



L C I E

Rapport d'essai / Test report

JDE : 00074020

N° : 200707-3910CR-A3-R10-E

DELIVRE A / ISSUED TO

: ATMEL (M. Guimet)
BP 123
Avenue de Rochepleine
38521 SAINT-EGREVE - 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)
CISPR22 (2005 + A1/2005+A2/2006)

Matériel testé / Apparatus under test :

- Produit / Product : Lecteur empreinte digitale USB / USB Fingerprint reader
- Marque / Trade mark : ATMEL
- Constructeur / Manufacturer : ATMEL
- Type / Model : AT77UR100 2V2
- N° de série / serial number : 0735#021 *
- FCC ID : VP6-AT77UR100B

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

Date des essais / Test date

: Du 1ier au 2 octobre 2007 / From October 1st to 2^{sd}, 2007

Lieu d'essai / Test location

: LCIE
ZI des Blanchisseries
38500 VOIRON - France

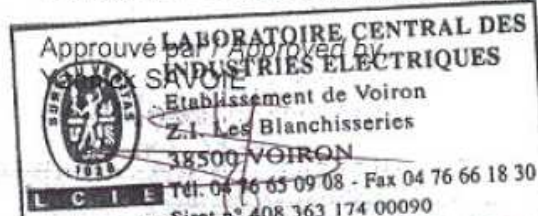
Test réalisé par / Test performed by

: Laurent CHAPUS

Ce document comporte / Composition of document : 15 pages.

VOIRON, LE 24 OCTOBRE 2007 / OCTOBER 24TH, 2007

Ecrit par / Written by
Laurent CHAPUS



La reproduction de ce document n'est autorisée que sous sa forme intégrale. Toute reproduction partielle ou toute insertion de résultats dans un texte d'accompagnement en vue de leur diffusion doit recevoir un accord préalable et formel du LCIE. Ce document résulte d'essais effectués sur un spécimen, un échantillon ou une éprouvette. Il ne préjuge pas de la conformité de l'ensemble des produits fabriqués à l'objet essayé. Sauf indication contraire, la décision de conformité prend en compte l'incertitude de mesures. Il ne préjuge en aucun cas d'une décision de certification.
This document shall not be reproduced, except in full, without the written approval of the LCIE. This document contains results related only to the item tested. It does not imply the conformity of the whole production to the item tested. Unless otherwise specified, the decision of conformity takes into account the uncertainty of measures. This document does not anticipate any certification decision.

**SUMMARY**

1. TEST PROGRAM	3
2. APPARATUS UNDER TEST: CONFIGURATION	4
3. MEASUREMENT OF CONDUCTED EMISSION (150KHZ-30MHZ)	5
4. MEASUREMENT OF RADIATED EMISSION (30MHZ-1GHZ).....	7
5. TEST EQUIPMENT LIST	9
6. UNCERTAINTIES CHART	11
7. ANNEX 1 (GRAPHS)	12



1. TEST PROGRAM

1.1. TEST OBJECTIVE

The test objective is to check that ATMEL's fingerprint module is compliant to EMC requirements. The USB module is connected to an USB port of a desktop personal computer.

1.2. REQUIREMENTS FOR DISTURBANCE EMISSIONS

Standard:

ANSI C63.4 (2003)

CISPR22 (2005 + A1/2005+A2/2006): Requirements for Information Technology Equipment (ITE).

Requirements for Class B equipment:

EMISSION TEST	LIMITS			RESULTS (Comments)
Limits for conducted disturbance at mains ports 150kHz-30MHz (Note: CISPR22 limits)	Frequency	Quasi-peak value (dB μ V)	Average value (dB μ V)	COMPLY NOTE: Test voltage of the desktop computer is 110V/60Hz
	150-500kHz	66 to 56	56 to 46	
	0.5-5MHz	56	46	
	5-30MHz	60	50	
	150-500kHz	84 to 74	74 to 64	
	0.5-30MHz	74	64	
Radiated emissions 30MHz-1GHz (Note: CISPR22 limits)	Measure at 10m (Quasi-peak) 30MHz-230MHz : 30 dB μ V/m 230MHz-1GHz : 37 dB μ V/m			COMPLY



2. APPARATUS UNDER TEST: CONFIGURATION

2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

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

AT77UR100 2V2

Serial number: 0735#021

FCC ID: VP6-AT77UR100B

Internal frequency list:

- 12MHz / 16MHz

- **Inputs/outputs:**

- USB cable (attached on EUT)

- **Cables:**

- USB cable (attached on EUT): 0.75m

- **Cables (used for testing configuration):**

- Mains power cable, 2 phases + PE, unshielded: 1.8m (PC and video monitor)

- VGA cable, shielded: 1.5m

- Serial cable, shielded: 1.5m

- **Auxiliaries equipment used during test:**

- Personal computer (Desktop) GATEWAY M/N: NLX-MINI-DT

Sn: 0001846667

- Keyboard HP P/N: C4742-60101

Sn: C990897683

- Mouse HP P/N: C3751B

Sn: LZA62831260

- Video Monitor HP P/N: D2846

Sn: JP4001000

- Parallel printer HP DJ600 P/N: C2184A

Sn: SG5AD1C2X5

- Microphone TELEX 700373-000A

Sn: none

2.2. RUNNING MODE

The desktop computer is running under Windows XP Professional.

The EUT exercise program used during testing was exercised the fingerprint sensor in a manner similar to a typical use.

The sensor is activated and is waiting for a fingerprint acquisition.

Test program: *FSP Demo V 2.0.11*

2.3. EQUIPMENT MODIFICATIONS

None

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

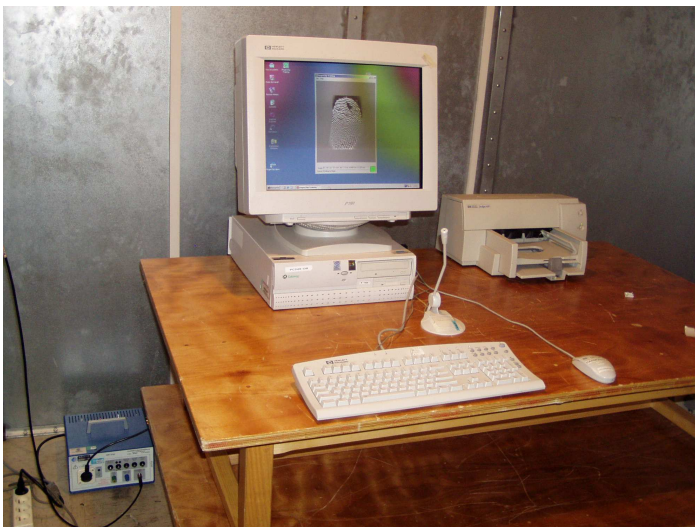
3.1. CLIMATIC CONDITIONS

Date of test : October 2nd, 2007
Test performed by : Laurent CHAPUS
Atmospheric pressure : 971mb
Relative humidity : 55%
Ambient temperature : 21°C

3.2. SETUP FOR CONDUCTED EMISSIONS MEASUREMENT

Mains terminals:

The EUT with its auxiliaries are set on a non-conducting 80cm above the ground reference plane. (Table-top equipment)
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 (measure). Auxiliaries are powered by another LISN.
Mains: 110Vac/60Hz.



The product has been tested according to ANSI C63.4-(2003) and FCC Part 15 subpart B.

The product has been tested with 110V/60Hz power line voltage and compared to the FCC Part 15 subpart B §15.107 limits. Measurement bandwidth was 9kHz from 150 kHz to 30 MHz.

Measurement is made with a Rohde & Schwarz ESH3 receiver in peak mode. This was followed by a Quasi-Peak, i.e. CISPR measurement 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 LISN (measure) is 50Ω / 50μH.

The Peak data are shown on plots in annex 1. 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.

**3.3. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION**

None

3.4. MEASUREMENTS RESULTS**Mains terminals:**

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

Results: (PEAK detection)

Measure on L1:	graph Emc#1	(see annex 1)
Measure on N:	graph Emc#2	(see annex 1)

RESULT: PASS

4. MEASUREMENT OF RADIATED EMISSION (30MHz-1GHz)

4.1. CLIMATIC CONDITIONS

Date of test : October 1st, 2007
Test performed by : Laurent CHAPUS
Atmospheric pressure : 972mb
Relative humidity : 52%
Ambient temperature : 22°C

4.2. 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 and auxiliaries are set on the non-conducting table of 80 cm height (Table-top equipment)

The EUT is powered by 230Vac/50Hz.

The product has been tested according to ANSI C63.4 (2003) / CISPR22 limits and FCC part 15 subpart B requirements. Radiated Emissions were measured on an open area test site. A description of the facility is on file with the FCC.

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.

During the measurement, the EUT is rotated on 4 faces of the equipment.

The pre-characterization graphs are obtained in PEAK detection.

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

The product has been tested at a distance of **10 meters** from the antenna and compared to the FCC part 15 subpart B, class B §15.109 limits (CISPR22 limits).

Measurement bandwidth was 120kHz from 30 MHz to 1GHz. A quasi-peak detector is used for measurement.

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.



**4.3. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION**

None

4.4. MEASUREMENTS RESULTS

Pre-characterisation measurement: pre-scan measurement at 3m (PEAK detection, graphs example)

Azimuth: 180°

Polarisation H: graph **Emr1#H** (see annex 1)

Polarisation V: graph **Emr1#V** (see annex 1)

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

Frequency list has been created with anechoic chamber pre-scan results.
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	32.000	30.0	20.6	-9.4	25	V	100	13.5	
2	191.997	30.0	26.9	-3.1	80	H	150	19.8	
3	596.799	37.0	30.7	-6.3	275	V	320	23.0	
4	632.807	37.0	26.3	-10.7	240	H	170	24.0	

RESULT: PASS

4.5. 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 52.5dBµV 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.

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

The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.

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



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
	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 chamber	ETS Lingren	Model 2065	F2000371VO
X	F2000372VO	Turntable controller chamber	ETS Lingren	Model 2066	F2000372VO
X	D3044009VO	Anechoic chamber	EUROSHIELD	RDF-F-60-060	1213
	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
	A4060018VO	Spectrum Analyzer 9KHz – 26.5GHz	HEWLETT PACKARD	8593E	3409u00537
X	A4049059VO	Adapter quasi-peak	HEWLETT PACKARD	HP85650A	2811A01134
X	A4060019VO	Spectrum analyzer display	HEWLETT PACKARD	HP85662A	2816A16603
X	A4060017VO	Spectrum analyzer	HEWLETT PACKARD	HP8568B	2732A04155
X	A4060027VO	Pre-selector RF	HEWLETT PACKARD	HP85685A	2837A00784
	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
	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)			
X	A5329059VO	Cable OATS (Mast at 10m)			
	A5329058VO	Cable OATS (Mast at 3m)			
CONDUCTED MEASUREMENT EMISSION					
X	A3169049VO	Conducted emission comb generator	BARDET		CGPR12
	A2320059VO	LISN	EMCO	3810/2SH	9511/1182
X	C2320068VO	LISN 50Ω / 50μH (Auxiliaries)	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		
X	C2320061VO	LISN 50Ω / 50μH (Measure)	TELEMETER ELECTRONIC	NNB-2/16Z	98010
X	A5329061VO	Cable Conduct. EMI (Analyzer/cage)			
X	A5329060VO	Cable Conduct. EMI (LISN/cage)			
MISCELLANEOUS (CONTROL EQUIPMENT)					
	A6440068VO	Data Logger	AGILENT	34970A	US37043935
	A6440068VO	Data Logger Board	AGILENT	34901A	MY41037442
	D1022117VO	Climatic chamber	BIA CLIMATIC	CL 6-25	200 105 6



	N°LCIE	TYPE	COMPANY	REF	SN
	A7043037VO	Power supply DC 30V 10A	ELC	AL924	95/00600
	A1240170VO	Multimeter	Fluke	87	75250745
	A1240171VO	Multimeter	FLUKE	189	89770115
	A4024018VO	Oscilloscope 500 MHz	Hewlett Packard	54542C	US36040602
	A4024019VO	Oscilloscope	Hewlett Packard	54720A	7426600
X	B4204052VO	Thermo-hygrometer	HUGER		
	A7043036VO	Power supply DC 300W / 150V-6A	SODILEC	7SDLIN/GB AUTO 300	493711
	A4083040VO	Oscilloscope 100 MHz 500Ms/s	Tektronix	TDS30-25	H712103



6. UNCERTAINTIES CHART

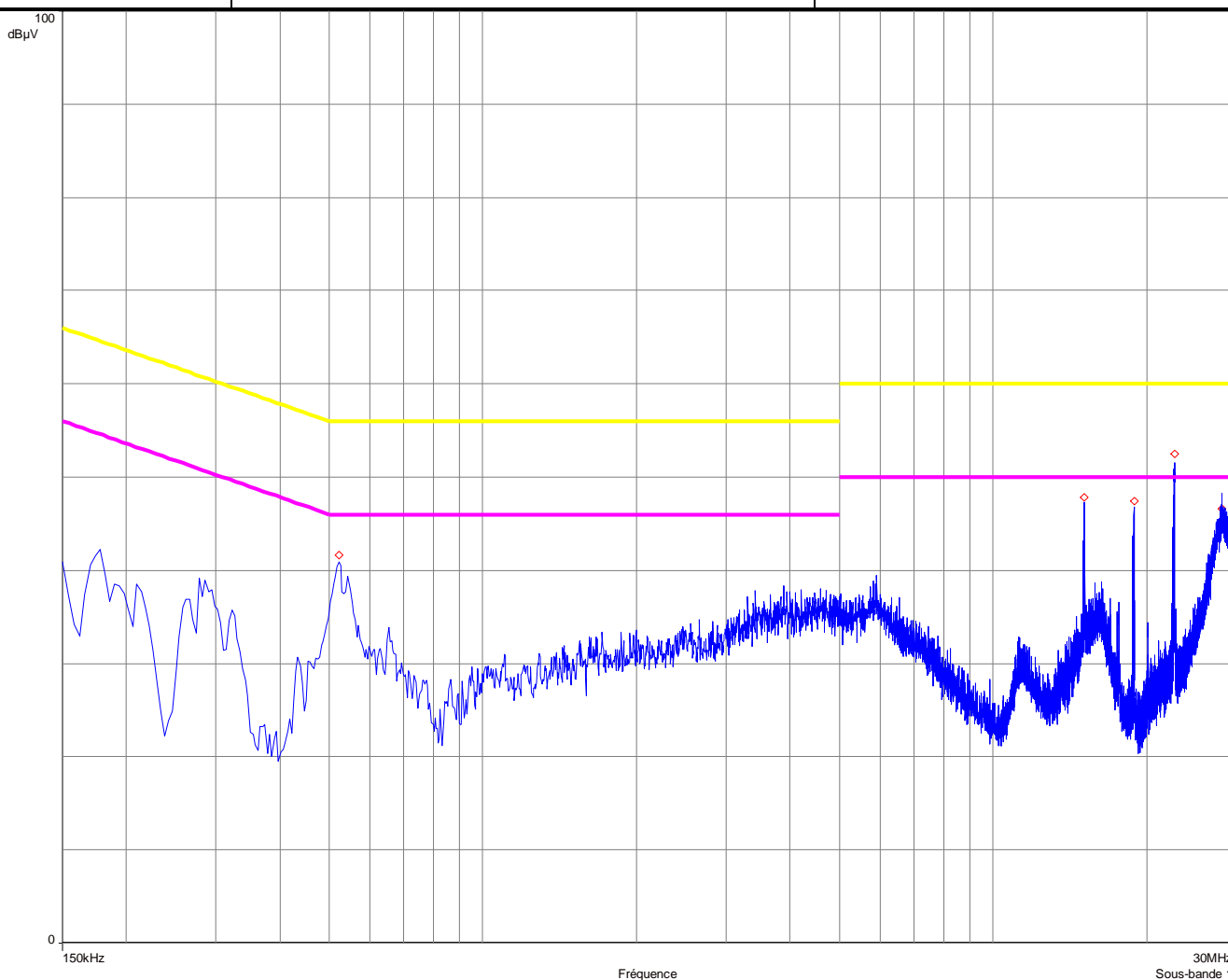
Type de mesure / Kind of measurement	Incertitude élargie laboratoire / Wide uncertainty laboratory (k=2) ± x	Incertitude limite du CISPR / CISPR uncertainty limit ± y
Mesure des perturbations conduites en tension sur le réseau d'énergie <i>Measurement of conducted disturbances in voltage on the power 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

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.



7. ANNEX 1 (GRAPHS)

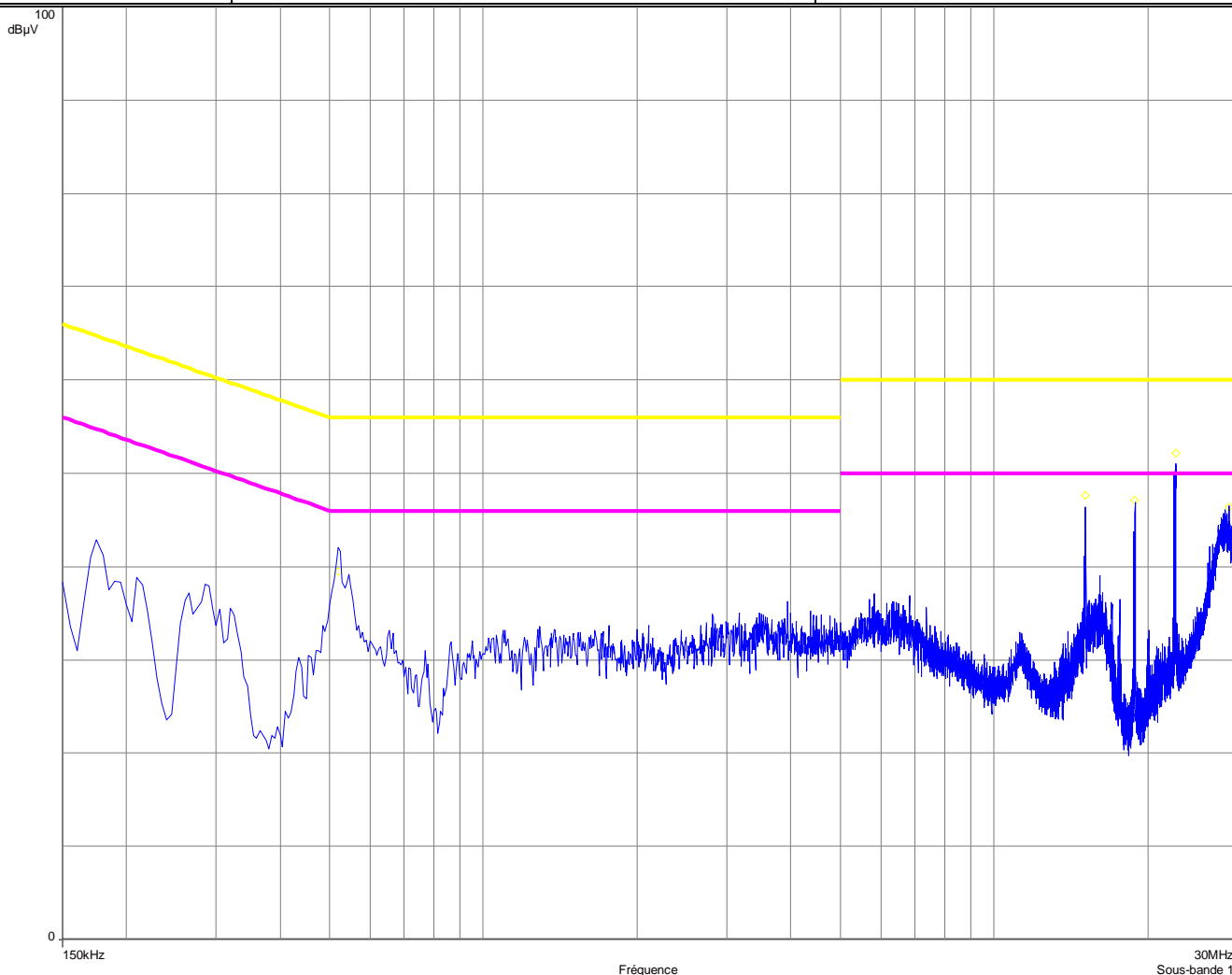
CONDUCTED EMISSIONS		Test configuration:
Graph name:	Emc#1	
Voltage / Frequency	110Vac/60Hz	
Line/Port	Phase L1	
RBW / VBW :	9kHz / 30kHz	



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
0.522	41.6	34.2	46.0	-11.8	38.7	56.0	-17.3
15.110	47.8	38.0	50.0	-12.0	43.5	60.0	-16.5
18.890	47.4	39.4	50.0	-10.6	43.7	60.0	-16.3
22.682	52.5	34.6	50.0	-15.4	47.4	60.0	-12.6
28.166	46.6	36.3	50.0	-13.7	41.2	60.0	-18.8



CONDUCTED EMISSIONS		Test configuration:
Graph name:	Emc#2	
Voltage / Frequency	110Vac/60Hz	
Line/Port	Neutral (N)	
RBW / VBW :	9kHz / 30kHz	

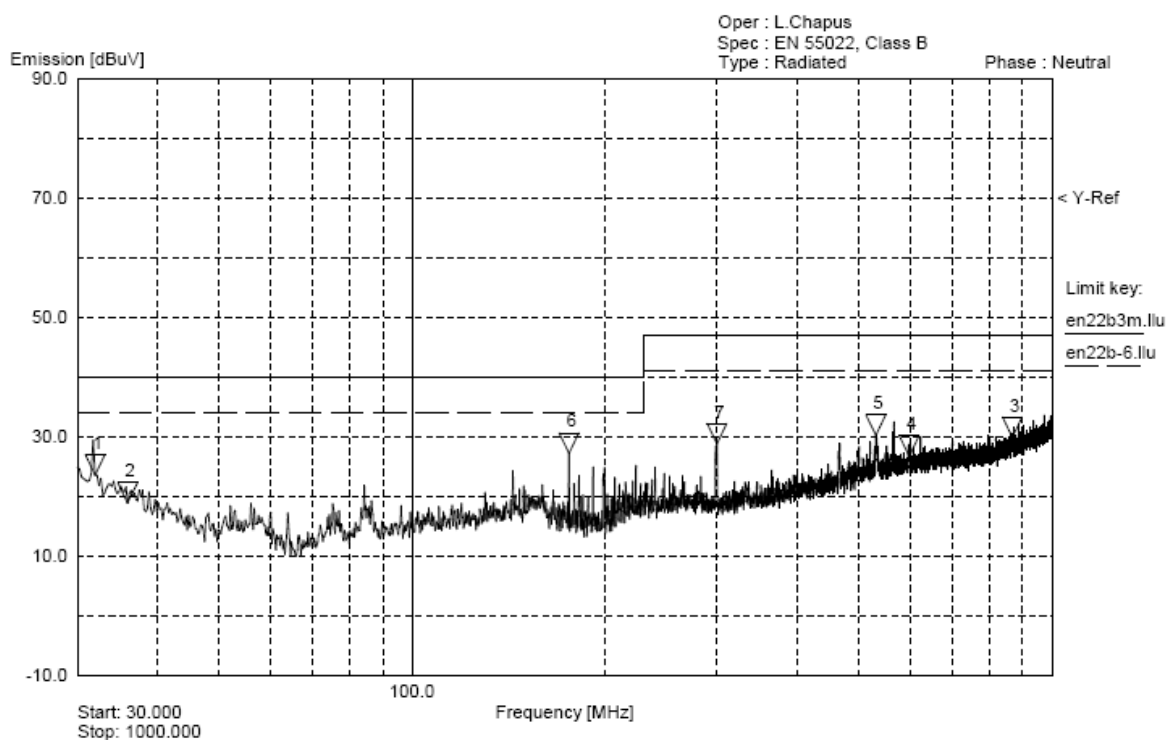


Frequency (MHz)	Measure Peak dBµV	Measure Average dBµV	Limit Average dBµV	Avg-Lim (Margin) dB	Measure Quasi-Peak dBµV	Limit QPeak dBµV	QPeak-Lim (Margin) dB
0.520	39.5	32.4	46.0	-13.6	35.9	56.0	-20.1
15.110	47.6	38.6	50.0	-11.4	43.0	60.0	-17.0
18.885	47.1	38.0	50.0	-12.0	42.6	60.0	-17.4
22.685	52.2	35.2	50.0	-14.8	47.6	60.0	-12.4
28.790	46.4	34.8	50.0	-15.2	39.8	60.0	-20.2



RADIATED EMISSIONS		Test configuration:
Graph name:	Emr#1	
Antenna polarisation	Horizontal	
Azimuth:	180°	
RBW / VBW :	120kHz / 300kHz	

RADIATED EMISSIONS - ATMEL



11:05:28 01 Oct 2007

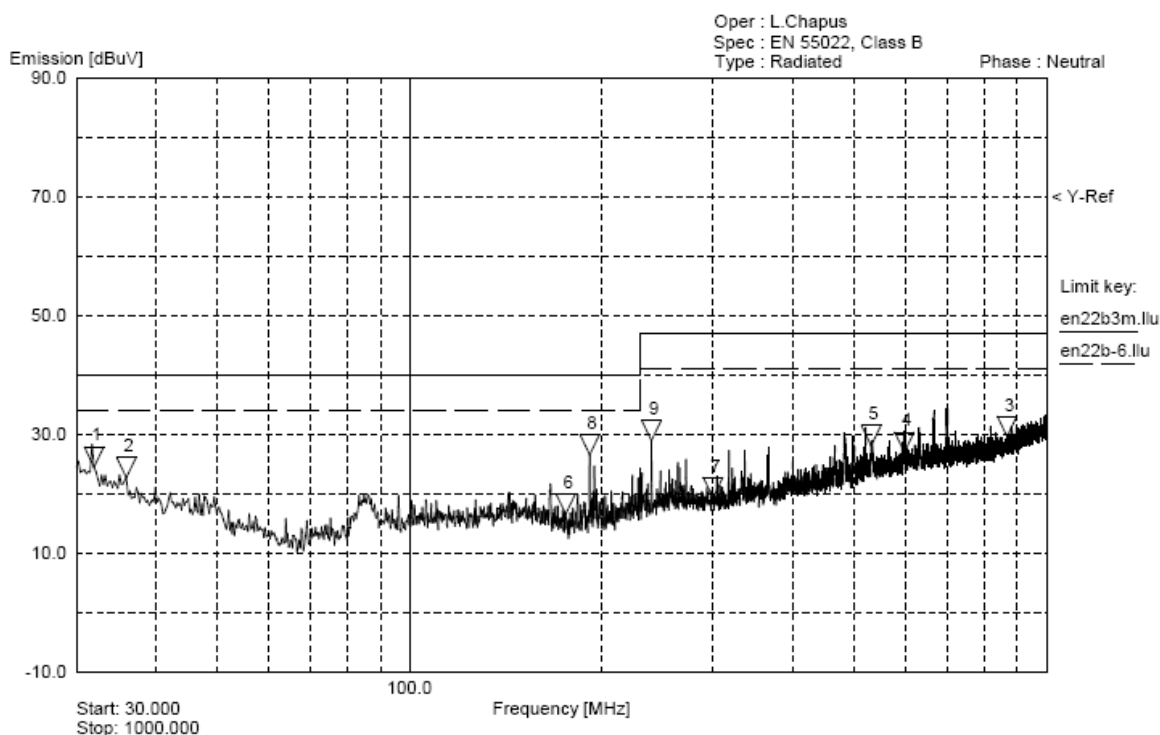
Device : AT77UR100 2V2
Serial #: sn:0735#021 (180°H)

Marker ▽	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	31.98	23.58	-	-	40.00
2	35.95	18.90	-	-	40.00
3	867.5	29.87	-	-	47.00
4	598.6	26.72	-	-	47.00
5	530.7	30.26	-	-	47.00
6	175.9	27.21	-	-	40.00
7	299.6	28.80	-	-	47.00



RADIATED EMISSIONS		Test configuration:
Graph name:	Emr#2	
Antenna polarisation	Vertical	
Azimuth:	180°	
RBW / VBW :	120kHz / 300kHz	

RADIATED EMISSIONS - ATMEL



11:08:19 01 Oct 2007

Device : AT77UR100 2V2
Serial #: sn:0735#021 (180°V)

Marker ▽	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	31.98	24.48	-	-	40.00
2	35.95	22.74	-	-	40.00
3	867.5	29.62	-	-	47.00
4	598.6	26.98	-	-	47.00
5	530.7	28.11	-	-	47.00
6	175.9	16.61	-	-	40.00
7	299.6	19.32	-	-	47.00
8	191.8	26.56	-	-	40.00
9	239.9	28.97	-	-	47.00