



FCC TEST REPORT

Report No: STS1908203W01

Issued for

Sonic Communications (Int) Limited

Birmingham International Park, Starley Way, Bickenhill,
Birmingham B37 7HB, United Kingdom

Product Name:	Remote Speaker Microphone (RSM)
Brand Name:	N/A
Model Name:	CA19684
Series Model:	N/A
FCC ID:	2AUAOCA19684
Test Standard:	FCC Part 15.249

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TEST RESULT CERTIFICATION

Applicant's Name: Sonic Communications (Int) Limited
Address.....: Birmingham International Park, Starley Way, Bickenhill, Birmingham B37 7HB, United Kingdom
Manufacture's Name: Sonic Communications (Int) Limited
Address.....: Birmingham International Park, Starley Way, Bickenhill, Birmingham B37 7HB, United Kingdom

Product Description

Product Name: Remote Speaker Microphone (RSM)
Brand Name: N/A
Model Name.....: CA19684
Series Model: N/A

Test Standards.....: FCC Part15.249
Test Procedure.....: ANSI C63.10-2013

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
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Date of Test.....:
Date of performance of tests ...: 04 Sept. 2019 ~ 09 Sept. 2019
Date of Issue: 10 Sept. 2019
Test Result: Pass

Testing Engineer : [Signature]
(Chris Chen)

Technical Manager : [Signature]
(Sunday Hu)

Authorized Signatory : [Signature]
(Vita Li)





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Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	10 Sept. 2019	STS1908203W01	ALL	Initial Issue





1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part 15.249 , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	N/A	
15.203	Antenna Requirement	Pass	
15.249	Radiated Spurious Emission	Pass	
15.205	Radiated Band Edge Emission	Pass	
15.249	20dB Bandwidth	Pass	

NOTE:

- (1) "N/A" denotes test is not applicable in this Test Report
- (2) All tests are according to ANSI C63.10-2013



1.1 TEST FACTORY

SHENZHEN STS TEST SERVICES CO., LTD

Add. : A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District, Bao'an District, Shenzhen, Guang Dong, China

FCC test Firm Registration Number: 625569

IC test Firm Registration Number: 12108A

A2LA Certificate No.: 4338.01

1.2 MEASUREMENT UNCERTAINTY

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

No.	Item	Uncertainty
1	RF output power,conducted	± 0.71 dB
2	Unwanted Emissions,conducted	± 0.63 dB
3	All emissions,radiated 30-200MHz	± 3.43 dB
4	All emissions,radiated 200MHz-1GHz	± 3.57 dB
5	All emissions,radiated>1G	± 4.13 dB
6	Conducted Emission(9KHz-150KHz)	± 3.18 dB
7	Conducted Emission(150KHz-30MHz)	± 2.70 dB



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name	Remote Speaker Microphone (RSM)
Trade Name	N/A
Model Name	CA19684
Series Model	N/A
Model Difference	N/A
Product Description	The EUT is a Remote Speaker Microphone (RSM)
	Operation Frequency: 2440MHz
	Modulation Type: GFSK
	Antenna Designation: Ceramic Antenna
	Antenna Gain(Peak): -0.5 dBi
	Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.
Power Rating	Input: DC 12V
Hardware version number	SD19684 issue 1
Software version number	SF251

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. Table for Filed Antenna

Ant	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	N/A	CA19684	Ceramic	NA	-0.5	Antenna

2.2 DESCRIPTION OF THE TEST MODES

For conducted test items and radiated spurious emissions
 Each of these EUT operation mode(s) or test configuration mode(s) mentioned below was evaluated respectively..

Pretest Mode	Description	Data/Modulation
Mode 1	TX	GFSK

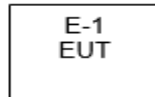
Note:

(1) All above mode have been measurement, only worst data was reported.

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

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

Radiated Spurious Emission Test



2.4 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Necessary accessories

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
N/A	N/A	N/A	N/A	N/A	N/A

Support units

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
N/A	N/A	N/A	N/A	N/A	N/A

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.



2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2018.10.13	2019.10.12
Signal Analyzer	Agilent	N9020A	MY51110105	2019.03.02	2020.03.01
Active loop Antenna	ZHINAN	ZN30900C	16035	2018.03.11	2021.03.10
Bilog Antenna	TESEQ	CBL6111D	34678	2017.11.02	2020.11.1
Horn Antenna	SCHWARZBECK	BBHA 9120D(1201)	9120D-1343	2018.10.19	2021.10.18
SHF-EHF Horn Antenna (18G-40GHz)	A-INFO	LB-180400-KF	J211020657	2018.03.11	2021.03.10
Pre-Amplifier(0.1M-3G Hz)	EM	EM330	060665	2018.10.13	2019.10.12
Pre-Amplifier (1G-18GHz)	SKET	LNPA-01018G-45	SK201808090 1	2018.10.13	2019.10.12
Temperature & Humidity	HH660	Mieo	N/A	2018.10.11	2019.10.10
turn table	EM	SC100_1	60531	N/A	N/A
Antenna mast	EM	SC100	N/A	N/A	N/A
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 RE)			

RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
USB RF power sensor	DARE	RPR3006W	15I00041SNO03	2018.10.13	2019.10.12
Signal Analyzer	Agilent	N9020A	MY49100060	2018.10.13	2019.10.12
Temperature & Humidity	HH660	Mieo	N/A	2018.10.11	2019.10.10
Test SW	FARAD	LZ-RF /LzRf-3A3			



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

Operating frequency band. In case the emission fall within the restricted band specified on Part 15.249 limit in the table below has to be followed.

FREQUENCY (MHz)	Quasi-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

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.

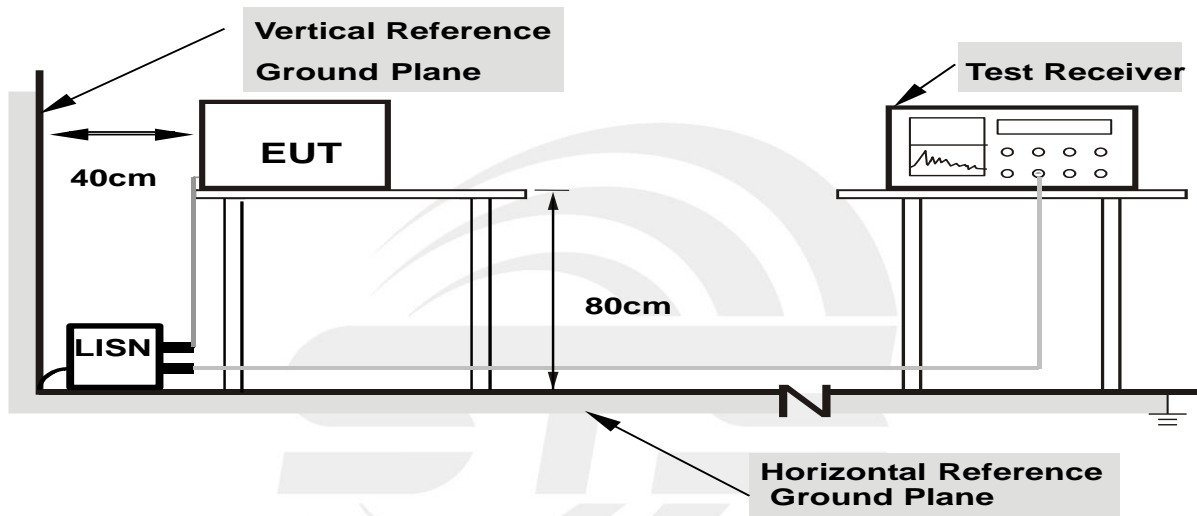
The following table is the setting of the receiver

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

3.1.2 TEST PROCEDURE

- a. The EUT was 0.8 meters from the horizontal ground plane and 0.4 meters from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered 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 ground plane 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.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 TEST SETUP



- Note: 1.Support units were connected to second LISN.**
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.1.4 TEST RESULTS

Temperature:	25.3 °C	Relative Humidity:	51%
Test Voltage:	N/A	Phase:	L/N
Test Mode:	N/A		

Note: EUT is only power by battery, So it is not applicable for this test.



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on Part 15.249 and the Part 15.209(a) limit in the table below has to be followed.

Standard FCC 15.209

Frequencies (MHz)	Field Strength (microrvolts/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
960~1000	500	3
Above 1000	Other:74.0 dB(μ V)/m (Peak) 54.0 dB(μ V)/m (Average)	3

Standard FCC 15.249

Frequency of Emission (MHz)	Field Strength of fundamental (millivolts /meter)	Field Strength of Harmonics (microvolts/meter)
900~928	50	500
2400~2483.5	50	500
5725~5875	50	500
24000~242500	250	2500

Notes:

- (1) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Spectrum Parameter	Setting
Detector	Peak/AV
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB (emission in restricted band)	>20BW
VB (emission in restricted band)	=3xRB



Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
	90kHz~110kHz / RB 200Hz for QP
	110kHz~490kHz / RB 200Hz for PK & AV
	490kHz~30MHz / RB 9kHz for QP
	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

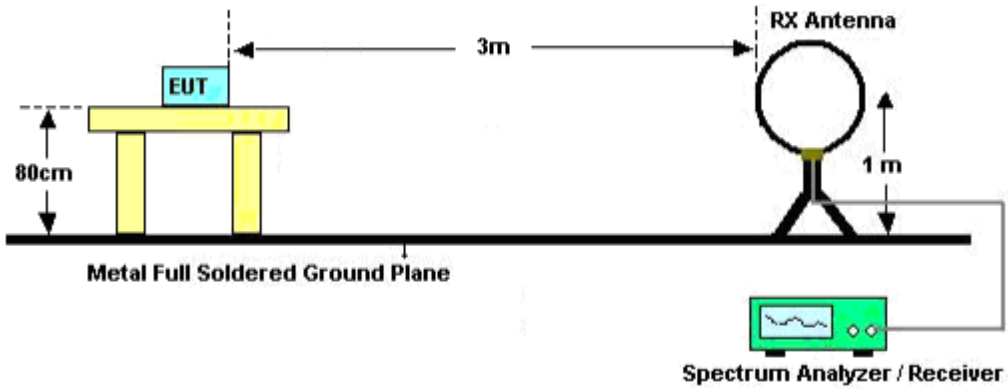
- a. The measuring distance of 3m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation (Below 1GHz)
- b. The measuring distance of 3m 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 test antenna shall vary between 1m to 4m. Both horizontal and vertical polarization of the antenna are set to make the measurement.
- d. The initial step in collecting radiated emission data is a receive peak detector mode. Pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- e. All readings are peak unless otherwise stated QP in column of Note. Peak denoted that the Peak reading complies with the QP limits and then QP Mode measurement didn't perform (Below 1GHz)
- f. All readings are Peak mode value unless otherwise stated AVG in column of Note. If the Peak mode measured value complies with the Peak limits and lower than AVG Limits, the EUT shall be deemed to meet Peak & AVG limits and then only Peak mode was measured, but AVG mode didn't perform. (Above 1GHz)
- g. For the actual test configuration, please refer to the related Item –EUT Test Photos.
Note: Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axes. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

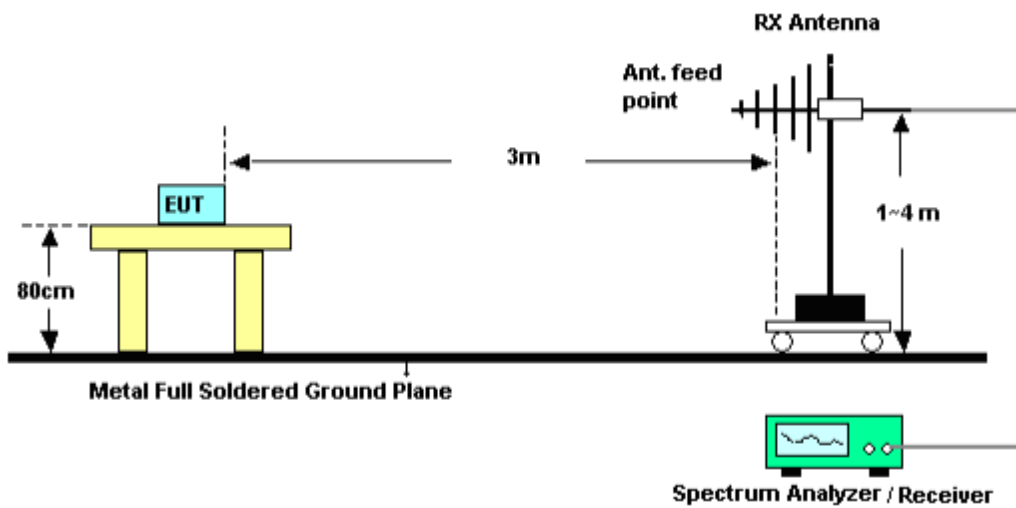
No deviation

3.2.4 TEST SETUP

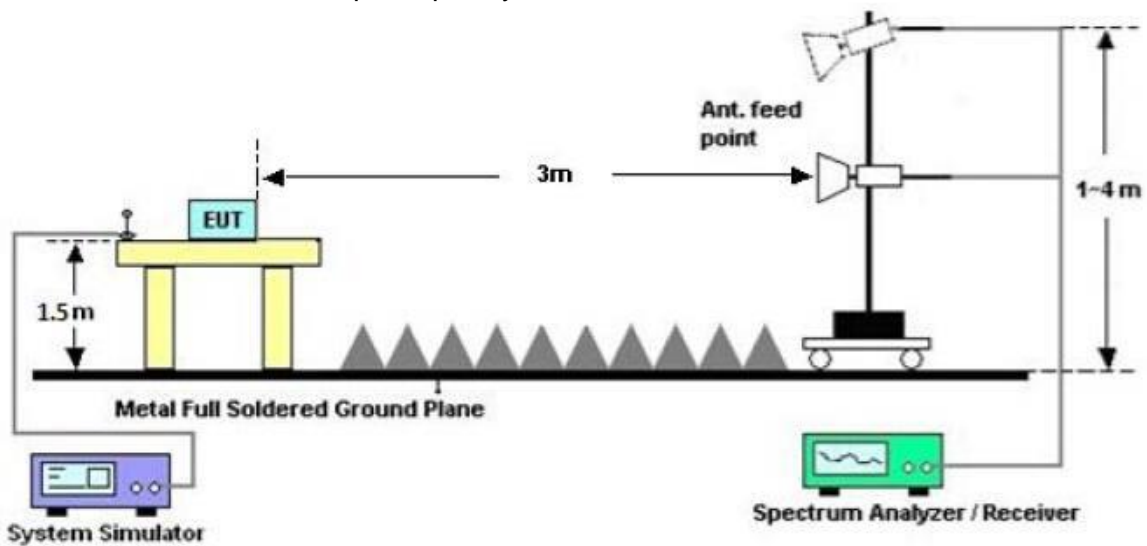
(A) Radiated Emission Test-Up Frequency Below 30MHz



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



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





3.2.5 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

Margin=PL-PK L or AL- AV L; Margin only shown the worst case.

Where

PR = Peak Reading

AR = Average Reading

PL = Peak Level

AL = Average Level

AF = Antenna Factor

PK L = Peak Limit

AV L = AV Limit

For example

Frequency	PR	AR	AF	PL	AL	PK L	AV L	Margin
(MHz)	(dB μ V/m)	(dB μ V/m)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB μ V/m)	(dB μ V/m)	(dB)
2178	40.23	30.31	9.83	50.06	40.14	74.00	54.00	-13.86



3.2.6 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

Below 30 MHz

Temperature:	25 °C	Relative Humidity:	64%
Test Voltage:	DC 12V	Polarization:	---
Test Mode:	TX Mode		

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

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



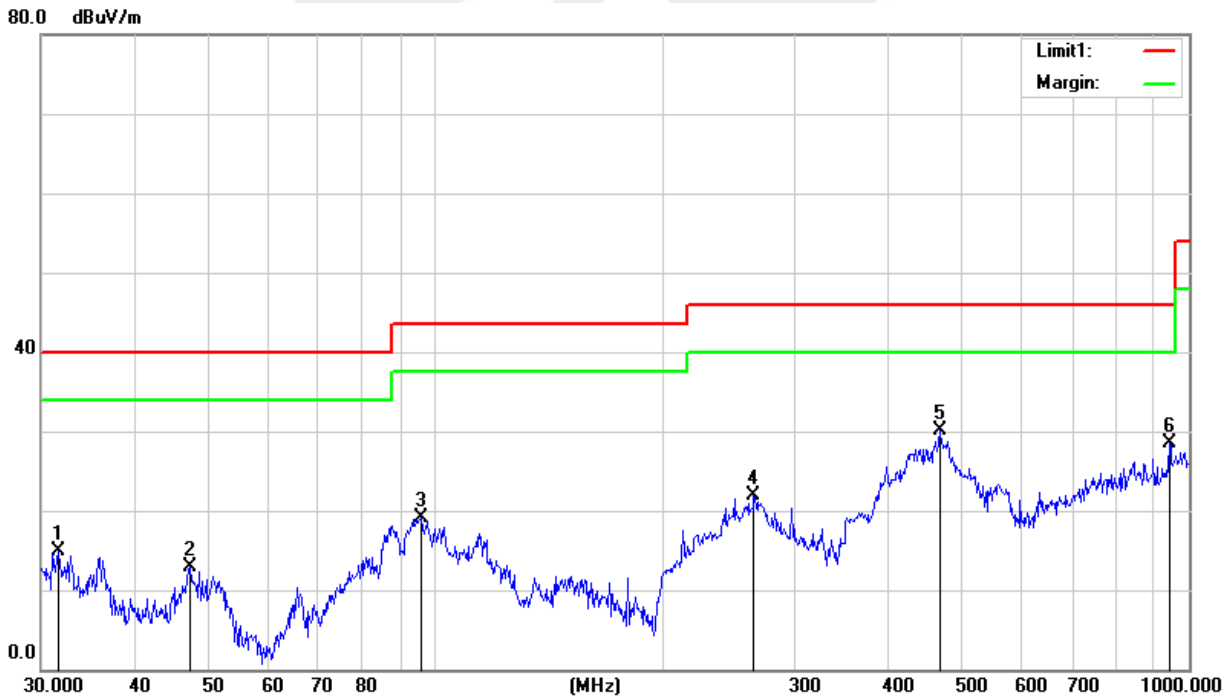
Between 30MHz – 1000 MHz Radiation Spurious

Temperature:	25 °C	Relative Humidity:	64%
Test Voltage:	DC 12V	Phase:	Horizontal
Test Mode:	Mode 1		

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
31.6202	28.57	-13.69	14.88	40.00	-25.12	QP
47.3255	34.79	-21.86	12.93	40.00	-27.07	QP
95.7622	39.74	-20.69	19.05	43.50	-24.45	QP
264.7457	36.71	-14.75	21.96	46.00	-24.04	QP
467.2350	39.18	-9.13	30.05	46.00	-15.95	QP
942.1305	27.02	1.43	28.45	46.00	-17.55	QP

Remark:

1. All readings are Quasi-Peak .
2. Margin = Result (Result =Reading + Factor)–Limit



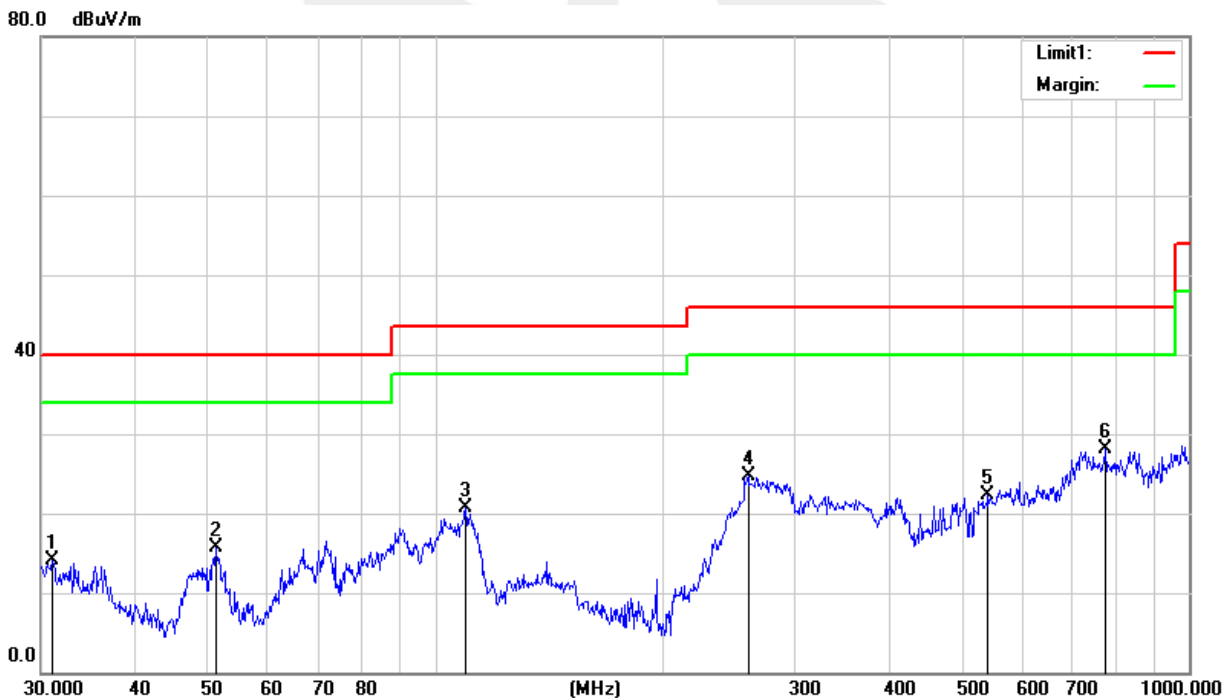


Temperature:	25.7 °C	Relative Humidity:	67%
Test Voltage:	DC 12V	Phase:	Vertical
Test Mode:	Mode 1		

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
31.0705	27.60	-13.41	14.19	40.00	-25.81	QP
51.1208	39.44	-23.73	15.71	40.00	-24.29	QP
109.7960	39.72	-19.09	20.63	43.50	-22.87	QP
260.1444	39.41	-14.78	24.63	46.00	-21.37	QP
541.3724	29.07	-6.71	22.36	46.00	-23.64	QP
774.1584	30.35	-2.28	28.07	46.00	-17.93	QP

Remark:

1. All readings are Quasi-Peak.
2. Margin = Result (Result = Reading + Factor) – Limit





Above 1G Radiation Spurious

**GFSK
Horizontal**

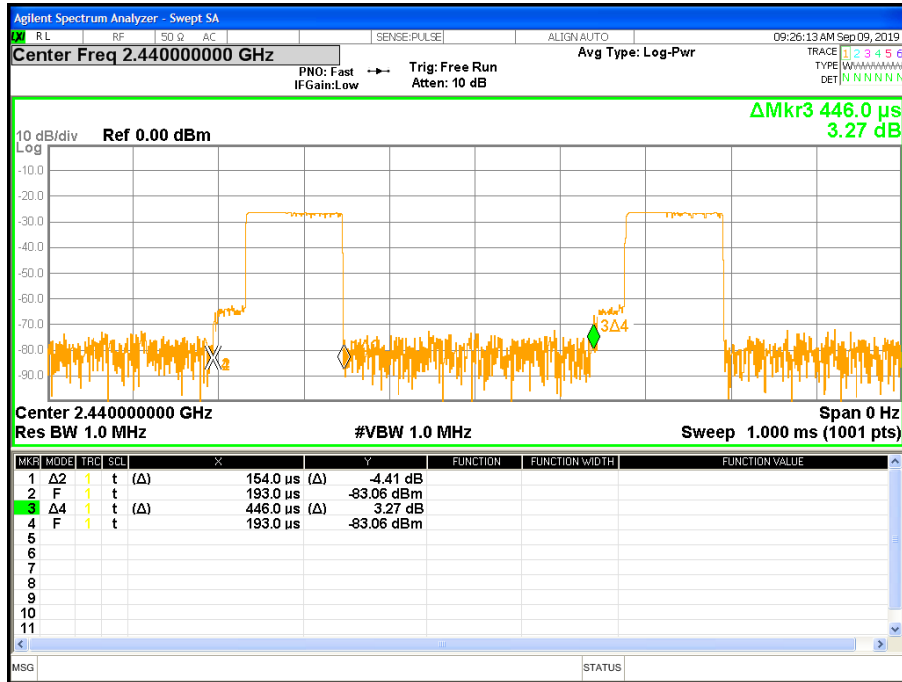
Frequency (MHz)	Peak Reading (dBuV/m)	Factor (dB)	Peak Level (dBuV/m)	Duty Factor (dB)	Average Level (dBuV/m)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Margin(dB)	ANT
1126.5	40.36	-1.14	39.22	9.24	29.98	74.00	54.00	-14.78	Horizontal
2988.5	40.00	7.75	47.75	9.24	38.51	74.00	54.00	-15.49	Horizontal
7625	51.08	4.33	55.41	9.24	46.17	74.00	54.00	-7.83	Horizontal
11065	49.91	9.97	59.88	9.24	50.64	74.00	54.00	-3.36	Horizontal
14907.5	47.66	12.38	60.04	9.24	50.80	74.00	54.00	-3.20	Horizontal
17007.5	49.46	11.49	60.95	9.24	51.71	74.00	54.00	-2.29	Horizontal

Vertical

Frequency (MHz)	Peak Reading (dBuV/m)	Factor (dB)	Peak Level (dBuV/m)	Duty Factor (dB)	Average Level (dBuV/m)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Margin(dB)	ANT
1414.5	40.15	0.01	40.16	9.24	30.92	74.00	54.00	-13.84	Vertical
2650	40.05	6.28	46.33	9.24	37.09	74.00	54.00	-16.91	Vertical
7695	50.74	4.55	55.29	9.24	46.05	74.00	54.00	-7.95	Vertical
11030	49.33	10.16	59.49	9.24	50.25	74.00	54.00	-3.75	Vertical
14962.5	47.95	12.39	60.34	9.24	51.10	74.00	54.00	-2.90	Vertical
17067.5	49.31	11.5	60.81	9.24	51.57	74.00	54.00	-2.43	Vertical



Duty cycle



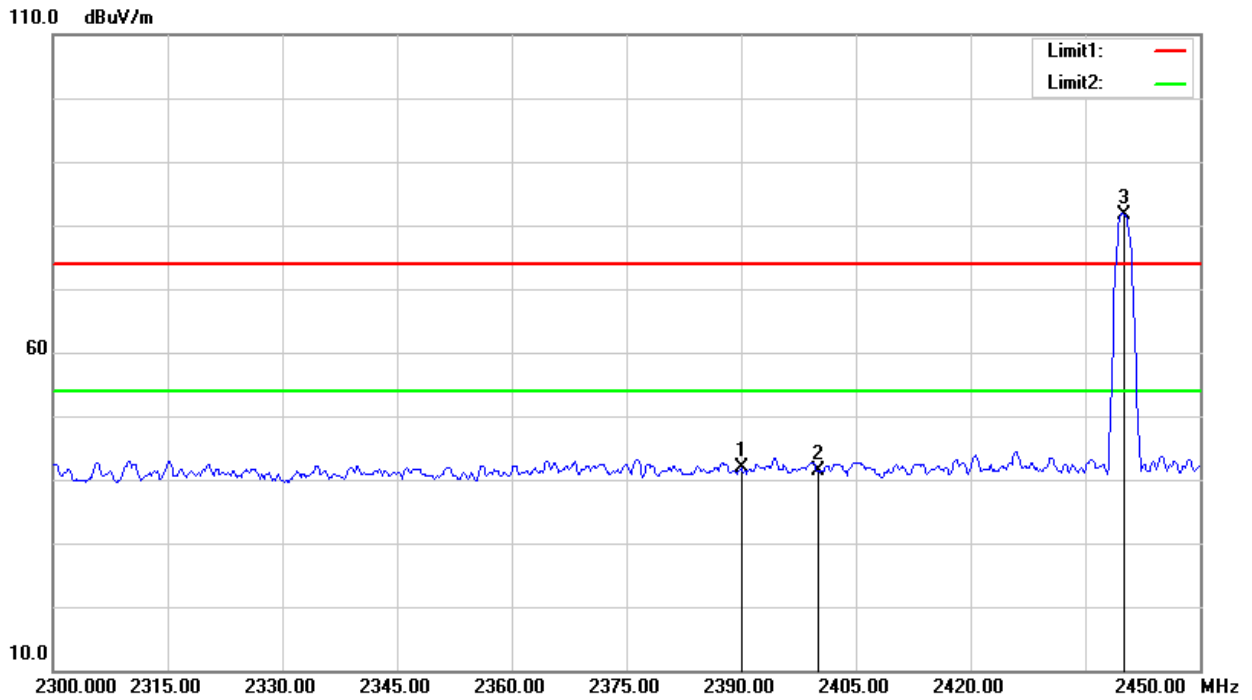
Ton (μs)	Tp (μs)	Duty Factor
154	446	9.24

Note: Duty Factor=20*LOG10(1/(Ton/Tp))



(Radiation Band edge)

GFSK-Low
Horizontal



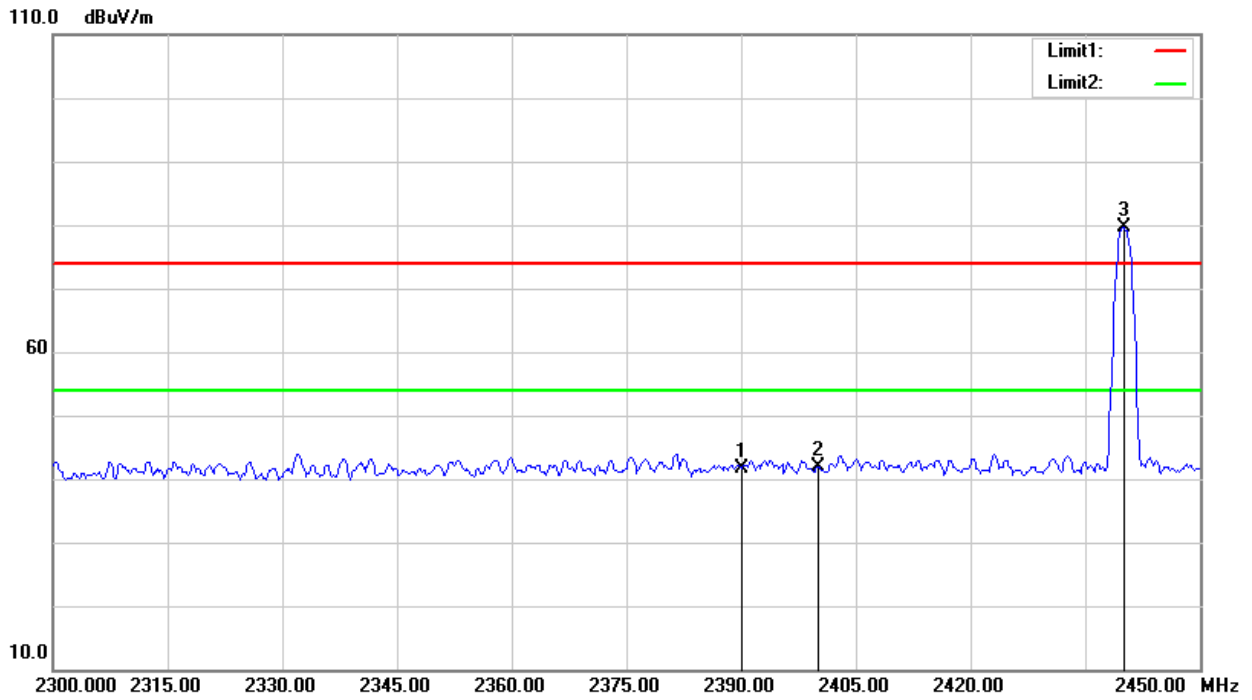
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2390.000	37.44	4.34	41.78	74.00	-32.22	peak
2	2400.000	36.82	4.49	41.31	74.00	-32.69	peak

Fundamental Frequency

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Duty cycle Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
3	2440.000	77.00	4.52	-	81.52	114.00	-32.48	peak
4	2440.000	77.00	4.52	9.24	72.28	94.00	-21.72	AV



Vertical



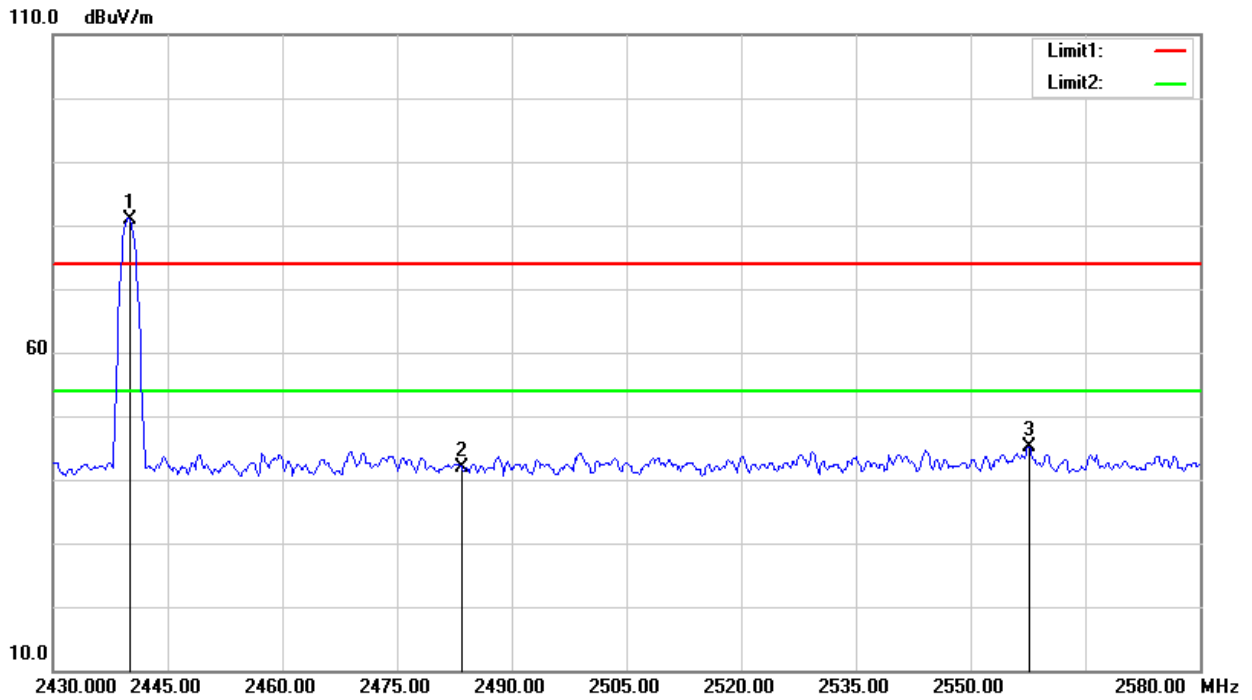
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2390.000	37.23	4.34	41.57	74.00	-32.43	peak
2	2400.000	37.50	4.49	41.99	74.00	-32.01	peak

Fundamental Frequency

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Duty cycle Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
3	2440.000	75.10	4.52	-	79.62	114.00	-34.38	peak
4	2440.000	75.10	4.52	9.24	70.38	94.00	-23.62	AV



GFSK-High
Horizontal



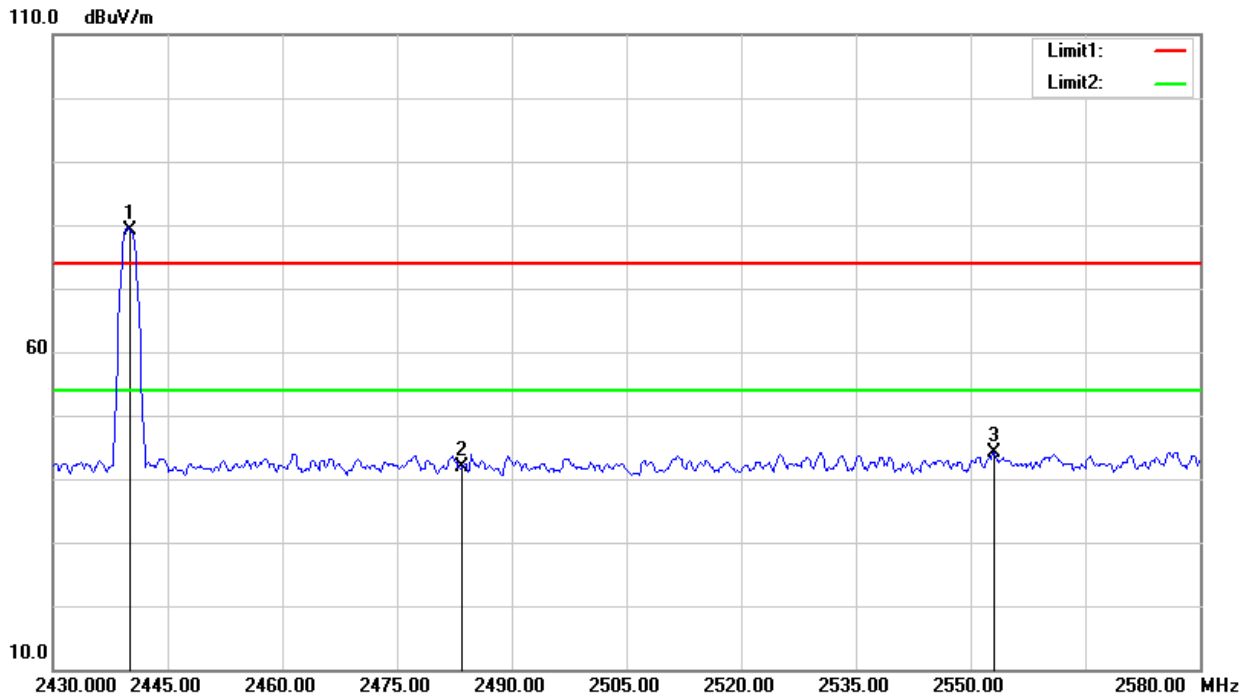
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2	2483.500	37.24	4.60	41.84	74.00	-32.16	peak
3	2557.650	40.23	4.99	45.22	74.00	-28.78	peak

Fundamental Frequency

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Duty cycle Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2440.000	76.45	4.52	-	80.97	114.00	-33.03	peak
4	2440.000	76.45	4.52	9.24	71.73	94.00	-22.27	AV



Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2	2483.500	37.40	4.60	42.00	74.00	-32.00	peak
3	2553.000	39.22	4.98	44.20	74.00	-29.80	peak

Fundamental Frequency

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Duty cycle Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2440.000	74.66	4.52	-	79.18	114.00	-34.82	peak
4	2440.000	74.66	4.52	9.24	69.94	94.00	-24.06	AV



4. BANDWIDTH TEST

4.1 TEST PROCEDURE

- 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= 30KHz, VBW \geq RBW, Sweep time = Auto.

4.2 TEST SETUP



4.3 EUT OPERATION CONDITIONS

TX mode.



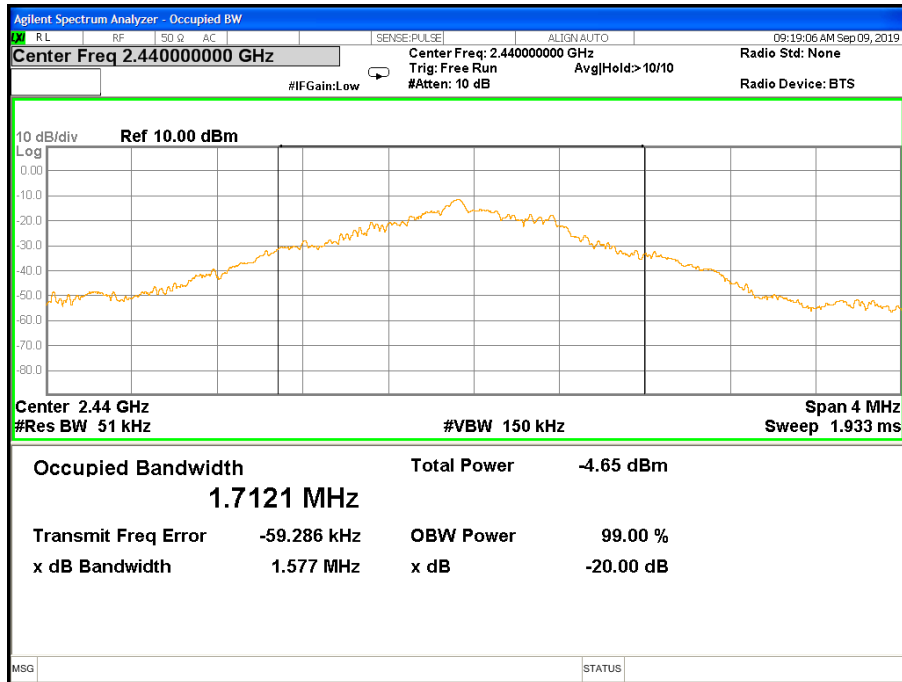


4.4 TEST RESULTS

Temperature:	25 °C	Relative Humidity:	50%
Test Voltage:	DC 3V from battery		

Frequency (MHz)	20 dBc Bandwidth (MHz)	99% Bandwidth (MHz)
2440	1.577	1.7121

Channel:2440MHz





5. ANTENNA REQUIREMENT

5.1 STANDARD REQUIREMENT

According to the FCC Part 15 Paragraph 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.

5.2 EUT ANTENNA

The EUT antenna is PCB Antenna. It conforms to the standard requirements.





APPENDIX- PHOTOS OF TEST SETUP

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

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

