

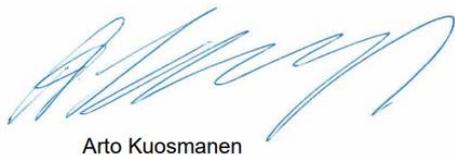
Radio Test Report

According to

**FCC part 15C,
RSS-247, RSS-Gen**

DUT Name: TR4111000
Model No. : 4111000
Customer: Treon Oy
Address: Visiokatu 3, 33720 Tampere, Finland
Summary IN COMPLIANCE
Date of Reception: 19.2.2024
Date(s) of Test(s): 8.3.2024 – 19.3.2024

Tested by Test Engineer



Arto Kuosmanen

Approved by Technical Manager



Jukka Rauma

The test report shall not be reproduced except in full, without the written approval of the laboratory. This report is only for the equipment which is described in page 4.

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Document Version History	Date of issue	Comments	Approved by
v0.1	24.4.2024	Initial version	
v0.2	13.5.2024	FCC/IC ID's, PMN, HVIN, FVIN, HMN added	
v1.0	26.6.2024	Approved version	Jukka Rauma
v2.0	8.7.2024	Internal, external and test setup pictures moved to separate Annex, 3955RER002_Annex1	Jukka Rauma
v3.0	14.8.2024	HMN removed	Jukka Rauma

1. General Information

Test Engineers: Arto Kuosmanen, Pekka Pulkkinen

Location:

Test Firm Name	Eurofins Electric & Electronics Finland Oy (EEEF)
Test Site	Yrttipellontie, Peltola
Address of Test Site	Yrttipellontie 6, 90230 Oulu, Finland
FCC Designation number	FI0008
FCC site registration number	771880
ISED number	29576
CAB Identifier	T290

Customer: Treon Oy
Visiokatu 3, 33720 Tampere, Finland
Mika Sipola
tel: +358 40 750 4514
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Climate Conditions: Temperature: 15 - 35 °C
Air pressure: 860 - 1060 hPa
Humidity: 30-60 rH%
These limits were not exceeded during testing.

2. Test Samples

General description:

4111000 and 5111000 together form a comprehensive and versatile tracking device.

4111000 is responsible for providing local & wide area connectivity to a backend service using in-built antennas, monitoring selected metrics using in-built sensors and autonomous operation using an in-built battery.

5111000 has a powerful processing unit, plenty of RAM and data storage for the processing of data from the monitored object 4111000, and for running internal applications for various purposes.

5111000 has multiple different connectors for data transfer, power transfer and connection of external devices.

Test sample (Conducted):

Sample number	Serial number	Manufacturer	DUT Type	Model	HW version	SW version
3955ER0014	24034339500341	Treon Oy	Connectivity Unit	4111000	05	5.3

Test sample (Radiated):

Sample number	Serial number	Manufacturer	DUT Type	Model	HW version	SW version
3955ER005	240343379600161 (CU EMC09 BT DTM)	Treon Oy	Connectivity unit	4111000	05	5.3
3955ER011	24034339500043 (CU EMC05 v2)	Treon Oy	Connectivity unit	4111000	05	5.3
3955ER013	PU0BF6CEBFCW2350	Treon Oy	Processing unit	5111000	C	0.0.2

Auxiliary equipment:

Sample number	Serial number	Manufacturer	DUT Type	Model	
3955ER008	NA	Treon Oy	USB-cable	NA	
3955ER009	NA	Treon Oy	Power cable	NA	

Description	Information	
Additional model	-	
Brand Names(s)	-	
PMN	4111000	
HVIN	4111000	
FVIN	5.3	
HMN		
FCC ID	2AR86-TR41	
IC I	24716-TR41	
Radio technology / type of equipment	Bluetooth LE 5.0	
- operating frequency range:	2400.0 MHz – 2483.5 MHz	
- Nominal Channel Bandwidth:	1 MHz	
Modulation:	GFSK	
Number of antennas	1 (ANT2)	
Bluetooth Specification	LE 1Mbps PHY	Yes
	LE 2Mbps PHY	No
	LE Coded PHY S=2 (500 kbit)	No
	LE Coded PHY S=8 (125 kbit)	No
	Stable Modulation Index - Transmitter	No
	Stable Modulation Index - Receiver	No
Antenna	Type	Integrated antenna
	Model	Treon
	Manufacturer	Treon
	Gain	0.91 dBi (ANT2)
Supply voltage	6.0 VDC	
Type of Power source	Internal battery	
Operating Temperature	TNom = 20 °C TMin = -30 °C TMax = 75 °C	
Manufacturer	Treon Oy Visiokatu 3, 33720 Tampere, Finland	

3. Configuration and Operation Modes

Conducted RF test:

Test modes / description
GFSK modulation, data rate 1 Mbps, duty cycle 63%
Continuous modulated carrier at 2402 MHz, 2442 MHz and 2480 MHz

Conducted and radiated emission test:

Test modes / description
EUT powered by lab power (6VDC), continuous modulated carrier at 2402 MHz, 2442 MHz and 2480 MHz, power level setting +8 dBm, data rate 1 Mbps
EUT powered by Agilent AC power 24 VAC/50 Hz, continuous reception at 2442 MHz

Test/configuration software

Manufacturer	Name	Version
Nordic Semiconductor	nRF Connect for Desktop	4.3.0

4. Test equipment

Conducted RF tests

R&S TS8997 Test System equipment list:

New ID	Manufacturer	Equipment type	Description	Serial	Calibration information	Next calibration
G4C462	Rohde & Schwarz	SMW200A	Vector signal generator	110578	27.6.2023	27.6.2026
G4C463	Rohde & Schwarz	SMB100A	Signal Generator	183205	27.6.2023	27.6.2026
G4C464	Rohde & Schwarz	OSP150	Open switch and control unit	101135	29.6.2023	29.6.2024
G4C465	Rohde & Schwarz	OSP220	Open switch and control unit	102440	29.6.2023	29.6.2024
G4C466	Rohde & Schwarz	ESW44	EMI test receiver	103103	5.7.2023	5.7.2024
G4C467	Rohde & Schwarz	CMW500	Wideband radio communication tester	171062	29.6.2023	29.6.2024

Radiated emission

New ID	Manufacturer	Equipment type	Description	Serial	Calibration information	Next calibration
G4C265	Rohde & Schwarz	ESW26	EMI test receiver	101324	6.7.2023	6.7.2024
G4C273	Frankonia	ALX-4000E	Broadband Antenna, 25MHz-4GHz with 6dB (50-A-MFN-06) att.	00816+1531	22.1.2024	22.1.2027
G4C292	Rohde & Schwarz	TS-LNA 1840	RF Preamplifier 18 to 40 GHz	100841	9.6.2022	9.6.2024
G4C298	Rohde & Schwarz	CMW500	Wideband radio communication tester	170980	29.6.2023	29.6.2024
G4C469	Rohde & Schwarz	TS_PRE2	RF Preamplifier	101541	9.6.2022	9.6.2024
G4C294	Rohde & Schwarz	Antenna	Horn Antenna -> 40GHz	101067	4.11.2022	4.11.2025
G4C572	Schaffner	CBL 6143	Bilog Antenna 30MHz-3GHz	5071	7.9.2022	7.9.2025
G4C576	Rohde & Schwarz	HF907	Double-Ridged Waveguide Horn Antenna 800MHz-18GHz	100163	9.8.2022	9.8.2025

Test software

Description	Manufacturer	Name	Version
EMC Software	Rohde & Schwarz	EMC32	10.60.20
RF Software	Rohde & Schwarz	WMS32	11.60.00

5. Uncertainties

Description	Expanded Uncertainty (k=2)
RF Output Power	0,99
Peak Power	0,80
Power Spectral Density	0,99
Accumulated Transmit Time	0,01%
Minimum Frequency Occupation Time	0,01%
Hopping Frequency Separation	0,60%
Occupied Channel Bandwidth	2,08 %
Out-of-band emissions	0,89
Transmitter unwanted emissions in the spurious domain	1,76
AC conducted emission	2,24
Radiated emission ≤ 1 GHz	4,62
Radiated emission > 1 GHz	5,72

6. Sample emission level calculation

The following is a description of term and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyzer in dBuV.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strength to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. RF path losses, including RF cables and preamplifiers, have been included with the A.F to simplify the calculations. The antenna factor is used in calculations as follows:

$$\text{Reading on Analyzer (dBuV)} + \text{A.F. (dB/m)} = \text{Net field strength (dBuV/m)}$$

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of dBuV/m). The FCC limits are given in units of uV/m. The following formula is used to convert the units of uV/m to dbuV/m:

$$\text{Limit (dBuV/m)} = 20 * \log(\text{uV/m})$$

Margin :

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

Reading + AF	= Net Reading :	Net reading – FCC limit	= Margin
+ 21.5 dBuV + 26 dB/m	= 47.5 dBuV/m :	47.5 dBuV/m – 57.0 dBuV/m	= -9.5 dB

7. Test conditions

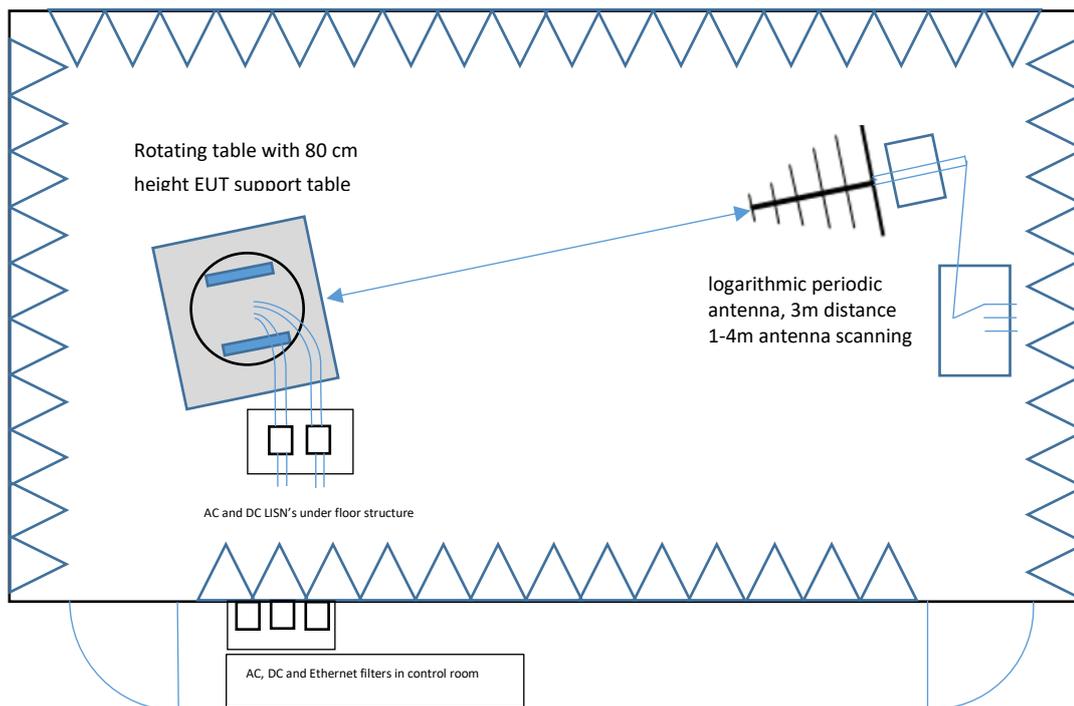
All radiated tests were performed in a semi-anechoic chamber, where the measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz, 1 GHz-18 GHz Double-ridged horn antenna and 18 GHz-40 GHz horn antenna) is located at a distance of 3 m.

The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height (all antennas) was varied from 1 to 4 meters to find the maximum radiated emission.

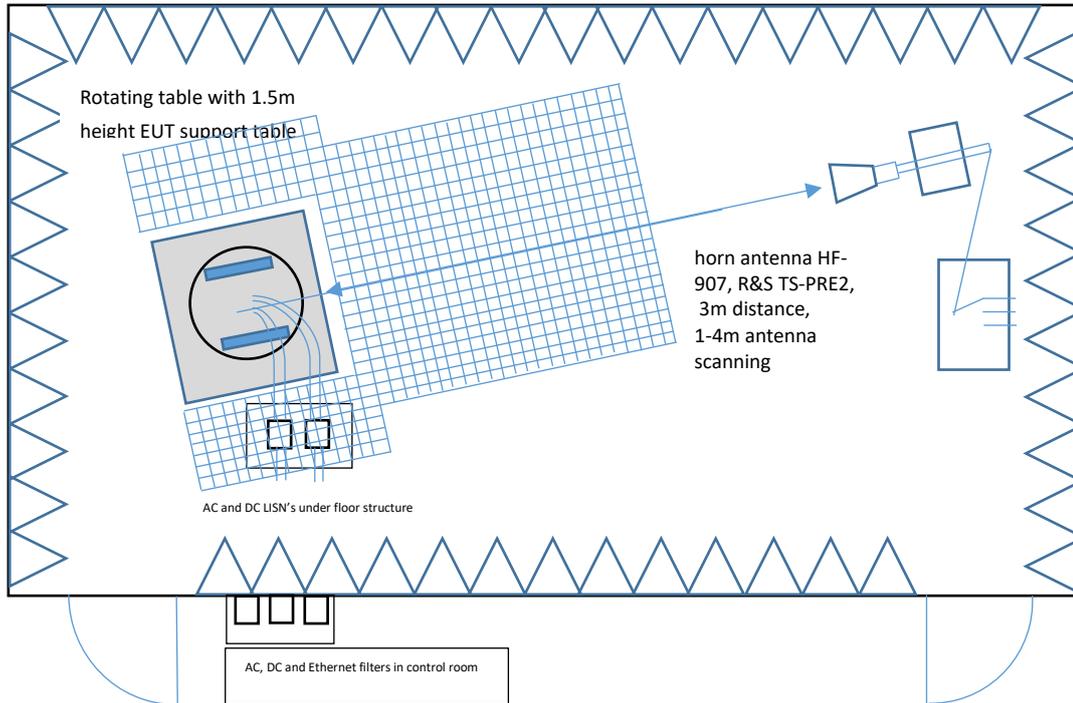
Measurements were made in both horizontal and vertical planes of polarization.

A resolution bandwidth / video bandwidth of 100 kHz / 300 kHz was used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

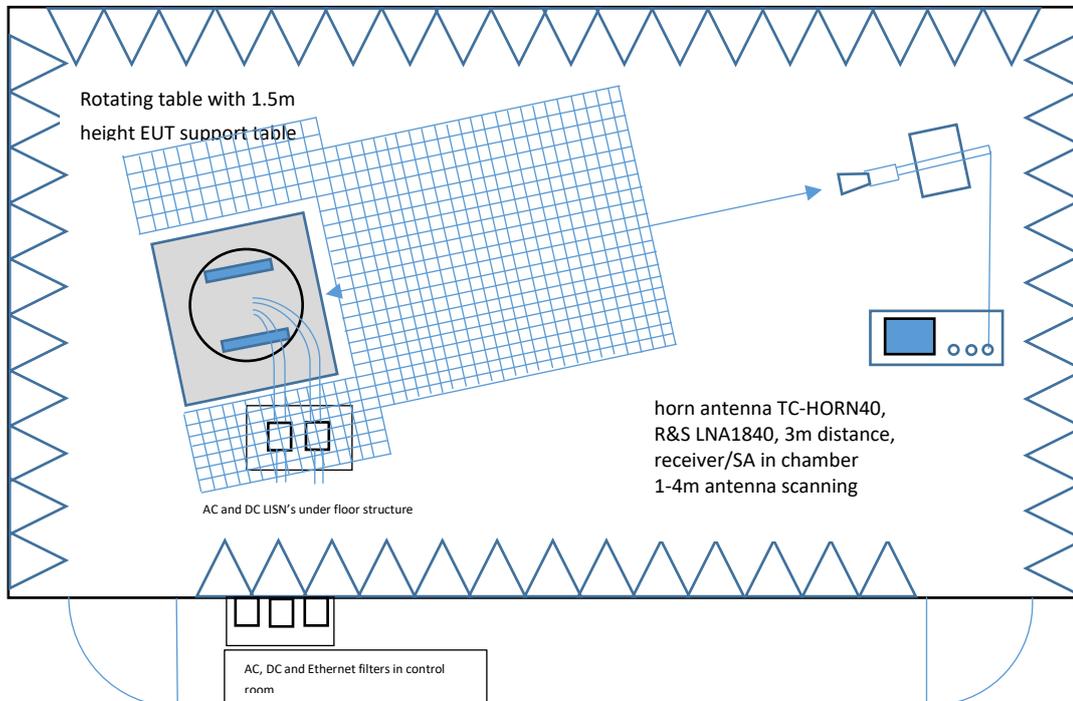
Radiated measurements setup from 30 MHz to 1 GHz:



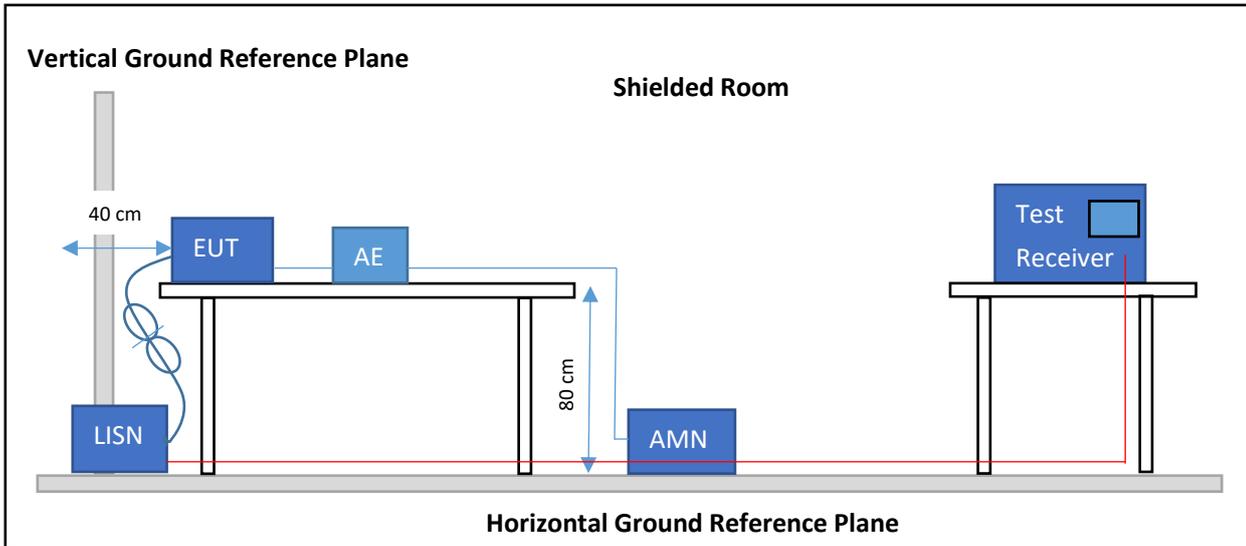
Radiated measurements setup from 1 GHz to 18 GHz:



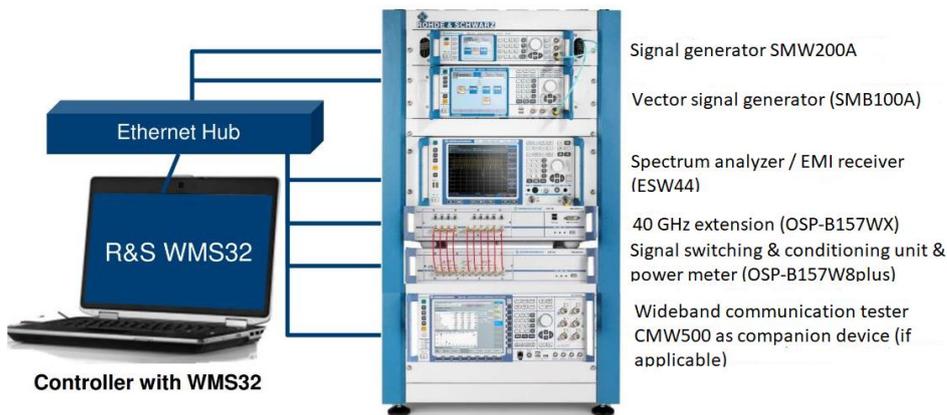
Radiated measurements setup from 18 GHz to 26 / 40 GHz:



Conducted emission setup



Conducted RF measurement system:



8. Summary

FCC/ISED Requirement (15.247 / RSS-247)		Reference method	Result	Remark
Occupied Bandwidth	ISED RSS-Gen, Issue 5 A2 (section 6.7)	ANSI C63.10-2013	N/R	Informational only
6 dB Bandwidth	FCC § 15.247(a)(2) / RSS-247, Issue 3 (section 5.2 (a))	ANSI C63.10-2013	PASS	
Maximum peak conducted power	FCC § 15.247(b) / RSS-247, Issue 3 (section 5.4 (d))	ANSI C63.10-2013	PASS	
Power spectral density	FCC § 15.247(e) / RSS-247, Issue 3 (section 5.2)	ANSI C63.10-2013	PASS	
AC power line conducted emissions	FCC § 15.207 / RSS-247, Issue 3 (section 3.1)	ANSI C63.10-2013	PASS	
Band edge compliance	FCC § 15.247(d) / RSS-247, Issue 3 (section 5.5)	ANSI C63.10-2013	PASS	
Conducted spurious emissions	FCC § 15.247(d) / RSS-247, Issue 3 (section 5.5)	ANSI C63.10-2013	PASS	
Transmitter radiated spurious emissions	FCC § 15.247(d), FCC § 15.209 / RSS-Gen, Issue 5 A2 (section 6.13)	ANSI C63.10-2013	PASS	
Receiver radiated spurious emissions	ISED RSS-247, Issue 3 (section 3.1)	ANSI C63.4-2014	PASS	
Possible test case verdicts: PASS = Tested device meets the requirements FAIL = Tested device does not meet the requirements N/A = Test requirement not applicable for tested device N/T = Test requirement applicable for tested device, but not tested				
Applicable FCC KDB(s): KDB 558074 DO1: DTS measurement guidance v 0502 (Apr 2, 2019)				

9. Occupied bandwidth

Reference: ISED RSS-Gen, Issue 5 A2 (section 6.7)

Test method: ANSI C63.10 (6.9.3)

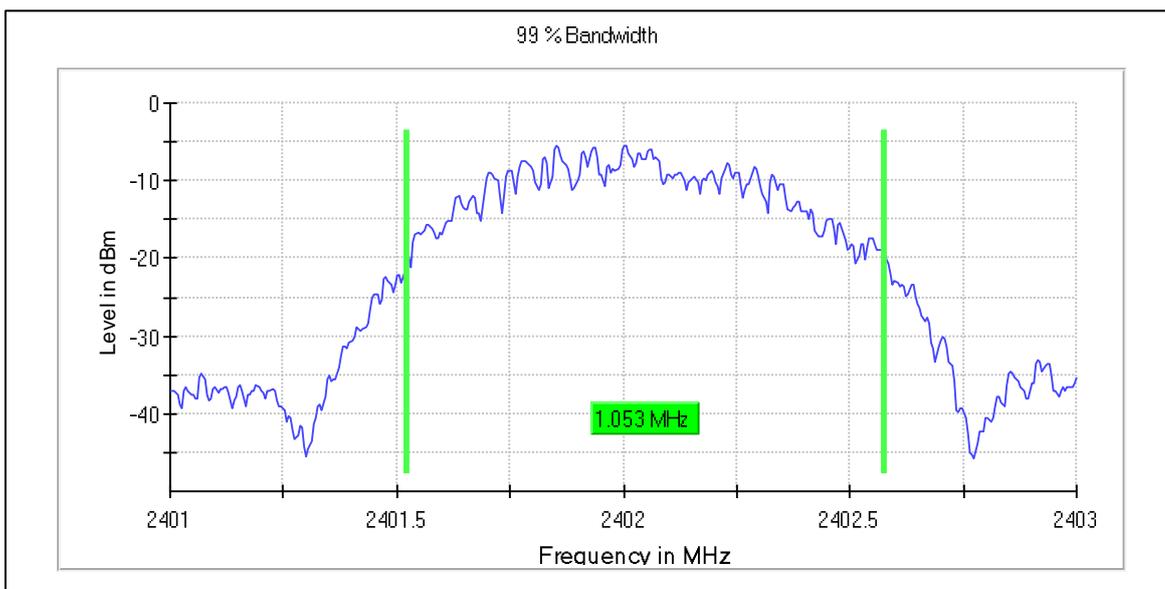
Limits
None (Informational only)

Procedure
<ol style="list-style-type: none"> 1. EUT transmitter is activated in test mode under normal conditions 2. Spectrum analyzer is set to peak detection and maximum hold with a span twice the emission spectrum 3. The resolution bandwidth is set to the range of 1% to 5% of the occupied bandwidth 4. The occupied bandwidth is measured with the build-in analyzer function

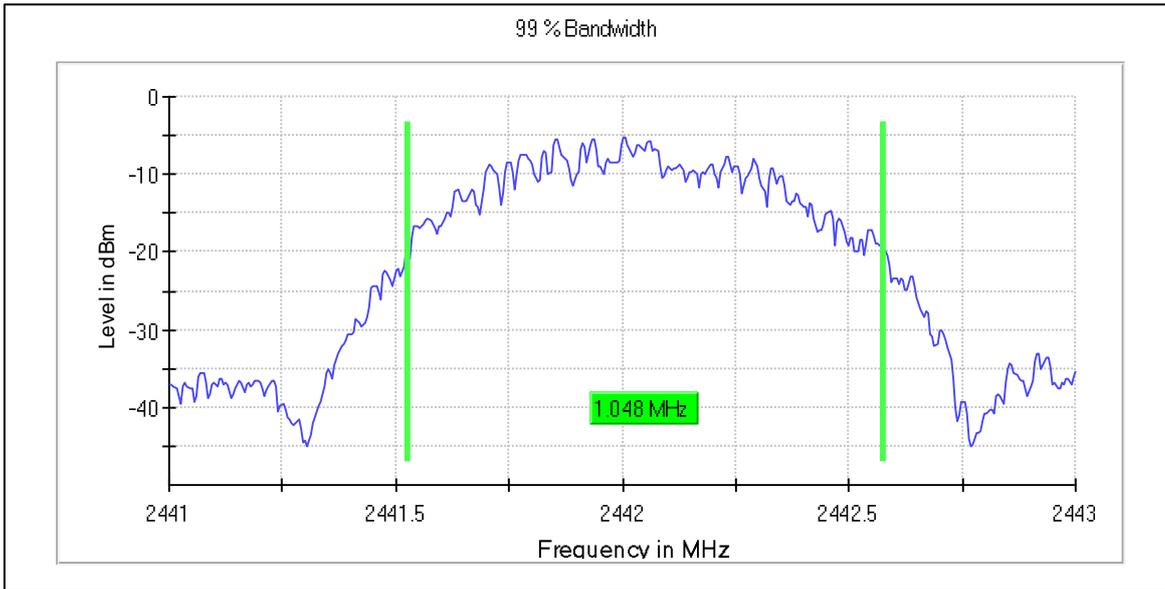
Summary:

Summary		
Mode / modulation	Frequency (MHz)	Bandwidth (MHz)
ANT 2 Bluetooth LE, 1 Mbps	2402	1.052632 MHz
ANT 2 Bluetooth LE, 1 Mbps	2442	1.047619 MHz
ANT 2 Bluetooth LE, 1 Mbps	2480	1.057644 MHz

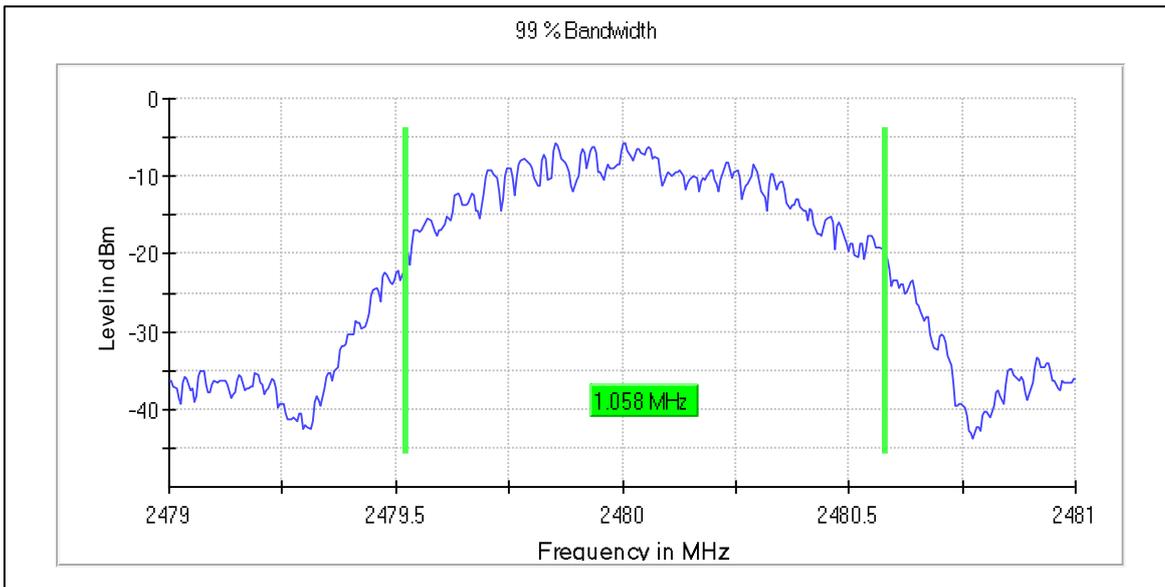
ANT 2 Occupied bandwidth, low channel



ANT 2, Occupied bandwidth, middle channel



ANT 2, Occupied bandwidth, high channel



10. 6 dB bandwidth

Reference: FCC title 47 part 15 §15.247(a), ISED RSS-247, Issue 3 (section 5.2)

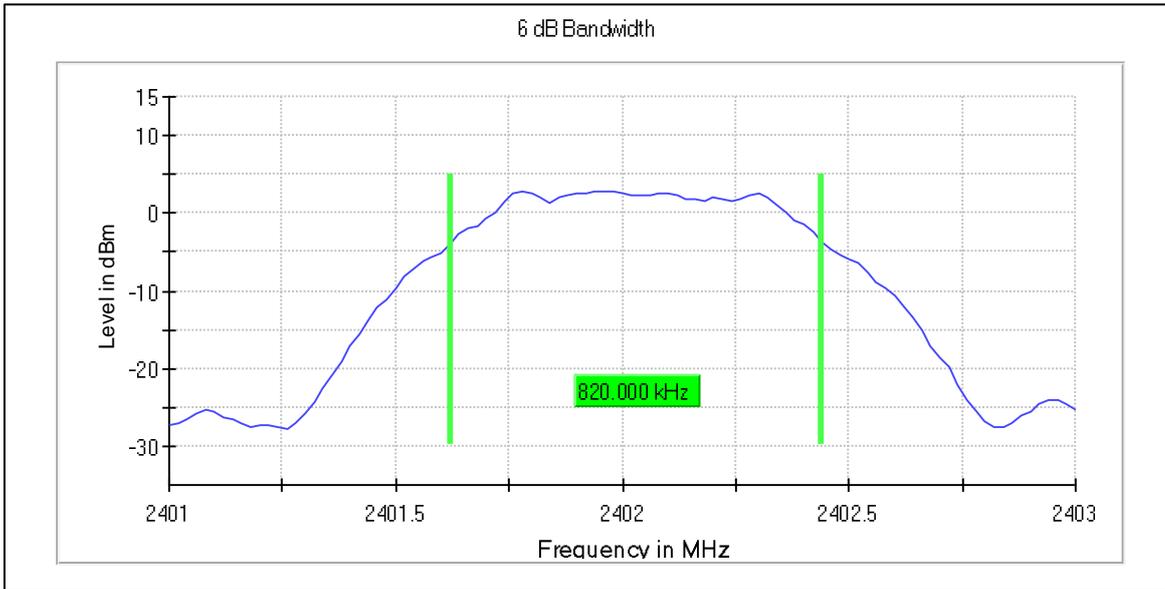
Test method: KDB 558074 D01 DTS Meas Guidance v05r02 and ANSI C63.10-2013 (11.8.1)

Limits
The minimum 6 dB bandwidth shall be at least 500 kHz.

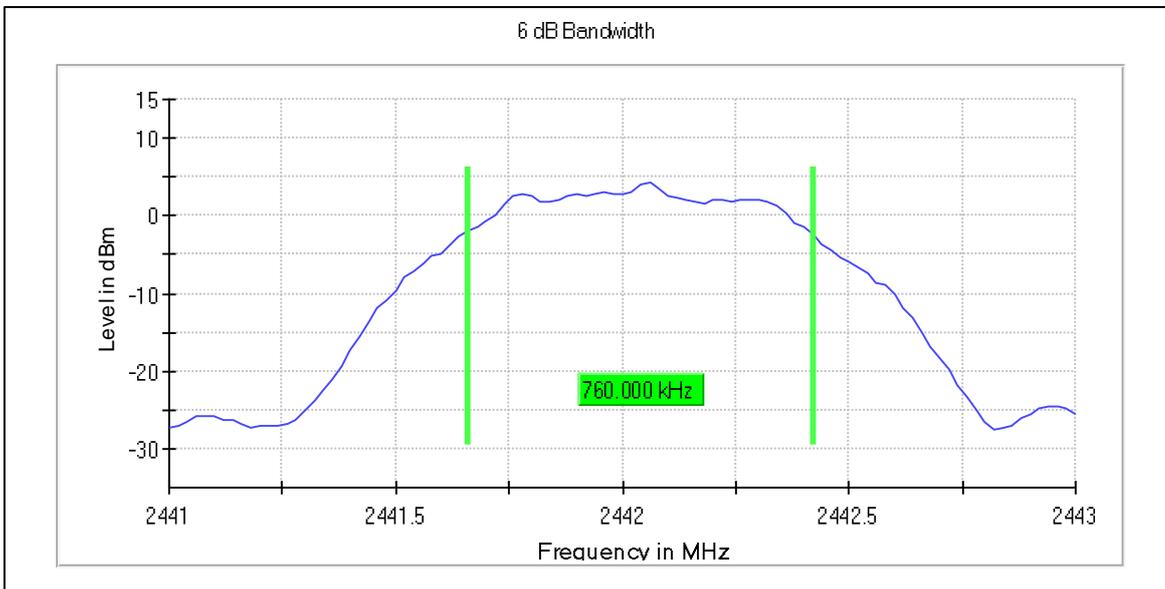
Test procedure
<ol style="list-style-type: none"> 1. EUT set to test mode 2. Span set to at least twice the emission spectrum 3. Detector set to peak and max hold and BW is set to 100 kHz 4. Envelope peak value of emission spectrum is selected 5. Marker on envelope of spectrum is set to level of -6 dB to the left of the peak 6. Marker on envelope of spectrum is set to level of -6 dB to the right of the peak 7. 6 dB bandwidth is determined by marker frequency separation

Mode / modulation	DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)	Result
ANT 2 Bluetooth LE, 1 Mbps	2402.000000	0.820000	0.500000	---	2401.620000	2402.440000	2.9	PASS
ANT 2 Bluetooth LE, 1 Mbps	2442.000000	0.760000	0.500000	---	2441.660000	2442.420000	4.2	PASS
ANT 2 Bluetooth LE, 1 Mbps	2480.000000	0.780000	0.500000	---	2479.640000	2480.420000	3.7	PASS

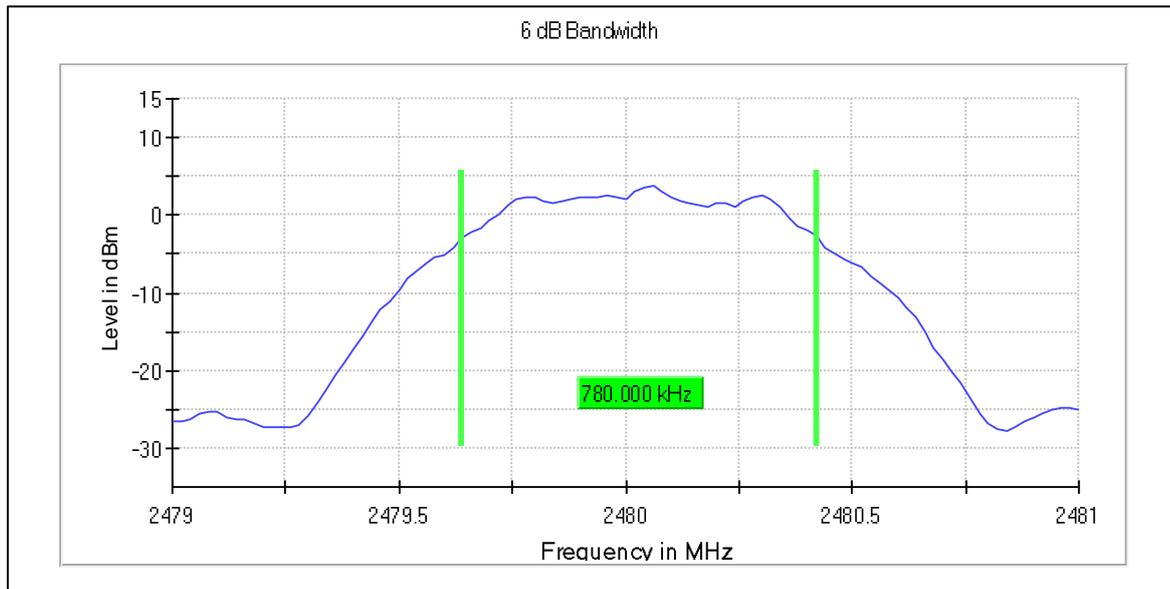
ANT, 2 6 dB Bandwidth, low channel:



ANT 2, 6 dB Bandwidth, middle channel:



ANT 2, 6 dB Bandwidth, high channel:



11. Peak conducted output power

Reference: FCC part 15 §15.247(b), ISED RSS-247, Issue 3 (section 5.4)

Test method: KDB 558074 D01 DTS Meas Guidance v05r02 and ANSI C63.10-2013 (11.9.1.1)

Limits
For systems using digital modulation in the 2400-2483.5 MHz band: 1 watt (30 dBm). The e.i.r.p. shall not exceed 4 W (36 dBm) (Canada).
The conducted output power limit specified above is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in the table, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

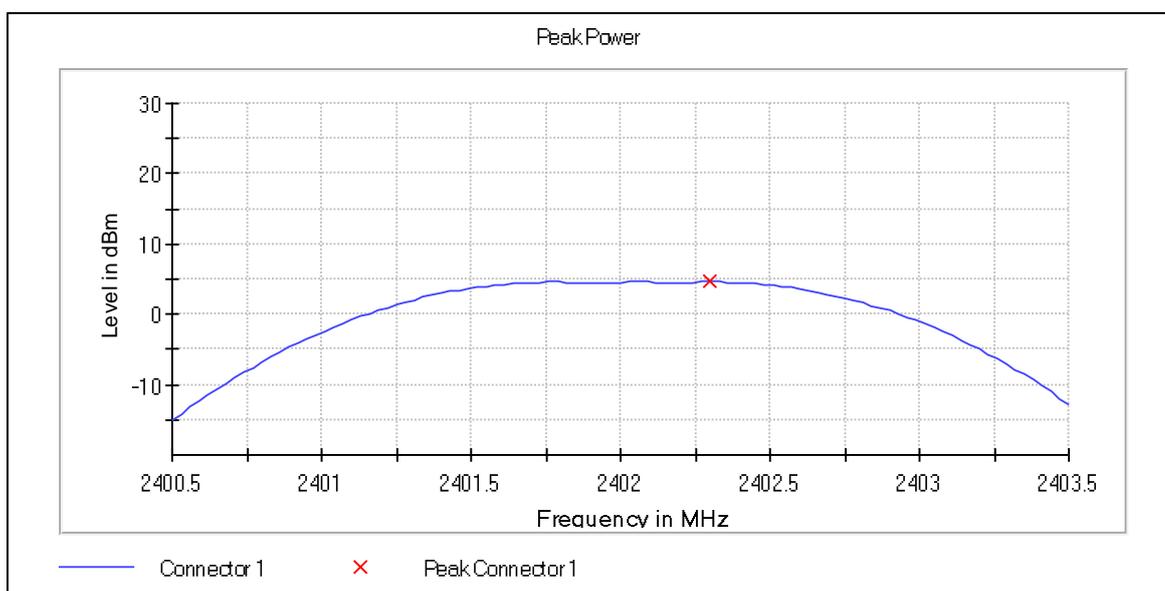
Test procedure
1. EUT set to test mode (communication tested is used if needed)
2. Analyzer resolution bandwidth is set \geq DTS bandwidth
3. Detector set to peak and max hold
4. Sweep time is set to auto
5. After trace has stabilized a marker is set to peak envelope

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

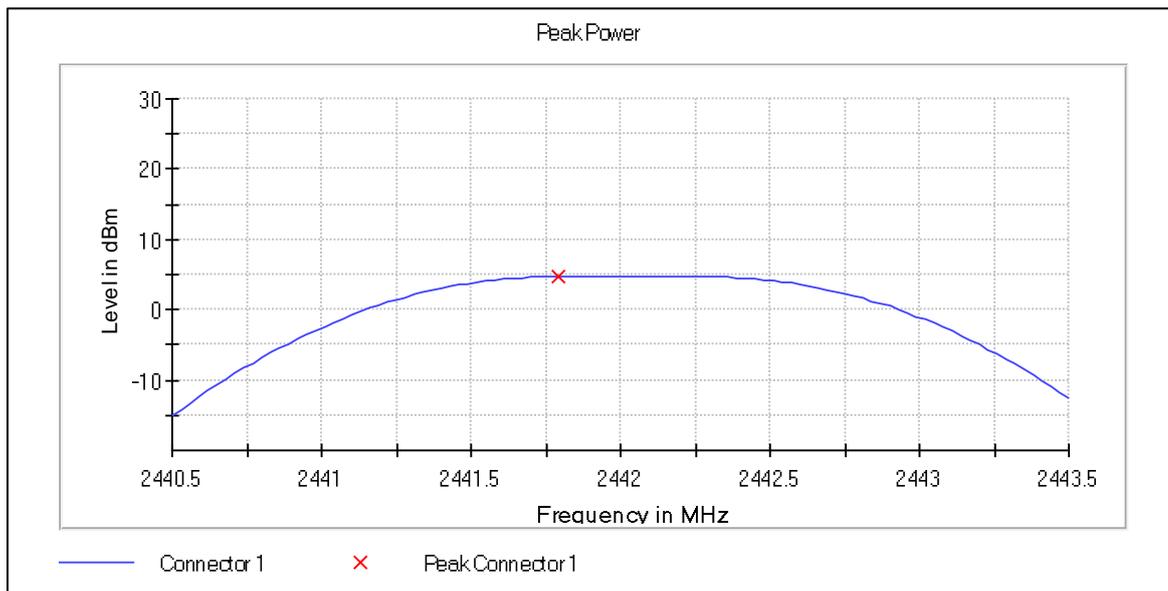
Maximum Declared Antenna Gain: ANT 2: 0.91 dBi

Mode / modulation	DUT Frequency (MHz)	Peak Power (dBm)	EIRP Power (dBm)	Result
ANT 2 Bluetooth LE, 1 Mbps	2402.000000	4.6	5.51	PASS
ANT 2 Bluetooth LE, 1 Mbps	2442.000000	4.7	5.61	PASS
ANT 2 Bluetooth LE, 1 Mbps	2480.000000	4.3	5.21	PASS

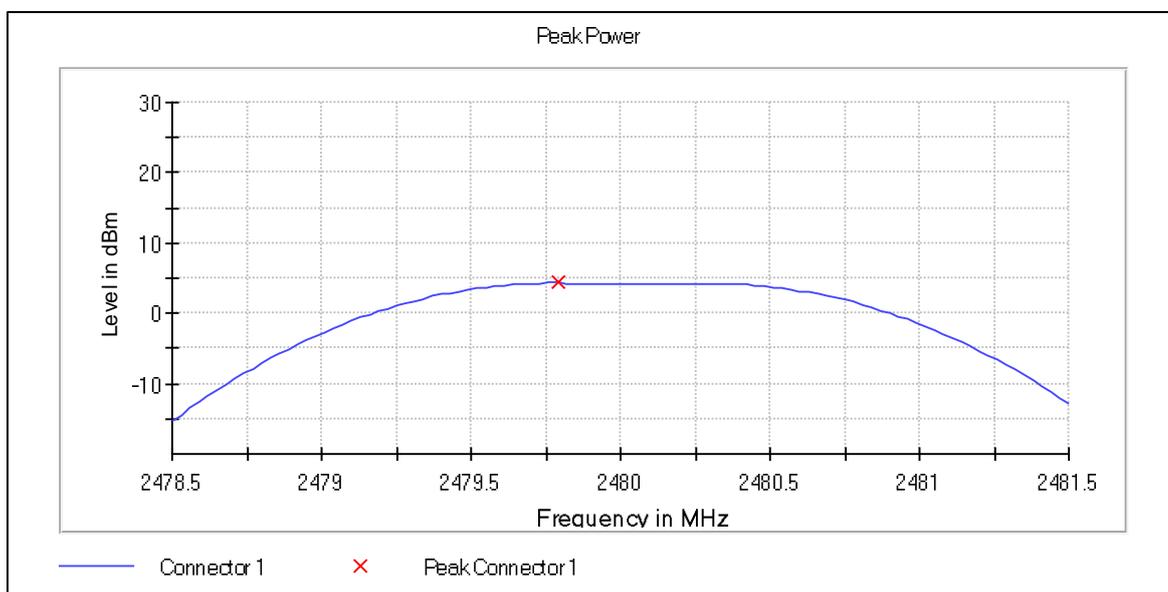
ANT 2, Peak power, low channel



ANT 2, Peak power, middle channel



ANT 2, Peak power, high channel



12. Peak Power Spectral Density

Reference: FCC §15.247(a),(e), ISED RSS-247, Issue 3 (section 5.2)

Test method: KDB 558074 D01 DTS Meas Guidance v05r02 and ANSI C63.10-2013 (11.10.2, 14.3.2)

Specification: 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.

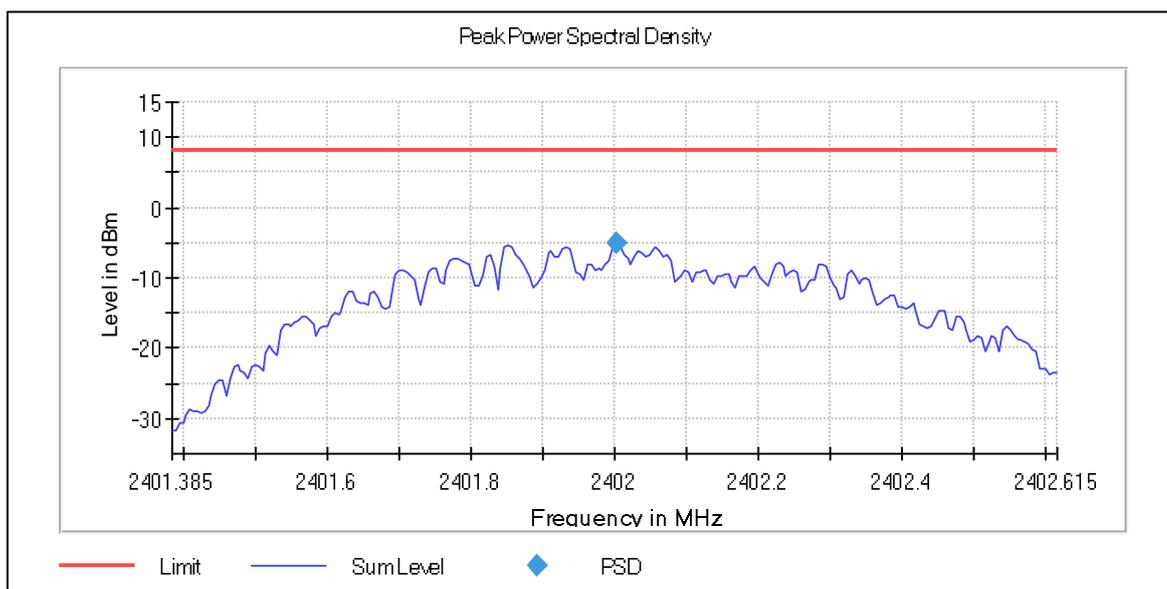
Limits
≤ 8 dBm / 3 kHz

Test procedure
<ol style="list-style-type: none"> 1. EUT set to test mode 2. The analyser is set to DTS channel center frequency with a span of 1.5 times the DTS bandwidth 3. The analyzer is set to 100 kHz with VBW ≥ RBW and the detector is set to peak with max hold 4. After trace has stabilized a marker is set to the envelope maximum 5. If the power spectral density is above the limit the RBW is reduces (not lower than 3 kHz) and the measurement is repeated 6. If the EUT has more than one transmit chain the procedure is repeated for each chain

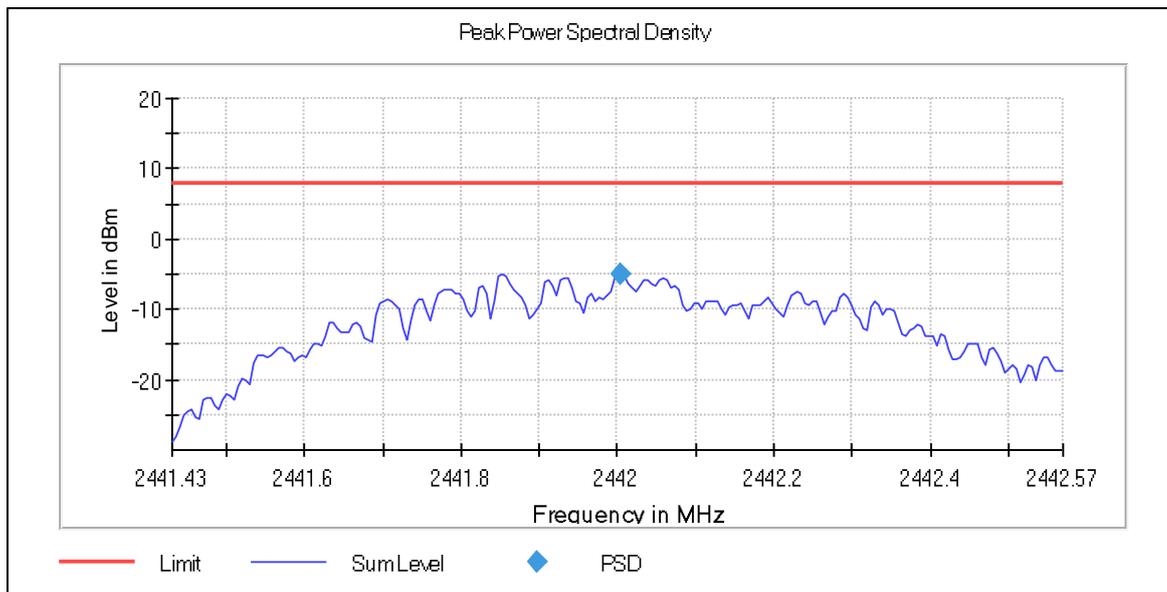
Summary

Mode / modulation	DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
ANT 2 Bluetooth LE, 1 Mbps	2402.000000	2402.002510	-5.155	8.0	PASS
ANT 2 Bluetooth LE, 1 Mbps	2442.000000	2442.002511	-4.916	8.0	PASS
ANT 2 Bluetooth LE, 1 Mbps	2480.000000	2480.002511	-5.475	8.0	PASS

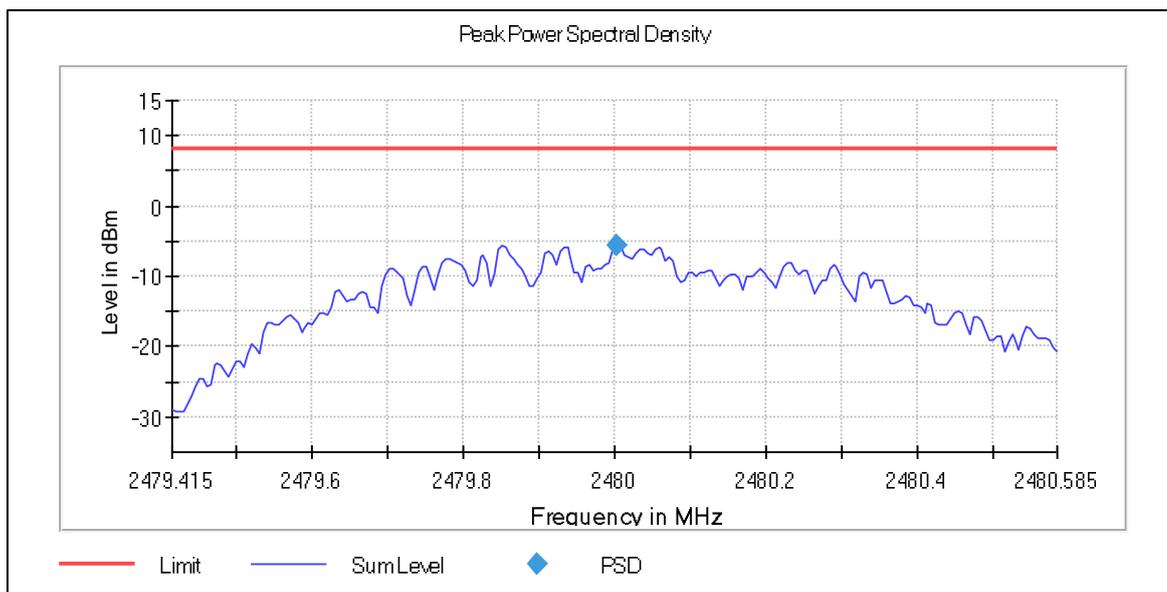
ANT 2, Peak power spectral density, low channel



ANT 2, Peak power spectral density, middle channel



ANT 2, Peak power spectral density, high channel:



13. AC power line conducted emissions

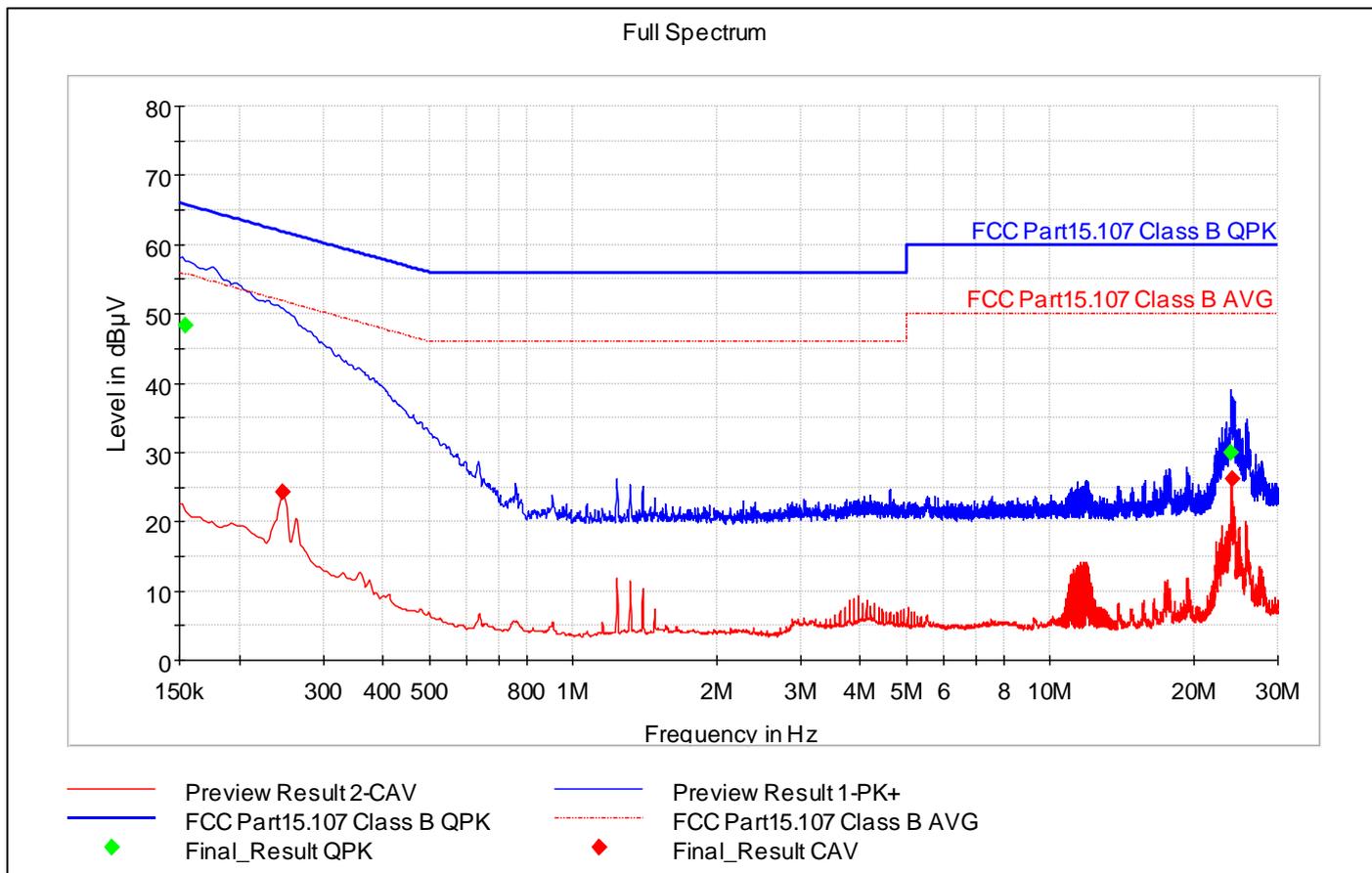
Reference: FCC §15.207, ISED RSS-247, Issue 3 (section 3.1)

Test method: ANSI C63.10-2013 (6.2)

Limits		
Frequency (MHz)	Quasi-Peak (dBuV)	Average (dBuV)
0.15 – 0.5	66 -56*	56 – 46*
0.5 – 5	56	46
5 - 30	60	50
*Limit decreases linearly with the logarithm of the frequency		

Operation mode(s)	Configuration	Test Verdict
Bluetooth LE RX, 1 Mbps	Mid channel, 2442 MHz	PASS

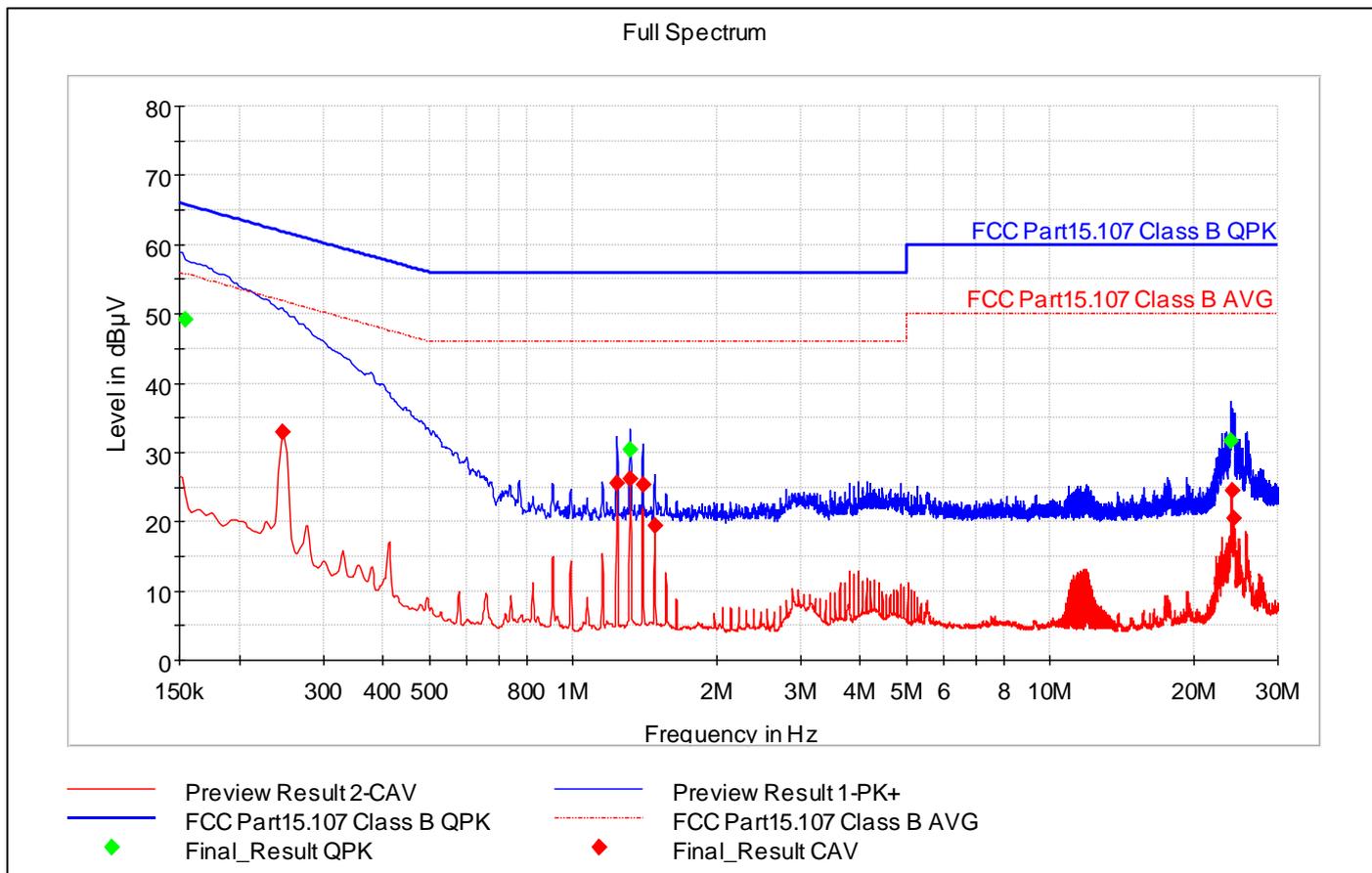
Conducted emission at the mains power port according to 47 CFR Part 15.207, Bluetooth LE 2442 MHz, Phase



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.154500	48.40	---	65.75	17.35	15000.0	9.000	L1	ON	9.8	PASS
0.246750	---	24.31	51.87	27.56	15000.0	9.000	L1	ON	9.8	PASS
23.887500	30.00	---	60.00	30.00	15000.0	9.000	L1	ON	10.4	PASS
23.986500	---	26.24	50.00	23.76	15000.0	9.000	L1	ON	10.4	PASS

Conducted emission at the mains power port according to 47 CFR Part 15.207, Bluetooth LE 2442 MHz, Neutral



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.154500	49.11	---	65.75	16.64	15000.0	9.000	N	ON	9.8	PASS
0.246750	---	32.98	51.87	18.88	15000.0	9.000	N	ON	9.8	PASS
1.236750	---	25.45	46.00	20.55	15000.0	9.000	N	ON	9.8	PASS
1.320000	---	26.28	46.00	19.72	15000.0	9.000	N	ON	9.8	PASS
1.320000	30.33	---	56.00	25.67	15000.0	9.000	N	ON	9.8	PASS
1.401000	---	25.33	46.00	20.67	15000.0	9.000	N	ON	9.8	PASS
1.484250	---	19.43	46.00	26.57	15000.0	9.000	N	ON	9.8	PASS
23.977500	31.70	---	60.00	28.30	15000.0	9.000	N	ON	10.5	PASS
23.988750	---	24.51	50.00	25.49	15000.0	9.000	N	ON	10.5	PASS
24.216000	---	20.57	50.00	29.43	15000.0	9.000	N	ON	10.5	PASS

14. Band edge emissions compliance (transmitter)

Reference: FCC §15.247(d), ISED RSS-247, Issue 3 (section 5.5)

Test method: KDB 558074 D01 DTS Meas Guidance v05r02 8.7 and ANSI C63.10-2013 (11.13)

Specification: In any 100 kHz bandwidths outside the frequency band in which the 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Limits	
Power measurement	Out-of-band attenuation (dB)
Peak	20
RMS	30

Limits	
1.	EUT set to test mode (communication tester is used if needed)
2.	Span set around lower band edge and detector is set to peak and max hold
3.	Resolution bandwidth is set to 100 kHz
4.	Peak emission level(s) within frequency band and outside frequency band is measured
5.	Band edge attenuation is determined from level difference

Summary

Mode / modulation	DUT Frequency (MHz)	Result
ANT 2 Bluetooth LE, 1 Mbps	2402.000000	PASS
ANT 2 Bluetooth LE, 1 Mbps	2480.000000	PASS

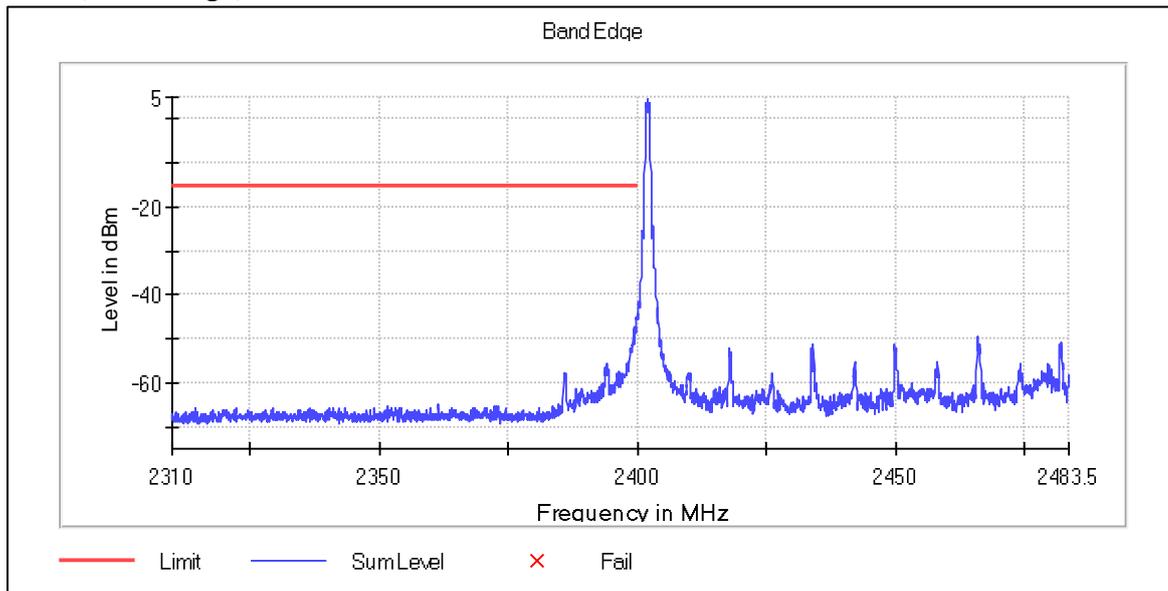
ANT 2, Measurements, band edge low

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.949972	-44.3	28.9	-15.4	PASS
2399.749861	-45.0	29.6	-15.4	PASS
2399.799889	-45.3	29.9	-15.4	PASS
2399.699833	-45.3	30.0	-15.4	PASS
2399.849917	-45.4	30.1	-15.4	PASS
2399.899944	-45.5	30.1	-15.4	PASS
2399.549750	-47.2	31.9	-15.4	PASS
2399.599778	-47.3	31.9	-15.4	PASS
2399.499722	-47.8	32.4	-15.4	PASS
2399.249583	-47.8	32.5	-15.4	PASS
2399.299611	-48.2	32.8	-15.4	PASS
2399.649805	-48.4	33.0	-15.4	PASS
2399.199555	-48.4	33.1	-15.4	PASS
2399.349639	-49.8	34.4	-15.4	PASS
2399.449694	-50.6	35.2	-15.4	PASS

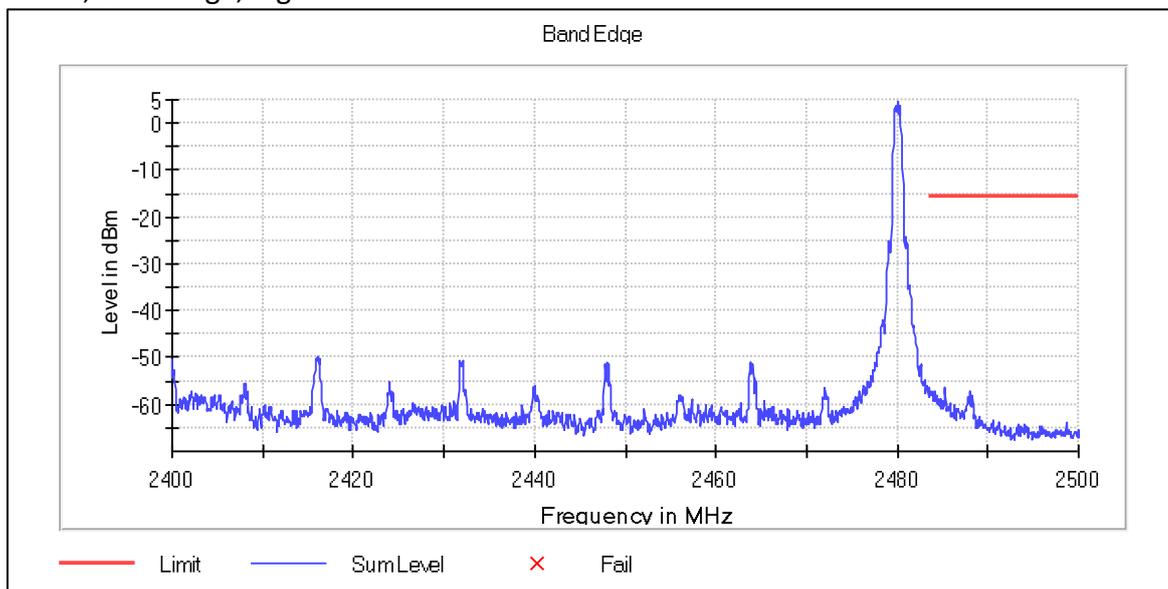
ANT 2, Measurements, band edge high

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2483.550152	-56.3	40.8	-15.5	PASS
2485.255319	-56.6	41.1	-15.5	PASS
2483.600304	-57.1	41.6	-15.5	PASS
2483.851064	-57.2	41.6	-15.5	PASS
2487.963526	-57.3	41.8	-15.5	PASS
2484.101824	-57.3	41.8	-15.5	PASS
2483.650456	-57.4	41.8	-15.5	PASS
2484.151976	-57.4	41.8	-15.5	PASS
2483.901216	-57.5	41.9	-15.5	PASS
2483.800912	-57.5	42.0	-15.5	PASS
2485.305471	-57.6	42.0	-15.5	PASS
2485.205167	-57.6	42.1	-15.5	PASS
2488.264438	-57.9	42.4	-15.5	PASS
2483.750760	-58.0	42.5	-15.5	PASS
2488.314590	-58.0	42.5	-15.5	PASS

ANT 2, Band edge, low channel



ANT 2, Band edge, high channel



15. Tx spurious emissions, conducted

Reference: FCC §15.247(d), ISED RSS-247, Issue 3 (section 5.5)

Test method: KDB 558074 D01 DTS Meas Guidance v05r02 8.5 and ANSI C63.10-2013 (11.11.2 & 11.11.3)

Limits	
Power measurement	Out-of-band attenuation (dB)
Peak	20
RMS	30

Test procedure
1. EUT set to test mode (communication tester is used if needed)
2. Span set around lower band edge and detector is set to peak and max hold
3. Resolution bandwidth is set to 100 kHz
4. Markers are set to peak emission levels outside frequency band

Mode / modulation	DUT Frequency (MHz)	Result
ANT 2 Bluetooth LE, 1 Mbps	2402.000000	PASS
ANT 2 Bluetooth LE, 1 Mbps	2440.000000	PASS
ANT 2 Bluetooth LE, 1 Mbps	2480.000000	PASS

ANT 2, Pre Measurements, low channel

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2390.000000	-58.0	41.1	-16.9
4803.154762	-66.8	49.9	-16.9
2290.000000	-68.8	51.9	-16.9
1960.000000	-70.6	53.7	-16.9
2210.000000	-70.8	53.9	-16.9
2340.000000	-70.9	54.0	-16.9
2493.498512	-71.0	54.1	-16.9
2270.000000	-71.1	54.2	-16.9
2250.000000	-71.3	54.5	-16.9
2280.000000	-71.7	54.9	-16.9
2380.000000	-71.9	55.0	-16.9
2360.000000	-71.9	55.0	-16.9
2140.000000	-71.9	55.1	-16.9
1270.000000	-72.0	55.2	-16.9
1900.000000	-72.0	55.2	-16.9

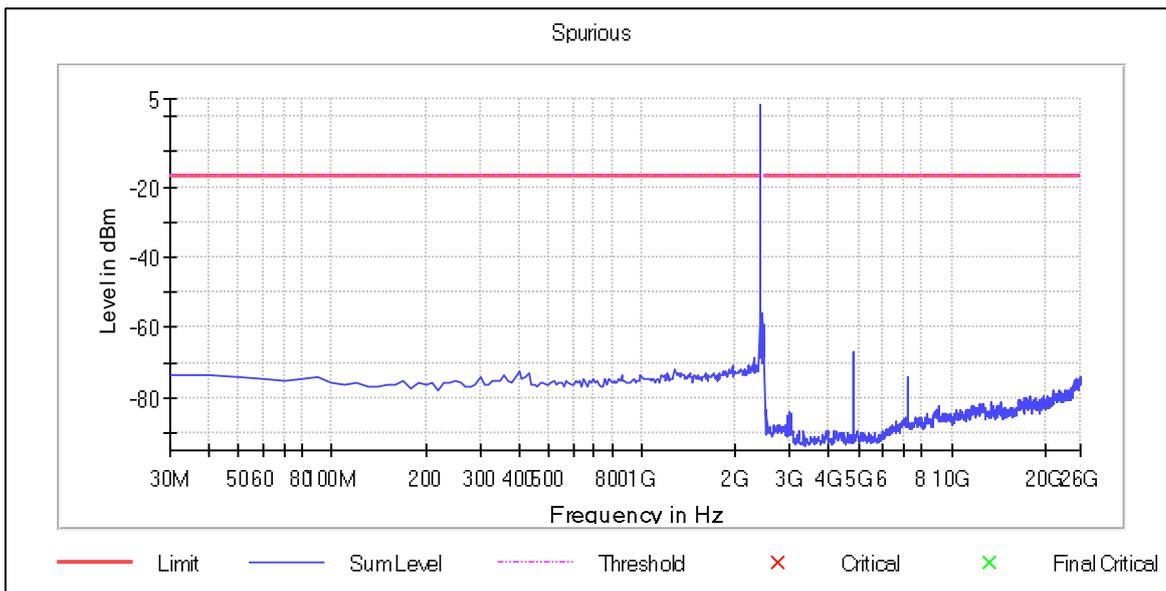
ANT 2, Pre Measurements, middle channel

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2390.000000	-63.3	47.2	-16.1
4883.142857	-67.8	51.7	-16.1
2350.000000	-69.1	53.1	-16.1
2330.000000	-71.6	55.5	-16.1
25430.084821	-73.8	57.7	-16.1
25900.014881	-74.0	57.9	-16.1
2320.000000	-74.5	58.4	-16.1
25860.020833	-74.6	58.5	-16.1
25040.142857	-74.7	58.6	-16.1
25500.074405	-74.7	58.6	-16.1
25930.010417	-75.0	58.9	-16.1
25340.098214	-75.0	58.9	-16.1
25880.017857	-75.0	58.9	-16.1
25110.132440	-75.0	58.9	-16.1
25890.016369	-75.1	59.0	-16.1

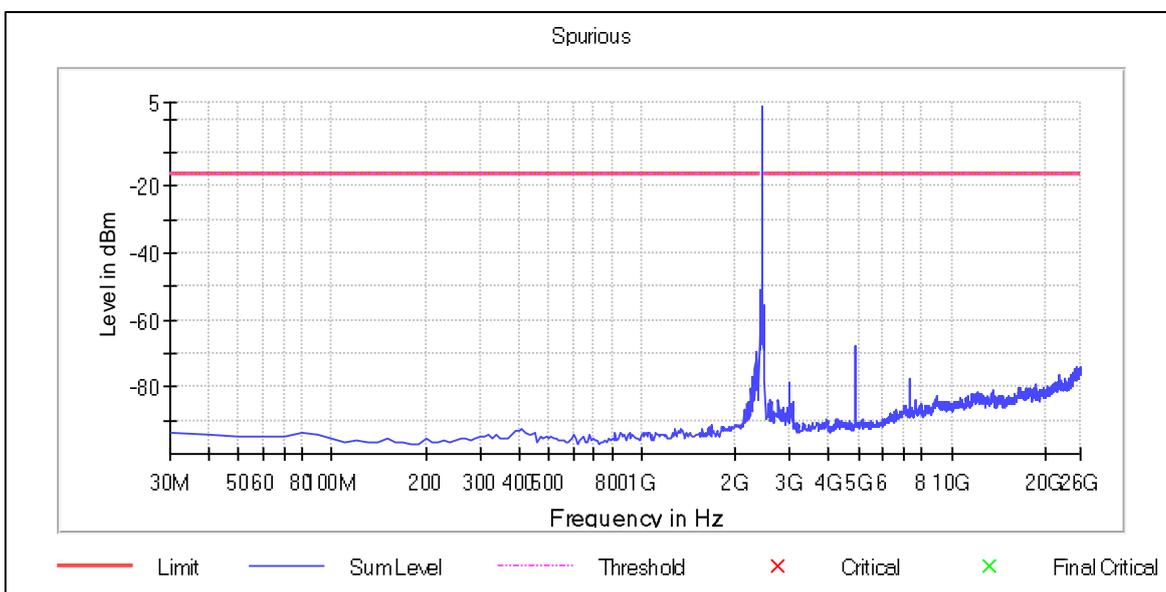
ANT 2, Pre Measurements, top channel

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
25920.011905	-53.3	37.7	-15.6
25890.016369	-53.6	38.0	-15.6
25810.028274	-53.7	38.1	-15.6
25910.013393	-53.9	38.3	-15.6
25950.007440	-53.9	38.3	-15.6
25930.010417	-54.2	38.5	-15.6
25820.026786	-54.2	38.6	-15.6
25460.080357	-54.2	38.6	-15.6
25940.008929	-54.2	38.6	-15.6
25850.022321	-54.3	38.7	-15.6
25400.089286	-54.3	38.7	-15.6
24960.154762	-54.3	38.7	-15.6
24850.171131	-54.4	38.8	-15.6
25770.034226	-54.4	38.8	-15.6
25380.092262	-54.4	38.8	-15.6

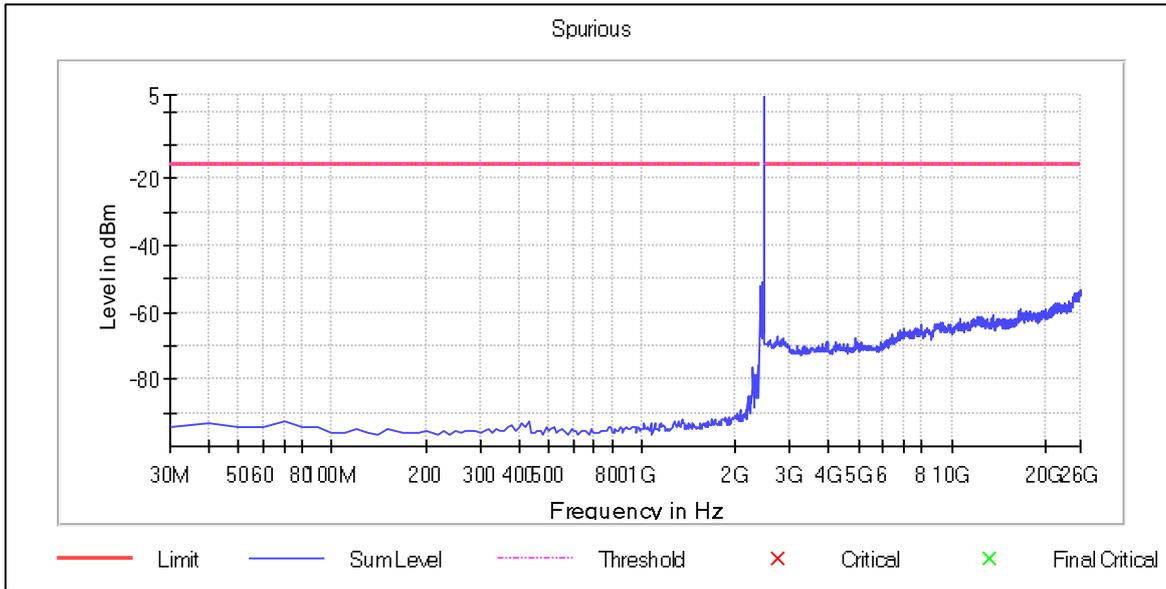
ANT 2, Spurious emissions, low channel



ANT 2, Spurious emissions, middle channel



ANT 2, Spurious emissions, high channel



16. Tx spurious emissions, radiated

Reference: FCC §15.247(d), FCC §15.209, ISED RSS-Gen Issue 5 A2 (section 6.13)

Test method: KDB 558074 D01 DTS Meas Guidance v05r02 8.5 and ANSI C63.10-2013 (6.4, 6.5, 6.6 & 11.12)

Specification: Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)/RSS-Gen):

Limits				
Frequency range (MHz)	Detector	Field strength (uV/m)	Field strength (dBuV/m)	Measurement distance (m)
0.009 – 0.09	Average	2400/F(kHz)	-	300
0.09 – 0.110	Quasi-Peak	2400/F(kHz)	-	300
0.110 – 0.490	Average	2400/F(kHz)	-	300
0.490 – 1.705	Quasi-Peak	24000/F(kHz)	-	30
1.705 – 30.0	Quasi-Peak	30	-	30
30 - 88	Quasi-Peak	100	40	3
88 – 216	Quasi-Peak	150	43.5	3
216 – 960	Quasi-Peak	200	46	3
960 - 1000	Quasi-Peak	500	54	3
>1000	Average	500	54	3

Test procedure 30 MHz -1 GHz

1. EUT is placed on a non conducting support at the center of a turn table 0.8m above the ground
2. EUT set to test mode
3. The receiver is set to peak detection with max hold
4. The EUT is rotated through 360 degrees (orientation varied), measurements were made in both horizontal and vertical planes of polarization
5. Found peak values were further maximized by adjusting turntable position $\pm 22,5$ degrees around detected value and scanning the antenna height 1 to 4m
6. For maximized values, final measurement was done with the corresponding final detector.

Test procedure > 1 GHz

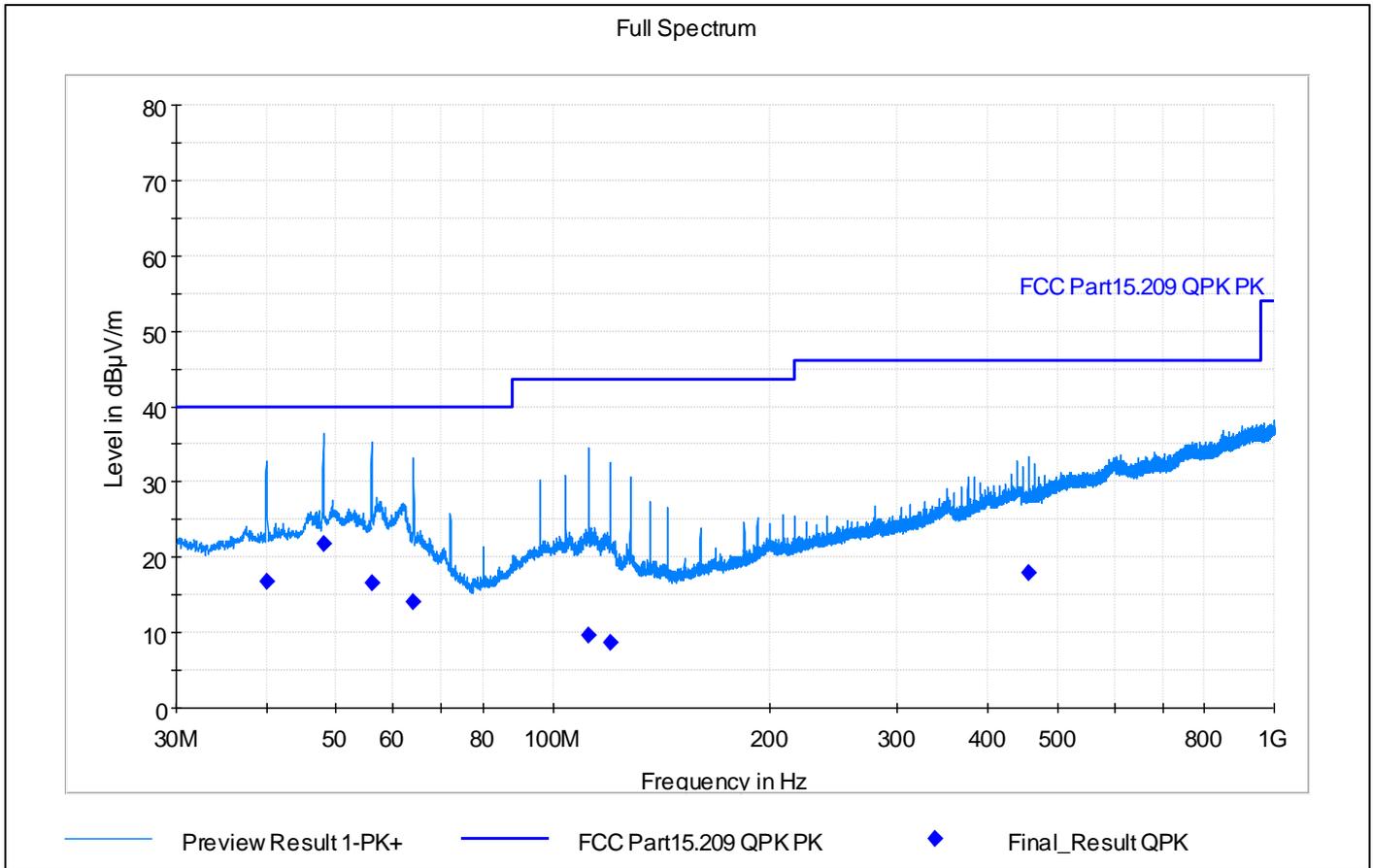
1. EUT is placed on a non conducting support at the center of a turn table 1.5m above the ground
2. EUT set to test mode
3. The receiver is set to peak detection with max hold
4. The EUT is rotated through 360 degrees (orientation varied), measurements were made in both horizontal and vertical planes of polarization.
5. Found peak values were further maximized by adjusting turntable position $\pm 22,5$ degrees around detected value and scanning the antenna height 1 to 4m
6. For maximized values, final measurement was done with the corresponding final detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function. RSS-247: Attenuation below the general field strength limits specified in RSS-Gen is not required.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

Operation mode(s)	Configuration	Test Verdict
ANT2 Bluetooth LE TX, 1 Mbps	Low channel, 2402 MHz	PASS
ANT2 Bluetooth LE TX, 1 Mbps	Mid channel, 2442 MHz	PASS
ANT2 Bluetooth LE TX, 1 Mbps	High channel, 2480 MHz	PASS

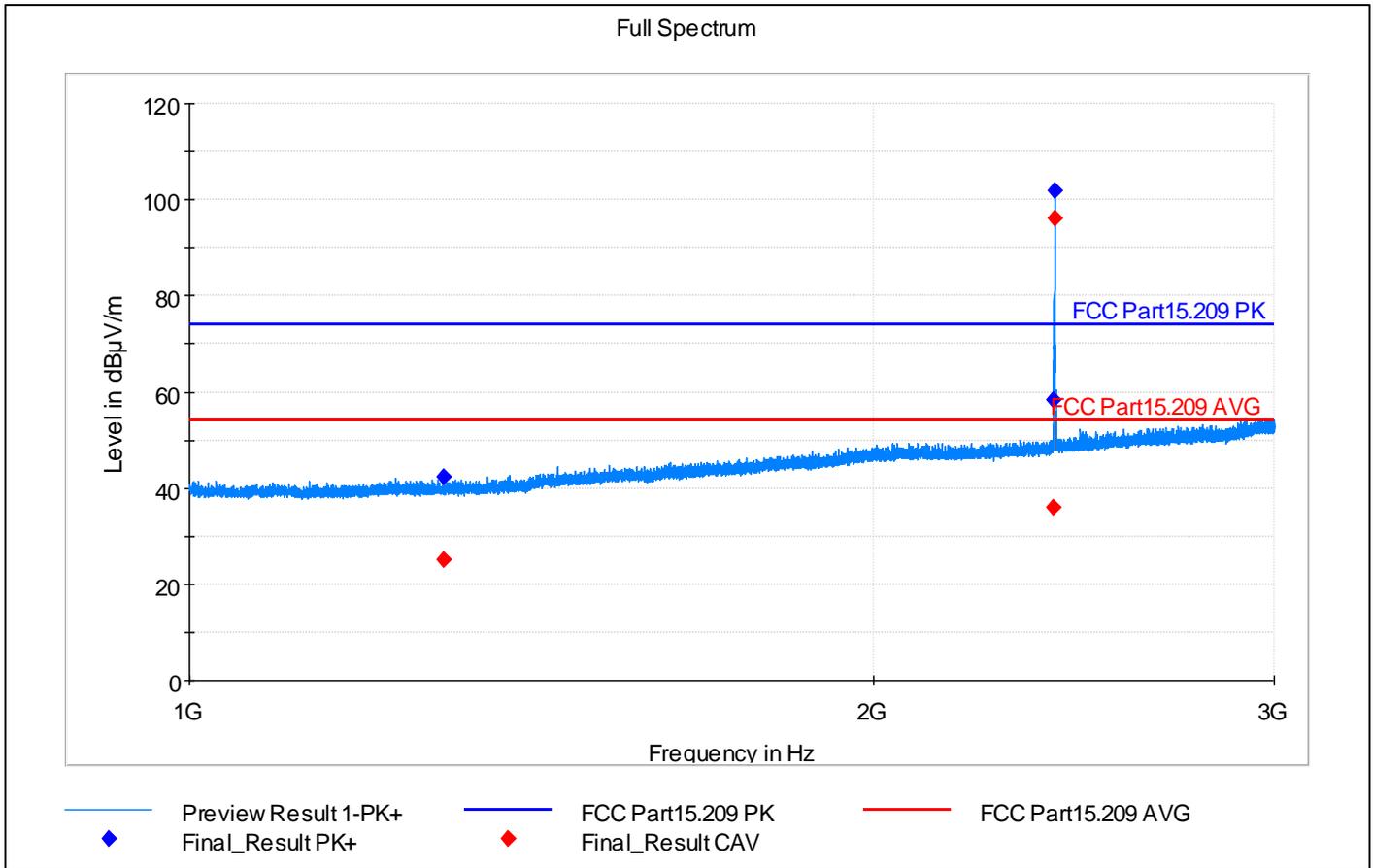
Low channel, 30 MHz – 1 GHz, ANT2 Bluetooth LE



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)	Comment
39.990000	16.70	40.00	23.30	15000.0	120.000	139.0	V	37.0	90.0	19.6	PASS
48.000000	21.85	40.00	18.15	15000.0	120.000	98.0	V	47.0	90.0	21.1	PASS
56.010000	16.51	40.00	23.49	15000.0	120.000	98.0	V	47.0	90.0	20.6	PASS
63.990000	13.99	40.00	26.01	15000.0	120.000	101.0	V	47.0	90.0	19.0	PASS
111.990000	9.62	43.50	33.88	15000.0	120.000	374.0	V	47.0	90.0	19.0	PASS
120.000000	8.65	43.50	34.85	15000.0	120.000	310.0	V	56.0	90.0	17.8	PASS
456.000000	18.02	46.00	27.98	15000.0	120.000	169.0	V	46.0	90.0	26.2	PASS

Low channel, 1-3 GHz, ANT2 Bluetooth LE

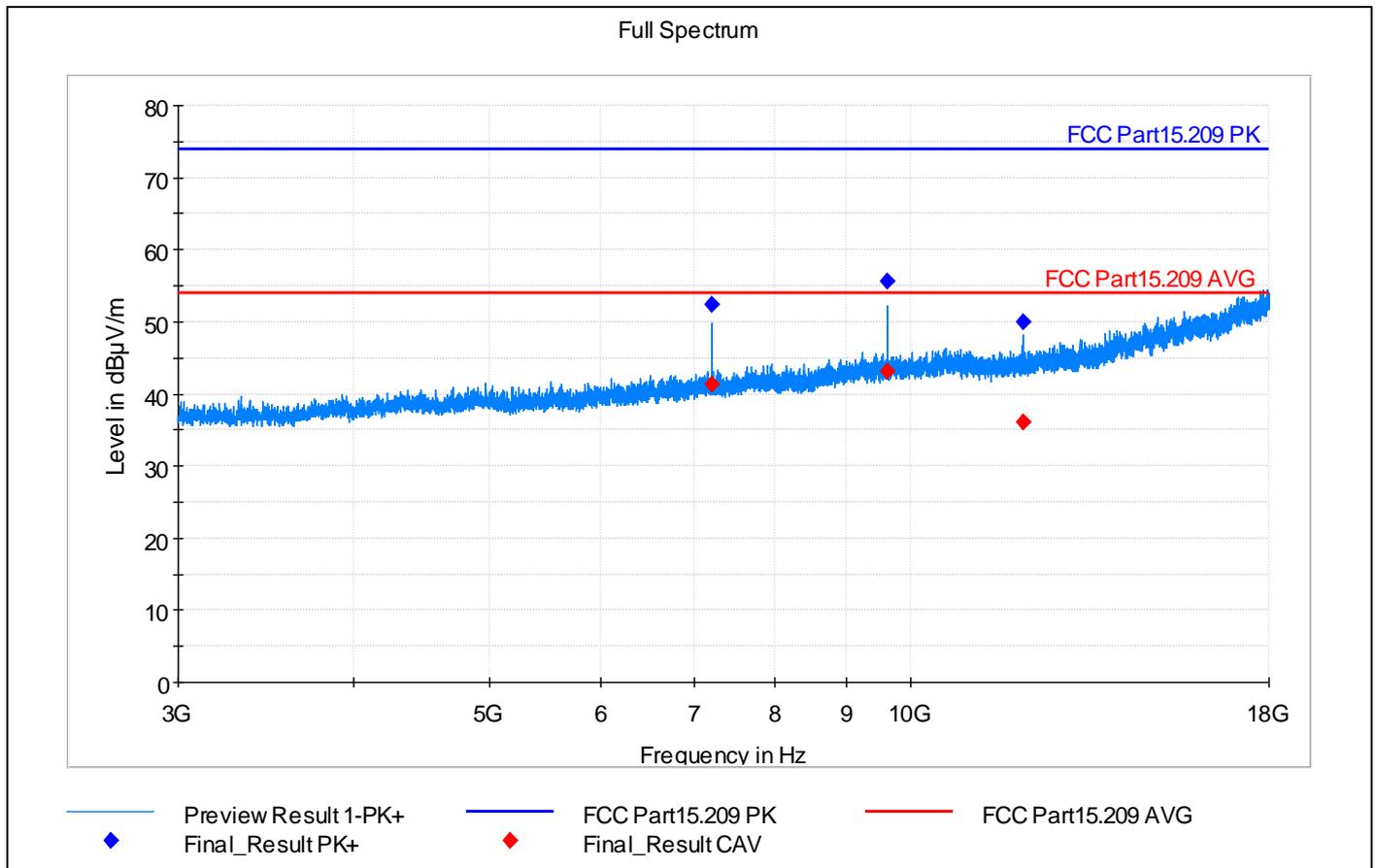


Note: Frequency 2402,200 MHz is excluded from spurious domain measurements and ignored. See table below.

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)	Comment
1293.250000	42.29	---	74.00	31.71	15000.0	1000.000	221.0	H	-7.0	0.0	31.7	PASS
1293.250000	---	25.13	54.00	28.87	15000.0	1000.000	221.0	H	-7.0	0.0	31.7	PASS
2398.300000	58.24	---	74.00	15.77	15000.0	1000.000	123.0	H	213.0	0.0	38.6	PASS
2398.300000	---	36.10	54.00	17.90	15000.0	1000.000	123.0	H	213.0	0.0	38.6	PASS
2402.200000	---	96.16	54.00	-42.16	15000.0	1000.000	128.0	H	207.0	90.0	38.6	Fundamental TX signal
2402.200000	101.90	---	74.00	-27.90	15000.0	1000.000	128.0	H	207.0	90.0	38.6	Fundamental TX signal

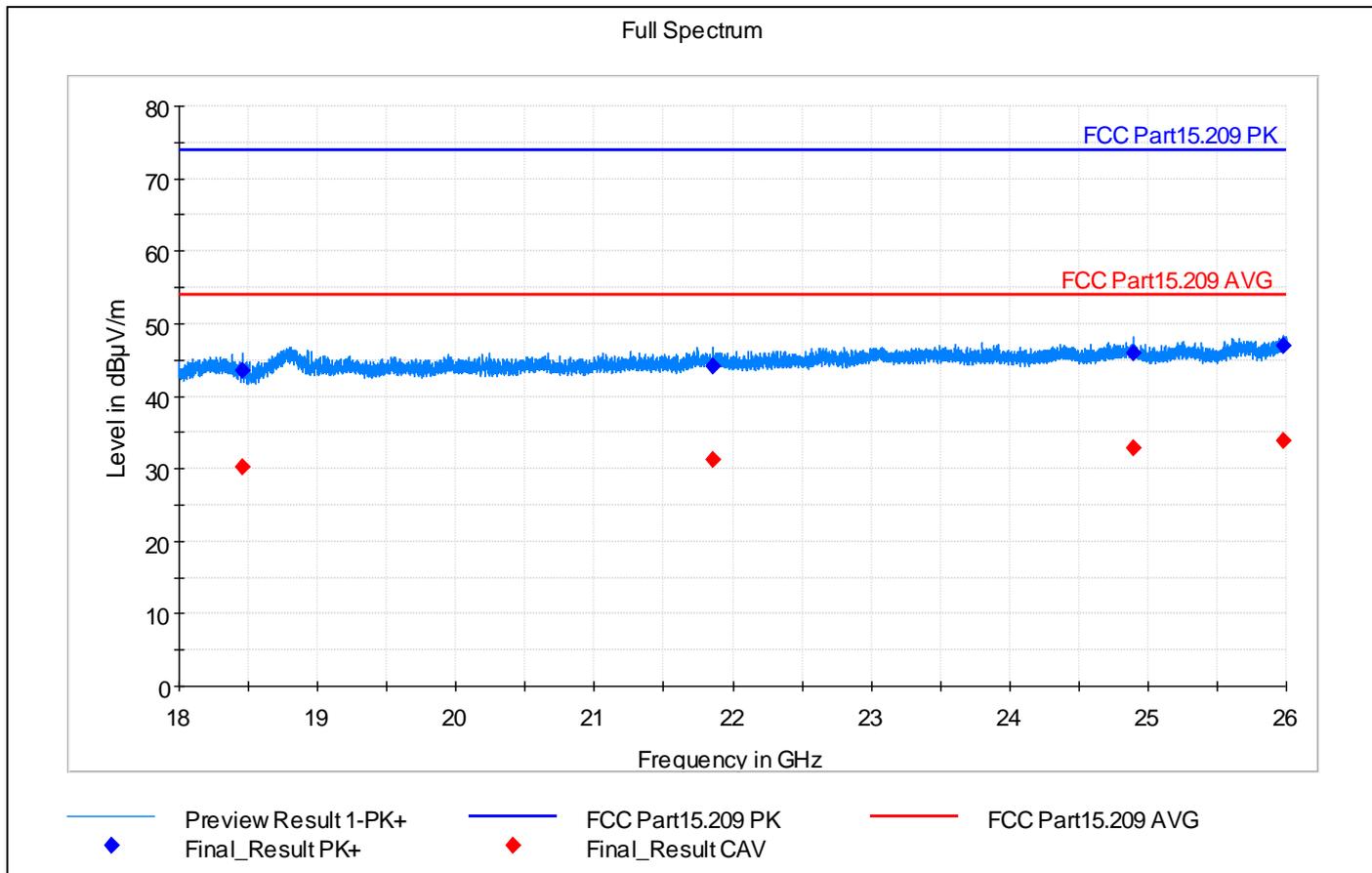
Low channel, 3–18 GHz, ANT2 Bluetooth LE



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)	Comment
7205.500000	52.46	---	74.00	21.54	15000.0	1000.000	150.0	V	173.0	0.0	14.9	PASS
7205.500000	---	41.31	54.00	12.69	15000.0	1000.000	150.0	V	173.0	0.0	14.9	PASS
9607.000000	---	43.12	54.00	10.88	15000.0	1000.000	111.0	H	187.0	0.0	19.4	PASS
9607.000000	55.60	---	74.00	18.40	15000.0	1000.000	111.0	H	187.0	0.0	19.4	PASS
12011.250000	49.99	---	74.00	24.01	15000.0	1000.000	162.0	H	82.0	0.0	23.1	PASS
12011.250000	---	36.12	54.00	17.88	15000.0	1000.000	162.0	H	82.0	0.0	23.1	PASS

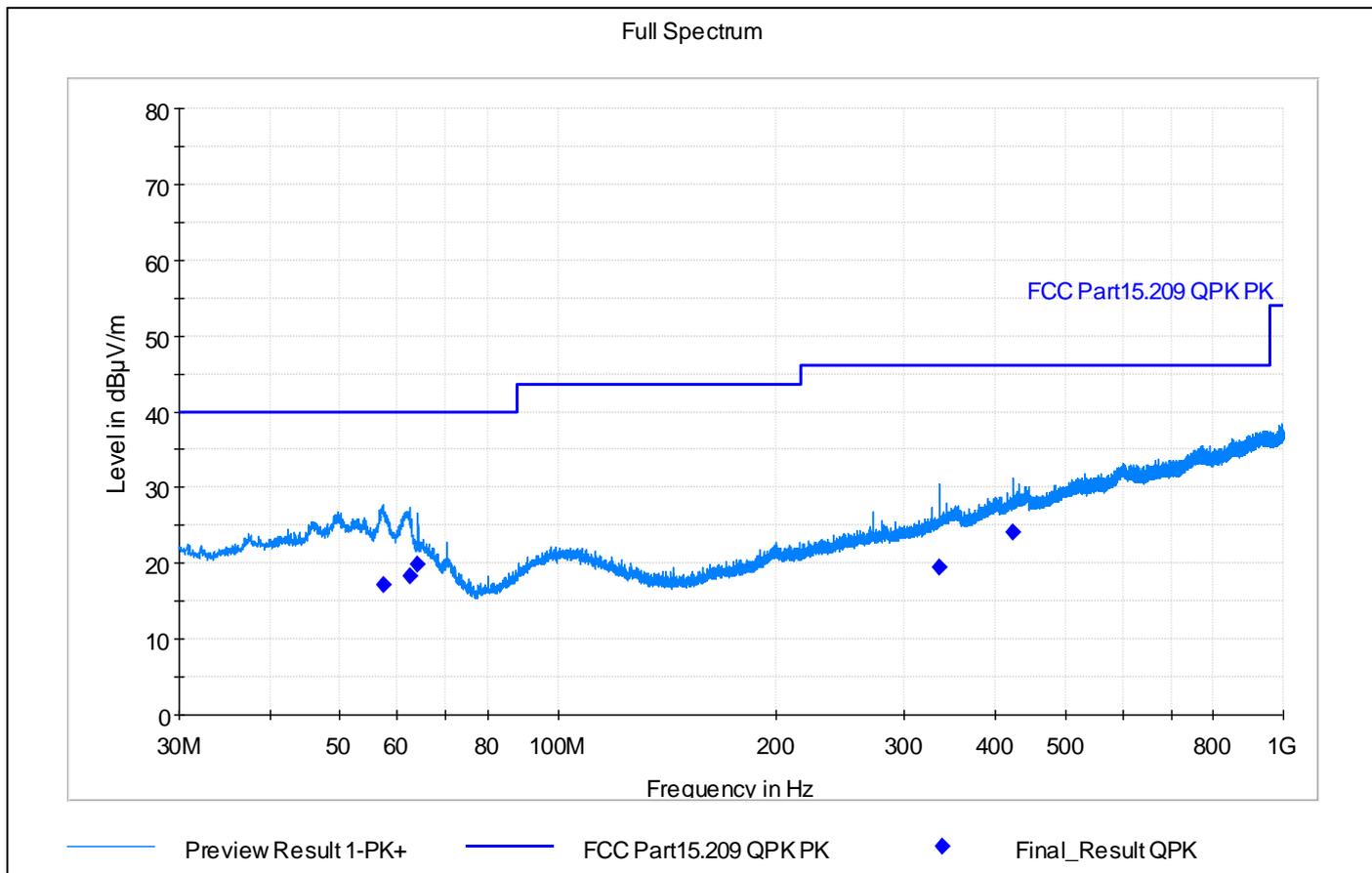
Low channel, 18–26 GHz, ANT2 Bluetooth LE



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Comment
18454.250000	---	30.31	54.00	23.69	3000.0	1000.000	278.0	H	273.0	0.0	23.4	PASS
18454.250000	43.52	---	74.00	30.48	3000.0	1000.000	278.0	H	273.0	0.0	23.4	PASS
21855.750000	---	31.33	54.00	22.67	3000.0	1000.000	290.0	H	318.0	0.0	24.8	PASS
21855.750000	44.21	---	74.00	29.79	3000.0	1000.000	290.0	H	318.0	0.0	24.8	PASS
24892.500000	---	32.87	54.00	21.13	3000.0	1000.000	199.0	V	103.0	0.0	26.5	PASS
24892.500000	45.98	---	74.00	28.02	3000.0	1000.000	199.0	V	103.0	0.0	26.5	PASS
25979.250000	---	33.81	54.00	20.19	3000.0	1000.000	254.0	V	112.0	0.0	27.1	PASS
25979.250000	46.88	---	74.00	27.12	3000.0	1000.000	254.0	V	112.0	0.0	27.1	PASS

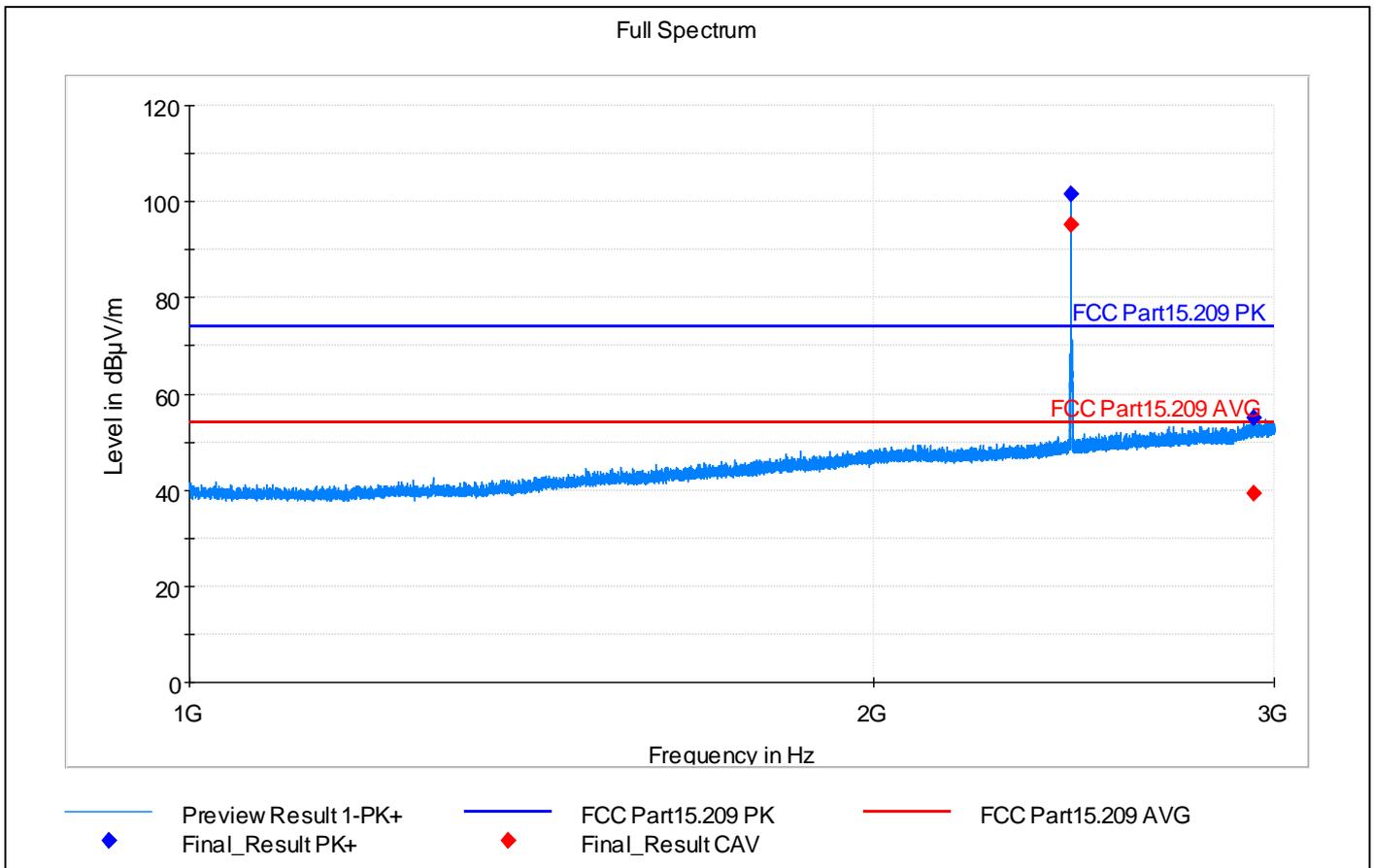
Mid channel, 30 MHz – 1 GHz, ANT2 Bluetooth LE



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)	Comment
57.300000	17.23	40.00	22.77	15000.0	120.000	100.0	V	271.0	0.0	20.4	PASS
62.520000	18.36	40.00	21.64	15000.0	120.000	100.0	V	254.0	90.0	19.4	PASS
64.020000	19.83	40.00	20.17	15000.0	120.000	98.0	V	92.0	0.0	19.0	PASS
336.000000	19.52	46.00	26.48	15000.0	120.000	114.0	H	333.0	0.0	23.7	PASS
424.020000	24.12	46.00	21.88	15000.0	120.000	100.0	V	154.0	0.0	25.9	PASS

Mid channel, 1-3 GHz, ANT2 Bluetooth LE

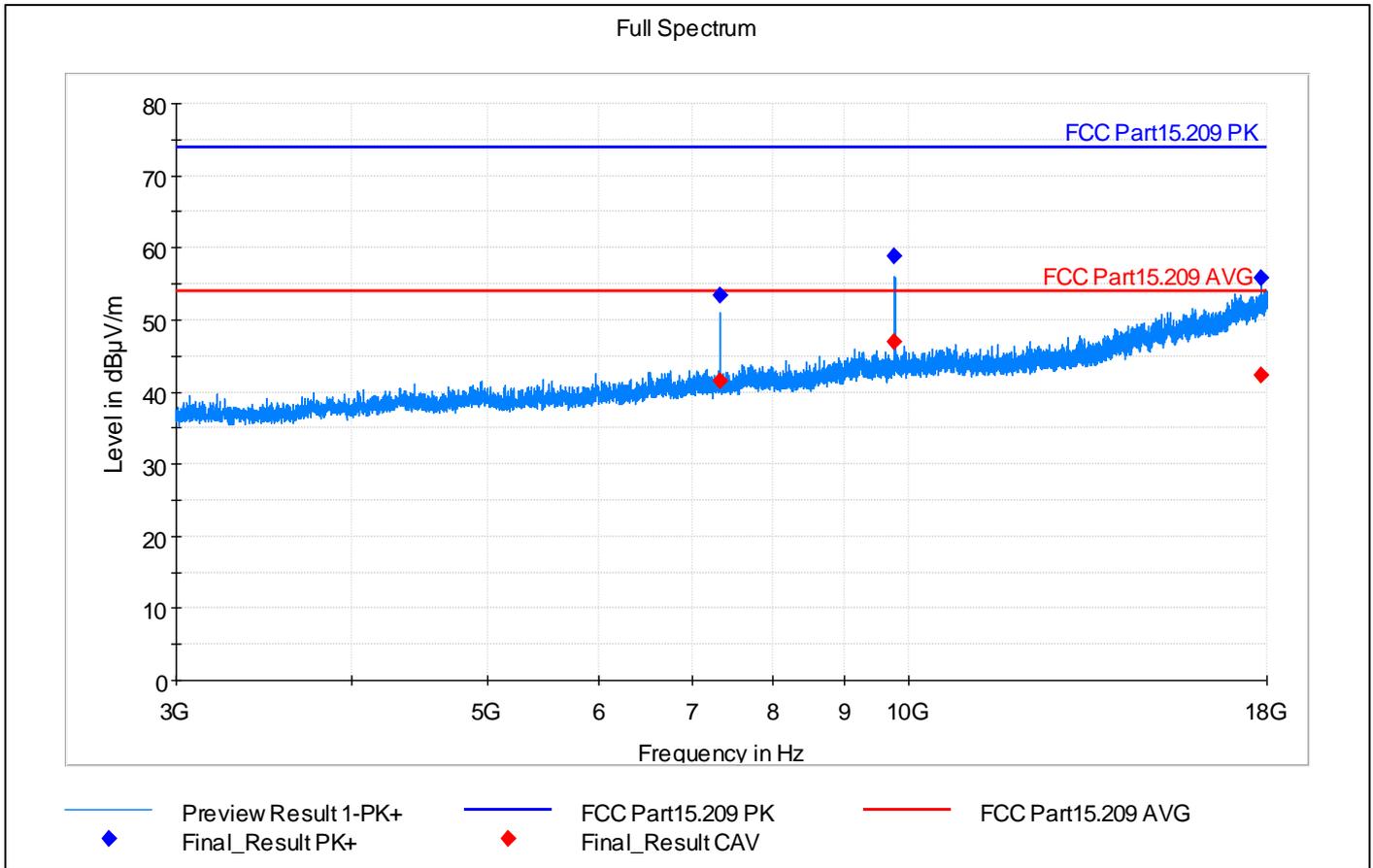


Note: Frequency 2441,750 MHz is excluded from spurious domain measurements and ignored. See table below.

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)	Comment
2441.750000	---	95.24	54.00	-41.24	15000.0	1000.000	163.0	H	205.0	90.0	38.9	Fundamental TX signal
2441.750000	101.56	---	74.00	-27.56	15000.0	1000.000	163.0	H	205.0	90.0	38.9	Fundamental TX signal
2939.550000	---	39.41	54.00	14.59	15000.0	1000.000	283.0	V	14.0	90.0	40.9	PASS
2939.550000	55.00	---	74.00	19.00	15000.0	1000.000	283.0	V	14.0	90.0	40.9	PASS

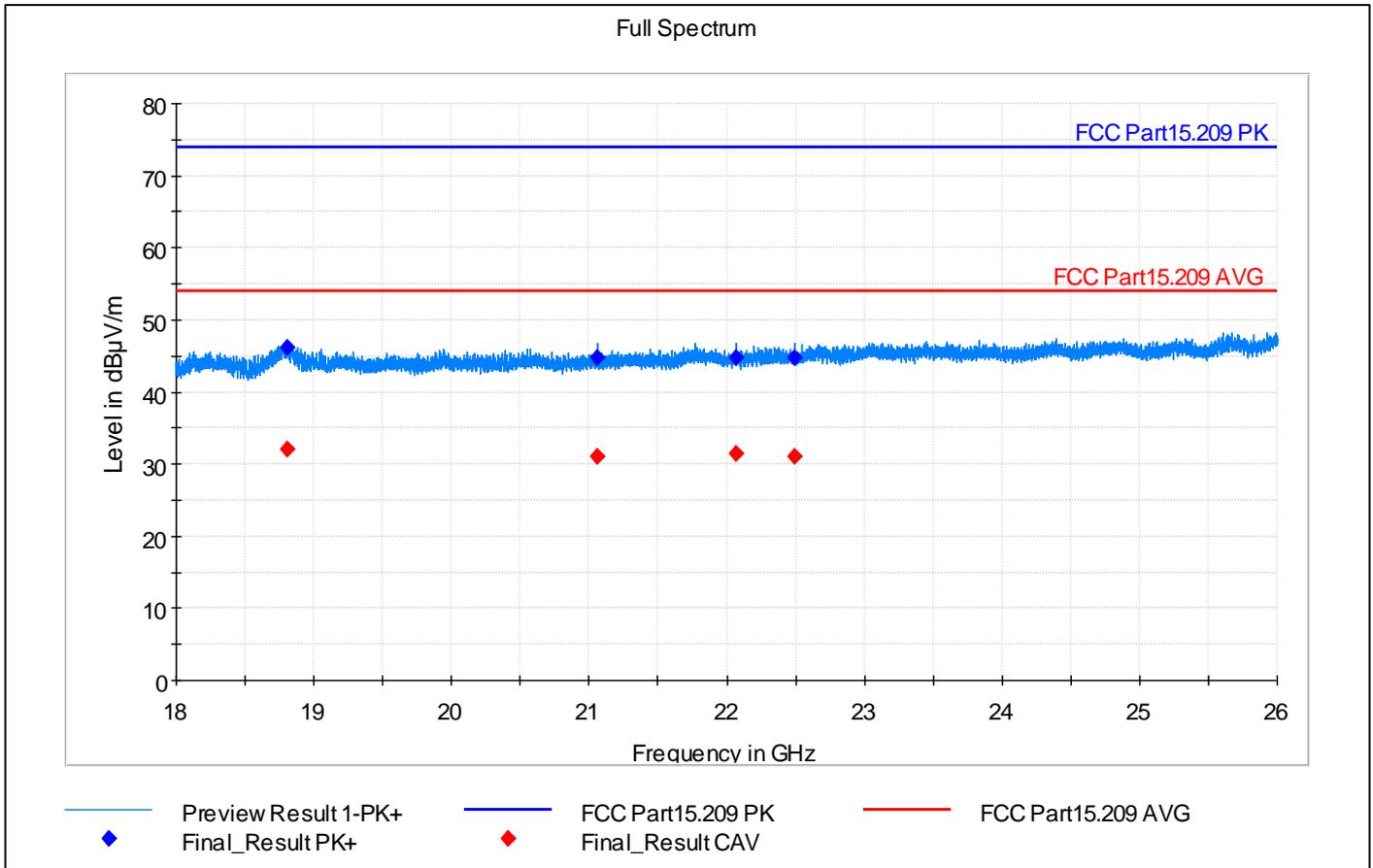
Mid channel, 3–18 GHz, ANT2 Bluetooth LE



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)	Comment
7325.250000	53.33	---	74.00	20.67	15000.0	1000.000	171.0	V	171.0	0.0	15.2	PASS
7325.250000	---	41.52	54.00	12.48	15000.0	1000.000	171.0	V	171.0	0.0	15.2	PASS
9767.000000	58.85	---	74.00	15.15	15000.0	1000.000	124.0	H	188.0	0.0	19.8	PASS
9767.000000	---	46.85	54.00	7.15	15000.0	1000.000	124.0	H	188.0	0.0	19.8	PASS
17814.250000	---	42.32	54.00	11.68	15000.0	1000.000	327.0	V	284.0	0.0	38.4	PASS
17814.250000	55.85	---	74.00	18.15	15000.0	1000.000	327.0	V	284.0	0.0	38.4	PASS

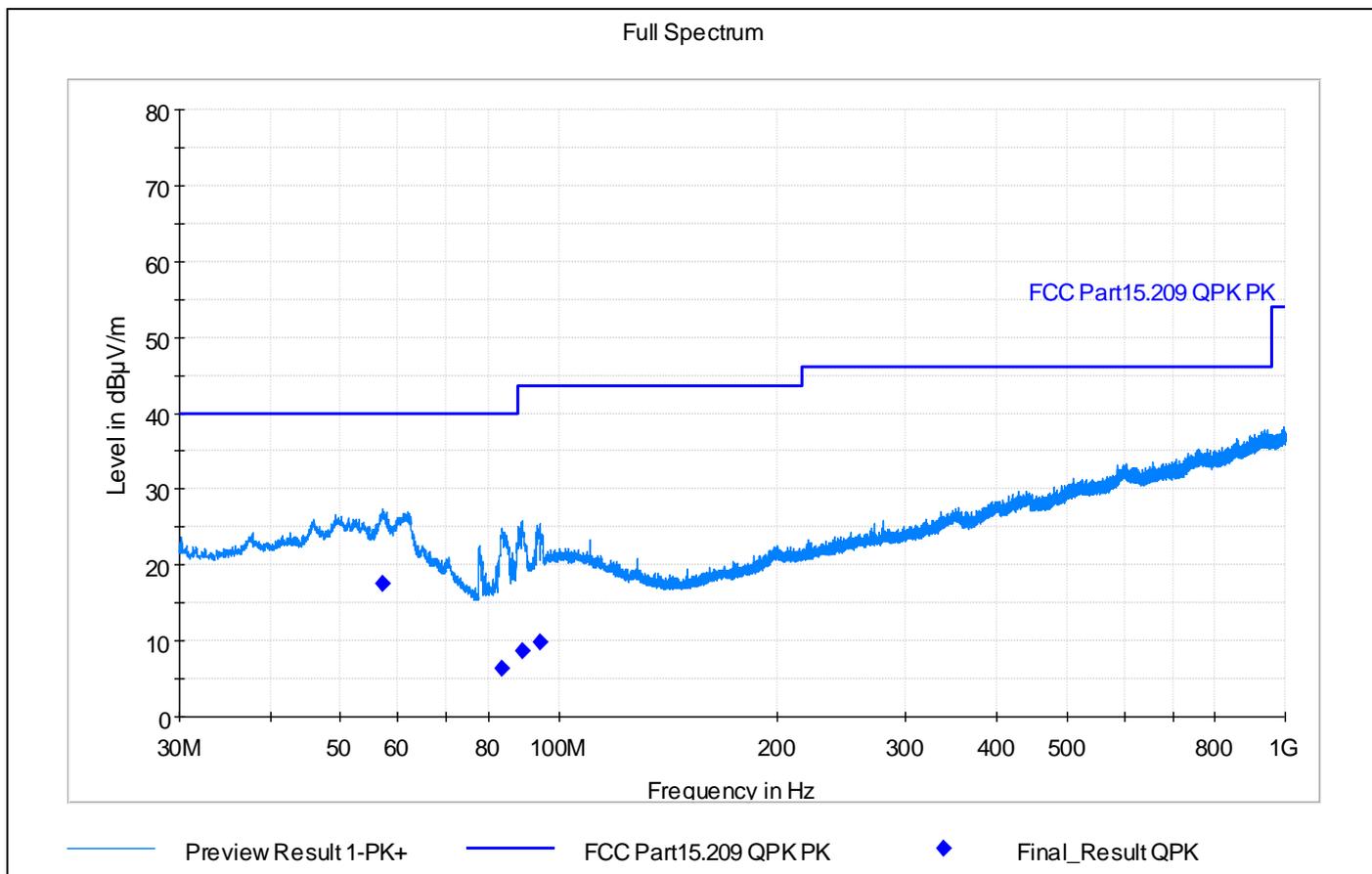
Mid channel, 18–26 GHz, ANT2 Bluetooth LE



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Comment
18808.250000	---	32.11	54.00	21.89	3000.0	1000.000	131.0	V	133.0	0.0	23.5	PASS
18808.250000	46.06	---	74.00	27.94	3000.0	1000.000	131.0	V	133.0	0.0	23.5	PASS
21055.250000	44.75	---	74.00	29.25	3000.0	1000.000	309.0	H	13.0	90.0	24.5	PASS
21055.250000	---	31.00	54.00	23.00	3000.0	1000.000	309.0	H	13.0	90.0	24.5	PASS
22070.250000	---	31.41	54.00	22.60	3000.0	1000.000	159.0	V	314.0	90.0	24.8	PASS
22070.250000	44.68	---	74.00	29.32	3000.0	1000.000	159.0	V	314.0	90.0	24.8	PASS
22496.750000	44.74	---	74.00	29.26	3000.0	1000.000	346.0	V	242.0	0.0	25.0	PASS
22496.750000	---	31.11	54.00	22.89	3000.0	1000.000	346.0	V	242.0	0.0	25.0	PASS

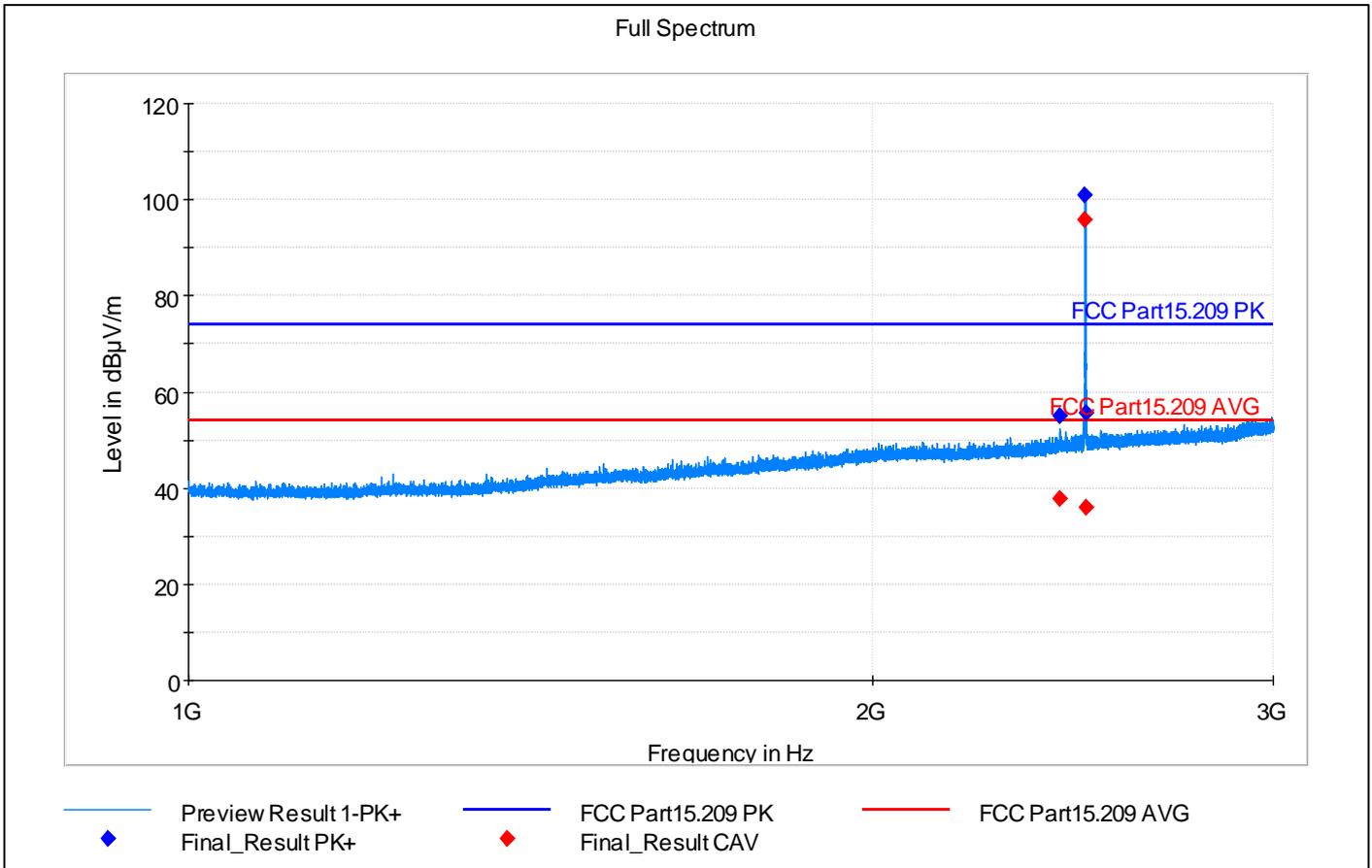
High channel, 30 MHz – 1 GHz, ANT2 Bluetooth LE



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)	Comment
57.180000	17.57	40.00	22.43	15000.0	120.000	100.0	V	271.0	0.0	20.4	PASS
83.340000	6.33	40.00	33.67	15000.0	120.000	398.0	H	15.0	90.0	14.9	PASS
88.920000	8.63	43.50	34.87	15000.0	120.000	186.0	H	3.0	90.0	16.9	PASS
93.990000	9.74	43.50	33.76	15000.0	120.000	98.0	H	-7.0	90.0	18.6	PASS

High channel, 1 – 3 GHz, ANT2 Bluetooth LE

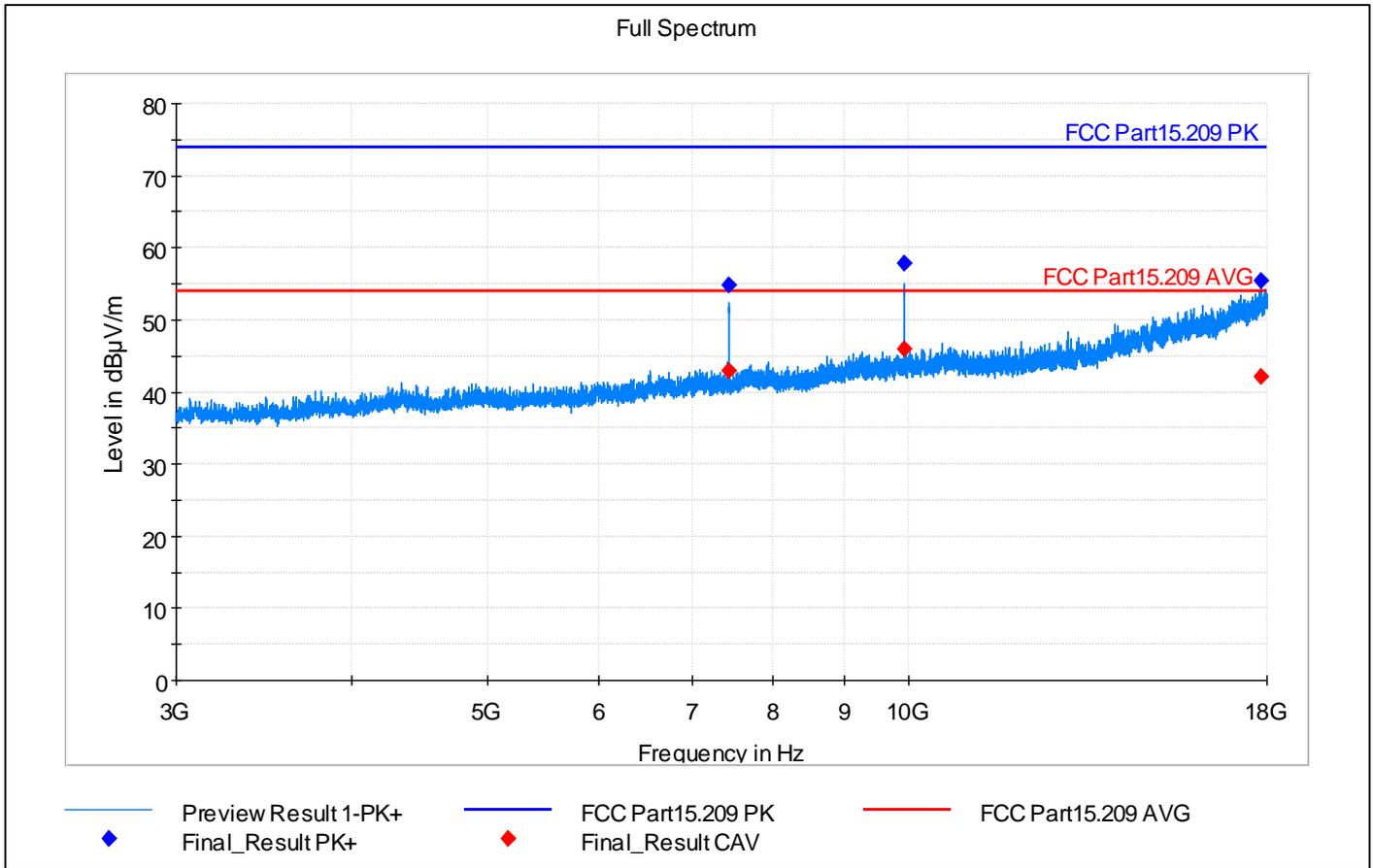


Note: Frequency 2480,100 MHz is excluded from spurious domain measurements and ignored. See table below.

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)	Comment
2416.050000	---	37.73	54.00	16.27	15000.0	1000.000	211.0	H	203.0	0.0	38.8	PASS
2416.050000	55.06	---	74.00	18.94	15000.0	1000.000	211.0	H	203.0	0.0	38.8	PASS
2480.100000	100.98	---	74.00	-26.98	15000.0	1000.000	111.0	H	194.0	90.0	39.2	Fundamental TX signal
2480.100000	---	95.81	54.00	-41.81	15000.0	1000.000	111.0	H	194.0	90.0	39.2	Fundamental TX signal
2483.000000	55.51	---	74.00	18.49	15000.0	1000.000	162.0	H	23.0	90.0	39.2	PASS
2483.000000	---	35.98	54.00	18.02	15000.0	1000.000	162.0	H	23.0	90.0	39.2	PASS

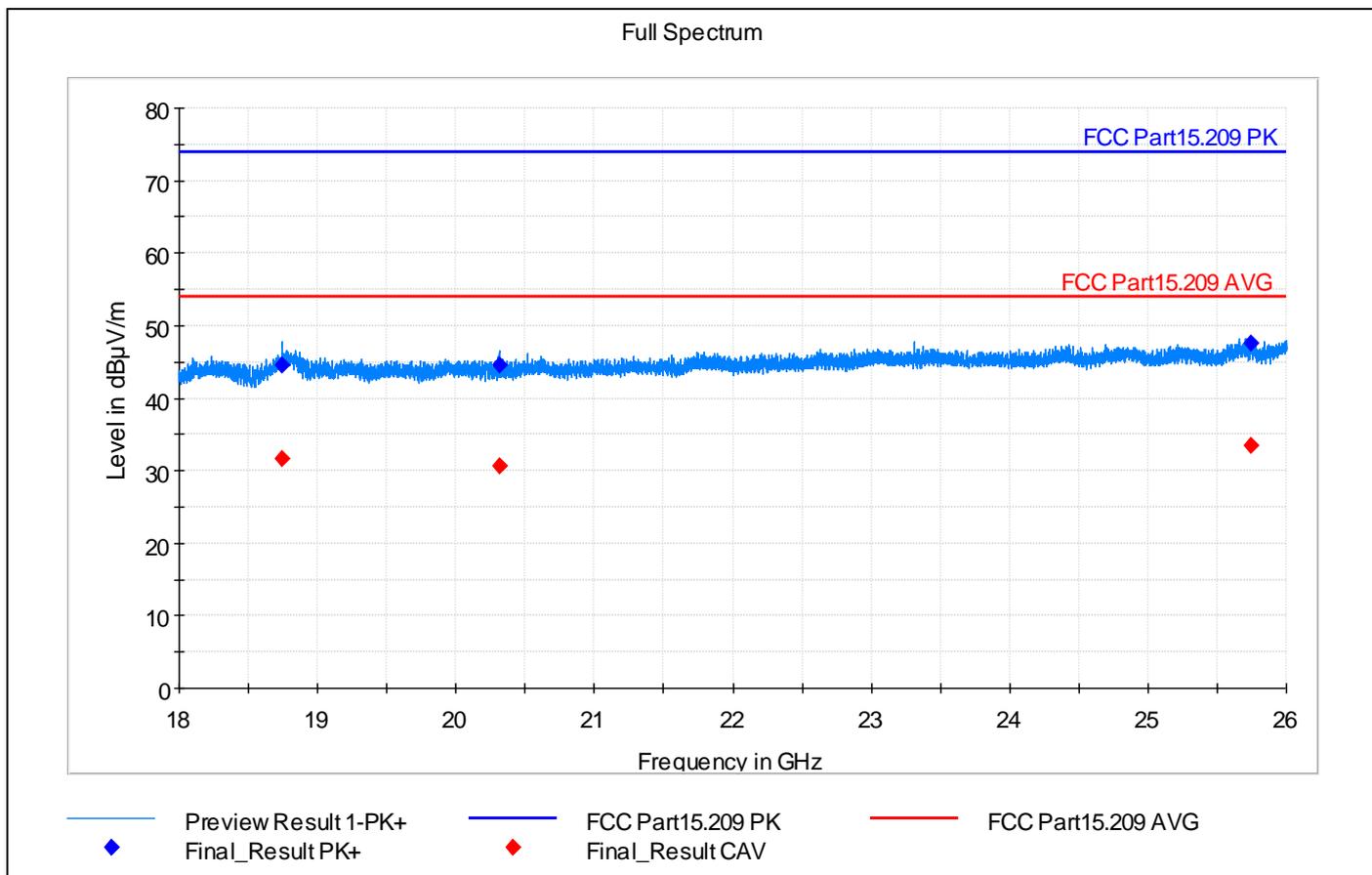
High channel, 3 – 18 GHz, ANT2 Bluetooth LE



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)	Comment
7440.750000	54.80	---	74.00	19.20	15000.0	1000.000	180.0	V	162.0	0.0	15.1	PASS
7440.750000	---	42.92	54.00	11.08	15000.0	1000.000	180.0	V	162.0	0.0	15.1	PASS
9919.000000	---	45.90	54.00	8.10	15000.0	1000.000	98.0	H	188.0	0.0	20.0	PASS
9919.000000	57.90	---	74.00	16.10	15000.0	1000.000	98.0	H	188.0	0.0	20.0	PASS
17837.000000	55.35	---	74.00	18.65	15000.0	1000.000	240.0	H	68.0	0.0	38.5	PASS
17837.000000	---	42.02	54.00	11.98	15000.0	1000.000	240.0	H	68.0	0.0	38.5	PASS

High channel, 18 – 26 GHz, ANT2 Bluetooth LE



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Comment
18746.500000	---	31.62	54.00	22.38	3000.0	1000.000	184.0	H	92.0	90.0	23.5	PASS
18746.500000	44.54	---	74.00	29.46	3000.0	1000.000	184.0	H	92.0	90.0	23.5	PASS
20311.000000	44.63	---	74.00	29.37	3000.0	1000.000	190.0	V	222.0	90.0	24.1	PASS
20311.000000	---	30.71	54.00	23.29	3000.0	1000.000	190.0	V	222.0	90.0	24.1	PASS
25742.000000	47.58	---	74.00	26.42	3000.0	1000.000	220.0	H	323.0	90.0	26.7	PASS
25742.000000	---	33.52	54.00	20.48	3000.0	1000.000	220.0	H	323.0	90.0	26.7	PASS

17. Receiver spurious emissions, radiated

Reference: ISED RSS-247, Issue 3 (section 3.1)

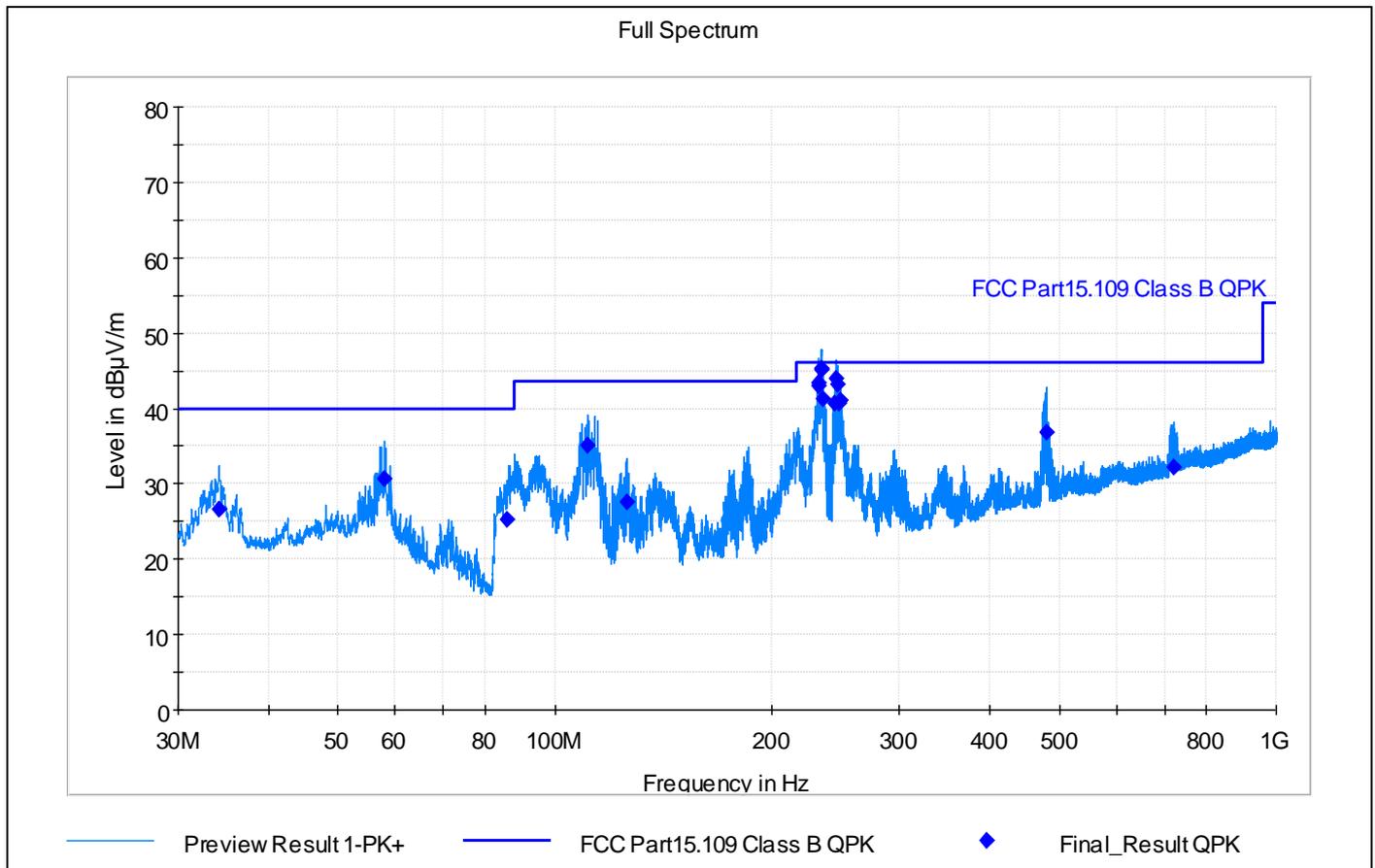
Test method: ANSI C63.4-2014 (8.1 – 8.3)

Limits			
Frequency (MHz)	Detector	Field strength (uV/m)	Measurement distance (m)
30 – 88	Quasi-Peak	100	3
88 - 216	Quasi-Peak	150	3
216 - 960	Quasi-Peak	200	3
960 - 1000	Quasi-Peak	500	3
> 1000	Average	500	3

Test procedure
<ol style="list-style-type: none"> 1. EUT is placed on a non conducting support at the center of a turn table 0.8m above the ground 2. EUT set to test mode 3. The receiver is set to peak detection with max hold 4. The EUT is rotated through 360 degrees (orientation varied), measurements were made in both horizontal and vertical planes of polarization 5. Found peak values were further maximized by adjusting turntable position $\pm 22,5$ degrees around detected value and scanning the antenna height 1 to 4m 6. For maximized values, final measurement was done with the corresponding final detector.

Operation mode(s)	Configuration	Test Verdict
Bluetooth LE RX	Mid channel, 2442 MHz	PASS

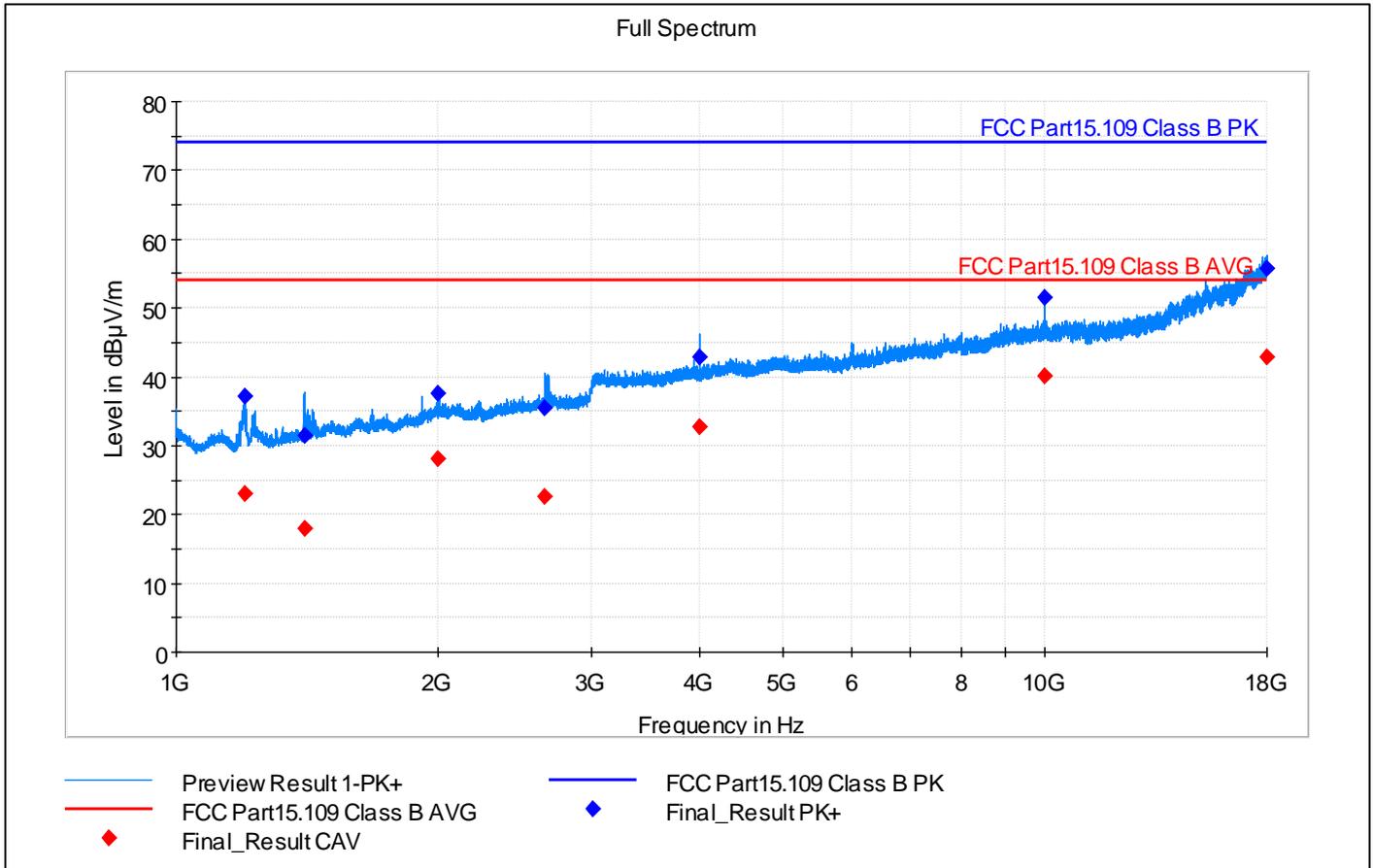
Mid channel, 30 MHz – 1 GHz



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)	Comment
34.200000	26.70	40.00	13.30	15000.0	120.000	116.0	V	292.0	0.0	17.3	PASS
57.990000	30.73	40.00	9.27	15000.0	120.000	105.0	V	216.0	0.0	20.3	PASS
85.800000	25.19	40.00	14.81	15000.0	120.000	121.0	V	-13.0	0.0	15.8	PASS
110.760000	35.05	43.50	8.45	15000.0	120.000	100.0	V	4.0	0.0	19.1	PASS
125.580000	27.64	43.50	15.86	15000.0	120.000	110.0	V	-12.0	0.0	17.0	PASS
231.510000	42.98	46.00	3.02	15000.0	120.000	134.0	H	335.0	0.0	20.6	PASS
232.410000	43.47	46.00	2.53	15000.0	120.000	102.0	V	222.0	0.0	20.7	PASS
233.640000	45.35	46.00	0.65	15000.0	120.000	100.0	V	227.0	0.0	20.7	PASS
234.480000	45.16	46.00	0.84	15000.0	120.000	103.0	V	242.0	0.0	20.8	PASS
235.320000	41.17	46.00	4.83	15000.0	120.000	101.0	V	240.0	0.0	20.8	PASS
244.650000	40.77	46.00	5.23	15000.0	120.000	100.0	V	334.0	0.0	21.2	PASS
245.520000	44.03	46.00	1.97	15000.0	120.000	100.0	V	323.0	0.0	21.2	PASS
246.390000	43.23	46.00	2.77	15000.0	120.000	100.0	V	316.0	0.0	21.2	PASS
247.590000	40.75	46.00	5.25	15000.0	120.000	102.0	V	323.0	0.0	21.3	PASS
248.460000	41.03	46.00	4.97	15000.0	120.000	100.0	V	321.0	0.0	21.3	PASS
480.000000	36.79	46.00	9.21	15000.0	120.000	171.0	H	164.0	0.0	26.7	PASS
720.000000	32.13	46.00	13.88	15000.0	120.000	102.0	H	0.0	0.0	30.7	PASS

Mid channel, 1 GHz – 18 GHz



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
1200.000000	---	23.07	54.00	30.93	500.0	1000.000	126.0	V	0.0	-7.6	PASS
1200.000000	37.22	---	74.00	36.78	500.0	1000.000	126.0	V	0.0	-7.6	PASS
1403.750000	31.44	---	74.00	42.56	500.0	1000.000	175.0	H	322.0	-6.4	PASS
1403.750000	---	17.85	54.00	36.15	500.0	1000.000	175.0	H	322.0	-6.4	PASS
2000.250000	37.62	---	74.00	36.38	500.0	1000.000	278.0	H	335.0	-1.5	PASS
2000.250000	---	28.08	54.00	25.92	500.0	1000.000	278.0	H	335.0	-1.5	PASS
2650.250000	35.52	---	74.00	38.48	500.0	1000.000	364.0	H	309.0	1.4	PASS
2650.250000	---	22.50	54.00	31.50	500.0	1000.000	364.0	H	309.0	1.4	PASS
4000.250000	42.75	---	74.00	31.25	500.0	1000.000	187.0	V	307.0	7.9	PASS
4000.250000	---	32.78	54.00	21.22	500.0	1000.000	187.0	V	307.0	7.9	PASS
10000.750000	---	40.09	54.00	13.91	500.0	1000.000	100.0	V	43.0	20.0	PASS
10000.750000	51.58	---	74.00	22.42	500.0	1000.000	100.0	V	43.0	20.0	PASS
17987.250000	---	42.81	54.00	11.19	500.0	1000.000	334.0	H	213.0	39.1	PASS
17987.250000	55.82	---	74.00	18.18	500.0	1000.000	334.0	H	213.0	39.1	PASS