

11.8 Occupied bandwidth – 20 dB bandwidth

Description:

Measurement of the 20 dB bandwidth of the modulated carrier.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	500 kHz
Span:	30 MHz / 50 MHz
Trace mode:	Single count with min. 200 counts
Test setup:	See sub clause 6.5 – A
Measurement uncertainty	See sub clause 8

Usage:

-/-	IC
Within the used band!	

Results: UFL port

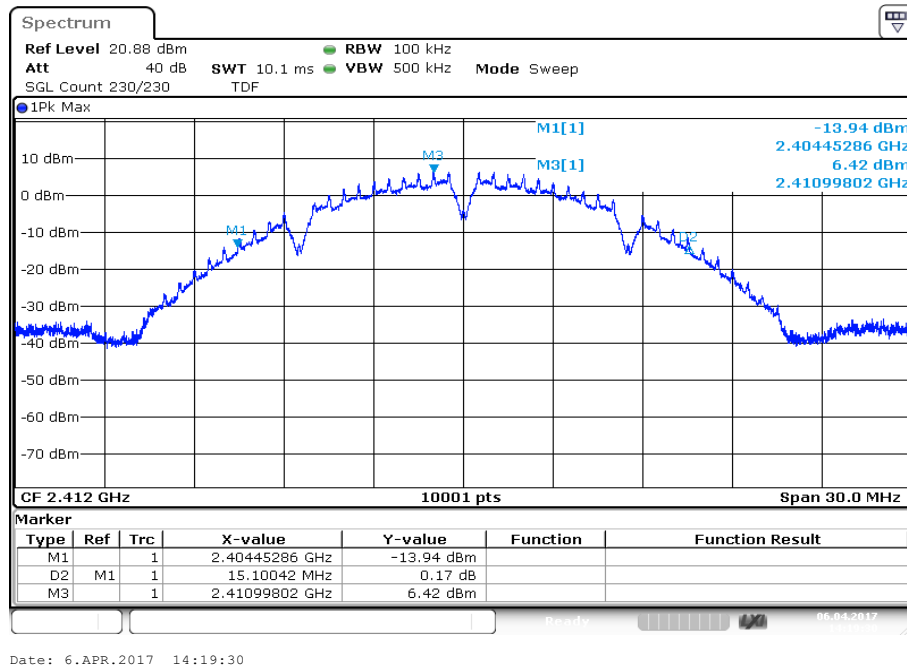
Modulation	20 dB bandwidth [MHz]		
	2412 MHz	2437 MHz	2462 MHz
Frequency			
DSSS / b – mode	15.100	15.095	15.583
OFDM / g – mode	17.497	17.464	17.440
OFDM / n HT20 – mode	18.391	18.598	18.418
Frequency	2422 MHz	2437 MHz	2452 MHz
OFDM / n HT40 – mode	37.472	37.172	37.262

Results: MMCX port

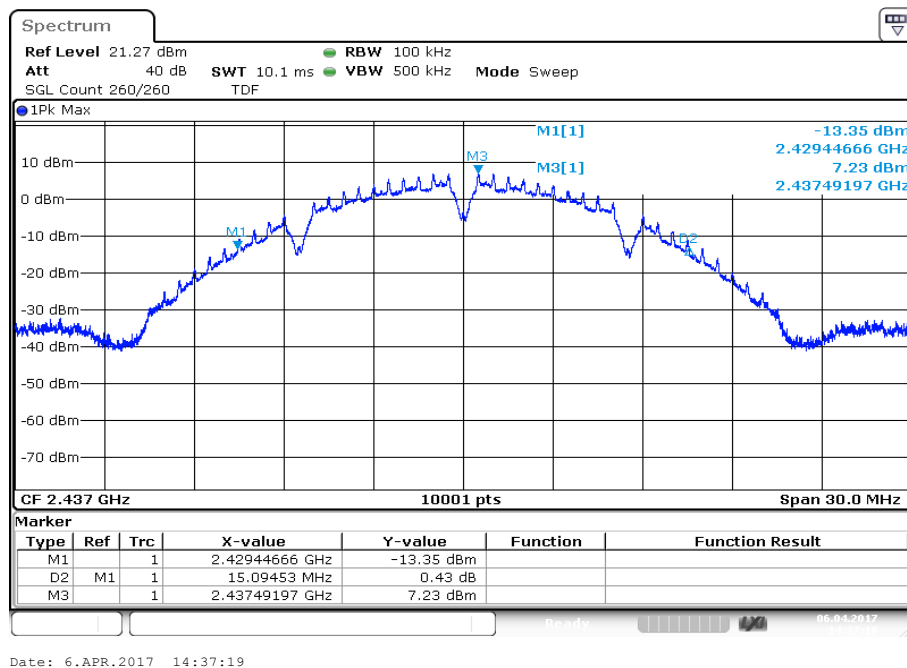
Modulation Frequency	20 dB bandwidth [MHz]		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	15.100	15.095	15.088
OFDM / g – mode	17.401	17.341	17.203
OFDM / n HT20 – mode	18.367	18.493	18.469
Frequency	2422 MHz	2437 MHz	2452 MHz
OFDM / n HT40 – mode	37.322	37.142	37.406

Plots: DSSS / b – mode, UFL port

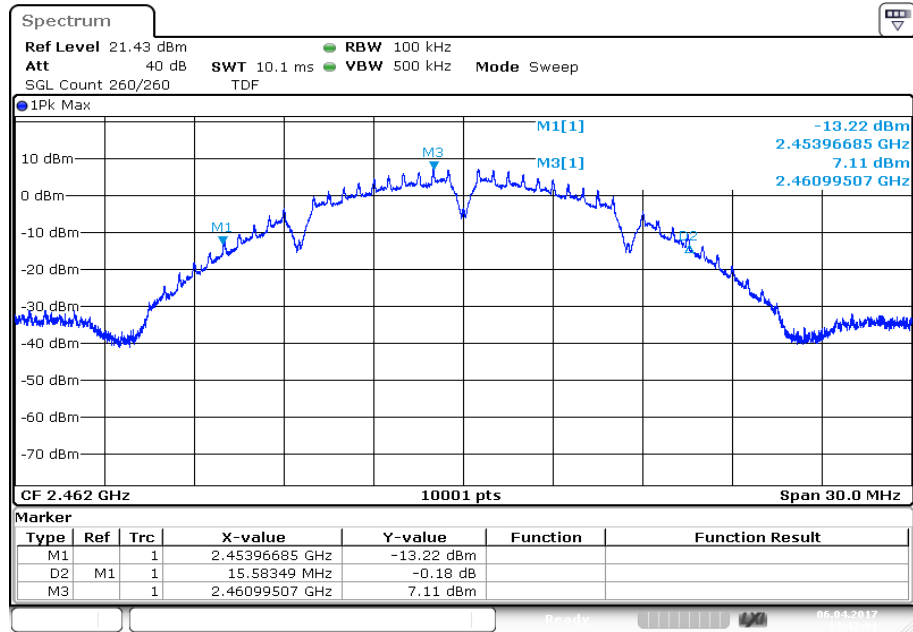
Plot 1: Lowest channel



Plot 2: Middle channel



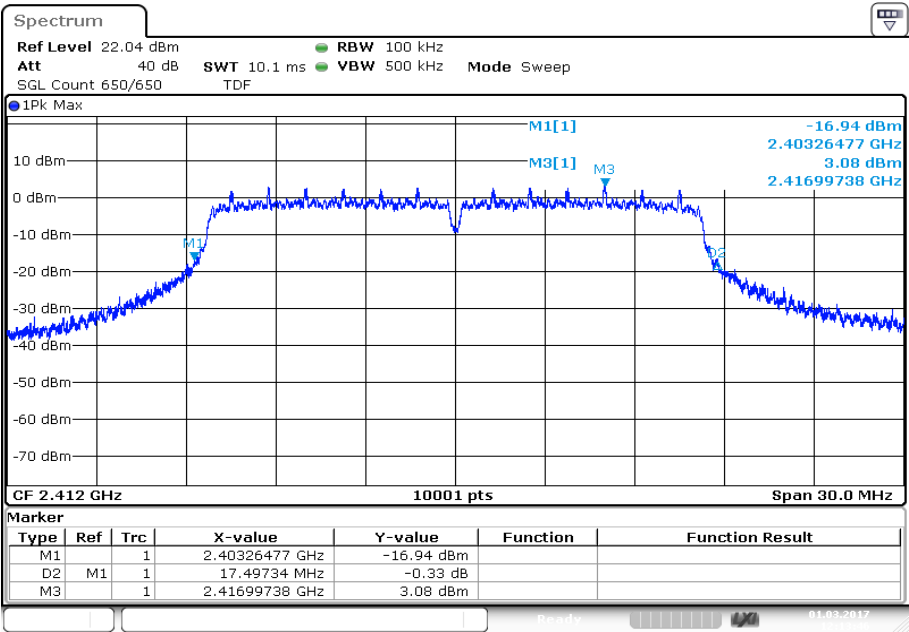
Plot 3: Highest channel



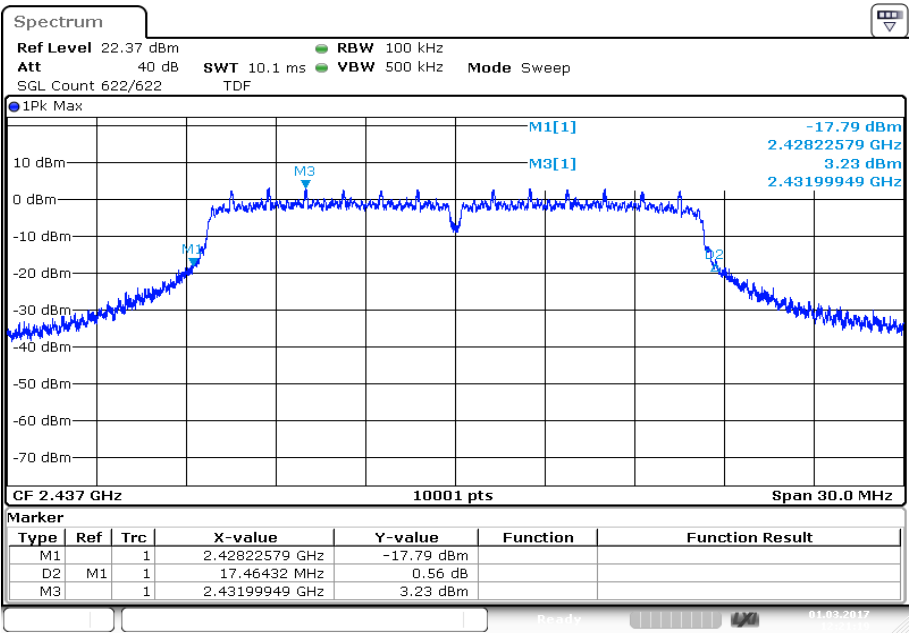
Date: 6.APR.2017 14:47:01

Plots: OFDM / g – mode, UFL port

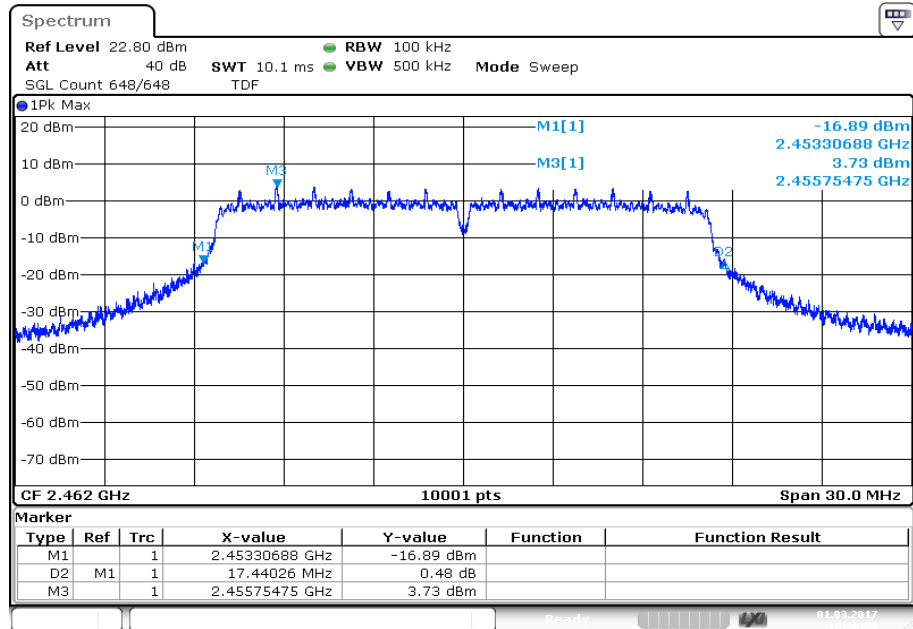
Plot 1: Lowest channel



Plot 2: Middle channel



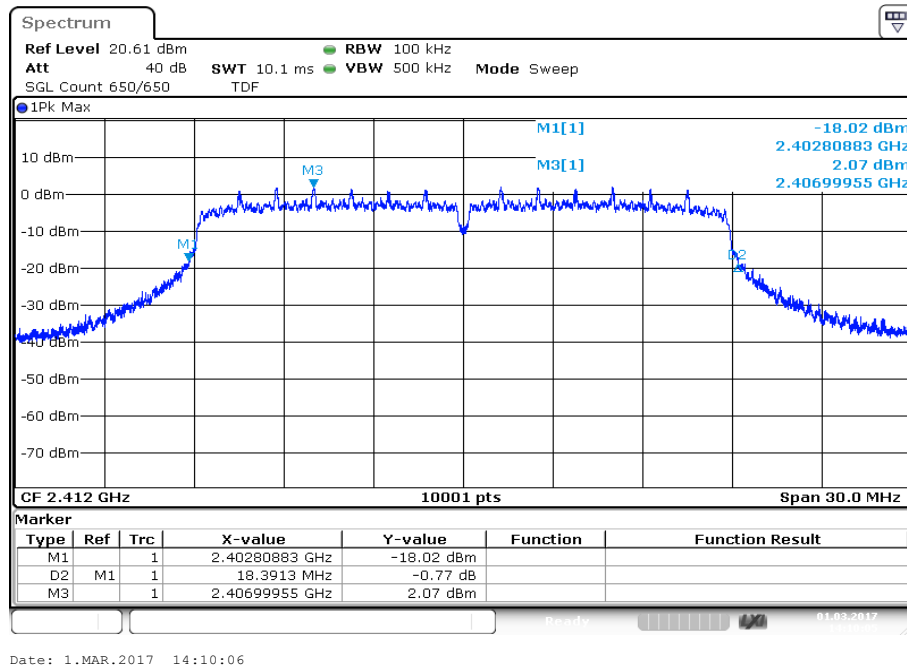
Plot 3: Highest channel



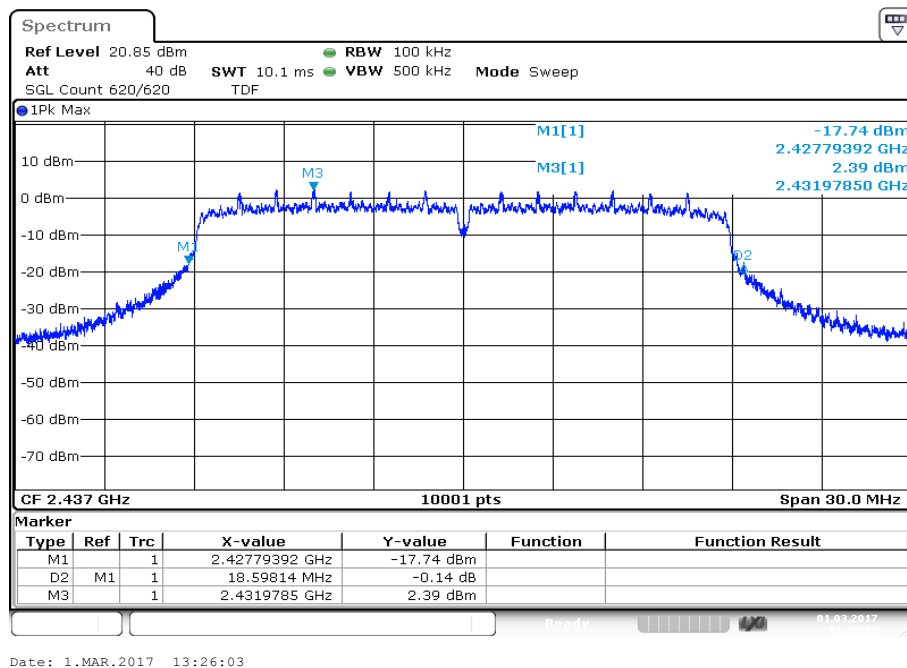
Date: 1.MAR.2017 12:38:38

Plots: OFDM / n HT20 – mode, UFL port

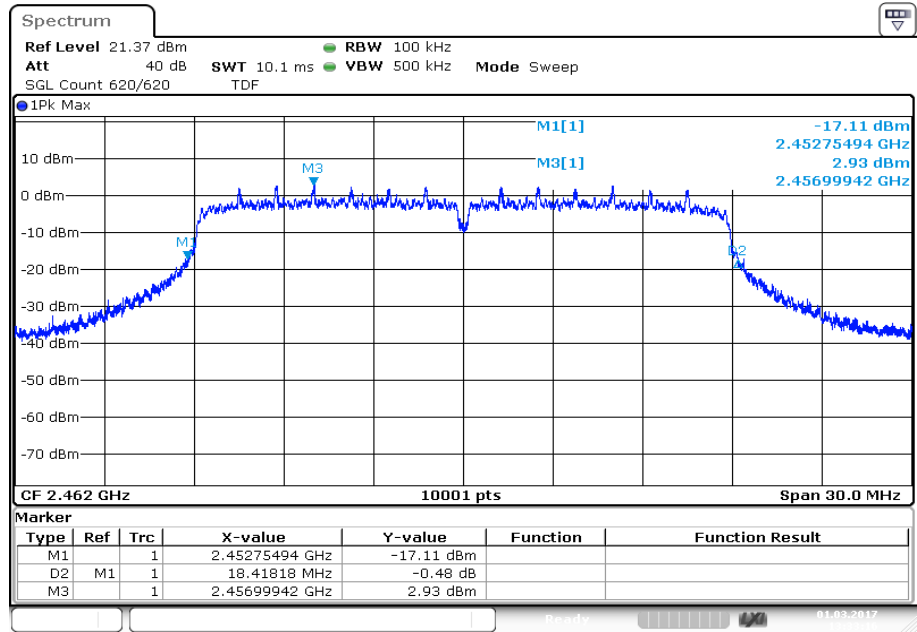
Plot 1: Lowest channel



Plot 2: Middle channel



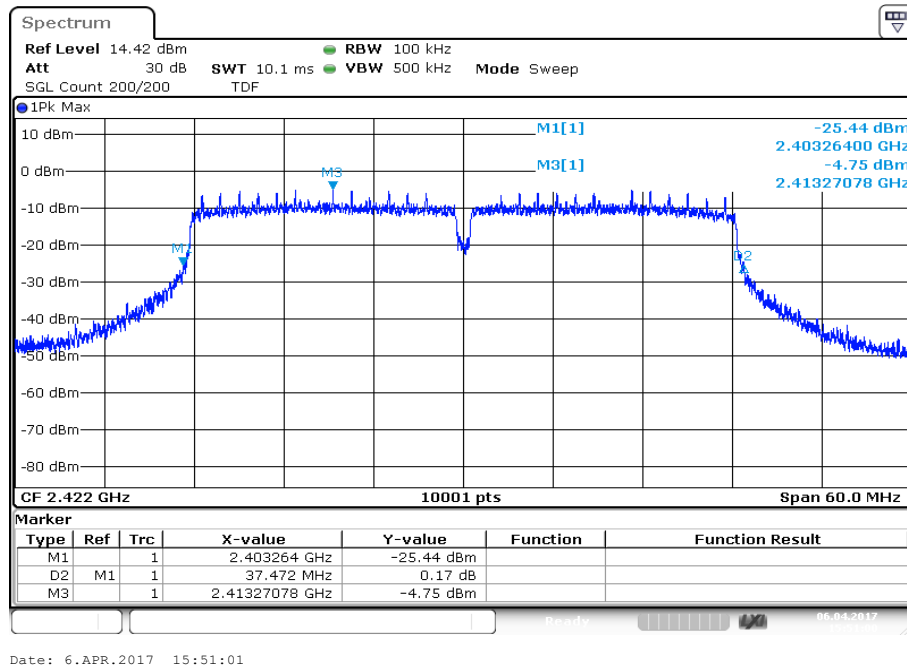
Plot 3: Highest channel



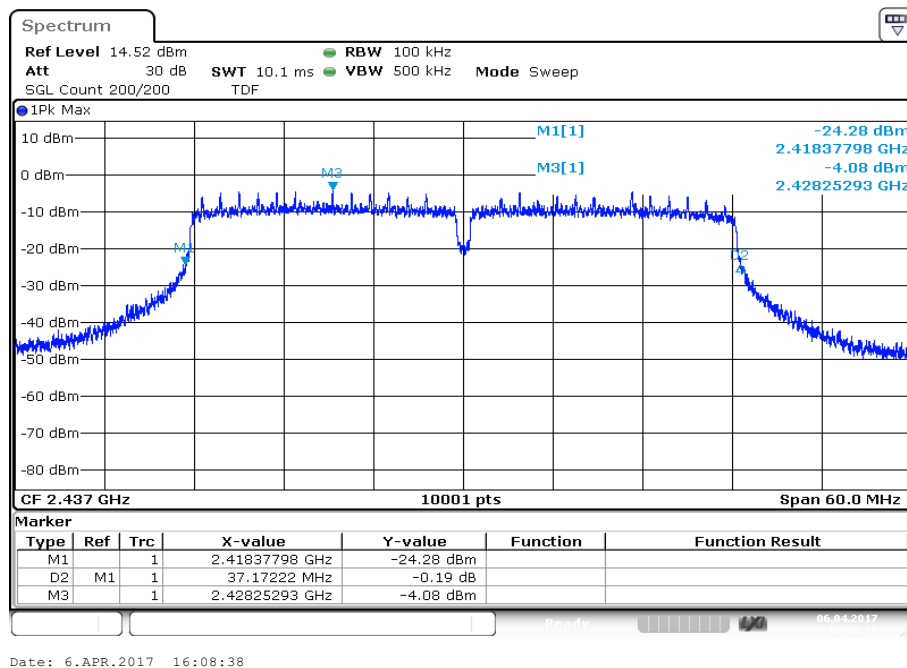
Date: 1.MAR.2017 13:33:17

Plots: OFDM / n HT40 – mode, UFL port

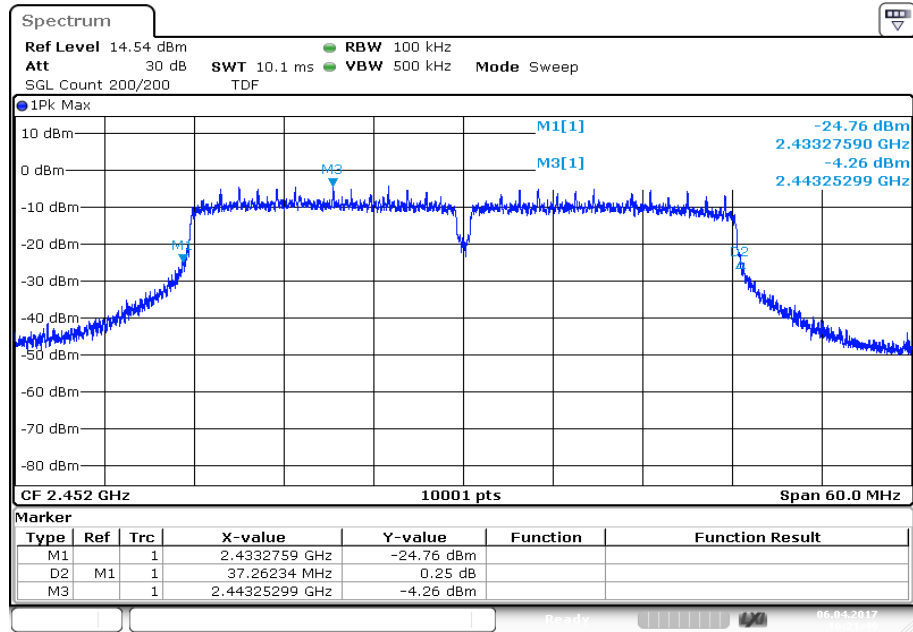
Plot 1: Lowest channel



Plot 2: Middle channel

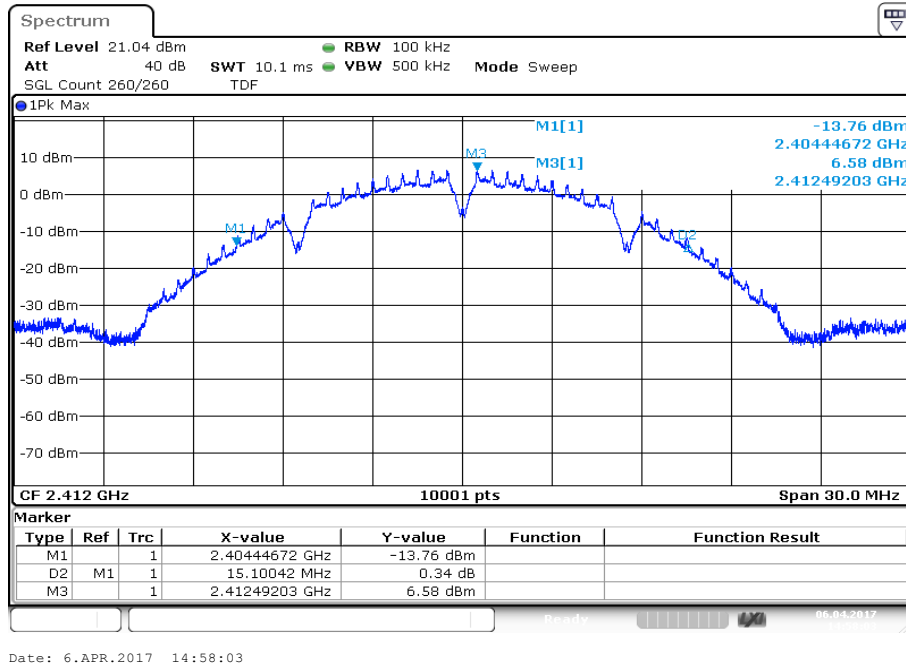


Plot 3: Highest channel

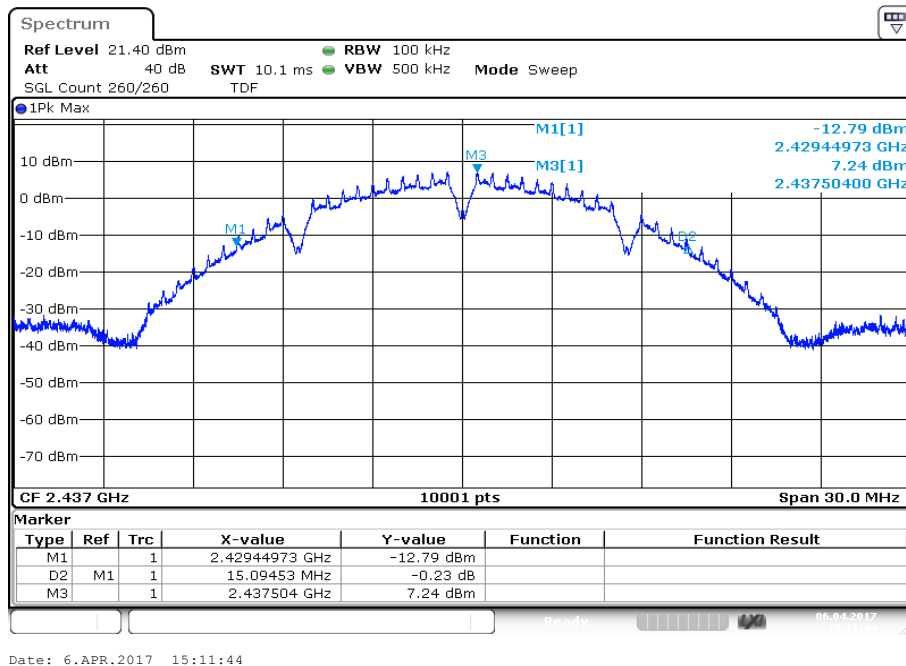


Plots: DSSS / b – mode, MMCX port

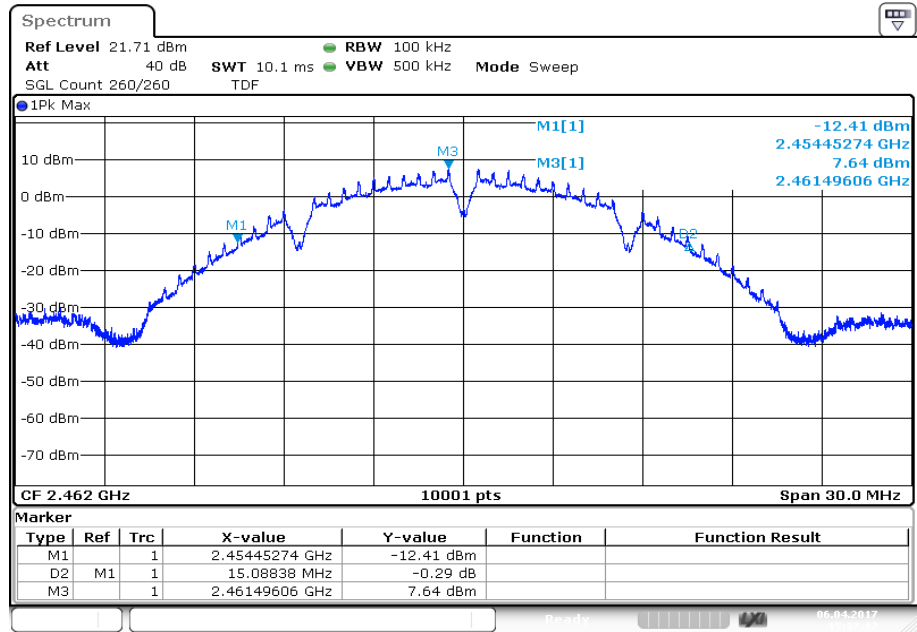
Plot 1: Lowest channel



Plot 2: Middle channel



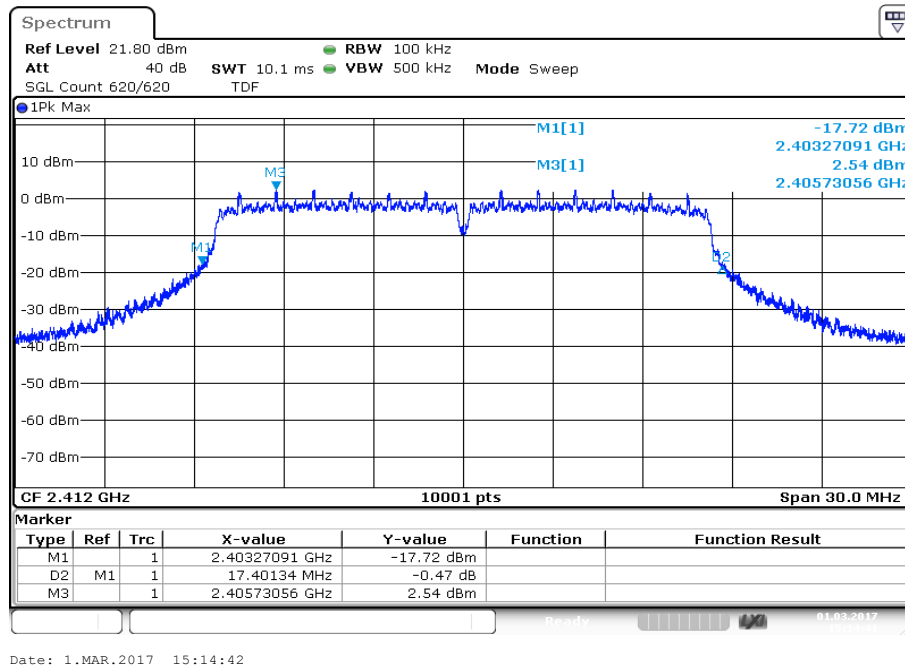
Plot 3: Highest channel



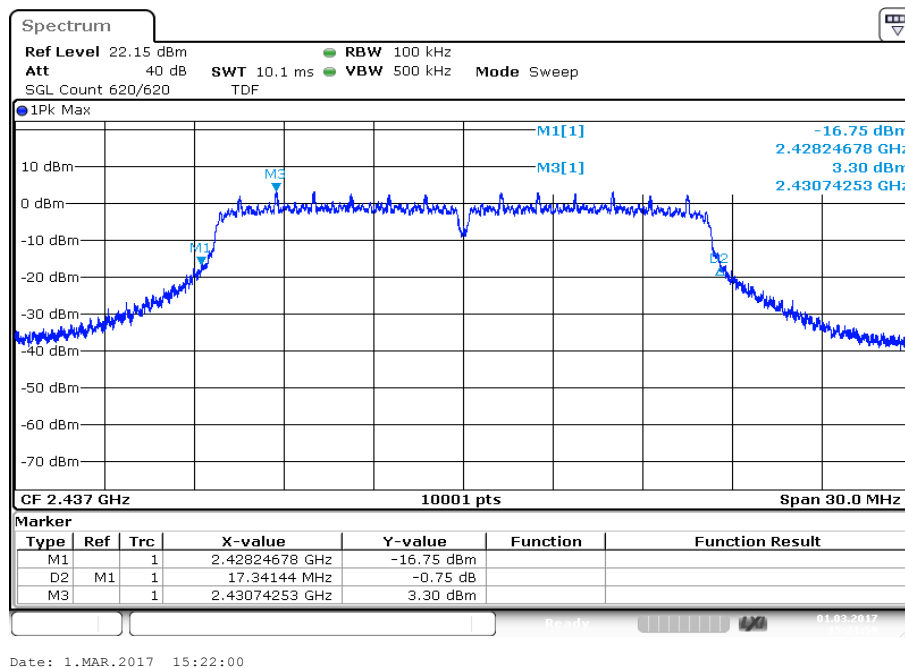
Date: 6.APR.2017 15:37:12

Plots: OFDM / g – mode, MMCX port

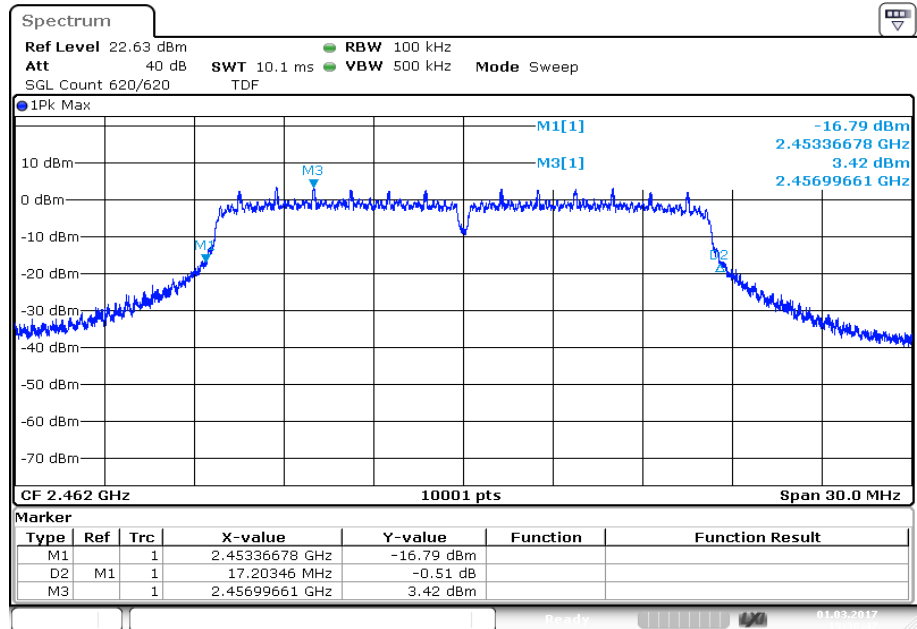
Plot 1: Lowest channel



Plot 2: Middle channel



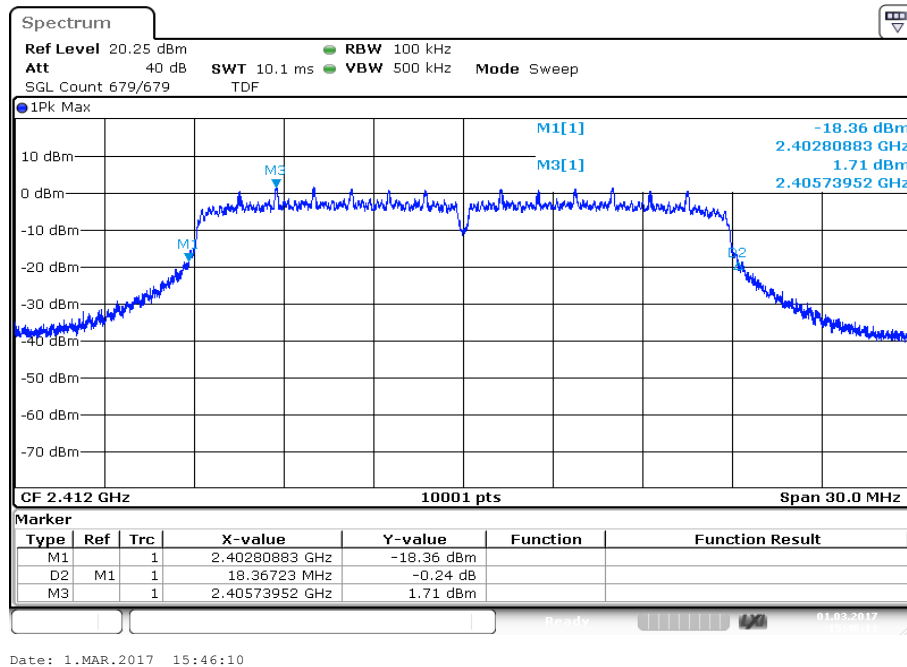
Plot 3: Highest channel



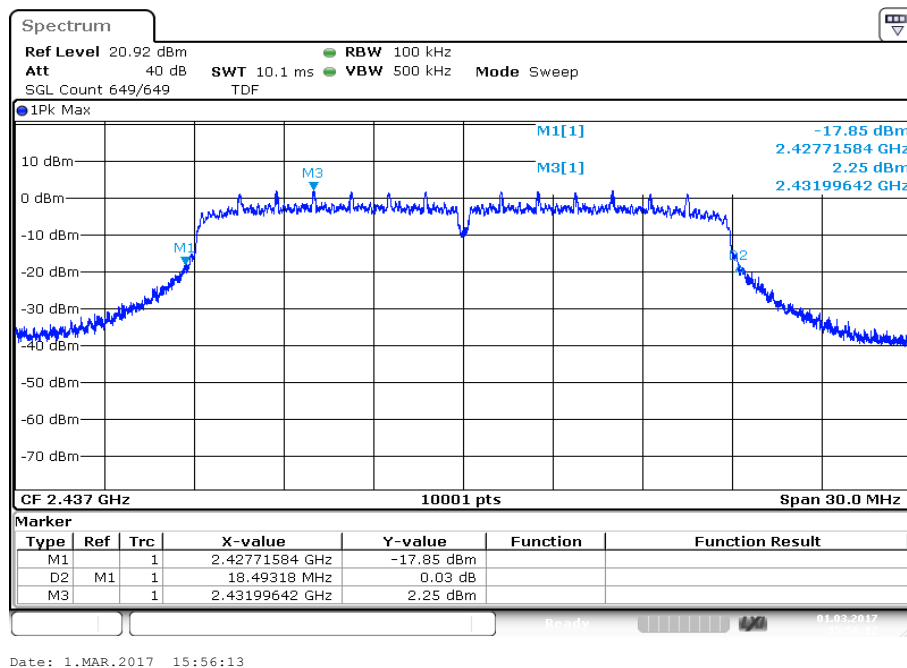
Date: 1.MAR.2017 15:38:48

Plots: OFDM / n HT20 – mode, MMCX port

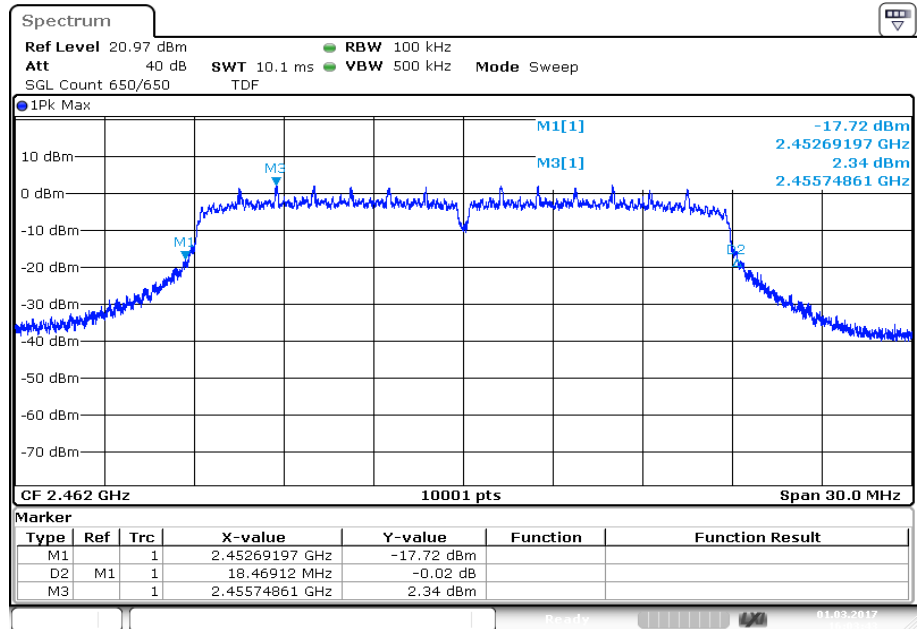
Plot 1: Lowest channel



Plot 2: Middle channel



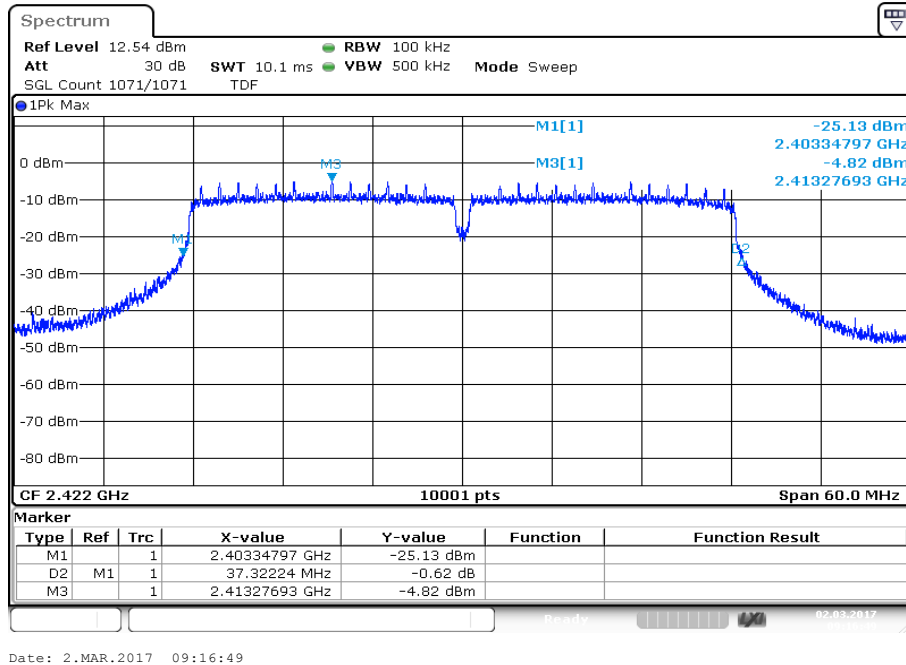
Plot 3: Highest channel



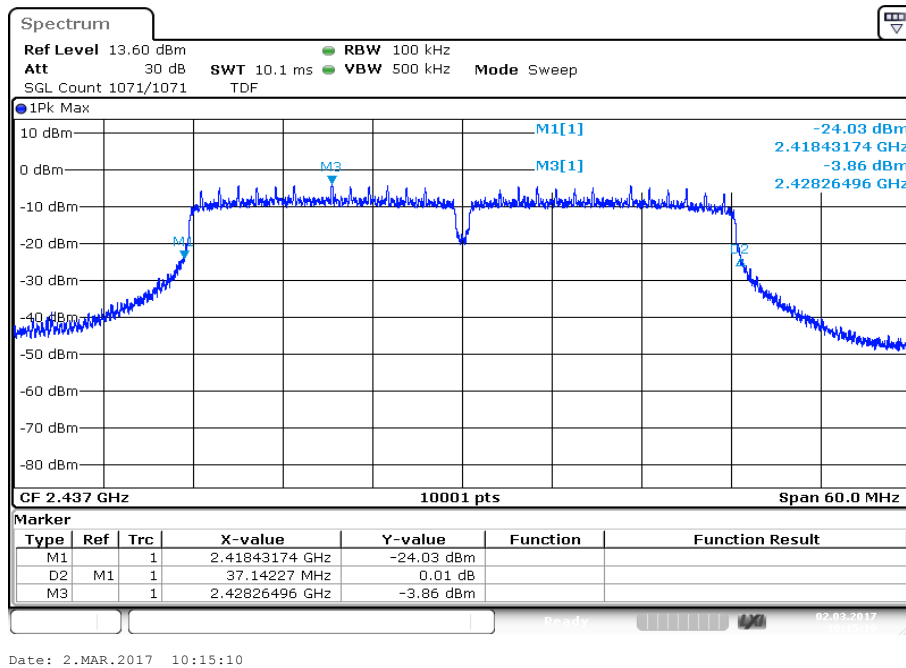
Date: 1.MAR.2017 16:03:44

Plots: OFDM / n HT40 – mode, MMCX port

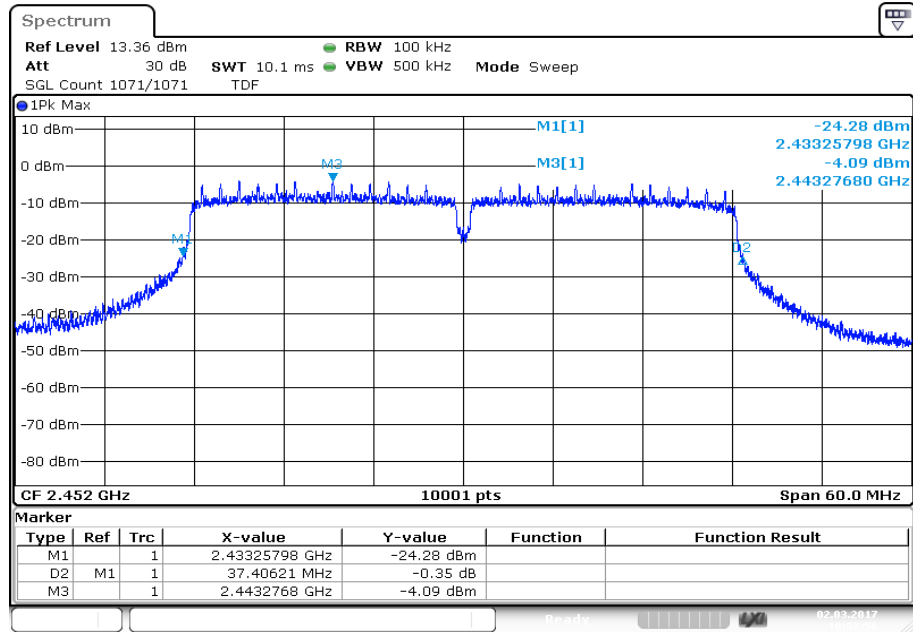
Plot 1: Lowest channel



Plot 2: Middle channel



Plot 3: Highest channel



Date: 2.MAR.2017 10:57:56

11.9 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:	Lower band edge: 2388 MHz to 2390 MHz (2 MHz) Upper band edge: 2483.5 MHz to 2485.5 MHz (2 MHz)
Trace mode:	Trace average with 200 counts
Test setup:	See sub clause 6.5 – A
Measurement uncertainty	See sub clause 8

Limits:

FCC	IC
-41.26 dBm	

Results: UFL port

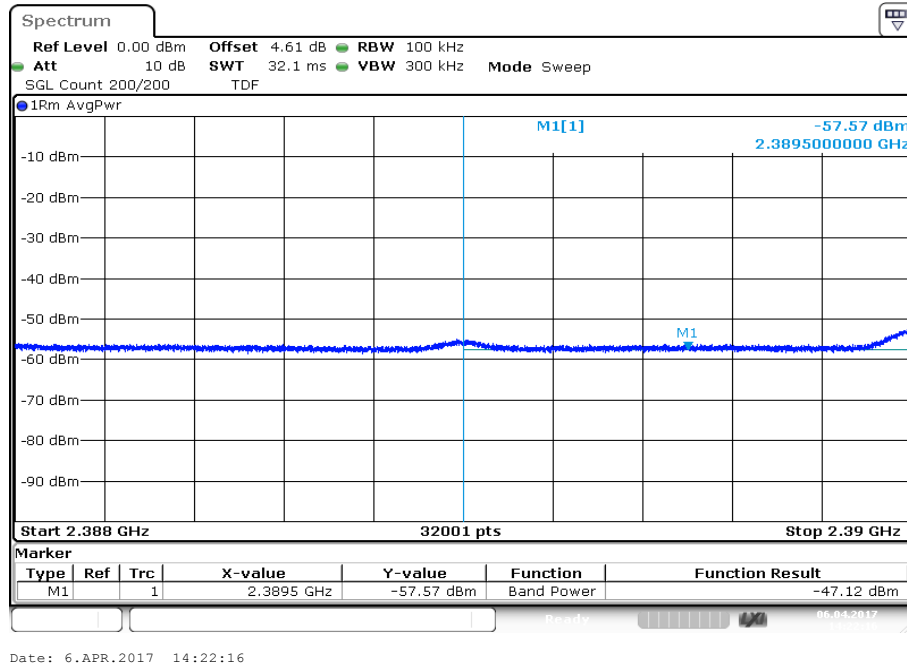
Scenario Modulation	Band edge compliance [dBm] (included antenna gain)			
	DSSS / b – mode	OFDM / g – mode	OFDM / n HT20 – mode	OFDM / n HT40 – mode
Max. lower band edge power	-47.1	-42.0	-44.3	-45.5
Max. upper band edge power	-50.3	-42.0	-44.3	-49.3

Results: MMCX port

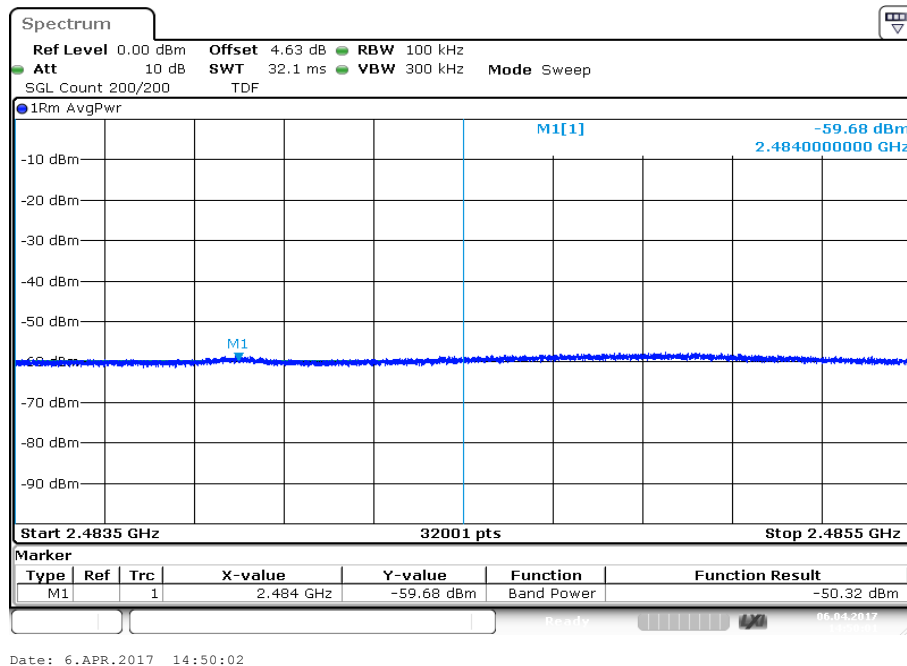
Scenario Modulation	Band edge compliance [dBm] (included antenna gain)			
	DSSS / b – mode	OFDM / g – mode	OFDM / n HT20 – mode	OFDM / n HT40 – mode
Max. lower band edge power	-47.1	-42.6	-42.9	-42.4
Max. upper band edge power	-50.2	-45.4	-47.0	-50.2

Plots: DSSS / b – mode, UFL port

Plot 1: Lower band edge

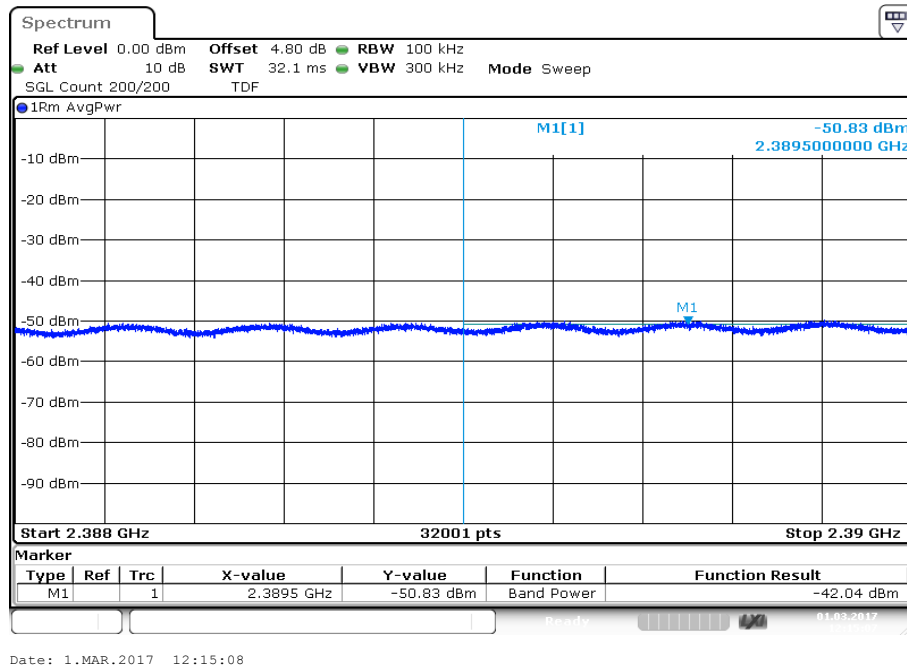


Plot 2: Upper band edge

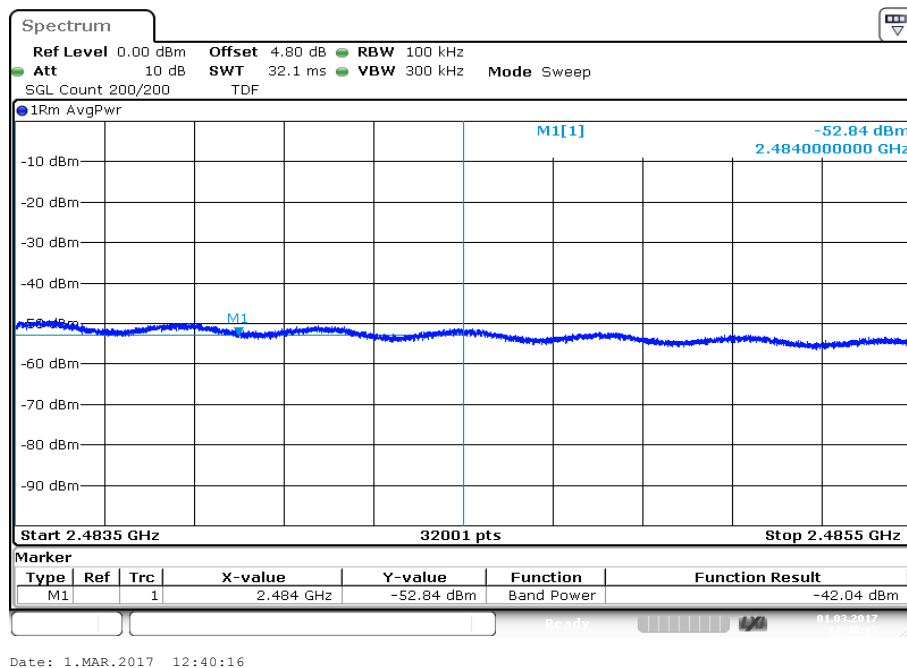


Plots: OFDM / g – mode, UFL port

Plot 1: Lower band edge

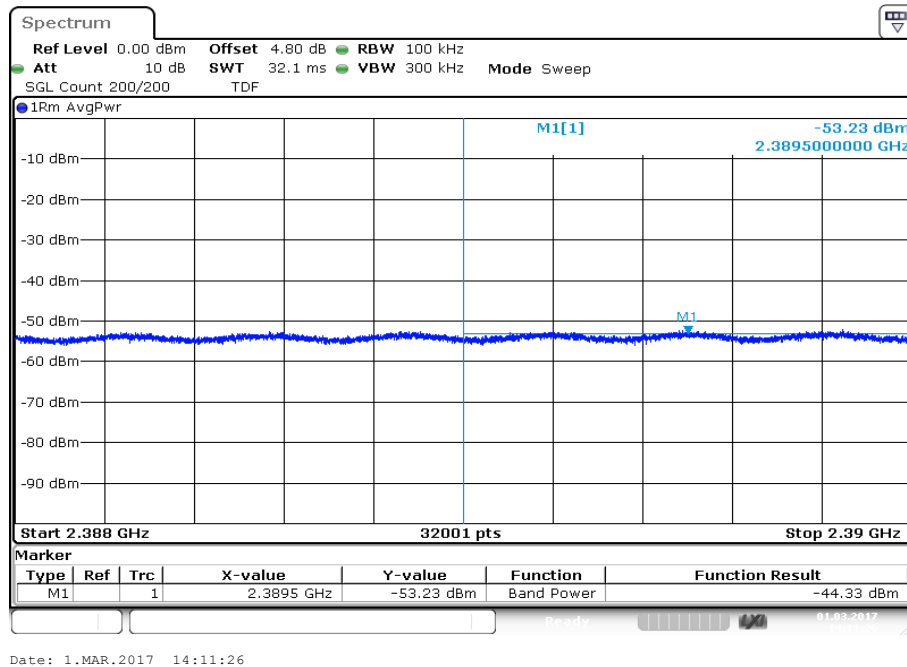


Plot 2: Upper band edge

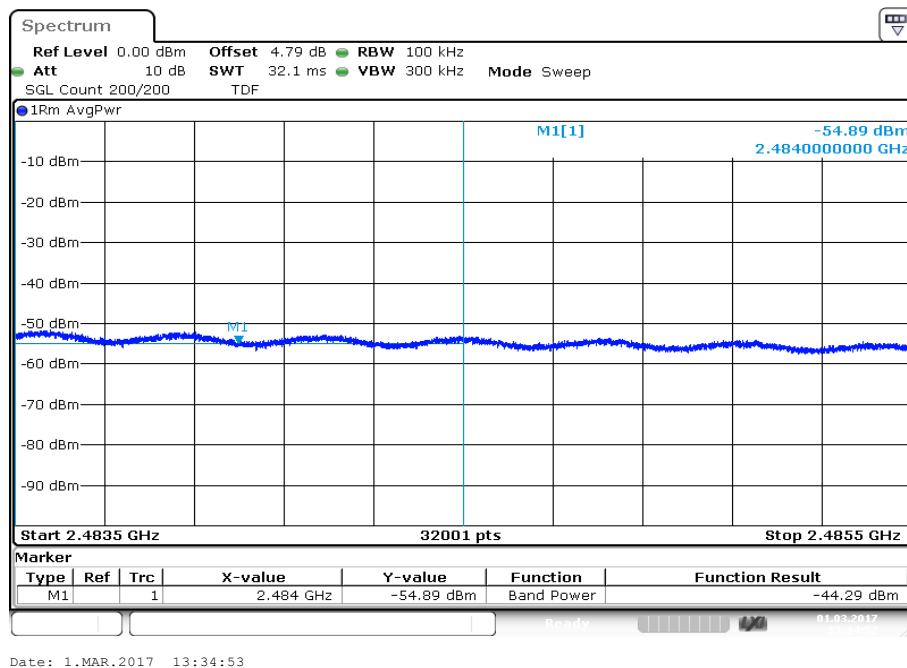


Plots: OFDM / n HT20 – mode, UFL port

Plot 1: Lower band edge

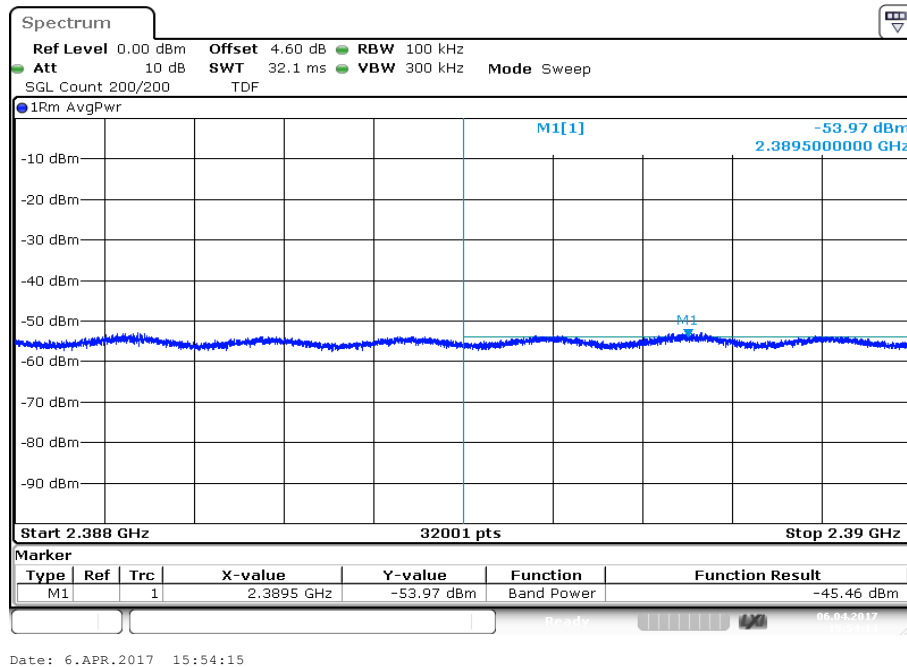


Plot 2: Upper band edge

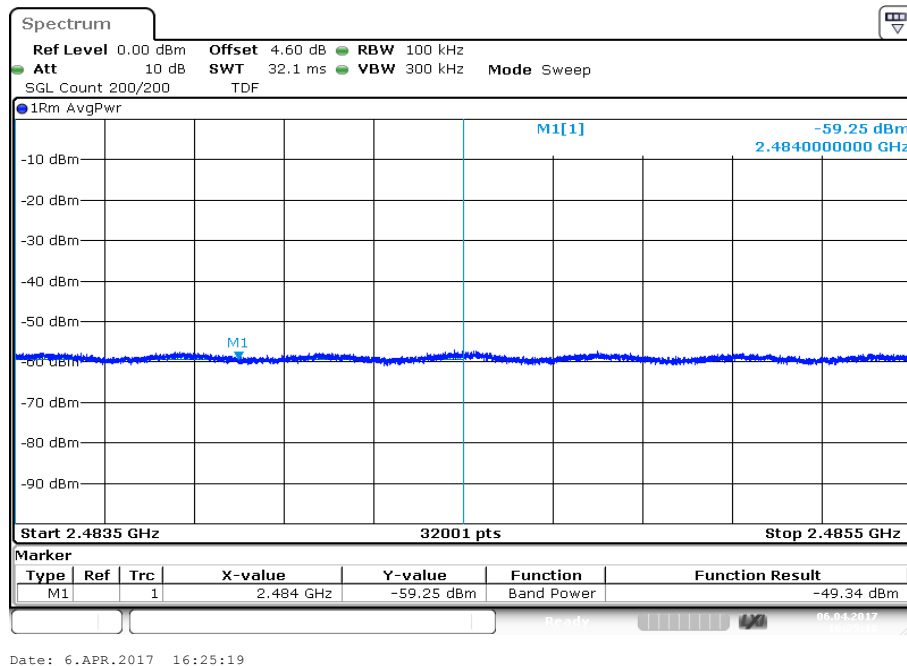


Plots: OFDM / n HT40 – mode, UFL port

Plot 1: Lower band edge

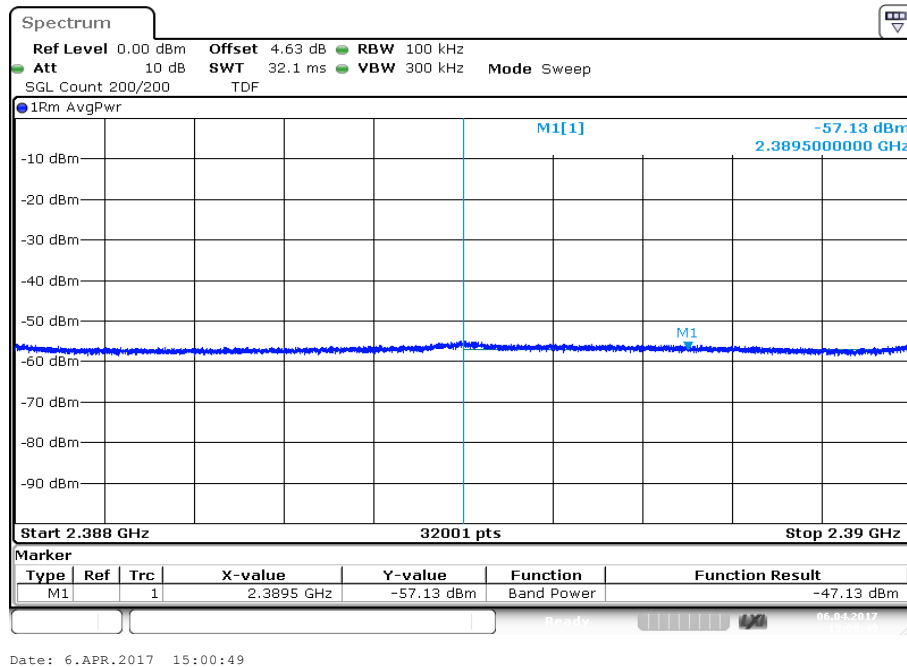


Plot 2: Upper band edge

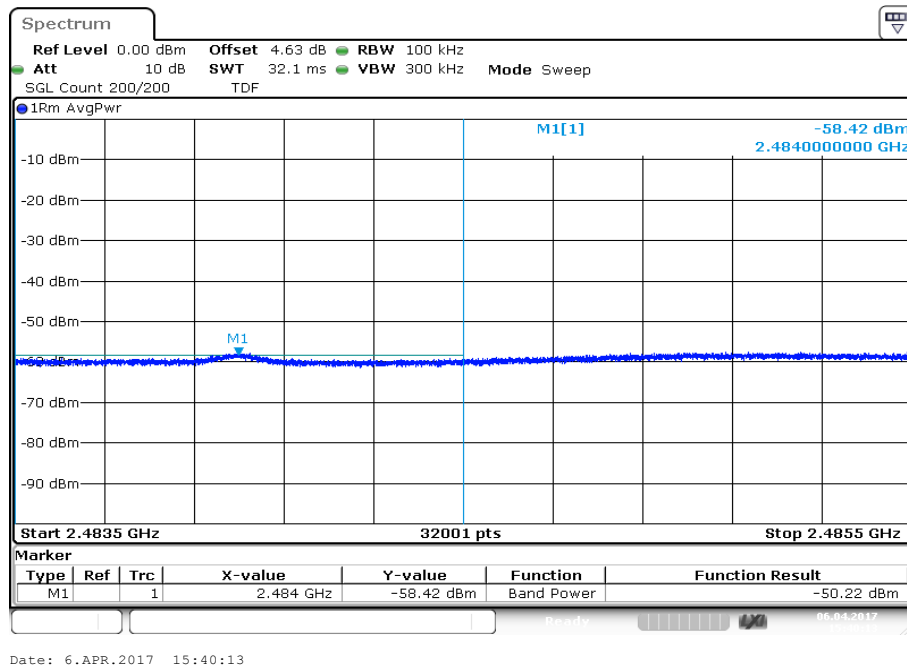


Plots: DSSS / b – mode, MMCX port

Plot 1: Lower band edge

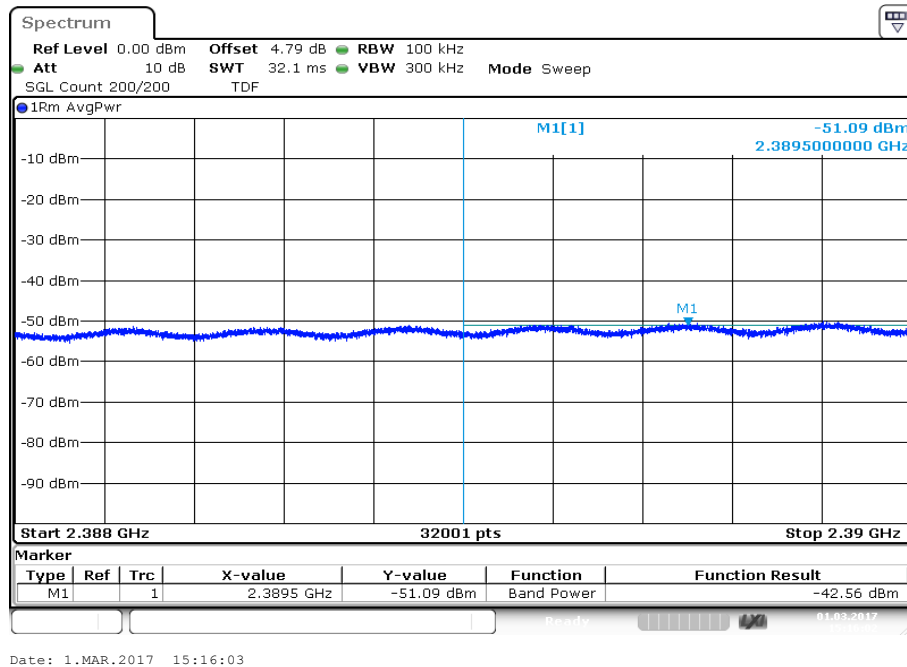


Plot 2: Upper band edge

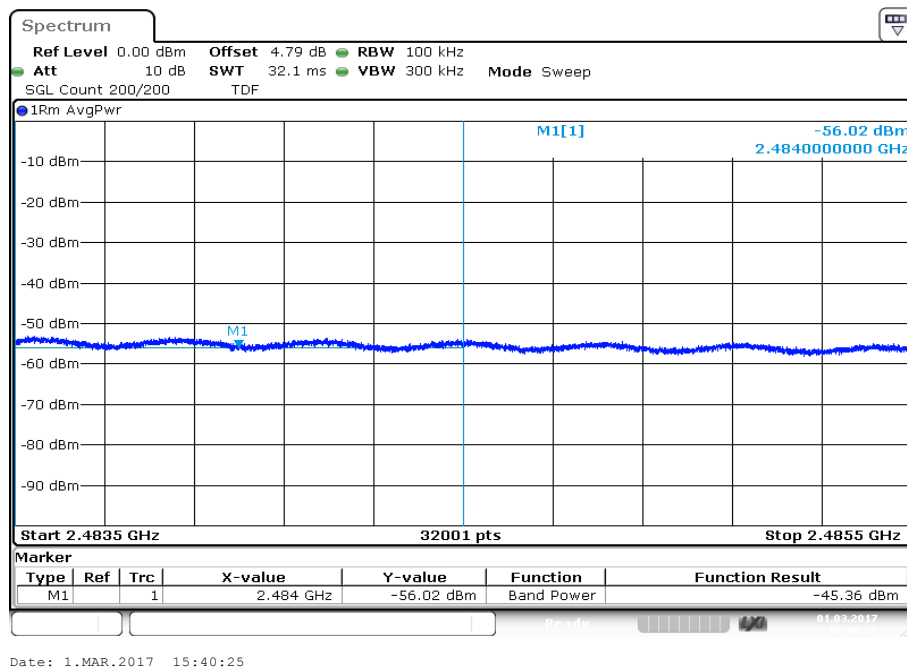


Plots: OFDM / g – mode, MMCX port

Plot 1: Lower band edge

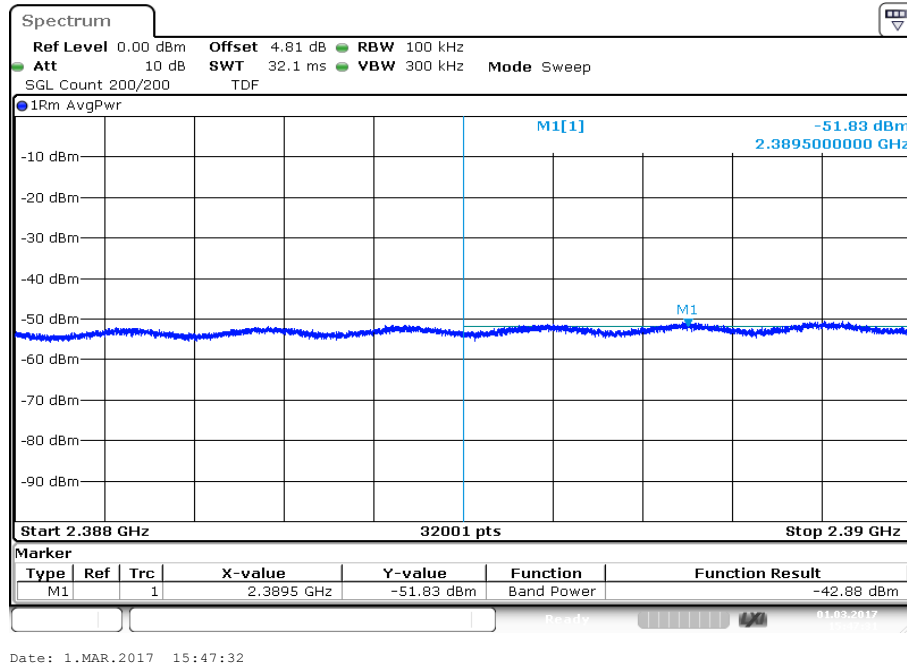


Plot 2: Upper band edge

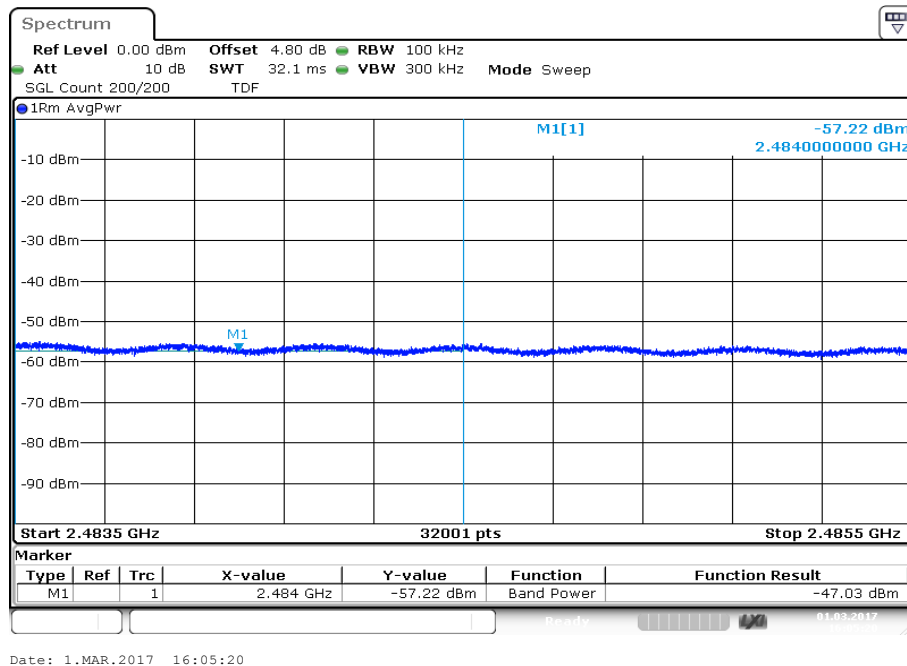


Plots: OFDM / n HT20 – mode, MMCX port

Plot 1: Lower band edge

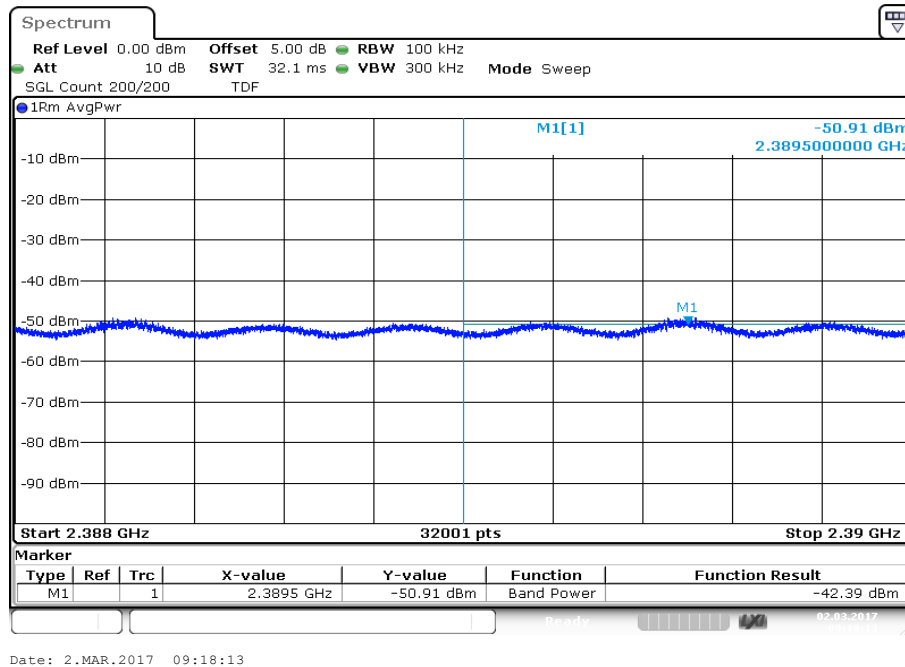


Plot 2: Upper band edge

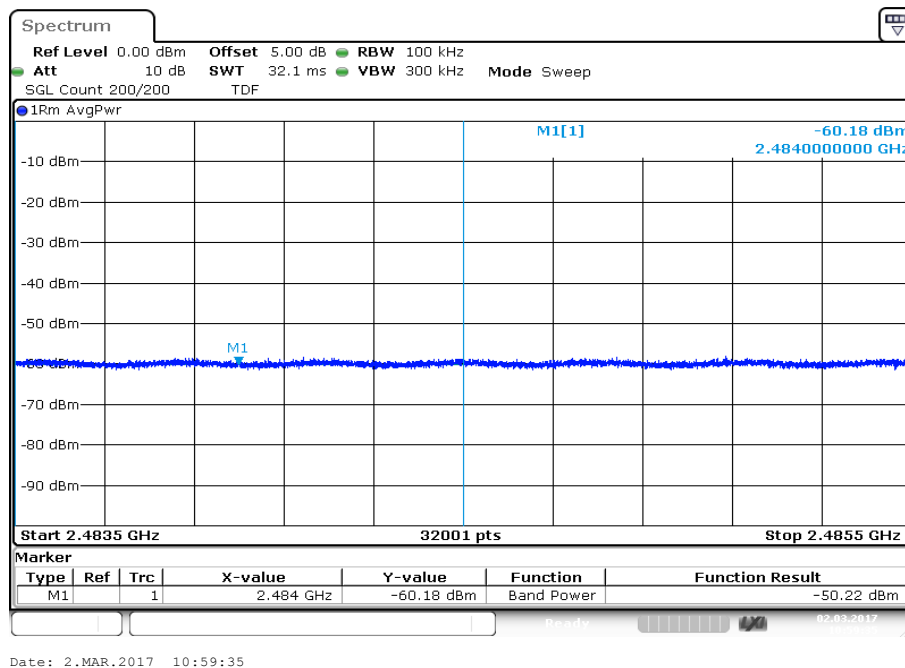


Plots: OFDM / n HT40 – mode, MMCX port

Plot 1: Lower band edge



Plot 2: Upper band edge



11.10 Spurious emissions conducted

Description:

Measurement of the conducted 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
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	500 kHz
Span:	9 kHz to 25 GHz
Trace mode:	Max Hold
Test setup:	See sub clause 6.5 – A
Measurement uncertainty	See sub clause 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, UFL port

TX Spurious Emissions Conducted					
DSSS / b – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		5.9	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2437		7.1	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2462		6.4	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant

Results: OFDM / g – mode, UFL port

TX Spurious Emissions Conducted					
OFDM / g – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		1.7	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2437		2.3	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2462		3.0	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant

Results: OFDM / n HT20 – mode, UFL port

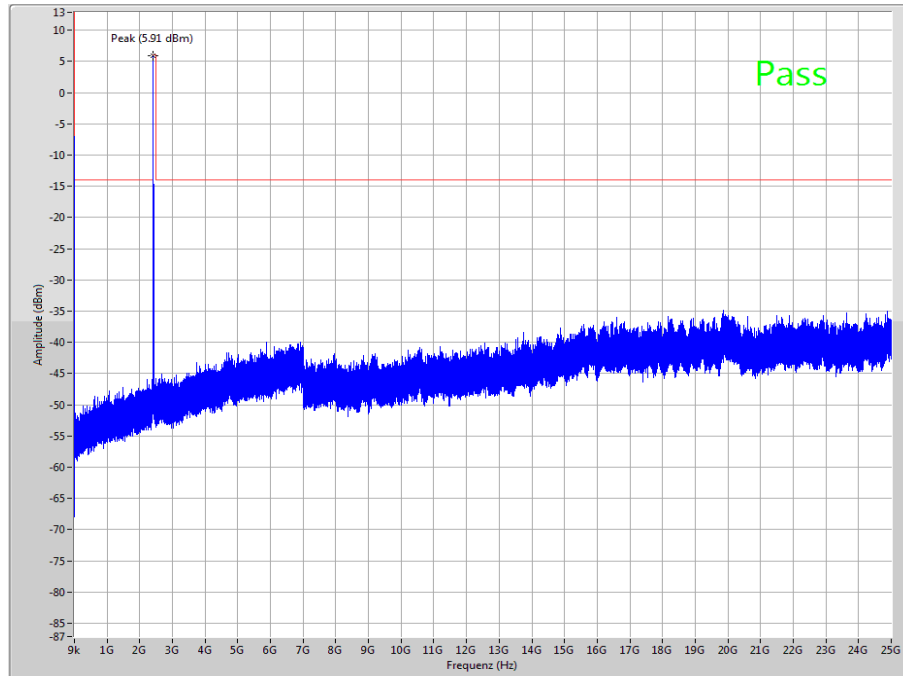
TX Spurious Emissions Conducted					
OFDM / n HT20 – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		1.1	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2437		2.0	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2462		1.6	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant

Results: OFDM / n HT40 – mode, UFL port

TX Spurious Emissions Conducted					
OFDM / n HT40 – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2422		-5.2	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2437		-5.5	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2452		-4.1	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant

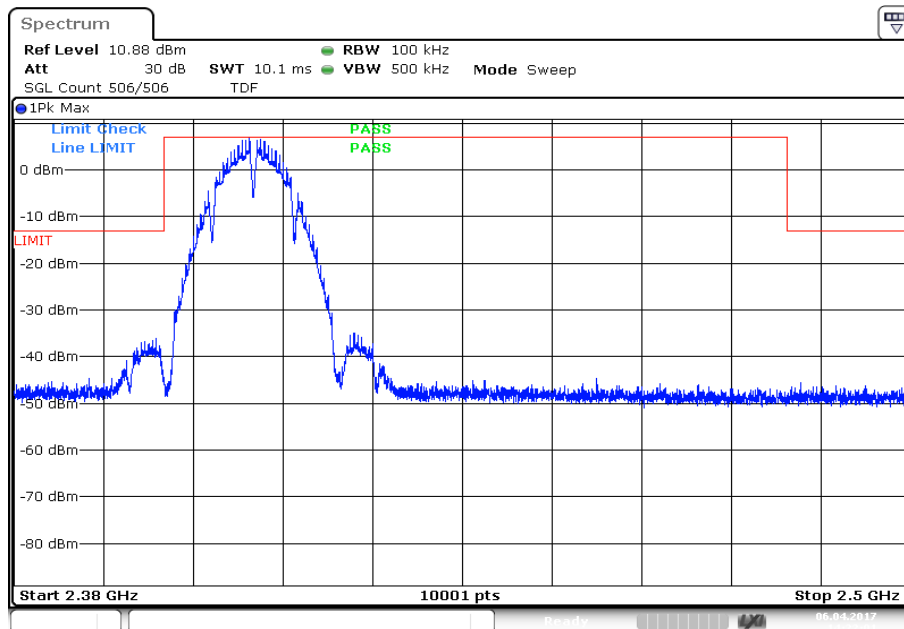
Plots: DSSS / b – mode, UFL port

Plot 1: Lowest channel, up to 25 GHz

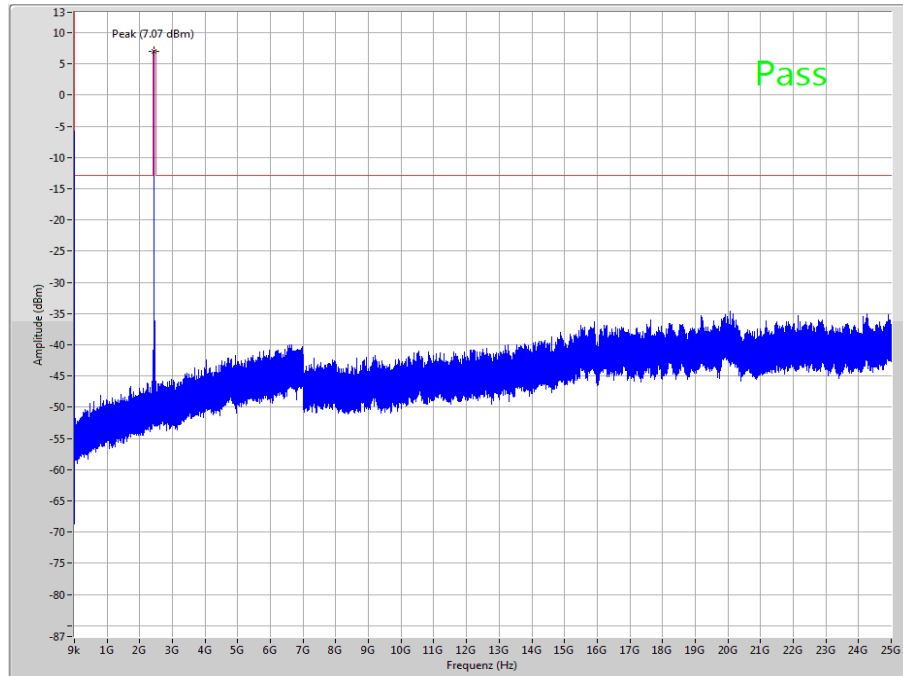


The peak at the beginning of the plot is the LO from the SA.

Plot 2: Lowest channel, zoomed carrier

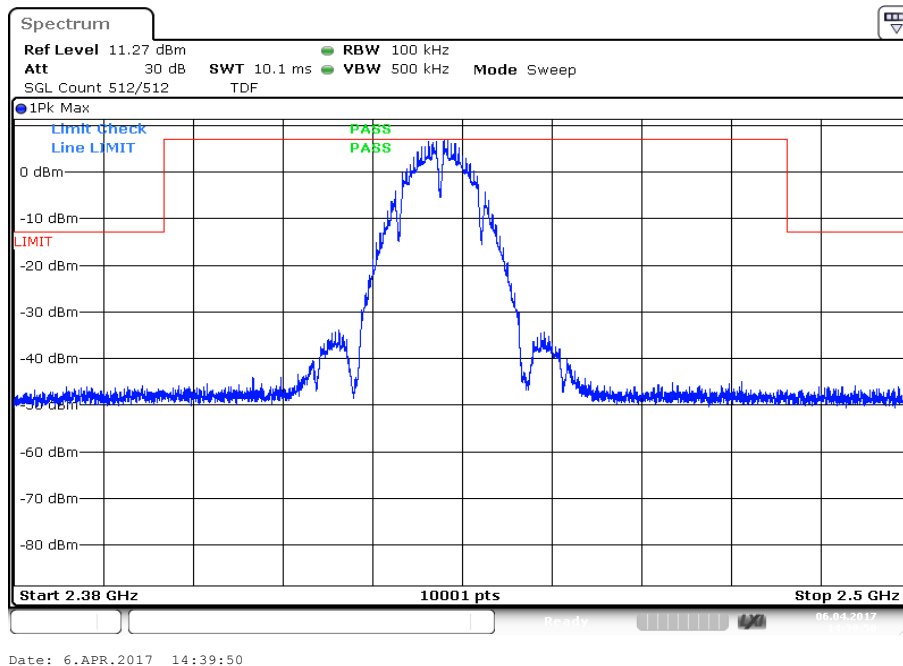


Plot 3: Middle channel, up to 25 GHz



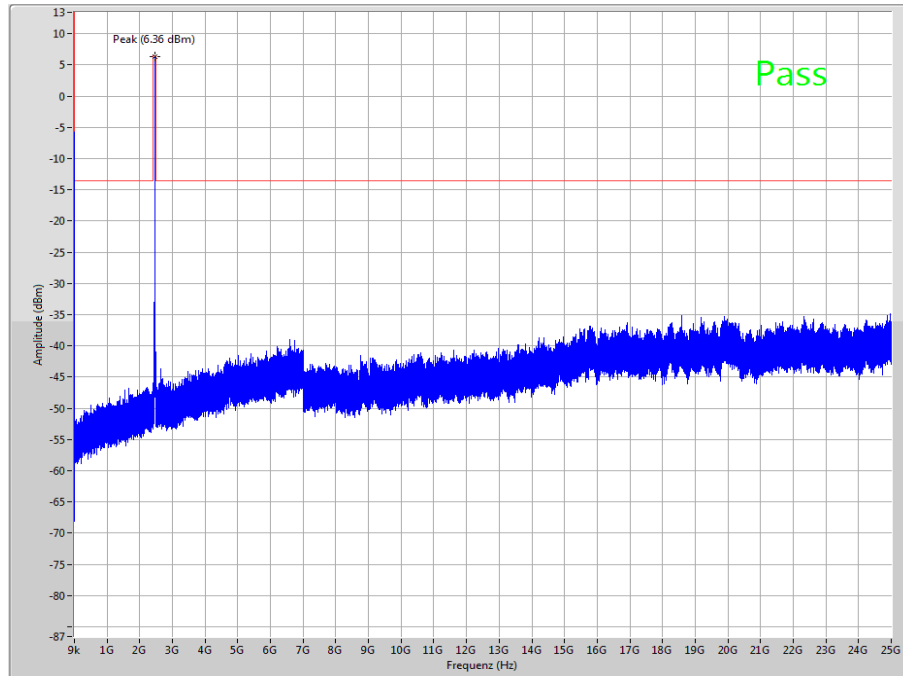
The peak at the beginning of the plot is the LO from the SA.

Plot 4: Middle channel, zoomed carrier



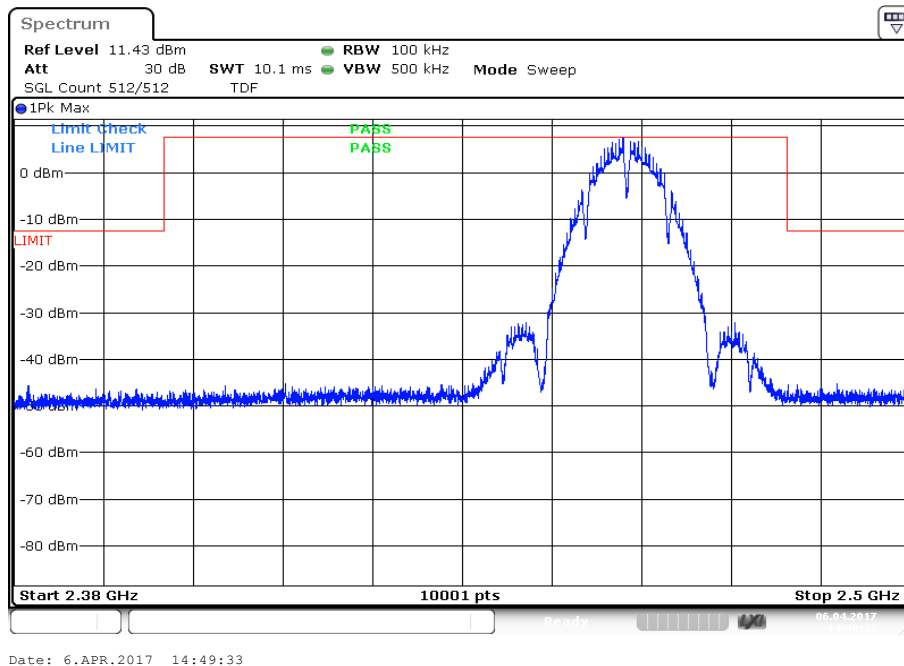
Date: 6.APR.2017 14:39:50

Plot 5: Highest channel, up to 25 GHz



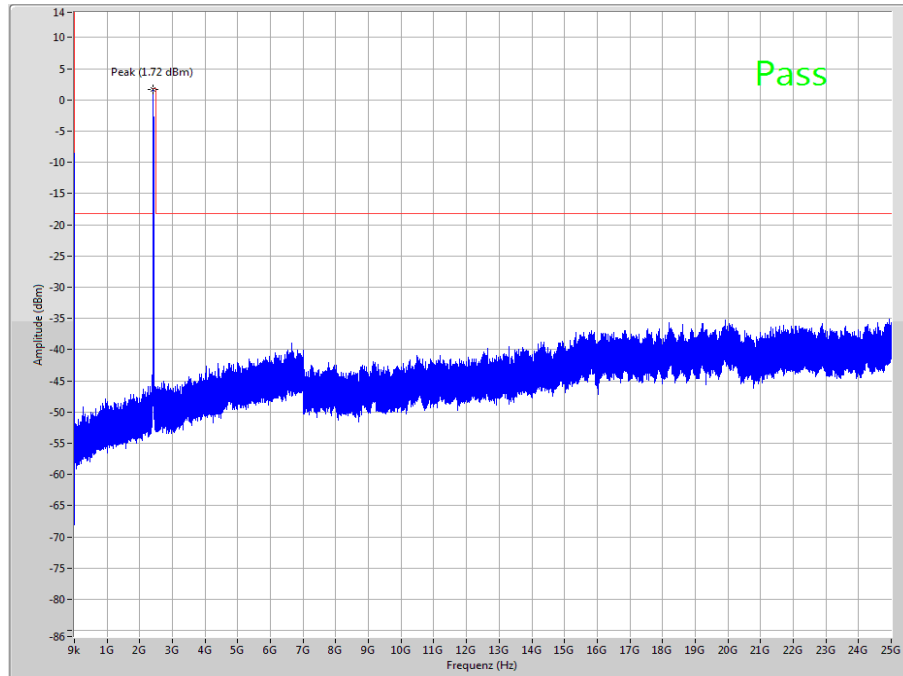
The peak at the beginning of the plot is the LO from the SA.

Plot 6: Highest channel, zoomed carrier



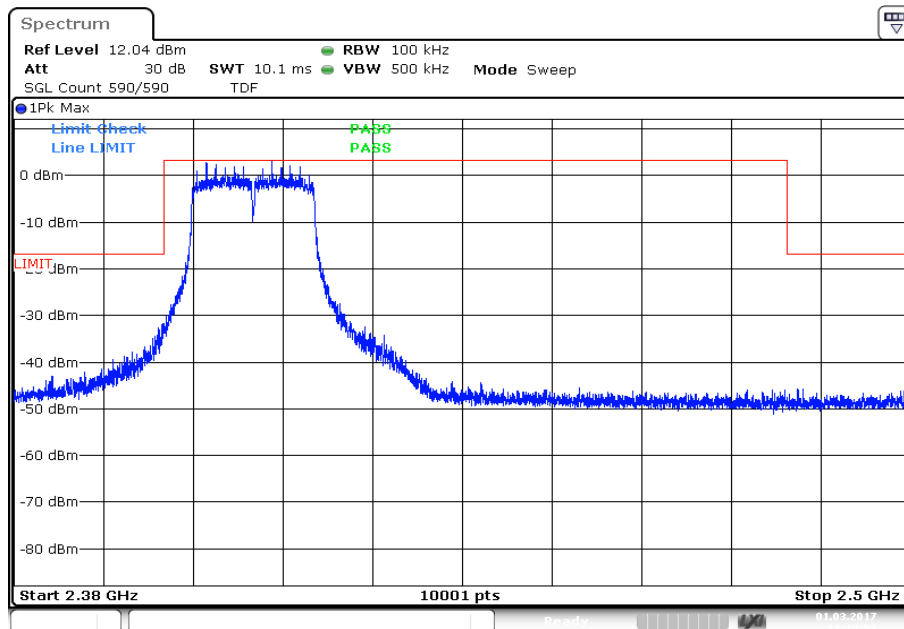
Plots: OFDM / g – mode, UFL port

Plot 1: Lowest channel, up to 25 GHz

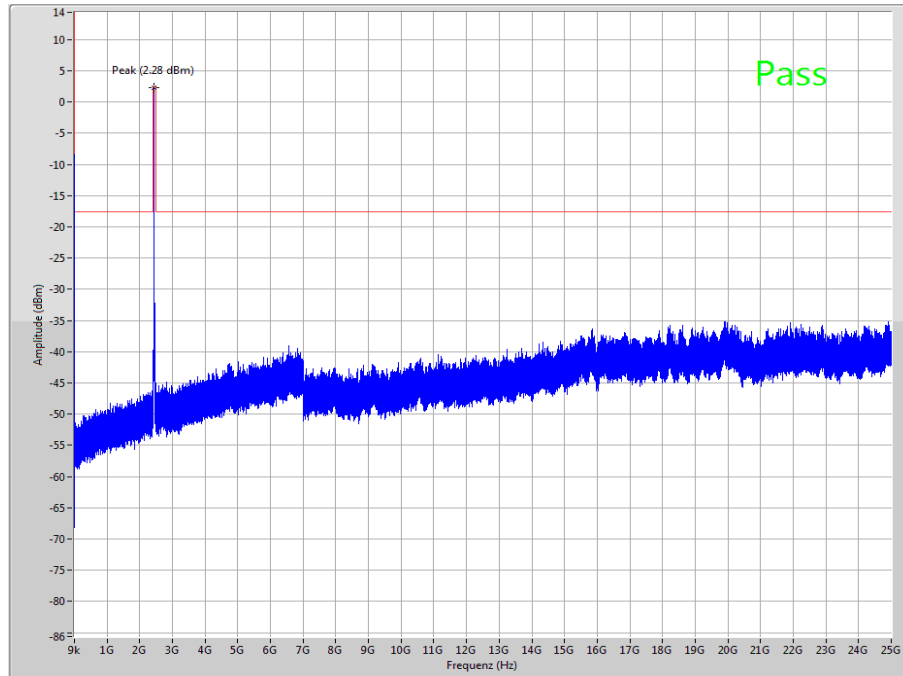


The peak at the beginning of the plot is the LO from the SA.

Plot 2: Lowest channel, zoomed carrier

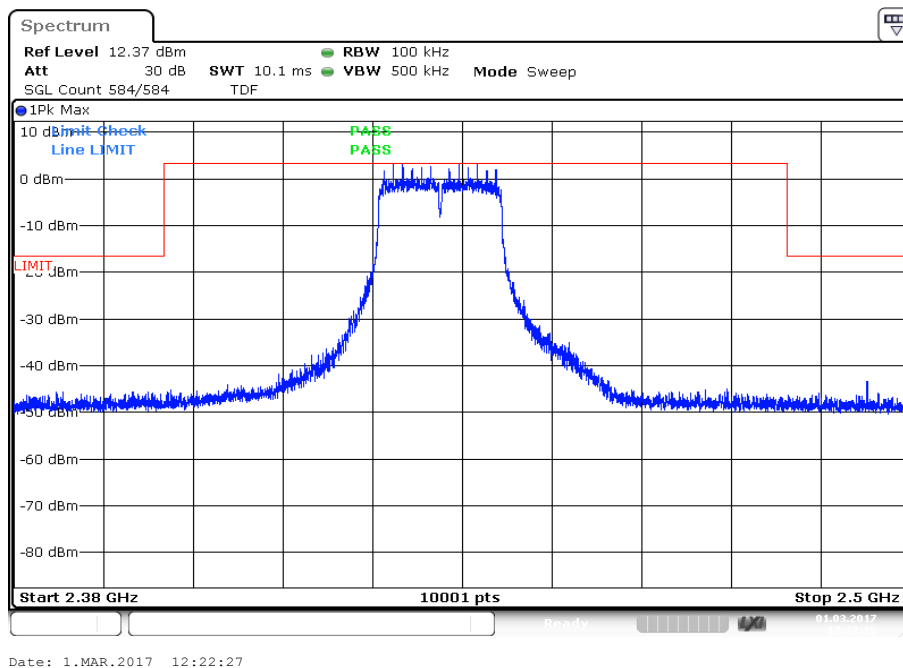


Plot 3: Middle channel, up to 25 GHz

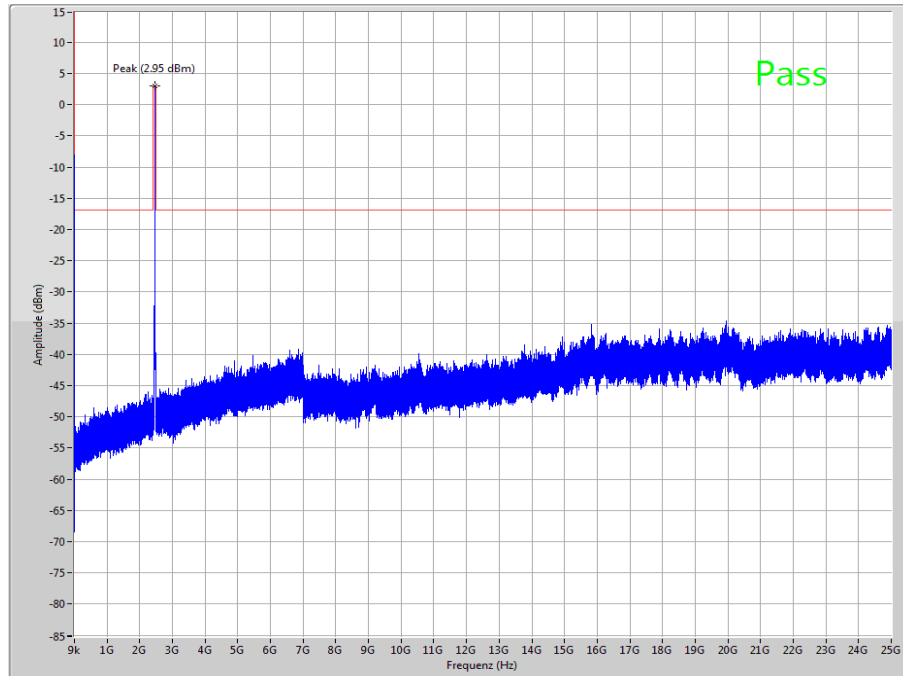


The peak at the beginning of the plot is the LO from the SA.

Plot 4: Middle channel, zoomed carrier

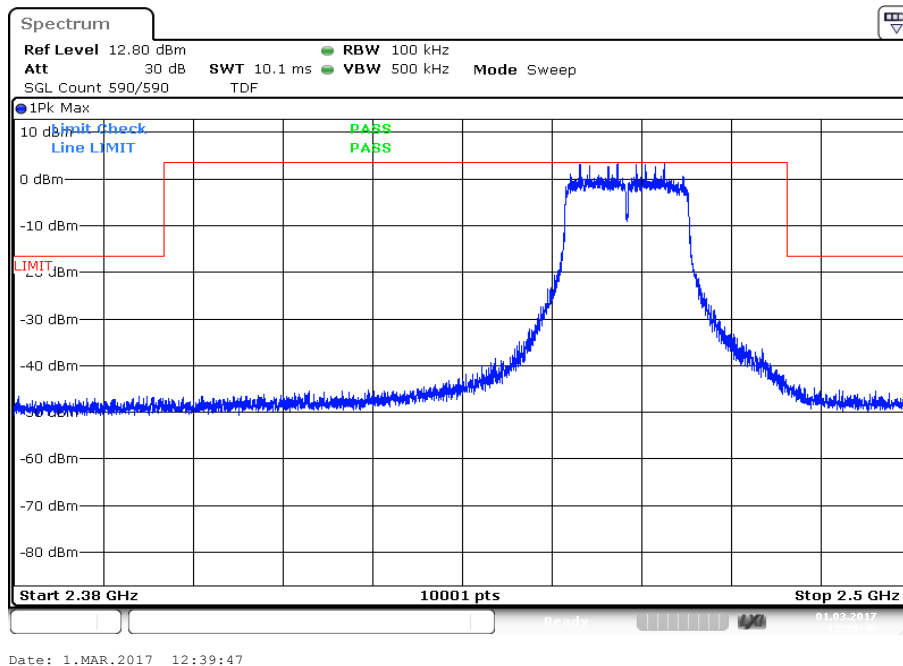


Plot 5: Highest channel, up to 25 GHz



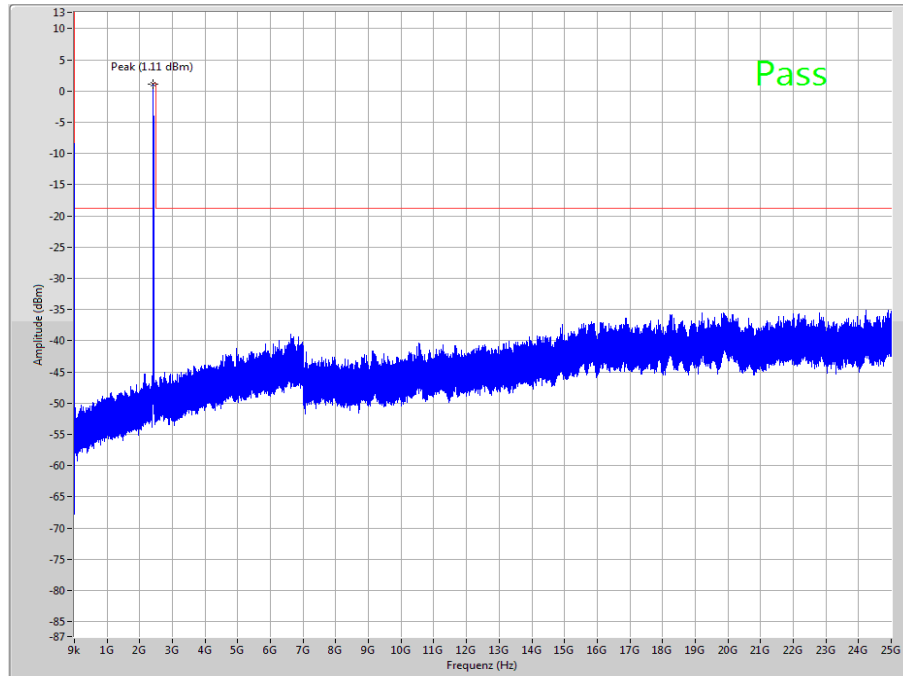
The peak at the beginning of the plot is the LO from the SA.

Plot 6: Highest channel, zoomed carrier



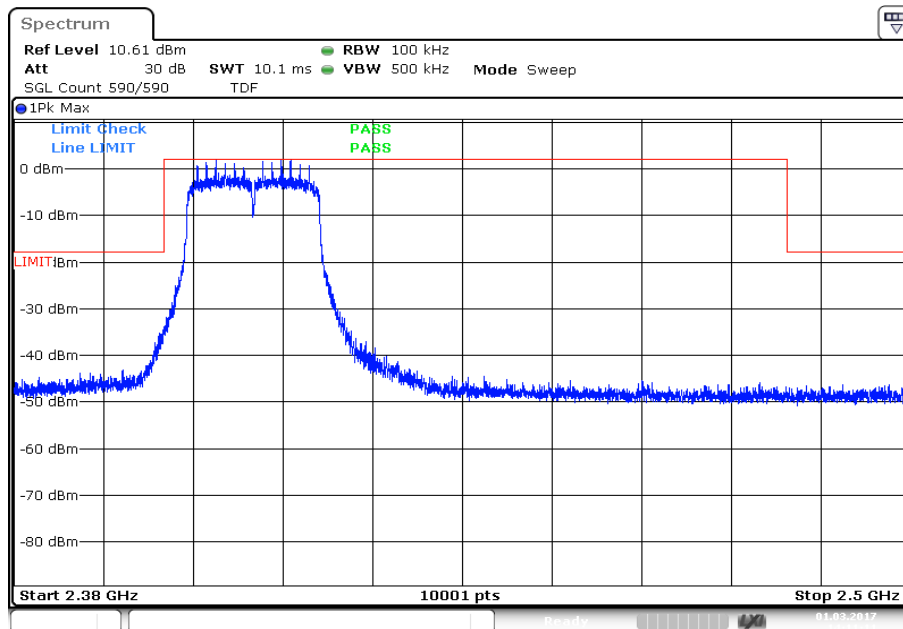
Plots: OFDM / n HT 20 – mode, UFL port

Plot 1: Lowest channel, up to 25 GHz



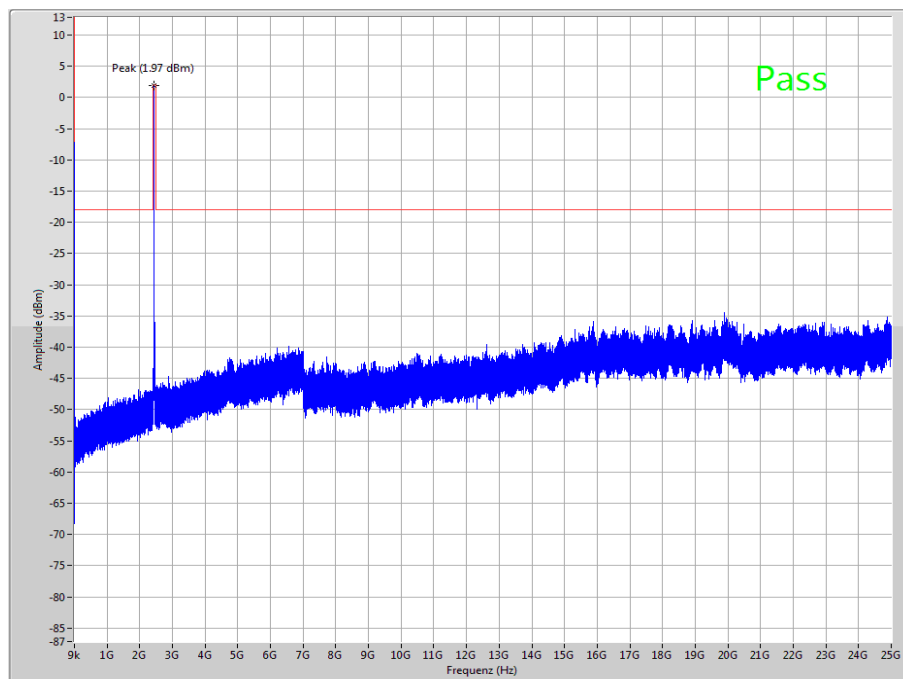
The peak at the beginning of the plot is the LO from the SA.

Plot 2: Lowest channel, zoomed carrier



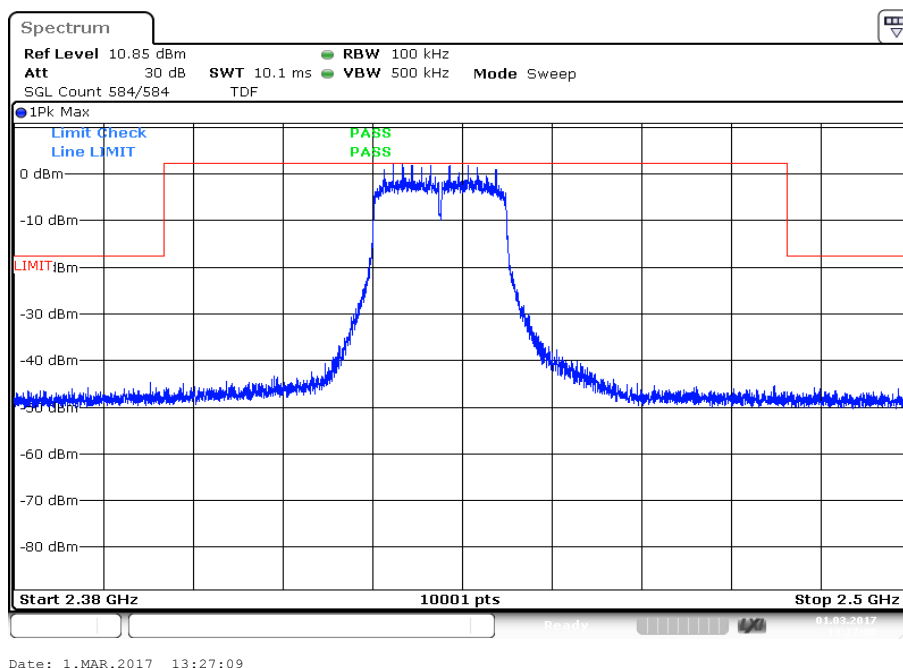
Date: 1.MAR.2017 14:11:12

Plot 3: Middle channel, up to 25 GHz



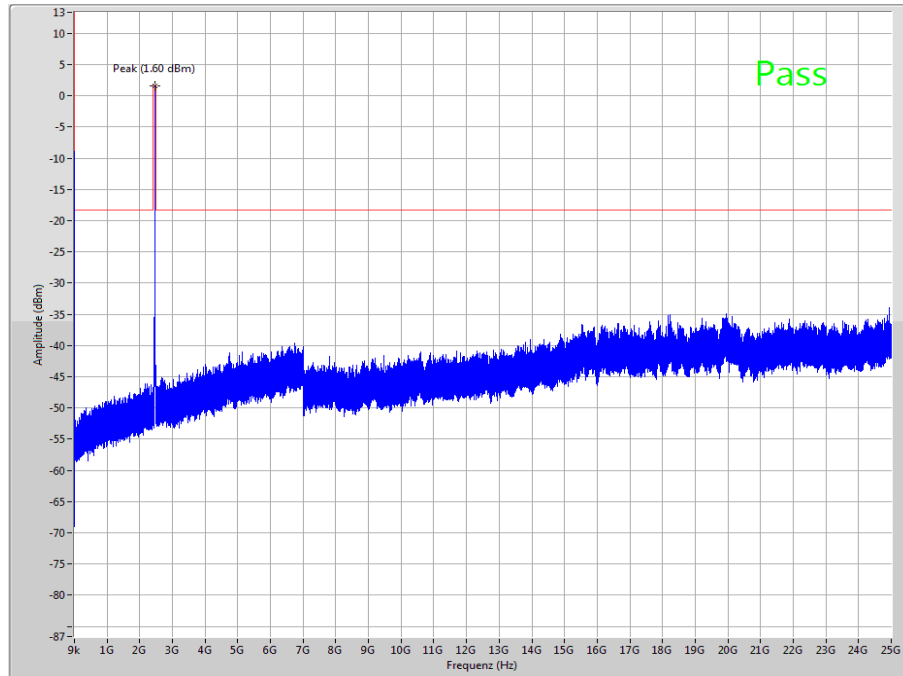
The peak at the beginning of the plot is the LO from the SA.

Plot 4: Middle channel, zoomed carrier



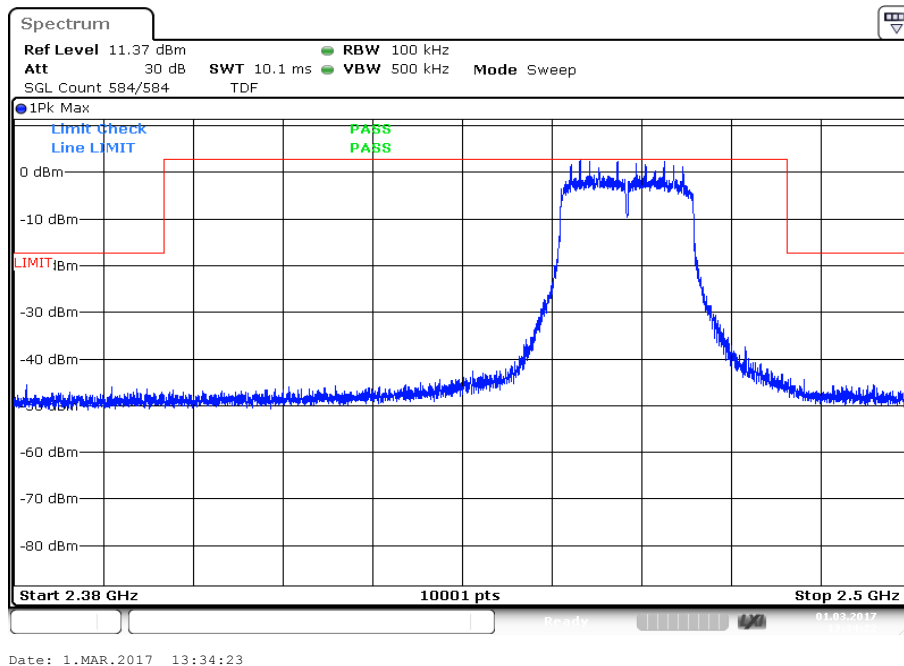
Date: 1.MAR.2017 13:27:09

Plot 5: Highest channel, up to 25 GHz



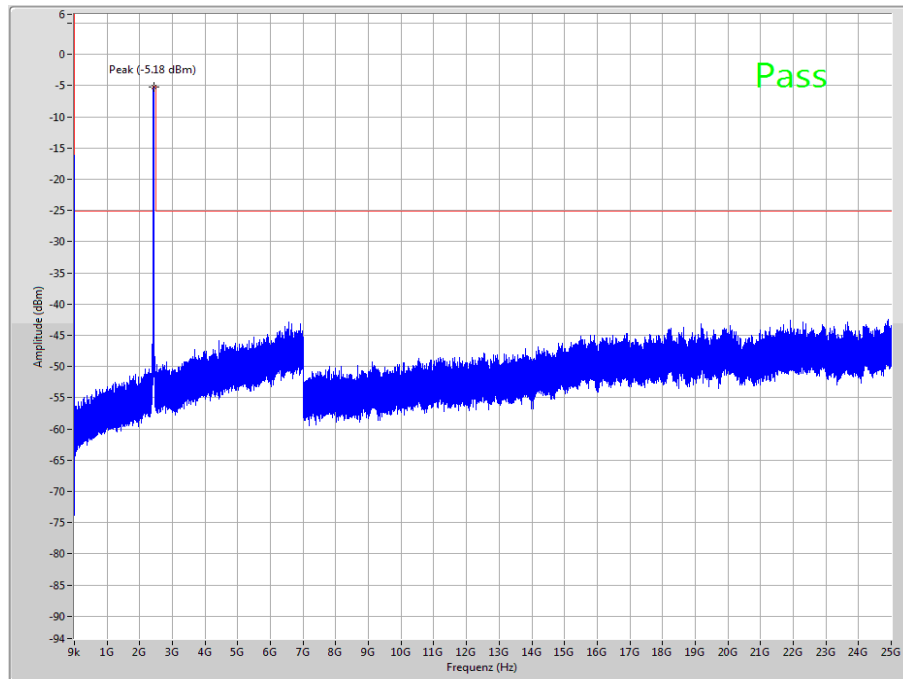
The peak at the beginning of the plot is the LO from the SA.

Plot 6: Highest channel, zoomed carrier



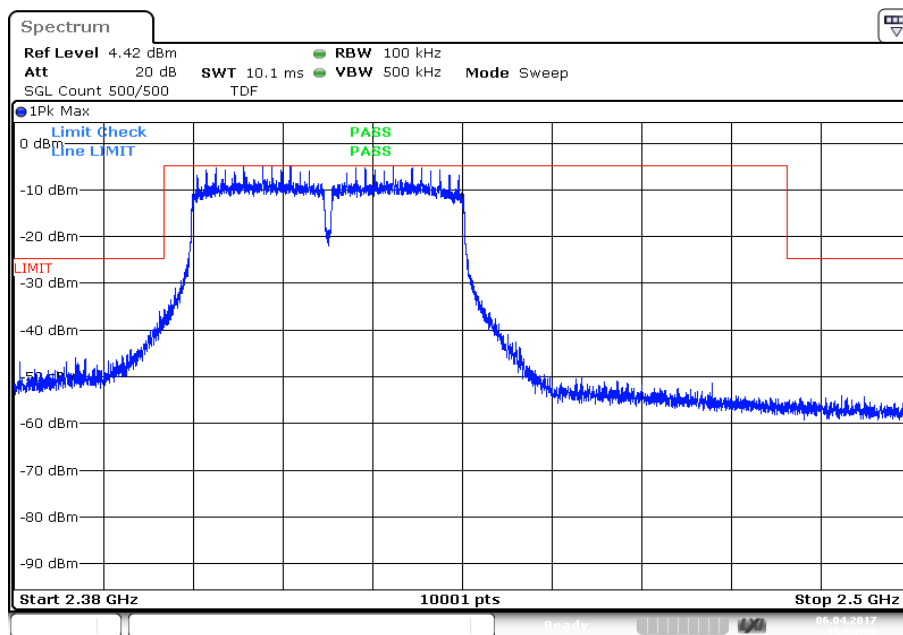
Plots: OFDM / n HT 40 – mode, UFL port

Plot 1: Lowest channel, up to 25 GHz



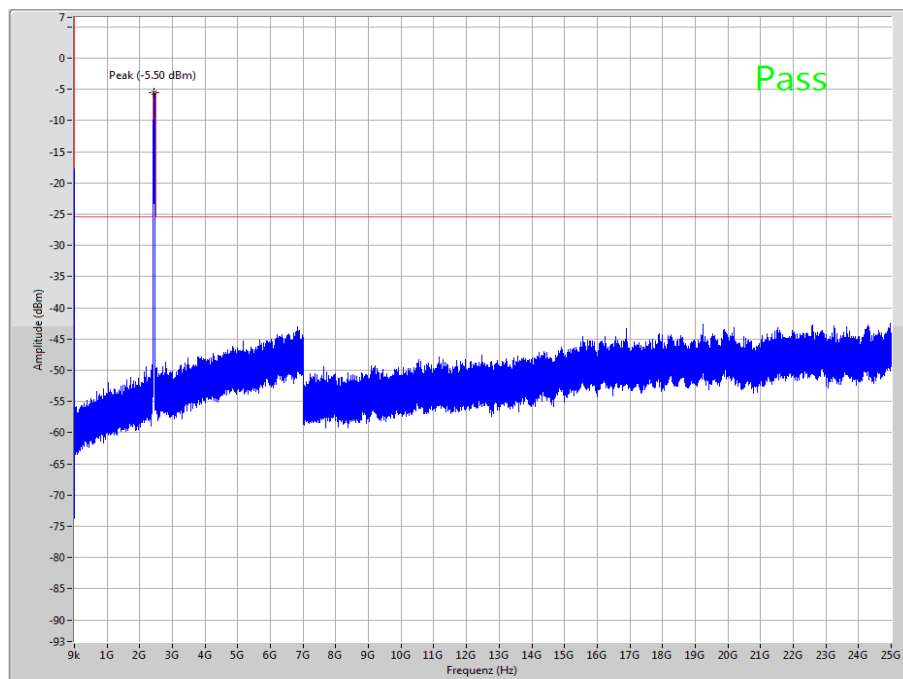
The peak at the beginning of the plot is the LO from the SA.

Plot 2: Lowest channel, zoomed carrier



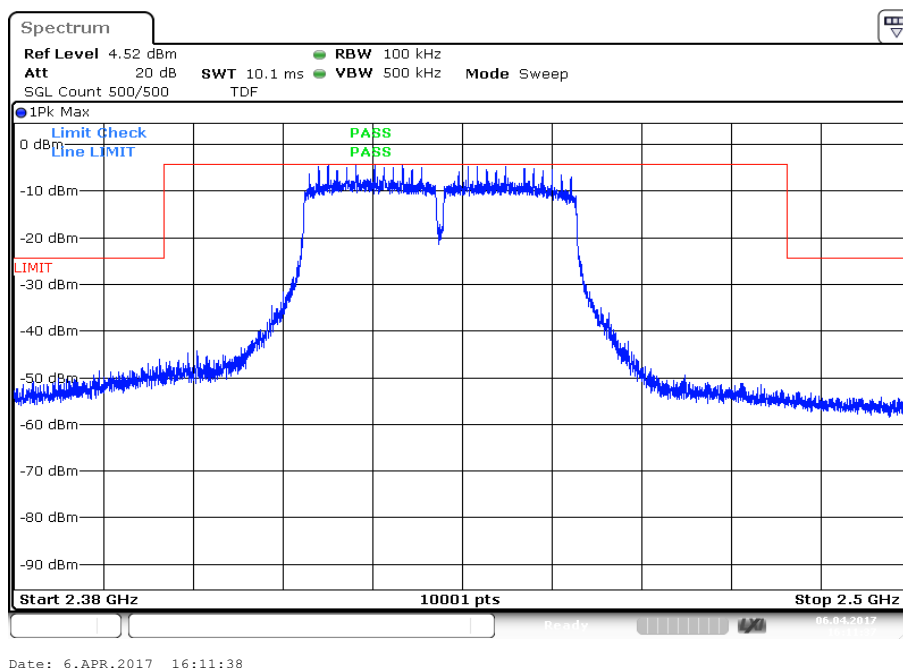
Date: 6.APR.2017 15:54:00

Plot 3: Middle channel, up to 25 GHz

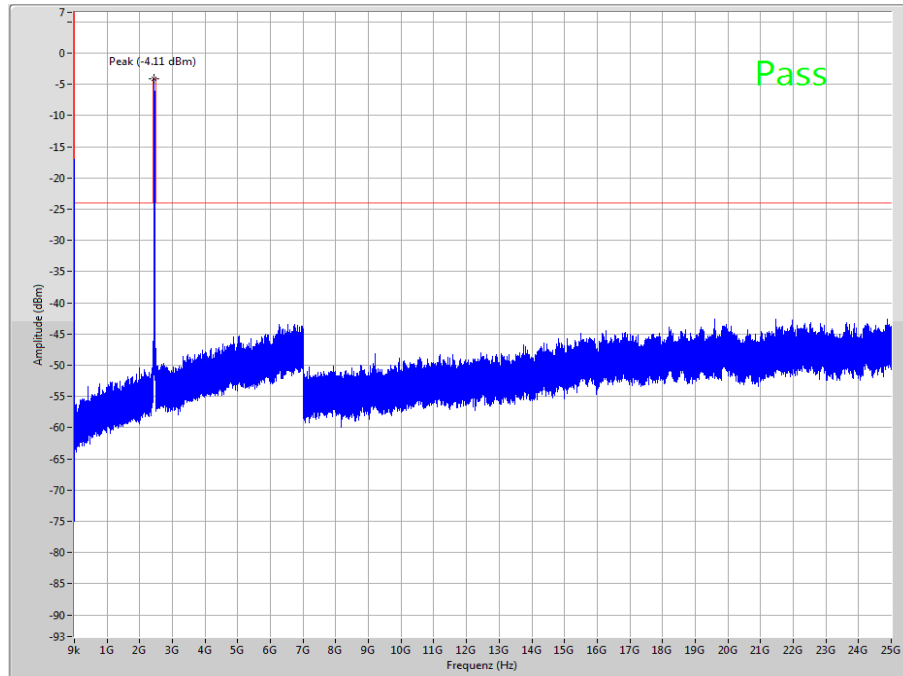


The peak at the beginning of the plot is the LO from the SA.

Plot 4: Middle channel, zoomed carrier

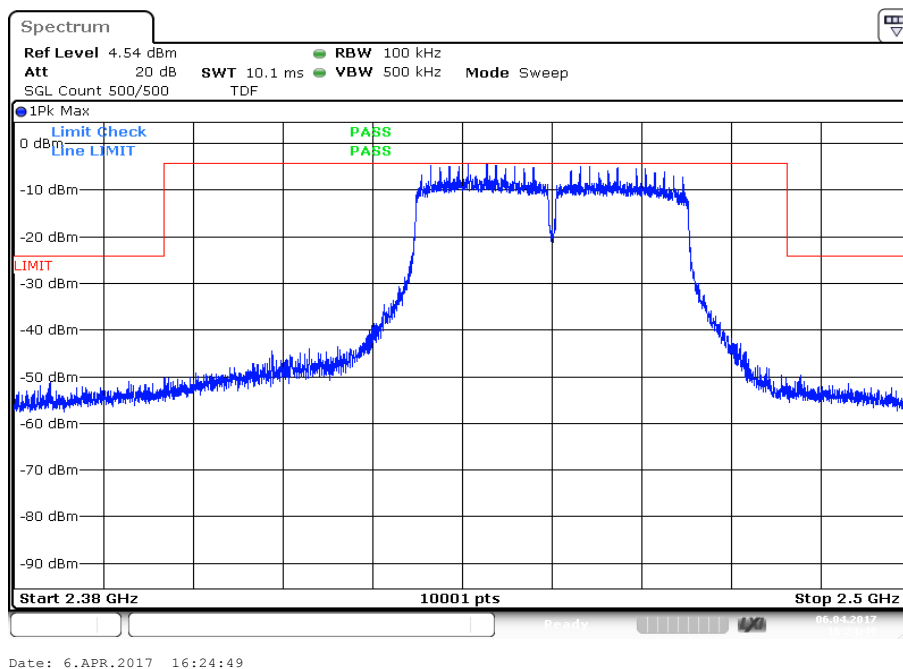


Plot 5: Highest channel, up to 25 GHz



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

Plot 6: Highest channel, zoomed carrier



Results: DSSS / b – mode, MMCX port

TX Spurious Emissions Conducted					
DSSS / b – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		6.8	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2437		6.5	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2462		7.1	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant

Results: OFDM / g – mode, MMCX port

TX Spurious Emissions Conducted					
OFDM / g – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		1.9	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2437		0.4	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2462		2.8	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant

Results: OFDM / n HT20 – mode, MMCX port

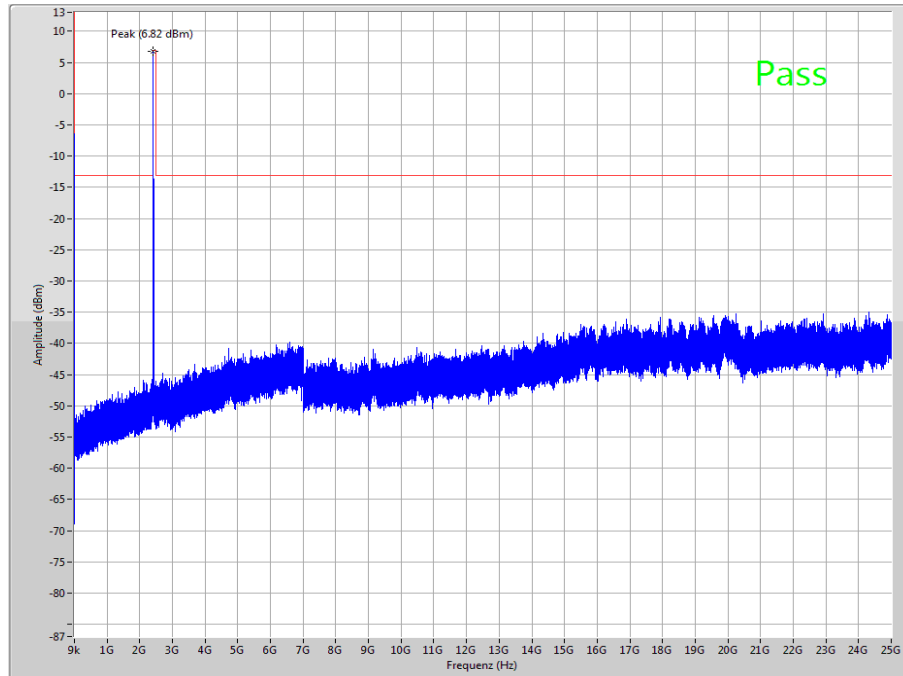
TX Spurious Emissions Conducted					
OFDM / n HT20 – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		-1.4	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2437		1.1	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2462		-0.1	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant

Results: OFDM / n HT40 – mode, MMCX port

TX Spurious Emissions Conducted					
OFDM / n HT40 – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2422		-5.4	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2437		-5.3	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant
2452		-4.3	30 dBm		Operating frequency
All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		compliant

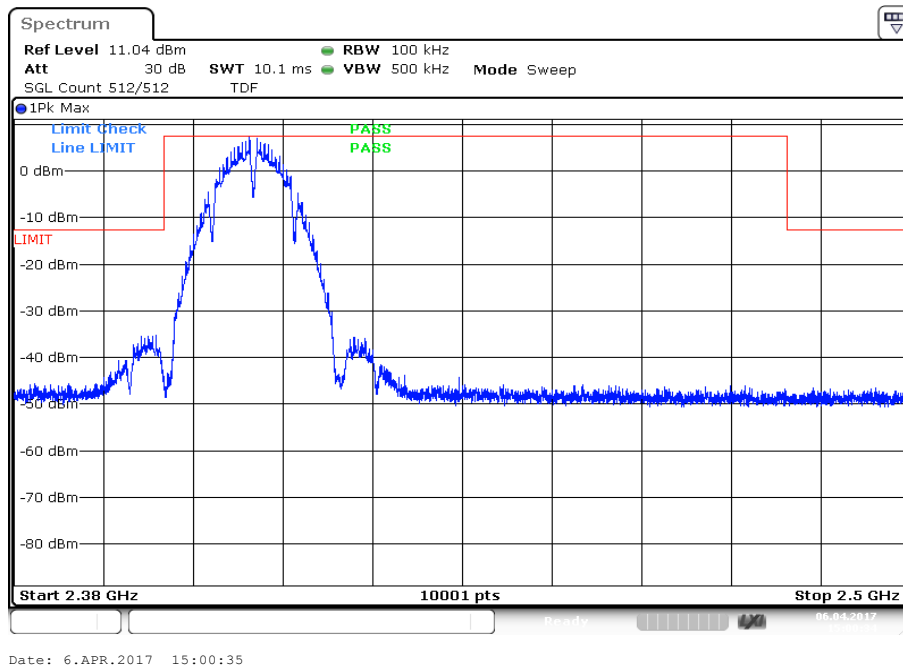
Plots: DSSS / b – mode, MMCX port

Plot 1: Lowest channel, up to 25 GHz

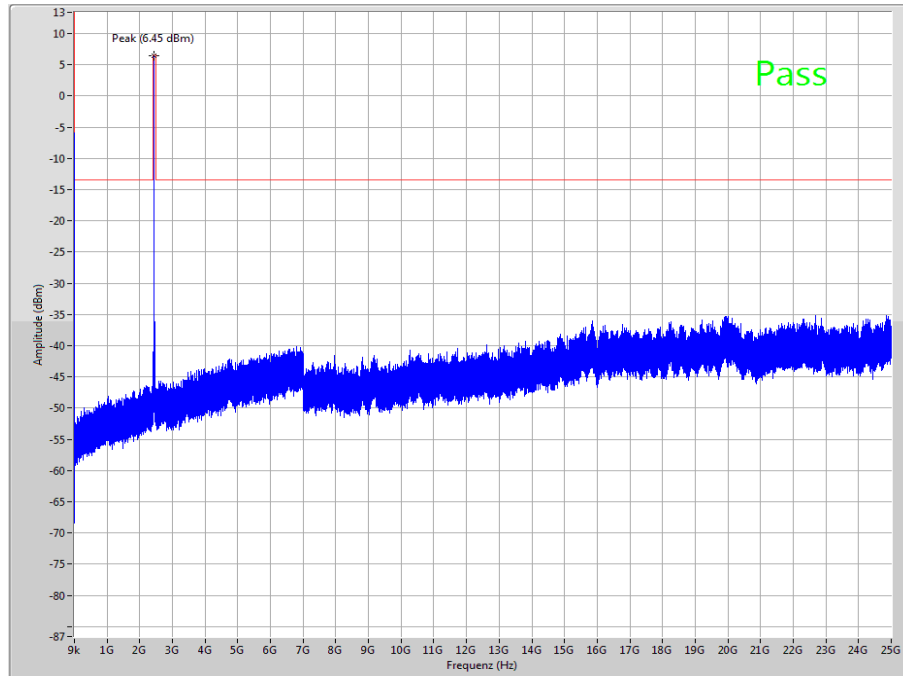


The peak at the beginning of the plot is the LO from the SA.

Plot 2: Lowest channel, zoomed carrier

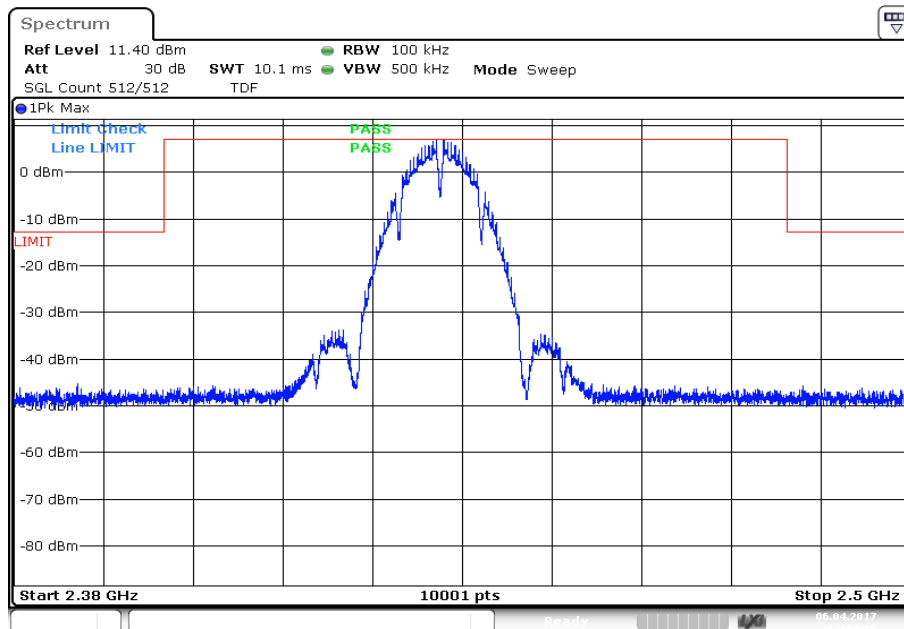


Plot 3: Middle channel, up to 25 GHz



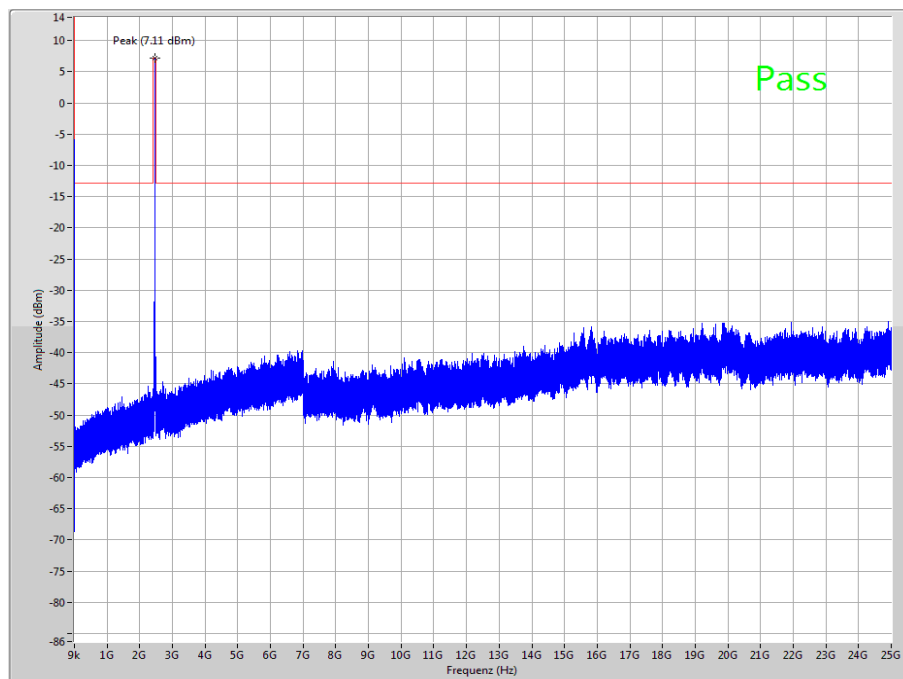
The peak at the beginning of the plot is the LO from the SA.

Plot 4: Middle channel, zoomed carrier



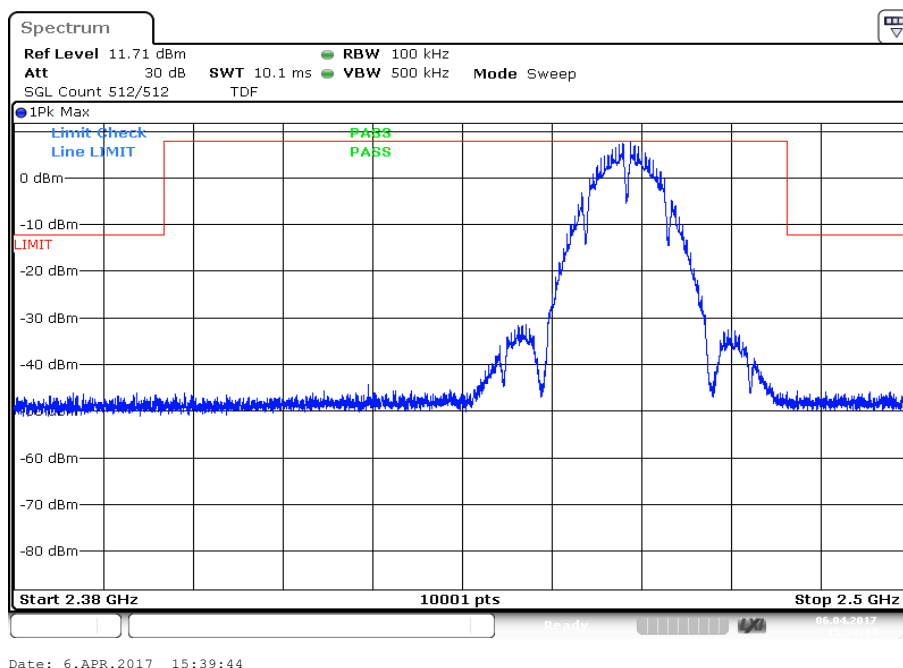
Date: 6.APR.2017 15:14:16

Plot 5: Highest channel, up to 25 GHz



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

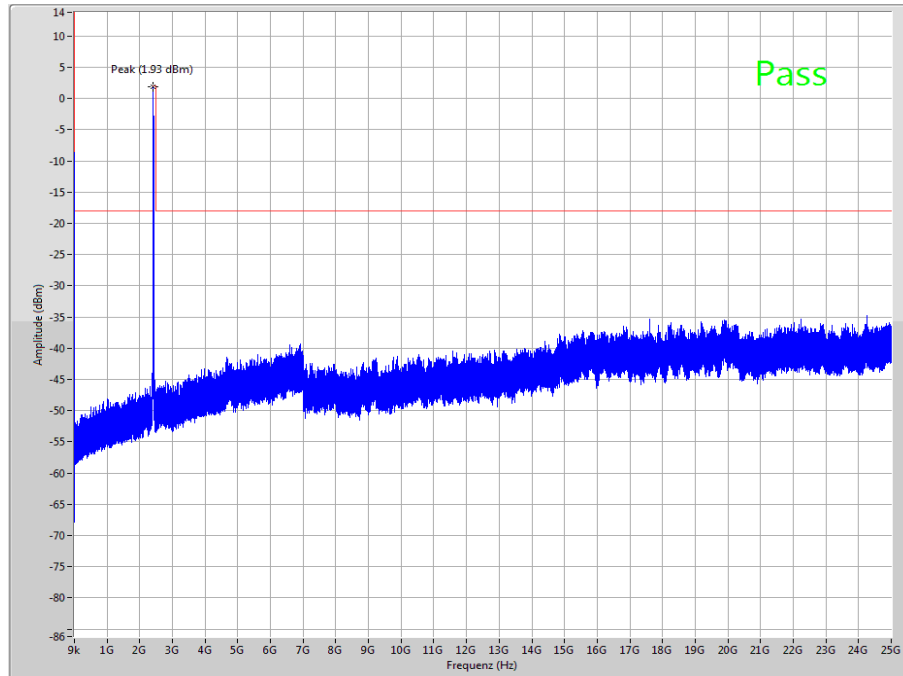
Plot 6: Highest channel, zoomed carrier



Date: 6.APR.2017 15:39:44

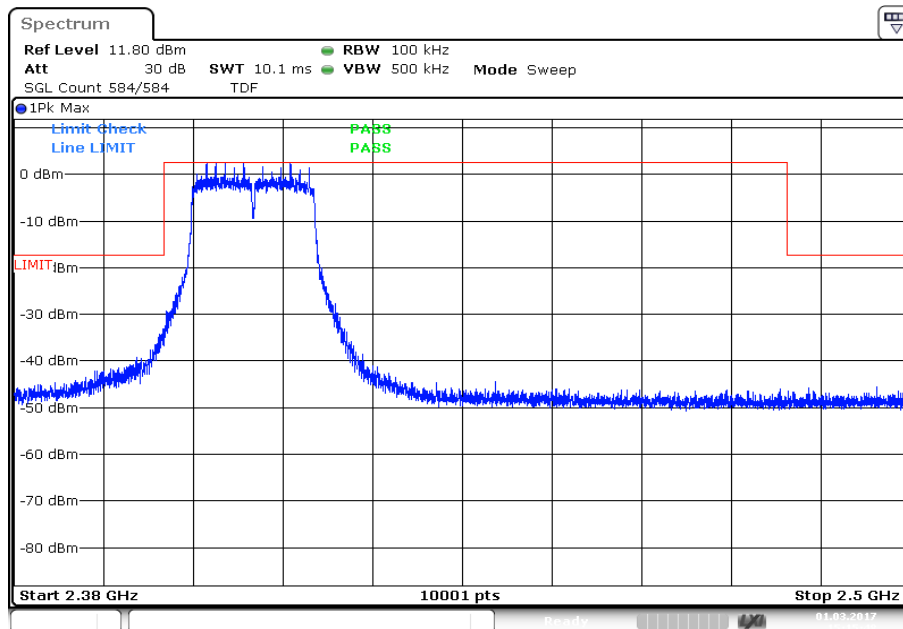
Plots: OFDM / g – mode, MMCX port

Plot 1: Lowest channel, up to 25 GHz

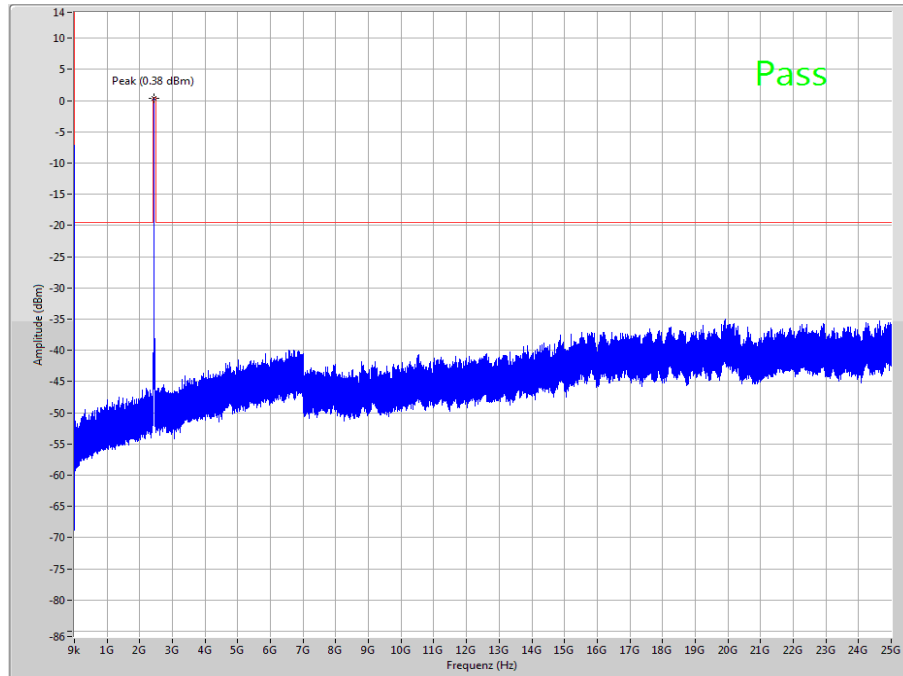


The peak at the beginning of the plot is the LO from the SA.

Plot 2: Lowest channel, zoomed carrier

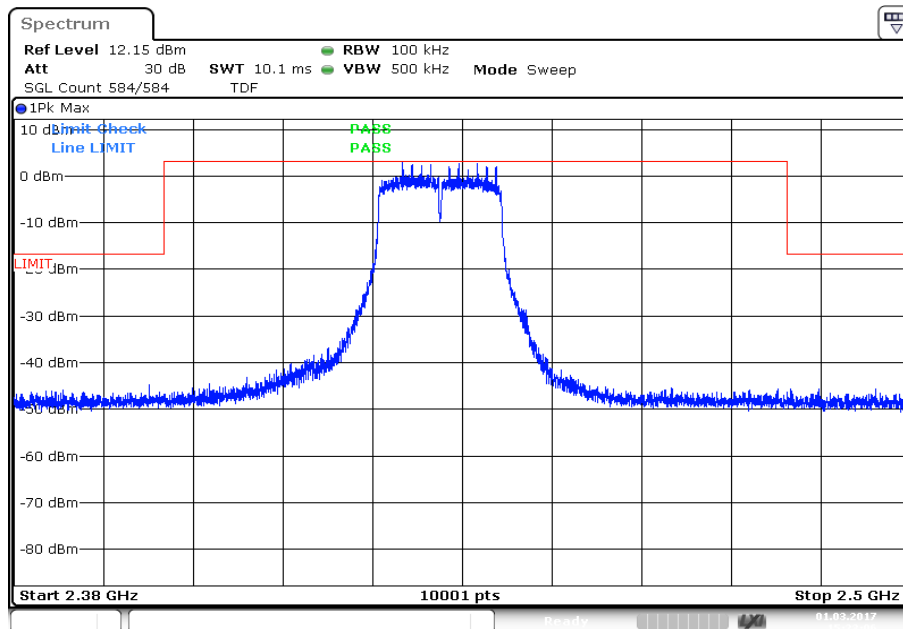


Plot 3: Middle channel, up to 25 GHz



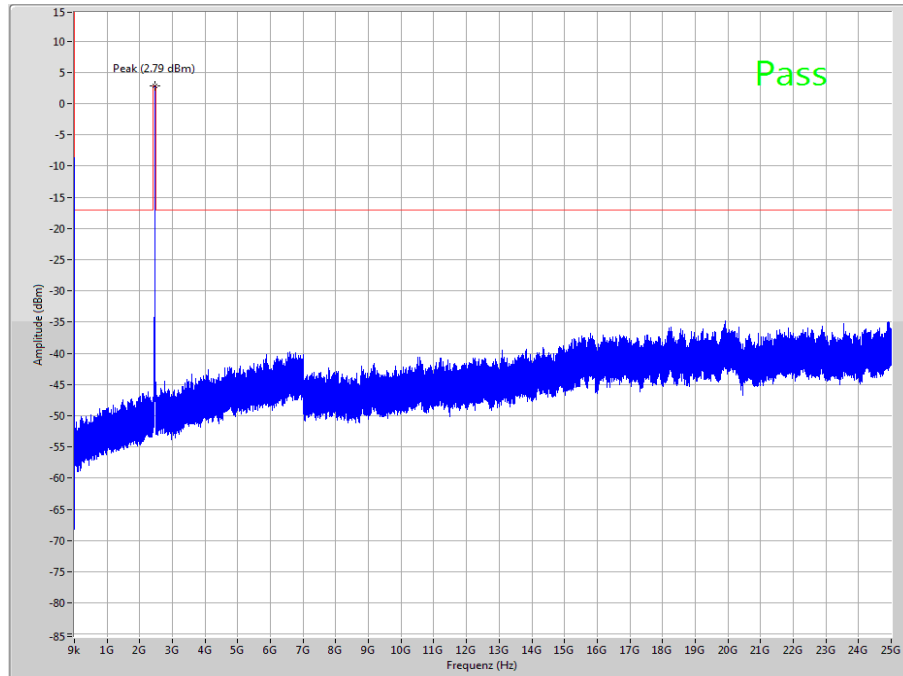
The peak at the beginning of the plot is the LO from the SA.

Plot 4: Middle channel, zoomed carrier



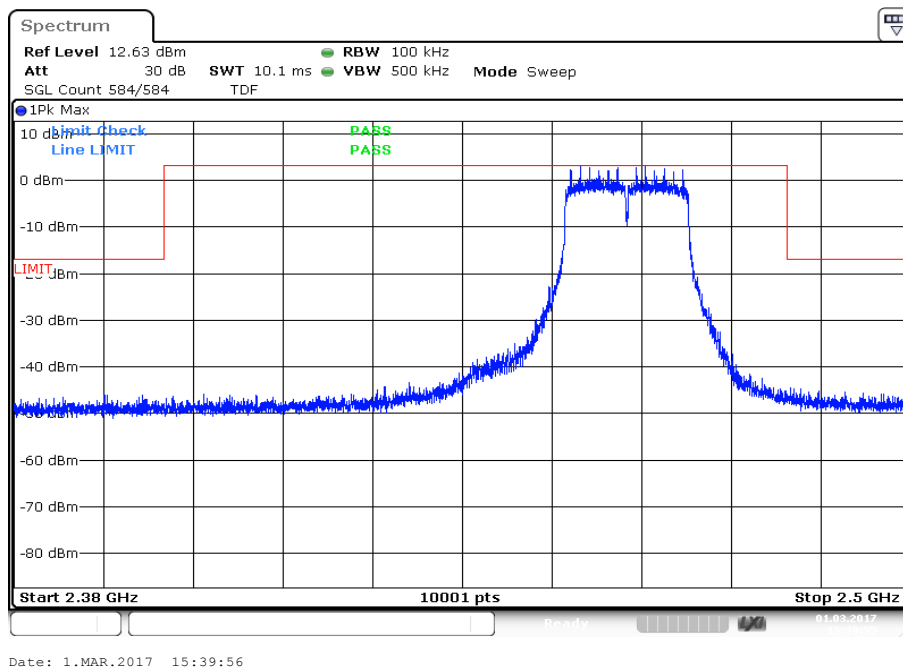
Date: 1.MAR.2017 15:23:07

Plot 5: Highest channel, up to 25 GHz



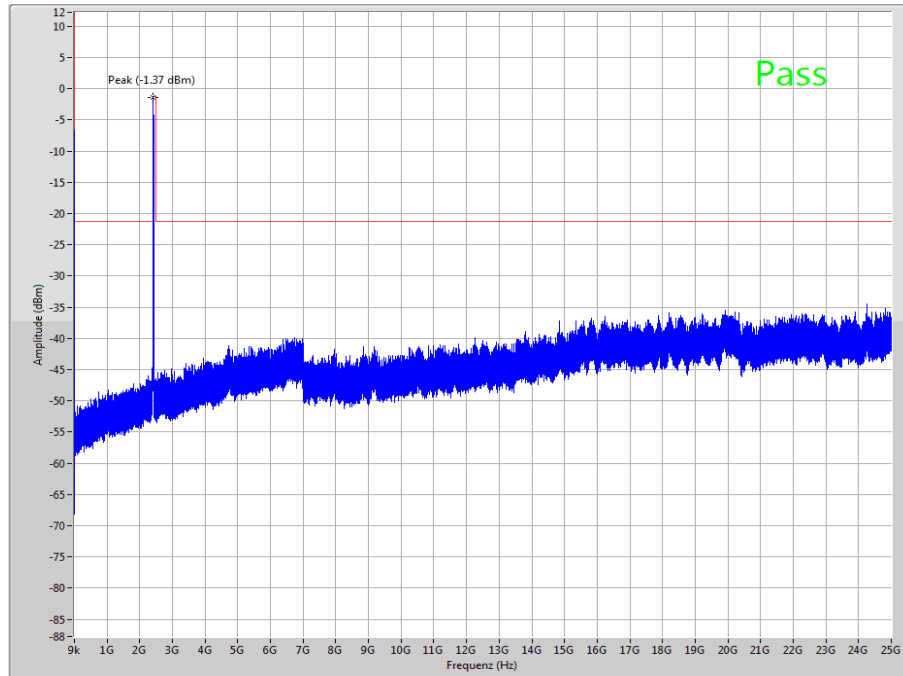
The peak at the beginning of the plot is the LO from the SA.

Plot 6: Highest channel, zoomed carrier



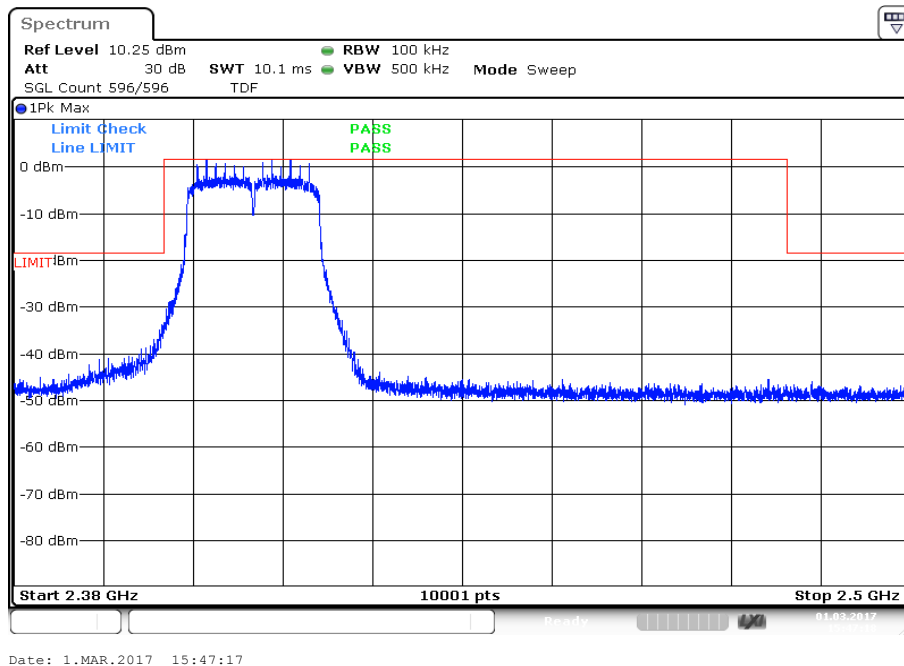
Plots: OFDM / n HT 20 – mode, MMCX port

Plot 1: Lowest channel, up to 25 GHz



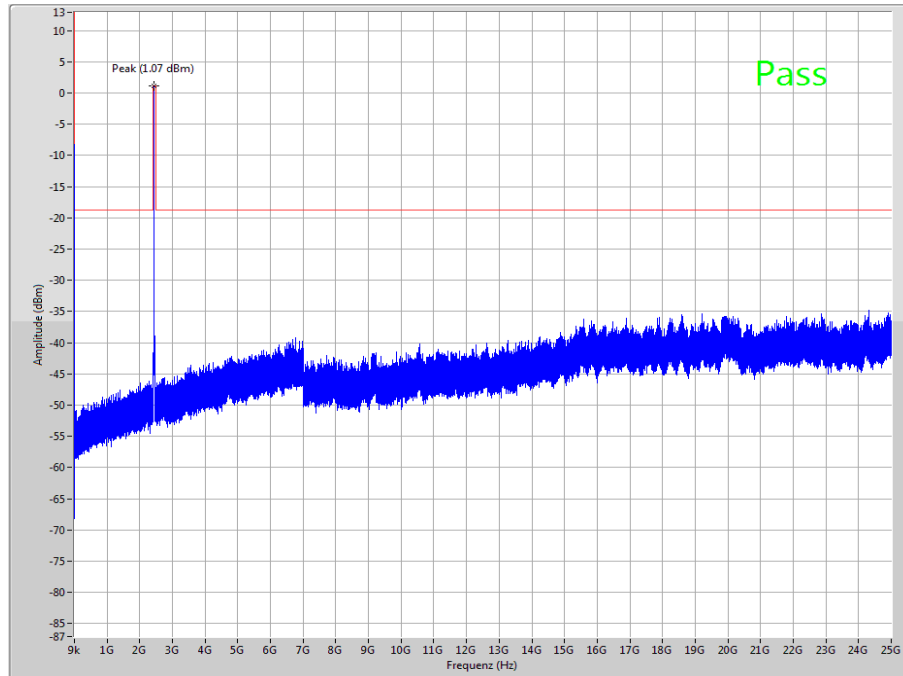
The peak at the beginning of the plot is the LO from the SA.

Plot 2: Lowest channel, zoomed carrier



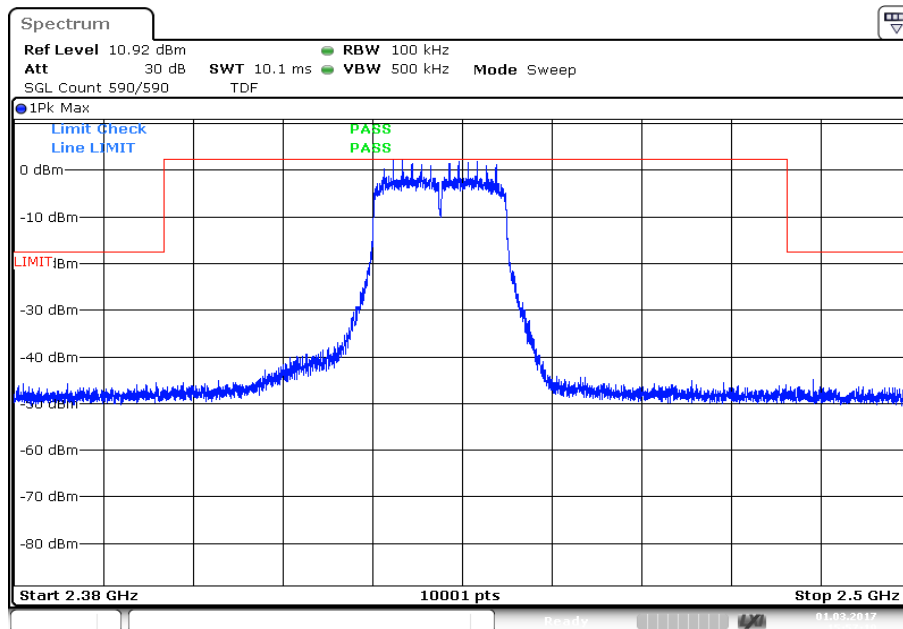
Date: 1.MAR.2017 15:47:17

Plot 3: Middle channel, up to 25 GHz

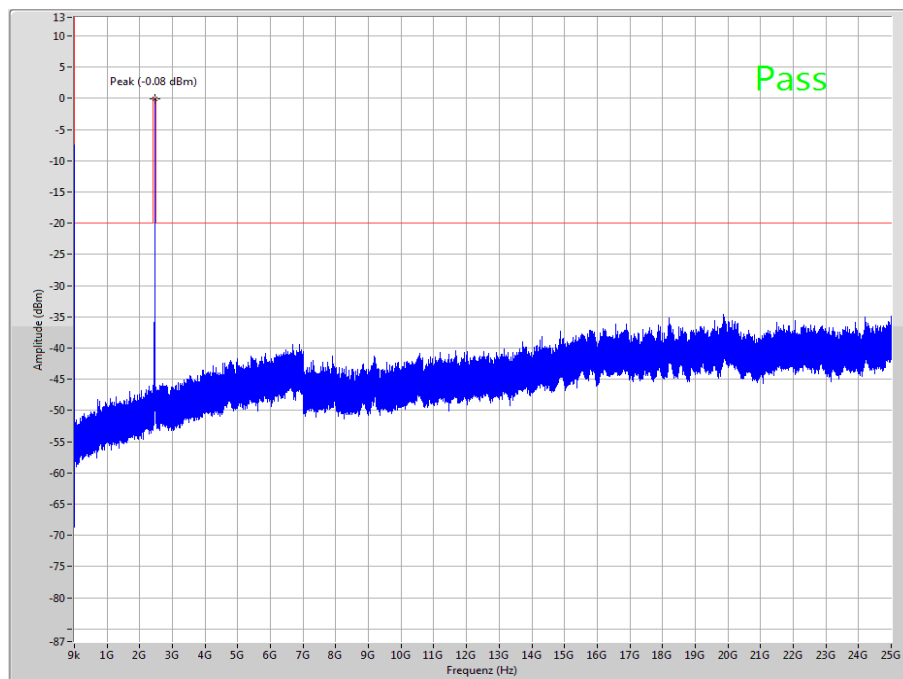


The peak at the beginning of the plot is the LO from the SA.

Plot 4: Middle channel, zoomed carrier

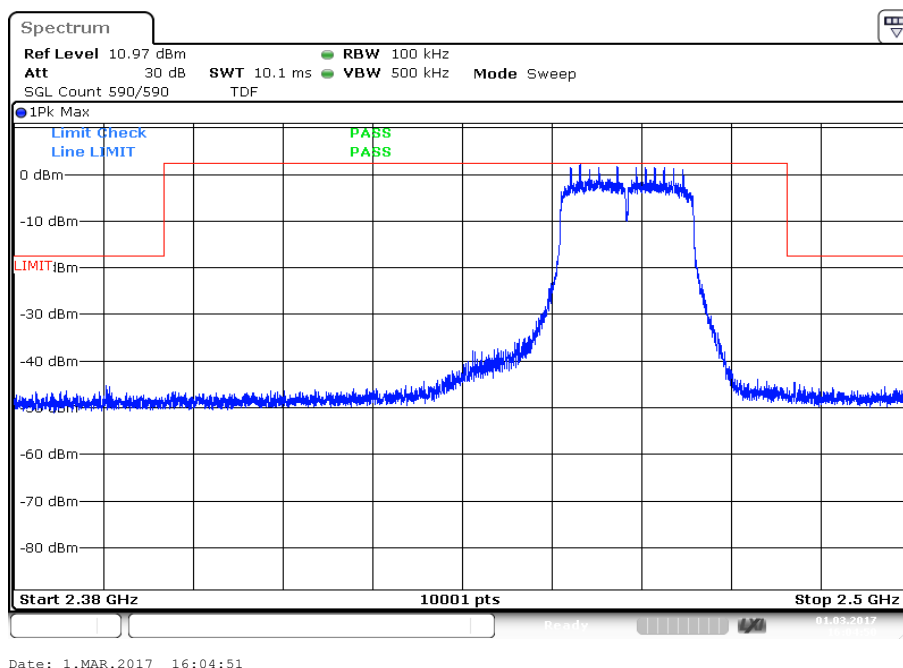


Plot 5: Highest channel, up to 25 GHz



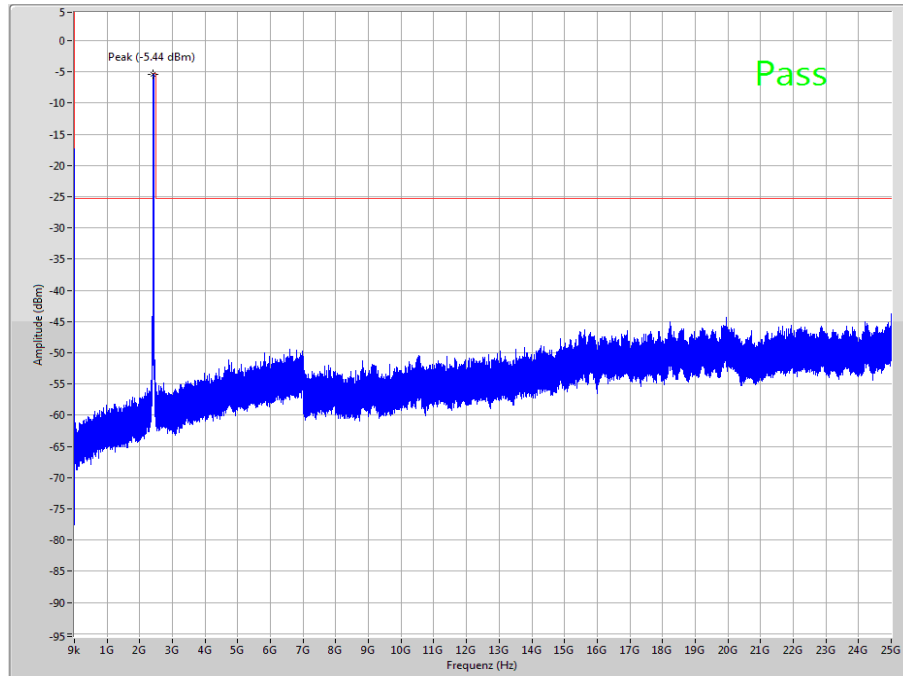
The peak at the beginning of the plot is the LO from the SA.

Plot 6: Highest channel, zoomed carrier



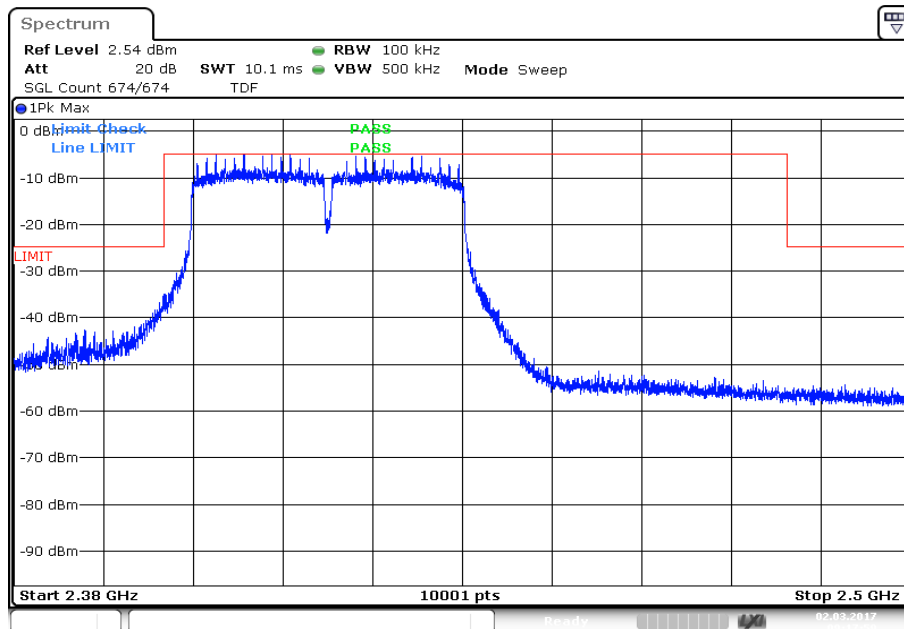
Plots: OFDM / n HT 40 – mode, MMCX port

Plot 1: Lowest channel, up to 25 GHz

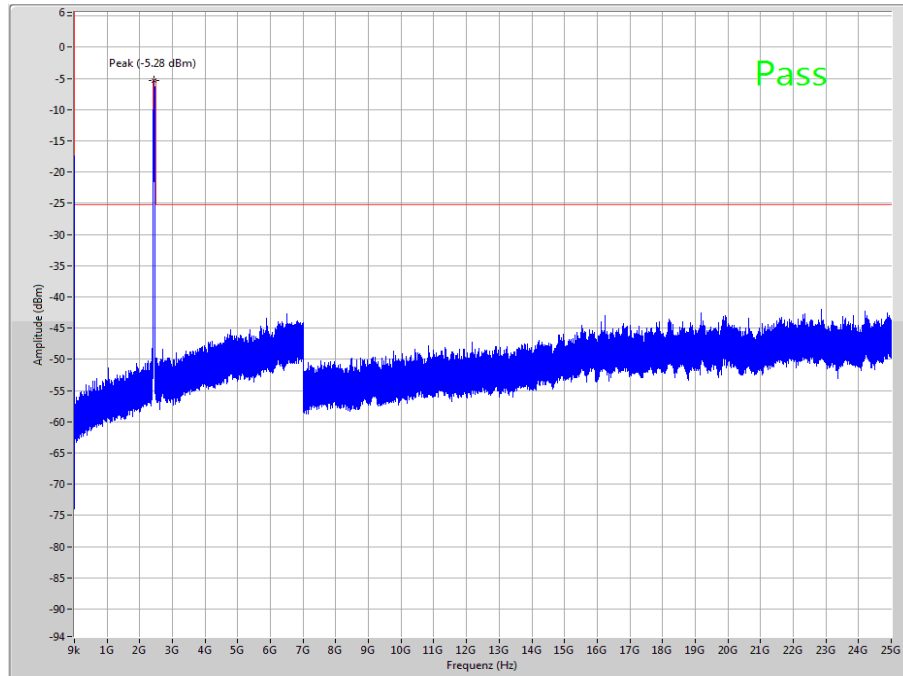


The peak at the beginning of the plot is the LO from the SA.

Plot 2: Lowest channel, zoomed carrier

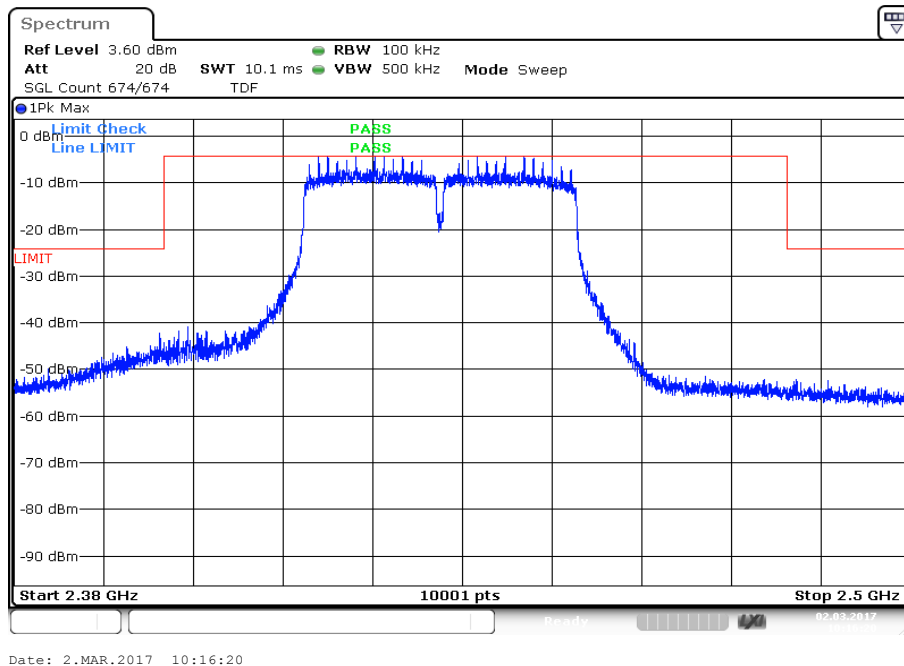


Plot 3: Middle channel, up to 25 GHz

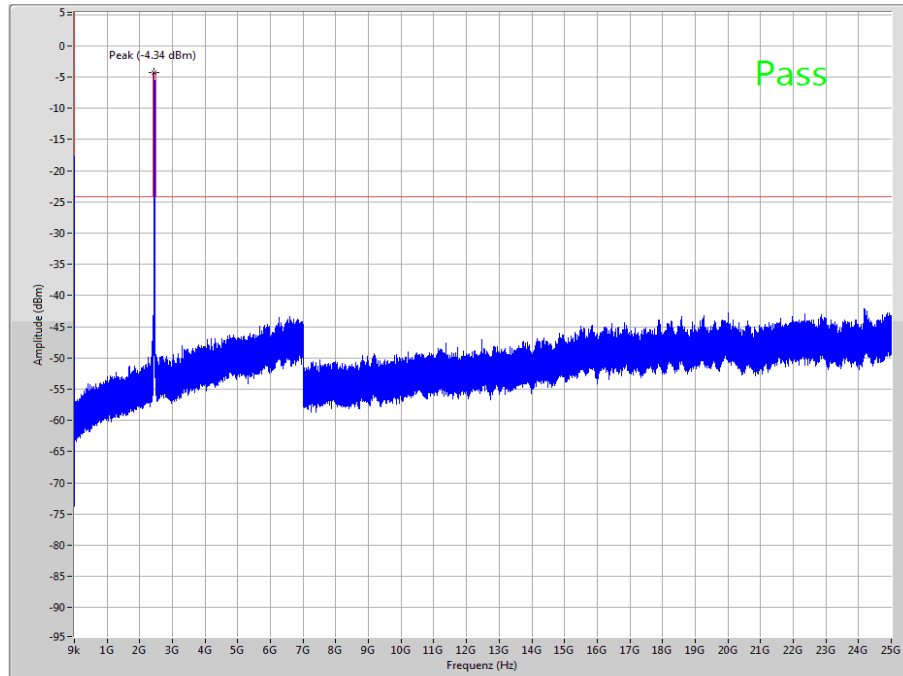


The peak at the beginning of the plot is the LO from the SA.

Plot 4: Middle channel, zoomed carrier

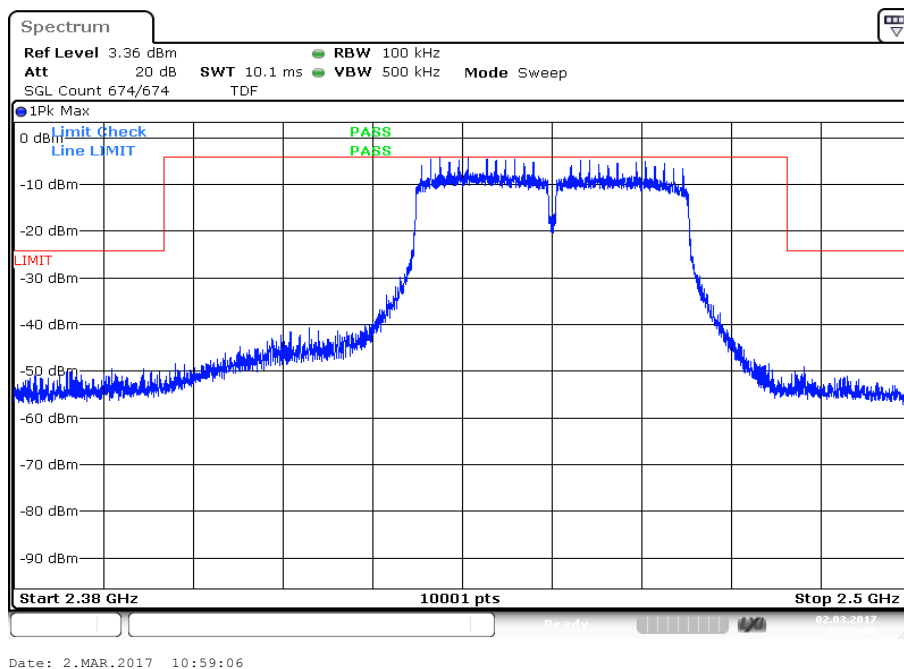


Plot 5: Highest channel, up to 25 GHz



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

Plot 6: Highest channel, zoomed carrier



11.11 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 6.2 - C
Measurement uncertainty	See sub clause 8

Limits:

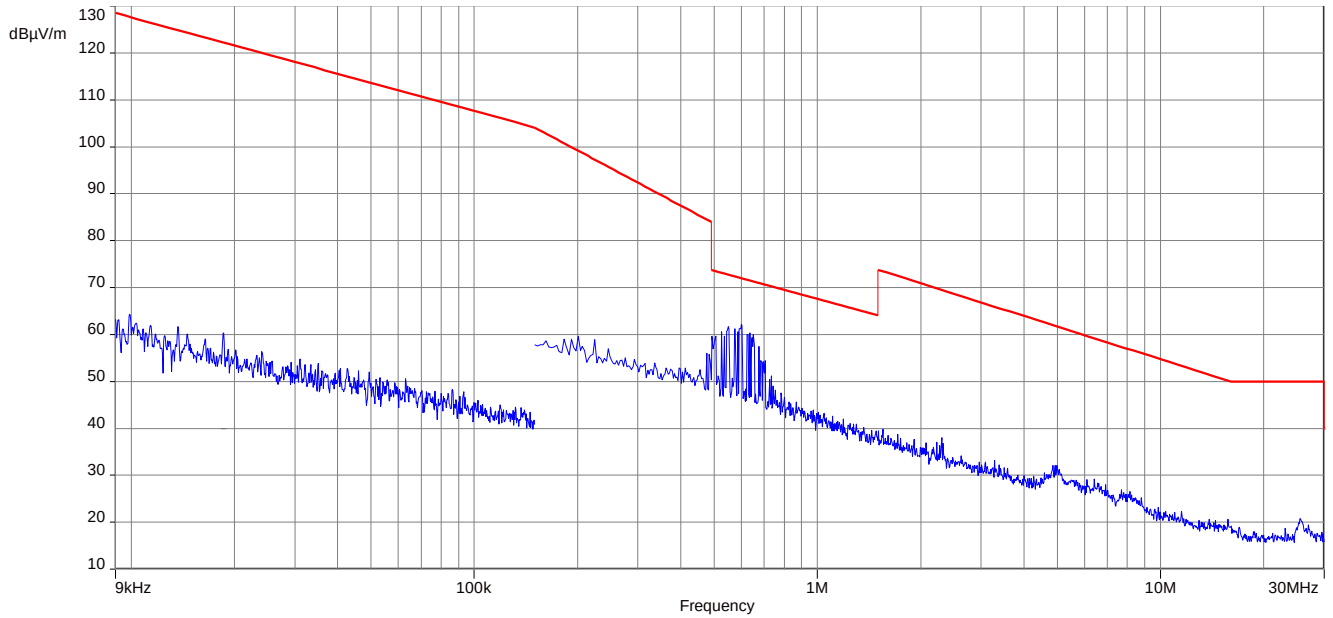
FCC		IC
Frequency (MHz)	Field Strength (dB μ V/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Results: ANT-X100P001B24553 PCB antenna

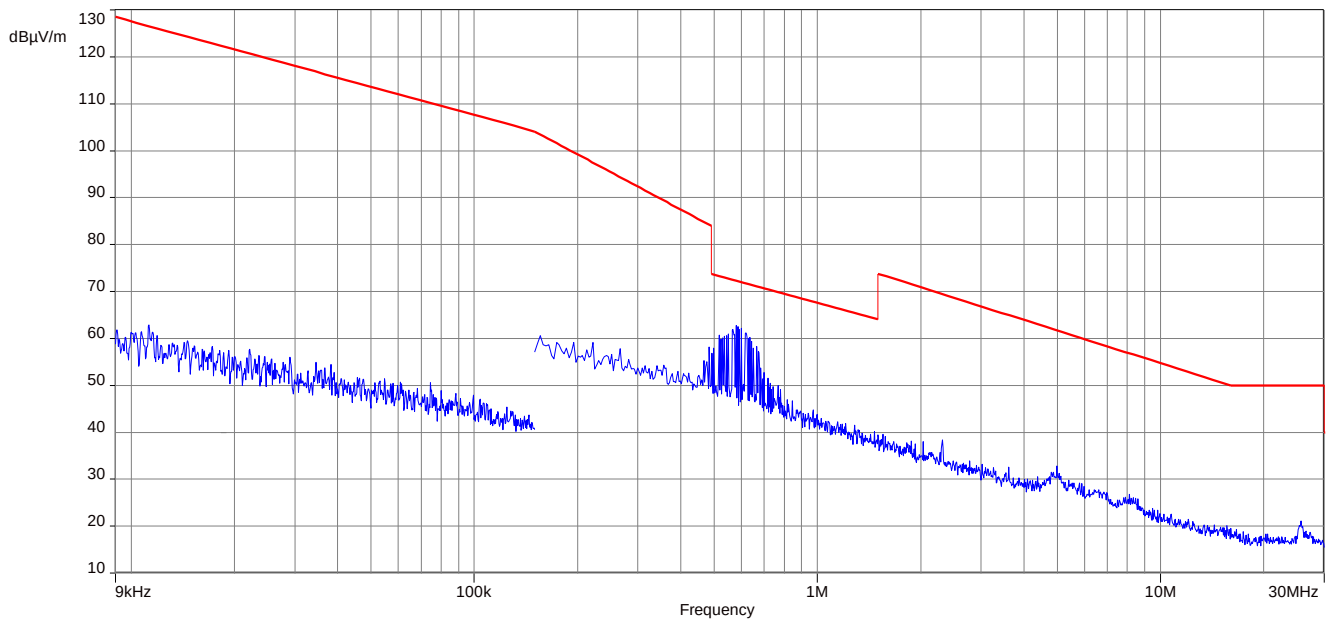
TX Spurious Emissions Radiated < 30 MHz [dB μ V/m]		
F [MHz]	Detector	Level [dB μ V/m]
All detected peaks are more than 20 dB below the limit.		

Plots: DSSS, ANT-X100P001B24553 PCB antenna

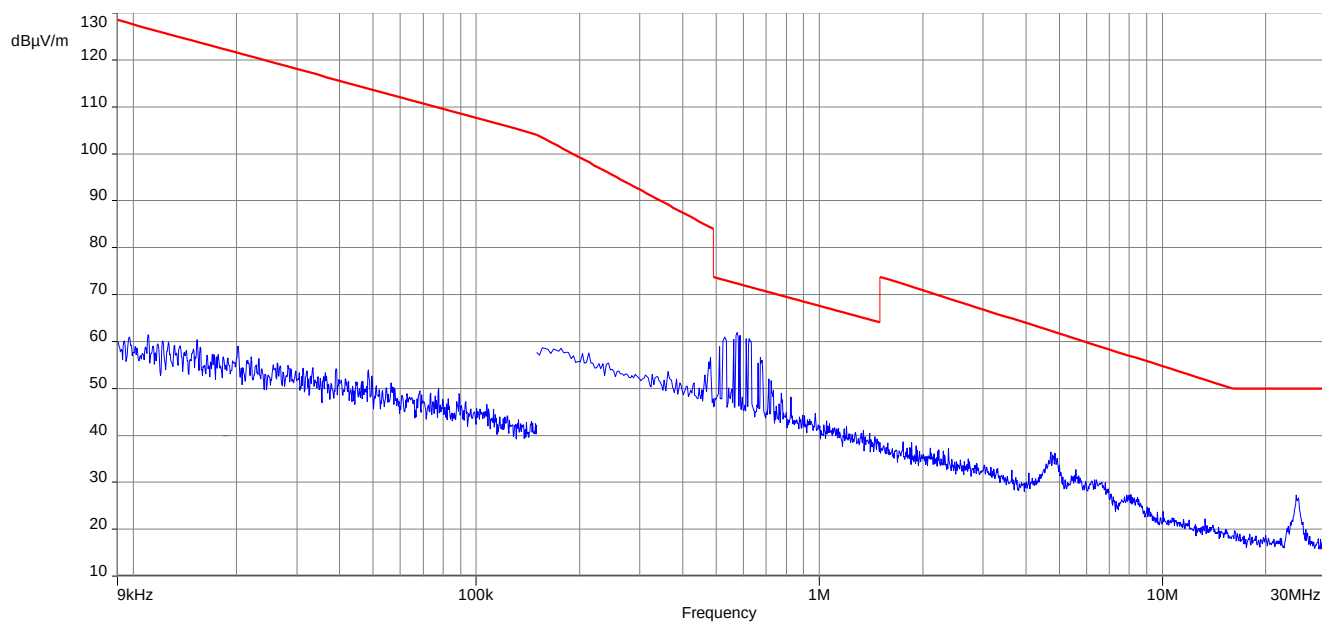
Plot 1: 9 kHz to 30 MHz, low channel



Plot 2: 9 kHz to 30 MHz, mid channel

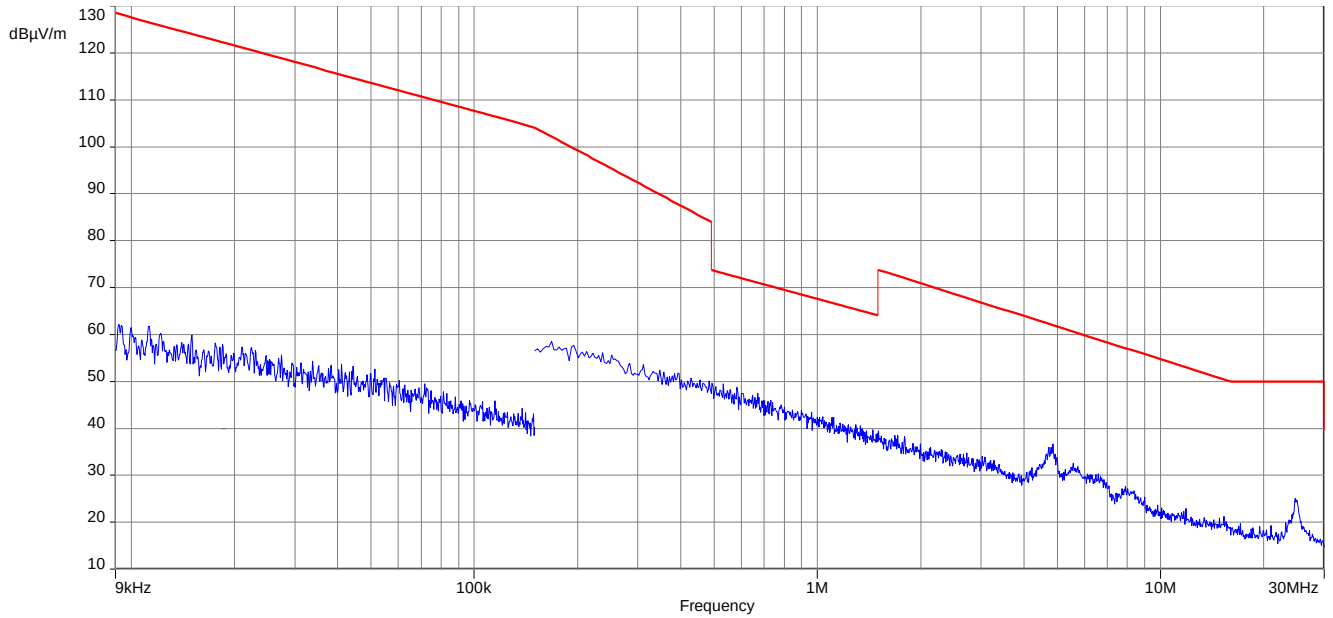


Plot 3: 9 kHz to 30 MHz, high channel

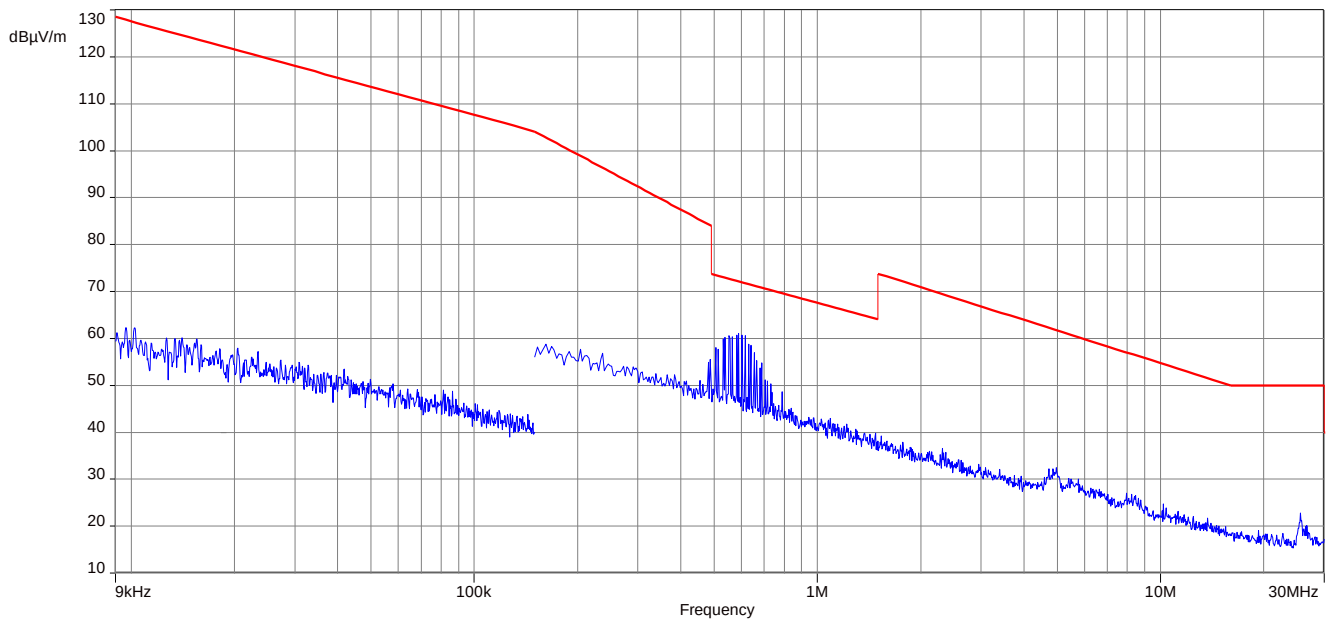


Plots: OFDM (20 MHz bandwidth), ANT100P001B24553 PCB antenna

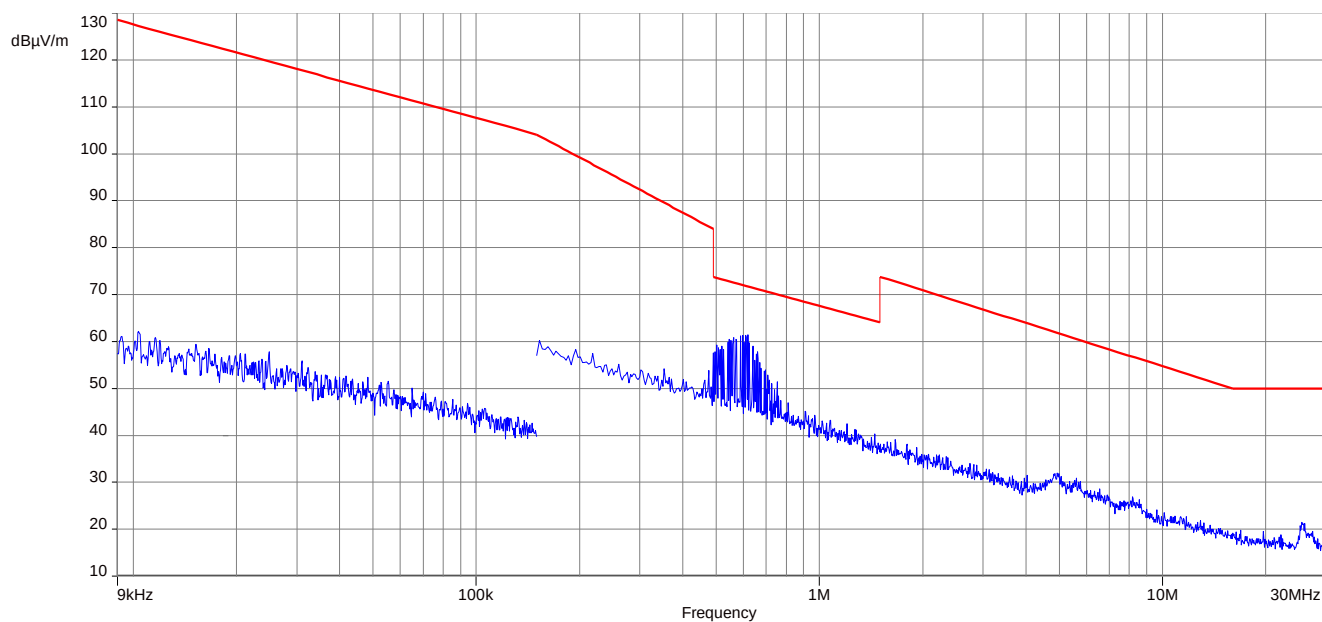
Plot 1: 9 kHz to 30 MHz, low channel



Plot 2: 9 kHz to 30 MHz, mid channel

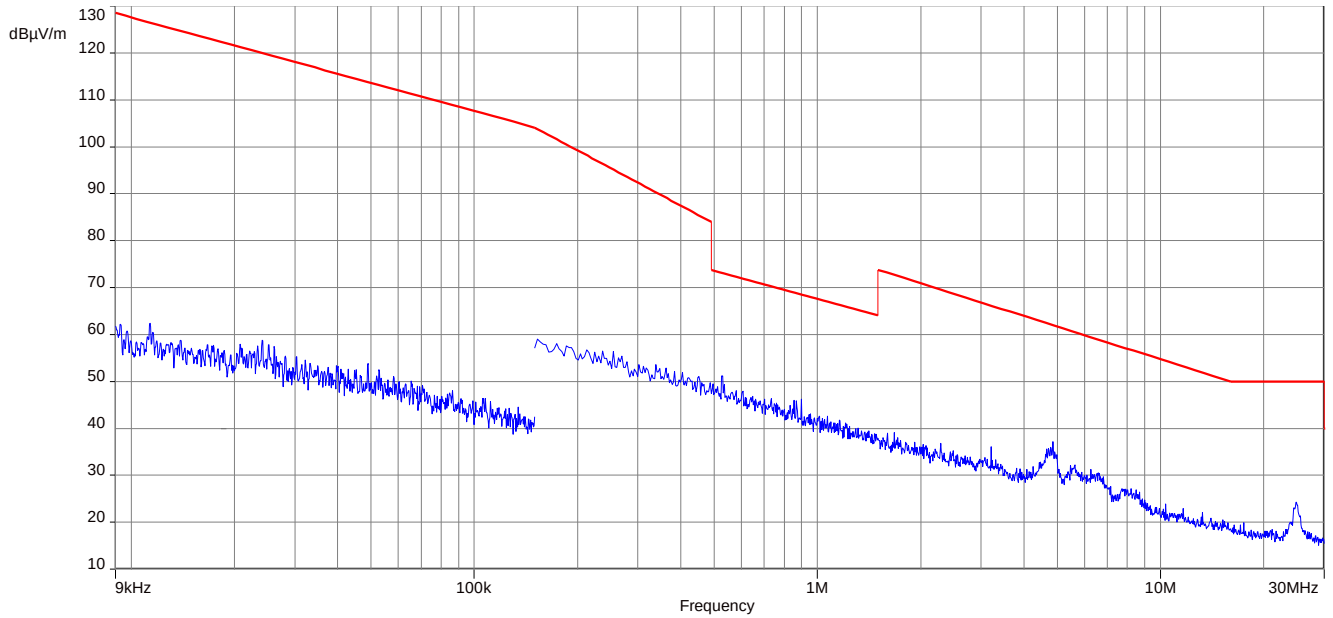


Plot 3: 9 kHz to 30 MHz, high channel

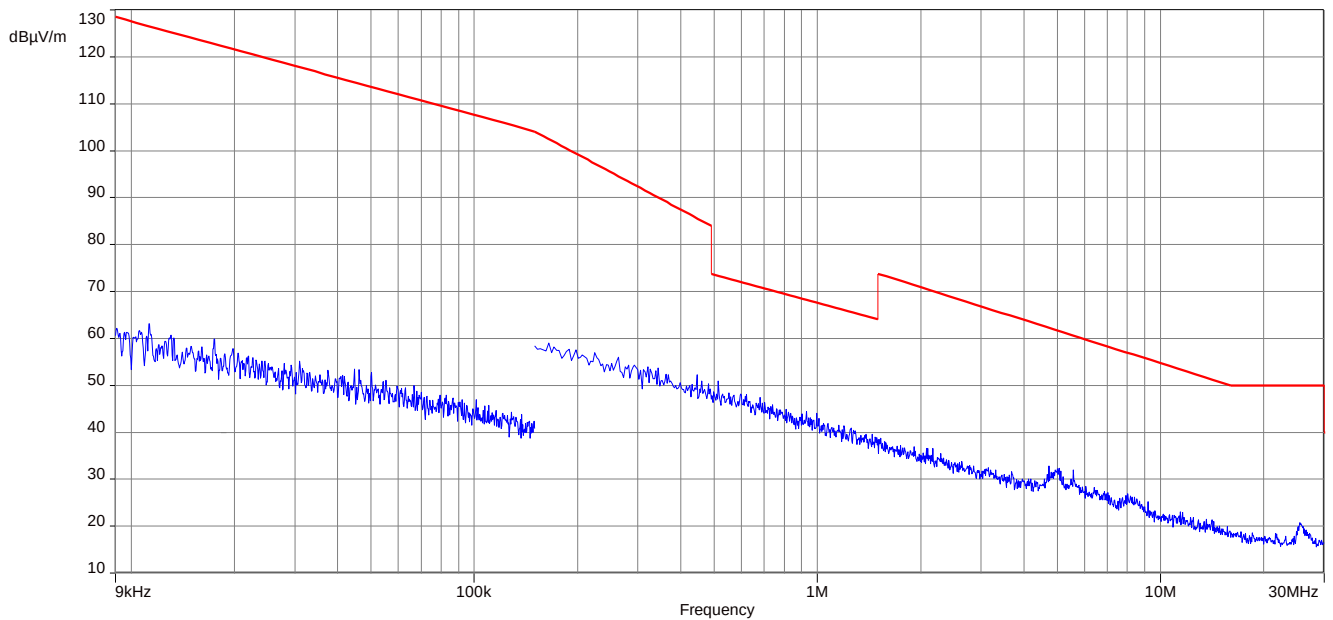


Plots: OFDM (40 MHz bandwidth), ANT100P001B24553 PCB antenna

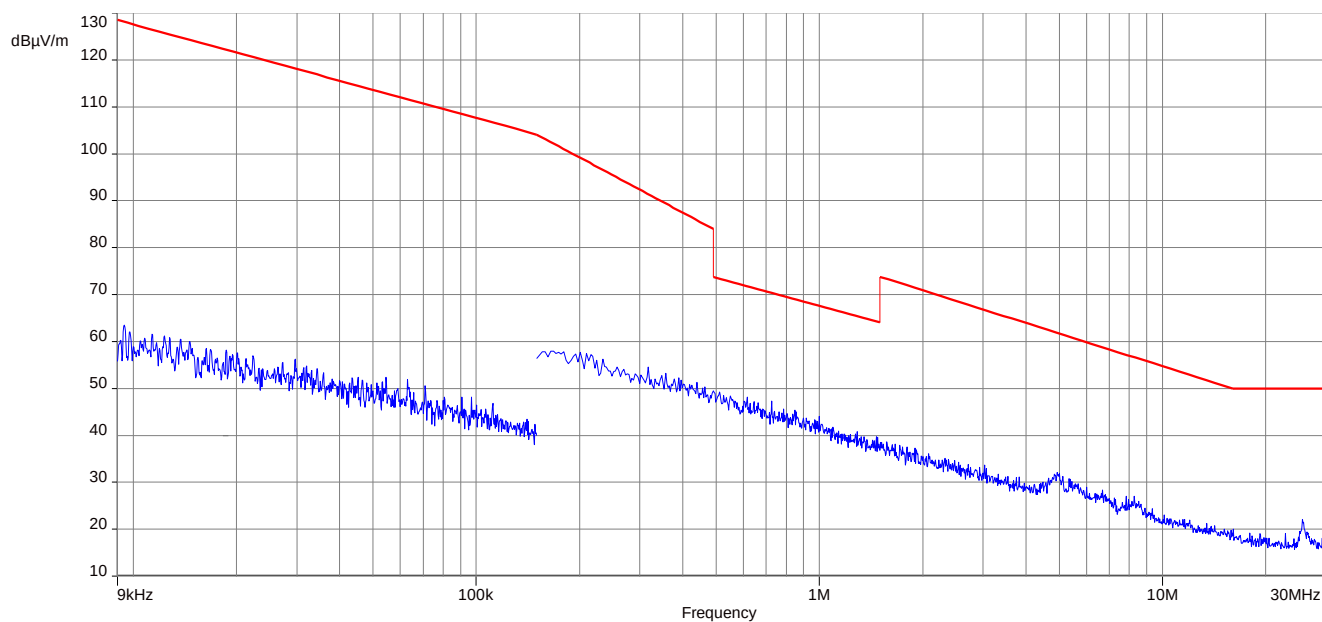
Plot 1: 9 kHz to 30 MHz, low channel



Plot 2: 9 kHz to 30 MHz, mid channel



Plot 3: 9 kHz to 30 MHz, high channel

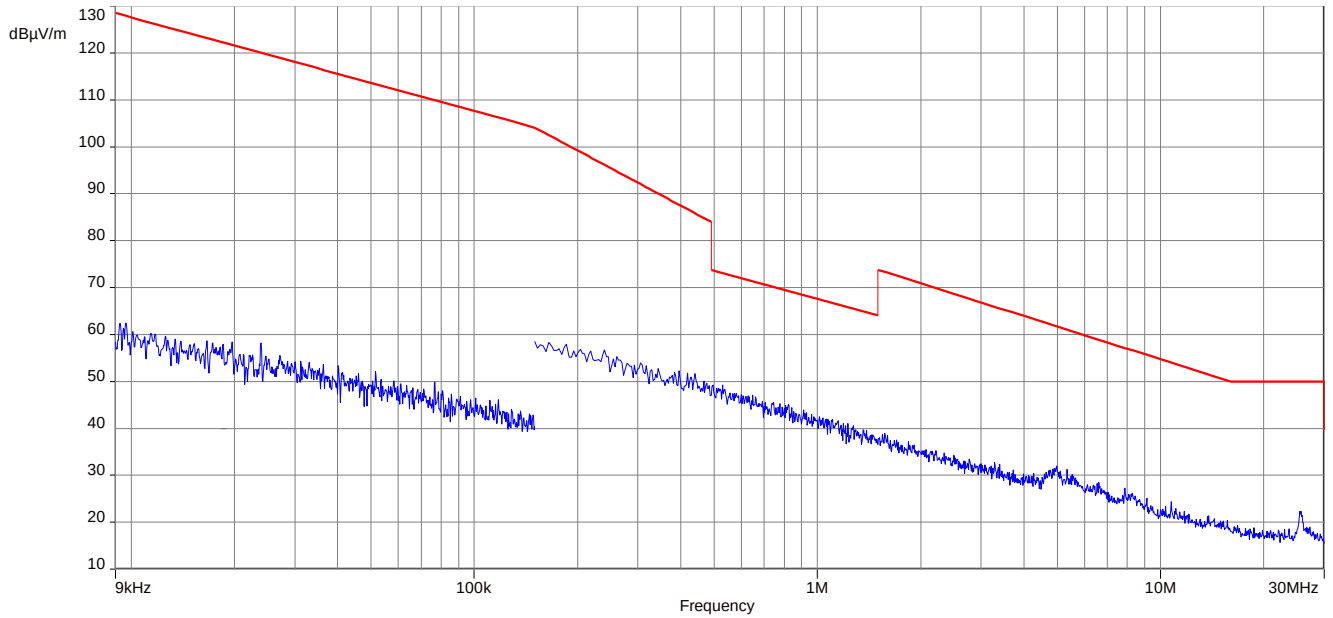


Results: ANT-DB1-RAF-xxx dipole antenna

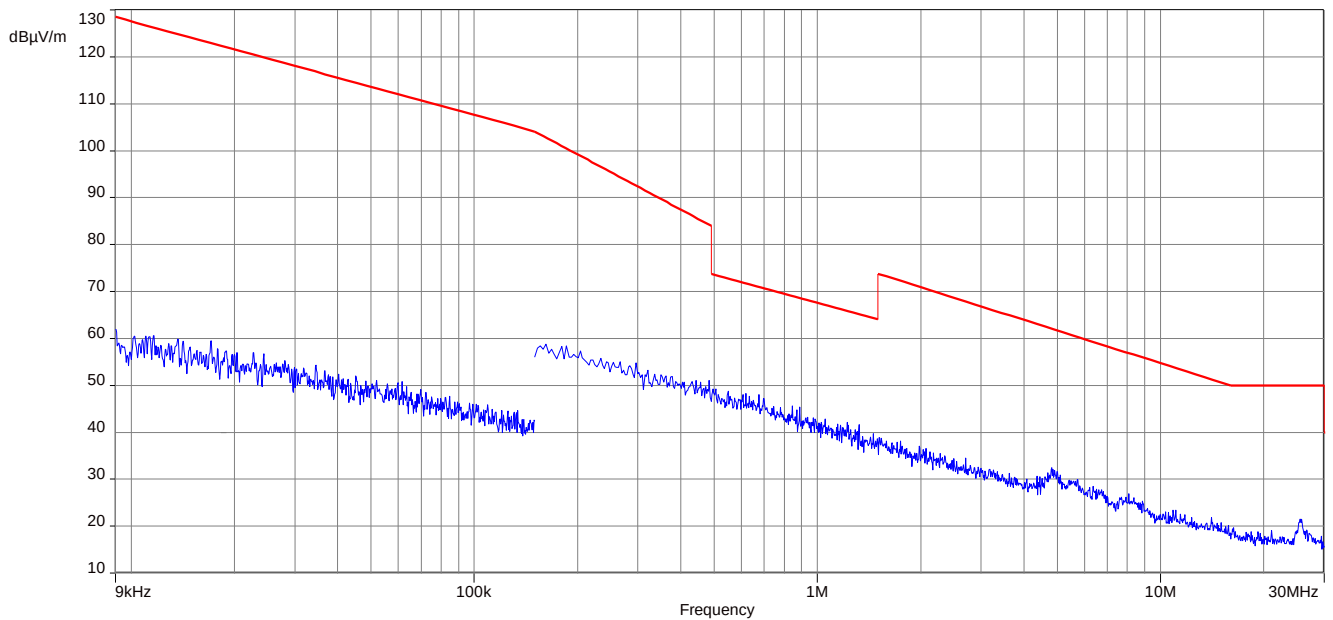
TX Spurious Emissions Radiated < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected peaks are more than 20 dB below the limit.		

Plots: DSSS, ANT-DB1-RAF-xxx dipole antenna

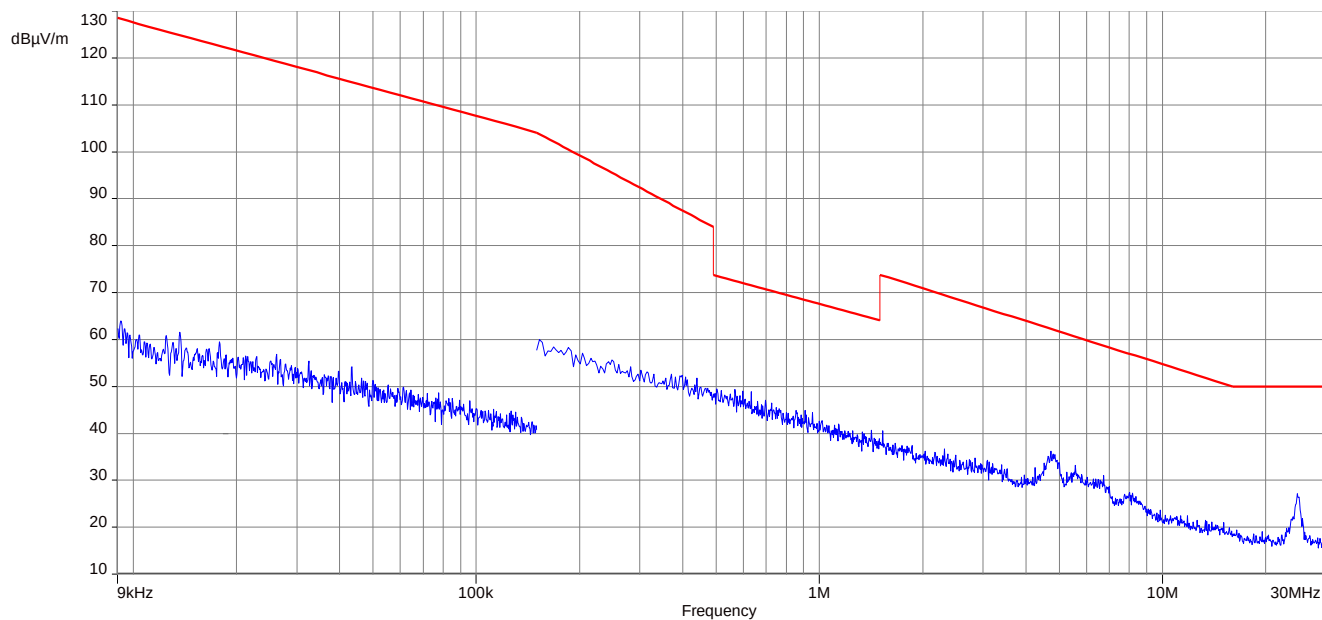
Plot 1: 9 kHz to 30 MHz, low channel



Plot 2: 9 kHz to 30 MHz, mid channel

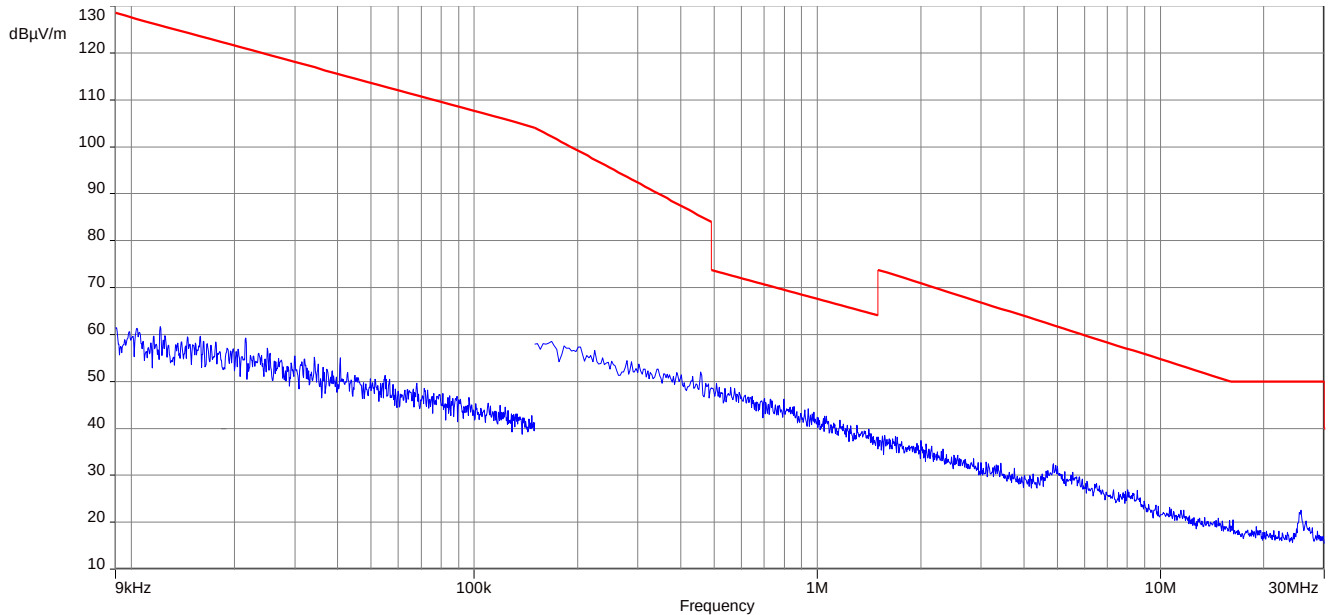


Plot 3: 9 kHz to 30 MHz, high channel

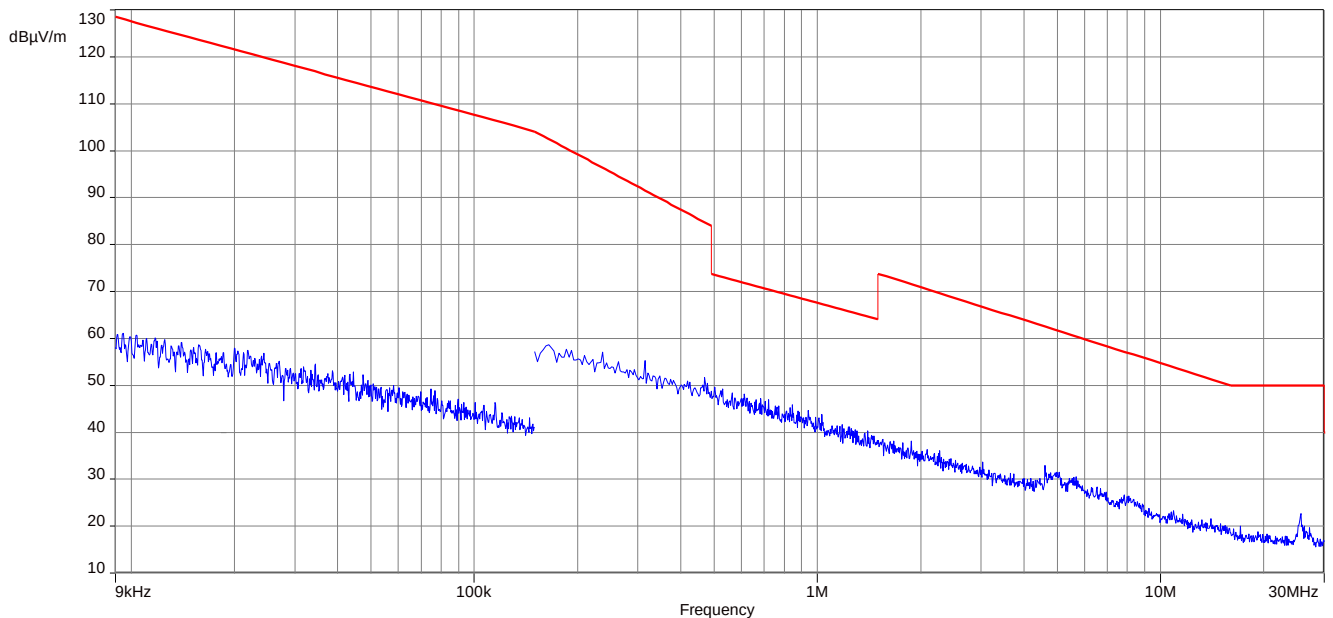


Plots: OFDM (20 MHz bandwidth), ANT-DB1-RAF-xxx dipole antenna

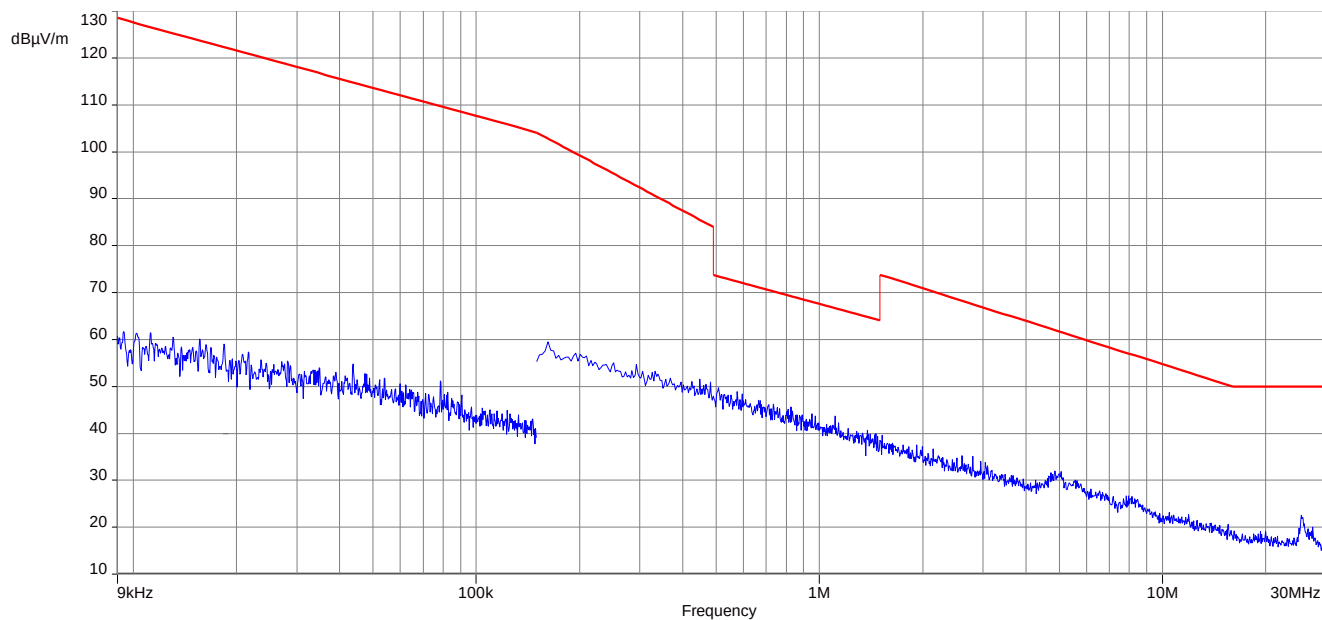
Plot 1: 9 kHz to 30 MHz, low channel



Plot 2: 9 kHz to 30 MHz, mid channel

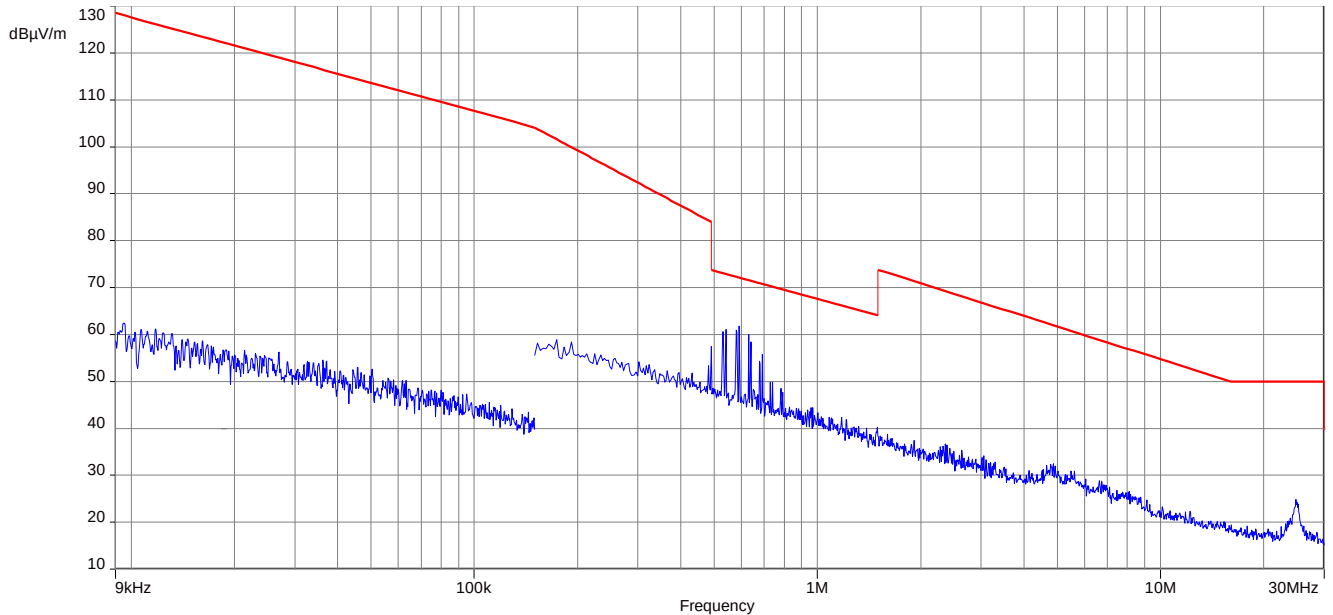


Plot 3: 9 kHz to 30 MHz, high channel

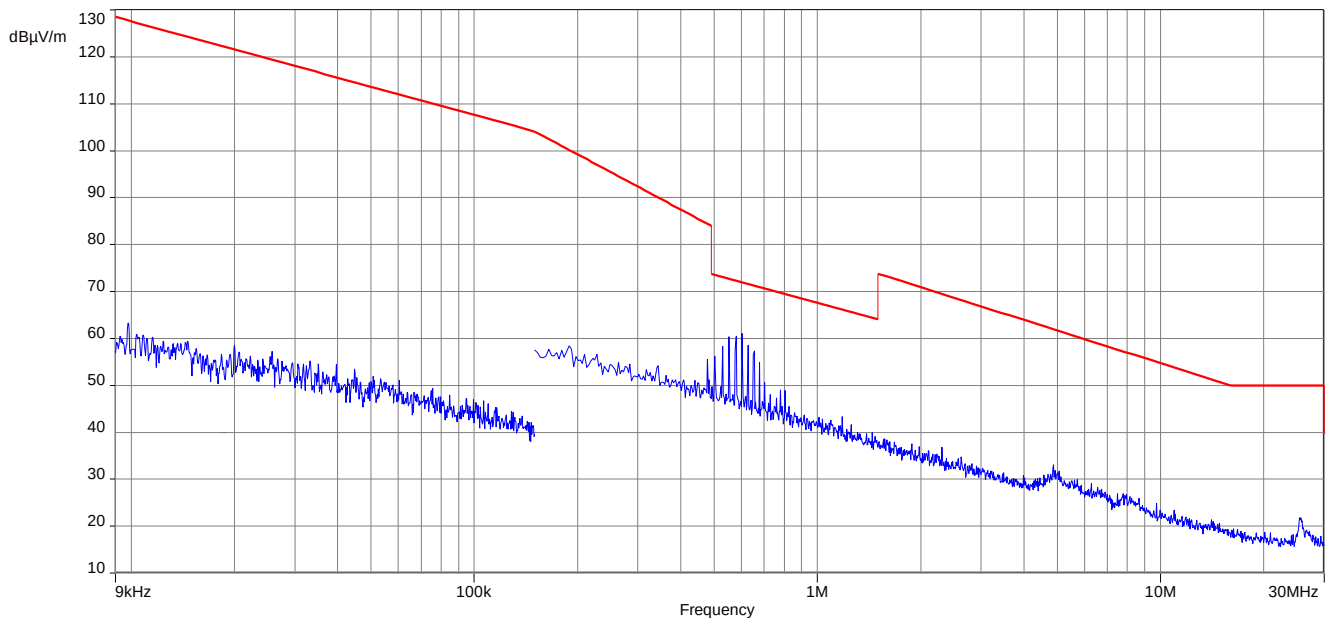


Plots: OFDM (40 MHz bandwidth), ANT-DB1-RAF-xxx dipole antenna

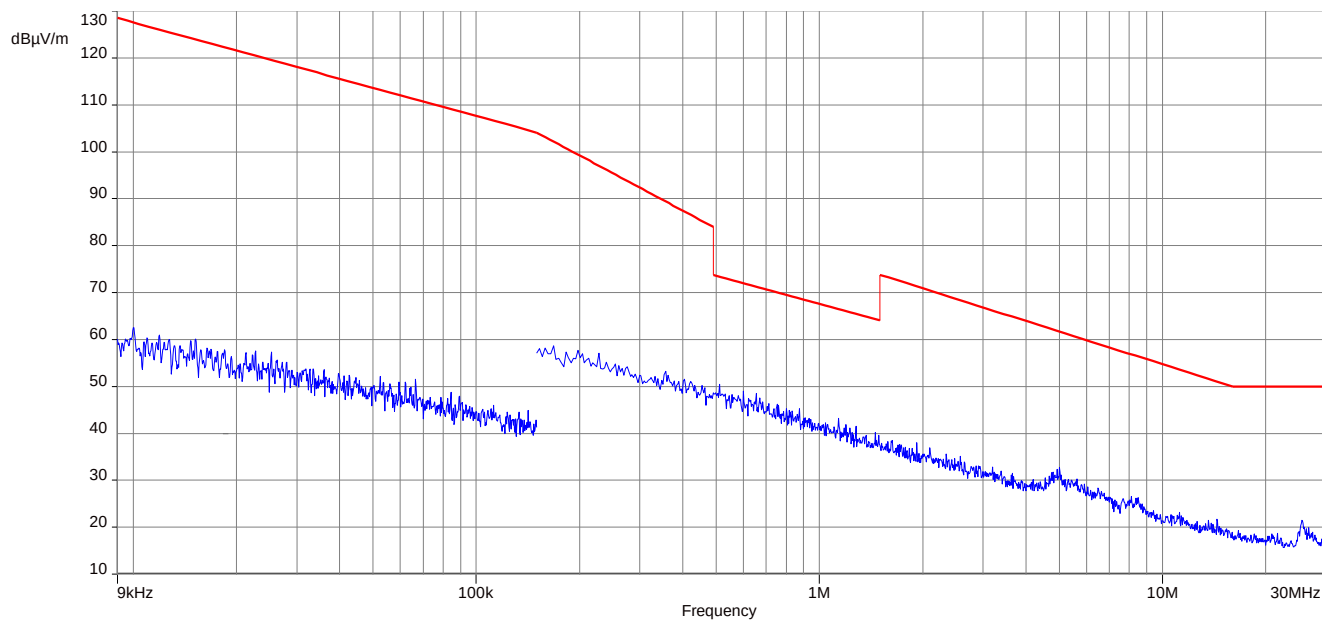
Plot 1: 9 kHz to 30 MHz, low channel



Plot 2: 9 kHz to 30 MHz, mid channel



Plot 3: 9 kHz to 30 MHz, high channel



11.12 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	☒ DSSS b – mode ☒ OFDM g – mode ☐ OFDM n HT20 – mode ☒ OFDM n HT40 – mode ☒ RX / Idle – mode
Test setup:	See sub clause 6.1 A
Measurement uncertainty	See sub clause 8

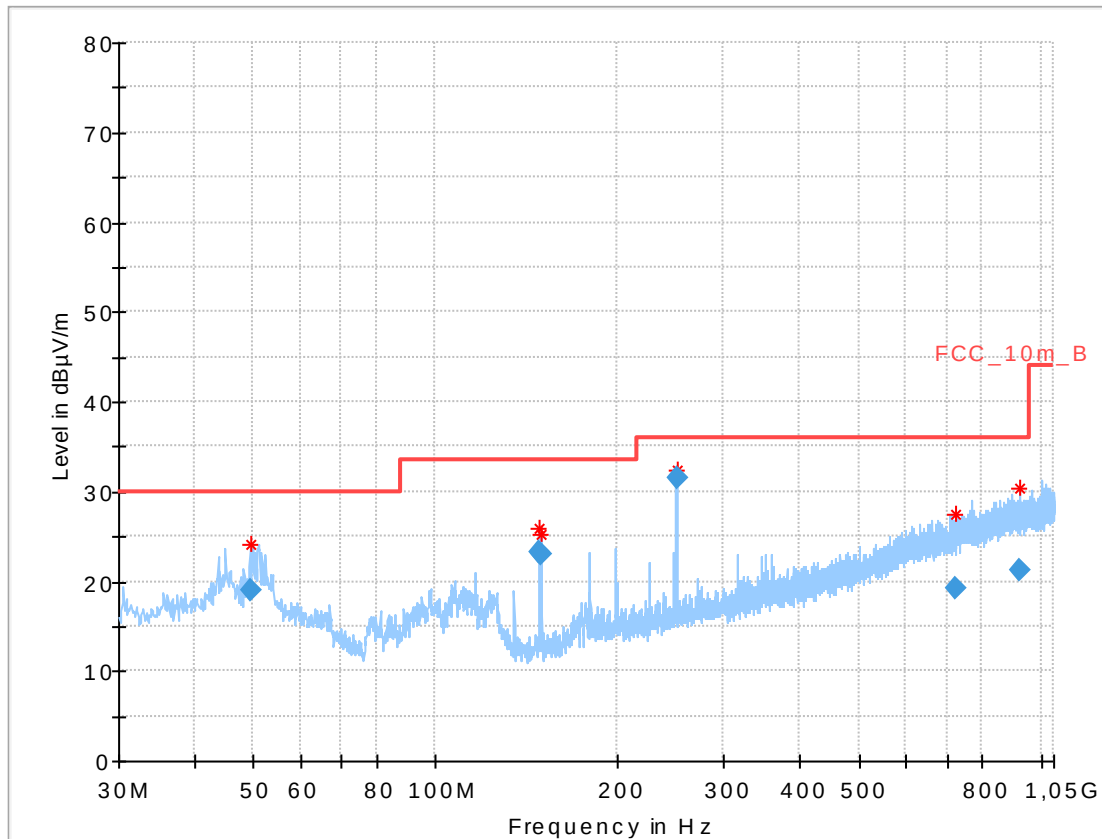
The modulation with the highest output power was used to perform the transmitter spurious emissions. If spurious were detected a re-measurement was performed on the detected frequency with each modulation.

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 (dB μ V/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10

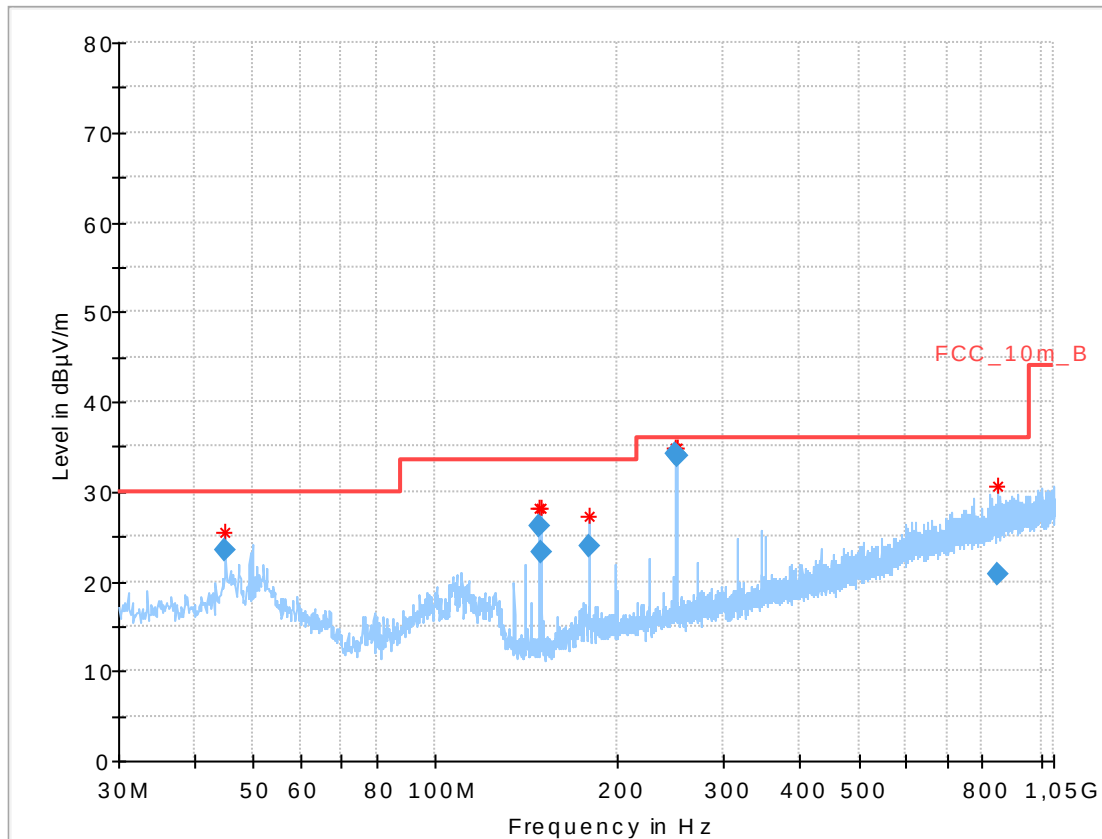
Plot: DSSS, ANT100P001B24553 PCB antenna

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

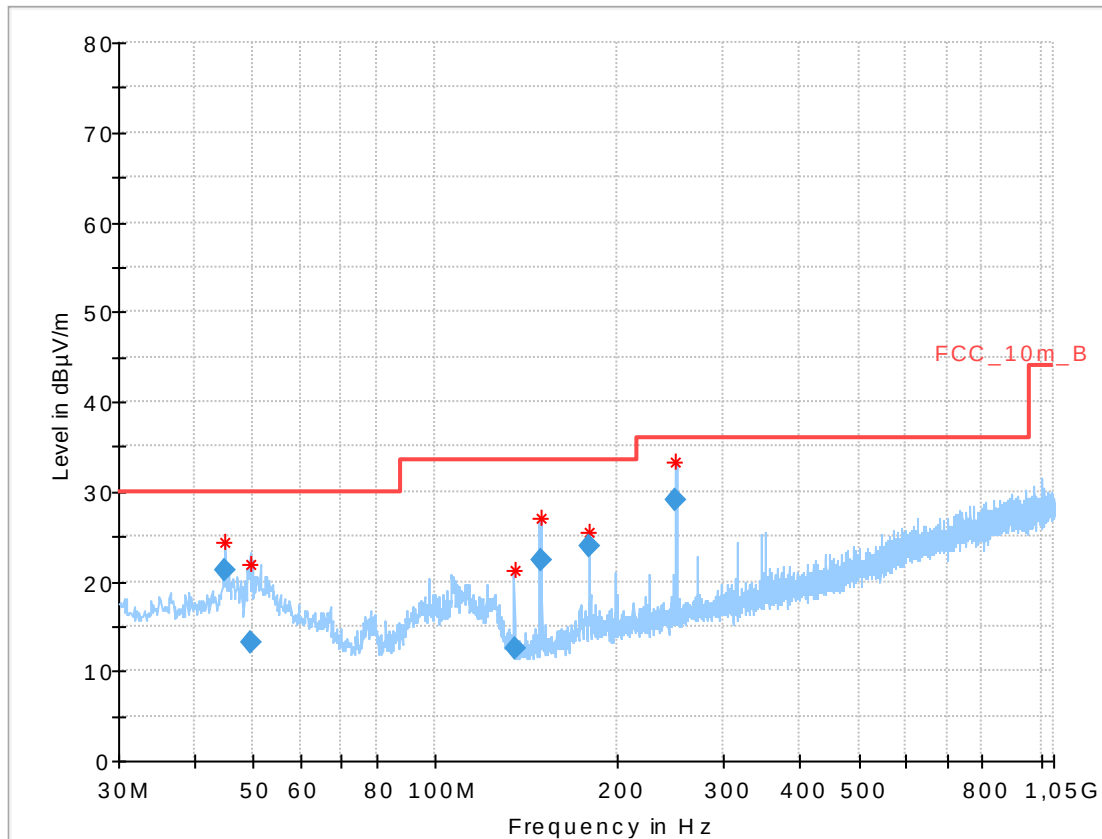


Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
49.501350	18.94	30.00	11.06	1000.0	120.000	185.0	V	271.0	13.7
148.498200	23.20	33.50	10.30	1000.0	120.000	98.0	V	97.0	9.2
149.995050	23.04	33.50	10.46	1000.0	120.000	98.0	V	120.0	9.3
250.002900	31.61	36.00	4.39	1000.0	120.000	98.0	V	349.0	13.4
722.073750	19.30	36.00	16.70	1000.0	120.000	185.0	V	243.0	22.1
925.083300	21.31	36.00	14.69	1000.0	120.000	185.0	V	58.0	24.3

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

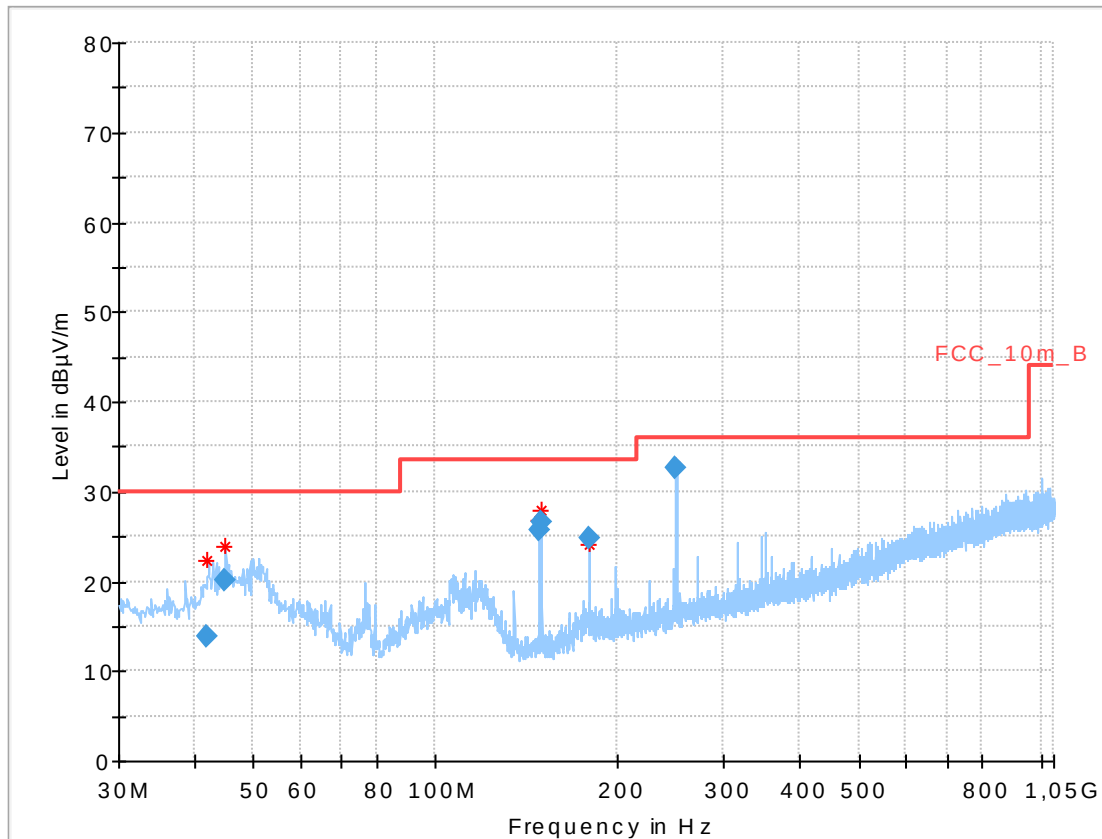
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
45.010650	23.48	30.00	6.52	1000.0	120.000	98.0	V	92.0	13.6
148.481700	26.23	33.50	7.27	1000.0	120.000	98.0	V	79.0	9.2
150.002700	23.29	33.50	10.21	1000.0	120.000	98.0	V	85.0	9.3
180.001200	24.02	33.50	9.48	1000.0	120.000	101.0	V	346.0	10.9
249.995700	34.11	36.00	1.89	1000.0	120.000	101.0	V	286.0	13.4
250.000800	34.07	36.00	1.93	1000.0	120.000	98.0	V	286.0	13.4

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

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
45.021450	21.26	30.00	8.74	1000.0	120.000	98.0	V	39.0	13.6
49.615950	13.26	30.00	16.74	1000.0	120.000	98.0	V	131.0	13.7
134.995800	12.46	33.50	21.04	1000.0	120.000	98.0	V	211.0	9.2
149.999700	22.31	33.50	11.19	1000.0	120.000	98.0	V	83.0	9.3
179.996550	23.88	33.50	9.62	1000.0	120.000	101.0	V	343.0	10.9
249.994350	29.16	36.00	6.84	1000.0	120.000	101.0	V	284.0	13.4

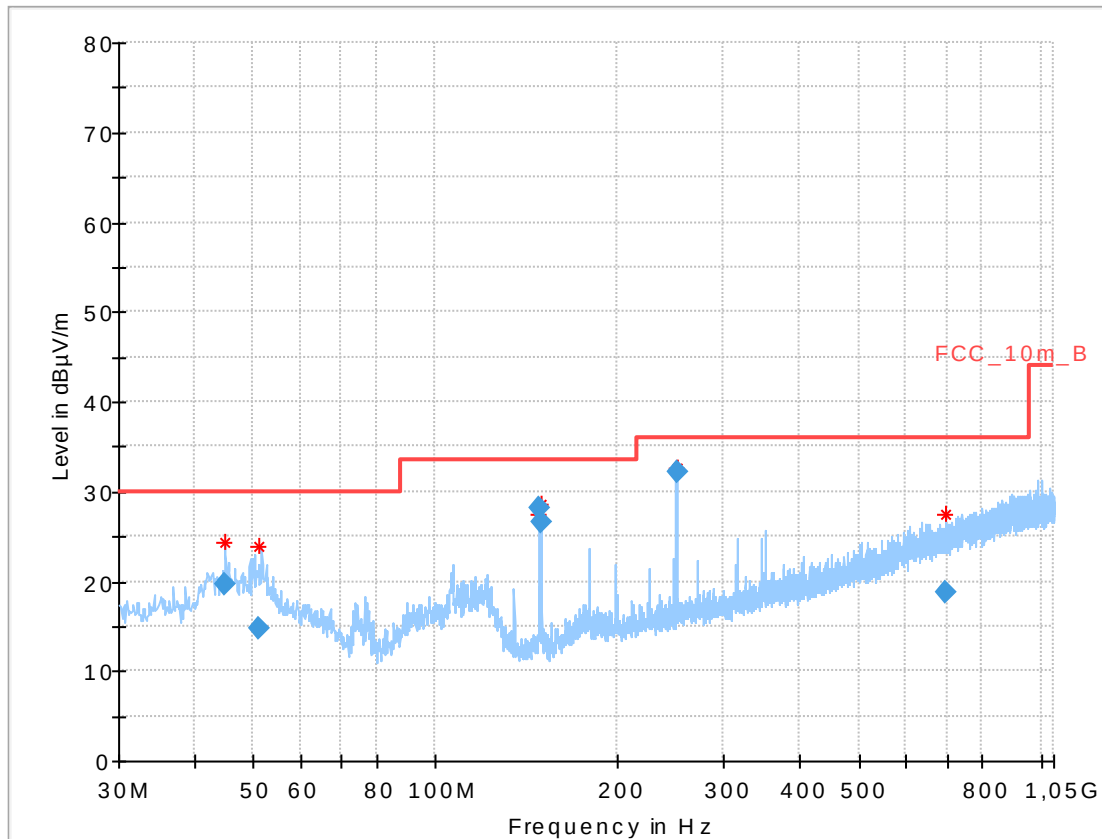
Plot: OFDM (20 MHz bandwidth), ANT100P001B24553 PCB antenna

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

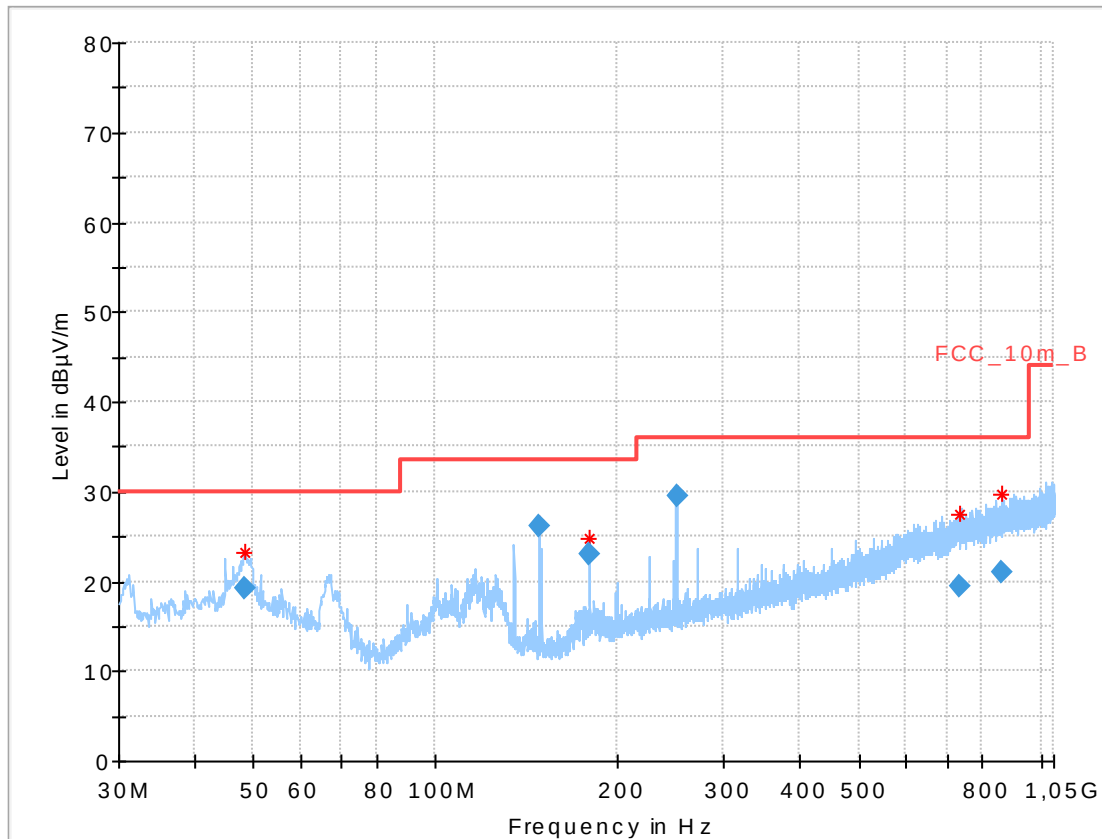


Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
41.935050	13.80	30.00	16.20	1000.0	120.000	98.0	V	182.0	13.4
44.974950	20.03	30.00	9.97	1000.0	120.000	101.0	V	52.0	13.6
148.475550	25.67	33.50	7.83	1000.0	120.000	101.0	V	59.0	9.2
150.001350	26.62	33.50	6.88	1000.0	120.000	98.0	V	93.0	9.3
180.004800	24.84	33.50	8.66	1000.0	120.000	101.0	V	353.0	10.9
249.993150	32.56	36.00	3.44	1000.0	120.000	98.0	V	353.0	13.4

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

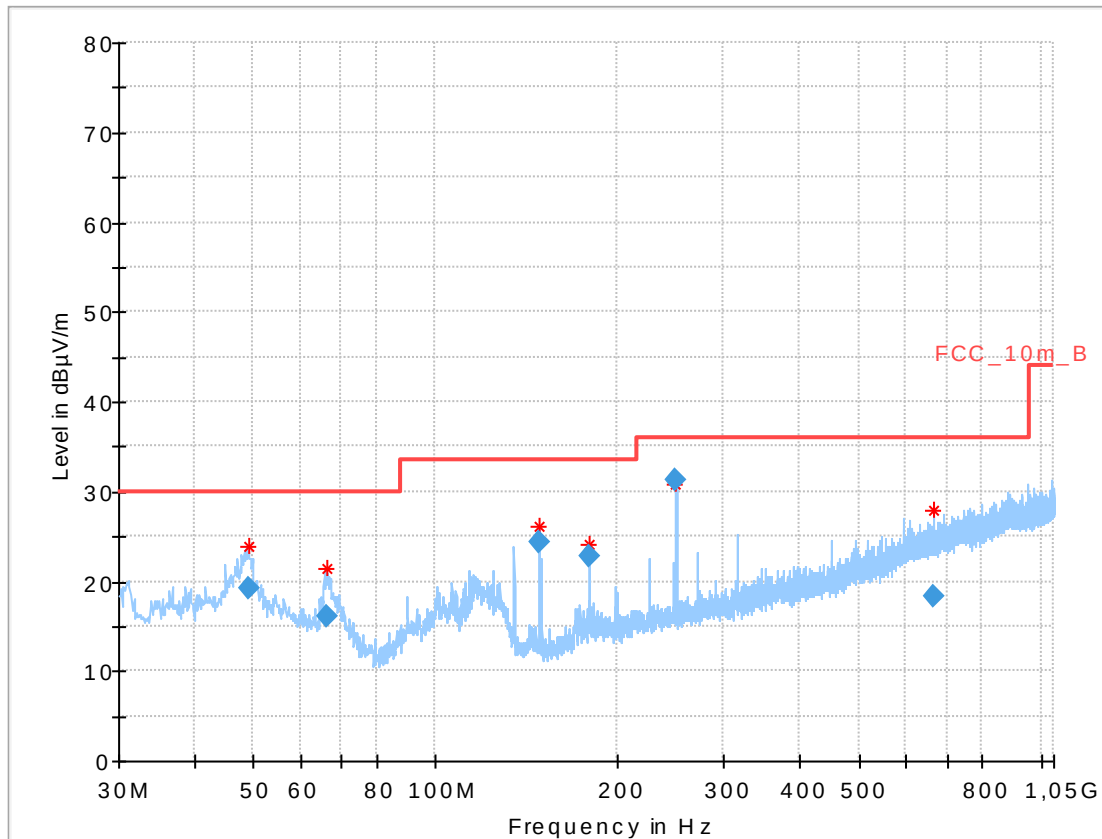
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
45.016350	19.76	30.00	10.24	1000.0	120.000	178.0	V	6.0	13.6
51.279300	14.66	30.00	15.34	1000.0	120.000	98.0	V	139.0	13.6
148.497000	28.07	33.50	5.43	1000.0	120.000	98.0	V	92.0	9.2
150.000450	26.53	33.50	6.97	1000.0	120.000	101.0	V	92.0	9.3
250.009500	32.16	36.00	3.84	1000.0	120.000	98.0	V	353.0	13.4
698.423850	18.80	36.00	17.20	1000.0	120.000	101.0	V	340.0	21.5

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

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
48.461100	19.12	30.00	10.88	1000.0	120.000	100.0	V	217.0	13.7
148.493250	26.09	33.50	7.41	1000.0	120.000	98.0	V	353.0	9.2
180.011400	23.05	33.50	10.45	1000.0	120.000	98.0	V	135.0	10.9
250.006800	29.52	36.00	6.48	1000.0	120.000	98.0	V	108.0	13.4
733.154100	19.54	36.00	16.46	1000.0	120.000	101.0	H	312.0	22.3
858.779100	20.99	36.00	15.01	1000.0	120.000	185.0	V	293.0	23.6

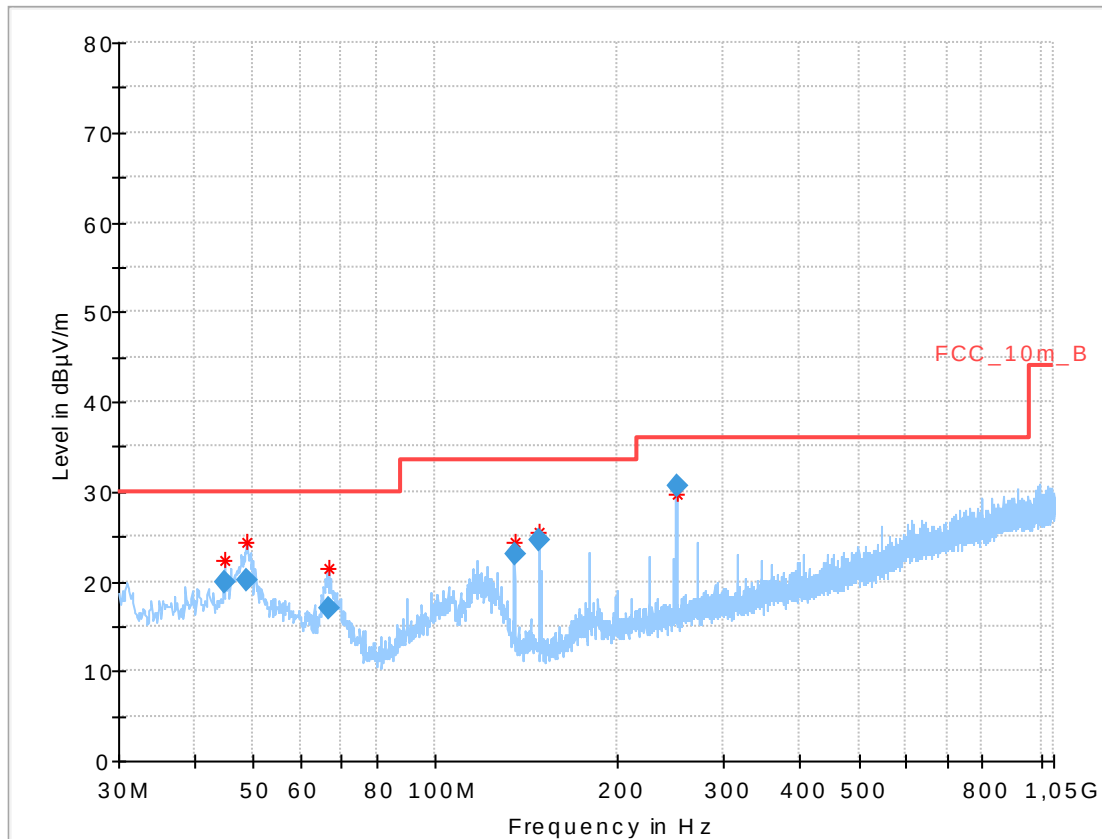
Plot: OFDM (40 MHz bandwidth), ANT100P001B24553 PCB antenna

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

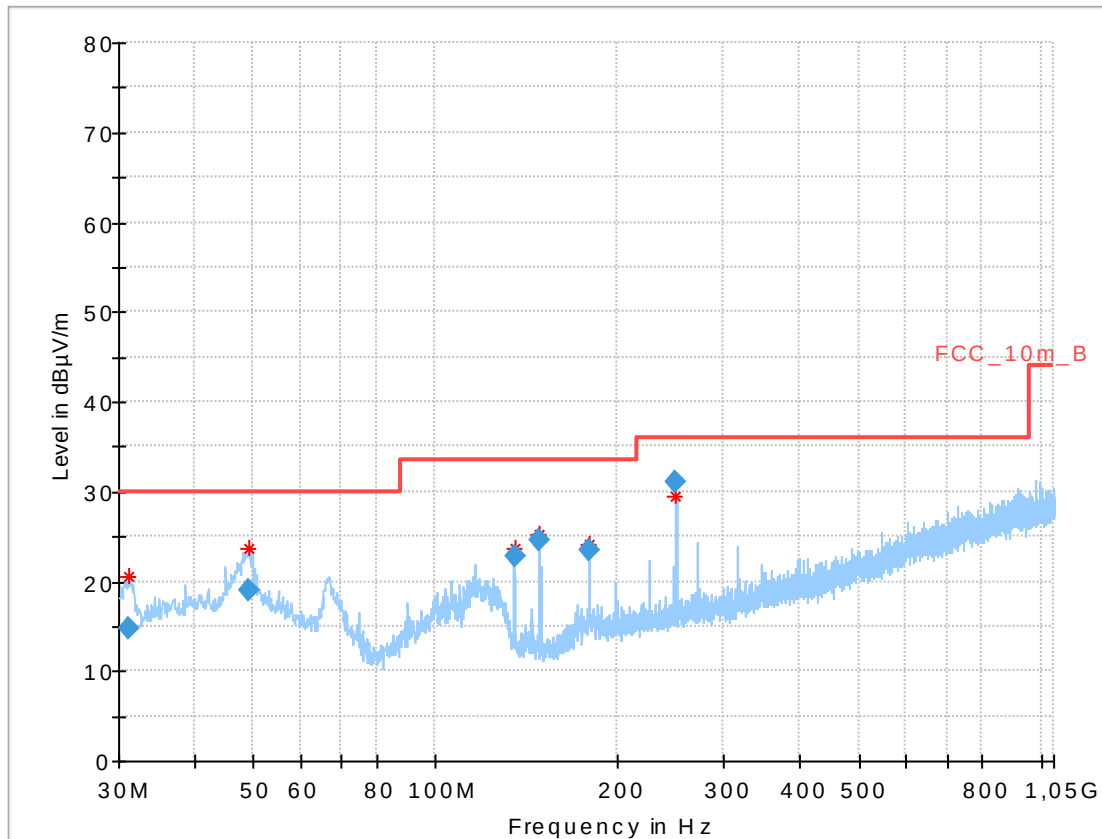


Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
49.256100	19.29	30.00	10.71	1000.0	120.000	98.0	V	35.0	13.7
66.384450	16.20	30.00	13.80	1000.0	120.000	98.0	V	83.0	10.5
148.490550	24.37	33.50	9.13	1000.0	120.000	101.0	V	345.0	9.2
180.006750	22.76	33.50	10.74	1000.0	120.000	98.0	V	63.0	10.9
249.987600	31.30	36.00	4.70	1000.0	120.000	98.0	V	0.0	13.4
664.096200	18.40	36.00	17.60	1000.0	120.000	185.0	H	47.0	21.2

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

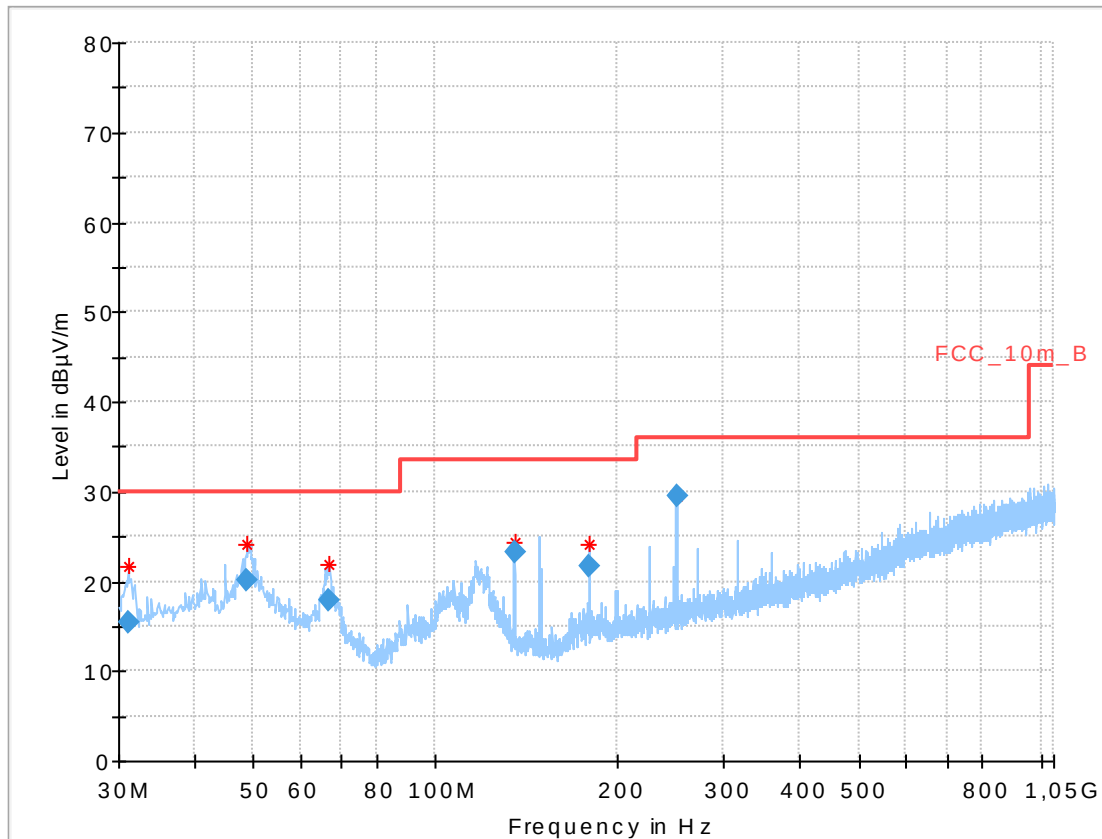
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
45.000600	19.93	30.00	10.07	1000.0	120.000	98.0	V	127.0	13.6
48.873750	20.17	30.00	9.83	1000.0	120.000	98.0	V	17.0	13.7
66.650550	16.97	30.00	13.03	1000.0	120.000	185.0	V	180.0	10.4
134.991600	23.01	33.50	10.49	1000.0	120.000	101.0	V	79.0	9.2
148.506000	24.62	33.50	8.88	1000.0	120.000	98.0	V	3.0	9.2
250.001700	30.60	36.00	5.40	1000.0	120.000	98.0	V	11.0	13.4

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

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.045950	14.71	30.00	15.29	1000.0	120.000	98.0	V	347.0	12.0
49.298400	18.92	30.00	11.08	1000.0	120.000	98.0	V	204.0	13.7
135.011550	22.75	33.50	10.75	1000.0	120.000	98.0	V	30.0	9.2
148.487550	24.63	33.50	8.87	1000.0	120.000	98.0	V	3.0	9.2
180.003900	23.55	33.50	9.95	1000.0	120.000	98.0	V	95.0	10.9
249.994800	30.99	36.00	5.01	1000.0	120.000	98.0	V	3.0	13.4

Plot: RX / Idle mode, ANT100P001B24553 PCB antenna

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

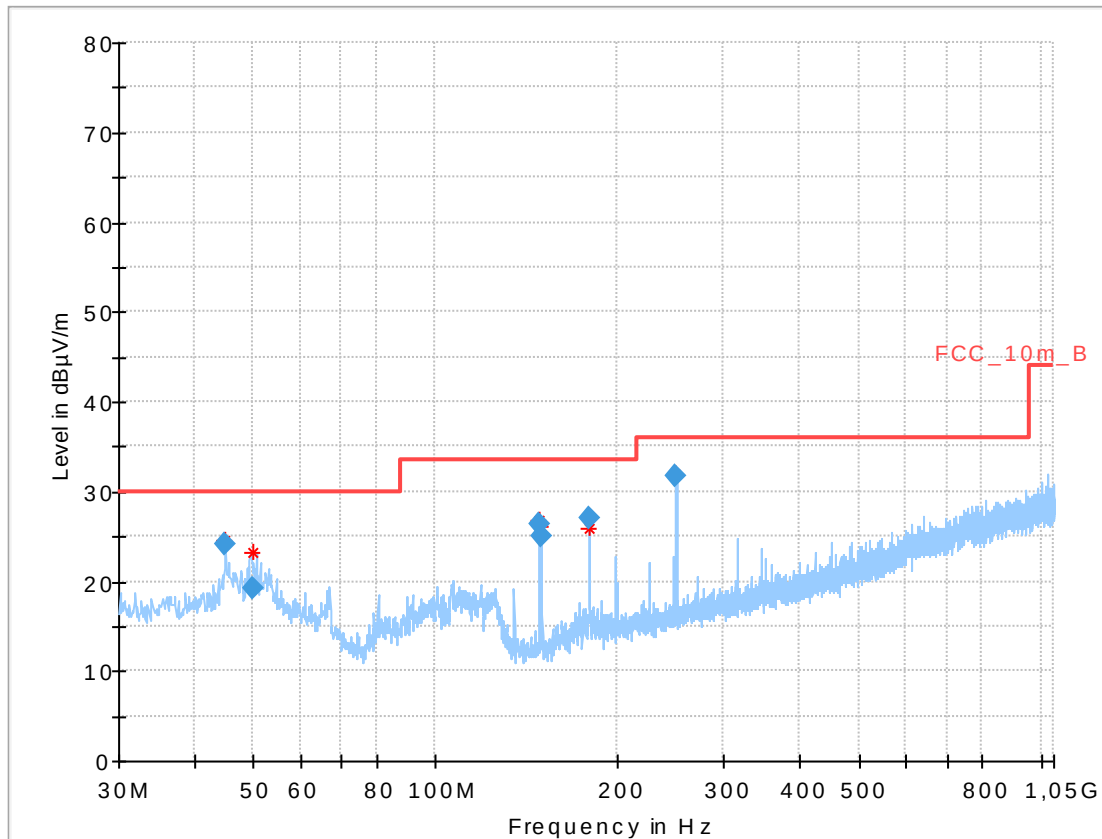


Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.124100	15.39	30.00	14.61	1000.0	120.000	101.0	V	238.0	12.0
48.931950	20.21	30.00	9.79	1000.0	120.000	101.0	V	3.0	13.7
66.918600	17.77	30.00	12.23	1000.0	120.000	185.0	V	146.0	10.4
134.998200	23.21	33.50	10.29	1000.0	120.000	98.0	V	83.0	9.2
179.985750	21.75	33.50	11.75	1000.0	120.000	98.0	V	199.0	10.9
250.003800	29.42	36.00	6.58	1000.0	120.000	101.0	V	48.0	13.4

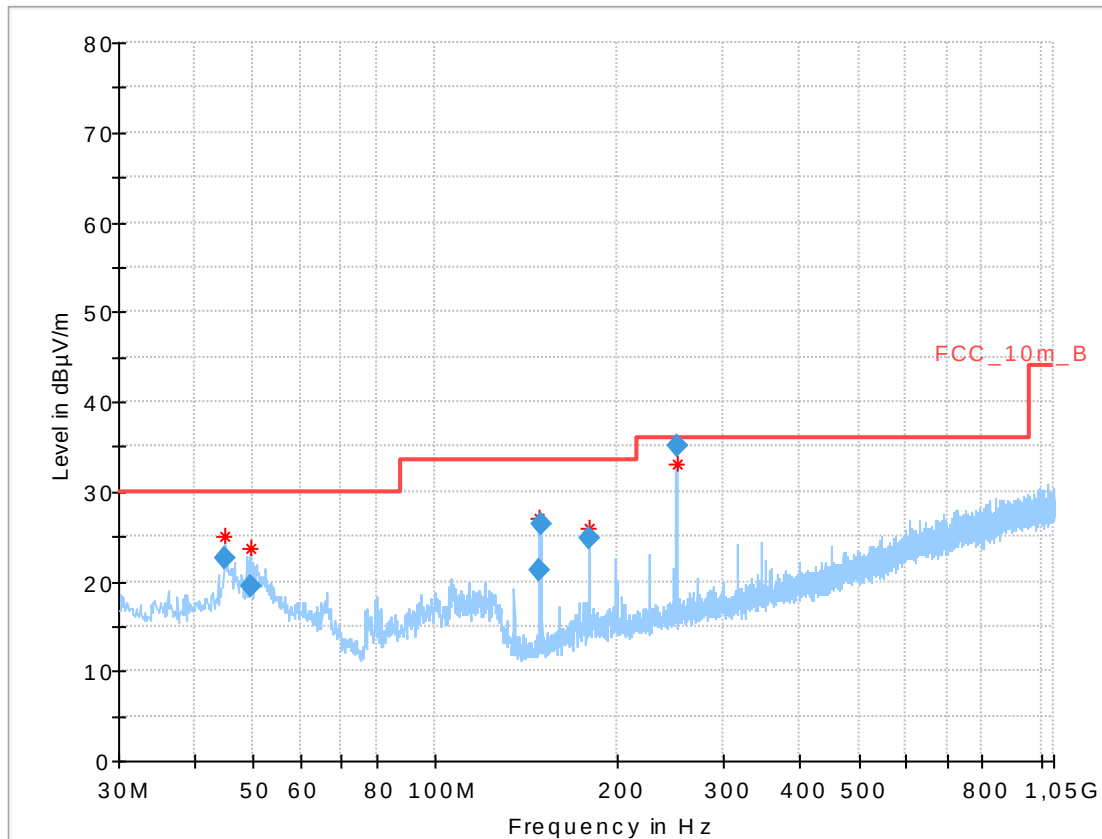
Plot: DSSS, ANT-DB1-RAF-xxx dipole antenna

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

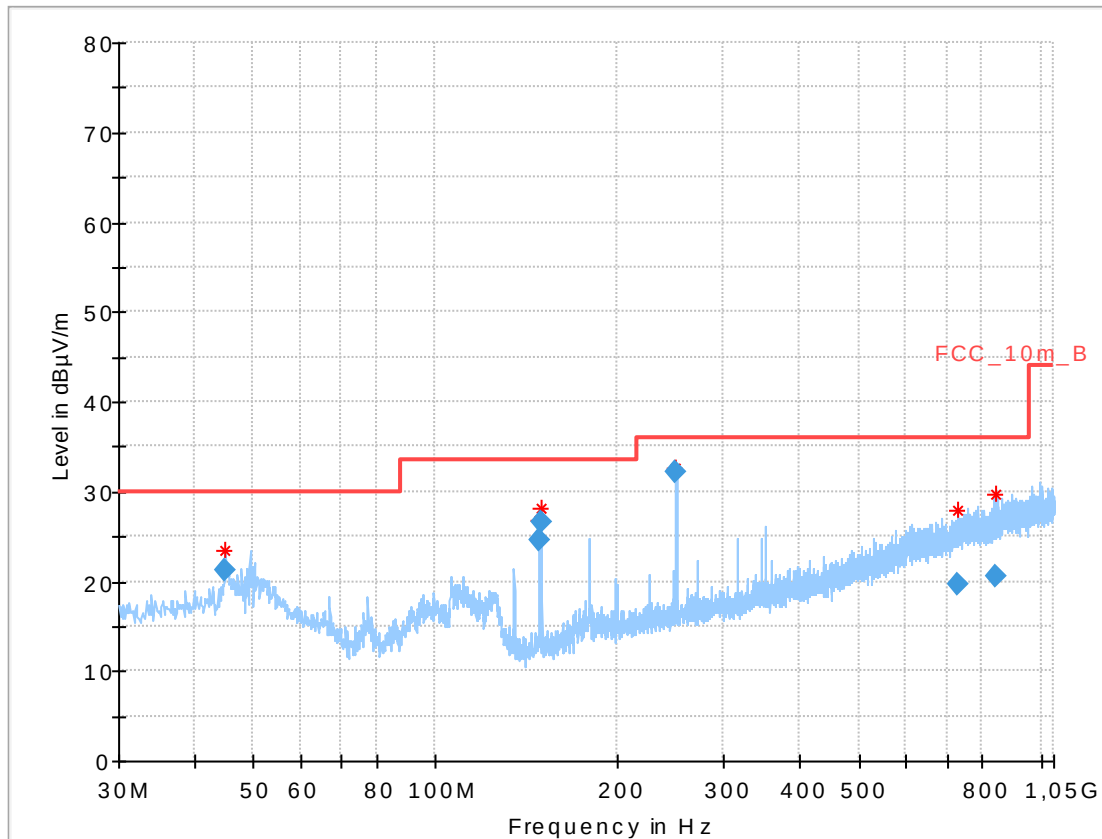


Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
44.996400	24.21	30.00	5.79	1000.0	120.000	98.0	V	76.0	13.6
49.979850	19.25	30.00	10.75	1000.0	120.000	98.0	V	97.0	13.7
148.496100	26.32	33.50	7.18	1000.0	120.000	98.0	V	353.0	9.2
150.012900	24.94	33.50	8.56	1000.0	120.000	98.0	V	117.0	9.3
179.995050	26.95	33.50	6.55	1000.0	120.000	101.0	V	353.0	10.9
249.995850	31.63	36.00	4.37	1000.0	120.000	98.0	V	353.0	13.4

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

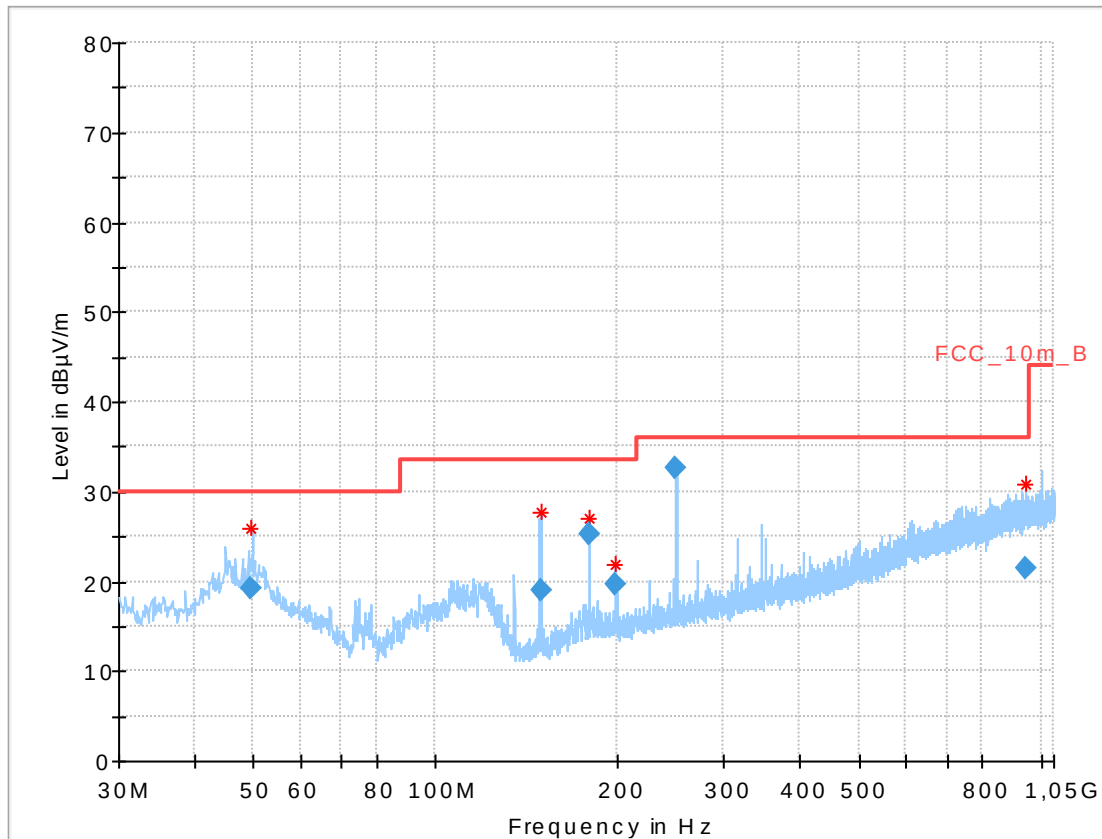
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
45.024900	22.63	30.00	7.37	1000.0	120.000	101.0	V	55.0	13.6
49.461300	19.37	30.00	10.63	1000.0	120.000	98.0	V	62.0	13.7
148.502100	21.30	33.50	12.20	1000.0	120.000	101.0	V	62.0	9.2
150.006900	26.38	33.50	7.12	1000.0	120.000	98.0	V	131.0	9.3
179.975700	24.90	33.50	8.60	1000.0	120.000	101.0	V	69.0	10.9
250.002900	35.05	36.00	0.95	1000.0	120.000	98.0	V	315.0	13.4

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

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
44.998500	21.12	30.00	8.88	1000.0	120.000	98.0	V	52.0	13.6
148.504050	24.69	33.50	8.81	1000.0	120.000	98.0	V	82.0	9.2
150.011700	26.61	33.50	6.89	1000.0	120.000	98.0	V	103.0	9.3
249.999150	32.25	36.00	3.75	1000.0	120.000	98.0	V	353.0	13.4
729.095850	19.58	36.00	16.42	1000.0	120.000	98.0	V	193.0	22.2
841.587600	20.62	36.00	15.38	1000.0	120.000	185.0	H	52.0	23.4

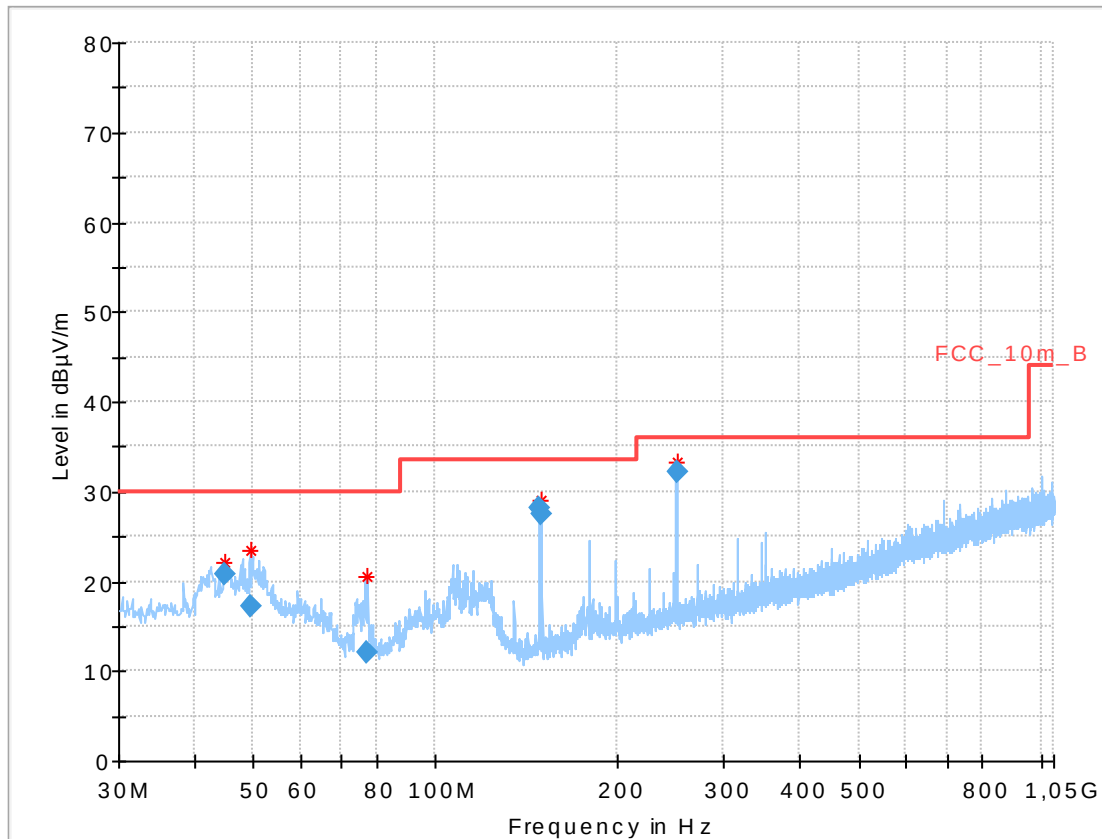
Plot: OFDM (20 MHz bandwidth), ANT-DB1-RAF-xxx dipole antenna

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

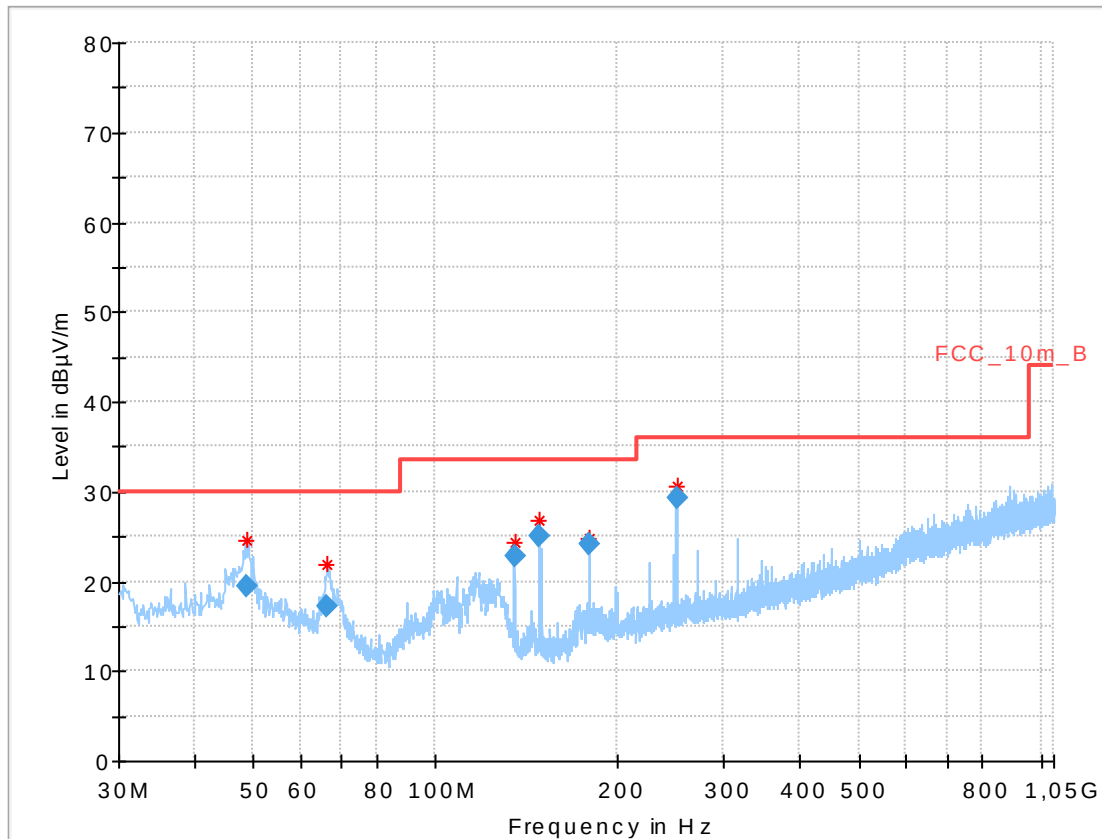


Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
49.478850	19.27	30.00	10.73	1000.0	120.000	98.0	V	158.0	13.7
150.000900	19.03	33.50	14.47	1000.0	120.000	98.0	V	76.0	9.3
180.003150	25.35	33.50	8.15	1000.0	120.000	98.0	V	353.0	10.9
197.981550	19.66	33.50	13.84	1000.0	120.000	98.0	V	131.0	11.8
249.997350	32.65	36.00	3.35	1000.0	120.000	106.0	V	353.0	13.4
943.051050	21.44	36.00	14.56	1000.0	120.000	98.0	H	277.0	24.3

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

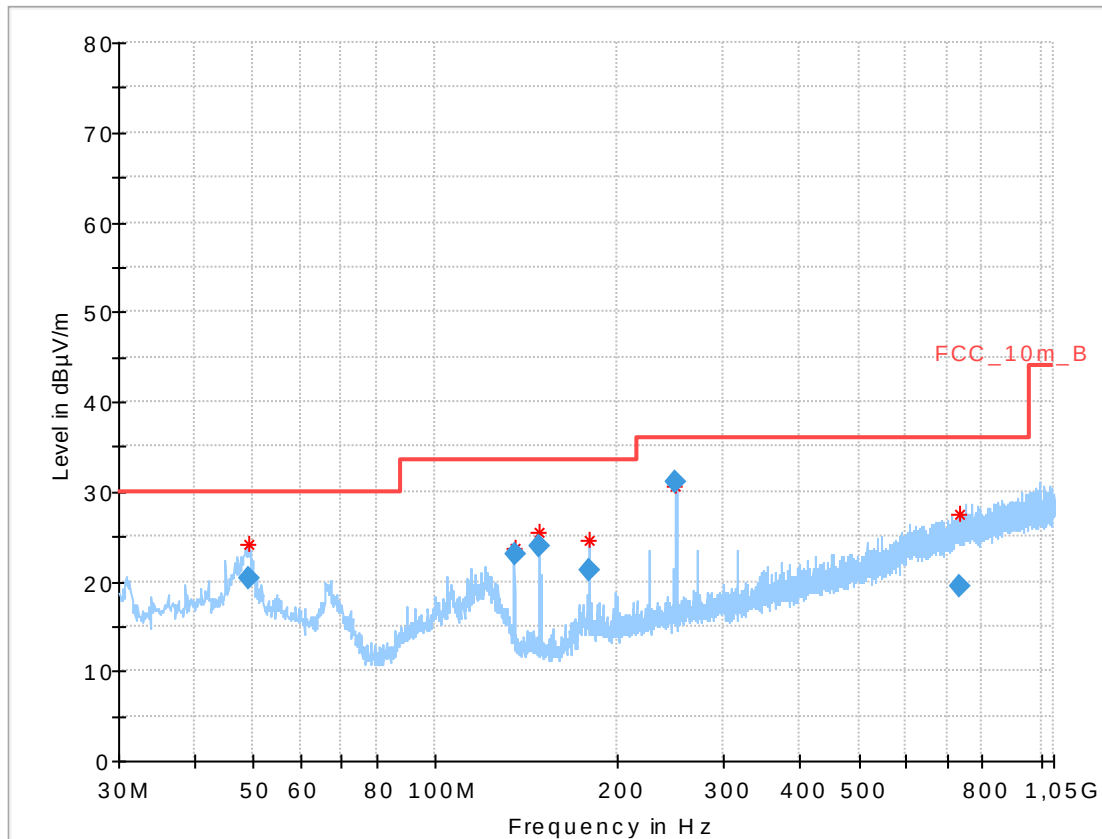
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
45.004500	20.75	30.00	9.25	1000.0	120.000	101.0	V	127.0	13.6
49.447500	17.16	30.00	12.84	1000.0	120.000	98.0	V	154.0	13.7
76.820550	12.08	30.00	17.92	1000.0	120.000	101.0	V	44.0	8.6
148.496400	28.12	33.50	5.38	1000.0	120.000	98.0	V	79.0	9.2
150.004200	27.59	33.50	5.91	1000.0	120.000	98.0	V	120.0	9.3
250.002450	32.28	36.00	3.72	1000.0	120.000	98.0	V	352.0	13.4

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

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
48.728250	19.43	30.00	10.57	1000.0	120.000	101.0	V	102.0	13.7
66.468300	17.17	30.00	12.83	1000.0	120.000	98.0	V	187.0	10.4
134.994300	22.88	33.50	10.62	1000.0	120.000	98.0	V	102.0	9.2
148.494150	25.13	33.50	8.37	1000.0	120.000	98.0	V	0.0	9.2
180.001050	24.11	33.50	9.39	1000.0	120.000	101.0	V	125.0	10.9
250.010700	29.28	36.00	6.72	1000.0	120.000	98.0	V	117.0	13.4

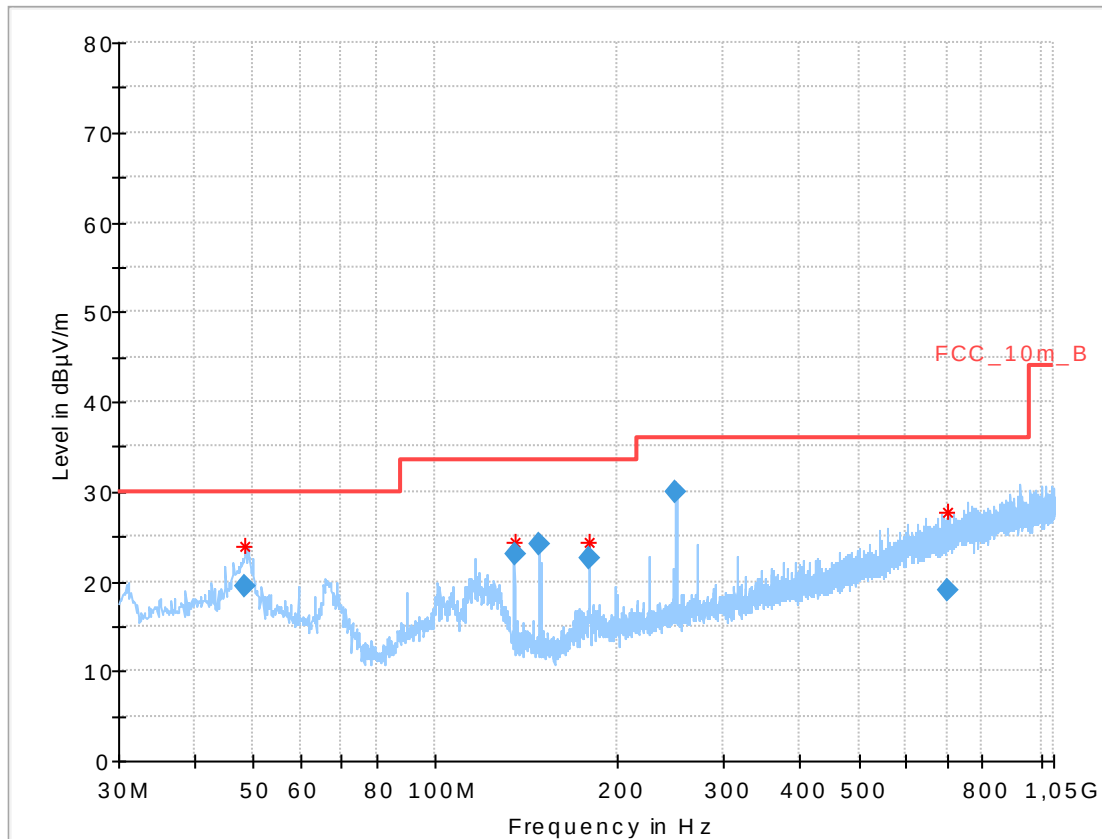
Plot: OFDM (40 MHz bandwidth), ANT-DB1-RAF-xxx dipole antenna

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

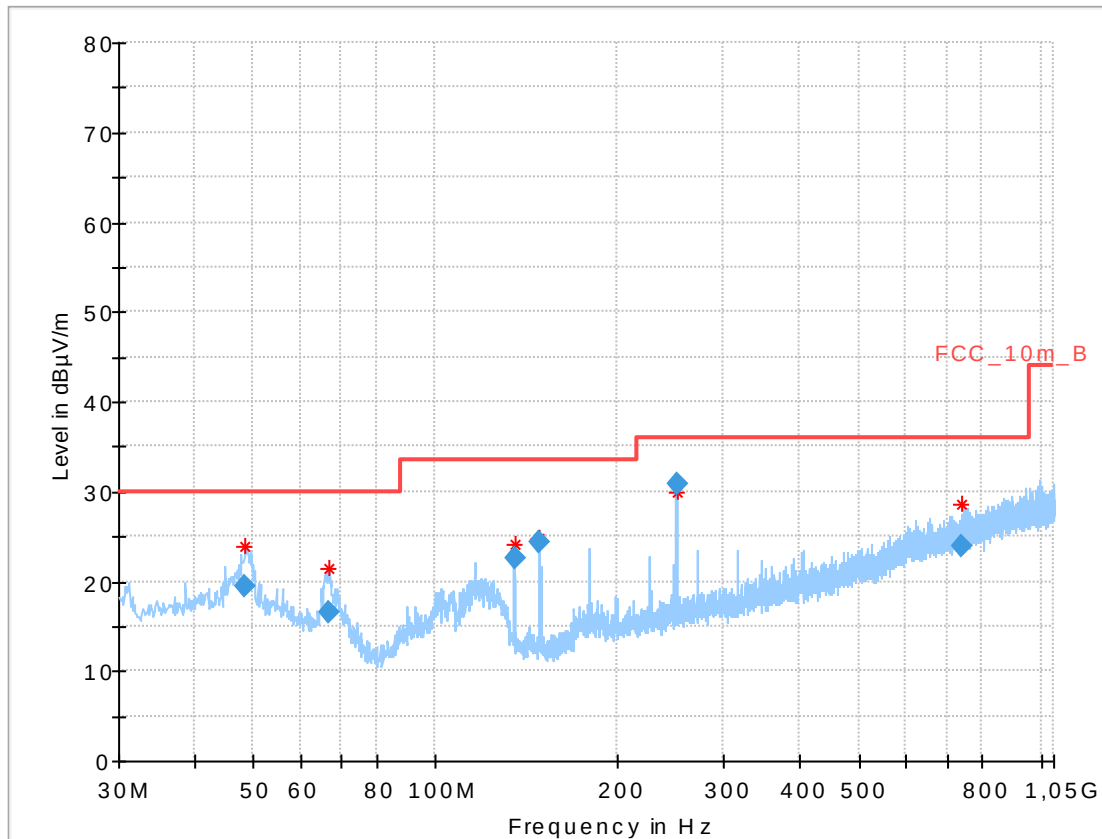


Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
49.095600	20.24	30.00	9.76	1000.0	120.000	98.0	V	24.0	13.7
135.006150	23.00	33.50	10.50	1000.0	120.000	98.0	V	39.0	9.2
148.485750	23.99	33.50	9.51	1000.0	120.000	98.0	V	39.0	9.2
179.994000	21.24	33.50	12.26	1000.0	120.000	98.0	V	18.0	10.9
249.988950	31.07	36.00	4.93	1000.0	120.000	98.0	V	3.0	13.4
732.038550	19.55	36.00	16.45	1000.0	120.000	185.0	H	350.0	22.3

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

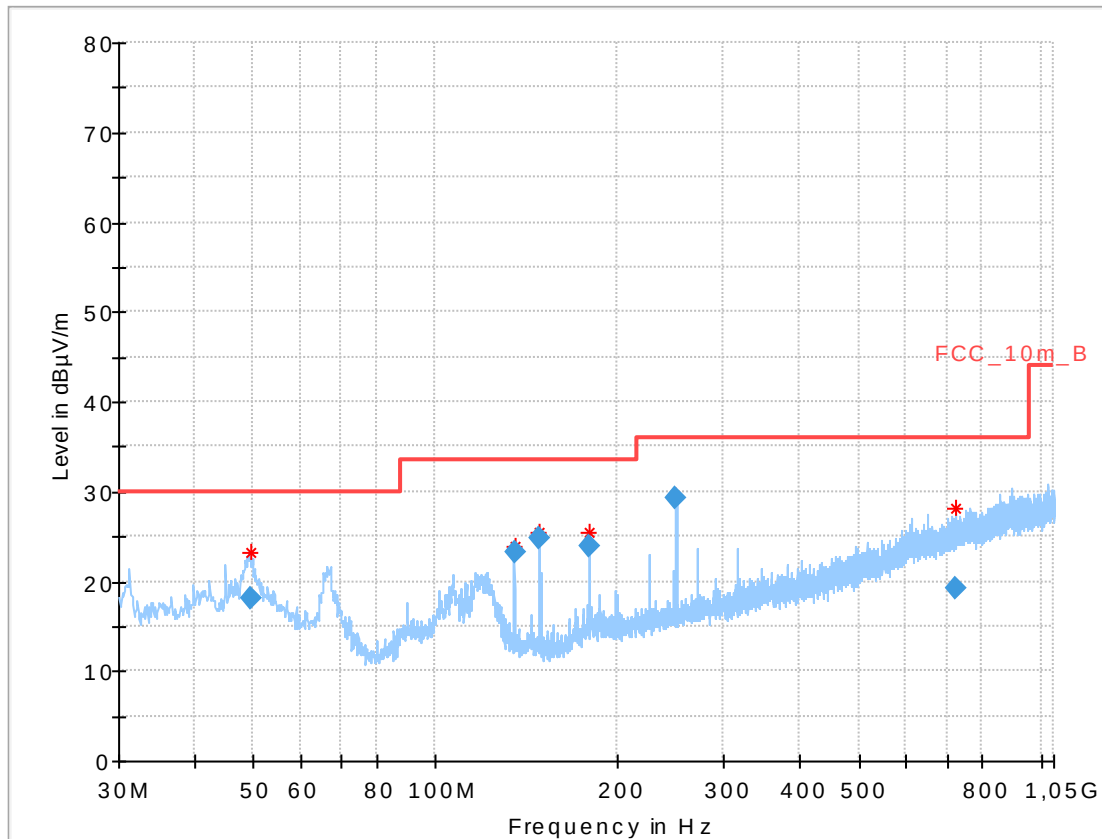
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
48.569550	19.49	30.00	10.51	1000.0	120.000	98.0	V	151.0	13.7
134.996100	23.07	33.50	10.43	1000.0	120.000	98.0	V	73.0	9.2
148.506300	24.18	33.50	9.32	1000.0	120.000	98.0	V	17.0	9.2
179.974800	22.53	33.50	10.97	1000.0	120.000	98.0	V	73.0	10.9
249.997350	29.93	36.00	6.07	1000.0	120.000	98.0	V	24.0	13.4
699.992550	18.98	36.00	17.02	1000.0	120.000	185.0	H	318.0	21.5

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

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
48.298650	19.46	30.00	10.54	1000.0	120.000	98.0	V	157.0	13.7
66.520500	16.46	30.00	13.54	1000.0	120.000	185.0	V	62.0	10.4
134.989500	22.67	33.50	10.83	1000.0	120.000	98.0	V	123.0	9.2
148.510650	24.32	33.50	9.18	1000.0	120.000	101.0	V	13.0	9.2
250.004400	30.80	36.00	5.20	1000.0	120.000	98.0	V	7.0	13.4
742.460250	23.83	36.00	12.17	1000.0	120.000	101.0	H	144.0	22.5

Plot: RX / Idle mode, ANT-DB1-RAF-xxx dipole antenna

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)
49.431000	18.05	30.00	11.95	1000.0	120.000	100.0	V	8.0	13.7
134.998350	23.28	33.50	10.22	1000.0	120.000	98.0	V	79.0	9.2
148.486050	24.82	33.50	8.68	1000.0	120.000	98.0	V	8.0	9.2
179.996400	23.83	33.50	9.67	1000.0	120.000	98.0	V	147.0	10.9
249.992550	29.26	36.00	6.74	1000.0	120.000	98.0	V	79.0	13.4
721.929000	19.32	36.00	16.68	1000.0	120.000	185.0	H	137.0	22.1

11.13 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	☒ DSSS b – mode ☒ OFDM g – mode ☐ OFDM n HT20 – mode ☒ OFDM n HT40 – mode ☒ RX / Idle – mode
Test setup:	See sub clause 6.2 A See sub clause 6.3 A
Measurement uncertainty	See sub clause 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
Above 960	54.0	3

Results: DSSS, ANT100P001B24553 PCB antenna

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]
2278	Peak	54.0	2211	Peak	55.6	4924	Peak	55.2
	AVG	49.3		AVG	51.3		AVG	51.5
4824	Peak	53.7	4874	Peak	53.5	7386	Peak	58.0
	AVG	50.7		AVG	49.7		AVG	52.6

Results: OFDM (20 MHz bandwidth), ANT100P001B24553 PCB antenna

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]
4824	Peak	51.7	-/-	Peak	-/-	7385	Peak	54.2
	AVG	41.7		AVG	-/-		AVG	41.2
-/-	Peak	-/-	-/-	Peak	-/-	-/-	Peak	-/-
	AVG	-/-		AVG	-/-		AVG	-/-

Results: OFDM (40 MHz bandwidth), ANT100P001B24553 PCB antenna

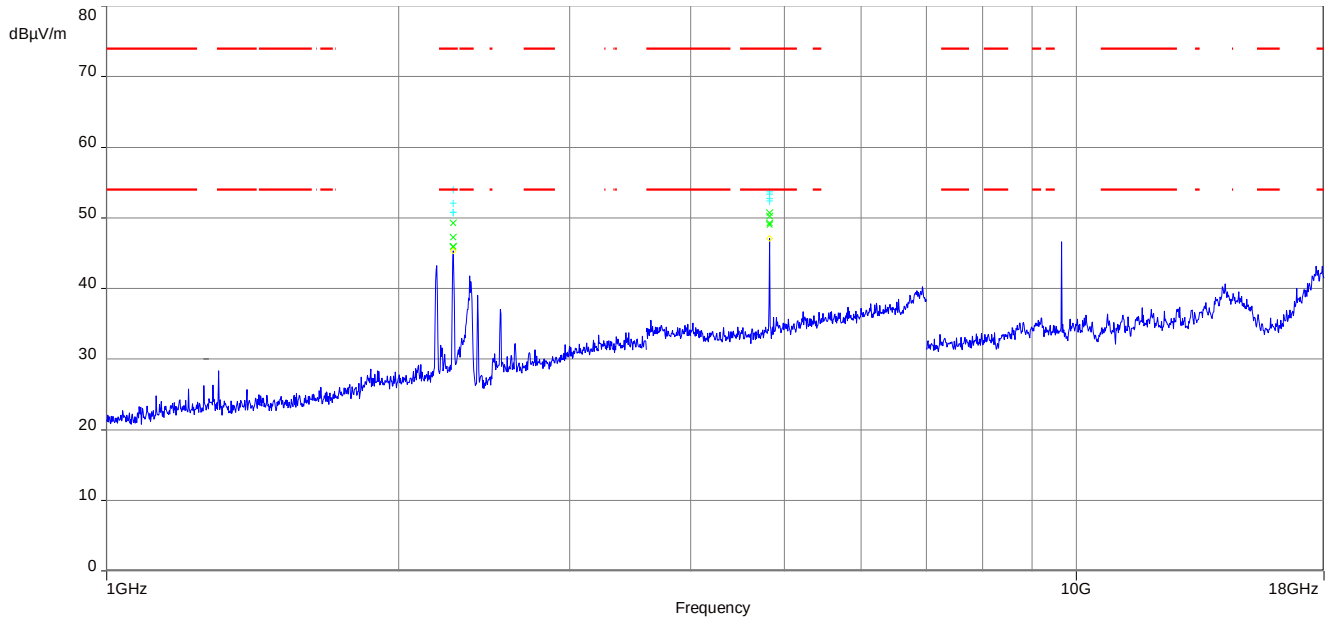
TX Spurious Emissions Radiated [dBµV/m]								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
-/-	Peak	-/-	-/-	Peak	-/-	-/-	Peak	-/-
	AVG	-/-		AVG	-/-		AVG	-/-
-/-	Peak	-/-	-/-	Peak	-/-	-/-	Peak	-/-
	AVG	-/-		AVG	-/-		AVG	-/-

Results: RX / idle – mode, ANT100P001B24553 PCB antenna

TX Spurious Emissions Radiated [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 20 dB below the limit.		
-/-	Peak	-/-
	AVG	-/-
-/-	Peak	-/-
	AVG	-/-

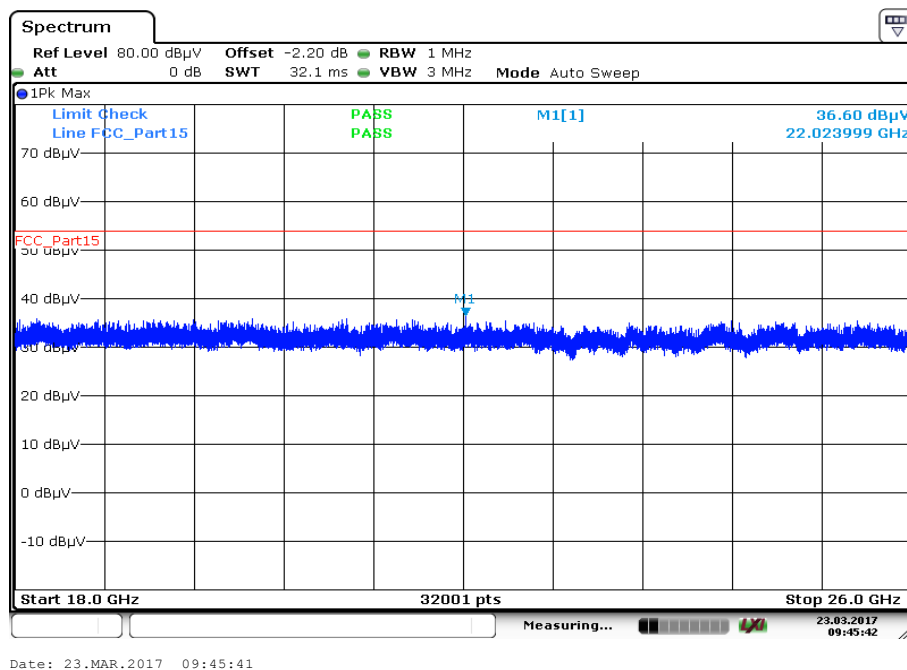
Plots: DSSS, ANT100P001B24553 PCB antenna

Plot 1: Lowest channel, 1 GHz to 18 GHz, vertical & horizontal polarization

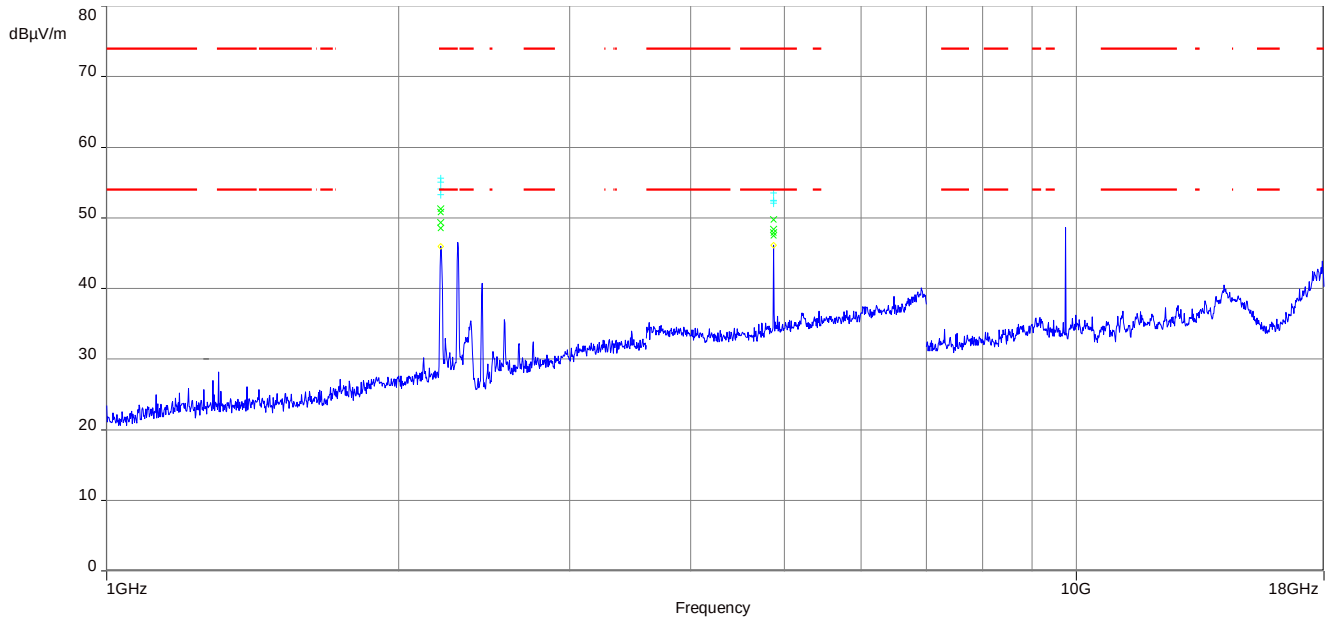


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

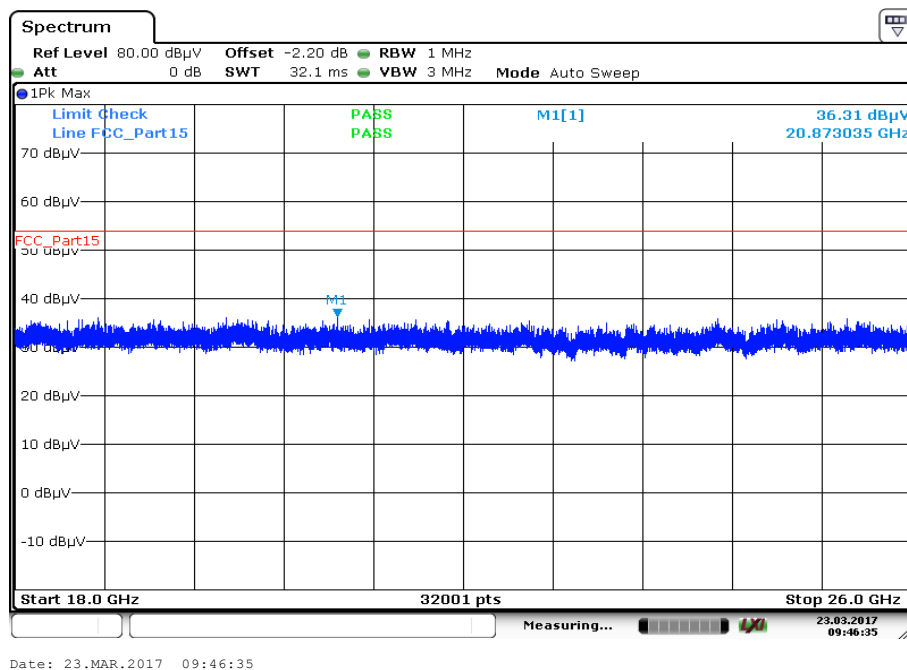


Plot 3: Middle channel, 1 GHz to 18 GHz, vertical & horizontal polarization

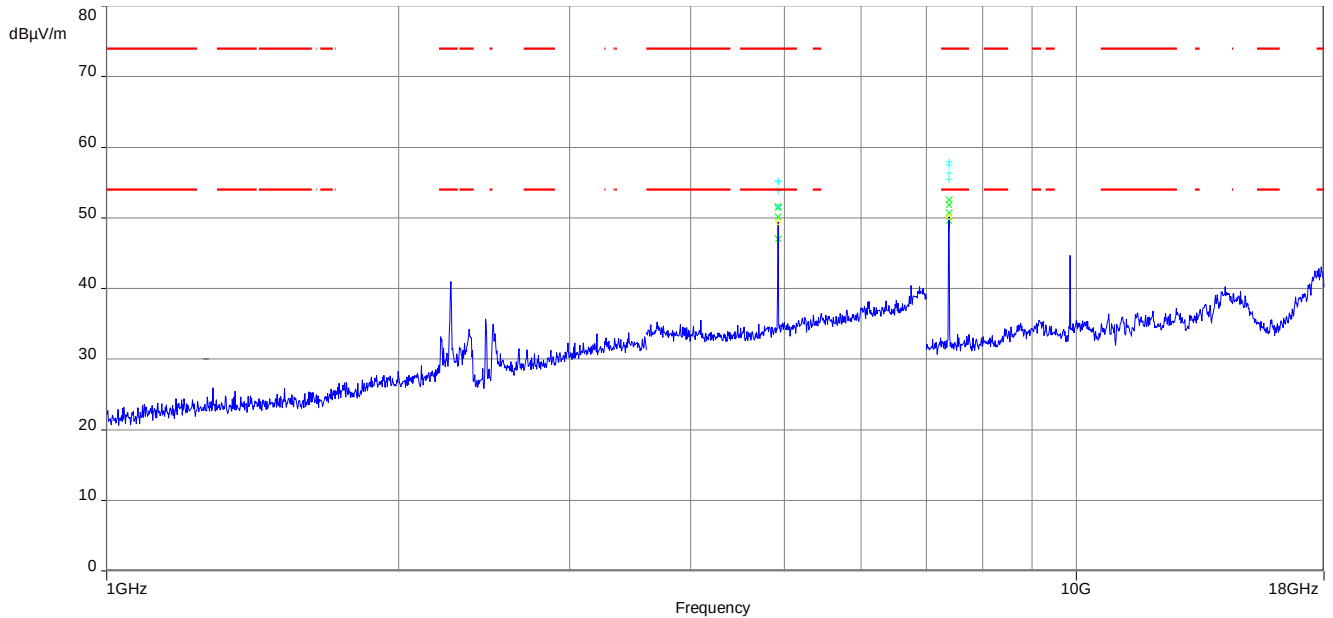


The carrier signal is notched with a 2.4 GHz band rejection filter.

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

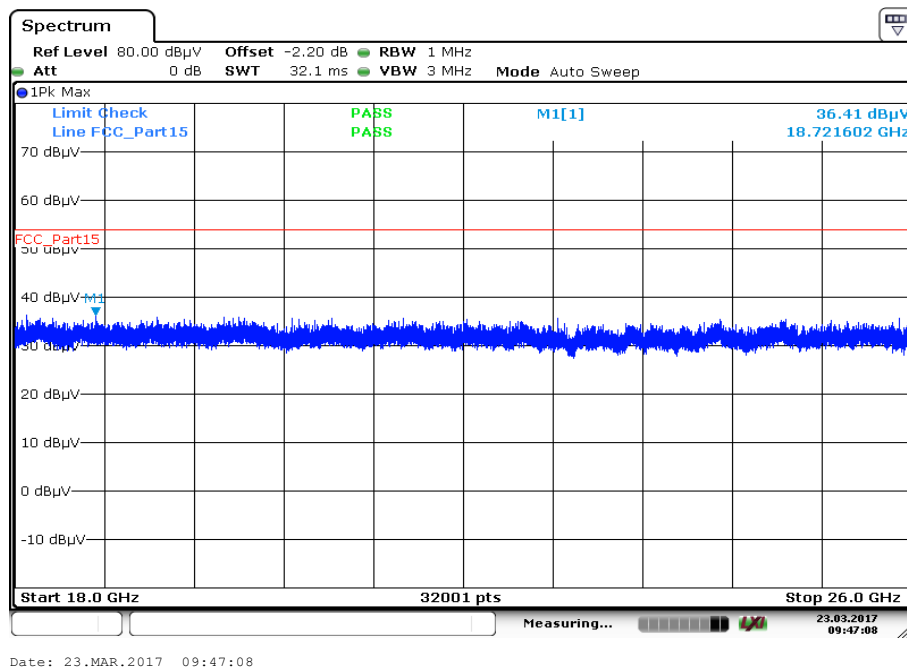


Plot 5: Highest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



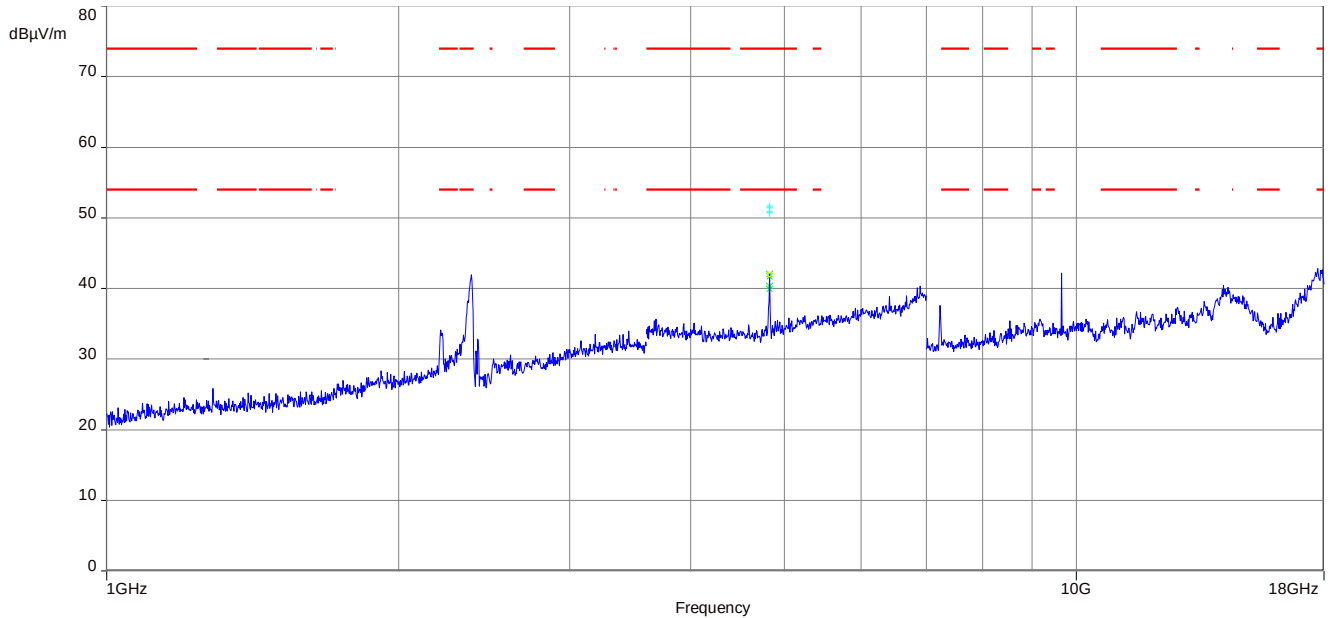
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 6: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



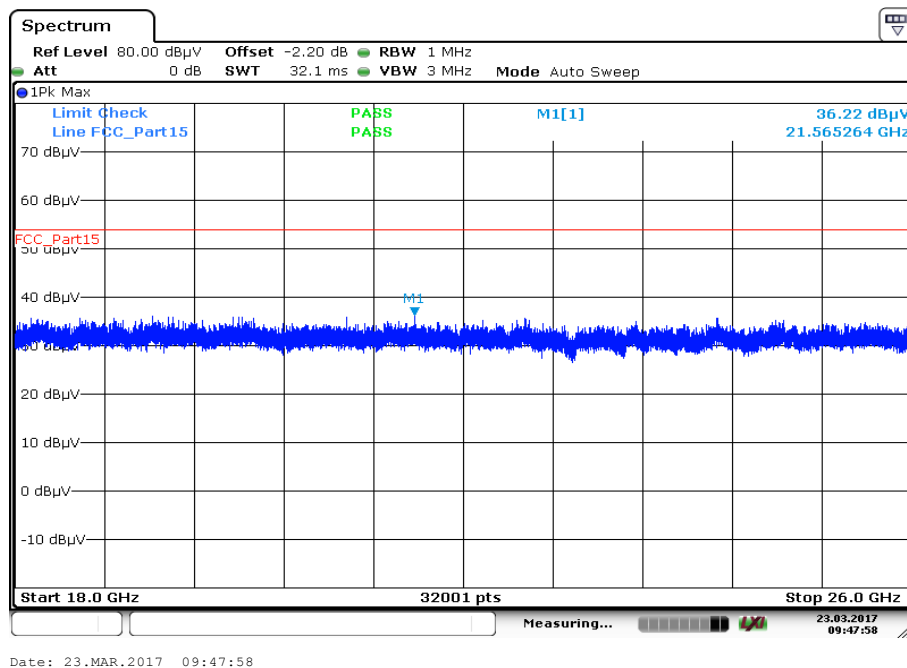
Plots: OFDM (20 MHz bandwidth), ANT100P001B24553 PCB antenna

Plot 1: Lowest channel, 1 GHz to 18 GHz, vertical & horizontal polarization

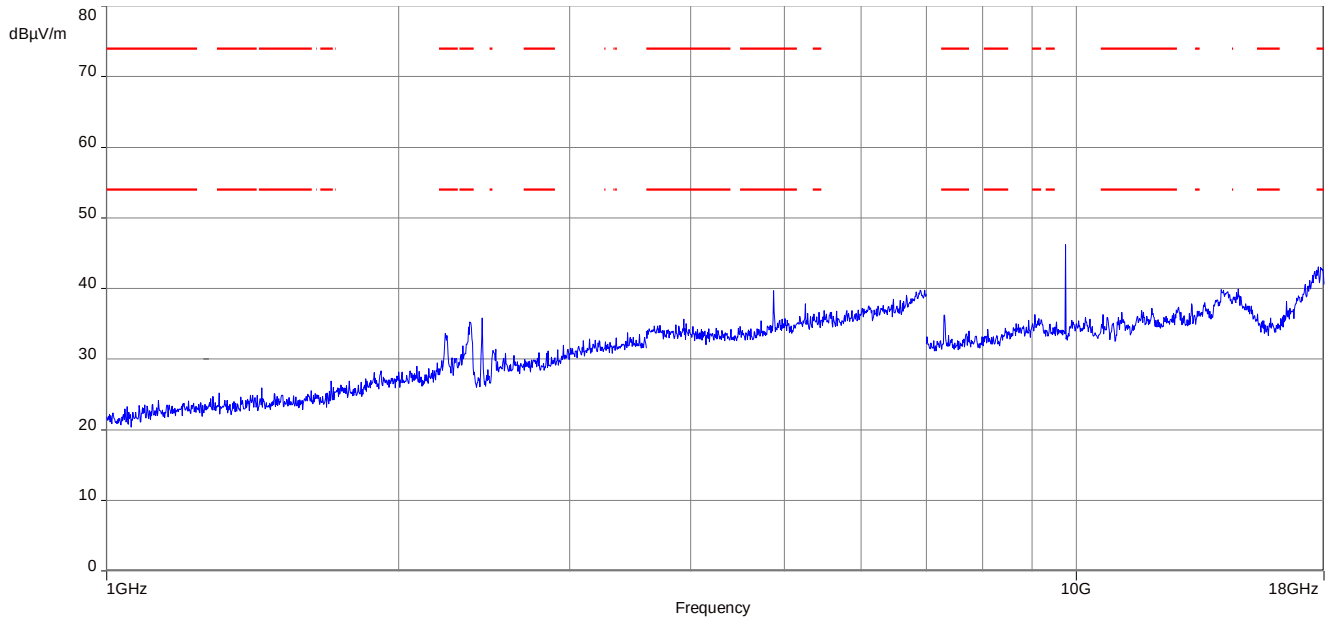


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

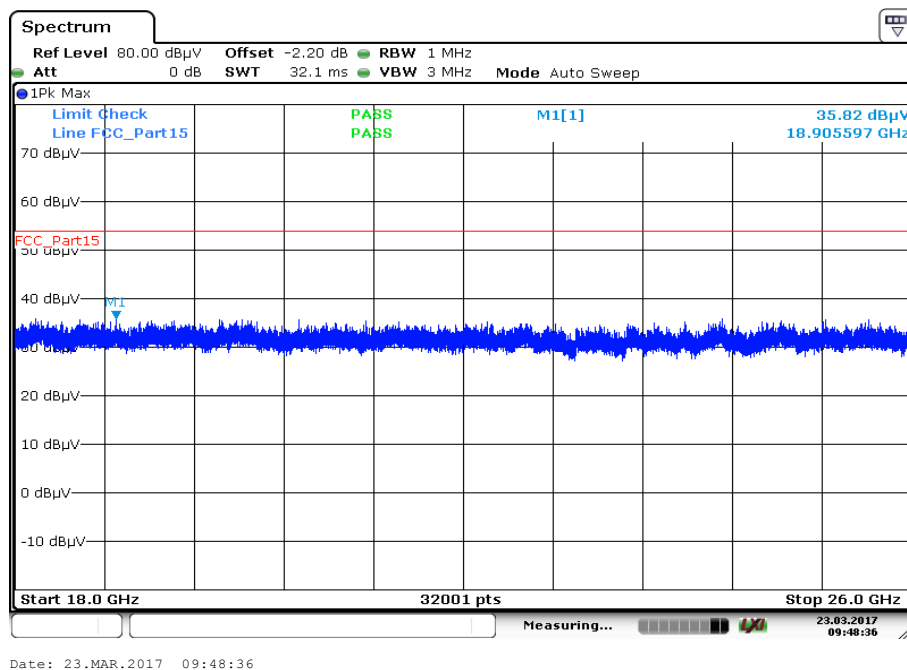


Plot 3: Middle channel, 1 GHz to 18 GHz, vertical & horizontal polarization

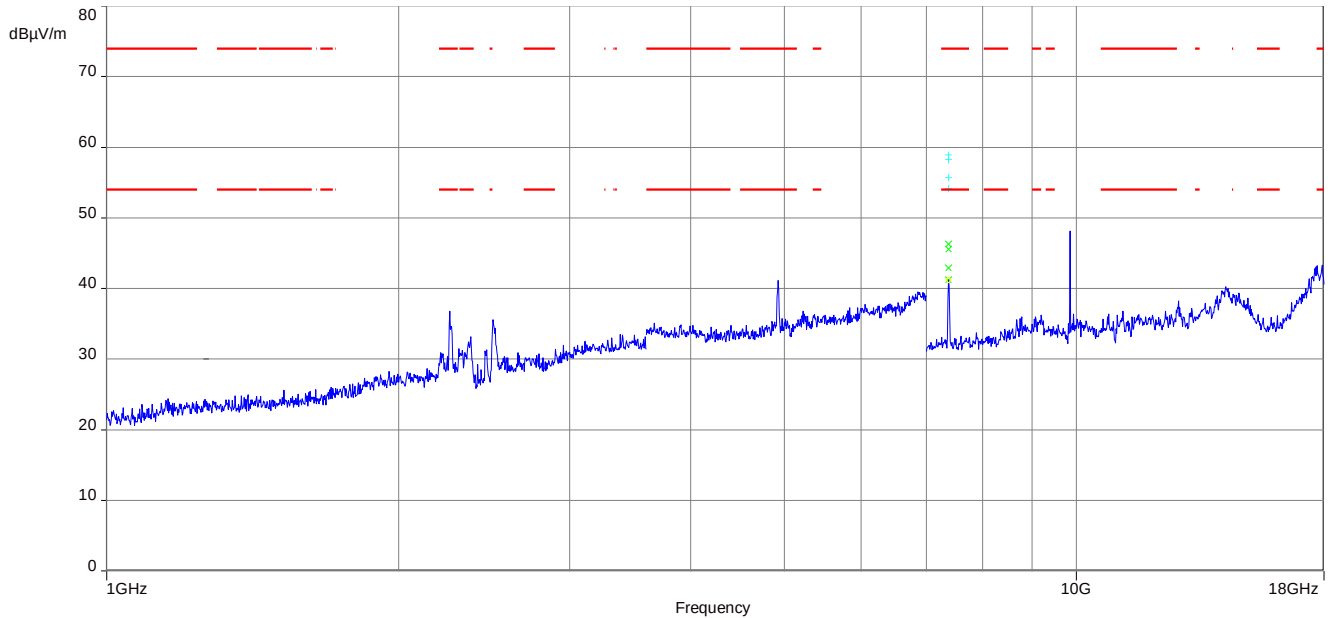


The carrier signal is notched with a 2.4 GHz band rejection filter.

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

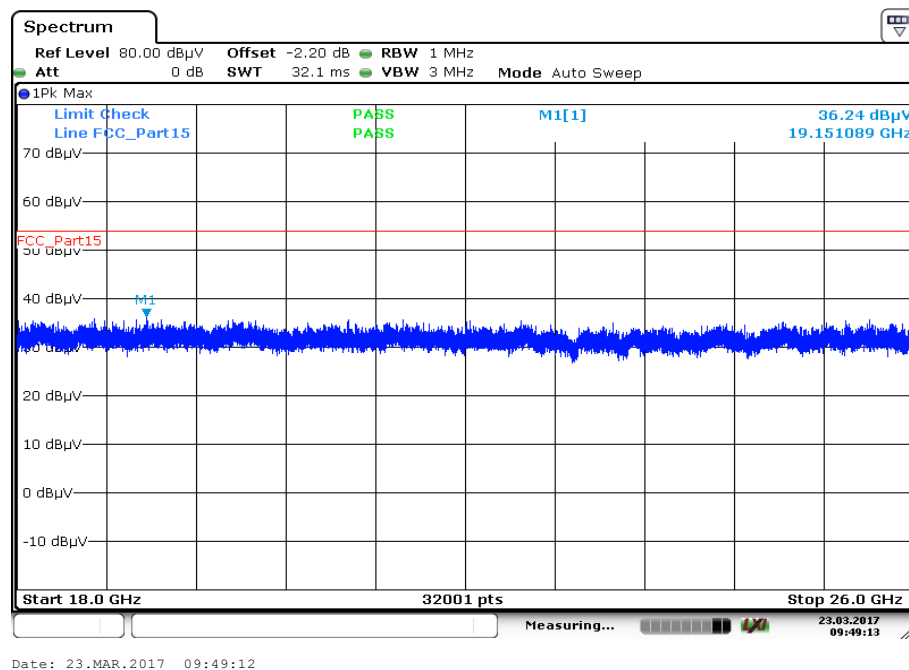


Plot 5: Highest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



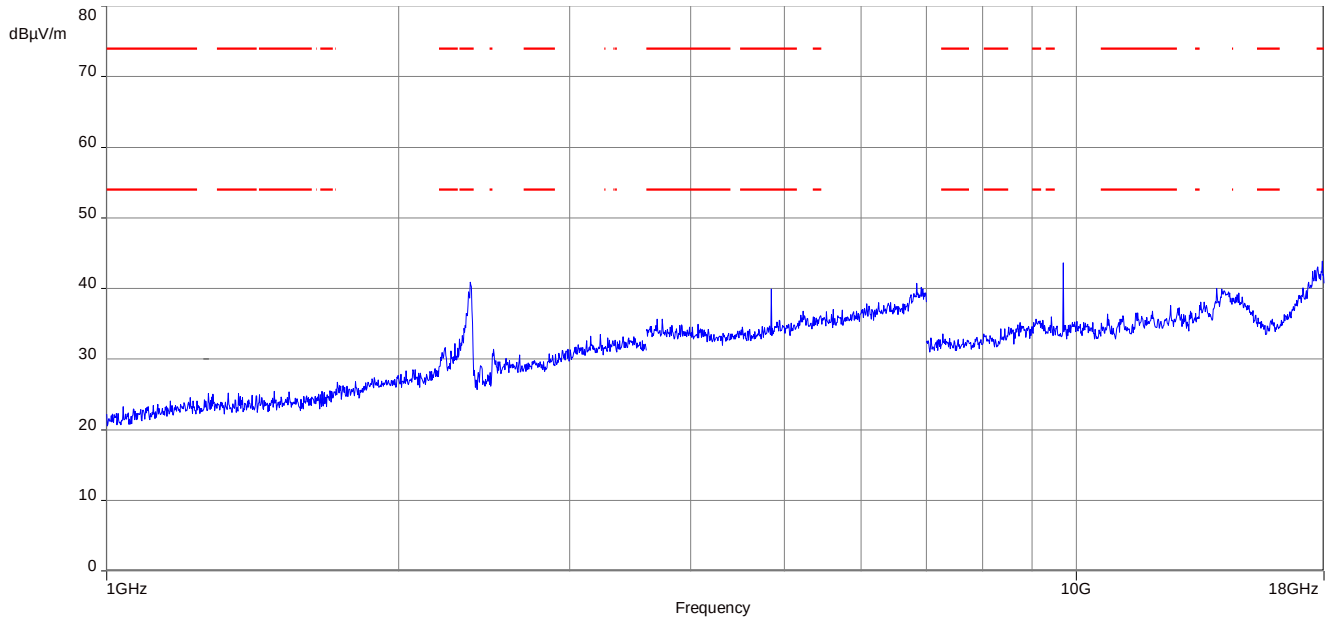
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 6: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



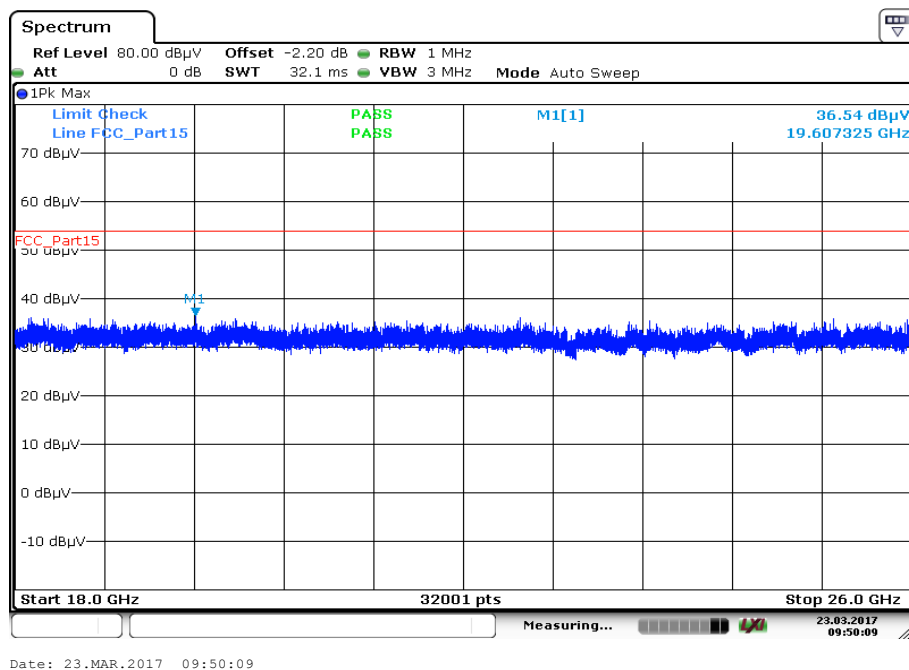
Plots: OFDM (40 MHz bandwidth), ANT100P001B24553 PCB antenna

Plot 1: Lowest channel, 1 GHz to 18 GHz, vertical & horizontal polarization

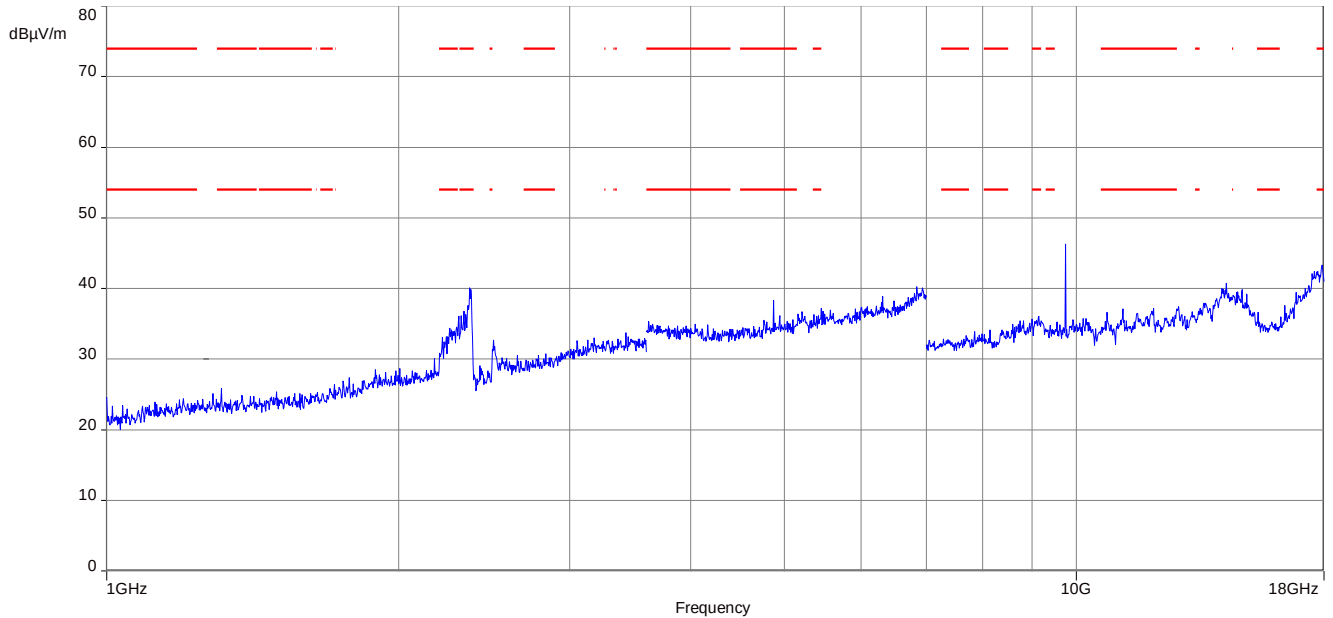


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

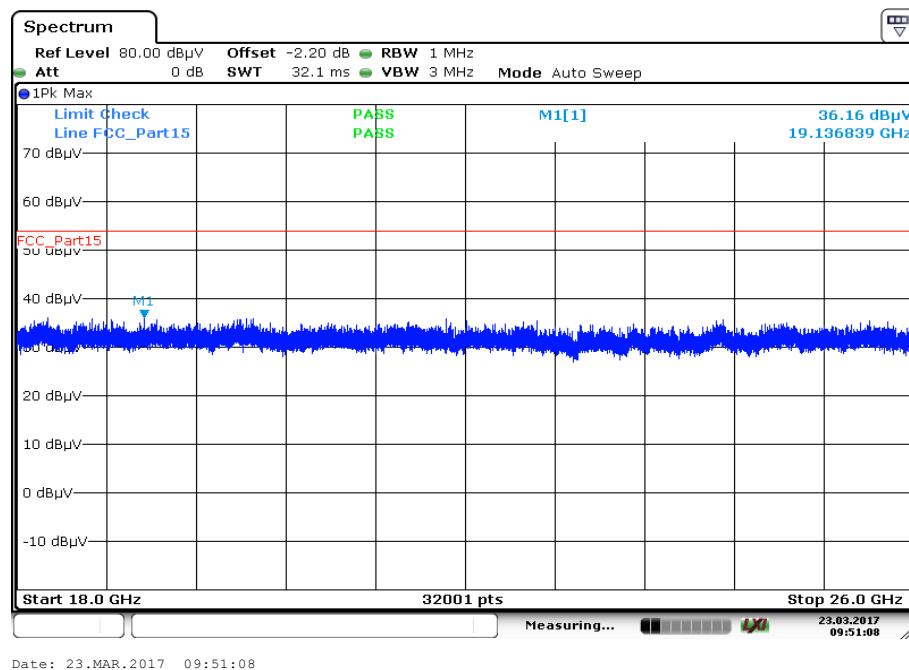


Plot 3: Middle channel, 1 GHz to 18 GHz, vertical & horizontal polarization

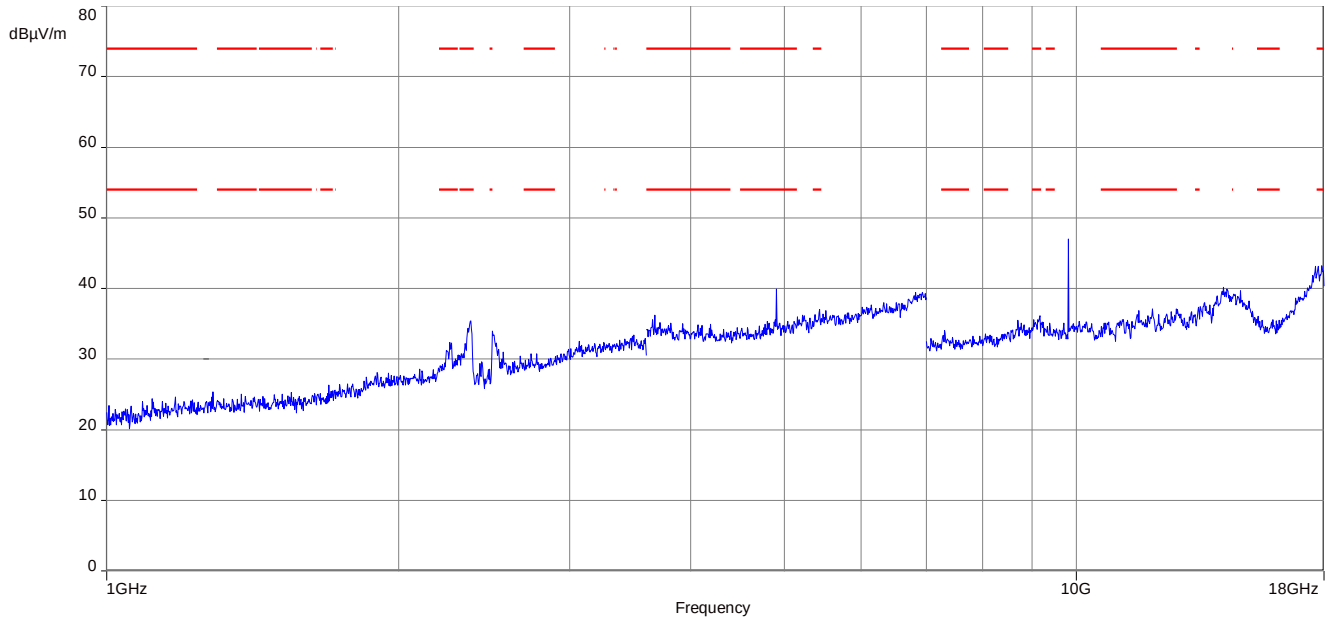


The carrier signal is notched with a 2.4 GHz band rejection filter.

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

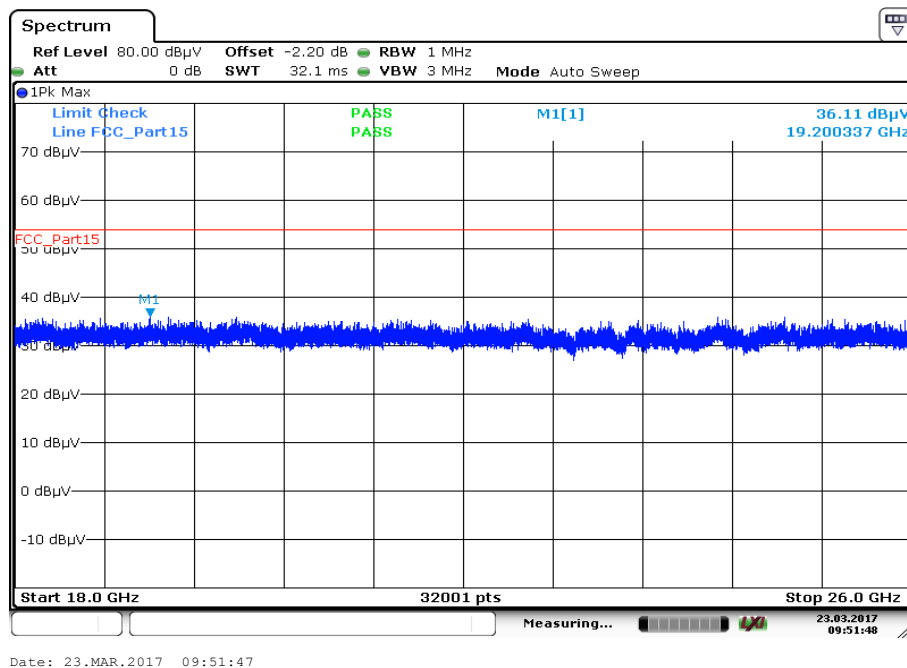


Plot 5: Highest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



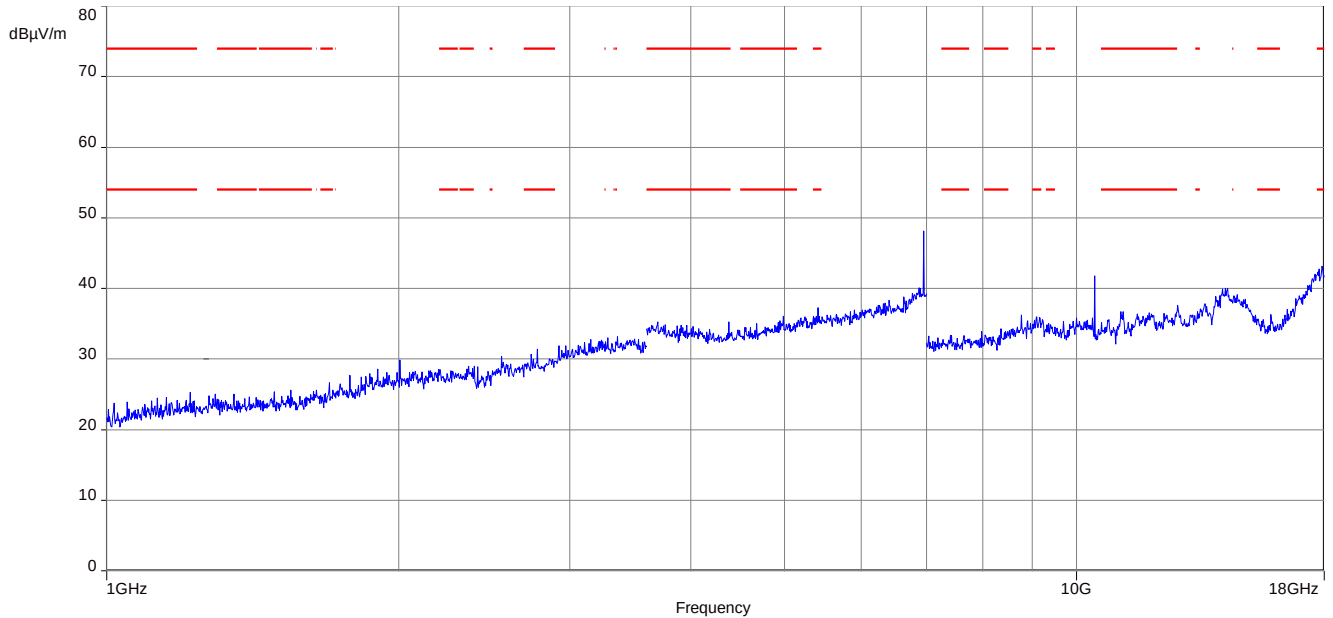
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 6: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

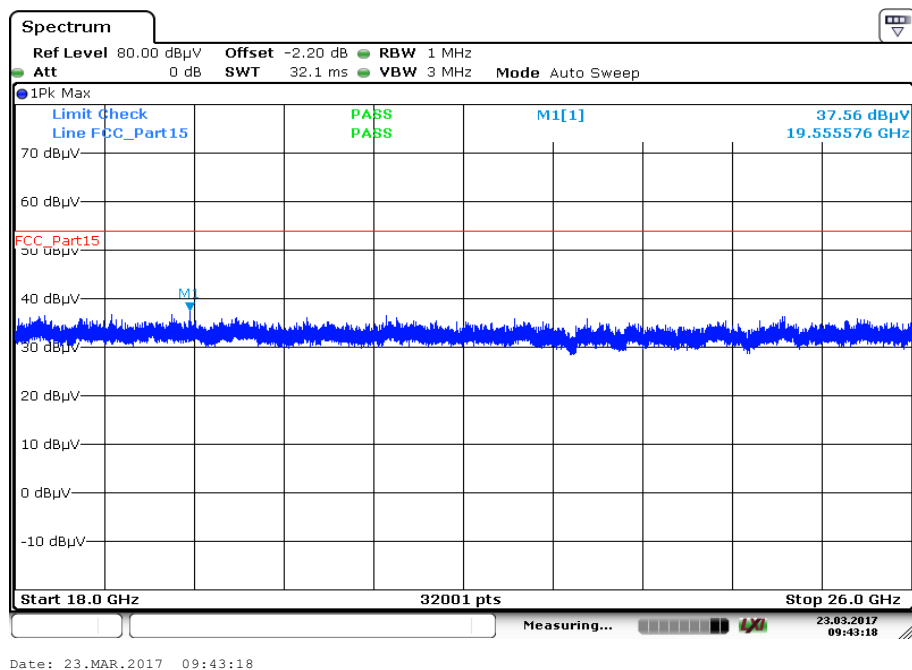


Plots: RX / idle mode, ANT-X100P001B24553 PCB antenna

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



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



Results: DSSS, ANT-DB1-RAF-xxx dipole antenna

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]
4824	Peak	52.3	4874	Peak	55.2	2263	Peak	53.1
	AVG	48.9		AVG	51.8		AVG	42.8
	Peak		7310	Peak	56.2	4924	Peak	56.0
	AVG			AVG	52.0		AVG	52.7
	Peak			Peak		7386	Peak	54.5
	AVG			AVG			AVG	48.6

Results: OFDM (20 MHz bandwidth), ANT-DB1-RAF-xxx dipole antenna

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 emissions are more than 20 dB below the limit.			All detected emissions are more than 20 dB below the limit.			All detected emissions are more than 20 dB below the limit.		
	Peak			Peak			Peak	
	AVG			AVG			AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	

Results: OFDM (40 MHz bandwidth), ANT-DB1-RAF-xxx dipole antenna

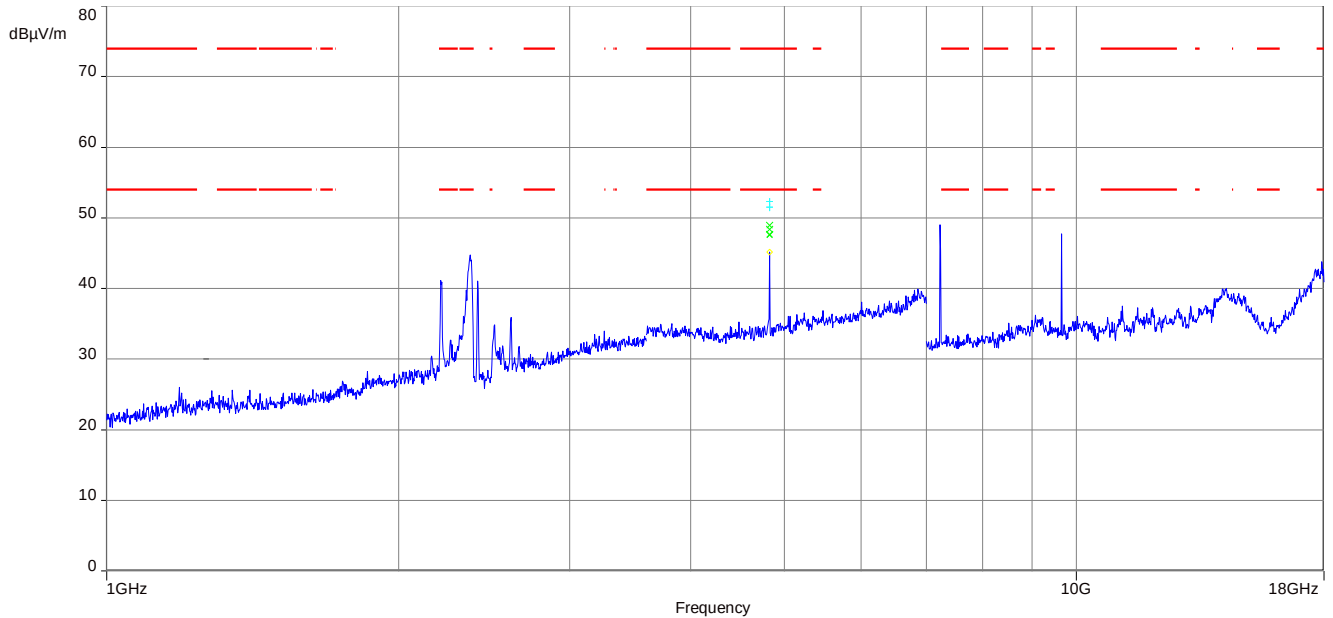
TX Spurious Emissions Radiated [dBµV/m]								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 20 dB below the limit.			All detected emissions are more than 20 dB below the limit.			All detected emissions are more than 20 dB below the limit.		
	Peak			Peak			Peak	
	AVG			AVG			AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	

Results: RX / idle – mode, ANT-DB1-RAF-xxx dipole antenna

TX Spurious Emissions Radiated [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 20 dB below the limit.		
	Peak	
	AVG	
	Peak	
	AVG	

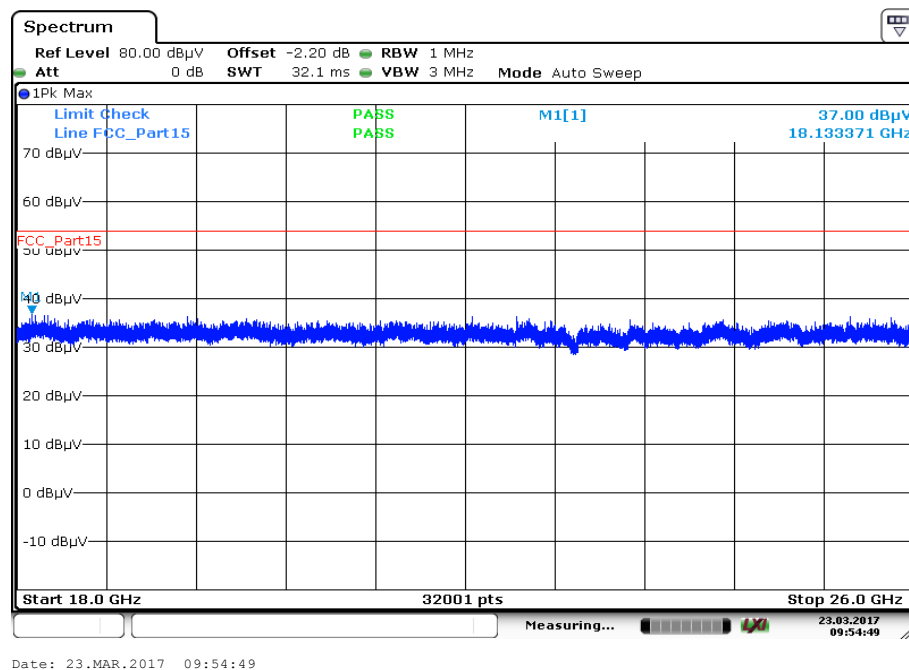
Plots: DSSS, ANT-DB1-RAF-xxx dipole antenna

Plot 1: Lowest channel, 1 GHz to 18 GHz, vertical & horizontal polarization

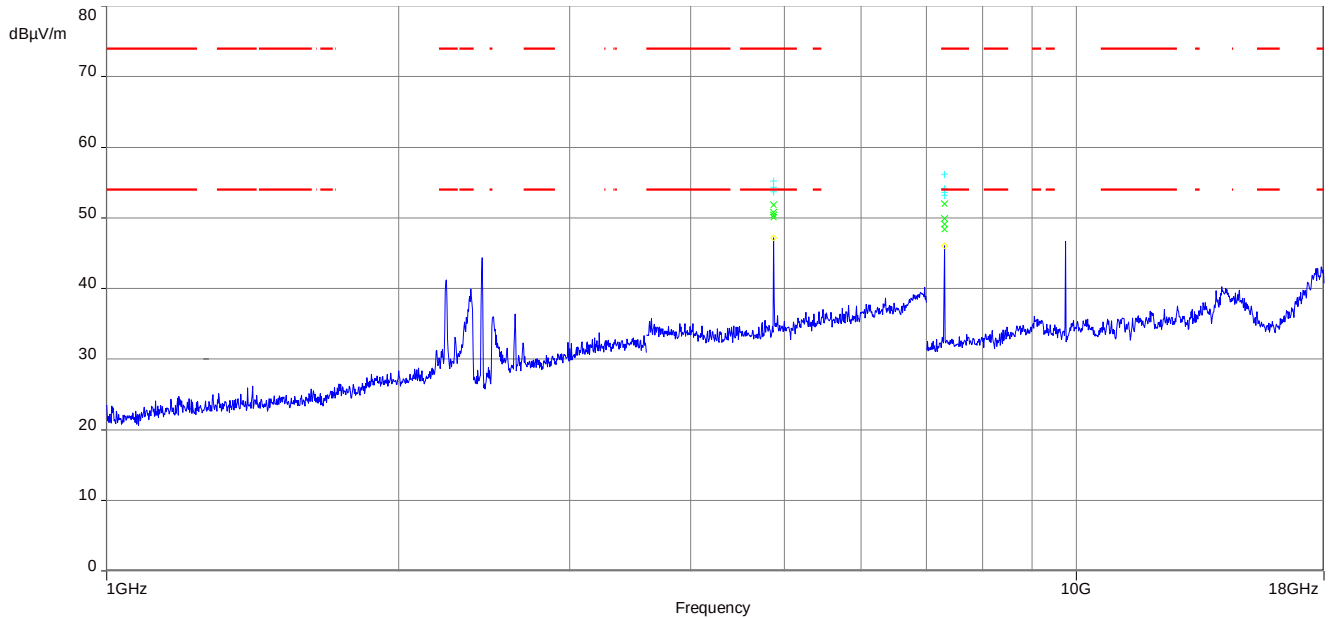


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

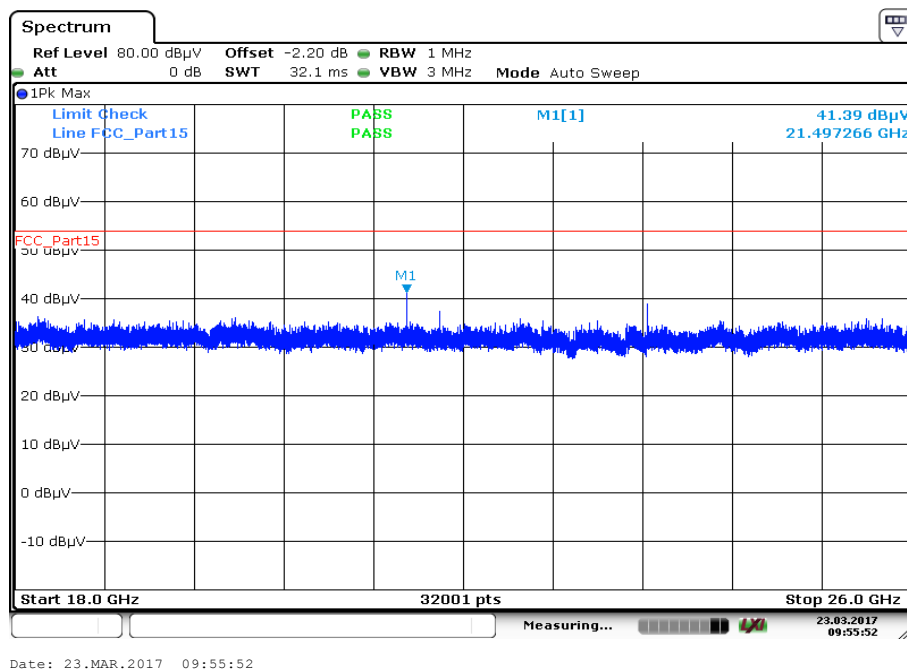


Plot 3: Middle channel, 1 GHz to 18 GHz, vertical & horizontal polarization

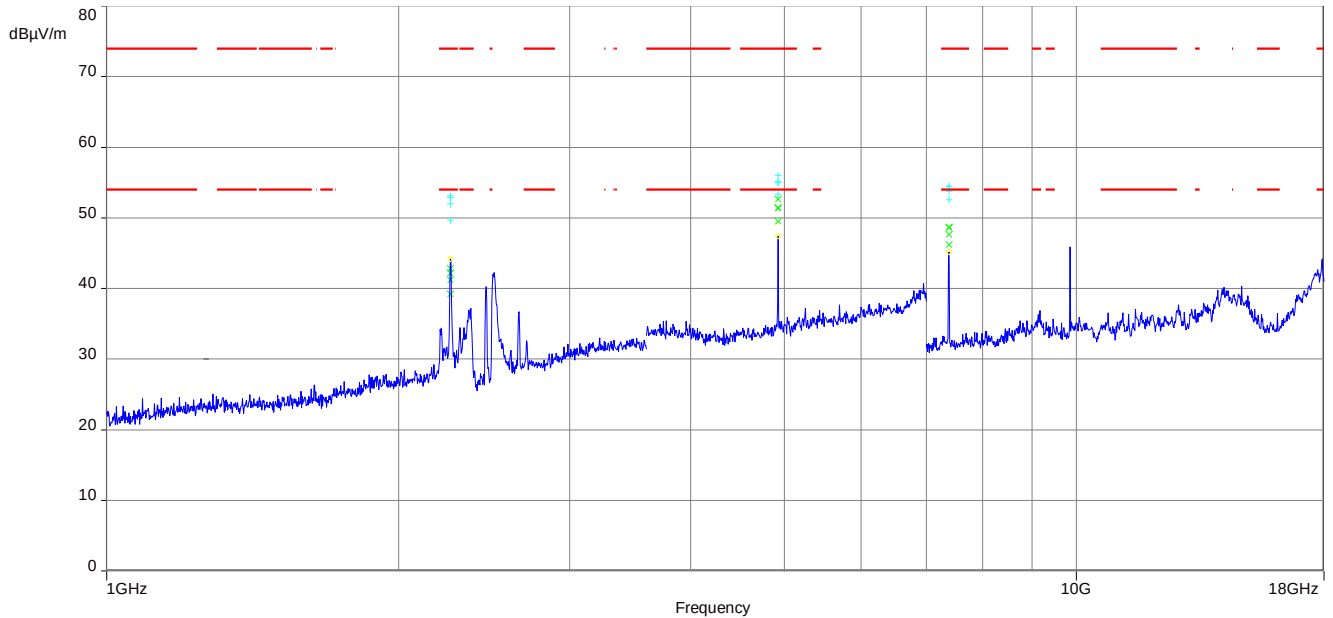


The carrier signal is notched with a 2.4 GHz band rejection filter.

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

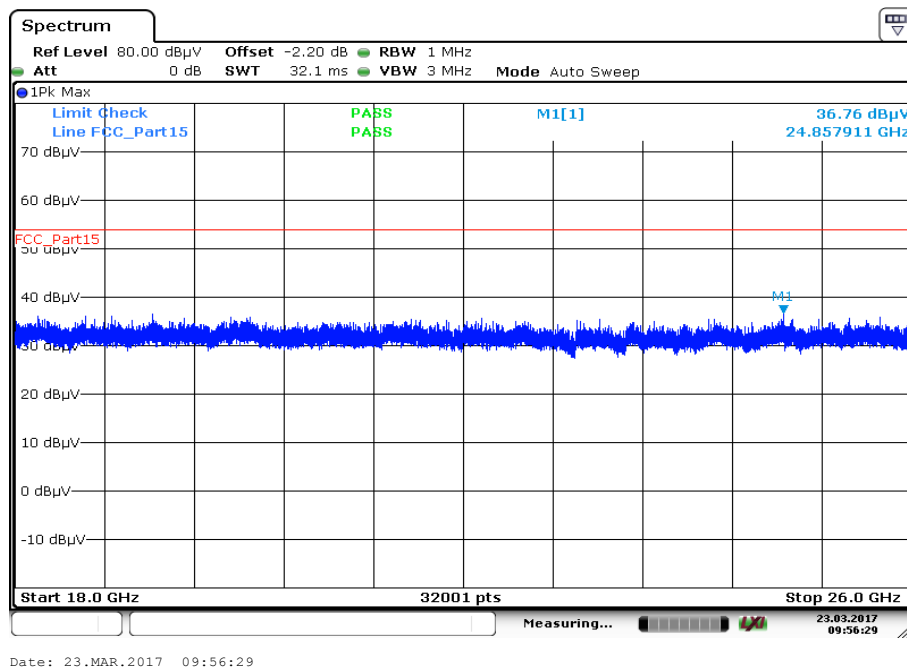


Plot 5: Highest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



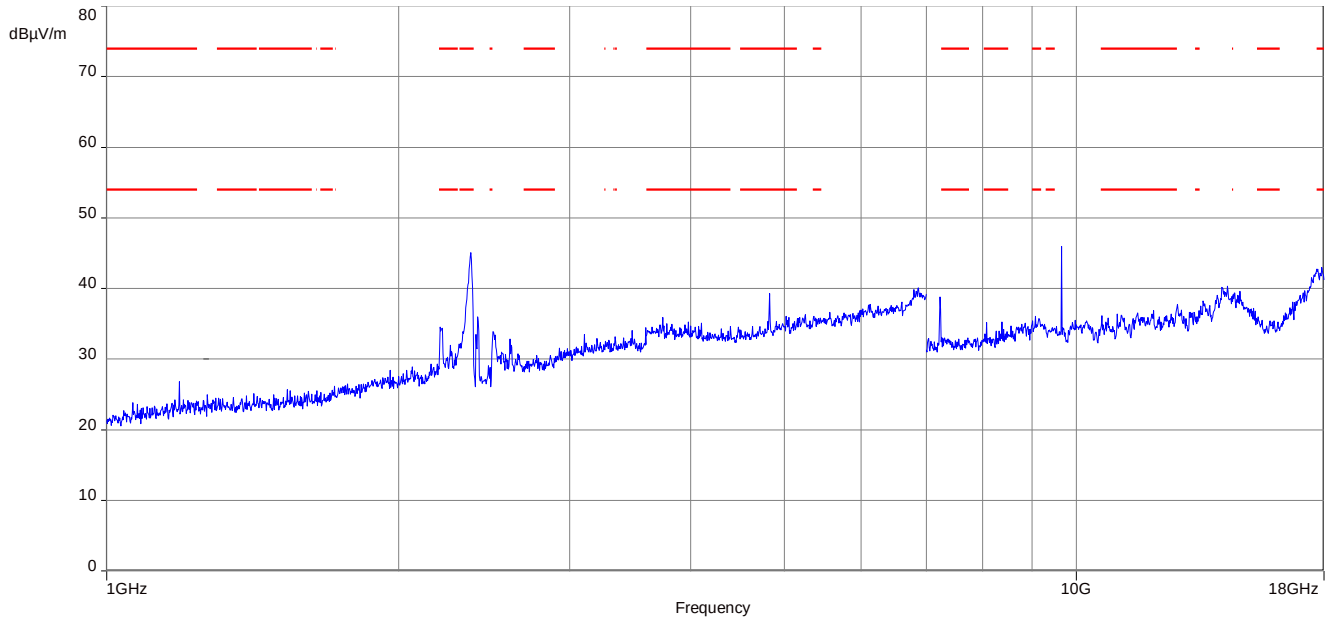
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 6: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



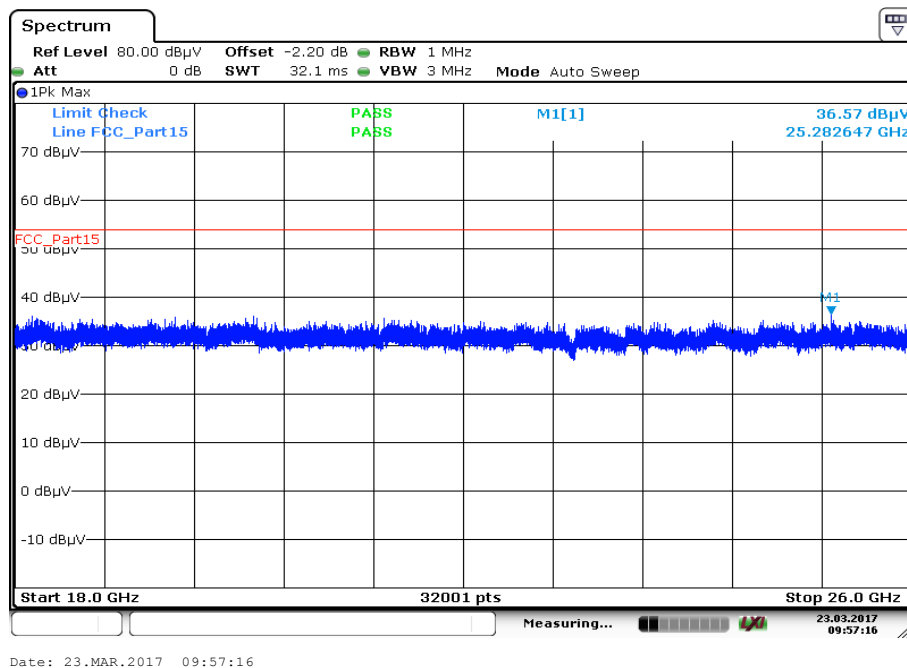
Plots: OFDM (20 MHz bandwidth), ANT-DB1-RAF-xxx dipole antenna

Plot 1: Lowest channel, 1 GHz to 18 GHz, vertical & horizontal polarization

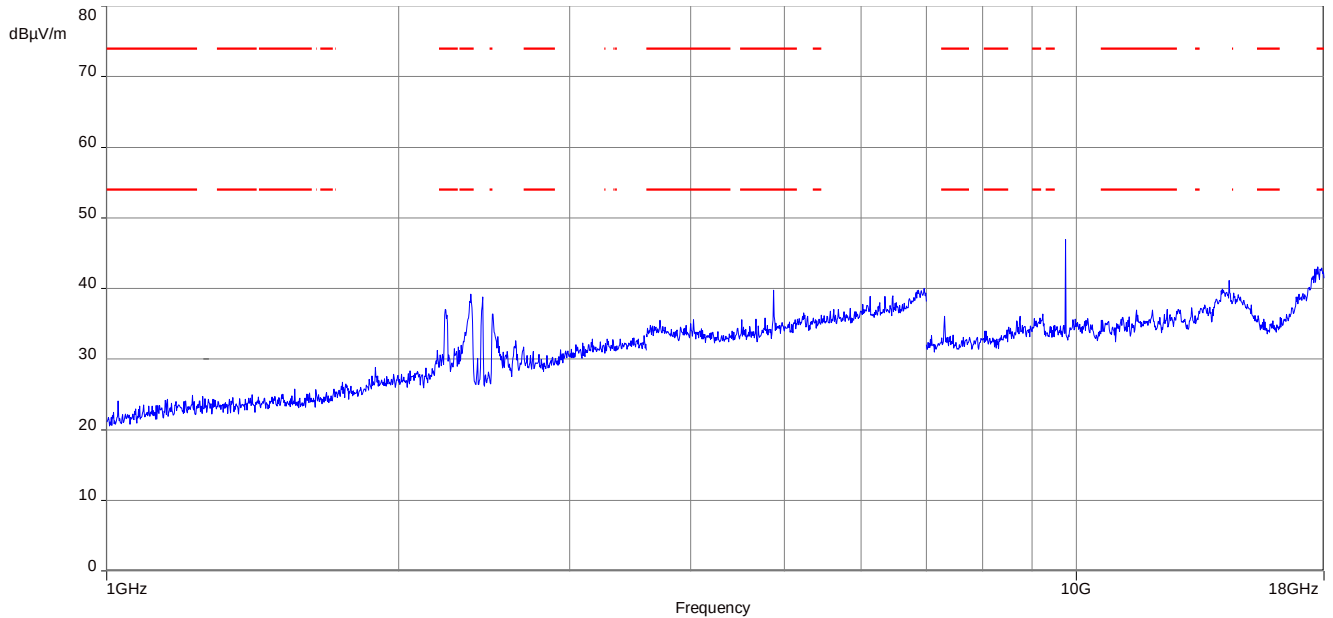


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

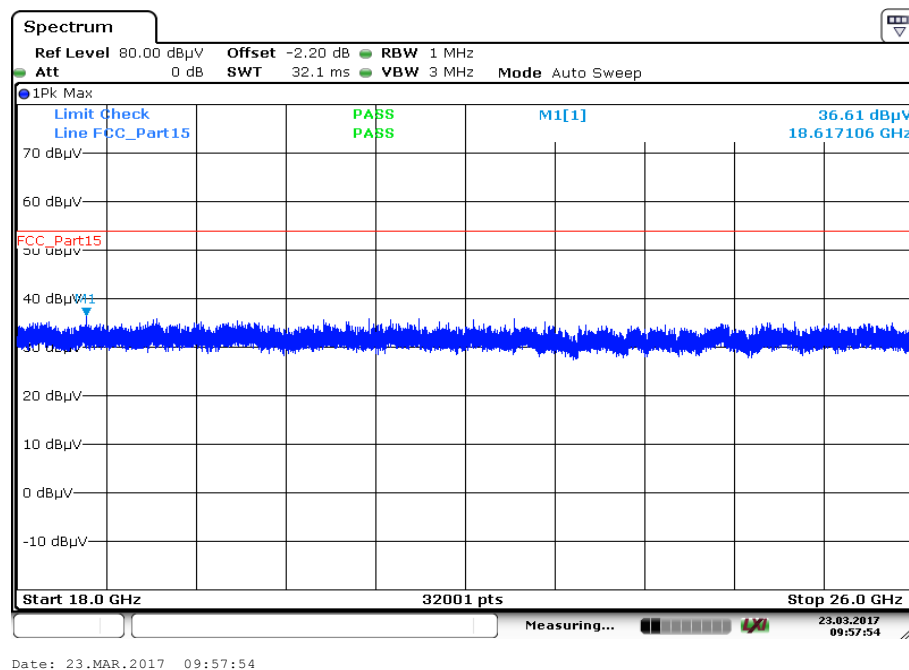


Plot 3: Middle channel, 1 GHz to 18 GHz, vertical & horizontal polarization

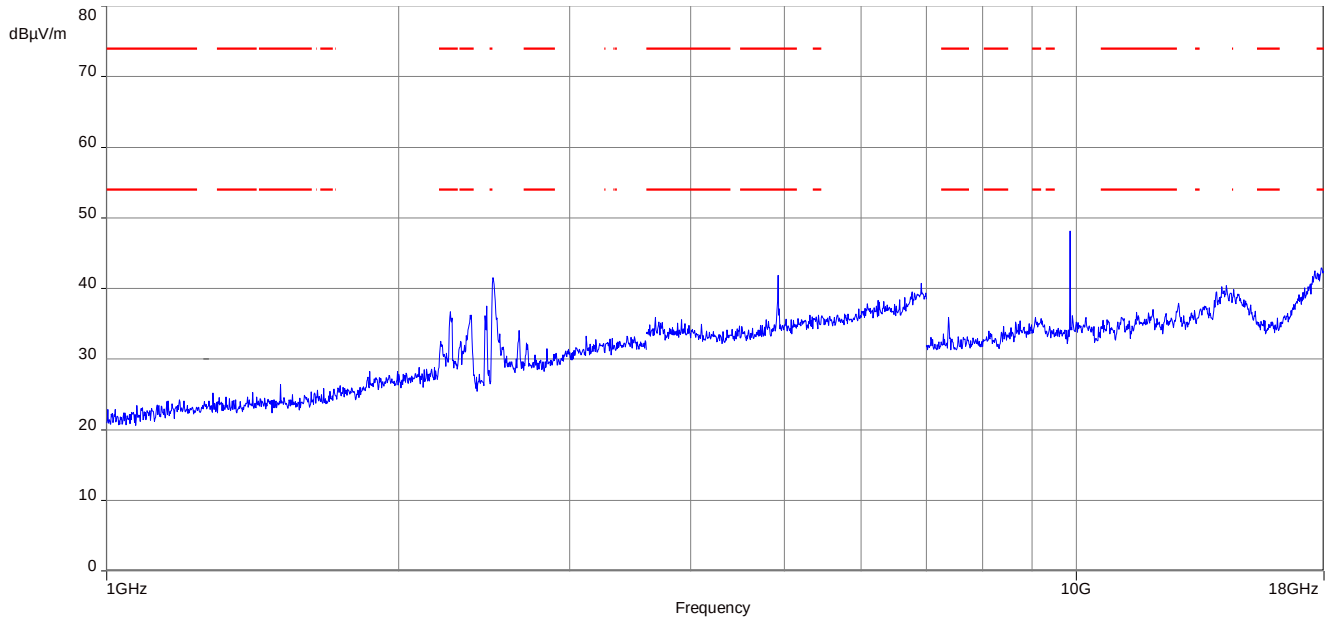


The carrier signal is notched with a 2.4 GHz band rejection filter.

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

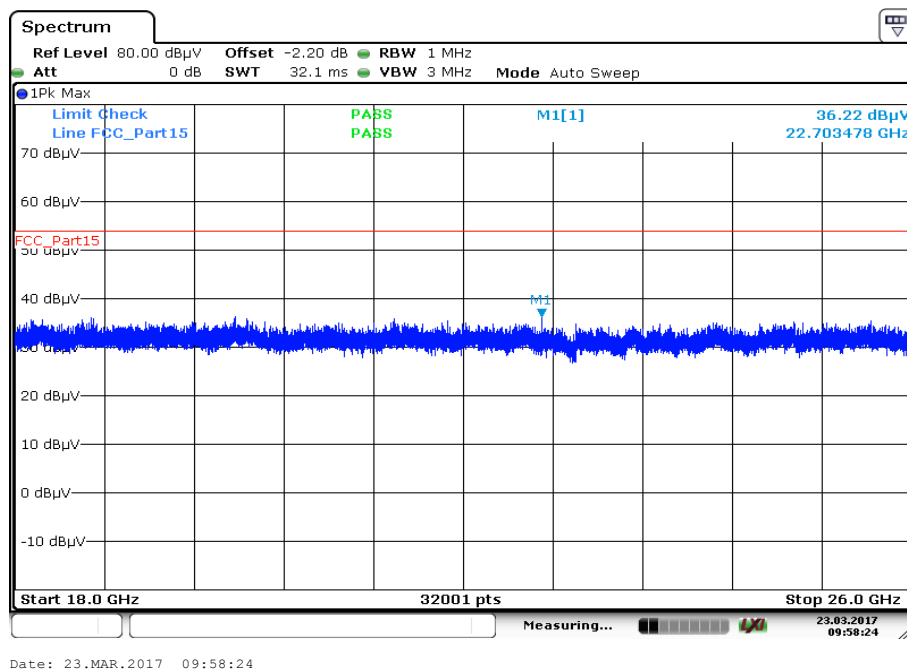


Plot 5: Highest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



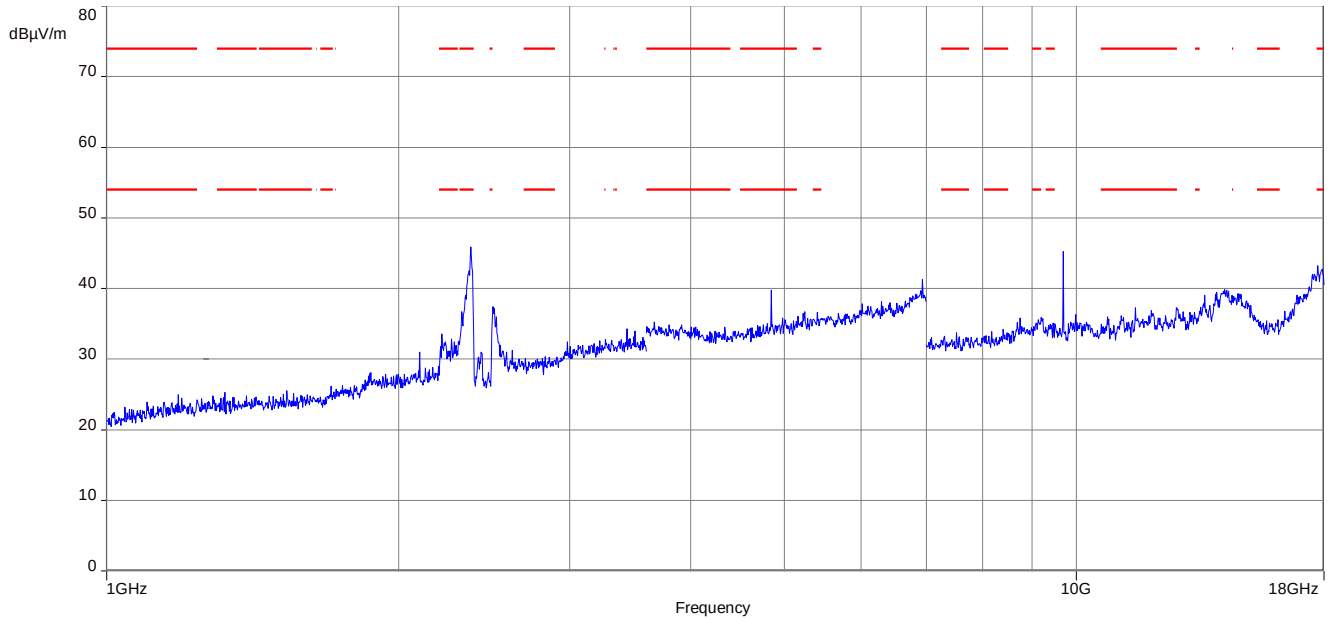
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 6: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



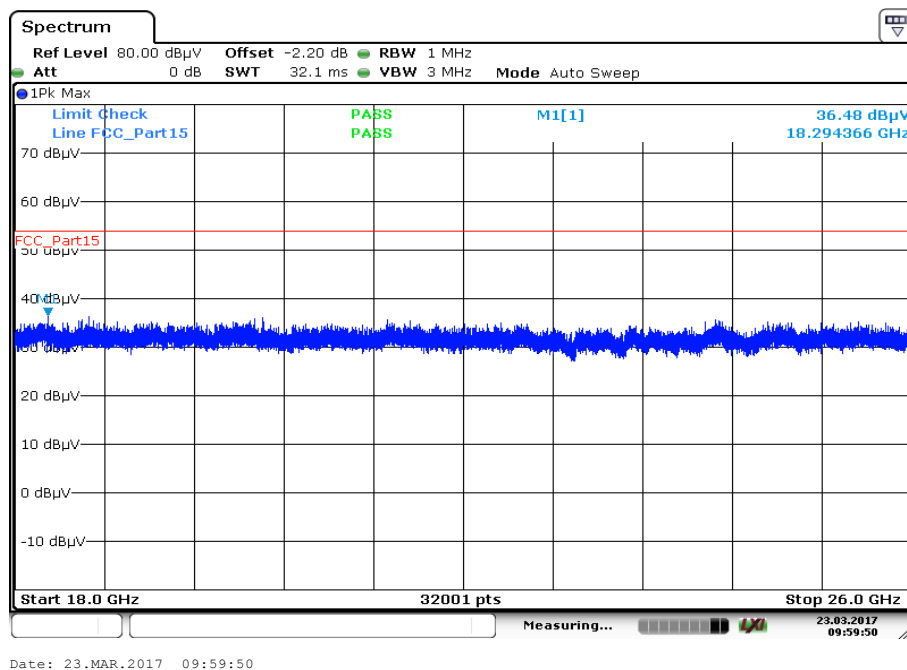
Plots: OFDM (40 MHz bandwidth), ANT-DB1-RAF-xxx dipole antenna

Plot 1: Lowest channel, 1 GHz to 18 GHz, vertical & horizontal polarization

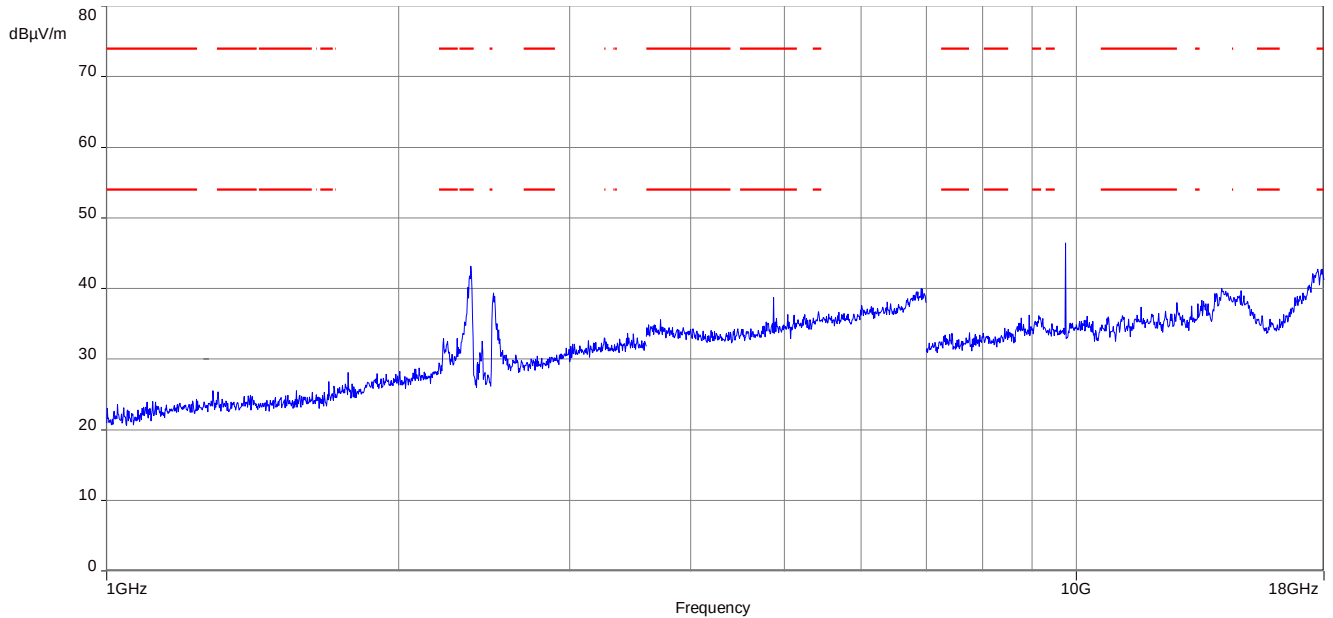


The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

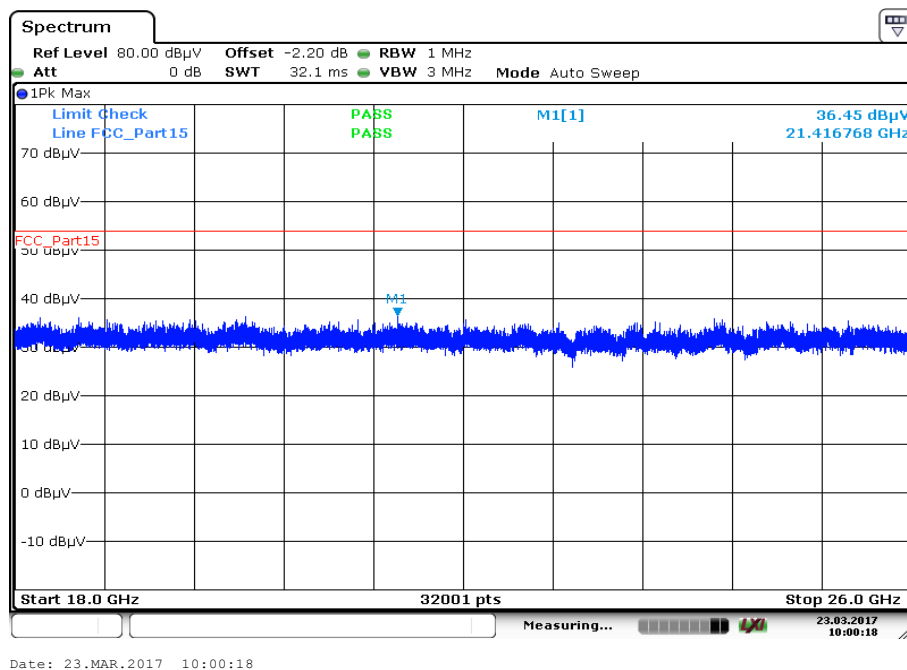


Plot 3: Middle channel, 1 GHz to 18 GHz, vertical & horizontal polarization

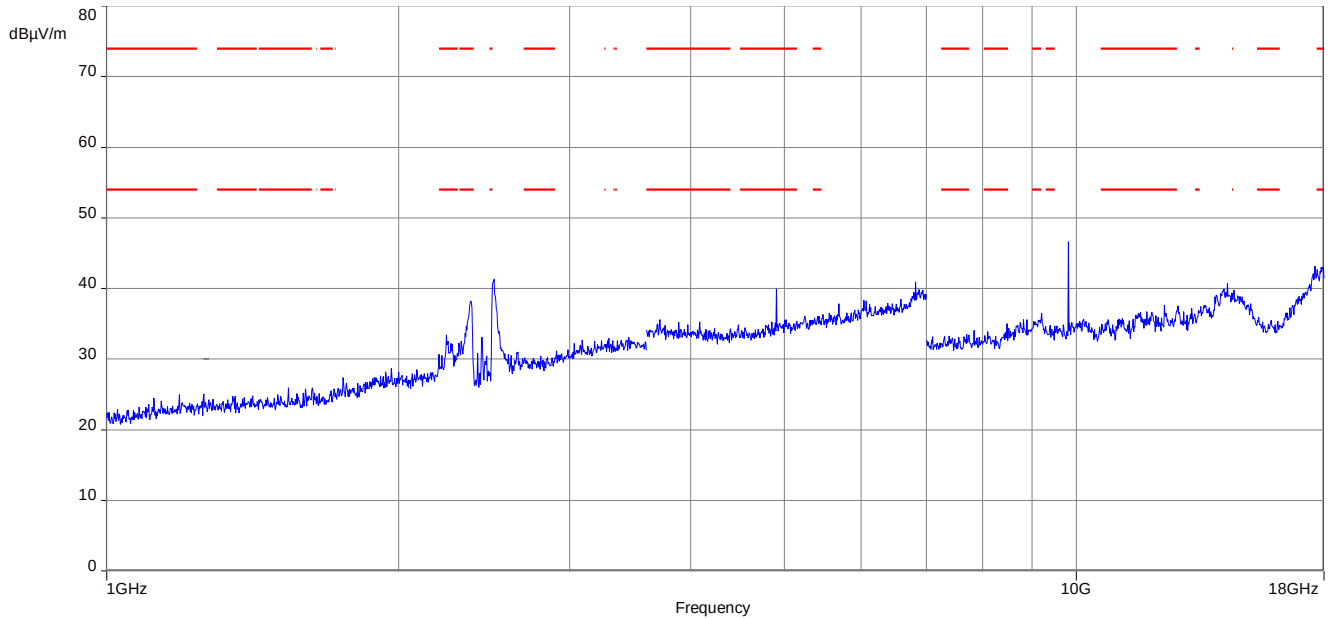


The carrier signal is notched with a 2.4 GHz band rejection filter.

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

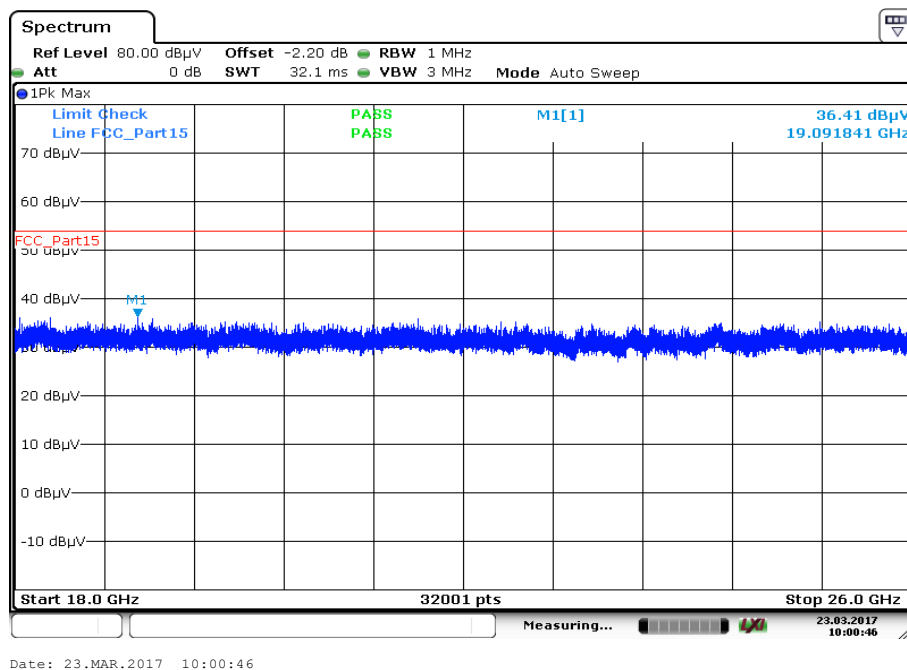


Plot 5: Highest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



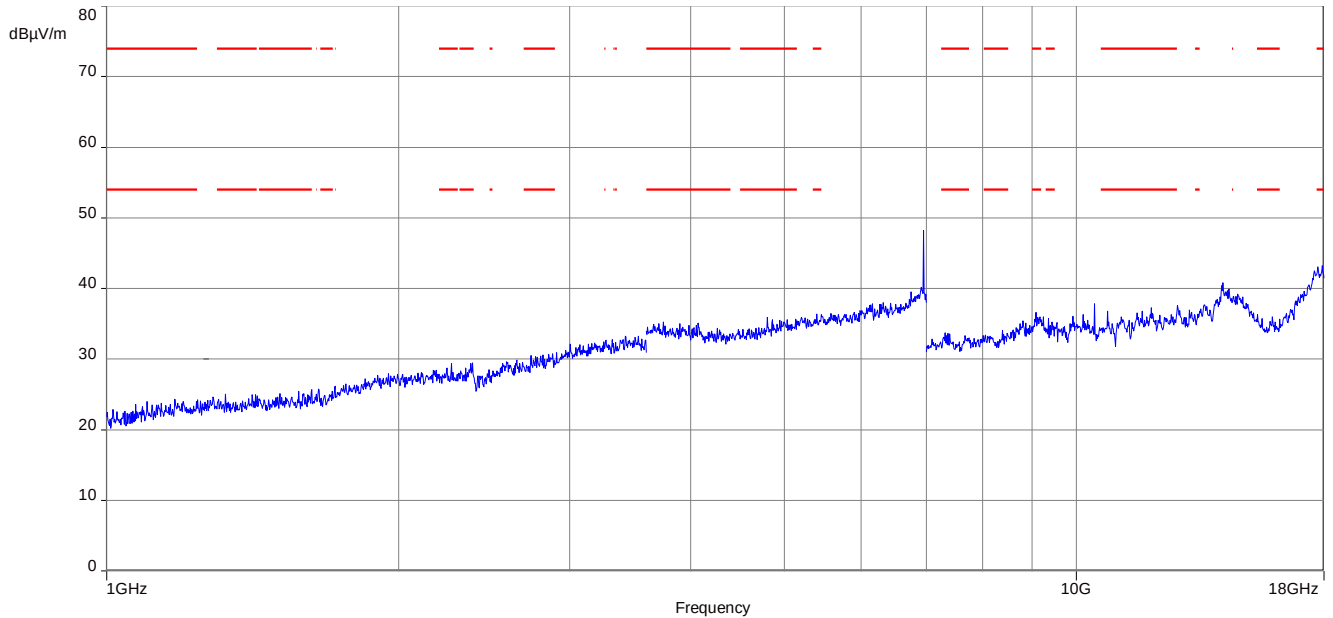
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 6: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

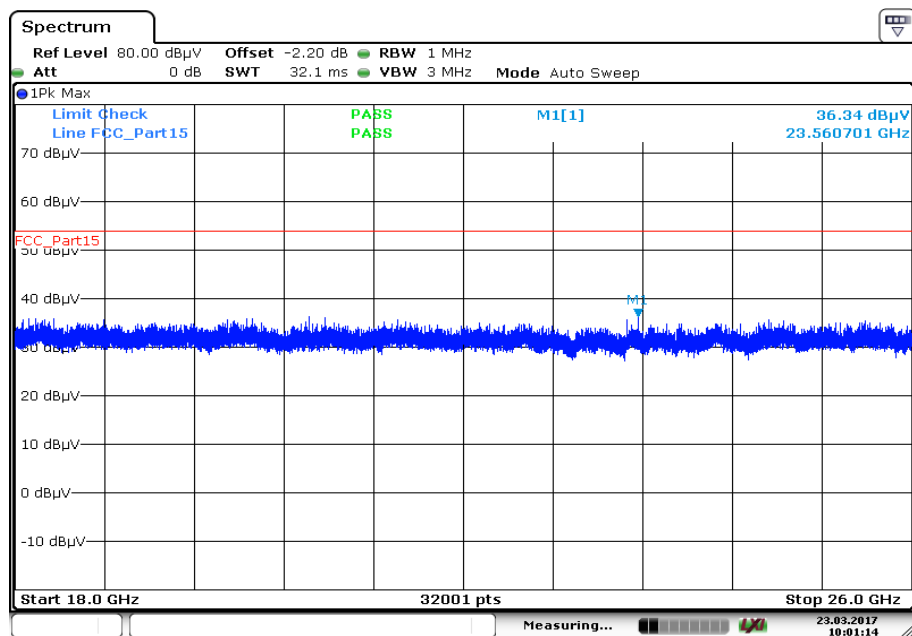


Plots: RX / idle mode, ANT-DB1-RAF-xxx dipole antenna

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



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



Date: 23.MAR.2017 10:01:14

11.14 Spurious emissions conducted below 30 MHz (AC conducted)

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
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 sub clause 7.4 - A
Measurement uncertainty:	See sub clause 8

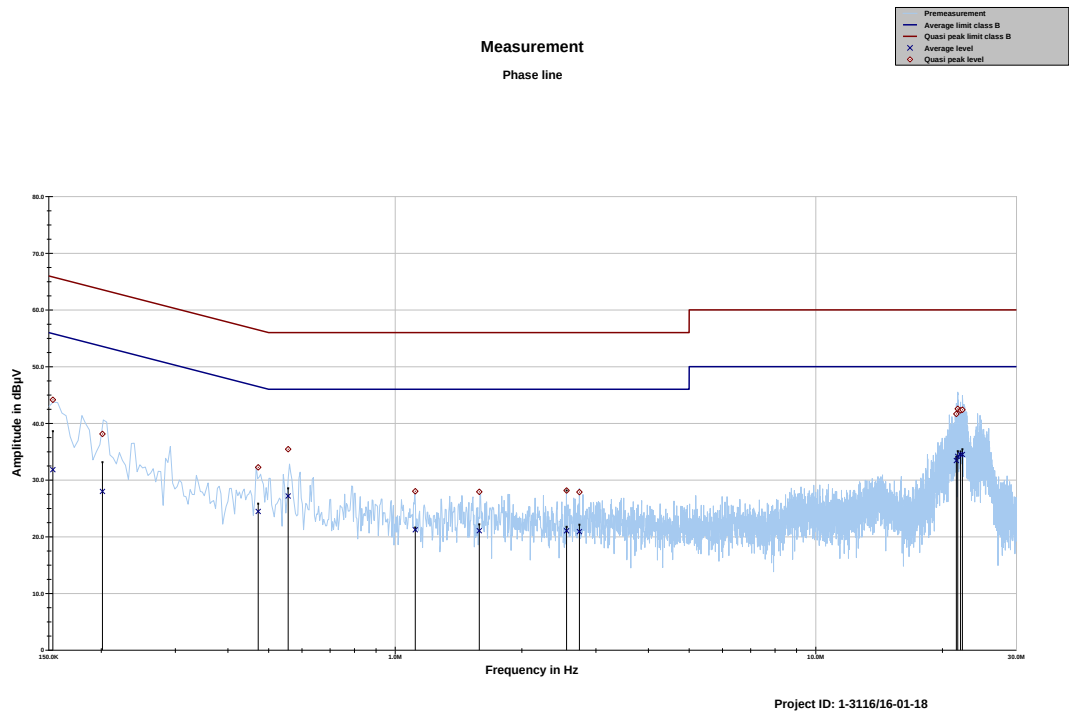
Limits:

FCC		IC
Frequency (MHz)	Quasi-Peak (dB μ V/m)	Average (dB μ V/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

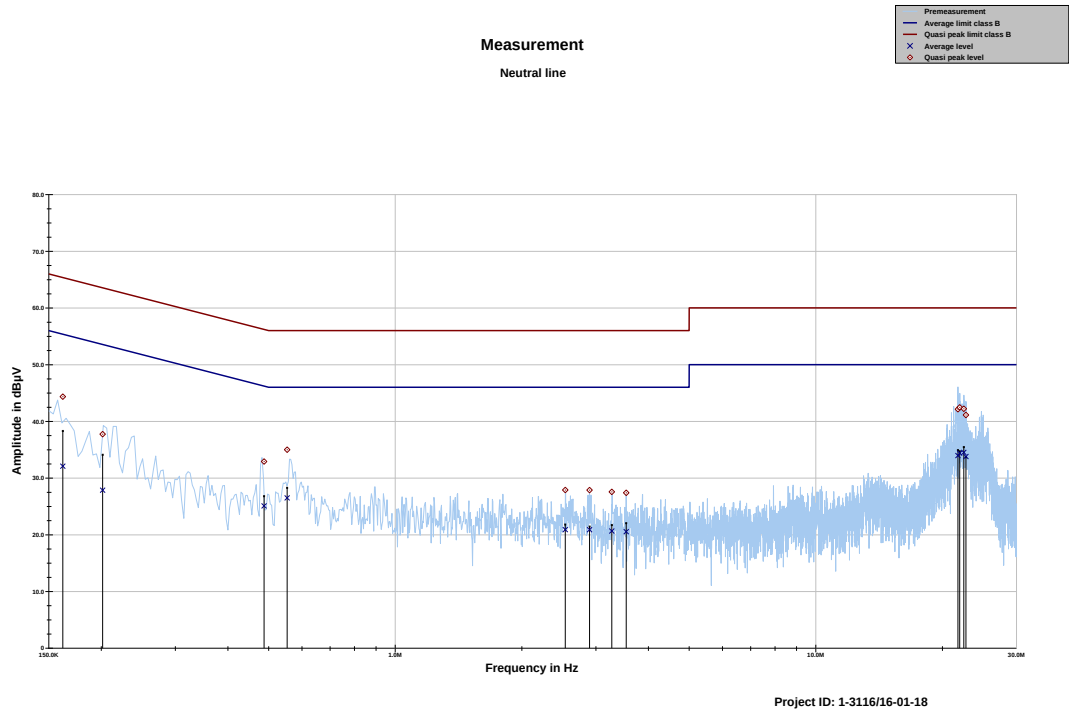
Results:

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

Plots:**Plot 1:** 150 kHz to 30 MHz, phase line**Final results:**

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.153404	44.16	21.65	65.814	31.83	24.07	55.903
0.201282	38.12	25.44	63.558	27.99	26.55	54.535
0.472239	32.24	24.24	56.474	24.45	22.34	46.793
0.556654	35.44	20.56	56.000	27.19	18.81	46.000
1.116087	28.02	27.98	56.000	21.22	24.78	46.000
1.585008	27.93	28.07	56.000	21.06	24.94	46.000
2.555585	28.15	27.85	56.000	21.05	24.95	46.000
2.741251	27.87	28.13	56.000	20.89	25.11	46.000
21.593843	41.66	18.34	60.000	33.44	16.56	50.000
21.760627	42.57	17.43	60.000	34.18	15.82	50.000
22.089607	42.28	17.72	60.000	34.47	15.53	50.000
22.323626	42.39	17.61	60.000	34.50	15.50	50.000

Plot 2: 150 kHz to 30 MHz, neutral line



Final results:

Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.162051	44.35	21.00	65.358	32.09	23.57	55.656
0.201488	37.73	25.82	63.549	27.86	26.67	54.529
0.487773	32.91	23.29	56.206	25.08	21.27	46.349
0.553521	35.00	21.00	56.000	26.50	19.50	46.000
2.537855	27.89	28.11	56.000	20.89	25.11	46.000
2.897890	27.87	28.13	56.000	20.88	25.12	46.000
3.273703	27.57	28.43	56.000	20.66	25.34	46.000
3.542713	27.40	28.60	56.000	20.53	25.47	46.000
21.779081	42.13	17.87	60.000	33.96	16.04	50.000
21.995232	42.46	17.54	60.000	34.39	15.61	50.000
22.489290	42.22	17.78	60.000	34.52	15.48	50.000
22.753651	41.12	18.88	60.000	33.80	16.20	50.000

12 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	2017-04-12
A	Reduced to 3 different antennas	2017-05-31

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
OBW		Occupied Bandwidth
OC		Operating Channel
OCW		Operating Channel Bandwidth
OOB		Out Of Band

Annex C Accreditation Certificate

first page

last page



Deutsche Akkreditierungsstelle GmbH

Befähigung gemäß § 8 Absatz 1 AkkStellG i.V.m. § 3 Absatz 1 AkkStellG-BV
Unterzeichnet der Multilateralen Abkommen
von EA, ILAC und IAF zur gegenseitigen Anerkennung

Akkreditierung



Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

CTC advanced GmbH
Untertürkheimer Straße 6-10, 66117 Saarbrücken

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

Funk
Mobilfunk (GSM / GPRS) + OTA
Elektromagnetische Verträglichkeit (EMV)
Frequenzstabilität
SAR / SARF
Umwelt
Invent Caril Technology
Bluetooth®
Automotive
Wi-Fi-Service
Kardinalische Anforderungen
Lärmanforderungen
Akustik
Near Field Communication (NFC)

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 25.11.2008 mit der
Akkreditierungsnummer D-PL-12076-01, und ist gültig bis 17.11.2018. Sie besteht aus diesem Bescheid,
der Fölsche des Certifikats und der folgenden Anlagen mit angehängt 54 Seiten.

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

Frankfurt, 26.11.2018

Bitte beachten Sie die Hinweise

Im Auftrag der
Deutsche Akkreditierungsstelle GmbH

Deutsche Akkreditierungsstelle GmbH

Standort Berlin
Spandauer-M 10
10117 Berlin

Standort Frankfurt am Main
Europa-Allee 52
60527 Frankfurt am Main

Standort Braunschweig
Kardinal-Allee 120
38110 Braunschweig

Die ausgenannte Veröffentlichung der Akkreditierungsstelle ist bedarf der vorherigen schriftlichen
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unveränderter Form.

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Die Akkreditierung erfolgt gemäß des Gesetzes über die Akkreditierungsstelle (AkkStellG) vom
21. Juli 2004 (BGBl. I S. 2022) sowie der Verordnung (EG) 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 (AEM 1218 vom 9. Juli 2008, S. 30).
Die DAkkS ist Unterzeichnerin der Multilateralen Abkommen zur gegenseitigen Anerkennung der
Europäischen Konvention für Akkreditierung (EA), des International Accreditation Forum (IAF) und
der International Laboratory Accreditation Cooperation (ILAC). Die Unterzeichner dieser Abkommen
erkennen ihre Akkreditierung gegenseitig an.

Der aktuelle Stand der Mitgliedschaft kann folgender Webseiten entnommen werden:
EA: www.eurpeanconvention.org/EA/448
IAF: www.iaf.org
ILAC: www.ilac.org

Note:

The current certificate including annex can be received on request.