

TEST REPORT

Report No.: BCTC2403955968-2E

Applicant: CHINA DRAGON TECHNOLOGY LIMITED

Product Name: WiFi 11ac + BT5.0 Module

Test Model: CDW-61821CE-00

Tested Date: 2024-03-05 to 2024-03-13

Issued Date: 2024-03-14

Shenzhen **BCTC** Testing Co., Ltd.



FCC ID: ROW-61821CE

Product Name: WiFi 11ac + BT5.0 Module
Trademark: N/A
Model/Type reference: CDW-61821CE-00
CDW-61821CE-01, CDW-61821CE-10, CDW-61821CE-11
Prepared For: CHINA DRAGON TECHNOLOGY LIMITED
Address: B4 Bidg. haosan No.1 Industry Park, Shajing street, B Shenzhen, China
Manufacturer: CHINA DRAGON TECHNOLOGY LIMITED
Address: B4 Bidg. haosan No.1 Industry Park, Shajing street, B Shenzhen, China
Prepared By: Shenzhen BCTC Testing Co., Ltd.
Address: 1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road,
Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China
Sample tested Date: 2024-03-05 to 2024-03-13
Issue Date: 2024-03-14
Report No.: BCTC2403955968-2E
Test Standards: FCC Part15.247
ANSI C63.10-2013
Test Results: PASS
Remark: This is Bluetooth Classic radio test report.

Tested by:



Brave Zeng/ Project Handler

Approved by:



Zero Zhou/Reviewer

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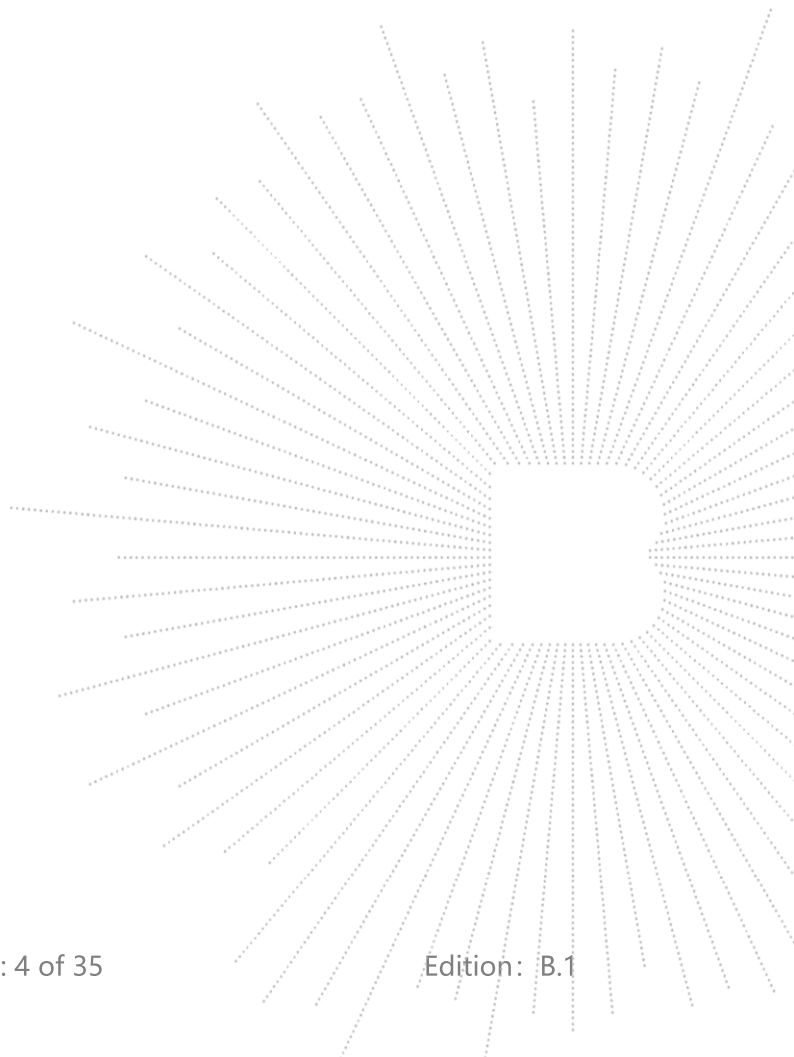
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(Note: N/A means not applicable)

1. Version

Report No.	Issue Date	Description	Approved
BCTC2101722088-2E	2021-02-26	Original	Valid
BCTC2403955968-2E	2024-03-14	Update the antenna of the product and change the restricted module to an independent module	Valid



2. Test Summary

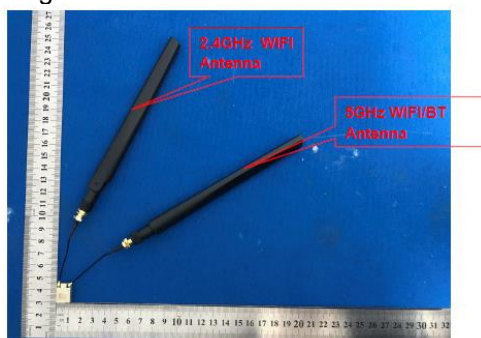
The Product has been tested according to the following specifications:

No.	Test Parameter	Clause No	Results
1	Conducted Emission	15.207	PASS
2	Radiated Spurious Emission	15.247 (d), 15.205	PASS
3	Restricted Band of Operation	15.205	PASS
4	Band Edge (Out of Band Emissions)	15.247(d)	PASS
5	Antenna Requirement	15.203	PASS
6	Conducted peak output power for FHSS	§15.247(b)(1)	PASS

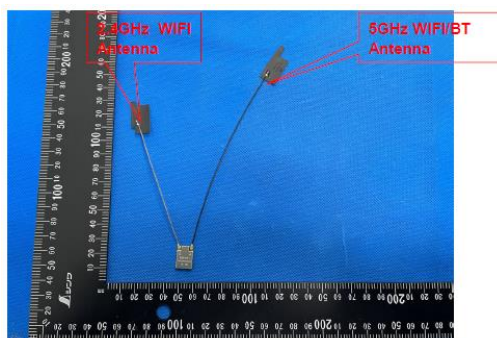
Note: According to the following changes in the product, the restricted module is changed to an independent module, the Bluetooth version is upgraded from 4.2 to 5.0, the RF chip board remains unchanged, and the product antenna is replaced.

Therefore, this report only updates the original report (BCTC2101722088-2E) for conducted emission and radiation emission, radiation spurious and radiation sideband, and Bluetooth power

Original:



new



Note: According to the following changes in the original test report (BCTC2101722088-2E), no changes have been made to the product.

Only the more commonly used test instruments, there are conducted emission, radiation emission, radiation sideband, radiation spurious, Bluetooth power, EUT photos.

The following table lists the basic antenna information provided for the EUT:

New

ANT Set	Brand	Model	ANT Gain(dBi)	Frequency (MHz)	ANT Type	Connector Type	Cable Length(mm)
BT	SWARD	SF2349A-1B2-A	0.97	2400-2500	PIFA	i-pex(MHF)	145
5G WIFI			2.53	5000-6000	PIFA	i-pex(MHF)	145
2.4G WIFI	SWARD	SF2350A-1B2-A	2.27	2400-2500	PIFA	i-pex(MHF)	100

Original:

ANT Set	Brand	Model	ANT Gain(dBi)	Frequency (MHz)	ANT Type	Connector Type	Cable Length(mm)
1	KIT	B0H5M7	5	2400-2500	Dipole	i-pex(MHF)	70
			5	5000-6000	Dipole	i-pex(MHF)	70
2.	KIT	B0H5M7	5	2400-2500	Dipole	i-pex(MHF)	70
			5	5000-6000	Dipole	i-pex(MHF)	70

3. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Uncertainty
1	3m chamber Radiated spurious emission(30MHz-1GHz)	U=4.3dB
2	3m chamber Radiated spurious emission(9KHz-30MHz)	U=3.7dB
3	3m chamber Radiated spurious emission(1GHz-18GHz)	U=4.5dB
4	3m chamber Radiated spurious emission(18GHz-40GHz)	U=3.34dB
5	Conducted Emission (150kHz-30MHz)	U=3.20dB
6	Conducted Adjacent channel power	U=1.38dB
7	Conducted output power uncertainty Above 1G	U=1.576dB
8	Conducted output power uncertainty below 1G	U=1.28dB
9	humidity uncertainty	U=5.3%
10	Temperature uncertainty	U=0.59°C

4. Product Information And Test Setup

4.1 Product Information

Model/Type reference:	CDW-61821CE-00 CDW-61821CE-01,CDW-61821CE-10, CDW-61821CE-11
Model differences:	All the model are the same circuit and RF module, except model names.
Bluetooth Version:	BT 5.0
Hardware Version:	v2.0
Software Version:	2024.0.10.213
Operation Frequency:	Bluetooth: 2402-2480MHz
Type of Modulation:	Bluetooth: GFSK, Pi/4 DQPSK, 8DPSK
Number Of Channel	79CH
Antenna installation:	Bluetooth: PIFA antenna Bluetooth: 0.97dBi
Antenna Gain:	Remark: ☒ The antenna gain of the product comes from the antenna report provided by the customer, and the test data is affected by the customer information. ☐ The antenna gain of the product is provided by the customer, and the test data is affected by the customer information.
Ratings:	DC 3.3V

4.2 Test Setup Configuration

See test photographs attached in *EUT TEST SETUP PHOTOGRAPHS* for the actual connections between Product and support equipment.

4.3 Support Equipment

No.	Device Type	Brand	Model	Series No.	Data Cable	Remark
E-1	WiFi 11ac + BT5.0 Module	N/A	CDW-61821 CE-00	N/A	N/A	EUT
E-2	Adapter	N/A	BTCT005	N/A	N/A	Auxiliary
E-3	mouse	N/A	BTCT002	N/A	N/A	Auxiliary
E-4	keyboard	N/A	BTCT003	N/A	N/A	Auxiliary
E-5	Computer monitor	N/A	BTCT004	N/A	N/A	Auxiliary

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	0.6M	VGA cable unshielded

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Channel List

CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)
0	2402	1	2403	2	2404	3	2405
4	2406	5	2407	6	2408	7	2409
8	2410	9	2411	10	2412	11	2413
12	2414	13	2415	14	2416	15	2417
16	2418	17	2419	18	2420	19	2421
20	2422	21	2423	22	2424	23	2425
24	2426	25	2427	26	2428	27	2429
28	2430	29	2431	30	2432	31	2433
32	2434	33	2435	34	2436	35	2437
36	2438	37	2439	38	2440	39	2441
40	2442	41	2443	42	2444	43	2445
44	2446	45	2447	46	2448	47	2449
48	2450	49	2451	50	2452	51	2453
52	2454	53	2455	54	2456	55	2457
56	2458	57	2459	58	2460	59	2461
60	2462	61	2463	62	2464	63	2465
64	2466	65	2467	66	2468	67	2469
68	2470	69	2471	70	2472	71	2473
72	2474	73	2475	74	2476	75	2477
76	2478	77	2479	78	2480	79	/

4.5 Test Mode

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Test Mode	Test mode	Low channel	Middle channel	High channel
1	Transmitting(GFSK)	2402MHz	2441MHz	2480MHz
2	Transmitting(Pi/4DQPSK)	2402MHz	2441MHz	2480MHz
3	Transmitting(8DPSK)	2402MHz	2441MHz	2480MHz
4	Charging (conducted emission)			
5	Transmitting (Radiated emission)			

Note:

- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) Fully-charged battery is used during the test

4.6 Table Of Parameters Of Text Software Setting

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	MP_Kit_RTL		
Frequency	2402 MHz	2441 MHz	2480 MHz
Parameters	DEF	DEF	DEF

5. Test Facility And Test Instrument Used

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Shenzhen BCTC Testing Co., Ltd. Address: 1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

FCC Test Firm Registration Number: 712850

A2LA certificate registration number is: CN1212

ISED Registered No.: 23583

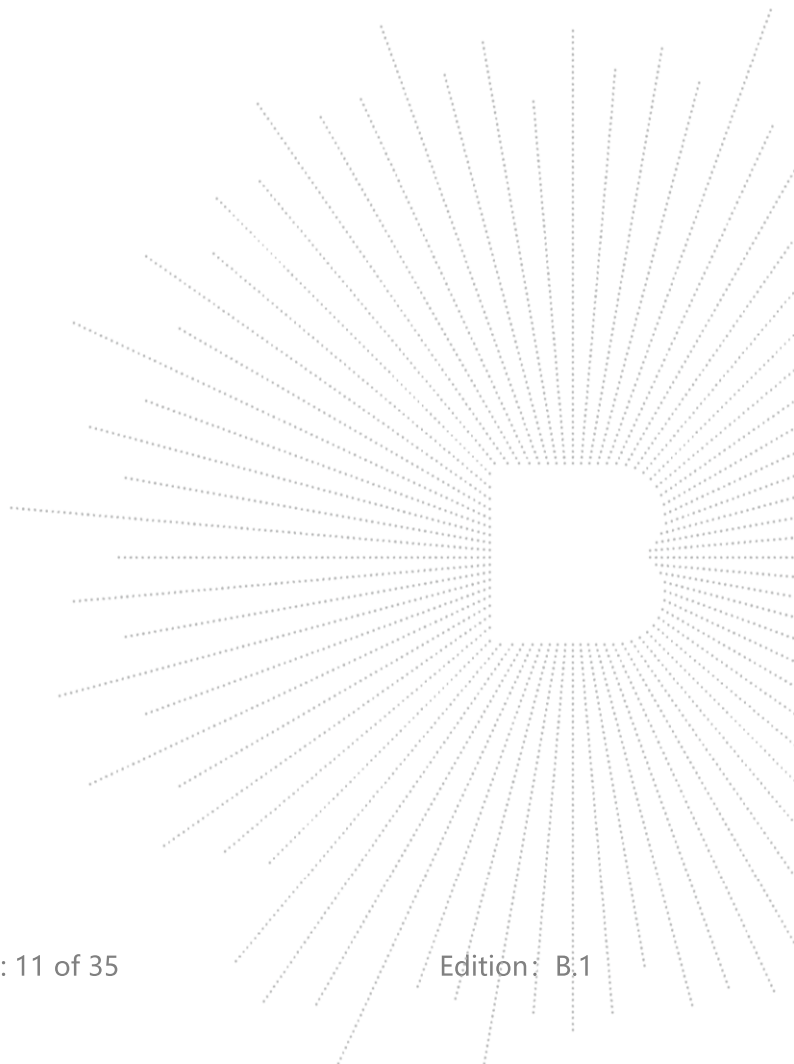
ISED CAB identifier: CN0017

5.2 Test Instrument Used

Conducted Emissions Test					
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.
Receiver	R&S	ESR3	102075	May 15, 2023	May 14, 2024
LISN	R&S	ENV216	101375	May 15, 2023	May 14, 2024
Software	Frad	EZ-EMC	EMC-CON 3A1	\	\
Pulse limiter	Schwarzbeck	VTSD9561-F	01323	Sept. 22, 2023	Sept. 21, 2024

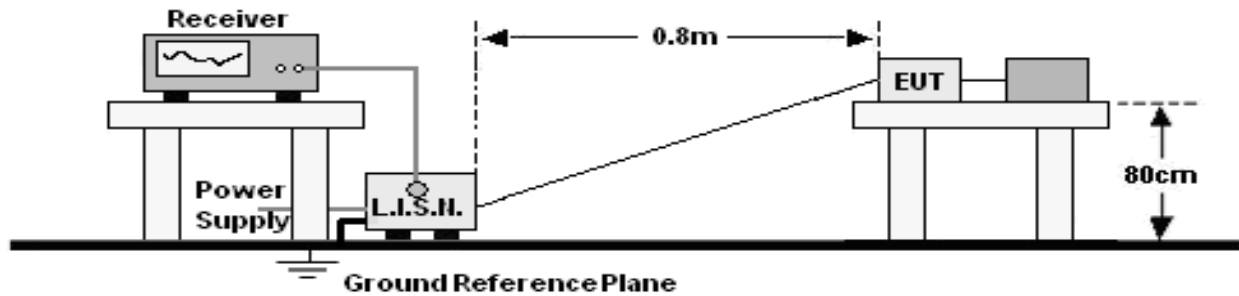
Radiated Emissions Test (966 Chamber01)					
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.
966 chamber	ChengYu	966 Room	966	May 15, 2023	May 14, 2026
Receiver	R&S	ESR3	102075	May 15, 2023	May 14, 2024
Receiver	R&S	ESRP	101154	May 15, 2023	May 14, 2024
Amplifier	Schwarzbeck	BBV9744	9744-0037	May 15, 2023	May 14, 2024
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	942	May 29, 2023	May 28, 2024
Loop Antenna(9KHz -30MHz)	Schwarzbeck	FMZB1519B	00014	May 31, 2023	May 30, 2024
Amplifier	SKET	LAPA_01G18 G-45dB	SK2021040901	May 15, 2023	May 14, 2024
Horn Antenna	Schwarzbeck	BBHA9120D	1541	May 31, 2023	May 30, 2024
Amplifier(18G Hz-40GHz)	MITEQ	TTA1840-35-HG	2034381	May 15, 2023	May 14, 2024
Horn Antenna18GHz-40GHz)	Schwarzbeck	BBHA9170	00822	May 31, 2023	May 30, 2024
Spectrum Analyzer9kHz-40GHz	R&S	FSP40	100363	May 15, 2023	May 14, 2024
Software	Frad	EZ-EMC	FA-03A2 RE	\	\

RF Conducted Test					
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.
Power Meter	Keysight	E4419	\	May 15, 2023	May 14, 2024
Power Sensor (AV)	Keysight	E9300A	\	May 15, 2023	May 14, 2024
Signal Analyzer20kHz-26.5GHz	Keysight	N9020A	MY49100060	May 15, 2023	May 14, 2024
Spectrum Analyzer9kHz-40GHz	R&S	FSP40	100363	May 15, 2023	May 14, 2024
Radio frequency control box	MAIWEI	MW100-RFC B	\	\	\
Software	MAIWEI	MTS 8310	\	\	\



6. Conducted Emissions

6.1 Block Diagram Of Test Setup



6.2 Limit

Frequency (MHz)	Limit (dBuV)	
	Quas-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Notes:

- *Decreasing linearly with logarithm of frequency.
- The lower limit shall apply at the transition frequencies.

6.3 Test Procedure

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

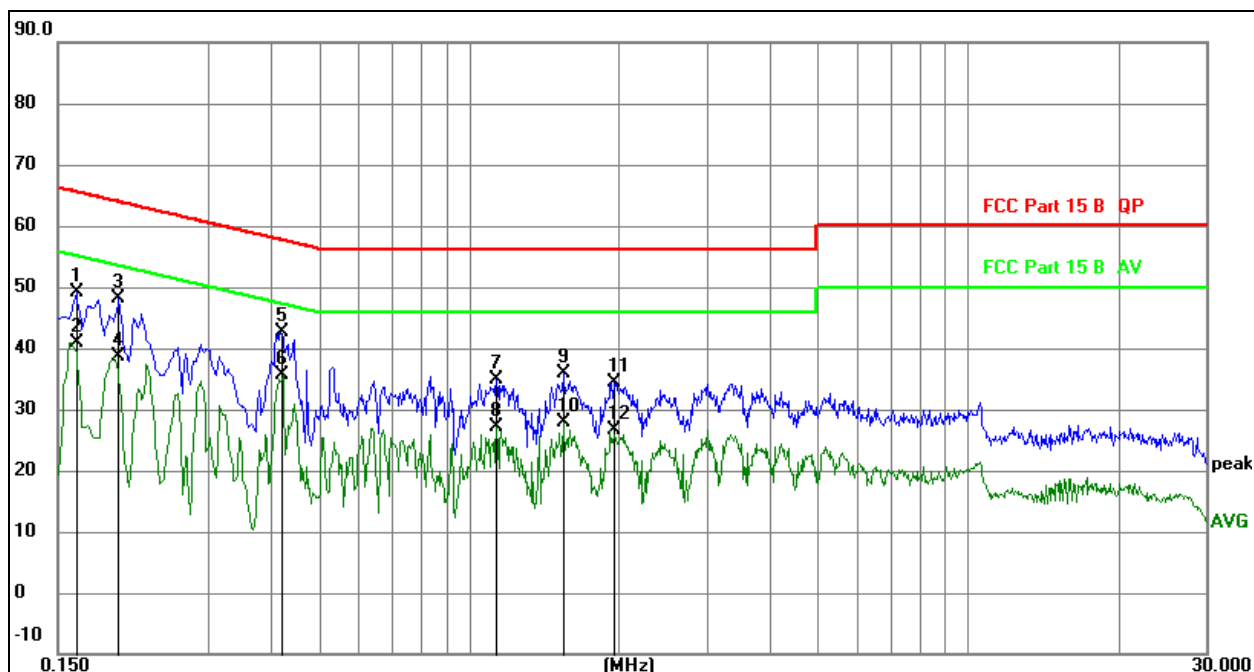
- The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N.).
- The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.
- For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

6.4 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.

6.5 Test Result

Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101KPa	Phase :	L
Test Mode:	Mode 4	Test Voltage :	AC120V/60Hz

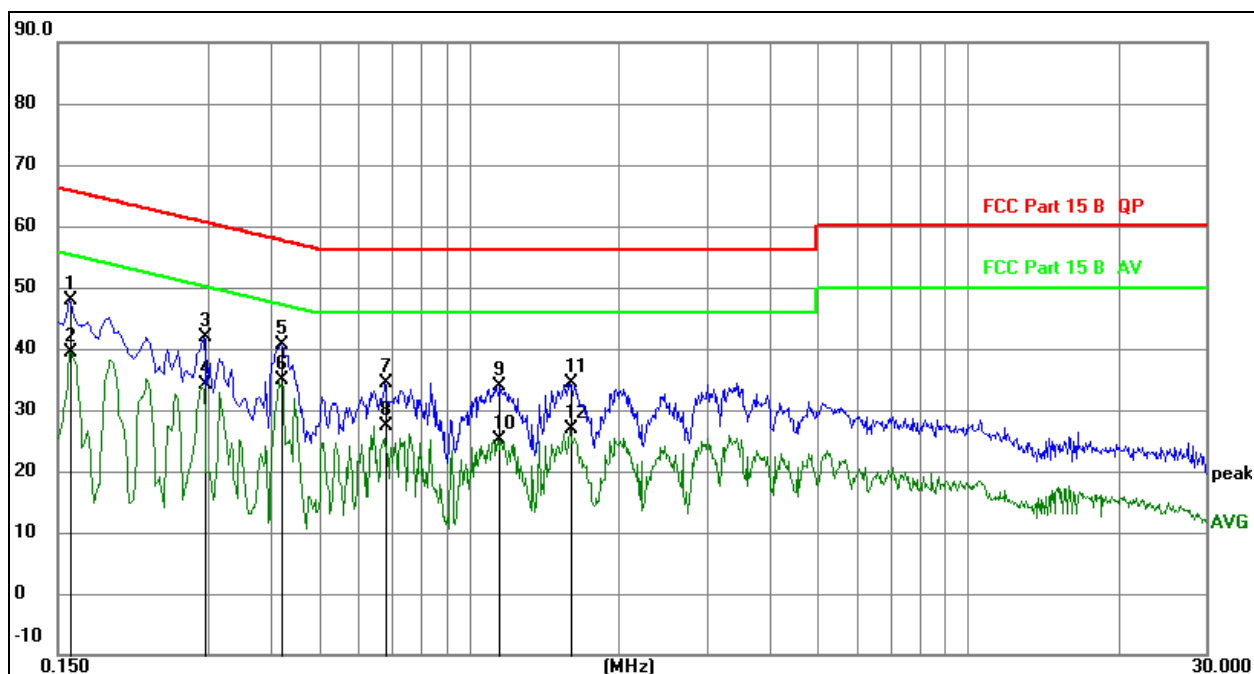


Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. Measurement = Reading Level + Correct Factor
4. Over = Measurement - Limit

No.	Mk.	Freq. MHz	Reading Level	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1		0.1633	29.42	19.76	49.18	65.29	-16.11	QP
2		0.1633	21.19	19.76	40.95	55.29	-14.34	AVG
3		0.1986	28.29	19.83	48.12	63.67	-15.55	QP
4		0.1986	18.74	19.83	38.57	53.67	-15.10	AVG
5		0.4193	22.82	19.84	42.66	57.46	-14.80	QP
6	*	0.4193	15.83	19.84	35.67	47.46	-11.79	AVG
7		1.1352	14.90	19.95	34.85	56.00	-21.15	QP
8		1.1352	7.15	19.95	27.10	46.00	-18.90	AVG
9		1.5436	16.05	19.95	36.00	56.00	-20.00	QP
10		1.5436	7.89	19.95	27.84	46.00	-18.16	AVG
11		1.9489	14.39	19.95	34.34	56.00	-21.66	QP
12		1.9489	6.69	19.95	26.64	46.00	-19.36	AVG

Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101KPa	Phase :	N
Test Mode:	Mode 4	Test Voltage :	AC120V/60Hz


Remark:

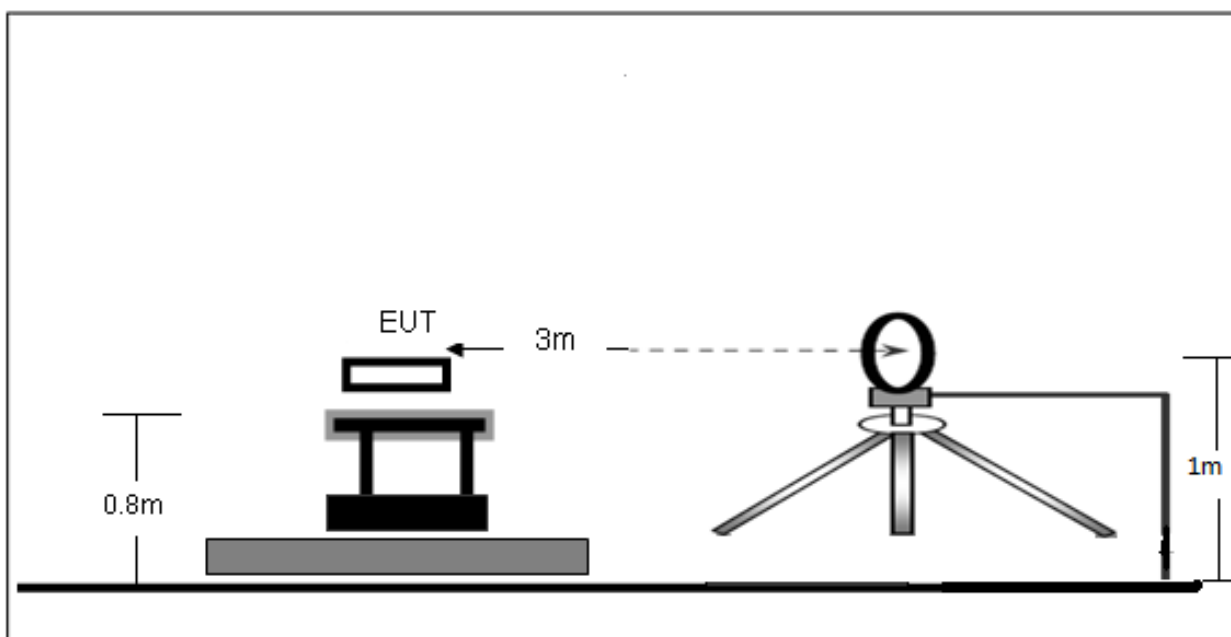
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. Measurement = Reading Level + Correct Factor
4. Over = Measurement - Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector
		MHz		dB	dBuV	dBuV	dB	
1		0.1590	28.15	19.75	47.90	65.52	-17.62	QP
2		0.1590	19.74	19.75	39.49	55.52	-16.03	AVG
3		0.2940	21.97	19.83	41.80	60.41	-18.61	QP
4		0.2940	14.29	19.83	34.12	50.41	-16.29	AVG
5		0.4200	20.87	19.84	40.71	57.45	-16.74	QP
6	*	0.4200	15.07	19.84	34.91	47.45	-12.54	AVG
7		0.6809	14.52	19.84	34.36	56.00	-21.64	QP
8		0.6809	7.55	19.84	27.39	46.00	-18.61	AVG
9		1.1534	13.98	19.95	33.93	56.00	-22.07	QP
10		1.1534	5.08	19.95	25.03	46.00	-20.97	AVG
11		1.5944	14.54	19.95	34.49	56.00	-21.51	QP
12		1.5944	6.98	19.95	26.93	46.00	-19.07	AVG

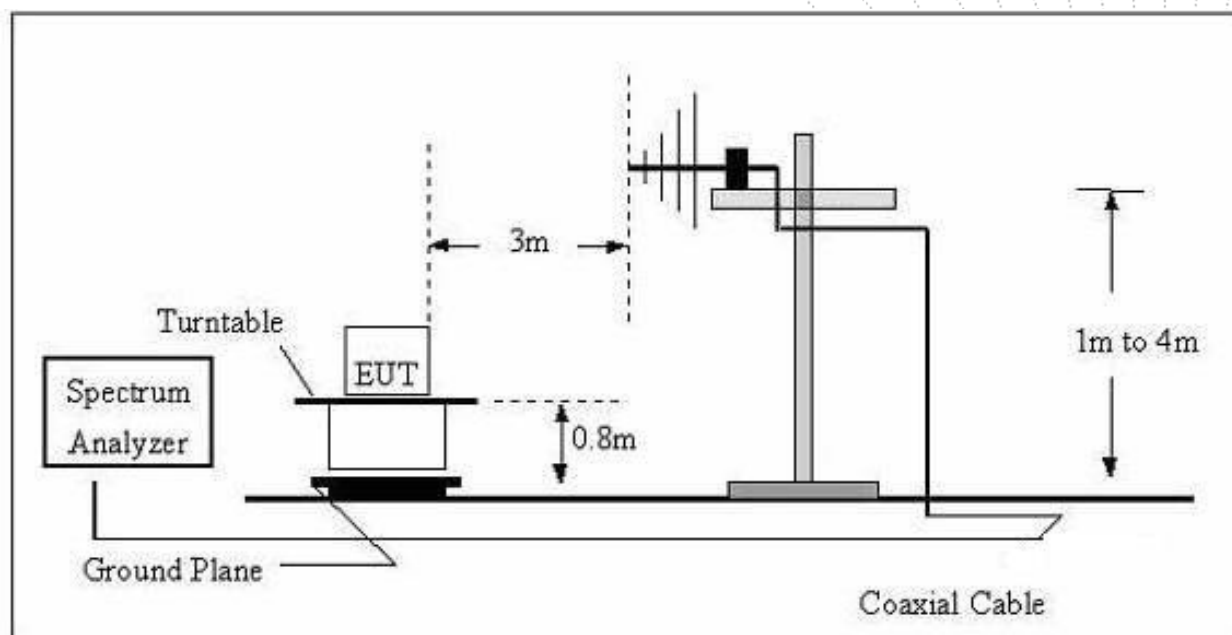
7. Radiated Emissions

7.1 Block Diagram Of Test Setup

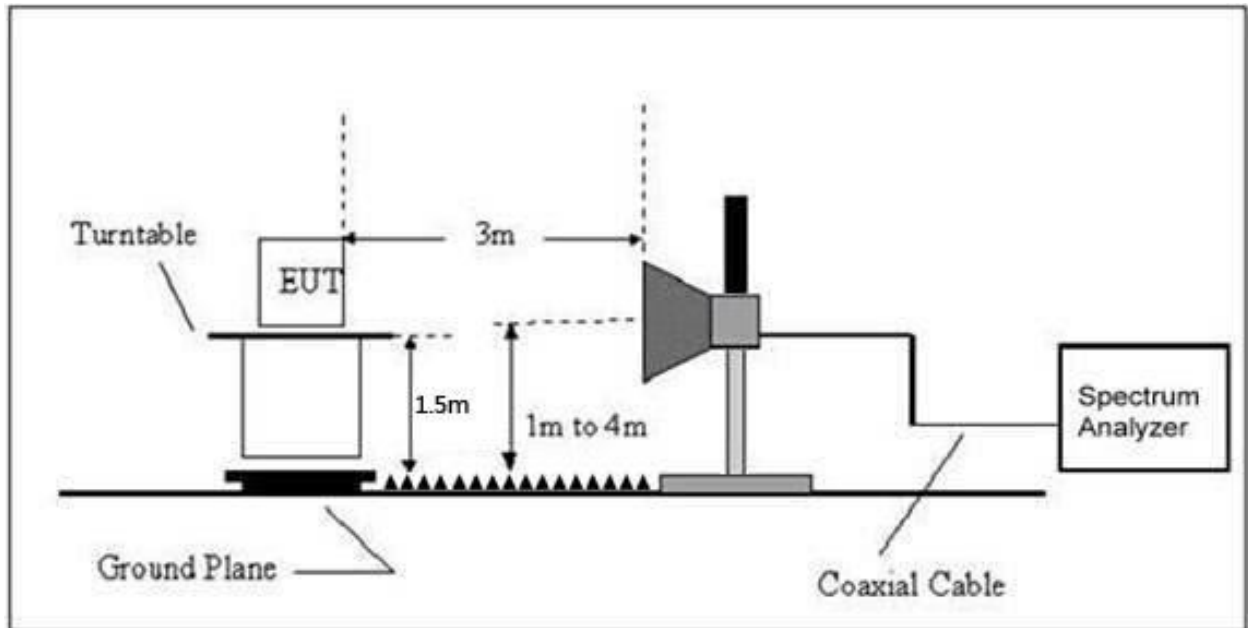
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



7.2 Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequency (MHz)	Field Strength uV/m	Distance (m)	Field Strength Limit at 3m Distance	
			uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log(2400/F(\text{kHz})) + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log(24000/F(\text{kHz})) + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log(30) + 40$
30 ~ 88	100	3	100	$20\log(100)$
88 ~ 216	150	3	150	$20\log(150)$
216 ~ 960	200	3	200	$20\log(200)$
Above 960	500	3	500	$20\log(500)$

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

Frequency (MHz)	Limit (dBuV/m) (at 3M)	
	Peak	Average
Above 1000	74	54

Notes:

- (1)The limit for radiated test was performed according to FCC PART 15C.
- (2)The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower

7.3 Test Procedure

Receiver Parameter	Setting
Attenuation	Auto
9kHz~150kHz	RBW 200Hz for QP
150kHz~30MHz	RBW 9kHz for QP
30MHz~1000MHz	RBW 120kHz for QP

Spectrum Parameter	Setting
1-25GHz	RBW 1 MHz /VBW 1 MHz for Peak, RBW 1 MHz / VBW 10Hz for Average

Below 1GHz test procedure as below:

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

- Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre(Above 18GHz the distance is 1 meter and table is 1.5 metre).
- Test the EUT in the lowest channel ,the middle channel ,the Highest channel.

Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

Above 1GHz test procedure as below:

- a. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the Highest channel.

Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

7.4 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.

7.5 Test Result

Below 30MHz

Temperature:	26℃	Relative Humidity:	24%
Pressure:	101 kPa	Test Voltage:	AC 120V/60Hz
Test Mode:	Mode 4	Polarization:	--

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

Note:

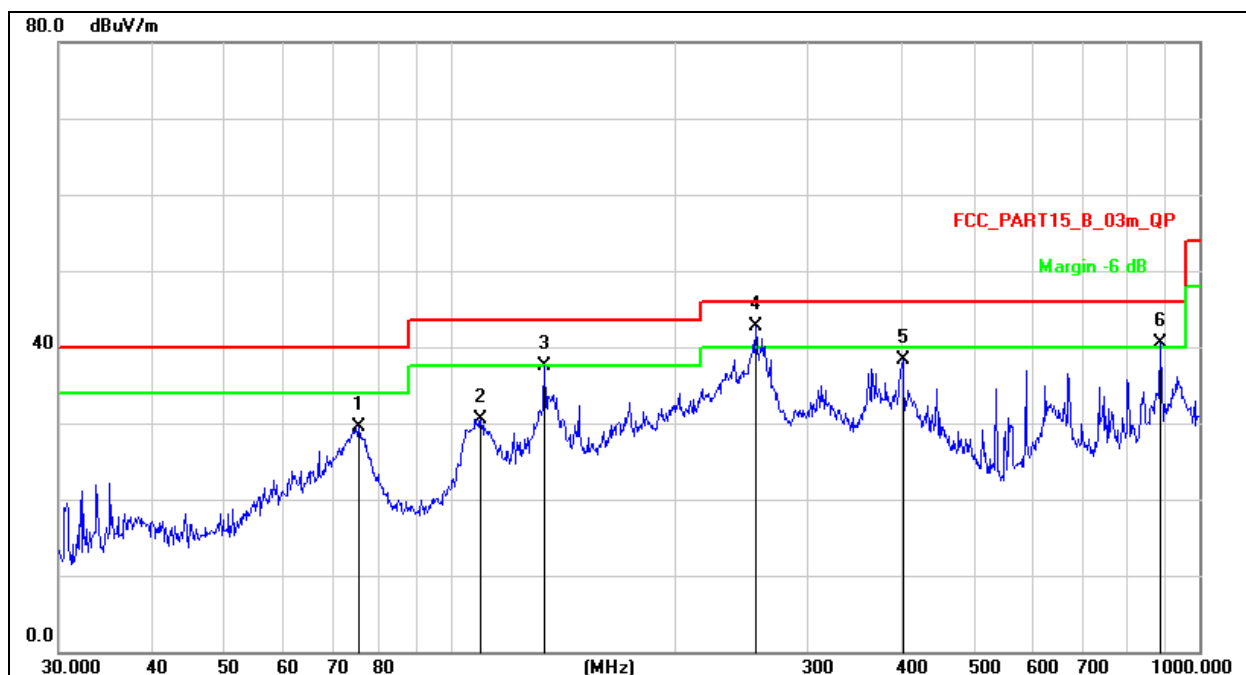
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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

Limit line = specific limits(dBuv) + distance extrapolation factor.

Between 30MHz – 1GHz

Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101KPa	Phase :	Horizontal
Test Mode:	Mode 4	Test Voltage :	AC120V/60Hz

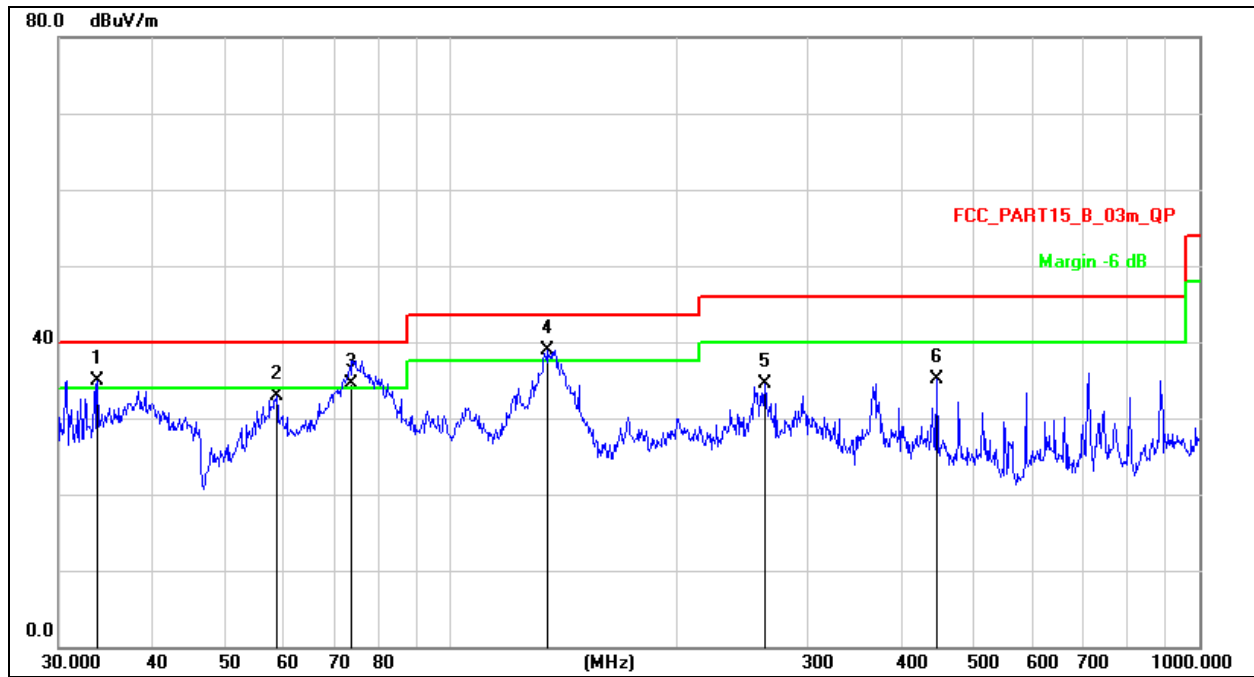


Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
2. Measurement = Reading Level + Correct Factor
3. Over = Measurement - Limit

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		75.4464	48.52	-18.95	29.57	40.00	-10.43	QP
2		109.7960	47.19	-16.62	30.57	43.50	-12.93	QP
3		133.6188	55.76	-18.28	37.48	43.50	-6.02	QP
4	*	255.6231	56.80	-14.17	42.63	46.00	-3.37	QP
5		401.8385	49.20	-10.80	38.40	46.00	-7.60	QP
6	!	887.6099	43.86	-3.33	40.53	46.00	-5.47	QP

Temperature:	26 °C	Relative Humidity:	54%
Pressure:	101KPa	Phase :	Vertical
Test Mode:	Mode 4	Test Voltage :	AC120V/60Hz



Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
2. Measurement = Reading Level + Correct Factor
3. Over = Measurement - Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	!	33.7986	50.87	-15.92	34.95	40.00	-5.05	QP
2		58.6126	47.96	-15.06	32.90	40.00	-7.10	QP
3	!	73.7462	53.18	-18.66	34.52	40.00	-5.48	QP
4	*	135.0319	57.36	-18.38	38.98	43.50	-4.52	QP
5		262.8955	48.44	-14.02	34.42	46.00	-11.58	QP
6		446.4141	44.95	-9.93	35.02	46.00	-10.98	QP

Between 1GHz – 25GHz

Polar (H/V)	Fre- quency	Reading Level	Correct Factor	Measure- ment	Limits	Over	Detector Type
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
GFSK Low channel							
V	4804.00	75.20	-19.99	55.21	74.00	-18.79	PK
V	4804.00	65.99	-19.99	46.00	54.00	-8.00	AV
V	7206.00	64.62	-14.22	50.40	74.00	-23.60	PK
V	7206.00	55.02	-14.22	40.80	54.00	-13.20	AV
H	4804.00	72.77	-19.99	52.78	74.00	-21.22	PK
H	4804.00	62.20	-19.99	42.21	54.00	-11.79	AV
H	7206.00	62.51	-14.22	48.29	74.00	-25.71	PK
H	7206.00	53.79	-14.22	39.57	54.00	-14.43	AV
GFSK Middle channel							
V	4882.00	73.69	-19.84	53.85	74.00	-20.15	PK
V	4882.00	66.92	-19.84	47.08	54.00	-6.92	AV
V	7323.00	65.61	-13.90	51.71	74.00	-22.29	PK
V	7323.00	55.94	-13.90	42.04	54.00	-11.96	AV
H	4882.00	69.21	-19.84	49.37	74.00	-24.63	PK
H	4882.00	60.12	-19.84	40.28	54.00	-13.72	AV
H	7323.00	63.74	-13.90	49.84	74.00	-24.16	PK
H	7323.00	56.47	-13.90	42.57	54.00	-11.43	AV
GFSK High channel							
V	4960.00	75.12	-19.68	55.44	74.00	-18.56	PK
V	4960.00	66.38	-19.68	46.70	54.00	-7.30	AV
V	7440.00	67.10	-13.57	53.53	74.00	-20.47	PK
V	7440.00	57.05	-13.57	43.48	54.00	-10.52	AV
H	4960.00	72.38	-19.68	52.70	74.00	-21.30	PK
H	4960.00	62.50	-19.68	42.82	54.00	-11.18	AV
H	7440.00	65.72	-13.57	52.15	74.00	-21.85	PK
H	7440.00	57.26	-13.57	43.69	54.00	-10.31	AV

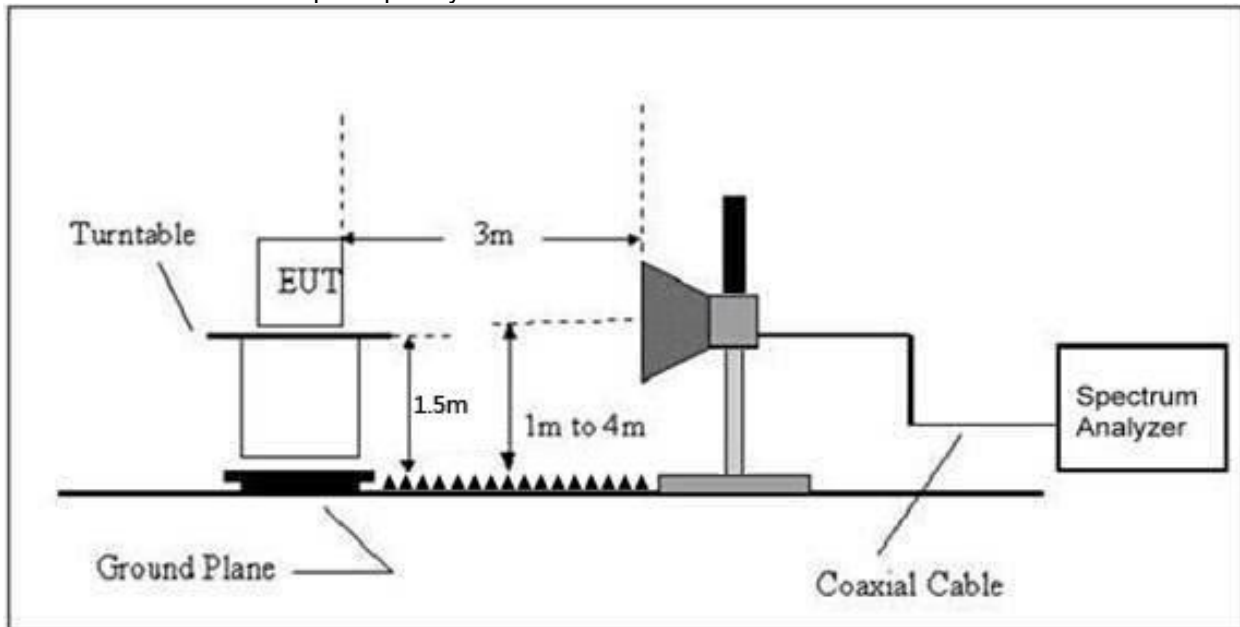
Remark:

1. Measurement = Reading Level + Correct Factor,
Correct Factor = Antenna Factor + Cable Loss – Pre-amplifier,
Over= Measurement – Limit
- 2.If peak below the average limit, the average emission was no test.
3. In restricted bands of operation, The spurious emissions below the permissible value more than 20dB
4. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
- 5.All the Modulation are test, the worst mode is GFSK, the data recording in the report.

8. Radiated Band Emission Measurement And Restricted Bands Of Operation

8.1 Block Diagram Of Test Setup

Radiated Emission Test-Up Frequency Above 1GHz



8.2 Limit

FCC Part15 C Section 15.209 and 15.205

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	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	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	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			

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

Frequency (MHz)	Limit (dBuV/m) (at 3M)	
	Peak	Average
Above 1000	74	54

Notes:

(1)The limit for radiated test was performed according to FCC PART 15C.

(2)The tighter limit applies at the band edges.

(3)Emission level (dBuV/m)=20log Emission level (uV/m).

8.3 Test Procedure

Receiver Parameter	Setting
Attenuation	Auto
Start Frequency	2300MHz
Stop Frequency	2520
RB / VB (Emission In Restricted Band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Above 1GHz test procedure as below:

a.The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c.The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d.For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

e.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g.Test the EUT in the lowest channel, the Highest channel.

Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

8.4 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.

8.5 Test Result

	Polar (H/V)	Frequency (MHz)	Reading Level (dBuV/m)	Correct Factor (dB)	Measure- ment (dBuV/m)	Limits (dBuV/m)		Result
					PK	PK	AV	
GFSK	Low Channel 2402MHz							
	H	2390.00	71.69	-25.43	46.26	74.00	54.00	PASS
	H	2400.00	75.87	-25.40	50.47	74.00	54.00	PASS
	V	2390.00	71.49	-25.43	46.06	74.00	54.00	PASS
	V	2400.00	76.09	-25.40	50.69	74.00	54.00	PASS
	High Channel 2480MHz							
	H	2483.50	76.15	-25.15	51.00	74.00	54.00	PASS
	H	2485.00	69.05	-25.10	43.95	74.00	54.00	PASS
	V	2483.50	73.67	-25.15	48.52	74.00	54.00	PASS
	V	2485.00	71.03	-25.10	45.93	74.00	54.00	PASS
Pi/4DQPSK	Low Channel 2402MHz							
	H	2390.00	71.46	-25.43	46.03	74.00	54.00	PASS
	H	2400.00	75.12	-25.40	49.72	74.00	54.00	PASS
	V	2390.00	71.08	-25.43	45.65	74.00	54.00	PASS
	V	2400.00	74.47	-25.40	49.07	74.00	54.00	PASS
	High Channel 2480MHz							
	H	2483.50	74.47	-25.15	49.32	74.00	54.00	PASS
	H	2485.00	69.67	-25.10	44.57	74.00	54.00	PASS
	V	2483.50	75.24	-25.15	50.09	74.00	54.00	PASS
	V	2485.00	71.20	-25.10	46.10	74.00	54.00	PASS
8DPSK	Low Channel 2402MHz							
	H	2390.00	71.53	-25.43	46.10	74.00	54.00	PASS
	H	2400.00	75.40	-25.40	50.00	74.00	54.00	PASS
	V	2390.00	71.20	-25.43	45.77	74.00	54.00	PASS
	V	2400.00	75.57	-25.40	50.17	74.00	54.00	PASS
	High Channel 2480MHz							
	H	2483.50	75.45	-25.15	50.30	74.00	54.00	PASS
	H	2485.00	68.89	-25.10	43.79	74.00	54.00	PASS
	V	2483.50	73.39	-25.15	48.24	74.00	54.00	PASS
	V	2485.00	68.62	-25.10	43.52	74.00	54.00	PASS
Remark:								
1. Measurement = Reading Level + Correct Factor, Correct Factor = Antenna Factor + Cable Loss – Pre-amplifier, Over= Measurement – Limit								
2. If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.								
3 In restricted bands of operation, The spurious emissions below the permissible value more than 20dB								
4. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.								

9. Maximum Peak Output Power

9.1 Block Diagram Of Test Setup



9.2 Limit

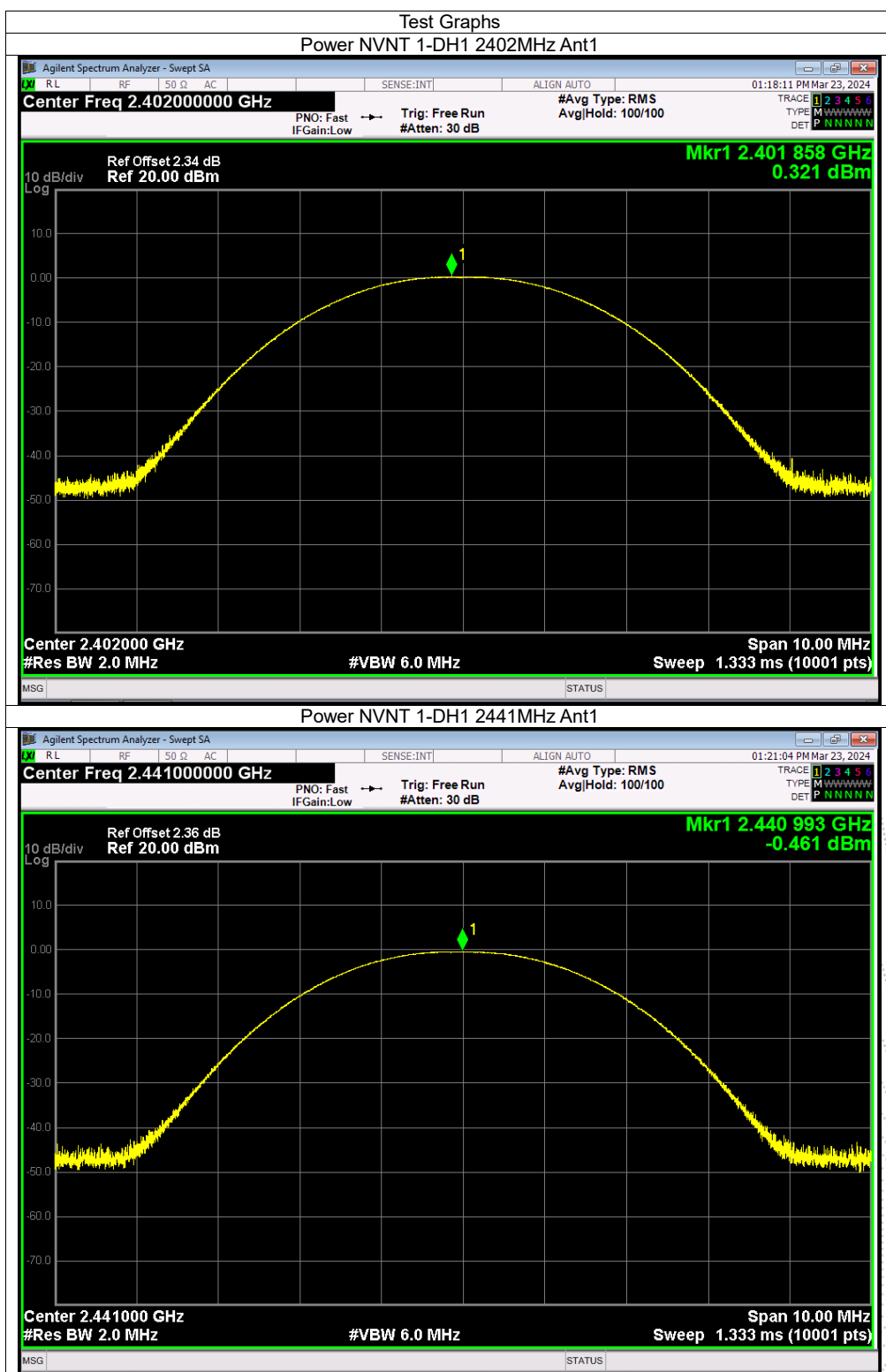
FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(1)	Peak Output Power	0.125 watt or 21dBm	2400-2483.5	PASS

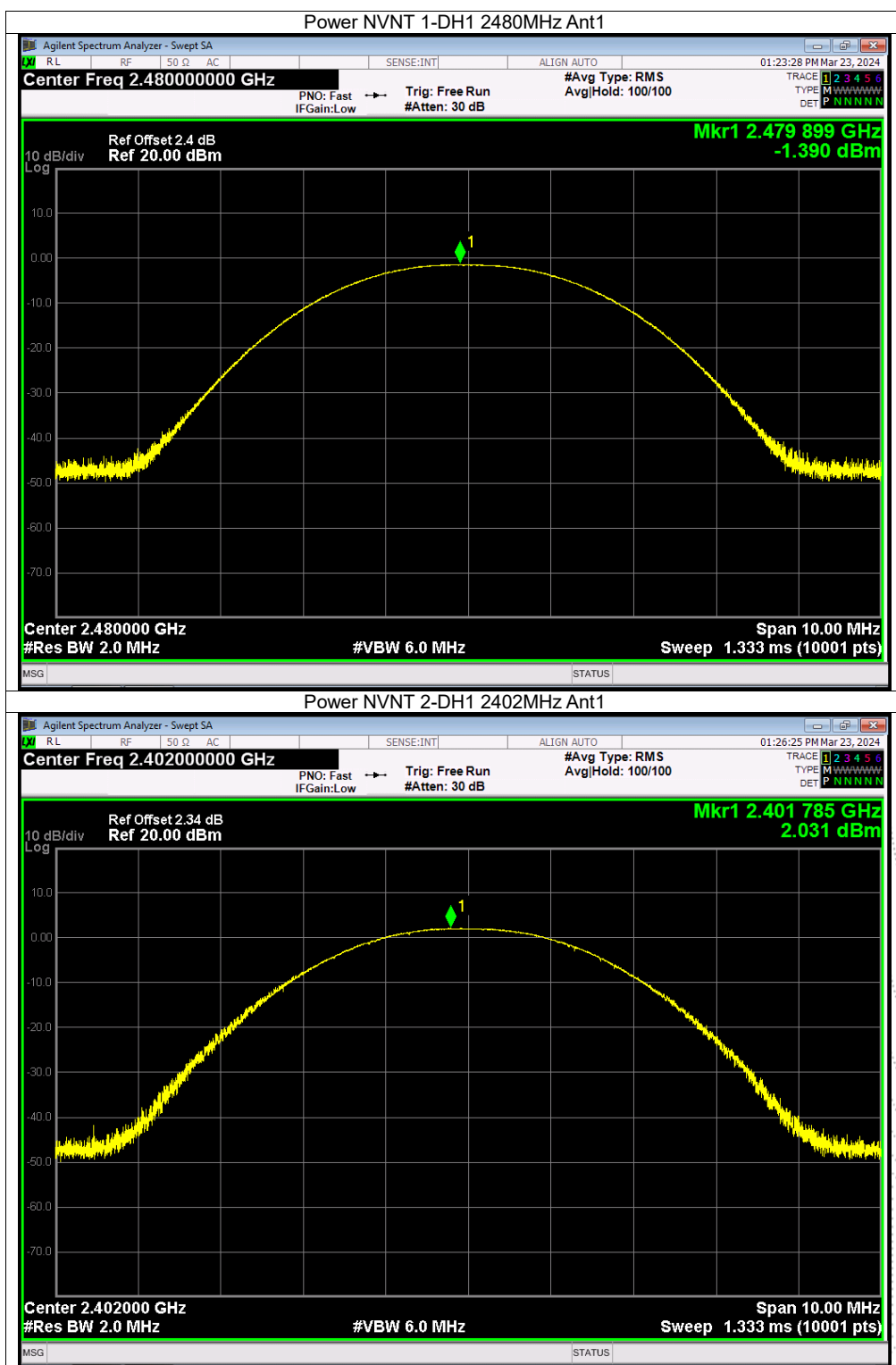
9.3 Test procedure

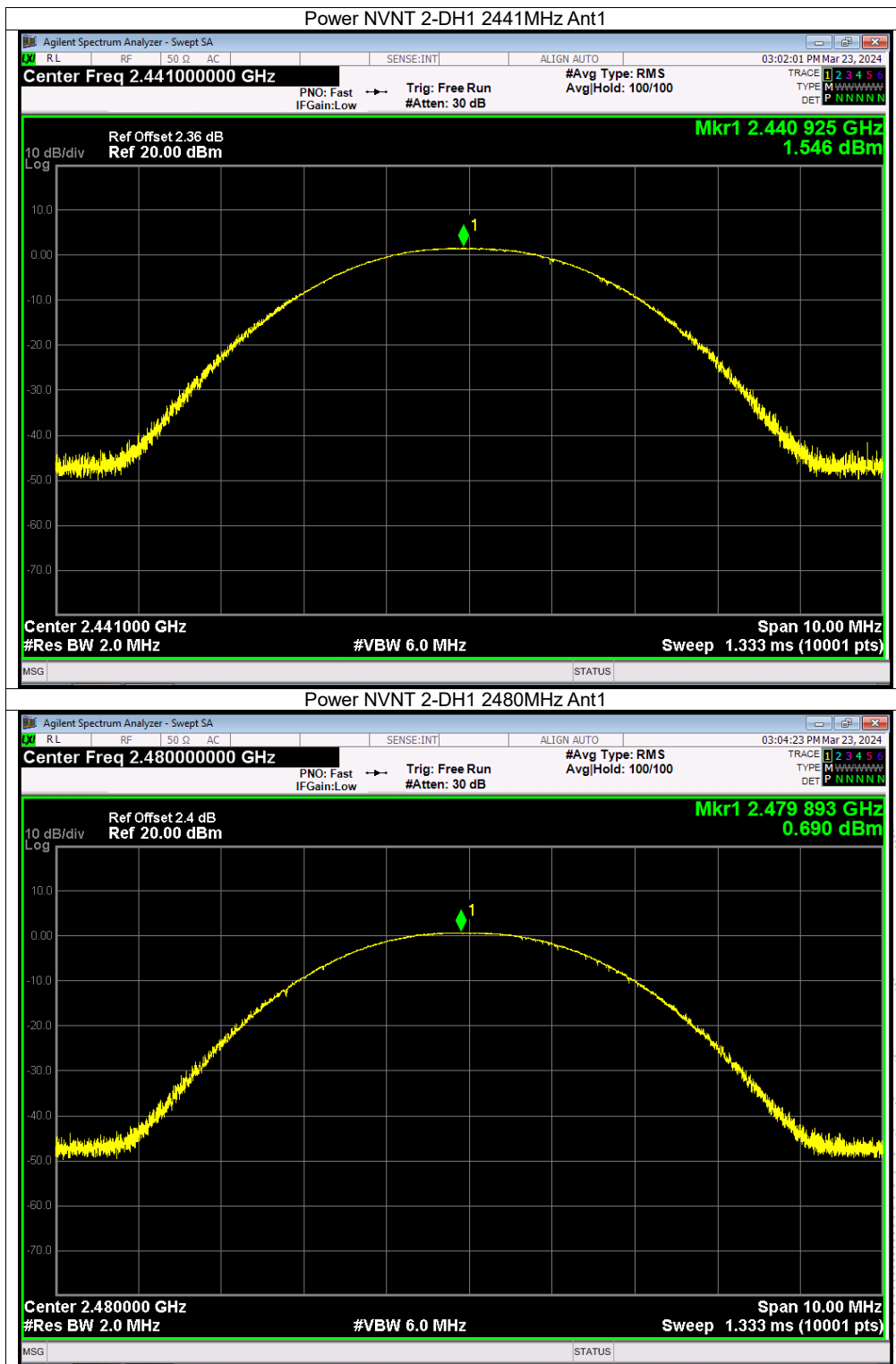
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 2MHz. VBW = 6MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

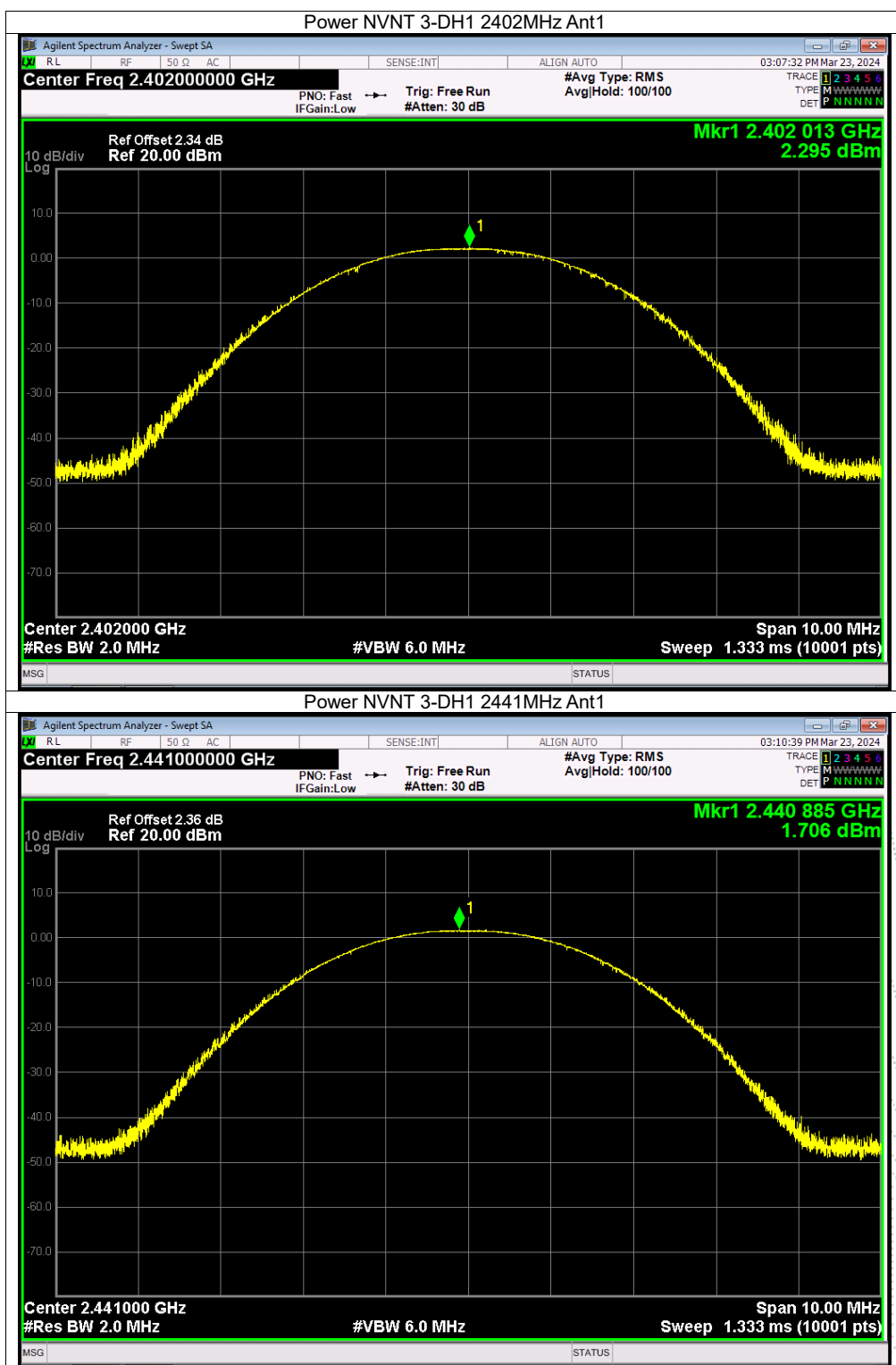
9.4 Test Result

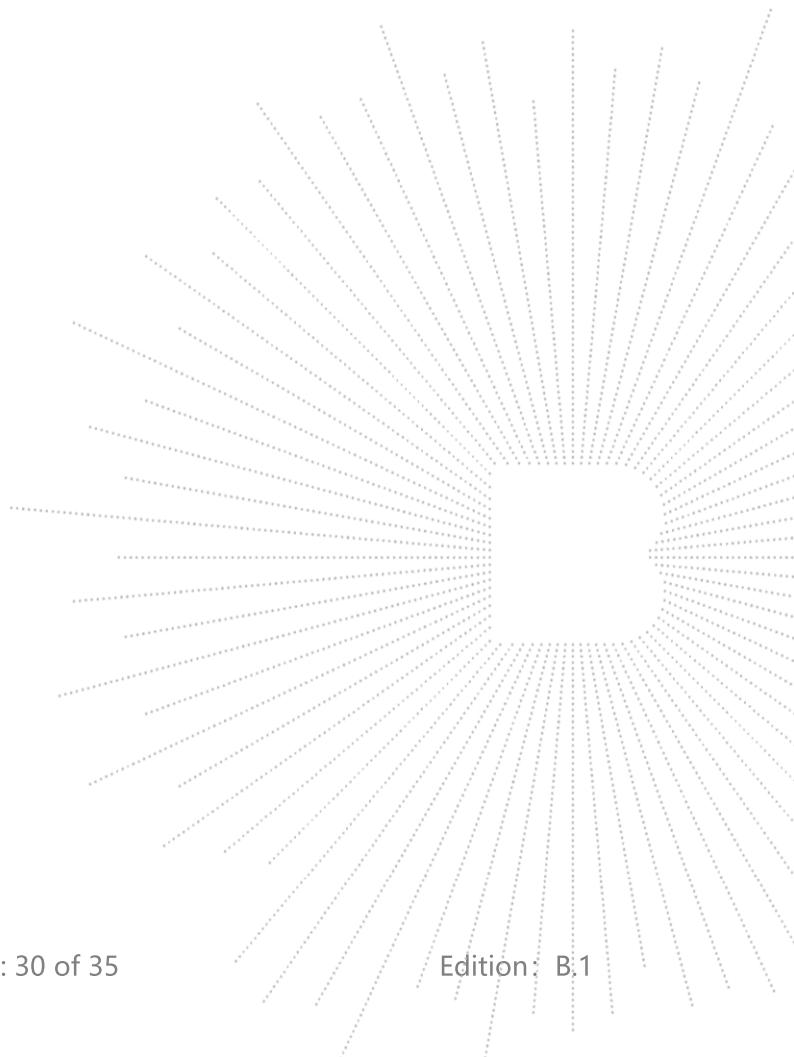
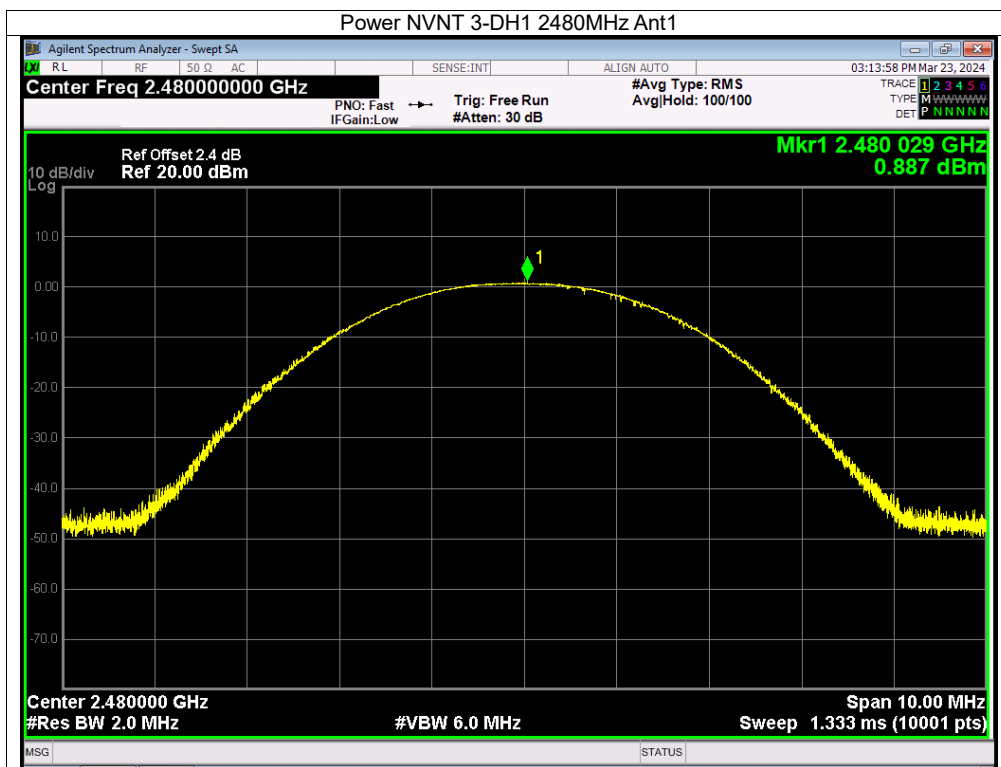
Condition	Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	1-DH1	2402	0.32	21	Pass
NVNT	1-DH1	2441	-0.46	21	Pass
NVNT	1-DH1	2480	-1.39	21	Pass
NVNT	2-DH1	2402	2.03	21	Pass
NVNT	2-DH1	2441	1.55	21	Pass
NVNT	2-DH1	2480	0.69	21	Pass
NVNT	3-DH1	2402	2.3	21	Pass
NVNT	3-DH1	2441	1.71	21	Pass
NVNT	3-DH1	2480	0.89	21	Pass











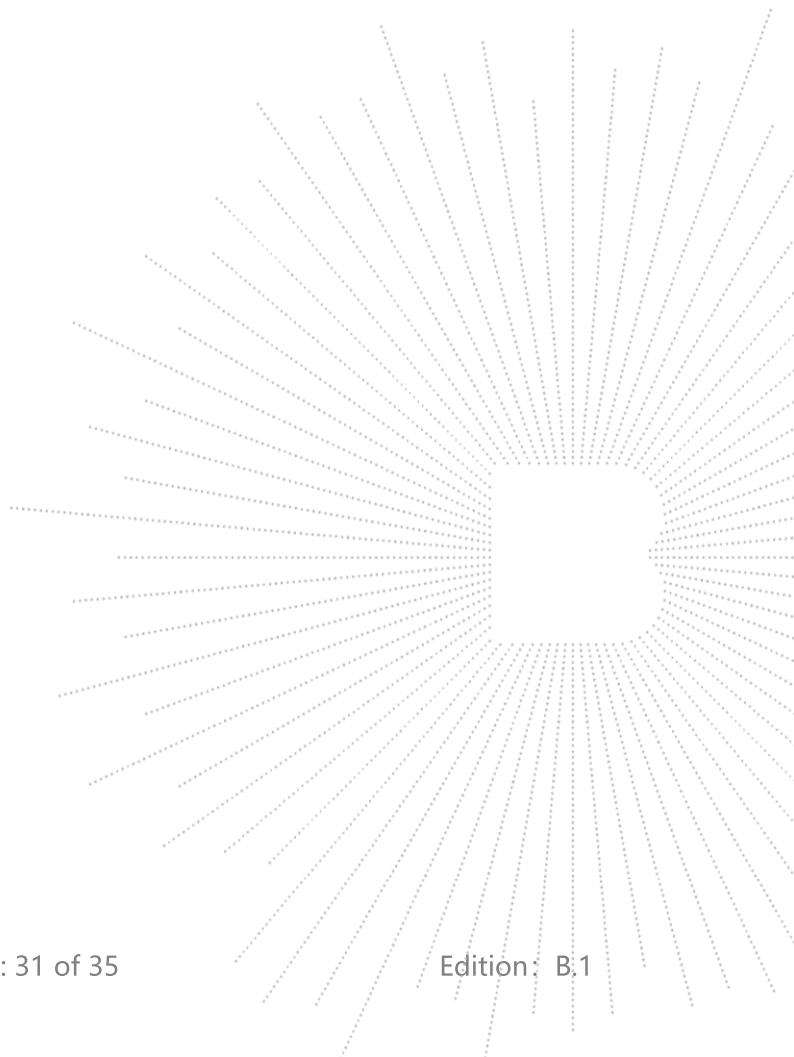
10. Antenna Requirement

10.1 Limit

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.

10.2 Test Result

The EUT antenna is PIFA antenna, antenna Gain is 0.97dBi, fulfill the requirement of this section.

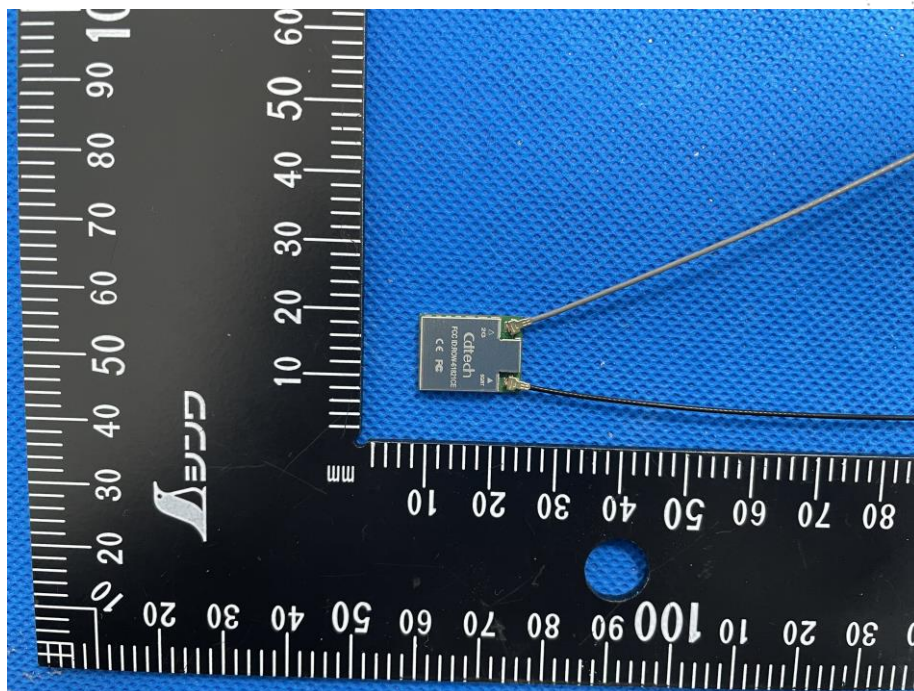


11. EUT Photographs

EUT Photo 1



EUT Photo 2



12. EUT Test Setup Photographs

Conducted emissions



Radiated Measurement Photos





STATEMENT

1. The equipment lists are traceable to the national reference standards.
2. The test report can not be partially copied unless prior written approval is issued from our lab.
3. The test report is invalid without the "special seal for inspection and testing".
4. The test report is invalid without the signature of the approver.
5. The test process and test result is only related to the Unit Under Test.
6. Sample information is provided by the client and the laboratory is not responsible for its authenticity.
7. The quality system of our laboratory is in accordance with ISO/IEC17025.
8. If there is any objection to this test report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

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***** END *****