EMITECH GROUPE

R041-14-104959-2A - DM / CBU

⇨ This test report cancels and replaces the report R041-14-104959-2A Ed.1

RADIO TEST REPORT

According to the standard(s):

FCC part 15 Subpart C

Equipment under test:

SA-TX1
(RADIO MODULE: SA-TX)
FCC ID: 2AE4JSATX

Company:

PST

Diffusion: Mr AGUIERE (Company: PST)

Number of pages: 22 including 1 annex

Ed.	Date	Modified page(s)	Written by Name / Visa	Technical verification Quality approval Name / Visa
2	04 Nov. 15	Refer to lines in the margin	David MONTAULON 	Olivier HEYER 

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NAME OF THE EQUIPMENT UNDER TEST (E.U.T.)	:	SA-TX1
Serial number	:	None
Part number	:	FCC ID: 2AE4JSATX
Software Version	:	None
MANUFACTURER'S NAME	:	PST

APPLICANT'S ADDRESS:

Company	:	PST
Address	:	ZAC de la Plaine - 1 rue Brindejonc des Moulinais - 31500 TOULOUSE FRANCE
Person(s) present during the tests	:	Mr AGUIERE
Responsible	:	Mr AGUIERE
DATE(S) OF TESTS	:	From December 5th of 2014 and February 23th to 24th of 2014
TESTS LOCATION(S)	:	EMITECH MONTPELLIER laboratory in VENDARGUES (34) - FRANCE Open area test site in SALINELLES (30) - FRANCE FCC Test Firm Registration Number: 954701
TESTS SUPERVISOR(S)	:	None
TESTS OPERATOR(S)	:	David MONTAULON

CONTENTS

1. INTRODUCTION

This document submits the results of Electromagnetic Compatibility tests performed on the equipment SA-TX1 (denominated hereafter E.U.T.: equipment under test) according to document(s) listed below.

2. REFERENCE DOCUMENT(S)

FCC Part 15	Code of Federal Regulations Title 47 – Telecommunications Chapter 1 – Federal Communications Commission Part 15 – Radio frequency devices Subpart C – Intentional Radiators
ANSI C 63.4:2009	American National Standard for Methods of measurement of Radio-Noise from low-voltage. Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

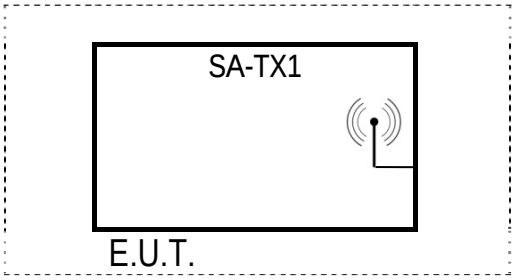
3. EQUIPMENT UNDER TEST CONFIGURATION

Equipment under test (E.U.T.) description:

Applicant: PST
Model: SA-TX
FCC ID: 2AE4JSATX

4. EQUIPMENT UNDER TEST CONFIGURATION SCHEME

Presentation of equipment for testing purposes:



Integral antennas

Powered by internal batteries

Frequency ranges used by the transmitter: 447.656kHz – 452.344kHz

Equipment
- ☐ single-frequency
- ☐ two-frequency
- ☒ multi-frequency

Total channel available / Channel separation: 51
Type of Modulation: CW
Duty cycle: Not communicated

Frequency ranges used by the receiver: 447.656kHz – 452.344kHz

Choice of model for testing:

Test(s) frequency(ies): 447.656kHz(CH0), 449.9kHz(CH24) & 452.344kHz(CH50)

Cycle and operating mode during emission tests: Permanent emission mode.

Equipment modifications applied during tests: No

5. SUMMARY OF TEST RESULTS

Tests designation	Results satisfying?	Comments
Antenna requirement - FCC part 15.203	YES	Integrated antennas
Restricted band of operation - FCC part 15.205	YES	
Conducted power lines - FCC part 15.207	N.A.	Powered by internal batteries
Unwanted radiated emissions - FCC part 15.209	YES	

N.P.: Not Performed. N.A.: Not Applicable.

- In emission:

Sample subject to the test complies with prescriptions of the standard(s) FCC Part 15 Subpart C according to limits specified in this test report.

6. UNWANTED RADIATED EMISSIONS – SECTION 15.209

Standards: FCC part 15 Radio part 15.209

Test method: ANSI C63.4:2009

a) *Pre-measurement in semi anechoic chamber*:

Frequency band	Tested side	Resolution bandwidth	Video bandwidth	Detection mode	E.U.T. height
9kHz-150kHz	Front side	200Hz	1kHz	Peak	80cm
150kHz-30MHz	Front side	10kHz	30kHz	Peak	80cm
30MHz-1GHz	Front side	100kHz	300kHz	Peak	80cm

Measurements below 30MHz are done with a loop antenna as describe in the standard.
Measurements are done in semi anechoic chamber at 3m. E.U.T. is set on a wooden table.
E.U.T. measurements are maximized at 360° in max-hold peak detection. The device was tested in three orthogonal planes.

Limits:

From 9 kHz to 30MHz: Limit indicated on the curves is calculated with 40 dB/decade extrapolation factor and 51.5 dB conversion factor.

From 30MHz to 1GHz: quasi peak limit provided is the limit given in 15.209

Test method deviation:

From 9 kHz to 30MHz: measurements are made in peak detection instead of average mode in frequency band 9 kHz-500 kHz

- Measurements are given in dBµA/m instead of µV/m
- Measuring distance is 3 meters instead of 30 and 300 meters

Radiated emissions limits in this frequency band are specified at 30 or 300 meters. Pre measurement distance used during the test, subject of this report, is 3 meters. Then published limits come from a theoretical conversion using an extrapolation factor of 40dB / decade.

Measuring distance: 3 meters

Test equipment list:

CATEGORY	BRAND	TYPE	N° EMITECH	DATE CAL.	DATE VAL
Antenna	Rohde & Schwarz	HFH2-Z2	5825	22/10/2012	22/12/2014
Antenna	Electro-Metrics	BIA-30HF	1107	03/03/2011	03/05/2015
Antenna	Rohde & Schwarz	HL223	1137	03/03/2011	03/05/2015
Cable	C&C	N-3m	10557	27/09/2013	27/11/2015
Cable	C&C	N-5m	10561	27/09/2013	27/11/2015
Receiver	Agilent	E4440A	5824	01/05/2014	01/07/2016
Software	Nexio	BAT EMC	0000	#	#
Shielded enclosure	RAY PROOF	C.GS3	1123	#	#
Thermohygrometer	Bioblock Scientific	Météostar	0963	31/10/2014	31/12/2016

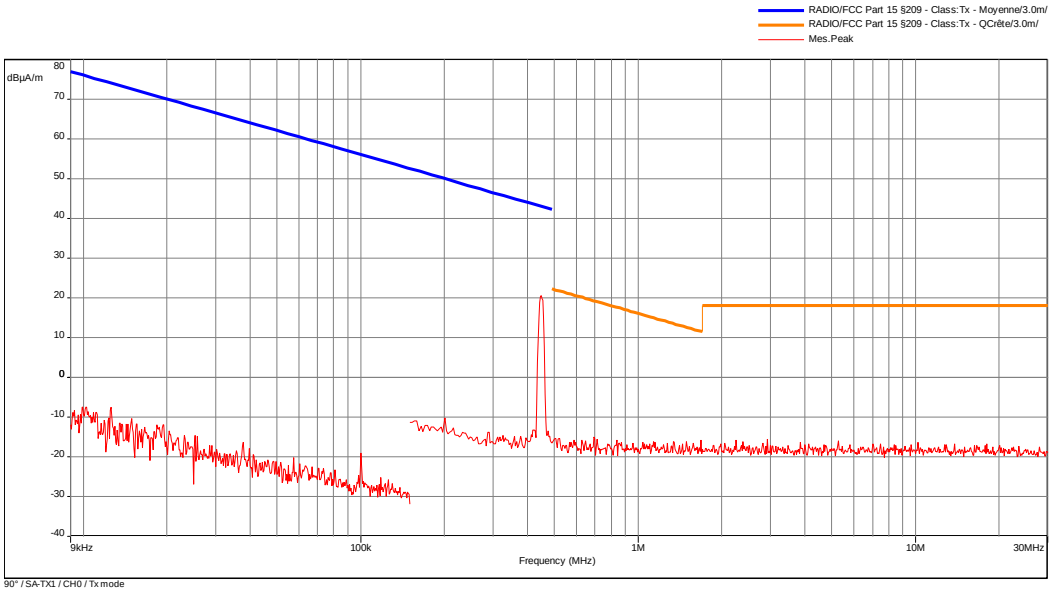
#: Permanent validity

BAT-EMC software version: V3.6.0.32

Results: See Graphs hereafter.

Radiated field strength — EMI2437

90° / SA-TX1 / CH0 / Tx mode



90° / SA-TX1 / CH0 / Tx mode

Date: 05/12/2014 16:17:14

Technician: DM

Detection:
Peak

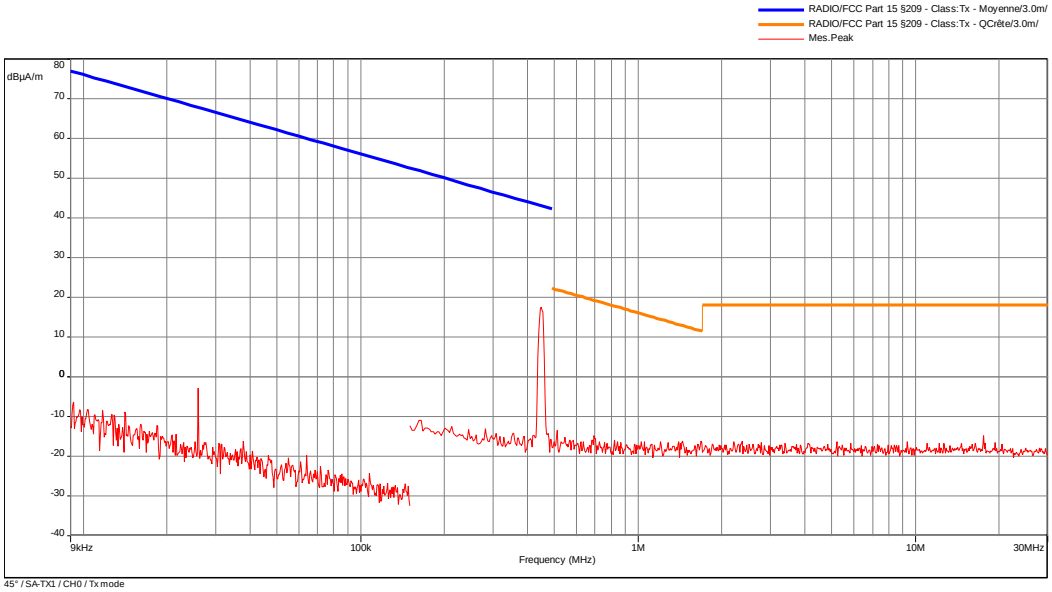
T (°C): 22
H (%): 39
P (hpa): 1008

Comments:

Modification(s) during test:
None

Radiated field strength — EMI2438

45° / SA-TX1 / CH0 / Tx mode



45° / SA-TX1 / CH0 / Tx mode

Date: 05/12/2014 16:19:41

Technician: DM

Detection:
Peak

T (°C): 22
H (%): 39
P (hpa): 1008

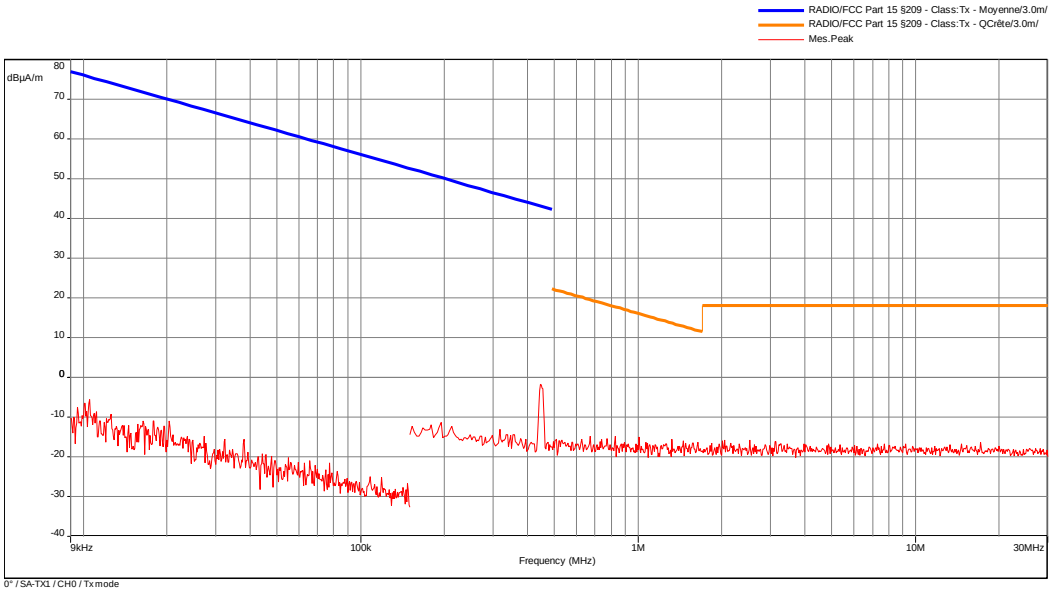
Comments:

Modification(s) during test:
None

Limit indicated on these plots are calculated with 40 dB/decade extrapolation factor and 51.5dB conversion factor.

Radiated field strength — EMI2439

0° / SA-TX1 / CH0 / Tx mode



Date: 05/12/2014 16:24:41

Technician: DM

Detection:
Peak

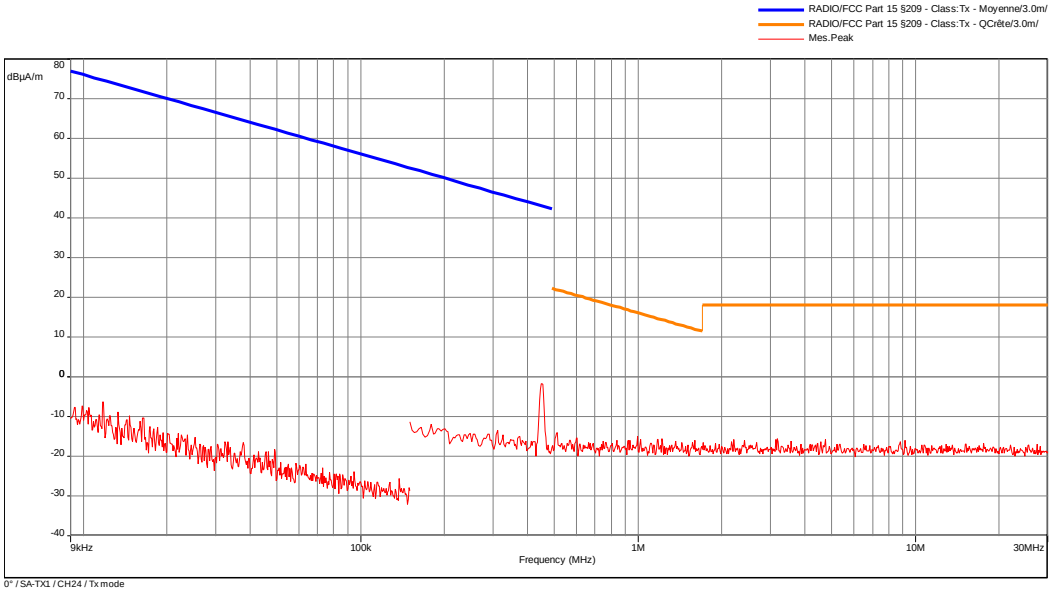
T (°C): 22
H (%): 39
P (hpa): 1008

Comments:

Modification(s) during test:
None

Radiated field strength — EMI2440

0° / SA-TX1 / CH24 / Tx mode



Date: 05/12/2014 16:27:02

Technician: DM

Detection:
Peak

T (°C): 22
H (%): 39
P (hpa): 1008

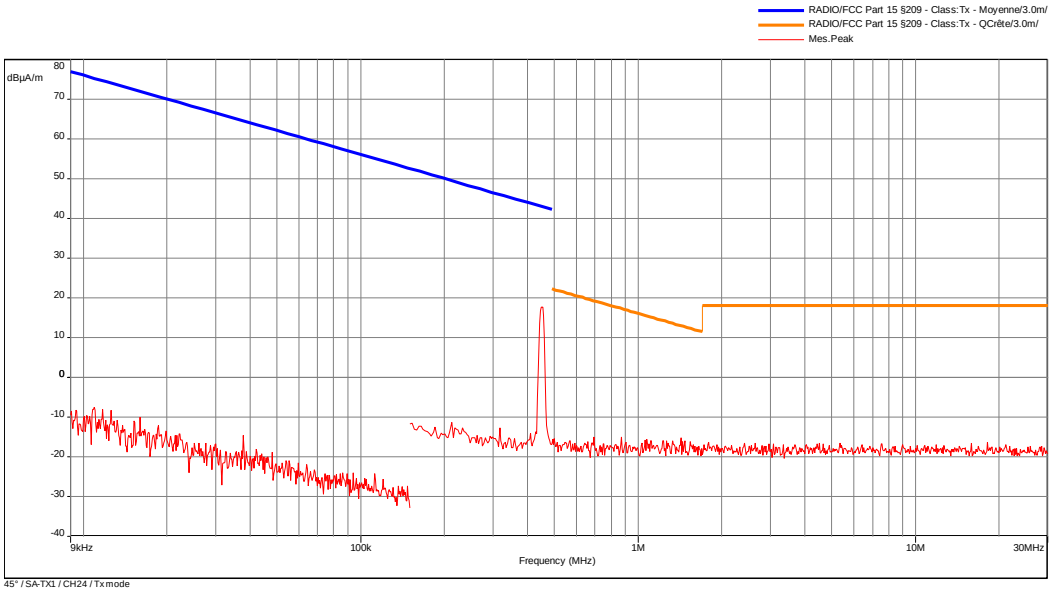
Comments:

Modification(s) during test:
None

Limit indicated on these plots are calculated with 40 dB/decade extrapolation factor and 51.5dB conversion factor.

Radiated field strength — EMI2441

45° / SA-TX1 / CH24 / Tx mode



Date: 05/12/2014 16:29:29

Technician: DM

Detection:
Peak

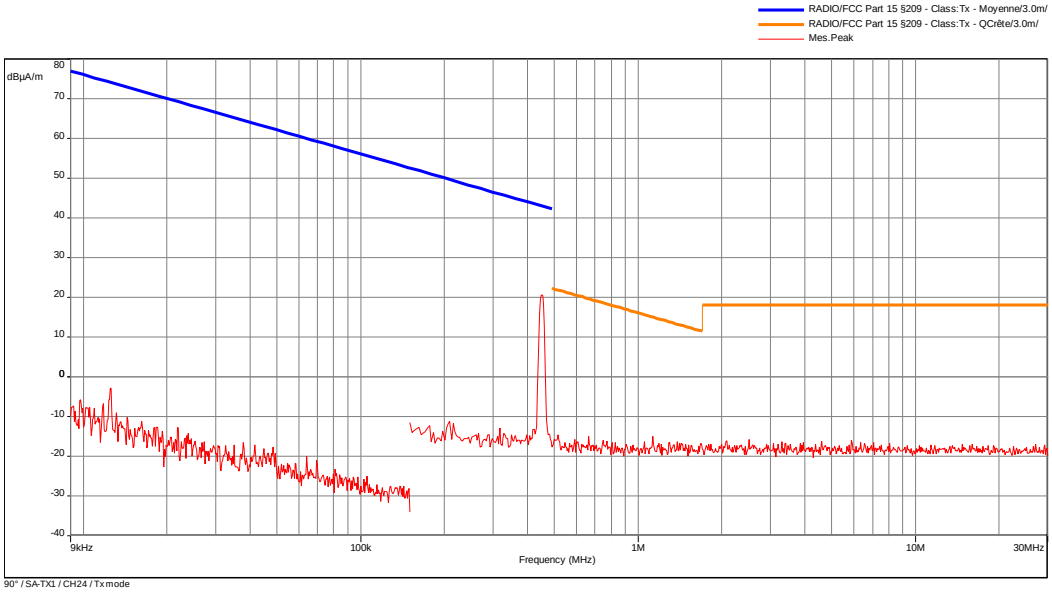
T (°C): 22
H (%): 39
P (hpa): 1008

Comments:

Modification(s) during test:
None

Radiated field strength — EMI2442

90° / SA-TX1 / CH24 / Tx mode



Date: 05/12/2014 16:31:46

Technician: DM

Detection:
Peak

T (°C): 22
H (%): 39
P (hpa): 1008

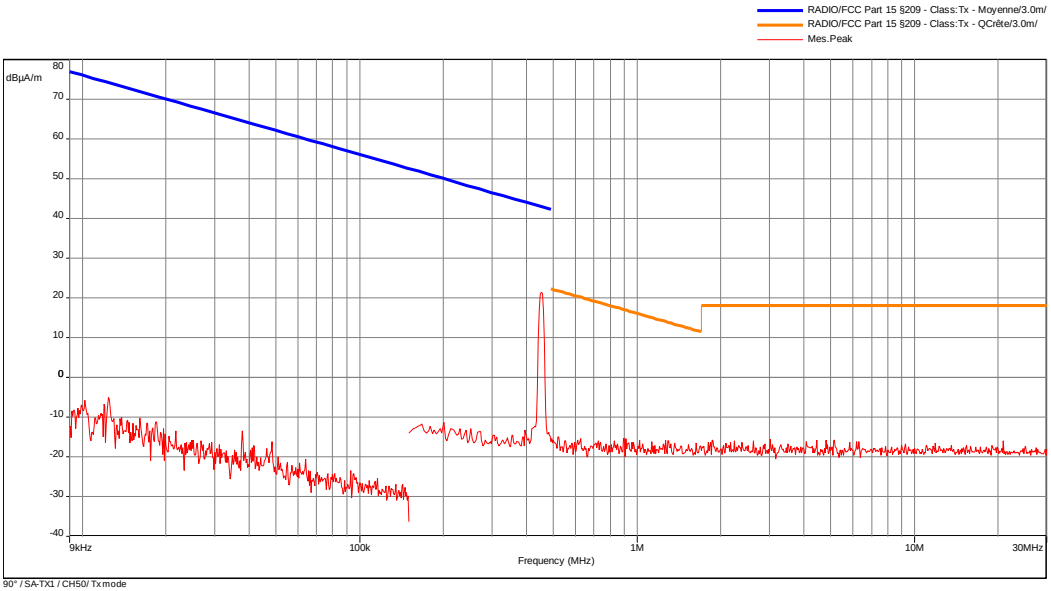
Comments:

Modification(s) during test:
None

Limit indicated on these plots are calculated with 40 dB/decade extrapolation factor and 51.5dB conversion factor.

Radiated field strength — EMI2443

90° / SA-TX1 / CH50/ Tx mode



90° / SA-TX1 / CH50/ Tx mode

Date: 05/12/2014 16:33:57

Technician: DM

Detection:
Peak

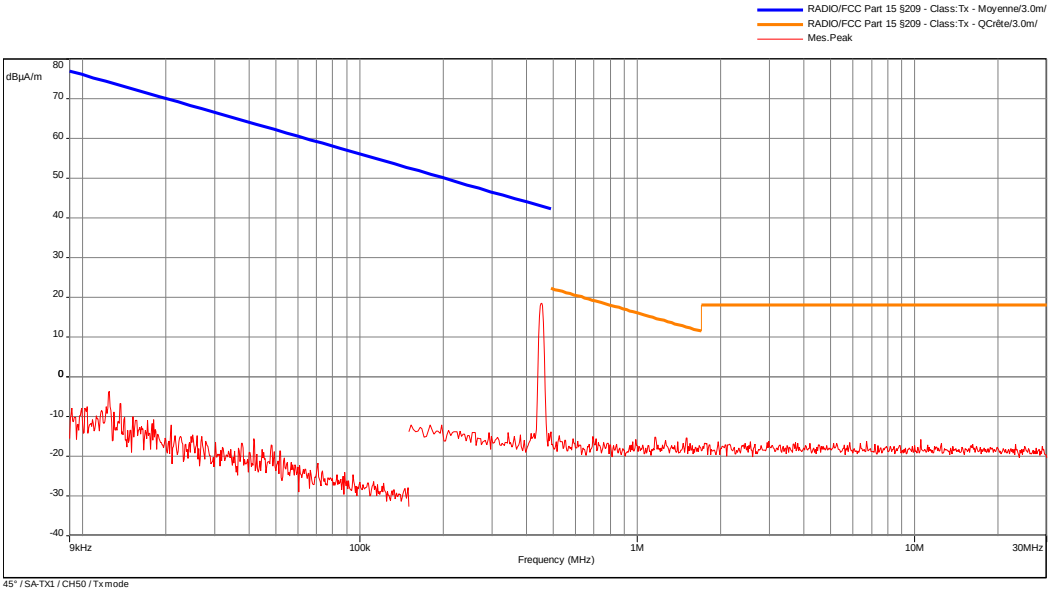
T (°C): 22
H (%): 39
P (hpa): 1008

Comments:

Modification(s) during test:
None

Radiated field strength — EMI2444

45° / SA-TX1 / CH50 / Tx mode



45° / SA-TX1 / CH50 / Tx mode

Date: 05/12/2014 16:36:15

Technician: DM

Detection:
Peak

T (°C): 22
H (%): 39
P (hpa): 1008

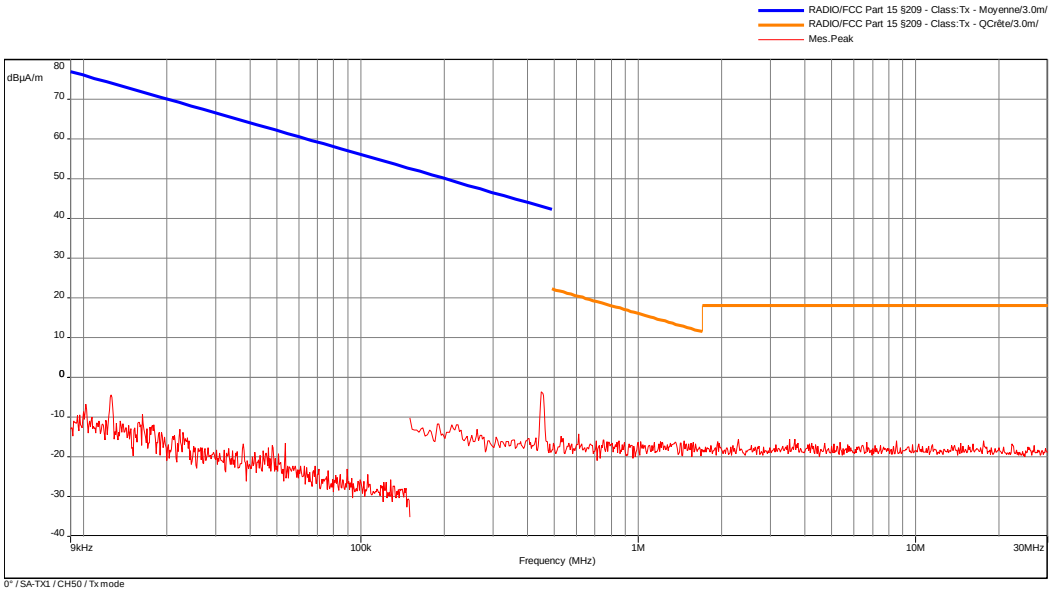
Comments:

Modification(s) during test:
None

Limit indicated on these plots are calculated with 40 dB/decade extrapolation factor and 51.5dB conversion factor.

Radiated field strength	EMI2445

0° / SA-TX1 / CH50 / Tx mode



Date: 05/12/2014 16:38:58

Technician: DM

Detection:
Peak

T (°C): 22
H (%): 39
P (hpa): 1008

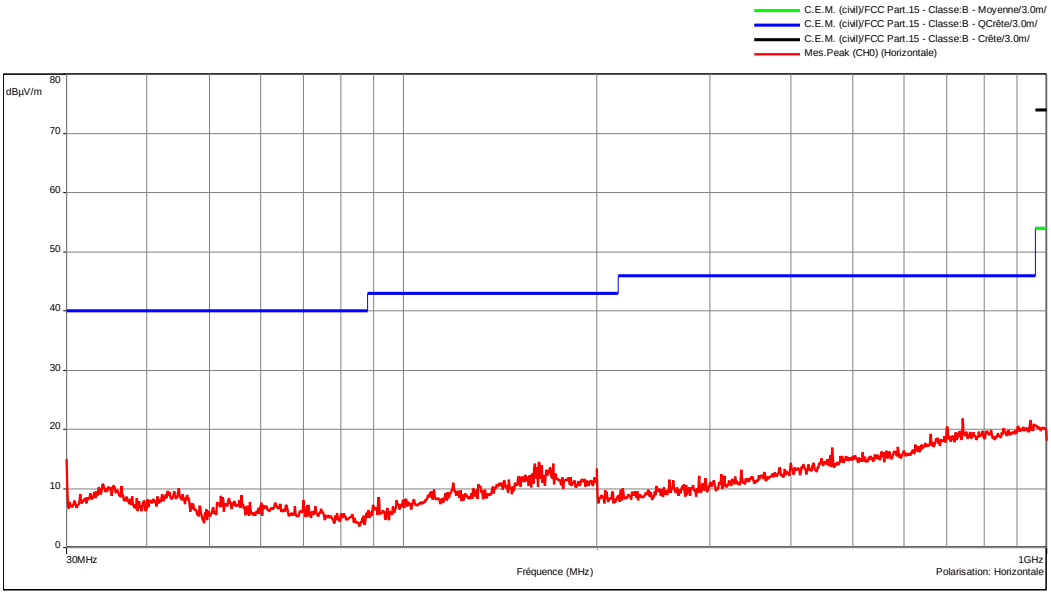
Comments:

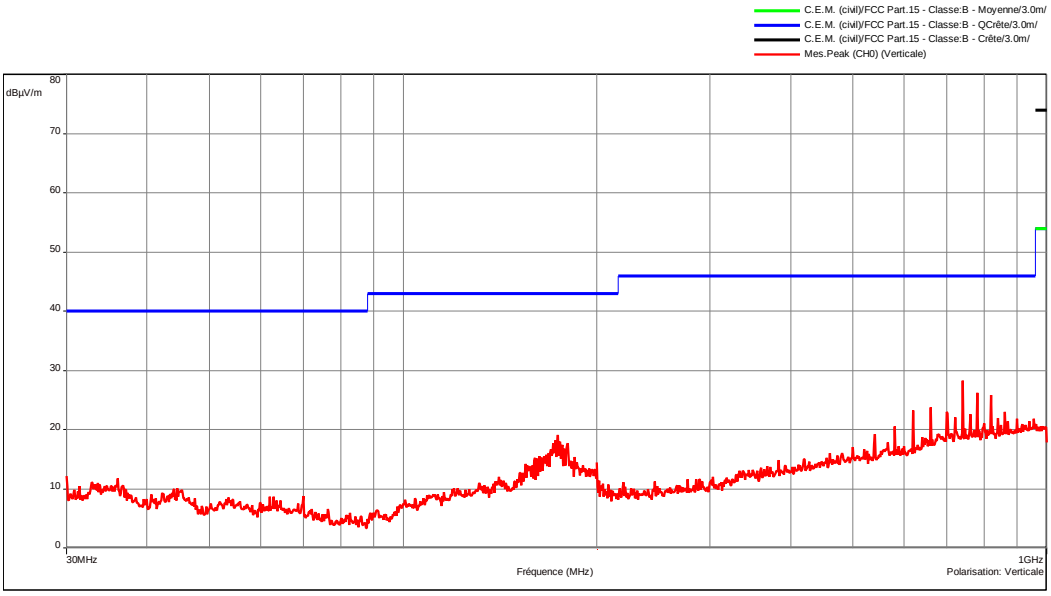
Modification(s) during test:
None

Limit indicated on these plots are calculated with 40 dB/decade extrapolation factor and 51.5dB conversion factor.

Radiated electric emission (measurement) | EMI1544

SA-TX1 / CH0





Date: 05/12/2014 16:44:32

Technician: DM

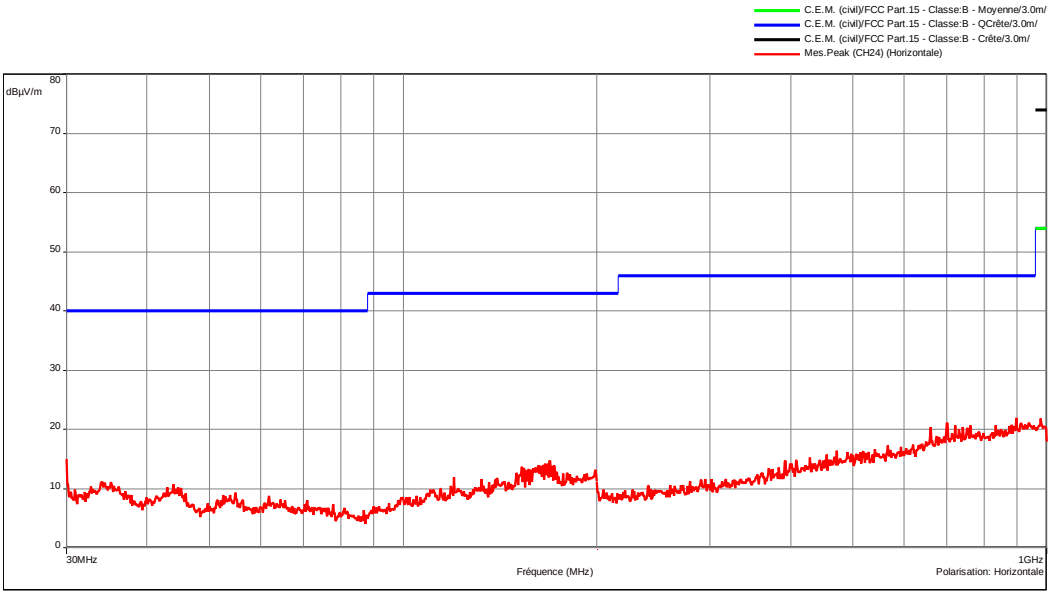
Class: B of the standard

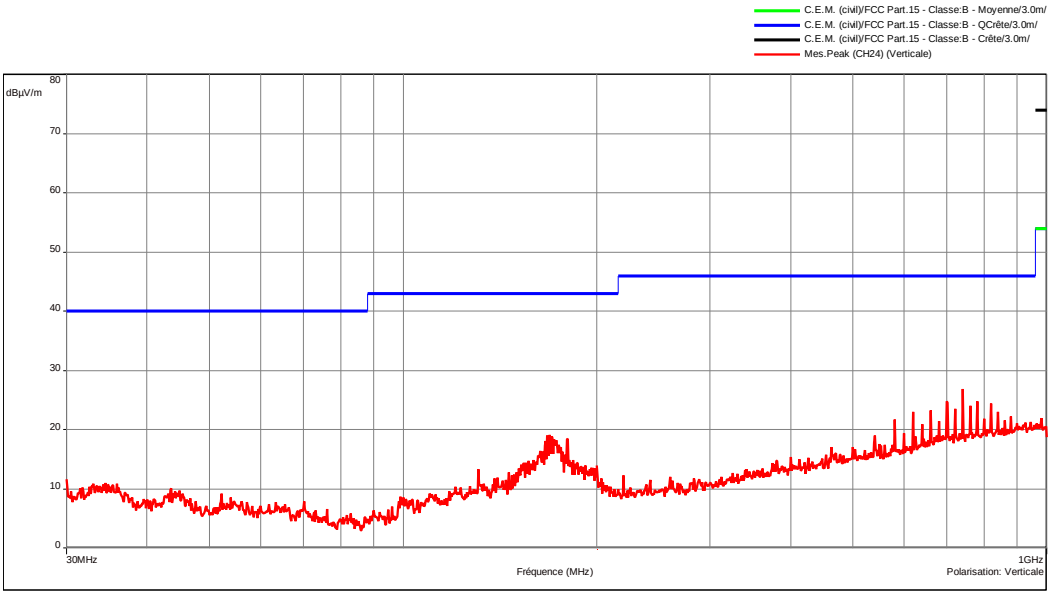
Detection:
Peak

Modification(s) during test:
No

Radiated electric emission (measurement) — EMI1545

SA-TX1 / CH24





Date: 05/12/2014 16:58:35

Technician: DM

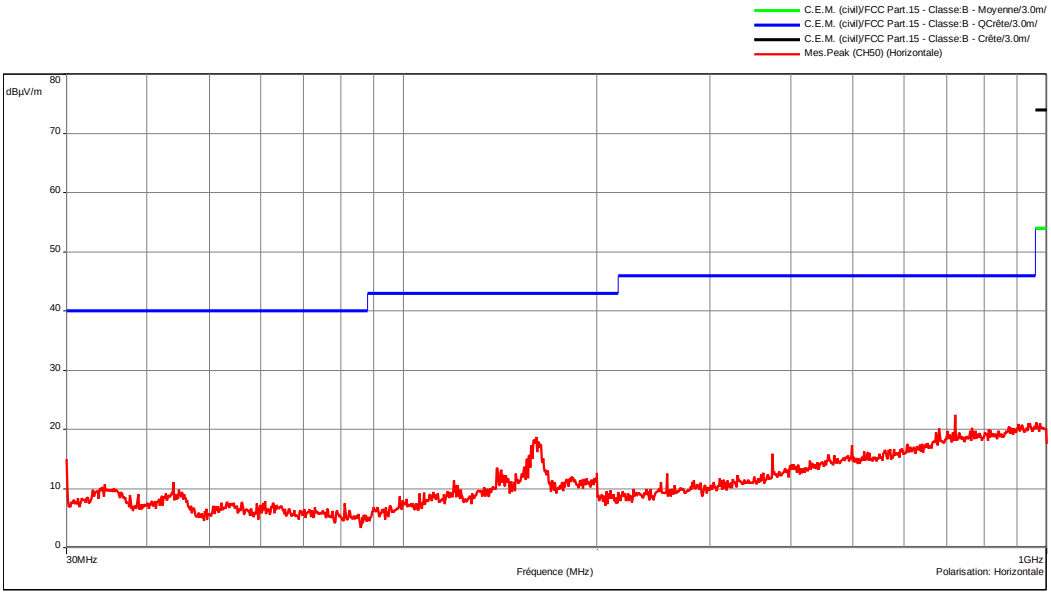
Class: B of the standard

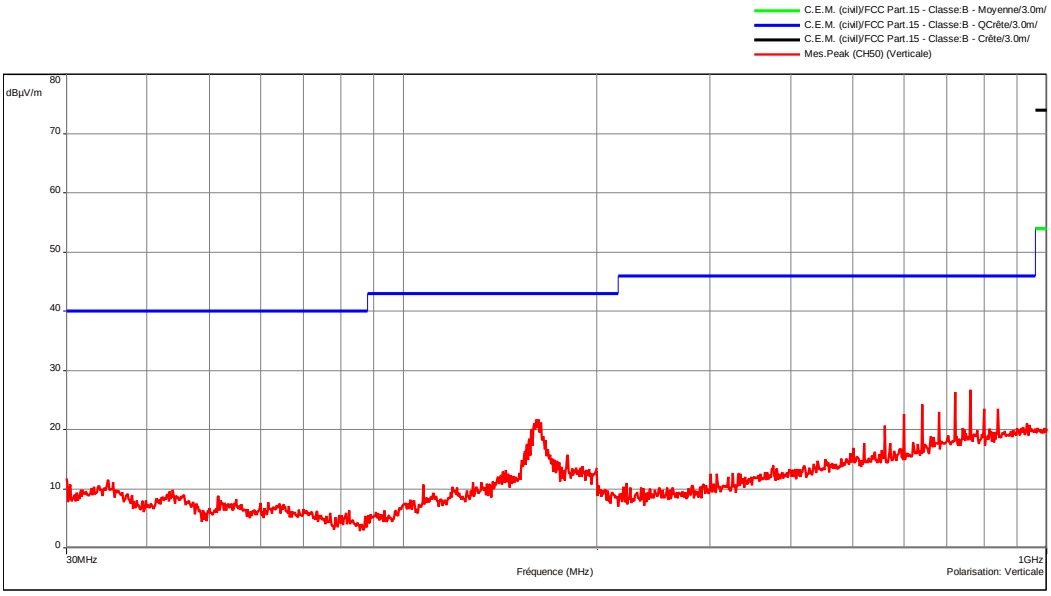
Detection:
Peak

Modification(s) during test:
No

Radiated electric emission (measurement) | EMI1546

SA-TX1 / CH50





Date: 05/12/2014 17:11:29

Technician: DM

Class: B of the standard

Detection:
Peak

Modification(s) during test:
No

b) Measurement at 3 meters on open area test site:

Temperature (°C): 17 *Humidity (%HR):* 32 *Pressure (hPa):* 1003

Test configuration: For each measured frequencies, E.U.T. is set via a turntable in order to find the highest level. Test antenna is set between 1m and 4m in order to find the highest level in vertical and horizontal polarization. Only highest levels are recorded. The device was tested in three orthogonal planes.

Frequency band	Initial position (0°)	Resolution bandwidth	Measuring distance	Detection mode	E.U.T. height
9kHz-150kHz	Front side	200Hz	10m	Quasi-peak	80cm
150kHz-30MHz	Front side	10kHz	10m	Quasi-peak	80cm
30MHz-1GHz	Front side	120kHz	3m	Quasi-peak	80cm

Test method deviation: Between 9 kHz to 30MHz: measurements are given in dBµA/m instead of dBµV/m (conversion factor: 51.5dB) and measuring distance is 10 meters instead of 300m.

Test equipment list:

CATEGORY	BRAND	TYPE	N° EMITECH	CAL DATE	DUE DATE
Antenna	Rohde & Schwarz	HL223	3126	03/03/2011	03/05/2015
Antenna	Rohde & Schwarz	HFH2-Z2	5825	22/10/2012	22/12/2014
Antenna	Electro-Metrics	BIA-30HF	1107	03/03/2011	03/05/2015
Antenna mast	INNCO	MA4000-EP-O	10261	#	#
Cable	Huber Sumner	N-14m	8146	04/06/2013	04/08/2015
Cable	Huber Sumner	N-20m	8385	04/06/2013	04/08/2015
Mast controller	INNCO	CO3000	10260	#	#
Open area test site	EMITECH	Salinelles	3482	22/04/2014	22/06/2017
Receiver	Agilent	E4440A	5824	22/10/2013	22/12/2015
Turntable	Heinrich Deisel	D4420	4038	#	#
Turntable controller	Heinrich Deisel	HD100	4036	#	#

#: Permanent validity

Results: See Boards hereafter.

SA TX1 CH0

Frequency (MHz)	Polarization	Azimuth (degree)	Antenna Height (cm)	Measure (dBµA/m)	Limit (dBµA/m) (*)	Comments
0.447	Circular 0°	90	100	0.88	22.18	C
0.447	Circular 45°	315	100	-1.17	22.18	C
0.447	Circular 90°	0	100	-2.25	22.18	C

C=Compliant

Carrier measurement at 10m: 0.88 dBµA/m (≈ 52.38dBµV/m)

(*) Using an extrapolation factor of 40 dB/decade (as described in section 15.31 (f)), the level at 300m is about -6.70dBµV/m (0.462µV/m) for a limit at 5.37 µV/m.

SA TX1 CH24

Frequency (MHz)	Polarization	Azimuth (degree)	Antenna Height (cm)	Measure (dBµA/m)	Limit (dBµA/m) (*)	Comments
0.450	Circular 0°	90	100	0.39	22.12	C
0.450	Circular 45°	315	100	-1.52	22.12	C
0.450	Circular 90°	0	100	-1.86	22.12	C

C=Compliant

Carrier measurement at 10m: 0.39 dBµA/m (≈ 51.89dBµV/m)

(*) Using an extrapolation factor of 40 dB/decade (as described in section 15.31 (f)), the level at 300m is about -7.19dBµV/m (0.437µV/m) for a limit at 5.33 µV/m.

SA TX1 CH50

Frequency (MHz)	Polarization	Azimuth (degree)	Antenna Height (cm)	Measure (dBµA/m)	Limit (dBµA/m) (*)	Comments
0.452	Circular 0°	90	100	1.87	22.09	C
0.452	Circular 45°	315	100	-0.07	22.09	C
0.452	Circular 90°	0	100	-1.52	22.09	C

C=Compliant

Carrier measurement at 10m: 1.87 dBµA/m (≈ 53.37dBµV/m)

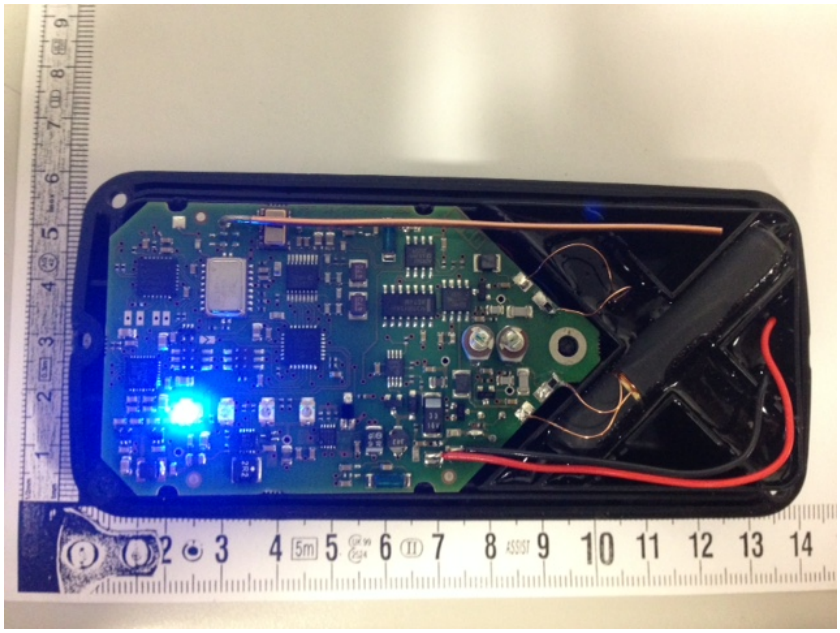
(*) Using an extrapolation factor of 40 dB/decade (as described in section 15.31 (f)), the level at 300m is about -5.71dBµV/m (0.518µV/m) for a limit at 5.31 µV/m.

All other unwanted radiated spurious are at least 20 dB below specified limits

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

ANNEX:
PHOTOGRAPH(S)

E.U.T. front side	
E.U.T. rear side	

E.U.T. marking plate	
E.U.T. internal view	

Radiated pre measurement (H field)	
Radiated measurement on open area test site