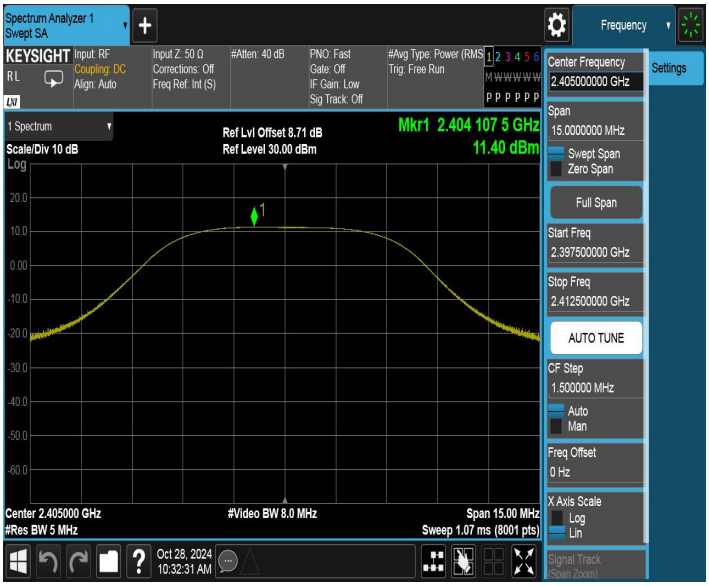
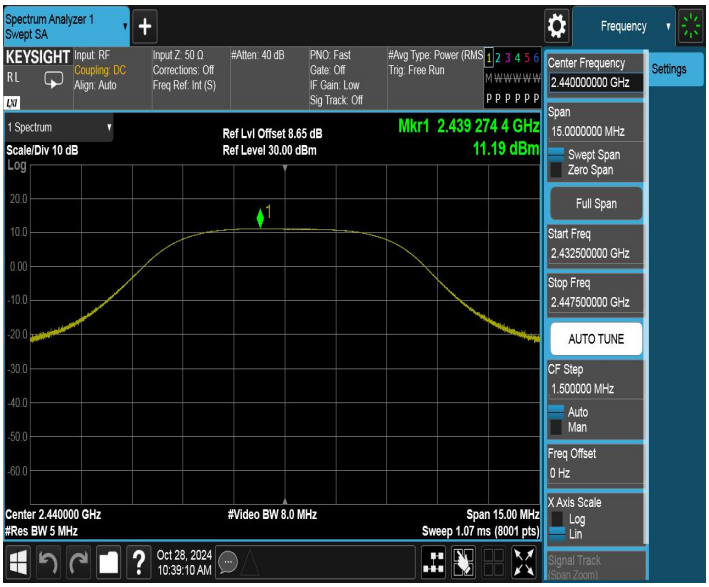
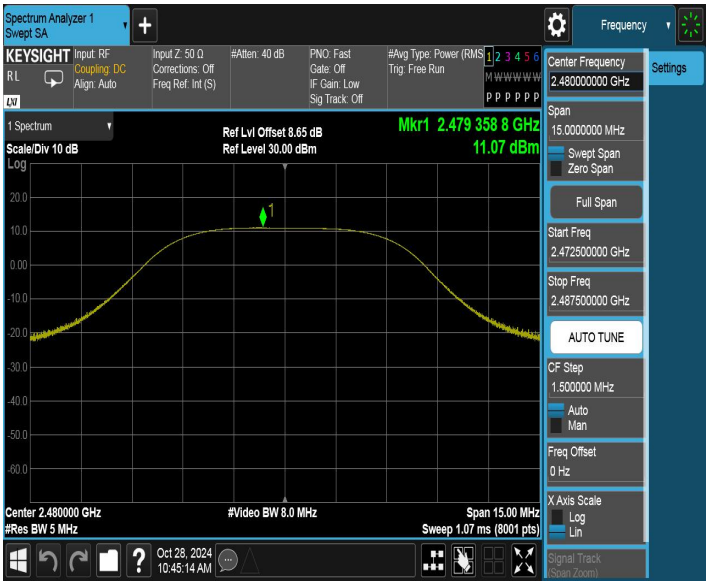
Test Graphs

ZIGB_Ant1_2405



ZIGB_Ant1_2440



ZIGB_Ant1_2480


7.4. Power Spectral Density Measurement

7.4.1. Test Limit

The maximum permissible power spectral density is 8dBm in any 3 kHz band. And for antenna gain greater than 6dBi the limit shall reduce by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.4.2. Test Procedure Used

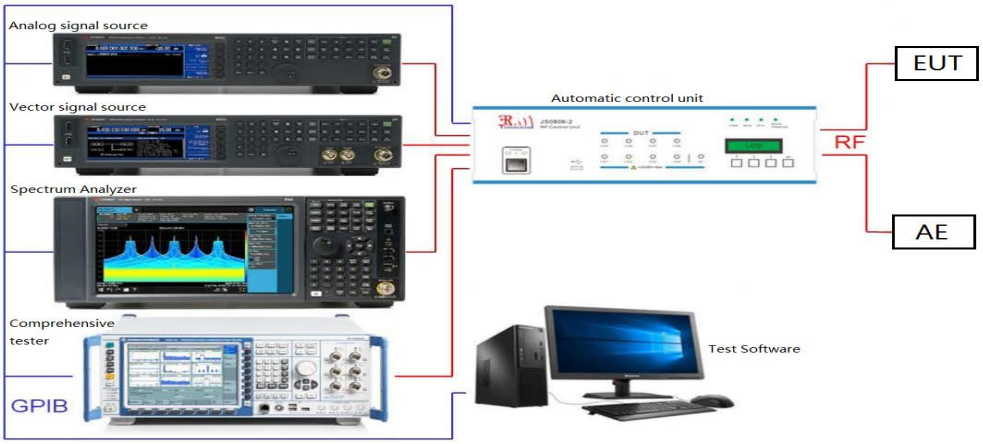
KDB 558074 D01 v05r02 - Section 8.4

ANSI C63.10 – Section 11.10.2

7.4.3. Test Setting

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ [3 × RBW].
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.

7.4.4. Test Setup

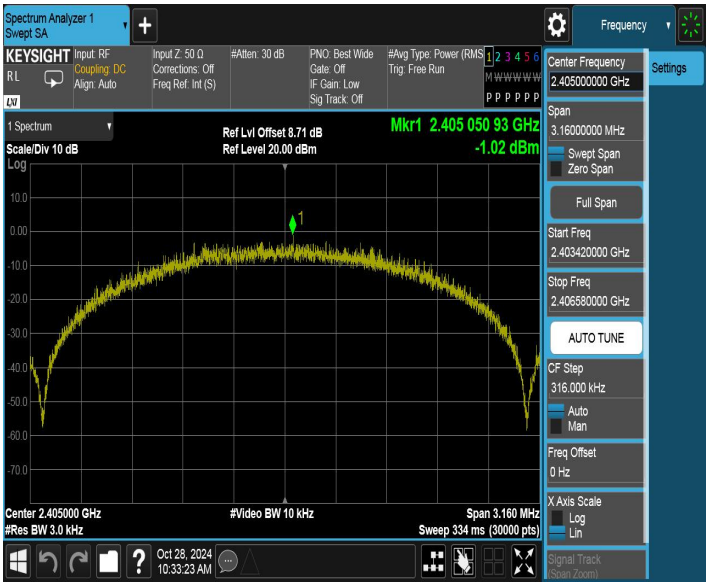


7.4.5. Test Result

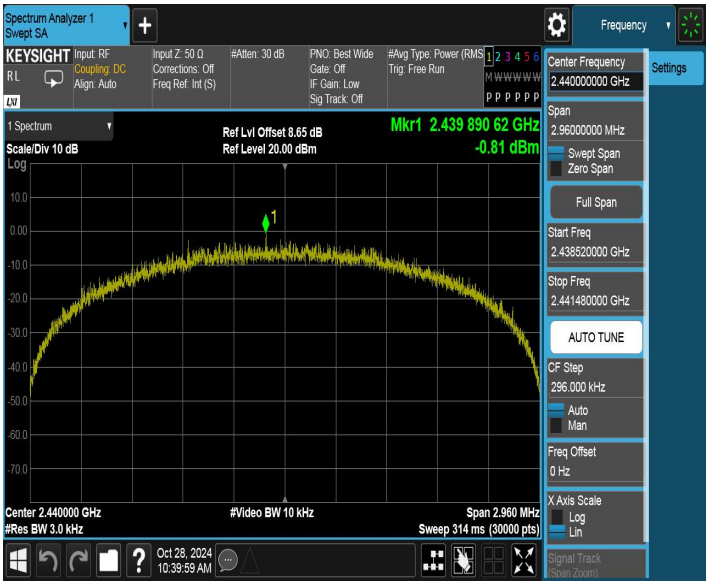
Test Mode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
Zigbee	Ant1	2405	-1.02	≤8.00	PASS
		2440	-0.81	≤8.00	PASS
		2480	-1.84	≤8.00	PASS

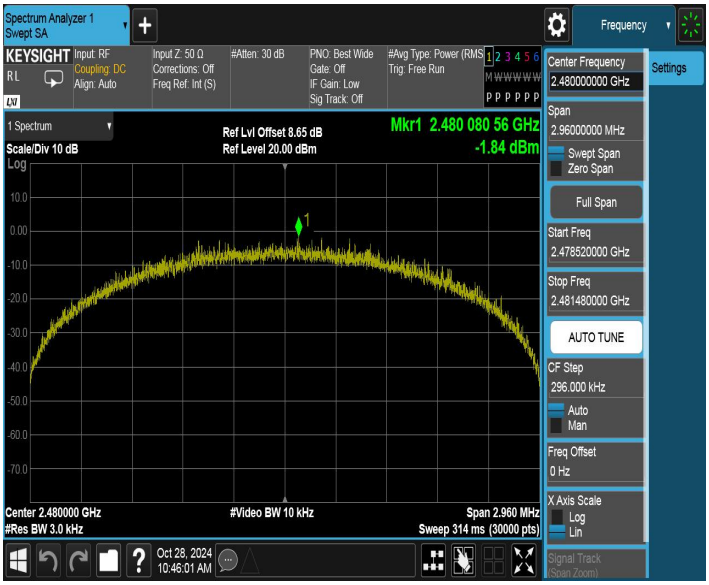
Test Graphs

ZIGB_Ant1_2405



ZIGB_Ant1_2440



ZIGB_Ant1_2480


7.5. Conducted Band Edge and Out-of-Band Emissions

7.5.1. Test Limit

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100 kHz bandwidth per the PSD procedure.

7.5.2. Test Procedure Used

KDB 558074 D01 v05r02 - Section 8.5 & Section 8.6

ANSI C63.10 – Section 11.11&11.12

7.5.3. Test Settitng

(a) Set the center frequency and span to encompass frequency range to be measured

(b) RBW = 100kHz

(c) VBW = 300kHz

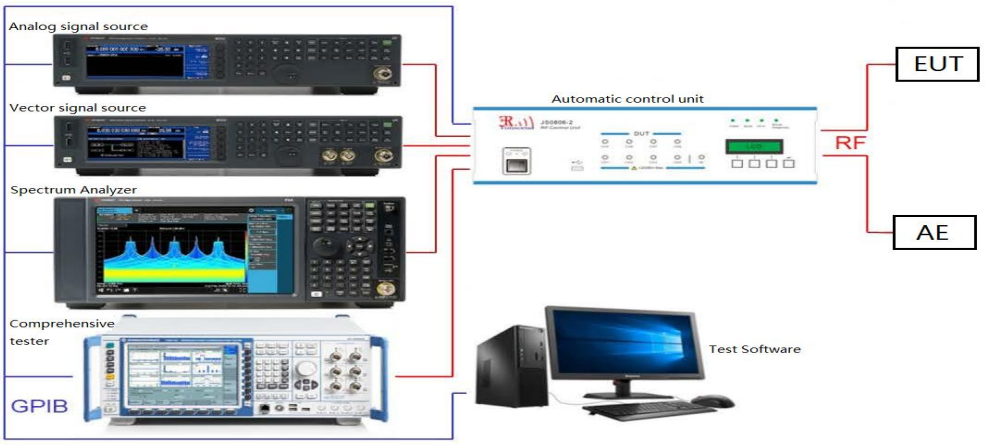
(d) Detector = Peak

(e) Trace mode = max hold

(f) Sweep time = auto couple

(g) The trace was allowed to stabilize

7.5.4. Test Setup



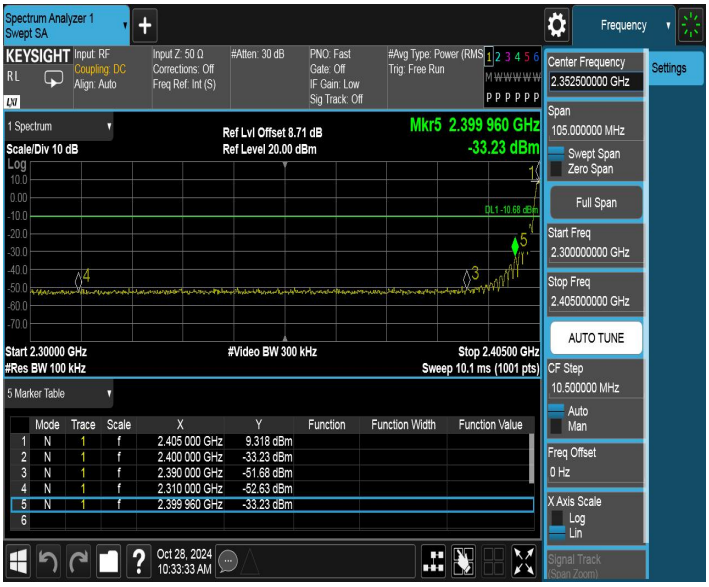
7.5.5. Test Result

Test Mode	Antenna	ChName	Frequency (MHz)	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
ZIGB	Ant1	Low	2405	9.32	-33.23	≤-10.68	PASS
		High	2480	8.61	-29.34	≤-11.40	PASS

Test Mode	Antenna	Frequency (MHz)	Frequency Range [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
ZIGB	Ant1	2405	Reference	9.32	9.32	---	PASS
			30~1000	9.32	-61.54	≤-10.68	PASS
			1000~26500	9.32	-48.26	≤-10.68	PASS
		2440	Reference	8.93	8.93	---	PASS
			30~1000	8.93	-60.82	≤-11.07	PASS
			1000~26500	8.93	-47.68	≤-11.07	PASS
		2480	Reference	8.63	8.63	---	PASS
			30~1000	8.63	-61.16	≤-11.37	PASS
			1000~26500	8.63	-47.65	≤-11.37	PASS

Test Graphs of Band Edge

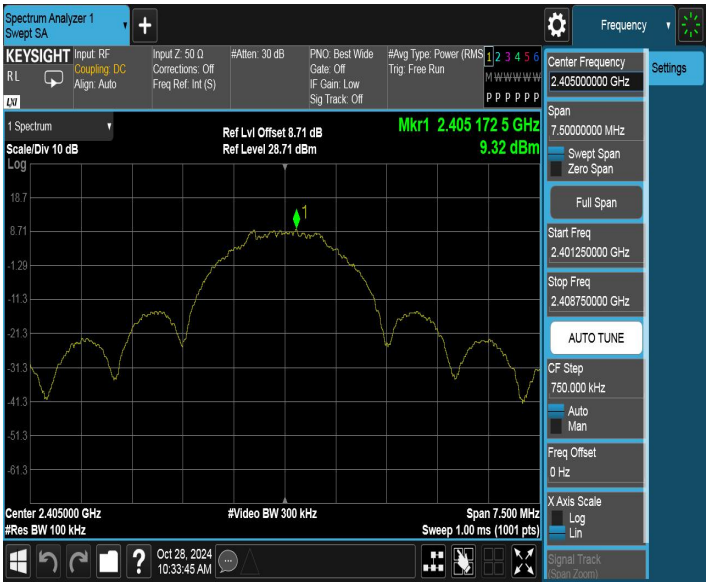
ZIGB_Ant1_Low_2405



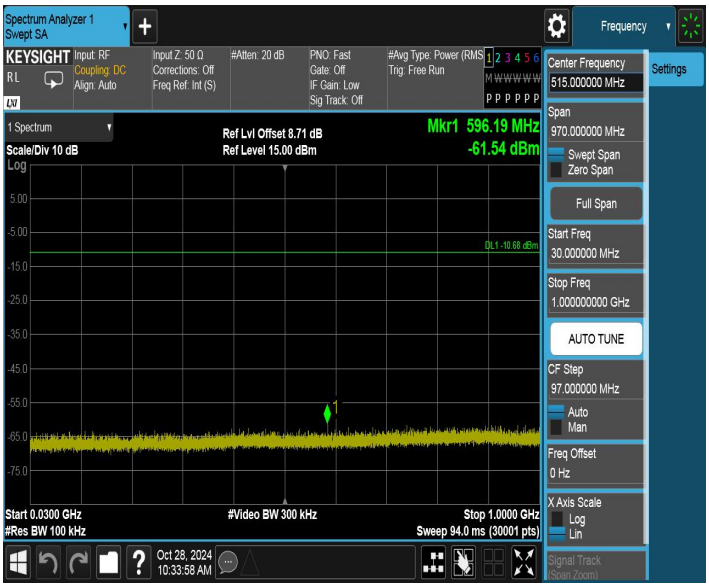
ZIGB_Ant1_High_2480

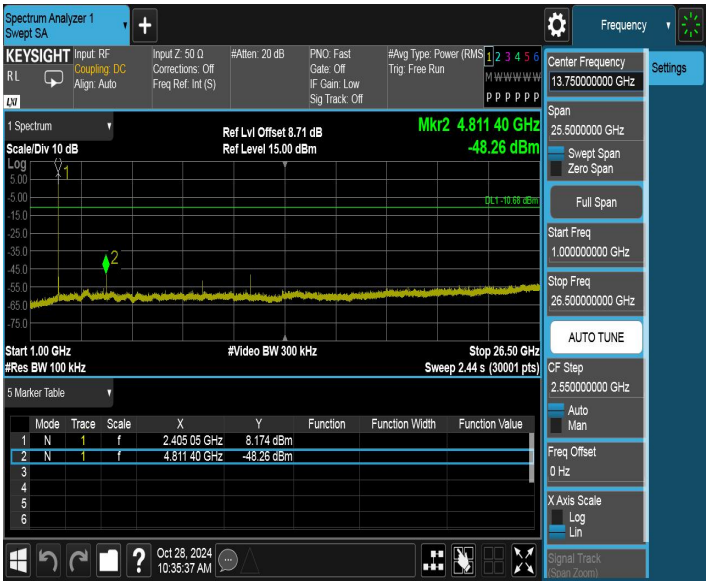
Test Graphs of Out-of-Band Emissions

ZIGB_Ant1_2405_0~Reference

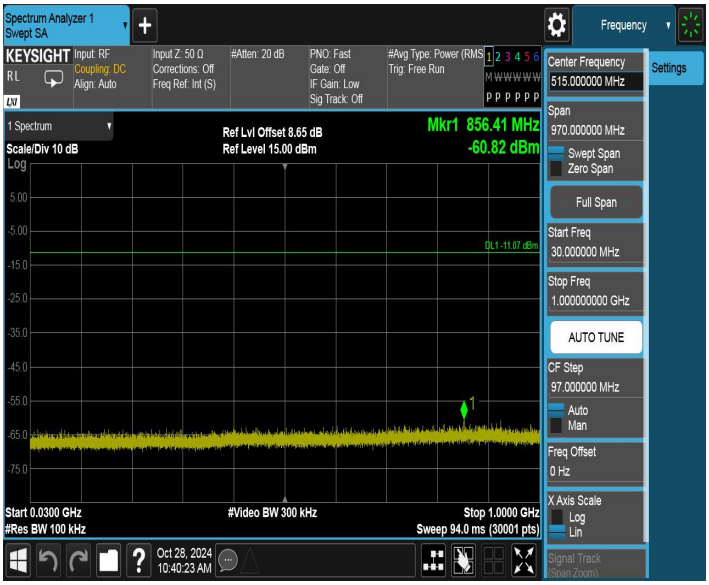


ZIGB_Ant1_2405_30~1000

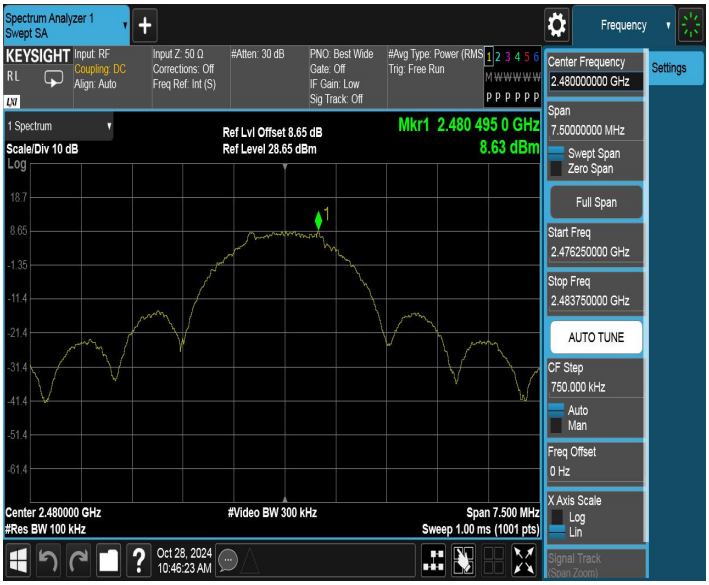


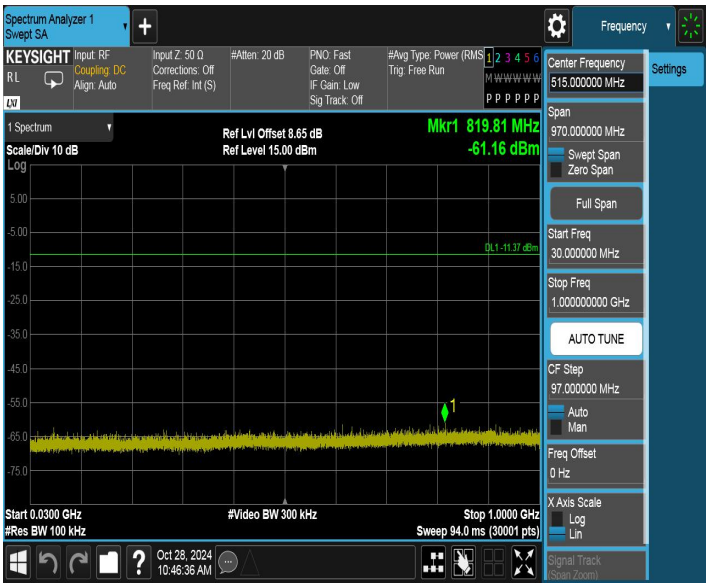
ZIGB_Ant1_2405_1000~26500


ZIGB_Ant1_2440_0~Reference

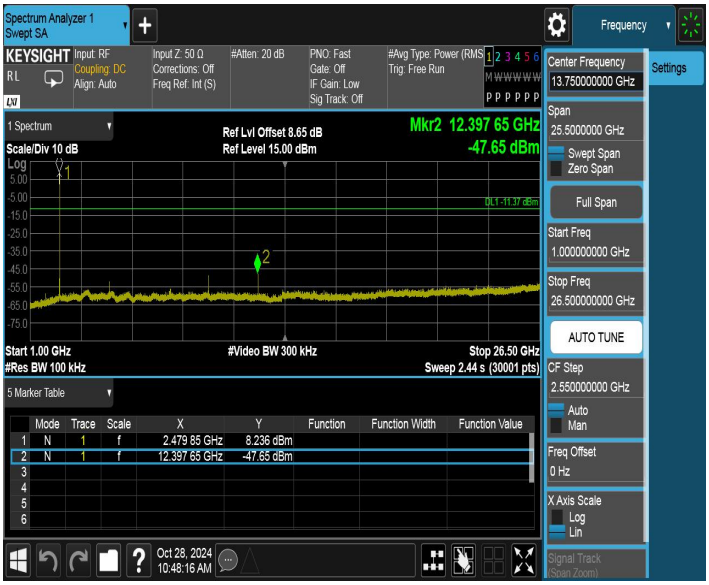

ZIGB_Ant1_2440_30~1000


ZIGB_Ant1_2440_1000~26500


ZIGB_Ant1_2480_0~Reference


ZIGB_Ant1_2480_30~1000


ZIGB_Ant1_2480_1000~26500



7.6. Radiated Spurious Emission Measurement

7.6.1. Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 – 0.490	2400/F (kHz)	300
0.490 – 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

7.6.2. Test Procedure Used

ANSI C63.10-2013 – Section 6.6.4.3

7.6.3. Test Setting

Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in Table 1
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold

7. Trace was allowed to stabilize

Table 1 - RBW as a function of frequency

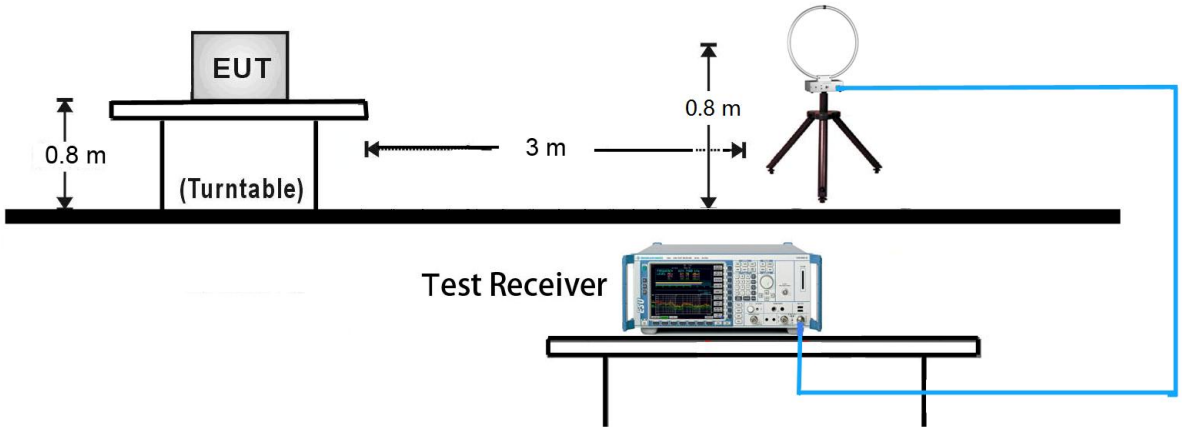
Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

Average Field Strength Measurements

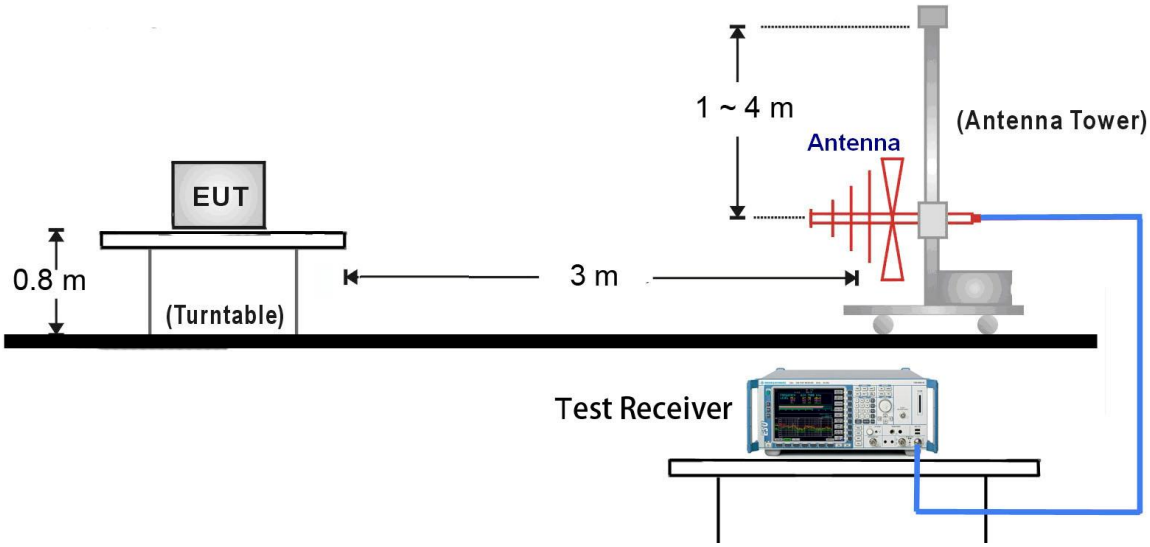
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = Power Average (RMS)
5. Number of sweep point = 2001 (Number of sweep points must be ≥ 2 x span / RBW)
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces.

7.6.4. Test Setup

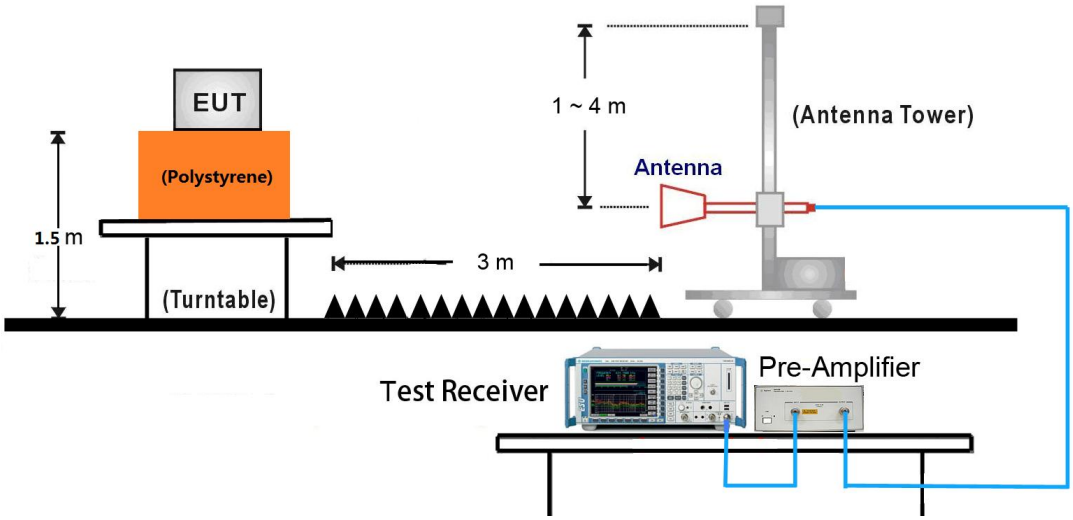
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



1GHz ~ 26.5GHz Test Setup:

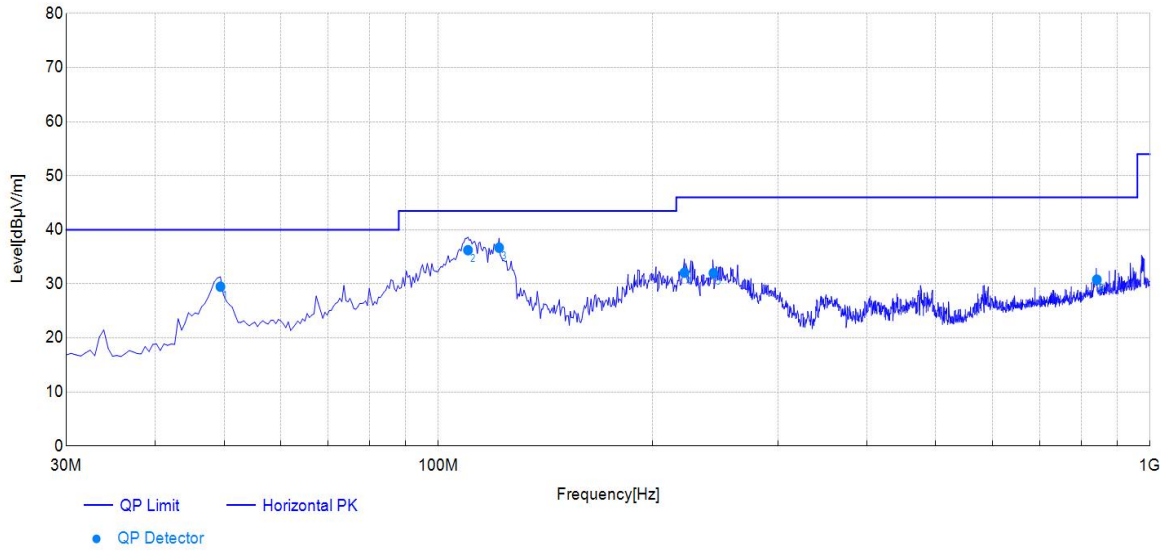


7.6.5. Test Result

The worst case of Radiated Emission below 1GHz:

30MHz – 1GHz Test Data

EUT:	IOT Module	Polarity:	Horizontal
Model:	TRZB1	SN:	N/A
Mode:	Transmit at Zigbee Channel 11	Voltage:	DC 3.3V
Environment:	Temp: 25.1℃; Humi:53%	Engineer:	Stone Zhang



Final Data List										
NO.	Frequency [MHz]	Factor [dB/m]	QP Reading [dBµV]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pol	Verdict
1	49.41	14.53	14.96	29.49	40.00	10.51	200	108	Horizontal	PASS
2	110.07	12.67	23.57	36.24	43.50	7.26	150	147	Horizontal	PASS
3	121.71	13.86	22.83	36.69	43.50	6.81	150	119	Horizontal	PASS
4	221.67	12.61	19.46	32.07	46.00	13.93	150	178	Horizontal	PASS
5	243.51	13.45	18.54	31.99	46.00	14.01	150	147	Horizontal	PASS
6	841.81	25.06	5.73	30.79	46.00	15.21	150	48	Horizontal	PASS

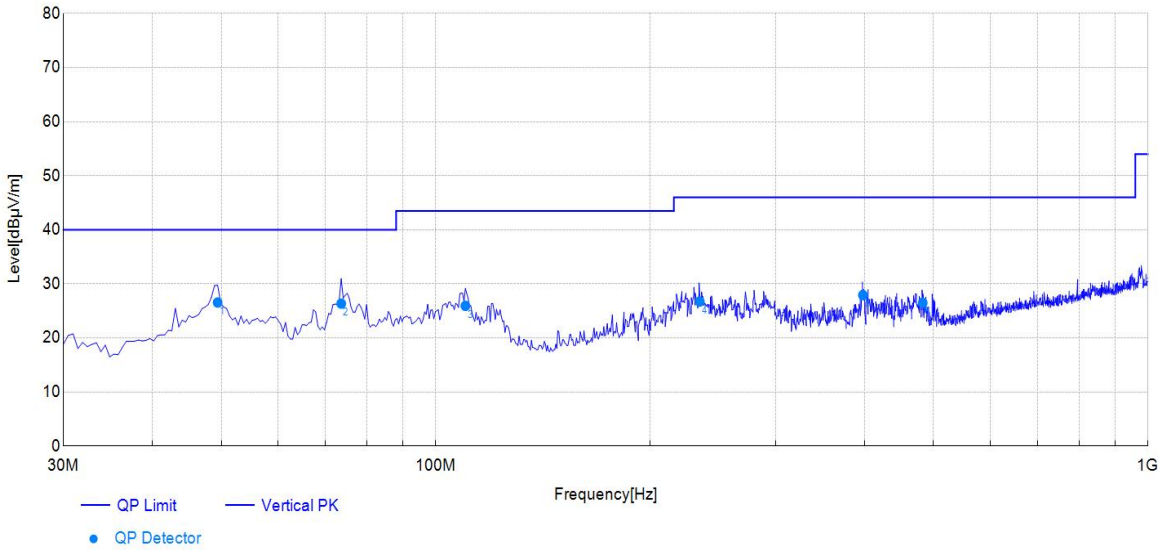
Note:

(1) Level=Reading + Factor

(2) Margin=Limit-Level

(3) The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

EUT:	IOT Module	Polarity:	Vertical
Model:	TRZB1	SN:	N/A
Mode:	Transmit at Zigbee Channel 11	Voltage:	DC 3.3V
Environment:	Temp: 25.1℃; Humi:53%	Engineer:	Stone Zhang



Final Data List										
NO.	Frequency [MHz]	Factor [dB/m]	QP Reading [dBµV]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pol	Verdict
1	49.41	14.53	12.03	26.56	40.00	13.44	150	42	Vertical	PASS
2	73.67	11.50	14.85	26.35	40.00	13.65	150	162	Vertical	PASS
3	110.07	12.67	13.27	25.94	43.50	17.56	200	215	Vertical	PASS
4	234.77	13.12	13.62	26.74	46.00	19.26	150	135	Vertical	PASS
5	397.81	17.36	10.57	27.93	46.00	18.07	200	54	Vertical	PASS
6	482.73	19.28	7.21	26.49	46.00	19.51	150	121	Vertical	PASS

Note:

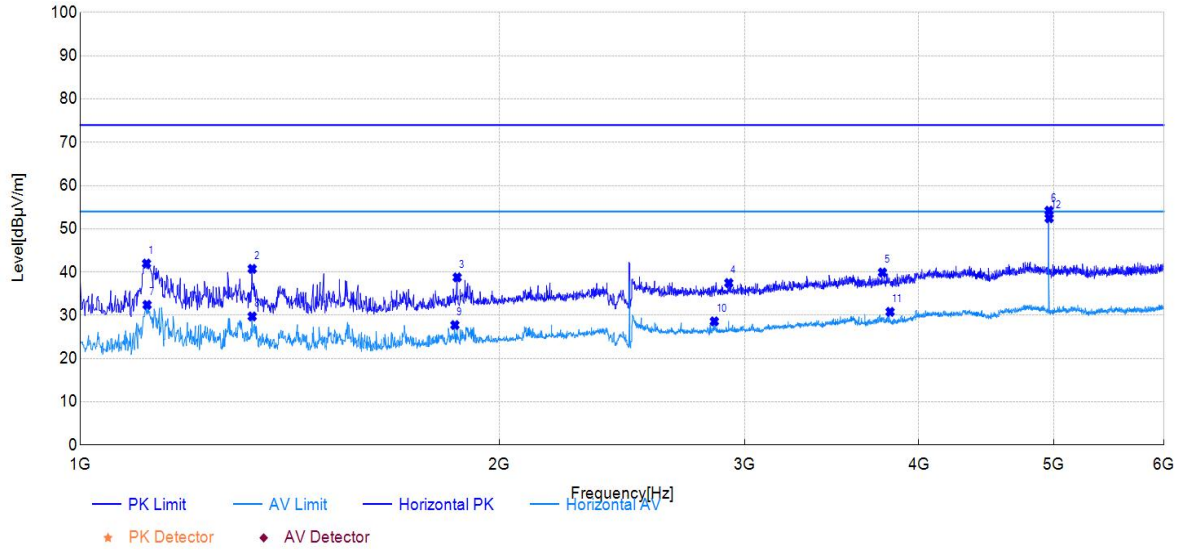
(1) Level=Reading + Factor

(2) Margin=Limit-Level

(3) The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

1GHz-6GHz

Test Mode:	Zigbee	Test Date:	2024-10-23
Test Channel:	11	Test Engineer:	Stone Zhang



Suspected Data List											
NO.	Frequency [MHz]	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Det	Pol	Verdict
1	1116.00	65.75	41.97	-23.78	74.00	32.03	150	140	PK	Horizontal	PASS
2	1329.00	63.43	40.74	-22.69	74.00	33.26	150	122	PK	Horizontal	PASS
3	1865.00	57.96	38.77	-19.19	74.00	35.23	150	302	PK	Horizontal	PASS
4	2922.00	52.17	37.47	-14.70	74.00	36.53	150	45	PK	Horizontal	PASS
5	3767.00	50.37	39.90	-10.47	74.00	34.10	150	207	PK	Horizontal	PASS
6	4961.00	60.40	54.19	-6.21	74.00	19.81	150	55	PK	Horizontal	PASS
7	1117.00	56.18	32.41	-23.77	54.00	21.59	150	145	AV	Horizontal	PASS
8	1329.00	52.43	29.74	-22.69	54.00	24.26	150	122	AV	Horizontal	PASS
9	1858.00	46.96	27.74	-19.22	54.00	26.26	150	356	AV	Horizontal	PASS
10	2853.00	43.55	28.60	-14.95	54.00	25.40	150	41	AV	Horizontal	PASS
11	3815.00	40.84	30.79	-10.05	54.00	23.21	150	9	AV	Horizontal	PASS
12	4962.00	58.64	52.44	-6.20	54.00	1.56	150	55	AV	Horizontal	PASS

Note:

(1) Level=Reading + Factor

(2) Margin=Limit-Level