RADIO TEST REPORT

No. 1023620-1

EQUIPMENT UNDER TEST

Equipment:	Wireless Communication Hub
Type / model:	AH20
Manufacturer:	ASSA ABLOY AB
Tested by request of:	ASSA ABLOY AB

SUMMARY

The equipment complies with the requirements of the following standards:

47 CFR, Part 15, Subpart B (2010) and Subpart C (2010);

RSS-GEN, Issue 3 (December 2010)
RSS-210, Issue 8 (December 2010)

Industry Canada listed test facility No. IC 2042G-2

Date of issue: 2011-03-11

Tested by: Niklas Boström Approved by: Stefan Andersson

Niklas Boström Stefan Andersson

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1. CLIENT INFORMATION

The EUT has been tested by request of

Company:	ASSA ABLOY AB Box 44032 100 73 Stockholm Sweden
Name of contact:	Johan Näreskog

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT according to the manufacturer/client declaration

Equipment:	Wireless Communication Hub
Type / Model:	AH20
Brand name:	ASSA ABLOY
Serial number:	MAC ID: 00.17.7A.01.02
Manufacturer:	ASSA ABLOY AB
Rating/Supplying voltage:	8-24V; 250 mA
Rating RF output power:	16 dBm EIRP (with internal antenna)
Antenna gain:	Internal antenna: 6 dBi External antenna: 3.9 dBi
External antenna connector:	Yes, reverse SMA
Frequency range:	2400 - 2483,5 MHz
Number of channels:	15
Modulation characteristics:	DSSS (IEEE 802.15.4)
Low channel = 11	2405 MHz
Mid channel = 18	2440 MHz
High channel = 25	2475 MHz

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2.2 Additional software information about the EUT

The EUT was started in a specific test mode that made it possible to set the required test modes during the tests. Commands were sent to the EUT from the Command Prompt in the Laptop via the RS-485 interface.

2.3 Peripheral equipment

Peripheral equipment is defined as equipment needed for correct operation of the EUT, but not included as part of the EUT.

Equipment	Manufacturer / Type	Serial number
Laptop	IBM / Thinkpad T40p	--
RS-485 interface	--	--

2.4 Modifications during the test

No modifications have been made during the tests.

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3. TEST SPECIFICATIONS

3.1 Standards

FCC 47 CFR part 15 (2010) Subpart B – Unintentional radiators

FCC 47 CFR part 15 (2010) Subpart C – Intentional Radiators; §15.247 Operation within the bands 902-928 MHz, 2400 – 2483.5 MHz and 5725 – 5850 MHz.

RSS-Gen, Issue 3 (December 2010): General Requirements and Information for the Certification of Radiocommunication Equipment

RSS-210, Issue 8 (December 2010): Low Power Licence-Exempt Radio communication Devices (All Frequency Bands): Category I Equipment.

Measurements methods according to:

FCC KDB 558074

and

ANSI C63.4-2009 - Methods of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

and

ANSI C63.10-2009 - Standard for Testing Unlicensed Wireless Devices

3.2 Additions, deviations and exclusions from standards

No additions, deviations or exclusions have been made from standards.

3.3 Test site

Measurements were performed at Intertek Semko AB, located at Torshamnsgatan 43 in Stockholm, Sweden.

3.3 Test set-up

Measurement set-ups for the test of out-of-band spurious emissions test are described in corresponding sections. During other tests the EUT was connected to the spectrum analyzer or peak power meter by cable.

During all tests the EUT was powered with 12 V DC.

3.4 Operating environment

If not additionally specified, the tests were performed under the following environmental conditions:

Air temperature:	20-25	°C
Relative humidity:	15-25	%

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4. TEST SUMMARY

The results in this report apply only to the sample tested.

FCC reference	IC reference	Test	Result	Note
15.247(b)	RSS-210 A8.4 (4)	Peak output power	PASS	
15.247(a)	RSS-210 A8.2 (a)	6 dB Bandwidth	PASS	
15.247(a)	RSS-210 A8.2 (b)	Spectral power density	PASS	
15.247(d)	RSS-210 A8.5	Band edge compliance	PASS	
15.247(d)	RSS-210 A8.5	Out of band spurious emissions, radiated	PASS	1
15.247(d)	RSS-210 A8.5	Out of band spurious emissions, conducted	PASS	
15B	RSS-Gen Table 2	Out of band spurious emissions, radiated	PASS	
15B	RSS-Gen Table 4	Conducted emission at AC port	NA	

NT = Not Tested
NA = Not Applicable

1. The measured result is below the upper limit, but by a margin less than half of the uncertainty interval. It is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance is more probable than non-compliance.

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5. PEAK OUTPUT POWER

5.1 Test equipment

Equipment	Manufacturer	Type	Inv. No.	Calibration due date
Power Meter	Rhode & Schwarz	NRVD	8745	2011-07
Peak Power Sensor	Rhode & Schwarz	NRV-Z31	7411	2011-07
RF attenuator	Hewlett Packard	8491A	30088	2011-07

5.2 Test protocol

Date of test: 2011-03-02

Channel (MHz)	Peak power dBm	Limit value (dBm)
2405	10.7	30
2440	10.7	
2475	10.6	

Measurement results are corrected for attenuation in the set-up configuration.

Example calculation:

Peak output power [dBm] = Power meter reading [dBm] + Attenuator [dB]

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6. 6 dB BANDWIDTH

6.1 Test equipment

Equipment	Manufacturer	Type	Inv. No.	Calibration due date
Signal Analyzer	Rhode & Schwarz	FSIQ	12793	2011-07
Cable	Huber + Suhner	Sucoflex 104	5188	2011-07
RF attenuator	Hewlett Packard	8491A	30088	2011-07

6.2 Test protocol

Date of test: 2011-03-02

Spectrum analyzer display is corrected for attenuation in the set-up configuration.

Channel (MHz)	6 dB Bandwidth (MHz)	Plot	Limit value (MHz)
2405	1.587	plot P6.1	> 0.5
2440	1.599	plot P6.2	
2475	1.587	plot P6.3	

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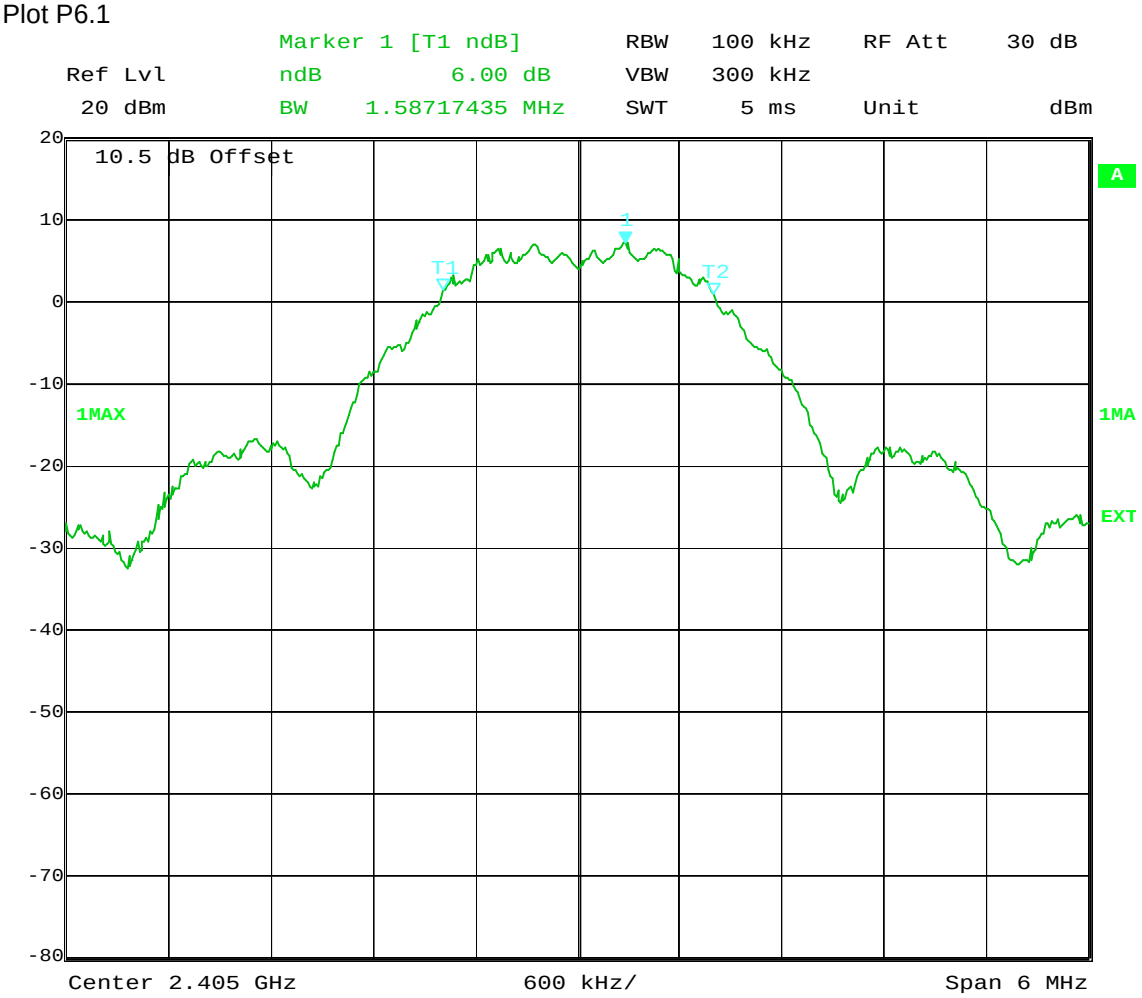
Plot P6.1



Date: 2.MAR.2011 11:10:45

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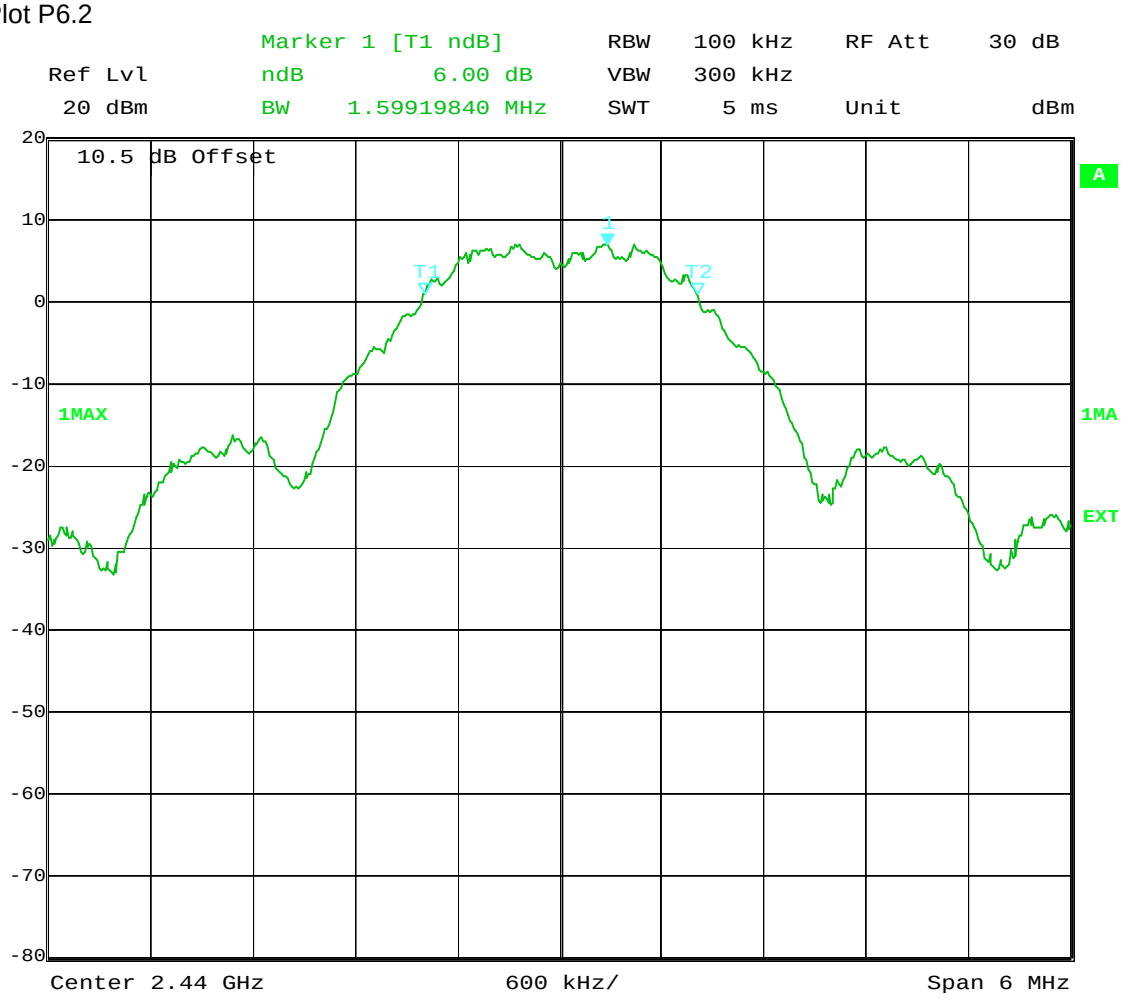
Plot P6.2



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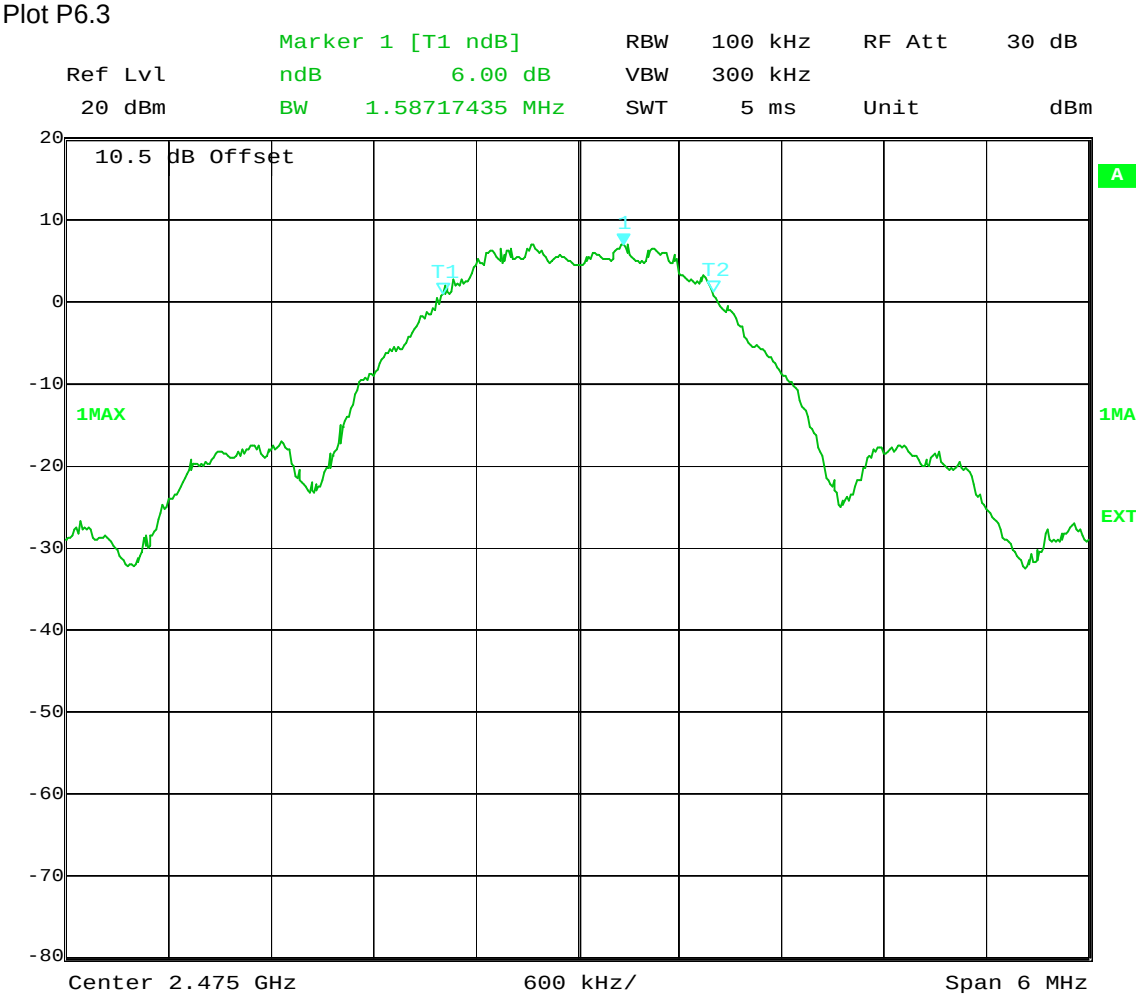
Plot P6.3



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7. BAND EDGE COMPLIANCE, CONDUCTED

7.1 Test equipment

Equipment	Manufacturer	Type	Inv. No.	Calibration due date
Signal Analyzer	Rhode & Schwarz	FSIQ	12793	2011-07
Cable	Huber + Suhner	Sucoflex 104	5188	2011-07
RF attenuator	Hewlett Packard	8491A	30088	2011-07

7.2 Test protocol

Date of test: 2011-03-02

Channel	Plot	Results	Limit value (dBc)
Low	plot P7.1	PASS	20
High	plot P7.2	PASS	20

Measurement results are corrected for attenuation in the set-up configuration.

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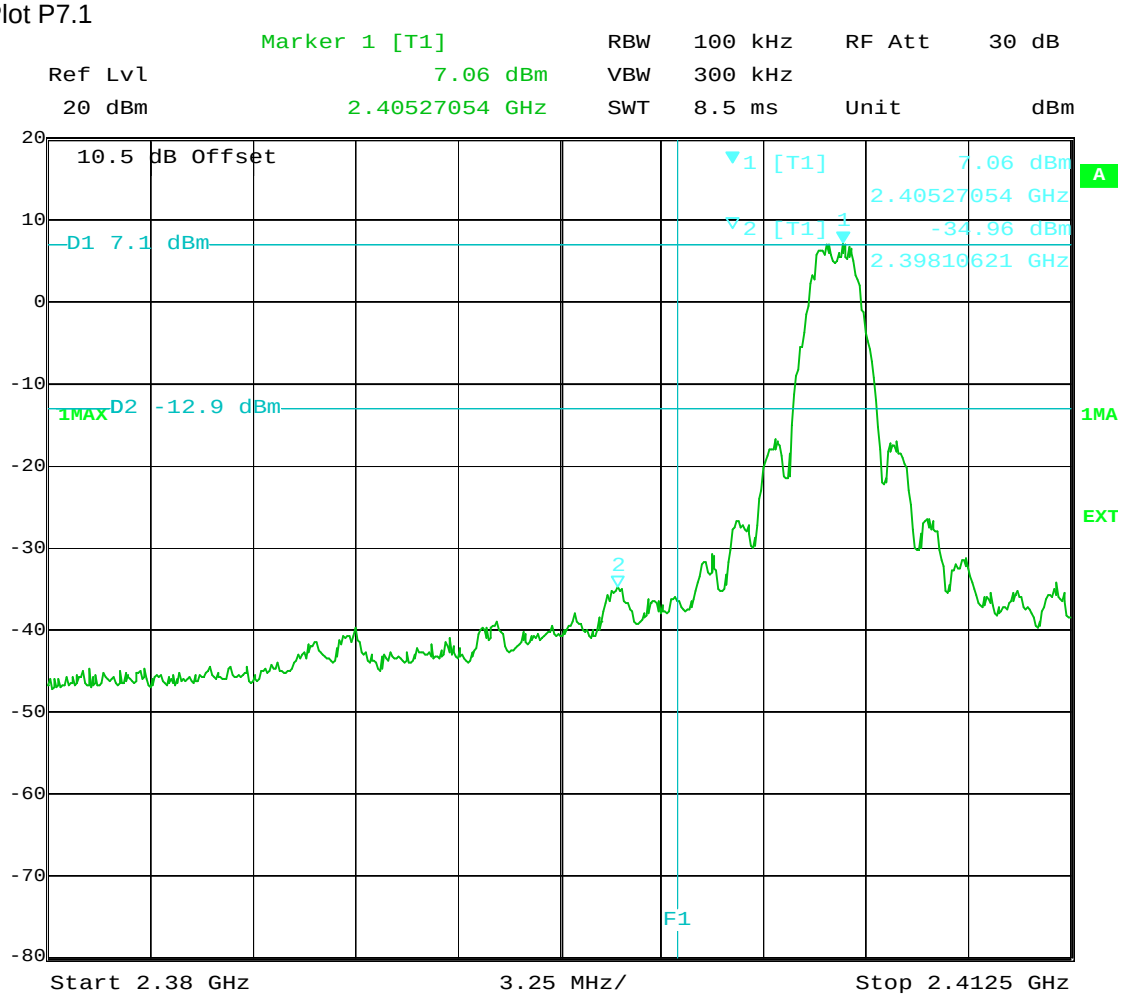
Plot P7.1



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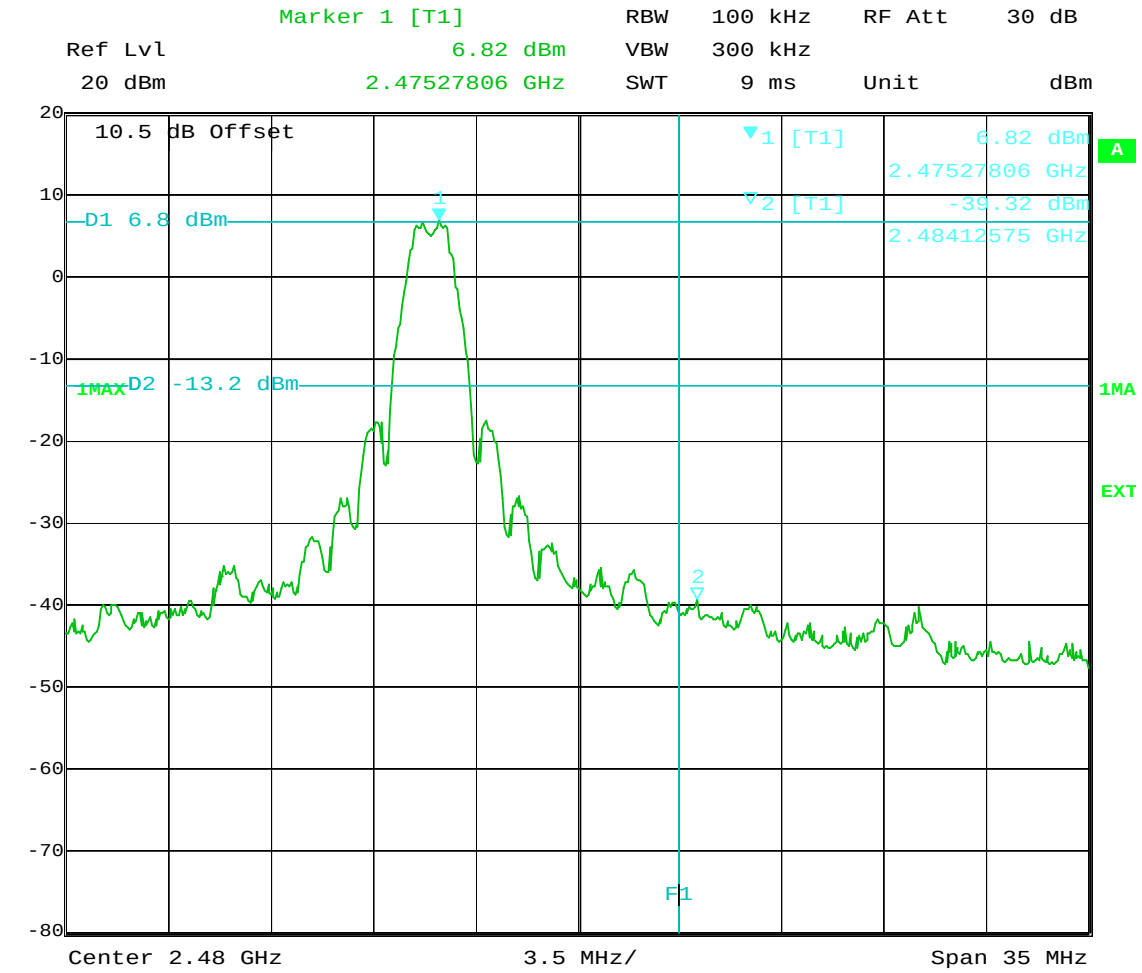
Plot P7.2



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8. POWER SPECTRAL DENSITY

8.1 Test equipment

Equipment	Manufacturer	Type	Inv. No.	Calibration due date
Signal Analyzer	Rhode & Schwarz	FSIQ	12793	2011-07
Cable	Huber + Suhner	Sucoflex 104	5188	2011-07
RF attenuator	Hewlett Packard	8491A	30088	2011-07

8.2 Test protocol

Date of test: 2011-03-02

Channel	Power spectral density (dBm)	Plot	Limit value (dBm)
Low	-5.6	plot P8.1	8
Mid	-6.1	plot P8.2	8
High	-5.2	plot P8.3	8

Measurement results are corrected for attenuation in the set-up configuration.

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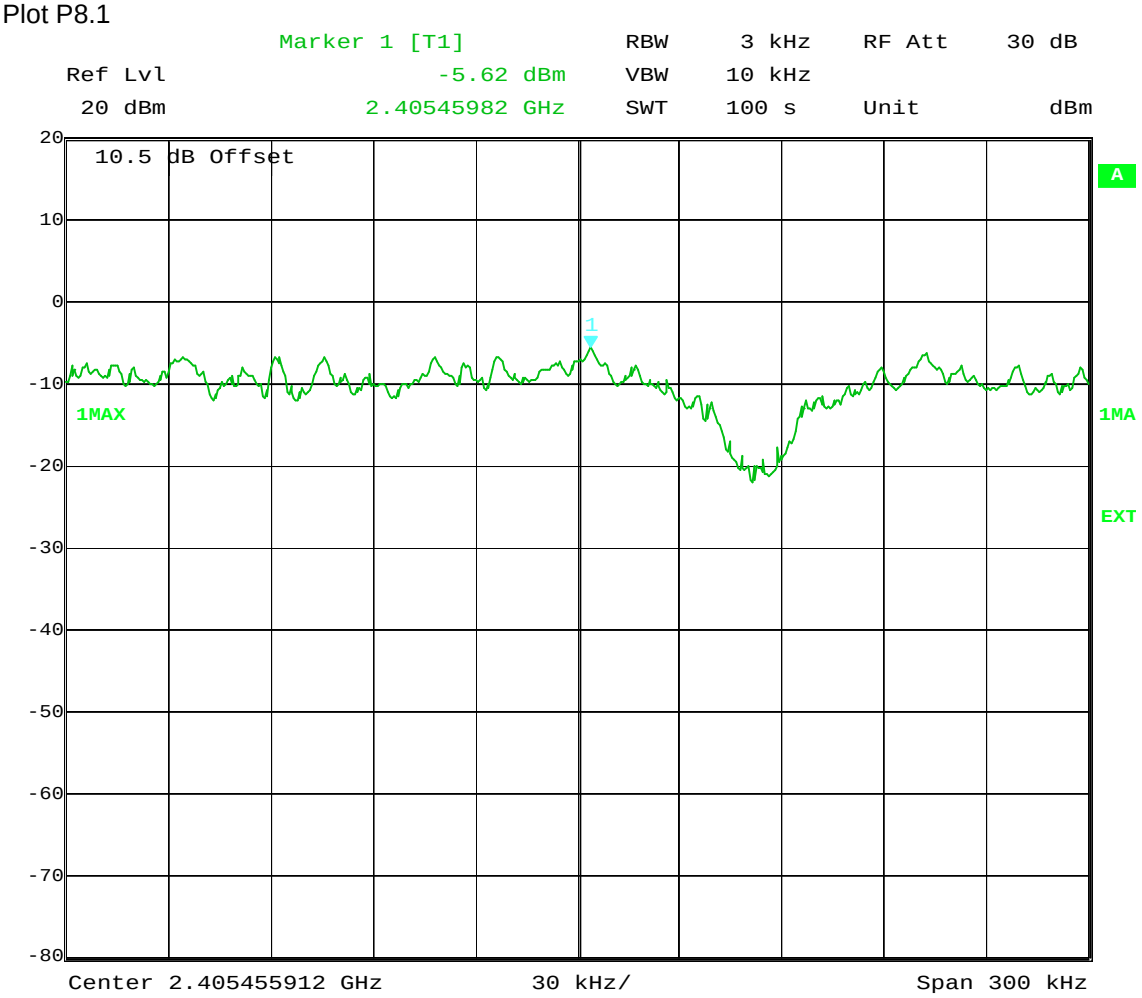
Plot P8.1



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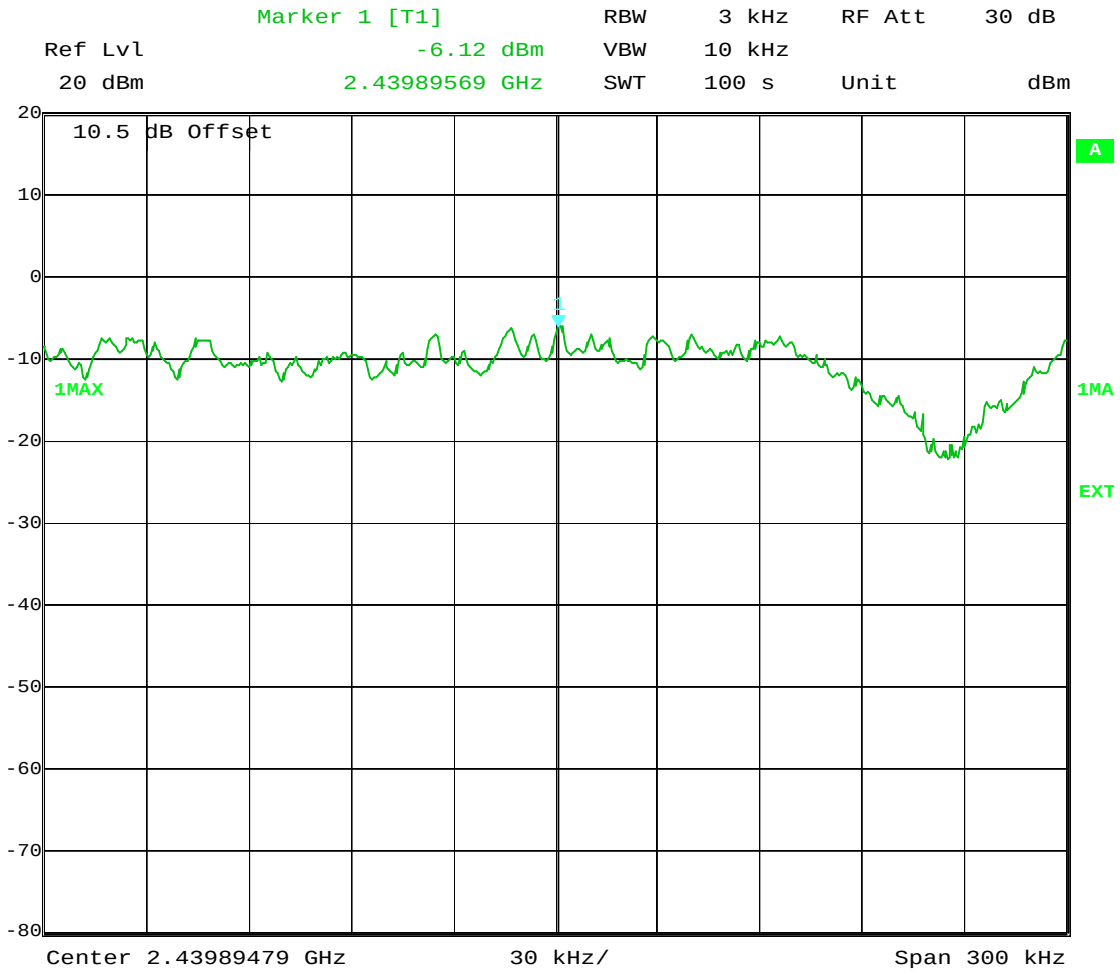
Plot P8.2



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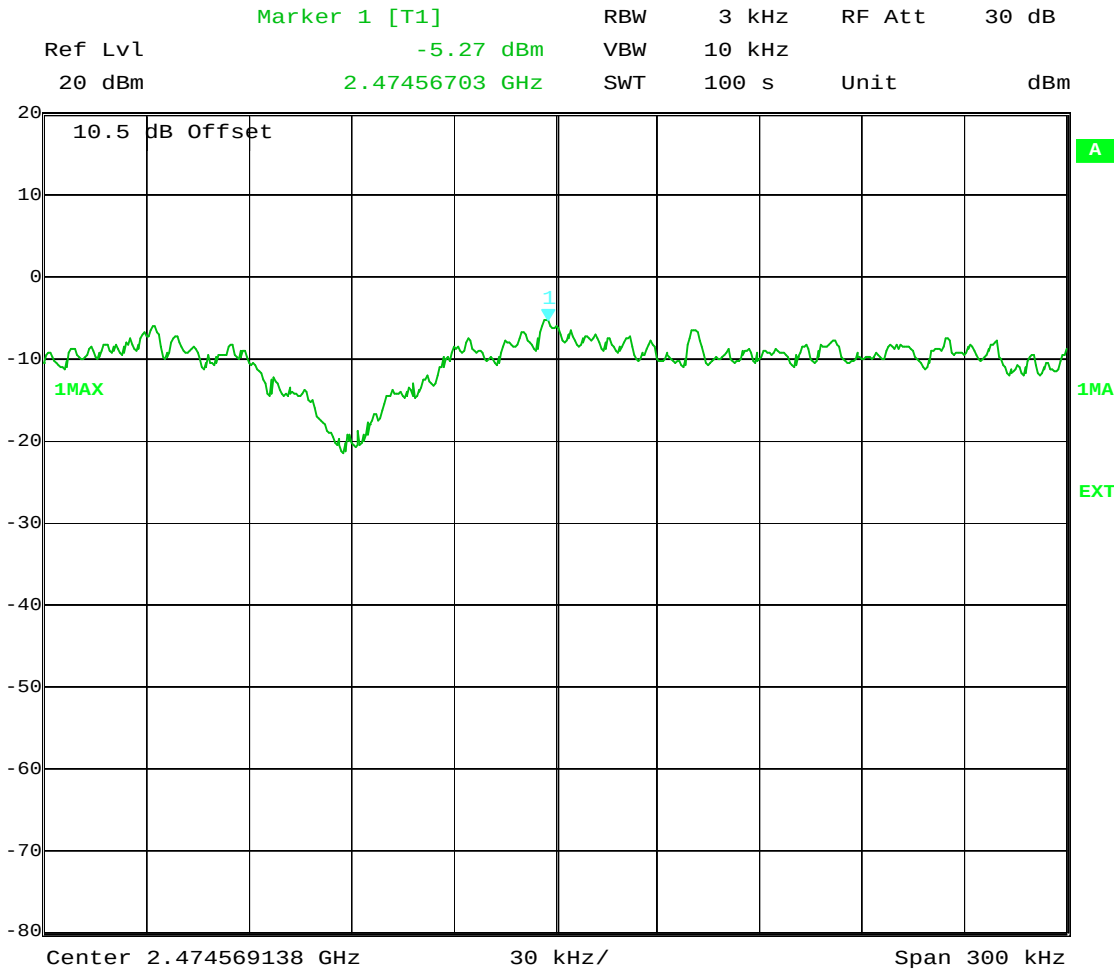
Plot P8.3



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9. RADIATED SPURIOUS EMISSIONS

9.1 Measurement uncertainty

Radiated disturbance electric field intensity, 30 – 1000 MHz: ± 4,6 dB
Radiated disturbance electric field intensity, 1000 – 26000 MHz: ± 6,0 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT. Measurement uncertainty is calculated in accordance with EA-4/02-1997. The uncertainty is given with a level of confidence of approximately 95% (k=2).

9.2 Test equipment

Equipment	Manufacturer	Type	Inv. No.	Calibration due date
Test site: Semi-anechoic shielded chamber, Stora Hallen			30300	
Software	Rohde & Schwarz	EMC 32		
Measurement receiver	Rohde & Schwarz	ESU 8	12866	2011-06
Measurement receiver	Rohde & Schwarz	ESU 40	13178	2011-07
Antenna, bilog	Chase	CBL6111	8578	2011-09
Preamplifier	Semko	AM1331	7992	2011-07
Cable	Suhner	RG 214	9506	2011-07
Cable	Suhner	Sucoflex 104	9511	2011-07
Cable	Suhner	Sucoflex 104	40035	2011-07
Cable	Suhner	Sucoflex 104	40036	2011-07
Horn antenna	EMCO	3115	3006	2015-02
Preamplifier	uComp Nordic	MCN-AMPL-06006-35	30939	2011-07
Cable	Rosenberger	Utiflex FA142A	9747	2011-07
Cable	Suhner	Sucoflex 104	5189	2011-07
Horn antenna with preamplifier	BONN Elektronik	BLMA 1826-5A	31247	2013-12
Horn antenna with preamplifier	BONN Elektronik	BLMA 2640-5A	31248	2013-12
Cable	Rosenberger	Utiflex FB311A	9748	2011-07
High pass filter	K & L Microwave Inc.	4410-X4500/18000-0	5133	2011-07
Band rejection filter	K & L Microwave Inc.	6N45-2450/T 100-0/0	12389	2011-07

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9.3 Measurement set-up

Test site Semi-anechoic shielded chamber

The radiated disturbance electric field intensity was measured in a semi-anechoic chamber at a distance of 3 m and the EUT was placed on a non-metallic table, 0,8 m above the reference ground plane. The specified test mode was enabled. Test set-up photos are given below.

An overview sweep with peak detection of the electric field intensity was performed with the measurement receiver in max-hold and with the antenna placed 1,5 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps. For some frequency ranges the overview sweeps were done with both a peak detector and with an average detection.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new measurements with the correct detector(s) were carried out.

The EUT was supplied with 12 V DC during the test.

Tests were performed with the EUT using the internal antenna and then repeated with the EUT using the external antenna.

Example calculation
Measured level [dBμV/m] = Analyser reading [dBμV] + cable loss [dB] – preamplifier gain [dB] + antenna factor [1/m]

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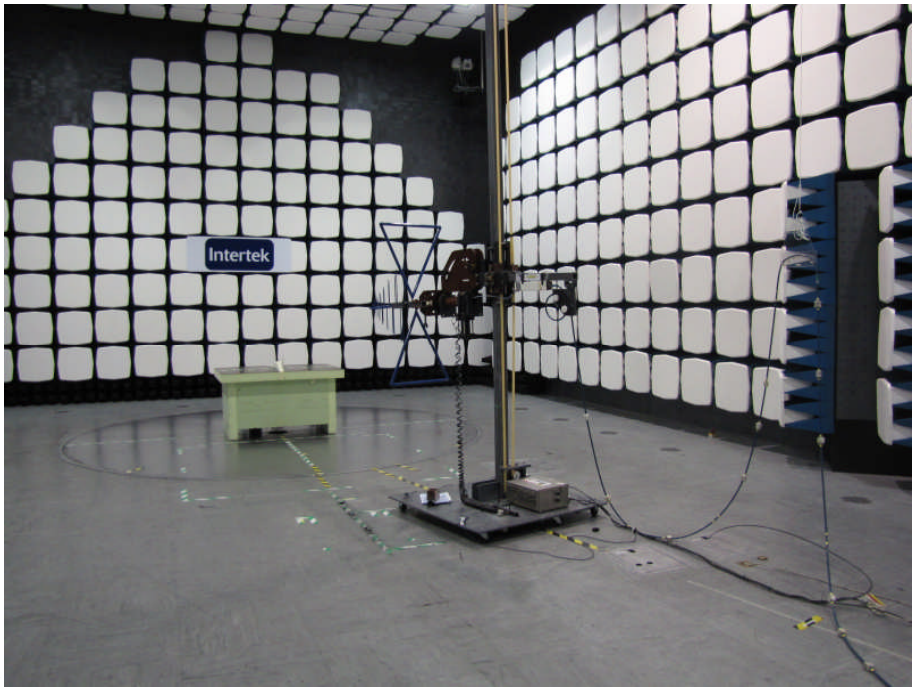
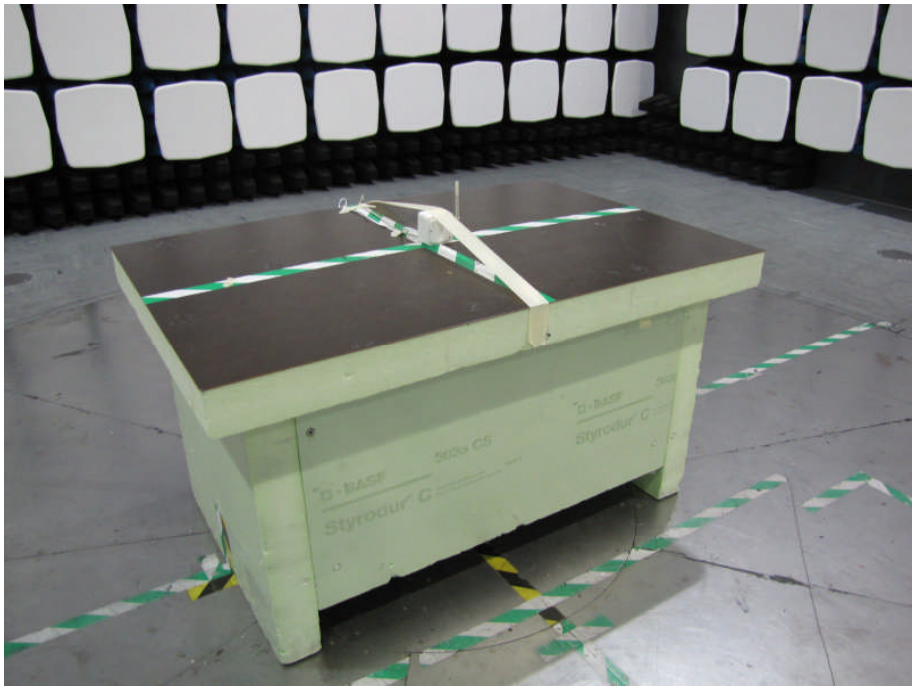
Test set-up photos 30 -1000 MHz





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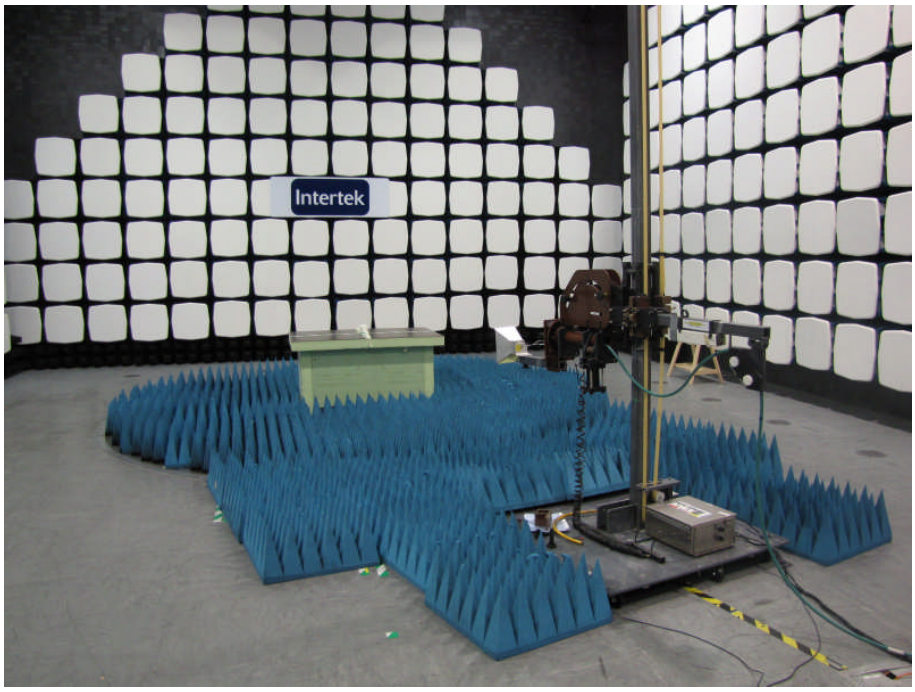
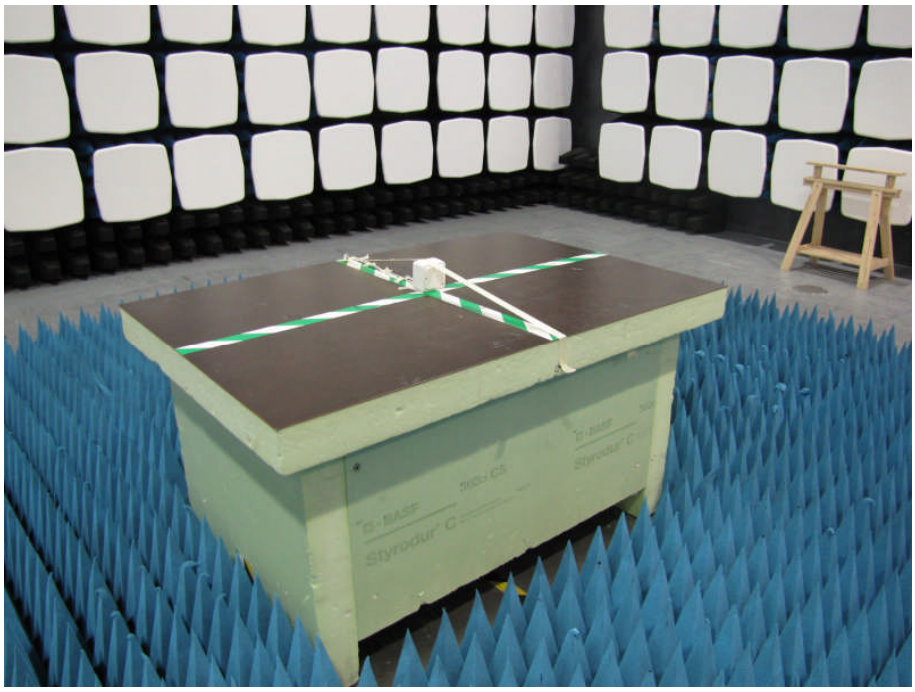
Test set-up photo above 1 GHz





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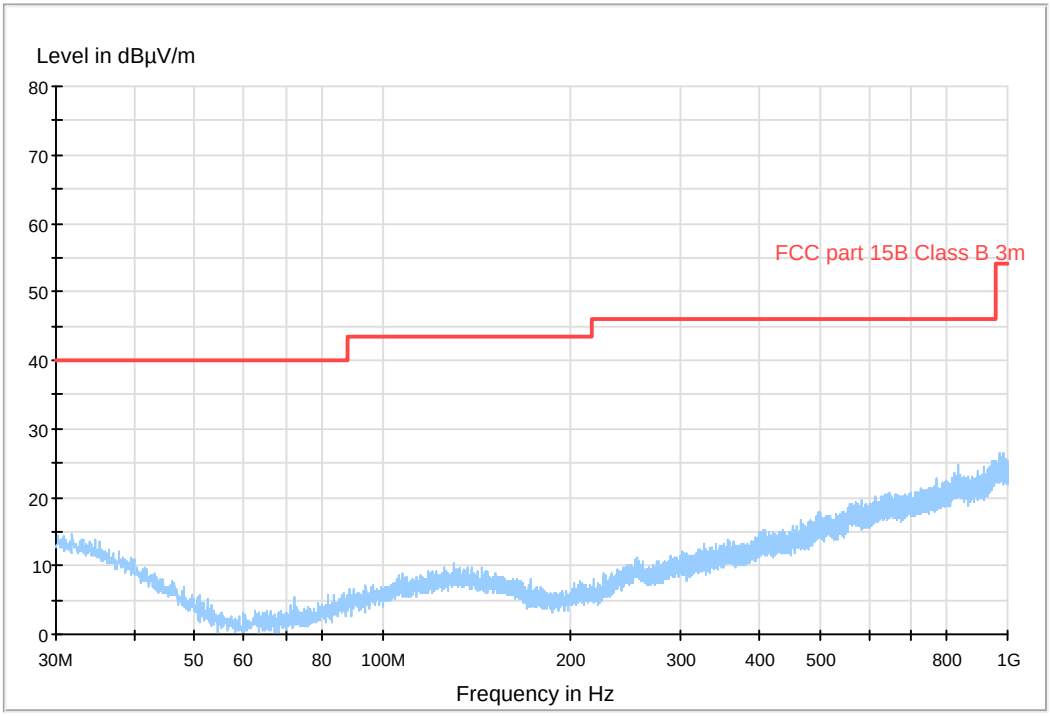
9.4 Test protocol

Semi-anechoic shielded chamber

Dates of test: 23-25 november 2011

30 – 1000 MHz, max peak at a distance of 3 m on the lowest TX channel with internal antenna

FCC 30 - 1000 MHz FCC class B 3m



No emissions above noise floor
The margin between noise floor and limit is more than 20 dB.

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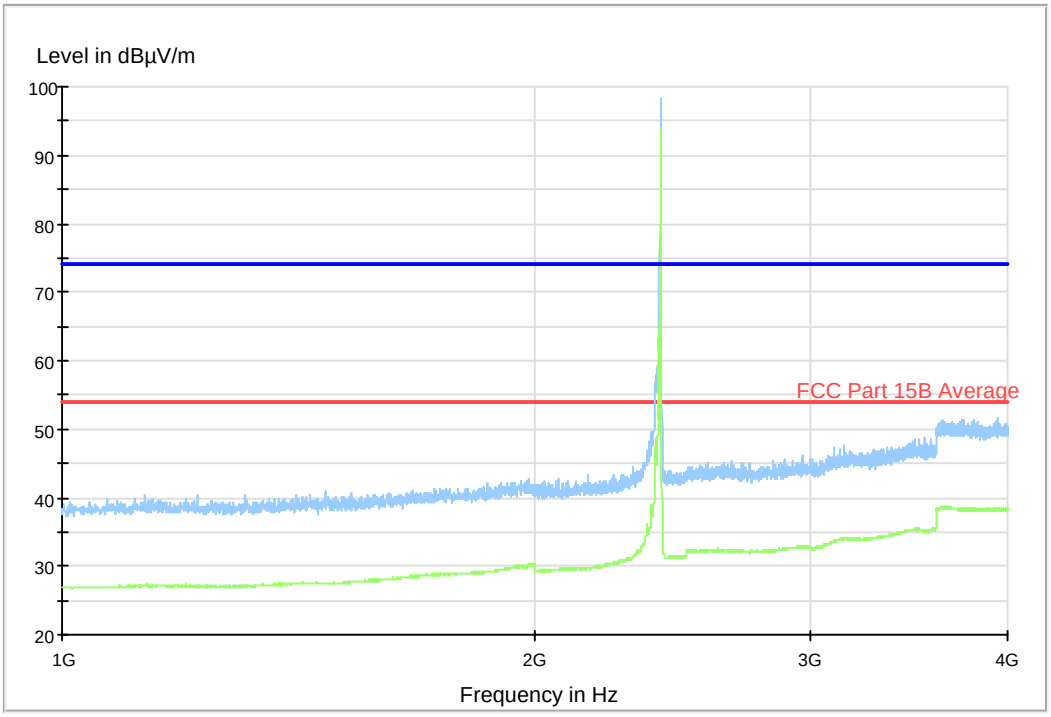
1 – 4 GHz, max peak and average traces at a distance of 3 m on the lowest TX channel with internal antenna
Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0

FCC 1G - 4 G class B 3m ESU40 EMCO3115



No emissions above noise floor were found except at the lower band edge. Measurements at the lower band edge are found on the next page.

The margin between noise floor and limit is more than 20 dB for the peak trace and more than 15 dB for the average trace.

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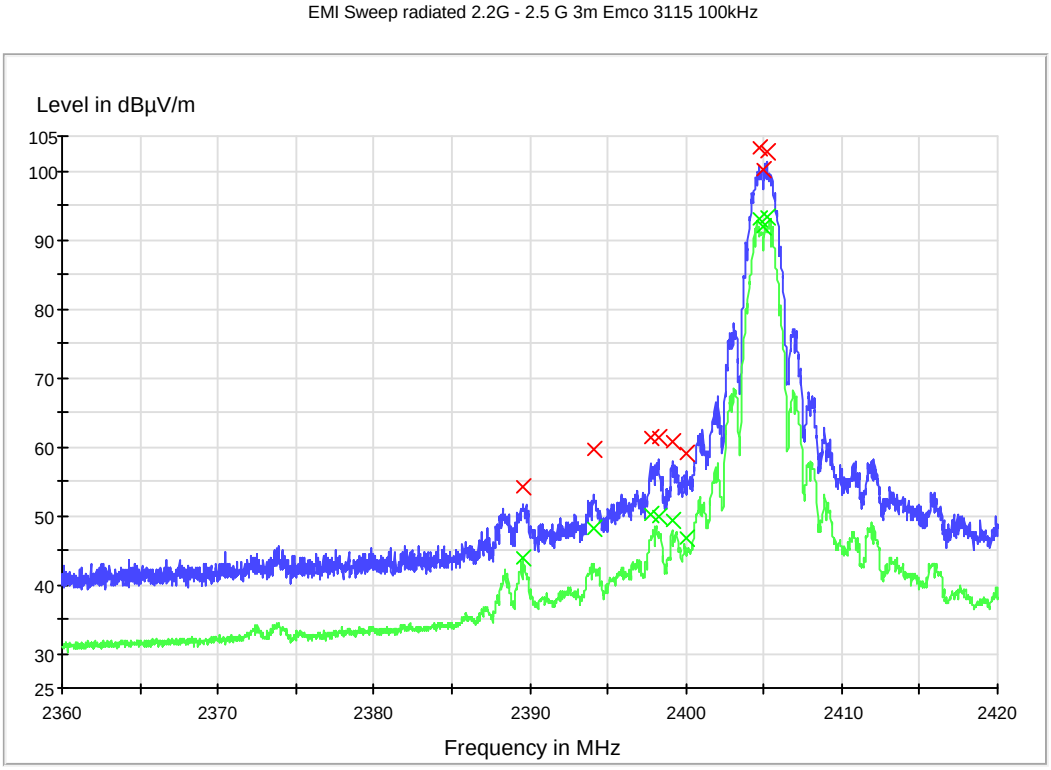
Emissions at the lower band edge at a distance of 3 m on the lowest TX channel with internal antenna. Max peak and average traces.



Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)
2405.000000	100.2	91.8	100.000	100.0	V	-8.0	-2.2
2404.740000	103.2	93.1	100.000	100.0	V	13.0	-2.2
2405.220000	102.8	93.2	100.000	100.0	V	32.0	-2.2
2400.000000	59.1	46.7	100.000	100.0	H	6.0	-2.2
2399.180000	60.8	49.2	100.000	100.0	V	1.0	-2.2
2398.280000	61.2	49.9	100.000	100.0	H	-3.0	-2.2
2397.720000	61.3	50.1	100.000	100.0	V	-4.0	-2.2
2394.140000	59.5	48.1	100.000	100.0	V	23.0	-2.2
2389.600000	54.3	43.9	100.000	100.0	V	6.0	-2.2

The out of band emissions are attenuated by more than 20 dB from the highest emission in the TX band in a 100 kHz measurement bandwidth

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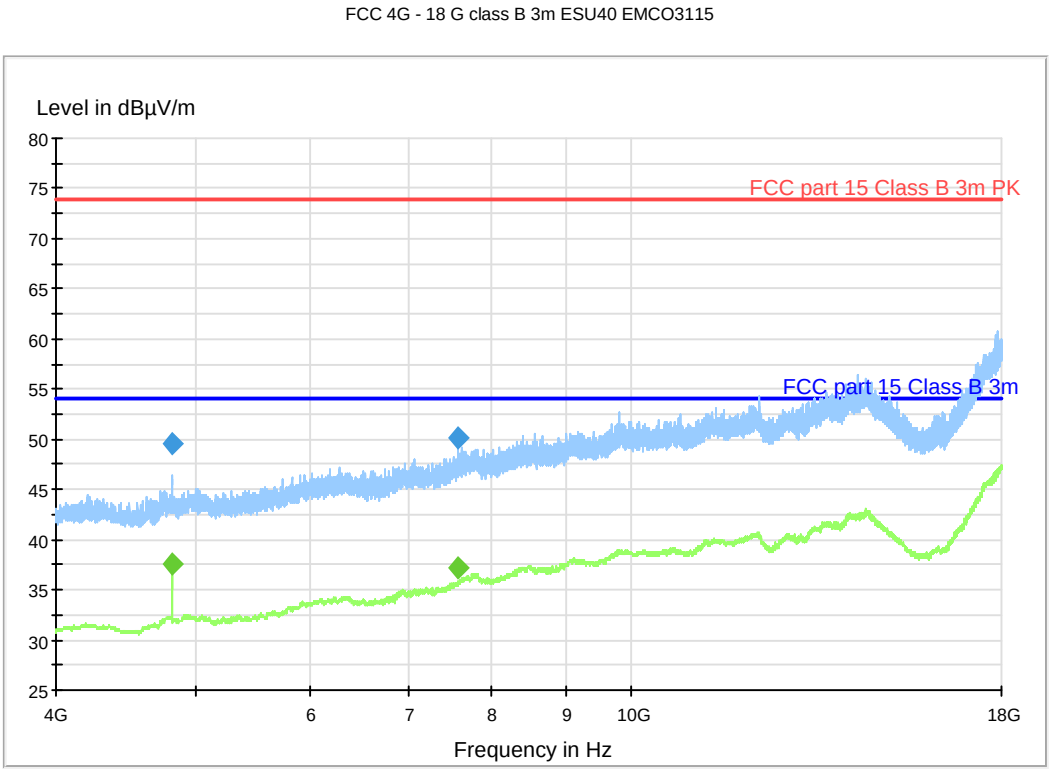
4 – 18 GHz, max peak and average traces at a distance of 3 m on the lowest TX channel with internal antenna
Emissions below 4 GHz are attenuated by high-pass filter K&L 4410-X4500/18000-0



Final Result Peak, lowest TX channel internal antenna

Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4810.800000	49.5	1000.000	157.0	H	-25.0	3.0	24.5	74.0
7588.200000	50.1	1000.000	265.0	V	240.0	7.5	23.9	74.0

No other significant emissions were found above noise floor.

Final Result Peak, lowest TX channel internal antenna

Frequency (MHz)	Average (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4809.400000	37.5	1000.000	174.0	H	31.0	3.0	16.5	54.0
7583.200000	37.1	1000.000	249.0	V	178.0	7.5	16.9	54.0

No other significant emissions were found above noise floor.

Note: These emissions are in a restricted band listed in §15.205.

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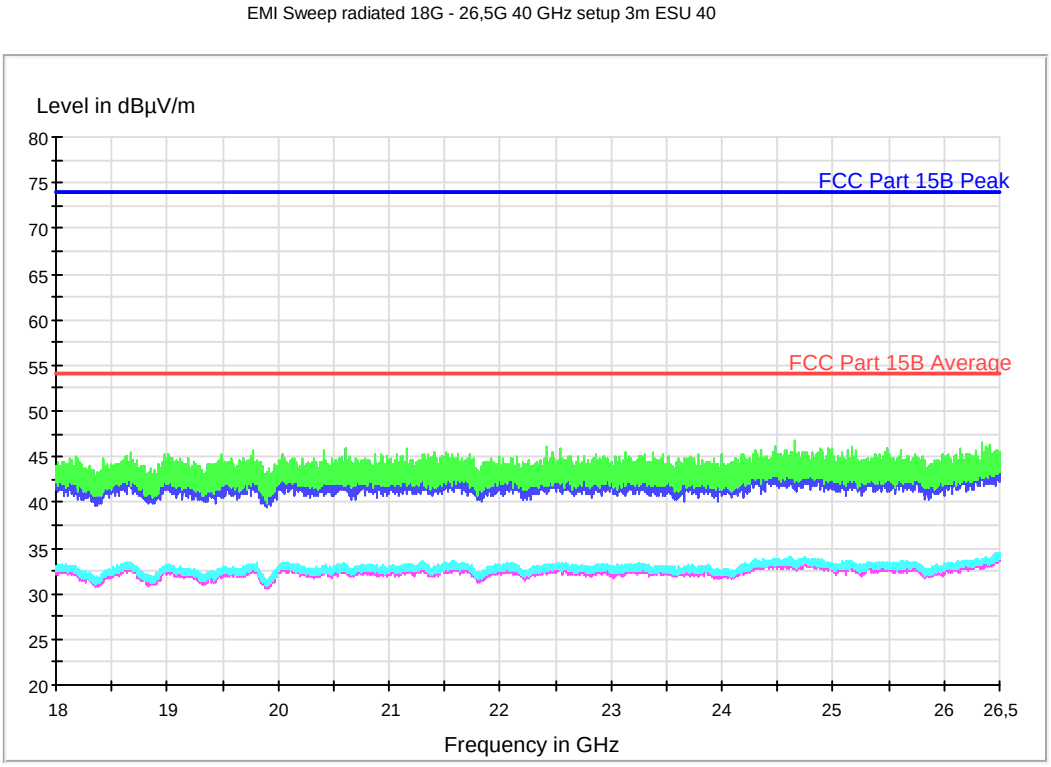
Registered in Sweden: No: SE556024059901, Registered office: As address

18 – 26 GHz, max peak and average traces at a distance of 3 m on the lowest TX channel with internal antenna



No emissions above noise floor
The margin between noise floor and limit is more than 20 dB.

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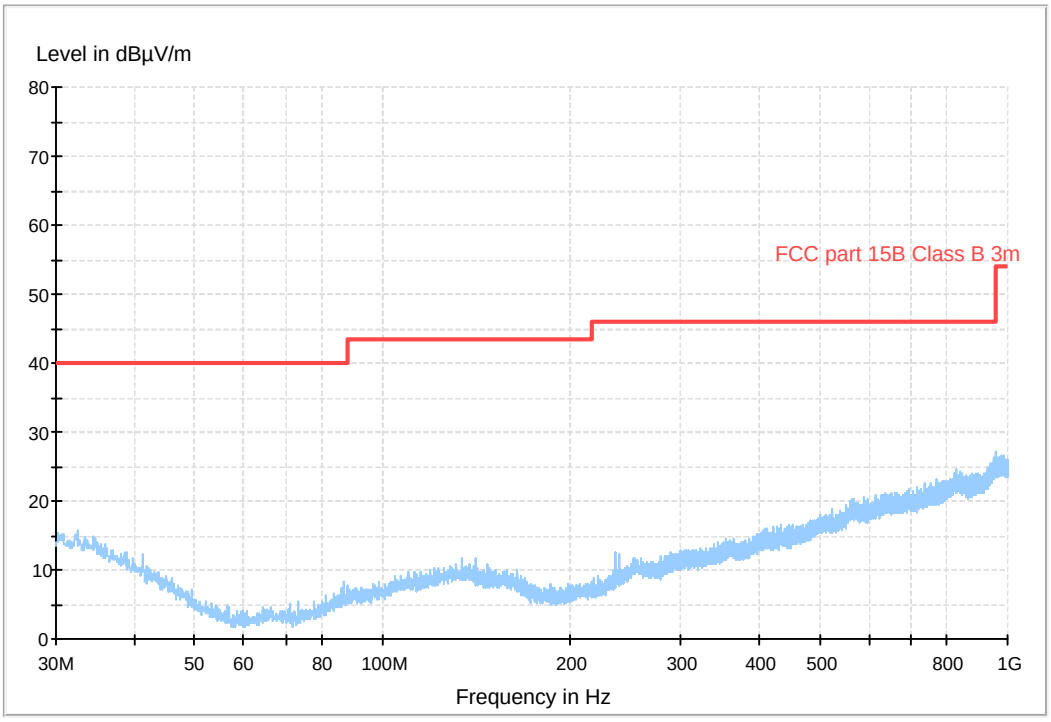
30 – 1000 MHz, max peak at a distance of 3 m on the lowest TX channel with external antenna

FCC 30 - 1000 MHz FCC class B 3m



No emissions above noise floor
The margin between noise floor and limit is more than 20 dB.

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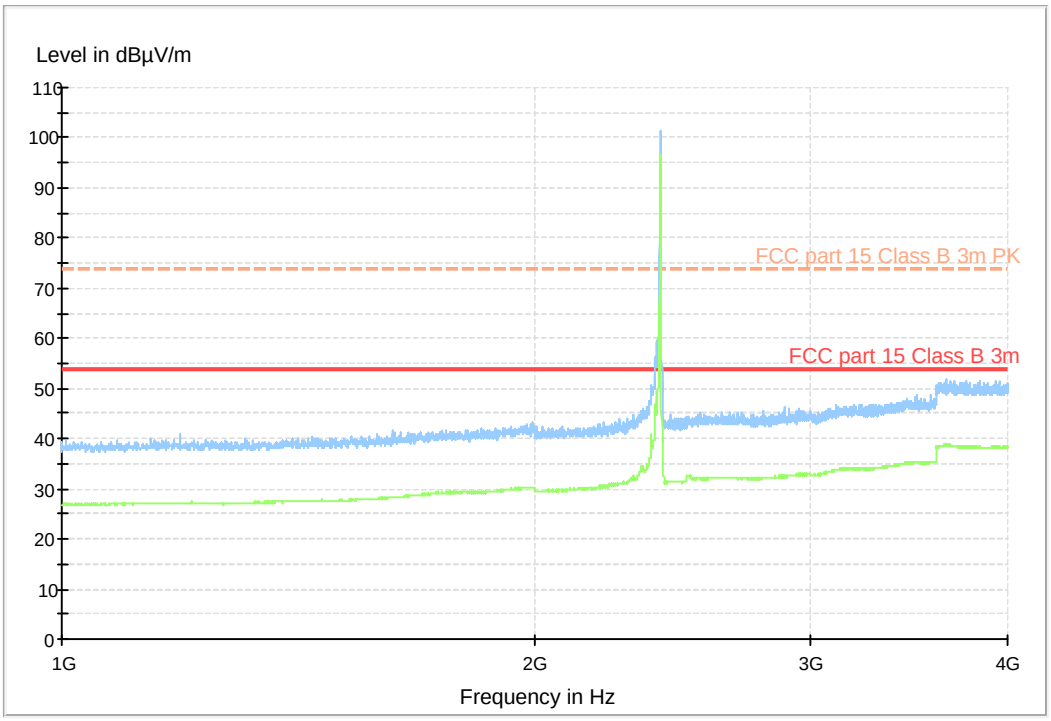
1 – 4 GHz, max peak and average traces at a distance of 3 m on the lowest TX channel with external antenna
Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0

FCC 1G - 4 G class B 3m ESU40 EMCO3115



No emissions above noise floor were found except at the lower band edge. Measurements at the lower band edge are found on the next page.

The margin between noise floor and limit is more than 20 dB for the peak trace and more than 15 dB for the average trace.

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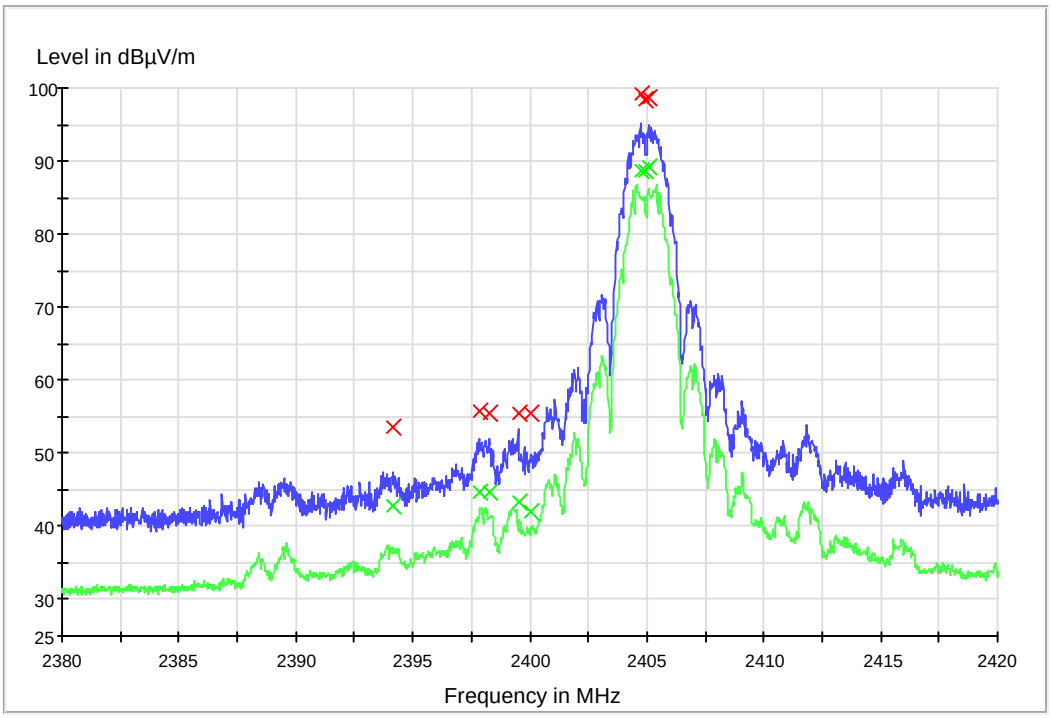
Emissions at the lower band edge at a distance of 3 m on the lowest TX channel with external antenna. Max peak and average traces.

EMI Sweep radiated 2.2G - 2.5 G 3m Emco 3115 100kHz



Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)
2394.140000	53.7	42.9	100.000	100.0	V	-6.0	-2.2
2397.820000	55.7	44.8	100.000	100.0	V	31.0	-2.2
2398.280000	55.5	44.6	100.000	100.0	V	-9.0	-2.2
2399.500000	55.5	43.4	100.000	100.0	V	32.0	-2.2
2400.000000	55.5	42.0	100.000	100.0	V	33.0	-2.2
2404.740000	99.2	88.7	100.000	100.0	V	-9.0	-2.2
2404.900000	98.4	88.6	100.000	100.0	V	-9.0	-2.2
2405.060000	98.6	89.2	100.000	100.0	V	33.0	-2.2

The out of band emissions are attenuated by more than 20 dB from the highest emission in the TX band in a 100 kHz measurement bandwidth

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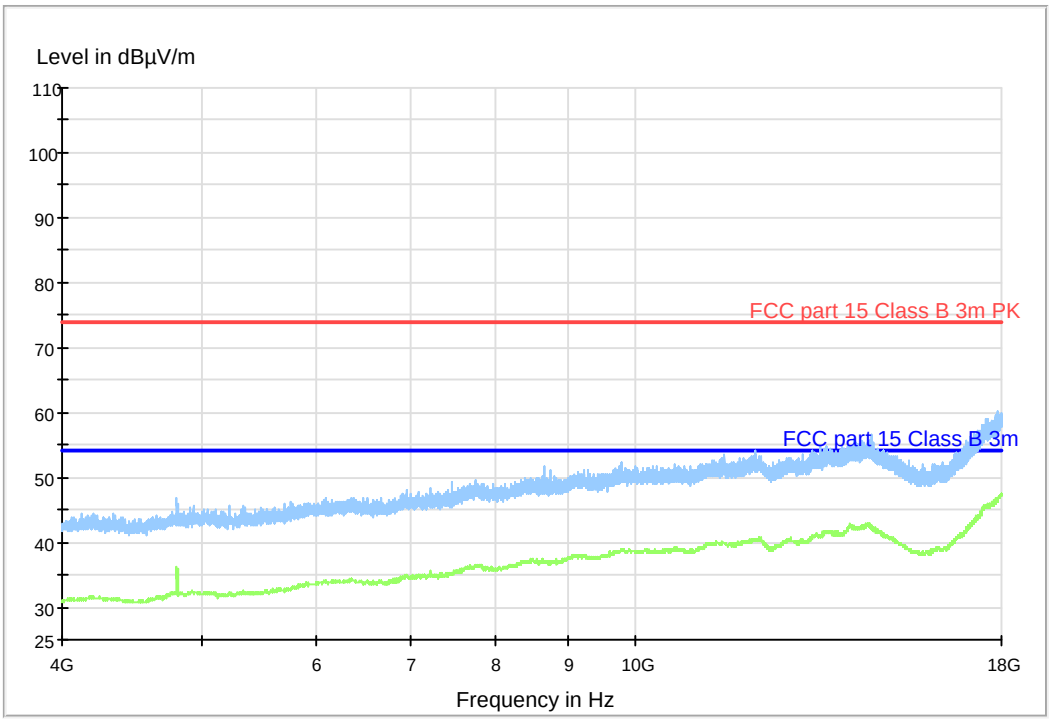
4 – 18 GHz, max peak and average traces at a distance of 3 m the lowest TX channel with external antenna
Emissions below 4 GHz are attenuated by high-pass filter K&L 4410-X4500/18000-0

FCC 4G - 18 G class B 3m ESU40 EMCO3115



Final Result Peak, middle TX channel with internal antenna

Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4808.800000	49.4	1000.000	150.0	H	-28.0	3.0	24.6	74.0

No other significant emissions were found above noise floor.

Final Result Average, middle TX channel with internal antenna

Frequency (MHz)	Average (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4810.800000	39.2	1000.000	150.0	H	48.0	3.0	14.8	54.0

No other significant emissions were found above noise floor.

Note: These emissions are in a restricted band listed in §15.205.

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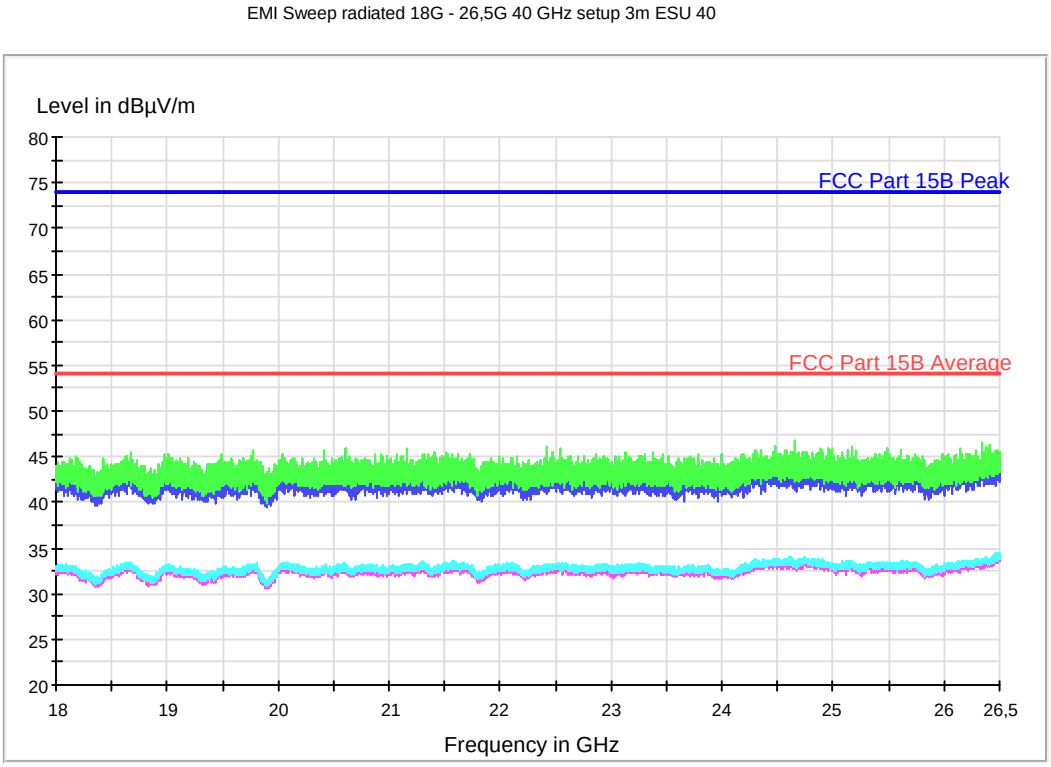
18 – 26 GHz, max peak and average traces at a distance of 3 m the lowest TX channel with external antenna



No emissions above noise floor
The margin between noise floor and limit is more than 20 dB.

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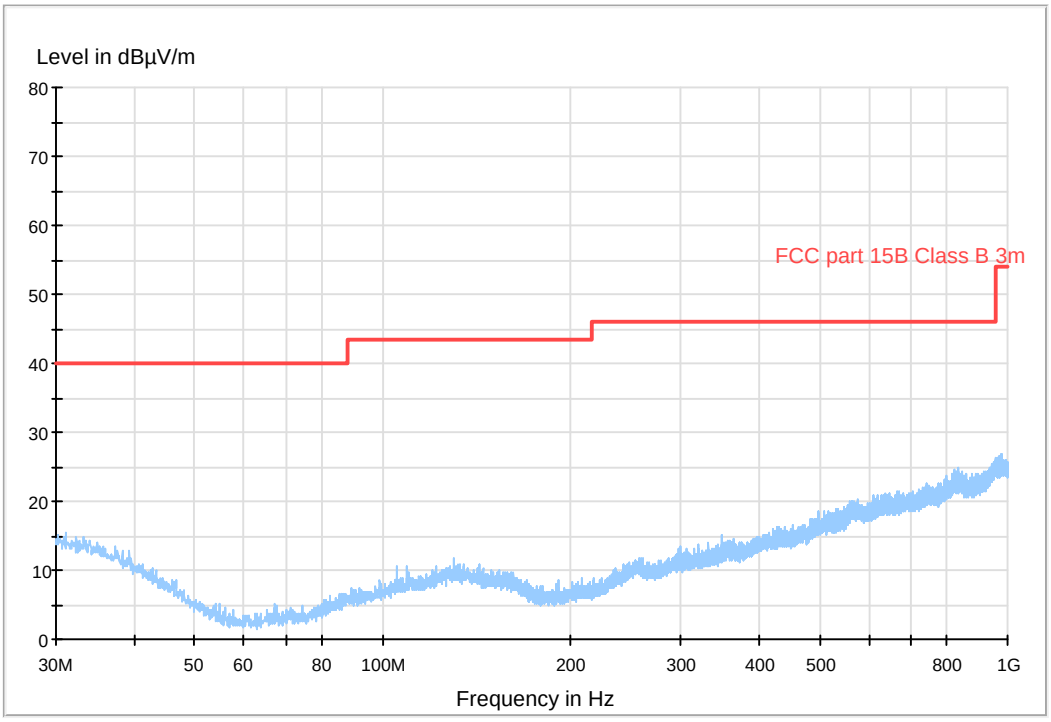
30 – 1000 MHz, max peak at a distance of 3 m on the middle TX channel with internal antenna



No emissions above noise floor
The margin between noise floor and limit is more than 20 dB.

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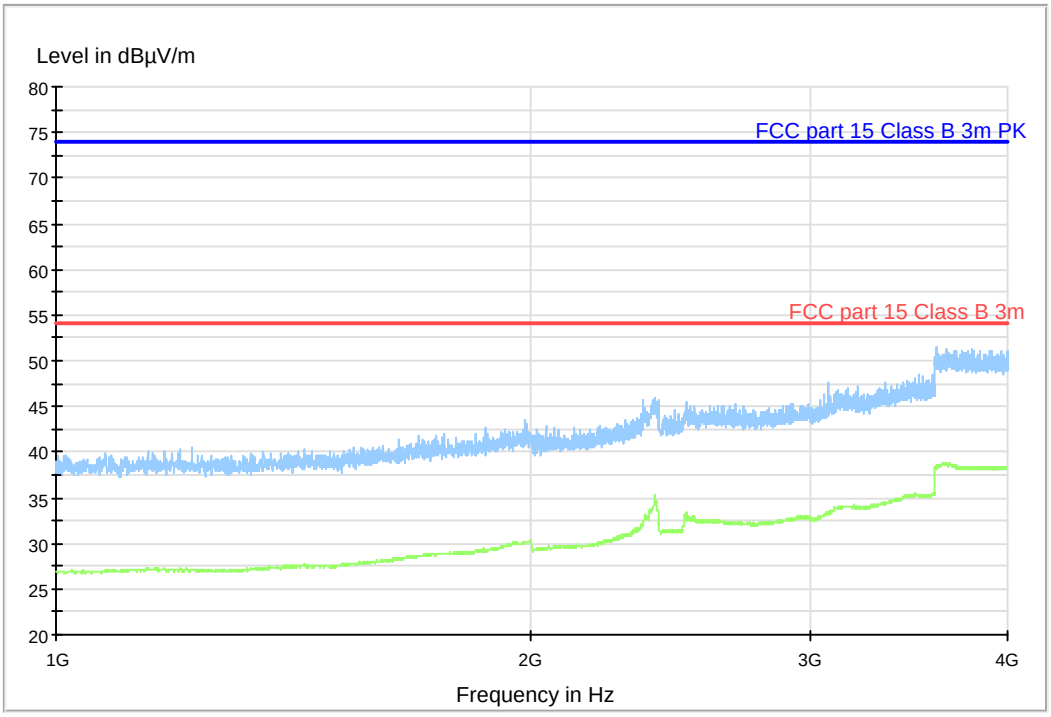
1 – 4 GHz, max peak and average traces at a distance of 3 m on the middle TX channel with internal antenna
Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0

FCC 1G - 4 G class B 3m ESU40 EMCO3115



No emissions above noise floor were found.
The margin between noise floor and limit is more than 20 dB.

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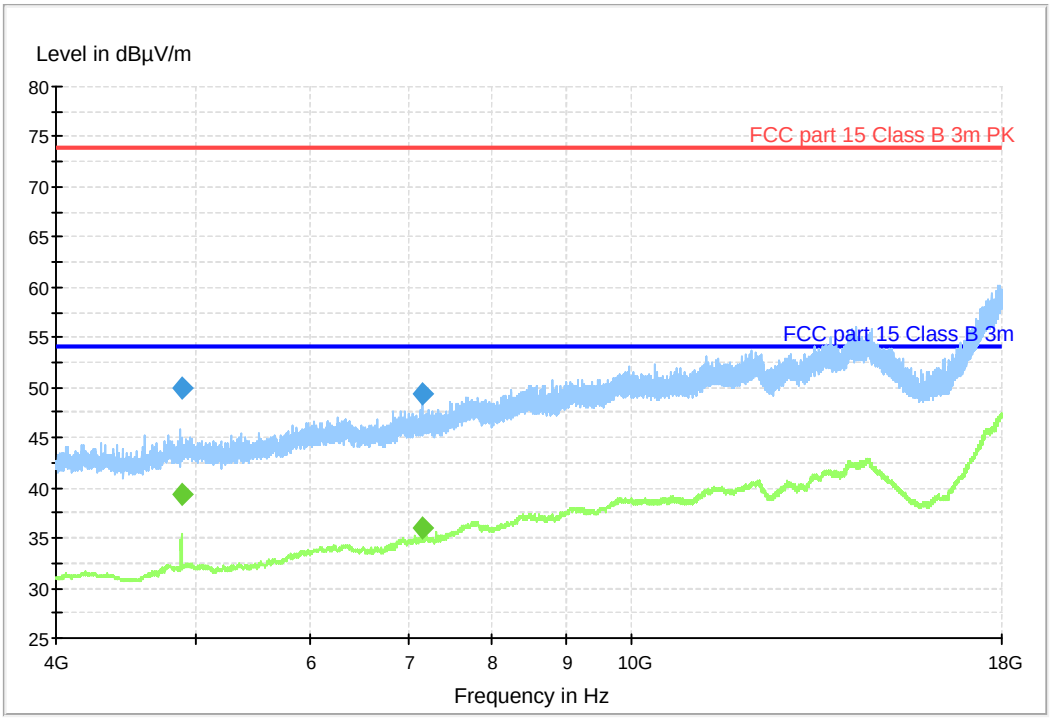
4 – 18 GHz, max peak and average traces at a distance of 3 m on the middle TX channel with internal antenna
Emissions below 4 GHz are attenuated by high-pass filter K&L 4410-X4500/18000-0

FCC 4G - 18 G class B 3m ESU40 EMCO3115



Final Result Peak, middle TX channel internal antenna

Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarizatio n	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4881.200000	50.0	1000.000	152.0	H	-32.0	3.2	24.0	74.0
7157.200000	49.4	1000.000	279.0	H	28.0	6.4	24.6	74.0

No other significant emissions were found above noise floor.

Final Result Average, middle TX channel internal antenna

Frequency (MHz)	Average (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4880.800000	39.4	1000.000	150.0	H	-30.0	3.2	14.6	54.0
7155.200000	36.1	1000.000	300.0	H	29.0	6.4	17.9	54.0

No other significant emissions were found above noise floor.

Note: The emission at 4881 MHz is in a restricted band listed in §15.205.

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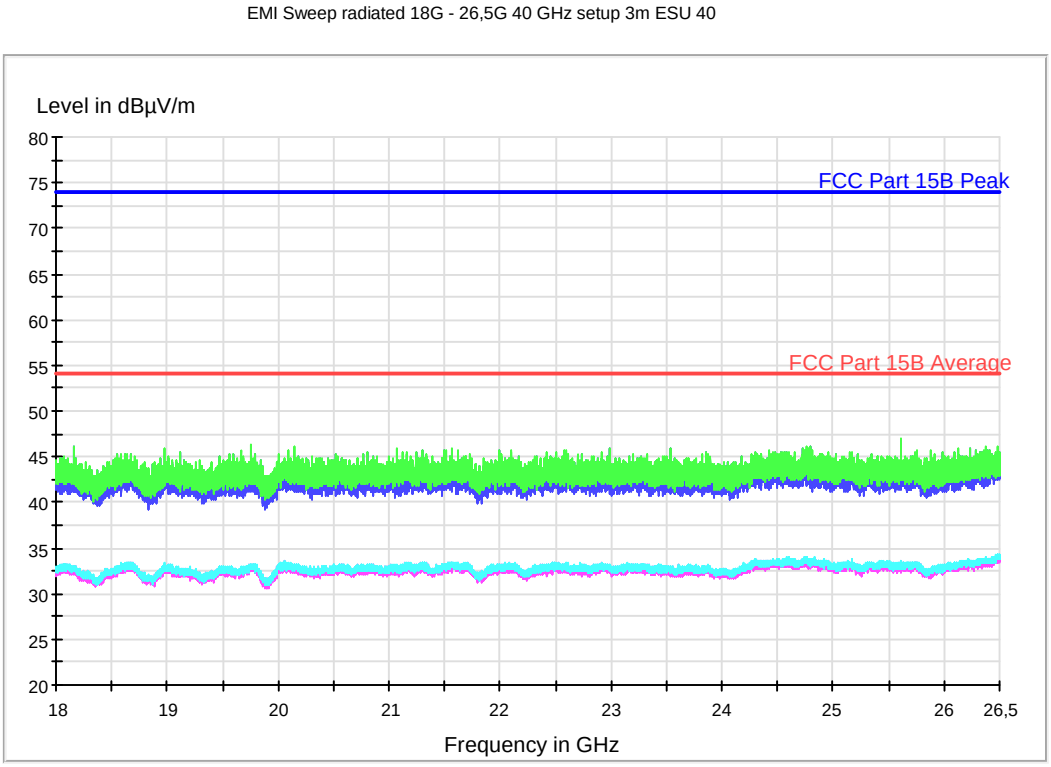
18 – 26 GHz, max peak and average traces at a distance of 3 m on the middle TX channel with internal antenna



No emissions above noise floor
The margin between noise floor and limit is more than 20 dB.

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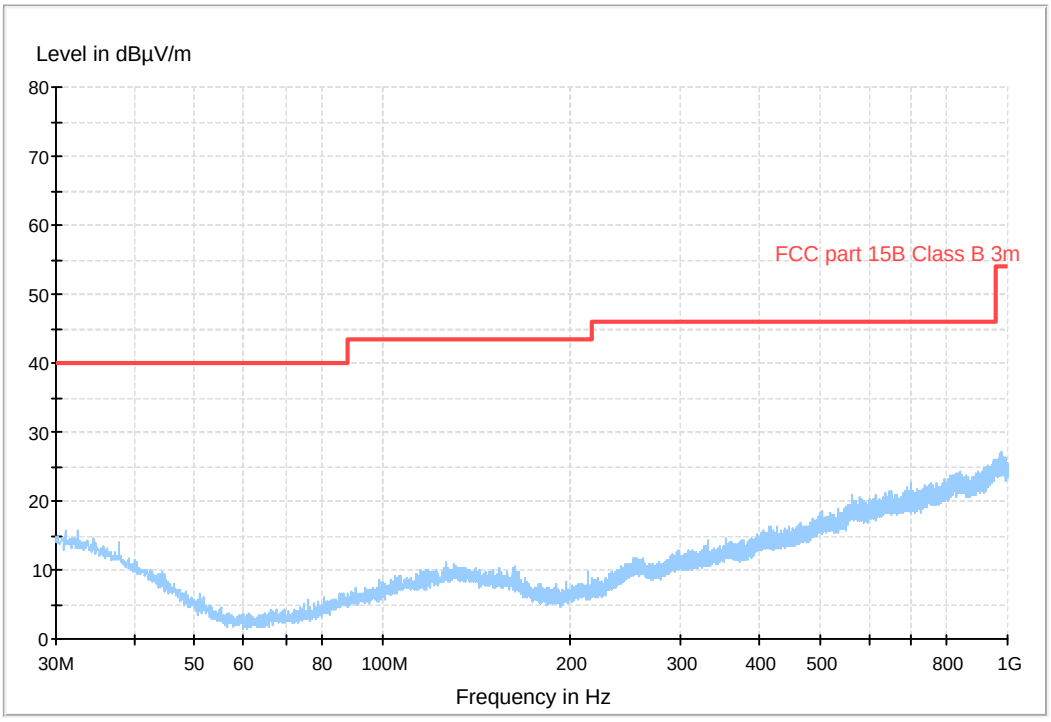
30 – 1000 MHz, max peak at a distance of 3 m on the middle TX channel with external antenna



No emissions above noise floor
The margin between noise floor and limit is more than 20 dB.

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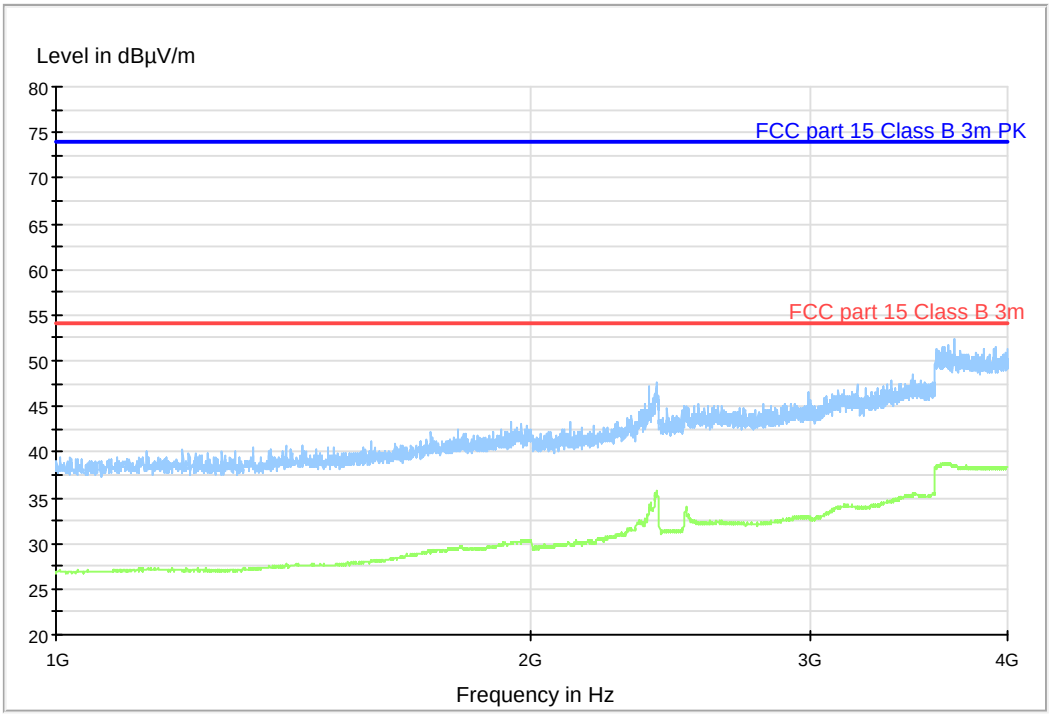
1 – 4 GHz, max peak and average traces at a distance of 3 m on the middle TX channel with external antenna
Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0

FCC 1G - 4 G class B 3m ESU40 EMCO3115



No emissions above noise floor were found.
The margin between noise floor and limit is more than 20 dB.

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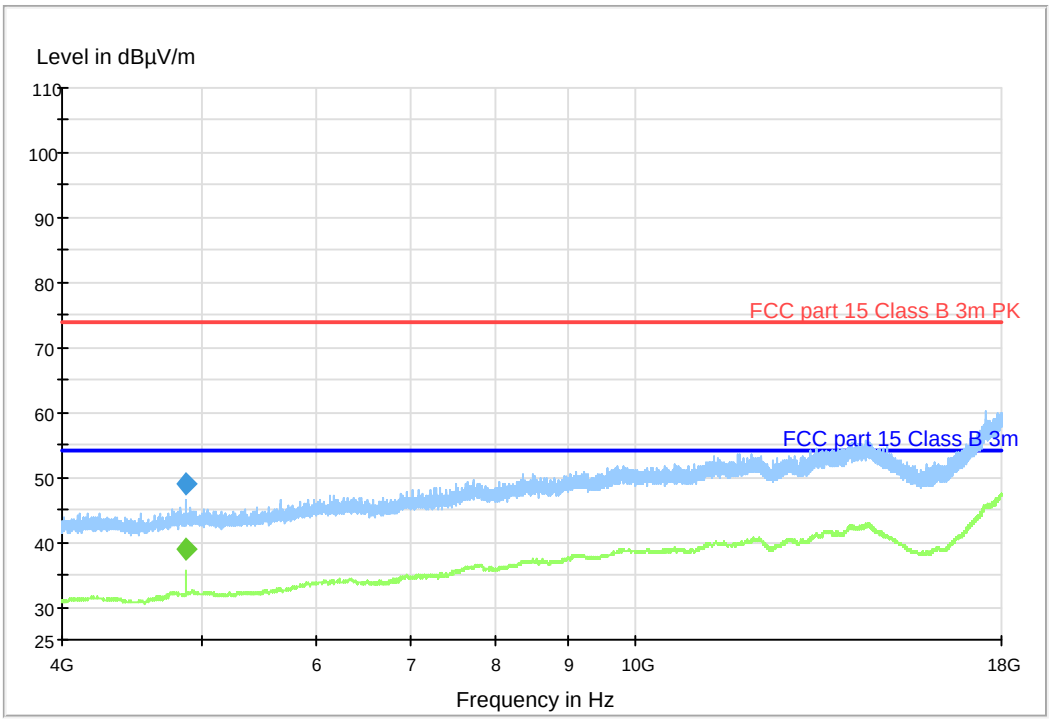
4 – 18 GHz, max peak and average traces at a distance of 3 m the middle TX channel with external antenna
Emissions below 4 GHz are attenuated by high-pass filter K&L 4410-X4500/18000-0

FCC 4G - 18 G class B 3m ESU40 EMCO3115



Final Result Peak, middle TX channel with external antenna

Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4879.400000	49.0	1000.000	166.0	H	39.0	3.2	25.0	74.0

No other significant emissions were found above noise floor.

Final Result Average, middle TX channel with external antenna

Frequency (MHz)	Average (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4880.800000	39.1	1000.000	167.0	H	36.0	3.2	14.9	54.0

No other significant emissions were found above noise floor.

Note: These emissions are in a restricted band listed in §15.205.

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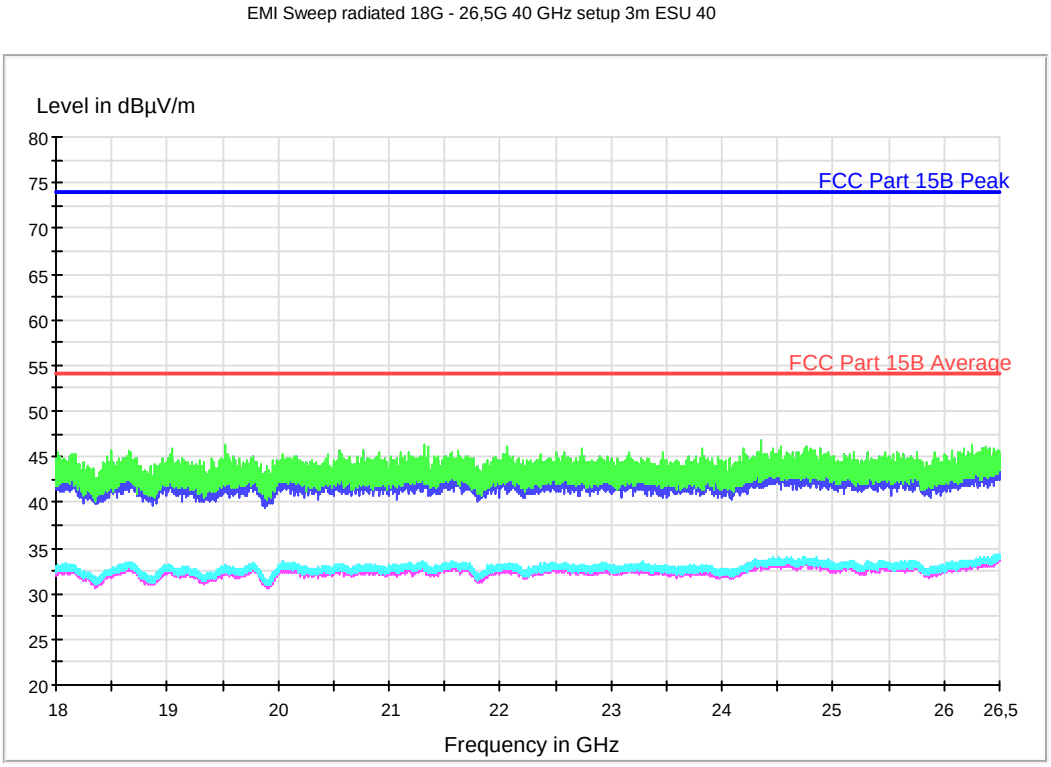
18 – 26 GHz, max peak and average traces at a distance of 3 m the middle TX channel with external antenna



No emissions above noise floor
The margin between noise floor and limit is more than 20 dB.

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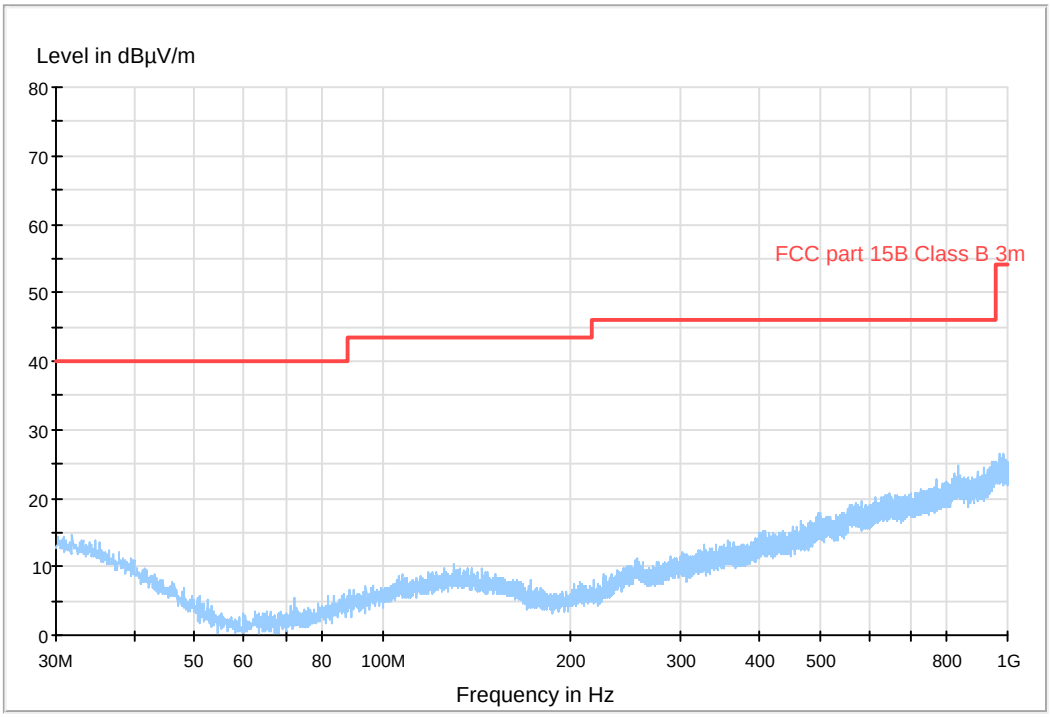
30 – 1000 MHz, max peak at a distance of 3 m on the highest TX channel with internal antenna

FCC 30 - 1000 MHz FCC class B 3m



No emissions above noise floor
The margin between noise floor and limit is more than 20 dB.

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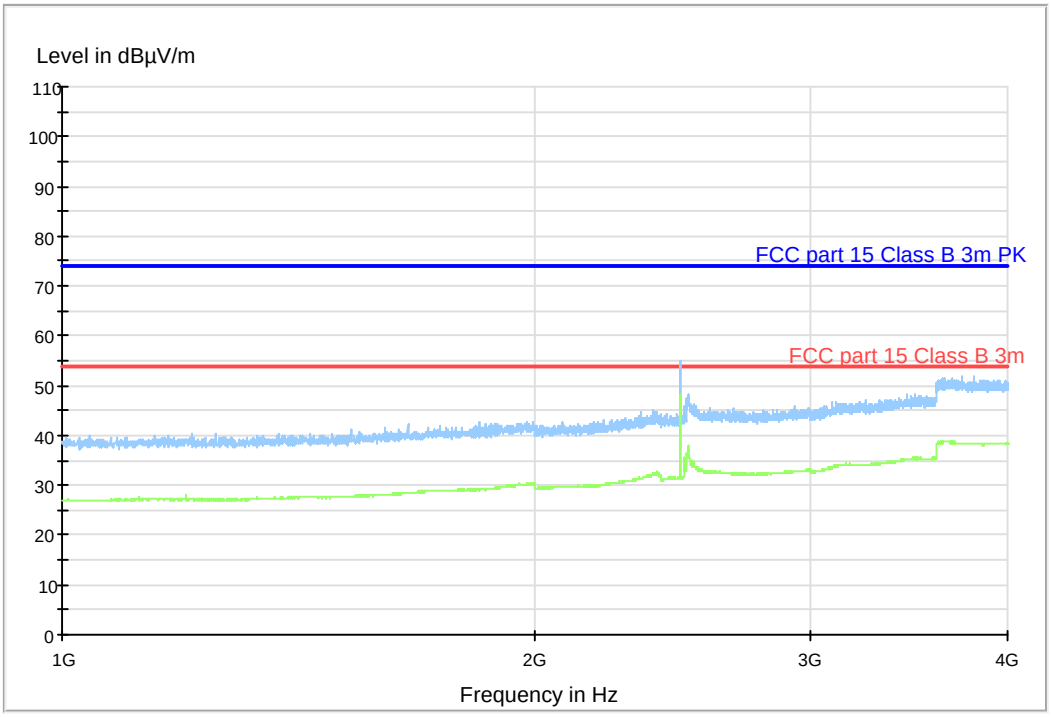
1 – 4 GHz, max peak and average traces at a distance of 3 m on the highest TX channel with internal antenna
Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0

FCC 1G - 4 G class B 3m ESU40 EMCO3115



No emissions above noise floor were found except at the upper band edge. Measurements at the upper band edge are found on the next page.

The margin between noise floor and limit is more than 20 dB for the peak trace and more than 15 dB for the average trace.

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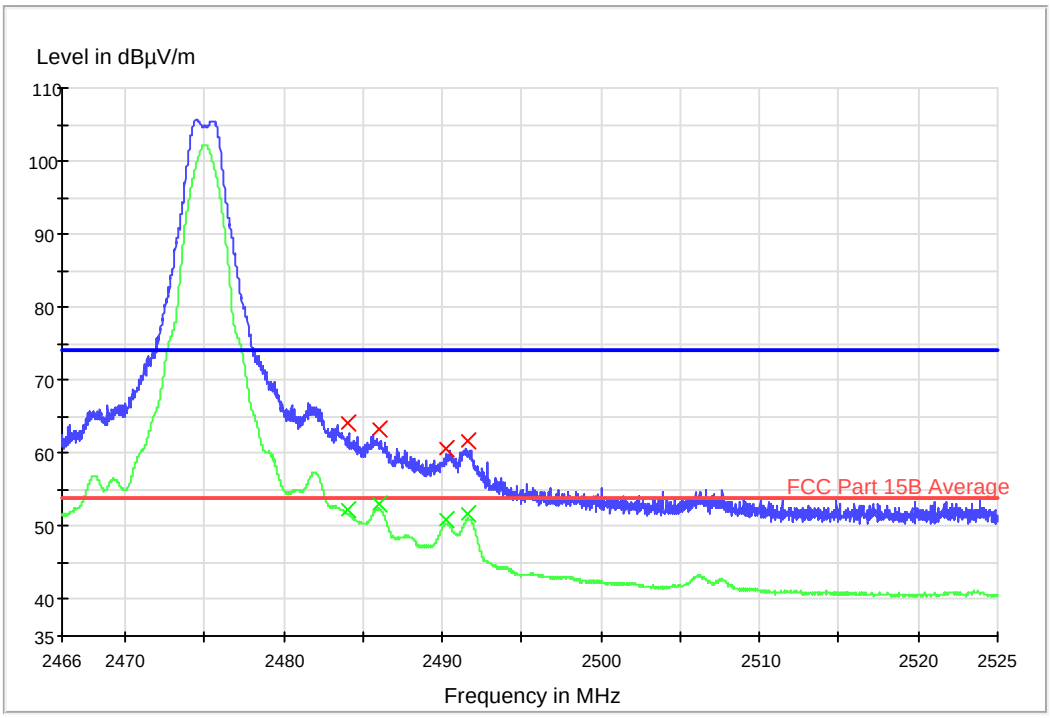
Emissions at the upper band edge at a distance of 3 m on the highest TX channel with internal antenna. Max peak and average traces.

EMI Sweep radiated 2.2G - 2.7 G 3m Emco 3115



Result Peak, highest TX channel with internal antenna

Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2484.000000	64.1	1000.000	150.0	V	58.0	-1.9	9.9	74.0
2486.000000	63.4	1000.000	150.0	H	-9.0	-1.9	10.6	74.0
2490.240000	60.7	1000.000	150.0	H	33.0	-1.9	13.3	74.0
2491.620000	61.6	1000.000	150.0	H	-9.0	-1.9	12.4	74.0

Result Average, highest TX channel with internal antenna

Frequency (MHz)	Average (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2484.000000	52.3	1000.000	150.0	V	58.0	-1.9	2.7	54.0
2486.000000	53.0	1000.000	150.0	H	-9.0	-1.9	2.0	54.0
2490.240000	50.8	1000.000	150.0	H	33.0	-1.9	3.2	54.0
2491.620000	51.6	1000.000	150.0	H	-9.0	-1.9	2.4	54.0

The measured average results are below the limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance with the specification limit.

Note: These emissions are in a restricted band listed in §15.205.

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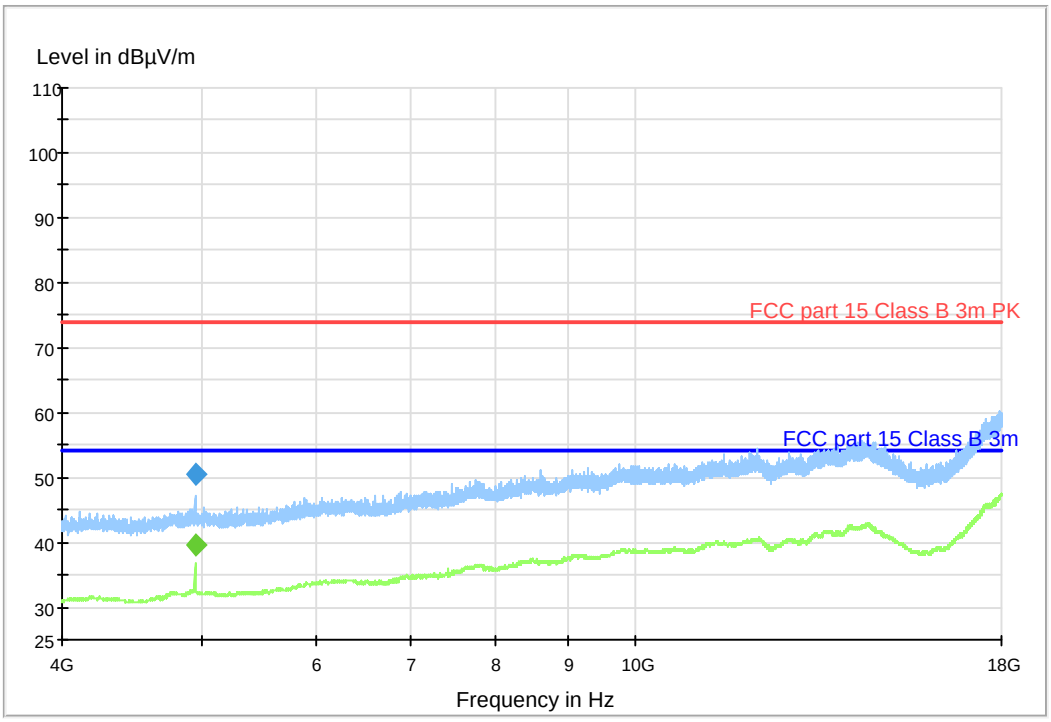
4 – 18 GHz, max peak and average traces at a distance of 3 m on the highest TX channel with internal antenna
Emissions below 4 GHz are attenuated by high-pass filter K&L 4410-X4500/18000-0

FCC 4G - 18 G class B 3m ESU40 EMCO3115



Final Result Peak, highest TX channel internal antenna

Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4950.800000	50.5	1000.000	165.0	H	-25.0	3.3	23.5	74.0

No other significant emissions were found above noise floor.

Final Result Peak, highest TX channel internal antenna

Frequency (MHz)	Average (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4950.800000	39.7	1000.000	164.0	H	-29.0	3.3	14.3	54.0

No other significant emissions were found above noise floor.

Note: These emissions are in a restricted band listed in §15.205.

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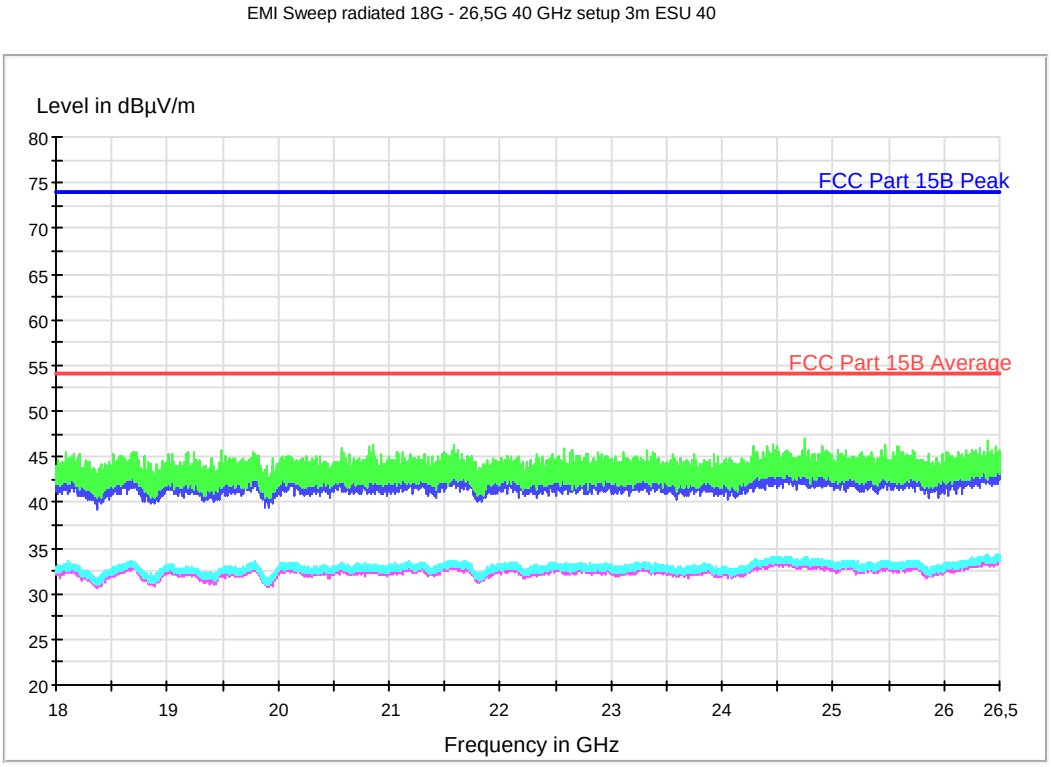
18 – 26 GHz, max peak and average traces at a distance of 3 m on the highest TX channel with internal antenna



No emissions above noise floor
The margin between noise floor and limit is more than 20 dB.

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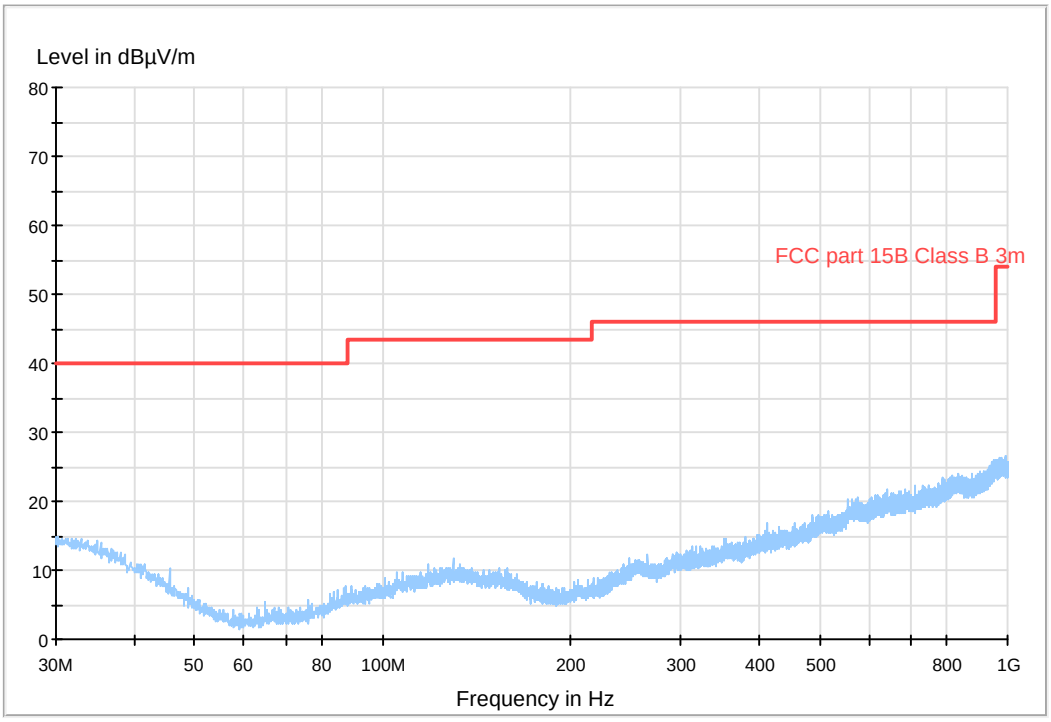
30 – 1000 MHz, max peak at a distance of 3 m on the highest TX channel with external antenna



No emissions above noise floor
The margin between noise floor and limit is more than 20 dB.

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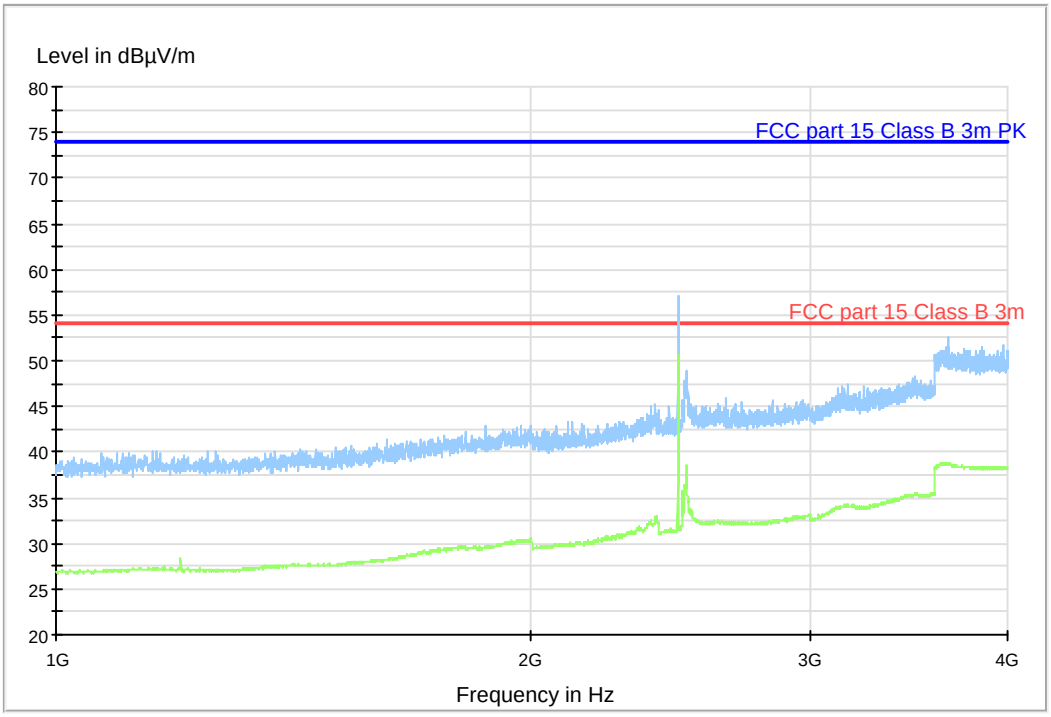
1 – 4 GHz, max peak and average traces at a distance of 3 m on the highest TX channel with external antenna
Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0

FCC 1G - 4 G class B 3m ESU40 EMCO3115



No emissions above noise floor were found except at the upper band edge. Measurements at the upper band edge are found on the next page.

The margin between noise floor and limit is more than 20 dB.

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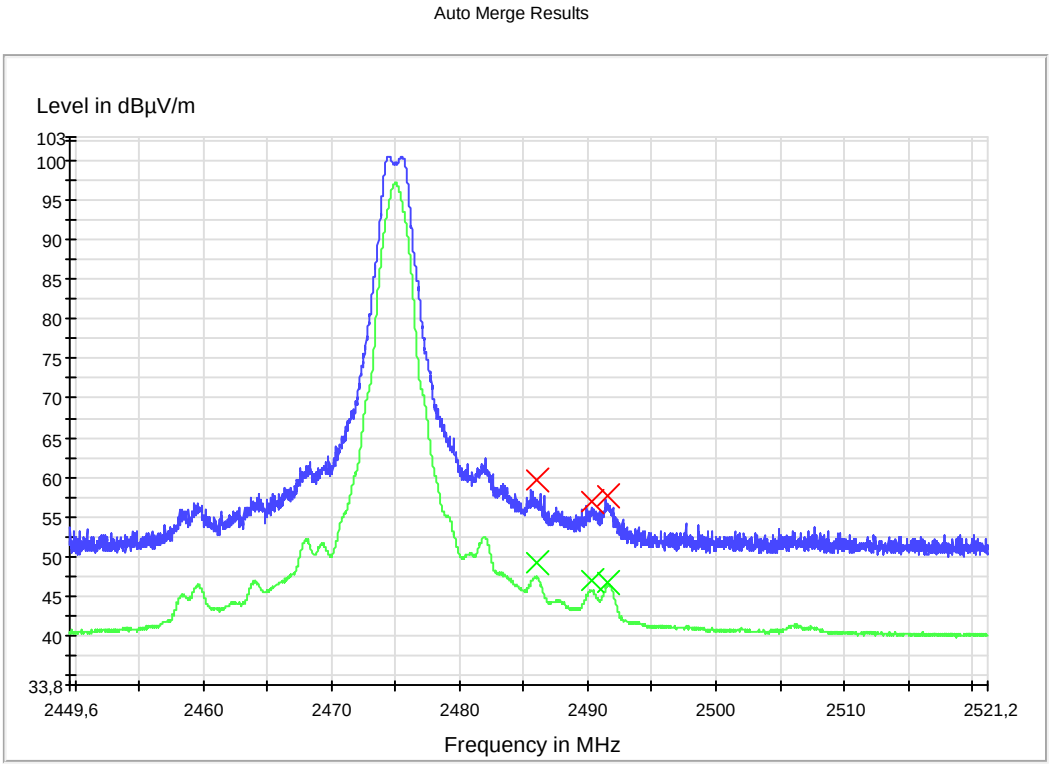
Emissions at the upper band edge at a distance of 3 m on the highest TX channel with external antenna. Max peak and average traces.



Result Peak, highest TX channel with external antenna

Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2485.940000	59.7	1000.000	150.0	V	33.0	-1.9	14.3	74.0
2490.280000	57.0	1000.000	150.0	V	33.0	-1.9	17.0	74.0
2491.600000	57.6	1000.000	150.0	V	-9.0	-1.9	16.4	74.0

No other significant emissions were found above noise floor.

Result Average, highest TX channel with external antenna

Frequency (MHz)	Average (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2485.940000	49.2	1000.000	150.0	V	33.0	-1.9	4.8	54.0
2490.280000	46.9	1000.000	150.0	V	33.0	-1.9	7.1	54.0
2491.600000	46.8	1000.000	150.0	V	-9.0	-1.9	7.2	54.0

No other significant emissions were found above noise floor.

One of the measured average results is below the limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance with the specification limit.

Note: These emissions are in a restricted band listed in §15.205.

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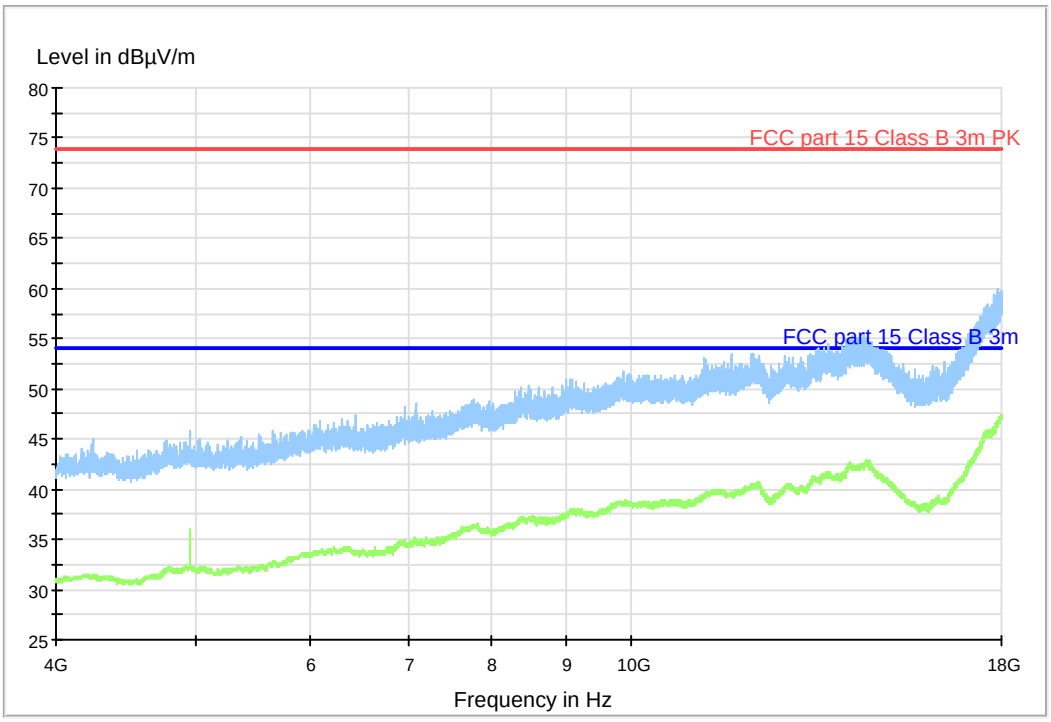
4 – 18 GHz, max peak and average traces at a distance of 3 m the highest TX channel with external antenna
Emissions below 4 GHz are attenuated by high-pass filter K&L 4410-X4500/18000-0

FCC 4G - 18 G class B 3m ESU40 EMCO3115



Final Result Peak, middle TX channel with internal antenna

Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4948.800000	47.1	1000.000	150.0	V	12.0	3.3	26.9	74.0

No other significant emissions were found above noise floor.

Final Result Average, middle TX channel with internal antenna

Frequency (MHz)	Average (dBµV/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4948.800000	38.2	1000.000	150.0	V	12.0	3.3	15.8	54.0

No other significant emissions were found above noise floor.

Note: These emissions are in a restricted band listed in §15.205.

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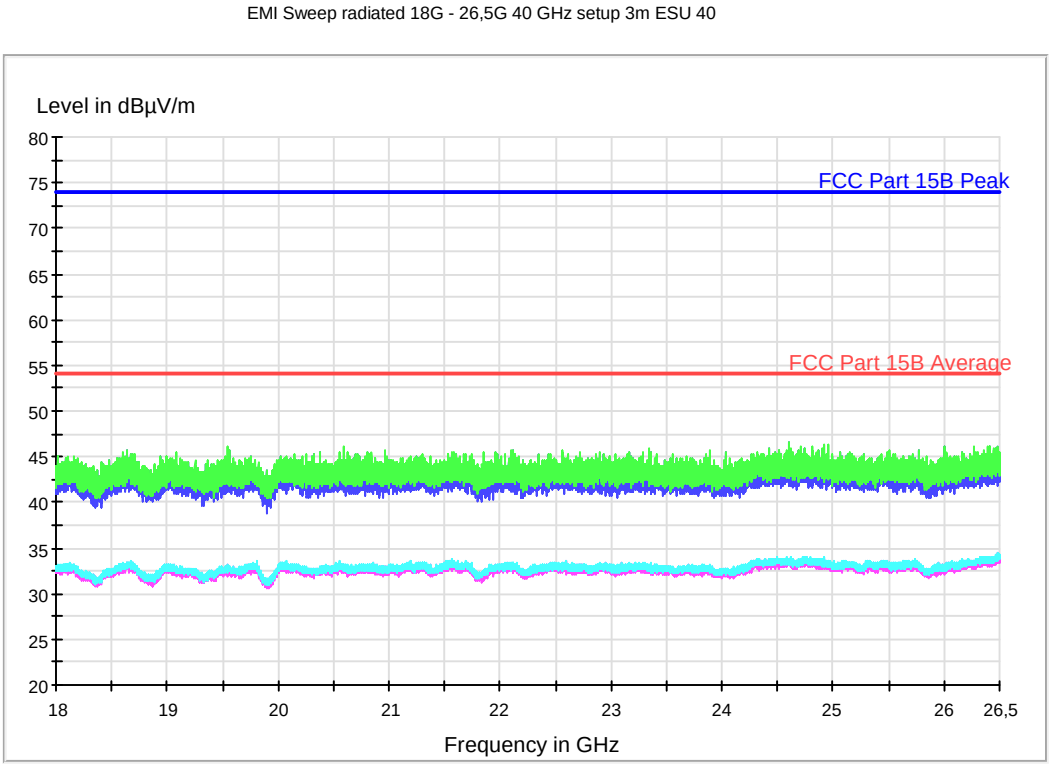
18 – 26 GHz, max peak and average traces at a distance of 3 m the highest TX channel with external antenna



No emissions above noise floor
The margin between noise floor and limit is more than 20 dB.

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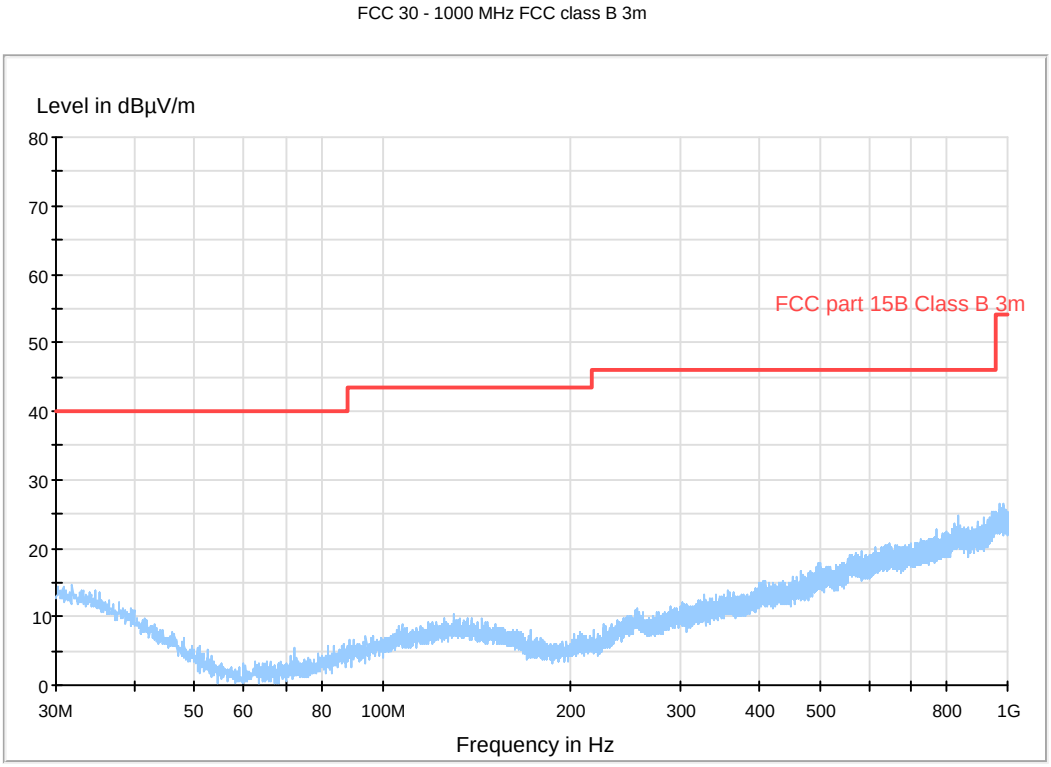
30 – 1000 MHz, max peak at a distance of 3 m with radio in RX mode with internal antenna.



No emissions above noise floor
The margin between noise floor and limit is more than 20 dB.

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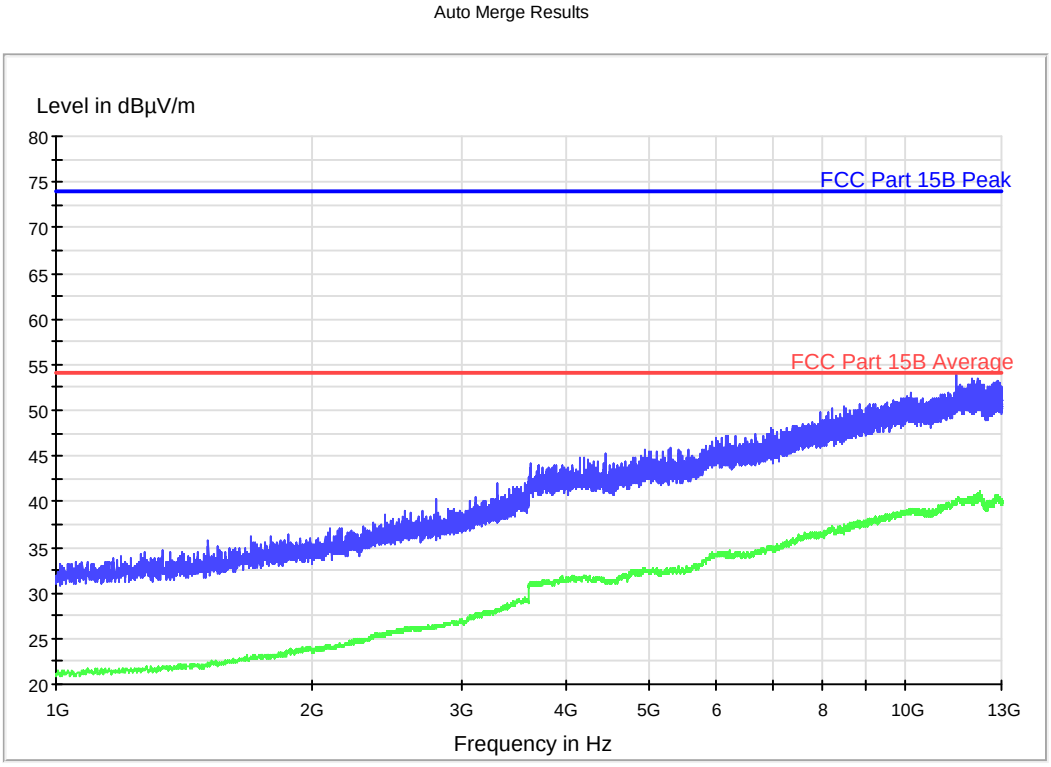
1 – 13 GHz, max peak and average traces at a distance of 3 m with radio in RX mode.



No emissions above noise floor
The margin between noise floor and limit is more than 20 dB for peak trace and more than 15 dB for average trace.

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10. CONDUCTED SPURIOUS EMISSIONS AT ANTENNA PORT

10.1 Measurement uncertainty

Measurement uncertainty for conducted disturbances at the antenna port ± 3,6 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT. Measurement uncertainty is calculated in accordance with EA-4/02-1997. The uncertainty is given with a level of confidence of approximately 95% (k=2).

10.2 Test equipment

Equipment	Manufacturer	Type	Inv. No.	Calibration due date
Signal Analyzer	Rhode & Schwarz	FSIQ	12793	2011-07
Cable	Huber + Suhner	Sucoflex 104	5188	2011-07
RF attenuator	Hewlett Packard	8491A	30088	2011-07

10.3 Test protocol

Date of test 2011-03-02

Channel	Plots	Results	Limit value (dBc)
Low	10.1 – 10.3	PASS	20
Middle	10.4 – 10.6	PASS	20
High	10.7 – 10.9	PASS	20

Limit In any 100 kHz bandwidth outside the operating frequency band (2400 – 2483.5 MHz), 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.

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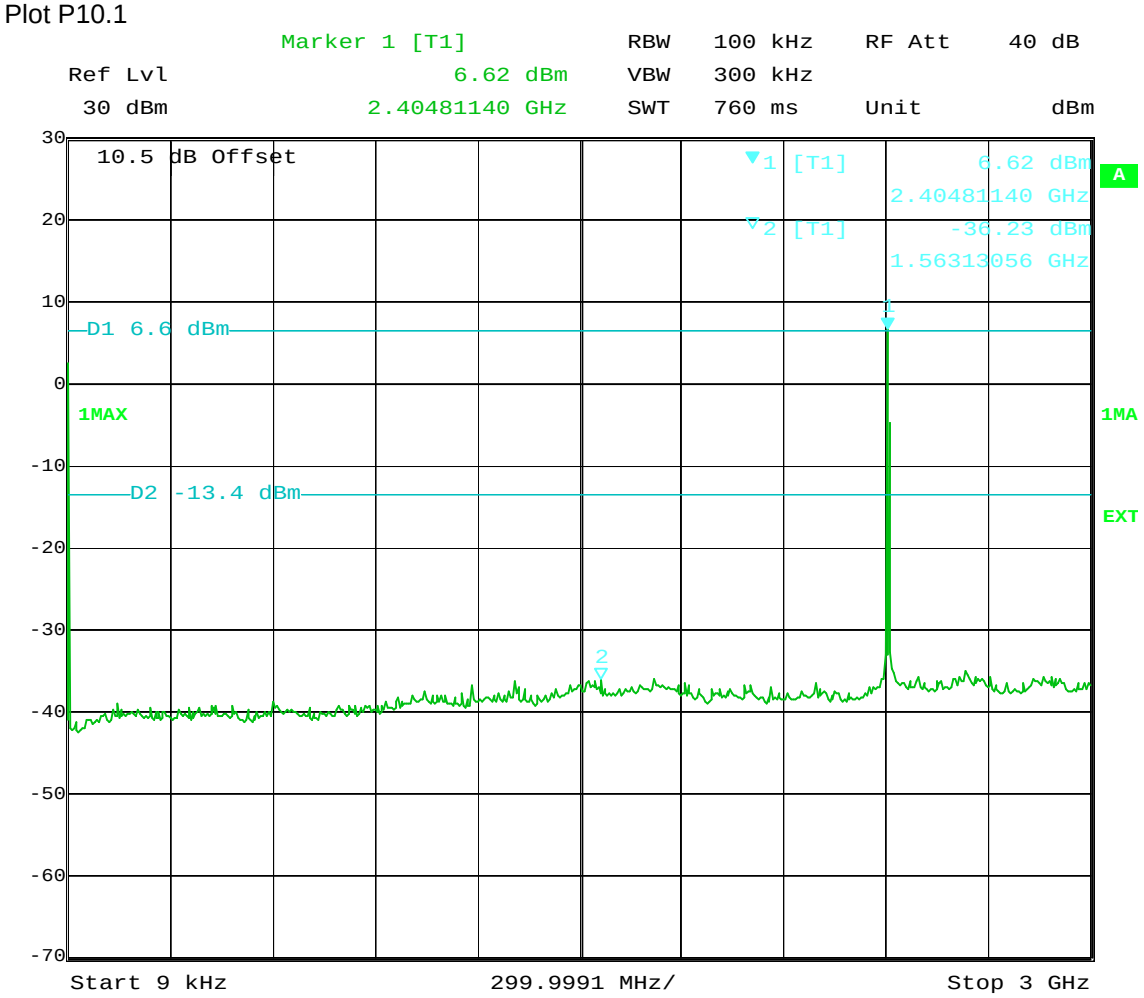
Plot P10.1



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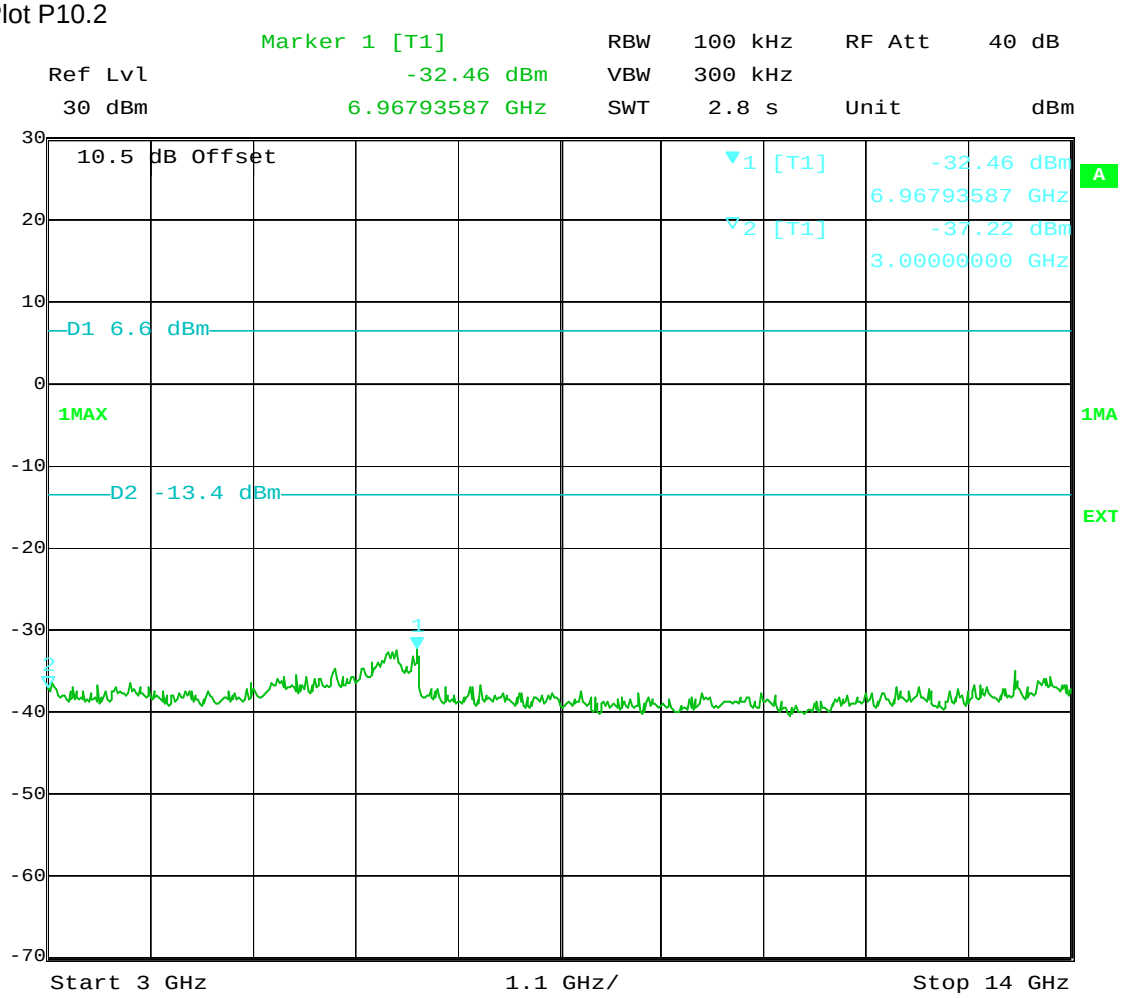
Plot P10.2



Date: 2.MAR.2011 13:49:28

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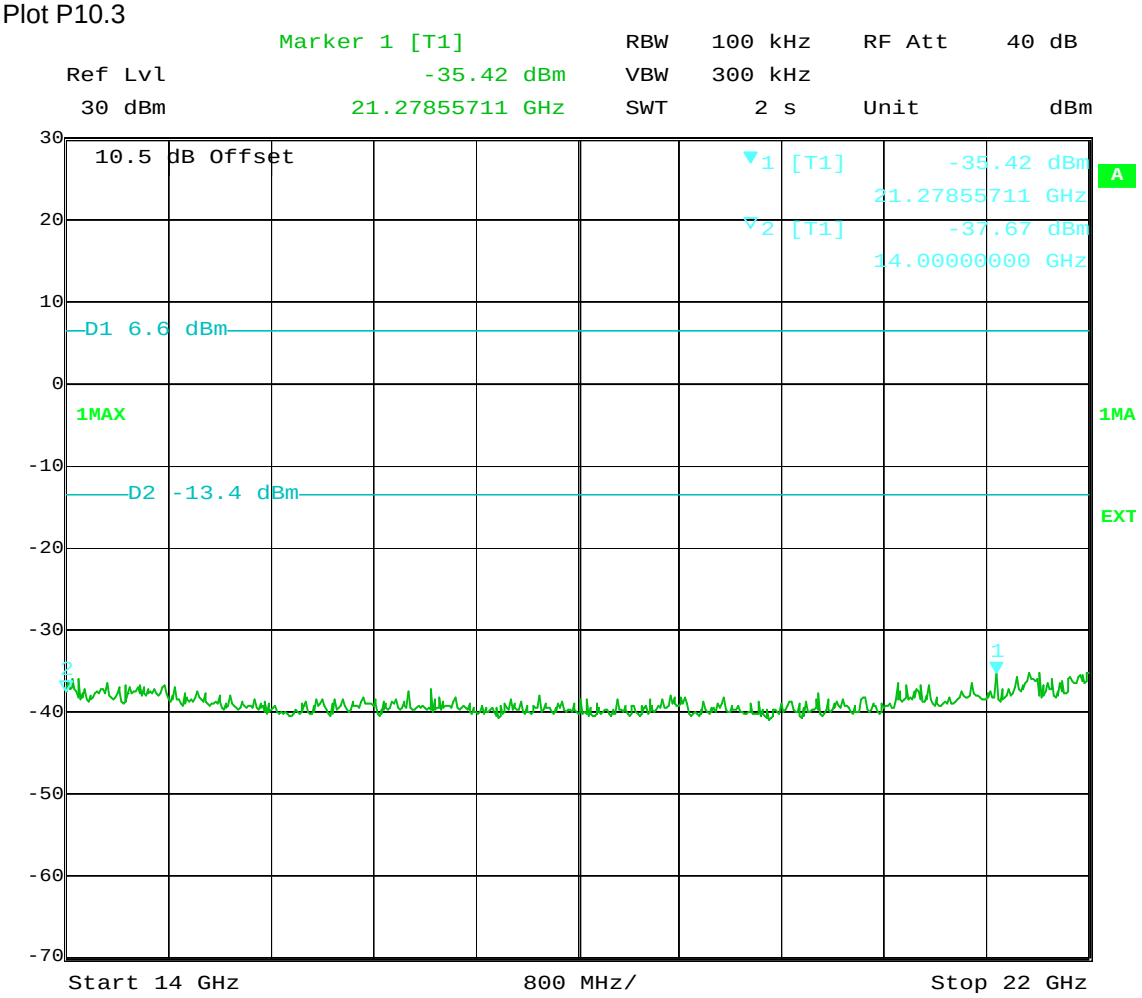
Plot P10.3



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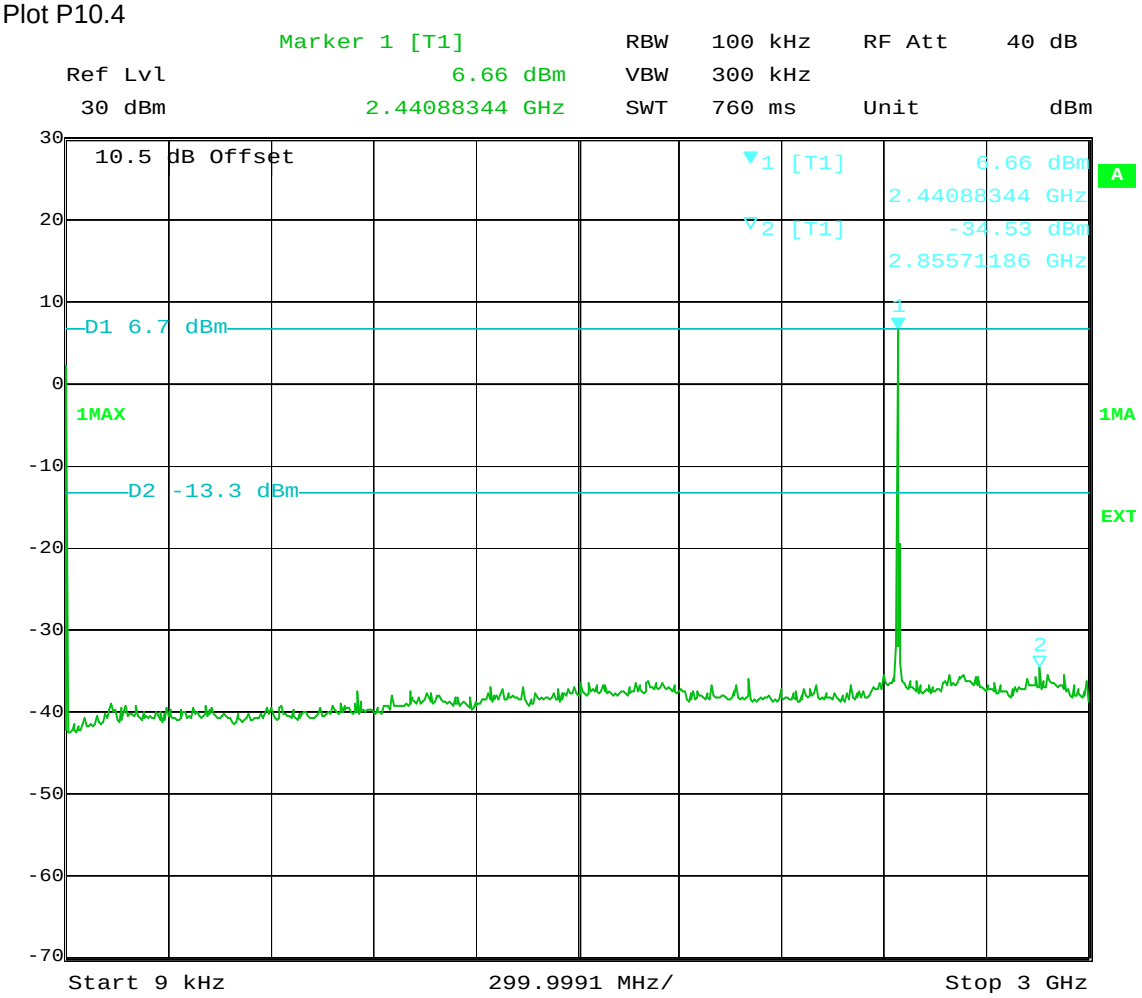
Plot P10.4



Date: 2.MAR.2011 13:51:06

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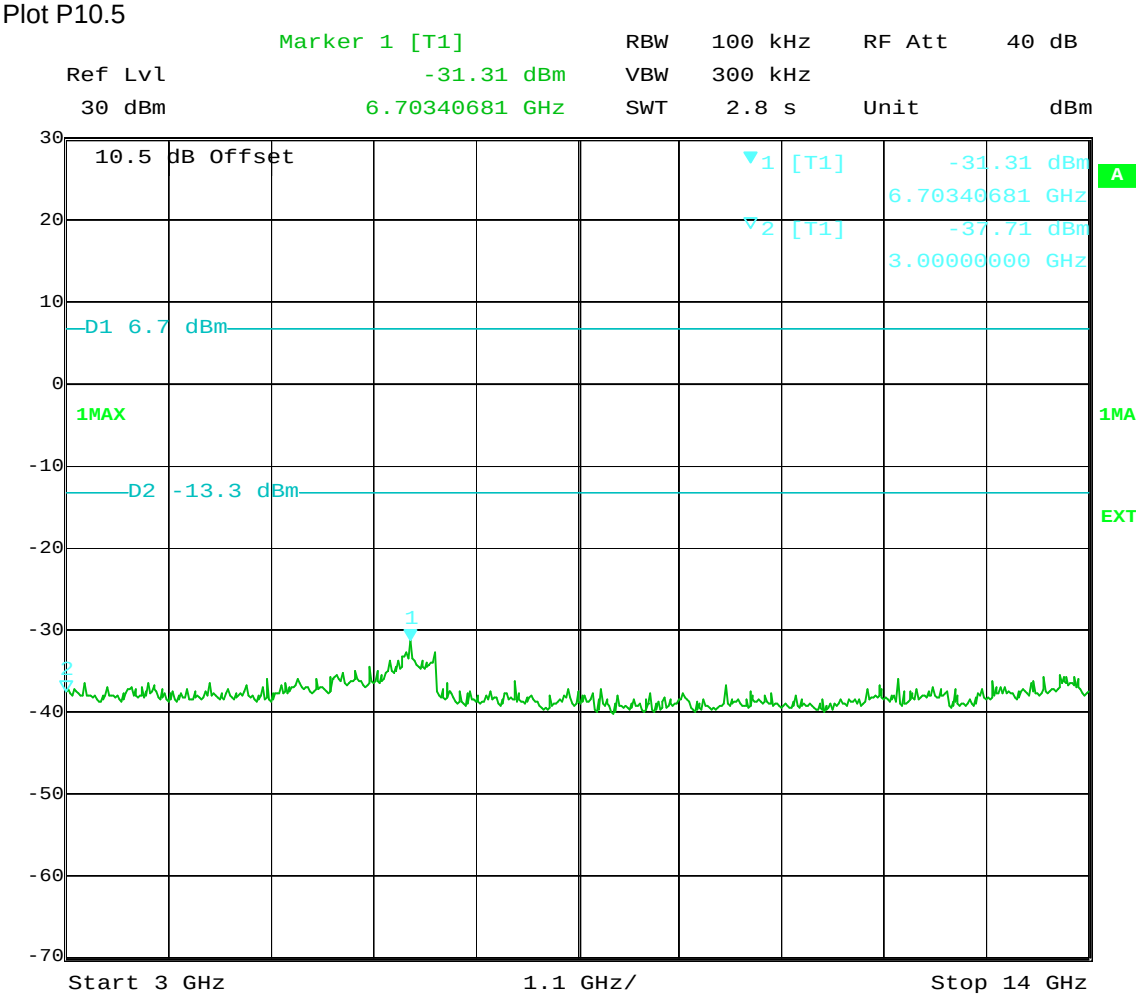
Plot P10.5



Date: 2.MAR.2011 13:51:34

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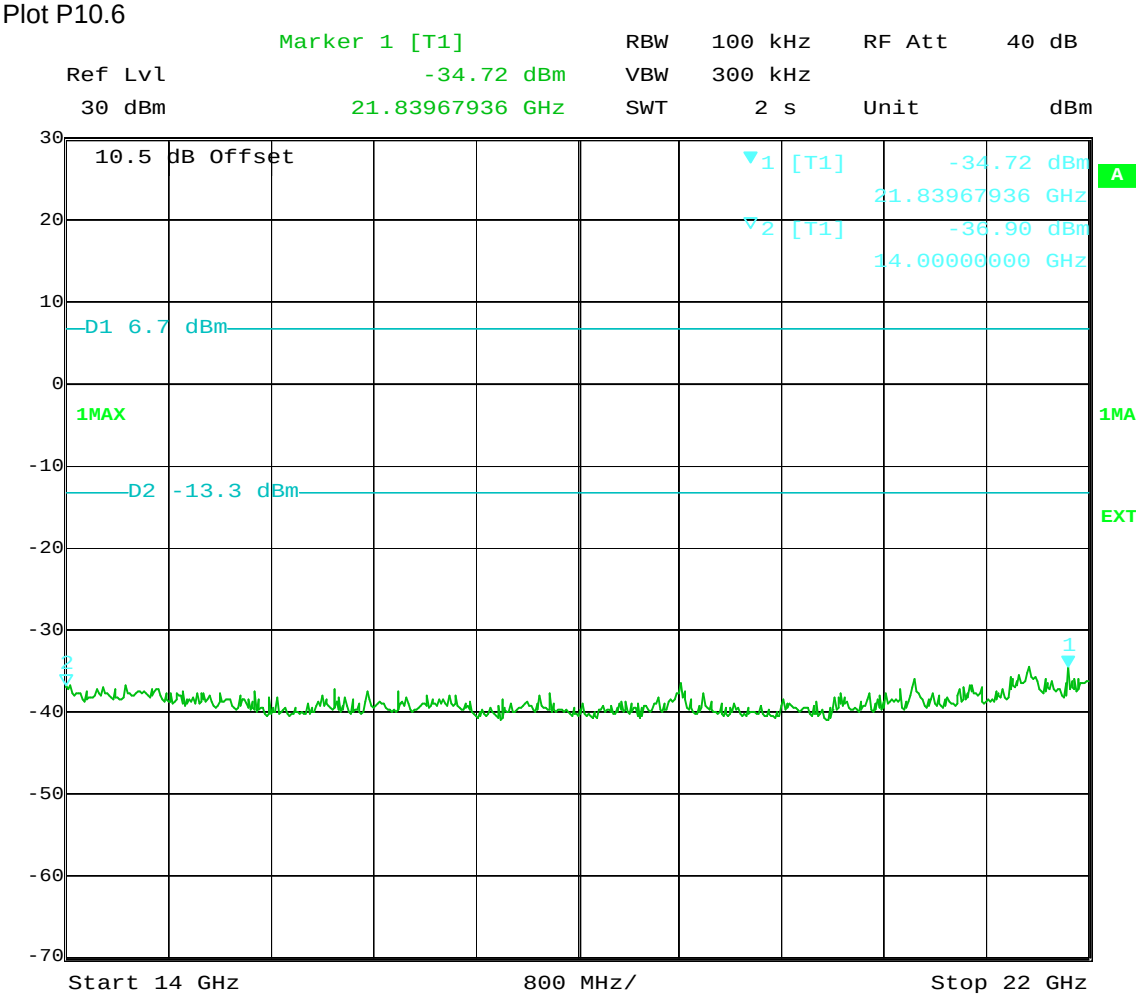
Plot P10.6



Date: 2.MAR.2011 13:52:03

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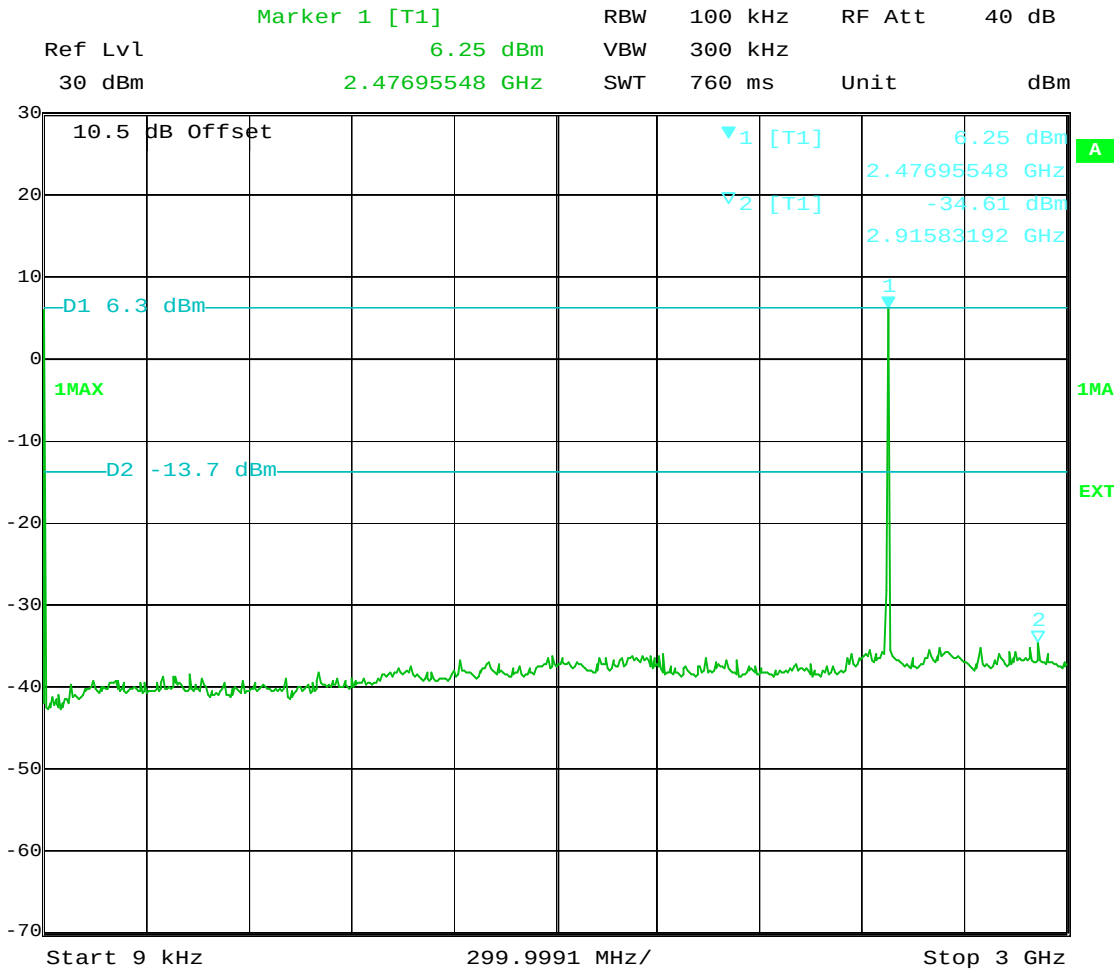
Plot P10.7



Date: 2.MAR.2011 13:53:17

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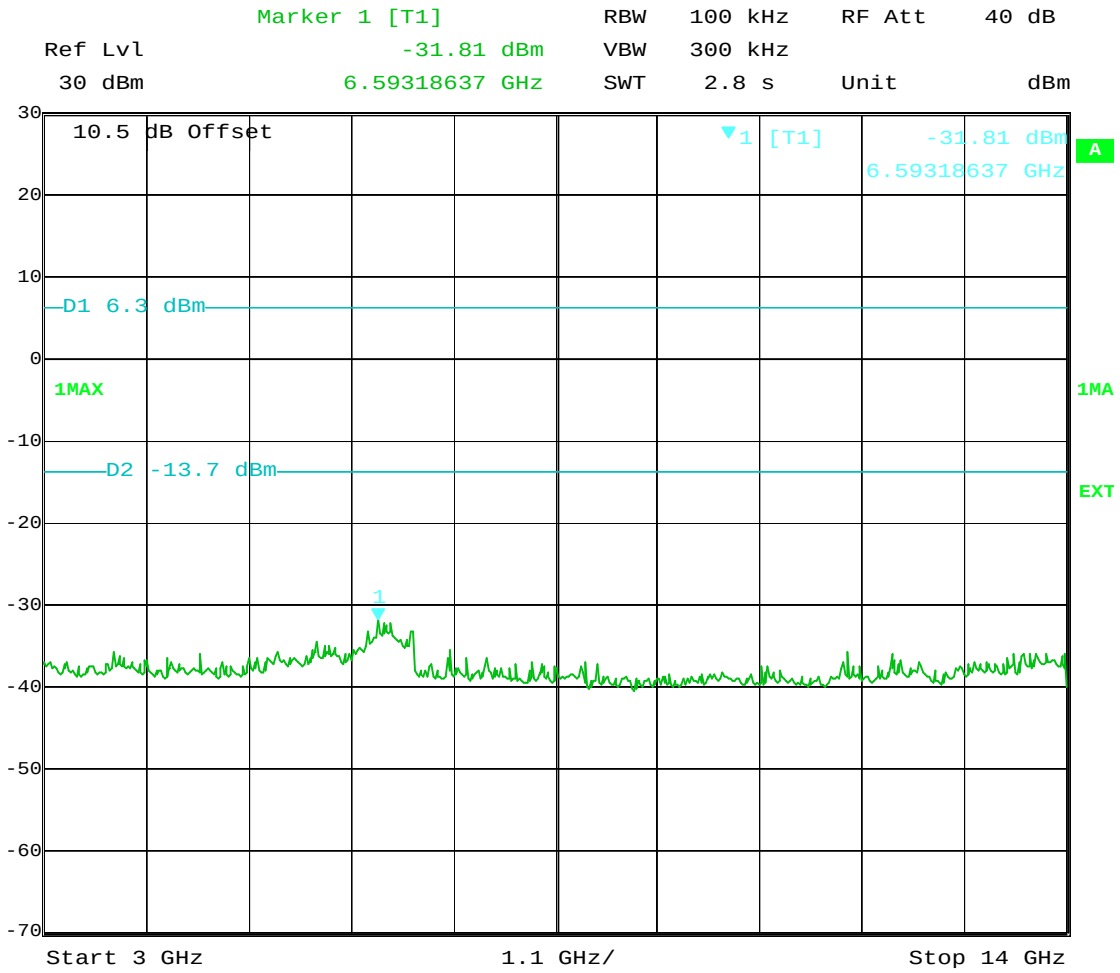
Plot P10.8



Date: 2.MAR.2011 13:53:56

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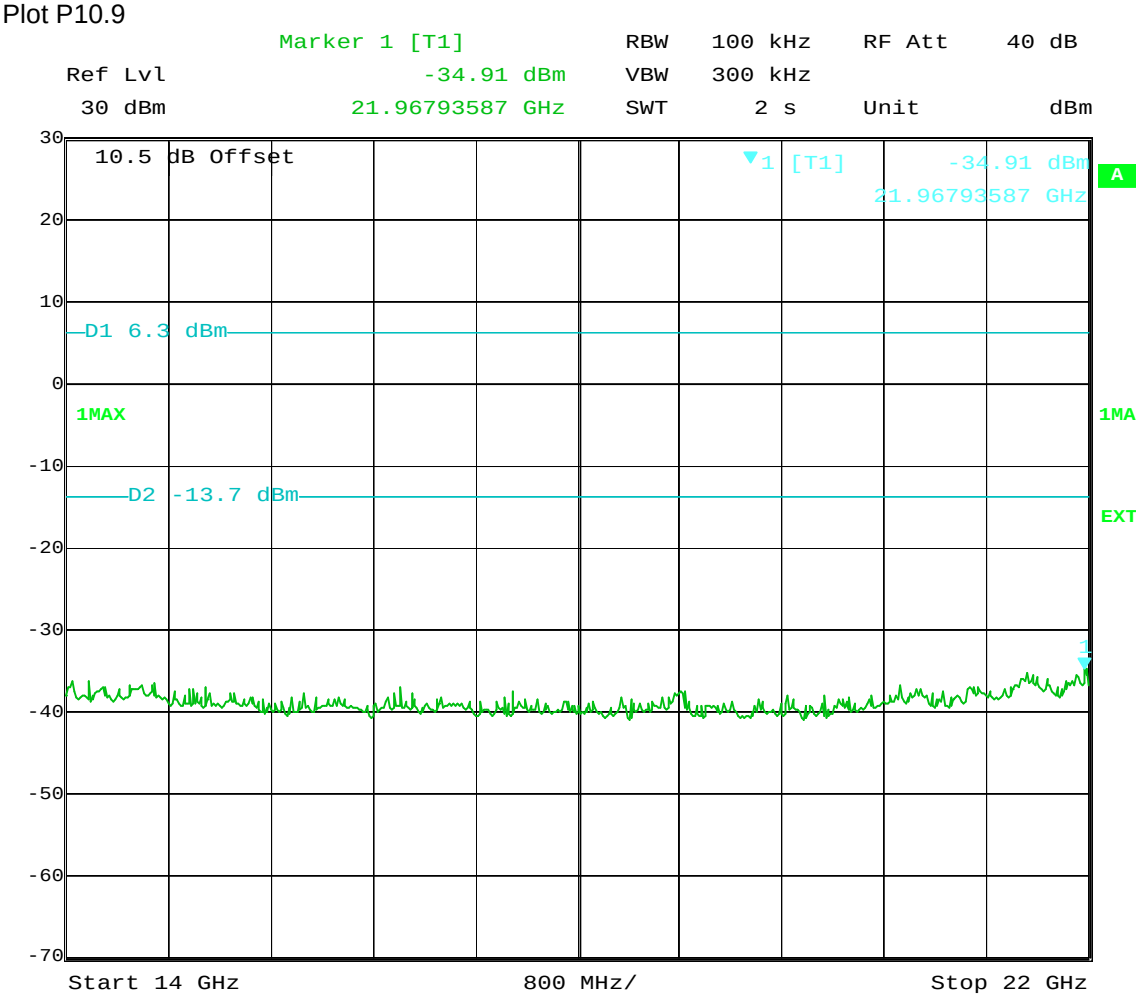
Plot P10.9



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APPENDIX I – PHOTOS OF THE EUT

EUT front side with external antenna mounted

EUT label

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