

Rapport d'essai / Test report

JDE : 107154 N° 137871-R2-E

DELIVRE A / ISSUED TO : GEMALTO
Z.I.Athélia III
BP 10000
13881 GEMENOS - 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 (2009)

Matériel testé / Apparatus under test :

• Produit / Product	: Lecteur Carte / Smart Card Reader
• Marque / Trade mark	: GEMALTO
• Constructeur / Manufacturer	: GEMALTO
• Type / Model	: PC USB-TR
• N° de série / serial number	: I113012947
• FCCID	: MES473GPO

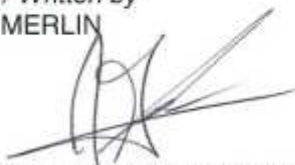
Date des essais / Test date : Le 8 Juin 2011 / June 8th, 2011

Lieu d'essai / Test location : LCIE SUD-EST
ZI Centr'Alp – 170 rue de Chatagnon
38430 MOIRANS - FRANCE

Test réalisé par / Test performed by : Anthony MERLIN

document comporte / Composition of document: 17 pages

Ecrit par / Written by
Anthony MERLIN



MOIRANS, LE 28 JUIN 2011 / JUNE 28th, 2011

Approuvé par / Approved by
Jacques LORQUIN



INDUSTRIES ELECTRIQUES
ZI Centr'Alp
170, Rue de Chatagnon
38430 MOIRANS
Tél. 04 76 07 36 36
Fax 04 76 55 90 88

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	10
6. UNCERTAINTIES CHART	11
7. ANNEX 1 (GRAPHS)	12



1. TEST PROGRAM

Standard:

- FCC Part 15, Subpart B (Digital Devices)
- ANSI C63.4 (2009)

EMISSION TEST	LIMITS			RESULTS (Comments)
Limits for conducted disturbance at mains ports 150kHz-30MHz	Frequency	Quasi-peak value (dBµV)	Average value (dBµV)	PASS
	150-500kHz	66 to 56	56 to 46	
	0.5-5MHz	56	46	
	5-30MHz	60	50	
Radiated emissions 30MHz-1GHz*	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			PASS

***§15.33:** The highest internal source of a testing device is defined like more the highest frequency generated or used in the testing device or on which the testing device works or agrees.

- If the highest frequency of the internal sources of the testing device is lower than 108 MHz, measurement must be only performed until 1GHz.
- If the highest frequency of the internal sources of the testing device ranges between 108 MHz and 500 MHz, measurement must be only performed until 2GHz.
- If the highest frequency of the internal sources of the testing device ranges between 500 MHz and 1 GHz, measurement must be only performed until 5GHz.

If the highest frequency of the internal sources of the testing device is above 1 GHz, measurement must be only performed until 5 times the highest frequency or 40 GHz, while taking smallest of both.

Highest frequency: 104MHz



2. APPARATUS UNDER TEST: CONFIGURATION

2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

- Equipment under test (EUT):

PC USB-TR

Serial Number: I113012947

- Inputs/outputs:

- USB cable

- Cables:

- USB cable, shielded, length: 1.5m

- Auxiliaries equipment used during test:

- 1 x Laptop TOSHIBA SATELITE S1410-704 (PS141E-04YCM-3V), sn: 13594938G

2.2. RUNNING MODE

The EUT exercise program (Apitest) used during radiated and conducted testing in loop was designed to exercise the PC USB-TR in a manner similar to a typical use:

- SIM: Reading – comparison
- MicroSD: reading
- Answer To Reset (ATR)

2.3. EQUIPMENT MODIFICATIONS

None

2.4. SPECIAL ACCESSORIES

None

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

3.1. TEST CONDITIONS

Date of test : June 8th, 2011
Test performed by : A.MERLIN
Atmospheric pressure : 983mb
Relative humidity : 21°C
Ambient temperature : 47%

3.2. SETUP FOR CONDUCTED EMISSIONS MEASUREMENT

The product has been tested according to ANSI C63.4-(2009) and FCC Part 15 subpart B.

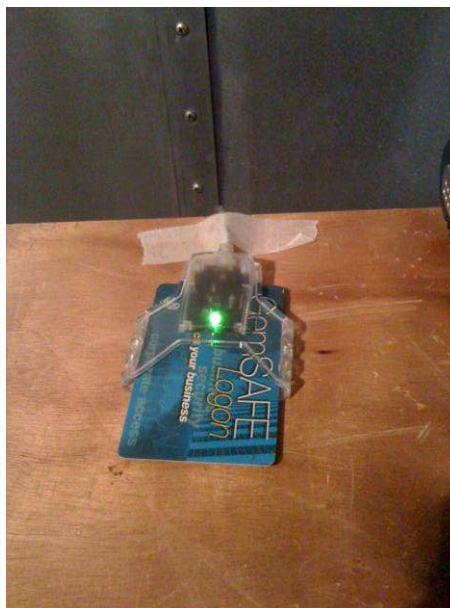
The product has been tested with 110V/60Hz power line voltage of laptop and compared to the FCC Part 15 subpart B §15.107 limits. Measurement bandwidth was 9kHz from 150 kHz to 30 MHz.

The EUT with its auxiliaries are set on a non-conducting table 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 laptop is powered through a LISN (measure).

Measurement is made with a Rohde & Schwarz ESU8 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 and auxiliaries) 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 110Vac/60Hz:

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

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. TEST CONDITIONS

Date of test : June 8th, 2011
Test performed by : A.MERLIN
Atmospheric pressure : 983mb
Relative humidity : 21°C
Ambient temperature : 47%

4.2. SETUP FOR RADIATED EMISSIONS MEASUREMENT

The installation of EUT is identical for pre-characterization measures in a 3 meters semi-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.

The laptop is powered by 230Vac/50Hz.

Pre-characterisation measurement:

A pre-scan of all the setup has been performed in a 3 meters semi-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 a 360° range.

The pre-characterization graphs are obtained in PEAK detection.

For frequency band 1GHz to 12.5GHz, a search is performed in the semi-anechoic chamber in order to determine frequencies radiated by the EUT (Measuring distance reduced to 1m).

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

The product has been tested according to ANSI C63.4 (2009), FCC part 15 subpart B. 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 **10 meters** (30MHz to 1GHz) and **3 meters** (1GHz to 12.5GHz) from the antenna and corrected according to requirements of 15.109.e).

Results are compared to the FCC part 15 subpart B §15.109 limits.

Measurement bandwidth was 120kHz from 30 MHz to 1GHz and 1MHz from 1GHz to 12.5GHz.

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, graph examples)

Polarisation H:	graph Emr#1	Axis XY	(see annex 1)
Polarisation V:	graph Emr#2	Axis XY	(see annex 1)
Polarisation H:	graph Emr#3	Axis Z	(see annex 1)
Polarisation V:	graph Emr#4	Axis Z	(see annex 1)

QUALIFICATION: 10 / 3 meters measurement on the Open Area Test Site.

Frequency list has been created with semi-anechoic chamber pre-scan results.
Measurements are performed using a QUASI-PEAK detection.

Frequency range 30MHz to 1GHz:

Measurements are performed using a QUASI-PEAK detection (RBW=120kHz)

No	Frequency (MHz)	Limit Quasi-Peak (dBµV/m)	Measure Quasi-Peak (dBµV/m)	Margin (Meas-Lim) (dB)	Angle Table (deg)	Pol Ant.	Ht Ant. (cm)	Correc. factor (dB)	Comments
1	34.356	40.0	26.3	-13.7	25	V	100	15.8	
2	35.951	40.0	35.6	-4.4	100	V	100	15.3	
3	38.428	40.0	31.8	-8.2	90	V	100	13.9	
4	45.865	40.0	28.8	-11.2	305	V	100	10.9	
5	62.414	40.0	34.2	-5.8	65	V	100	6.8	
6	114.598	43.5	31.6	-11.9	0	V	100	13.9	
7	126.717	43.5	32.9	-10.6	330	V	100	14.8	
8	498.949	46.0	43.3	-2.7	80	V	150	21.6	
9	895.601	46.0	43.7	-2.3	90	V	200	27.3	
10	997.748	54.0	45.6	-8.4	110	V	100	28.5	

Note: Measures have been done at 10m distance and corrected according to requirements of 15.109.e)
(M@3m = M@10m+10.5dB)

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 52.5dB 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 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.

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



5. TEST EQUIPMENT LIST

USED	N°LCIE	TYPE	COMPANY	REF
Radiated emission measurement (Pre-characterization)				
x	C2040051	Antenna Bi-log	CHASE	CBL6111A
x	A5329198	Cable	-	-
x	A5329207	Cable	UTIFLEX	-
x	D3044017	Semi-Anechoic chamber #3	SIEPEL	-
x	A3169050	Radiated emission comb generator	BARDET	-
x	A2642019	Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8
x	F2000371	Turntable chamber (Cage#3)	ETS Lingren	Model 2165
x	F2000393	Turntable controller (Cage#2-3)	ETS Lingren	Model 2066
Radiated emission measurement (OATS)				
x	C2040051	Antenna Bi-log	CHASE	CBL6111A
x	A5329061	Cable	SUCOFLEX	106G
x	A5329188	Cable OATS (Mast at 10m)	UTIFLEX	-
x	A5329199	Cable OATS (Mast at 10m)	UTIFLEX	-
x	F2000409	OATS	-	-
x	A2642019	Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8
x	F2000372	Turntable / Mast controller (OATS)	ETS Lindgren	Model 2066
x	F2000392	Antenna mast (OATS)	ETS Lindgren	2071-2
x	F2000403	Turntable (OATS)	ETS Lindgren	Model 2187
Conducted measurement emission				
x	A5329045	Cable	-	-
x	D3044010	Faraday Cage	RAY PROOF	-
x	A3169049	Conducted emission comb generator	BARDET	-
x	C2320123	LISN	RHODE & SCHWARZ	ENV216
x	A2642019	Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8
x	A4049061	Transient limiter	HEWLETT PACKARD	11947A



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 (triphasé) <i>Measurement of conducted disturbances in voltage on the power port (three phases)</i>	3.6 dB	3.6 dB
Mesure des perturbations conduites en tension sur le réseau d'énergie (monophasé) <i>Measurement of conducted disturbances in voltage on the power port (single line)</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 Moirans <i>Measurement of radiated electric field on the Moirans 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)

