

R041-13-104897-16A - DM / CBU

RADIO TEST REPORT

According to the standard(s):

FCC part 15 Subpart C
RSS-Gen _ Issue 3, December 2010
OET Bulletin 65 (1997), RSS 102 (2010)

Equipment under test:

WORKABOUT PRO V4 7528XLF
WORKABOUT PRO V4 7528XPLF
(RFID MODULE LF-ID1)

FCC ID: UZ77528LFA
IC ID: 109AN-7528LFA

Company:

MOTOROLA SOLUTIONS

Diffusion: Mr BONNEFOY

(Company: MOTOROLA SOLUTIONS)

Number of pages: 31 including 1 annex

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NAME OF THE EQUIPMENT UNDER TEST (E.U.T.) : WORKABOUT PRO V4 7528XLF
WORKABOUT PRO V4 7528XPLF
(RFID MODULE LF-ID1)

Serial number : None

Part number : WA9906 (RFID module)
FCC ID: UZ77528LFA
IC ID: 109AN-7528LFA

Software Version : None

MANUFACTURER'S NAME : MOTOROLA SOLUTIONS

APPLICANT'S ADDRESS:

Company : MOTOROLA SOLUTIONS

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13591 AIX EN PROVENCE Cedex 3
FRANCE

Person(s) present during the tests : Mr FORNIER

Responsible : Mr BONNEFOY

DATE(S) OF TESTS : From January 17th to February 20th 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
IC Filling number : 4379C-1

TESTS SUPERVISOR(S) : None

TESTS OPERATOR(S) : David MONTAULON

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1. INTRODUCTION

This document submits the results of Electromagnetic Compatibility tests performed on the equipment WORKABOUT PRO V4: 7528XLF & 7528XPLF (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 63.4:2003	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
RSS-Gen: 2010 Issue 3, December 2010	Exigences générales et information relatives à la certification du matériel de radiocommunication

3. EQUIPMENT UNDER TEST CONFIGURATION

Equipment under test (E.U.T.) description: The 125kHz RFID MODULE LF-ID1 consists of an RFID IDTRONICS reader, an interface PCB and a wire wound antenna. The module is plugged into the internal expansion port of the WORKABOUT PRO4 Handheld Computer.

The WORKABOUT PRO4 with integrated LF-ID1 is a colour mobile computer. The product is a mobile device and must not be held closer than 20 cm from the rest of the body and must not be used in a holster or on a belt-clip. It also has a Lithium Ion polymer rechargeable battery pack, WLAN, Bluetooth and WWAN radios (7528XPLF only) and is supplied with an AC/DC adaptor.

The RFID module has to pass Limited Modular approval for FCC and Canadian rules. This module will be approved for use when installed in the following WORKABOUT PRO4 Handheld Computer models 7528XLF & 7528XPLF:

RFID MODULE LF-ID1
Applicant: Motorola Solutions
Model: WA9906
FCC ID: UZ77528LFA
IC ID: 109AN-7528LFA

Model: 7528XLF - in co- transmission with Bluetooth module and WLAN

- Permanent transmitter emission with a loop coil antenna:
- Integral antenna, dedicated antenna supplied with the equipment
- Frequency range used by E.U.T.: 125kHz (RFID), 2400-2483.5MHz (Wifi and Bluetooth)
- Tested frequency: 125kHz (RFID)
- Equipment: multi frequency
- Total channel available: 1 (For RFID module)
- Power supply: 110Vac/60Hz with AC adaptor

Model: 7528XPLF in co- transmission with Bluetooth module, WLAN and WWAN.

- Permanent transmitter emission with a loop coil antenna:
- Integral antenna, dedicated antenna supplied with the equipment
- Frequency range used by E.U.T.: 125kHz (RFID), 2400-2483.5MHz (Wifi and Bluetooth) GSM 850, DCS1900.
- Tested frequency: 125kHz (RFID)
- Equipment: multi frequency
- Total channel available: 1 (For RFID module)
- Power supply: 110Vac/60Hz with AC adaptor

The following radio modules used in the configurations are already approved:

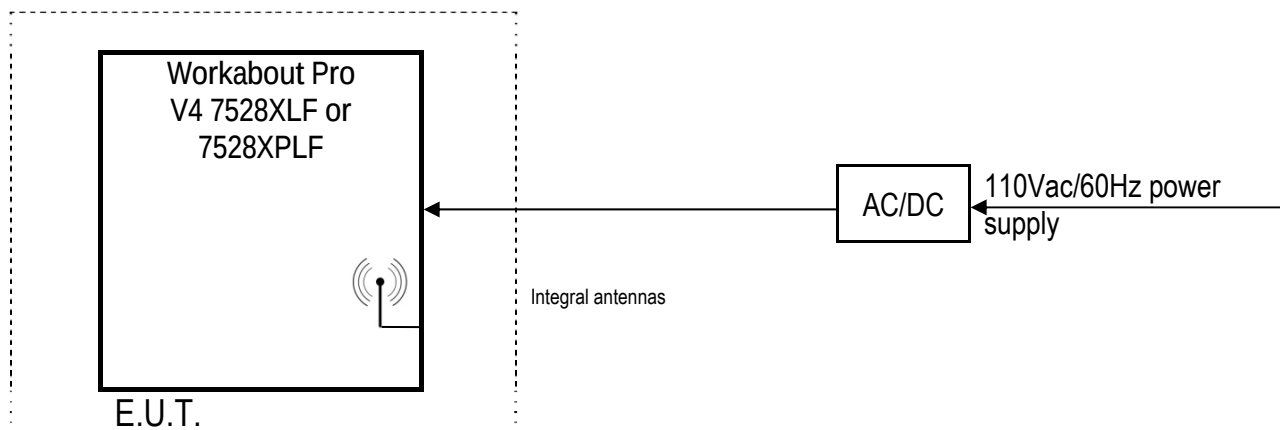
Model: 21-148603-0B

- FCC ID: UZ7211486030B and IC: 109AN-211486030B

Model: 7528P

- FCC ID: UZ77528PA and IC: 109AN-7528PA

4. EQUIPMENT UNDER TEST CONFIGURATION SCHEME



Cycle and operating mode during emission tests: Permanent emission mode. AC/DC direct loading mode is the worst configuration.

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 and RSS Gen:2010 §7.2.2	YES	
Conducted power lines - FCC part 15.207 and RSS Gen:2010 §7.2.4	YES	
Unwanted radiated emissions - FCC part 15.209 and RSS Gen:2010 table 5	YES	
Collocation - OET Bulletin 65:1997, RSS 102:2010	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 , RSS-Gen:2010 and to OET Bulletin 65:1997, RSS 102:2010 according to limits specified in this test report.

6. CONDUCTED EMISSIONS – SECTION 15.207, RSS-GEN §7.2.4

Standards: FCC part 15 Subpart C 15.207, RSS Gen:2010 §7.2.4

Tests methods: ANSI C63.4:2003, RSS Gen:2010 §7.2.4

Test configuration:

Tested cable(s)	Measure with	E.U.T. height
110Vac/60Hz power supply / XPLF	L.I.S.N.	80cm
110Vac/60Hz power supply / XLF	L.I.S.N.	80cm

Frequency band	Tested cable(s)	Resolution bandwidth	Video bandwidth	Detection mode
150kHz-30MHz	110Vac/60Hz power supply / XPLF	10KHz	30kHz	Peak / Average
150kHz-30MHz	110Vac/60Hz power supply / XLF	10KHz	30kHz	Peak / Average

Test method deviation: No

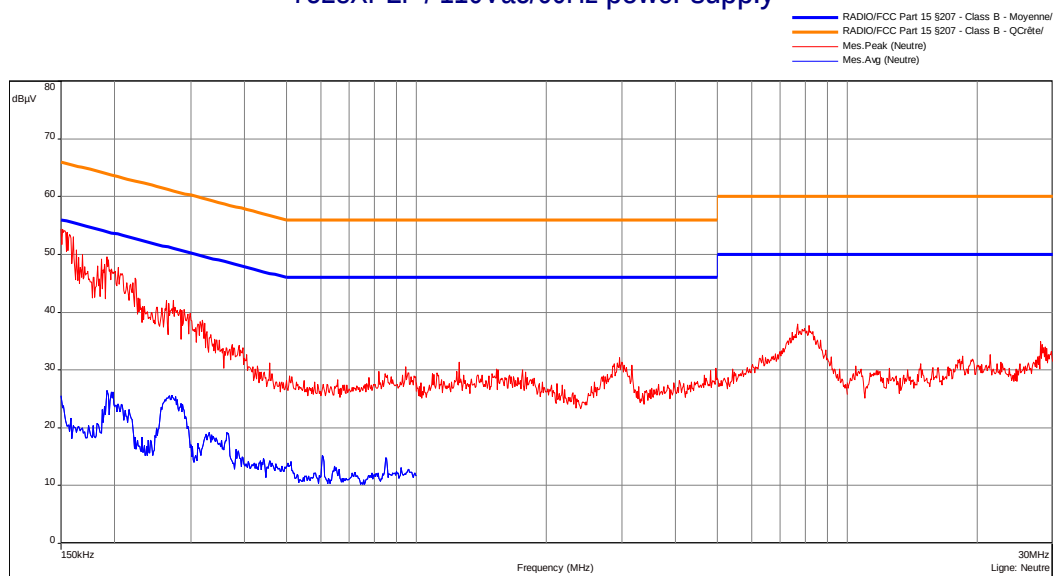
Test equipment list:

CATEGORY	BRAND	TYPE	N° EMITECH	DATE CAL.	DATE VAL
Cable	Emitech	Current absorber sheath	9491	14/09/2012	14/11/2014
Cable		N-0.5m	3237	29/06/2012	29/08/2014
Cable	Micro-coax	N-3m	10537	05/09/2013	05/11/2015
Cable	Micro-coax	N-5m	10528	05/09/2013	05/11/2015
Ground choke	EMITECH	CISPR 16-2-1 : 2008	10071	#	#
Ground choke	EMITECH	CISPR 16-2-1 : 2008	10080	#	#
Limiter	Hewlett Packard	11947A	0239	22/10/2013	22/12/2015
LISN	PMM	L3-25	0833	15/11/2013	15/01/2016
Receiver	Agilent	E4440A	5824	22/10/2013	22/12/2015
Receiver	Rohde & Schwarz	ESHS10	3371	26/11/2012	26/01/2015
Shielded enclosure	RAY PROOF	C.GS3	1123	17/10/2013	17/12/2016
Software	Nexio	BAT EMC	0000	#	#

#: Permanent validity

BAT-EMC software version: V3.6.0.32

Results: See Graph(s) hereafter. Limits on the graphs are average and quasi-peak limits (upper limit).

Conducted voltage emission (measurement)
7528XPLF / 110Vac/60Hz power supply
EMI2276


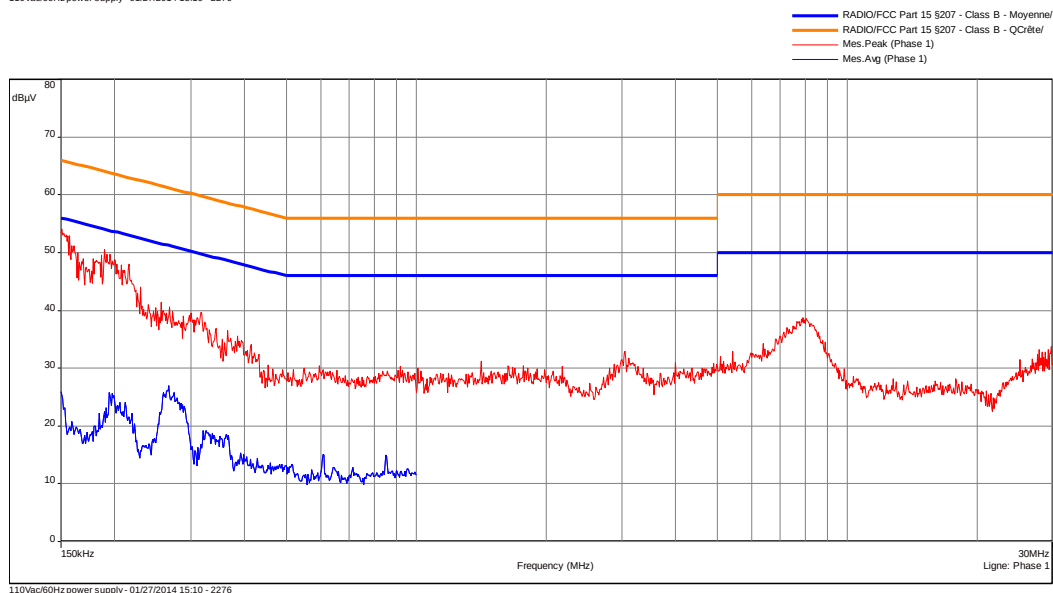
Date: 27/01/2014 15:10:24

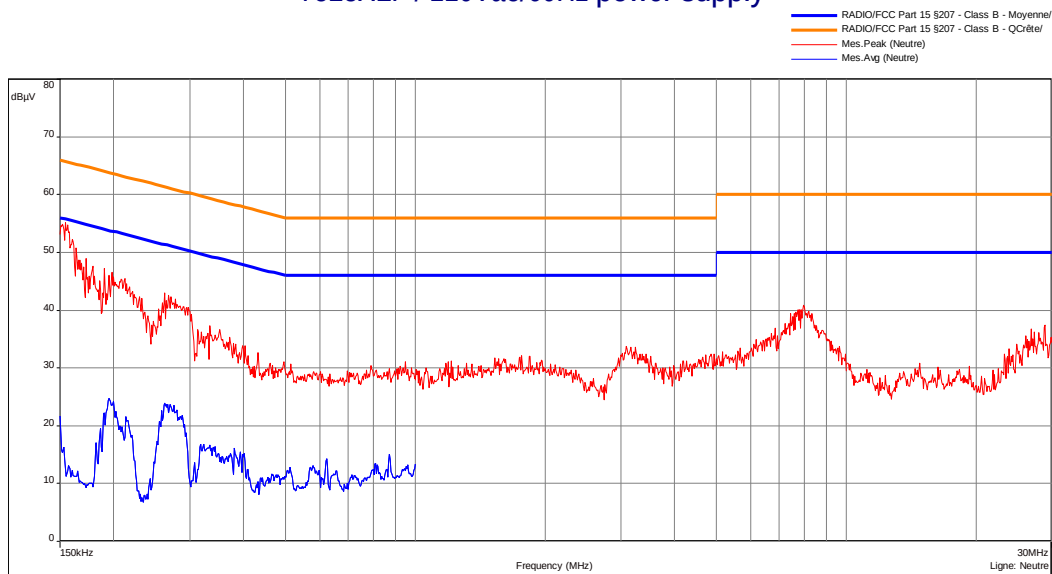
Technician: DM

Class: B of the standard

Detection:
Peak and average

Modification(s) during test:



Conducted voltage emission (measurement)
7528XLF / 110Vac/60Hz power supply
EMI2273


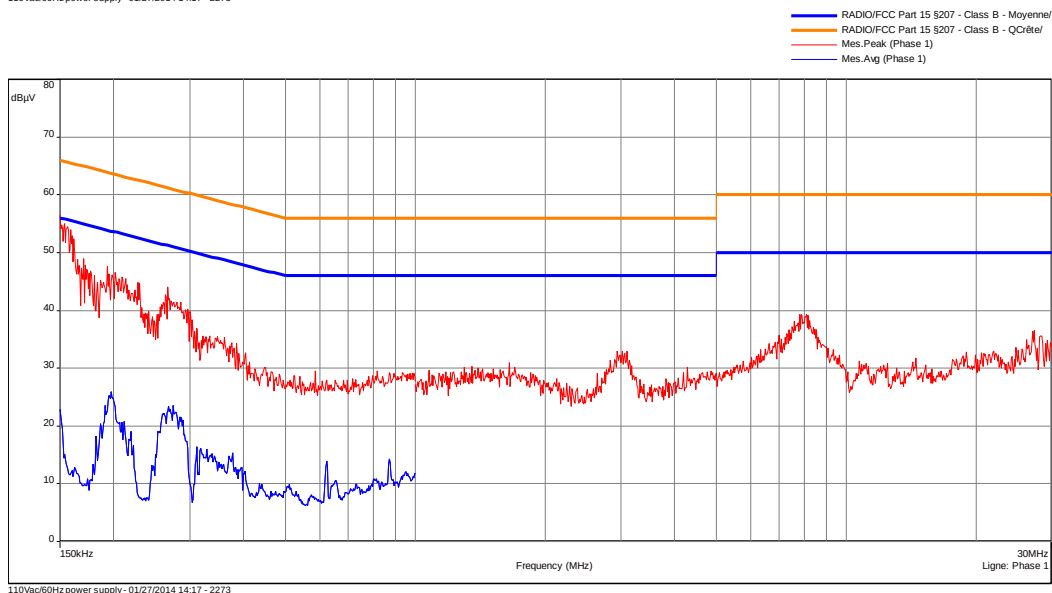
Date: 27/01/2014 14:17:28

Technician: DM

Class: B of the standard

Detection:
Peak and average

Modification(s) during test:



7. UNWANTED RADIATED EMISSIONS – SECTION 15.209, RSS-GEN TABLE 5

Standards: FCC part 15 Radio part 15.209, RSS Gen:2010 and OET Bulletin 65:1997, RSS 102:2010

Tests methods: FCC part 15.209 and ANSI C63.4:2003, RSS-Gen:2010 Table 5

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-12.75GHz	Front side	1MHz	3MHz	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.

For collocation measurement, notch filters are used to avoid overloads of measurement system.

Radiocommunication links are done by a CMU200.

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 54dB μ V/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 dB μ A/m instead of μ V/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	ETS LINDGREN	3117	8387	26/08/2011	26/10/2015
Antenna	Electro-Metrics	BIA-30HF	1107	03/03/2011	03/05/2015
Antenna	Rohde & Schwarz	HFH2-Z2	5825	22/10/2012	22/12/2014
Antenna	Rohde & Schwarz	HL223	1137	03/03/2011	03/05/2015
Cable	C&C	N-1.5m	10553	27/09/2013	27/11/2015
Cable	C&C	N-3m	10557	27/09/2013	27/11/2015
Cable	C&C	N-3m	10558	27/09/2013	27/11/2015
Cable	C&C	N-5m	10559	27/09/2013	27/11/2015
Cable	C&C	N-5m	10561	27/09/2013	27/11/2015
Filter	Micro-Tronics	HPM 11630	4392	19/01/2012	19/03/2014
Filter	MICROTRONICS	HPM 15162	10273	07/06/2013	07/08/2015
Filter	Wainwright	WRCD 1800/2000	9773	29/01/2013	29/03/2015
Filter	Wainwright	WRCG 2400/2483	9771	19/12/2012	19/02/2015
Preamplifier	IMPULSE	CA118-546ACN	9169	28/03/2013	28/05/2014
Receiver	Agilent	E4440A	5824	22/10/2013	22/12/2015
Shielded enclosure	RAY PROOF	C.GS3	1123	17/10/2013	17/12/2016
Software	Nexio	BAT EMC	0000	#	#
Thermohygromètre	Bioblock Scientific	Météostar	0963	06/07/2012	06/09/2014

#: Permanent validity

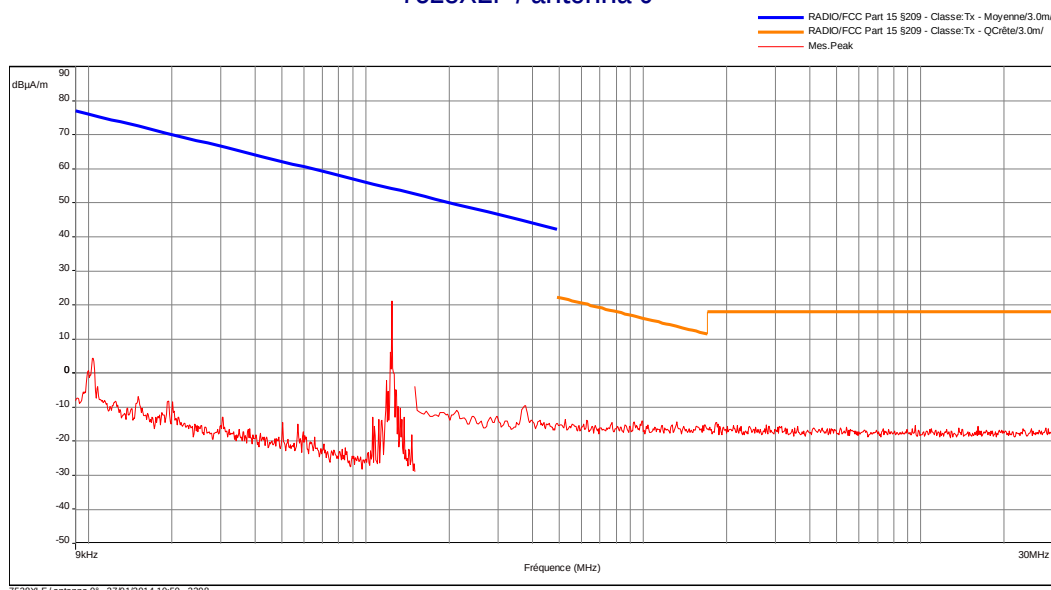
BAT-EMC software version: V3.6.0.32

Results: See Graphs hereafter.

Radiated magnetic field emission (measurement)

7528XLF / antenna 0°

EMI2398



Date: 27/01/2014 10:50:59

Technician: DM

Class: Tx of the standard

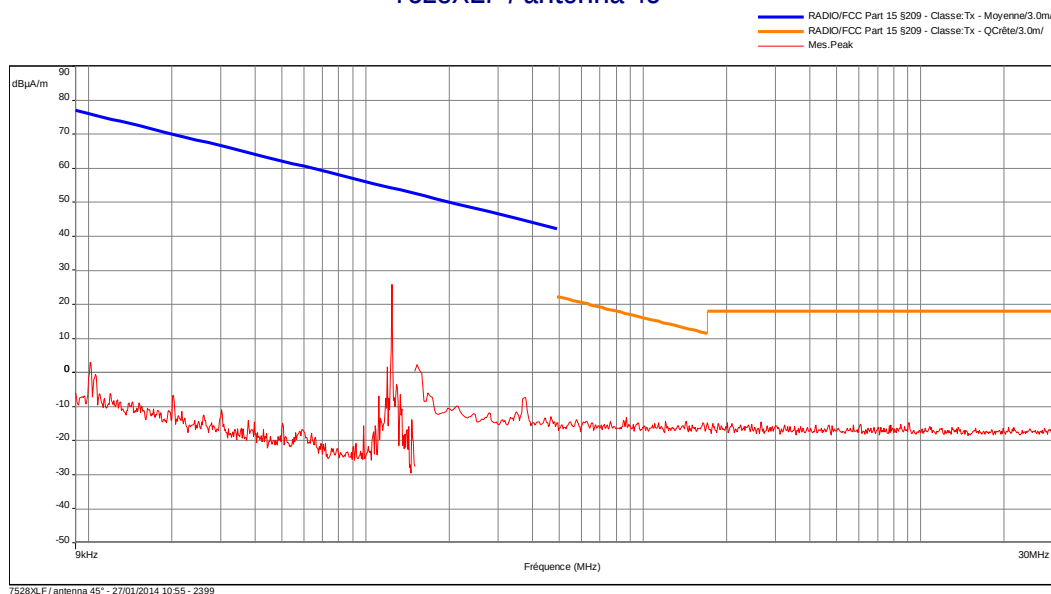
Detection:
Peak

Modification(s) during test:
No

Radiated magnetic field emission (measurement)

7528XLF / antenna 45°

EMI2399



Date: 27/01/2014 10:55:25

Technician: DM

Class: Tx of the standard

Detection:
Peak

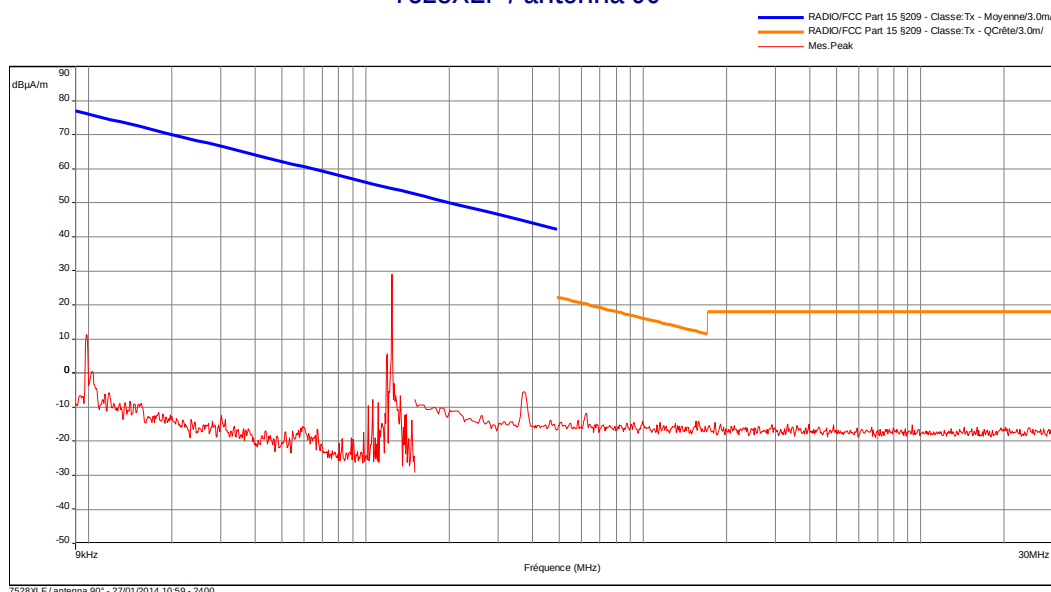
Modification(s) during test:
No

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

Radiated magnetic field emission (measurement)

EMI2400

7528XLF / antenna 90°



Date: 27/01/2014 10:59:23

Technician: DM

Class: Tx of the standard

Detection:
Peak

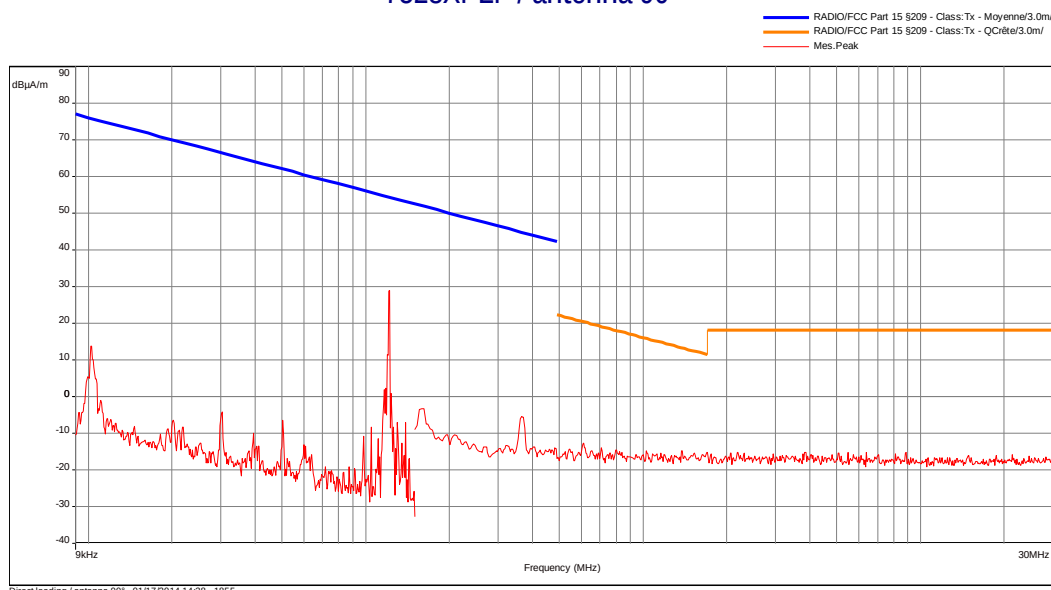
Modification(s) during test:
No

Limit indicated on this plot is calculated with 40 dB/decade extrapolation factor and 51.5dB conversion factor.

Radiated magnetic field emission (measurement)

7528XPLF / antenna 90°

EMI1855



Date: 17/01/2014 14:38:23

Technician: DM

Class: Tx of the standard

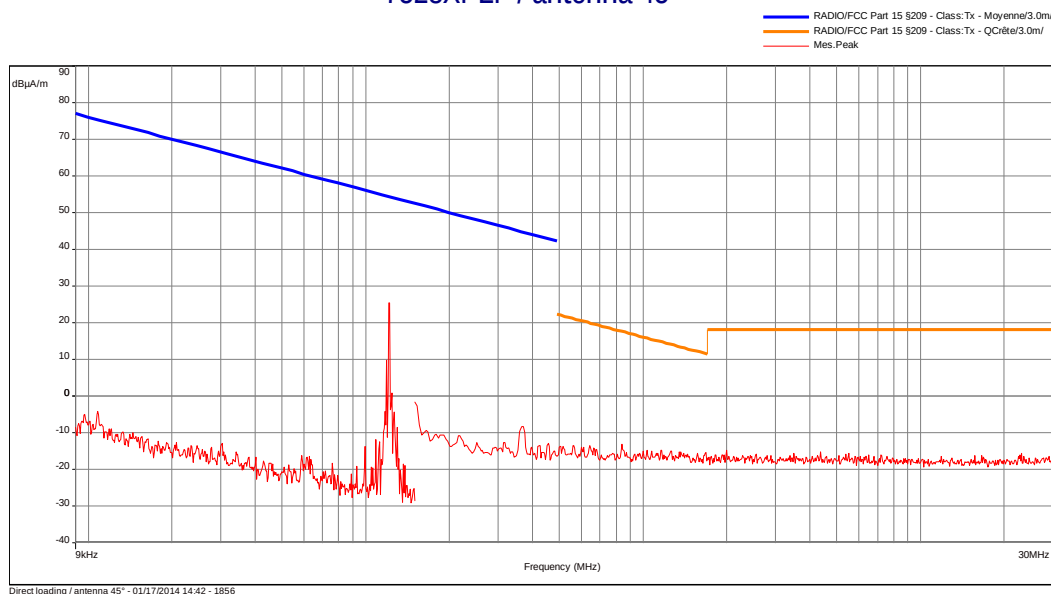
Detection:
Peak

Modification(s) during test:
No

Radiated magnetic field emission (measurement)

7528XPLF / antenna 45°

EMI1856



Date: 17/01/2014 14:42:13

Technician: DM

Class: Tx of the standard

Detection:
Peak

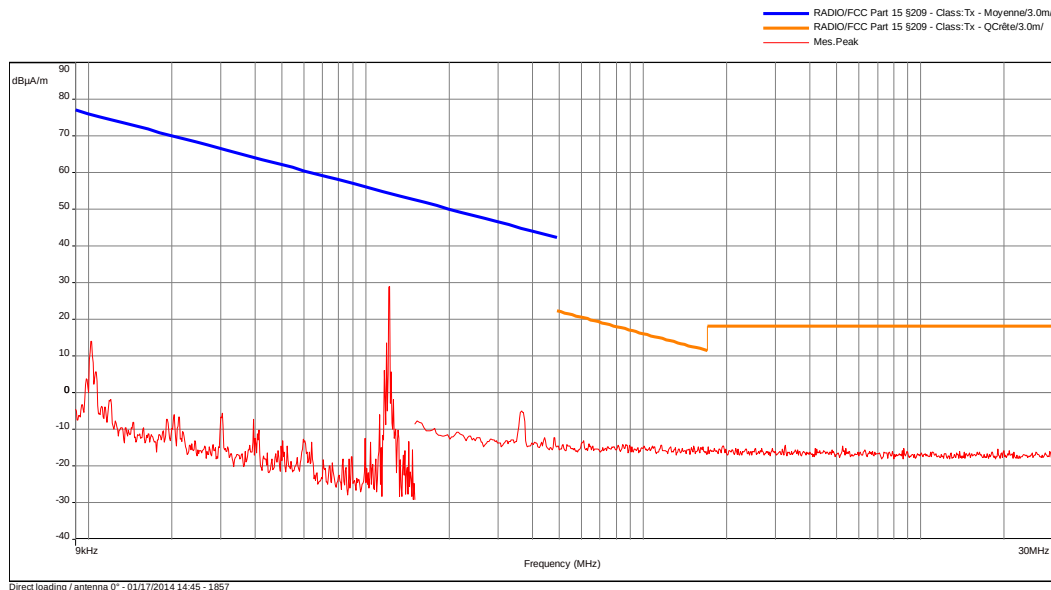
Modification(s) during test:
No

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

Radiated magnetic field emission (measurement)

EMI1857

7528XPLF / antenna 0°



Date: 17/01/2014 14:45:28

Technician: DM

Class: Tx of the standard

Detection:
Peak

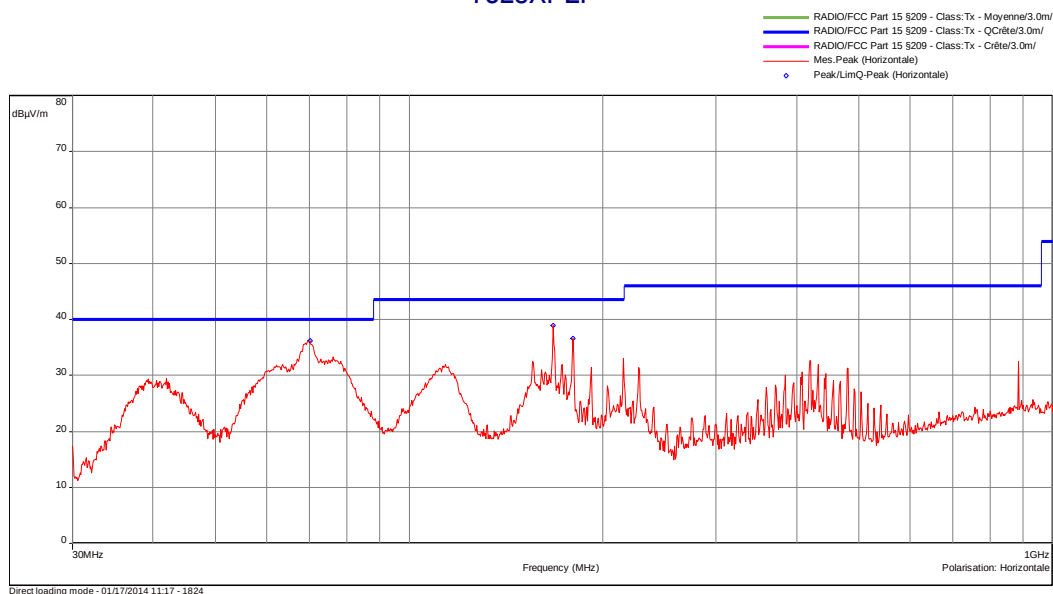
Modification(s) during test:
No

Limit indicated on this plot is calculated with 40 dB/decade extrapolation factor and 51.5dB conversion factor.

Radiated electric emission (measurement)

EMI1824

7528XPLF



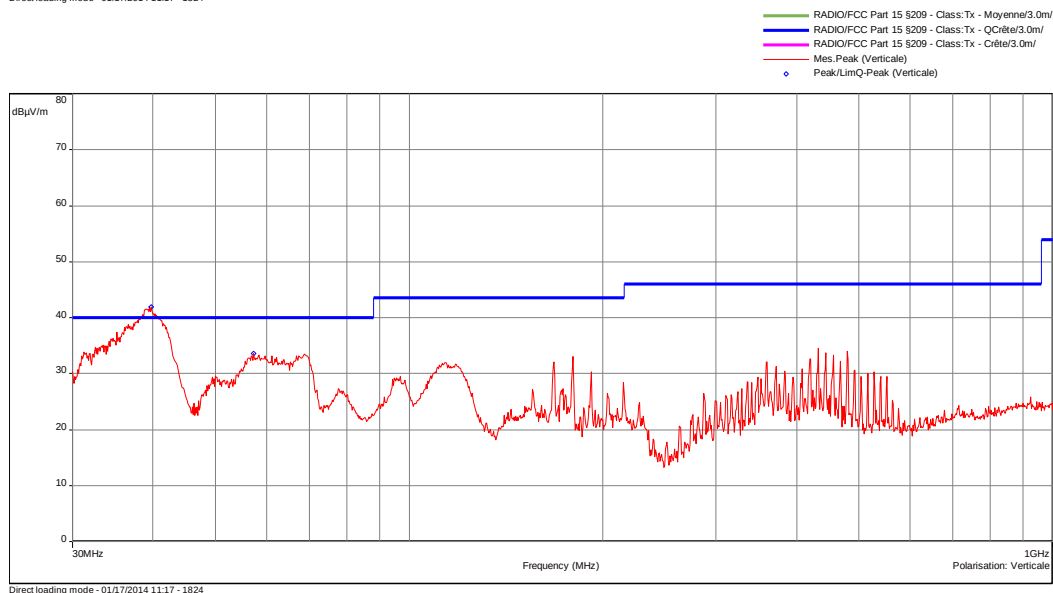
Date: 17/01/2014 11:17:52

Technician: DM

Class: Tx of the standard

Detection:
Peak

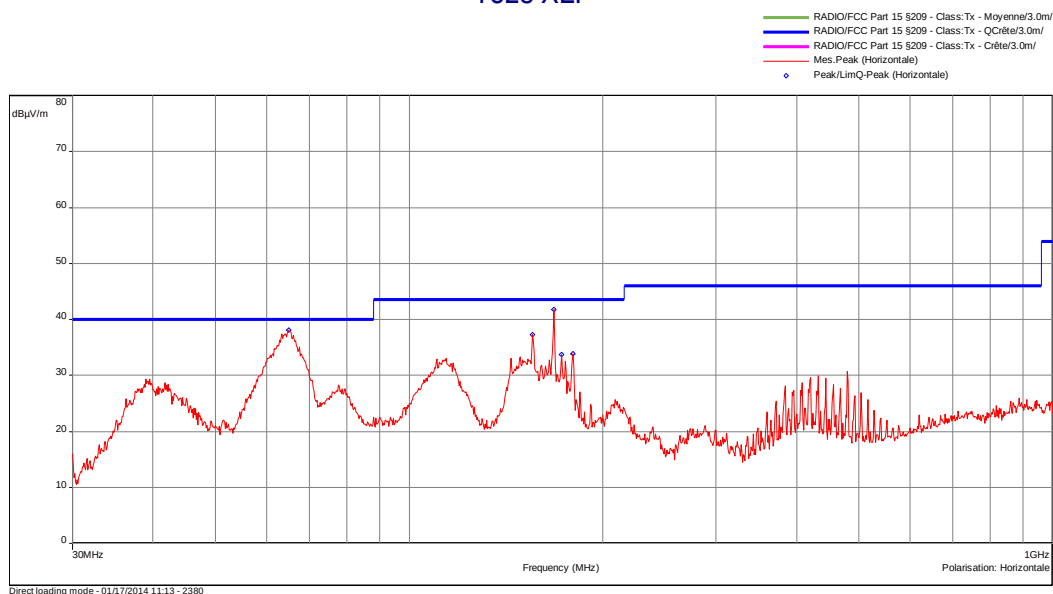
Pre measurement - maximized
at 360°

Modification(s) during test:
No


Radiated electric emission (measurement)

EMI2380

7528 XLF



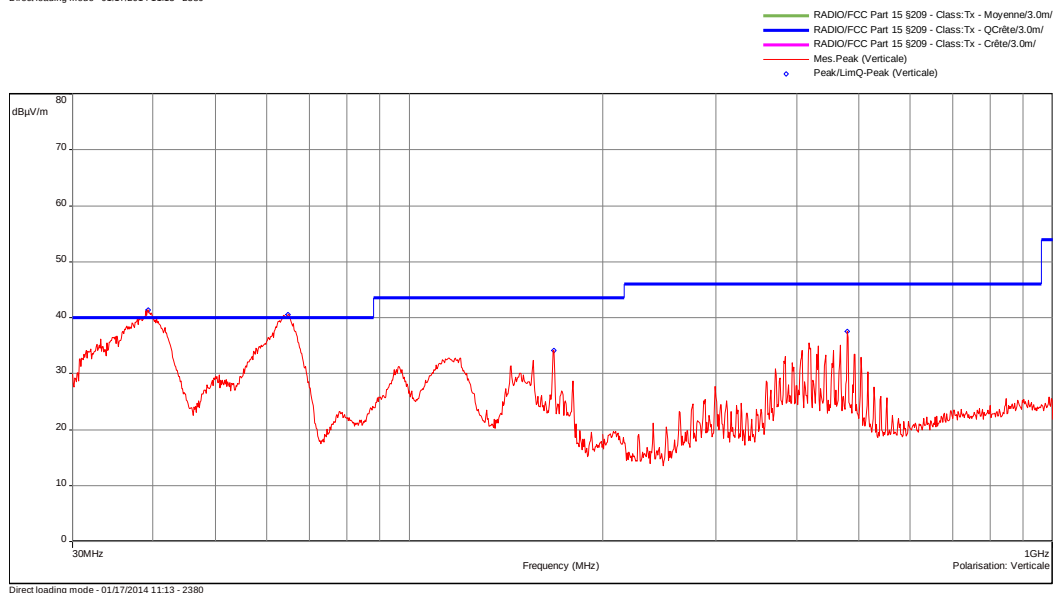
Date: 17/01/2014 11:13:21

Technician: DM

Class: Tx of the standard

Detection:
Peak

Pre measurement - maximized
at 360°

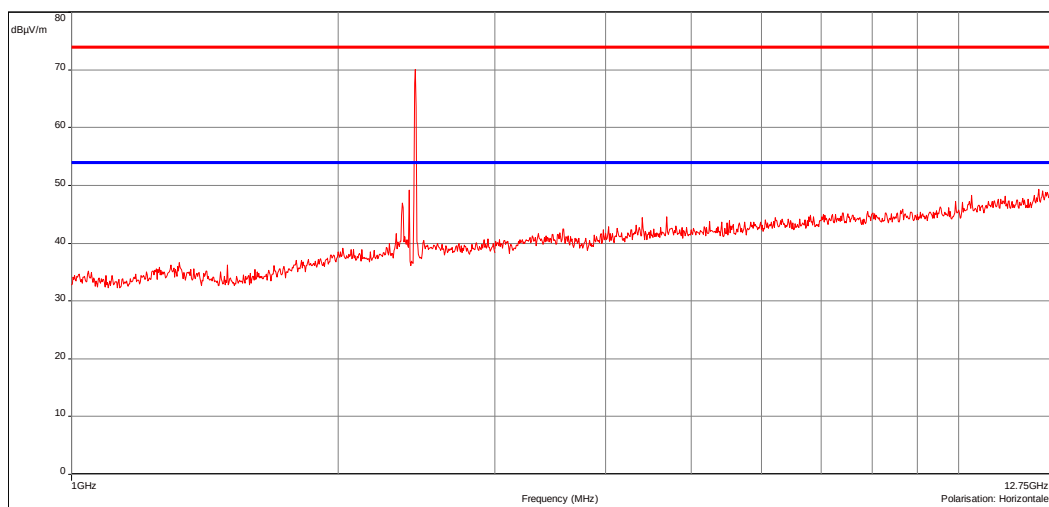
Modification(s) during test:
No


Radiated electric emission (measurement)

EMI2379

7528XLF / RFID + Wifi + Bluetooth

RADIO/FCC Part 15 §209 - Class:Tx - Moyenne/3.0m/
 RADIO/FCC Part 15 §209 - Class:Tx - QCrête/3.0m/
 RADIO/FCC Part 15 §209 - Class:Tx - Crête/3.0m/
 Mes.Peak (Horizontale)



RFID + Wifi + Bluetooth - 02/18/2014 14:09 - 2379

Date: 18/02/2014 14:09:57

Technician: DM

Class: Tx of the standard

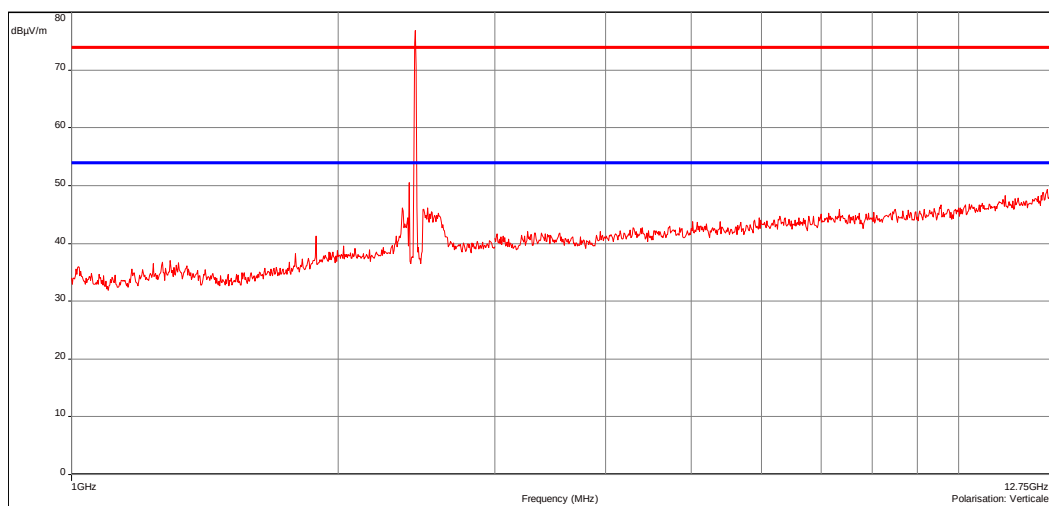
Detection:
Peak

Measurement - maximized at
360°

Frequencies identification:
2.4GHz : Wifi, Bluetooth

Modification(s) during test:
No

RADIO/FCC Part 15 §209 - Class:Tx - Moyenne/3.0m/
 RADIO/FCC Part 15 §209 - Class:Tx - QCrête/3.0m/
 RADIO/FCC Part 15 §209 - Class:Tx - Crête/3.0m/
 Mes.Peak (Verticale)

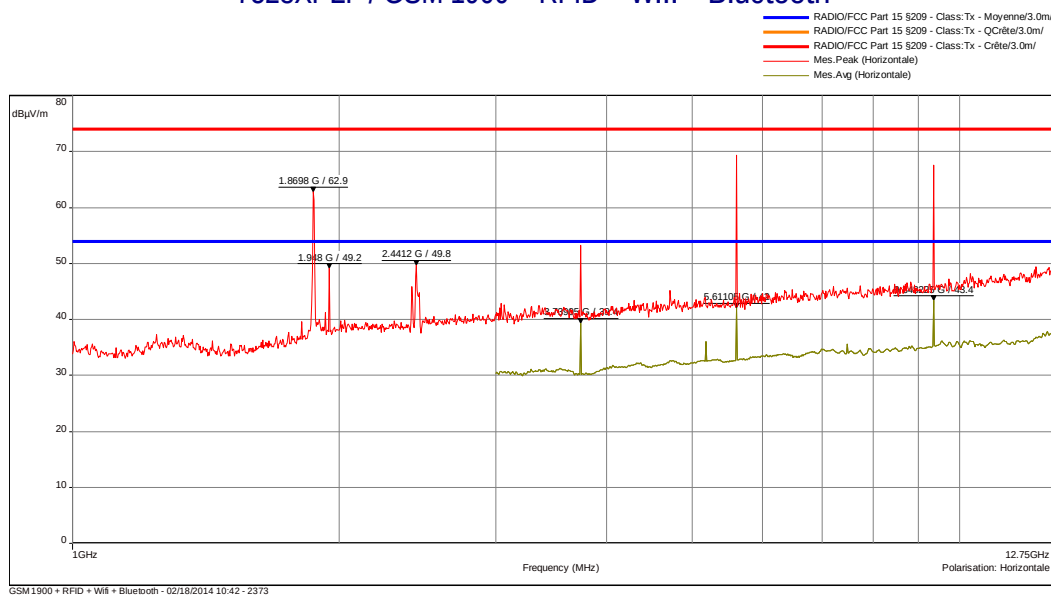


RFID + Wifi + Bluetooth - 02/18/2014 14:09 - 2379

Radiated electric emission (measurement)

7528XPLF / GSM 1900 + RFID + Wifi + Bluetooth

EMI2373



Date: 18/02/2014 10:42:03

Technician: DM

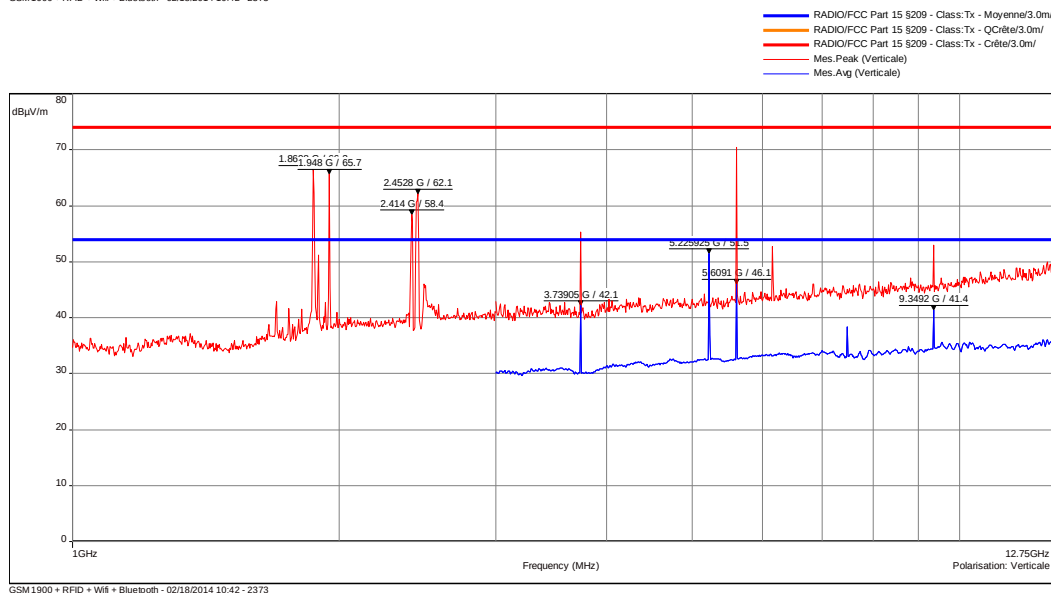
Class: Tx of the standard

Detection:
Peak

Measurement - maximized at
360°

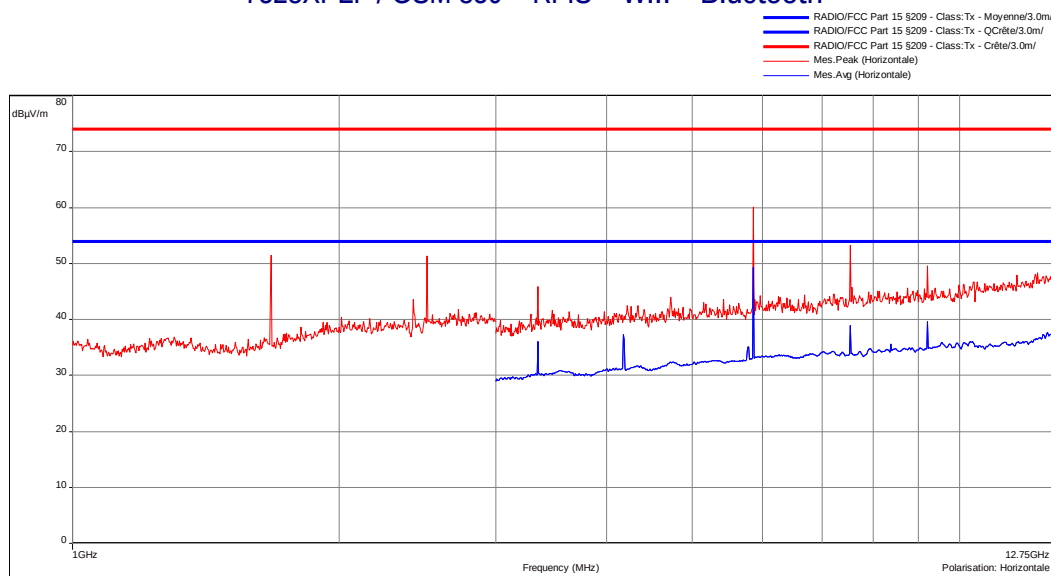
Frequencies identification:
1.870GHz: Uplink
1.947GHz: Downlink
2.4GHz : Wifi, Bluetooth
5.2GHz : Wifi

Modification(s) during test:



Radiated electric emission (measurement) 7528XPLF / GSM 850 + RFIS + Wifi + Bluetooth

EMI2375



GSM 850 + RFIS + Wifi + Bluetooth - 02/18/2014 11:35 - 2375

Date: 18/02/2014 11:35:22

Technician: DM

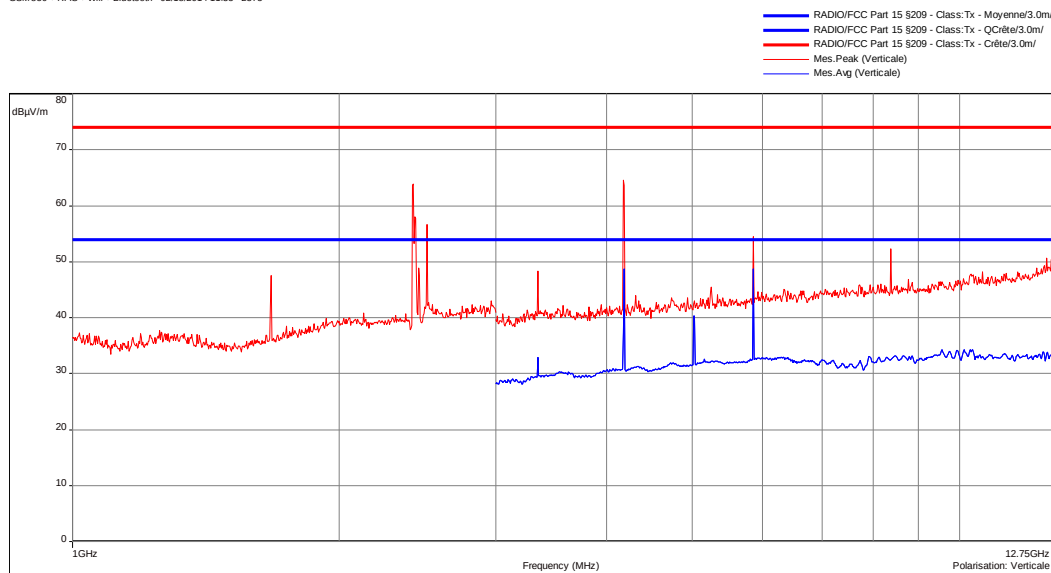
Class: Tx of the standard

Detection:
Peak

Measurement - maximized at
360°

Frequencies identification:
2.4GHz : Wifi, Bluetooth

Modification(s) during test:



GSM 850 + RFIS + Wifi + Bluetooth - 02/18/2014 11:35 - 2375

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

Temperature (°C): 17

Humidity (%HR): 35

Pressure (hPa): 1002

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
1GHz-12.75GHz	Front side	1MHz	3m	Average	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	ETS LINDGREN	3117	5456	17/08/2012	17/10/2016
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	Cables & Connetiques	N-1.5m	4203	04/06/2013	04/08/2015
Cable	Huber Sumner	N-14m	8146	04/06/2013	04/08/2015
Cable	Huber Sumner	N-20m	8385	04/06/2013	04/08/2015
Filter	Micro-Tronics	HPM 11630	4392	19/01/2012	19/03/2014
Filter	MICROTRONICS	HPM 15162	10273	07/06/2013	07/08/2015
Filter	Wainwright	WRCD 1800/2000	9773	29/01/2013	29/03/2015
Filter	Wainwright	WRCG 2400/2483	9771	19/12/2012	19/02/2015
Mast controller	INNCO	CO3000	10260	#	#
Open area test site	EMITECH	Salinelles	3482	04/03/2011	04/05/2014
Preamplifier	IMPULSE	CA118-546ACN	9169	28/03/2013	28/05/2014
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.

XLF Version

Frequency (MHz)	Polarization	Azimut (degree)	Antenna Height (cm)	Measure (dB μ A/m)	Limit (dB μ A/m) (*)	Comments
0.125	Circular 0°	185	100	4.30	33.25	C
0.125	Circular 45°	210	100	2.37	33.25	C
0.125	Circular 90°	90	100	-1.38	33.25	C

C=Compliant

Carrier measurement at 10m: 4.30 dB μ A/m ($\approx$ 55.8dB μ V/m)

(*) Using an extrapolation factor of 40 dB/decade (as described in section 15.31 (f)), the level at 300m is about -3.28dB μ V/m (0.685 μ V/m) for a limit at 19.2 μ V/m.

XLF Version

Frequency (MHz)	Polarization	Azimut (degree)	Antenna Height (cm)	Measure (dB μ V/m)	Limit (dB μ V/m)	Comments
39.33	Vertical	0	100	29.90	40	C
64.83	Vertical	0	100	27.95	40	C
167.63	Vertical	32	125	35.16	43	C
65.11	Horizontal	0	100	26.85	40	C
155.66	Horizontal	31	250	35.56	43	C
167.73	Horizontal	30	250	38.46	43	C
172.72	Horizontal	30	250	35.31	43	C
179.94	Horizontal	31	250	33.20	43	C
480.00	Vertical	0	150	38.80	46	C

C=Compliant

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

XPLF Version

Frequency (MHz)	Polarization	Azimut (degree)	Antenna Height (cm)	Measure (dB μ A/m)	Limit (dB μ A/m) (*)	Comments
0.125	Circular 0°	193	100	4.25	33.25	C
0.125	Circular 45°	214	100	2.20	33.25	C
0.125	Circular 90°	90	100	-1.63	33.25	C

C=Compliant

Carrier measurement at 10m: 4.25 dB μ A/m ($\approx$ 55.75dB μ V/m)

(*) Using an extrapolation factor of 40 dB/decade (as described in section 15.31 (f)), the level at 300m is about -3.33dB μ V/m (0.682 μ V/m) for a limit at 19.2 μ V/m.

XPLF Version

Frequency (MHz)	Polarization	Azimut (degree)	Antenna Height (cm)	Measure (dBμV/m)	Limit (dBμV/m)	Comments
39.78	Vertical	0	100	30.15	40	C
57.30	Vertical	0	100	24.61	40	C
70.24	Horizontal	0	400	25.22	40	C
167.50	Horizontal	30	250	38.47	43	C
179.62	Horizontal	35	250	33.39	43	C

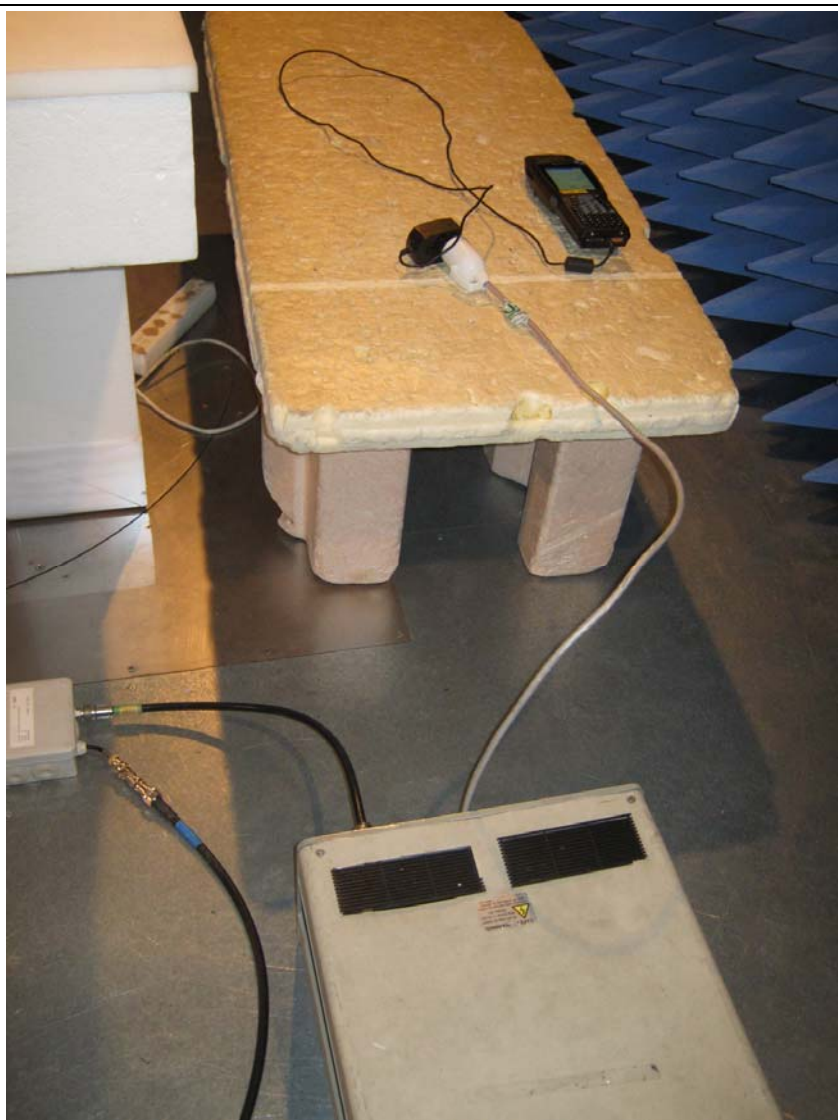
C=Compliant

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

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

ANNEX: PHOTOGRAPH(S)

Conducted emissions



Radiated measurement on open
area test site



Radiated measurement on open
area test site



Radiated measurement on open
area test site



Radiated measurement on open
area test site (carriers
measurements)



Frequency tolerance (climatic
enclosure)



Ac power supply used for
110Vac/60Hz power supply
measurement

