




RF TEST REPORT



Report No.: 14070617-FCC-R2

Supersede Report No.: N/A

| | | |
|--|---|---|
| Applicant | Verykool USA Inc | |
| Product Name | Mobile Phone | |
| Model No. | s5015 | |
| Test Standard | FCC Part 15.247: 2013, ANSI C63.10: 2009 | |
| Test Date | December 02, 2014 to January 08, 2015 | |
| Issue Date | January 08, 2015 | |
| Test Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |
| Equipment complied with the specification | <input checked="" type="checkbox"/> | |
| Equipment did not comply with the specification | <input type="checkbox"/> | |
|  |  |  |
| Herith Shi Test Engineer | Alex Liu Checked By | |
| This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only | | |

Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

Zone A, Floor 1, Building 2 Wan Ye Long Technology Park

South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108

Phone: +86 0755 2601 4629801 Email: China@siemic.com.cn

Laboratories Introduction

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In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

| Country/Region | Scope |
|----------------|------------------------------------|
| USA | EMC, RF/Wireless, SAR, Telecom |
| Canada | EMC, RF/Wireless, SAR, Telecom |
| Taiwan | EMC, RF, Telecom, SAR, Safety |
| Hong Kong | RF/Wireless, SAR, Telecom |
| Australia | EMC, RF, Telecom, SAR, Safety |
| Korea | EMI, EMS, RF, SAR, Telecom, Safety |
| Japan | EMI, RF/Wireless, SAR, Telecom |
| Singapore | EMC, RF, SAR, Telecom |
| Europe | EMC, RF, SAR, Telecom, Safety |

| | |
|-------------|-----------------|
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1. Report Revision History

| Report No. | Report Version | Description | Issue Date |
|-----------------|----------------|-------------|------------------|
| 14070617-FCC-R2 | NONE | Original | January 08, 2015 |
| | | | |
| | | | |
| | | | |
| | | | |

2. Customer information

| | |
|------------------|--|
| Applicant Name | Verykool USA Inc |
| Applicant Add | 3636 Nobel Drive, Suite 325, San Diego, CA 92122 |
| Manufacturer | Sprocomm Technologies CO.,LTD |
| Manufacturer Add | 5D-506 F1.6 Block,Tianfa Building,Tianan Chegongmiao Industrial park,Futian Dist,Shenzhen, P.R China |

3. Test site information

| | |
|----------------------|--|
| Lab performing tests | SIEMIC (Shenzhen-China) LABORATORIES |
| Lab Address | Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108 |
| FCC Test Site No. | 718246 |
| IC Test Site No. | 4842E-1 |
| Test Software | Labview of SIEMIC version 2.0 |

4. Equipment under Test (EUT) Information

| | |
|-------------------------------|---|
| Description of EUT: | Mobile Phone |
| Main Model: | s5015 |
| Serial Model: | N/A |
| Date EUT received: | November 26, 2014 |
| Test Date(s): | December 02, 2014 to January 08, 2015 |
| Equipment Category : | DSS |
| Antenna Gain: | UMTS-FDD Band V/GSM850: 0.8 dBi UMTS-FDD Band II: 1.7 dBi UMTS-FDD Band IV: 1.7 dBi PCS1900: 1.2 dBi Bluetooth/BLE: 2.3 dBi WIFI: 2.3 dBi |
| Type of Modulation: | GSM / GPRS: GMSK EGPRS: GMSK, 8PSK UMTS-FDD: QPSK 802.11b/g/n: DSSS, OFDM Bluetooth: GFSK, π /4DQPSK, 8DPSK BLE: GFSK |
| RF Operating Frequency (ies): | GSM850 TX: 824.2 ~ 848.8 MHz; RX: 869.2 ~ 893.8 MHz PCS1900 TX: 1850.2 ~ 1909.8 MHz; RX: 1930.2 ~ 1989.8 MHz UMTS-FDD Band V TX: 826.4 ~ 846.6 MHz; RX: 871.4 ~ 891.6 MHz UMTS-FDD Band II TX: 1852.4 ~ 1907.6 MHz; RX: 1932.4 ~ 1987.6 MHz UMTS-FDD Band IV TX : 1712.4 ~ 1752.6 MHz; RX : 2112.4 ~ 2152.6 MHz WIFI: 802.11b/g/n(20M): 2412-2462 MHz WIFI: 802.11n(40M): 2422-2452 MHz Bluetooth & BLE: 2402-2480 MHz |

ERP/EIRP: Bluetooth: 4.683 dBm

Number of Channels: GSM 850: 124CH
PCS1900: 299CH
UMTS-FDD Band V : 102CH
UMTS-FDD Band II : 277CH
UMTS-FDD Band IV: 202CH
WIFI :802.11b/g/n(20M): 11CH
WIFI :802.11n(40M): 7CH
Bluetooth: 79CH
BLE: 40CH

Port: Power Port, Earphone Port, USB Port

Input Power: Battery:
Model: X5021
Spec: 3.8V 2100mAh 7.98Wh
Limited charger voltage: 4.35V
Adapter:
Model: SC050100-US
Input: AC 100-240V; 50/60Hz 0.4A
Output: DC 5.0V; 1000mA

Trade Name : verykool

GPRS/EGPRS Multi-slot class 8/10/12

FCC ID: WA6S5015

5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

| FCC Rules | Description of Test | Result |
|------------------------------|--------------------------------|------------|
| §15.203 | Antenna Requirement | Compliance |
| §15.247(a)(1) | Channel Separation | Compliance |
| §15.247(a)(1) | 20 dB Bandwidth | Compliance |
| §15.247(b)(1) | Peak Output Power | Compliance |
| §15.247(a)(1)(iii) | Number of Hopping Channel | Compliance |
| §15.247(a)(1)(iii) | Time of Occupancy (Dwell Time) | Compliance |
| §15.247(d) | Band Edge | Compliance |
| §15.207(a) | AC Line Conducted Emissions | Compliance |
| §15.205, §15.209, §15.247(d) | Radiated Emissions | Compliance |

Measurement Uncertainty

| Emissions | | |
|---|---|---------------|
| Test Item | Description | Uncertainty |
| Band Edge and Radiated Spurious Emissions | Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m) | +5.6dB/-4.5dB |
| | | |

6. Measurements, Examination And Derived Results

6.1 Antenna Requirement

Applicable Standard

According to § 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has 2 antennas:

A PIFA antenna for Bluetooth/BLE/WIFI, the gain is 2.3 dBi for Bluetooth/BLE/WIFI.

A PIFA antenna for GSM and UMTS, the gain is 0.8 dBi for UMTS-FDD Band V/ GSM850, 1.7 dBi for UMTS-FDD Band II / UMTS-FDD Band IV and 1.2 dBi for PCS1900

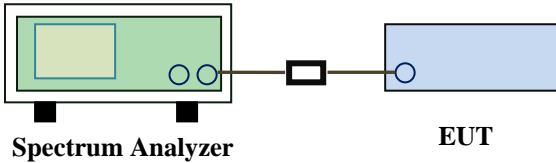
The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 Channel Separation

| | |
|----------------------|-------------------|
| Temperature | 24°C |
| Relative Humidity | 54% |
| Atmospheric Pressure | 1005mbar |
| Test date : | December 05, 2014 |
| Tested By : | Herith Shi |

Requirement(s):

| Spec | Item | Requirement | Applicable |
|----------------|--|---|-------------------------------------|
| § 15.247(a)(1) | a) | Channel Separation < 20dB BW and 20dB BW < 25KHz ; Channel Separation Limit=25KHz Chanel Separation < 20dB BW and 20dB BW > 25kHz ; Channel Separation Limit=2/3 20dB BW | <input checked="" type="checkbox"/> |
| Test Setup |  <p style="text-align: center;">Spectrum Analyzer EUT</p> | | |
| Test Procedure | <p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings:</p> <ul style="list-style-type: none"> - The EUT must have its hopping function enabled - Span = wide enough to capture the peaks of two adjacent channels - Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span - Video (or Average) Bandwidth (VBW) ≥ RBW - Sweep = auto - Detector function = peak - Trace = max hold - Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot. | | |

| | |
|--------|--|
| Remark | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |

Test Data Yes N/A

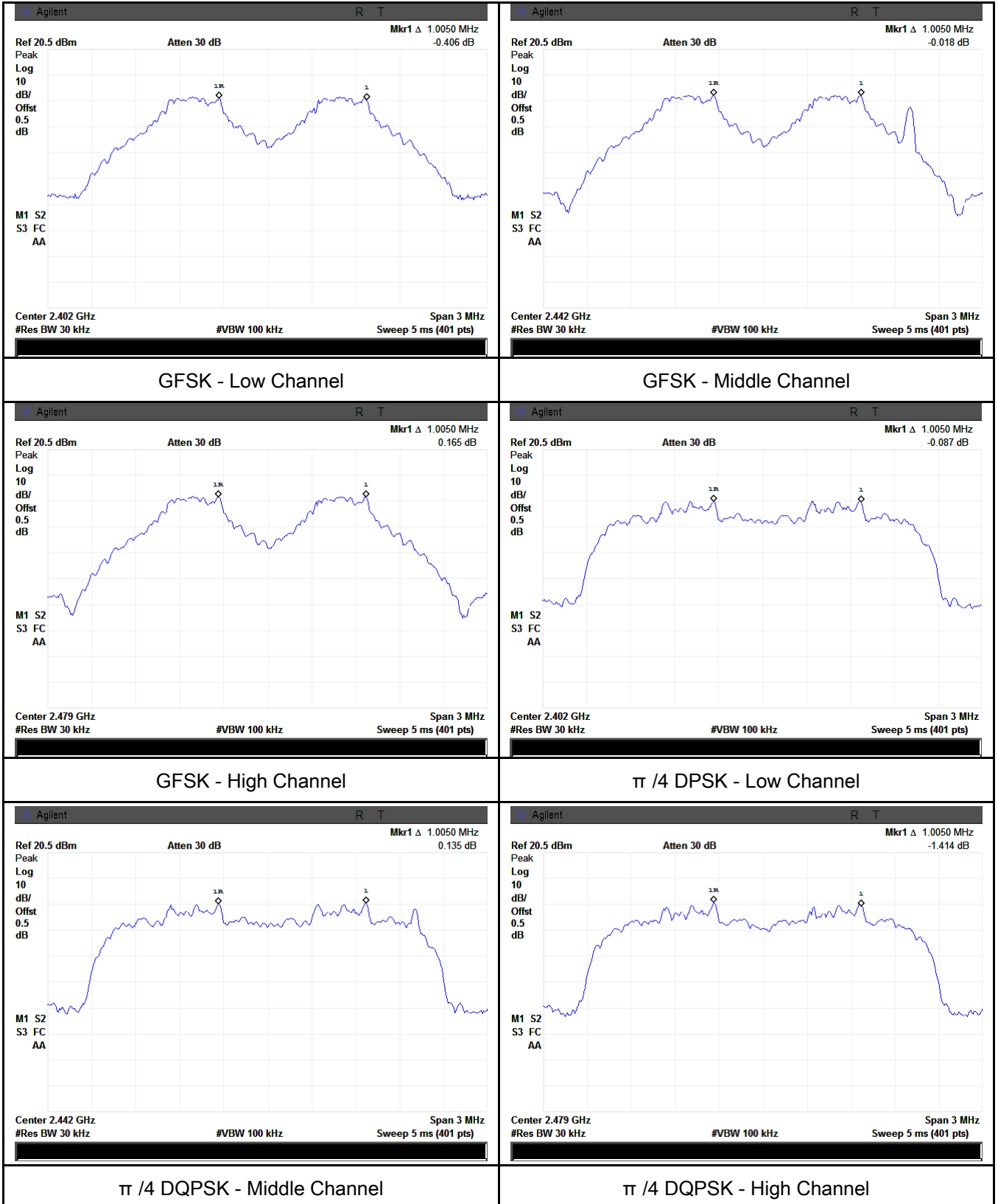
Test Plot Yes (See below) N/A

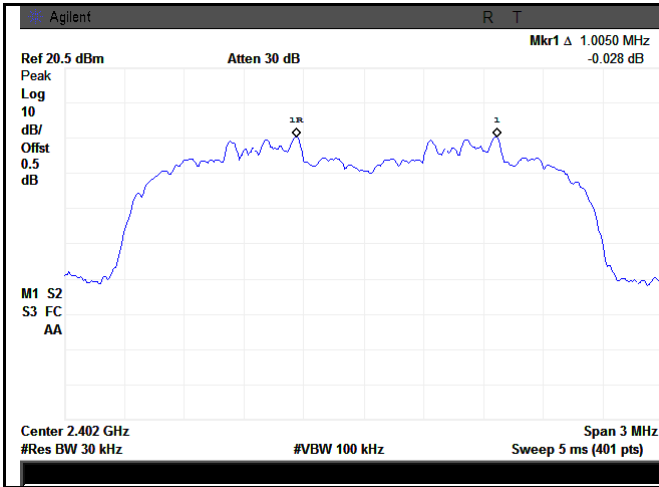
Channel Separation measurement result

| Type/ Modulation | CH | CH Freq (MHz) | CH Separation (MHz) | Limit (MHz) | Result |
|--------------------------------|-------------------|------------------|------------------------|----------------|--------|
| CH Separation GFSK | Low Channel | 2402 | 1.005 | 0.698 | Pass |
| | Adjacency Channel | 2403 | | | |
| | Mid Channel | 2440 | 1.005 | 0.689 | Pass |
| | Adjacency Channel | 2441 | | | |
| | High Channel | 2480 | 1.005 | 0.683 | Pass |
| | Adjacency Channel | 2479 | | | |
| CH Separation $\pi/4$ DQPSK | Low Channel | 2402 | 1.005 | 0.872 | Pass |
| | Adjacency Channel | 2403 | | | |
| | Mid Channel | 2440 | 1.005 | 0.869 | Pass |
| | Adjacency Channel | 2441 | | | |
| | High Channel | 2480 | 1.005 | 0.871 | Pass |
| | Adjacency Channel | 2479 | | | |
| CH Separation 8DPSK | Low Channel | 2402 | 1.005 | 0.869 | Pass |
| | Adjacency Channel | 2403 | | | |
| | Mid Channel | 2440 | 1.005 | 0.873 | Pass |
| | Adjacency Channel | 2441 | | | |
| | High Channel | 2480 | 1.005 | 0.870 | Pass |
| | Adjacency Channel | 2479 | | | |

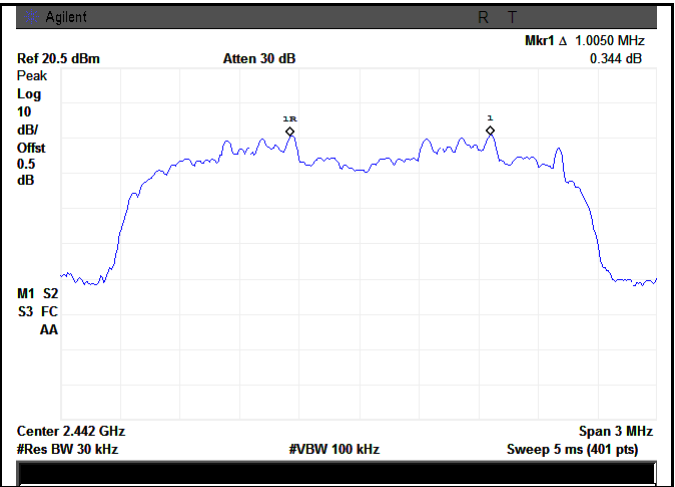
Test Plots

Channel Separation measurement result

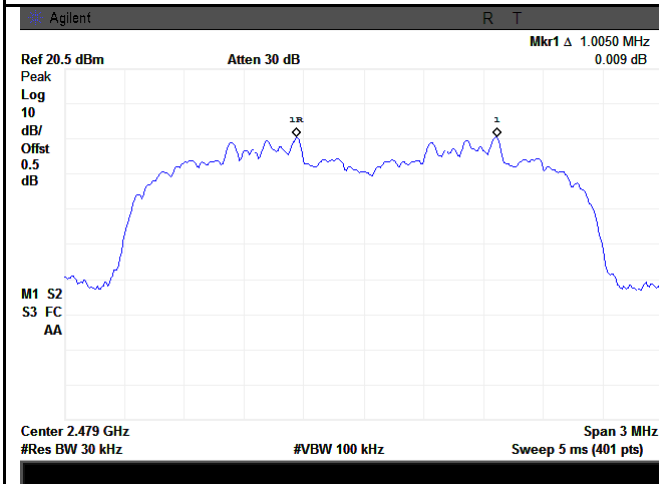




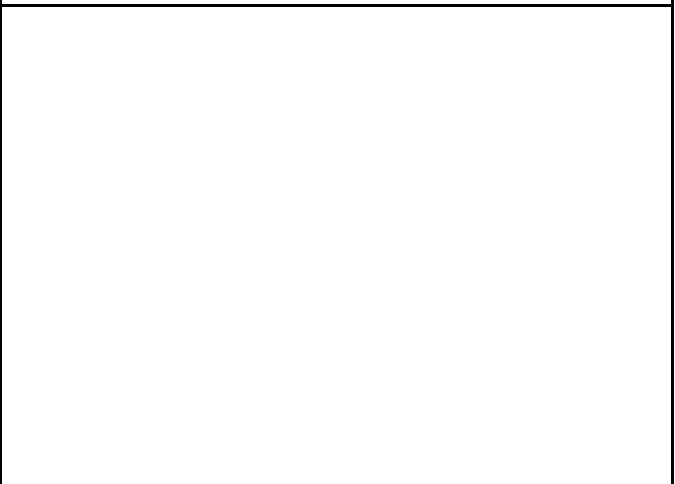
8DPSK - Low Channel



8DPSK - Middle Channel



8DPSK - High Channel

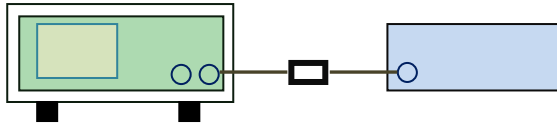


6.3 20dB Bandwidth

| | |
|----------------------|-------------------|
| Temperature | 24°C |
| Relative Humidity | 54% |
| Atmospheric Pressure | 1005mbar |
| Test date : | December 05, 2014 |
| Tested By : | Herith Shi |

Requirement(s):

| Spec | Item | Requirement | Applicable |
|-------------------|------|--|-------------------------------------|
| §15.247(a) (1) | a) | Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. | <input checked="" type="checkbox"/> |

| | |
|------------|---|
| Test Setup |  <p>The diagram illustrates the test setup. On the left is a green box representing the Spectrum Analyzer. A black cable connects it to a blue box on the right representing the EUT (Equipment Under Test). The Spectrum Analyzer has two small circles on its front panel, and the EUT has one small circle on its front panel.</p> |
|------------|---|

| | |
|----------------|--|
| Test Procedure | <p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings:</p> <ul style="list-style-type: none"> - Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel - RBW \geq 1% of the 20 dB bandwidth - VBW \geq RBW - Sweep = auto - Detector function = peak - Trace = max hold. - The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference |
|----------------|--|

| | |
|--------|---|
| | marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s). |
| Remark | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |

Test Data Yes N/A

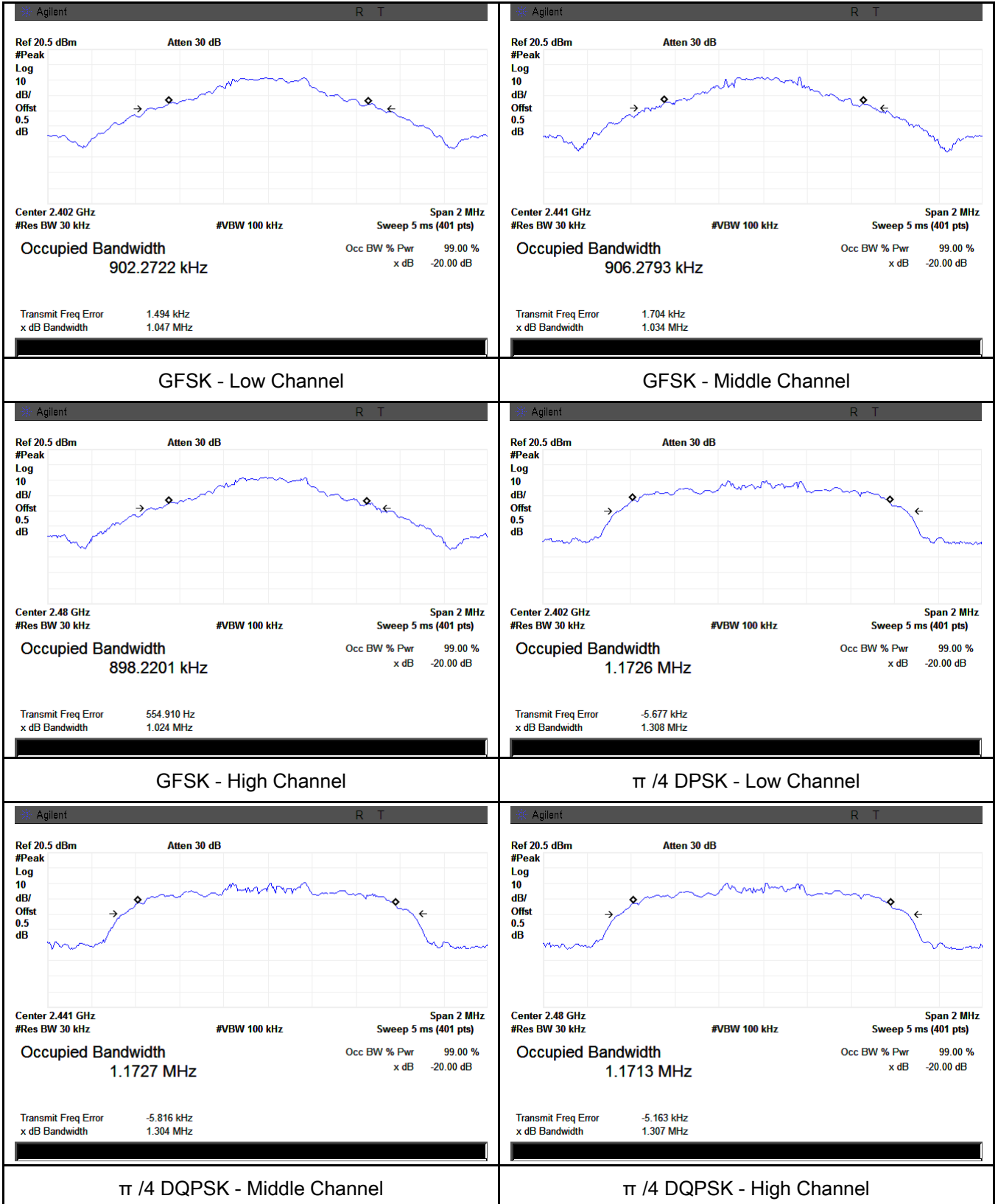
Test Plot Yes (See below) N/A

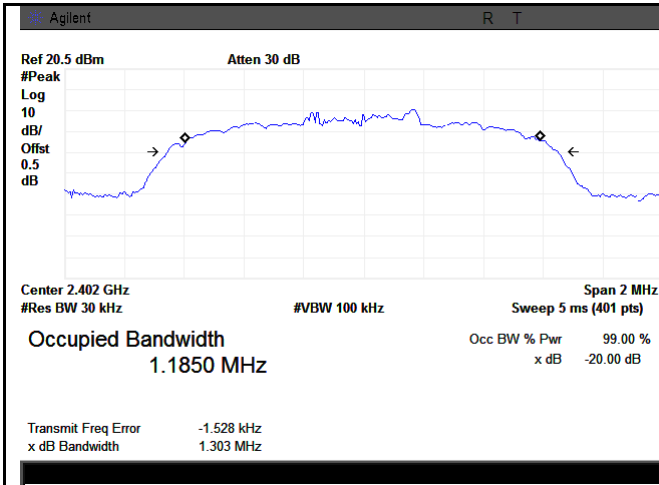
20dB Bandwidth measurement result

| Type | Modulation | CH | CH Freq (MHz) | 20dB Bandwidth (MHz) |
|---------|-----------------|------|---------------|----------------------|
| 20dB BW | GFSK | Low | 2402 | 1.047 |
| | | Mid | 2441 | 1.034 |
| | | High | 2480 | 1.024 |
| | π / 4 DQPSK | Low | 2402 | 1.308 |
| | | Mid | 2441 | 1.304 |
| | | High | 2480 | 1.307 |
| | 8-DPSK | Low | 2402 | 1.303 |
| | | Mid | 2441 | 1.310 |
| | | High | 2480 | 1.305 |

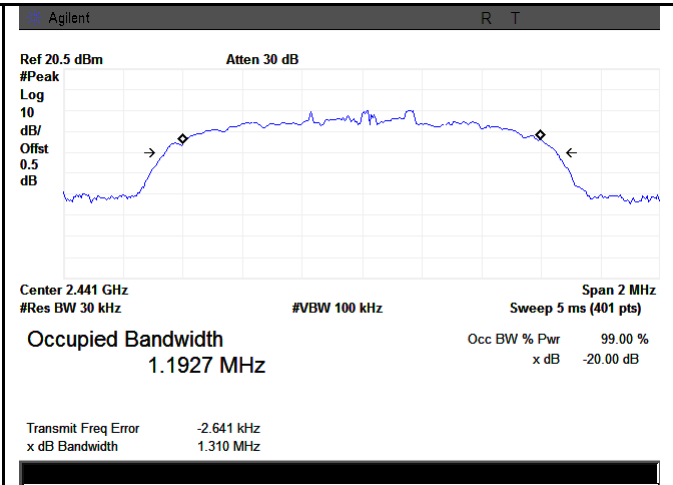
Test Plots

20dB Bandwidth measurement result

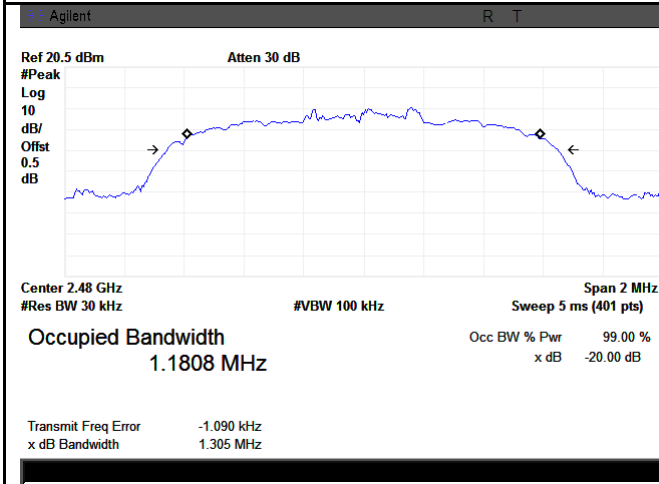




8DPSK - Low Channel



8DPSK - Middle Channel



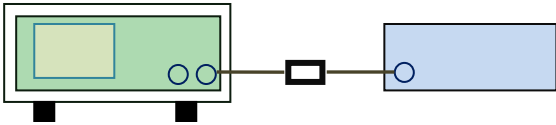
8DPSK - High Channel

6.4 Peak Output Power

| | |
|----------------------|-------------------|
| Temperature | 25°C |
| Relative Humidity | 55% |
| Atmospheric Pressure | 1006mbar |
| Test date : | December 06, 2014 |
| Tested By : | Herith Shi |

Requirement(s):

| Spec | Item | Requirement | Applicable |
|-------------------|------|---|-------------------------------------|
| §15.247(b) (2) | a) | FHSS in 2400-2483.5MHz with ≥ 75 channels: ≤ 1 Watt | <input checked="" type="checkbox"/> |
| | b) | FHSS in 5725-5850MHz: ≤ 1 Watt | <input type="checkbox"/> |
| | c) | For all other FHSS in the 2400-2483.5MHz band: ≤ 0.125 Watt. | <input checked="" type="checkbox"/> |
| | d) | FHSS in 902-928MHz with ≥ 50 channels: ≤ 1 Watt | <input type="checkbox"/> |
| | e) | FHSS in 902-928MHz with ≥ 25 & < 50 channels: ≤ 0.25 Watt | <input type="checkbox"/> |
| | f) | DSSS in 902-928MHz, 2400-2483.5MHz, 5725-5850MHz: ≤ 1 Watt | <input type="checkbox"/> |

| | |
|------------|--|
| Test Setup |  <p style="text-align: center;">Spectrum Analyzer EUT</p> |
|------------|--|

| | |
|----------------|--|
| Test Procedure | <p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Use the following spectrum analyzer settings:</p> <ul style="list-style-type: none"> - Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel - RBW $>$ the 20 dB bandwidth of the emission being measured - VBW \geq RBW - Sweep = auto - Detector function = peak - Trace = max hold |
|----------------|--|

| | |
|--------|--|
| | <ul style="list-style-type: none"> - 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 (see the note above regarding external attenuation and cable loss). The limit is specified in one of the subparagraphs of this Section. Submit this plot. A peak responding power meter may be used instead of a spectrum analyzer. |
| Remark | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |

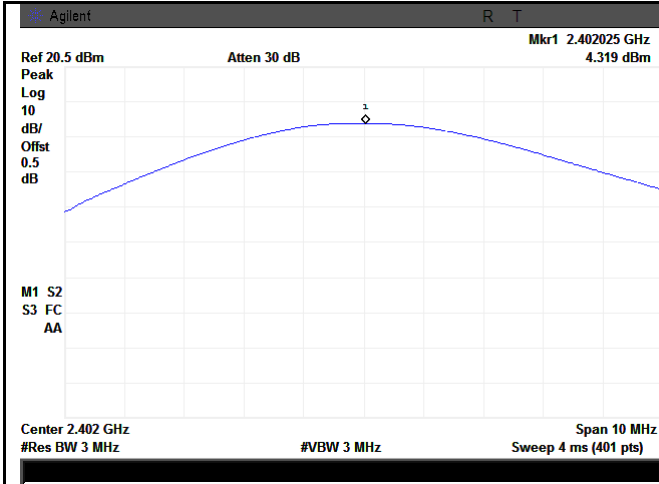
Test Data Yes N/A
 Test Plot Yes (See below) N/A

Peak Output Power measurement result

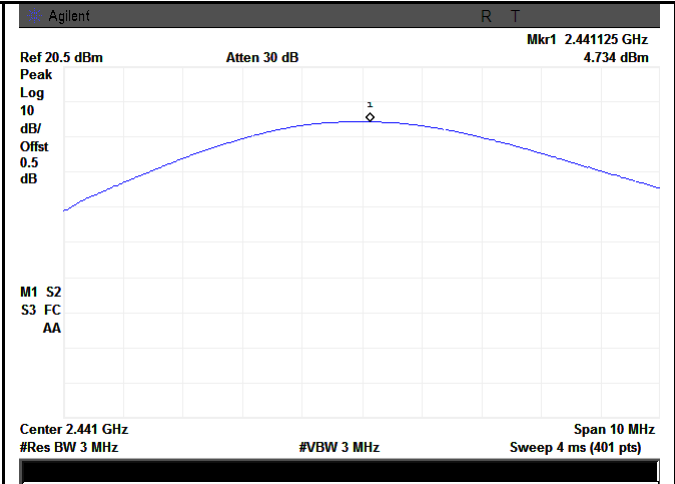
| Type | Modulation | CH | Freq (MHz) | Conducted Power (dBm) | Limit (mW) | Result |
|--------------|---------------|------|------------|-----------------------|------------|--------|
| Output power | GFSK | Low | 2402 | 4.319 | 125 | Pass |
| | | Mid | 2441 | 4.734 | 125 | Pass |
| | | High | 2480 | 4.683 | 125 | Pass |
| | $\pi/4$ DQPSK | Low | 2402 | 4.101 | 125 | Pass |
| | | Mid | 2441 | 4.480 | 125 | Pass |
| | | High | 2480 | 4.426 | 125 | Pass |
| | 8-DPSK | Low | 2402 | 4.123 | 125 | Pass |
| | | Mid | 2441 | 4.560 | 125 | Pass |
| | | High | 2480 | 4.512 | 125 | Pass |

Test Plots

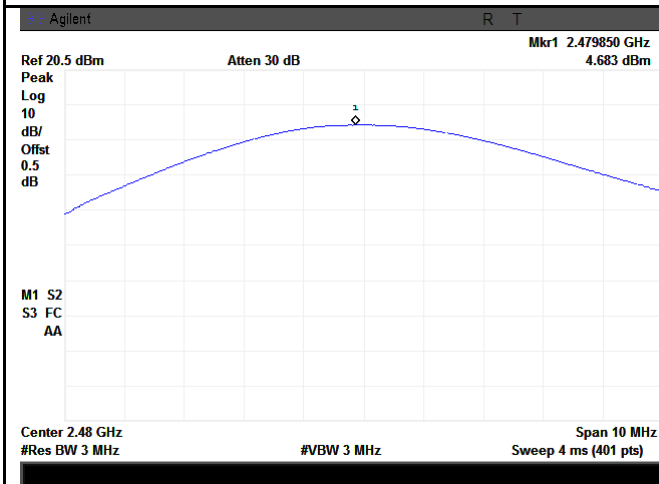
Output Power measurement result



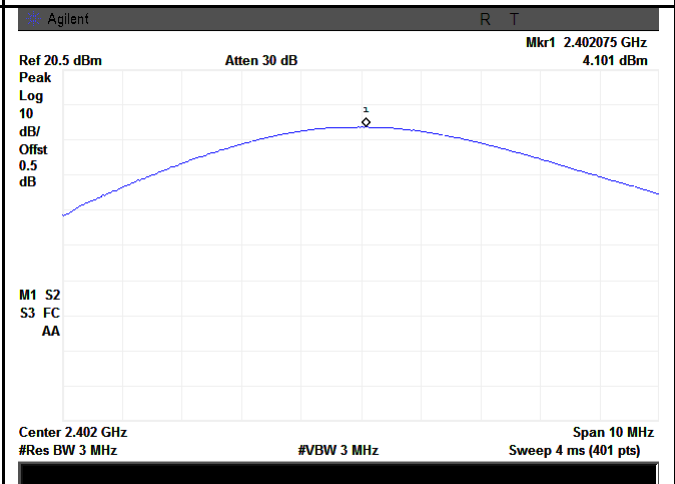
GFSK Output power - Low CH 2402



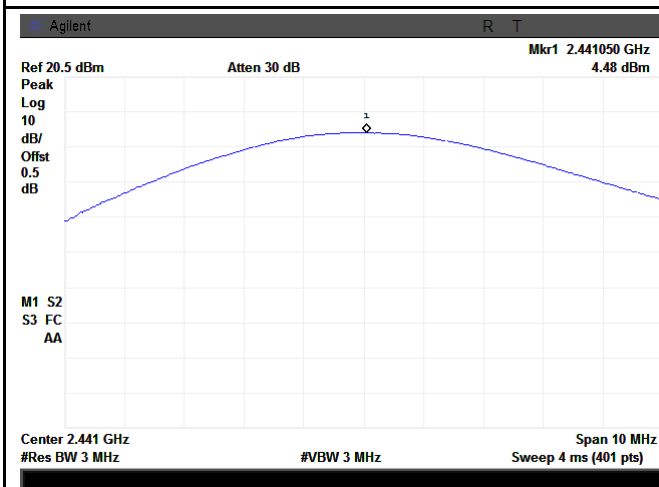
GFSK Output power - Mid CH 2441



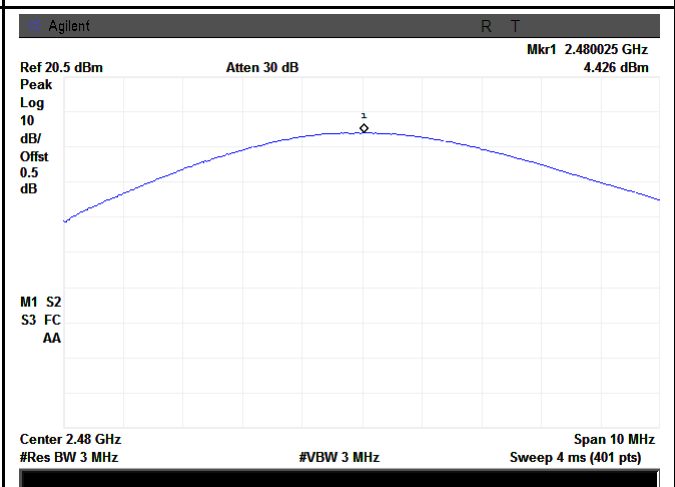
GFSK Output power - High CH 2480



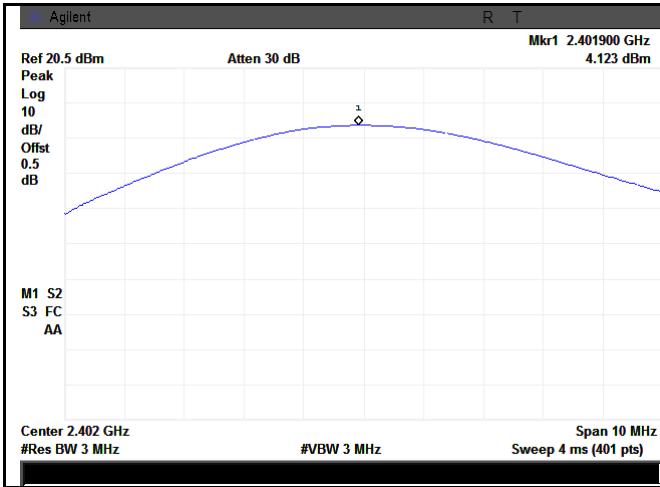
$\pi/4$ DQPSK Output power - Low CH 2402



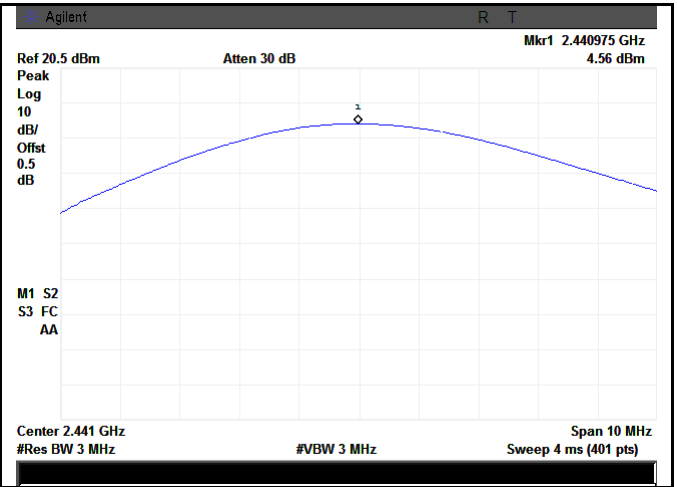
$\pi/4$ DQPSK Output power - Mid CH 2441



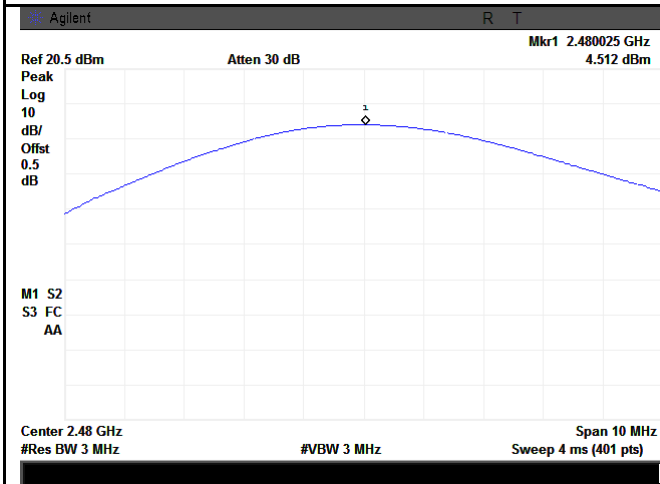
$\pi/4$ DQPSK Output power - High CH 2480



8DPSK Output power - Low CH 2402



8DPSK Output power - Mid CH 2441

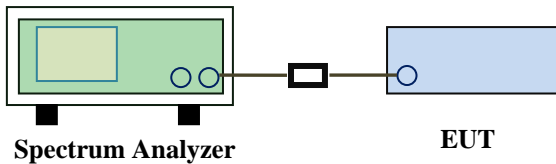


8DPSK Output power - High CH 2480

6.5 Number of Hopping Channel

| | |
|----------------------|-------------------|
| Temperature | 25°C |
| Relative Humidity | 55% |
| Atmospheric Pressure | 1006mbar |
| Test date : | December 06, 2014 |
| Tested By : | Herith Shi |

Requirement(s):

| Spec | Item | Requirement | Applicable |
|------------------------|---|--------------------------------------|-------------------------------------|
| §15.247(a) (1)(iii) | a) | FHSS in 2400-2483.5MHz ≥ 15 channels | <input checked="" type="checkbox"/> |
| Test Setup |  <p style="text-align: center;">Spectrum Analyzer EUT</p> | | |
| Test Procedure | <p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. <u>Use the following spectrum analyzer settings:</u> The EUT must have its hopping function enabled.</p> <ul style="list-style-type: none"> - Span = the frequency band of operation - RBW ≥ 1% of the span - VBW ≥ RBW - Sweep = auto - Detector function = peak - Trace = max hold - Allow trace to fully stabilize. - It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s). | | |
| Remark | | | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | | |

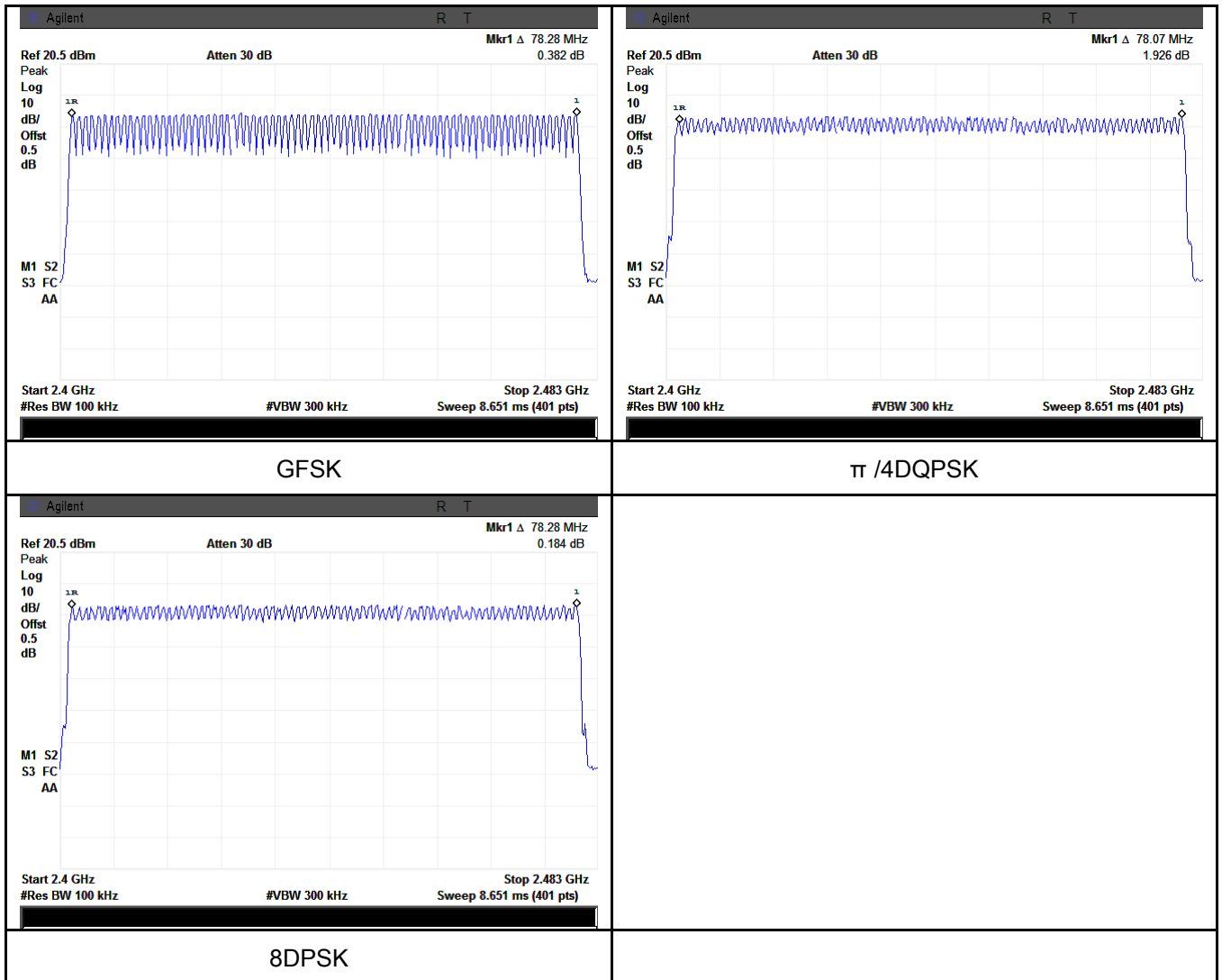
Test Data Yes N/A
 Test Plot Yes (See below) N/A

Number of Hopping Channel measurement result

| Type | Modulation | Frequency Range | Number of Hopping Channel | Limit |
|---------------------------|---------------|-----------------|---------------------------|-------|
| Number of Hopping Channel | GFSK | 2400-2483.5 | 79 | 15 |
| | $\pi/4$ DQPSK | 2400-2483.5 | 79 | 15 |
| | 8-DPSK | 2400-2483.5 | 79 | 15 |

Test Plots

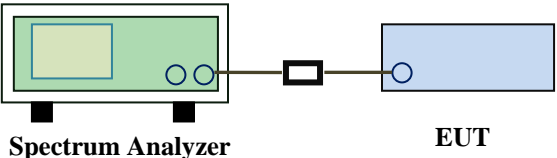
Number of Hopping Channels measurement result



6.6 Time of Occupancy (Dwell Time)

| | |
|----------------------|-------------------|
| Temperature | 22°C |
| Relative Humidity | 50% |
| Atmospheric Pressure | 1011mbar |
| Test date : | December 10, 2014 |
| Tested By : | Herith Shi |

Requirement(s):

| Spec | Item | Requirement | Applicable |
|------------------------|---|-------------------|-------------------------------------|
| §15.247(a) (1)(iii) | a) | Dwell Time < 0.4s | <input checked="" type="checkbox"/> |
| Test Setup |  <p style="text-align: center;">Spectrum Analyzer EUT</p> | | |
| Test Procedure | <p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. <u>Use the following spectrum analyzer</u></p> <ul style="list-style-type: none"> - Span = zero span, centered on a hopping channel - RBW = 1 MHz - VBW ≥ RBW - Sweep = as necessary to capture the entire dwell time per hopping channel - Detector function = peak - Trace = max hold - use the marker-delta function to determine the dwell time | | |
| Remark | | | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | | |

Test Data Yes N/A
 Test Plot Yes (See below) N/A

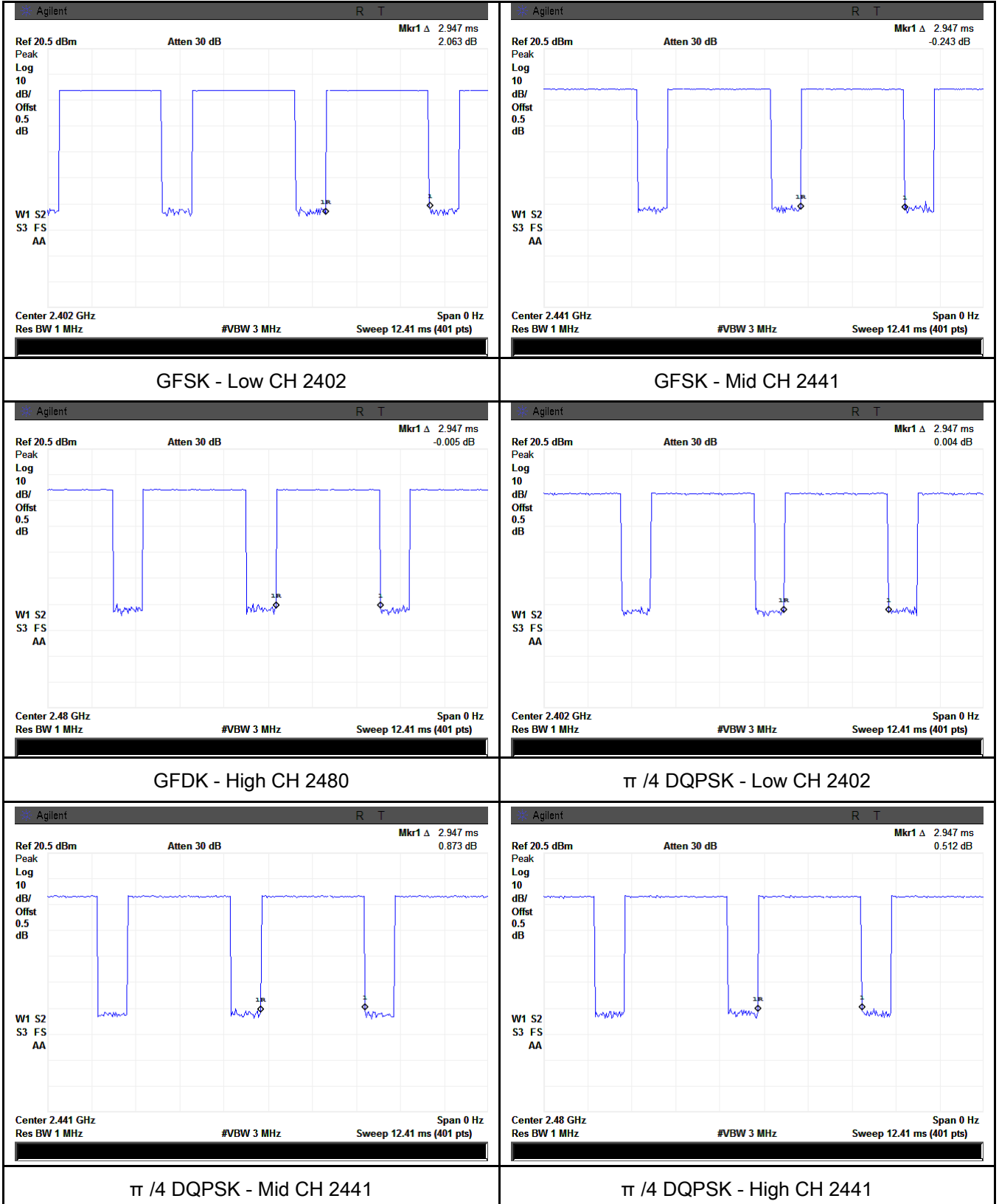
Dwell Time measurement result

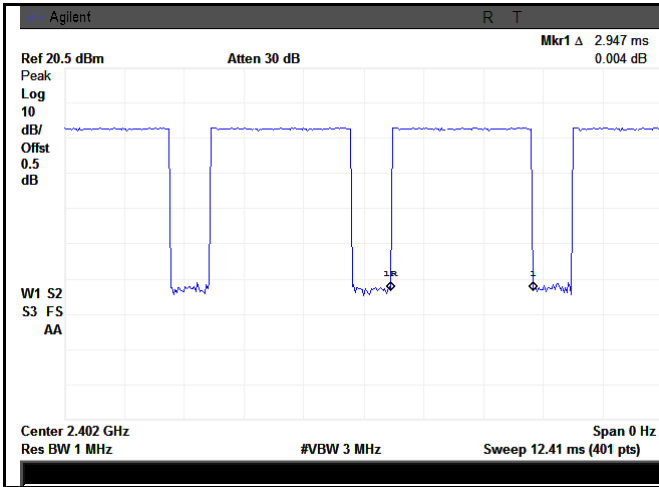
| Type | Modulation | CH | Pulse Width (ms) | Dwell Time (s) | Limit (s) | Result |
|------------|------------|------|------------------|----------------|-----------|--------|
| Dwell Time | GFSK | Low | 2.947 | 0.314 | 0.4 | Pass |
| | | Mid | 2.947 | 0.314 | 0.4 | Pass |
| | | High | 2.947 | 0.314 | 0.4 | Pass |
| | π /4 DQPSK | Low | 2.947 | 0.314 | 0.4 | Pass |
| | | Mid | 2.947 | 0.314 | 0.4 | Pass |
| | | High | 2.947 | 0.314 | 0.4 | Pass |
| | 8-DPSK | Low | 2.947 | 0.314 | 0.4 | Pass |
| | | Mid | 2.947 | 0.314 | 0.4 | Pass |
| | | High | 2.947 | 0.314 | 0.4 | Pass |

Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second

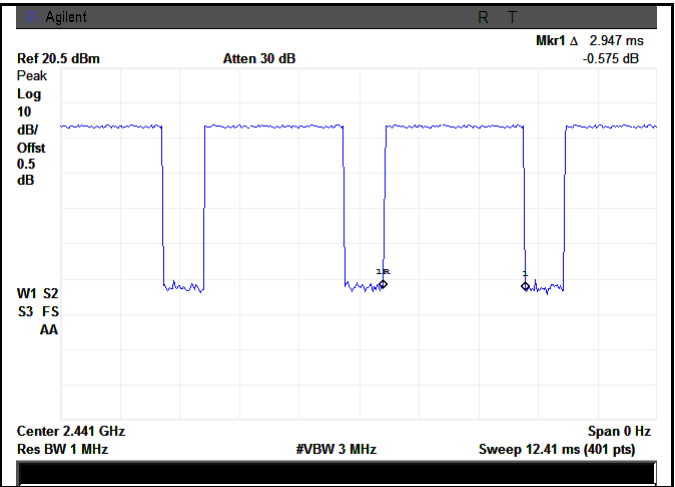
Test Plots

Dwell Time measurement result

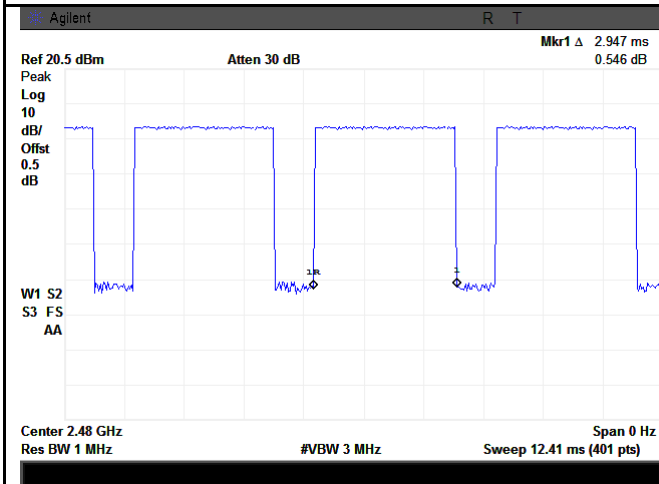




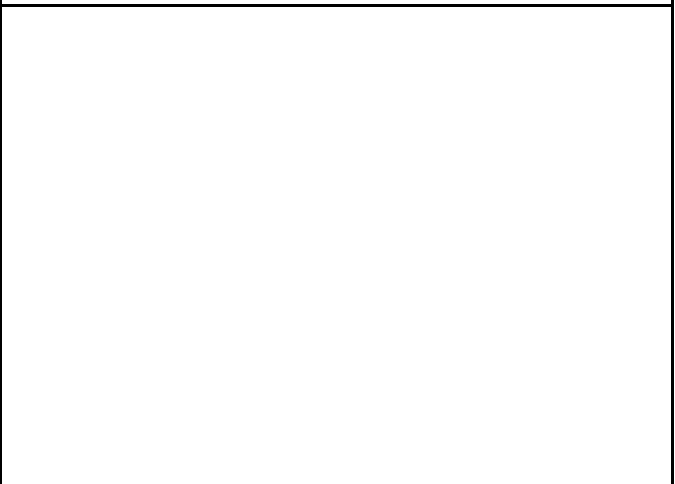
8DPSK - Low CH 2402



8DPSK - Mid CH 2441



8DPSK - High CH 2480



6.7 Band Edge

| | |
|----------------------|-------------------|
| Temperature | 20°C |
| Relative Humidity | 57% |
| Atmospheric Pressure | 1009mbar |
| Test date : | December 08, 2014 |
| Tested By : | Herith Shi |

Requirement(s):

| Spec | Item | Requirement | Applicable |
|------------------------|------|---|-------------------------------------|
| §15.247(a) (1)(iii) | a) | 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. | <input checked="" type="checkbox"/> |

| | |
|------------|--|
| Test Setup | |
|------------|--|

| | |
|----------------|---|
| Test Procedure | <p>The test follows FCC Public Notice DA 00-705 Measurement Guidelines. Radiated Method Only</p> <ul style="list-style-type: none"> - 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. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range. - 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a |
|----------------|---|

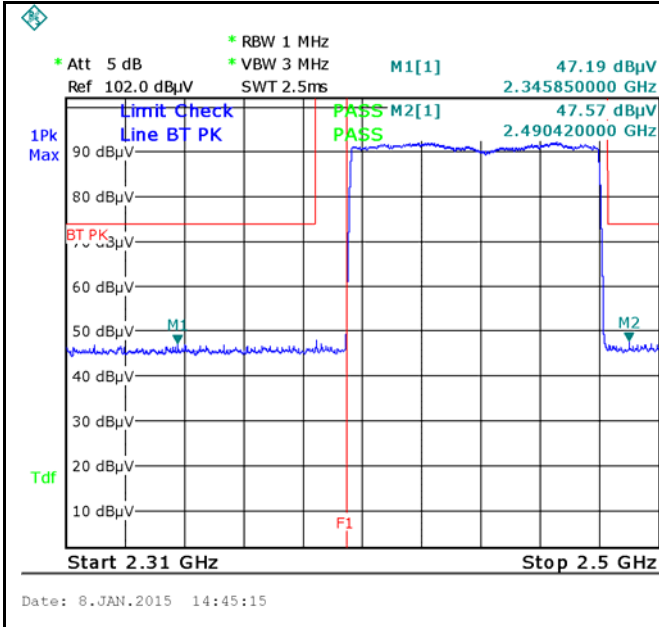
| | |
|-------------|-----------------|
| Test Report | 14070617-FCC-R2 |
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| | |
|--------|---|
| | <p>convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below:</p> <p>a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.</p> <p>b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz.</p> <p>c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz.</p> <ul style="list-style-type: none"> - 4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency. - 5. Repeat above procedures until all measured frequencies were complete. |
| Remark | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |

Test Data Yes N/A
Test Plot Yes (See below) N/A

Test Plots

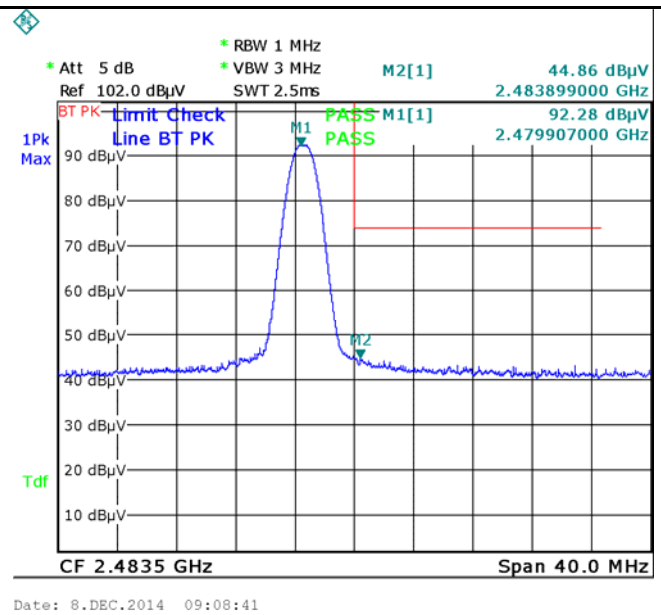
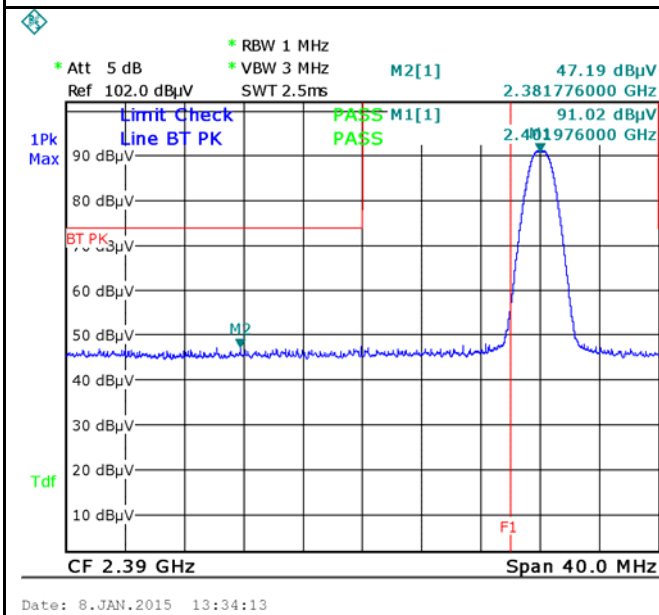
GFSK Mode:



Note: (no need if PK value less than the AV limit)

GFSK-Hopping-PK

GFSK-Hopping-Ave



GFSK-Left Side-PK

GFSK-Right Side-PK

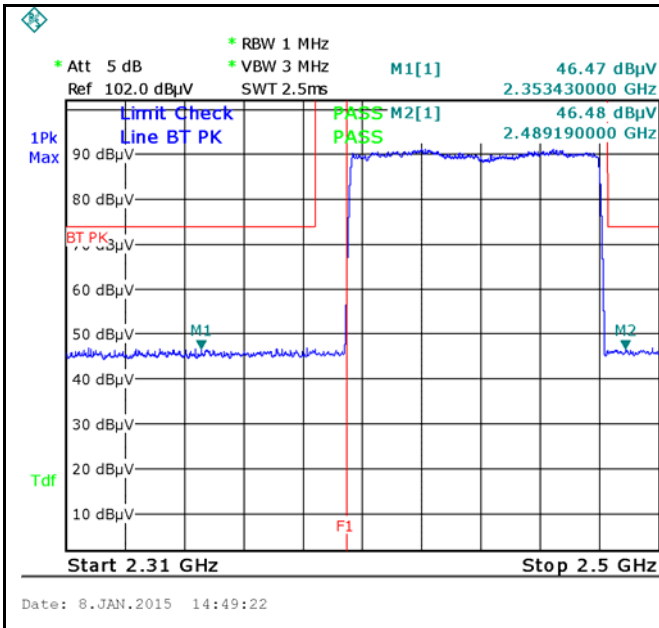
Note: (no need if PK value less than the AV limit)

Note: (no need if PK value less than the AV limit)

GFSK-Left Side-AV

GFSK-Right Side-AV

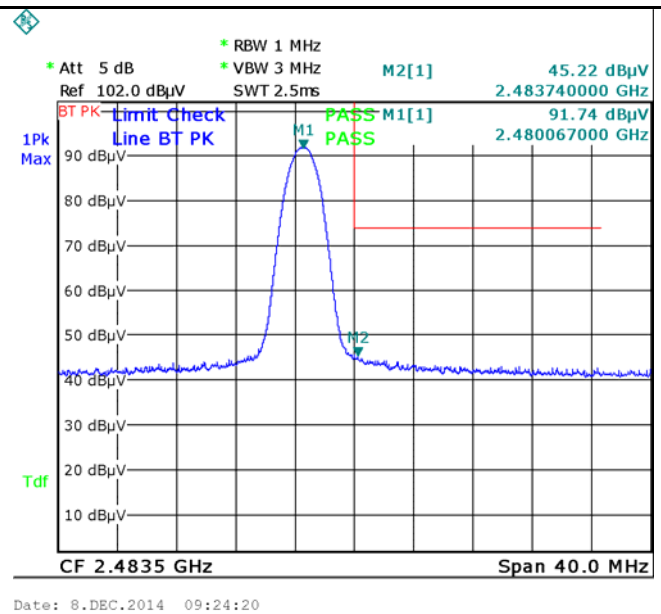
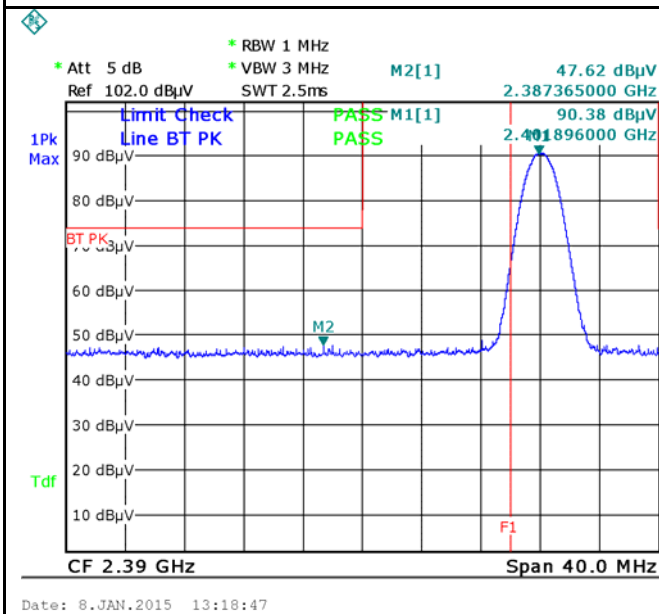
$\pi/4$ DQPSK Mode:



Note: (no need if PK value less than the AV limit)

$\pi/4$ DQPSK-Hopping-PK

$\pi/4$ DQPSK-Hopping-Ave



$\pi/4$ DQPSK-Left Side-PK

$\pi/4$ DQPSK-Right Side-PK

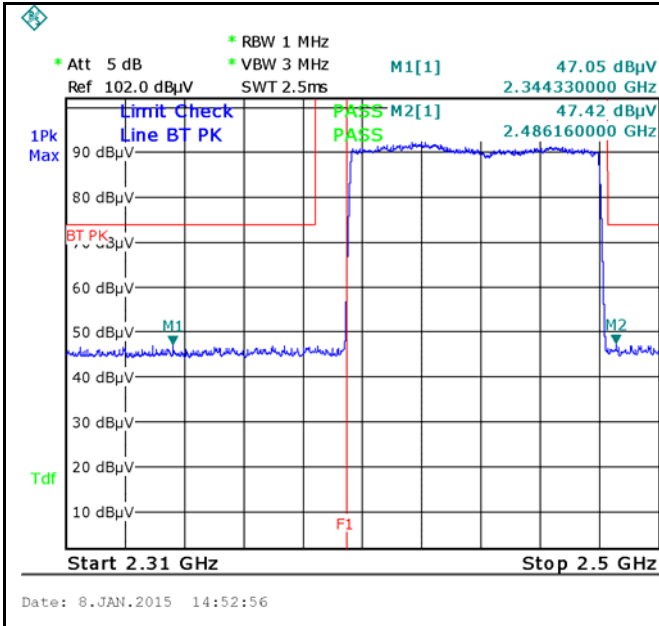
Note: (no need if PK value less than the AV limit)

Note: (no need if PK value less than the AV limit)

$\pi/4$ DQPSK-Left Side-AV

$\pi/4$ DQPSK-Right Side-AV

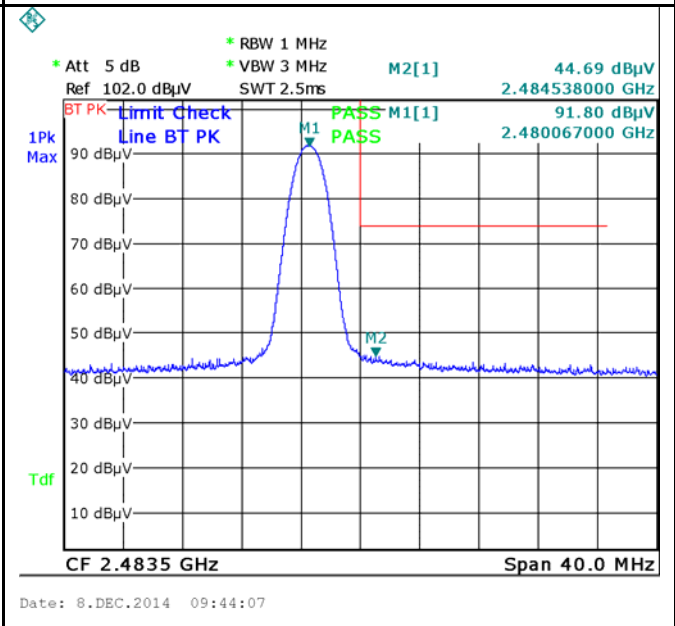
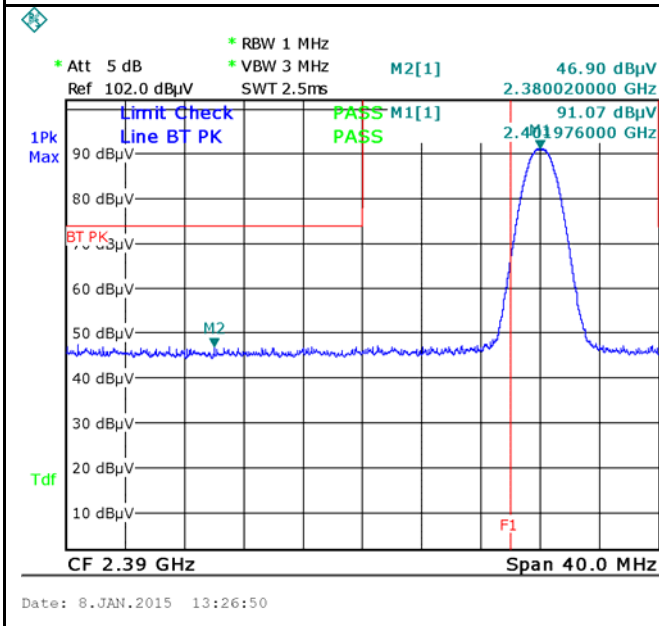
8-DPSK Mode:



Note: (no need if PK value less than the AV limit)

8DPSK-Hopping-PK

8DPSK-Hopping-Ave



8DPSK-Left Side-PK

8DPSK-Right Side-PK

Note: (no need if PK value less than the AV limit)

Note: (no need if PK value less than the AV limit)

8DPSK-Left Side-AV

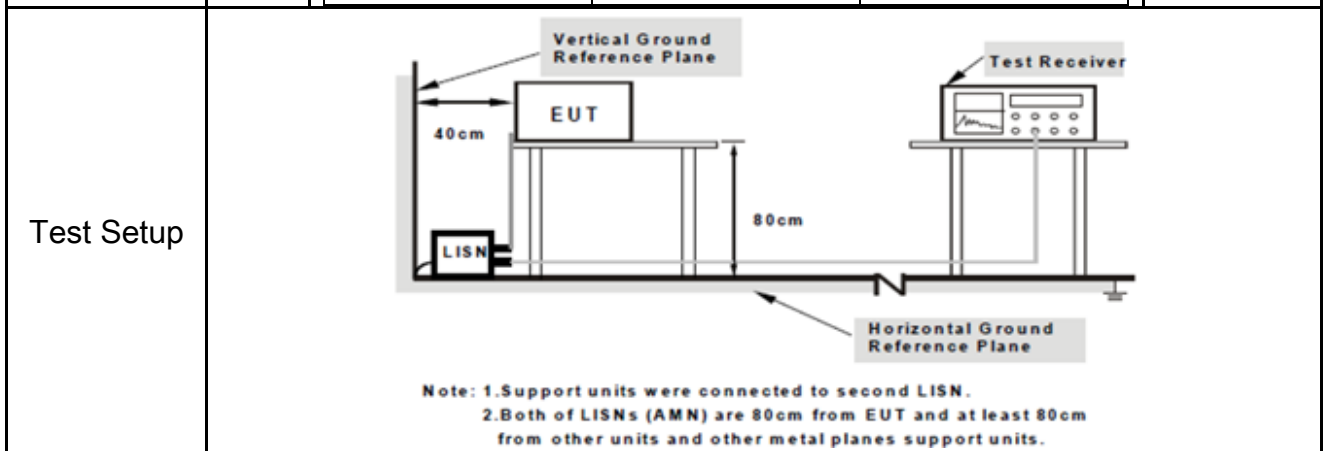
8DPSK-Right Side-AV

6.8 AC Power Line Conducted Emissions

| | |
|----------------------|-------------------|
| Temperature | 21°C |
| Relative Humidity | 51% |
| Atmospheric Pressure | 1002mbar |
| Test date : | December 02, 2014 |
| Tested By : | Herith Shi |

Requirement(s):

| Spec | Item | Requirement | Applicable | | | | | | | | | | | | | | |
|-----------------------------|---------|---|-------------------------------------|------------------------|--------------------|--|----|---------|------------|---------|---------|---------|----|----|--------|----|----|
| 47CFR§15.207, RSS210 (A8.1) | a) | For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges. | <input checked="" type="checkbox"/> | | | | | | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th rowspan="2">Frequency ranges (MHz)</th> <th colspan="2">Limit (dBμV)</th> </tr> <tr> <th>QP</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15 ~ 0.5</td> <td>66 – 56</td> <td>56 – 46</td> </tr> <tr> <td>0.5 ~ 5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5 ~ 30</td> <td>60</td> <td>50</td> </tr> </tbody> </table> | | Frequency ranges (MHz) | Limit (dB μ V) | | QP | Average | 0.15 ~ 0.5 | 66 – 56 | 56 – 46 | 0.5 ~ 5 | 56 | 46 | 5 ~ 30 | 60 | 50 |
| | | Frequency ranges (MHz) | | | Limit (dB μ V) | | | | | | | | | | | | |
| | | | | QP | Average | | | | | | | | | | | | |
| 0.15 ~ 0.5 | 66 – 56 | 56 – 46 | | | | | | | | | | | | | | | |
| 0.5 ~ 5 | 56 | 46 | | | | | | | | | | | | | | | |
| 5 ~ 30 | 60 | 50 | | | | | | | | | | | | | | | |



| | |
|-----------|---|
| Procedure | <ol style="list-style-type: none"> The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table. The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss |
|-----------|---|

| | |
|-------------|-----------------|
| Test Report | 14070617-FCC-R2 |
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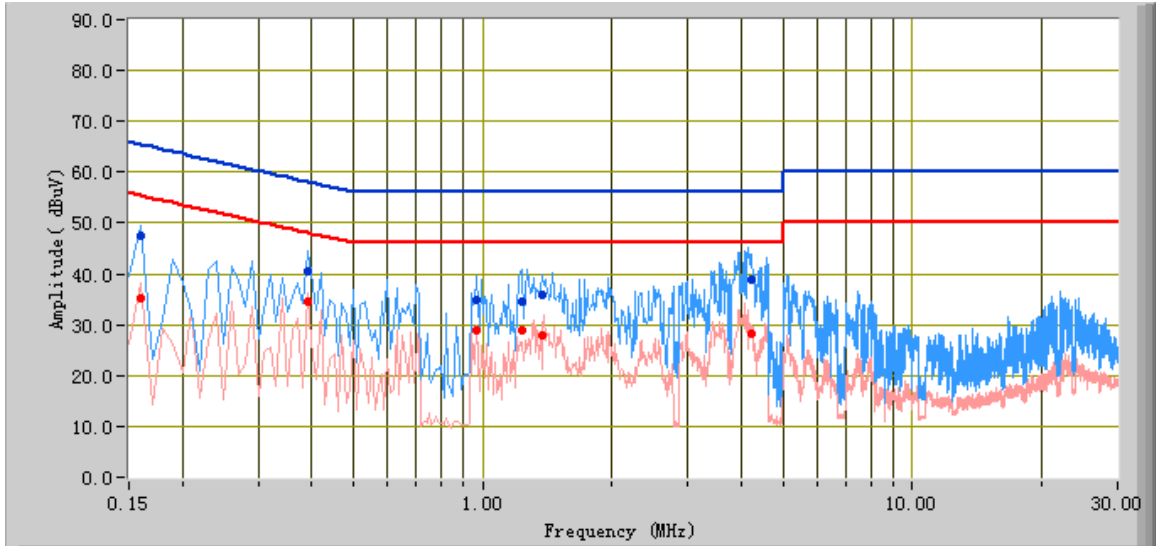
| | |
|--------|--|
| | <p>coaxial cable.</p> <ol style="list-style-type: none"> 4. All other supporting equipment were powered separately from another main supply. 5. The EUT was switched on and allowed to warm up to its normal operating condition. 6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver. 7. High peaks, relative to the limit line, The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz. 8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power). |
| Remark | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |

Test Data Yes N/A

Test Plot Yes (See below) N/A

Test Mode: Transmitting Mode

Peak Detector  **Quasi Peak Limit** 
Average Detector  **Average Limit** 



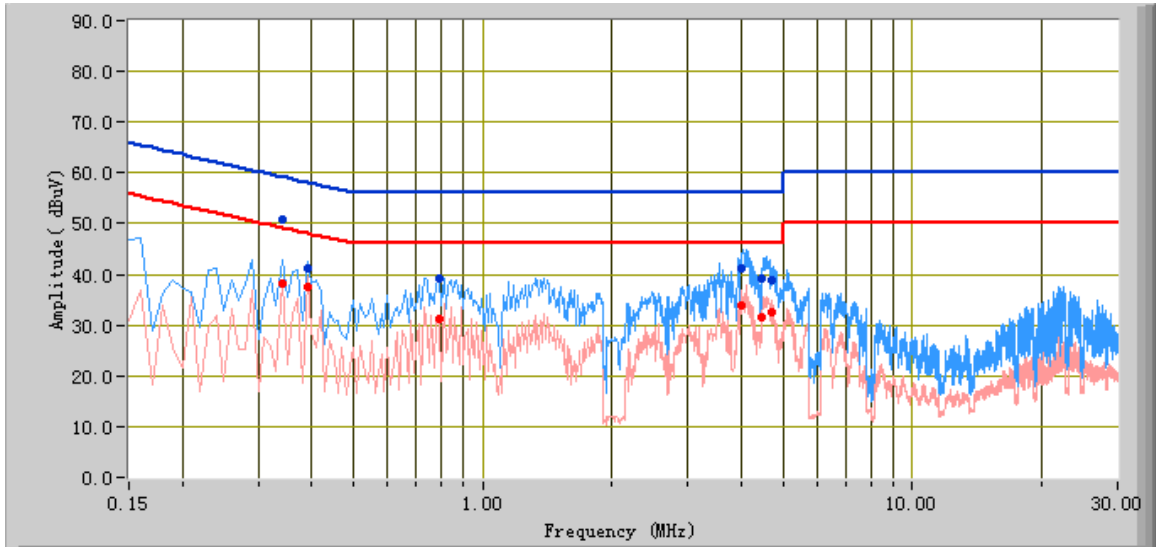
Test Data

Phase Line Plot at 120Vac, 60Hz

| Frequency (MHz) | Quasi Peak (dBµV) | Limit (dBµV) | Margin (dB) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Factors (dB) |
|-----------------|-------------------|--------------|-------------|----------------|--------------|-------------|--------------|
| 4.22 | 38.89 | 56.00 | -17.11 | 28.20 | 46.00 | -17.80 | 10.85 |
| 0.39 | 40.48 | 58.06 | -17.58 | 34.46 | 48.06 | -13.60 | 11.03 |
| 1.23 | 34.66 | 56.00 | -21.34 | 28.99 | 46.00 | -17.01 | 10.30 |
| 1.38 | 35.82 | 56.00 | -20.18 | 28.00 | 46.00 | -18.00 | 10.33 |
| 0.16 | 47.57 | 65.47 | -17.89 | 35.20 | 55.47 | -20.27 | 12.43 |
| 0.97 | 34.90 | 56.00 | -21.10 | 28.95 | 46.00 | -17.05 | 10.31 |

Test Mode: Transmitting Mode

Peak Detector  Quasi Peak Limit 
 Average Detector  Average Limit 



Test Data

Phase Neutral Plot at 120Vac, 60Hz

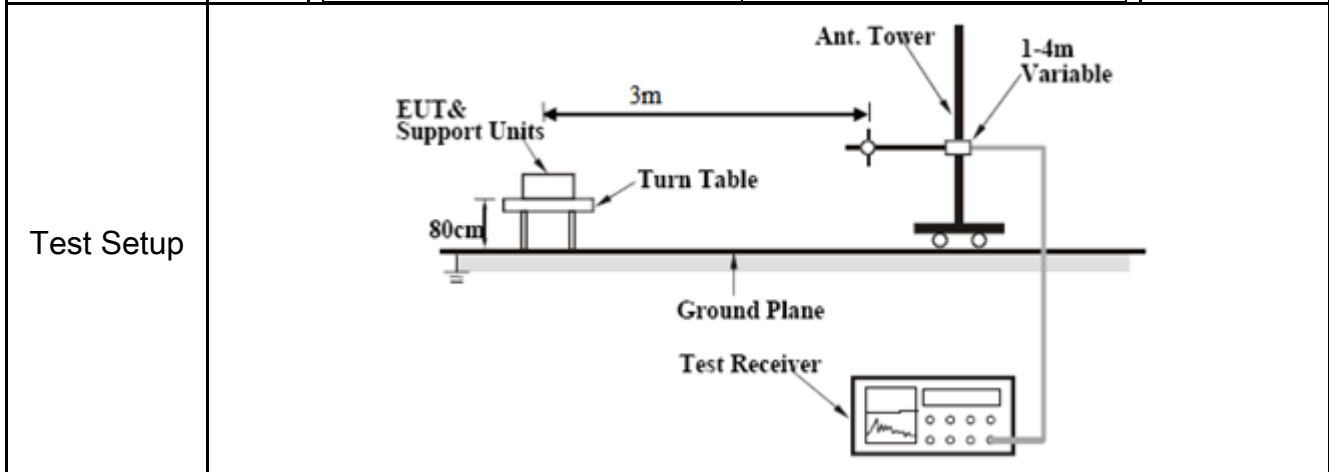
| Frequency (MHz) | Quasi Peak (dBµV) | Limit (dBµV) | Margin (dB) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Factors (dB) |
|-----------------|-------------------|--------------|-------------|----------------|--------------|-------------|--------------|
| 3.98 | 41.31 | 56.00 | -14.69 | 33.86 | 46.00 | -12.14 | 10.81 |
| 4.46 | 39.32 | 56.00 | -16.68 | 31.48 | 46.00 | -14.52 | 10.90 |
| 0.39 | 41.24 | 58.06 | -16.82 | 37.60 | 48.06 | -10.46 | 11.03 |
| 4.70 | 38.70 | 56.00 | -17.30 | 32.48 | 46.00 | -13.52 | 10.94 |
| 0.34 | 50.81 | 59.20 | -8.39 | 38.26 | 49.20 | -10.94 | 11.29 |
| 0.79 | 39.33 | 56.00 | -16.67 | 31.15 | 46.00 | -14.85 | 10.40 |

6.9 Radiated Spurious Emissions

| | |
|----------------------|-------------------|
| Temperature | 21°C |
| Relative Humidity | 51% |
| Atmospheric Pressure | 1002mbar |
| Test date : | December 02, 2014 |
| Tested By : | Herith Shi |

Requirement(s):

| Spec | Item | Requirement | Applicable | | | | | | | | | | |
|---|-----------------------|--|-----------------------|-----------------------|---------|-----|----------|-----|---------|-----|-----------|-----|-------------------------------------|
| 47CFR§15.205, §15.209, §15.247(d) | a) | <p>Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges</p> <table border="1"> <thead> <tr> <th>Frequency range (MHz)</th> <th>Field Strength (µV/m)</th> </tr> </thead> <tbody> <tr> <td>30 – 88</td> <td>100</td> </tr> <tr> <td>88 – 216</td> <td>150</td> </tr> <tr> <td>216 960</td> <td>200</td> </tr> <tr> <td>Above 960</td> <td>500</td> </tr> </tbody> </table> | Frequency range (MHz) | Field Strength (µV/m) | 30 – 88 | 100 | 88 – 216 | 150 | 216 960 | 200 | Above 960 | 500 | <input checked="" type="checkbox"/> |
| Frequency range (MHz) | Field Strength (µV/m) | | | | | | | | | | | | |
| 30 – 88 | 100 | | | | | | | | | | | | |
| 88 – 216 | 150 | | | | | | | | | | | | |
| 216 960 | 200 | | | | | | | | | | | | |
| Above 960 | 500 | | | | | | | | | | | | |



| Procedure | 1. | 2. |
|-----------|---|--|
| | The EUT was switched on and allowed to warm up to its normal operating condition. | The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: |



| | |
|--------|---|
| | <p>a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.</p> <p>b. The EUT was then rotated to the direction that gave the maximum emission.</p> <p>c. Finally, the antenna height was adjusted to the height that gave the maximum emission.</p> <p>3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.</p> <p>4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz.</p> <p>5. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</p> |
| Remark | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |

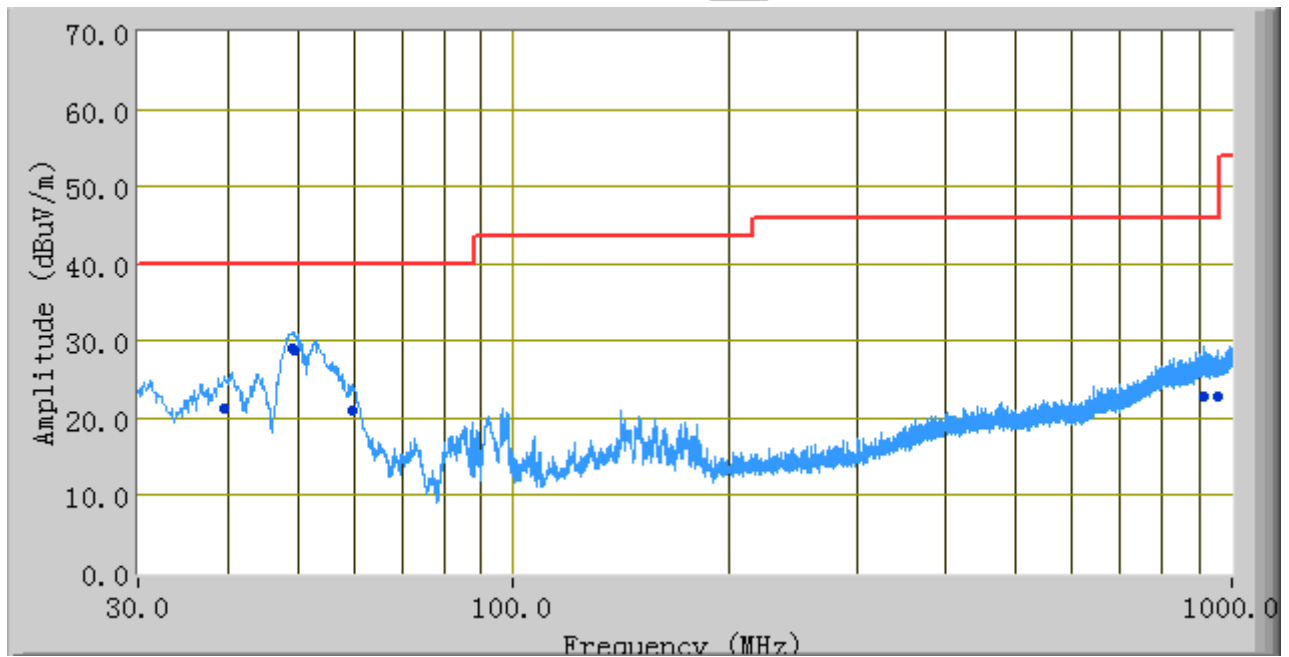
Test Data Yes N/A

Test Plot Yes (See below) N/A

| | |
|-------------------|--------------------------|
| Test Mode: | Transmitting Mode |
|-------------------|--------------------------|

(Below 1GHz)

Peak Detector 
Quasi Peak Limit 



Test Data

Vertical & Horizontal Polarity Plot @3m

| Frequency (MHz) | Quasi Peak (dB μ V/m) | Azimuth | Polarity (H/V) | Height (cm) | Factors (dB) | Limit (dB μ V/m) | Margin (dB) |
|-----------------|---------------------------|---------|----------------|-------------|--------------|----------------------|-------------|
| 49.06 | 29.12 | 0.00 | V | 102.00 | -13.48 | 40.00 | -10.88 |
| 49.39 | 28.88 | 336.00 | V | 100.00 | -13.66 | 40.00 | -11.12 |
| 39.63 | 21.19 | 232.00 | V | 138.00 | -7.22 | 40.00 | -18.81 |
| 59.41 | 21.02 | 19.00 | V | 165.00 | -13.98 | 40.00 | -18.98 |
| 916.65 | 22.70 | 352.00 | V | 137.00 | 5.03 | 46.00 | -23.30 |
| 953.27 | 22.87 | 218.00 | V | 160.00 | 5.61 | 46.00 | -23.13 |

| | |
|-------------------|--------------------------|
| Test Mode: | Transmitting Mode |
|-------------------|--------------------------|

Note: Other modes were verified, only the result of worst case basic rate mode was presented.

Mode: GFSK

Low Channel (2402 MHz)

| Frequency (MHz) | S.A. Reading (dBμV) | Detector (PK/AV) | Polarity (H/V) | Ant. Factor (dB/m) | Cable Loss (dB) | Pre-Amp. Gain (dB) | Cord. Amp. (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|---------------------|------------------|----------------|--------------------|-----------------|--------------------|---------------------|----------------|-------------|
| 4804 | 34.55 | AV | V | 33.83 | 4.87 | 24 | 49.25 | 54 | -4.75 |
| 4804 | 35.78 | AV | H | 33.83 | 4.87 | 24 | 50.48 | 54 | -3.52 |
| 4804 | 43.13 | PK | V | 33.83 | 4.87 | 24 | 57.83 | 74 | -16.17 |
| 4804 | 44.86 | PK | H | 33.83 | 4.87 | 24 | 59.56 | 74 | -14.44 |

Middle Channel (2441 MHz)

| Frequency (MHz) | S.A. Reading (dBμV) | Detector (PK/AV) | Polarity (H/V) | Ant. Factor (dB/m) | Cable Loss (dB) | Pre-Amp. Gain (dB) | Cord. Amp. (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|---------------------|------------------|----------------|--------------------|-----------------|--------------------|---------------------|----------------|-------------|
| 4882 | 34.74 | AV | V | 33.86 | 4.87 | 24 | 49.47 | 54 | -4.53 |
| 4882 | 35.48 | AV | H | 33.86 | 4.87 | 24 | 50.21 | 54 | -3.79 |
| 4882 | 43.65 | PK | V | 33.86 | 4.87 | 24 | 58.38 | 74 | -15.62 |
| 4882 | 44.46 | PK | H | 33.86 | 4.87 | 24 | 59.19 | 74 | -14.81 |

High Channel (2480 MHz)

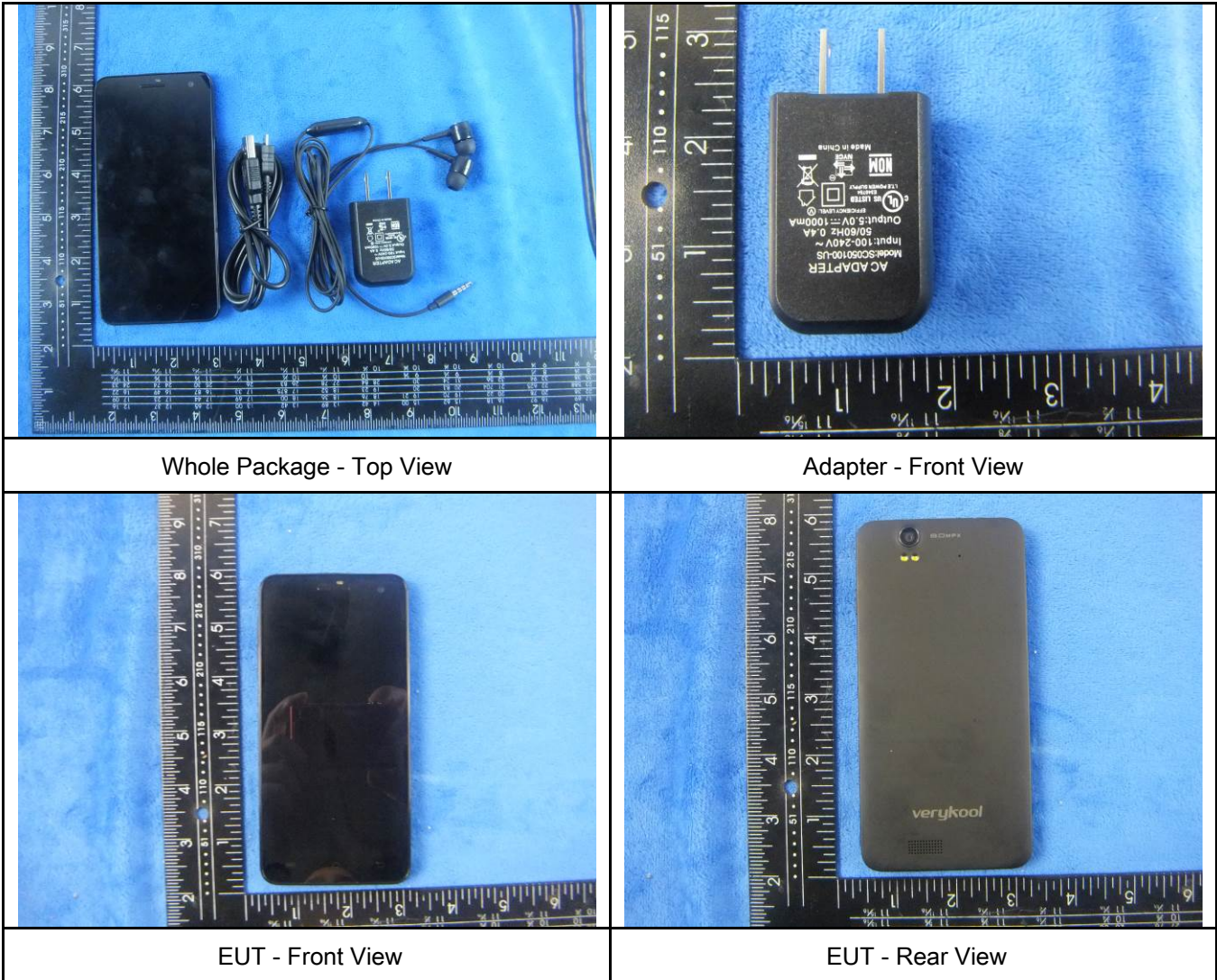
| Frequency (MHz) | S.A. Reading (dBμV) | Detector (PK/AV) | Polarity (H/V) | Ant. Factor (dB/m) | Cable Loss (dB) | Pre-Amp. Gain (dB) | Cord. Amp. (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|---------------------|------------------|----------------|--------------------|-----------------|--------------------|---------------------|----------------|-------------|
| 4960 | 35.01 | AV | V | 33.9 | 4.87 | 24 | 49.78 | 54 | -4.22 |
| 4960 | 35.67 | AV | H | 33.9 | 4.87 | 24 | 50.44 | 54 | -3.56 |
| 4960 | 43.43 | PK | V | 33.9 | 4.87 | 24 | 58.20 | 74 | -15.80 |
| 4960 | 44.12 | PK | H | 33.9 | 4.87 | 24 | 58.89 | 74 | -15.11 |

Annex A. TEST INSTRUMENT

| Instrument | Model | Serial # | Cal Date | Cal Due | In use |
|---|----------|-------------|------------|------------|-------------------------------------|
| AC Line Conducted | | | | | |
| EMI test receiver | ESCS30 | 8471241027 | 09/18/2014 | 09/17/2015 | <input checked="" type="checkbox"/> |
| Line Impedance | LI-125A | 191106 | 09/26/2014 | 09/25/2015 | <input checked="" type="checkbox"/> |
| Line Impedance | LI-125A | 191107 | 09/26/2014 | 09/25/2015 | <input checked="" type="checkbox"/> |
| LISN | ISN T800 | 34373 | 09/26/2014 | 09/25/2015 | <input checked="" type="checkbox"/> |
| Double Ridge Horn Antenna (1 ~18GHz) | AH-118 | 71283 | 09/25/2014 | 09/24/2015 | <input checked="" type="checkbox"/> |
| Transient Limiter | LIT-153 | 531118 | 09/02/2014 | 09/01/2015 | <input checked="" type="checkbox"/> |
| RF conducted test | | | | | |
| Agilent ESA-E SERIES | E4407B | MY45108319 | 09/18/2014 | 09/17/2015 | <input checked="" type="checkbox"/> |
| Power Splitter | 1# | 1# | 09/02/2014 | 09/01/2015 | <input checked="" type="checkbox"/> |
| DC Power Supply | E3640A | MY40004013 | 09/18/2014 | 09/17/2015 | <input checked="" type="checkbox"/> |
| Radiated Emissions | | | | | |
| EMI test receiver | ESL6 | 100262 | 09/18/2014 | 09/17/2015 | <input checked="" type="checkbox"/> |
| Positioning Controller | UC3000 | MF780208282 | 11/20/2014 | 11/19/2015 | <input checked="" type="checkbox"/> |
| OPT 010 AMPLIFIER (0.1-1300MHz) | 8447E | 2727A02430 | 09/02/2014 | 09/01/2015 | <input checked="" type="checkbox"/> |
| Microwave Preamplifier (0.5 ~ 18GHz) | PAM-118 | 443008 | 09/02/2014 | 09/01/2015 | <input checked="" type="checkbox"/> |
| Bilog Antenna (30MHz~6GHz) | JB6 | A110712 | 09/22/2014 | 09/21/2015 | <input checked="" type="checkbox"/> |
| Double Ridge Horn Antenna (1 ~18GHz) | AH-118 | 71283 | 09/25/2014 | 09/24/2015 | <input checked="" type="checkbox"/> |
| Universal Radio Communication Tester | CMU200 | 121393 | 09/26/2014 | 09/25/2015 | <input checked="" type="checkbox"/> |

Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph: EUT External Photo



Whole Package - Top View

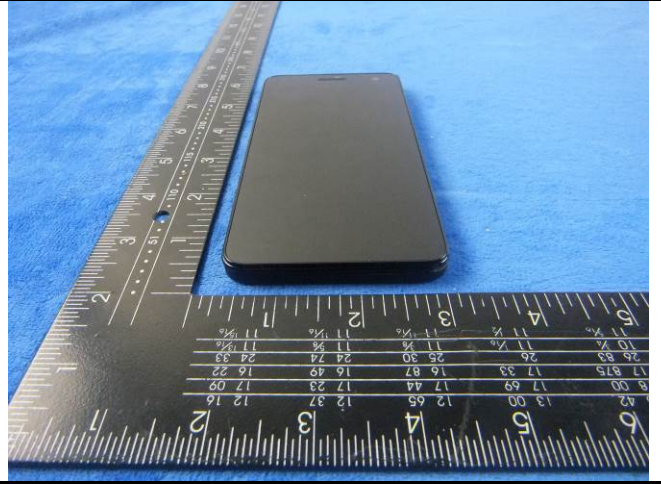
Adapter - Front View

EUT - Front View

EUT - Rear View



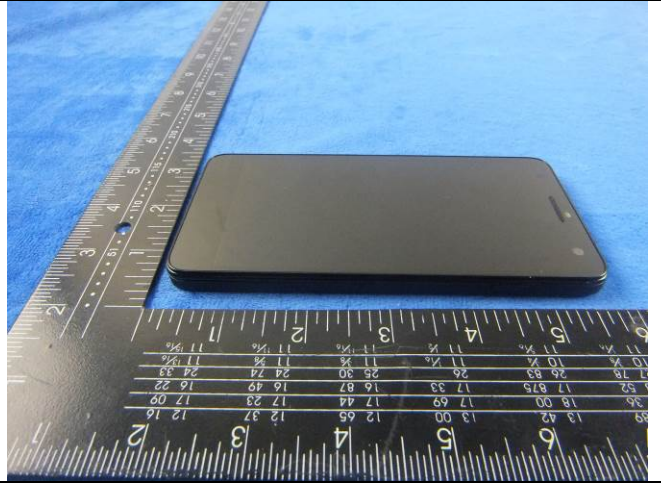
EUT - Top View



EUT - Bottom View



EUT - Left View



EUT - Right View

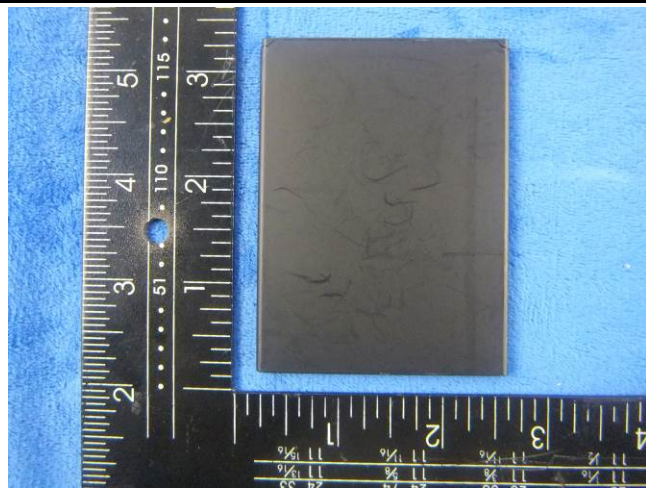
Annex B.ii. Photograph: EUT Internal Photo



Cover Off - Top View 1



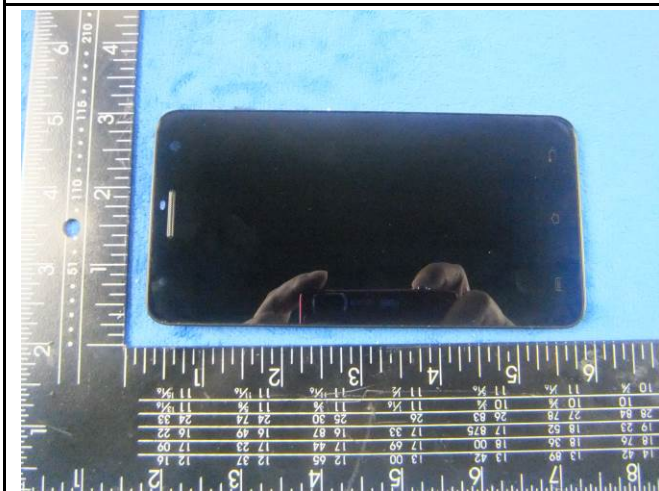
Cover Off - Top View 2



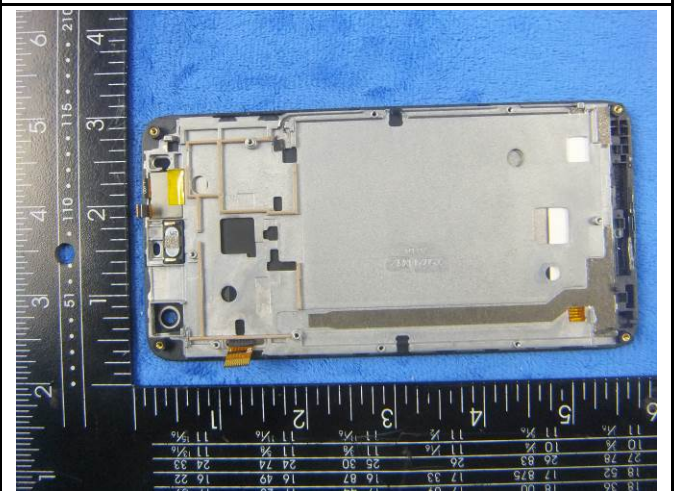
Battery - Top View



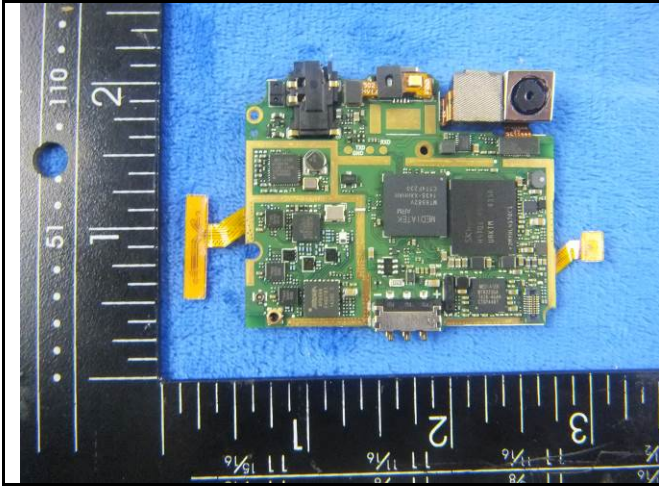
Battery - Bottom View



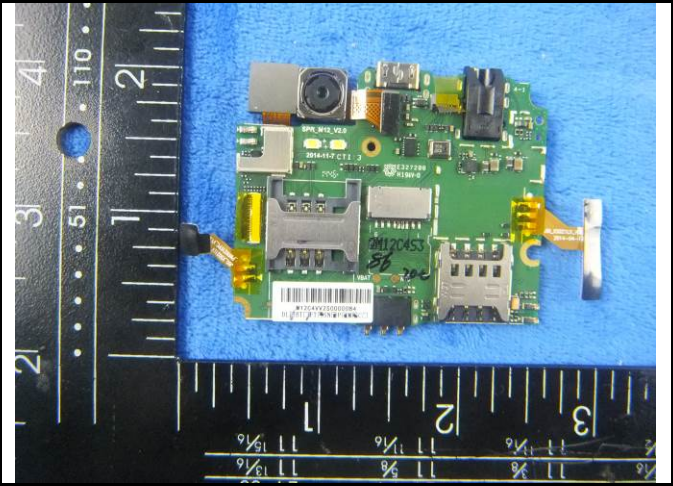
LCD - Front View



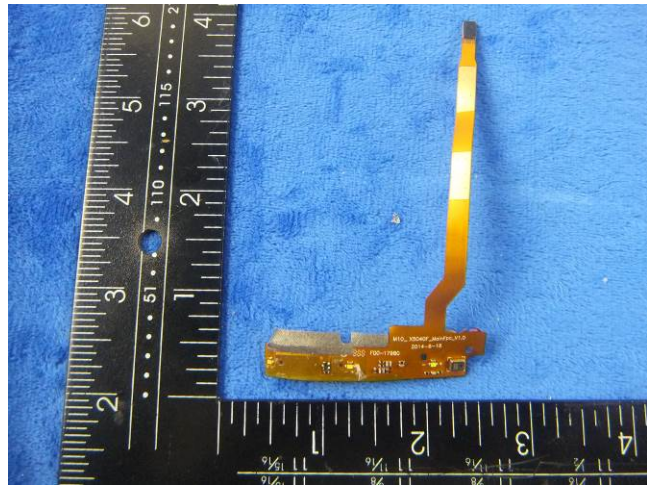
LCD - Rear View



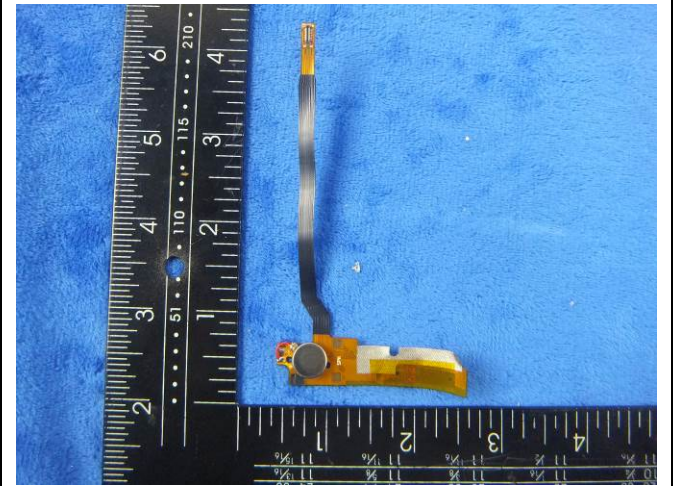
Mainboard With Shielding - Front View



Mainboard Without Shielding - Front View



Mainboard With Shielding - Rear View



Mainboard Without Shielding - Rear View



BT/BLE/WIFI Antenna View



GSM/PCS/UMTS-FDD Antenna View

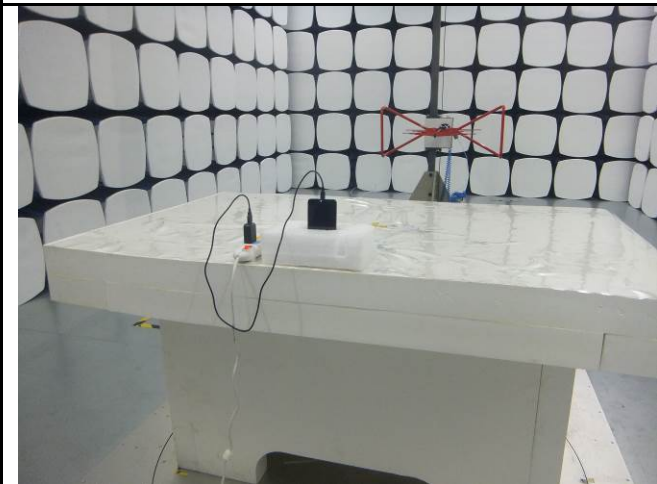
Annex B.iii. Photograph: Test Setup Photo



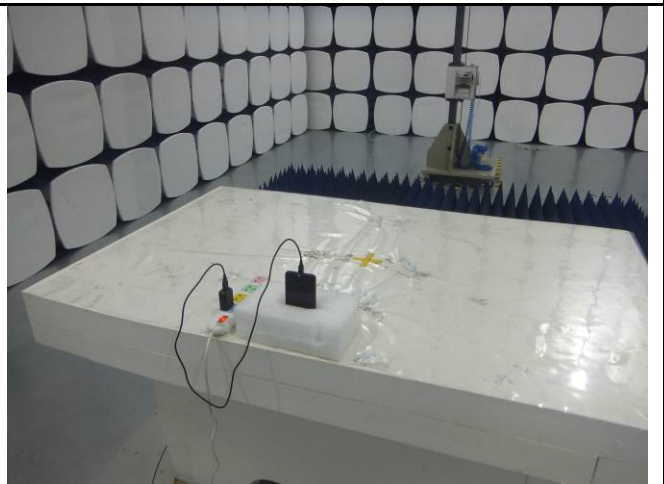
Conducted Emissions Test Setup Front View



Conducted Emissions Test Setup Side View



Radiated Spurious Emissions Test Setup Below 1GHz

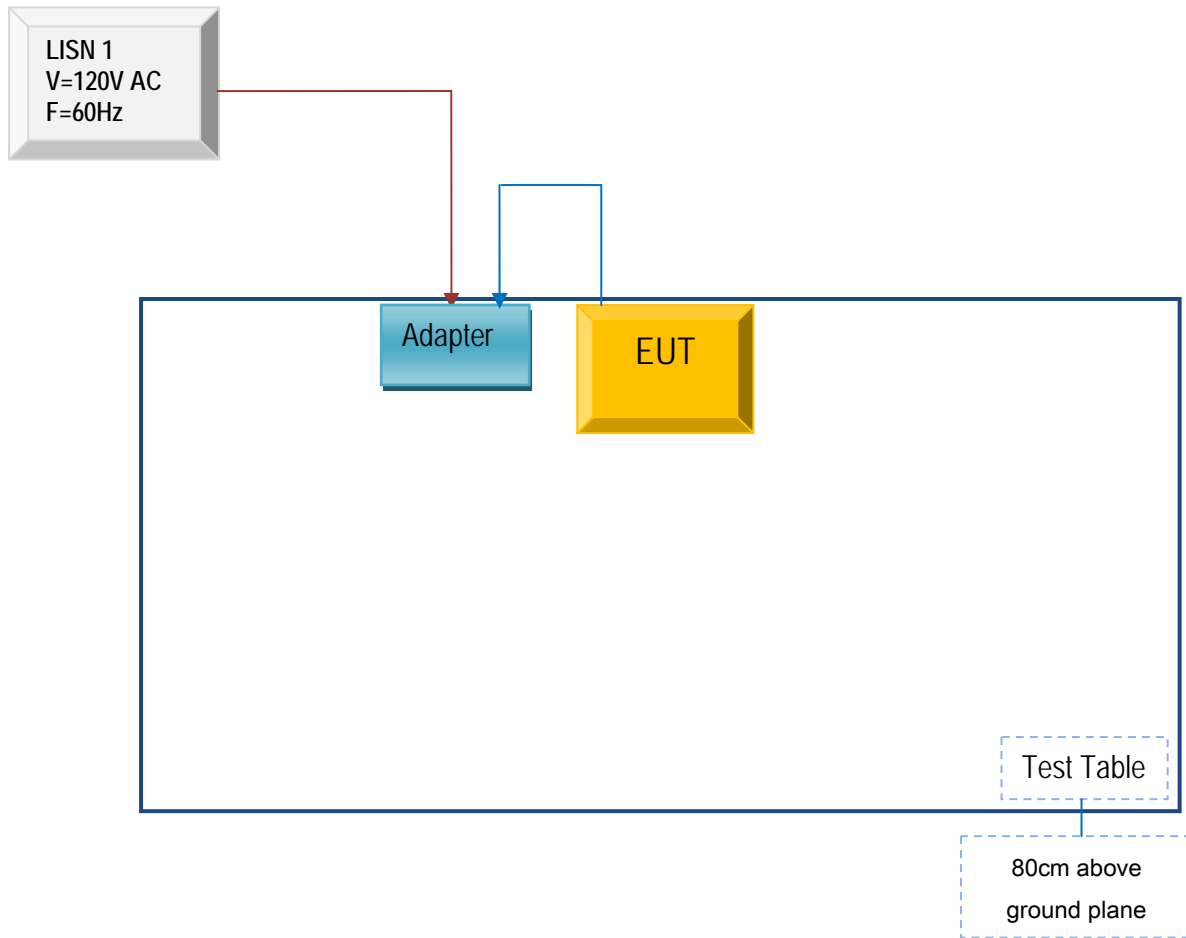


Radiated Spurious Emissions Test Setup Above 1GHz

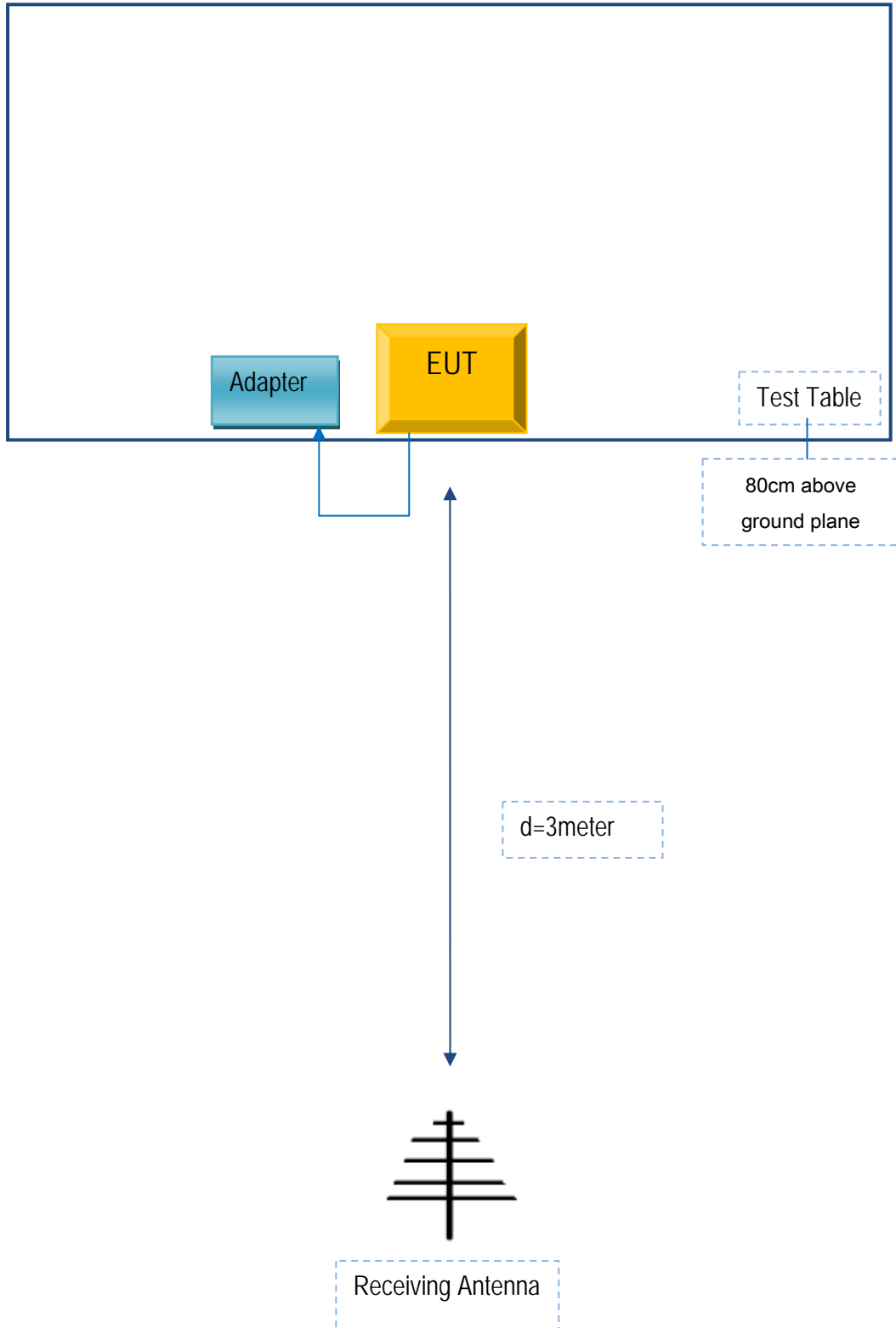
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

Block Configuration Diagram for AC Line Conducted Emissions



Block Configuration Diagram for Radiated Emissions



Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

| Manufacturer | Equipment Description | Model | Calibration Date | Calibration Due Date |
|--------------|-----------------------|-------|------------------|----------------------|
| N/A | N/A | N/A | N/A | N/A |

| | |
|-------------|-----------------|
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Annex D. User Manual / Block Diagram / Schematics / Partlist

Please see attachment

| | |
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Annex E. DECLARATION OF SIMILARITY

N/A