



FCC Radio Test Report FCC ID: VLJ-SP016

The report concerns: Original Grant

Report Reference No:	19EFAS12007 4311
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Testing Laboratory: DongGuan ShuoXin Electronic Technology Co., Ltd.

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Address XinAn District, ChangAn Town, DongGuan City,

GuangDong, China

Applicant's name Binatone Electronics Internationnal Ltd.

Floor 23A, 9 Des Voeux Road West, Sheung Wan

Address Hong Kong, China

Manufacturer...... Musilab Electronic (DongGuan) Co., Ltd

Equipment...... Protable Bluetooth Speaker

Trade Mark motorola

Model SP016

Ratings I/P: DC 3.7V by Li-ion Battery

Charging by micro-usb DC 5V

Responsible Engineer:

Smile Wang

Authorized Signatory:

King Wang



Table of Contents	Page
1 . TEST REPORT DECLARE	5
2 . SUMMARY OF TEST RESULTS	6
2.1 MEASUREMENT UNCERTAINTY	7
3. GENERAL INFORMATION	8
3.1 GENERAL DESCRIPTION OF EUT	8
3.2 DESCRIPTION OF TEST MODES	10
3.3 PARAMETERS OF TEST SOFTWARE	11
3.4 BLOCKDIAGRAMSHOWINGTHECONFIGURATIONOFSYSTEMTESTED	11
3.5 SUPPORT UNITS	11
3.6 TEST ENVIRONMENT CONDITIONS	12
4 .AC POWER LINE CONDUCTED EMISSIONS TEST	13
4.1 LIMIT	13
4.2 TEST PROCEDURE	13
4.3 MEASUREMENT INSTRUMENTS LIST	13
4.4 TESTSETUP	14
4.5 EUT OPERATING CONDITIONS	14
4.6 TEST RESULTS	15
5 . RADIATED EMISSION TEST	17
5.1 LIMIT	17
5.2 TEST PROCEDURE AND SETTING	18
5.3 MEASUREMENT INSTRUMENTS LIST	19
5.4 TESTSETUP	19
5.5 EUT OPERATING CONDITIONS	20
5.6 TEST RESULTS - 9 KHZ TO 30MHZ	21
5.7 TEST RESULTS- 30 MHZ TO 1000MHZ	22
5.8 TEST RESULTS - ABOVE 1000MHZ(BAND EDGE)	24
5.9 TEST RESULTS - ABOVE 1000MHZ(HARMONIC)	32
6 .NUMBER OF HOPPING FREQUENCY	44
6.1 LIMIT	44
6.2 TEST PROCEDURE AND SETTING	44
6.3 MEASUREMENT INSTRUMENTS LIST 6.4 TEST SETUP	44 44
0.4 IE31 3ETUP	44





6.5 EUT OPERATION CONDITIONS 6.6 TEST RESULTS 7 .AVERAGE TIME OF OCCUPANCY 7.1 LIMIT 7.2 TEST PROCEDURE AND SETTING 7.3 MEASUREMENT INSTRUMENTS LIST 7.4 TEST SETUP 7.5 EUT OPERATION CONDITIONS 7.6 TEST RESULTS 8 .HOPPING CHANNEL SEPARATION MEASUREMENT 8.1 LIMIT 8.2 TEST PROCEDURE AND SETTING	44 45 46 46 46 46 46 46
7 .AVERAGE TIME OF OCCUPANCY 7.1 LIMIT 7.2 TEST PROCEDURE AND SETTING 7.3 MEASUREMENT INSTRUMENTS LIST 7.4 TEST SETUP 7.5 EUT OPERATION CONDITIONS 7.6 TEST RESULTS 8 .HOPPING CHANNEL SEPARATION MEASUREMENT 8.1 LIMIT	46 46 46 46 46
7.1 LIMIT 7.2 TEST PROCEDURE AND SETTING 7.3 MEASUREMENT INSTRUMENTS LIST 7.4 TEST SETUP 7.5 EUT OPERATION CONDITIONS 7.6 TEST RESULTS 8 .HOPPING CHANNEL SEPARATION MEASUREMENT 8.1 LIMIT	46 46 46 46 46
7.2 TEST PROCEDURE AND SETTING 7.3 MEASUREMENT INSTRUMENTS LIST 7.4 TEST SETUP 7.5 EUT OPERATION CONDITIONS 7.6 TEST RESULTS 8 .HOPPING CHANNEL SEPARATION MEASUREMENT 8.1 LIMIT	46 46 46 46
7.3 MEASUREMENT INSTRUMENTS LIST 7.4 TEST SETUP 7.5 EUT OPERATION CONDITIONS 7.6 TEST RESULTS 8 .HOPPING CHANNEL SEPARATION MEASUREMENT 8.1 LIMIT	46 46 46
7.4 TEST SETUP 7.5 EUT OPERATION CONDITIONS 7.6 TEST RESULTS 8 .HOPPING CHANNEL SEPARATION MEASUREMENT 8.1 LIMIT	46 46
7.5 EUT OPERATION CONDITIONS 7.6 TEST RESULTS 8 .HOPPING CHANNEL SEPARATION MEASUREMENT 8.1 LIMIT	46
7.6 TEST RESULTS 8 .HOPPING CHANNEL SEPARATION MEASUREMENT 8.1 LIMIT	
8 .HOPPING CHANNEL SEPARATION MEASUREMENT 8.1 LIMIT	47
8.1 LIMIT	
	49
8.2 TEST PROCEDURE AND SETTING	49
	49
8.3 MEASUREMENT INSTRUMENTS LIST	49
8.4 TEST SETUP	49
8.5 EUT OPERATION CONDITIONS	49
8.6 TEST RESULTS	50
9 .BANDWIDTH TEST	52
9.1 LIMIT	52
9.2 TEST PROCEDURE AND SETTING	52
9.3 MEASUREMENT INSTRUMENTS LIST	52
9.4 TEST SETUP	52
9.5 EUT OPERATION CONDITIONS	52
9.6 TEST RESULTS	53
10 .MAXIMUM OUTPUT POWER	55
10.1 LIMIT	55
10.2 TEST PROCEDURE AND SETTING	55
10.3 MEASUREMENT INSTRUMENTS LIST	55
10.4 TEST SETUP	55
10.5 EUT OPERATION CONDITIONS	55
10.6 TEST RESULTS	56
11 .CONDUCTED SPURIOUS EMISSION	59
11.1 LIMIT	59
11.2 TEST PROCEDURE AND SETTING	59
11.3 MEASUREMENT INSTRUMENTS LIST	59





Table of Contents	Page
11.4 TEST SETUP 11.5 EUT OPERATION CONDITIONS 11.6 TEST RESULTS	59 59 60



1. TEST REPORT DECLARE

Applicant	Binatone Electronics Internationnal Ltd.
Address	Floor 23A, 9 Des Voeux Road West, Sheung Wan Hong Kong, China
Manufacturer	Binatone Electronics Internationnal Ltd.
Address	Floor 23A, 9 Des Voeux Road West, Sheung Wan Hong Kong, China
Factory	Musilab Electronic (DongGuan) Co., Ltd
Address	No.5 Huanwei Street, Fugang, Qingxi Town, Dongguan, Guangdong, China
Equipment Name	Protable Bluetooth Speaker
Model No.	SP016
Trade Mark	N/A
Standard	FCC Part15, Subpart C (15.247) ANSI C63.10-2013

We Declare:

The equipment described above is tested by DongGuan ShuoXin Electronic Technology Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and DongGuan ShuoXin Electronic Technology Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.





2. SUMMARY OF TEST RESULTS

The EUT have been tested according to the applicable standards as referenced below:

Standard(s) Section	Test Item	Judgment	Remark
FCC	ISED	Test item	Judgment	Kemark
15.207		AC Power Line Conducted Emissions	PASS	
15.247(d) 15.205(a) 15.209(a)		Radiated Emission	PASS	
15.247(a)(1)(iii)		Number of Hopping Frequency	PASS	
15.247(a)(1)(iii)		Average Time Of Occupancy	PASS	
15.247(a)(1)		Hopping Channel Separation	PASS	
15.247(a)(1)		Bandwidth	PASS	
15.247(a)(1)		Maximum Output Power	PASS	
15.247(d)		Conducted Spurious Emission	PASS	
		Frequency Stability	N/A	
15.203	-	Antenna Requirement	PASS	Note(2)

Note:

- (1) "N/A" denotes test is not applicable in this test report
- (2) The device what use a permanently attached antenna were considered sufficient to comply with the provisions of 15.203.





2.1MEASUREMENT UNCERTAINTY

Test Item	Uncertainty
Uncertainty for Conductionemission test (9kHz-150kHz)	3.7 dB
Uncertainty for Conduction emission test (150kHz-30MHz)	3.3 dB
Uncertainty for Radiation Emission test (30MHz-200MHz)	4.60 dB (Polarize: V)
Officertainty for Radiation Emission test (30km/2-200km/2)	4.60 dB (Polarize: H)
Lincortainty for Padiation Emission toot (200MHz 10Hz)	6.10 dB (Polarize: V)
Uncertainty for Radiation Emission test (200MHz-1GHz)	5.08 dB (Polarize: H)
Uncertainty for Padiation Emission toot (1CHz 6CHz)	5.01 dB (Polarize: V)
Uncertainty for Radiation Emission test (1GHz-6GHz)	5.01 dB (Polarize: H)
Uncertainty for Radiation Emission toot (60Hz 190Hz)	5.26 dB (Polarize: V)
Uncertainty for Radiation Emission test (6GHz-18GHz)	5.26 dB (Polarize: H)
Lipportainty for Radiation Emission toot (1904-10047)	5.06 dB (Polarize: V)
Uncertainty for Radiation Emission test (18GHz-40GHz)	5.06 dB (Polarize: H)
Uncertainty for radio frequency	±0.048kHz
Uncertainty for conducted RF Power	±0.32dB

Note:

This uncertainty represents an expanded uncertainty expressed at approximately the 95%confidence level using a coverage factor of k=2.



3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	Protable Bluetooth Speaker	
Brand Name	motorola	
Test Model	SP016	
Series Model	1	
Model Difference(s)	1	
Hardware Version	V1.0	
Software Version	V1.0	
Power Rating	Charging by micro-usb DC 5V DC 3.7V by Li-ion Battery	
Operation Frequency	2402 MHz ~ 2480 MHz	
Modulation Technology	GFSK, π/4-DQPSK, 8-DPSK	
Bit Rate of Transmitter	1Mbps /2Mbps /3Mbps	
Antenna Information	Antenna Type: PCB	Maximum Peak Gain:1.9dBi
Max. Output Power	1Mbps: -0.580 dBm (0.000875 V 2Mbps: 1.777 dBm (0.001506 W 3Mbps: 1.787 dBm (0.001509 W	<u>'</u>

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.





2. Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		



3.2 DESCRIPTION OF TEST MODES

The test system was pre-tested based on the consideration of all possible combinations of EUT operation mode.

Pretest Mode	Description
Mode 1	TX Mode note (1)
Mode 2	TX Mode Channel 00 _3Mbps

Following mode(s) was (were) found to be the worst case(s) and selected for the final test.

AC power line conducted emissions test		
Final Test Mode	Description	
Mode 2	TX Mode Channel 00 _3Mbps	

Radiated emissions test - Below 1GHz		
Final Test Mode	Description	
Mode 2	TX Mode Channel 00 _3Mbps	

Radiated emissions test - Above 1GHz				
Final Test Mode Description				
Mode 1 TXMode NOTE (1)				

Conducted test				
Final Test Mode Description				
Mode 1	TX Mode note (1)			

Note:

- (1) The measurements are performed at the high, middle, low available channels.
- (2) The measurements for Hopping Channel Separation, Bandwidth and Maximum Output Powerwere tested during 1Mbps, 2Mbps and 3Mbps, the worst case are 1Mbps and 3Mbps, onlyworst case was documented.

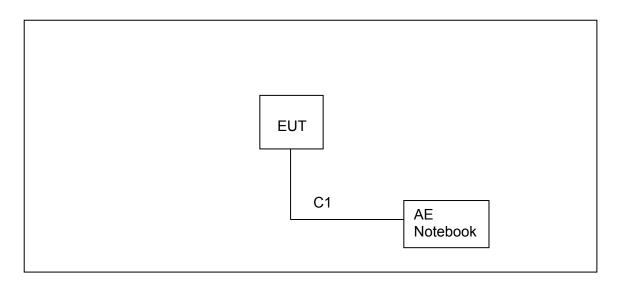


3.3PARAMETERS OF TEST SOFTWARE

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 of FHSS

Test Software	BT-Tool			
Frequency (MHz)	2402	2441	2480	
Parameters(1Mbps)	7	7	7	
Parameters(2Mbps)	7	7	7	
Parameters(3Mbps)	7	7	7	

3.4BLOCKDIAGRAMSHOWINGTHECONFIGURATIONOFSYSTEMTESTED



3.5SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.
AE	Notebook	ACER	MS2367	32807810766

Item	Cable Type	Shielded Type	Ferrite Core	Length
C1	DC Cable	NO	NO	0.8m





3.6TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage
AC Power Line Conducted Emissions	25°C	53%	DC 5V
Radiated Emissions-9K-30MHz	26.4°C	54%	DC 3.7V
Radiated Emissions-30 MHz to 1GHz	26.4°C	54%	DC 3.7V
Radiated Emissions-Above 1000 MHz	26.4°C	54%	DC 3.7V
Number of Hopping Frequency	24.8°C	40.9%	DC 3.7V
Average Time Of Occupancy	24.8°C	40.9%	DC 3.7V
Hopping Channel Separation	24.8°C	40.9%	DC 3.7V
Bandwidth	24.8°C	40.9%	DC 3.7V
Maximum Output Power	24.8°C	40.9%	DC 3.7V
Conducted Spurious Emission	24.8°C	40.9%	DC 3.7V



4.AC POWER LINE CONDUCTED EMISSIONS TEST

4.1LIMIT

Fraguency of Emission (MHz)	Limit (dBµV)			
Frequency of Emission (MHz)	Quasi-peak	Average		
0.15 - 0.50	66 to 56*	56 to 46*		
0.50 - 5.0	56	46		
5.0 - 30.0	60	50		

Note:

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

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

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

4.2TEST PROCEDURE

- a. 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 equipmentpowered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the groundplane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. 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.
- d. LISN at least 80 cm from nearest part of EUT chassis.

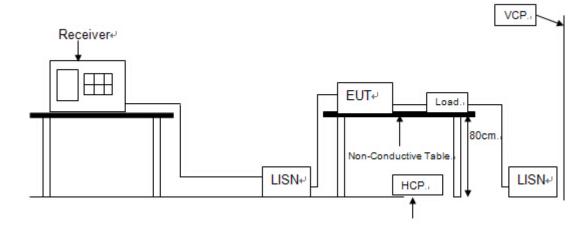
4.3MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Pulse Limiter	MTS-systemtec hnik MTS-IMP-13		261115-010-0024	12/16/2019
2	EMI Test Receiver	R&S	ESCI	101308	12/16/2019
3	LISN	AFJ	LS16	16011103219	12/16/2019
4	LISN	Schwarzbeck	NSLK 8127	8127-432	12/16/2019
5	Measurement Software	Farad	EZ-EMC (Ver.ATT-03A)	N/A	N/A





4.4TESTSETUP



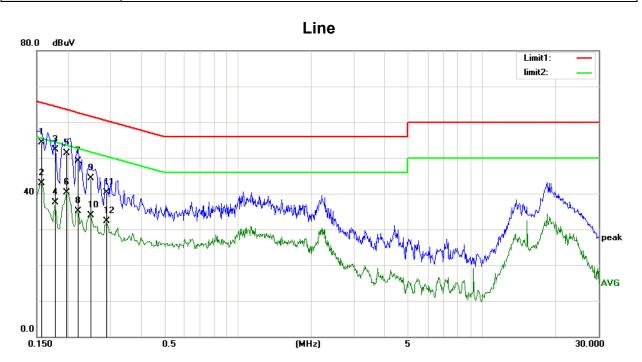
4.5EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical function (as a customer would normally use it), EUT was programmed to be in continuouslytransmitting data or hopping on mode.



4.6TEST RESULTS

Test Mode: TX Mode Channel 00 _3Mbps



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1580	42.47	11.74	54.21	65.56	-11.35	QP
2	0.1580	31.14	11.74	42.88	55.56	-12.68	AVG
3	0.1779	40.81	11.55	52.36	64.58	-12.22	QP
4	0.1779	25.93	11.55	37.48	54.58	-17.10	AVG
5	0.1980	40.01	11.37	51.38	63.69	-12.31	QP
6	0.1980	29.01	11.37	40.38	53.69	-13.31	AVG
7	0.2220	37.91	11.15	49.06	62.74	-13.68	QP
8	0.2220	23.89	11.15	35.04	52.74	-17.70	AVG
9	0.2500	33.38	10.90	44.28	61.75	-17.47	QP
10	0.2500	22.97	10.90	33.87	51.75	-17.88	AVG
11	0.2899	29.79	10.53	40.32	60.52	-20.20	QP
12	0.2899	21.84	10.53	32.37	50.52	-18.15	AVG

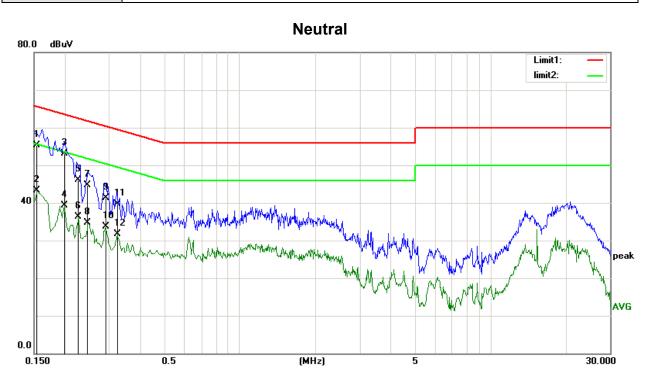
Remarks:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value Limit Value.





Test Mode: TX Mode Channel 39 _3Mbps



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1539	43.47	11.77	55.24	65.78	-10.54	QP
2	0.1539	31.58	11.77	43.35	55.78	-12.43	AVG
3	0.1980	41.74	11.37	53.11	63.69	-10.58	QP
4	0.1980	27.91	11.37	39.28	53.69	-14.41	AVG
5	0.2260	34.94	11.11	46.05	62.59	-16.54	QP
6	0.2260	25.17	11.11	36.28	52.59	-16.31	AVG
7	0.2460	33.80	10.93	44.73	61.89	-17.16	QP
8	0.2460	23.79	10.93	34.72	51.89	-17.17	AVG
9	0.2900	30.74	10.53	41.27	60.52	-19.25	QP
10	0.2900	23.20	10.53	33.73	50.52	-16.79	AVG
11	0.3220	29.24	10.41	39.65	59.65	-20.00	QP
12	0.3220	21.28	10.41	31.69	49.65	-17.96	AVG

Remarks:

- (1) Measurement Value = Reading Level + Correct Factor.(2) Margin Level = Measurement Value Limit Value.



5. RADIATED EMISSION TEST

5.1LIMIT

In case the emission fall within the restricted band specified on15.205(a), then the 15.209(a) limit in the table below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (9 kHz-1000MHz)

Frequency	Field Strength	Measurement Distance
(MHz)	(microvolts/meter)	(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

LIMITS OF RADIATED EMISSION MEASUREMENT (9 kHz-30 MHz)

Frequency	Magnetic field strength (H-Field)	Measurement Distance
(MHz)	(μA/m)	(meters)
0.009-0.490	6.37/F(kHz)	300
0.490-1.705	6.37/F(kHz)	30
1.705-30.0	0.08	30

LIMITS OF RADIATED EMISSION MEASUREMENT (30 MHz-1000MHz)

Frequency	Field Strength
(MHz)	(μV/m at 3m)
30-88	100
88-216	150
216-960	200
Above 960	500

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

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

Note:

- (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).



5.2TEST PROCEDURE AND SETTING

- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- c. The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. 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 find the maximum reading (used Bore sight function).
- e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
- f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1GHz)
- h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1GHz)
- i: Measurement Value = Reading Level + Correct Factor.

 Margin Level = Measurement Value Limit Value.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW	RBW 1MHz VBW 3MHz peak detector for Pk value
(Emission in restricted band)	RMS detector for AV value

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30MHz~1000MHz for QP detector

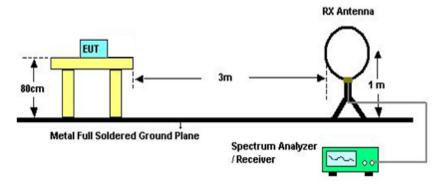


5.3MEASUREMENT INSTRUMENTS LIST

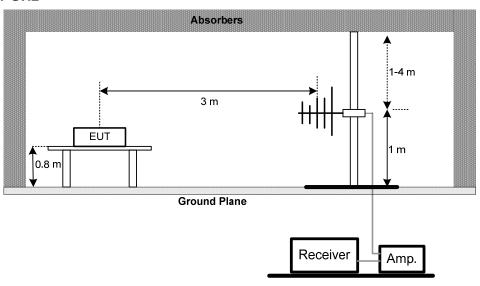
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EMI Test Receiver	//II Test Receiver R&S ESCI		101307	2019/12/16
2	Spectrum Analyzer	Agilent	E4407B	US40240708	11/20/2019
3	Spectrum analyzer	R&S	FSU	1166.1660.26	2019/12/16
4	Loop antenna	TESEQ	HLA6120	20129	2019/12/16
5	Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	2019/12/16
6	Double Ridged Horn Antenna	Schwarzbeck	BBHA9120D	9120D 1065	2019/12/16
7	Horn Antenna	Schwarzbeck	BBHA 9170	9170 1248	2019/12/16
8	Pre-amplifier	A.H.	PAM-1840VH	562	2019/12/16
9	Pre-amplifier	R&S	AFS33-18002 650-30-8P-44	SEL0080	2019/12/16
10	Pre-Amplifier	HP	8449B	3274A06298	2019/12/16
11	RF Cable	R&S	R01	10403	2019/12/16
12	RF Cable	R&S	R02	10512	2019/12/16

5.4TESTSETUP

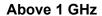
9 kHz-30 MHz

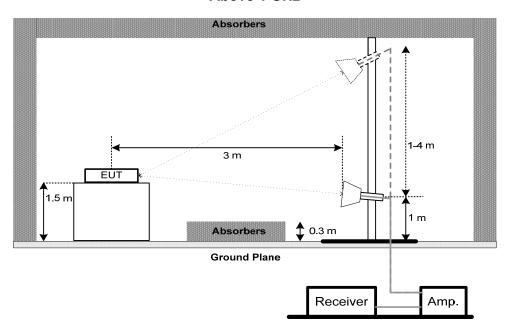


30 MHz to 1 GHz









5.5EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

Remark: The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss Amplifier Gain + Attenuator
- (3) Margin = Result Limit





5.6TEST RESULTS - 9 kHz TO 30MHz

EUT:	Protable Bluetooth Speaker	Model No.:	SP016
Temperature:	24 ℃	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 5V
Polarization:		Test Result:	Pass
Test Mode:	TX Mode Channel 00_3Mbps	Test By:	Hanson Huang

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

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 =20 log (specific distance/test distance)(dB);

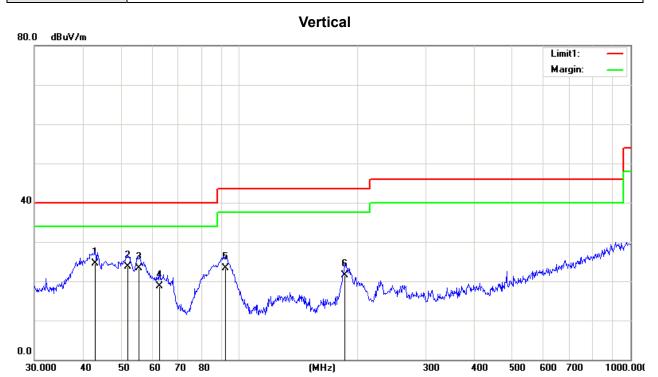
Limit line = specific limits(dBuv) + distance extrapolation factor





5.7TEST RESULTS- 30 MHz TO 1000MHz

Test Mode: TX Mode Channel 00_3Mbps

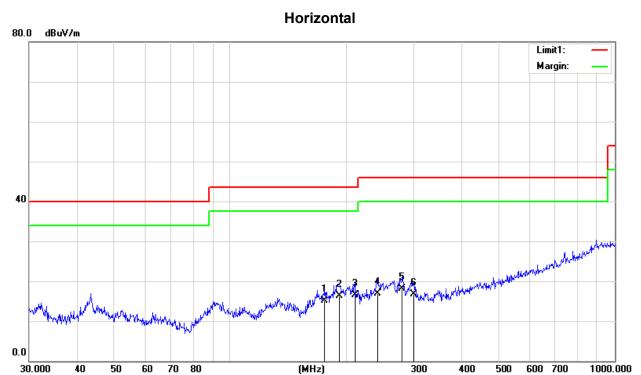


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	42.8998	38.03	-13.51	24.52	40.00	-15.48	QP
2	51.8430	36.67	-12.91	23.76	40.00	-16.24	QP
3	55.4147	35.87	-12.59	23.28	40.00	-16.72	QP
4	62.6507	31.42	-12.68	18.74	40.00	-21.26	QP
5	92.1388	38.32	-14.99	23.33	43.50	-20.17	QP
6	186.4409	32.56	-11.14	21.42	43.50	-22.08	QP







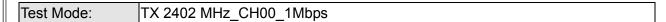


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	176.2684	24.54	-9.52	15.02	43.50	-28.48	QP
2	192.4185	25.92	-9.53	16.39	43.50	-27.11	QP
3	210.7860	25.32	-8.89	16.43	43.50	-27.07	QP
4	241.6762	23.18	-6.18	17.00	46.00	-29.00	QP
5	280.0237	23.08	-5.06	18.02	46.00	-27.98	QP
6	300.3672	22.66	-5.92	16.74	46.00	-29.26	QP

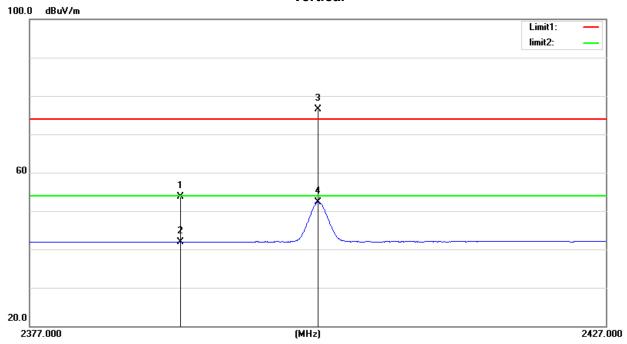




5.8TEST RESULTS - ABOVE 1000MHz(BAND EDGE)



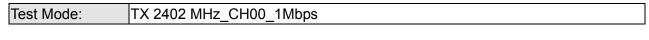
Vertical

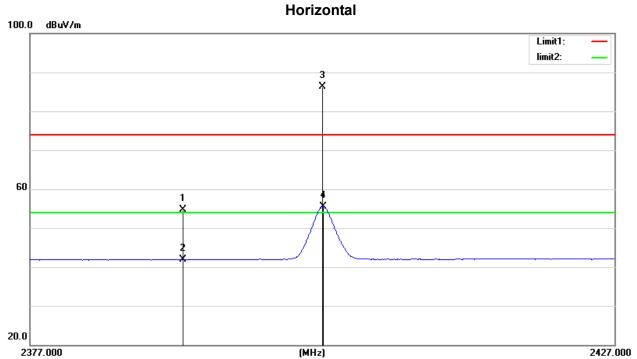


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2390.000	22.16	31.62	53.78	74.00	-20.22	peak
2	2390.000	10.29	31.62	41.91	54.00	-12.09	AVG
3	2401.950	44.96	31.64	76.60	/	/	peak
4	2401.950	20.71	31.64	52.35	/	/	AVG







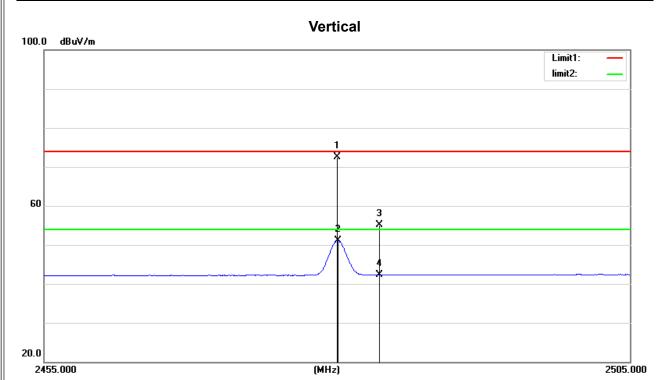


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2390.000	23.03	31.62	54.65	74.00	-19.35	peak
2	2390.000	10.25	31.62	41.87	54.00	-12.13	AVG
3	2401.900	54.61	31.64	86.25	/	/	peak
4	2402.000	23.95	31.64	55.59	/	/	AVG









No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2479.850	40.69	31.88	72.57	/	/	peak
2	2479.950	19.30	31.88	51.18	/	/	AVG
3	2483.500	23.14	31.89	55.03	74.00	-18.97	peak
4	2483.500	10.45	31.89	42.34	54.00	-11.66	AVG

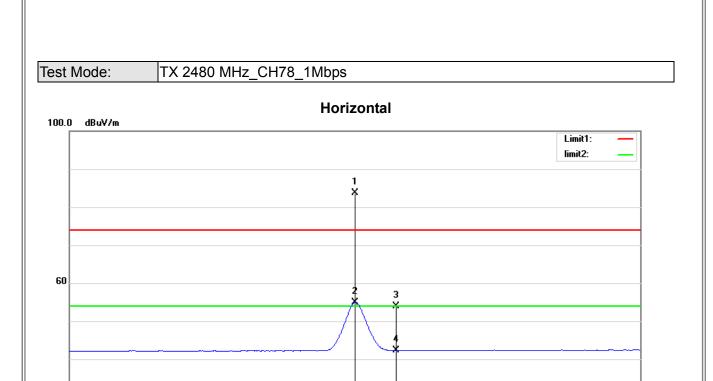


20.0

2455.000



2505.000

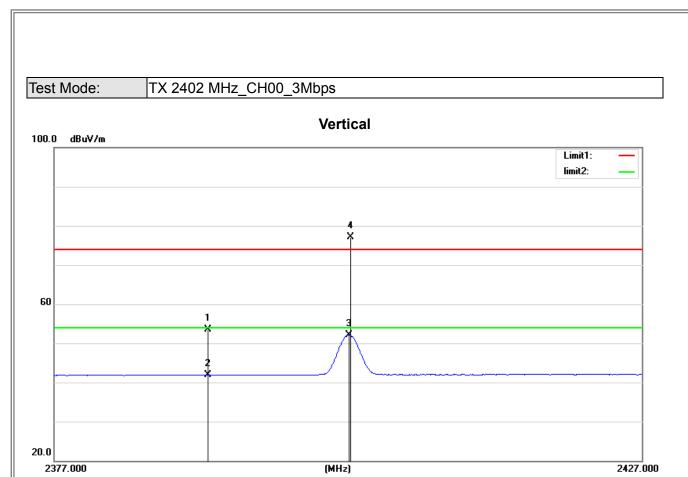


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2479.850	51.83	31.88	83.71	/	/	peak
2	2479.950	23.09	31.88	54.97	/	/	AVG
3	2483.500	22.08	31.89	53.97	74.00	-20.03	peak
4	2483.500	10.43	31.89	42.32	54.00	-11.68	AVG

(MHz)







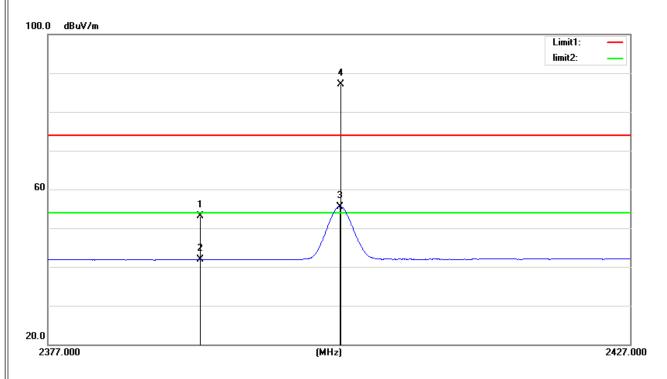
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2390.000	21.92	31.62	53.54	74.00	-20.46	peak
2	2390.000	10.28	31.62	41.90	54.00	-12.10	AVG
3	2402.000	20.55	31.64	52.19	/	/	AVG
4	2402.100	45.44	31.64	77.08	/	/	peak







Horizontal

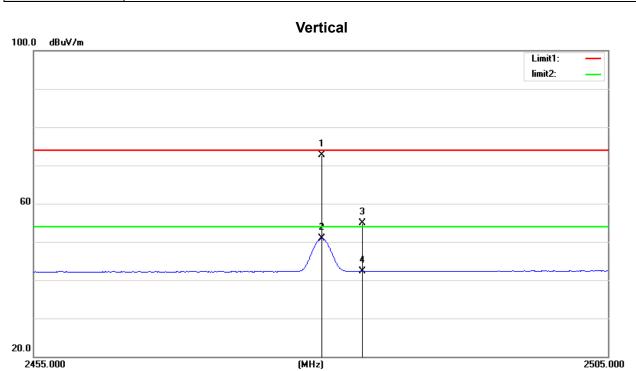


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2390.000	21.47	31.62	53.09	74.00	-20.91	peak
2	2390.000	10.29	31.62	41.91	54.00	-12.09	AVG
3	2402.000	23.94	31.64	55.58	/	/	AVG
4	2402.050	55.55	31.64	87.19	/	/	peak









No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2479.950	40.74	31.88	72.62	/	/	peak
2	2480.000	18.97	31.88	50.85	/	/	AVG
3	2483.500	22.94	31.89	54.83	74.00	-19.17	peak
4	2483.500	10.43	31.89	42.32	54.00	-11.68	AVG

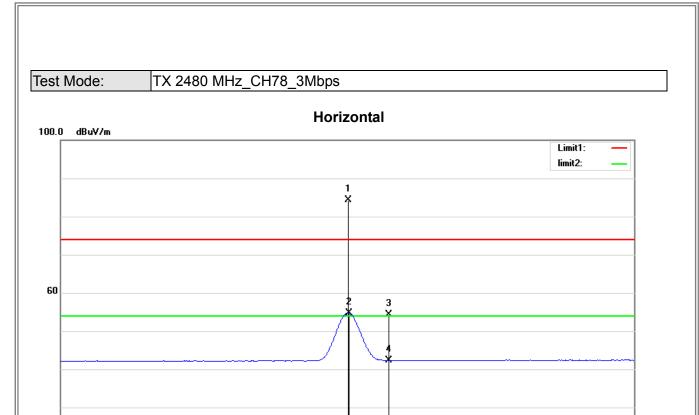


20.0

2455.000



2505.000



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2479.950	52.43	31.88	84.31	/	/	peak
2	2480.050	22.90	31.88	54.78	/	/	AVG
3	2483.500	22.42	31.89	54.31	74.00	-19.69	peak
4	2483.500	10.42	31.89	42.31	54.00	-11.69	AVG

(MHz)



1000.000 3550.00

6100.00

8650.00

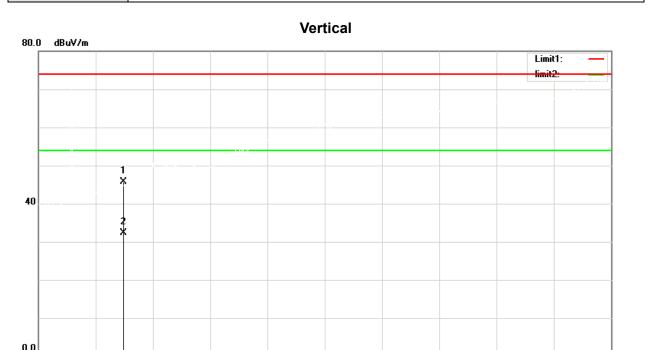
11200.00



26500.00 MHz

5.9TEST RESULTS - ABOVE 1000MHz(HARMONIC)

Test Mode: TX 2402 MHz_CH00_1Mbps



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4804.000	49.01	-3.33	45.68	74.00	-28.32	peak
2	4804.000	35.57	-3.33	32.24	54.00	-21.76	AVG

13750.00

16300.00 18850.00

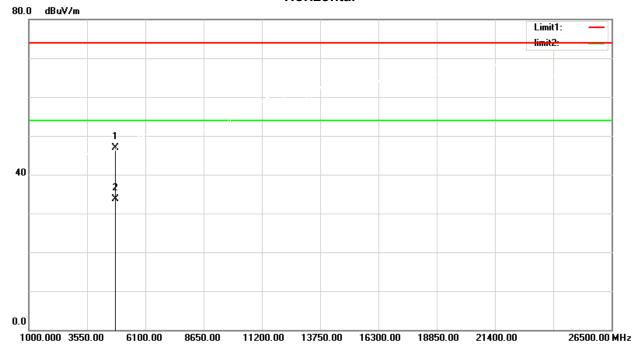
21400.00





Test Mode: TX 2402 MHz_CH00_1Mbps

Horizontal



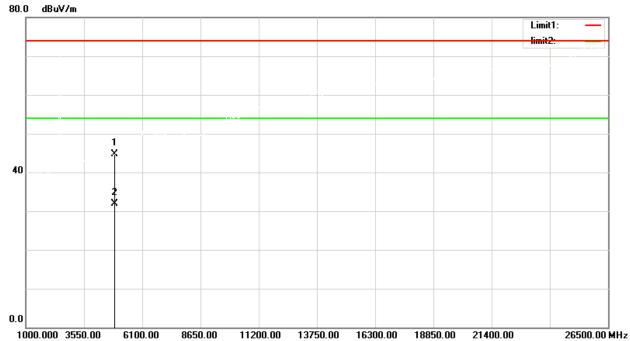
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4804.000	50.14	-3.33	46.81	74.00	-27.19	peak
2	4804.000	37.09	-3.33	33.76	54.00	-20.24	AVG





Test Mode: TX 2441 MHz_CH39_1Mbps





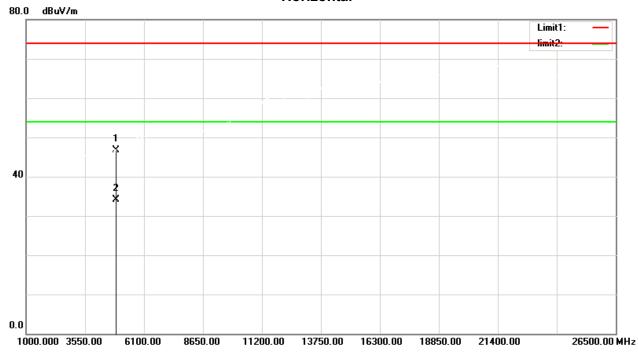
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4882.000	47.79	-3.03	44.76	74.00	-29.24	peak
2	4882.000	34.98	-3.03	31.95	54.00	-22.05	AVG
•							-





Test Mode: TX 2441 MHz_CH39_1Mbps

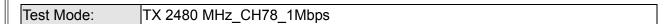
Horizontal



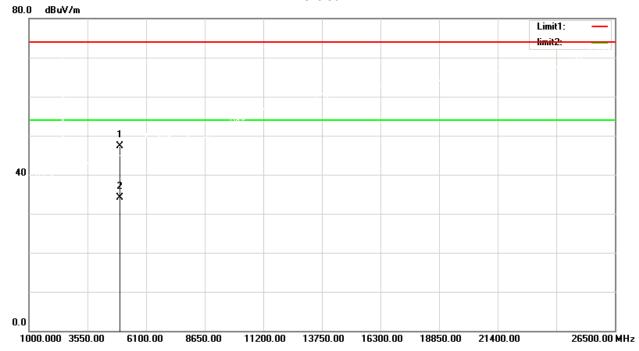
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4882.000	49.82	-3.03	46.79	74.00	-27.21	peak
2	4882.000	37.19	-3.03	34.16	54.00	-19.84	AVG











No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4960.063	49.95	-2.74	47.21	74.00	-26.79	peak
2	4960.063	36.86	-2.74	34.12	54.00	-19.88	AVG





Test Mode: TX 2480 MHz_CH78_1Mbps

Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4960.000	50.46	-2.74	47.72	74.00	-26.28	peak
2	4960.000	37.42	-2.74	34.68	54.00	-19.32	AVG





Test Mode: TX 2402 MHz_CH00_3Mbps

Vertical



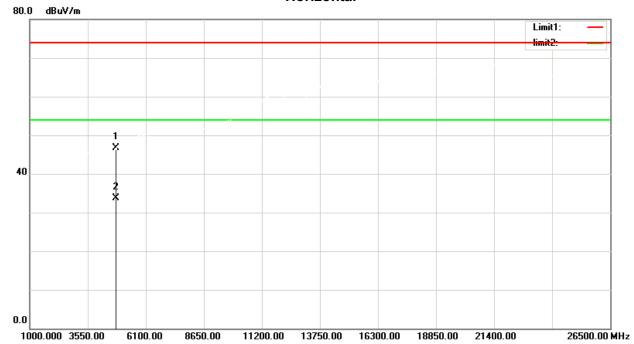
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4804.000	48.45	-3.33	45.12	74.00	-28.88	peak
2	4804.000	36.16	-3.33	32.83	54.00	-21.17	AVG





Test Mode: TX 2402 MHz_CH00_3Mbps

Horizontal



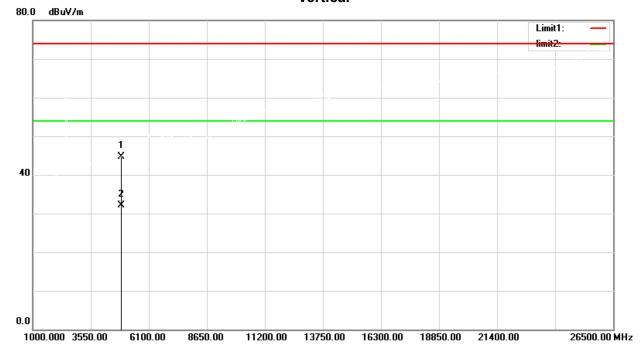
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4804.000	50.05	-3.33	46.72	74.00	-27.28	peak
2	4804.000	37.00	-3.33	33.67	54.00	-20.33	AVG





Test Mode: TX 2441 MHz_CH39_3Mbps

Vertical



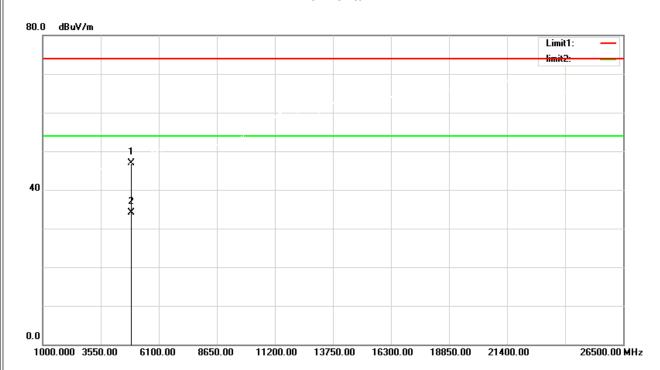
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4882.000	47.72	-3.03	44.69	74.00	-29.31	peak
2	4882.000	35.15	-3.03	32.12	54.00	-21.88	AVG





Test Mode: TX 2441 MHz_CH39_3Mbps

Horizontal



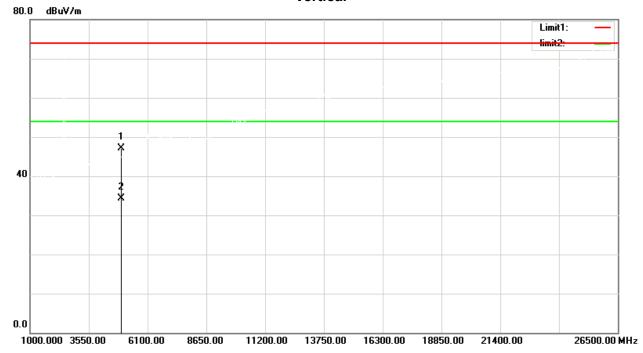
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4882.000	49.85	-3.03	46.82	74.00	-27.18	peak
2	4882.000	37.16	-3.03	34.13	54.00	-19.87	AVG





Test Mode: TX 2480 MHz_CH78_3Mbps

Vertical



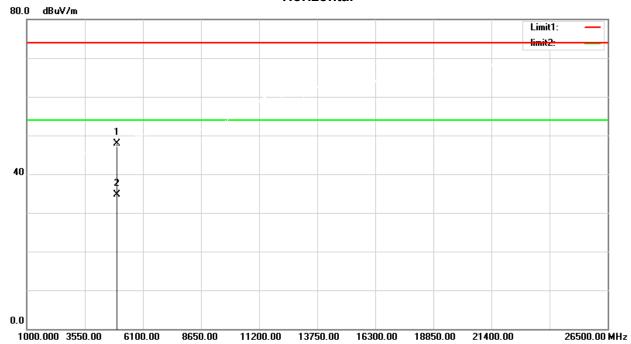
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4960.063	49.89	-2.74	47.15	74.00	-26.85	peak
2	4960.063	36.97	-2.74	34.23	54.00	-19.77	AVG





Test Mode: TX 2480 MHz_CH78_3Mbps

Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4960.000	50.55	-2.74	47.81	74.00	-26.19	peak
2	4960.000	37.37	-2.74	34.63	54.00	-19.37	AVG





6.NUMBER OF HOPPING FREQUENCY

6.1LIMIT

FCC Part15, Subpart C (15.247)				
Section Test Item				
15.247(a)(1)(iii)	Number of Hopping Frequency			

6.2TEST PROCEDURE AND SETTING

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Spectrum Setting: RBW=100 kHz, VBW=100 kHz, Sweep time = Auto.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating Frequency Range
RBW	100kHz
VBW	300kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

6.3MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16
3	RF Cable	Mi-cable	C10-01-01-1	100309	2019/12/16

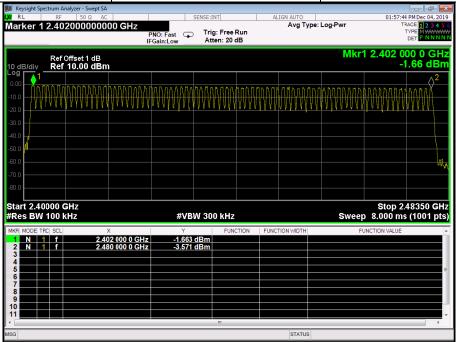
6.4TEST SETUP

EUT	SPECTRUM
	ANALYZER

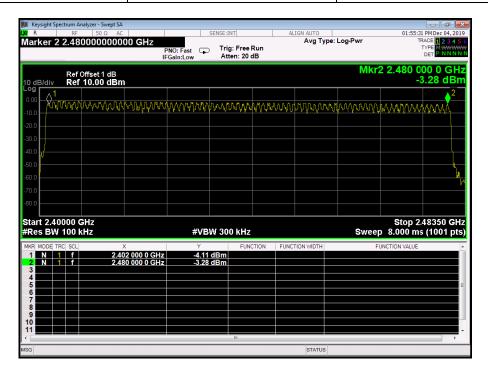
6.5EUT OPERATION CONDITIONS



	Hopping Mode_1Mbps	
Number of Hopping	Measurement result(CH)	Limit(CH)
Frequency	79	≥15



Hopping Mode_3Mbps				
Number of Hopping	Measurement result(CH)	Limit(CH)		
Frequency	79	≥15		





7.AVERAGE TIME OF OCCUPANCY

7.1LIMIT

FCC Part15, Subpart C (15.247)			
Section Test Item Limit			
15.247(a)(1)(iii)	Average Time of Occupancy	0.4sec	

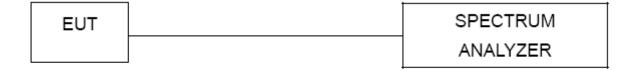
7.2TEST PROCEDURE AND SETTING

- a. The transmitter output (antenna port) was connected to the spectrum analyzer
- b. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz
- c. Use a video trigger with the trigger level set to enabletriggering only on full pulses
- d. Sweep Time is more than once pulse time
- e. Set the center frequency on any frequency would be measure and set the frequency span to zero span
- f. Measure the maximum time duration of one single pulse
- g. Set the EUT for DH1, DH3 and DH5 packet transmitting
- h. Measure the maximum time duration of one single pulse
- i. DH1 Packet permit maximum 1600 / 79 / 2 = 10.12 hops per second in each channel (1 time slot TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times $10.12 \times 31.6 = 320$ within 31.6 seconds
- j. DH3 Packet permit maximum 1600 / 79 / 4 = 5.06 hops per second in each channel (3 time slotsTX, 1 time slot RX).So, the dwell time is the time duration of the pulse times 5.06 x 31.6 = 160 within 31.6 seconds
- k. DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slotsTX, 1 time slot RX).So, the dwell time is the time duration of the pulse times 3.37 x 31.6 = 106.6 within 31.6 seconds

7.3MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16
3	RF Cable	Mi-cable	C10-01-01-1	100309	2019/12/16

7.4TEST SETUP



7.5EUT OPERATION CONDITIONS



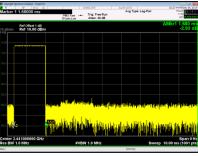


TX Mode_1Mbps				
Mode	Channel Frequency	Pulse Time	Dwell Time	Limit
Mode	(MHz)	(ms)	(ms)	(ms)
DH1	2441	0.42	134.4	400
DH3	2441	1.68	268.8	400
DH5	2441	2.94	313.6	400

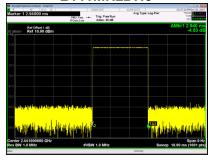
2441MHzDH1



2441MHzDH3



2441MHzDH5







	TX Mode_3Mbps				
Mode	Channel Frequency	Pulse Time	Dwell Time	Limit	
Mode	(MHz)	(ms)	(ms)	(ms)	
DH1	2441	0.42	134.4	400	
DH3	2441	1.72	275.2	400	
DH5	2441	2.92	311.5	400	

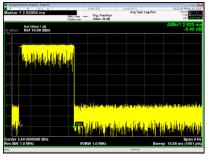
2441MHzDH1



2441MHzDH3



2441MHzDH5





8.HOPPING CHANNEL SEPARATION MEASUREMENT

8.1LIMIT

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

8.2TEST PROCEDURE AND SETTING

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Span = wide enough to capture the peaks of two adjacent channels Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span

Video (or Average) Bandwidth (VBW) ≥ RBW

Sweep = Auto

Detector function = Peak

Trace = Max Hold

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RBW	30 kHz
VBW	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

8.3MEASUREMENT INSTRUMENTS LIST

Ī	Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
Ī	1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27
	2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16
Ī	3	RF Cable	Mi-cable	C10-01-01-1	100309	2019/12/16

8.4TEST SETUP

EUT	SPECTRUM
	ANALYZER

8.5EUT OPERATION CONDITIONS



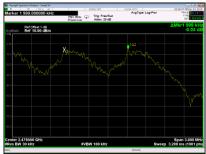


TX Mode_1Mbps				
Channel	Frequency (MHz)	Channel Separation(MHz)	Limit (MHz)	Result
CH00	2402	0.993	>(25KHz or 2/3*20dB Bandwidth)	PASS
CH39	2441	0.999	>(25KHz or 2/3*20dB Bandwidth)	PASS
CH78	2480	0.999	>(25KHz or 2/3*20dB Bandwidth)	PASS













TX Mode_3Mbps				
Channel	Frequency	Channel	Limit	Result
Onamici	(MHz)	Separation(MHz)	(MHz)	result
CH00	2402	0.999	>(25KHz or 2/3*20dB	PASS
СПОО	2402	0.999	Bandwidth)	FASS
CH39	2441	1.002	>(25KHz or 2/3*20dB	PASS
СПЗЭ	2441	1.002	Bandwidth)	PASS
CH78	2490	0.000	>(25KHz or 2/3*20dB	PASS
СП/о	2480	0.999	Bandwidth)	PASS









9.BANDWIDTH TEST

9.1LIMIT

FCC Part15, Subpart C (15.247)		
Section Test Item		
15.247(a)(1) Bandwidth		

9.2TEST PROCEDURE AND SETTING

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Spectrum Setting: RBW= 30 kHz, VBW=100 kHz, Sweep Time = Auto.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth
RBW	30kHz
VBW	100kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

9.3MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16
3	RF Cable	Mi-cable	C10-01-01-1	100309	2019/12/16

9.4TEST SETUP

EUT	SPECTRUM
	ANALYZER

9.5EUT OPERATION CONDITIONS

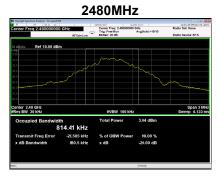




TX Mode_1Mbps						
Channel	Frequency	20dB Bandwidth	99 % Emission Bandwidth	Result		
	(MHz)	(MHz)	(MHz)			
CH00	2402	0.8815	0.8157	PASS		
CH39	2441	0.8821	0.8151	PASS		
CH78	2480	0.8805	0.8144	PASS		

2402WHZ | 2402WHZ | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100









TX Mode_3Mbps						
Channel	Frequency	20dB Bandwidth	99 % Emission Bandwidth	Result		
	(MHz)	(MHz)	(MHz)			
CH00	2402	1.248	1.144	PASS		
CH39	2441	1.250	1.145	PASS		
CH78	2480	1.250	1.145	PASS		









10.MAXIMUM OUTPUT POWER

10.1LIMIT

FCC Part15 , Subpart C (15.247)				
Section Test Item Limit				
15.247(a)(1)	Maximum Output Power	0.125Watt or 21dBm		

Note:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB band width of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

10.2TEST PROCEDURE AND SETTING

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Spectrum Setting: RBW= 1MHz/3MHz, VBW= 3MHz/8MHz, Sweep time = Auto.

10.3MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16
3	RF Cable	Mi-cable	C10-01-01-1	100309	2019/12/16

10.4TEST SETUP



10.5EUT OPERATION CONDITIONS





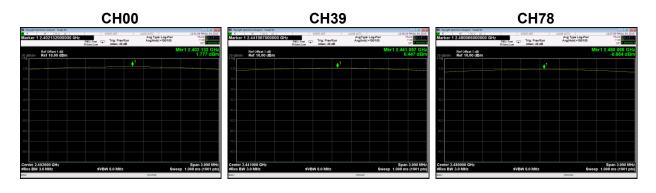
TX Mode_1Mbps						
Channel	Frequency	Output Power	Output Power	Result		
Channel	(MHz)	(dBm)	(W)	Result		
CH00	2402	-0.58	0.000875	PASS		
CH39	2441	-2.118	0.000614	PASS		
CH78	2480	-3.203	0.000478	PASS		
Limit	21dBm /0.125W					







TX Mode_2Mbps						
Channel	Frequency	Frequency Output Power Output Power		Dogult		
Chamilei	(MHz)	(dBm)	(W)	Result		
CH00	2402	1.777	0.001506	PASS		
CH39	2441	0.447	0.001108	PASS		
CH78	2480	-0.864	0.000820	PASS		
Limit	21dBm /0.125W					







TX Mode_3Mbps						
Channel	Frequency	Output Power	Output Power	Dogult		
Chamilei	(MHz)	(dBm)	(W)	Result		
CH00	2402	1.787	0.001509	PASS		
CH39	2441	0.333	0.001080	PASS		
CH78	2480	-0.719	0.000847	PASS		
Limit	21dBm /0.125W					





11.CONDUCTED SPURIOUS EMISSION

11.1LIMIT

For FCC

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 Output Power limits. If the transmitter complies with the Output 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 Section 15.209(a) is not required.

For ISED

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak Output Power limits. If the transmitter complies with the Output Power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

11.2TEST PROCEDURE AND SETTING

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b Spectrum Setting: RBW= 100 kHz, VBW=300 kHz, Sweep time = Auto.

11.3MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16
3	RF Cable	Mi-cable	C10-01-01-1	100309	2019/12/16

11.4TEST SETUP

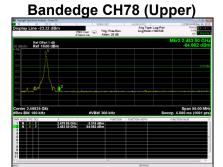


11.5EUT OPERATION CONDITIONS

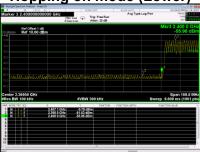


TX Mode_1Mbps

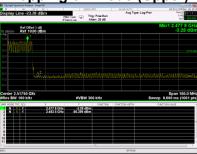




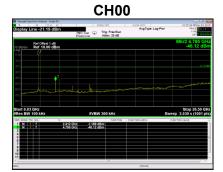








CH00 – 10th Harmonic of the fundamental frequency







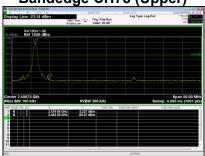




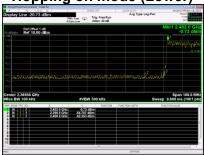
Bandedge- CH00 (Lower)



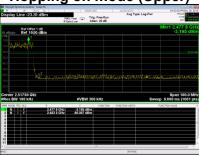
Bandedge CH78 (Upper)



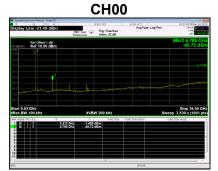
Hopping on mode (Lower)



Hopping on mode (Upper)



CH00 – 10th Harmonic of the fundamental frequency







END OF TEST REPORT