

RA-24-07101386-4/A Ed. 0

**FCC CERTIFICATION
RADIO Measurement
Technical Report**

**standard to apply:
FCC Part 15.249**

**Equipment under test:
Electronic Voting System HM CAMPUS
Base**

**FCC ID:
V64R-HM-C-2400MHZ**

**Company:
NAVARIN S.A.**

FOR THE ATTENTION OF: Mr GACEUS

Company: SOREC

TRANSMIT TO: Mr GUETTA

Company: NAVARIN S.A.

Number of pages: 13 including 1 annex

Ed.	Date	Modified pages	Written by		Technical Verification Quality Approval	
			Name	Visa	Name	Visa
0	9-Apr-08	Creation	L. BERTHAUD	LB		

Duplication of this document is only permitted for an integral photographic facsimile. It includes the number of pages referenced here above.
This document is the result of testing a specimen or a sample of the product submitted. It does not imply an assessment of the conformity of the whole manufactured products of the tested sample.



PRODUCT: Electronic Voting System

Reference / model: HM CAMPUS Base

Serial number: not communicated

MANUFACTURER: SOREC

COMPANY SUBMITTING THE PRODUCT:

Company: NAVARIN S.A.

Address: 36 bis rue Gay Lussac
94431 Chennevières Sur Marne
FRANCE

Responsible: Mr GUETTA

TECHNICAL SUPPORT:

Company: SOREC

Address: Z.A. le pâtureau de la grange
41200 Pruniers En Sologne
FRANCE

Responsible: Mr GACEUS

DATE(S) OF TEST: 10 and 11 March 2008

TESTING LOCATION: EMITECH ATLANTIQUE laboratory at ANGERS (49) FRANCE
EMITECH ATLANTIQUE open area test site in LA POUEZE (49)
FRANCE

Registration Number by FCC: 101696/FRN: 0006 6490 08

TESTED BY: L. BERTHAUD

CONTENTS

TITLE	PAGE
1. INTRODUCTION.....	4
2. PRODUCT DESCRIPTION	4
3. NORMATIVE REFERENCE.....	4
4. TEST METHODOLOGY	5
5. ADD ATTACHMENTS FILES	5
6. TESTS AND CONCLUSIONS	6
7. FIELD STRENGTH OF FUNDAMENTAL	7
8. RADIATED EMISSION OF TRANSMITTER.....	9
ANNEX: PHOTOS OF THE EQUIPMENT UNDER TEST	11

1. INTRODUCTION

This document presents the result of RADIO test carried out on the following equipment: Electronic Voting System HM CAMPUS - Base in accordance with normative reference.

2. PRODUCT DESCRIPTION

Class: B (residential environment)

Utilization: Base for Electronic Voting System

Antenna type: dedicated antenna

Operating frequency range: from 2401 MHz to 2482 MHz

Number of channels: 82

Channel spacing: 1 MHz

Frequency generation: ☐ SAW Resonator ☐ Crystal ☒ Synthetiser

Modulation: ☐ Amplitude ☐ Digital ☒ Frequency ☐ Phase

Power source: USB port (5 Vd.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. NORMATIVE REFERENCE

The standards and testing methods related throughout this report are those listed below. They are applied on the whole test report even though the extensions (version, date and amendment) are not repeated.

FCC Part 15 (2007) 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.

4. 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 203: antenna requirement
- Paragraph 205: restricted bands of operation
- Paragraph 209: radiated emission limits; general requirements
- Paragraph 249: operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz and 24.0-24.25 GHz

5. 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 “***

6. TESTS AND CONCLUSIONS

Test procedure	Description of test	Criteria respected ?				Comment
		Yes	No	NAP	NAs	
FCC Part 15.203	ANTENNA REQUIREMENT	X				<i>Note 1</i>
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				<i>Note 2</i>
FCC Part 15.249	OPERATION WITHIN THE BANDS 902-928 MHZ, 2400-2483.5 MHZ, 5725-5875 MHZ AND 24.0-24.25 GHZ					
	(a) field strength fundamental and harmonics	X				
	(b) fixed point-to-point operation			X		
	(c) field strength distance	X				
	(d) radiated emissions outside specified frequency bands	X				
	(e) peak measurements	X				
	(f) requirement note of section 15.37 (d)			X		

NAP: Not Applicable

NAs: Not Asked

Note 1: dedicated antenna (see photos in annex).

Note 2: see FCC part 15.249 (d).

Conclusion:

The sample of Electronic Voting System HM CAMPUS - Base 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.

7. FIELD STRENGTH OF FUNDAMENTAL**Standard:** FCC Part 15**Test procedure:** paragraph 15.249**Test equipment:**

TYPE	BRAND	EMITECH NUMBER
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Antenna RGA-60	Electrometrics	1204
Antenna RGA-60	Electrometrics	1938
Open site	EMITECH	1274
Radiofrequency generator SME06	Rohde & Schwarz	1669
Power meter 8541B	Gigatronics	3479
Power sensor 80401A	Gigatronics	3182

Test set up:

The system is tested in an open area test site (OATS) and placed on a rotating table, 0.8 m from a ground plane. Zero degree azimuth corresponds to the front of the equipment under test. The equipment under test is directly supplied by the USB port of a computer.

Detection mode: Peak

Resolution bandwidth: 1 MHz

Video bandwidth: 3 MHz

Distance of antenna: 3 meters**Antenna height:** 1 to 4 meters**Antenna polarization:** vertical and horizontal**Equipment under test operating condition:**

The equipment is blocked in continuous transmission mode, modulated by internal data signal.

Results:

Ambient temperature (°C): 18
Relative humidity (%): 65

Power supply: 5 Vd.c. (USB port)

Sample n° 1 Channel 1 (2401 MHz)

Level (dBμV)	Cable loss (dB)	Antenna factor (dB)	Electro-magnetic field (dBμV/m)	P* (W)	Limit (dBμV/m)
58.57	4.62	28.90	92.09	0.294×10^{-3}	93.98

Polarization of test antenna: vertical (height: 172 cm)
Position of equipment: use position (azimuth: 0 degree)

Sample n° 1 Channel 41 (2441 MHz)

Level (dBμV)	Cable loss (dB)	Antenna factor (dB)	Electro-magnetic field (dBμV/m)	P* (W)	Limit (dBμV/m)
59.92	4.65	29.02	93.59	0.416×10^{-3}	93.98

Polarization of test antenna: vertical (height: 152 cm)
Position of equipment: use position (azimuth: 0 degree)

Sample n° 1 Channel 82 (2482 MHz)

Level (dBμV)	Cable loss (dB)	Antenna factor (dB)	Electro-magnetic field (dBμV/m)	P* (W)	Limit (dBμV/m)
59.83	4.69	29.14	93.66	0.422×10^{-3}	93.98

Polarization of test antenna: vertical (height: 179 cm)
Position of equipment: use position (azimuth: 0 degree)

* $P = (E \times d)^2 / (30 \times G_p)$ with $d = 3$ m and $G_p = 1.65$ (2.17 dBi)

Test conclusion:

RESPECTED STANDARD

8. RADIATED EMISSION OF TRANSMITTER

Standard: FCC Part 15

Test procedure: paragraph 15.205
paragraph 15.209
paragraph 15.249

Test equipment:

TYPE	BRAND	EMITECH NUMBER
Test receiver ESH3	Rohde & Schwarz	1058
Test receiver ESVS 10	Rohde & Schwarz	1219
Spectrum analyzer FSP 40	Rohde & Schwarz	4088
Loop antenna	EMCO	1406
Biconical antenna HP 11966C	Hewlett Packard	728
Log periodic antenna HL 223	Rohde & Schwarz	1999
Open site	Emitech	1274
Antenna RGA-60	Electrometrics	1204

Test set up:

The system is tested in an open area test site (OATS) and placed on a rotating table, 0.8 m from a ground plane. Zero degree azimuth corresponds to the front of the equipment under test. The equipment under test is directly supplied by the USB port of a computer.

Frequency range: from 9 kHz to harmonic 10 ($F_{\text{carrier}} \leq 10 \text{ GHz}$)

Bandwidth: 120 kHz ($F < 1 \text{ GHz}$) or 100 kHz, following 15.205 or 15.249
1 MHz ($F > 1 \text{ GHz}$) or 100 kHz, following 15.205 or 15.249

Distance of antenna: between 30 m and 3 m according the frequencies and the limits.

Antenna height: 1 to 4 meters

Antenna polarization: vertical and horizontal, only the highest level is recorded.

Equipment under test operating condition:

The equipment is blocked in continuous transmission mode, modulated by internal data signal.

Results:

Ambient temperature (°C): 19.5
Relative humidity (%): 64

Power source: 5 Vd.c. (USB port)

The polarity column refers to the antenna polarity at which the maximum emissions level is measured.

Channel 1 (2401 MHz)

FREQUENCIES (MHz)	Detector	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
4802	Avg	145	143	1000	H	35.66	53.98	18.32
4802	Peak	145	143	1000	H	61.24	73.98	12.74

Channel 41 (2441 MHz)

FREQUENCIES (MHz)	Detector	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
4882.08	Avg	145	143	1000	H	35.62	53.98	18.36
4882.08	Peak	145	143	1000	H	57.8	73.98	16.18

Channel 82 (2482 MHz)

FREQUENCIES (MHz)	Detector	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
4964	Avg	137	166	1000	H	< 35	53.98	> 19
4964	Peak	137	166	1000	H	55.48	73.98	18.5

Any spurious which has more than 20 dB of margin compared to the limit is not necessarily reported.

Test conclusion:

RESPECTED STANDARD

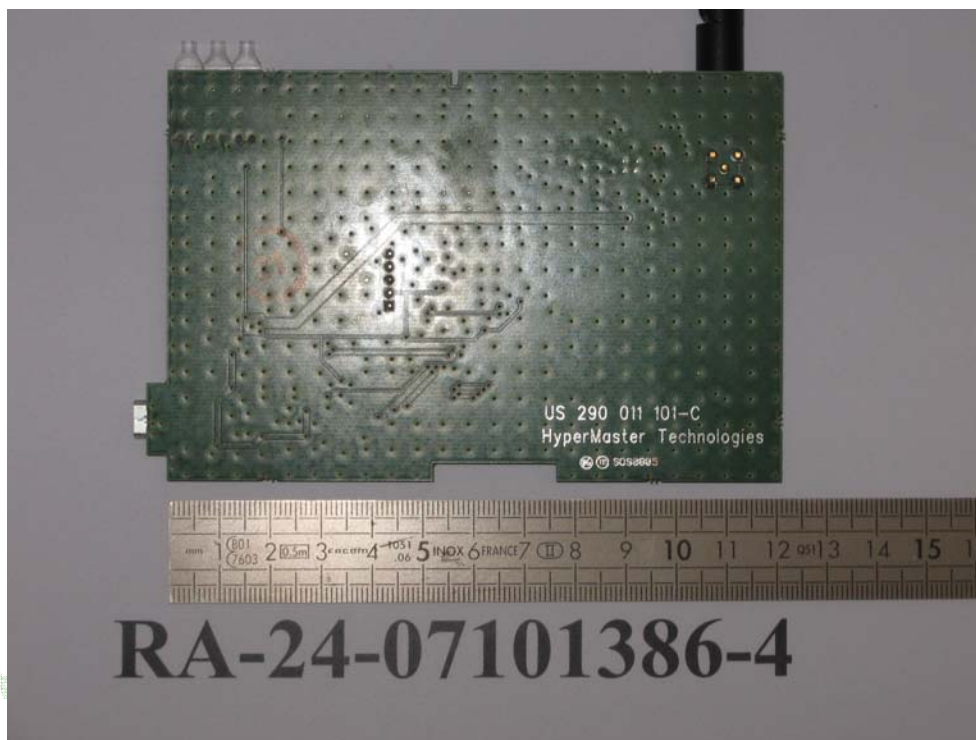
□□□ End of report, 1 annex to be forwarded □□□

ANNEX: PHOTOS OF THE EQUIPMENT UNDER TEST

GENERAL VIEW



Printed circuit board: face 1



Printed circuit board: face 2



Antenna



Test set up radiated measurement

