7.4. Carrier Frequency Separation Measurement

7.4.1. Test Limit

For BDR Mode, the minimum permissible channel separation for this system is the value of the 20dB BW. For EDR Mode, the minimum permissible channel separation for this system is 2/3 the value of the 20dB BW.

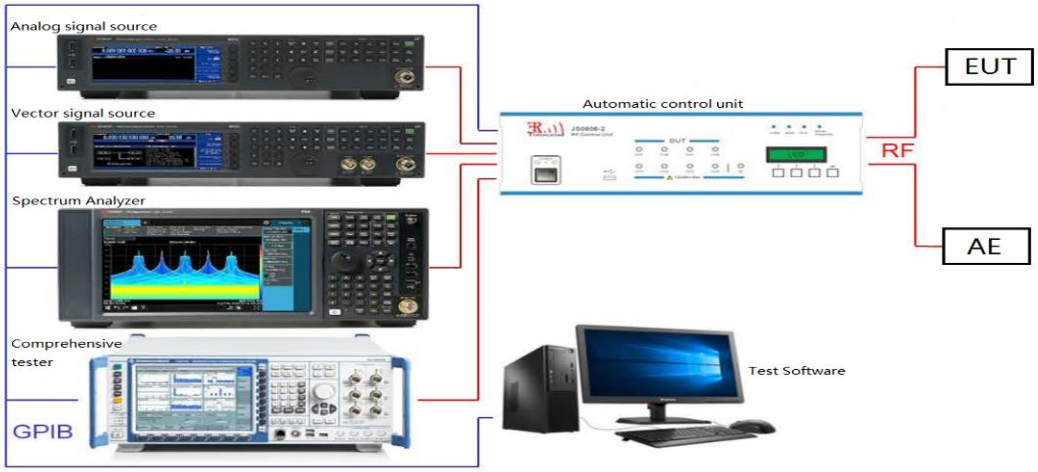
7.4.2. Test Procedure Used

ANSI C63.10-2013 - Section 7.8.2

7.4.3. Test Setting

1. Span = wide enough to capture the peaks of two adjacent channels.
2. Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
3. VBW ≥ RBW
4. Sweep time = Auto couple
5. Detector = Peak
6. Trace mode = Max hold
7. Allowed the trace to stabilize
8. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

7.4.4. Test Setup



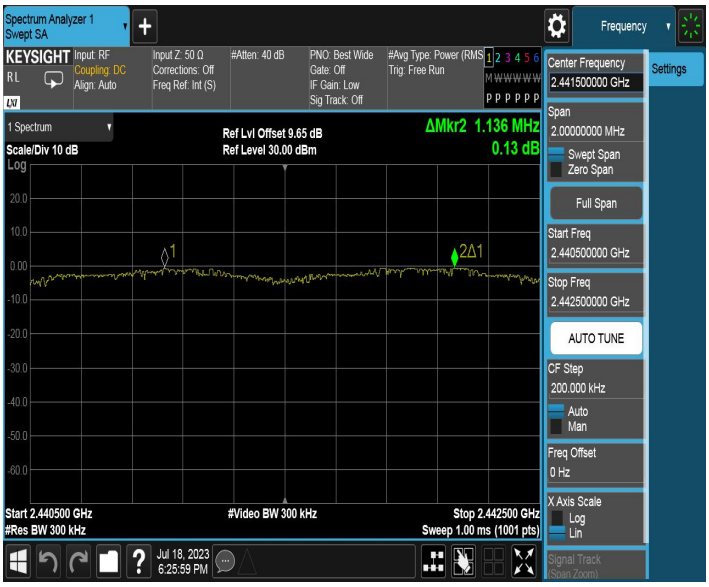
7.4.5. Test Result

Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	Hop	0.976	≥0.963	PASS
2DH5	Ant1	Hop	1.136	≥0.892	PASS

DH5 Limit:0.963*1=0.963

2DH5 Limit:1.338*2/3=0.892

DH5_Ant1_Hop

2DH5_Ant1_Hop


7.5. Number of Hopping Channels Measurement

7.5.1. Test Limit

This frequency hopping system must employ a minimum of 15 hopping channels.

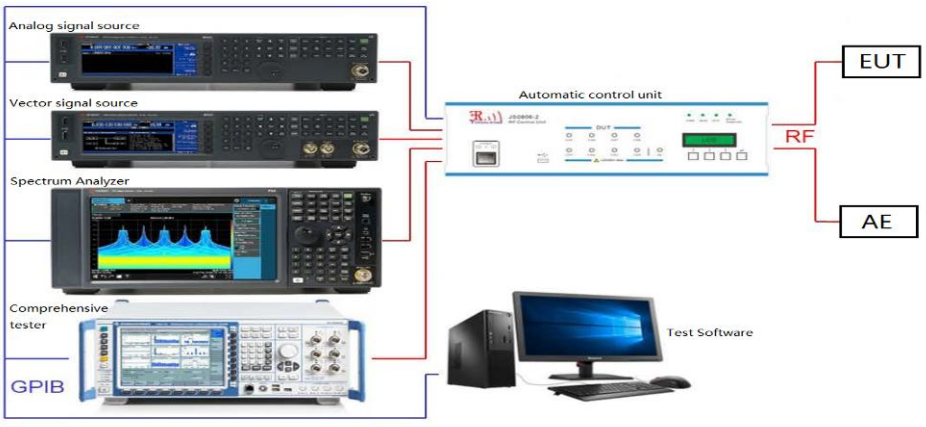
7.5.2. Test Procedure Used

ANSI C63.10-2013 - Section 7.8.3

7.5.3. Test Settitng

1. Span = the frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
2. To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
3. VBW ≥ RBW
4. Sweep time = Auto couple
5. Detector = Peak
6. Trace mode = Max hold
7. Allow the trace to stabilize

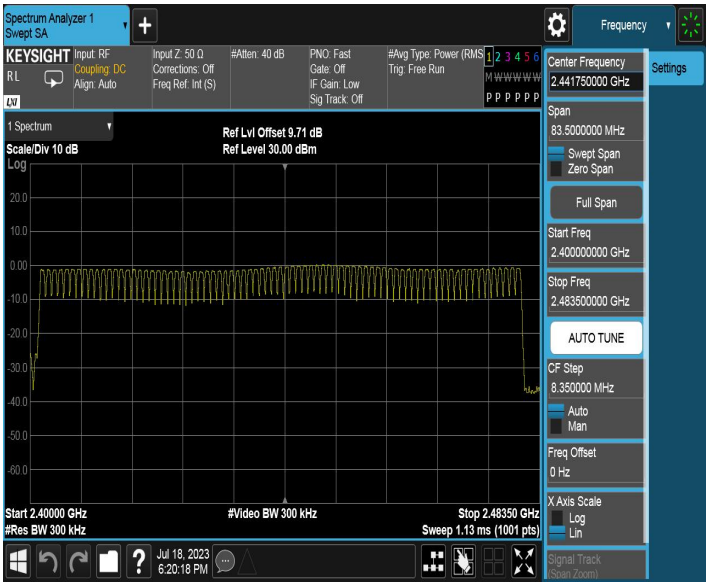
7.5.4. Test Setup



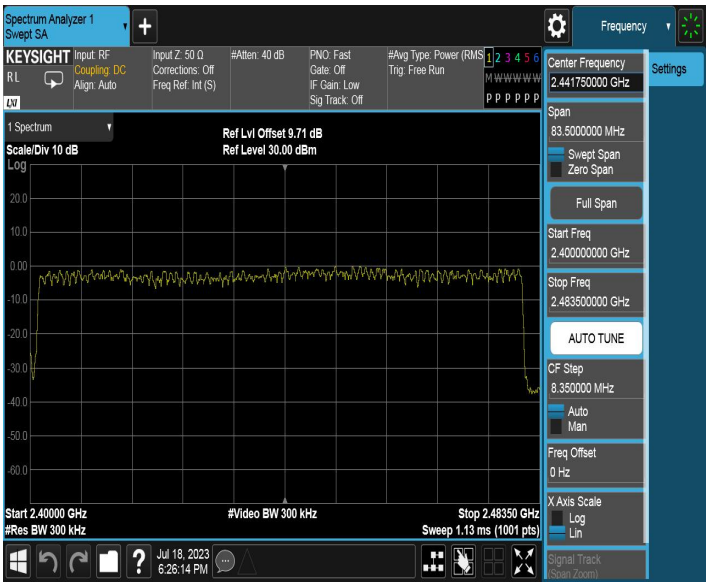
7.5.5. Test Result

Test Mode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH5	Ant1	Hop	79	>=15	PASS
2DH5	Ant1	Hop	79	>=15	PASS

DH5_Ant1_Hop



2DH5_Ant1_Hop



7.6. Time of Occupancy Measurement

7.6.1. Test Limit

The maximum permissible time of occupancy is 400ms within a period of 400ms multiplied by the number of hopping channels employed.

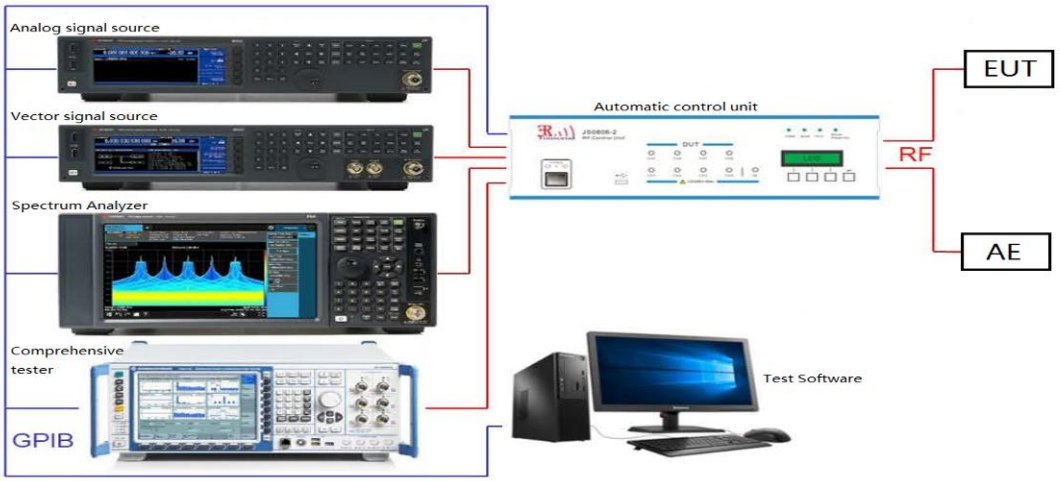
7.6.2. Test Procedure Used

ANSI C63.10-2013 - Section 7.8.4

7.6.3. Test Settitng

1. Span = zero span, centered on a hopping channel.
2. RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
3. VBW ≥ RBW
4. Sweep time = as necessary to capture the entire dwell time per hopping channel
5. Detector = Peak
6. Trace mode = max hold
7. Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time. An oscilloscope may be used instead of a spectrum analyzer. The EUT shall show compliance with the appropriate regulatory limit for the number of hopping channels. A plot of the data shall be included in the test report.

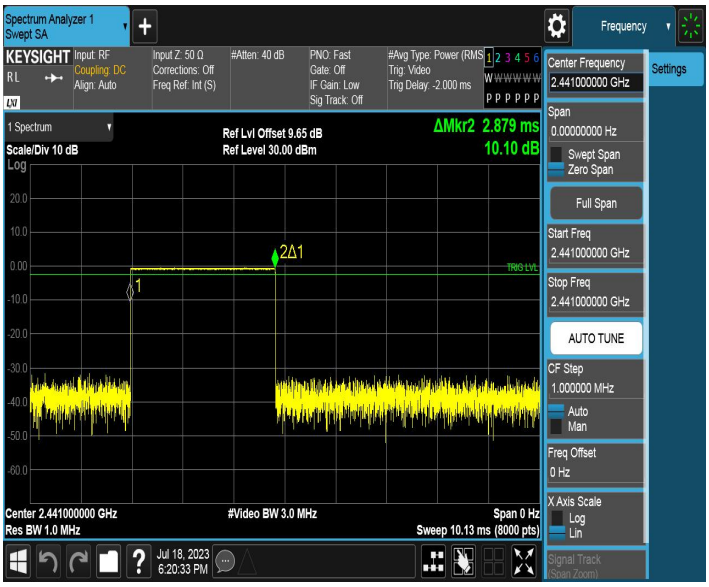
7.6.4. Test Setup

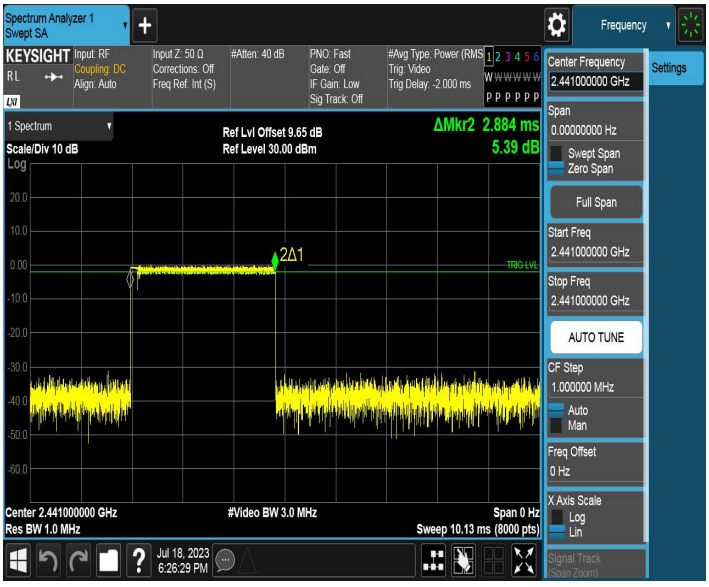


7.6.5. Test Result

Test Mode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH5	Ant1	Hop	2.879	106.67	0.307	<=0.4	PASS
2DH5	Ant1	Hop	2.884	106.67	0.308	<=0.4	PASS

Note 1: According the Bluetooth Standard Specification, the nominal hop rate is 1600 hops/s.
AlBluetooth unit participating in the piconet are time and hop synchronized to the channel.
Hops Over Occupancy Time in 31.6s for DH5/2DH5 = 1600 / 6 / 79 * 31.6 = 106.67
Note 2: Time of Occupancy = Packet Transfer Time * Hops Over Occupancy Time in 31.6s.

DH5_Ant1_Hop


2DH5_Ant1_Hop


7.7. Band-edge Compliance Measurement

7.7.1. Test Limit

The maximum permissible emission level is 20dBc. Any emissions were lying outside of the emission bandwidth and in authorized band edges to a field strength limit specified in Section 15.209 of the Title 47 CFR.

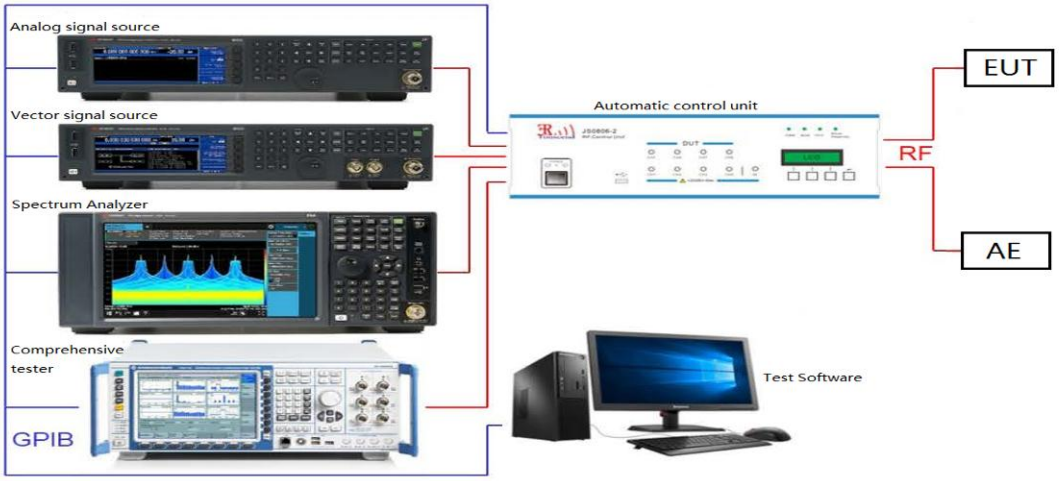
7.7.2. Test Procedure Used

ANSI C63.10-2013 - Section 6.10.4

7.7.3. Test Setting

1. Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation.
2. RBW = 100kHz
3. VBW = 300kHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize
8. Allow the trace to stabilize. Set the marker on the emission at the band edge, or on the highest modulation product outside of the band, if this level is greater than that at the band edge. Enable the marker-delta function, than use the marker-to-peak function to move the marker to the peak of the in-band emission.

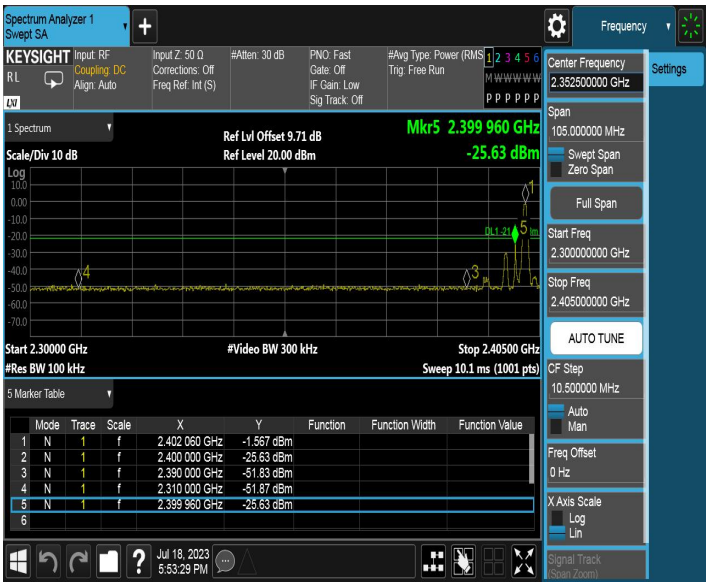
7.7.4. Test Setup



7.7.5. Test Result

Test Mode	Antenna	Ch Name	Channel	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	-1.57	-25.63	≤-21.57	PASS
		High	2480	-0.98	-44.22	≤-20.98	PASS
		Low	Hop_2402	-1.94	-27.84	≤-21.94	PASS
		High	Hop_2480	-1.26	-46.01	≤-21.26	PASS
2DH5	Ant1	Low	2402	-2.38	-25.78	≤-22.38	PASS
		High	2480	-0.79	-43.89	≤-20.79	PASS
		Low	Hop_2402	-1.80	-27.37	≤-21.8	PASS
		High	Hop_2480	-2.18	-32	≤-22.18	PASS

DH5_Ant1_Low_2402

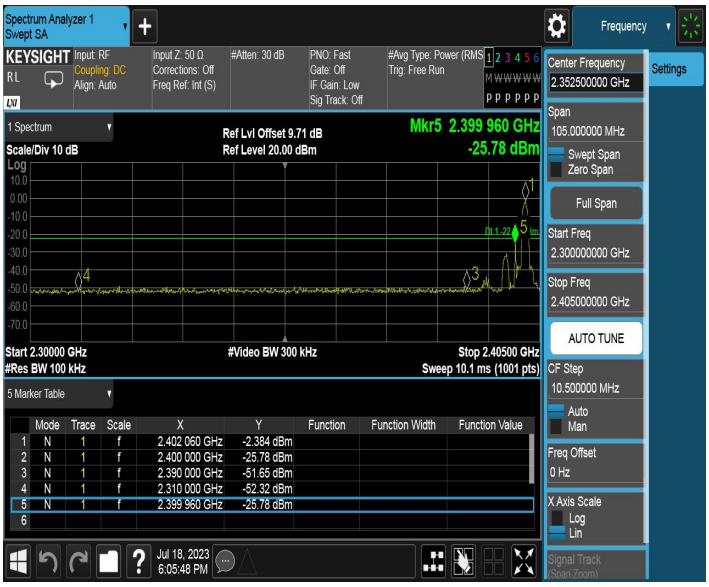


DH5_Ant1_High_2480

DH5_Ant1_Low_Hop_2402

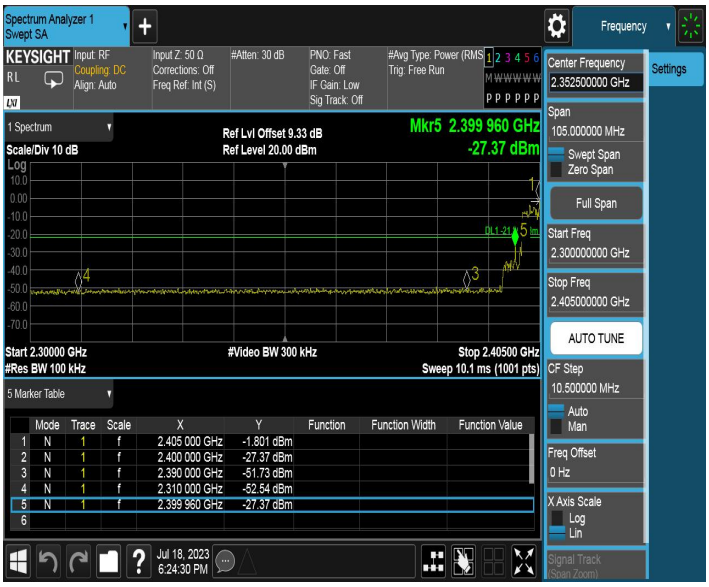
DH5_Ant1_High_Hop_2480

2DH5_Ant1_Low_2402



2DH5_Ant1_High_2480

2DH5_Ant1_Low_Hop_2402



2DH5_Ant1_High_Hop_2480

7.8. Conducted Spurious Emissions Measurement

7.8.1. Test Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted 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.

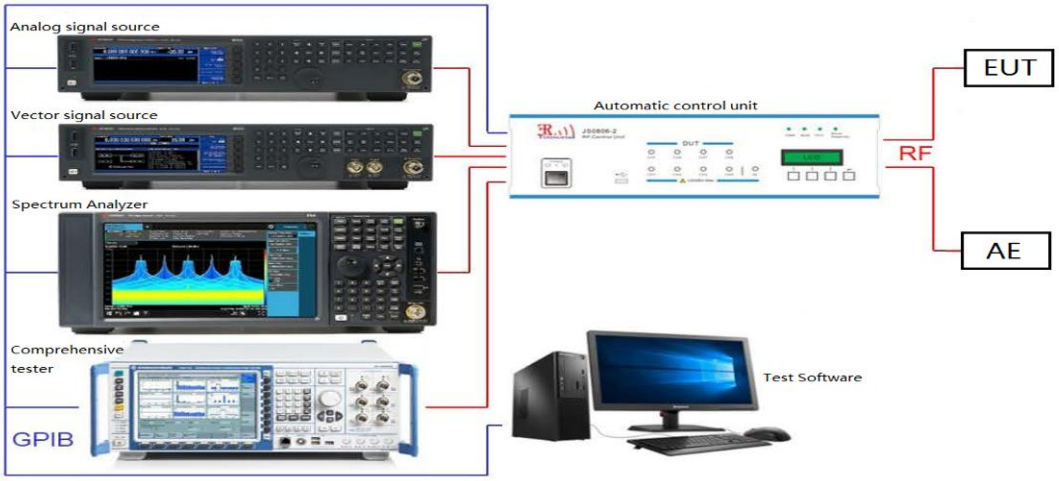
7.8.2. Test Procedure Used

ANSI C63.10-2013 - Section 7.8.8

7.8.3. Test Setting

1. Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
2. RBW = 100 KHz
3. VBW ≥ RBW
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize
8. Set the marker on the peak of any spurious emission recorded. The level displayed must comply with the limit specified in this section.

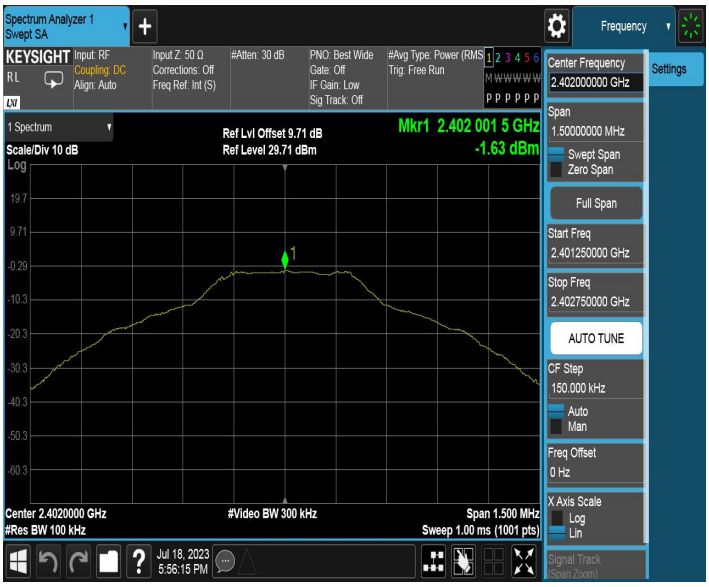
7.8.4. Test Setup



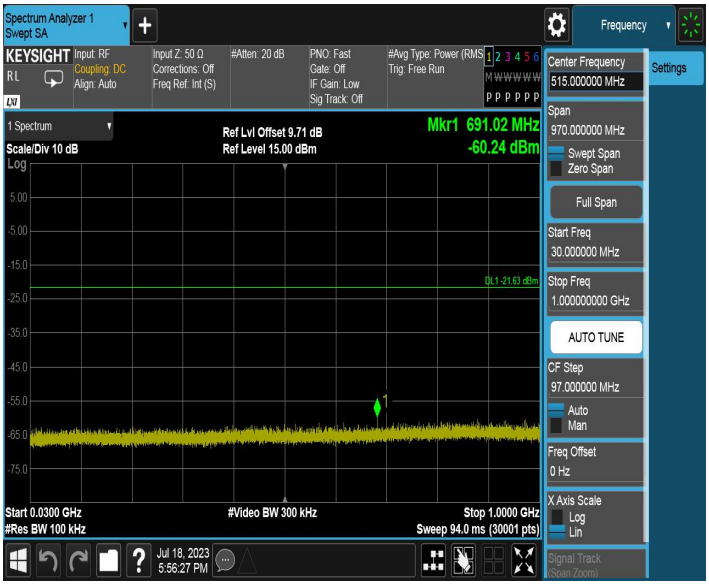
7.8.5. Test Result

Test Mode	Antenna	Channel	Freq Range [MHz]	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	Reference	-1.63	-1.63	---	PASS
			30~1000	-1.63	-60.24	≤-21.63	PASS
			1000~26500	-1.63	-46.11	≤-21.63	PASS
		2441	Reference	-0.77	-0.77	---	PASS
			30~1000	-0.77	-60.49	≤-20.77	PASS
			1000~26500	-0.77	-42.88	≤-20.77	PASS
		2480	Reference	-1.12	-1.12	---	PASS
			30~1000	-1.12	-60.28	≤-21.12	PASS
			1000~26500	-1.12	-41.71	≤-21.12	PASS
2DH5	Ant1	2402	Reference	-1.45	-1.45	---	PASS
			30~1000	-1.45	-60.76	≤-21.45	PASS
			1000~26500	-1.45	-45.36	≤-21.45	PASS
		2441	Reference	-0.64	-0.64	---	PASS
			30~1000	-0.64	-48.77	≤-20.64	PASS
			1000~26500	-0.64	-44.78	≤-20.64	PASS
		2480	Reference	-0.92	-0.92	---	PASS
			30~1000	-0.92	-60.61	≤-20.92	PASS
			1000~26500	-0.92	-41.55	≤-20.92	PASS

DH5_Ant1_2402_0~Reference

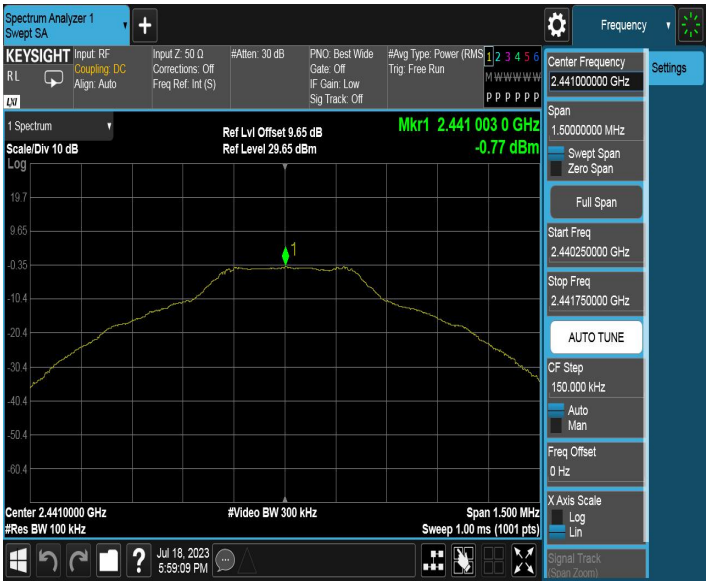


DH5_Ant1_2402_30~1000

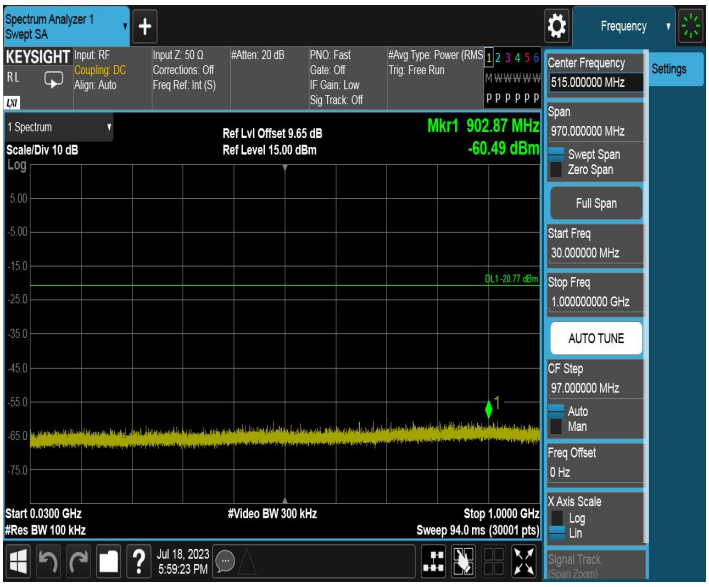


DH5_Ant1_2402_1000~26500

DH5_Ant1_2441_0~Reference



DH5_Ant1_2441_30~1000



DH5_Ant1_2441_1000~26500