REPORT
issued by an FCC listed Laboratory Reg. no. 93866. The test site complies with RSS-Gen, file no: IC 3482A-2

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Date	Reference	Page
2015-04-01	5P01967-F15C Rev1	1 (2)

1002
ISO/IEC 17025

Rev 1: 2015-06-09

HD Wireless AB
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Equipment Authorization measurements on 2412-2462 MHz Transceiver Unit
FCC ID: XO2HDG200

(12 appendices)

Rev.1, 2015-06-09: This side and Appendix 1, 3, 5 and 7 have been revised. Corrected the frequency in the header. Added P in the product name. New 6 dB BW measurements with proper reference level. Corrected some corr-figure in Appendix 3 and corrected unit for power density in Appendix 7.

Test objects

Product name: SPB820P.
The SPB820 contains the SiP module HDG820P with HDG820P firmware.
Product number: Unit for radiated tests: SPB820P-B, unit for conducted tests: SPB820P-D
(The EUT is also a mounted on an adapter PCB (SPB419) to fit in the PC connection board (SPB406)).
Identity numbers: 78C40E104797 (unit for radiated test).
78C40E104796 (unit for conducted tests).
Firmware revision: 1.0.8.
Radio firmware: pico 2.2.
The test objects were tested stand alone as a module and connected to a PC Connection board SPB406, during the test.

Summary

See Appendix 1 for general information and Appendix 12 for photos.
Emission measurements as specified below have been performed.

Standard	Compliant	Appendix	Remarks
FCC 47 CFR Part 15 C 15.247 Operation within the band 2400-2483.5 MHz	**Yes**		
Duty cycle measurements	N/A	2	
15.247 (a) (2) 6 dB bandwidth	Yes	3	
15.247 (b) (3) Maximum peak conducted power	Yes	4	
15.247 (d) Restricted bands of operation and 20 dB below fundamental	Yes	5	
15.247 (e) Power spectral density	Yes	6	
15.247 (i) / RF Safety	Yes	7	
15.215 (c) 20 dB bandwidth	Yes	8	
15.207 Conducted emission limits	Yes	9	
2.1049 Occupied bandwidth	Yes	10	
2.1049 Band Edge	Yes	11	

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Performance test and requirements

The tests were performed to verify that SPB820P module meets the electromagnetic compatibility requirements of FCC 47 CFR part 15 C.

Test facility

The used anechoic chamber is compliant with the requirements of section 2.948 of the FCC rules and listed, registration number 96866, as a facility accepted for certification under parts 15 and 18. The site complies with RSS Gen, Issue 4 and is accepted by Industry Canada for the performance of radiated measurements, IC-file number 3482A-2.

Test object

Transceiver:	SBP820P
Antenna:	Chip antenna, Amotech ALA931C5
Antenna gain, peak, typical:	3.5 dBi
Antenna gain, total average, typical:	-0.2 dBi
Frequency range:	2412-2462 MHz
Frequencies used during test:	2412 MHz 2442 MHz 2462 MHz
Modulations/Data rate:	DPSK, 1 Mbit/s QDPSK, 2 Mbit/s CCK/DPSK, 5.5 Mbits/s CCK/BPSK, 11 Mbits/s OFDM/BPSK, 6 Mbits/s OFDM/BPSK, 9 Mbit/s OFDM/QPSK, 12 Mbit/s OFDM/QPSK, 18 Mbit/s OFDM/16-QAM, 24 Mbit/s OFDM/16-QAM, 36 Mbit/s OFDM/64-QAM, 48 Mbit/s OFDM/64-QAM, 54 Mbit/s MCS-0, OFDM/BPSK, 7.2 Mbit/s MCS-1, OFDM/BPSK, 14.4 Mbit/s MCS-2, OFDM/BPSK, 21.7 Mbit/s MCS-3, OFDM/16-QAM, 28.9 Mbit/s MCS-4, OFDM/16-QAM, 43.4 Mbit/s MCS-5, OFDM/16-QAM, 57.8 Mbit/s MCS-6, OFDM/16-QAM, 65 Mbit/s
Supply voltage:	Nominal: 3.3 V DC via USB Extreme voltage acc. to client: 2.85-4.35 VDC ±15% acc. to 15.31(e): 2.805-3.795 V DC

At the conducted sample also the chip antenna was mounted at the PCB. The chip antenna was not connected to the RF-port of the EUT during the conducted tests.

Conducted tests:
The test object was tested stand alone as a module The module was powered by a separate external DC Power supply, 3.3 V DC, which was powered with 120 V AC/60 Hz, The PC Connection board was powered via USB from a PC laptop, which was also powered with 120 V AC/60 Hz.

Radiated tests:
The test objects were tested stand alone as a module. The module was powered by the PC Connection board was powered via USB from a PC laptop, which was powered with 120 V AC/60 Hz.
The PC was placed outside the anechoic chamber during the test.

Preliminary tests were performed at mid channel (2442 MHz) and all data rates (modulations). The measurements were then done at OFDM/BPSK, 9 Mbit/s mode since this mode had the highest conducted output power. See Appendix 4, if not otherwise stated. Some complementary test with other modulation/data rates were also performed for some different tests, see each Appendix.

Measurement equipment

Measurement equipment	Calibration Due	SP number
Test Site Galvani	-	15:117
Test site Edison	2015-12	504 114
Signal Analyser R&S FSQ26	2015-07	-
R&S FSIQ40 Signal Analyser	2015-07	503 738
Spectrum analyzer R&S ESU 26	2015-07	902 210
LISN Schwarzbeck NNLA 8120	2016-01	504 129
LISN Schwarzbeck NSLK 8126	2016-01	503 114
Antenna Schaffner CBL 6143	2016-10	504 079
Horn antenna ETS Lindgren 3115	2016-10	902 212
Standard gain horn Flann 16240-25	-	503 939
Standard gain horn Flann 18240-25	-	503 900
Standard gain horn Flann 20240-20	-	503 674
Low Noise Amplifier Miteq	2015-12	503 277
Low Noise Amplifier Miteq	2016-02	504 160
High pass filter Wainwright WHNX6	2015-12	BX40074
120 V AC/60 Hz AC Power source HP 6813B	2015-03	503 091
DC power supply HP E3632A	-	503 170
True RMS Multimeter Fluke 85III	2015-08	503 418
Multimeter Fluke 83	2015-08	501 522
Temperature and humidity meter Testo 615	2015-06	503 498
Temperature and humidity meter Testo 625	2015-06	504 117

Operational test mode

The following were set in the s/w RF test software, if not otherwise stated.
Modulation/Rate: OFDM/BPSK 9 Mbit/s with PRBS9 (9-bits Pseudo Random Bit Sequence) (the rate with the highest output power, see Appendix 4).
Tx power dBm: 20 dBm
Idle time: 0
Number of frames: 1 000 000
Frame length (byte): 1536

For duty cycle measurements see appendix 2.
With the setting above the duty cycle was measured and was varied between 431.39/774.39 µs = 0.557 = 55.7% and 431.39/495.49 µs = 0.871 = 87.1% .
The PRF was calculated to PRF = 1/T = 1/495.49 µs = 2 018 Hz, broad band,"pulse spectrum", RBW>PRF=1/T.
$1/\tau$ = 1/431.39 µs = 2 318 Hz, $1/\tau$<RBW.

The PRF was calculated to PRF = 1/T = 1/495.49 µs = 2 018 Hz, thus QP-detector was used without any correction for pulse desensitization.

Cabling during radiated emission test:

EUT port	Cable type	Termination / use
USB	Multi-wire, shielded, 4.0 m length. The cable was also extended with active USB repeater, to get enough cable length to reach the PC laptop.	Connected to the PC laptop outside the chamber. Twenty clamp on ferrites, type amidon 2X-43-151, the first was attached 2 m away from the EUT. The shield of the cable was also grounded at lead-through of the chamber and also a ferrite clamp Lüthi FTC101 was attached at the lead-through.

Connected equipment during the test

PC laptop Dell Vostro with s/w: ProdTestGui.	Client equipment

Uncertainties

Measurement and test instrument uncertainties are described in the quality assurance documentation "SP QD 10885". The measurement uncertainties can be found in the table below. The uncertainties are calculated with a coverage factor k=2 (95% level of confidence). The measurement uncertainties can be found in the table below:

Method	**Uncertainty**
Radiated emission, 30 – 1000 MHz	4.8/5.6 dB (V/H-pol)
Radiated emission, 1 – 40 GHz	2.6 dB
Conducted emission	3.5 dB

Compliancy evaluation is based on a shared risk principle with respect to the measurement uncertainty.

Reservation

The test results in this report apply only to the particular test object as declared in the report.

Delivery of test object

The test object was delivered: 2015-03-11

Test engineers

Fredrik Isaksson and Ermin Pasalic, SP

Duty cycle measurements

Date	Temperature	Humidity
2015-03-12	24 °C ± 3 °C	18 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009 and the KDB 558074 D01 DTS Meas Guidance v03r02, June 5, 2014, according to clause 6.0 b).

Conducted measurements were performed at the antenna connector and with continuous transmission and with normal modulation, OFDM/BPSK 9 Mbits/s.
The sweep points were set to 1251 in the signal analyser.
The test equipment was connected to an external 10 MHz reference standard during measurements.

Measurement equipment	SP number
Test site Galvani	15:117
Signal Analyser R&S FSQ26	-
120 V AC/60 Hz AC Power source HP 6813B	503 091
DC power supply HP E3632A	503 170
Multimeter Fluke 85 III	503 418
Temperature and humidity meter Testo 625	503 498

Measurement uncertainty: 1.3 %

Results

The duty cycle measurements can be found in the diagrams below:

Diagram 1:	2412 MHz, Tx on, OFDM/BPSK 9 Mbits/s, Frame length=1536 byte
Diagram 2:	2412 MHz, Period time, measurement 1 (T min), OFDM/BPSK 9 Mbits/s, Frame length=1536 byte
Diagram 3:	2412 MHz, Period time, measurement 2 (T max), OFDM/BPSK 9 Mbits/s, Frame length=1536 byte

Complies?	N/A

Diagram 1

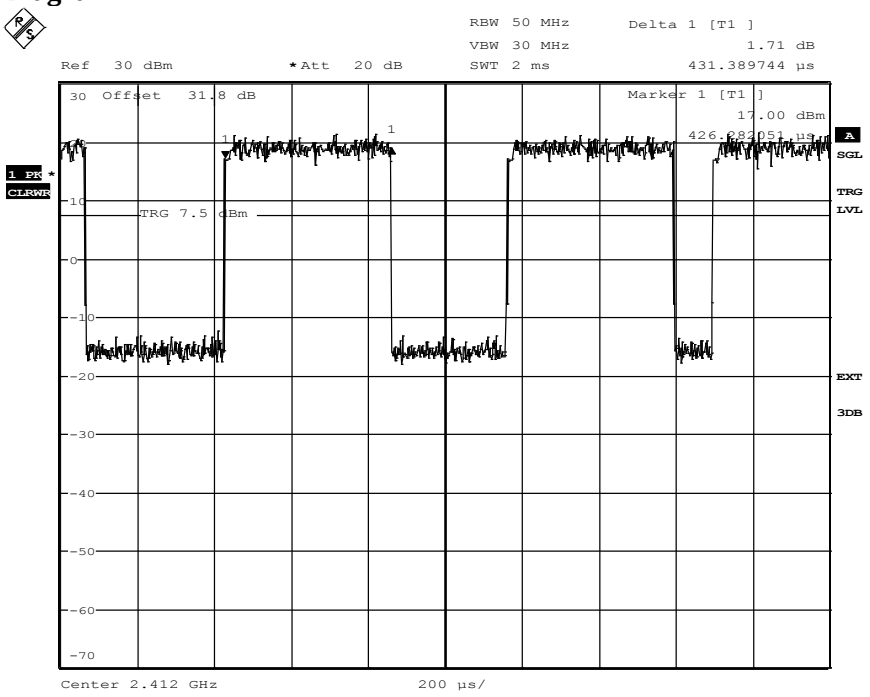

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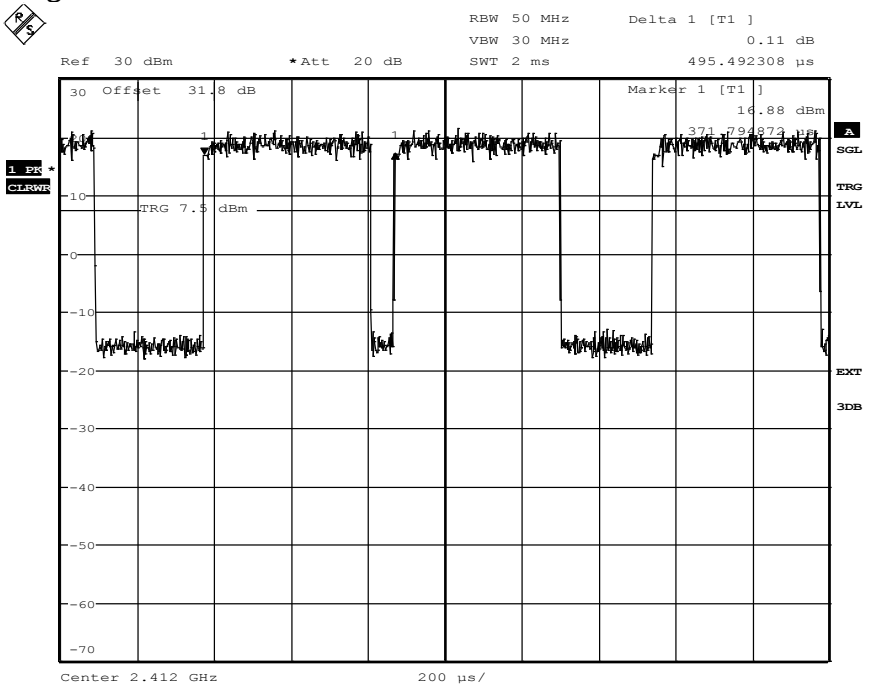
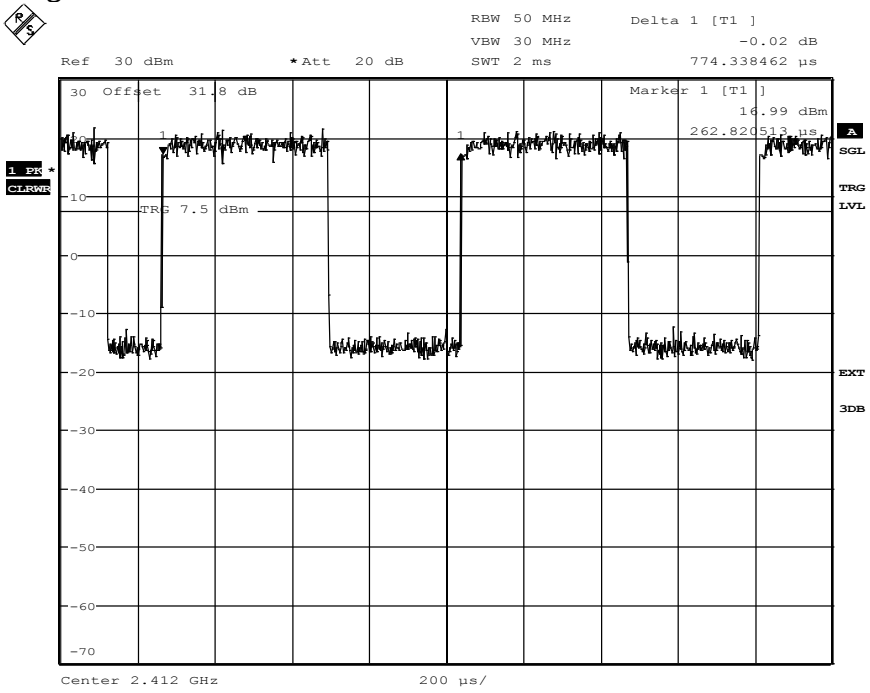
Diagram 2



Date: 12.MAR.2015 09:47:17

Diagram 3



Date: 12.MAR.2015 09:48:11

6 dB bandwidth measurements according to FCC 47 CFR part 15.247 (a) (2)

Date	Temperature	Humidity
2015-06-08	24 °C ± 3 °C	22 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009 and the KDB 558074 D01 DTS Meas Guidance v03r02, June 5, 2014, clause 8.1 option 1.

Conducted measurements were performed at the antenna connector and with continuous transmission and with different modulations, see the results.
The test equipment was connected to an external 10 MHz reference standard during measurements.

Measurement equipment	SP number
Test site Galvani	15:117
Signal Analyser R&S FSQ26	-
120 V AC/60 Hz AC Power source HP 6813B	503 091
DC power supply HP E3632A	503 170
Multimeter Fluke 85 III	503 418
Temperature and humidity meter Testo 625	503 498

Measurement uncertainty: 2.6 %

Results

Preliminary test, 2447 MHz, 6 dB BW vs. modulation/data rate:

Data rate (modulation)	6 dB BW, MHz
DPSK, 1 Mbit/s	10.16
QDPSK, 2 Mbit/s	10.16
CCK/DPSK, 5.5 Mbits/s	**8.27**
CCK/BPSK, 11 Mbits/s	9.13
OFDM/BPSK, 6 Mbits/s	16.06
OFDM/BPSK, 9 Mbit/s	16.15
OFDM/QPSK, 12 Mbit/s	15.86
OFDM//QPSK, 18 Mbit/s	15.51
OFDM/16-QAM, 24 Mbit/s	16.41
OFDM/16-QAM, 36 Mbit/s	16.31
OFDM/64-QAM, 48 Mbit/s	16.38
OFDM/64-QAM, 54 Mbit/s	16.31
MCS-0, OFDM/BPSK, 7.2 Mbit/	16.79
MCS-1, OFDM/BPSK, 14.4 Mbit/s	15.48
MCS-2, OFDM/BPSK, 21.7 Mbit/s	15.74
MCS-3, OFDM/16-QAM, 28.9 Mbit/s	16.47
MCS-4, OFDM/16-QAM, 43.4 Mbit/s	16.63
MCS-5, OFDM/16-QAM, 57.8 Mbit/s	16.60
MCS-6, OFDM/16-QAM, 65 Mbit/s	16.89

Final test, 6 dB measurements with modulation CCK/DPSK, 5.5 Mbits/s, can be found in the diagrams below:

Diagram 1	2412 MHz	6 dBW = **7.95 MHz**
Diagram 2	2442 MHz	6 dBW = **8.20 MHz**
Diagram 3	2462 MHz	6 dBW = **8.27 MHz**

Limits

According to 47CFR 15.247(a)(2), the minimum 6 dB bandwidth shall be at least 500 kHz.

Complies?	Yes

Diagram 1

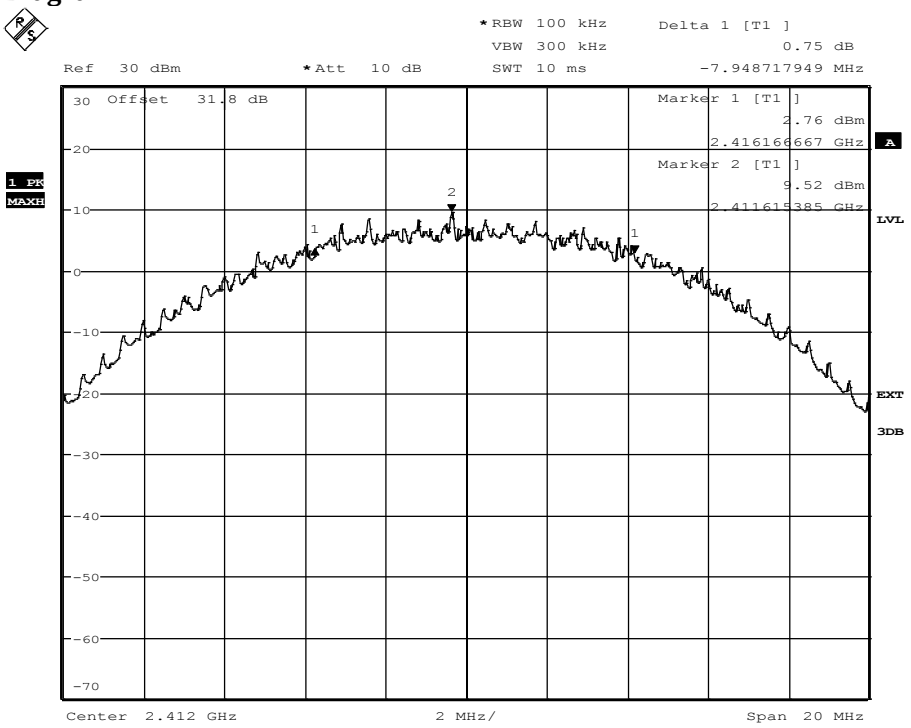


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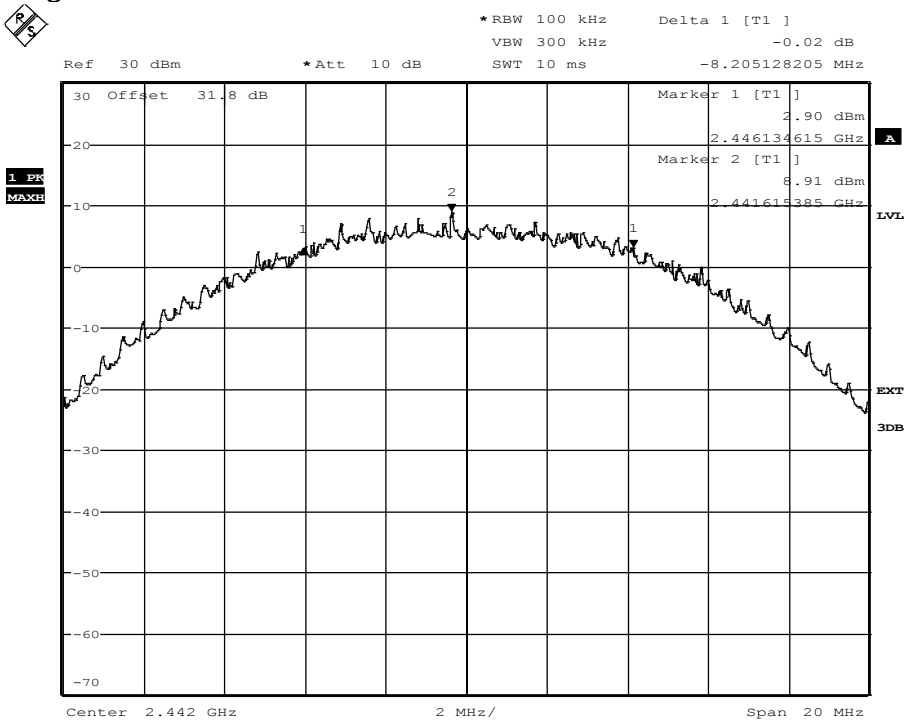
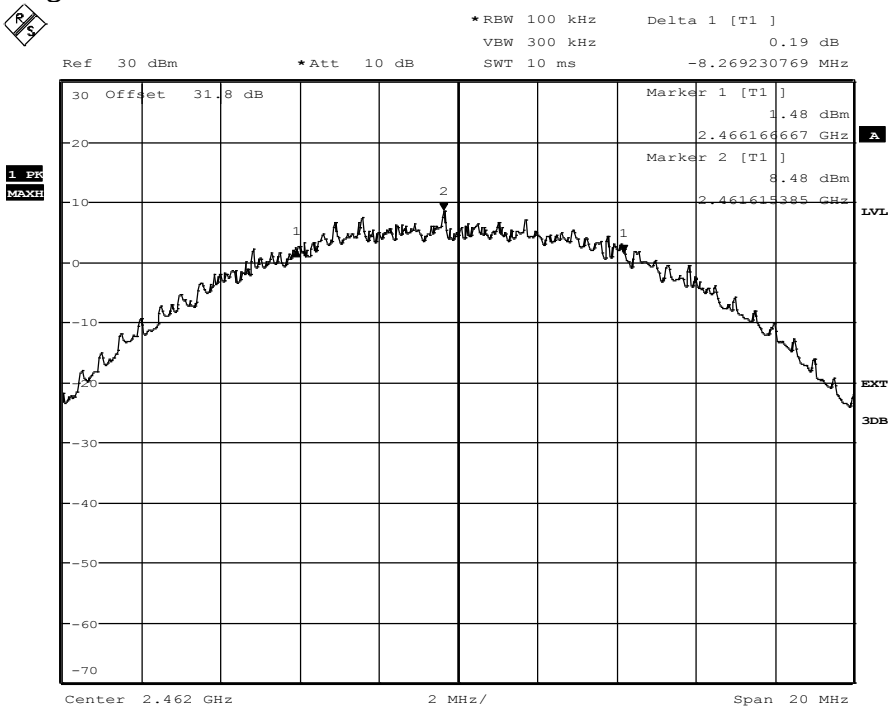
Diagram 2



Date: 8.JUN.2015 14:33:52

Diagram 3



Date: 8.JUN.2015 14:37:06

Maximum peak conducted output power measurements according to FCC 47 CFR part 15.247 (b) (3)

Date	Temperature	Humidity
2015-03-12	24 °C ± 3 °C	18 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009 and the KDB 558074 D01 DTS Meas Guidance v03r02, June 5, 2014, clause 9.1.1.

Conducted measurements were performed at the antenna connector and with continuous transmission and with different modulations, see the results.
The test equipment was connected to an external 10 MHz reference standard during measurements.

Measurement equipment	SP number
Test site Galvani	15:117
Signal Analyser R&S FSQ26	-
120 V AC/60 Hz AC Power source HP 6813B	503 091
DC power supply HP E3632A	503 170
Multimeter Fluke 85 III	503 418
Temperature and humidity meter Testo 625	503 498

Measurement uncertainty: 2.6 dB

Results

Preliminary test, 2442 MHz, maximum conducted peak output power vs. modulation/data rates:

Data rate (modulation)	Max conducted output power Peak det, dBm	RBW, MHz (RBW>6 dB BW, DTS BW)
DPSK, 1 Mbit/s	19.0	20
QDPSK, 2 Mbit/s	19.1	20
CCK/DPSK, 5.5 Mbits/s	19.2	20
CCK/BPSK, 11 Mbits/s	19.4	20
OFDM/BPSK, 6 Mbits/s	21.7	20
OFDM/BPSK, 9 Mbit/s	**22.1**	**20**
OFDM/QPSK, 12 Mbit/s	21,4	20
OFDM//QPSK, 18 Mbit/s	21.2	20
OFDM/16-QAM, 24 Mbit/s	21.8	20
OFDM/16-QAM, 36 Mbit/s	21.6	20
OFDM/64-QAM, 48 Mbit/s	21.5	20
OFDM//64-QAM, 54 Mbit/s	21.6	20
MCS-0, OFDM/BPSK, 7.2 Mbit/	20.0	20
MCS-1, OFDM/BPSK, 14.4 Mbit/s	19.4	20
MCS-2, OFDM/BPSK, 21.7 Mbit/s	19.7	20
MCS-3, OFDM/16-QAM, 28.9 Mbit/s	19.4	20
MCS-4, OFDM/16-QAM, 43.4 Mbit/s	19.5	20
MCS-5, OFDM/16-QAM, 57.8 Mbit/s	19.0	20
MCS-6, OFDM/16-QAM, 65 Mbit/s	19.7	20

Final test, maximum conducted peak output power, OFDM/BPSK, 9 Mbit/s can be found in the diagrams below:

Diagram 1	2412 MHz	3.30 V DC
Diagram 2	2442 MHz	3.30 V DC
Diagram 3	2462 MHz	3.30 V DC

Final test, OFDM/BPSK, 9 Mbit/s, RBW= 20 MHz (greater than 6 dB BW):

		Max peak output power Peak (dBm)		
		2412 MHz	2442 MHz	2462 MHz
T_{nom} 24°C	V_{nom} 3.30 V DC	22.3	22.1	21.8
T_{nom} 24°C	V_{min} 2.85 V DC Note 1	20.9	20.4	20.2
T_{nom} 24°C	V_{max} 4.35 V DC Note 1	22.4	22.2	22.2

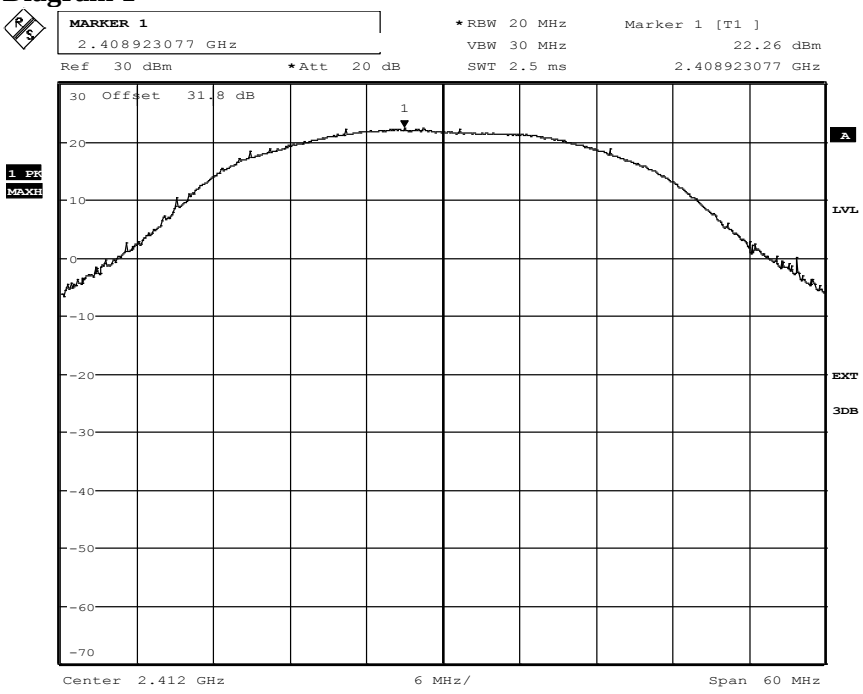
Note 1: According 47CFR 15.31(e), for intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.
In our case:
Nominal: 3.3 V DC.
Extreme voltage according to the client: 2.85-4.35 V DC
±15% according to 15.31(e): 2.805-3.795 V DC
The EUT did not transmit at 2.805 V DC, 2.85 was used as low voltage condition.

Limits

According to 47CFR 15.247(b)(3), for systems using digital modulation in the 2400-2483.5 MHz band: 1 Watt (30 dBm).

Complies?	Yes

Diagram 1



Date: 12.MAR.2015 08:03:46

Diagram 2

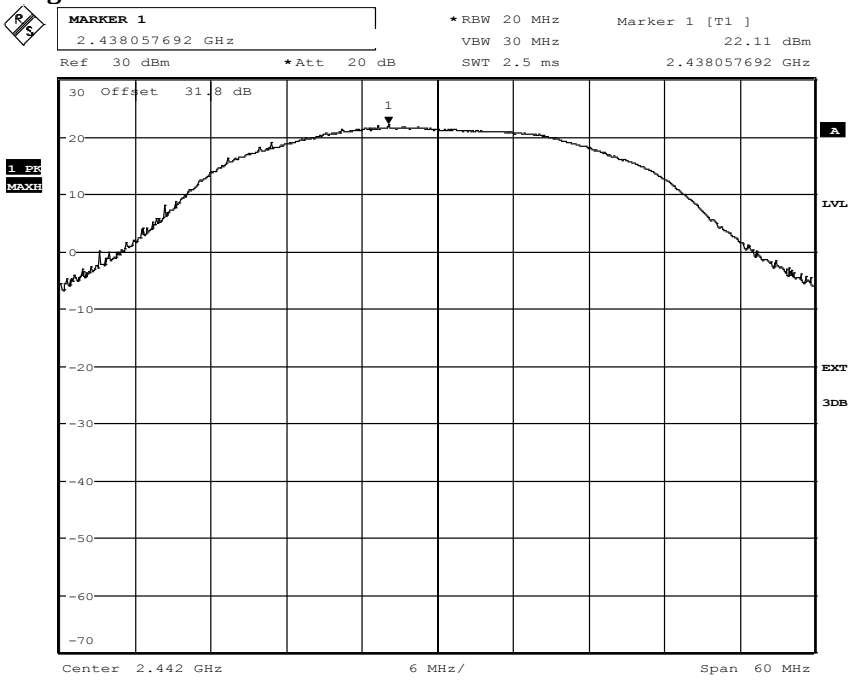


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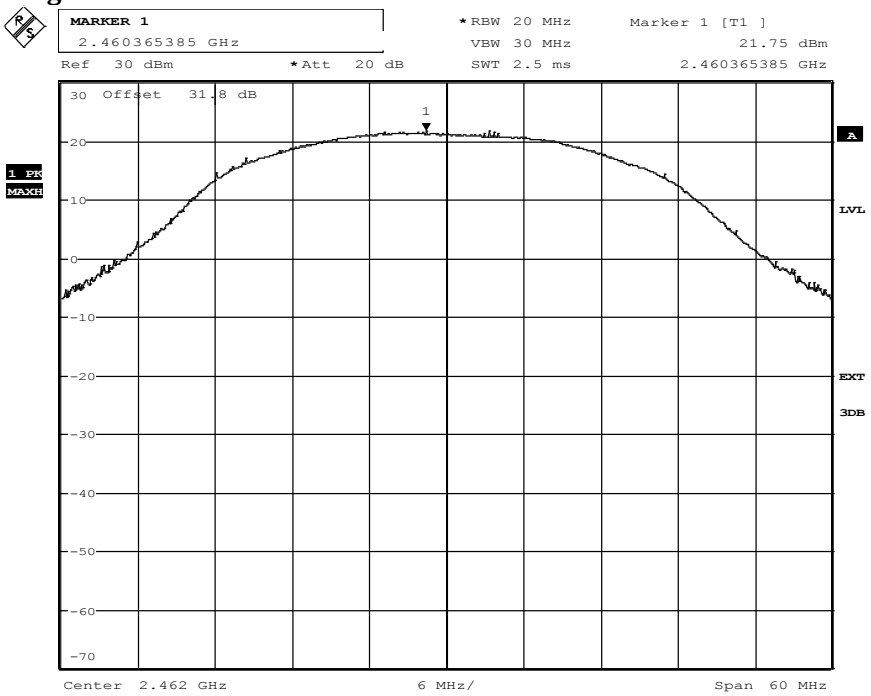
Diagram 3



Date: 12.MAR.2015 08:24:08

Restricted bands of operation and 20 dBc below fundamental measurements according to FCC 47 CFR part 15.247 (d)

Date	Temperature	Humidity
2015-03-13	22 °C ± 3 °C	21 % ± 5 %
2015-03-16	22 °C ± 3 °C	25 % ± 5 %
2015-03-17	22 °C ± 3 °C	26 % ± 5 %
2015-03-18	22 °C ± 3 °C	25 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009 and the KDB 558074 D01 DTS Meas Guidance v03r02, June 5, 2014.
Measured average levels related to the fundamental were measured according to cl. 12.2.5.3 and with trace mode in Max hold.

The test was performed with continuous transmission and with modulation OFDM/BPSK, 9 Mbit/s, which was deemed to be worst case according to Appendix 4.

The test of radiated emission was performed in a semi anechoic chamber. The measurements were performed with both horizontal and vertical polarizations of the antenna. The antenna distance during the measurements was 3.0 m in the frequency range 30 MHz-18 GHz and 1.0 m in the frequency range 18-25 GHz.

The measurement procedure is as follows:

1. A pre-measurement is performed with peak detector. The test object is measured in eight directions with the antenna in the frequency range 30-1000 MHz and in sixteen directions at frequencies above 1 GHz, with the antenna at three heights, 1.0 m, 1.5 m and 2.0 m.
2. If the emission is close or above the limit during the pre-measurement, the test object is scanned 360 degrees and the antenna height scanned from 1 to 4 m for maximum response. Then the emission is measured with the quasi-peak detector on frequencies below 1 GHz and with the average detector above 1 GHz.

The following RBW were used:
30 MHz-1 GHz: RBW=120 kHz
1-25 GHz: RBW=1 MHz

Test set-up photos during the tests can be found in Appendix 12.

Measurement equipment	SP number
Semi anechoic chamber, Edison	504 114
Spectrum analyser R&S ESU 26	902 210
EMI measurement computer	-
Software: R&S EMC32, ver. 9.15.0	503 745
Antenna Schaffner Bilog CBL6143	504 079
Horn antenna ETS Lindgren 3115	902 212
Low Noise Amplifier Miteq	504 160
Low Noise Amplifier Miteq	503 277
Standard gain horn Flann 16240-25	503 939
Standard gain horn Flann 18240-25	503 900
Standard gain horn Flann 20240-20	503 674
High pass filter Wainwright WHNX6	BX40074
Multimeter Fluke 83	501 522
Temperature and humidity meter Testo 625	504 117

Measurement uncertainty: Radiated emission, 30 – 1000 MHz 4.8/5.6 dB (V/H-pol)
Radiated emission, 1 – 40 GHz 2.6 dB

Results

The pre-measurement emission spectra for the worst case configuration can be found in the diagrams below:

Diagram 1:	Ambient, 30-1000 MHz vertical and horizontal polarization
Diagram 2:	Ambient, 1-8.2 GHz vertical and horizontal polarization
Diagram 3:	30-1000 MHz, 2442 MHz, vertical and horizontal polarization
Diagram 4:	1-3 GHz, 2442 MHz, vertical and horizontal polarization
Diagram 5:	3-8.2 GHz, 2412 MHz, vertical and horizontal polarization
Diagram 6:	8.2-12 GHz, 2442 MHz, vertical and horizontal polarization
Diagram 7:	12-18 GHz, 2442 MHz, vertical and horizontal polarization
Diagram 8:	18-25 GHz, 2442 MHz, vertical polarization
Diagram 9:	18-25 GHz, 2442 MHz, horizontal polarization

Note: Worst-case plots are attached.

The highest detected levels during the final measurement in the frequency range 30 MHz-25 GHz are listed in the tables below.

2412 MHz:

Frequency (MHz)	QP level (dBµV/m)	CAV level (dBµV/m)	Peak level (dBµV/m)	Corr (dB)	Limit (dBµV/m)	Height (m)	Azimuth (deg)	Polarization
2416.407	N/A	82.9	95.9 *)	31.2	Carrier	1.00	0	Horizontal
4830.420	N/A	**53.4 **)**	**53.8**	-10.2	54 (Av)	1.00	186	Vertical
9652.456	N/A	51.5 **)	**51.9**	-14.7	69.2 (Pk) (20 dBc)	1.00	194	Vertical
11026.188	N/A	**41.1**	**44.2**	-11.9	54 (Av)	1.00	118	Horizontal

*) With RBW 100 kHz the peak level was 89.2 dBµV/m.
**) Average measurements were performed according to clause 12.2.5.3 in the KDB 558074 with max hold.

2442 MHz:

Frequency (MHz)	QP level (dBµV/m)	CAV level (dBµV/m)	Peak level (dBµV/m)	Corr (dB)	Limit (dBµV/m)	Height (m)	Azimuth (deg)	Polarization
59.999	23.4	N/A	**25.6**	11.2	67.8 (Pk) (20 dBc)	3.00	27	Vertical
360.120	27.5	N/A	**31.9**	15.8	67.8 (Pk) (20 dBc)	1.04	312	Horizontal
2440.118	N/A	82.3	95.6 *)	31.2	Carrier	1.03	154	Horizontal
4882.878	N/A	**52.9 **)**	**54.7**	-10.2	54 (Av)	1.10	179	Vertical
9777.250	N/A	49.2 **)	**50.0**	-14.7	75.6 (Pk) (20 dBc)	1.04	190	Vertical
11163.302	N/A	**40.0**	**43.0**	-11.9	54 (Av)	1.00	128	Horizontal

*) With RBW 100 kHz the peak level was 87.8 dBµV/m.
**) Average measurements were performed according to clause 12.2.5.3 in the KDB 558074 with max hold.

2462 MHz:

Frequency (MHz)	QP level (dBµV/m)	CAV level (dBµV/m)	Peak level (dBµV/m)	Corr (dB)	Limit (dBµV/m)	Height (m)	Azimuth (deg)	Polarization
2466.487	N/A	83.8	96.9 *)	31.2	(Carrier)	1.00	0	Horizontal
4922.686	N/A	**54.0 **)**	**54.6**	-10.2	54 (Av)	1.67	180	Vertical
9852.350	N/A	47.9 **)	**48.0**	-14.7	68.0 (Pk) (20 dBc)	1.00	192	Vertical
11254.762	N/A	**39.6**	**42.5**	-11.9	54 (Av)	1.00	127	Horizontal

*) With RBW 100 kHz the peak level was 88.0 dBµV/m.
**) Average measurements were performed according to clause 12.2.5.3 in the KDB 558074 with max hold.

Limits

According to 47CFR 15.247(d), in any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

Complies?	Yes

Diagram 1

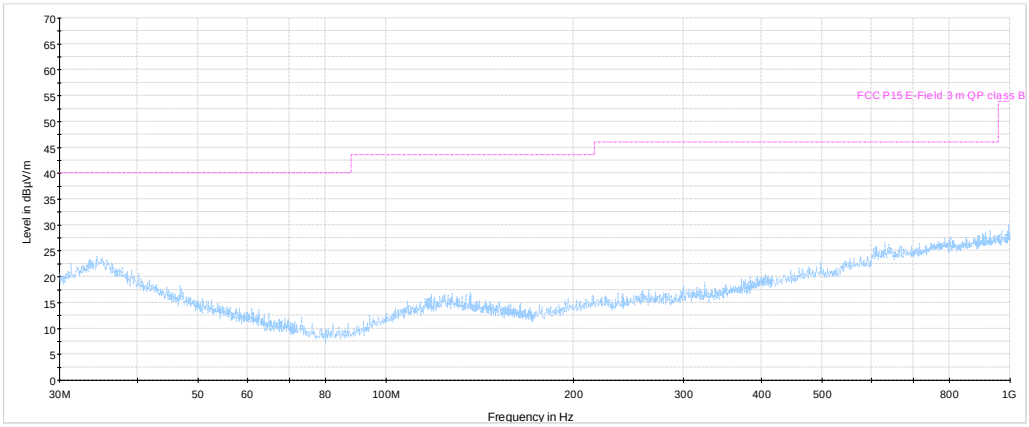


Diagram 2

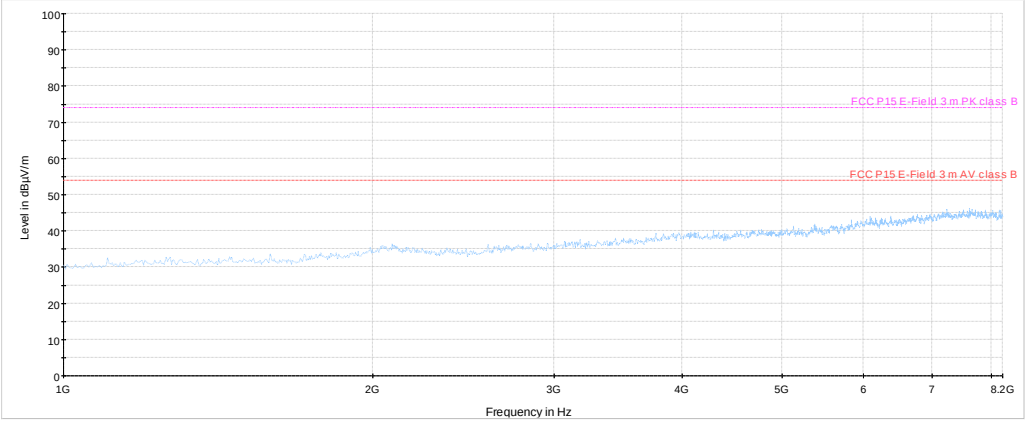


Diagram 3

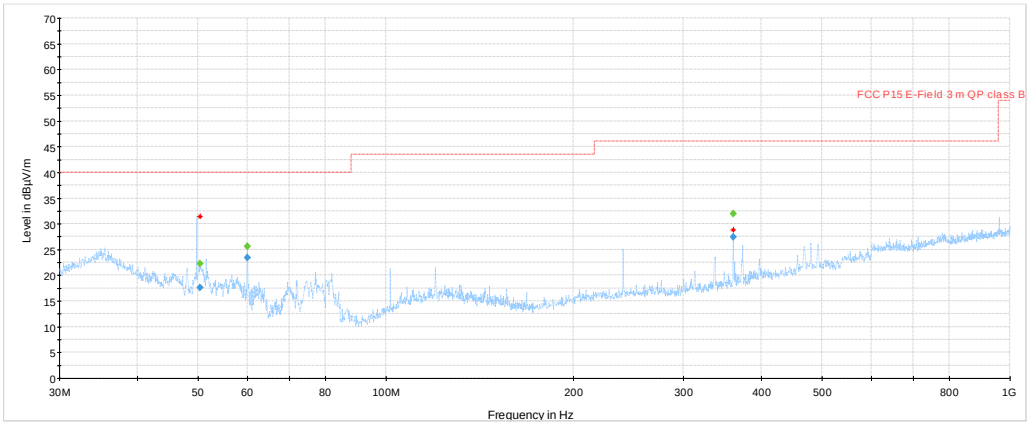


Diagram 4

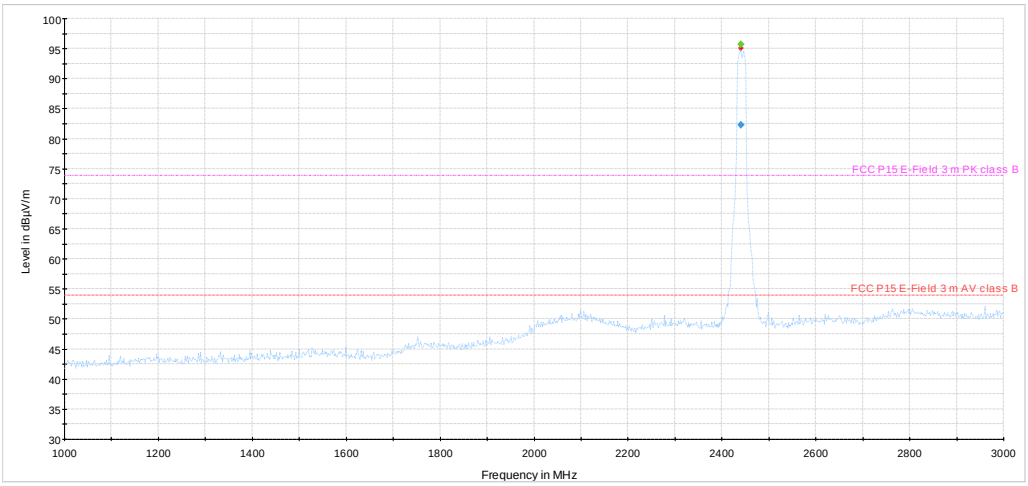


Diagram 5

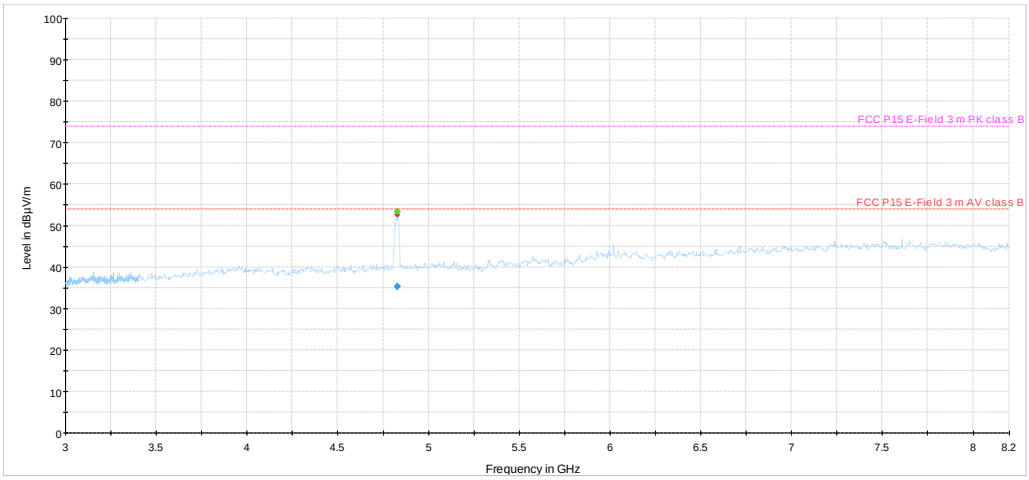


Diagram 6

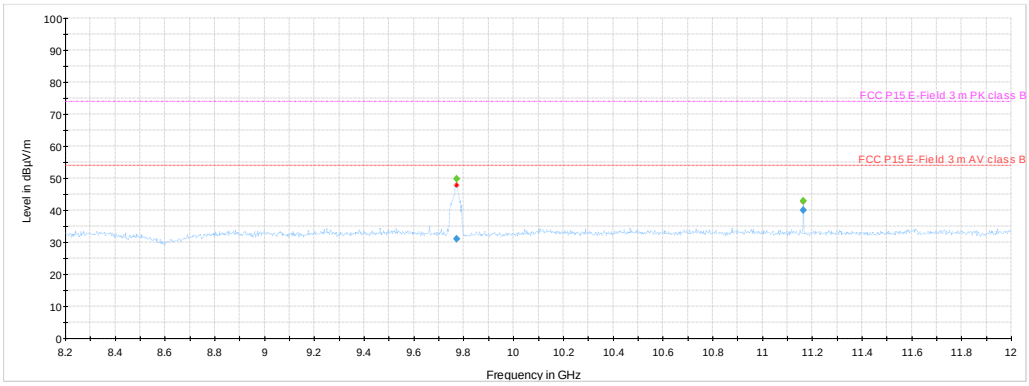


Diagram 7

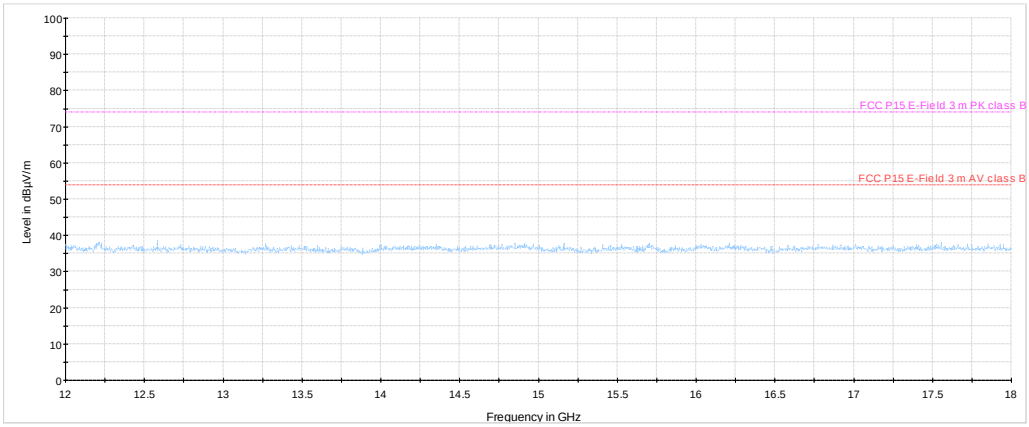


Diagram 8

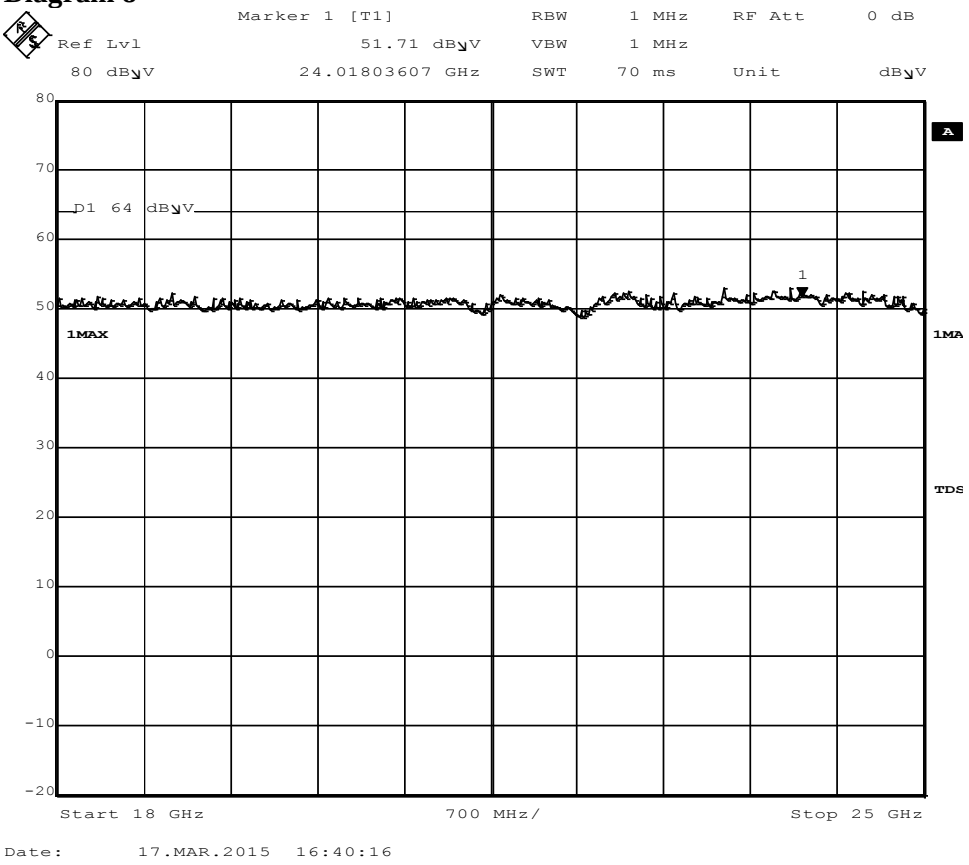
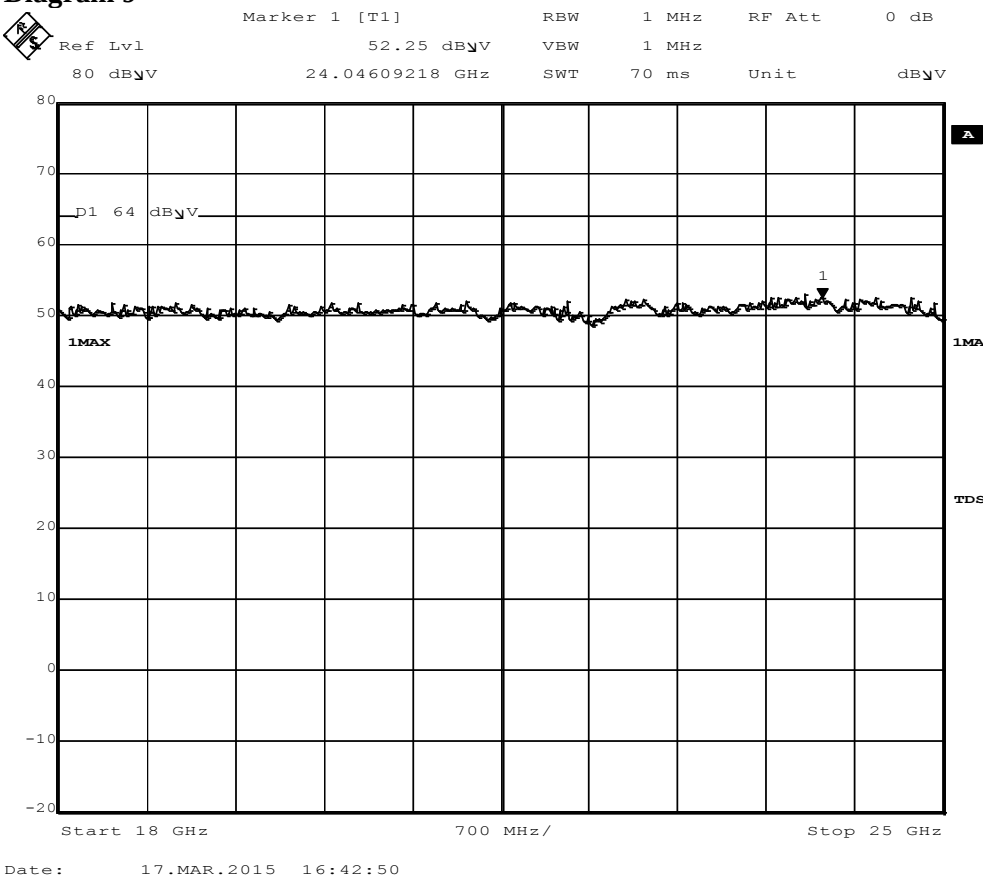


Diagram 9


Marker 1 [T1]
RBW 1 MHz
RF Att 0 dB
Ref Lvl
52.25 dBµV
VBW 1 MHz
80 dBµV
24.04609218 GHz
SWT 70 ms
Unit dBµV
D1 64 dBµV
1MAX
1
A
1MA
TDS
Start 18 GHz
700 MHz/
Stop 25 GHz
Date: 17.MAR.2015 16:42:50

Power spectral density according to FCC 47 CFR part 15.247 (e)

Date	Temperature	Humidity
2015-04-17	22 °C ± 3 °C	21 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009 and the KDB 558074 D01 DTS Meas Guidance v03r02, June 5, 2014, clause 10.2.

Conducted measurements were performed at the antenna connector and with continuous transmission and with different modulations, see the results.
The sweep points were set to 30 001 in the signal analyser.
The test equipment was connected to an external 10 MHz reference standard during measurements.

Measurement equipment	SP number
Test site Galvani	15:117
Signal Analyser R&S FSQ26	-
120 V AC/60 Hz AC Power source HP 6813B	503 091
DC power supply HP E3632A	503 170
Multimeter Fluke 85 III	503 418
Temperature and humidity meter Testo 625	503 498

Measurement uncertainty: 2.2 dB

Results

Preliminary test, 2442 MHz, Power spectral density vs. modulation/data rates:

Data rate (modulation)	Power spectral density, dBm RBW=20 kHz
DPSK, 1 Mbit/s	7.4
QDPSK, 2 Mbit/s	7.4
CCK/DPSK, 5.5 Mbits/s	7.3
CCK/DPSK, 11 Mbits/s	**7.6**
OFDM/BPSK, 6 Mbits/s	-3.8
OFDM/BPSK, 9 Mbit/s	-3.2
OFDM/QPSK, 12 Mbit/s	-3.5
OFDM//QPSK, 18 Mbit/s	-3.0
OFDM/16-QAM, 24 Mbit/s	-2.8
OFDM/16-QAM, 36 Mbit/s	-2.5
OFDM/64-QAM, 48 Mbit/s	-3.6
OFDM/64-QAM, 54 Mbit/s	-3.6
MCS-0, OFDM/BPSK, 7.2 Mbit/	-6.3
MCS-1, OFDM/BPSK, 14.4 Mbit/s	-6.7
MCS-2, OFDM/BPSK, 21.7 Mbit/s	-5.9
MCS-3, OFDM/16-QAM, 28.9 Mbit/s	-5.2
MCS-4, OFDM/16-QAM, 43.4 Mbit/s	-5.7
MCS-5, OFDM/16-QAM, 57.8 Mbit/s	-5.5
MCS-6, OFDM/16-QAM, 65 Mbit/s	-5.8

The final measurements with CCK/DPSK, 11 Mbits/s can be found in the diagrams below:
RBW=3 kHz

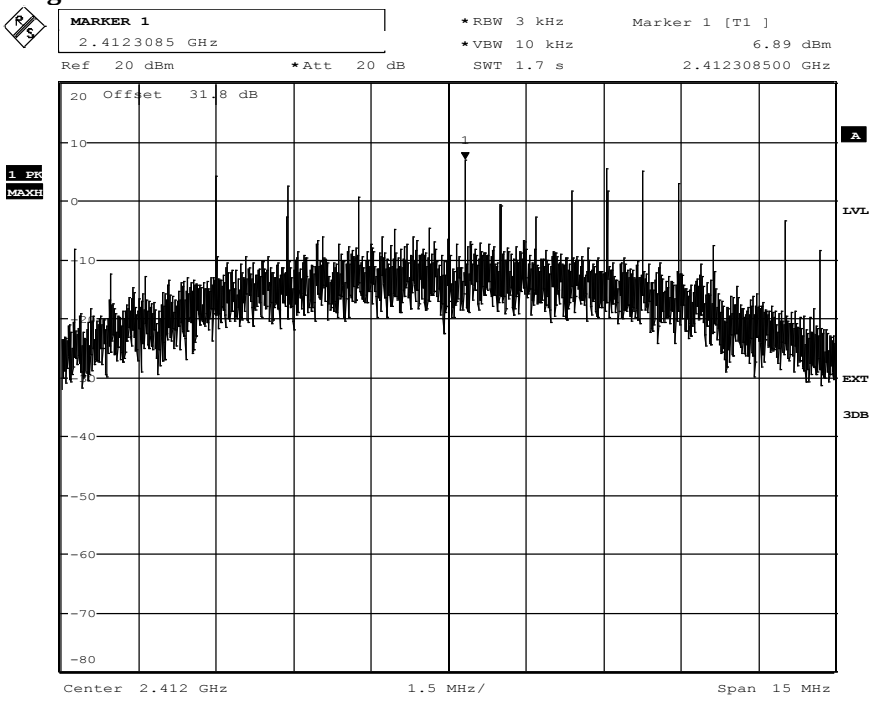
Diagram 1	2412 MHz	Power spectral density = **6.9 dBm**
Diagram 2	2442 MHz	Power spectral density = **6.0 dBm**
Diagram 3	2462 MHz	Power spectral density = **5.1 dBm**

Limits

According to 47CFR 15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

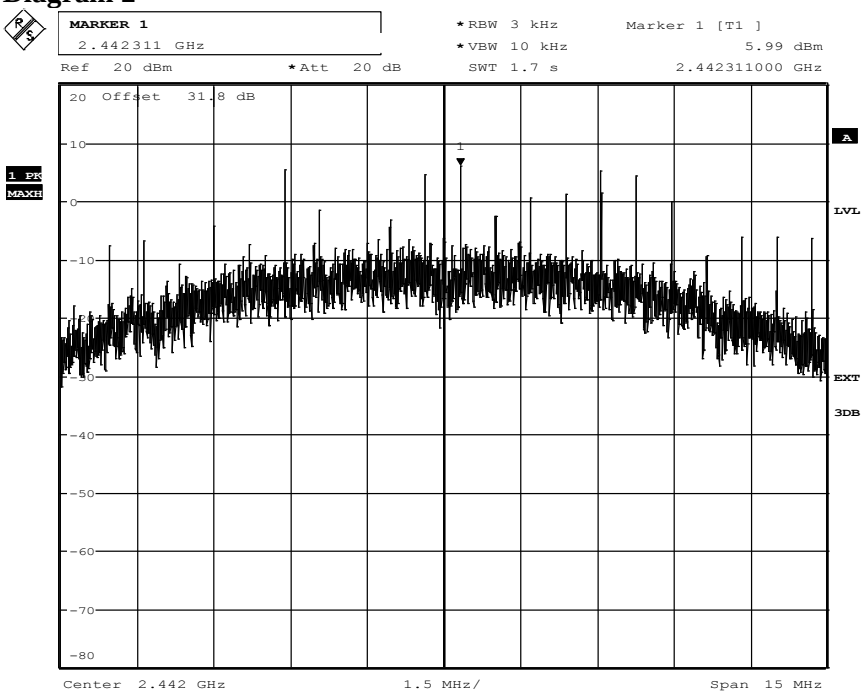
Complies?	Yes

Diagram 1



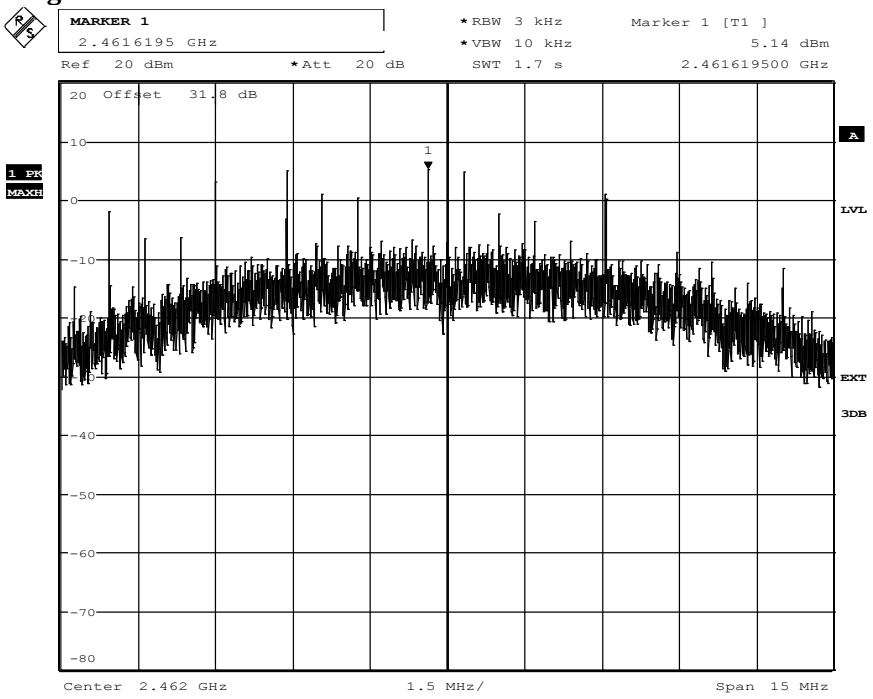
Date: 17.APR.2015 13:18:15

Diagram 2



Date: 17.APR.2015 13:14:40

Diagram 3



Date: 17.APR.2015 13:23:53

RF exposure evaluation: Mobile equipment FCC 47 CFR part 15.247 (i)

Date	Temperature	Humidity
2015-03-12	24 °C ± 3 °C	18 % ± 5 %

Procedure

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

Results

The following formula was used to calculate the RF exposure,
$Pd = Pout \times G/(4 \times \pi \times r^2_{cm})$

where,
Pd = power density in mW/cm^2
Pout = output power to antenna in mW
G = gain of antenna in linear scale
$\pi = 3.1416$
r = distance between observation and center of the radiator in cm

From the peak EUT RF output power, the minimum mobile separation distance, r=20 cm, as well as the gain of the used antenna, the RF power density can be obtained.

The maximum conducted peak output power from appendix 4 was used for calculation of MPE.

Antenna gain, peak, typical (dBi)	Antenna Gain (numeric)	Peak output power (mW)	Power density, Pd [S] (mW/cm^2)	Limit of power density (mW/cm^2)
3.5	2.24	173.8	**0.077**	1.0

Limits

(A) Limits for Occupational/Controlled Exposure

Frequency range (MHz)	Electric field strength [E] (V/m)	Magnetic filed strength [H] (A/m)	Power density [S] (mW/cm^2)	Averaging time $|E|^2$, $|H|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100000			5	6

(B) Limits for General Population/Uncontrolled Exposure

Frequency range (MHz)	Electric field strength [E] (V/m)	Magnetic filed strength [H] (A/m)	Power density [S] (mW/cm^2)	Averaging time $|E|^2$, $|H|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100000			**1.0**	**30**

Note: f=frequency in MHz, *Plane-wave equivalent power density

Complies?	Yes

20 dB bandwidth measurements according to FCC 47 CFR part 15.215 (c)

Date	Temperature	Humidity
2015-03-12	24 °C ± 3 °C	18 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009 and the KDB 558074 D01 DTS Meas Guidance v03r02, June 5, 2014.

Conducted measurements were performed at the antenna connector and with continuous transmission and with modulation MCS-0, OFDM/BPSK, 7.2 Mbit/s, which deemed to be worst case according to Appendix 10, OBW.
The sweep points were set to 1251 in the signal analyser.
The test equipment was connected to an external 10 MHz reference standard during measurements.

Measurement equipment	SP number
Test site Galvani	15:117
Signal Analyser R&S FSQ26	-
120 V AC/60 Hz AC Power source HP 6813B	503 091
DC power supply HP E3632A	503 170
Multimeter Fluke 85 III	503 418
Temperature and humidity meter Testo 625	503 498

Measurement uncertainty: 2.6 %

Results

For preliminary test, see OBW in Appendix 10.

The final measurements with modulation MCS-0, OFDM/BPSK 7.2 Mbit/s, can be found in the diagrams below:

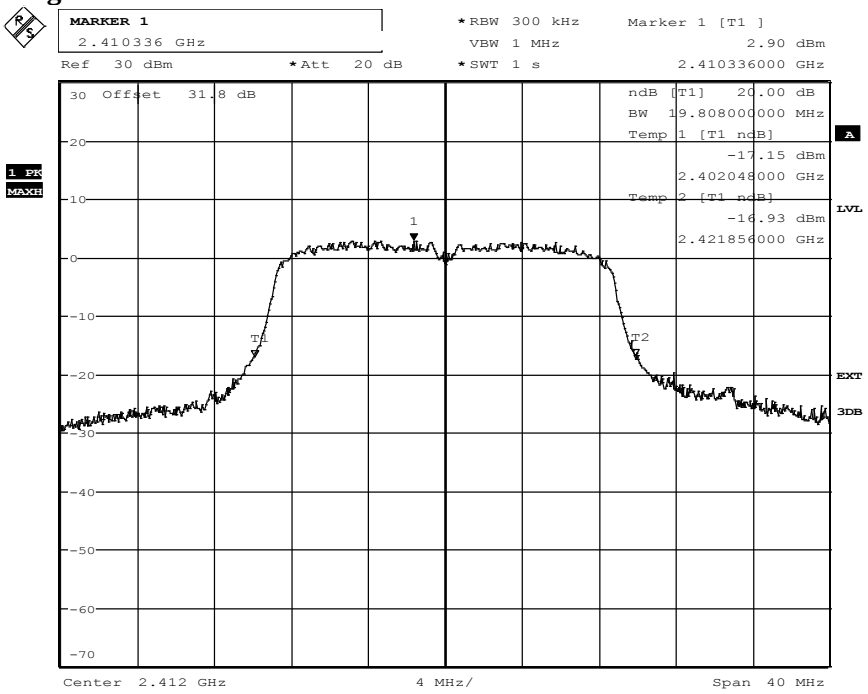
Diagram 1:	2412 MHz	20 dB BW = **19.81 MHz**
Diagram 2:	2442 MHz	20 dB BW = **19.81 MHz**
Diagram 3:	2462 MHz	20 dB BW = **19.97 MHz**

Limits

According to 47CFR 15.215(c), intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

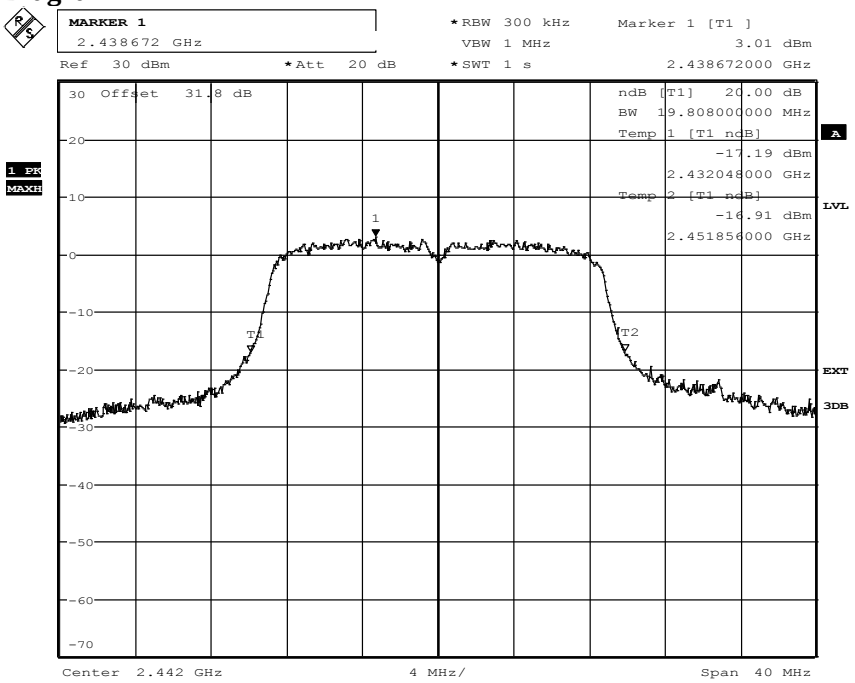
Complies?	Yes

Diagram 1



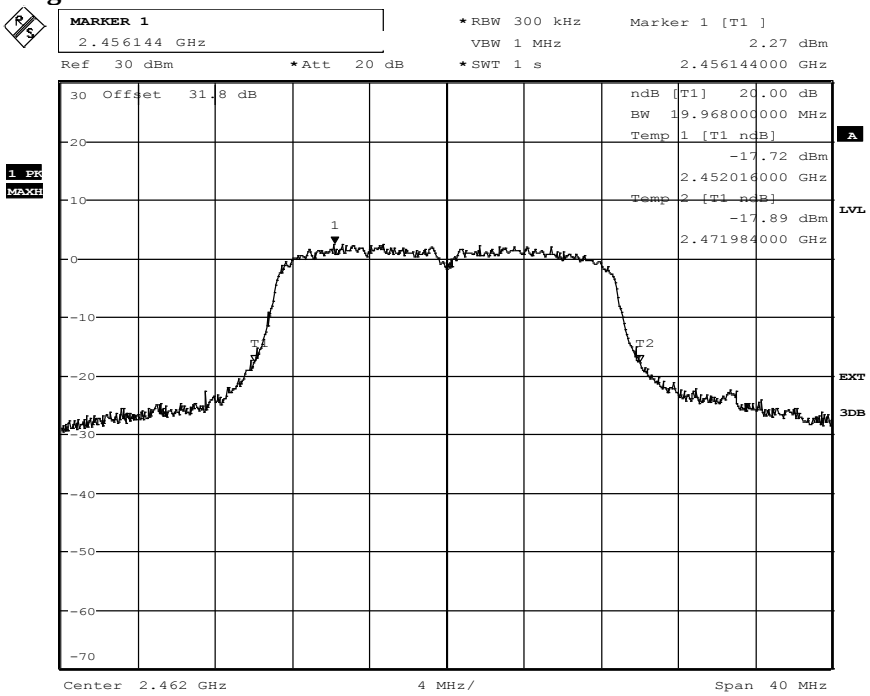
Date: 12.MAR.2015 11:39:32

Diagram 2



Date: 12.MAR.2015 11:37:11

Diagram 3



Date: 12.MAR.2015 11:33:16

Conducted emission measurements according to FCC 47 CFR part 15.207, class B

Date	Temperature	Humidity
2015-03-18	22 °C ± 3 °C	25 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009.

The test was performed with continuous transmission and with modulation OFDM/BPSK, 9 Mbit/s, which deemed to be worst case according to Appendix 4.

The test was performed on the 120 V AC/60 Hz, phase and neutral terminals, at the AC-side of the external DC power supply, Agilent E3631A SP503997, to the module.
The PC laptop was powered by 120 V AC/60 Hz via a separate LISN.

Test set-up photos during the tests can be found in Appendix 12.

Measurement equipment	SP number
Semi anechoic chamber, Edison	504 114
Spectrum analyser R&S ESU 26	902 210
EMI measurement computer	-
Software: R&S EMC32, ver. 9.15.0	503 745
LISN Schwarzbeck NNLA 8120	504 129
LISN Schwarzbeck NSLK 8126	503 114
120 V AC/60 Hz AC Power source HP 6813B	503 091
DC power supply HP E3632A	503 170
Multimeter Fluke 83	501 522
Temperature and humidity meter Testo 625	504 117

Measurement uncertainty: 3.5 dB

Result

The conducted emission spectra can be found in the diagrams below:

Diagram 1:	Ambient, 120 V AC, neutral terminal, DC output power off
Diagram 2:	Ambient, 120 V AC, phase terminal, AC input LISN disconnected
Diagram 3:	120 V AC, phase terminal, 2412 MHz
Diagram 4:	120 V AC, neutral terminal, 2412 MHz
Diagram 5:	120 V AC, phase terminal, 2442 MHz
Diagram 6:	120 V AC, neutral terminal, 2442 MHz
Diagram 7:	120 V AC, phase terminal, 2462 MHz
Diagram 8:	120 V AC, neutral terminal, 2462 MHz

The limit lines indicated as Voltage on Mains in the diagrams are the same limit lines as of FCC part 15.

Limits

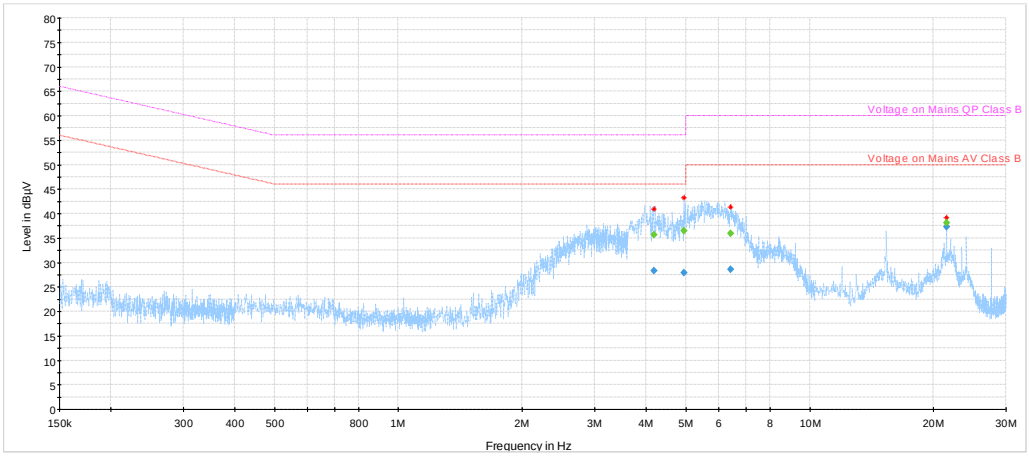
According to 47CFR 15.207:

Frequency (MHz)	Quasi-peak value (dBµV)	Average value (dBµV/m)
0.15-0.5	66-56*	56-46*
0.5-5	56	46
5-30	60	50

*=Decreases with the logarithm of the frequency

Complies?	Yes

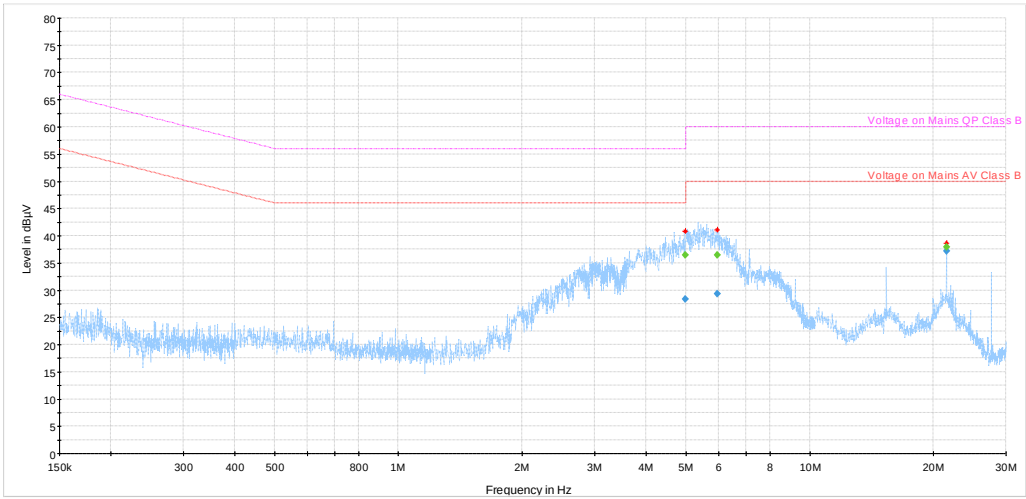
Diagram 1



Final measurement:

Frequency (MHz)	CAverage (dBµV)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
4.180981	---	35.71	56.00	20.29	5000.0	9.000	N	10.0
4.180981	28.30	---	46.00	17.70	5000.0	9.000	N	10.0
4.957381	---	36.49	56.00	19.51	5000.0	9.000	N	10.0
4.957381	27.84	---	46.00	18.16	5000.0	9.000	N	10.0
6.435688	---	35.96	60.00	24.04	5000.0	9.000	N	10.1
6.435688	28.61	---	50.00	21.39	5000.0	9.000	N	10.1
21.502912	---	38.16	60.00	21.84	5000.0	9.000	N	10.9
21.502912	37.22	---	50.00	12.78	5000.0	9.000	N	10.9

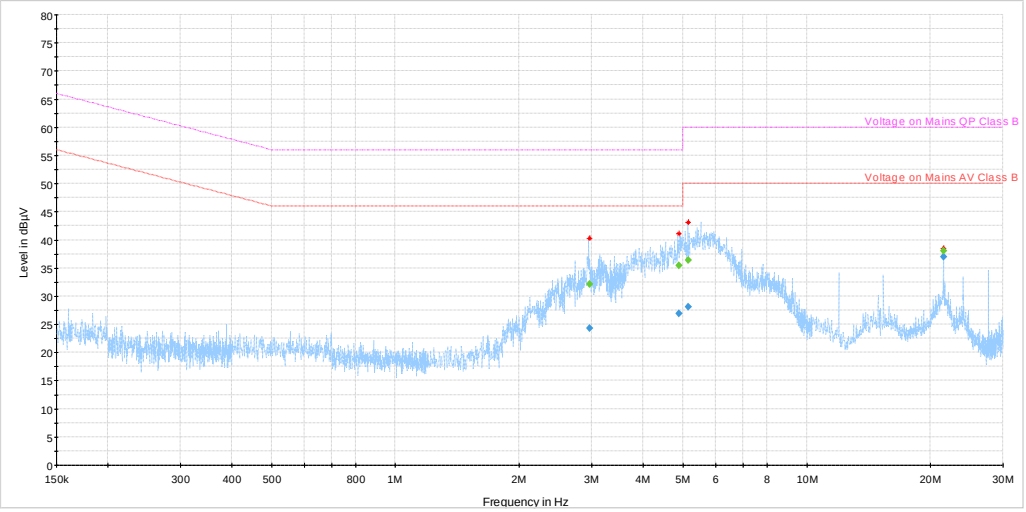
Diagram 2



Final measurement:

Frequency (MHz)	CAverage (dBµV)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
4.977338	---	36.45	56.00	19.55	5000.0	9.000	N	10.0
4.977338	28.29	---	46.00	17.71	5000.0	9.000	N	10.0
5.952581	---	36.41	60.00	23.59	5000.0	9.000	N	10.1
5.952581	29.37	---	50.00	20.63	5000.0	9.000	N	10.1
21.502969	---	37.92	60.00	22.08	5000.0	9.000	N	10.9
21.502969	37.13	---	50.00	12.87	5000.0	9.000	N	10.9

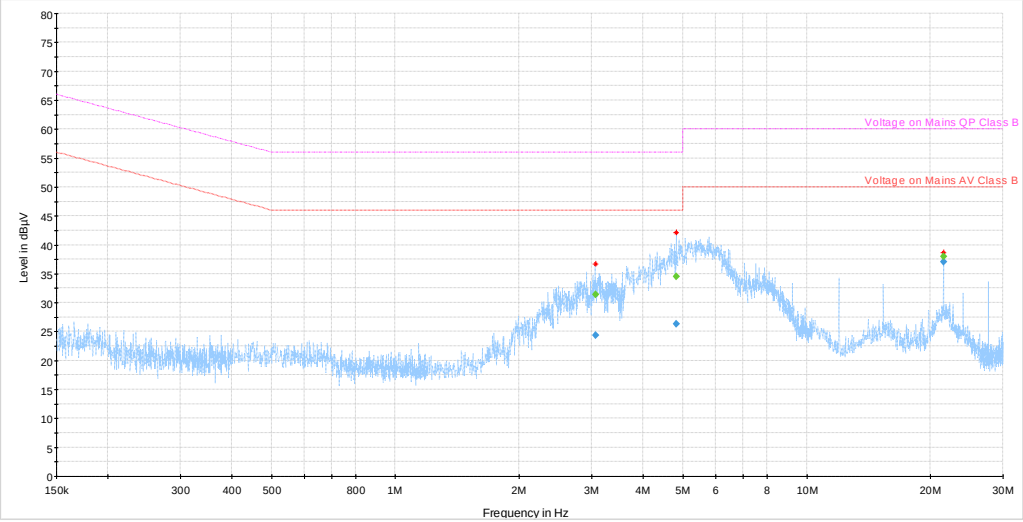
Diagram 3



Final measurement:

Frequency (MHz)	CAverage (dBµV)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
2.968912	---	32.16	56.00	23.84	5000.0	9.000	N	9.9
2.968912	24.26	---	46.00	21.74	5000.0	9.000	N	9.9
4.886419	---	35.44	56.00	20.56	5000.0	9.000	N	10.0
4.886419	26.90	---	46.00	19.10	5000.0	9.000	N	10.0
5.149606	---	36.36	60.00	23.64	5000.0	9.000	N	10.0
5.149606	28.04	---	50.00	21.96	5000.0	9.000	N	10.0
21.503981	---	38.04	60.00	21.96	5000.0	9.000	N	10.9
21.503981	36.94	---	50.00	13.06	5000.0	9.000	N	10.9

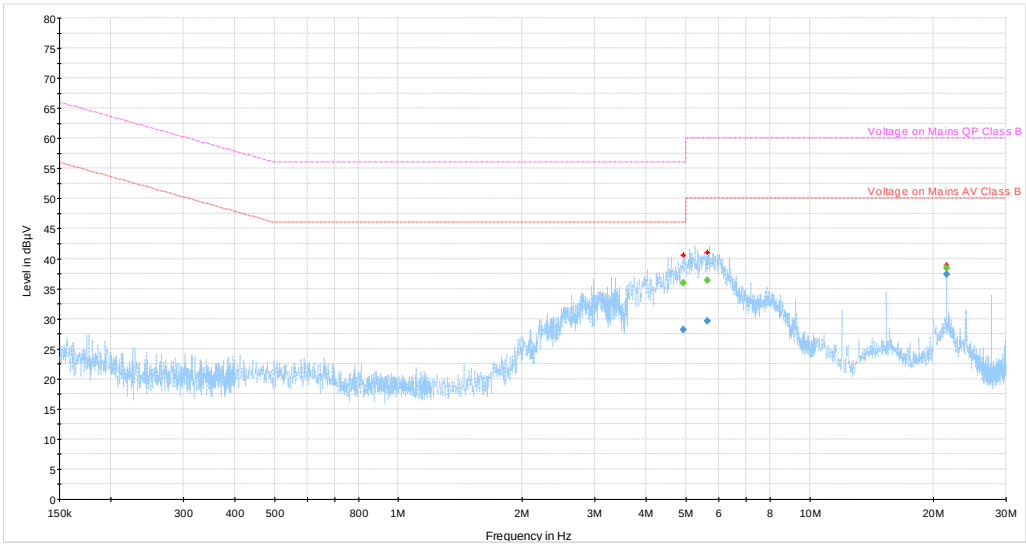
Diagram 4



Final measurement:

Frequency (MHz)	CAverage (dBµV)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
3.072454	---	31.44	56.00	24.56	5000.0	9.000	L1	10.0
3.072454	24.33	---	46.00	21.67	5000.0	9.000	L1	10.0
4.813362	---	34.54	56.00	21.46	5000.0	9.000	L1	10.0
4.813362	26.27	---	46.00	19.73	5000.0	9.000	L1	10.0
21.503902	---	38.02	60.00	21.98	5000.0	9.000	L1	10.9
21.503902	37.10	---	50.00	12.90	5000.0	9.000	L1	10.9

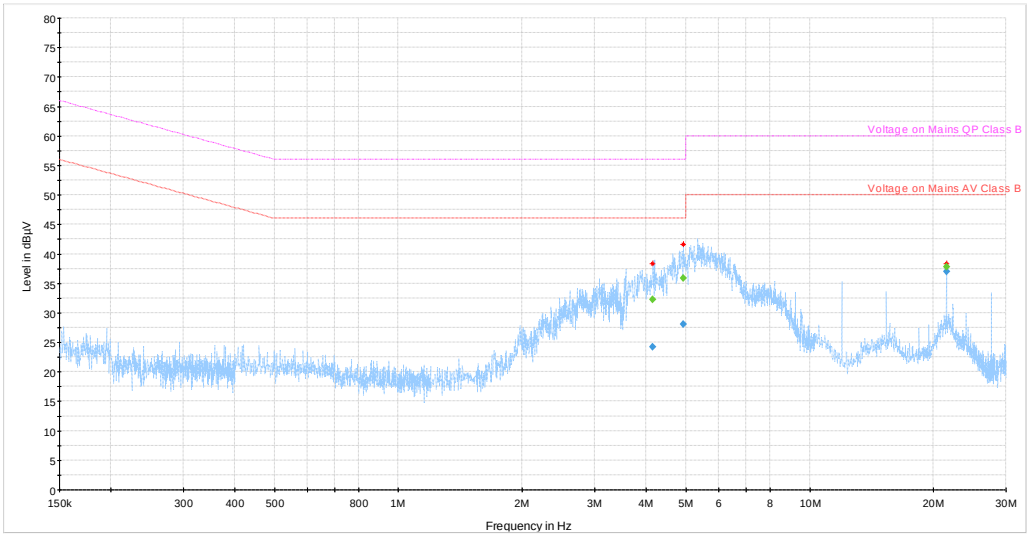
Diagram 5



Final measurement:

Frequency (MHz)	CAverage (dBµV)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
4.936000	---	35.97	56.00	20.03	5000.0	9.000	N	10.0
4.936000	28.13	---	46.00	17.87	5000.0	9.000	N	10.0
5.644788	---	36.42	60.00	23.58	5000.0	9.000	N	10.1
5.644788	29.58	---	50.00	20.42	5000.0	9.000	N	10.1
21.504150	---	38.34	60.00	21.66	5000.0	9.000	N	10.9
21.504150	37.43	---	50.00	12.57	5000.0	9.000	N	10.9

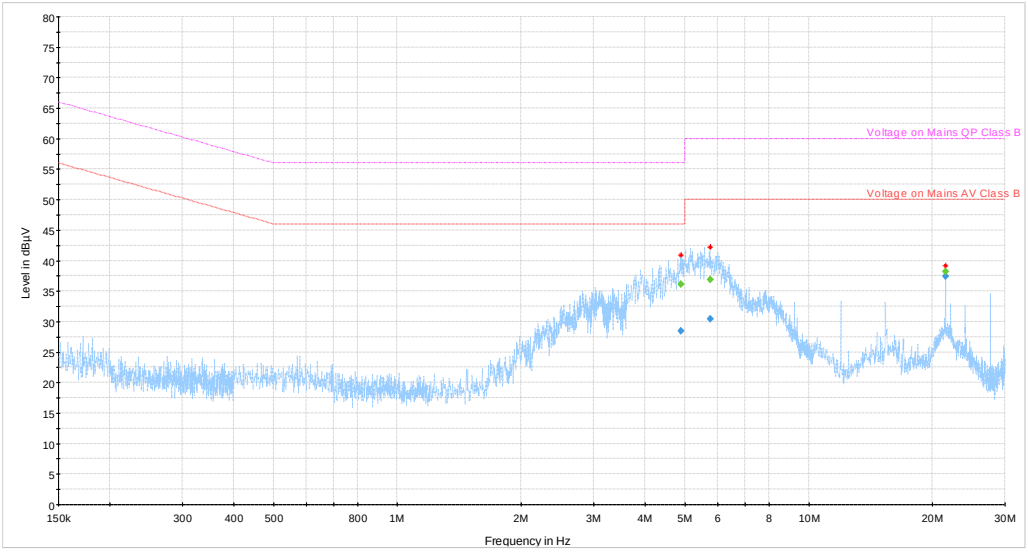
Diagram 6



Final measurement:

Frequency (MHz)	CAverage (dBµV)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
4.148228	---	32.21	56.00	23.79	5000.0	9.000	L1	10.0
4.148228	24.20	---	46.00	21.80	5000.0	9.000	L1	10.0
4.927908	---	35.86	56.00	20.14	5000.0	9.000	L1	10.1
4.927908	28.03	---	46.00	17.97	5000.0	9.000	L1	10.1
21.503801	---	37.82	60.00	22.18	5000.0	9.000	L1	10.9
21.503801	37.03	---	50.00	12.97	5000.0	9.000	L1	10.9

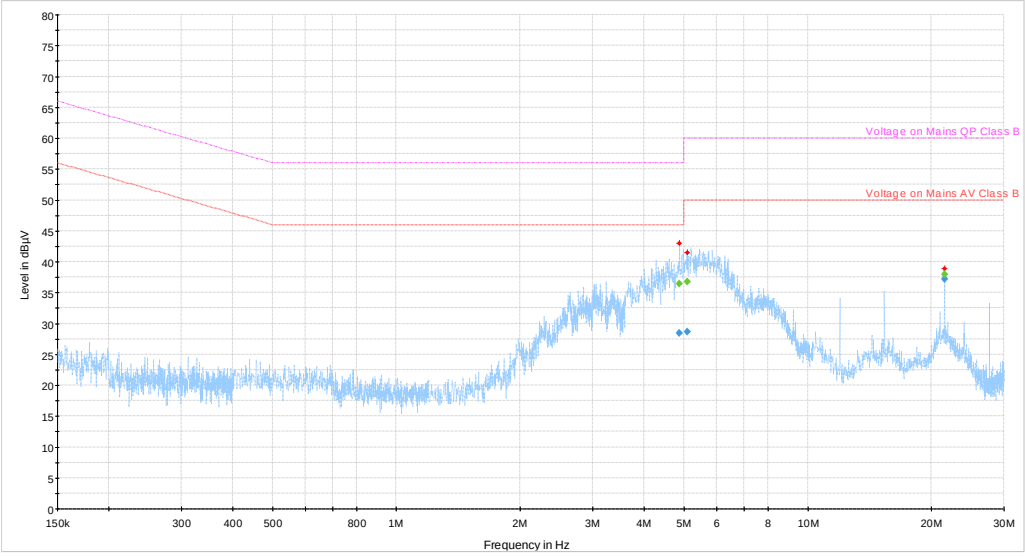
Diagram 7



Final measurement:

Frequency (MHz)	CAverage (dBµV)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
4.897012	---	36.13	56.00	19.87	5000.0	9.000	N	10.0
4.897012	28.41	---	46.00	17.59	5000.0	9.000	N	10.0
5.756369	---	36.91	60.00	23.09	5000.0	9.000	N	10.1
5.756369	30.37	---	50.00	19.63	5000.0	9.000	N	10.1
21.503025	---	38.23	60.00	21.77	5000.0	9.000	N	10.9
21.503025	37.42	---	50.00	12.58	5000.0	9.000	N	10.9

Diagram 8



Final measurement:

Frequency (MHz)	CAverage (dBµV)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
4.883299	---	36.45	56.00	19.55	5000.0	9.000	L1	10.1
4.883299	28.48	---	46.00	17.52	5000.0	9.000	L1	10.1
5.093378	---	36.81	60.00	23.19	5000.0	9.000	L1	10.1
5.093378	28.69	---	50.00	21.31	5000.0	9.000	L1	10.1
21.503768	---	37.93	60.00	22.07	5000.0	9.000	L1	10.9
21.503768	37.19	---	50.00	12.81	5000.0	9.000	L1	10.9

Occupied bandwidth measurements according to 47CFR 2.1049

Date	Temperature	Humidity
2015-03-12	24 °C ± 3 °C	18 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009 and the KDB 558074 D01 DTS Meas Guidance v03r02, June 5, 2014.

Conducted measurements were performed at the antenna connector and with continuous transmission and with different modulations, see the results.
The sweep points were set to 1251 in the signal analyser.
The test equipment was connected to an external 10 MHz reference standard during measurements.

Measurement equipment	SP number
Test site Galvani	15:117
Signal Analyser R&S FSQ26	-
120 V AC/60 Hz AC Power source HP 6813B	503 091
DC power supply HP E3632A	503 170
Multimeter Fluke 85 III	503 418
Temperature and humidity meter Testo 625	503 498

Measurement uncertainty: 2.6 %

Results

Preliminary test, 2442 MHz, OBW vs. modulation/data rates:

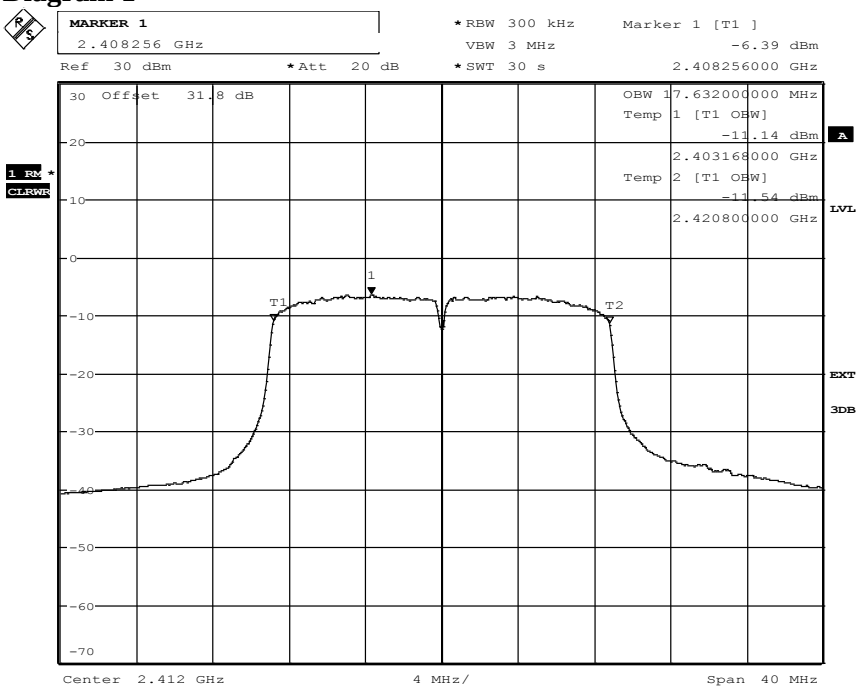
Data rate (modulation)	OBW, MHz
DPSK, 1 Mbit/s	15.39
QDPSK, 2 Mbit/s	15.42
CCK/DPSK, 5.5 Mbits/s	14.14
CCK/DPSK, 11 Mbits/s	14.84
OFDM/BPSK, 6 Mbits/s	16.51
OFDM/BPSK, 9 Mbit/s	16.51
OFDM/QPSK, 12 Mbit/s	16.51
OFDM//QPSK, 18 Mbit/s	16.48
OFDM/16-QAM, 24 Mbit/s	16.48
OFDM/16-QAM, 36 Mbit/s	16.51
OFDM/64-QAM, 48 Mbit/s	16.48
OFDM//64-QAM, 54 Mbit/s	16.48
MCS-0, OFDM/BPSK, 7.2 Mbit/	**17.63**
MCS-1, OFDM/BPSK, 14.4 Mbit/s	17.63
MCS-2, OFDM/BPSK, 21.7 Mbit/s	17.60
MCS-3, OFDM/16-QAM, 28.9 Mbit/s	17.60
MCS-4, OFDM/16-QAM, 43.4 Mbit/s	17.57
MCS-5, OFDM/16-QAM, 57.8 Mbit/s	17.54
MCS-6, OFDM/16-QAM, 65 Mbit/s	17.54

The final measurements with modulation MCS-0, OFDM/BPSK, 7.2 Mbit/s can be found in the diagrams below:

Diagram 1	2412 MHz	OBW = **17.60 MHz** (99%)
Diagram 2	2442 MHz	OBW = **17.63 MHz** (99%)
Diagram 3	2462 MHz	OBW = **17.63 MHz** (99%)

Complies?	Yes

Diagram 1



Date: 12.MAR.2015 10:43:51

Diagram 2

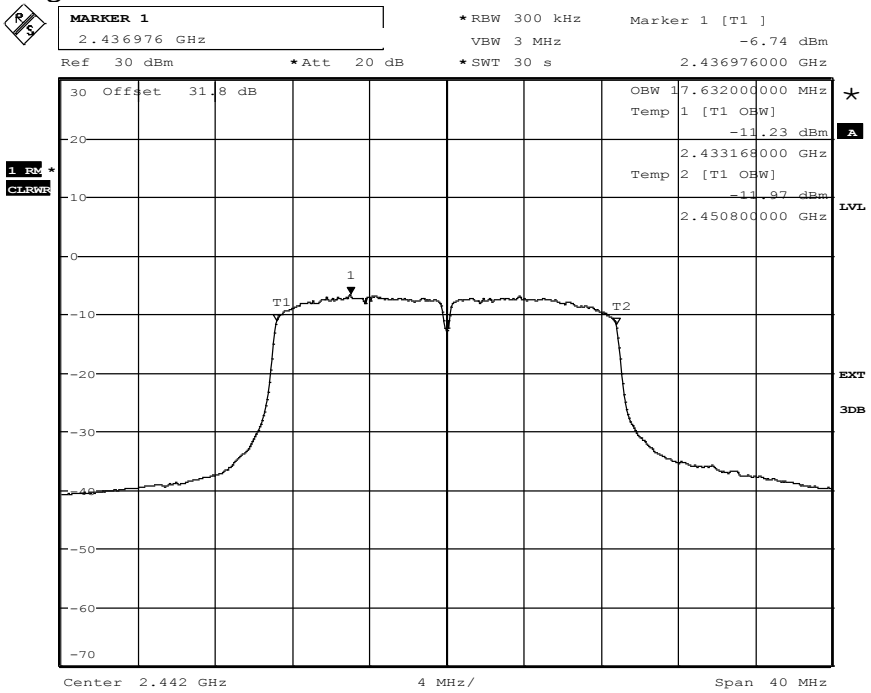


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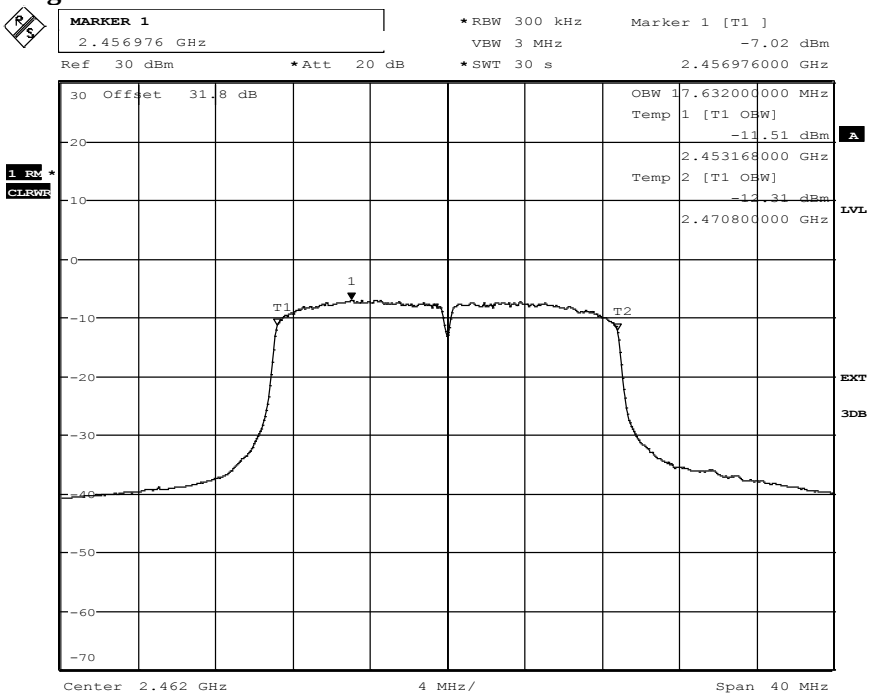
Diagram 3



Date: 12.MAR.2015 10:45:02

Band edge measurements according to 47CFR 2.1049

Date	Temperature	Humidity
2015-03-13	22 °C ± 3 °C	21 % ± 5 %
2015-03-16	22 °C ± 3 °C	25 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.10-2009 and the KDB 558074 D01 DTS Meas Guidance v03r02, June 5, 2014, cl. 13.3.3 and with trace mode in Max hold.

The test was performed with continuous transmission and with modulation OFDM/BPSK, 9 Mbit/s, deemed to be worst case according to Appendix 4, Maximum peak conducted output power.

The radiated measurements were performed in a semi anechoic chamber. The measurements were performed with the antenna and the turntable at the position with the highest level of the fundamental. The antenna distance was 3.0 m.

Test set-up photos during the tests can be found in Appendix 12.

Measurement equipment	SP number
Semi anechoic chamber, Edison	504 114
Spectrum analyser R&S ESI 26	503 885
EMI measurement computer	-
Software: R&S EMC32, ver. 8.52.0	503 745
Horn antenna EMCO 3115	501 548
Multimeter Fluke 83	501 522
Temperature and humidity meter Testo 625	504 117

Measurement uncertainty: 2.6 dB

Results

Operation band 2400-2483.5 MHz

The pre-measurement diagrams with modulation OFDM/BPSK, 9 Mbit/s and with peak detector, can be found in the diagrams below:

Diagram 1	2412 MHz	Band edge at 2400 MHz (20 dBc)
Diagram 2	2412 MHz	Band edge at 2390 MHz (restricted band)
Diagram 3	2462 MHz	Band edge at 2483.5 MHz (restricted band)

Final measurements, with modulation OFDM/BPSK, 9 Mbit/s:

2412 MHz:

Frequency (MHz)	CAV level (dBµV/m)	Peak level (dBµV/m)	AV Limit (dBµV/m)	Peak Limit (dBµV/m)	dBc, peak det (limit=20dBc)	Polarization
2390.00 *)	51.0 Note 1	61.5	54.0	74.0	N/A	Horizontal
2400.00 **)	N/A	N/A	N/A	N/A	28.7 Note 2	Horizontal

*) Restricted band
**) 20 dBc

Note 1: Average measurements were performed according to clause 13.3.3 with max hold in the KDB 558074.
Additional test with the following modulations were also performed:
DPSK, 1 Mbit/s: CAV-level=46.4 dBµV/m
MCS-6, OFDM/64-QAM, 65 Mbit/s: CAV-level=46.6 dBµV/m

Note 2: Additional test with the following modulations were also performed:
DPSK, 1 Mbit/s: 40.4 dBc
MCS-6, OFDM/64-QAM, 65 Mbit/s: 36.3 dBc

2462 MHz:

Frequency (MHz)	AV level (dBµV/m)	Peak level (dBµV/m)	AV Limit (dBµV/m)	Peak Limit (dBµV/m)	dBc, peak det (limit=20dBc)	Polarization
2483.50 *)	51.9 Note 3	61.9	54.0	74.0	N/A	Horizontal

*) Restricted band

Note 3: Average measurements were performed according to clause 13.3.3 with max hold in the KDB 558074.
Additional test with the following modulations were also performed:
DPSK, 1 Mbit/s: CAV-level=46.9 dBµV/m
MCS-6, OFDM/64-QAM, 65 Mbit/s: CAV-level=47.8 dBµV/m

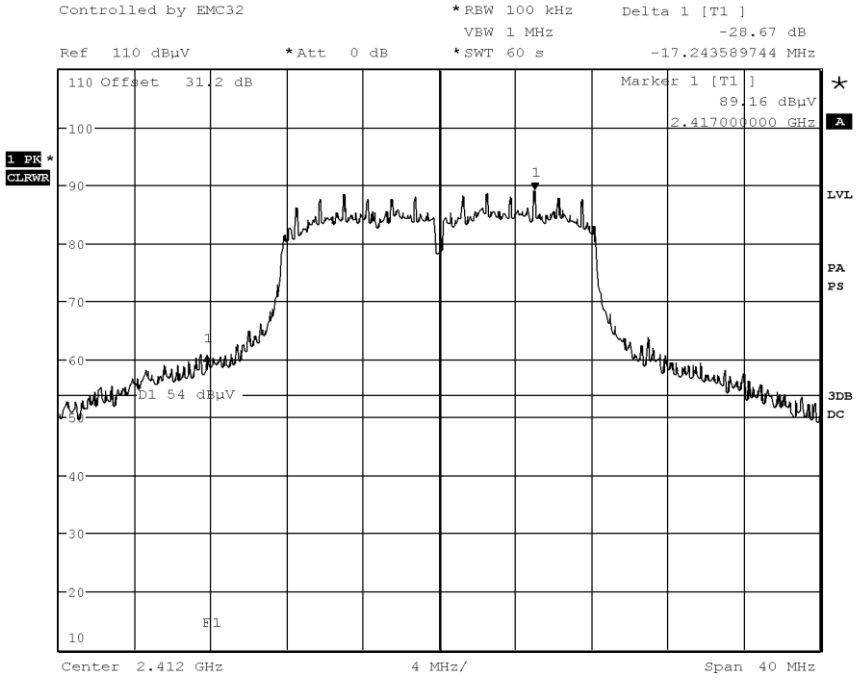
Limits

Band edge at 2400 MHz:
According to 47CFR 15.247(d), in any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Band edge at 2390 and 2483.5 MHz:
In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section15.209(a).

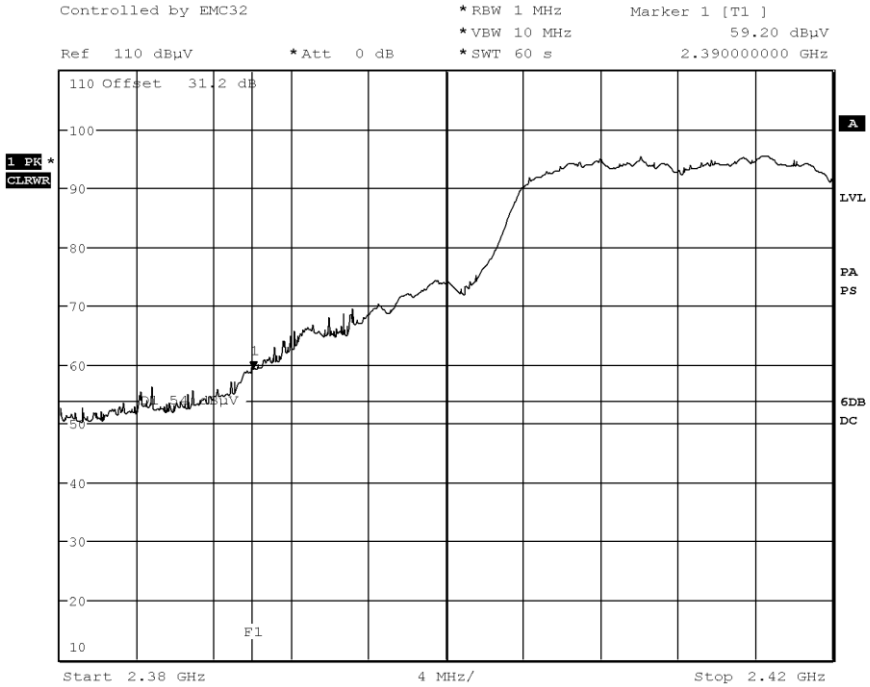
Complies?	Yes

Diagram 1



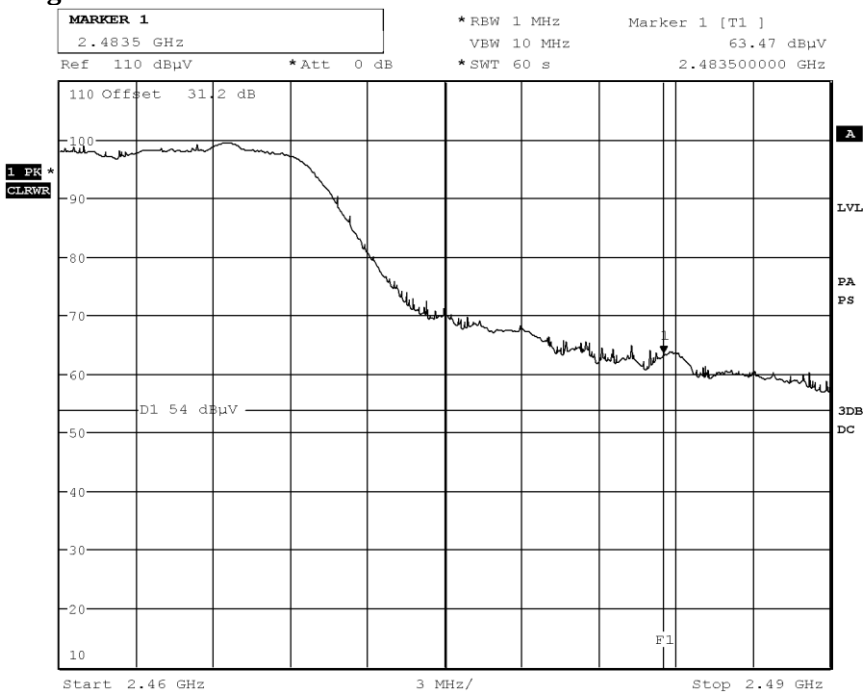
Date: 13.MAR.2015 15:55:24

Diagram 2



Date: 13.MAR.2015 14:10:58

Diagram 3

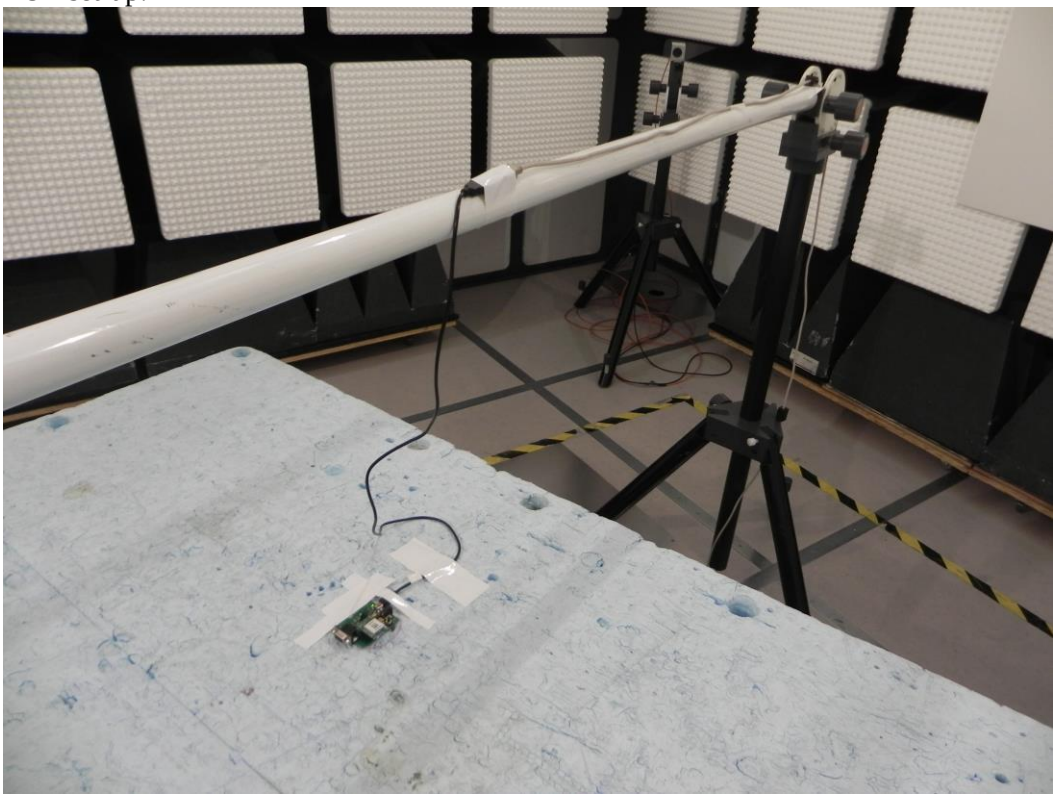


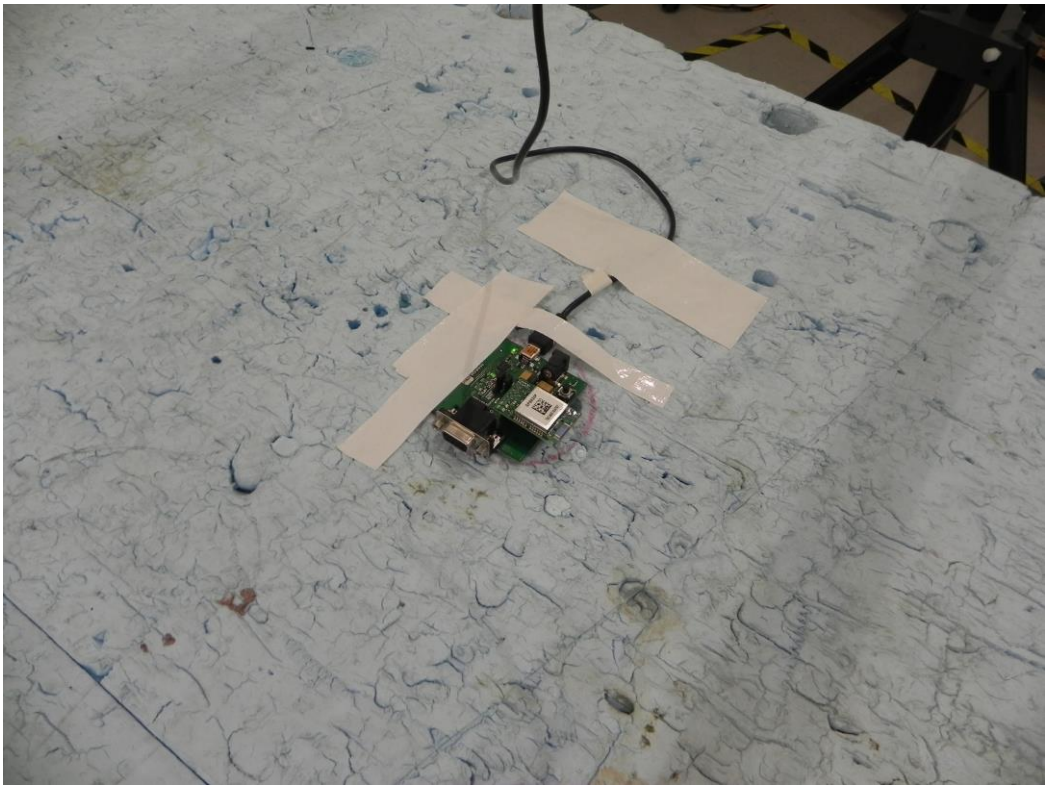
Date: 13.MAR.2015 14:47:17

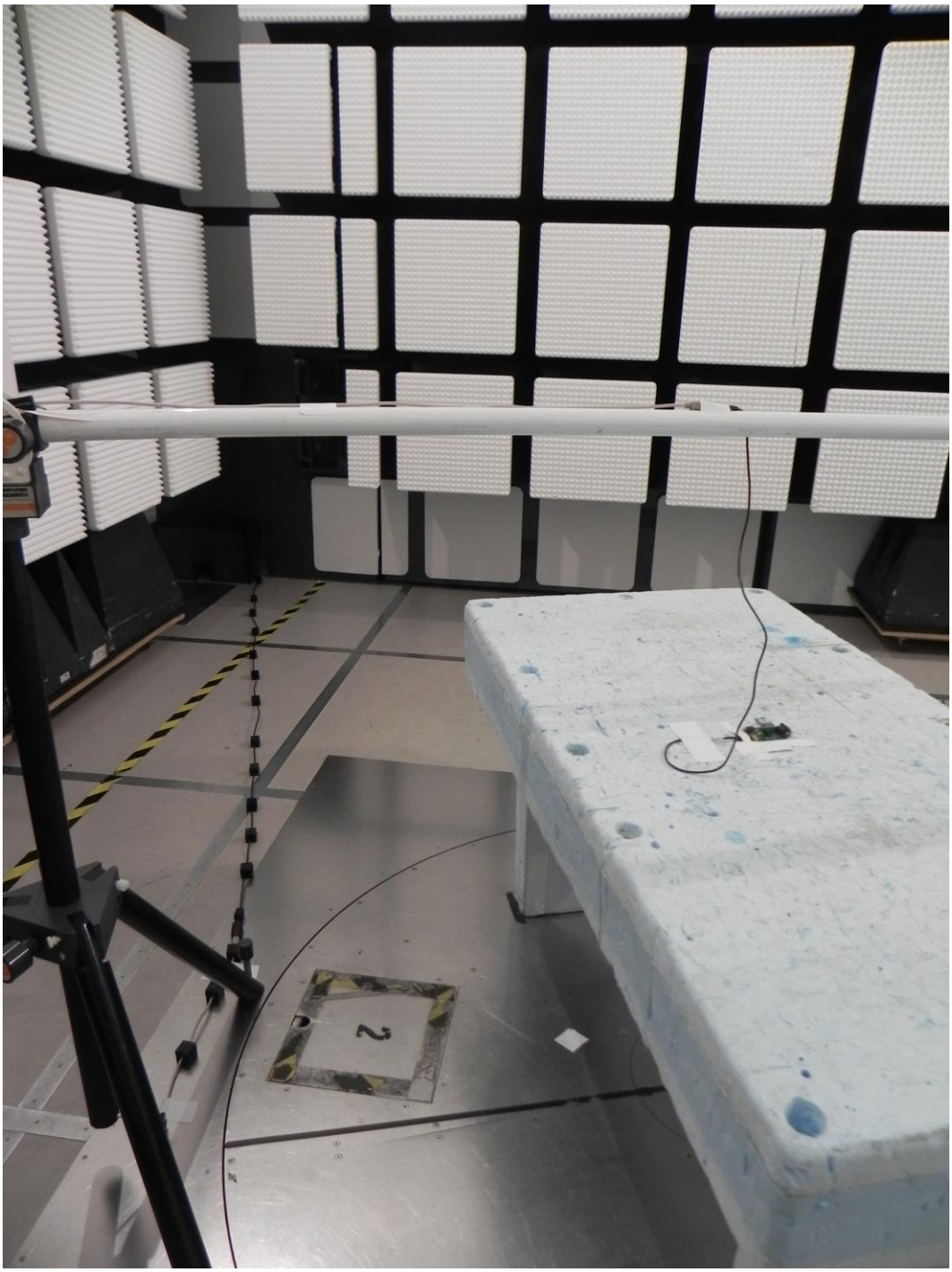
Photos

The test set-up during all the radiated tests can be seen in the pictures below.

EUT set-up:






2

30-1000 MHz:

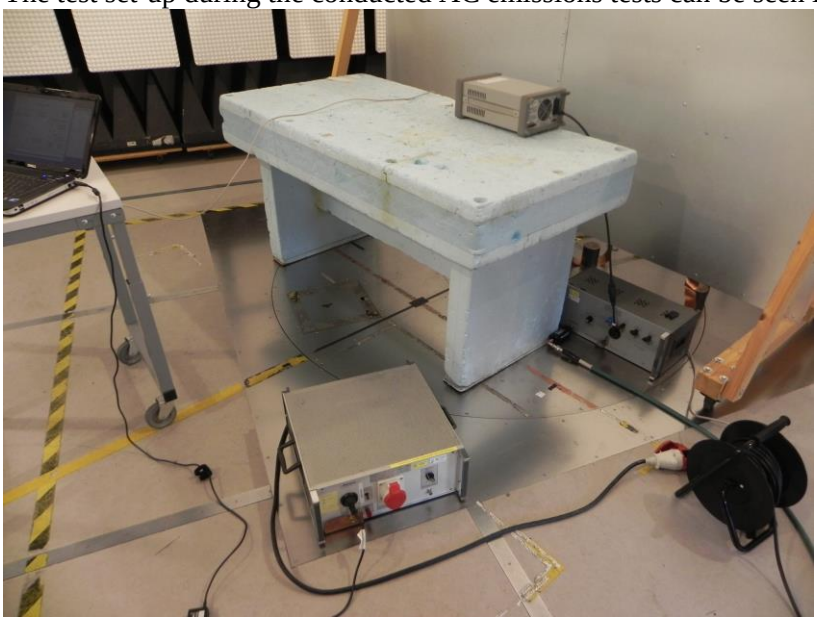
1-8.2 GHz:

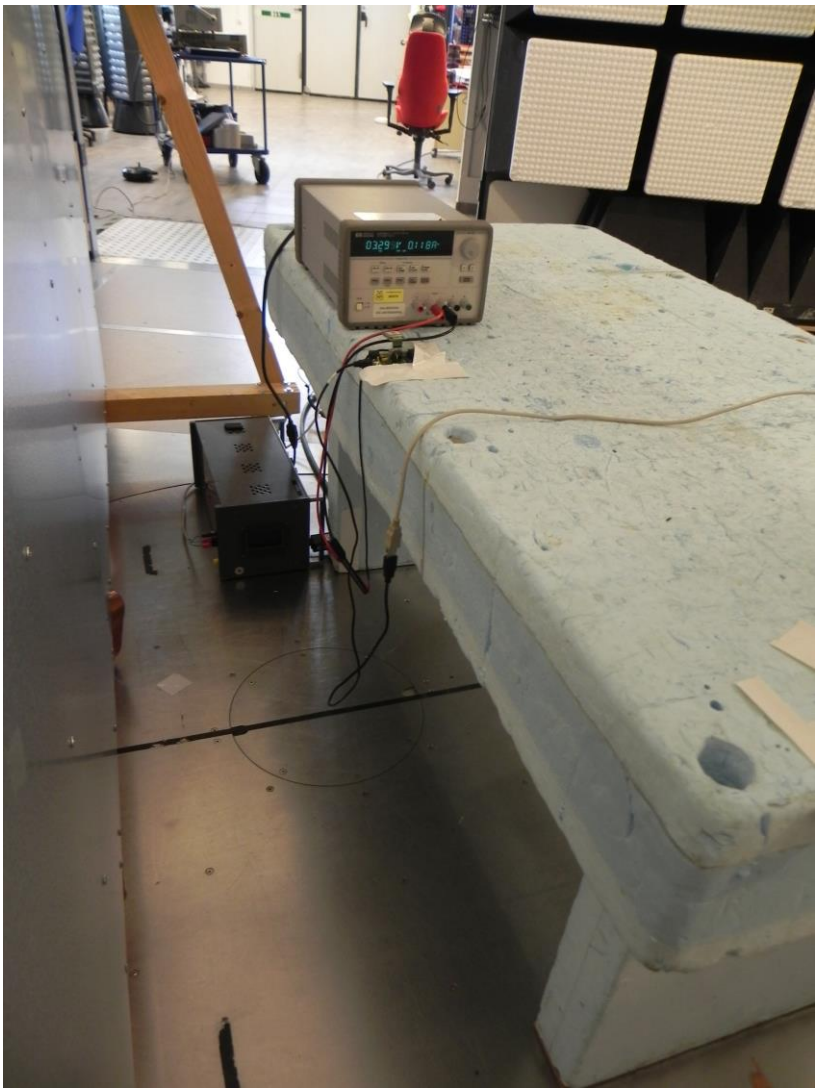
8.2-12 GHz

12-18 GHz

18-25 GHz:

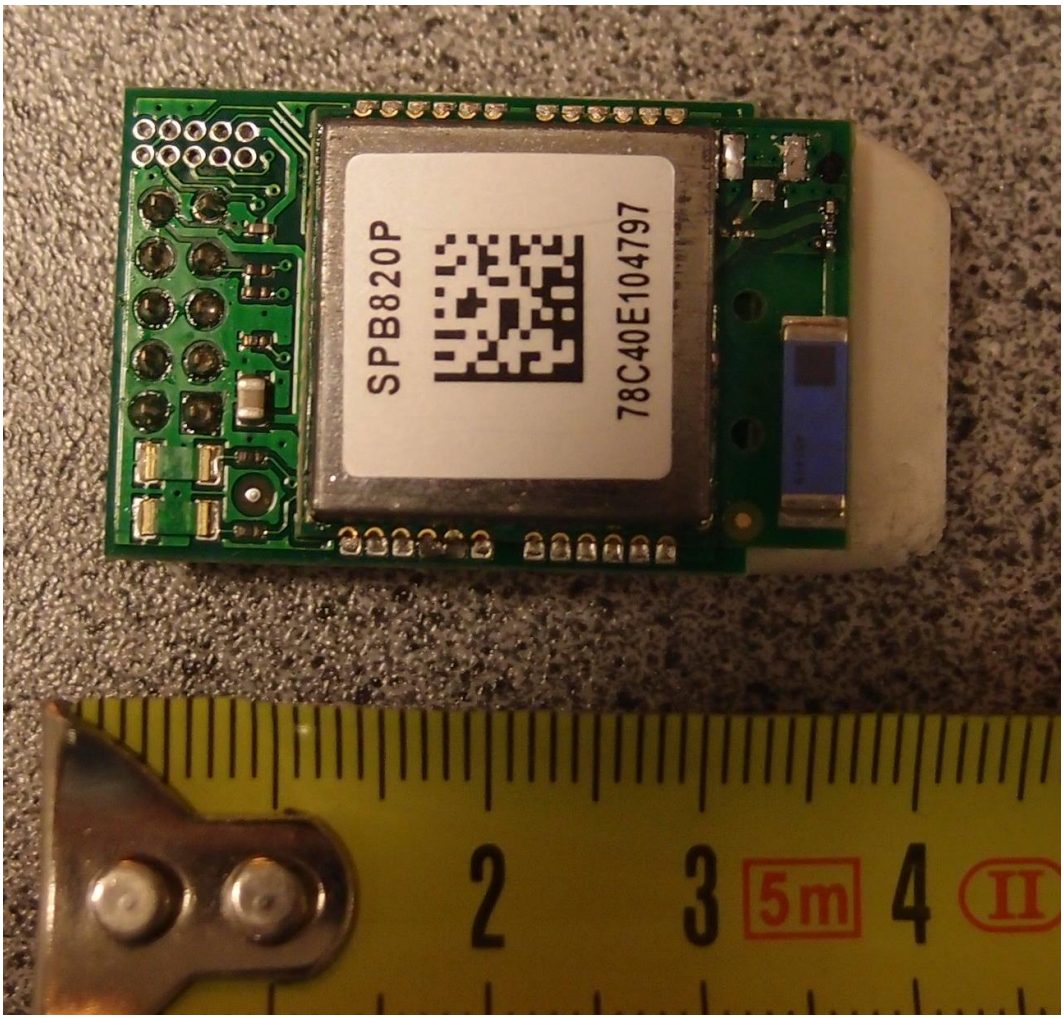
The test set-up during the conducted AC emissions tests can be seen in the pictures below.



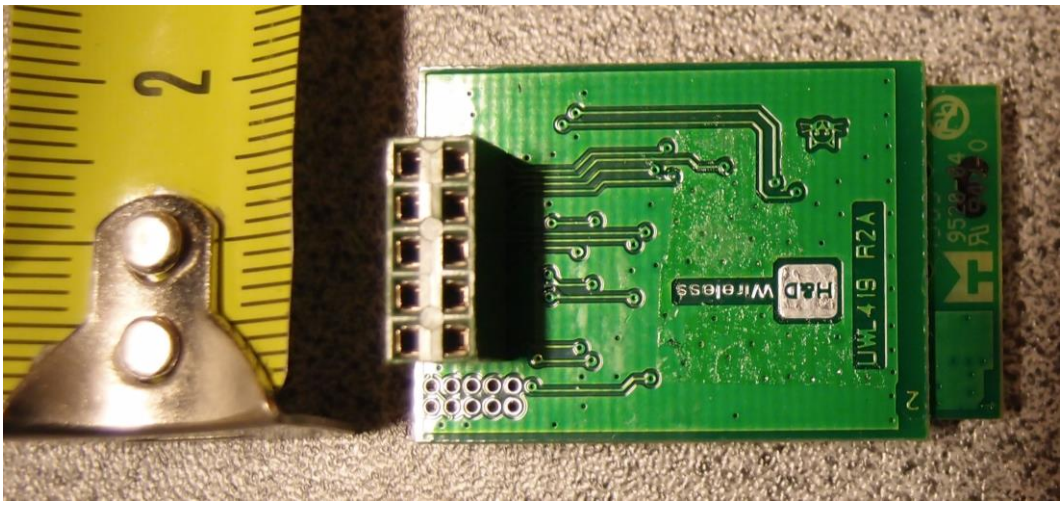


EUT, radiated sample

Front

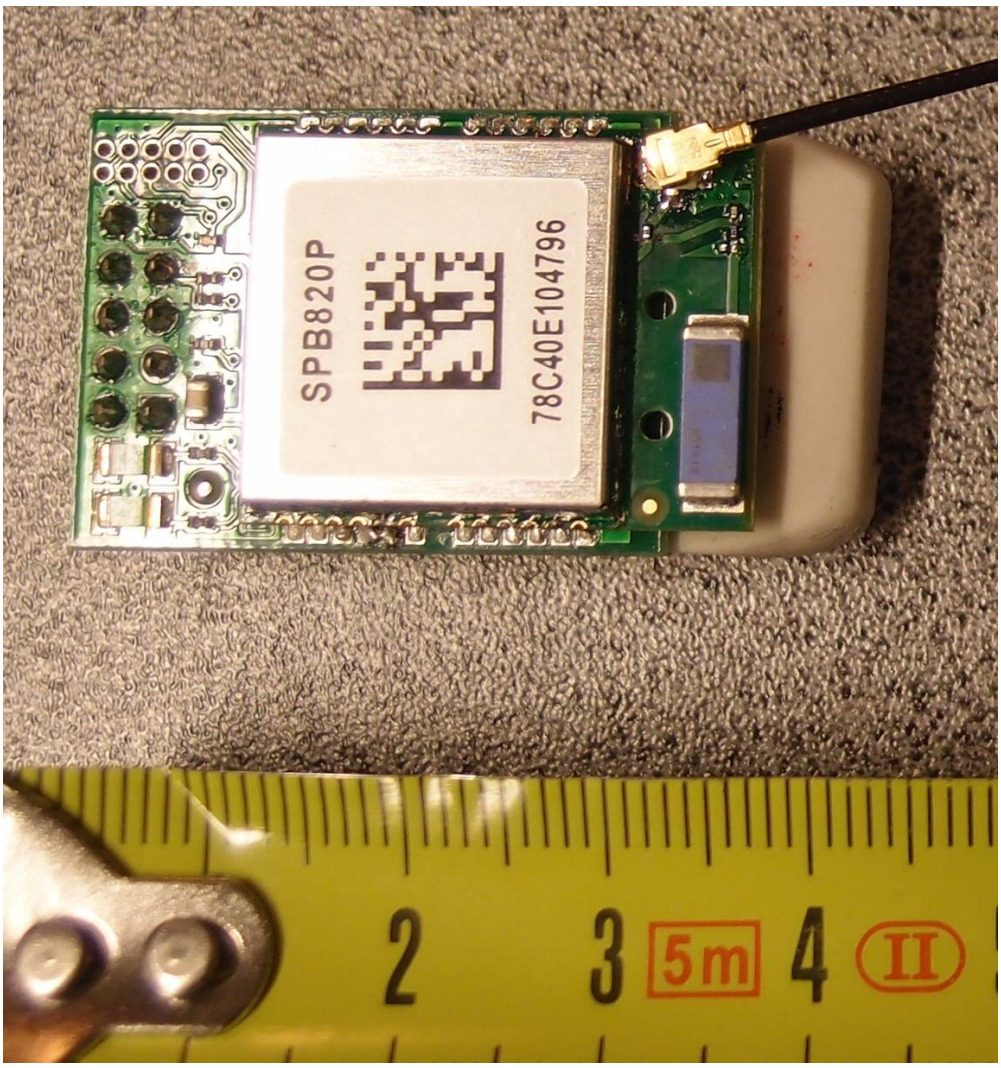


Rear



EUT, conducted sample
At the conducted sample also the chip antenna was mounted at the PCB. The chip antenna was not connected to the RF-port of the EUT during the conducted tests.

Front



Rear