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FCC CERTIFICATION RADIO Measurement Technical Report

**standard to apply:
FCC Part 15.247**

**Equipment under test:
BLUETOOTH BASE AND TERMINAL
I7780 (handset)
I7770 (base)**

**FCC ID :
T8D-I7780 (handset)
T8D-I7770BAS (base)**

**Company:
INGENICO**

DISTRIBUTION: Mr GOBION

Company: INGENICO

Number of pages: 54 including 4 annexes

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PRODUCT: **BLUETOOTH BASE AND TERMINAL**

Reference / model: I7780 (handset)
I7770 (base)

Serial number: not communicated

MANUFACTURER: not communicated

COMPANY SUBMITTING THE PRODUCT:

Company: INGENICO

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DATES OF TEST: 14, 20 and 23 March 2006

TESTING LOCATION: EMITECH ATLANTIQUE laboratory at ANGERS (49) FRANCE
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Registration Number by FCC: 101696/FRN: 0006 6490 08

TESTED BY: L. BERTHAUD
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1.INTRODUCTION

This document presents the result of RADIO test carried out on the following equipment: BLUETOOTH BASE AND TERMINAL in accordance with normative reference.

2.PRODUCT DESCRIPTION OF THE BASE

ITU Emission code: 1M00F7D

Class: A (commercial, industrial or business environment)

Utilization: payment base

Antenna type: incorporated antenna

Operating frequency range: I.S.M. band from 2400 MHz to 2483.5 MHz

Number of channels: 79

Channel spacing: 1 MHz

Frequency generation: ☒ SAW Resonator ☐ Crystal ☒ Synthetiser

Modulation: Frequency Hopping Spread Spectrum
☒ Amplitude ☐ Digital ☒ Frequency ☐ Phase

Power source: 115 V.a.c.

Power level, frequency range and channels characteristics are not user adjustable.

The details pictures of the product and the circuit boards are joined with this file.

3.PRODUCT DESCRIPTION OF THE TERMINAL

ITU Emission code: 1M00F7D

Class: A (commercial, industrial or business environment)

Utilization: payment terminal

Antenna type: incorporated antenna

Operating frequency range: I.S.M. band from 2400 MHz to 2483.5 MHz

Number of channels: 79

Channel spacing: 1 MHz

Frequency generation: ☐ SAW Resonator ☐ Crystal ☒ Synthetiser

Modulation: Frequency Hopping Spread Spectrum
☐ Amplitude ☐ Digital ☒ Frequency ☐ Phase

Power source: Li-Ion battery (1 × 7.4 V)

Power level, frequency range and channels characteristics are not user adjustable.

The details pictures of the product and the circuit boards are joined with this file.

4.NORMATIVE REFERENCE

FCC Part 15 (2006) Code of Federal Regulations
Title 47 - Telecommunication
Chapter 1 - Federal Communications Commission
Part 15 - Radio frequency devices
Subpart C - Intentional Radiators

ANSI C63.4 (2003) Methods of Measurement of Radio-Noise Emissions from
Low-voltage Electrical and Electronics Equipment in the range
of 9 kHz to 40 GHz

5.TEST METHODOLOGY

Radio performance tests procedures given in part 15:

- Paragraph 33: frequency range of radiated measurements
- Paragraph 35: measurement detector functions and bandwidths
- Paragraph 205: restricted bands of operation
- Paragraph 207: conducted limits
- Paragraph 209: radiated emission limits; general requirements
- Paragraph 247: operation within the bands 2400-2483.5 MHz

6.ADD ATTACHMENTS FILES

- “Synoptic “***
- “Block diagram “***
- “External photos and Product labeling “***
- “Assembly of components “***
- “Internal photos “***
- “Layout pcb “***
- “Bil of materials “***
- “Schematics “***
- “Product description “***
- “User guide “***

7. TESTS AND CONCLUSIONS OF THE BASE

Test procedure	Description of test	Criteria respected ?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.205	RESTRICTED BANDS OF OPERATION	X				
FCC Part 15.207	CONDUCTED LIMITS	X				
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				Note 4
FCC Part 15.247	OPERATION WITHIN THE BAND 2400-2483.5 MHz					
	(a) (1) <i>hopping systems</i>	X				Notes 1 & 2
	(a) (2) digital modulation techniques			X		
	(b) (1) <i>max output power</i>	X				Note 5
	(c) operation with directional antenna gains > 6 dBi			X		Note 3
	(d) <i>intentional radiator</i>	X				
	(e) <i>peak power spectral density</i>	X				Note 5
	(f) hybrid system			X		
	(g)	X				
	(h)	X				
	(i) RF exposure compliance	X				Note 6

NAP: Not Applicable

NAs: Not Asked

Note 1: the frequency hopping system have hopping channel carrier frequencies separated by 1 MHz. The system hop to channel frequencies from a pseudo randomly ordered list of hopping frequencies. Each frequency is used equally on the average by the transmitter, and separated by a minimum of 20 dB bandwidth of the hopping channel (see annex 1).

Note 2: the frequency hopping system use more than 15 non-overlapping channels.

The timing by channel is 436 μ s.

During 79 channels $\times$ 0.4 s (part 15) = 31.6 s, any channel is used 328 times, then

$328 \times 436 \mu$ s = 143.01 ms, thus the average time of occupancy on any channel is less than 400 ms within a period of 0.4 s multiplied by the number of hopping channels employed, in normal operating mode (see annex 2).

Note 3: the antenna gain is less than 6 dBi.

Note 4: see FCC part 15.247 (d).

Note 5: for information only, conducted measurement is not possible (integral antenna), so we used the substitution method in open field.

Note 6: this type of equipment uses less than 0.5 W of output power with a high signal transmitting duty factor (section 3 from Oet 65c).

8.TESTS AND CONCLUSIONS OF THE TERMINAL

Test procedure	Description of test	Criteria respected ?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.205	RESTRICTED BANDS OF OPERATION	X				
FCC Part 15.207	CONDUCTED LIMITS			X		Note 4
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				Note 5
FCC Part 15.247	OPERATION WITHIN THE BAND 2400-2483.5 MHz					
	(a) (1) <i>hopping systems</i>	X				Notes 1 & 2
	(a) (2) digital modulation techniques			X		
	(b) (1) <i>max output power</i>	X				Note 6
	(c) operation with directional antenna gains > 6 dBi			X		Note 3
	(d) <i>intentional radiator</i>	X				
	(e) <i>peak power spectral density</i>	X				Note 6
	(f) hybrid system			X		
	(g)	X				
	(h)	X				
	(i) RF exposure compliance	X				Note 7

NAp: Not Applicable

NAs: Not Asked

Note 1: the frequency hopping system have hopping channel carrier frequencies separated by 1 MHz. The system hop to channel frequencies from a pseudo randomly ordered list of hopping frequencies. Each frequency is used equally on the average by the transmitter, and separated by a minimum of 20 dB bandwidth of the hopping channel (see annex 1).

Note 2: the frequency hopping system use more than 15 non-overlapping channels.

The timing by channel is 436 μ s.

During 79 channels $\times$ 0.4 s (part 15) = 31.6 s, any channel is used 336 times, then

$336 \times 436 \mu$ s = 146.49 ms, thus the average time of occupancy on any channel is less than 400 ms within a period of 0.4 s multiplied by the number of hopping channels employed, in normal operating mode (see annex 2).

Note 3: the antenna gain is less than 6 dBi.

Note 4: battery source power

Note 5: see FCC part 15.247 (d).

Note 6: for information only, conducted measurement is not possible (integral antenna), so we used the substitution method in open field.

Note 7: this type of equipment uses less than 0.5 W of output power with a high signal transmitting duty factor (section 3 from Oet 65c).

Conclusion:

The sample of BLUETOOTH BASE AND TERMINAL submitted to the tests complies with the regulations of the standard FCC Part 15 in accordance with the limits or criteria defined in this report.

9.MEASUREMENT OF THE CONDUCTED DISTURBANCES OF THE BASE

Standard: FCC Part 15

Test procedure: Paragraph 15.207

Test equipment:

TYPE	BRAND	EMITECH NUMBER
Test receiver ESH3	Rohde & Schwarz	1058
Pulse limiter ESH3-Z2	Rohde & Schwarz	976
Artificial main network L3-25	PMM	834
Spectrum analyzer FSBS	Rohde & Schwarz	3133
AC Power Supply ALT 2000	K. SERRAS	2441

Software used: BAT-EMC V 3.1.7.1

Test set up:

The test unit is placed on a wooden table, 0.8 m over a horizontal reference plane and 0.4 m from a vertical reference plane. It is powered by an artificial main network placed on the ground reference plane (see photo in annex 4).

See photos in the annex 1.

Equipment under test operating condition:

The equipment is powered with the AC power operating voltage of 115 V / 60 Hz.

Frequency range: 150 kHz - 30 MHz

Detection mode: Peak / Average

Bandwidth: 9 kHz

Results:

The first measurement is made with peak detector:

Curve N° 1: measurement on the Neutral with peak detector

Curve N° 2: measurement on the Line with peak detector

The frequencies which aren't 6 dB under the Average limit are analysed with Average detector.
The results are noted in the following curves.

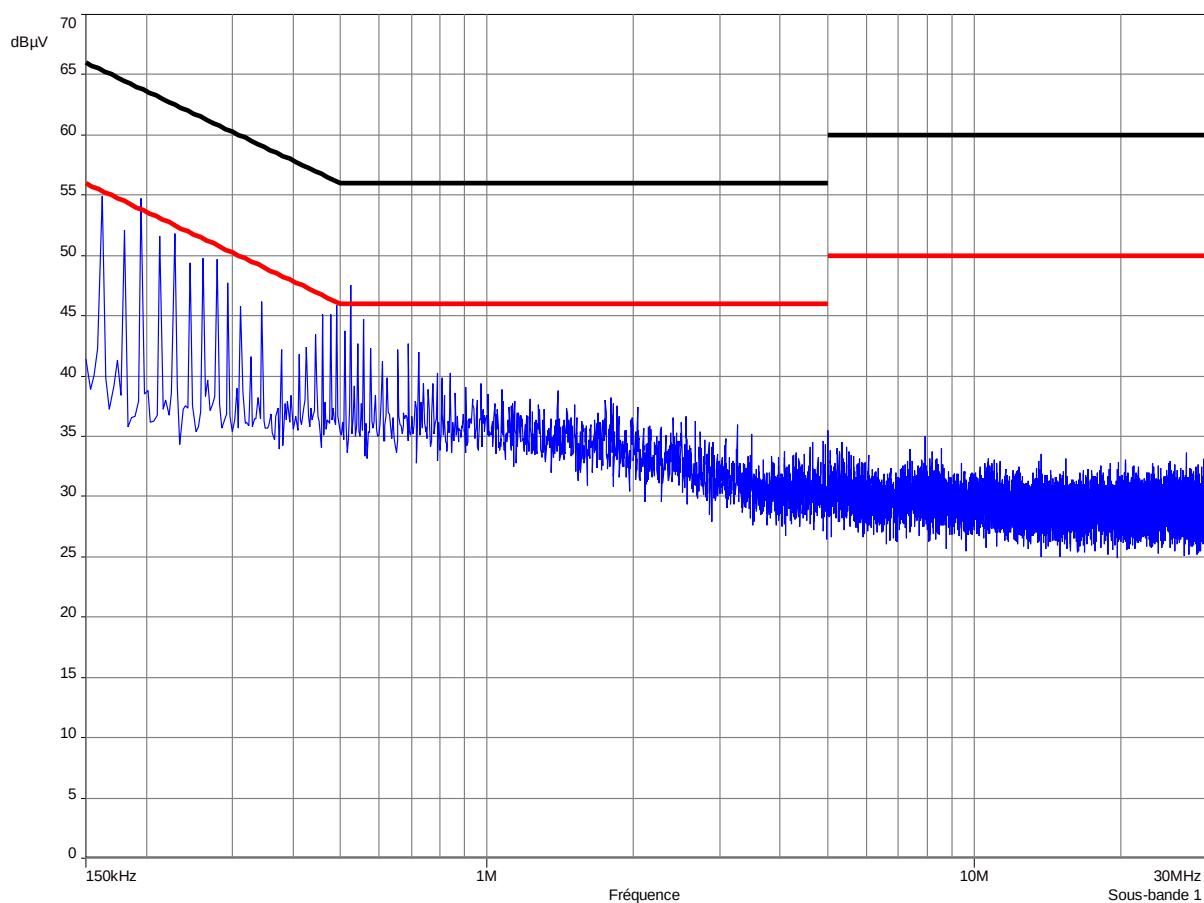
Measurement with Average detector from 150 kHz to 1.5 MHz on the Neutral and on Line:

Curve N° 3: measurement on the neutral with average detector

Curve N° 4: measurement on the line with average detector

CURVE N°: 1.

Measurement on the neutral with peak detector



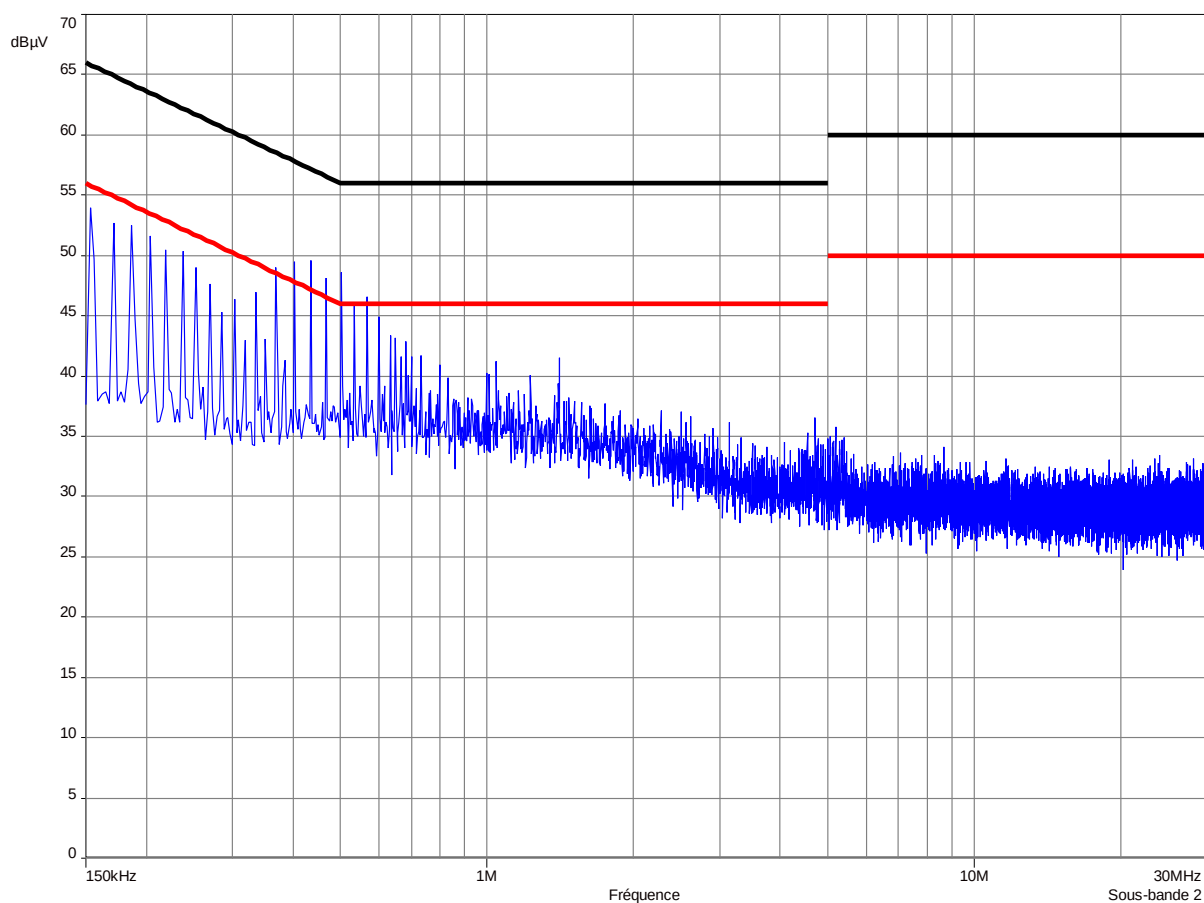
RBW filter: 10 kHz

VBW filter: 10 kHz

Sweep time: 500 ms/MHz

CURVE N°: 2.

Measurement on the line with peak detector



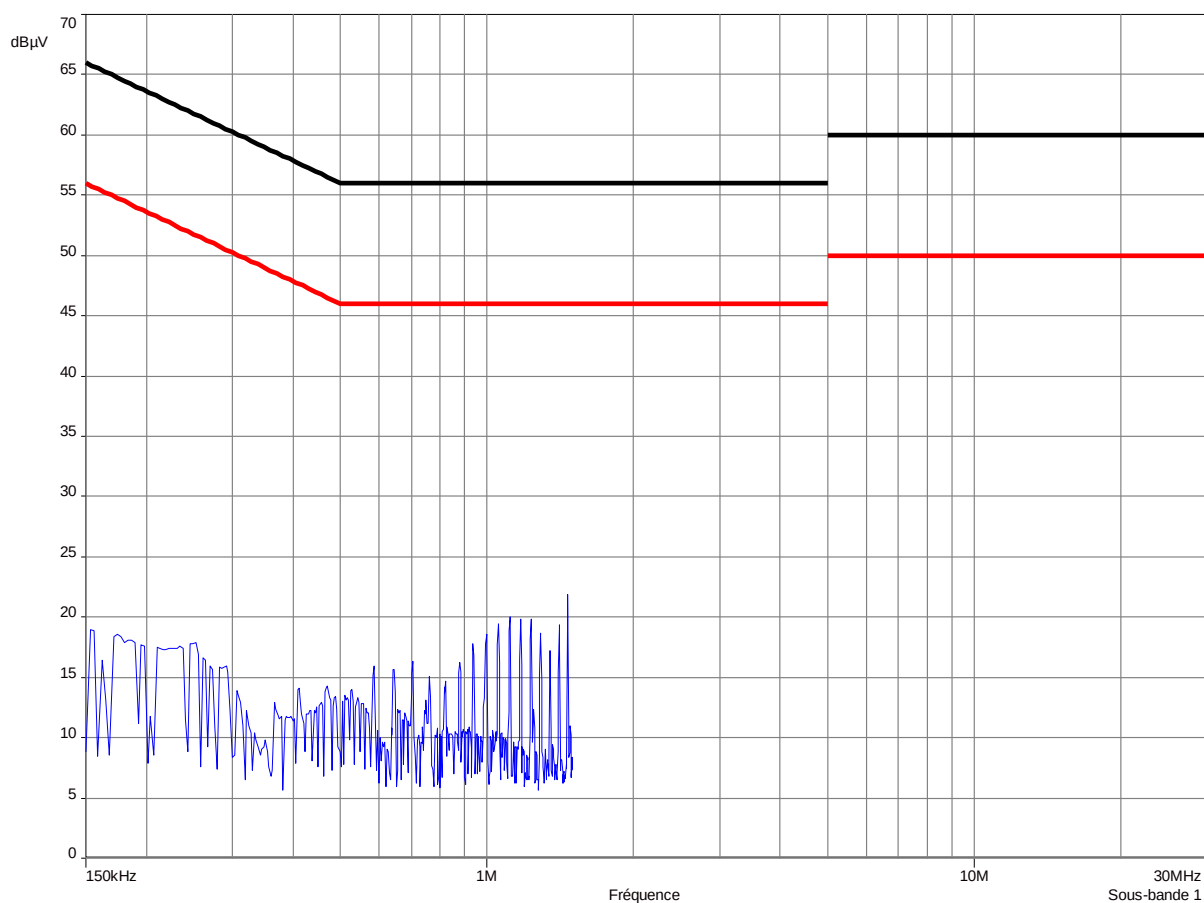
RBW filter: 10 kHz

VBW filter: 10 kHz

Sweep time: 500 ms/MHz

CURVE N°: 3.

Measurement on the neutral with average detector

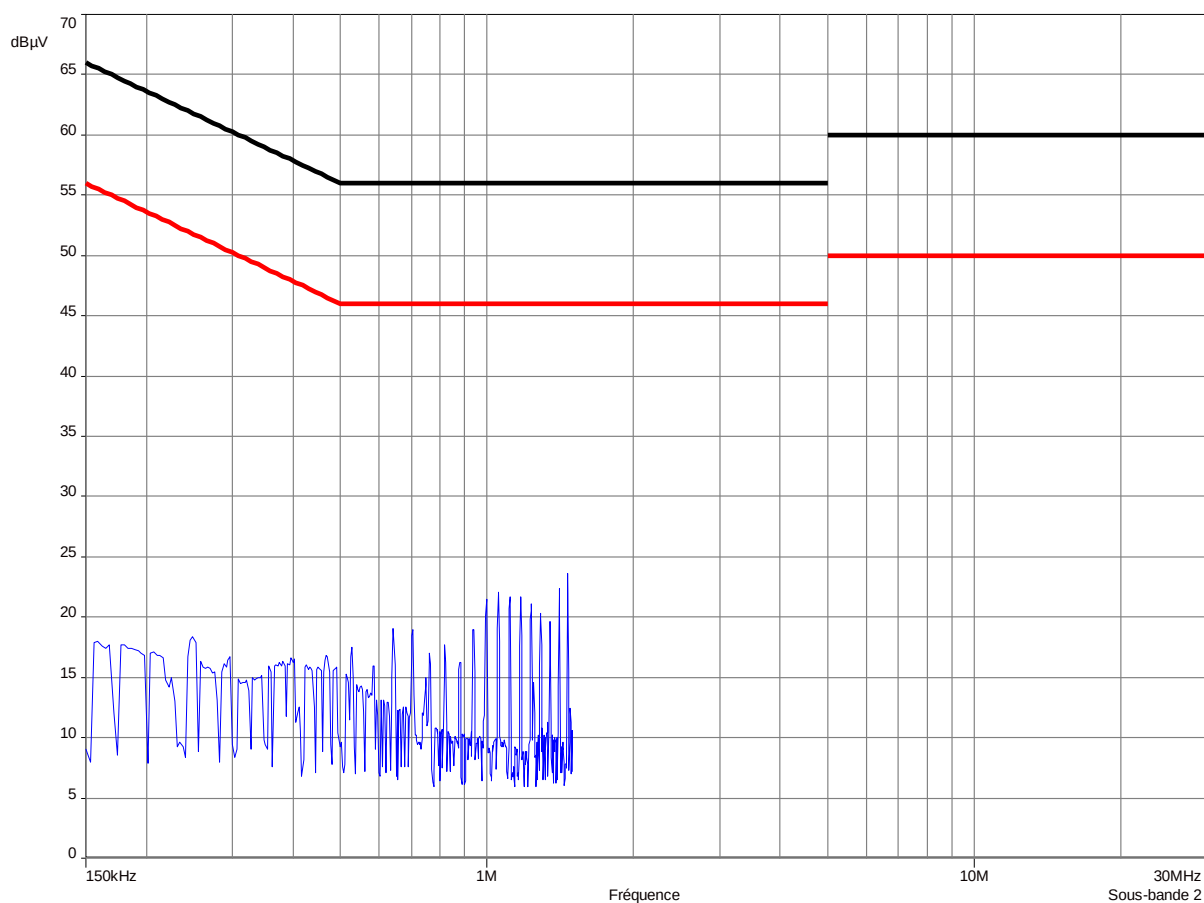


RBW filter: 9 kHz

Sweep time: 500 ms/MHz

CURVE N°: 4.

Measurement on the line with average detector



RBW filter: 9 kHz

Sweep time: 500 ms/MHz