

Application for FCC Certification  
On behalf of

ZHEJIANG REXENSE TECHNOLOGY CO., LTD.

Product Name: 802.15.4 / ZigBee Module

Model No.: REX3SP

Serial No.: 5016A9AF, 50169F26

FCC ID: O46RY12M02

Prepared For : ZHEJIANG REXENSE TECHNOLOGY CO., LTD.  
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Report No. : ACI-F12138  
Date of Test : Aug. 15 - 22, 2012  
Date of Report : Aug. 22, 2012

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## TEST REPORT FOR FCC CERTIFICATE

Applicant : ZHEJIANG REXENSE TECHNOLOGY CO., LTD.  
Manufacturer : ZHEJIANG REXENSE TECHNOLOGY CO., LTD.  
EUT Description : 802.15.4 / ZigBee Module  
(A) Model No. : REX3SP  
(B) Serial No. : 5016A9AF, 50169F26  
(C) Test Voltage : DC 3.3V

Test Procedure Used:

*FCC RULES AND REGULATIONS PART 15 SUBPART C OCTOBER 2011  
AND ANSI C63.4-2003*

The device described above is tested by Audix Technology (Shanghai) Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits.

The test results are contained in this test report and Audix Technology (Shanghai) Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. This report also shows that the EUT (M/N: see Sec. 2.1, S/N: see Sec. 2.1), which was tested on Aug. 15 - 22, 2012 is technically compliance with the FCC limits.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Audix Technology (Shanghai) Co., Ltd.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

Date of Test : Aug. 15 - 22, 2012 Date of Report : Aug. 22, 2012

Producer : Kathy Wang  
KATHY WANG / Assistant

Review : Dio Yang  
DIO YANG / Assistant Manager

 For and on behalf of  
Audix Technology (Shanghai) Co., Ltd.

Signatory : Sammy Chen  
Authorized Signature EMC SAMMY CHEN / Deputy Manager

# 1 SUMMARY OF STANDARDS AND RESULTS

## 1.1 Description of Standards and Results

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

| Description / Test Item                  | Test Standard                                                                                                | Results | Meets Limit               |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------|---------|---------------------------|
| <b>EMISSION</b>                          |                                                                                                              |         |                           |
| Conducted Emission                       | FCC RULES AND REGULATIONS PART 15<br>SUBPART C October 2011<br>AND ANSI C63.4:2003<br>AND KDB558074 v01:2012 | N/A     | N/A                       |
| Radiated Emission                        | FCC RULES AND REGULATIONS PART 15<br>SUBPART C October 2011<br>AND ANSI C63.4:2003<br>AND KDB558074 v01:2012 | Pass    | 15.209(a)<br>15.205(a)(c) |
| 6 dB Bandwidth<br>Measurement            | FCC RULES AND REGULATIONS PART 15<br>SUBPART C October 2011<br>AND ANSI C63.4:2003<br>AND KDB558074 v01:2012 | Pass    | 15.247(a)(2)              |
| Maximum Peak Output<br>Power Measurement | FCC RULES AND REGULATIONS PART 15<br>SUBPART C October 2011<br>AND ANSI C63.4:2003<br>AND KDB558074 v01:2012 | Pass    | 15.247(b)(3)              |
| Emission Limitations<br>Measurement      | FCC RULES AND REGULATIONS PART 15<br>SUBPART C October 2011<br>AND ANSI C63.4:2003<br>AND KDB558074 v01:2012 | Pass    | 15.247(d)                 |
| Band Edge<br>Measurement                 | FCC RULES AND REGULATIONS PART 15<br>SUBPART C October 2011<br>AND ANSI C63.4:2003<br>AND KDB558074 v01:2012 | Pass    | 15.247(d)                 |
| Power Spectral Density<br>Measurement    | FCC RULES AND REGULATIONS PART 15<br>SUBPART C October 2011<br>AND ANSI C63.4:2003<br>AND KDB558074 v01:2012 | Pass    | 15.247(e)                 |

## 2 GENERAL INFORMATION

### 2.1 Description of Equipment Under Test

Description : 802.15.4 / ZigBee Module

Type of EUT ☒ Production ☐ Pre-product ☐ Pro-type

Model Number : REX3SP

Note 1 : The REX3SP has 2 types of antenna:  
one is the PCB antenna on board, the other  
is the external SMA antenna.

Serial Number : 5016A9AF (PCB antenna type),  
50169F26 (SMA antenna type)

Note 2 : The only difference of above 2 samples is using PCB  
antenna or SMA antenna, so we select 1 sample to  
perform the RF conducted test and both 2 samples to  
perform the RF radiated test.

Radio Tech : IEEE 802.15.4 (ZigBee®)

Freq. Band : 2405 MHz ~ 2475 MHz  
Total 15 Channels in 5 MHz Separation

Tested Freq. : 2405 MHz (Channel 11)  
2440 MHz (Channel 18)  
2475 MHz (Channel 25)

Antenna Gain : 2.0 dBi (for both PCB antenna and SMA antenna)

Applicant : ZHEJIANG REXENSE TECHNOLOGY CO., LTD.  
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Manufacturer : ZHEJIANG REXENSE TECHNOLOGY CO., LTD.  
Room 105, Hangzhou E-Commerce Industry Park,  
No.7 Cuibai Road, Hangzhou 310012 P.R.C

## 2.2 Description of Test Facility

Site Description (Semi-Anechoic Chamber) : Sept. 17, 1998 file on  
Apr 29, 2009 Renewed  
Federal Communications Commission  
FCC Engineering Laboratory  
7435 Oakland Mills Road  
Columbia, MD 21046, USA

Name of Firm : Audix Technology (Shanghai) Co., Ltd.

Site Location : 3 F 34 Bldg 680 Guiping Rd.,  
Caohejing Hi-Tech Park,  
Shanghai 200233, China

FCC registration Number : 91789

Accredited by NVLAP, Lab Code : 200371-0

## 2.3 Measurement Uncertainty

Radiated Emission Expanded Uncertainty (30-200MHz):  
U = 4.58dB (Horizontal)  
U = 4.70dB (Vertical)

Radiated Emission Expanded Uncertainty (200M-1GHz):  
U = 4.84dB (Horizontal)  
U = 4.70dB (Vertical)

Radiated Emission Expanded Uncertainty (Above 1GHz):  
U= 4.60 dB (Horizontal)  
U= 4.18 dB (Vertical)

6 dB Bandwidth Expanded Uncertainty : U = 0.05 kHz

Maximum Peak Output Power Expanded Uncertainty: U = 0.30 dB

Emission Limitations Expanded Uncertainty : U = 0.15 dB

Band Edge Expanded Uncertainty : U = 0.15 dB

Power Spectral Density Expanded Uncertainty : U = 0.15 dB

### 3 RADIATED EMISSION TEST

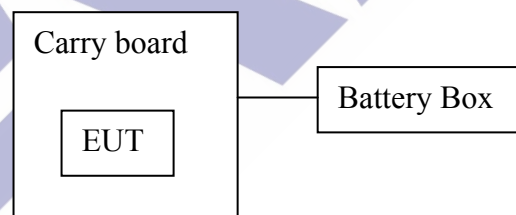
#### 3.1 Test Equipment

The following test equipment are used during the radiated emission test in a semi-anechoic chamber:

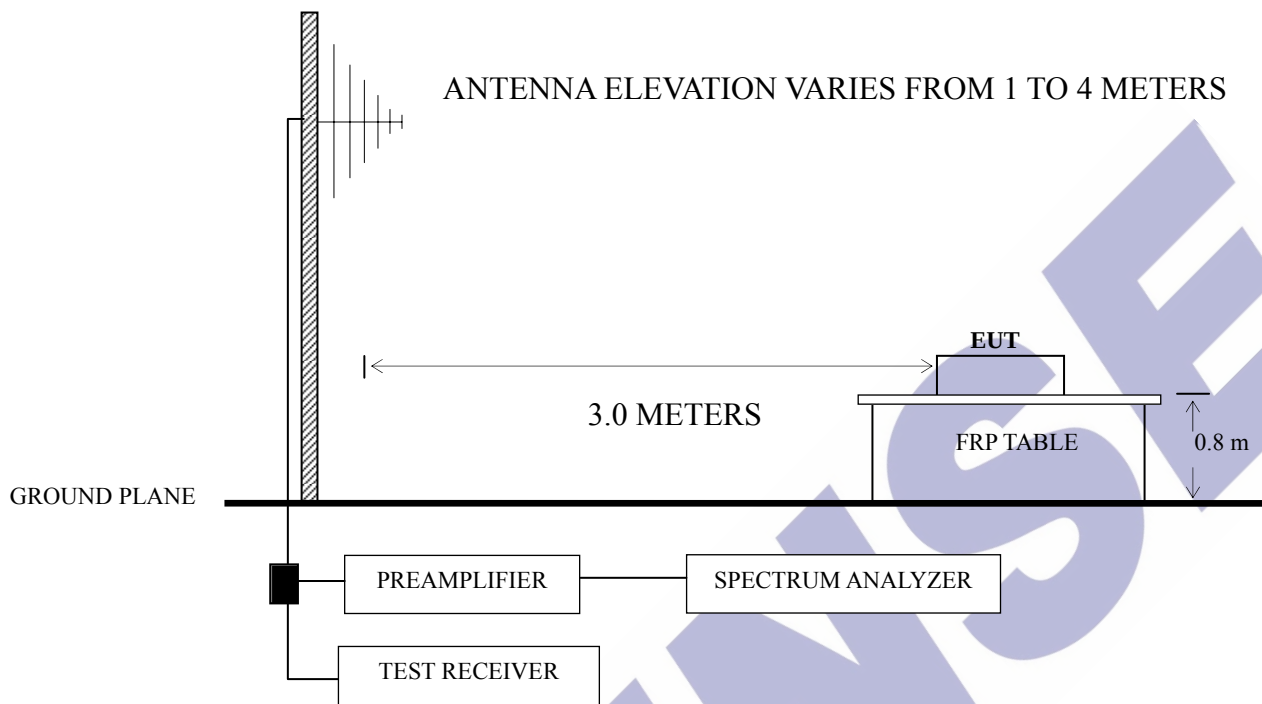
| Item | Type                       | Manufacturer | Model No. | Serial No.             | Last Cal.    | Next Cal.    |
|------|----------------------------|--------------|-----------|------------------------|--------------|--------------|
| 1.   | Preamplifier               | Agilent      | 8447D     | 2944A10548             | Mar 18, 2012 | Sep 18, 2012 |
| 2.   | Preamplifier               | HP           | 8449B     | 3008A00864             | Mar 22, 2012 | Mar 22, 2013 |
| 3.   | Spectrum Analyzer          | Agilent      | E7405A    | MY45106600             | Mar 22, 2012 | Mar 22, 2013 |
| 4.   | Test Receiver              | R&S          | ESVS10    | 844594/001             | Mar 22, 2012 | Mar 22, 2013 |
| 5.   | Bi-log Antenna             | TESEQ        | CBL6112D  | 23192                  | Dec 01, 2011 | Dec 01, 2012 |
| 6.   | Horn Antenna               | EMCO         | 3115      | 9607-4878              | May 06, 2012 | May 06, 2013 |
| 7.   | Horn Antenna               | EMCO         | 3116      | 00062643               | Jun 05, 2012 | Jun 05, 2013 |
| 8.   | 50 $\Omega$ Coaxial Switch | Anritsu      | MP59B     | 6200426390             | Mar 18, 2012 | Sep 18, 2012 |
| 9.   | Software                   | Audix        | E3        | SET00200<br>9912M295-2 | -            | -            |

#### 3.2 Block Diagram of Test Setup

##### 3.2.1 EUT & Peripherals



### 3.2.2 Test Setup



■ : 50 ohm Coaxial Switch

### 3.3 Radiated Emission Limit [FCC Part 15 Subpart C 15.209]

| Frequency<br>(MHz) | Distance<br>(m) | Field strength limits ( $\mu\text{V/m}$ ) |                       |
|--------------------|-----------------|-------------------------------------------|-----------------------|
|                    |                 | ( $\mu\text{V/m}$ )                       | dB( $\mu\text{V/m}$ ) |
| 30 ~ 88            | 3               | 100                                       | 40.0                  |
| 88 ~ 216           | 3               | 150                                       | 43.5                  |
| 216 ~ 960          | 3               | 200                                       | 46.0                  |
| Above 960          | 3               | 500                                       | 54.0                  |

NOTE 1 - Emission Level dB ( $\mu\text{V/m}$ ) = 20 log Emission Level ( $\mu\text{V/m}$ )

NOTE 2 - The tighter limit applies at the band edges.

NOTE 3 - Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

NOTE 4 - The limits shown are based on Quasi-peak value detector below or equal to 1GHz and Average value detector above 1GHz.

NOTE 5 - Above 1 GHz, the limit on peak emission is 20 dB above the maximum permitted average emission limit applicable to the EUT

### 3.4 Test Configuration

The EUT (listed in Sec.2.1) and the simulators (listed in Sec.2.2) were installed as shown on Sec.3.2 to meet FCC requirements and operating in a manner that tends to maximize its emission level in a normal application.

### 3.5 Operating Condition of EUT

3.5.1 Setup the EUT as shown in Sec. 3.2.

3.5.2 Turn on the power of all equipment.

3.5.3 Turn the EUT on the test mode, and then test.

3.5.4 Configured the EUT in three axis: Lying / Side / Stand, and test separately.

### 3.6 Test Procedures

Radiated emission test applies to harmonics/spurs that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209. A pre-amp is necessary for this measurement. For measurement above 1 GHz, set RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation.

The EUT was placed on a turntable that is 0.8 meter above ground. The turntable rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. The antenna moved up and down between 1 meter and 4 meters to find out the maximum emission level. Broadband antenna (Calibrated Bilog Antenna) or Horn antenna was used as receiving antenna. Both horizontal and vertical polarizations of the antenna were set on measurement. In order to find the maximum emission, all of the interference cables were manipulated according to ANSI C63.4:2003 requirements during radiated emission test.

The bandwidth of Test Receiver R&S ESVS10 was set at 120 kHz from 30MHz to 1000MHz.

The bandwidth of the VBW was set at 1MHz and RBW was set at 1MHz for peak emission measurement above 1GHz for Spectrum Agilent E7405A.

The frequency range from 30 MHz to 25 GHz (Up to 10<sup>th</sup> harmonics from fundamental frequency) was checked.

The EUT was tested under the following test modes:

| Mode | Operation    | Channel | Frequency |
|------|--------------|---------|-----------|
| 1.   | Transmitting | 11      | 2405 MHz  |
| 2.   |              | 18      | 2440 MHz  |
| 3.   |              | 25      | 2475 MHz  |
| 4.   | Receiving    | 18      | 2440 MHz  |
| 5.   | Transmitting | 11      | 2405 MHz  |
| 6.   | Band-Edge    | 25      | 2475 MHz  |

All the test results are listed in Sec.3.7.

### 3.7 Test Results

<PASS>

The frequency and amplitude of the highest radiated emission relative the limit is reported. All the emissions not reported below are too low against the FCC limit.

| No. | Operation    | Antenna | Channel    | Frequency | Data Page    |
|-----|--------------|---------|------------|-----------|--------------|
| 1.  | Transmitting | PCB     | 11         | 2405 MHz  | P12          |
| 2.  |              |         | 18         | 2440 MHz  | P13          |
| 3.  |              |         | 25         | 2475 MHz  | P14          |
| 4.  |              | SMA     | 11         | 2405 MHz  | P15          |
| 5.  |              |         | 18         | 2440 MHz  | P16          |
| 6.  |              |         | 25         | 2475 MHz  | P17          |
| 7.  | Receiving    | PCB     | 18         | 2440 MHz  | P18          |
| 8.  |              | SMA     | 18         | 2440 MHz  | P19          |
| 9.  | Transmitting | --      | Duty Cycle |           | P21-22       |
| 10. |              |         | 11         | 2405 MHz  | Band P23-P24 |
| 11. |              |         | 25         | 2475 MHz  | Edge P25-P26 |

NOTE 1 – Level = Read Level + Antenna Factor + Cable Loss (<1GHz)

NOTE 2 – Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor (>1GHz)

NOTE 3 – All reading are Quasi-Peak values below or equal to 1GHz, Peak and Average values above 1GHz.

For above 1GHz test, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.

For harmonic frequencies:

Average value = Peak value - |Duty cycle Factor |

Where, Duty cycle Factor = 20dB (see P22)

NOTE 4 – For Receiving Mode, we selected Receiving Ch18 mode to perform the test.

NOTE 5 – The emission levels recorded below is data of EUT configured in Lying direction, for Lying direction was the maximum emission direction during the test. The data of Side & Stand direction are too low against the official limit to be reported.

EUT : 802.15.4 / ZigBee Module Temperature : 25°C

Model No. : REX3SP Humidity : 45%RH

Serial No. : 5016A9AF Date of Test : Aug 17, 2012

Test Mode : Transmitting Ch11 Antenna : PCB

| Polarization | Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|--------------|-----------------|-----------------------|-----------------------|-----------------|--------------------|--------------------------|------------------|-------------|--------|
| Horizontal   | 42.20           | 11.70                 | 11.52                 | 0.88            | --                 | 24.10                    | 40.00            | 15.90       | QP     |
|              | 93.05           | 17.87                 | 11.12                 | 1.77            | --                 | 30.76                    | 43.50            | 12.74       |        |
|              | 166.77          | 10.54                 | 10.16                 | 2.30            | --                 | 23.00                    | 43.50            | 20.50       |        |
|              | 270.56          | 2.83                  | 12.82                 | 2.67            | --                 | 18.32                    | 46.00            | 27.68       |        |
|              | 496.57          | 0.84                  | 17.56                 | 3.27            | --                 | 21.67                    | 46.00            | 24.33       |        |
|              | 789.51          | 0.26                  | 20.50                 | 3.86            | --                 | 24.62                    | 46.00            | 21.38       |        |
|              | 2071.00         | 48.94                 | 30.62                 | 6.52            | 36.08              | 50.00                    | 74.00            | 24.00       | PK     |
|              | 4042.00         | 47.28                 | 32.58                 | 8.21            | 35.38              | 52.69                    | 74.00            | 21.31       |        |
|              | 4816.00         | 46.07                 | 30.03                 | 9.09            | 35.05              | 50.14                    | 74.00            | 23.86       |        |
|              | 7210.00         | 47.84                 | 34.90                 | 9.83            | 34.53              | 58.04                    | 74.00            | 15.96       |        |
|              | 4816.00         | --                    | --                    | --              | --                 | 30.14                    | 54.00            | 23.86       | AV     |
|              | 7210.00         | --                    | --                    | --              | --                 | 38.04                    | 54.00            | 15.96       |        |
| Vertical     | 34.85           | 5.12                  | 15.70                 | 0.84            | --                 | 21.66                    | 40.00            | 18.34       | QP     |
|              | 75.59           | 6.81                  | 10.27                 | 1.53            | --                 | 18.61                    | 40.00            | 21.39       |        |
|              | 191.99          | 10.92                 | 9.87                  | 2.40            | --                 | 23.19                    | 43.50            | 20.31       |        |
|              | 340.40          | 8.33                  | 14.83                 | 2.86            | --                 | 26.02                    | 46.00            | 19.98       |        |
|              | 583.87          | 0.69                  | 18.12                 | 3.44            | --                 | 22.25                    | 46.00            | 23.75       |        |
|              | 803.09          | 1.23                  | 20.59                 | 3.99            | --                 | 25.81                    | 46.00            | 20.19       |        |
|              | 2080.00         | 48.97                 | 30.59                 | 6.52            | 36.07              | 50.01                    | 74.00            | 23.99       | PK     |
|              | 3115.00         | 49.74                 | 29.35                 | 6.58            | 35.62              | 50.05                    | 74.00            | 23.95       |        |
|              | 4816.00         | 52.06                 | 30.03                 | 9.09            | 35.05              | 56.13                    | 74.00            | 17.87       |        |
|              | 7210.00         | 48.22                 | 34.90                 | 9.83            | 34.53              | 58.42                    | 74.00            | 15.58       |        |
|              | 4816.00         | --                    | --                    | --              | --                 | 36.13                    | 54.00            | 17.87       | AV     |
|              | 7210.00         | --                    | --                    | --              | --                 | 38.42                    | 54.00            | 15.58       |        |

TEST ENGINEER: RAVEN JIN

EUT : 802.15.4 / ZigBee Module Temperature : 25°C

Model No. : REX3SP Humidity : 45%RH

Serial No. : 5016A9AF Date of Test : Aug 17, 2012

Test Mode : Transmitting Ch18 Antenna : PCB

| Polarization | Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|--------------|-----------------|-----------------------|-----------------------|-----------------|--------------------|--------------------------|------------------|-------------|--------|
| Horizontal   | 39.70           | 11.20                 | 12.80                 | 0.87            | --                 | 24.87                    | 40.00            | 15.13       | QP     |
|              | 64.92           | 6.71                  | 9.49                  | 1.30            | --                 | 17.50                    | 40.00            | 22.50       |        |
|              | 170.65          | 15.28                 | 10.10                 | 2.32            | --                 | 27.70                    | 43.50            | 15.80       |        |
|              | 245.34          | 8.19                  | 11.75                 | 2.60            | --                 | 22.54                    | 46.00            | 23.46       |        |
|              | 450.01          | 3.91                  | 16.98                 | 3.13            | --                 | 24.02                    | 46.00            | 21.98       |        |
|              | 806.00          | 1.84                  | 20.58                 | 3.99            | --                 | 26.41                    | 46.00            | 19.59       |        |
|              | 1711.00         | 50.70                 | 28.04                 | 6.10            | 36.48              | 48.36                    | 74.00            | 25.64       | PK     |
|              | 3781.00         | 48.53                 | 31.92                 | 7.62            | 35.44              | 52.63                    | 74.00            | 21.37       |        |
|              | 4888.00         | 47.76                 | 29.86                 | 9.14            | 35.01              | 51.75                    | 74.00            | 22.25       |        |
|              | 7327.00         | 49.44                 | 35.34                 | 9.91            | 34.53              | 60.16                    | 74.00            | 13.84       |        |
|              | 4888.00         | --                    | --                    | --              | --                 | 31.75                    | 54.00            | 22.25       | AV     |
|              | 7327.00         | --                    | --                    | --              | --                 | 40.16                    | 54.00            | 13.84       |        |
| Vertical     | 32.91           | 1.52                  | 16.79                 | 0.82            | --                 | 19.13                    | 40.00            | 20.87       | QP     |
|              | 104.69          | 9.15                  | 11.27                 | 1.89            | --                 | 22.31                    | 43.50            | 21.19       |        |
|              | 157.07          | 10.52                 | 10.30                 | 2.26            | --                 | 23.08                    | 43.50            | 20.42       |        |
|              | 268.62          | 3.88                  | 12.74                 | 2.66            | --                 | 19.28                    | 46.00            | 26.72       |        |
|              | 493.66          | 1.69                  | 17.53                 | 3.25            | --                 | 22.47                    | 46.00            | 23.53       |        |
|              | 831.22          | 1.62                  | 20.51                 | 4.22            | --                 | 26.35                    | 46.00            | 19.65       |        |
|              | 1882.00         | 48.64                 | 30.00                 | 6.29            | 36.24              | 48.69                    | 74.00            | 25.31       | PK     |
|              | 3592.00         | 48.46                 | 31.15                 | 7.32            | 35.48              | 51.45                    | 74.00            | 22.55       |        |
|              | 4888.00         | 54.17                 | 29.86                 | 9.14            | 35.01              | 58.16                    | 74.00            | 15.84       |        |
|              | 7327.00         | 50.37                 | 35.34                 | 9.91            | 34.53              | 61.09                    | 74.00            | 12.91       |        |
|              | 4888.00         | --                    | --                    | --              | --                 | 38.16                    | 54.00            | 15.84       | AV     |
|              | 7327.00         | --                    | --                    | --              | --                 | 41.09                    | 54.00            | 12.91       |        |

TEST ENGINEER: RAVEN JIN

EUT : 802.15.4 / ZigBee Module Temperature : 25°C

Model No. : REX3SP Humidity : 45%RH

Serial No. : 5016A9AF Date of Test : Aug 17, 2012

Test Mode : Transmitting Ch25 Antenna : PCB

| Polarization | Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|--------------|-----------------|-----------------------|-----------------------|-----------------|--------------------|--------------------------|------------------|-------------|--------|
| Horizontal   | 47.46           | 12.36                 | 9.37                  | 0.90            | --                 | 22.63                    | 40.00            | 17.37       | QP     |
|              | 88.20           | 9.35                  | 10.93                 | 1.70            | --                 | 21.98                    | 43.50            | 21.52       |        |
|              | 182.29          | 10.31                 | 9.97                  | 2.36            | --                 | 22.64                    | 43.50            | 20.86       |        |
|              | 332.64          | 6.21                  | 14.62                 | 2.84            | --                 | 23.67                    | 46.00            | 22.33       |        |
|              | 481.05          | 1.06                  | 17.39                 | 3.21            | --                 | 21.66                    | 46.00            | 24.34       |        |
|              | 749.74          | 1.36                  | 20.05                 | 3.80            | --                 | 25.21                    | 46.00            | 20.79       |        |
|              | 1990.00         | 48.12                 | 30.91                 | 6.41            | 36.11              | 49.33                    | 74.00            | 24.67       | PK     |
|              | 3952.00         | 47.02                 | 32.52                 | 8.13            | 35.41              | 52.26                    | 74.00            | 21.74       |        |
|              | 4951.00         | 47.21                 | 29.73                 | 9.20            | 34.98              | 51.16                    | 74.00            | 22.84       |        |
|              | 7425.00         | 47.96                 | 35.76                 | 10.02           | 34.52              | 59.22                    | 74.00            | 14.78       |        |
|              | 4951.00         | --                    | --                    | --              | --                 | 31.16                    | 54.00            | 22.84       | AV     |
|              | 7425.00         | --                    | --                    | --              | --                 | 39.22                    | 54.00            | 14.78       |        |
| Vertical     | 36.79           | 7.18                  | 14.57                 | 0.85            | --                 | 22.60                    | 40.00            | 17.40       | QP     |
|              | 52.31           | 11.28                 | 8.63                  | 0.97            | --                 | 20.88                    | 40.00            | 19.12       |        |
|              | 164.83          | 13.79                 | 10.18                 | 2.30            | --                 | 26.27                    | 43.50            | 17.23       |        |
|              | 298.69          | 3.42                  | 13.67                 | 2.75            | --                 | 19.84                    | 46.00            | 26.16       |        |
|              | 470.38          | 2.00                  | 17.24                 | 3.19            | --                 | 22.43                    | 46.00            | 23.57       |        |
|              | 791.45          | 1.55                  | 20.50                 | 3.88            | --                 | 25.93                    | 46.00            | 20.07       |        |
|              | 1333.00         | 58.00                 | 25.11                 | 5.53            | 37.39              | 51.25                    | 74.00            | 22.75       | PK     |
|              | 3979.00         | 47.15                 | 32.63                 | 8.13            | 35.40              | 52.51                    | 74.00            | 21.49       |        |
|              | 4951.00         | 55.28                 | 29.73                 | 9.20            | 34.98              | 59.23                    | 74.00            | 14.77       |        |
|              | 7425.00         | 50.35                 | 35.76                 | 10.02           | 34.52              | 61.61                    | 74.00            | 12.39       |        |
|              | 4951.00         | --                    | --                    | --              | --                 | 39.23                    | 54.00            | 14.77       | AV     |
|              | 7425.00         | --                    | --                    | --              | --                 | 41.61                    | 54.00            | 12.39       |        |

TEST ENGINEER: RAVEN JIN

EUT : 802.15.4 / ZigBee Module Temperature : 25°C

Model No. : REX3SP Humidity : 45%RH

Serial No. : 50169F26 Date of Test : Aug 17, 2012

Test Mode : Transmitting Ch11 Antenna : SMA

| Polarization | Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|--------------|-----------------|-----------------------|-----------------------|-----------------|--------------------|--------------------------|------------------|-------------|--------|
| Horizontal   | 37.76           | 8.24                  | 14.00                 | 0.86            | --                 | 23.10                    | 40.00            | 16.90       | QP     |
|              | 67.83           | 8.21                  | 9.70                  | 1.36            | --                 | 19.27                    | 40.00            | 20.73       |        |
|              | 163.86          | 13.25                 | 10.20                 | 2.29            | --                 | 25.74                    | 43.50            | 17.76       |        |
|              | 237.58          | 9.77                  | 11.41                 | 2.57            | --                 | 23.75                    | 46.00            | 22.25       |        |
|              | 468.44          | 2.98                  | 17.22                 | 3.19            | --                 | 23.39                    | 46.00            | 22.61       |        |
|              | 756.53          | 1.69                  | 20.16                 | 3.82            | --                 | 25.67                    | 46.00            | 20.33       |        |
|              | 1846.00         | 48.35                 | 29.62                 | 6.26            | 36.29              | 47.94                    | 74.00            | 26.06       | PK     |
|              | 3628.00         | 49.00                 | 31.31                 | 7.42            | 35.47              | 52.26                    | 74.00            | 21.74       |        |
|              | 4816.00         | 50.51                 | 30.03                 | 9.09            | 35.05              | 54.58                    | 74.00            | 19.42       |        |
|              | 7210.00         | 48.18                 | 34.90                 | 9.83            | 34.53              | 58.38                    | 74.00            | 15.62       |        |
|              | 4816.00         | --                    | --                    | --              | --                 | 34.58                    | 54.00            | 19.42       | AV     |
|              | 7210.00         | --                    | --                    | --              | --                 | 38.38                    | 54.00            | 15.62       |        |
| Vertical     | 33.88           | 2.07                  | 16.26                 | 0.83            | --                 | 19.16                    | 40.00            | 20.84       | QP     |
|              | 94.99           | 6.04                  | 11.18                 | 1.80            | --                 | 19.02                    | 43.50            | 24.48       |        |
|              | 142.52          | 8.05                  | 10.56                 | 2.18            | --                 | 20.79                    | 43.50            | 22.71       |        |
|              | 246.31          | 4.01                  | 11.80                 | 2.60            | --                 | 18.41                    | 46.00            | 27.59       |        |
|              | 533.43          | 0.57                  | 17.80                 | 3.33            | --                 | 21.70                    | 46.00            | 24.30       |        |
|              | 762.35          | 1.49                  | 20.20                 | 3.82            | --                 | 25.51                    | 46.00            | 20.49       |        |
|              | 1324.00         | 53.60                 | 25.08                 | 5.51            | 37.41              | 46.78                    | 74.00            | 27.22       | PK     |
|              | 3358.00         | 49.07                 | 30.34                 | 6.92            | 35.54              | 50.79                    | 74.00            | 23.21       |        |
|              | 4816.00         | 59.23                 | 30.03                 | 9.09            | 35.05              | 63.30                    | 74.00            | 10.70       |        |
|              | 7210.00         | 62.07                 | 34.90                 | 9.83            | 34.53              | 72.27                    | 74.00            | 1.73        |        |
|              | 4816.00         | --                    | --                    | --              | --                 | 43.30                    | 54.00            | 10.70       | AV     |
|              | 7210.00         | --                    | --                    | --              | --                 | 52.27                    | 54.00            | 1.73        |        |

TEST ENGINEER: RAVEN JIN

EUT : 802.15.4 / ZigBee Module Temperature : 25°C

Model No. : REX3SP Humidity : 45%RH

Serial No. : 50169F26 Date of Test : Aug 17, 2012

Test Mode : Transmitting Ch18 Antenna : SMA

| Polarization | Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|--------------|-----------------|-----------------------|-----------------------|-----------------|--------------------|--------------------------|------------------|-------------|--------|
| Horizontal   | 37.76           | 9.46                  | 14.00                 | 0.86            | --                 | 24.32                    | 40.00            | 15.68       | QP     |
|              | 65.89           | 3.38                  | 9.55                  | 1.32            | --                 | 14.25                    | 40.00            | 25.75       |        |
|              | 160.95          | 13.04                 | 10.24                 | 2.28            | --                 | 25.56                    | 43.50            | 17.94       |        |
|              | 269.59          | 2.84                  | 12.78                 | 2.66            | --                 | 18.28                    | 46.00            | 27.72       |        |
|              | 518.88          | 1.42                  | 17.72                 | 3.31            | --                 | 22.45                    | 46.00            | 23.55       |        |
|              | 803.09          | 1.43                  | 20.59                 | 3.99            | --                 | 26.01                    | 46.00            | 19.99       |        |
|              | 2044.00         | 49.23                 | 30.78                 | 6.48            | 36.09              | 50.40                    | 74.00            | 23.60       | PK     |
|              | 3763.00         | 48.93                 | 31.84                 | 7.62            | 35.44              | 52.95                    | 74.00            | 21.05       |        |
|              | 4888.00         | 51.50                 | 29.86                 | 9.14            | 35.01              | 55.49                    | 74.00            | 18.51       |        |
|              | 7327.00         | 48.10                 | 35.34                 | 9.91            | 34.53              | 58.82                    | 74.00            | 15.18       |        |
|              | 4888.00         | --                    | --                    | --              | --                 | 35.49                    | 54.00            | 18.51       | AV     |
|              | 7327.00         | --                    | --                    | --              | --                 | 38.82                    | 54.00            | 15.18       |        |
| Vertical     | 37.76           | 8.21                  | 14.00                 | 0.86            | --                 | 23.07                    | 40.00            | 16.93       | QP     |
|              | 54.25           | 11.40                 | 8.76                  | 1.03            | --                 | 21.19                    | 40.00            | 18.81       |        |
|              | 158.04          | 13.03                 | 10.28                 | 2.27            | --                 | 25.58                    | 43.50            | 17.92       |        |
|              | 270.56          | 2.51                  | 12.82                 | 2.67            | --                 | 18.00                    | 46.00            | 28.00       |        |
|              | 493.66          | 0.90                  | 17.53                 | 3.25            | --                 | 21.68                    | 46.00            | 24.32       |        |
|              | 806.00          | 2.14                  | 20.58                 | 3.99            | --                 | 26.71                    | 46.00            | 19.29       |        |
|              | 1387.00         | 53.76                 | 25.29                 | 5.57            | 37.23              | 47.39                    | 74.00            | 26.61       | PK     |
|              | 3745.00         | 48.21                 | 31.79                 | 7.62            | 35.45              | 52.17                    | 74.00            | 21.83       |        |
|              | 4888.00         | 58.98                 | 29.86                 | 9.14            | 35.01              | 62.97                    | 74.00            | 11.03       |        |
|              | 7327.00         | 59.79                 | 35.34                 | 9.91            | 34.53              | 70.51                    | 74.00            | 3.49        |        |
|              | 4888.00         | --                    | --                    | --              | --                 | 42.97                    | 54.00            | 11.03       | AV     |
|              | 7327.00         | --                    | --                    | --              | --                 | 50.51                    | 54.00            | 3.49        |        |

TEST ENGINEER: RAVEN JIN

EUT : 802.15.4 / ZigBee Module Temperature : 25°C

Model No. : REX3SP Humidity : 45%RH

Serial No. : 50169F26 Date of Test : Aug 17, 2012

Test Mode : Transmitting Ch25 Antenna : SMA

| Polarization | Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|--------------|-----------------|-----------------------|-----------------------|-----------------|--------------------|--------------------------|------------------|-------------|--------|
| Horizontal   | 38.73           | 9.81                  | 13.40                 | 0.86            | --                 | 24.07                    | 40.00            | 15.93       | QP     |
|              | 97.90           | 6.60                  | 11.28                 | 1.83            | --                 | 19.71                    | 43.50            | 23.79       |        |
|              | 164.83          | 11.99                 | 10.18                 | 2.30            | --                 | 24.47                    | 43.50            | 19.03       |        |
|              | 254.07          | 5.46                  | 12.18                 | 2.62            | --                 | 20.26                    | 46.00            | 25.74       |        |
|              | 431.58          | 5.53                  | 16.72                 | 3.08            | --                 | 25.33                    | 46.00            | 20.67       |        |
|              | 786.60          | 1.27                  | 20.47                 | 3.86            | --                 | 25.60                    | 46.00            | 20.40       |        |
|              | 1657.00         | 48.86                 | 27.37                 | 6.03            | 36.57              | 45.69                    | 74.00            | 28.31       | PK     |
|              | 2971.00         | 49.99                 | 28.88                 | 6.49            | 35.68              | 49.68                    | 74.00            | 24.32       |        |
|              | 4951.00         | 57.23                 | 29.73                 | 9.20            | 34.98              | 61.18                    | 74.00            | 12.82       |        |
|              | 7425.00         | 54.79                 | 35.76                 | 10.02           | 34.52              | 66.05                    | 74.00            | 7.95        |        |
|              | 4951.00         | --                    | --                    | --              | --                 | 41.18                    | 54.00            | 12.82       | AV     |
|              | 7425.00         | --                    | --                    | --              | --                 | 46.05                    | 54.00            | 7.95        |        |
| Vertical     | 35.82           | 11.06                 | 15.19                 | 0.84            | --                 | 27.09                    | 40.00            | 12.91       | QP     |
|              | 64.92           | 7.09                  | 9.49                  | 1.30            | --                 | 17.88                    | 40.00            | 22.12       |        |
|              | 167.74          | 11.24                 | 10.14                 | 2.31            | --                 | 23.69                    | 43.50            | 19.81       |        |
|              | 400.54          | 6.10                  | 16.30                 | 2.99            | --                 | 25.39                    | 46.00            | 20.61       |        |
|              | 610.06          | 0.83                  | 18.33                 | 3.49            | --                 | 22.65                    | 46.00            | 23.35       |        |
|              | 816.67          | 0.78                  | 20.55                 | 4.11            | --                 | 25.44                    | 46.00            | 20.56       |        |
|              | 1342.00         | 51.90                 | 25.15                 | 5.53            | 37.37              | 45.21                    | 74.00            | 28.79       | PK     |
|              | 4060.00         | 47.81                 | 32.49                 | 8.21            | 35.37              | 53.14                    | 74.00            | 20.86       |        |
|              | 4951.00         | 61.74                 | 29.73                 | 9.20            | 34.98              | 65.69                    | 74.00            | 8.31        |        |
|              | 7425.00         | 58.66                 | 35.76                 | 10.02           | 34.52              | 69.92                    | 74.00            | 4.08        |        |
|              | 4951.00         | --                    | --                    | --              | --                 | 45.69                    | 54.00            | 8.31        | AV     |
|              | 7425.00         | --                    | --                    | --              | --                 | 49.92                    | 54.00            | 4.08        |        |

TEST ENGINEER: RAVEN JIN

EUT : 802.15.4 / ZigBee Module Temperature : 25°C

Model No. : REX3SP Humidity : 45%RH

Serial No. : 5016A9AF Date of Test : Aug 17, 2012

Test Mode : Receiving Ch18 Antenna : PCB

| Polarization | Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|--------------|-----------------|-----------------------|-----------------------|-----------------|--------------------------|--------------------------|------------------|-------------|--------|
| Horizontal   | 34.85           | 5.30                  | 15.70                 | 0.84            | --                       | 21.84                    | 40.00            | 18.16       | QP     |
|              | 80.44           | 14.85                 | 10.56                 | 1.59            | --                       | 27.00                    | 40.00            | 13.00       |        |
|              | 161.92          | 11.44                 | 10.23                 | 2.28            | --                       | 23.95                    | 43.50            | 19.55       |        |
|              | 259.89          | 6.10                  | 12.40                 | 2.64            | --                       | 21.14                    | 46.00            | 24.86       |        |
|              | 550.89          | 0.53                  | 17.92                 | 3.37            | --                       | 21.82                    | 46.00            | 24.18       |        |
|              | 831.22          | 0.55                  | 20.51                 | 4.22            | --                       | 25.28                    | 46.00            | 20.72       | PK     |
|              | 1333.00         | 53.55                 | 25.11                 | 5.53            | 37.39                    | 46.80                    | 74.00            | 27.20       |        |
|              | 1999.00         | 48.46                 | 31.00                 | 6.44            | 36.10                    | 49.80                    | 74.00            | 24.20       |        |
|              | 3871.00         | 47.23                 | 32.25                 | 7.88            | 35.42                    | 51.94                    | 74.00            | 22.06       |        |
|              | 8371.00         | 47.83                 | 36.06                 | 11.15           | 34.63                    | 60.41                    | 74.00            | 13.59       |        |
|              | 8371.00         | 30.55                 | 36.06                 | 11.15           | 34.63                    | 43.13                    | 54.00            | 10.87       | AV     |
| Vertical     | 46.49           | 13.61                 | 9.72                  | 0.90            | --                       | 24.23                    | 40.00            | 15.77       | QP     |
|              | 96.93           | 13.33                 | 11.24                 | 1.82            | --                       | 26.39                    | 43.50            | 17.11       |        |
|              | 176.47          | 11.84                 | 10.03                 | 2.34            | --                       | 24.21                    | 43.50            | 19.29       |        |
|              | 295.78          | 9.42                  | 13.60                 | 2.75            | --                       | 25.77                    | 46.00            | 20.23       |        |
|              | 476.20          | 0.99                  | 17.32                 | 3.21            | --                       | 21.52                    | 46.00            | 24.48       |        |
|              | 744.89          | -0.18                 | 20.01                 | 3.78            | --                       | 23.61                    | 46.00            | 22.39       | PK     |
|              | 1369.00         | 53.70                 | 25.24                 | 5.55            | 37.29                    | 47.20                    | 74.00            | 26.80       |        |
|              | 2143.00         | 50.02                 | 30.20                 | 6.59            | 36.05                    | 50.76                    | 74.00            | 23.24       |        |
|              | 3772.00         | 48.74                 | 31.88                 | 7.62            | 35.44                    | 52.80                    | 74.00            | 21.20       |        |
|              | 7489.00         | 47.77                 | 35.90                 | 10.14           | 34.52                    | 59.29                    | 74.00            | 14.71       |        |
|              | 7489.00         | 29.98                 | 35.90                 | 10.14           | 34.52                    | 41.50                    | 54.00            | 12.50       | AV     |

TEST ENGINEER: RAVEN JIN

EUT : 802.15.4 / ZigBee Module Temperature : 25°C

Model No. : REX3SP Humidity : 45%RH

Serial No. : 50169F26 Date of Test : Aug 17, 2012

Test Mode : Receiving Ch18 Antenna : SMA

| Polarization | Frequency (MHz) | Meter Reading dB (μV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Emission Level dB (μV/m) | Limits dB (μV/m) | Margin (dB) | Remark |
|--------------|-----------------|-----------------------|-----------------------|-----------------|--------------------|--------------------------|------------------|-------------|--------|
| Horizontal   | 35.82           | 10.72                 | 15.19                 | 0.84            | --                 | 26.75                    | 40.00            | 13.25       | QP     |
|              | 96.93           | 12.79                 | 11.24                 | 1.82            | --                 | 25.85                    | 43.50            | 17.65       |        |
|              | 171.62          | 15.27                 | 10.09                 | 2.32            | --                 | 27.68                    | 43.50            | 15.82       |        |
|              | 266.68          | 5.31                  | 12.66                 | 2.66            | --                 | 20.63                    | 46.00            | 25.37       |        |
|              | 458.74          | 2.89                  | 17.09                 | 3.15            | --                 | 23.13                    | 46.00            | 22.87       |        |
|              | 762.35          | 1.19                  | 20.20                 | 3.82            | --                 | 25.21                    | 46.00            | 20.79       |        |
|              | 1342.00         | 53.10                 | 25.15                 | 5.53            | 37.37              | 46.41                    | 74.00            | 27.59       | PK     |
|              | 2053.00         | 49.81                 | 30.72                 | 6.48            | 36.08              | 50.93                    | 74.00            | 23.07       |        |
|              | 4105.00         | 47.74                 | 32.32                 | 8.30            | 35.36              | 53.00                    | 74.00            | 21.00       |        |
|              | 8443.00         | 47.97                 | 36.27                 | 11.37           | 34.66              | 60.95                    | 74.00            | 13.05       |        |
| Vertical     | 8443.00         | 30.10                 | 36.27                 | 11.37           | 34.66              | 43.08                    | 54.00            | 10.92       | AV     |
|              | 37.76           | 15.86                 | 14.00                 | 0.86            | --                 | 30.72                    | 40.00            | 9.28        | QP     |
|              | 62.98           | 5.61                  | 9.36                  | 1.26            | --                 | 16.23                    | 40.00            | 23.77       |        |
|              | 164.83          | 9.95                  | 10.18                 | 2.30            | --                 | 22.43                    | 43.50            | 21.07       |        |
|              | 346.22          | 6.23                  | 15.00                 | 2.88            | --                 | 24.11                    | 46.00            | 21.89       |        |
|              | 486.87          | 0.44                  | 17.46                 | 3.23            | --                 | 21.13                    | 46.00            | 24.87       |        |
|              | 752.65          | 0.47                  | 20.09                 | 3.80            | --                 | 24.36                    | 46.00            | 21.64       | PK     |
|              | 1324.00         | 57.00                 | 25.08                 | 5.51            | 37.41              | 50.18                    | 74.00            | 23.82       |        |
|              | 3556.00         | 49.24                 | 31.03                 | 7.22            | 35.49              | 52.00                    | 74.00            | 22.00       |        |
|              | 5392.00         | 47.23                 | 32.68                 | 9.50            | 34.79              | 54.62                    | 74.00            | 19.38       |        |
|              | 8479.00         | 47.50                 | 36.40                 | 11.37           | 34.67              | 60.60                    | 74.00            | 13.40       |        |
|              | 5392.00         | 29.23                 | 32.68                 | 9.50            | 34.79              | 36.62                    | 54.00            | 17.38       | AV     |
|              | 8479.00         | 27.23                 | 36.40                 | 11.37           | 34.67              | 40.33                    | 54.00            | 13.67       |        |

TEST ENGINEER: RAVEN JIN

**Band edge using conducted measurement:**

According to the KDB 558074 D01 DTS Meas Guidance v01 5.4.2.1, antenna-port conducted measurements is also be permitted as an alternative to radiated measurements in the restricted frequency bands.

The transmitter output was connected to the spectrum analyzer. The EUT was set to transmit continuously ( $\geq 98\%$  duty cycle).

The test procedure is defined in KDB558074 v01:2012 (the 5.4.2.2.1 Measurement Procedure RBAVG1 (Power Averaging) was used for average measurement & the 5.4.2.2.3 was used for peak measurement).

Note1 – The additional radiated test was performed to prove that the cabinet emissions (transmit antenna be replaced with a termination) also meets the requirement.

**Cabinet Emission:**

| Polarization | Frequency (MHz) | Meter Reading dB ( $\mu$ V) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Emission Level dB ( $\mu$ V/m) | Limits dB ( $\mu$ V/m) | Margin (dB) | Remark |
|--------------|-----------------|-----------------------------|-----------------------|-----------------|--------------------------|--------------------------------|------------------------|-------------|--------|
| Horizontal   | 2390.00         | 55.20                       | 29.19                 | 6.89            | 36.09                    | 55.19                          | 74.00                  | 18.81       | PK     |
|              | 2483.50         | 52.93                       | 29.55                 | 6.96            | 36.07                    | 53.37                          | 74.00                  | 20.63       |        |
|              | 2390.00         | 44.93                       | 29.19                 | 6.89            | 36.09                    | 44.92                          | 54.00                  | 9.08        | AV     |
|              | 2483.50         | 42.94                       | 29.55                 | 6.96            | 36.07                    | 43.38                          | 54.00                  | 10.62       |        |
| Vertical     | 2390.00         | 55.45                       | 29.19                 | 6.89            | 36.09                    | 55.44                          | 74.00                  | 18.56       | PK     |
|              | 2483.50         | 56.56                       | 29.55                 | 6.96            | 36.07                    | 57.00                          | 74.00                  | 17.00       |        |
|              | 2390.00         | 45.33                       | 29.19                 | 6.89            | 36.09                    | 45.32                          | 54.00                  | 8.68        | AV     |
|              | 2483.50         | 43.88                       | 29.55                 | 6.96            | 36.07                    | 44.32                          | 54.00                  | 9.68        |        |

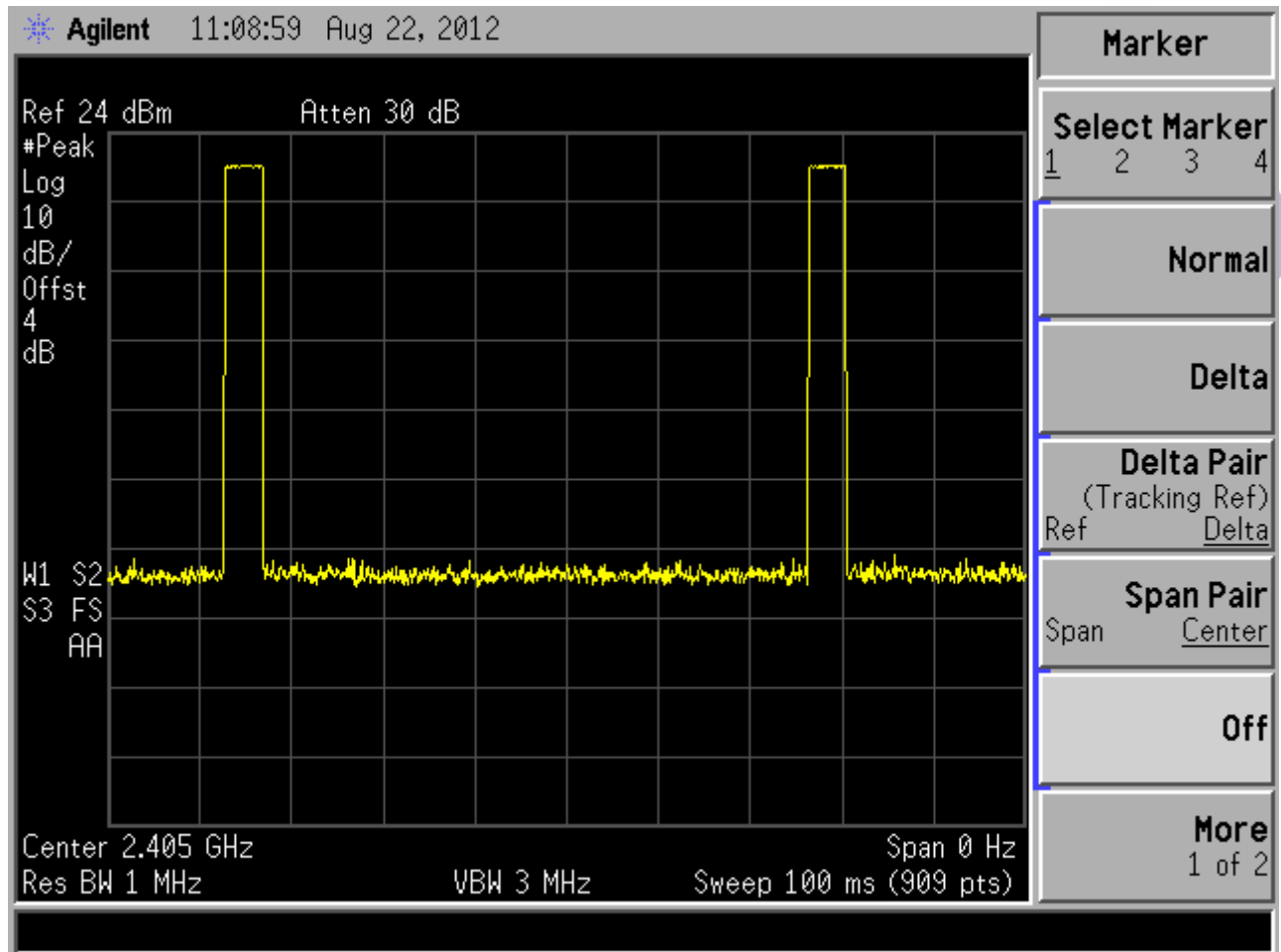
Note2 - Under normal operating conditions according to IEEE Std 802.15.4-2006, the transmitter dwell time on one channel is below 10% , therefore average detector reading are reduced by the duty cycle correction factor of **20 dB**. (the duty cycle plot refer to the next page.)

Note3 - The antenna gain (2dBi) and cable loss (2dB) were set as offset (4dB) in the spectrum.

## Duty Cycle

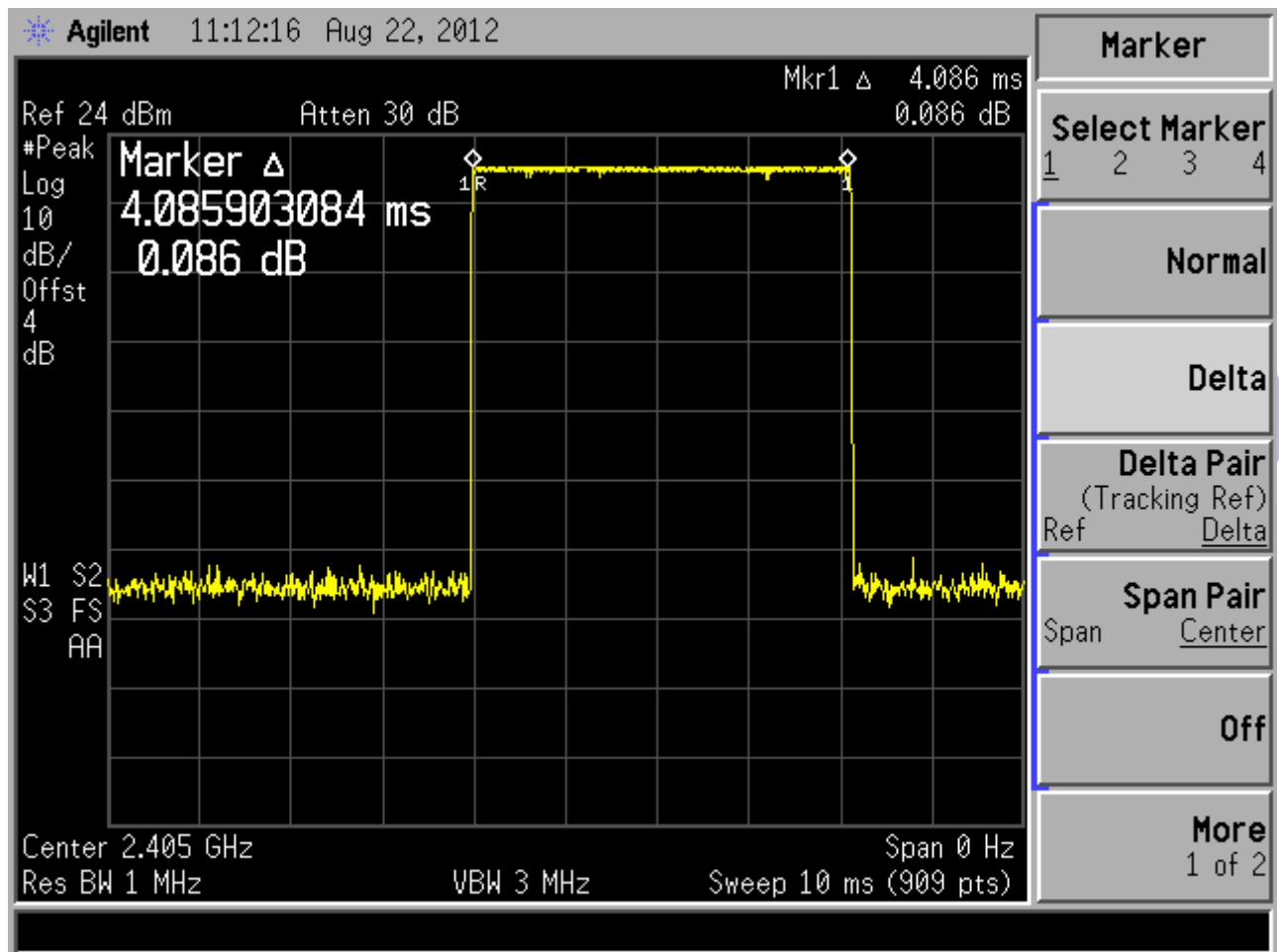
The worst-case duty cycle for typical EUT operation is shown below.

The pulse train of the EUT extends beyond 100 ms as shown in the following plot:



100ms period

This period contains one kind of typical pulse.

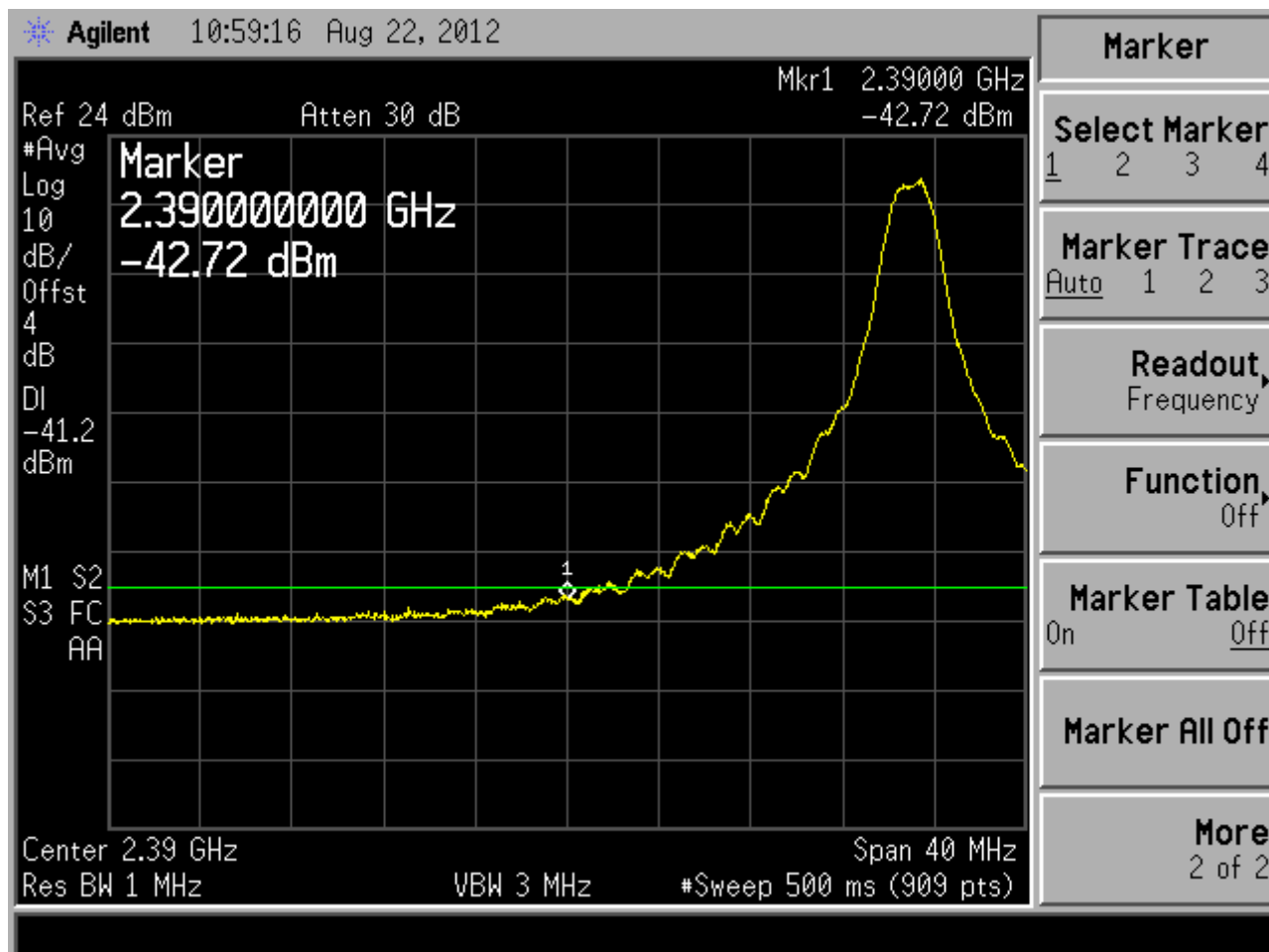


Typical pulse width (4.086 ms)

Duty cycle =  $2 \times (4.086 \text{ ms}) = 8.172 \text{ ms}$  in a 100ms period  
 Duty cycle factor =  $|20 \log (8.172 / 100)| = 21.75 \text{ dB}$

We use 20 dB as the duty cycle factor in the average value calculation.

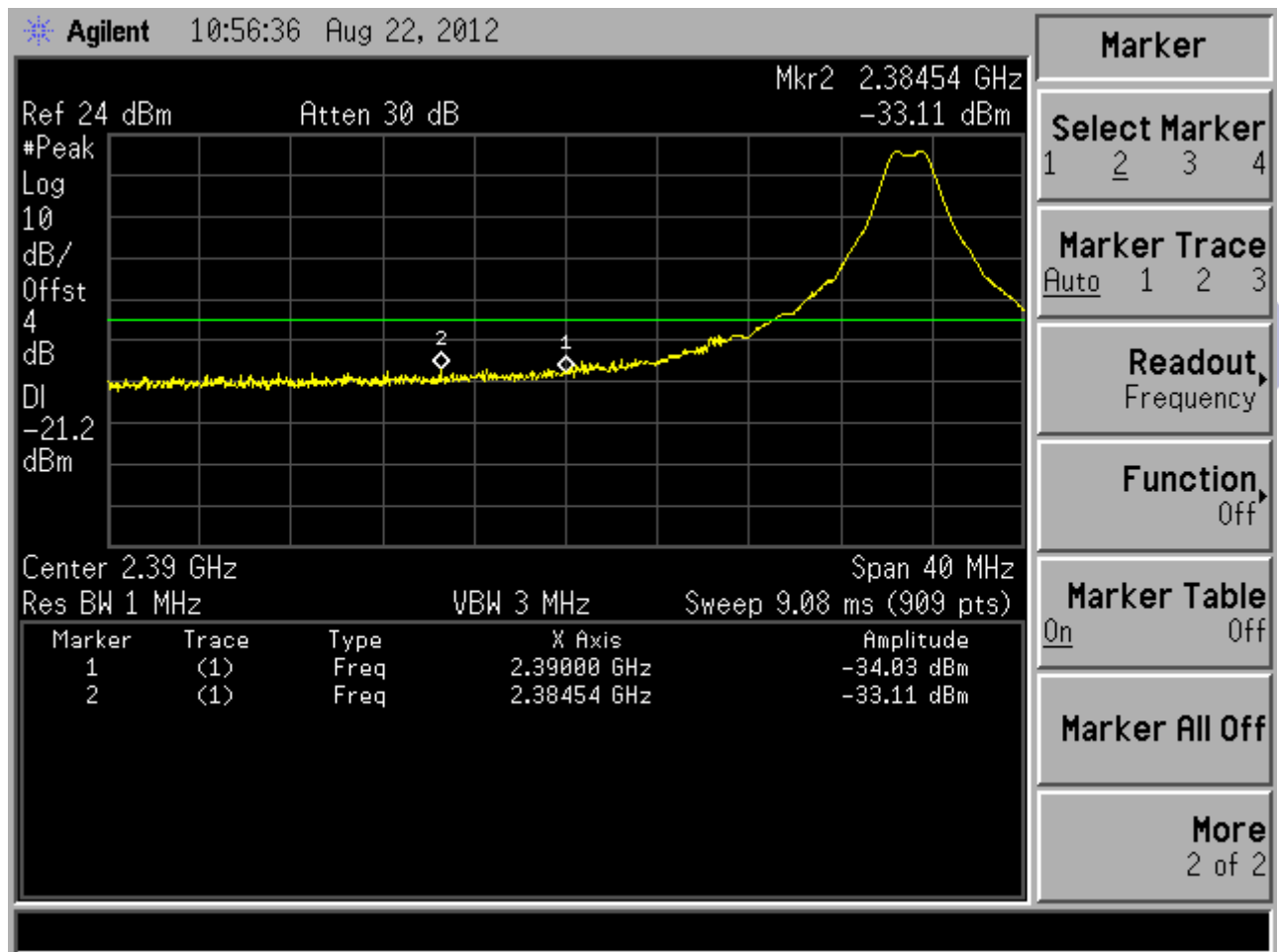
## AV Result on CH 11



Maximum AV value @ 2390MHz = -42.72 dBm  
Limit = -41.2 dBm

Result is **PASS**

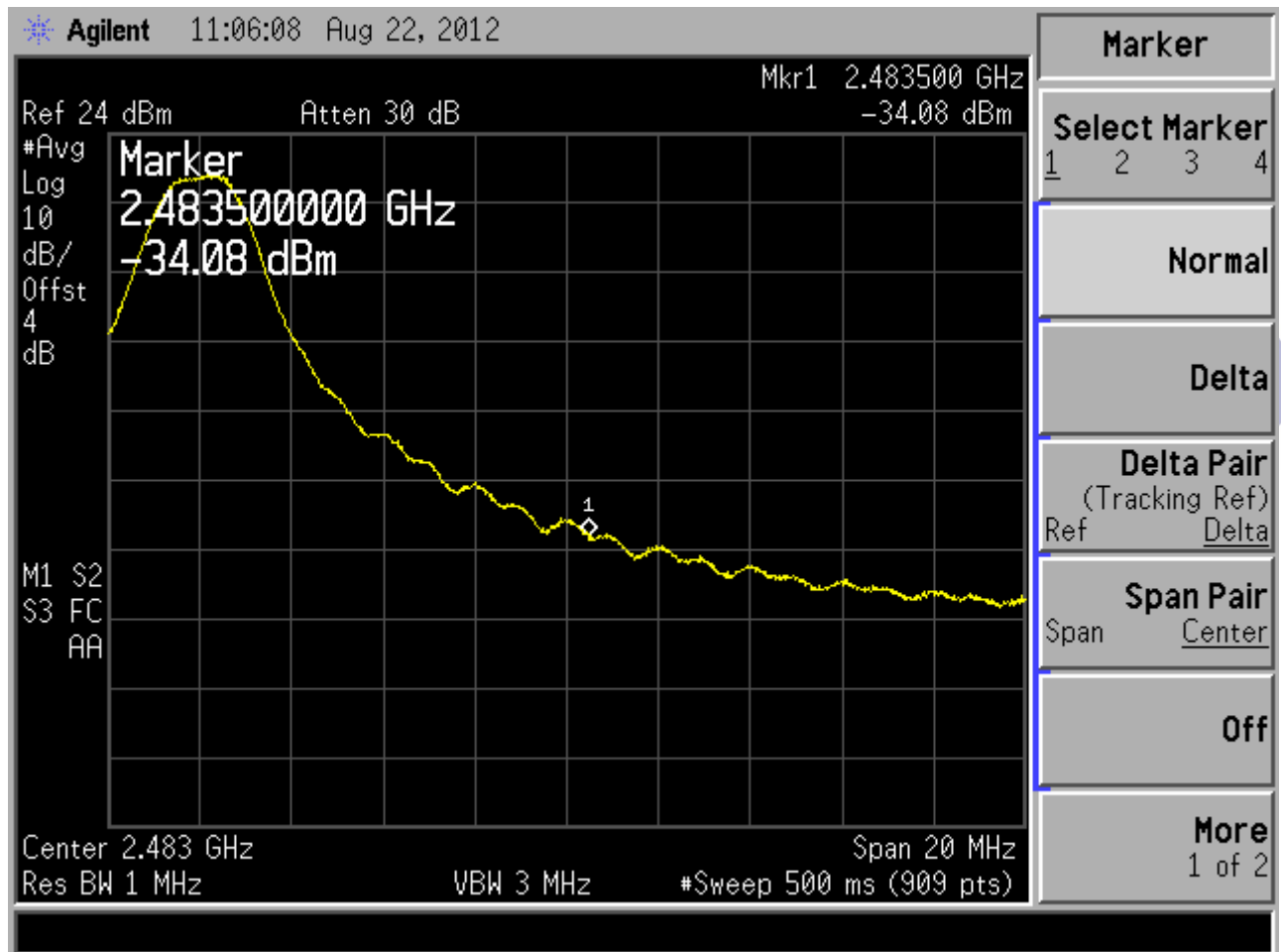
## PK Result on CH 11



Maximum PK value @ 2384.54MHz = -33.11 dBm  
Limit = -21.2 dBm

Result is **PASS**

## AV Result on CH 25



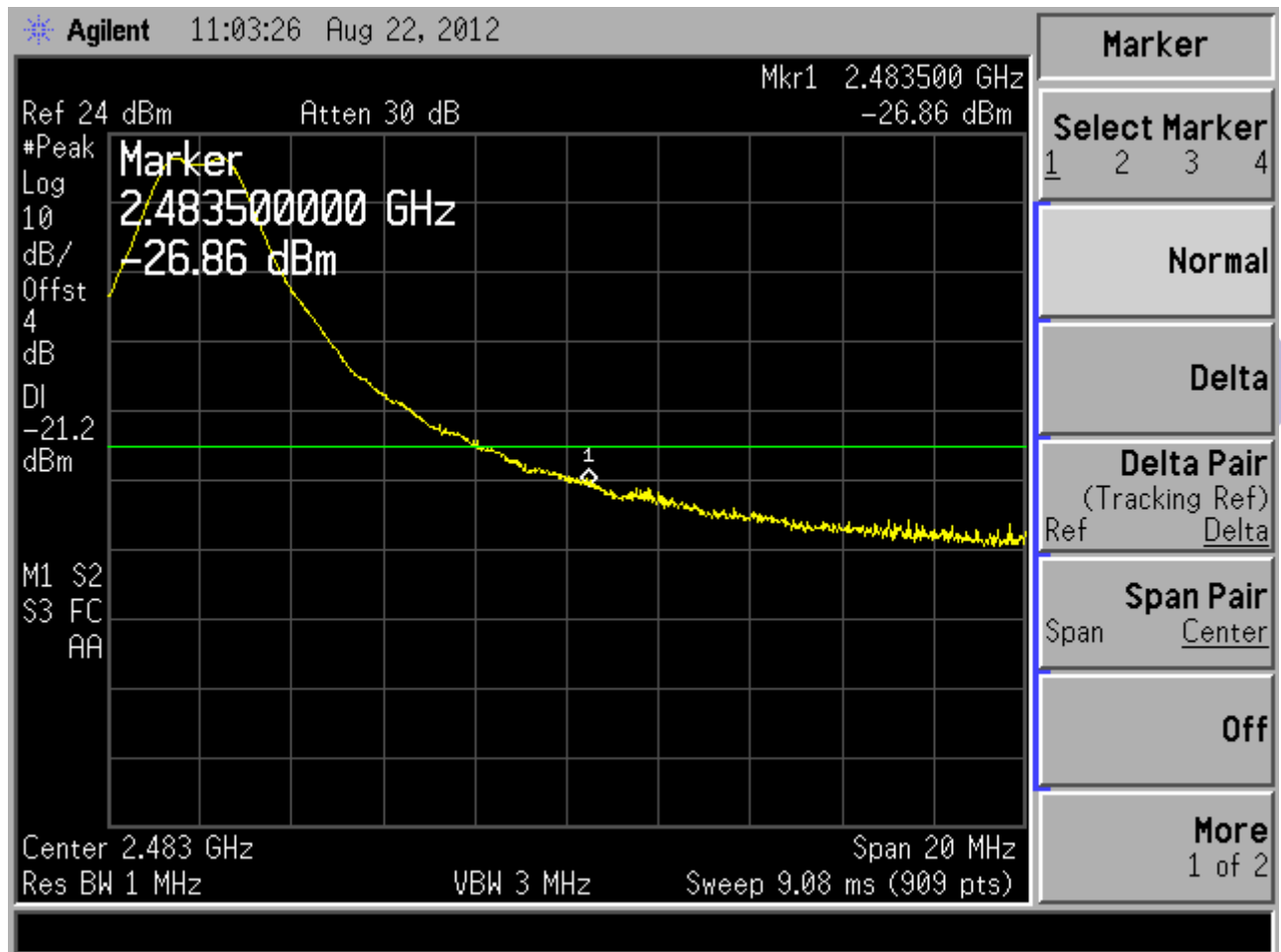
Maximum AV value @ 2483.5MHz = -34.08 dBm

AV Final Result = AV Reading - Duty cycle Factor (Note 2)  
= -34.08 - 20 = -54.08 dBm

Limit = -41.2 dBm

Result is **PASS**

## PK Result on CH 25



PK Result = -26.86 dBm  
Limit = -21.2 dBm

Result is **PASS**

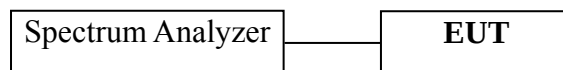
## 4 6 dB BANDWIDTH MEASUREMENT

### 4.1 Test Equipment

The following test equipment was used during the Emission Bandwidth measurement:

| Item | Type              | Manufacturer | Model No. | Serial No. | Last Cal.    | Next Cal.    |
|------|-------------------|--------------|-----------|------------|--------------|--------------|
| 1.   | Spectrum Analyzer | Agilent      | E7405A    | MY45106600 | Mar 22, 2012 | Mar 22, 2013 |

### 4.2 Block Diagram of Test Setup



### 4.3 Specification Limits (§15.247(a)(2))

The minimum 6 dB bandwidth shall be at least 500 kHz.

### 4.4 Operating Condition of EUT

The test program “Hyper-Terminal” was used to enable the EUT to transmit data at different channel frequency individually.

### 4.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with 100 kHz RBW / 100 kHz VBW.

The 6 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6 dB.

In addition, the Emission Bandwidth (EBW) is required information. The test procedure is defined in KDB558074 v01:2012 (the 5.1.1 EBW Measurement Procedure was used). The RBW/EBW ratio should be 1-5%.

### 4.6 Test Results

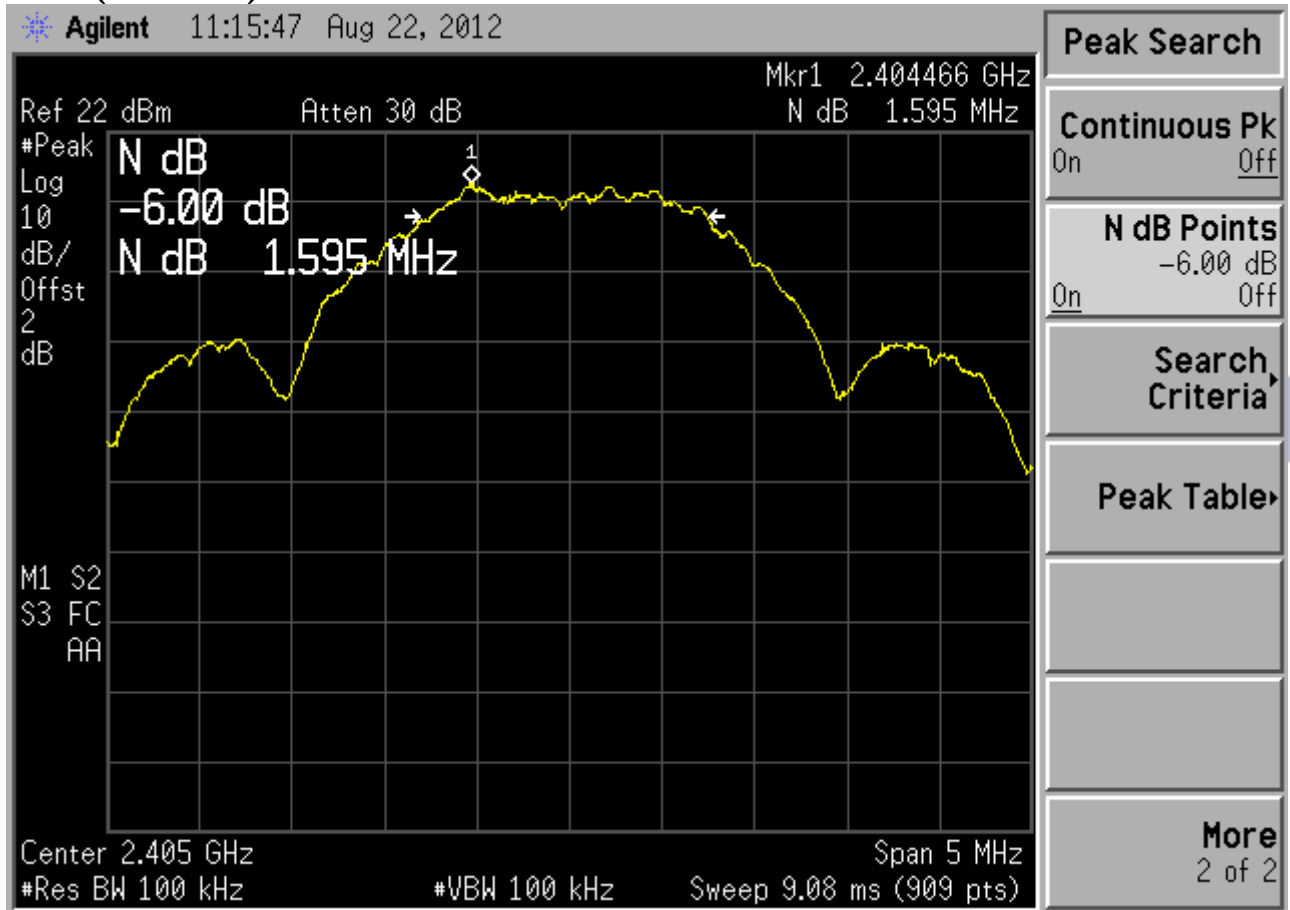
**PASSED.**

All the test results are attached in next pages.

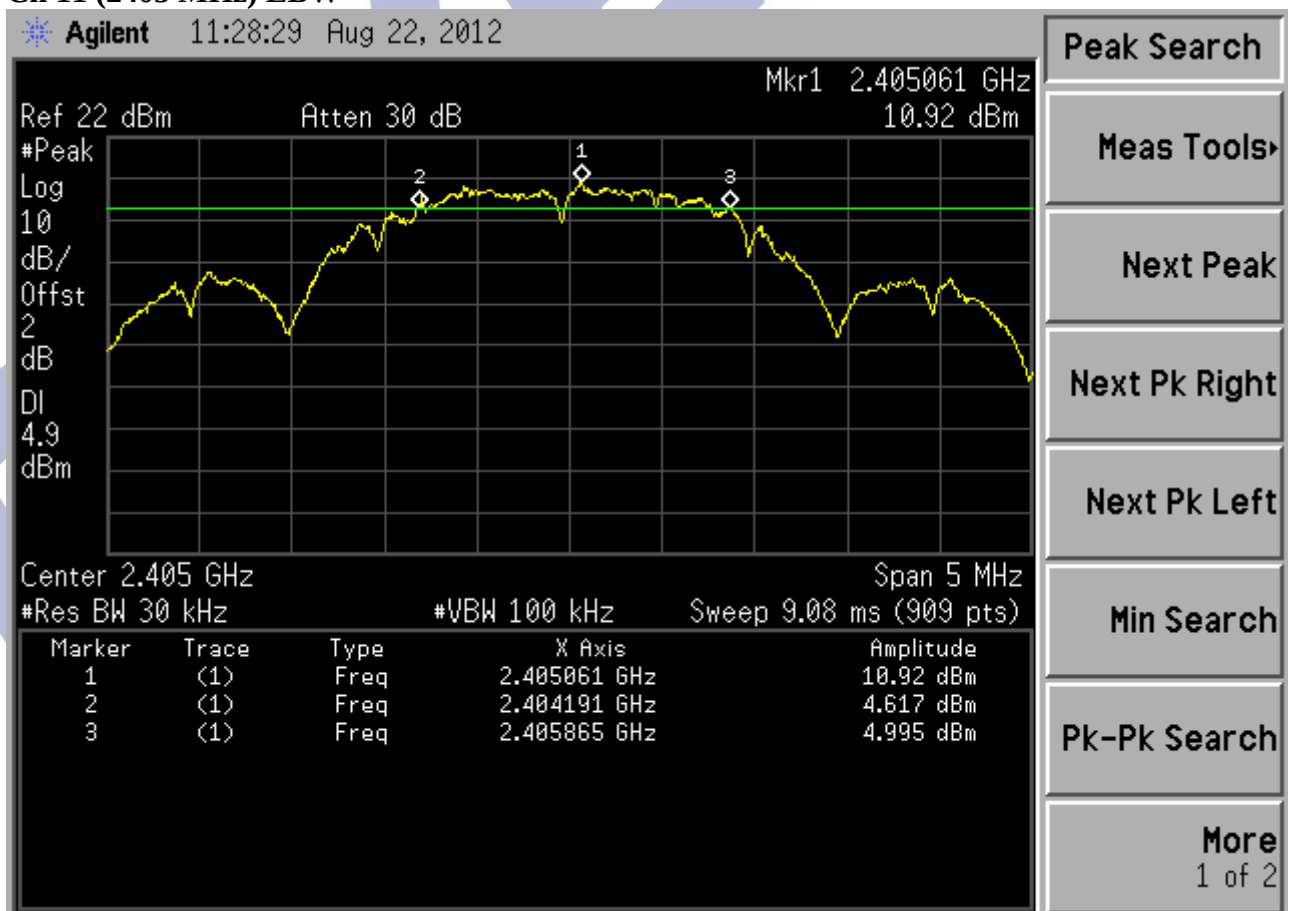
(Test Date: Aug. 22, 2012 Temperature: 25°C Humidity: 48 %)

| Channel | Frequency | 6dB Bandwidth | Emission Bandwidth (EBW) |
|---------|-----------|---------------|--------------------------|
| 11      | 2405 MHz  | 1.595 MHz     | 1.674 MHz                |
| 18      | 2440 MHz  | 1.524 MHz     | 1.443 MHz                |
| 25      | 2475 MHz  | 1.524 MHz     | 1.454 MHz                |

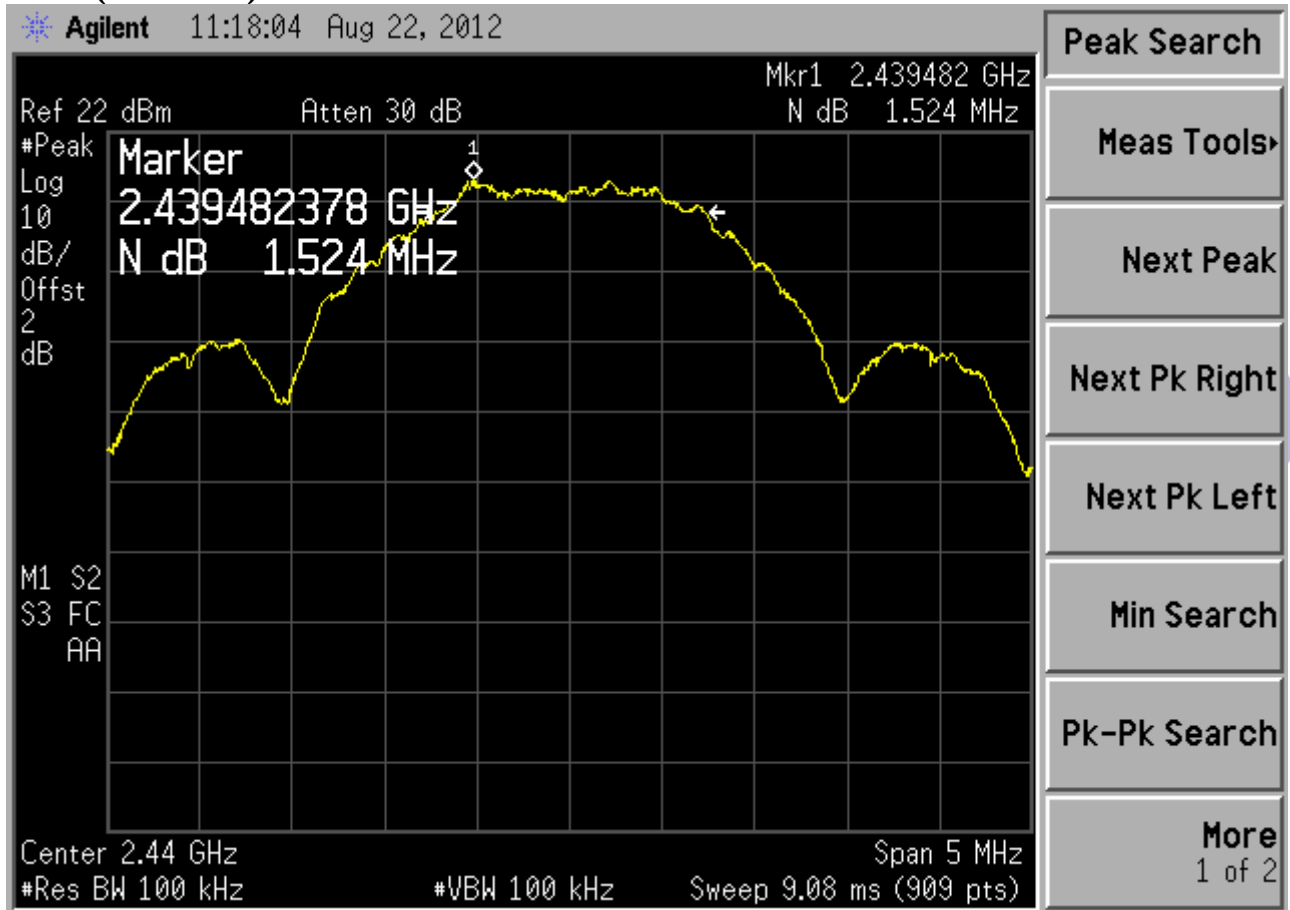
### Ch 11 (2405 MHz) 6dB Bandwidth



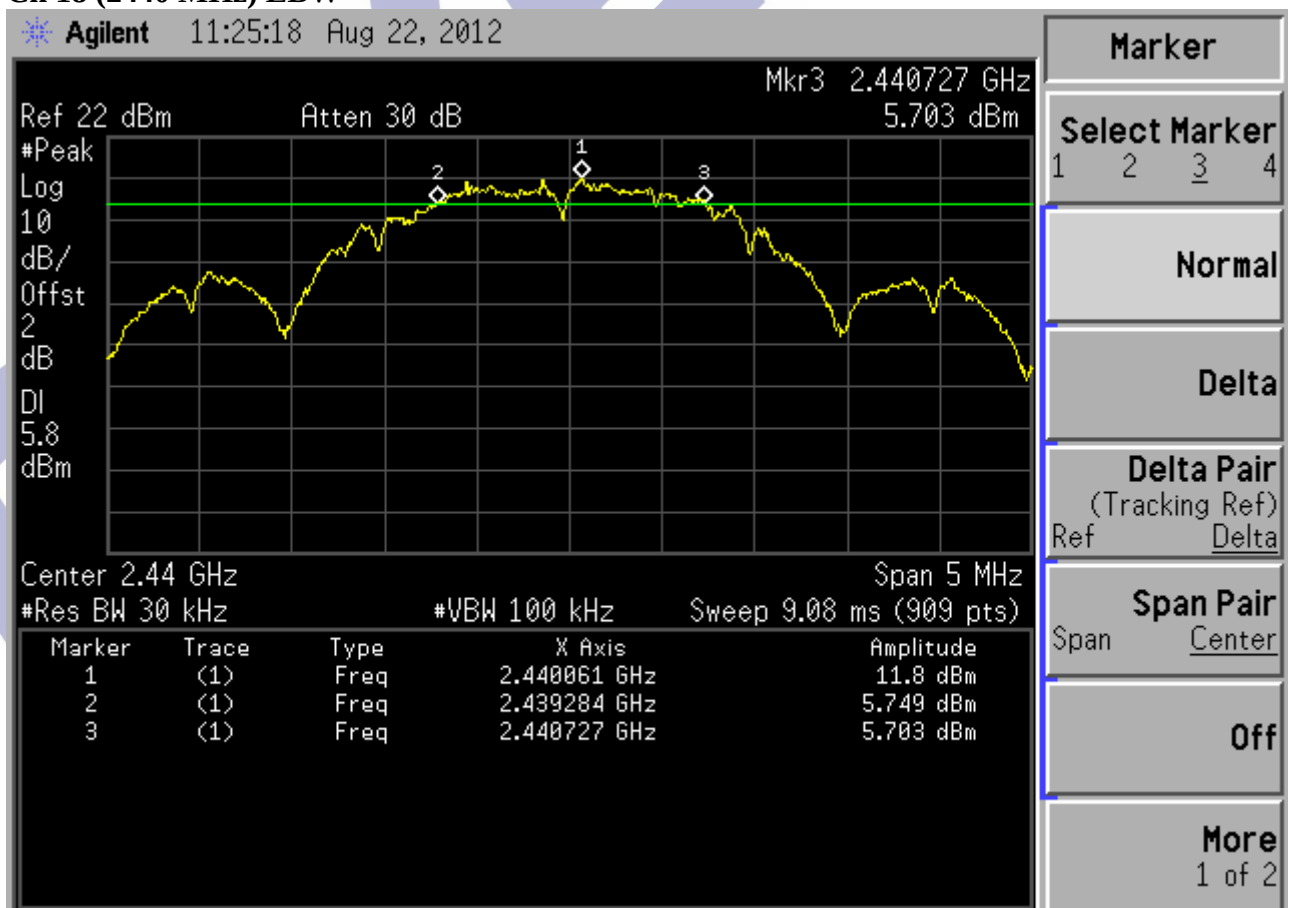
### Ch 11 (2405 MHz) EBW



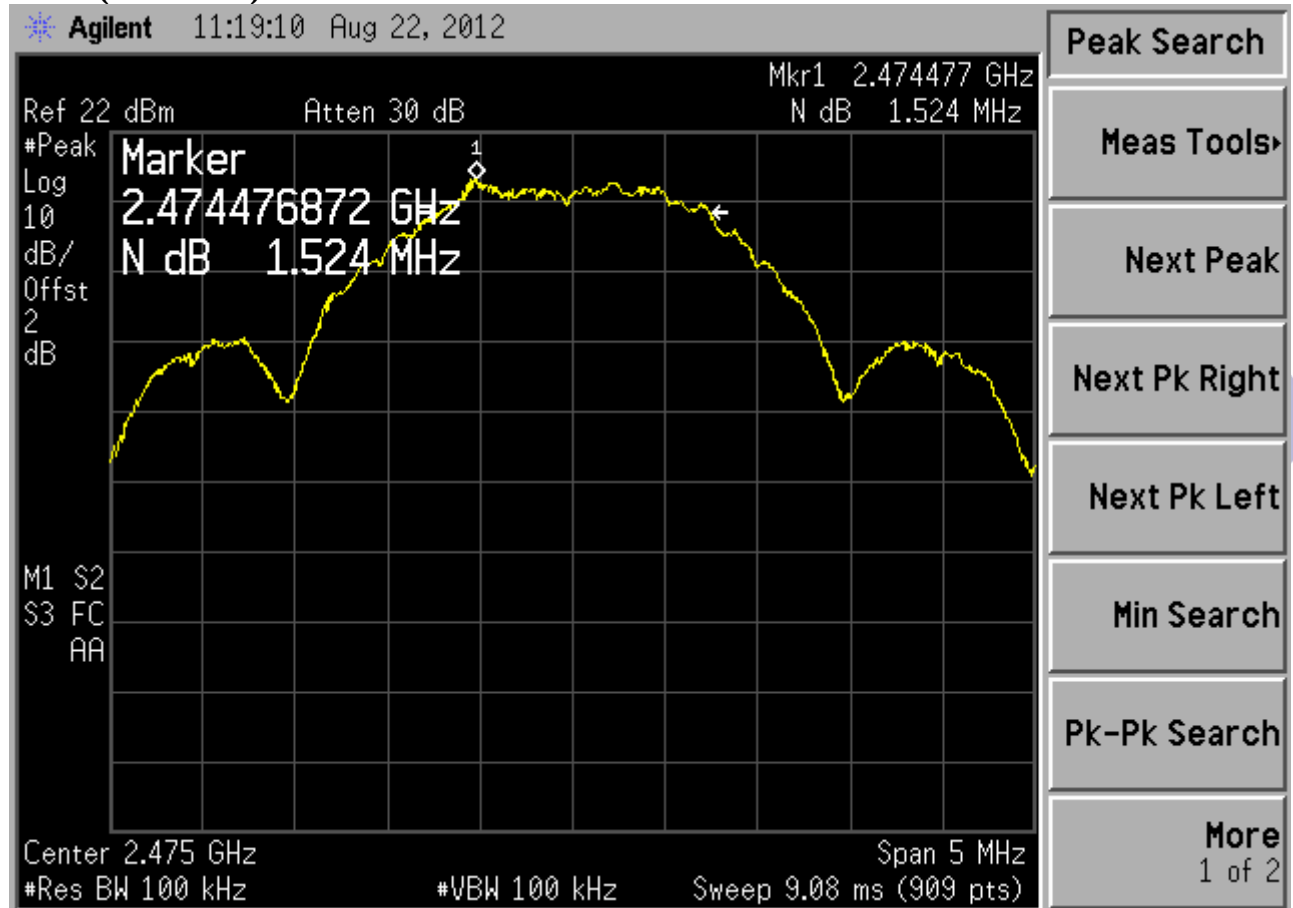
### Ch 18 (2440 MHz) 6dB Bandwidth



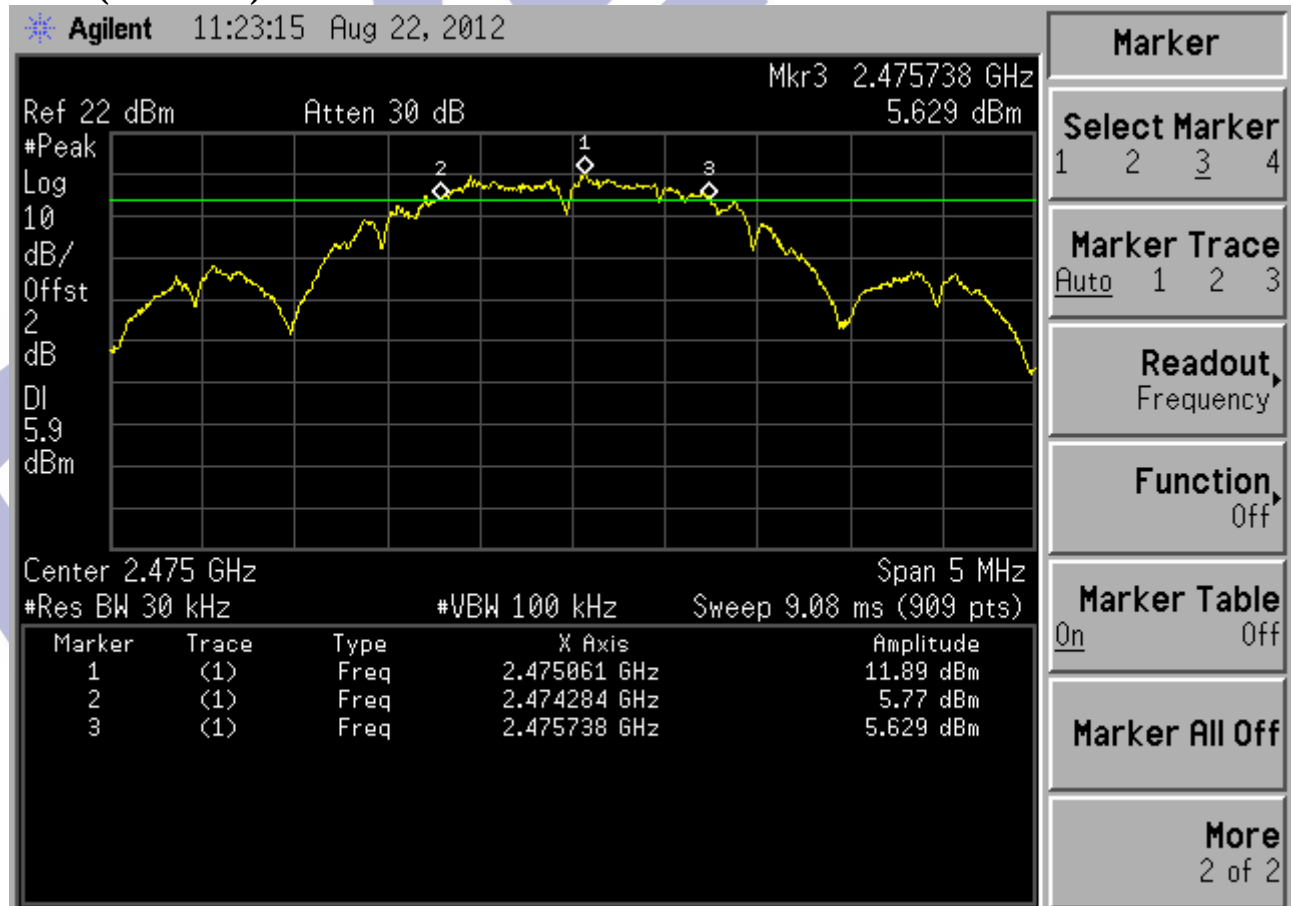
### Ch 18 (2440 MHz) EBW



### Ch 25 (2475 MHz) 6dB Bandwidth



### Ch 25 (2475 MHz) EBW



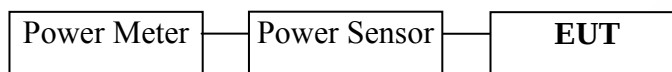
## 5 MAXIMUM PEAK OUTPUT POWER MEASUREMENT

### 5.1 Test Equipment

The following test equipment was used during the maximum peak output power measurement:

| Item | Type         | Manufacturer | Model No. | Serial No. | Last Cal.    | Next Cal.    |
|------|--------------|--------------|-----------|------------|--------------|--------------|
| 1.   | Power Meter  | Anritsu      | ML2487A   | 6K00003245 | Mar 28, 2012 | Mar 28, 2013 |
| 2.   | Power Sensor | Anritsu      | MA2491A   | 32489      | Mar 28, 2012 | Mar 28, 2013 |

### 5.2 Block Diagram of Test Setup



### 5.3 Specification Limits ((§15.247(b)(3))

The Limits of maximum Peak Output Power for digital modulation in 2400-2483.5 MHz is: 1 Watt. (30 dBm)

### 5.4 Operating Condition of EUT

The test program “Hyper-Terminal” was used to enable the EUT to transmit data at different channel frequency individually.

### 5.5 Test Procedure

This is an RF conducted test. Use a direct connection between the antenna port of the transmitter and the power meter, through suitable attenuation. The transmitter output was connected to the power meter that was designed to detect peak value automatically.

Note: The bandwidth of the power meter is 20MHz.

### 5.6 Test Results

**PASSED.**

All the test results are attached in next pages.

(Test Date: Aug. 21, 2012    Temperature: 25°C    Humidity: 45 %)

| Channel | Frequency | Peak Output Power<br>(final value) | Limit  |
|---------|-----------|------------------------------------|--------|
| 11      | 2405 MHz  | <b>18.14 dBm</b>                   | 30 dBm |
| 18      | 2440 MHz  | <b>18.41 dBm</b>                   | 30 dBm |
| 25      | 2475 MHz  | <b>18.60 dBm</b>                   | 30 dBm |

## 6 EMISSION LIMITATIONS MEASUREMENT

### 6.1 Test Equipment

The following test equipment was used during the emission limitations test :

| Item | Type              | Manufacturer | Model No. | Serial No. | Last Cal.    | Next Cal.    |
|------|-------------------|--------------|-----------|------------|--------------|--------------|
| 1.   | Spectrum Analyzer | Agilent      | E7405A    | MY45106600 | Mar 22, 2012 | Mar 22, 2013 |

### 6.2 Block Diagram of Test Setup

The same as Section. 4.2.

### 6.3 Specification Limits (§15.247(d))

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (See Section 15.205(c)).(※This test result attaching to Section. 4.7)

### 6.4 Operating Condition of EUT

The test program “Hyper-Terminal” was used to enable the EUT to transmit data at different channel frequency individually.

### 6.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. Set RBW = 100 kHz, VBW = 300 kHz, scan up through 10<sup>th</sup> harmonic. All harmonics/spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

The test procedure is defined in KDB558074 v01:2012 (the 5.4.1.1 Measurement Procedure – Reference Level & 5.4.1.2 Measurement Procedure – Unwanted Emission was used).

### 6.6 Test Results

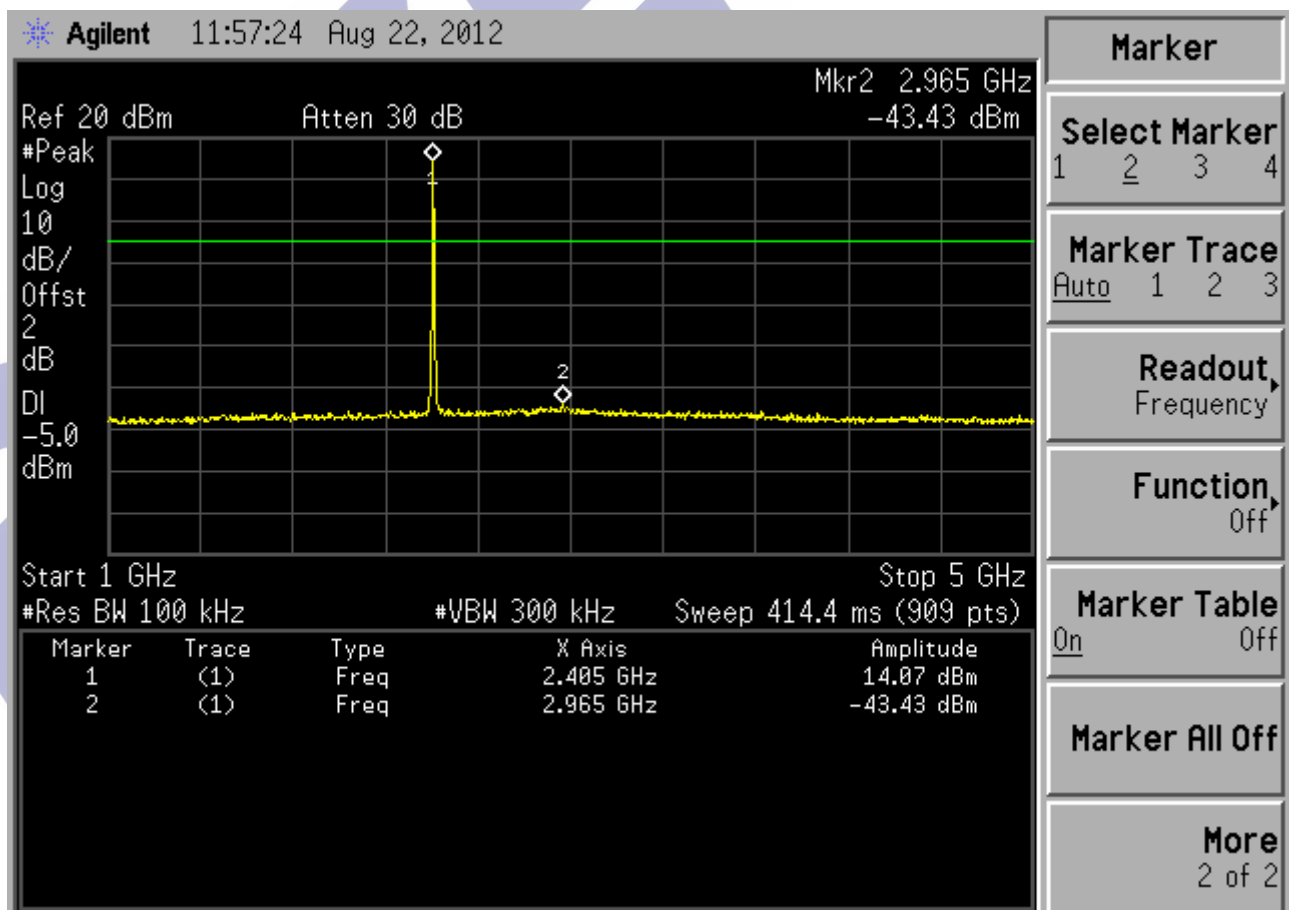
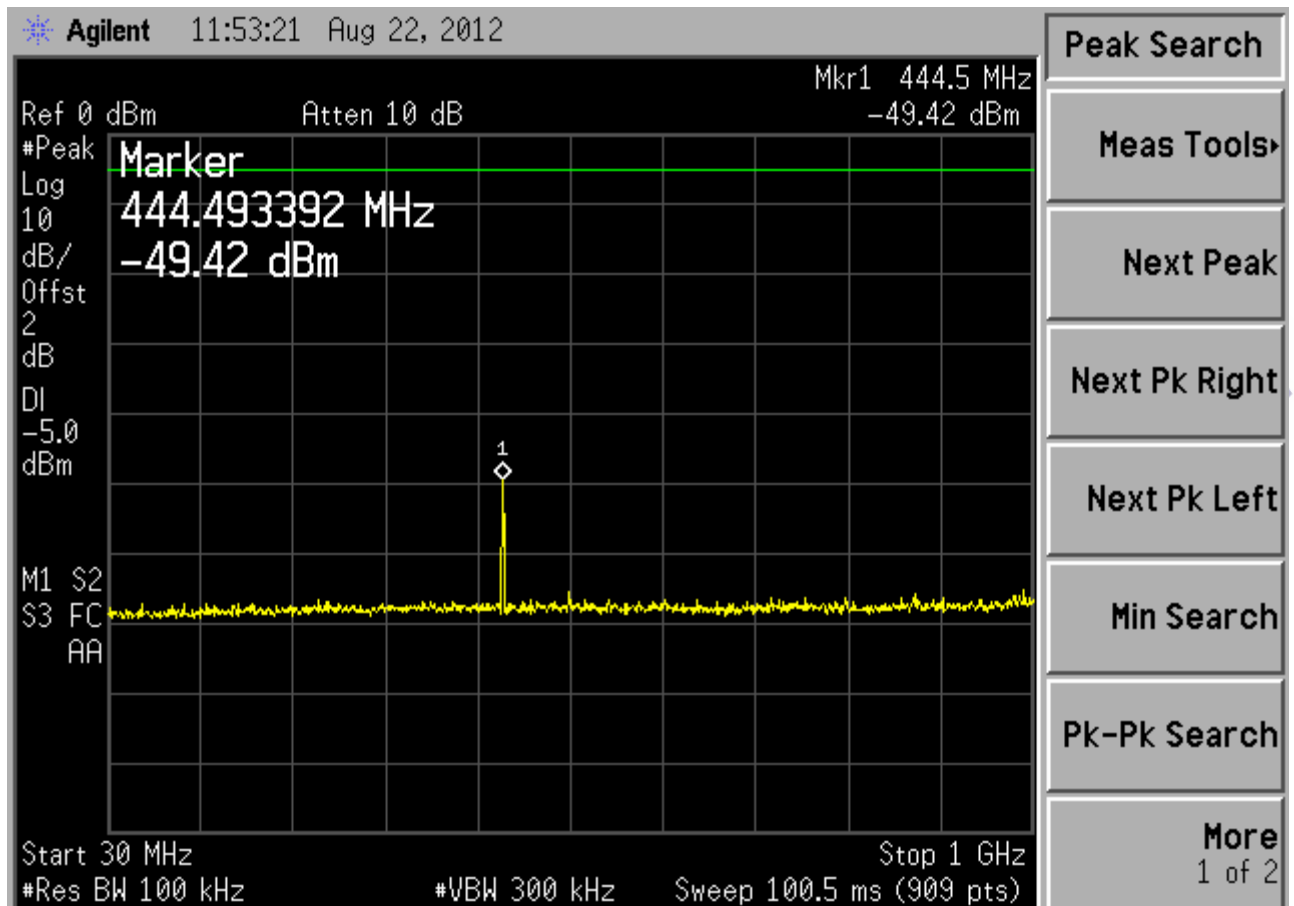
**PASSED.**

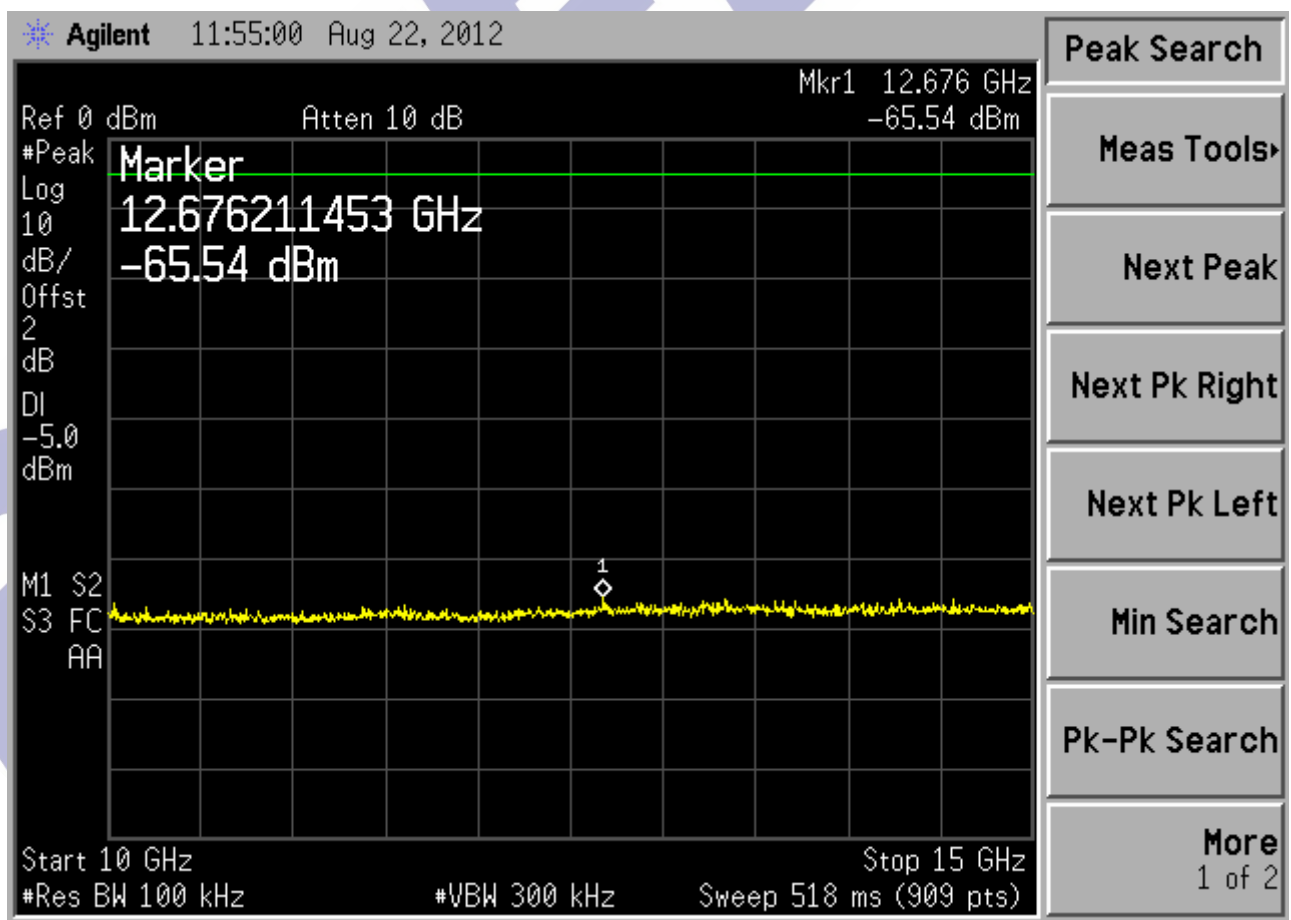
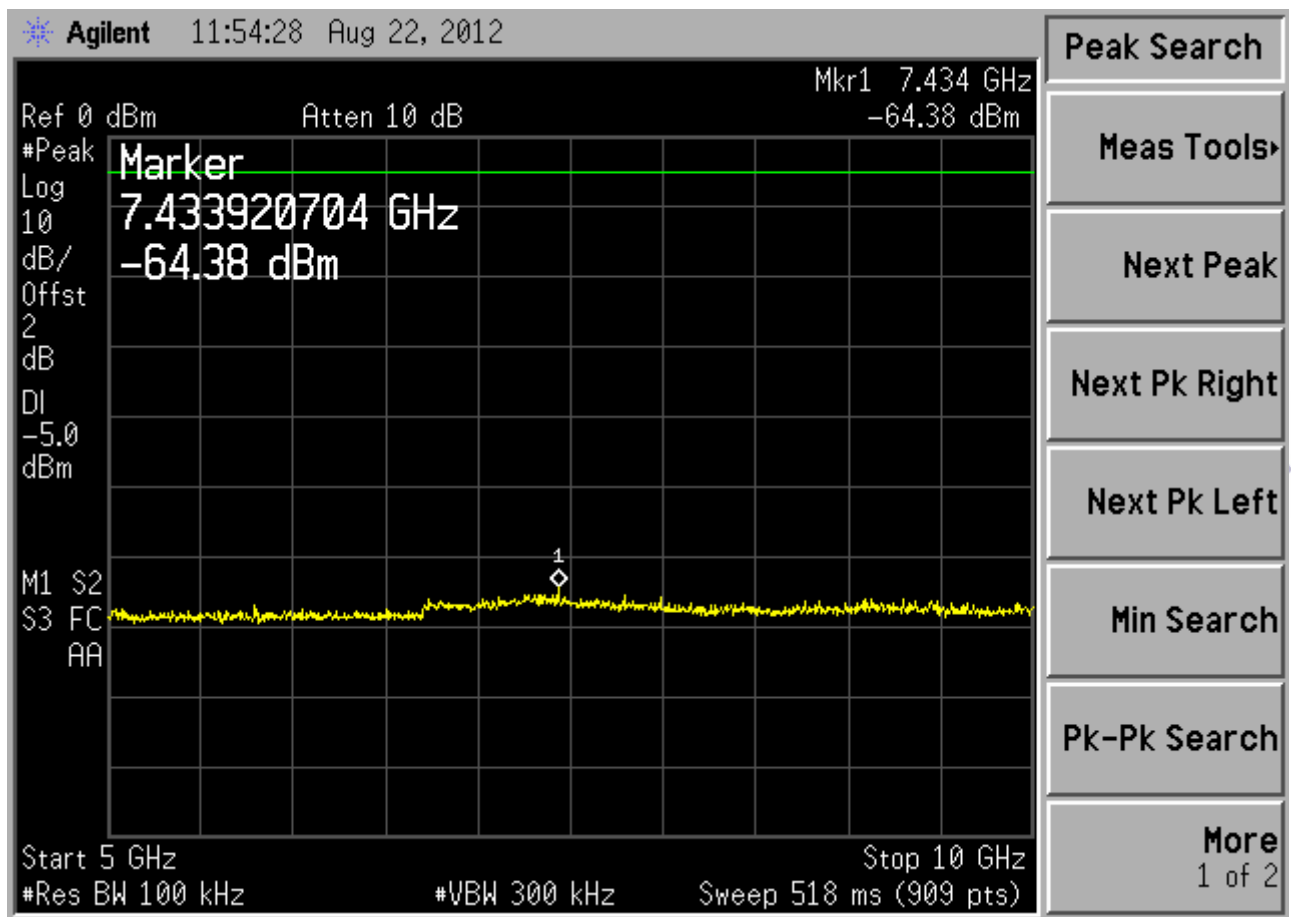
The test data was attached in the next pages.

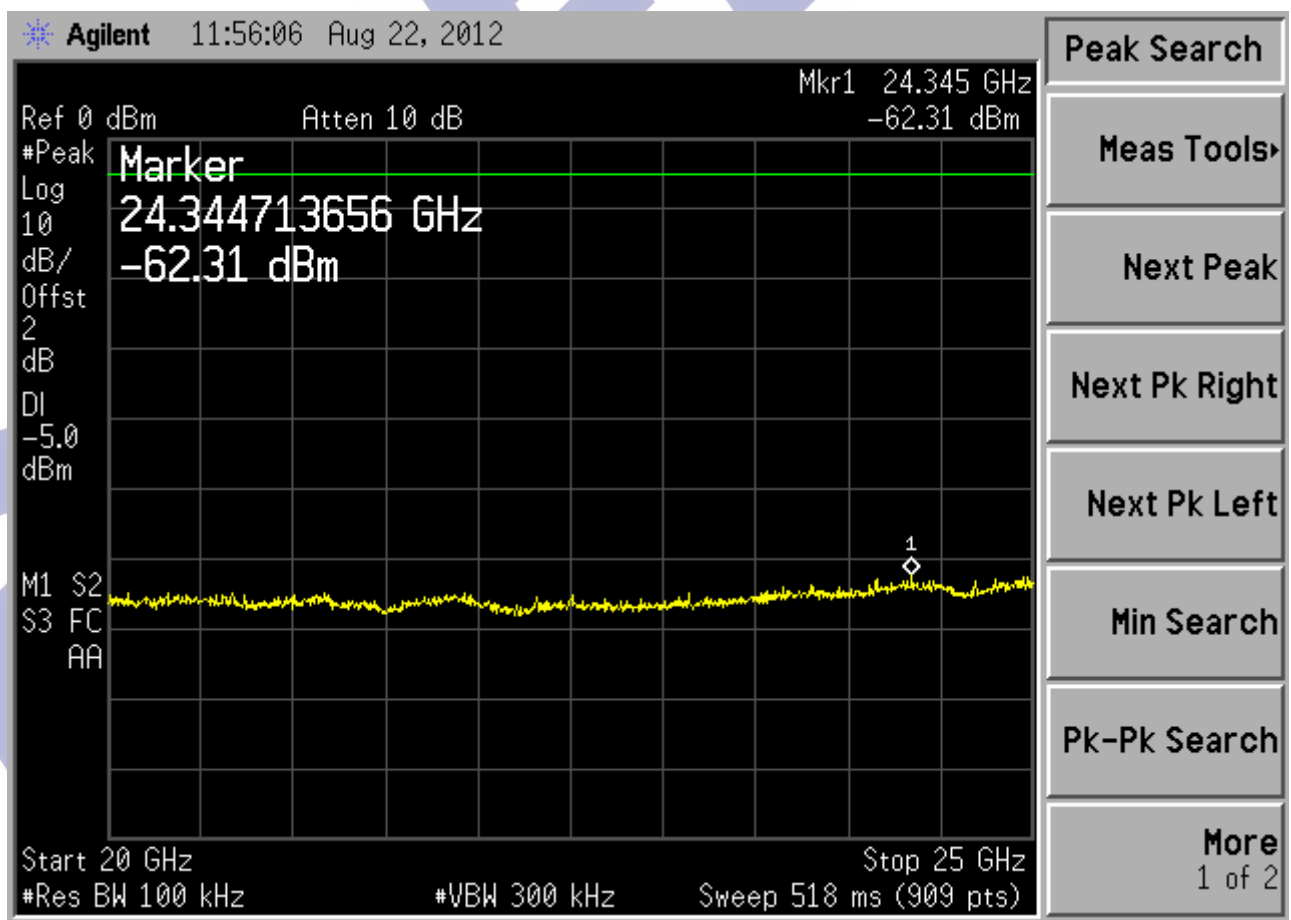
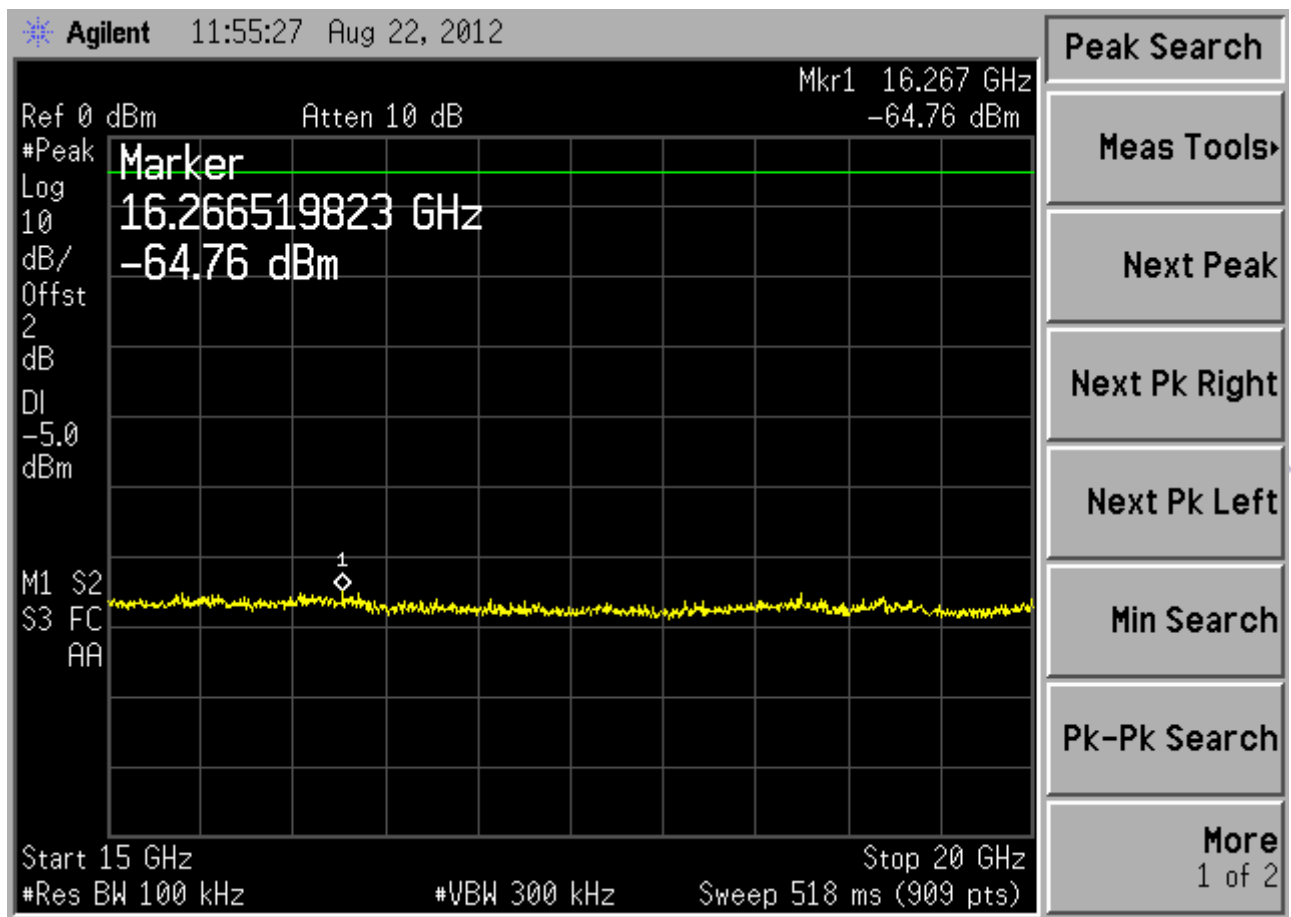
Note – The Reference Level refer to Sec. 8.6 PSD (in 100kHz) which tested according to “5.4.1.1 Measurement Procedure – Reference Level” of KDB558074 v01:2012

(Test Date: Aug. 22, 2012 Temperature: 23°C Humidity: 48 %)

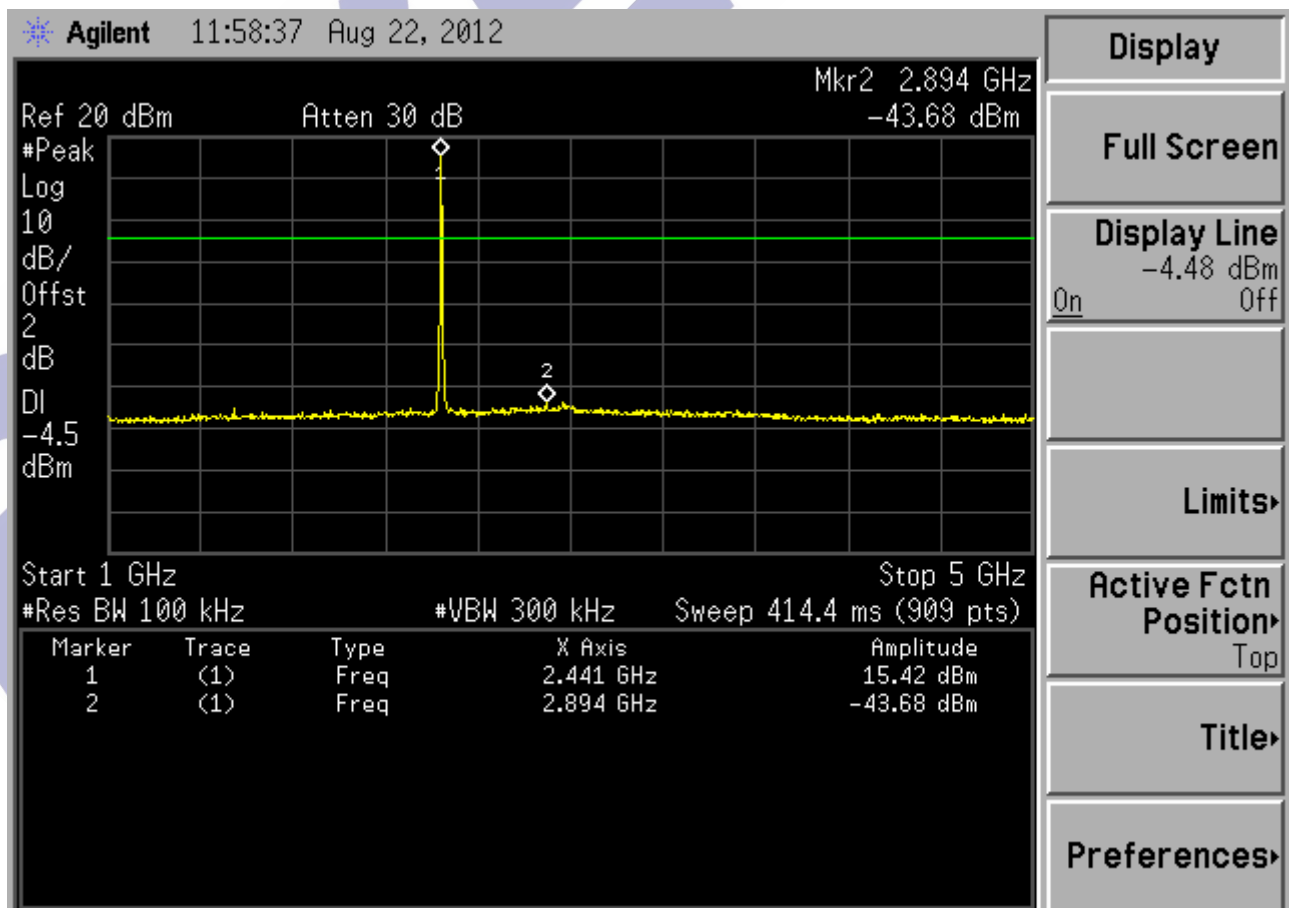
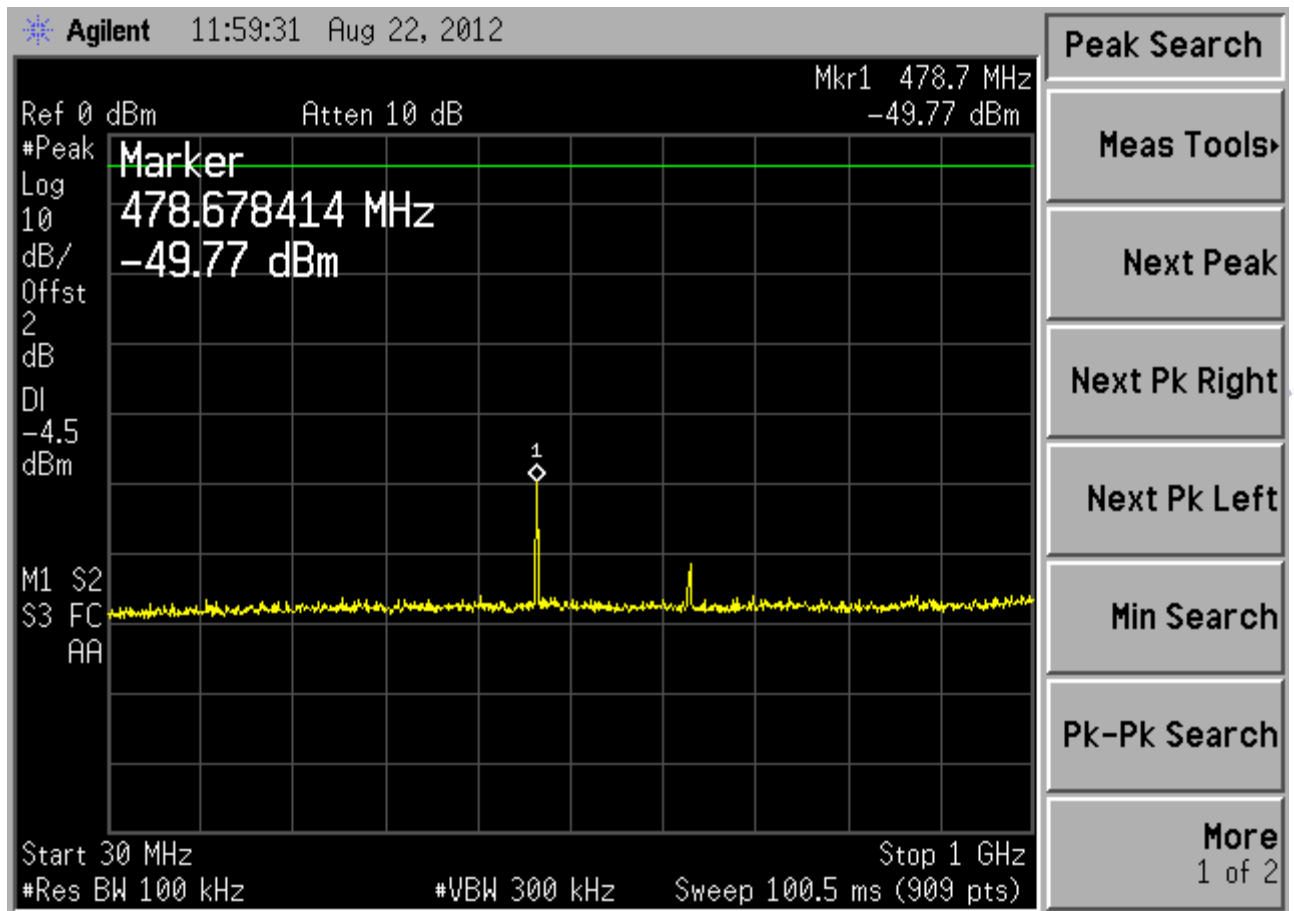
## Ch 11 (2405 MHz)

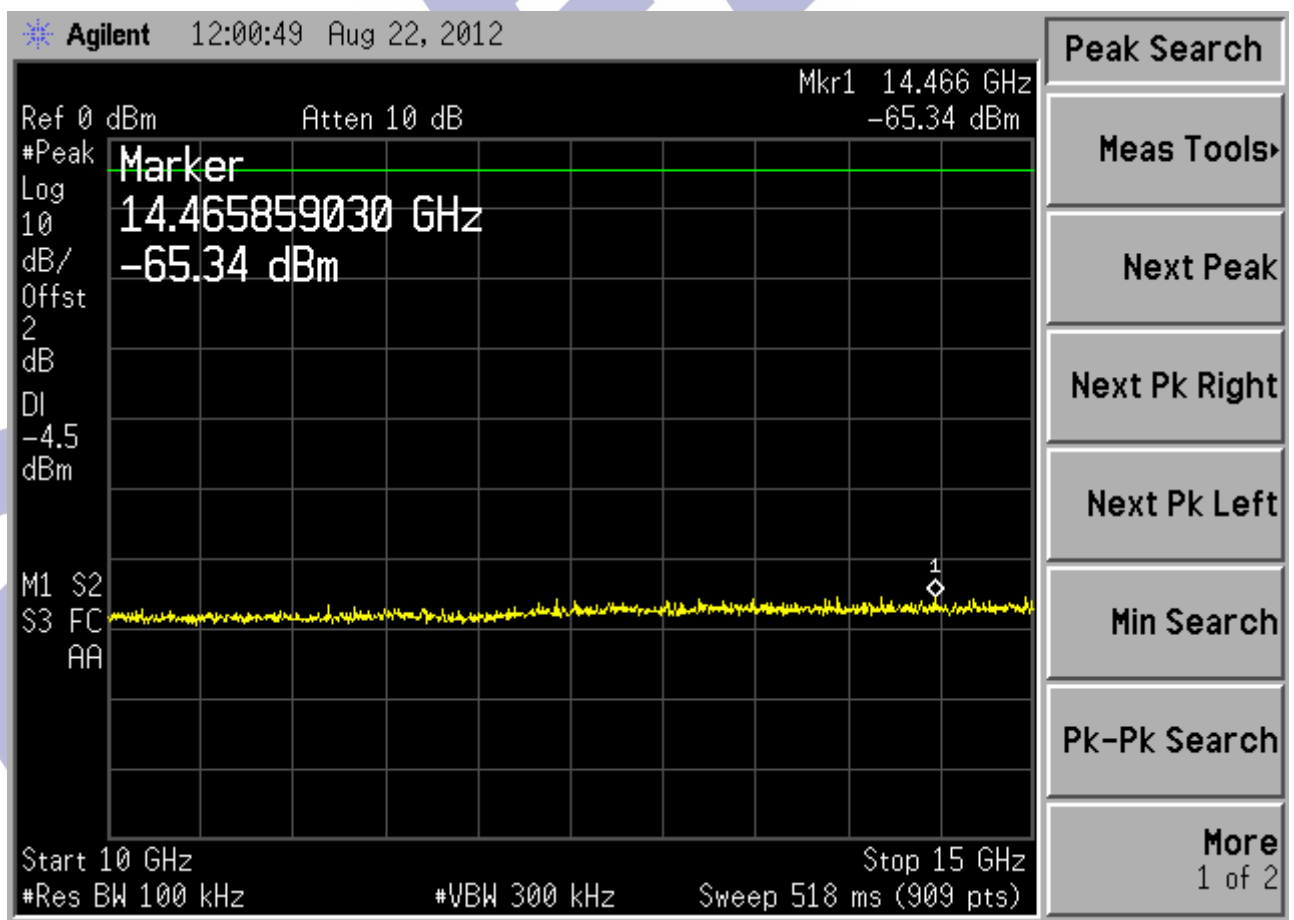
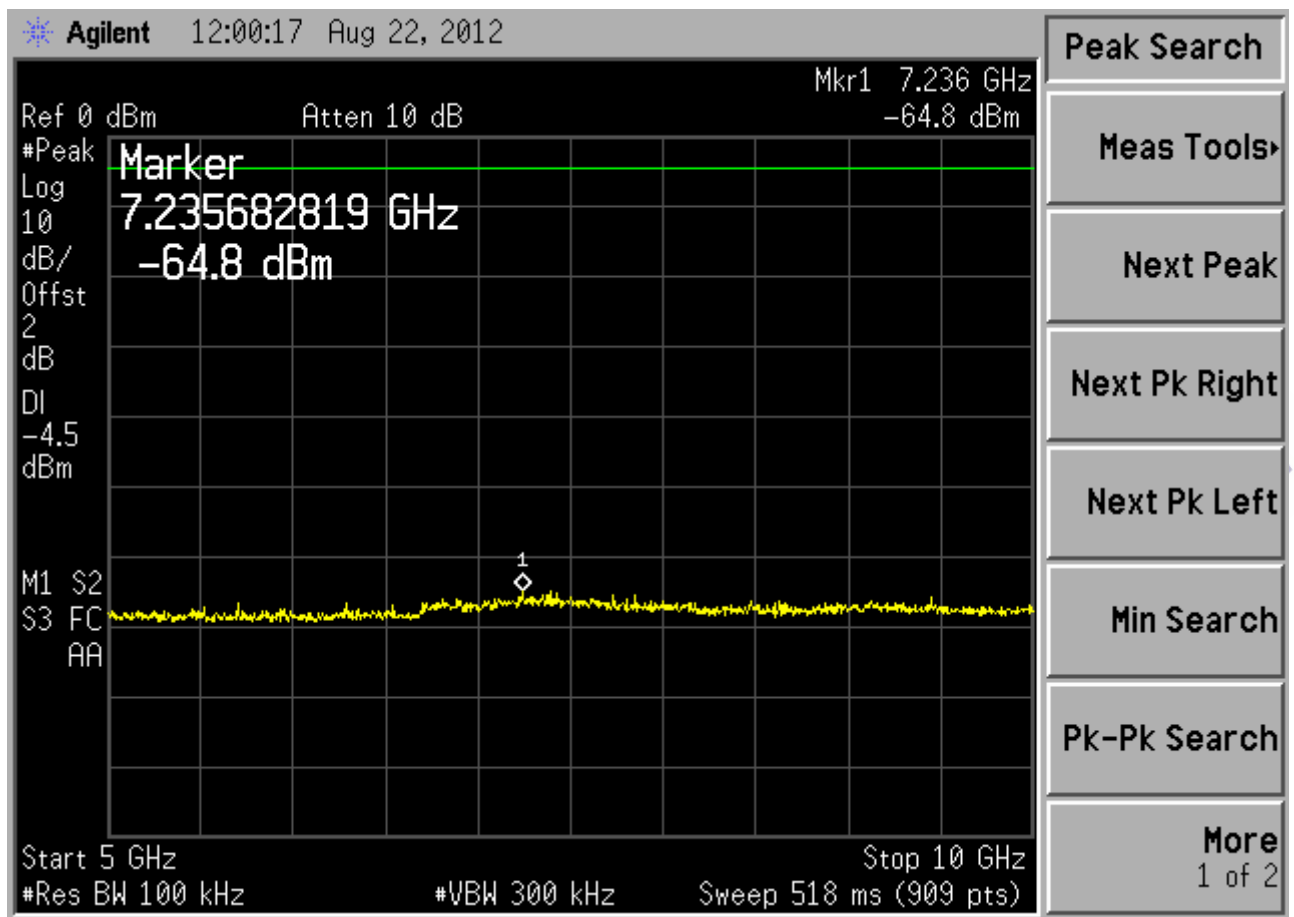


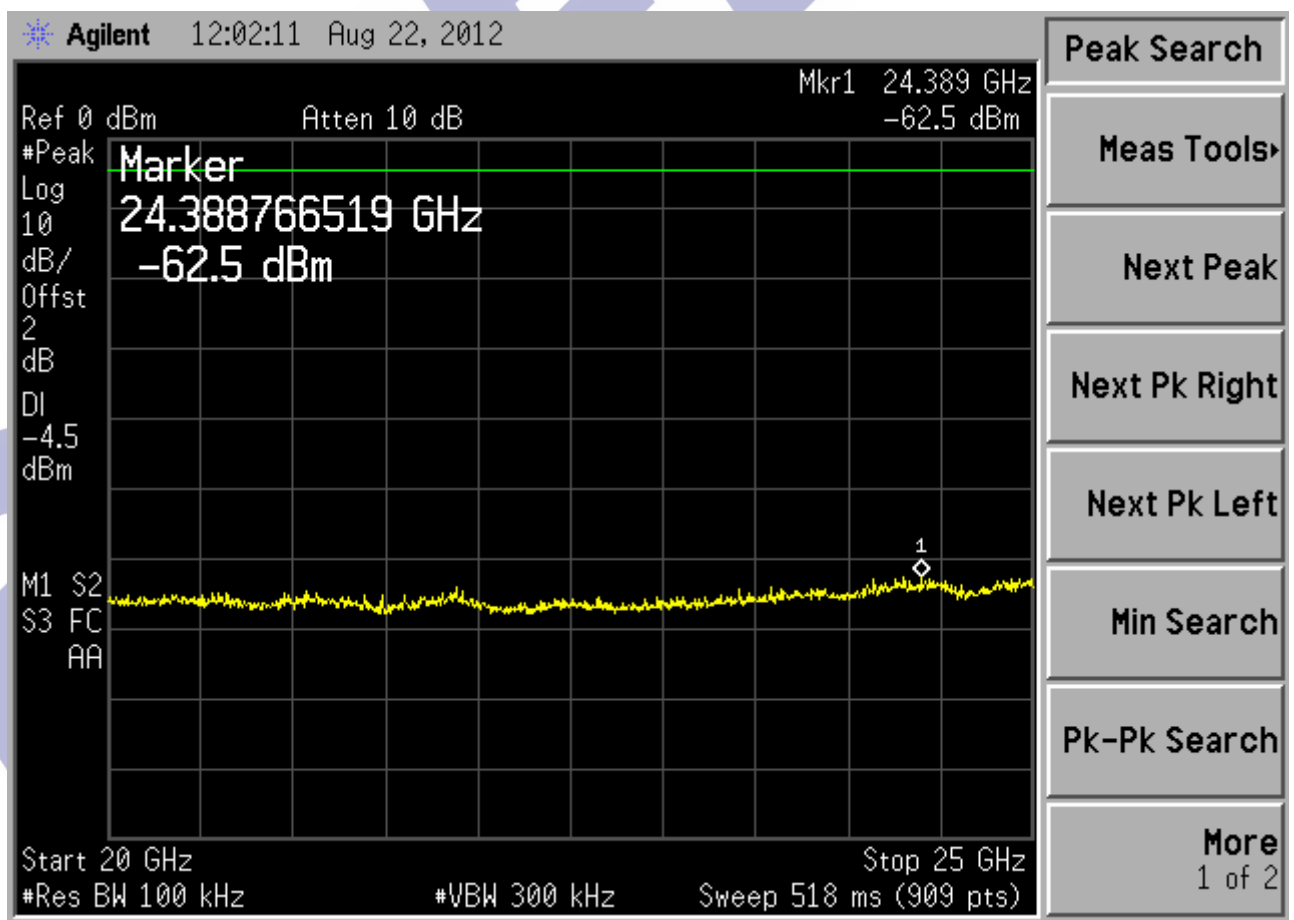
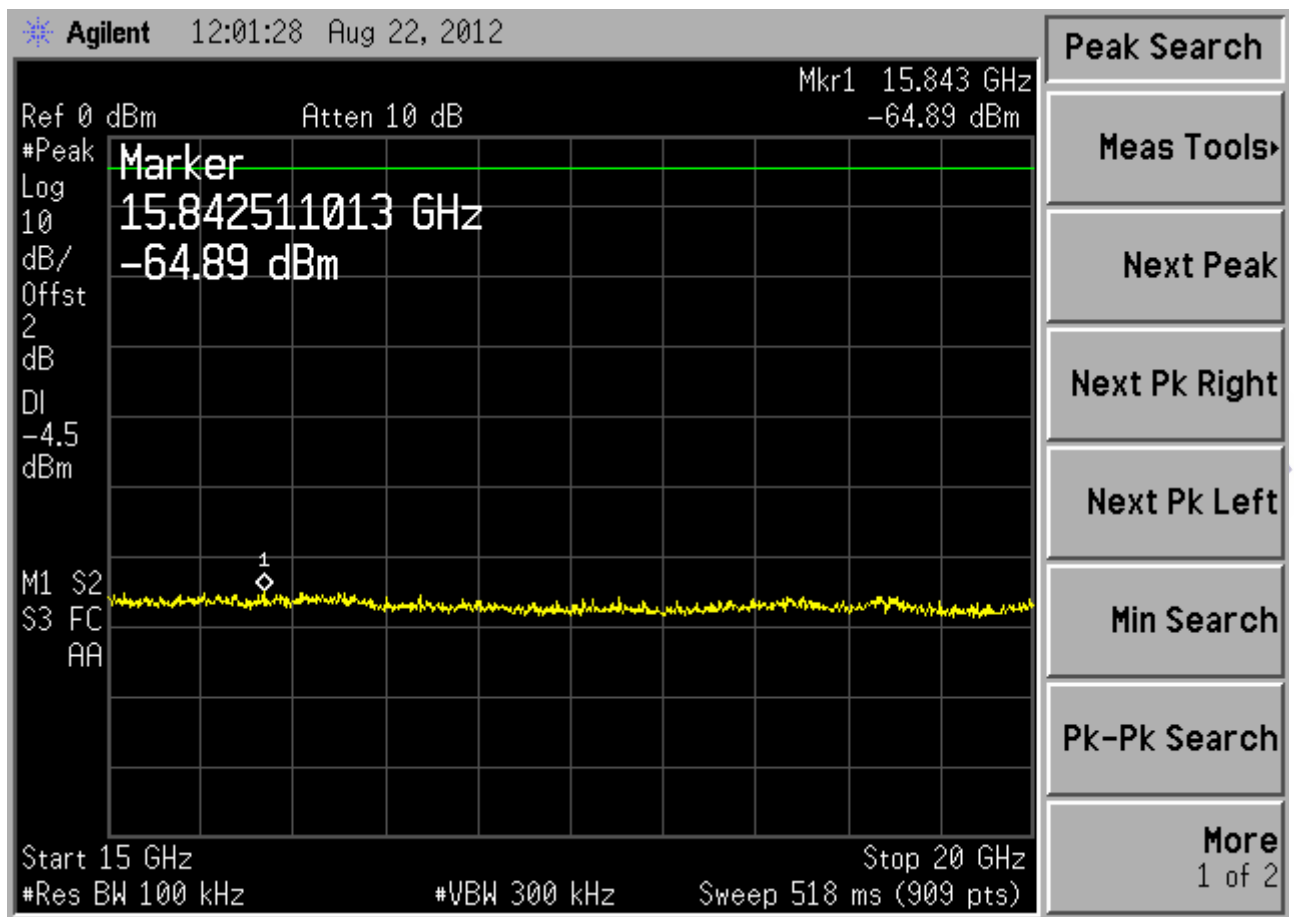




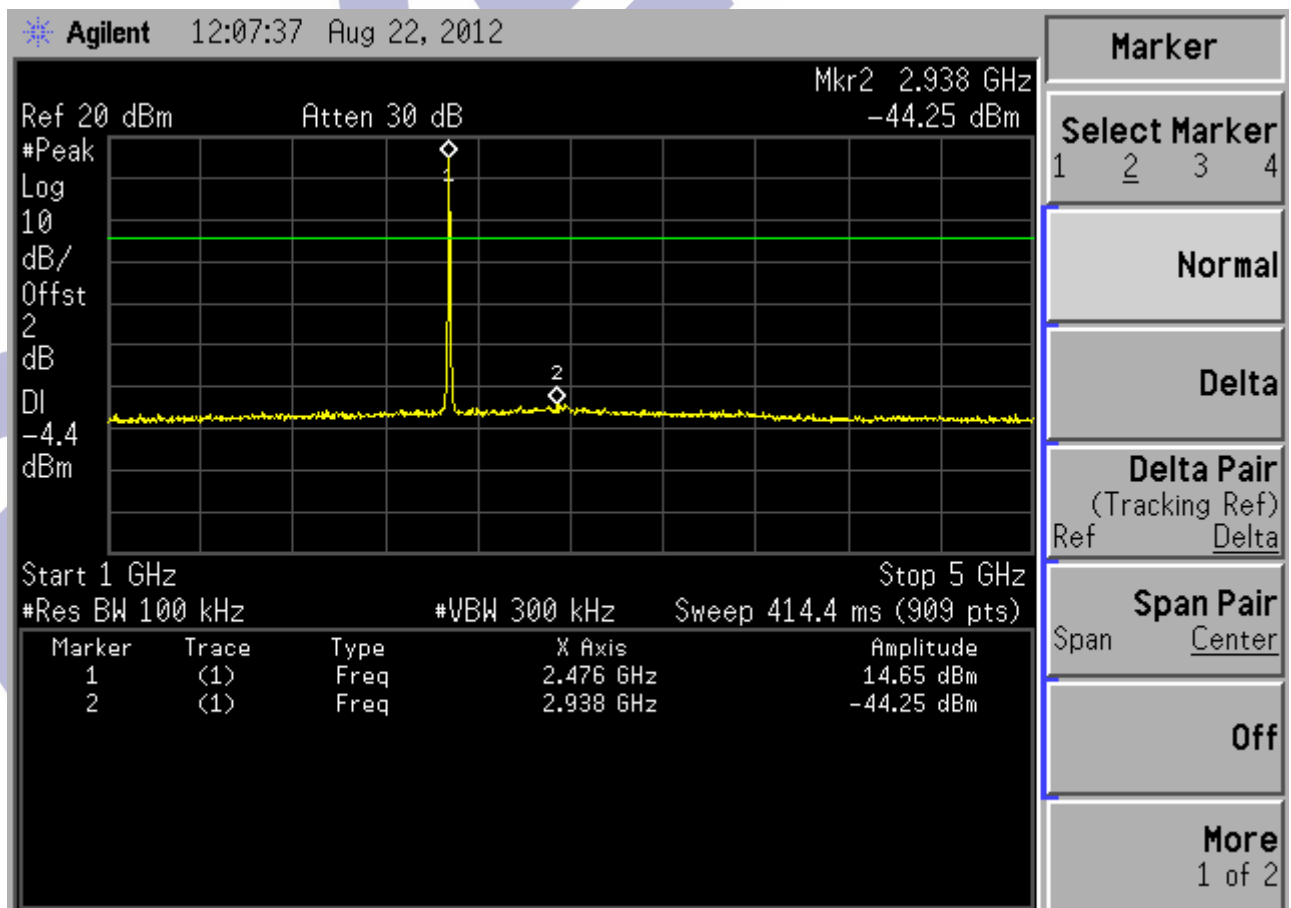
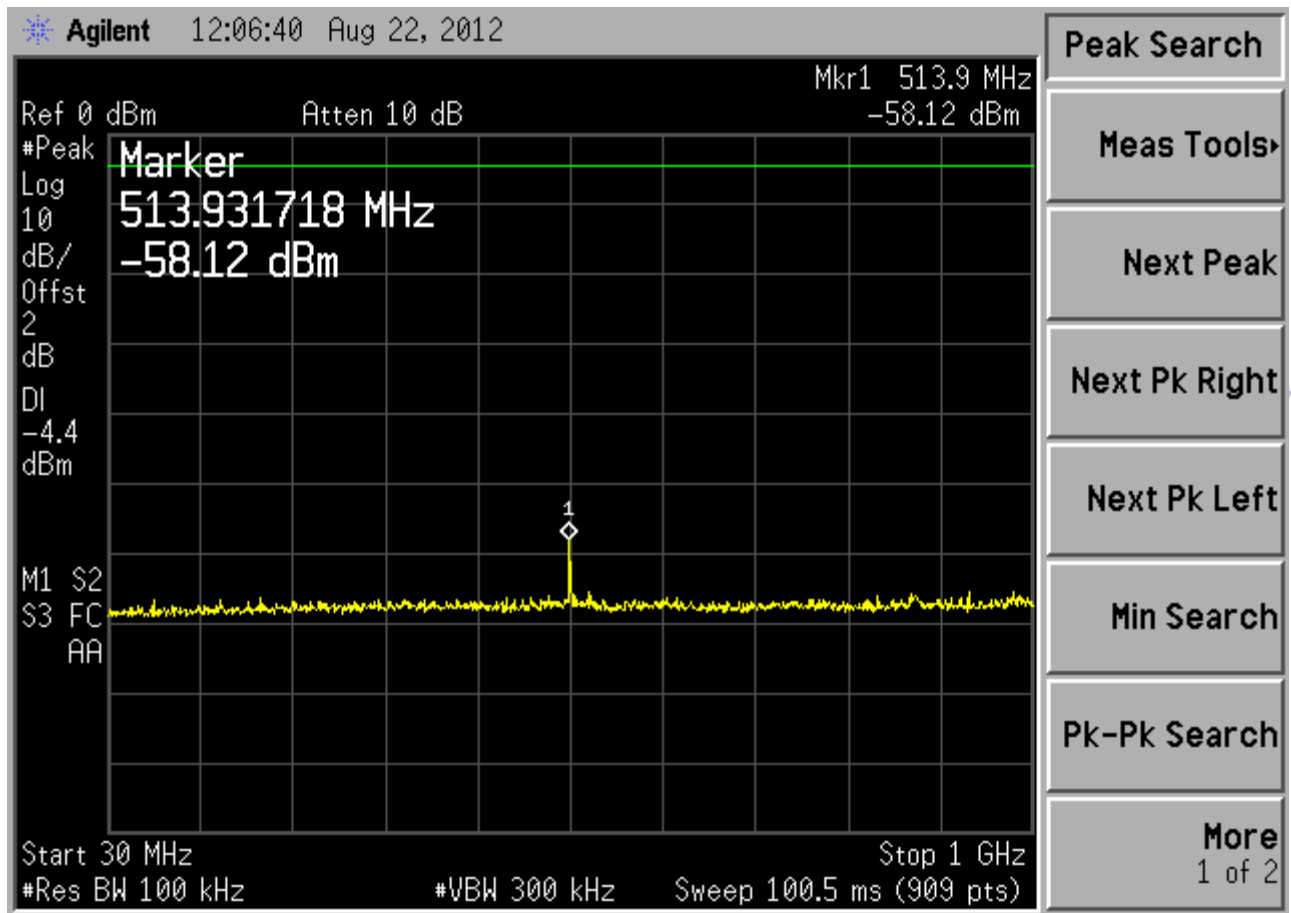
## Ch 18 (2440 MHz)

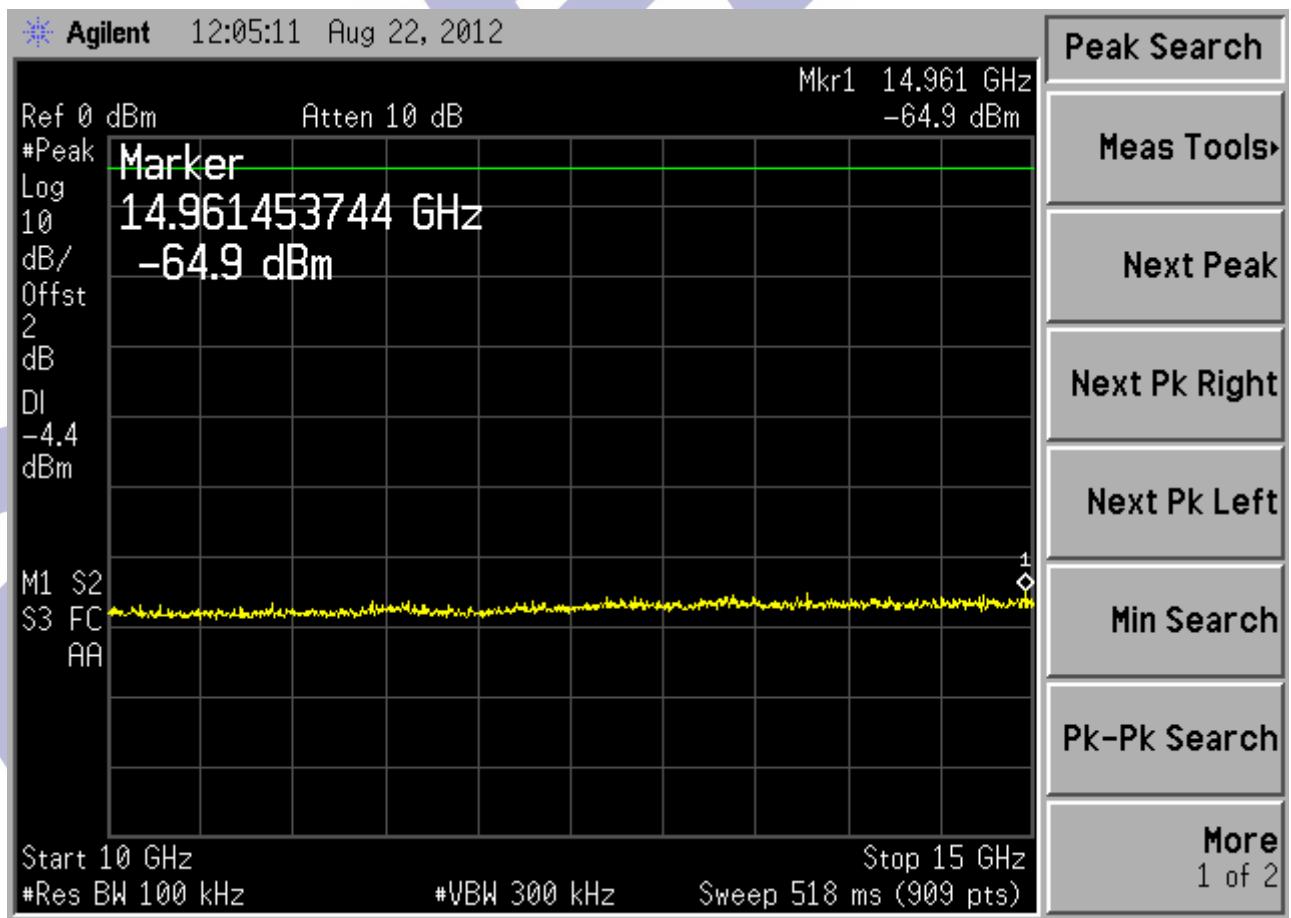
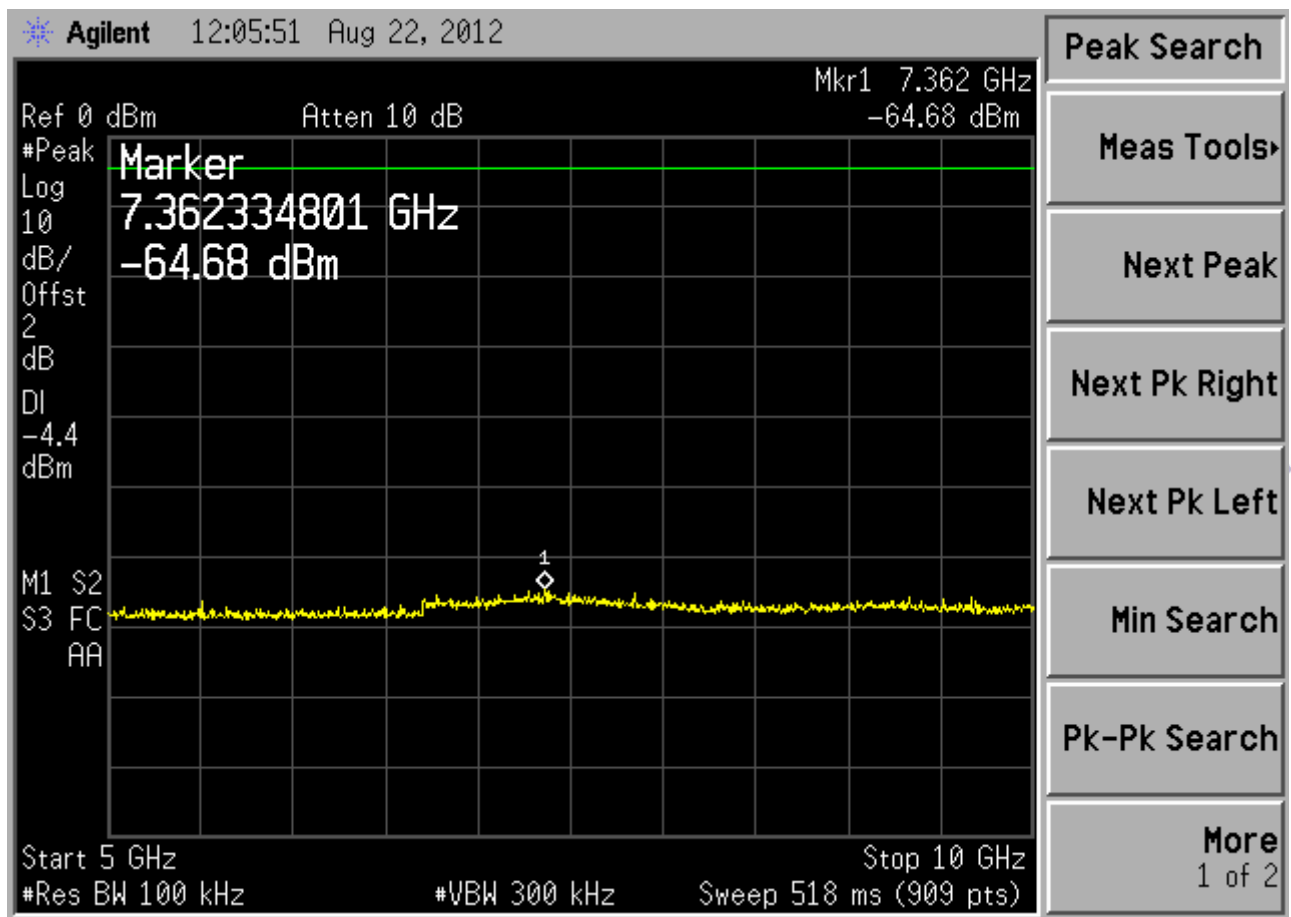


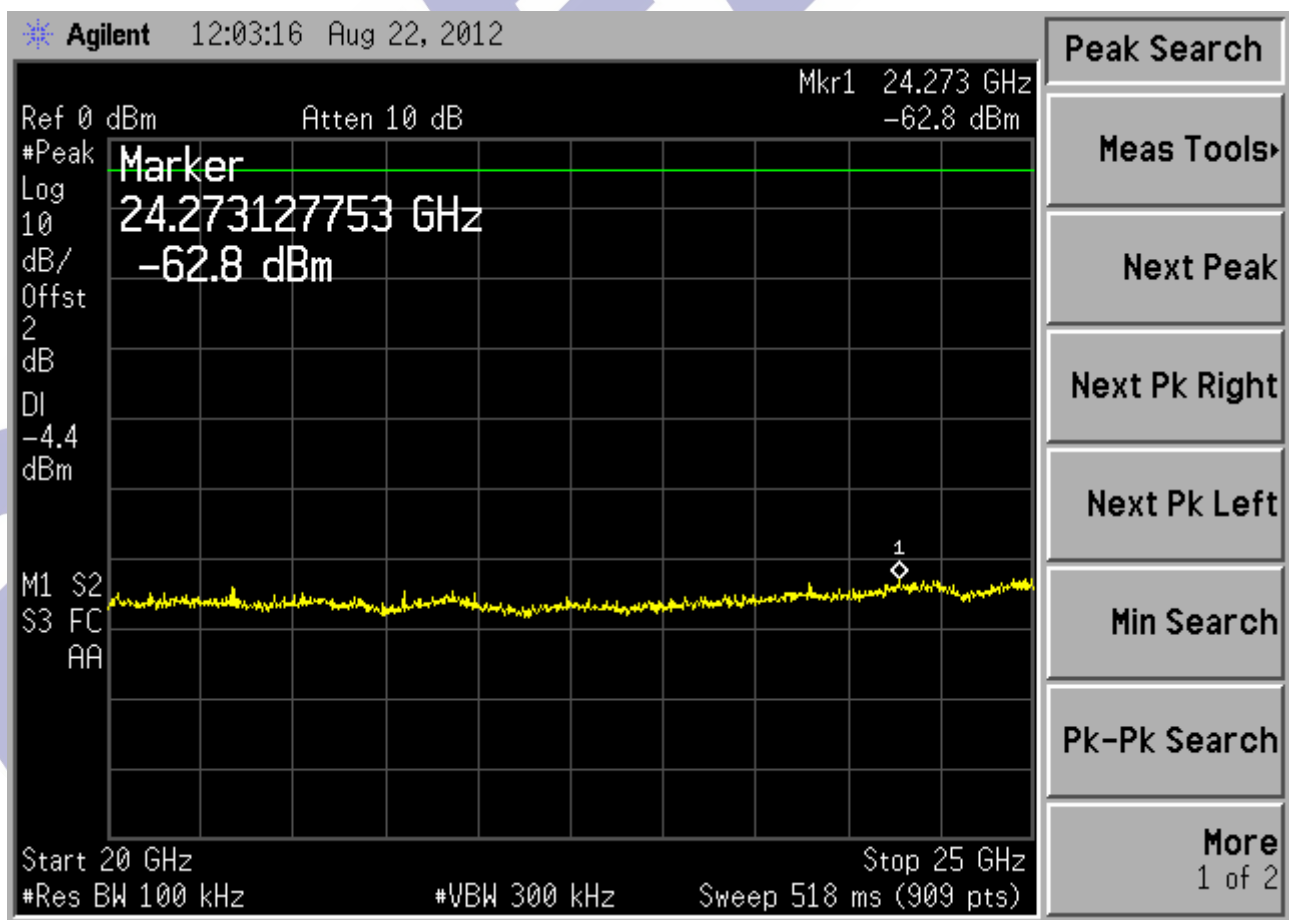
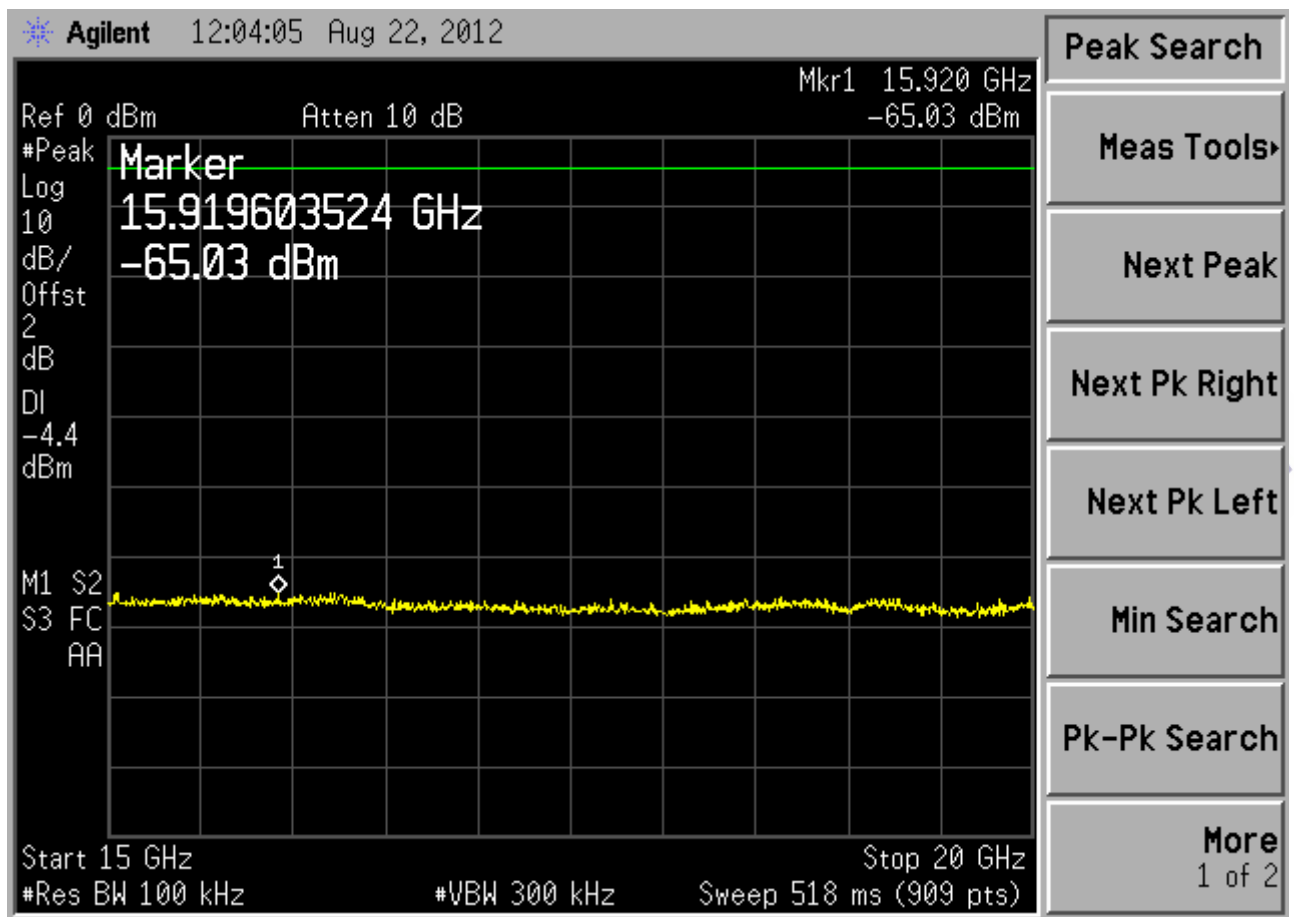




## Ch 25 (2475 MHz)







## 7 BAND EDGES MEASUREMENT

### 7.1 Test Equipment

The following test equipment was used during the band edges measurement:

| Item | Type              | Manufacturer | Model No. | Serial No. | Last Cal.    | Next Cal.    |
|------|-------------------|--------------|-----------|------------|--------------|--------------|
| 1.   | Spectrum Analyzer | Agilent      | E7405A    | MY45106600 | Mar 22, 2011 | Mar 22, 2012 |

### 7.2 Block Diagram of Test Setup

The same as section.4.2.

### 7.3 Specification Limits (§15.247(d))

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

### 7.4 Operating Condition of EUT

The test program “Hyper-Terminal” was used to enable the EUT to transmit and receive data at different channel frequency individually.

### 7.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. Set both RBW and VBW of spectrum analyzer to 100kHz with suitable frequency span including 100kHz bandwidth from band edge.

### 7.6 Test Results

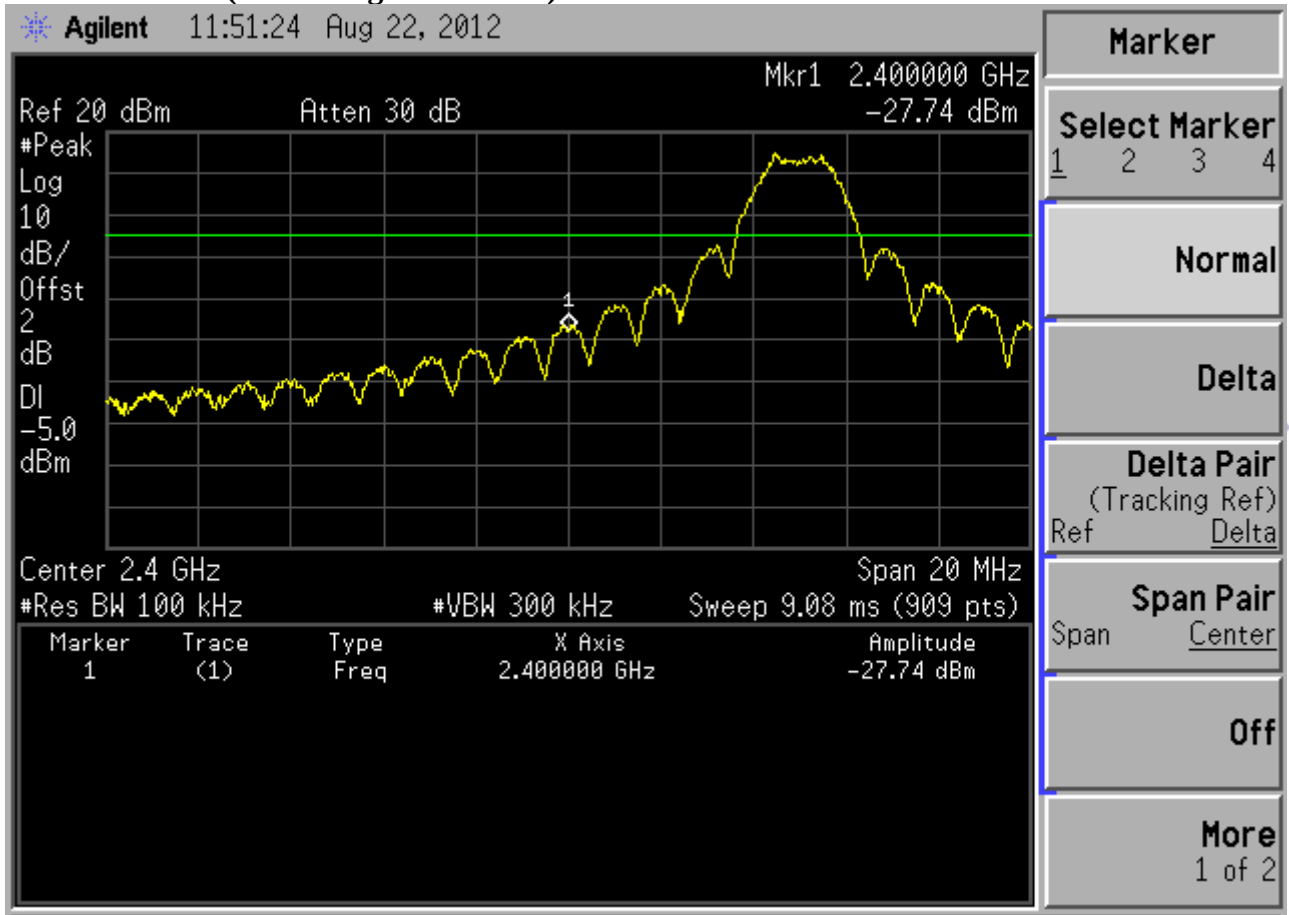
**PASSED.** All the test results are attached in next pages.

Note – The Reference Level refer to Sec. 8.6 PSD (in 100kHz) which tested according to “5.4.1.1 Measurement Procedure – Reference Level” of KDB558074 v01: 2012

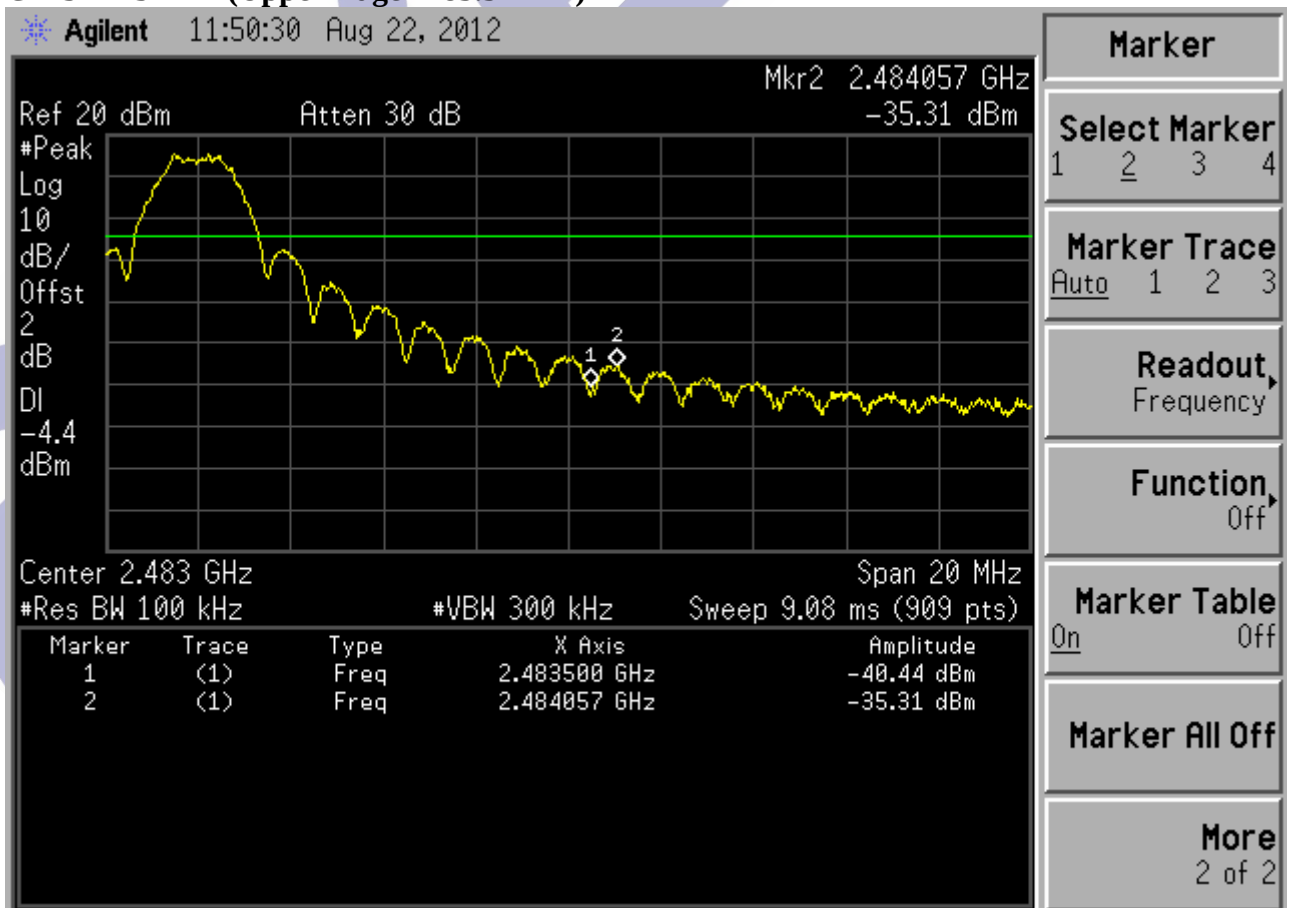
(Test Date: Aug. 22, 2012 Temperature: 23°C Humidity: 48 %%)

| Location        | Channel | Frequency | Delta Marker | Result                                                       |
|-----------------|---------|-----------|--------------|--------------------------------------------------------------|
| Below Band Edge | 11      | 2405 MHz  | 42.74 dB     | More than 20 dB below the highest level of the desired power |
| Upper Band Edge | 25      | 2475 MHz  | 50.87 dB     |                                                              |

## Ch11 2405MHz (Below Edge 2400 MHz)



## Ch25 2475MHz (Upper Edge 2483.5 MHz)



## 8 POWER SPECTRAL DENSITY MEASUREMENT

### 8.1 Test Equipment

The following test equipment was used during the power spectral density measurement:

| Item | Type              | Manufacturer | Model No. | Serial No. | Last Cal.    | Next Cal.    |
|------|-------------------|--------------|-----------|------------|--------------|--------------|
| 1.   | Spectrum Analyzer | Agilent      | E7405A    | MY45106600 | Mar 22, 2012 | Mar 22, 2013 |

### 8.2 Block Diagram of Test Setup

The same as section.4.2.

### 8.3 Specification Limits (§15.247(e))

The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band.

### 8.4 Operating Condition of EUT

The test program “Hyper-Terminal” was used to enable the EUT to transmit data at different channel frequency individually.

### 8.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. The spectrum analyzer was set as RBW = 100kHz, VBW = 300kHz, span = 800kHz (5 – 30% greater than the EBW).

The test procedure is defined in KDB558074 v01:2012 (the 5.3.1 Measurement Procedure PKPSD was used).

### 8.6 Test Results

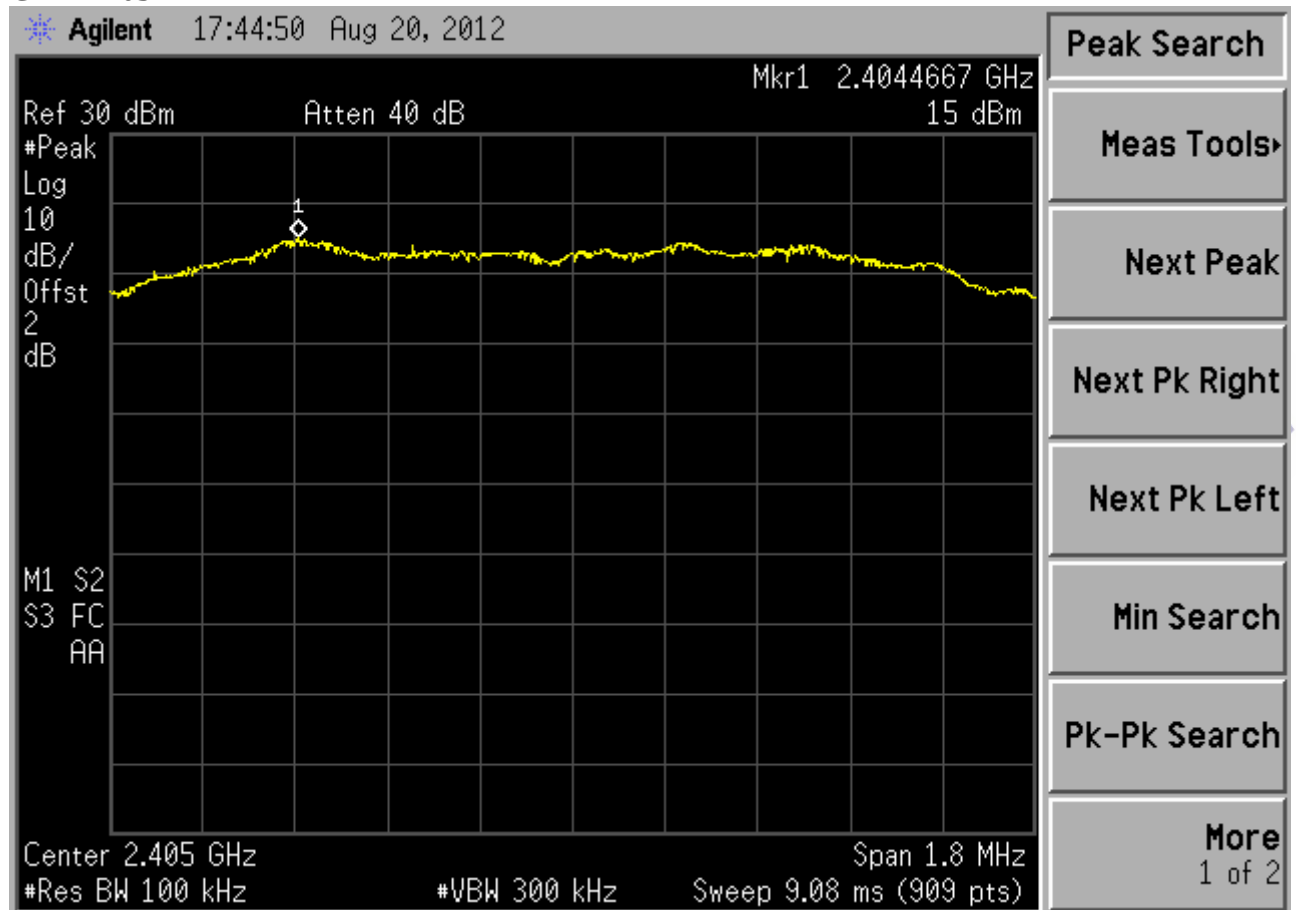
**PASSED.** All the test results are attached in next pages.

(Test Date: Aug. 20, 2012 Temperature: 23°C Humidity: 48 %)

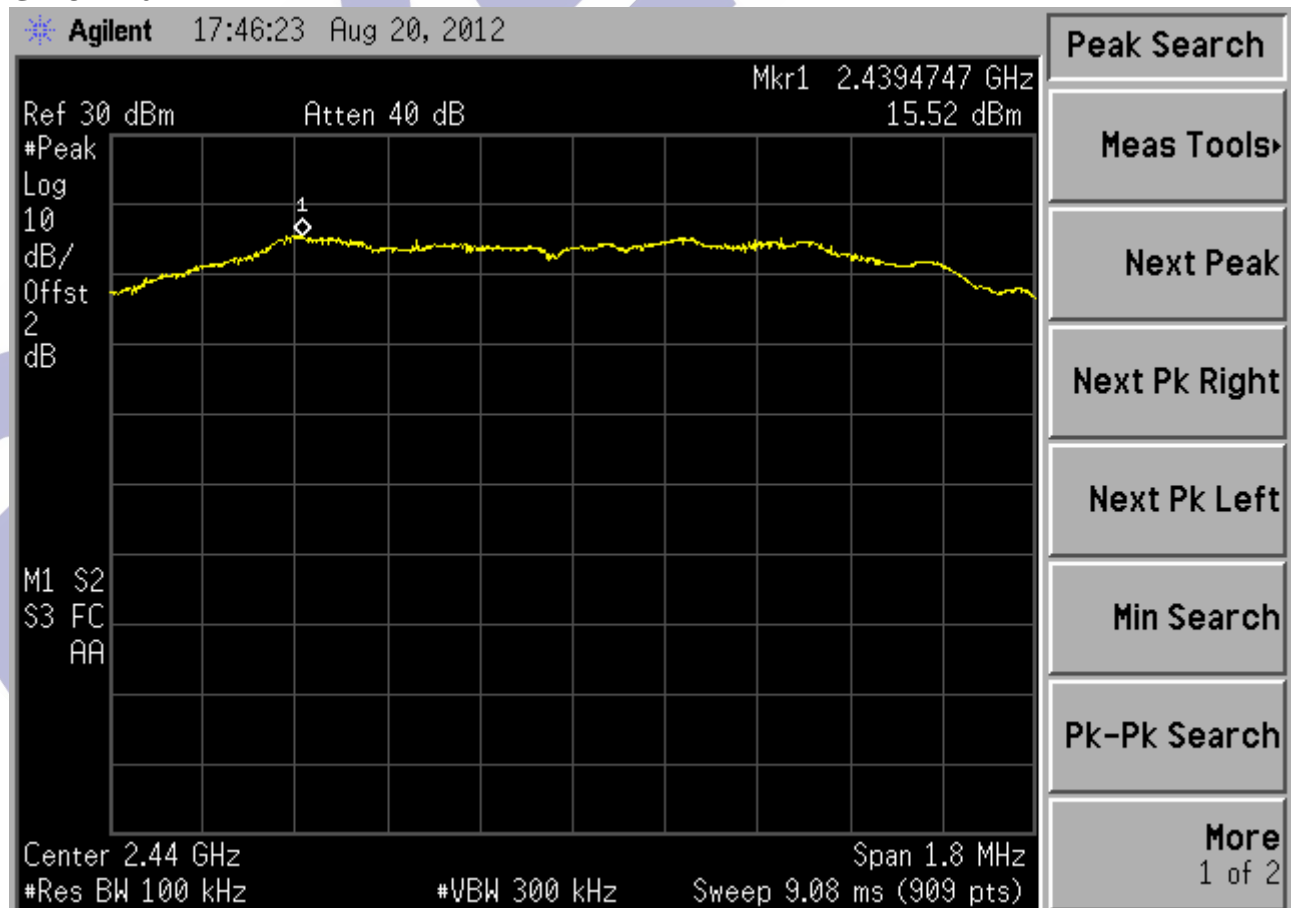
| Channel | Frequency | Power Spectral Density reading value (in 100kHz) | Power Spectral Density reading value (in 3kHz) | Limit |
|---------|-----------|--------------------------------------------------|------------------------------------------------|-------|
| 11      | 2405 MHz  | 15.00 dBm                                        | -0.2 dBm                                       | 8dBm  |
| 18      | 2440 MHz  | 15.52 dBm                                        | 0.32 dBm                                       | 8dBm  |
| 25      | 2475 MHz  | 15.56 dBm                                        | 0.36 dBm                                       | 8dBm  |

Note – The PSD (in 3kHz) = PSD (in 100kHz) + BWCF  
Where BWCF =  $10\log(3\text{kHz}/100\text{kHz}) = -15.2\text{dB}$

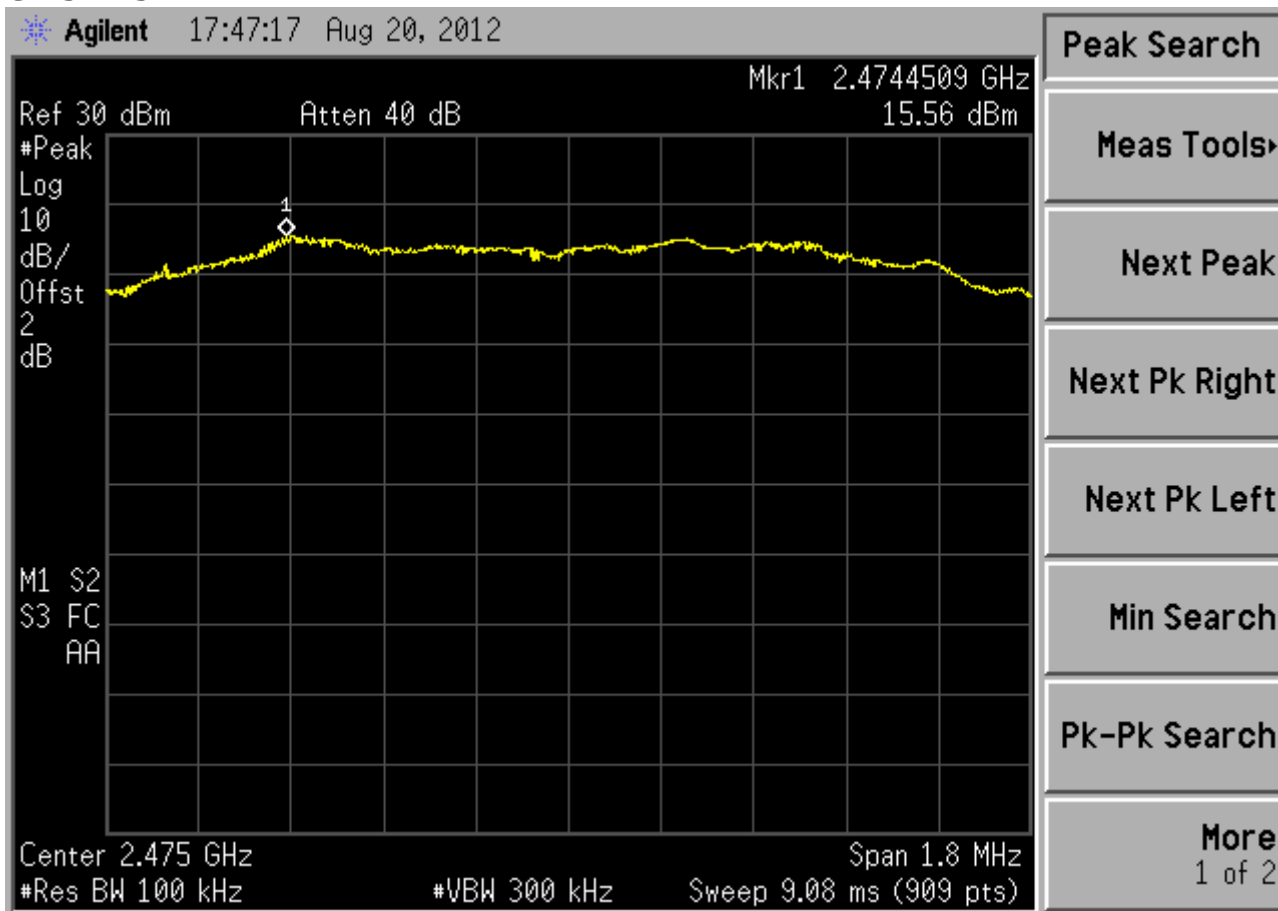
### Ch11 2405 MHz



### Ch18 2440 MHz



Ch25 2475 MHz



## 9 DEVIATION TO TEST SPECIFICATIONS

None.

REXENSE