

8.6.3 Test data, Continued

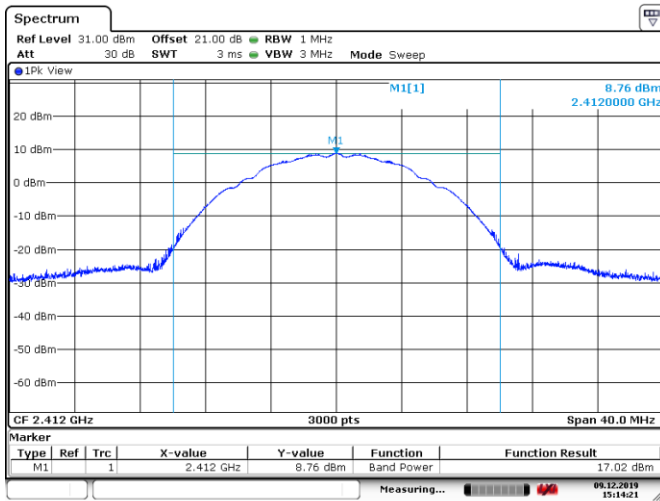


Figure 8.6-1: Output power on low channel

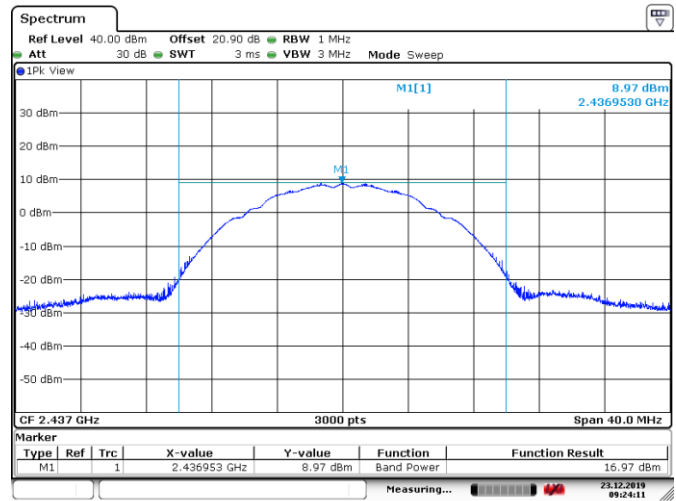


Figure 8.6-2: Output power on mid channel

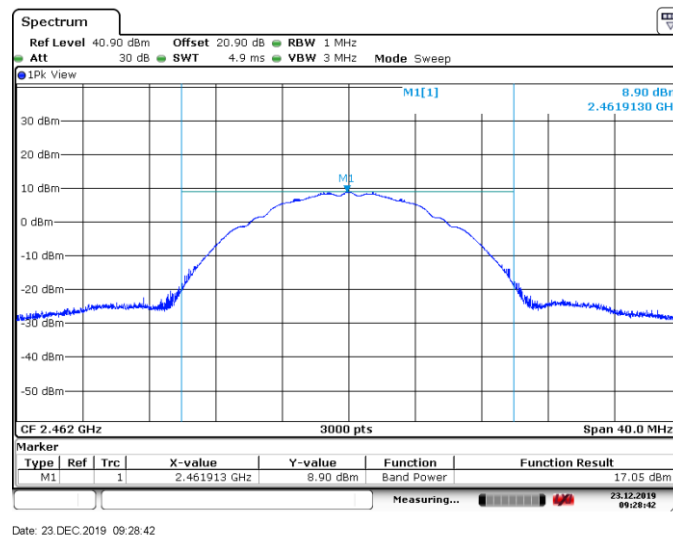


Figure 8.6-3: Output power on high channel

8.6.4 Test data, OFDM Modulation

Table 8.6-2: *Output power measurements results*

Frequency, MHz	Conducted output power, dBm		Margin, dB	Antenna gain, dBi	EIRP, dBm	EIRP limit, dBm	EIRP margin, dB
	Measured	Limit					
2412	23.13	30	6.87	3.5	26.63	36	9.37
2437	23.13	30	6.87	3.5	26.63	36	9.37
2462	23.28	30	6.72	3.5	26.78	36	9.22

8.6.5 Test data, Continued

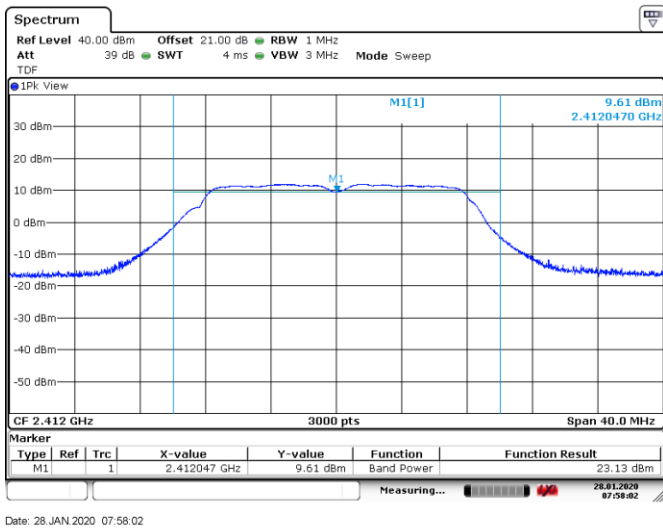


Figure 8.6-4: Output power on low channel

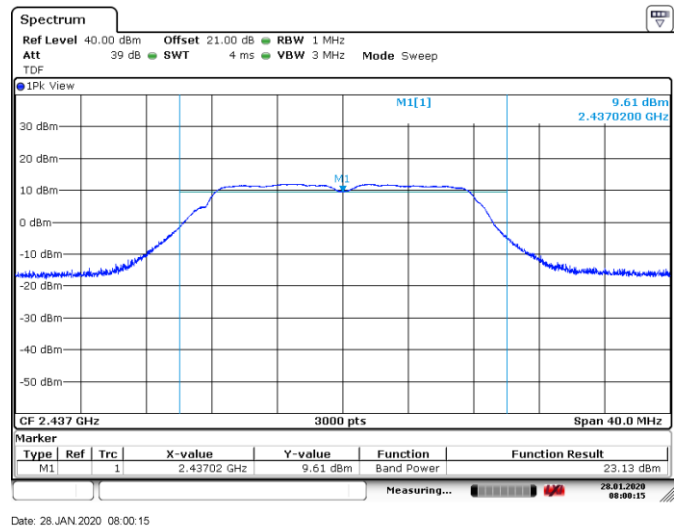


Figure 8.6-5: Output power on mid channel

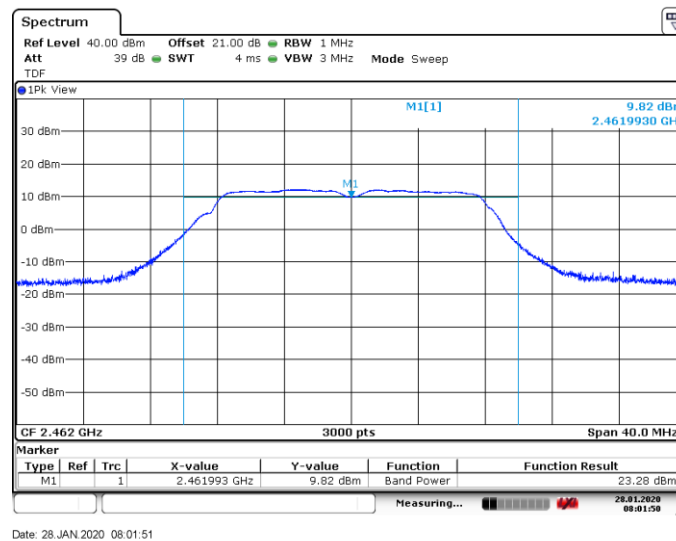


Figure 8.6-6: Output power on high channel

8.6.6 Test data, OFDM Modulation (802.11n.HT20)

Table 8.6-3: *Output power measurements results*

Frequency, MHz	Conducted output power, dBm		Margin, dB	Antenna gain, dBi	EIRP, dBm	EIRP limit, dBm	EIRP margin, dB
	Measured	Limit					
2412	23.31	30	6.69	3.5	26.81	36	9.19
2437	23.28	30	6.72	3.5	26.78	36	9.22
2462	23.43	30	6.57	3.5	26.93	36	9.07

8.6.7 Test data, Continued

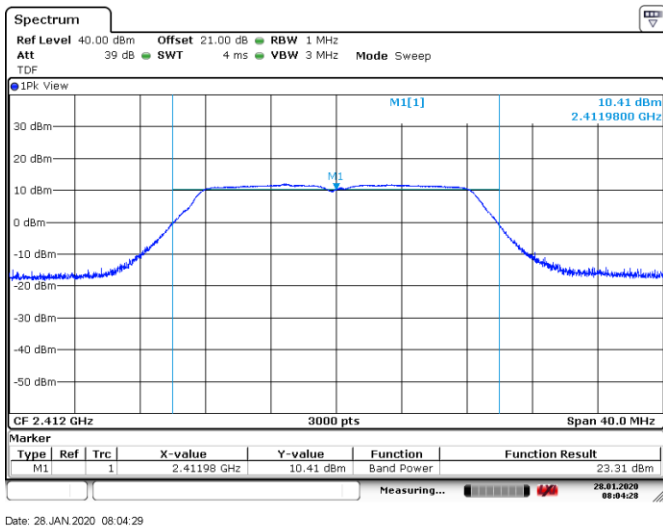


Figure 8.6-7: Output power on low channel

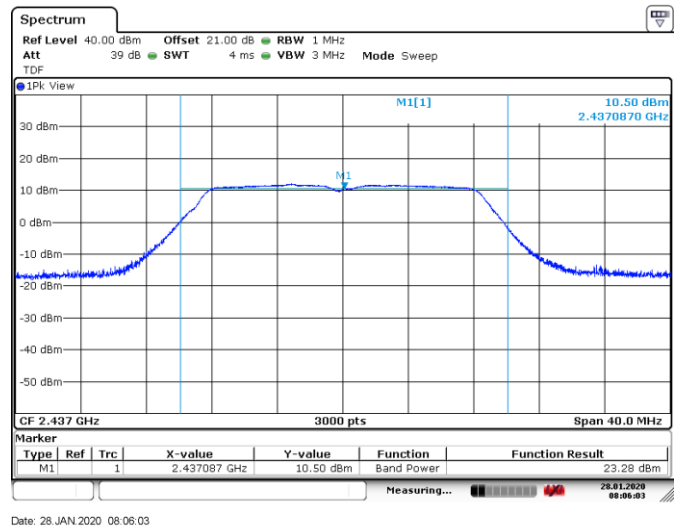


Figure 8.6-8: Output power on mid channel

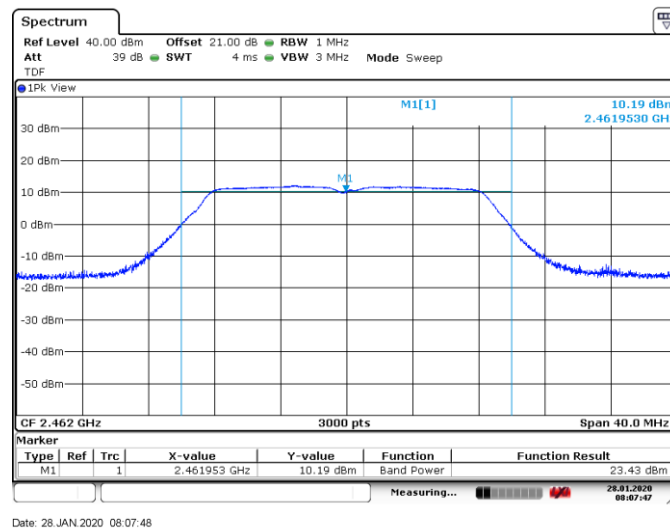


Figure 8.6-9: Output power on high channel

8.6.8 Test data, OFDM Modulation (802.11n.HT40)

Table 8.6-4: *Output power measurements results*

Frequency, MHz	Conducted output power, dBm		Margin, dB	Antenna gain, dBi	EIRP, dBm	EIRP limit, dBm	EIRP margin, dB
	Measured	Limit					
2422	21.10	30	8.90	3.5	24.60	36	11.40
2437	20.91	30	9.09	3.5	24.41	36	11.59
2452	21.09	30	8.91	3.5	24.59	36	11.41

8.6.8 Test data, Continued

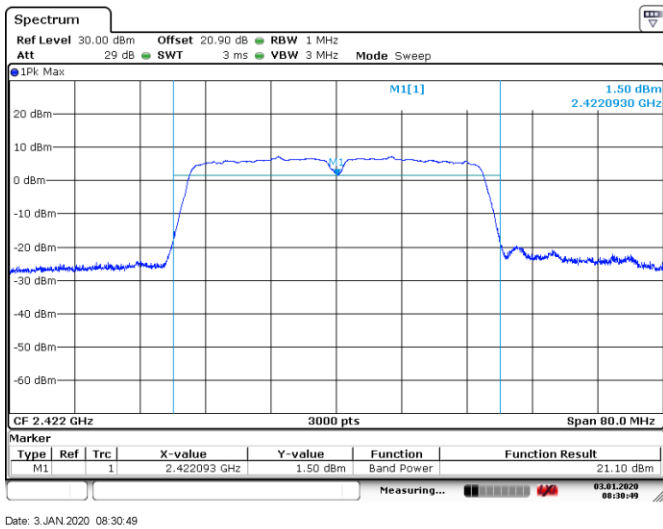


Figure 8.6-10: Output power on low channel

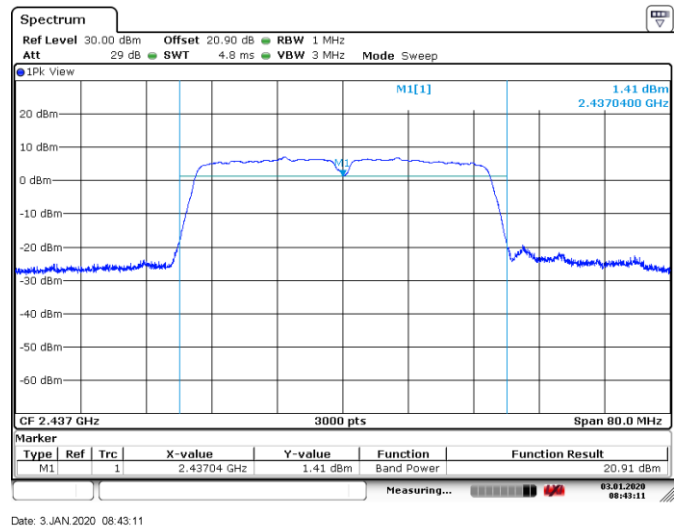


Figure 8.6-11: Output power on mid channel

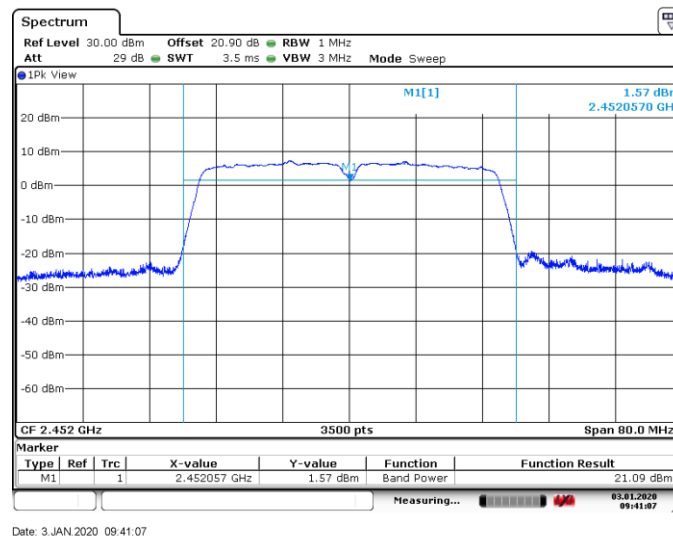


Figure 8.6-12: Output power on high channel

8.7 FCC 15.247(d) and RSS-247 5.5 Spurious (out-of-band) unwanted emissions (Wifi)

8.7.1 Definitions and limits

FCC:

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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §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)).

ISED:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Table 8.7-1: FCC §15.209 and RSS-Gen – Radiated emission limits

Frequency, MHz	Field strength of emissions		Measurement distance, m
	µV/m	dBµV/m	
0.009–0.490	2400/F	$67.6 - 20 \times \log_{10}(F)$	300
0.490–1.705	24000/F	$87.6 - 20 \times \log_{10}(F)$	30
1.705–30.0	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

Notes: In the emission table above, the tighter limit applies at the band edges.

For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test

Table 8.7-2: ISED restricted frequency bands

MHz	MHz	MHz	GHz
0.090–0.110	12.57675–12.57725	399.9–410	7.25–7.75
0.495–0.505	13.36–13.41	608–614	8.025–8.5
2.1735–2.1905	16.42–16.423	960–1427	9.0–9.2
3.020–3.026	16.69475–16.69525	1435–1626.5	9.3–9.5
4.125–4.128	16.80425–16.80475	1645.5–1646.5	10.6–12.7
4.17725–4.17775	25.5–25.67	1660–1710	13.25–13.4
4.20725–4.20775	37.5–38.25	1718.8–1722.2	14.47–14.5
5.677–5.683	73–74.6	2200–2300	15.35–16.2
6.215–6.218	74.8–75.2	2310–2390	17.7–21.4
6.26775–6.26825	108–138	2483.5–2500	22.01–23.12
6.31175–6.31225	149.9–150.05	2655–2900	23.6–24.0
8.291–8.294	156.52475–156.52525	3260–3267	31.2–31.8
8.362–8.366	156.7–156.9	3332–3339	36.43–36.5
8.37625–8.38675	162.0125–167.17	3345.8–3358	
8.41425–8.41475	167.72–173.2	3500–4400	
12.29–12.293	240–285	4500–5150	Above 38.6
12.51975–12.52025	322–335.4	5350–5460	

Note: Certain frequency bands listed in Table 8.7-2 and above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

Table 8.7-3: FCC restricted frequency bands

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41			

8.7.2 Test date

Start date November 20, 2019

8.7.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to the 10th harmonic.

DTS emissions in non-restricted frequency bands test was performed as per KDB 558074, section 8.5 with reference to ANSI C63.10 subclause 11.11.

Since fundamental power was tested using the maximum peak conducted output power procedure to demonstrate compliance, the spurious emissions limit is –20 dBc/100 kHz.

DTS emissions in restricted frequency bands test was performed as per KDB 558074, section 8.6 with reference to ANSI C63.10 subclause 11.12.

DTS band-edge emission measurements test was performed as per KDB 558074, section 8.7 with reference to ANSI C63.10 subclause 11.13.

Radiated measurements were performed at a distance of 3 m.

No spurious emissions within 10 dB below the limit were detected above 18 GHz. Different modulations mode were investigated, worst representative case are presented.

Spectrum analyser settings for radiated measurements within restricted bands below 1 GHz:

Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for peak radiated measurements within restricted bands above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for average radiated measurements within restricted bands above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	10 Hz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for conducted spurious emissions measurements:

Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Detector mode:	Peak
Trace mode:	Max Hold

8.7.4 Test data, CCK Modulation

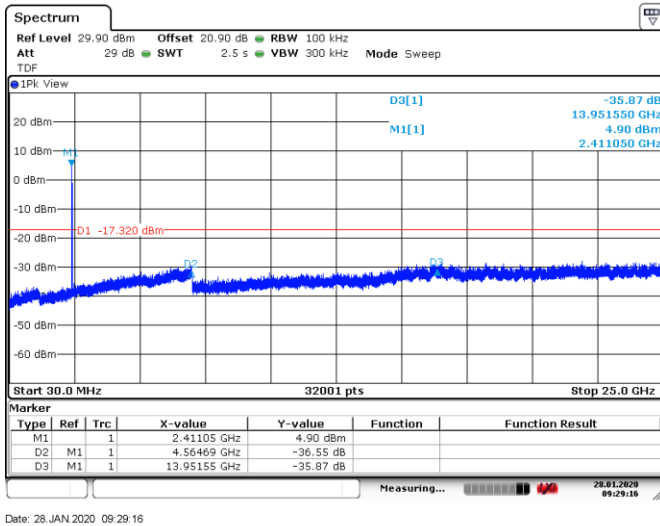


Figure 8.7-1: Conducted spurious emissions for low channel

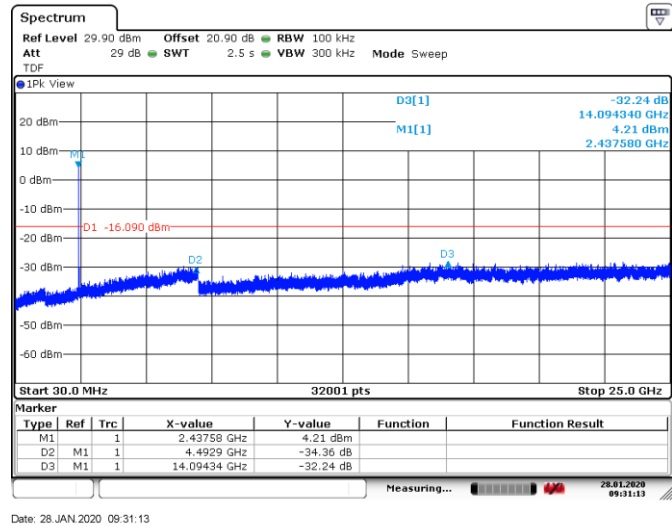


Figure 8.7-2: Conducted spurious emissions for mid channel

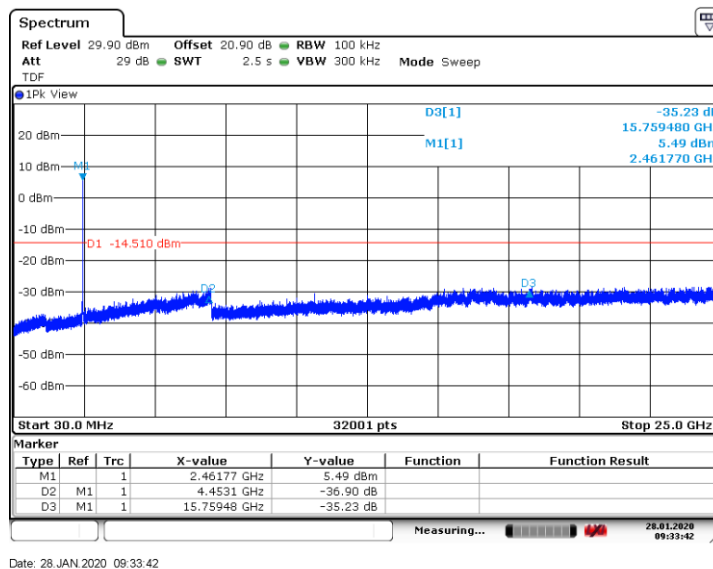


Figure 8.7-3: Conducted spurious emissions for high channel

8.7.4 Test data, OFDM (802.11g) Modulation

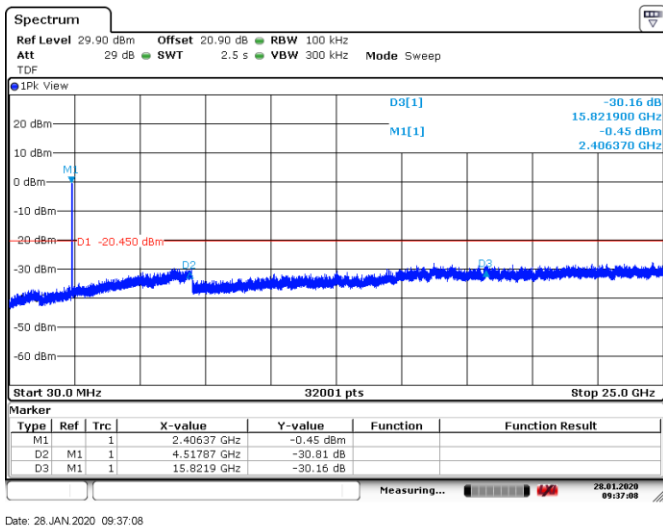


Figure 8.7-4: Conducted spurious emissions for low channel

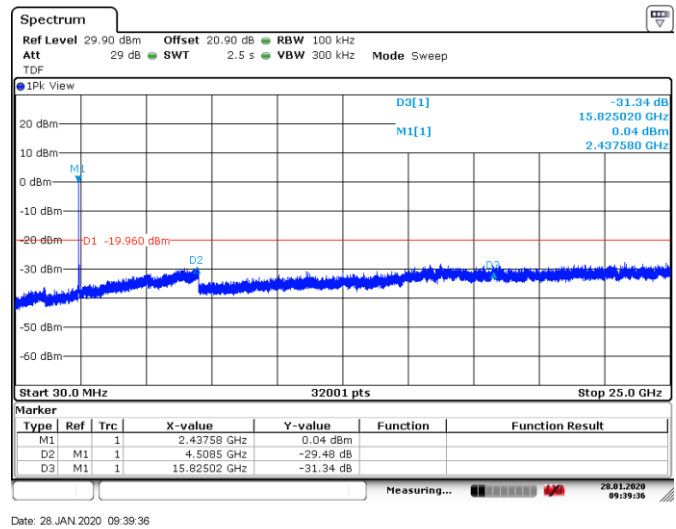


Figure 8.7-5: Conducted spurious emissions for mid channel

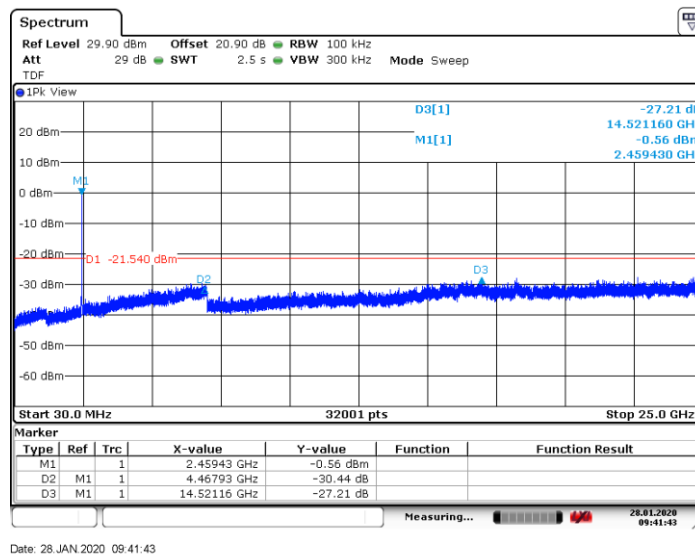
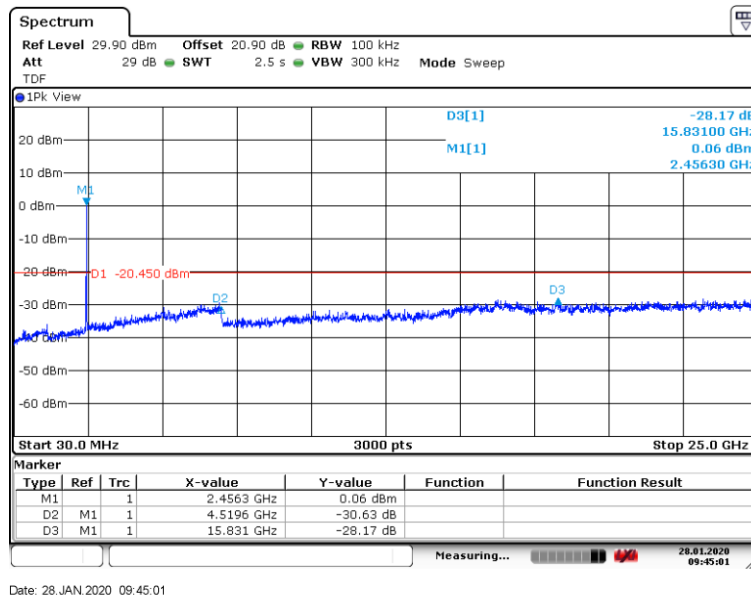
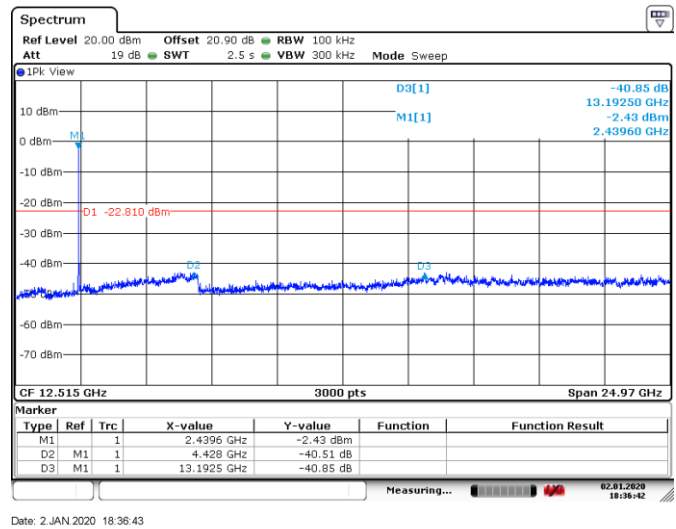
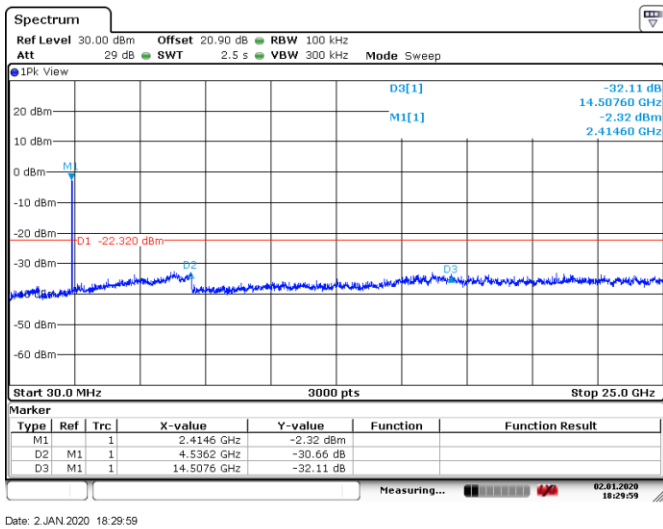
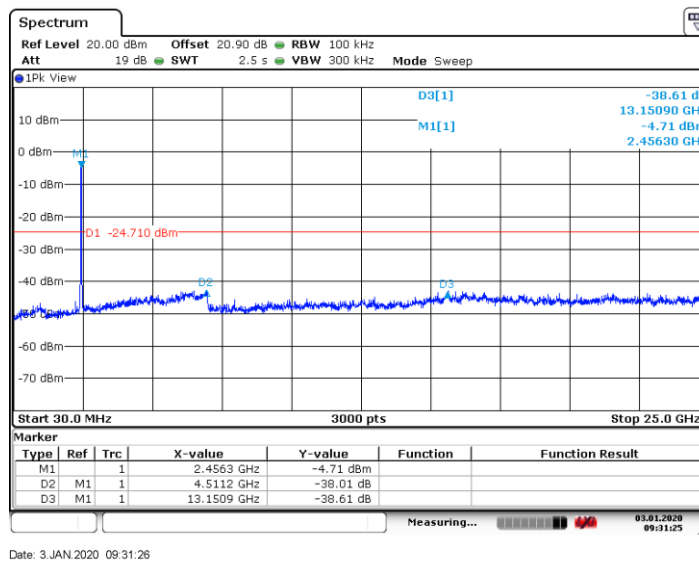
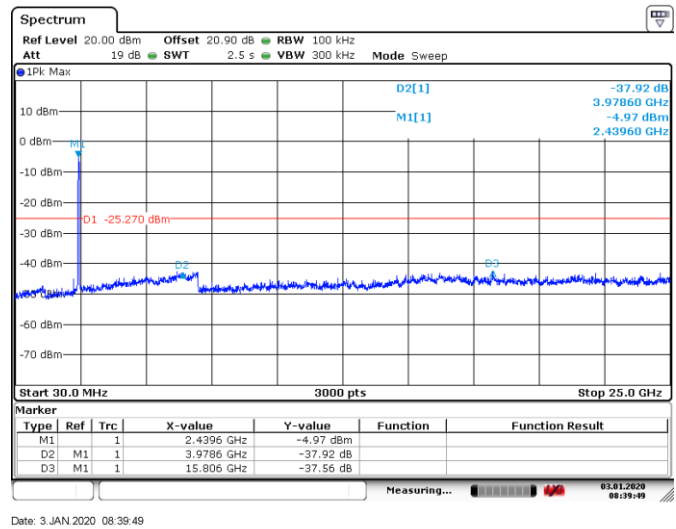
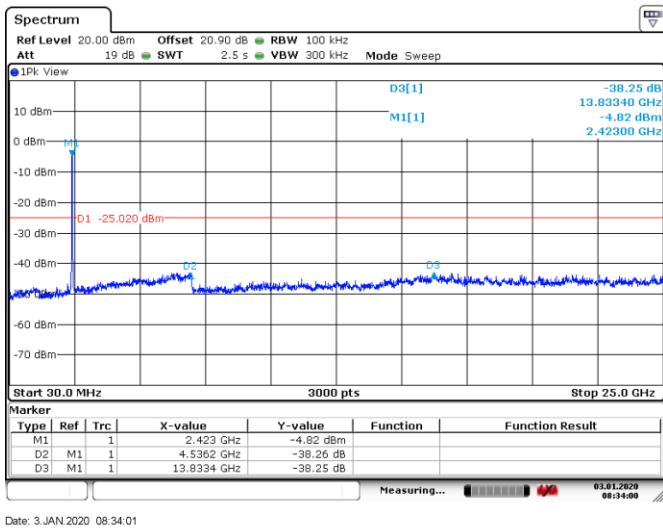


Figure 8.7-6: Conducted spurious emissions for high channel

8.7.4 Test data, OFDM (802.11n.HT20), Modulation



8.7.4 Test data, OFDM (802.11n.HT40), Modulation



8.7.4 Test data, CCK Modulation – Band Edge

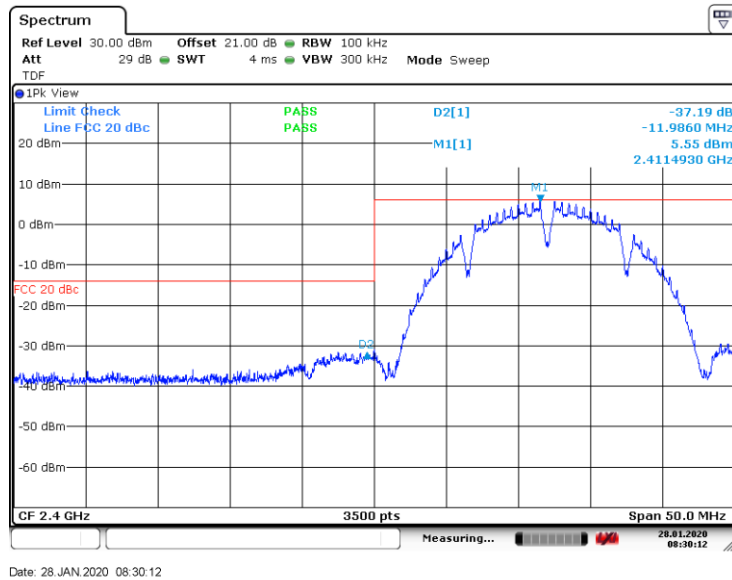


Figure 8.7-13: Band Edge conducted emissions for low channel

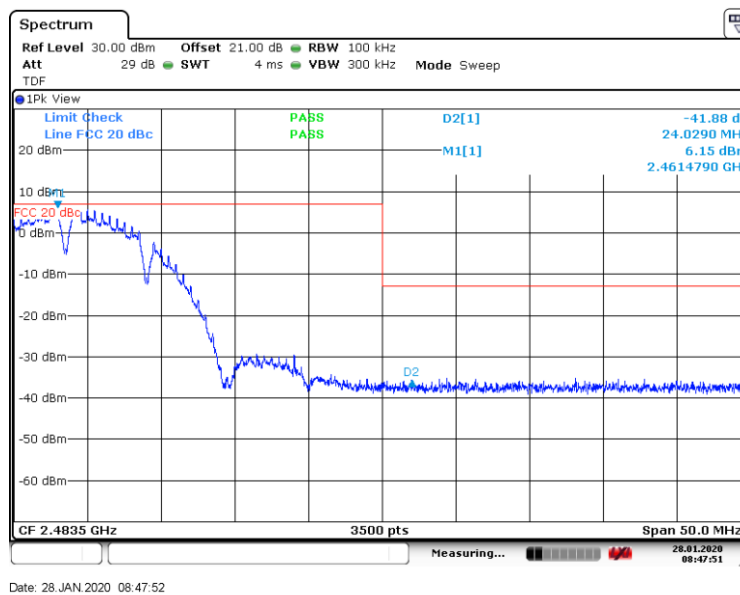


Figure 8.7-14: Band Edge conducted emissions for high channel

8.7.4 Test data, OFDM Modulation – Band Edge

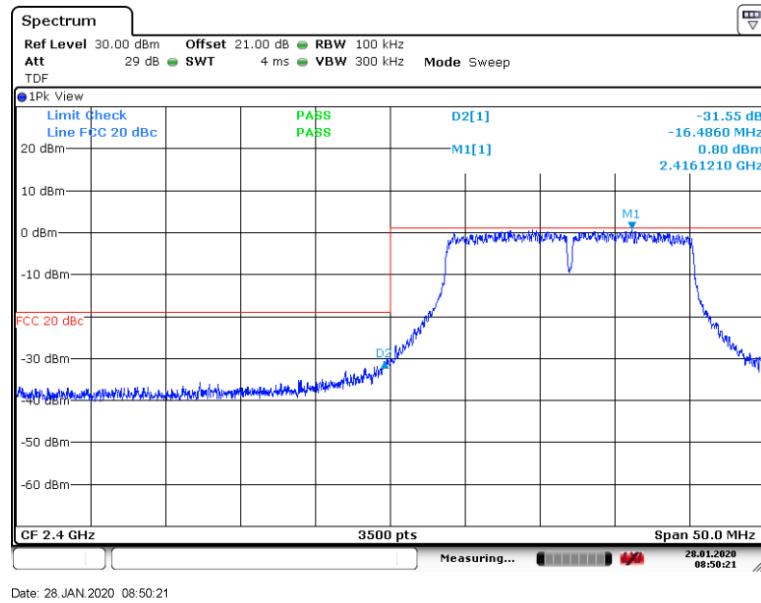


Figure 8.7-15: Band Edge conducted emissions for low channel

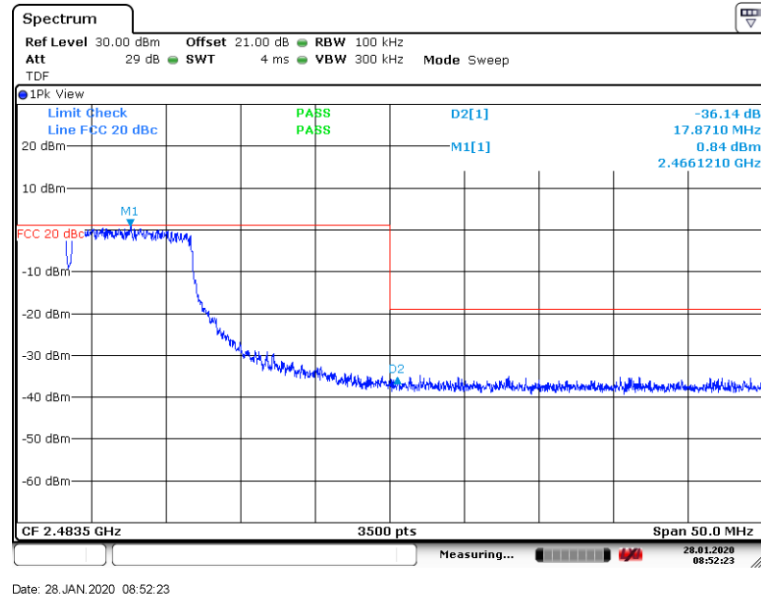


Figure 8.7-16: Band Edge conducted emissions for high channel

8.7.4 Test data, OFDM Modulation (802.11n.HT20) – Band Edge

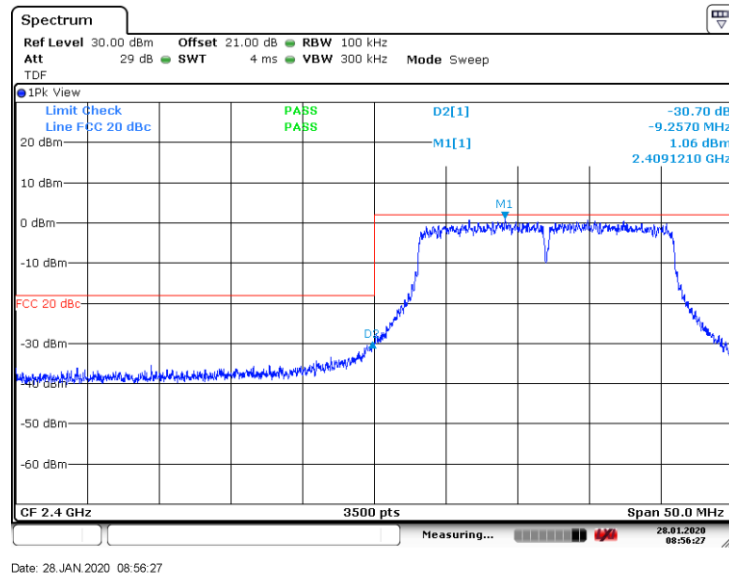


Figure 8.7-17: Band Edge conducted emissions for low channel

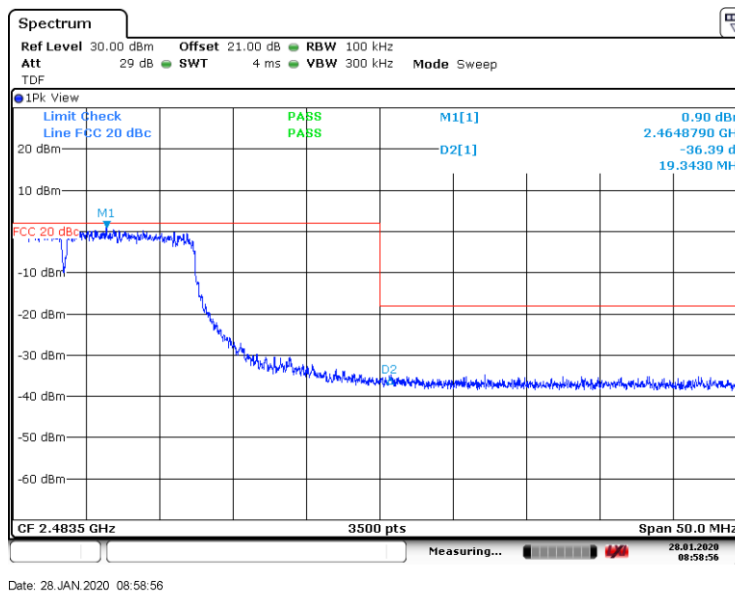


Figure 8.7-18: Band Edge conducted emissions for high channel

8.7.4 Test data, OFDM Modulation (802.11n.HT40) – Band Edge

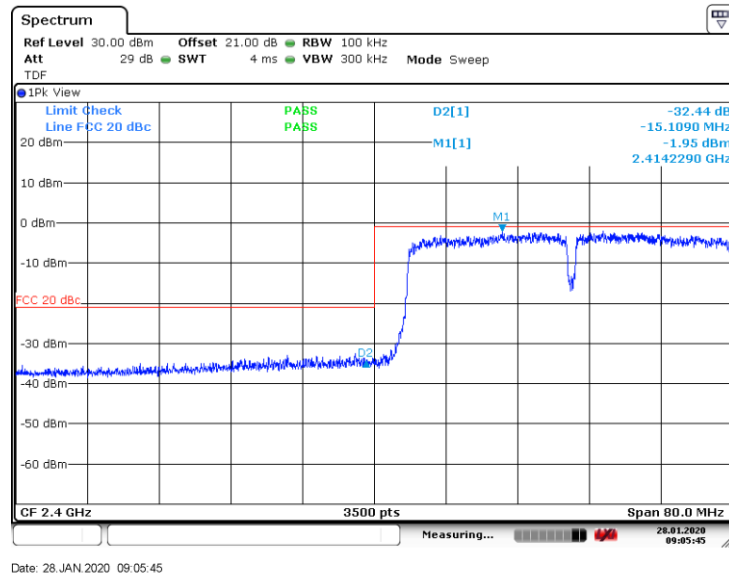


Figure 8.7-19: Band Edge conducted emissions for low channel

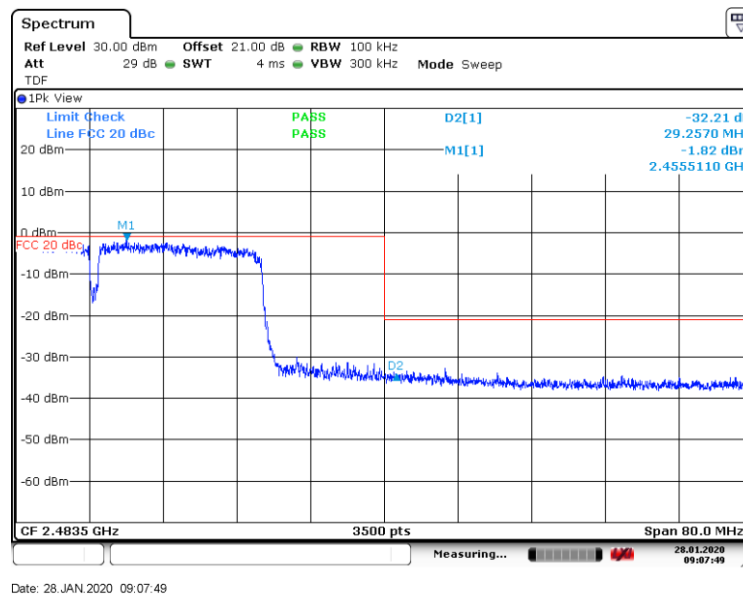


Figure 8.7-20: Band Edge conducted emissions for high channel

8.7.4 Test data, CCK Modulation – Restricted Band Edge

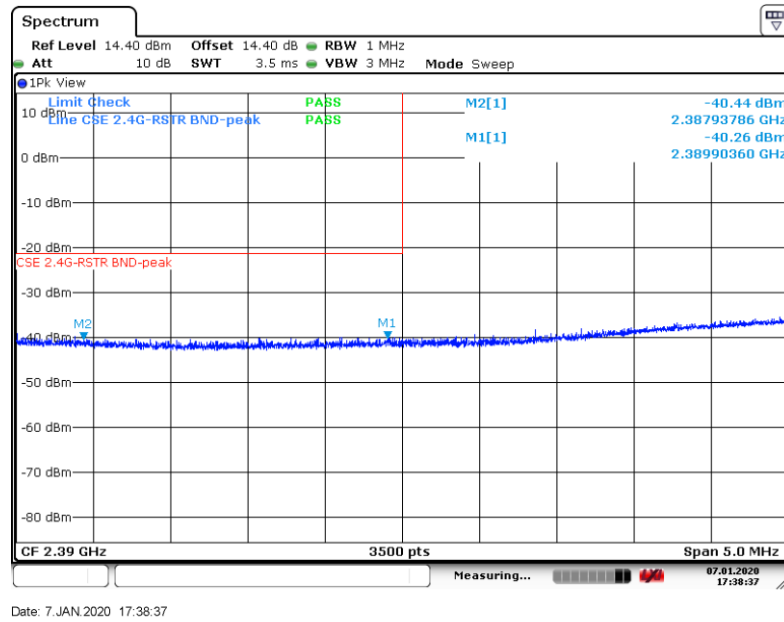


Figure 8.7-21: Restricted Band Edge emissions for low channel, Peak

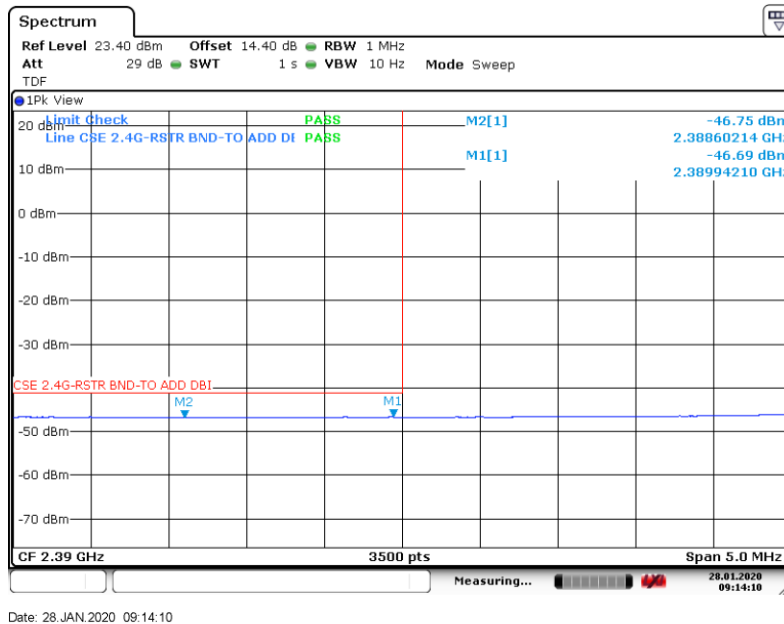


Figure 8.7-22: Restricted Band Edge emissions for low channel, Average

8.7.4 Test data, OFDM (802.11g) Modulation – Restricted Band Edge

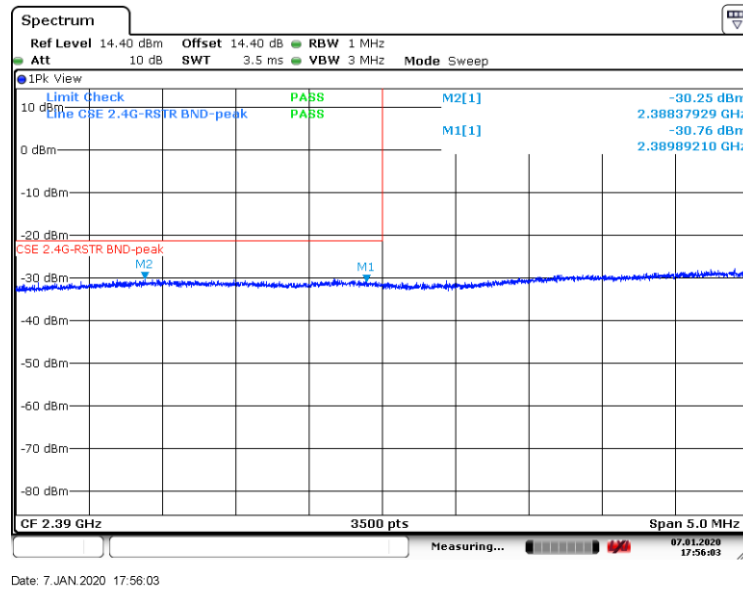


Figure 8.7-23: Restricted Band Edge emissions for low channel, Peak

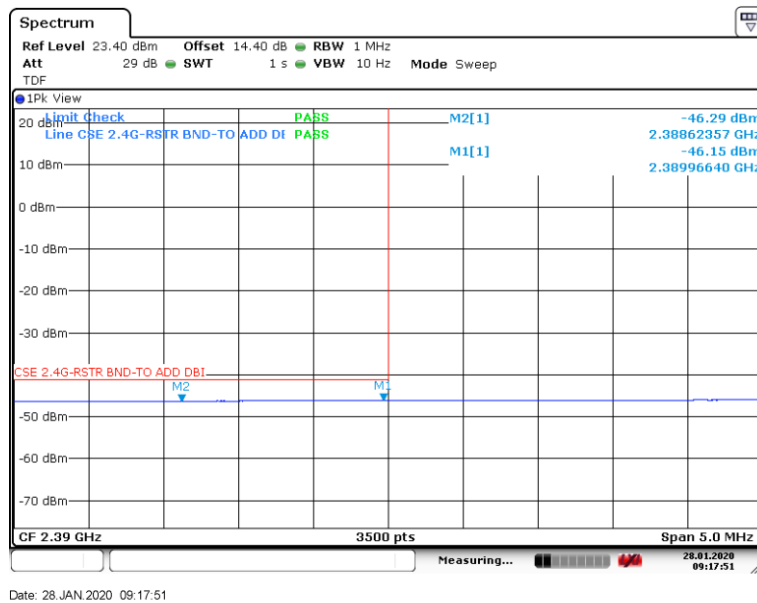


Figure 8.7-24: Restricted Band Edge emissions for low channel, Average

8.7.4 Test data, OFDM Modulation (802.11n.HT20) – Restricted Band Edge

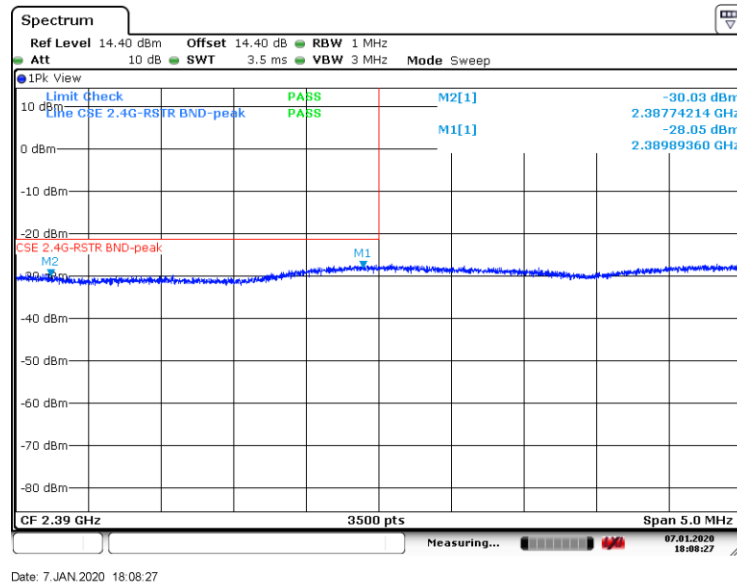


Figure 8.7-25: Restricted Band Edge emissions for low channel, Peak

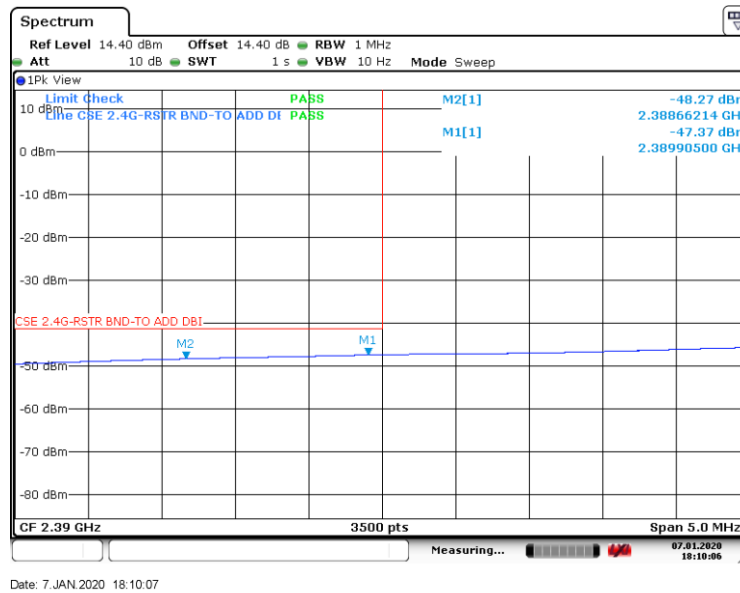


Figure 8.7-26: Restricted Band Edge emissions for low channel, Average

8.7.4 Test data, OFDM Modulation (802.11n.HT40)– Restricted Band Edge

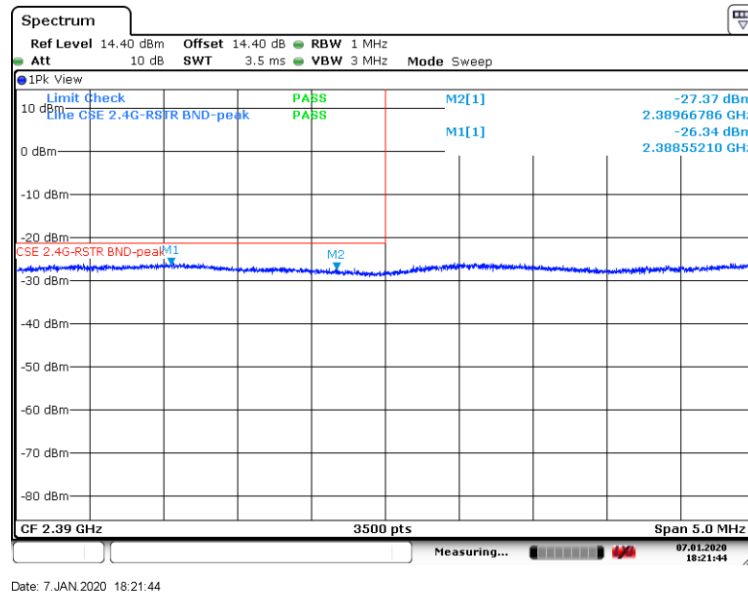


Figure 8.7-27: Restricted Band Edge emissions for low channel, Peak

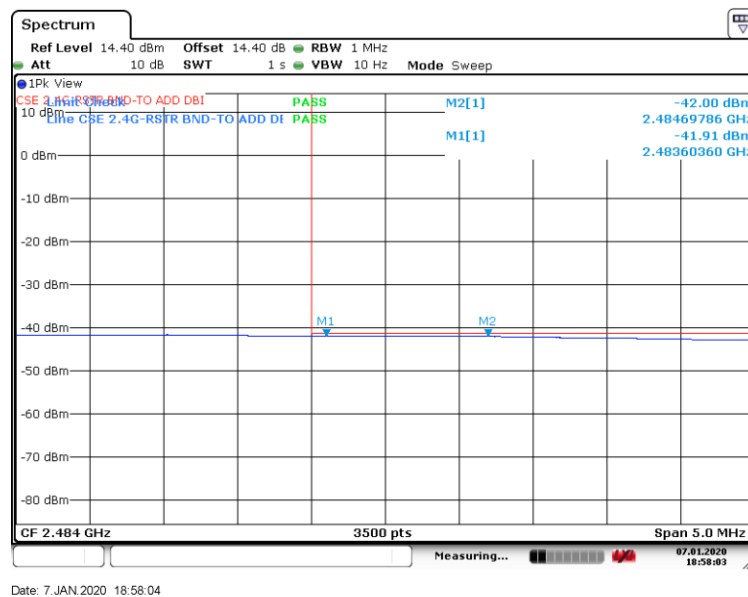


Figure 8.7-28: Restricted Band Edge emissions for low channel, Average

8.7.5 Test data, CCK modulation

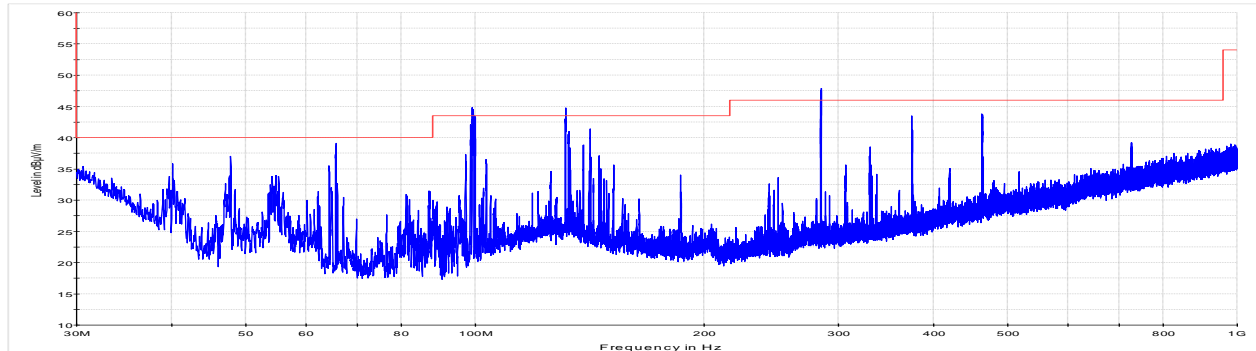


Figure 8.7-29: Cabinet Radiated spurious emissions for low channel 30 MHz to 1 GHz

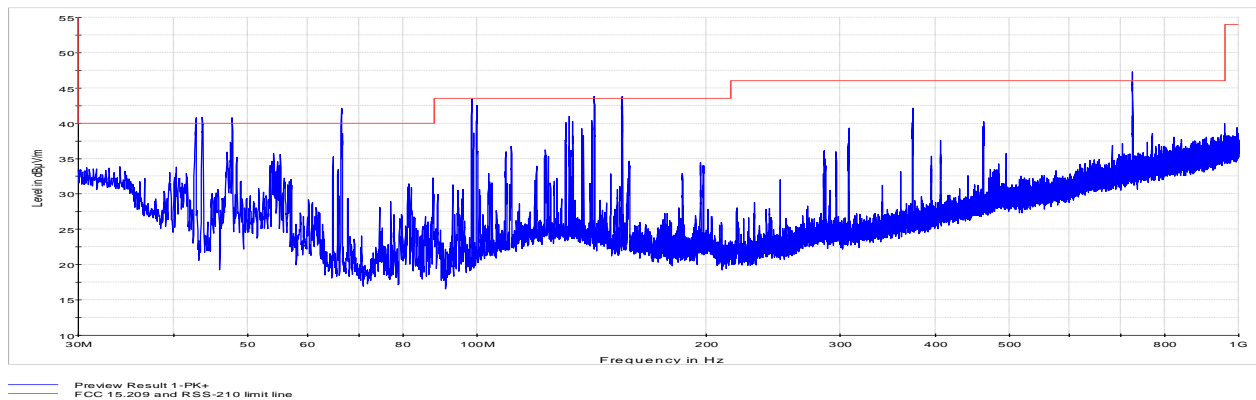


Figure 8.7-30: Cabinet Radiated spurious emissions for mid channel 30 MHz to 1 GHz

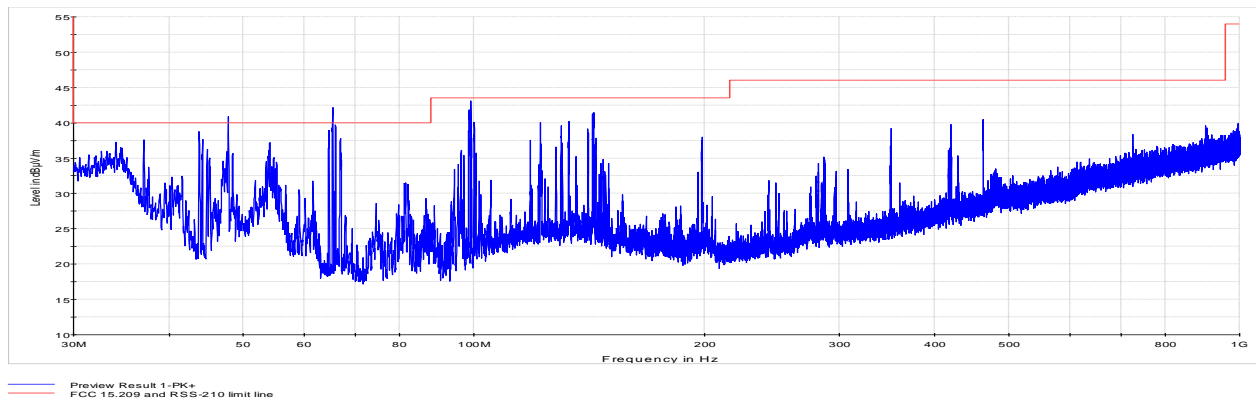


Figure 8.7-31: Cabinet Radiated spurious emissions for high channel 30 MHz to 1 GHz

8.7.6 Test data

Table 8.7-4: Radiated field strength measurement results

Channel	Frequency, MHz	Quasi Peak Field strength, dBμV/m		Margin, dB
		Measured	Limit	
Low	40.104	31.96	40.00	8.04
Low	47.783	39.28	40.00	0.72
Low	65.688	32.93	40.00	7.07
Low	98.708	29.32	43.50	14.18
Low	99.193	32.20	43.50	11.3
Low	99.476	32.97	43.50	10.53
Low	99.961	31.40	43.50	12.1
Low	131.446	36.15	43.50	7.35
Low	141.671	30.05	43.50	13.45
Low	186.049	22.35	43.50	21.15
Low	284.100	33.36	46.00	12.64
Low	284.342	36.91	46.00	9.09
Low	374.269	33.16	46.00	12.84
Low	462.580	34.04	46.00	11.96
Low	725.611	32.68	46.00	13.32
Mid	42.812	30.58	40.00	9.42
Mid	43.661	32.00	40.00	8.00
Mid	47.783	40.35	40.00	-0.35 ²
Mid	66.415	31.81	40.00	8.19
Mid	98.587	31.95	43.50	11.55
Mid	100.042	30.97	43.50	12.53
Mid	132.295	34.55	43.50	8.95
Mid	142.722	31.86	43.50	11.64
Mid	155.130	34.16	43.50	9.34
Mid	373.420	32.18	46.00	13.82
Mid	725.935	39.24	46.00	6.76
High	37.073	25.99	40.00	14.01
High	43.742	27.39	40.00	12.61
High	47.783	40.41	40.00	-0.41 ²
High	64.678	29.37	40.00	10.63
High	65.445	31.28	40.00	8.72
High	65.971	30.75	40.00	9.25
High	66.941	29.51	40.00	10.49
High	98.628	31.12	43.50	12.38
High	99.153	31.72	43.50	11.78
High	122.150	29.93	43.50	13.57
High	132.982	30.39	43.50	13.11
High	142.965	30.42	43.50	13.08
High	143.369	30.68	43.50	12.82
High	198.538	28.72	43.50	14.78
High	462.903	31.68	46.00	14.32

Note: 1.Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.
 2.Part 15.209 emissions limit only applied to emissions within restricted band. All other readings are for information purpose only.

8.7.7 Test data, CCK modulation

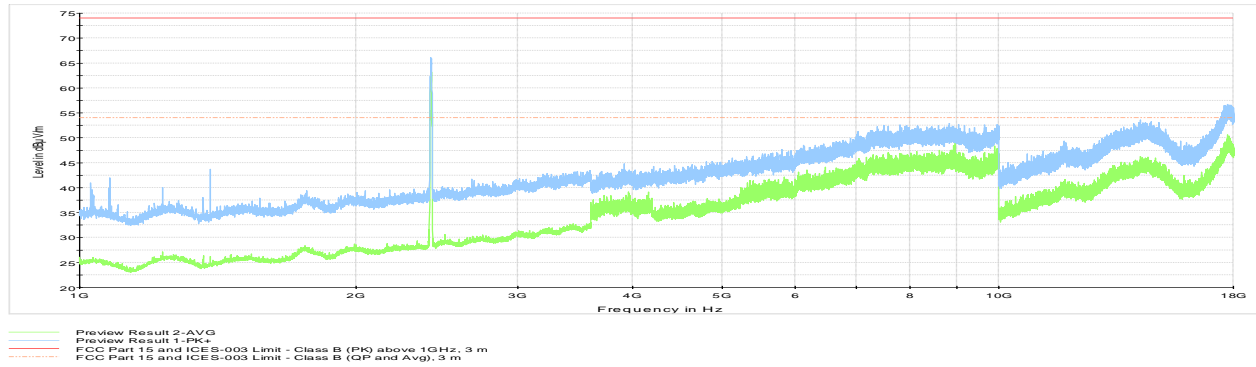


Figure 8.7-32: Cabinet Radiated spurious emissions for low channel 1 GHz to 18 GHz

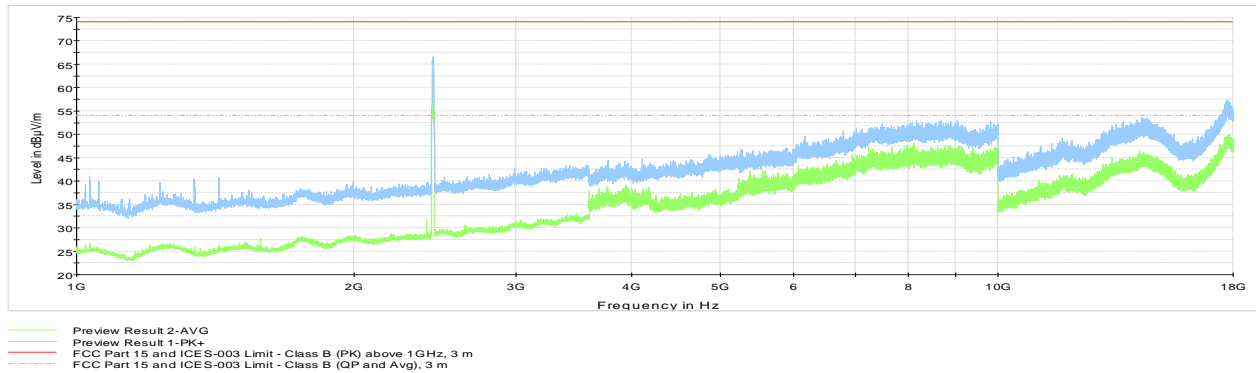


Figure 8.1 1: Cabinet Radiated spurious emissions for mid channel 1 GHz to 18 GHz

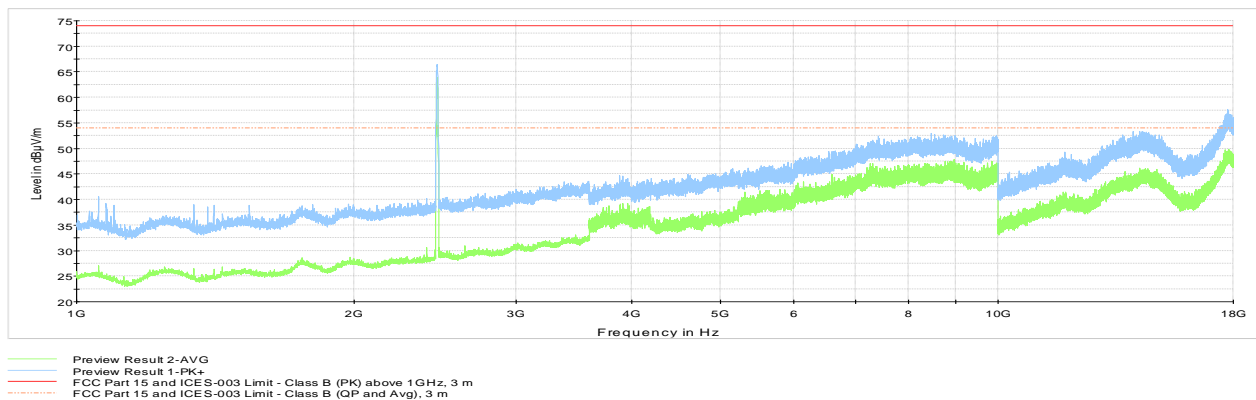


Figure 8.1 1: Cabinet Radiated spurious emissions for high channel 1 GHz to 18 GHz

Note: emissions at 2.4 GHz band is from intentional transmitter

8.8 FCC 15.247(e) and RSS-247 5.2(b) Power spectral density for digitally modulated devices (Wifi)

8.8.1 Definitions and limits

FCC:

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

(f) For the purposes of this section, hybrid systems are those that employ a combination of both frequency hopping and digital modulation techniques. The frequency hopping operation of the hybrid system, with the direct sequence or digital modulation operation turned-off, shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4. The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

ISED:

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of section 5.4(d), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

5.3 Hybrid systems

Hybrid systems employ a combination of both frequency hopping and digital transmission techniques and shall comply with the following:

- With the frequency hopping turned off, the digital transmission operation shall comply with the power spectral density requirements for digital modulation systems set out in of section 5.2(b) or section 6.2.4 for hybrid devices operating in the band 5725–5850 MHz.

8.8.2 Test date

Start date	November 25, 2019
------------	-------------------

8.8.3 Observations, settings and special notes

Power spectral density test was performed as per KDB 558074, section 8.4 with reference to ANSI C63.10 subclause 11.10.

The test was performed using method PKPSD (peak PSD).

Spectrum analyser settings:

Resolution bandwidth:	3 kHz ≤ RBW ≤ 100 kHz
-----------------------	-----------------------

Video bandwidth:	≥ 3 × RBW
------------------	-----------

Frequency span:	1.5 times the DTS BW (Peak)
-----------------	-----------------------------

Detector mode:	Peak
----------------	------

Trace mode:	Max Hold
-------------	----------

8.8.4 Test data, CCK Modulation

Table 8.8-1: *PSD measurements results*

Frequency, MHz	PSD, dBm/100 kHz	PSD limit, dBm/3 kHz	Margin, dB
2412	5.12	8.00	2.88
2437	4.93	8.00	3.07
2462	4.96	8.00	3.04

8.8.3 Test data, Continued, CCK Modulation

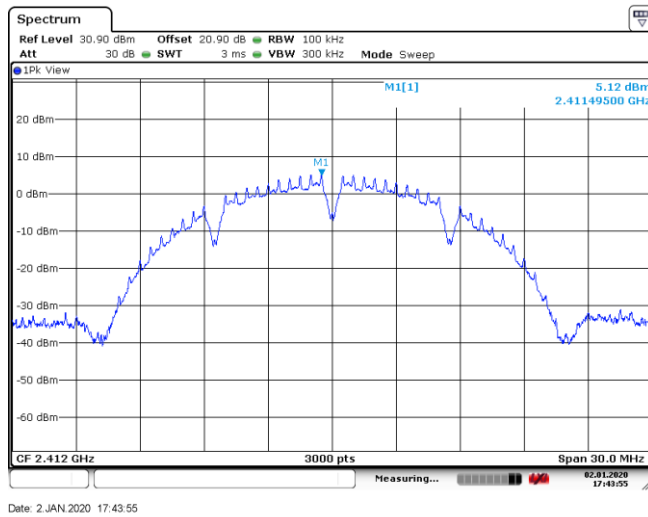


Figure 8.8-1: PSD on low channel

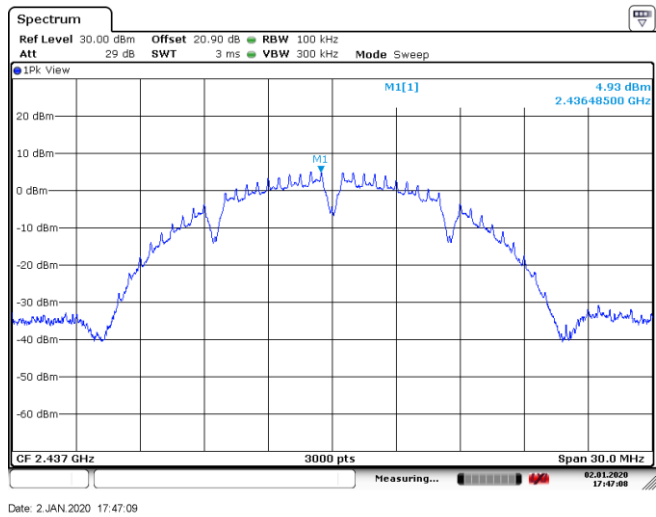


Figure 8.8-2: PSD on mid channel

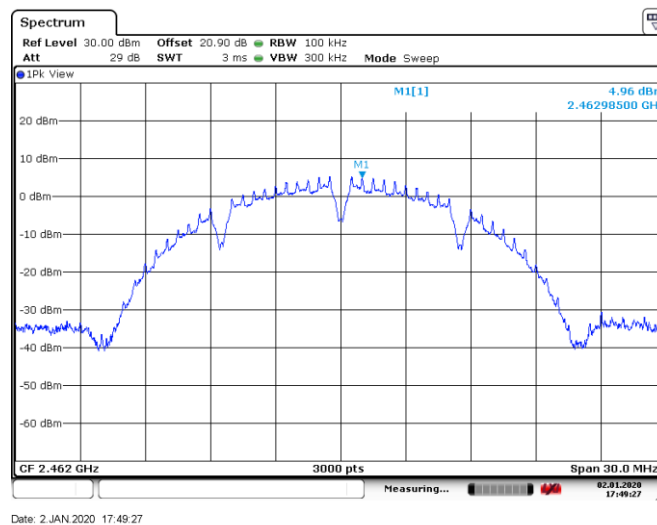


Figure 8.8-3: PSD on high channel

8.8.4 Test data, OFDM (802.11g) Modulation

Table 8.8-2: *PSD measurements results*

Frequency, MHz	PSD, dBm/100 kHz	PSD limit, dBm/3 kHz	Margin, dB
2412	2.54	8.00	5.46
2437	2.63	8.00	5.37
2462	3.00	8.00	5.00

8.8.4 Test data, OFDM (802.11g) Modulation, Continued

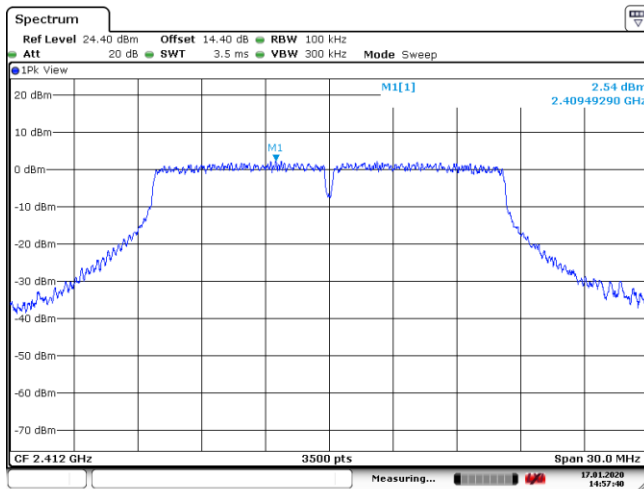


Figure 8.8-4: PSD on low channel

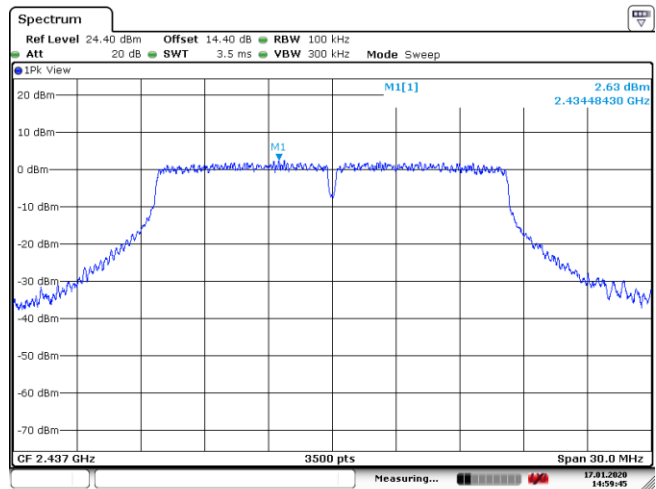


Figure 8.8-5: PSD on mid channel

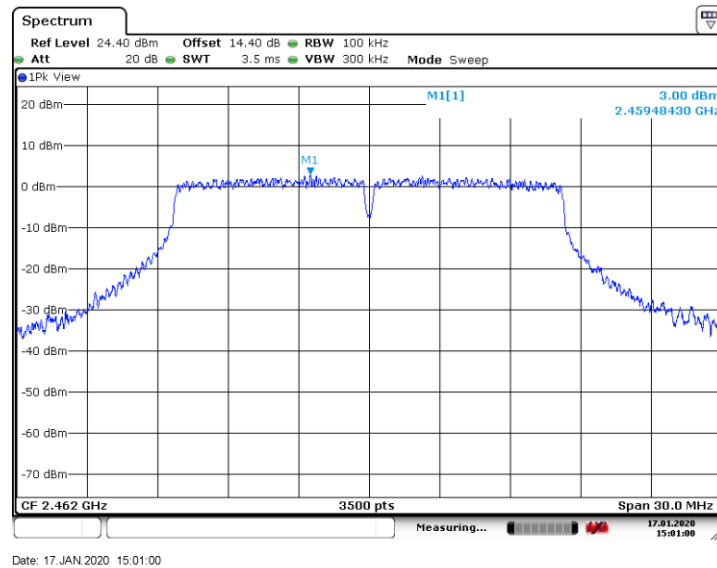


Figure 8.8-6: PSD on high channel



8.8.5 Test data, OFDM Modulation (802.11n.HT20)

Table 8.8-3: *PSD measurements results*

Frequency, MHz	PSD, dBm/100 kHz	PSD limit, dBm/3 kHz	Margin, dB
2412	-1.01	8.00	9.01
2437	-0.44	8.00	8.44
2462	-0.14	8.00	8.14

8.8.5 Test data, OFDM Modulation (802.11n.HT20), Continued

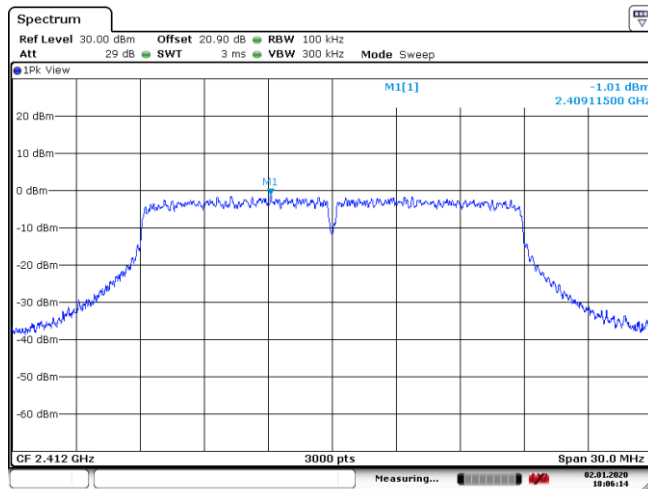


Figure 8.8-7: PSD on low channel

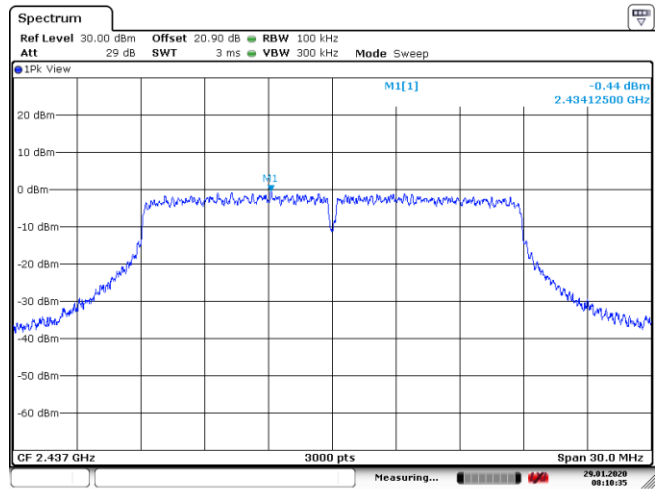


Figure 8.8-8: PSD on mid channel

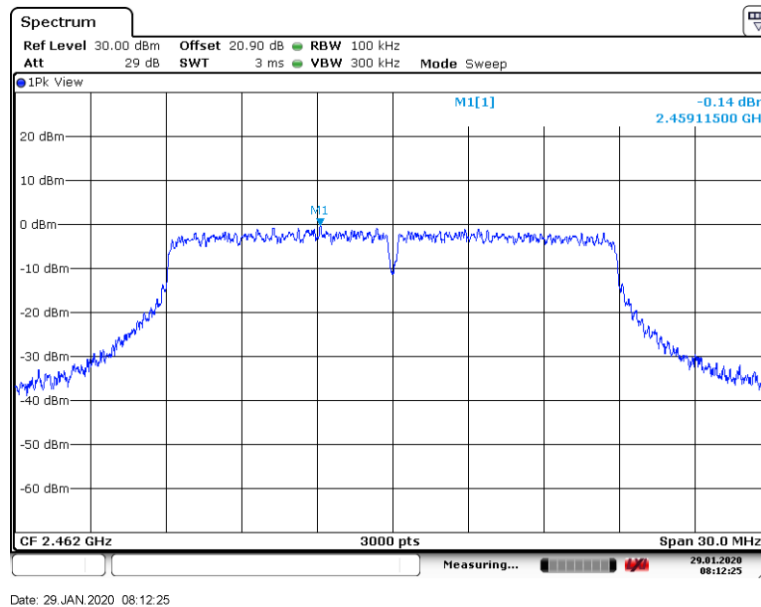


Figure 8.8-9: PSD on high channel

8.8.6 Test data, OFDM Modulation (802.11n.HT40)

Table 8.8-4: PSD measurements results

Frequency, MHz	PSD, dBm/100 kHz	PSD limit, dBm/3 kHz	Margin, dB
2422	-3.51	8.00	11.51
2437	-4.10	8.00	12.10
2452	-3.76	8.00	11.76

8.8.6 Test data, OFDM Modulation (802.11n.HT40), Continued

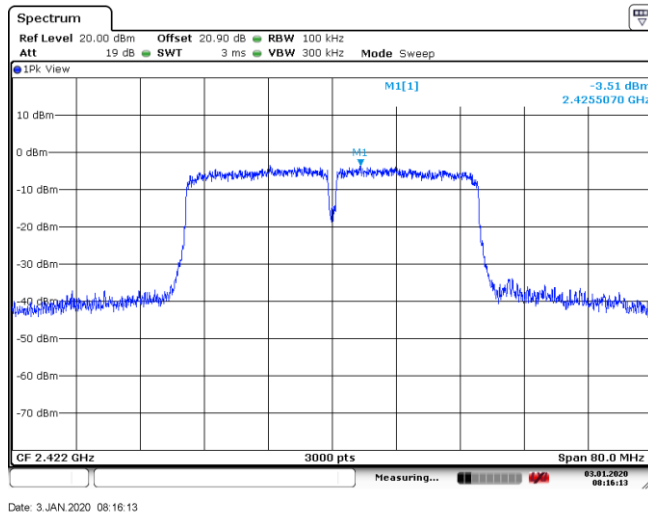


Figure 8.8-10: PSD on low channel

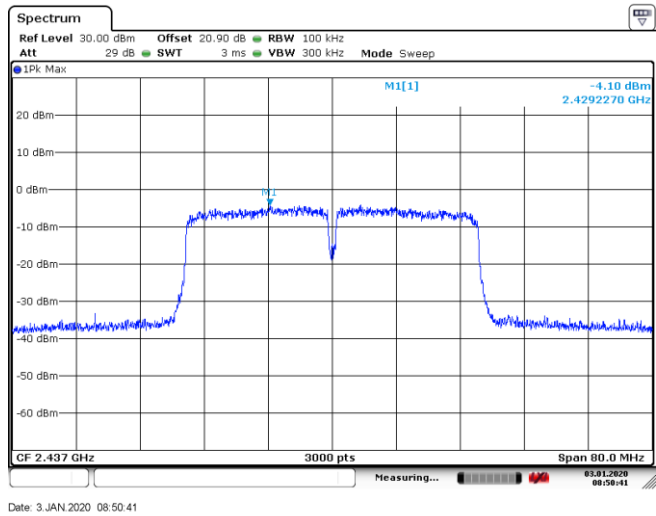


Figure 8.8-11: PSD on mid channel

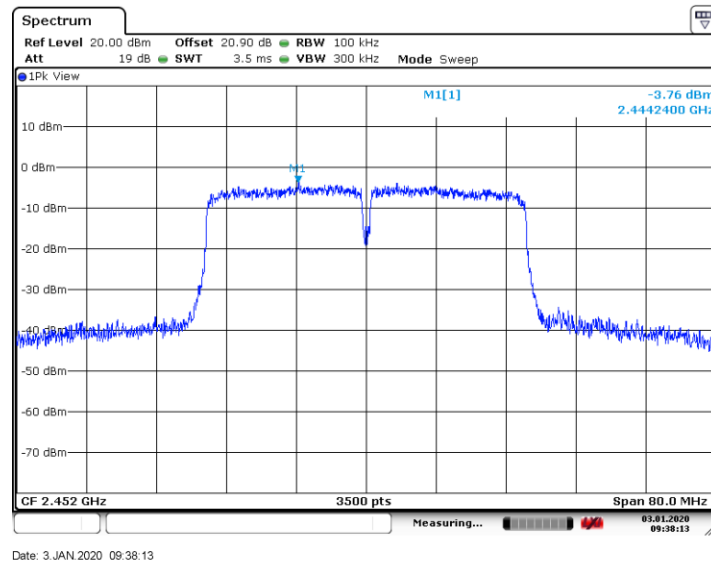
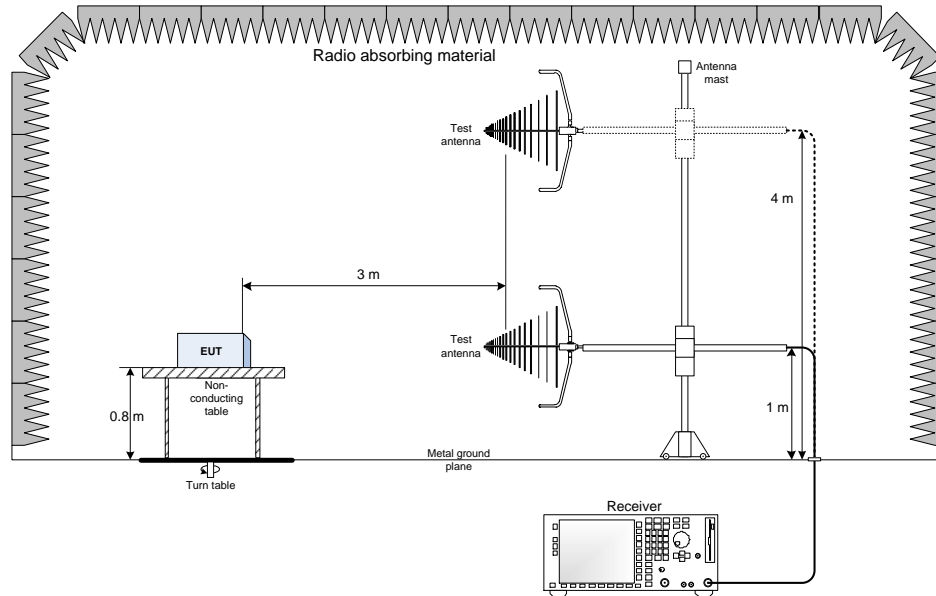


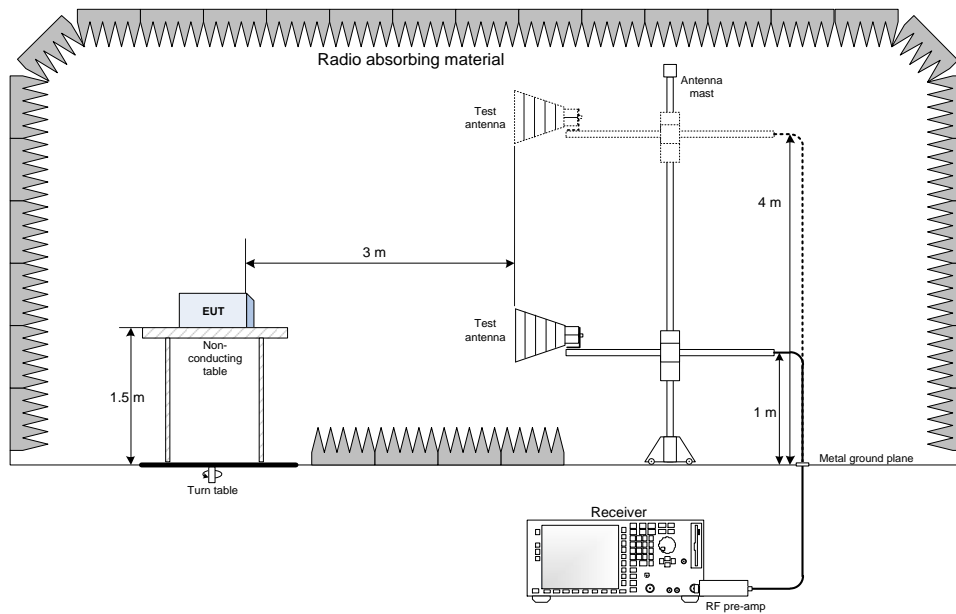
Figure 8.8-12: PSD on high channel

Section 9. Block diagrams of test set-ups

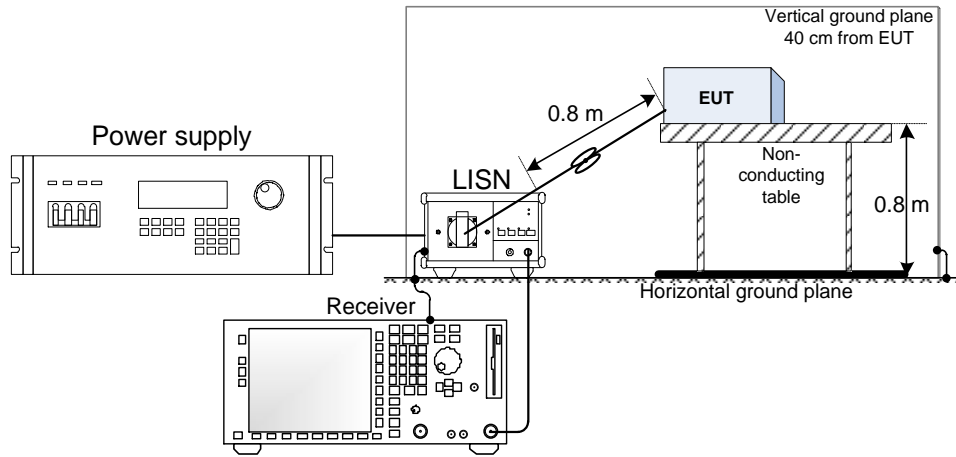
9.1 Radiated emissions set-up for frequencies below 1 GHz



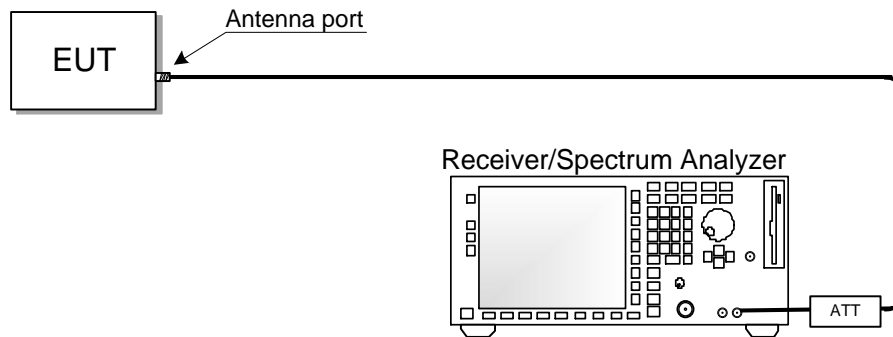
9.2 Radiated emissions set-up for frequencies above 1 GHz



9.3 Conducted emissions set-up



9.4 Antenna port set-up



(End of Report)