

TEST REPORT

Report Number		RAPA13-O-623
Type of Equipment		Singing Machine Home
Model Name		SMC HOME MIC
FCC ID		2AAXO-SMCMIC
IC Number		11387A-SMCMIC
Applicant	Name	The Singing Machine Company, Inc.
	Logo	
	Address	6301 NW 5 th Way, Suite 2900, Fort Lauderdale FL 33309
Manufacturer	Name	VisionScape
	Address	404, 60-19, Gasan-dong, Geumcheon-gu, Seoul, Korea
Test period		August 20, 2013 to September 10, 2013
Issuing date of report		September 16, 2013
Total page		27 pages (including this page)

SUMMARY

The equipment complies with FCC Part 15.247: Operation within the bands 902 MHz to 928 MHz, 2 400 MHz to 2 483.5 MHz, and 5 725 MHz to 5 850 MHz and IC RSS-210 Issue8 Annex 1-2010.

This test report contains only the results of a single test of the sample supplied for the examination. It is not a general valid assessment of the features of the respective products of the mass-production.

Date : September 16, 2013

Date : September 16, 2013




Prepared and tested by Tae Yang Yoon
Manager / TCL of RAPA

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Executive Managing Director / TCL of RAPA

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1. GENERAL DESCRIPTION

1.1 Applicant

- Company name : The Singing Machine Company, Inc.
- Address : 6301 NW 5th Way, Suite 2900, Fort Lauderdale FL 33309
- Contact person : Gary Atkinson / CEO
- Phone/Fax : +1-954-596-1000 / +1-954-596-2000

1.2 Manufacturer

- Company name : VisionScape
- Address : 404, 60-19, Gasan-dong, Geumcheon-gu, Seoul, Korea
- Contact person : Hun Pil Lim / CEO
- Phone/Fax : 82-2-856-8150 / 82-2-856-2828

1.3 Basic description of EUT

- Product name : Singing Machine Home
- Model name : SMC HOME MIC
- Serial number : N/A
- Frequency : 2 405 MHz to 2 475 MHz
- Number of channel(s) : 18 Channels
- Modulation method : GFSK
- FCC Rule Part(s) : FCC CFR47 Part 15 Subpart C Section 15.247
- IC Rule Part(s) : IC RSS-210 Issue8 Annex 8-2010
- FCC classification : DTS / Digital Transmission System
- IC classification : Annex 8 / Frequency Hopping and Digital Modulation Systems Operating in the bands 902 - 928 MHz, 2 400 - 2 483.5 MHz and 5 725 - 5 850 MHz
- Test period : August 26, 2013 to September 10, 2013
- Issuing date of report : September 16, 2013
- Place of test : Head office
824 & B104, Anyang Megavalley, 799, Gwanyang-dong,
Dongan-gu, Anyang-si, Gyeonggi-do 431-767, Korea

Open area test site

80, Jeil-ri, Yangji-myun, Cheoin-gu, Yongin-si, Gyeonggi-do
449-825, Korea

(FCC Registration Number : 337229)

(IC Submission Number : 143881)

(KCC Designation Number : KR0027)

1.4 Electrical specification

Item	Specifications
Input power	DC 3.0V
Internal clock	2.4G Wireless Audio CC8520 : 48MHz
RF frequency	Wireless Audio CC8520 : 2.4GHz
Transmitter frequency	Wireless Audio CC8520 : 2.4GHz
Number of layer	4 layer PCB
External connector	X
Working temperature	0 ~ 50
Storage temperature	-20 ~ 60
Battery	1.5 V(AA size) x 2 ea
Relative humidity	60%
Dimensions (W x H x D)	129.8 x 55 x 47.3
Sound	Condenser Microphone
RF method	Wireless Audio

2. General information of test

2.1 Standard for measurement methods

Applied Standard : FCC CFR47 Part 15 Subpart C 15.247, IC RSS-210 Issue8 Annex 8-2010				
FCC	IC	Description of Test	Limit	Result
15.247(a)(1)	RSS-210 A8.1(a)	6 dB Bandwidth	≤ 500 kHz	Pass
-	RSS-GEN 4.6.1	99% Bandwidth	-	Pass
15.247(b)(1)	RSS-210 A8.1(b)	Maximum Peak Output Power	≤ 30 dBm	Pass
15.247(e)	RSS-210 A8.2(b)	Power spectral density	≤ 8 dBm	Pass
15.247(d)	RSS-210 A8.5	Conducted band edges and spurious emission	≤ 20 dBc	Pass
15.247(d)	RSS-GEN 7.2.4	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass
15.203 &15.247(c)	RSS-210 A8.4	Antenna Requirement	< 6 dBi	Pass

2.2 Description of EUT modification

During the test, there was no mechanical or circuitry modification to improve any RF specification including spurious characteristic, and any RF and spurious suppression device(s) were not added against the device tested.

2.3 Description of test system configuration

- Peripheral equipment used;

Description	Model name	Serial No.	Manufacturer	FCC ID
EUT	SMC HOME MIC	Proto Type	VisionScape	2AAAXO-SMCMIC
Test fixer (JIG)	CC Debugger	Proto Type	TEXAS INSTRUMENTS	-
Control PC	E655X-8FA	JT0802G100530031	JOOYONTECH	-

- Cables used

Device from	Device to	Type of cable	Type of connector	Length
EUT	Test fixer (JIG)	Non-shielded	Wire	0.30 m
Test fixer (JIG)	Control PC	Non-shielded	USB to USB	2.00 m
Control PC	Test fixer (JIG)	Non-shielded	USB to USB	2.00 m
EUT	Spectrum analyzer	Shielded	SMA to SMA	1.00 m

3. Measurement data

3.1 6 dB and 99 % bandwidth

3.1.1 6 dB bandwidth

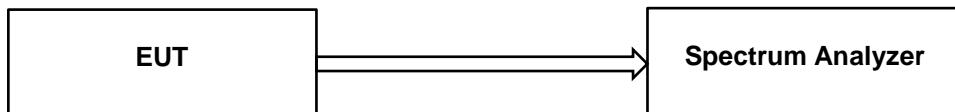
3.1.2 Specification

- FCC Rules Part 15 Subpart C Section 15.247(a)(2)
- IC Rules RSS-210 Issue8 Annex 8-2010 A8.1(a), RSS-GEN 4.6.1

3.1.3 Measurement method

- 558074 D01 DTS Meas Guidance v03r01, Section 8.0

3.1.4 Set-up



3.1.5 Test equipment list

Equipment	Model name	Serial No.
EUT	SMC HOME MIC	VisionScape
Test fixer (JIG)	CC Debugger	TEXAS INSTRUMENTS
Spectrum analyzer	FSV30	Rohde & Schwarz
Control PC	E655X-8FA	JT0802G100530031

3.1.6 Test procedure

- The output of EUT was connected to the spectrum analyzer.

3.1.7 Test condition

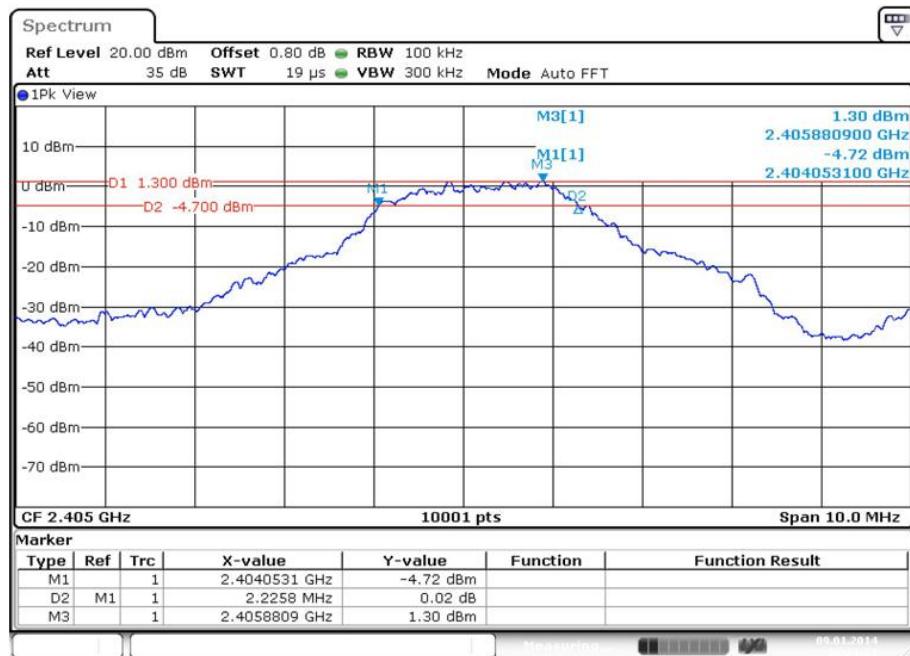
- Test place : Test room
- Test environment : 25 °C, 56 % R.H.
- Test mode : Operation at single channel

3.1.8 Test result

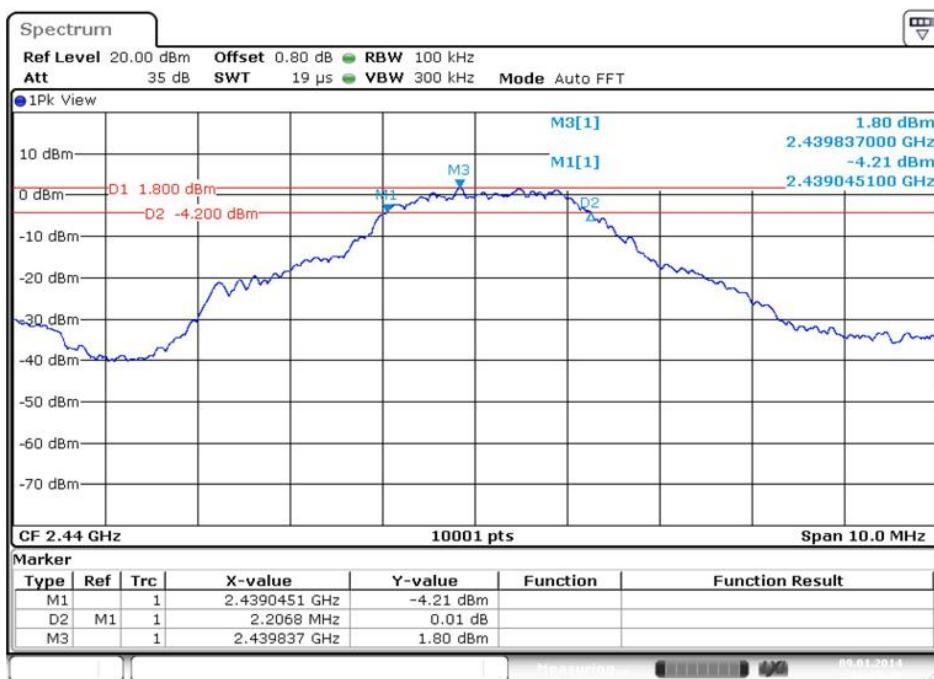
Frequency [MHz]	6 dB Bandwidth [MHz]	99 % Bandwidth [MHz]
2 405	2.225	4.375
2 440	2.206	4.115
2 475	2.179	4.049

3.1.9 Plots of 6 dB bandwidth

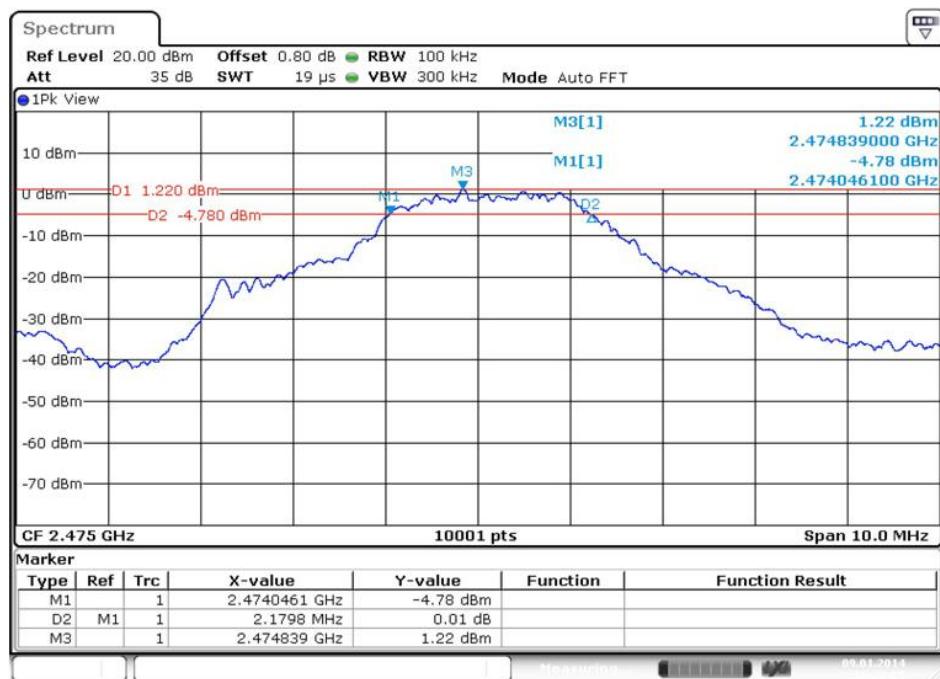
3.1.9.1 Low Channel



3.1.9.2 Middle Channel

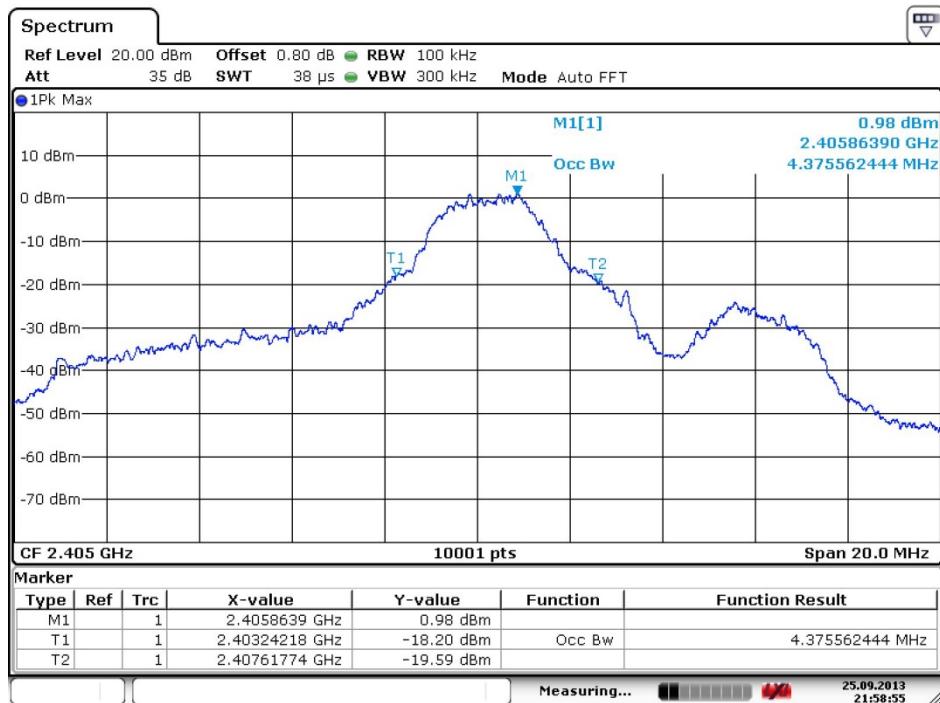


3.1.9.3 High Channel

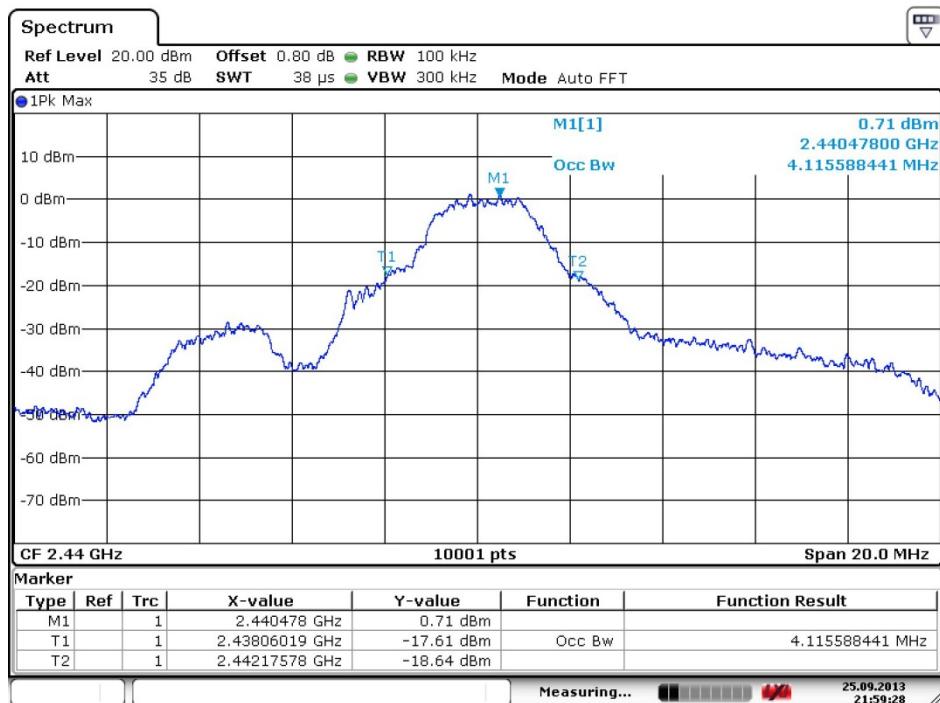


3.1.10 Plots of 99 % bandwidth

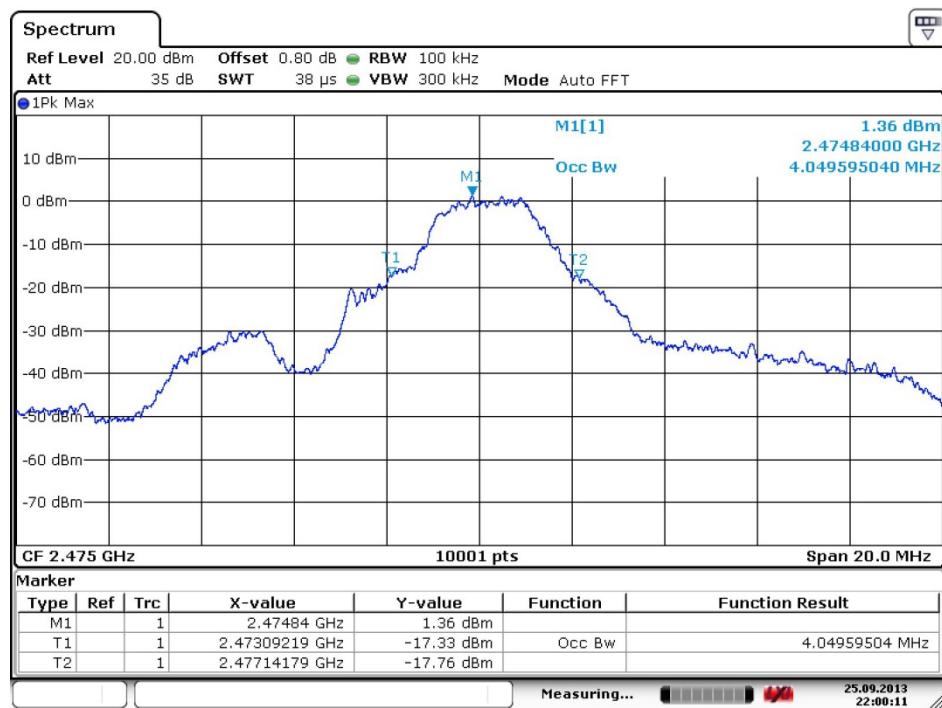
3.1.10.1 Low Channel



3.1.10.2 Middle Channel



3.1.10.3 High Channel



3.2 Maximum peak output power

3.2.1 Specification

- FCC Rules Part 15 Section 15.247(b)(1)
- IC RSS-210 A8.4

3.2.2 Measurement method

- 558074 D01 DTS Meas Guidance v03r01, Section 8.0

3.2.3 Set-up



3.2.4 Test equipment list

Equipment	Model name	Manufacturer
EUT	SMC HOME MIC	VisionScape
Spectrum analyzer	FSV30	Rohde & Schwarz
Power supply	E3633A	Agilent
Control PC	E655X-8FA	JOYONTECH
Test fixer	CC Debugger	TEXAS INSTRUMENTS

3.2.5 Test condition

- Test place : Test room
- Test environment : 19 °C, 35 % R.H.
- Test mode : Operation at single channel

3.2.6 Test result

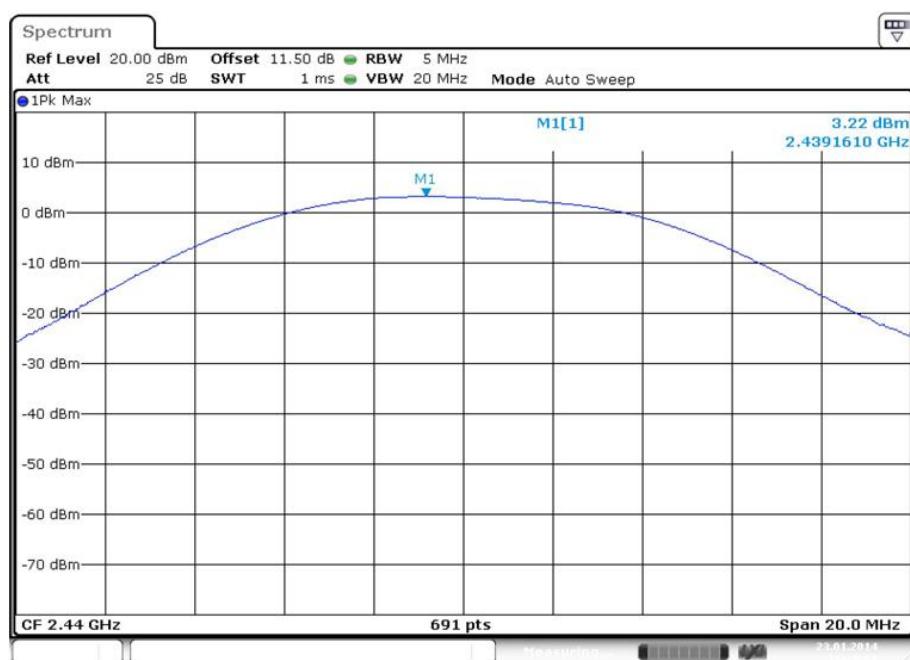
Frequency [MHz]	Peak Power		Average Power		Limit [dBm]
	Output Power [dBm]	Output Power [mW]	Output Power [dBm]	Output Power [mW]	
2 405	4.33	2.71	3.49	2.23	30.00
2 440	3.22	2.09	2.38	1.72	
2 475	3.54	2.25	3.18	2.07	

3.2.7 Plots of maximum peak output power

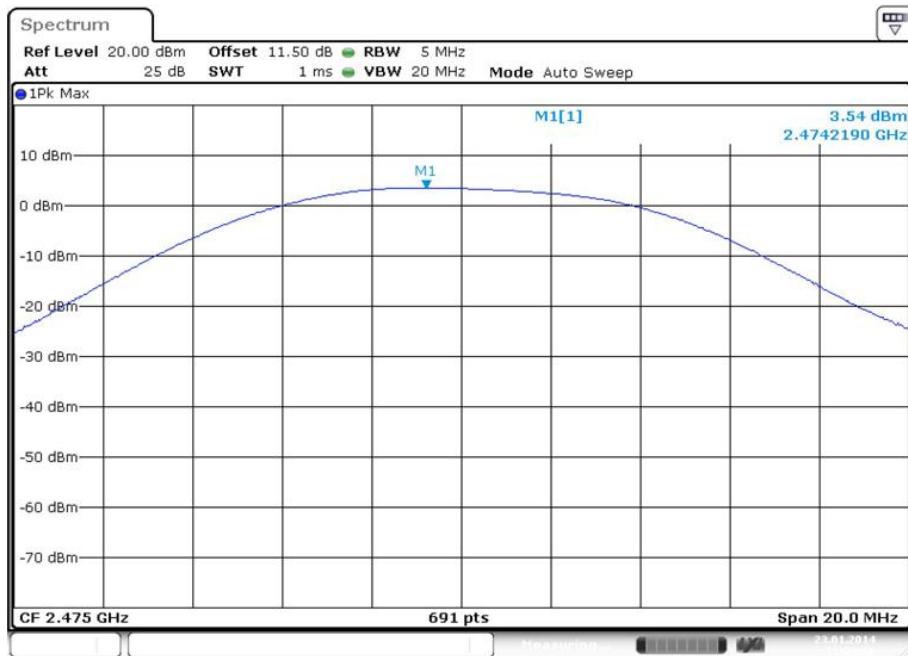
3.2.7.1 Low frequency



3.2.7.2 Middle Frequency

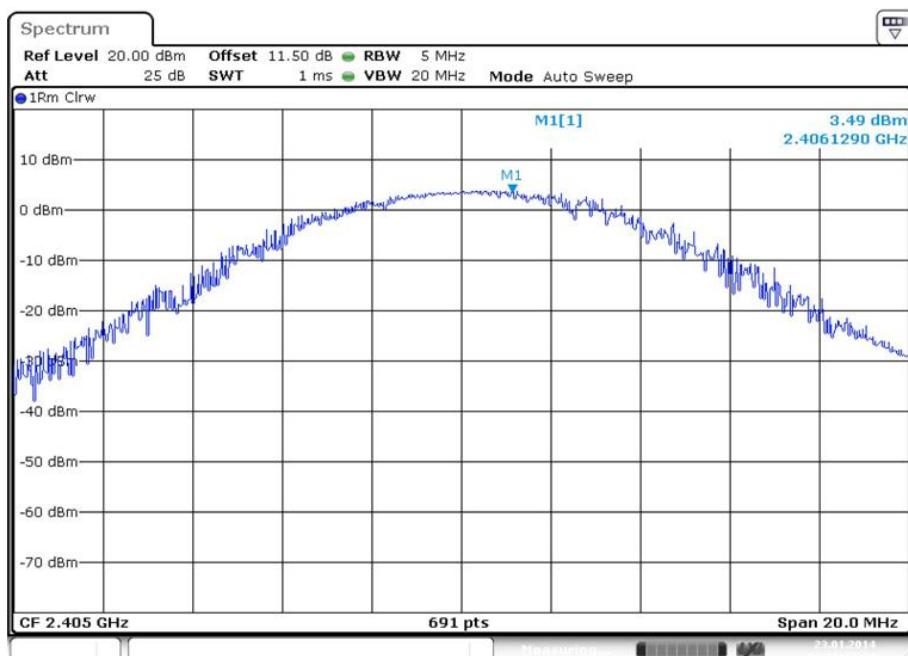


3.2.7.3 High Frequency

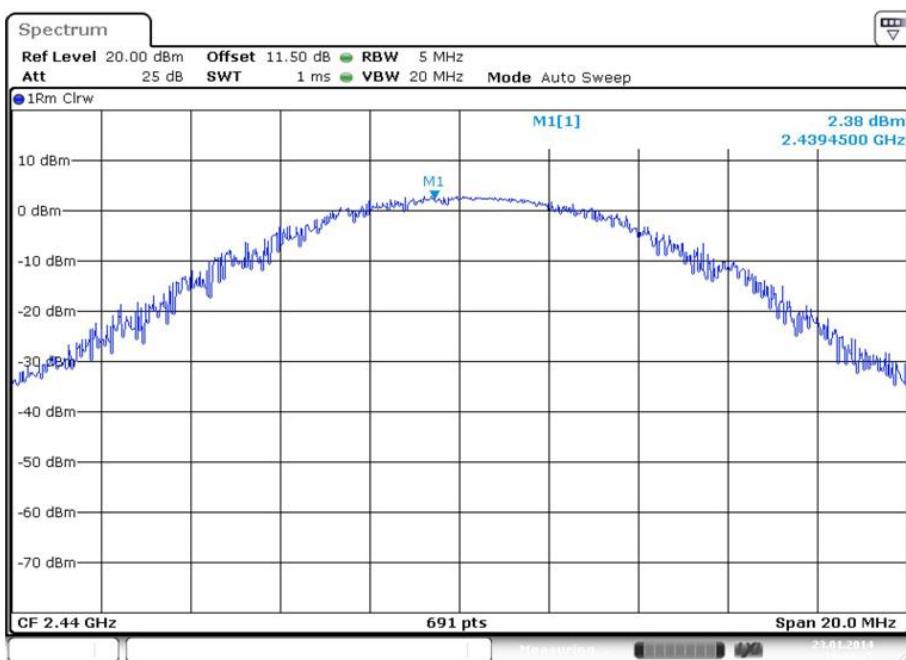


3.2.8 Plots of peak output power at Average power

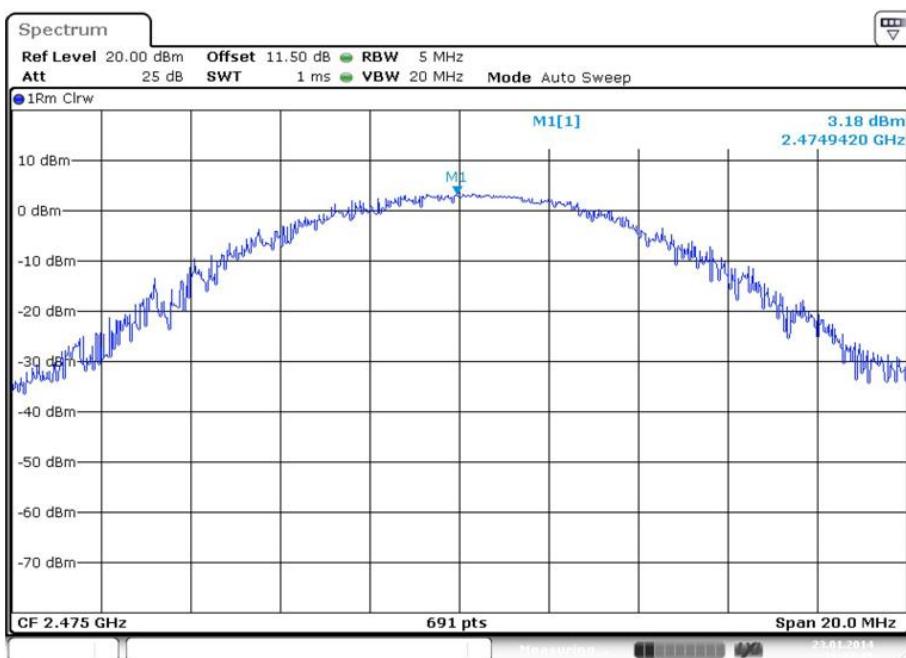
3.2.8.1 Low Frequency



3.2.8.2 Middle Frequency



3.2.8.3 High Frequency



3.3 Power spectral density

3.3.1 Specification

- FCC Rules Part 15 Section 15.247(e)
- IC RSS-210 A8.2(b)

3.3.2 Measurement method

- 558074 D01 DTS Meas Guidance v03r01, Section 9.0

3.3.3 Set-up



3.3.4 Test equipment list

Equipment	Model name	Manufacturer
EUT	SMC HOME MIC	VisionScape
Spectrum analyzer	FSV30	Rohde & Schwarz
Power supply	E3633A	Agilent
Control PC	E655X-8FA	JOYONTECH
Test fixer	CC Debugger	TEXAS INSTRUMENTS

3.3.5 Test condition

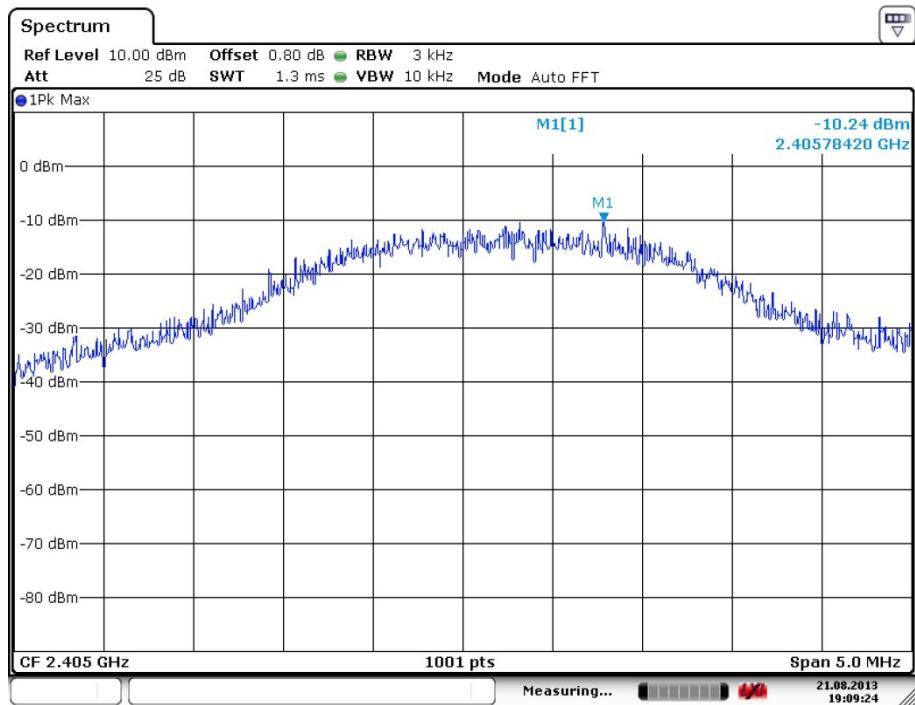
- Test place : Test room
- Test environment : 19 °C, 35 % R.H.
- Test mode : Operation at single channel

3.3.6 Test result

Channel number	Frequency [MHz]	Measured power density [dBm]	Limit [dBm]
Channel 0	2 405	-10.24	8.00
Channel	2 440	-9.72	
Channel 17	2 475	-9.91	

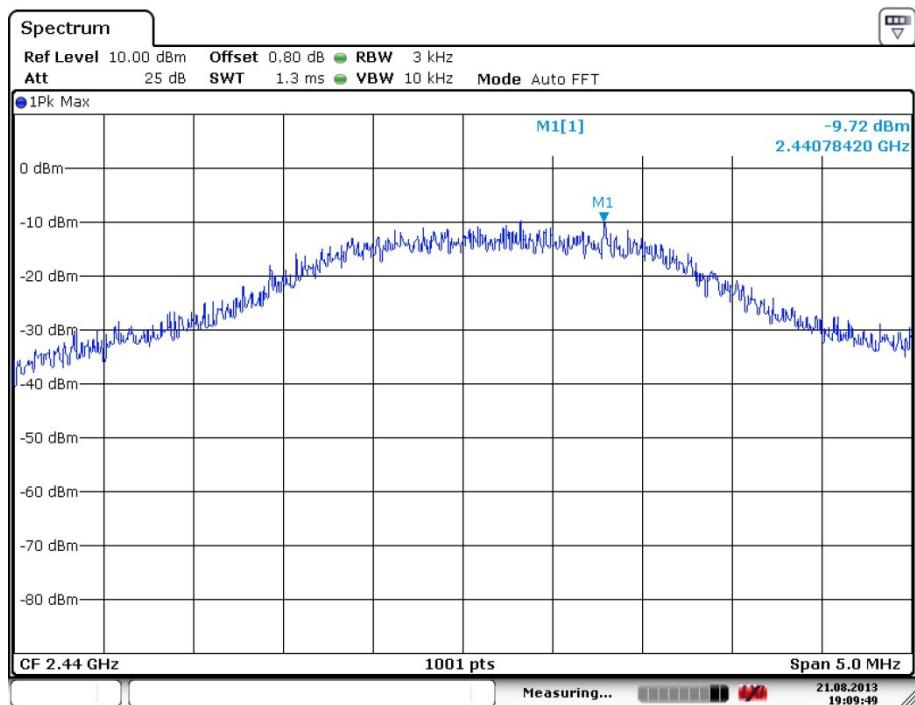
3.3.7 Plots of power spectral density

3.3.7.1 Low frequency



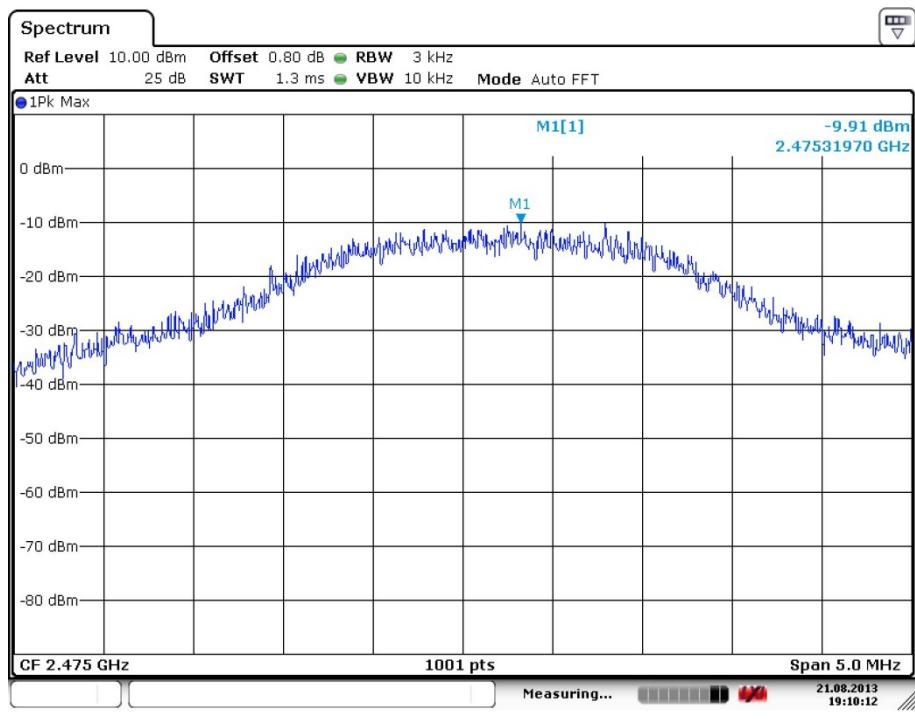
Date: 21.AUG.2013 19:09:25

3.3.7.2 Middle frequency



Date: 21.AUG.2013 19:09:49

3.3.7.3 High frequency



Date: 21.AUG.2013 19:10:12

3.4 Conducted band edges and spurious emission

3.4.1 Specification

- FCC Rules Part 15 Section 15.247(d)
- IC RSS-210 A8.5

3.4.2 Measurement method

- 558074 D01 DTS Meas Guidance v03r01, Section 10.0

3.4.3 Set-up



3.4.4 Test equipment list

Equipment	Model name	Manufacturer
EUT	SMC HOME MIC	VisionScape
Spectrum analyzer	FSV30	Rohde & Schwarz
Power supply	E3633A	Agilent
Control PC	E655X-8FA	JOYONTECH
Test fixer	CC Debugger	TEXAS INSTRUMENTS

3.4.5 Test condition

- Test place : Test room
- Test environment : 19 °C, 35 % R.H.
- Test mode : Operation at single channel

3.4.6 Test result at low frequency

Frequency [MHz]	Level [dBm]	Deviation [dBc]	Limit [dBc]	Margin [dB]
2 405	2.38	-	-	-
4 805	-26.45	24.07	20	4.07
29 925	-60.62	58.24	20	38.24

Calculation formula [Deviation = Level of fundamental frequency - Level of unwanted emission frequency]

3.4.7 Test result at middle frequency

Frequency [MHz]	Level [dBm]	Deviation [dBc]	Limit [dBc]	Margin [dB]
2 440	3.23	-	-	-
4 865	-27.77	24.54	20	4.54
7 320	-59.51	56.28	20	36.28

Calculation formula [Deviation = Level of fundamental frequency - Level of unwanted emission frequency]

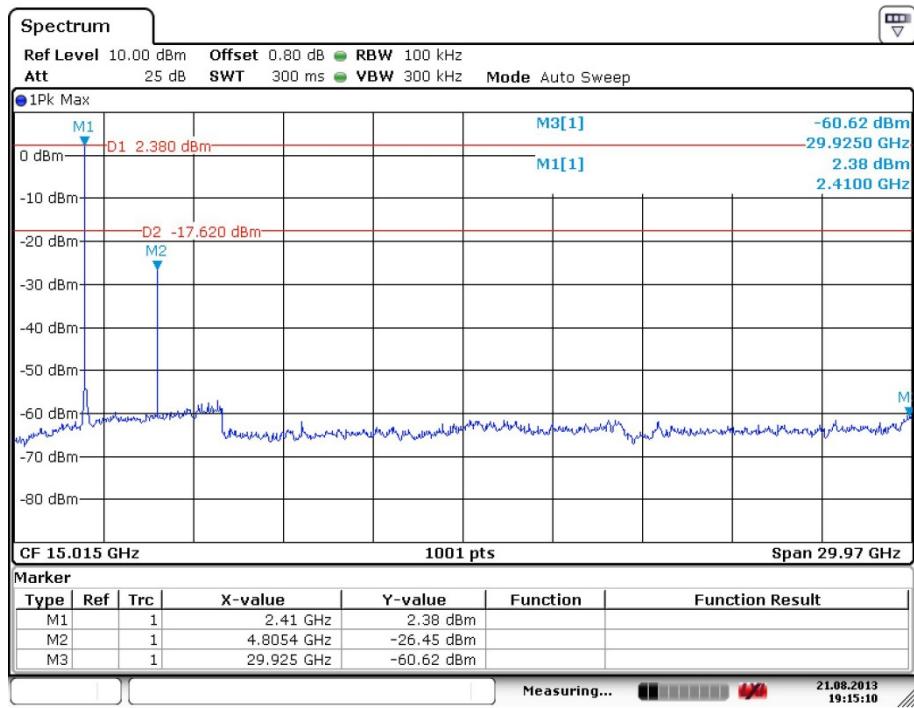
3.4.8 Test result at high frequency

Frequency [MHz]	Level [dBm]	Deviation [dBc]	Limit [dBc]	Margin [dB]
2 475	3.73	-	-	-
4 955	-29.21	25.48	20	5.48
7 410	-57.38	53.65	20	33.65

Calculation formula [Deviation = Level of fundamental frequency - Level of unwanted emission frequency]

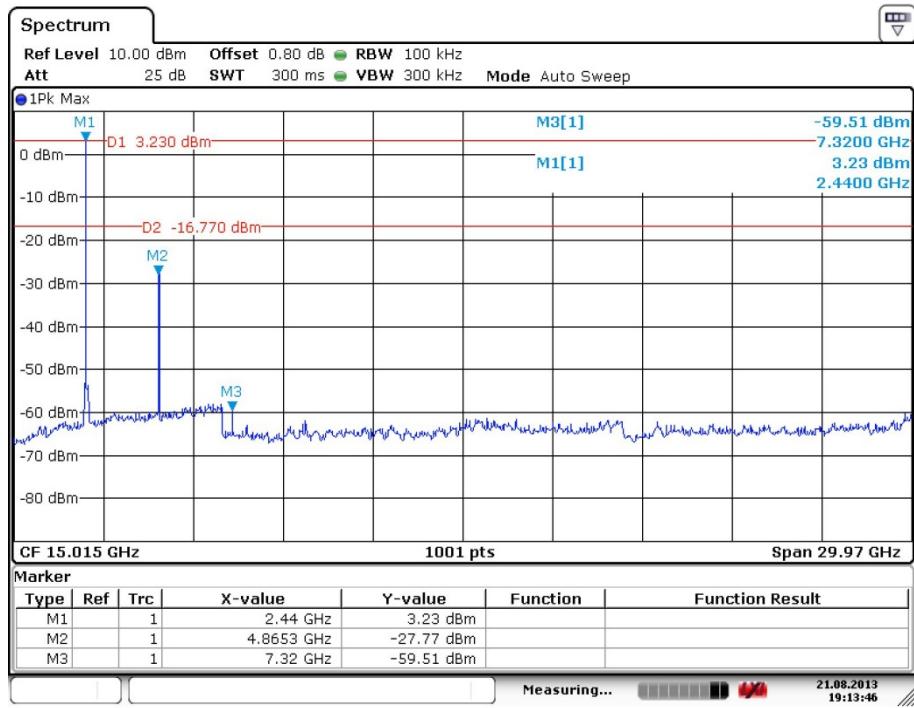
3.4.9 Plots of Unwanted Emission

3.4.9.1 Spurious Emission at Low Frequency



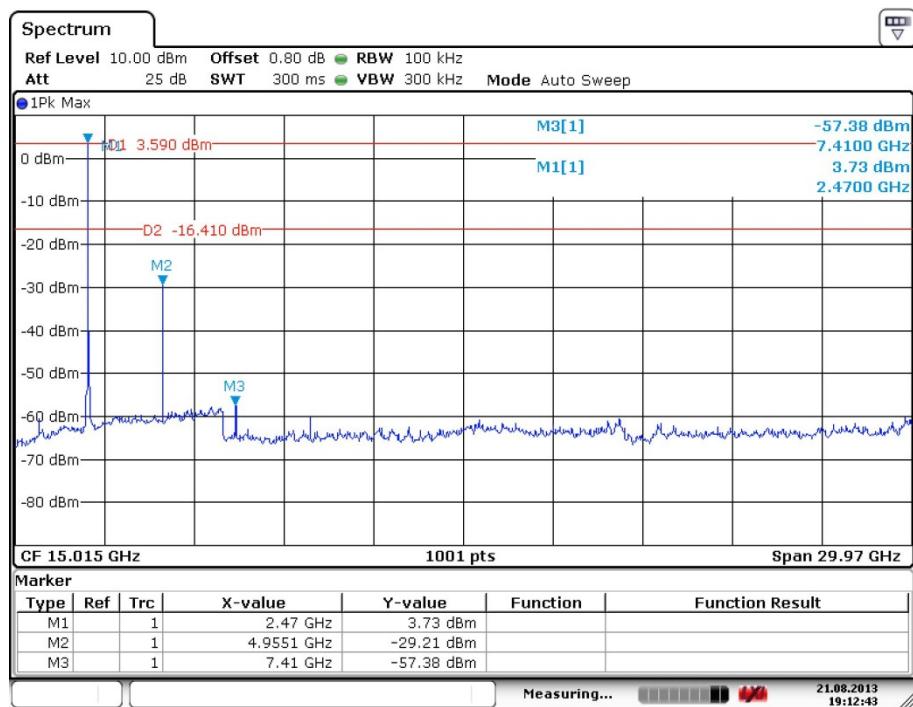
Date: 21.AUG.2013 19:15:11

3.4.9.2 Spurious Emission at Middle Frequency



Date: 21.AUG.2013 19:13:46

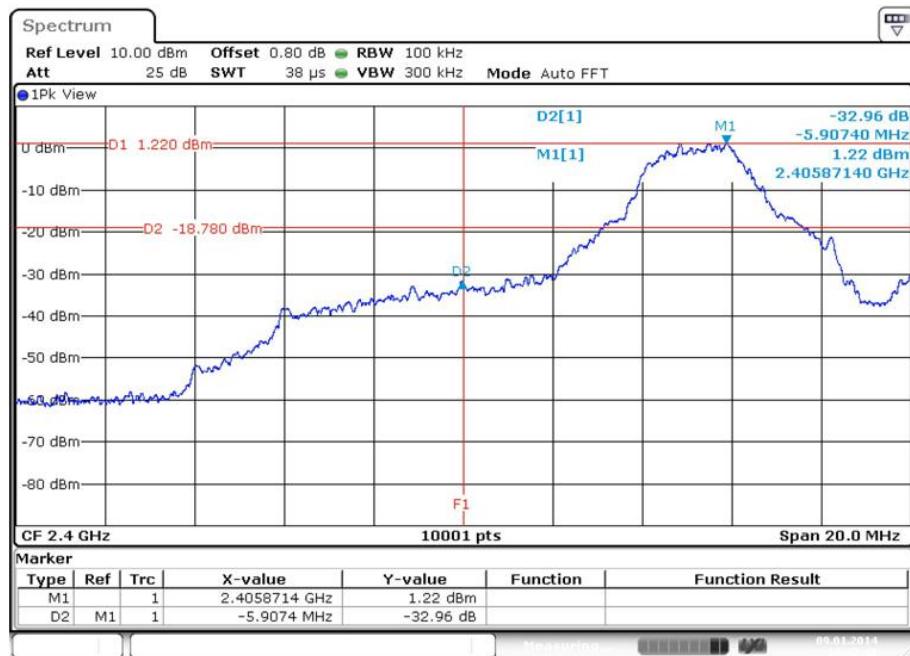
3.4.9.3 Spurious Emission at High Frequency



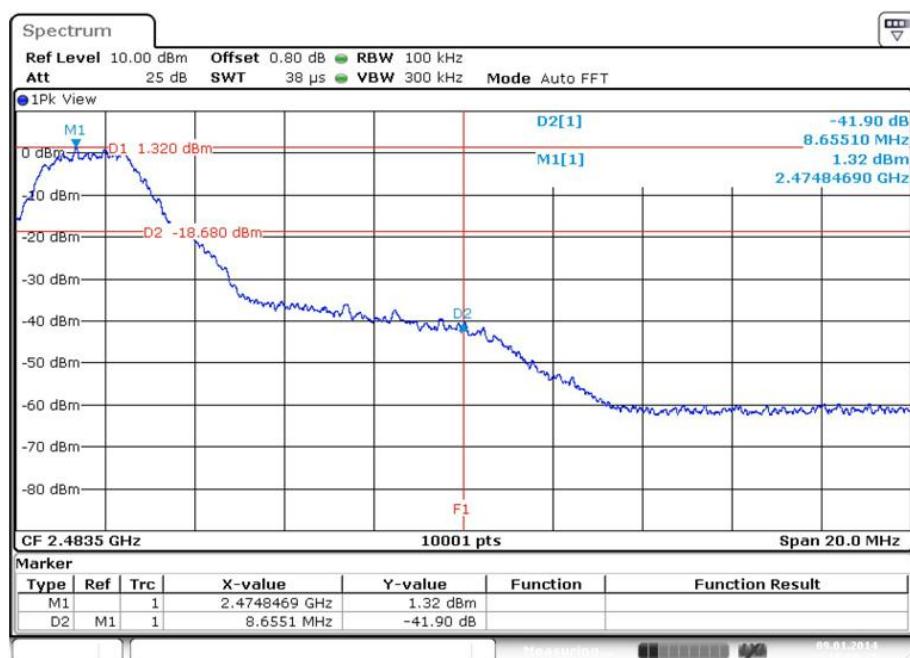
Date: 21.AUG.2013 19:12:43

3.4.10 Plots of Band Edge Emission

3.4.10.1 Band Edge Emission at Low Frequency



3.4.10.2 Band Edge Emission at High Frequency



3.5 Radiated Band Edges and Spurious Emission

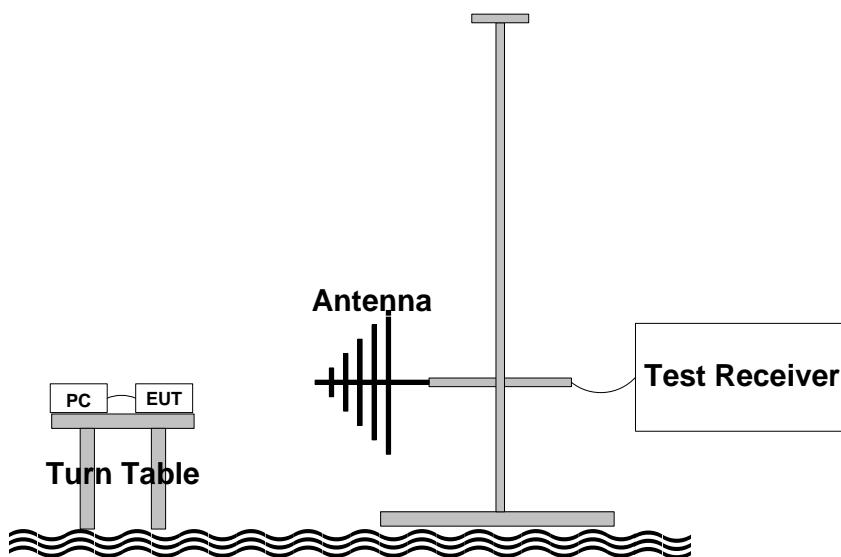
3.5.1 Specification

- FCC Rules Part 15 Section 15.247(d)
- IC RSS-210 Clause 2.6 (Transmitter)
- IC RSS-GEN Clause 6 (Receiver)

3.5.2 Measurement method

- 558074 D01 DTS Meas Guidance v03r01
- ANSI C63.4-2003 Section 7

3.5.3 Set-up



3.5.4 Test equipment list

Equipment	Model name	Manufacturer
EUT	SMC HOME MIC	VisionScape
Test Receiver	ESCI 7	Rohde & Schwarz
Power supply	E3633A	Agilent
Control PC	HP6560b	HP
Test fixer	RS232	WaveShare
Loop antenna	EMCO 6502	EMCO
Bi-conical antenna	VHA9103	Schwarzbeck
Log periodic antenna	VULP9118A	Schwarzbeck
Horn Antenna	BBHA-9120D	Schwarzbeck
Horn Antenna	FR6517	ORBIT

3.5.5 Test procedure

The EUT is placed on a turntable, which is 0.8 meter high above ground.

The turntable rotates 360 degrees to determine the position of the maximum emission level.

EUT is set 3.0 meters away from the receiving antenna, broadband antenna, which is mounted on an antenna mast. The antenna moved up and down between 1 meter and 4 meters to find out the maximum emission level from the EUT. Both horizontal and vertical polarizations of the antenna are set on measurement.

In order to find out the maximum emission levels, all of the EUT location were manipulated according to ANSI 63.4 during the radiated emission measurement. The EUT was tested to 3 orthogonal planes.

The RBW of test receiver is 120 kHz between 30 to 1 000 MHz, and 1 MHz above 1 GHz.

For measurement peak mode, VBW is set to 3 times of RBW.

For measurement average mode, VBW is set to 10 Hz.

3.5.6 Test condition

- Test place : Open area test site
- Test environment : 5 °C, 34 % R.H.
- Test mode : Operation at single channel

3.5.7

Frequency [MHz]	Field Strength [μ V/m]	Field Strength [dB μ V/m]	Measurement Distance [m]
0.009 – 0.490	2 400 / F(kHz)	48.52 to 13.80	300
0.490 – 1.705	2 4000 / F(kHz)	33.80 to 22.97	30
1.705 – 30.0	30	29.54	30
30 – 88	100	40.00	3
88 – 216	150	43.52	3
216 – 960	200	46.02	3
Above 960	500	53.98	3

§15.205 and RSS-210(2.7 Table 1) : Restrict Band of Operation : 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
1) 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	Above 38.6

1) Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.

3.5.8 Test result

3.5.8.1 Transmitter

Frequency [MHz]	Pol. [H/V]	Plane [X/Y/Z]	Detect mode [Peak/AVG]	Reading [dB μ V]	Antenna factor [dB/m]	Cable loss [dB]	Pre-amp gain [dB]	Emission level [dB μ V]	Limit [dB μ V]	Margin [dB]
Operation Channel 1										
*2 336	V	Y	Peak	23.26	27.1	6.5	0	56.86	74.0	17.14
			Average	15.15	27.1	6.5	0	48.75	54.0	5.25
2 405	V	Y	Peak	41.77	27.3	6.7	0	75.77	-	-
			Average	30.92	27.3	6.7	0	64.92	-	-
*4 804	V	Y	Peak	17.65	31.3	9.9	0	58.85	74.0	15.15
			Average	3.89	31.3	9.9	0	45.09	54.0	8.91
Operation Channel 9										
2 440	V	Y	Peak	40.66	27.4	6.7	0	74.76	-	-
			Average	30.48	27.4	6.7	0	64.58	-	-
*4 880	V	Y	Peak	17.09	31.5	10.0	0	58.59	74.0	15.41
			Average	4.97	31.5	10.0	0	46.47	54.0	7.53
Operation Channel 18										
2 475	V	Y	Peak	39.86	27.5	6.8	0	74.16	-	-
			Average	30.95	27.5	6.8	0	65.25	-	-
*2 496	V	Y	Peak	24.76	27.9	7.0	0	59.66	74.0	14.34
			Average	12.38	27.9	7.0	0	47.28	54.0	6.72
*4 960	V	Y	Peak	15.61	31.7	10.1	0	57.41	74.0	16.59
			Average	5.13	31.7	10.1	0	46.93	54.0	7.07
The other emissions were not detected.										

Here, * is restricted frequency.

3.5.8.2 Receiver

Frequency [MHz]	Pol. [H/V]	Plane [X/Y/Z]	Detect mode [Peak/AVG]	Reading [dB μ V]	Antenna factor [dB/m]	Cable loss [dB]	Pre-amp gain [dB]	Emission level [dB μ V]	Limit [dB μ V]	Margin [dB]
No Receiver Emissions within 6 dB of limit										

4. RF Exposure Compliance Requirement

According to KDB447498 D01 General RF Exposure Guidance v05r01

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances \leq 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where}$

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is \leq 50 mm and for transmission frequencies between 100 MHz and 6 GHz.

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Channel Number	Frequency [MHz]	Max. Average Power [dBm]	Max. Average Power [mW]	Separation distance [mm]	1-g SAR value	Test exclusion thresholds
0	2 405	4.0	2.5	5	0.77	3.0
8	2 440	4.0	2.5	5	0.78	3.0
17	2 475	4.0	2.5	5	0.78	3.0

Result:

SAR is not required.

5. Test equipment list

The listing below denotes the test equipment for the test(s).

No.	Equipment	Model	Manufacturer	Serial Number	Calibration Due date
1	Spectrum analyzer	FSV	Rohde & Schwarz	101673	02/04/14
2	Test receiver	ESCI 7	Rohde & Schwarz	1166.5950.07	01/30/14
3	Power supply	E3633A	Agilent	SG40002272	01/28/14
4	Loop antenna	6502	EMCO	9609-9087	03/03/14
5	Biconical antenna	VHA9103	Schwarzbeck	2217	11/23/13
6	Log-Periodic antenna	VULP9118A	Schwarzbeck	382	11/23/13
7	Horn antenna	BBHA 9120 D	Schwarzbeck	395	08/07/14
8	Horn antenna	FR6517	ORBIT	0511106	08/07/14
9	Turn table	N/A	Daeil EMC	N/A	N/A
10	Antenna mast	EAM4.5	Daeil EMC	N/A	N/A
11	Controller	DE200	Daeil EMC	AAA69813111	N/A