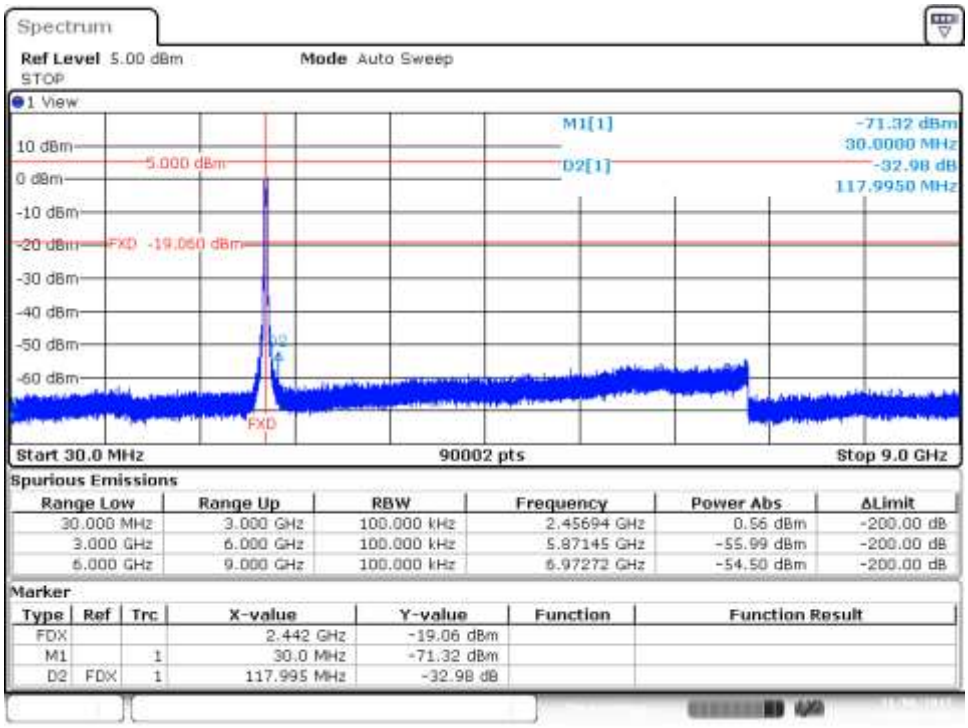
CHAIN A DIV2, 802.11n40, HT0

Channel 7F - Spurious 1 Delta Marker Measurement



Spurious Emissions

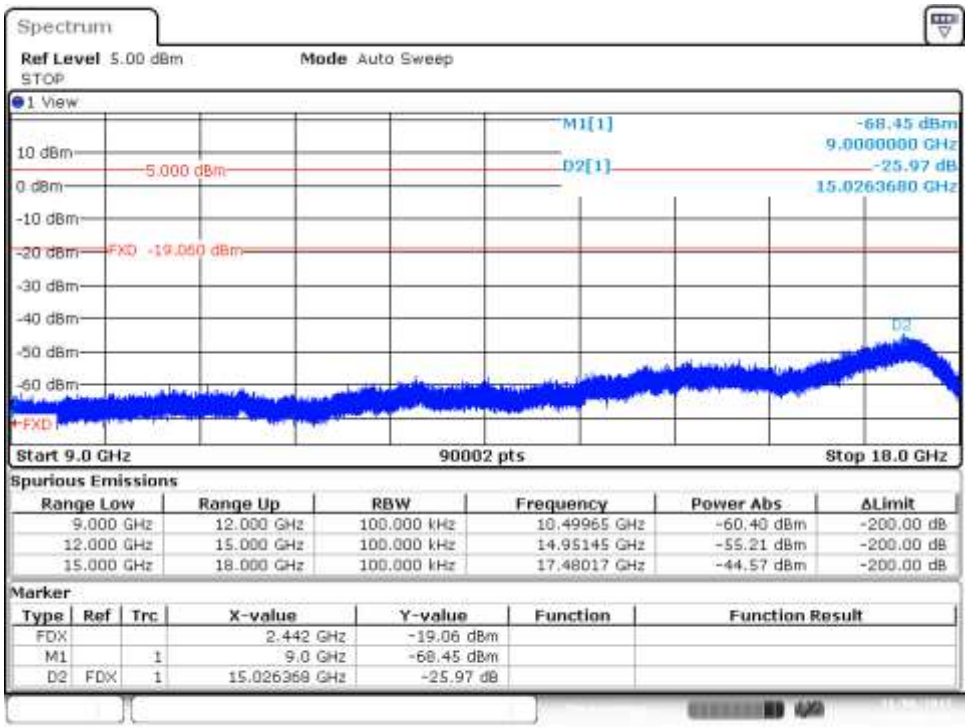
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	3.000 GHz	100.000 kHz	2.45694 GHz	0.56 dBm	-200.00 dB
3.000 GHz	6.000 GHz	100.000 kHz	5.87145 GHz	-55.99 dBm	-200.00 dB
6.000 GHz	9.000 GHz	100.000 kHz	6.97272 GHz	-54.50 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.442 GHz	-19.06 dBm		
M1		1	30.0 MHz	-71.32 dBm		
D2	FDX	1	117.995 MHz	-32.98 dB		

Date: 8.NOV.2017 11:53:23

Channel 7F - Spurious 2 Delta Marker Measurement



Spurious Emissions

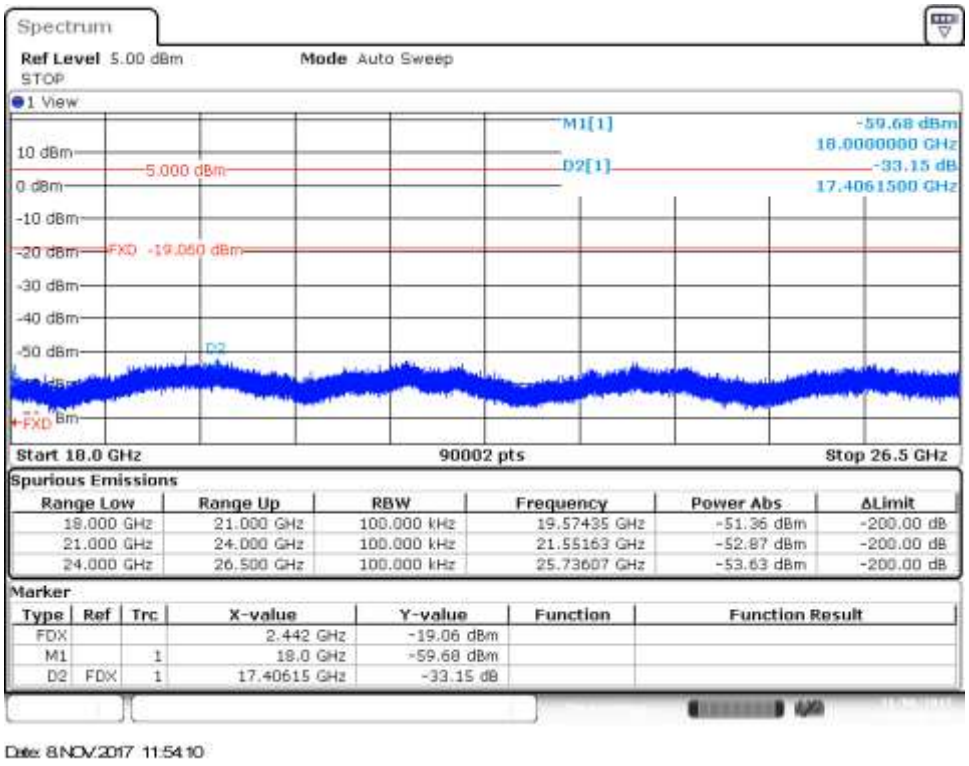
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 GHz	12.000 GHz	100.000 kHz	10.49965 GHz	-60.40 dBm	-200.00 dB
12.000 GHz	15.000 GHz	100.000 kHz	14.95145 GHz	-55.21 dBm	-200.00 dB
15.000 GHz	18.000 GHz	100.000 kHz	17.48017 GHz	-44.57 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.442 GHz	-19.06 dBm		
M1		1	9.0 GHz	-68.45 dBm		
D2	FDX	1	15.026368 GHz	-25.97 dB		

Date: 8.NOV.2017 11:53:46

Channel 7F - Spurious 3 Delta Marker Measurement



Annex C. Test Results BLE

C.1 Test Results BLE

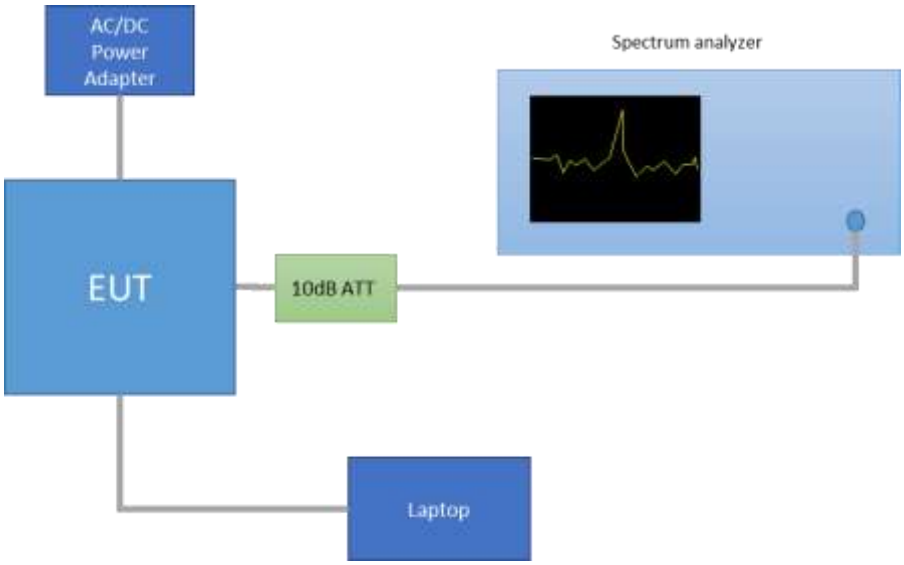
C.1.1 6dB & 99% Bandwidth

Test limits

FCC part	RSS part	Limits
15.247 (a) (2)	RSS-247 Clause 5.2 (a)	Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test procedure

The setup below was used to measure the 6dB & 99% Bandwidth. 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.



Results tables

Mode	Antenna	Channel	Frequency [MHz]	6dB BW [MHz]	99% BW [MHz]
BLE	Div 1	0	2402	0.64	1.16
		19	2440	0.64	1.15
		39	2480	0.65	1.15
BLE	Div 2	0	2402	0.64	1.15
		19	2440	0.65	1.15
		39	2480	0.65	1.15

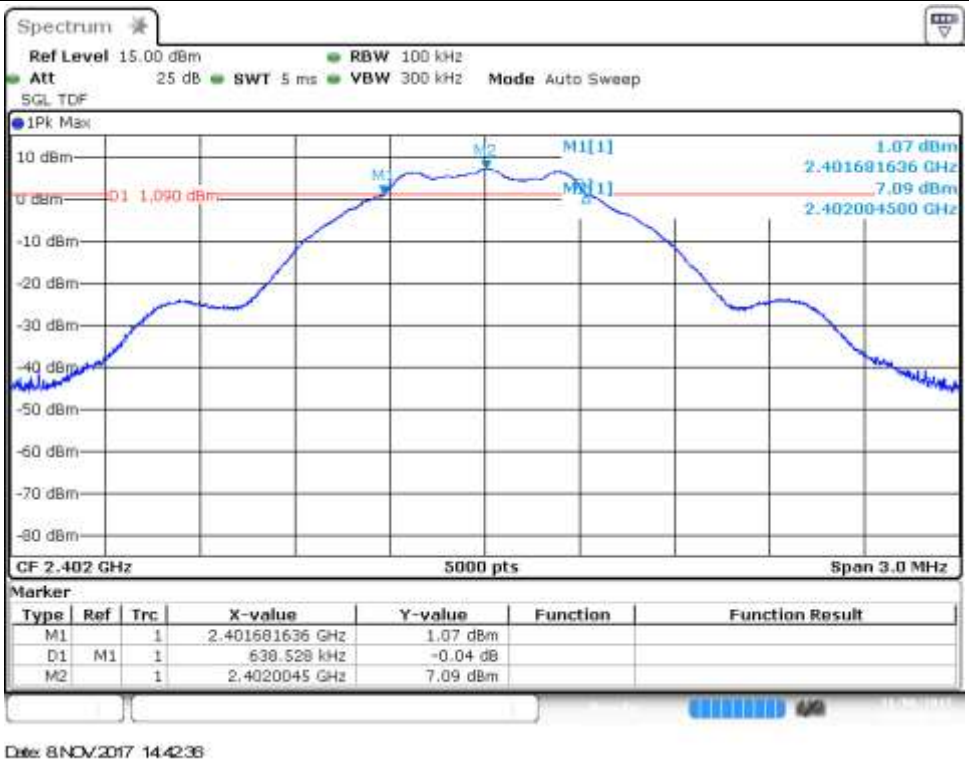
Results screenshot

BLE

CHAIN A DIV1_6dB BW – CH0

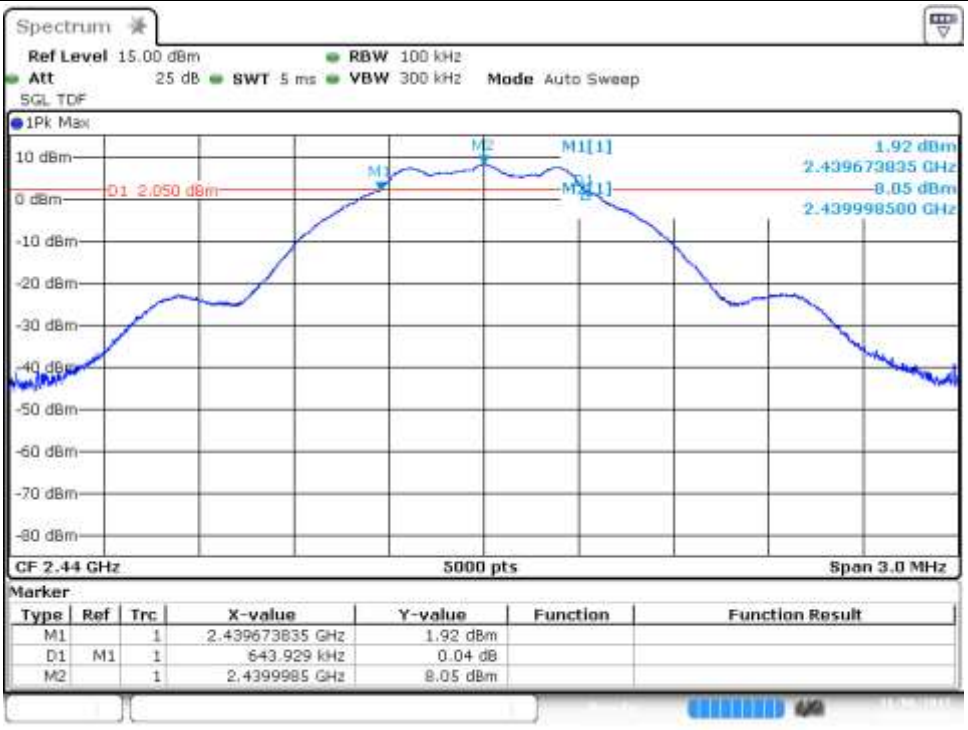
CHAIN A DIV1_99% BW – CH0

CHAIN A DIV2_6dB BW – CH0



CHAIN A DIV2_99% BW – CH0

CHAIN A DIV1_6dB BW – CH19

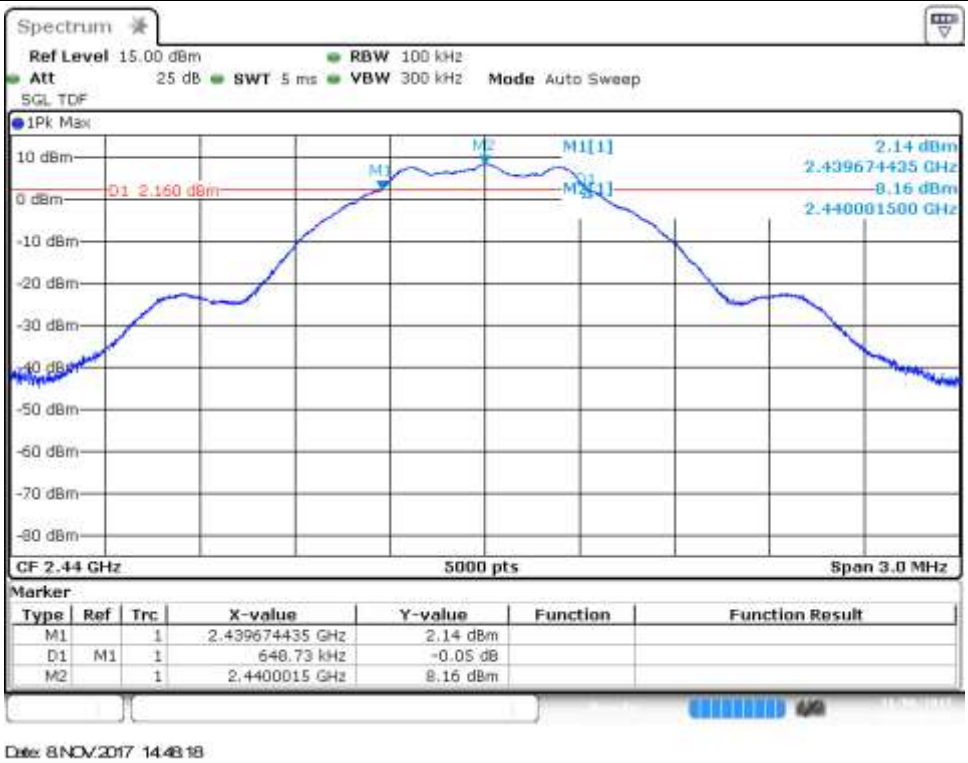


Date: 8.NOV.2017 15:21:59

CHAIN A DIV1_99% BW – CH19

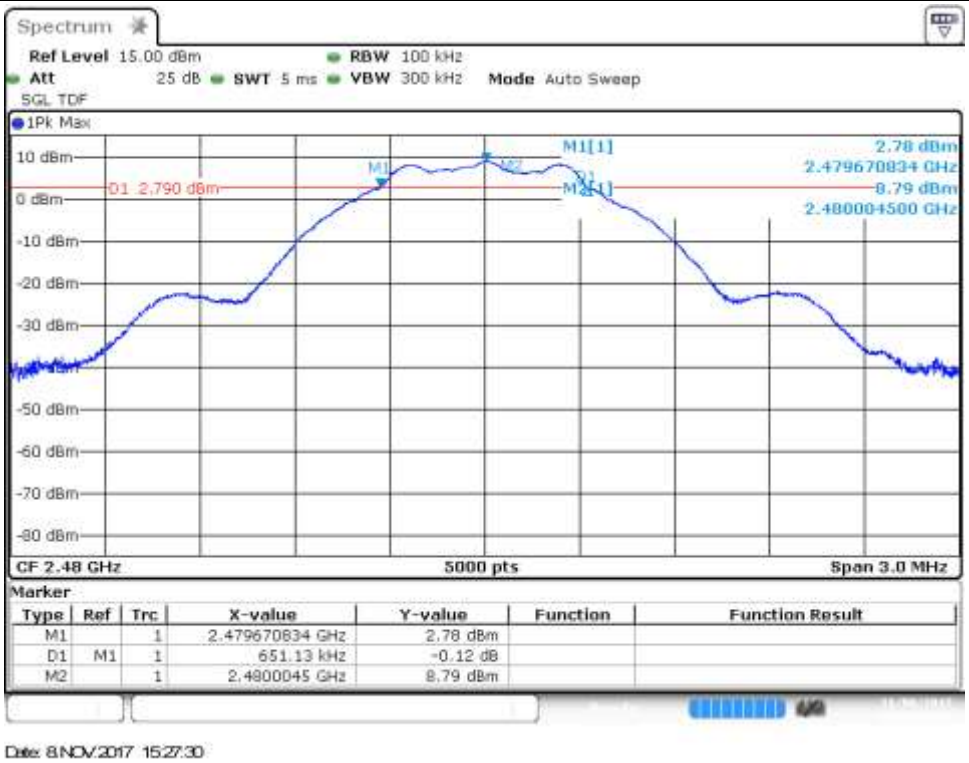
Date: 8.NOV.2017 15:21:08

CHAIN A DIV2_6dB BW – CH19



CHAIN A DIV2_99% BW – CH19

CHAIN A DIV1_6dB BW – CH39



CHAIN A DIV1_99% BW – CH39

CHAIN A DIV2_6dB BW – CH39

CHAIN A DIV2_99% BW – CH39

C.1.2 Maximum Output Power and antenna gain

Test limits

	Limits
FCC Part 15.247 (b) (3)	(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. (4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi.
RSS-247 Clause 5.4 (d)	For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e). As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode

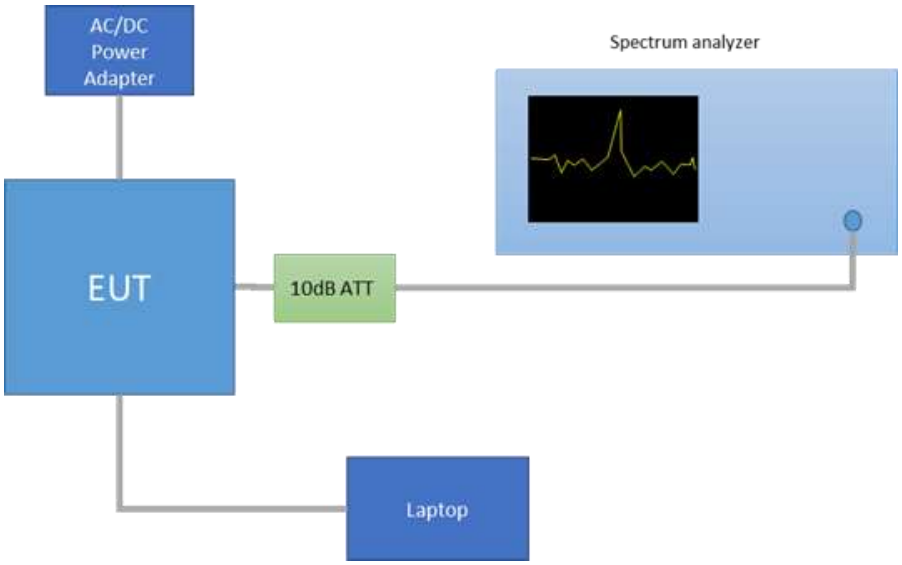
Test procedure:

The Maximum peak conducted output power was measured using the *RBW ≥ DTS bandwidth* method defined in paragraph 9.1.1 of FCC KDB 558074 D01 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

The Maximum conducted average output power was measured using the channel integration method according to Method AVGSA-2, defined in paragraph 9.2.2.4 of FCC KDB 558074 D01 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power. The declared maximum antenna gain is 3.24dBi.

The setup below was used to measure the maximum conducted output power. 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.



Results tables

Mode	Antenna	Meas. Duty Cycle [%]	CH	Frequency [MHz]	Peak Power [dBm] Measured Conducted Output Power	EIRP	Peak Output Power [mW]
BLE	Div 1	61.9%	0	2402	7.27	10.51	**5.33**
			19	2440	8.39	11.63	6.90
			39	2480	9.14	12.38	8.20
	Div 2	61.9%	0	2402	7.34	10.58	5.42
			19	2440	8.45	11.69	7.00
			39	2480	9.18	12.42	**8.28**

Max Value
Min Value

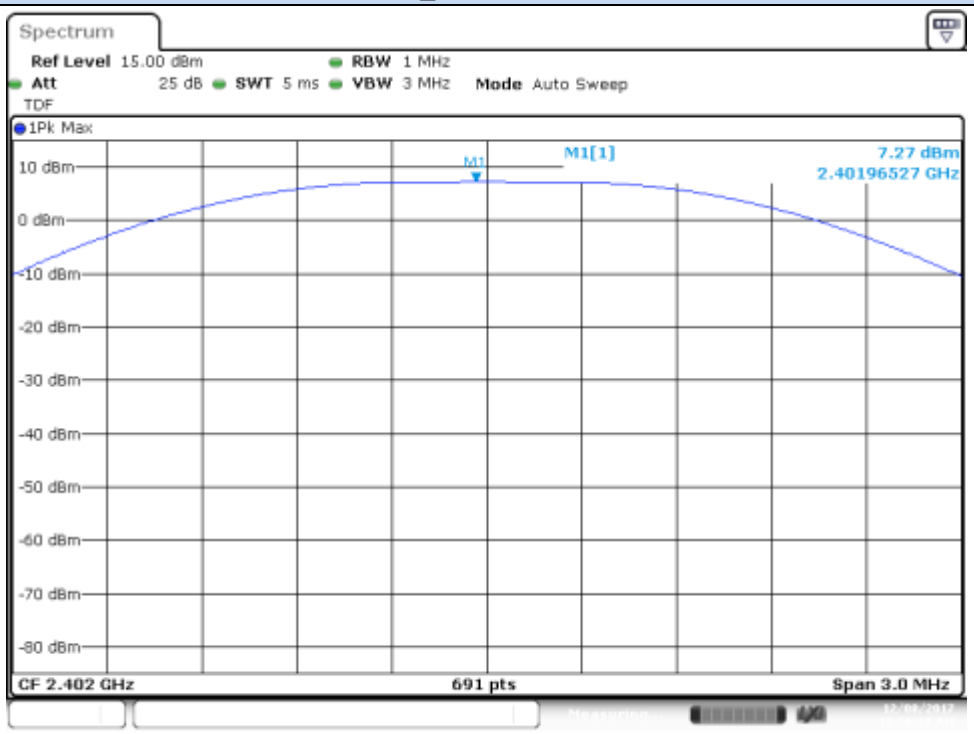
Mode	Antenna	Meas. Duty Cycle [%]	CH	Frequency [MHz]	Average Output Power* [dBm] Maximum Conducted Output Power	Maximum Conducted Output Power Duty cycle Compensated	EIRP	Average Output Power [mW]
BLE	Div 1	61.9%	0	2402	4.92	7.00	10.24	5.02
			19	2440	6.04	8.12	11.36	6.49
			39	2480	6.79	8.87	12.11	7.71
	Div 2	61.9%	0	2402	5.08	7.16	10.40	5.20
			19	2440	6.15	8.23	11.47	6.66
			39	2480	6.85	8.93	12.17	7.82

* Output Power RMS values are shown for indicative purpose only

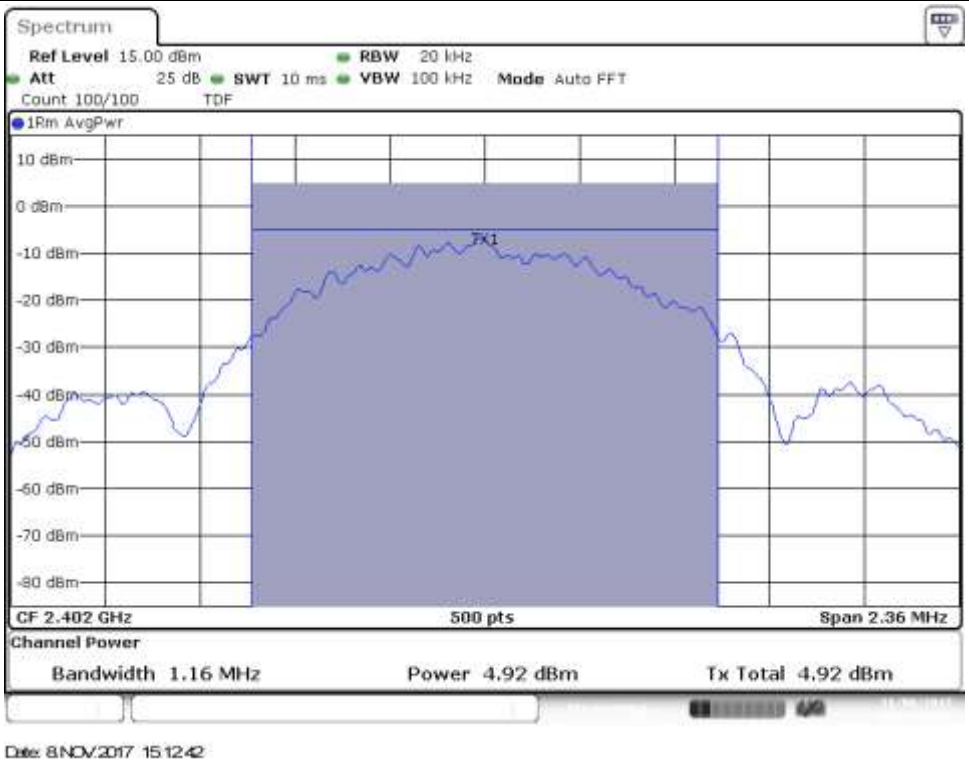
Results screenshot

BLE

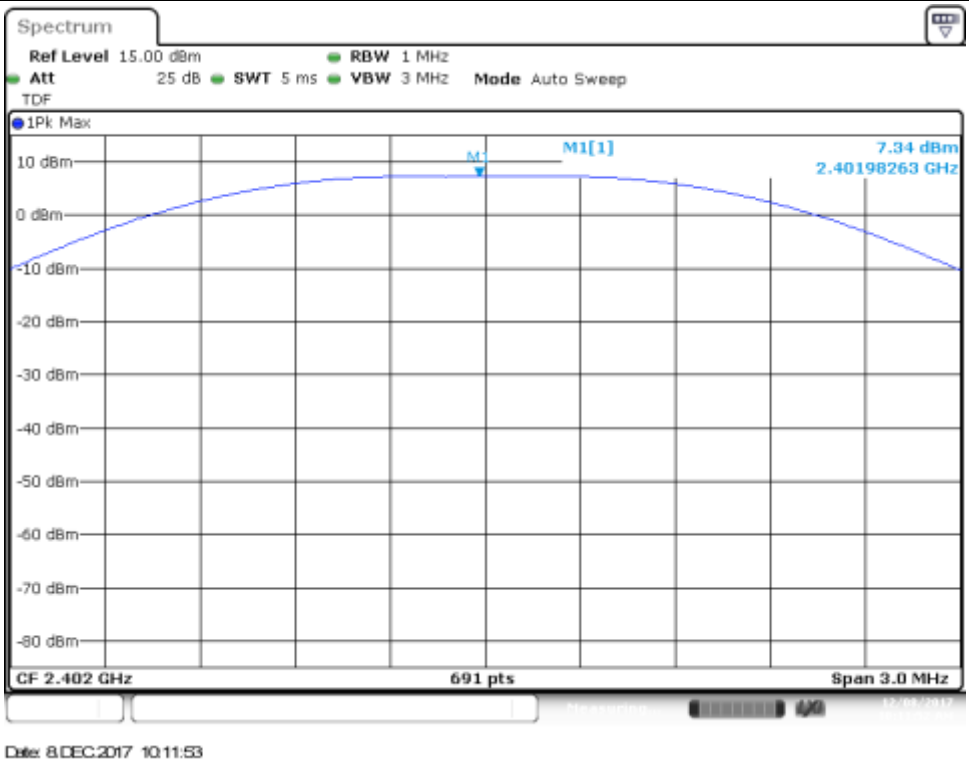
CHAIN A DIV1_Max Power Peak – CH0



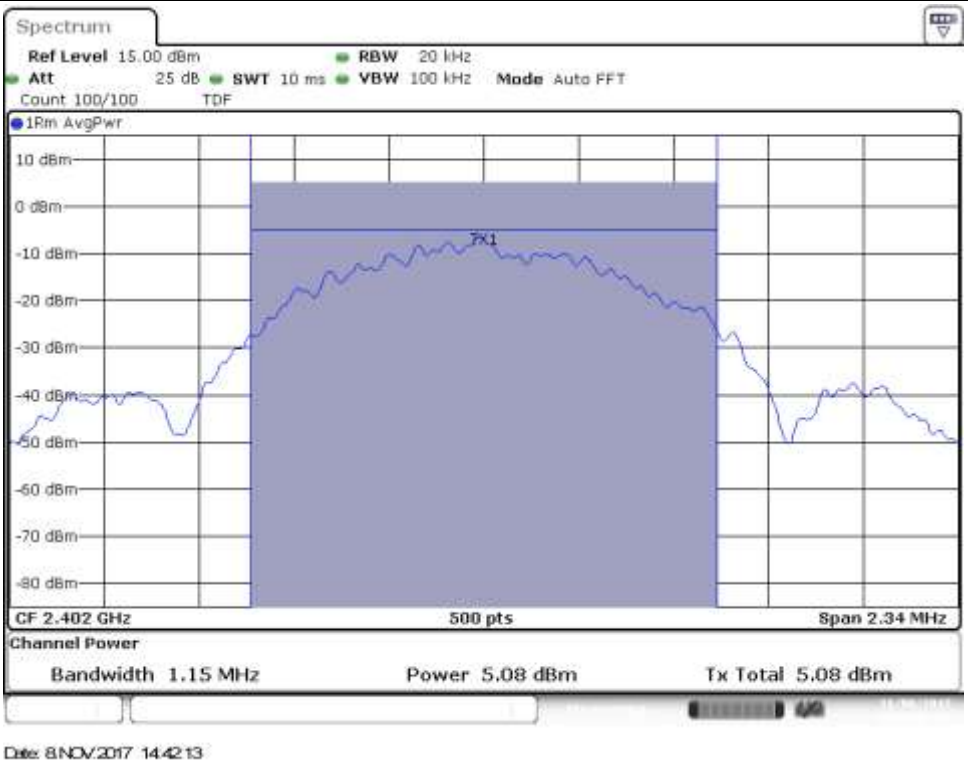
CHAIN A DIV1_Max Power RMS – CH0



CHAIN A DIV2_Max Power Peak – CH0

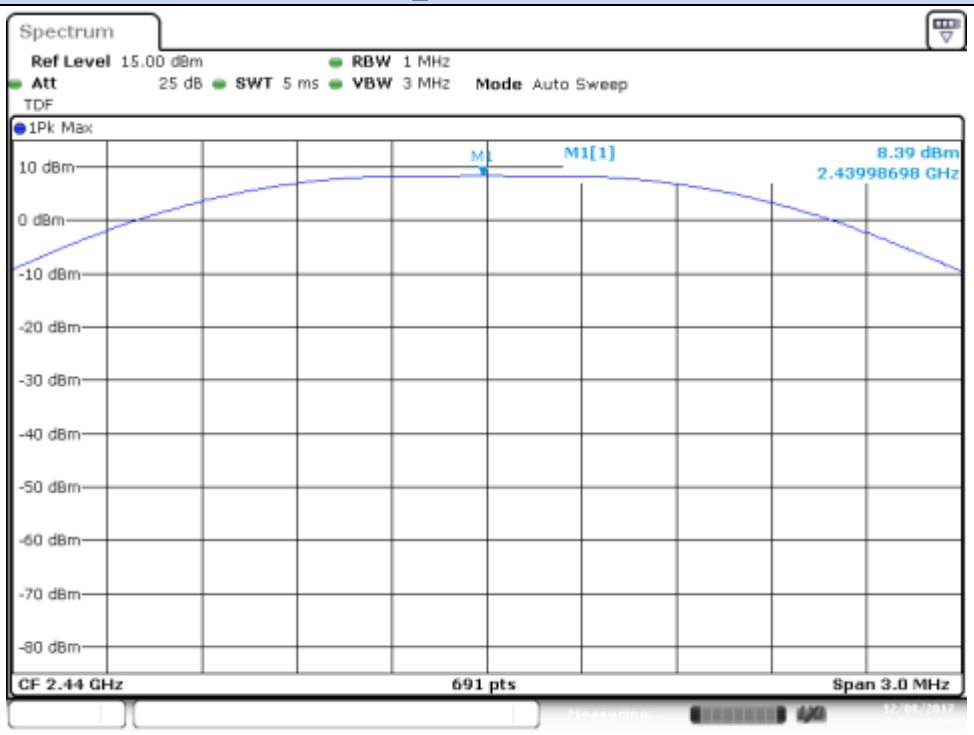


CHAIN A DIV2_Max Power RMS – CH0

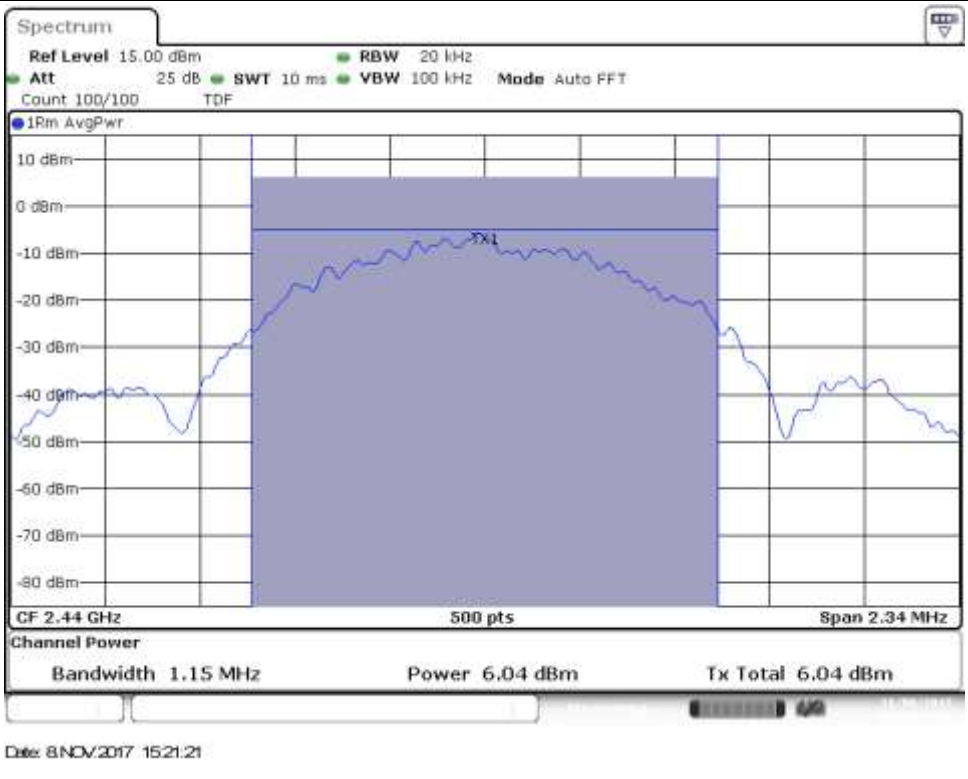


BLE

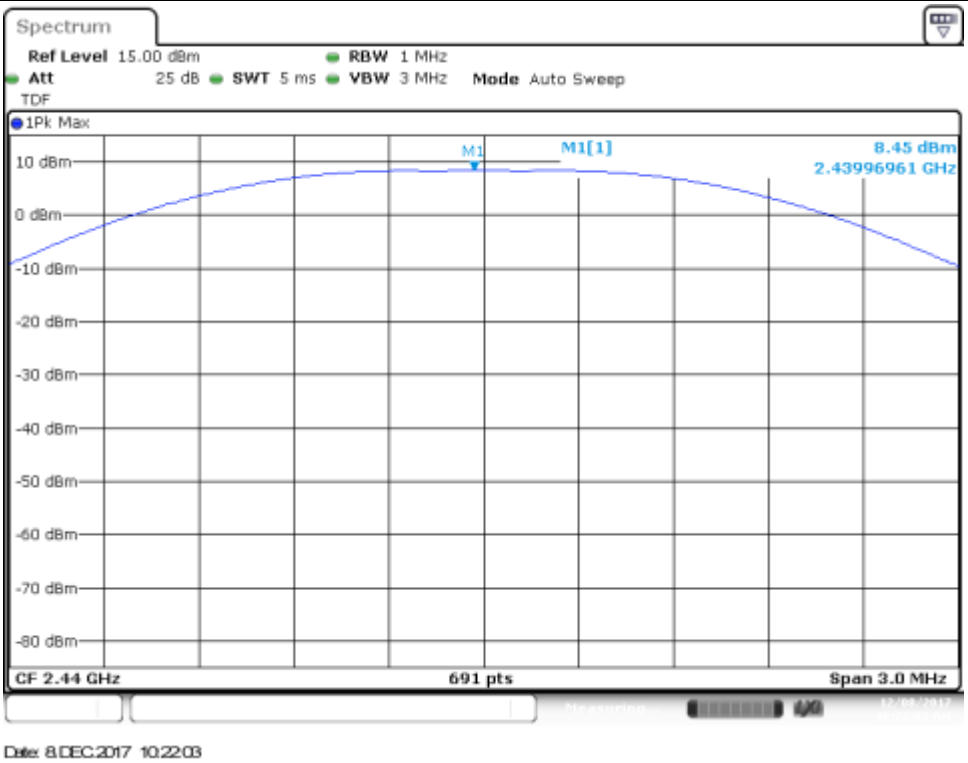
CHAIN A DIV1_Max Power Peak – CH19



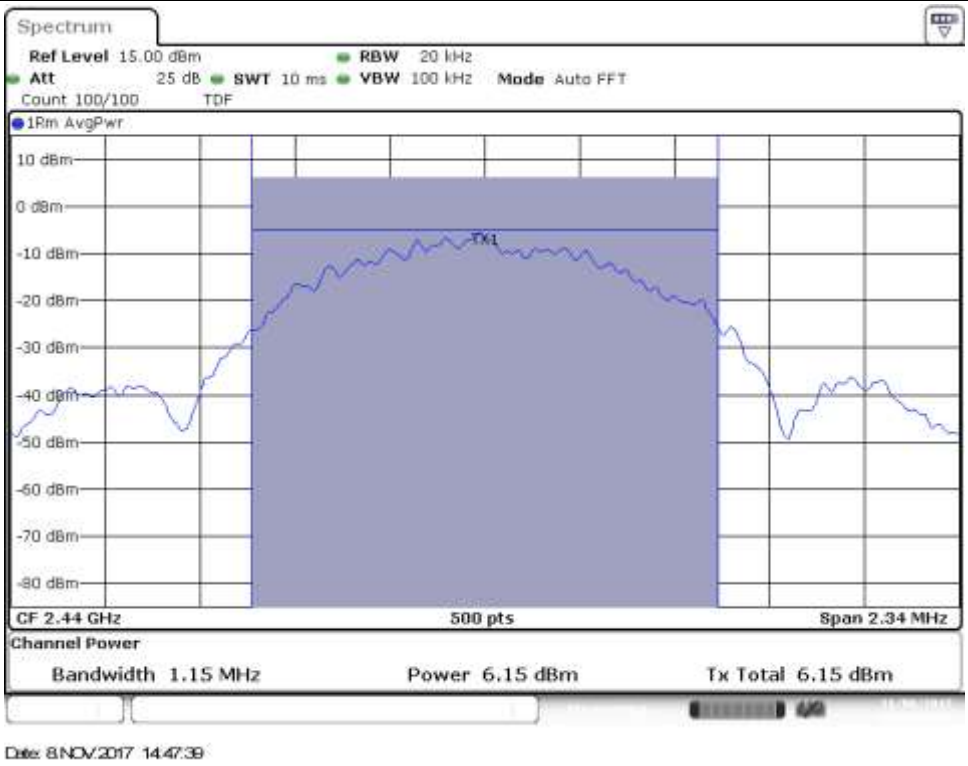
CHAIN A DIV1_Max Power RMS – CH19



CHAIN A DIV2_Max Power Peak – CH19

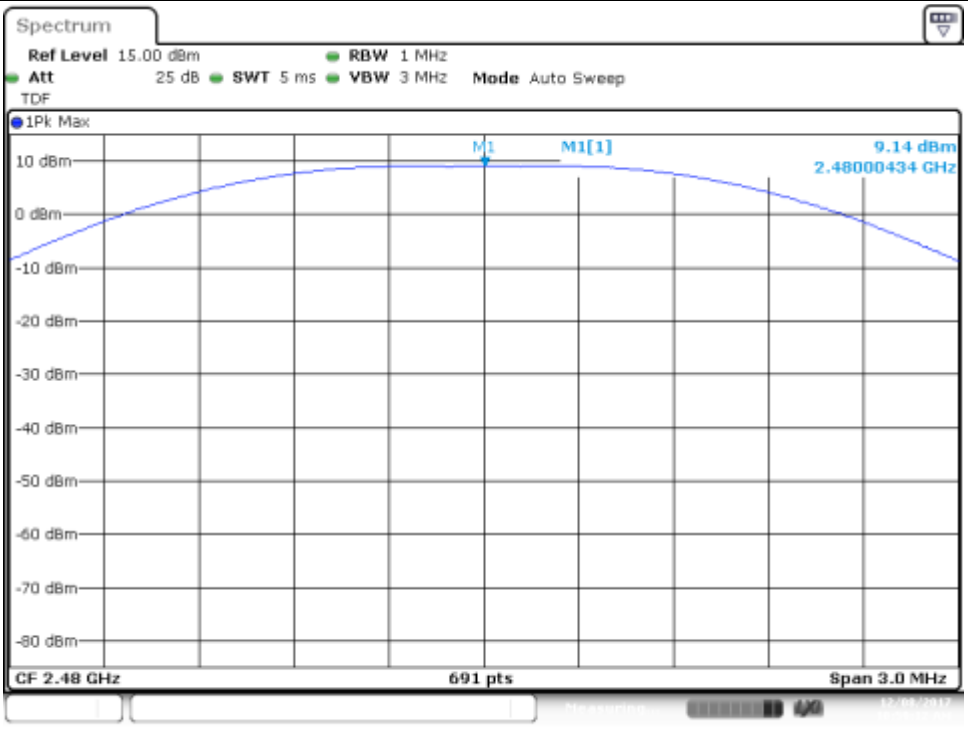


CHAIN A DIV2_Max Power RMS – CH19



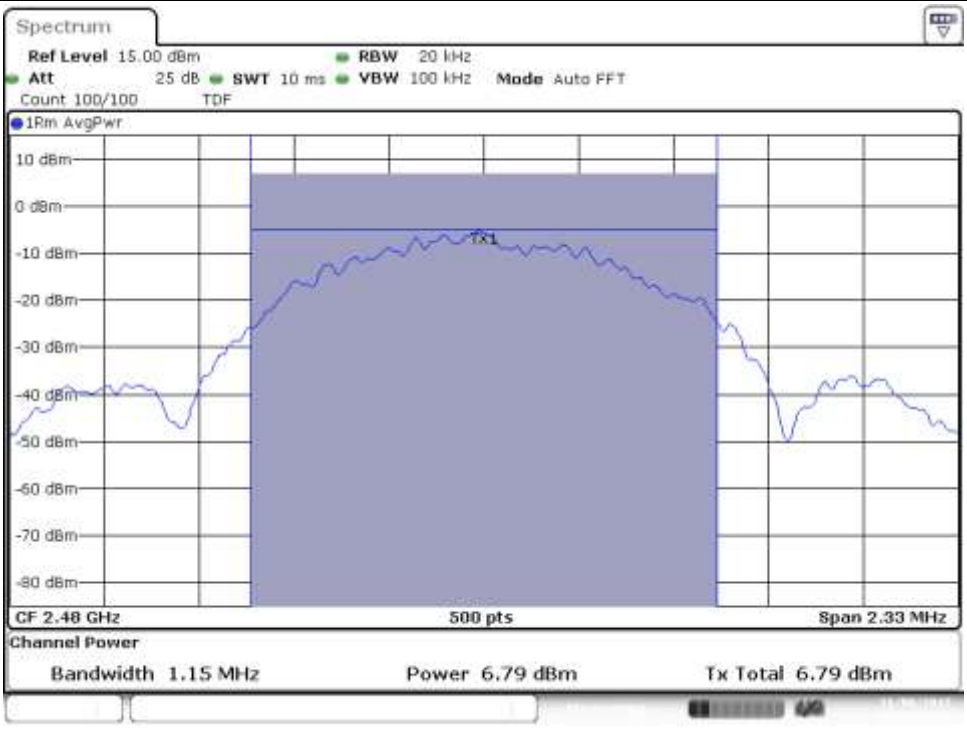
BLE

CHAIN A DIV1_Max Power Peak – CH39



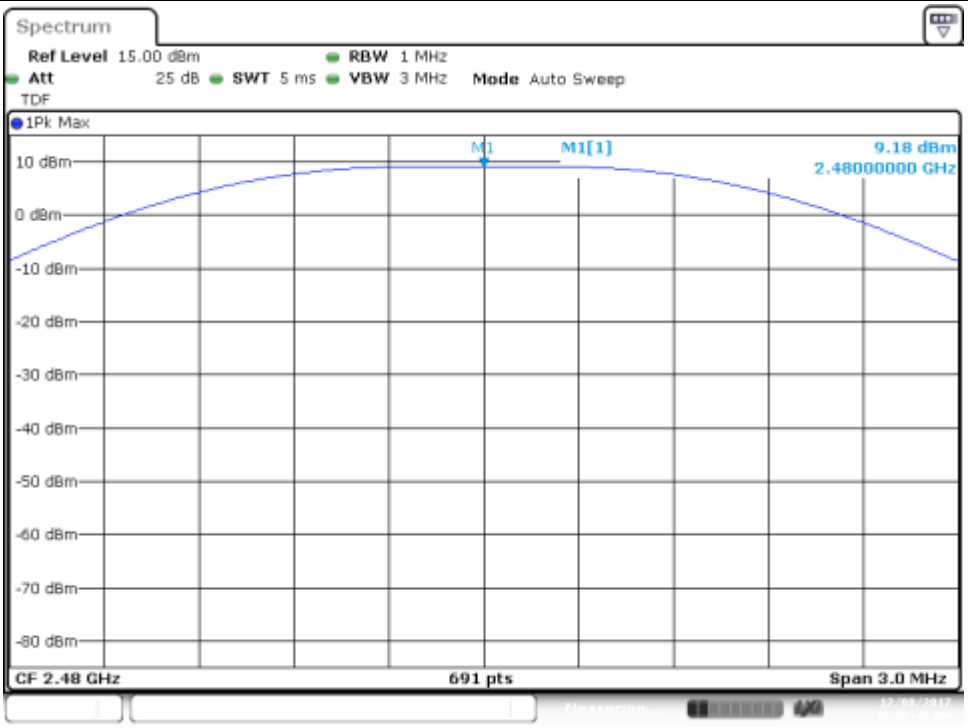
Date: 8.DEC.2017 10:59:12

CHAIN A DIV1_Max Power RMS – CH39

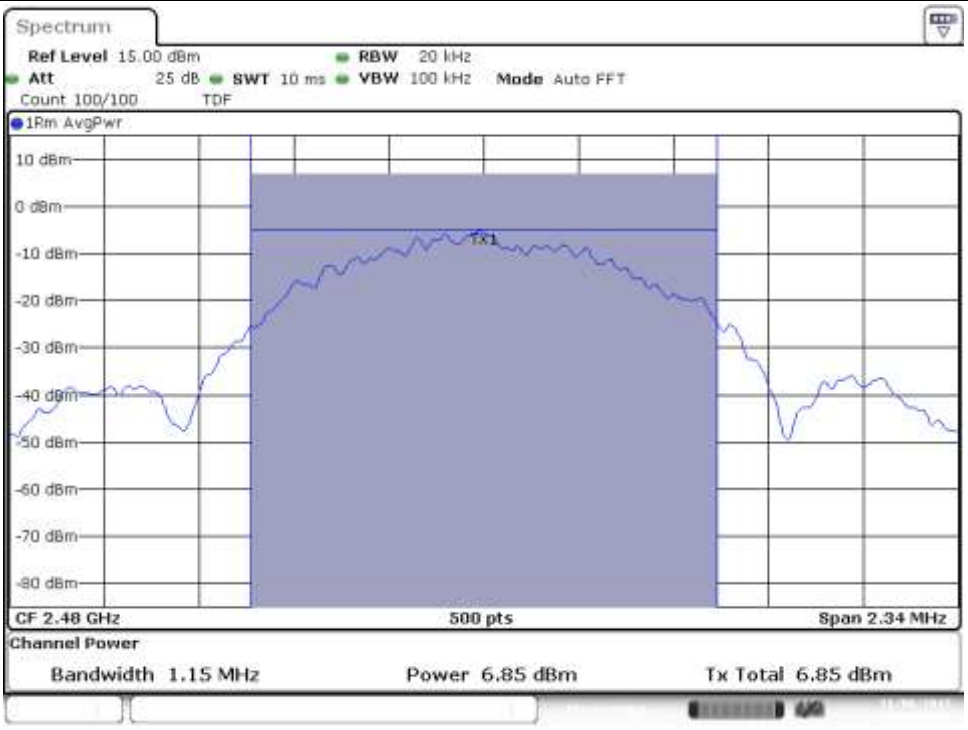


Date: 8.NOV.2017 15:28:52

CHAIN A DIV2_Max Power Peak – CH39



CHAIN A DIV2_Max Power RMS – CH39



C.1.3 Power Spectral Density

Test limits

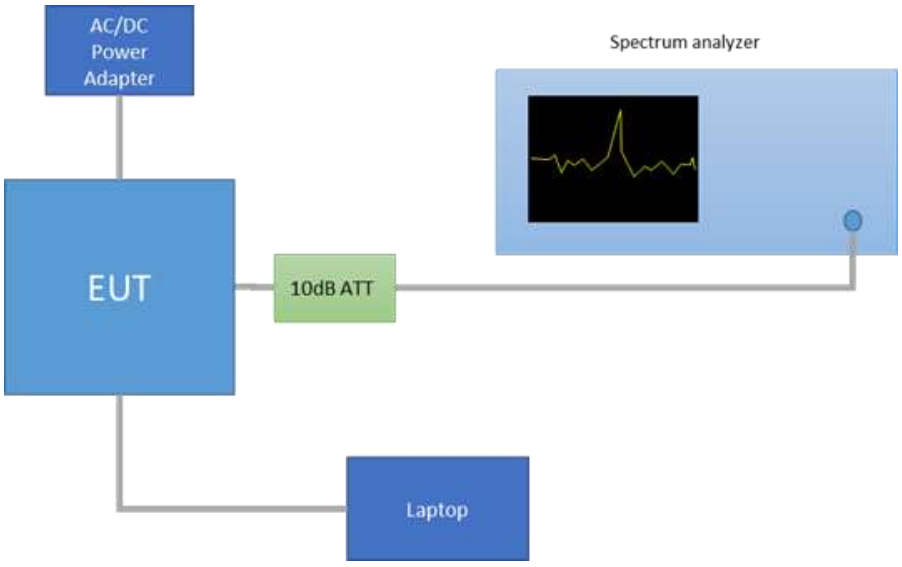
FCC part	RSS part	Limits
15.247 (e)	RSS-247 Clause 5.2 (b)	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density 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 10.2 of FCC KDB 558074 D01 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

The setup below 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.

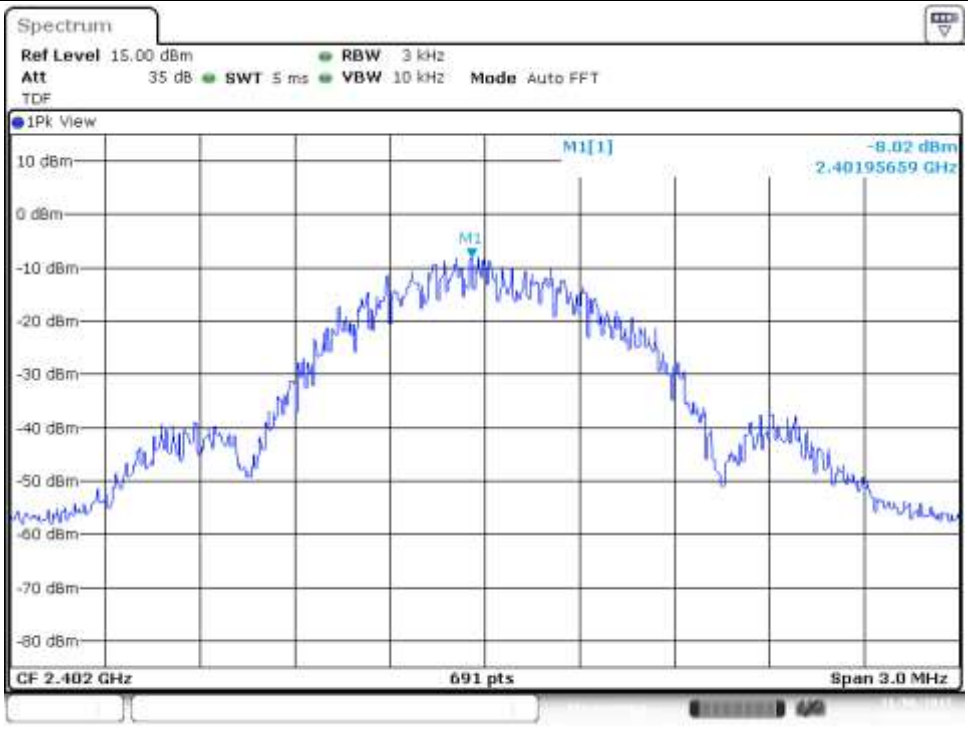


Results tables

Mode	Antenna	CH	Frequency [MHz]	PSD Peak [dBm]
BLE	Div 1	0	2402	-8.02
		19	2440	-6.78
		39	2480	-6.16
	Div 2	0	2402	-7.80
		19	2440	-6.69
		39	2480	-6.03

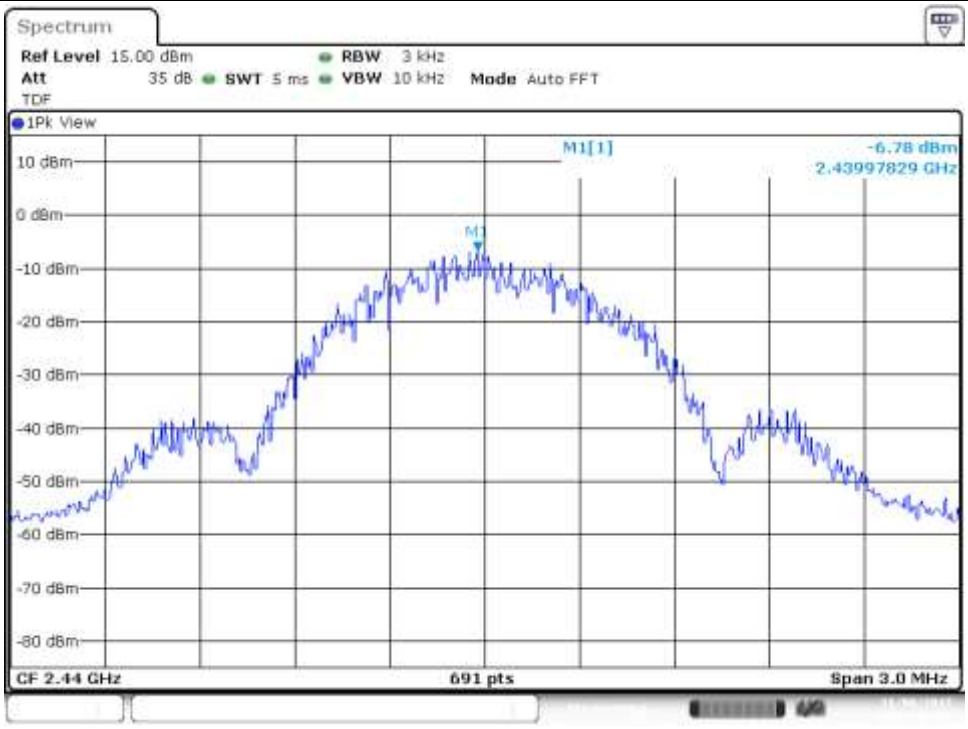
BLE

CHAIN A DIV1_PSD Peak – CH0



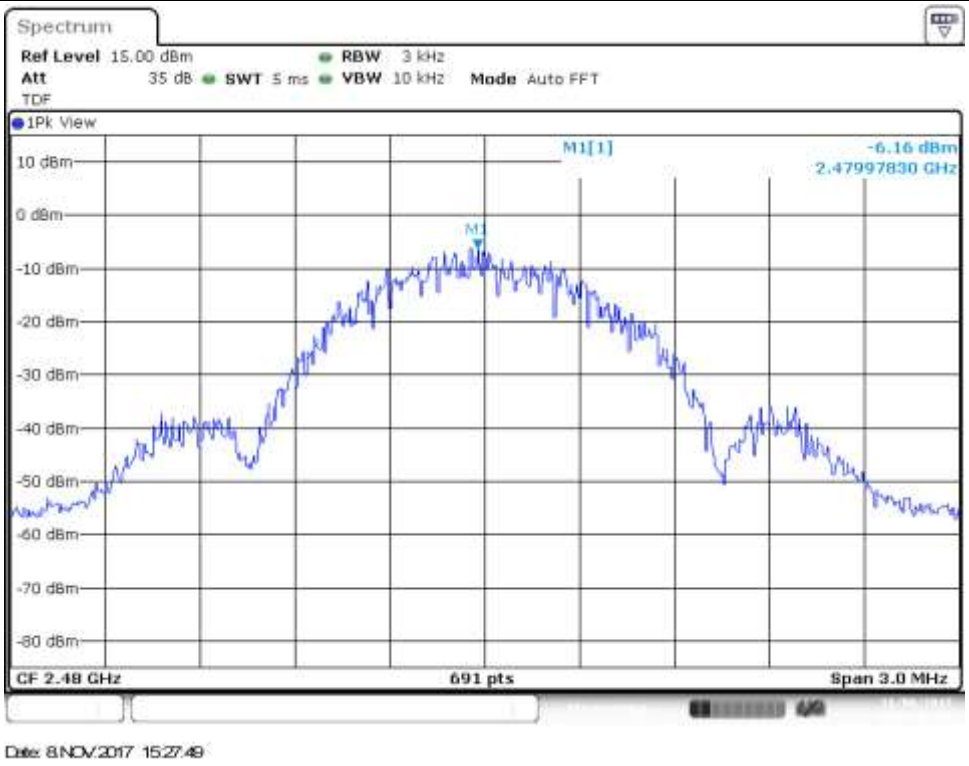
Date: 8.NOV.2017 15:13:39

CHAIN A DIV1_PSD Peak – CH19

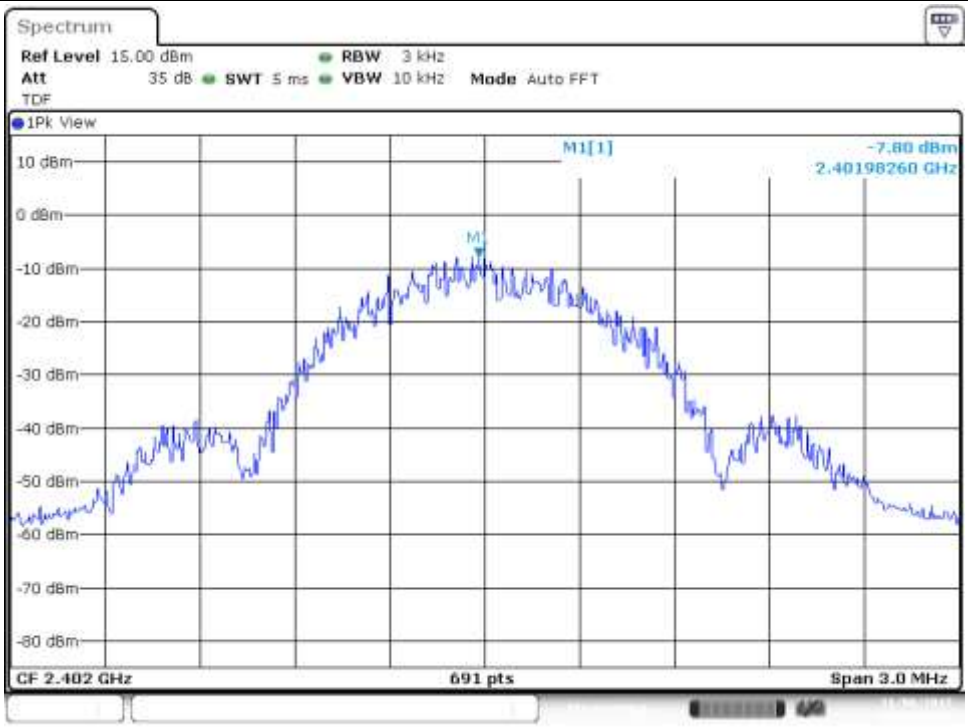


Date: 8.NOV.2017 15:22:17

CHAIN A DIV1_PSD Peak – CH39

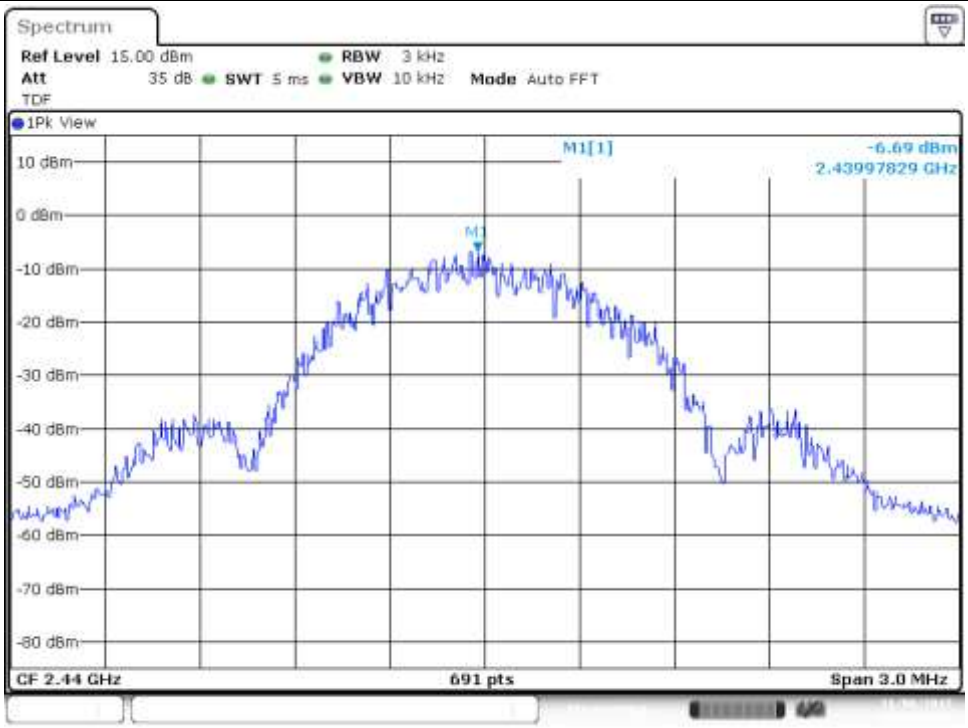


CHAIN A DIV2_PSD Peak – CH0



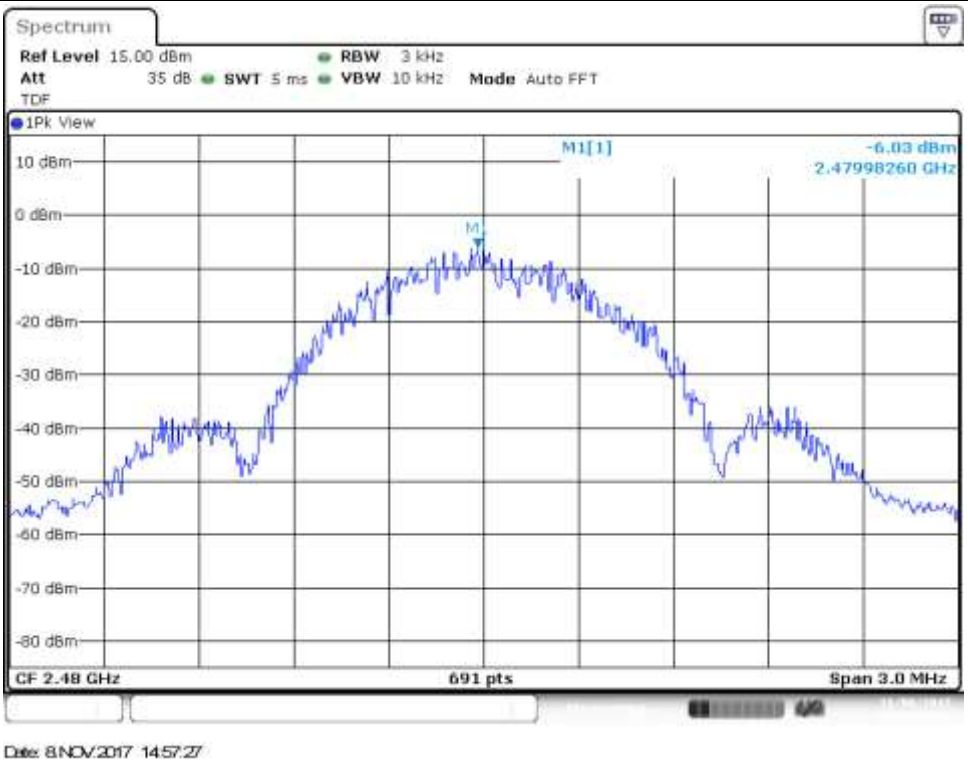
Date: 8.NOV.2017 14:42:54

CHAIN A DIV2_PSD Peak – CH19



Date: 8.NOV.2017 14:48:36

CHAIN A DIV2_PSD Peak – CH39



C.1.4 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
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

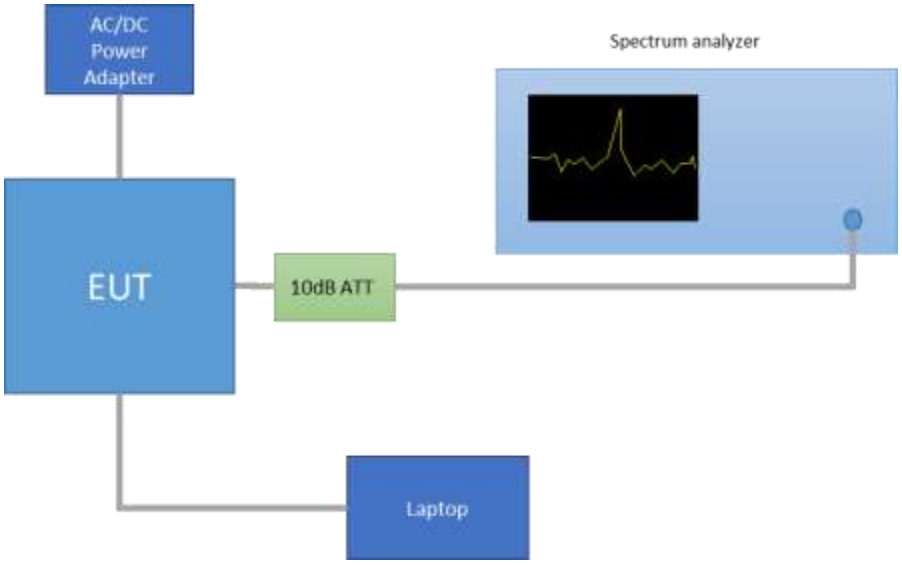
The setup below was used to measure the out-of-band emissions. The antenna terminal of the EUT is connected to the spectrum through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.

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 setup below 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.

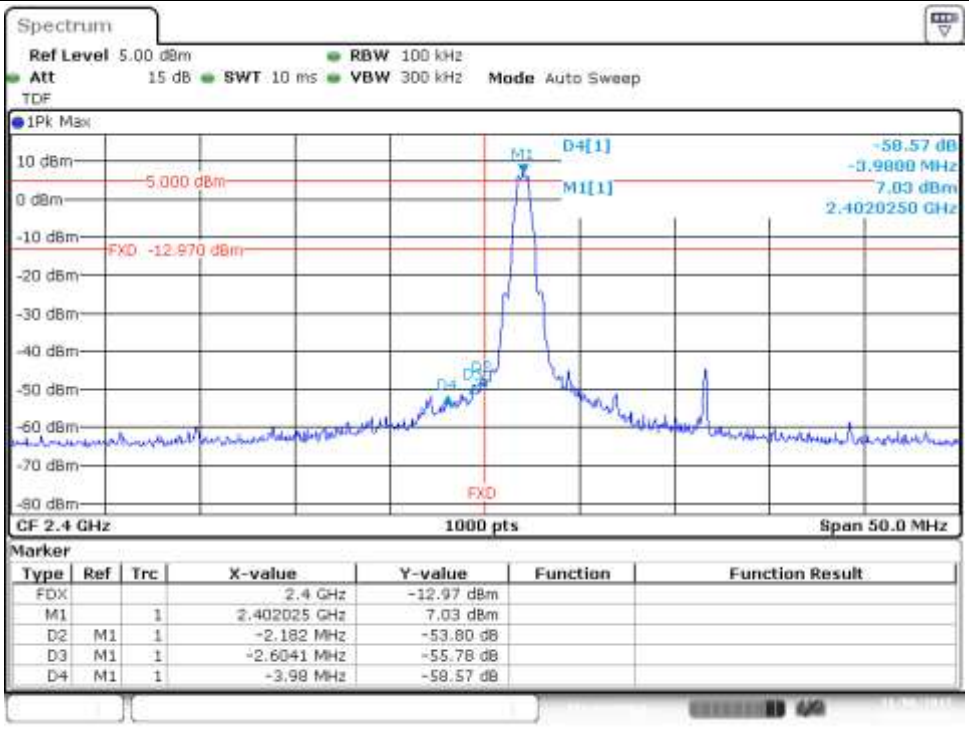


Note: these PSD_{Peak} values are shown just as a reference for the compliance of the Out-of-band Measurements. Thus the RBW used for these measurements was 100kHz.

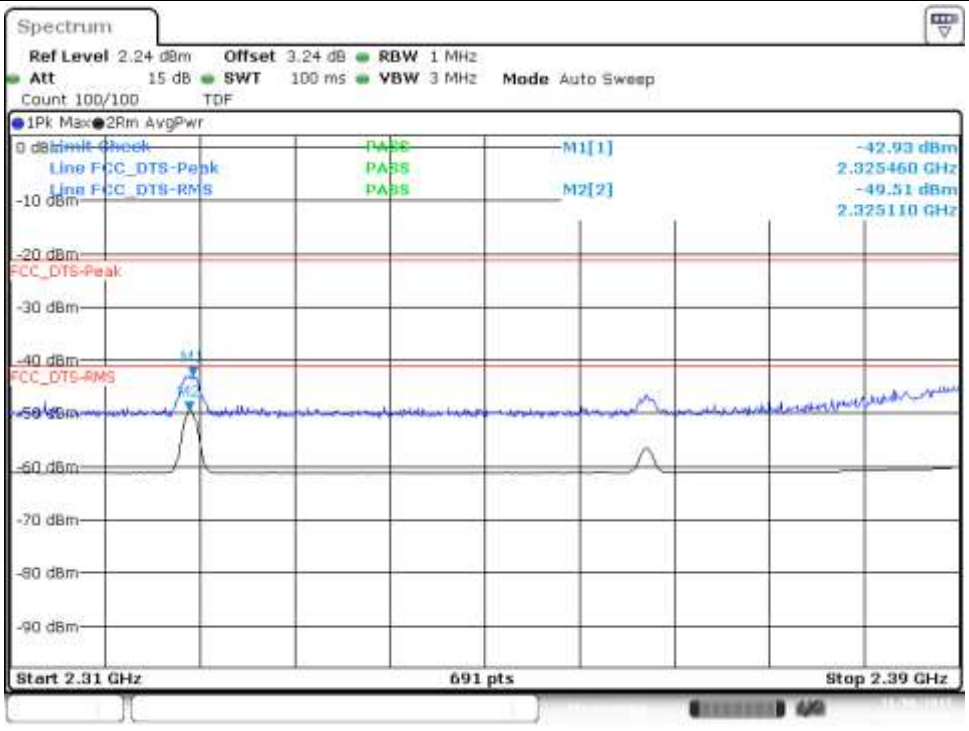
Mode	Antenna	CH	Frequency [MHz]	PSD Peak [dBm]
BLE	Div 1	0	2402	7.03
		19	2440	8.06
		39	2480	8.78
	Div 2	0	2402	7.22
		19	2440	8.17
		39	2480	8.88

BLE

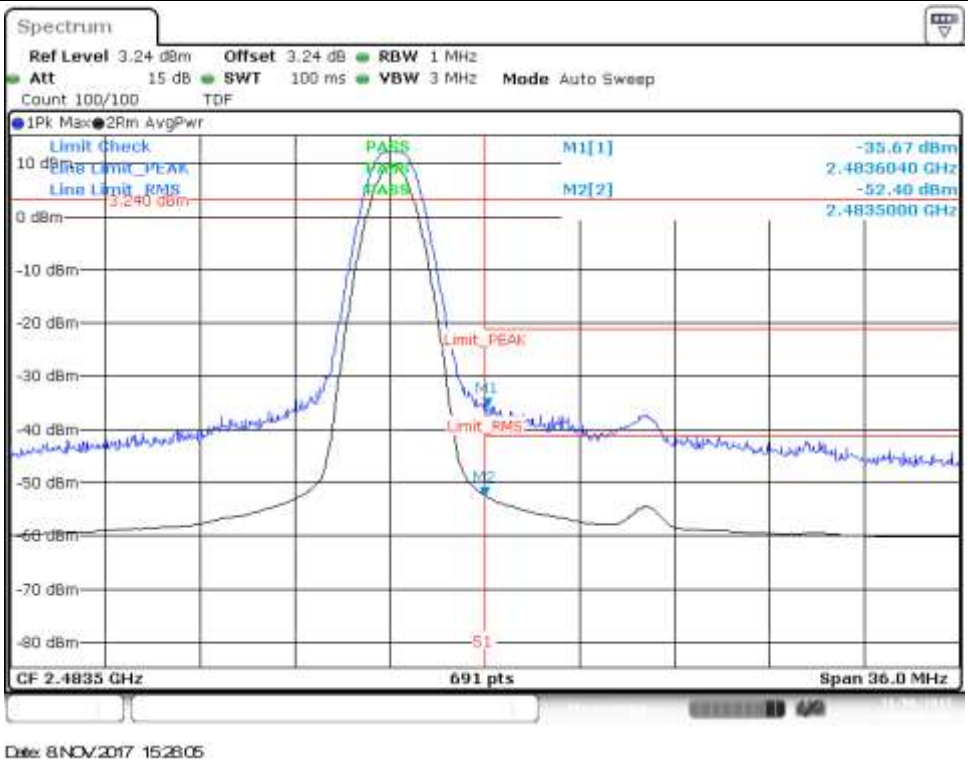
CHAIN A DIV1_BE Low Freq Section – CH0



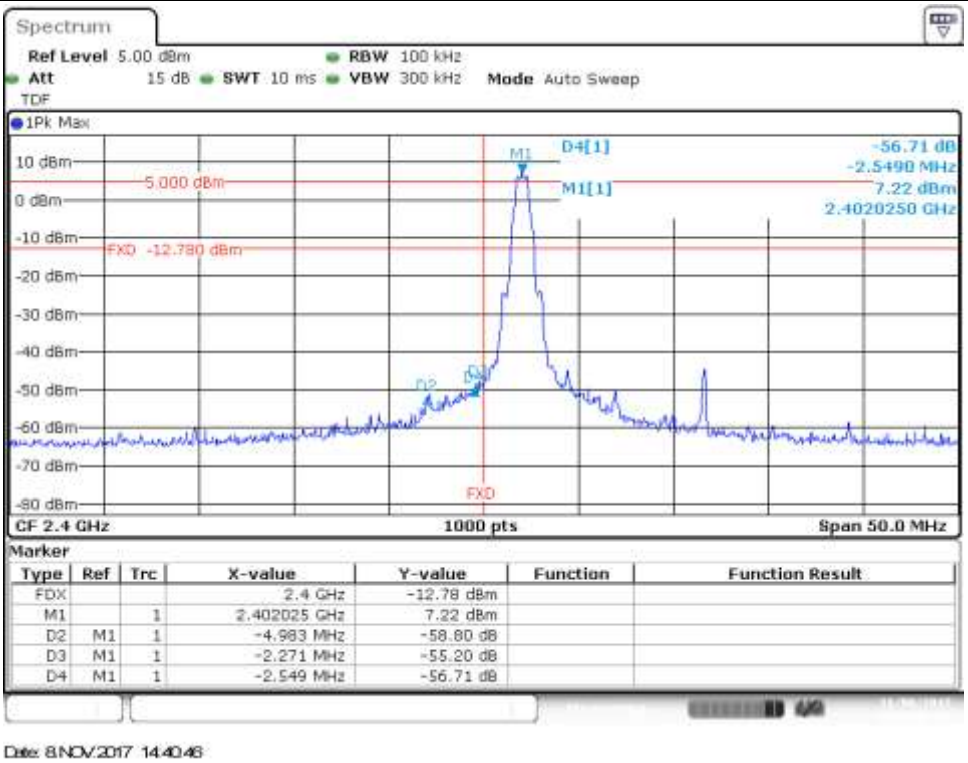
CHAIN A DIV1_BE Low (Non Restricted) – CH0



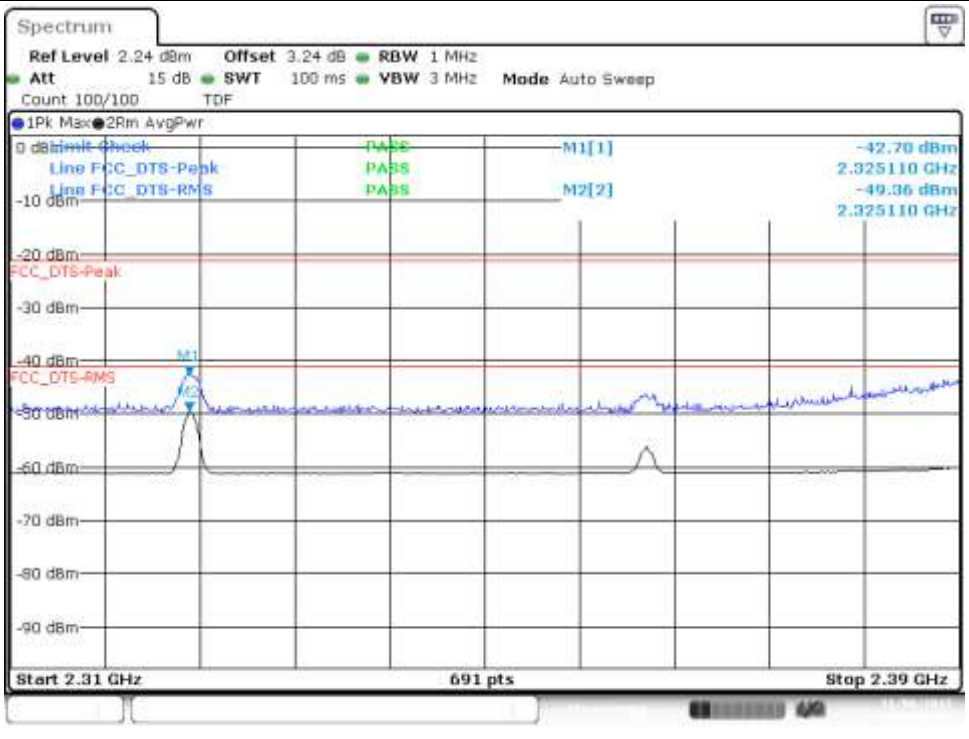
CHAIN A DIV1_BE High Freq Section (Restricted) – CH39



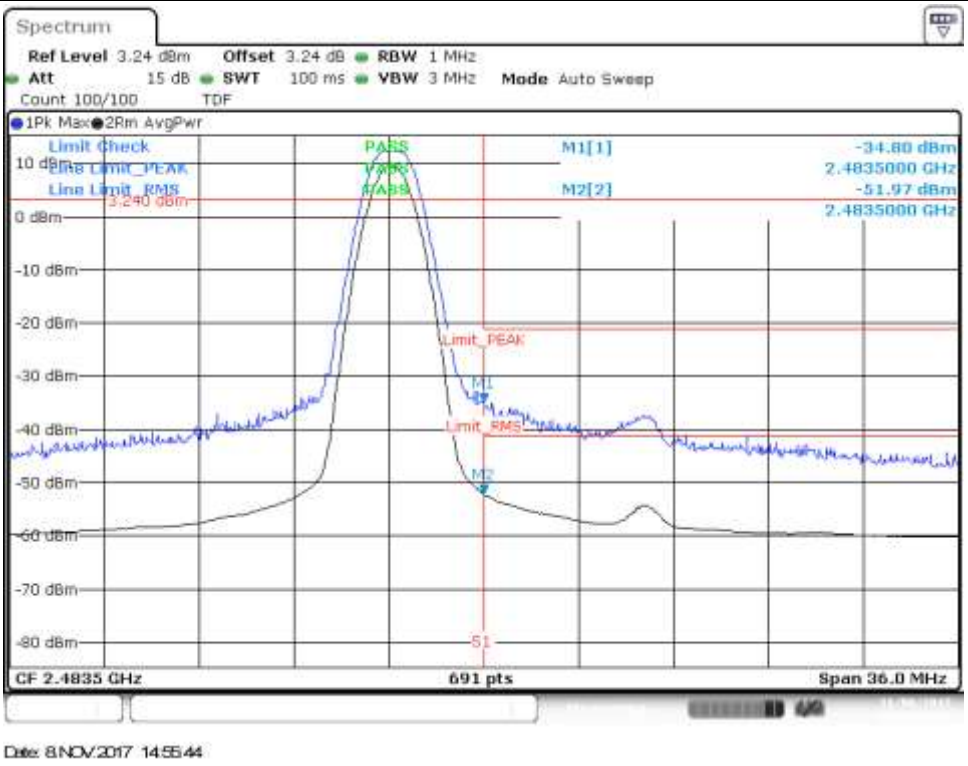
CHAIN A DIV2_BE Low Freq Section – CH0



CHAIN A DIV2_BE Low (Non Restricted) – CH0

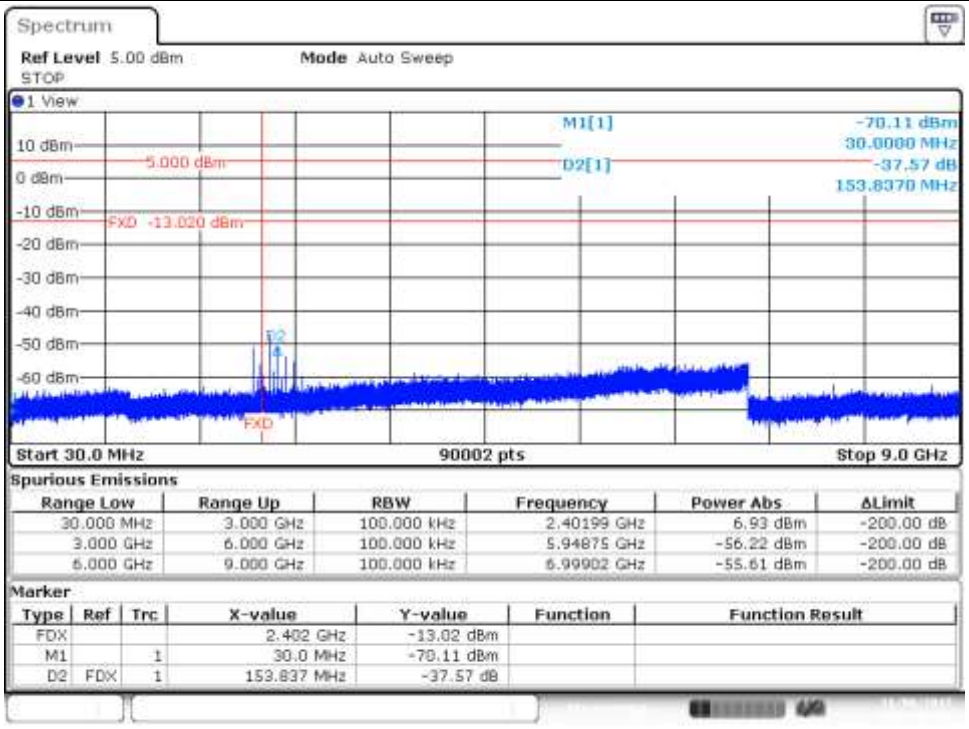


CHAIN A DIV2_BE High Freq Section (Restricted) – CH39



BLE, CH0

CHAIN A DIV1_Cond Spur, 30MHz – 9GHz



Spurious Emissions

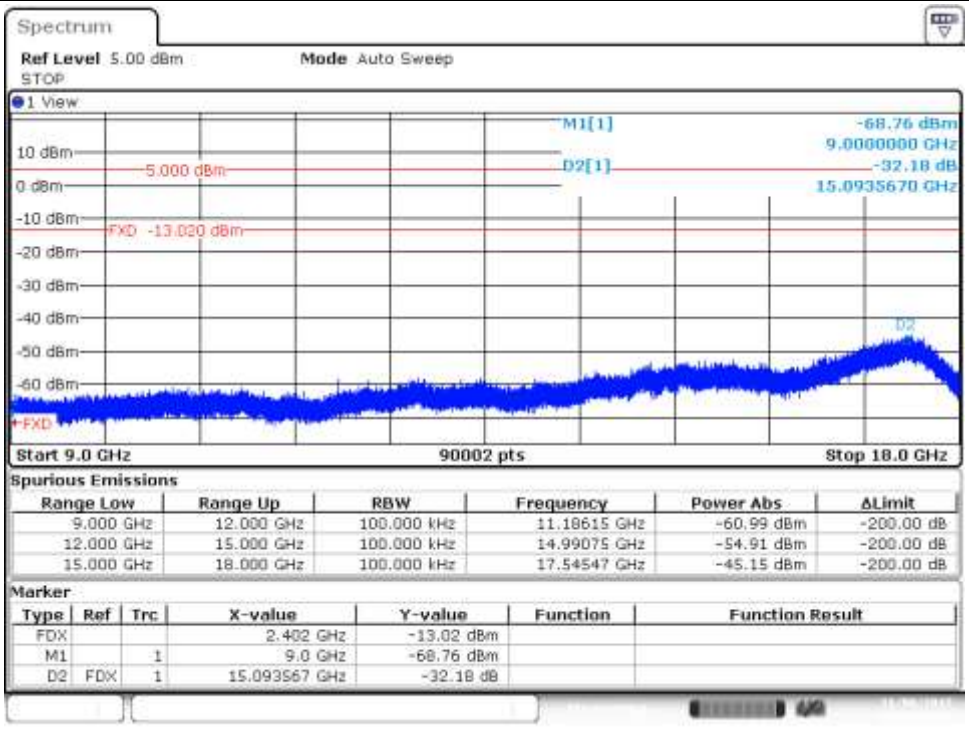
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	3.000 GHz	100.000 kHz	2.40199 GHz	6.93 dBm	-200.00 dB
3.000 GHz	6.000 GHz	100.000 kHz	5.94875 GHz	-56.22 dBm	-200.00 dB
6.000 GHz	9.000 GHz	100.000 kHz	6.99902 GHz	-55.61 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.402 GHz	-13.02 dBm		
M1		1	30.0 MHz	-70.11 dBm		
D2	FDX	1	153.837 MHz	-37.57 dB		

Date: 8.NOV.2017 15:14:20

CHAIN A DIV1_Cond Spur, 9GHz – 18GHz



Spurious Emissions

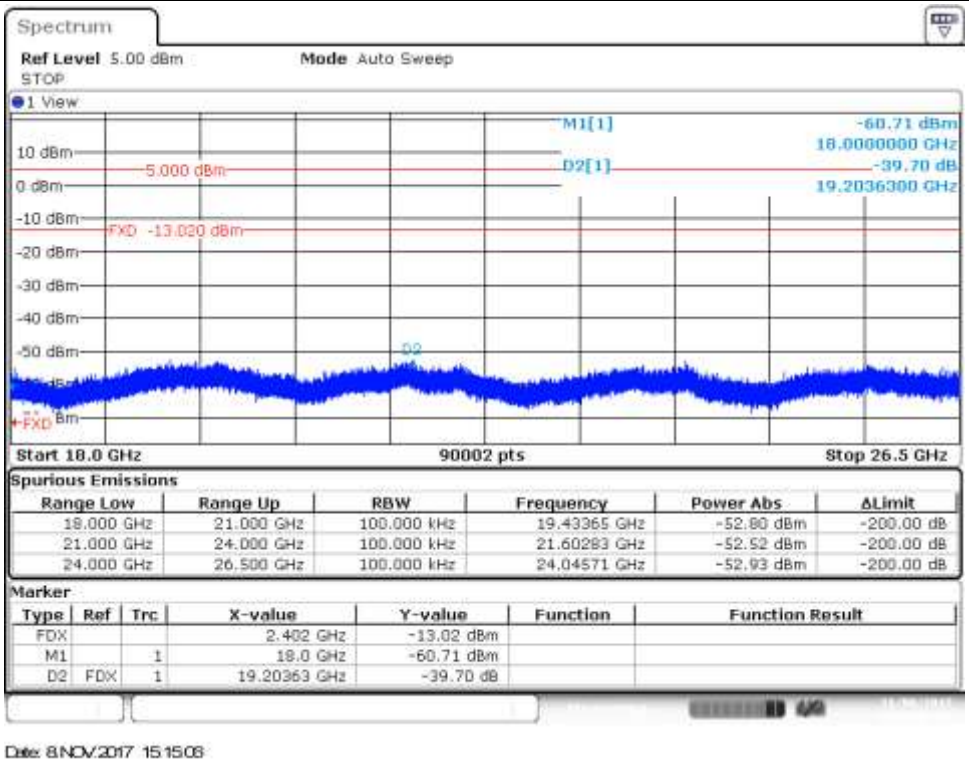
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 GHz	12.000 GHz	100.000 kHz	11.18615 GHz	-60.99 dBm	-200.00 dB
12.000 GHz	15.000 GHz	100.000 kHz	14.99075 GHz	-54.91 dBm	-200.00 dB
15.000 GHz	18.000 GHz	100.000 kHz	17.54547 GHz	-45.15 dBm	-200.00 dB

Marker

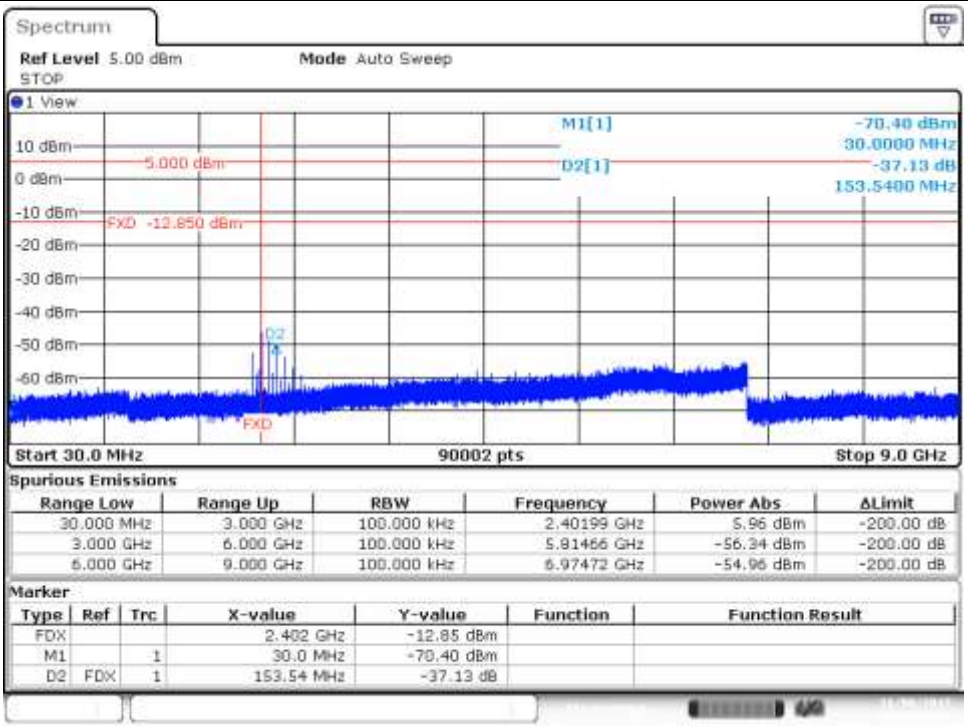
Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.402 GHz	-13.02 dBm		
M1		1	9.0 GHz	-68.76 dBm		
D2	FDX	1	15.093567 GHz	-32.18 dB		

Date: 8.NOV.2017 15:14:43

CHAIN A DIV1_Cond Spur,18GHz – 26.5GHz



CHAIN A DIV2_Cond Spur, 30MHz – 9GHz



Spurious Emissions

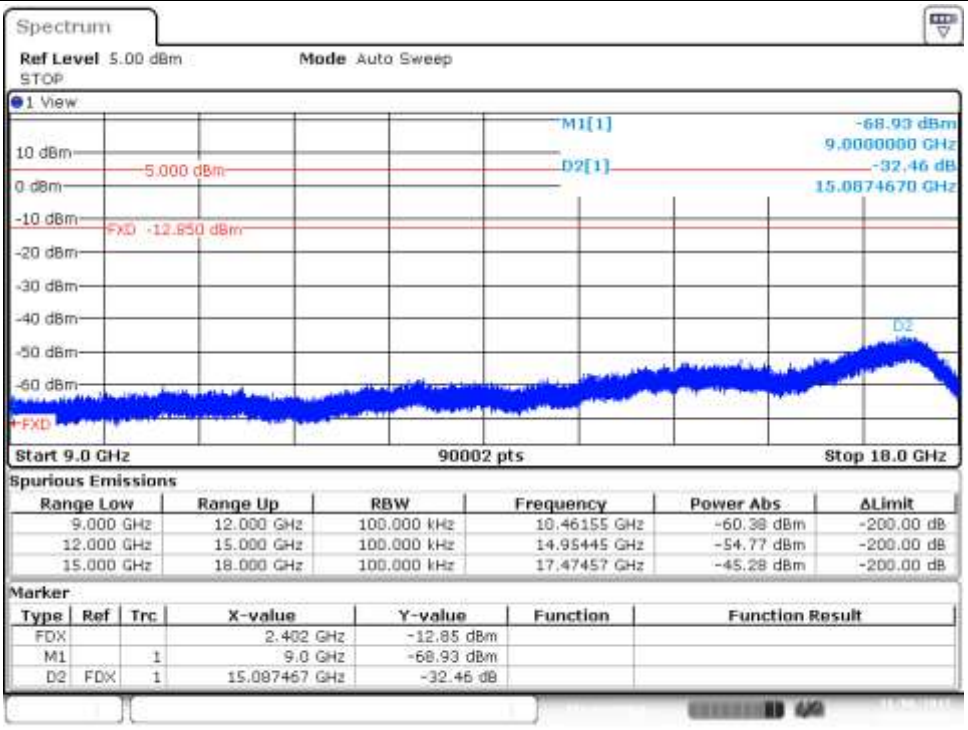
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	3.000 GHz	100.000 kHz	2.40199 GHz	5.96 dBm	-200.00 dB
3.000 GHz	6.000 GHz	100.000 kHz	5.81466 GHz	-56.34 dBm	-200.00 dB
6.000 GHz	9.000 GHz	100.000 kHz	6.97472 GHz	-54.96 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.402 GHz	-12.85 dBm		
M1		1	30.0 MHz	-70.40 dBm		
D2	FDX	1	153.54 MHz	-37.13 dB		

Date: 8.NOV.2017 14:43:35

CHAIN A DIV2_Cond Spur, 9GHz – 18GHz



Spurious Emissions

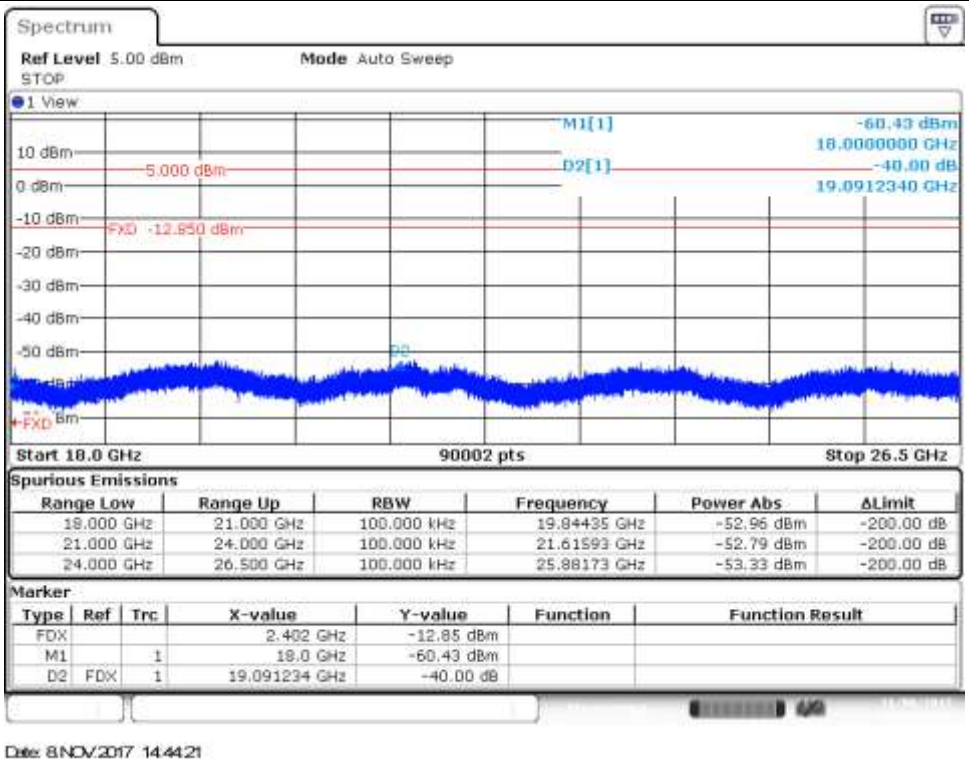
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 GHz	12.000 GHz	100.000 kHz	10.46155 GHz	-60.38 dBm	-200.00 dB
12.000 GHz	15.000 GHz	100.000 kHz	14.95445 GHz	-54.77 dBm	-200.00 dB
15.000 GHz	18.000 GHz	100.000 kHz	17.47457 GHz	-45.28 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.402 GHz	-12.85 dBm		
M1		1	9.0 GHz	-68.93 dBm		
D2	FDX	1	15.087467 GHz	-32.46 dB		

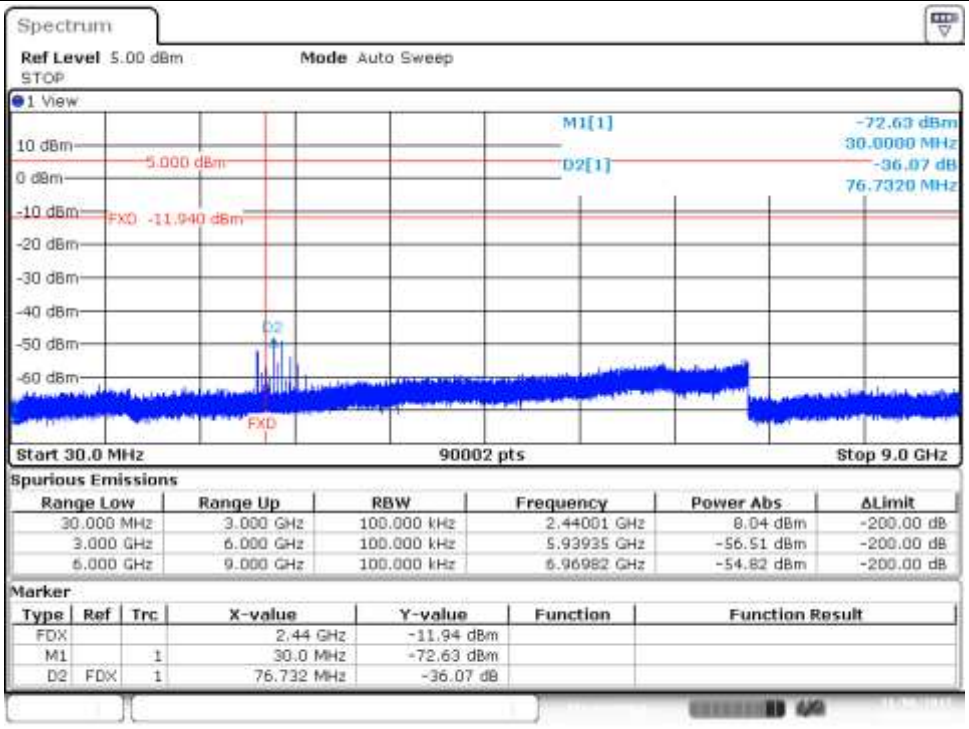
Date: 8.NOV.2017 14:43:58

CHAIN A DIV2_Cond Spur,18GHz – 26.5GHz



BLE, CH19

CHAIN A DIV1_Cond Spur, 30MHz – 9GHz



Spurious Emissions

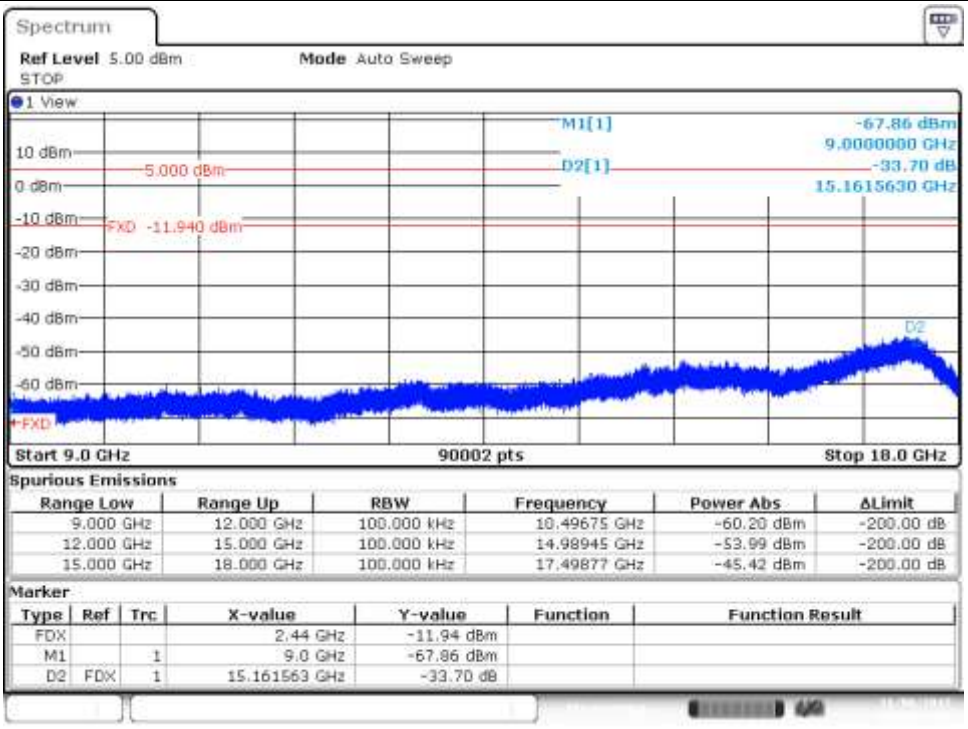
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	3.000 GHz	100.000 kHz	2.44001 GHz	8.04 dBm	-200.00 dB
3.000 GHz	6.000 GHz	100.000 kHz	5.93935 GHz	-56.51 dBm	-200.00 dB
6.000 GHz	9.000 GHz	100.000 kHz	6.96982 GHz	-54.82 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.44 GHz	-11.94 dBm		
M1		1	30.0 MHz	-72.63 dBm		
D2	FDX	1	76.732 MHz	-36.07 dB		

Date: 8.NOV.2017 15:22:58

CHAIN A DIV1_Cond Spur, 9GHz – 18GHz



Spurious Emissions

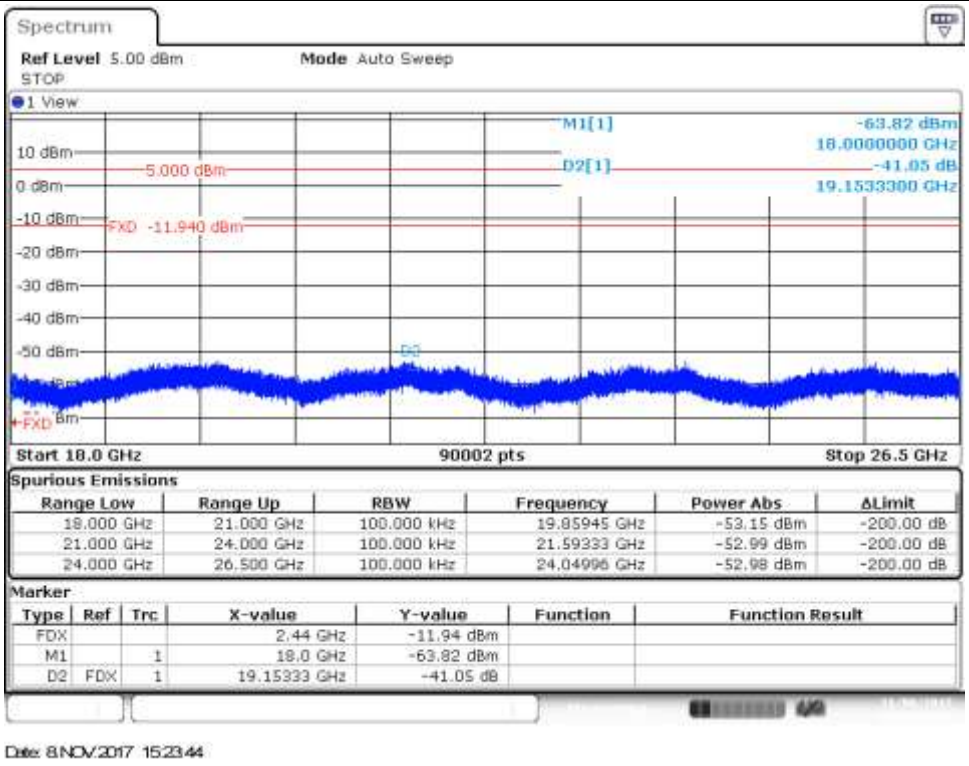
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 GHz	12.000 GHz	100.000 kHz	10.49675 GHz	-60.20 dBm	-200.00 dB
12.000 GHz	15.000 GHz	100.000 kHz	14.98945 GHz	-53.99 dBm	-200.00 dB
15.000 GHz	18.000 GHz	100.000 kHz	17.49877 GHz	-45.42 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.44 GHz	-11.94 dBm		
M1		1	9.0 GHz	-67.86 dBm		
D2	FDX	1	15.161563 GHz	-33.70 dB		

Date: 8.NOV.2017 15:23:21

CHAIN A DIV1_Cond Spur,18GHz – 26.5GHz



Spurious Emissions

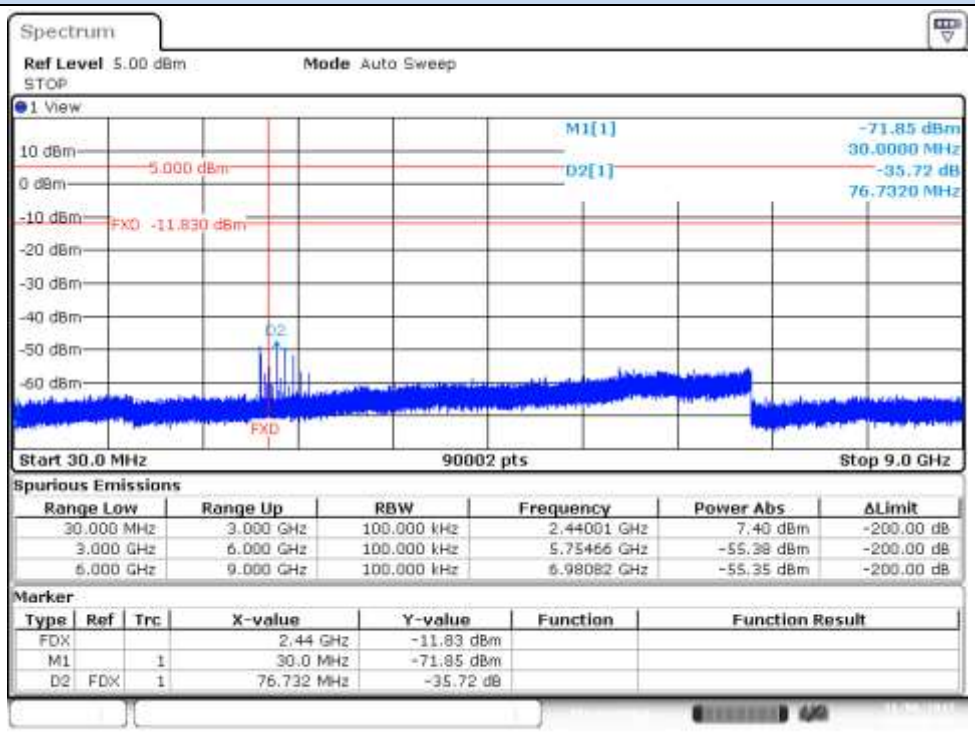
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
18.000 GHz	21.000 GHz	100.000 kHz	19.85945 GHz	-53.15 dBm	-200.00 dB
21.000 GHz	24.000 GHz	100.000 kHz	21.59333 GHz	-52.99 dBm	-200.00 dB
24.000 GHz	26.500 GHz	100.000 kHz	24.04996 GHz	-52.98 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.44 GHz	-11.94 dBm		
M1		1	18.0 GHz	-63.82 dBm		
D2	FDX	1	19.15333 GHz	-41.05 dB		

Date: 8.NOV.2017 15:23:44

CHAIN A DIV2_Cond Spur, 30MHz – 9GHz



Spurious Emissions

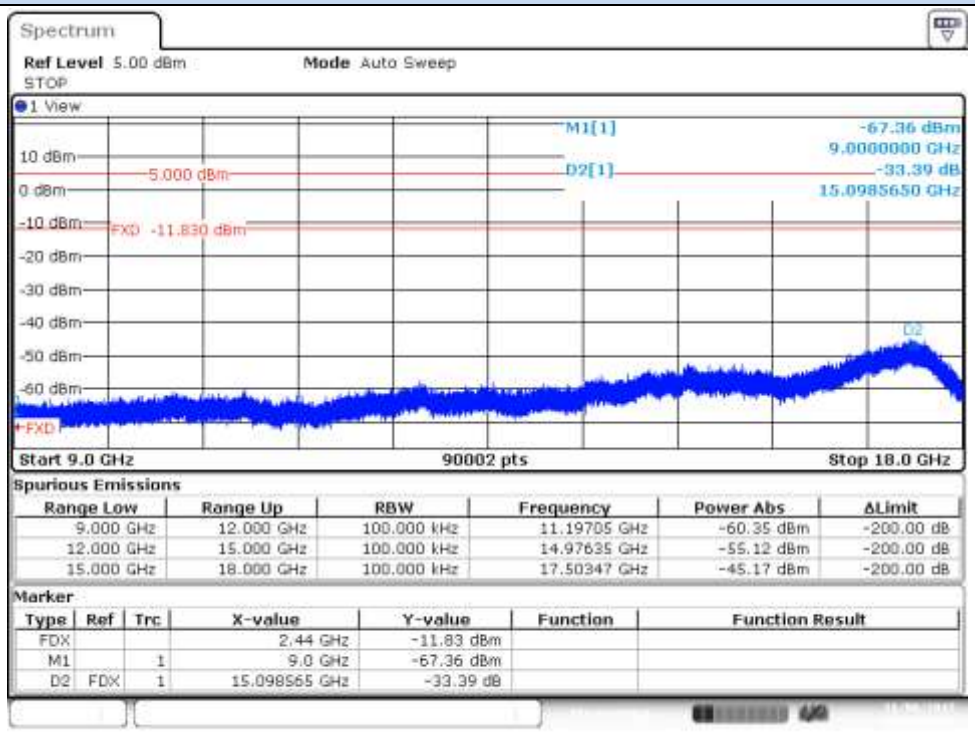
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	3.000 GHz	100.000 kHz	2.44001 GHz	7.40 dBm	-200.00 dB
3.000 GHz	6.000 GHz	100.000 kHz	5.75466 GHz	-55.38 dBm	-200.00 dB
6.000 GHz	9.000 GHz	100.000 kHz	6.98082 GHz	-55.35 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.44 GHz	-11.83 dBm		
M1		1	30.0 MHz	-71.85 dBm		
D2	FDX	1	76.732 MHz	-35.72 dB		

Date: 8.NOV.2017 14:49:16

CHAIN A DIV2_Cond Spur, 9GHz – 18GHz



Spurious Emissions

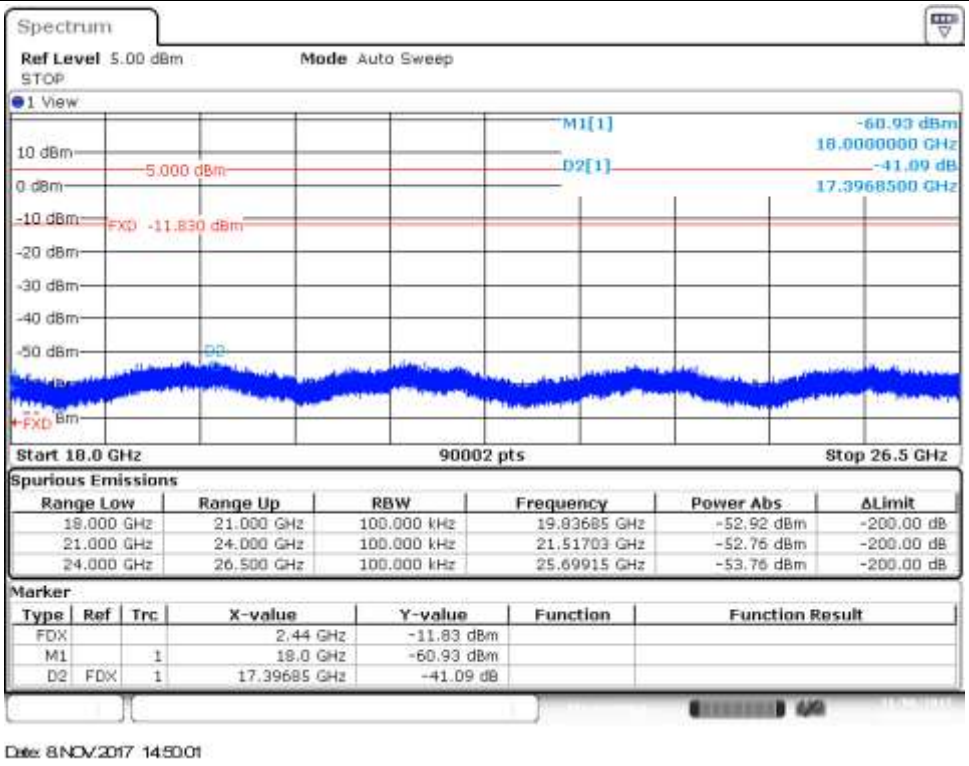
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 GHz	12.000 GHz	100.000 kHz	11.19705 GHz	-60.35 dBm	-200.00 dB
12.000 GHz	15.000 GHz	100.000 kHz	14.97635 GHz	-55.12 dBm	-200.00 dB
15.000 GHz	18.000 GHz	100.000 kHz	17.50347 GHz	-45.17 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.44 GHz	-11.83 dBm		
M1		1	9.0 GHz	-67.36 dBm		
D2	FDX	1	15.098565 GHz	-33.39 dB		

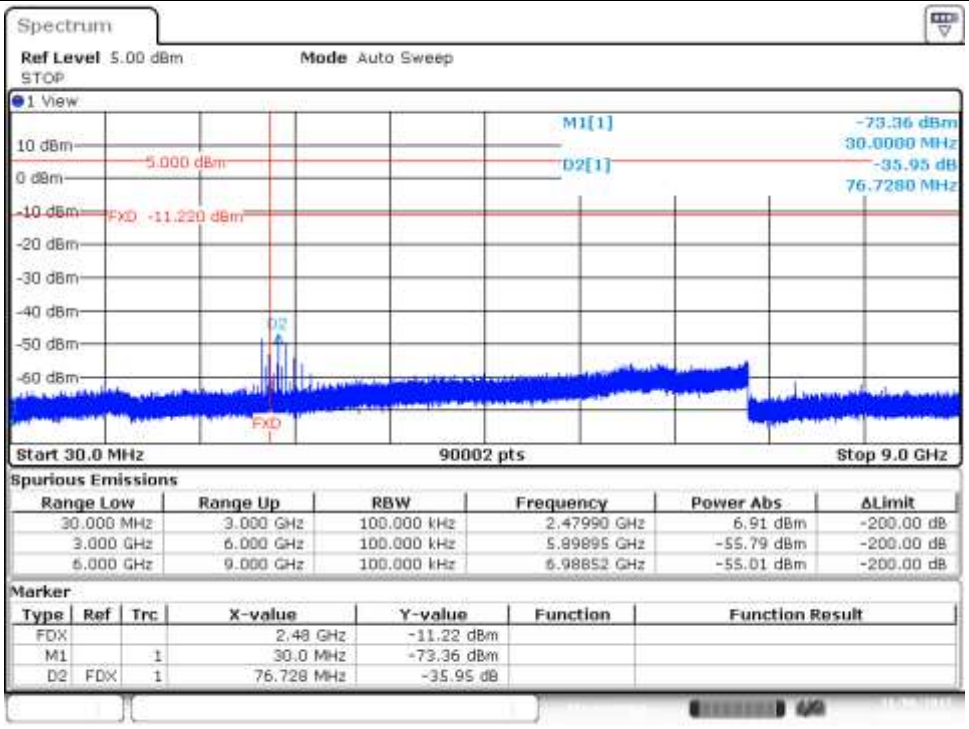
Date: 8.NOV.2017 14:49:39

CHAIN A DIV2_Cond Spur,18GHz – 26.5GHz



BLE, CH39

CHAIN A DIV1_Cond Spur, 30MHz – 9GHz



Spurious Emissions

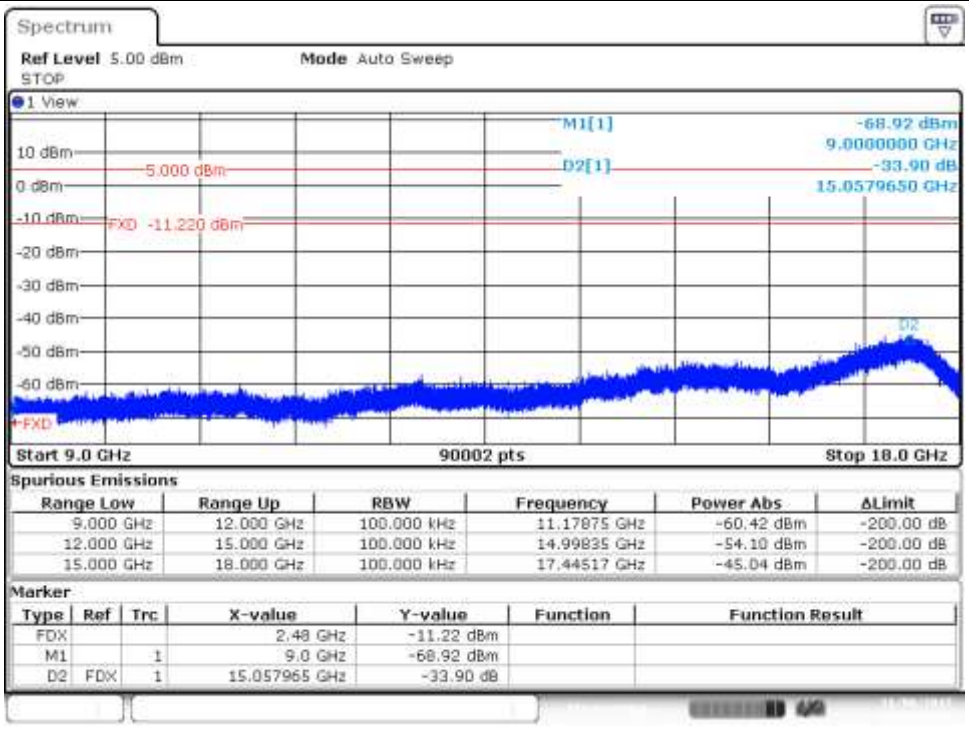
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	3.000 GHz	100.000 kHz	2.47990 GHz	6.91 dBm	-200.00 dB
3.000 GHz	6.000 GHz	100.000 kHz	5.99895 GHz	-55.79 dBm	-200.00 dB
6.000 GHz	9.000 GHz	100.000 kHz	6.98852 GHz	-55.01 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.48 GHz	-11.22 dBm		
M1		1	30.0 MHz	-73.36 dBm		
D2	FDX	1	76.728 MHz	-35.95 dB		

Date: 8.NOV.2017 15:28:29

CHAIN A DIV1_Cond Spur, 9GHz – 18GHz



Spurious Emissions

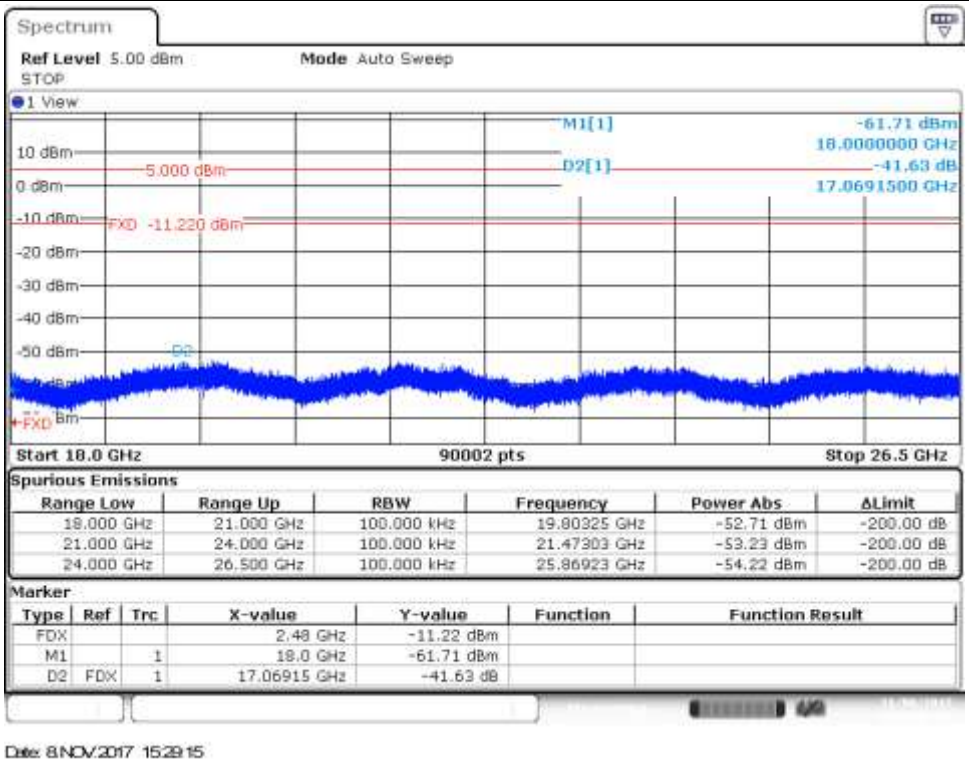
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 GHz	12.000 GHz	100.000 kHz	11.17875 GHz	-60.42 dBm	-200.00 dB
12.000 GHz	15.000 GHz	100.000 kHz	14.99835 GHz	-54.10 dBm	-200.00 dB
15.000 GHz	18.000 GHz	100.000 kHz	17.44517 GHz	-45.04 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.48 GHz	-11.22 dBm		
M1		1	9.0 GHz	-68.92 dBm		
D2	FDX	1	15.057965 GHz	-33.90 dB		

Date: 8.NOV.2017 15:28:52

CHAIN A DIV1_Cond Spur,18GHz – 26.5GHz



Spurious Emissions

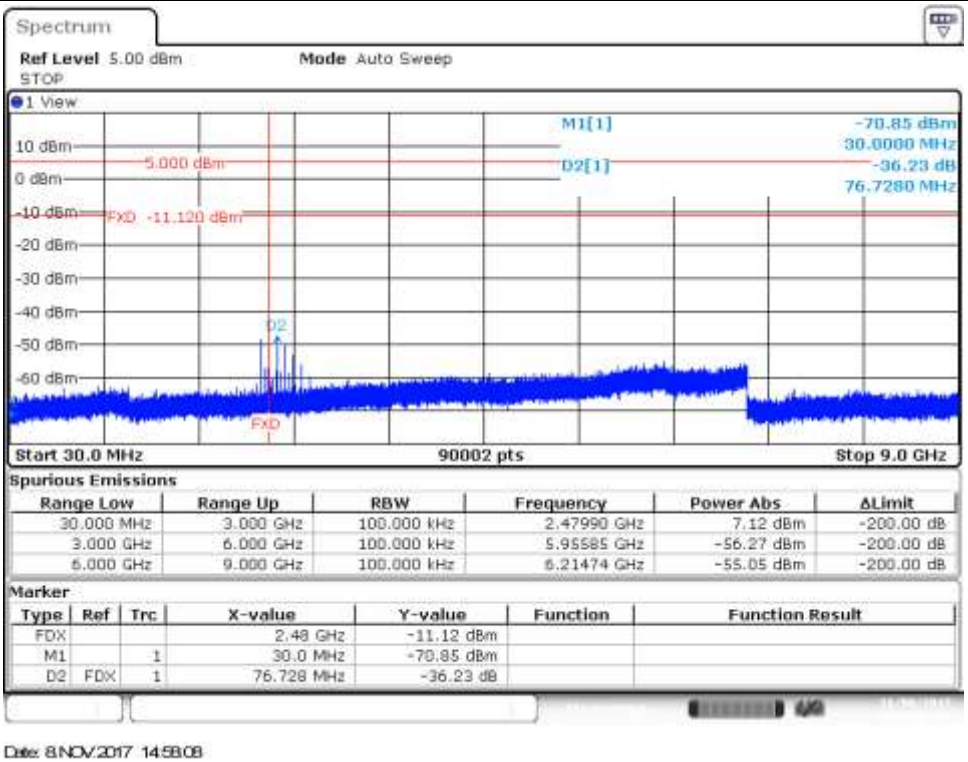
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
18.000 GHz	21.000 GHz	100.000 kHz	19.80325 GHz	-52.71 dBm	-200.00 dB
21.000 GHz	24.000 GHz	100.000 kHz	21.47303 GHz	-53.23 dBm	-200.00 dB
24.000 GHz	26.500 GHz	100.000 kHz	25.86923 GHz	-54.22 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.48 GHz	-11.22 dBm		
M1		1	18.0 GHz	-61.71 dBm		
D2	FDX	1	17.06915 GHz	-41.63 dB		

Date: 8.NOV.2017 15:29:15

CHAIN A DIV2_Cond Spur, 30MHz – 9GHz



Spurious Emissions

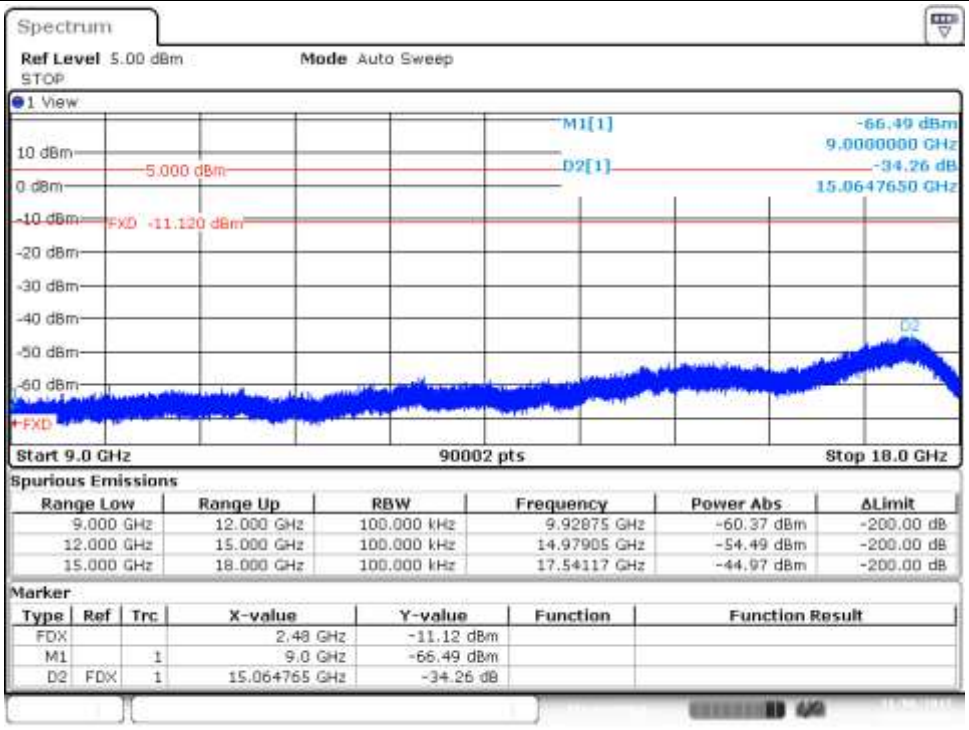
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	3.000 GHz	100.000 kHz	2.47990 GHz	7.12 dBm	-200.00 dB
3.000 GHz	6.000 GHz	100.000 kHz	5.95585 GHz	-56.27 dBm	-200.00 dB
6.000 GHz	9.000 GHz	100.000 kHz	6.21474 GHz	-55.05 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.48 GHz	-11.12 dBm		
M1		1	30.0 MHz	-70.85 dBm		
D2	FDX	1	76.728 MHz	-36.23 dB		

Date: 8.NOV.2017 14:58:08

CHAIN A DIV2_Cond Spur, 9GHz – 18GHz



Spurious Emissions

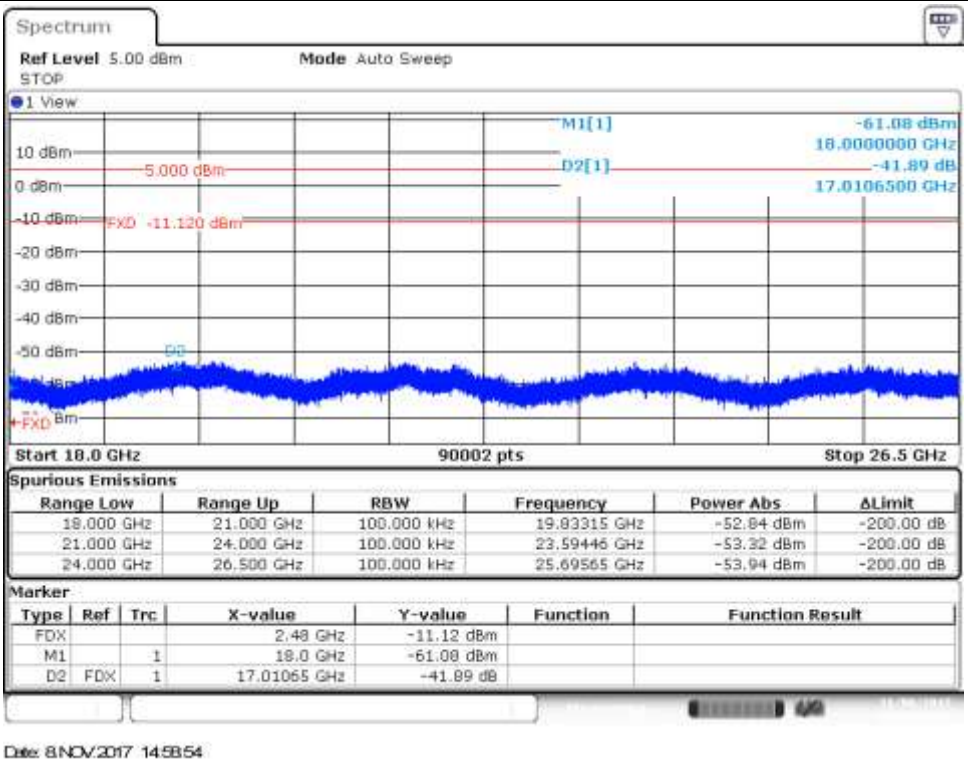
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 GHz	12.000 GHz	100.000 kHz	9.92875 GHz	-60.37 dBm	-200.00 dB
12.000 GHz	15.000 GHz	100.000 kHz	14.97905 GHz	-54.49 dBm	-200.00 dB
15.000 GHz	18.000 GHz	100.000 kHz	17.54117 GHz	-44.97 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.48 GHz	-11.12 dBm		
M1		1	9.0 GHz	-66.49 dBm		
D2	FDX	1	15.064765 GHz	-34.26 dB		

Date: 8.NOV.2017 14:58:31

CHAIN A DIV2_Cond Spur,18GHz – 26.5GHz



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
18.000 GHz	21.000 GHz	100.000 kHz	19.83315 GHz	-52.84 dBm	-200.00 dB
21.000 GHz	24.000 GHz	100.000 kHz	23.59446 GHz	-53.32 dBm	-200.00 dB
24.000 GHz	26.500 GHz	100.000 kHz	25.69565 GHz	-53.94 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.48 GHz	-11.12 dBm		
M1		1	18.0 GHz	-61.08 dBm		
D2	FDX	1	17.01065 GHz	-41.89 dB		

Date: 8.NOV.2017 14:58:54

C.1.5 Radiated spurious emission

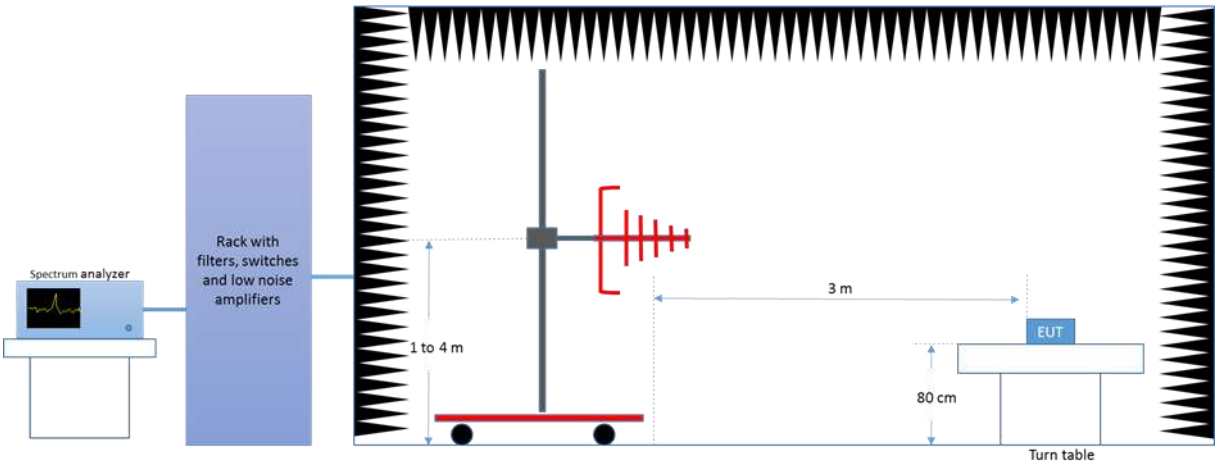
Standards references

<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
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>

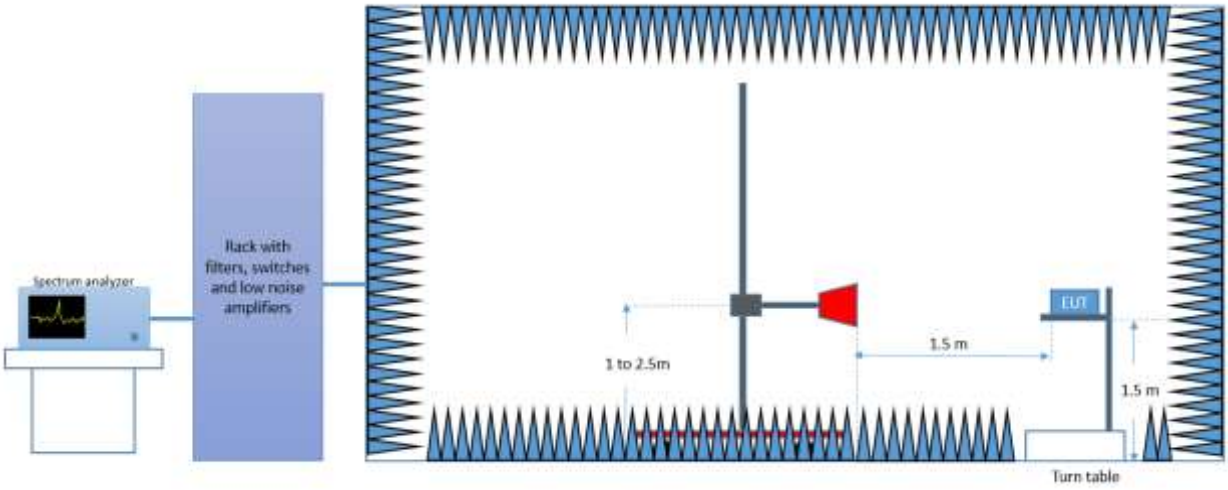
Test procedure

The setups below 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.

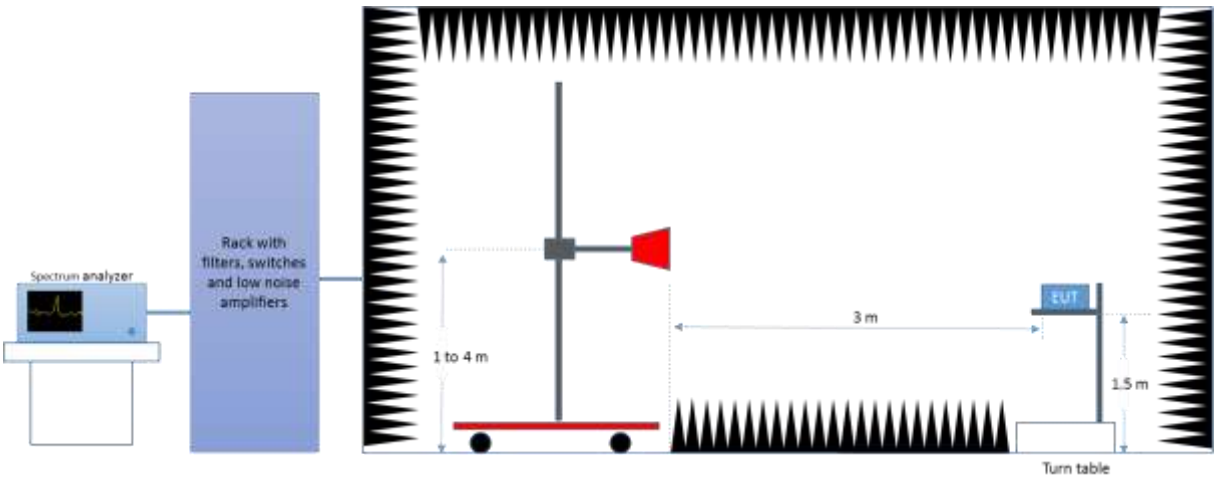
Radiated Setup 30 MHz - 1GHz



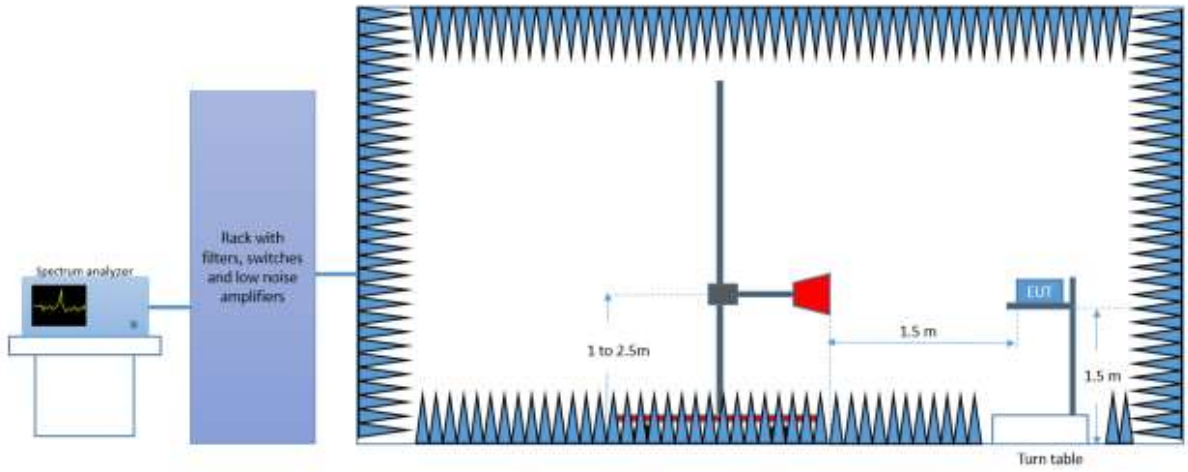
Radiated Setup 1 GHz – 6.4 GHz



Radiated Setup 6.4GHz – 18 GHz



Radiated Setup 18 GHz – 26.5 GHz



Sample Calculation

The field strength is deduced from the radiated measurement using the following equation:

$$E = 126.8 - 20\log(\lambda) + P - G$$

where

E is the field strength of the emission at the measurement distance, in dBµV/m

P is the power measured at the output of the test antenna, in dBm

λ is the wavelength of the emission under investigation [300/f_{MHz}], in m

G is the gain of the test antenna, in dBi

NOTE – The measured power P includes all applicable instrument correction factors up to the connection to the test

Antenna e.g. cable losses, amplifier gains.

For field strength measurements made at other than the distance at which the applicable limit is specified, the field strength of the emission at the distance specified by the limit is deduced as follows:

$$E_{SpecLimit} = E_{Meas} + 20\log(D_{Meas}/D_{SpecLimit})$$

where

$E_{SpecLimit}$ *is the field strength of the emission at the distance specified by the limit, in dBµV/m*

E_{Meas} *is the field strength of the emission at the measurement distance, in dBµV/m*

D_{Meas} *is the measurement distance, in m*

$D_{SpecLimit}$ *is the distance specified by the limit, in m*

Test Results

30 MHz – 26.5 GHz, BLE Chain A Div1

Radiated Spurious – CH0

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
110.9	24.3	---	43.5	19.2
137.0	25.1	---	43.5	18.4
216.0	27.4	---	46.0	18.6
456.0	32.8	---	46.0	13.2
576.1	34.0	---	46.0	12.1
1113.4	---	41.3	54.0	12.7
1151.9	---	40.6	54.0	13.4
1190.3	---	43.0	54.0	11.0
2325.6	---	44.9	54.0	9.1
2555.6	---	44.1	54.0	9.9
22000.0	---	35.2	54.0	18.8
22173.3	48.6	---	74.0	25.4

Radiated Spurious – CH19

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
72.0	22.7	---	40.0	17.3
110.8	26.6	---	43.5	16.9
138.2	25.2	---	43.5	18.3
216.0	28.7	---	43.5	14.8
263.0	34.9	---	46.0	11.1
576.0	35.0	---	46.0	11.0
2363.4	---	45.5	54.0	8.5
2516.6	---	46.4	54.0	7.6
2517.2	56.6	---	74.0	17.5
2593.4	---	44.4	54.0	9.6
2593.4	56.9	---	74.0	17.2
3444.4	59.3	---	74.0	14.7
24214.4	48.5	---	74.0	25.5
25901.5	---	35.8	54.0	18.2

Radiated Spurious – CH39

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
71.9	22.6	---	40.0	17.4
111.0	26.2	---	43.5	17.3
138.1	24.2	---	43.5	19.3
216.0	27.4	---	43.5	16.1
456.0	33.7	---	46.0	12.3
576.0	33.9	---	46.0	12.1
1190.3	52.3	---	74.0	21.7
1190.3	---	44.1	54.0	9.9
2556.6	---	46.9	54.0	7.1
2556.9	57.0	---	74.0	17.0
2633.8	---	45.8	54.0	8.2
2710.3	---	44.5	54.0	9.5
24131.9	48.1	---	74.0	25.9
25935.3	---	35.8	54.0	18.2

30 MHz – 26.5 GHz, BLE Chain A Div2

Radiated Spurious – CH0

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
58.6	22.5	---	40.0	17.6
72.0	23.5	---	40.0	16.5
111.0	25.4	---	43.5	18.1
216.0	26.8	---	43.5	16.7
456.0	32.8	---	46.0	13.2
576.0	35.9	---	46.0	10.1
1113.4	---	41.2	54.0	12.8
1151.9	---	40.5	54.0	13.5
1190.3	---	43.0	54.0	11.0
1190.3	51.3	---	74.0	22.7
2325.3	55.6	---	74.0	18.4
2325.3	---	44.9	54.0	9.1
2478.8	---	45.1	54.0	8.9
25661.9	48.1	---	74.0	25.9
25921.4	---	35.6	54.0	18.4

Radiated Spurious – CH19

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
71.9	22.6	---	40.0	17.4
111.0	26.2	---	43.5	17.3
216.0	27.4	---	43.5	16.1
456.0	33.7	---	46.0	12.3
576.0	33.9	---	46.0	12.1
1113.4	---	41.3	54.0	12.7
1151.9	---	40.5	54.0	13.5
1190.3	---	43.3	54.0	10.7
2363.4	56.2	---	74.0	17.8
2363.4	---	45.3	54.0	8.7
2516.9	---	45.4	54.0	8.6
2516.9	55.5	---	74.0	18.5
2593.8	---	44.1	54.0	9.9
2670.6	---	44.6	54.0	9.4
25875.6	48.0	---	74.0	26.0
25898.1	---	35.7	54.0	18.3

Radiated Spurious – CH39

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
110.8	26.0	---	43.5	17.5
136.9	25.6	---	43.5	17.9
216.0	27.5	---	43.5	16.0
263.9	27.5	---	46.0	18.5
346.2	34.4	---	46.0	11.6
576.0	36.0	---	46.0	10.0
1113.4	---	41.1	54.0	12.9
1151.9	---	40.4	54.0	13.6
1190.3	---	43.1	54.0	10.9
1190.3	51.3	---	74.0	22.7
2556.6	---	44.4	54.0	9.6
2633.8	---	44.4	54.0	9.6
2710.3	---	44.4	54.0	9.6
25911.6	---	35.7	54.0	18.3
25915.0	48.3	---	74.0	25.7