

12.9 Band edge compliance conducted

Description:

Measurement of the radiated band edge compliance with a conducted test setup.

Measurement:

Measurement parameter for measurements	
According to DTS clause: 13.3.2 and clause 12.2.2	
Detector	RMS
Sweep time	Auto
Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Span	2 MHz lower band edge 2388 MHz to 2390 MHz upper band edge 2483.5 MHz to 2485.5 MHz
Trace mode	Trace average with 200 counts
Test setup	See chapter 6.5 A
Measurement uncertainty	See chapter 8

Limits:

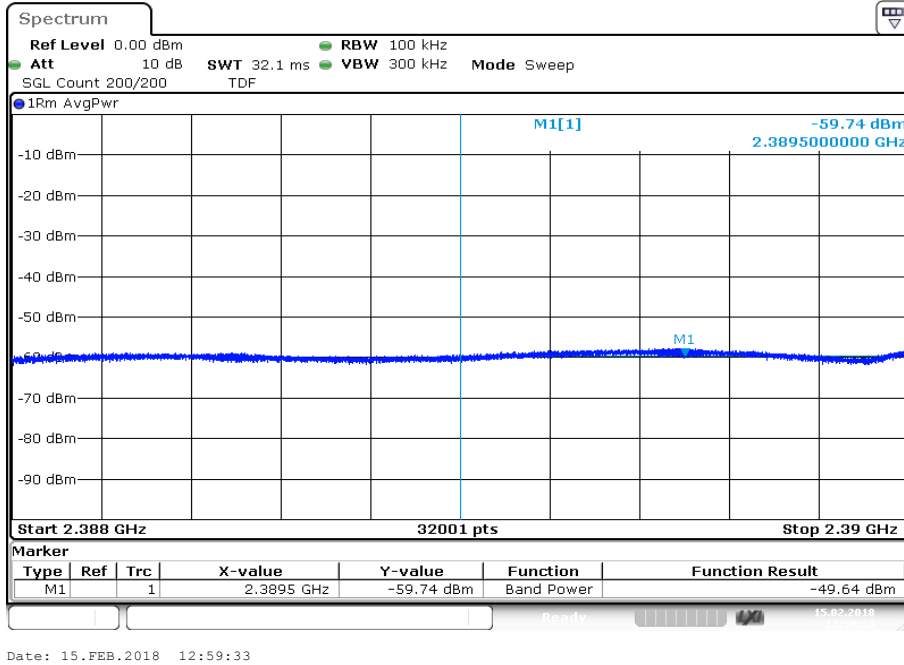
FCC	IC
-41.26 dBm	

Results:

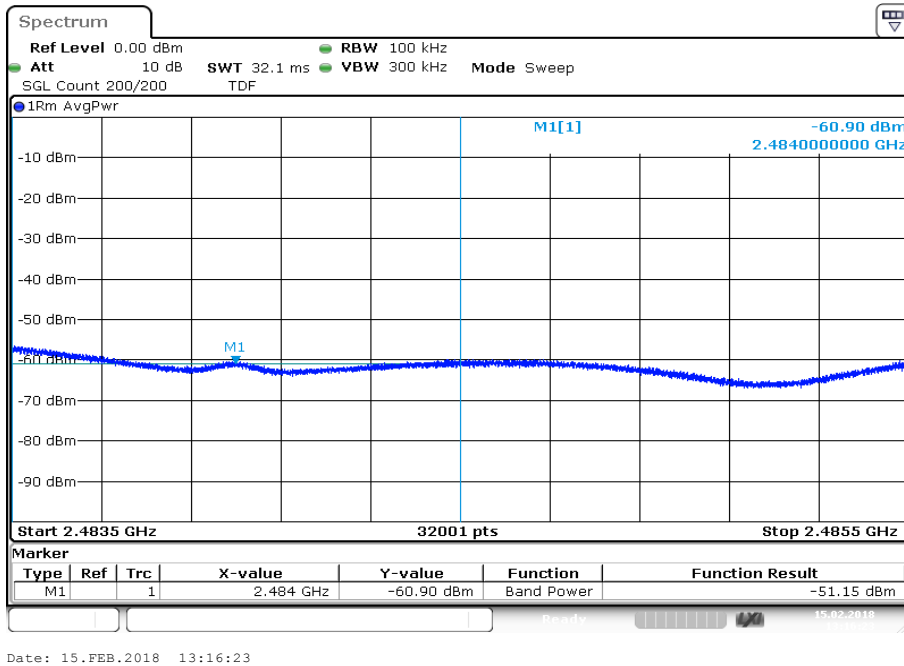
Modulation:	band edge compliance / dBm			
	DSSS / b – mode	OFDM / g – mode	OFDM / n HT20 – mode	OFDM / n HT40 – mode
Max. lower band edge power conducted	-49.6	-47.6	-45.4	-48.8
Antenna gain / dBi	2.2			
Max. lower band edge power radiated	-47.4	-45.4	-43.2	-46.6
Max. upper band edge power conducted	-51.2	-46.2	-43.4	-42.7
Antenna gain / dBi	1.2			
Max. upper band edge power radiated	-50.0	-45.0	-42.2	-41.5

Plots: DSSS / b – mode

Plot 1: Lower band edge

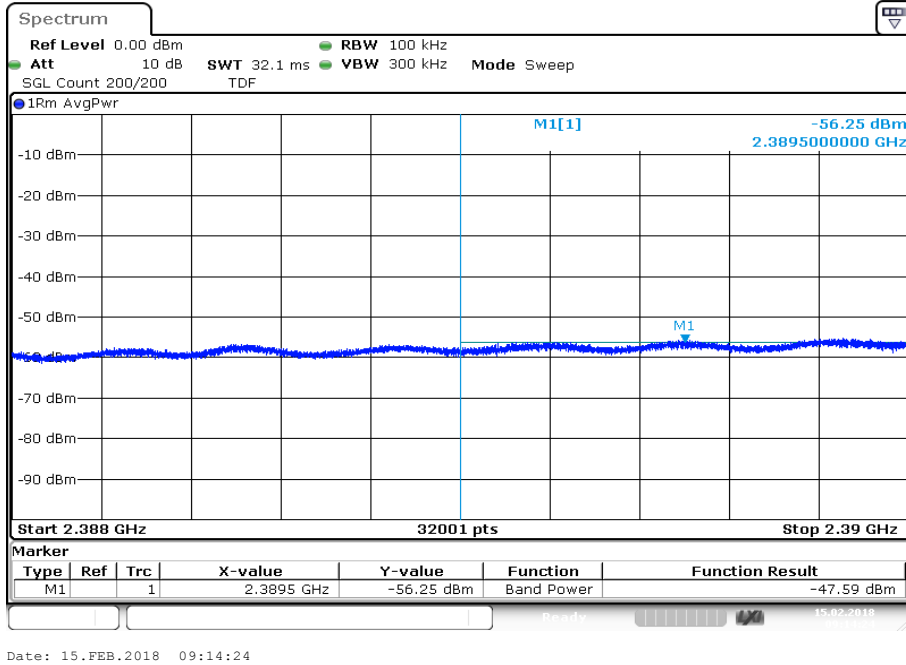


Plot 2: Upper band edge

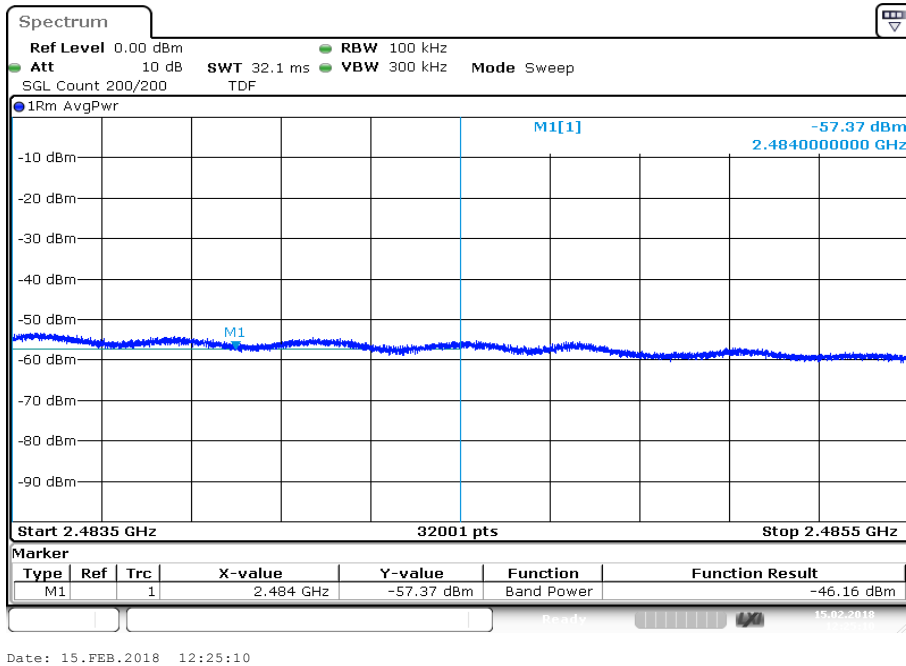


Plots: OFDM / g – mode

Plot 1: Lower band edge

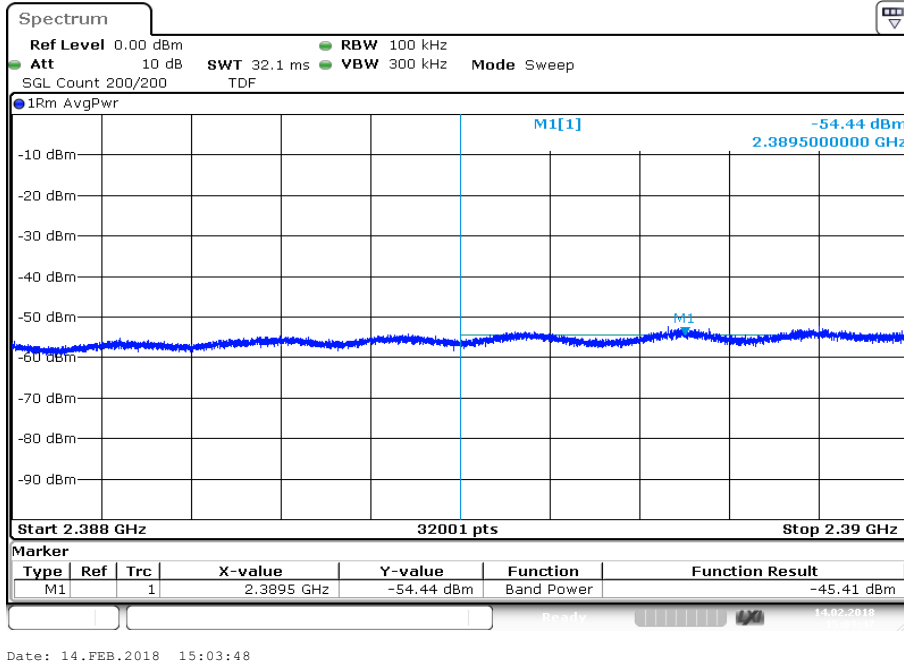


Plot 2: Upper band edge

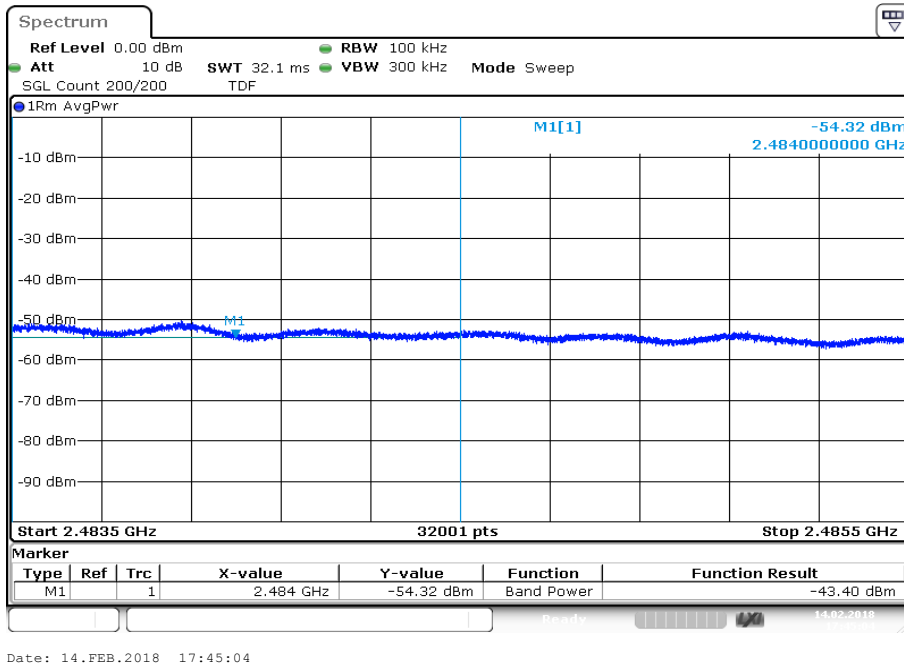


Plots: OFDM / n HT20 – mode

Plot 1: Lower band edge

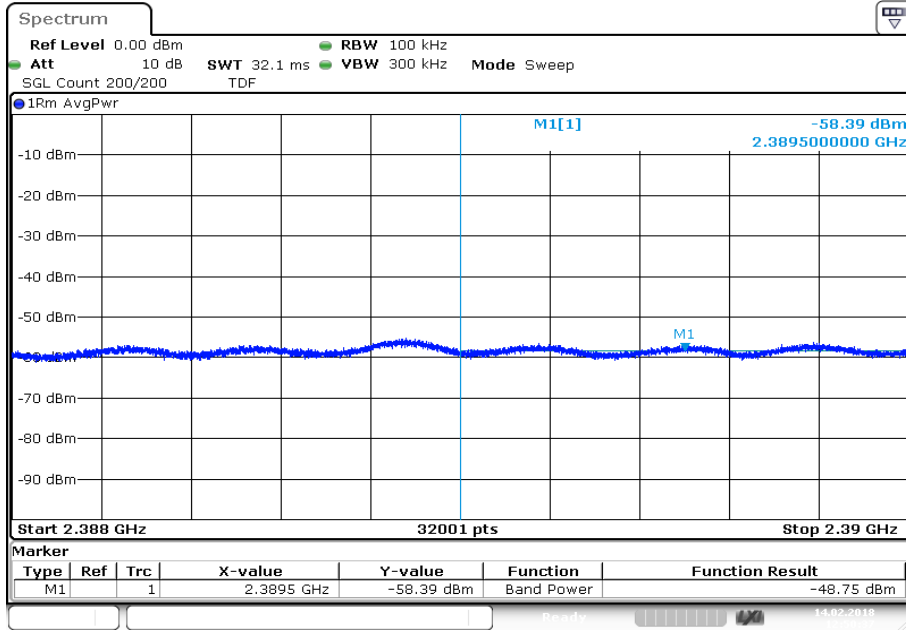


Plot 2: Upper band edge



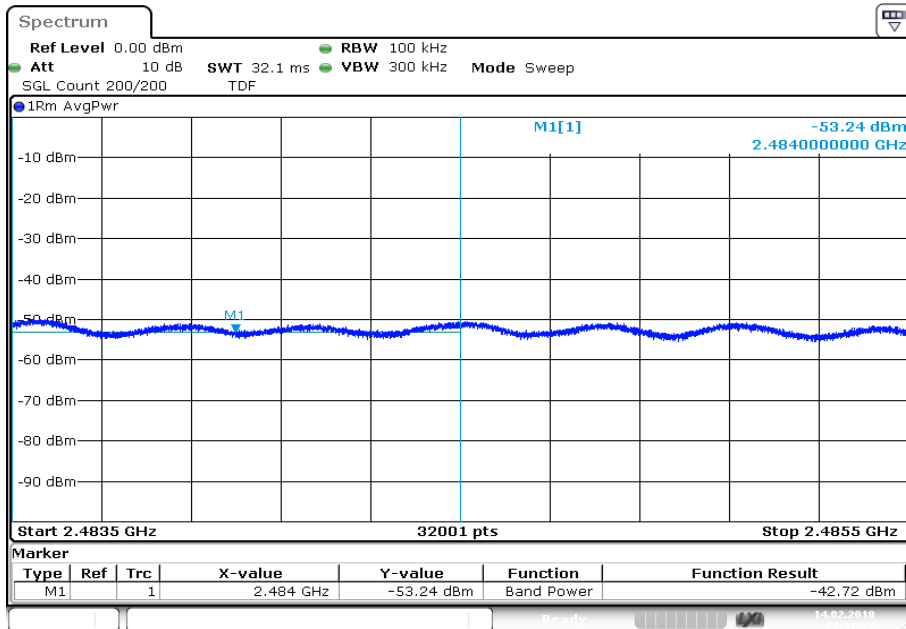
Plots: OFDM / n HT40 – mode

Plot 1: Lower band edge



Date: 14.FEB.2018 12:50:37

Plot 2: Upper band edge



Date: 14.FEB.2018 14:31:27

12.10 Spurious emissions conducted

Description:

Measurement of the conducted spurious emissions in transmit mode. The measurement is performed at the lowest; the middle and the highest channel. The measurement is repeated for all modulations.

Measurement:

Measurement parameter	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	100 kHz
Video bandwidth	500 kHz
Span	9 kHz to 25 GHz
Trace mode	Max Hold
Test setup	See chapter 6.5 A
Measurement uncertainty	See chapter 8

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	

Results: DSSS / b – mode

TX spurious emissions conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
Channel 1		1.4	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 6		1.2	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 11		1.9	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant

Results: OFDM / g – mode

TX spurious emissions conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
Channel 1		-7.3	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 2		-5.0	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 3		-5.5	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 4		-2.7	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 5		-2.4	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 6		-1.6	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 7		-2.7	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 8		-1.9	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 9		-4.5	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 10		-4.4	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 11		-8.1	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant

Results: OFDM / n HT20 – mode

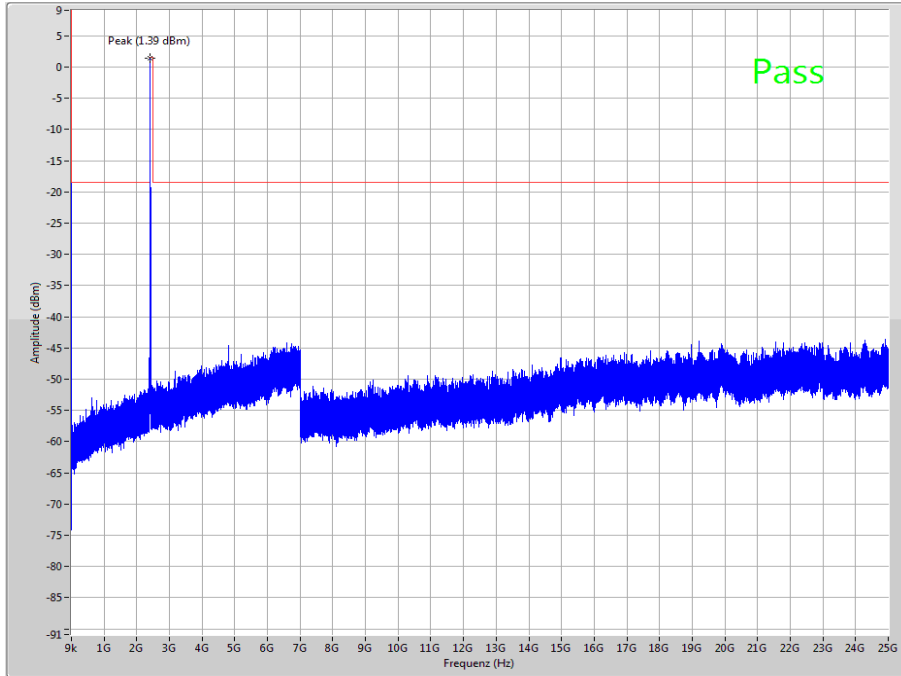
TX spurious emissions conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
Channel 1		-7.2	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 2		-4.4	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 3		-5.4	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 4		-2.6	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 5		-2.2	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 6		-0.8	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 7		-2.2	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 8		-3.3	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 9		-4.1	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 10		-4.5	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 11		-7.2	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant

Results: OFDM / n HT40 – mode

TX spurious emissions conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
Channel 3		-11.5	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 6		-11.8	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
Channel 9		-11.8	30 dBm		Operating frequency
All detected emissions are below the -20 dBc & -30 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant

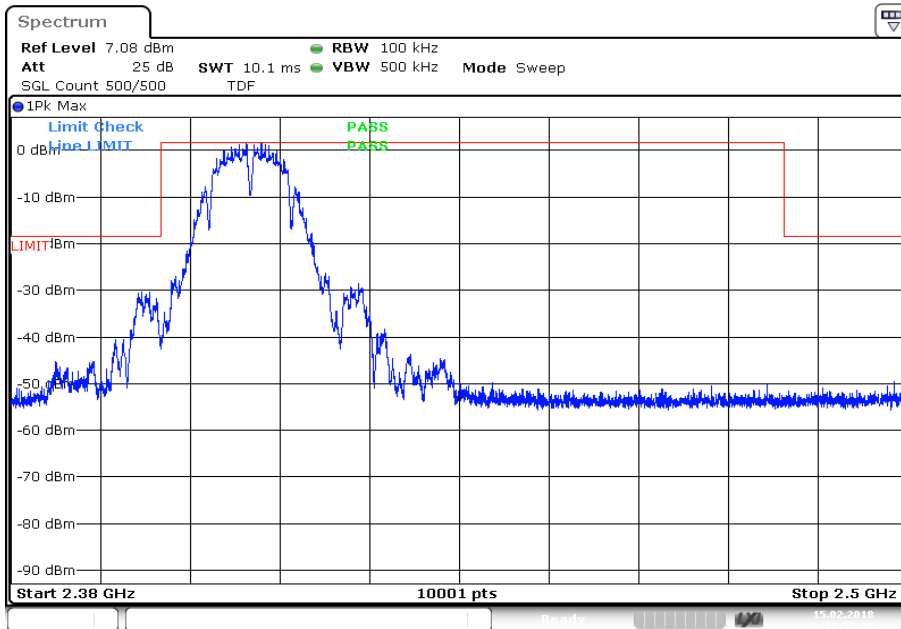
Plots: DSSS / b – mode

Plot 1: Channel 1, up to 25 GHz



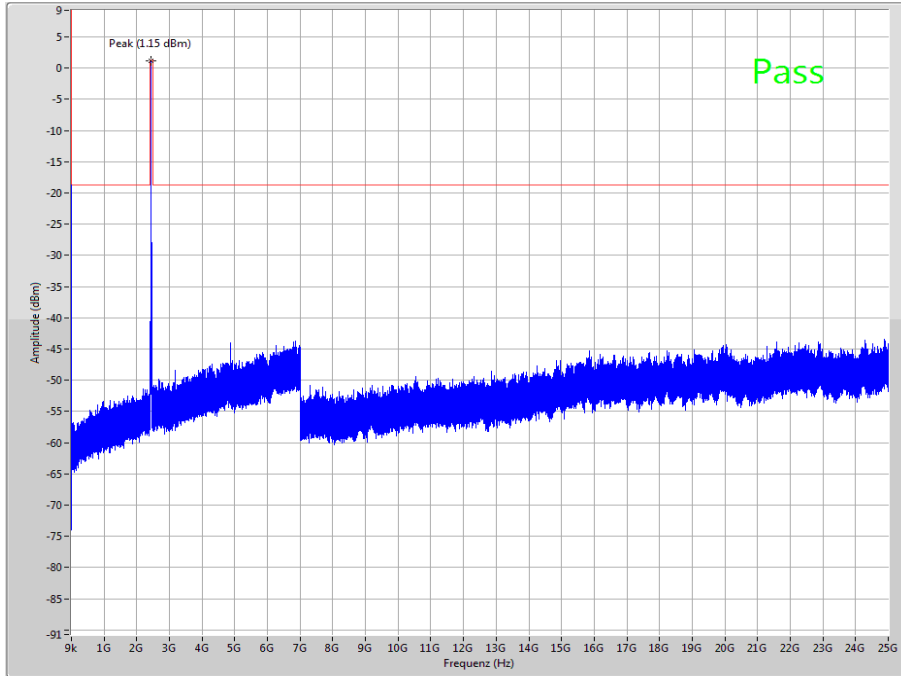
The peak at the beginning of the plot is the LO from the SA.

Plot 2: Channel 1, zoomed carrier



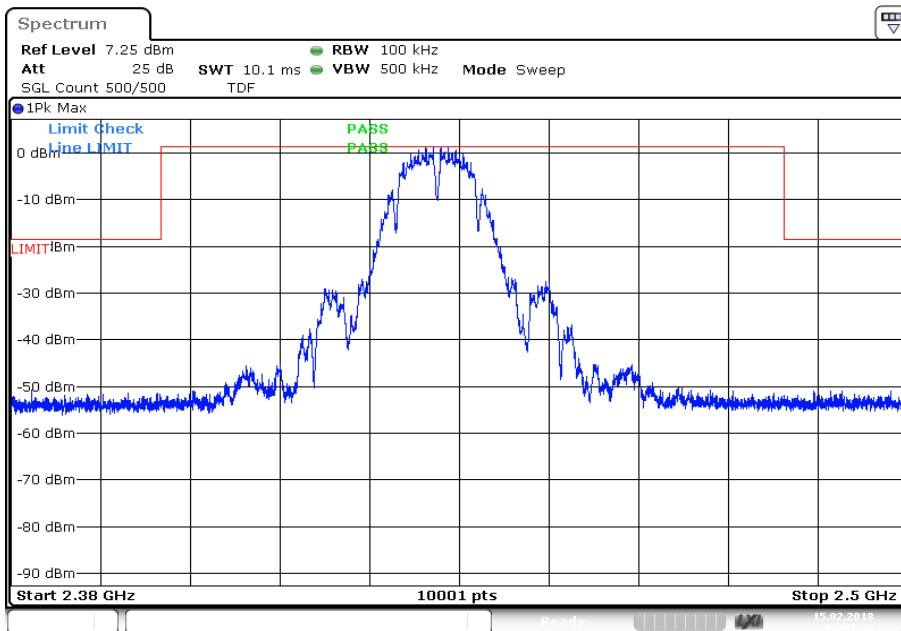
Date: 15.FEB.2018 12:59:18

Plot 3: Channel 6, up to 25 GHz

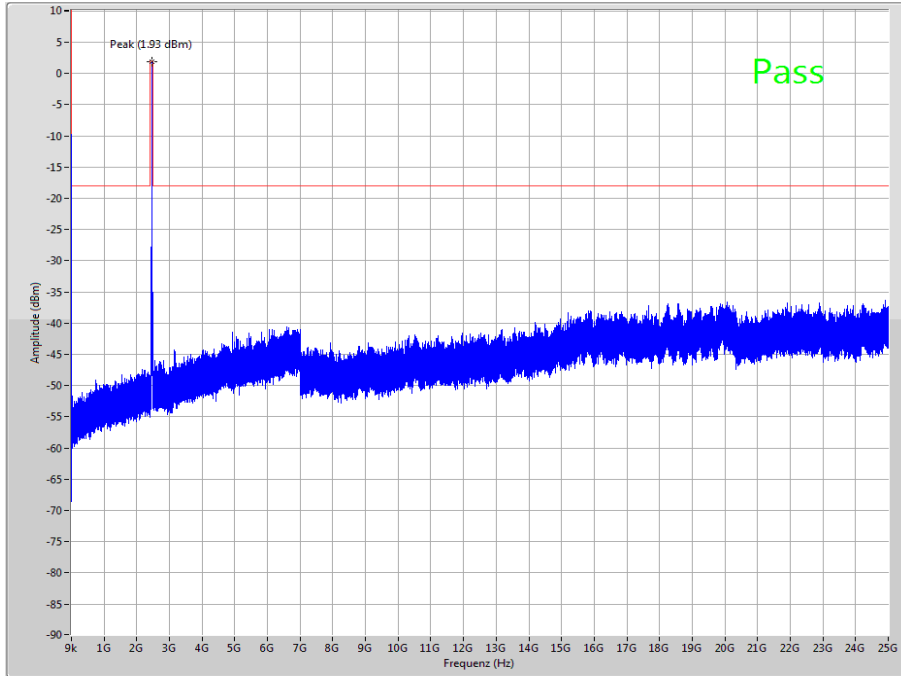


The peak at the beginning of the plot is the LO from the SA.

Plot 4: Channel 6, zoomed carrier

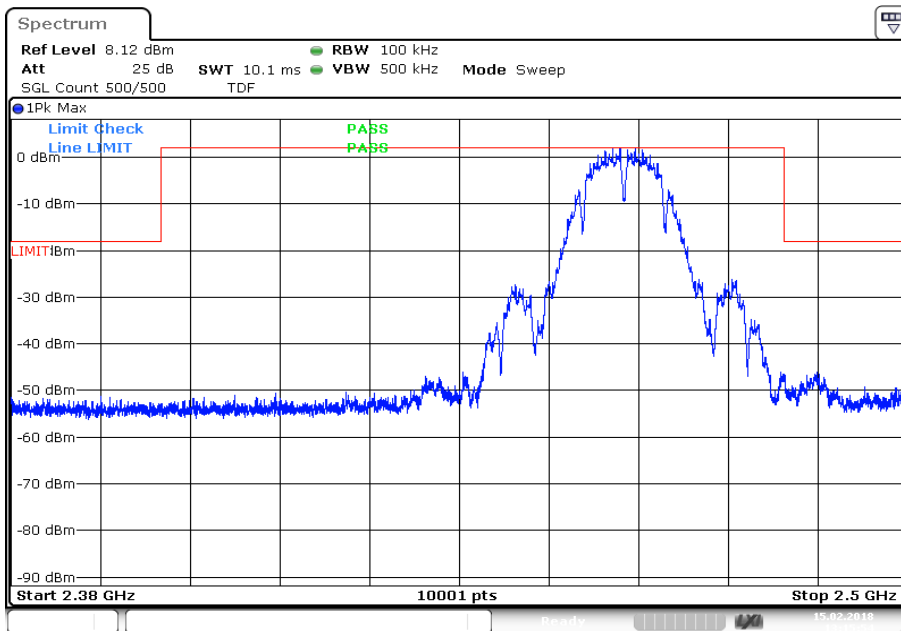


Plot 5: Channel 11, up to 25 GHz



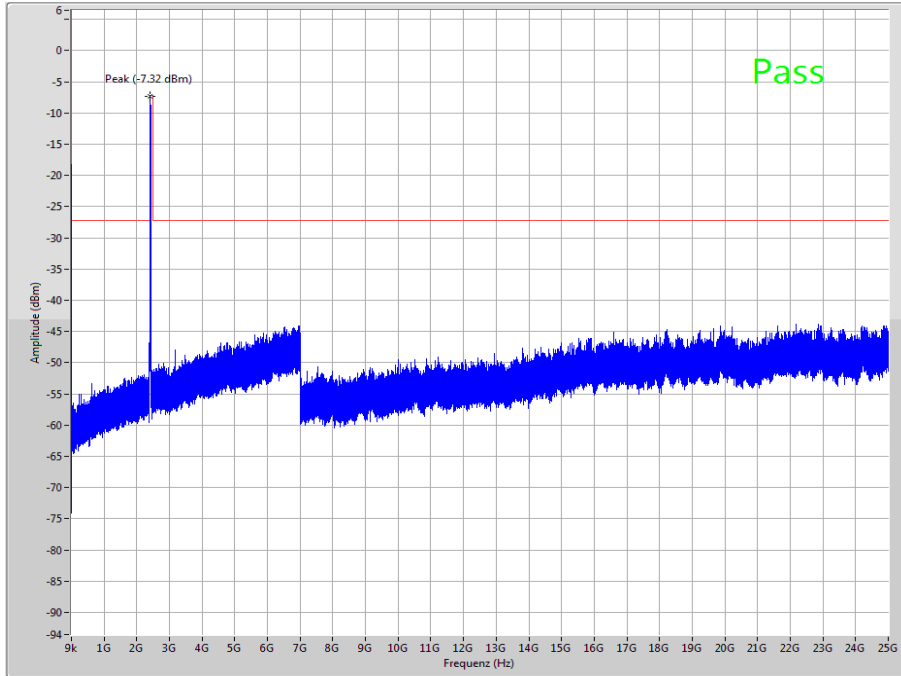
The peak at the beginning of the plot is the LO from the SA.

Plot 6: Channel 11, zoomed carrier



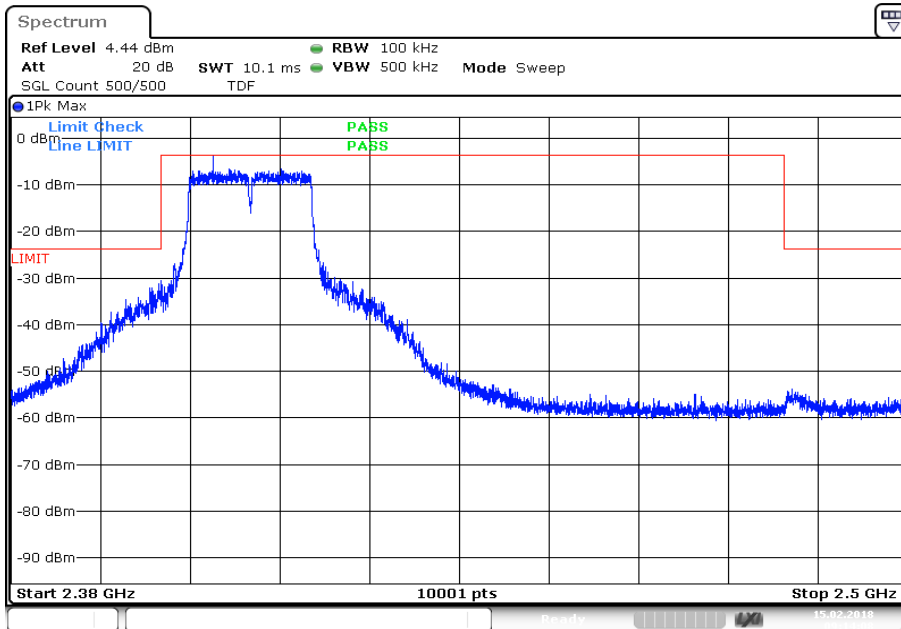
Plots: OFDM / g – mode

Plot 1: Channel 1, up to 25 GHz

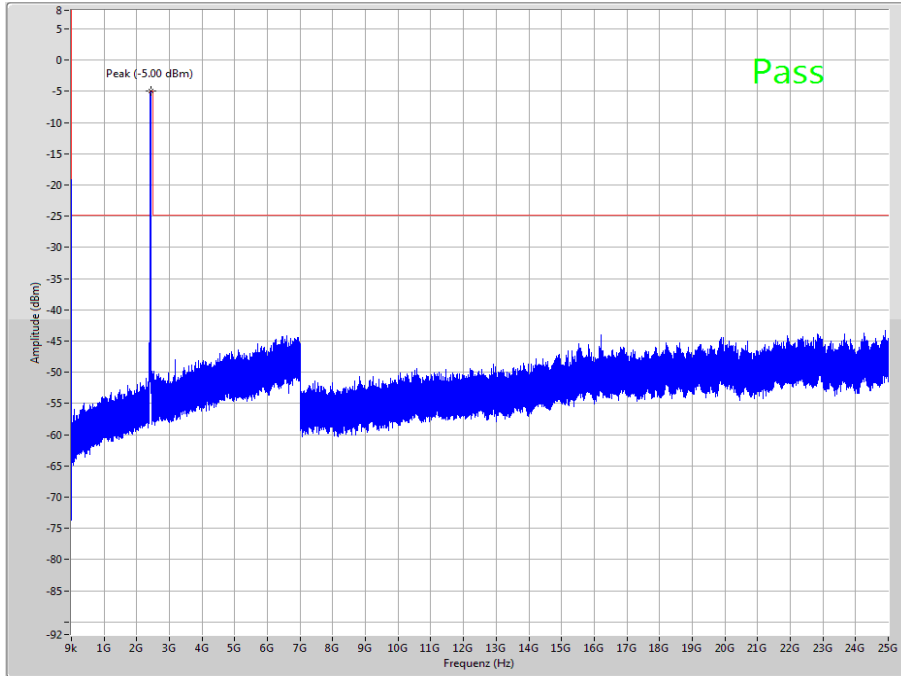


The peak at the beginning of the plot is the LO from the SA.

Plot 2: Channel 1, zoomed carrier

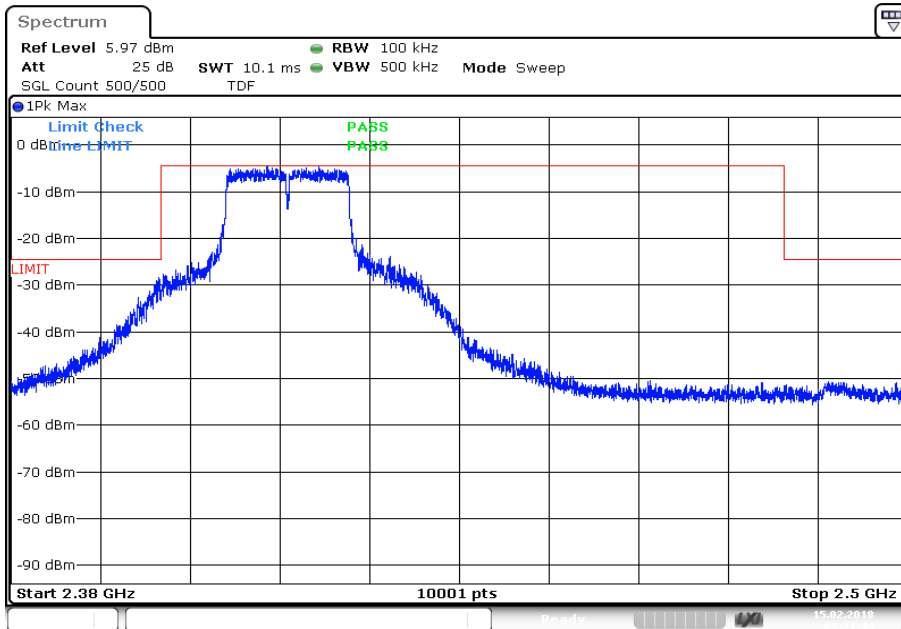


Plot 3: Channel 2, up to 25 GHz

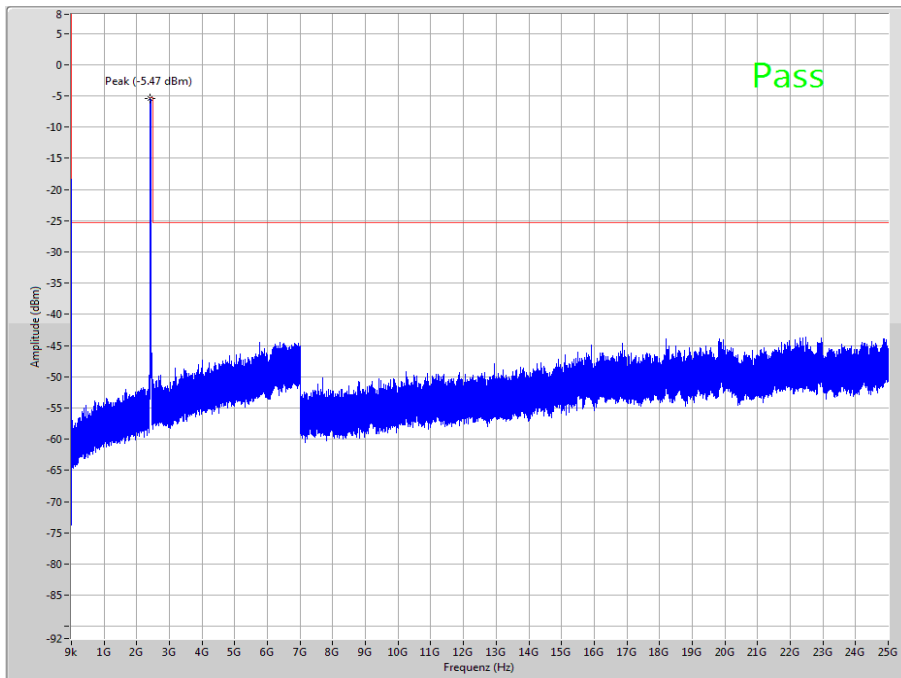


The peak at the beginning of the plot is the LO from the SA.

Plot 4: Channel 2, zoomed carrier

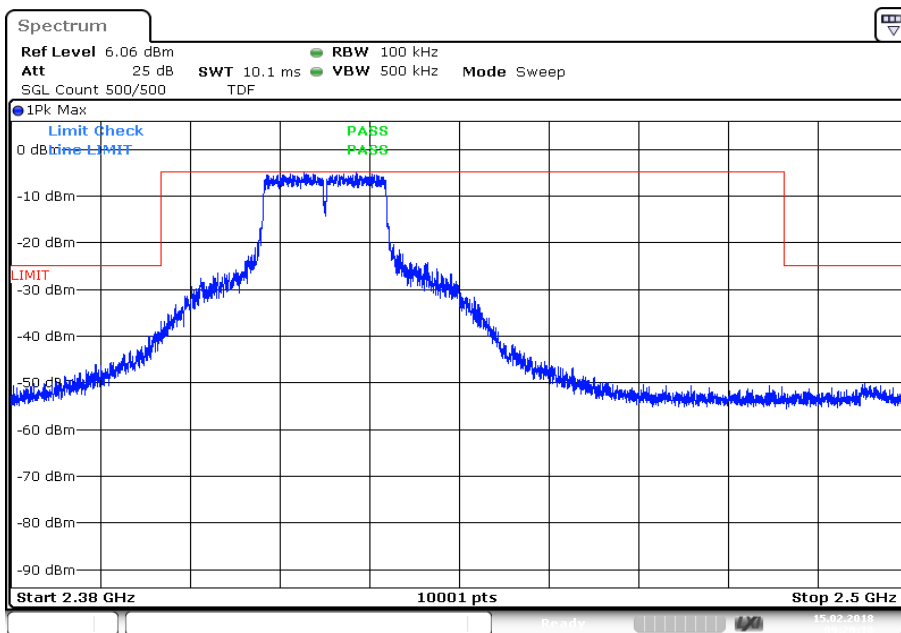


Plot 5: Channel 3, up to 25 GHz

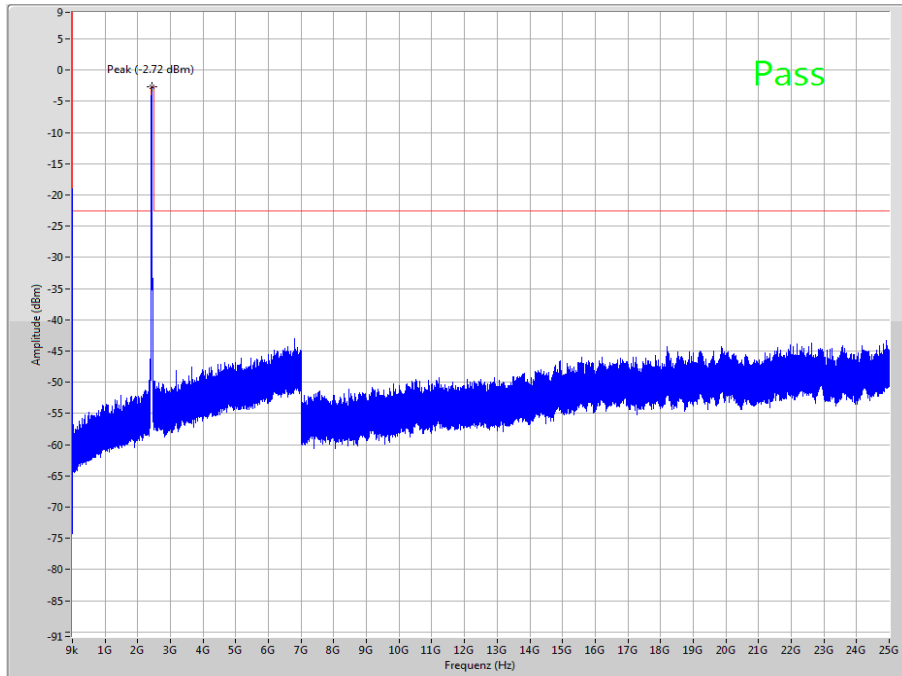


The peak at the beginning of the plot is the LO from the SA.

Plot 6: Channel 3, zoomed carrier

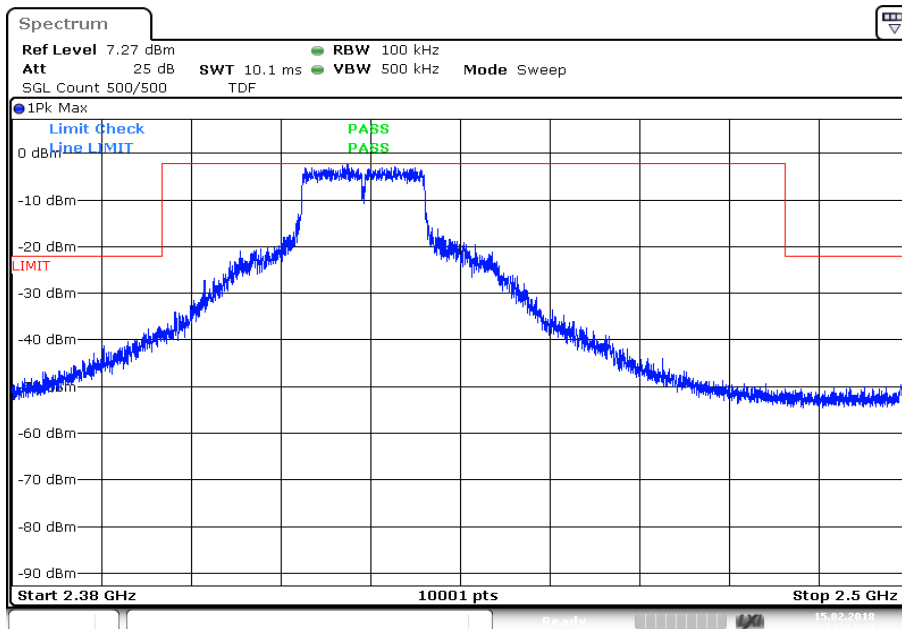


Plot 7: Channel 4, up to 25 GHz



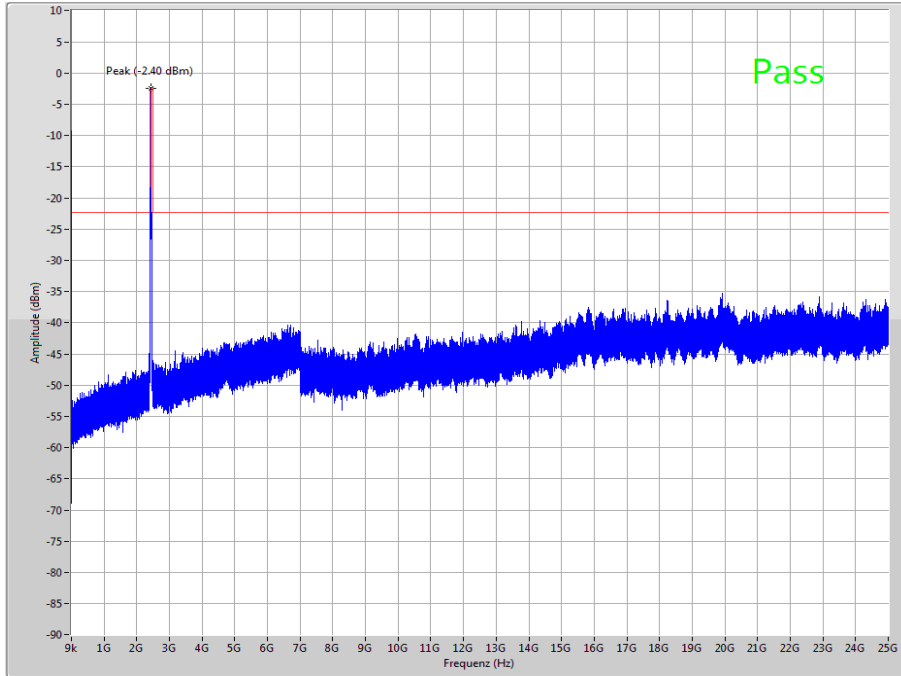
The peak at the beginning of the plot is the LO from the SA.

Plot 8: Channel 4, zoomed carrier



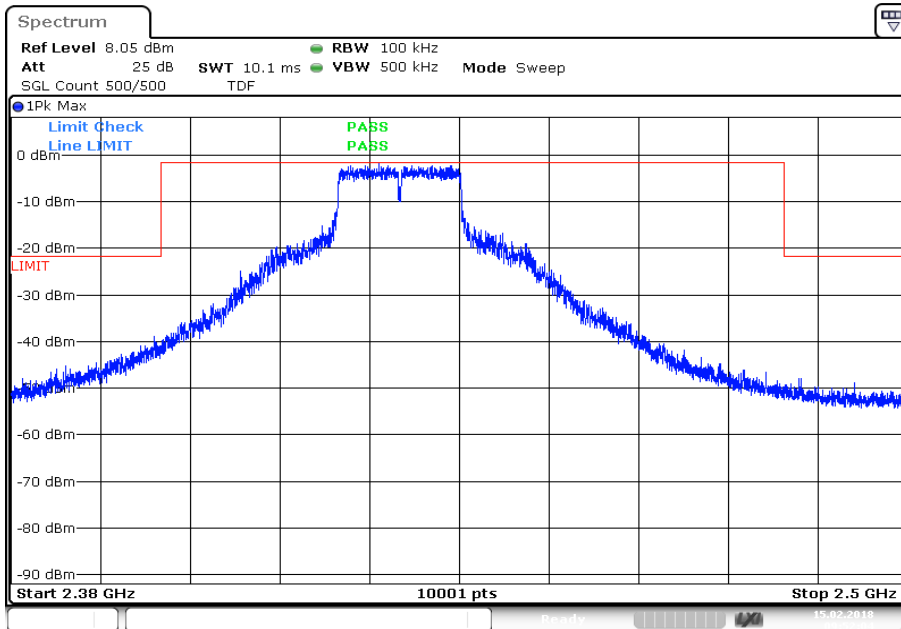
Date: 15.FEB.2018 09:44:23

Plot 9: Channel 5, up to 25 GHz

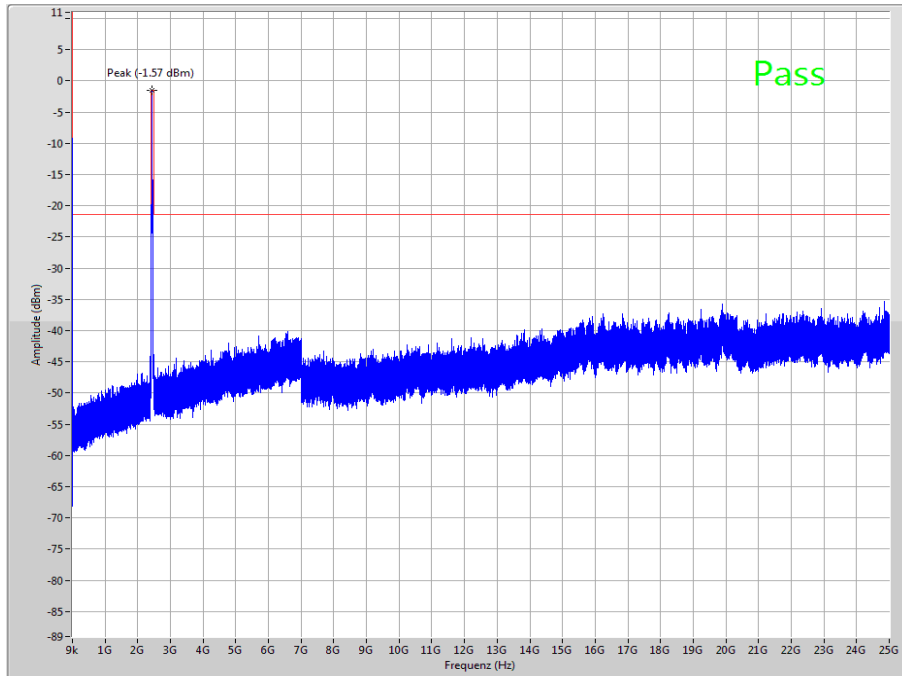


The peak at the beginning of the plot is the LO from the SA.

Plot 10: Channel 5, zoomed carrier

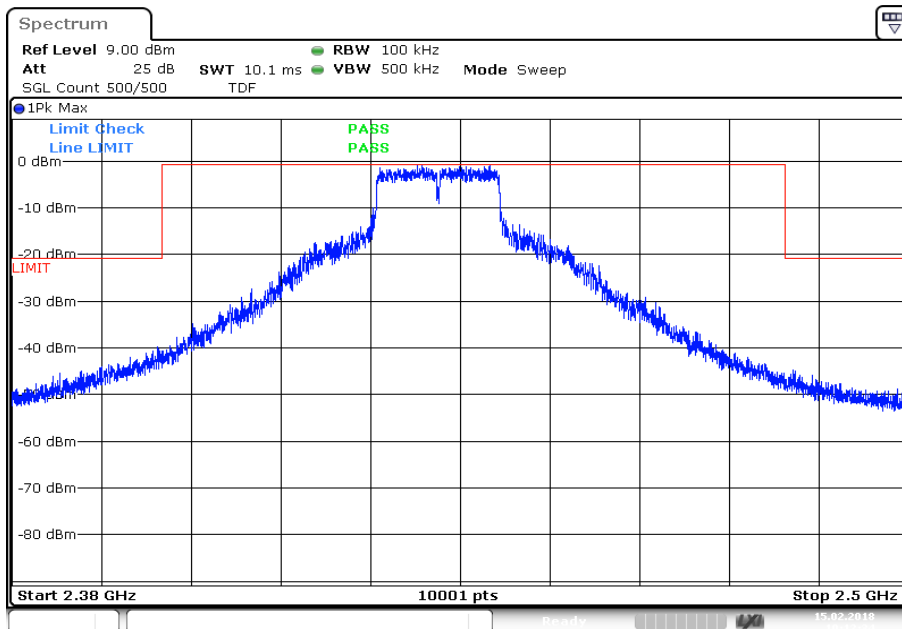


Plot 11: Channel 6, up to 25 GHz



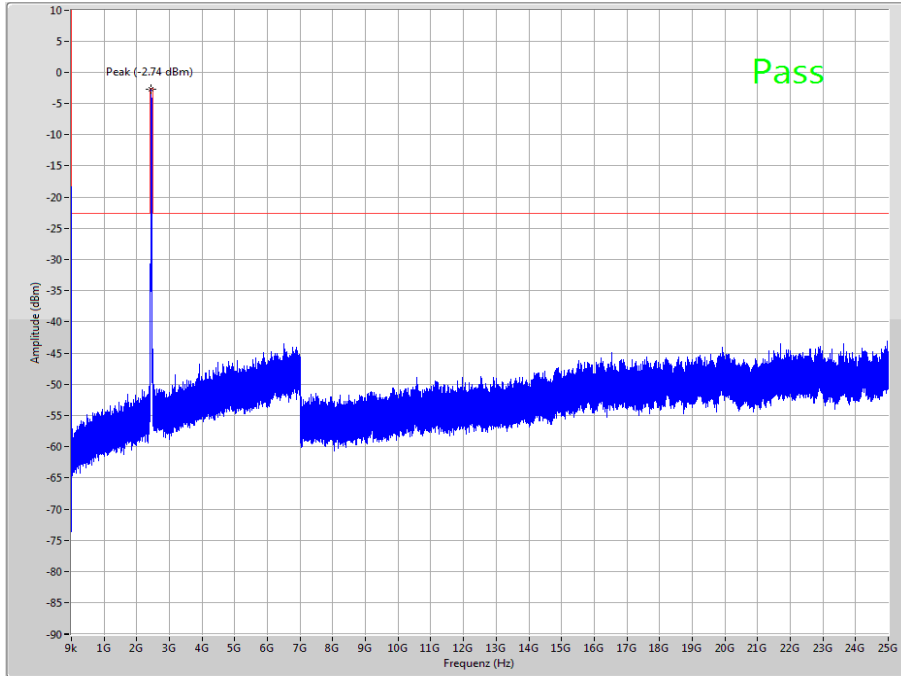
The peak at the beginning of the plot is the LO from the SA.

Plot 12: Channel 6, zoomed carrier



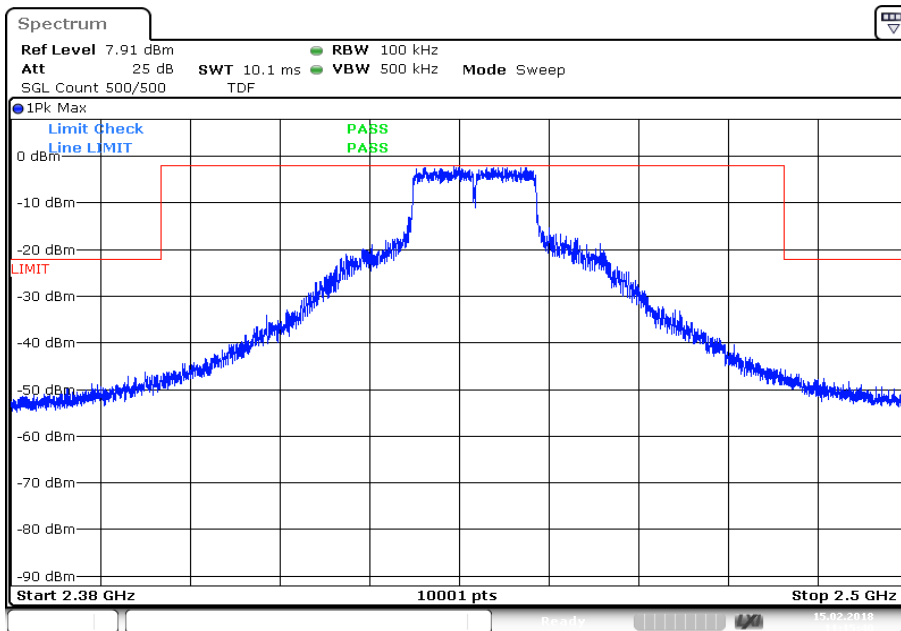
Date: 15.FEB.2018 10:12:33

Plot 13: Channel 7, up to 25 GHz

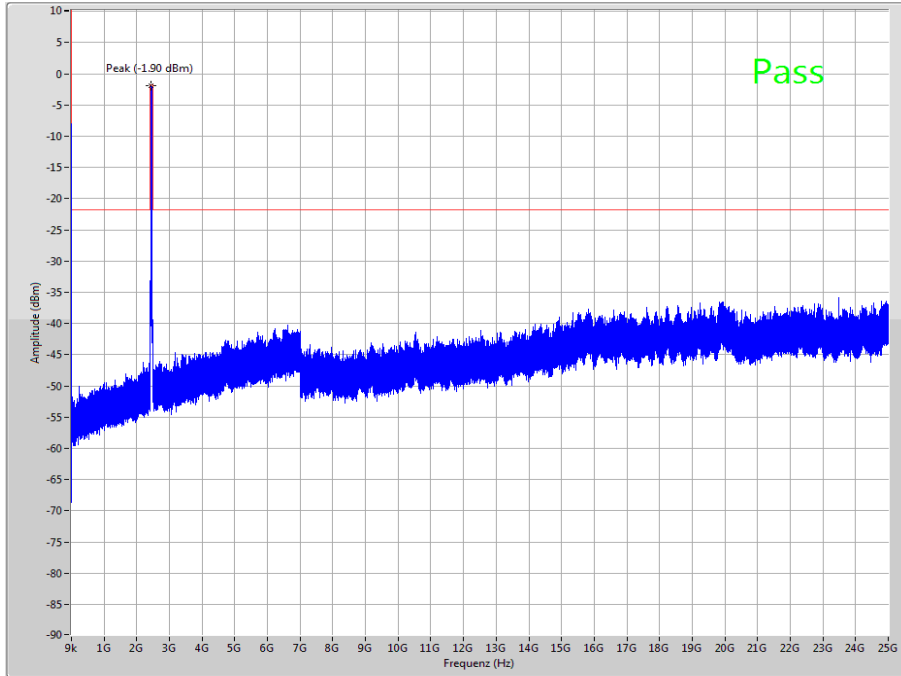


The peak at the beginning of the plot is the LO from the SA.

Plot 14: Channel 7, zoomed carrier

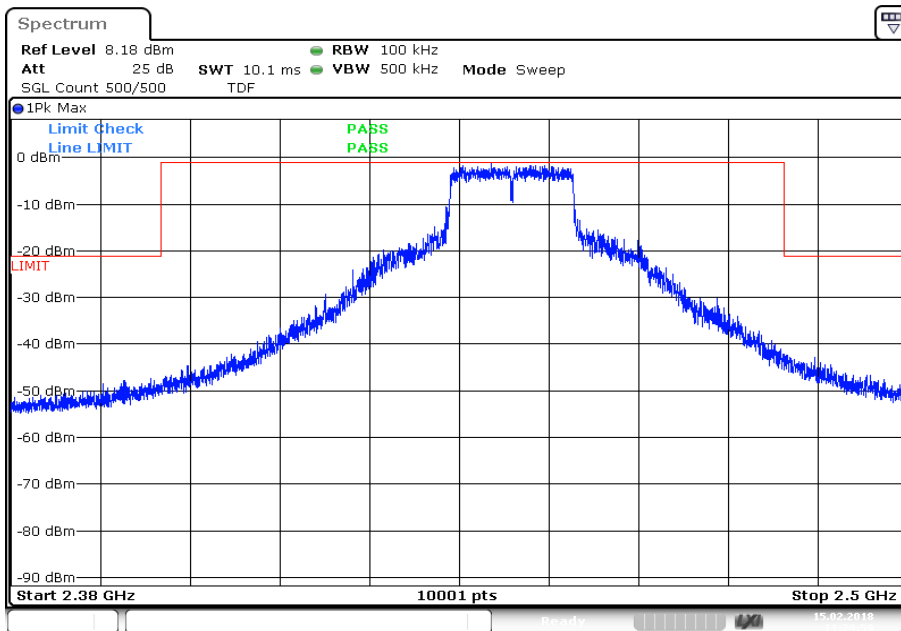


Plot 15: Channel 8, up to 25 GHz



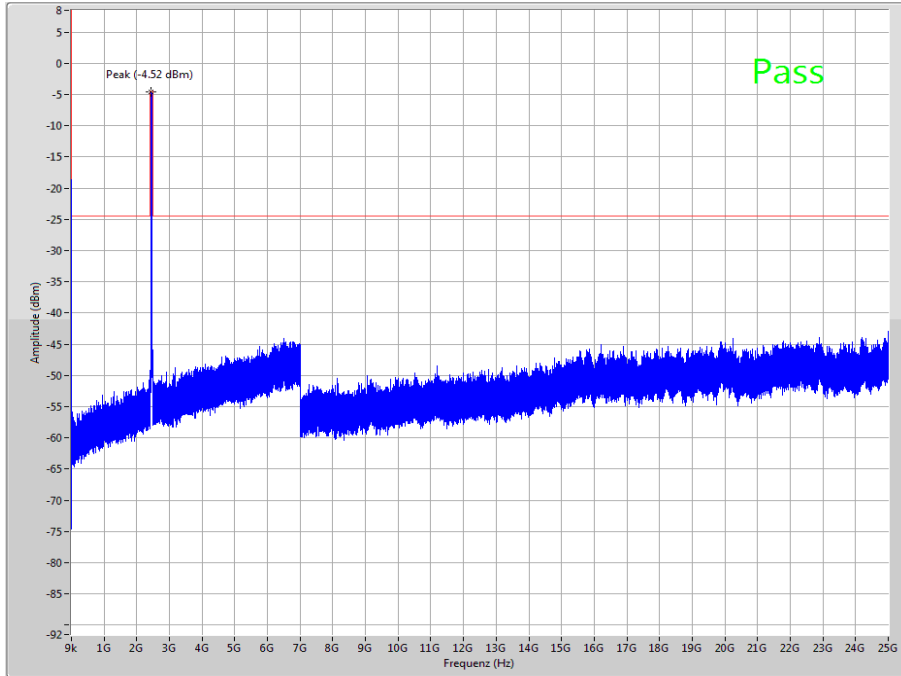
The peak at the beginning of the plot is the LO from the SA.

Plot 16: Channel 8, zoomed carrier



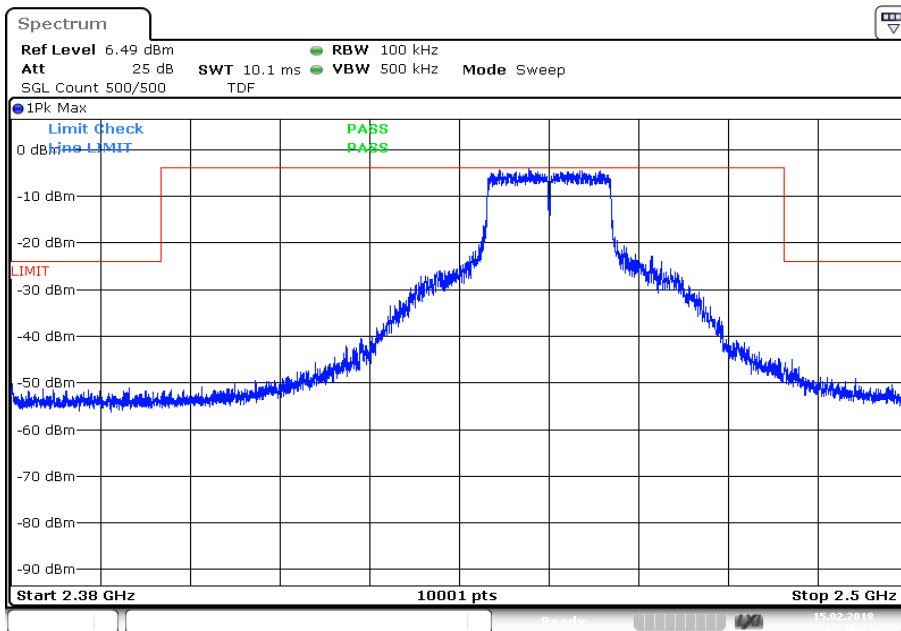
Date: 15.FEB.2018 11:29:59

Plot 17: Channel 9, up to 25 GHz



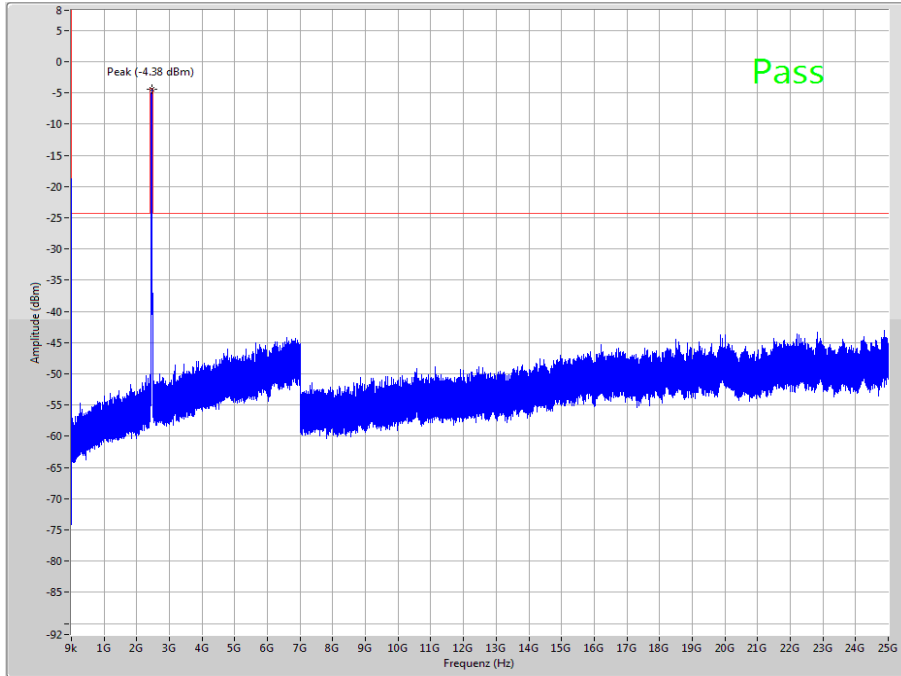
The peak at the beginning of the plot is the LO from the SA.

Plot 18: Channel 9, zoomed carrier



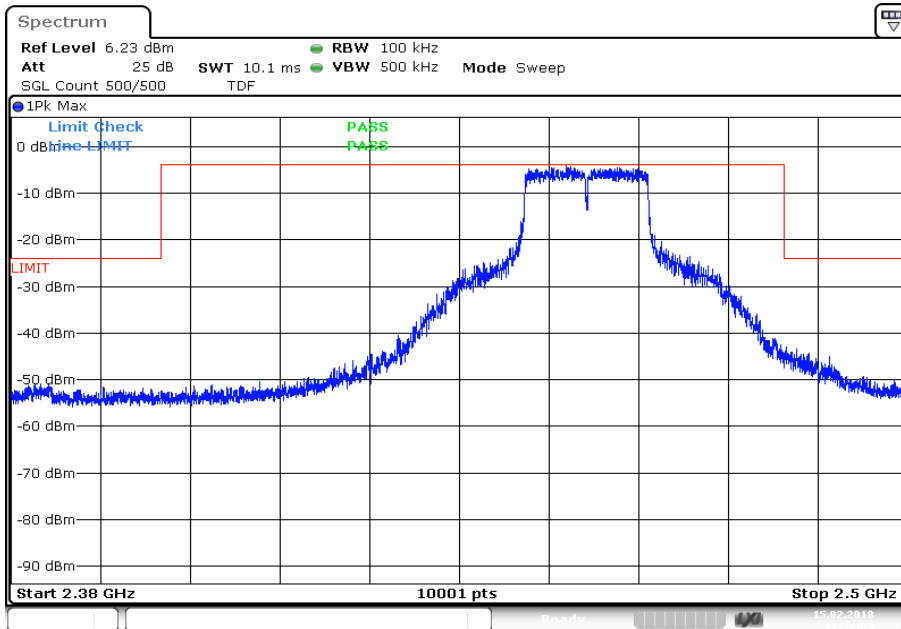
Date: 15.FEB.2018 13:30:14

Plot 19: Channel 10, up to 25 GHz

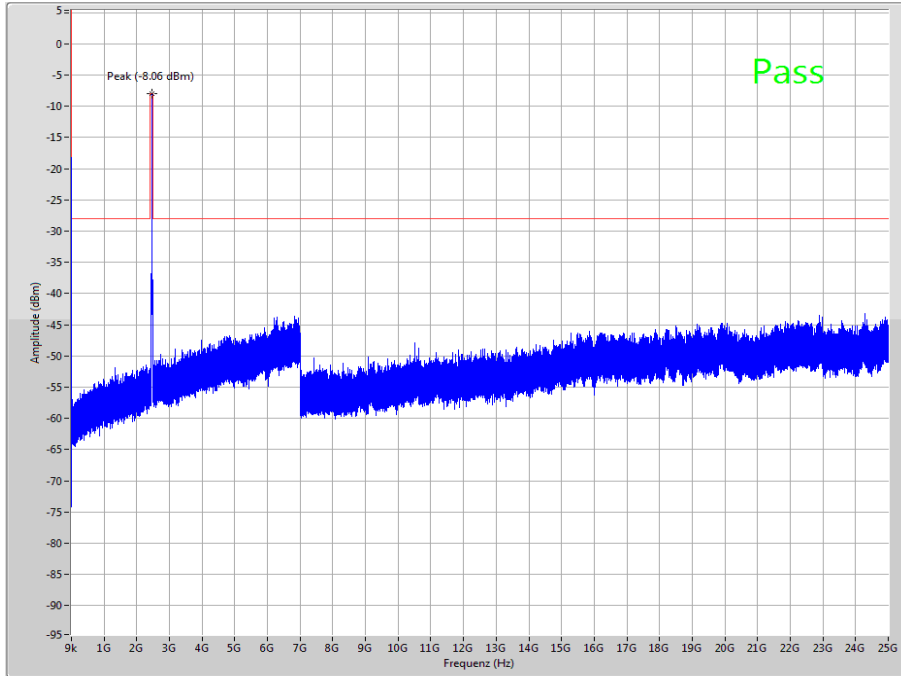


The peak at the beginning of the plot is the LO from the SA.

Plot 20: Channel 10, zoomed carrier

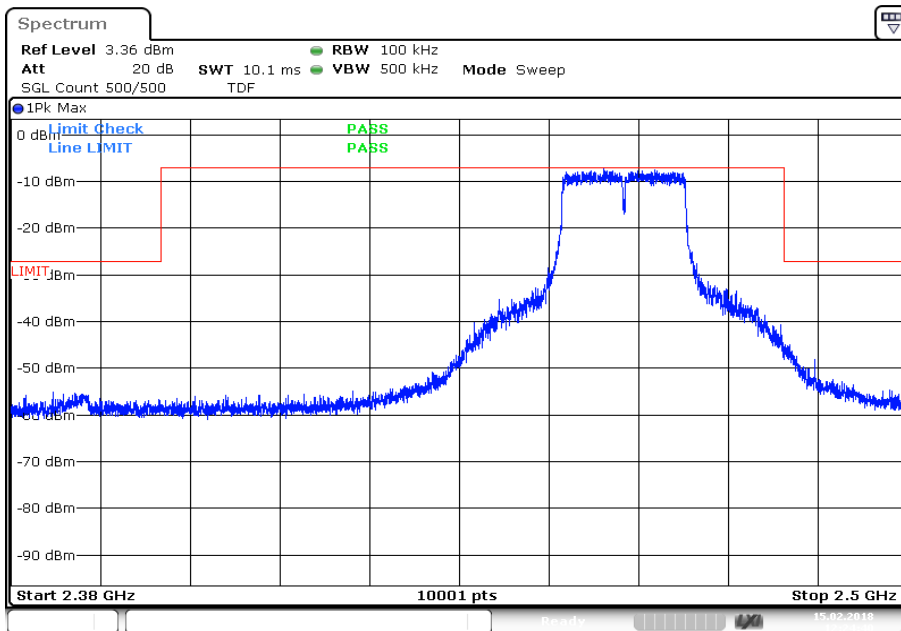


Plot 21: Channel 11, up to 25 GHz



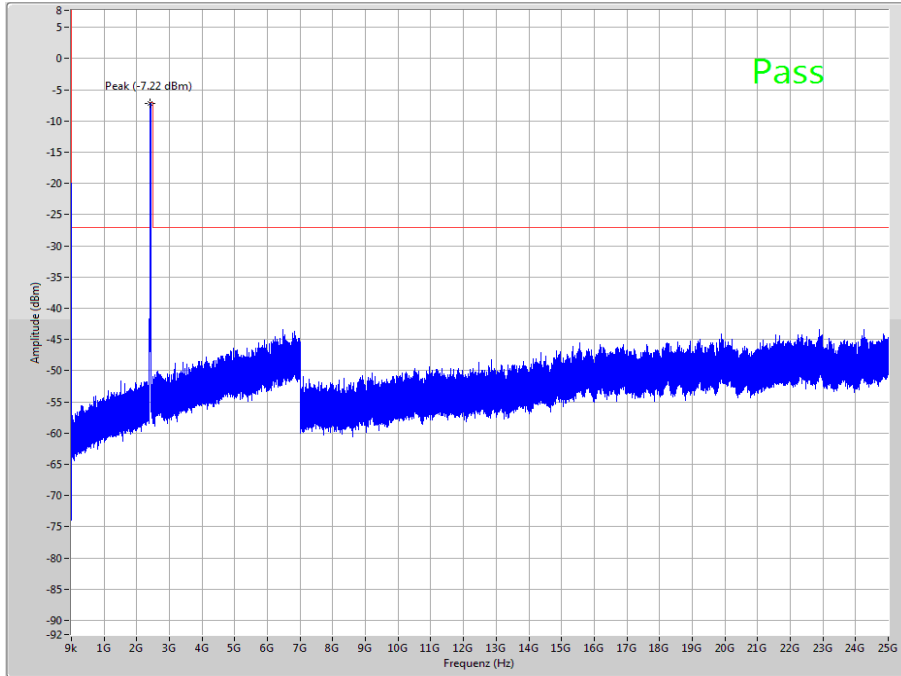
The peak at the beginning of the plot is the LO from the SA.

Plot 22: Channel 11, zoomed carrier



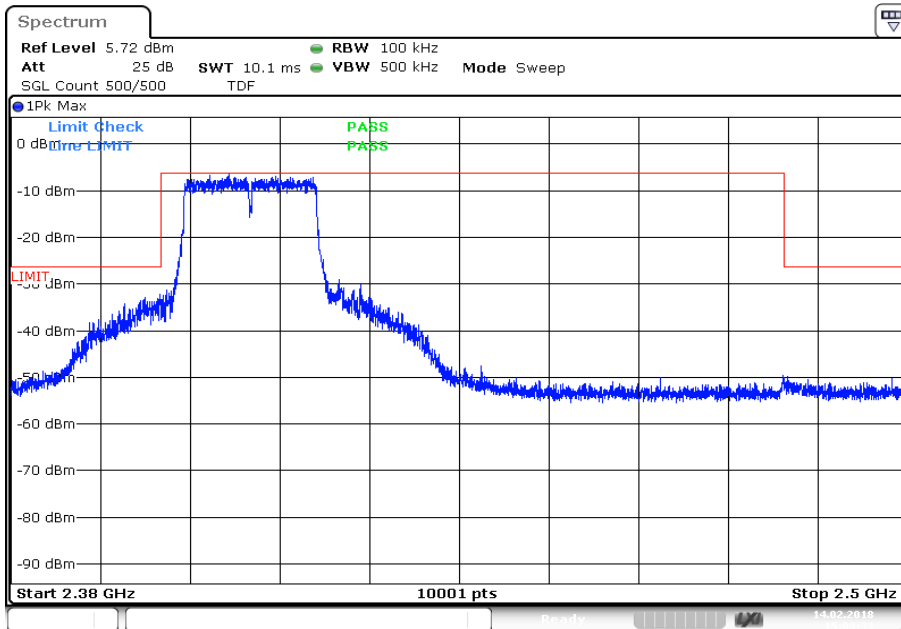
Plots: OFDM / n HT 20 – mode

Plot 1: Channel 1, up to 25 GHz

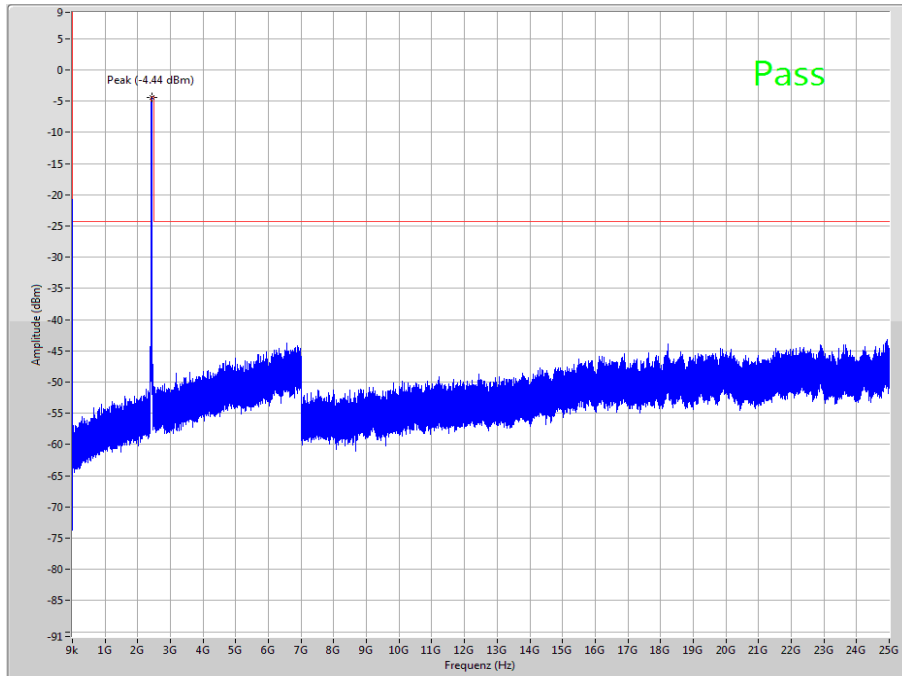


The peak at the beginning of the plot is the LO from the SA.

Plot 2: Channel 1, zoomed carrier

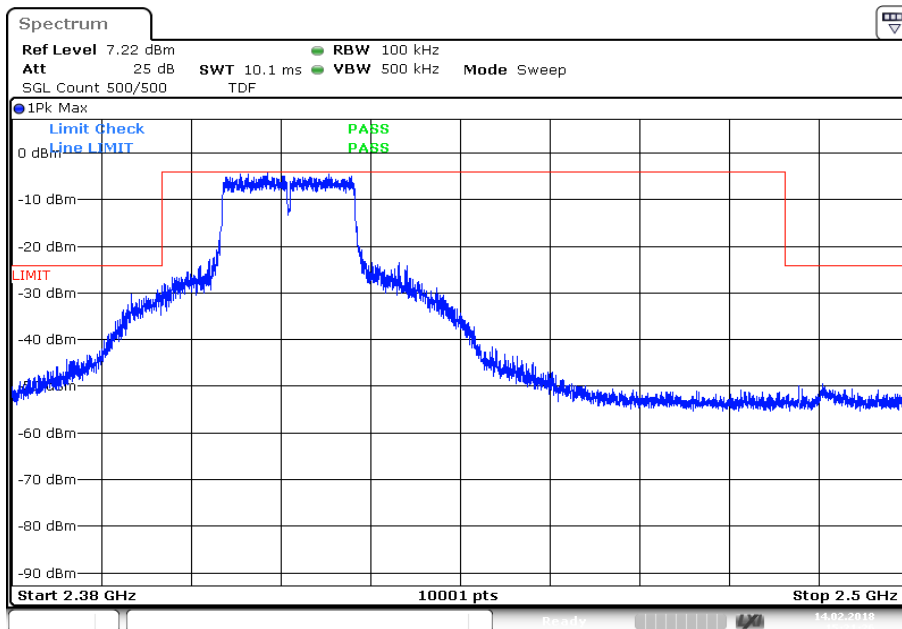


Plot 3: Channel 2, up to 25 GHz

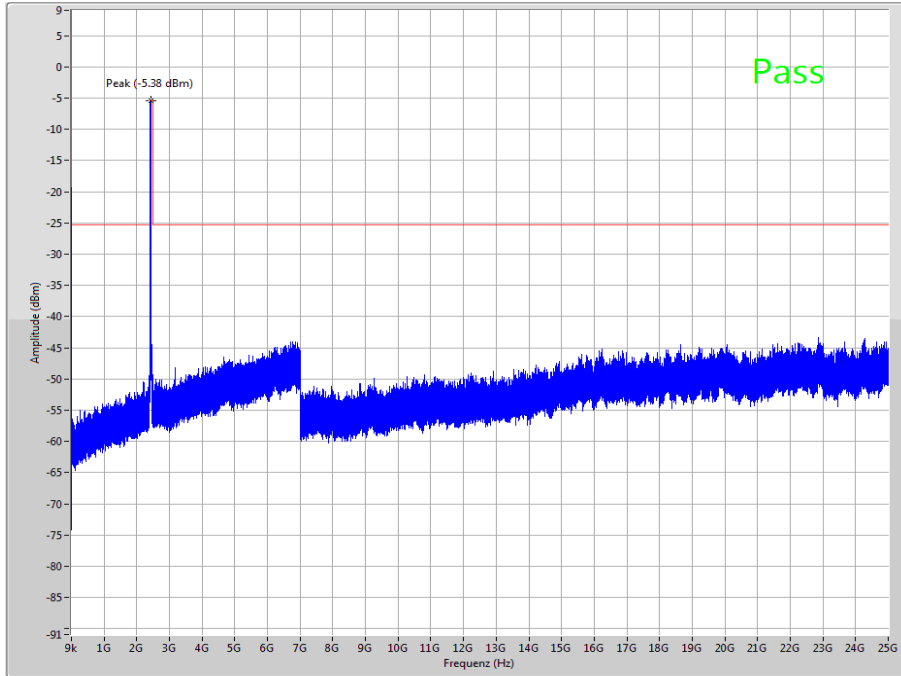


The peak at the beginning of the plot is the LO from the SA.

Plot 4: Channel 2, zoomed carrier

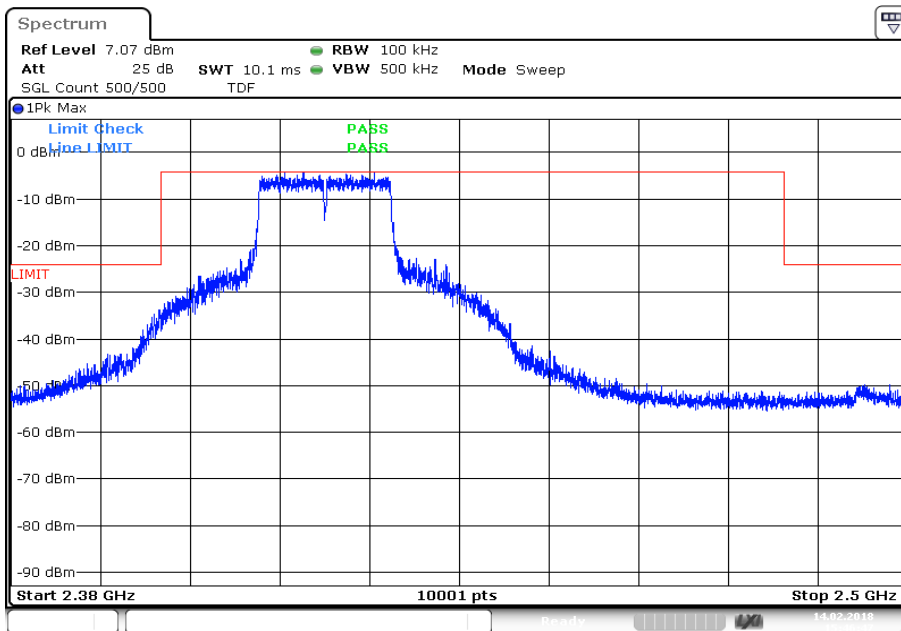


Plot 5: Channel 3, up to 25 GHz



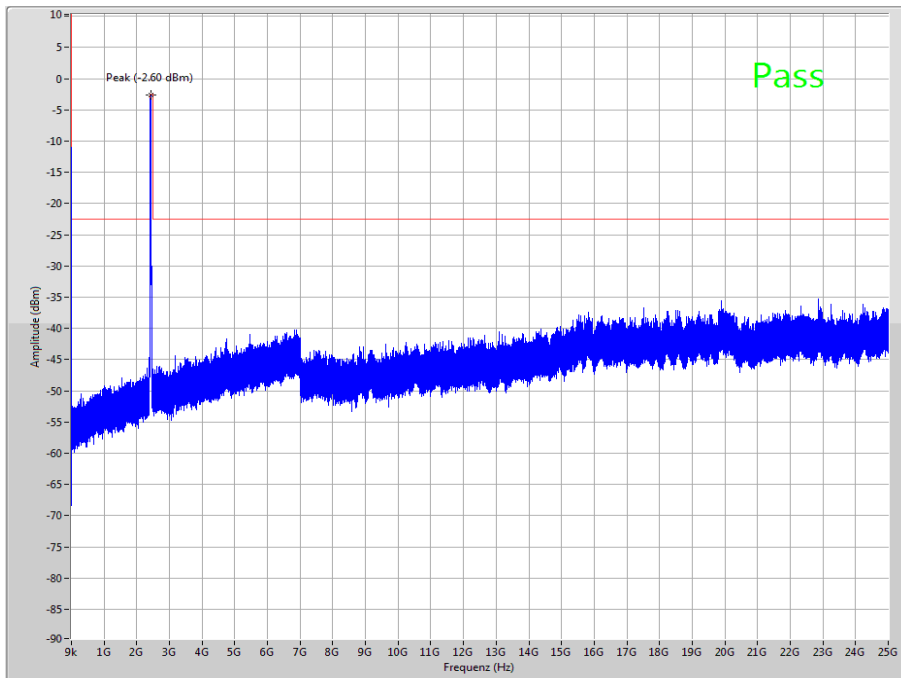
The peak at the beginning of the plot is the LO from the SA.

Plot 6: Channel 3, zoomed carrier



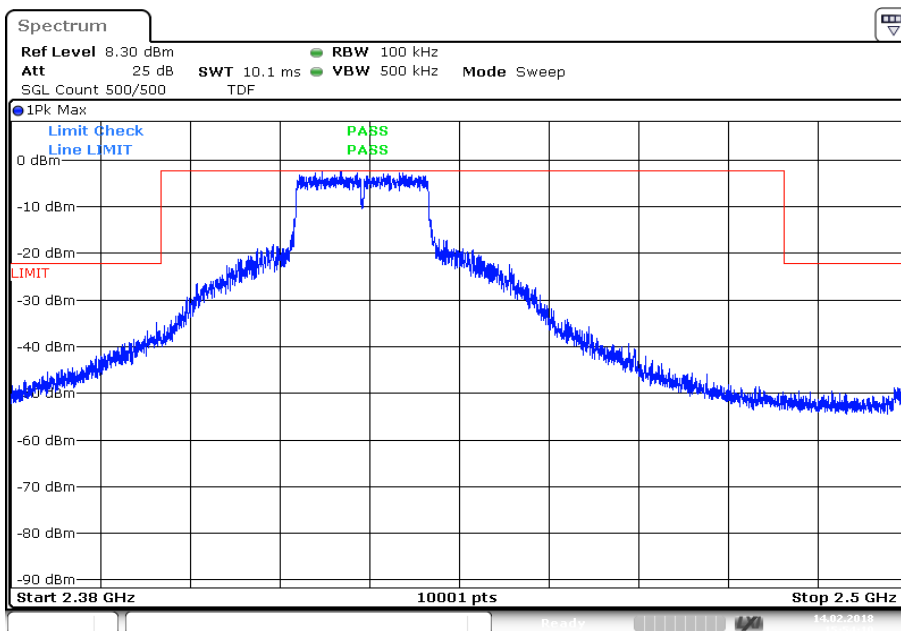
Date: 14.FEB.2018 15:46:48

Plot 7: Channel 4, up to 25 GHz

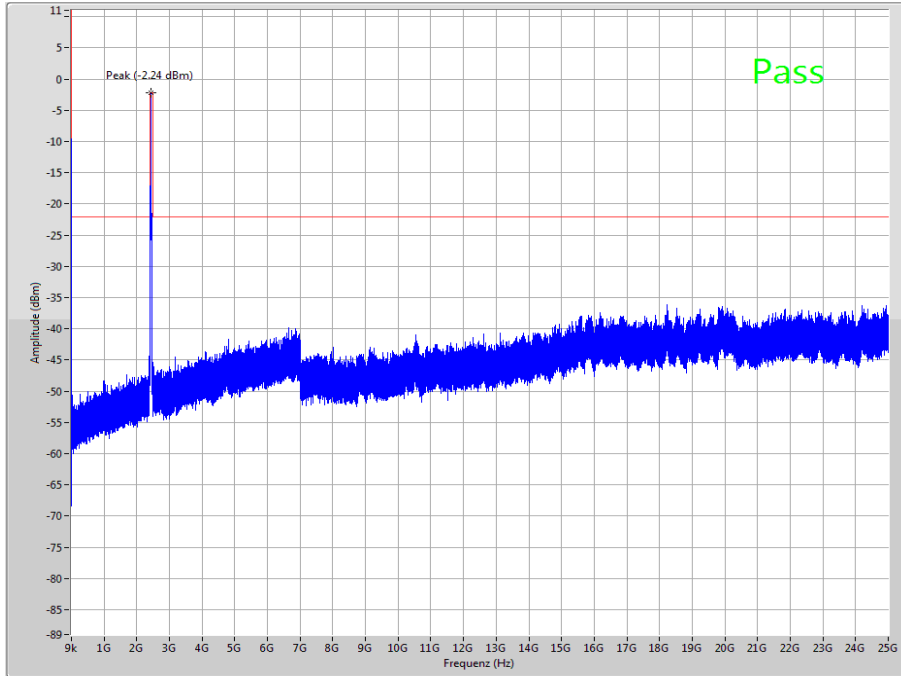


The peak at the beginning of the plot is the LO from the SA.

Plot 8: Channel 4, zoomed carrier

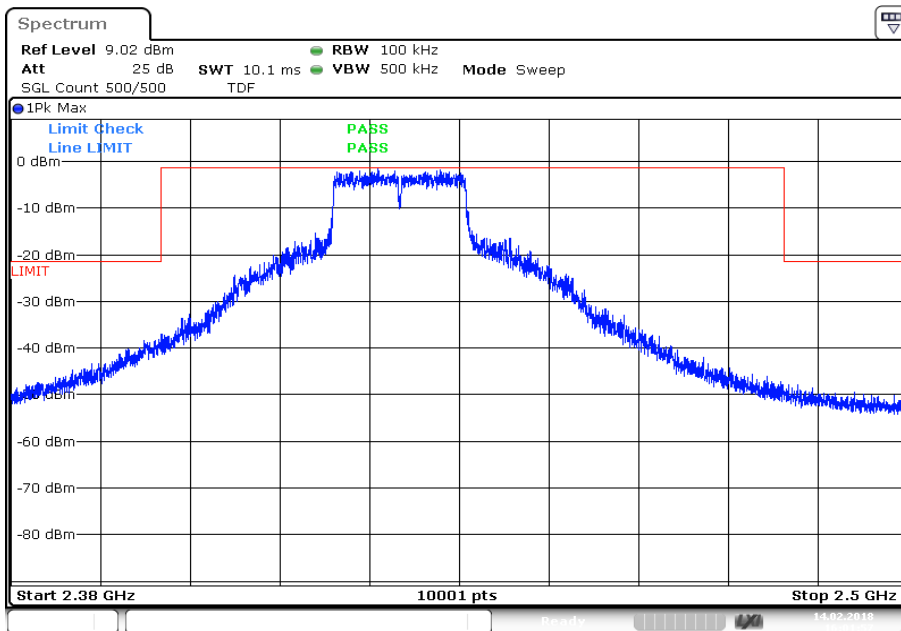


Plot 9: Channel 5, up to 25 GHz

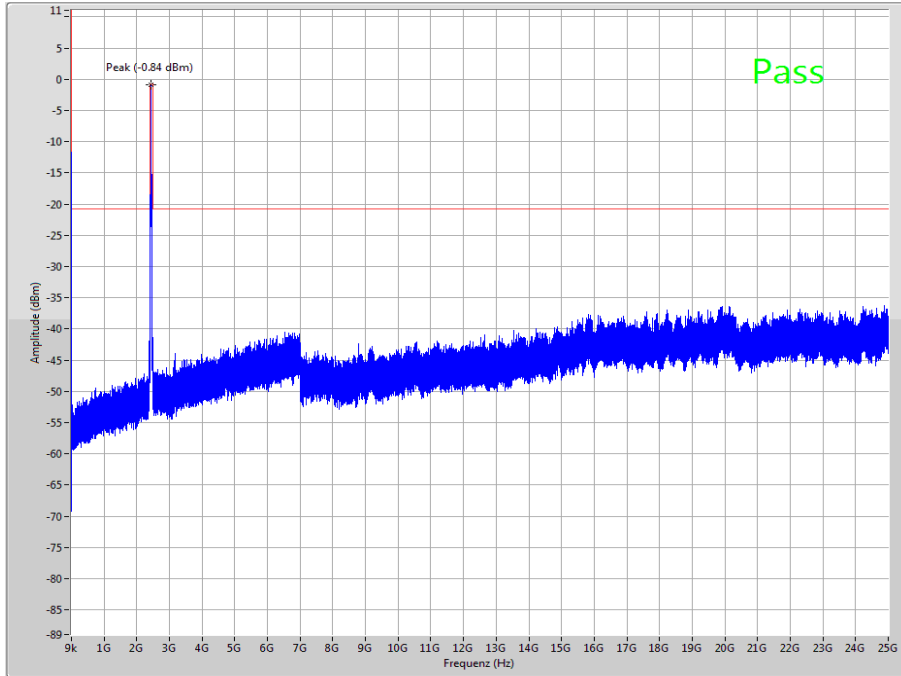


The peak at the beginning of the plot is the LO from the SA.

Plot 10: Channel 5, zoomed carrier

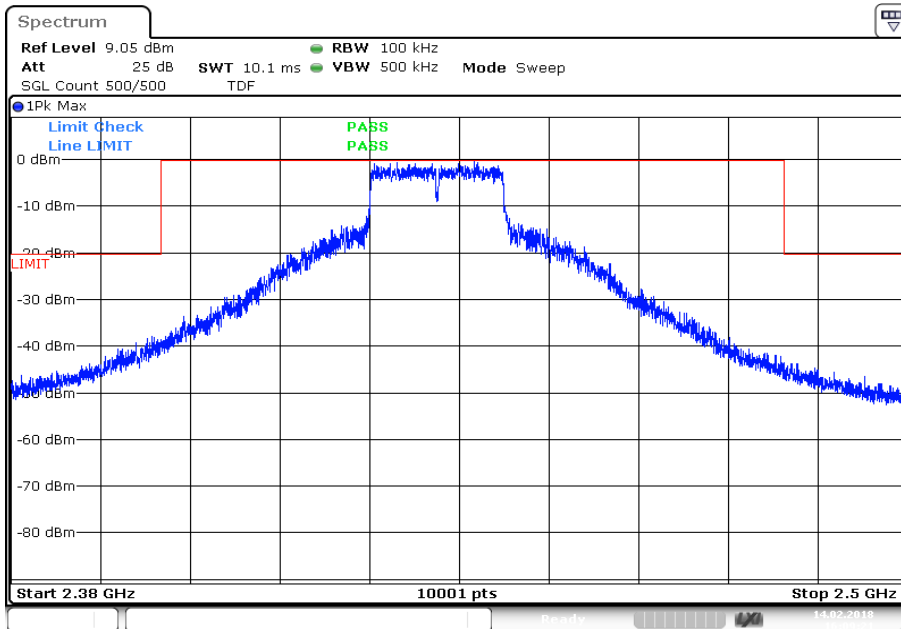


Plot 11: Channel 6, up to 25 GHz

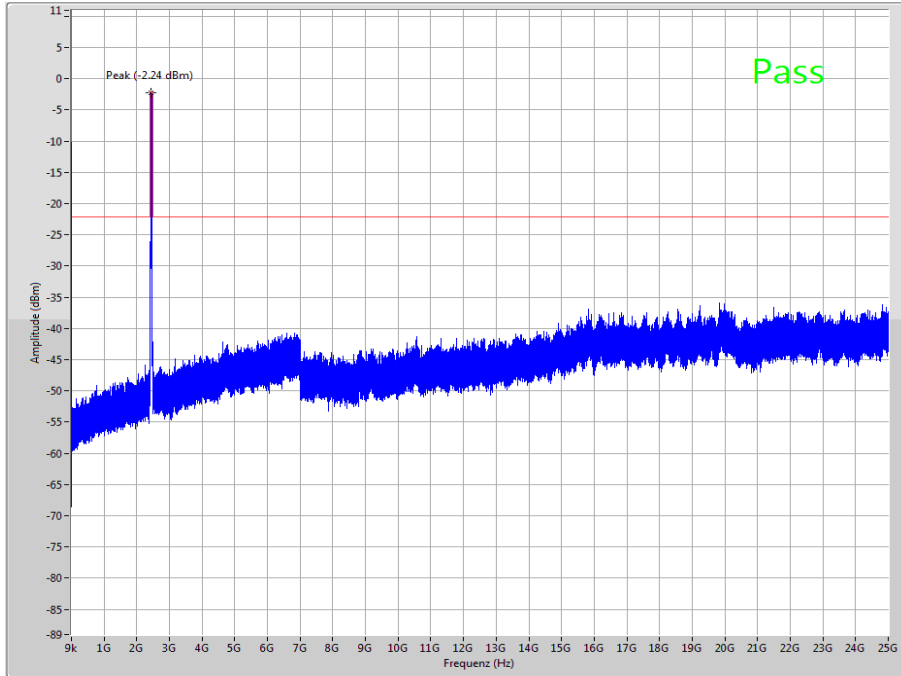


The peak at the beginning of the plot is the LO from the SA.

Plot 12: Channel 6, zoomed carrier

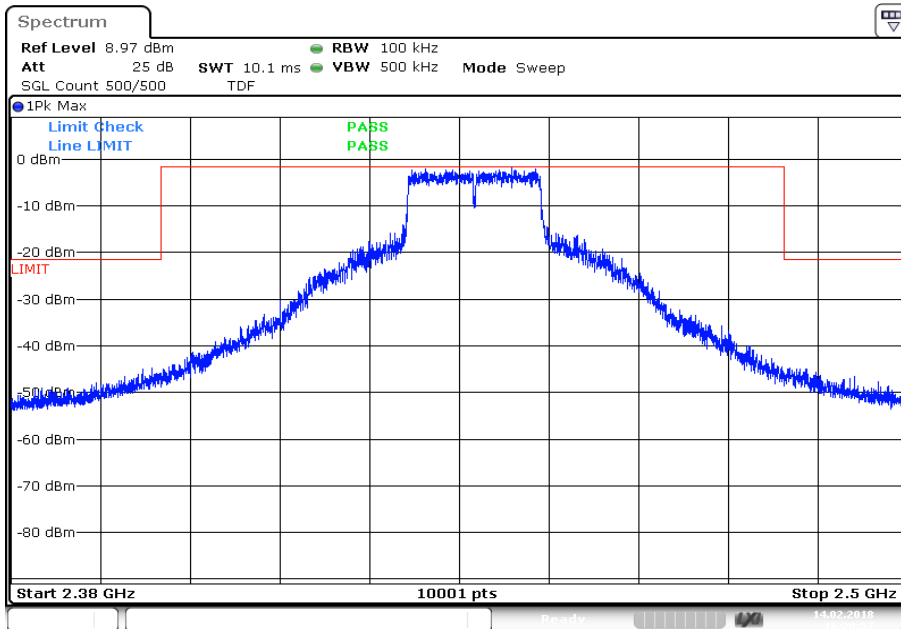


Plot 13: Channel 7, up to 25 GHz

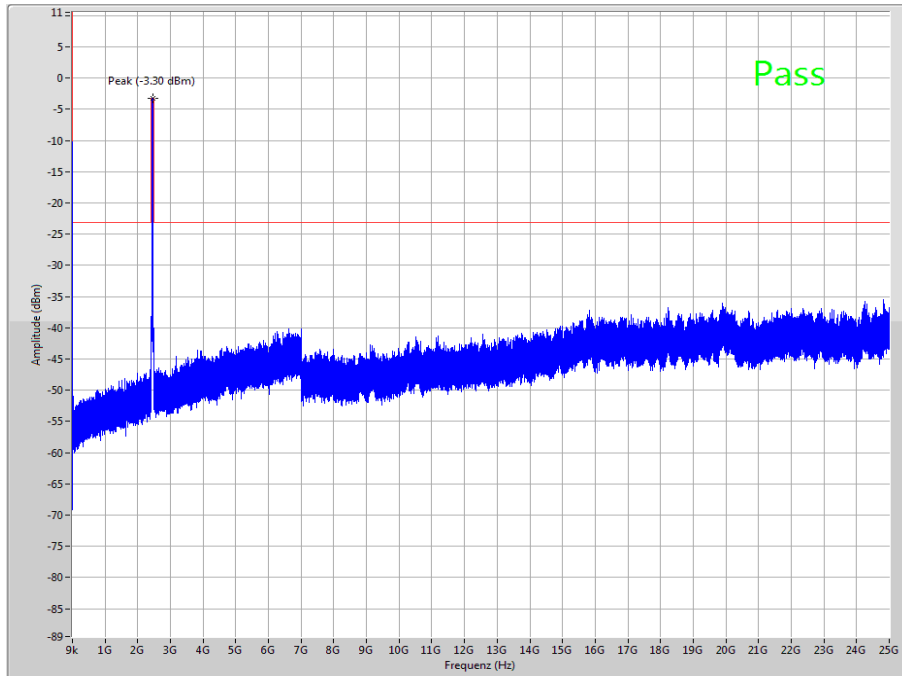


The peak at the beginning of the plot is the LO from the SA.

Plot 14: Channel 7, zoomed carrier

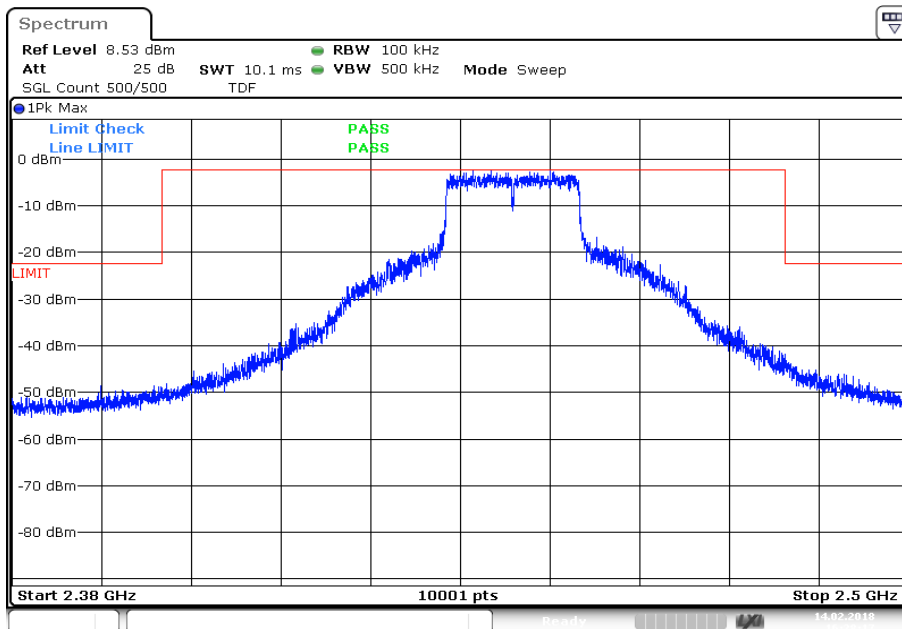


Plot 15: Channel 8, up to 25 GHz

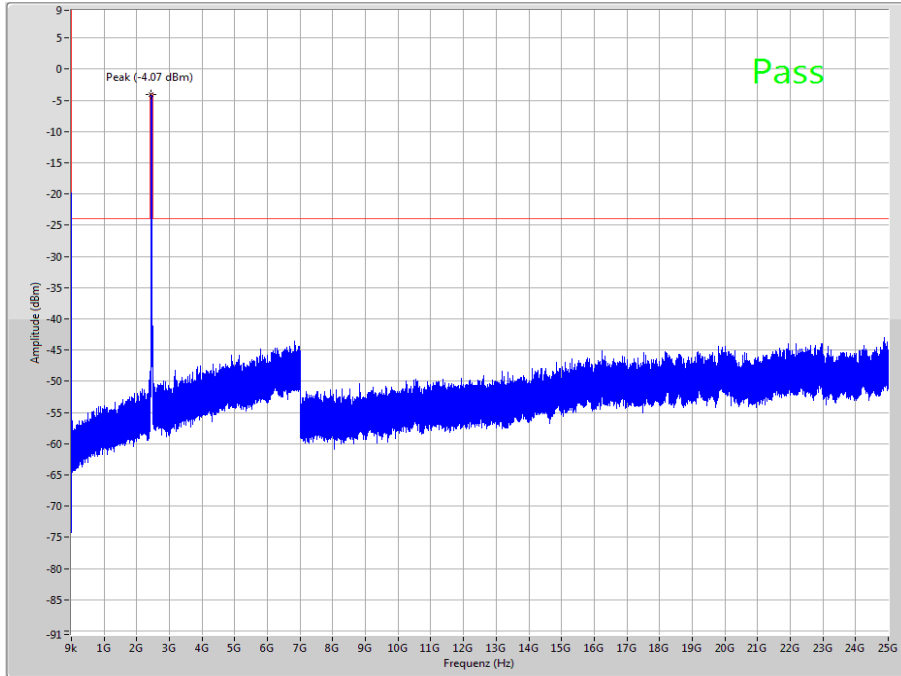


The peak at the beginning of the plot is the LO from the SA.

Plot 16: Channel 8, zoomed carrier

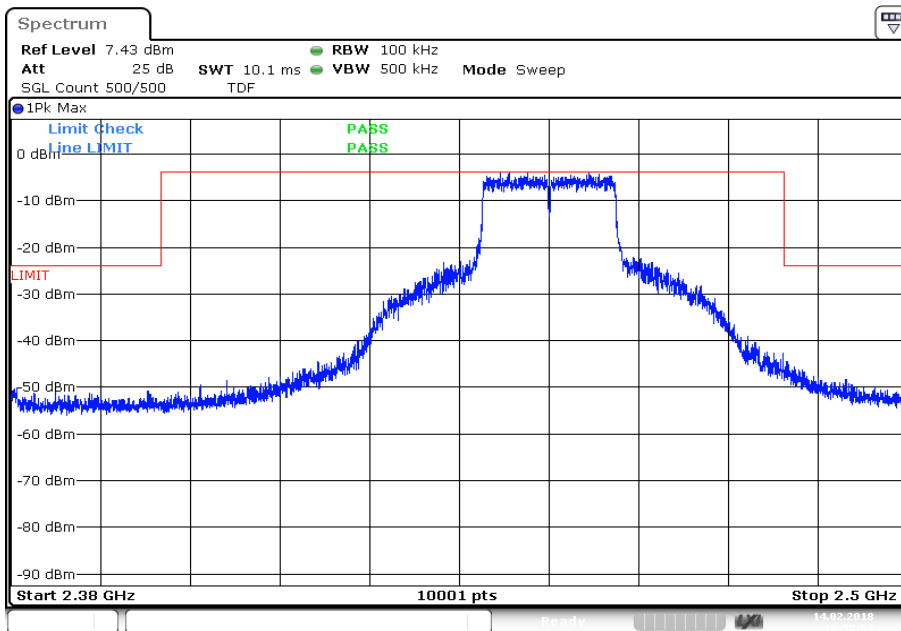


Plot 17: Channel 9, up to 25 GHz

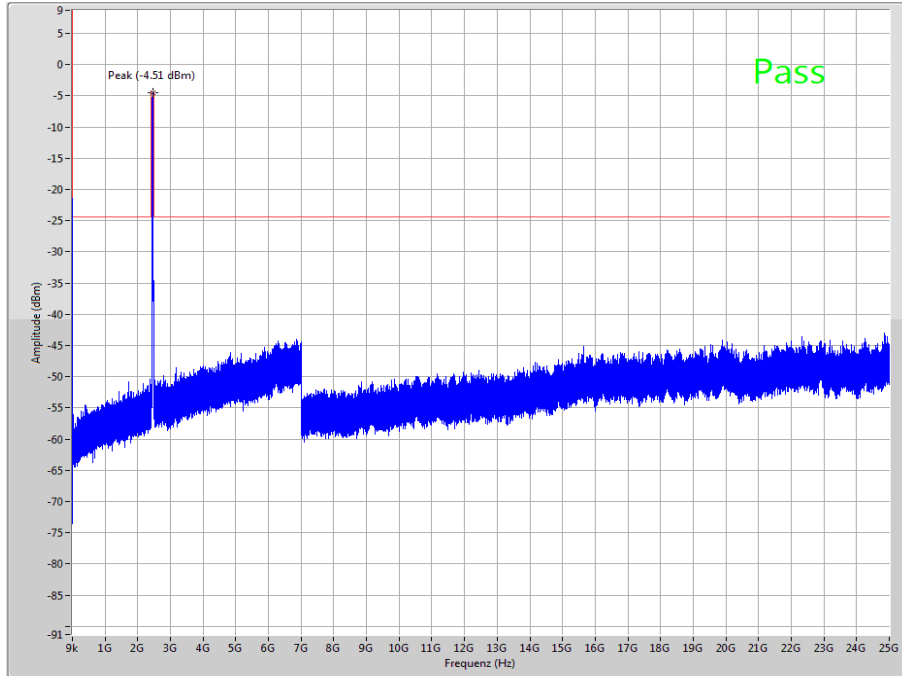


The peak at the beginning of the plot is the LO from the SA.

Plot 18: Channel 9, zoomed carrier

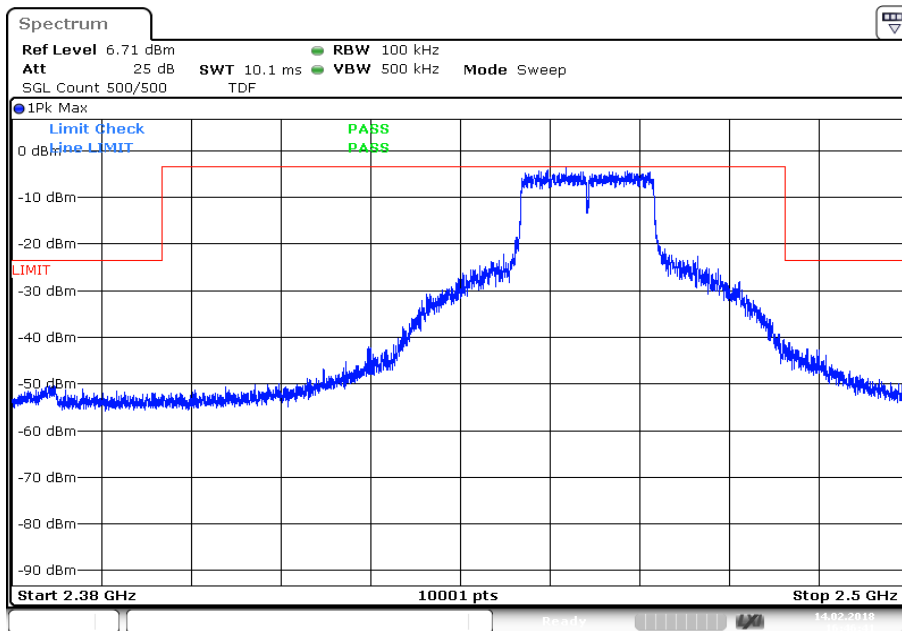


Plot 19: Channel 10, up to 25 GHz

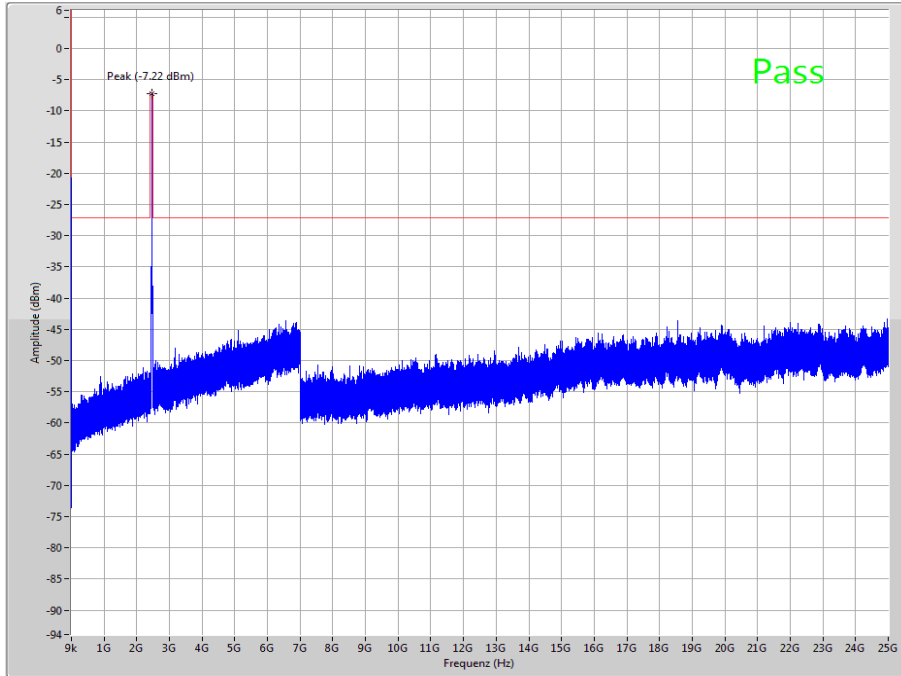


The peak at the beginning of the plot is the LO from the SA.

Plot 20: Channel 10, zoomed carrier

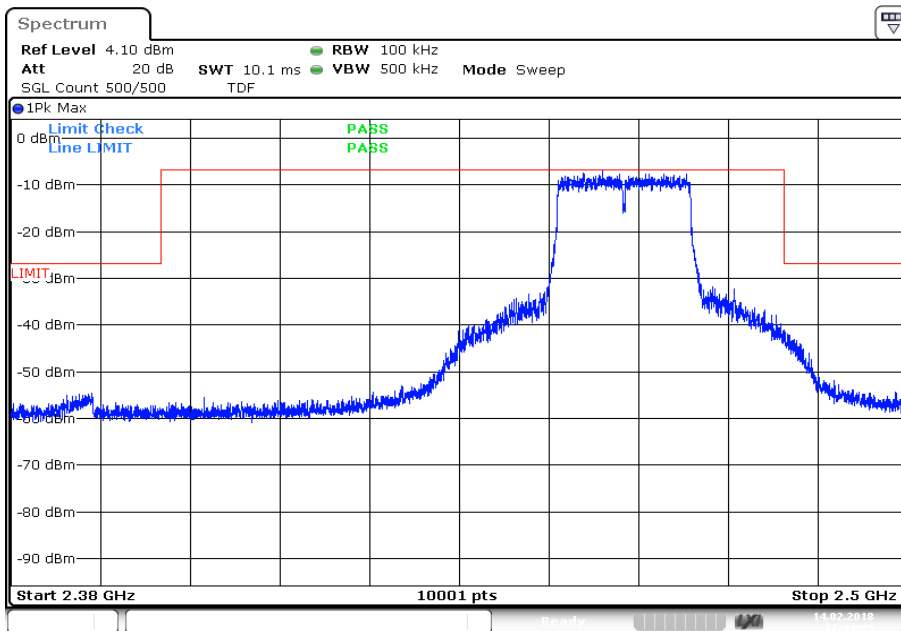


Plot 21: Channel 11, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

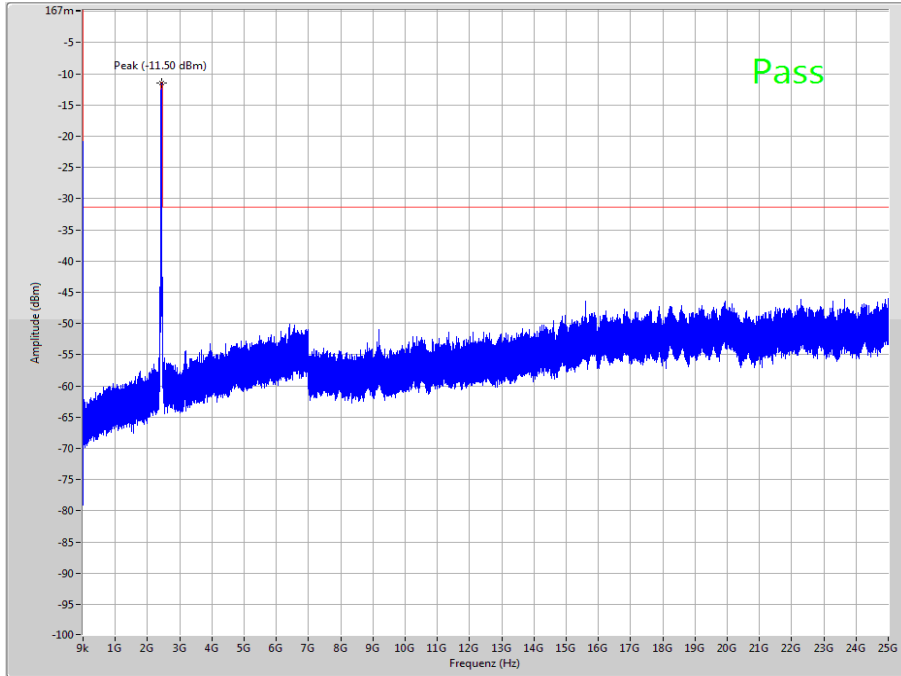
Plot 22: Channel 11, zoomed carrier



Date: 14.FEB.2018 17:44:35

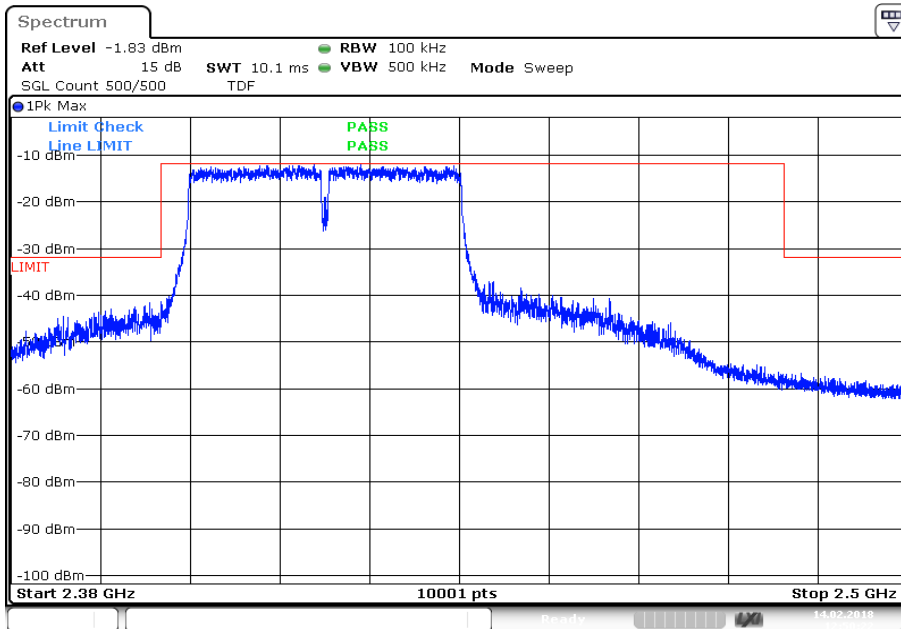
Plots: OFDM / n HT 40 – mode

Plot 1: Channel 3, up to 25 GHz



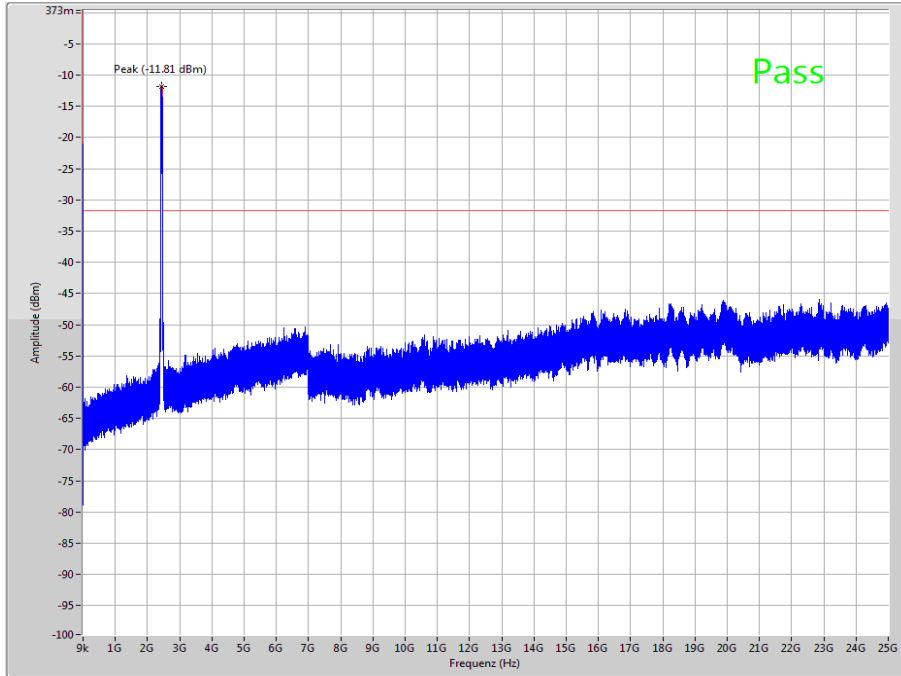
The peak at the beginning of the plot is the LO from the SA.

Plot 2: Channel 3, zoomed carrier



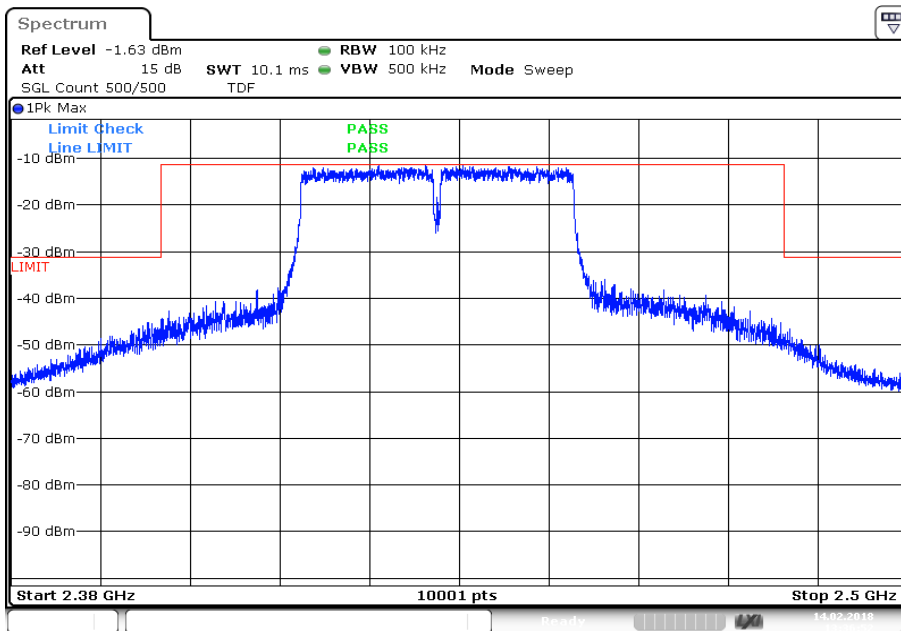
Date: 14.FEB.2018 12:50:22

Plot 3: Channel 6, up to 25 GHz

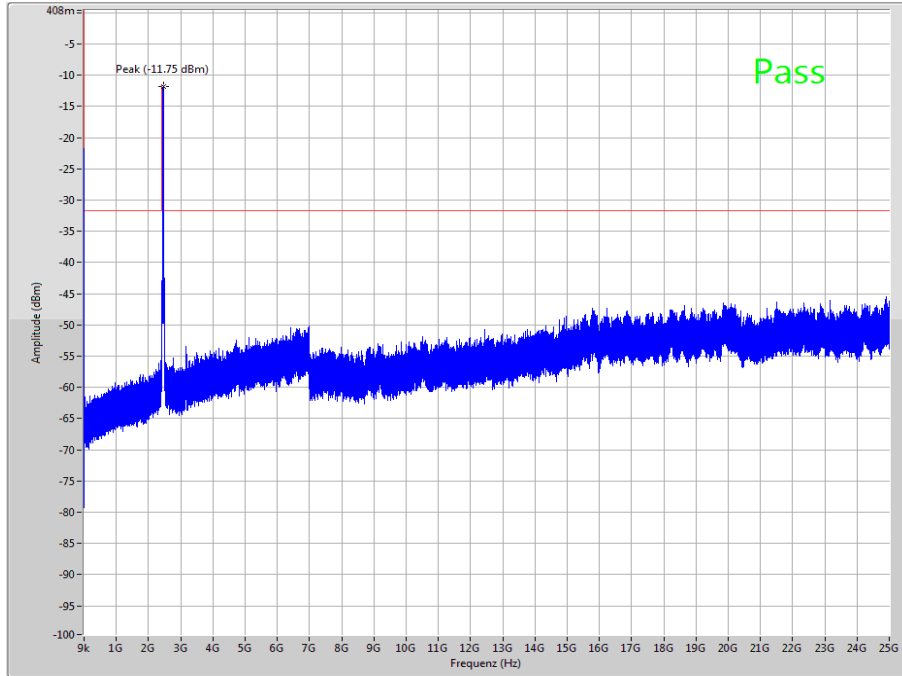


The peak at the beginning of the plot is the LO from the SA.

Plot 4: Channel 6, zoomed carrier

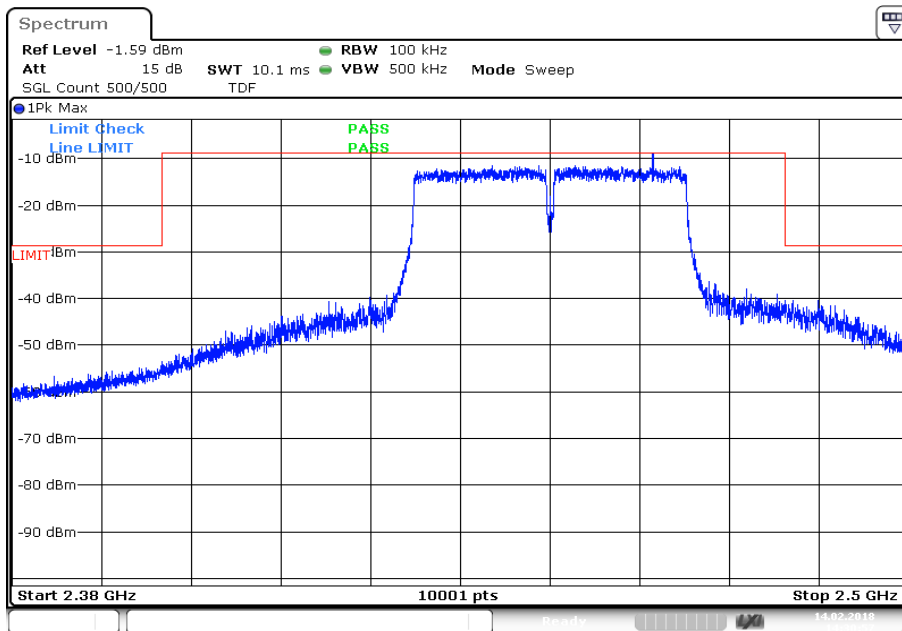


Plot 5: Channel 9, up to 25 GHz



The peak at the beginning of the plot is the LO from the SA.

Plot 6: Channel 9, zoomed carrier



Date: 14.FEB.2018 14:30:58

12.11 Spurious emissions radiated below 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. 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	<input checked="" type="checkbox"/> DSSS b – mode <input checked="" type="checkbox"/> OFDM g – mode <input type="checkbox"/> OFDM n HT20 – mode <input checked="" type="checkbox"/> OFDM n HT40 – mode
Test setup	See chapter 6.2 A
Measurement uncertainty	See chapter

Limits:

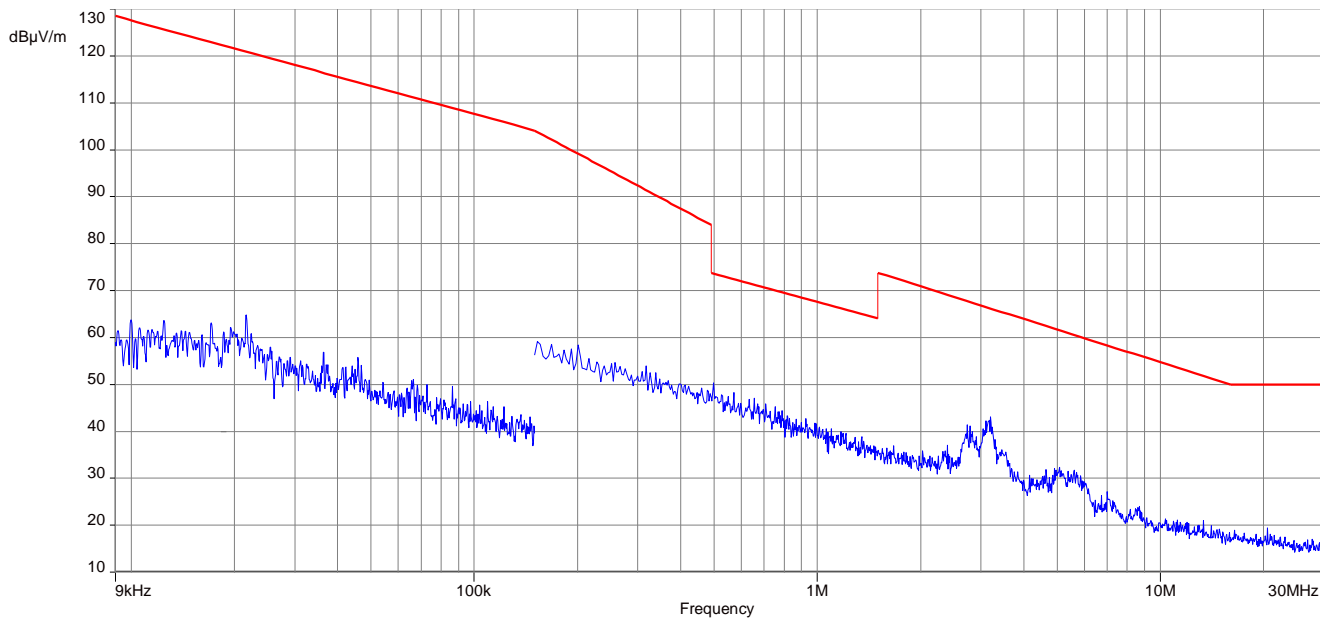
FCC		IC
Frequency / MHz	Field Strength / (dB μ V / m)	Measurement distance / m
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Results:

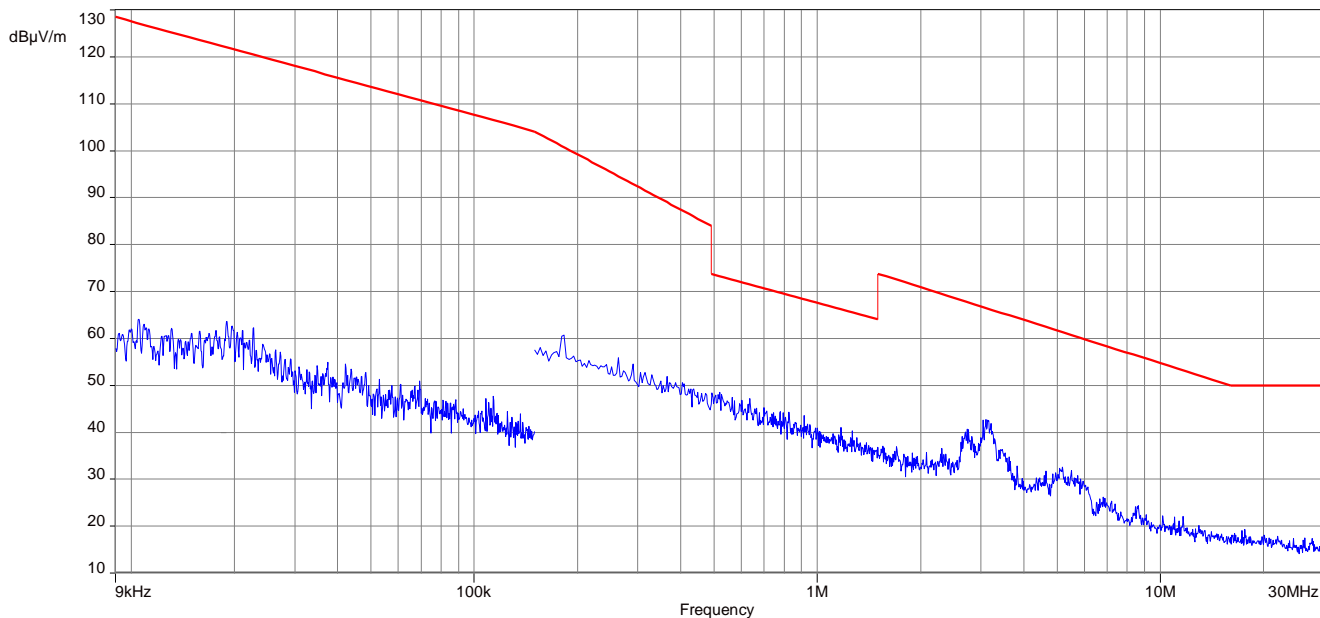
TX spurious emissions radiated < 30 MHz / (dB μ V / m) @ 3 m		
Frequency / MHz	Detector	Level / (dB μ V / m)
All detected peaks are more than 20 dB below the limit.		

Plots: DSSS

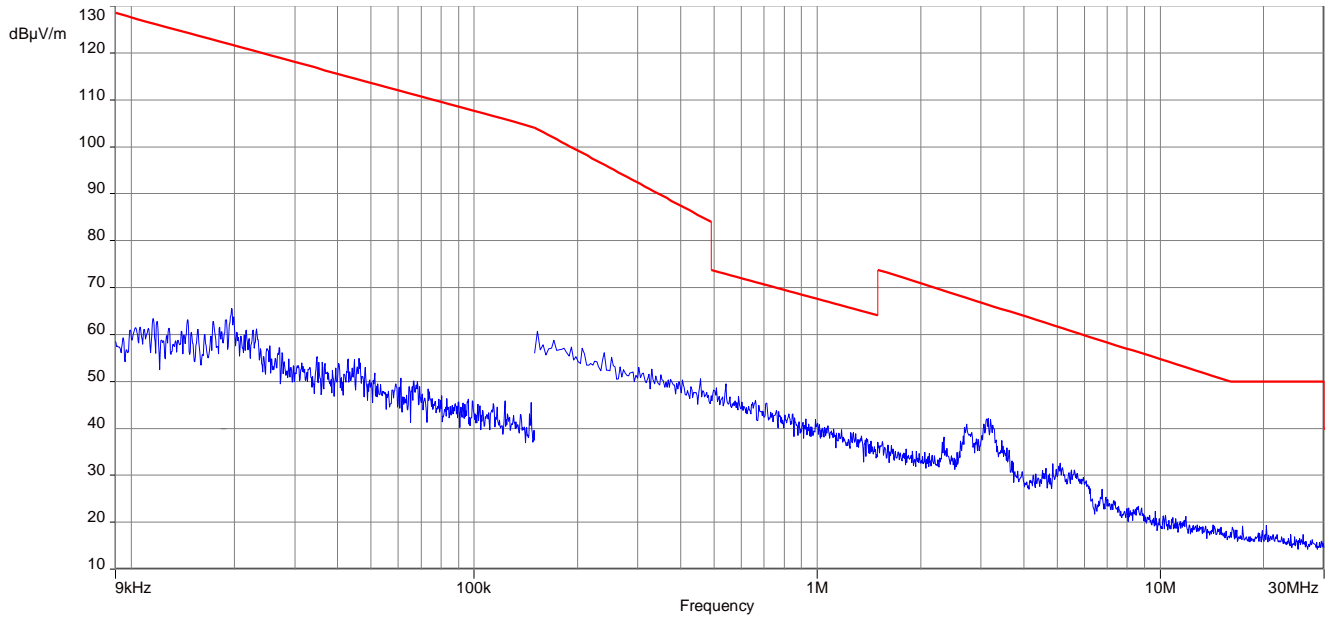
Plot 1: 9 kHz to 30 MHz, Channel 1



Plot 2: 9 kHz to 30 MHz, Channel 6

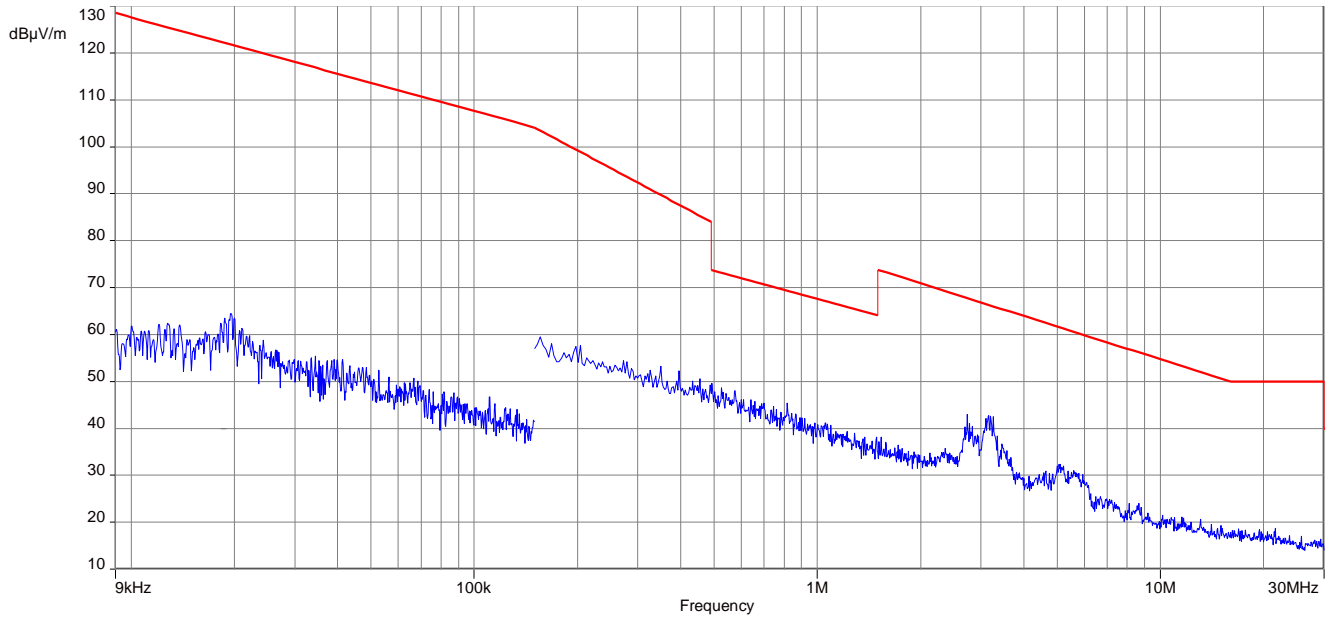


Plot 3: 9 kHz to 30 MHz, Channel 11

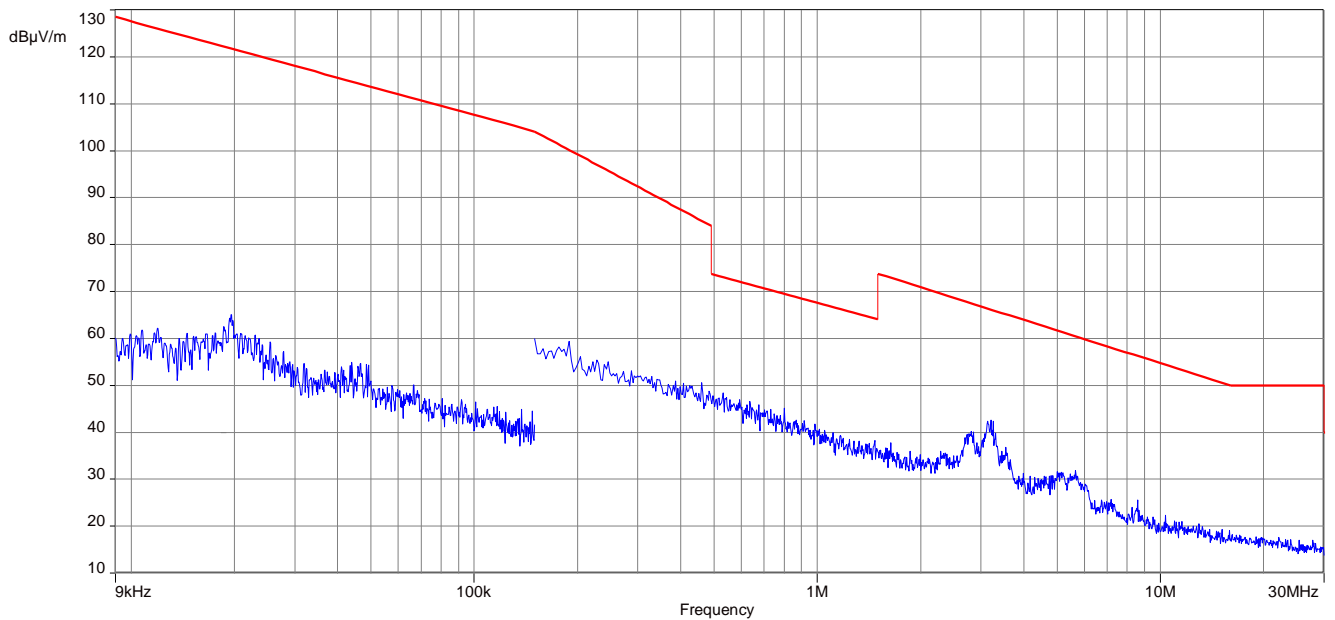


Plots: OFDM (20 MHz nominal channel bandwidth)

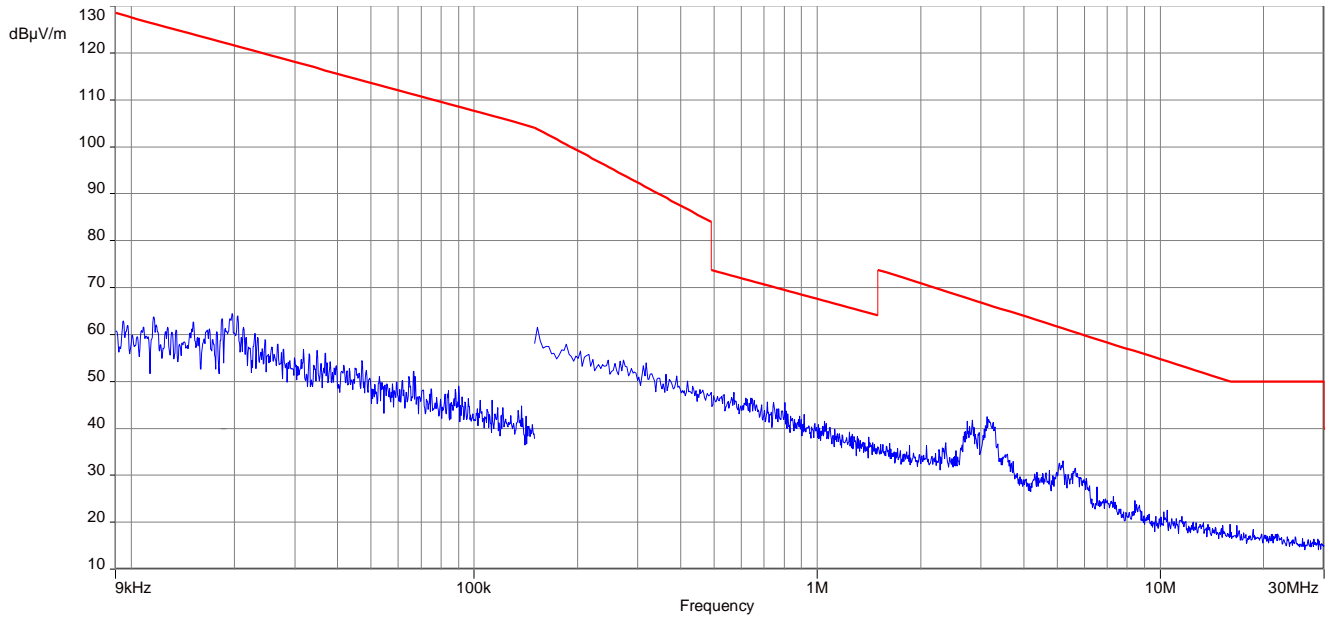
Plot 1: 9 kHz to 30 MHz, Channel 1



Plot 2: 9 kHz to 30 MHz, Channel 6

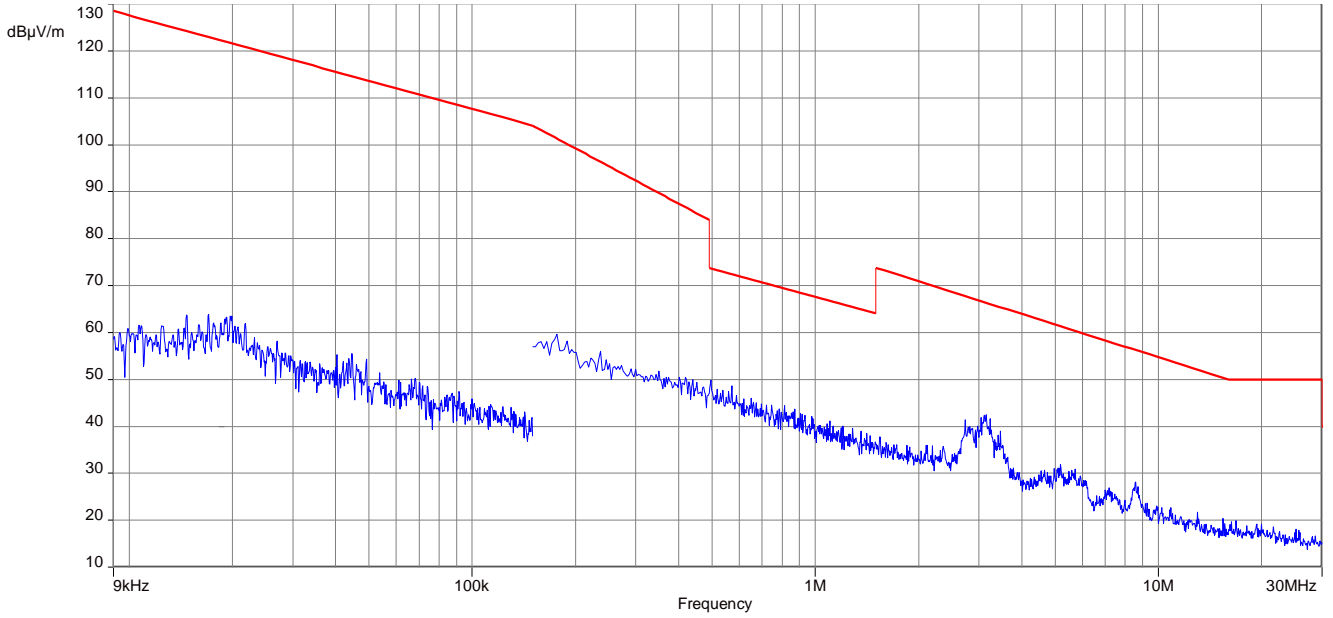


Plot 3: 9 kHz to 30 MHz, Channel 11

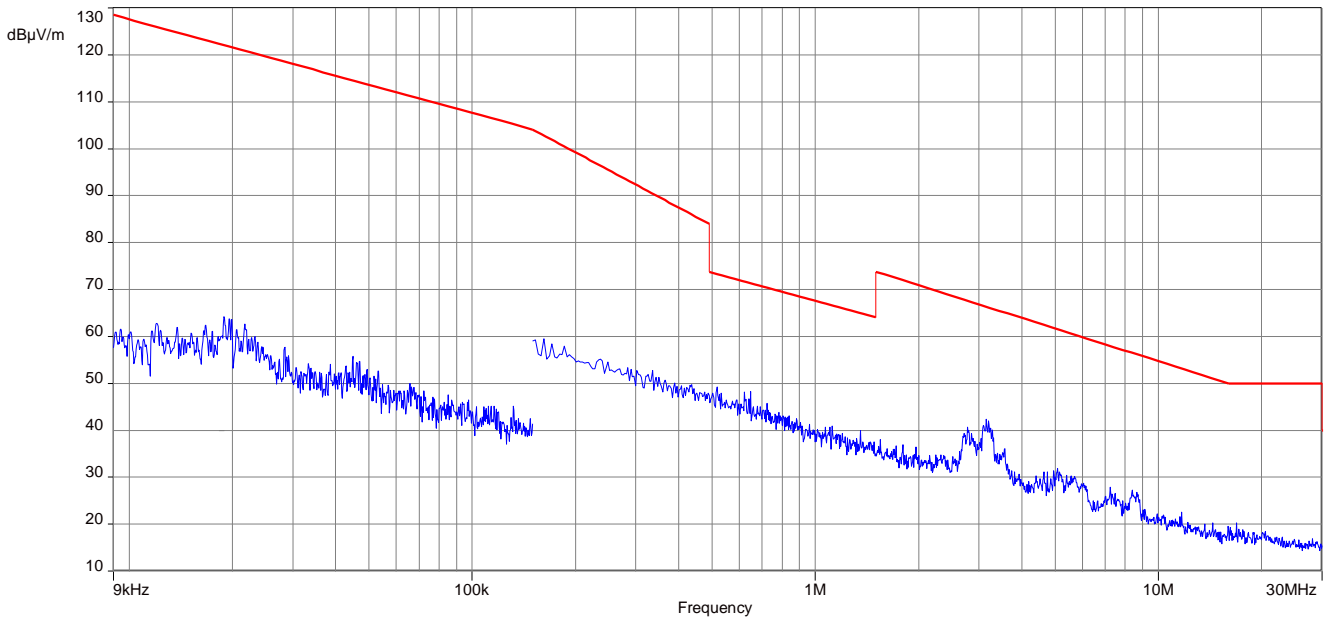


Plots: OFDM (40 MHz nominal channel bandwidth)

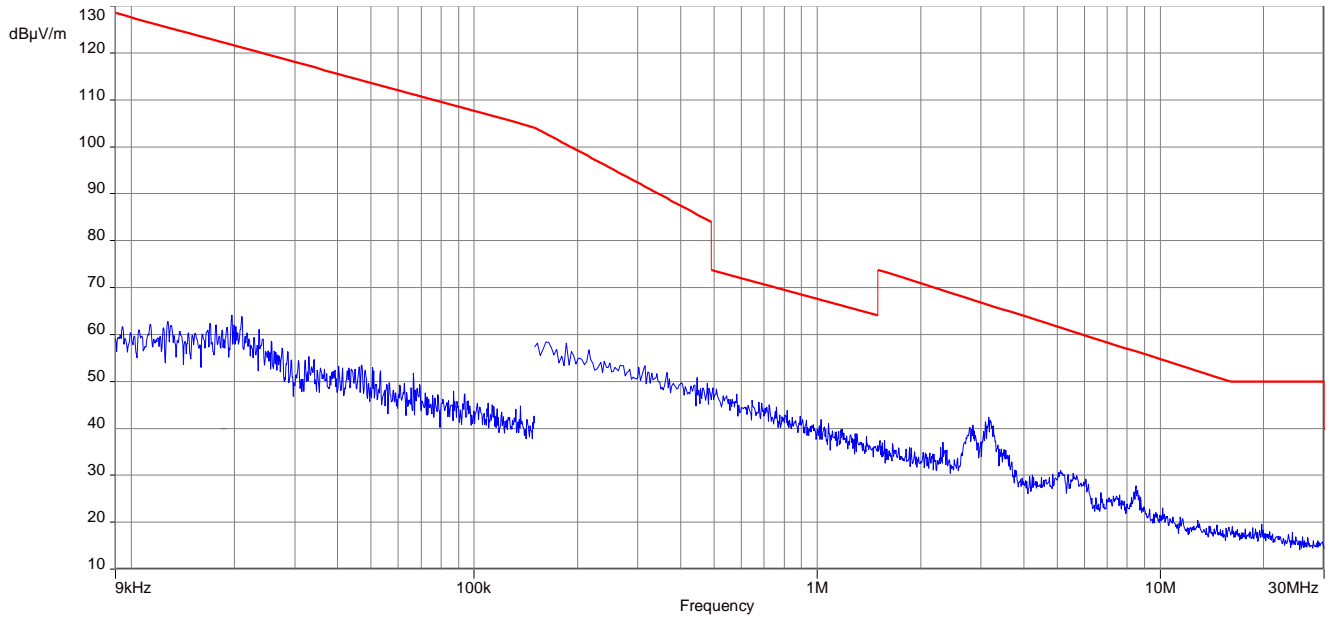
Plot 1: 9 kHz to 30 MHz, Channel 3



Plot 2: 9 kHz to 30 MHz, Channel 6



Plot 3: 9 kHz to 30 MHz, Channel 9



12.12 Spurious emissions radiated 30 MHz to 1 GHz

Description:

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

Measurement:

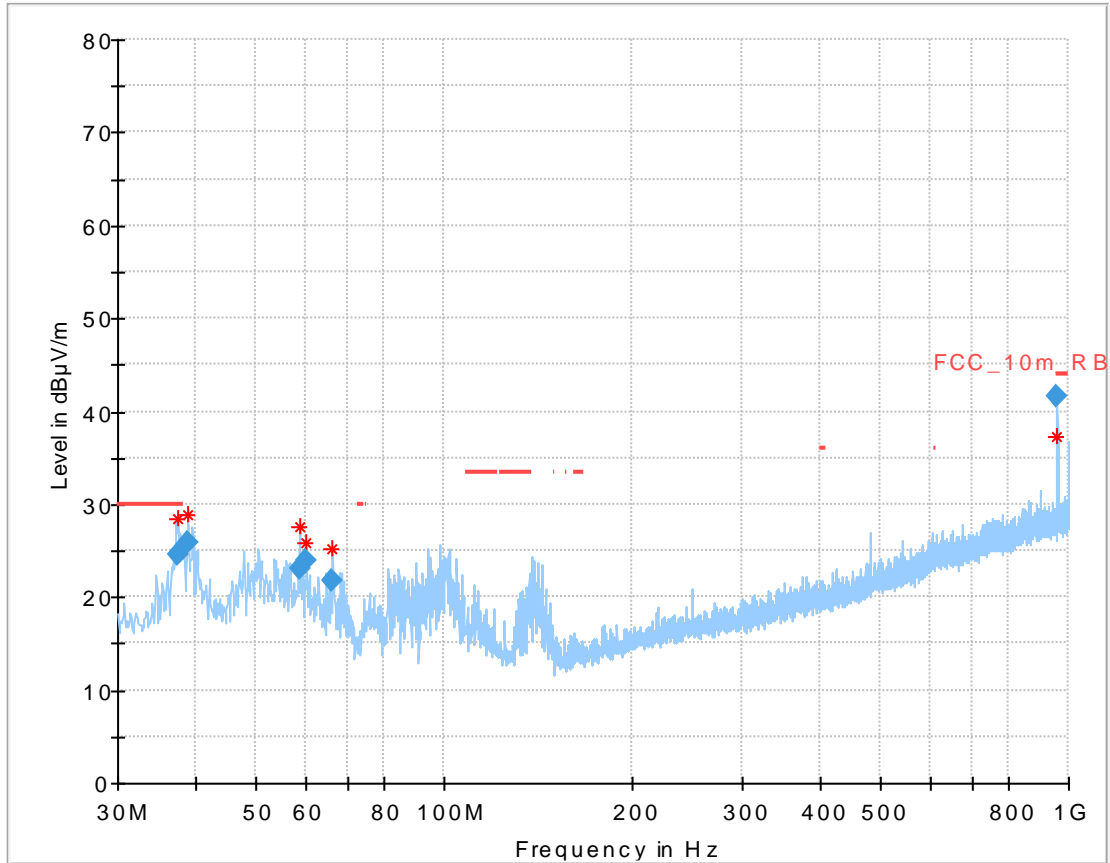
Measurement parameter	
Detector	Peak / Quasi Peak
Sweep time	Auto
Resolution bandwidth	120 kHz
Video bandwidth	3 x RBW
Span	30 MHz to 1 GHz
Trace mode	Max Hold
Measured modulation	<input checked="" type="checkbox"/> DSSS b – mode <input checked="" type="checkbox"/> OFDM g – mode <input type="checkbox"/> OFDM n HT20 – mode <input checked="" type="checkbox"/> OFDM n HT40 – mode <input checked="" type="checkbox"/> RX / Idle – mode
Test setup	See chapter 6.1 A
Measurement uncertainty	See chapter

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 / m
30 – 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10

Plot: DSSS

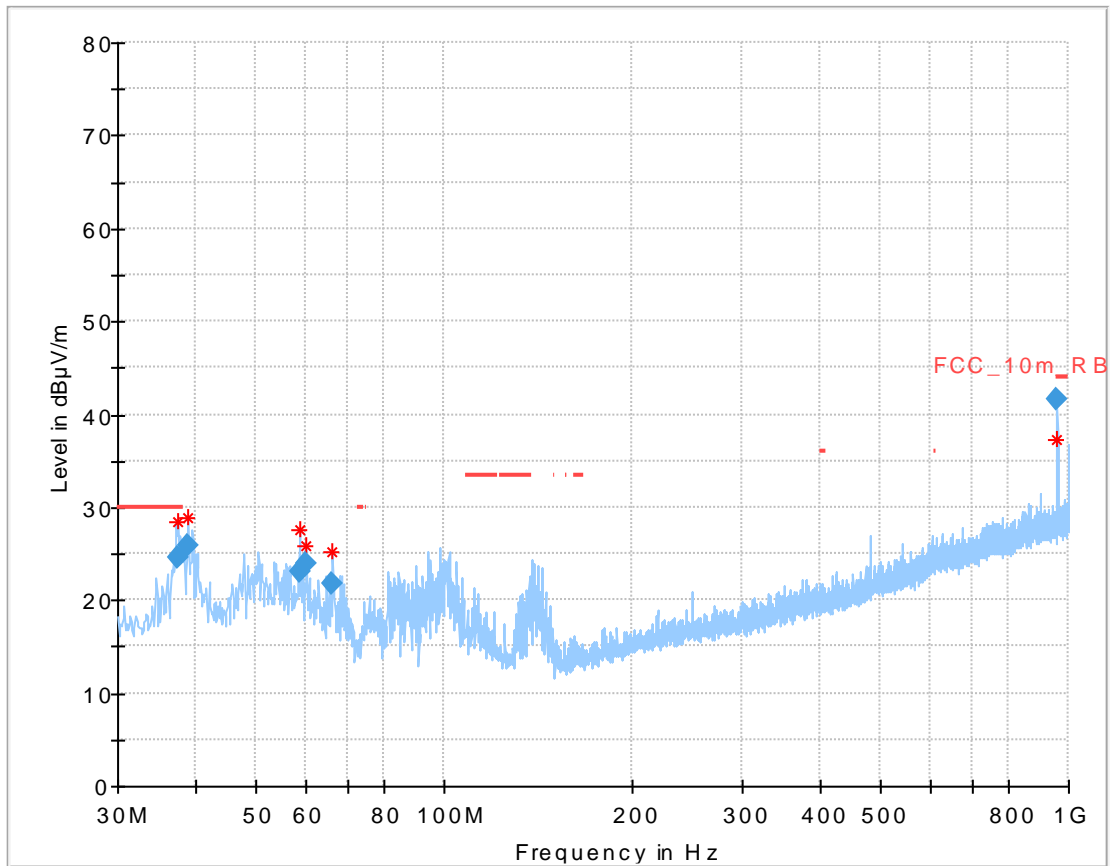
Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, Channel 1



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
37.538	24.65	30.0	5.35	1000	120	101.0	V	329.0	12.9
38.961	25.87	30.0	4.13	1000	120	101.0	V	60.0	13.1
58.736	23.15	30.0	6.85	1000	120	104.0	V	160.0	12.2
60.210	23.94	30.0	6.06	1000	120	98.0	V	242.0	11.8
66.301	21.74	30.0	8.26	1000	120	101.0	V	171.0	10.5
960.006	41.67	44.0	2.33	1000	120	98.0	H	182.0	24.5

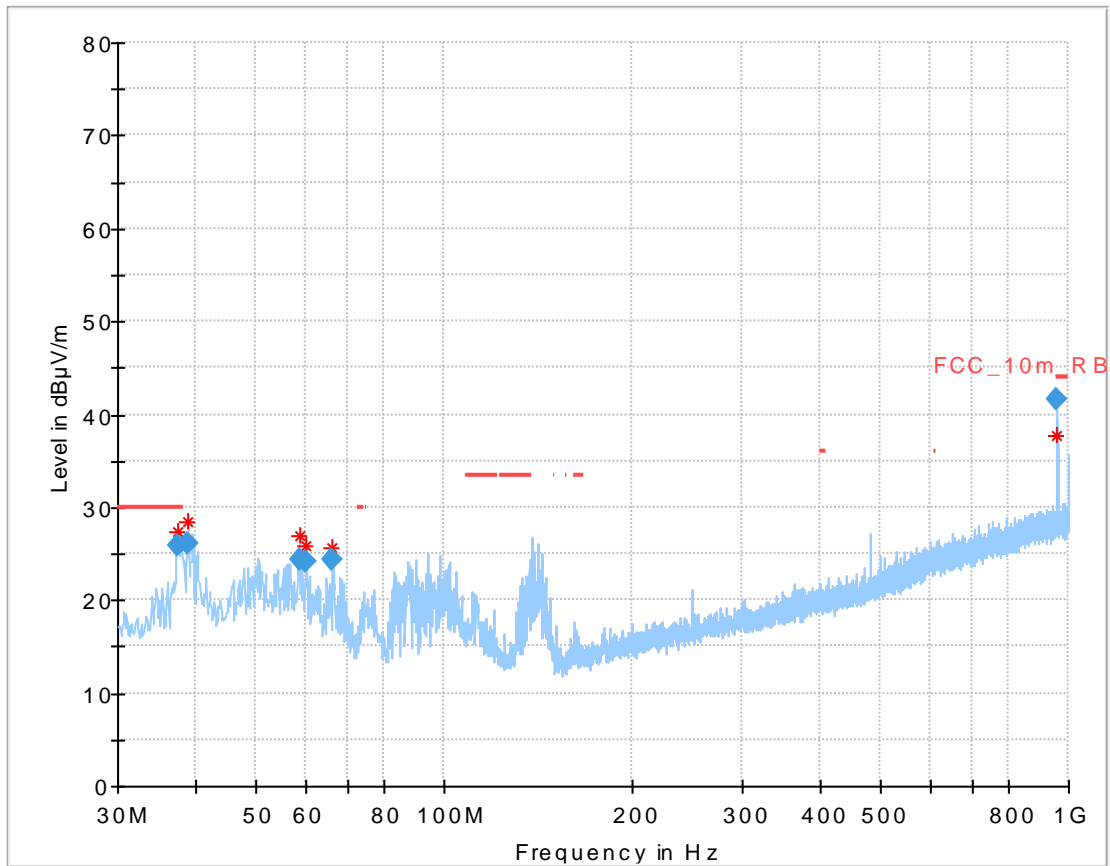
Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, Channel 6



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	PoI	Azimuth (deg)	Corr. (dB)
37.538	24.65	30.0	5.35	1000	120	101.0	V	329.0	12.9
38.961	25.87	30.0	4.13	1000	120	101.0	V	60.0	13.1
58.736	23.15	30.0	6.85	1000	120	104.0	V	160.0	12.2
60.210	23.94	30.0	6.06	1000	120	98.0	V	242.0	11.8
66.301	21.74	30.0	8.26	1000	120	101.0	V	171.0	10.5
960.006	41.67	44.0	2.33	1000	120	98.0	H	182.0	24.5

Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, Channel 11

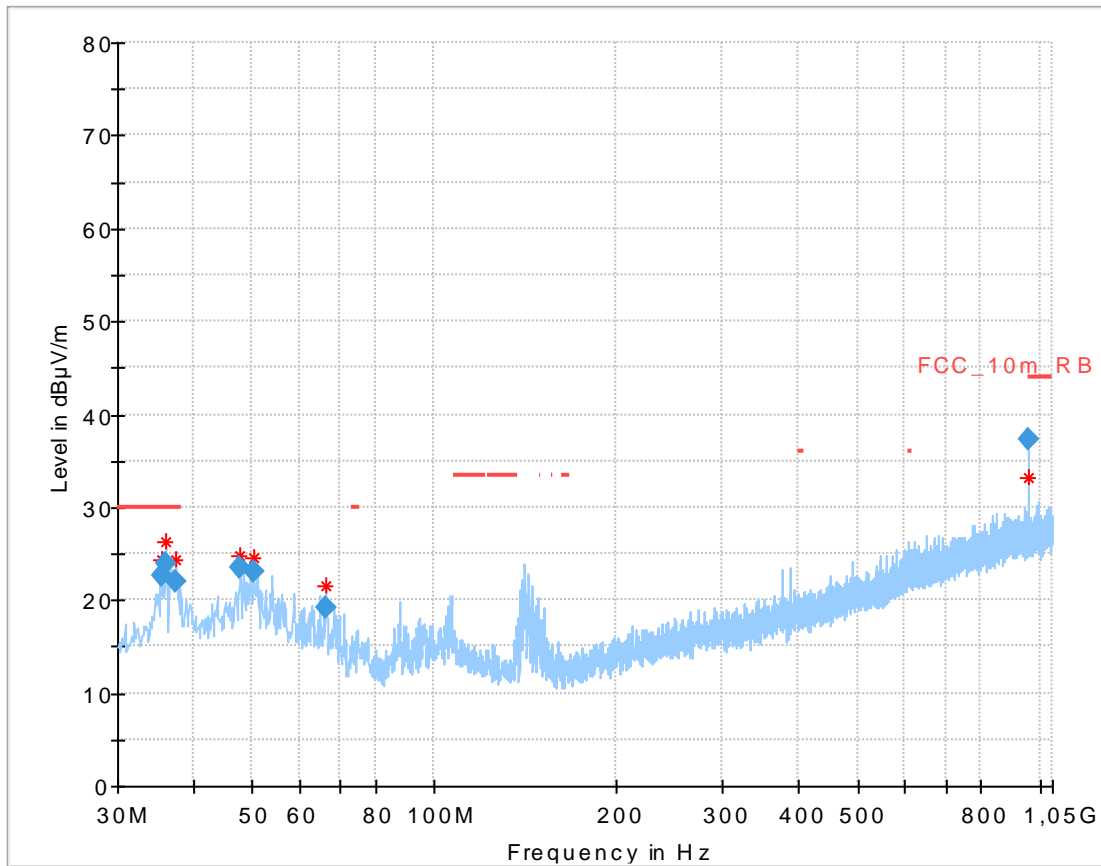


Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
37.522	25.88	30.0	4.12	1000	120	98.0	V	242.0	12.9
38.949	26.19	30.0	3.81	1000	120	101.0	V	44.0	13.1
58.736	24.36	30.0	5.64	1000	120	101.0	V	-10.0	12.2
60.230	24.16	30.0	5.84	1000	120	101.0	V	11.0	11.8
66.282	24.40	30.0	5.60	1000	120	101.0	V	10.0	10.5
959.987	41.71	36.0	-5.71	1000	120	98.0	H	183.0	24.5

Plot: OFDM (20 MHz nominal channel bandwidth)

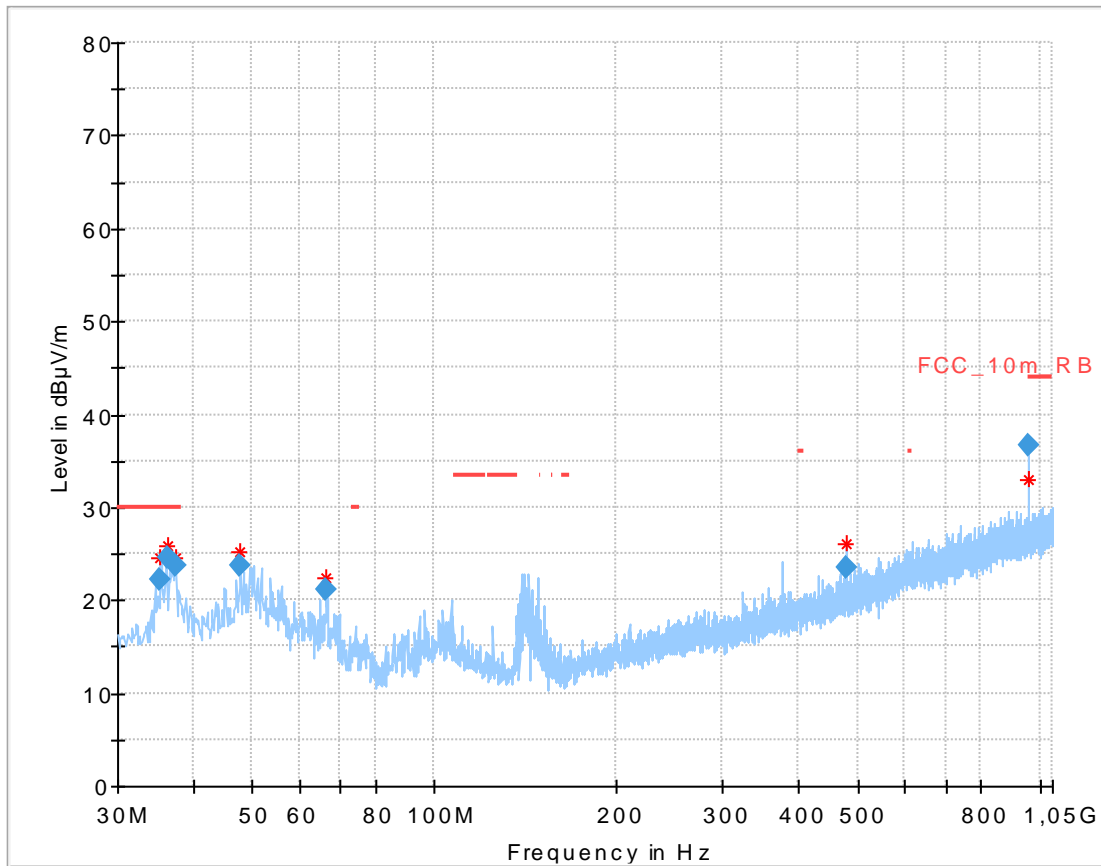
Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, Channel 1



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	PoI	Azimuth (deg)	Corr. (dB)
35.347	22.61	30.0	7.39	1000	120	170.0	V	90.0	12.7
36.151	23.99	30.0	6.01	1000	120	98.0	V	270.0	12.8
37.533	21.91	30.0	8.09	1000	120	101.0	V	270.0	12.9
47.815	23.52	30.0	6.48	1000	120	98.0	V	90.0	13.7
50.436	23.09	30.0	6.91	1000	120	98.0	V	270.0	13.7
66.231	19.09	30.0	10.91	1000	120	170.0	V	270.0	10.5
959.989	37.33	36.0	-1.33	1000	120	100.0	H	180.0	24.5

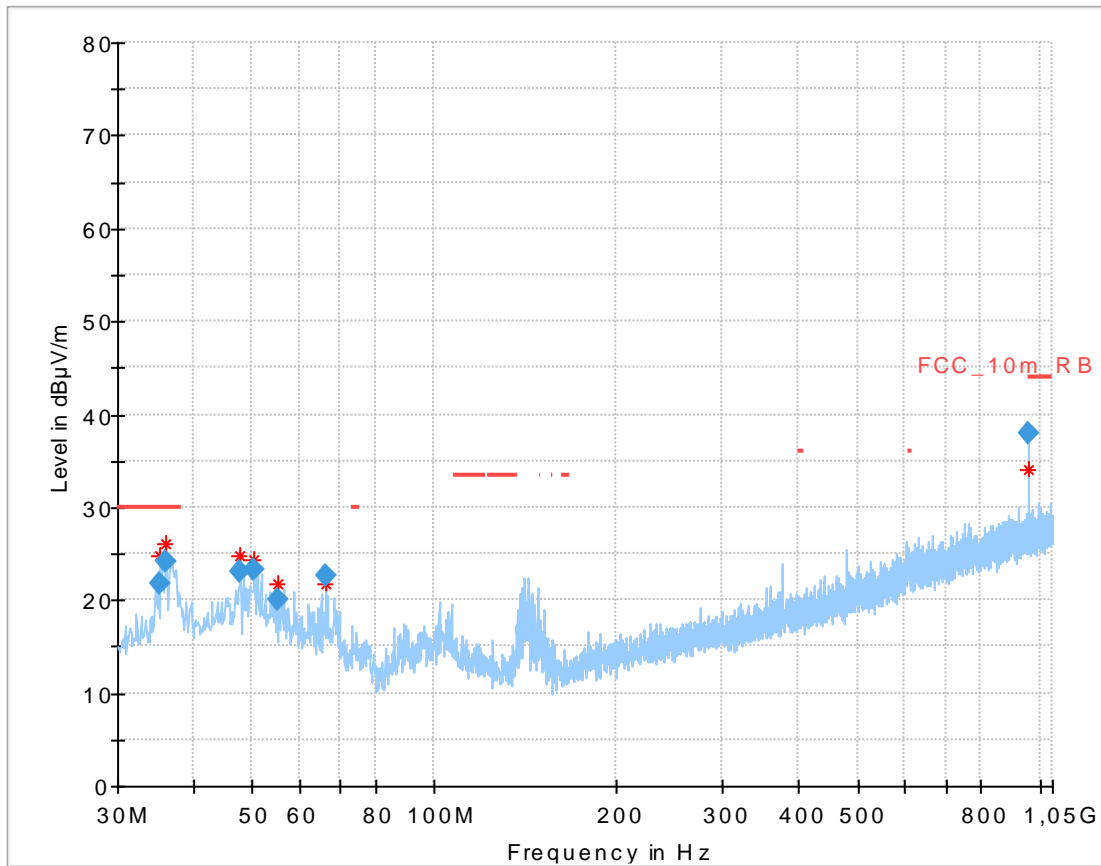
Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, Channel 6



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	PoI	Azimuth (deg)	Corr. (dB)
35.326	22.25	30.0	7.75	1000	120	170.0	V	90.0	12.7
36.159	24.67	30.0	5.33	1000	120	101.0	V	90.0	12.8
37.355	23.82	30.0	6.18	1000	120	101.0	V	270.0	12.9
47.792	23.76	30.0	6.24	1000	120	98.0	V	90.0	13.7
66.251	21.05	30.0	8.95	1000	120	170.0	V	270.0	10.5
480.004	23.52	36.0	12.48	1000	120	101.0	H	270.0	18.3
960.000	36.60	36.0	-0.60	1000	120	101.0	H	270.0	24.5

Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, Channel 11

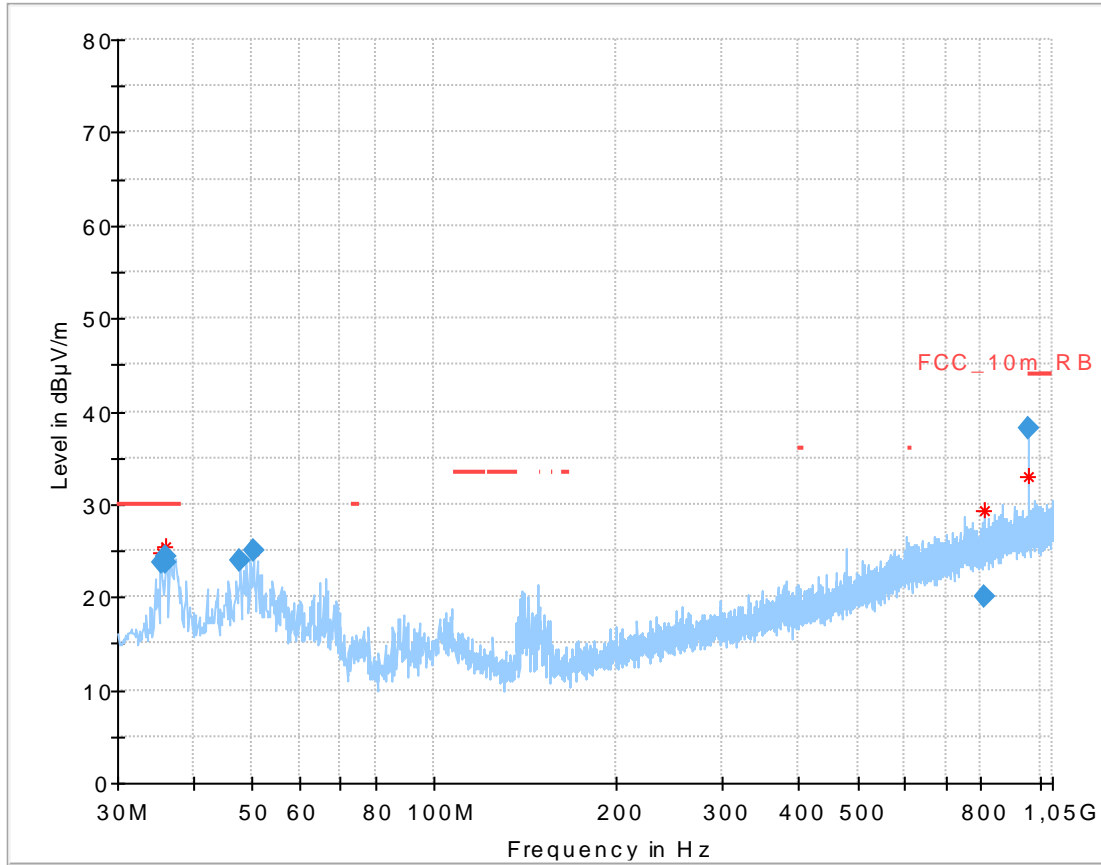


Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	PoI	Azimuth (deg)	Corr. (dB)
35.316	21.72	30.0	8.28	1000	120	170.0	V	90.0	12.7
36.128	24.07	30.0	5.93	1000	120	170.0	V	90.0	12.8
47.791	23.17	30.0	6.83	1000	120	98.0	V	180.0	13.7
50.453	23.33	30.0	6.67	1000	120	98.0	V	180.0	13.7
55.277	20.07	30.0	9.93	1000	120	170.0	V	270.0	13.0
66.288	22.54	30.0	7.46	1000	120	170.0	V	270.0	10.5
959.999	38.02	36.0	-2.02	1000	120	98.0	H	180.0	24.5

Plot: OFDM (40 MHz nominal channel bandwidth)

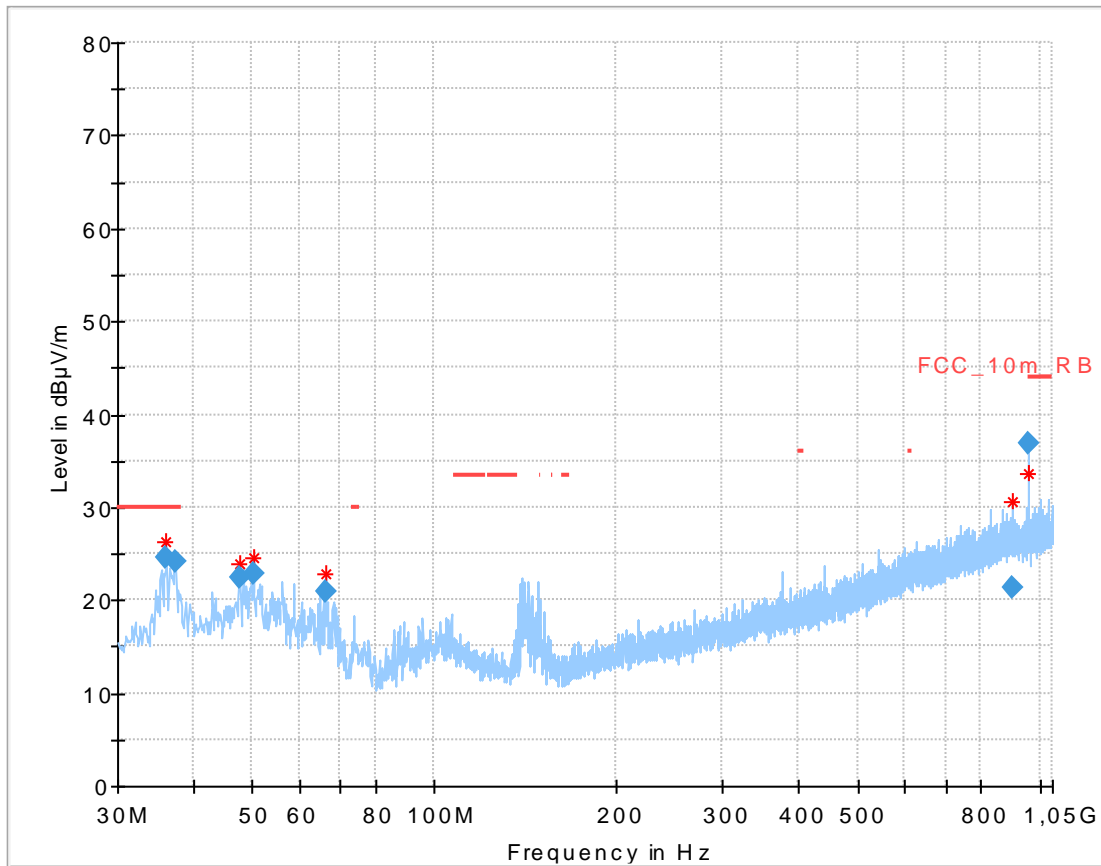
Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, Channel 3



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	PoI	Azimuth (deg)	Corr. (dB)
35.351	23.76	30.0	6.24	1000	120	100.0	V	0.0	12.7
36.136	24.45	30.0	5.55	1000	120	170.0	V	90.0	12.8
36.139	23.63	30.0	6.37	1000	120	98.0	V	270.0	12.8
47.802	23.95	30.0	6.05	1000	120	98.0	V	180.0	13.7
50.433	25.10	30.0	4.90	1000	120	98.0	V	270.0	13.7
812.931	20.08	36.0	15.92	1000	120	170.0	H	0.0	23.0
960.003	38.17	44.0	5.83	1000	120	98.0	H	180.0	24.5

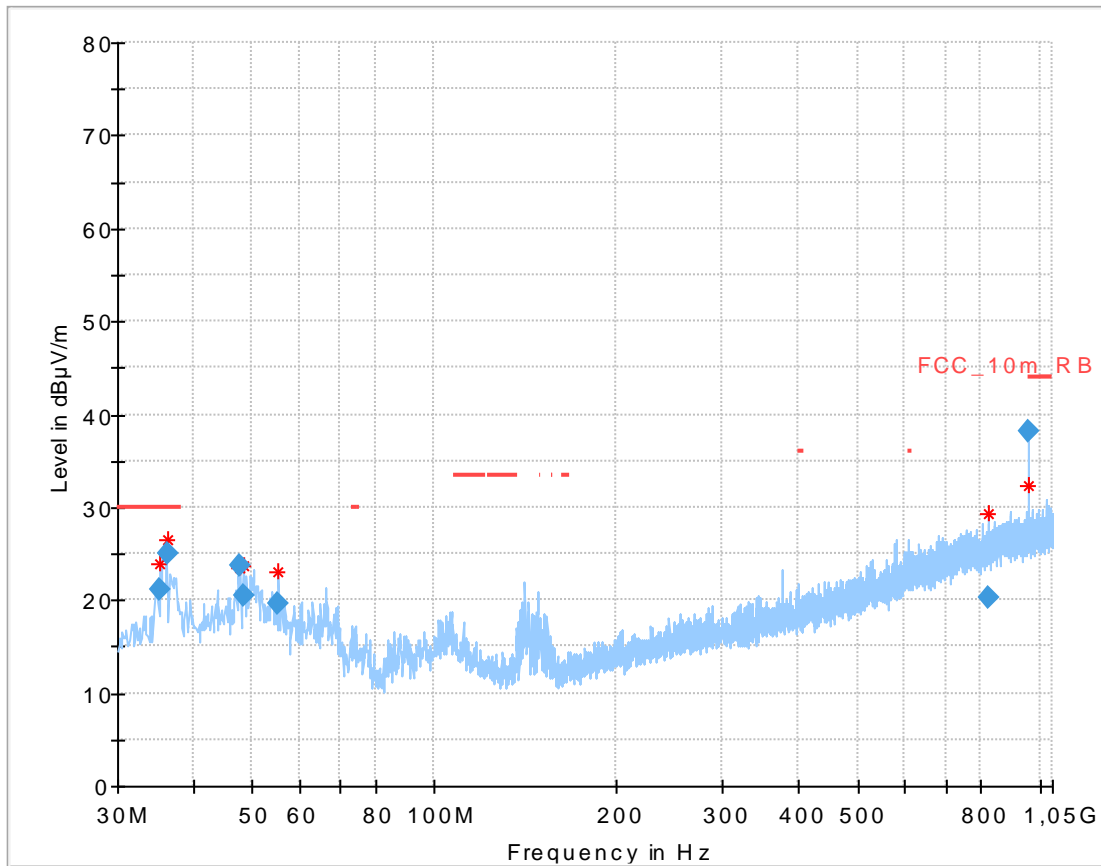
Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, Channel 6



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	PoI	Azimuth (deg)	Corr. (dB)
36.129	24.51	30.0	5.49	1000	120	101.0	V	270.0	12.8
37.358	24.05	30.0	5.95	1000	120	101.0	V	270.0	12.9
47.795	22.42	30.0	7.58	1000	120	170.0	V	180.0	13.7
50.412	22.76	30.0	7.24	1000	120	98.0	V	90.0	13.7
66.259	20.82	30.0	9.18	1000	120	170.0	V	180.0	10.5
899.246	21.26	36.0	14.74	1000	120	170.0	V	0.0	24.2
960.008	36.78	44.0	7.22	1000	120	98.0	H	270.0	24.5

Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, Channel 9

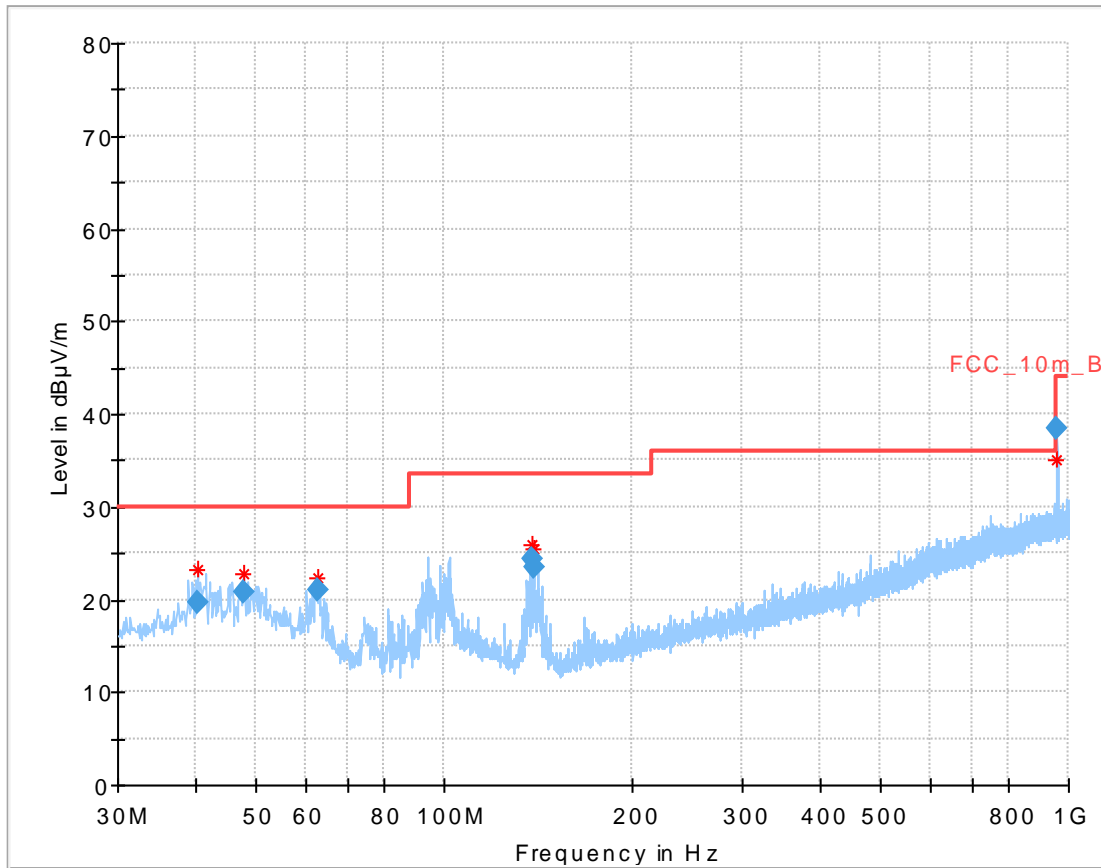


Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	PoI	Azimuth (deg)	Corr. (dB)
35.298	21.21	30.0	8.79	1000	120	101.0	V	90.0	12.7
36.154	25.12	30.0	4.88	1000	120	98.0	V	90.0	12.8
47.797	23.80	30.0	6.20	1000	120	98.0	V	180.0	13.7
48.427	20.48	30.0	9.52	1000	120	98.0	V	270.0	13.7
55.279	19.62	30.0	10.38	1000	120	170.0	V	180.0	13.0
825.407	20.25	36.0	15.75	1000	120	170.0	H	270.0	23.2
960.002	38.06	44.0	5.94	1000	120	98.0	H	180.0	24.5

Plot: RX / Idle mode

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



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
40.322	19.77	30.0	10.23	1000	120	101.0	V	20.0	13.2
47.820	20.85	30.0	9.15	1000	120	101.0	V	31.0	13.7
62.772	21.01	30.0	8.99	1000	120	98.0	V	92.0	11.2
138.402	24.37	33.5	9.13	1000	120	170.0	V	195.0	9.0
139.199	23.53	33.5	9.97	1000	120	170.0	V	172.0	8.9
960.025	38.54	44.0	5.46	1000	120	101.0	H	327.0	24.5

12.13 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	<input type="checkbox"/> DSSS b – mode <input type="checkbox"/> OFDM g – mode <input type="checkbox"/> OFDM n HT20 – mode <input type="checkbox"/> OFDM n HT40 – mode <input type="checkbox"/> RX / Idle – mode
Test setup	See chapter 6.2 C See chapter 6.2 A
Measurement uncertainty	See chapter 8

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 / (dBµV / m)	Measurement distance / m
Above 960	54.0 (AVG)	3
	74.0 (peak)	

Results: DSSS

TX spurious emissions radiated / dBµV/m @ 3 m								
Channel 1			Channel 6			Channel 11		
f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m
1440	Peak	43.1	1440	Peak	43.1	1440	Peak	43.1
	AVG	42.1		AVG	42.1		AVG	42.1
4824	Peak	54.9	4874	Peak	56.9	4924	Peak	57.2
	AVG	49.5		AVG	52.6		AVG	53.7

Results: OFDM (20 MHz nominal channel bandwidth)

TX spurious emissions radiated / dBµV/m @ 3 m								
Channel 1			Channel 6			Channel 11		
f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m
1440	Peak	43.1	1440	Peak	43.1	1440	Peak	43.1
	AVG	42.1		AVG	42.1		AVG	42.1
4826	Peak	54.8	4876	Peak	55.9	4924	Peak	55.1
	AVG	43.8		AVG	44.7		AVG	44.9

Results: OFDM (40 MHz nominal channel bandwidth)

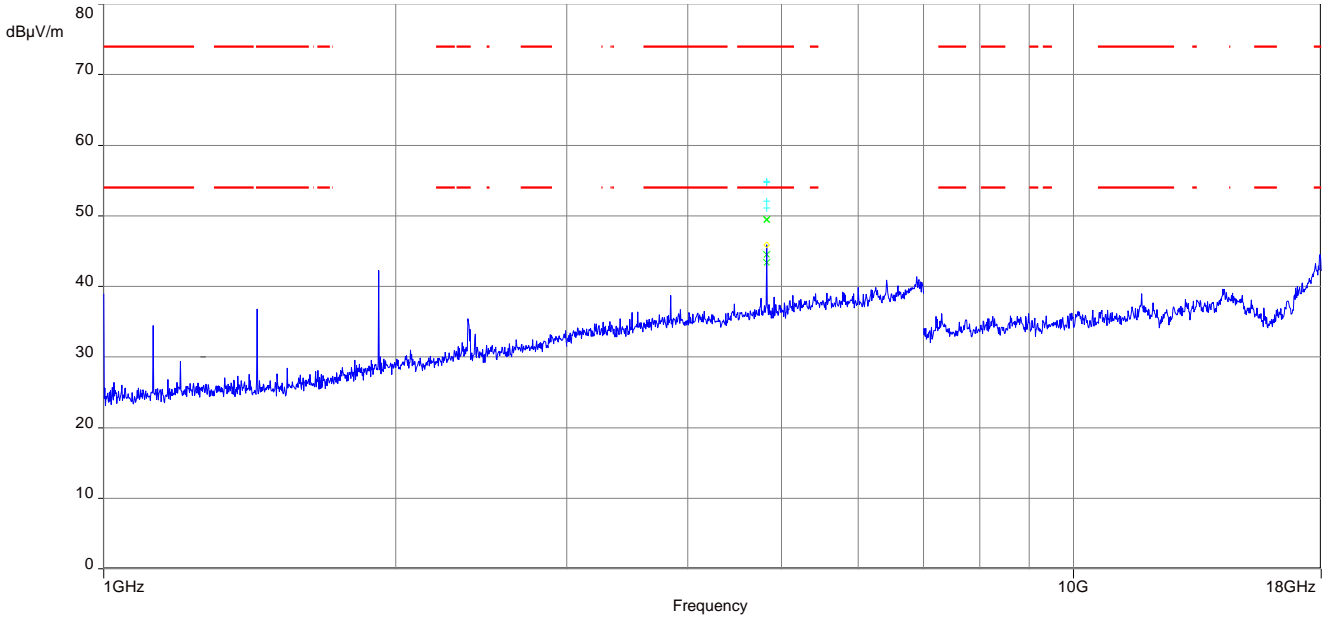
TX spurious emissions radiated / dBµV/m @ 3 m								
Channel 6			Channel 6			Channel 9		
f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m	f / MHz	Detector	Level / dBµV/m
1440	Peak	43.1	1440	Peak	43.1	1440	Peak	43.1
	AVG	42.1		AVG	42.1		AVG	42.1
	Peak			Peak			Peak	
	AVG			AVG			AVG	

Results: RX / idle – mode

RX Spurious Emissions Radiated [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
1440	Peak	43.1
1440	RMS	42.1
1920	Peak	45.8
1920	RMS	44.7

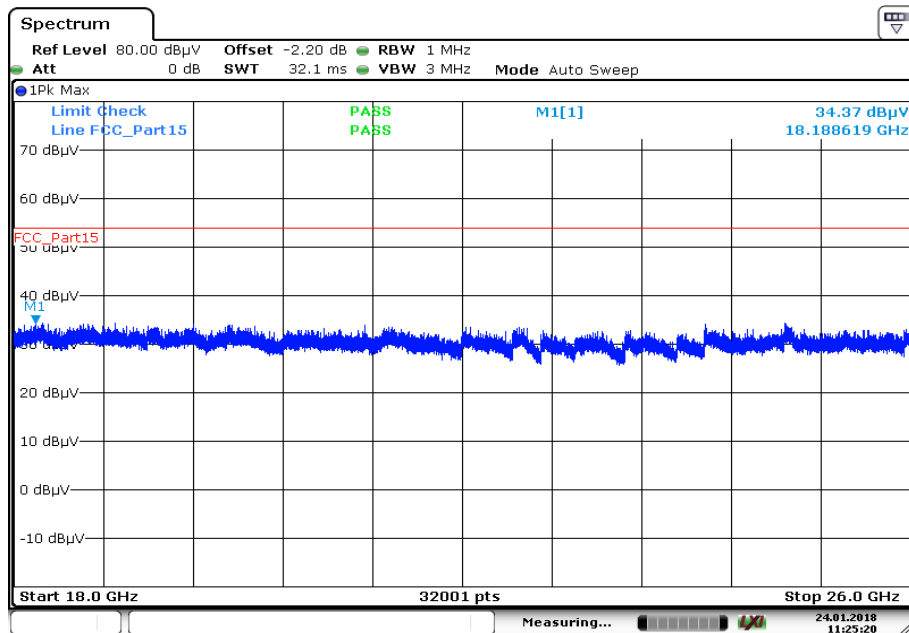
Plots: DSSS

Plot 1: Channel 1, 1 GHz to 18 GHz, vertical & horizontal polarization



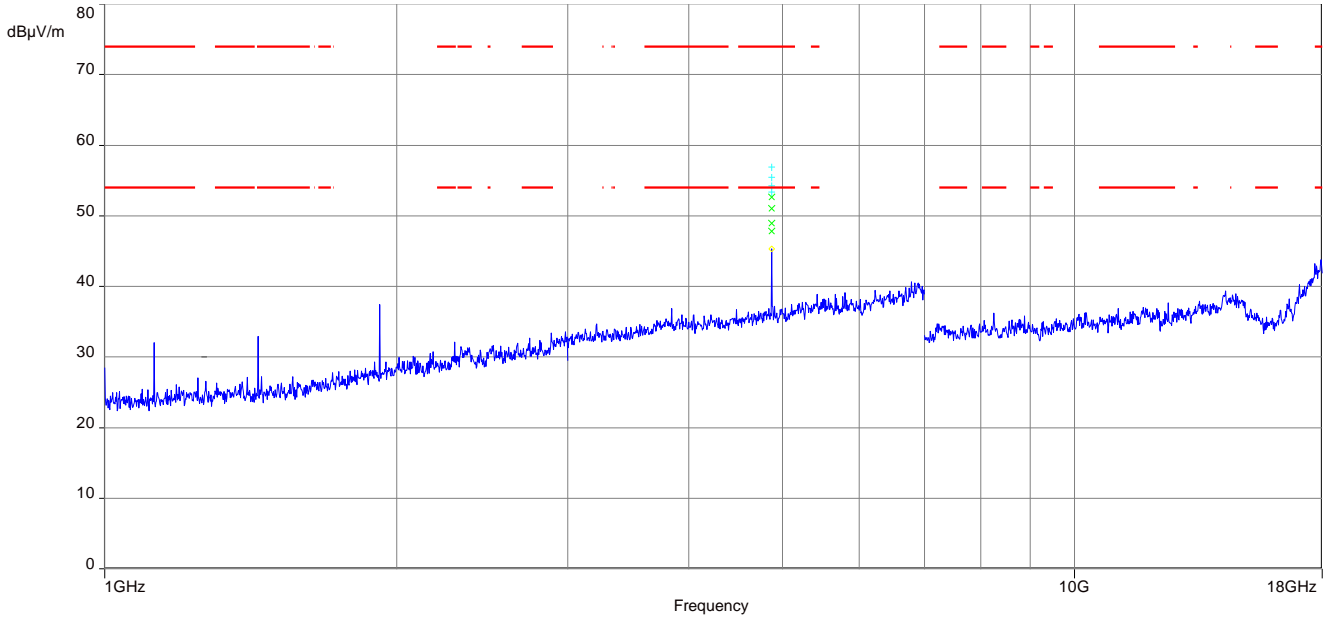
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: Channel 1, 18 GHz to 26 GHz, vertical & horizontal polarization



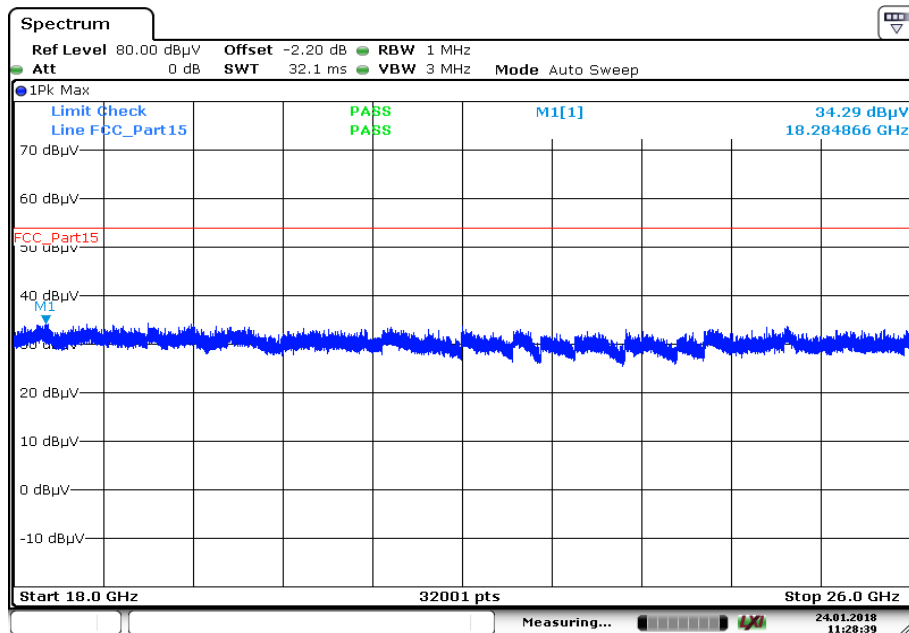
Date: 24.JAN.2018 11:25:20

Plot 3: Channel 6, 1 GHz to 18 GHz, vertical & horizontal polarization

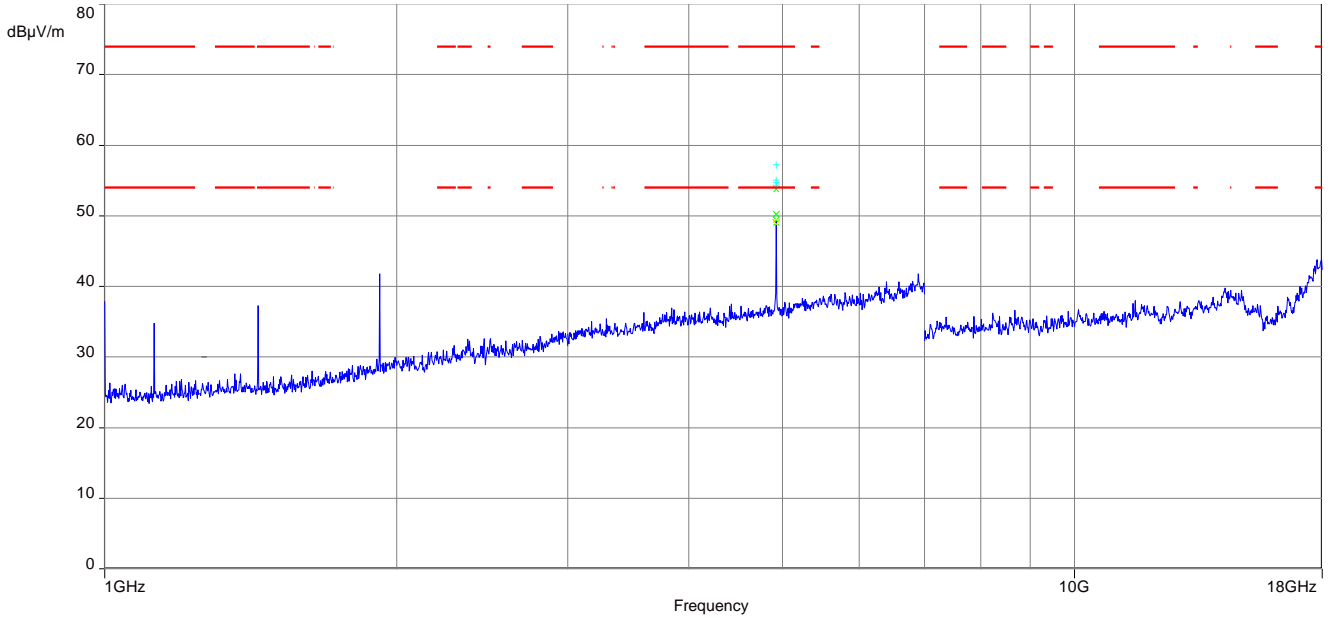


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 4: Channel 6, 18 GHz to 26 GHz, vertical & horizontal polarization

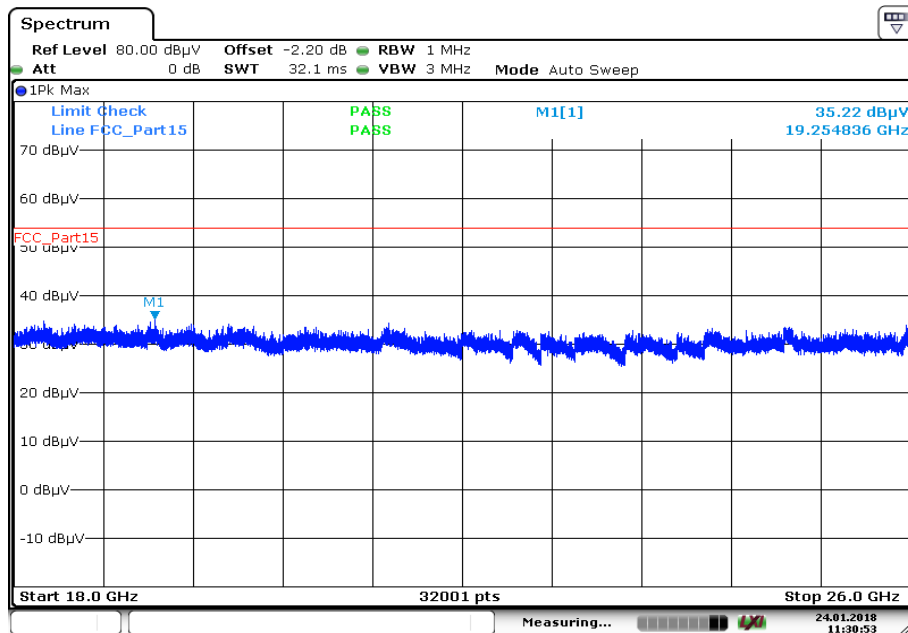


Plot 5: Channel 11, 1 GHz to 18 GHz, vertical & horizontal polarization



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

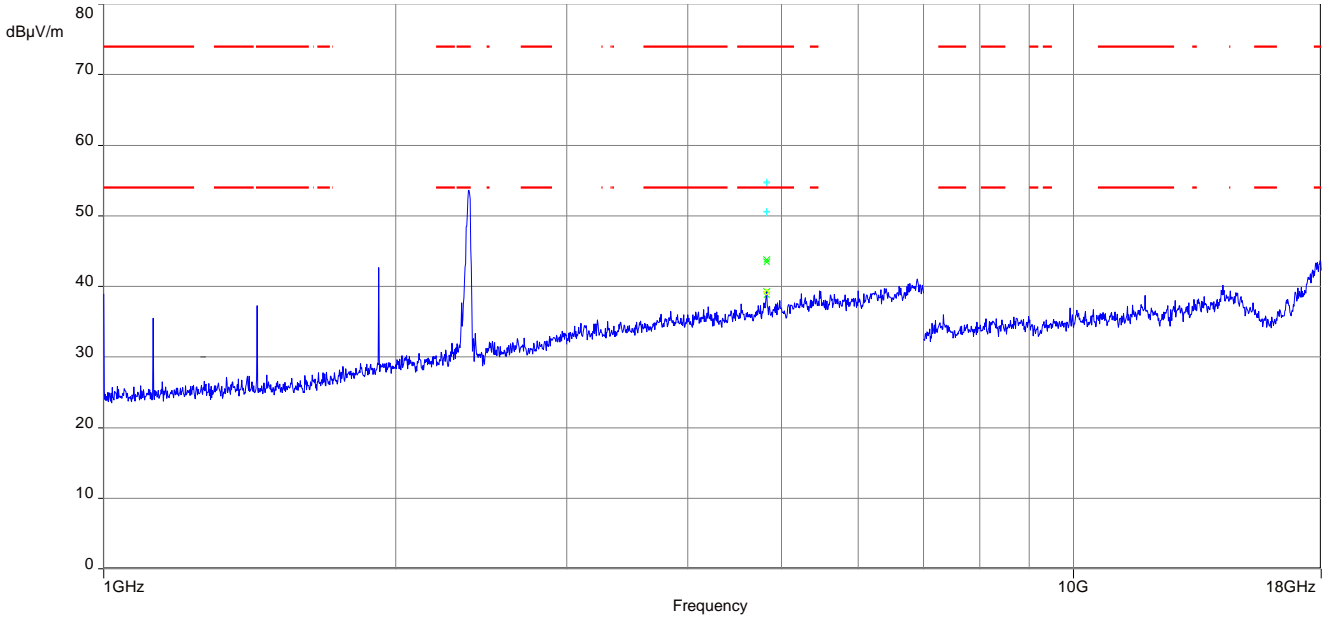
Plot 6: Channel 11, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 24.JAN.2018 11:30:53

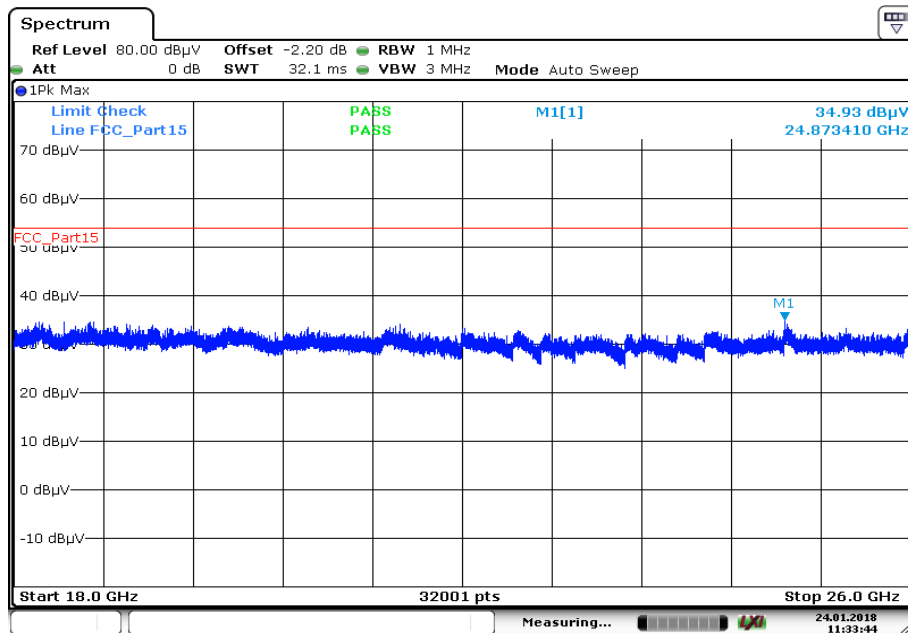
Plots: OFDM (20 MHz bandwidth)

Plot 1: Channel 1, 1 GHz to 18 GHz, vertical & horizontal polarization



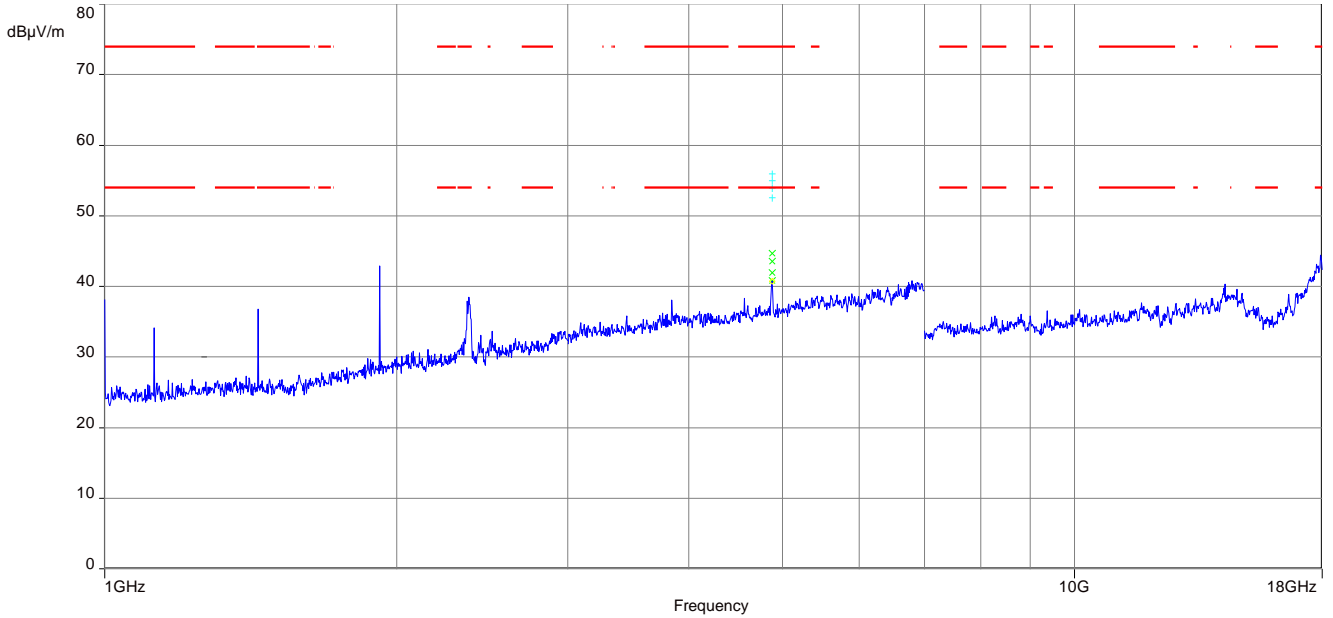
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: Channel 1, 18 GHz to 26 GHz, vertical & horizontal polarization



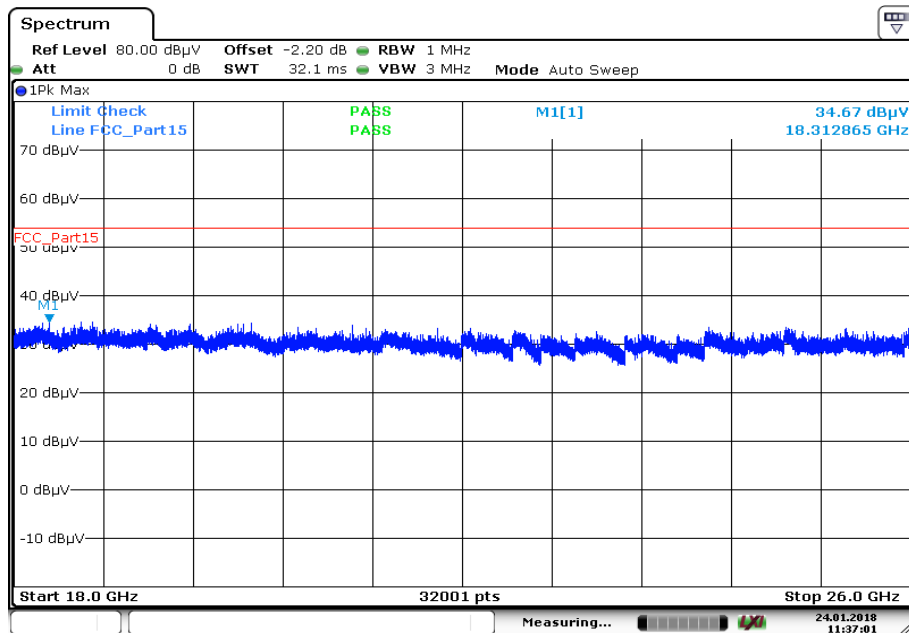
Date: 24.JAN.2018 11:33:44

Plot 3: Channel 6, 1 GHz to 18 GHz, vertical & horizontal polarization



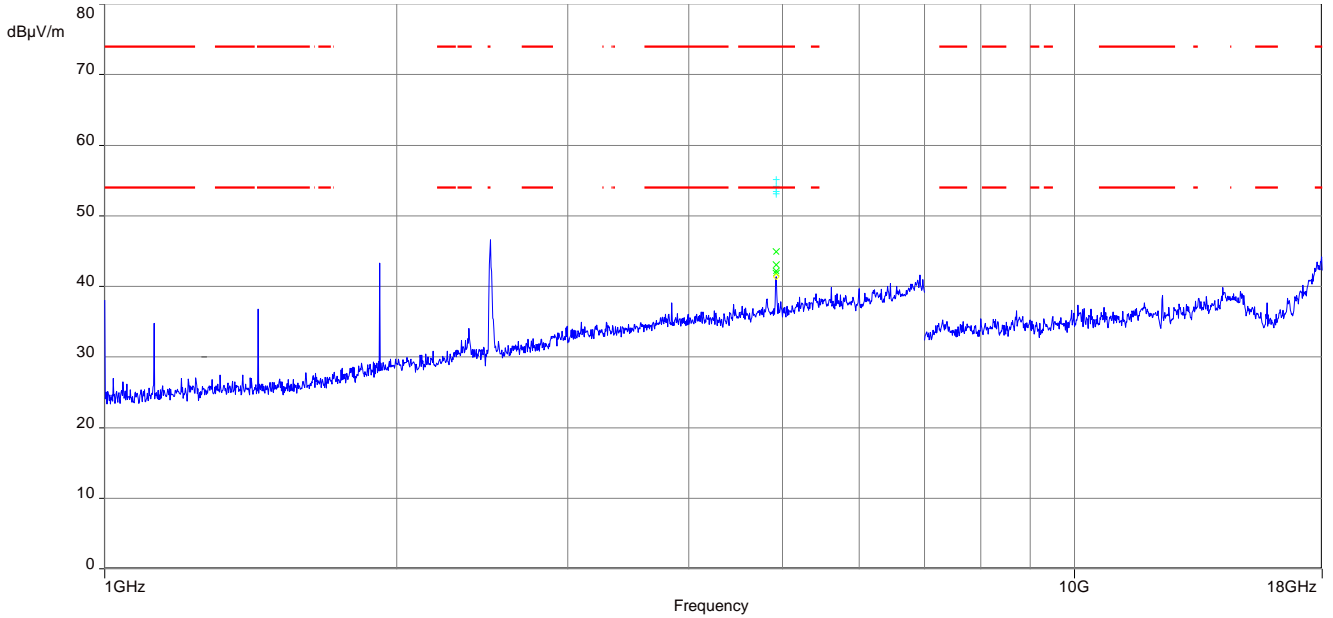
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 4: Channel 6, 18 GHz to 26 GHz, vertical & horizontal polarization



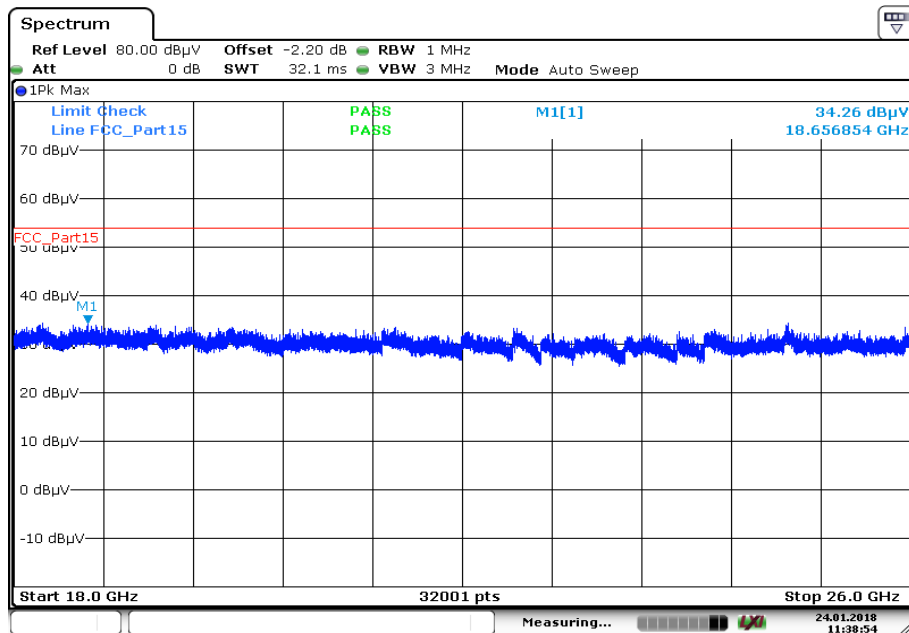
Date: 24.JAN.2018 11:37:01

Plot 5: Channel 11, 1 GHz to 18 GHz, vertical & horizontal polarization



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

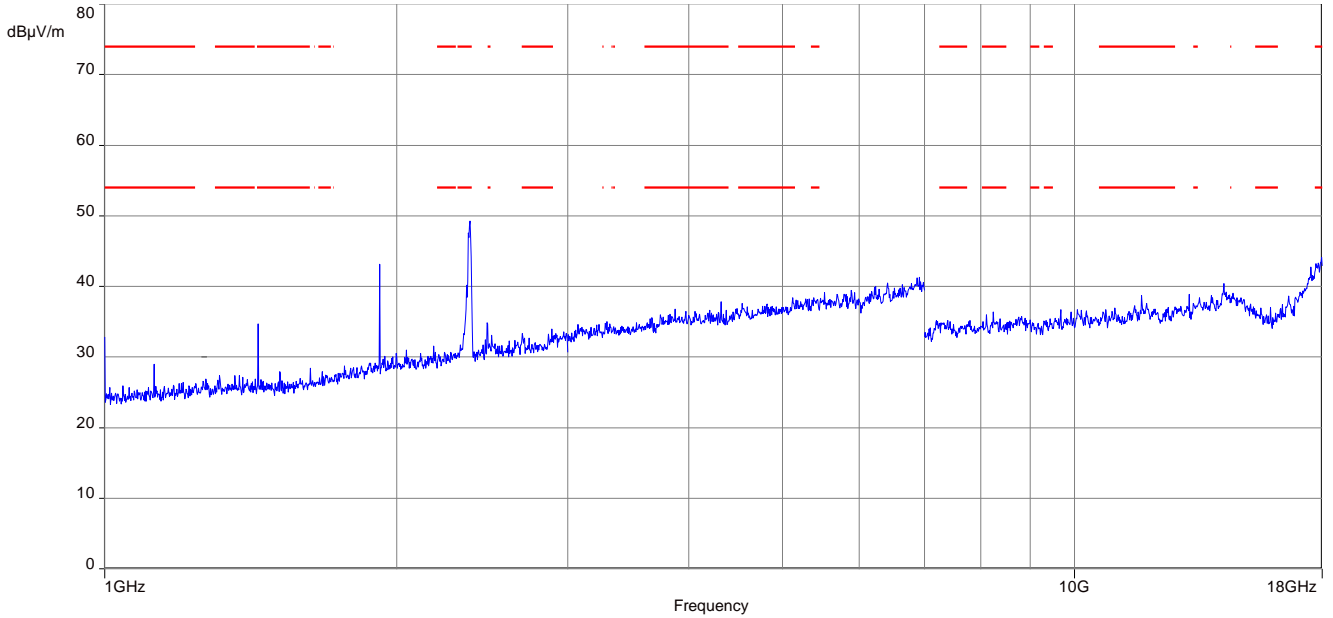
Plot 6: Channel 11, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 24.JAN.2018 11:38:55

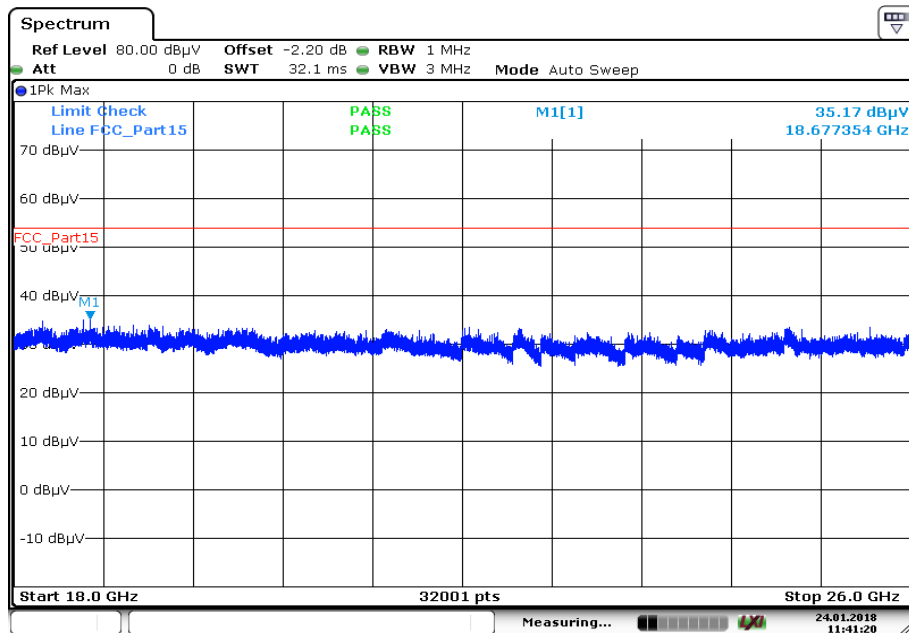
Plots: OFDM (40 MHz bandwidth)

Plot 1: Channel 3, 1 GHz to 18 GHz, vertical & horizontal polarization



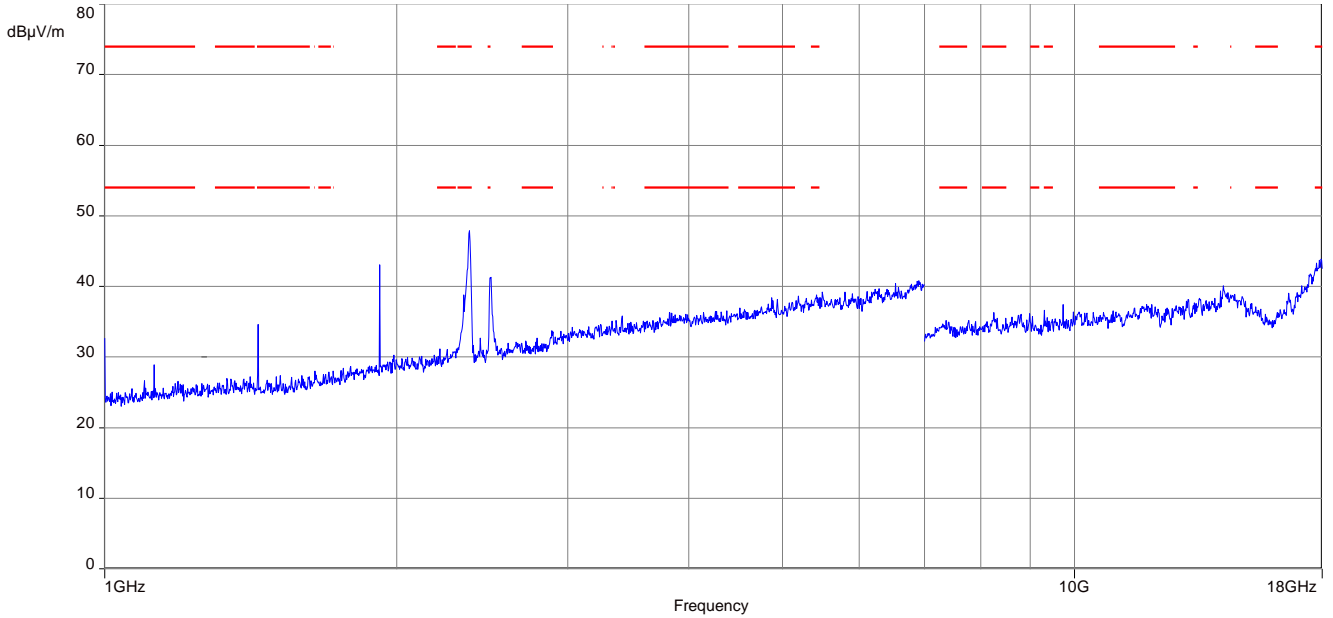
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: Channel 3, 18 GHz to 26 GHz, vertical & horizontal polarization



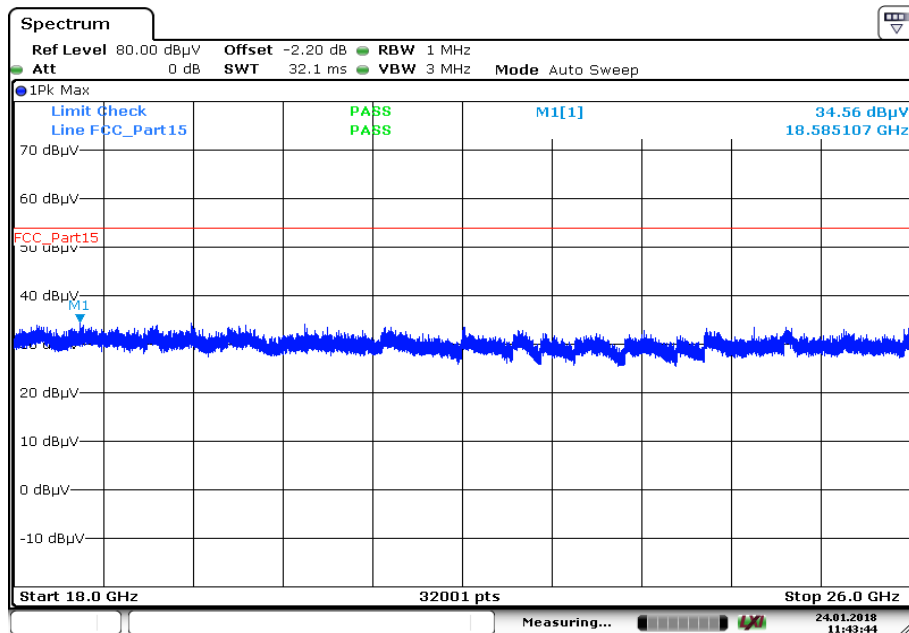
Date: 24.JAN.2018 11:41:20

Plot 3: Channel 6, 1 GHz to 18 GHz, vertical & horizontal polarization



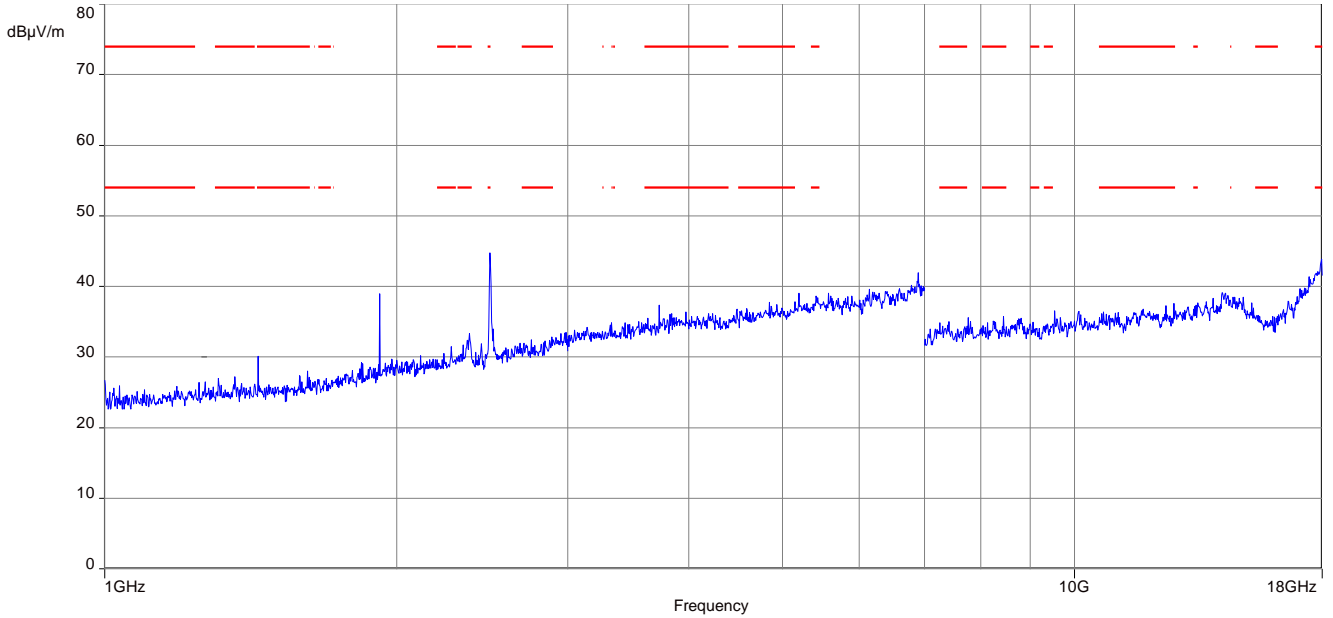
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 4: Channel 6, 18 GHz to 26 GHz, vertical & horizontal polarization



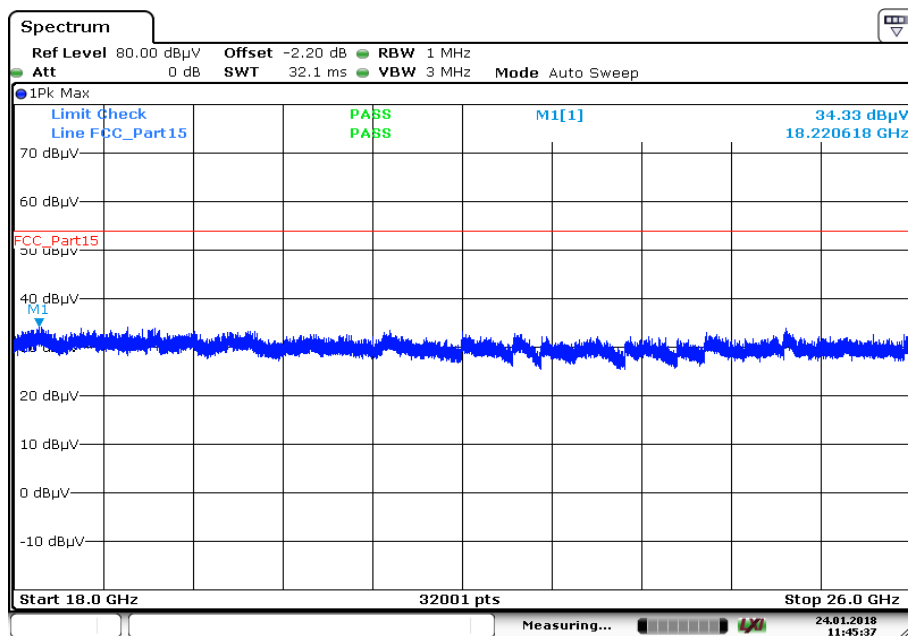
Date: 24.JAN.2018 11:43:45

Plot 5: Channel 9, 1 GHz to 18 GHz, vertical & horizontal polarization



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

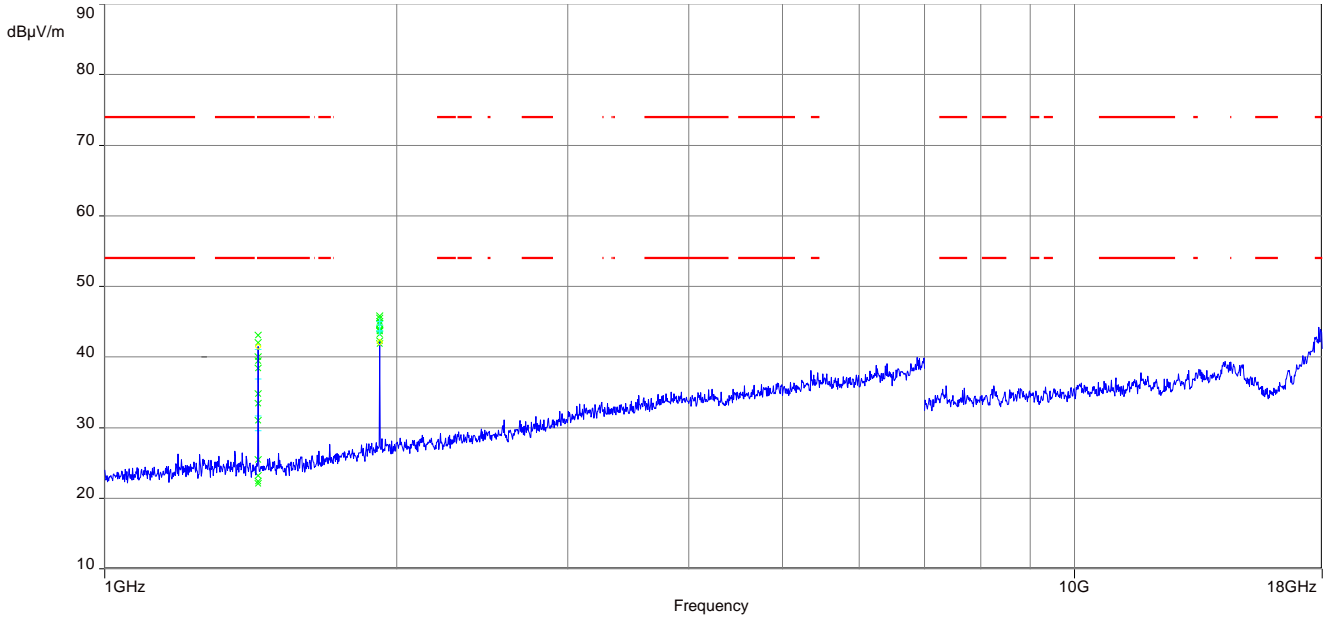
Plot 6: Channel 9, 18 GHz to 26 GHz, vertical & horizontal polarization



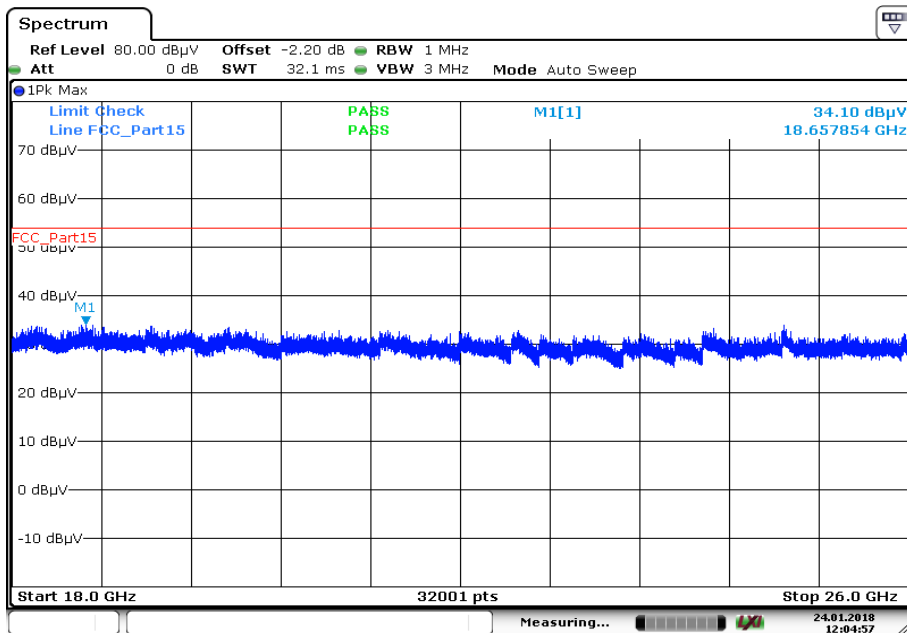
Date: 24.JAN.2018 11:45:37

Plots: RX / idle mode

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



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



Date: 24.JAN.2018 12:04:58

12.14 Spurious emissions conducted below 30 MHz (AC conducted)

Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. 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
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
Test setup	See chapter 6.4 A
Measurement uncertainty	See chapter 8

Limits:

FCC		IC
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

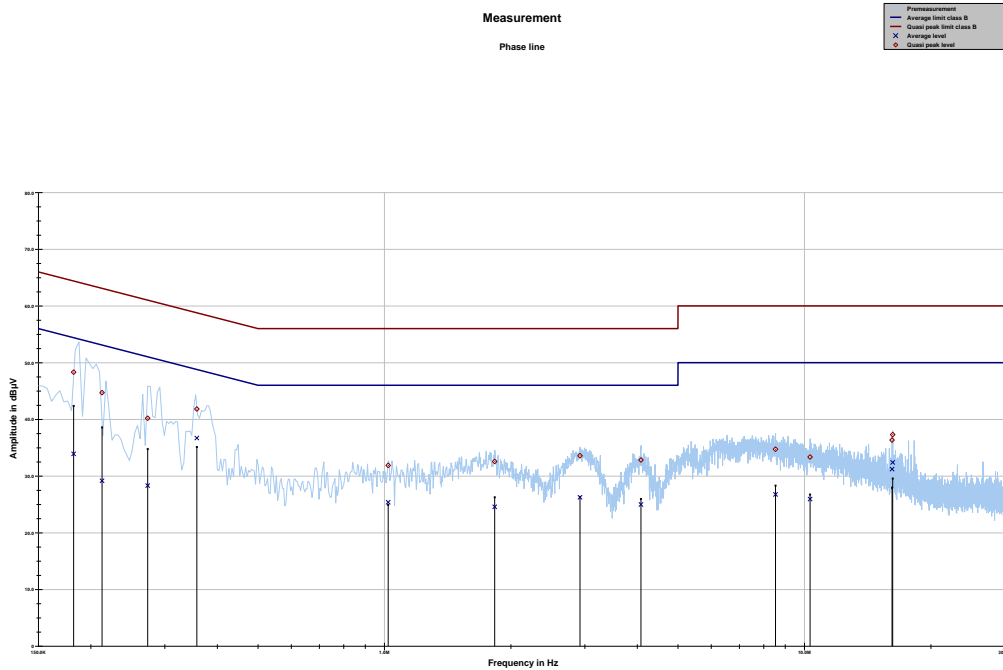
*Decreases with the logarithm of the frequency

Results:

TX spurious emissions conducted < 30 MHz / (dBµV / m) @ 3m		
f / MHz	Detector	Level / dBµV/m
All detected peaks are more than 20 dB below the limit.		

Plots:

Plot 1: 150 kHz to 30 MHz, phase line

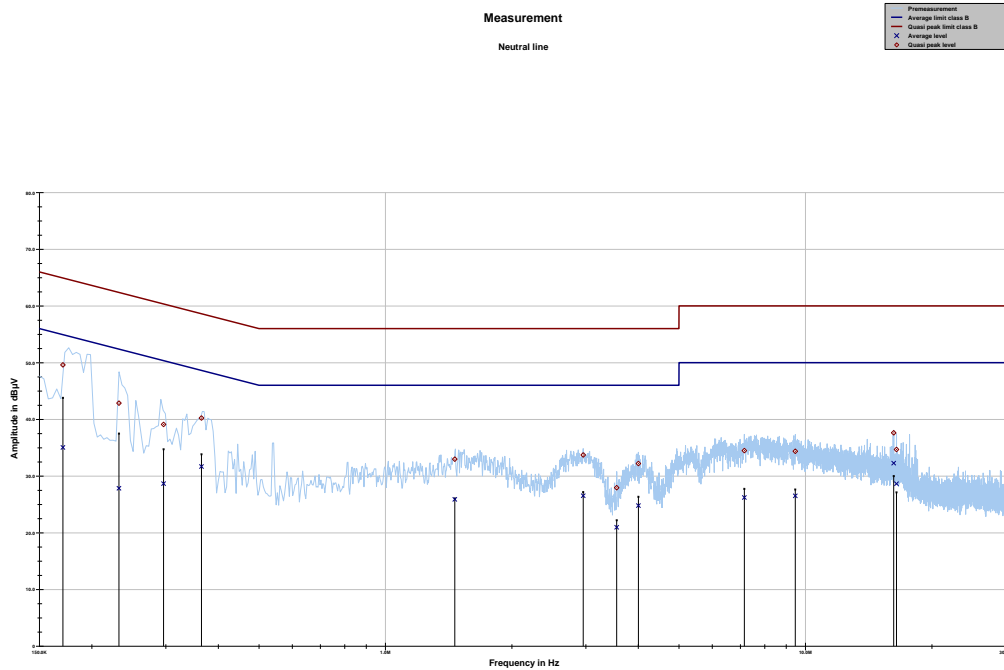


Project ID: 1-5253/17-01-02

Final results:

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.181970	48.32	16.08	64.395	33.92	21.17	55.087
0.212688	44.71	18.39	63.100	29.16	25.05	54.209
0.273207	40.20	20.82	61.020	28.32	24.16	52.480
0.357648	41.83	16.96	58.783	36.69	13.37	50.067
1.020806	31.88	24.12	56.000	25.38	20.62	46.000
1.830075	32.56	23.44	56.000	24.58	21.42	46.000
2.921459	33.59	22.41	56.000	26.24	19.76	46.000
4.080798	32.83	23.17	56.000	24.99	21.01	46.000
8.532974	34.73	25.27	60.000	26.76	23.24	50.000
10.313818	33.35	26.65	60.000	25.93	24.07	50.000
16.166091	36.34	23.66	60.000	31.23	18.77	50.000
16.228939	37.31	22.69	60.000	32.40	17.60	50.000

Plot 2: 150 kHz to 30 MHz, neutral line



Project ID: 1-5253/17-01-02

Final results:

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.170648	49.61	15.32	64.929	35.05	20.36	55.410
0.232076	42.85	19.52	62.375	27.84	25.81	53.655
0.296348	39.10	21.24	60.345	28.66	23.15	51.819
0.364845	40.23	18.38	58.617	31.68	18.18	49.862
1.462499	32.98	23.02	56.000	25.89	20.11	46.000
2.957401	33.72	22.28	56.000	26.53	19.47	46.000
3.552671	27.95	28.05	56.000	20.97	25.03	46.000
4.003277	32.20	23.80	56.000	24.79	21.21	46.000
7.155819	34.48	25.52	60.000	26.21	23.79	50.000
9.459229	34.36	25.64	60.000	26.50	23.50	50.000
16.226526	37.62	22.38	60.000	32.27	17.73	50.000
16.473488	34.68	25.32	60.000	28.65	21.35	50.000

13 Observations

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

Annex A Glossary

EUT	Equipment under test
DUT	Device under test
UUT	Unit under test
GUE	GNSS User Equipment
ETSI	European Telecommunications Standards Institute
EN	European Standard
FCC	Federal Communications Commission
FCC ID	Company Identifier at FCC
IC	Industry Canada
PMN	Product marketing name
HMN	Host marketing name
HVIN	Hardware version identification number
FVIN	Firmware version identification number
EMC	Electromagnetic Compatibility
HW	Hardware
SW	Software
Inv. No.	Inventory number
S/N or SN	Serial number
C	Compliant
NC	Not compliant
NA	Not applicable
NP	Not performed
PP	Positive peak
QP	Quasi peak
AVG	Average
OC	Operating channel
OCW	Operating channel bandwidth
OBW	Occupied bandwidth
OOB	Out of band
DFS	Dynamic frequency selection
CAC	Channel availability check
OP	Occupancy period
NOP	Non occupancy period
DC	Duty cycle
PER	Packet error rate
CW	Clean wave
MC	Modulated carrier
WLAN	Wireless local area network
RLAN	Radio local area network
DSSS	Dynamic sequence spread spectrum
OFDM	Orthogonal frequency division multiplexing
FHSS	Frequency hopping spread spectrum
GNSS	Global Navigation Satellite System
C/N₀	Carrier to noise-density ratio, expressed in dB-Hz

Annex B Document history

Version	Applied changes	Date of release
-/-	Initial release	2018-02-22

Annex C Accreditation Certificate

first page	last page
 <p>DAkkS Deutsche Akkreditierungsstelle</p> <p>Deutsche Akkreditierungsstelle GmbH</p> <p>Entrusted according to Section 8 subsection 1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition</p> <p>Accreditation</p> <p>The Deutsche Akkreditierungsstelle GmbH attests that the testing laboratory CTC advanced GmbH Untertürkheimer Straße 6-10, 66117 Saarbrücken</p> <p>is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out tests in the following fields: Telecommunication</p> <p>The accreditation certificate shall only apply in connection with the notice of accreditation of 02.06.2017 with the accreditation number D-PL-12076-01 and is valid until 21.04.2021. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 43 pages.</p> <p>Registration number of the certificate: D-PL-12076-01-03</p> <p>Frankfurt, 02.06.2017</p> <p>Dipl.-Ing. (FH) Ralf Böker Head of Division</p>	 <p>Deutsche Akkreditierungsstelle GmbH</p> <p>Office Berlin Spittelmarkt 10 10117 Berlin</p> <p>Office Frankfurt am Main Europa-Allee 52 60327 Frankfurt am Main</p> <p>Office Braunschweig Bundesallee 100 38116 Braunschweig</p> <p>The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akkreditierungsstelle GmbH (DAkkS). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf.</p> <p>No impression shall be made that the accreditation also extends to fields beyond the scope of accreditation attested by DAkkS.</p> <p>The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAkkS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.</p> <p>The up-to-date state of membership can be retrieved from the following websites: EA: www.european-accreditation.org ILAC: www.ilac.org IAF: www.iaf.nu</p>

Note: The current certificate annex is published on the website (link see below) of the Accreditation Body DAkkS or may be received by CTC advanced GmbH on request

<http://www.dakks.de/as/ast/d/D-PL-12076-01-03.pdf>