

Please refer to the following test plots for the worst test mode (GFSK 2LE).

Test Frequency 1GHz-25GHz:

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Low Channel:2402MHz									
V	4804.00	55.81	30.55	5.77	24.66	55.69	74	-18.31	Pk
V	4804.00	45.30	30.55	5.77	24.66	45.18	54	-8.82	AV
V	7206.00	53.98	30.33	6.32	24.55	54.52	74	-19.48	Pk
V	7206.00	43.30	30.33	6.32	24.55	43.84	54	-10.16	AV
V	9608.00	52.22	30.85	7.45	24.69	53.51	74	-20.49	Pk
V	9608.00	42.73	30.85	7.45	24.69	44.02	54	-9.98	AV
V	12010.00	49.17	31.02	8.99	25.57	52.71	74	-21.29	Pk
V	12010.00	41.32	31.02	8.99	25.57	44.86	54	-9.14	AV
H	4804.00	55.91	30.55	5.77	24.66	55.79	74	-18.21	Pk
H	4804.00	45.86	30.55	5.77	24.66	45.74	54	-8.26	AV
H	7206.00	53.34	30.33	6.32	24.55	53.88	74	-20.12	Pk
H	7206.00	44.04	30.33	6.32	24.55	44.58	54	-9.42	AV
H	9608.00	50.80	30.85	7.45	24.69	52.09	74	-21.91	Pk
H	9608.00	41.46	30.85	7.45	24.69	42.75	54	-11.25	AV
H	12010.00	48.99	31.02	8.99	25.57	52.53	74	-21.47	Pk
H	12010.00	40.76	31.02	8.99	25.57	44.30	54	-9.70	AV

Polar (H/V)	Frequency	Meter Reading	Pre- amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
Middle Channel:2440MHz									
V	4880.00	54.85	30.55	5.77	24.66	54.73	74	-19.27	Pk
V	4880.00	45.32	30.55	5.77	24.66	45.20	54	-8.80	AV
V	7320.00	52.80	30.33	6.32	24.55	53.34	74	-20.66	Pk
V	7320.00	44.02	30.33	6.32	24.55	44.56	54	-9.44	AV
V	9760.00	51.56	30.85	7.45	24.69	52.85	74	-21.15	Pk
V	9760.00	42.05	30.85	7.45	24.69	43.34	54	-10.66	AV
V	12200.00	49.67	31.02	8.99	25.57	53.21	74	-20.79	Pk
V	12200.00	41.12	31.02	8.99	25.57	44.66	54	-9.34	AV
H	4880.00	53.77	30.55	5.77	24.66	53.65	74	-20.35	Pk
H	4880.00	45.19	30.55	5.77	24.66	45.07	54	-8.93	AV
H	7320.00	53.75	30.33	6.32	24.55	54.29	74	-19.71	Pk
H	7320.00	44.97	30.33	6.32	24.55	45.51	54	-8.49	AV
H	9760.00	52.20	30.85	7.45	24.69	53.49	74	-20.51	Pk
H	9760.00	43.98	30.85	7.45	24.69	45.27	54	-8.73	AV
H	12200.00	50.38	31.02	8.99	25.57	53.92	74	-20.08	Pk
H	12200.00	41.07	31.02	8.99	25.57	44.61	54	-9.39	AV

Polar (H/V)	Frequency	Meter Reading	Pre- amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
High Channel:2480MHz									
V	4960.00	54.19	30.55	5.77	24.66	54.07	74	-19.93	Pk
V	4960.00	44.07	30.55	5.77	24.66	43.95	54	-10.05	AV
V	7440.00	52.86	30.33	6.32	24.55	53.40	74	-20.60	Pk
V	7440.00	43.61	30.33	6.32	24.55	44.15	54	-9.85	AV
V	9920.00	50.50	30.85	7.45	24.69	51.79	74	-22.21	Pk
V	9920.00	39.90	30.85	7.45	24.69	41.19	54	-12.81	AV
V	12400.00	49.33	31.02	8.99	25.57	52.87	74	-21.13	Pk
V	12400.00	39.24	31.02	8.99	25.57	42.78	54	-11.22	AV
H	4960.00	55.24	30.55	5.77	24.66	55.12	74	-18.88	Pk
H	4960.00	46.36	30.55	5.77	24.66	46.24	54	-7.76	AV
H	7440.00	51.94	30.33	6.32	24.55	52.48	74	-21.52	Pk
H	7440.00	44.59	30.33	6.32	24.55	45.13	54	-8.87	AV
H	9920.00	50.19	30.85	7.45	24.69	51.48	74	-22.52	Pk
H	9920.00	41.39	30.85	7.45	24.69	42.68	54	-11.32	AV
H	12400.00	48.58	31.02	8.99	25.57	52.12	74	-21.88	Pk
H	12400.00	38.40	31.02	8.99	25.57	41.94	54	-12.06	AV

Note: 1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,

Margin= Emission Level - Limit

2. If peak below the average limit, the average emission was no test.

3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Please refer to the following test plots for the worst test mode (GFSK 2LE).

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

	Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV/m)	Detector Type	Result
GFSK	Low Channel: 2402MHz									
	H	2390.00	55.37	30.22	4.85	23.98	53.98	74	PK	PASS
	H	2390.00	47.45	30.22	4.85	23.98	46.06	54	AV	PASS
	H	2400.00	55.01	30.22	4.85	23.98	53.62	74	PK	PASS
	H	2400.00	46.94	30.22	4.85	23.98	45.55	54	AV	PASS
	V	2390.00	55.85	30.22	4.85	23.98	54.46	74	PK	PASS
	V	2390.00	45.01	30.22	4.85	23.98	43.62	54	AV	PASS
	V	2400.00	55.37	30.22	4.85	23.98	53.98	74	PK	PASS
	V	2400.00	45.94	30.22	4.85	23.98	44.55	54	AV	PASS
	High Channel: 2480MHz									
	H	2483.50	56.14	35.11	3.56	27.75	52.34	74	PK	PASS
	H	2483.50	46.28	35.11	3.56	27.75	42.48	54	AV	PASS
	H	2500.00	56.95	35.1	3.57	27.8	53.22	74	PK	PASS
	H	2500.00	46.23	35.1	3.57	27.8	42.50	54	AV	PASS
	V	2483.50	56.35	35.11	3.56	27.75	52.55	74	PK	PASS
	V	2483.50	56.70	35.11	3.56	27.75	52.90	54	AV	PASS
V	2500.00	57.56	35.1	3.57	27.8	53.83	74	PK	PASS	
V	2500.00	46.98	35.1	3.57	27.8	43.25	54	AV	PASS	
Remark:										
1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier, Margin= Emission Level - Limit										

7 Conduct Band Edge And Spurious Emissions Measurement

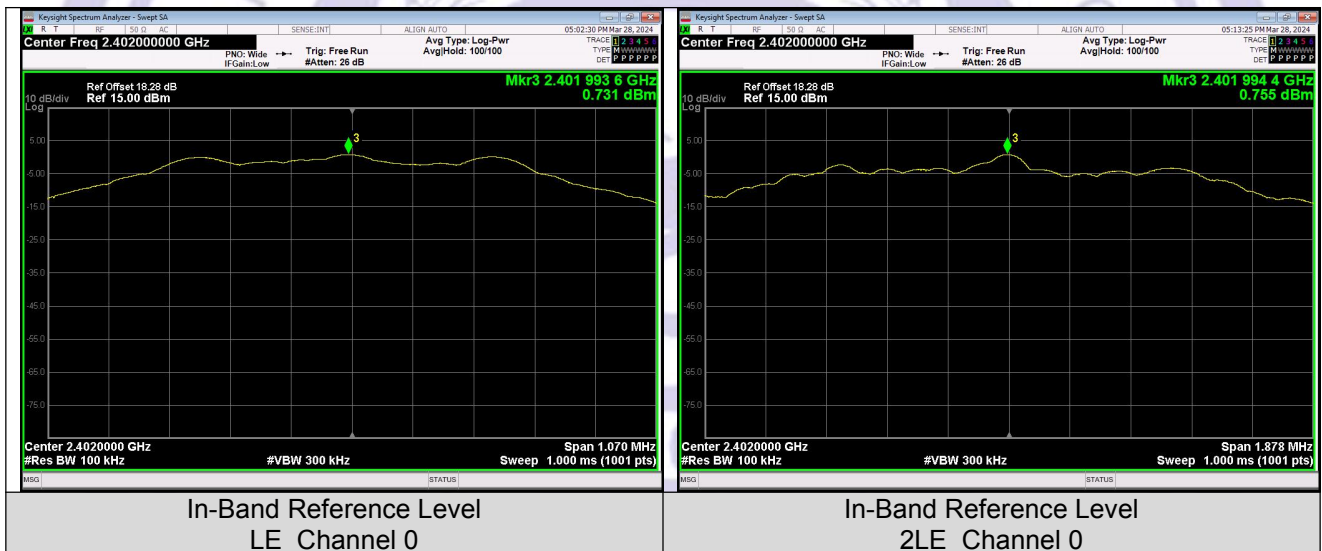
- Test Requirement : Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
- Test Method : ANSI C63.10:2013
- Test Limit : Regulation 15.247 (d),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 power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, 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)).

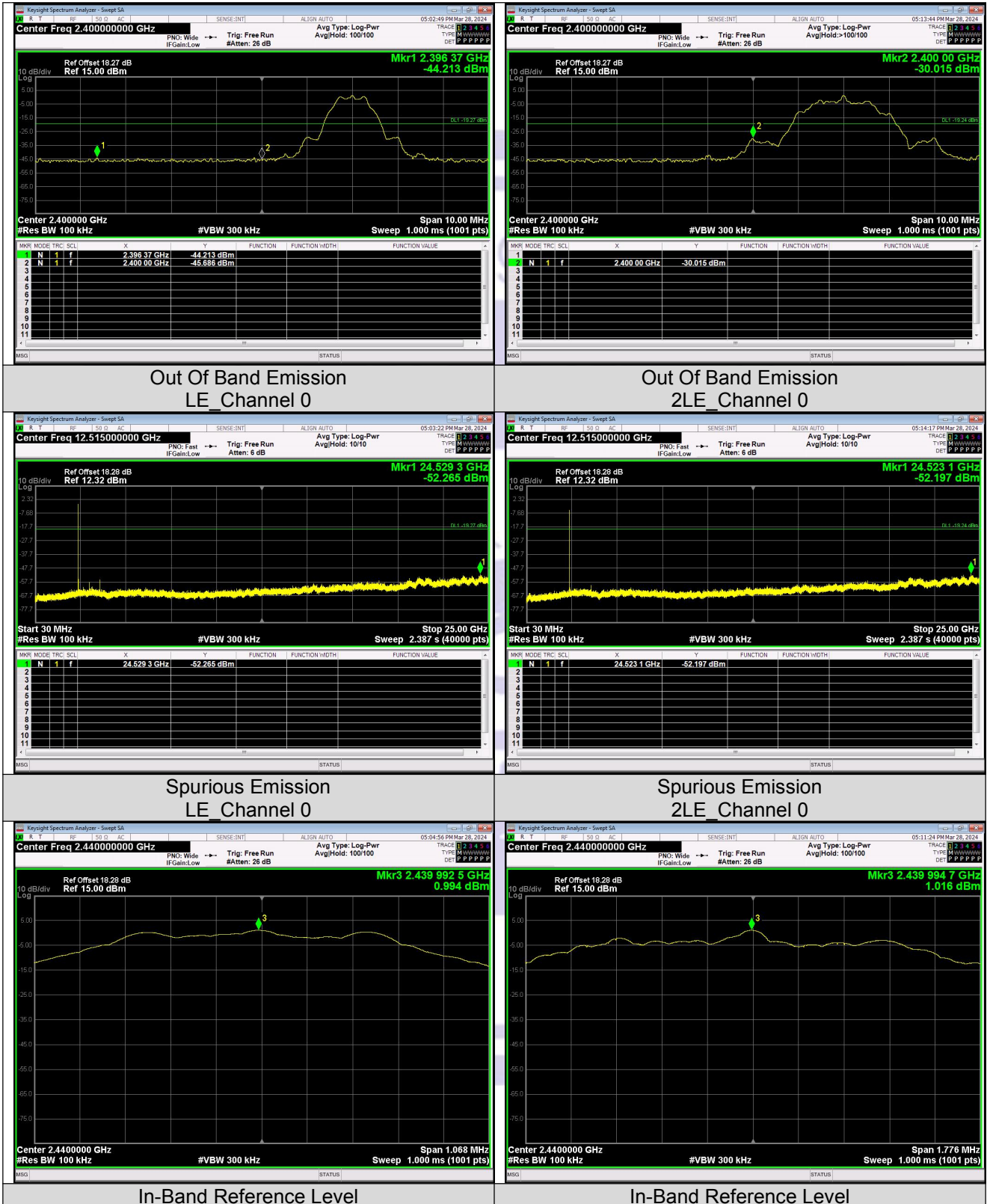
7.1 Test Procedure

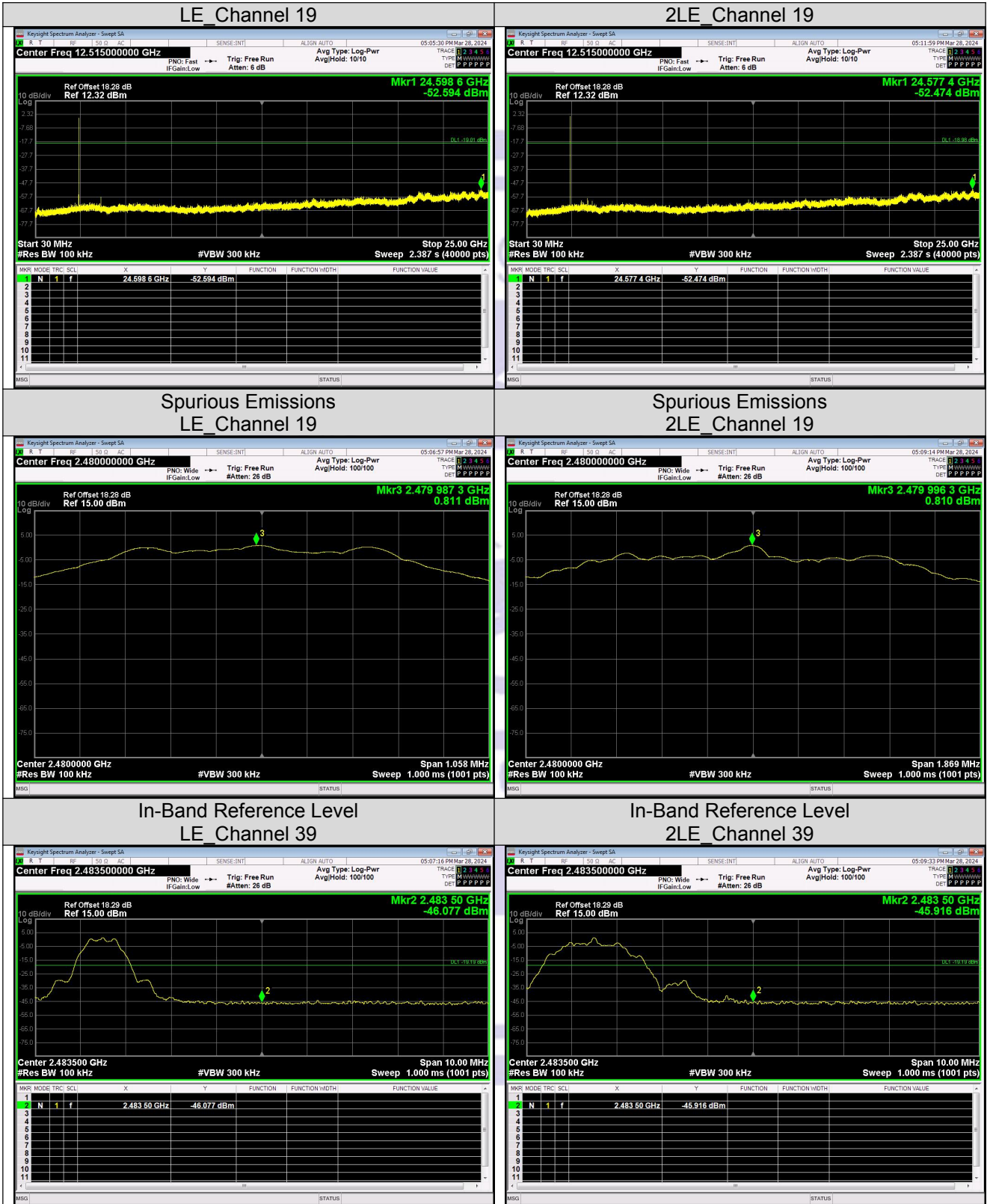
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold

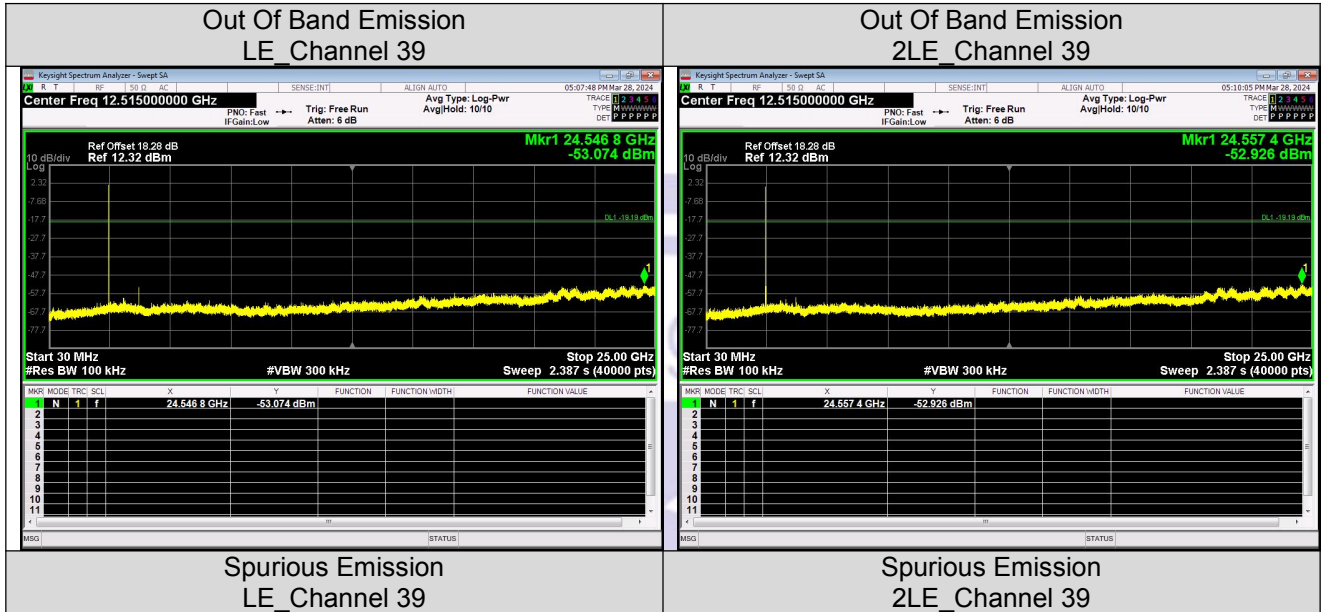
7.2 Test Result

Mode	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
LE	0	2400.00	-45.686	-19.27	-26.416	PASS
		2396.37	-44.213	-19.27	-24.943	PASS
		24529.3	-52.265	-19.27	-32.995	PASS
	39	24598.6	-52.594	-19.01	-33.584	PASS
		2483.50	-46.077	-19.19	-26.887	PASS
		24546.8	-53.074	-19.19	-33.884	PASS
2LE	0	2400.00	-30.015	-19.24	-10.775	PASS
		24523.1	-52.197	-19.24	-32.957	PASS
	19	24577.4	-52.474	-18.98	-33.494	PASS
		2483.50	-45.916	-19.19	-26.726	PASS
	39	24557.4	-52.926	-19.19	-33.736	PASS









8 6dB Bandwidth Measurement & 99% OCB Test

Test Requirement : FCC CFR47 Part 15 Section 15.247 (a)(2)

Test Method : ANSI C63.10:2013

Test Limit
Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

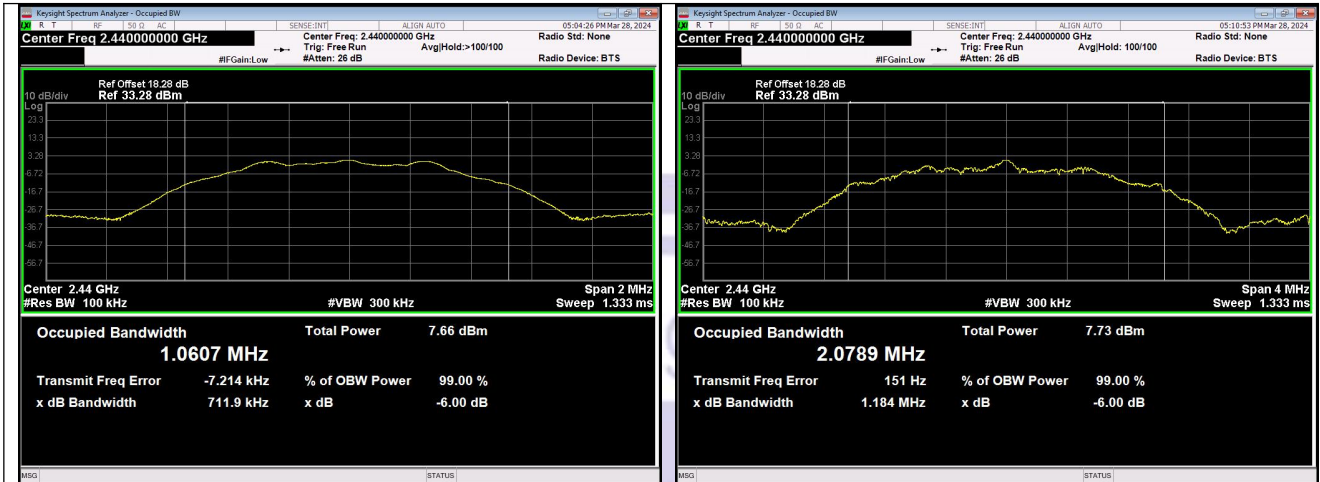
8.1 Test Procedure

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(For 6dB bandwidth)
3. Set the spectrum analyzer: RBW = 20kHz, VBW = 62kHz(For LE 99% bandwidth)
4. Set the spectrum analyzer: RBW = 30kHz, VBW = 91kHz(For 2LE 99% bandwidth)

8.2 Test Result

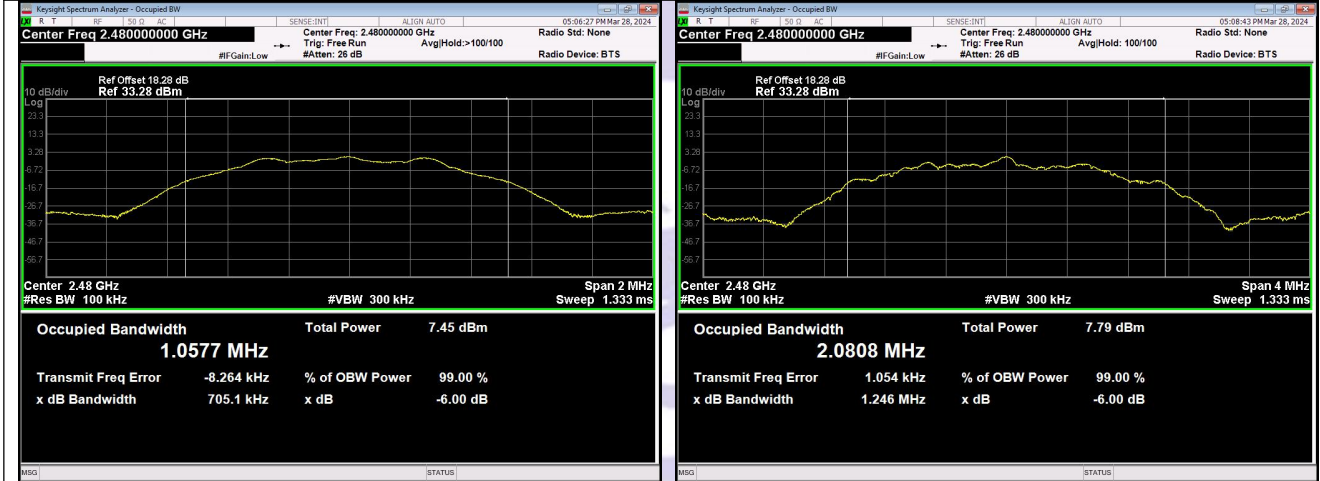
Mode	Channel number	Channel frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	6dB BW Required Limit (KHz)	Result
LE	00	2402	0.7131	1.0373	>500	Pass
	19	2440	0.7119	1.0373	>500	
	39	2480	0.7051	1.0349	>500	
2LE	00	2402	1.252	2.0545	>500	Pass
	19	2440	1.184	2.0518	>500	
	39	2480	1.246	2.0457	>500	





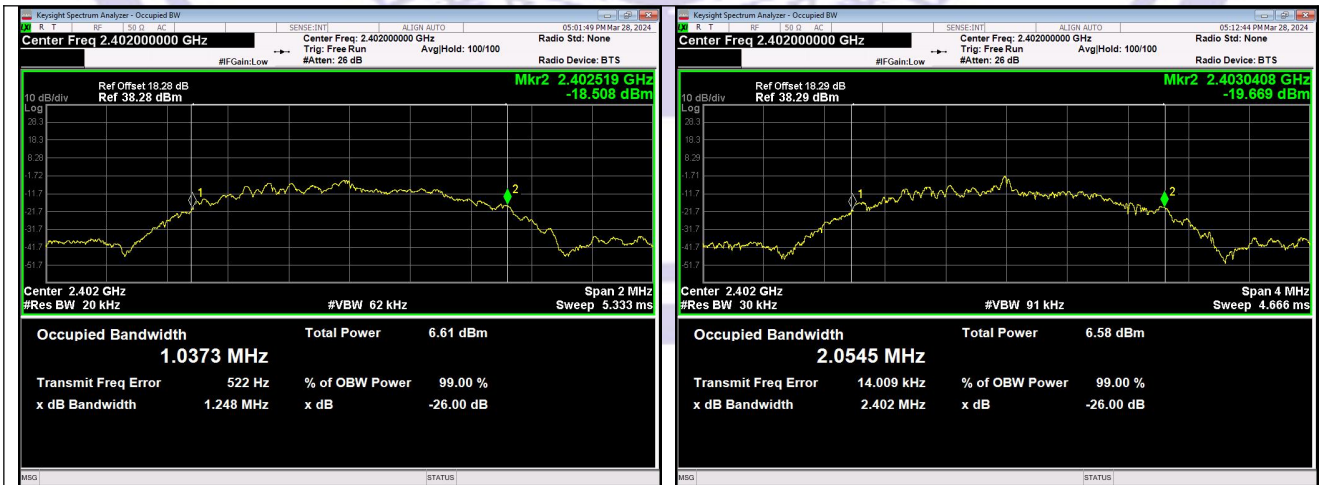
LE_Channel 19

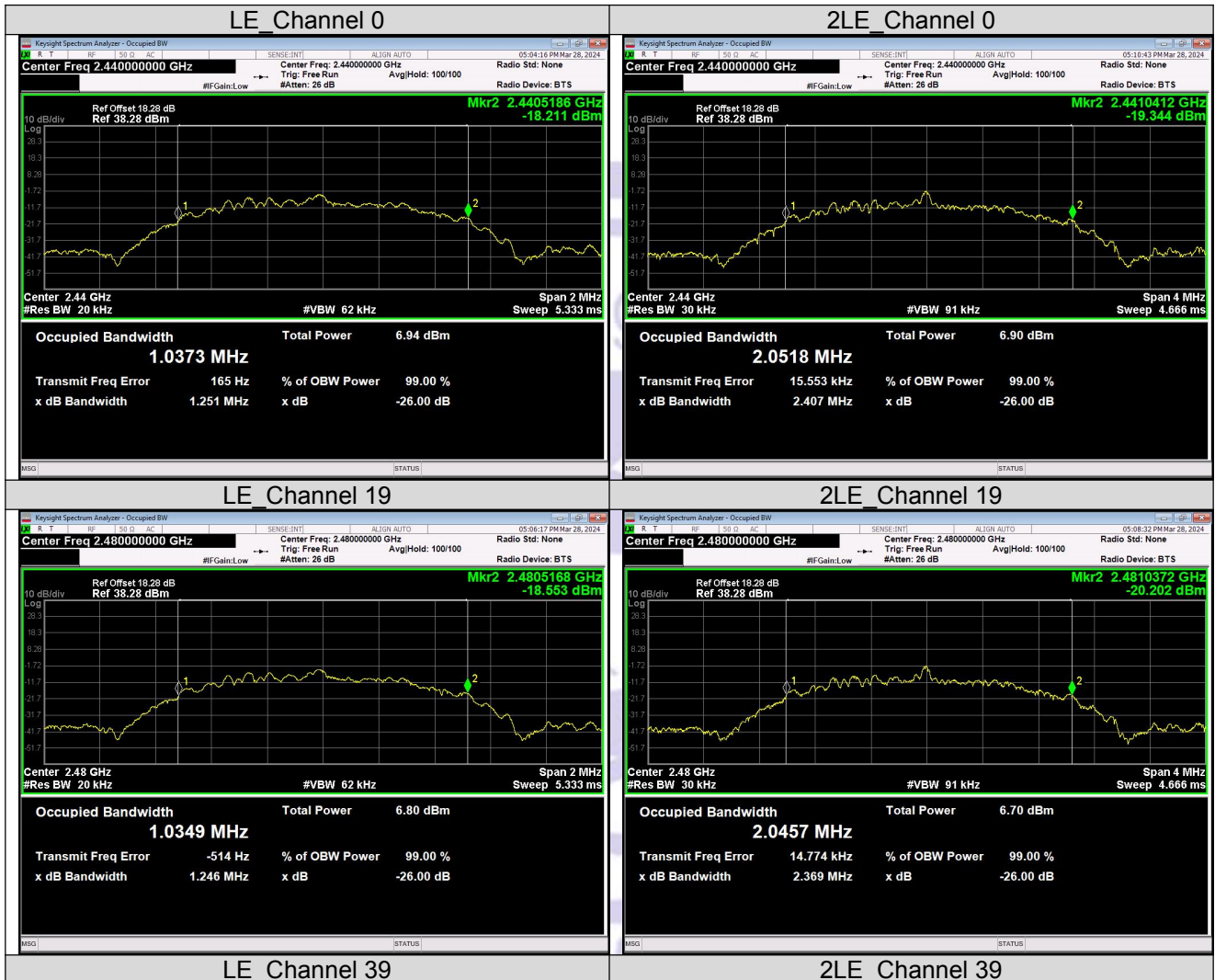
2LE_Channel 19



LE_Channel 39

2LE_Channel 39





9 Maximum Peak Output Power

Test Requirement : FCC CFR47 Part 15 Section 15.247 (b)(3)

Test Method : ANSI C63.10:2013

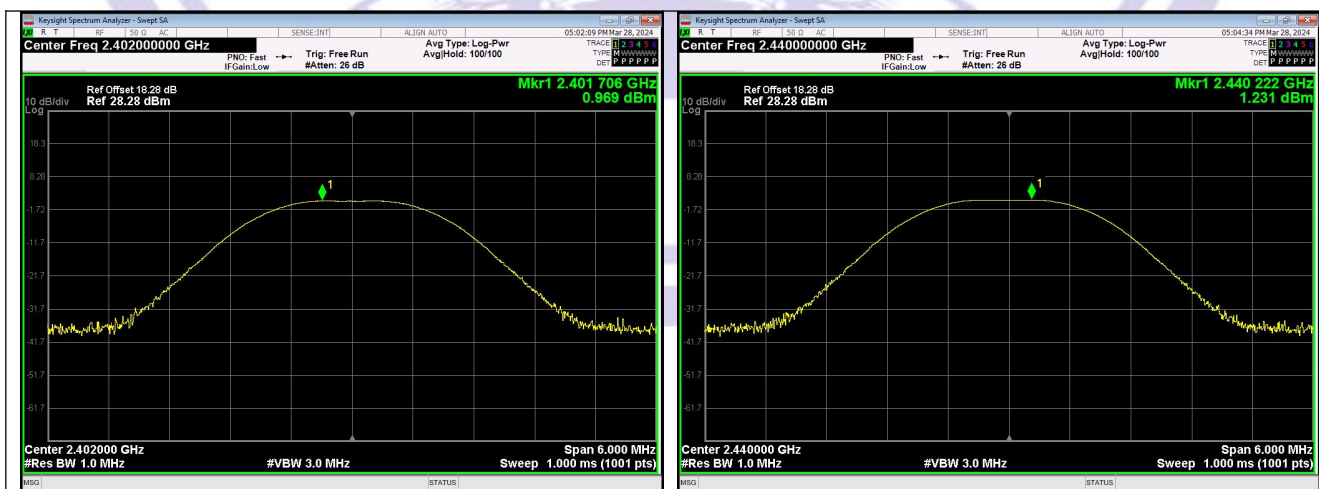
Test Limit : Regulation 15.247 (b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power.

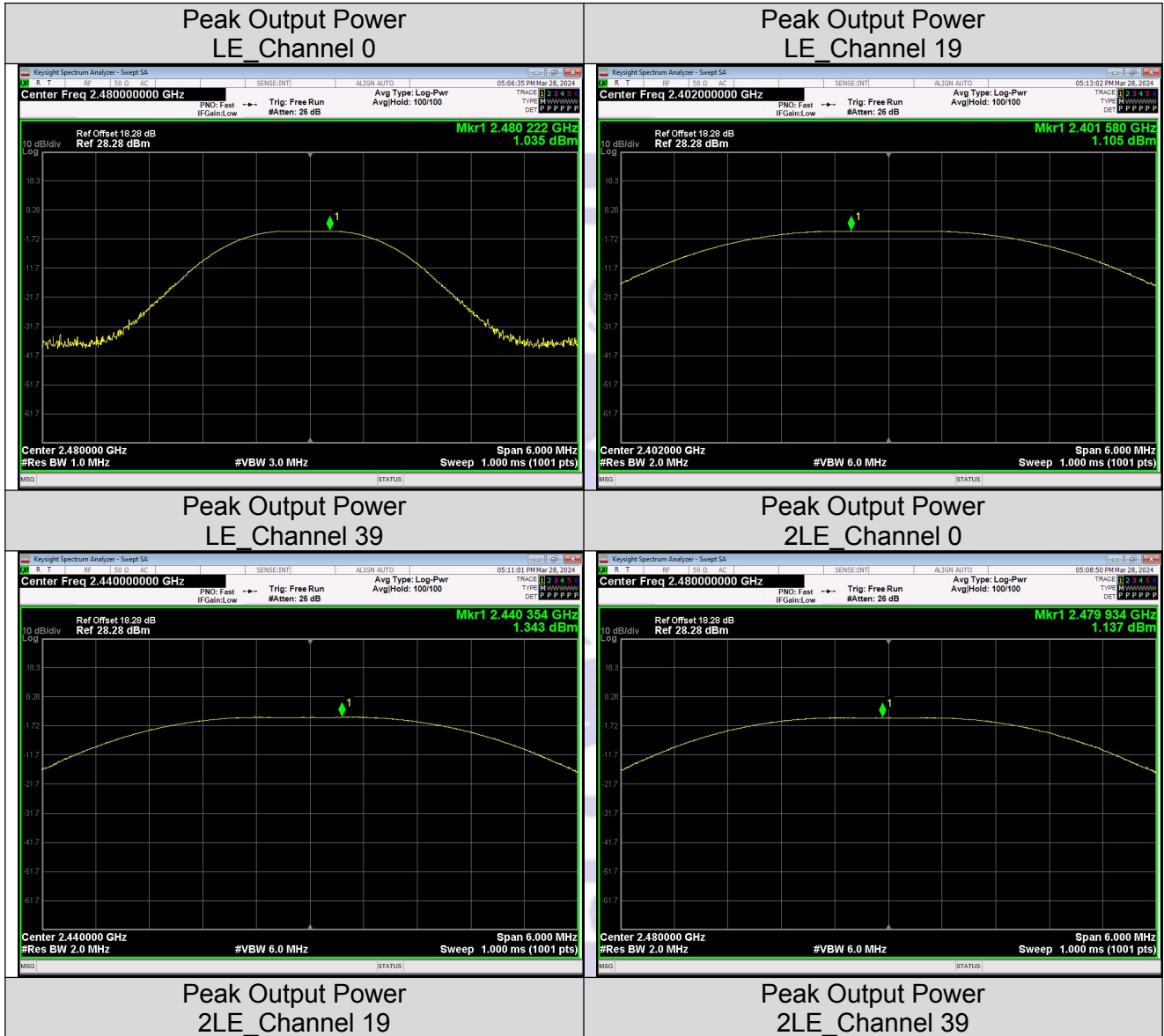
9.1 Test Procedure

1. The RF output of EUT was connected to the spectrum analyzer by RF cable and 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. Measure the conducted output power and record the results in the test report.

9.2 Test Result

Mode	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Max. Avg. Power (dBm)	Limit (dBm)	Result
LE	0	0.969	1.25	None	30	PASS
	19	1.231	1.33	None	30	PASS
	39	1.035	1.27	None	30	PASS
2LE	0	1.105	1.29	None	30	PASS
	19	1.343	1.36	None	30	PASS
	39	1.137	1.3	None	30	PASS





10 Power Spectral density

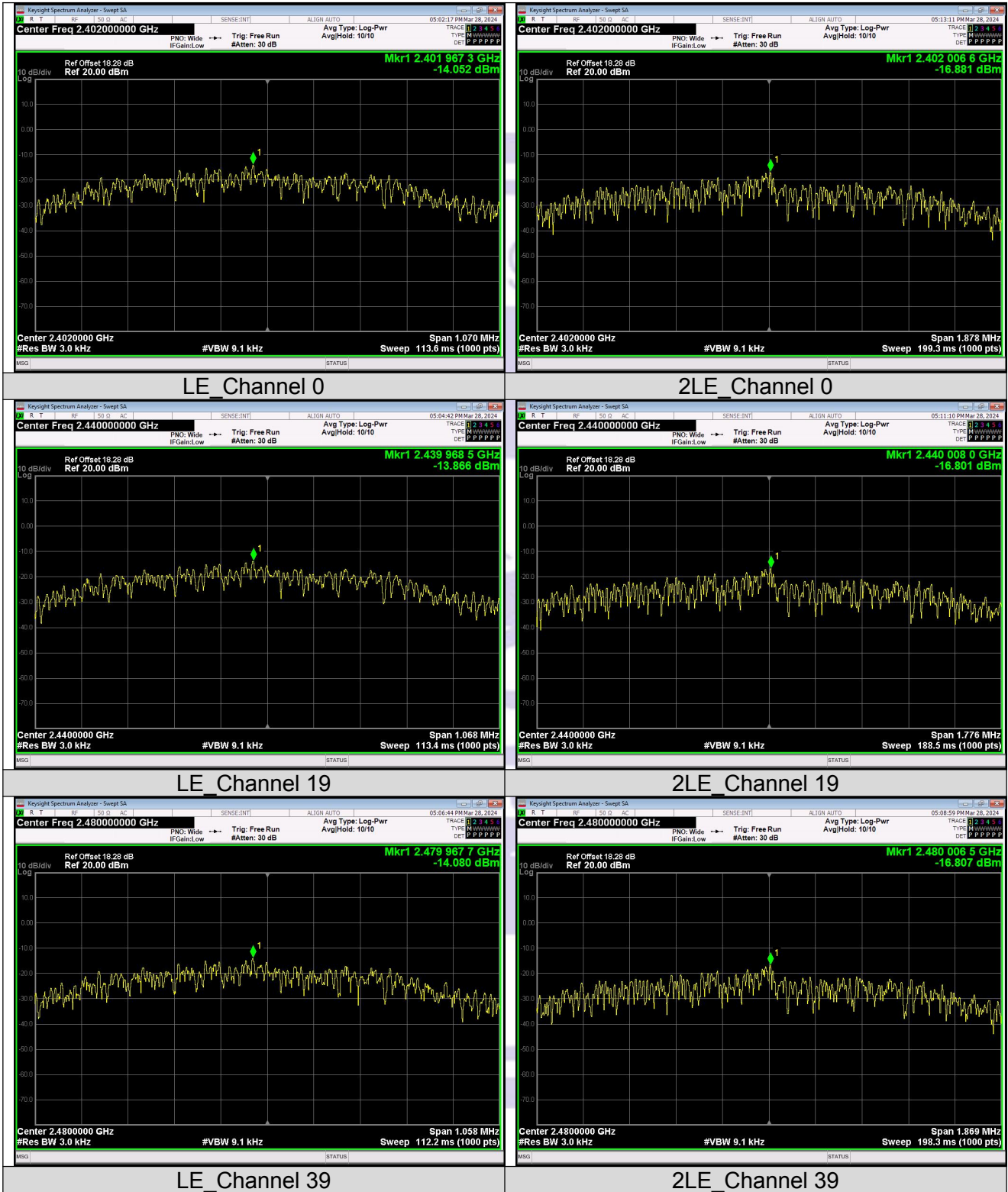
- Test Requirement : FCC CFR47 Part 15 Section 15.247 (e)
- Test Method : ANSI C63.10:2013
- Test Limit : Regulation 15.247(f) The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

10.1 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 = 3kHz. VBW = 9.1kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). 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.

10.2 Test Result

Mode	Channel number	Channel frequency (MHz)	Measurement level (dBm)	Required Limit (dBm/3kHz)	Pass/Fail
			PSD/3kHz		
LE	00	2402	-14.052	8	PASS
	19	2440	-13.866	8	PASS
	39	2480	-14.080	8	PASS
2LE	00	2402	-16.881	8	PASS
	19	2440	-16.801	8	PASS
	39	2480	-16.807	8	PASS



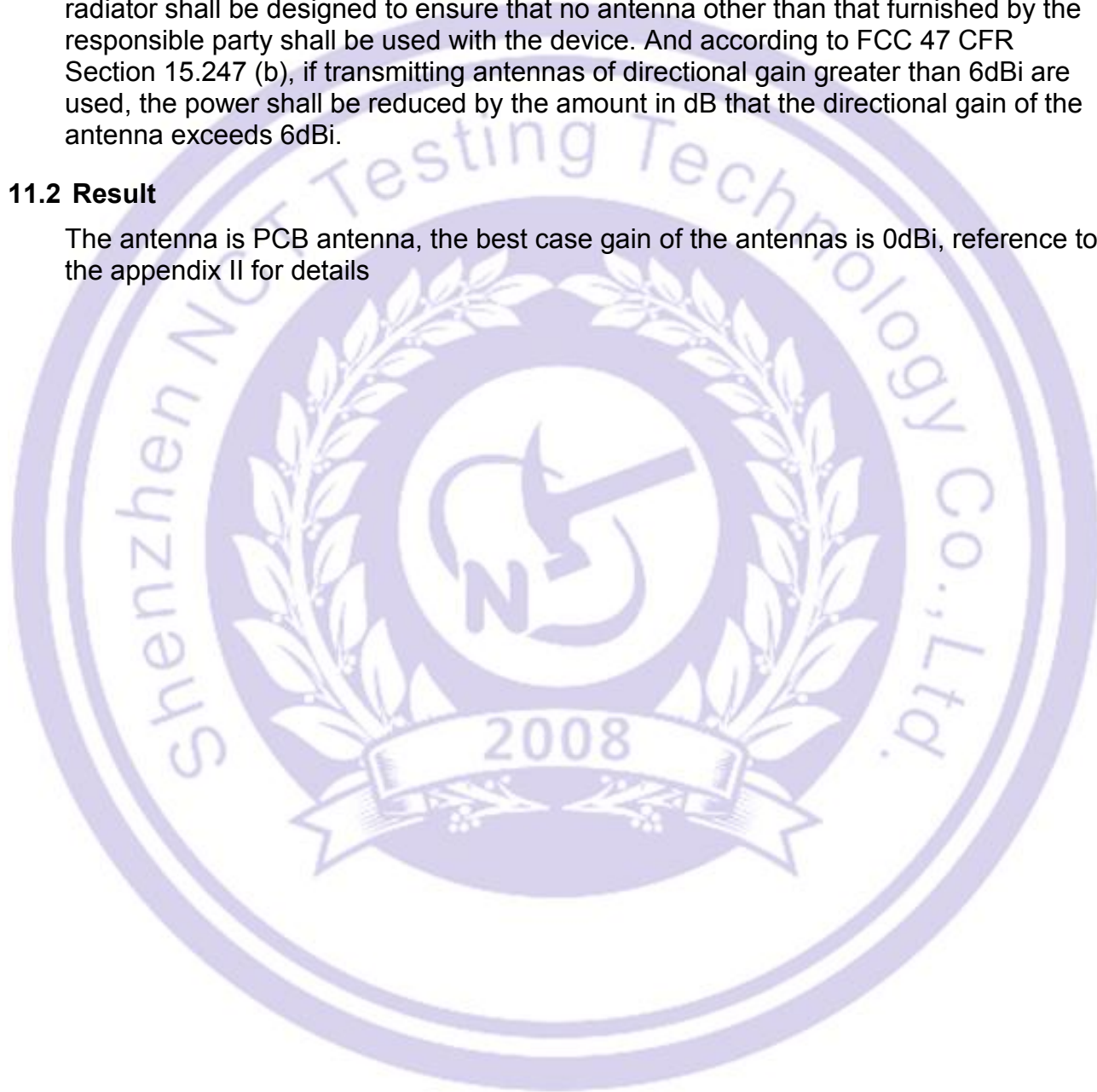
11 Antenna Application

11.1 Antenna Requirement

For intentional device, according to FCC 47 CFR Section 15.203, 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

11.2 Result

The antenna is PCB antenna, the best case gain of the antennas is 0dBi, reference to the appendix II for details



12 Test Setup

Please see the attachment for details.



13 EUT Photos

Please see the attachment for details.

*****THE END REPORT*****

