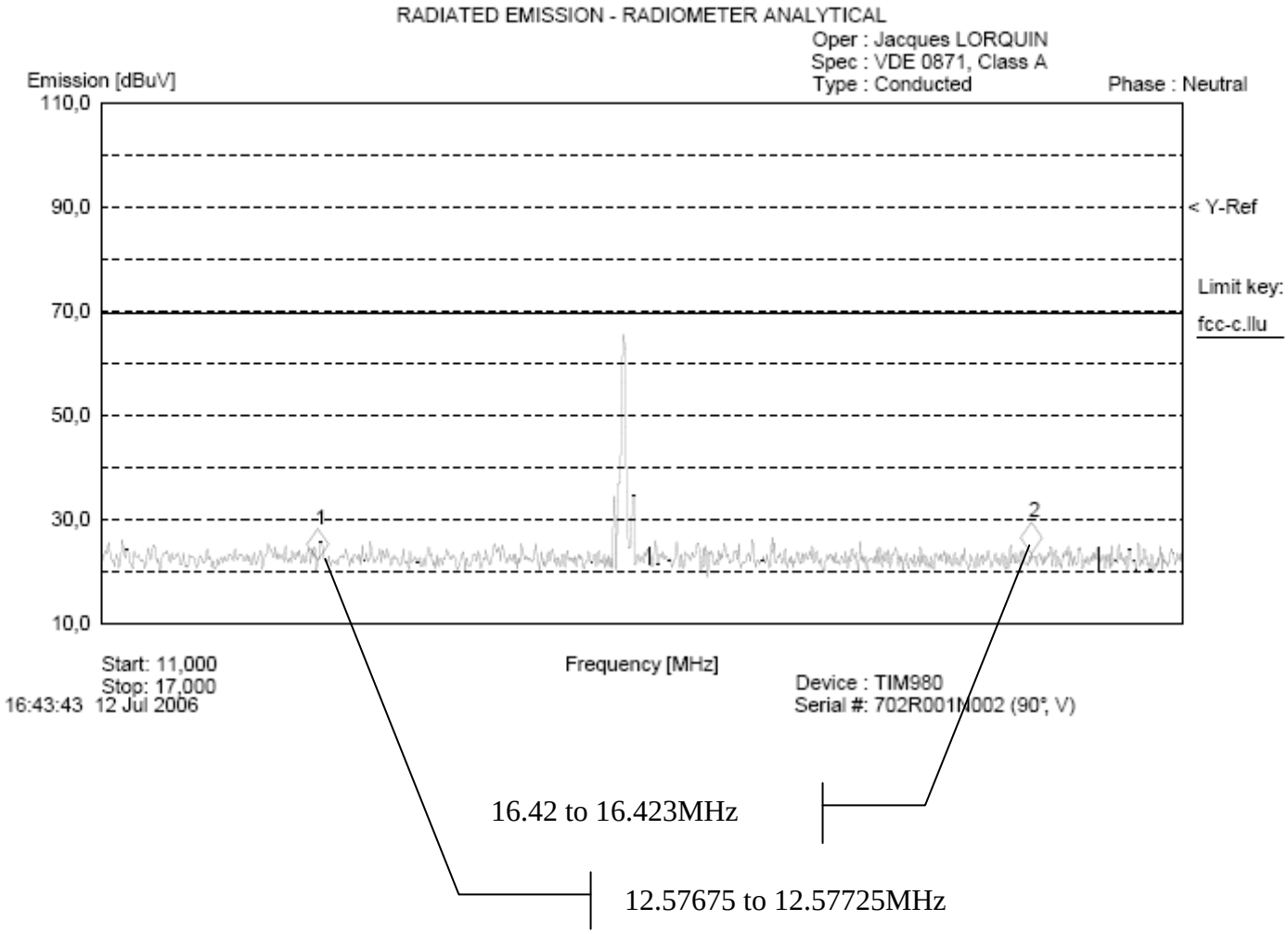
6.2. Temperature

Temperature has been set at –20℃ and +50℃ at nomi nal voltage 110Vac.
Operating frequency: 13.5614 MHz
Upper limit: 13.562756 MHz
Lower limit: 13.560044 MHz

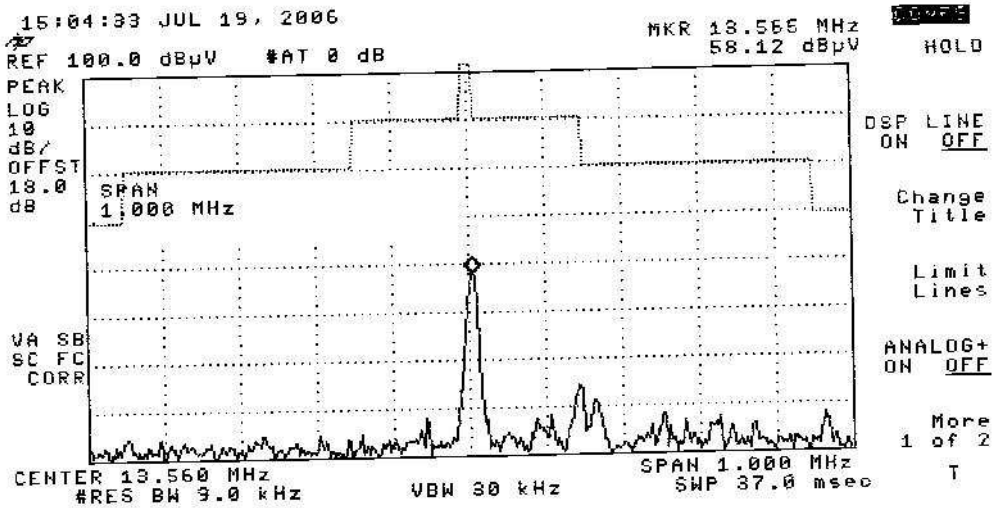
Voltage	-20℃	25℃	+50℃
Frequency (MHz)	13.561500	13.561400	13.561313
Result	Pass	Operating frequency	Pass

7. OCCUPIED BANDWIDTH §15.205

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



8. BAND-EDGE COMPLIANCE §15.209



End of Tests

9. CONCLUSION

The Equipment Under Test (TIM980 sn:702R001N002) in the configuration described in this report, shows a sufficient margin with the limits of the FCC Part 15 Subpart C limits.

LISTE DE MATERIEL / *LIST OF EQUIPMENT*

	N°LCIE	GENRE	MARQUE	TYPE	SERIE
	A1481006VO	Voltmètre RF	BOOTON	9200C	339301AA
	A1240169VO	Multimètre	Wavetek	DM15XL	40417876
	C2320056VO	Réseau de couplage découplage	FCC	FCC 801 M1 25	28
	C2320057VO	Réseau de couplage découplage	FCC	FCC 801 M2 25	38
	C2320058VO	Réseau de couplage découplage	FCC	FCC 801 M3 25	96
	A4083040VO	Oscilloscope 100 MHz 500Ms/s	Tektronix	TDS30-25	H712103
EMC	A2640011VO	Récepteur de mesure 9 KHz – 30 MHz	Rohde et Schwarz	ESH3	972079/117
EMC	A4049061VO	Transient limiter	Hewlett Packard	11947A	3107A01596
EMR	A7102019VO	Amplificateur 9 KHz – 1300 MHz	Hewlett Packard	8447F Opt 64	3113A06394
EMC	A3169049VO	Conducted emission comb generator	Bardet		CGPR12
	A2320059VO	Réseau divers (LISN)	EMCO	3810/2SH	9511/1182
EMR	A3169050VO	Radiated emission comb generator	Bardet		PR17B
EMR EMC	A4060016VO	Analyseur de spectre 9 –1.8 KHz	Hewlett Packard	8591E	3536A00384
EMR	C2040051VO	Antenne bi-log	Chase	CBL6111A	1628
	A5160028VO	Générateur de Burst	Schaffner	NSG2025-1	1109
	C1127003VO	Générateur onde de choc	Schaffner	NSG650	269
	A2249072VO	Pince de couplage	Schaffner	CDN 126	194
	A7130044VO	Coupleur directif	Schaffner	CDN 110	294
	C2320060VO	Réseau de couplage	Schaffner	CDN116	166
	A2249019VO	Sonde de champ 30-1000 MHz	Hewlett Packard	11940A	2650A05962
	A2249023VO	Sonde de champ 9 KHz – 30 MHz	Hewlett Packard	11941A	2807A04302
	A5322008VO	Pistolet de DES 15 KV	Schaffner	NSG 435	1354
	A5322009VO	Pistolet de DES 25 KV	Schaffner	NSG 432	1226
	A2120003VO	Harmonic/Flickermetre	Hewlett Packard	6842A	3531A00109
	A7156005VO	Adaptateur 50-150 ohms	FCC	FCC-150-50	378
	A7156006VO	Adaptateur 50-150 ohms	FCC	FCC-150-50	379
	B2163022VO	Synthétiseur de fréquence	Marconi	2023	112158027
	A2249021VO	Sonde de champ	Holaday	HI-4422	90264
	A7102020VO	Amplificateur 0.01-1000 MHz	KALMUS	757LC	122297-7
	A7132005VO	Coupleur bi-directionnel 40 dB	KALMUS	DC100RHH	7330A-1
	A7122008VO	Attenuateur 6 dB	BIRD	8343-060	2038
	B4204052VO	Thermo-hygromètre	HUGER		
EMR	D3044009VO	Chambre anéchoïque	EUROSHIELD	RDF-F-60-060	1213
EMC	D3044010VO	Cage de faraday	RAY PROOF		4854
	A1290016VO	Pince multimètre	LEM HEME	LH240	9611006692
	A5329032VO	Pince d'absorption	LUTHI	MDS21	2826
	A5329033VO	Pince d'injection	LUTHI	EM101	35430
	A5329042VO	Tube de ferrite	LUTHI	FTC 101	4485
	A5322010VO	Station d'essai ESD			
	A5329043VO	Câble blindé « IMR&EMR »	AIRCOM		
	A7122009VO	Atténuateur 10 dB	Hewlett Packard	8491A	2708A53166
	A5329034VO	Câble blindé injection IMC			
	A5329035VO	Câble blindé calibrage IMC	AIRCOM		
	A5329036VO	Module d'injection direct		MID01-100 ohms	

	N°LCIE	GENRE	MARQUE	TYPE	SERIE
		100ohms			
EMR	C2040050VO	Antenne biconique	EMCO	3104C	9401-4636
EMR	C2040056VO	Antenne logpériodique	EMCO	3146	2178
EMR	F2000286VO	Contrôleur de table	EMCO	1060-10	1217
EMR	F2000287VO	Contrôleur de mat d'antenne	EMCO	1050	8811-1295
	A4049059VO	Adaptateur quasi-peak	Hewlett Packard	HP85650	2811A01136
	A4060017VO	Analyseur de spectre	Hewlett Packard	HP8568B	2732A04140
	A4060019VO	Spectrum analyseur display	Hewlett Packard	HP85662A	2816A16561
	A4060027VO	RF preselector	Hewlett Packard	HP85685A	2833A00773
EMR	F2000288VO	Mat d'antenne	EMCO	1050	
EMR	F2000289VO	Table tournante	EMCO	1060	
EMR	C4040009VO	Compresseur d'air	ATLAS COPCO	LX111	0615-038
	C1207122VO	Dipole de précision	Schwarzbeck	VHAP	211
	C1207123VO	Dipole de précision	Schwarzbeck	UHAP	205
	C2040054VO	Antenne logpériodique	Schwarzbeck	UHALP 9107	910
	C2040047VO	Antenne biconique	Schwarzbeck	VHA 910	911
	C2040048VO	Antenne biconique	EMCO	3104	3767
	C2040049VO	Antenne biconique	EMCO	3110	1245
	C2040055VO	Antenne logpériodique	EMCO	3146A	9011-1151
EMC	C2320061VO	Réseau LISN	Telemeter electronic	NNB-2/16Z	98010
	C2320062VO	Réseau LISN triphasé ESH2-Z5	Rhode et Schwarz	33852.19.53	841223/008
	C2320063VO	Réseau LISN triphasé ESH2-Z5	Rhode et Schwarz	33852.19.53	841223/007
	A1240170VO	Multimètre	Fluke	87	75250745
	C2320064VO	Réseau divers	EM TEST	CDN-M3	6219C
	C2320065VO	Réseau divers	EM TEST	CDN-T8/RJ45	9011C
	C2040057VO	Antenne monopole	AH SYSTEM	SAS-551	181
	A1290017VO	Sonde de courant	Schaffner	CSP9160	1097
	C2320066VO	Réseau RSIL 4 Fils	Rhode et Schwarz	ENY41	838119/023
	C2320067VO	Réseau RSIL 2 x 2 Fils	Rhode et Schwarz	ENY22	836727/015
	A5329034VO	Sonde injection de courant	Schaffner	CIP8213	52
	C2042027VO	Antenne cornet	EMCO	3115	6382
	A4060018VO	Analyseur de spectre 9 KHz – 26.5 GHz	Hewlett Packard	8593E	3409u00537
	A4024018VO	Oscilloscope 500 MHz	Hewlett Packard	54542C	US36040602
	A5442021VO	Générateur HF 100 KHz – 3200 MHz	Hewlett Packard	8648C	3443U00509
	A4024019VO	Oscilloscope	Hewlett Packard	54720A	0007426600
	A4089115VO	Active probe 2.5 GHz	Hewlett Packard	54701A	3220A 00325
	A4089116VO	Active probe 2.5 GHz	Hewlett Packard	54701A	3220A 00329
	C2040058VO	Close fied probe 30 MHz – 1 GHz	Hewlett Packard	HP11940A	
	C2040059VO	Close fied probe 9 KHz – 30 MHz	Hewlett Packard	HP11941A	
	A4069007VO	High frequency probe	Hewlett Packard	85024A	280 1A 04205
	A5329044VO	Pince d'absorption 30MHz–1GHz	Rhode et Schwarz	85024A	194.0100.50
	A3169048VO	Field site source	EMCO	4610	9012-1161
	A7102021VO	Amplificateur 9 KHz – 1300 MHz	Hewlett Packard	8447F	2944A04010
	A7102022VO	Amplificateur 0.5-1000 MHz	KALMUS	706FC	7359-1
	A7122010VO	Atténuateur 70 dB	Hewlett Packard	8495B	3308A17069
	A7122011VO	Atténuateur 20 dB - 0.1 GHz	ROLS ESH	ESH 2Z11	349.7518.52
	A1290018VO	Sonde de courant	HF STROMWANDLER	ESH2-Z1	872 545/24
	A2240015VO	Sonde de champ	EMCO	7405	9301-2355

	N°LCIE	GENRE	MARQUE	TYPE	SERIE
	A7132006VO	Coupleur bi-directionnel	Hewlett Packard	778D	1144A07705
	A7102023VO	Amplificateur 2.5 GHz	Mini-circuits	ZFL-2500VH AS	
	A7102024VO	Amplificateur 8 GHz	HEROTEK	A1080304A	222033
	D1022117VO	Enceinte climatique	BIA CLIMATIC	CL 6-25	200 105 6
	A5329045VO	Câble IMR&EMR	SMEE	KX13	
	A5329046VO	Câble EMR FCC	RADIALL	9542 gd câb. vert	
	A5329047VO	Câble EMR FCC	RADIALL	960603 pt câb. vert	
	C2040052VO	Antenne boucle	Electro-metrics	EM-6879	690234
	C2040053VO	Antenne boucle	TELEC	CT2A	140
	A2322003VO	Outil courant de fuite	SMEE	61010A3&A4	
	A5329048VO	Câble EMR FCC	SUCOFLEX	106G	553
	A1500016VO	Wattmètre RF	ANRITSU	ML1437A	03050003
	A7132007VO	Coupleur bi-directionnel 20 dB	MCLI	C36-20	0D2LS 0148
	A5329038VO	Câble coaxial 3.5 m	SUHNER	SUCOFLEX 106	26732/6
	A2249024VO	Sonde de champ électrique 5GHz	HOLADAY	HI-6005	107884
	A7102025VO	Amplificateur 0.8-3GHz	PRANA	AP32 SV125A	0310-0573
EMR	A4049060VO	Adaptateur quasi-peak	Hewlett Packard	HP85650A	2811A01134
EMR	A4060028VO	Spectrum analyseur display	Hewlett Packard	HP85662A	2816A16603
EMR	A4060029VO	Spectrum analyseur	Hewlett Packard	HP8568B	2732A04155
EMR	A4060030VO	Preselcteur RF	Hewlett Packard	HP85685A	2837A00784
	C2042028VO	Antenne cornet	Schwarzbeck	BBHA 9170	BBHA9170232
	A7043036VO	Alimentation DC 300W	SODILEC	7SDLIN/GB AUTO 300-150.6	493711
	A5320017VO	BEST EMC	Schaffner		200040-023SC
	A5322011VO	Pistolet de DES	Schaffner	BEST ESD	1033
	C2320073VO	Pince de couplage TRS	Schaffner	CDN8014	074
EMC	C2320068VO	Line impedance stabilisation network	EMCO	3825/2	9309/2122
	C2320069VO	Réseau divers	LUTHI	CDN L-801 M2	2076
	C2320070VO	Réseau divers	LUTHI	CDN L-801 M2	2075
	A7102026VO	Amplificateur	ALDETEC	ALS01452	001
	A5442022VO	Générateur 2GHz – 18GHz	Hewlett Packard	8672A	2104A01703
	A7122013VO	Burst verification coupler	Schaffner	INA 265 A	20935/1
	A7122014VO	Burst verification coupler	Schaffner	INA 266	20935/2
	A5329040VO	Câble coaxial		RG58	
	A2249022VO	HV PROBE (E6N CVH1-100/1)	Schaffner	MD200	037005
	A1092039VO	Pince ampèremétrique	Chauvin Arnoux	P01120040A	100044CAV
	A1091249VO	Shunt coaxial	LEM	ISM 5P/5	4502
	A5329041VO	Câble coaxial vert 45cm			
	D2124025VO	Marteau de choc	LCIE	Marteau V01	V01
	A7043037VO	Alimentation DC 30V 10A	ELC	AL924	95/00600
	A4089117VO	Sonde de tension	SMEE		
	A7156004VO	Adaptateur 100ohms	LUTHI	CR100A	221
	A1240171VO	Multimètre	FLUKE	189	89770115
	C2320071VO	CDN	LUTHI	L 801 M4 PE	2088
	A7122012VO	Atténuateur	WEINSCHEL	48-40-43	BT2126
	A1092041VO	PINCE ELECTROMAGNETIQUE	LUTHI	EM101	35758
EMR	A1092042VO	PINCE FERRITE	LUTHI	FTC101	4763

EMR : Emission rayonnée / *Radiated emission*
EMC : Emission conduite / *Conducted emission*

TABLE DES INCERTITUDES / *UNCERTAINTIES CHART*

Type de mesure / *Kind of measurement*	**Incertitude élargie laboratoire / *Wide uncertainty laboratory* (k=2) ±x(dB)**	**Incertitude limite du CISPR / *CISPR uncertainty limit* ±y(dB)**
Emission Rayonnée / Radiated emission		
Antenne biconique (30MHz - 200MHz) - polarisation horizontale	±4.46 dB	±5.2
Antenne biconique (30MHz - 200MHz) - polarisation verticale	±5.15 dB	±5.2
Antenne log-périodique (200MHz - 1GHz) - polarisation horizontale	±4.48 dB	±5.2
Antenne log- périodique (200MHz - 1GHz) - polarisation verticale	±5.04 dB	±5.2
Emission conduite RSIL / Conducted emission LISN		
Estimation de l'incertitude pour des mesures de 150kHz à 30MHz	±3.40 dB	±3.6
Emission conduite RSI / Conducted emission LIS		
Estimation de l'incertitude pour des mesures de 150kHz à 30MHz	±3.20 dB	±3.6
Emission conduite sonde de courant / Conducted emission current probe		
Estimation de l'incertitude pour des mesures de 150kHz à 30MHz	±2.68 dB	±3.6

Les valeurs d'incertitudes calculées du laboratoire étant inférieures aux valeurs d'incertitudes limites établies par le CISPR, la conformité de l'échantillon est établie directement par les niveaux limites applicables. / *The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the CISPR. The conformity of the sample is directly established by the applicable limits values.*