**CETECOM™****CETECOM ICT Services**
consulting - testing - certification >>>

TEST REPORT

Test report no.: 1-6965/13-20-14

Deutsche
Akkreditierungsstelle
D-PL-12076-01-01

Testing laboratory

CETECOM ICT Services GmbH

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Internet: <http://www.cetecom.com>e-mail: ict@cetecom.com**Accredited Testing Laboratory:**

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)

The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-01

Area of Testing:

Radio Communications & EMC (RCE)

Applicant

Sony Mobile Communications AB

Nya Vattentornet

22188 Lund / SWEDEN

Phone: +46 46 19 30 00

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Phone: +46 7 03 22 75 03

Manufacturer

Sony Mobile Communications AB

Nya Vattentornet

22188 Lund / SWEDEN

Test standard/s

47 CFR Part 15

Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item: Smart Phone GPRS/EGPRS 850/900/1800/1900; UMTS HSPA FDDI/III/V/VIII; LTE FDD2/3/4/7/13; CDMA 2K BC0/BC1; WLAN b/g/n/a/ac; BT 4.0; RFID; A-GPS

FCC ID: PY7PM-0742

IC: -/-

Frequency: DTS band 2400 MHz to 2483.5 MHz
(lowest channel 01 – 2412 MHz; highest channel 11 – 2462 MHz)

Technology tested: WLAN (DSSS/b – mode; OFDM/g – mode and n HT20 – mode)

Antenna: Integrated antenna

Power supply: 4.2V DC by Li - polymer battery

Temperature range: -30°C to +50°C

This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorised:

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Marco Bertolino
Testing Manager

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2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

2.2 Application details

Date of receipt of order:	2014-05-19
Date of receipt of test item:	2014-05-27
Start of test:	2014-05-29
End of test:	2014-06-02
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	-/-	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

3.1 Measurement guidance

DTS : KDB 558074	2013-04	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
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4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	+50 °C during high temperature tests
	T_{min}	-30 °C during low temperature tests
Relative humidity content:		47 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	4.2 V DC by Li - polymer battery
	V_{max}	4.2 V
	V_{min}	3.3 V

5 Test item

Kind of test item	:	Smart Phone GPRS/EGPRS 850/900/1800/1900; UMTS HSPA FDDI/II/V/VIII; LTE FDD2/3/4/7/13; CDMA 2K BC0/BC1; WLAN b/g/n/a/ac; BT 4.0; RFID; A-GPS
S/N serial number	:	Radiated units: CB5A1Z1Y2Y; CB5A1Z1Y8P
HW hardware status	:	TP3.0
SW software status	:	RF test software
Frequency band [MHz]	:	DTS band 2400 MHz to 2483.5 MHz (lowest channel 01 – 2412 MHz; highest channel 11 – 2462 MHz)
Type of radio transmission	:	DSSS, OFDM
Use of frequency spectrum	:	
Type of modulation	:	BPSK, QPSK, 16 – QAM, and 64 – QAM
Number of channels	:	11
Antenna	:	Integrated antenna
Power supply	:	4.2 V DC by Li - polymer battery
Temperature range	:	-30°C to +50 °C

5.1 Additional information

Test setup- and EUT-photos are included in test report: 1-6965/13-20-01_AnnexA
 1-6965/13-20-01_AnnexB
 1-6965/13-20-01_AnnexD

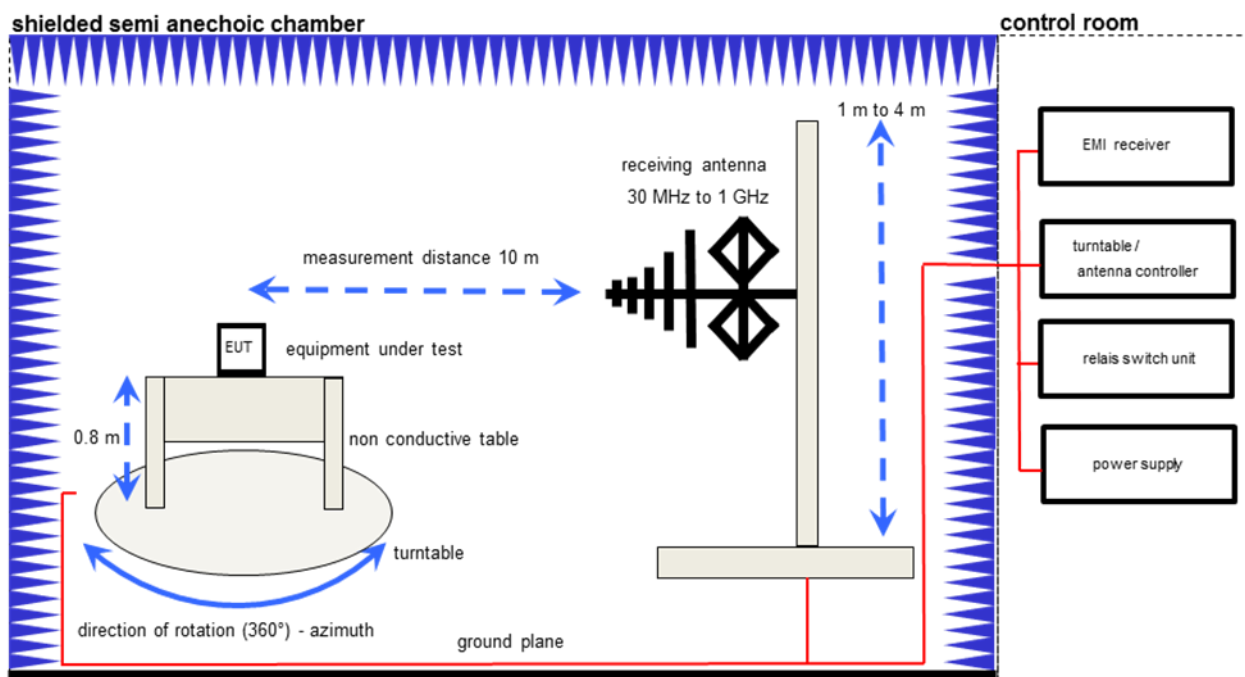
6 Test laboratories sub-contracted

None

7 Description of the test setup

7.1 Radiated measurements chamber F

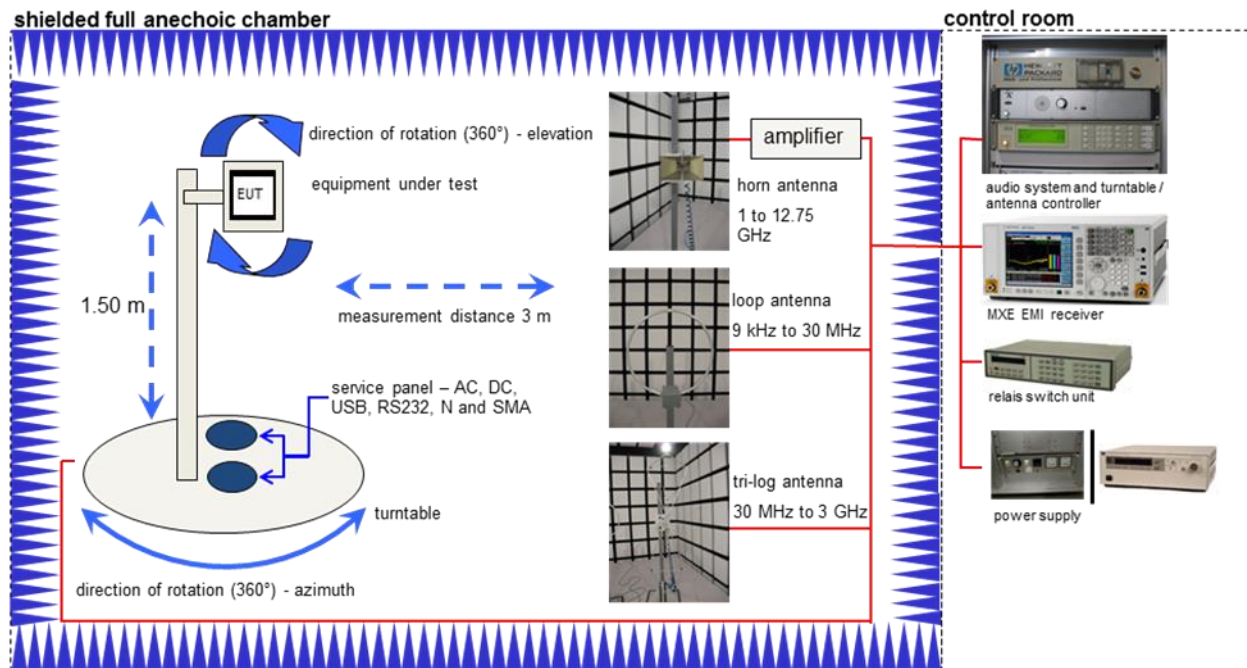
The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368
DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580
EMI Test Receiver	ESCI 3	R&S	100083	300003312
Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379
Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745
Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746
Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747
TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787

7.2 Radiated measurements chamber C



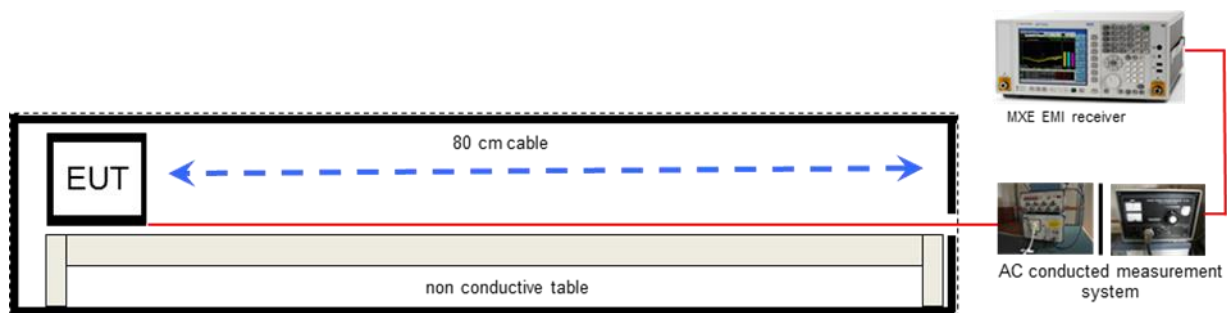
Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405
TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854
Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351
Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789
Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032
Active Loop Antenna	6502	EMCO	8905-2342	300000256
Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996
Switch / Control Unit	3488A	HP Meßtechnik	*	300000199
Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001156
Isolating Transformer	MPL IEC625 Bus Regeltrenntrafo	Erfi	91350	300001155
Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997
Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143

7.3 Radiated measurements 12.75 GHz to 25 GHz**Equipment table:**

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787
Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8205	300002442
Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP Meßtechnik	00419	300002268
Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003443
Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517

7.4 AC conducted



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405
Isolating Transformer	MPL IEC625 Bus Regeltrenntrafo	Erft	91350	300001155
Switch / Control Unit	3488A	HP Meßtechnik	*	300000199
Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001168
Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210

8 Summary of measurement results



No deviations from the technical specifications were ascertained



There were deviations from the technical specifications ascertained

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15	Passed	2014-06-12	Delta tests according to manufacturer test plan!

Test specification clause	Test case	Guideline	Temperature conditions	Power source voltages	Mode	Pass	Fail	NA	NP	Remark
§15.247(b)(4)	Antenna gain	-/-	Nominal	Nominal	DSSS	☐	☐	☐	☐	Declared
§15.247(e)	Power spectral density	KDB 558074 DTS clause: 10.2	Nominal	Nominal	DSSS OFDM g & n	☐ ☐	☐ ☐	☐ ☐	☒ ☒	-/-
§15.247(a)(2)	Spectrum bandwidth – 6 dB bandwidth	KDB 558074 DTS clause: 8.2	Nominal	Nominal	DSSS OFDM g & n	☐ ☐	☐ ☐	☐ ☐	☒ ☒	-/-
-/-	Occupied bandwidth	-/-	Nominal	Nominal	DSSS OFDM g & n	☐ ☐	☐ ☐	☐ ☐	☒ ☒	-/-
§15.247(b)(3)	Maximum output power	KDB 558074 DTS clause: 9.1.2	Nominal	Nominal	DSSS OFDM g & n	☐ ☐	☐ ☐	☐ ☐	☒ ☒	-/-
§15.247(d)	Band edge compliance conducted	KDB 558074 DTS clause: 13.2.1	Nominal	Nominal	DSSS OFDM g & n	☐ ☐	☐ ☐	☐ ☐	☒ ☒	-/-
§15.205	Band edge compliance radiated	-/-	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	Complies
§15.247(d)	TX spurious emissions conducted	KDB 558074 DTS clause: 11.1 & 11.2	Nominal	Nominal	DSSS OFDM g & n	☐ ☐	☐ ☐	☐ ☐	☒ ☒	-/-
§15.247(d)	TX spurious emissions radiated	-/-	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	Complies
§15.109	RX spurious emissions radiated	-/-	Nominal	Nominal	-/-	☒	☐	☐	☐	Complies
§15.209(a)	TX spurious emissions radiated < 30 MHz	-/-	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	Complies
§15.107(a) §15.207	Conducted emissions < 30 MHz	-/-	Nominal	Nominal	DSSS OFDM g & n	☒ ☒	☐ ☐	☐ ☐	☐ ☐	Complies

Note: NA = Not Applicable; NP = Not Performed

9 Additional comments

Reference documents: Main test report: 1-6965/13-04-14-A (FCC ID: PY7PM-0740)

Special test descriptions: None

Configuration descriptions: None

Test mode:

- ☐ No test mode available.
Iperf was used to ping another device with the largest support packet size
- ☒ Special software is used.
EUT is transmitting pseudo random data by itself

10 Measurement results**10.1 Antenna gain****Limits:**

FCC	-/-
Antenna Gain	
6 dBi	

Results:

T _{nom}	V _{nom}	lowest channel 2402 MHz	middle channel 2441 MHz	highest channel 2480 MHz
Gain [dBi] Declared by the manufacturer		0.8	1.7	1.0

Result: -/-

10.2 Band edge compliance radiated

Description:

Measurement of the radiated band edge compliance. The EUT is turned in the position that results in the maximum level at the band edge. Then a sweep over the corresponding restricted band is performed. The EUT is set to channel 1 for the lower restricted band and to channel 11 for the upper restricted band. The measurement is repeated for all modulations. Measurement distance is 3m.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 MHz / 1 MHz
Video bandwidth:	1 MHz / 10 Hz
Span:	See plot!
Trace-Mode:	Max Hold

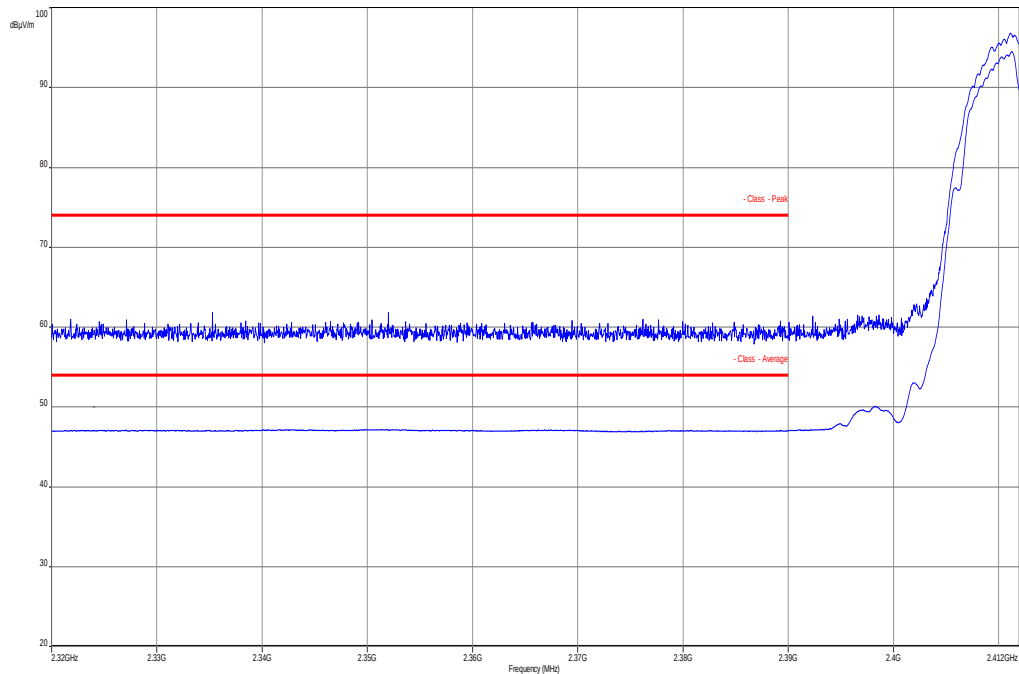
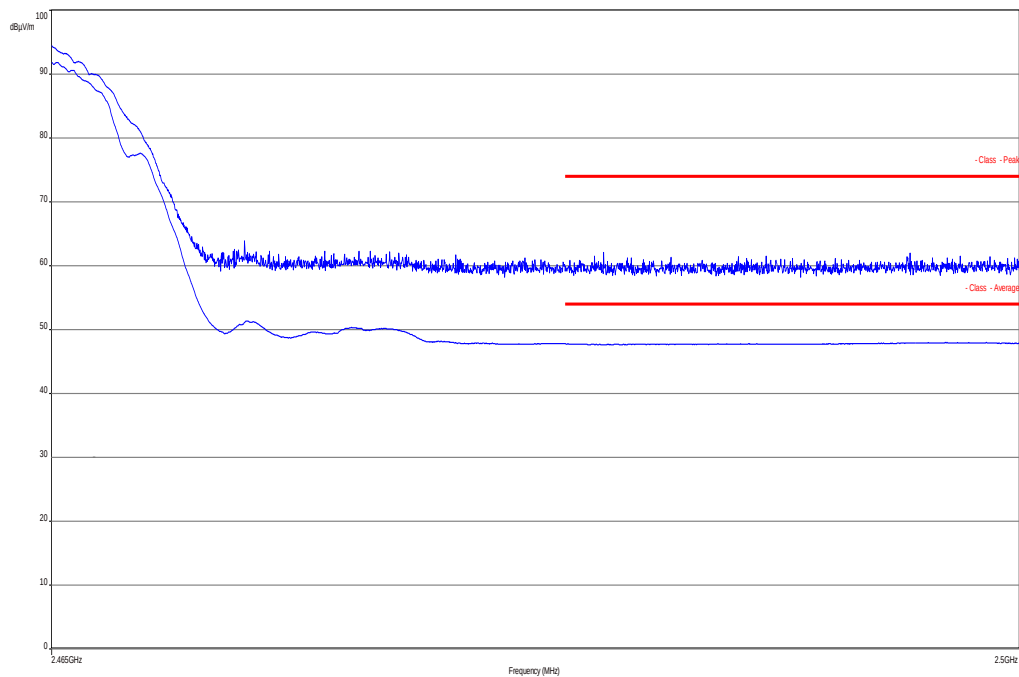
Limits:

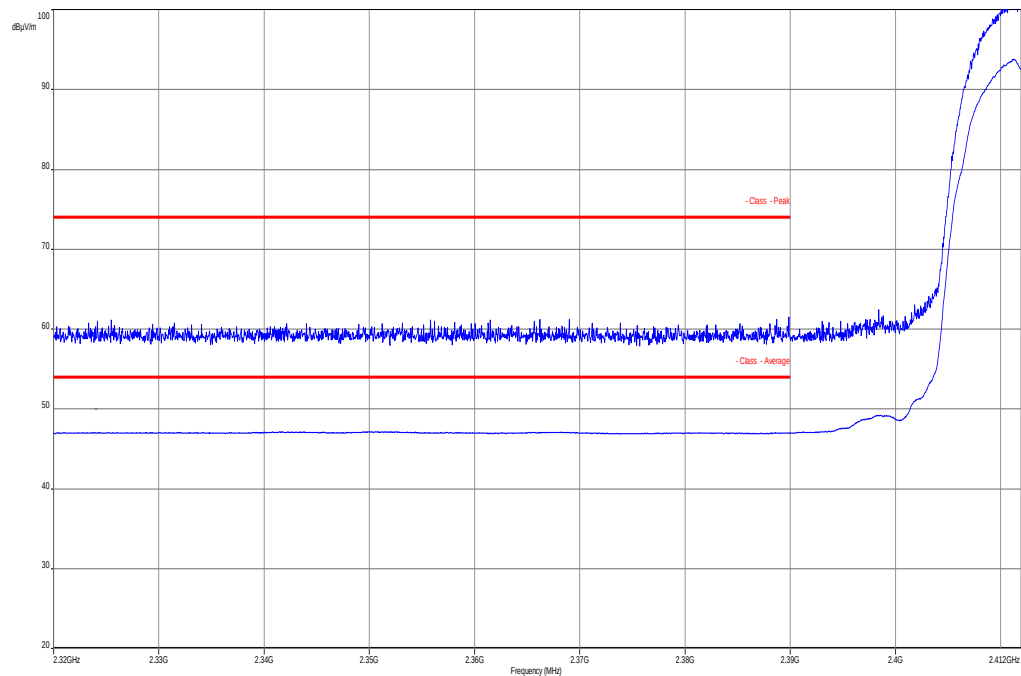
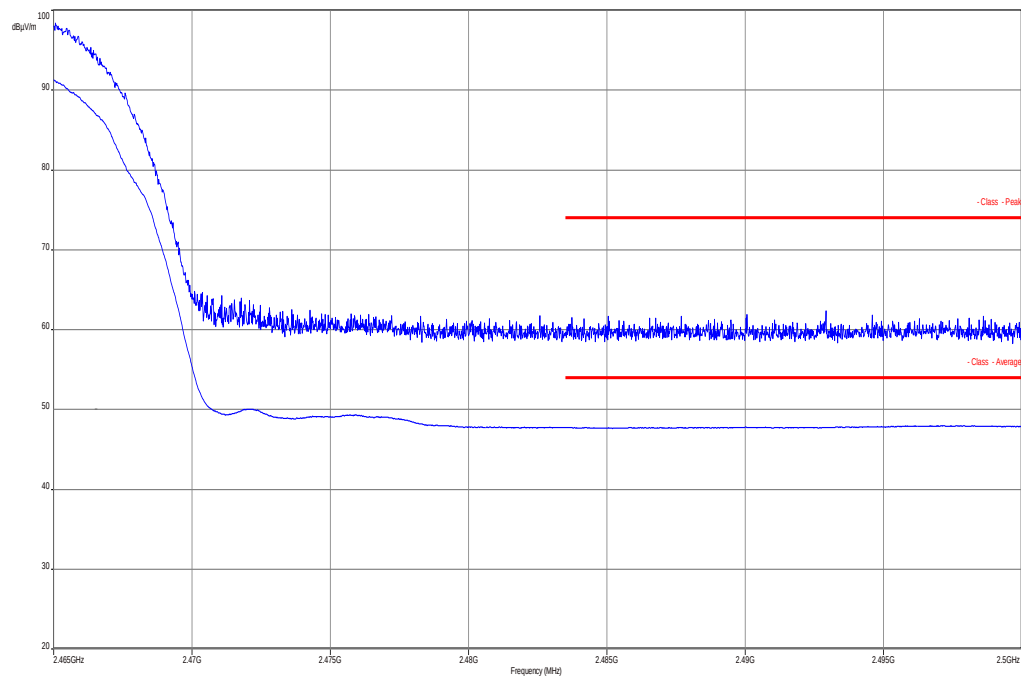
FCC	-/-
Band Edge Compliance Radiated	
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. 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 Section 15.209(a) (see Section 5.205(c)).	
74 dBμV/m Peak 54 dBμV/m AVG	

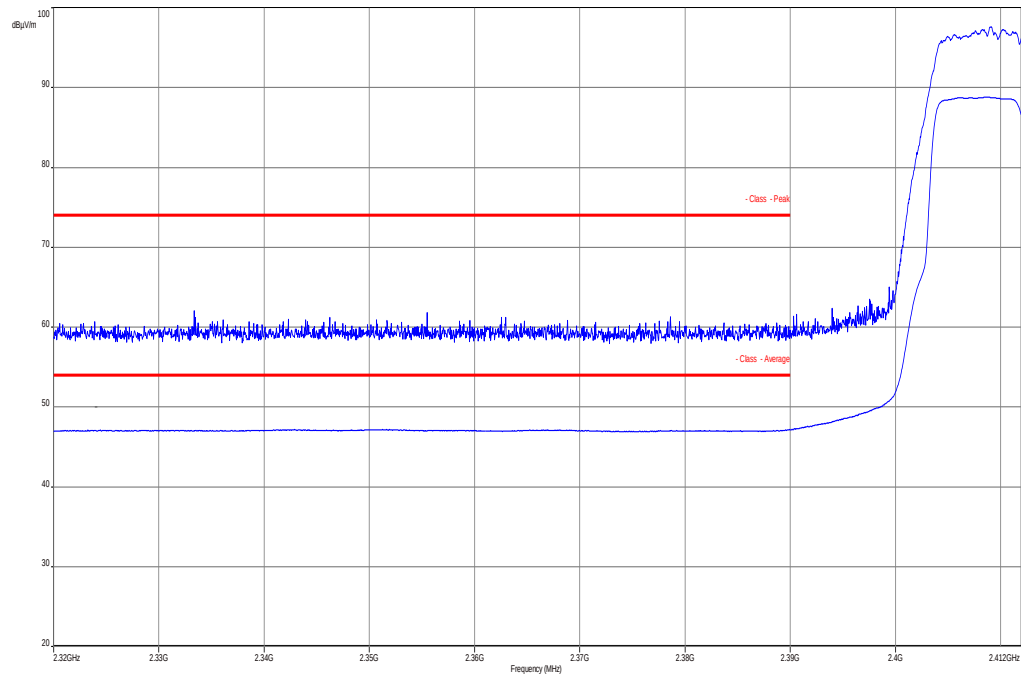
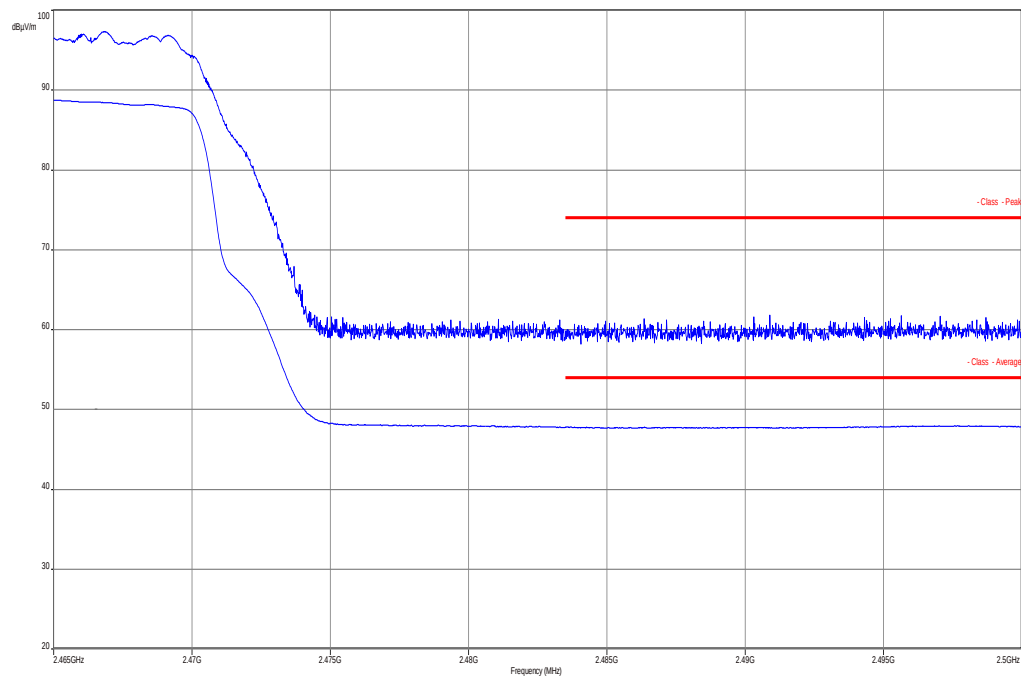
Results:

Scenario Modulation	Band Edge Compliance Conducted [dB]		
	DSSS / b – mode	OFDM / g – mode	OFDM / n HT20 – mode
Lower Band Edge – Channel 1	> 10 dB (Peak) > 10 dB (AVG)	> 10 dB (Peak) > 10 dB (AVG)	> 10 dB (Peak) > 10 dB (AVG)
Upper Band Edge – Channel 11	> 10 dB (Peak) > 10 dB (AVG)	> 10 dB (Peak) > 10 dB (AVG)	> 10 dB (Peak) > 10 dB (AVG)
Measurement uncertainty	± 3 dB		

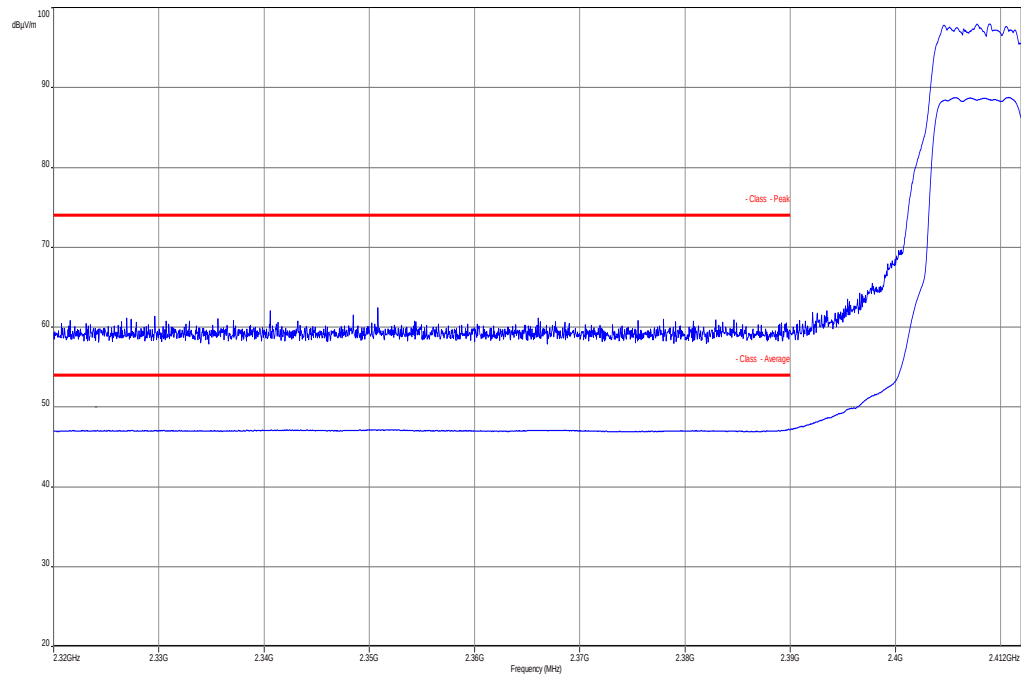
Result: Passed

Plots: DSSS/ b – mode peak / average**Plot 1:** TX mode, lower band edge, vertical & horizontal polarization, low data rate**Plot 2:** TX mode, upper band edge, vertical & horizontal polarization, low data rate

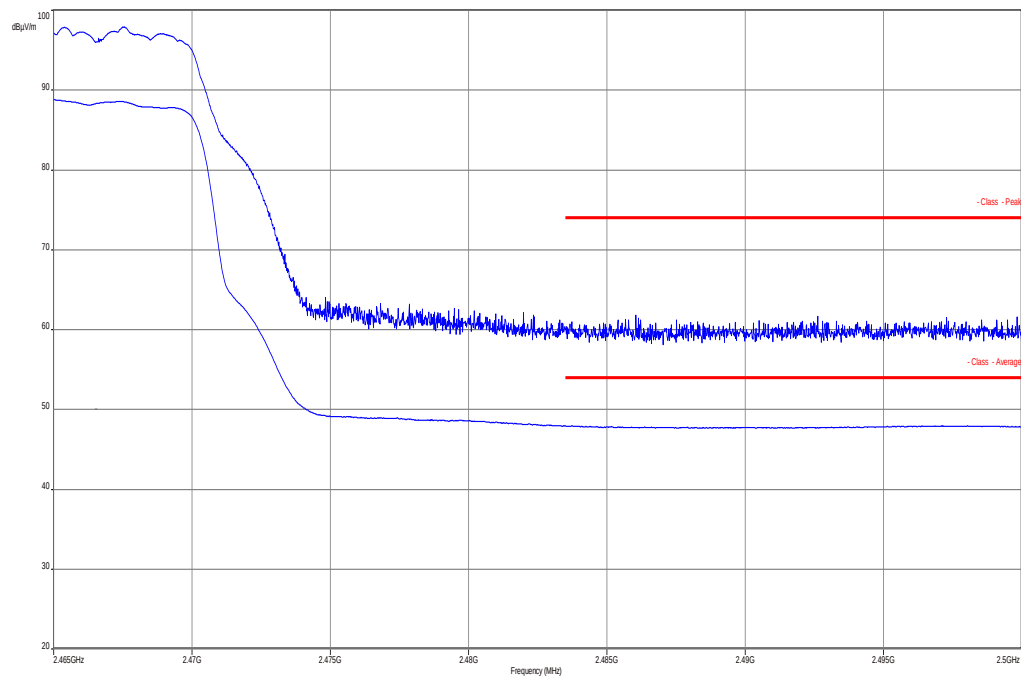
Plot 3: TX mode, lower band edge, vertical & horizontal polarization, high data rate**Plot 4:** TX mode, upper band edge, vertical & horizontal polarization, high data rate

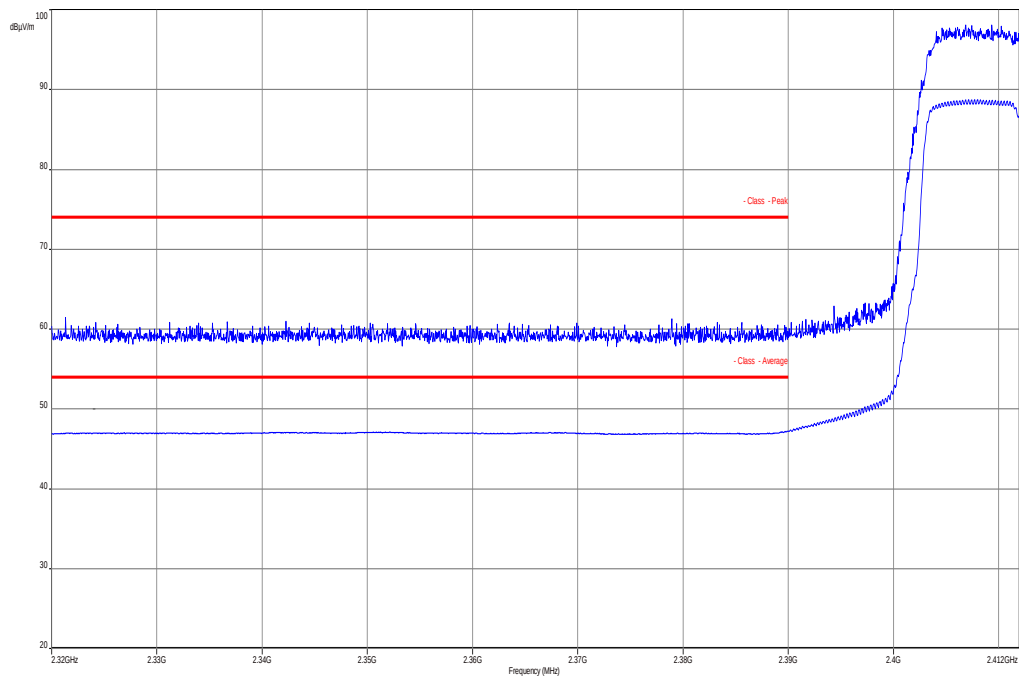
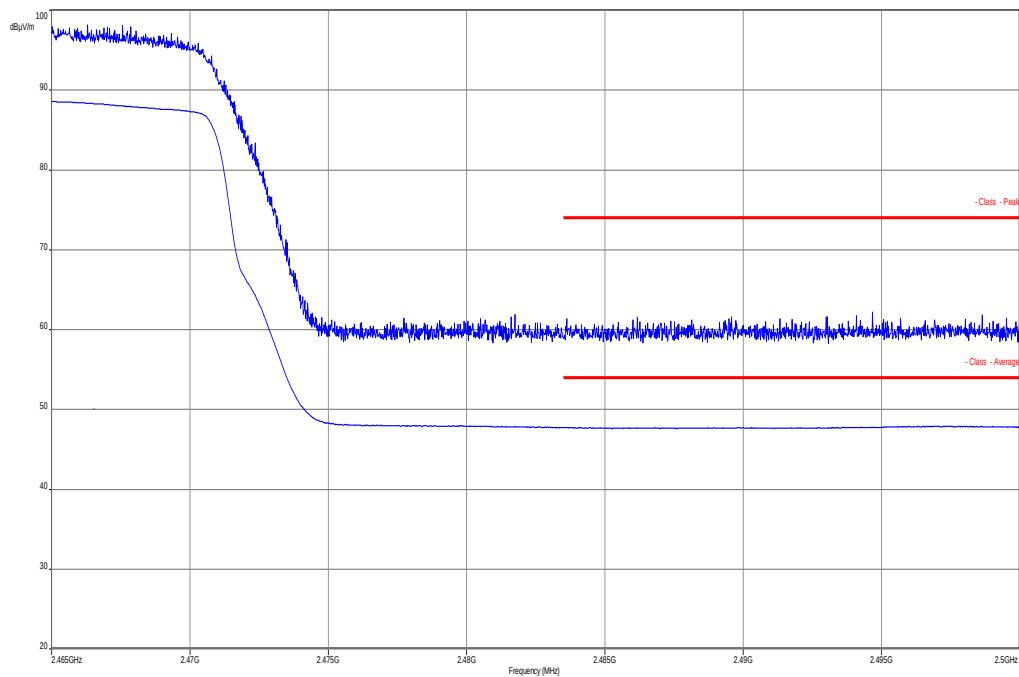
Plots: OFDM / g – mode peak / average**Plot 1:** TX mode, lower band edge, vertical & horizontal polarization, low data rate**Plot 2:** TX mode, upper band edge, vertical & horizontal polarization, low data rate

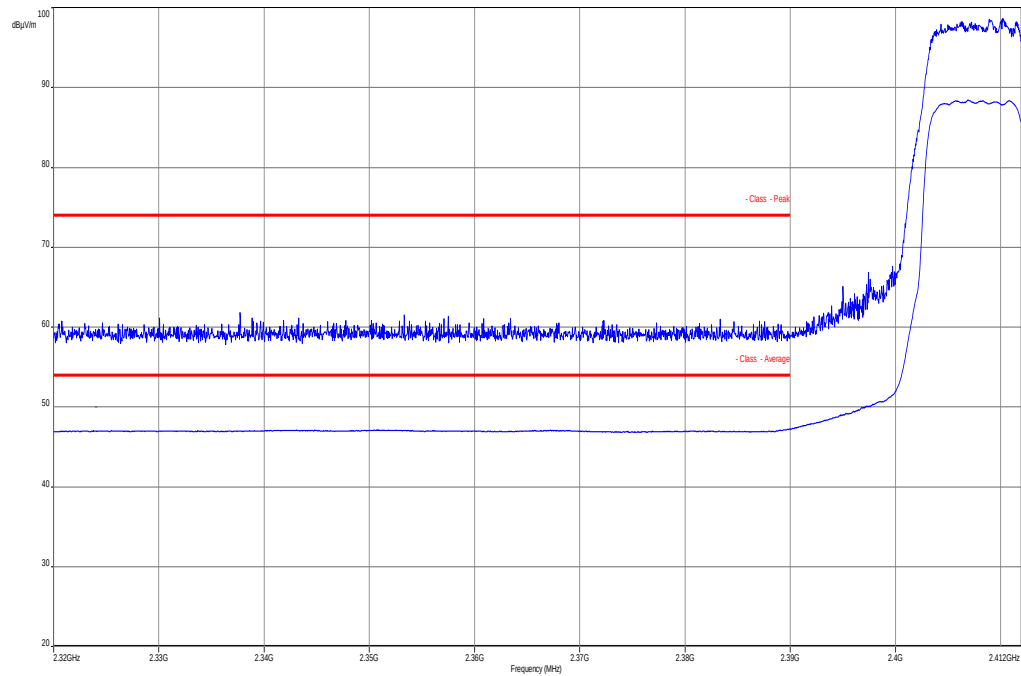
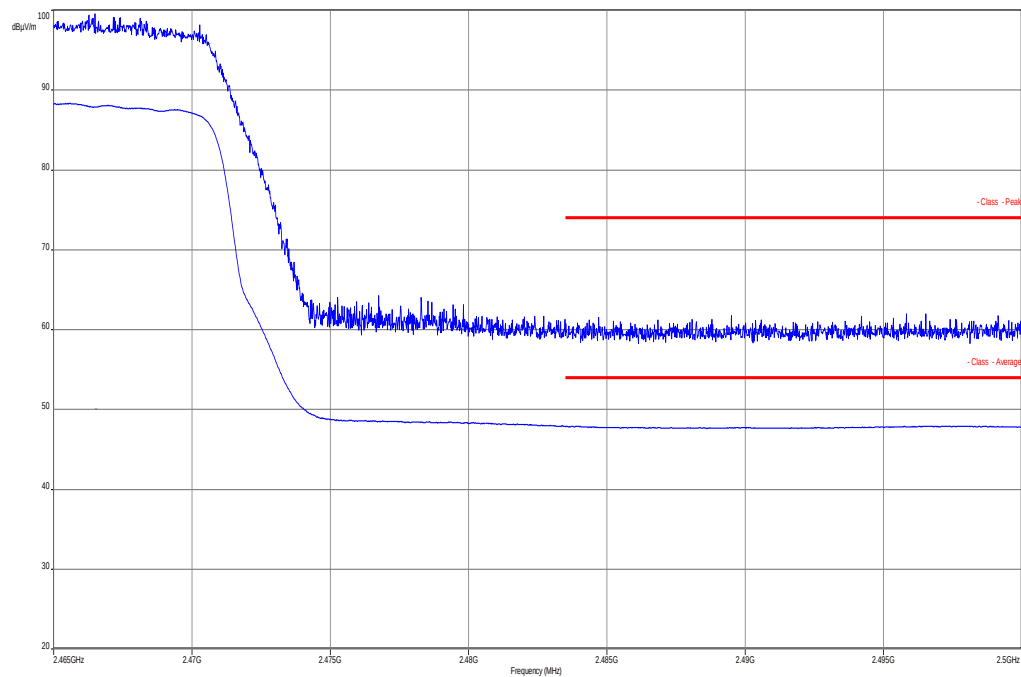
Plot 3: TX mode, lower band edge, vertical & horizontal polarization, high data rate



Plot 4: TX mode, upper band edge, vertical & horizontal polarization high, data rate



Plots: OFDM / n HT20 – mode peak / average**Plot 1:** TX mode, lower band edge, vertical & horizontal polarization, low data rate**Plot 2:** TX mode, upper band edge, vertical & horizontal polarization, low data rate

Plot 3: TX mode, lower band edge, vertical & horizontal polarization, high data rate**Plot 4:** TX mode, upper band edge, vertical & horizontal polarization high, data rate

10.3 TX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in transmit mode. The measurement is performed at channel 1, 6 and 11. The measurement is repeated for all modulations.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak / RMS
Sweep time:	Auto
Resolution bandwidth:	F > 1 GHz: 1 MHz F < 1 GHz: 100 kHz
Video bandwidth:	3 x RBW Remeasurement: 10 Hz / 3 MHz
Span:	30 MHz to 26 GHz
Trace-Mode:	Max Hold
Measured Modulation	☒ DSSS b – mode ☒ OFDM g – mode ☒ OFDM n – mode

The modulation with the highest output power was used to perform the transmitter spurious emissions. If spurious were detected a re-measurement was performed on the detected frequency with each modulation.

Limits:

FCC		-/-
TX Spurious Emissions Radiated		
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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).		
Frequency (MHz)	Field Strength (dBμV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Results: DSSS / b – mode

TX Spurious Emissions Radiated [dBμV/m]								
DSSS / b – mode								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
All detected peak emissions above 1 GHz are below the average limit!			All detected peak emissions above 1 GHz are below the average limit!			All detected peak emissions above 1 GHz are below the average limit!		
Measurement uncertainty			± 3 dB					

Result: Passed**Results: OFDM / g – mode**

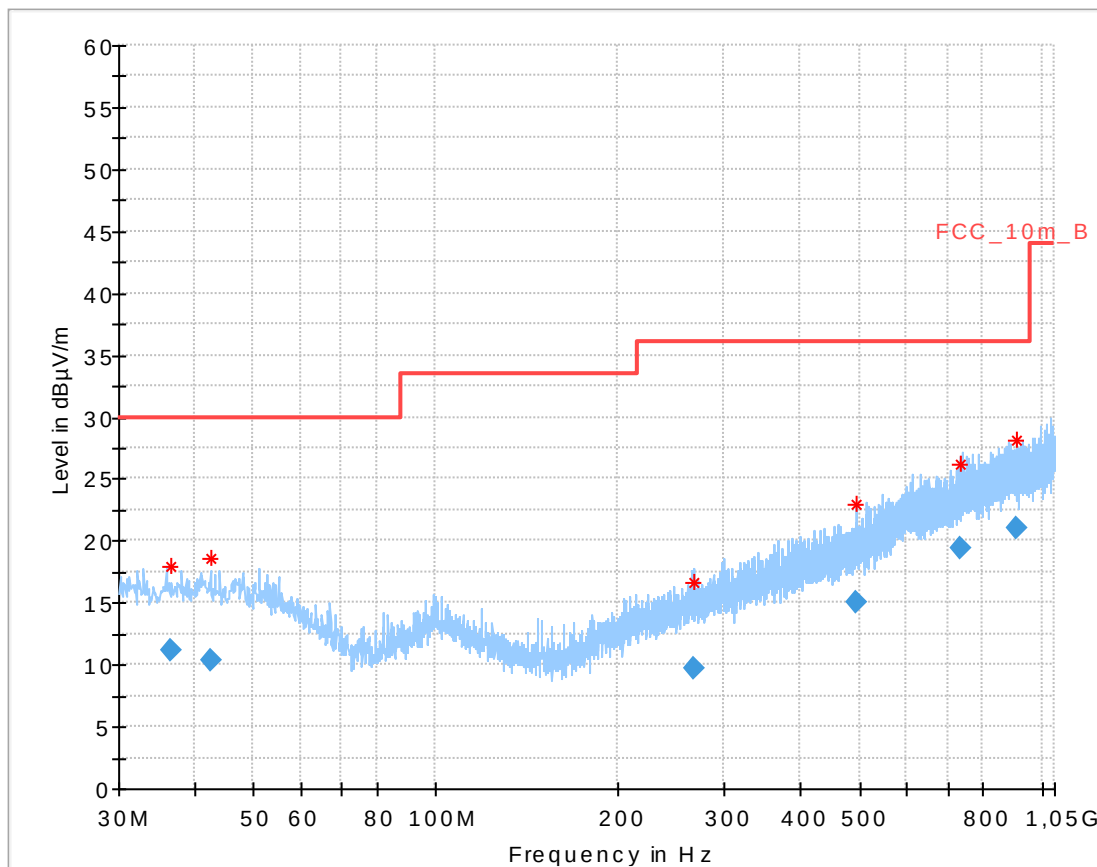
TX Spurious Emissions Radiated [dBμV/m]								
OFDM / g – mode								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
All detected peak emissions above 1 GHz are below the average limit!			All detected peak emissions above 1 GHz are below the average limit!			All detected peak emissions above 1 GHz are below the average limit!		
Measurement uncertainty			± 3 dB					

Result: Passed**Results: OFDM / n HT20 – mode**

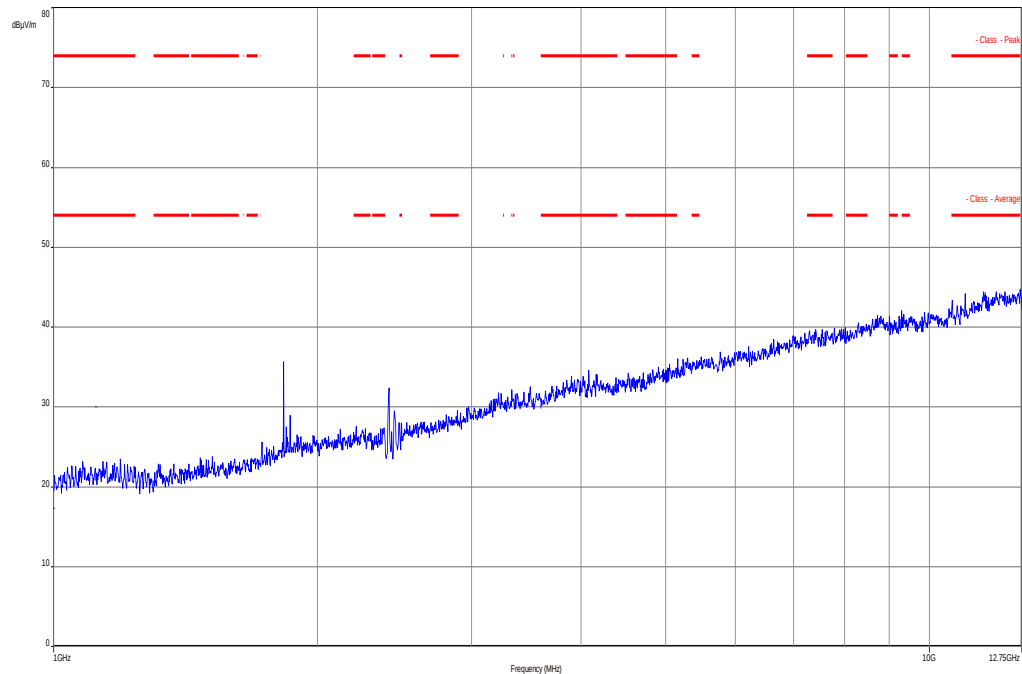
TX Spurious Emissions Radiated [dBμV/m]								
OFDM / n HT20 – mode								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
All detected peak emissions above 1 GHz are below the average limit!			All detected peak emissions above 1 GHz are below the average limit!			All detected peak emissions above 1 GHz are below the average limit!		
Measurement uncertainty			± 3 dB					

Result: Passed

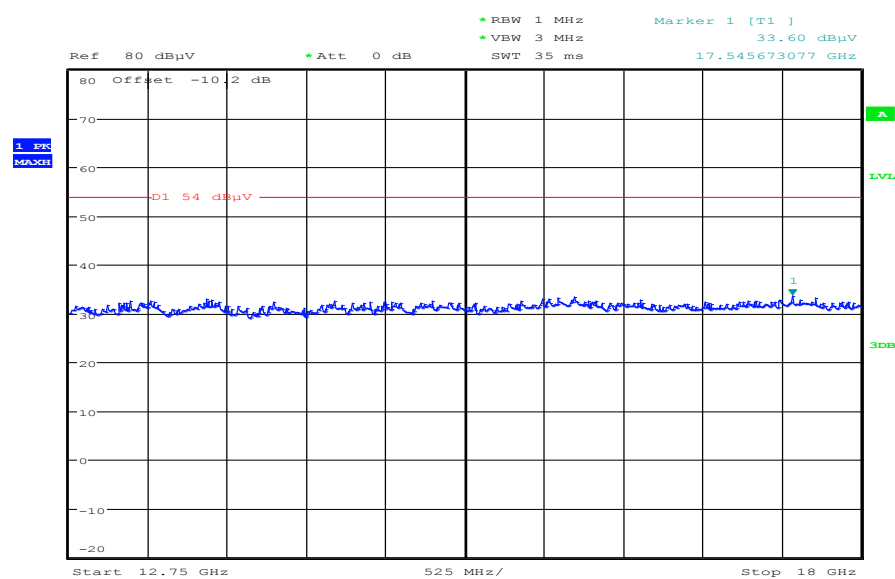
Note: The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)

Plots: DSSS / b – mode
Plot 1: Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

Final result:

Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
36.531600	11.13	30.00	18.87	1000.0	120.000	170.0	V	280.0	13.9
42.634950	10.33	30.00	19.67	1000.0	120.000	170.0	H	86.0	13.9
267.481950	9.74	36.00	26.26	1000.0	120.000	170.0	V	190.0	13.8
493.006500	15.02	36.00	20.98	1000.0	120.000	165.0	H	190.0	18.6
735.163650	19.38	36.00	16.62	1000.0	120.000	170.0	V	180.0	22.4
911.361600	21.08	36.00	14.92	1000.0	120.000	118.0	H	190.0	24.1

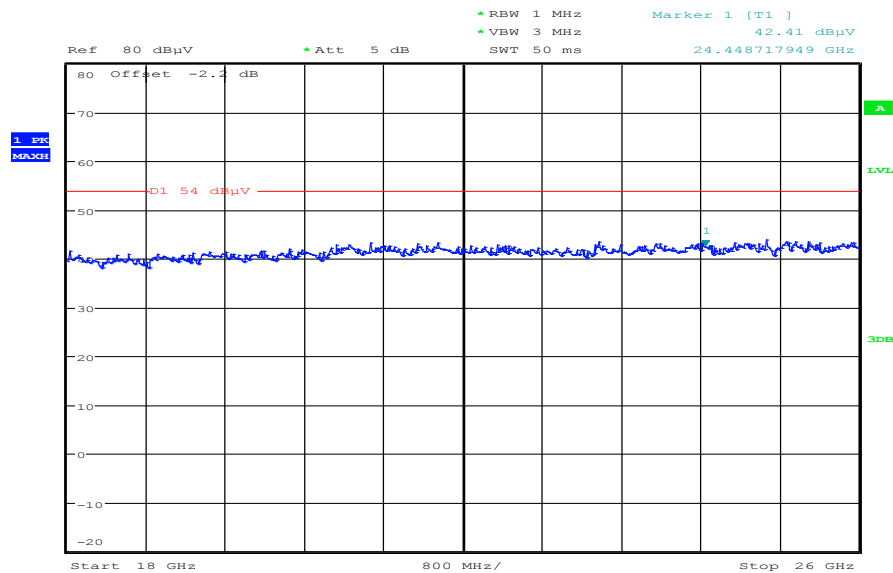
Plot 2: Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

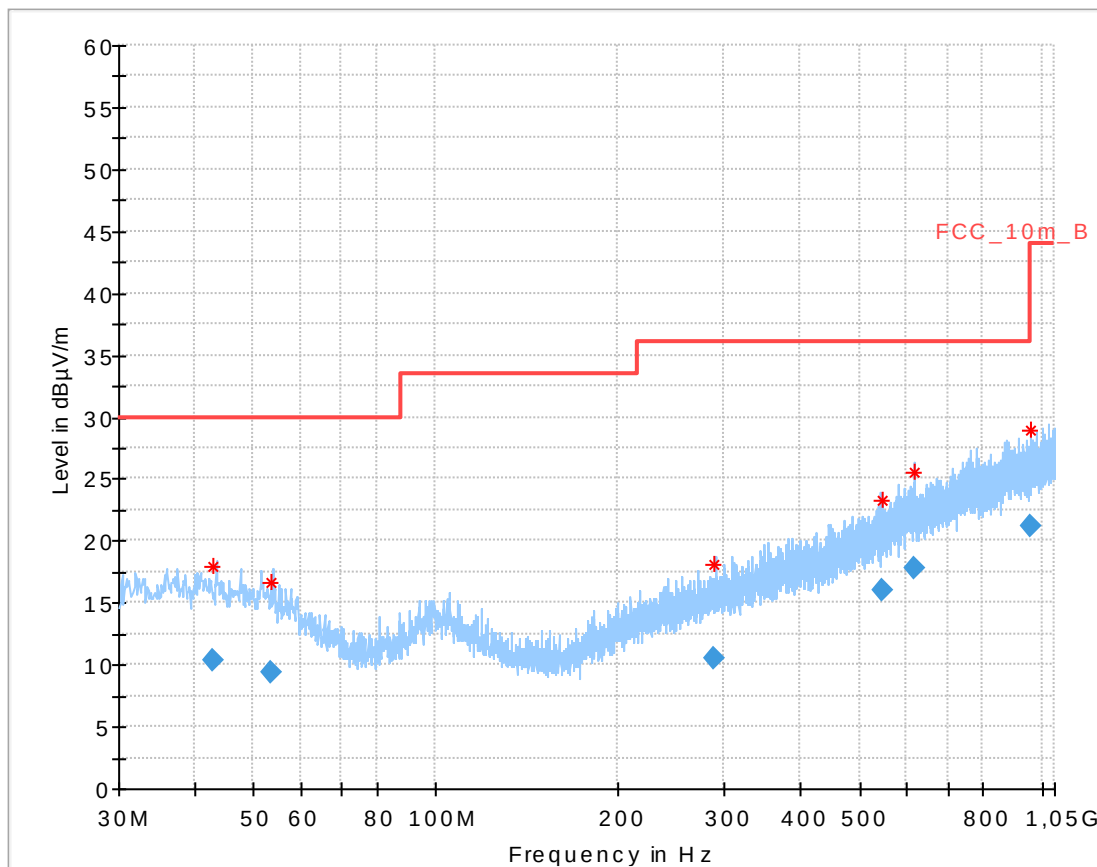
Plot 3: Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Date: 28.MAY.2014 10:42:02

Plot 4: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



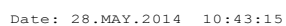
Date: 28.MAY.2014 10:29:53

Plot 5: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Final result:**

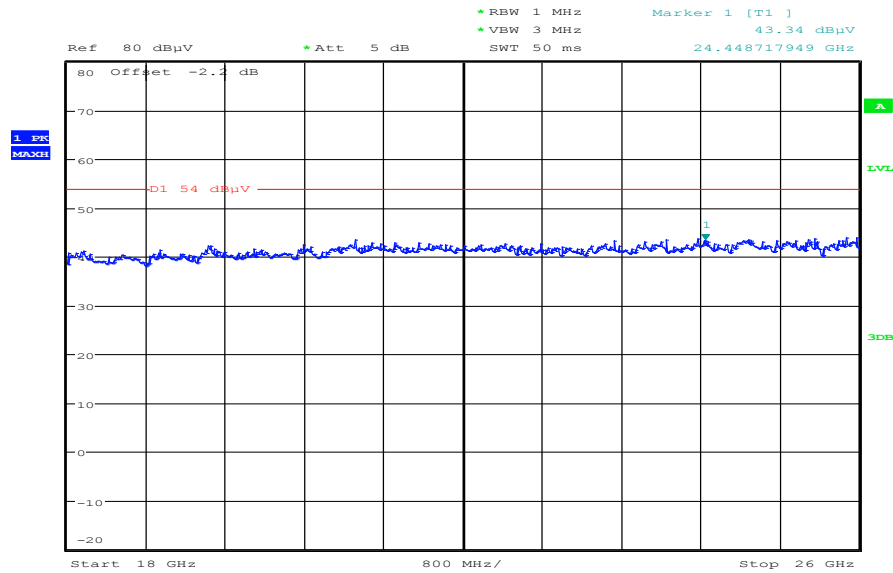
Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
42.999600	10.37	30.00	19.63	1000.0	120.000	170.0	V	100.0	13.9
53.481900	9.44	30.00	20.56	1000.0	120.000	170.0	H	190.0	13.1
288.552600	10.48	36.00	25.52	1000.0	120.000	157.0	V	-9.0	14.2
543.722250	15.94	36.00	20.06	1000.0	120.000	170.0	V	10.0	19.2
615.485550	17.82	36.00	18.18	1000.0	120.000	170.0	V	270.0	20.8
955.810650	21.26	36.00	14.74	1000.0	120.000	170.0	H	190.0	24.3

The graph displays the spectral density of noise power across a wide frequency range. The x-axis represents Frequency in MHz on a logarithmic scale, with major ticks at 1 GHz, 10 GHz, and 12.75 GHz. The y-axis represents the noise power in dBm/Hz, ranging from 0 to 80. The 'Class - Peak' (red dashed line) is constant at approximately 74 dBm/Hz. The 'Class - Average' (red dashed line) is constant at approximately 54 dBm/Hz. The 'Class - Noise' (blue solid line) shows a noisy, increasing trend, starting around 20 dBm/Hz at 1 GHz and rising to approximately 45 dBm/Hz at 12.75 GHz. A legend in the top right corner identifies the three series.

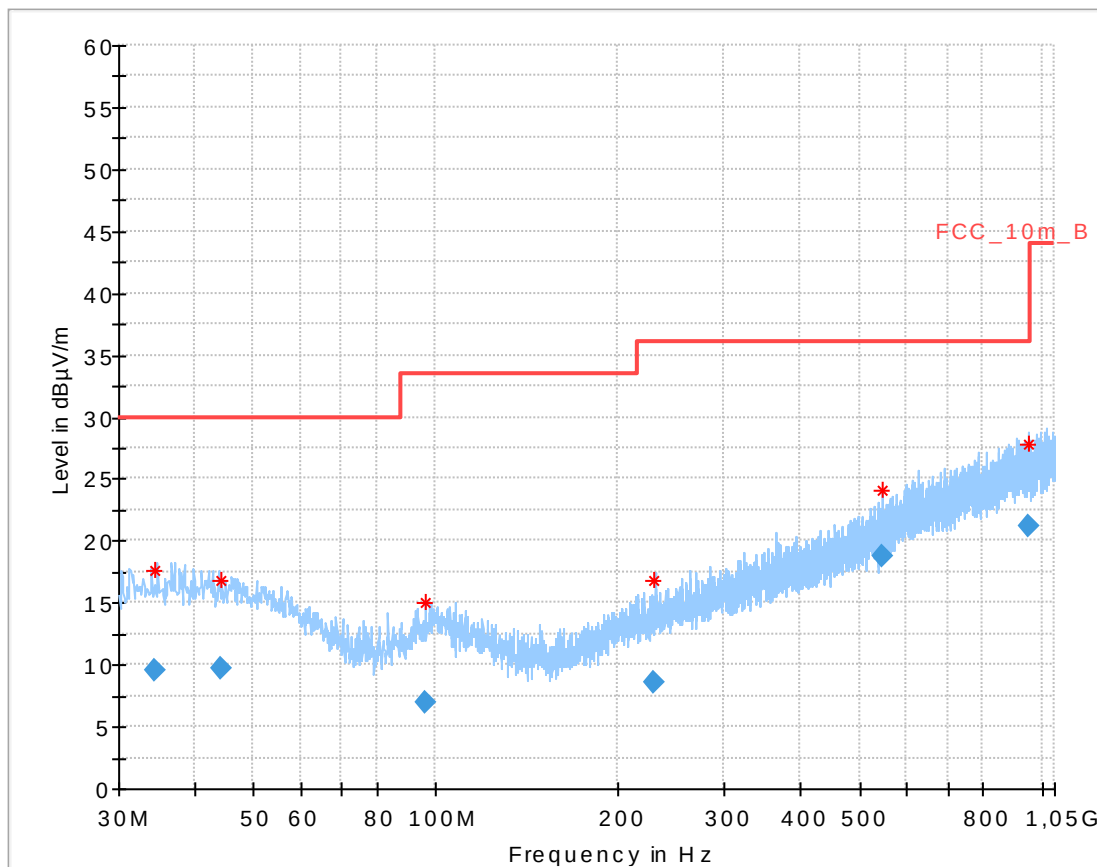
Plot 7: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



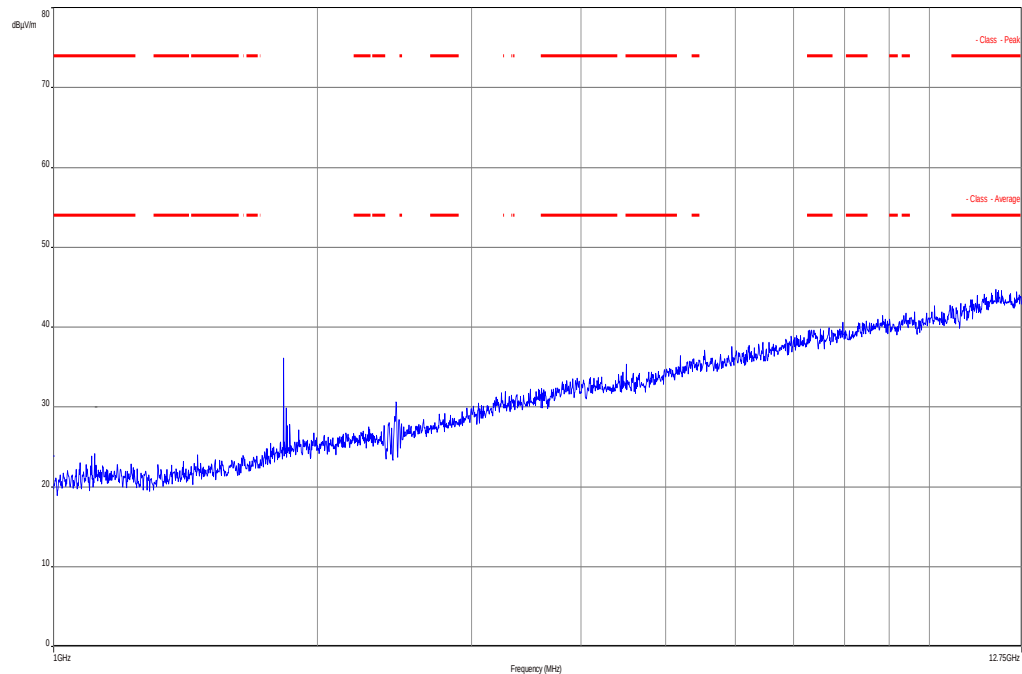
Plot 8: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization



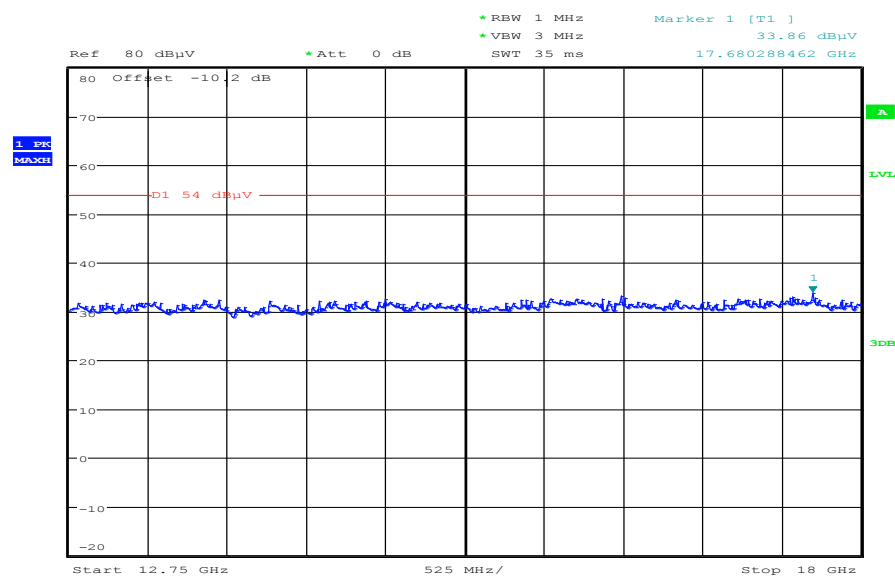
Date: 28.MAY.2014 10:31:25

Plot 9: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Final result:**

Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.303800	9.50	30.00	20.50	1000.0	120.000	170.0	H	100.0	13.7
44.073600	9.70	30.00	20.30	1000.0	120.000	98.0	V	280.0	13.9
96.123150	7.03	33.50	26.47	1000.0	120.000	115.0	V	190.0	11.5
229.391400	8.52	36.00	27.48	1000.0	120.000	170.0	V	86.0	12.7
543.999450	18.82	36.00	17.18	1000.0	120.000	170.0	V	171.0	19.2
951.932700	21.24	36.00	14.76	1000.0	120.000	170.0	V	190.0	24.3

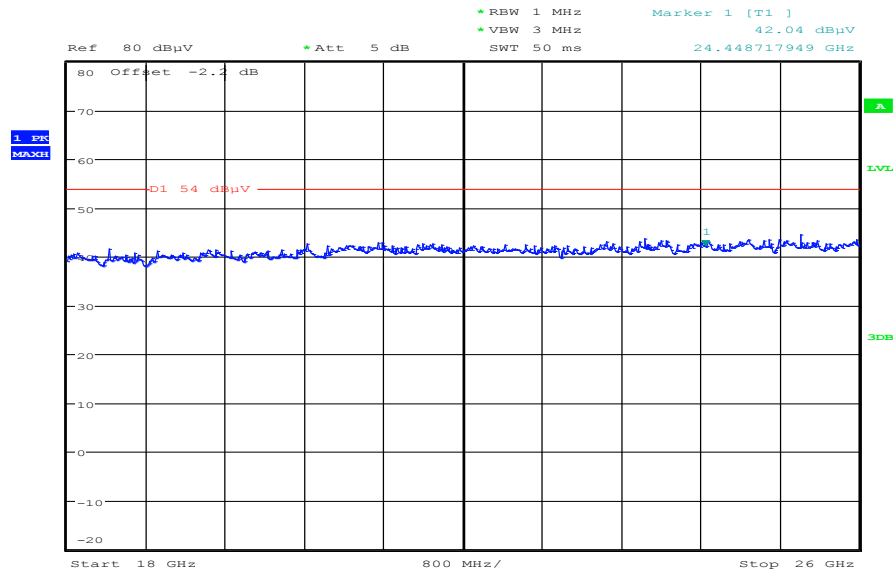
Plot 10: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

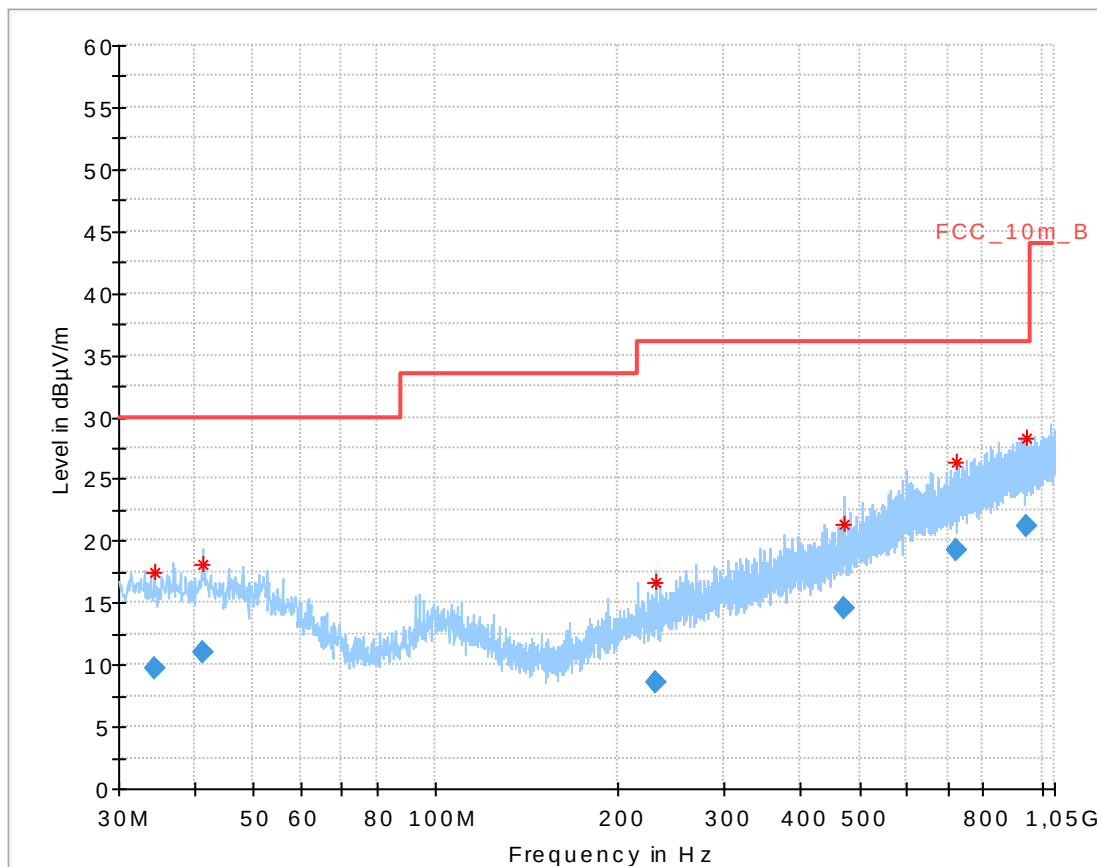
Plot 11: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Date: 28.MAY.2014 10:44:36

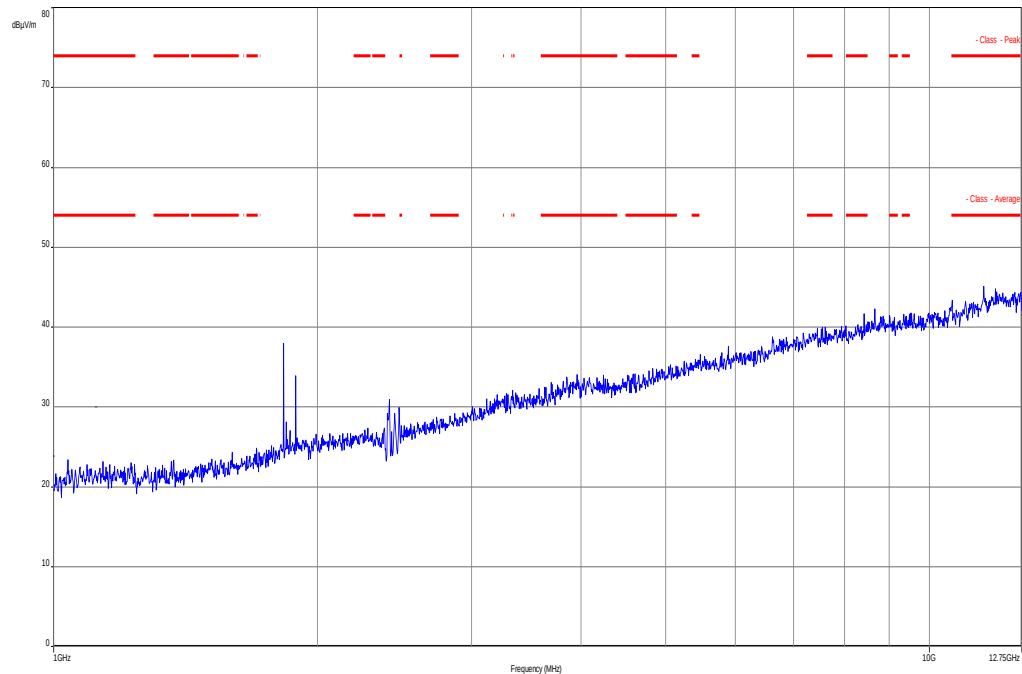
Plot 12: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



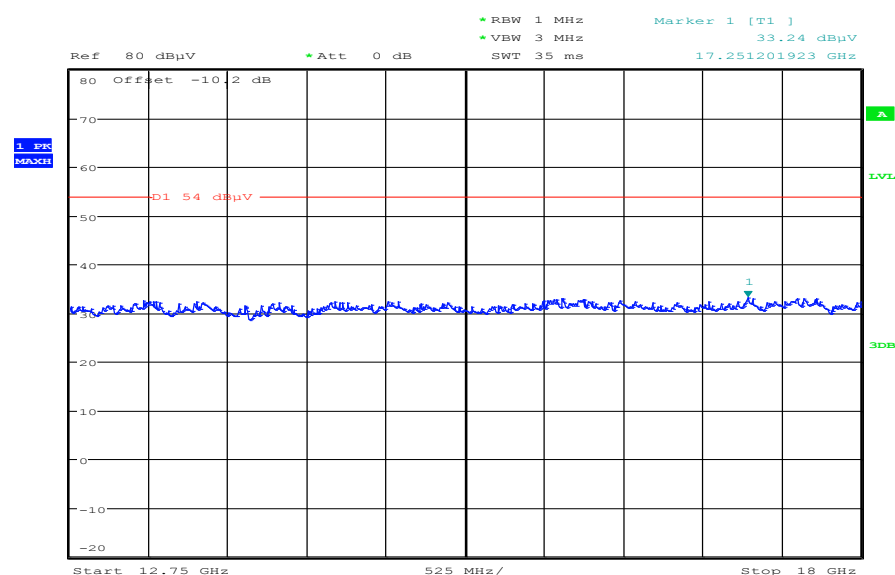
Date: 28.MAY.2014 10:32:31

Plots: OFDM / g – mode
Plot 1: Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

Final result:

Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.374750	9.67	30.00	20.33	1000.0	120.000	170.0	V	271.0	13.7
41.454750	10.92	30.00	19.08	1000.0	120.000	170.0	H	190.0	14.0
230.479500	8.63	36.00	27.37	1000.0	120.000	170.0	V	100.0	12.7
473.214150	14.53	36.00	21.47	1000.0	120.000	170.0	H	81.0	18.1
724.992750	19.20	36.00	16.80	1000.0	120.000	113.0	V	181.0	22.1
945.363000	21.20	36.00	14.80	1000.0	120.000	116.0	H	10.0	24.2

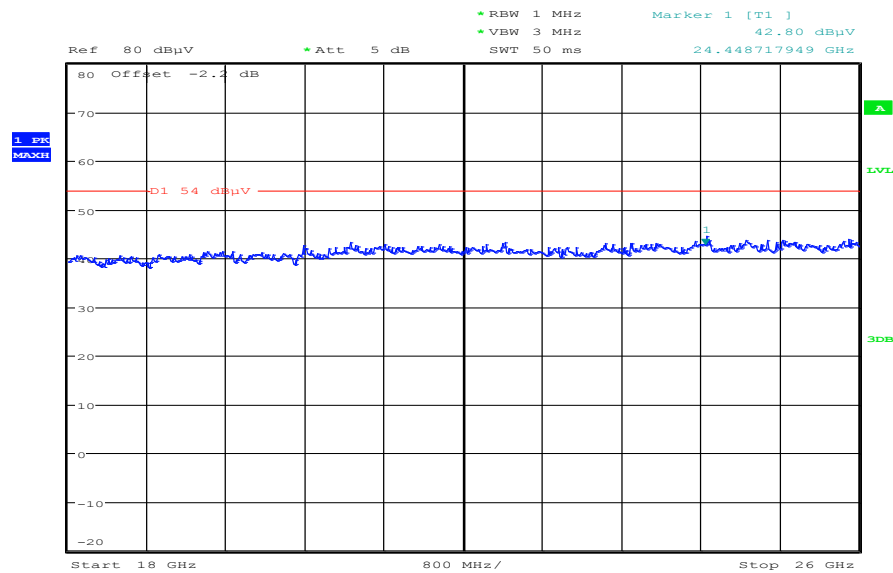
Plot 2: Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

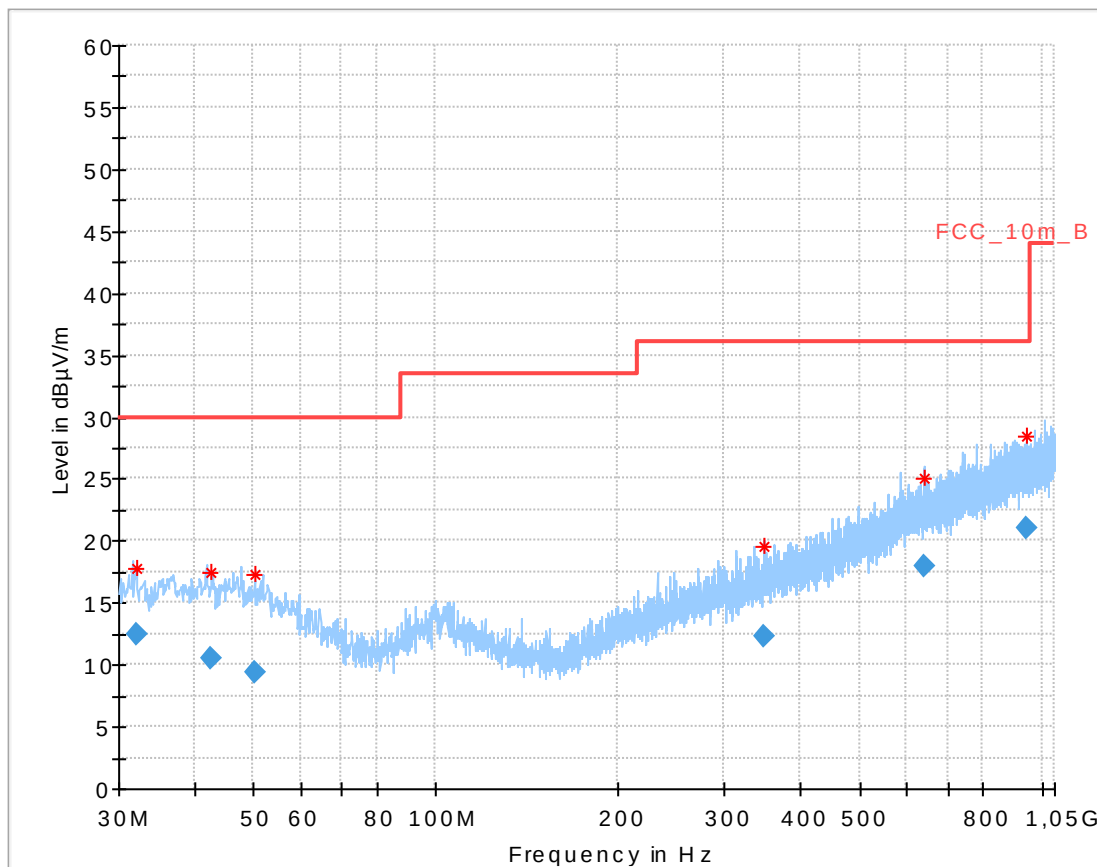
Plot 3: Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Date: 28.MAY.2014 10:46:44

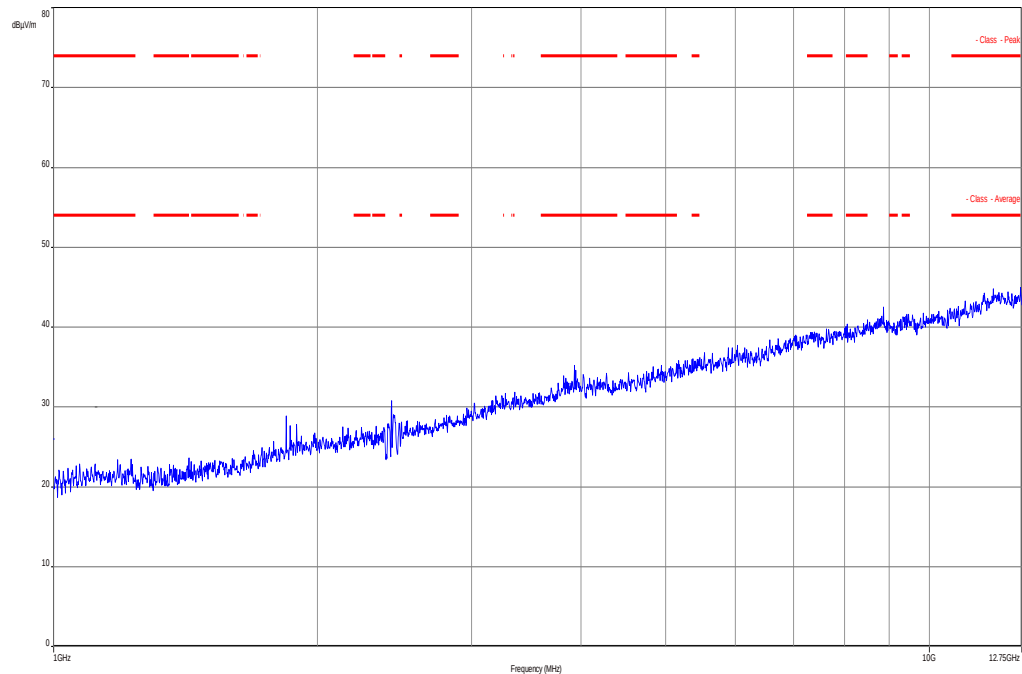
Plot 4: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



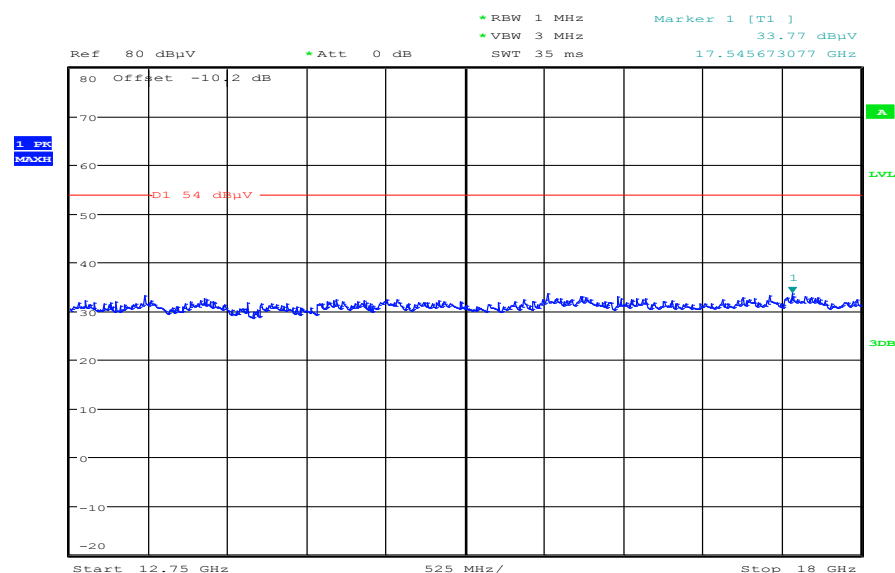
Date: 28.MAY.2014 11:19:34

Plot 5: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Final result:**

Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
32.010150	12.49	30.00	17.51	1000.0	120.000	101.0	V	260.0	13.5
42.422700	10.58	30.00	19.42	1000.0	120.000	133.0	H	265.0	14.0
50.227650	9.45	30.00	20.55	1000.0	120.000	170.0	H	280.0	13.6
347.101950	12.36	36.00	23.64	1000.0	120.000	170.0	H	190.0	15.9
637.946550	17.91	36.00	18.09	1000.0	120.000	170.0	V	-7.0	21.0
943.105650	21.07	36.00	14.93	1000.0	120.000	130.0	V	10.0	24.2

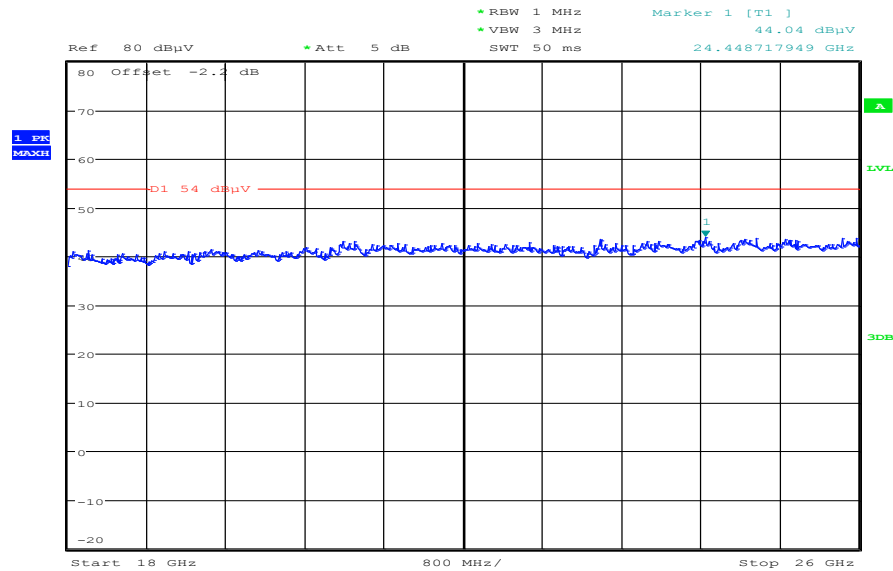
Plot 6: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

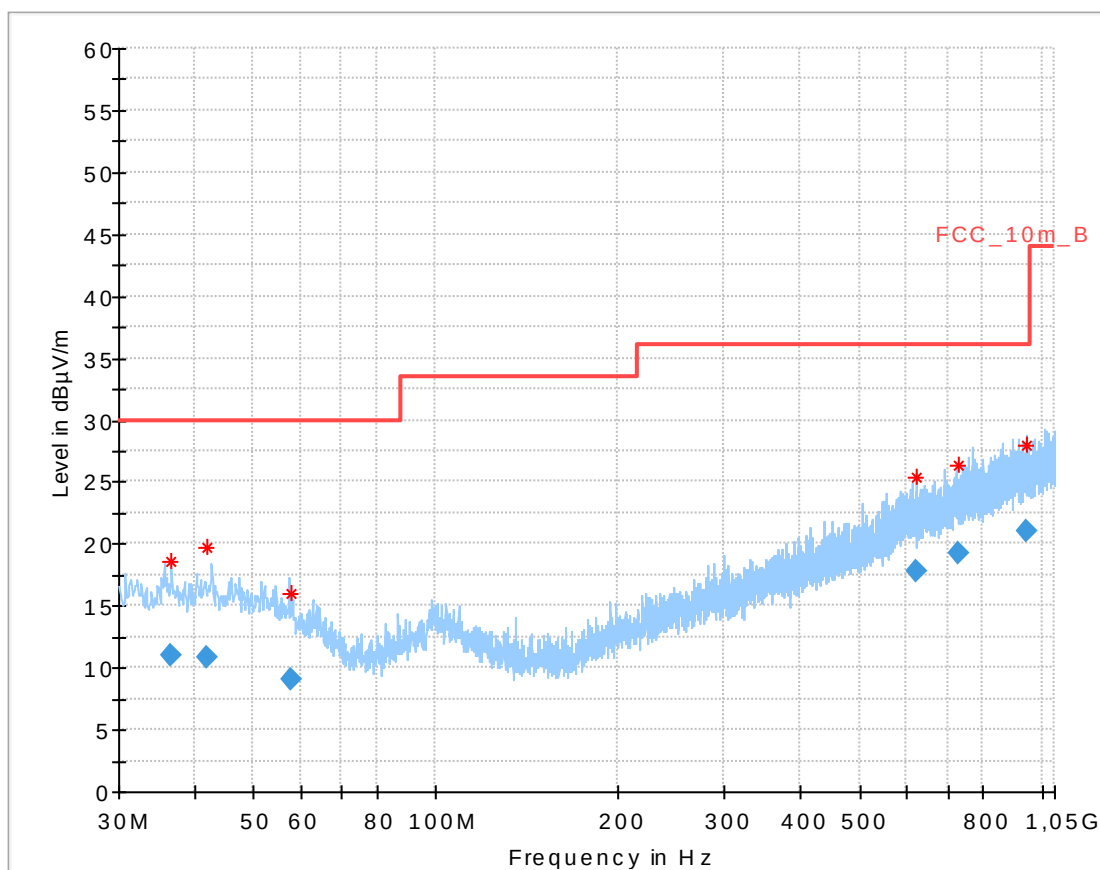
Plot 7: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Date: 28.MAY.2014 10:48:28

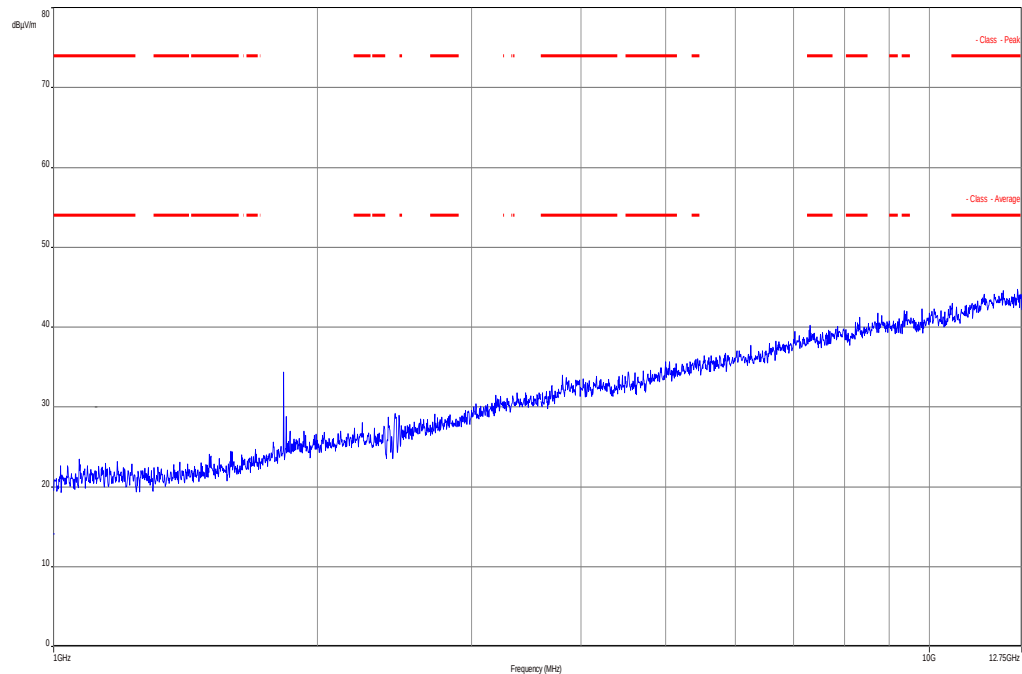
Plot 8: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization



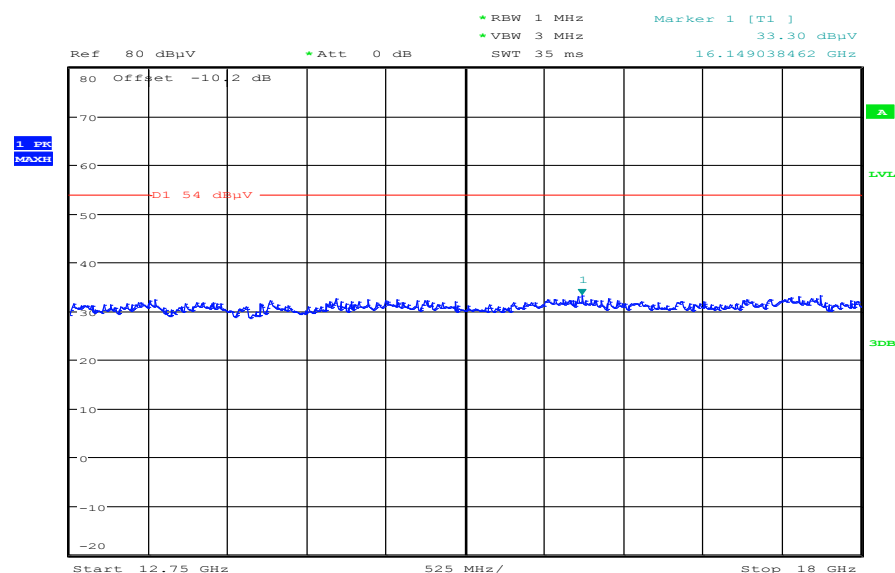
Date: 28.MAY.2014 11:18:10

Plot 9: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Final result:**

Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
36.517800	10.98	30.00	19.02	1000.0	120.000	170.0	H	100.0	13.9
42.049950	10.84	30.00	19.16	1000.0	120.000	170.0	V	89.0	14.0
57.830850	8.98	30.00	21.02	1000.0	120.000	170.0	V	10.0	12.1
620.137350	17.76	36.00	18.24	1000.0	120.000	130.0	V	190.0	20.9
725.943900	19.17	36.00	16.83	1000.0	120.000	106.0	H	190.0	22.1
942.828450	21.10	36.00	14.90	1000.0	120.000	170.0	V	266.0	24.2

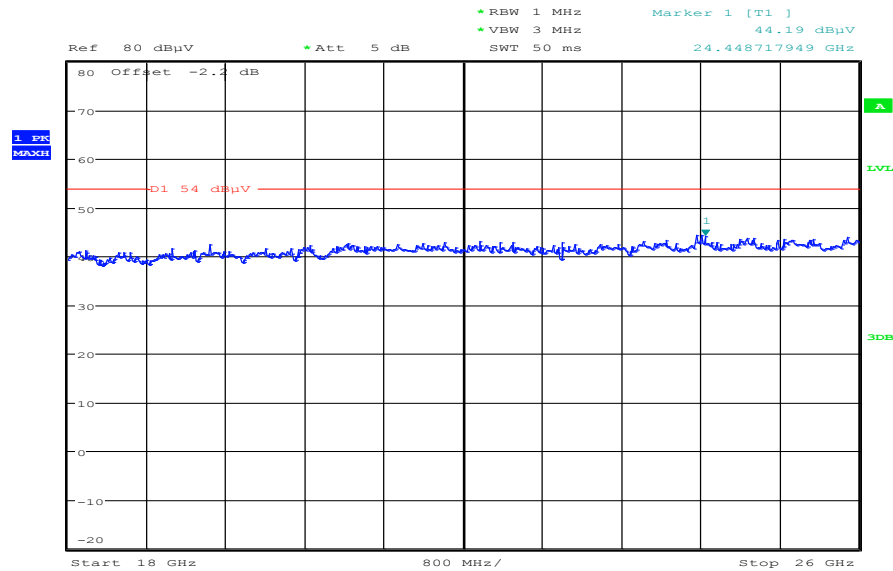
Plot 10: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

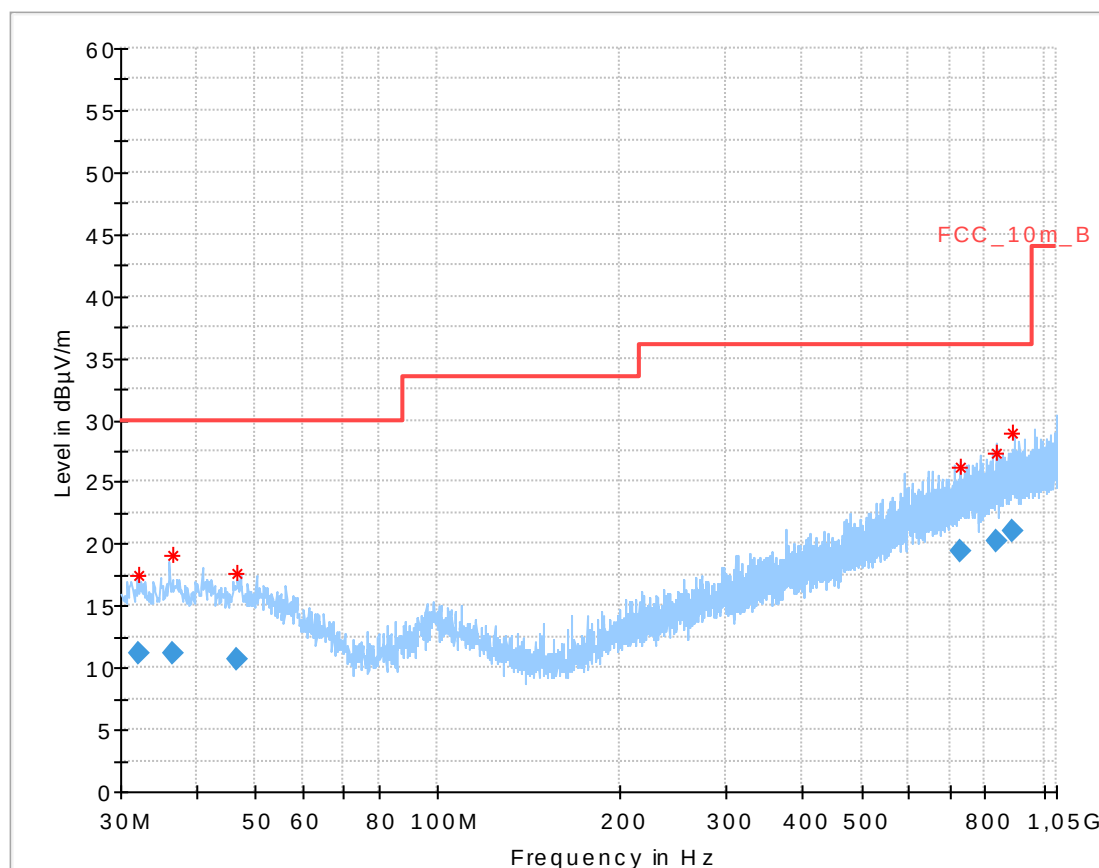
Plot 11: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Date: 28.MAY.2014 10:49:41

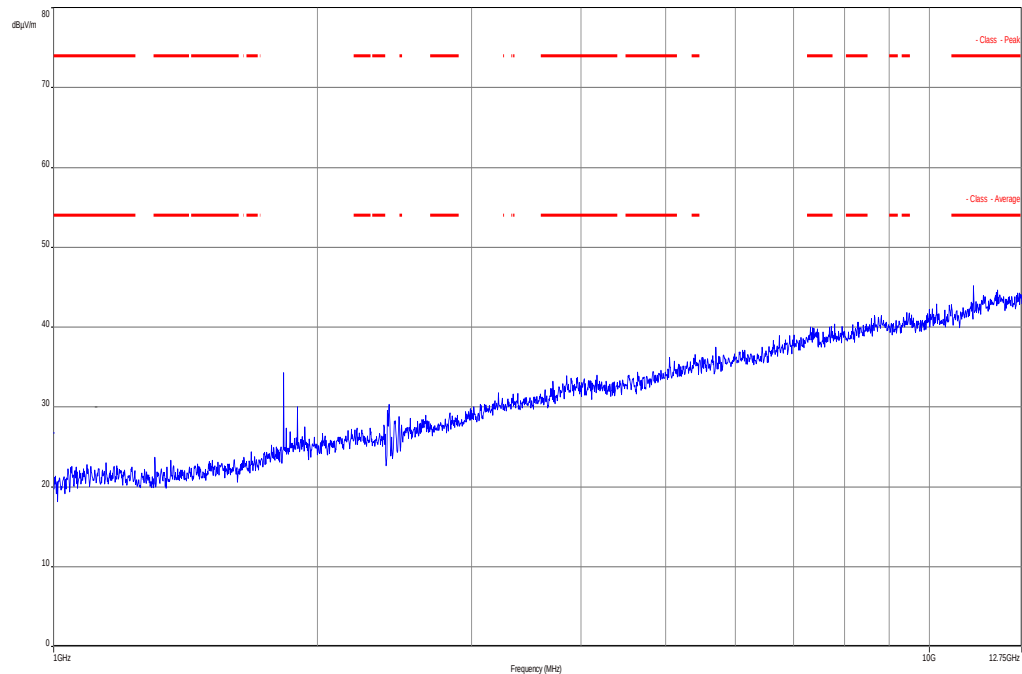
Plot 12: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



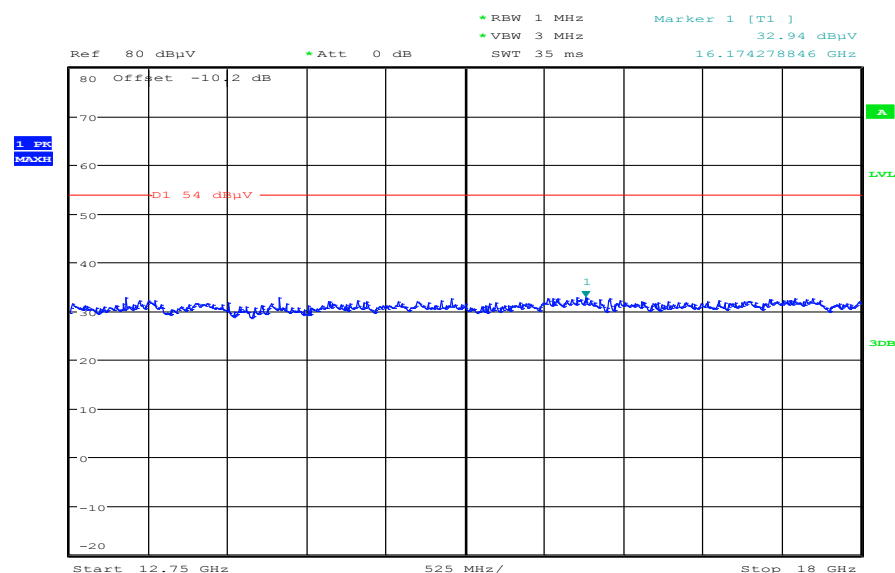
Date: 28.MAY.2014 10:52:08

Plots: OFDM / n – mode**Plot 1:** Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Final result:**

Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
32.033100	11.23	30.00	18.77	1000.0	120.000	170.0	H	170.0	13.5
36.566850	11.18	30.00	18.82	1000.0	120.000	170.0	V	93.0	13.9
46.741500	10.69	30.00	19.31	1000.0	120.000	170.0	H	10.0	13.8
731.097600	19.38	36.00	16.62	1000.0	120.000	170.0	V	170.0	22.3
837.159150	20.28	36.00	15.72	1000.0	120.000	170.0	H	86.0	23.3
891.276000	20.96	36.00	15.04	1000.0	120.000	106.0	H	10.0	24.0

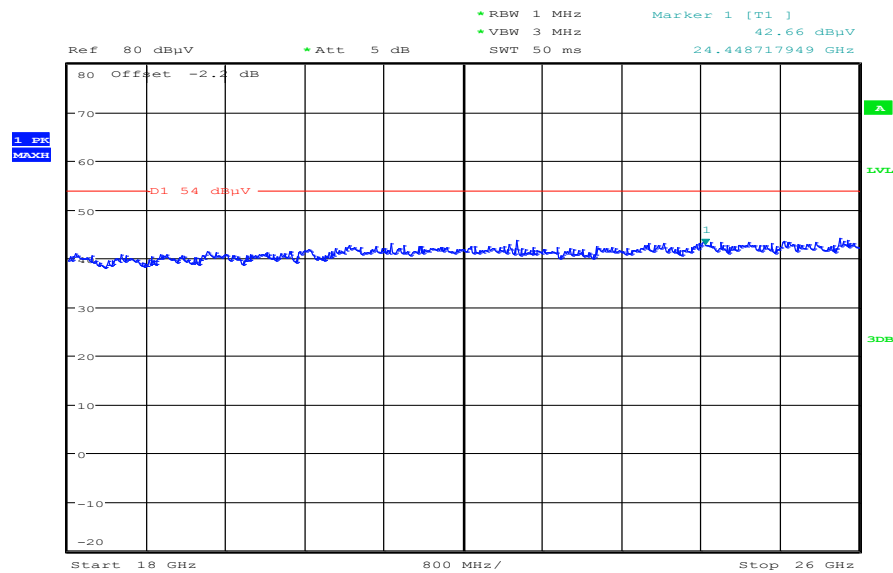
Plot 2: Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

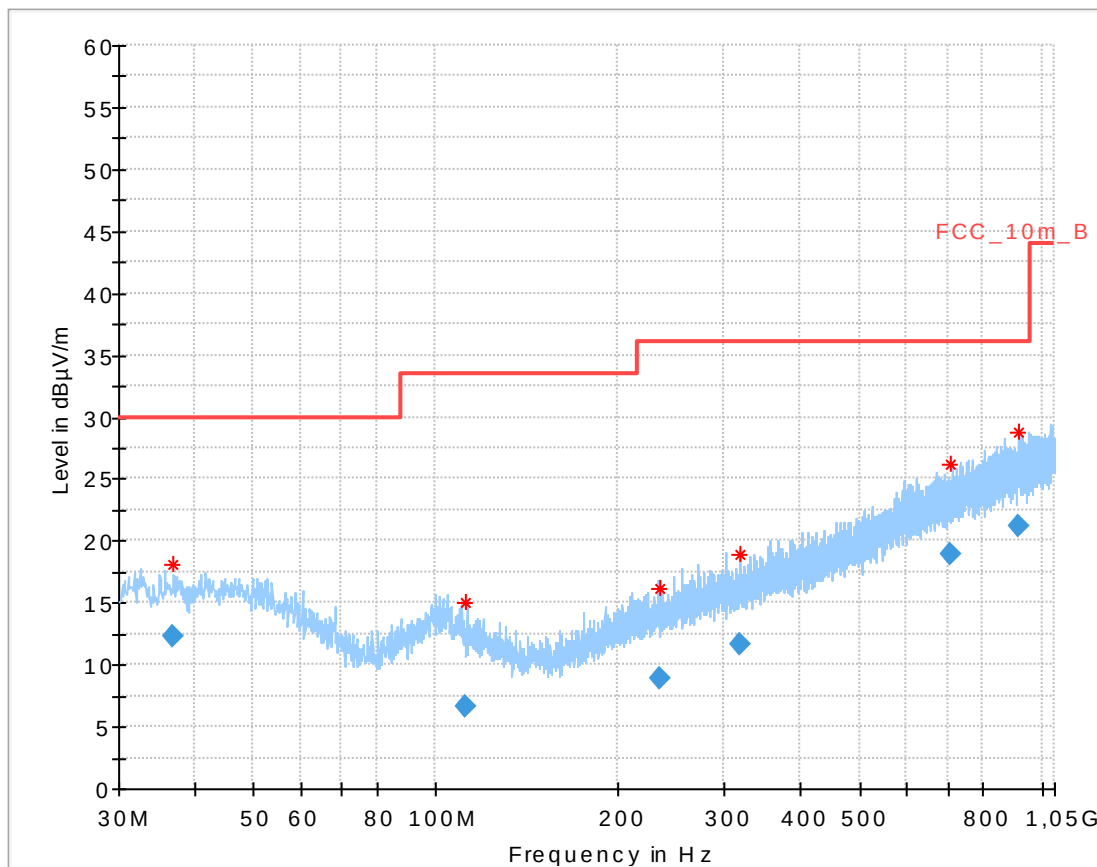
Plot 3: Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Date: 28.MAY.2014 11:28:37

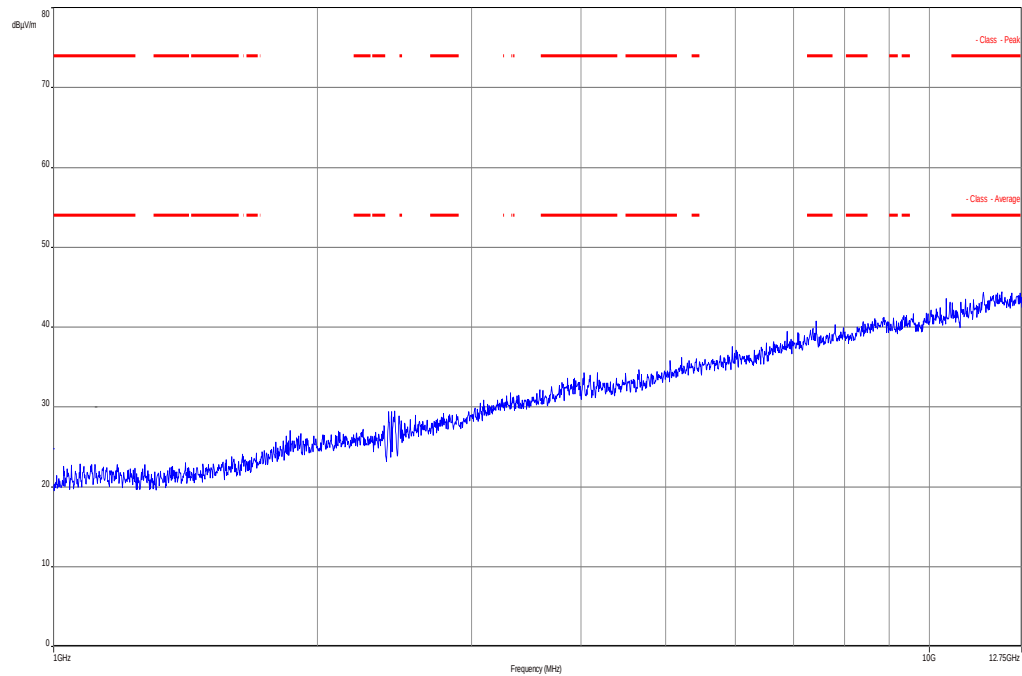
Plot 4: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



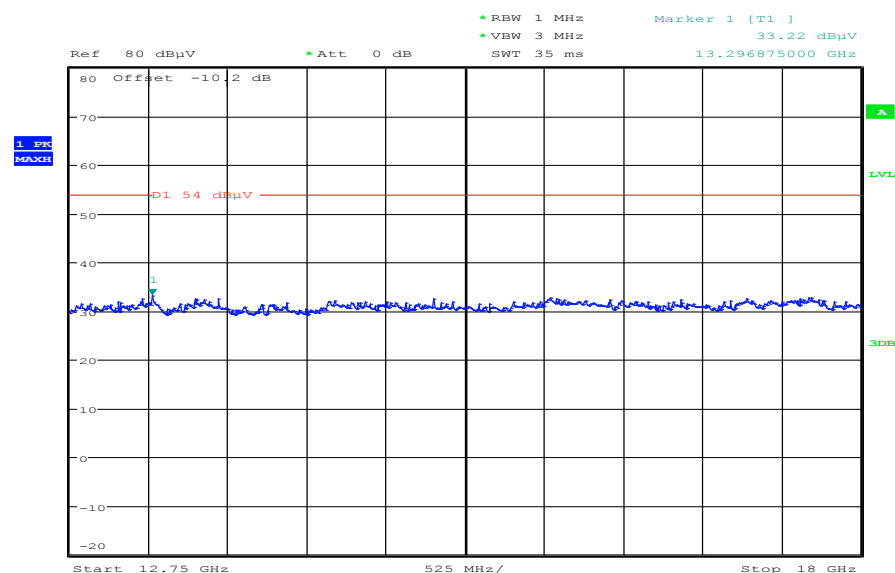
Date: 28.MAY.2014 11:21:20

Plot 5: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Final result:**

Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
36.813300	12.31	30.00	17.69	1000.0	120.000	170.0	V	10.0	13.9
112.367850	6.71	33.50	26.79	1000.0	120.000	113.0	V	93.0	10.9
233.555250	8.91	36.00	27.09	1000.0	120.000	122.0	H	88.0	12.8
317.760450	11.58	36.00	24.42	1000.0	120.000	170.0	V	268.0	15.0
709.418400	18.88	36.00	17.12	1000.0	120.000	170.0	H	81.0	21.7
915.637650	21.14	36.00	14.86	1000.0	120.000	113.0	H	170.0	24.2

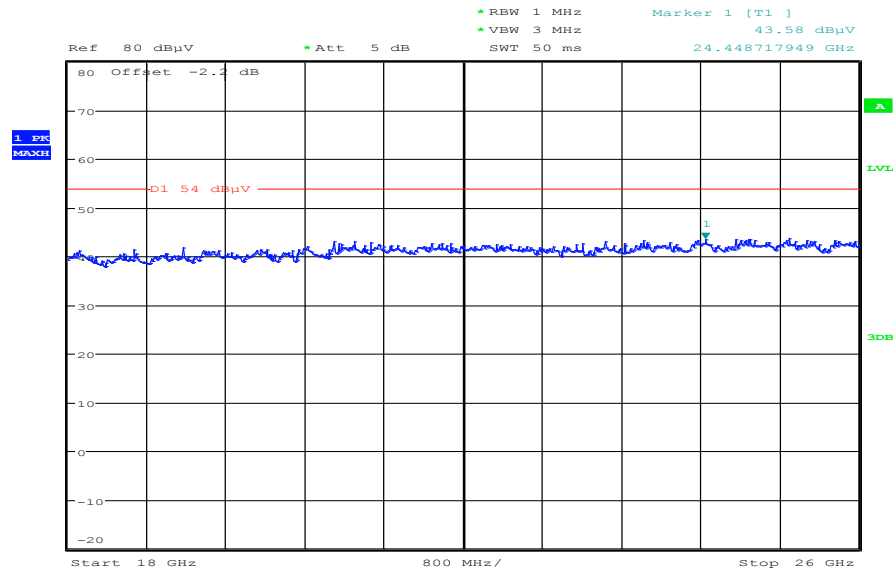
Plot 6: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

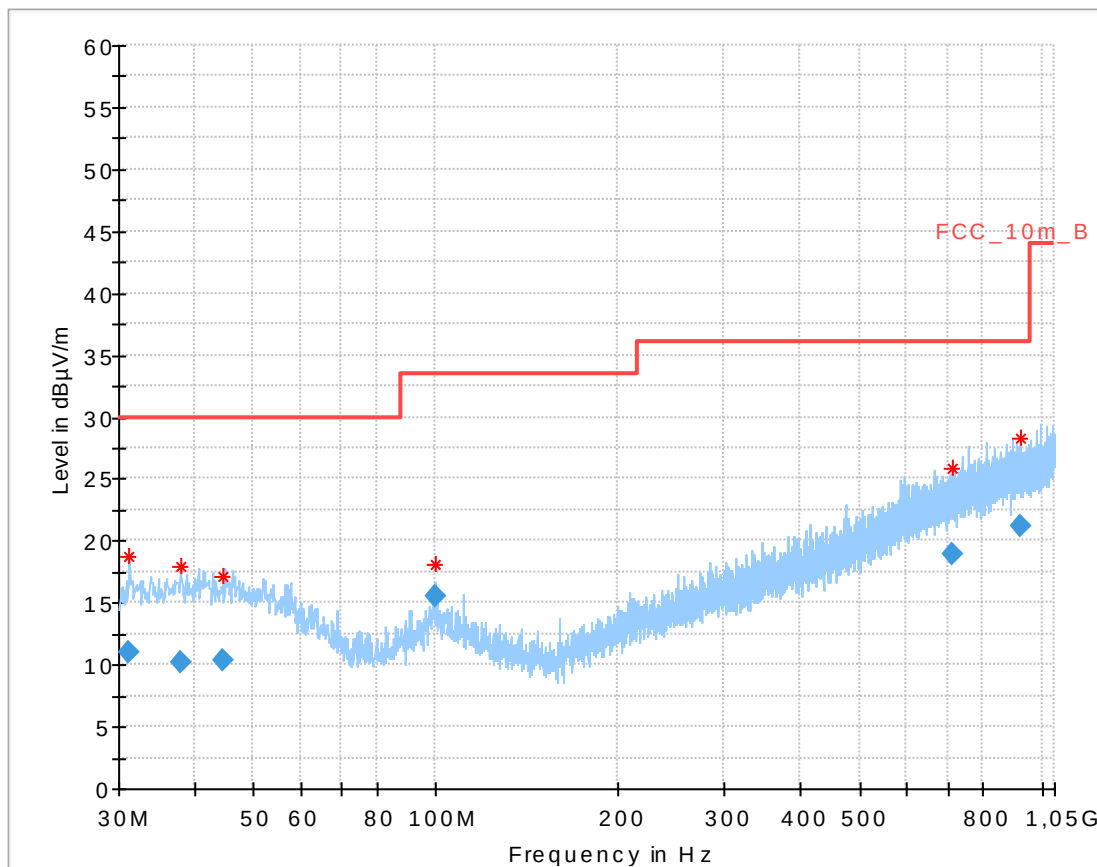
Plot 7: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Date: 28.MAY.2014 11:27:34

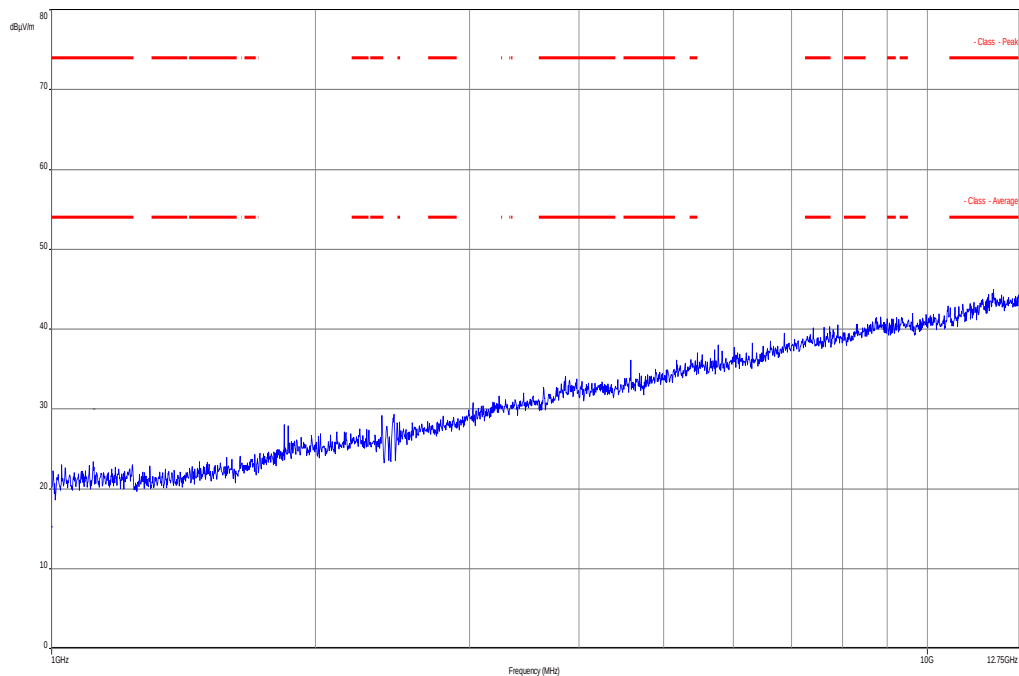
Plot 8: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization



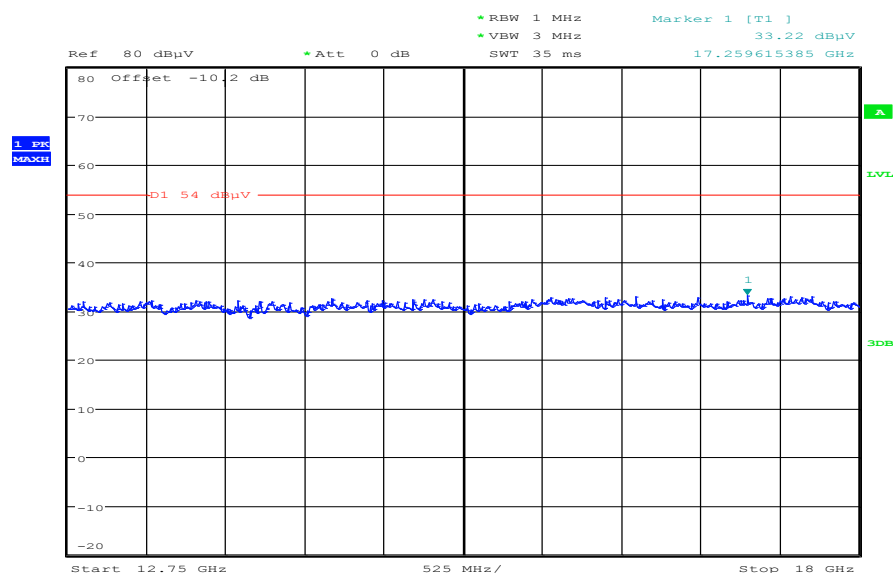
Date: 28.MAY.2014 11:22:28

Plot 9: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Final result:**

Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.193250	11.03	30.00	18.97	1000.0	120.000	170.0	V	260.0	13.4
38.010750	10.24	30.00	19.76	1000.0	120.000	105.0	H	171.0	13.9
44.642400	10.32	30.00	19.68	1000.0	120.000	114.0	V	176.0	13.9
99.586950	15.57	33.50	7.93	1000.0	120.000	124.0	V	190.0	12.1
714.653850	18.94	36.00	17.06	1000.0	120.000	170.0	H	-7.0	21.9
922.846950	21.11	36.00	14.89	1000.0	120.000	170.0	H	-7.0	24.2

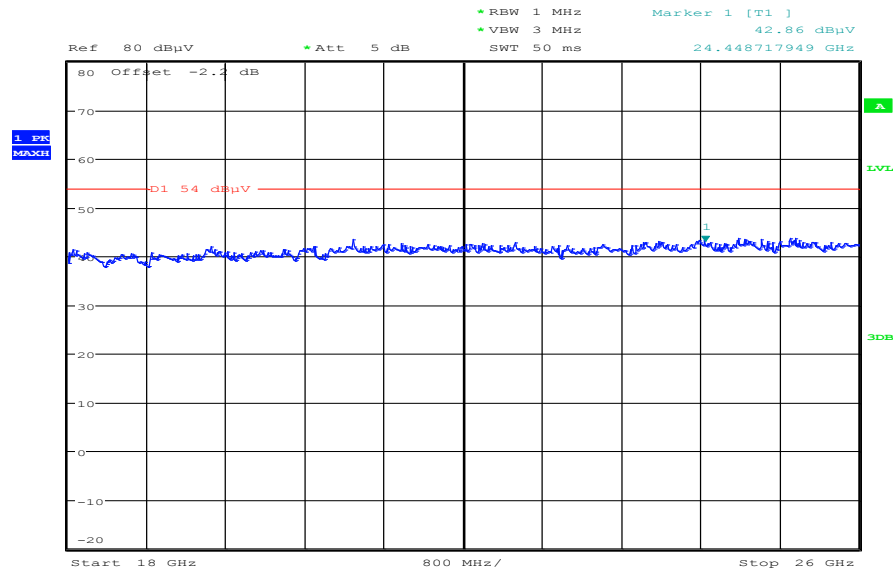
Plot 10: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 11: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization

Date: 28.MAY.2014 11:26:14

Plot 12: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 28.MAY.2014 11:23:36

10.4 RX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in idle/receive mode. The results are valid for both modes.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak / RMS
Sweep time:	Auto
Resolution bandwidth:	F > 1 GHz: 1 MHz F < 1 GHz: 100 kHz
Video bandwidth:	3 x RBW Remeasurement: 10 Hz / 3 MHz
Span:	30 MHz to 26 GHz
Trace-Mode:	Max Hold

Limits:

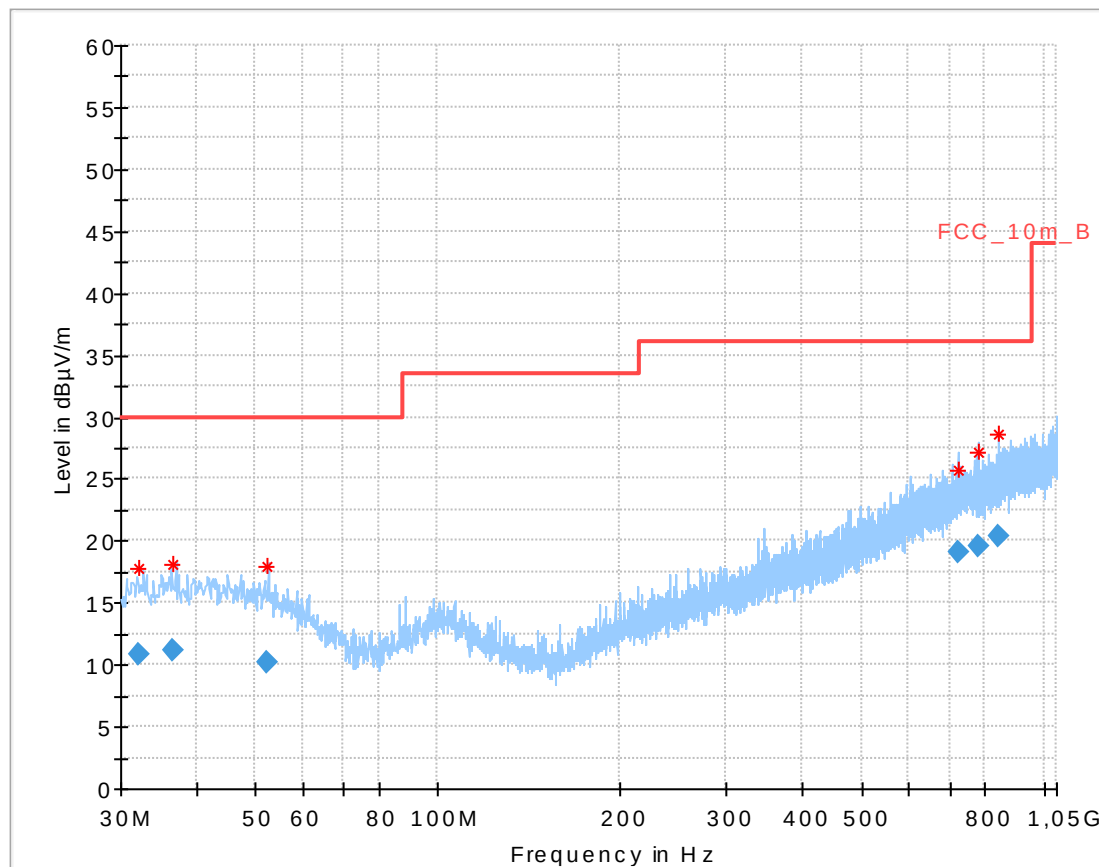
FCC		-/-
RX Spurious Emissions Radiated		
Frequency (MHz)	Field Strength (dB μ V/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Results:

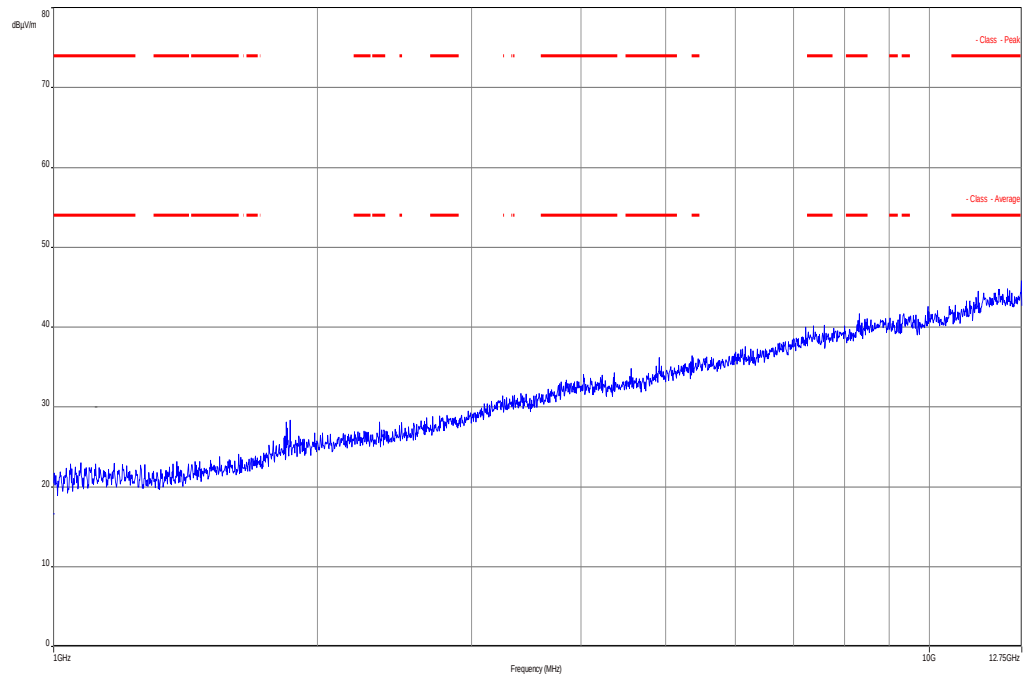
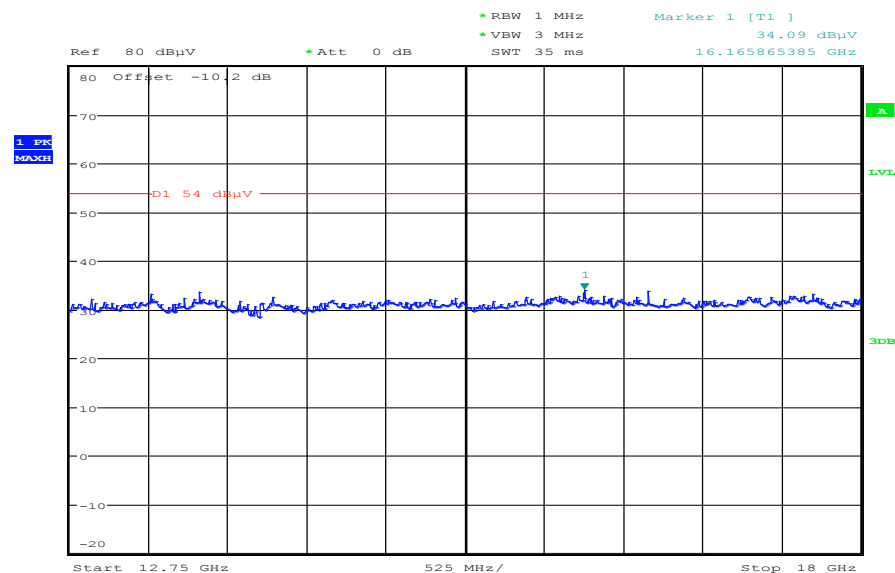
RX Spurious Emissions Radiated [dB μ V/m]		
F [MHz]	Detector	Level [dB μ V/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
All detected peak emissions above 1 GHz are below the average limit!		
Measurement uncertainty	± 3 dB	

Result: Passed.

Note: The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)

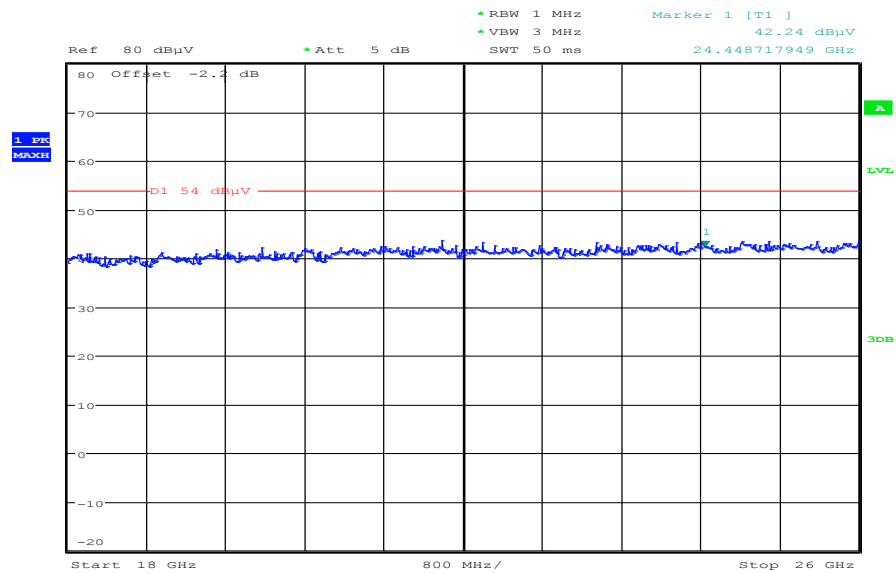
Plots: RX / Idle – mode
Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization

Final result:

Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
32.143050	10.87	30.00	19.13	1000.0	120.000	105.0	H	93.0	13.5
36.593550	11.15	30.00	18.85	1000.0	120.000	170.0	V	10.0	13.9
52.201650	10.19	30.00	19.81	1000.0	120.000	101.0	V	190.0	13.3
720.973500	19.03	36.00	16.97	1000.0	120.000	170.0	V	88.0	22.0
779.729550	19.58	36.00	16.42	1000.0	120.000	170.0	H	91.0	22.7
841.501800	20.31	36.00	15.69	1000.0	120.000	146.0	V	1.0	23.3

Plot 2: 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 3: 12.75 GHz to 18 GHz, vertical & horizontal polarization**

Date: 28.MAY.2014 10:37:48

Plot 4: 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 28.MAY.2014 10:34:45

10.5 Spurious emissions radiated < 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The EUT is set to channel 6. This measurement is representative for all channels and modes. If peaks are found channel 1 and channel 11 will be measured too. The measurement is performed with the data rate producing the highest output power. The limits are recalculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

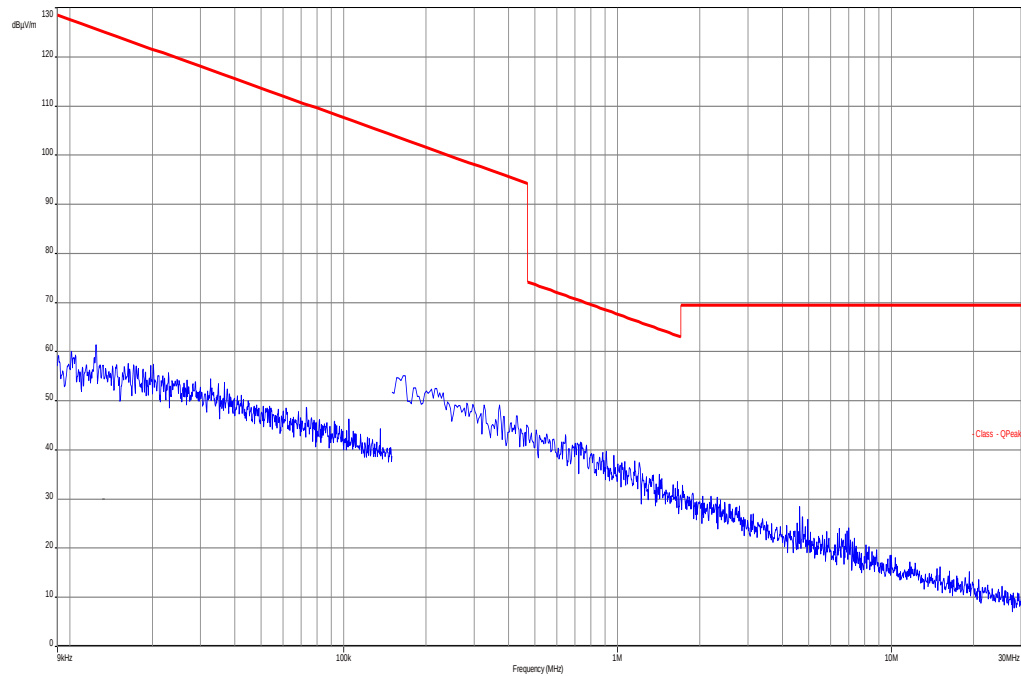
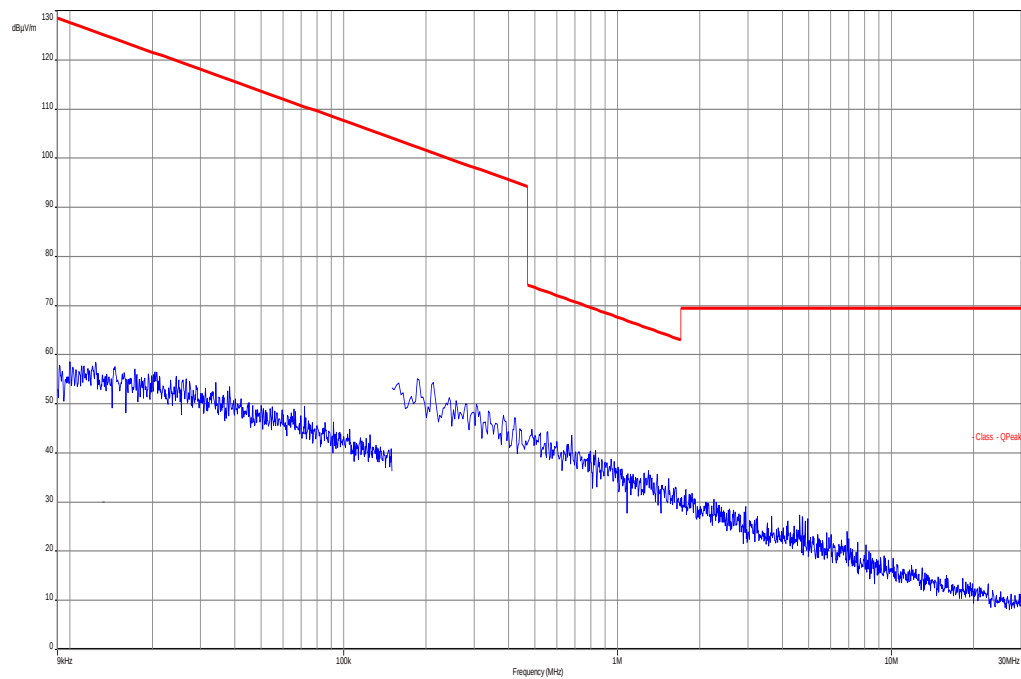
Limits:

FCC		-/-
TX Spurious Emissions Radiated < 30 MHz		
Frequency (MHz)	Field Strength (dBμV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Results:

TX Spurious Emissions Radiated < 30 MHz [dBμV/m]		
F [MHz]	Detector	Level [dBμV/m]
No spurious emissions detected.		
Measurement uncertainty	± 3 dB	

Result: Passed

Plots: TX mode**Plot 1: 9 kHz to 30 MHz****Plots: RX / Idle – mode****Plot 1: 9 kHz to 30 MHz**

10.6 Spurious emissions conducted < 30 MHz

Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. The EUT is set to channel 6. This measurement is repeated for DSSS and OFDM modulation. If peaks are found channel 1 and channel 11 will be measured too. The measurement is performed with the data rate producing the highest output power. Both power lines, phase and neutral line, are measured. Found peaks are re-measured with average and quasi peak detection to show compliance to the limits.

Measurement:

Measurement parameter	
Detector:	Peak - Quasi Peak / Average
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

Limits:

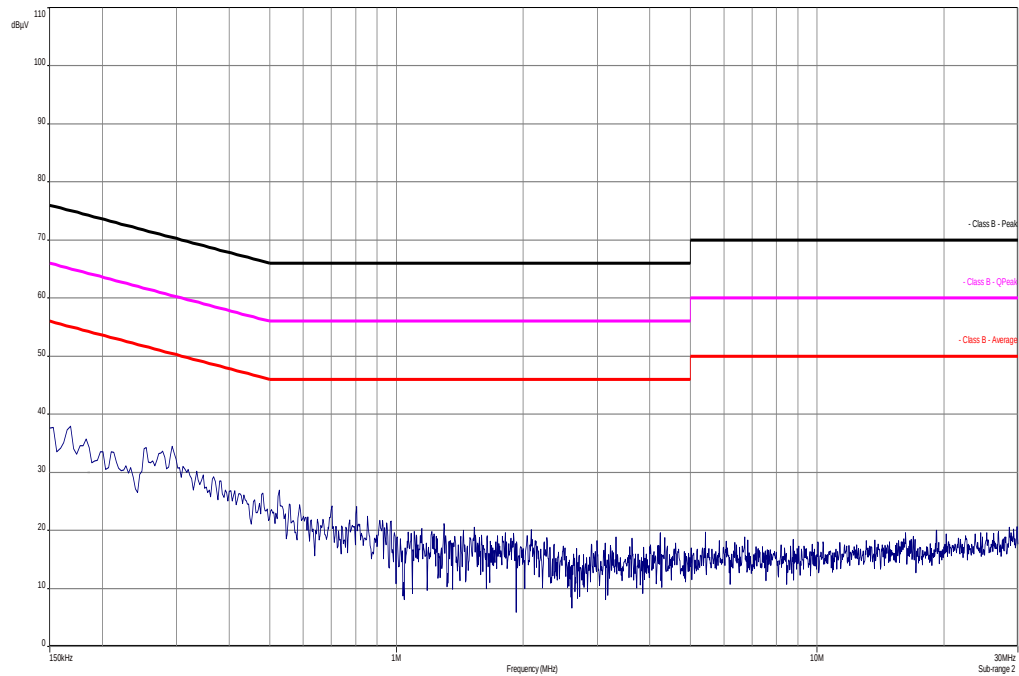
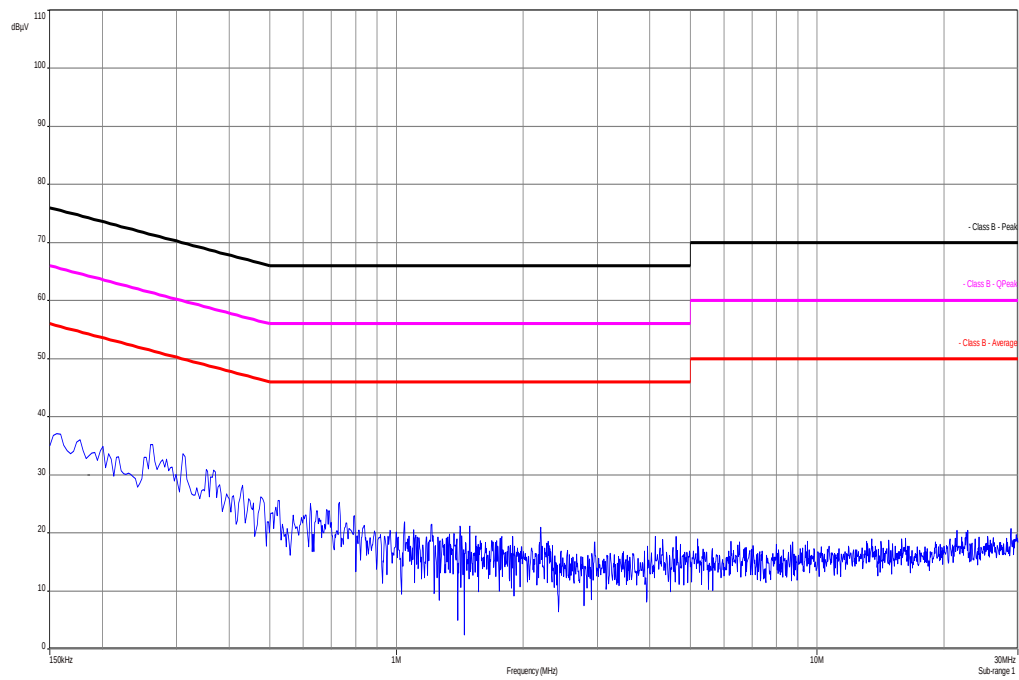
FCC		-/-
TX Spurious Emissions Conducted < 30 MHz		
Frequency (MHz)	Quasi-Peak (dBμV/m)	Average (dBμV/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

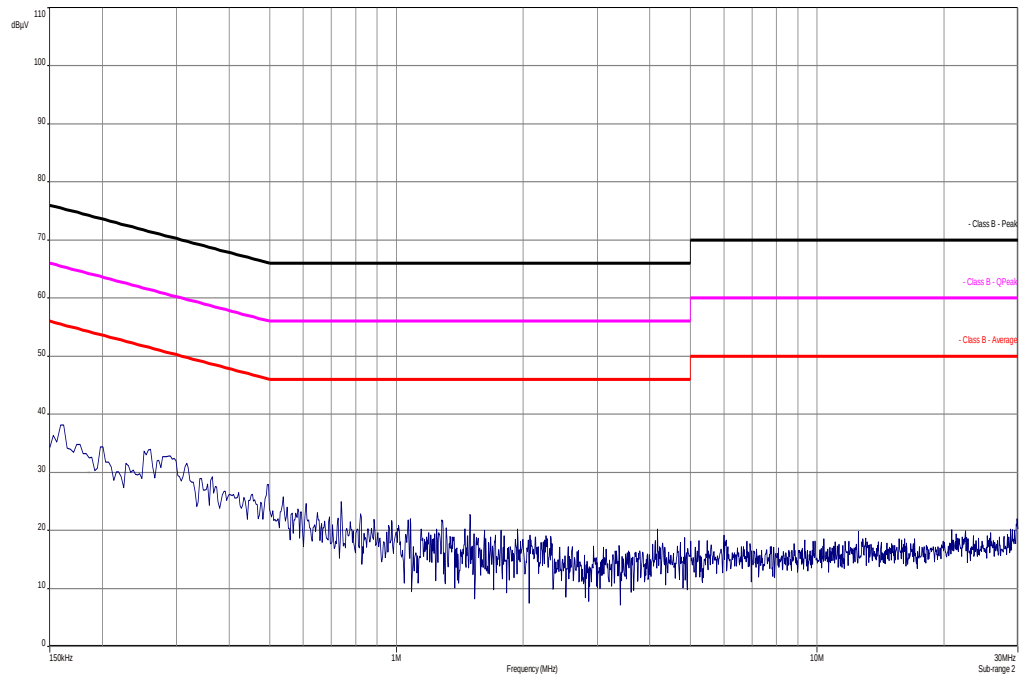
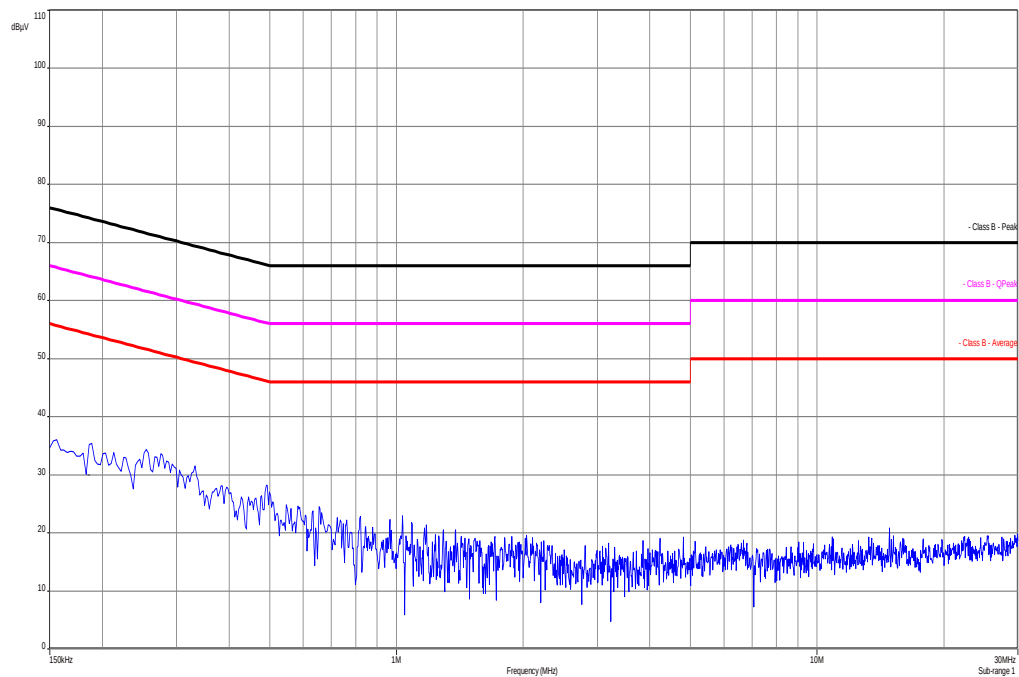
*Decreases with the logarithm of the frequency

Results:

TX Spurious Emissions Conducted < 30 MHz [dBμV/m]		
F [MHz]	Detector	Level [dBμV/m]
No spurious emissions detected.		
Measurement uncertainty	± 3 dB	

Result: Passed

Plots:**Plot 1: TX mode, 150 kHz to 30 MHz, phase line****Plot 2: TX mode, 150 kHz to 30 MHz, neutral line**

Plot 3: RX / Idle – mode, 150 kHz to 30 MHz, phase line**Plot 4: RX / Idle – mode, 150 kHz to 30 MHz, neutral line**

11 Test equipment and ancillaries used for tests

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, rf-generating and signalling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
2	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	ne		
3	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	27.01.2014	27.01.2015
4	n. a.	Funkstörmessempfänger 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	28.02.2014	28.02.2015
5	n. a.	Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745	izw		
6	n. a.	Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746	izw		
7	n. a.	Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747	izw		
8	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	22.04.2014	22.04.2016
9	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2818A03450	300001040	Ve	12.01.2012	12.01.2015
10	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKII	08.05.2013	08.05.2015
11	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
12	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	*	300000199	ne		
13	9	Isolating Transformer	MPL IEC625 Bus Regeltrennt ravo	Erfi	91350	300001155	ne		
14	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	13.06.2013	13.06.2015
15	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
16	n. a.	Band Reject filter	WRCG240 0/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
17	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vIKII	14.10.2011	14.10.2014
18	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	13.03.2014	13.03.2015
19	11b	Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP Meßtechnik	00419	300002268	ev		
20	A026	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787	k	22.07.2013	22.07.2015
21	A029	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8205	300002442	k	19.07.2013	19.07.2015
22	n. a.	Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003443	Ve	09.10.2012	09.10.2014

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vlk!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

12 Observations

No observations exceeding those reported with the single test cases have been made.

Annex A Document history

Version	Applied changes	Date of release
	Initial release	2014-06-12

Annex B Further information**Glossary**

AVG	-	Average
DUT	-	Device under test
EMC	-	Electromagnetic Compatibility
EN	-	European Standard
EUT	-	Equipment under test
ETSI	-	European Telecommunications Standard Institute
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
N/A	-	Not applicable
PP	-	Positive peak
QP	-	Quasi peak
S/N	-	Serial number
SW	-	Software

Annex C Accreditation Certificate

Front side of certificate



Deutsche Akkreditierungsstelle GmbH

Befehlens gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV
Unterzeichnerin der Multilateralen Abkommen
von EA, ILAC und IAF zur gegenseitigen Anerkennung

Akkreditierung



Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

CETECOM ICT Services GmbH
Untertürkheimer Straße 6-10, 66117 Saarbrücken

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen durchzuführen:

Drahtgebundene Kommunikation einschließlich xDSL

VoIP und DECT

Akustik

Funk einschließlich WLAN

Short Range Devices (SRD)

RFID

WiMax und Richtfunk

Mobilfunk (GSM / DCS, Over the Air (OTA) Performance)

Elektromagnetische Verträglichkeit (EMV) einschließlich Automotive

Produktsicherheit

SAR und Hearing Aid Compatibility (HAC)

Umweltsimulation

Smart Card Terminals

Bluetooth

Wi-Fi Services

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 07.03.2014 mit der
Akkreditierungsnummer D-PL-12076-01 und ist gültig 17.01.2018. Sie besteht aus diesem Deckblatt, der
Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 77 Seiten.

Registrierungsnummer der Urkunde: D-PL-12076-01-00

Frankfurt am Main, 07.03.2014

Zurückseite auf der Rückseite

Im Auftrag D-PL-12076-01-00
Hildegard

Back side of certificate

Deutsche Akkreditierungsstelle GmbH

Standort Berlin
Spittelmarkt 10
10117 Berlin

Standort Frankfurt am Main
Gartenstraße 6
60504 Frankfurt am Main

Standort Braunschweig
Bundesallee 100
38116 Braunschweig

Die auszugsweise Veröffentlichung der Akkreditierungsurkunde bedarf der vorherigen schriftlichen
Zustimmung der Deutsche Akkreditierungsstelle GmbH (DAkkS). Ausgenommen davon ist die separate
Weiterverbreitung des Deckblattes durch die umseitig genannte Konformitätsbewertungsstelle in
unveränderter Form.

Es darf nicht der Anschein erweckt werden, dass sich die Akkreditierung auch auf Bereiche erstreckt,
die über den durch die DAkkS bestätigten Akkreditierungsbereich hinausgehen.

Die Akkreditierung erfolgte gemäß des Gesetzes über die Akkreditierungsstelle (AkkStelleG) vom
31. Juli 2009 (BGBl. I S. 2025) sowie der Verordnung (VO) Nr. 765/2008 des Europäischen Parlaments
und des Rates vom 9. Juli 2008 über die Vorschriften für die Akkreditierung und Marktüberwachung
im Zusammenhang mit der Vermarktung von Produkten (Abt. L 228 vom 9. Juli 2008, S. 30).
Die DAkkS ist Unterzeichnerin der Multilateralen Abkommen zur gegenseitigen Anerkennung der
Europäischen Organisation für Akkreditierung (EA), des International Accreditation Forum (IAF) und
der International Laboratory Accreditation Cooperation (ILAC). Die Unterzeichner dieser Abkommen
erkennen ihre Akkreditierungen gegenseitig an.

Der aktuelle Stand der Mitgliedschaft kann folgenden Webseiten entnommen werden:
EA: www.european-accreditation.org
IAF: www.iaf.org
ILAC: www.ilac.org

Note:

The current certificate including annex is published on our website (see link below) or may be received from CETECOM ICT Services on request.

<http://www.cetecom.com/eu/de/cetecom-group/europa/deutschland-saarbruecken/akkreditierungen.html>