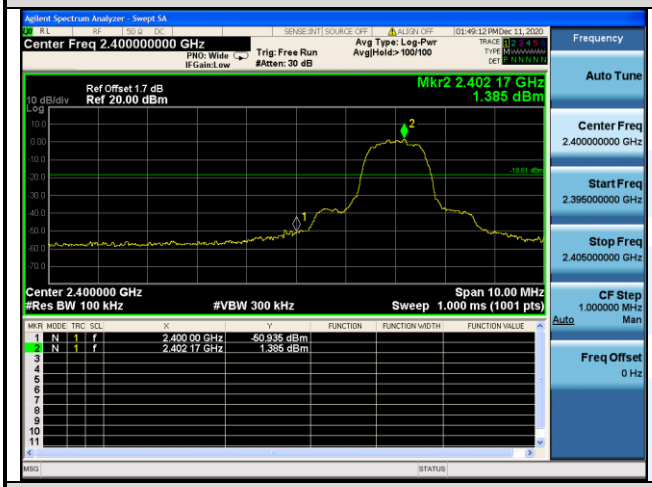
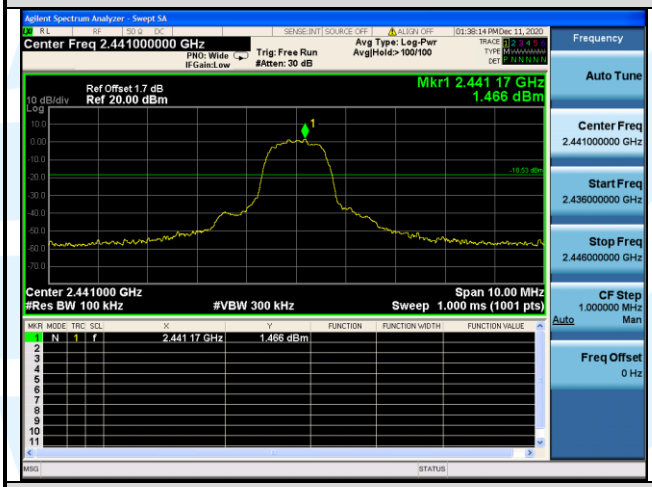
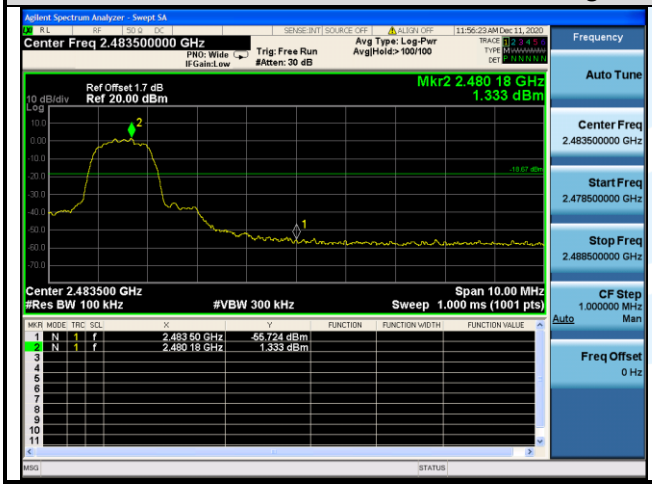
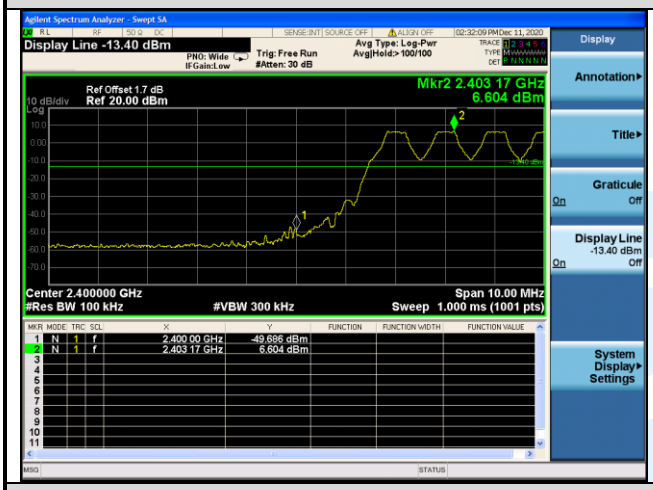
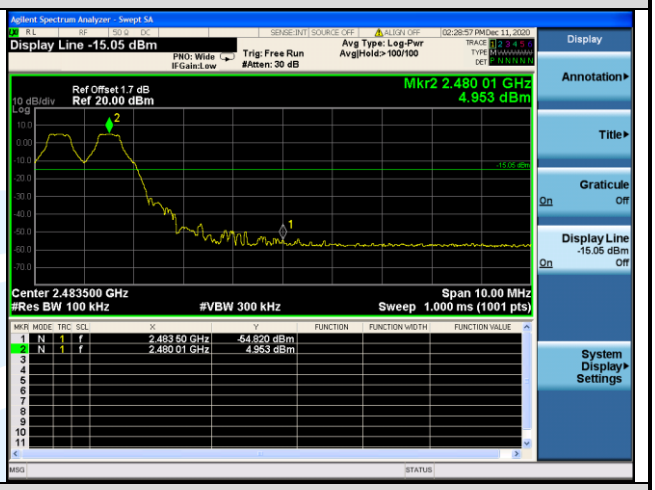
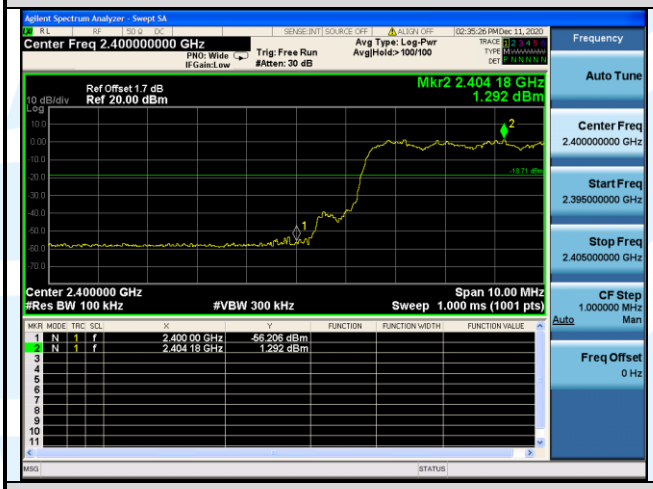
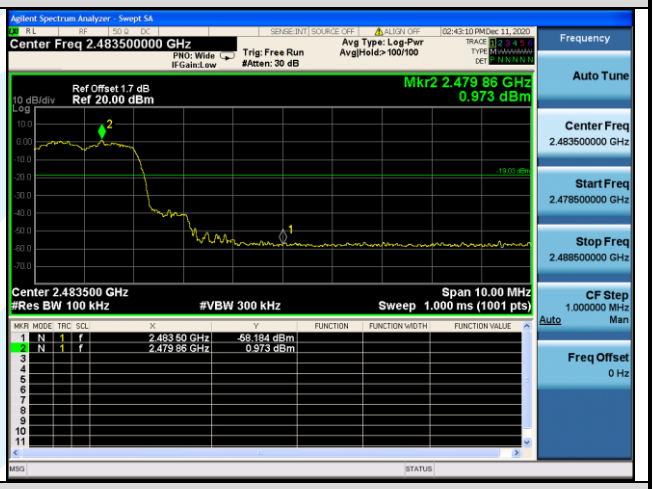
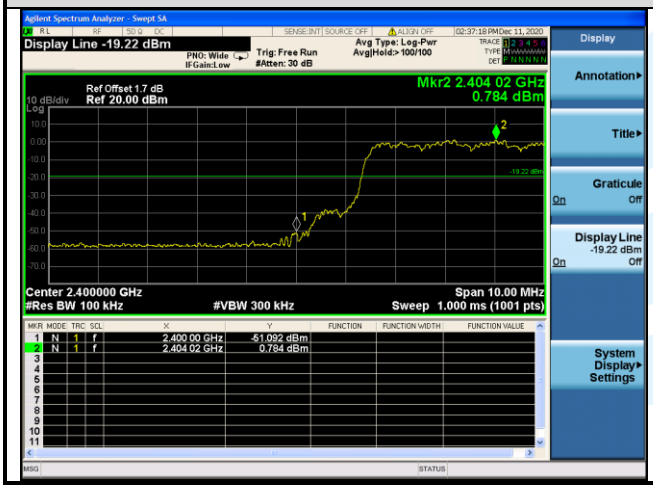
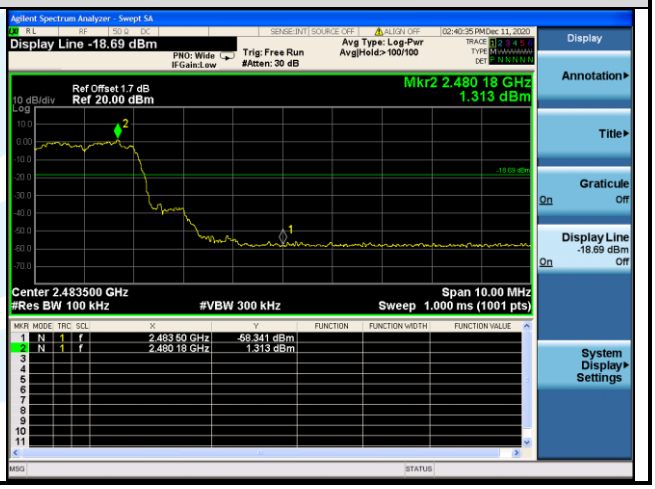
8DPSK	
In-Band Reference Level	Out of Band Emission
Lowest Channel	
	
Middle Channel	
	
Highest Channel	
	

Hopping Lowest Channel	Hopping Highest Channel
GFSK	
	
π/4DQPSK	
	
8DPSK	
	

5.9 RADIATED SPURIOUS EMISSIONS

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.205/15.209
RSS-Gen Issue 5, Section 6.13/8.9/8.10

Test Method: ANSI C63.10-2013 Section 6.3 & 6.5 & 6.6

Receiver Setup:

Frequency	RBW
0.009 MHz-0.150 MHz	200/300 kHz
0.150 MHz -30 MHz	9/10 kHz
30 MHz-1 GHz	100/120 kHz
Above 1 GHz	1 MHz

Limits:

Spurious Emissions

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009 MHz-0.490 MHz	2400/F(kHz)	--	--	300
0.490 MHz-1.705 MHz	24000/F(kHz)	--	--	30
1.705 MHz-30 MHz	30	--	--	30
30 MHz-88 MHz	100	40.0	Quasi-peak	3
88 MHz-216 MHz	150	43.5	Quasi-peak	3
216 MHz-960 MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1 GHz	500	54.0	Average	3

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

Test Setup: Refer to section 4.5.1 for details.

Test Procedures:

1. From 30 MHz to 1GHz test procedure as below:

1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3) The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.
5) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

2. Above 1GHz test procedure as below:

1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).

2) Test the EUT in the lowest channel ,middle channel, the Highest channel
3) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the Y axis positioning which it is worse case.
4) Repeat above procedures until all frequencies measured was complete.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

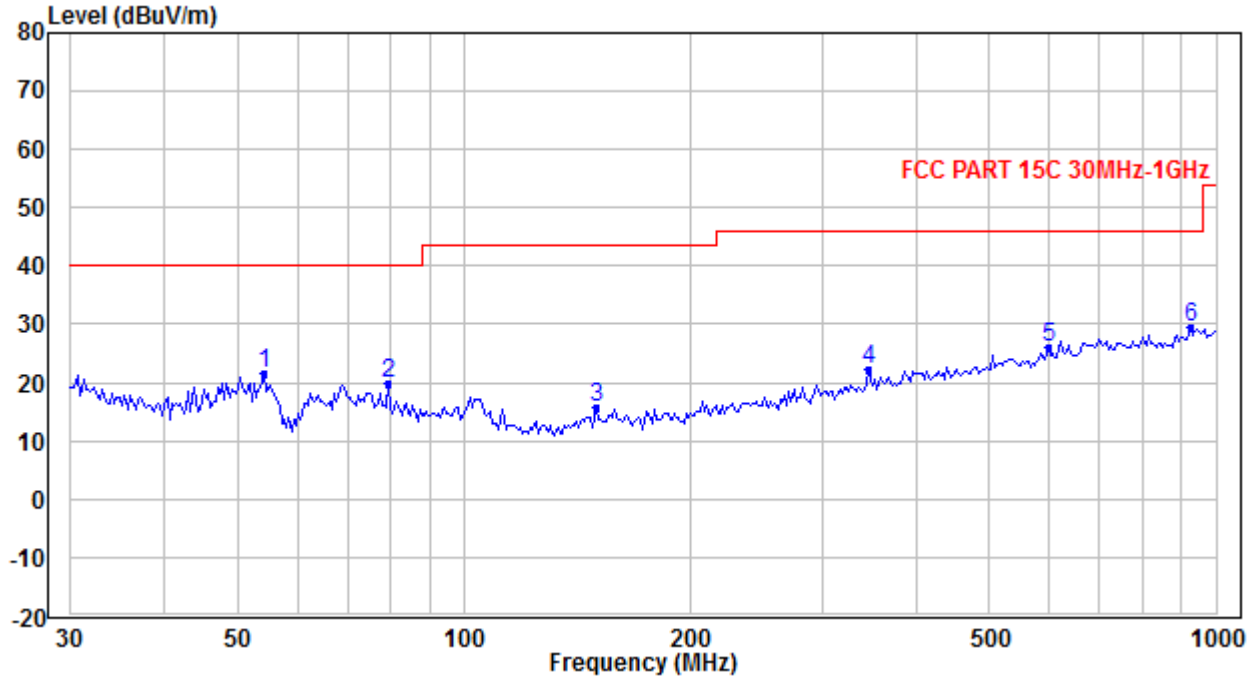
The measurement data as follows:

Radiated Emission Test Data (9 KHz ~ 30 MHz):
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Radiated Emission Test Data (30 MHz ~ 1 GHz):

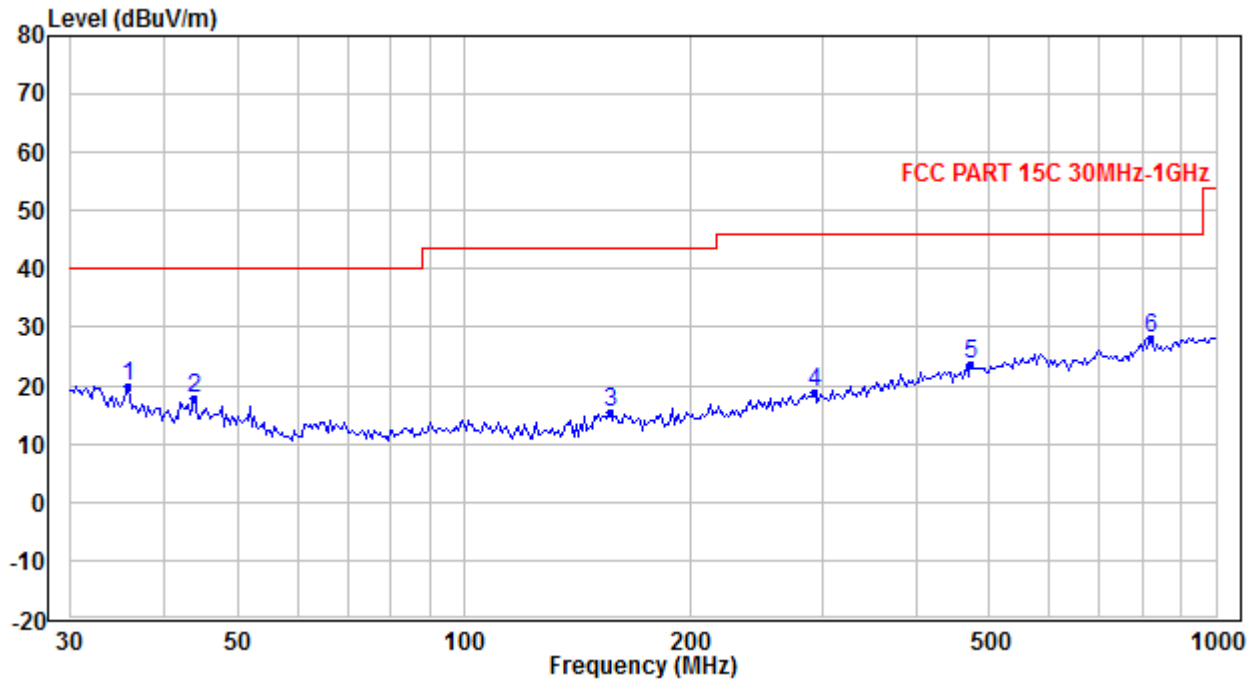
Left Earbud_Worst-Case Configuration

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	54.135	36.37	-14.90	21.47	40.00	-18.53	QP
2	79.119	33.93	-14.18	19.75	40.00	-20.25	QP
3	149.968	27.48	-11.78	15.70	43.50	-27.80	QP
4	346.074	27.29	-5.04	22.25	46.00	-23.75	QP
5	598.707	26.37	-0.28	26.09	46.00	-19.91	QP
6	925.613	25.10	4.23	29.33	46.00	-16.67	QP

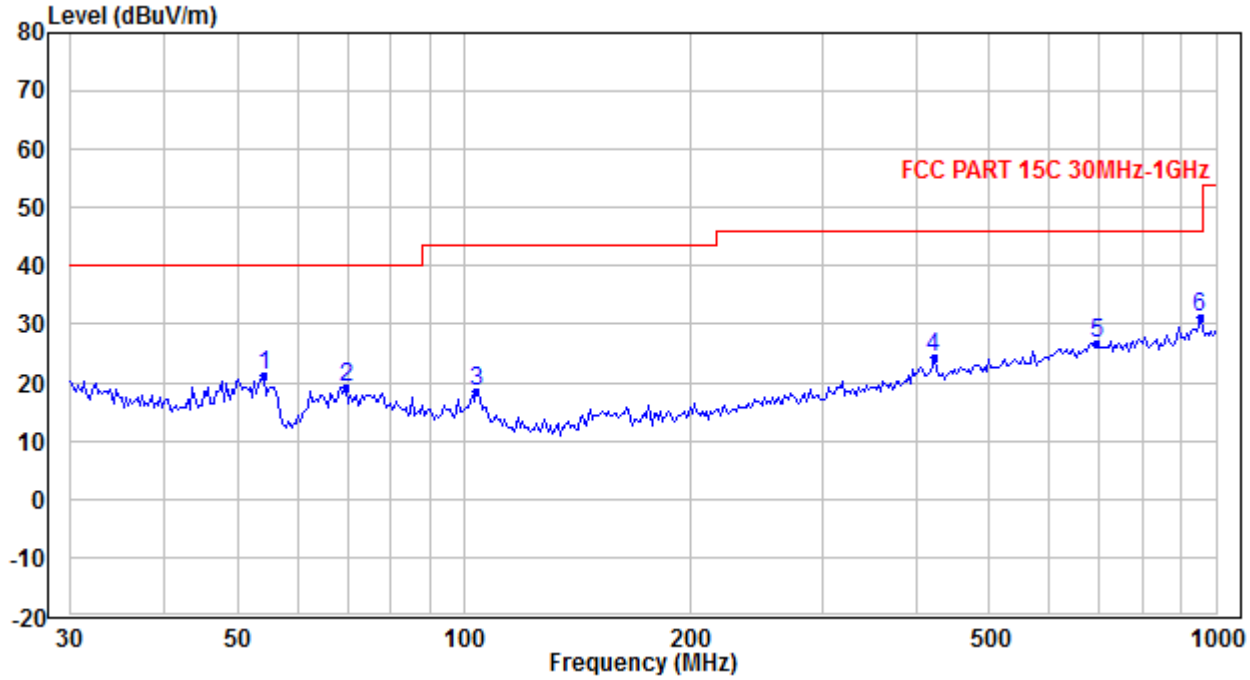
Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	35.762	29.04	-9.03	20.01	40.00	-19.99	QP
2	43.845	30.88	-12.96	17.92	40.00	-22.08	QP
3	156.426	27.10	-11.60	15.50	43.50	-28.00	QP
4	292.364	25.80	-6.85	18.95	46.00	-27.05	QP
5	471.467	26.45	-2.86	23.59	46.00	-22.41	QP
6	821.387	25.95	2.18	28.13	46.00	-17.87	QP

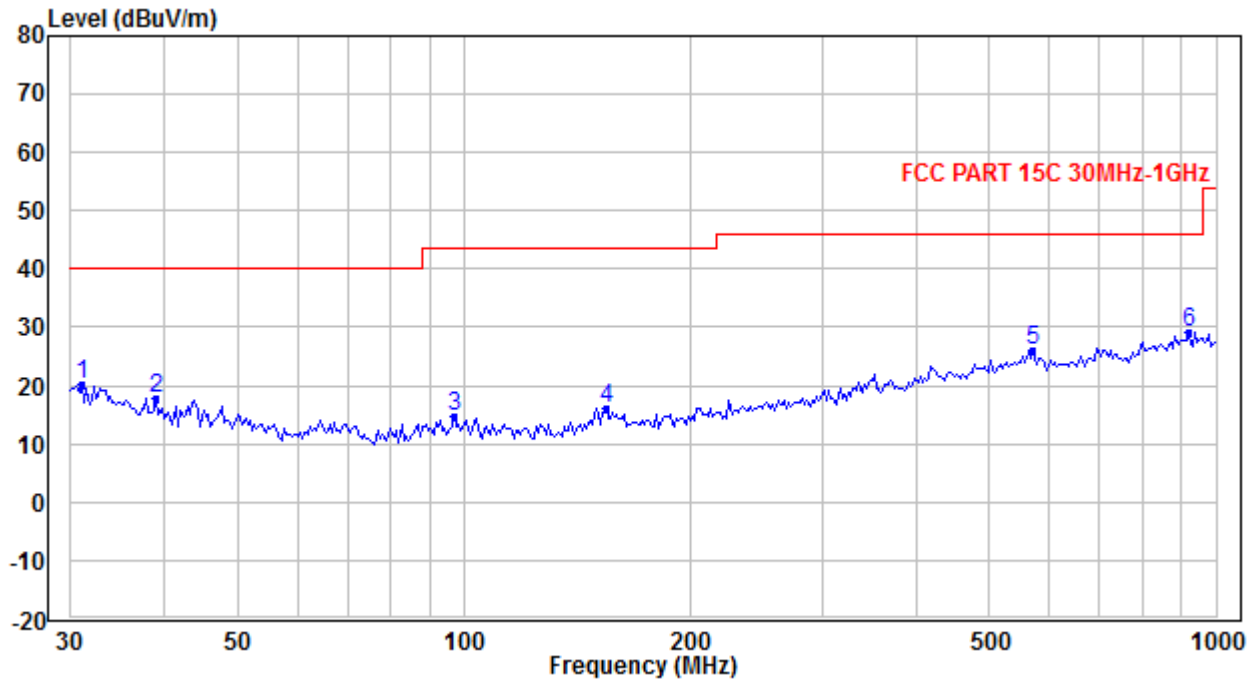
Radiated Emission Test Data (30 MHz ~ 1 GHz):
Right Earbud _Worst-Case Configuration

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	54.135	36.08	-14.90	21.18	40.00	-18.82	QP
2	69.718	33.53	-14.51	19.02	40.00	-20.98	QP
3	104.064	31.32	-12.79	18.53	43.50	-24.97	QP
4	421.329	27.79	-3.60	24.19	46.00	-21.81	QP
5	693.910	25.19	1.59	26.78	46.00	-19.22	QP
6	952.000	26.03	5.03	31.06	46.00	-14.94	QP

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	31.073	26.44	-6.10	20.34	40.00	-19.66	QP
2	38.908	28.68	-11.00	17.68	40.00	-22.32	QP
3	97.002	27.78	-12.98	14.80	43.50	-28.70	QP
4	154.243	27.84	-11.66	16.18	43.50	-27.32	QP
5	569.969	26.85	-0.78	26.07	46.00	-19.93	QP
6	919.132	25.49	3.55	29.04	46.00	-16.96	QP

Radiated Emission Test Data (Above 1GHz):

Left Earbud _Lowest Channel:

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4804.00	44.69	-3.32	41.37	74.00	-32.63	Peak	Horizontal
2	4804.00	33.06	-3.32	29.74	54.00	-24.26	Average	Horizontal
3	7206.00	43.71	0.84	44.55	74.00	-29.45	Peak	Horizontal
4	7206.00	32.43	0.84	33.27	54.00	-20.73	Average	Horizontal
5	4804.00	43.91	-3.22	40.69	74.00	-33.31	Peak	Vertical
6	4804.00	32.47	-3.22	29.25	54.00	-24.75	Average	Vertical
7	7206.00	43.57	0.94	44.51	74.00	-29.49	Peak	Vertical
8	7206.00	32.26	0.94	33.20	54.00	-20.80	Average	Vertical

Left Earbud _Middle Channel:

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4882.00	44.37	-3.24	41.13	74.00	-32.87	Peak	Horizontal
2	4882.00	33.08	-3.24	29.84	54.00	-24.16	Average	Horizontal
3	7323.00	43.75	0.98	44.73	74.00	-29.27	Peak	Horizontal
4	7323.00	32.24	0.98	33.22	54.00	-20.78	Average	Horizontal
5	4882.00	44.01	-3.06	40.95	74.00	-33.05	Peak	Vertical
6	4882.00	31.76	-3.06	28.70	54.00	-25.30	Average	Vertical
7	7323.00	44.57	1.08	45.65	74.00	-28.35	Peak	Vertical
8	7323.00	32.09	1.08	33.17	54.00	-20.83	Average	Vertical

Left Earbud _Highest Channel:

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4960.00	44.74	-3.17	41.57	74.00	-32.43	Peak	Horizontal
2	4960.00	32.14	-3.17	28.97	54.00	-25.03	Average	Horizontal
3	7440.00	43.87	1.13	45.00	74.00	-29.00	Peak	Horizontal
4	7440.00	31.60	1.13	32.73	54.00	-21.27	Average	Horizontal
5	4960.00	42.81	-3.81	39.00	74.00	-35.00	Peak	Vertical
6	4960.00	34.02	-3.81	30.21	54.00	-23.79	Average	Vertical
7	7440.00	43.70	1.23	44.93	74.00	-29.07	Peak	Vertical
8	7440.00	31.64	1.23	32.87	54.00	-21.13	Average	Vertical

Radiated Emission Test Data (Above 1GHz):

Right Earbud _Lowest Channel:

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4804.00	43.75	-3.32	40.43	74.00	-33.57	Peak	Horizontal
2	4804.00	33.09	-3.32	29.77	54.00	-24.23	Average	Horizontal
3	7206.00	43.70	0.84	44.54	74.00	-29.46	Peak	Horizontal
4	7206.00	32.15	0.84	32.99	54.00	-21.01	Average	Horizontal
5	4804.00	43.26	-3.22	40.04	74.00	-33.96	Peak	Vertical
6	4804.00	33.02	-3.22	29.80	54.00	-24.20	Average	Vertical
7	7206.00	43.49	0.94	44.43	74.00	-29.57	Peak	Vertical
8	7206.00	31.97	0.94	32.91	54.00	-21.09	Average	Vertical

Right Earbud _Middle Channel:

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4882.00	43.75	-3.24	40.51	74.00	-33.49	Peak	Horizontal
2	4882.00	31.98	-3.24	28.74	54.00	-25.26	Average	Horizontal
3	7323.00	43.81	0.98	44.79	74.00	-29.21	Peak	Horizontal
4	7323.00	31.98	0.98	32.96	54.00	-21.04	Average	Horizontal
5	4882.00	42.51	-3.06	39.45	74.00	-34.55	Peak	Vertical
6	4882.00	32.20	-3.06	29.14	54.00	-24.86	Average	Vertical
7	7323.00	43.91	1.08	44.99	74.00	-29.01	Peak	Vertical
8	7323.00	31.80	1.08	32.88	54.00	-21.12	Average	Vertical

Right Earbud _Highest Channel:

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4960.00	43.24	-3.17	40.07	74.00	-33.93	Peak	Horizontal
2	4960.00	31.96	-3.17	28.79	54.00	-25.21	Average	Horizontal
3	7440.00	42.99	1.13	44.12	74.00	-29.88	Peak	Horizontal
4	7440.00	32.43	1.13	33.56	54.00	-20.44	Average	Horizontal
5	4960.00	43.54	-2.91	40.63	74.00	-33.37	Peak	Vertical
6	4960.00	32.12	-2.91	29.21	54.00	-24.79	Average	Vertical
7	7440.00	42.23	1.23	43.46	74.00	-30.54	Peak	Vertical
8	7440.00	31.73	1.23	32.96	54.00	-21.04	Average	Vertical

Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result – Limit

5.10 BAND EDGE MEASUREMENTS (RADIATED)

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.205/15.209
RSS-247 Issue 2, Section 5.5

Test Method: ANSI C63.10-2013 Section 6.10.5

Limits:

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).

Frequency	Limit (dBμV/m @3m)	Remark
30 MHz-88 MHz	40.0	Quasi-peak Value
88 MHz-216 MHz	43.5	Quasi-peak Value
216 MHz-960 MHz	46.0	Quasi-peak Value
960 MHz-1 GHz	54.0	Quasi-peak Value
Above 1 GHz	54.0	Average Value
	74.0	Peak Value

Test Setup: Refer to section 4.5.1 for details.

Test Procedures:

Radiated band edge measurements at 2390 MHz and 2483.5 MHz were made with the unit transmitting in the low end of the channel range and the high end closest to the restricted bands respectively. The emissions were made on the 966 Semi-Chamber. Use (resolution bandwidth (RBW) = 1 MHz, video bandwidth (VBW) = 3 MHz for peak levels and RBW = 1 MHz and VBW = 10 Hz or 1/T for average levels).

1. Use radiated spurious emission test procedure described in clause 5.10. The transmitter output (antenna port) was connected to the test receiver.
2. Set the PK and AV limit line.
3. Record the fundamental emission and emissions out of the band-edge.
4. Determine band-edge compliance as required.

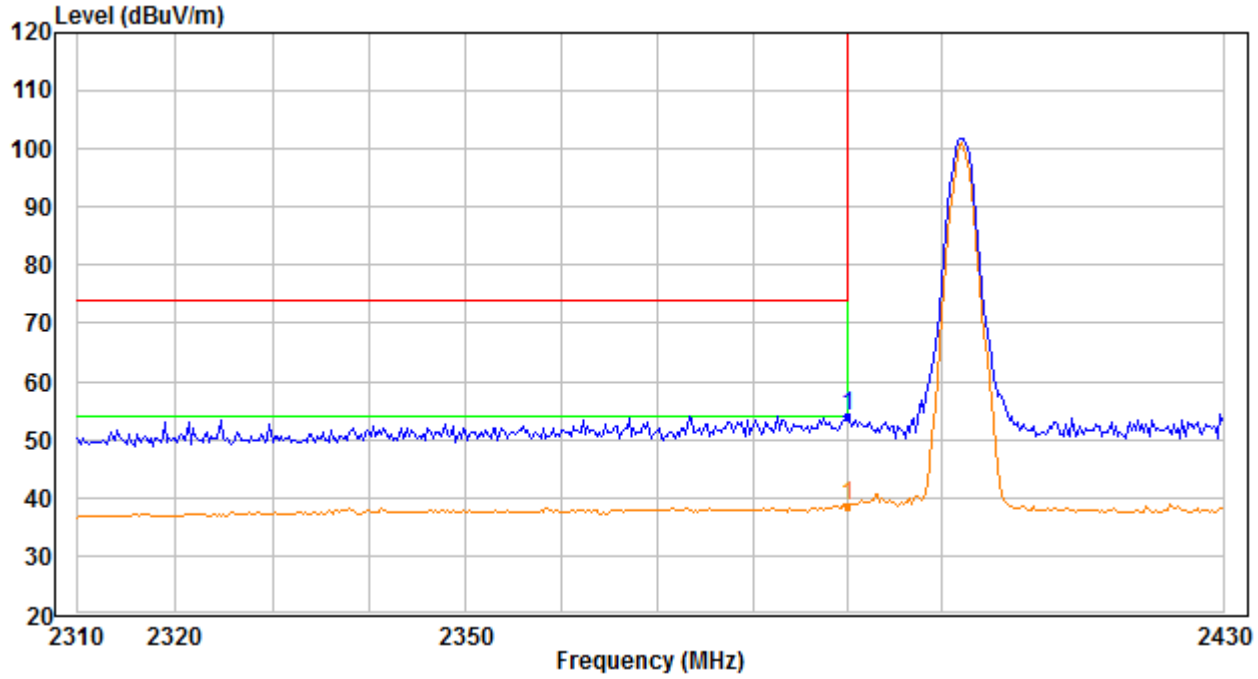
Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

Left Earbud

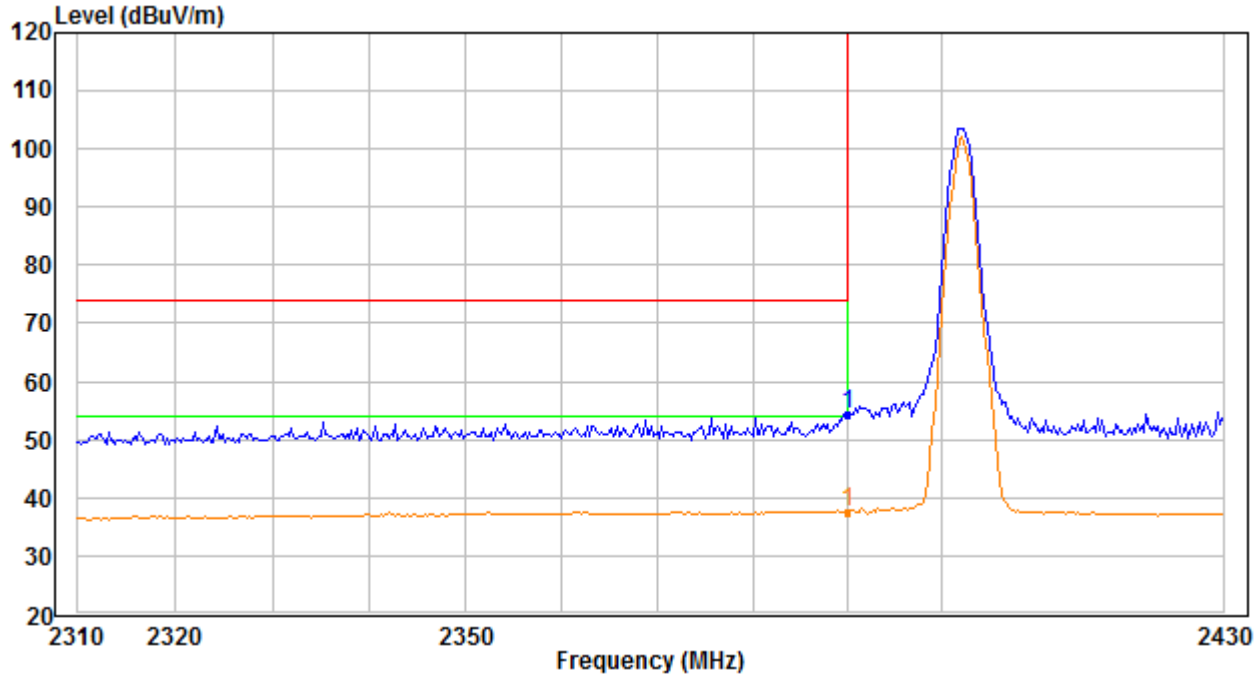
Test Channel:	Lowest Channel	Ant. Polar. :	Horizontal



Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2390.0000	53.94	74.00	38.86	54.00	Pass

Left Earbud

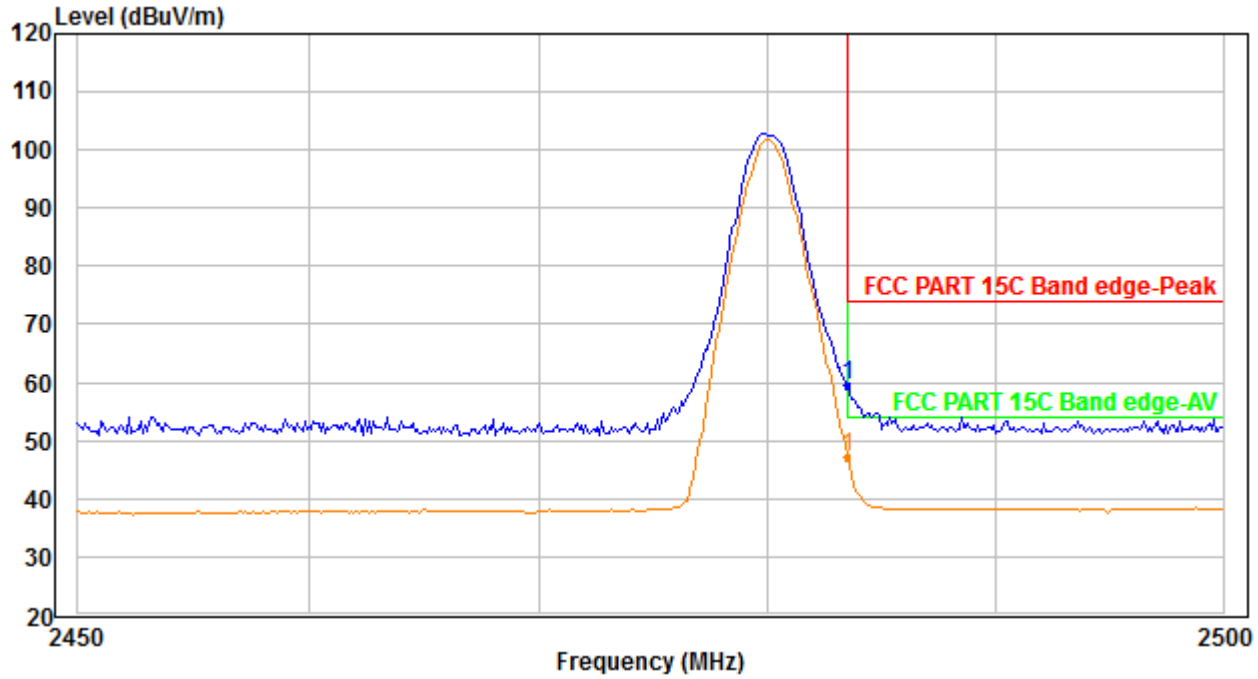
Test Channel:	Lowest Channel	Ant. Polar. :	Vertical



Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2390.0000	54.49	74.00	37.54	54.00	Pass

Left Earbud

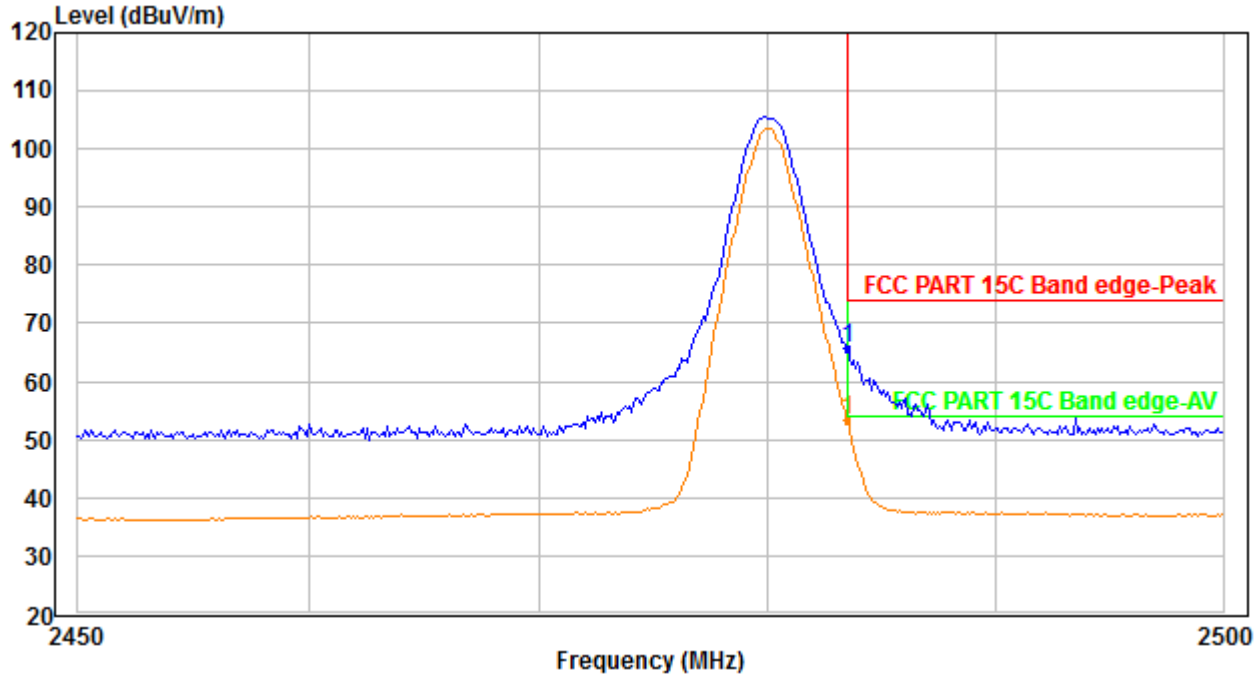
Test Channel:	Highest Channel	Ant. Polar. :	Horizontal



Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2483.5000	59.58	74.00	47.31	54.00	Pass

Left Earbud

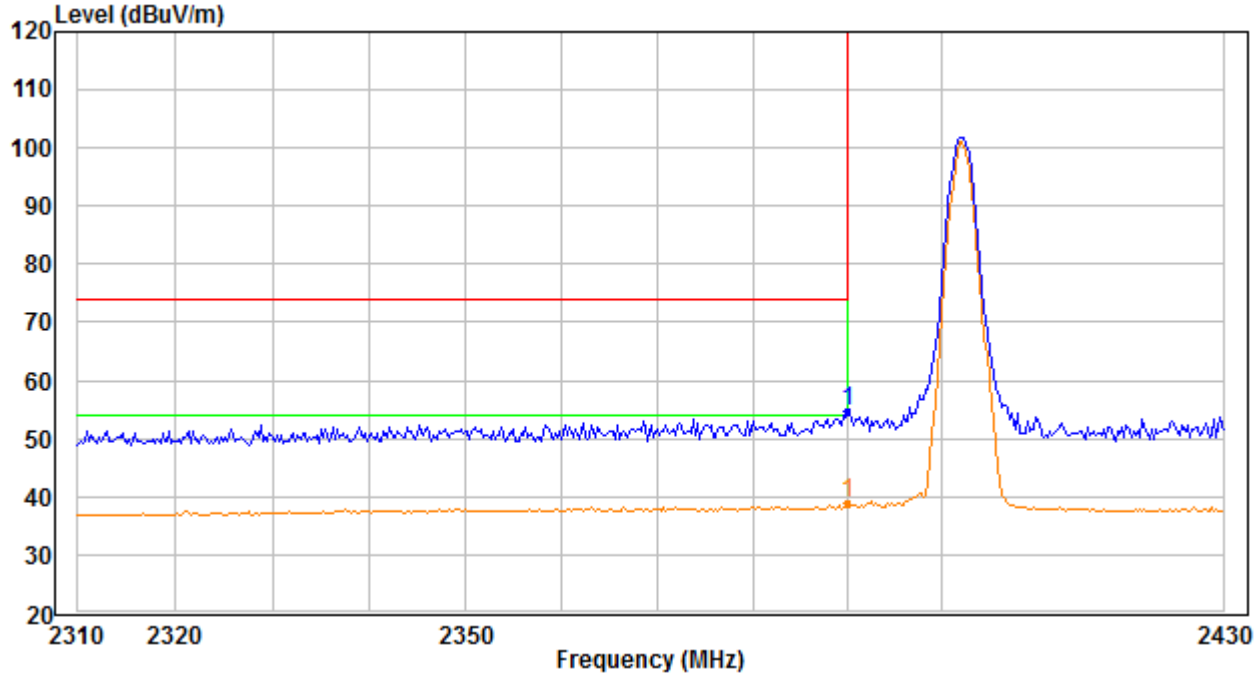
Test Channel:	Highest Channel	Ant. Polar. :	Vertical



Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2483.5000	65.69	74.00	53.38	54.00	Pass

Right Earbud

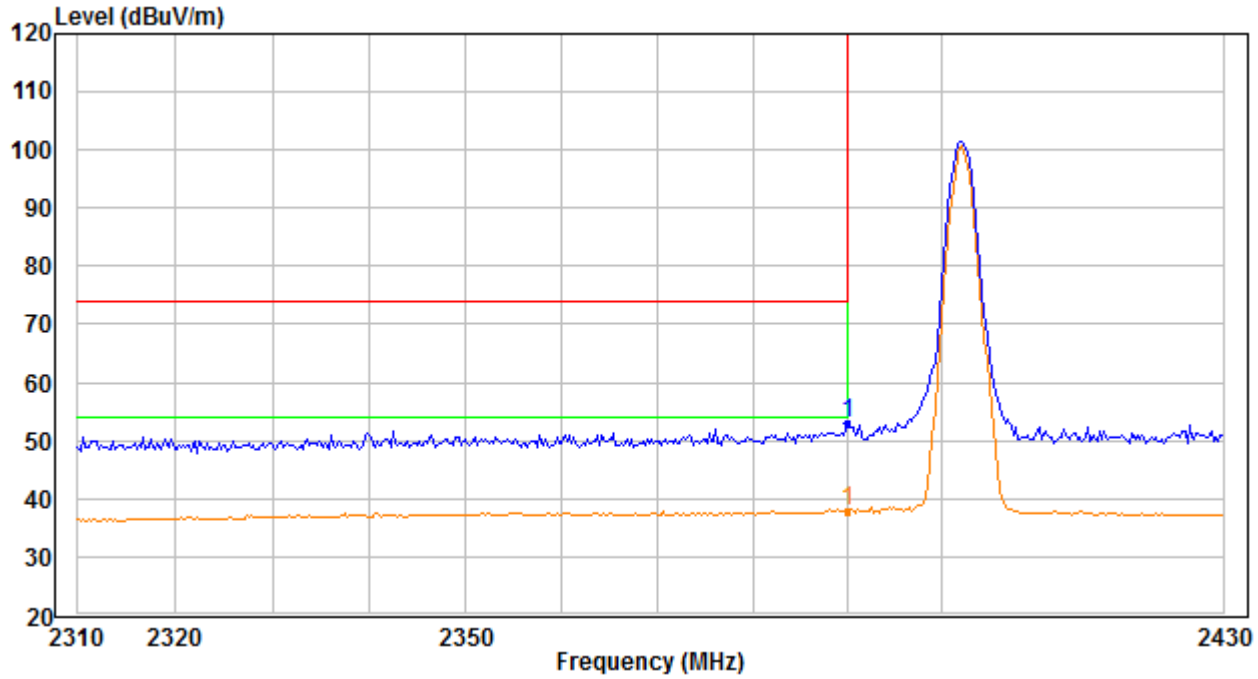
Test Channel:	Lowest Channel	Ant. Polar. :	Horizontal



Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2390.0000	54.76	74.00	38.81	54.00	Pass

Right Earbud

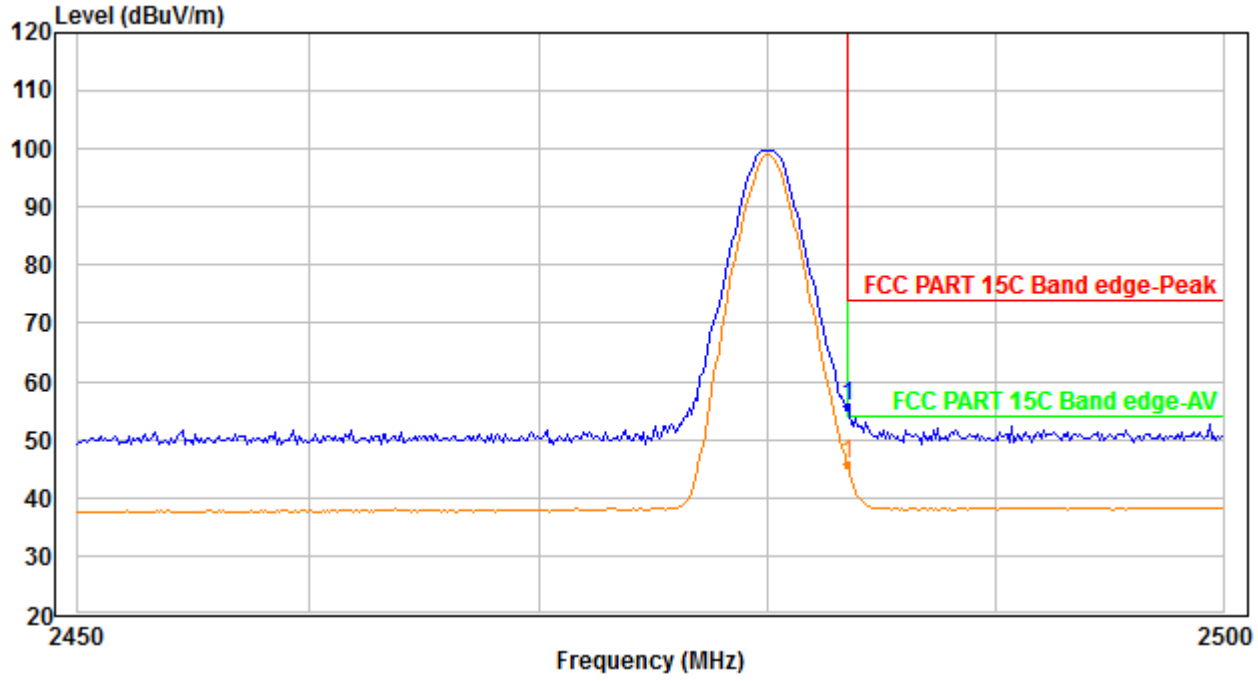
Test Channel:	Lowest Channel	Ant. Polar. :	Vertical



Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2390.0000	52.92	74.00	37.93	54.00	Pass

Right Earbud

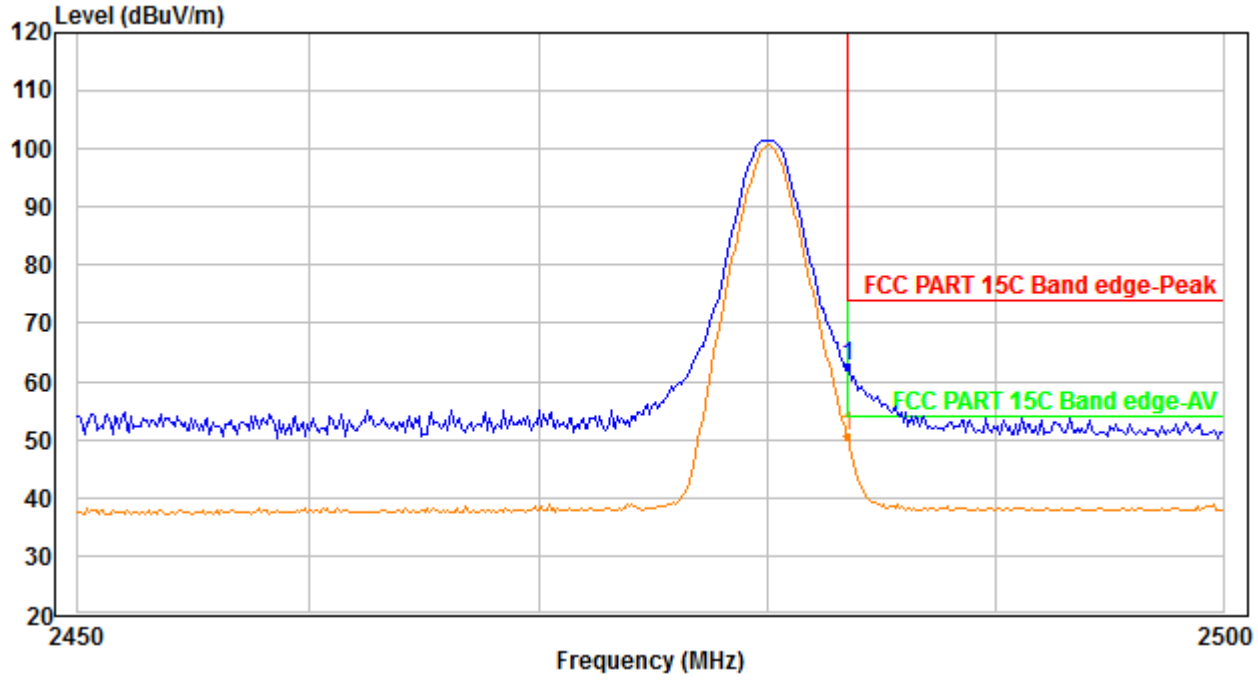
Test Channel:	Highest Channel	Ant. Polar. :	Horizontal



Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2483.5000	55.60	74.00	45.68	54.00	Pass

Right Earbud

Test Channel:	Highest Channel	Ant. Polar. :	Vertical



Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2483.5000	62.49	74.00	50.42	54.00	Pass

APPENDIX 1 PHOTOS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

*** End of Report ***

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