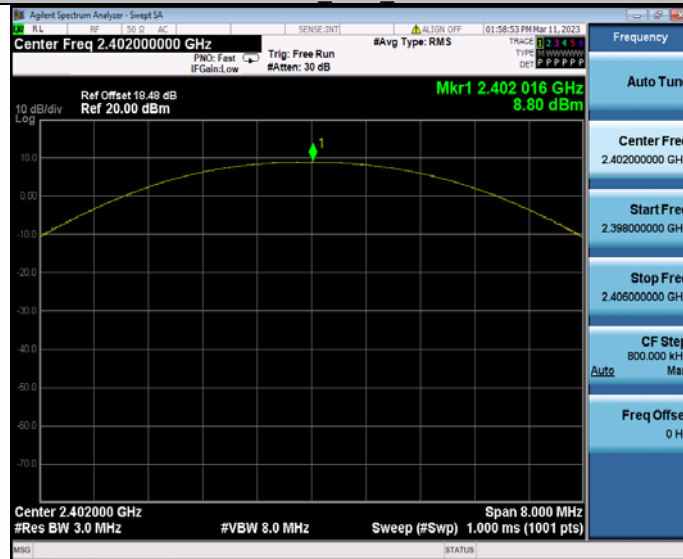
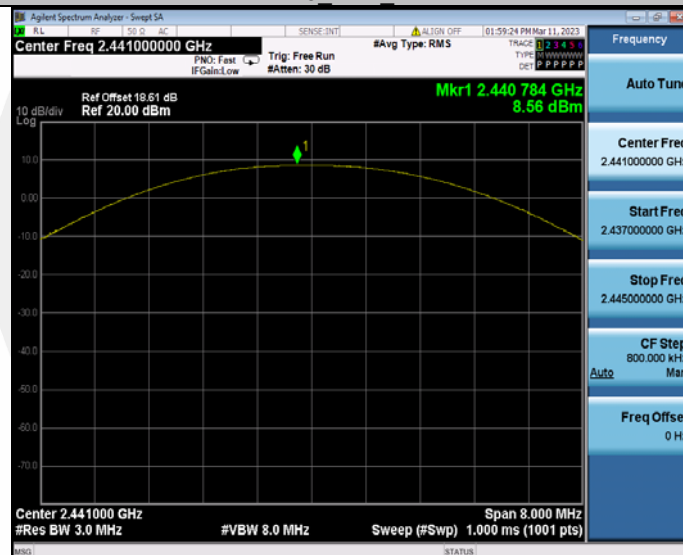


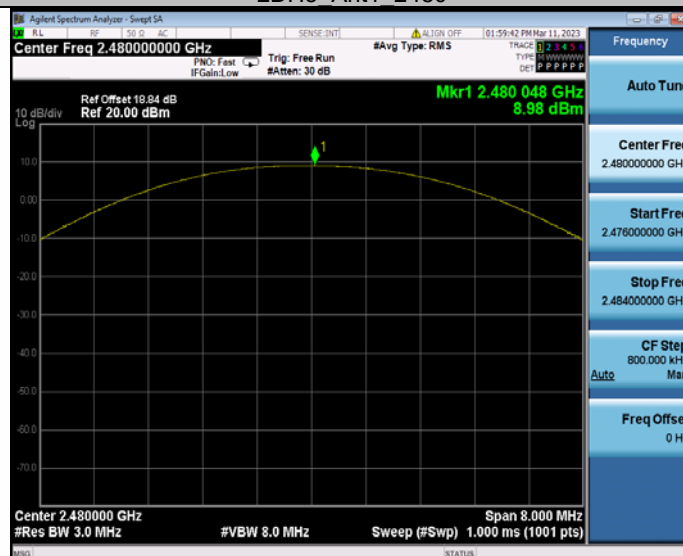
2DH5 Ant1 2402



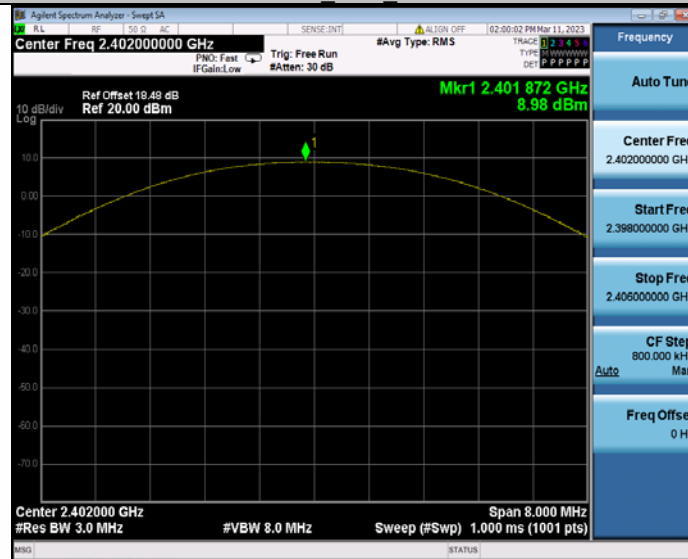
2DH5 Ant1 2441



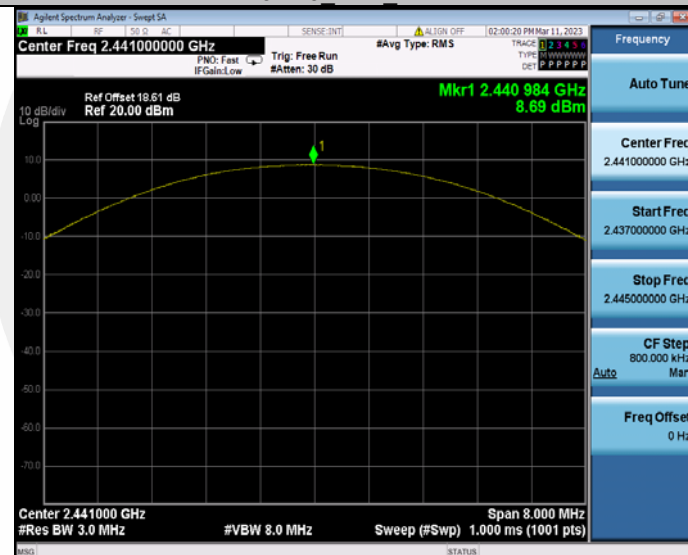
2DH5 Ant1 2480



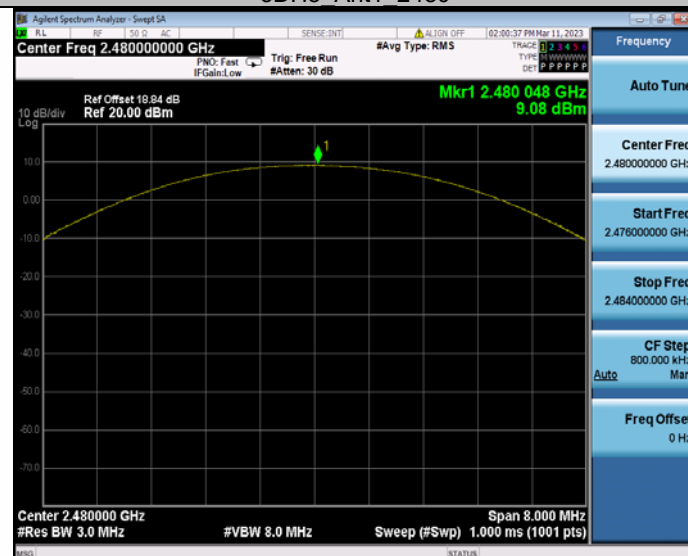
3DH5 Ant1 2402



3DH5 Ant1 2441



3DH5 Ant1 2480



9.6 CONDUCTED SUPRIIOUS EMISSION

9.6.1 Applicable Standard

According to FCC Part 15.247(d) and KDB 558074 D01 15.247 MEAS GUIDANCE v05r02

9.6.2 Conformance Limit

According to FCC Part 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, provided the transmitter demonstrates compliance with the peak conducted power limits.

9.6.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

9.6.4 Test Procedure

The transmitter output (antenna port) was connected to the spectrum analyzer

■ Reference level measurement

Establish a reference level by using the following procedure:

Set instrument center frequency to DSS channel center frequency.

Set Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel.

Set the RBW = 100 kHz. Set the VBW $\geq 3 \times$ RBW.

Set Detector = peak. Set Sweep time = auto couple.

Set Trace mode = max hold. Allow trace to fully stabilize.

Use the peak marker function to determine the maximum Maximum conduceted level.

Note that the channel found to contain the maximum conduceted level can be used to establish the reference level.

■ Band-edge Compliance of RF Conducted Emissions

Use the following spectrum analyzer settings:

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

Set RBW $\geq 1\%$ of the span=100kHz Set VBW $\geq$ RBW

Set Sweep = auto Set Detector function = peak Set Trace = max hold

Allow the trace to stabilize. Set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. The marker-delta value now displayed must comply with the limit specified in this Section.

Now, using the same instrument settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

■ Conduceted Spurious RF Conducted Emission

Use the following spectrum analyzer settings:

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.(30MHz to 25GHz). Set RBW = 100 kHz Set VBW $\geq$ RBW

Set Sweep = auto Set Detector function = peak Set Trace = max hold

Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded. The level displayed must comply with the limit specified in this Section.

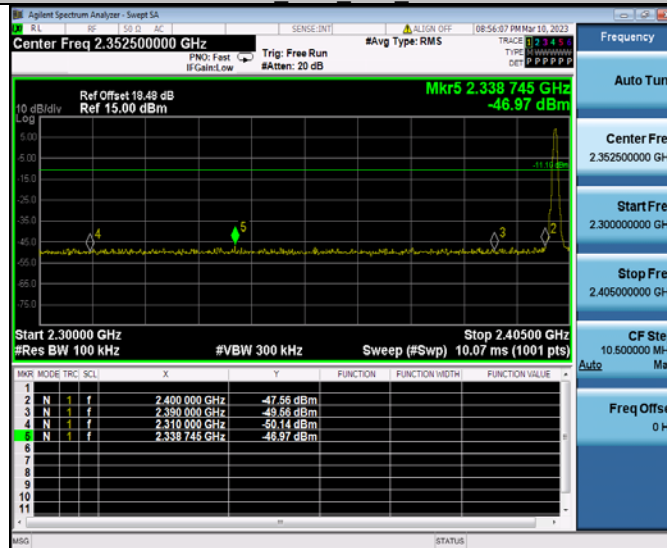
9.6.5 Test Results

Band edge measurements

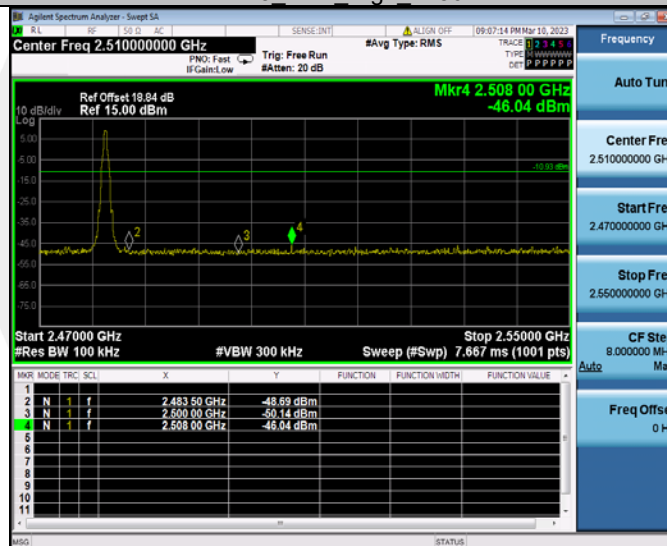
TestMode	Antenna	ChName	Frequency[MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	8.90	-46.97	≤-11.1	PASS
		High	2480	9.07	-46.04	≤-10.93	PASS
		Low	Hop_2402	7.25	-47.5	≤-12.75	PASS
		High	Hop_2480	7.90	-46.97	≤-12.1	PASS
2DH5	Ant1	Low	2402	8.87	-47.28	≤-11.13	PASS
		High	2480	8.81	-46.23	≤-11.19	PASS
3DH5	Ant1	Low	2402	8.64	-46.61	≤-11.36	PASS
		High	2480	8.60	-46.5	≤-11.4	PASS



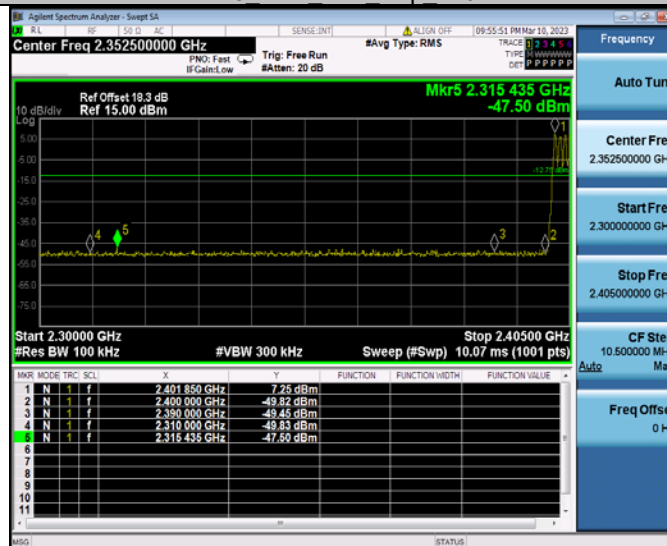
DH5 Ant1 Low 2402



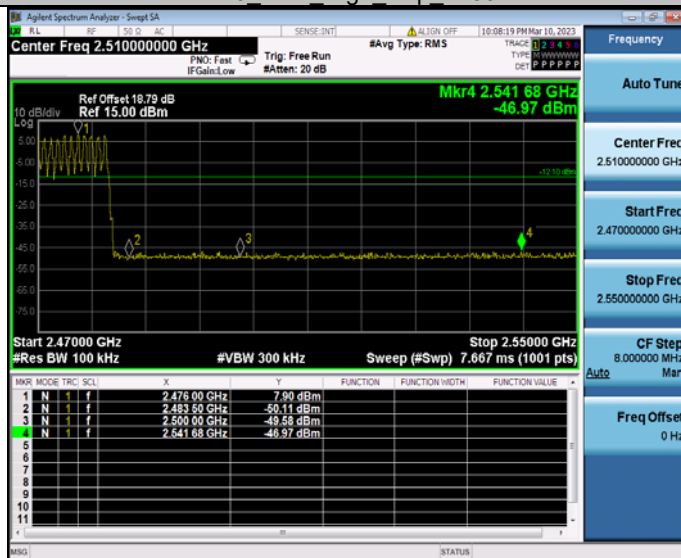
DH5 Ant1 High 2480



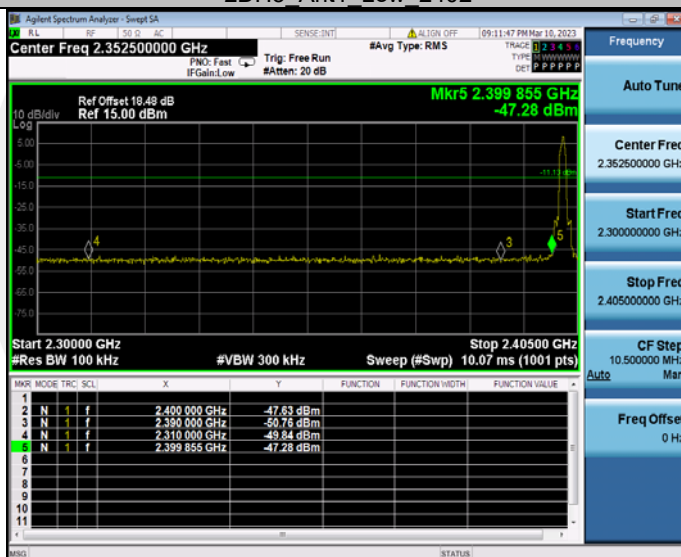
DH5 Ant1 Low Hop 2402



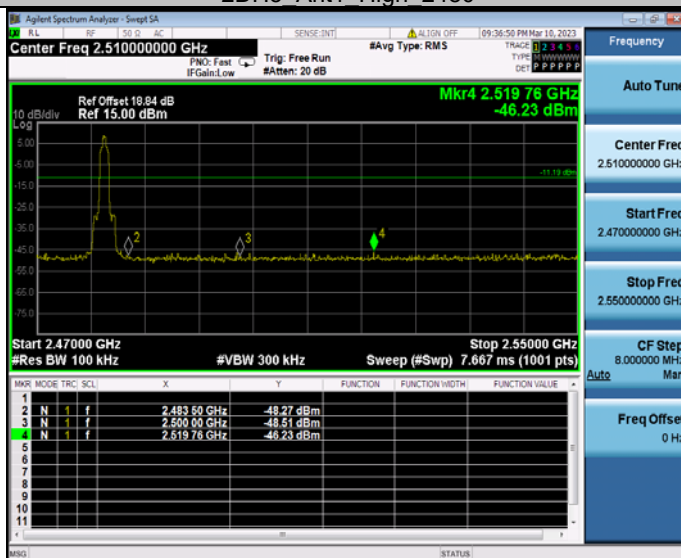
DH5 Ant1 High Hop 2480



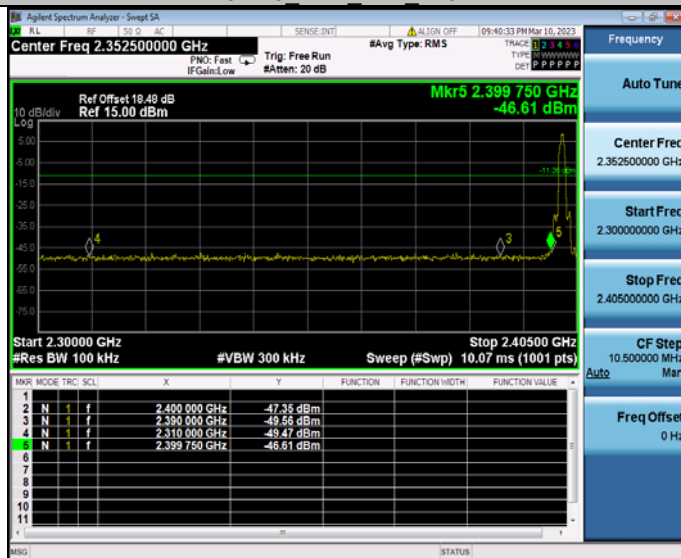
2DH5 Ant1 Low 2402



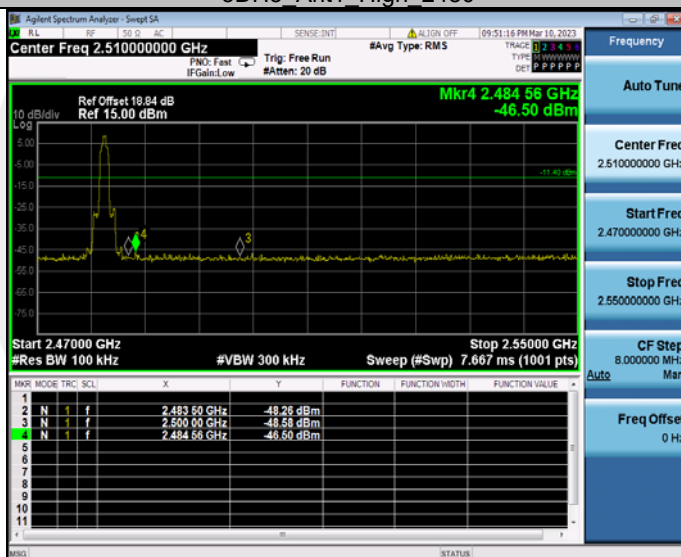
2DH5 Ant1 High 2480



3DH5 Ant1 Low 2402



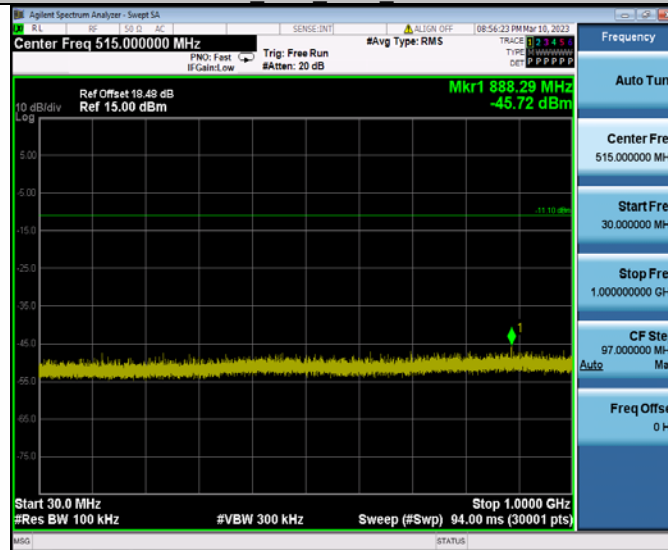
3DH5 Ant1 High 2480



Conduceted Spurious Emission

TestMode	Antenna	Frequency[MHz]	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	30~1000	8.90	-45.72	≤-11.1	PASS
			1000~26500	8.90	-30.11	≤-11.1	PASS
		2441	30~1000	8.71	-46.17	≤-11.29	PASS
			1000~26500	8.71	-31.13	≤-11.29	PASS
		2480	30~1000	9.07	-45.91	≤-10.93	PASS
			1000~26500	9.07	-30.63	≤-10.93	PASS
2DH5	Ant1	2402	30~1000	8.87	-46.5	≤-11.13	PASS
			1000~26500	8.87	-30.83	≤-11.13	PASS
		2441	30~1000	8.63	-46.6	≤-11.37	PASS
			1000~26500	8.63	-30.87	≤-11.37	PASS
		2480	30~1000	8.81	-46.02	≤-11.19	PASS
			1000~26500	8.81	-30.8	≤-11.19	PASS
3DH5	Ant1	2402	30~1000	8.64	-46.02	≤-11.36	PASS
			1000~26500	8.64	-30.76	≤-11.36	PASS
		2441	30~1000	8.27	-46.42	≤-11.73	PASS
			1000~26500	8.27	-30.46	≤-11.73	PASS
		2480	30~1000	8.60	-46.22	≤-11.4	PASS
			1000~26500	8.60	-30.18	≤-11.4	PASS

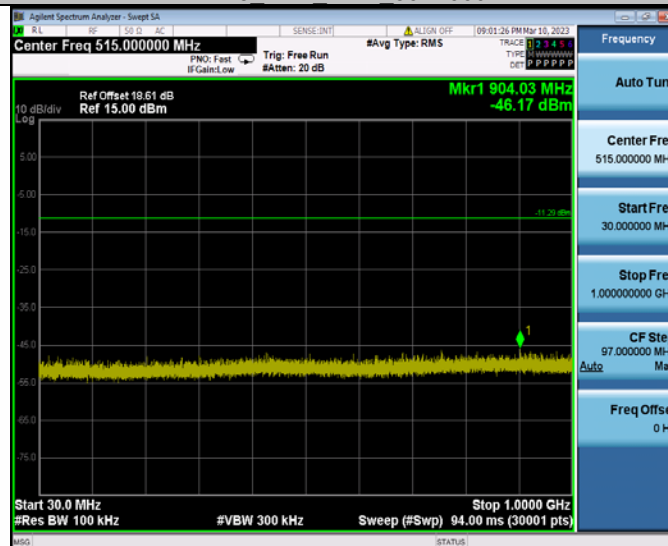
DH5 Ant1 2402 30~1000



DH5 Ant1 2402 1000~26500



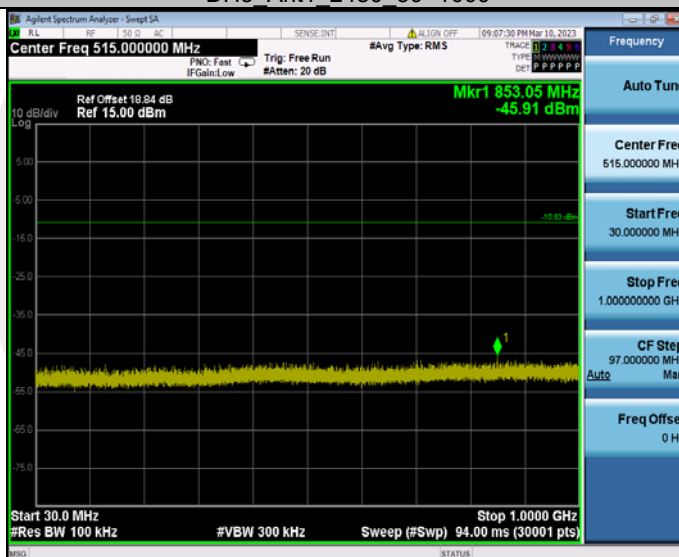
DH5 Ant1 2441 30~1000



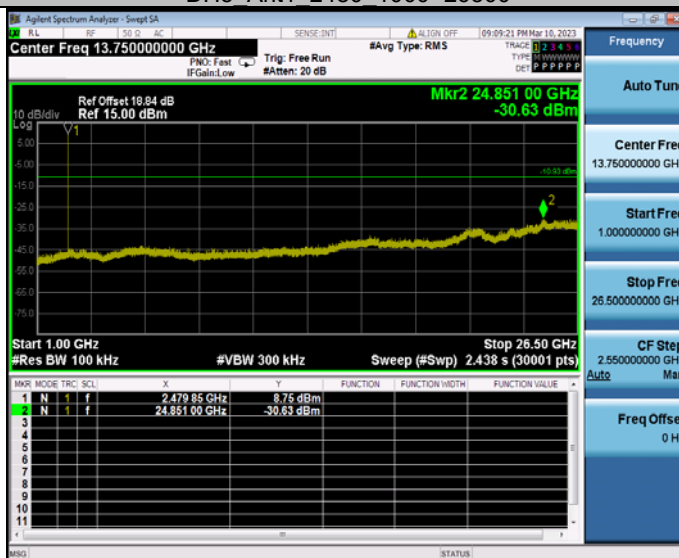
DH5 Ant1 2441 1000~26500



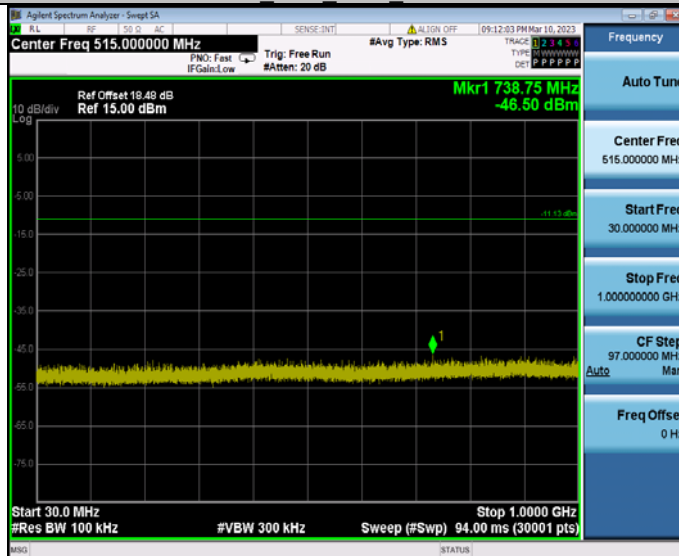
DH5 Ant1 2480 30~1000



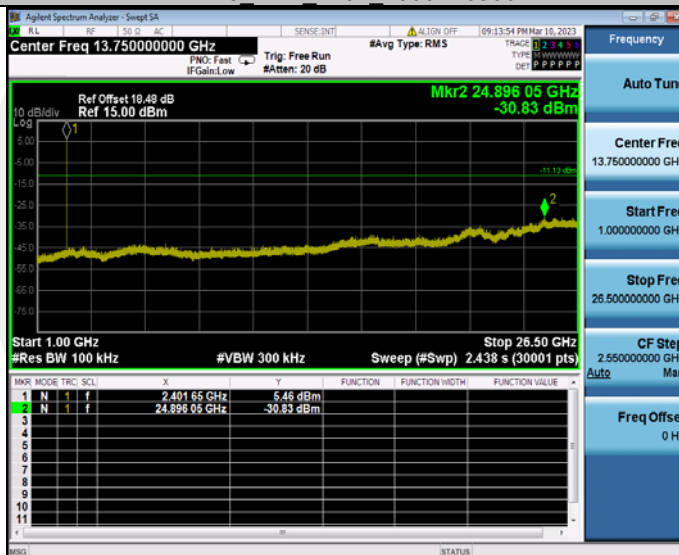
DH5 Ant1 2480 1000~26500



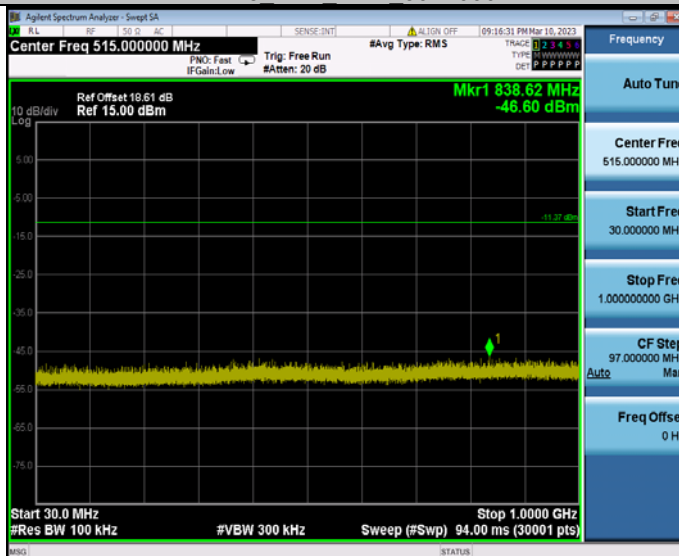
2DH5_Ant1_2402_30~1000



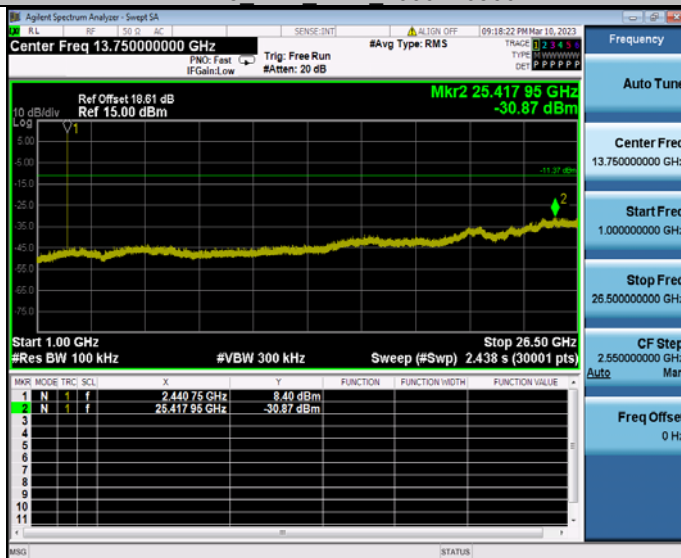
2DH5_Ant1_2402_1000~26500



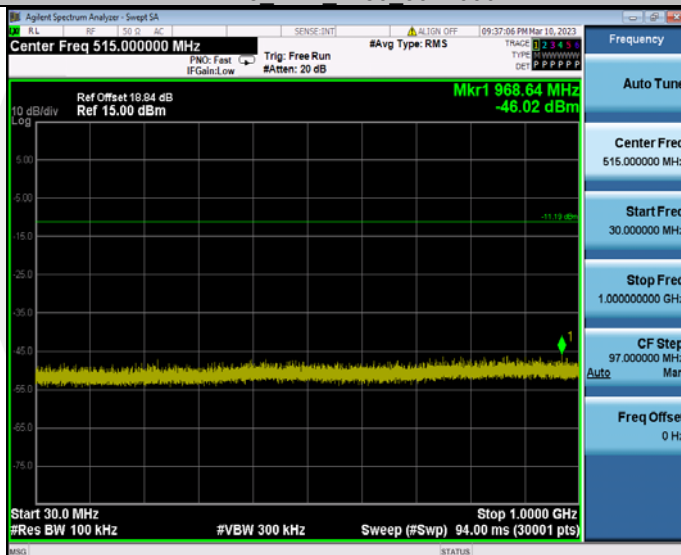
2DH5_Ant1_2441_30~1000



2DH5 Ant1 2441 1000~26500



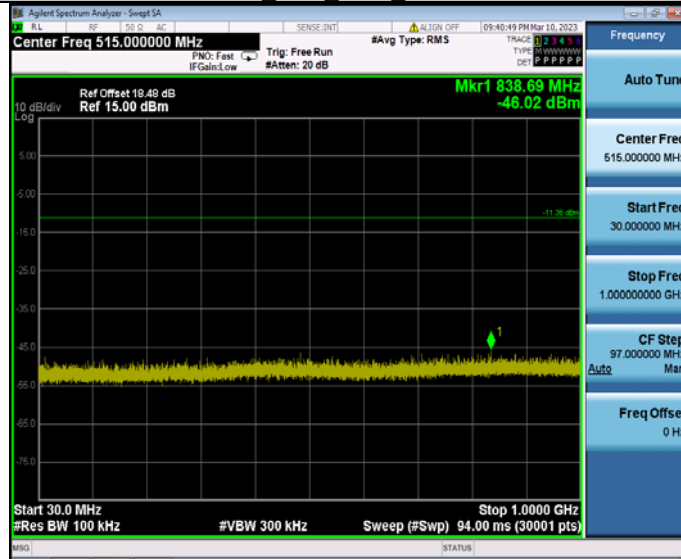
2DH5 Ant1 2480 30~1000



2DH5 Ant1 2480 1000~26500



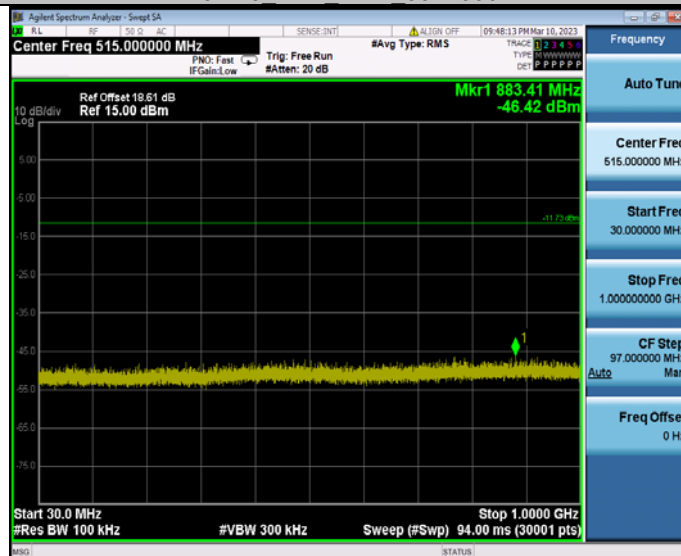
3DH5_Ant1_2402_30~1000



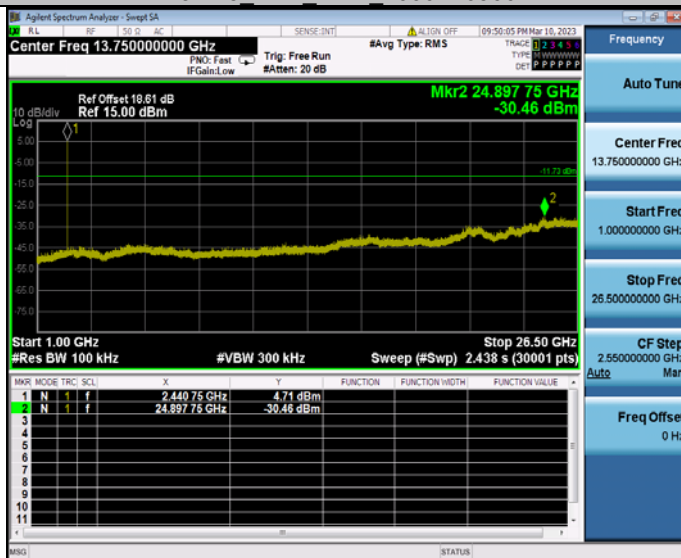
3DH5_Ant1_2402_1000~26500



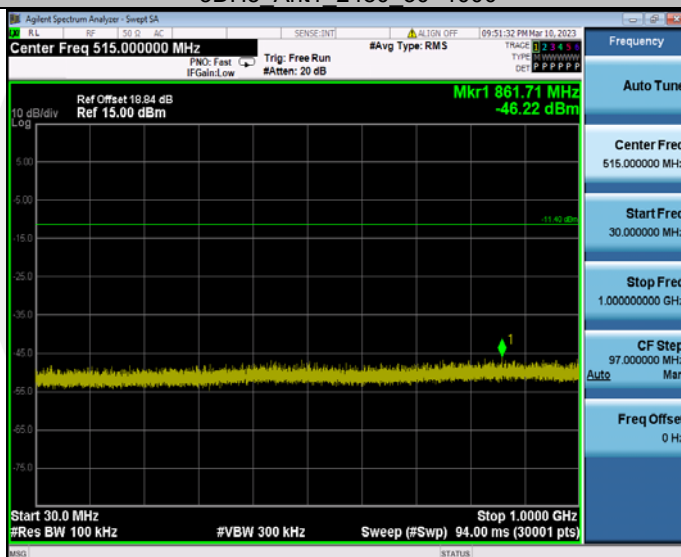
3DH5_Ant1_2441_30~1000



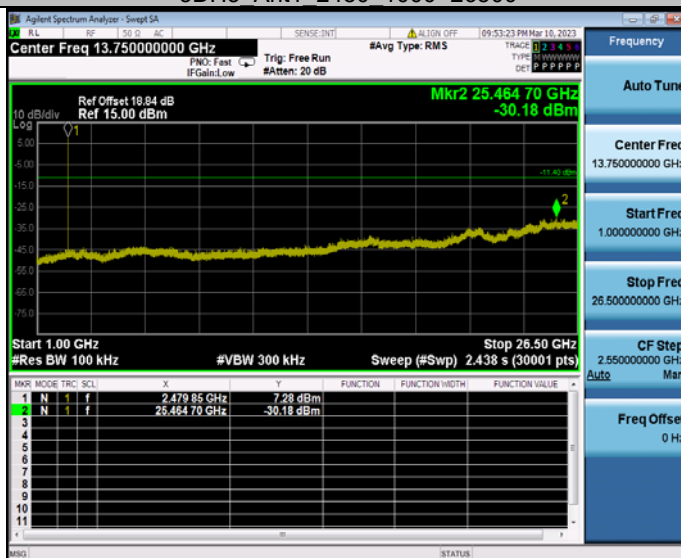
3DH5 Ant1 2441 1000~26500



3DH5 Ant1 2480 30~1000



3DH5 Ant1 2480 1000~26500



9.7 RADIATED SPURIOUS EMISSION

9.7.1 Applicable Standard

According to FCC Part 15.247(d) and 15.209 and KDB 558074 D01 15.247 MEAS GUIDANCE v05r02

9.7.2 Conformance Limit

According to FCC Part 15.247(d): radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

According to FCC Part 15.205, Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(2)
13.36-13.41			

According to FCC Part 15.205, the level of any transmitter spurious emission in Restricted bands shall not exceed the level of the emission specified in the following table

Restricted Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance
0.009-0.490	2400/F(KHz)	20 log (uV/m)	300
0.490-1.705	24000/F(KHz)	20 log (uV/m)	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

9.7.3 Test Configuration

Test according to clause 7.2 radio frequency test setup 2

9.7.4 Test Procedure

This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

For Above 1GHz:

The EUT was placed on a turn table which is 1.5m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

For Below 1GHz:

The EUT was placed on a turn table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 100 kHz for

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

For Below 30MHz:

The EUT was placed on a turn table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 9kHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

For Below 150KHz:

The EUT was placed on a turn table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 200Hz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Follow the guidelines in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b). Submit this data.

Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from $20\log(\text{dwell time}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Repeat above procedures until all frequency measured was complete.

9.7.5 Test Results

■ Spurious Emission below 30MHz (9KHz to 30MHz)

Temperature:	25° C
Relative Humidity:	60%
ATM Pressure:	1011 mbar

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
--	--	--	--	--	--	--	--

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor = $40 \log(\text{Specific distance} / \text{test distance})$ (dB);

Limit line = Specific limits (dBuV) + distance extrapolation factor

■ Spurious Emission Above 1GHz (1GHz to 25GHz)

Bluetooth (GFSK, π /4-DQPSK, 8DPSK) mode have been tested, and the worst result(GFSK) was report as below:

Test mode: GFSK Frequency: Channel 0: 2402MHz

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)	Limit 3m(dBuV/m)	Over(dB)	Detector
4803.75	V	46.75	74.00	27.25	peak
14570.6	V	64.31	74.00	9.69	peak
17623.1	V	69.91	74.00	4.09	peak
4803.75	V	39.25	54.00	14.75	AVG
14570.62	V	50.53	54.00	3.47	AVG
17623.12	V	50.97	54.00	3.03	AVG
4803.75	H	48.14	74.00	25.86	peak
14600.6	H	65.02	74.00	8.98	peak
17617.5	H	69.27	74.00	4.73	peak
4803.75	H	38.85	54.00	15.15	AVG
14600.62	H	50.12	54.00	3.88	AVG
17617.5	H	50.20	54.00	3.80	AVG

Test mode: GFSK Frequency: Channel 39: 2441MHz

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)	Limit 3m(dBuV/m)	Over(dB)	Detector
4798.12	V	48.13	74.00	25.87	peak
14581.8	V	63.85	74.00	10.15	peak
17621.2	V	69.79	74.00	4.21	peak
4798.125	V	38.65	54.00	15.35	AVG
14581.87	V	50.26	54.00	3.74	AVG
17621.25	V	49.13	54.00	4.87	AVG
4882.5	H	47.70	74.00	26.30	peak
14623.1	H	64.83	74.00	9.17	peak
17621.2	H	70.18	74.00	3.82	peak
4882.5	H	39.15	54.00	14.85	AVG
14623.12	H	50.58	54.00	3.42	AVG
17621.25	H	50.03	54.00	3.97	AVG

Test mode: GFSK Frequency: Channel 78: 2480MHz

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)	Limit 3m(dBuV/m)	Over(dB)	Detector
4959.37	V	48.13	74.00	25.87	peak
14613.7	V	64.47	74.00	9.53	peak
17626.8	V	70.49	74.00	3.51	peak
4959.375	V	39.21	54.00	14.79	AVG
14613.75	V	50.52	54.00	3.48	AVG
17626.87	V	49.85	54.00	4.15	AVG
4959.37	H	49.86	74.00	24.14	peak
14561.2	H	63.57	74.00	10.43	peak
17613.7	H	70.51	74.00	3.49	peak
4959.375	H	37.48	54.00	16.52	AVG
14561.25	H	50.05	54.00	3.95	AVG
17613.75	H	50.54	54.00	3.46	AVG

- Note:** (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
 (2) Emission Level= Reading Level+Probe Factor +Cable Loss.
 (3) The reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

■ Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz

Bluetooth (GFSK, $\pi/4$ -DQPSK, 8DPSK, Hopping) mode have been tested, and the worst result(GFSK, Hopping) was report as below:

Test mode: GFSK Frequency: Channel 0: 2402MHz

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)	Limit 3m(dBuV/m)	Over(dB)	Detector
2322.01	V	44.72	74.00	29.28	peak
2322.01	V	41.26	54.00	12.74	AVG
2328.12	H	45.25	74.00	28.75	peak
2328.12	H	41.35	54.00	12.65	AVG

Test mode: GFSK Frequency: Channel 78: 2480MHz

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)	Limit 3m(dBuV/m)	Over(dB)	Detector
2484.00	V	47.03	74.00	26.97	peak
2484.00	V	43.34	54.00	10.66	AVG
2487.66	H	47.73	74.00	26.27	peak
2487.66	H	43.34	54.00	10.66	AVG

Test mode: GFSK Frequency: Hopping

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)	Limit 3m(dBuV/m)	Over(dB)	Detector
2399.27	V	45.36	74.00	28.64	peak
2482.66	V	46.94	74.00	27.06	peak
2399.27	V	43.36	54.00	10.64	AVG
2482.66	V	43.56	54.00	10.44	AVG
2397.73	H	45.89	74.00	28.11	peak
2483.30	H	46.81	74.00	27.19	peak
2397.73	H	43.44	54.00	10.56	AVG
2483.30	H	43.55	54.00	10.45	AVG

- Note:** (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
(2) Emission Level= Reading Level+Probe Factor +Cable Loss.
(3) Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Test Model

Spurious Emission in Restricted Band 2310-2390MHz

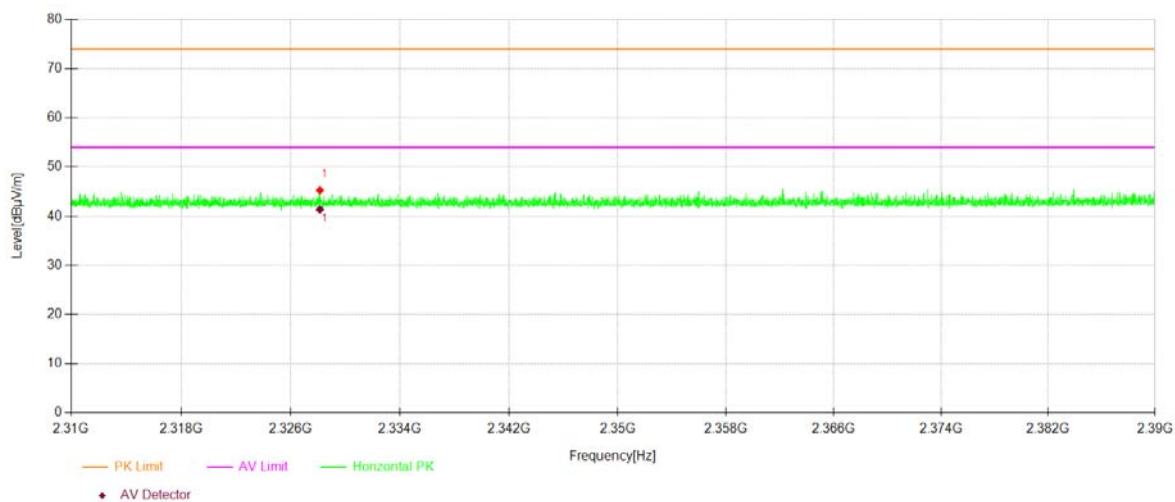
BT

Channel 0: 2402MHz

GFSK

H

Test By: HYD



Test Model

Spurious Emission in Restricted Band 2310-2390MHz

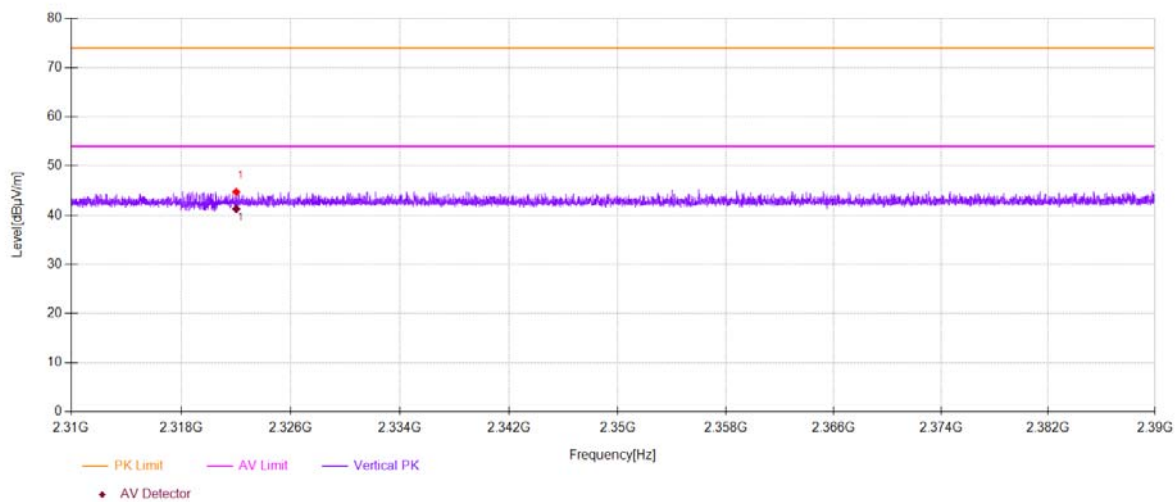
BT

Channel 0: 2402MHz

GFSK

V

Test By: HYD



Test Model

Spurious Emission in Restricted Band 2483.5-2500MHz

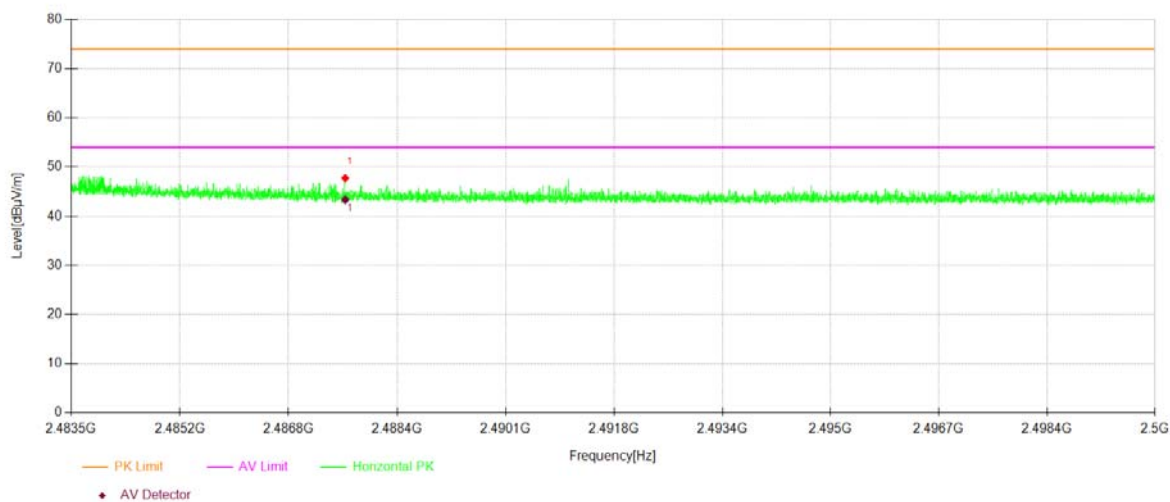
BT

Channel 78: 2480MHz

GFSK

H

Test By: HYD



Test Model

Spurious Emission in Restricted Band 2483.5-2500MHz

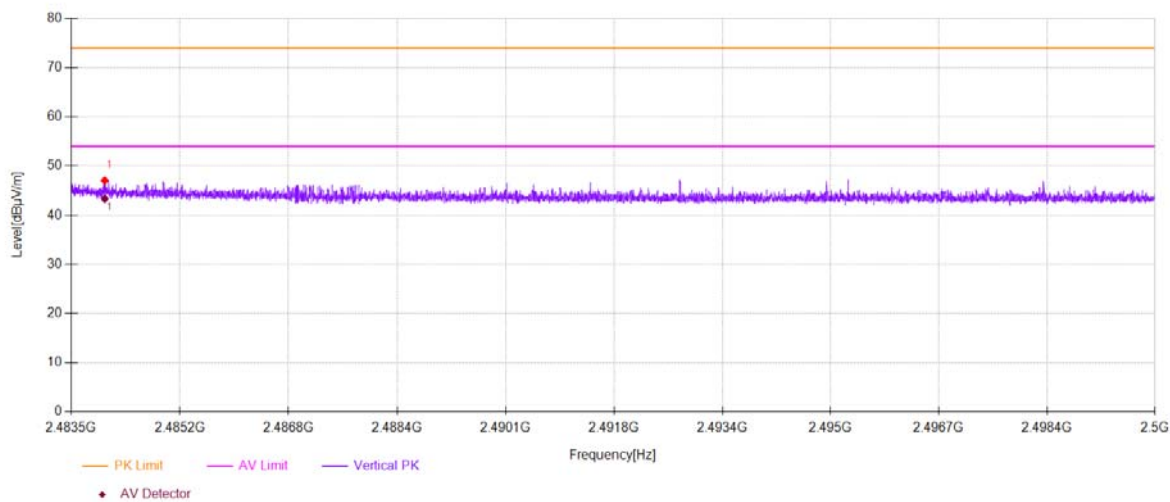
BT

Channel 78: 2480MHz

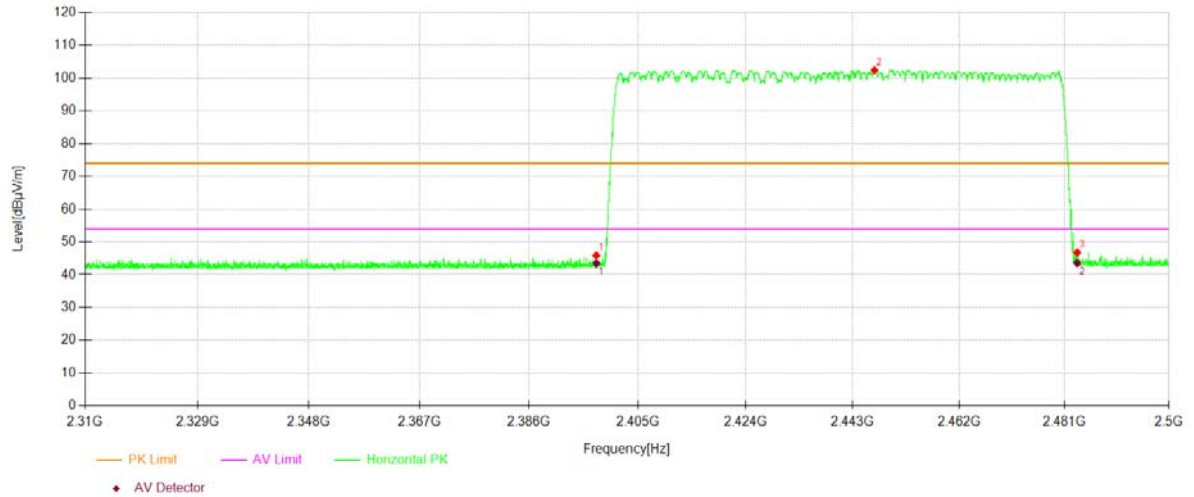
GFSK

V

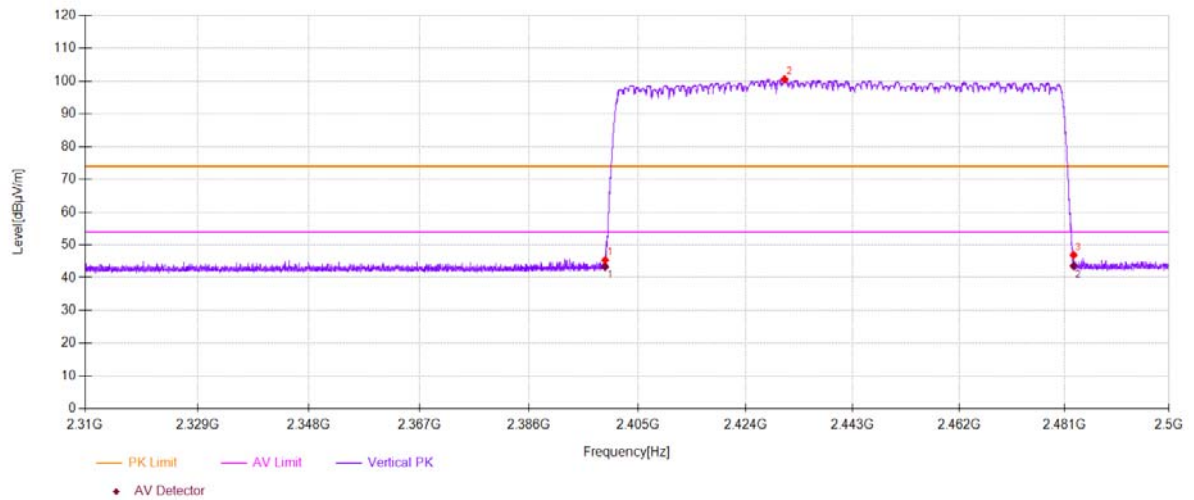
Test By: HYD



Test Model	Spurious Emission in Restricted Band 2310-2390MHz and 2400-2483.5MHz		
	BT		
	Hopping	GFSK	H
Test By: HYD			



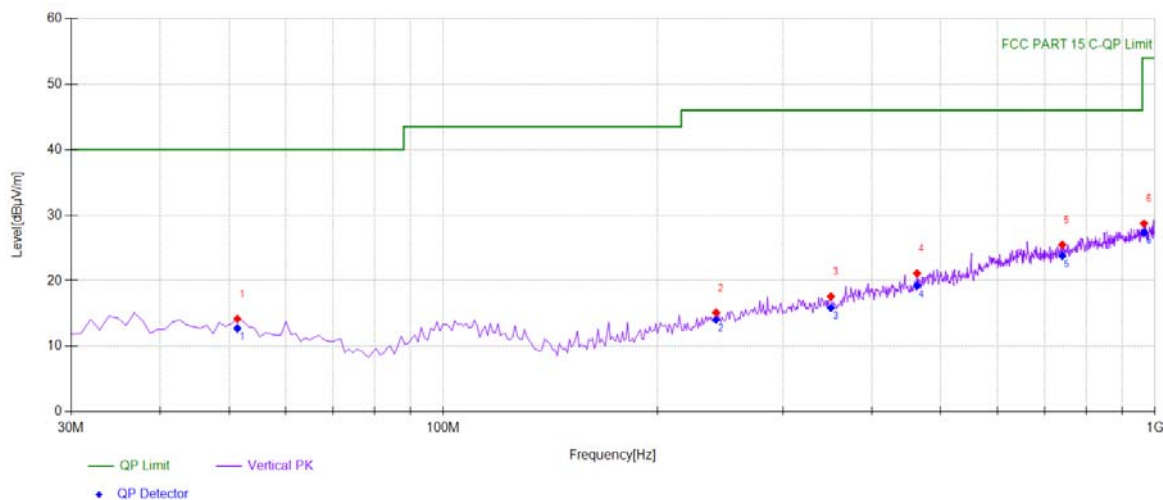
Test Model	Spurious Emission in Restricted Band 2310-2390MHz and 2400-2483.5MHz		
	BT		
	Hopping	GFSK	V
Test By: HYD			



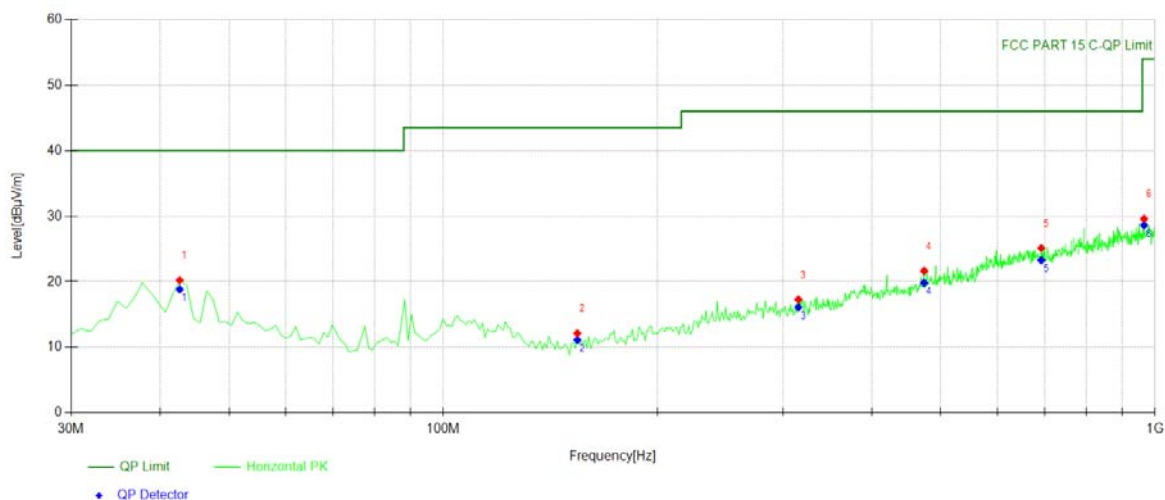
■ Spurious Emission below 1GHz (30MHz to 1GHz)

Bluetooth (GFSK, $\pi/4$ -DQPSK, 8DPSK) mode have been tested, and the worst result(GFSK) was report as below:

Test mode: GFSK Frequency: Channel 0: 2402MHz



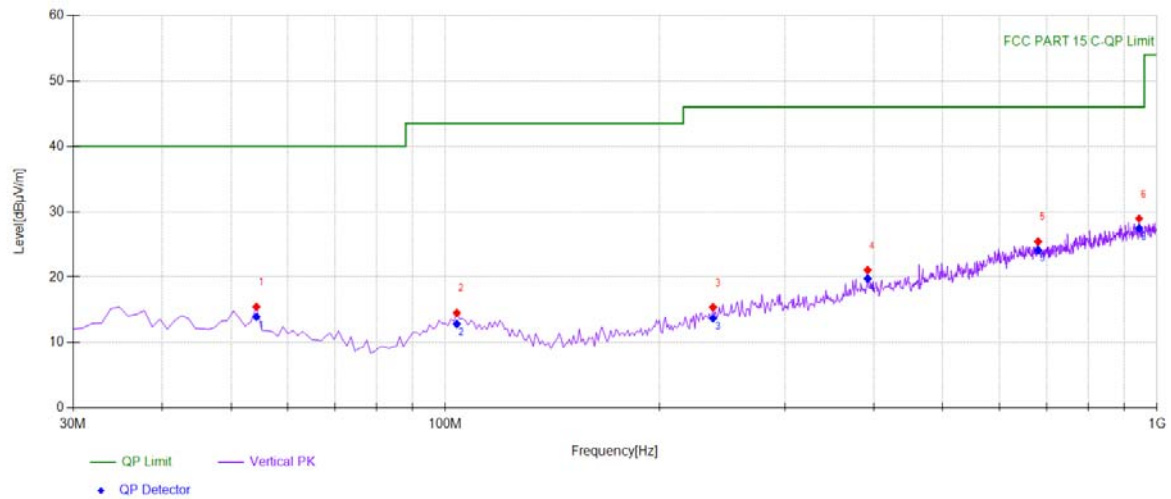
Suspected Data List										
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity	Angle[°]	Height[cm]
1	51.3614	31.56	-17.39	14.17	PK	40.00	25.83	V	329	100
2	241.671	30.33	-15.19	15.14	PK	46.00	30.86	V	277	100
3	350.420	31.05	-13.47	17.58	PK	46.00	28.42	V	16	100
4	463.053	31.97	-10.85	21.12	PK	46.00	24.88	V	183	100
5	740.750	30.85	-5.35	25.50	PK	46.00	20.50	V	125	100
6	965.045	30.87	-2.15	28.72	PK	54.00	25.28	V	211	100



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity	Angle[°]	Height[cm]
1	42.6226	37.96	-17.73	20.23	PK	40.00	19.77	H	249	100
2	154.284	31.83	-19.70	12.13	PK	43.50	31.37	H	122	100
3	315.465	31.43	-14.14	17.29	PK	46.00	28.71	H	83	100
4	473.733	31.84	-10.19	21.65	PK	46.00	24.35	H	31	100
5	692.202	31.15	-6.01	25.14	PK	46.00	20.86	H	183	100
6	965.045	31.75	-2.15	29.60	PK	54.00	24.40	H	202	100

Test mode: GFSK Frequency: Channel 39: 2441MHz



Suspected Data List										
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity	Angle[°]	Height [cm]
1	54.2743	33.23	-17.78	15.45	PK	40.00	24.55	V	91	100
2	103.793	31.53	-17.00	14.53	PK	43.50	28.97	V	5	100
3	237.787	30.79	-15.40	15.39	PK	46.00	30.61	V	315	100
4	392.172	32.91	-11.82	21.09	PK	46.00	24.91	V	205	100
5	680.550	31.55	-6.10	25.45	PK	46.00	20.55	V	119	100
6	943.683	31.36	-2.40	28.96	PK	46.00	17.04	V	129	100