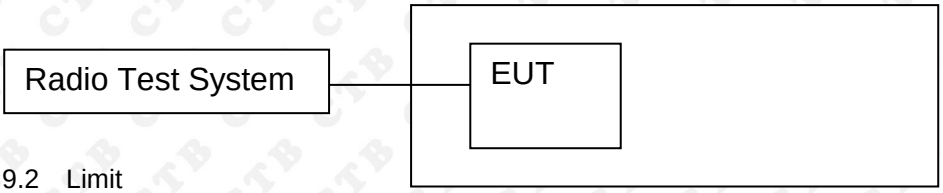
9. COUDUCTED PEAK OUTPUT POWER

9.1 Block Diagram Of Test Setup



9.2 Limit

The maximum peak conducted output power of the intentional radiator shall not exceed the following:
(1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
(2) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.
(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. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.
(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. Except as shown in paragraph (c) of this section, 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 paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Peak output Power: <1W=30dBm

9.3 Test procedure

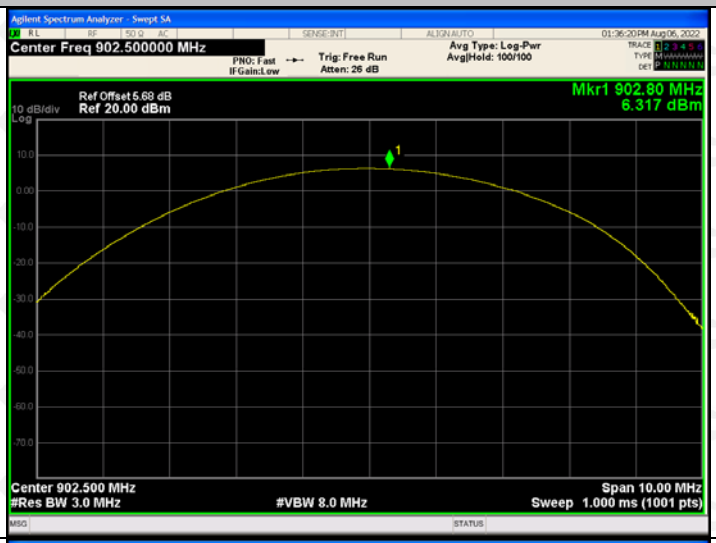
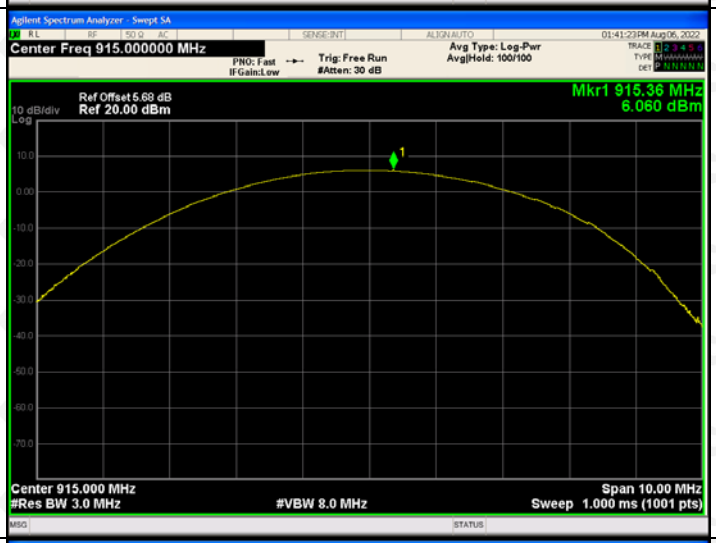
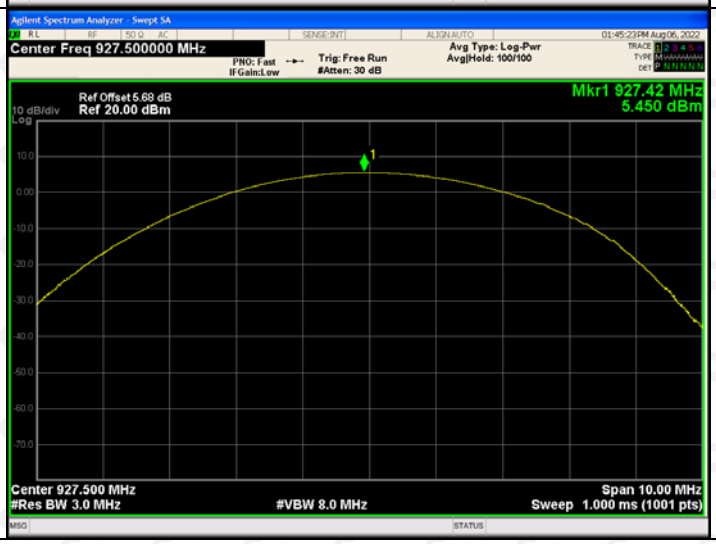
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3MHz. VBW = 8MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, middle and highest channel individually. Record the max value.

9.4 Test Result

Channel.	Maximum Output Power [dBm] ant 1	Maximum Output Power [dBm] ant 2	Maximum Output Power [dBm] ant 3	Maximum Output Power [dBm] ant 4	Total Power Conducted Output Power(PK)	Limit[dBm]	Verdict
LCH	6.317	5.886	5.639	5.883	11.959	24	PASS
MCH	6.06	5.341	5.308	5.627	11.615	24	PASS
HCH	5.45	5.058	5.134	5.102	11.209	24	PASS

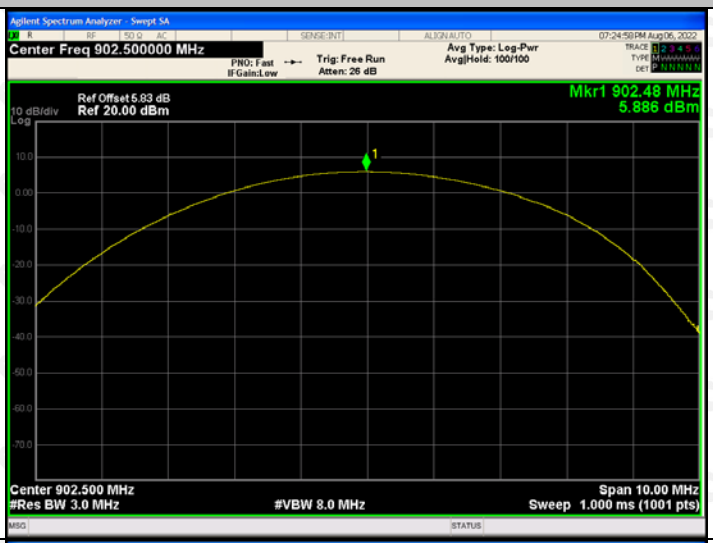
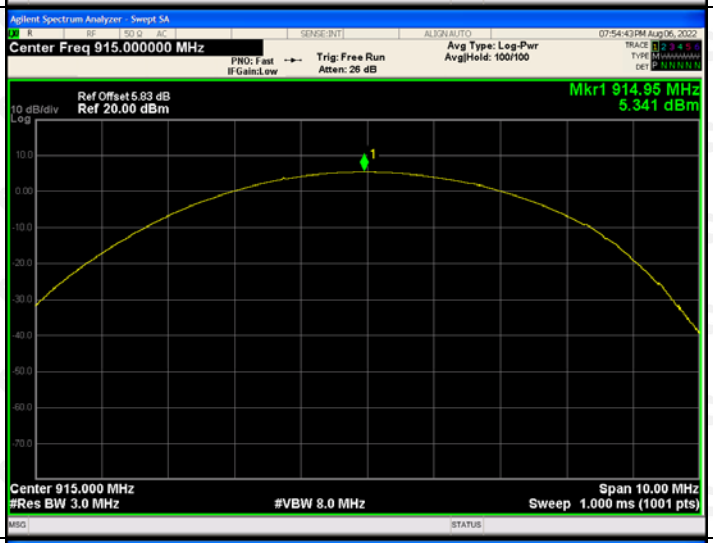
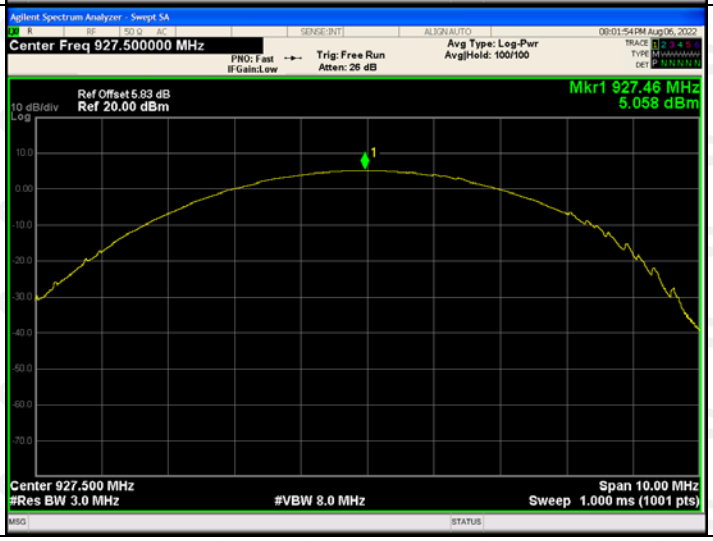
ANT1:

Test Graph:

Graphs			
LCH			
MCH			
HCH			

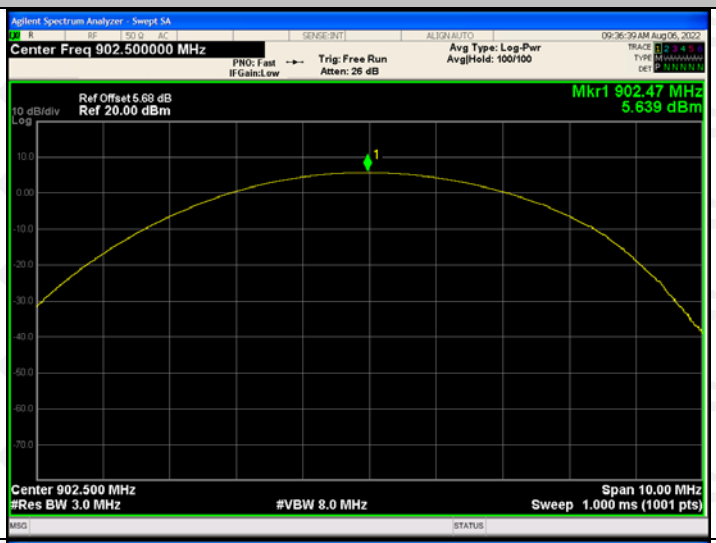
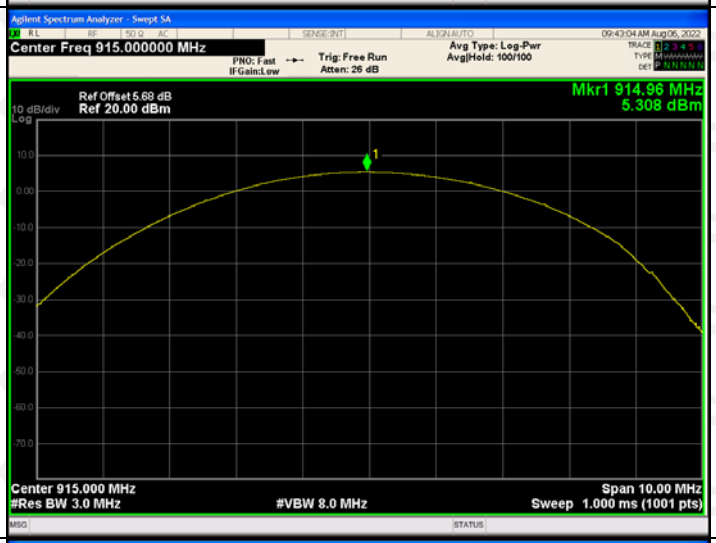
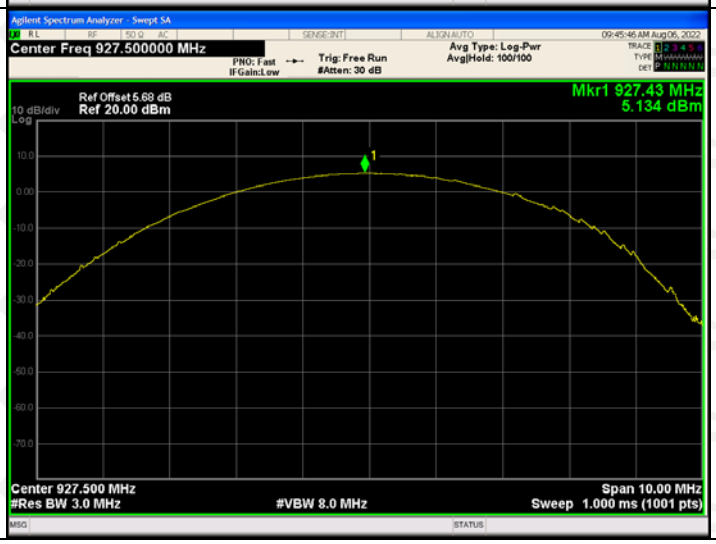
ANT2:

Test Graph:

Graphs		
LCH		
MCH		
HCH		

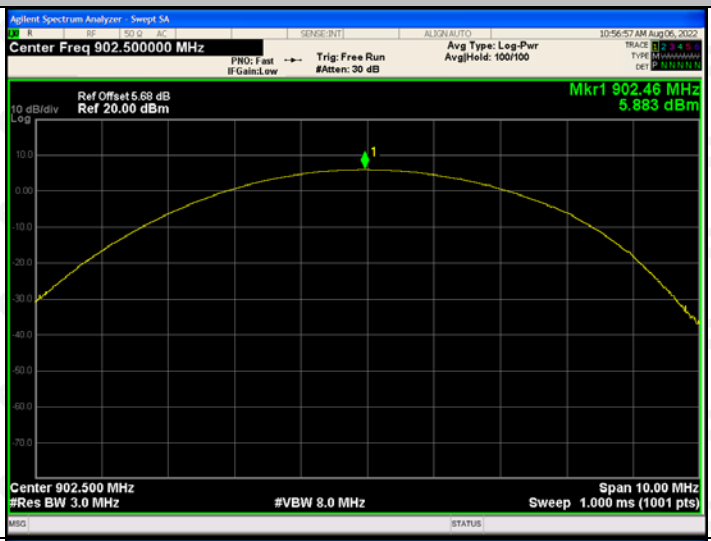
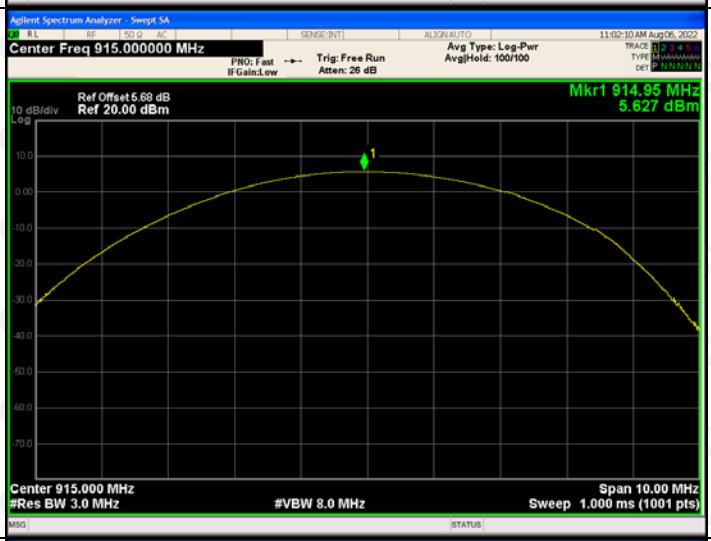
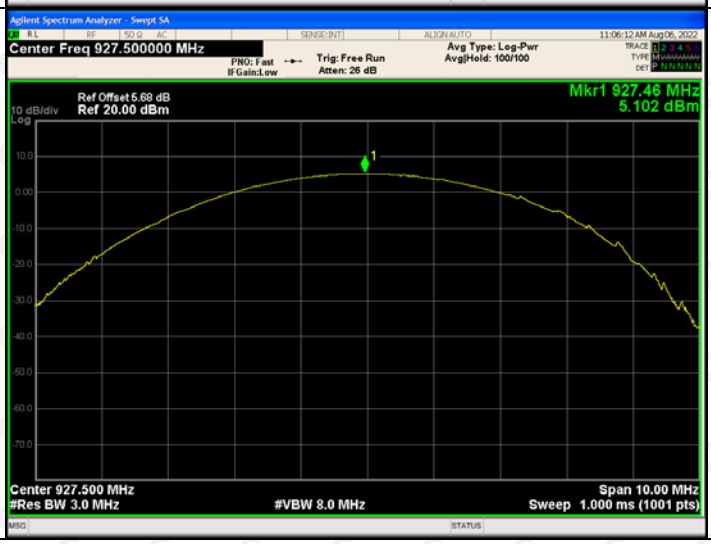
ANT3:

Test Graph:

Graphs		
LCH		
MCH		
HCH		

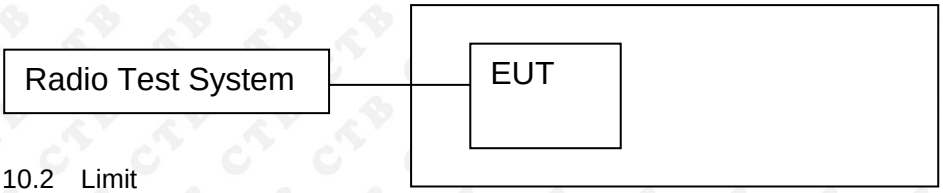
ANT4:

Test Graph:

Graphs			
LCH			
MCH			
HCH			

10. 20DB OCCUPIED BANDWIDTH

10.1 Block Diagram Of Test Setup



10.2 Limit

If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

10.3 Test procedure

1. Rem1. Set RBW = 10 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

10.4 Test Result

ANT1

Frequency	20dB Bandwidth (MHz)	Result
Low channel	0.267	**PASS**
Mid channel	0.251	**PASS**
High channel	0.311	**PASS**

Note: All modes of operation were Pre-scan and the worst-case emissions are reported.

ANT2

Frequency	20dB Bandwidth (MHz)	Result
Low channel	0.265	**PASS**
Mid channel	0.287	**PASS**
High channel	0.289	**PASS**

Note: All modes of operation were Pre-scan and the worst-case emissions are reported.

ANT3

Frequency	20dB Bandwidth (MHz)	Result
Low channel	0.280	**PASS**
Mid channel	0.286	**PASS**
High channel	0.256	**PASS**

Note: All modes of operation were Pre-scan and the worst-case emissions are reported.

ANT4

Frequency	20dB Bandwidth (MHz)	Result
Low channel	0.414	**PASS**
Mid channel	0.389	**PASS**
High channel	0.482	**PASS**

Note: All modes of operation were Pre-scan and the worst-case emissions are reported.

Test Graph:

ANT1

Low channel		
Mid channel		
High channel		

ANT2

Low channel		
Mid channel		
High channel		

ANT3

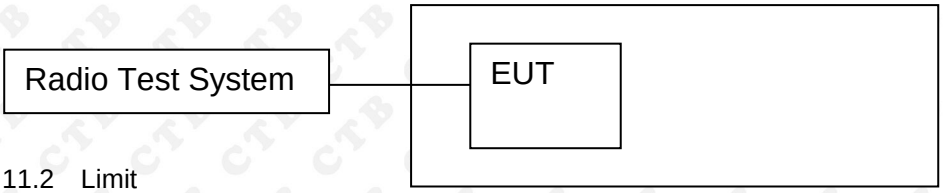
Low channel		
Mid channel		
High channel		

ANT4

Low channel		
Mid channel		
High channel		

11. CARRIERFREQUENCIES SEPARATION

11.1 Block Diagram Of Test Setup



11.2 Limit

At least 25kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

11.3 Test procedure

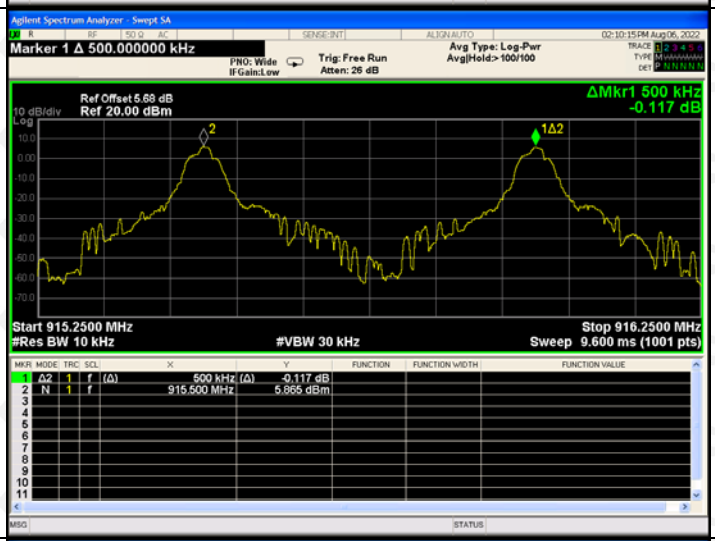
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 10kHz. VBW = 30kHz , Span = 3.0MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

11.4 Test Result

Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
ANT1	LCH	0.501	0.267	PASS
	MCH	0.500	0.251	PASS
	HCH	0.500	0.311	PASS
ANT2	LCH	0.500	0.265	PASS
	MCH	0.500	0.287	PASS
	HCH	0.500	0.289	PASS
ANT3	LCH	0.500	0.280	PASS
	MCH	0.500	0.286	PASS
	HCH	0.501	0.256	PASS
ANT4	LCH	0.500	0.414	PASS
	MCH	0.500	0.389	PASS
	HCH	0.501	0.482	PASS

Test Graph

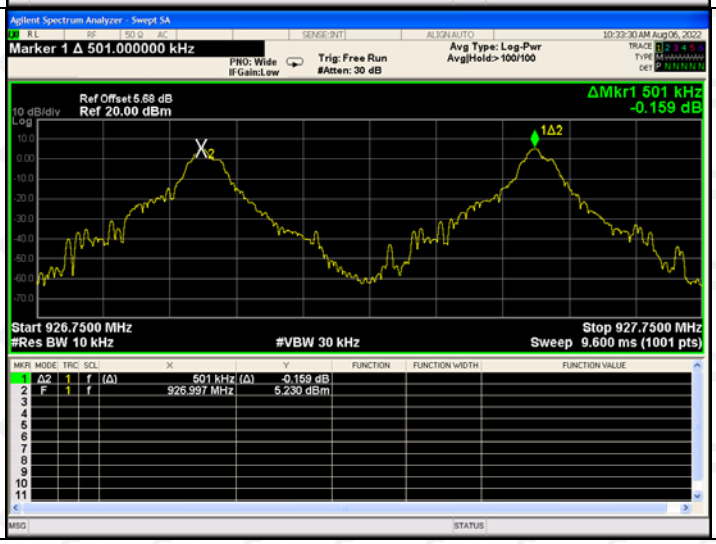
ANT1

Graphs			
LCH			
MCH			
HCH			

ANT2

Graphs			
LCH			
MCH			
HCH			

ANT3

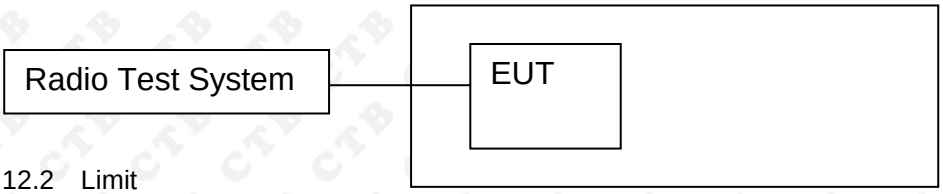
Graphs			
LCH			
MCH			
HCH			

ANT4

Graphs			
LCH			
MCH			
HCH			

12. HOPPING CHANNEL NUMBER

12.1 Block Diagram Of Test Setup



12.2 Limit

Frequency hopping systems in the 920-928 MHz band shall use at least 50 channels.

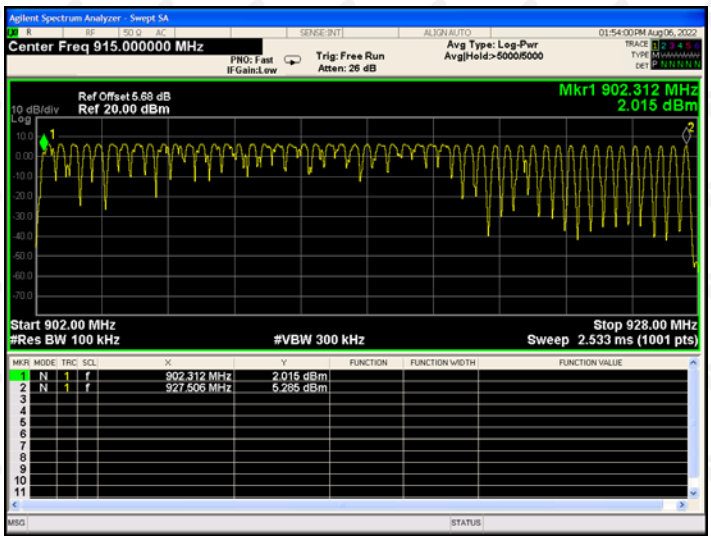
12.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100kHz. VBW = 300kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.
4. Set the spectrum analyzer: Start Frequency = 902MHz, Stop Frequency =928MHz. Sweep=auto;

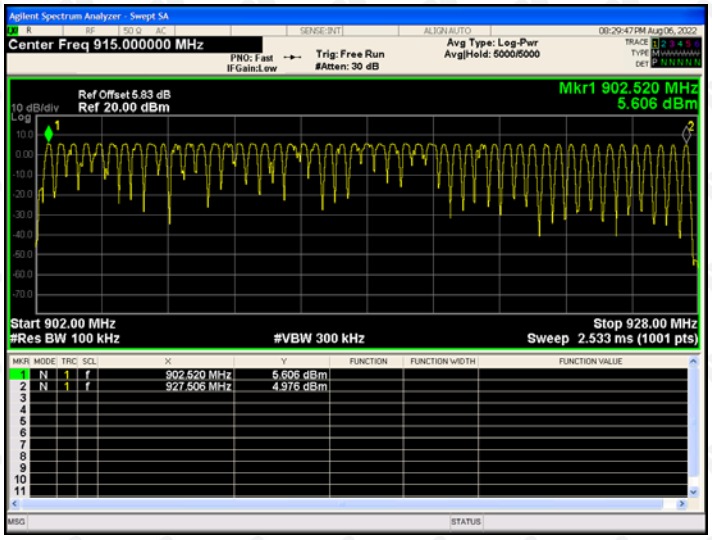
12.4 Test Result

Mode	Channel.	Number of Hopping Channel	Verdict
ASK	Hop	47	PASS

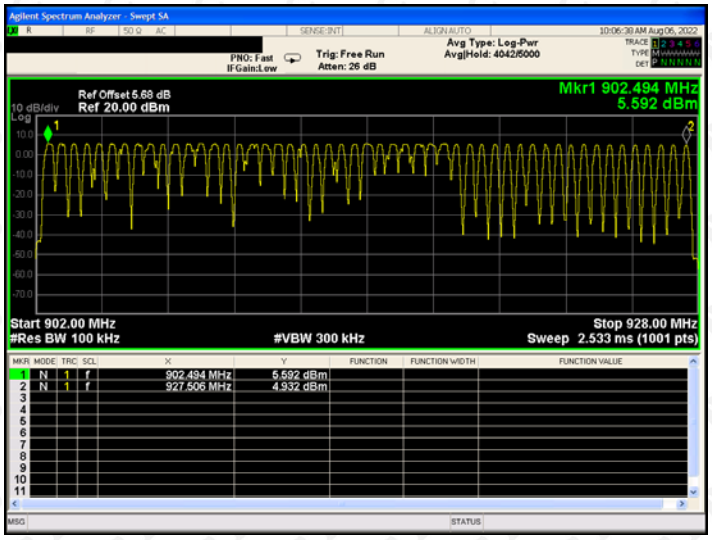
ANT1



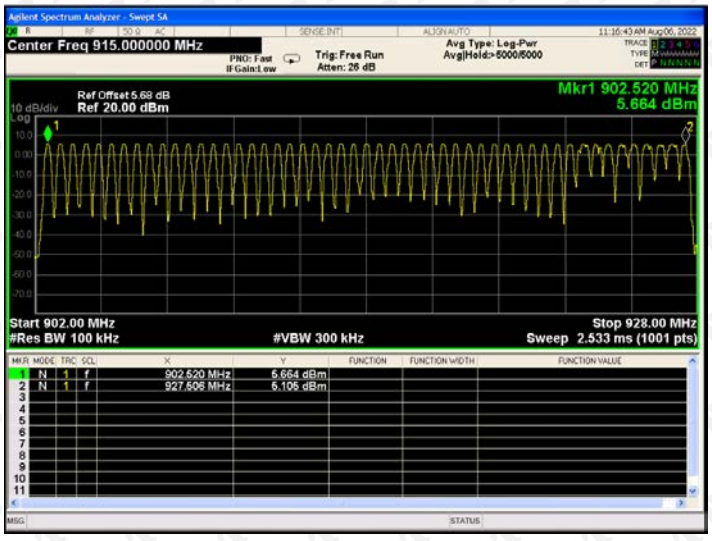
ANT2



ANT3

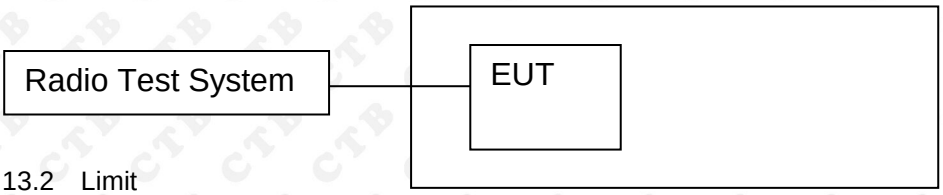


ANT4



13. DWELL TIME

13.1 Block Diagram Of Test Setup



13.2 Limit

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel
is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

13.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set spectrum analyzer span = 0. Centred on a hopping channel;
3. Set RBW = 1MHz and VBW = 3MHz.Sweep = as necessary to capture the entire dwell time per hopping channel. Set the EUT for ASK packet transmitting.
4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

13.4 Test Result

ANT1

Channel	No. of transmission in10s(a)	Pulse Time (ms)(b)	Total Dwell Time in 10s (ms) (c)	Limit (ms)	Verdict
LCH	14	21.54	301.56	400	PASS
MCH	15	21.57	323.55	400	PASS
HCH	11	21.53	236.83	400	PASS

Remark: Total dwell time in 10s, c=(a)*(b)

ANT2

Channel	No. of transmission in10s(a)	Pulse Time (ms)(b)	Total Dwell Time in 10s (ms) (c)	Limit (ms)	Verdict
LCH	14	21.56	301.84	400	PASS
MCH	14	21.58	302.12	400	PASS
HCH	7	21.59	151.13	400	PASS

Remark: Total dwell time in 10s, c=(a)*(b)

ANT3

Channel	No. of transmission in10s(a)	Pulse Time (ms)(b)	Total Dwell Time in 10s (ms) (c)	Limit (ms)	Verdict
LCH	8	21.56	172.48	400	PASS
MCH	14	21.52	301.28	400	PASS
HCH	10	21.53	215.30	400	PASS

Remark: Total dwell time in 10s, c=(a)*(b)

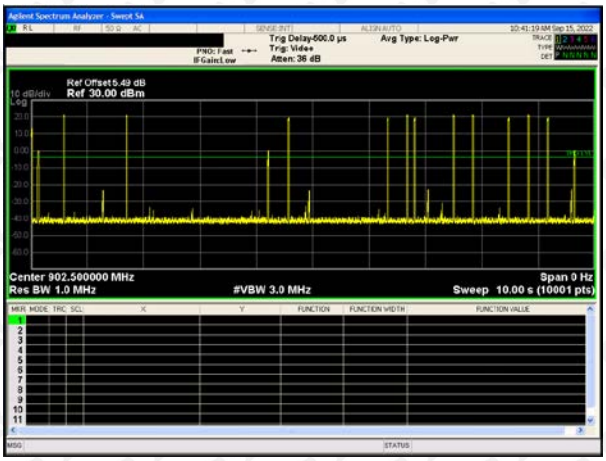
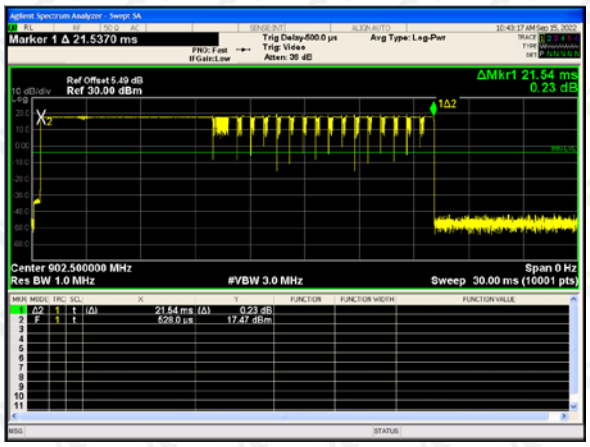
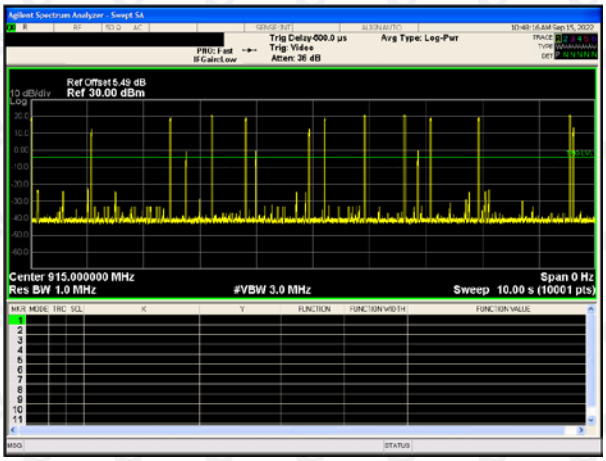
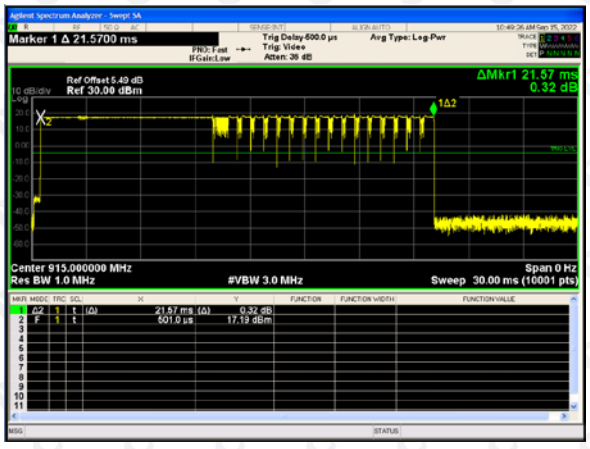
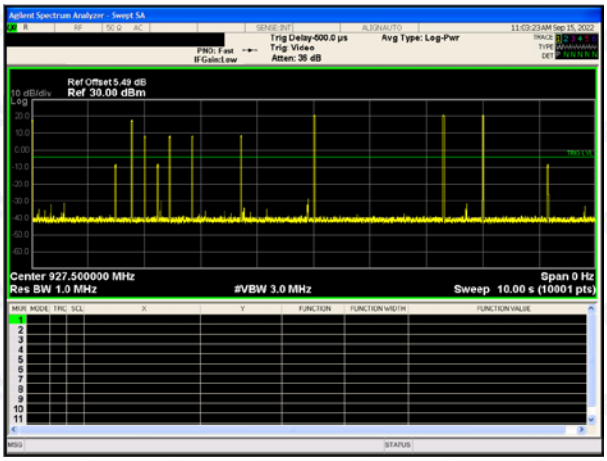
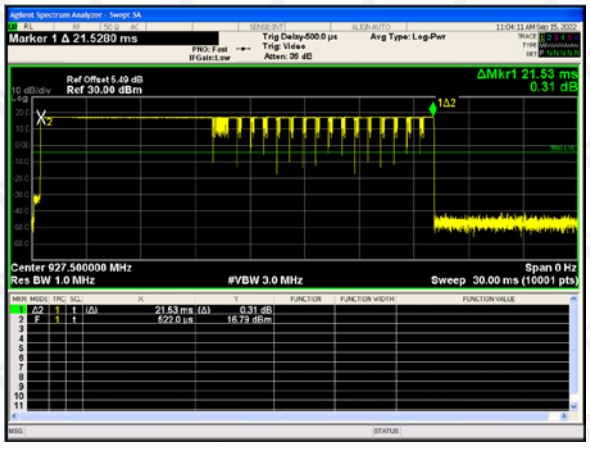
ANT4

Channel	No. of transmission in10s(a)	Pulse Time (ms)(b)	Total Dwell Time in 10s (ms) (c)	Limit (ms)	Verdict
LCH	10	21.56	215.60	400	PASS
MCH	11	21.58	237.38	400	PASS
HCH	11	21.56	237.16	400	PASS

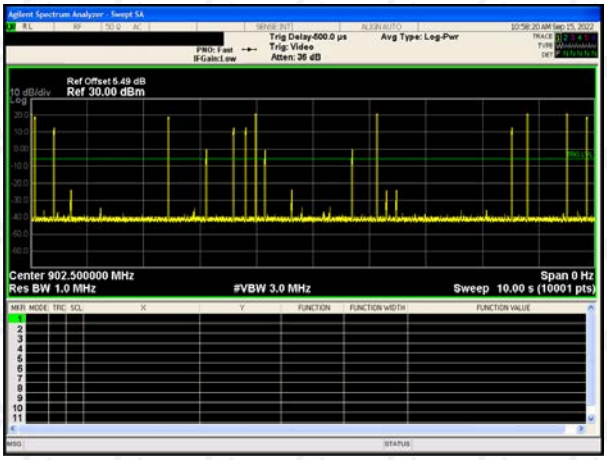
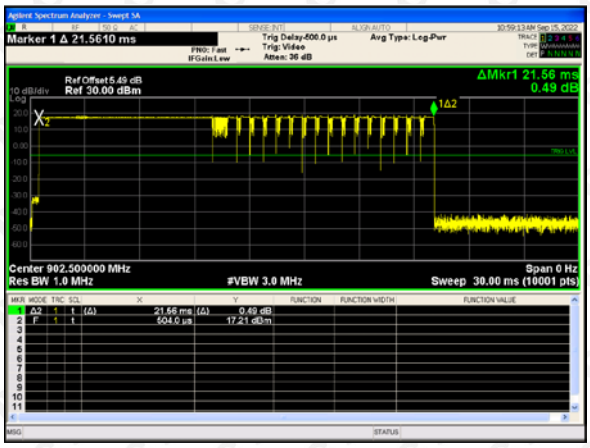
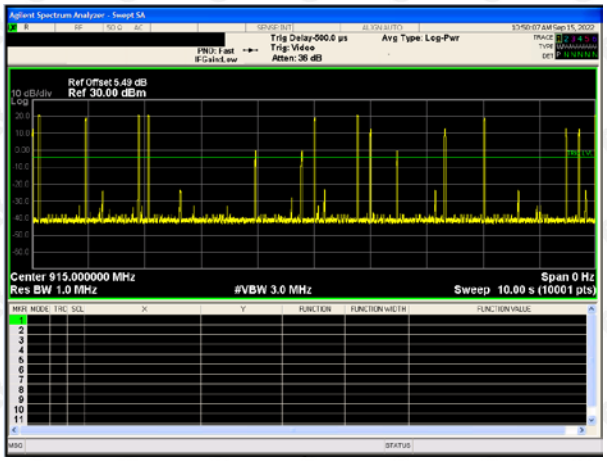
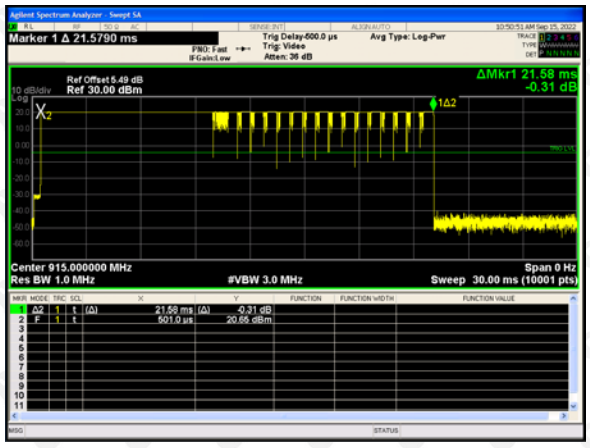
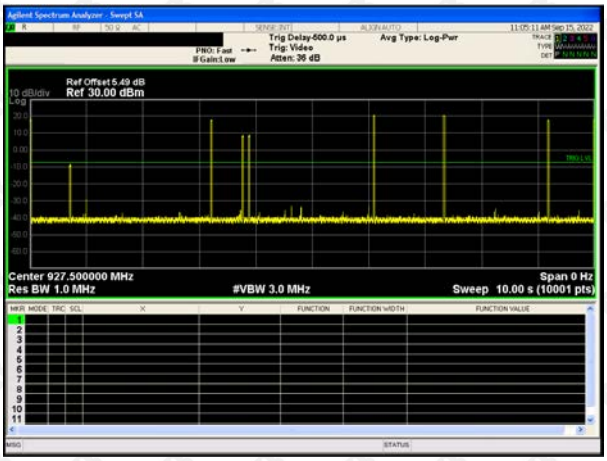
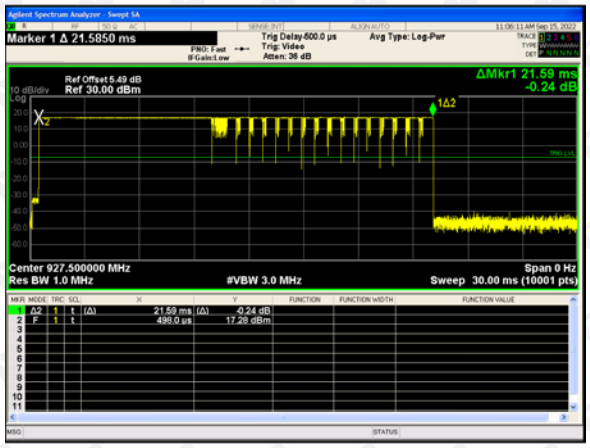
Remark: Total dwell time in 10s, c=(a)*(b)

Test Graph

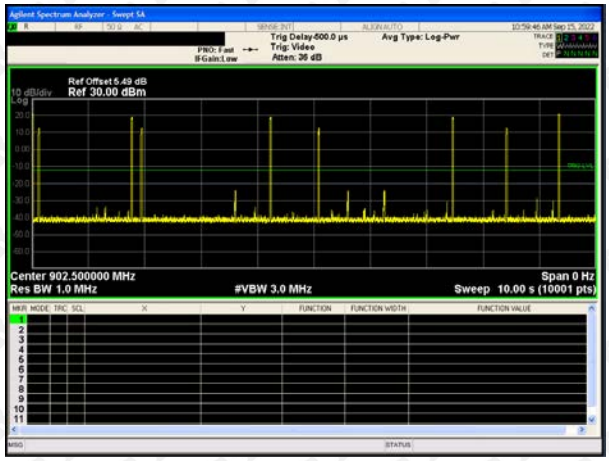
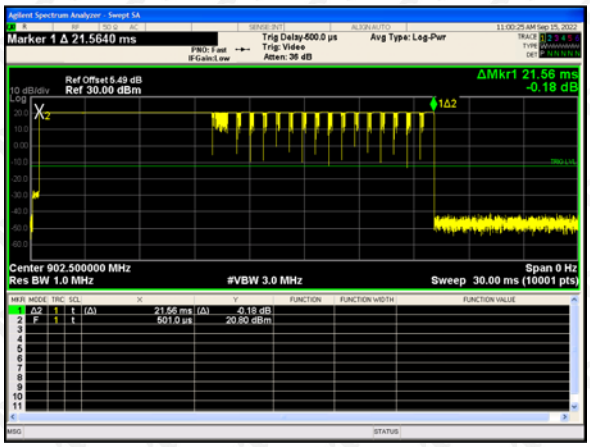
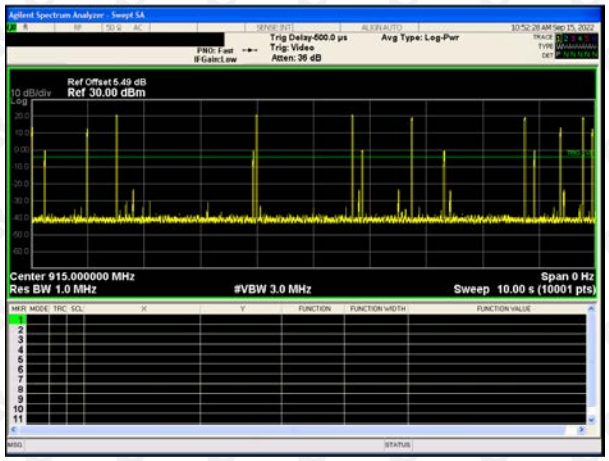
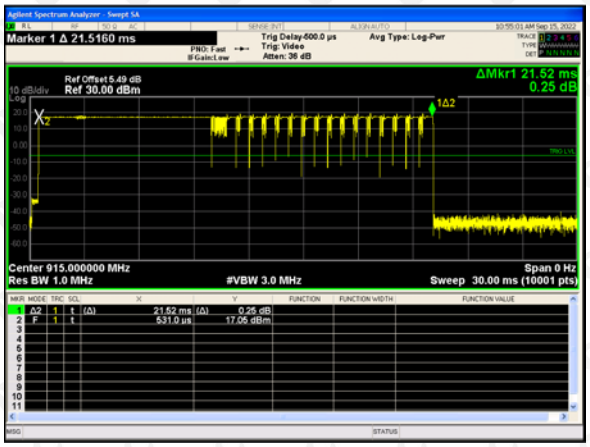
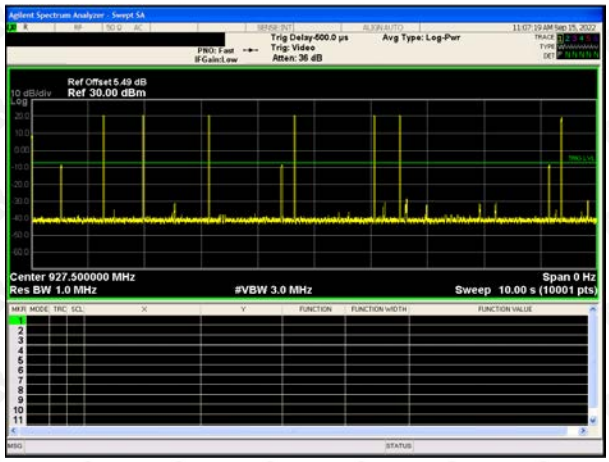
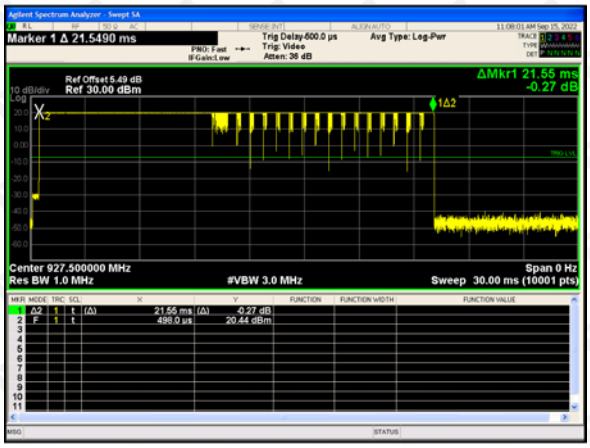
ANT1

Graphs		
LCH		
MCH		
HCH		

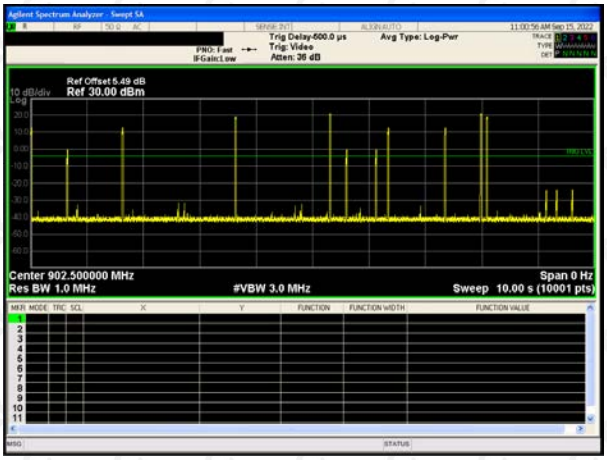
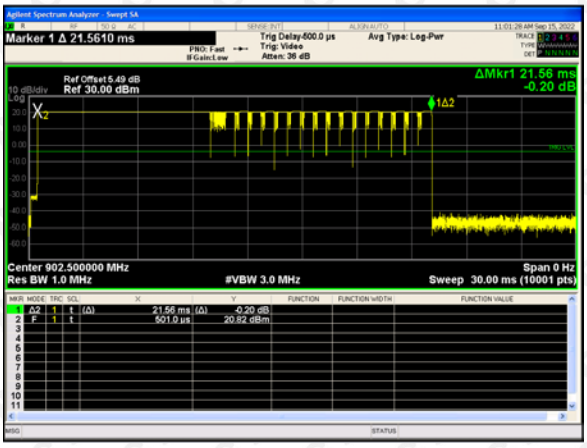
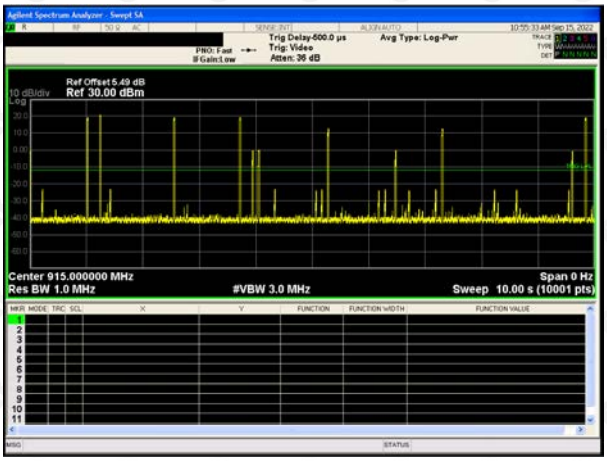
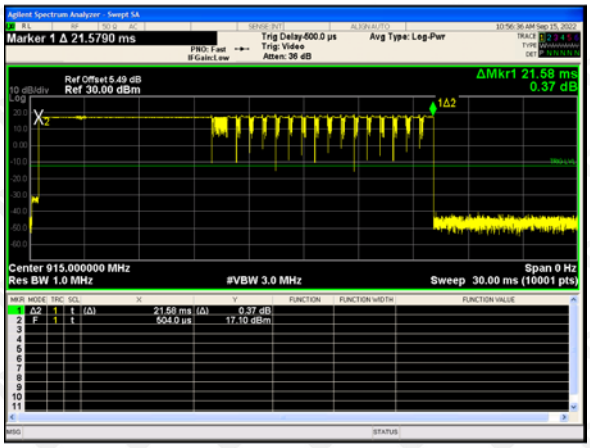
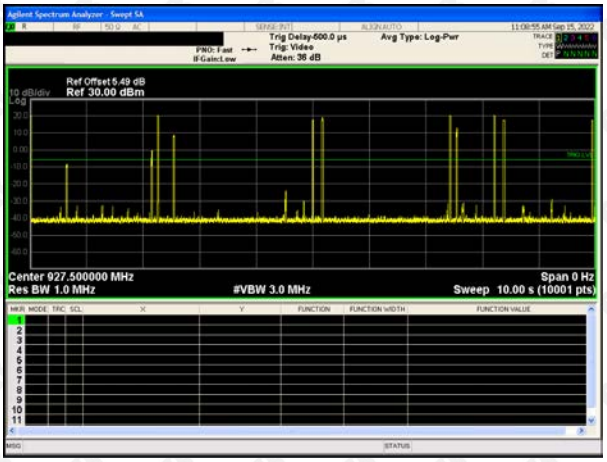
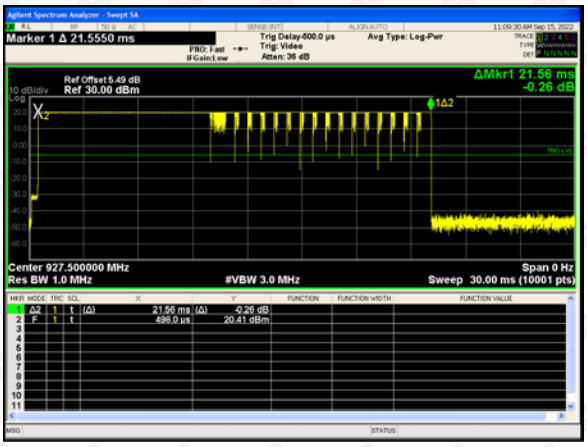
ANT2

Graphs		
LCH		
MCH		
HCH		

ANT3

Graphs		
LCH		
MCH		
HCH		

ANT4

Graphs		
LCH		
MCH		
HCH		

14. ANTENNA REQUIREMENT

15.203 requirement:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.
15.247(b) (4) requirement:
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. Except as shown in paragraph (c) of this section, 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 paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is External Antenna. The best case gain of the antenna is 1.91dBi.

15. EUT PHOTOGRAPHS

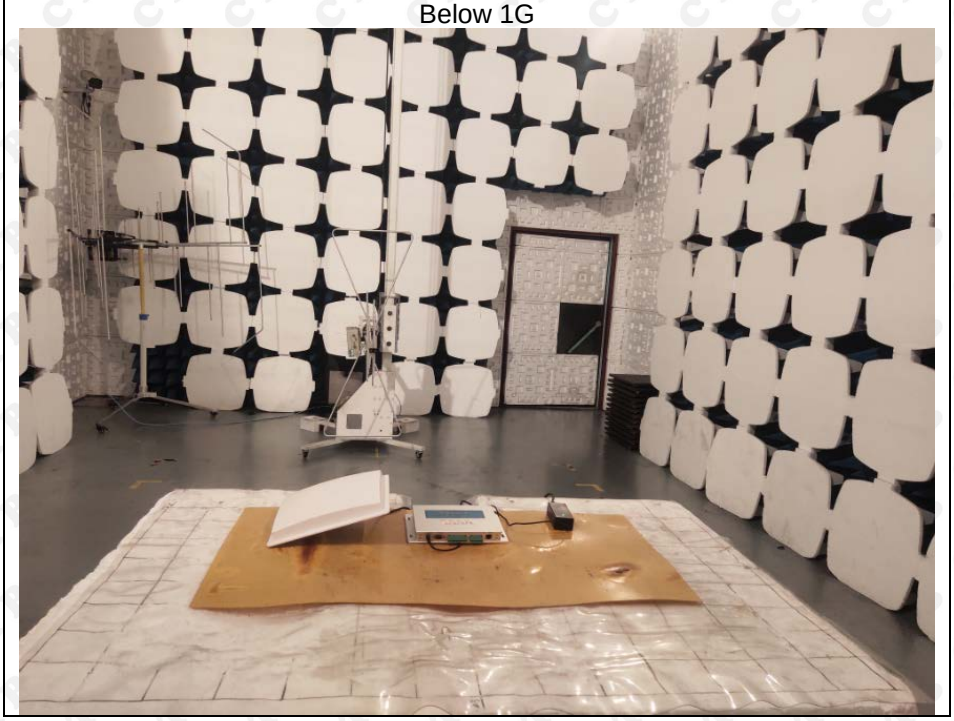
EUT Photo 1

EUT Photo 2

16. EUT TEST SETUP PHOTOGRAPHS

Radiated Emission

Below 1G



Above 1G

Conducted Emission

※※※※※ END OF REPORT ※※※※※