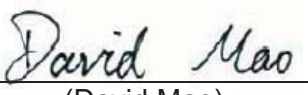
FCC Radio Test Report

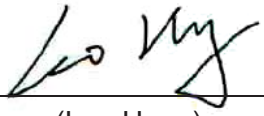
FCC ID: FSUGKZHH

This report concerns (check one): ■ **Original Grant** □ **Class II Change**

Project No.	:	1407C024A
Equipment	:	2.4GHz Wireless Keyboard and Mouse Combo
Model Name	:	GK-140001/K
Applicant	:	KYE SYSTEMS CORP.
Address	:	No.492, Sec.5, Chongxin Rd, Sanchong Dist, New Taipei City 24160, Taiwan(R.O.C)

Tested by: BTL Inc. EMC Laboratory
Date of Receipt: Jul. 01, 2014
Date of Test: Jul. 01, 2014~ Jul. 10, 2014
Issued Date: Jul. 11, 2014

Testing Engineer : 
(David Mao)

Technical Manager : 
(Leo Hung)

Authorized Signatory : 
(Steven Lu)

BTL INC.
No.3, Jinshagang 1st Road, Shixia,
Dalang Town, Dongguan, China.
TEL: 0769-8318-3000 FAX: 0769-8319-6000

Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with the standards traceable to National Measurement Laboratory (**NML**) of **CHINA**, or National Institute of Standards and Technology (**NIST**) of **U.S.A.**

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Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
NEI-FCCP-1-1407C024A	Original Issue.	Jul. 11, 2014

1. CERTIFICATION

Equipment	:	2.4GHz Wireless Keyboard and Mouse Combo
Brand Name	:	Genius
Model Name	:	GK-140001/K
Applicant		KYE SYSTEMS CORP
Manufacturer	:	SHENZHEN SENBIZ INDUSTRY CO.,LTD
Address	:	Building 11-12,XinQiao XinFa Industrial Zone, Shajing town, Bao An district, Shenzhen Guangdong,China
Factory	:	SHENZHEN SENBIZ INDUSTRY CO.,LTD
Address	:	Building A, No.11,First row,Xinfa Industrial Zone, XinQiao,Shajing Town,Bao'an District,Shenzhen,Guangdong,China
Date of Test	:	Jul. 01, 2014 ~Jul. 10, 2014
Test Item	:	ENGINEERING SAMPLE
Standard(s)	:	FCC Part15, Subpart C : 2013 (15.247) / ANSI C63.4 : 2009 / FCC Public Notice DA 00-705, March 30, 2000. Canada RSS-210: 2010 RSS-GEN Issue 3, Dec 2010

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc. EMC Laboratory.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. NEI-FCCP-1-1407C024A) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).
Note: This report only records the test datas of model: GK-140001/K, keyboard sample.

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

Applied Standard(s): 47 CFR Part 15, Subpart C: 2013;			
Standard(s) Section **FCC**	Test Item	Judgment	Remark
15.207	Conducted Emission	N/A	
15.247(d)	Antenna conducted Spurious Emission	PASS	
15.247 (a)(1)	Hopping Channel Separation	PASS	
15.247 (b)(1)	Peak Output Power	PASS	
15.247(d) 15.209	Radiated Spurious Emission	PASS	
15.247 (a)(1)(iii)	Number of Hopping Frequency	PASS	
15.247 (a)(1)(iii)	Dwell Time	PASS	
15.205	Restricted Bands	PASS	
15.203	Antenna Requirement	PASS	

Note:

(1)" N/A" denotes test is not applicable in this test report

(2) According to FCC Public Notice DA 00-705, March 30, 2000.

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is **DG-C02/DG-CB03** at the location of No.3,Jinshagang 1st Road, Shixia, Dalang Town, Dong Guan, China.523792
BTL's test firm number for FCC: 319330
BTL's test firm number for IC: 4428B-1

2.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

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

A. Conducted Measurement :

Test Site	Method	Measurement Frequency Range	U，(dB)	Note
DG-C02	CISPR	150 KHz ~ 30MHz	1.94	

B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	Ant. H / V	U，(dB)	Note
DG-CB03	CISPR	9KHz~30MHz	V	3.79	
		9KHz~0MHz	H	3.57	
		30MHz ~ 200MHz	V	3.82	
		30MHz ~ 200MHz	H	3.60	
		200MHz ~ 1,000MHz	V	3.86	
		200MHz ~ 1,000MHz	H	3.94	
		1GHz~18GHz	V	3.12	
		1GHz~18GHz	H	3.68	
		18GHz~40GHz	V	4.15	
		18GHz~40GHz	H	4.14	

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	2.4GHz Wireless Keyboard and Mouse Combo	
Brand Name	Genius	
Model Name	GK-140001/K	
Model Difference	N/A	
Output Power (Max.)	Operation Frequency	2402~2480 MHz
	Modulation Technology	DFSK
	Bit Rate of Transmitter	1Mbps
	Output Power Max.	-8.75 dBm
Power Source	Supplier from 2*AAA battery	
Power Rating	DC 3V	
Connecting I/O Port(s)	Please refer to the User's Manual	

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)
01	2402	19	2430	37	2458
02	2403	20	2430	38	2461
03	2404	21	2431	39	2462
04	2405	22	2433	40	2465
05	2407	23	2434	41	2466
06	2409	24	2435	42	2467
07	2410	25	2437	43	2468
08	2411	26	2438	44	2469
09	2413	27	2439	45	2470
10	2414	28	2441	46	2471
11	2415	29	2443	47	2473
12	2418	30	2447	48	2475
13	2421	31	2449	49	2476
14	2422	32	2450	50	2476
15	2425	33	2451	51	2477
16	2426	34	2453	52	2478
17	2427	35	2454	53	2479
18	2429	36	2455	54	2480

3 Table for Filed Antenna

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Ant.	Manufacturer	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	printed	N/A	0

3.2 DESCRIPTION OF TEST MODES

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

Pretest Mode	Description
Mode 1	TX Mode **Note (1)**

For Radiated Emission	
Final Test Mode	Description
Mode 1	TX Mode **Note (1)**

The EUT system operated these modes were found to be the worst case during the pre-scanning test as following:

Note:

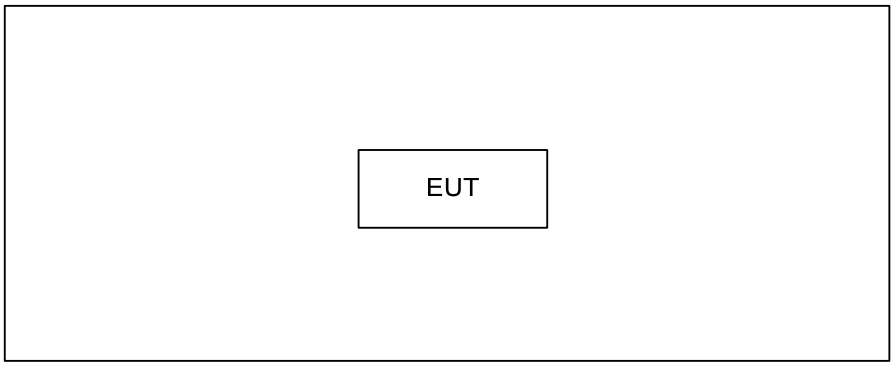
(1) The measurements are performed at the high, middle, low available channels.
new battery is used during all test

3.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

During testing, channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS

Test software version	Bluetest		
Frequency	2402 MHz	2441 MHz	2480 MHz
Parameters-1Mbps	N/A	N/A	N/A

3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.5 DESCRIPTION OF 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.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID/IC	Series No.	Note
-	-	-	-	-	-	

Item	Shielded Type	Ferrite Core	Length	Note
-	-	-	-	

4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

Frequency (MHz)	Class A (dBuV)		Class B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	73.00	60.00	56.00	46.00	CISPR
5.0 -30.0	73.00	60.00	60.00	50.00	CISPR
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	73.00	60.00	56.00	46.00	FCC
5.0 -30.0	73.00	60.00	60.00	50.00	FCC

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

4.1.2 TEST 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 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.

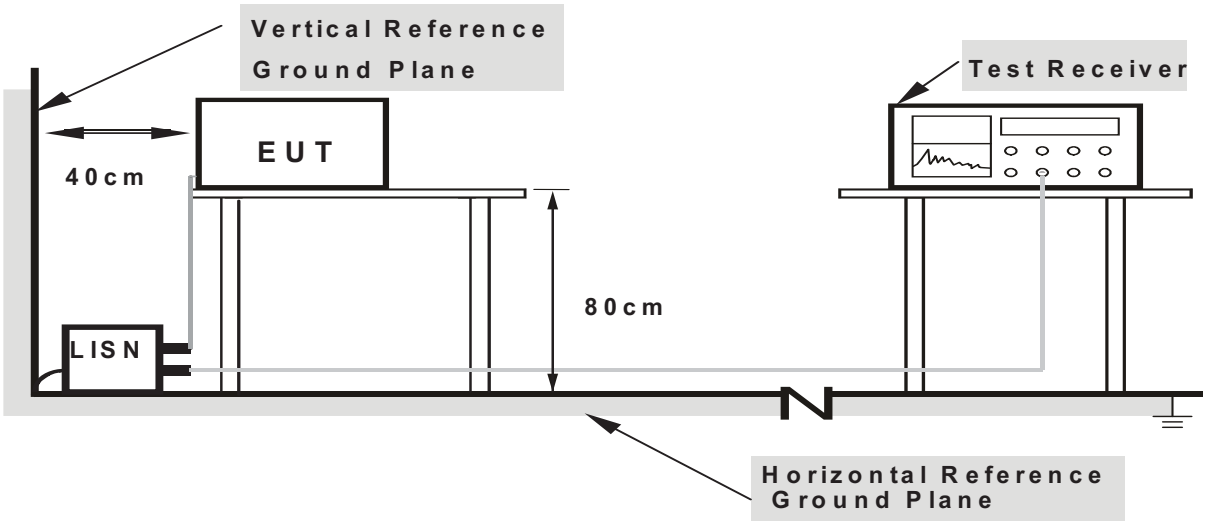
d. LISN at least 80 cm from nearest part of EUT chassis.

e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.1.3 DEVIATION FROM TEST STANDARD

No deviation

4.1.4 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

4.1.5 EUT 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 continuously transmitting/receiving data or hopping on mode.

4.1.6 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: DC 3V

4.1.7 TEST RESULTS

Please refer to the Attachment A.

Remark:

(1) All readings are QP Mode value unless otherwise stated AVG in column of『Note』. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform in this case, a "*" marked in AVG Mode column of Interference Voltage Measured.

(2) Measuring frequency range from 150KHz to 30MHz.

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 RADIATED EMISSION LIMITS (Frequency Range 9KHz -1000MHz)

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

Frequency (MHz)	Field Strength (microvolts/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

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

Frequency (MHz)	dB(uV/m) (at 3 meters)	
	Peak	Average
Above 1000	74	54

Notes:

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

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

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

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

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

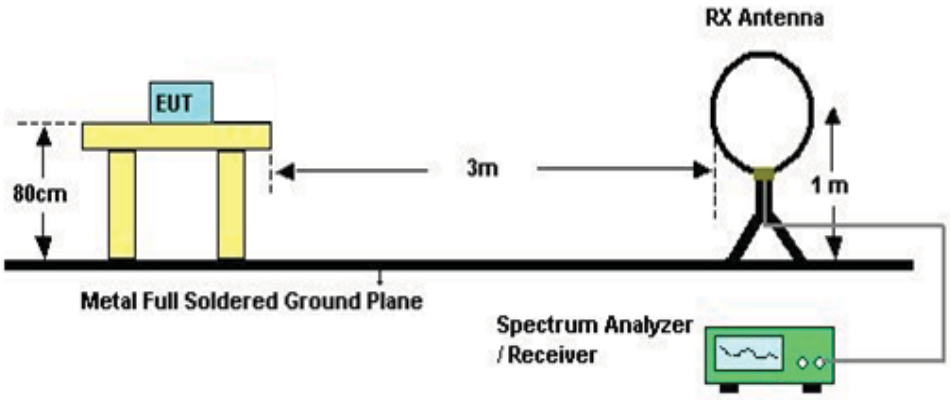
4.2.2 TEST PROCEDURE

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
c. The height of the equipment or of the substitution antenna shall be 0.8 m; 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. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.2.3 DEVIATION FROM TEST STANDARD

No deviation

(C) For radiated emissions below 30MHz



4.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **4.1.5** Unless otherwise a special operating condition is specified in the follows during the testing

4.2.6 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: DC 3V

4.2.7 TEST RESULTS (9KHZ TO 30MHZ)

Please refer to the Attachment B

Remark:

(1) The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.
(2) Distance extrapolation factor = 40 log (specific distance / test distance) (dB).
(3) Limit line = specific limits (dBuV) + distance extrapolation factor.

4.2.8 TEST RESULTS (BETWEEN 30MHZ TO 1000 MHZ)

Please refer to the Attachment C.

Remark:

(1) Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode or Peak Mode with Detector BW=120KHz；SPA setting in RBW=120KHz, VBW =120KHz, Swp. Time = 0.3 sec./MHz.
(2) 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.
(3) Measuring frequency range from 30MHz to 1000MHz.
(4) If the peak scan value lower limit more than 20dB, then this signal data does not show in table.

4.2.9 TEST RESULTS (ABOVE 1000 MHZ)

Please refer to the Attachment D.

Remark:

(1) 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.
(2) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode of the emission
(3) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
(4) EUT Orthogonal Axis:
”X” - denotes Laid on Table；”Y” - denotes Vertical Stand；”Z” - denotes Side Stand
(5) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna

5. NUMBER OF HOPPING CHANNEL

5.1 APPLIED PROCEDURES

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Frequency Range (MHz)	Result
15.247(a)(1)(iii)	Number of Hopping Channel	2400-2483.5	PASS

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

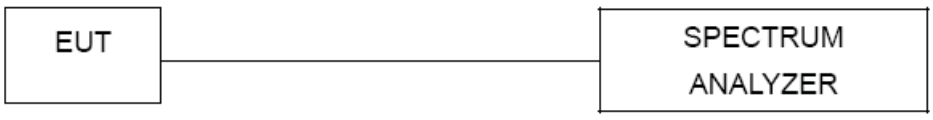
5.1.1 TEST PROCEDURE

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=100KHz, VBW=100KHz, Sweep time = Auto.

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP



5.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 Unless otherwise a special operating condition is specified in the follows during the testing.

5.1.5 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: DC 3V

5.1.6 TEST RESULTS

Please refer to the Attachment E

6. AVERAGE TIME OF OCCUPANCY

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(1)(iii)	Average Time of Occupancy	0.4sec	2400-2483.5	PASS

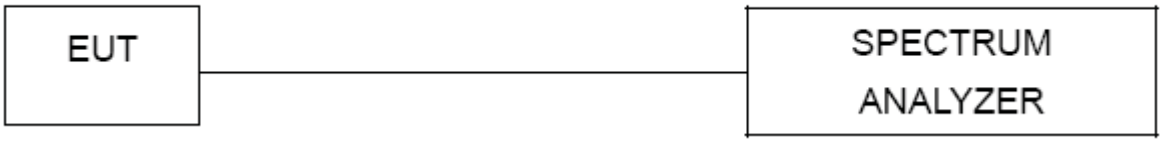
6.1.1 TEST PROCEDURE

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 enable triggering 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 packet transmitting.
h. Measure the maximum time duration of one single pulse.
i. Dwell time = [spreading rate/16] x duty-cycle x 0.4 seconds

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP



6.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 Unless otherwise a special operating condition is specified in the follows during the testing.

6.1.5 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: DC 3V

6.1.6 TEST RESULTS

Please refer to the Attachment F

7. HOPPING CHANNEL SEPARATION MEASUREMENT

7.1 APPLIED PROCEDURES / LIMIT

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.

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

7.1.1 TEST PROCEDURE

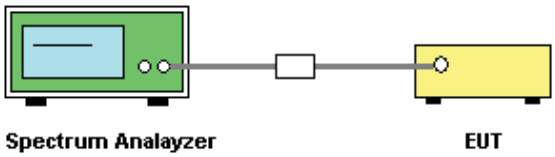
a. The EUT must have its hopping function enabled

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

7.1.2 DEVIATION FROM STANDARD

No deviation.

7.1.3 TEST SETUP



7.1.4 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: DC 3V

7.1.5 TEST RESULTS

Please refer to the Attachment G

8. BANDWIDTH TEST

8.1 APPLIED PROCEDURES

FCC Part15 (15.247) , Subpart C		
Section	Test Item	Frequency Range (MHz)
15.247(a)(2)	Bandwidth	2400-2483.5

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RBW	30 KHz (20dB Bandwidth) / 30 KHz (Channel Separation)
VBW	100 KHz (20dB Bandwidth) / 100 KHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

8.1.1 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=100KHz, Sweep Time = Auto.

8.1.2 DEVIATION FROM STANDARD

No deviation.

8.1.3 TEST SETUP

8.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 Unless otherwise a special operating condition is specified in the follows during the testing.

8.1.5 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: DC 3V

8.1.6 TEST RESULTS

Please refer to the Attachment H

9. PEAK OUTPUT POWER TEST

9.1 APPLIED PROCEDURES / LIMIT

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

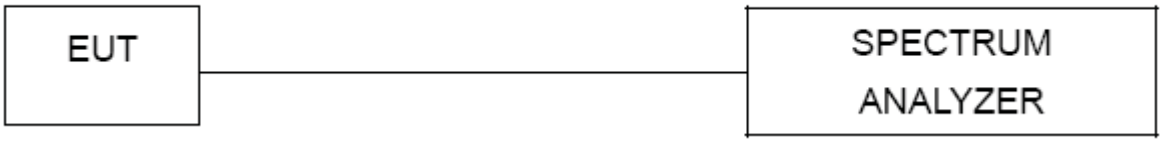
9.1.1 TEST PROCEDURE

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= 1MHz/3MHz, VBW= 1MHz/3MHz, Sweep time = Auto.

9.1.2 DEVIATION FROM STANDARD

No deviation.

9.1.3 TEST SETUP



9.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 Unless otherwise a special operating condition is specified in the follows during the testing.

9.1.5 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: DC 3V

9.1.6 TEST RESULTS

Please refer to the Attachment I

10. ANTENNA CONDUCTED SPURIOUS EMISSION

10.1 APPLIED PROCEDURES / LIMIT

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 measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

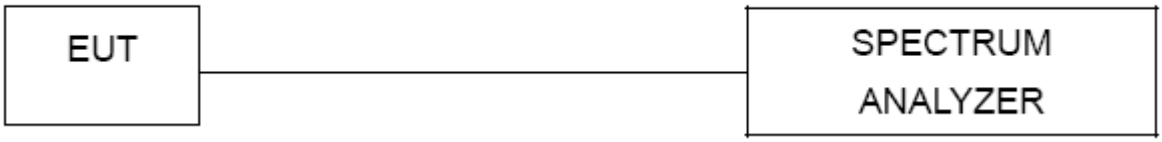
10.1.1 TEST PROCEDURE

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= 100KHz, VBW=100KHz, Sweep time = Auto.

10.1.2 DEVIATION FROM STANDARD

No deviation.

10.1.3 TEST SETUP



10.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 Unless otherwise a special operating condition is specified in the follows during the testing.

10.1.5 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: DC 3V

10.1.6 TEST RESULTS

Please refer to the Attachment J

Remark :Hopping on and hopping off mode all have been tested ,hopping off mode is worse case ,and only worse case is reported shown in Attachement J.

11. MEASUREMENT INSTRUMENTS LIST

Conducted Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	LISN	EMCO	3816/2	00052765	Mar. 29, 2015
2	LISN	R&S	ENV216	101447	Mar. 29, 2015
3	Test Cable	N/A	C_17	N/A	Mar. 14, 2015
4	EMI TEST RECEIVER	R&S	ESCS30	833364/017	Mar. 29, 2015
5	50Ω Terminator	SHX	TF2-3G-A	08122902	Mar. 29, 2015

Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarbeck	VULB9160	9160-3232	Mar. 29, 2015
2	Amplifier	HP	8447D	2944A09673	Mar. 29, 2015
3	Test Receiver	R&S	ESCI	100382	Mar. 29, 2015
4	Test Cable	N/A	C-01_CB03	N/A	Jul. 01, 2015
5	Antenna	ETS	3115	00075789	Mar. 29, 2015
6	Amplifier	Agilent	8449B	3008A02274	Mar. 29, 2015
7	Spectrum	Agilent	E4408B	US39240143	Nov. 09, 2014
8	Test Cable	HUBER+SUHNER	C-45	N/A	Apr. 29, 2015
9	Controller	CT	SC100	N/A	N/A
10	Horn Antenna	EMCO	3115	9605-4803	Mar. 29, 2015
11	Active Loop Antenna	R&S	HFH2-Z2	830749/020	Mar. 29, 2015

Number of Hopping Channel					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov. 11, 2014

Average Time of Occupancy					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov. 11, 2014

Hopping Channel Separation Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov. 11, 2014

Bandwidth					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov. 11, 2014

Peak Output Power					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov. 11, 2014

Antenna Conducted Spurious Emission					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov. 11, 2014

Remark: “N/A” denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

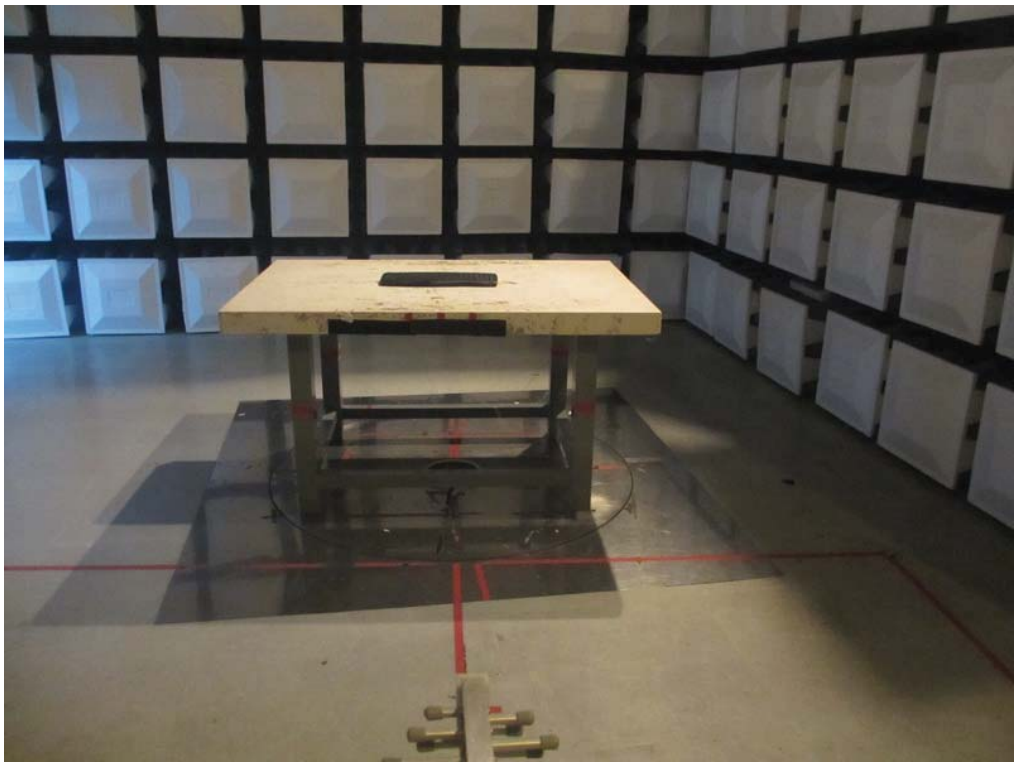
12. EUT TEST PHOTO

Radiated Measurement Photos

9KHz to 30MHz

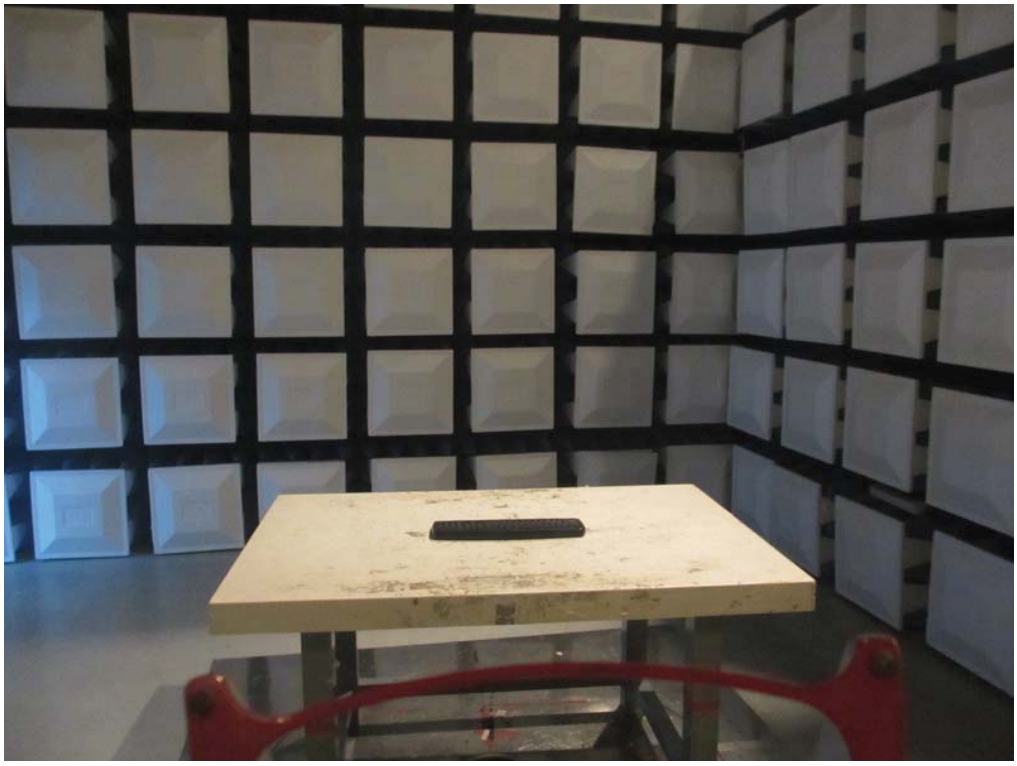
Radiated Measurement Photos

30MHz to 1000MHz



Radiated Measurement Photos

Above 1000MHz



ATTACHMENT A - CONDUCTED EMISSION

Test Mode: N/A

Note: “N/A” denotes test is not applicable to this device.

ATTACHMENT B - RADIATED EMISSION (9KHZ-30MHZ)

Remark :Test at hopping off mode

Test Mode:	TX Mode

Freq. (MHz)	Ant. 0°/90°	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits(QP) (dBuV/m)	Margin (dB)	Note
0.0196	0°	73.65	24.33	97.98	101.76	-3.78	AVG
0.0196	0°	81.56	24.33	105.89	121.76	-15.87	PEAK
0.0252	0°	54.78	23.97	78.75	99.58	-20.83	AVG
0.0252	0°	60.35	23.97	84.32	119.58	-35.26	PEAK
0.0358	0°	57.75	23.30	81.05	96.53	-15.48	AVG
0.0358	0°	62.85	23.30	86.15	116.53	-30.38	PEAK
0.0467	0°	57.35	22.61	79.96	94.22	-14.26	AVG
0.0467	0°	62.75	22.61	85.36	114.22	-28.86	PEAK
0.4975	0°	19.85	19.81	39.66	73.67	-34.01	QP
1.7176	0°	18.53	19.53	38.06	69.54	-31.48	QP

Freq. (MHz)	Ant. 0°/90°	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits(QP) (dBuV/m)	Margin (dB)	Note
0.0167	90°	68.55	24.30	92.85	123.15	-30.30	AVG
0.0167	90°	76.16	24.30	100.46	143.15	-42.69	PEAK
0.0275	90°	55.48	23.83	79.31	118.82	-39.51	AVG
0.0275	90°	64.35	23.83	88.18	138.82	-50.64	PEAK
0.0352	90°	52.85	23.34	76.19	116.67	-40.49	AVG
0.0352	90°	58.15	23.34	81.49	136.67	-55.19	PEAK
0.0429	90°	60.75	22.85	83.60	114.96	-31.36	AVG
0.0429	90°	67.35	22.85	90.20	134.96	-44.76	PEAK
0.4932	90°	17.15	19.82	36.97	73.74	-36.78	QP
1.7146	90°	18.92	19.53	38.45	69.54	-31.09	QP

ATTACHMENT C - RADIATED EMISSION (30MHZ TO 1000MHZ)

Remark :Test at hopping off mode

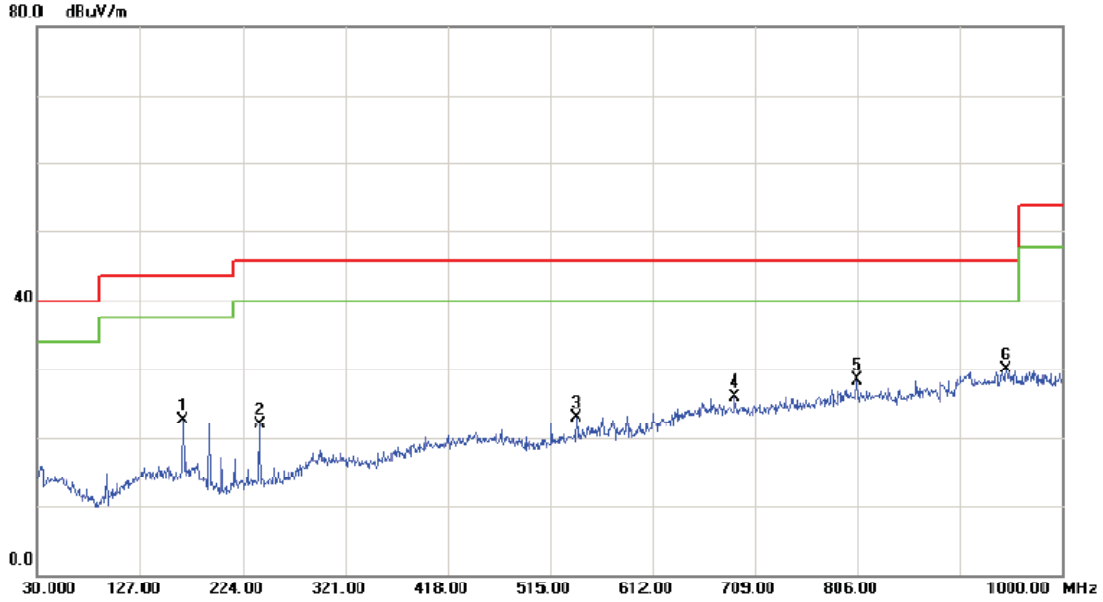
Test Mode:	TX 2402MHz _CH01

Vertical

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		131.8500	29.12	-13.24	15.88	43.50	-27.62	peak	
2		294.8100	28.62	-11.14	17.48	46.00	-28.52	peak	
3		430.6100	30.08	-9.06	21.02	46.00	-24.98	peak	
4		644.9800	29.98	-5.48	24.50	46.00	-21.50	peak	
5		792.4200	29.89	-3.18	26.71	46.00	-19.29	peak	
6	*	951.5000	30.24	-0.30	29.94	46.00	-16.06	peak	

Test Mode:	TX 2402MHz _CH01

Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		167.7400	35.42	-13.01	22.41	43.50	-21.09	peak	
2		239.5200	35.98	-14.06	21.92	46.00	-24.08	peak	
3		540.2200	31.39	-8.58	22.81	46.00	-23.19	peak	
4		690.5700	30.88	-5.00	25.88	46.00	-20.12	peak	
5		805.0300	31.16	-2.94	28.22	46.00	-17.78	peak	
6	*	945.6800	30.35	-0.42	29.93	46.00	-16.07	peak	

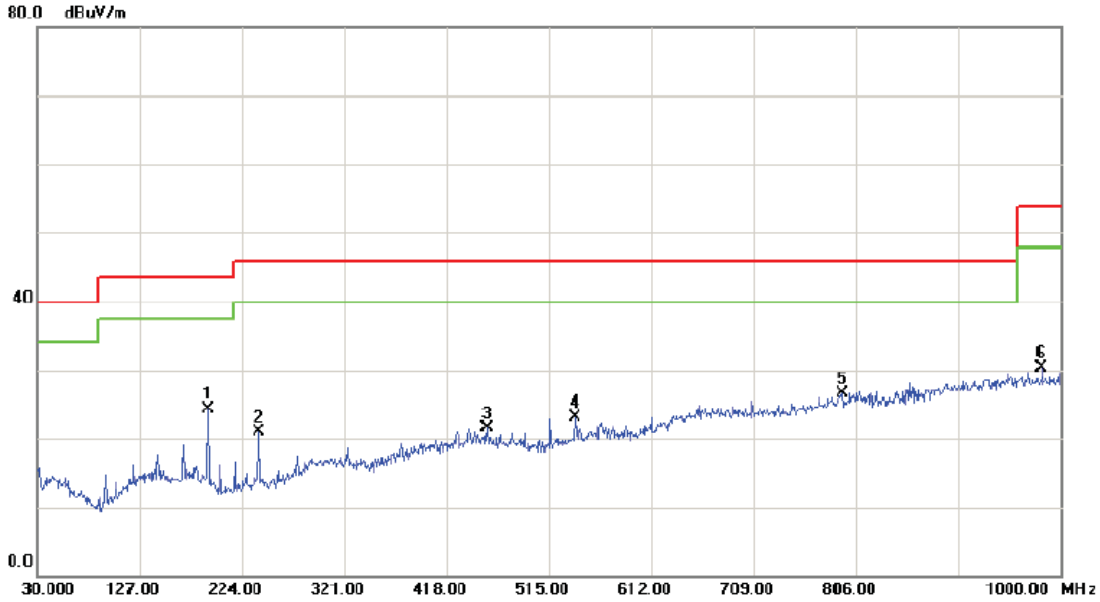
Test Mode:	TX 2441MHz _CH28

Vertical

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		177.4400	30.25	-13.04	17.21	43.50	-26.29	peak	
2		309.3600	28.93	-11.18	17.75	46.00	-28.25	peak	
3		448.0700	29.61	-8.70	20.91	46.00	-25.09	peak	
4		562.5300	29.78	-8.10	21.68	46.00	-24.32	peak	
5		664.3800	30.36	-5.12	25.24	46.00	-20.76	peak	
6	*	791.4500	30.34	-3.21	27.13	46.00	-18.87	peak	

Test Mode:	TX 2441MHz _CH28

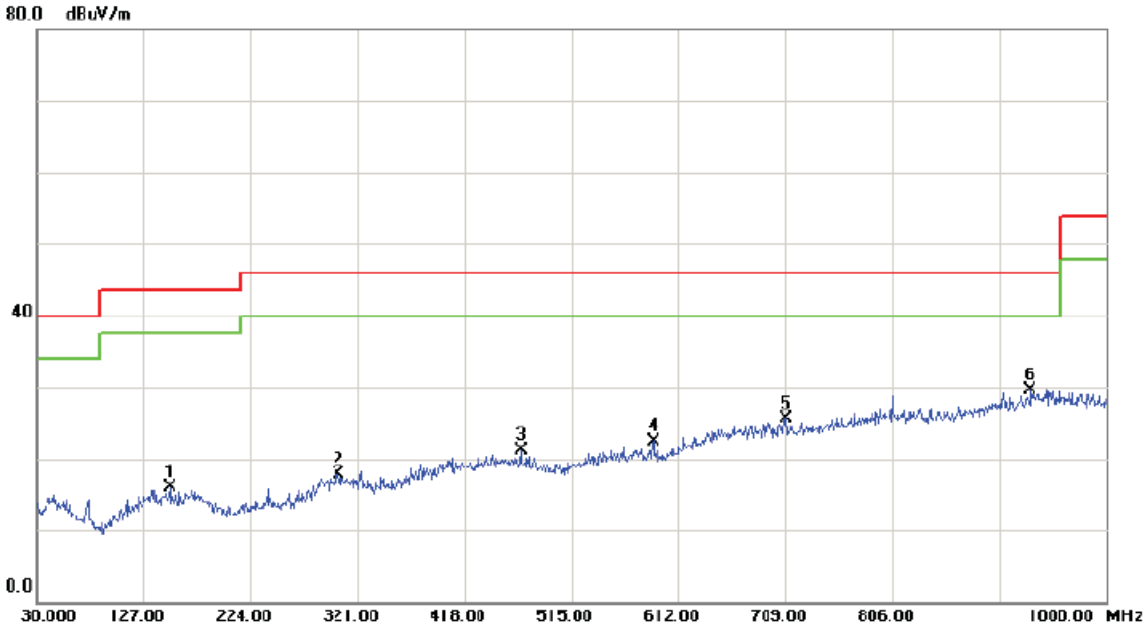
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	191.9900	38.85	-14.54	24.31	43.50	-19.19	peak	
2		240.4900	34.98	-14.06	20.92	46.00	-25.08	peak	
3		455.8300	30.29	-8.88	21.41	46.00	-24.59	peak	
4		540.2200	31.71	-8.58	23.13	46.00	-22.87	peak	
5		792.4200	29.73	-3.18	26.55	46.00	-19.45	peak	
6		981.5700	30.60	-0.38	30.22	54.00	-23.78	peak	

Test Mode:	TX 2480MHz _CH54

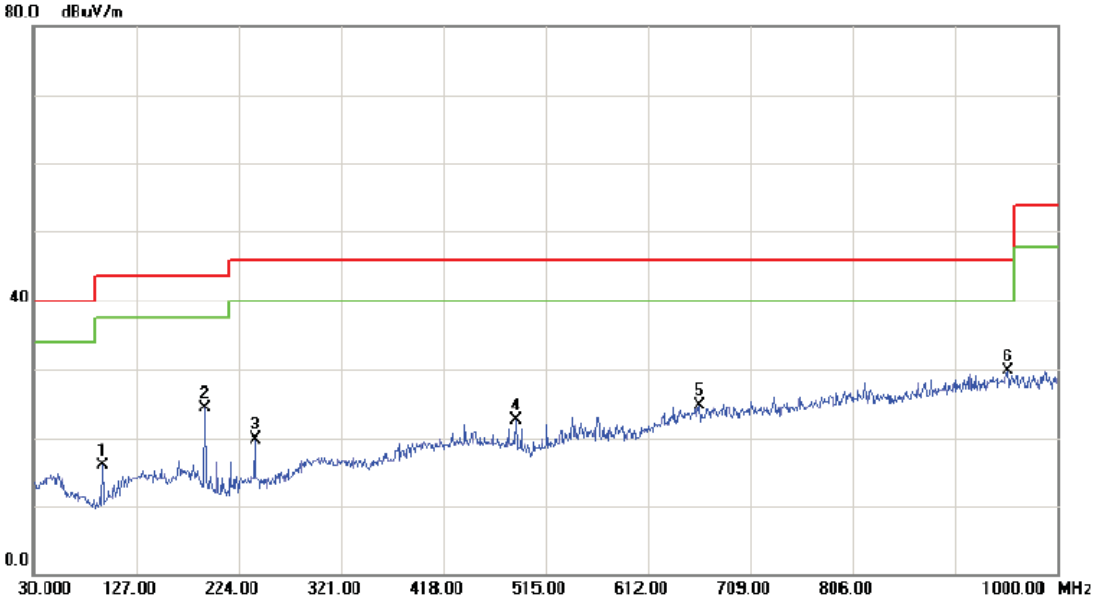
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		150.2800	29.06	-13.23	15.83	43.50	-27.67	peak	
2		303.5400	28.74	-11.11	17.63	46.00	-28.37	peak	
3		468.4400	30.44	-9.36	21.08	46.00	-24.92	peak	
4		588.7200	30.50	-8.10	22.40	46.00	-23.60	peak	
5		709.9700	30.39	-4.90	25.49	46.00	-20.51	peak	
6	*	931.1300	30.26	-0.81	29.45	46.00	-16.55	peak	

Test Mode:	TX 2480MHz _CH54

Horizontal



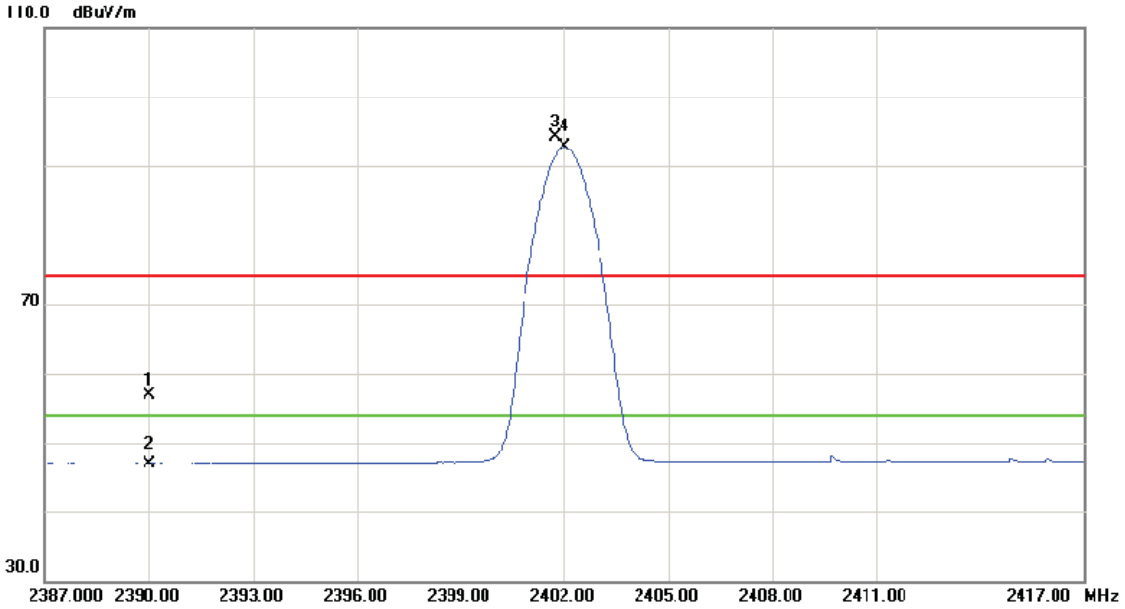
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		94.9900	33.19	-17.25	15.94	43.50	-27.56	peak	
2		191.9900	38.81	-14.54	24.27	43.50	-19.23	peak	
3		239.5200	33.73	-14.06	19.67	46.00	-26.33	peak	
4		486.8700	32.48	-10.04	22.44	46.00	-23.56	peak	
5		660.5000	29.80	-5.14	24.66	46.00	-21.34	peak	
6	*	952.4700	30.02	-0.31	29.71	46.00	-16.29	peak	

ATTACHMENT D - RADIATED EMISSION (ABOVE 1000MHZ)

Remark :Test at hopping off mode

Orthogonal Axis :	X
Test Mode :	TX 2402MHz _CH01

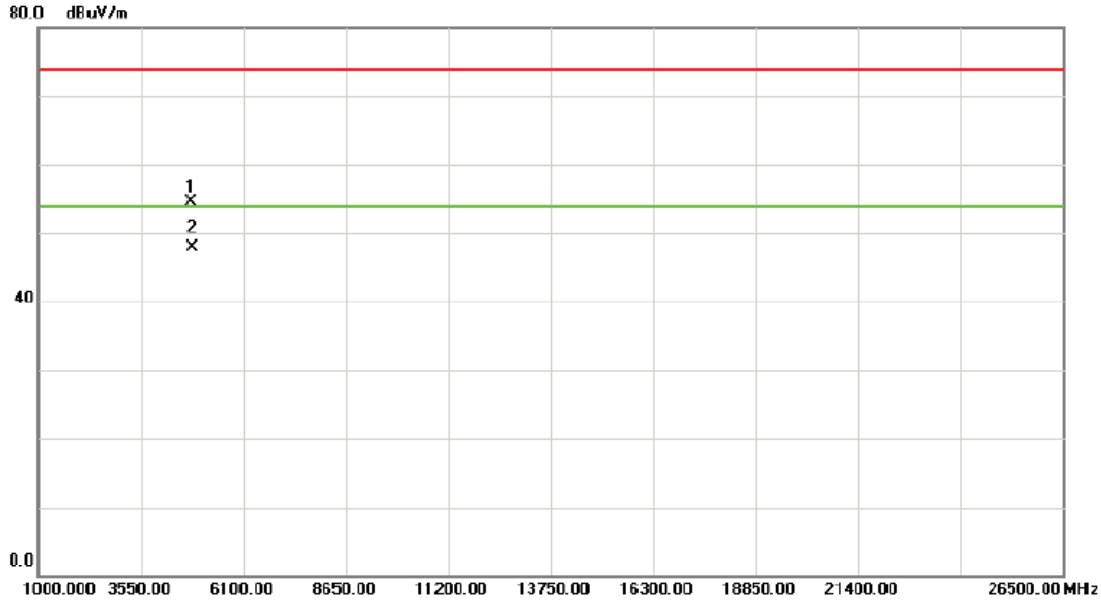
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	23.61	33.38	56.99	74.00	-17.01	peak	
2		2390.000	13.61	33.38	46.99	54.00	-7.01	AVG	
3	X	2401.730	60.86	33.41	94.27	74.00	20.27	peak	Fundamental frequency, no limit
4	*	2402.030	59.40	33.41	92.81	54.00	38.81	AVG	Fundamental frequency, no limit

Orthogonal Axis :	X
Test Mode :	TX 2402MHz _CH01

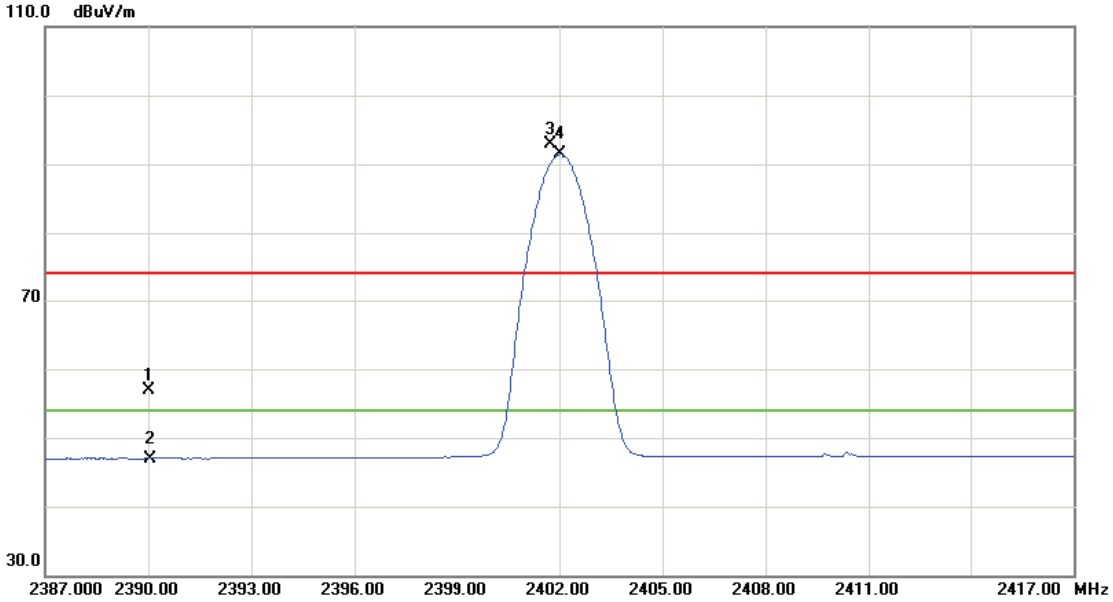
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4803.470	48.13	6.39	54.52	74.00	-19.48	peak	
2	*	4803.640	41.47	6.39	47.86	54.00	-6.14	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2402MHz _CH01

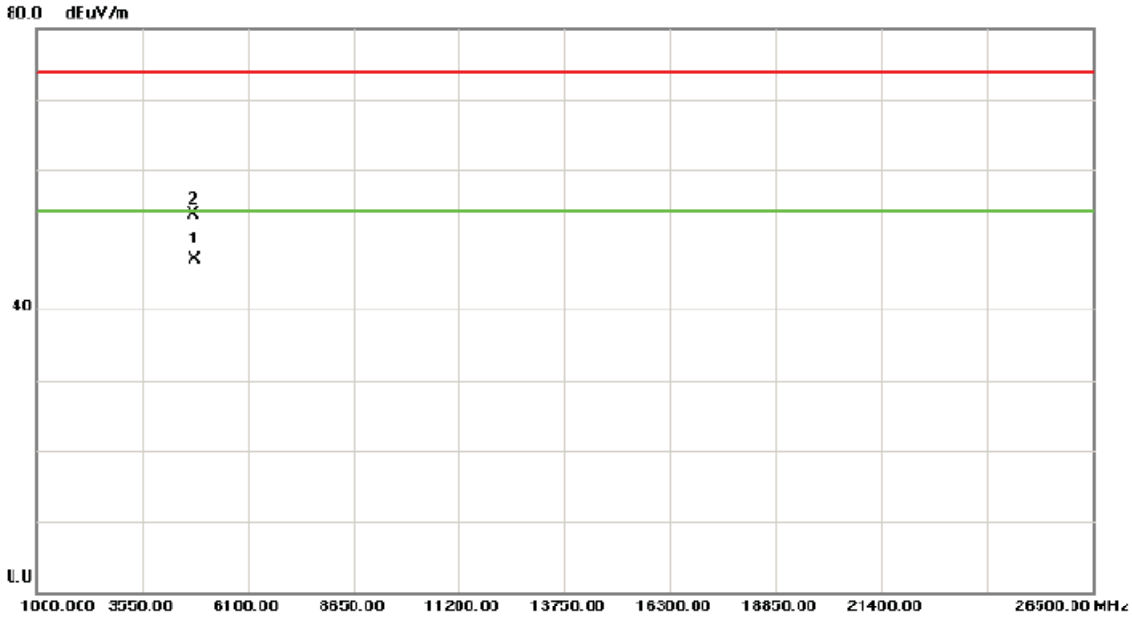
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	23.47	33.38	56.85	74.00	-17.15	peak	
2		2390.000	13.62	33.38	47.00	54.00	-7.00	AVG	
3	X	2401.730	59.50	33.41	92.91	74.00	18.91	peak	Fundamental frequency, no limit
4	*	2402.030	58.00	33.41	91.41	54.00	37.41	AVG	Fundamental frequency, no limit

Orthogonal Axis :	X
Test Mode :	TX 2402MHz _CH01

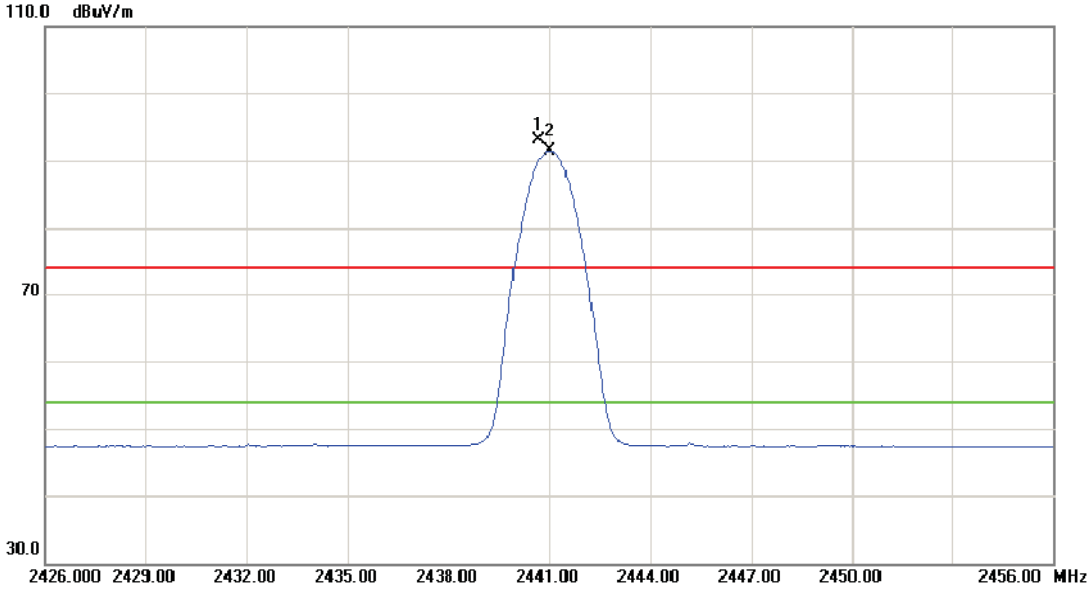
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	4803.650	40.70	6.39	47.09	54.00	-6.91	AVG	
2		4804.700	47.14	6.39	53.53	74.00	-20.47	peak	

Orthogonal Axis :	X
Test Mode :	TX 2441MHz _CH28

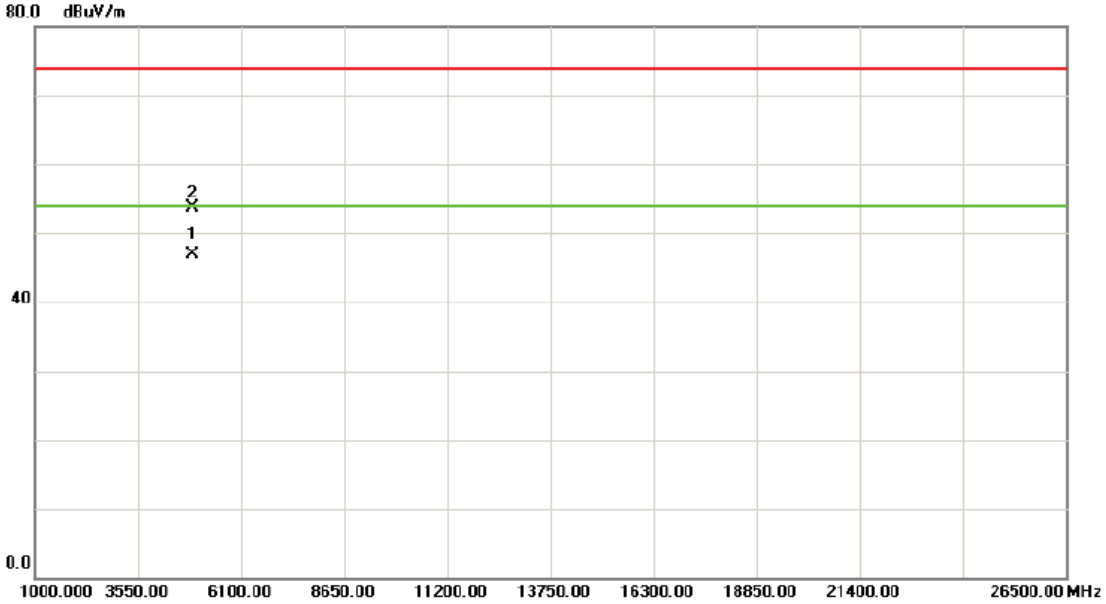
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2440.700	59.65	33.51	93.16	74.00	19.16	peak	Fundamental frequency, no limit
2	*	2441.030	58.07	33.51	91.58	54.00	37.58	AVG	Fundamental frequency, no limit

Orthogonal Axis :	X
Test Mode :	TX 2441MHz _CH28

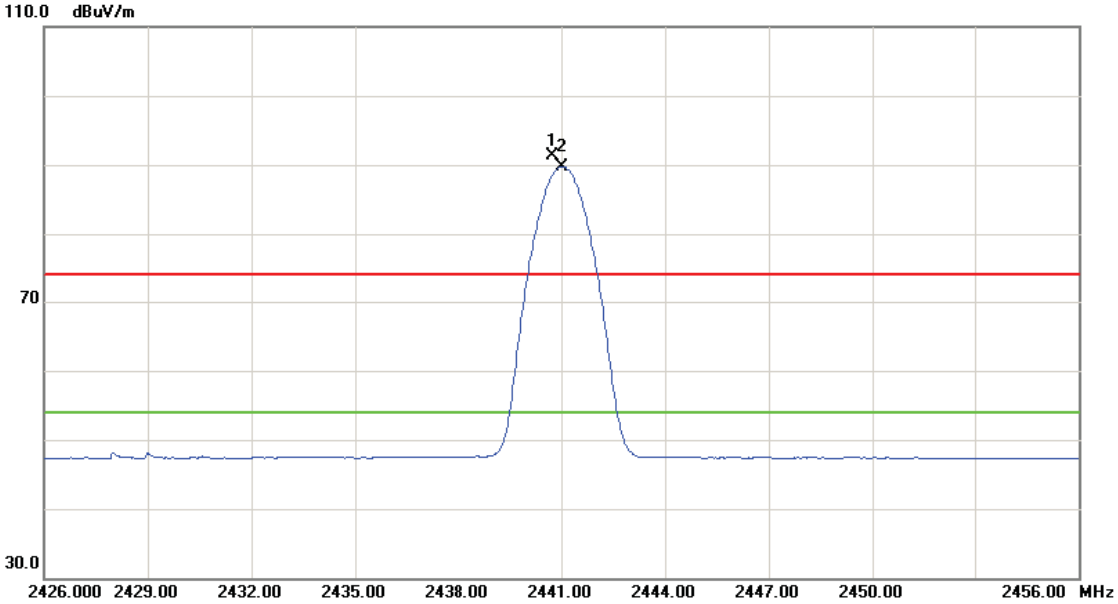
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	4881.610	40.32	6.57	46.89	54.00	-7.11	AVG	
2		4882.660	47.18	6.57	53.75	74.00	-20.25	peak	

Orthogonal Axis :	X
Test Mode :	TX 2441MHz _CH28

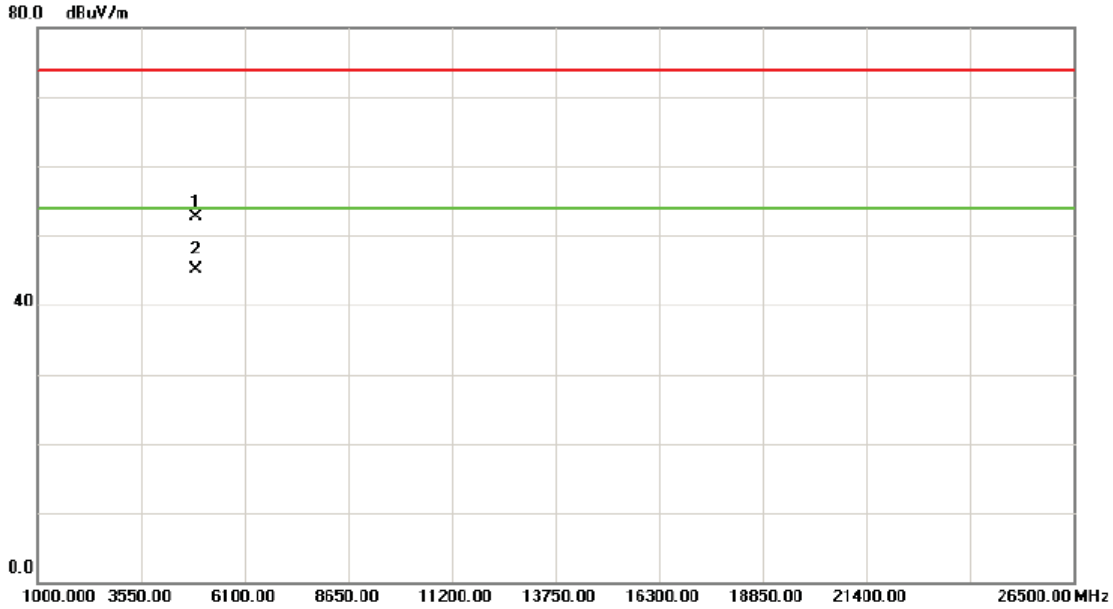
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2440.730	57.82	33.51	91.33	74.00	17.33	peak	Fundamental frequency, no limit
2	*	2441.030	56.22	33.51	89.73	54.00	35.73	AVG	Fundamental frequency, no limit

Orthogonal Axis :	X
Test Mode :	TX 2441MHz _CH28

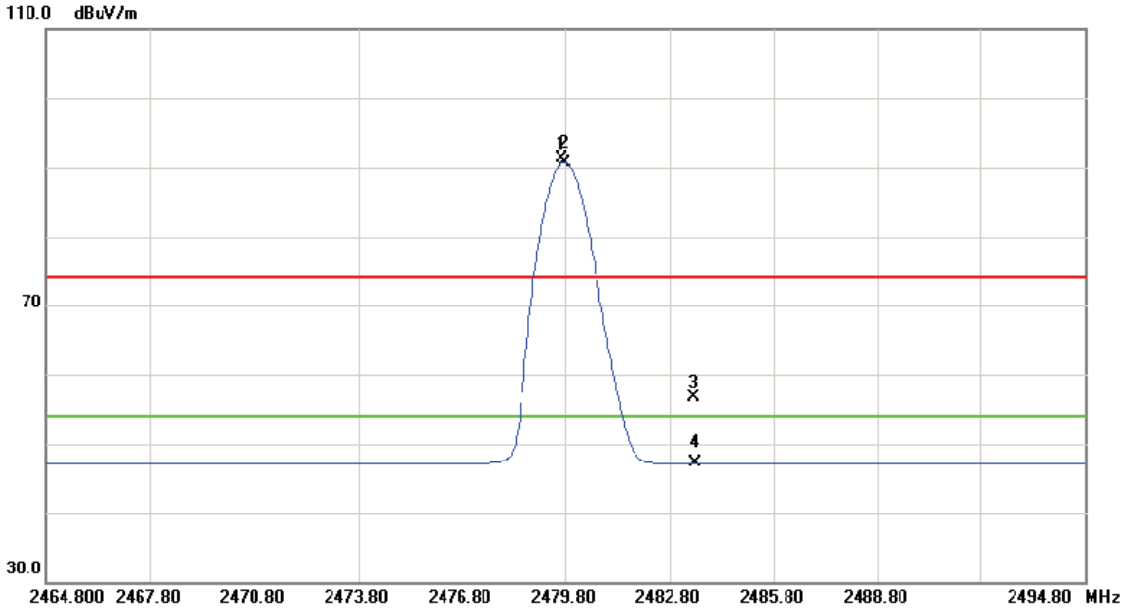
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4881.570	46.18	6.57	52.75	74.00	-21.25	peak	
2	*	4882.480	38.58	6.57	45.15	54.00	-8.85	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2480MHz _CH54

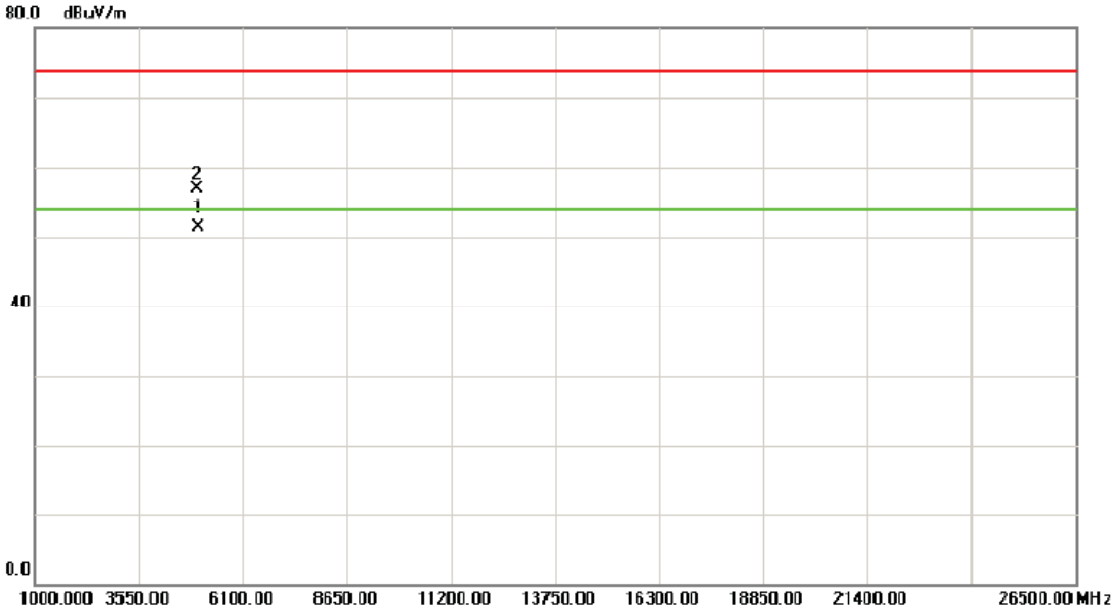
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2479.680	57.66	33.61	91.27	74.00	17.27	peak	Fundamental frequency, no limit
2	*	2479.770	57.16	33.61	90.77	54.00	36.77	AVG	Fundamental frequency, no limit
3		2483.500	23.06	33.62	56.68	74.00	-17.32	peak	
4		2483.500	13.71	33.62	47.33	54.00	-6.67	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2480MHz _CH54

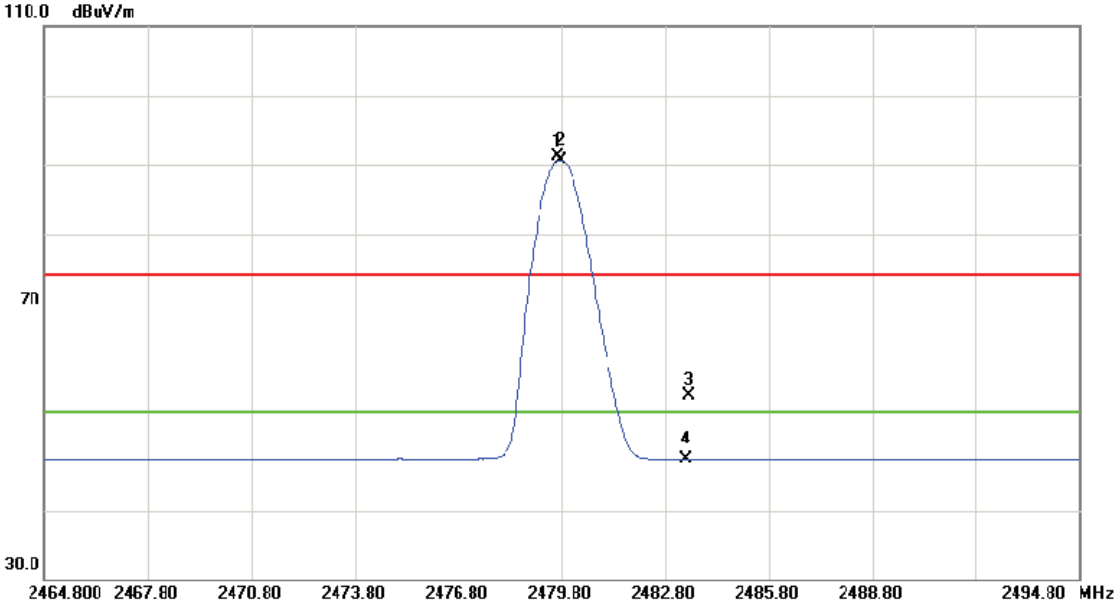
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	4959.370	44.67	6.73	51.40	54.00	-2.60	AVG	
2		4959.390	50.24	6.74	56.98	74.00	-17.02	peak	

Orthogonal Axis :	X
Test Mode :	TX 2480MHz _CH54

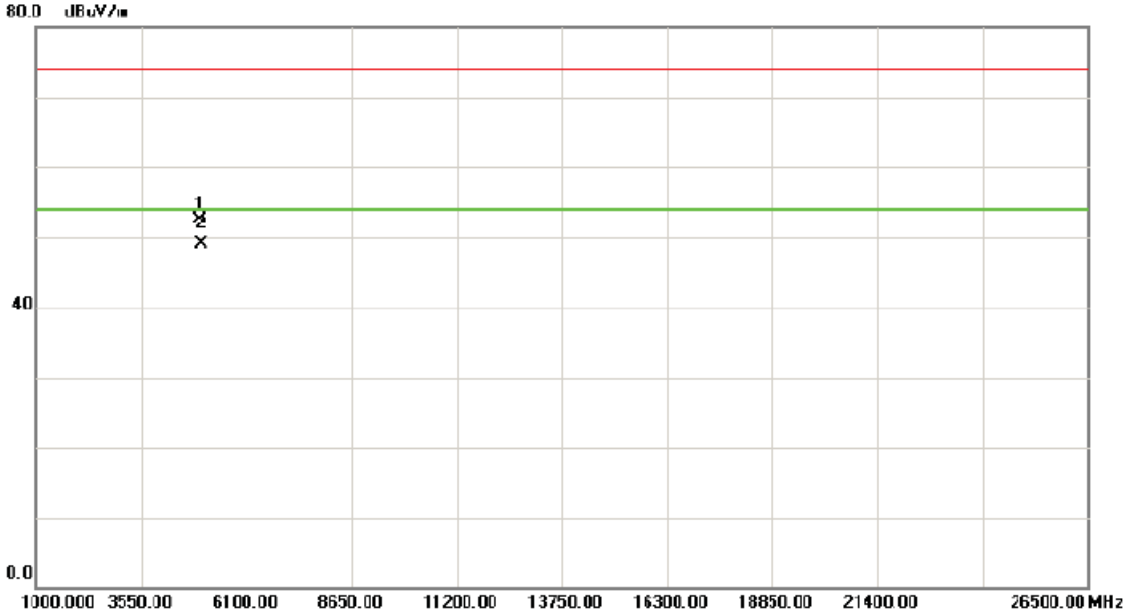
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2479.680	57.65	33.61	91.26	74.00	17.26	peak	Fundamental frequency, no limit
2	*	2479.770	57.15	33.61	90.76	54.00	36.76	AVG	Fundamental frequency, no limit
3		2483.500	22.81	33.62	56.43	74.00	-17.57	peak	
4		2483.500	13.65	33.62	47.27	54.00	-6.73	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2480MHz _CH54

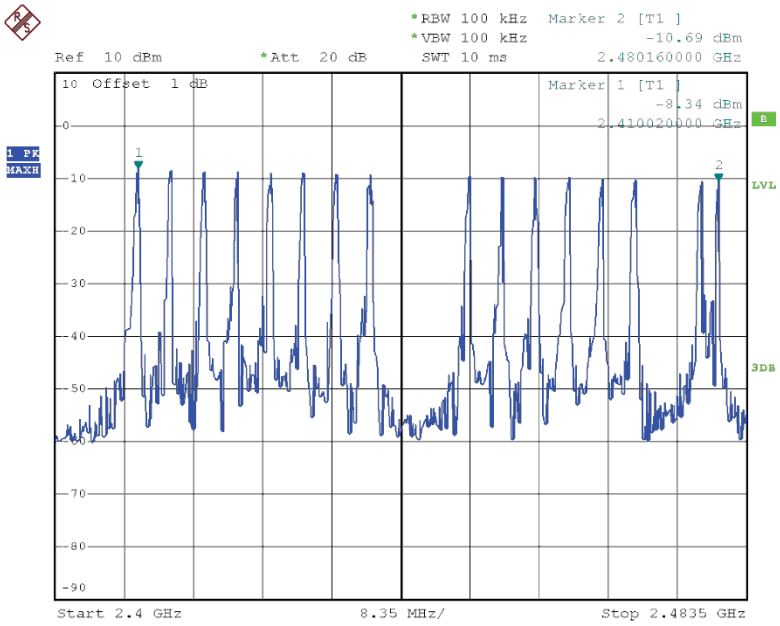
Horizontal



No	Mk	Freq	Reading Level	Correct Factor	Measurc-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4959.370	45.85	6.73	52.58	74.00	-21.42	peak	
2	*	4959.440	42.30	6.74	49.04	54.00	-4.96	AVG	

ATTACHMENT E - NUMBER OF HOPPING CHANNEL

Test Mode	Hopping Mode
Number of Hopping Channel	16



Date: 9.JUL.2014 17:32:05

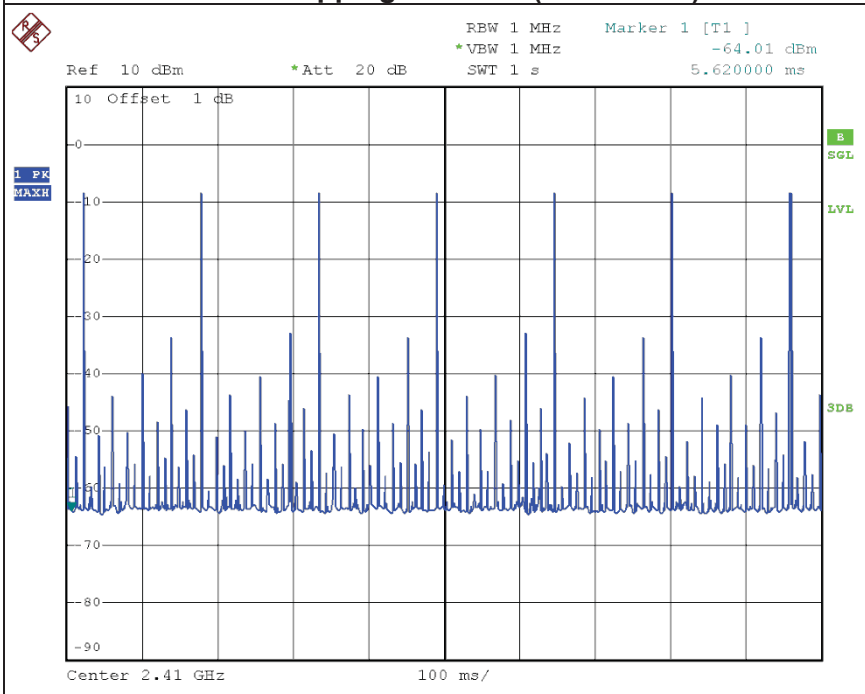
ATTACHMENT F - AVERAGE TIME OF OCCUPANCY

Test Mode: Hopping Mode			
Number of transmission in a 6.4(16Hopping*0.4)	**Length of transmission time (msec)**	**Result (msec)**	**Limit (msec)**
(7/1) *6.4=44.8 times **Note1**	0.24	10.75	400

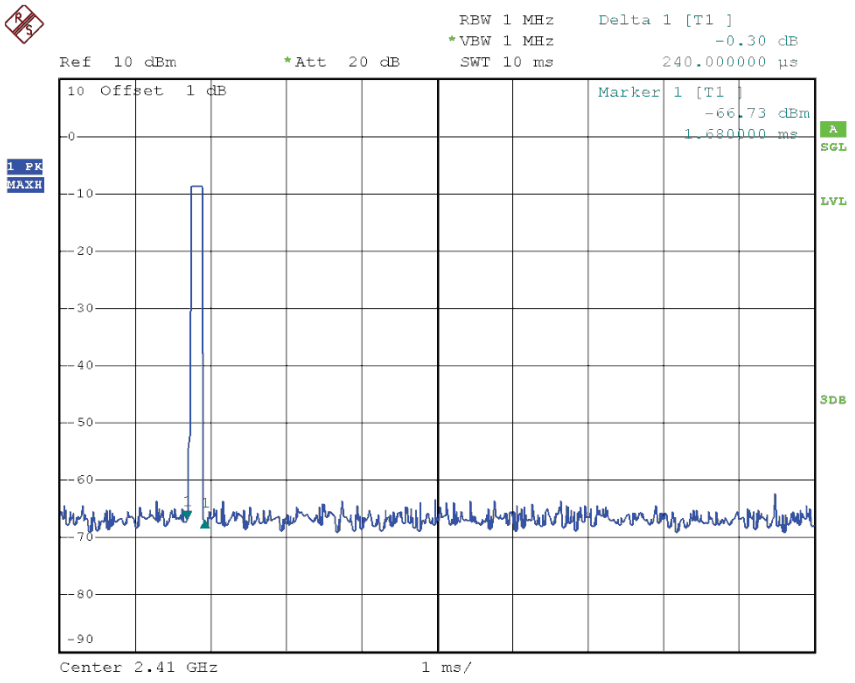
Note1: 7 times of occupied channels per 1 second

	Results
Measured cycle (sec)	16 CH*0.4=6.4
The total number of frequency-hopping per second	((7/1)*6.4)=44.8
The number of occupied channels per second	44.8/6.4=7 (number/sec)
occupied time for each channel(1)	0.24 ms
The total number of channels occupied within one cycle (2)	(7/1) *6.4=44.8 times
The average time of occupancy within one cycle(1)*(2)	10.75 msec
LIMIT (msec)	400msec

Hopping Mode : 7 (times/1sec)



Date: 9.JUL.2014 17:38:16



Date: 14.JUL.2014 19:04:05

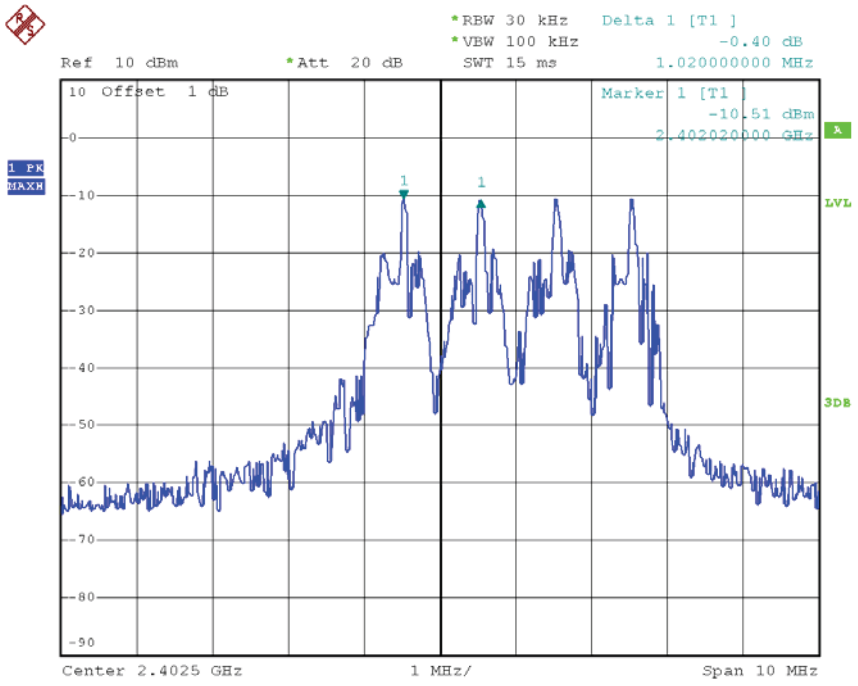
ATTACHMENT G - HOPPING CHANNEL SEPARATION MEASUREMENT

Test Mode: Hopping on _CH07/41/54

Frequency MHz	Ch. Separation (MHz)	Result
2402	1.0200	**Complies**
2410	4.0000	**Complies**
2466	4.0000	**Complies**
2480	2.0000	**Complies**

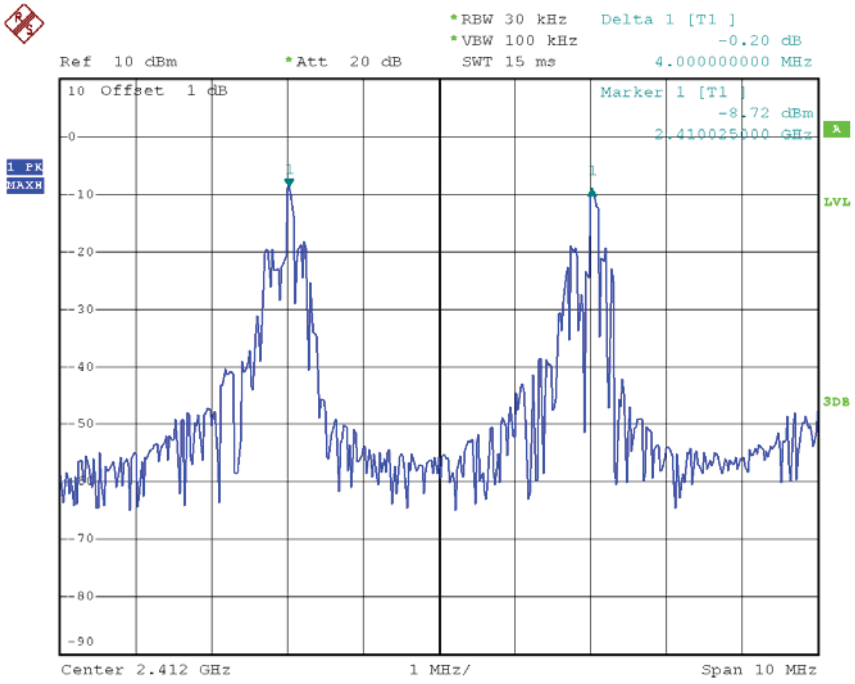
Remark： 20dB BW is 1.23MHz， so limit is > (1.23x2/3=0.82MHz)

CH01



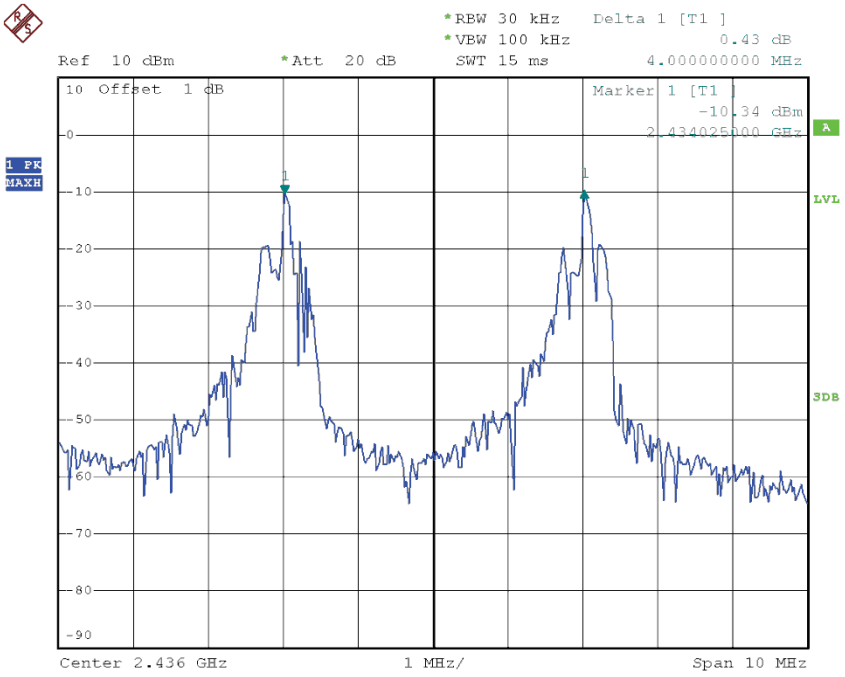
Date: 29.JUL.2014 14:16:10

CH07



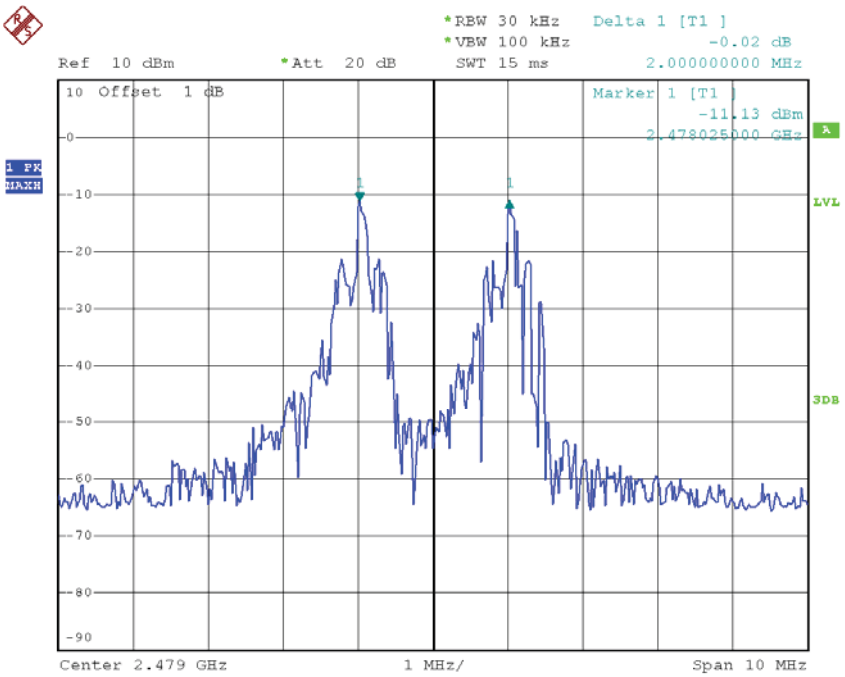
Date: 7.JUL.2014 21:33:58

CH41



Date: 7.JUL.2014 21:37:54

CH54



Date: 7.JUL.2014 21:39:38

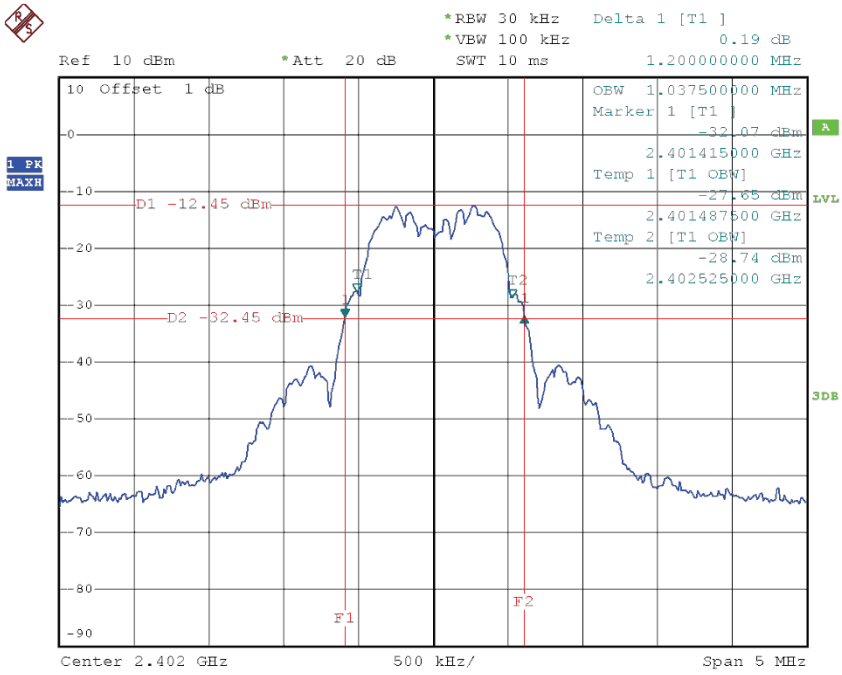
ATTACHMENT H - BANDWIDTH

Remark :Test at hopping off mode

Test Mode: 1Mbps_CH01/28/54

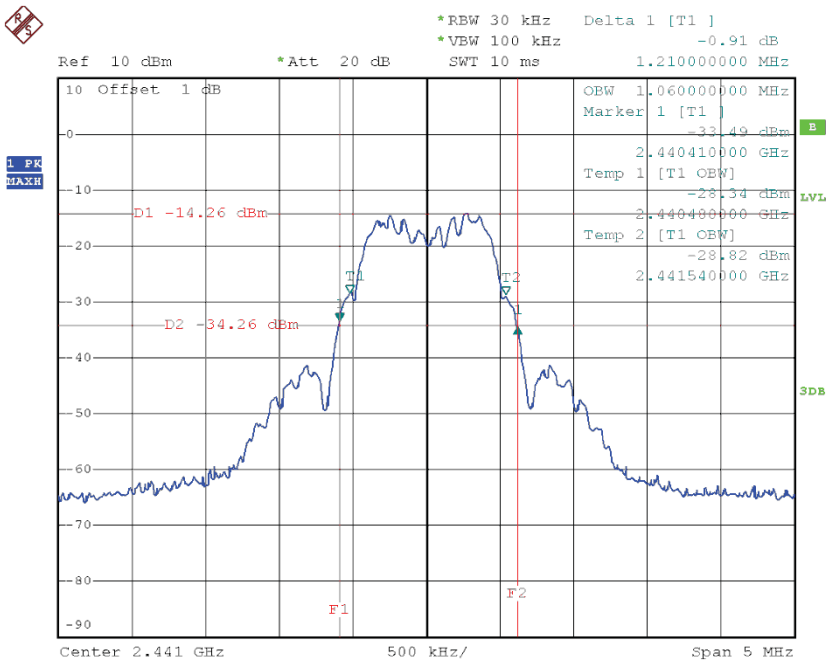
Frequency MHz	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Result
2402	1.20	1.03	**PASS**
2441	1.21	1.06	**PASS**
2480	1.23	1.07	**PASS**

CH01



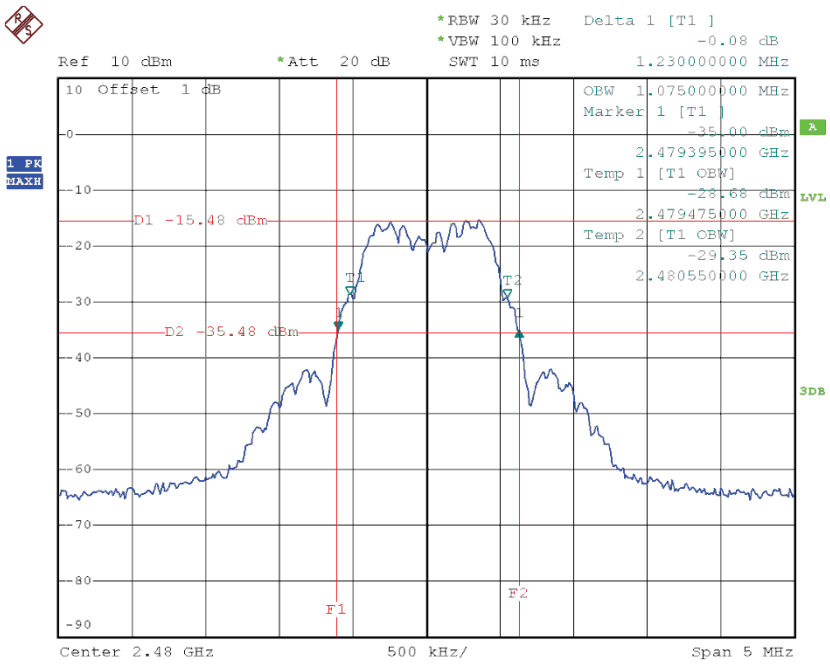
Date: 7.JUL.2014 21:26:57

CH28



Date: 7.JUL.2014 21:02:36

CH54



Date: 7.JUL.2014 21:28:34

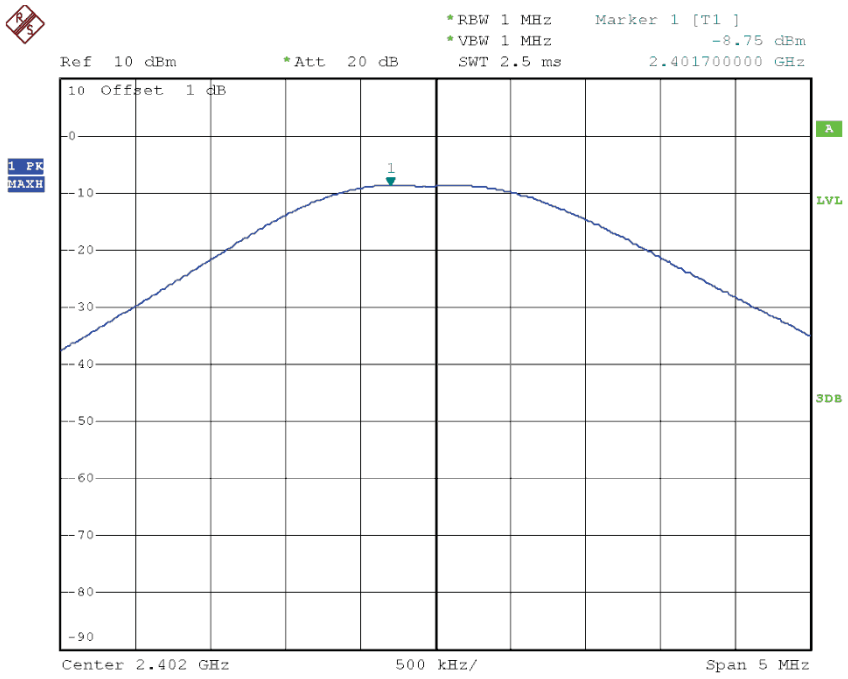
ATTACHMENT I - PEAK OUTPUT POWER

Remark :Test at hopping off mode

Test Mode: 1Mbps_CH01/28/54

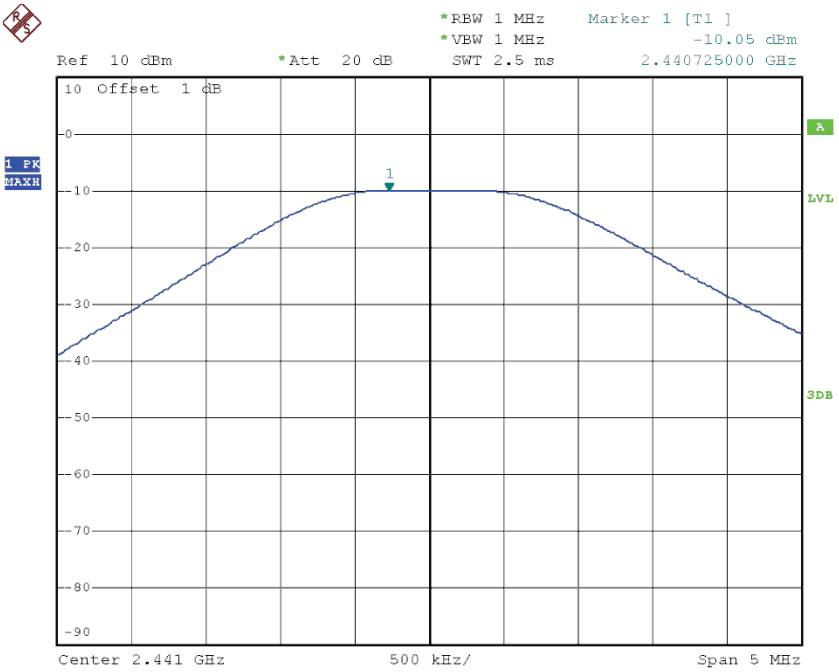
Test Channel	Frequency (MHz)	Peak Output Power (dBm)	LIMIT (dBm)	LIMIT (W)
CH01	2402	-8.75	21	0.125
CH28	2441	-10.05	21	0.125
CH54	2480	-11.22	21	0.125

CH01



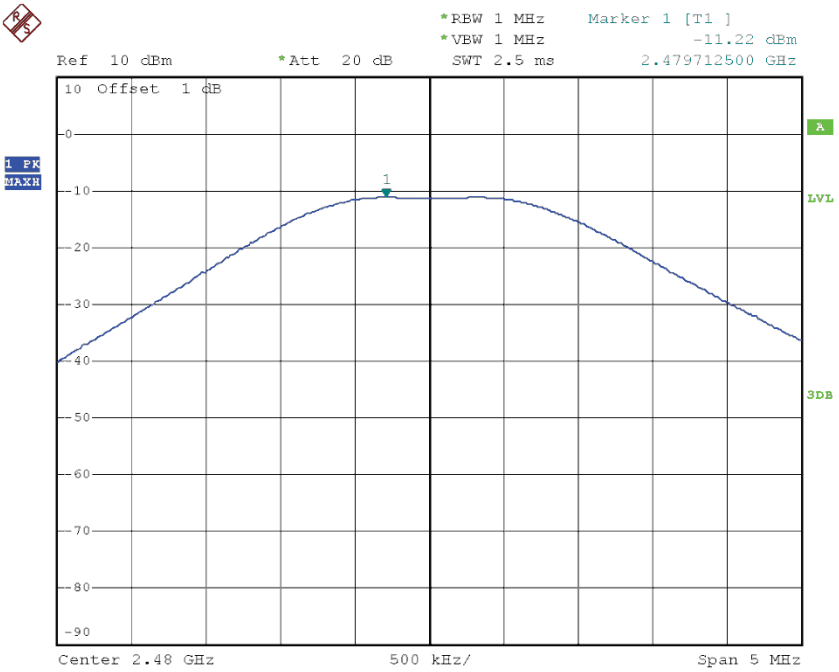
Date: 7.JUL.2014 20:57:38

CH28



Date: 7.JUL.2014 21:00:44

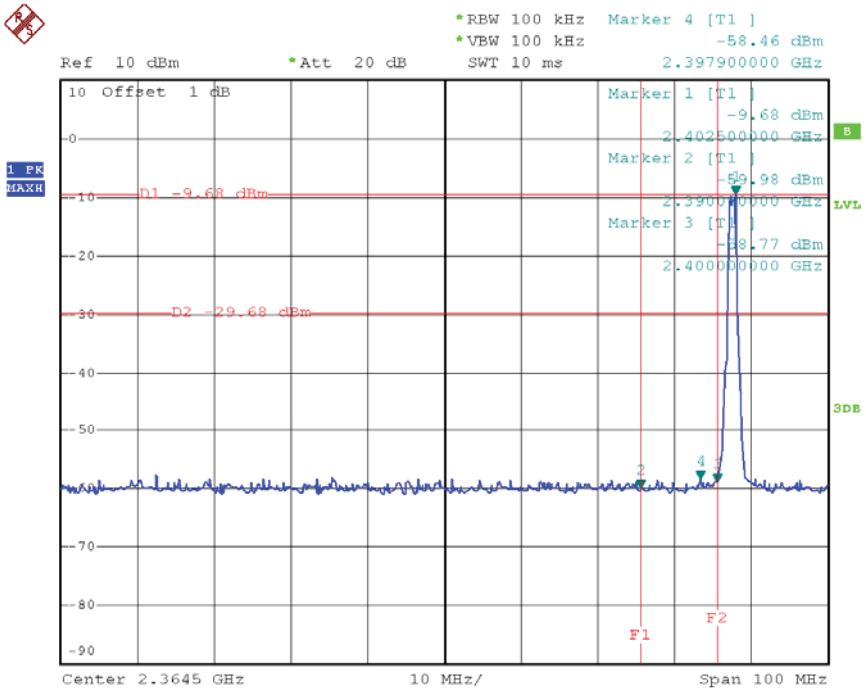
CH54



Date: 7.JUL.2014 21:02:52

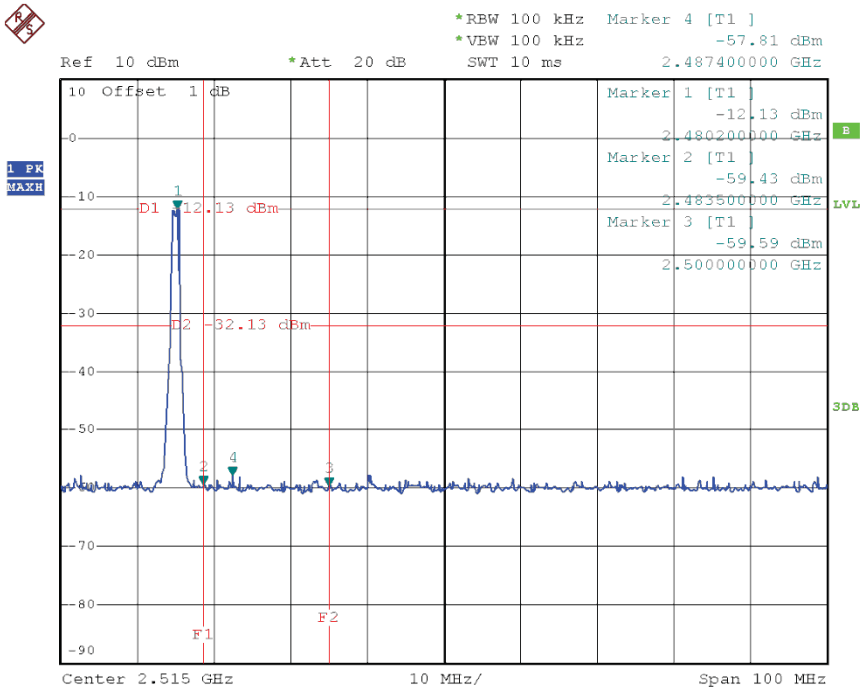
ATTACHMENT J - ANTENNA CONDUCTED SPURIOUS EMISSION

CH01 (Lower)



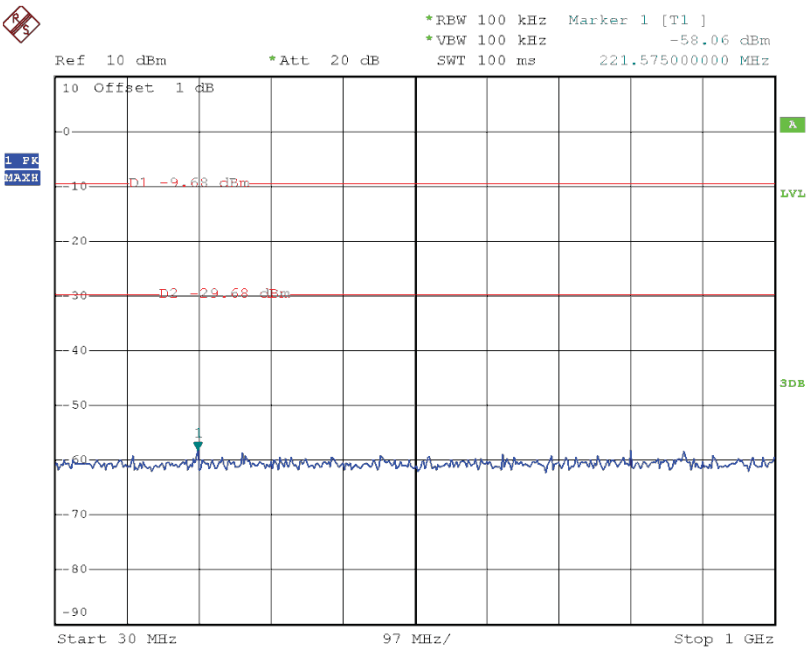
Date: 7.JUL.2014 21:48:58

CH54 (Upper)



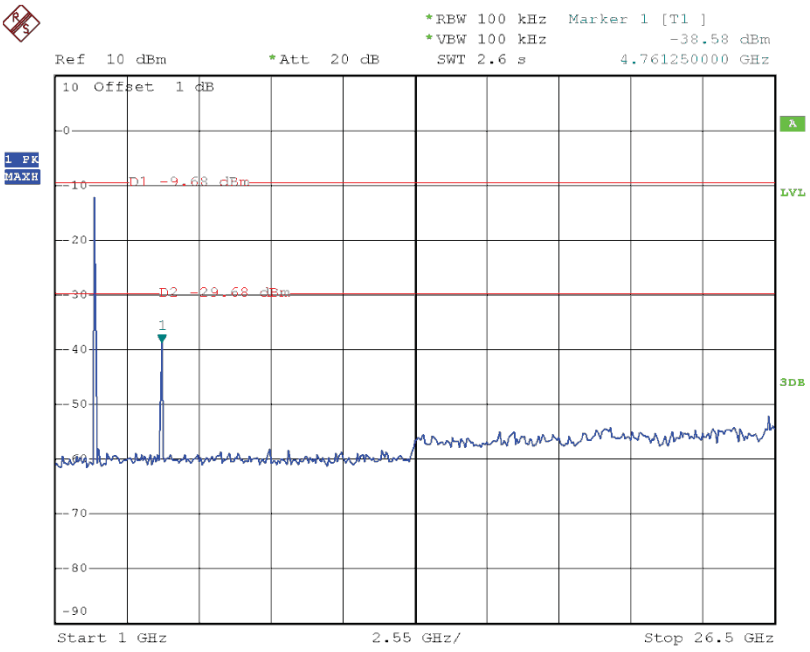
Date: 7.JUL.2014 21:53:35

CH01 (30MHz~1GHz)



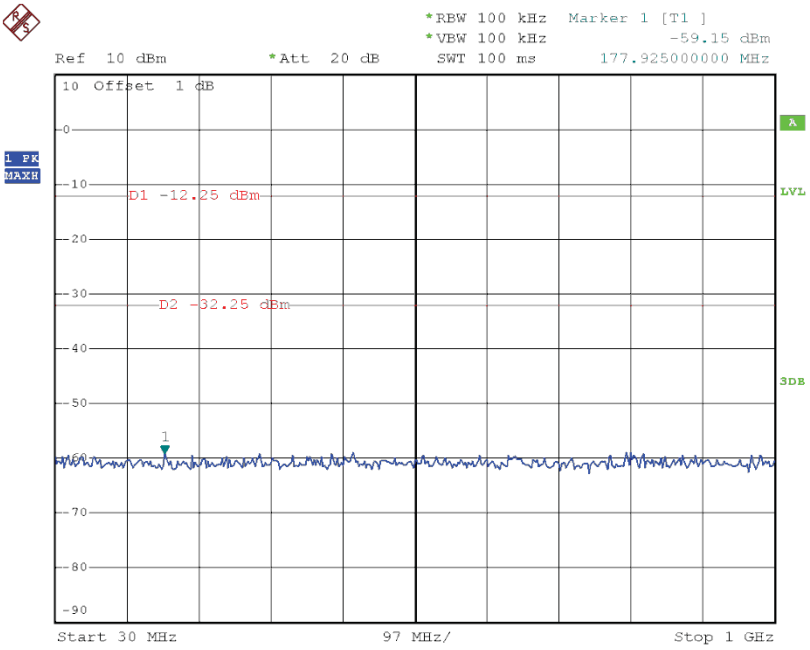
Date: 7.JUL.2014 21:49:50

CH01 (1GHz～10th Harmonic)



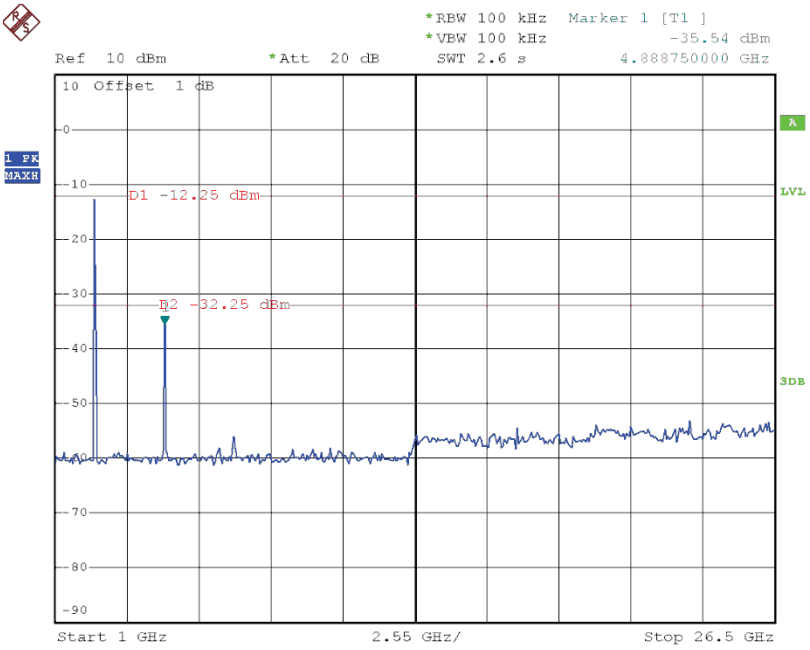
Date: 7.JUL.2014 21:50:10

CH28 (30MHz~1GHz)



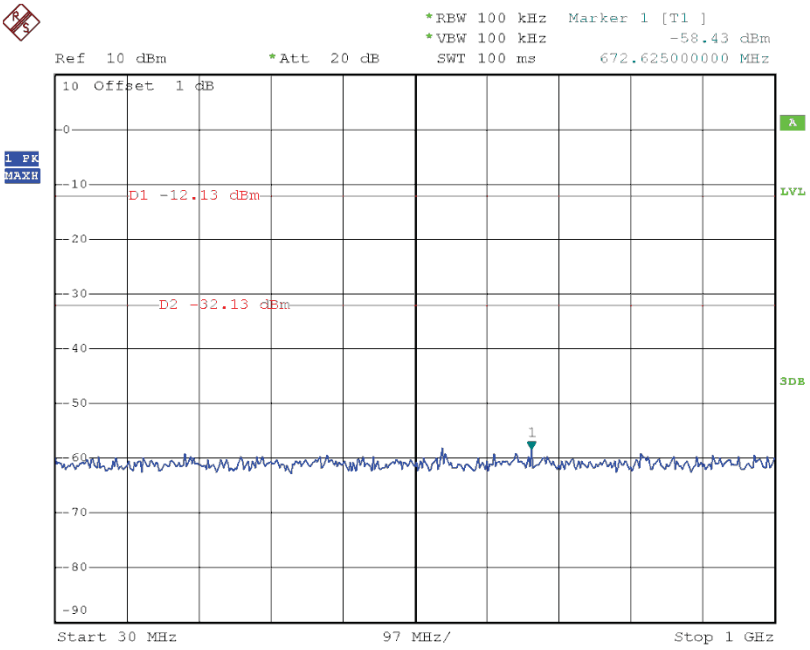
Date: 7.JUL.2014 21:51:33

CH28 (1GHz～10th Harmonic)



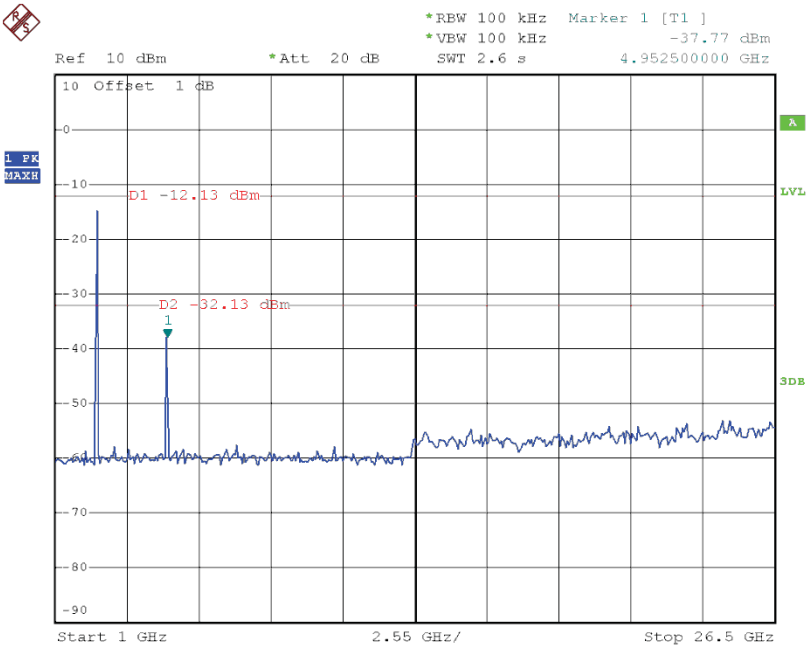
Date: 7.JUL.2014 21:52:08

CH54 (30MHz~1GHz)



Date: 7.JUL.2014 21:54:05

CH54 (1GHz～10th Harmonic)



Date: 7.JUL.2014 21:54:21