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#### Report Number: 68.950.13.168.01

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#### 2 **Details about the Test Laboratory**

# Details about the Test Laboratory

Test Site 1

| Company name:                | TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch<br>6th Floor, H Hall,Culture Creative Park,<br>No. 4001, Fuqiang Road, |
|------------------------------|--|
|                              | Futian District 518048,<br>Shenzhen,P.R.C.   |
| Telephone:<br>Fax:           | 86 755 8828 6998<br>86 755 828 5299  |
| Test Site 2<br>Company name: | Audix Technology (shenzhen) Co.,Ltd<br>Block Shenzhen, Science & Industry Park,<br>Nantou, Shenzhen,<br>Guangdong,<br>China                |
| Telephone:<br>Fax:           | 86 755 2663 9496<br>86 755 2663 2877   |



#### **Description of the Equipment Under Test** 3

| Product:                               | Multimedia Speakers 2.0 with Bluetooth                                   |  |  |  |  |
|--|--|--|--|--|--|
| Model no.:                             | SPA4270BT/37   |  |  |  |  |
| FCC ID:                                | 2AANUSPA4270BT   |  |  |  |  |
| IC ID:                                 | 11260A-SPA4270BT   |  |  |  |  |
| Brand Name:                            | PHILIPS  |  |  |  |  |
| Options and accessories:               | NIL  |  |  |  |  |
| Rating:                                | 120V~60Hz, 500mA   |  |  |  |  |
| RF Transmission                        | 2402-2480MHz   |  |  |  |  |
| Frequency:<br>No. of Operated Channel: | 79   |  |  |  |  |
| Modulation:                            | GFSK, π/4-DQPSK, 8DPSK   |  |  |  |  |
| Duty Cycle:                            | 33.41%   |  |  |  |  |
| Antenna Type:                          | PCB  |  |  |  |  |
| Antenna Gain:                          | 0.5dBi   |  |  |  |  |
| Description of the EUT:                | The Equipment Under Test (EUT) is a Bluetooth Speaker operated at 2.4GHz |  |  |  |  |



#### **Summary of Test Standards** 4

| Test Standards        |   |  |  |  |  |  |
|-----------------------|---|--|--|--|--|--|
| FCC Part 15 Subpart C | PART 15 - RADIO FREQUENCY DEVICES                             |  |  |  |  |  |
| 10-1-2013 Edition     | Subpart C - Intentional Radiators                             |  |  |  |  |  |
| RSS-Gen Issue 3       | General Requirements and Information for the Certification of |  |  |  |  |  |
| December 2010         | Radio Apparatus   |  |  |  |  |  |
| RSS-210 Issue 8       | RSS-210 — Licence-exempt Radio Apparatus (All Frequency       |  |  |  |  |  |
| December 2010         | Bands): Category I Equipment                                  |  |  |  |  |  |

All the test methods were according to Public Notice DA 00-705 -Frequency Hopper Spread Spectrum Test Procedure released by FCC on March 30, 2000 and C63.10 (2009).



#### **Summary of Test Results** 5

|                           | Technical Requirements                        |  |       |           |             |  |  |  |
|---------------------------|---|--|-------|-----------|-------------|--|--|--|
|                           | FCC Part 15 Subpart C, RSS-Gen, RSS-210       |  |       |           |             |  |  |  |
| Test Condition            |   |  | Pages | Test Site | Test Result |  |  |  |
| §15.207                   | RSS-GEN<br>A7.2.4                             | Conducted emission AC power port                               | 10    | Site 2    | Pass        |  |  |  |
| §15.247(b)(1)             | RSS-210 A8.4                                  | Conducted peak output power                                    | 13    | Site 2    | Pass        |  |  |  |
| §15.247(a)(2)             | RSS-210 A8.2(a)                               | 6dB bandwidth  |       |           | N/A         |  |  |  |
| §15.247(a)(1)             | RSS-210 A8.1(a)<br>& RSSGEN<br>4.6.2          | 20dB bandwidth and<br>99% Occupied<br>Bandwidth                | 15    | Site 2    | Pass        |  |  |  |
| §15.247(a)(1)             | RSS-210 A8.1(b)                               | Carrier frequency separation                                   | 20    | Site 2    | Pass        |  |  |  |
| §15.247(a)(1)(iii)        | RSS-210 A8.1(d)                               | Number of hopping<br>frequencies                               | 22    | Site 2    | Pass        |  |  |  |
| §15.247(a)(1)(iii)        | RSS-210 A8.1(c)                               | Dwell Time   | 24    | Site 2    | Pass        |  |  |  |
| §15.247(e)                | RSS-210 A8.2(b)                               | Power spectral density*  |       |           | N/A         |  |  |  |
| §15.247(d)                | RSS-210 A8.5                                  | Spurious RF conducted emissions                                | 27    | Site 2    | Pass        |  |  |  |
| §15.247(d)                | RSS-210 A8.5                                  | Band edge  | 33    | Site 2    | Pass        |  |  |  |
| §15.247(d) &<br>§15.209 & | RSS-210 2.5 &<br>RSSGEN 7.2.5<br>& RSSGEN 6.1 | Spurious radiated<br>emissions for transmitter<br>and receiver | 38    | Site 2    | Pass        |  |  |  |
| §15.203                   | RSSGEN 7.1.2                                  | Antenna requirement  | See   | e note 2  | Pass        |  |  |  |

Note 1: N/A=Not Applicable.

Note 2: The EUT uses a permanently ceramic antenna, which gain is 0dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.



# 6 General Remarks

### Remarks

This submittal(s) (test report) is intended for FCC ID: 2AANUSPA4270BT, IC ID: 11260A-SPA4270BT complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules and RSS-210.

## SUMMARY:

All tests according to the regulations cited on page 5 were

Performed

- Not Performed

The Equipment Under Test

- - Fulfills the general approval requirements.
- □ **Does not** fulfill the general approval requirements.

Sample Received Date: January 2, 2014

Testing Start Date: January 6, 2014

Testing End Date:

January 17, 2014

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch

Reviewed by:

Ken Li EMC Project Manager

Prepared by:

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Tested by:

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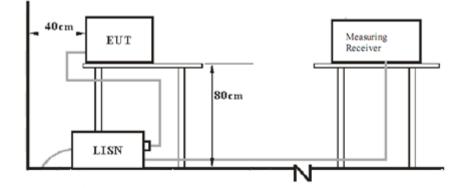
Leo Li EMC Test Engineer

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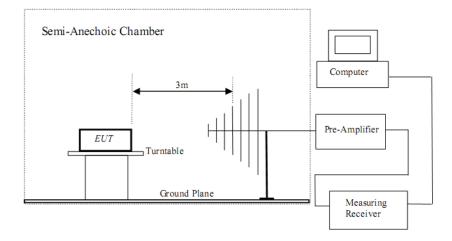


#### **Test Setups** 7

# 7.1 AC Power Line Conducted Emission test setups



# 7.2 Radiated test setups



# 7.3 Conducted RF test setups





# 8 Systems test configuration

Auxiliary Equipment Used during Test:

| DESCRIPTION | MANUFACTURER | MODEL NO.(SHIELD) | S/N(LENGTH) |
|-------------|--------------|-------------------|-------------|
| NoteBook    | Lenovo       | X200              |             |

Test software: ASTTestTool, which used to control the EUT in continues transmitting mode

The system was configured to hopping mode and non-hopping mode.

Hopping mode: typical working mode (normal hopping status)

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power



# 9 Technical Requirement

# 9.1 Conducted Emission

## **Test Method**

- 1. The EUT was placed on a table, which is 0.8m above ground plane
- 2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
- 3. Maximum procedure was performed to ensure EUT compliance
- 4. A EMI test receiver is used to test the emissions from both sides of AC line

## Limit

According to §15.207 & RSS-GEN A7.2.4, conducted emissions limit as below:

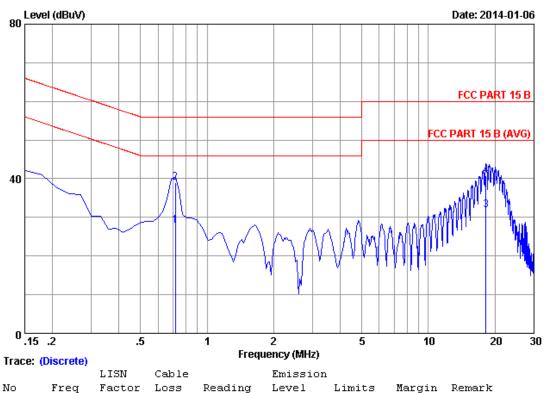
| Frequency |   | QP Limit | AV Limit |  |  |  |  |
|-----------|---|----------|----------|--|--|--|--|
|           | MHz   | dBµV     | dBµV     |  |  |  |  |
| _         | 0.150-0.500   | 66-56*   | 56-46*   |  |  |  |  |
|           | 0.500-5   | 56       | 46       |  |  |  |  |
|           | 5-30  | 60       | 50       |  |  |  |  |
| D         | Decreasing linearly with logarithm of the frequency |          |          |  |  |  |  |

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#### **Conducted Emission**

| Product Type<br>M/N |   | Multimedia Speakers 2.0 with Bluetooth SPA4270BT/37 |
|---------------------|---|---|
| Operating Condition |   | Transmitting  |
| Test Specification  | : | Line  |
| Comment             | : | AC 120V/60Hz  |



| NO<br> | (MHz)   | (dB) | LOSS<br>(dB) | (dBuV) | Level<br>(dBuV) | (dBuV) | (dB)  | Remark  |
|--------|---------|------|--------------|--------|-----------------|--------|-------|---------|
| 1      | 0.71700 | 0.17 | 0.03         | 27.59  | 27.79           | 46.00  | 18.21 | Average |
| 2      | 0.71700 | 0.17 | 0.03         | 38.70  | 38.90           | 56.00  | 17.10 | QP      |
| 3      | 18.239  | 1.46 | 0.13         | 30.23  | 31.82           | 50.00  | 18.18 | Average |
| 4      | 18.239  | 1.46 | 0.13         | 39.10  | 40.69           | 60.00  | 19.31 | QP      |
|        |         |      |              |        |                 |        |       |         |

Remarks: 1.Emission Level=LISN Factor+Cable Loss+Reading.

2. If the average limit is met when useing a quasi-peak detector. the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

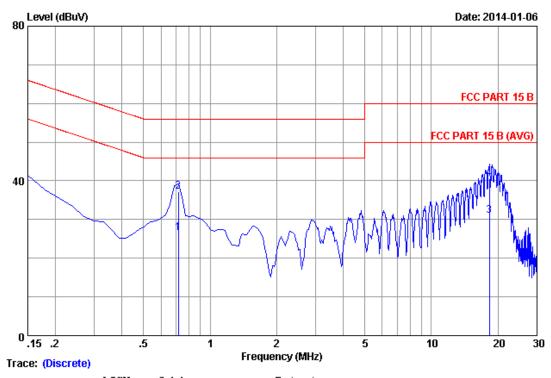


#### **Conducted Emission**

| Product Type        | : | Μu  |
|---------------------|---|-----|
| M/N                 | : | SF  |
| Operating Condition | : | Tra |
| Test Specification  | : | Ne  |
| Comment             | : | AC  |

Multimedia Speakers 2.0 with Bluetooth SPA4270BT/37 Transmitting Neutral

AC 120V/60Hz



|    |               | LISN           | Cable        |                   | Emission        | 1                |                |         |
|----|---------------|----------------|--------------|-------------------|-----------------|------------------|----------------|---------|
| No | Freq<br>(MHz) | Factor<br>(dB) | Loss<br>(dB) | Reading<br>(dBuV) | Level<br>(dBuV) | Limits<br>(dBuV) | Margin<br>(dB) | Remark  |
| 1  | 0.71700       | 0.27           | 0.03         | 26.23             | 26.53           | 46.00            | 19.47          | Average |
| 2  | 0.71700       | 0.27           | 0.03         | 36.90             | 37.20           | 56.00            | 18.80          | QP      |
| 3  | 18.298        | 1.12           | 0.13         | 29.78             | 31.03           | 50.00            | 18.97          | Average |
| 4  | 18.298        | 1.12           | 0.13         | 39.20             | 40.45           | 60.00            | 19.55          | QP      |
|    |               |                |              |                   |                 |                  |                |         |

Remarks: 1.Emission Level=LISN Factor+Cable Loss+Reading.

 If the average limit is met when useing a quasi-peak detector. the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

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# 9.2 Conducted peak output power

# **Test Method**

- Use the following spectrum analyzer settings: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel RBW > the 20 dB bandwidth of the emission being measured, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2. Add a correction factor to the display.
- 3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power

# Limits

According to §15.247 (b) (1) and RSS-210 A8.4, conducted peak output power limit as below:

|   | Frequency Range | Limit | Limit |
|---|-----------------|-------|-------|
| _ | MHz             | W     | dBm   |
|   | 2400-2483.5     | ≤1    | ≤30   |



# Conducted peak output power

| Bluetooth Mode GFSI    | K modulation Test<br>Conducted Peak | t Result |
|------------------------|-------------------------------------|----------|
| Frequency              | Output Power                        | Result   |
| MHz                    | dBm                                 |          |
| Low channel 2402MHz    | 7.40                                | Pass     |
| Middle channel 2441MHz | 6.98                                | Pass     |
| High channel 2480MHz   | 8.20                                | Pass     |

#### Bluetooth Mode π/4-DQPSK modulation Test Result Conducted Peak

| Frequency<br>MHz       | Output Power<br>dBm | Result |
|------------------------|---------------------|--------|
| Low channel 2402MHz    | 5.93                | Pass   |
| Middle channel 2441MHz | 5.50                | Pass   |
| High channel 2480MHz   | 6.67                | Pass   |

### Bluetooth Mode 8DPSK modulation Test Result

| Frequency<br>MHz       | Conducted Peak<br>Output Power<br>dBm | Result |
|------------------------|---------------------------------------|--------|
| Low channel 2402MHz    | 6.05                                  | Pass   |
| Middle channel 2441MHz | 5.61                                  | Pass   |
| High channel 2480MHz   | 6.80                                  | Pass   |



# 9.3 20 dB bandwidth and 99% Occupied Bandwidth

## **Test Method**

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- 3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
- 4. Repeat above procedures until all frequencies measured were complete.

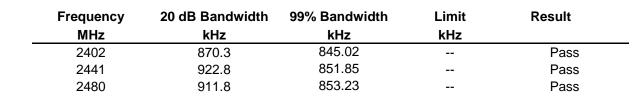
## Limit

Limit [kHz]

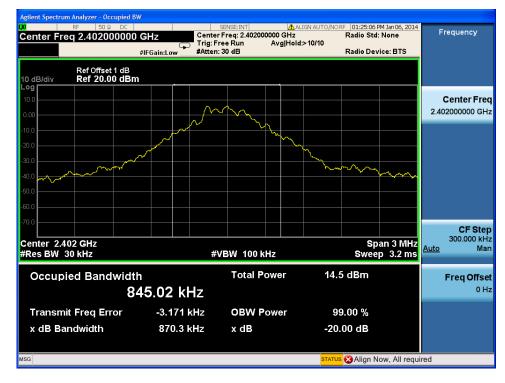
N/A



## 20 dB bandwidth and 99% Occupied Bandwidth



Bluetooth Mode GFSK Modulation test result



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#### m Analyzer - Occupied BV GHZ Center Freq: 2.44100000 GHz Trig: Free Run Avg|Hold>10/10 #IFGain:Low #Atten: 30 dB F 01:25:29 PM Jan 06, 2014 Radio Std: None Frequency Center Freq 2.441000000 GHz Radio Device: BTS Ref Offset 1 dB Ref 20.00 dBm Center Fred 2.441000000 GHz CF Step 300.000 kHz Man Center 2.441 GHz #Res BW 30 kHz Span 3 MHz Sweep 3.2 ms Auto #VBW 100 kHz Total Power 14.1 dBm **Occupied Bandwidth** Freq Offset 0 Hz 851.85 kHz Transmit Freq Error -159 Hz **OBW Power** 99.00 % 922.8 kHz -20.00 dB x dB Bandwidth x dB Align Now, All required

#### 20 dB bandwidth and 99% Occupied Bandwidth



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## 20 dB bandwidth and 99% Occupied Bandwidth

| Frequency | 20 dB Bandwidth | 99% Bandwidth | Limit | Result |
|-----------|-----------------|---------------|-------|--------|
| MHz       | kHz             | kHz           | kHz   |        |
| <br>2402  | 1215            | 1143.2        |       | Pass   |
| 2441      | 1215            | 1142.1        |       | Pass   |
| 2480      | 1215            | 1138.0        |       | Pass   |

Bluetooth Mode 8DPSK Modulation test result



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# 9.4 Carrier Frequency Separation

## **Test Method**

- 1. Use the following spectrum analyzer settings: Span = wide enough to capture the peaks of two adjacent channels, RBW  $\geq$  1% of the span, VBW) ≥RBW, Sweep = auto, Detector function = peak
- 2. By using the Max-Hold function record the separation of two adjacent channels.
- 3. Measure the frequency difference of these two adjacent channels by spectrum analyzer marker function.
- 4. Repeat above procedures until all frequencies measured were complete.

## Limit

Limit kHz ≥25KHz or 2/3 of the 20 dB bandwidth which is greater

## **GFSK Modulation Limit**

| Frequency | 2/3 of 20 dB Bandwidth |
|-----------|------------------------|
| MHz       | kHz                    |
| 2402      | 580.20                 |
| 2441      | 615.20                 |
| 2480      | 607.87                 |

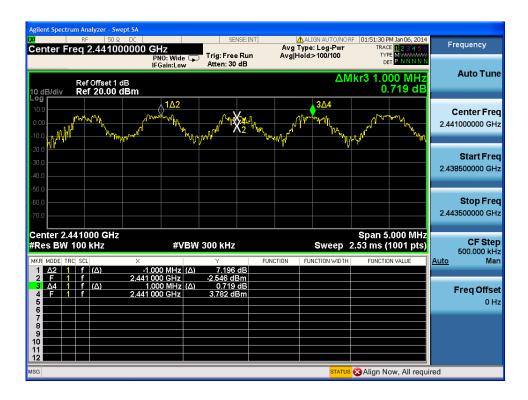


### **Carrier Frequency Separation**

Test result: The measurement was performed with the typical configuration (normal hopping status), here GFSK modulation mode was used to show compliance.

#### **GFSK Modulation test result**

| Frequency<br>MHz | Carrier Frequency Separation<br>kHz | Result |
|------------------|-------------------------------------|--------|
| 2402             | 1000                                | Pass   |
| 2441             | 1000                                | Pass   |
| 2480             | 1000                                | Pass   |





# 9.5 Number of hopping frequencies

## **Test Method**

- 1. Use the following spectrum analyzer settings:
- Span = wide enough to capture the peaks of two adjacent channels, RBW  $\ge$  1% of the span, VBW)  $\ge$ RBW, Sweep = auto, Detector function = peak
- 2. Set the spectrum analyzer on Max-Hold Mode, and then keep the EUT in hopping mode.
- 3. Record all the signals from each channel until each one has been recorded.
- 4. Repeat above procedures until all frequencies measured were complete.

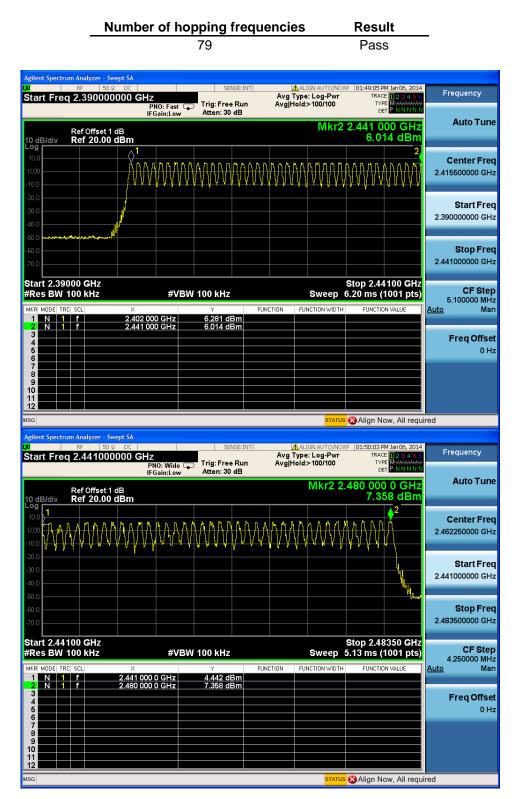
## Limit

Limit <u>number</u> ≥ 15



#### Number of hopping frequencies

Test result: The measurement was performed with the typical configuration (normal hopping status), and the total hopping channels is constant for the all modulation mode according with the Bluetooth Core Specification. Here GFSK modulation mode was used to show compliance.



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# 9.6 Dwell Time

# **Test Method**

- 1. Connect EUT antenna terminal to the spectrum analyzer with a low loss cable. Equipment mode: Spectrum analyzer
- 2. RBW: 1MHz; VBW: 1MHz; SPAN: Zero Span
- 3. Adjust the center frequency of spectrum analyzer on any frequency be measured.
- 4. Measure the Dwell Time by spectrum analyzer Marker function.
- 5. Repeat above procedures until all frequencies measured were complete.

## Limit

According to §15.247(a)(1)(iii) & RSS-210 A8.1(c) The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.



#### **Dwell Time**

#### Dwell time

The maximum dwell time shall be 0,4 s.

According to the Bluetooth Core Specification, the worse result (DH5 mode) was reported to show compliance.

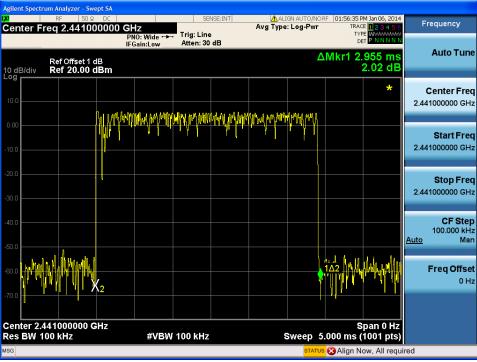
The Dwell Time = Burst Width \* Total Hops. The detailed calculations are showed as follows: The duration for dwell time calculation: 0.4 [s] \* hopping number = 0.4 [s] \* 79 [ch] = 31.6 [s\*ch]; The burst width, which is directly measured, refers to the duration on one channel hop.

The maximum number of hopping channels in 31.6s for DH5=1600 / 6 / 79 \*31.6=106.67

#### Test Result

| Modulation | Mode | Reading<br>(µs) | Total Hops | Test Result<br>(ms) | Limit<br>(ms) | Result |
|------------|------|-----------------|------------|---------------------|---------------|--------|
| GFSK       | DH5  | 2995            | 106.67     | 319.48              | < 400         | Pass   |
| π/4-DQPSK  | 2DH5 | 2990            | 106.67     | 318.94              | < 400         | Pass   |
| 8-DPSK     | 3DH5 | 2990            | 106.67     | 318.94              | < 400         | Pass   |

**GFSK Modulation** 





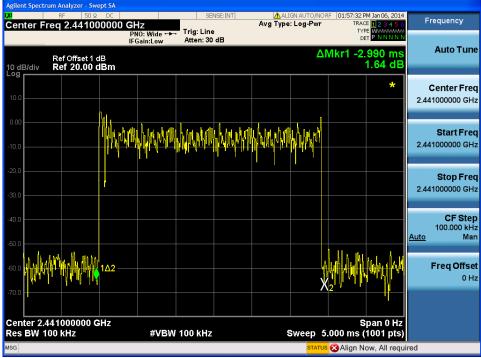
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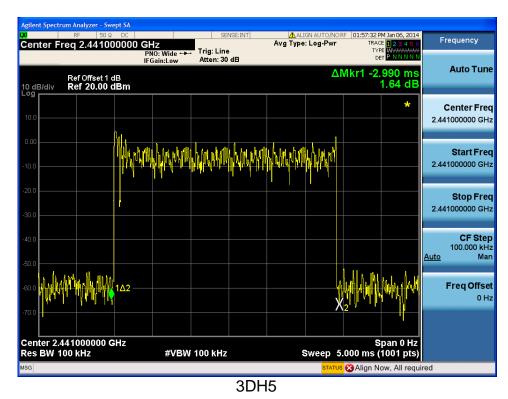


## π/4-DQPSK Modulation



2DH5

# 8-DPSK Modulation



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# 9.7 Spurious RF conducted emissions

## **Test Method**

1. Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10<sup>th</sup> harmonic. Typically, several plots are required to cover this entire span. RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold

- Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
- 3. The level displayed must comply with the limit specified in this Section. Submit these plots.
- 4. Repeat above procedures until all frequencies measured were complete.

### Limit

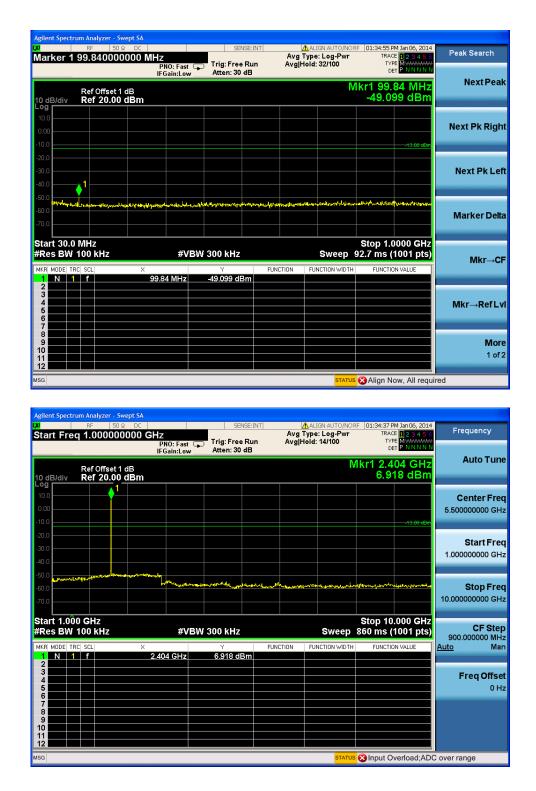
| Frequency Range<br>MHz | Limit (dBc) |
|------------------------|-------------|
| 30-25000               | -20         |



## Spurious RF conducted emissions

Only the worse case (which is subject to the maximum EIRP, GFSK mode) test result is listed in the report.

#### 2402MHz



Report Number: 68.950.13.168.01

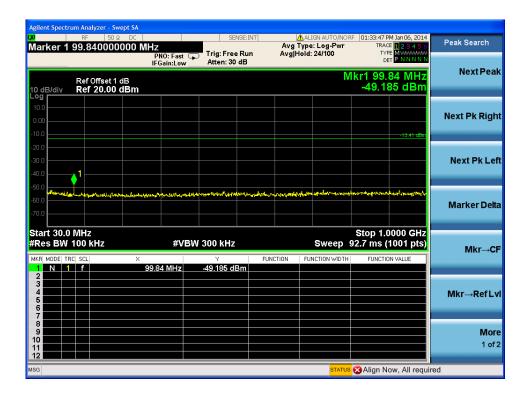
TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch 6 floor, H Hall, Culture Creative Park, No. 4001, Fuqiang Road, Futian District, Shenzhen 518048, P. R. China, Tel. +86 755 8828 6998, Fax: +86 755 8828 5299



#### Spurious RF conducted emissions

| arker 1 23.9200000000000000000000000000000000000                        | IO GHZ<br>PNO: Fast C<br>IFGain: I ow<br>Atten: 30 d                         | Avg Type: Log-Pwr<br>un Avg Hold: 1/100               | RF         01:35:06 PM Jan 06, 2014           TRACE         1 2 3 4 5 6           TYPE         MWWWWW           DET         P. N N N N | Peak Search  |
|---|--|---|--|--------------|
| Ref Offset 1 dB<br>0 dB/div Ref 20.00 dBm                               |  | Μ   | kr1 23.920 GHz<br>-53.702 dBm  | NextPeak     |
| 10.0<br>0.00<br>10.0  |  |   |  | Next Pk Righ |
| 20.0<br>30.0<br>40.0  |  |   | 1  | Next Pk Lef  |
| 60.0<br>60.0 <mark>- АНДинтики, Милик, Малик, Суру, Мини</mark><br>70.0 | hand to differ a statistical poly for the press of a statistical poly of the | allantarhousen an |  | Marker Delt  |
| Start 10.000 GHz<br>KRes BW 100 kHz<br>KR MODE TRC SCL ×<br>1 N 1 f 23  | #VBW 300 kHz<br>3.920 GHz -53.702 dBr  | FUNCTION FUNCTION WIDTH                               | Stop 25.000 GHz<br>p 1.43 s (1001 pts)   | Mkr→Cl       |
| 2 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4                                 |  |   |  | Mkr→RefLv    |
| 7 8 9   |  |   |  | Mon          |

#### 2441MHz



Report Number: 68.950.13.168.01

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| tart Freq 1.00                              | 50 Ω DC<br>0000000 GHz<br>PN0:  | SENSE:I™<br>Fast               | Avg                                  | ALIGN AUTO/NOF<br>Type: Log-Pwr<br>Iold: 21/100 | TRACE<br>TYPE                      | 123456<br>MWWWWW                     | Frequency                                       |
|---|---------------------------------|--------------------------------|--------------------------------------|---|------------------------------------|--------------------------------------|---|
| OdB/div Ref 2                               | IFGair<br>fset 1 dB<br>0.00 dBm |                                |                                      | N   | 1kr1 2.44                          | <sup>P NNNNN</sup><br>0 GHz<br>5 dBm | Auto Tun  |
|   |                                 |                                |                                      |   |                                    |                                      | Center Fre<br>5.500000000 GH                    |
| 0.0<br>0.0<br>0.0<br>0.0                    |                                 |                                |                                      |   |                                    | -13.41 dBm                           | <b>Start Fre</b><br>1.000000000 Gi              |
| 0.0   |                                 | Augustalauthauthauthauthauthau | and main and an and a second descent | poloninasin'ny oranjina                         | يو <mark>لەسىمەر يارى</mark>       | ***** <b>*</b> ******                | <b>Stop Fr</b><br>10.00000000 G                 |
| tart 1.000 GHz<br>Res BW 100 kH             | Iz<br>×<br>2.440 G              | #VBW 300 kHz                   | FUNCTION                             | Sweep<br>FUNCTION WIDTH                         | Stop 10.0<br>860 ms (1<br>FUNCTION | 001 pts)                             | <b>CF Ste</b><br>900.000000 MI<br><u>Auto</u> M |
| 1 N 1 f                                     |                                 |                                |                                      |   |                                    |                                      |   |
| 1         N         1         f           2 |                                 |                                |                                      |   |                                    |                                      | Freq Offs<br>01                                 |

| larker 1                            | RF 50<br>24.14500                  |                     | GHz<br>PNO: Fast (<br>EGain: Low |                             |  |                      | IGN AUTO/NOR<br>2: Log-Pwr<br>: 2/100 | TRACE                             | 1 2 3 4 5 6<br>MWWWWW<br>P N N N N N | Peak Search      |
|-------------------------------------|------------------------------------|---------------------|----------------------------------|-----------------------------|--|----------------------|---------------------------------------|-----------------------------------|--------------------------------------|------------------|
| 0 dB/div                            | Ref Offset<br>Ref 20.00            | 1 dB                | Call.LUw                         |                             |  |                      | M                                     | (r1 24.14<br>-52.98               | 45 GHz<br>4 dBm                      | NextPea          |
| . <b>og</b><br>10.0<br>0.00<br>10.0 |                                    |                     |                                  |                             |  |                      |                                       |                                   | -13.41 dBm                           | Next Pk Rig      |
| 20.0<br>30.0<br>40.0                |                                    |                     |                                  |                             |  |                      |                                       |                                   | 1                                    | Next Pk Le       |
| 50.0<br>60.0                        | 1999 an Alland Property and the op | YIR. of the Canadan | stalentad for a state of the     | alder meditioner and        | ŧ <mark>ġa<sup>l</sup>usk<sub>Y</sub>u ≵piteren</mark> ¶*ü | interferingenetation | a tegan di saas min di sa             | all have been appeared and an and |                                      | Marker De        |
| IKR MODE T                          | 100 kHz                            | ×<br>24.1           | #VB                              | W 300 kHz<br>Y<br>-52.984 d | FUN  | ICTION FU            | Sweep                                 | Stop 25.<br>1.43 s (1             | 001 pts)                             | Mkr→C            |
| 2<br>3<br>4<br>5<br>6<br>7          |                                    |                     |                                  |                             |  |                      |                                       |                                   |                                      | Mkr→RefL         |
| 8<br>9<br>10                        |                                    |                     |                                  |                             |  |                      |                                       |                                   |                                      | <b>Mo</b><br>1 o |

 Report Number: 68.950.13.168.01
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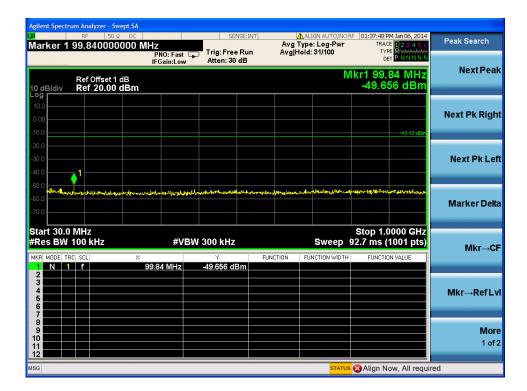
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#### **Spurious RF conducted emissions**

#### 2480MHz







# Spurious RF conducted emissions

| Agilent Spectrum Analyzer - Swept<br>X RF 50 Q (<br>Marker 1 24.61000000                                  | 0000 GHz<br>PN0: Fast (  | SENSE:II  | Avg                        | ALIGN AUTO/NOF<br>Type: Log-Pwr<br>Iold: 1/100 | F 01:37:56 PM Jan 06, 2014<br>TRACE 1 2 3 4 5 6<br>TYPE MWWWWWW<br>DET P N N N N N | Peak Search    |
|---|--|---|----------------------------|--|--|----------------|
| Ref Offset 1 dB<br>10 dB/div Ref 20.00 dB   | IFGain:Low_  | Atten: 30 dB  |                            | MI   | (r1 24.610 GHz<br>-53.651 dBm  | Next Peak      |
| Log<br>10.0<br>0.00<br>-10.0  |  |   |                            |  | -13.15 dBm   | Next Pk Right  |
| -20.0   |  |   |                            |  |  | Next Pk Lef    |
| 50.0  | and the state of t | the the second states and the second s | <u>Hananak</u> herikkaappa | watuulkuttu kapananakakka                      | annan dan bernandera   | Marker Delta   |
| Start 10.000 GHz           #Res BW 100 kHz           MKR MODE           1         N           1         N | #VB<br>×<br>24.610 GHz   | W 300 kHz<br>Y<br>-53.651 dBm   | FUNCTION                   | Sweep  | Stop 25.000 GHz<br>1.43 s (1001 pts)<br>FUNCTION VALUE                             | Mkr→CF         |
| 2 3 4 4 5 5 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7   |  |   |                            |  |  | Mkr→RefLv      |
| 8<br>9<br>10<br>11<br>12  |  |   |                            |  |  | More<br>1 of 2 |
| ISG   |  |   |                            | STATUS   | SAlign Now, All requir   | ed             |



#### **Test Method**

1 Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 kHz, VBW  $\ge$  RBW, Sweep = auto, Detector function = peak, Trace = max hold

- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section. .
- 4 Repeat the test at the hopping off and hopping on mode, submit all the plots.

### Limit:

According to §15.247(d) and RSS-210 A8.5, in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) and RSS-Gen7.2.2, must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)) and RSS-Gen.



**GFSK Modulation Test Result:** Hopping on mode:

| gilent Spectrum Analyzer - S<br>RF 50   |   | SENSE:INT                            | ALIGN AUTO/NC  | RF 01:47:02 PM Jan 06, 2014   |   |
|---|---|--------------------------------------|--|---|---|
| tart Freq 2.31000   | 0000 GHz<br>PNO: Fas  | t 🖵 Trig: Free Run                   | Avg Type: Log-Pwr<br>Avg Hold:>100/100                         | TRACE 1 2 3 4 5 6<br>TYPE MWWWW<br>DET PINNNN   | Frequency   |
|   | IFGain:Lo   | W Atten: 30 dB                       | M  | kr1 2.402 0 GHz   | Auto Tu   |
| Ref Offset 1<br>0 dB/div Ref 20.00  |   |                                      |  | 6.923 dBm   |   |
| og<br>10.0  |   |                                      |  |   | Center Fre  |
|   |   |                                      |  | ÁDADAAA   | 2.36000000 GI   |
| 10.0  |   |                                      |  | /14444  |   |
| 20.0  |   |                                      |  |   | Start Fre   |
| 30.0  |   |                                      |  | 3   | 2.310000000 GI  |
| 40.0  |   |                                      |  | \$ <sup>2</sup>   |   |
| 50.0  |   |                                      |  |   | Stop Fre  |
| 70.0  |   |                                      |  |   | 2.41000000 GI   |
| tart 2.31000 GHz  |   |                                      |  | Stop 2.41000 GHz  |   |
| Res BW 100 kHz  | #\  | /BW 300 kHz                          | Sweep  | 9.60 ms (1001 pts)  | CF Ste  |
| IKR MODE TRC SCL  | ×   | Y 1                                  | FUNCTION FUNCTION WIDTH  | FUNCTION VALUE  | 10.000000 Mi<br>Auto Mi   |
| 1 N 1 f<br>2 N 1 f  | 2.402 0 GHz<br>2.390 0 GHz  | 6.923 dBm<br>-50.718 dBm             |  |   |   |
| 3 N 1 f   | 2.400 0 GHz   | -45.989 dBm                          |  |   | Freq Offs   |
| 5   |   |                                      |  |   | 01  |
| 7   |   |                                      |  |   |   |
| 8   |   |                                      |  |   |   |
| 0   |   |                                      |  |   |   |
|   |   |                                      |  |   |   |
| 2   |   |                                      |  |   |   |
| GG  |   |                                      | STATU  | s <mark>⊗</mark> Align Now, All requi   | red   |
| gilent Spectrum Analyzer - S<br>RF 50   | Ω DC<br>0000 GHz<br>PNO: Wid  | e C Trig: Free Run<br>w Atten: 30 dB |  | RF 01:46:09 PM Jan 06, 2014   | red<br>Frequency  |
| glent Spectrum Analyzer - S<br>RE 50<br>tart Freq 2.477001<br>Ref Offset 1<br>0 dB/div Ref 20.00  | Ω DC<br>0000 GHz<br>PNO: Wid<br>IFGain:Lo   | e 😱 Trig: Free Run                   | Auton Auto/No<br>Avg Type: Log-Pwr<br>Avg Hold>100/100         | IRF 01:46:09 PM Jan 06, 2014<br>TRACE 02:4 5 6  | Frequency   |
| si<br>gilent Spectrum Analyzer - S<br>RF   50<br>tart Freq 2.477000<br>Ref Offset 1<br>0 dB/div Ref 20.00<br>° ■ ▲ 1  | Ω DC<br>0000 GHz<br>PNO: Wid<br>IFGain:Lo   | e 😱 Trig: Free Run                   | Auton Auto/No<br>Avg Type: Log-Pwr<br>Avg Hold>100/100         | RF 01:46:09 PM Jan 05, 2014<br>TRACE 12 3 4 5 6<br>TYPE MUNITOR DET PUNINN N<br>DET PUNINN N<br>2.479 904 GHz   | Frequency<br>Auto Tur   |
| si<br>gilent Spectrum Analyzer - S<br>kart Freq 2.477000<br>Ref Offset 1<br>0 dB/div Ref 20.00<br>0 d<br>0 d D d 0  | Ω DC<br>0000 GHz<br>PNO: Wid<br>IFGain:Lo   | e 😱 Trig: Free Run                   | Auton Auto/No<br>Avg Type: Log-Pwr<br>Avg Hold>100/100         | RF 01:46:09 PM Jan 05, 2014<br>TRACE 12 3 4 5 6<br>TYPE MUNITOR DET PUNINN N<br>DET PUNINN N<br>2.479 904 GHz   | Frequency<br>Auto Tur<br>Center Fre   |
| si<br>gilent Spectrum Analyzer - S<br>RF   50<br>tart Freq 2.477000<br>Ref Offset 1<br>0 dB/div Ref 20.00<br>° ■ ▲ 1  | Ω DC<br>0000 GHz<br>PNO: Wid<br>IFGain:Lo   | e 😱 Trig: Free Run                   | Auton Auto/No<br>Avg Type: Log-Pwr<br>Avg Hold>100/100         | RF 01:46:09 PM Jan 05, 2014<br>TRACE 12 3 4 5 6<br>TYPE MUNITOR DET PUNINN N<br>DET PUNINN N<br>2.479 904 GHz   | Frequency<br>Auto Tur<br>Center Fre   |
| silent Spectrum Analyzer - So           RF         [So           tart Freq 2.477000           0 dB/div         Ref Offset 1           0 dB/div         Ref 20.00           9         1           10.0         1   | Ω DC<br>0000 GHz<br>PNO: Wid<br>IFGain:Lo   | e 😱 Trig: Free Run                   | Auton Auto/No<br>Avg Type: Log-Pwr<br>Avg Hold>100/100         | RF 01:46:09 PM Jan06, 2014<br>TRACE 1 2 3 4 5 6<br>TYPE MUNAWW<br>DET PININN N<br>2.479 904 GHz<br>7.615 dBm  | Frequency<br>Auto Tur<br>Center Fr<br>2.493500000 Gi  |
| 36         RF         150           tart Freq 2.477000         Ref Offset 1         1           0 dB/div         Ref 20.00         9         1           0.0         0         1         1         1  | Ω DC<br>0000 GHz<br>PNO: Wid<br>IFGain:Lo   | e 😱 Trig: Free Run                   | Auton Auto/No<br>Avg Type: Log-Pwr<br>Avg Hold>100/100         | RF 01:46:09 PM Jan06, 2014<br>TRACE 1 2 3 4 5 6<br>TYPE MUNAWW<br>DET PININN N<br>2.479 904 GHz<br>7.615 dBm  | Frequency<br>Auto Tur<br>Center Fr<br>2.493500000 G<br>Start Fro  |
| 36         RF         150           tart Freq 2.477000         Ref Offset 1         1           0 dB/div         Ref 20.00         9         1           0.00         0         1         1         1           0.00         0         1  | Ω DC<br>0000 GHz<br>PNO: Wid<br>IFGain:Lo   | e 😱 Trig: Free Run                   | Auton Auto/No<br>Avg Type: Log-Pwr<br>Avg Hold>100/100         | RF 01:46:09 PM Jan06, 2014<br>TRACE 1 2 3 4 5 6<br>TYPE MUNAWW<br>DET PININN N<br>2.479 904 GHz<br>7.615 dBm  | Frequency<br>Auto Tur<br>Center Fr<br>2.493500000 G<br>Start Fro  |
| signet Spectrum Analyzer - 5<br>RF 50<br>tart Freq 2.477000<br>0 dB/div Ref Offset 1<br>0 dB/div Ref 20.00<br>0 0<br>0 0<br>0 0<br>0 0<br>0 0<br>0 0<br>0 0   | Ω DC<br>0000 GHz<br>PNO: Wid<br>IFGain:Lo   | e 😱 Trig: Free Run                   | Auton Auto/No<br>Avg Type: Log-Pwr<br>Avg Hold>100/100         | RF 01:46:09 PM Jan06, 2014<br>TRACE 1 2 3 4 5 6<br>TYPE MUNAWW<br>DET PININN N<br>2.479 904 GHz<br>7.615 dBm  | Frequency<br>Auto Tur<br>Center Fro<br>2.493500000 Gi<br>Start Fro<br>2.477000000 Gi  |
| signt Spectrum Analyzer - S<br>RF 50<br>tart Freq 2.477000<br>G dB/div Ref 20.00<br>9<br>10<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0  | Ω DC<br>0000 GHz<br>PNO: Wid<br>IFGain:Lo   | e 😱 Trig: Free Run                   | Auton Auto/No<br>Avg Type: Log-Pwr<br>Avg Hold>100/100         | RF 01:46:09 PM Jan06, 2014<br>TRACE 1 2 3 4 5 6<br>TYPE MUNAWW<br>DET PININN N<br>2.479 904 GHz<br>7.615 dBm  | Frequency<br>Auto Tur<br>Center Fr<br>2.493500000 Gi<br>Start Fr<br>2.477000000 Gi<br>Stop Fr   |
| signet Spectrum Analyzer - S<br>RF 50<br>tart Freq 2.477000<br>G dB/div Ref 20.00<br>9<br>9<br>10<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0  | Ω DC<br>0000 GHz<br>PNO: Wid<br>IFGain:Lo   | e 😱 Trig: Free Run                   | Auton Auto/No<br>Avg Type: Log-Pwr<br>Avg Hold>100/100         | RF 01:46:09 PM Jan06, 2014<br>TRACE 1 2 3 4 5 6<br>TYPE MUNAWW<br>DET PININN N<br>2.479 904 GHz<br>7.615 dBm  | Frequency<br>Auto Tur<br>Center Fre<br>2.493500000 Gi<br>Start Fre<br>2.477000000 Gi<br>Stop Fre  |
| gient Spectrum Analyzer _ S<br>RF _ [50<br>tart Freq 2.477000<br>0 dB/div Ref 20.00<br>0 dB/div Ref 20.00<br>0 dB/div Ref 20.00<br>0 0<br>0 0<br>0 0<br>0 0<br>0 0<br>0 0<br>0 0  | Ω DC<br>0000 GHz<br>PNO: Wid<br>IFGain:Lo   | e 😱 Trig: Free Run                   | ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Mkr1 | INF         01:46:09 PM Jan06, 2014           TRACE         3:3:4:5:6           TYPE         MWWWW           2.479         904           7.615         dBm           -12:39.45%         -12:39.45%           Stop 2.51000         GHz | Frequency<br>Auto Tur<br>Center Fro<br>2.493500000 Gi<br>Start Fro<br>2.477000000 Gi<br>Stop Fro<br>2.510000000 Gi  |
| signt Spectrum Analyzer - S<br>RF 50<br>tart Freq 2.477000<br>Comparison of the second secon  | CC C C C C C C C C C C C C C C C C  | e 😱 Trig: Free Run                   | ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Mkr1 | RF 01:46:09 PM Jan06, 2014<br>TRACE 1 2 3 4 5 6<br>TYPE MUNAWW<br>DET PININN N<br>2.479 904 GHz<br>7.615 dBm  | Frequency<br>Auto Tur<br>Center Fr<br>2.493500000 G<br>Start Fr<br>2.477000000 G<br>Stop Fr<br>2.510000000 G  |
| silent Spectrum Analyzer - S<br>RF 0ffset 1<br>0 dB/div Ref 20.00<br>0 d  | CC     CO     CHz     PN0:Wid     FGain:Lo     I dB     dBm     C   | rrig: Free Run<br>Atten: 30 dB       | ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Mkr1 | RF 01:46:09 PM Jan05, 2014<br>TRACE 02:34 5 6<br>TYPE P VINNEN<br>2.479 904 GHz<br>7.615 dBm<br>12:39 dBm<br>12:39 dBm<br>5.000 GHz<br>3.20 ms (1001 pts)   | Frequency<br>Auto Tur<br>Center Fre<br>2.493500000 Gl<br>Start Fre<br>2.477000000 Gl<br>Stop Fre<br>2.510000000 Gl<br>CF Ste<br>3.300000 Ml                     |
| silent Spectrum Analyzer - S<br>RF 0ffset 1<br>0 dB/div Ref 20.00<br>0 d  | Q DC GHz<br>PN0: Wid<br>If Gain:Lo<br>I dB<br>dBm<br>Q<br>2<br>2<br>4<br>2<br>4<br>2<br>4<br>2<br>4<br>2<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4  | Trig: Free Run<br>Atten: 30 dB       | ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Mkr1 | RF 01:46:09 PM Janob, 2014<br>TRACE 02:34 5 6<br>TYPE P NUMMAN<br>2.479 904 GHz<br>7.615 dBm<br>12:39 dBm<br>12:39 dBm<br>5 construction<br>Stop 2.51000 GHz<br>3.20 ms (1001 pts)  | Frequency<br>Auto Tur<br>Center Fre<br>2.493500000 Gl<br>Start Fre<br>2.477000000 Gl<br>Stop Fre<br>2.510000000 Gl<br>CF Ste<br>3.300000 Ml                     |
| SG         SIG         Ref Offset 1         O db/div         Ref Offset 1         O db/div         Ref Offset 1         O db/div         O db/di  | CC     CO     CHz     PN0:Wid     FGain:Lo     I dB     dBm     C   | E Trig: Free Run<br>Atten: 30 dB     | ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Mkr1 | RF 01:46:09 PM Janob, 2014<br>TRACE 02:34 5 6<br>TYPE P NUMMAN<br>2.479 904 GHz<br>7.615 dBm<br>12:39 dBm<br>12:39 dBm<br>5 construction<br>Stop 2.51000 GHz<br>3.20 ms (1001 pts)  | Frequency<br>Auto Tur<br>Center Fre<br>2.493500000 Gi<br>Start Fre<br>2.477000000 Gi<br>Stop Fre<br>2.510000000 Gi<br>3.300000 Mi<br>Auto M                     |
| gilent Spectrum Analyzer _ S       RF       Itart Freq 2.477000       0 </td <td>© DC  <br/>0000 GHz<br/>PN0: Wid<br/>IFGain:Lo<br/>1 dB<br/>0 dBm<br/>↓<br/>2<br/>↓<br/>2<br/>↓<br/>2<br/>↓<br/>2<br/>↓<br/>4<br/>↓<br/>2<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓<br/>4<br/>↓</td> <td>E Trig: Free Run<br/>Atten: 30 dB</td> <td>ALIGN AUTO/NC<br/>Avg Type: Log-Pwr<br/>Avg Hold&gt;100/100<br/>Mkr1</td> <td>RF 01:46:09 PM Janob, 2014<br/>TRACE 02:34 5 6<br/>TYPE P NUMMAN<br/>2.479 904 GHz<br/>7.615 dBm<br/>12:39 dBm<br/>12:39 dBm<br/>5 construction<br/>Stop 2.51000 GHz<br/>3.20 ms (1001 pts)</td> <td>Frequency<br/>Auto Tur<br/>Center Fre<br/>2.493500000 GH<br/>Start Fre<br/>2.477000000 GH<br/>2.510000000 GH<br/>3.300000 MH<br/>Auto Mi<br/>Freq Offs</td> | © DC  <br>0000 GHz<br>PN0: Wid<br>IFGain:Lo<br>1 dB<br>0 dBm<br>↓<br>2<br>↓<br>2<br>↓<br>2<br>↓<br>2<br>↓<br>4<br>↓<br>2<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓ | E Trig: Free Run<br>Atten: 30 dB     | ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Mkr1 | RF 01:46:09 PM Janob, 2014<br>TRACE 02:34 5 6<br>TYPE P NUMMAN<br>2.479 904 GHz<br>7.615 dBm<br>12:39 dBm<br>12:39 dBm<br>5 construction<br>Stop 2.51000 GHz<br>3.20 ms (1001 pts)  | Frequency<br>Auto Tur<br>Center Fre<br>2.493500000 GH<br>Start Fre<br>2.477000000 GH<br>2.510000000 GH<br>3.300000 MH<br>Auto Mi<br>Freq Offs                   |
| gilent Spectrum Analyzer - S       RF ISO       tart Freq 2.477000       O dB/div       Ref Offset 1       O dB/div       Ref Offset 1       O dB/div       Ref Offset 1       O dB/div       O dB/div   <  | © DC  <br>0000 GHz<br>PN0: Wid<br>IFGain:Lo<br>1 dB<br>0 dBm<br>↓<br>2<br>↓<br>2<br>↓<br>2<br>↓<br>2<br>↓<br>4<br>↓<br>2<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓ | E Trig: Free Run<br>Atten: 30 dB     | ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Mkr1 | RF 01:46:09 PM Janob, 2014<br>TRACE 02:34 5 6<br>TYPE P NUMMAN<br>2.479 904 GHz<br>7.615 dBm<br>12:39 dBm<br>12:39 dBm<br>5 construction<br>Stop 2.51000 GHz<br>3.20 ms (1001 pts)  | Frequency<br>Auto Tur<br>Center Fre<br>2.493500000 GH<br>Start Fre<br>2.477000000 GH<br>Stop Fre<br>2.510000000 GH  |
| 363       374       374       374         374       374       374       374         375       374       374       374         376       374       374       374         377       374       374       374         377       374       374       374         377       374       374       374         377       374       374       374         377       374       374       374         377       374       374       374         377       374       374       374         377       374       374       374         377       374       374       374         377       374       374       374         377       374       374       374         377       374       374       374         377       374       374       374         377       374       374       374         377       374       374       374         377       374       374       374         377       374       374       374         377       3   | © DC  <br>0000 GHz<br>PN0: Wid<br>IFGain:Lo<br>1 dB<br>0 dBm<br>↓<br>2<br>↓<br>2<br>↓<br>2<br>↓<br>2<br>↓<br>4<br>↓<br>2<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓<br>4<br>↓ | E Trig: Free Run<br>Atten: 30 dB     | ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Mkr1 | RF 01:46:09 PM Janob, 2014<br>TRACE 02:34 5 6<br>TYPE P NUMMAN<br>2.479 904 GHz<br>7.615 dBm<br>12:39 dBm<br>12:39 dBm<br>5 construction<br>Stop 2.51000 GHz<br>3.20 ms (1001 pts)  | Frequency<br>Auto Tur<br>Center Fre<br>2.493500000 GH<br>Start Fre<br>2.477000000 GH<br>2.510000000 GH<br>2.510000000 GH<br>3.300000 MH<br>Auto Ma<br>Freq Offs |

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Align Now, All required

 Report Number: 68.950.13.168.01
 Page 3

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### Hopping off mode:

Analyzer - Swept SA Avg Type: Log-Pwr Avg|Hold:>100/100 :55 PM Jan TRACE 1 2 TYPE MV DET P N Frequency Start Freq 2.310000000 GHz Trig: Free Run Atten: 30 dB PNO: Fast IFGain:Low Auto Tune Mkr1 2.401 865 GHz 6.994 dBm Ref Offset 1 dB Ref 20.00 dBm **Center Freq** 2.357500000 GHz Start Freq 2.310000000 GHz  $\langle \rangle^2$ Stop Freq 2.40500000 GHz Start 2.31000 GHz #Res BW 100 kHz Stop 2.40500 GHz 9.13 ms (1001 pts) CF Step 9.500000 MHz #VBW 300 kHz Sweep Man Auto 6.994 dBm -50.157 dBm -37.154 dBm 234 2.390 000 GHz 2.400 000 GHz N Freq Offset 156789 0 Hz 10 11 12 MSG 🛿 Align Now, All required Frequency Start Freq 2.477000000 GHz Avg Type: Log-Pwr Avg|Hold:>100/100 HZ PNO: Wide Trig: Free Run IFGain:Low Atten: 30 dB TYPE MWW DET P N N Auto Tune Mkr1 2.479 871 GHz 7.839 dBm Ref Offset 1 dB Ref 20.00 dBm 10 dB/div Log **r Center Freq** 2.493500000 GHz Start Freq 2.477000000 GHz 2  $\langle \rangle$ Stop Freq 2.510000000 GHz Start 2.47700 GHz #Res BW 100 kHz Stop 2.51000 GHz Sweep 3.20 ms (1001 pts) CF Step 3.300000 MHz #VBW 300 kHz Auto Mar 2.479 871 2.483 500 2 500 000 49.070 dBn 49.476 dBn Freq Offset 0 Hz 7 8 9 10 11 12

SG

🔀 Align Now, All required

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8DPSK Modulation Test Result: Hopping on mode:

| gilent Spectrum Analyzer - Swe<br>RF 50 Ω   |   | SENSE:INT                      | ALIGN AUTO/NC   | RF 01:43:55 PM Jan 06, 2014   | E.   |
|---|---|--------------------------------|---|---|--|
| tart Freq 2.3100000   | PNO: Fast   | Trig: Free Run                 | Avg Type: Log-Pwr<br>Avg Hold:>100/100                            | TRACE 123456<br>TYPE MWWWW<br>DET PNNNNN  | Frequency  |
|   | IFGain:Low  | Atten: 30 dB                   |   |   | Auto Tu  |
| Ref Offset 1 d<br>0 dB/div Ref 20.00 d  |   |                                | IAII  | r1 2.406 9 GHz<br>5.369 dBm   |  |
| log   |   |                                |   | 1   |  |
| 10.0  |   |                                |   | A A A B BOOK  | Center Fre   |
| 0.00  |   |                                |   | <u> Aradhah da</u>  | 2.36000000 G   |
| 20.0  |   |                                |   | -14.63 dBm  |  |
| 30.0  |   |                                |   |   | Start Fr   |
| 40.0  |   |                                |   | · 3   | 2.31000000 G   |
| 50.0  | والمحاف الانفاصة الرحوان الدريان ووستوادراهم  | بالمحود موسيا وموجو ما المحر   | -   | Land the second |  |
| 50.0  |   |                                |   |   | Stop Fr  |
| 70.0  |   |                                |   |   | 2.41000000 G   |
| tart 2.31000 GHz  |   |                                |   | Stop 2.41000 GHz  |  |
| Res BW 100 kHz  | #VE   | SW 300 kHz                     | Sweep   | 9.60 ms (1001 pts)  | CF Ste   |
| IKR MODE TRC SCL  | X   | Y                              | FUNCTION FUNCTION WIDTH   | FUNCTION VALUE  | 10.000000 M<br>Auto M  |
| 1 N 1 f<br>2 N 1 f  | 2.406 9 GHz<br>2.390 0 GHz  | 5.369 dBm<br>-49.664 dBm       |   |   |  |
| 3 N 1 f   | 2.400 0 GHz   | -43.954 dBm                    |   |   | Freq Offs  |
| 4<br>5  |   |                                |   |   | . 01   |
| 6   |   |                                |   |   |  |
| 8   |   |                                |   |   |  |
| 10  |   |                                |   |   |  |
|   |   |                                |   |   |  |
|   |   |                                |   |   |  |
| 12 SG   |   |                                | STATU   | <sup>s</sup> ⊗Align Now, All requi  | ired   |
| 2<br>3G<br>cjilent Spectrum Analyzer - Swey<br>RF 50 Q  | DC<br>100 GHz<br>PNO: Wide (  | SENSE:INT                      |   | RF 01:45:29 PM Jan 06, 2014   | red<br>Frequency   |
| i2<br>sg<br>gilent Spectrum Analyzer - Sweg<br>RF 50 Ω<br>Start Freq 2.4770000<br>Ref Offset 1 d  | DC<br>DOD GHz<br>PNO: Wide (<br>IFGain:Low  | Talas France Dava              | I <u>A</u> ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100 | RF 01:45:29 PM Jan 06, 2014<br>TRACE 128 34 55<br>TYPE MWWWW<br>DET PINNINN<br>2.479 178 GHz  | Frequency  |
| glient Spectrum Analyzer - Swee<br>RF 50 Q<br>itart Freq 2.4770000<br>Ref Offset 1 d<br>0 dB/div Ref 20.00 d  | DC<br>DOD GHz<br>PNO: Wide (<br>IFGain:Low  | Trig: Free Run                 | I <u>A</u> ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100 | RF 01:45:20 PM Jan 06, 2014<br>TRACE 1234 55<br>TYPE M<br>DET P NNNNN   | Frequency  |
| glient Spectrum Analyzer - Swee<br>RF 50 Q<br>Start Freq 2.4770000<br>Ref Offset 1 d<br>0 dB/div Ref 20.00 d  | DC<br>DOD GHz<br>PNO: Wide (<br>IFGain:Low  | Trig: Free Run                 | I <u>A</u> ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100 | RF 01:45:29 PM Jan 06, 2014<br>TRACE 128 34 55<br>TYPE MWWWW<br>DET PINNINN<br>2.479 178 GHz  | Frequency<br>Auto Tur  |
| glient Spectrum Analyzer - Swee<br>RF 50 Q<br>Start Freq 2.4770000<br>Ref Offset 1 d<br>0 dB/div Ref 20.00 d  | DC<br>DOD GHz<br>PNO: Wide (<br>IFGain:Low  | Trig: Free Run                 | I <u>A</u> ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100 | RF 01:45:29 PM Jan 06, 2014<br>TRACE 128 34 55<br>TYPE MWWWW<br>DET PINNINN<br>2.479 178 GHz  | Frequency<br>Auto Tur<br>Center Fre  |
| iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii  | DC<br>DOD GHz<br>PNO: Wide (<br>IFGain:Low  | Trig: Free Run                 | I <u>A</u> ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100 | RF 01:45:29 PM Jan 06, 2014<br>TRACE 128 34 55<br>TYPE MWWWW<br>DET PINNINN<br>2.479 178 GHz  | Frequency<br>Auto Tur<br>Center Fre  |
| 12<br>glient Spectrum Analyzer - Swee<br>RF 50 Q<br>Start Freq 2.4770000<br>Ref Offset 1 d<br>Ref 20.00 d<br>0 00<br>0 0<br>0 0<br>0<br>0 0<br>0 0<br>0 0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0   | DC<br>DOD GHz<br>PNO: Wide (<br>IFGain:Low  | Trig: Free Run                 | I <u>A</u> ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100 | RF 01:45:29 PM Jan 06, 2014<br>TRACE 128 34 55<br>TYPE MWWWW<br>DET PINNINN<br>2.479 178 GHz  | Frequency<br>Auto Tur<br>Center Fr<br>2.493500000 G  |
| 12<br>glient Spectrum Analyzer - Swee<br>RF 50 Q<br>Start Freq 2.4770000<br>Ref Offset 1 d<br>0 dB/div Ref 20.00 d<br>0 00<br>0 | DC<br>DOD GHz<br>PNO: Wide (<br>IFGain:Low  | Trig: Free Run                 | I <u>A</u> ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100 | RF 01:45:29 PM Jan 06, 2014<br>TRACE 128 34 55<br>TYPE MWWWW<br>DET PINNINN<br>2.479 178 GHz  | Frequency<br>Auto Tur<br>Center Fr<br>2.493500000 G<br>Start Fra   |
| 12<br>sc<br>sc<br>sc<br>sc<br>sc<br>sc<br>sc<br>sc<br>sc<br>sc  | DC<br>DOD GHz<br>PNO: Wide (<br>IFGain:Low  | Trig: Free Run                 | I <u>A</u> ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100 | RF 01:45:29 PM Jan 06, 2014<br>TRACE 128 34 55<br>TYPE MWWWW<br>DET PINNINN<br>2.479 178 GHz  | Frequency<br>Auto Tur<br>Center Fr<br>2.493500000 G<br>Start Fra   |
| 12<br>gilent Spectrum Analyzer - Sweg<br>scalart Freq 2.4770000<br>Ref Offset 1 d<br>0 dB/div Ref 20.00 d<br>0 00<br>0 0<br>0 00<br>0 0 | DC<br>DOD GHz<br>PNO: Wide (<br>IFGain:Low  | Trig: Free Run                 | I <u>A</u> ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100 | RF 01:45:29 PM Jan 06, 2014<br>TRACE 128 34 55<br>TYPE MWWWW<br>DET PINNINN<br>2.479 178 GHz  | Frequency<br>Auto Tur<br>Center Fr<br>2.493500000 G<br>Start Fr<br>2.477000000 G   |
| i2<br>sG<br>sG<br>sG<br>sG<br>RF SO Ω<br>start Freq 2.4770000<br>Ref Offset 1 d<br>0 dB/div Ref 20.00 d<br>0 0<br>0 0<br>0 0<br>0 0<br>0 0<br>0 0<br>0 0  | DC<br>DOD GHz<br>PNO: Wide (<br>IFGain:Low  | Trig: Free Run                 | I <u>A</u> ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100 | RF 01:45:29 PM Jan 06, 2014<br>TRACE 128 34 55<br>TYPE MWWWW<br>DET PINNINN<br>2.479 178 GHz  | Frequency<br>Auto Tur<br>Center Fn<br>2.493500000 G<br>Start Fn<br>2.477000000 G<br>Stop Fn  |
| 12<br>glient Spectrum Analyzer - Swee<br>itart Freq 2.4770000<br>0 dB/div Ref 20.00 d<br>10 0<br>0 dB/div Ref 20.00 d<br>10 0<br>0 00<br>0 0<br>0 0<br>0 0<br>0 0<br>0 0<br>0   | DC<br>DOO GHz<br>PNO: Wide (<br>IFGain:Low<br>B   | Trig: Free Run                 | I <u>A</u> ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100 | RF 01:45:29 PM Jan06, 2014<br>TRACE 12 3 4 5 6<br>TYPE MWWWW<br>DET PINNINN<br>2.479 178 GHz<br>6.150 dBm<br>13:69 dbm  | Frequency<br>Auto Tur<br>Center Fn<br>2.493500000 G<br>Start Fn<br>2.477000000 G<br>Stop Fn  |
| 2<br>glient Spectrum Analyzer - Sweg<br>scalart Freq 2.4770000<br>Ref Offset 1 d<br>0 dB/div Ref 20.00 d<br>0 0<br>0 0<br>0 0<br>0 0<br>0 0<br>0 0<br>0 0   | 2<br>2<br>2<br>2<br>00 GH2<br>PNO: Wide<br>IFGain:Low<br>B<br>B<br>M<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2         | Trig: Free Run<br>Atten: 30 dB | ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Mkr1    | RF 01:45:29 PM Jan06, 2014<br>TRACE 02:3:45 6<br>TYPE PM WANNAW<br>DET PNNNNN<br>2.479 178 GHz<br>6.150 dBm<br>   | Frequency<br>Auto Tu<br>Center Fr<br>2.493500000 G<br>Start Fr<br>2.477000000 G<br>Stop Fr<br>2.510000000 G  |
| i2<br>gilent Spectrum Analyzer - Swee<br>so and the second sec  | DO CHZ<br>PNO: Wide (<br>IFGain:Low<br>B<br>Bm<br>2<br>2<br>2<br>4<br>4<br>4<br>4<br>4<br>4<br>4  | Trig: Free Run<br>Atten: 30 dB | ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Mkr1    | RF 01:45:29 PM Janob, 2014<br>TRACE 23 4 5 6<br>TYPE P NUMBER<br>2.479 178 GHz<br>6.150 dBm<br>-13:65 dbm<br>-13:65 dbm<br>Stop 2.51000 GHz<br>3.20 ms (1001 pts)   | Frequency<br>Auto Tur<br>Center Fro<br>2.493500000 G<br>Start Fro<br>2.477000000 G<br>Stop Fro<br>2.510000000 G  |
| i2         I2           glient Spectrum Analyzer - Sweg         Ref Offset 1 d           o dB/div         Ref Offset 1 d           0 dB/div         Ref 20.00 d           0 dB/div <td>DO GHZ<br/>PNO: Wide (<br/>IFGain:Low<br/>B<br/>Bm<br/>2<br/>2<br/>4<br/>4<br/>4<br/>4<br/>4<br/>4<br/>4<br/>4<br/>4<br/>4<br/>4<br/>4<br/>4<br/>4<br/>4<br/>4<br/>4</td> <td>Trig: Free Run<br/>Atten: 30 dB</td> <td>ALIGN AUTO/NC<br/>Avg Type: Log-Pwr<br/>Avg Hold&gt;100/100<br/>Mkr1</td> <td>RF 01:45:29 PM Janob, 2014<br/>TRACE 23 4 5 6<br/>TYPE P NUMBER<br/>2.479 178 GHz<br/>6.150 dBm<br/>-13:65 dbm<br/>-13:65 dbm<br/>Stop 2.51000 GHz<br/>3.20 ms (1001 pts)</td> <td>Frequency<br/>Auto Tur<br/>Center Fro<br/>2.493500000 G<br/>Start Fro<br/>2.477000000 G<br/>Stop Fro<br/>2.510000000 G</td>   | DO GHZ<br>PNO: Wide (<br>IFGain:Low<br>B<br>Bm<br>2<br>2<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4 | Trig: Free Run<br>Atten: 30 dB | ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Mkr1    | RF 01:45:29 PM Janob, 2014<br>TRACE 23 4 5 6<br>TYPE P NUMBER<br>2.479 178 GHz<br>6.150 dBm<br>-13:65 dbm<br>-13:65 dbm<br>Stop 2.51000 GHz<br>3.20 ms (1001 pts)   | Frequency<br>Auto Tur<br>Center Fro<br>2.493500000 G<br>Start Fro<br>2.477000000 G<br>Stop Fro<br>2.510000000 G  |
| i2<br>gilent Spectrum Analyzer - Swei<br>gilent Spectrum Analyzer - Swei<br>start Freq 2.4770000<br>Ref Offset 1 d<br>0 dB/div Ref 20.00 d<br>0 d<br>0 d<br>0 d<br>0 d<br>0 d<br>0 d<br>0 d   | DO GHZ<br>PNO: Wide<br>IFGain:Low<br>B<br>Bm<br>2<br>2<br>2<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4   | Trig: Free Run<br>Atten: 30 dB | ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Mkr1    | RF 01:45:29 PM Janob, 2014<br>TRACE 23 4 5 6<br>TYPE P NUMBER<br>2.479 178 GHz<br>6.150 dBm<br>-13:65 dbm<br>-13:65 dbm<br>Stop 2.51000 GHz<br>3.20 ms (1001 pts)   | Frequency<br>Auto Tur<br>Center Fr<br>2.493500000 G<br>Start Fr<br>2.477000000 G<br>Stop Fr<br>2.510000000 G<br>CF St<br>3.300000 M<br>Auto M  |
| Ref Offset 1 d           0 dB/div         Ref Offset 1 d           0 d0         1           1 n         1           1 n         1           3 n         1   | 2.443 500 GHz   | Trig: Free Run<br>Atten: 30 dB | ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Mkr1    | RF 01:45:29 PM Janob, 2014<br>TRACE 23 4 5 6<br>TYPE P NUMBER<br>2.479 178 GHz<br>6.150 dBm<br>-13:65 dbm<br>-13:65 dbm<br>Stop 2.51000 GHz<br>3.20 ms (1001 pts)   | Frequency<br>Auto Tur<br>Center Fre<br>2.493500000 Gi<br>Start Fre<br>2.477000000 Gi<br>Stop Fre<br>2.510000000 Gi<br>3.300000 Mi<br>Auto Mi   |
| Ref Offset 1 d           0 dB/div         Ref Offset 1 d           0 dB/div         Ref 20.00 d           0 d0 d         Ref 20.00 d           0 d1 d1 f         Ref 20.00 d           0 d1 d1 f         Ref 20.00 d  | 2.443 500 GHz   | Trig: Free Run<br>Atten: 30 dB | ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Mkr1    | RF 01:45:29 PM Janob, 2014<br>TRACE 23 4 5 6<br>TYPE P NUMBER<br>2.479 178 GHz<br>6.150 dBm<br>-13:65 dbm<br>-13:65 dbm<br>Stop 2.51000 GHz<br>3.20 ms (1001 pts)   | Frequency<br>Auto Tur<br>Center Fre<br>2.493500000 Gi<br>Start Fre<br>2.477000000 Gi<br>Stop Fre<br>2.510000000 Gi<br>3.300000 Mi<br>Auto Mi   |
| Start Freq 2.4770000<br>Ref Offset 1 d<br>0 dB/div Ref 20.00 d<br>0 d<br>0 d<br>0 d<br>0 d<br>0 d<br>0 d<br>0 d   | 2.443 500 GHz   | Trig: Free Run<br>Atten: 30 dB | ALIGN AUTO/NC<br>Avg Type: Log-Pwr<br>Avg Hold>100/100<br>Mkr1    | RF 01:45:29 PM Janob, 2014<br>TRACE 23 4 5 6<br>TYPE P VINNAW<br>0 cr P VINNAW<br>2.479 178 GHz<br>6.150 dBm<br>-13:65 dbm<br>-13:65 dbm<br>Stop 2.51000 GHz<br>3.20 ms (1001 pts)  | Frequency           Auto Tur           Center Fre           2.493500000 GH           Start Fre           2.477000000 GH           Stop Fre           2.510000000 GH           CF Ste           3.300000 MH |

11 12

MSG 🗼 Alignment Completed

Align Now, All required

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### Hopping off mode:

Analyzer - Swept SA ALIGN AUTO/NORF 01:42 Avg Type: Log-Pwr Avg|Hold:>100/100 2:04 PM Jani TRACE 1 2 TYPE MW DET P N Frequency Start Freq 2.310000000 GHz Trig: Free Run Atten: 30 dB PNO: Fast IFGain:Low Auto Tune Mkr1 2.401 865 GHz 5.471 dBm Ref Offset 1 dB Ref 20.00 dBm **Center Freq** 2.357500000 GHz Start Freq 2.310000000 GHz 3  $\Diamond^2$ Stop Freq 2.40500000 GHz Start 2.31000 GHz #Res BW 100 kHz Stop 2.40500 GHz 9.13 ms (1001 pts) CF Step 9.500000 MHz #VBW 300 kHz Sweep Man Auto 5.471 dBm -49.732 dBm -44.884 dBm 234 2.390 000 GHz 2.400 000 GHz N Freq Offset 156789 0 Hz 10 11 12 MSG 🛿 Align Now, All required Frequency Start Freg 2.477000000 GHz Avg Type: Log-Pwr Avg|Hold:>100/100 PNO: Wide Trig: Free Run IFGain:Low Atten: 30 dB DET P N N N Auto Tune Mkr1 2.480 168 GHz 6.293 dBm Ref Offset 1 dB Ref 20.00 dBm 10 dB/d **Center Freq** 2.493500000 GHz Start Freq 2.477000000 GHz 13 Stop Freq 2.51000000 GHz

 Start 2.47700 GHz

 Stort 2.47700 GHz

 #Res BW 100 kHz
 Storp 2.51000 GHz

 #Res BW 100 kHz
 #VBW 300 kHz
 Storp 2.51000 GHz

 MKR MODE TRC SCL
 X
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 FUNCTION
 FUNCTION width
 FUNCTION Value

 MKR MODE TRC SCL
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# 9.9 Spurious radiated emissions for transmitter and receiver

## **Test Method**

- 1. The EUT is placed on a turntable, which is 0.8m above ground plane.
- 2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- Use the following spectrum analyzer settings: Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for f ≥ 1GHz, 100 kHz for f < 1 GHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 4. Follow the guidelines in ANSI C63.4-1992 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 5. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from 20log(duty cycle/100 ms), in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

## Limit

According to part 15.247(d), the radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

| Frequency  | Field Strength | Field Strength | Detector |
|------------|----------------|----------------|----------|
| MHz        | uV/m           | dBµV/m         |          |
| 30-88      | 100            | 40             | QP       |
| 88-216     | 150            | 43.5           | QP       |
| 216-960    | 200            | 46             | QP       |
| 960-1000   | 500            | 54             | QP       |
| Above 1000 | 500            | 54             | AV       |
| Above 1000 | 5000           | 74             | PK       |



#### Spurious radiated emissions for transmitter and receiver

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

The only worse case (which is subject to the maximum EIRP, GFSK mode) test result is listed in the report.

### Transmitting spurious emission test result as below:

| Frequency | Antenna<br>Factor | Cable<br>Loss | Amp.<br>Factor | Reading | Emission<br>Level | Polarization | Limit  | Detector | Result |
|-----------|-------------------|---------------|----------------|---------|-------------------|--------------|--------|----------|--------|
| MHz       | dB/m              | dB            | dB             | dBuV    | dBuV/m            |              | dBµV/m |          |        |
| 39.70     | 14.26             | 1.00          | 0              | 8.83    | 24.09             | Horizontal   | 40     | QP       | Pass   |
| 177.44    | 9.83              | 1.70          | 0              | 18.48   | 30.01             | Horizontal   | 43.5   | QP       | Pass   |
| 40.57     | 13.76             | 1.02          | 0              | 21.00   | 35.78             | Vertical     | 40     | QP       | Pass   |
| 128.94    | 12.80             | 1.52          | 0              | 19.91   | 34.23             | Vertical     | 43.5   | QP       | Pass   |
| *4804     | 32.85             | 8.56          | 35.70          | 46.22   | 51.93             | Horizontal   | 74     | PK       | Pass   |
| *4804     | 32.85             | 8.56          | 35.70          | 44.77   | 50.48             | Vertical     | 74     | PK       | Pass   |

Bluetooth Mode GFSK Modulation 2402MHz Test Result

Bluetooth Mode GFSK Modulation 2441MHz Test Result

| Frequency | Antenna<br>Factor | Cable<br>Loss | Amp.<br>Factor | Reading | Emission<br>Level | Polarization | Limit  | Detector | Result |
|-----------|-------------------|---------------|----------------|---------|-------------------|--------------|--------|----------|--------|
| MHz       | dB/m              | dB            | dB             | dBuV    | dBuV/m            |              | dBµV/m |          |        |
| *4882     | 32.99             | 8.64          | 35.70          | 45.65   | 51.58             | Horizontal   | 74     | PK       | Pass   |
| *4882     | 32.99             | 8.64          | 35.70          | 46.28   | 52.21             | Vertical     | 74     | PK       | Pass   |

Bluetooth Mode GFSK Modulation 2480MHz Test Result

| Frequency | Antenna<br>Factor | Cable<br>Loss | Amp.<br>Factor | Reading | Emission<br>Level | Polarization | Limit  | Detector | Result |
|-----------|-------------------|---------------|----------------|---------|-------------------|--------------|--------|----------|--------|
| MHz       | dB/m              | dB            | dB             | dBuV    | dBuV/m            |              | dBµV/m |          |        |
| *4960     | 33.13             | 8.72          | 35.70          | 45.77   | 51.92             | Horizontal   | 74     | PK       | Pass   |
| *4960     | 33.13             | 8.72          | 35.70          | 45.17   | 51.32             | Vertical     | 74     | PK       | Pass   |

Remark:

 QP Emission Level= Antenna Factor +Cable Loss + Reading PK Emission Level= Antenna Factor +Cable Loss - Amp. factor + Reading AV Emission Level= PK Emission Level+20log(dutycycle)

- (2) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
- (3) "\*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

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## Receiving emission test result as below:

| Frequency      | Antenna<br>Factor | Cable<br>Loss | Amp.<br>Factor | Reading | Emission<br>Level | Polarization | Limit  | Detector | Result |
|----------------|-------------------|---------------|----------------|---------|-------------------|--------------|--------|----------|--------|
| MHz            | dB/m              | dB            | dB             | dBuV    | dBuV/m            |              | dBµV/m |          |        |
| 39.70          | 14.26             | 1.00          | 0              | 8.33    | 23.59             | Horizontal   | 40     | QP       | Pass   |
| 177.44         | 9.83              | 1.70          | 0              | 18.52   | 30.05             | Horizontal   | 43.5   | QP       | Pass   |
| 40.57          | 13.76             | 1.02          | 0              | 17.45   | 32.23             | Vertical     | 40     | QP       | Pass   |
| 128.94         | 12.80             | 1.52          | 0              | 16.87   | 31.19             | Vertical     | 43.5   | QP       | Pass   |
| 1000-<br>25000 |                   |               |                |         |                   | Horizontal   | 74     | PK       | Pass   |
| 1000-<br>25000 |                   |               |                |         |                   | Vertical     | 74     | PK       | Pass   |

Remark:

(1) QP Emission Level= Antenna Factor +Cable Loss + Reading PK Emission Level= Antenna Factor +Cable Loss - Amp. factor + Reading AV Emission Level= PK Emission Level+20log (dutycycle)

(2) Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are the noise floor or attenuated more than 20db below the permissible limits or the field strength is too small to be measured.

(3) "\*" means the emission(s) appear within the restrict bands shall follow the requirement of section RSS-Gen.

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# **10 Test Equipment List**

|            | DESCRIPTION            | MANUFACTURER    | MODEL NO.          | SERIAL NO.    | CAL. DUE<br>DATE |           |
|------------|------------------------|-----------------|--------------------|---------------|------------------|-----------|
|            | Test Receiver          | Rohde & Schwarz | ESHS10             | 838693/001    | Nov.04, 14       | $\square$ |
|            | L.I.S.N.#1             | Rohde & Schwarz | ESH2-Z5            | 834066/011    | Nov.04, 14       | $\square$ |
|            | L.I.S.N.#3             | Kyoritsu        | KNW-242C           | 8-1920-1      | May.07, 14       |           |
| CE         | RF Cable               | 3D-2W           | Fujikura           | LISN Cable 1# | May.07, 14       | $\square$ |
|            | Coaxial Switch         | MP59B           | Anritsu            | M55367        | May.07, 14       | $\square$ |
|            | Passive Probe          | ESH2-Z3         | Rohde &<br>Schwarz | 299.7810.52   | May.07, 14       |           |
|            | Pulse Limiter          | ESH3-Z2         | Rohde &<br>Schwarz | 100341        | May.07, 14       |           |
| С          | Spectrum               | Agilent         | E4446A             | US44300459    | May.08, 14       | $\bowtie$ |
| RE<br>< 1  | Test Receiver<br><1GHz | Rohde & Schwarz | ESVS10             | 834468/011    | May.07, 14       | $\square$ |
| GHz        | Amplifier < 1 GHz      | HP              | 8447D              | 2648A04738    | May.07, 14       | $\square$ |
|            | HF Cable               | Hubersuhne      | Sucoflex104        | Room 2        | May.08, 14       | $\square$ |
|            | Bilog Antenna          | Schaffner       | CBL6111C           | 2598          | Oct.25, 14       | $\square$ |
| RE         | Spectrum > 1GHz        | Agilent         | E4446A             | US44300459    | May.08, 14       | $\square$ |
| > 1<br>GHz | Horn Antenna           | EMCO            | 3115               | 9607-4877     | Jun. 24, 14      | $\square$ |
|            | Amp > 1 Ghz            | HP              | 8449B              | 3008A08495    | May.08, 14       | $\square$ |
|            | HF Cable               | Hubersuhne      | Sucoflex104        | Room1         | May.08, 14       | $\square$ |

## **List of Test Instruments**

C - Conducted RF tests

- Conducted peak output power •
- 6dB bandwidth •
- 20dB bandwidth and 99% Occupied Bandwidth
- Carrier frequency separation •
- Number of hopping frequencies •
- **Dwell Time** •
- Power spectral density\* •
- Spurious RF conducted emissions ٠
- Band edge



# **11 System Measurement Uncertainty**

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

| Bystern medsurement entertainty |                      |  |  |  |  |
|---------------------------------|----------------------|--|--|--|--|
| Items                           | Extended Uncertainty |  |  |  |  |
| Padiated spurious amission      | 4.32dB (30MHz-1GHz)  |  |  |  |  |
| Radiated spurious emission      | 2.27dB (1GHz -25GHz) |  |  |  |  |
| Conducted spurious emission     | 2.10dB(30MHz-25GHz)  |  |  |  |  |
| Bandwidth test                  | 1*10 <sup>-9</sup>   |  |  |  |  |
| Conducted emission              | 2.4dB                |  |  |  |  |

#### System Measurement Uncertainty