TEST REPORT

of

FCC Part 15 Subpart C

☒ New Application; ☐ Class I PC; ☐ Class II PC

Product :	**Skale**
Brand:	**ATOMAX**
Model:	**SK02**
Model Difference:	**N/A**
FCC ID:	**2AD5WSK02**
FCC Rule Part:	**§15.249, Cat:DXX**
Applicant:	**Atomax Inc.**
Address:	**2F-2., No.51, Sec. 2, Nei-hu road, Taipei, Taiwan 114**

Test Performed by:

International Standards Laboratory
<Lung-Tan LAB>
*Site Registration No.
BSMI: SL2-IN-E-0013; MRA TW1036; TAF: 0997; IC: IC4067B-3;
*Address:
No. 120, Lane 180, Hsin Ho Rd.
Lung-Tan Dist., Tao Yuan City 325, Taiwan
*Tel : 886-3-407-1718; Fax: 886-3-407-1738

Report No.: **ISL-16LR170FCDXX**

Issue Date : **2016/08/09**

Testing laboratory
0997

VERIFICATION OF COMPLIANCE

Applicant:	Atomax Inc.
Product Description:	Skale
Brand Name:	ATOMAX
Model No.:	SK02
Model Difference:	N/A
FCC ID:	2AD5WSK02
FCC Rule Part:	§15.249, Cat:DXX
Date of test:	2016/07/07 ~ 2016/08/08
Date of EUT Received:	2016/07/07

We hereby certify that:

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

Test By:	Dion Chen	***Date:***	2016/08/09
	Dion Chang / Engineer		
Prepared By:	Gigi yeh	***Date:***	2016/08/09
	Gigi Yeh / Specialist		
Approved By:	Vincent Su	***Date:***	2016/08/09
	Vincent Su / Technical Manager		

Version

Version No.	Date	Description
00	2016/08/09	Initial creation of document

Table of Contents

1. General Information

1.1. Product Description

General:

Product Name	Skale
Brand Name	ATOMAX
Model Name	SK02
Model Difference	N/A
USB port	One provided for power input or USB port
Power Supply	DC6V (AAA*4)
TestSW Version:	SSCOM3.2
RFpower setting:	default

2.4G:

Modulation type	GFSK
Frequency Range(MHz)	2402MHz – 2480MHz
Channel Number	40
Frequency space	2MHz
Measured Power	86.01dBuV/m at 3 m
Antenna Designation:	PCB Antenna; 1.5 dBi

The report applies for 2.4GHz mode.

Remark: The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID**: **2AD5WSK02** filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

1.3. Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2013) and RSS-Gen: 2014. Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4. Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of **International Standards Laboratory** <Lung-Tan LAB> No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2014. FCC Registration Number is: TW1036, Canada Registration Number: 4067B-3.

1.5. Special Accessories

Not available for this EUT intended for grant.

1.6. Equipment Modifications

Not available for this EUT intended for grant.

2. System Test Configuration

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The Transmitter was operated in the engineering operating mode. the Tx frequency was fixed at Lowest, Mid and highest channel which were for the purpose of the measurements.

2.3. Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7 and 13 of ANSI C63.10: 2013 and RSS-Gen: 2014. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m /1.5m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 8 and 13 of ANSI C63.4- 2014, ANSI C63.10: 2013and RSS-Gen:2014.

2.4. Limitation

(1) Conducted Emission

According to section 15.207(a) and RSS-Gen §8.8 Conducted Emission Limits is as following.

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 – 0.5	66 - 56	56 - 46
0.5 – 5	56	46
5 - 30	60	50

(2) Radiated Emission 15.249(a) and RSS-210 issue 8,§A2.9(a)

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following.

Frequency (MHz)	Field strength of Fundamental	Field strength of Harmonics	Distance (m)
902 - 928	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
2400 – 2483.5	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
5725 – 5875	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3

(3) Radiated Emission15.249 (d) and RSS-210 issue 8,§A2.9(b)

Emission Radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 15.209 and RSS-210 issue 8,§A2.9(a) as below, whichever is the lesser attenuation.

Frequency (MHz)	Field strength μV/m	Distance (m)	Field strength at 3m dBμV/m
1.705-30	30	30	69.54
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

(4) Radiated Emission 15.249(e) and RSS-210 issue 8

For frequencies above 1000MHz, the above field strength limits are based on average limits. The peak filed strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20dB under any condition of modulation.

Remark:
1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of § 15.205
4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of § 15.205, then the general radiated emission limits in ξ 15.209 apply.

2.5. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

Table 2-2 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	**Power Cord**
1	NB	Lenovo	X220i	NA	Non-shielded	Non-shielded
2	Power supply	MRL	Th-3205	NA	NA	Non-shielded
3	JIG	NA	NA	NA	Non-shielded	Non-shielded

Note: All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

Grounding: Grounding was in accordance with the manufacturer's requirements and conditions for the intended use.

3. Summary of Test Results

FCC Rules	Description Of Test	Result

4. Conducted Emissions Test

4.1 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

4.2 Test SET-UP (Block Diagram of Configuration)

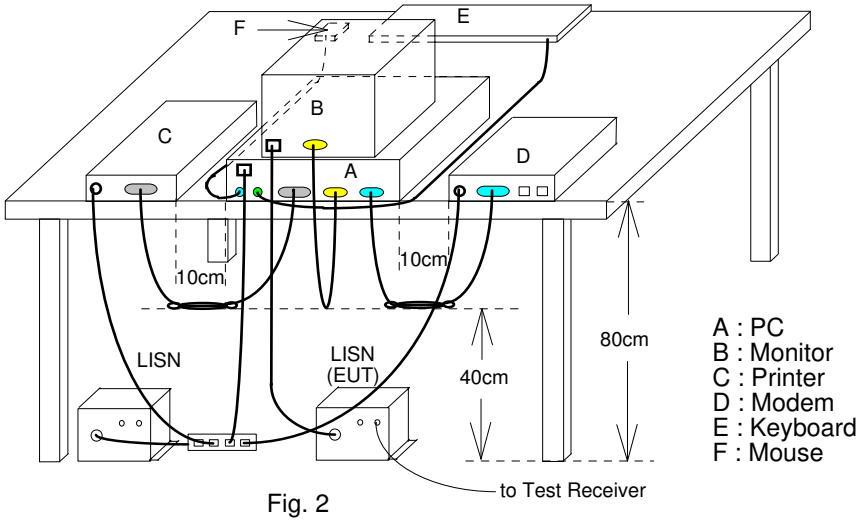


Fig. 2

4.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Conduction 04-3 Cable	WOKEN	CFD 300-NL	Conduction 04 -3	07/27/2016	07/26/2017
EMI Receiver 17	Rohde & Schwarz	ESCI 7	100887	09/08/2015	09/07/2016
LISN 18	ROHDE & SCHWARZ	ENV216	101424	02/11/2016	02/10/2017
LISN 19	ROHDE & SCHWARZ	ENV216	101425	03/12/2016	03/11/2017

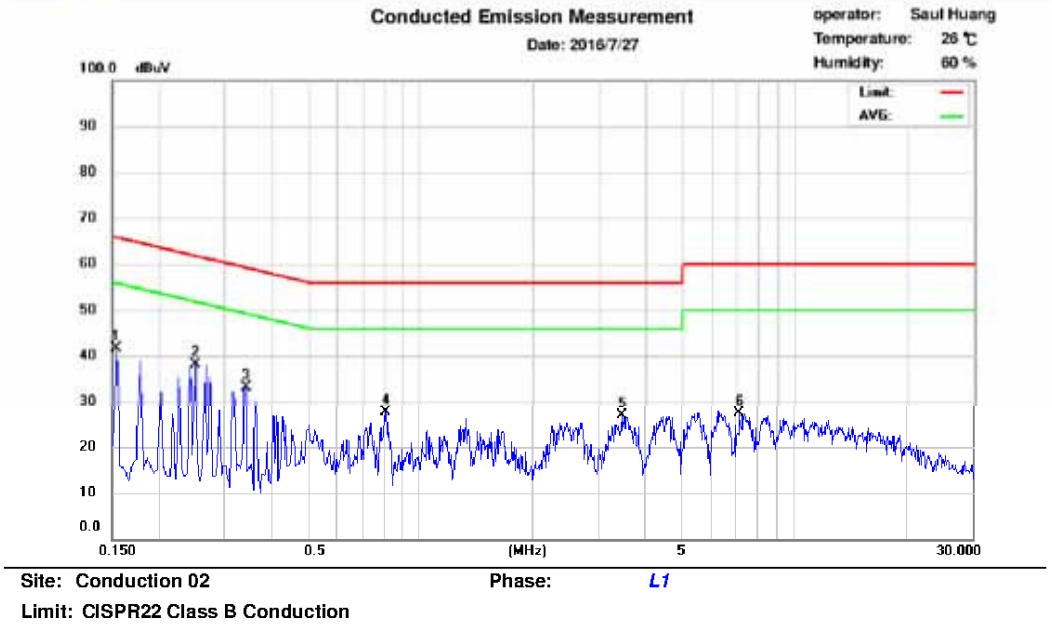
4.4 Measurement Result:

Note: Refer to next page for measurement data and plots.

AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation Mode	Test Date:	2016/07/27
Test By:	Dino		

Address:No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,
Tao Yuan City 325, Taiwan.
Tel:03-4071718

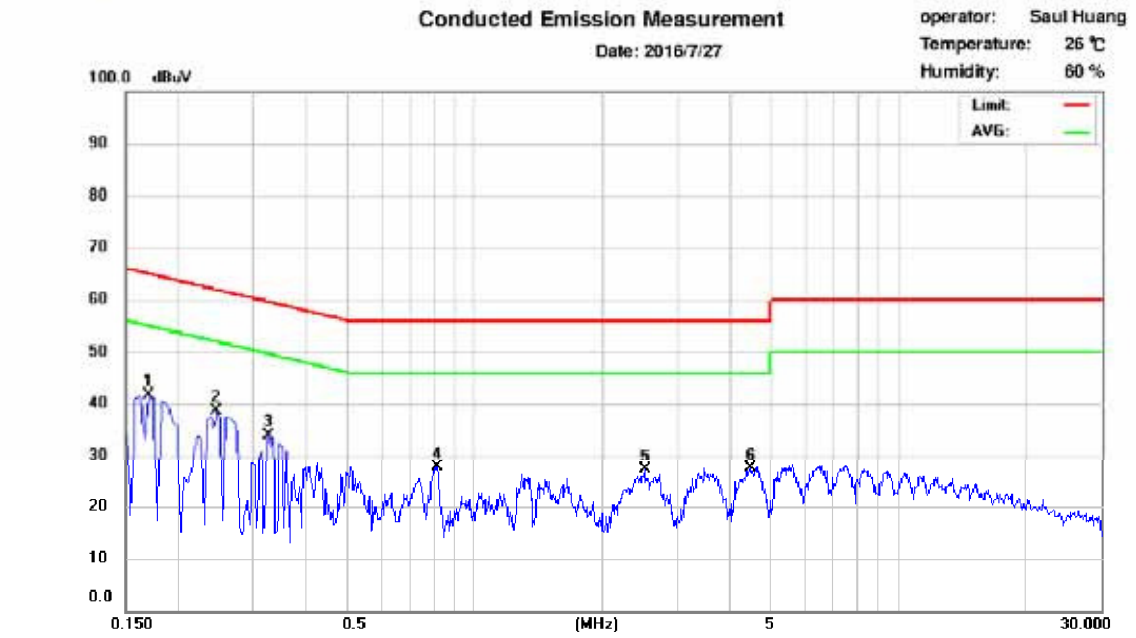


Site: Conduction 02 Phase: L1

Limit: CISPR22 Class B Conduction

No.	Frequency (MHz)	QP_R (dBuV)	AVG_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
1	0.154	25.08	3.11	9.64	34.72	65.78	-31.06	12.75	55.78	-43.03
2	0.250	22.39	1.89	9.65	32.04	61.76	-29.72	11.54	51.76	-40.22
3	0.342	16.58	-0.44	9.65	26.23	59.15	-32.92	9.21	49.15	-39.94
4	0.810	13.74	5.58	9.68	23.42	56.00	-32.58	15.26	46.00	-30.74
5	3.470	10.26	0.98	9.75	20.01	56.00	-35.99	10.73	46.00	-35.27
6	7.146	8.48	-0.85	9.84	18.32	60.00	-41.68	8.99	50.00	-41.01

Address:No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,
Tao Yuan City 325, Taiwan.
Tel:03-4071718



Site: Conduction 02 Phase: N

Limit: CISPR22 Class B Conduction

No.	Frequency (MHz)	QP_R (dBuV)	AVG_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
1	0.170	25.86	3.02	9.64	35.50	64.96	-29.46	12.66	54.96	-42.30
2	0.246	22.28	1.36	9.63	31.91	61.89	-29.98	10.99	51.89	-40.90
3	0.326	16.97	-0.66	9.63	26.60	59.55	-32.95	8.97	49.55	-40.58
4	0.814	13.03	5.83	9.67	22.70	56.00	-33.30	15.50	46.00	-30.50
5	2.522	10.51	1.39	9.71	20.22	56.00	-35.78	11.10	46.00	-34.90
6	4.434	11.92	2.26	9.77	21.69	56.00	-34.31	12.03	46.00	-33.97

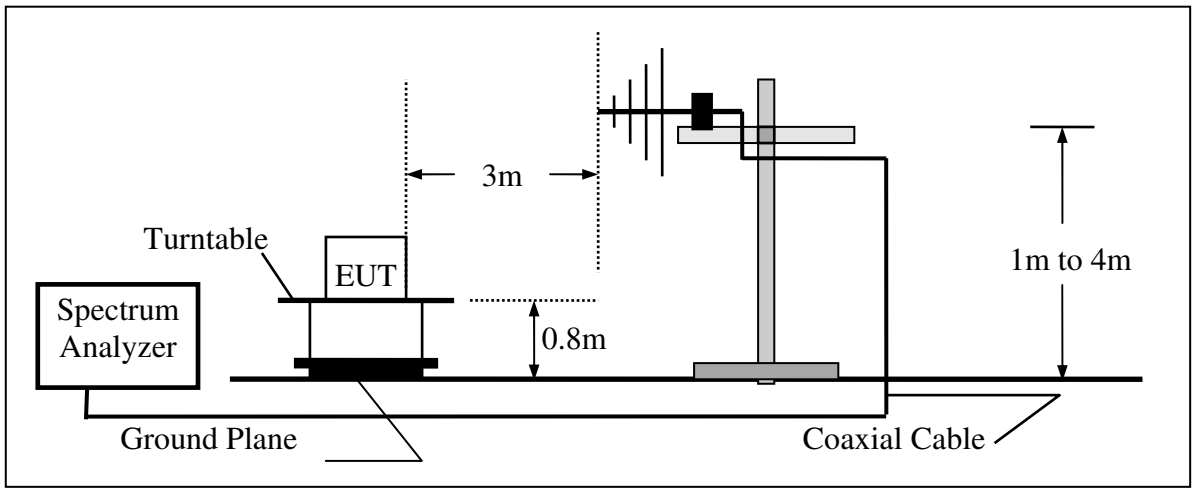
5. Radiated Emission Test (TX)

5.1 Measurement Procedure

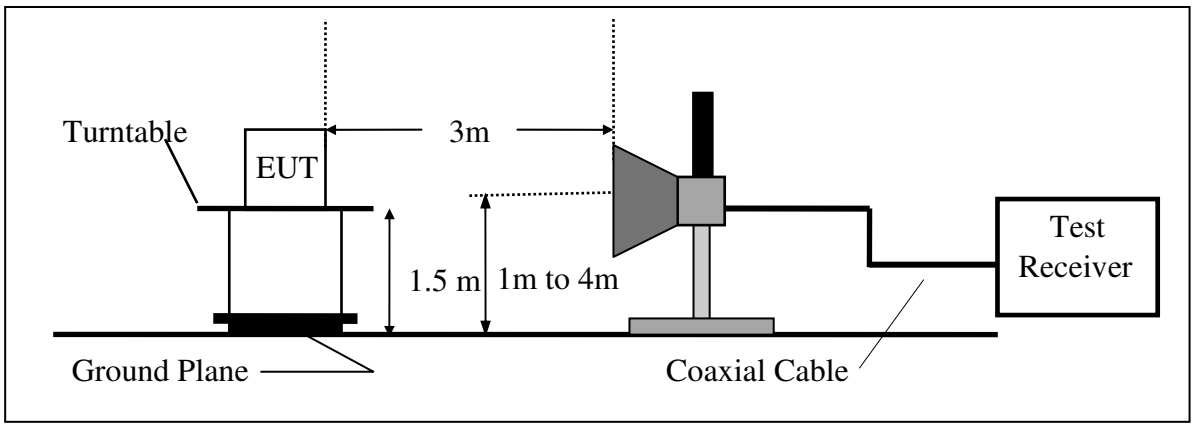
1. The EUT was placed on a turntable that is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

5.2 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



5.3 Measurement Equipment Used:

Chamber 14(966)					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer 21(26.5GHz)	Agilent	N9010A	MY49060537	07/29/2016	07/28/2017
Spectrum Analyzer 20(6.5GHz)	Agilent	E4443A	MY48250315	05/20/2016	05/19/2017
Spectrum Analyzer 22(43GHz)	R&S	FSU43	100143	05/22/2016	05/21/2017
Loop Antenna9K-30M	A.H.SYSTEM	SAS-564	294	06/17/2015	06/16/2017
Bilog Antenna30-1G	SCHWARZBECK	VULB9168	644	03/02/2016	03/01/2017
Horn antenna1-18G	ETS	3117	00066665	11/30/2015	11/29/2016
Horn antenna26-40G(05)	Com-power	AH-640	100A	01/21/2015	01/20/2017
Horn antenna18-26G(04)	Com-power	AH-826	081001	07/24/2015	07/23/2017
Preamplifier9-1000M	HP	8447D	NA	03/09/2016	03/08/2017
Preamplifier1-18G	MITEQ	AFS44-00101800-25-10P-44	1329256	07/27/2016	07/26/2017
Preamplifier1-26G	EM	EM01M26G	NA	03/10/2016	03/09/2017
Preamplifier26-40G	MITEQ	JS-26004000-27-5A	818471	07/23/2015	07/22/2017
Cable1-18G	HUBER SUHNER	Sucoflex 106	NA	11/25/2015	11/24/2016
Cable UP to 1G	HUBER SUHNER	RG 214/U	NA	10/02/2015	10/01/2016
SUCOFLEX 1GHz~40GHz cable	HUBER SUHNER	Sucoflex 102	27963/2&37421/2	11/03/2015	11/02/2017
2.4G Filter	Micro-Tronics	Brm50702	76	12/26/2015	12/25/2016

5.4 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:

FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

5.5 Measurement Result

5.5.1 Fundamental Emission Measurement Result

Test Date : 2016/08/02 Test By : Dino
Temp : 25

5.5.2 Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	TX CH Low	Test Date	2016/08/02
Fundamental Frequency	2402 MHz	Test By	Dino
Temperature	25		

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	TX CH Mid	Test Date	2016/08/02
Fundamental Frequency	2442 MHz	Test By	Dino
Temperature	25		

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	TX CH High	Test Date	2016/08/02
Fundamental Frequency	2480 MHz	Test By	Dino
Temperature	25		

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	: TX CH Low	Test Date	: 2016/08/02
Fundamental Frequency	: 2402 MHz	Test By	: Dino
Temp	: 25		

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	: TX CH Mid	Test Date	: 2016/08/02
Fundamental Frequency	: 2442 MHz	Test By	: Dino
Temp	: 25		

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	: TX CH High	Test Date	: 2016/08/02
Fundamental Frequency	: 2480 MHz	Test By	: Dino
Temp	: 25		

Radiated Spurious Emission Measurement Result (Band Edge)

Operation Mode	: Band Edge	Test Date	:2014/06/07
Temp./Hum.	: 25		

6. 20 dB Band Width Measurement

6.1 Measurement Procedure

1. The EUT was placed on a turn table which is 1.5m above ground plane.
2. Set ETU normal operating mode.
3. Set SPA Center Frequency = fundamental frequency, RBW = 100kHz, VBW = 300kHz, Span =5MHz.
4. Set SPA Max hold. Mark peak, -20dB.

6.2 Test SET-UP (Block Diagram of Configuration)

Same as 4.2 Radiated Emission Measurement.

6.3 Measurement Equipment Used:

Same as 4.2 Radiated Emission Measurement.

6.4 Measurement Results:

2402 Channel : 1.982 MHz

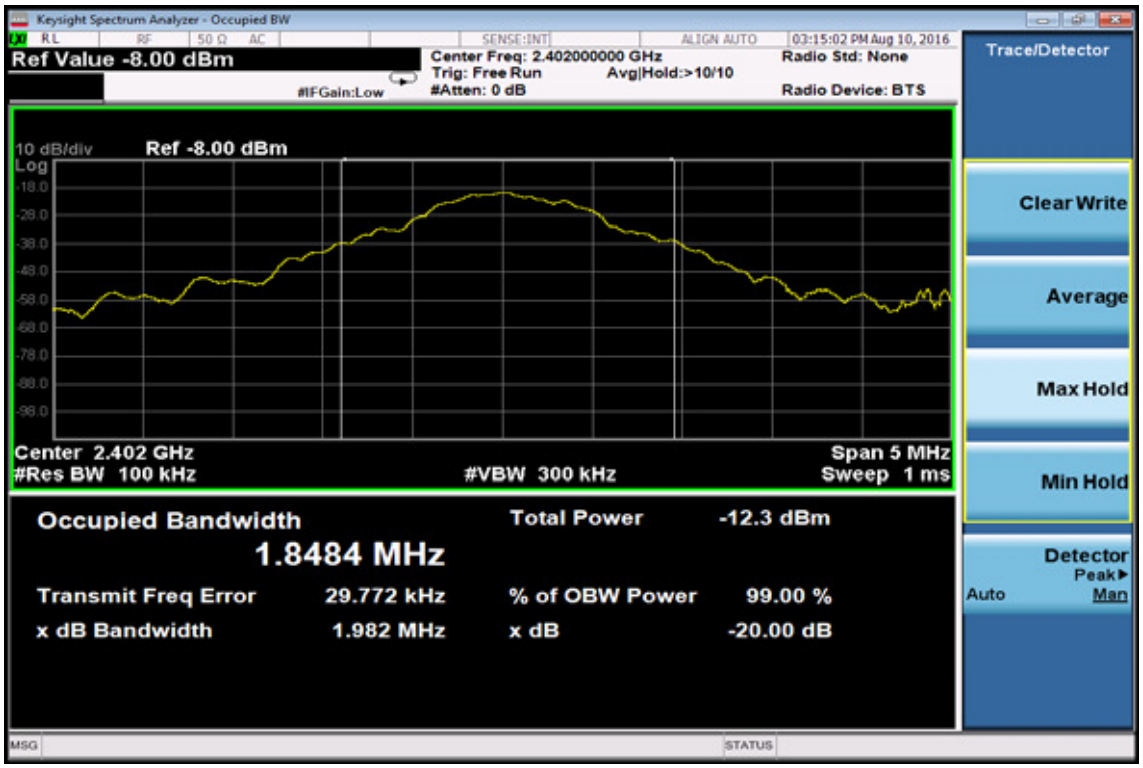
2442 Channel : 1.935 MHz

2480 Channel : 1.969 MHz

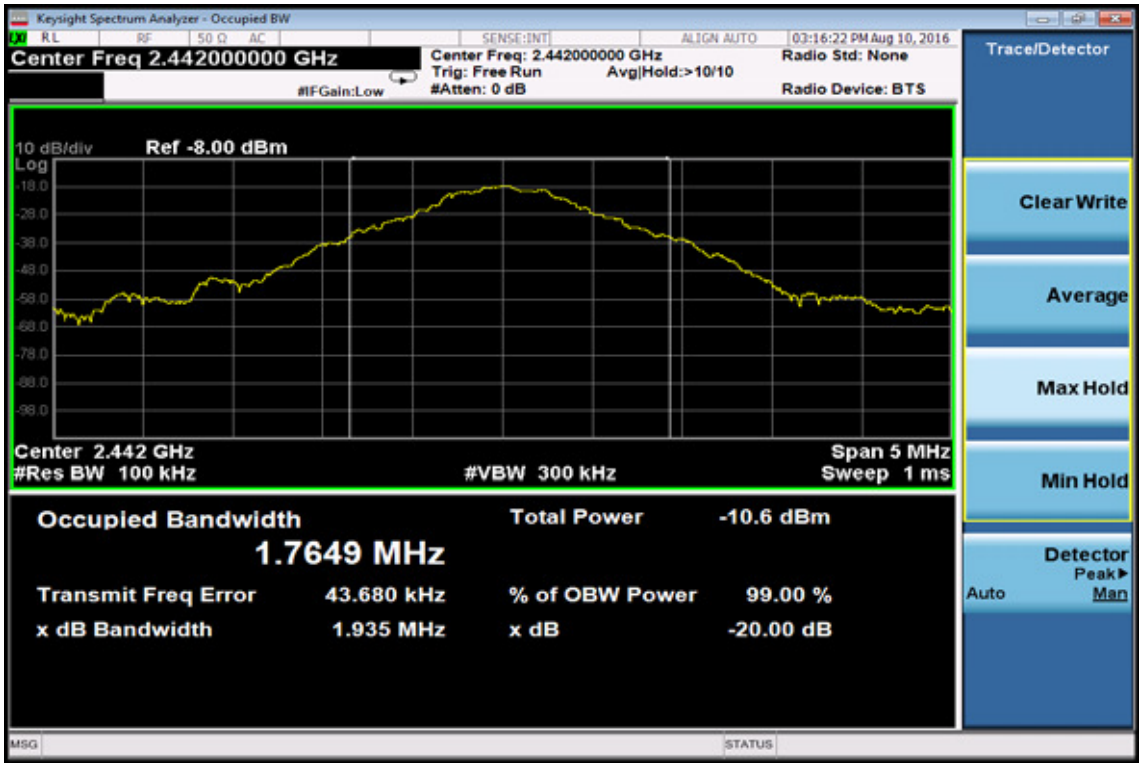
Refer to attached data chart.

20dB Band Width test Plot

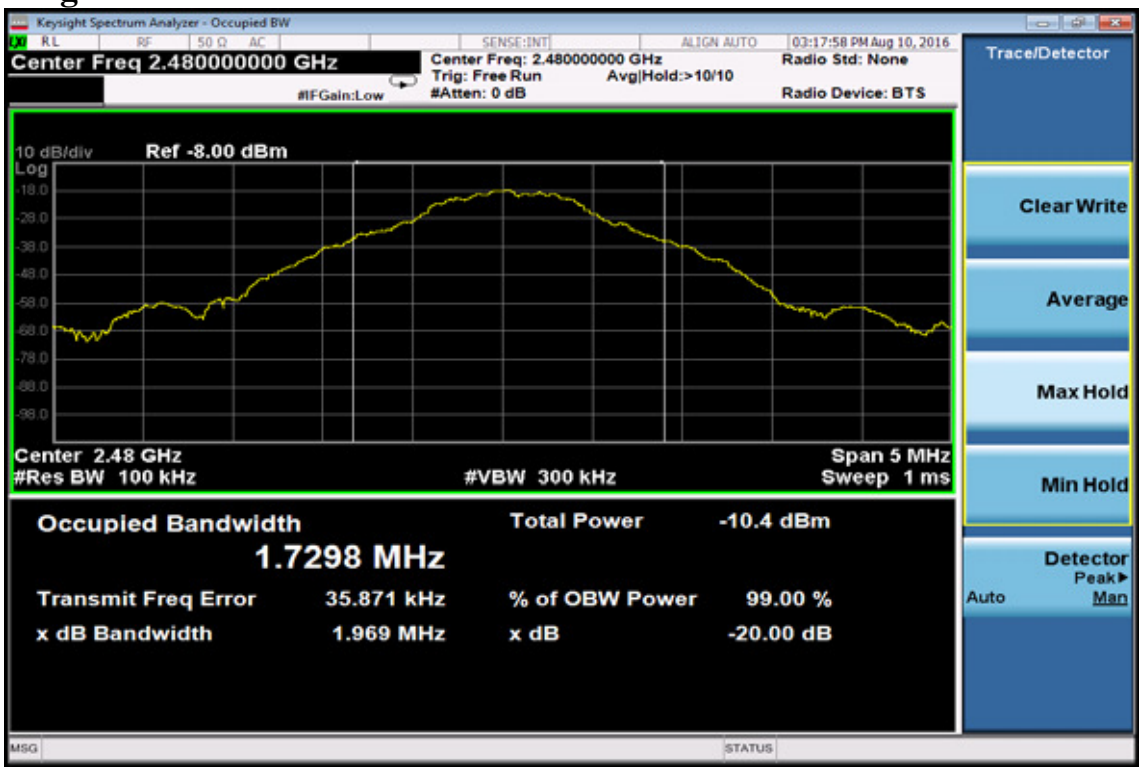
CH Low



CH Mid



CH High


Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
03:17:58 PM Aug 10, 2016
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 0 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Trace/Detector
10 dB/div
Log
Ref -8.00 dBm
-18.0
-28.0
-38.0
-48.0
-58.0
-68.0
-78.0
-88.0
-98.0
Center 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 5 MHz
Sweep 1 ms
Occupied Bandwidth
1.7298 MHz
Total Power
-10.4 dBm
Transmit Freq Error
35.871 kHz
% of OBW Power
99.00 %
x dB Bandwidth
1.969 MHz
x dB
-20.00 dB
Clear Write
Average
Max Hold
Min Hold
Detector
Peak
Auto
Man
MSG
STATUS