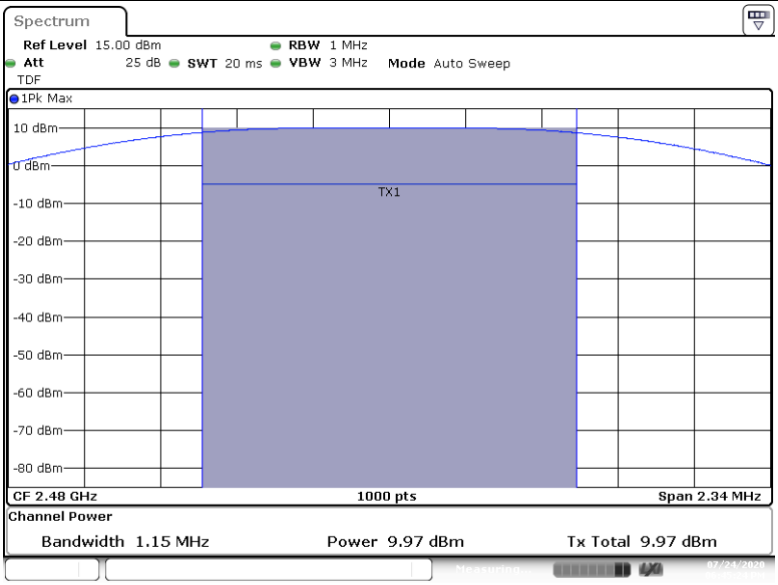
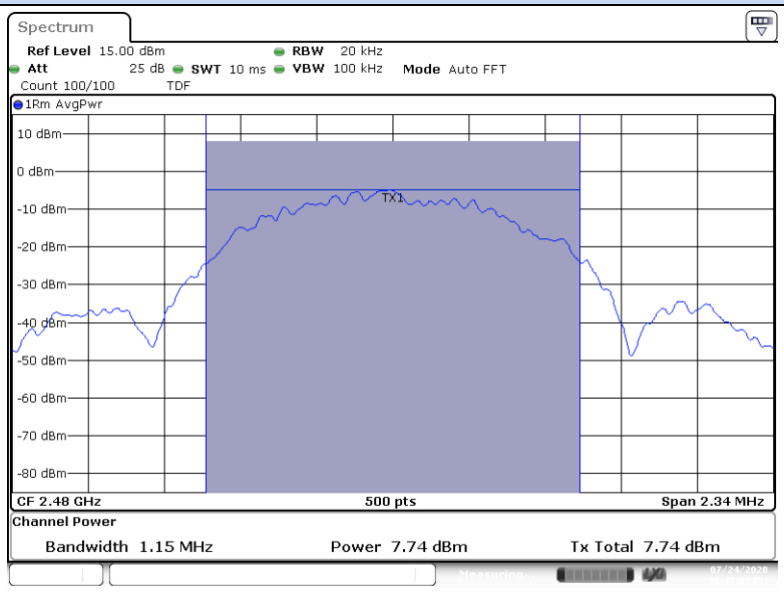
BLE

Max Power Peak – 2480 MHz



Date: 24.JUL.2020 18:45:25

Max Power RMS – 2480 MHz



Date: 24.JUL.2020 18:45:03

B.4.3 Power Spectral Density

Test limits

FCC part	RSS part	Limits
15.247 (e)	RSS-247 Clause 5.2 (b)	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.

Test procedure

The maximum peak power spectral density level of the fundamental emission was measured using the method PKPSD, defined in paragraph 11.10.2 of ANSI C63.10-2013.

The conducted setup shown in section *Test & System Description* was used to measure the power spectral density. The antenna terminal of the EUT is connected to the spectrum through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.

The declared maximum antenna gain is +3.24dBi.

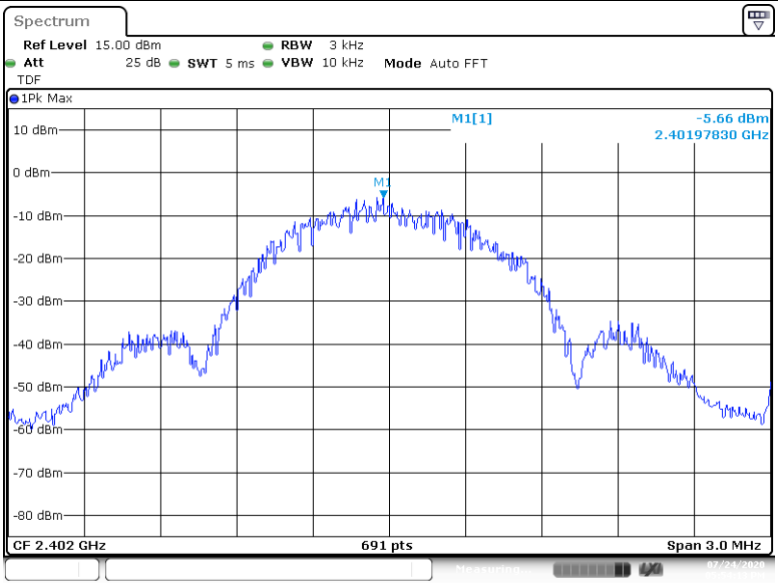
Results tables

Mode	CH	Frequency [MHz]	PSD Peak [dBm/3kHz]	PSD Peak* [dBm/100kHz]
BLE	0	2402	-5.66	9.34
	19	2440	-5.69	9.45
	39	2480	-5.62	9.78

*Note: these PSD_{Peak} values are shown just as a reference for the compliance of the Out-of-band Measurements. Thus the RBW used for these measurements was 100kHz.

BLE

PSD Peak – 2402 MHz



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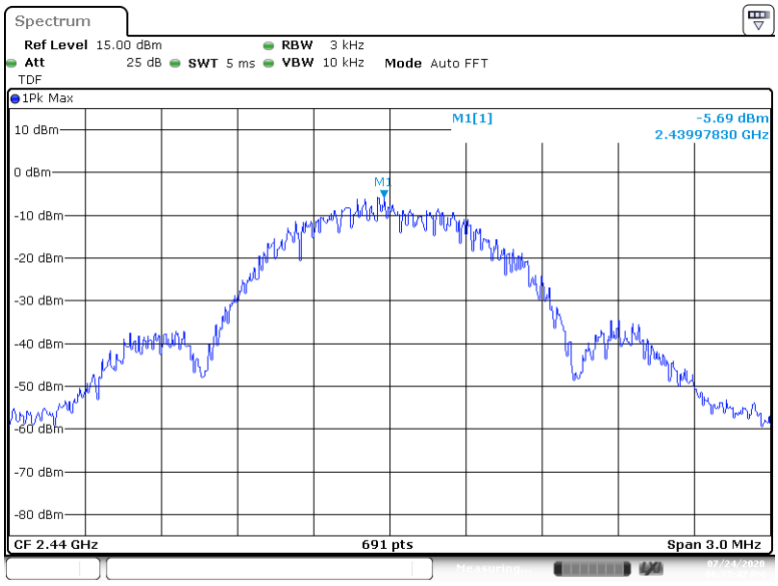
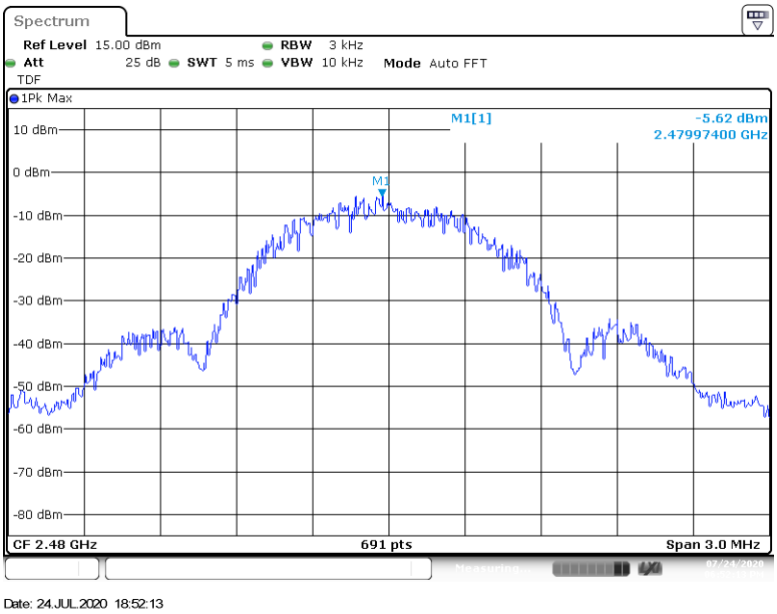
PSD Peak – 2440 MHz



Date: 24.JUL.2020 18:37:48

PSD Peak – 2480 MHz


B.4.4 Out-of-band emission (Conducted)

Test Limits

<table>
<tr><th>FCC part</th><th>RSS part</th><th>Limits</th></tr>
<tr><td>15.247 (d)</td><td>RSS-247
Clause 5.5</td><td>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.</td></tr>
<tr><td>15.209</td><td>RSS-Gen A1
Clause 8.9</td><td>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):
<table>
<tr><th>Freq Range (MHz)</th><th>Field Stregth (µV/m)</th><th>Field Stregth (dBµV/m)</th><th>Meas. Distance (m)</th></tr>
<tr><td>30-88</td><td>100</td><td>40</td><td>3</td></tr>
<tr><td>88-216</td><td>150</td><td>43.5</td><td>3</td></tr>
<tr><td>216-960</td><td>200</td><td>46</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>54</td><td>3</td></tr>
</table>
The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
For average radiated emission measurements above 1000 MHz, there is also a limit specified when measuring with peak detector function, corresponding to 20 dB above the indicated values in the table.</td></tr>
</table>

Test procedure

In case of band edge measurements falling in restricted bands, the declared Antenna Gain is also compensated in the graph. The declared maximum antenna gain is +3.24dBi.

For band edge measurements falling in restricted bands, the following limits in dBm were applied for the average detector after the conversion from the limits detailed above in dBµV/m, according to FCC 47 CFR part 15 - Subpart C – §15.209(a). The limits in dBm for peak detector are 20dB above the indicated values in the table.

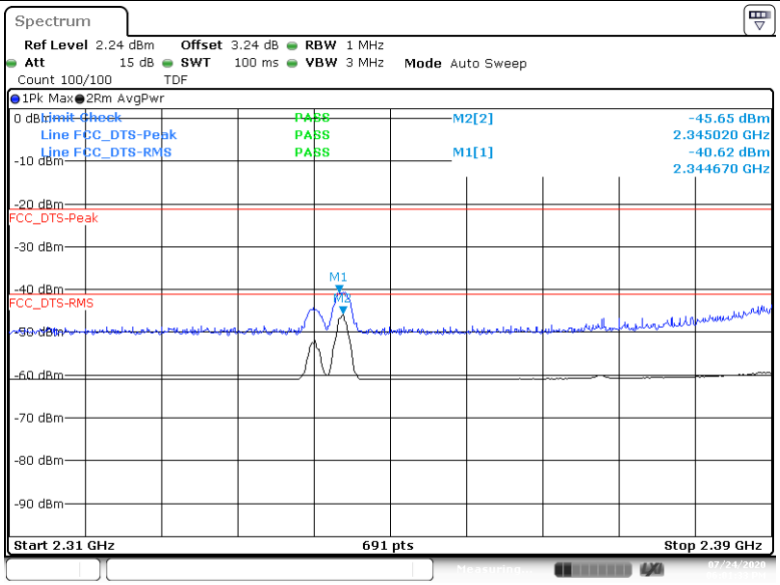
§15.209(a)			Converted values	
Freq Range (MHz)	Distance (m)	Field strength (microvolts/meter)	Field strength (dB microvolts/meter)	Power (dBm)
Above 960	3	500	54.0	-41.2

The conducted setup shown in section *Test & System Description* was used to measure the out-of-band emissions. The antenna terminal of the EUT is connected to the spectrum through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.

Note: For the compliance of the out-of-band Measurements, PSD_{Peak} were measured with 100kHz RBW and values are shown just as a reference in section B.4.3.

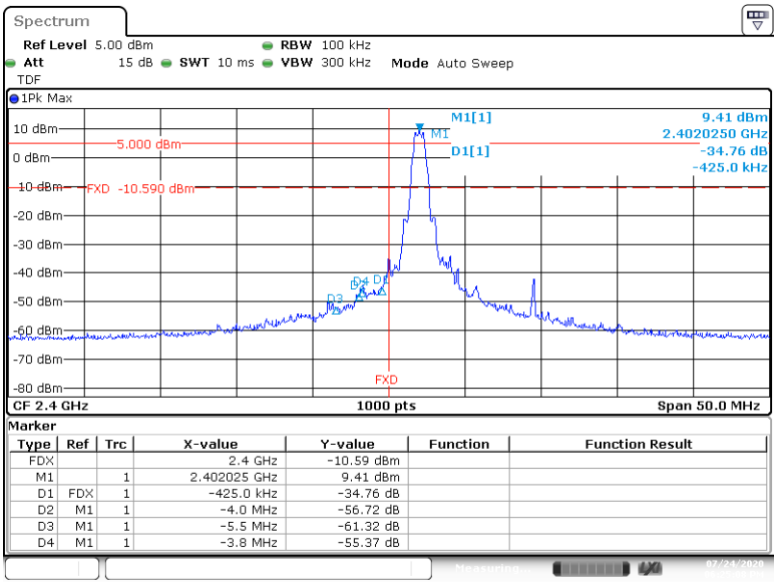
BLE

BE Low Freq Section(Restricted) – 2402 MHz



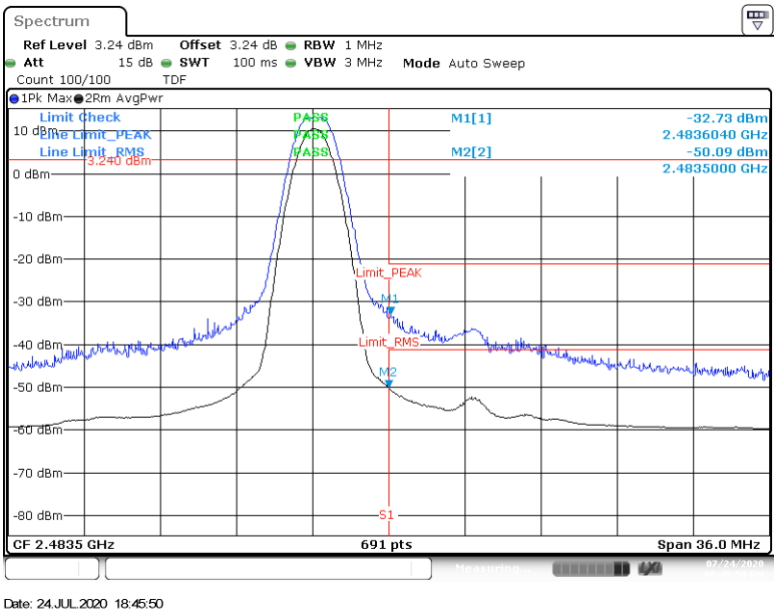
Date: 24.JUL.2020 18:01:33

BE Low (Non Restricted) – 2402 MHz



Date: 24.JUL.2020 18:25:08

BE High Freq Section (Restricted) – 2480 MHz



B.4.5 Radiated spurious emission

Standards references

<table>
<tr><th>FCC part</th><th>RSS part</th><th>Limits</th></tr>
<tr><td>15.247 (d)
15.209</td><td>RSS-247
Clause 5.5
RSS-Gen A1
Clause 8.9</td><td>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):
<table>
<tr><th>Freq Range (MHz)</th><th>Field Stregth (µV/m)</th><th>Field Stregth (dBµV/m)</th><th>Meas. Distance (m)</th></tr>
<tr><td>30-88</td><td>100</td><td>40</td><td>3</td></tr>
<tr><td>88-216</td><td>150</td><td>43.5</td><td>3</td></tr>
<tr><td>216-960</td><td>200</td><td>46</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>54</td><td>3</td></tr>
</table>
The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
For average radiated emission measurements above 1000 MHz, there is also a limit specified when measuring with peak detector function, corresponding to 20 dB above the indicated values in the table.</td></tr>
</table>

Test procedure

The radiated setups shown in section *Test & System Description* were used to measure the radiated spurious emissions. Depending of the frequency range and bands being tested, different antennas and filters were used.
The final measurement is done by varying the antenna height from 1 to 4 meters, the EUT azimuth over 360º and for both Vertical and Horizontal polarizations.
The radiated spurious emissions were measured on the lowest, middle and highest channels.

Test Results

Radiated Spurious - 30 MHz – 1 GHz

Frequency	Quasi-Peak	Limit	Margin	Polarization
MHz	dBµV/m	dBµV/m	dB	
260.2	33.4	46.0	12.6	H
277.6	32.6	46.0	13.4	H

Note 1: The spurious signals detected do not depend on either the operating channel or the modulation mode.

1 GHz – 26.5 GHz, BLE

Radiated Spurious – CH0

Frequency	MaxPeak	Avg	Limit	Margin	Polarization
MHz	dBµV/m	dBµV/m	dBµV/m	dB	
3381.5	---	47.8	54.0	**6.2**	V
3381.5	60.8	---	74.0	13.2	V
17838.5	---	39.6	54.0	14.4	H
17840.0	52.1	---	74.0	21.9	V
25924.6	49.5	---	74.0	24.5	V
25924.6	---	37.5	54.0	16.5	H

Radiated Spurious – CH19

Frequency	MaxPeak	Avg	Limit	Margin	Polarization
MHz	dBµV/m	dBµV/m	dBµV/m	dB	
3385.0	---	47.7	54.0	6.3	V
3385.0	60.6	---	74.0	13.4	V
17826.0	---	39.6	54.0	14.4	V
17838.5	52.3	---	74.0	21.6	V
24292.19	48.3	---	74.0	25.7	H
24292.19	---	37.0	54.0	17.0	H

Radiated Spurious – CH39

Frequency	MaxPeak	Avg	Limit	Margin	
MHz	dBµV/m	dBµV/m	dBµV/m	dB	
3325.0	---	47.6	54.0	6.40	V
3325.0	61.45	---	74.0	12.55	H
17944.5	52.42	---	74.0	21.58	V
17993.5	---	39.81	54.0	14.19	V
25917.81	48.9	---	74.0	25.1	V
25917.81	---	37.6	54.0	16.4	H