

Test Report

Product: Solar Repeater Kit

Trade Mark: KEEPTEN

Model No: D5L, D5L-R1, D5L-R2, D5L-R3,
D5L-R4, D5L-R5, D5L-R6, D5L-H1,
D5L-H2, D5L-H3, D5L-H4, D5L-H5,
D5L-H6, D5L-1A, D5L-2A, D5L-S1,
D5L-S2, D5L-S3, D5L-S4, D5L-S5,
D5L-S6, D5L-L1, D5L-L2, D5L-L3,
D5L-L4, D5L-L5, D5L-L6, D5L-G1,
D5L-G2, D5L-G3, D5L-G4, D5L-G5,
D5L-G6, D5L-E1, D5L-E2, D5L-E3,
D5L-E4, D5L-E5, D5L-E6

Report Number: SZNTT26038248E1-3

Test Standards: FCC 47 CFR Part 15 Subpart C

FCC ID: 2BE4P-D5L

Test Result: PASS

Date of Issue: Sep. 18, 2026

Prepared for

Shenzhen KeepTeen Electronic Technology Co., Ltd.
Room 502,5th Floor, No.1 Longtang Industrial Zone, Henggang Street,
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Prepared by

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Revision History of This Test Report

[illegible]

TEST RESULT CERTIFICATION

Applicant's name	Shenzhen KeepTeen Electronic Technology Co., Ltd.
Address	Room 502,5th Floor, No.1 Longtang Industrial Zone, Henggang Street, Longgang District, Shenzhen
Manufacturer's Name	Shenzhen KeepTeen Electronic Technology Co., Ltd.
Address	Room 502,5th Floor, No.1 Longtang Industrial Zone, Henggang Street, Longgang District, Shenzhen
Product description	
Product name	Solar Repeater Kit
Trademark	KEEPTTEEN
Model Name	D5L
Serial Model.....	D5L-R1, D5L-R2, D5L-R3 D5L-R4, D5L-R5, D5L-R6, D5L-H1, D5L-H2, D5L-H3, D5L-H4, D5L-H5, D5L-H6, D5L-1A, D5L-2A, D5L-S1, D5L-S2, D5L-S3, D5L-S4, D5L-S5, D5L-S6, D5L-L1, D5L-L2, D5L-L3, D5L-L4, D5L-L5, D5L-L6, D5L-G1, D5L-G2, D5L-G3, D5L-G4, D5L-G5, D5L-G6, D5L-E1, D5L-E2, D5L-E3, D5L-E4, D5L-E5, D5L-E6
Standards	FCC 47 CFR Part 15.247
Test procedure	ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024
Date of Test	
Date (s) of performance of tests	Jun. 06, 2026 to Sep. 18, 2026
Test Result.....	Pass
This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Shenzhen NTT Testing Technology Co.,Ltd.	

Prepared by(Test Engineer):
Cindy Qin

Cindy Qin

Reviewer(Supervisor):
Ken Wu

Ken Wu

Approved(Manager):
Abel Yu



1 General Description

1.1 Description of EUT

Product name:	KEEPTEEN
Model name:	D5L
Series Model:	D5L-R1, D5L-R2, D5L-R3 D5L-R4, D5L-R5, D5L-R6, D5L-H1, D5L-H2, D5L-H3, D5L-H4, D5L-H5, D5L-H6, D5L-1A, D5L-2A, D5L-S1, D5L-S2, D5L-S3, D5L-S4, D5L-S5, D5L-S6, D5L-L1, D5L-L2, D5L-L3, D5L-L4, D5L-L5, D5L-L6, D5L-G1, D5L-G2, D5L-G3, D5L-G4, D5L-G5, D5L-G6, D5L-E1, D5L-E2, D5L-E3, D5L-E4, D5L-E5, D5L-E6
Different of series model:	All the model are the same circuit and RF module, only the model names and the number of batteries installed inside are different. Test sample model: D5L
Operation frequency:	902.3-914.9MHz
Modulation type:	LoRa
Antenna type:	External antenna
Antenna gain:	2dBi
Maximum Field Strength:	84.54 dB μ V/m @3m
Hardware version:	V1.0
Software version:	V1.0
Battery:	Battery Capacity: 3.7Vdc 2600mAh 9.62Wh(4*batteries in parallel)
Power supply:	Input: 5V=1A Battery Capacity: 3.7Vdc 2600mAh 9.62Wh(4*batteries in parallel)

1.2 Test Mode

Test mode	Low channel	Middle channel	High channel
Transmitting (8FSK)	902.3MHz	908.9MHz	914.9
Receiving (8FSK)	902.3MHz	908.9MHz	914.9

1.3 Operation Channel List

CH No.	Frequency (MHz)	CH No.	Frequency (MHz)	CH No.	Frequency (MHz)	CH No.	Frequency (MHz)
0	902.3	16	905.5	32	908.7	48	911.9
1	902.5	17	905.7	33	908.9	49	912.1
2	902.7	18	905.9	34	909.1	50	912.3
3	902.9	19	906.1	35	909.3	51	912.5
4	903.1	20	906.3	36	909.5	52	912.7
5	903.3	21	906.5	37	909.7	53	912.9
6	903.5	22	906.7	38	909.9	54	913.1
7	903.7	23	906.9	39	910.1	55	913.3
8	903.9	24	907.1	40	910.3	56	913.5
9	904.1	25	907.3	41	910.5	57	913.7
10	904.3	26	907.5	42	910.7	58	913.9
11	904.5	27	907.7	43	910.9	59	914.1
12	904.7	28	907.9	44	911.1	60	914.3
13	904.9	29	908.1	45	911.3	61	914.5
14	905.1	30	908.3	46	911.5	62	914.7
15	905.3	31	908.5	47	911.7	63	914.9

1.4 Test Setup

See photographs of the test setup in the report for the actual setup and connections between EUT and support equipment.

1.5 EUT Operation Test Setup

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters.

Test software Version		Engineering Mode	
Frequency			
Parameters	Default	Default	Default
RF cable			
Description	Connector	Length	Supplied by
Antenna Cable	SMA	10cm	Applicant

Note: Disclaimer: the loss of RF cable is too small and can be ignored.

1.6 Ancillary equipment list

Equipment	Model	S/N	Manufacturer
Adapter	JIYIN	/	JY-05100C

2 Summary of Test Result

错误!未找到引用源。 Test Cases				
No.	Test Item	Test Requirement	Test Method	Result
1	Antenna Requirement	CC 47 CFR Part 15 Subpart C Section 15.203/15.247 (c)	N/A	Pass
2	Peak Output Power	FCC 47 CFR Part 15 Subpart C Section 15.247 (b)(1)	ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024	Pass
3	Conducted Emission	FCC 47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024	Pass
4	Radiated Emission	FCC 47 CFR Part 15 Subpart C Section 15.205/15.209	ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024	Pass
5	20dB occupied bandwidth	FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(1)	ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024	Pass
6	Carrier Frequencies Separation	FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(1)	ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024	Pass
7	Hopping channel number	FCC 47 CFR Part 15 Subpart C Section 15.247 (b)(1)	ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024	Pass
8	Dwell time	FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(1)	ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024	Pass
9	Spurious RF Conducted Emissions	FCC 47 CFR Part 15 Subpart C Section 15.247(d)	ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024	Pass
Disclaimer and Explanations: The declared of product specification and data (e.g., antenna gain, RF specification, etc) for EUT presented in the report are provided by the customer, and the customer takes all the responsibilities for the accuracy of product specification.				

3 Test Facilities and Accreditations

3.1 Test Laboratory

Test Site	Shenzhen NTT Testing Technology Co.,Ltd.
Test Site Location	1B, Building 2, Factory Building & 103, Building 3, Factory Building, Dayang Industrial Park, No.4, Industrial Avenue, Tangwei Community, Fuhai Sub-district, Bao 'an District, Shenzhen City, China
Telephone:	0755-27889935
FCC Designation Number	CN3446
FCC Test Firm Registration Number	129414

3.2 Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15°C~35°C
Relative Humidity:	20%~75%
Air Pressure:	98kPa~101kPa

3.3 Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

The data and results quoted in this document are true and accurate values, and uncertainties are not involved in the calculations.

In addition, components and mass production processes that are similar to testing equipment may introduce additional deviations, and the manufacturer is solely responsible for the continued compliance of the equipment.

Parameter	Uncertainty
RF output power, conducted	$\pm 1.0\text{dB}$
Power Spectral Density, conducted	$\pm 2.2\text{dB}$
Radio Frequency	$\pm 1 \times 10^{-6}$
Bandwidth	$\pm 1.5 \times 10^{-6}$
Time	$\pm 2\%$
Duty Cycle	$\pm 2\%$
Temperature	$\pm 1^\circ\text{C}$
Humidity	$\pm 5\%$
DC and low frequency voltages	$\pm 3\%$
Conducted Emissions (150kHz~30MHz)	$\pm 3.64\text{dB}$
Radiated Emission(9KHz~30MHz)	$\pm 4.51\text{dB}$
Radiated Emission(30MHz~1GHz)	$\pm 5.03\text{dB}$
Radiated Emission(1GHz~25GHz)	$\pm 4.74\text{dB}$
Remark:When making a conformity declaration based on test results for regulations/standards or specifications,the default is to use Clause 4.2.1of ILAC-G8:09/2019 and the guidelines on decision rules and	

conformity declaration in IEC Guide 115:2023.

3.4 Test Software

Item	Name	Manufacturer	Model	Software version
1	EMC Conduction Test System	FALA	EZ-EMC	Ver.EMC-CON 3A1.1+
2	EMC radiation test system	FALA	EZ-EMC	Ver.FA-03A2 RE+
3	RF test system	TACHOY	RFTest	V1.0.0
4	RF communication test system	TACHOY	RFTest	V1.0.0

4 List of Test Equipment

4.1 List of Test Equipment

Conducted Test Site

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
944 Shielded Room	HSRCE944	/	HTEC	2025/04/30	2028/04/29
EMI Test Receiver	ESCI	100881/003	ROHDE&SCHWARZ	2026/09/04	2027/09/03
LISN	AMN6500	101185	ROHDE&SCHWARZ	2026/09/04	2027/09/03
LISN	NNLK 8129	00603	SCHWARZBECK	2026/09/04	2027/09/03
Pulse Limiters	VTSD 9561 F	00343	SCHWARZBECK	2026/09/04	2027/09/03
Cable	RG223-2M	/	RG	2026/09/04	2027/09/03

Radiated Test Site(Below 1G and Above 1G)&RF Test Site

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
966 Shielded Room	966 Room	/	EMToni	2025/07/24	2028/07/23
EMI Test Receiver	ESPI	101018	ROHDE&SCHWARZ	2026/09/04	2027/09/03
Amplifier (30MHz-1GHz)	BBV 9745	00431	SCHWARZBECK	2026/09/04	2027/09/03
Bilog Antenna (30MHz-1GHz)	VULB9168	1858	SCHWARZBECK	2026/09/05	2027/09/04
Horn antenna (1GHz-18GHz)	BBHA 9120 D	02622	SCHWARZBECK	2026/09/05	2027/09/04
Preamplifier (1GHz-18GHz)	BBV 9718D	0024	SCHWARZBECK	2026/09/04	2027/09/03
Spectrum Analyzer (10Hz-40GHz)	FSV 40	100952	ROHDE&SCHWARZ	2026/09/04	2027/09/03
Preamplifier (18GHz-40GHz)	BBV 9721	0056	SCHWARZBECK	2026/09/04	2027/09/03
Double Ridge Guide Horn Antenna (18GHz-40GHz)	SAS-574	588	A.H.System	2026/09/05	2027/09/04
Loop Antenna (9KHz-30MHz)	FMZB 1513-60	00115	SCHWARZBECK	2026/09/04	2027/09/03
MXG Signal Analyzer	N9020A	MY49100730	Agilent	2026/09/04	2027/09/03
MXG Vector Signal Generator	N5182A	MY50144920	Agilent	2026/09/04	2027/09/03

WIDEBAND RADIO COMMUNICATION TESTER	CMW500	/	ROHDE&SCHWARZ	2026/09/07	2027/09/06
Power Sensor	MW100-RFC B-2	MW260105N TT-64	MWRFtest	2026/09/04	2027/09/03
RF Swith	MW100-RFC B-1	MW260105N TT-64	MWRFtest	2026/09/04	2027/09/03
Cable	RG223-3M	/	DA	2026/09/04	2027/09/03
Cable	RG223-12 M	/	DA	2026/09/04	2027/09/03
Cable	SFT205-NM NMSW-2.5M	/	DA	2026/09/04	2027/09/03
Cable	SFT205-NM NM-12M	/	DA	2026/09/04	2027/09/03
Cable	UCA500-NJ WSM-1.5M	017	MWRFtest	2026/09/04	2027/09/03

5 Test Item And Results

5.1 Antenna Requirement

5.1.1 Standard Requirement

15.203 requirement: For intentional device, according to 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

5.1.2 Test Result

The EUT antenna is Rod Antenna. It comply with the standard requirement. In case of replacement of broken antenna the same antenna type must be used.

5.2 Conducted Emission

5.2.1 Limits

Limits – Class B		
Frequency (MHz)	Limit (dBμV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

Note:

- the tighter limit applies at the band edges.
- the limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

5.2.2 Test Procedures

a) EUT Operating Conditions

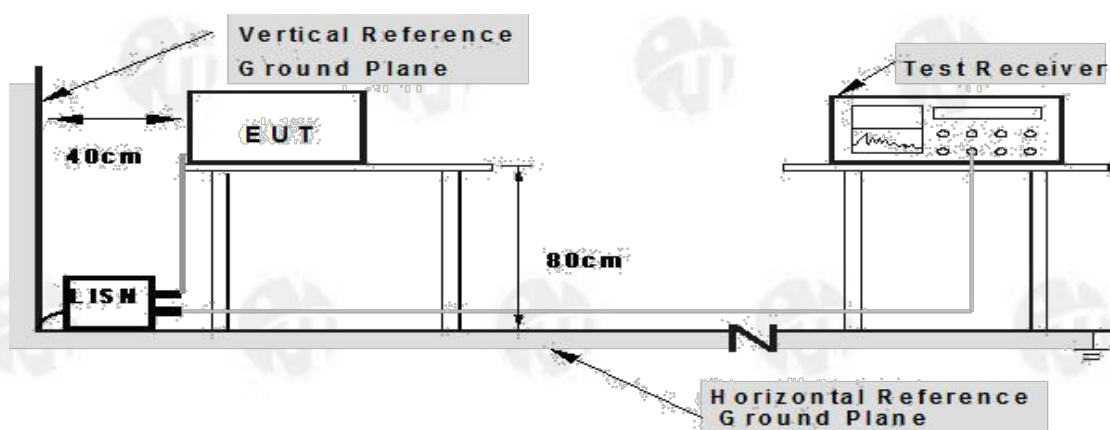
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

b) The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

- The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN is at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item – photographs of the test setup.

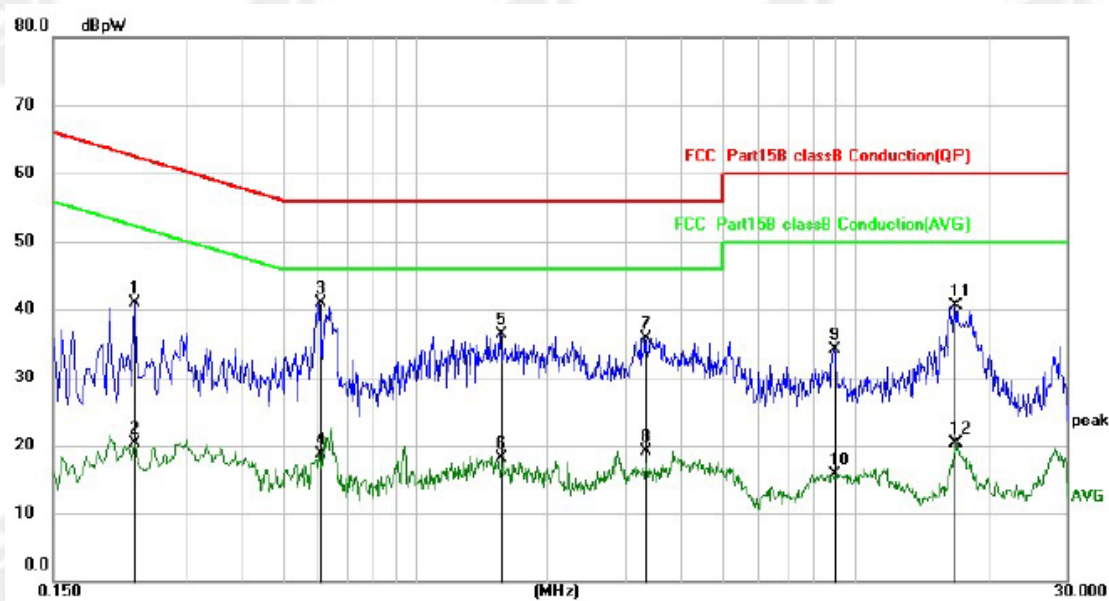
5.2.3 Test Setup



5.2.4 Test Result



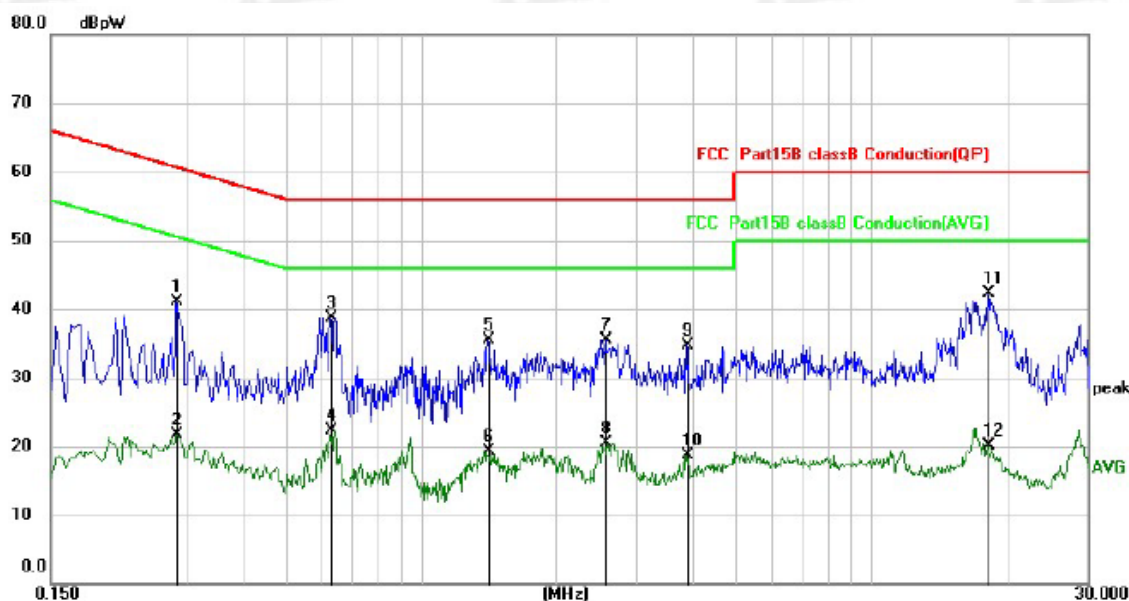
Temperature:	25.1℃	Relative Humidity:	56%
Pressure:	1008hPa	Phase:	L
Test Voltage :	DC 5V from Adapter Input AC 120V/60Hz	Test Mode:	Low channel(Worst case)



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over
		MHz	dBpW	dB	dBpW	dBpW	dB Detector
1		0.2300	30.91	10.08	40.99	62.45	-21.46 QP
2		0.2300	10.27	10.08	20.35	52.45	-32.10 AVG
3	*	0.6059	30.75	10.10	40.85	56.00	-15.15 QP
4		0.6059	8.66	10.10	18.76	46.00	-27.24 AVG
5		1.5620	26.15	10.15	36.30	56.00	-19.70 QP
6		1.5620	8.00	10.15	18.15	46.00	-27.85 AVG
7		3.3420	25.58	10.22	35.80	56.00	-20.20 QP
8		3.3420	8.84	10.22	19.06	46.00	-26.94 AVG
9		8.9500	23.70	10.42	34.12	60.00	-25.88 QP
10		8.9500	5.32	10.42	15.74	50.00	-34.26 AVG
11		16.8338	29.73	10.81	40.54	60.00	-19.46 QP
12		16.8338	9.48	10.81	20.29	50.00	-29.71 AVG



Temperature:	25.1℃	Relative Humidity:	56%
Pressure:	1008hPa	Phase:	N
Test Voltage :	DC 5V from Adapter Input AC 120V/60Hz	Test Mode:	Low channel(Worst case)



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBpW	dB	dBpW	dBpW	dB	Detector
1		0.2859	31.12	10.08	41.20	60.64	-19.44	QP
2		0.2859	11.69	10.08	21.77	50.64	-28.87	AVG
3	*	0.6300	28.63	10.10	38.73	56.00	-17.27	QP
4		0.6300	12.27	10.10	22.37	46.00	-23.63	AVG
5		1.4100	25.31	10.15	35.46	56.00	-20.54	QP
6		1.4100	9.08	10.15	19.23	46.00	-26.77	AVG
7		2.5700	25.39	10.19	35.58	56.00	-20.42	QP
8		2.5700	10.39	10.19	20.58	46.00	-25.42	AVG
9		3.8860	24.39	10.24	34.63	56.00	-21.37	QP
10		3.8860	8.50	10.24	18.74	46.00	-27.26	AVG
11		17.9659	31.50	10.87	42.37	60.00	-17.63	QP
12		17.9659	9.31	10.87	20.18	50.00	-29.82	AVG

5.3 Radiated Emission

5.3.1 Limits

Frequencies (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

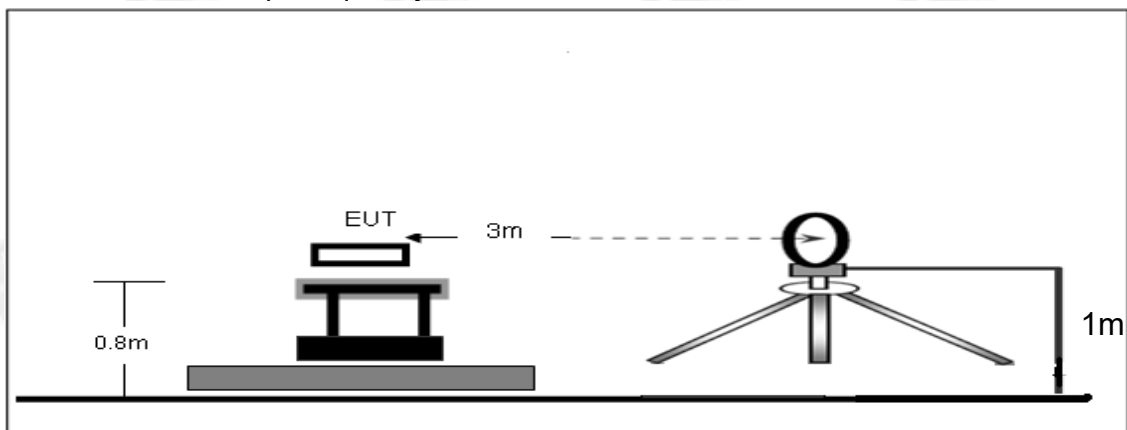
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200kHz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

5.3.2 Test Procedures

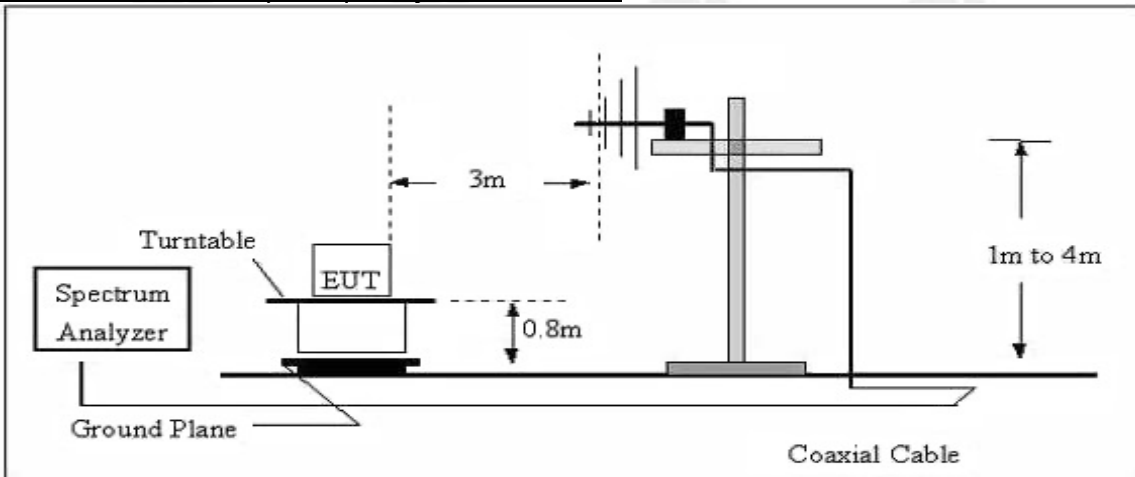
- The radiated emission tests were performed in the 3 meters.
- The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- The height of the test antenna shall vary between 1m to 4m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- If the peak mode measured value compliance with and lower than quasi peak mode limit, the EUT shall be deemed to meet QP limits and then no additional QP mode measurement performed.
- If the peak mode measured value compliance with and lower than average mode limit, the EUT shall be deemed to meet average limits and then no additional average mode measurement performed.
- For the actual test configuration, please refer to the related item – EUT test photos.

5.3.3 Test Setup

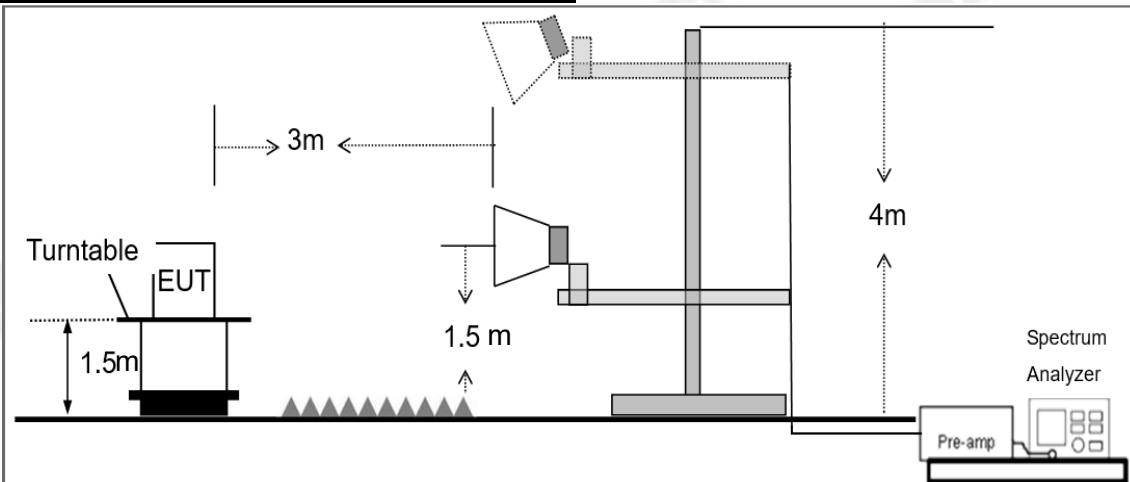
Radiated Emission Test-Up Frequency Below 30MHz



Radiated Emission Test-Up Frequency 30MHz~1GHz



Radiated emission test-up frequency above 1GHz



5.3.4 Test Result

Below 30MHz

Temperature:	25.1℃	Relative Humidity:	56%
Pressure:	1008hPa	Phase :	--
Test Voltage :	DC 5V from Adapter Input AC 120V/60Hz	Test Mode:	--

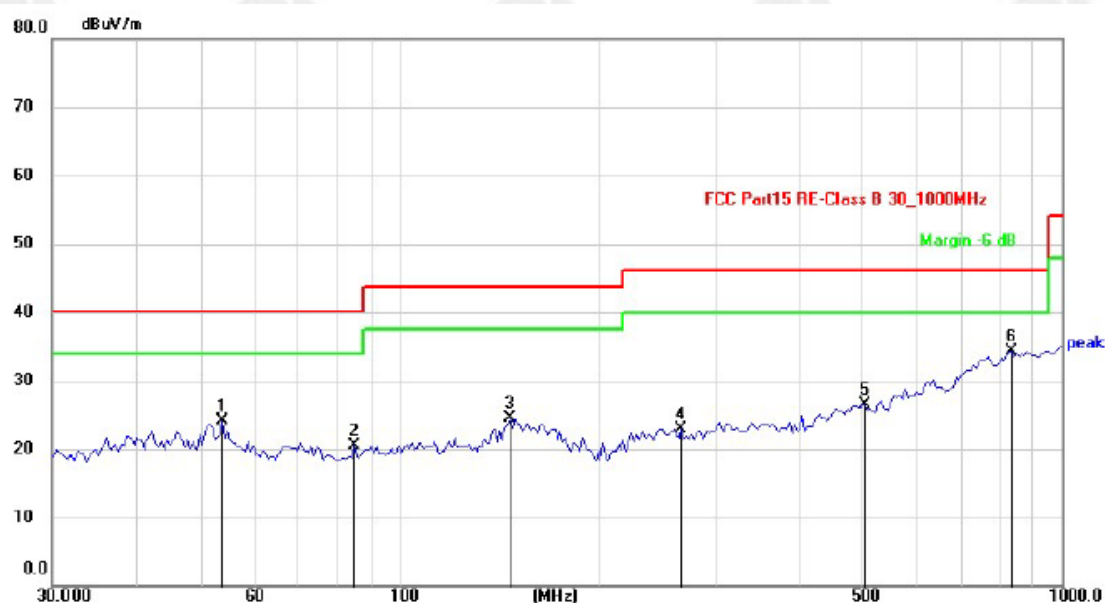
Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	Pass
--	--	--	--	Pass

Note:

1. For 9kHz-30MHz, the amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Distance extrapolation factor = $40 \log (\text{specific distance}/\text{test distance})(\text{dB})$;
3. Limit line = specific limits (dBuV) + distance extrapolation factor.

Frequency range (30MHz – 1GHz)

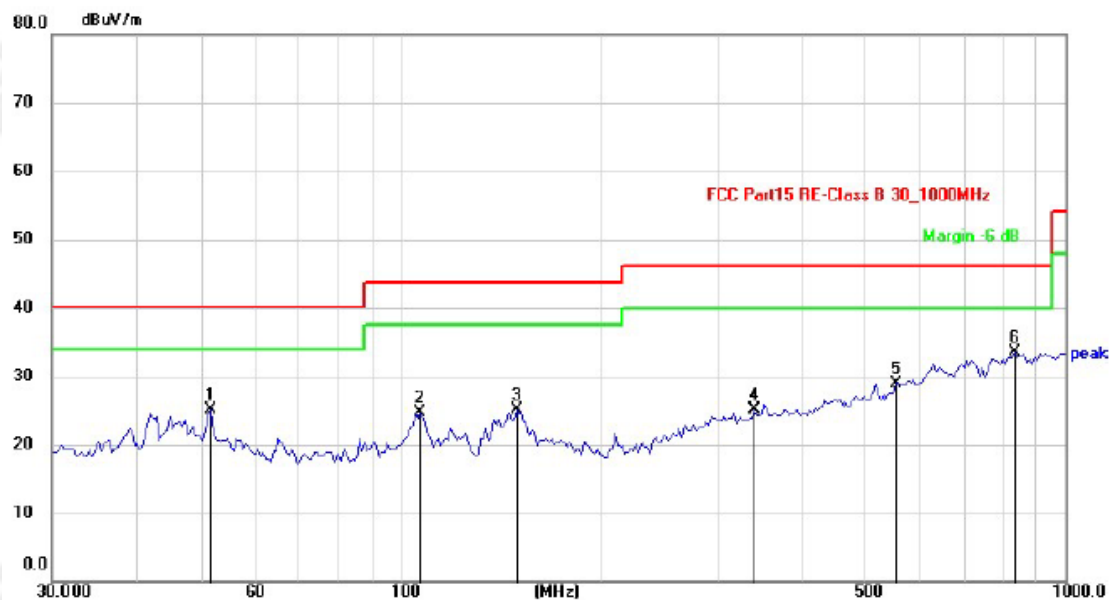
Temperature:	25.1℃	Relative Humidity:	56%
Pressure:	1008hPa	Phase:	Vertical
Test Voltage:	DC 5V from Adapter Input AC 120V/60Hz	Test Mode:	Low channel(Worst case)



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		53.9763	30.89	-6.77	24.12	40.00	-15.88	QP
2		85.1486	29.00	-8.41	20.59	40.00	-19.41	QP
3		146.6303	29.14	-4.73	24.41	43.50	-19.09	QP
4		266.1419	26.98	-4.03	22.95	46.00	-23.05	QP
5		504.7062	25.35	1.08	26.43	46.00	-19.57	QP
6	*	839.1816	25.29	8.93	34.22	46.00	-11.78	QP



Temperature:	25.1℃	Relative Humidity:	56%
Pressure:	1008hPa	Phase:	Horizontal
Test Voltage:	DC 5V from Adapter Input AC 120V/60Hz	Test Mode:	Low channel(Worst case)



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		51.6613	31.63	-6.58	25.05	40.00	-14.95	QP
2		106.9458	31.80	-7.16	24.64	43.50	-18.86	QP
3		149.2238	29.57	-4.48	25.09	43.50	-18.41	QP
4		340.1847	27.05	-1.87	25.18	46.00	-20.82	QP
5		555.7989	26.34	2.64	28.98	46.00	-17.02	QP
6	*	839.1816	24.59	8.93	33.52	46.00	-12.48	QP

5.3.5 Band Edge - Radiated

For 125kHz Bandwidth (902.3 MHz to 914.9 MHz):

Field Strength of the Fundamental Signal and Bandedge								
No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
Lowest Channel_902.3MHz								
1	902.495	70.23	4.75	74.98	94	-19.02	QP	Horizontal
2	902.000	29.95	4.74	34.69	46	-11.31	QP	Horizontal
3	902.491	77.11	4.75	81.86	94	-12.14	QP	Vertical
4	902.000	29.51	4.74	34.25	46	-11.75	QP	Vertical
Highest Channel_914.9MHz								
1	914.898	76.21	4.73	80.94	94	-13.06	QP	Horizontal
2	928.000	26.11	5.24	31.35	46	-14.65	QP	Horizontal
3	914.889	79.81	4.73	84.54	94	-9.46	QP	Vertical
4	928.000	26.46	5.24	31.7	46	-14.3	QP	Vertical

Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result – Limit

5.3.6 Spurious emission in restricted band

For 125kHz Bandwidth (902.3 MHz to 914.9 MHz):

No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
Lowest Channel_902.3MHz								
1	1813.04	55.61	-10.39	45.22	54	-8.78	Average	Horizontal
2	1813.04	61.71	-10.39	51.32	74	-22.68	Peak	Horizontal
3	2739.21	52.17	-6.06	46.11	54	-7.89	Average	Horizontal
4	2739.21	65.69	-6.06	59.63	74	-14.37	Peak	Horizontal
5	3721.123	49.71	-2.87	46.84	54	-7.16	Average	Horizontal
6	3721.123	58.71	-2.87	55.84	74	-18.16	Peak	Horizontal
7	1813.04	52.21	-10.39	41.82	54	-12.18	Average	Vertical
8	1813.04	72.93	-10.39	62.54	74	-11.46	Peak	Vertical
9	2739.21	51.27	-6.06	45.21	54	-8.79	Average	Vertical
10	2739.21	65.63	-6.06	59.57	74	-14.43	Peak	Vertical
11	3721.123	48.22	-2.87	45.35	54	-8.65	Average	Vertical
12	3721.123	54.41	-2.87	51.54	74	-22.46	Peak	Vertical
Middle Channel_908.9MHz								
1	1824.18	47.38	-10.42	36.96	54	-17.04	Average	Horizontal
2	1824.18	59.28	-10.42	48.86	74	-25.14	Peak	Horizontal
3	2736.95	51.32	-6.1	45.22	54	-8.78	Average	Horizontal
4	2736.95	63.86	-6.1	57.76	74	-16.24	Peak	Horizontal
5	3669.71	47.65	-2.94	44.71	54	-9.29	Average	Horizontal
6	3669.71	56.22	-2.94	53.28	74	-20.72	Peak	Horizontal
7	9024.51	43.36	3.95	47.31	54	-6.69	Average	Horizontal
8	9024.51	54.39	3.95	58.34	74	-15.66	Peak	Horizontal
9	1824.18	60.71	-10.42	50.29	54	-3.71	Average	Vertical
10	1824.18	73.72	-10.42	63.3	74	-10.7	Peak	Vertical
11	2736.95	51.66	-6.1	45.56	54	-8.44	Average	Vertical
12	2736.95	63.14	-6.1	57.04	74	-16.96	Peak	Vertical
13	3669.71	46.61	-2.94	43.67	54	-10.33	Average	Vertical
14	3669.71	55.86	-2.94	52.92	74	-21.08	Peak	Vertical
15	9024.51	46.97	-1.28	45.69	54	-8.31	Average	Vertical
16	9024.51	52.54	-1.28	51.26	74	-22.74	Peak	Vertical
Highest Channel_914.9MHz								
1	1829.9	48.55	-10.35	38.2	54	-15.8	Average	Horizontal
2	1829.9	58.31	-10.35	47.96	74	-26.04	Peak	Horizontal
3	2744.721	52.93	-6.04	46.89	54	-7.11	Average	Horizontal
4	2744.721	67.51	-6.04	61.47	74	-12.53	Peak	Horizontal
5	3657.566	43.66	-2.78	40.88	54	-13.12	Average	Horizontal
6	3657.566	58.17	-2.78	55.39	74	-18.61	Peak	Horizontal

7	8230.933	43.21	2.47	45.68	54	-8.32	Average	Horizontal
8	8230.933	49.36	2.47	51.83	74	-22.17	Peak	Horizontal
9	9146.65	43.94	3.85	47.79	54	-6.21	Average	Horizontal
10	9146.65	53.74	3.85	57.59	74	-16.41	Peak	Horizontal
11	1829.9	47.45	-10.35	37.1	54	-16.9	Average	Vertical
12	1829.9	58.28	-10.34	47.94	74	-26.06	Peak	Vertical
13	2744.721	54.57	-10.35	44.22	54	-9.78	Average	Vertical
14	2744.721	69.52	-10.35	59.17	74	-14.83	Peak	Vertical
15	3657.566	51.72	-6.04	45.68	54	-8.32	Average	Vertical
16	3657.566	69.76	-6.04	63.72	74	-10.28	Peak	Vertical
17	8230.933	43.48	-2.78	40.7	54	-13.3	Average	Vertical
18	8230.933	56.5	-2.78	53.72	74	-20.28	Peak	Vertical
19	9146.65	41.68	-1.24	40.44	54	-13.56	Average	Vertical
20	9146.65	59.61	-1.24	58.37	74	-15.63	Peak	Vertical

5.4 Peak Output Power

5.4.1 Limit

FCC Part15 Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
15.247(b)(3)	Peak output power	1 watt or 30dBm	2400-2483.5

5.4.2 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:
RBW=2MHz, VBW=10MHz, Detector=Peak
- (3) The EUT was set to continuously transmitting in the max power during the test.

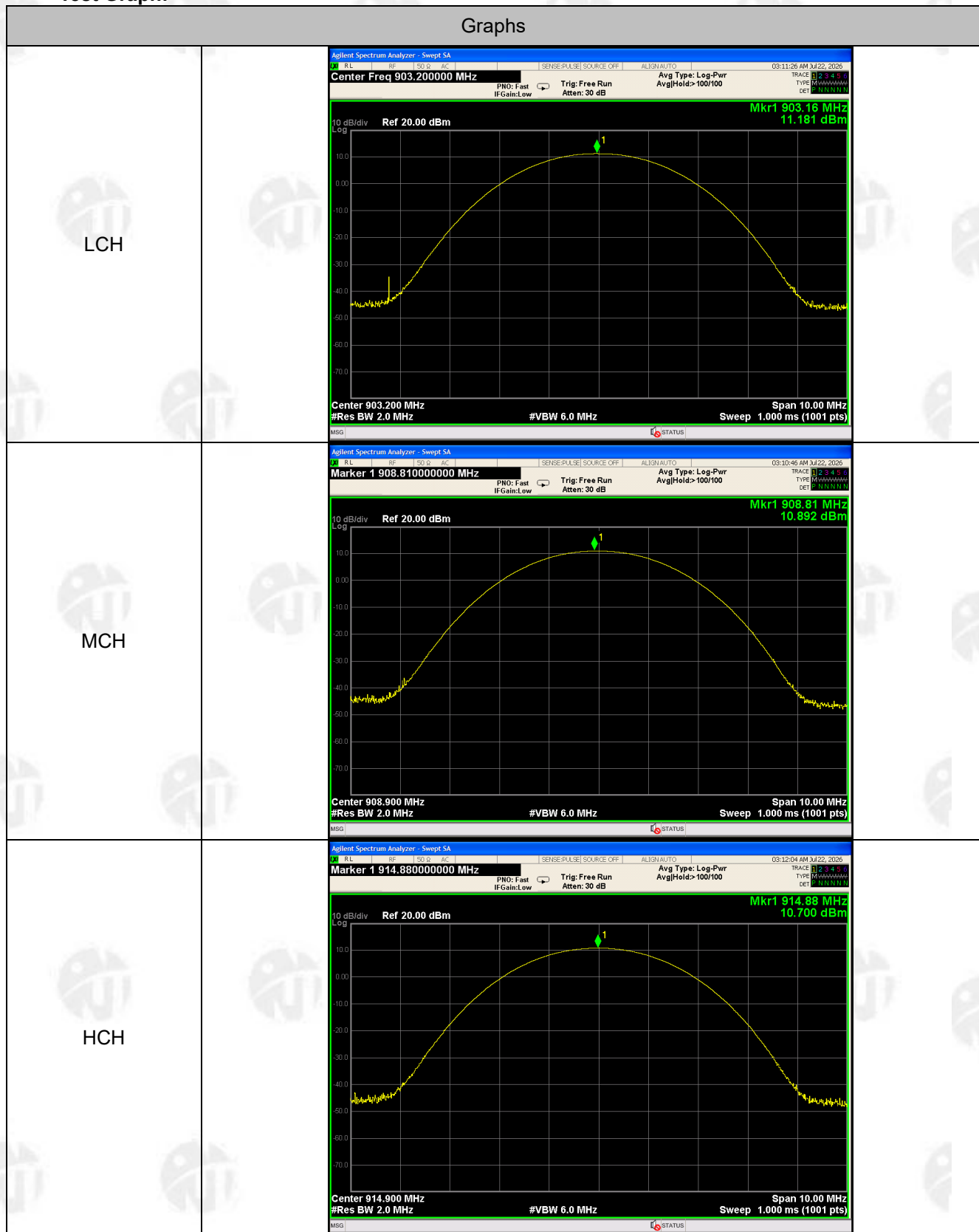
5.4.3 Test Setup



5.4.4 Test Results

Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
LCH	11.181	30	PASS
MCH	10.892	30	PASS
HCH	10.7	30	PASS

Test Graph:



5.5 20dB Occupied Channel Bandwidth

5.5.1 Limit

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
15.247a(1)	20dB bandwidth	N/A	2400-2483.5

5.5.2 Test Procedure

(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

(2) Spectrum Setting:

Bandwidth: RBW=30 kHz, VBW=100 kHz, detector= Peak

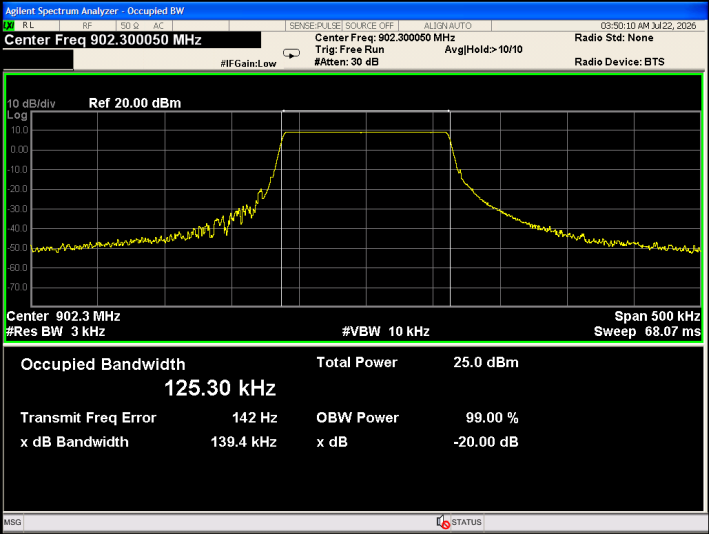
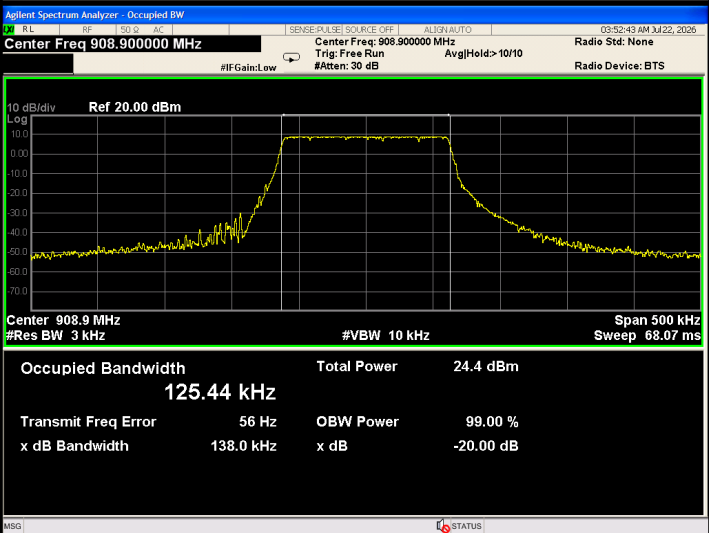
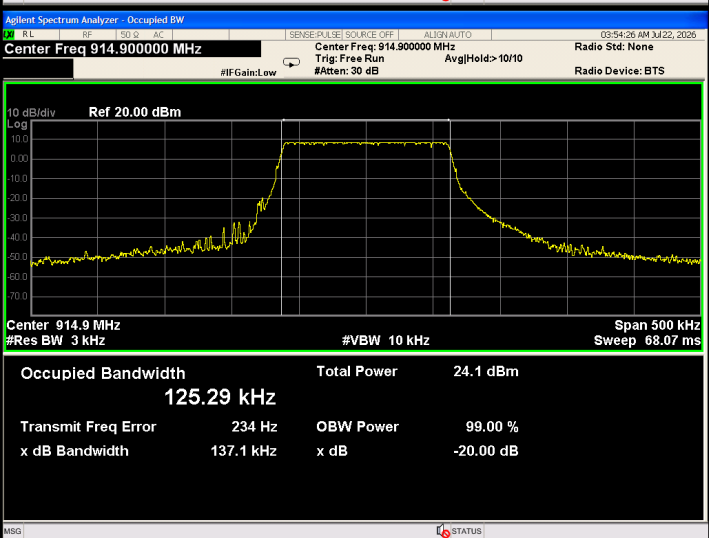
5.5.3 Test Setup



5.5.4 Test Results

Frequency	20dB Bandwidth (kHz)	Result
Low channel	139.4	PASS
Mid channel	138	PASS
High channel	137.1	PASS

Test Graph:

Low channel	 Agilent Spectrum Analyzer - Occupied BW Center Freq 902.300050 MHz Ref 20.00 dBm Occupied Bandwidth 125.30 kHz Total Power 25.0 dBm Transmit Freq Error 142 Hz OBW Power 99.00 % x dB Bandwidth 139.4 kHz x dB -20.00 dB
Mid channel	 Agilent Spectrum Analyzer - Occupied BW Center Freq 908.900000 MHz Ref 20.00 dBm Occupied Bandwidth 125.44 kHz Total Power 24.4 dBm Transmit Freq Error 56 Hz OBW Power 99.00 % x dB Bandwidth 138.0 kHz x dB -20.00 dB
High channel	 Agilent Spectrum Analyzer - Occupied BW Center Freq 914.900000 MHz Ref 20.00 dBm Occupied Bandwidth 125.29 kHz Total Power 24.1 dBm Transmit Freq Error 234 Hz OBW Power 99.00 % x dB Bandwidth 137.1 kHz x dB -20.00 dB

5.6 Carrier Frequency Separation

5.6.1 Limit

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
15.247(a)(1)	Channel Separation	>25kHz or >two-thirds of the 20 dB bandwidth (Which is greater)	2400-2483.5

5.6.2 Test Procedure

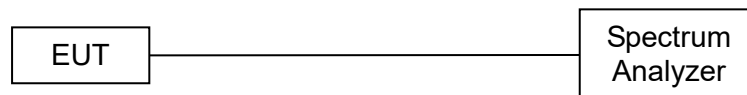
(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

(2) Spectrum Setting:

RBW=30 kHz, VBW=100 kHz, detector= Peak, Sweep Time =auto.

(3) The EUT was set to the Hopping Mode for Channel Separation Test and continuously transmitting for the Test.

5.6.3 Test Setup



5.6.4 Test Results

Channel.	Carrier Frequency Separation [MHz]	Verdict
LCH	0.1989	PASS
MCH	0.2012	PASS
HCH	0.2	PASS

Test Graph



5.7 Hopping Channel Number

5.7.1 Limit

Frequency hopping systems in the 2400-2483.5MHz band shall use at least 15 channels.

5.7.2 Test Procedure

The testing follows IEEE / ANSI C63.10-2020 clause 7.8.3

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.

Set to the maximum power setting and enable the EUT transmit continuously.

The EUT must have its hopping function enabled.

Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW : 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.

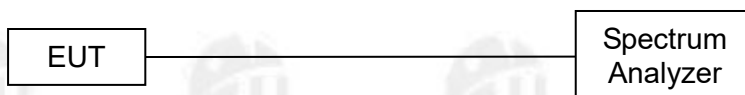
VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

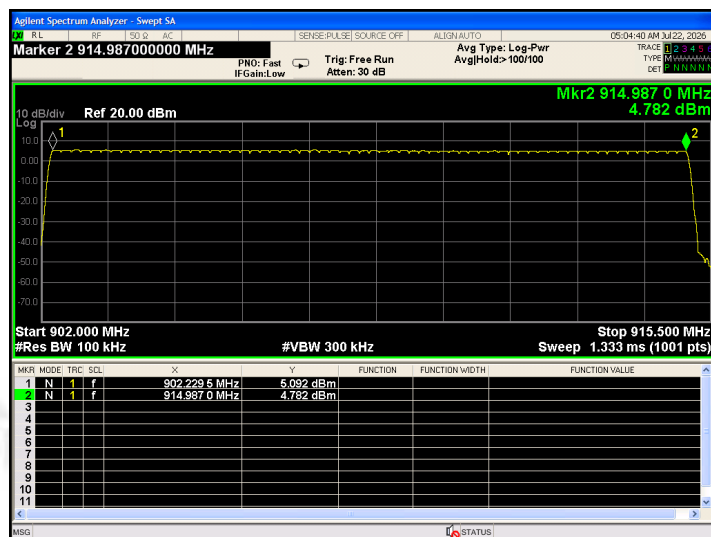
5.7.3 Test Setup



5.7.4 Test Results



Mode	Channel.	Number of Hopping Channel	Verdict
ASK	Hop	64	PASS



5.8 Dwell Time

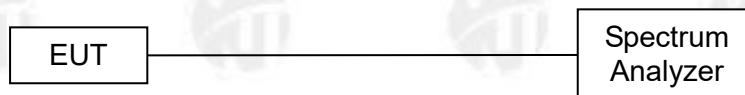
5.8.1 Limit

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
15.247(a)(1)	Dwell time	0.4 sec	2400-2483.5

5.8.2 Test Procedure

- 1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting: RBW=1MHz, VBW=3MHz, Span=0Hz, Detector=Peak
- (3) Use video trigger with the trigger level set to enable triggering only on full pulses.
- (4) Sweep Time is more than once pulse time.
- (5) Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- (6) Measure the maximum time duration of one single pulse.
- (7) Set the EUT for packet transmitting.
- (8) Measure the maximum time duration of one single pulse.
- (9) The EUT was set to the Hopping Mode for Dwell Time Test.

5.8.3 Test Setup



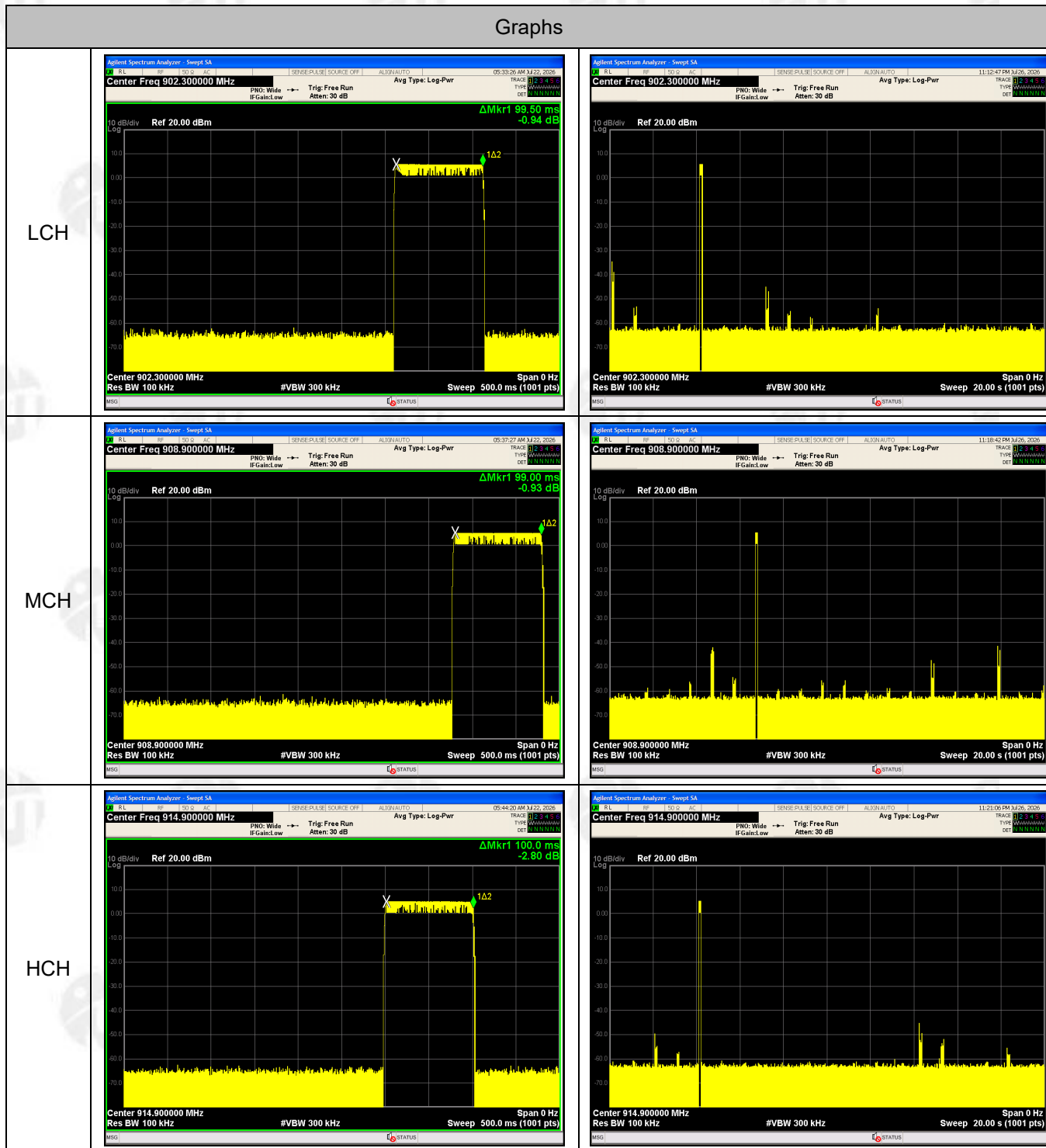
5.8.4 Test Results

Channel	No. of transmission in 20s(a)	Pulse Time (ms)(b)	Total Dwell Time in 20s (ms) (c)	Limit (ms)	Verdict
LCH	1	99.5	99.5	400	PASS
MCH	1	99	99	400	PASS
HCH	1	100	100	400	PASS

Remark: Total dwell time in 20s, c=(a)*(b)

Test Graph

Graphs



5.9 Conducted Band Edge

5.9.1 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 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)).

5.9.2 Test Procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
- Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- Repeat above procedures until all measured frequencies were complete.

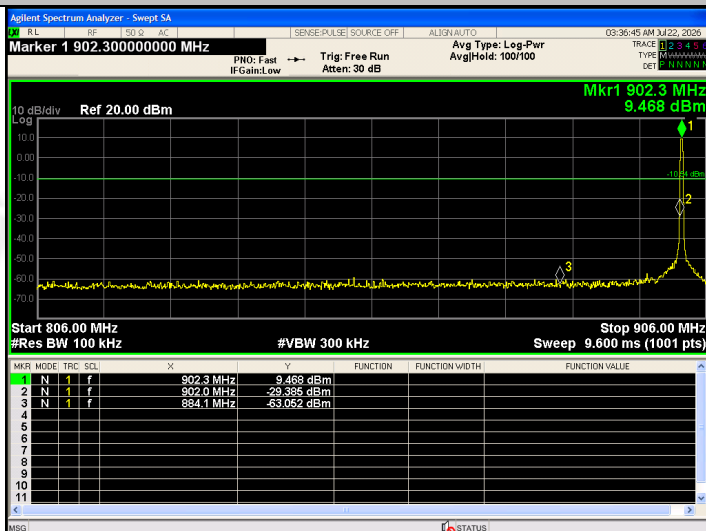
5.9.3 Test Setup



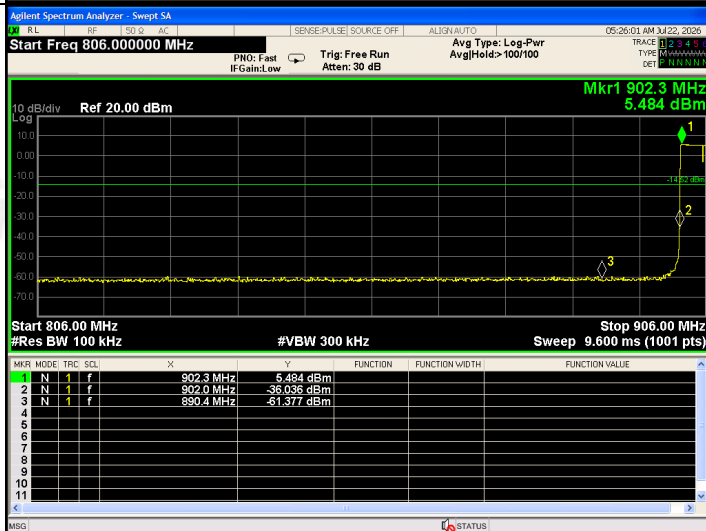
5.9.4 Test Results

BAND EDGE Graphs

LCH/
No Hop

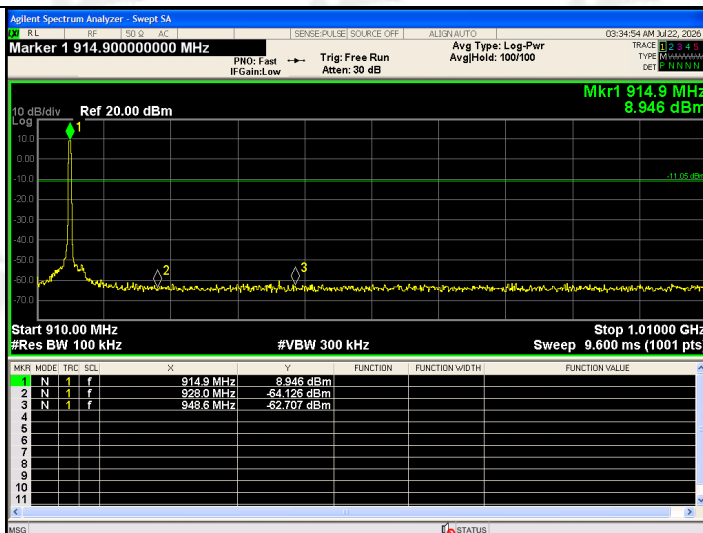


LCH/
Hop

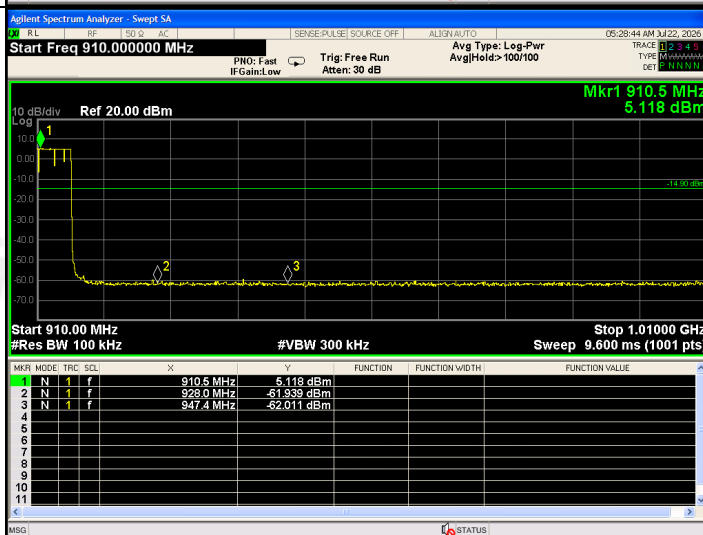




HCH/
No Hop

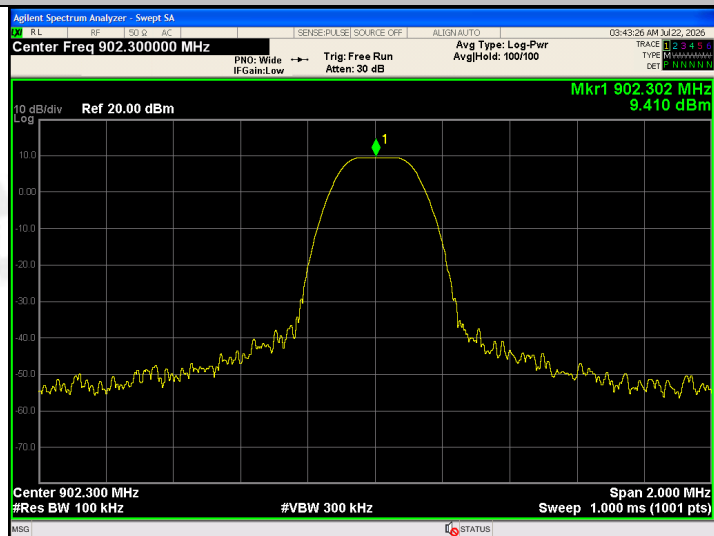


HCH/
Hop

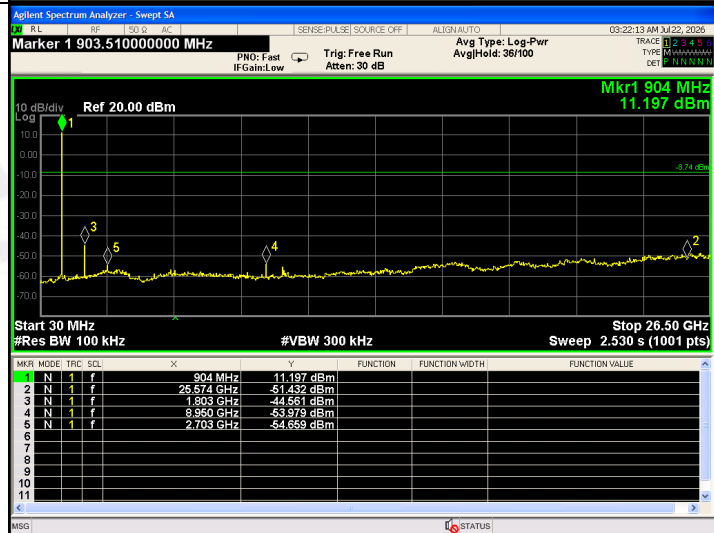


RF Conducted Spurious Emissions Graphs

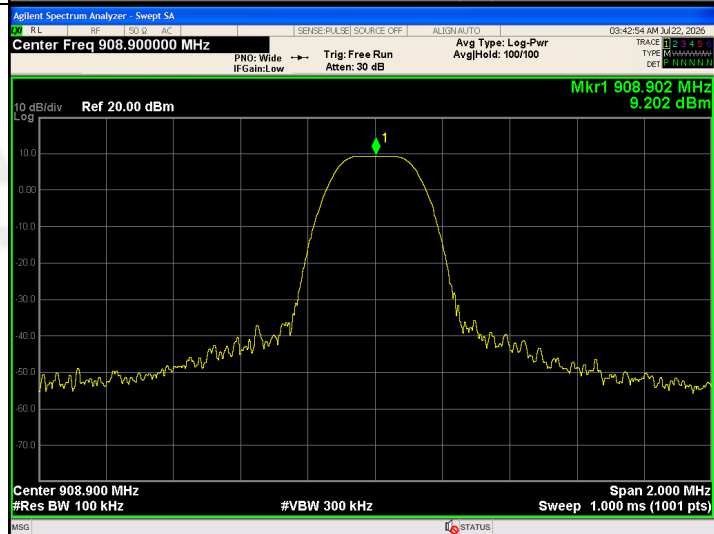
LCH



LCH

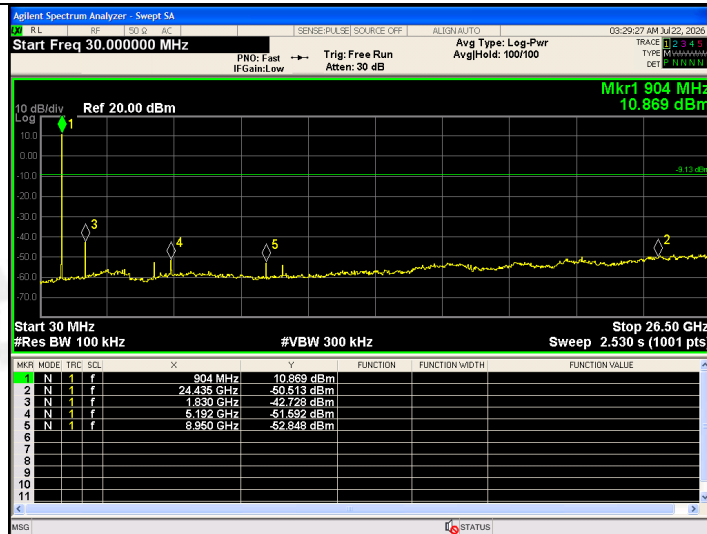


MCH

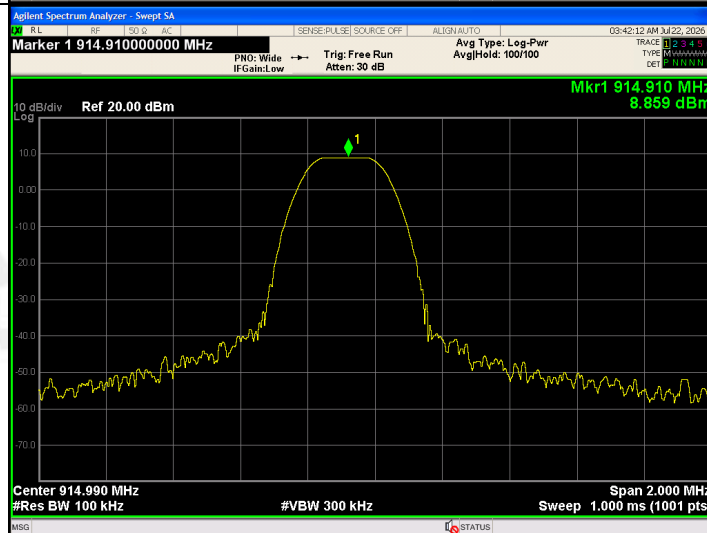




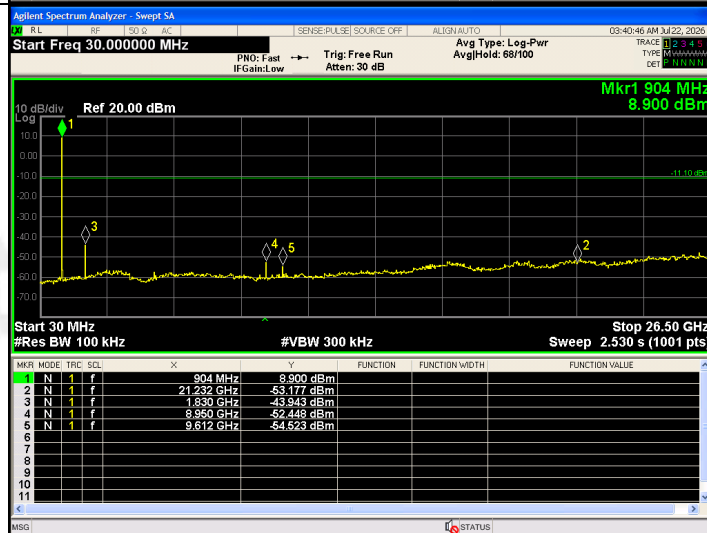
MCH



HCH



HCH



6 Photographs of the Test Setup

Please see EUT Photo for details.

7 Photographs of the EUT

Please see EUT Photo for details.

***** END OF REPORT *****