

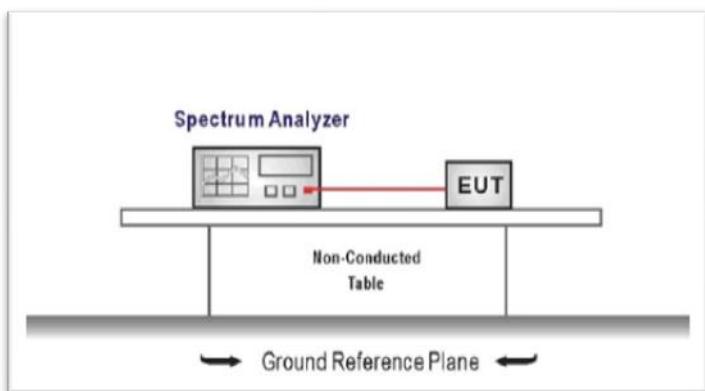
5.10. Bandedge and Spurious Emission (conducted)

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

TEST CONFIGURATION



TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
RBW = 100 kHz, VBW \geq RBW
Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

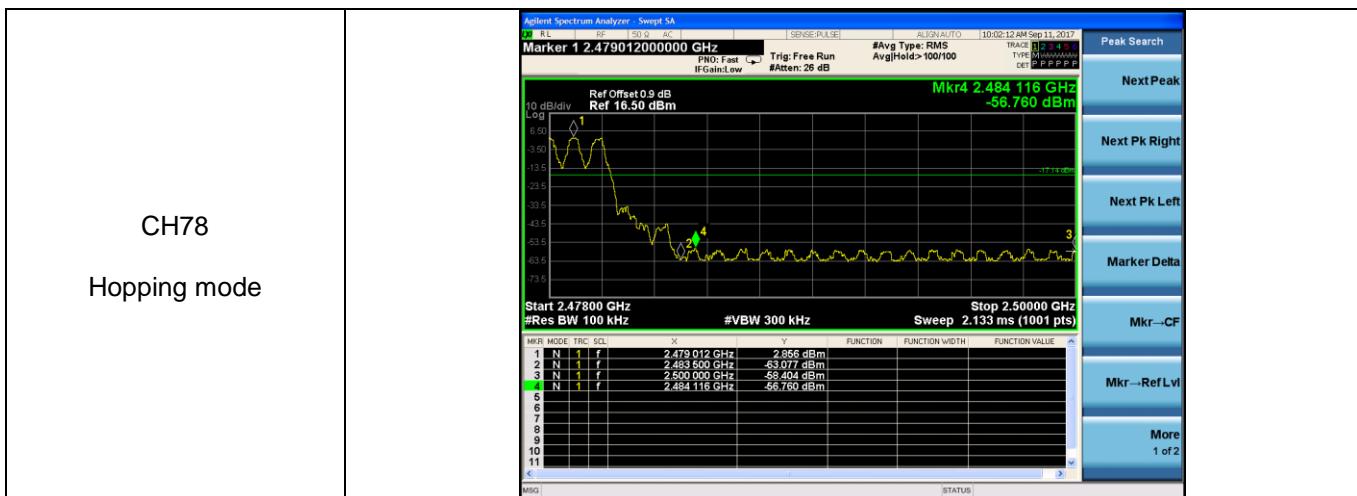
TEST MODE:

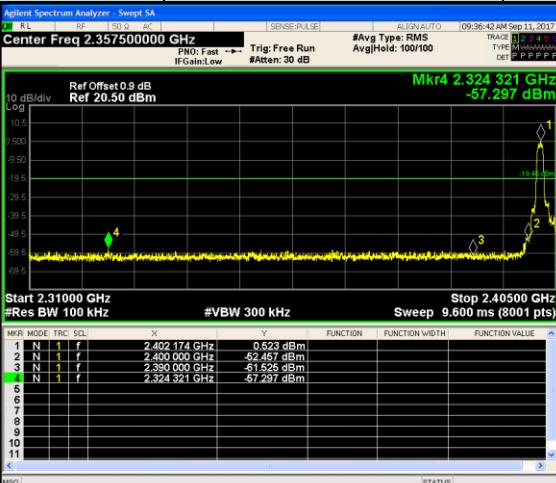
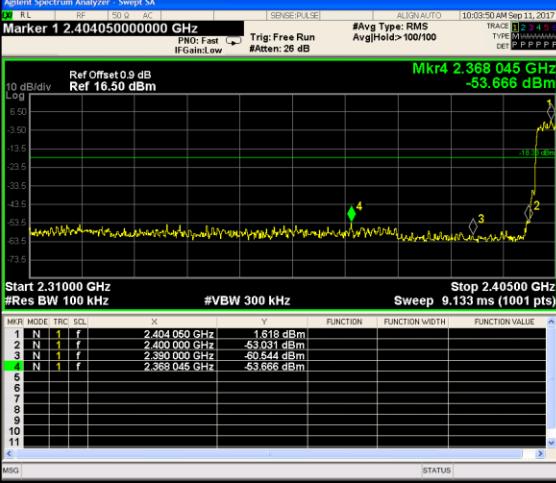
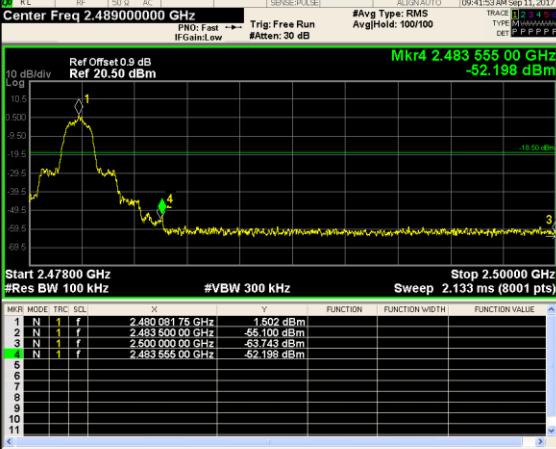
Please refer to the clause 3.3

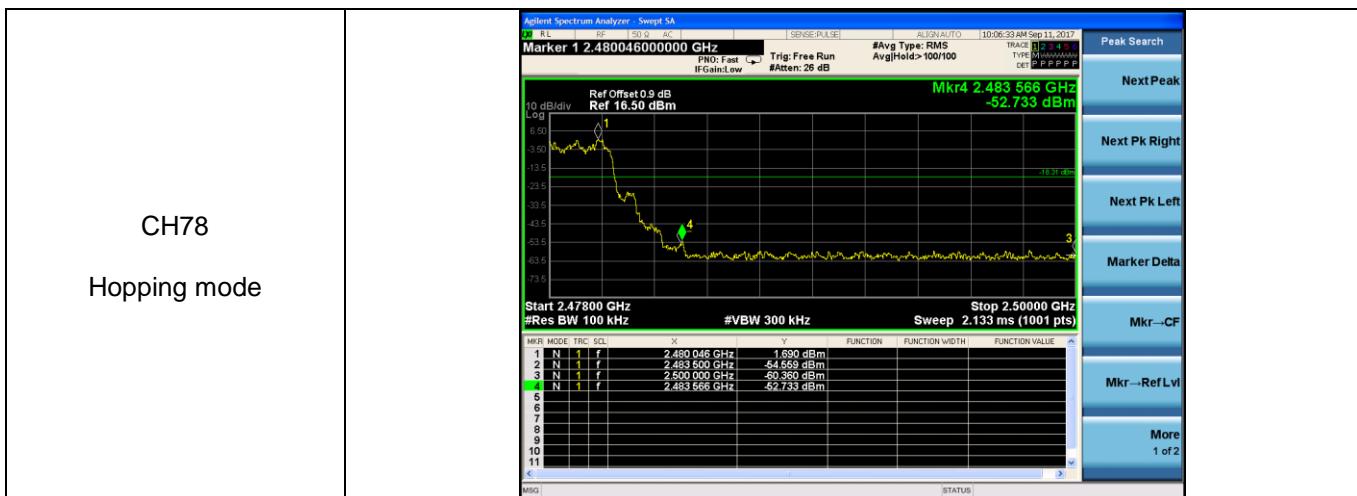
TEST RESULTS

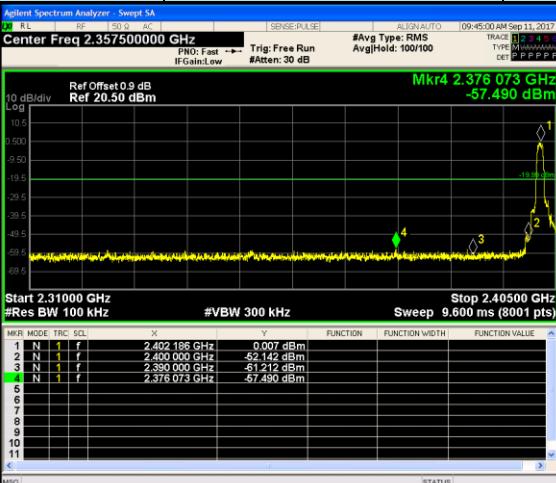
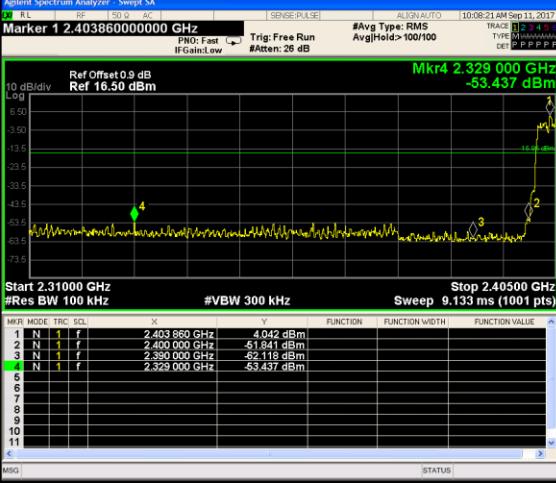
Passed Not Applicable

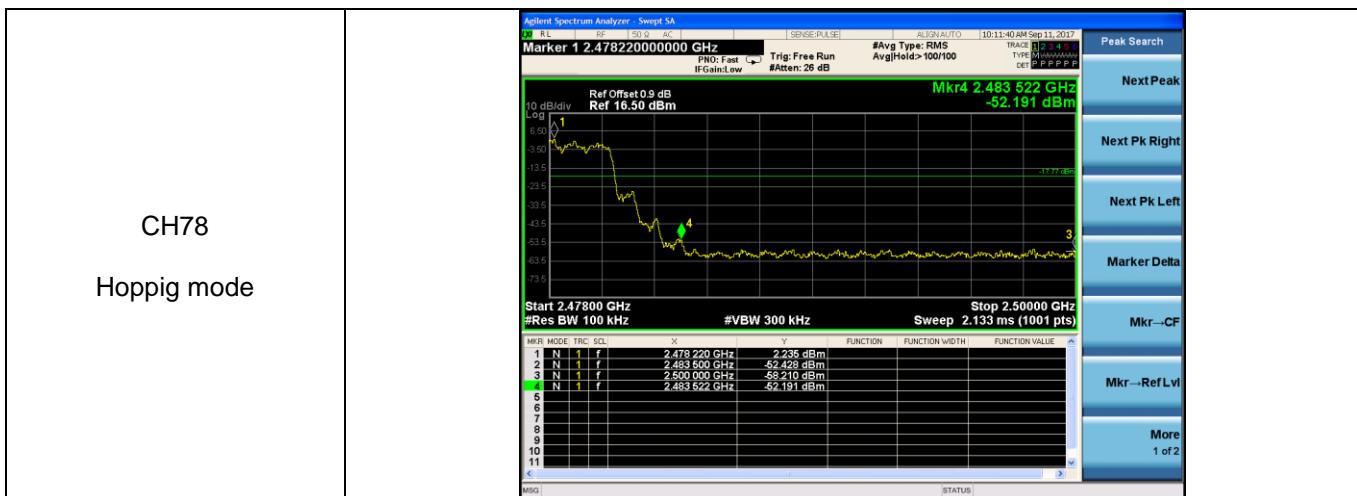
Test Item:	Band edge	Modulation type:	GFSK																																																																		
CH00	No hopping mode	<p>Agilent Spectrum Analyzer - Sweep SA</p> <p>Center Freq 2.357500000 GHz</p> <p>PNO: Fast IFGain:Low Trig: Free Run #Atten: 30 dB</p> <p>#Avg Type: RMS Avg Hold: 100/100</p> <p>REF 20.50 dBm</p> <p>Start 2.31000 GHz Stop 2.40500 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 9.600 ms (8001 pts)</p> <p>MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE</p> <table border="1"> <tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.402 209 GHz</td><td>5.827 dBm</td></tr> <tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.400 000 GHz</td><td>-47.761 dBm</td></tr> <tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.399 000 GHz</td><td>-60.984 dBm</td></tr> <tr><td>4</td><td>N</td><td>1</td><td>f</td><td>2.350 197 GHz</td><td>-54.509 dBm</td></tr> <tr><td>5</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>6</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>7</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>8</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>9</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>10</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>11</td><td></td><td></td><td></td><td></td><td></td></tr> </table> <p>MSG STATUS</p>	1	N	1	f	2.402 209 GHz	5.827 dBm	2	N	1	f	2.400 000 GHz	-47.761 dBm	3	N	1	f	2.399 000 GHz	-60.984 dBm	4	N	1	f	2.350 197 GHz	-54.509 dBm	5						6						7						8						9						10						11						Frequency Auto Tune Center Freq 2.357500000 GHz Start Freq 2.310000000 GHz Stop Freq 2.405000000 GHz CF Step 9.500000 MHz Auto Freq Offset 0 Hz
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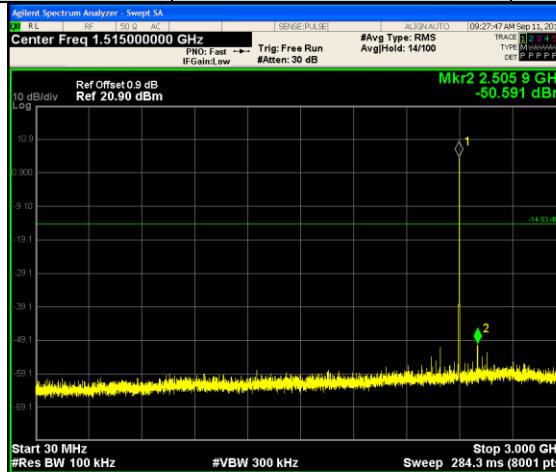
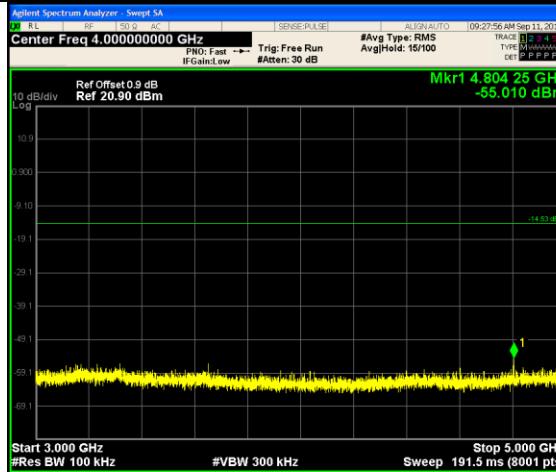
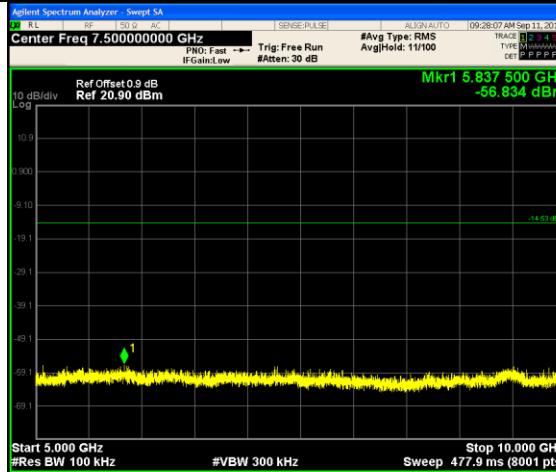


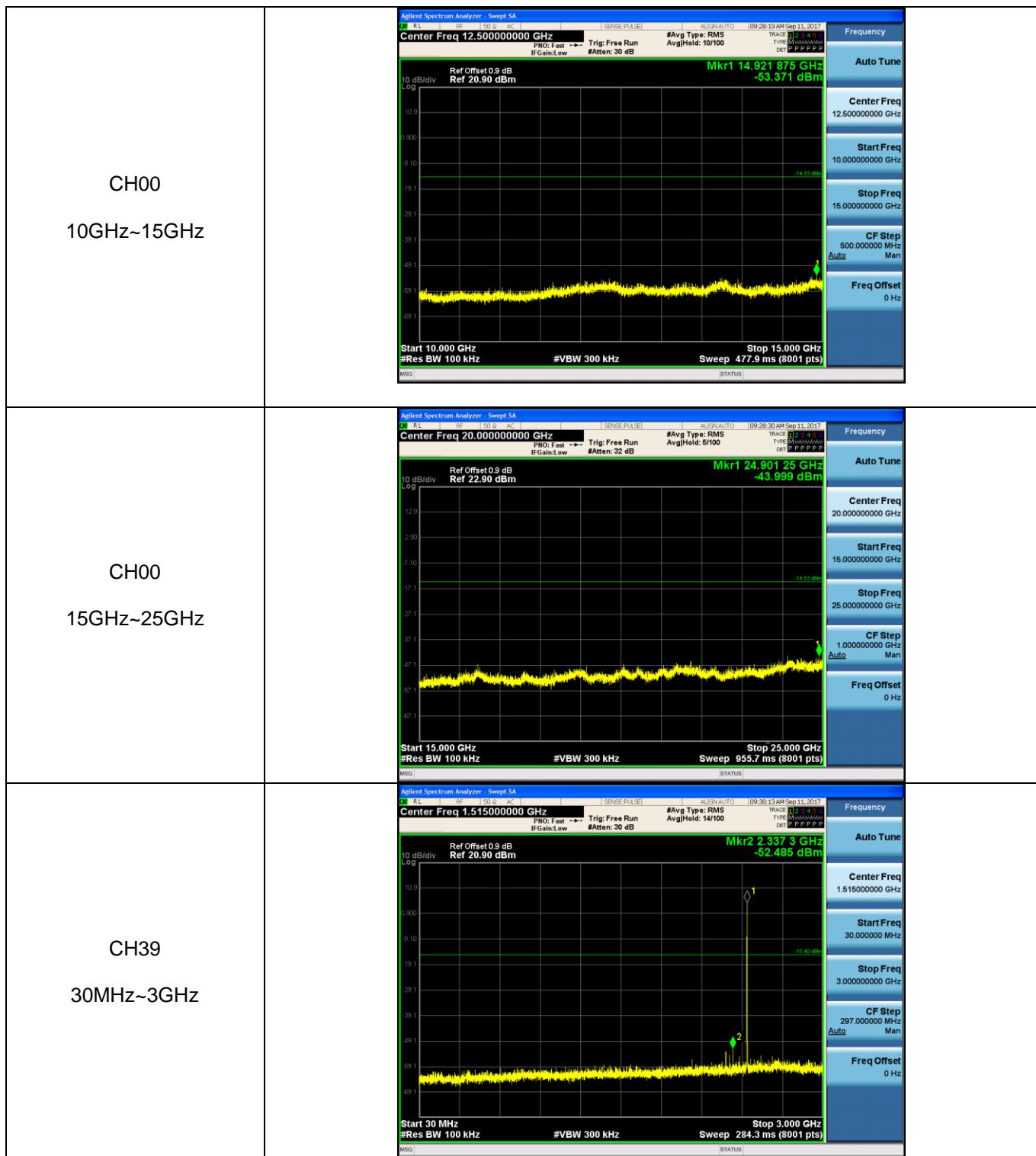
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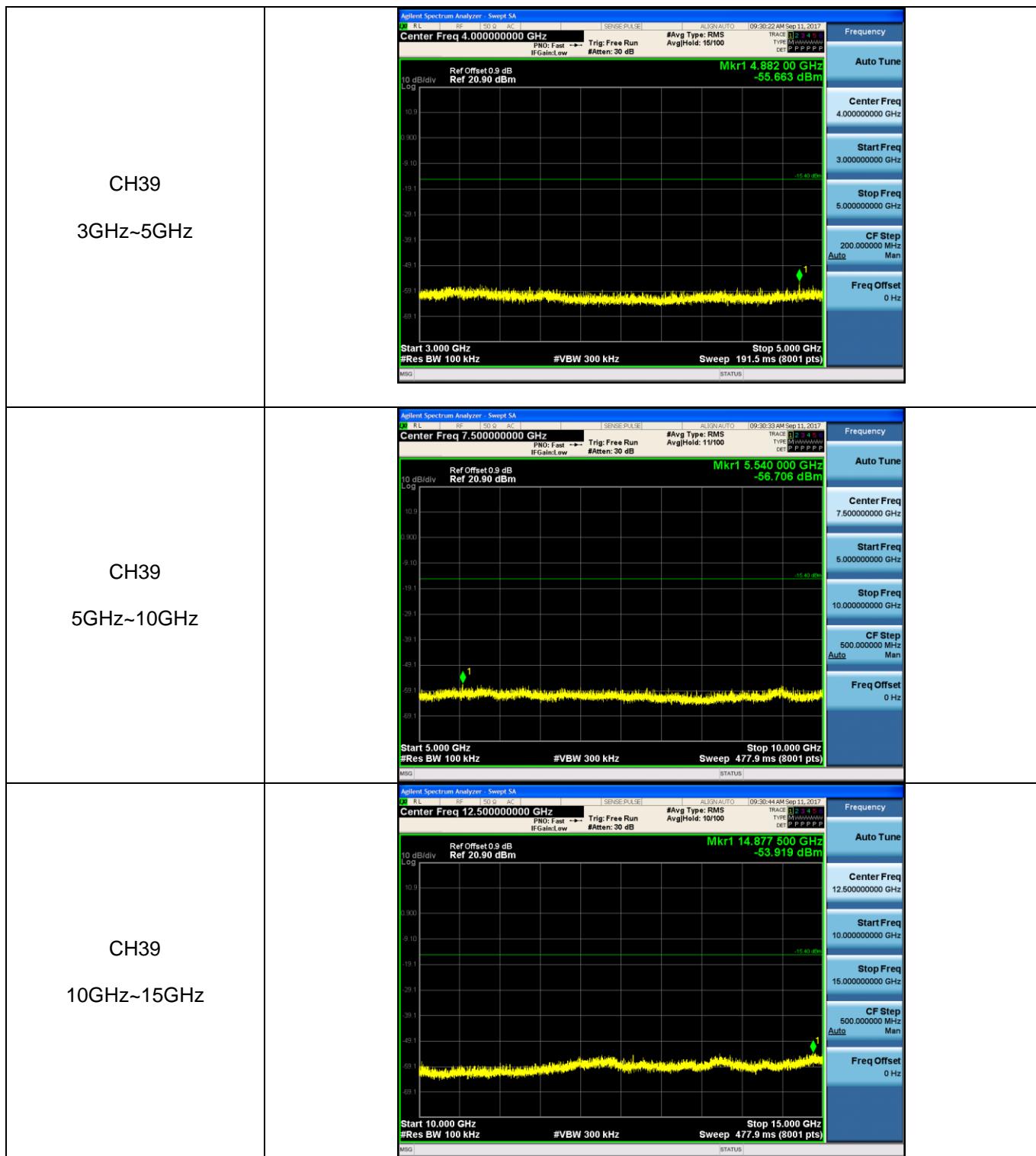


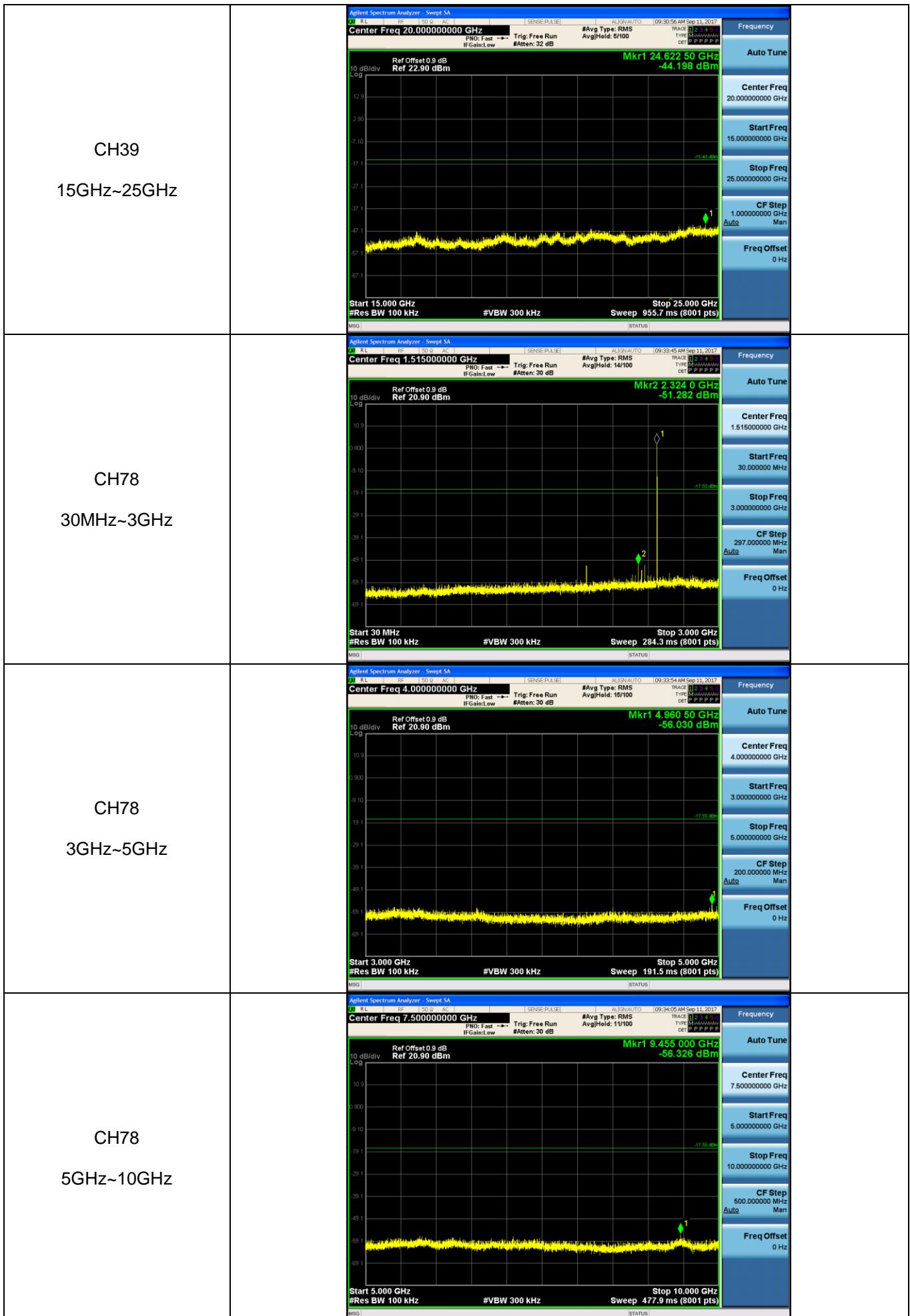
Test Item:	Band edge	Modulation type:	8DPSK																																																																								
CH00	No hopping mode	 <p>Marker 4 2.376 073 GHz -57.490 dBm</p> <p>Start 2.31000 GHz Stop 2.40500 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 9.600 ms (8001 pts)</p> <table border="1"> <tr><th>MKR MODE TRC SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr> <tr><td>1 N 1 f</td><td>2.402 186 GHz</td><td>0.007 dBm</td><td></td><td></td><td></td></tr> <tr><td>2 N 1 f</td><td>2.400 000 GHz</td><td>-52.142 dBm</td><td></td><td></td><td></td></tr> <tr><td>3 N 1 f</td><td>2.399 000 GHz</td><td>-51.212 dBm</td><td></td><td></td><td></td></tr> <tr><td>4 N 1 f</td><td>2.376 073 GHz</td><td>-57.490 dBm</td><td></td><td></td><td></td></tr> <tr><td>5</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>6</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>7</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>8</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>9</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>10</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>11</td><td></td><td></td><td></td><td></td><td></td></tr> </table>	MKR MODE TRC SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1 N 1 f	2.402 186 GHz	0.007 dBm				2 N 1 f	2.400 000 GHz	-52.142 dBm				3 N 1 f	2.399 000 GHz	-51.212 dBm				4 N 1 f	2.376 073 GHz	-57.490 dBm				5						6						7						8						9						10						11						Frequency Auto Tune Center Freq 2.35750000 GHz Start Freq 2.31000000 GHz Stop Freq 2.40500000 GHz CF Step 9.500000 MHz Auto Freq Offset 0 Hz
MKR MODE TRC SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																																																																						
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CH00	Hopping mode	 <p>Marker 1 2.403860000000 GHz -53.437 dBm</p> <p>Start 2.31000 GHz Stop 2.40500 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 9.133 ms (1001 pts)</p> <table border="1"> <tr><th>MKR MODE TRC SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr> <tr><td>1 N 1 f</td><td>2.403 860 GHz</td><td>4.042 dBm</td><td></td><td></td><td></td></tr> <tr><td>2 N 1 f</td><td>2.400 000 GHz</td><td>-51.841 dBm</td><td></td><td></td><td></td></tr> <tr><td>3 N 1 f</td><td>2.399 000 GHz</td><td>-52.119 dBm</td><td></td><td></td><td></td></tr> <tr><td>4 N 1 f</td><td>2.329 000 GHz</td><td>-53.437 dBm</td><td></td><td></td><td></td></tr> <tr><td>5</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>6</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>7</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>8</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>9</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>10</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>11</td><td></td><td></td><td></td><td></td><td></td></tr> </table>	MKR MODE TRC SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1 N 1 f	2.403 860 GHz	4.042 dBm				2 N 1 f	2.400 000 GHz	-51.841 dBm				3 N 1 f	2.399 000 GHz	-52.119 dBm				4 N 1 f	2.329 000 GHz	-53.437 dBm				5						6						7						8						9						10						11						Peak Search Next Peak Next Pk Right Next Pk Left Marker Delta Mkr--CF Mkr-->Ref Lvl More 1 of 2
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CH78	No hopping mode	 <p>Marker 4 2.483 527 50 GHz -50.458 dBm</p> <p>Start 2.47800 GHz Stop 2.50000 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 2.133 ms (8001 pts)</p> <table border="1"> <tr><th>MKR MODE TRC SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr> <tr><td>1 N 1 f</td><td>2.480 090 00 GHz</td><td>1.106 dBm</td><td></td><td></td><td></td></tr> <tr><td>2 N 1 f</td><td>2.483 500 00 GHz</td><td>-52.773 dBm</td><td></td><td></td><td></td></tr> <tr><td>3 N 1 f</td><td>2.500 000 00 GHz</td><td>-60.869 dBm</td><td></td><td></td><td></td></tr> <tr><td>4 N 1 f</td><td>2.483 527 50 GHz</td><td>-50.458 dBm</td><td></td><td></td><td></td></tr> <tr><td>5</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>6</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>7</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>8</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>9</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>10</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>11</td><td></td><td></td><td></td><td></td><td></td></tr> </table>	MKR MODE TRC SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1 N 1 f	2.480 090 00 GHz	1.106 dBm				2 N 1 f	2.483 500 00 GHz	-52.773 dBm				3 N 1 f	2.500 000 00 GHz	-60.869 dBm				4 N 1 f	2.483 527 50 GHz	-50.458 dBm				5						6						7						8						9						10						11						Frequency Auto Tune Center Freq 2.48900000 GHz Start Freq 2.47800000 GHz Stop Freq 2.50000000 GHz CF Step 2.200000 MHz Auto Freq Offset 0 Hz
MKR MODE TRC SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																																																																						
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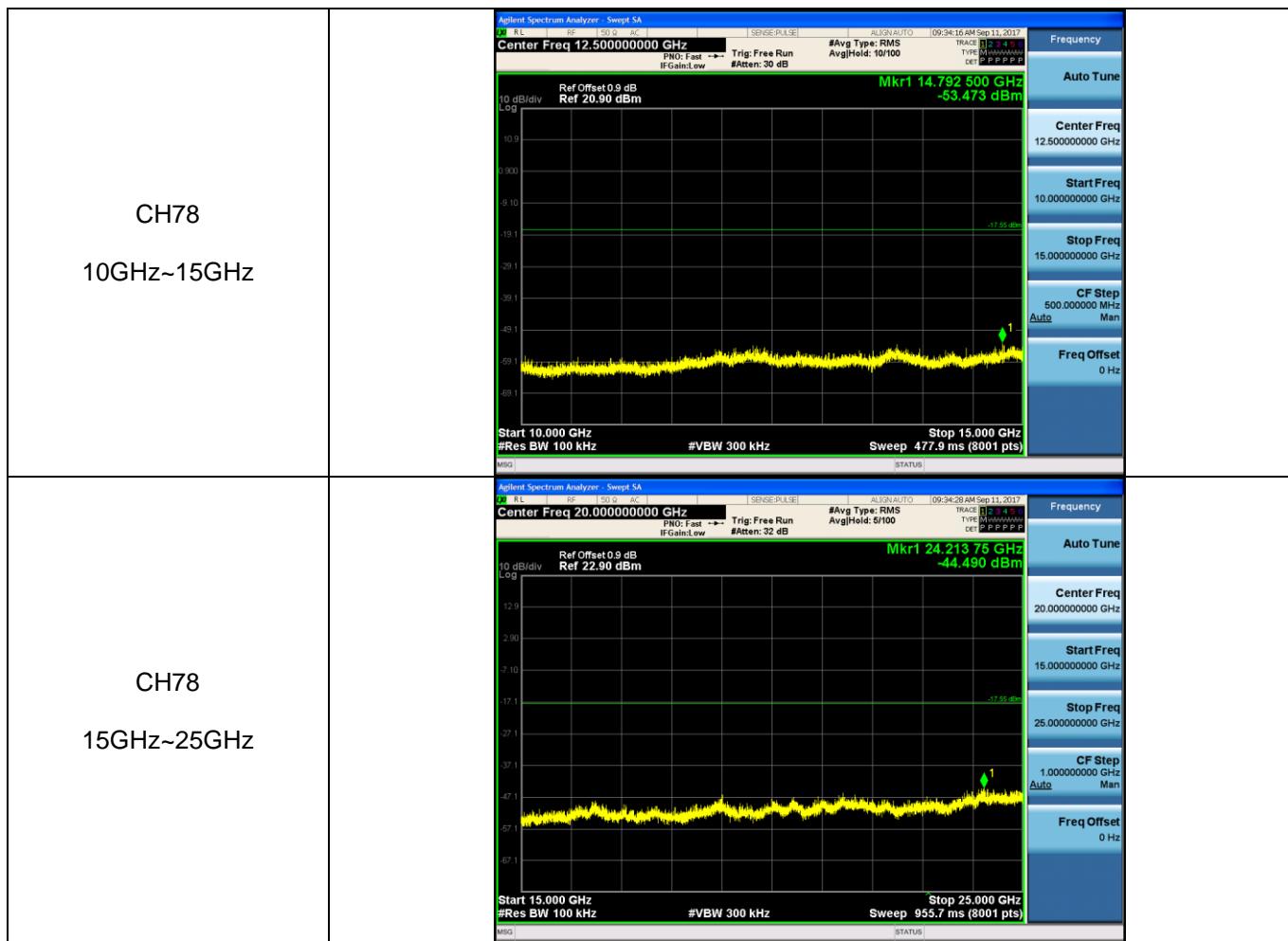


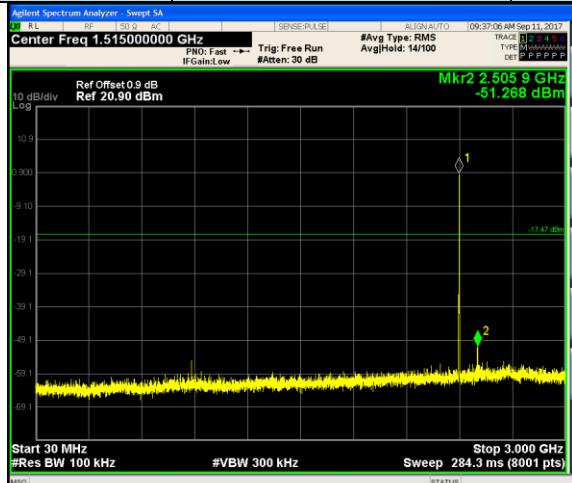
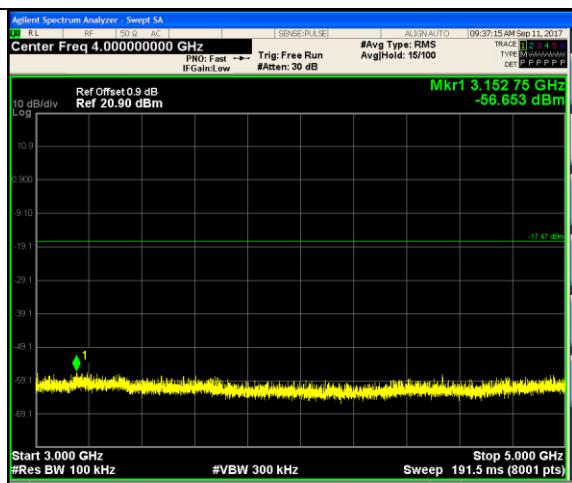
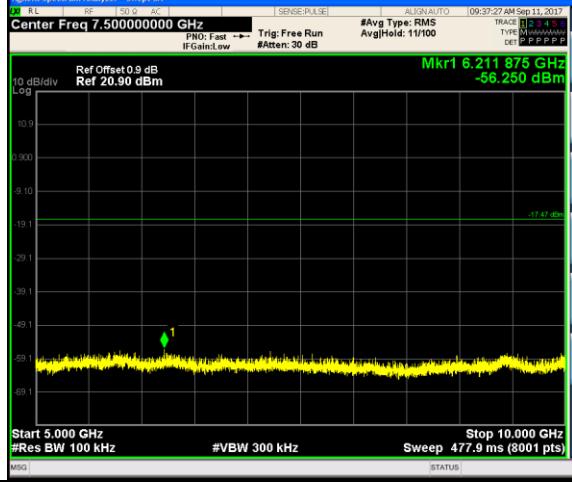
Test Item:	SE	Modulation type:	GFSK
CH00 30MHz~3GHz			
CH00 3GHz~5GHz			
CH00 5GHz~10GHz			

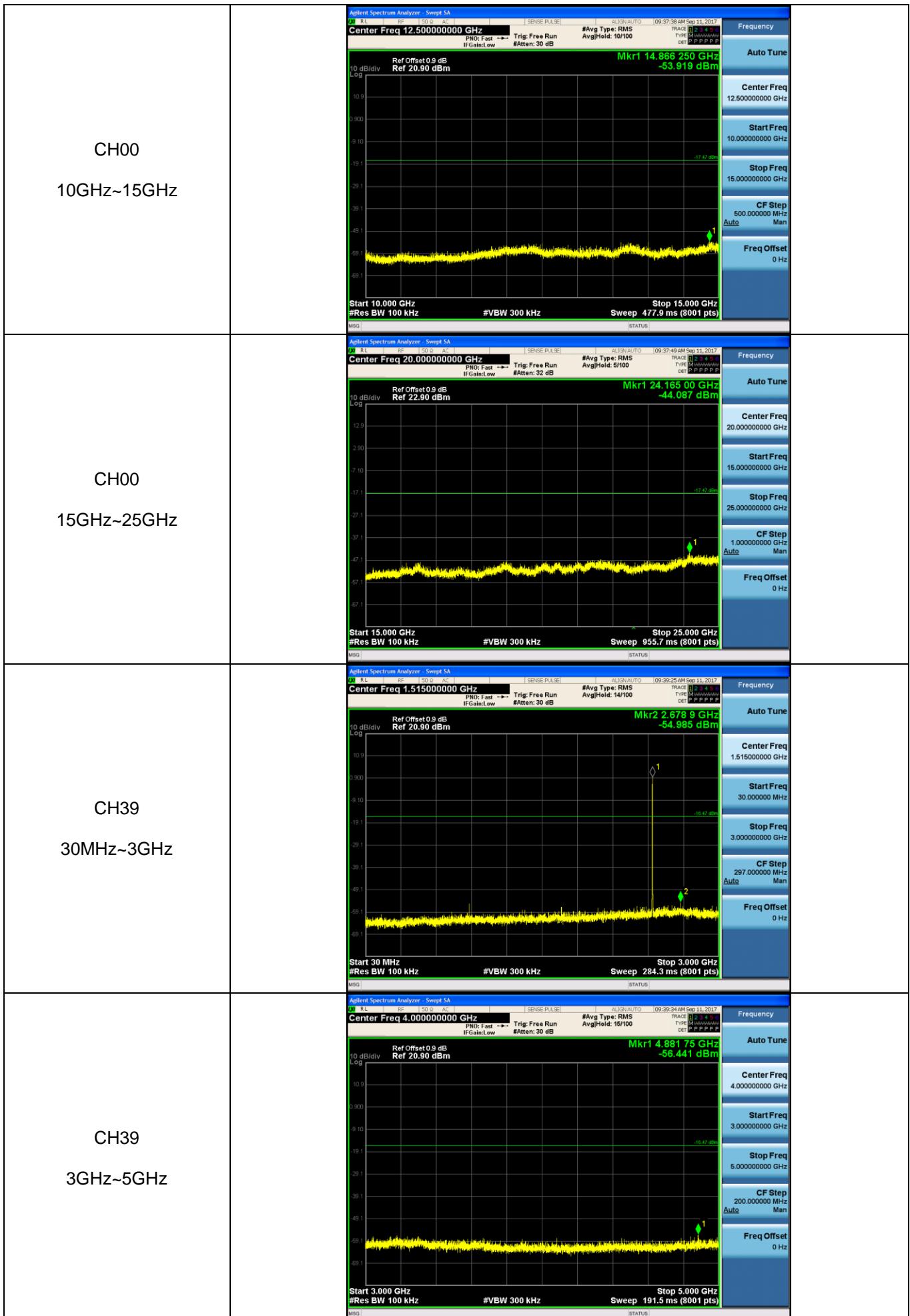


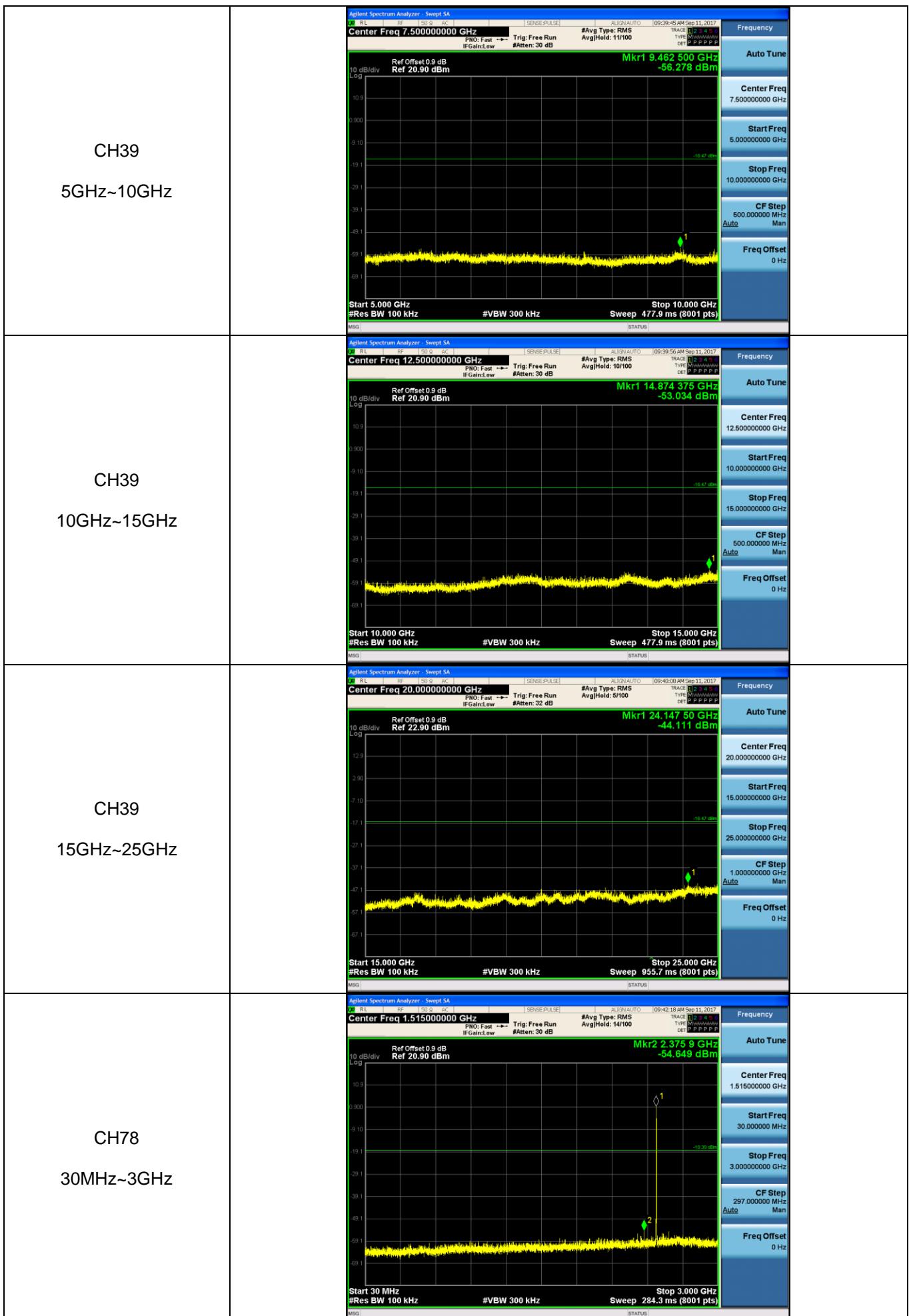


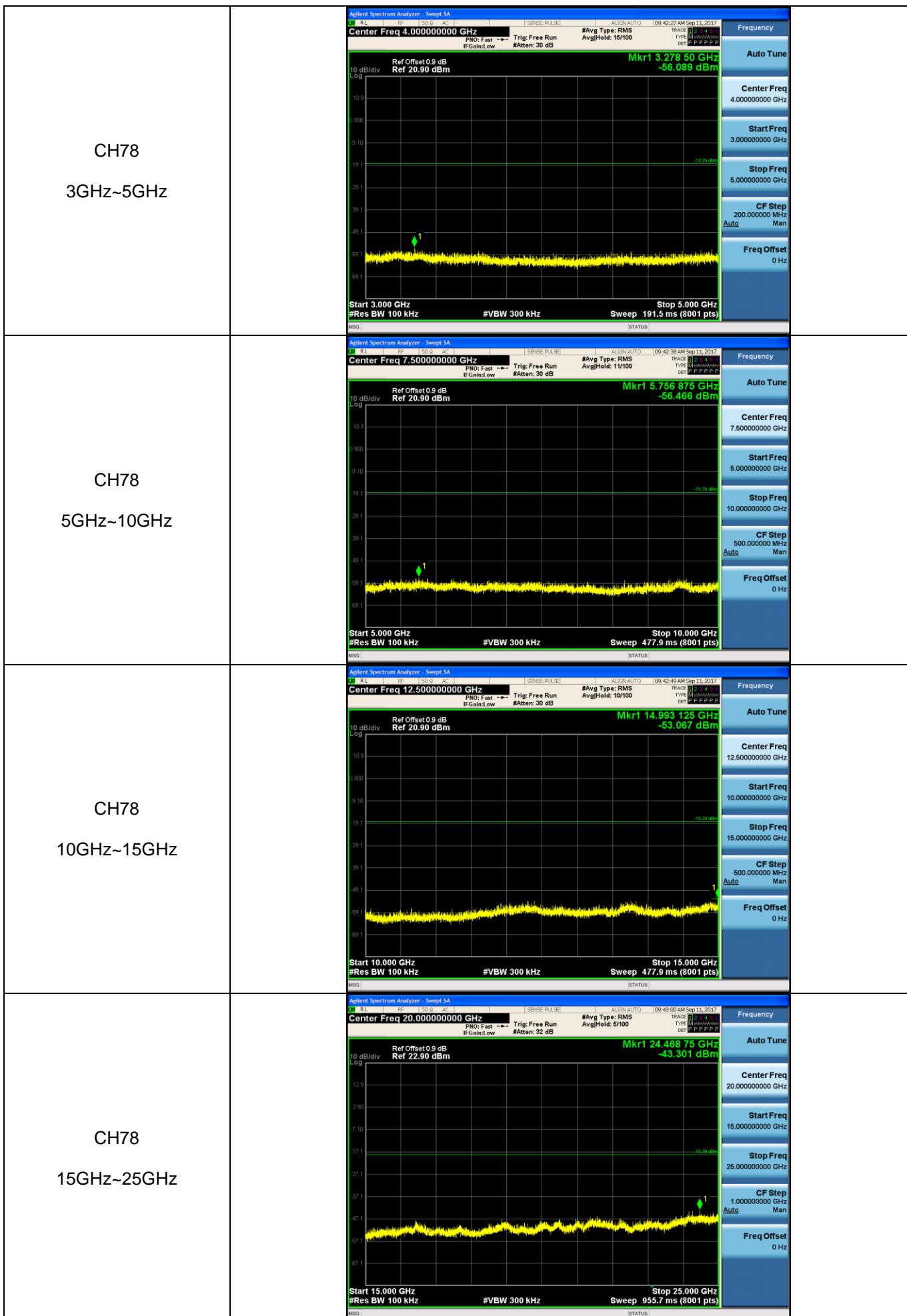




Test Item:	SE	Modulation type:	$\pi/4$ DQPSK
CH00 30MHz~3GHz			Frequency Auto Tune Center Freq 1.515000000 GHz Start Freq 30.000000 MHz Stop Freq 3.000000000 GHz CF Step 297.000000 MHz Auto Man Freq Offset 0 Hz
CH00 3GHz~5GHz			Frequency Auto Tune Center Freq 4.000000000 GHz Start Freq 3.000000000 GHz Stop Freq 5.000000000 GHz CF Step 200.000000 MHz Auto Man Freq Offset 0 Hz
CH00 5GHz~10GHz			Frequency Auto Tune Center Freq 7.500000000 GHz Start Freq 5.000000000 GHz Stop Freq 10.000000000 GHz CF Step 500.000000 MHz Auto Man Freq Offset 0 Hz







5.11. Spurious Emission (radiated)

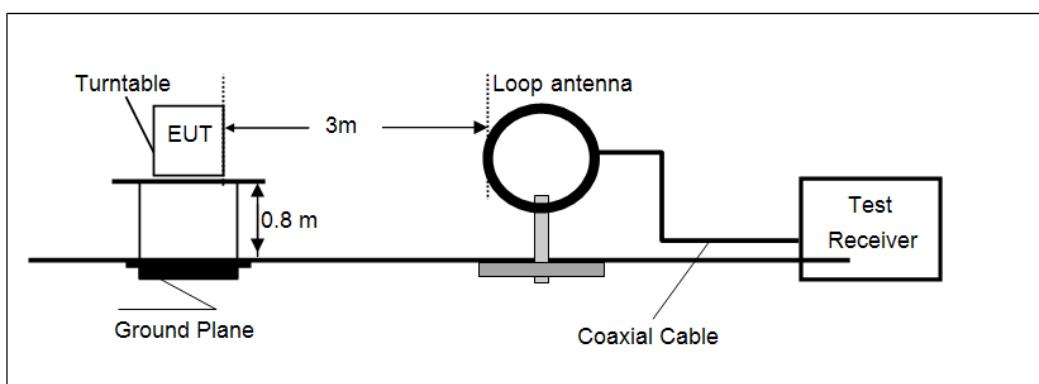
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209

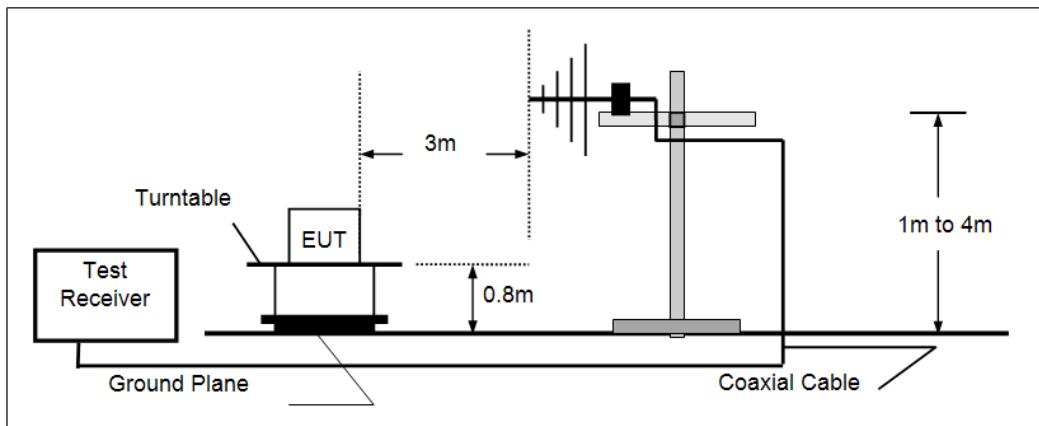
Frequency	Limit (dB _{UV} /m @ 3m)	Value
30 MHz ~ 88 MHz	40.00	Quasi-peak
88 MHz ~ 216 MHz	43.50	Quasi-peak
216 MHz ~ 960 MHz	46.00	Quasi-peak
960 MHz ~ 1 GHz	54.00	Quasi-peak
Above 1 GHz	54.00	Average
	74.00	Peak

TEST CONFIGURATION

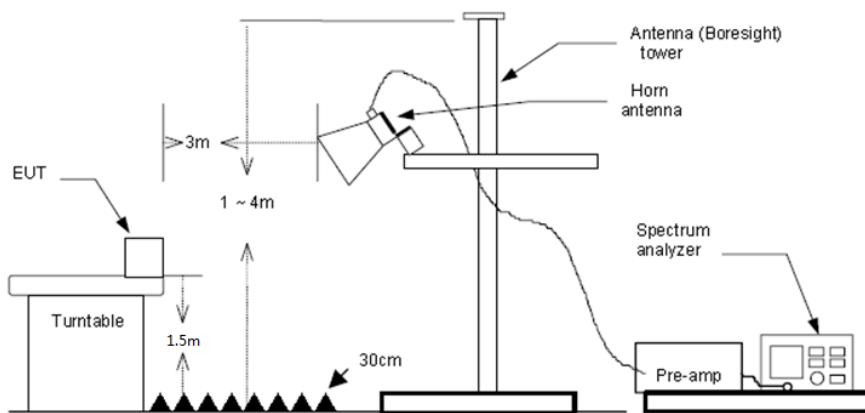
- Below 30 MHz



- 30 MHz ~1000 MHz



- Above 1 GHz



TEST PROCEDURE

1. The EUT was tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna.
5. Use the following spectrum analyzer settings
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Below 1 GHz, RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold; If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
 - (3) Above 1 GHz, RBW=1 MHz, VBW=3 MHz for Peak value
RBW=1 MHz, VBW=10 Hz for Average value.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

Passed Not Applicable

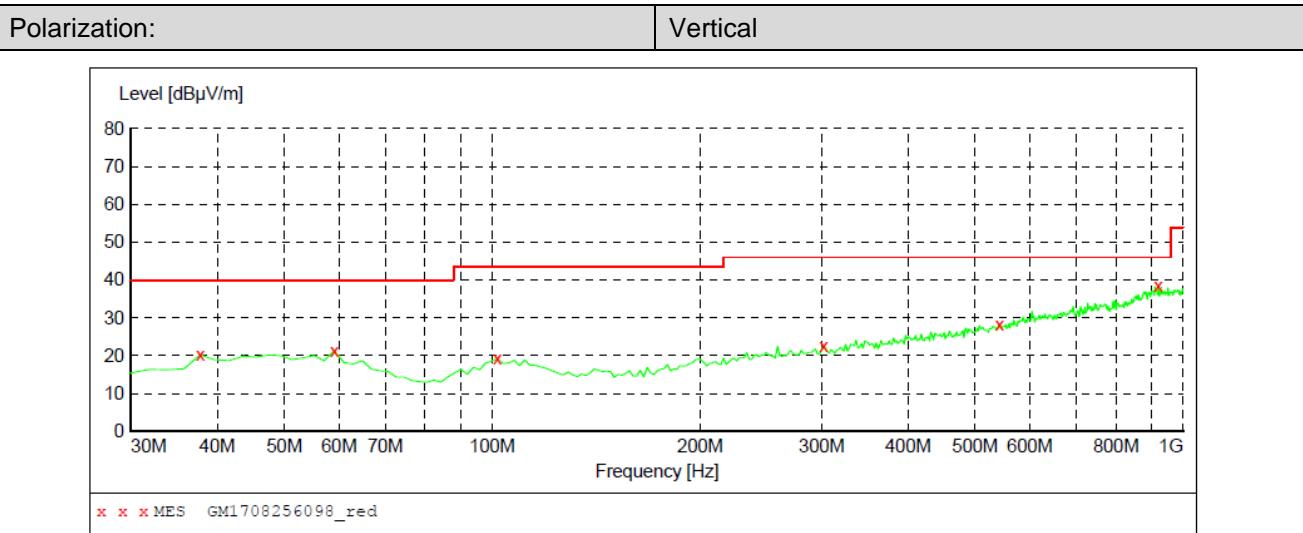
Note:

- 1) Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
- 2) The emission levels of other frequencies are very lower than the limit and not show in test report.
- 3) Below 1 GHz, Have pre-scan all modulation mode, found the GFSK modulation High channel which it was worst case, so only the worst case's data on the test report.
- 4) Above 1 GHz, Have pre-scan all modulation mode, found the GFSK modulation which it was worst case, so only the worst case's data on the test report
- 5) The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.

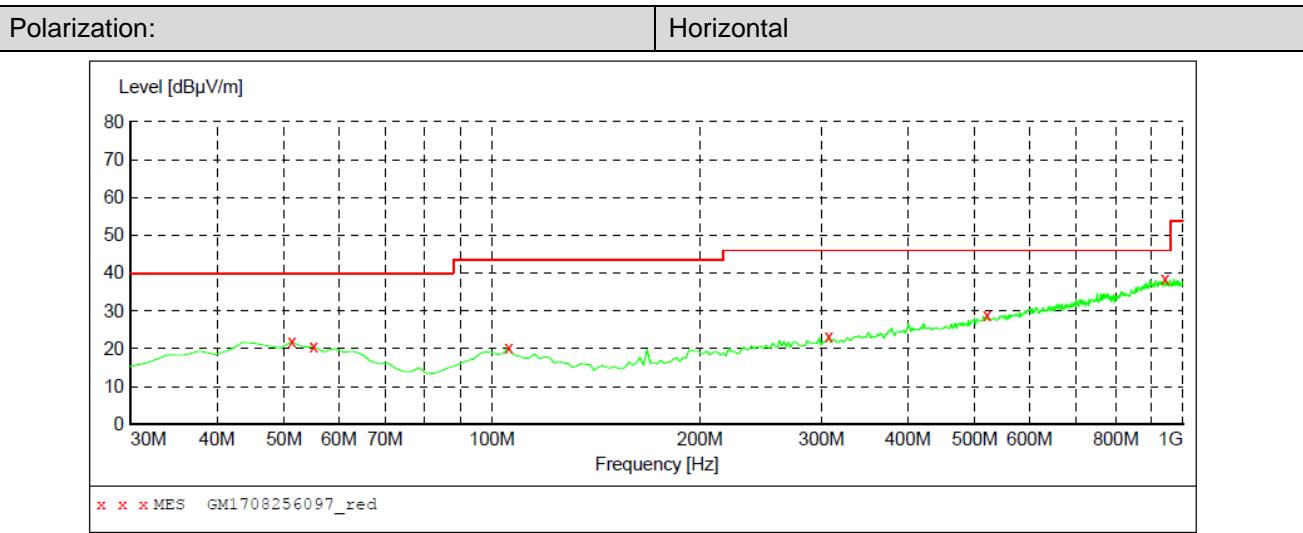
➤ 9 kHz ~ 30 MHz

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

> 30 MHz ~ 1 GHz

**MEASUREMENT RESULT: "GM1708256098_red"**

8/25/2017 8:44PM								
Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
37.760000	20.20	-10.8	40.0	19.8	QP	100.0	146.00	VERTICAL
59.100000	21.40	-9.8	40.0	18.6	QP	100.0	200.00	VERTICAL
101.780000	19.20	-10.5	43.5	24.3	QP	100.0	322.00	VERTICAL
301.600000	22.60	-7.2	46.0	23.4	QP	100.0	170.00	VERTICAL
542.160000	28.30	-0.9	46.0	17.7	QP	100.0	5.00	VERTICAL
920.460000	38.40	7.0	46.0	7.6	QP	100.0	359.00	VERTICAL

**MEASUREMENT RESULT: "GM1708256097_red"**

8/25/2017 8:42PM								
Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
51.340000	21.90	-8.8	40.0	18.1	QP	100.0	322.00	HORIZONTAL
55.220000	20.60	-9.2	40.0	19.4	QP	300.0	242.00	HORIZONTAL
105.660000	20.20	-10.5	43.5	23.3	QP	300.0	272.00	HORIZONTAL
307.420000	23.30	-7.1	46.0	22.7	QP	300.0	25.00	HORIZONTAL
520.820000	28.90	-1.3	46.0	17.1	QP	300.0	25.00	HORIZONTAL
941.800000	38.40	7.2	46.0	7.6	QP	300.0	66.00	HORIZONTAL

> Above 1 GHz

CH00 for GFSK									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
1597.40	45.26	24.92	5.56	36.72	39.02	74.00	-34.98	Vertical	Peak
3192.37	41.10	28.80	7.71	38.20	39.41	74.00	-34.59	Vertical	
4809.50	43.65	31.58	9.55	36.93	47.85	74.00	-26.15	Vertical	
7209.02	33.22	36.21	11.87	35.07	46.23	74.00	-27.77	Vertical	
1593.34	38.12	24.96	5.55	36.71	31.92	74.00	-42.08	Horizontal	Peak
2995.54	41.72	28.60	7.48	38.23	39.57	74.00	-34.43	Horizontal	
4809.50	42.93	31.58	9.55	36.93	47.13	74.00	-26.87	Horizontal	
7209.02	34.90	36.21	11.87	35.07	47.91	74.00	-26.09	Horizontal	

CH39 for GFSK									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
1860.99	40.31	25.34	6.05	37.19	34.51	74.00	-39.49	Vertical	Peak
3489.84	37.12	28.92	8.10	38.42	35.72	74.00	-38.28	Vertical	
4883.52	43.31	31.43	9.59	36.73	47.60	74.00	-26.40	Vertical	
7319.96	32.41	36.30	11.99	34.92	45.78	74.00	-28.22	Vertical	
1350.36	36.83	26.05	4.92	36.49	31.31	74.00	-42.69	Horizontal	Peak
3225.04	36.98	28.65	7.75	38.24	35.14	74.00	-38.86	Horizontal	
4883.52	43.17	31.43	9.59	36.73	47.46	74.00	-26.54	Horizontal	
7527.83	32.21	36.13	12.49	34.92	45.91	74.00	-28.09	Horizontal	

CH78 for GFSK									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
1601.47	39.65	24.90	5.57	36.72	33.40	74.00	-40.60	Vertical	Peak
4256.33	39.92	30.11	8.99	37.62	41.40	74.00	-32.60	Vertical	
4958.68	42.01	31.46	9.64	36.52	46.59	74.00	-27.41	Vertical	
7840.75	32.23	36.35	13.06	34.96	46.68	74.00	-27.32	Vertical	
1597.40	41.50	24.92	5.56	36.72	35.26	74.00	-38.74	Horizontal	Peak
2995.54	38.48	28.60	7.48	38.23	36.33	74.00	-37.67	Horizontal	
4958.68	42.06	31.46	9.64	36.52	46.64	74.00	-27.36	Horizontal	
6921.30	32.79	34.83	11.75	34.87	44.50	74.00	-29.50	Horizontal	

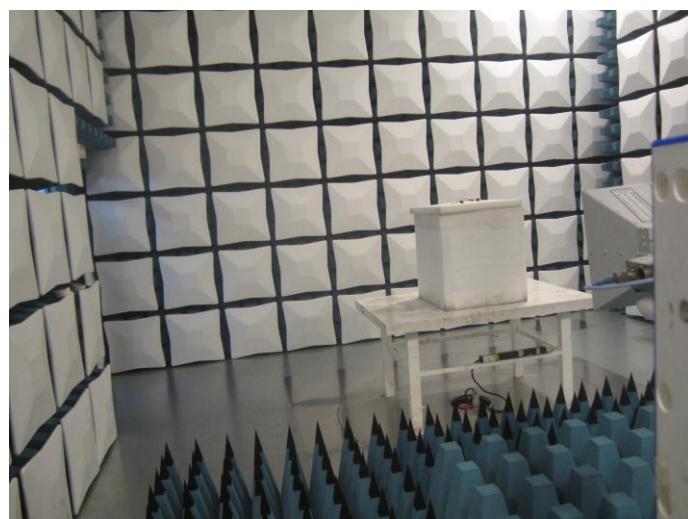
6. Test Setup Photos of the EUT

Conducted Emission (AC Mains)



Radiated Emission



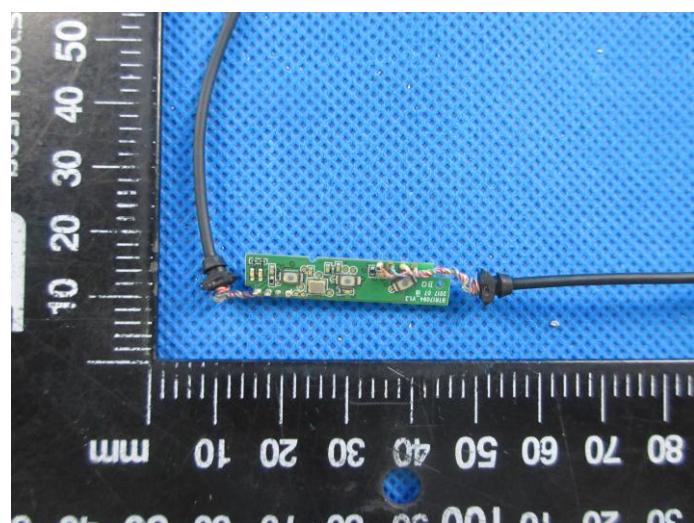
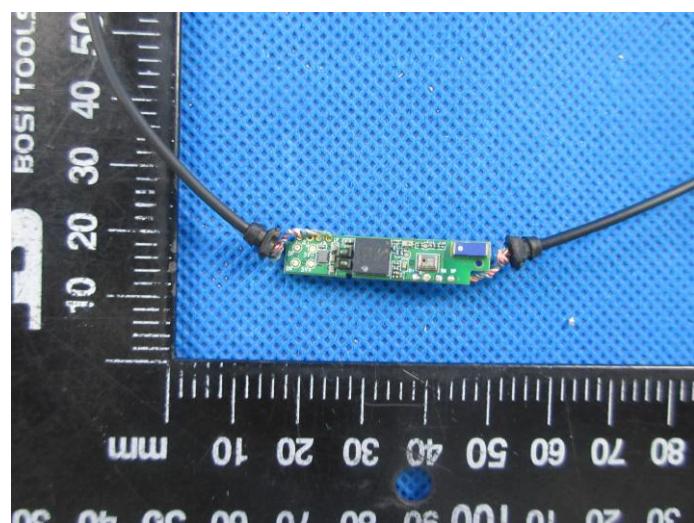
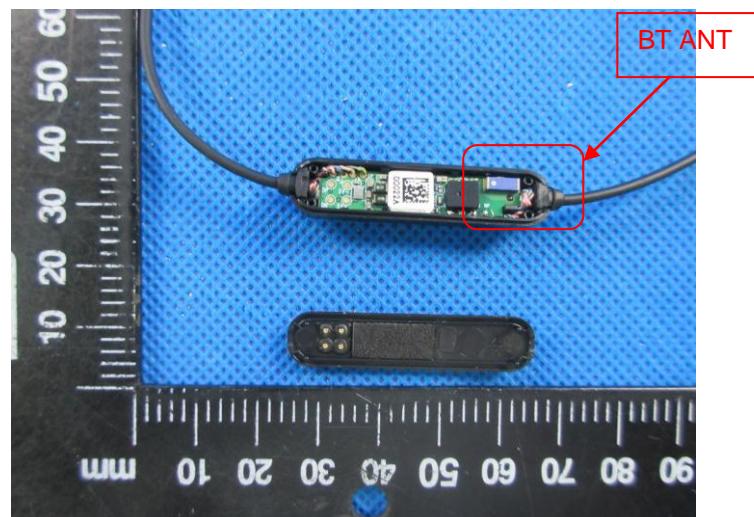


7. External and Internal Photos of the EUT

External Photos of the EUT





Internal Photos of the EUT

-----End of Report-----