

12.10 Spurious emissions radiated below 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
Resolution bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Video bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace mode:	Max Hold
Measured modulation	☒ DSSS b – mode ☒ OFDM g – mode ☒ OFDM n HT20 – mode ☐ OFDM n HT40 – mode
Test setup:	See sub clause 7.2 – B
Measurement uncertainty	See sub clause 9

Limits:

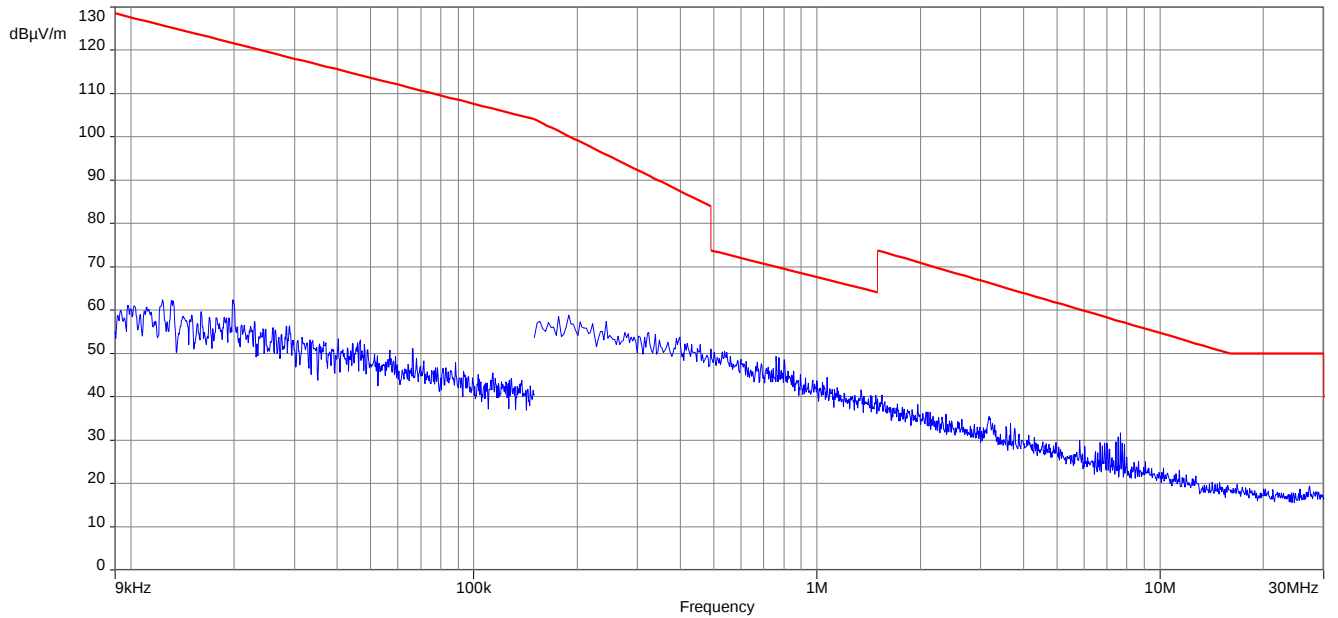
FCC		IC
Frequency (MHz)	Field Strength (dB μ V/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Results:

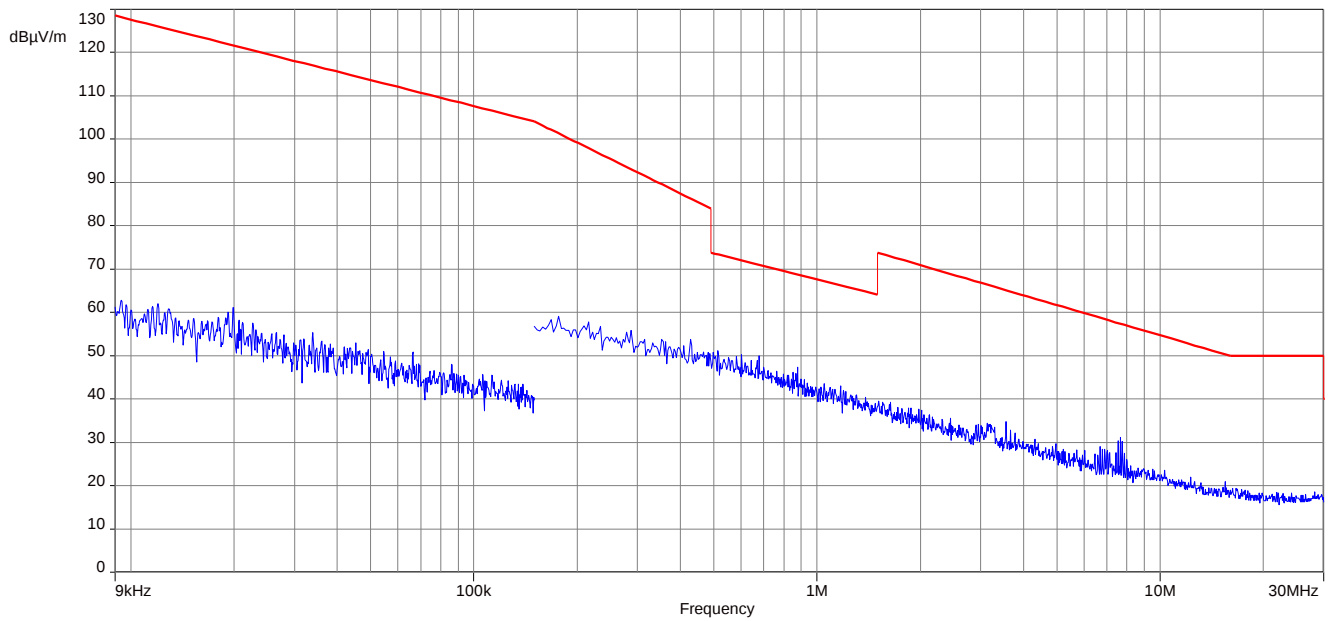
TX Spurious Emissions Radiated < 30 MHz [dB μ V/m]		
F [MHz]	Detector	Level [dB μ V/m]
All detected peaks are more than 20 dB below the limit.		

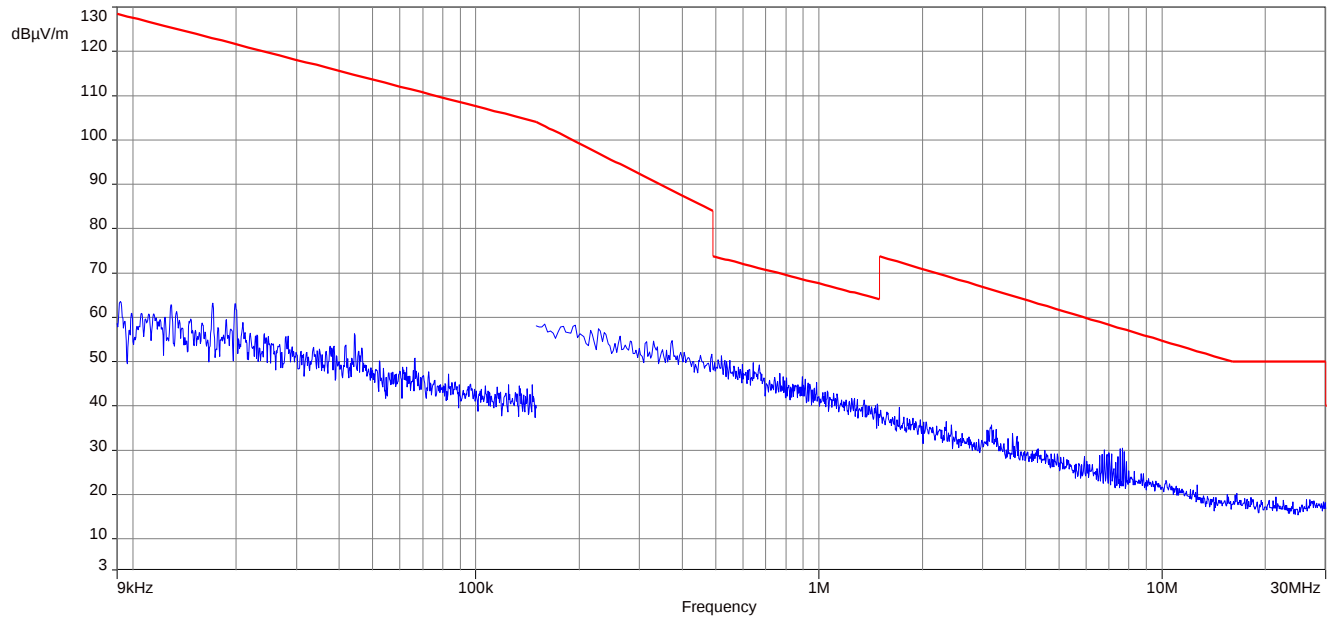
Plots: DSSS / b – mode

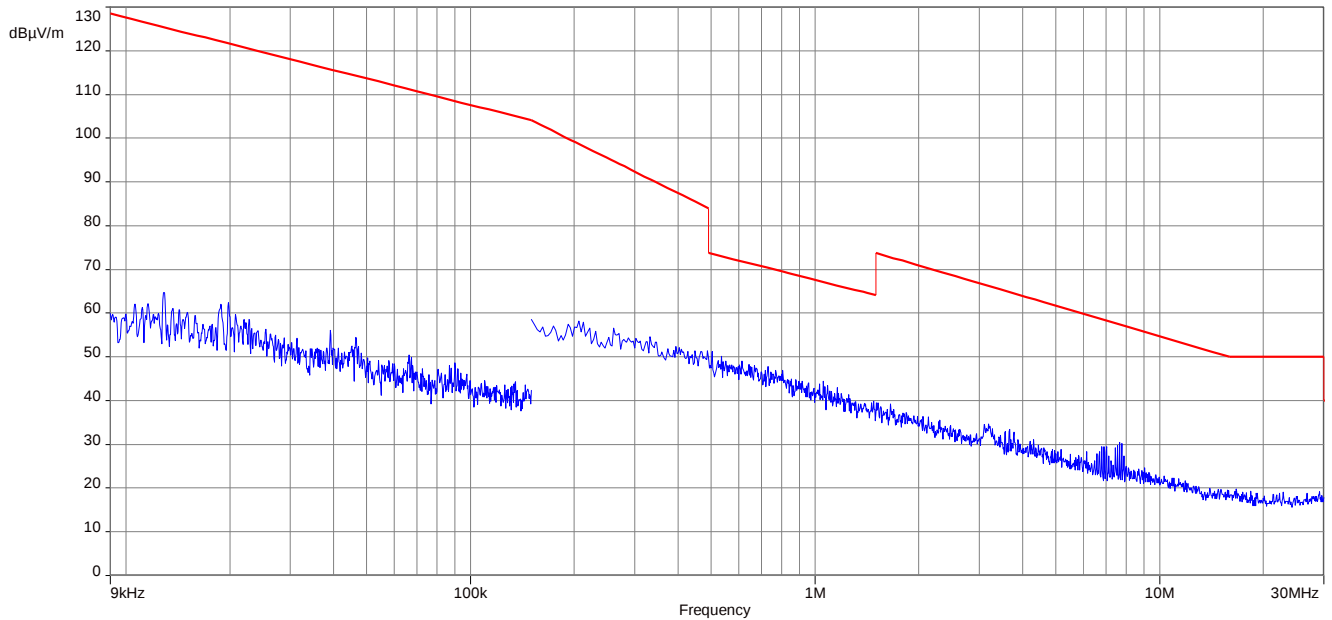
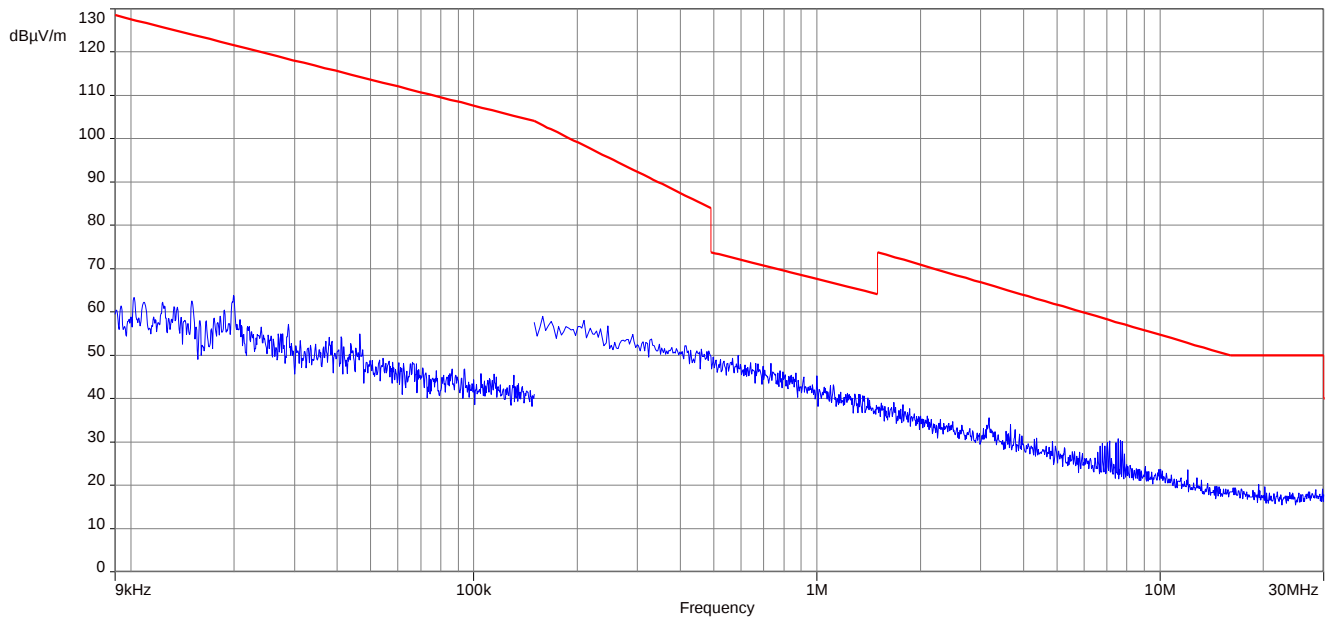
Plot 1: 9 kHz to 30 MHz, low channel

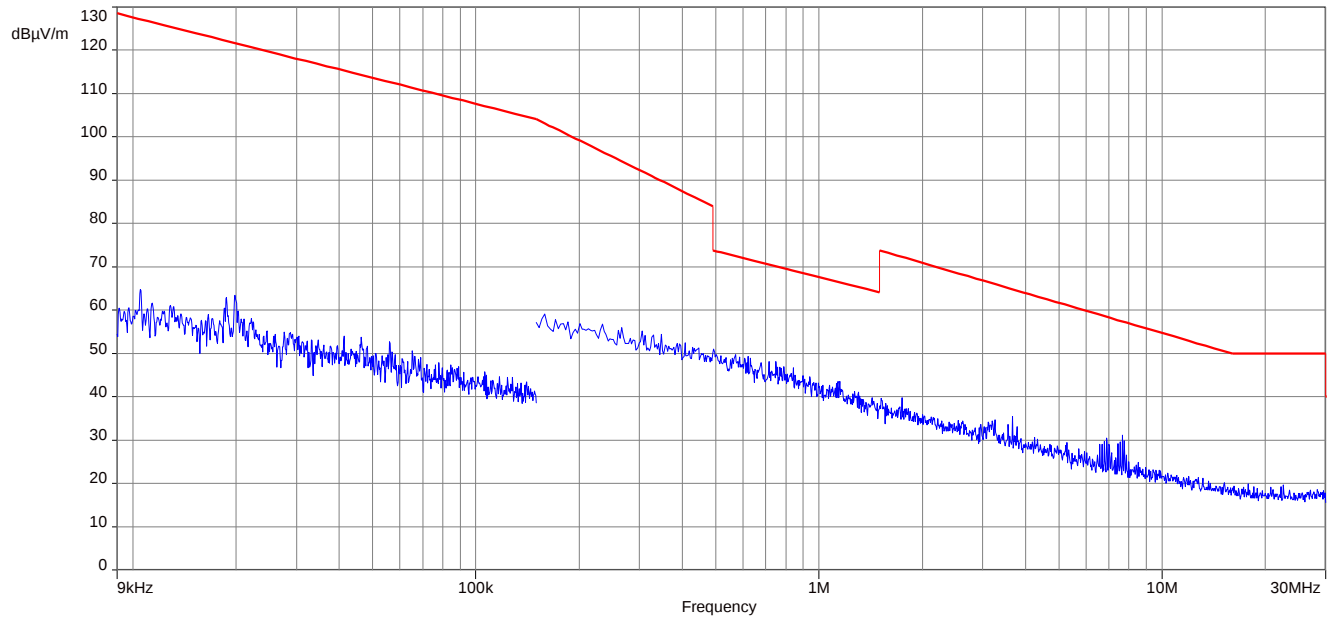


Plot 2: 9 kHz to 30 MHz, mid channel



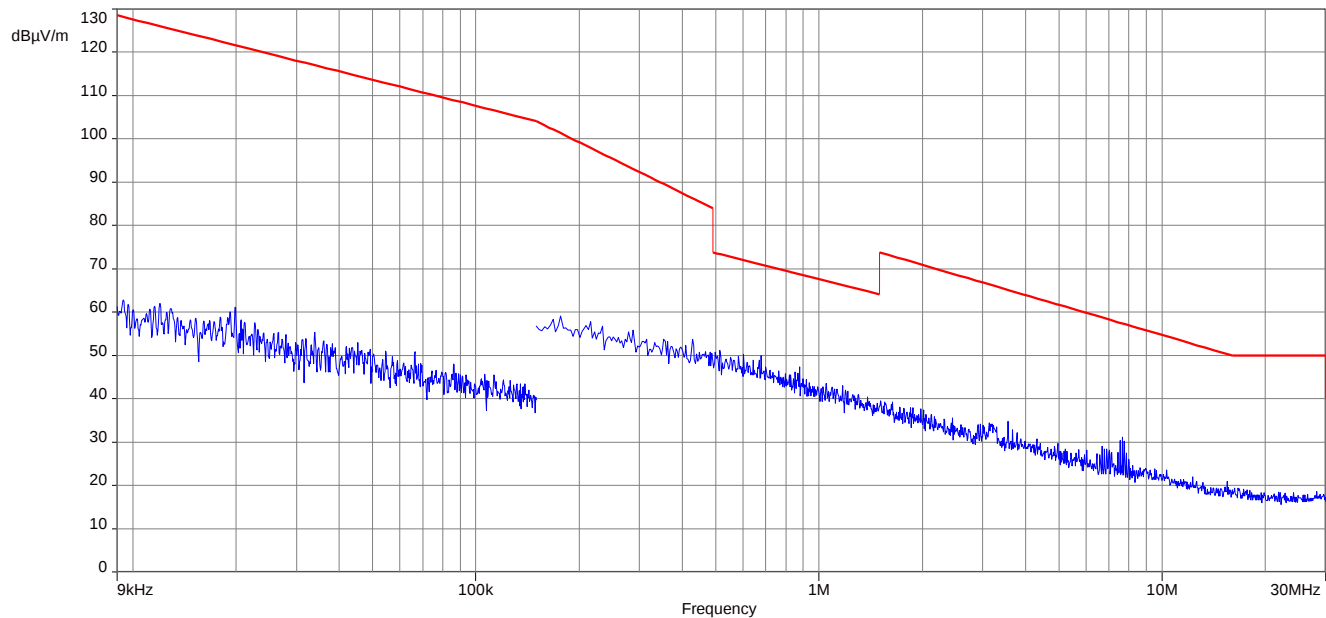
Plot 3: 9 kHz to 30 MHz, high channel

Plots: OFDM / g – mode**Plot 1:** 9 kHz to 30 MHz, low channel**Plot 2:** 9 kHz to 30 MHz, mid channel

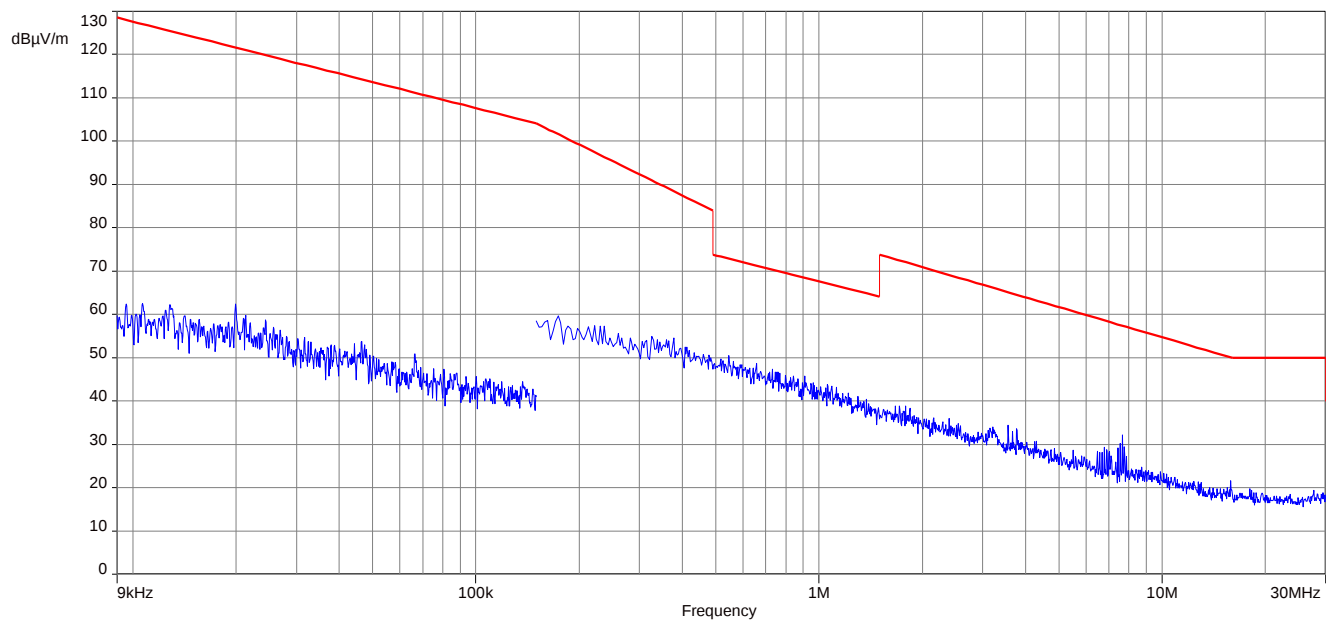
Plot 3: 9 kHz to 30 MHz, high channel

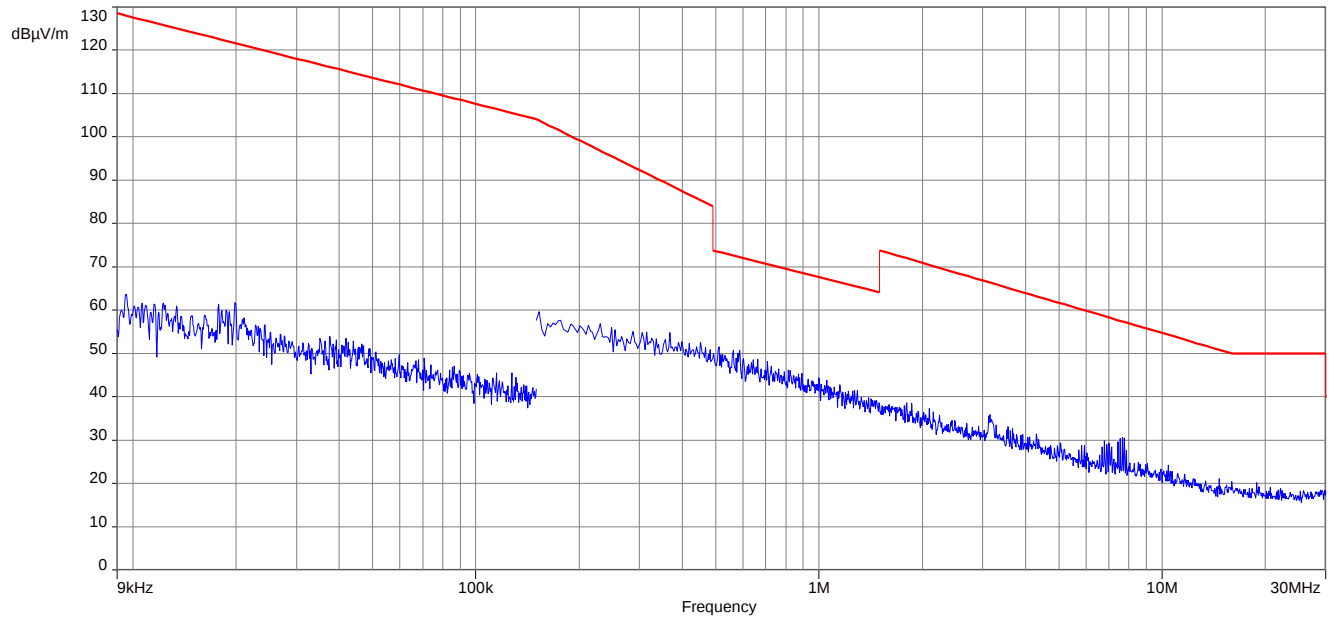
Plots: OFDM / n HT20 – mode

Plot 1: 9 kHz to 30 MHz, low channel



Plot 2: 9 kHz to 30 MHz, mid channel



Plot 3: 9 kHz to 30 MHz, high channel

12.11 Spurious emissions radiated 30 MHz to 1 GHz

Description:

Measurement of the radiated spurious emissions and cabinet radiations below 1 GHz.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Resolution bandwidth:	120 kHz
Video bandwidth:	3 x RBW
Span:	30 MHz to 1 GHz
Trace mode:	Max Hold
Measured modulation	☒ DSSS b – mode ☒ OFDM g – mode ☒ OFDM n HT20 – mode ☐ OFDM n HT40 – mode ☒ RX / Idle – mode
Test setup:	See sub clause 7.1 - A
Measurement uncertainty	See sub clause 9

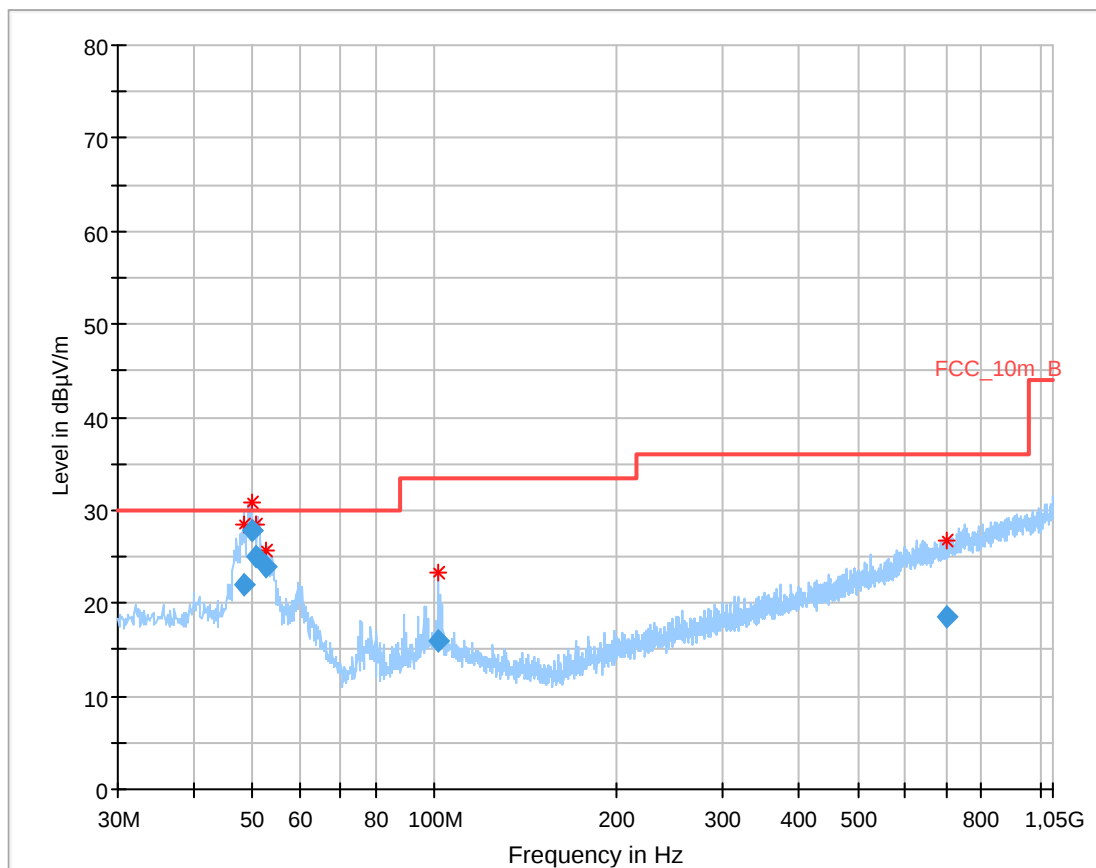
The modulation with the highest output power was used to perform the transmitter spurious emissions. If spurious were detected a re-measurement was performed on the detected frequency with each modulation.

Limits:

FCC		IC
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

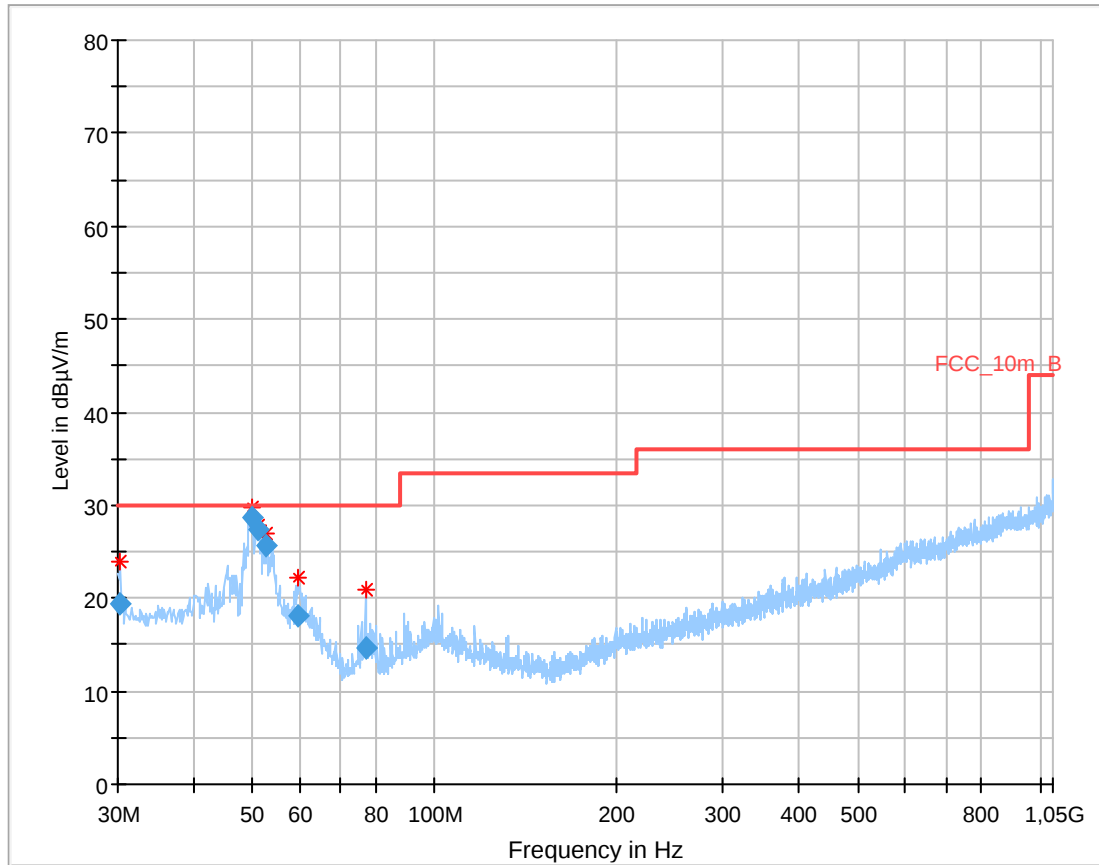
Plot: DSSS / b – mode

Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, low channel

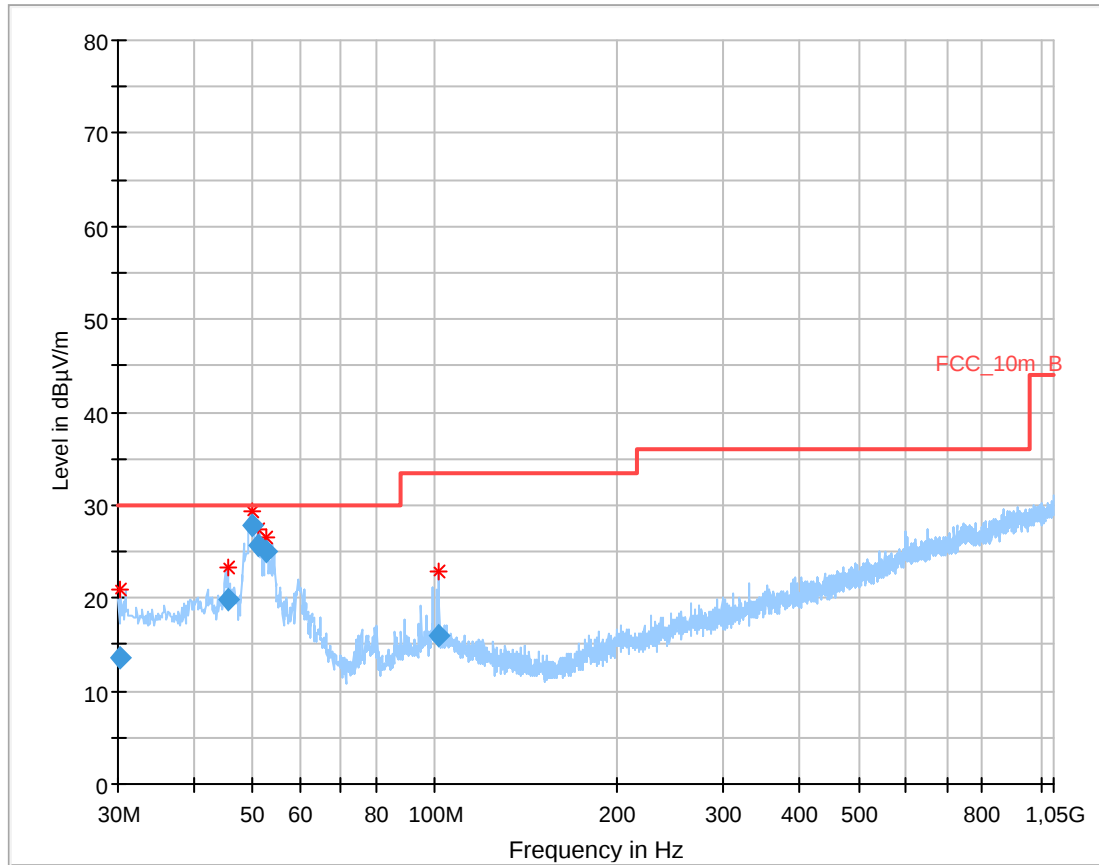


Final_Result:

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
48.451950	21.98	30.00	8.02	1000.0	120.000	98.0	V	171	13.0
49.777950	27.83	30.00	2.17	1000.0	120.000	98.0	V	243	12.7
50.779950	25.05	30.00	4.95	1000.0	120.000	98.0	V	243	12.5
52.793400	23.94	30.00	6.06	1000.0	120.000	98.0	V	202	12.2
101.678700	15.94	33.50	17.56	1000.0	120.000	101.0	V	331	12.0
701.743500	18.60	36.00	17.40	1000.0	120.000	101.0	H	316	21.6

Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, mid channel**Final_Result:**

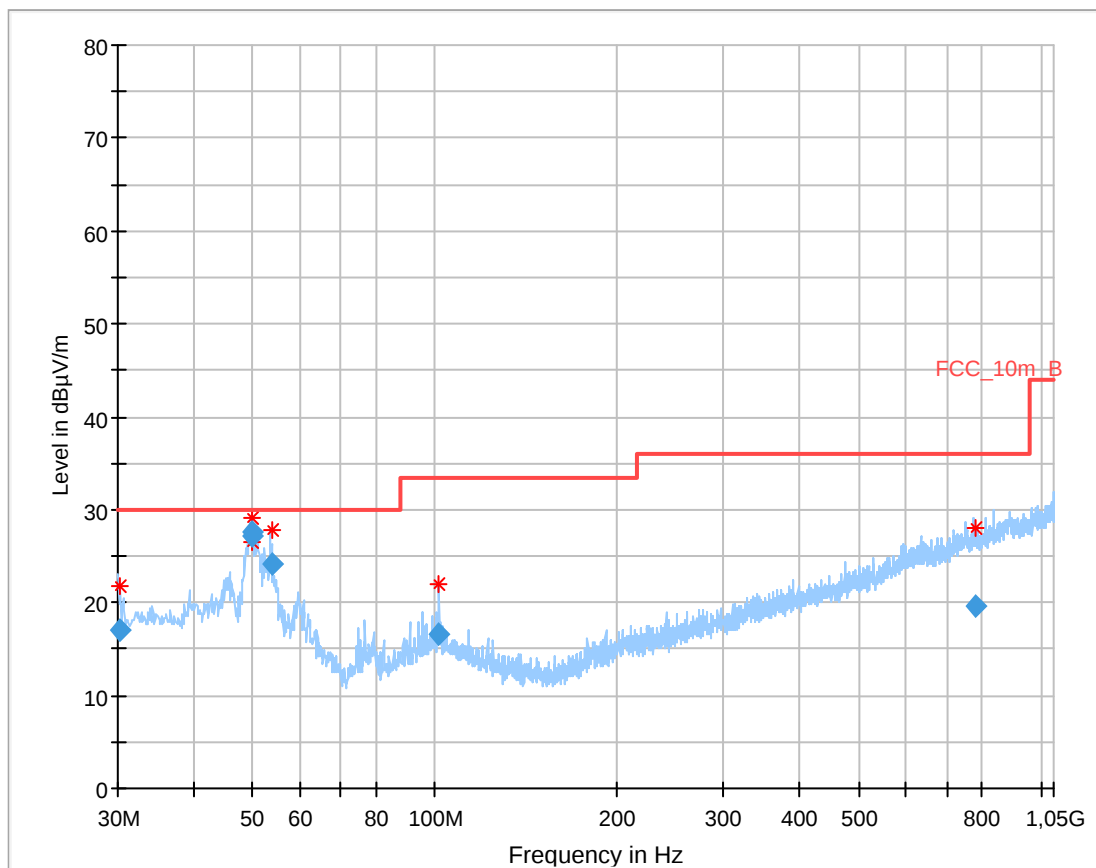
Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.224331	19.38	30.00	10.62	1000.0	120.000	101.0	V	208	13.4
49.794900	28.62	30.00	1.38	1000.0	120.000	98.0	V	21	12.7
51.137850	27.38	30.00	2.62	1000.0	120.000	98.0	V	1	12.5
52.787400	25.63	30.00	4.37	1000.0	120.000	98.0	V	1	12.2
59.704800	18.16	30.00	11.84	1000.0	120.000	170.0	V	127	10.6
77.016000	14.65	30.00	15.35	1000.0	120.000	170.0	V	293	8.2

Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, high channel**Final_Result:**

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.300300	13.63	30.00	16.37	1000.0	120.000	170.0	V	323	13.4
45.536850	19.88	30.00	10.12	1000.0	120.000	170.0	V	79	13.7
49.817100	27.75	30.00	2.25	1000.0	120.000	101.0	V	56	12.7
51.148350	25.58	30.00	4.42	1000.0	120.000	98.0	V	68	12.5
52.807950	25.02	30.00	4.98	1000.0	120.000	98.0	V	40	12.2
101.667150	15.97	33.50	17.53	1000.0	120.000	170.0	V	103	12.0

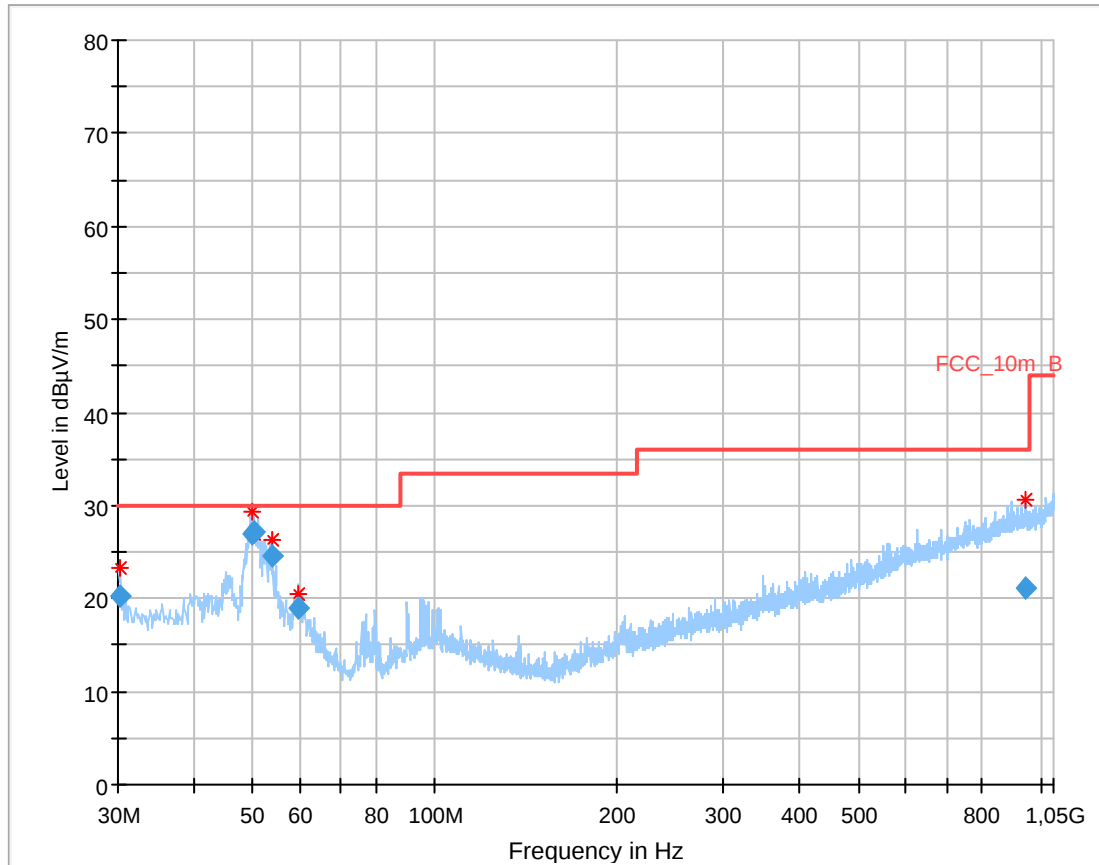
Plot: OFDM / g – mode

Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, low channel

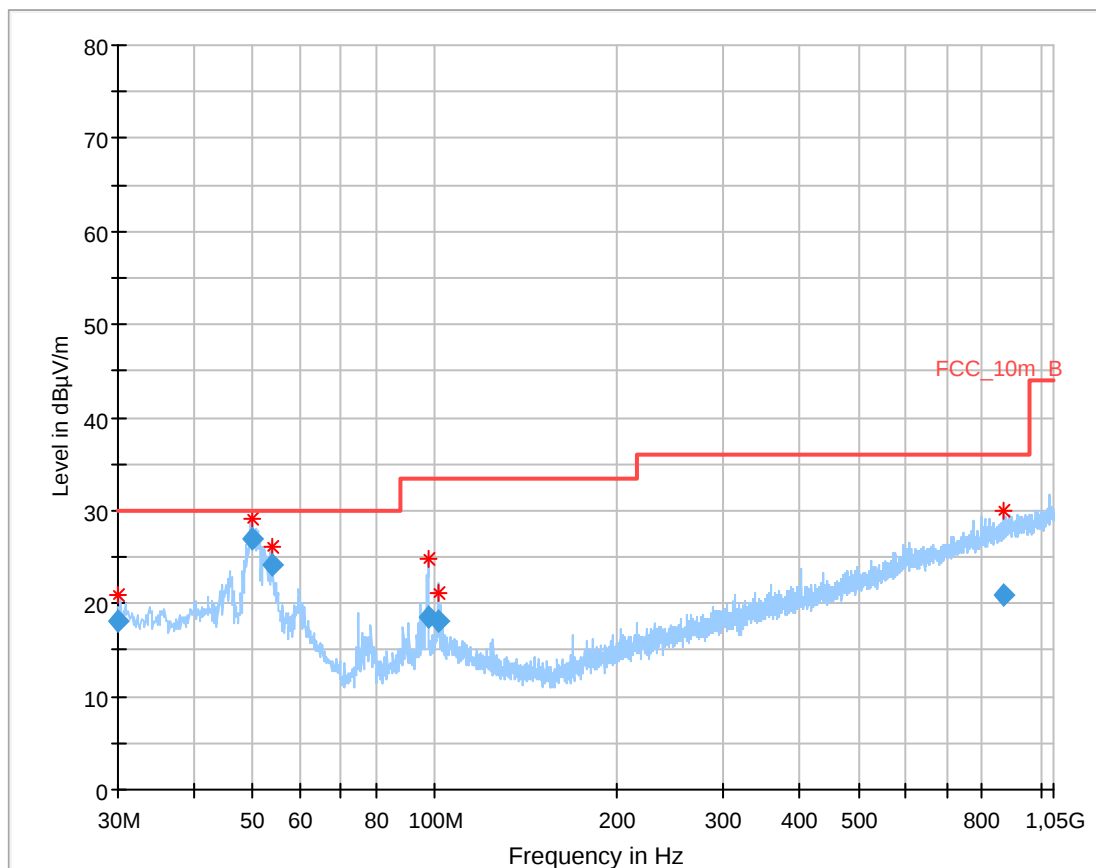


Final_Result:

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.210330	17.13	30.00	12.87	1000.0	120.000	101.0	V	4	13.4
49.818750	27.70	30.00	2.30	1000.0	120.000	98.0	V	4	12.7
50.153100	27.18	30.00	2.82	1000.0	120.000	98.0	V	16	12.6
53.801100	24.18	30.00	5.82	1000.0	120.000	98.0	V	25	12.0
101.687550	16.60	33.50	16.90	1000.0	120.000	98.0	V	353	12.0
779.338800	19.52	36.00	16.48	1000.0	120.000	170.0	V	77	22.7

Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, mid channel**Final_Result:**

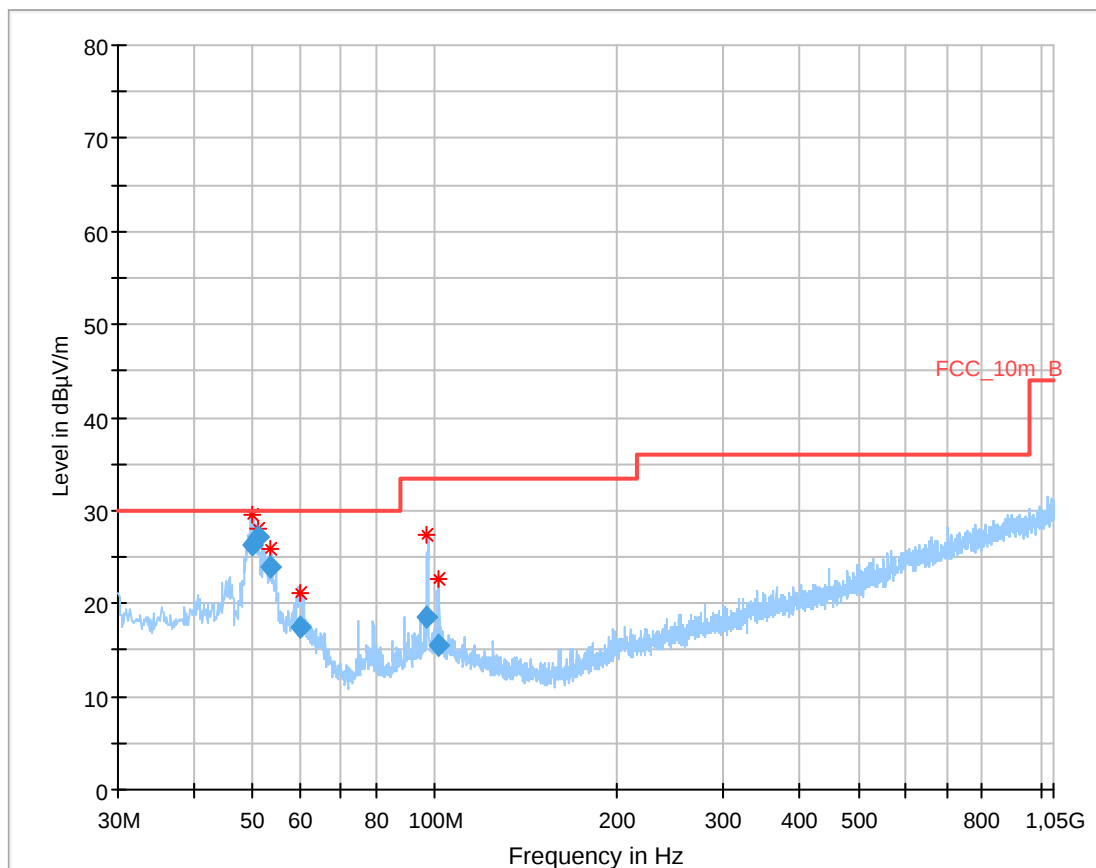
Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.229888	20.27	30.00	9.73	1000.0	120.000	98.0	V	217	13.4
49.851750	26.99	30.00	3.01	1000.0	120.000	98.0	V	125	12.7
50.198400	27.17	30.00	2.83	1000.0	120.000	98.0	V	14	12.6
53.816100	24.50	30.00	5.50	1000.0	120.000	98.0	V	14	12.0
59.432700	19.06	30.00	10.94	1000.0	120.000	101.0	V	14	10.7
946.829400	21.14	36.00	14.86	1000.0	120.000	98.0	V	288	24.3

Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, high channel**Final_Result:**

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.008016	18.01	30.00	11.99	1000.0	120.000	101.0	V	104	13.3
49.860900	27.02	30.00	2.98	1000.0	120.000	98.0	V	217	12.7
53.830350	24.25	30.00	5.75	1000.0	120.000	101.0	V	24	12.0
97.393800	18.59	33.50	14.91	1000.0	120.000	101.0	V	340	11.7
101.699550	18.10	33.50	15.40	1000.0	120.000	98.0	V	0	12.0
866.803950	20.81	36.00	15.19	1000.0	120.000	101.0	H	45	23.7

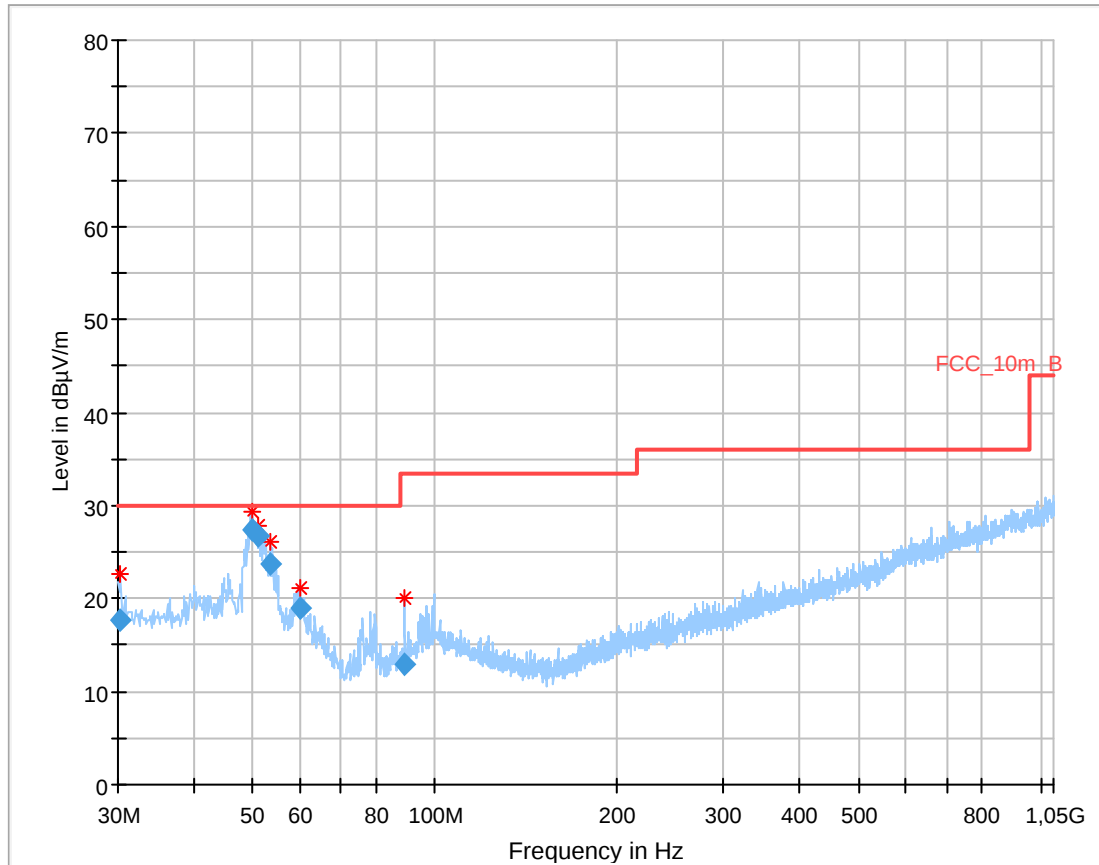
Plot: OFDM / n HT20 – mode

Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, low channel

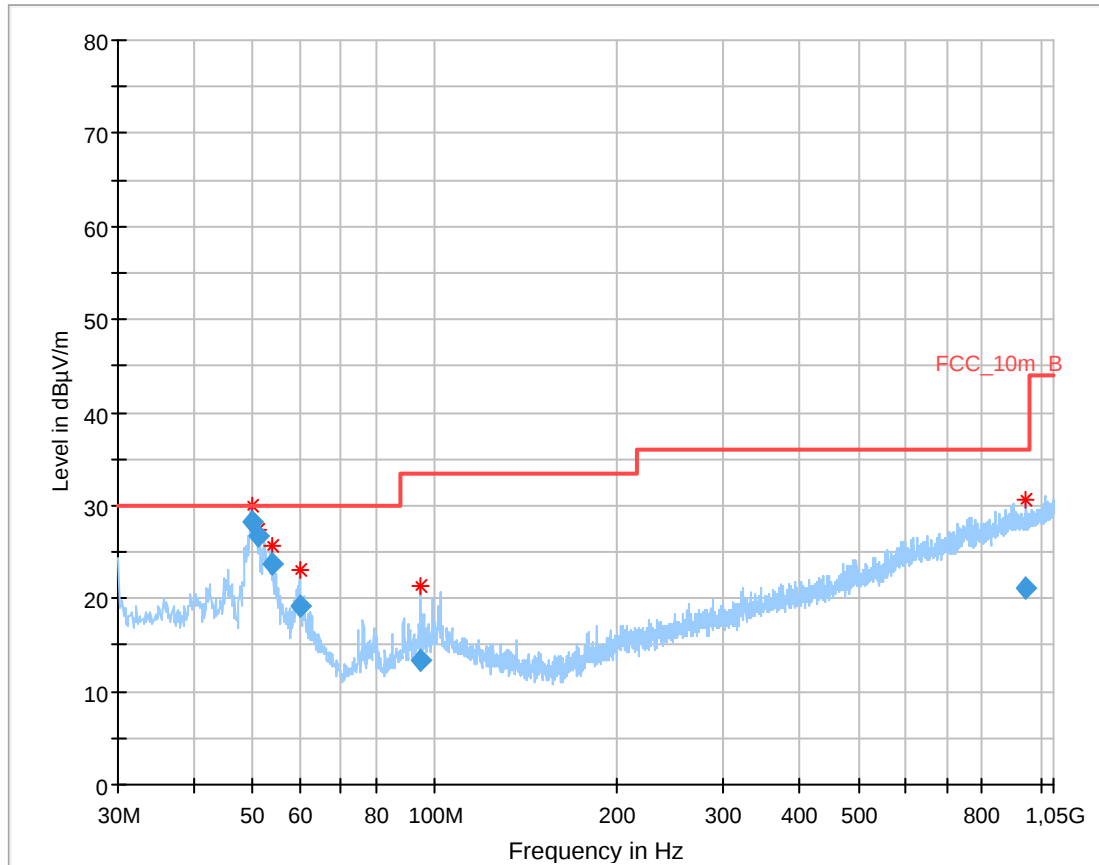


Final_Result:

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
49.869150	26.35	30.00	3.65	1000.0	120.000	170.0	V	75	12.7
51.197700	27.11	30.00	2.89	1000.0	120.000	98.0	V	12	12.4
53.490900	23.99	30.00	6.01	1000.0	120.000	98.0	V	60	12.1
59.766900	17.52	30.00	12.48	1000.0	120.000	98.0	V	224	10.6
97.134750	18.48	33.50	15.02	1000.0	120.000	101.0	V	353	11.7
101.707650	15.42	33.50	18.08	1000.0	120.000	98.0	V	313	12.0

Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, mid channel**Final_Result:**

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.231171	17.75	30.00	12.25	1000.0	120.000	101.0	V	87	13.4
49.874250	27.41	30.00	2.59	1000.0	120.000	98.0	V	195	12.7
51.191850	26.78	30.00	3.22	1000.0	120.000	98.0	V	44	12.4
53.498250	23.68	30.00	6.32	1000.0	120.000	98.0	V	68	12.1
59.777550	19.08	30.00	10.92	1000.0	120.000	101.0	V	0	10.6
89.333100	12.91	33.50	20.59	1000.0	120.000	98.0	V	32	10.3

Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, high channel**Final_Result:**

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
49.845300	28.22	30.00	1.78	1000.0	120.000	98.0	V	4	12.7
51.213900	26.78	30.00	3.22	1000.0	120.000	98.0	V	4	12.4
53.810700	23.80	30.00	6.20	1000.0	120.000	98.0	V	91	12.0
59.776650	19.10	30.00	10.90	1000.0	120.000	98.0	V	10	10.6
94.741500	13.40	33.50	20.10	1000.0	120.000	101.0	V	10	11.3
946.231200	21.07	36.00	14.93	1000.0	120.000	170.0	V	4	24.3

12.12 Spurious emissions radiated above 1 GHz

Description:

Measurement of the radiated spurious emissions above 1 GHz in transmit mode and receiver / idle mode.

Measurement:

Measurement parameter	
Detector:	Peak / RMS
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	3 x RBW
Span:	1 GHz to 26 GHz
Trace mode:	Max Hold
Measured modulation	☒ DSSS b – mode ☒ OFDM g – mode ☒ OFDM n HT20 – mode ☐ OFDM n HT40 – mode ☒ RX / Idle – mode
Test setup:	See sub clause 7.2 – A & – C
Measurement uncertainty	See sub clause 9

Limits:

FCC		IC
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 30 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 (dB μ V/m)	Measurement distance
Above 960	54.0	3

Results: DSSS / b – mode

TX Spurious Emissions Radiated [dBμV/m]								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]
All detected peak emissions are below the average limit.			All detected peak emissions are below the average limit.			All detected peak emissions are below the average limit.		
	Peak			Peak			Peak	
	AVG			AVG			AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	

Results: OFDM / g – mode

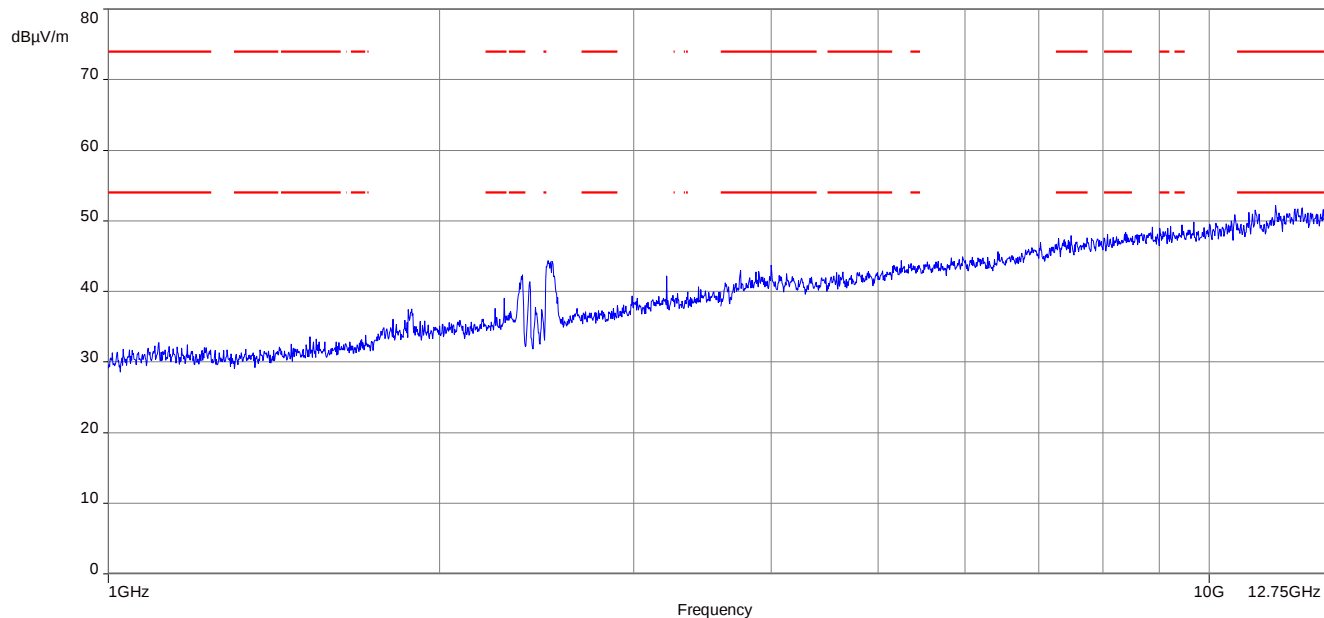
TX Spurious Emissions Radiated [dBμV/m]								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]
All detected peak emissions are below the average limit.			All detected peak emissions are below the average limit.			All detected peak emissions are below the average limit.		
	Peak			Peak			Peak	
	AVG			AVG			AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	

Results: OFDM / n HT20 – mode

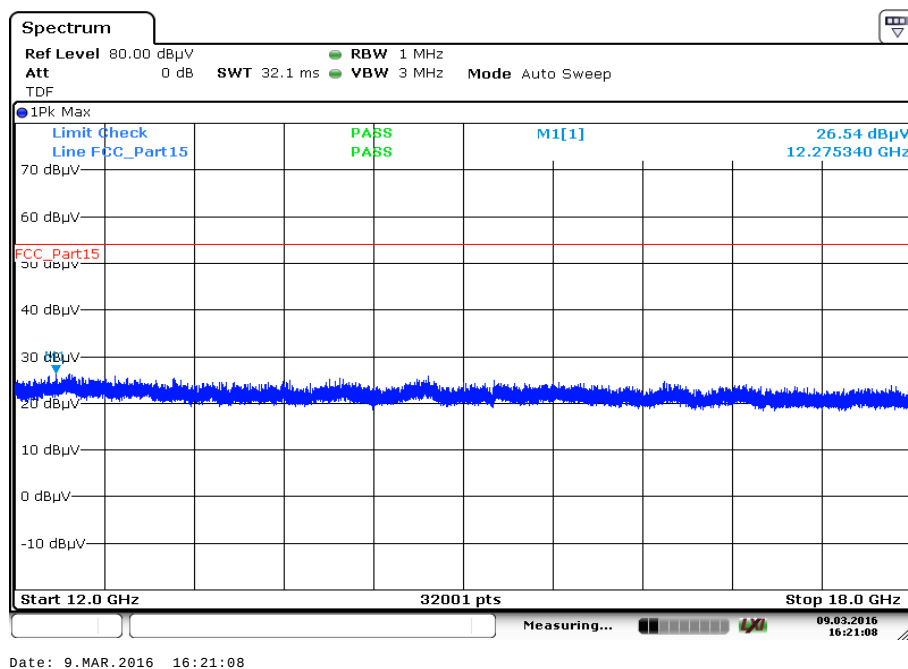
TX Spurious Emissions Radiated [dBμV/m]								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]
All detected peak emissions are below the average limit.			All detected peak emissions are below the average limit.			All detected peak emissions are below the average limit.		
	Peak			Peak			Peak	
	AVG			AVG			AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	

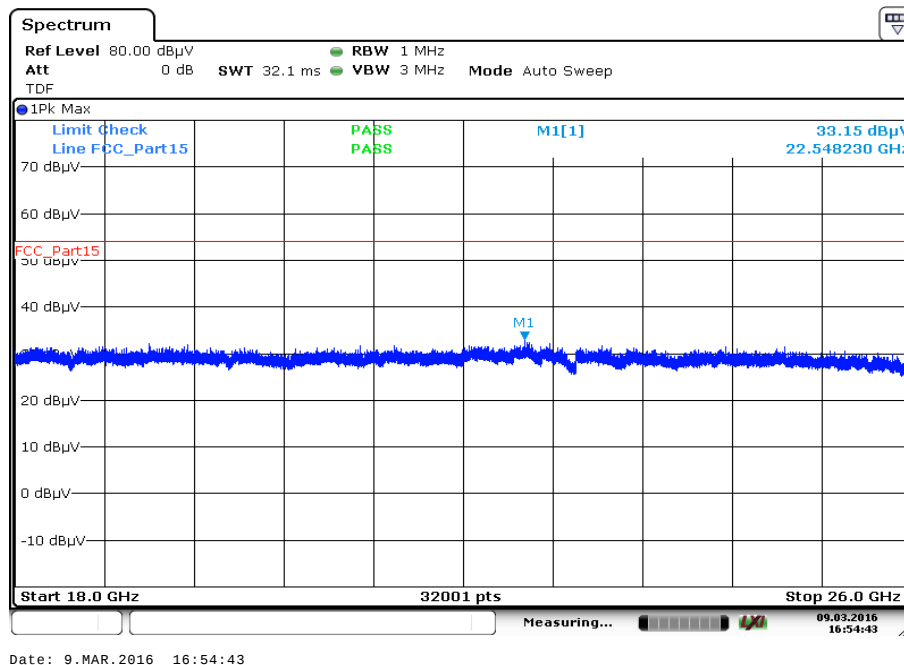
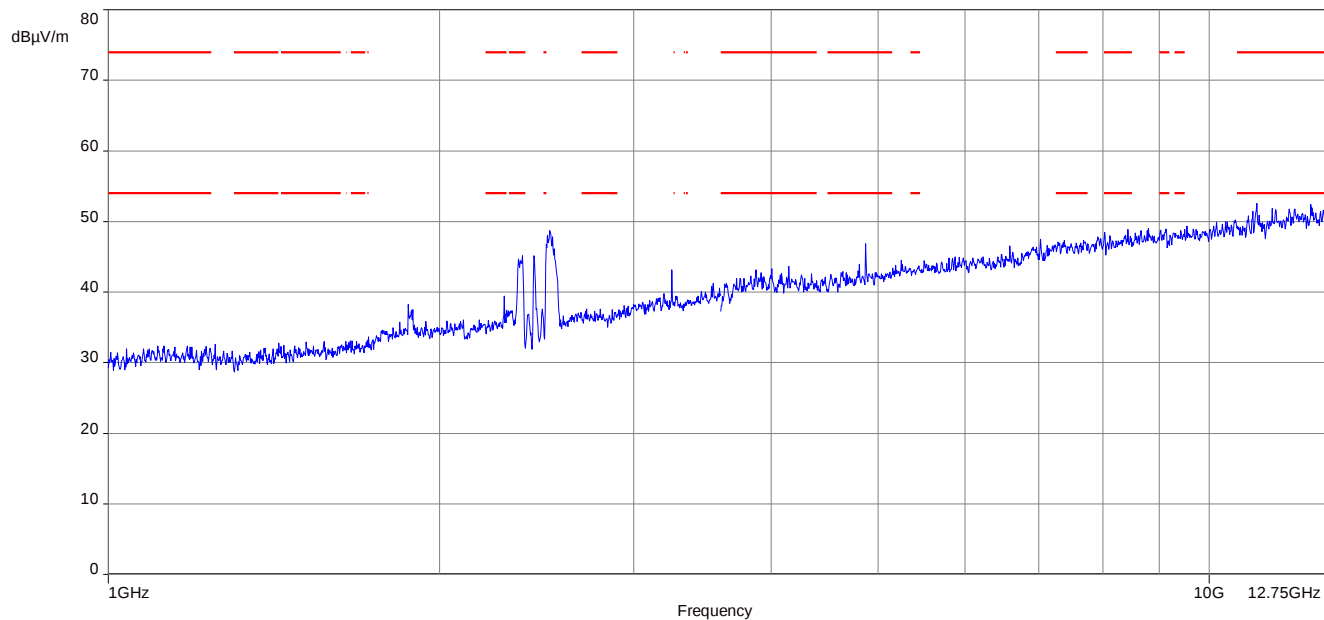
Results: RX / idle – mode

TX Spurious Emissions Radiated [dBμV/m]		
F [MHz]	Detector	Level [dBμV/m]
All detected peak emissions are below the average limit.		
	Peak	
	AVG	
	Peak	
	AVG	

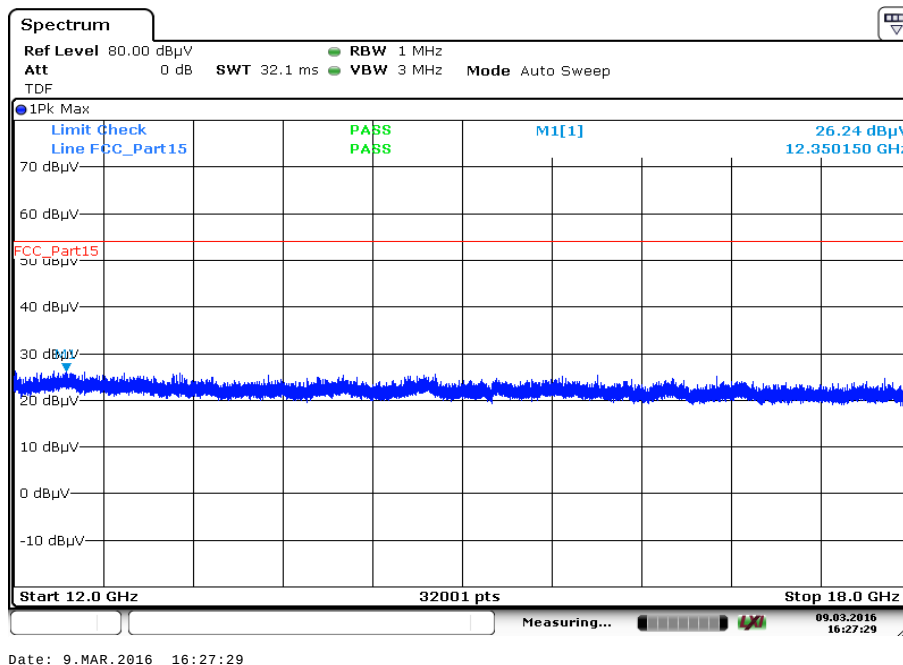
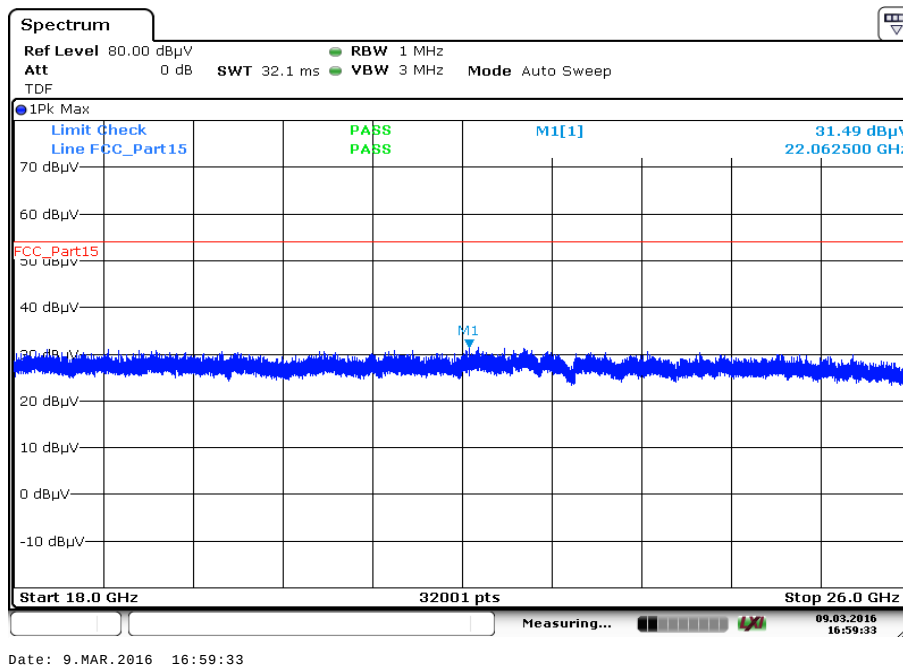
Plots: DSSS / b – mode**Plot 1:** lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

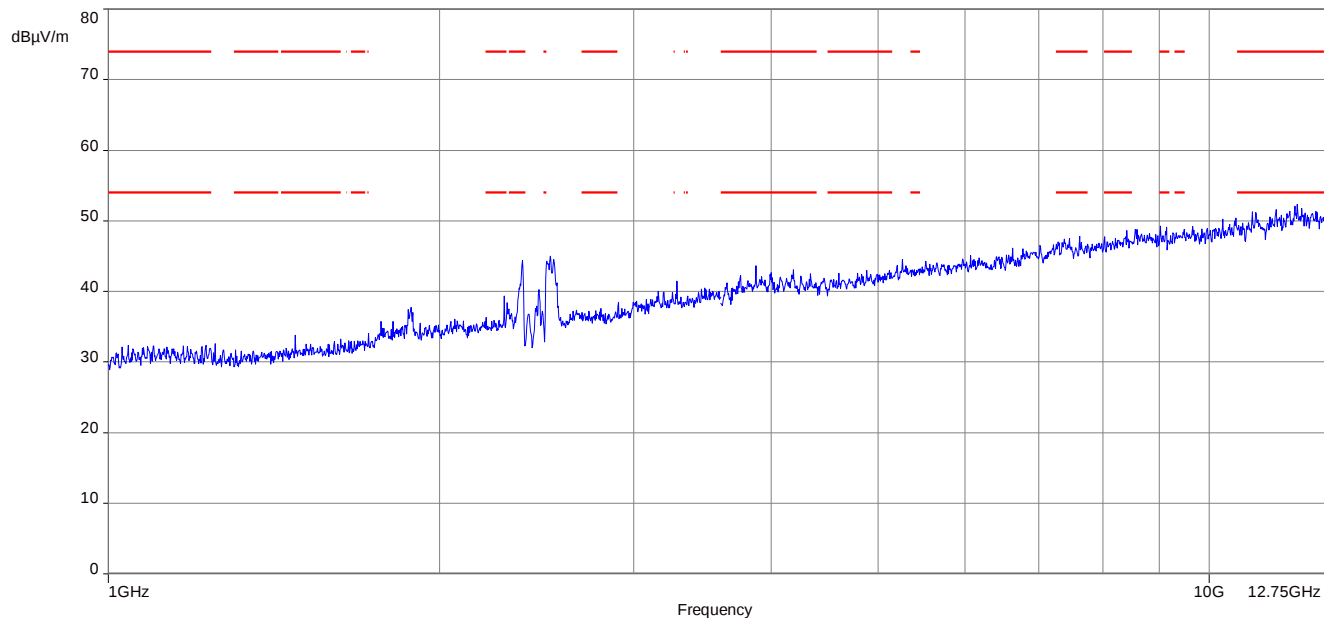
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: lowest channel, 12.0 GHz to 18 GHz, vertical & horizontal polarization, peak & average

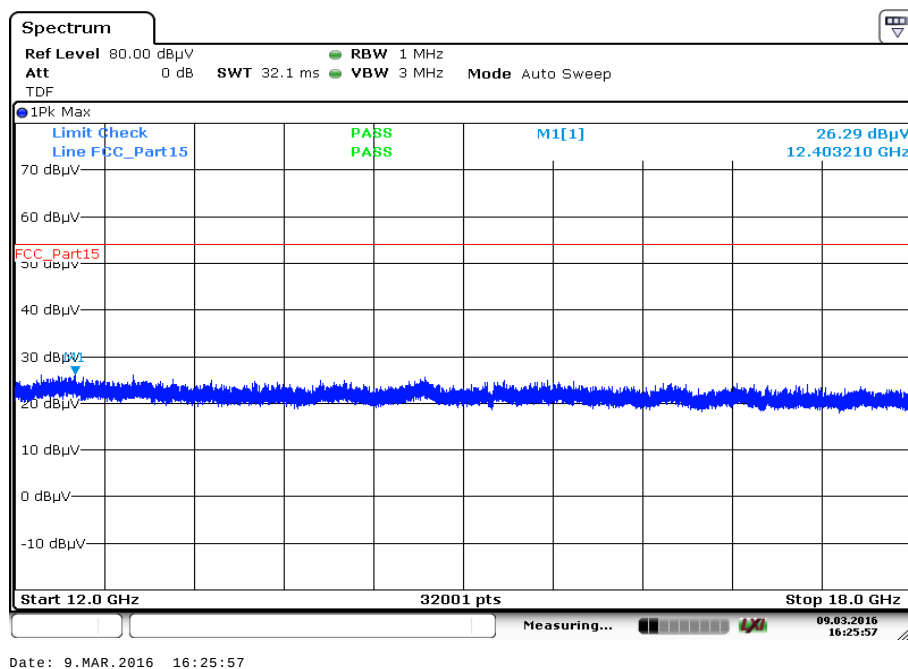
Plot 3: lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization**Plot 4:** middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

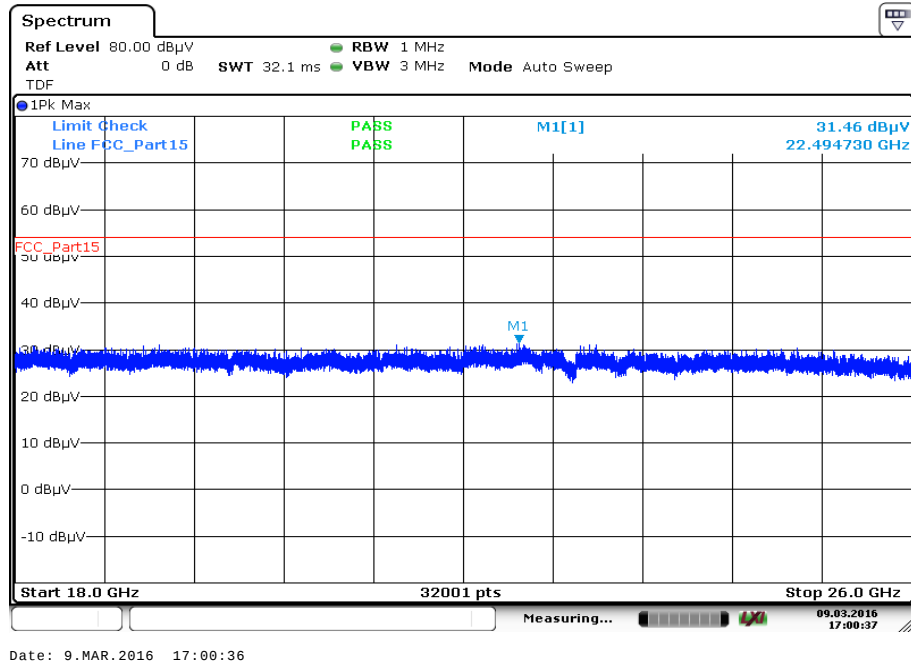
The carrier signal is notched with a 2.4 GHz band rejection filter.

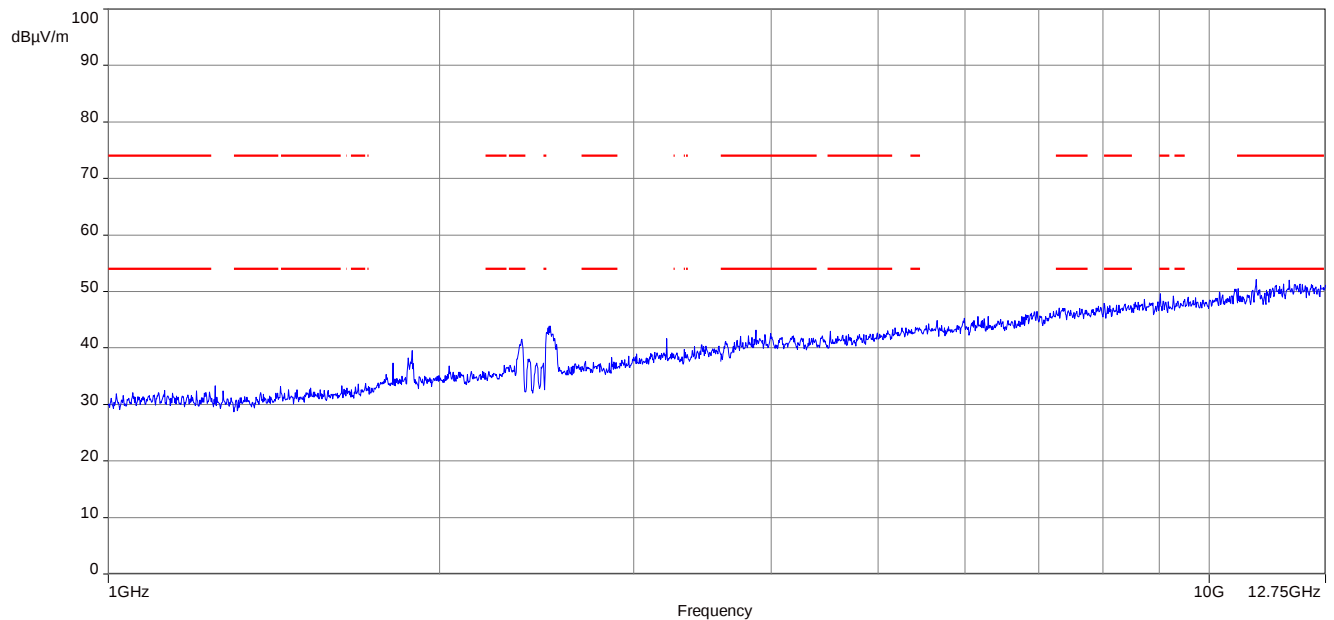
Plot 5: middle channel, 12.0 GHz to 18 GHz, vertical & horizontal polarization**Plot 6:** middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Plot 7: highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

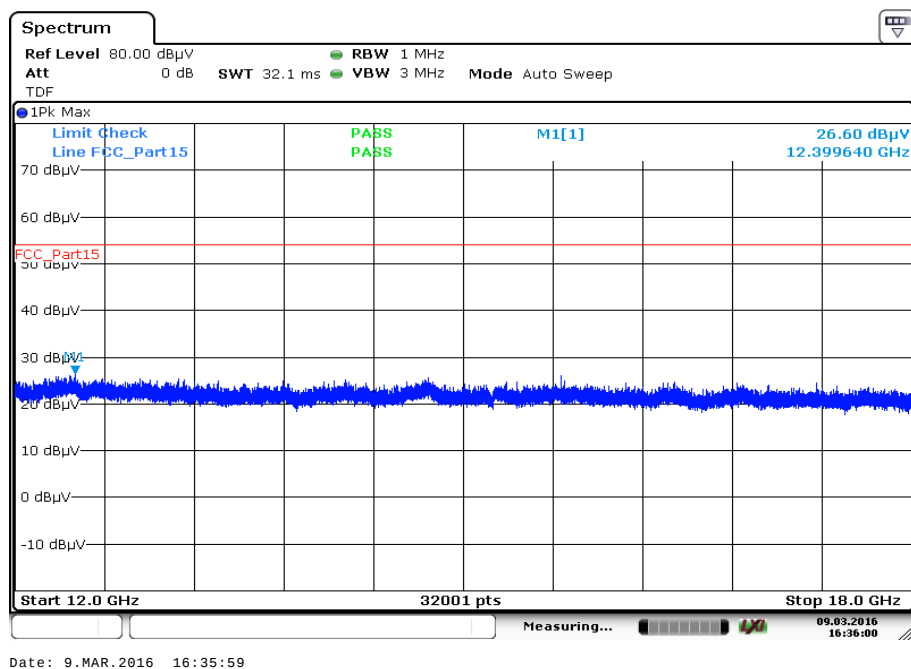
The carrier signal is notched with a 2.4 GHz band rejection filter.

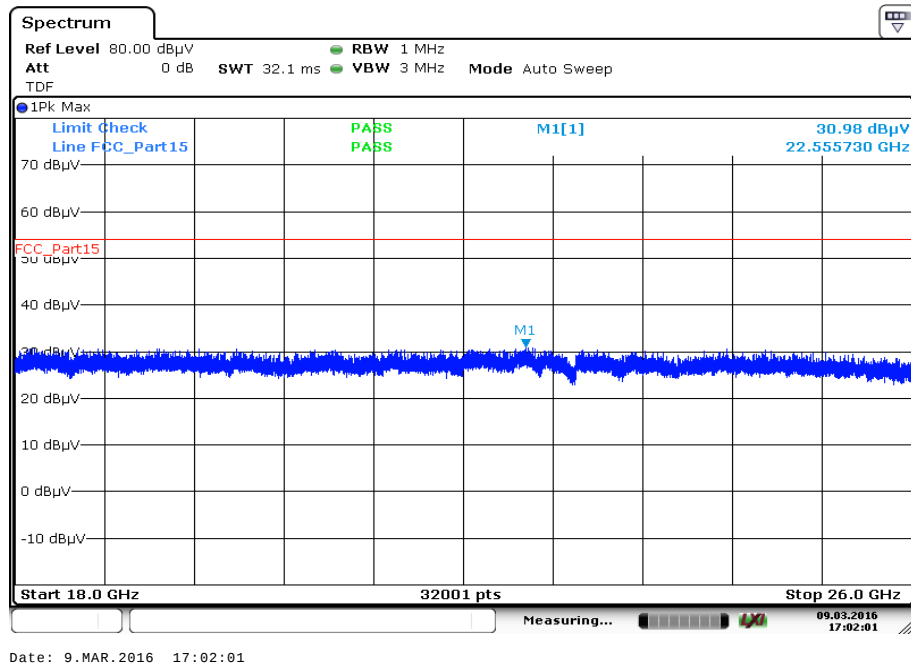
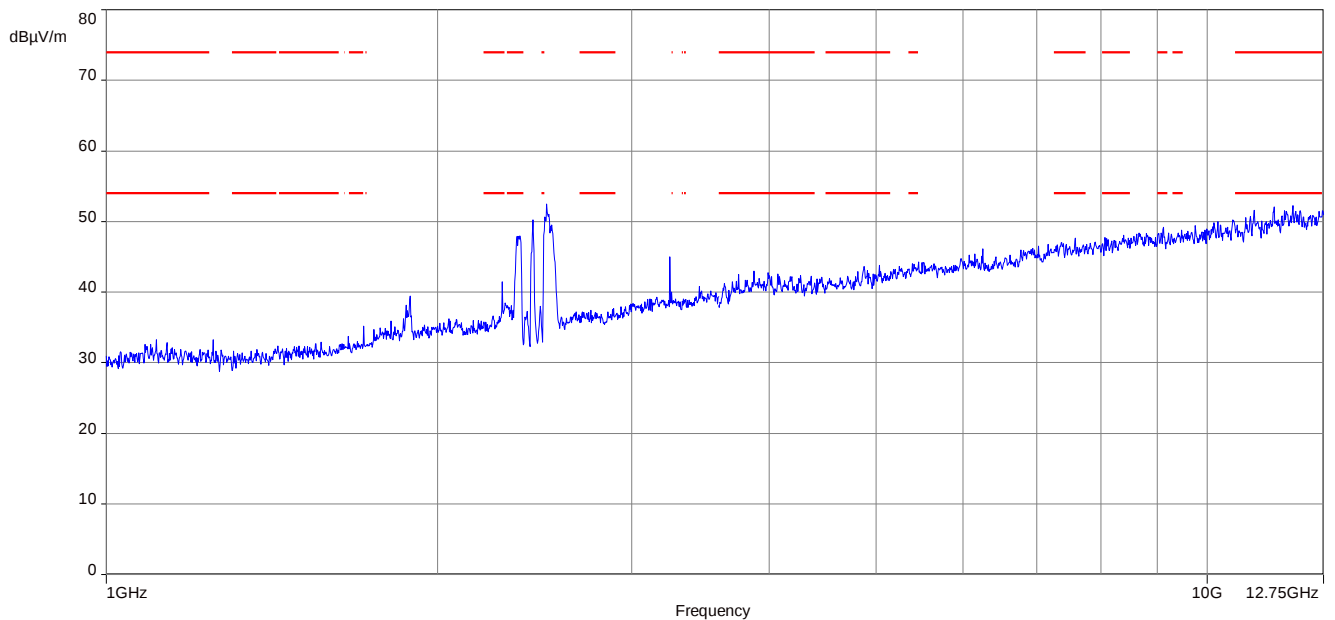
Plot 8: highest channel, 12.0 GHz to 18 GHz, vertical & horizontal polarization

Plot 9: highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

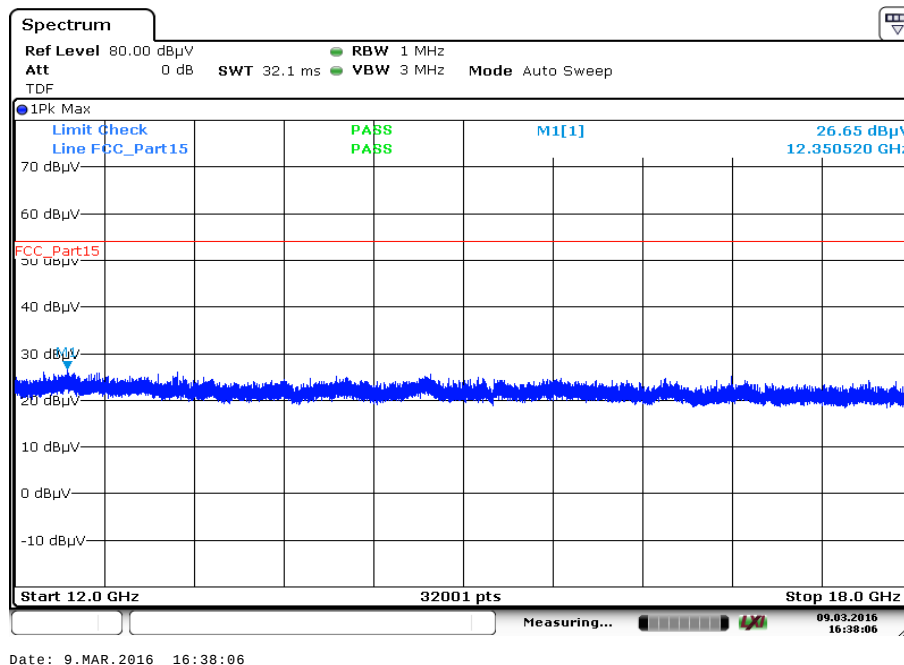
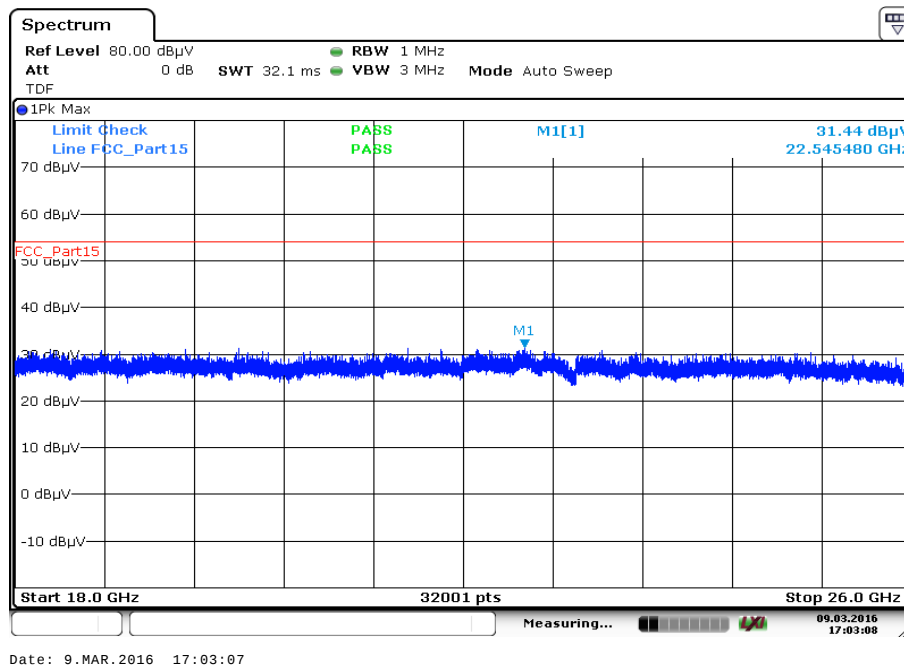
Plots: OFDM / g – mode**Plot 1:** lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

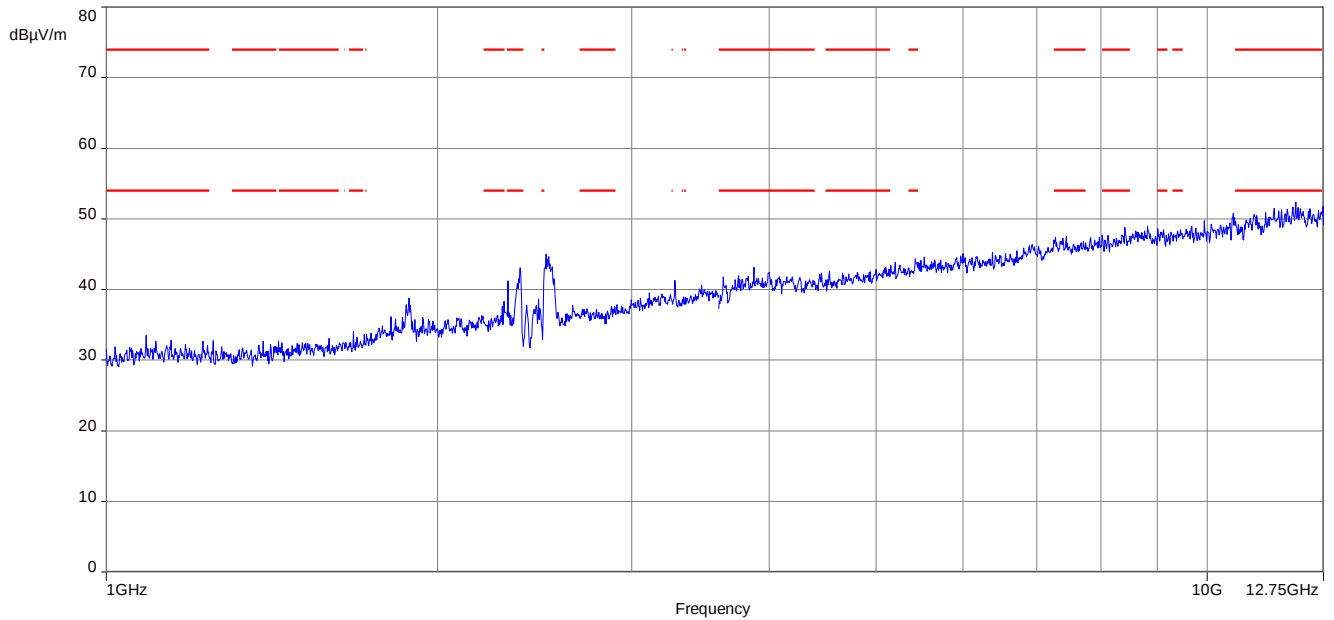
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: lowest channel, 12.0 GHz to 18 GHz, vertical & horizontal polarization, peak & average

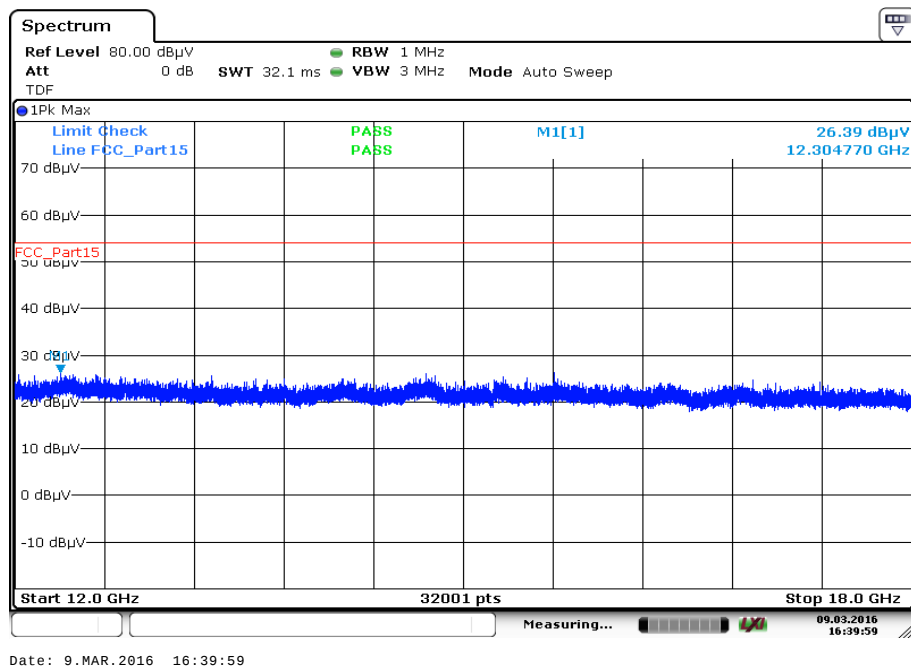
Plot 3: lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization**Plot 4:** middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

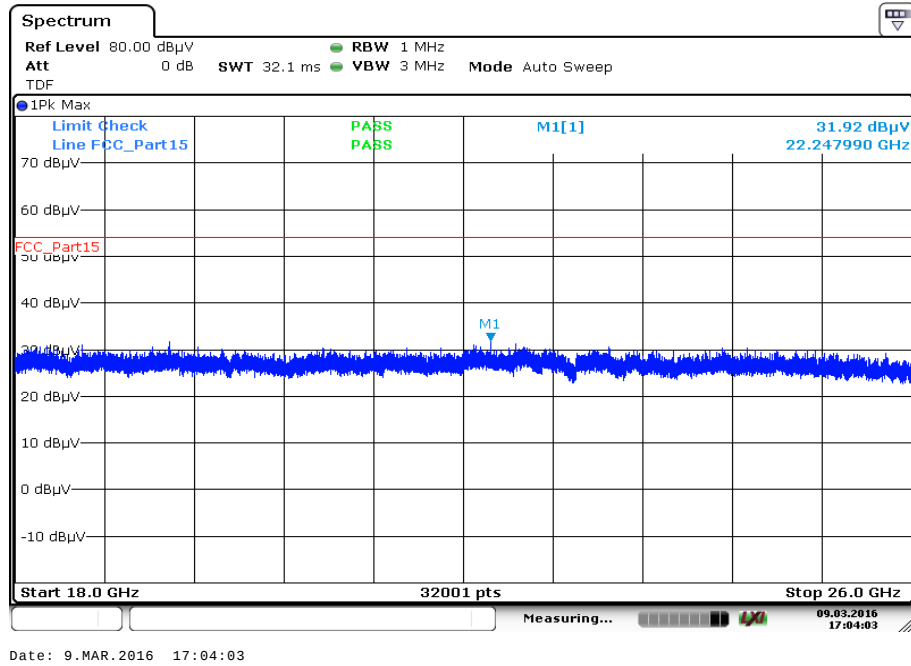
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 5: middle channel, 12.0 GHz to 18 GHz, vertical & horizontal polarization**Plot 6:** middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Plot 7: 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 8: highest channel, 12.0 GHz to 18 GHz, vertical & horizontal polarization

Plot 9: highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

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



Spectrum

Ref Level 80.00 dBμV
 Att 0 dB
 TDF
 RBW 1 MHz
 VBW 3 MHz
 Mode Auto Sweep
 SWT 32.1 ms

● 1Pk Max

Limit Check
 Line FCC_Part15

PASS
 PASS

M1[1]

26.42 dBμV
 12.386710 GHz

70 dBμV
 60 dBμV
 50 dBμV
 40 dBμV
 30 dBμV
 20 dBμV
 10 dBμV
 0 dBμV
 -10 dBμV

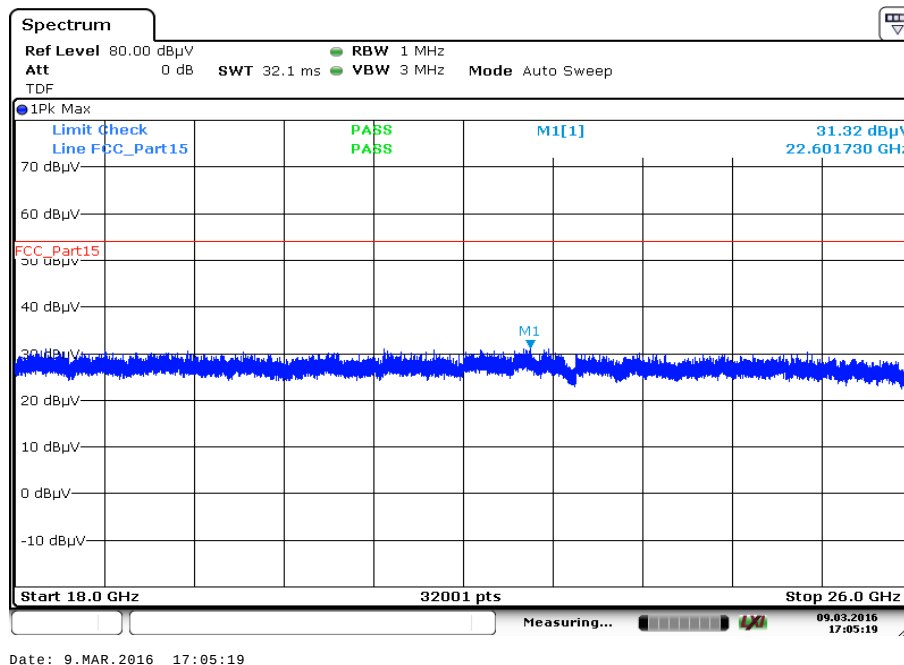
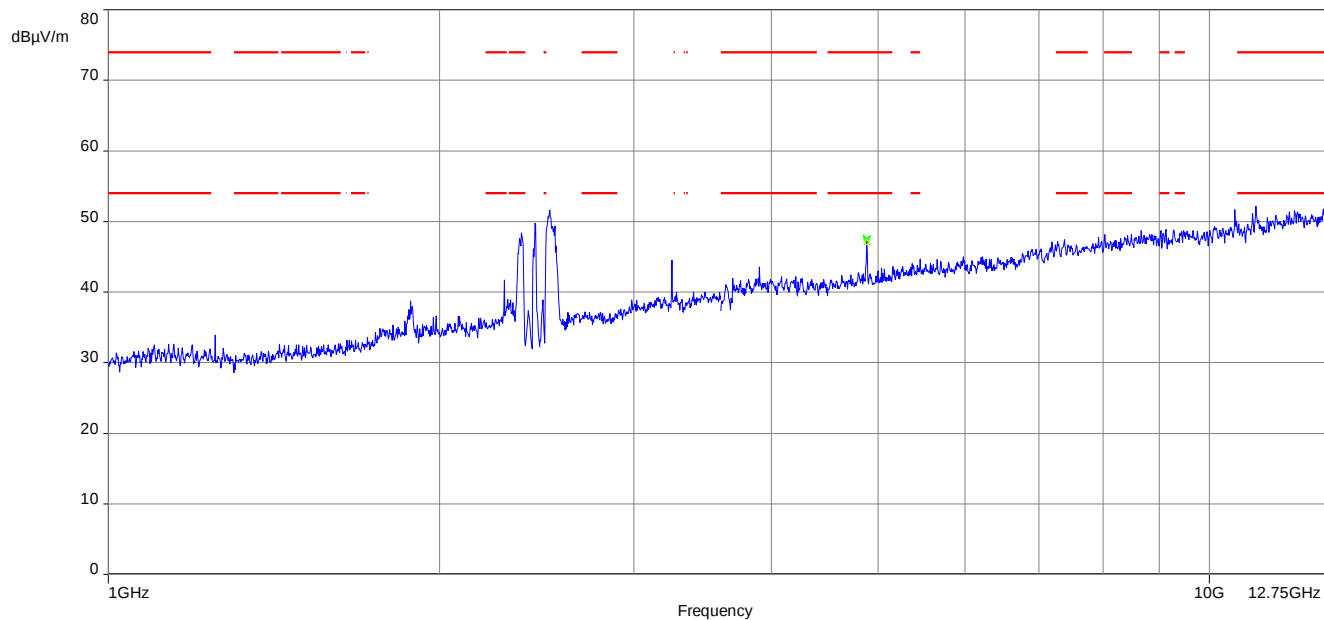
FCC_Part15

Start 12.0 GHz 32001 pts Stop 18.0 GHz

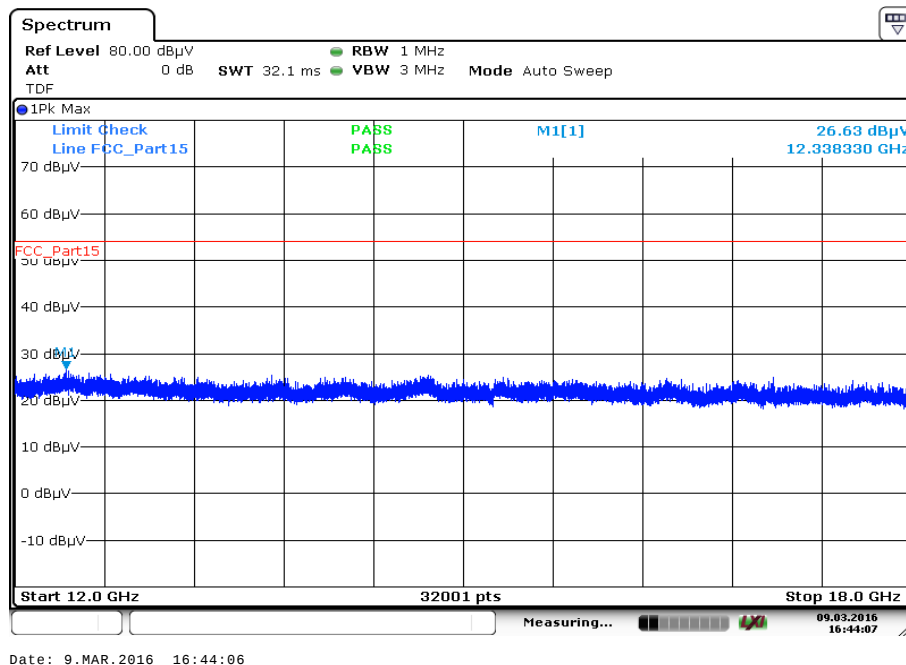
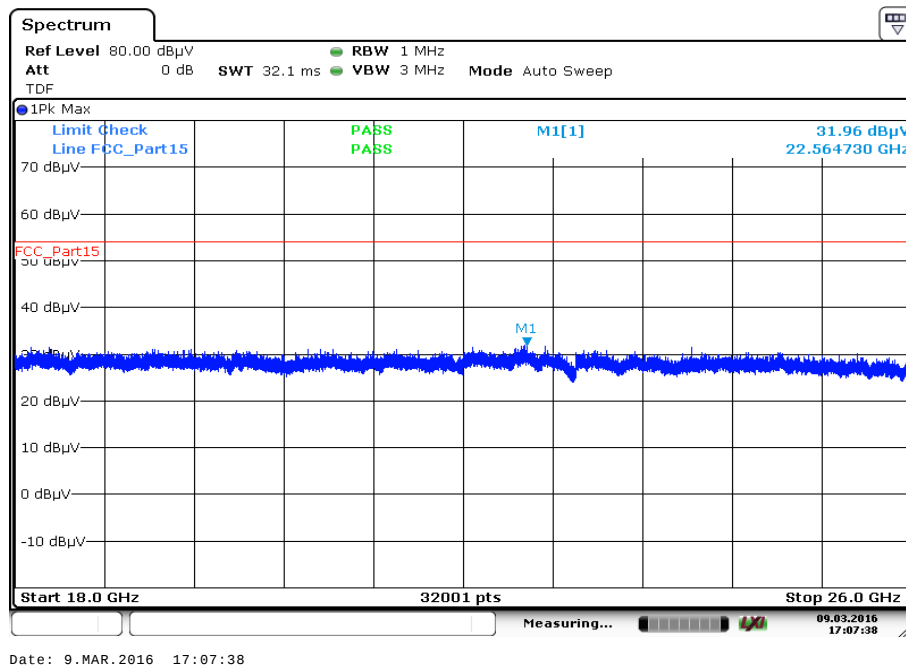
Measuring...

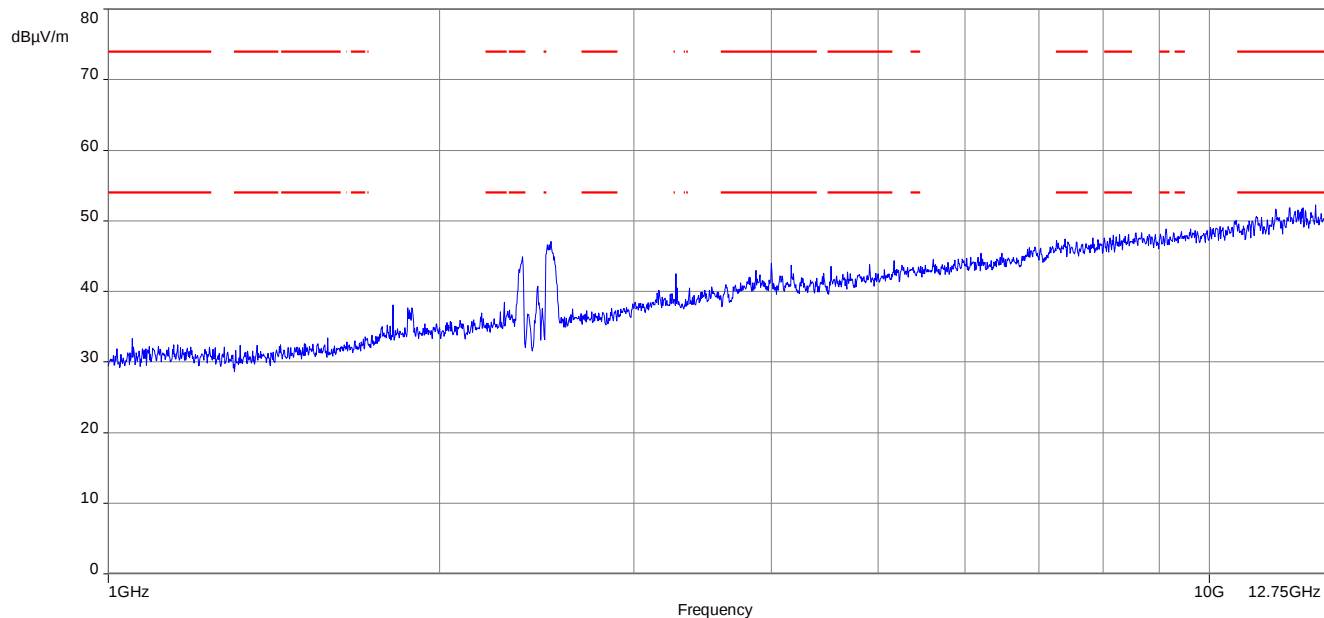
09.03.2016 16:42:29

Date: 9.MAR.2016 16:42:29

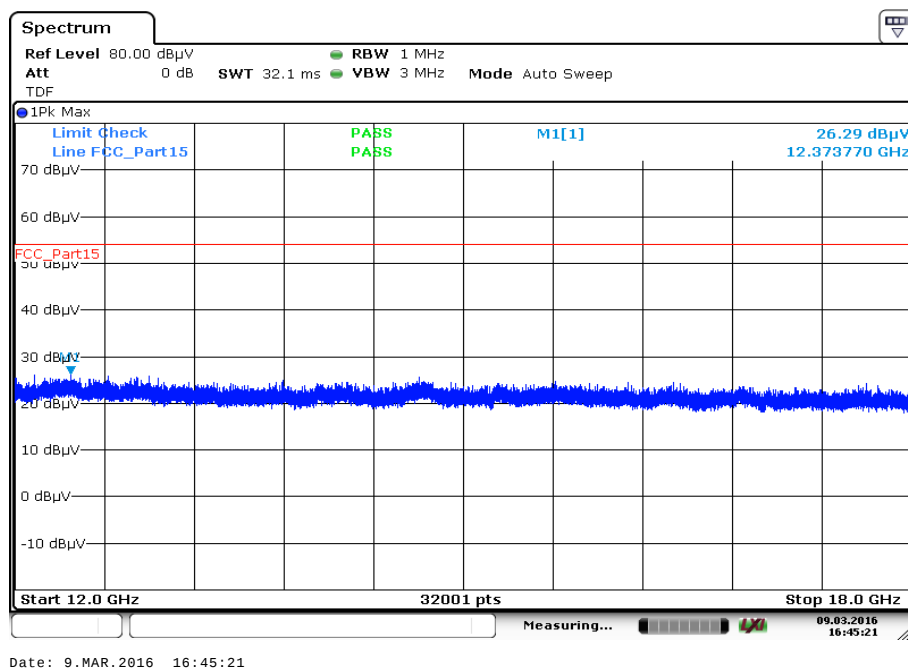
Plot 3: lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization**Plot 4:** middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

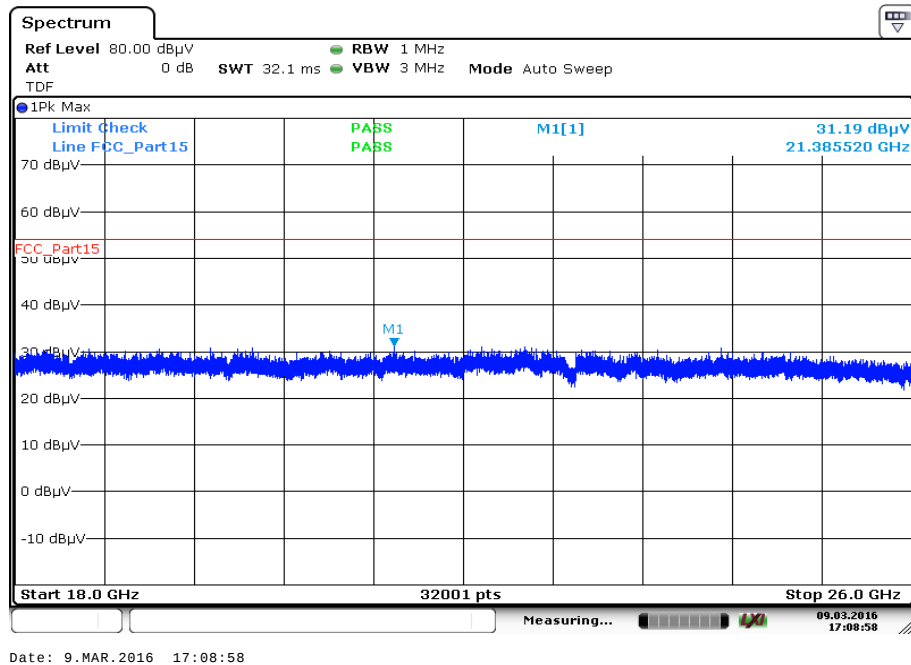
The carrier signal is notched with a 2.4 GHz band rejection filter.

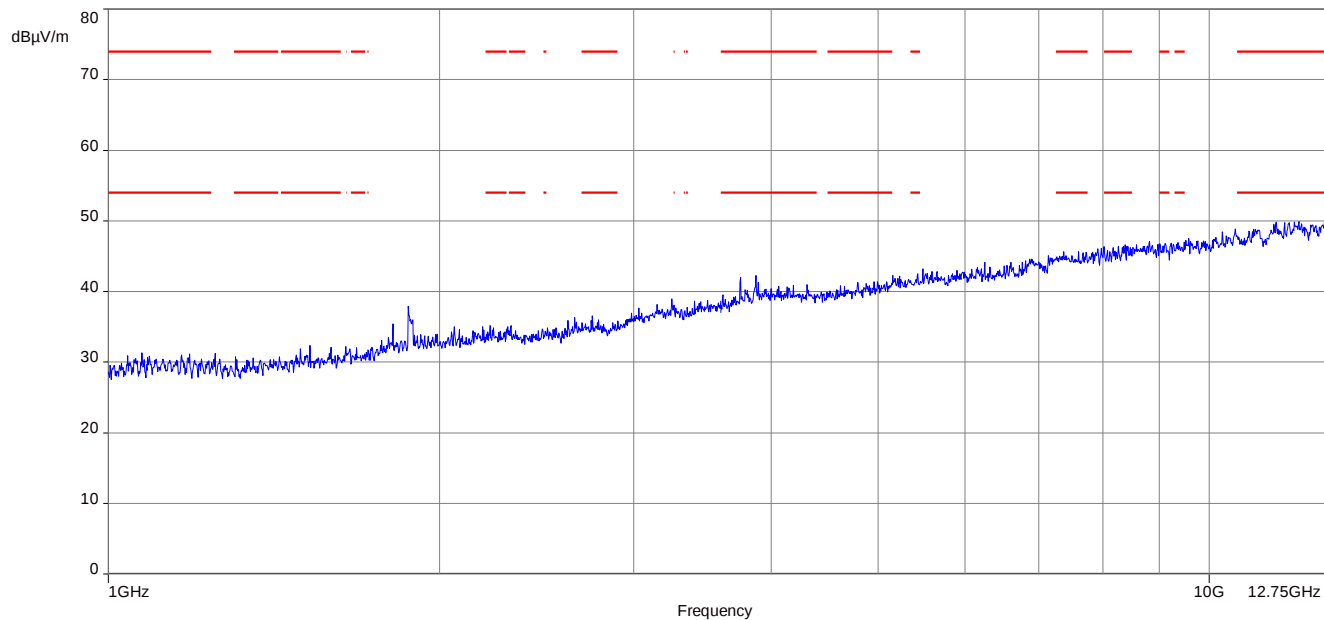
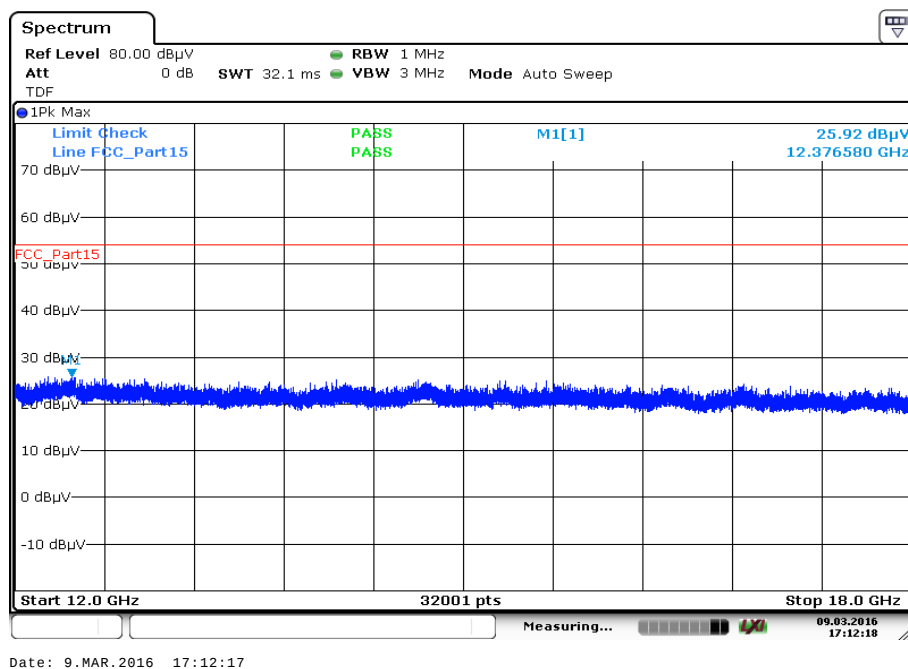
Plot 5: middle channel, 12.0 GHz to 18 GHz, vertical & horizontal polarization**Plot 6:** middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

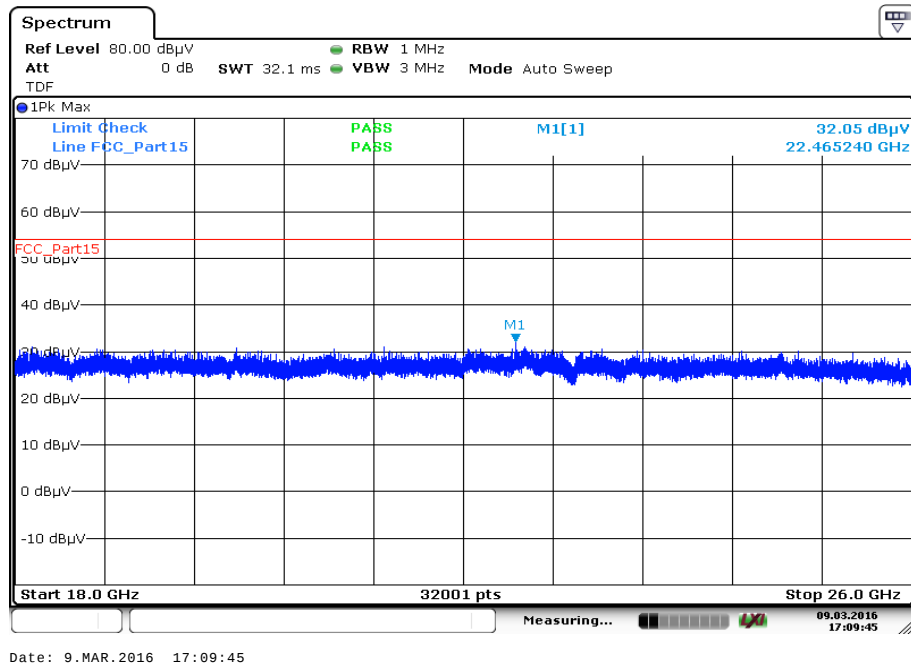
Plot 7: highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

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

Plot 8: highest channel, 12.0 GHz to 18 GHz, vertical & horizontal polarization

Plot 9: highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Plots: RX / idle mode**Plot 1:** 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 2:** 12.75 GHz to 18 GHz, vertical & horizontal polarization

Plot 3: 18 GHz to 26 GHz, vertical & horizontal polarization

13 Observations

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

Annex A Document history

Version	Applied changes	Date of release
	Initial release	2016-04-26

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
PMN	-	Product marketing name
HMN	-	Host marketing name
HVIN	-	Hardware version identification number
FVIN	-	Firmware version identification number

Back side of certificate



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