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L C I E

Rapport d'essai / Test report

JDE : 600556690 N° 200703-3657A-R1-E

DELIVRE A / ISSUED TO

: SAGEM MONETEL
Rue Claude CHAPPE – BP344
07503 GUILHERAND GRANGES
FRANCE

Objet / Subject

: Essais de compatibilité électromagnétique conformément aux normes :
Electromagnetic compatibility tests according to the standards:
FCC CFR 47 Part 15, Subpart B.
ANSI C63.4 (2003)

Matériel testé / Apparatus under test

- Produit / Product : Terminal de paiement bancaire / Bank payment terminal
(Communication Modem / Modem communication)
- Marque / Trade mark : SAGEM MONETEL
- Constructeur / Manufacturer : SAGEM MONETEL
- Type / Model : EFT930S
- N° de série / serial number : N° 154010

Date des essais / Test date

: Le 28 Mars 2007 / March 28th 2007

Lieu d'essai / Test location

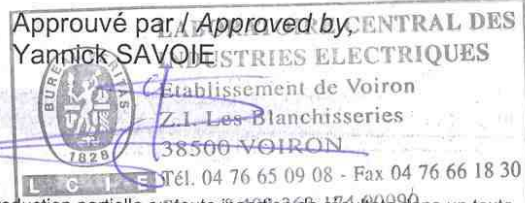
: LCIE
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Test réalisé par / Test performed by : Jonathan PAUC

Ce document comporte / Composition of document: 16 pages.

VOIRON, LE 27 AVRIL 2007 / APRIL 27th, 2007

Ecrit par / Written by
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1. TEST PROGRAM

1.1. REQUIREMENTS FOR DISTURBANCE EMISSIONS

Standard:

- FCC Part 15, Subpart B (Digital Devices)
- ANSI C63.4 (2003)

EMISSION TEST	LIMITS			RESULTS (Comments)
Limits for conducted disturbance at mains ports 150kHz-30MHz	Frequency	Quasi-peak value (dBµV)	Average value (dBµV)	Comply
	150-500kHz	66 to 56	56 to 46	
	0.5-5MHz	56	46	
	5-30MHz	60	50	
Radiated emissions 30MHz-2Ghz	Measure at 3m 30MHz-88MHz : 40 dBµV/m 88MHz-216MHz : 43.5 dBµV/m 216MHz-960MHz : 46.0 dBµV/m Above 960MHz : 54.0 dBµV/m			Comply

NA: Not Applicable

NP: Not Performed



2. APPARATUS UNDER TEST: CONFIGURATION

2.1. JUSTIFICATION

The system was configured for testing in a typical fashion (as a customer would normally use it). All functions available on the EFT930S are activated during the measurement test.

2.2. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES)

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

EFT930S

Sn: N°154010

→ With mains power adapter **SAGEM MONETEL AD5632LF**

Input: 100-240Vac 50-60Hz

Output: 8Vdc/3.6A

- Internal frequencies: 32 kHz, 20 MHz, 48MHz, 57 MHz, 171 MHz

- Dimensions: 174 x 77 x 66 mm

- Soft: Test EMC

- **Inputs/outputs:**

- DC power input (8Vdc)
- 2 x USB ports
- 1 x Serial link (RS232C)
- 1 x Modem V32 Bis line

- **Cables:**

- 1x EFT930 extension cord with I/O connectors (DC power, Modem IN & OUT and Serial link), spiraled, unshielded: 1m (1)
- 1x DC power supply cable (fixed on mains power unit), unshielded: 1.75m
- 1x Modem cable, unshielded, RJ11, length: 1.5m
- 1x RS232 Com cable, RJ11, unshielded, 1.5m
- 1x USB cable, Mini A&B connectors, shielded: 1m

- **Auxiliaries equipment used during test:**

- 1x Smartcard (Bank card)
- 2x SAM/SIM cards
- 1x Telephone line simulator

TELTONE TLS-5B02

sn: none

sn: none

sn: 017652

(1) : Ref : 252587073



2.3. RUNNING MODE

The EUT is connected to a telephone line simulator.

The inboard software (EMC TEST) performed the followings tests and activates the followings functions:

- Printer ON,
- Smartcards reading: CAM0, SAM1,2 & 3 (power ON and reading)
- USB ON (host looped back on slave port)
- Serial link (Rx data looped back on Tx)
- Backlight and display are ON.

2.4. EQUIPMENT MODIFICATIONS

None

2.5. SPECIAL ACCESSORIES

Special accessories used during testing are supplied with the equipment under test:

- Connection cable (spiraled, attached to EUT)
- Power supply adapter

3. MEASUREMENT OF RADIATED EMISSION (30MHz to 2GHz)

3.1. TEST CONDITIONS

Date of test : March 28th, 2007
Test performed by : Jonathan PAUC

3.2. SETUP FOR RADIATED EMISSIONS MEASUREMENT

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

The EUT is set on the non-conducting table of 80 cm height.

The EUT is powered by 230Vac/50Hz.

The Modem port of the EUT is connected to a Telephone line simulator.

Pre-characterisation measurement:

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.

The pre-characterization graphs are obtained in PEAK detection. During the max-hold measurement, the EUT is rotated on 360 degree range.

For frequency band 1GHz to 2GHz, a manual search is performed in the anechoic chamber in order to determine frequencies radiated by the EUT.

Characterization on 3 meters open site from 30MHz to 2GHz:

The product has been tested according to ANSI C63.4 (2003), 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 at a distance of **3 meters** from the antenna and compared to the FCC part 15 subpart B §15.209 limits.

Measurement bandwidth was 120kHz from 30 MHz to 1GHz and 1MHz from 1GHz to 2GHz.

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.

A summary of the worst case emissions found in all test configurations and modes is shown on clause 3.4 (Pre-characterization results).



3.3. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None



3.4. MEASUREMENTS RESULTS

Pre-characterisation measurement: pre-scan measurement at 3m (PEAK detection, graph examples)

Power adapter AD5632LF

30MHz-1GHz Polarisation H: graph **Emr1#H** (see annex 1)
Polarisation V: graph **Emr1#V** (see annex 1)

1GHz-2GHz No frequency observed

QUALIFICATION: 10 meters measurement on the Open Area Test Site.

Frequency list has been created with anechoic chamber pre-scan results. Measurements are performed with the AD5632LF power adapter.

Measurements are performed using a QUASI-PEAK detection.

No	Frequency (MHz)	Limit Quasi-Peak (dBμV/m)	Measure Quasi-Peak (dBμV/m)	Margin (Mes-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. factor (dB)	Comments
1	32.773	29.5	23.8	-5.7	235	V	130	13.1	
2	48.007	29.5	28.1	-1.4	190	V	320	11.8	
3	163.895	33.0	23.9	-9.1	245	V	160	19.0	
4	239.972	35.5	24.0	-11.5	180	V	120	14.7	
5	335.872	35.5	27.7	-7.8	240	V	120	18.0	
6	483.312	35.5	35.2	-0.3	290	H	210	21.3	
7	516.063	35.5	32.5	-3.0	340	H	180	22.0	
8	884.675	35.5	33.3	-2.2	45	V	200	28.2	

RESULT: PASS



3.5. 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.

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

3.6. CONCLUSION

The sample of the equipment EFT 930S Sn : 154010, tested in the configuration presented in this test report satisfies to requirements of class B limits of the standard FCC part 15B / ANSI C63.4 (2003), for radiated emissions.

4. MEASUREMENT OF CONDUCTED EMISSION (150kHz-30MHz)

4.1. TEST CONDITIONS

Date of test : March 28th, 2007
Test performed by : Jonathan PAUC

4.2. SETUP FOR CONDUCTED EMISSIONS MEASUREMENT

Mains terminals:

The EUT with its auxiliaries are set on a non-conducting 80cm above the ground reference plane.
The distance between the EUT and the LISN is 80cm. The EUT is 40cm away for the vertical ground plane.
The EUT is powered through a LISN 50Ω / 50μH (measure). Auxiliaries are powered by another LISN.
Mains: 110V/60Hz.



4.3. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

4.4. MEASUREMENTS RESULTS

Measurements are performed on the phase (L1) and neutral (N) of the power line.

Power adapter AD5632LF

Results: (PEAK detection)

Measure on L1: graph **Emc1#L1** (see annex 1)
Measure on N : graph **Emc1#N** (see annex 1)

RESULT: PASS



4.5. CONCLUSION

The sample of the equipment EFT 930S Sn : 154010, tested in the configuration presented in this test report satisfies to requirements of class B limits of the standard FCC part 15B / ANSI C63.4 (2003), for conducted emissions.



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5. TEST EQUIPMENT LIST

	N°LCIE	TYPE	COMPANY	REF	SN
RADIATED EMISSION MEASUREMENT					
	C2040057VO	Antenna monopole	AH SYSTEM	SAS-551	181
	A7102026VO	Amplifier 8-26GHz	ALDETEC	ALS01452	1
X	C4040009VO	Air Compressor	ATLAS COPCO	LX111	0615-038
X	A3169050VO	Radiated emission comb generator	BARDET		PR17B
X	C2040051VO	Antenna Bi-log	CHASE	CBL6111A	1628
	C2040052VO	Antenna Loop	ELECTRO-METRICS	EM-6879	690234
X	C2042027VO	Antenna horn	EMCO	3115	6382
X	C2040050VO	Antenna biconic	EMCO	3104C	9401-4636
X	C2040056VO	Antenna log-periodic	EMCO	3146	2178
X	F2000286VO	Turntable controller	EMCO	1060-10	1217
X	F2000287VO	Antenna mast controller	EMCO	1050	8811-1295
X	F2000288VO	Antenna mast	EMCO	1050	
X	F2000289VO	Turntable	EMCO	1060	
X	F2000371VO	Turntable (Anechoic chamber)	ETS LINGREN	Model 2065	
X	F2000372VO	Turntable controller (Anechoic chb)	ETS LINGREN	Model 2090	
X	D3044009VO	Anechoic chamber	EUROSHIELD	RDF-F-60-060	1213
X	A7102024VO	Amplifier 8 GHz	HEROTEK	A1080304A	222033
X	A4060016VO	Spectrum analyzer 9kHz –1.8GHz	HEWLETT PACKARD	8591E	3536A00384
X	A7102019VO	Amplifier 9 KHz – 1300 MHz	HEWLETT PACKARD	8447F Opt 64	3113A06394
X	A4060018VO	Spectrum Analyzer 9KHz – 26.5GHz	HEWLETT PACKARD	8593E	3409u00537
X	A4049060VO	Adapter quasi-peak	HEWLETT PACKARD	HP85650A	2811A01134
X	A4060028VO	Spectrum analyzer display	HEWLETT PACKARD	HP85662A	2816A16603
X	A4060029VO	Spectrum analyzer	HEWLETT PACKARD	HP8568B	2732A04155
X	A4060030VO	Pre-selector RF	HEWLETT PACKARD	HP85685A	2837A00784
X	A5329032VO	Absorption clamp	LUTHI	MDS21	2826
	A5329044VO	Absorption clamp	RHODE ET SCHWARZ	85024A	194.0100.50
	A2640011VO	Measurement receiver 9kHz–30MHz	ROHDE ET SCHWARZ	ESH3	972079/117
	C2042028VO	Antenna horn 26GHz	SCHWARZBECK	BBHA 9170	BBHA9170232
X	A5329045VO	Cable IMR&EMR (Anechoic chamber)	SMEE	KX13	
X	A5329048VO	Cable EMR OATS	SUCOFLEX	106G	553
X	A5329038VO	Cable coaxial 3.5 m (Blue)	SUHNER	SUCOFLEX 106	26732/6
X	A5329056VO	Cable Radiat EMI (Pre-amp/Analyzer)			
X	A5329057VO	Cable Radiat. EMI (Pre-amp/cage)			
	A5329059VO	Cable OATS (Mast at 10m)			
X	A5329058VO	Cable OATS (Mast at 3m)			
CONDUCTED MEASUREMENT EMISSION					
X	A3169049VO	Conducted emission comb generator	BARDET		CGPR12
X	A2320059VO	LISN 50Ω / 50μH (Measure)	EMCO	3810/2SH	9511/1182
X	C2320068VO	LISN 50Ω / 50μH	EMCO	3825/2	9309/2122
X	A4049061VO	Transient limiter	HEWLETT PACKARD	11947A	3107A01596
X	A2120003VO	Programable PSU, HAR/FLK	HEWLETT PACKARD	6842A	3531A00109
	A4060016VO	Spectrum analyzer 9kHz –1.8GHz	HEWLETT PACKARD	8591E	3536A00384
	A5329036VO	Direct Injection Module 100 Ohms	LCIE	MID01-100 ohms	
	A5329042VO	Ferrite Tube	LUTHI	FTC 101	4485
	A1092042VO	Ferrite Tube	LUTHI	FTC101	4763
X	D3044010VO	Faraday Cage	RAY PROOF		4854
	C2320062VO	LISN tri-phase ESH2-Z5	RHODE ET SCHWARZ	33852.19.53	841223/008
	C2320063VO	LISN tri-phase ESH2-Z5	RHODE ET SCHWARZ	33852.19.53	841223/007
	C2320066VO	RSI 4 wires	RHODE ET SCHWARZ	ENY41	838119/023
	C2320067VO	RSI 2 x 2 wires	RHODE ET SCHWARZ	ENY22	836727/015
X	A2640011VO	Measurement receiver 9kHz–30MHz	ROHDE ET SCHWARZ	ESH3	972079/117
	A1290017VO	Current probe	SCHAFFNER	CSP9160	1097
	A5329034VO	Current injection probe	SCHAFFNER	CIP8213	52
	A4089117VO	Voltage probe	SMEE		
	C2320061VO	LISN 50Ω / 50μH	TELEMETER ELECTRONIC	NNB-2/16Z	98010
X	A5329061VO	Cable Conduct. EMI (Analyzer/cage)			
X	A5329060VO	Cable Conduct. EMI (LISN/cage)			



6. UNCERTAINTIES CHART

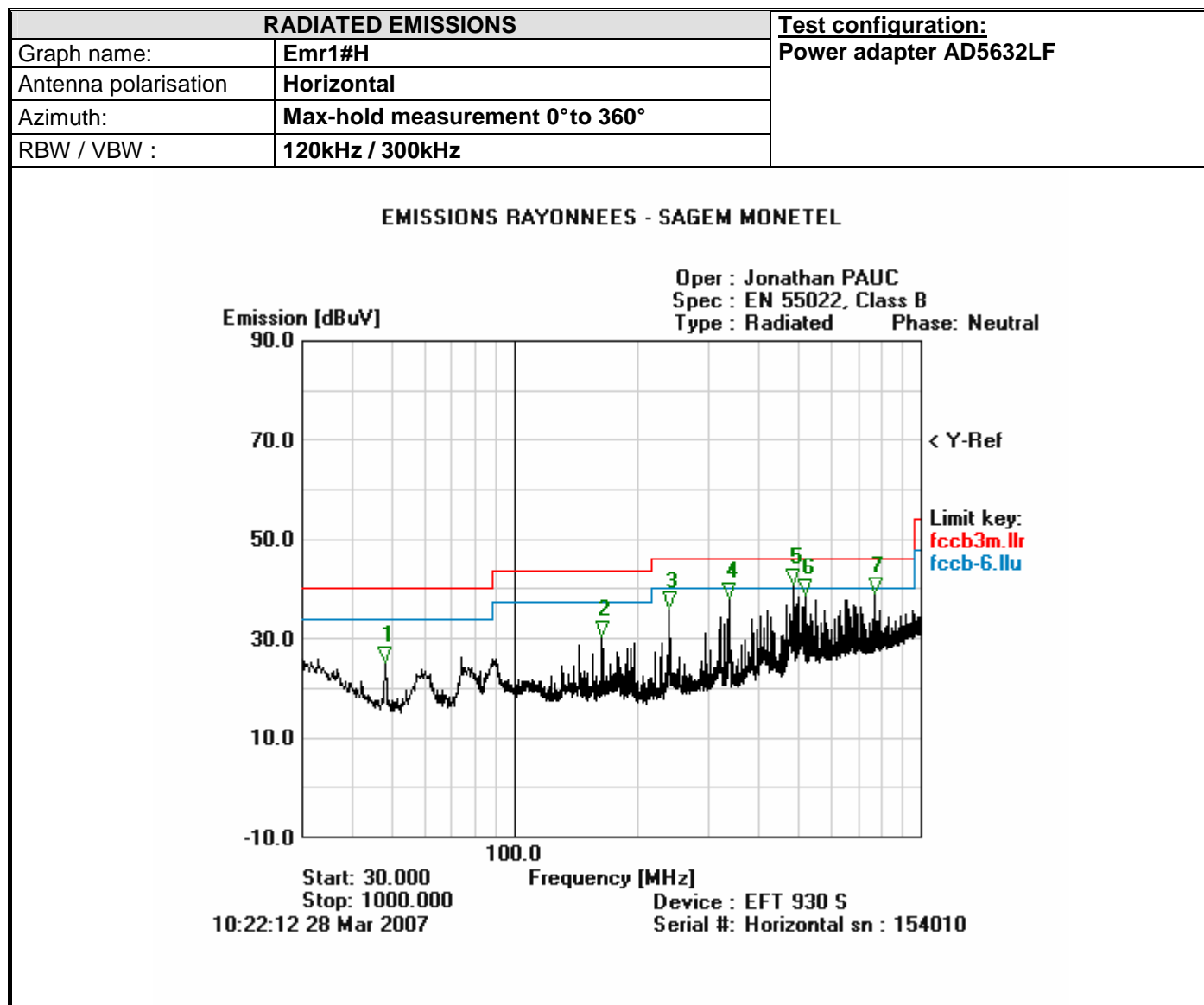
Type de mesure / Kind of measurement	Incertitude élargie laboratoire / Wide uncertainty laboratory (k=2) ± x	Incertitude limite du CISPR / CISPR uncertainty limit ± y
Mesure des perturbations conduites en tension sur le réseau d'énergie <i>Measurement of conducted disturbances in voltage on the power port</i>	3.57 dB	3.6 dB
Mesure des perturbations conduites en tension sur le réseau de télécommunication <i>Measurement of conducted disturbances in voltage on the telecommunication port.</i>	3.28 dB	A l'étude / Under consid.
Mesure des perturbations discontinues conduites en tension <i>Measurement of discontinuous conducted disturbances in voltage</i>	3.47 dB	3.6 dB
Mesure des perturbations conduites en courant <i>Measurement of conducted disturbances in current</i>	2.90 dB	A l'étude / Under consid.
Mesure du champ électrique rayonné sur le site en espace libre de Voiron <i>Measurement of radiated electric field on the Voiron open area test site</i>	5.07 dB	5.2 dB
Mesure du champ électrique rayonné IN SITU de 30 à 1000 MHz <i>IN SITU measurement of radiated electric field from 30 to 1000MHz</i>	A l'étude / Under consideration	5.2 dB
Mesure de la puissance perturbatrice / <i>Measurement of disturbance power</i>	3.37 dB	4.5 dB

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.



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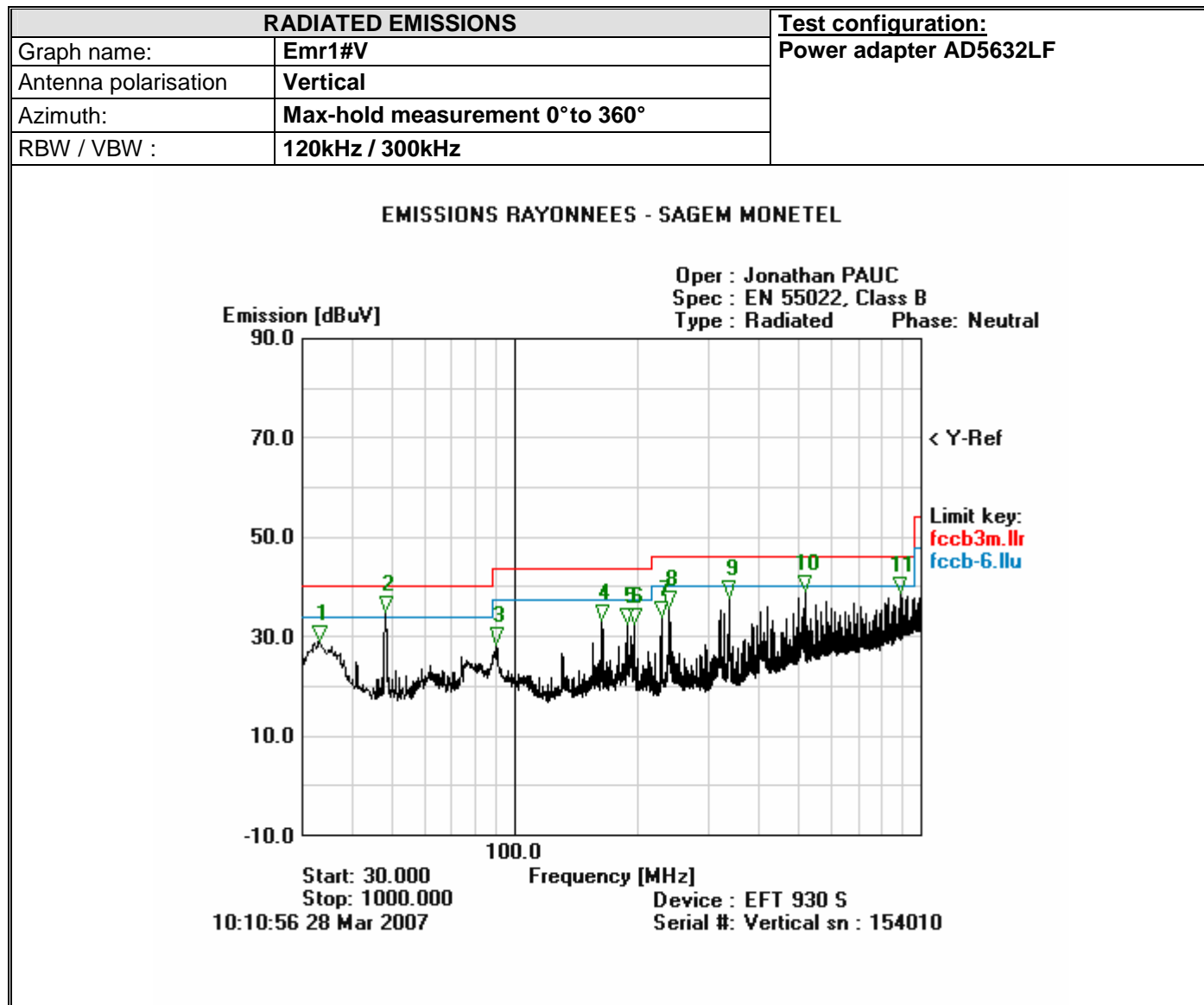
7. ANNEX 1 (GRAPHS)



Marker	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	47.86	25.22	-	-	40.00
2	164.0	30.37	-	-	43.50
3	240.1	36.04	-	-	46.00
4	336.2	38.11	-	-	46.00
5	483.3	40.88	-	-	46.00
6	516.3	38.61	-	-	46.00
7	768.1	39.10	-	-	46.00



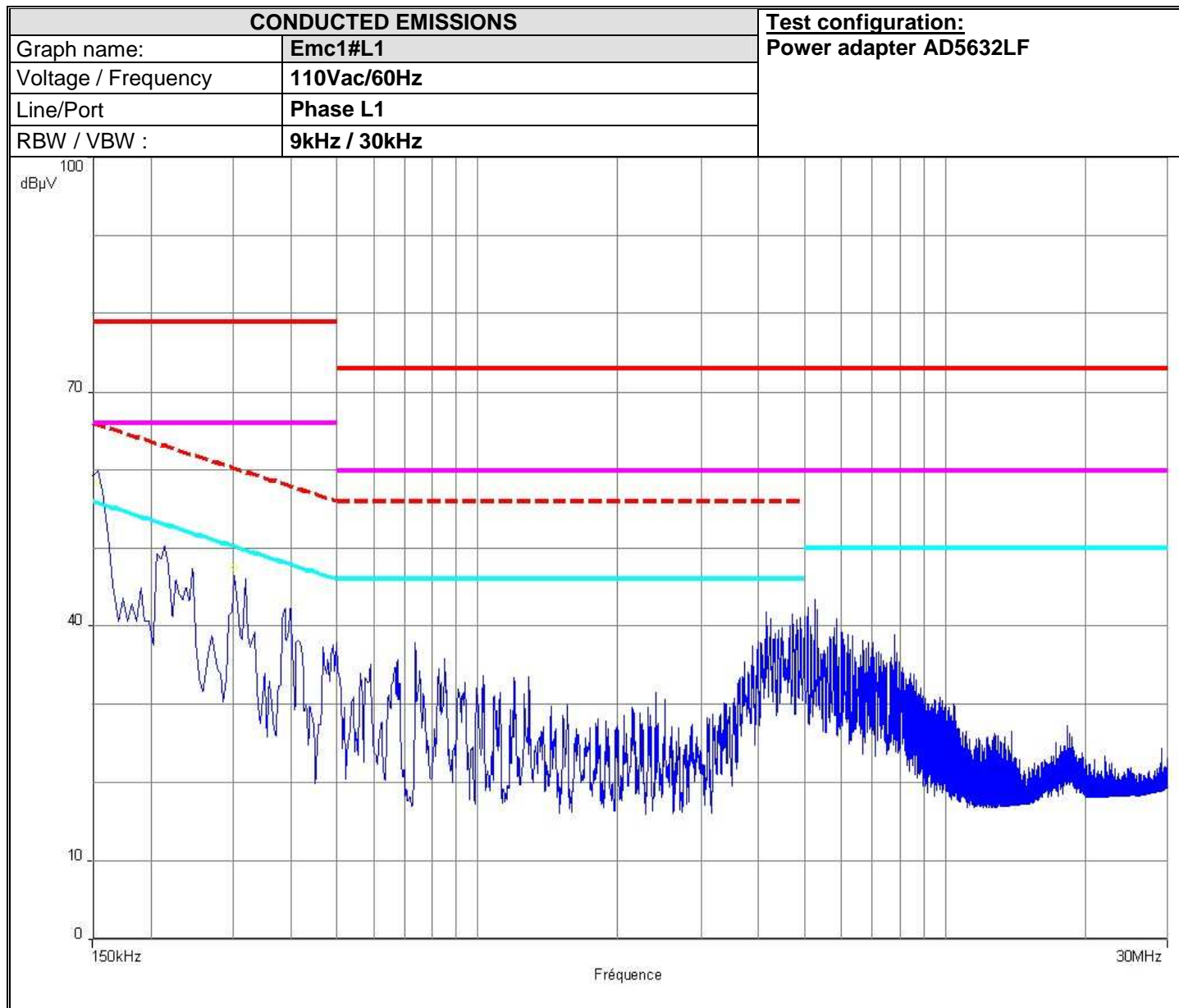
L C I E



Marker	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	33.09	28.87	-	-	40.00
2	48.08	34.87	-	-	40.00
3	90.18	28.52	-	-	40.00
4	164.0	33.09	-	-	40.00
5	188.5	32.37	-	-	40.00
6	196.9	32.40	-	-	40.00
7	229.5	33.87	-	-	40.00
8	240.1	35.81	-	-	47.00
9	336.0	37.84	-	-	47.00
10	516.3	39.09	-	-	47.00
11	884.7	38.65	-	-	47.00



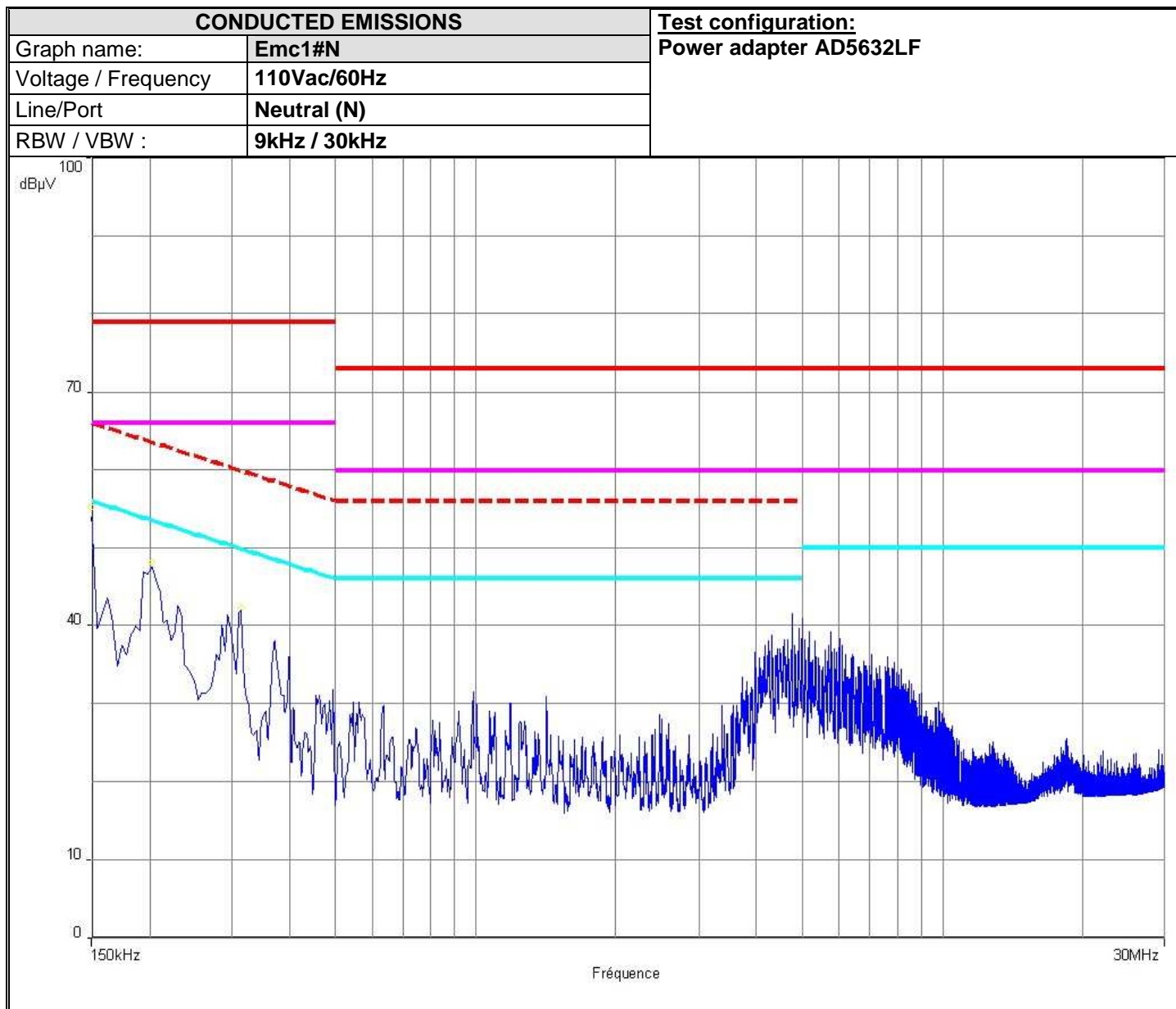
L C I E



Frequency (MHz)	Measure Peak dBμV	Measure Average dBμV	Limit Average dBμV	Avg-Lim (Margin) dB	Measure Quasi-Peak dBμV	Limit QPeak dBμV	QPeak-Lim (Margin) dB
0.154	58.5	27.4	55.8	-28.4	49.4	65.8	-16.4
0.214	49.3	21.9	53	-31.2	40.6	63	-22.5
0.302	47.4	17.7	50.2	-32.5	36.2	60.2	-24



L C I E



Frequency (MHz)	Measure Peak dBμV	Measure Average dBμV	Limit Average dBμV	Avg-Lim (Margin) dB	Measure Quasi-Peak dBμV	Limit QPeak dBμV	QPeak-Lim (Margin) dB
0.15	55.2	20	56	-36	47.3	66	-18.7
0.202	48.2	22.3	53.5	-31.2	40.3	63.5	-23.2
0.314	42.3	15.2	49.9	-34.7	32.4	59.9	-27.5