

R041-16-103497-3A - DMO / CBU

This report cancels and replaces the test report R041-16-103497-3A Ed.0

RADIO TEST REPORT

According to the standard(s):

FCC part 15 Subpart C

Equipment under test:

smartCENTER
(model: 7472A SMC2_RC_1)

FCC ID: 2AIXASM7472ARC

Company:

SmartINST SAS

Diffusion: Mr GASTEUIL

(Company: SmartINST SAS)

Number of pages: 29 including 1 annex

Ed.	Date	Modified page(s)	Technical verification	
			Quality approval	Visa
1	29 Sep. 16	Refer to lines in the margin	David MONTAULON	

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NAME OF THE EQUIPMENT UNDER TEST (E.U.T.) : smartCENTER

Serial number : Not communicated

P/N : 7472A SMC2_RC_1

Software version : Not communicated

MANUFACTURER'S NAME : SmartINST SAS

APPLICANT'S ADDRESS:

Company : SmartINST SAS

Address : 213 rue de Gerland - Bâtiment B1
69007 LYON
FRANCE

Person(s) present during the tests : Mr GASTEUIL

Responsible : Mr GASTEUIL

TESTS LOCATION(S) : EMITECH MONTPELLIER laboratory in
VENDARGUES (34) - FRANCE
Open area test site in SALINELLES (30) -
FRANCE
FCC Accredited under US-EU MRA
Designation Number : FR0006

TESTS SUPERVISOR(S) : David MONTAULON

TESTS OPERATOR(S) : Fabien MOINACHE

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1. INTRODUCTION

This document submits the results of Electromagnetic Compatibility tests performed on the **smartCENTER** (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 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: The smartCENTER is a benchtop device. It contains a computer to store analyze and display the signals that are measured and a dedicated electronic board with 5 entries to retrieve the RF signals from the smartCAPS.

Model: 7472A SMC2 RC_1
FCC ID: 2AIXASM7472ARC

4. TECHNICAL SPECIFICATIONS

Presentation of equipment for testing purposes:

Frequency ranges used by the transmitter: 433.45MHz to 434.40 MHz

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

Choice of model for testing:

Total channel available: 4

Channel 9; 433,45 MHz

Channel 16; 433,80 MHz

Channel 22; 434,10 MHz

Channel 28; 434,40 MHz

Most used channel is the Low Channel 433.45

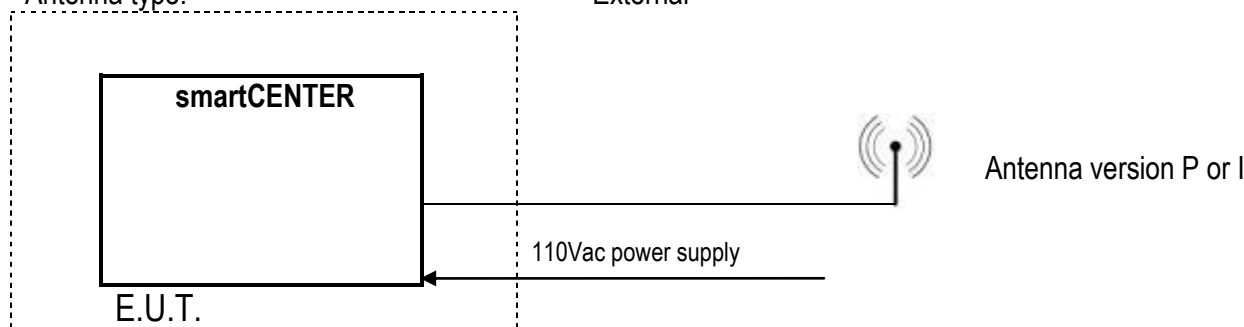
Test(s) frequency(ies): 433.45MHz & 434.40 MHz (Lower and upper channels)

Extremes temperature ranges: 5°C/+35°C

Mechanical and electrical design:

Power source / Battery type: 110Vac/60Hz

Antenna type: External



Tests were performed with two possible kind of antenna (equipped with SMA RP connector), Antenna P and antenna I

Antennas:

Version P (benchtop antenna)	Version I (immersed antenna)
Maximum gain: 0dBi (34Ohms; VSWR: 1.5) SMA reverse polarity cable. 	Maximum gain: 0dBi (22-70Ohms; VSWR: 7) SMA reverse polarity cable. 

Auxiliary test equipment: No

Equipment modifications applied during tests: No

5. SUMMARY OF TEST RESULTS

Tests designation	Results satisfying?	Comments
Antenna requirement - FCC part 15.203	YES	External antenna with SMA connector reverse polarity
Restricted band of operation - FCC part 15.205	YES	
Conducted power lines - FCC part 15.207	YES	
Unwanted radiated emissions - FCC part 15.209 and 15.231 b)	YES	
Periodic operation in the band 40.66-40.70MHz and above 70Mhz - FCC part 15.231 b)	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. CONDUCTED EMISSIONS – SECTION 15.207

Standards: FCC part 15 Subpart C 15.207

Tests methods: ANSI C63.10: 2013

Test configuration:

Tested cable(s)	Measure with	E.U.T. height
110Vac/60Hz power supply RF on 50 Ohms load	L.I.S.N.	40cm

Frequency band	Tested cable(s)	Resolution bandwidth	Video bandwidth	Detection mode
150kHz-30MHz	110Vac/60Hz power supply RF on 50 Ohms load	10KHz	30kHz	Peak

Test method deviation: No

Test equipment list:

CATEGORY	BRAND	TYPE	N° EMITECH	DATE CAL.	DATE VAL.
Cable	EMITECH	Current absorber sheath	10653	24/11/2015	24 months
Cable	MICRO-COAX	N-3m	10535	24/11/2015	24 months
Cable	MICRO-COAX	N-5m	10527	24/11/2015	24 months
LISN	AFJ	LT42C\10	12007	04/05/2015	12 months
PE chocke	EMITECH	PE chocke 100A	10071	#	#
PE chocke	EMITECH	PE chocke 16A	10080	#	#
Receiver	Agilent Technologies	E4440A	5824	11/01/2016	24 months
Receiver	Rohde & Schwarz	ESHS10	3371	16/04/2015	24 months
Shielded enclosure	RAY PROOF	C.GS3	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

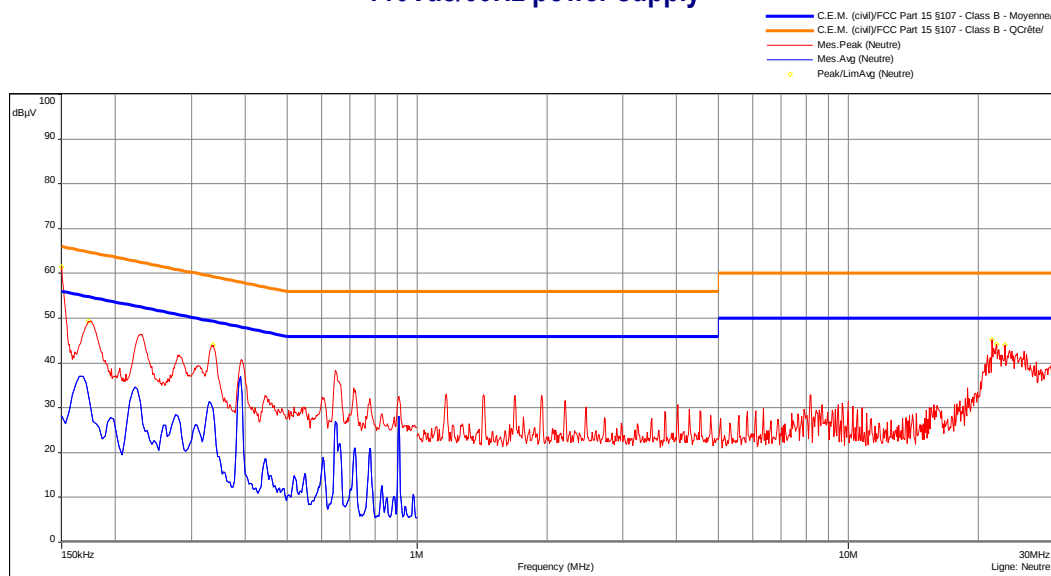
BAT-EMC software version: V3.6.0.32

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

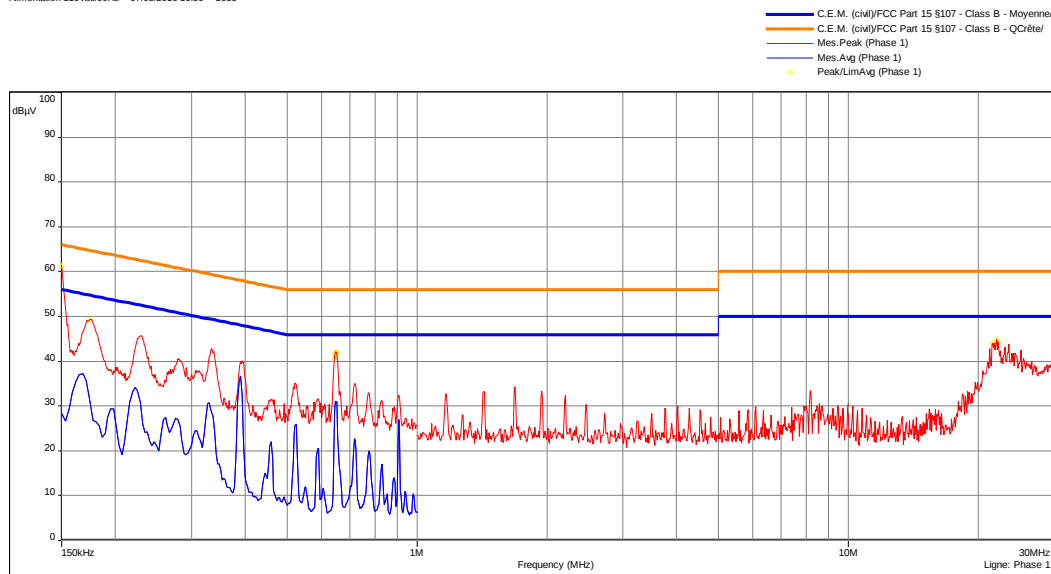
Conducted voltage emission (measurement)

110Vac/60Hz power supply

EMI2447



Alimentation 110Vac/60Hz - 07/05/2016 16:50 - 2635



Alimentation 110Vac/60Hz - 07/05/2016 16:50 - 2635

Date: 05/07/2016 16:50:29

Technician: FMO

Classe: B of the standard

Detection:
Peak

Modification(s) during test:
No

7. UNWANTED RADIATED EMISSIONS

Standards: FCC part 15 Radio part 15.209 and 15.231 b)

Tests methods: FCC part 15.209

a) Measurement in fully 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-5GHz	Front side	1MHz	3MHz	Peak	80cm

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.

Measurements are done in max-hold peak detection in hopping mode maximized at 360°.

Above 1GHz test is done in fully anechoic shielded chamber at 3m. E.U.T. is set on a styrofoam table. In order to find highest levels, tests are done on 3 axes of E.U.T.

Measurements are done in max-hold peak detection in hopping mode maximized at 360°.

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 15.231 e).

Above 1GHz average limits in restricted bands and general limits are 54dBμV/m.

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	12 months
Cable	C&C	N-3m	10558	24/11/2015	24 months
Cable	C&C	N-3m	10557	25/11/2015	24 months
Cable	MICRO-COAX	N-5m	10529	24/11/2015	24 months
Filter	Micro-Tronics	HPM 11630	4392	07/08/2014	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

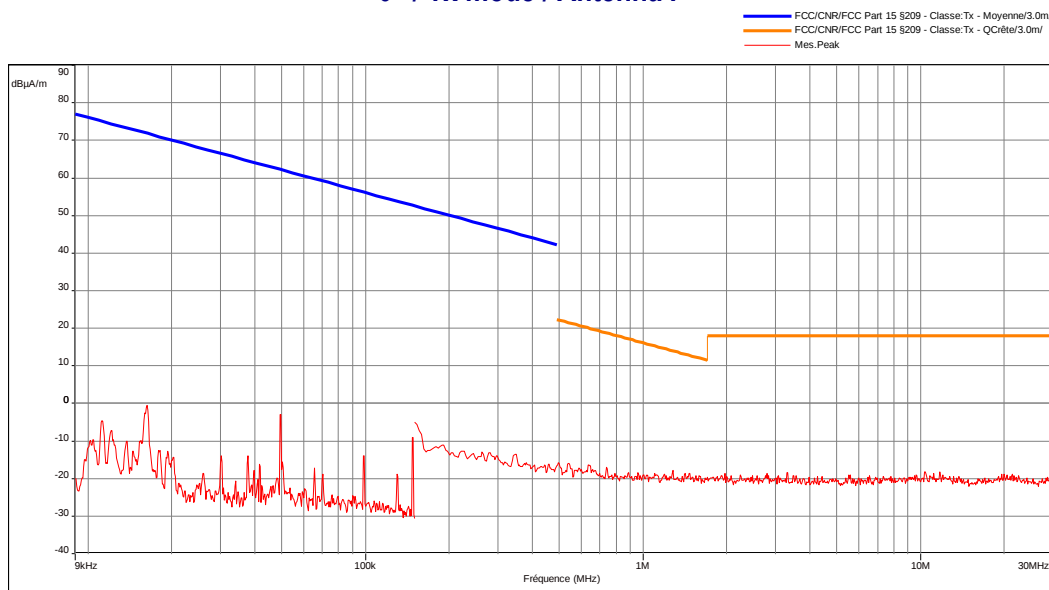
BAT-EMC software version: V3.6.0.32

Results: See **Graphs** hereafter.

Radiated magnetic field emission (measurement)

0° / Tx mode / Antenna P

EMI2454



Date: 05/07/2016 15:45:22

Technician: FMO

Classe: Tx of the standard

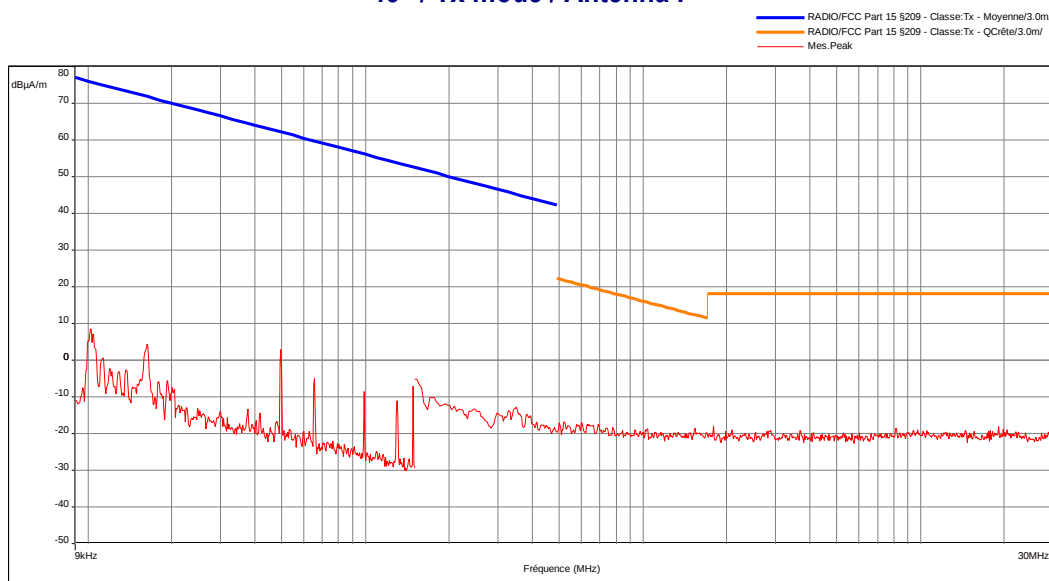
Detection:
Peak

Modification(s) during test:
None

Radiated magnetic field emission (measurement)

45° / Tx mode / Antenna P

EMI2455



Date: 05/07/2016 15:42:09

Technician: FMO

Classe: Tx of the standard

Detection:
Peak

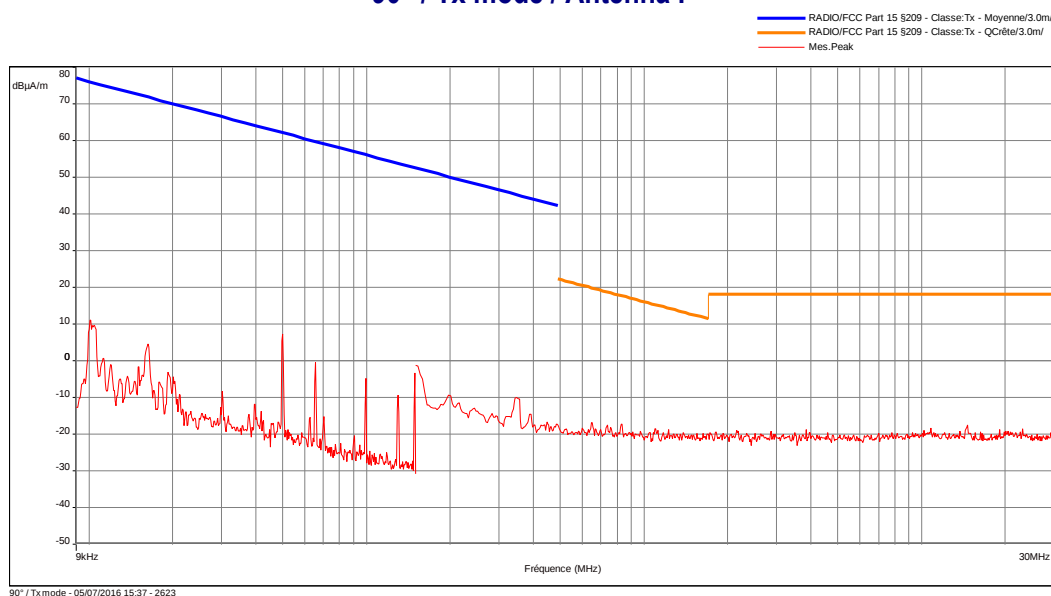
Modification(s) during test:
None

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

Radiated magnetic field emission (measurement)

EMI2456

90° / Tx mode / Antenna P



Date: 05/07/2016 15:37:14

Technician: FMO

Classe: Tx of the standard

Detection:
Peak

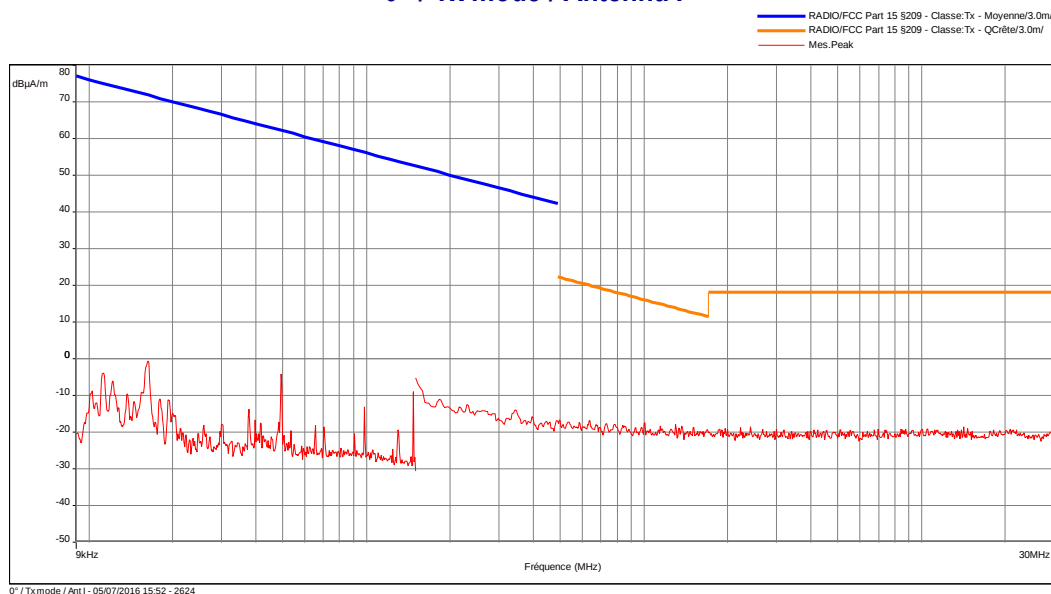
Modification(s) during test:
None

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

Radiated magnetic field emission (measurement)

0° / Tx mode / Antenna I

EMI2454



Date: 05/07/2016 15:45:22

Technician: FMO

Classe: Tx of the standard

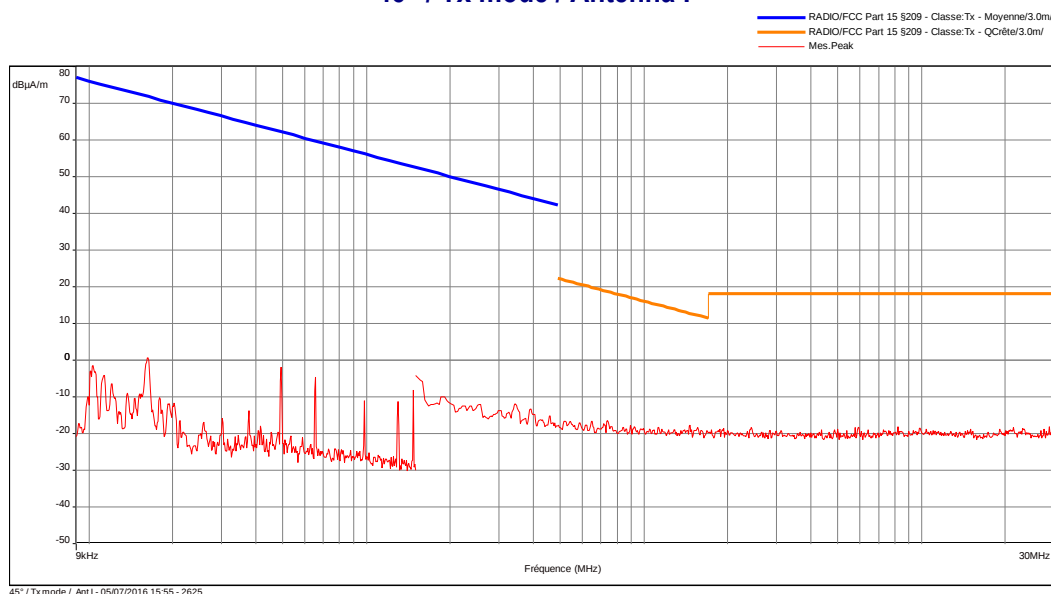
Detection:
Peak

Modification(s) during test:
None

Radiated magnetic field emission (measurement)

45° / Tx mode / Antenna I

EMI2455



Date: 05/07/2016 15:42:09

Technician: FMO

Classe: Tx of the standard

Detection:
Peak

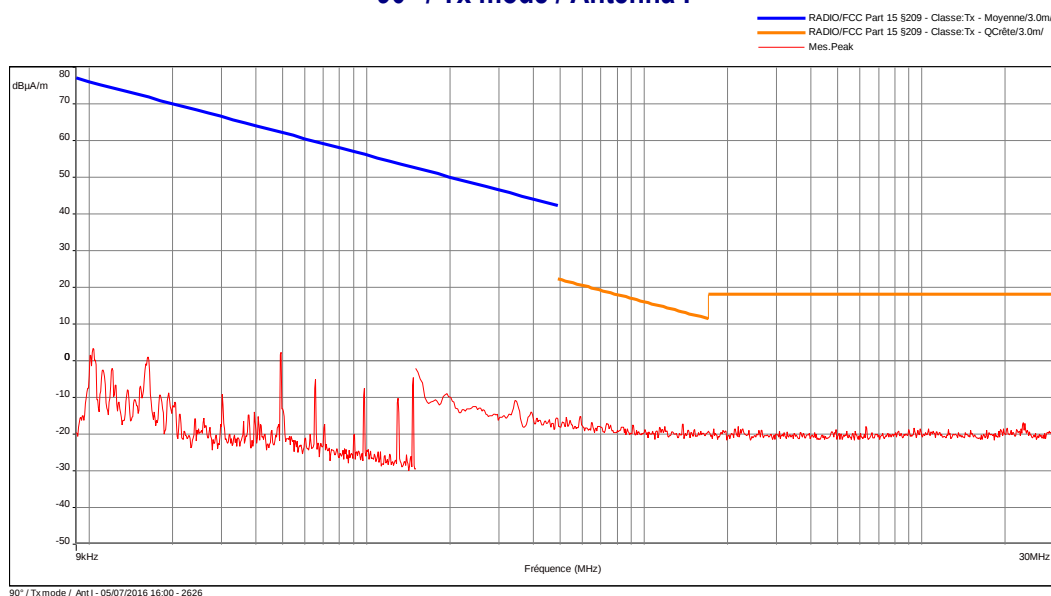
Modification(s) during test:
None

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

Radiated magnetic field emission (measurement)

EMI2456

90° / Tx mode / Antenna I



Date: 05/07/2016 15:37:14

Technician: FMO

Classe: Tx of the standard

Detection:
Peak

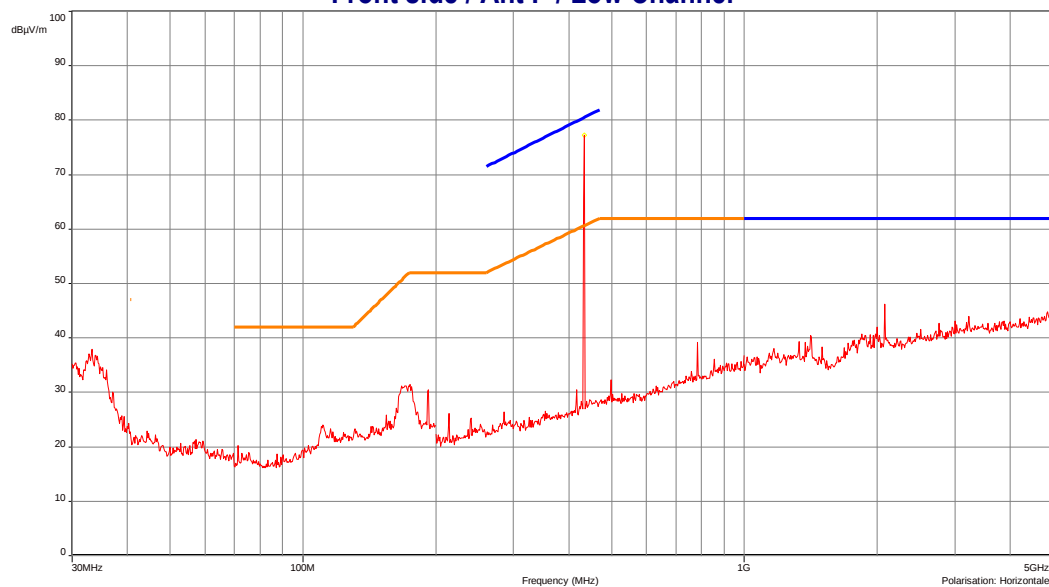
Modification(s) during test:
None

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

Radiated electric field measurement

EMI2581

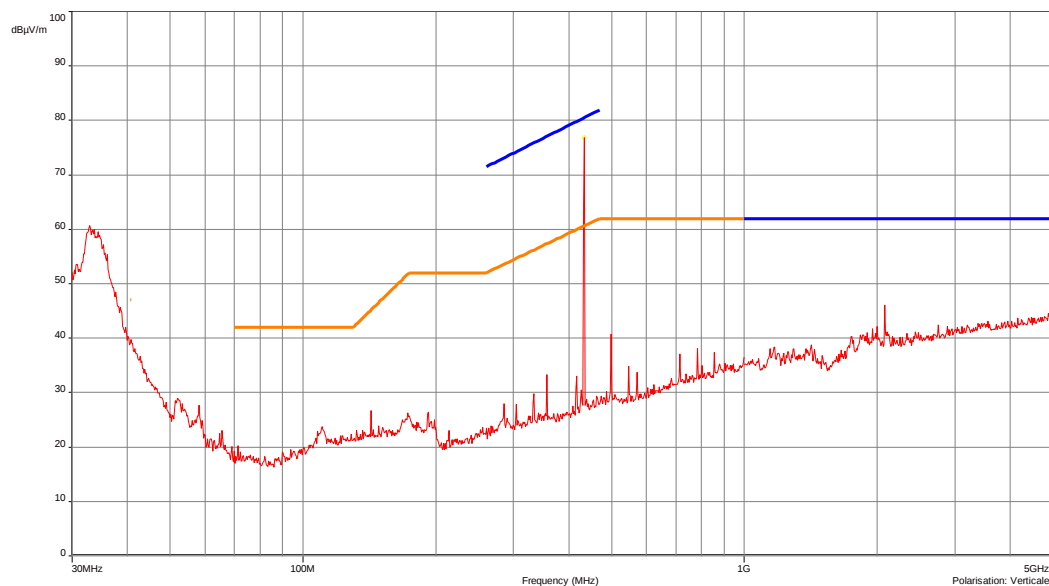
Front side / Ant P / Low Channel



Date: 05/07/2016 10:32:09

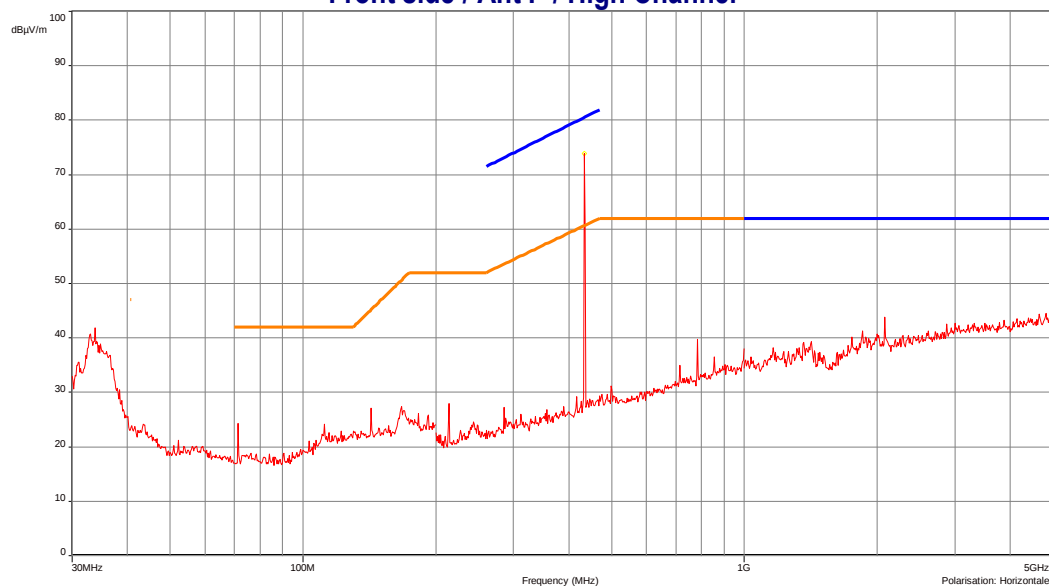
Technician: FMO

Detection:
Peak

Modification(s) during test:
None


Radiated electric field measurement Front side / Ant P / High Channel

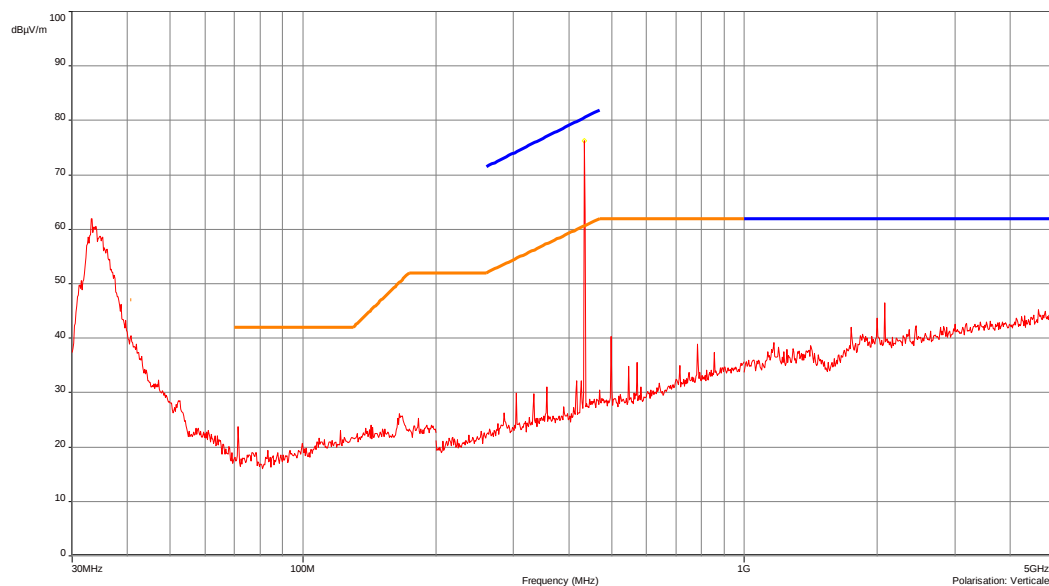
EMI2588



Date: 05/07/2016 13:51:25

Technician: FMO

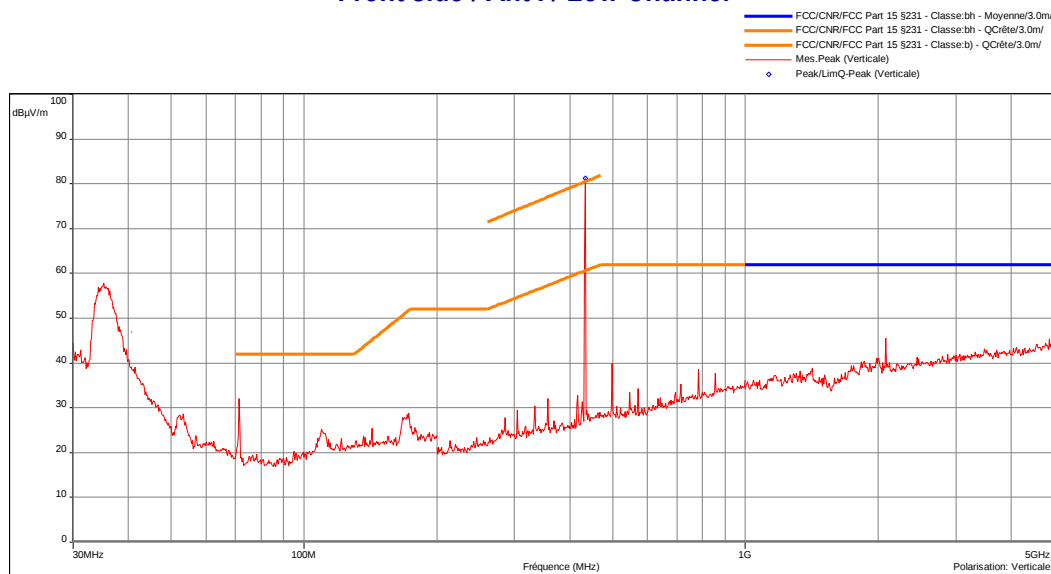
Detection:
Peak

Modification(s) during test:
None


Radiated electric field measurement

EMI2488

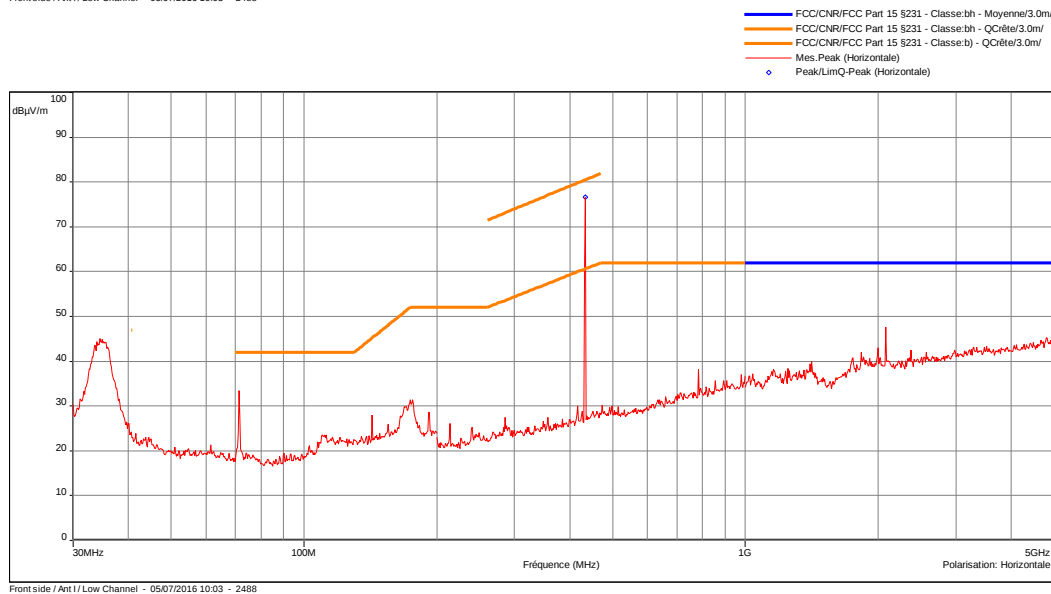
Front side / Ant I / Low Channel



Date: 05/07/2016 10:03:45

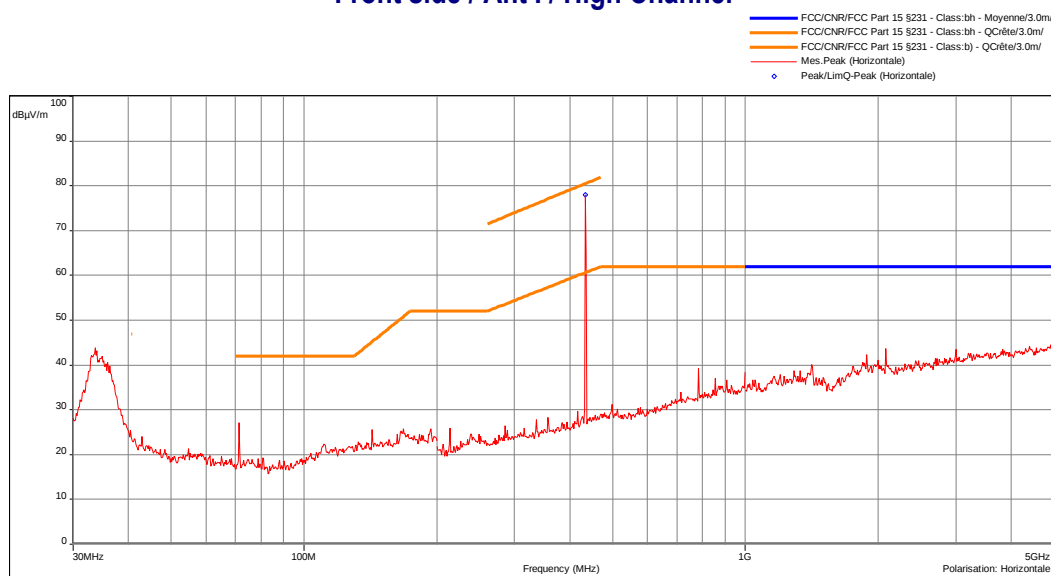
Technician: FMO

Detection:
Peak

Modification(s) during test:
None


Radiated electric field measurement Front side / Ant I / High Channel

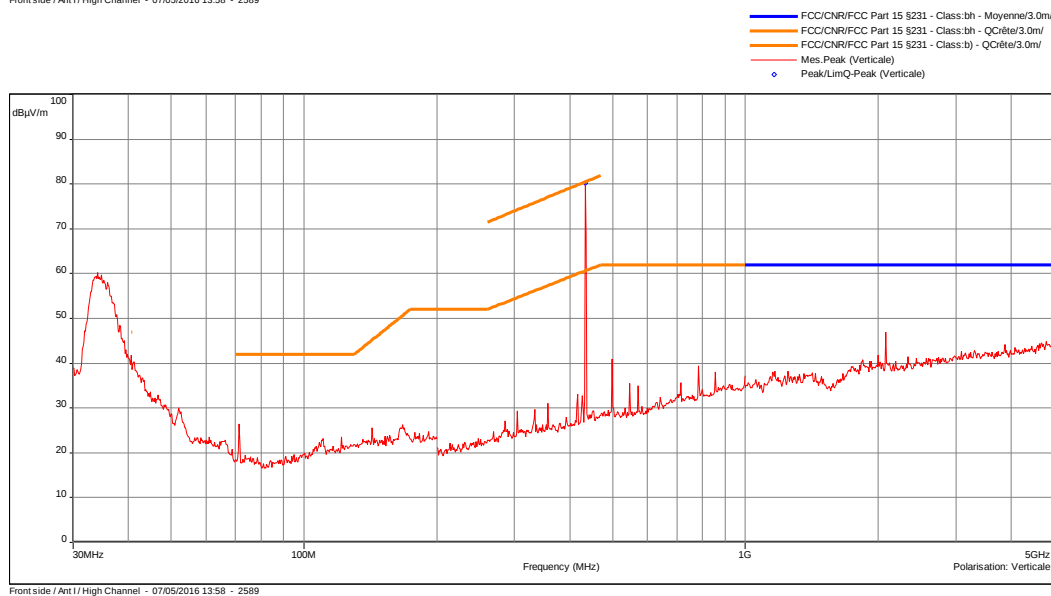
EMI2589



Date: 05/07/2016 13:58:39

Technician: FMO

Detection:
Peak

Modification(s) during test:
None


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

Temperature (°C): 26.5

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.

Frequency (MHz)	Polarization	Azimuth (degree)	Antenna Height (cm)	Measure (dBμV/m)	Limit (dBμV/m)	Margin
71.31	Vertical	270	270	23.11	40	-16.89
32.90	Vertical	180	100	33.00	40	-7.00
38.67	Vertical	180	100	34.58	40	-5.42
499.16	Vertical	0	100	43.29	46	-2.71

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

8. PERIODIC OPERATION IN THE BAND 40.66-40.70MHZ AND ABOVE 70MHZ

Standards: FCC Part 15 Radio part 15.231 b)

Tests methods: ANSI C63.10:2013

Test configuration:

Frequency band	Tested side	Resolution bandwidth	Video bandwidth	Detection mode	E.U.T. height
433MHz-435MHz	Front side	100kHz	300kHz	Peak	80cm

Test method deviation: No

Test equipment list:

CATEGORY	BRAND	TYPE	N° EMITECH	DATE CAL.	DATE VAL
Antenna	Rohde & Schwarz	HFH2-Z2	5825	27/01/2015	24 months
Cable	Huber Suhner	N-20m	8385	23/04/2015	24 months
Receiver	Agilent Technologies	E4440A	5824	11/01/2016	24 months
Receiver	Rohde & Schwarz	ESHS10	3371	16/04/2015	24 months
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 Graph(s) hereafter

ANTENNA P

Frequency (MHz)	Polarization	Azimuth (degree)	Antenna Height (cm)	Measure (dBμV/m)	Limit (dBμV/m)	Margin (dB)
433.45	Vertical	200	100	80.40	80.50	-0.1
434.40	Vertical	220	100	78.42	80.55	-2.13

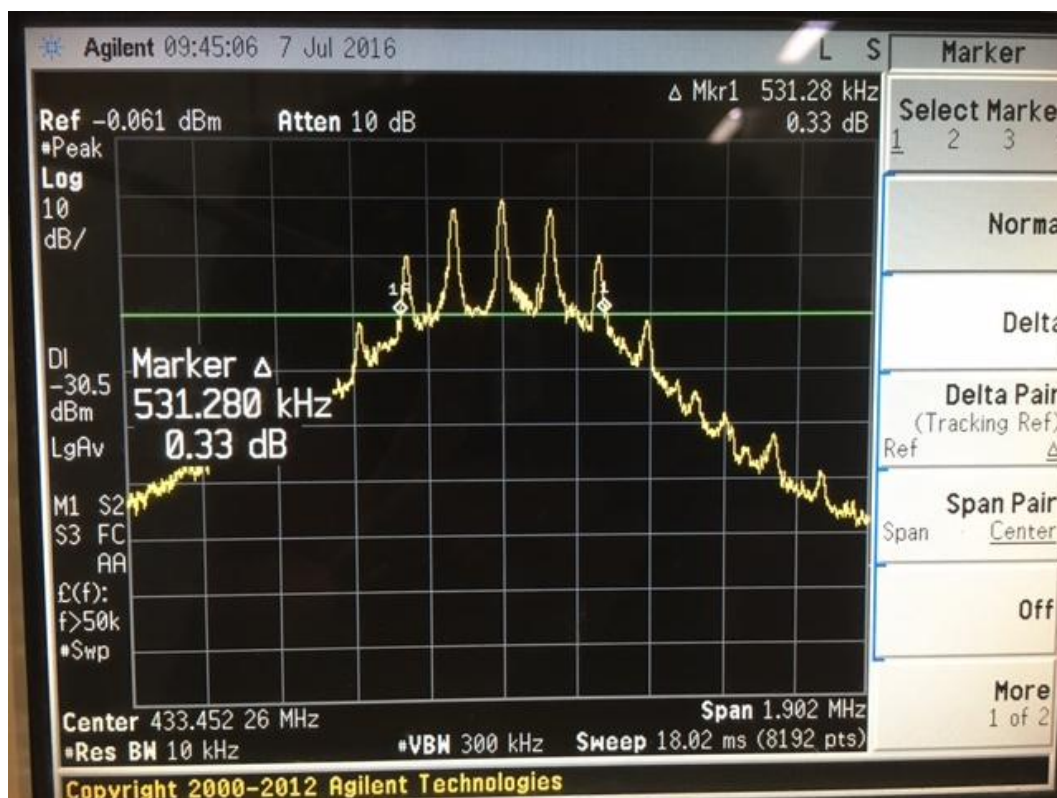
ANTENNA I

Frequency (MHz)	Polarization	Azimuth (degree)	Antenna Height (cm)	Measure (dBμV/m)	Limit (dBμV/m)	Margin (dB)
433.45	Vertical	270	100	79.73	80.50	-0.77
434.40	Vertical	270	100	78.53	80.55	-2.02

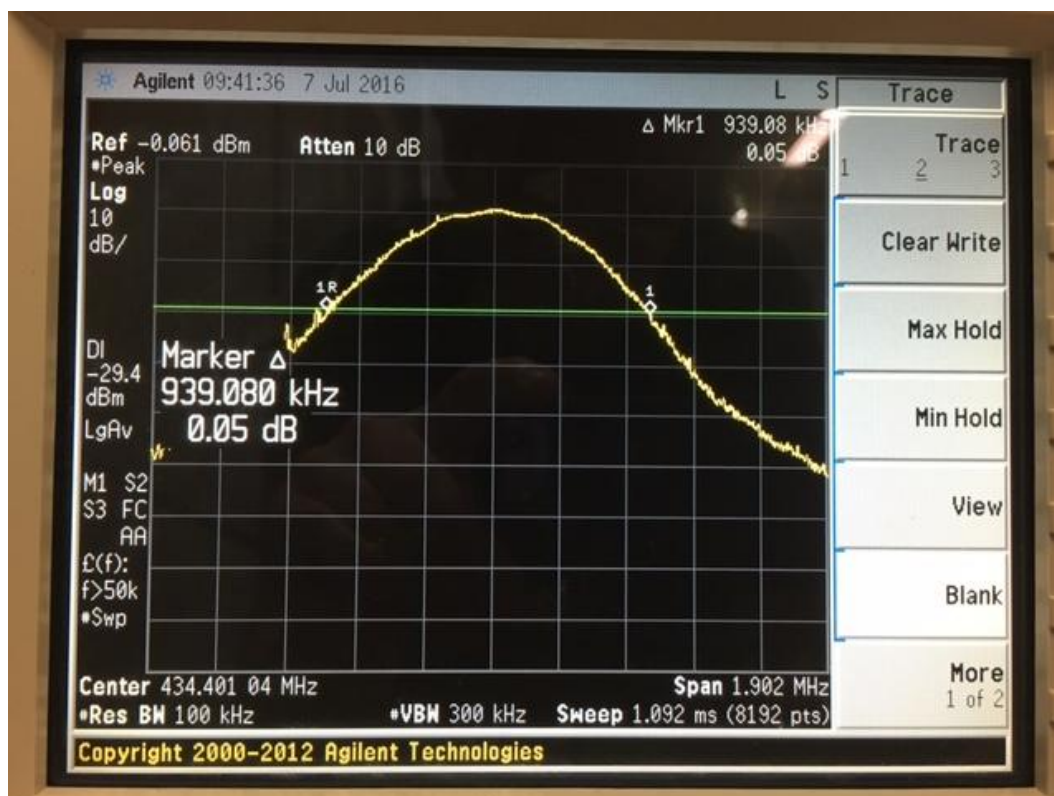
20dB Bandwidth Low Channel: 875.790 kHz (RBW=100kHz)



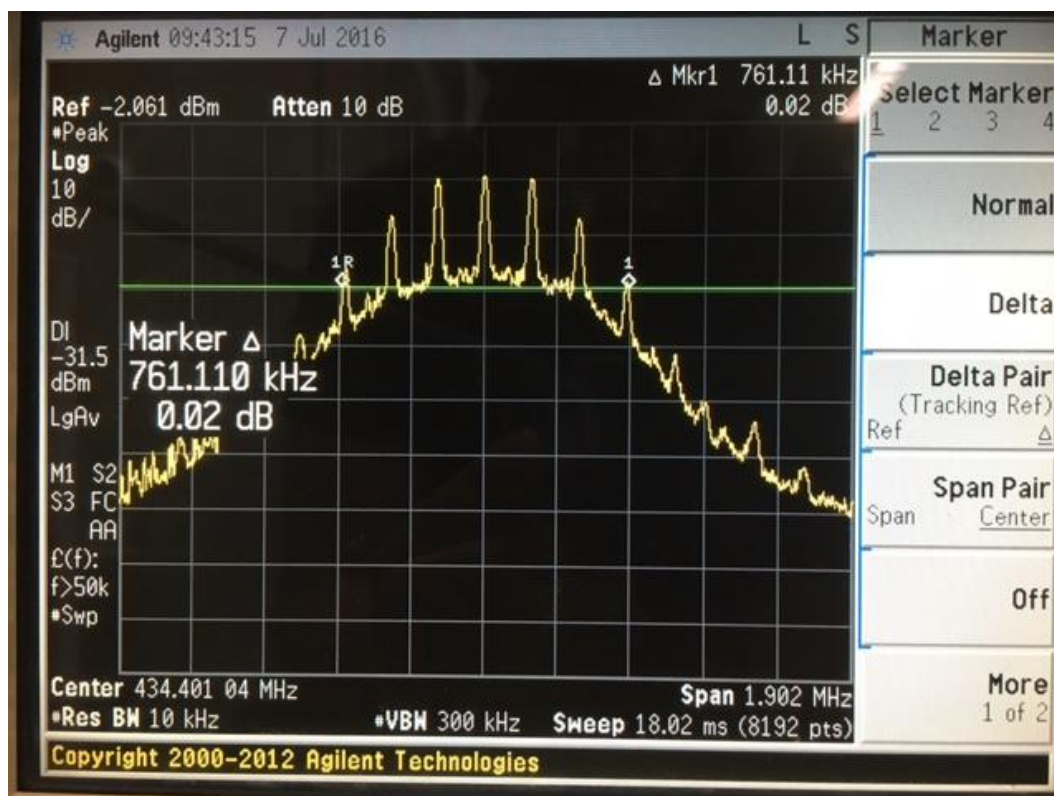
20dB Bandwidth Low Channel: 531.28 kHz (RBW=10kHz)



20dB Bandwidth High Channel: 939.08 kHz (RBW=100kHz)



20dB Bandwidth High Channel: 761.11 kHz (RBW=10kHz)



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

ANNEX: PHOTOGRAPH(S)

**E.U.T General view
(Top view)**



Antenna SMA RP connectors



Radiated pre measurement



Radiated pre measurement



Unwanted emissions ($f > 1\text{GHz}$)



Unwanted emissions ($f < 1\text{GHz}$)
(OATS)



Unwanted emissions ($f < 1\text{GHz}$)
And carrier measurement
(OATS)



Unwanted emissions (f<1GHz)
(OATS)



Conducted emissions

