



EMC TEST REPORT

Nr 3351-FCC

This test report applies only on equipment described hereafter.

Proposal number: 200502-2637

Date of test..... : March 14th and 25th, 2005

Location..... : SMEE **Actions Mesures** Laboratory - 38 VOIRON

Performed by..... : Laurent CHAPUS

Customer..... : **GEMPLUS** (Represented by Mr. Pierre André Collet)
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13705 LA CIOTAT
FRANCE

Product..... : **OTP TOKEN**
(FCC ID: MESOTP)

Type of test : **Radiated and conducted emission Test**

Applied standards or specification: **FCC Part 15, Subpart B**
CISPR 22 (2003)
ANSI C63-4 (2003)

Level : CISPR 22 Class B

Test objective : Qualification

Results : **Sample tested in configuration and description presented in this test report complies with prescriptions and limits of CISPR 22 standards (class B).**

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Written by..... : Laurent CHAPUS

Approved by : Jean-Pierre ORY

Date : March 25th, 2005



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 equipment OTP TOKEN may be used as a USB flash drive connected to a PC or in a standalone mode for One Time Password (OTP) and PKI authentication.

1.2. HARDWARE IDENTIFICATION:

* Equipment Under Test (EUT):	OTP Token (without flash memory)	Sn: none
	OTP Token (with 128Mo flash memory)	Sn: none

- Input/output : USB 1.1 port
- Frequencies : 12MHz-6MHz-1.5MHz
- Power supply: 3x 1.5V batteries (LR44)

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
OTP TOKEN * (sn: none) Without Flash memory	MES0TP	Personal Security device	USB extension cord (1.1 standard): 1m
OTP TOKEN * (sn: none) With 128Mo Flash memory	MES0TP	Personal Security device (with storage)	Mobile device secure USB extension cord (1.1 standard): 1m
TOSHIBA T9000 PIII Model: PT9000E-03SFH-FR (sn: Y1081087G ST900-0	CJ6PA3070W L	Laptop PC	DC power supply cable, unshielded: 1.8m
TOSHIBA AC adaptor Model: PA3215U-1ACA (sn: 03410994)	None	AC/DC adapter (100V-240V / 15Vdc)	AC power cable, 2 wires: 2m

*: Equipment under test

1.4. RUNNING MODE:

For testing the **OTP TOKEN**, it is connected to the USB port of a PC laptop running under Windows 2000 Professional.

The program APITEST.EXE V2 is running in loop with data access to the EUT (ATR data control performed at each loop).

In the standalone mode, the EUT is generated password in loop (OTP).

1.5. I/O CABLES:

- USB 1.1 extension cord: 1m
- AC power cord: 2m (for power supply of the PC)
- DC power cable (attached on PC's AC/DC adapter): 1.8m

**1.6. EQUIPMENT MODIFICATIONS:**

No equipment modification has been necessary during testing to achieve compliance to CIRPR22 Class B levels. The unit tested was representative to a production unit.

2. Radiated emission data**2.1. TEST SET-UP:**

The equipment under test and auxiliaries are set on a non-conducted table of 80cm height, above the ground plane.

Test is performed with EUT directly plugged into the USB port and with a 1m USB extension cord.

For the standalone mode, new batteries are used during the test.

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.

2.2. TEST EQUIPMENT:

Test Equipment from 30MHz to 1GHz on the 10 meters open site:

Equipment	Company	Model	Serial
Spectrum Analyzer	HP	8568B	2732A04140
Quasi-Peak adapter	HP	85650A	2811A01136
RF Pre-selector	HP	85685A	2833A00773
Biconical Antenna	EMCO	3104C	9401-4636
Log Periodic Antenna	EMCO	3146	2178
OATS			

EMCO-1050, 6 meters height antenna mast & EMC0-1060, 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
EMC Analyzer	HP	8591EM	3536A00384
Amplifier	HP	8447F H64	3113A06394
Antenna (30MHz-1GHz)	CHASE	CBL6111A	1628

2.3. TEST SEQUENCE AND RESULTS:**2.3.1. Pre-characterization at 3 meters**

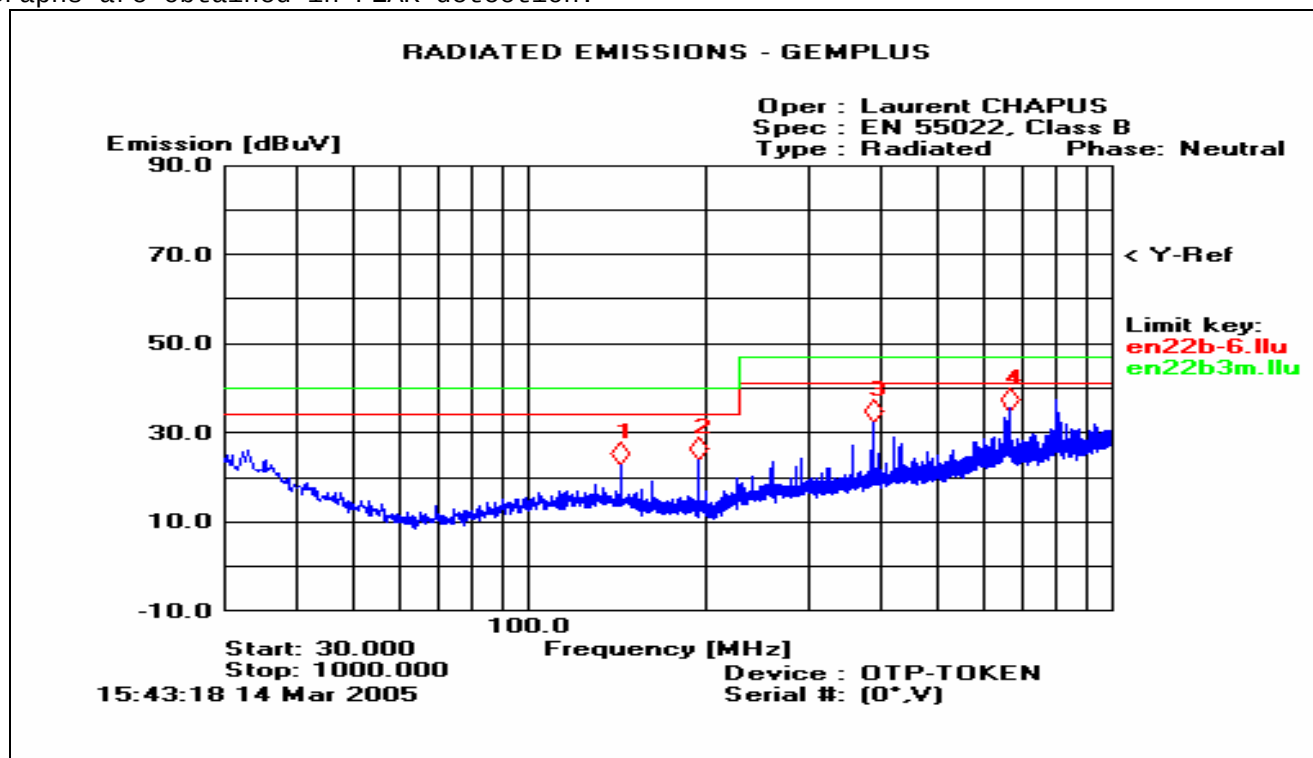
A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber. The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) polarization, and on 4 faces of the EUT. See below for graph example.

A pre-characterization is performed for followings configuration:

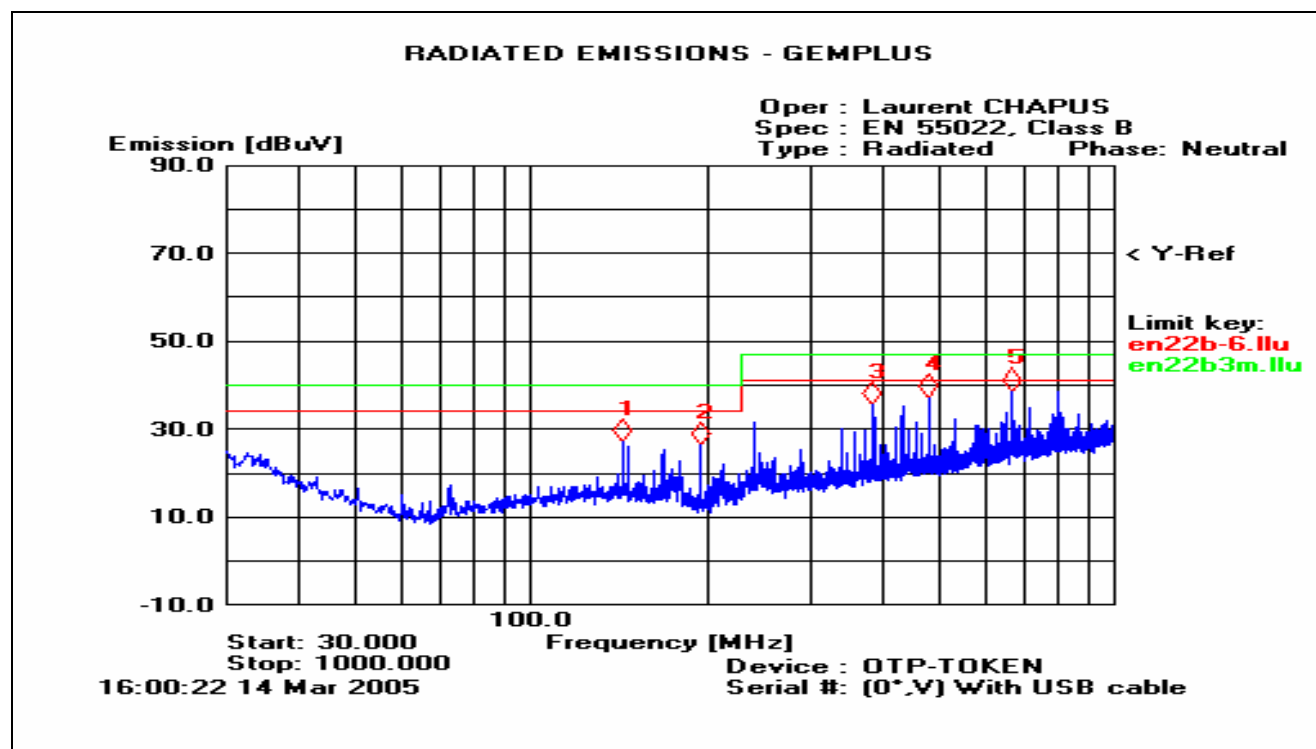
- USB mode without extension cord
- USB mode with extension cord
- USB mode with flash memory.
- Standalone mode



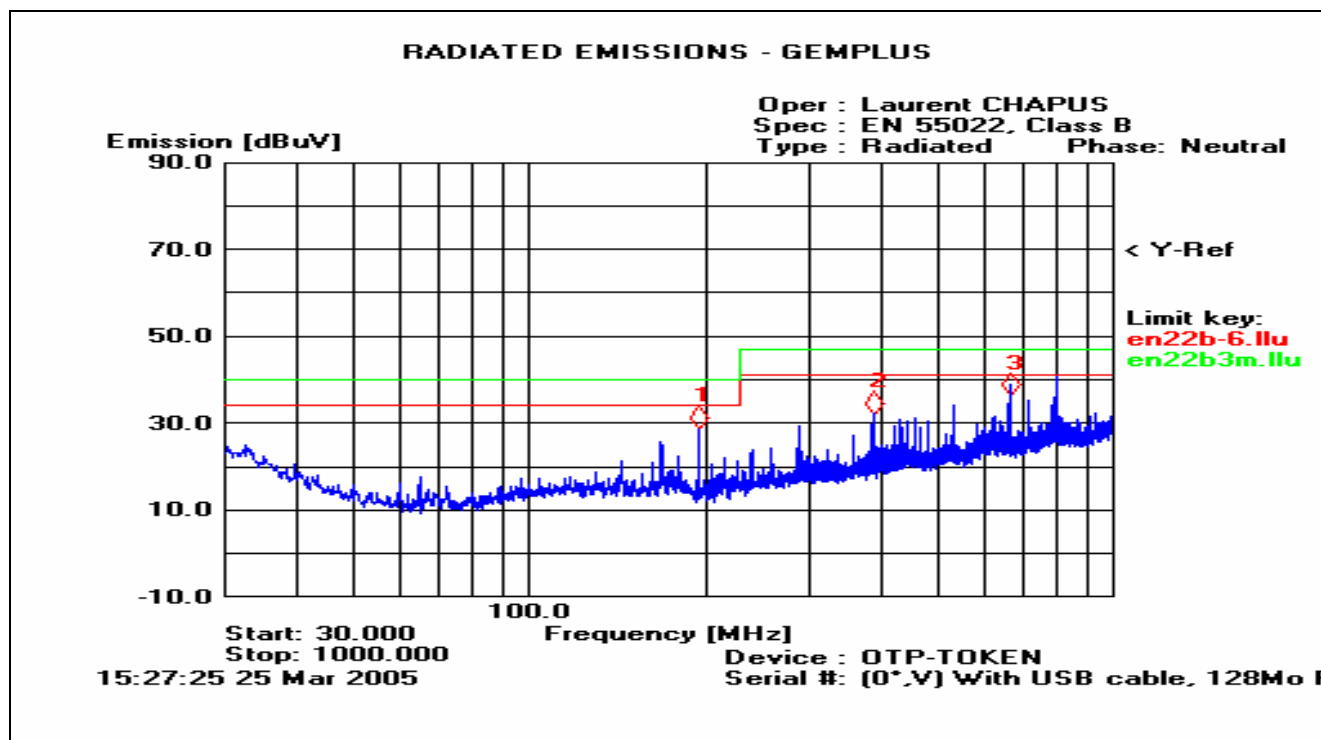
Graphs are obtained in PEAK detection.



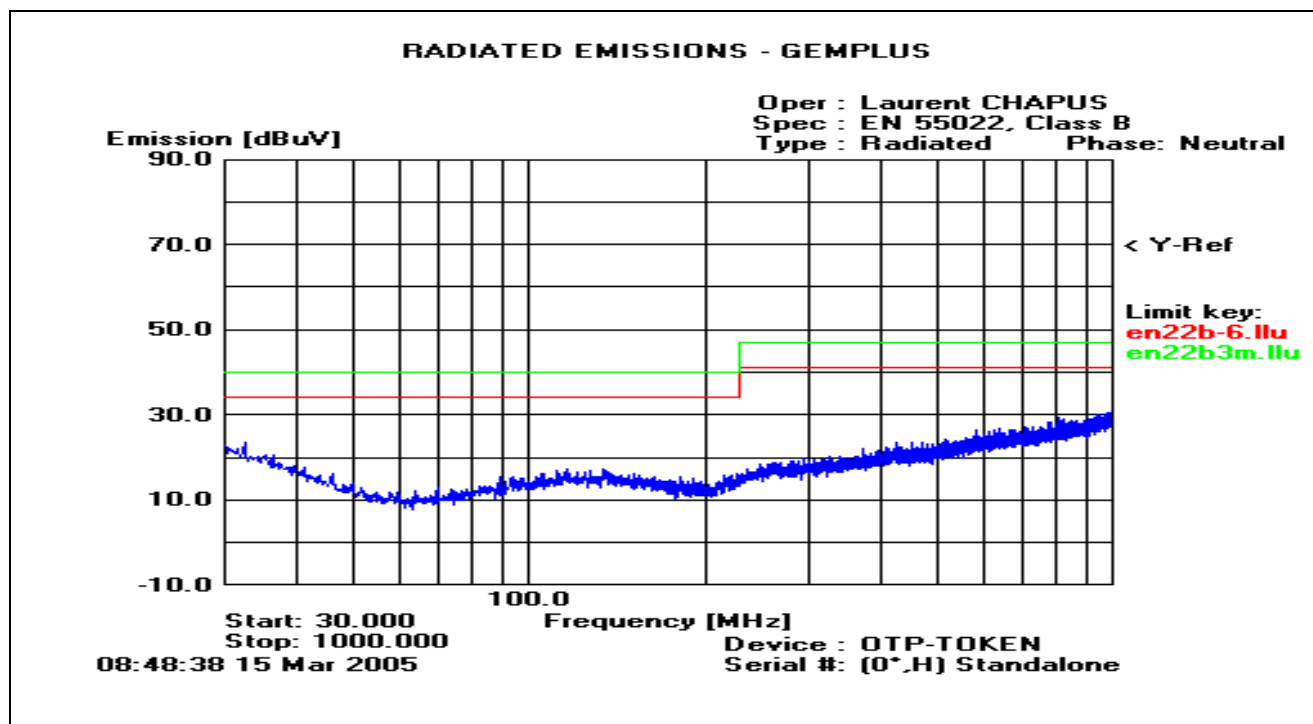
Graph [30MHz-1GHz] - EUT without USB extension cord
(RBW is 120kHz; VBW is 300kHz)



Graph [30MHz-1GHz] - EUT with USB extension cord
(RBW is 120kHz; VBW is 300kHz)



Graph [30MHz-1GHz] - EUT (128Mo memory) with USB extension cord
(RBW is 120kHz; VBW is 300kHz)



Graph [30MHz-1GHz] - EUT in standalone mode
(RBW is 120kHz; VBW is 300kHz)



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

The product has been tested according to ANSI C63.4 (2003) and CISPR 22 (2003). 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 with new batteries, at a distance of 10 meters from the antenna and compared to the CISPR 22 Class B 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.

Frequency band investigated is 30MHz to 1GHz.

Equipment was moved to position that maximized emission. A summary of the worst case emissions found in all test configurations and modes is shown on clause 2.3.1.

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

2.3.3. Qualification results

Frequency list has been created with anechoic chamber pre-characterization results. Measurements are performed in QUASI-PEAK detection.

EUT without USB extension cord:

No	Frequency (MHz)	QPeak Limit * (dBμV/m)	QPeak (dBμV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)	Comments
1	143.185	30.0	25.6	-4.4	177	V	108	14.8	
2	194.939	30.0	22.9	-7.1	201	V	189	19.0	
3	384.034	37.0	28.1	-8.9	101	H	211	18.2	
4	480.041	37.0	36.2	-0.8	351	H	173	20.8	Worst margin
5	666.477	37.0	31.7	-5.3	341	V	253	24.5	
6	688.090	37.0	26.9	-10.1	255	V	268	24.9	

EUT with USB extension cord:

No	Frequency (MHz)	QPeak Limit * (dBμV/m)	QPeak (dBμV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)	Comments
1	143.194	30.0	24.4	-5.6	170	V	102	14.8	
2	239.999	37.0	28.0	-9.0	339	H	249	14.1	
3	384.011	37.0	30.4	-6.6	159	V	108	18.2	
4	480.038	37.0	36.6	-0.4	73	H	171	20.8	Worst margin

*: CISPR22 Class B limits

Results: COMPLY.



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-(2003) and CISPR22 (2003). The product has been tested with 110V/60Hz power line voltage and compared to the CISPR22 Class B 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. TEST SET-UP:

Mains: 110V/60Hz

The equipment under test with its auxiliaries are set 80cm above the ground reference plane on a non-conducting table. The distance between the EUT and the LISN is 80cm.

The distance between the EUT with its auxiliaries and the vertical plane is 40cm.

The EUT is powered through a LISN (measure - 50Ω / $50\mu\text{H}$). The distance between the EUT and each auxiliary is 10cm.

Measurements are performed on the AC power line of the PC. The EUT is plugged into the USB port of the PC with an extension cord.

3.2. TEST EQUIPMENT:

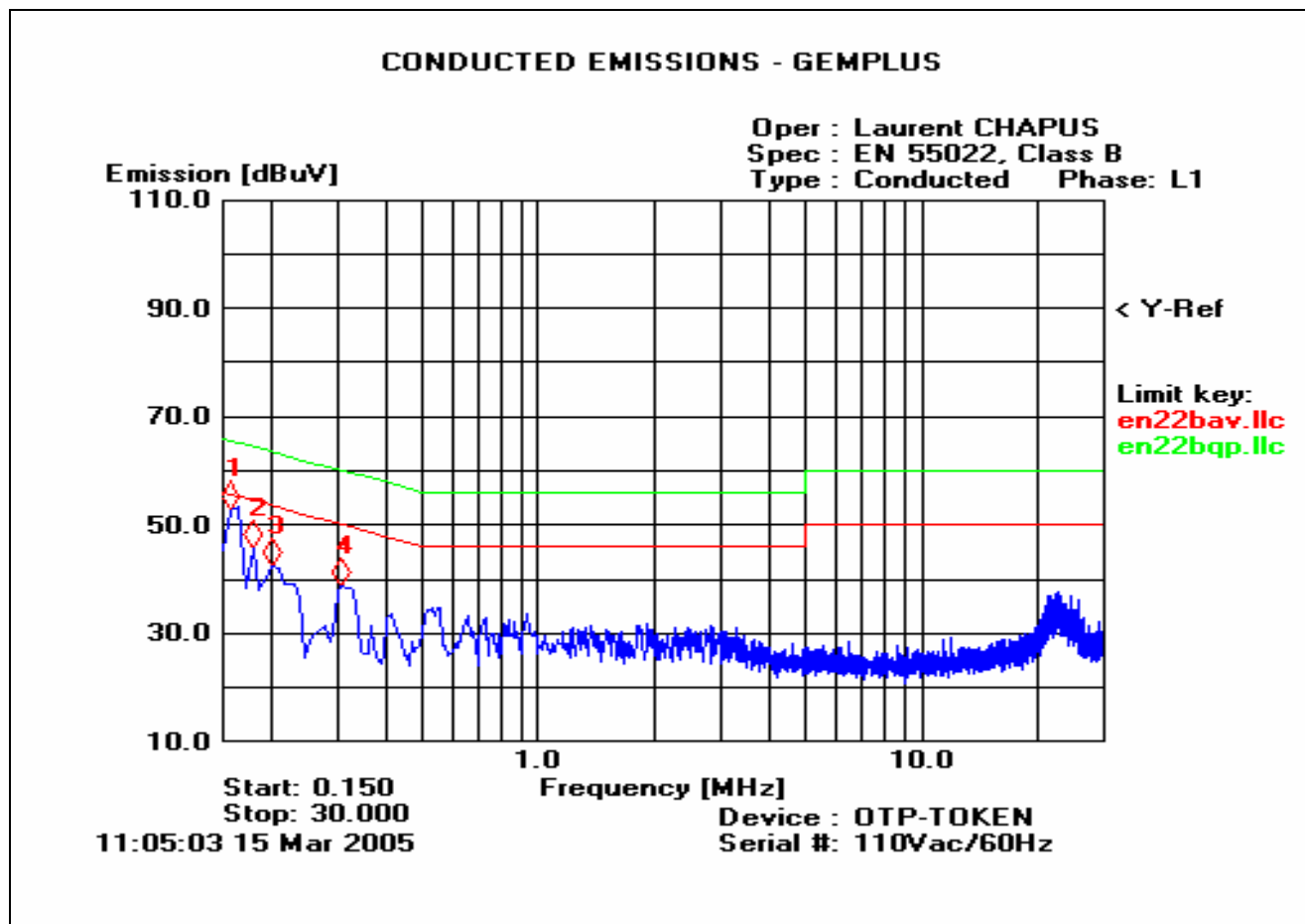
Equipment	Company	Model	Serial
EMC Analyzer	HP	8591EM	3536A00384
Test receiver	Rohde&Schwarz	ESH3	872079/117
Transient Limiter	HP	11947A	3107A01596
LISN(auxiliary)	EMCO	3810/2SH	9511-11821628
LISN(measure)	Telemeter	TGmbH	NNB 9511-11821628
50Ω / $50\mu\text{H}$	Electronis	2/16	
Faraday room	Rayproof		4854

3.3. TEST SEQUENCE AND RESULTS:

Measures are performed on line 1 and neutral of the power supply of the laptop PC.



3.3.1. Line conducted emission data (110V/60Hz)

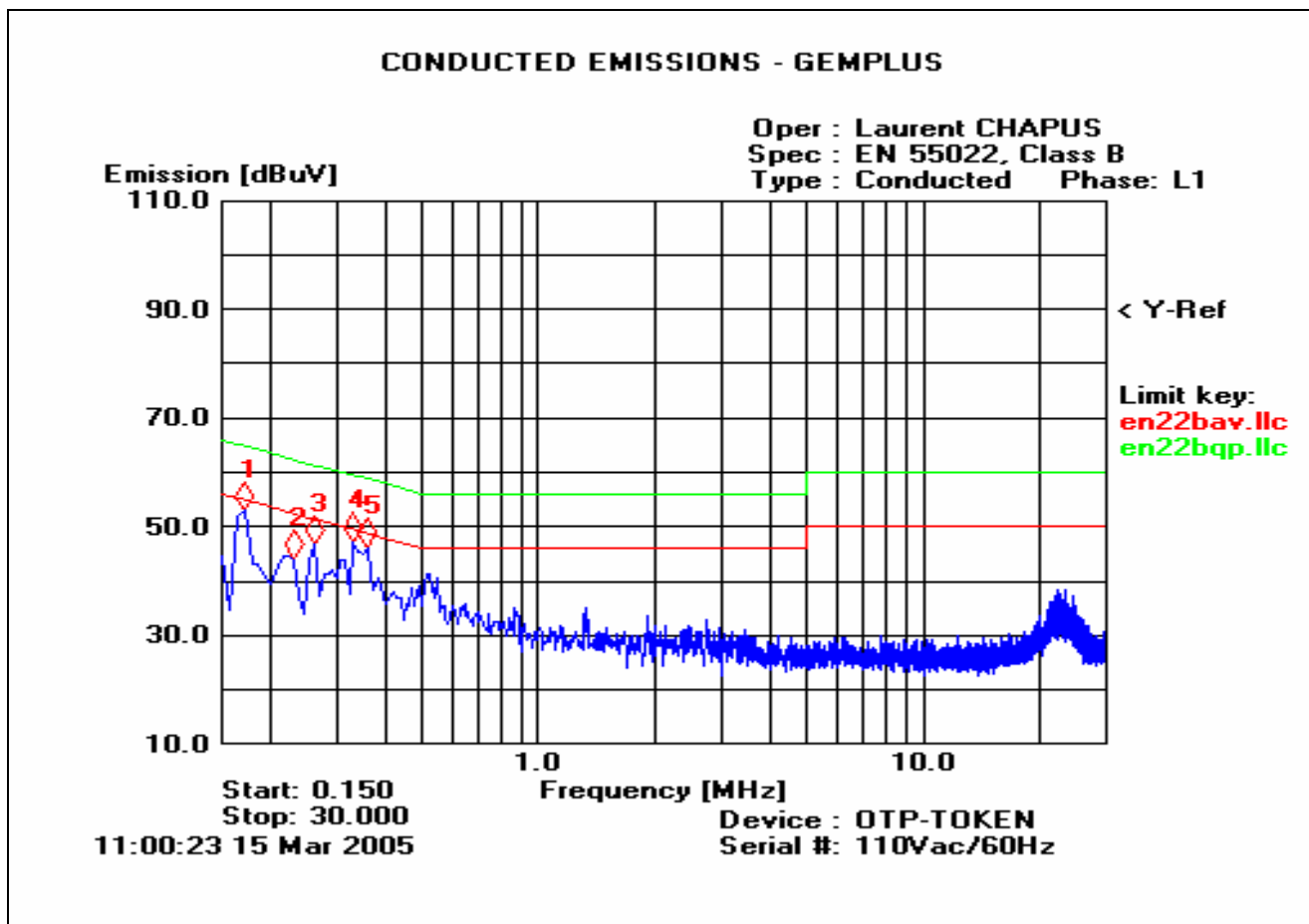


RBW = 9kHz / VBW = 30kHz

Marker	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.160	55.31	50.25	27.09	54.00
2	0.180	51.24	47.38	28.14	54.00
3	0.200	41.71	38.34	32.07	52.00
4	0.310	39.29	36.91	28.42	50.00



3.3.2. Neutral conducted emission data (110V/60Hz)



RBW = 9kHz / VBW = 30kHz

Marker	Freq. [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.170	54.71	48.71	28.35	54.00
2	0.230	48.05	41.64	23.11	52.00
3	0.260	47.81	40.18	23.99	50.00
4	0.330	45.61	41.23	29.79	48.00
5	0.360	41.71	38.50	23.01	48.00

4. CONCLUSION

Sample of the equipment OTP TOKEN tested in the configuration described in this report, complies with prescriptions and limits of the CISPR 22 (2003) standard, class B.