

# TEST REPORT

of

FCC Part 15 Subpart C §15.247

FCC ID: 2AFE8GH8123BT

Equipment Under Test : Blood Glucose Monitoring System  
Model Name : Medisign GH83 BT  
Variant Model Names : Medisign GH81 BT, Medisign GH82 BT  
Applicant : Tianjin Empecs Medical Device Co., Ltd.  
Manufacturer : Tianjin Empecs Medical Device Co., Ltd.  
Date of Test(s) : 2015.12.01 ~ 2015.12.04  
Date of Issue : 2016.01.18

In the configuration tested, the EUT complied with the standards specified above.

Tested By:

  
Youngmin Park

Date:

2016.01.18

Approved By:

  
Hyunchae You

Date:

2016.01.18

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

# INDEX

| <u>Table of Contents</u>  | Page |
|---|------|
| 1. General Information -----  | 3    |
| 2. Radiated Spurious Emissions and Conducted Spurious Emission----- | 6    |
| 3. 6 dB Bandwidth -----   | 22   |
| 4. Maximum Conducted Output Power -----                             | 25   |
| 5. Power Spectral Density -----                                     | 27   |
| 6. Antenna Requirement -----  | 30   |

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

**SGS Korea Co., Ltd. (Gunpo Laboratory)** 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## 1. General Information

### 1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- Wireless Div. 2FL, 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

Phone No. : +82 31 688 0901

Fax No. : +82 31 688 0921

### 1.2. Details of Applicant

Applicant : Tianjin Empecs Medical Device Co., Ltd.

Address : No.35, Yingcheng Street, Hangu, Binhai New Area, 300480 Tianjin, China

Contact Person : Kim, Ho-Kyum

Phone No. : +82 70 7124 0463

### 1.3. Description of EUT

|                             |  |
|-----------------------------|--|
| <b>Kind of Product</b>      | Blood Glucose Monitoring System              |
| <b>Model Name</b>           | Medisign GH83 BT                             |
| <b>Variant Model Names</b>  | Medisign GH81 BT, Medisign GH82 BT           |
| <b>Power Supply</b>         | DC 3 V (Lithium Battery)                     |
| <b>Frequency Range</b>      | 2 402 MHz ~ 2 480 MHz (Bluetooth Low Energy) |
| <b>Modulation Technique</b> | GFSK   |
| <b>Number of Channels</b>   | 40 channels (Bluetooth Low Energy)           |
| <b>Antenna Type</b>         | PCB Antenna                                  |
| <b>Antenna Gain</b>         | -3.93 dBi                                    |

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

**SGS Korea Co., Ltd. (Gunpo Laboratory)** 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## 1.4. Test Equipment List

| Equipment         | Manufacturer                | Model                                | S/N            | Cal Date      | Cal Interval | Cal Due.      |
|-------------------|-----------------------------|--------------------------------------|----------------|---------------|--------------|---------------|
| Signal Generator  | Agilent                     | E8257D                               | MY51501169     | Jul. 13, 2015 | Annual       | Jul. 13, 2016 |
| Spectrum Analyzer | Agilent                     | N9030A                               | MY53120526     | Jun. 23, 2015 | Annual       | Jun. 23, 2016 |
| Spectrum Analyzer | Agilent                     | N9020A                               | MY53421758     | Sep. 24, 2015 | Annual       | Sep. 24, 2016 |
| Attenuator        | Mini-Circuits               | BW-N20W5+                            | 0950-2         | Jun. 23, 2015 | Annual       | Jun. 23, 2016 |
| High Pass Filter  | Wainwright Instrument GmbH  | WHK3.0/18G-6SS                       | 4              | Jun. 23, 2015 | Annual       | Jun. 23, 2016 |
| High Pass Filter  | Wainwright Instrument GmbH  | WHK7.5/26.5G-6SS                     | 15             | Jun. 23, 2015 | Annual       | Jun. 23, 2016 |
| Low Pass Filter   | Mini-Circuits               | NLP-1200+                            | V 8979400903-2 | Mar. 12, 2015 | Annual       | Mar. 12, 2016 |
| Power Sensor      | R&S                         | NRP-Z81                              | 100669         | Mar. 12, 2015 | Annual       | Mar. 12, 2016 |
| DC Power Supply   | Agilent                     | U8002A                               | MY53150029     | Jun. 22, 2015 | Annual       | Jun. 22, 2016 |
| Preamplifier      | H.P.                        | 8447F                                | 2944A03909     | Aug. 27, 2015 | Annual       | Aug. 27, 2016 |
| Preamplifier      | R&S                         | SCU-18                               | 10117          | Apr. 10, 2015 | Annual       | Apr. 10, 2016 |
| Preamplifier      | MITEQ Inc.                  | JS44-18004000-35-8P                  | 1546891        | May 07, 2015  | Annual       | May 07, 2016  |
| Loop Antenna      | R&S                         | HFH2-Z2                              | 100118         | Jun. 04, 2015 | Biennial     | Jun. 04, 2017 |
| Bilog Antenna     | Schwarzbeck Mess-Elektronik | VULB9163                             | 396            | Jun. 18, 2015 | Biennial     | Jun. 18, 2017 |
| Horn Antenna      | R&S                         | HF906                                | 100608         | Oct. 16, 2014 | Biennial     | Oct. 16, 2016 |
| Horn Antenna      | Schwarzbeck Mess-Elektronik | BBHA9170                             | BBHA9170431    | May 15, 2014  | Biennial     | May 15, 2016  |
| Antenna Master    | INN-CO                      | MM4000                               | N/A            | N.C.R.        | N/A          | N.C.R.        |
| Turn Table        | INN-CO                      | DS 1200 S                            | N/A            | N.C.R.        | N/A          | N.C.R.        |
| Test Receiver     | R&S                         | ESU26                                | 100109         | Mar. 03, 2015 | Annual       | Mar. 03, 2016 |
| Anechoic Chamber  | SY Corporation              | L x W x H<br>(9.6 m x 6.4 m x 6.6 m) | N/A            | N.C.R.        | N/A          | N.C.R.        |

## 1.5. Variant Models

| Model name                      | Information   |
|---------------------------------|---|
| Medesign GH83                   | - Basic model   |
| Medesign GH81,<br>Medesign GH82 | - Same to basic model, but it is different following a feature.<br>- The shape of switch is different from basic model. |

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## 1.6. Summary of Test Results

The EUT has been tested according to the following specifications:

| APPLIED STANDARD : FCC Part15 Subpart C |  |                   |
|---|--|-------------------|
| Standard section                        | Test Item(s)   | Result            |
| 15.205<br>15.209<br>15.247(d)           | Radiated Spurious Emissions and<br>Conducted Spurious Emission | Complied          |
| 15.247(a)(2)                            | 6 dB Bandwidth   | Complied          |
| 15.247(b)(3)                            | Maximum Conducted Output Power                                 | Complied          |
| 15.247(e)                               | Power Spectral Density   | Complied          |
| 15.207                                  | AC Power Line Conducted Emissions                              | N/A <sup>1)</sup> |

### Note.

1. EUT does not operate at charging mode. Therefore, AC conducted emission test is not necessary.

## 1.7. Test Procedure(s)

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2009) and the guidance provided in KDB 558074 D01 v03r03 were used in the measurement of the DUT.

## 1.8. Sample calculation

Where relevant, the following sample calculation is provided:

### 1.8.1. Conducted test

Offset value (dB) = Attenuator(dB) + Cable loss (dB)

### 1.8.2. Radiation test

Field strength level (dB $\mu$ V/m) = Measured level (dB $\mu$ V) + Antenna factor (dB) + Cable loss (dB) – amplifier (dB)

## 1.9. Test report revision

| Revision | Report number          | Date of Issue | Description                            |
|----------|------------------------|---------------|--|
| 0        | F690501/RF-RTL009331   | 2015.12.21    | Initial                                |
| 0        | F690501/RF-RTL009331-1 | 2016.01.18    | Modified basic and variant model names |

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

**SGS Korea Co., Ltd. (Gunpo Laboratory)** 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

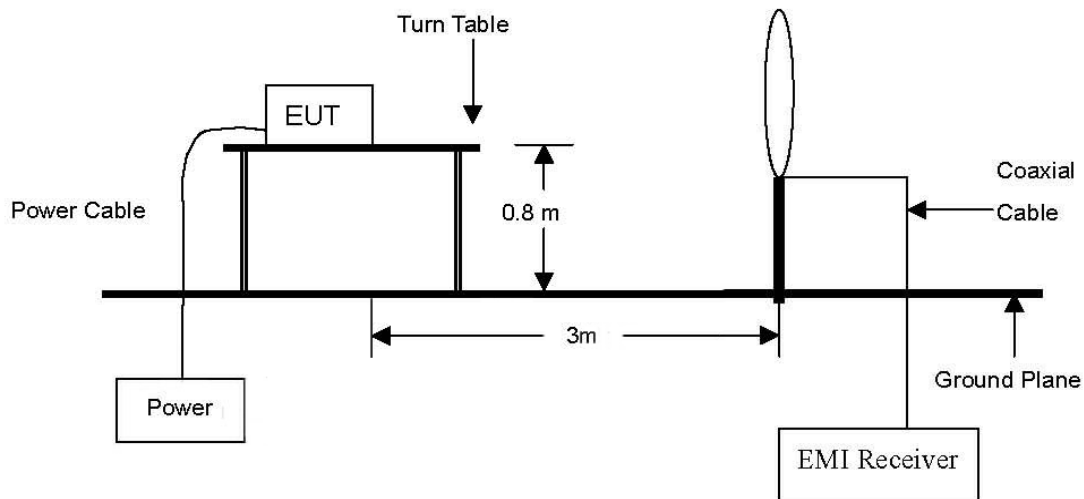
A4(210 mm x 297 mm)

## 2. Radiated Spurious Emissions and Conducted Spurious Emission

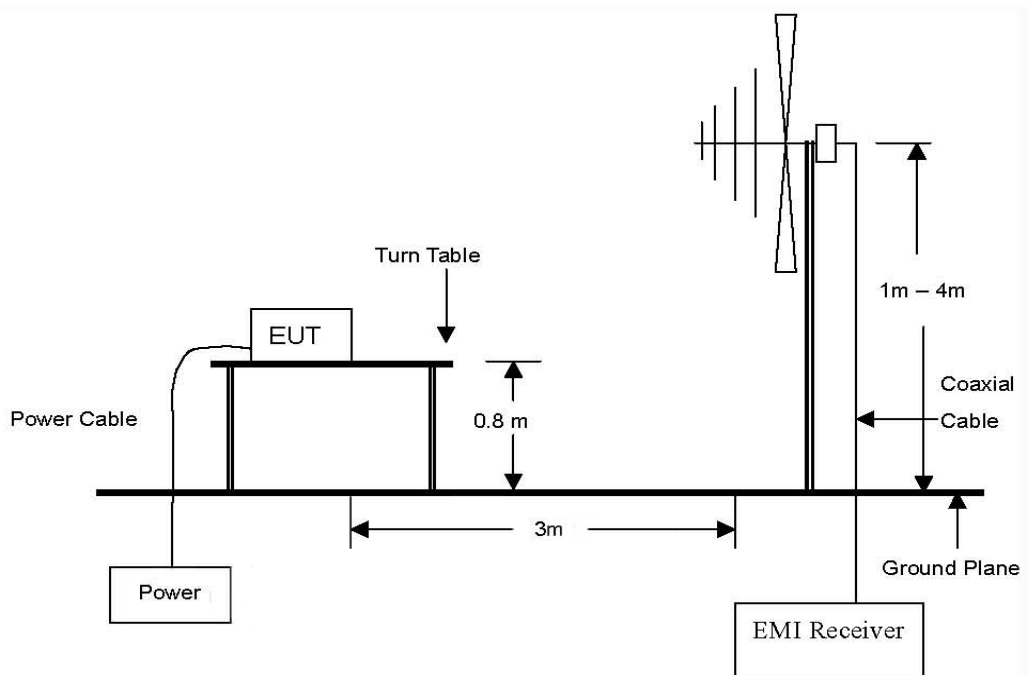
## 2.1. Test Setup

### 2.1.1. Radiated Spurious Emissions

The diagram below shows the test setup that is utilized to make the measurements for emission below 30 MHz Emissions.

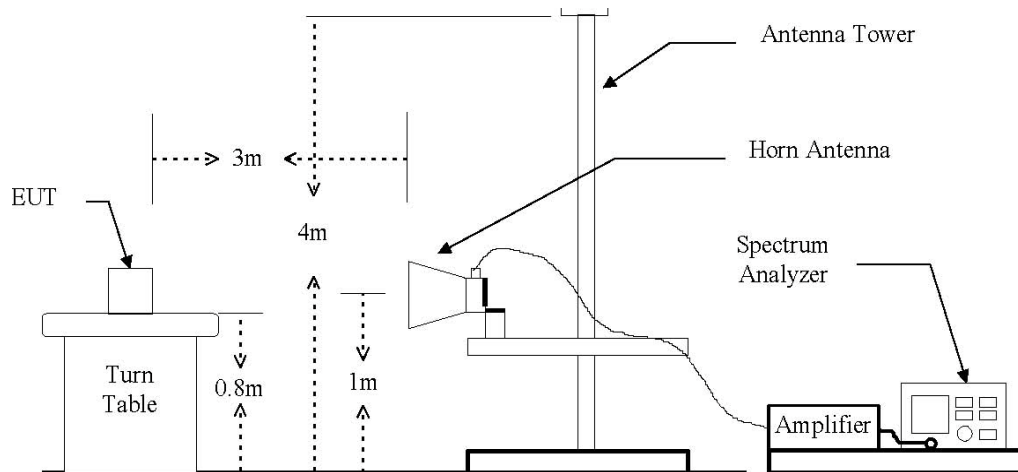


The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

The diagram below shows the test setup that is utilized to make the measurements for emission. The spurious emissions were investigated from 1 GHz to the 10<sup>th</sup> harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.



*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

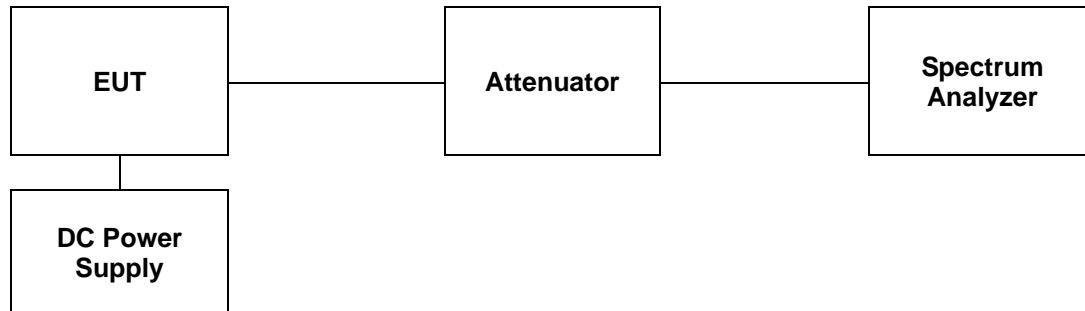
**SGS Korea Co., Ltd. (Gunpo Laboratory)** 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

### 2.1.2. Conducted Spurious Emissions



### 2.2. Limit

According to §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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph(b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

According to § 15.209(a), Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

| Frequency<br>(MHz) | Distance<br>(Meters) | Field Strength<br>(dBμV/m) | Field Strength<br>(μV/m) |
|--------------------|----------------------|----------------------------|--------------------------|
| 0.009 – 0.490      | 300                  | 20 log (2 400/F(kHz))      | 2 400/F(kHz)             |
| 0.490 – 1.705      | 30                   | 20 log (24 000/F(kHz))     | 24 000/F(kHz)            |
| 1.705 – 30.0       | 30                   | 29.54                      | 30                       |
| 30 - 88            | 3                    | 40.0                       | 100                      |
| 88 – 216           | 3                    | 43.5                       | 150                      |
| 216 – 960          | 3                    | 46.0                       | 200                      |
| Above 960          | 3                    | 54.0                       | 500                      |

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

**SGS Korea Co., Ltd. (Gunpo Laboratory)** 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)



## 2.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates in section 11.0 & 12.0 of KDB 558074 D01 v03r03 and ANSI C63.10-2009.

### 2.3.1. Test Procedures for emission below 30 MHz

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
3. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
4. The test-receiver system was set to average or quasi peak detect function and Specified Bandwidth with Maximum Hold Mode.

#### Note;

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 meter open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.

### 2.3.2. Test Procedures for emission from above 30 MHz

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
3. The antenna is a bi-log antenna, a horn antenna and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

**SGS Korea Co., Ltd. (Gunpo Laboratory)** 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

# NOTE;

## 1. Unwanted Emissions into Non-Restricted Frequency Bands

- The Reference Level Measurement refer to section 11.2

Set analyzer center frequency to DTS channel center frequency, the span  $\geq 1.5$  times the DTS bandwidth, the RBW = 100 kHz and the VBW  $\geq 3 \times$  RBW, Detector = peak, Sweep time = auto couple, Trace mode = max hold, the trace was allowed to stabilize

- Unwanted Emissions Level Measurement refer to section 11.3

Set the center frequency and span to encompass frequency range to be measured, the RBW = 100 kHz and the VBW  $\geq 3 \times$  RBW, Detector = peak, Sweep time = auto couple, Trace mode = max hold, the trace was allowed to stabilize

## 2. Unwanted Emissions into Restricted Frequency Bands

- Peak Power measurement procedure refer to section 12.2.4

Set RBW = as specified in Table 1, VBW  $\geq 3 \times$  RBW, Detector = Peak, Sweep time = auto, Trace = max hold

**Table 1- RBW as a function of frequency**

| Frequency      | RBW           |
|----------------|---------------|
| 9 – 150 kHz    | 200 – 300 Hz  |
| 0.15 – 30 MHz  | 9 – 10 kHz    |
| 30 – 1 000 MHz | 100 – 120 kHz |
| > 1 000 MHz    | 1 MHz         |

-Average Power measurements procedure refer to section 12.2.5.1

The EUT shall be configured to operate at the duty cycle more than 98 percent.

Set RBW = 1 MHz, VBW  $\geq 3 \times$  RBW, Detector = RMS, Average type = power(i.e., RMS), Sweep time = auto, Perform a trace average of at least 100 traces.

## 3. To get a maximum emission level from the EUT, the EUT is manipulated through three orthogonal planes.

Definition of DUT three orthogonal planes were described in the test setup photos.

Worst orthogonal plan of EUT is **X – axis** during radiation test.

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

**SGS Korea Co., Ltd. (Gunpo Laboratory)** 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

### 2.3.3. Test Procedures for Conducted Spurious Emissions

Per the guidance of KDB 558074 D01 v03r03, section 11.1 & 11.2 & 11.3, the reference level for out of band emissions is established from the plots of this section since the band edge emissions are measured with a RBW of 100 kHz. This reference level is then used as the limit in subsequent plots for out of band spurious emissions shown in section 2.4.3. The limit for out of band spurious emission at the band edge is 20 dB or 30 dB below the fundamental emission level measured in a 100 kHz bandwidth.

#### 1. Conducted Emissions at Band Edge

- The Measurement refer to section 11.2

Set analyzer center frequency to DTS channel center frequency, the span  $\geq 1.5$  times the DTS bandwidth, the RBW = 100 kHz and the VBW  $\geq 3 \times$  RBW, Detector = peak, Sweep time = auto couple, Trace mode = max hold, the trace was allowed to stabilize

#### 2. Conducted Spurious Emissions

- The Measurement refer to section 11.3

Start frequency was set to 32.768 kHz and stop frequency was set to 24.8 GHz (separated into two plots per channel), Set the center frequency and span to encompass frequency range to be measured, the RBW = 100 kHz and the VBW  $\geq 3 \times$  RBW, Detector = peak, Sweep time = auto couple, Trace mode = max hold, the trace was allowed to stabilize

#### 3. Correction function

- For plots showing conducted spurious emissions from 30 kHz to 24.8 GHz, all path loss of wide frequency range was investigated and compensated to spectrum analyzer as Correction function.  
The reading values shown in plots were final result.

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

**SGS Korea Co., Ltd. (Gunpo Laboratory)** 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## 2.4. Test Results

Ambient temperature : (23 ± 1) °C

Relative humidity : 47 % R.H.

### 2.4.1. Spurious Radiated Emission below 1 000 MHz

The frequency spectrum below 1 000 MHz was investigated. All reading values are peak values.

| Radiated Emissions |                |             | Ant  | Correction Factors |               | Total           | FCC Limit      |             |
|--------------------|----------------|-------------|------|--------------------|---------------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP + CL (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 45.20              | 33.90          | Peak        | H    | 16.12              | -27.09        | 22.93           | 40.00          | 17.07       |
| 47.38              | 40.30          | Peak        | V    | 14.61              | -27.06        | 27.85           | 40.00          | 12.15       |
| 125.79             | 44.10          | Peak        | H    | 10.91              | -26.38        | 28.63           | 43.50          | 14.87       |
| 128.01             | 46.10          | Peak        | V    | 9.15               | -26.37        | 28.88           | 43.50          | 14.62       |
| 226.59             | 40.80          | Peak        | V    | 12.93              | -25.58        | 28.15           | 46.00          | 17.85       |
| 352.40             | 40.50          | Peak        | H    | 15.50              | -25.31        | 30.69           | 46.00          | 15.31       |
| Above 400.00       | Not detected   | -           | -    | -                  | -             | -               | -              | -           |

Remark:

1. Spurious emissions for all channels were investigated and almost the same below 1 GHz.
2. Reported spurious emissions are in **High channel** as worst case among other channels.
3. According to § 15.31(o), the amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.
4. Radiated spurious emission measurement as below.  
(Actual = Reading + AF + AMP + CL)
5. The device has a reference clock operating at 32.768 kHz.

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

**SGS Korea Co., Ltd. (Gunpo Laboratory)** 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

### 2.4.2. Spurious Radiated Emission above 1 000 MHz

The frequency spectrum above 1 000 MHz was investigated. All reading values are peak and average values.

#### A. Low Channel (2 402 MHz)

| Radiated Emissions |                      |             | Ant. | Correction Factors |         | Total                 | FCC Limit            |             |
|--------------------|----------------------|-------------|------|--------------------|---------|-----------------------|----------------------|-------------|
| Frequency (MHz)    | Reading (dB $\mu$ V) | Detect Mode | Pol. | AF (dB/m)          | CL (dB) | Actual (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) |
| *2 310.00          | 24.29                | Peak        | H    | 27.77              | 5.35    | 57.41                 | 74.00                | 16.59       |
| *2 310.00          | 15.12                | Average     | H    | 27.77              | 5.35    | 48.24                 | 54.00                | 5.76        |
| *2 369.63          | 25.72                | Peak        | H    | 28.18              | 5.37    | 59.27                 | 74.00                | 14.73       |
| *2 369.63          | 14.51                | Average     | H    | 28.18              | 5.37    | 48.06                 | 54.00                | 5.94        |
| *2 390.00          | 25.27                | Peak        | H    | 28.08              | 5.38    | 58.73                 | 74.00                | 15.27       |
| *2 390.00          | 15.31                | Average     | H    | 28.08              | 5.38    | 48.77                 | 54.00                | 5.23        |

| Radiated Emissions |                      |             | Ant. | Correction Factors |             | Total                 | FCC Limit            |             |
|--------------------|----------------------|-------------|------|--------------------|-------------|-----------------------|----------------------|-------------|
| Frequency (MHz)    | Reading (dB $\mu$ V) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | Actual (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) |
| Above 1 000.00     | Not detected         | -           | -    | -                  | -           | -                     | -                    | -           |

#### B. Middle Channel (2 440 MHz)

| Radiated Emissions |                      |             | Ant. | Correction Factors |             | Total                 | FCC Limit            |             |
|--------------------|----------------------|-------------|------|--------------------|-------------|-----------------------|----------------------|-------------|
| Frequency (MHz)    | Reading (dB $\mu$ V) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | Actual (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) |
| Above 1 000.00     | Not detected         | -           | -    | -                  | -           | -                     | -                    | -           |

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## C. High Channel (2 480 MHz)

| Radiated Emissions |                      |             | Ant. | Correction Factors |         | Total                 | FCC Limit            |             |
|--------------------|----------------------|-------------|------|--------------------|---------|-----------------------|----------------------|-------------|
| Frequency (MHz)    | Reading (dB $\mu$ V) | Detect Mode | Pol. | AF (dB/m)          | CL (dB) | Actual (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) |
| *2 483.50          | 26.81                | Peak        | H    | 28.17              | 5.44    | 60.42                 | 74.00                | 13.58       |
| *2 483.50          | 15.72                | Average     | H    | 28.17              | 5.44    | 49.33                 | 54.00                | 4.67        |
| *2 494.39          | 28.00                | Peak        | H    | 28.27              | 5.47    | 61.74                 | 74.00                | 12.26       |
| *2 494.39          | 15.75                | Average     | H    | 28.27              | 5.47    | 49.49                 | 54.00                | 4.51        |
| *2 500.00          | 27.72                | Peak        | H    | 28.31              | 5.49    | 61.52                 | 74.00                | 12.48       |
| *2 500.00          | 15.42                | Average     | H    | 28.31              | 5.49    | 49.22                 | 54.00                | 4.78        |

| Radiated Emissions |                      |             | Ant. | Correction Factors |             | Total                 | FCC Limit            |             |
|--------------------|----------------------|-------------|------|--------------------|-------------|-----------------------|----------------------|-------------|
| Frequency (MHz)    | Reading (dB $\mu$ V) | Detect Mode | Pol. | AF (dB/m)          | AMP+CL (dB) | Actual (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) |
| Above 1 000.00     | Not detected         | -           | -    | -                  | -           | -                     | -                    | -           |

## Remarks;

1. “\*” means the restricted band.
2. Measuring frequencies from 1 GHz to the 10<sup>th</sup> harmonic of highest fundamental frequency.
3. According to § 15.31(o), the amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.
4. Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using peak/average detector mode.
5. Band edge measurement  
(Actual = Reading + AF + CL)
6. Radiated spurious emission measurement  
(Actual = Reading + AF + AMP + CL)

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

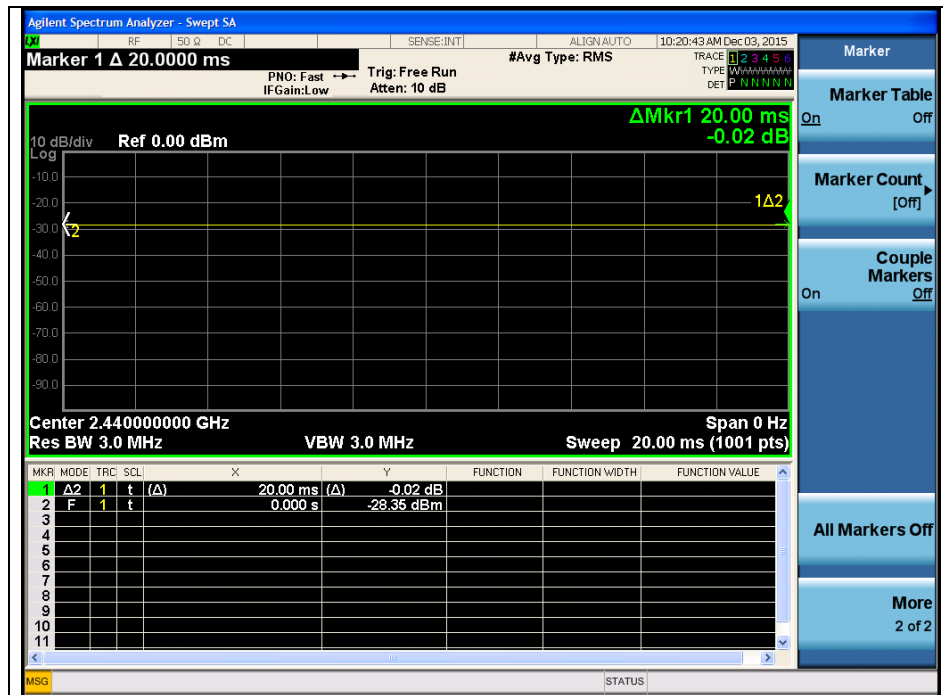
A4(210 mm x 297 mm)

Note;

Duty cycle measurement of EUT

Duty cycle (x) = Tx(on) / Tx(on+off) = 20 ms / 20 ms = 1

Duty factor = 10log(1/x), 10log(1/1) = 0



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

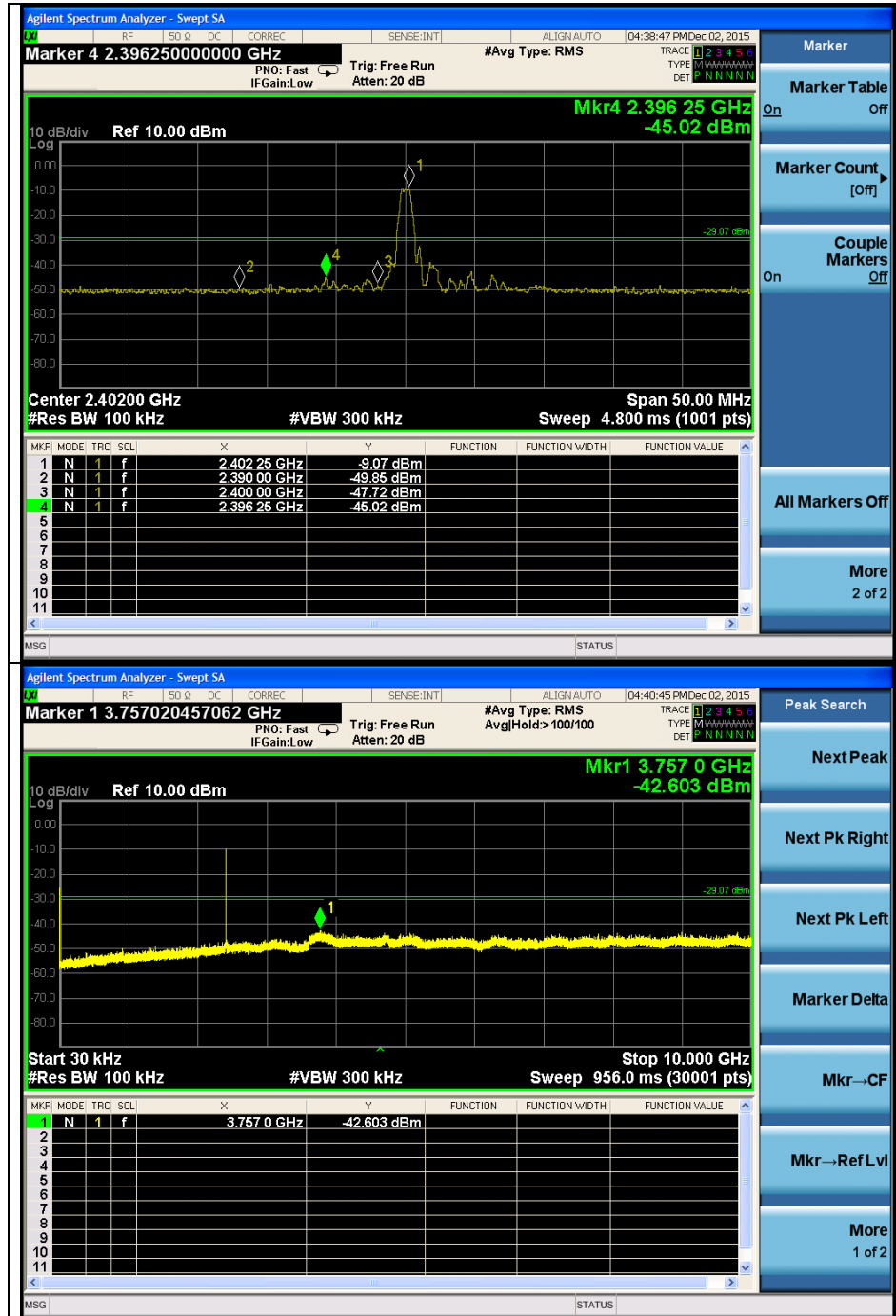
RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## 2.4.3. Spurious RF Conducted Emissions: Plot of Spurious RF Conducted Emission

Low Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

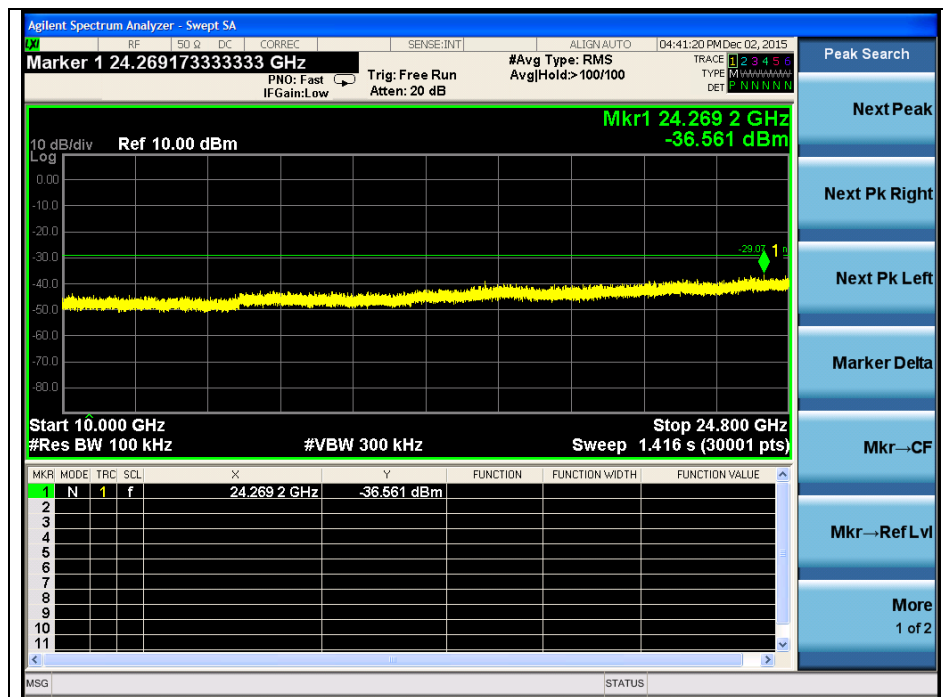
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)





The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

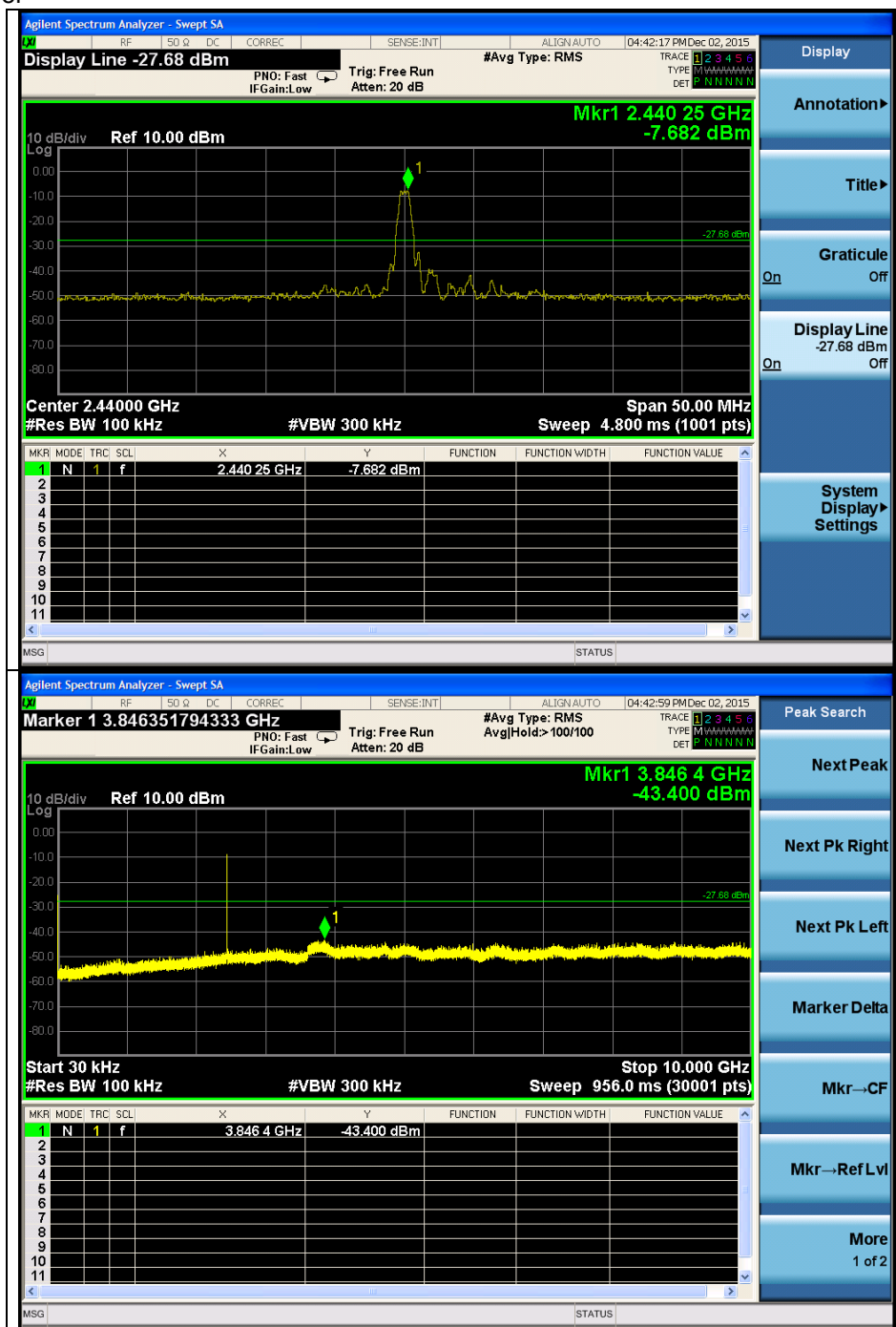
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## Middle Channel



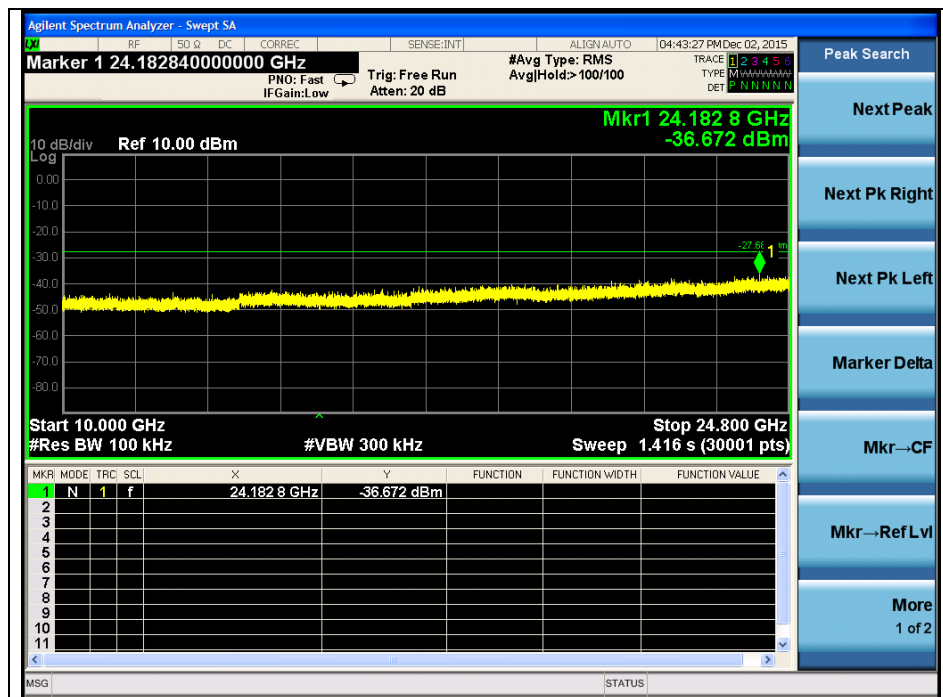
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

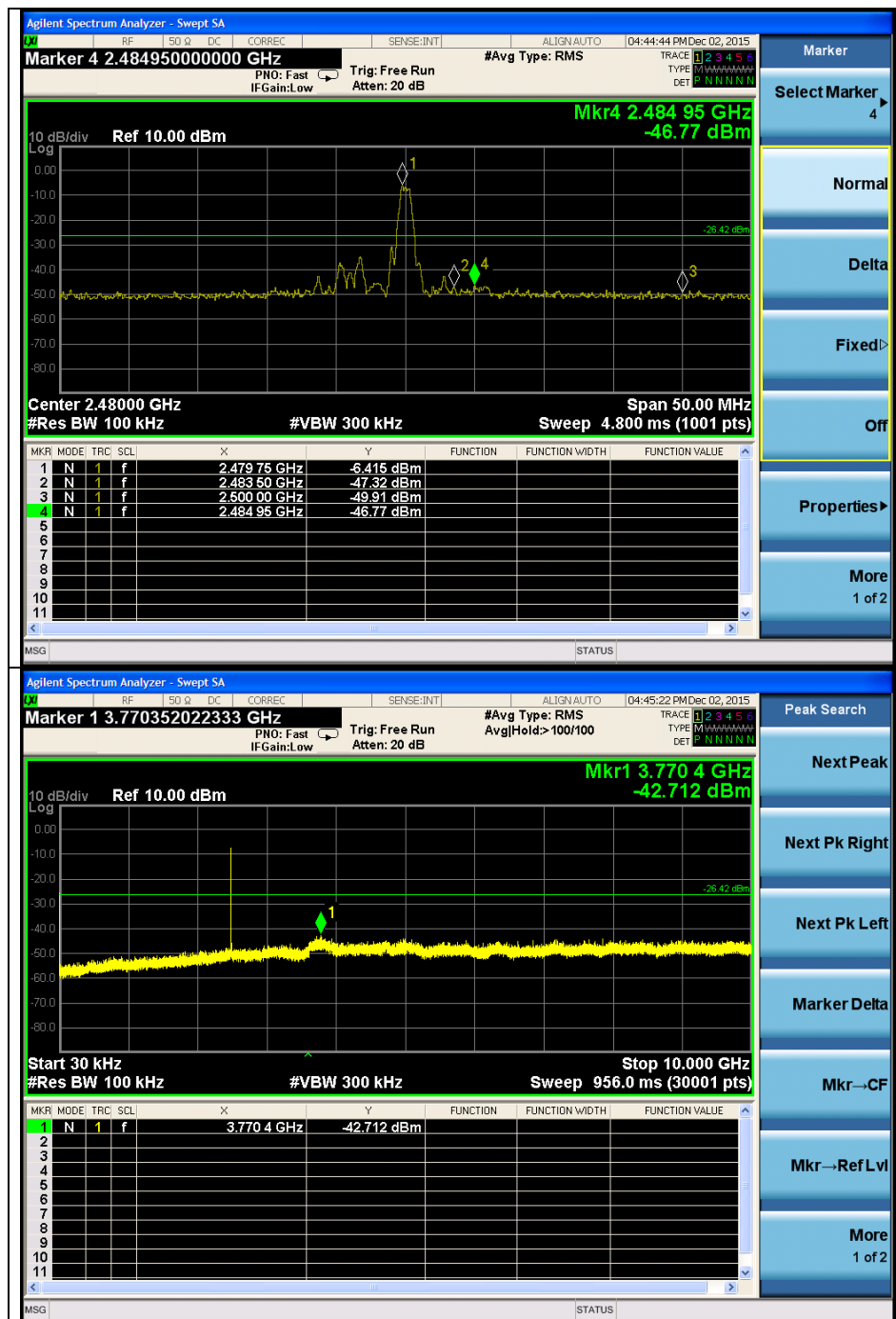
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## High Channel



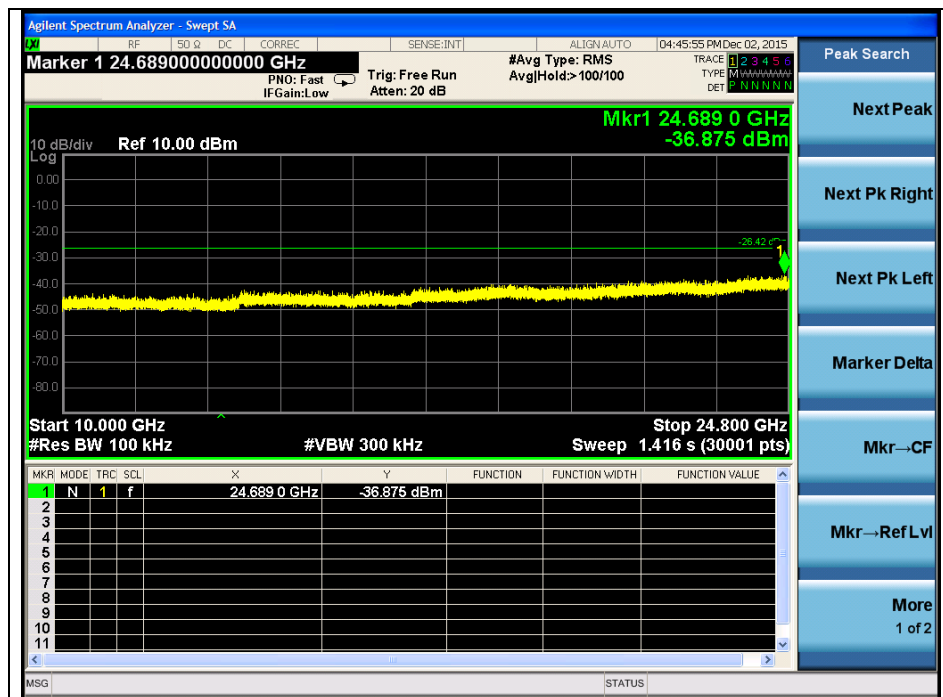
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

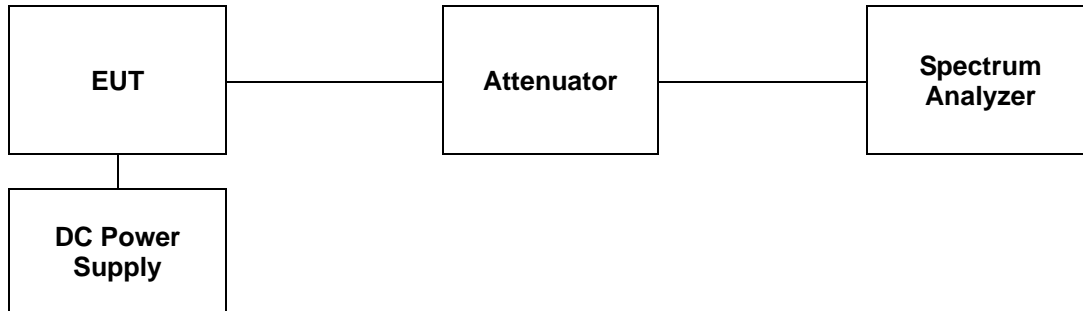
RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

### 3. 6 dB Bandwidth

#### 3.1. Test Setup



#### 3.2. Limit

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 ~ 928 MHz, 2 400 ~ 2 483.5 MHz, and 5 725 ~ 5 825 MHz bands. The minimum of 6 dB Bandwidth shall be at least 500 kHz.

#### 3.3. Test Procedure

##### 3.3.1. 6 dB Bandwidth

The test follows section 8.0 DTS bandwidth of FCC KDB Publication 558074 D01 v03r03.

Tests performed using section 8.2 Option 2.

- Option 2:

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above(i.e.,  $RBW = 100 \text{ kHz}$ ,  $VBW \geq 3 \times RBW$ , peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be  $\geq 6 \text{ dB}$ .

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

**SGS Korea Co., Ltd. (Gunpo Laboratory)** 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

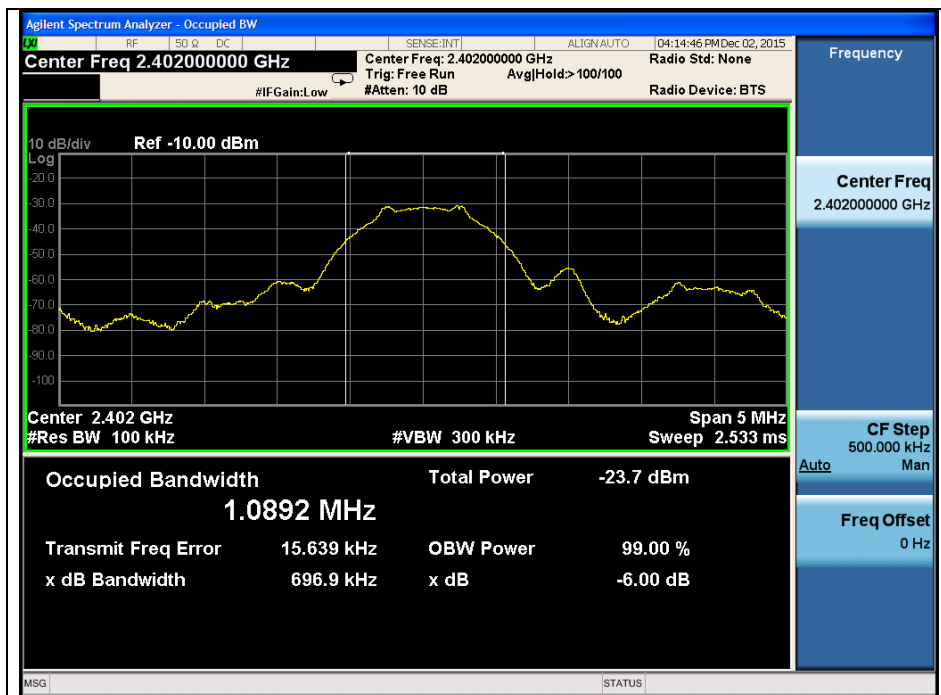
### 3.4. Test Results

Ambient temperature : (23 ± 1) °C  
Relative humidity : 47 % R.H.

| Operation Mode | Channel | Channel Frequency (MHz) | 6 dB Bandwidth (kHz) | Minimum Bandwidth (kHz) |
|----------------|---------|-------------------------|----------------------|-------------------------|
| GFSK           | Low     | 2 402                   | 697                  | 500                     |
|                | Middle  | 2 440                   | 678                  | 500                     |
|                | High    | 2 480                   | 676                  | 500                     |

### 6 dB Bandwidth

Low Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

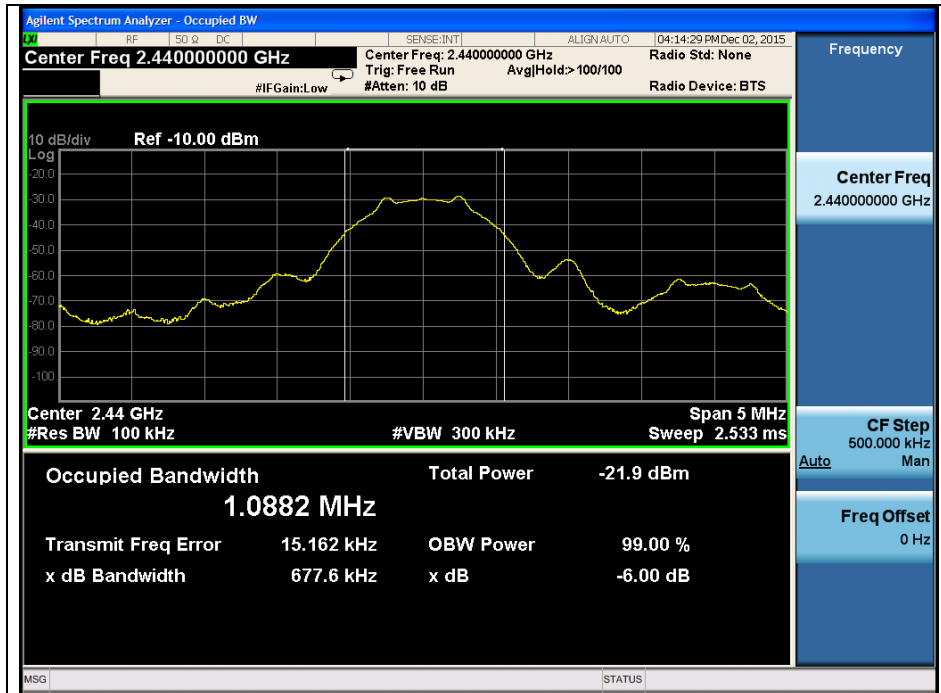
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## Middle Channel



## High Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

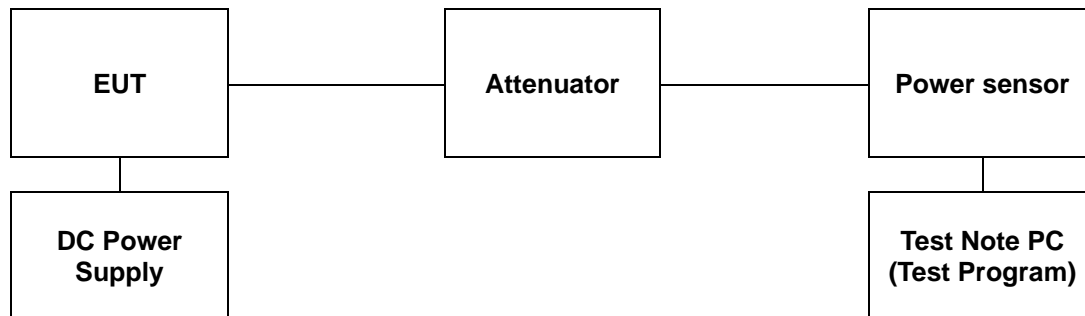
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)



## 4. Maximum Conducted Output Power

### 4.1. Test Setup



### 4.2. Limit

According to §15.247(b)(3), for systems using digital modulation in the 902 ~ 928 MHz, 2 400 ~ 2 483.5 MHz, and 5 725 ~ 5 850 MHz band : 1 Watt. As an alternative to a peak power measurement, compliance with the one watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antenna elements. The average must not include any intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to §15.247(b)(4), the conducted output power limit specified in paragraph(b) of this section is based on the use of antenna with directional gains that do not exceed 6 dBi. Except as shown in paragraph(c) of this section, if transmitting antenna of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 4.3. Test Procedure

The test follows section 9.1.2 of FCC KDB Publication 558074 D01 v03r03.

#### - Peak power meter method

-The maximum peak conducted output power can be measured using a broad band peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

#### Test program: (S/W name : R&S Power Viewer, Version : 3.2.0)

1. Initially overall offset for attenuator and cable loss is measured per frequency.
2. Measured offset is inserted in test program in advance of measurement for output power.
3. Power for each frequency (channel) and data rate of device is investigated as final result.
4. Final result reported on this section from R&S power viewer program includes with several factors and test program shows only final result.

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

**SGS Korea Co., Ltd. (Gunpo Laboratory)** 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

#### 4.4. Test Results

Ambient temperature : (23 ± 1) °C  
Relative humidity : 47 % R.H.

| Mode | Channel | Channel Frequency (MHz) | Attenuator + Cable offset (dB) | Peak Power Result (dB m) | Peak Power Limit (dB m) |
|------|---------|-------------------------|--------------------------------|--------------------------|-------------------------|
| GFSK | Low     | 2 402                   | 23.68                          | <u>2.57</u>              | 30.00                   |
|      | Middle  | 2 440                   | 23.71                          | 2.40                     | 30.00                   |
|      | High    | 2 480                   | 23.70                          | 2.23                     | 30.00                   |

**Remark;**

Cable offset was compensated in test program (R&S Power Viewer) before measuring.

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

**SGS Korea Co., Ltd. (Gunpo Laboratory)** 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

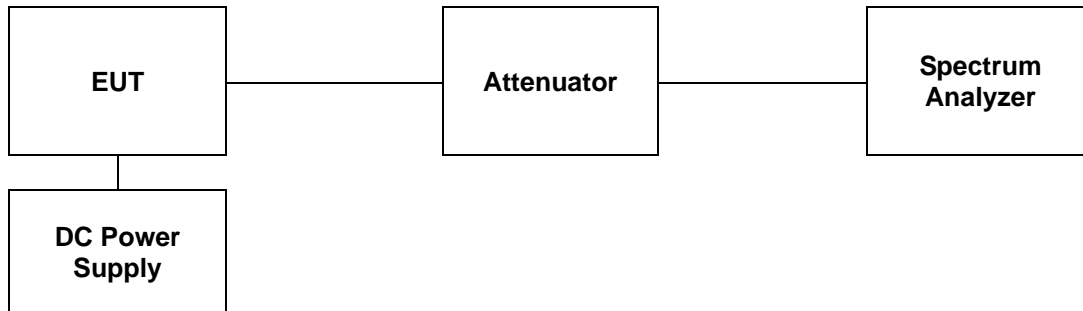
RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## 5. Power Spectral Density

### 5.1. Test Setup



### 5.2. Limit

§15.247(e) For digitally modulated system, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dB m in any 3 kHz band any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

### 5.3. Test Procedure

The measurement is recorded using the PKPSD measurement procedure in 10.2 of KDB 558074 D01 v03r03.

- This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.
- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to at least 1.5 times the DTS channel bandwidth.
- c) Set the RBW to :  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d) Set the VBW  $\geq 3 \times \text{RBW}$ .
- e) Detector = Peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

**SGS Korea Co., Ltd. (Gunpo Laboratory)** 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

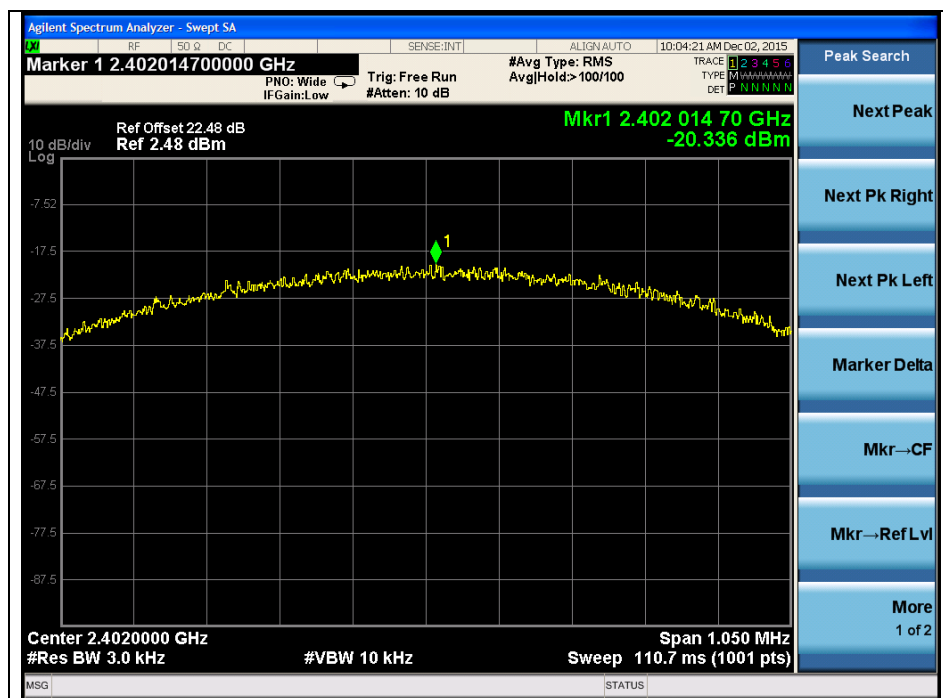
A4(210 mm x 297 mm)

## 5.4. Test Results

Ambient temperature : (23 ± 1) °C  
Relative humidity : 47 % R.H.

| Mode | Channel | Channel Frequency (MHz) | Measured PSD (dB m) | Maximum Limit (dB m) |
|------|---------|-------------------------|---------------------|----------------------|
| GFSK | Low     | 2 402 MHz               | -20.34              | 8                    |
|      | Middle  | 2 440 MHz               | -17.97              | 8                    |
|      | High    | 2 480 MHz               | -19.46              | 8                    |

### Low Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

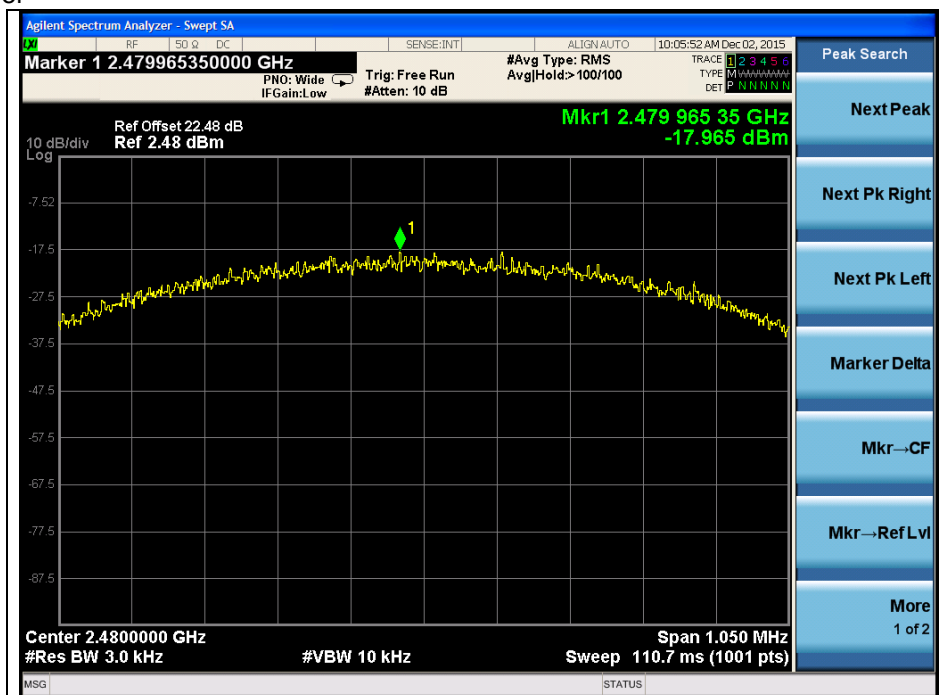
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

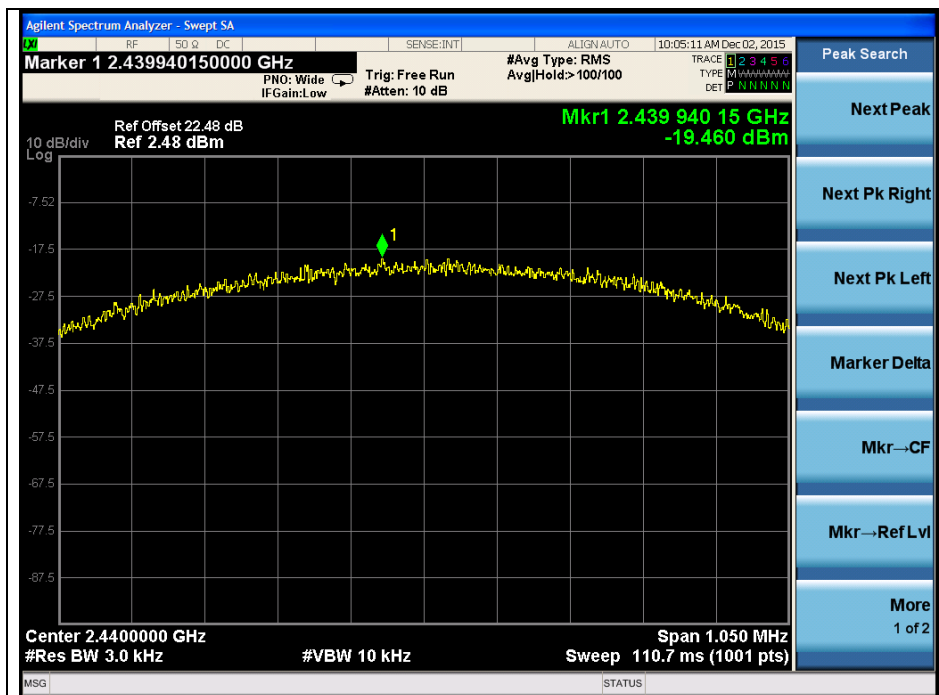
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## Middle Channel



## High Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

---

## 6. Antenna Requirement

### 6.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section §15.247 (b) if transmitting antennas of directional gain greater than 6 dB i are used, the power shall be reduced by the amount in dB that the gain of the antenna exceeds 6 dB i.

### 6.2. Antenna Connected Construction

Antenna used in this product is PCB antenna with gain of -3.93 dB i.

---

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

**SGS Korea Co., Ltd. (Gunpo Laboratory)** 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)