R041-16-103784-1A - FMO / CBU

RADIO TEST REPORT

According to standard(s):

FCC part 15 Subpart C
RSS-210 Issue 9, August 2016

Equipment under test:

Wireless Dial Thermostat – Model: A3800165

FCC ID: V9MSMATR1
IC: 7664A-SMATR1

Company:

WATTS ELECTRONICS FRANCE

Diffusion: Mr BAGNOL (Company: WATTS ELECTRONICS FRANCE)

Number of pages: 22 including 1 annex

Ed.	Date	Modified page(s)	Technical verification Quality approval Name / Visa
1	12 Dec. 16	Refer to lines in the margin	David MONTAULON

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NAME OF THE EQUIPMENT UNDER TEST (E.U.T.)	:	Wireless Dial Thermostat
Serial number	:	Not communicated
Part number	:	A3800165
Software Version	:	Not communicated
MANUFACTURER'S NAME	:	WATTS ELECTRONICS FRANCE

APPLICANT'S ADDRESS:

Company	:	WATTS ELECTRONICS FRANCE
Address	:	Z.A des Tourettes - BP 10 - 48300 ROSIERES FRANCE
Person(s) present during the tests	:	Mr BAGNOL
Responsible	:	Mr BAGNOL
DATE(S) OF TESTS	:	July, the 18th and 21th of 2016
TESTS LOCATION(S)	:	EMITECH MONTPELLIER laboratory in VENDARGUES (34) - FRANCE MRA US-EU Designation Number: FR0006 IC Assigned Code: 4379C
TESTS SUPERVISOR(S)	:	David MONTAULON
TESTS OPERATOR(S)	:	Fabien MOINACHE

CONTENTS

1. INTRODUCTION

This document submits the results of Electromagnetic Compatibility tests performed on the **Wireless Dial Thermostat – Model: A3800165** (denominated hereafter E.U.T.: equipment under test) according to document(s) listed below.

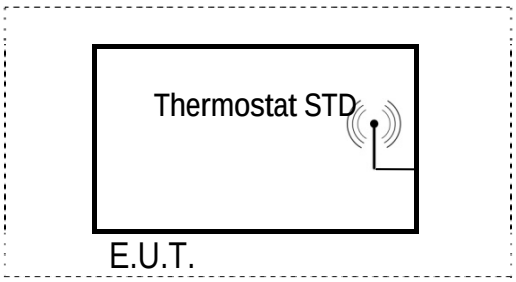
2. REFERENCE DOCUMENT(S)

Code of Federal Regulations	Title 47 – Telecommunications Chapter 1 – Federal Communications Commission Subchapter A -General Part 15 – Radio frequency devices Subpart C – Intentional Radiators
RSS-210	Issue 9, August 2016 Licence-exempt Radio Apparatus: Category I Equipment
RSS-Gen	Issue 4, November 2014 General Requirements for Compliance of Radio Apparatus
ANSI C63.10	2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

3. EQUIPMENT UNDER TEST CONFIGURATION

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

Wireless Dial single room temperature sensor



4. TECHNICAL SPECIFICATIONS

Presentation of equipment for testing purposes:

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

Tested frequency(ies): 912MHz

Operation within the band 902-928MHz for any application.

Equipment modifications applied during tests: No

5. SUMMARY OF TEST RESULTS

Tests designation	Results satisfying?	Comments
Antenna requirement - FCC part 15.203	YES	Integrated antenna (PCB)
Restricted band of operation - FCC part 15.205 / RSS-Gen §8.10	YES	
Conducted limits - FCC part 15.207 / RSS-Gen §8.8	N.A.	Battery operated device
Unwanted radiated emissions - FCC part 15.209 / RSS-Gen §8.9	YES	
Operation within the bands 902-928MHz - FCC part 15.249 / RSS-210 §B.10	YES	
Occupied bandwidth - RSS-Gen §6.6	YES	

N.A.: Not Applicable.

- Conclusion(s):

Sample submitted to test complies with prescriptions of standard(s) CFR 47 Part 15 – Subpart C and RSS-210 according to limits specified in this test report.

To declare, or not, the compliance with the specifications, it was not explicitly taken account of uncertainty associated with the results.

6. OPERATION WITHIN THE BAND 902-928 MHZ

Standard: CFR 47 Part 15 – Subpart C §15.249 / RSS-210 §B.10

Test method: ANSI C63.10

Test configuration:

Frequency band	Tested	Resolution bandwidth	Video bandwidth	Detection mode	E.U.T. height
900MHz-908MHz	Band Edge (A1 Group)	100kHz	300kHz	Max-hold Peak	0cm
922MHz-932MHz	Band Edge (A8 Group)	100kHz	300kHz	Max-hold Peak	0cm

Test is done in max-hold peak detection; transmitter output is directly connected to a spectrum analyzer throught attenuators. Measurements are performed on lower and upper channels groups.

The purpose of this test is to demonstrate in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

Test method deviation: No

Test equipment list:

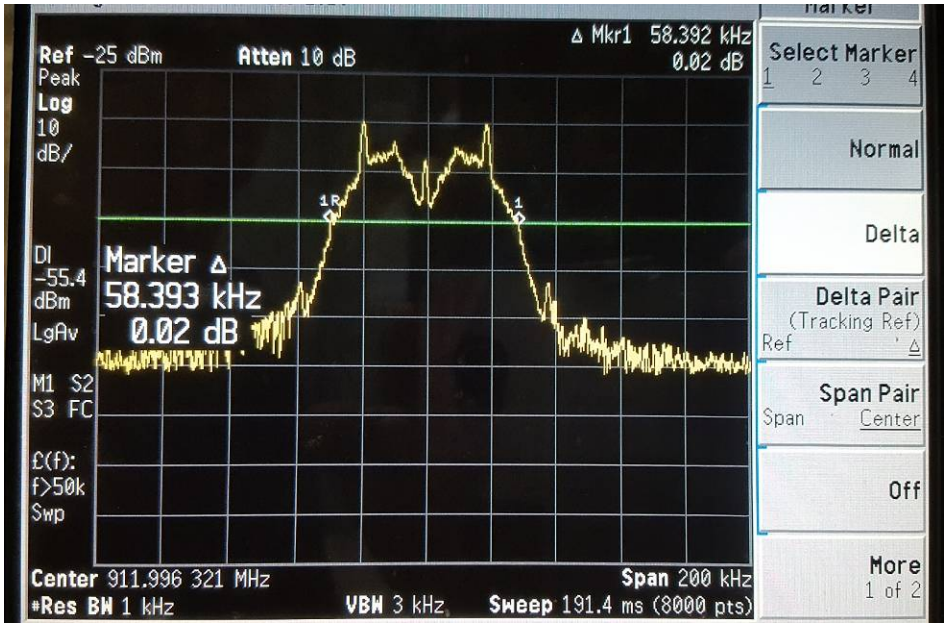
CATEGORY	BRAND	TYPE	N° EMITECH	DATE CAL.	DATE VAL.
Antenna	Rohde & Schwarz	HL223	1137	25/04/2015	36 months
Cable	C&C	N-3m	10558	24/11/2015	24 months
Cable	MICRO-COAX	N-5m	10529	24/11/2015	24 months
Receiver	Agilent Technologies	E4440A	5824	11/01/2016	24 months
Shielded enclosure	RAY PROOF	C.V1	1123	#	#
Software	Nexio	BAT EMC	0000	#	#
Thermohygrometer	Testo	608-H1	7561	26/09/2014	24 months
Thermohygrometer	Bioblock Scientific	Météostar	0963	31/10/2014	24 months
Antenna mast	INNCO	MA4000-EP-O	10261	#	#
Cable	Huber Suhner	N-20m	8385	23/04/2015	24 months
Cable	Huber Suhner	N-14m	8146	25/09/2015	24 months
Mast controller	INNCO	CO3000	10260	#	#
Open area test site	Emitech	Salinelles	3482	18/04/2014	36 months
Turntable	Heinrich Deisel	D4420	4038	#	#
Turntable controller	Heinrich Deisel	HD100	4036	#	#

BAT-EMC software version: V3.6.0.32

Results: See Graph(s) hereafter.

Frequency (MHz)	Polarization	Azimuth (degree)	Antenna Height (cm)	Measure (dBµV/m)	Limit (dBµV/m)
911.98	Vertical	180	137	89.96	94

20dB bandwidth



The 20dB bandwidth of channel is 58.393 kHz (in RBW=1 kHz).

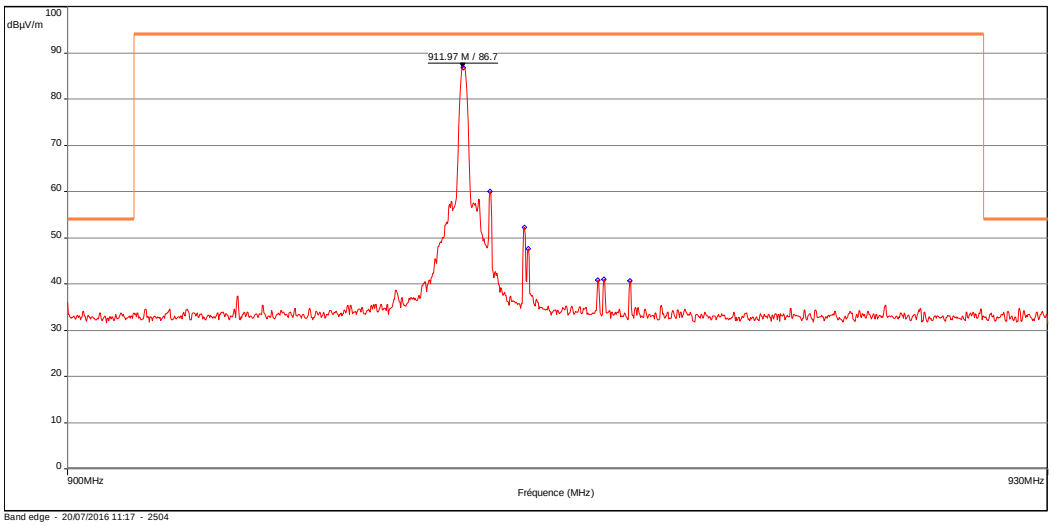
Radiated electric field measurement

EMI2504

Band edge / Thermostat STD

Fréquence (MHz) : 900 MHz - 930 MHz (Mode analyseur)
Réglage: RBW: 100 kHz, VBW: 300 kHz, Auto, nombre de Balayages 2
Polarisation : Verticale
Distance: 3 m

FCC/CNR/Copie de FCC Part 15 §249 §215 b) - Classe:Tx - QCrête/3.0m/
Mes.Peak (Verticale)
Peak/LimQ-Peak (Verticale)



Band edge - 20/07/2016 11:17 - 2504

Date: 20/07/2016 11:17:16

Technician: FMO

Detection: Peak

T (°C): 24.5
H (%): 48.2
P (hpa): 1010

Comments:

Modification(s) during test:

7. UNWANTED RADIATED EMISSIONS

Standards: CFR 47 Part 15 – Subpart C §15.209 / RSS-Gen §8.9

Tests methods: ANSI C63.10

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
1GHz-10GHz	Front side	1MHz	3MHz	Peak	150cm

Measurements below 30MHz are done with a loop antenna on a normalized Open Area Test Site as describe in the standard.
Measure is done with an antenna position of 0°, 90° and 45°.
Below 1GHz pre-measurements are done in a semi anechoic chamber at 3m. Finals measurements are conducted on a normalized Open Area Test Site.
Above 1GHz test is done in fully anechoic shielded chamber at 3m. E.U.T. is set on a styrofoam table. Measurements are done in max-hold peak detection, maximized at 360°.
Only highest levels are recorded on each configurations of E.U.T.

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 and RSS Gen.
Above 1GHz average limits in restricted bands and general limits are 54dBµV/m. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20dB under any condition of modulation.

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	Electro Metrics	BIA-30HF	1107	25/05/2015	36 months
Antenna	Rohde & Schwarz	HFH2-Z2	5825	27/01/2015	24 months
Antenna	Rohde & Schwarz	HL223	1137	25/04/2015	36 months
Antenna	ETS-Lindgren	3117	8387	16/03/2016	24 months
Cable	C&C	N-3m	10558	24/11/2015	24 months
Cable	MICRO-COAX	N-5m	10529	24/11/2015	24 months
Filter	Micro-Tronics	HPM18865	12843	04/04/2016	24 months
Filter	Wainwright Instruments	WTRCTV5-700-1000-20-60	12838	14/03/2016	24 months
Preamplifier	IMPULSE	CA118-546ACN	9169	11/08/2015	24 months
Receiver	Agilent Technologies	E4440A	5824	11/01/2016	24 months
Shielded enclosure	RAY PROOF	C.V1	1123	#	#
Software	Nexio	BAT EMC	0000	#	#
Thermohygrometer	Testo	608-H1	7561	26/09/2014	24 months
Thermohygrometer	Bioblock Scientific	Météostar	0963	31/10/2014	24 months

#: Permanent validity

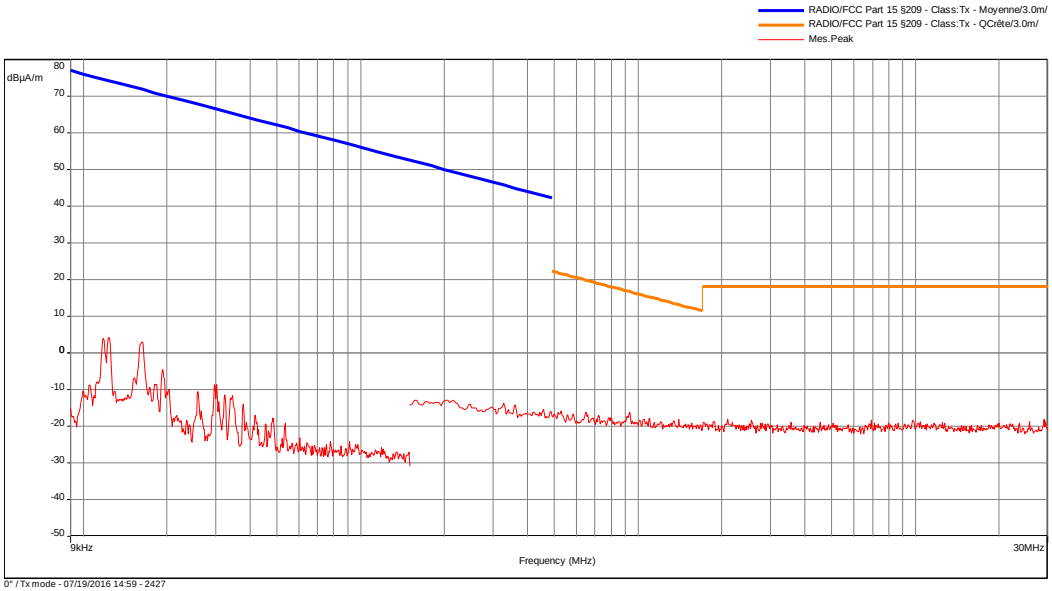
BAT-EMC software version: V3.6.0.32

Results: See Graphs hereafter.

Radiated field strength

EMI2427

0° / Tx mode / Thermostat STD



Date: 19/07/2016 14:59:21

Technician: FMO

Detection:
Peak

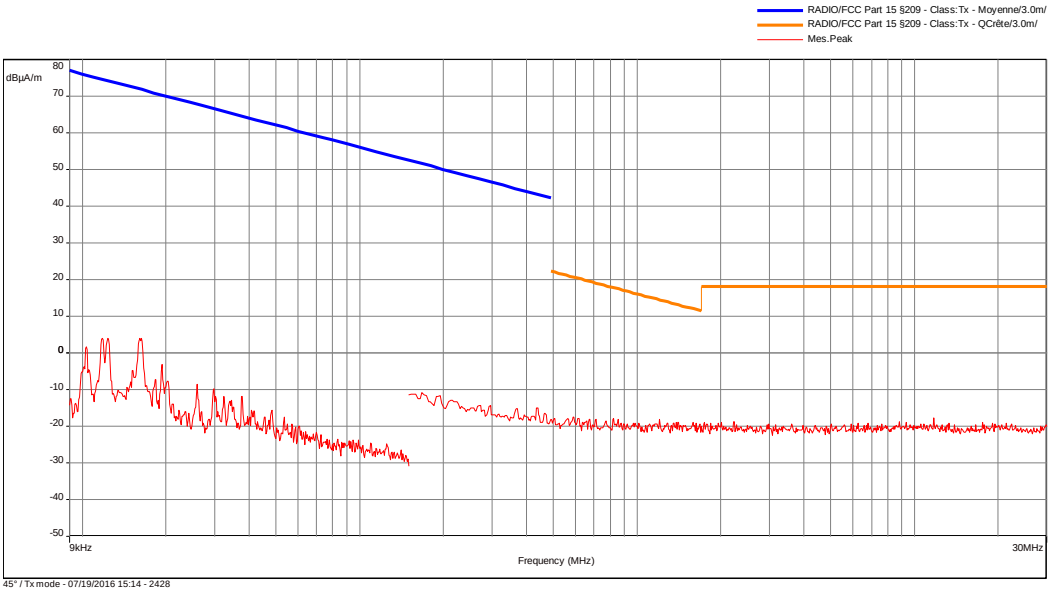
T (°C): 27.5
H (%): 43.1
P (hpa): 1011

Comments:

Modification(s) during test:
None

Radiated field strength	EMI2428

45° / Tx mode / Thermostat STD



45° / Tx mode - 07/19/2016 15:14 - 2428

Date: 19/07/2016 15:14:27

Technician: FMO

Detection:
Peak

T (°C): 27.5
H (%): 43.1
P (hpa): 1011

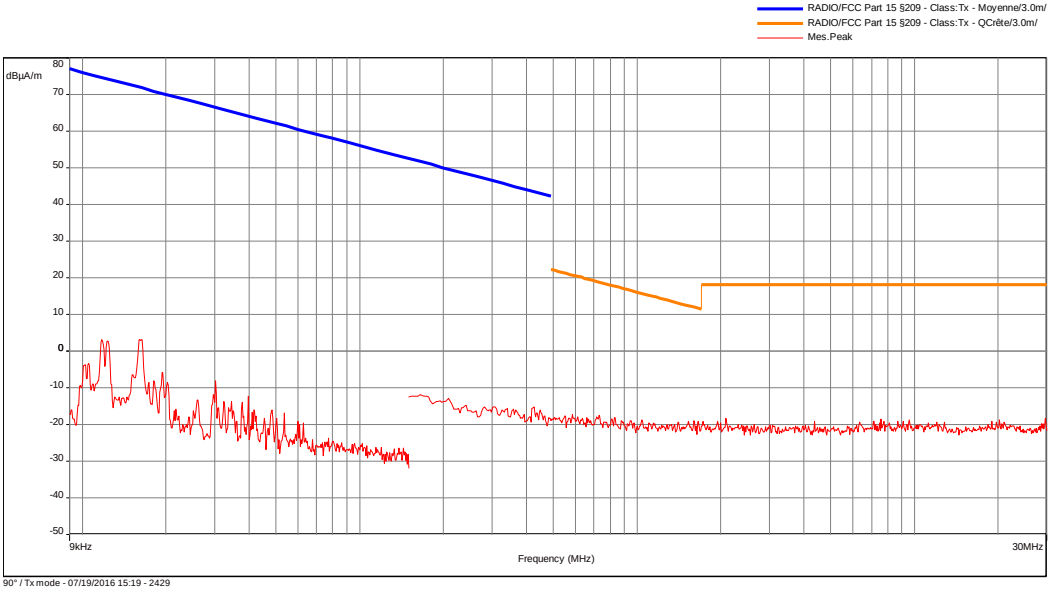
Comments:

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	EMI2429

90° / Tx mode / Thermostat STD



90° / Tx mode - 07/19/2016 15:19 - 2429

Date: 19/07/2016 15:19:57

Technician: FMO

Detection:
Peak

T (°C): 27.5
H (%): 43.1
P (hpa): 1011

Comments:

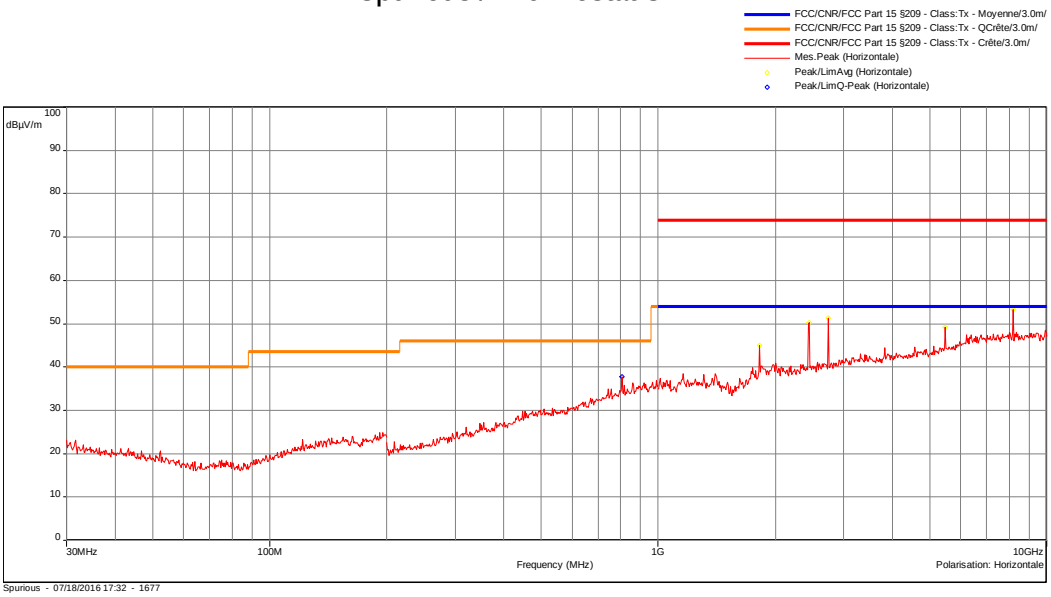
Modification(s) during test:
None

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

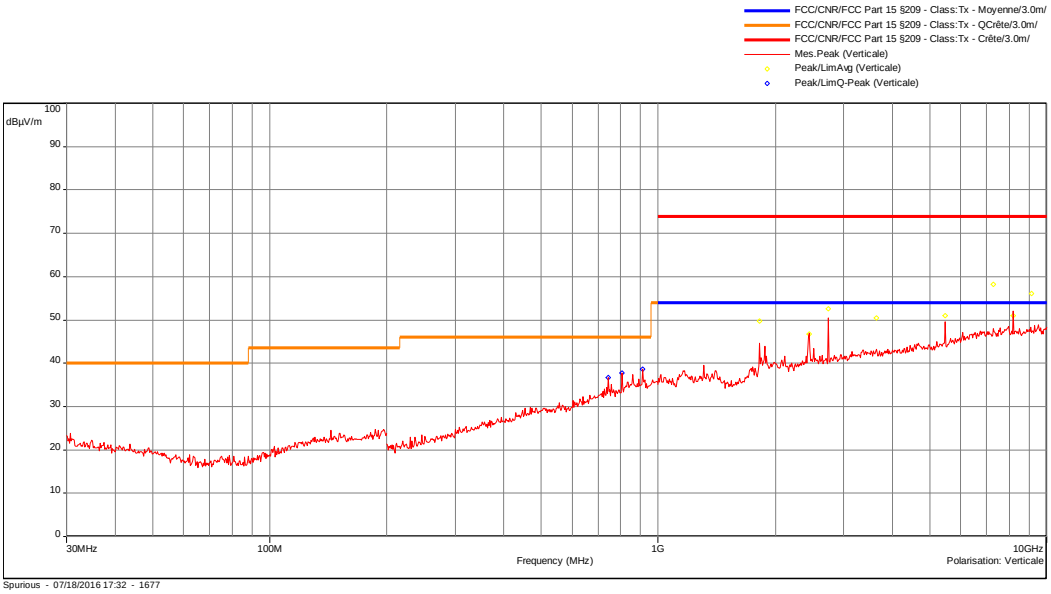
Radiated electric field measurement

EMI1677

Spurious / Thermostat STD



Spurious - 07/18/2016 17:32 - 1677



Spurious - 07/18/2016 17:32 - 1677

Date: 18/07/2016 17:32:23

Technician: FMO

Detection:
Peak

T (°C): 24.5
H (%): 48.2
P (hpa): 1010

Comments:

Modification(s) during test:

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

Temperature (°C): 17 *Humidity (%HR):* 45 *Pressure (hPa):* -

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.

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	DATE CAL.	DATE VAL.
Antenna	Electro Metrics	BIA-30HF	1107	25/05/2015	36 months
Antenna	Rohde & Schwarz	HFH2-Z2	5825	27/01/2015	24 months
Antenna	Rohde & Schwarz	HL223	1137	25/04/2015	36 months
Antenna mast	INNCO	MA4000-EP-O	10261	#	#
Cable	Huber Suhner	N-20m	8385	23/04/2015	24 months
Cable	Huber Suhner	N-14m	8146	25/09/2015	24 months
Receiver	Agilent Technologies	E4440A	5824	11/01/2016	24 months
Receiver	Rohde & Schwarz	ESVS10	3211	17/04/2015	24 months
Mast controller	INNCO	CO3000	10260	#	#
Open area test site	Emitech	Salinelles	3482	18/04/2014	36 months
Thermohygrometer	Testo	608-H2	12269	20/08/2015	24 months
Turntable	Heinrich Deisel	D4420	4038	#	#
Turntable controller	Heinrich Deisel	HD100	4036	#	#

#: Permanent validity

Results: See Boards hereafter.

Measurement uncertainty: +/- 4.84 dB (f<200MHz, Vertical)
+/- 4.62 dB (f<200MHz, Horizontal)
+/- 4.77 dB (f>200MHz, Vertical)
+/- 4.78 dB (f<200MHz, Horizontal)
+/- 5.16 dB (f>1GHz)

All unwanted radiated emissions are at least 20 dB below specified limits.

8. OCCUIPIED BANDWIDTH

Standard: CNR-Gen § 6.6

Test method: CNR-Gen § 6.6

Test configuration: A near field probe detects field near equipment (relative measurement).

Resolutions:

Frequency	Resolution bandwidth	Video bandwidth
912MHz	1kHz	3kHz

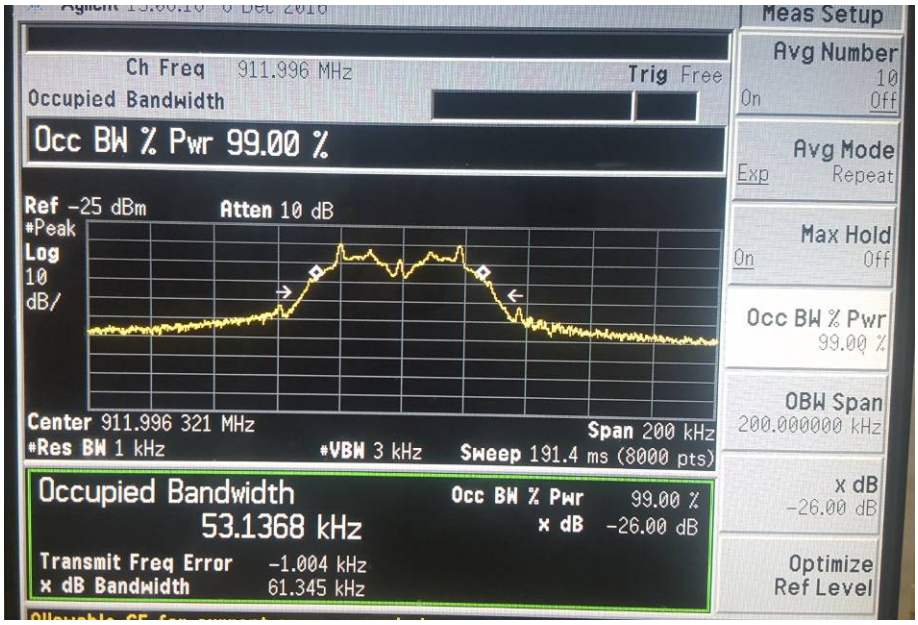
Test method deviation: No

Test equipment list:

CATEGORY	BRAND	TYPE	N° EMITECH	DATE CAL.	DATE VAL.
Antenna	Emitech	3.5 cm	4653	#	#
Cable	C&C	N-3m	10558	24/11/2015	24 months
Receiver	Agilent Technologies	E4440A	5824	11/01/2016	24 months

#: Permanent validity

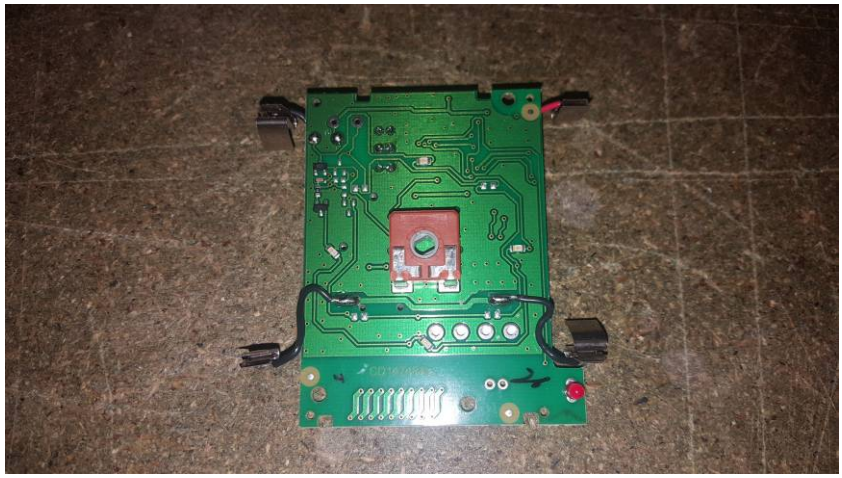
Results:



Occupied Bandwidth: 53.1368kHz

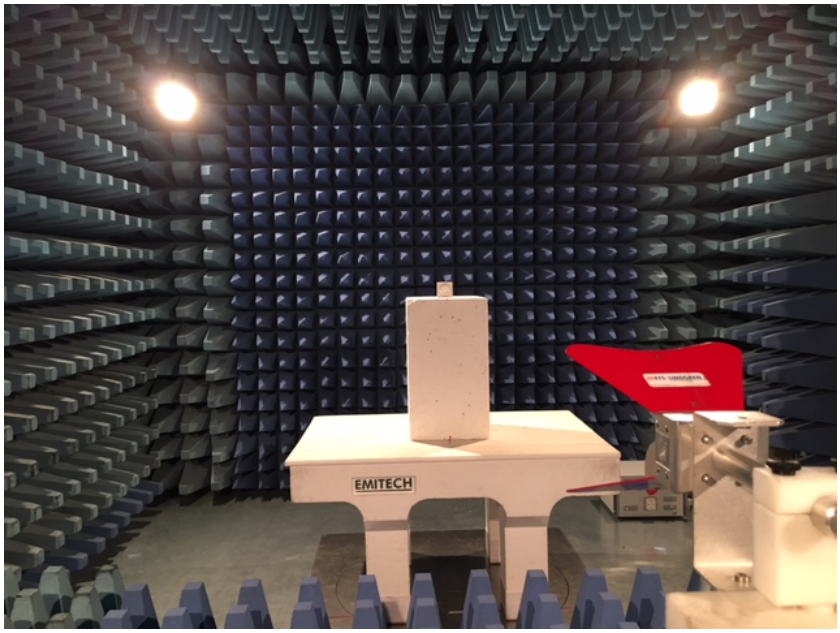
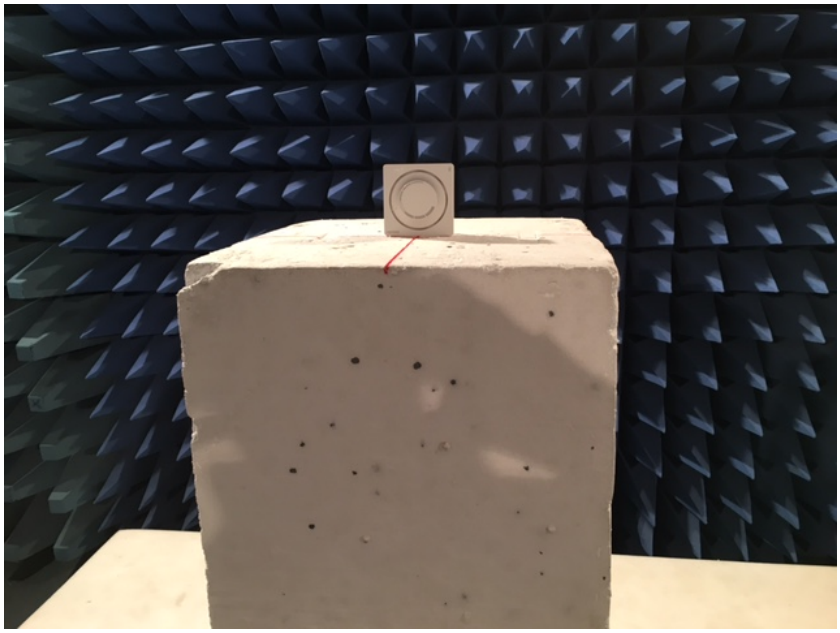
□□□ End of report – 1 annex to be forwarded □□□

ANNEX:
PHOTOGRAPH(S)

E.U.T General view (Top view) Thermostat STD	
E.U.T. internal view Thermostat STD	
E.U.T. internal view Thermostat STD	

E.U.T. internal view (Antenna) Thermostat STD	
E.U.T. internal view (Radio part) Thermostat STD	

Radiated pre measurement Thermostat STD	
Radiated pre measurement Thermostat STD	

Unwanted emissions (f>1GHz) Thermostat STD	
Unwanted emissions	

Unwanted emissions (f<1GHz) (OATS) Thermostat STD	
Unwanted emissions (f<1GHz) And carrier measurement (OATS) Thermostat STD	

Unwanted emissions (f<1GHz) (OATS) Thermostat STD