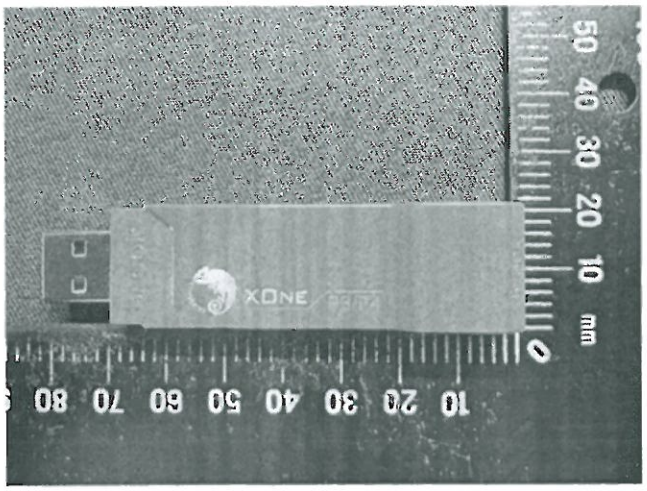
| | | | | |
|---|---|---|---|---|
| **Prüfbericht-Nr.:** *Test Report No.:* | **10052125 001** | **Auftrags-Nr.:** *Order No.:* | 114031357 | Seite 1 von 50 *Page 1 of 50* |
| **Kunden-Referenz-Nr.:** *Client Reference No.:* | N/A | **Auftragsdatum:** *Order date:* | 15-Jan-2015 | |
| **Auftraggeber:** *Client:* | Zeroplus, 3F., No.121, Jian Ba Rd., Chung Ho District, New Taipei City, TW-235, Taiwan, R.O.C. | | | |
| **Prüfgegenstand:** *Test item:* | Game Controller Super Converters | | | |
| **Bezeichnung / Typ-Nr.:** *Identification / Type No.:* | Super PS3 Controller Converter for XBOX One(ZPPK002), Super PS3/PS4 Controller Converter for XBOX One(ZPP004P), Super XBOX360/XBOX One Controller Converter for XBOX One(ZPPK001) | | | |
| **Auftrags-Inhalt:** *Order content:* | FCC Part 15C Test report | | | |
| **Prüfgrundlage:** *Test specification:* | FCC 47CFR Part 15: Subpart C Section 15.247 | | | |

| | |
|---|---|
| **Wareneingangsdatum:** *Date of receipt:* | 15-Jun-2015 |
| **Prüfmuster-Nr.:** *Test sample No.:* | A000201352-007<br>A000201352-006 |
| **Prüfzeitraum:** *Testing period:* | 3-Jul-2015 - 22-Jul-2015 |
| **Ort der Prüfung:** *Place of testing:* | EMC Laboratory Taipei |
| **Prüflaboratorium:** *Testing laboratory:* | TUV Rheinland Taiwan Ltd. |
| **Prüfergebnis*:** *Test result*:* | Pass |




| **geprüft von** / *tested by:* | | | **kontrolliert von** / *reviewed by:* | | |
|---|---|---|---|---|---|
| 2015-08-03 | Ryan W. T. Chen / Project Engineer | | 2015-08-03 | Rene Charton/Senior Project Manager | |
| **Datum** *Date* | **Name / Stellung** *Name / Position* | **Unterschrift** *Signature* | **Datum** *Date* | **Name / Stellung** *Name / Position* | **Unterschrift** *Signature* |

**Sonstiges** / *Other:*

| | |
|---|---|
| **Zustand des Prüfgegenstandes bei Anlieferung:** *Condition of the test item at delivery:* | Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged* |

| | | | | | |
|---|---|---|---|---|---|
| * Legende: | 1 = sehr gut | 2 = gut | 3 = befriedigend | 4 = ausreichend | 5 = mangelhaft |
| | P(ass) = entspricht o.g. Prüfgrundlage(n) | | F(ail) = entspricht nicht o.g. Prüfgrundlage(n) | N/A = nicht anwendbar | N/T = nicht getestet |
| *Legend:* | *1 = very good* | *2 = good* | *3 = satisfactory* | *4 = sufficient* | *5 = poor* |
| | *P(ass) = passed a.m. test specification(s)* | | *F(ail) = failed a.m. test specification(s)* | *N/A = not applicable* | *N/T = not tested* |

# TEST SUMMARY

**5.1.1 ANTENNA REQUIREMENT**
*RESULT: Passed*

**5.1.2 PEAK OUTPUT POWER**
*RESULT: Passed*

**5.1.3 20DB BANDWIDTH**
*RESULT: Passed*

**5.1.4 99% BANDWIDTH**
*RESULT: Passed*

**5.1.5 CONDUCTED SPURIOUS EMISSIONS AND FREQUENCY BAND EDGE MEASURED IN 100KHZ BANDWIDTH**
*RESULT: Passed*

**5.1.6 SPURIOUS EMISSION**
*RESULT: Passed*

**5.1.7 FREQUENCY SEPARATION**
*RESULT: Passed*

**5.1.8 NUMBER OF HOPPING FREQUENCY**
*RESULT: Passed*

**5.1.9 TIME OF OCCUPANCY**
*RESULT: Passed*

**5.2.1 MAINS CONDUCTED EMISSIONS**
*RESULT: Passed*

**6.1.1 ELECTROMAGNETIC FIELDS**
*RESULT: Passed*

# Contents

# 1. General Remarks

## 1.1 Complementary Materials

The following attachments are integral parts of this test report:

**Appendix P: Photo Documentation**
**(File Name: 10052125APPENDIX P)**
**Appendix D: Test Result of Radiated Emissions**
**(File Name: 10052125APPENDIX D)**

Test Specifications

The following standards were applied

**Table 1: Applied Standard and Test Levels**

| **Radio** |
|---|
| FCC CFR47 Part 15: Subpart C Section 15.247<br>RSS-247 Issue 1 May 2015<br>RSS-Gen, Issue 4, November 2014<br>ANSI C63.10:2013<br>Public Notice DA 00-705<br>NCC Low-power Radio-frequency Devices Technical Regulations LP0002(2011)(100年6月28日) |

# 2. Test Sites

## 2.1 Test Laboratory

TUV Rheinland Taiwan Ltd.
Taichung Branch Office

No.9, Lane 36, Minsheng Rd., Sec. 3, Daya District,
Taichung City 428
Taiwan (R.O.C.)

## 2.2 Test Facility

TUV Rheinland Taiwan Ltd.
Taipei Office

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

FCC RegistrationNo.: 365730
IC Canada Registration No.: 9465A-1
TAF Accredited NCC Test Lab. No.:0759
TAF ISO17025 Certification effective periods: 2013-Jul-1st to 2016-Jun-30th

Testing Laboratory
0759

## 2.3 List of Test and Measurement Instruments

### Table 2: List of Test and Measurement Equipment

| Kind of Equipment | Manufacturer | Type | S/N | Last Calibration | Next Calibration |
|---|---|---|---|---|---|
| EMI Test Receiver | R&S | ESR7 | 101062 | 31-Aug-14 | 30-Aug-15 |
| Bilog Antenna | TESEQ | CBL6111D | 29802 | 4-Jul-14 | 3-Jul-16 |
| Spectrum Analyzer | R&S | FSV 40 | 100921 | 17-Dec-14 | 16-Dec-15 |
| Spectrum Analyzer | Agilent | N9010A | MY53470241 | 1-Apr-15 | 30-Mar-16 |
| Horn Antenna | ETS-Lindgren | 3117 | 138160 | 12-Jan-15 | 11-Jan-17 |
| Horn Antenna (18GHz~40GHz) | COM-POWER | AH840 | 101031 | 30-Oct-13 | 29-Oct-15 |
| Preamplifier (30MHz -1GHz) | HP | 8447F | 2805A03335 | 23-Aug-14 | 22-Aug-15 |
| Preamplifier (18 GHz -40 GHz) | COM-POWER | PAM-840 | 461257 | 26-Aug-14 | 25-Aug-15 |
| Pre-Amplifier (1GHz~18GHz) | EM Electronics | EM30180 | 60558 | 4-Nov-14 | 3-Nov-15 |
| Loop Antenna | Schwarzbeck | FMZB 1513 | 1513-076 | 22-Oct-14 | 21-Oct-15 |
| EMI Test Receiver | R&S | ESCI7 | 100797 | 28-Dec-14 | 27-Dec-15 |
| Spectrum Analyzer | R&S | FSL3 | 101943 | 14-Sep-14 | 13-Sep-15 |
| LISN (1 phase) | R&S | ENV216 | 101243 | 1-Jun-15 | 31-May-16 |
| LISN | Rolf Heine | NNB-2/16Z | 99080 | 26-Aug-14 | 25-Aug-15 |

## 2.4 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

## 2.5 Calibration

requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

## 2.6 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements:.

**Table 3: Emission Measurement Uncertainty**

| Parameter | Uncertainty |
|---|---|
| RF power, conducted | ± 1.5 dB |
| Adjacent channel power | ± 3 dB |
| Radiated emission of transmitter, valid up to 26 GHz | ± 6 dB |
| Radiated emission of receiver, valid up to 26 GHz | ± 6 dB |
| Temperature | ± 2 ºC |
| Humidity | ± 10 % |

# 3. General Product Information

## 3.1 Product Function and Intended Use

The EUT is a Bluetooth equivalent Dongle enabling the user to communicate data through a Wireless interface.

At this time, there are three different versions:
Super PS3 Controller Converter for XBOX One(ZPPK002),
Super PS3/PS4 Controller Converter for XBOX One(ZPP004P),
Super XBOX360/XBOX One Controller Converter for XBOX One(ZPPK001)
All 3 versions use the same RF circuitd and PCB. The difference is in the pin-compatible controller Chips in the Digital Device portion of the device.

For details refer to the User Guide, Data Sheet and Circuit Diagram.

## 3.2 System Details and Ratings

### Table 4: Basic Information of EUT

| Item | EUT information |
|---|---|
| Kind of Equipment | Game Controller Super Converters |
| Type Designation | Super PS3 Controller Converter for XBOX One(ZPPK002), Super PS3/PS4 Controller Converter for XBOX One(ZPP004P), Super XBOX360/XBOX One Controller Converter for XBOX One(ZPPK001) |
| Brand Name | Brook |
| FCC ID | 2ADKM004P |

### Table 5: Technical Specification of EUT

| Technical Specification | Value |
|---|---|
| Operating Frequency | 2402 MHz ~ 2480 MHz |
| Channel Spacing | 1 MHz |
| Channel number | 79 |
| Operation Voltage | 5V (USB) |
| Modulation | GFSK, $\pi$/4 QPSK, 8 DPSK |
| Antenna gain | -6.72 dBi |

**Table 6: Frequency hopping information**

| Technical Specification | Description |
|---|---|
| Hopping Range | Hereby we declare that the maximum frequency of this device is: 2402-2480MHz. This is according the Bluetooth Core Specification V2.1+EDR for devices which will be operated in the USA. This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/04). |
| Hopping Sequence | Example of a 79 hopping sequence in data mode:<br><br>33,04,21,44,23,42,53,46,55,48,40,59,72,29,76,31,08,73,<br>07,75,09,45,60,39,58,13,47,11,77,52,35,50,65,54,67,56,<br>69,62,71,64, 7,25,27,66,57,70,74,61,78,63,10,41,05,43,<br>15,44,64,68,02,70,06,01,51,03,55,05,03,66,53,49,36,47, |
| Receiver input bandwidth | The input bandwidth of the receiver is 1MHz. In every connection one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master.<br><br>Additionally the type of connection is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings.<br><br>Repeating of a packer has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case.<br><br>That means a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence. |

## 3.3 Independent Operation Modes

The basic operation modes are:

A. Transmitting
    1. Low channel
    2. Middle channel
    3. High channel
B. Receiving
C. Standby
D. Off

## 3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

## 3.5 Submitted Documents

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description

# 4. Test Set-up and Operation Modes

## 4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use.

## 4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 4. All testing were performed according to the procedures in ANSI C63.10: 2013 and DA 00-705 of March 30, 2000.

The samples were used as follows:
Conducted: **A000201352-006**
Radiation: **A000201352-007**

Full test was applied on all test modes, but only worst case was shown.

## 4.3 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

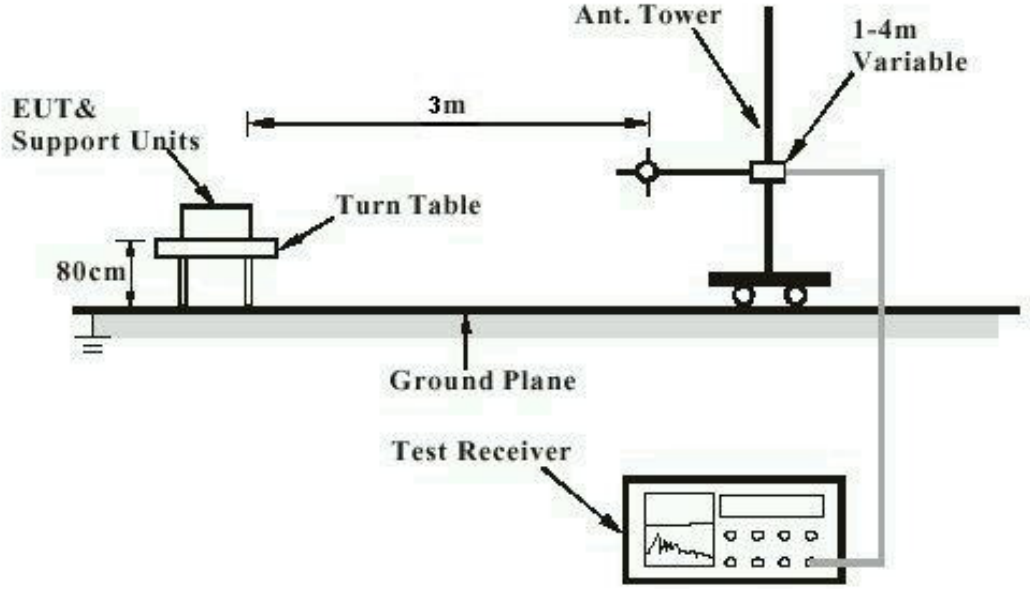
| Kind of Equipment | Manufacturer | Model Name | S/N |
|---|---|---|---|
| Laptop | HP | HSTNN-Q78C-3 | CNF0339QBM |

## 4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested containing the noise suppression parts as in the Photo Appendix and the Test Setup Photos. No additional measures were employed to achieve compliance.

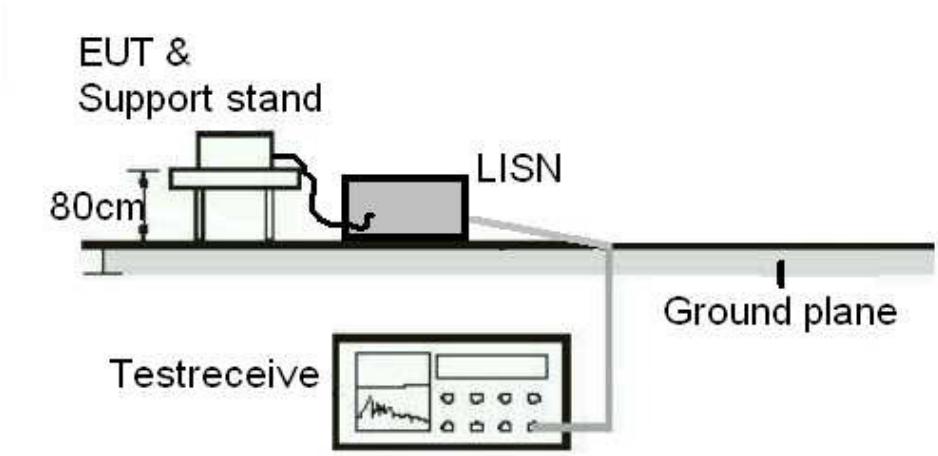
## 4.5 Test Setup Diagram

**Diagram of Measurement Configuration for Radiation Test**

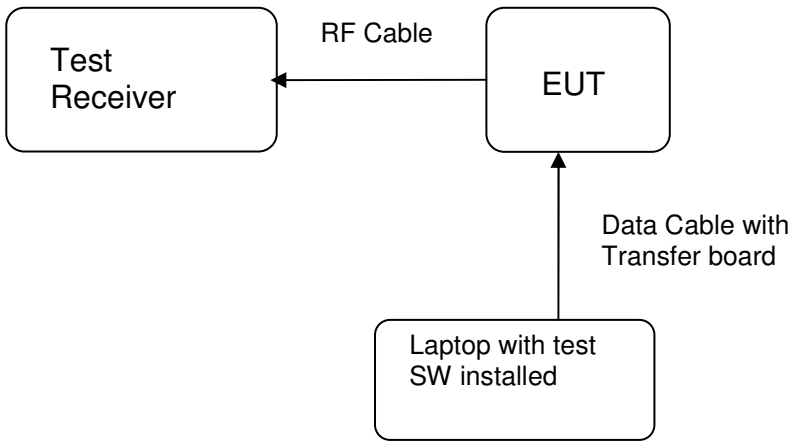



Note: Measurements above 1 GHz are done with a table height of 1.5m

## Diagram of Measurement Equipment Configuration for Mains Conduction Measurement




## Diagram of Measurement Equipment Configuration for Conducted Transmitter Measurement



# 5. Test Results

## 5.1 Transmitter Requirement & Test Suites

### 5.1.1 Antenna Requirement

**RESULT:** **Passed**

| | | |
|---|---|---|
| Test standard | : | LP0002(2011): 2.2, 3.10.1, (3)<br>FCC Part 15.247(b)(4), Part 15.203 and RSS-Gen 8.3 |
| Requirement | : | use of approved antennas only with directional gains that do not exceed 6 dBi |

According to the manufacturer declaration, the EUT has an  antenna with a directional gain of -6.72 dBi dBi.  The antenna is a printed PCB trace with  no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.

Refer to EUT photo for details.

## 5.1.2 Peak Output Power

**RESULT:** **Passed**

| | | |
|---|---|---|
| Test standard | : | FCC Part 15.247(b)(1),<br>RSS-247 5.4(2)<br>LP0002(2011): 3.10.1, (2) |
| Basic standard | : | DA 00-705 of March 30, 2000<br>LP0002(2011) Appendix II |
| Kind of test site | : | Shielded room |

**Test setup**

| | | |
|---|---|---|
| Test Channel | : | Low/ Middle/ High |
| Operation Mode | : | A |

| | | |
|---|---|---|
| Ambient temperature | : | 22-26 °C |
| Relative humidity | : | 50-65 % |
| Atmospheric pressure | : | 100-103 kPa |

**Table 7: Test result of Peak Output Power, GFSK modulation**

| Channel | Channel Frequency | Peak Output Power | | Limit |
|---|---|---|---|---|
| | (MHz) | (dBm) | (W) | (W) |
| Low Channel | 2402 | -22.41 | 0.00001 | 0.125 |
| Middle Channel | 2441 | -21.17 | 0.00001 | 0.125 |
| High Channel | 2480 | -20.43 | 0.00001 | 0.125 |

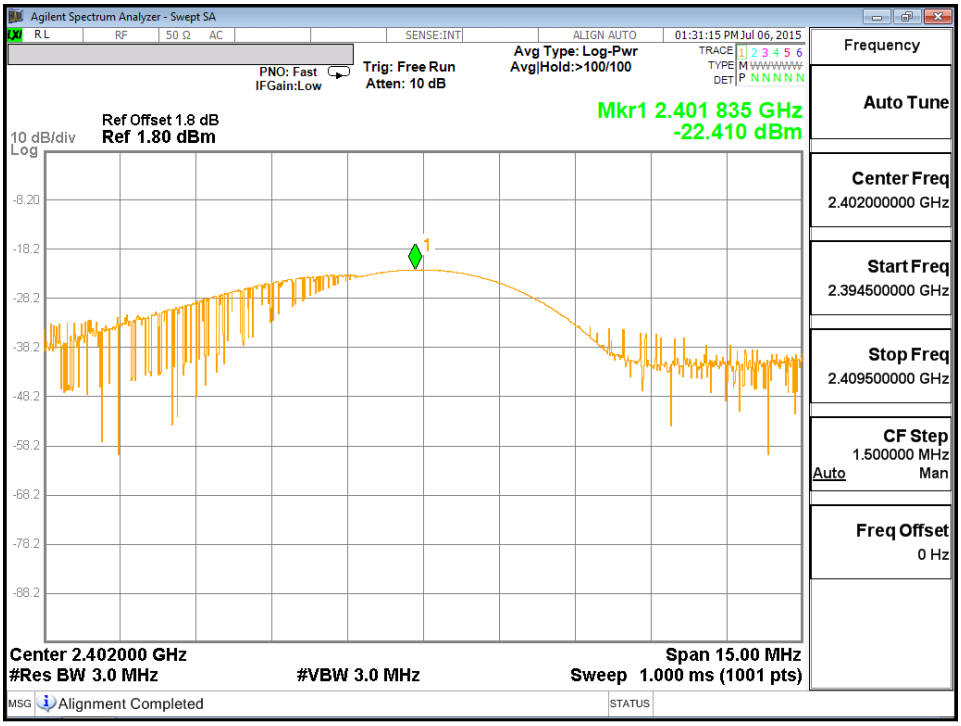
**Table 8: Test result of Peak Output Power, 8DPSK modulation**

| Channel | Channel Frequency | Peak Output Power | | Limit |
|---|---|---|---|---|
| | (MHz) | (dBm) | (W) | (W) |
| Low Channel | 2402 | -22.30 | 0.00001 | 0.125 |
| Middle Channel | 2441 | -21.00 | 0.00001 | 0.125 |
| High Channel | 2480 | -20.42 | 0.00001 | 0.125 |

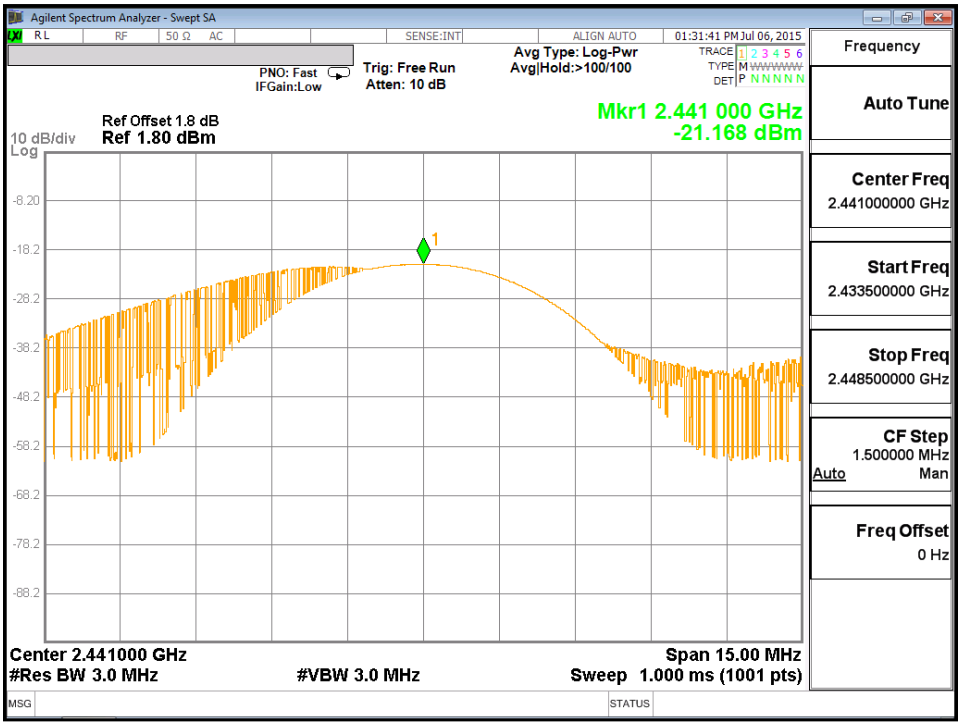
Pmax: 0.0091 mW

# Test Plot of Peak Output Power, GFSK modulation

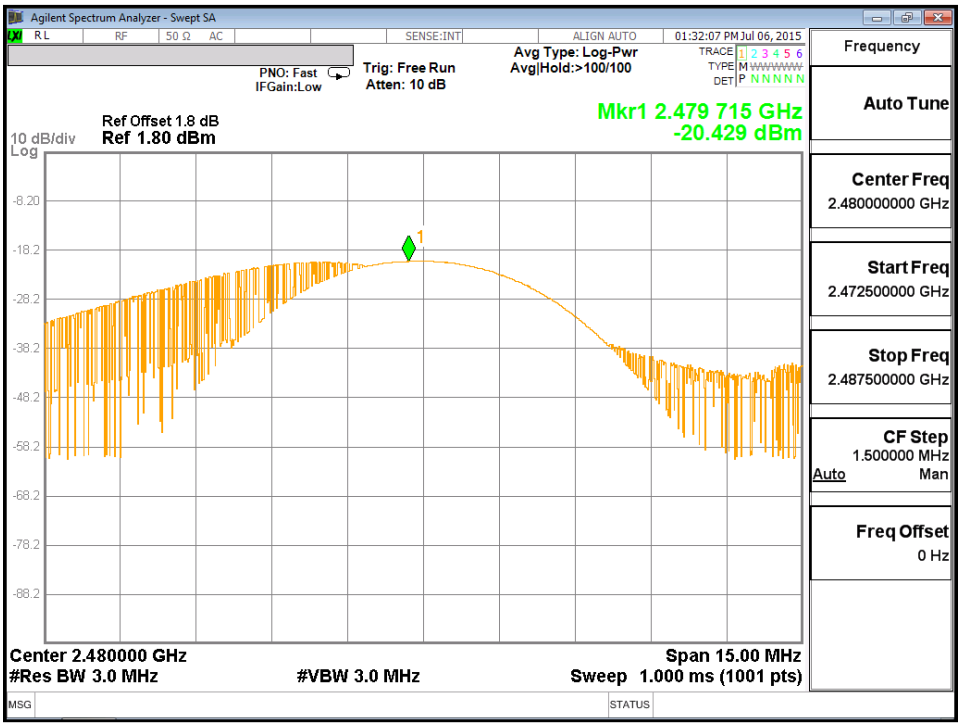
## Low Channel




## Middle Channel

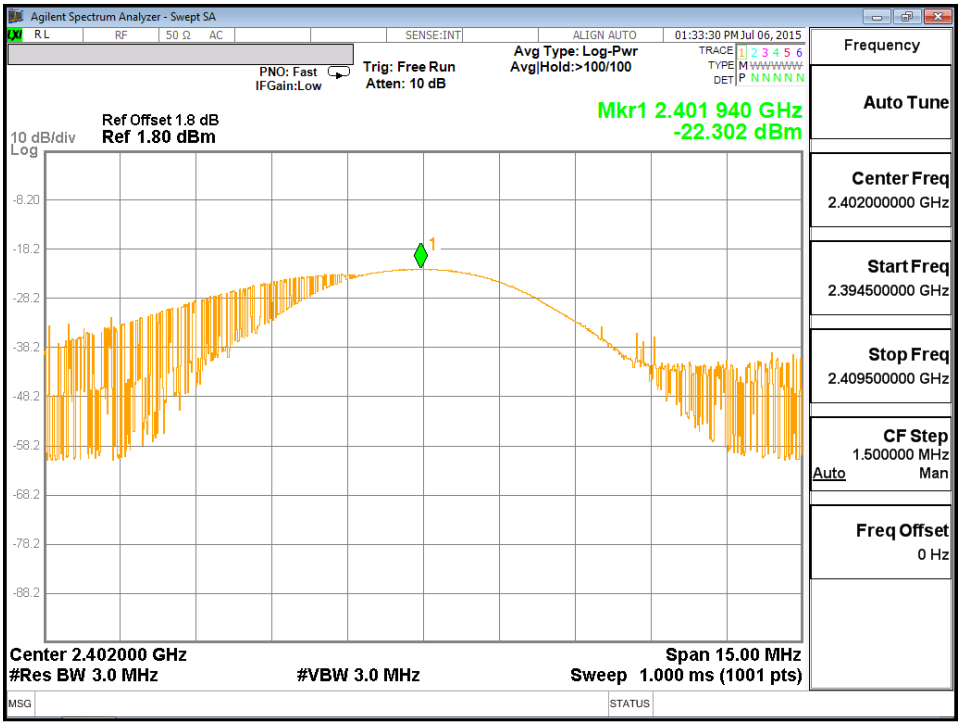


### High Channel

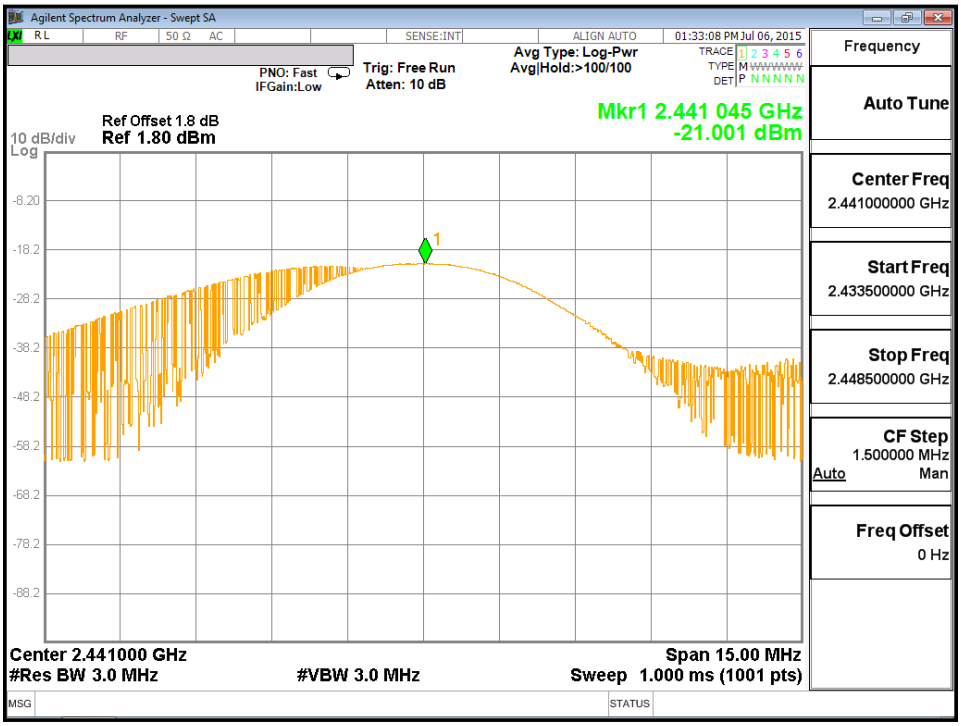



## Test Plot of Peak Output Power, 8DPSK modulation

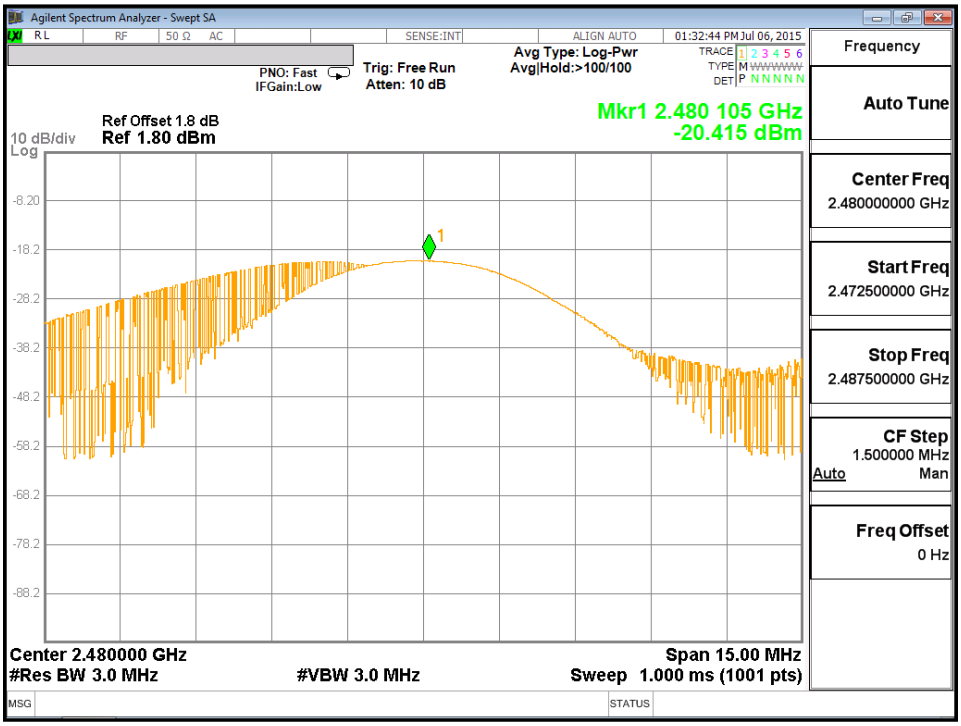
### Low Channel



## Middle Channel




## High Channel



## 5.1.3 20dB Bandwidth

**RESULT:** **Passed**

| | | |
|---|---|---|
| Test standard | : | FCC Part 15.247(a)(1),<br>RSS-247 5.1(1)<br>LP0002(2011): 3.10.1, (6.1.1) |
| Basic standard | : | DA 00-705 of March 30, 2000<br>LP0002(2011) Appendix II |
| Kind of test site | : | Shielded room |

**Test setup**

| | | |
|---|---|---|
| Test Channel | : | Low/ Middle/ High |
| Operation Mode | : | A |
| Ambient temperature | : | 22-26°C |
| Relative humidity | : | 50-65% |
| Atmospheric pressure | : | 100-103kPa |

### Table 9: Test result of 20dB Bandwidth, GFSK modulation

| Channel | Channel Frequency (MHz) | 20dB Bandwidth (kHz) | Limit (MHz) | Result |
|---|---|---|---|---|
| Low Channel | 2402 | 849.4 | 1.5 | Pass |
| Mid Channel | 2441 | 851.9 | 1.5 | Pass |
| High Channel | 2480 | 860.4 | 1.5 | Pass |

Note: Limit is for Channel Separation of 1 MHz and a power limit of 125 mW.

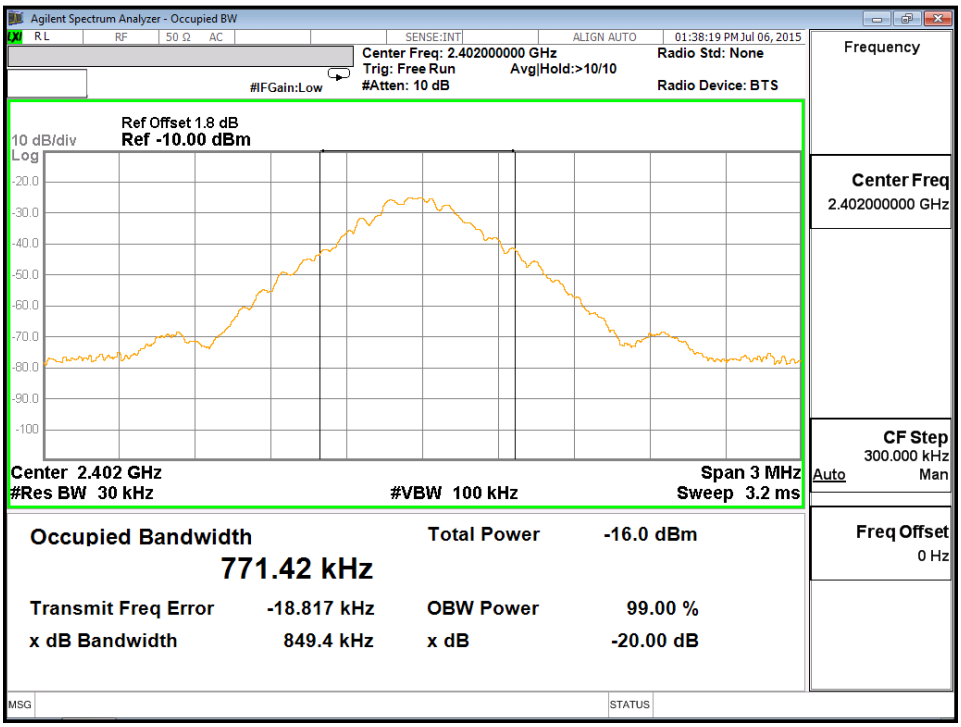
### Table 10: Test result of 20dB Bandwidth, 8DPSK modulation

| Channel | Channel Frequency (MHz) | 20dB Bandwidth (kHz) | Limit (MHz) | Result |
|---|---|---|---|---|
| Low Channel | 2402 | 1484 | 1.5 | Pass |
| Mid Channel | 2441 | 1483 | 1.5 | Pass |
| High Channel | 2480 | 1479 | 1.5 | Pass |

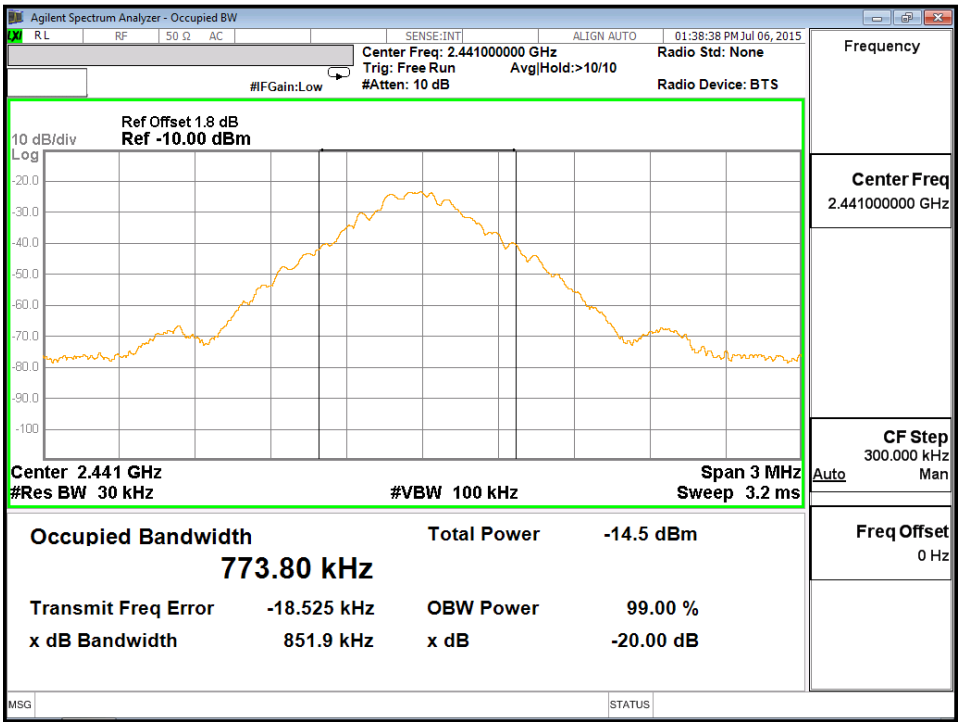
Note: Limit is for Channel Separation of 1 MHz and a power limit of 125 mW.
If the carrier separation frequency of a Bluetooth Device is set at 1 MHz due to the firmware setting and the Bluetooth Standard, then the limit for the 20 dB Bandwidth, becomes 1 MHZ / 0.66666 = 1.5 MHz.

# Test Plot of 20dB Bandwidth, GFSK modulation

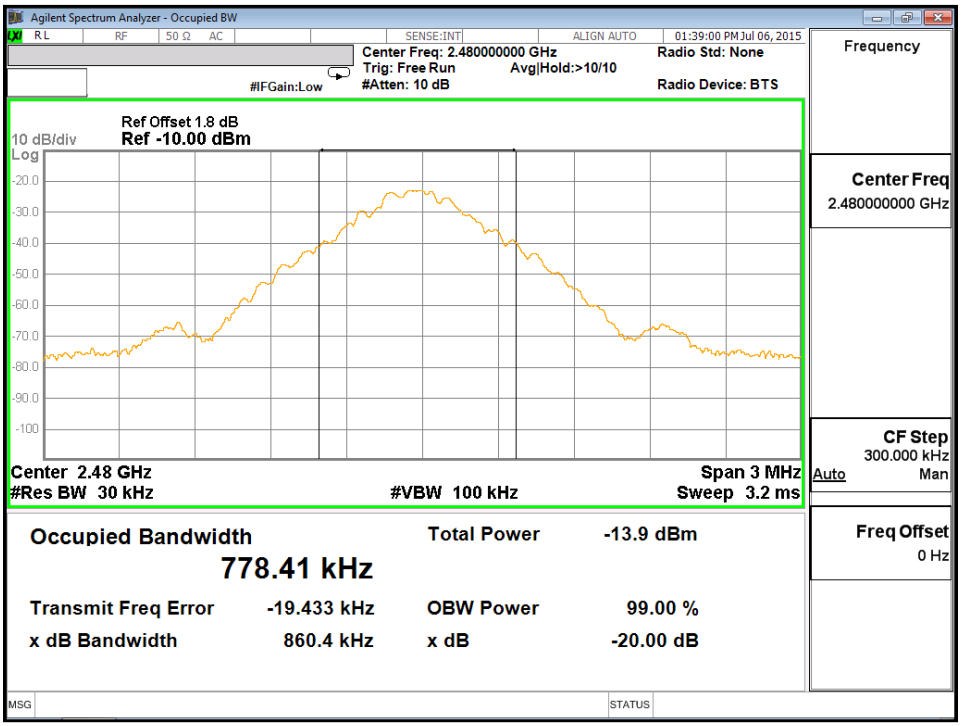
## Low Channel




## Middle Channel

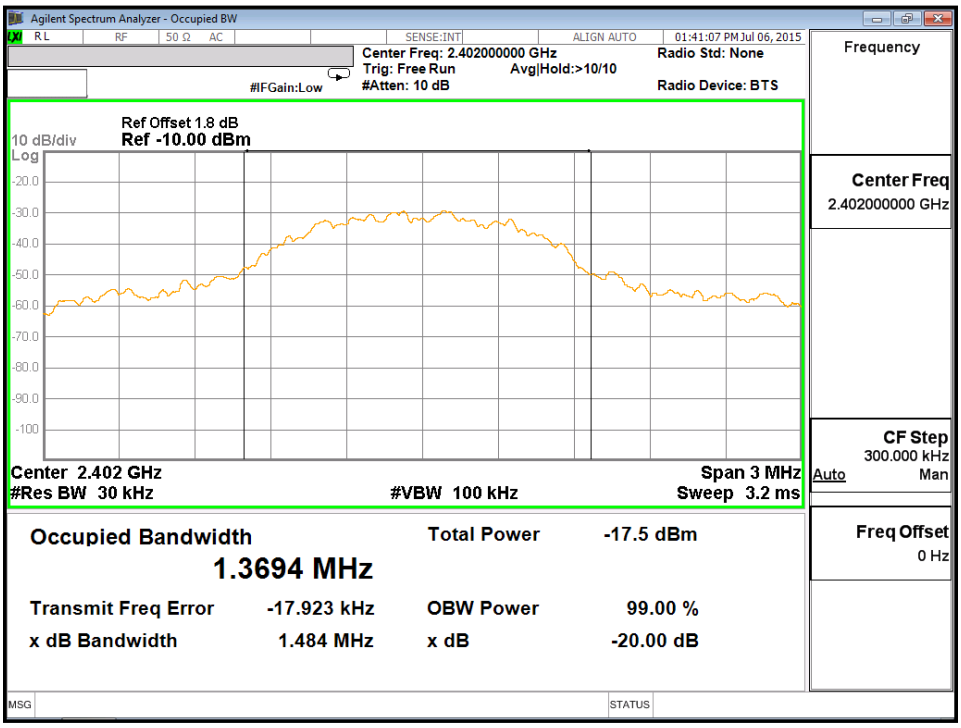


### High Channel

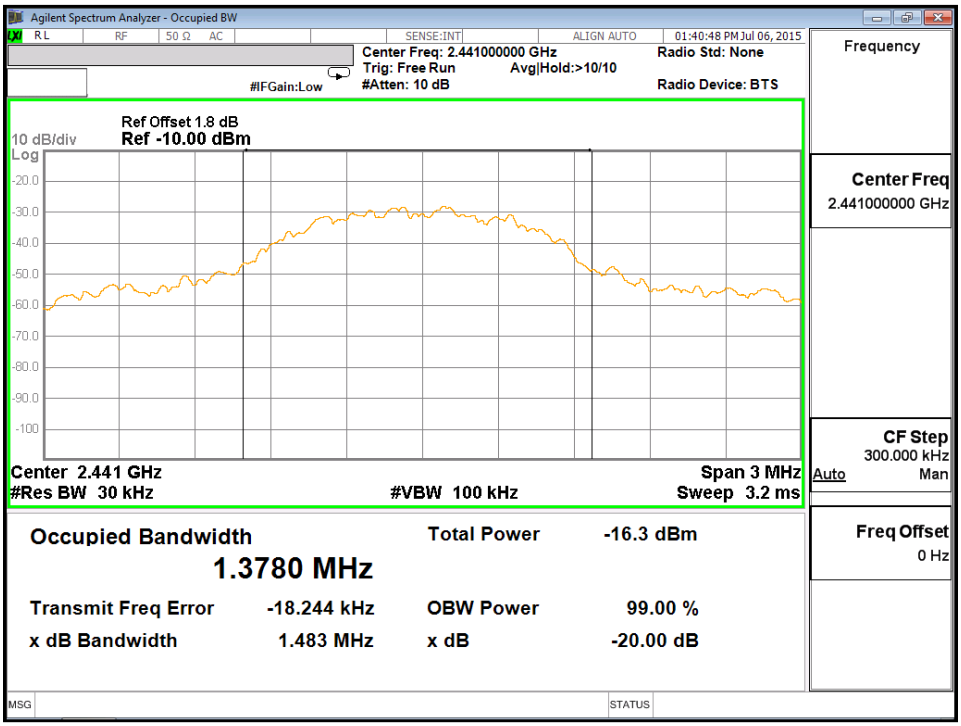



## Test Plot of 20dB Bandwidth, 8DPSK modulation

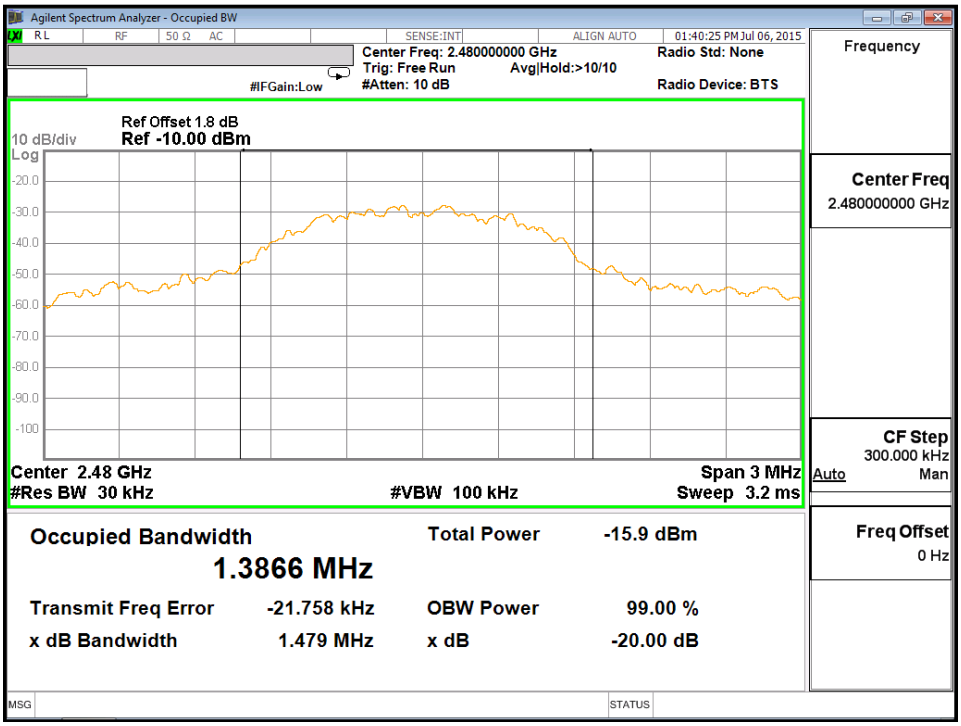
### Low Channel



## Middle Channel




## High Channel



## 5.1.4 99% Bandwidth

**RESULT:** **Passed**

Test standard : RSS-Gen (Issue 4)
Basic standard : RSS-Gen (Issue 4)
Kind of test site : Shielded room

**Test setup**

Test Channel : Low/ Middle/ High
Operation Mode : A

Ambient temperature : 22-26°C
Relative humidity : 50-65%
Atmospheric pressure : 100-103kPa

### Table 11: Test result of 99% Bandwidth, GFSK modulation

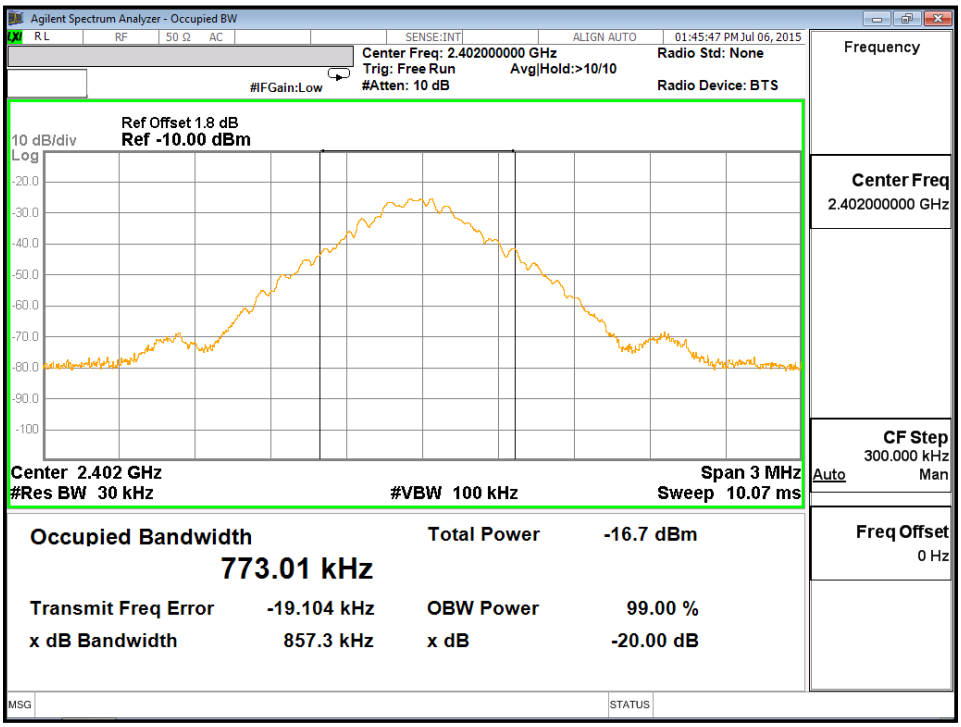
| Channel | Channel Frequency (MHz) | 99% Bandwidth (kHz) | Result |
|---|---|---|---|
| Low Channel | 2402 | 773.01 | Pass |
| Mid Channel | 2441 | 778.26 | Pass |
| High Channel | 2480 | 780.54 | Pass |

### Table 12: Test result of 99% Bandwidth, PSK modulation

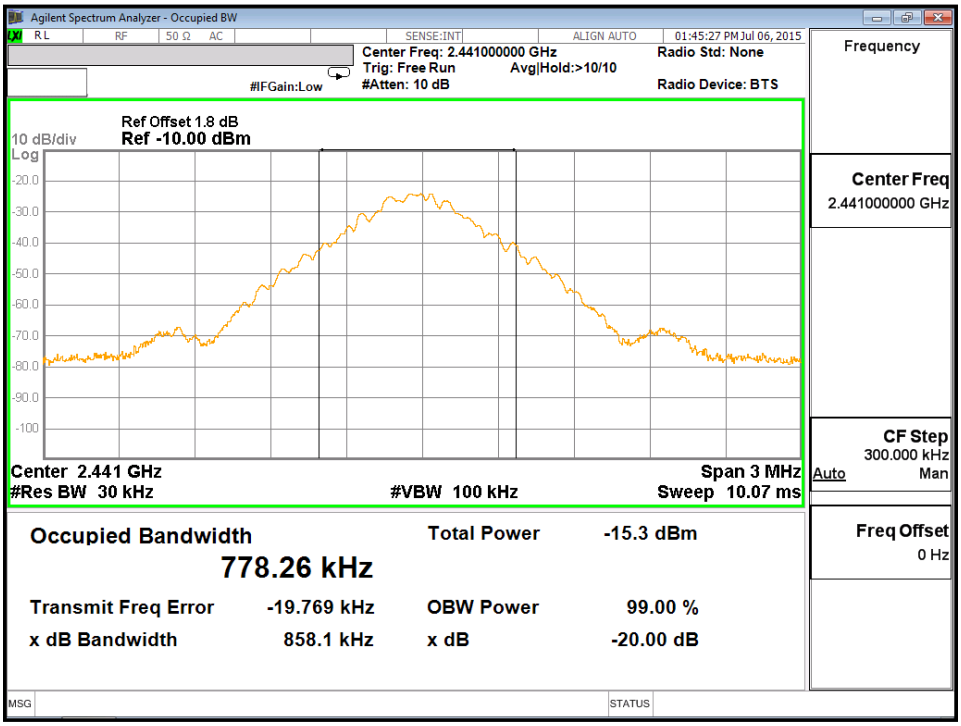
| Channel | Channel Frequency (MHz) | 99% Bandwidth (kHz) | Result |
|---|---|---|---|
| Low Channel | 2402 | 1369 | Pass |
| Mid Channel | 2441 | 1374.6 | Pass |
| High Channel | 2480 | 1385.4 | Pass |

# Test Plot of 99% Bandwidth, GFSK modulation

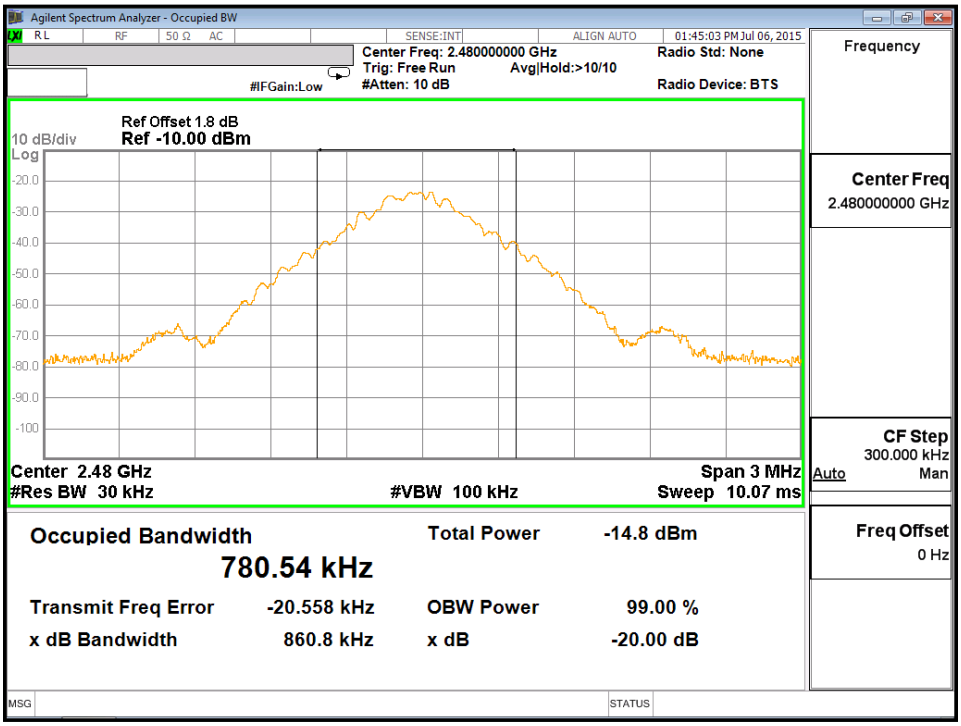
## Low Channel




## Middle Channel

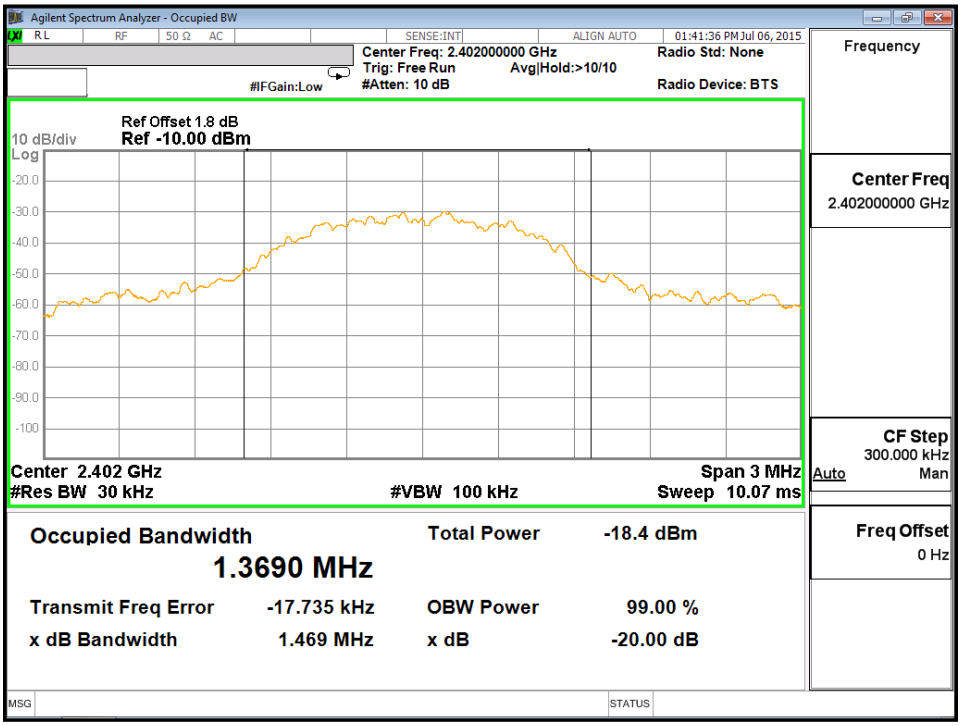


### High Channel

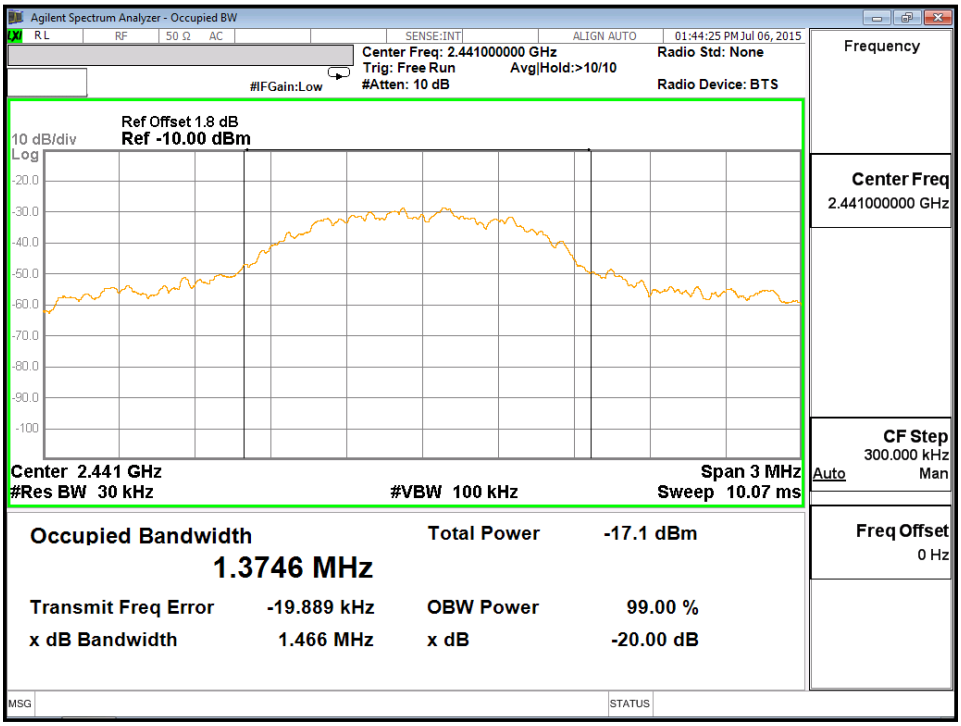



## Test Plot of 99% Bandwidth, 8DPSK modulation

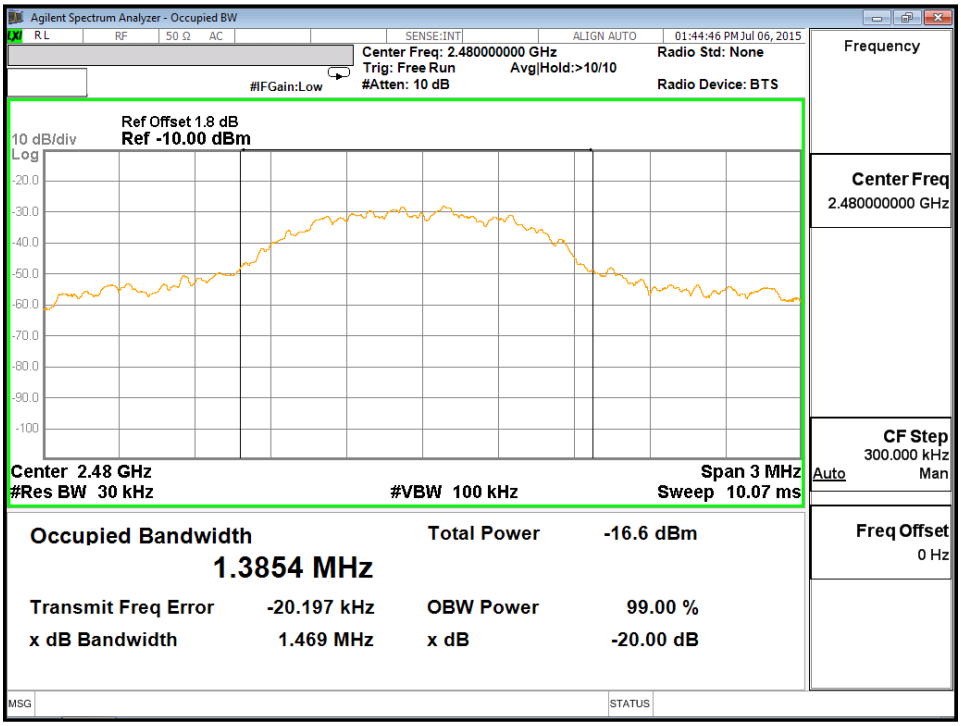
### Low Channel



## Middle Channel




## High Channel



## 5.1.5 Conducted spurious emissions and Frequency Band Edge measured in 100kHz Bandwidth

**RESULT:** **Passed**

| | | |
|---|---|---|
| Test standard | : | FCC part 15.247(d),<br>RSS-247 5.5<br>LP0002(2011): 3.10.1, (5) |
| Basic standard | : | DA 00-705 of March 30, 2000<br>LP0002(2011) Appendix II |
| Limit | : | 20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power) |
| Kind of test site | : | Shielded room |

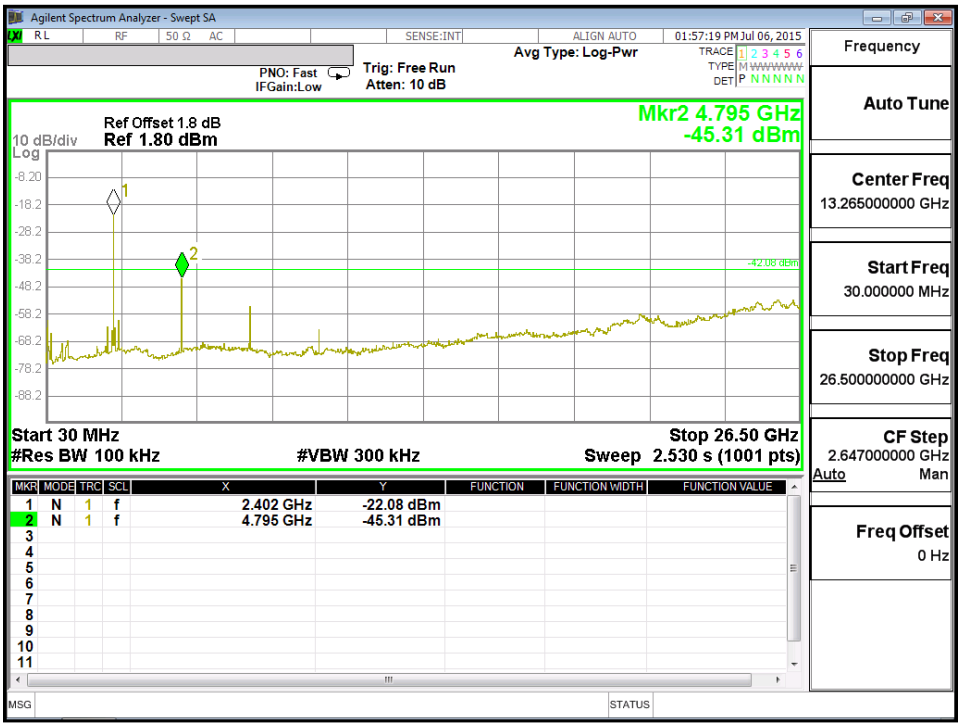
**Test setup**

| | | |
|---|---|---|
| Test Channel | : | Low/ Middle/ High |
| Operation Mode | : | A |
| Ambient temperature | : | 22-26°C |
| Relative humidity | : | 50-65% |
| Atmospheric pressure | : | 100-103 kPa |

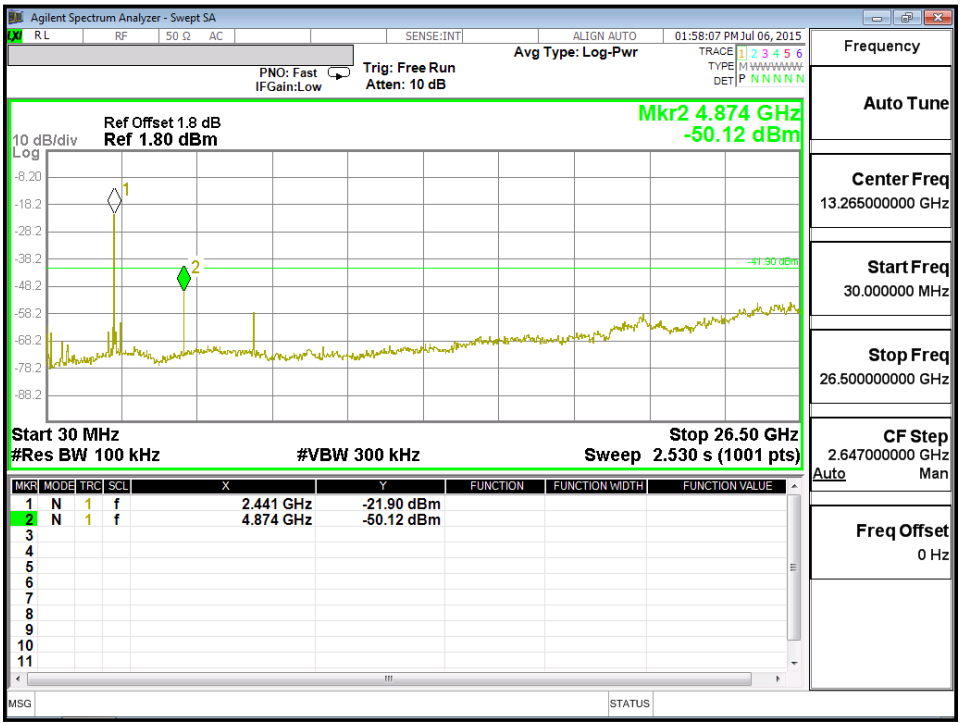
All emissions are more than 20dB below fundamental, details refer to following test plot, and compliance is achived as well.
Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

# Test Plot of 100kHz Conducted Emissions, GFSK modulation

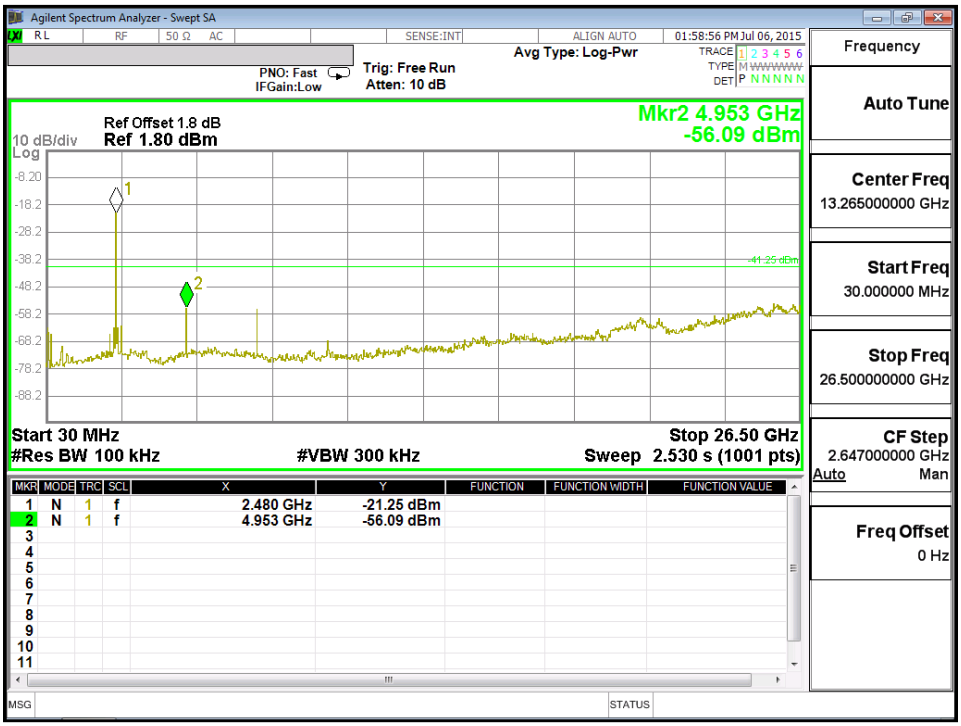
## Low Channel




## Middle Channel

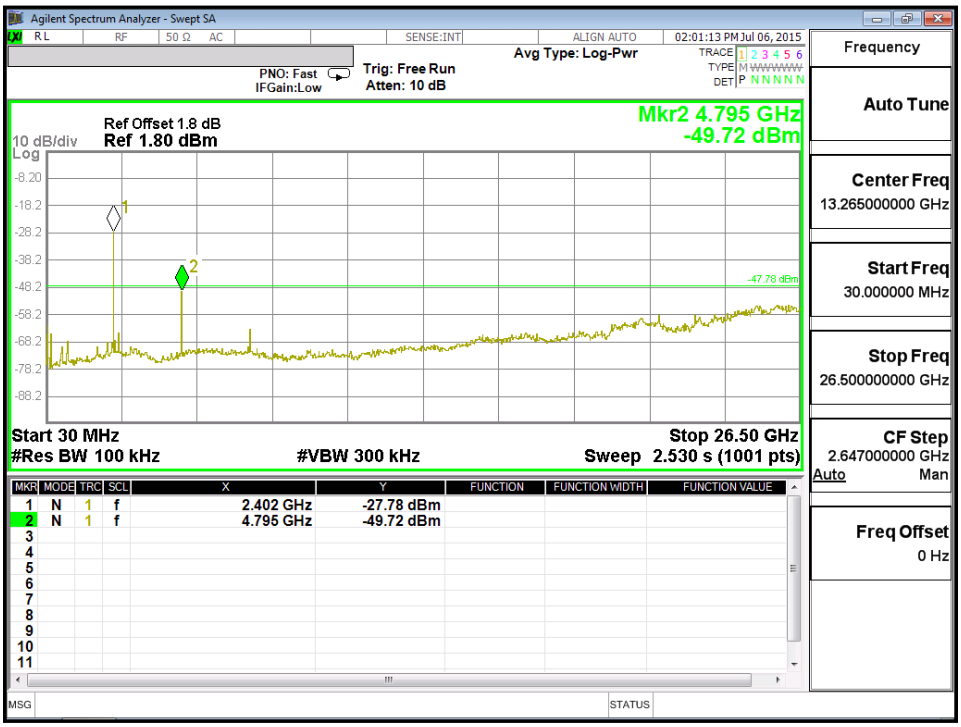


### High Channel

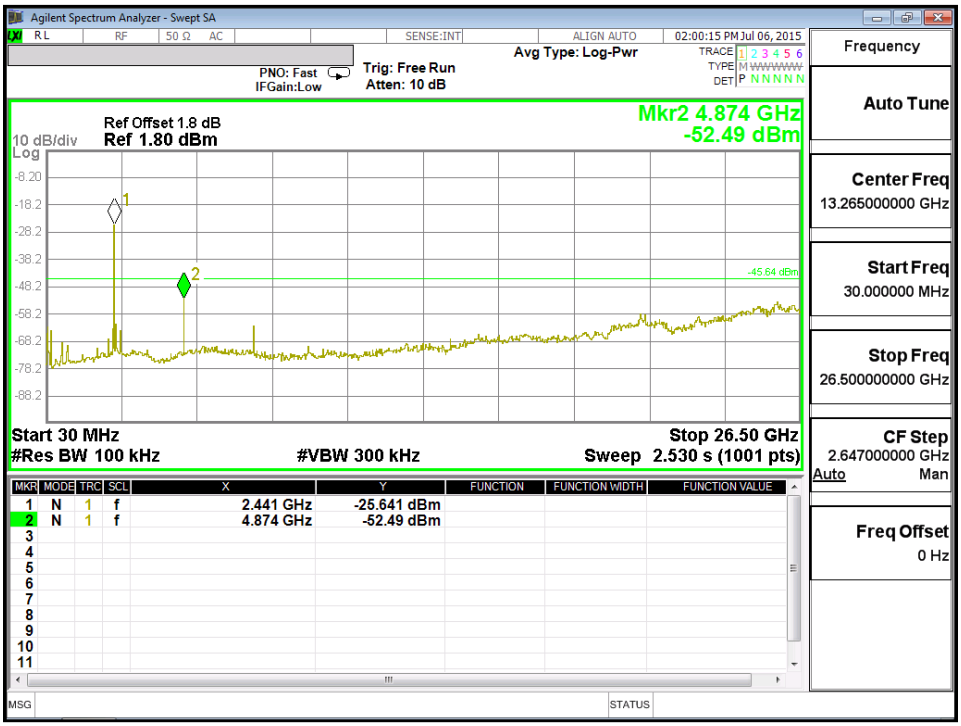



## Test Plot of 100kHz Conducted Emissions, 8DPSK modulation

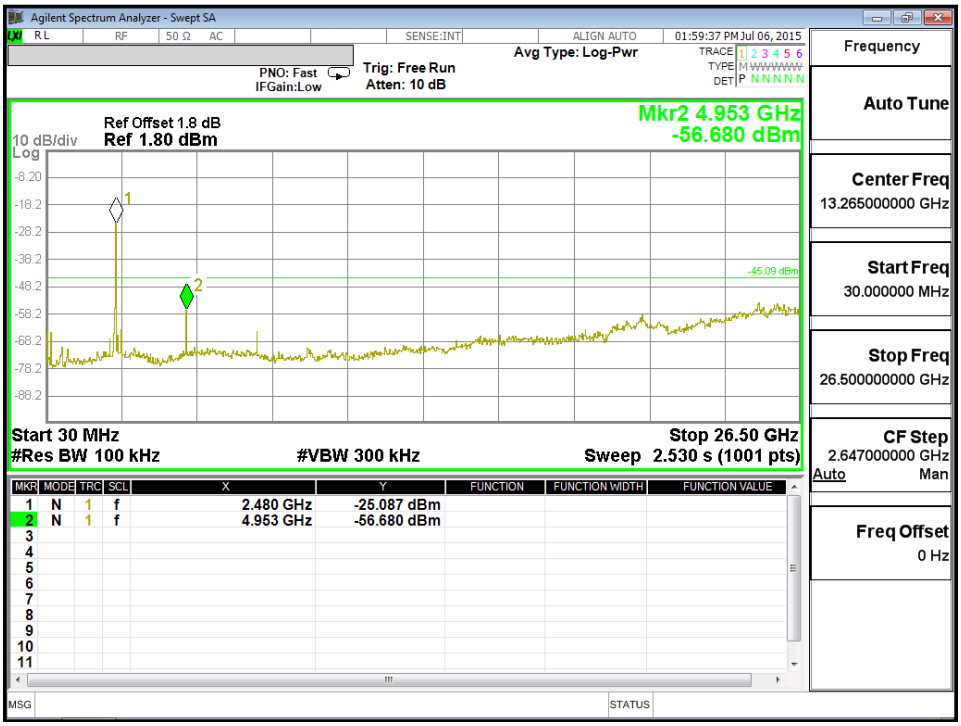
### Low Channel



## Middle Channel

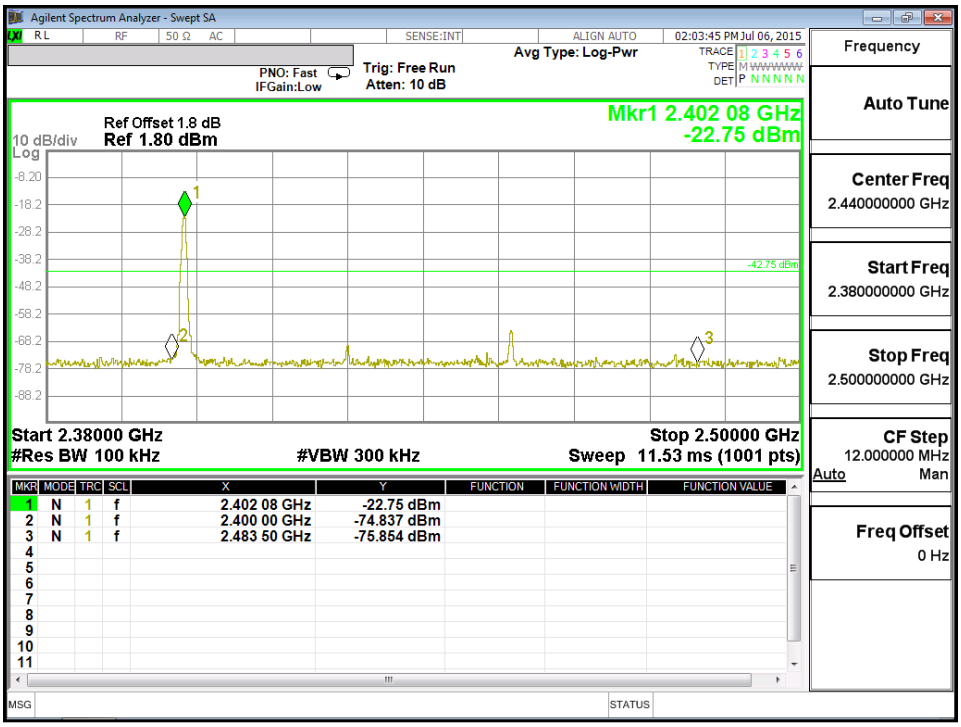



## High Channel

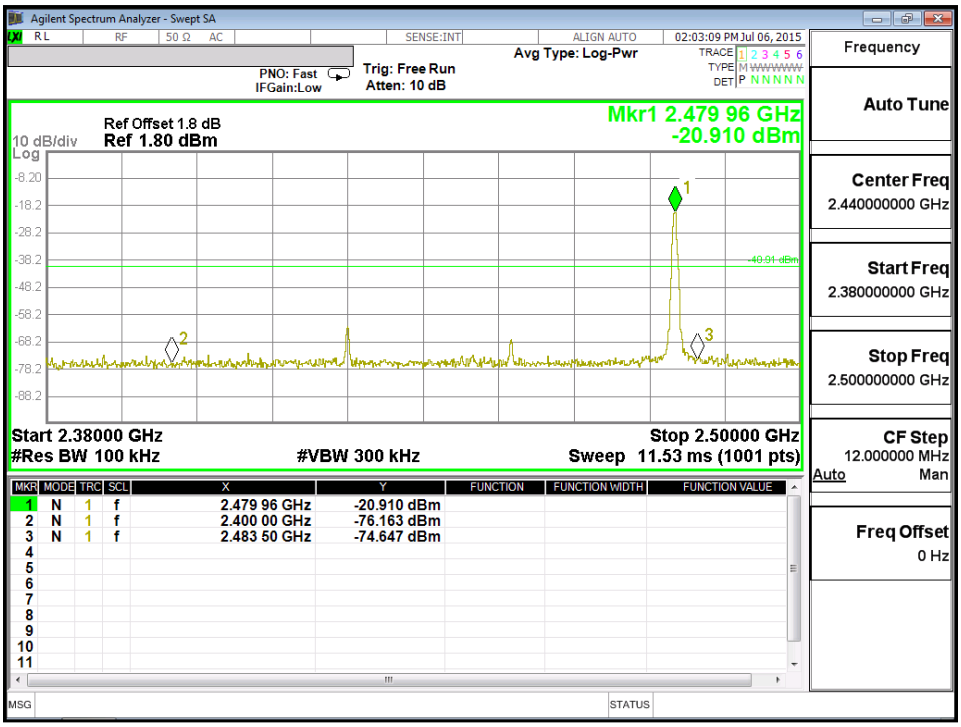


# Test Plot of 100kHz Bandwidth of Frequency Band Edge, GFSK modulation

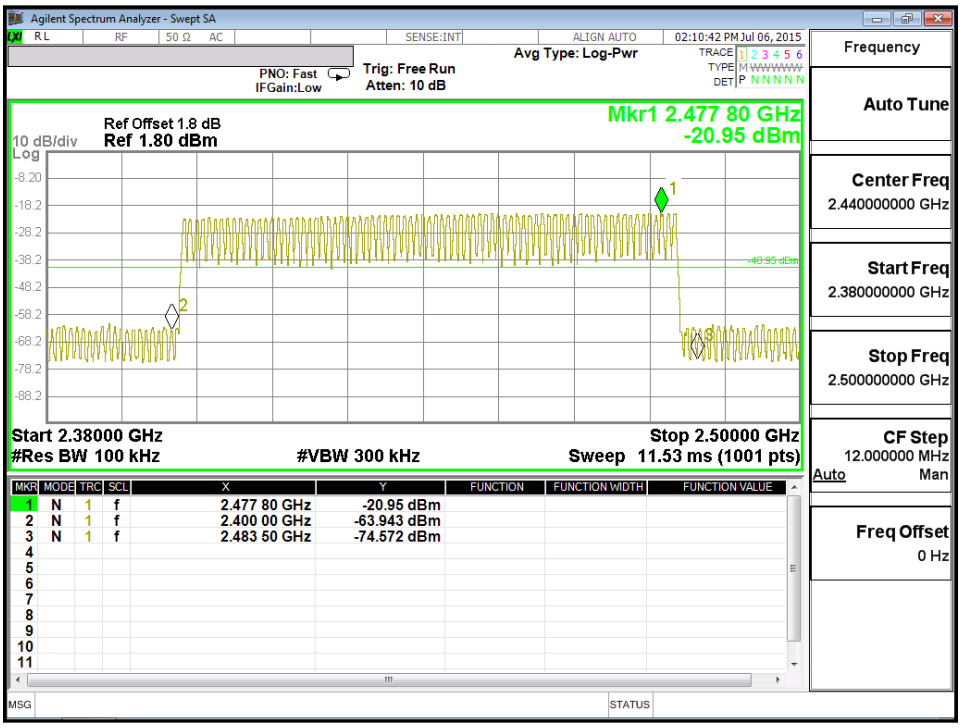
## Low Channel




## High Channel

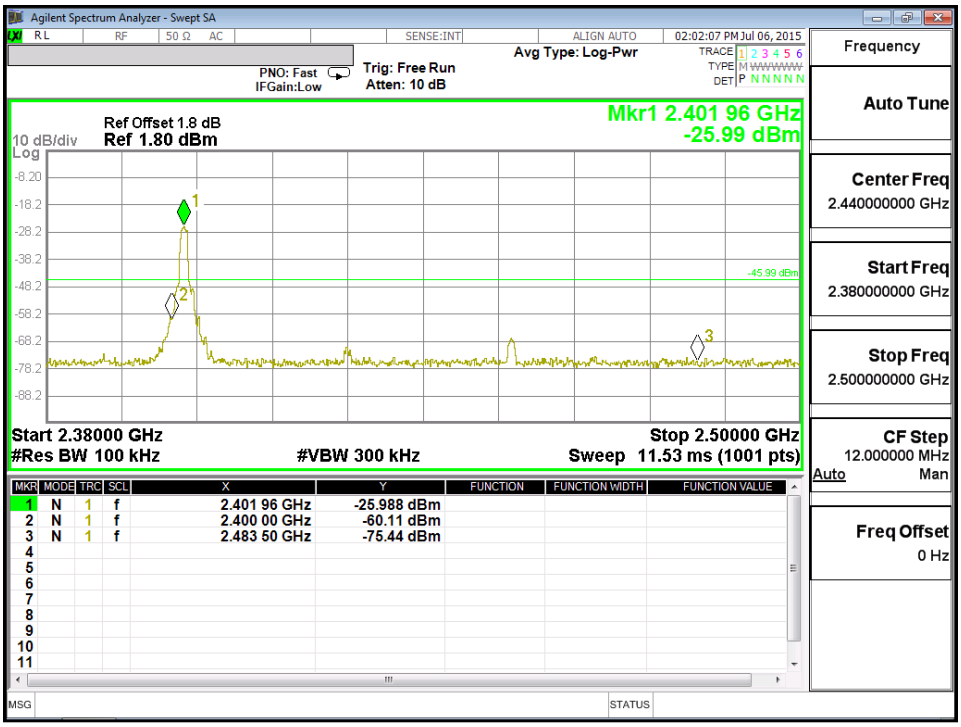


## Hopping ON

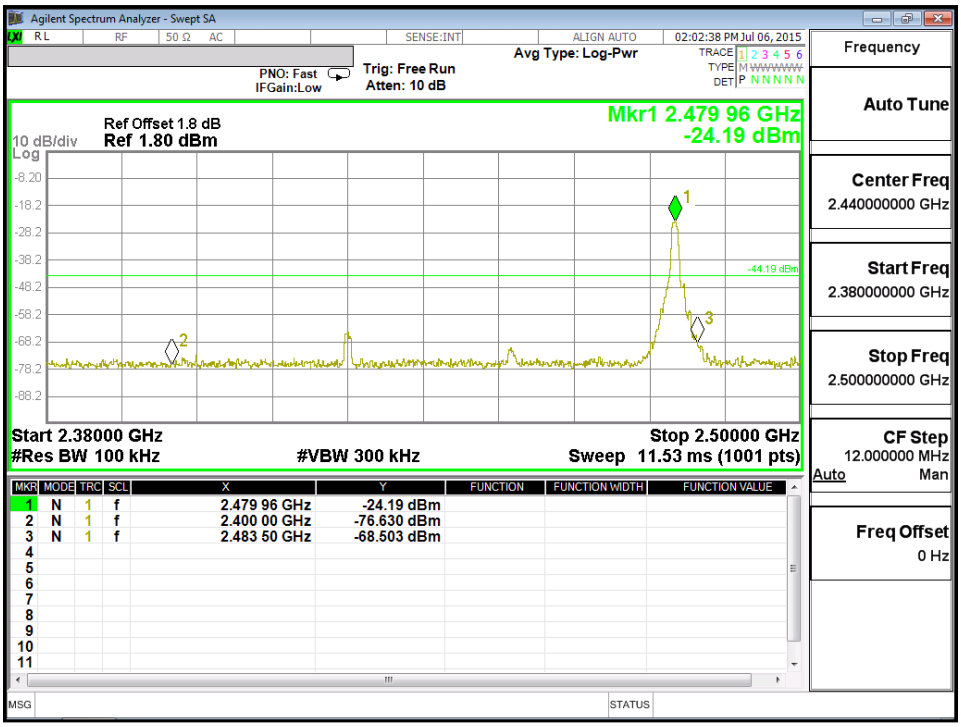

Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
02:10:42 PM Jul 06, 2015
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Ref Offset 1.8 dB
10 dB/div
Log
Ref 1.80 dBm
Mkr1 2.477 80 GHz
-20.95 dBm
-8.20
-18.2
-28.2
-38.2
-48.2
-58.2
-68.2
-78.2
-88.2
-40.95 dBm
Start 2.38000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 11.53 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.477 80 GHz -20.95 dBm
2 N 1 f 2.400 00 GHz -63.943 dBm
3 N 1 f 2.483 50 GHz -74.572 dBm
MSG
STATUS
Frequency
Auto Tune
Center Freq
2.440000000 GHz
Start Freq
2.380000000 GHz
Stop Freq
2.500000000 GHz
CF Step
12.000000 MHz
Auto
Man
Freq Offset
0 Hz

# Test Plot of 100kHz Bandwidth of Frequency Band Edge, 8DPSK modulation

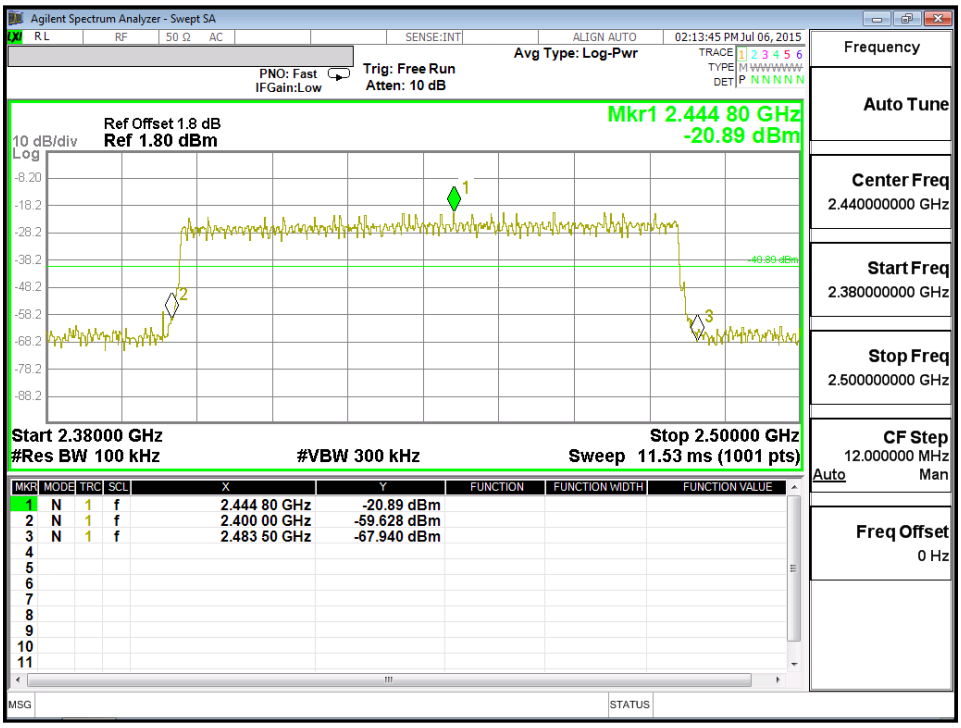
## Low Channel




## High Channel



## Hopping ON


Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
02:13:45 PM Jul 06, 2015
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Mkr1 2.444 80 GHz
-20.89 dBm
Ref Offset 1.8 dB
10 dB/div
Log
Ref 1.80 dBm
-8.20
-18.2
-28.2
-38.2
-48.2
-58.2
-68.2
-78.2
-88.2
-40.89 dBm
Start 2.38000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 11.53 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.444 80 GHz -20.89 dBm
2 N 1 f 2.400 00 GHz -59.628 dBm
3 N 1 f 2.483 50 GHz -67.940 dBm
Frequency
Auto Tune
Center Freq
2.440000000 GHz
Start Freq
2.380000000 GHz
Stop Freq
2.500000000 GHz
CF Step
12.000000 MHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

## 5.1.6 Spurious Emission

**RESULT:** **Passed**

| | | |
|---|---|---|
| Test standard | : | FCC part 15.247(d), FCC 15.205, FCC 15.209, RSS-210 2.2, RSS-247 5.5 and RSS-Gen 8.9<br>LP0002(2011): 3.10.1, (5) |
| Basic standard | : | ANSI C63.10 |
| Limits | : | Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and RSS-Gen i4, 8.9 (Table 6), must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-Gen i4, 8.9 (Table 4 and 5).<br>Radiated emissions which fall in the restricted bands, as defined in LP0002(2011): 2.7 , must comply with the radiated emission limits specified in LP0002(2011): 2.8<br>Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in FCC 15.209(a) and FCC 15.249(a), RSS-Gen i4, 8.9 (Table 4 and 5) and RSS-210 A2.9(a).<br>Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in LP0002(2011): 2.8 |
| Kind of test site | : | 3m Semi-Anechoic Chamber |

**Test setup**

| | | |
|---|---|---|
| Test Channel | : | Low/ Middle/ High |
| Operation Mode | : | A, B |

Remark: Testing was carried out within frequency range 30MHz to the tenth harmonic. For details refer to Appendix D. The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The worst-case Axis orientation is recorded in this test report. Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

## 5.1.7 Frequency Separation

**RESULT:** **Passed**

| | | |
|---|---|---|
| Test standard | : | FCC part 15.247(a)(1)<br>RSS-247 5.1<br>LP0002(2011): 3.10.1, (6.1.1) |
| Basic standard | : | DA 00-705 of March 30, 2000<br>LP0002(2011) Appendix II |
| Limit | : | ≥ 25kHz or 2/3 of 20dB bandwidth, whichever is greater |

**Test setup**

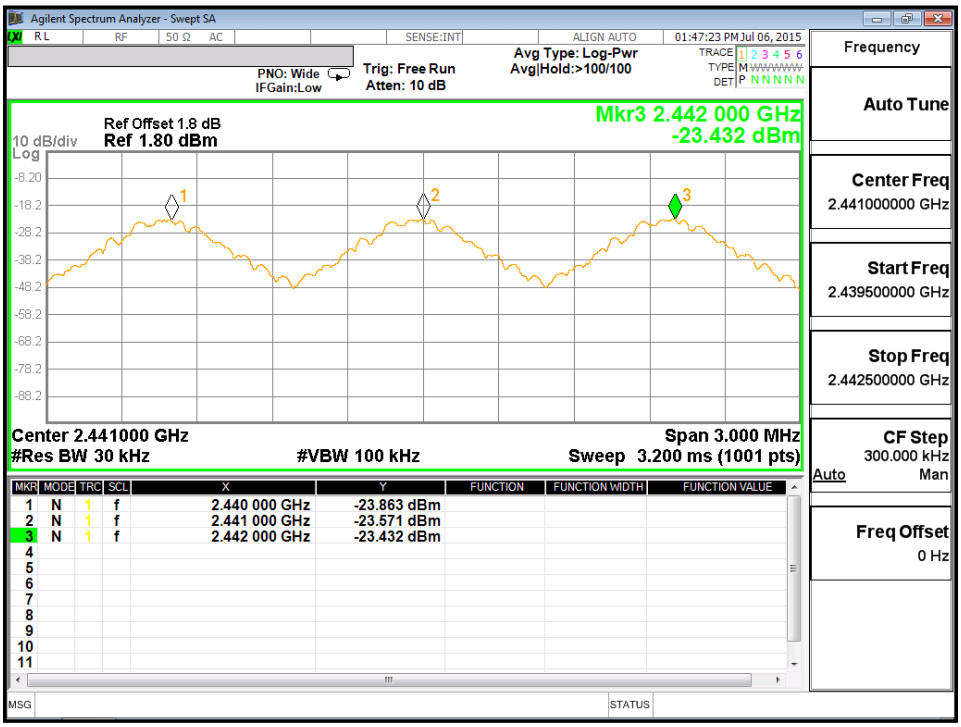
| | | |
|---|---|---|
| Test Channel | : | Low/ Middle/ High |
| Operation Mode | : | A |
| Ambient temperature | : | 24℃ |
| Relative humidity | : | 53% |

**Table 13: Test result of Frequency Separation**

| Channel | Channel Frequency (MHz) | Measured Channel Separation (MHz) | Limit (kHz) | Result |
|---|---|---|---|---|
| Record Channel | 2441 | 1 | ≥ 25kHz or 2/3 of 20dB bandwidth | Pass |
| Record Channel adj 1 | 2440 | | | |
| Record Channel adj 2 | 2442 | | | |

# Test Plot of Frequency Separation

## GFSK



## 5.1.8 Number of hopping frequency

**RESULT:** **Passed**

| | | |
|---|---|---|
| Test standard | : | FCC part 15.247(a)(1)(iii)<br>RSS-247 5.1(5)<br>LP0002(2011): 3.10.1, (6.1.2) |
| Basic standard | : | DA 00-705 of March 30, 2000<br>LP0002(2011) Appendix II |
| Limits | : | ≥ 15 non-overlapping channels |
| Kind of test site | : | Shield room |

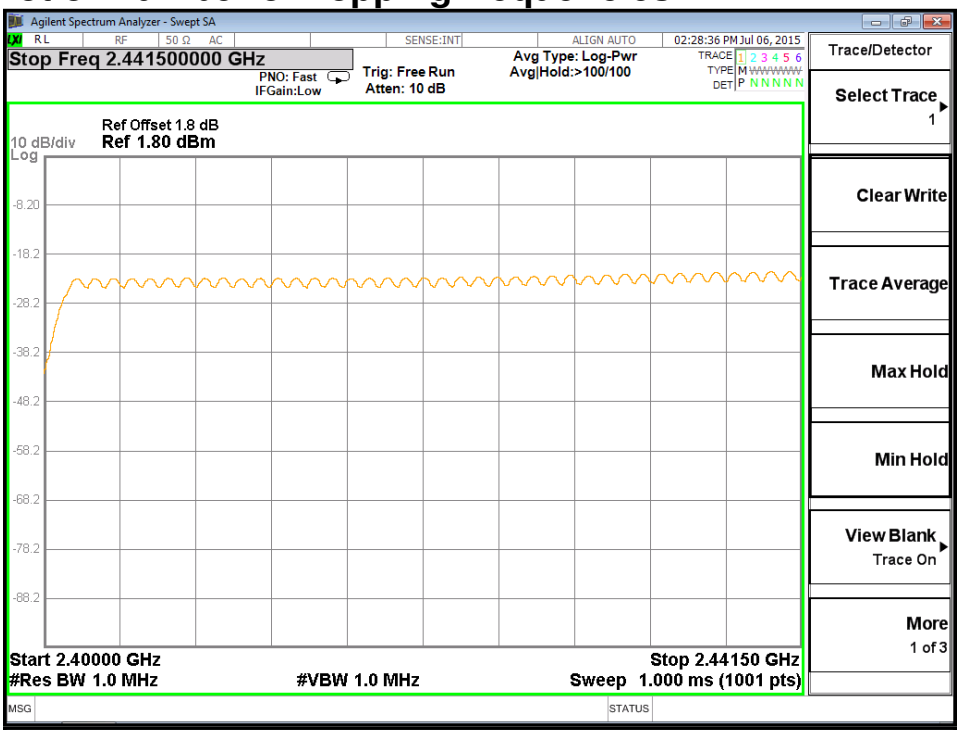
**Test setup**

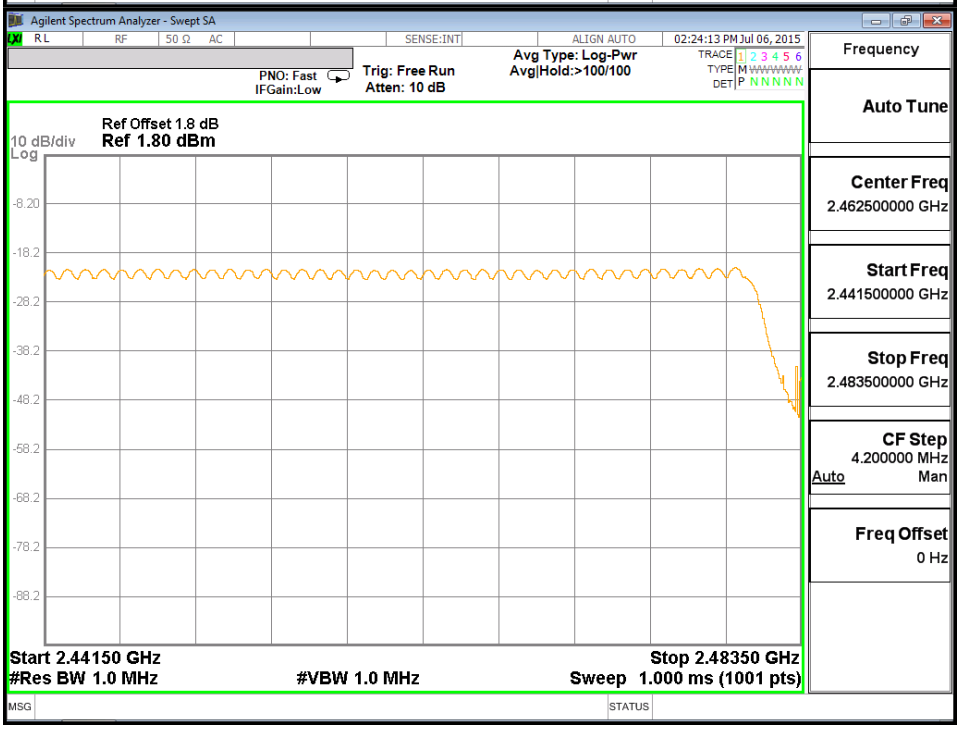
| | | |
|---|---|---|
| Test Channel | : | Low/ Middle/ High |
| Operation Mode | : | A |
| Ambient temperature | : | 22-26°C |
| Relative humidity | : | 50-65% |
| Atmospheric pressure | : | 100-103 kPa |

**Table 14: Test result of Number of hopping frequency**

| Frequency Range | Measured Quantity of Hopping Channel | Limit | Result |
|---|---|---|---|
| 2400 to 2483.5 MHz | 79 | ≥15 | Pass |

# Test Plot of Number of hopping frequencies



## 5.1.9 Time of Occupancy

**RESULT:** **Passed**

| | | |
|---|---|---|
| Test standard | : | FCC part 15.247(a)(1)(iii)<br>RSS-247 5.1(5)<br>LP0002(2011): 3.10.1, (6.1.2) |
| Basic standard | : | DA 00-705 of March 30, 2000<br>LP0002(2011) Appendix II |
| Limits | : | 0.4s |
| Kind of test site | : | Shield room |

**Test setup**

| | | |
|---|---|---|
| Test Channel | : | Low/ Middle/ High |
| Operation Mode | : | A |
| Ambient temperature | : | 22-26°C |
| Relative humidity | : | 50-65% |
| Atmospheric pressure | : | 100-103 kPa |

**Table 15: Test result of Time of Occupancy**

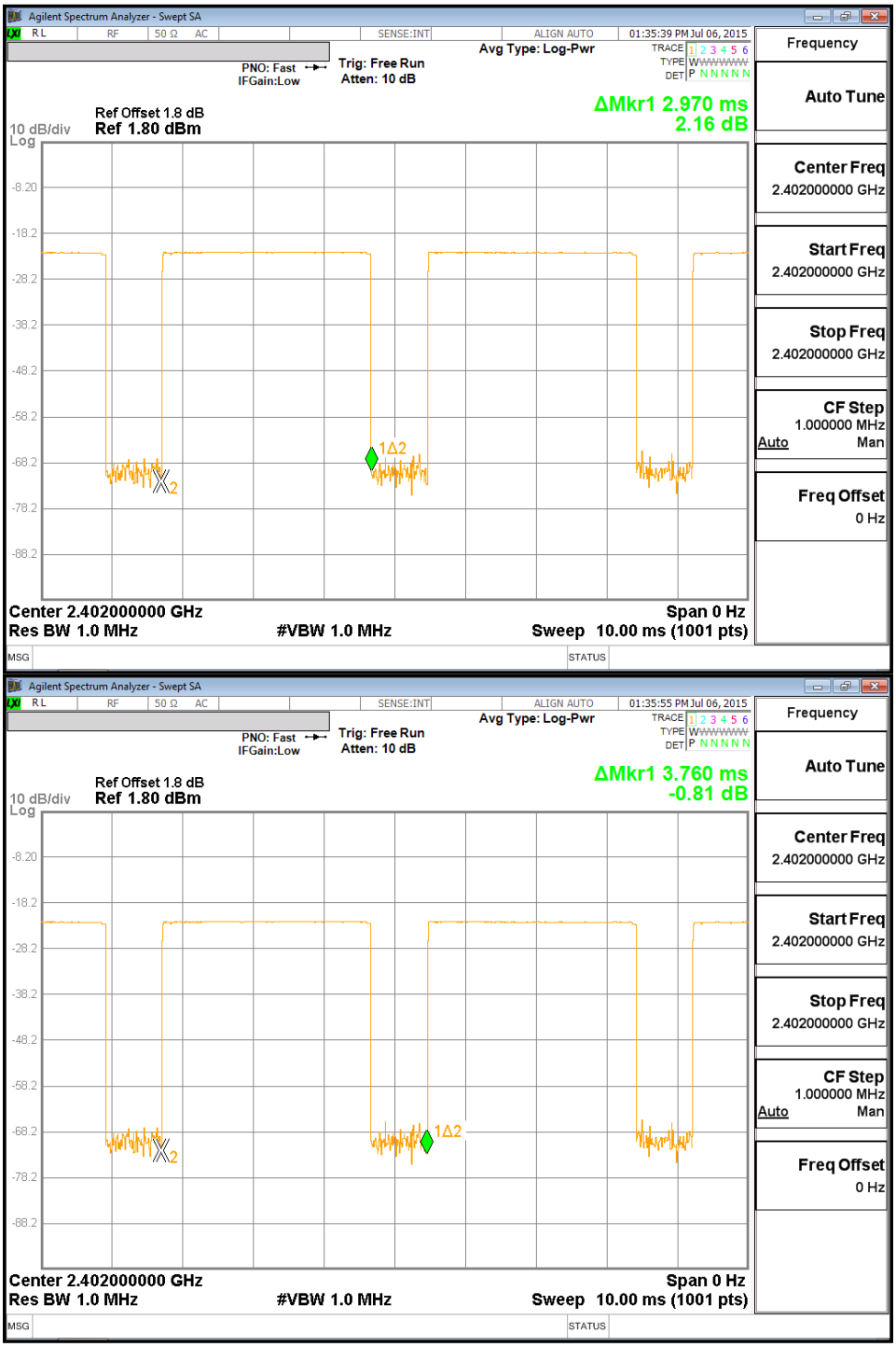
| Data Mode | Captured Burst (s) | Dwell time (s) | On+Off time (s) | Limit (s) | Result |
|---|---|---|---|---|---|
| DH5 | 0.00297 | 0.3160 | 0.00376 | 0.4 | Pass |
| 3DH5 | 0.00297 | 0.3168 | 0.00375 | 0.4 | Pass |

Note:
Dwell time = Pulse width x (Hopping rate / Number of channels) x Period

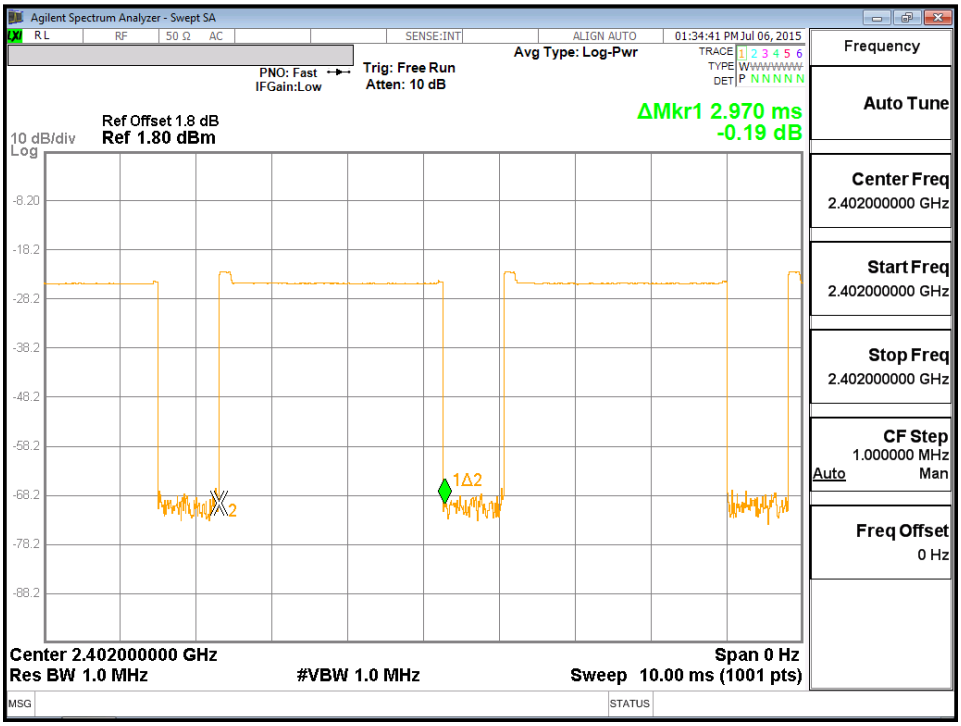
Period = 0.4 (seconds/ channel) x 79 (channel) = 31.6 seconds.

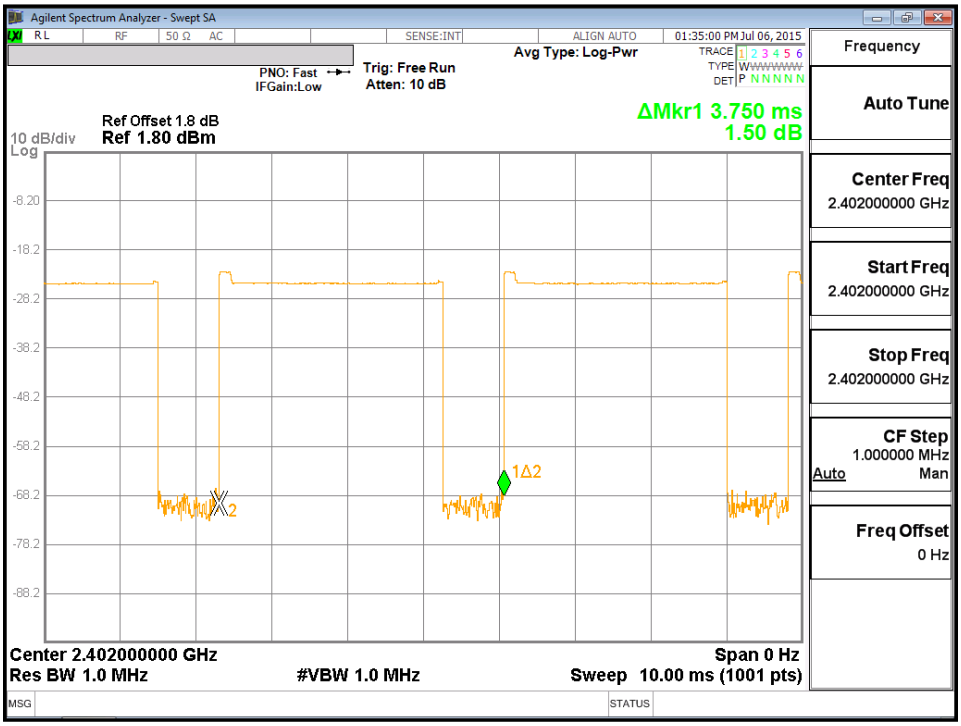
Hopping rate = 1 / (On+Off time) = 266 Hz

# Test Plot of Time of Occupancy, GFSK modulation



# Test Plot of Time of Occupancy, 8DPSK modulation



# 5.2 Mains Emissions

## 5.2.1 Mains Conducted Emissions

**RESULT:** **Passed**

| | | |
|---|---|---|
| Test standard | : | FCC Part 15.207<br>FCC Part 15.107<br>RSS-Gen 8.8<br>LP0002: 2.3 |
| Limits | : | Mains Conducted emissions as defined in above test standards must comply with the mains conducted emission limits specified |
| Kind of test site | : | Shielded Room |

**Test setup**

| | | |
|---|---|---|
| Test Channel | : | Middle |
| Operation mode | : | A |

Remark: For details refer to Appendix D.

# 6. Safety Human exposure

## 6.1 Radio Frequency Exposure Compliance

### 6.1.1 Electromagnetic Fields

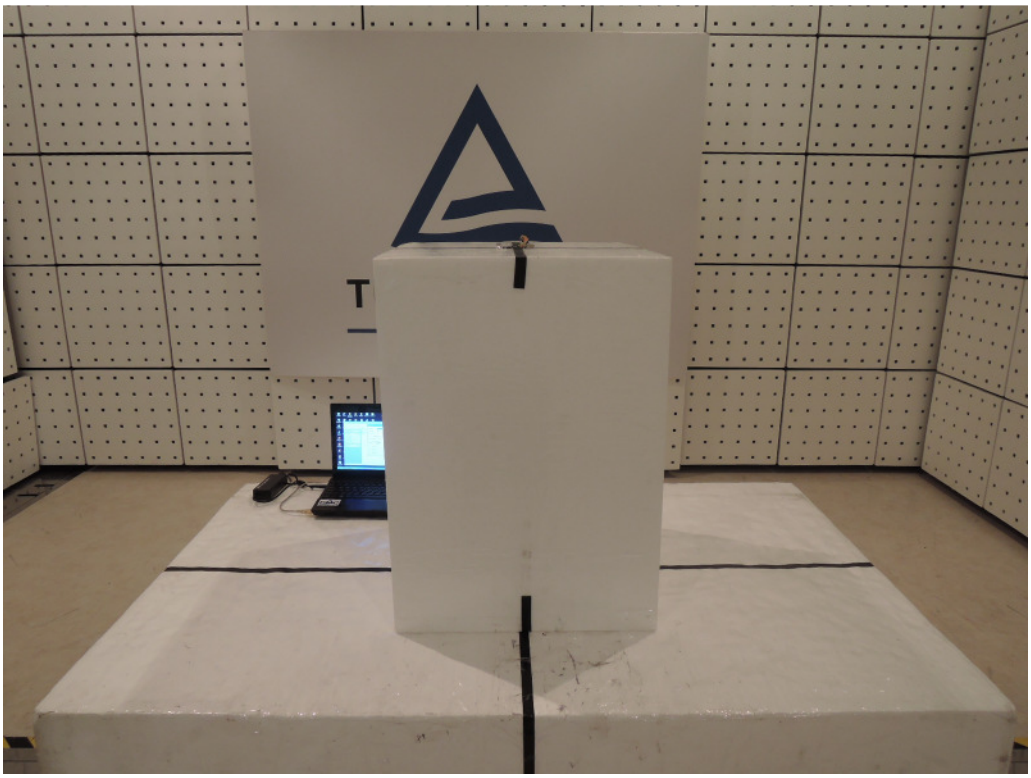
**RESULT:** **Passed**

Test standard : FCC KDB Publication 447498

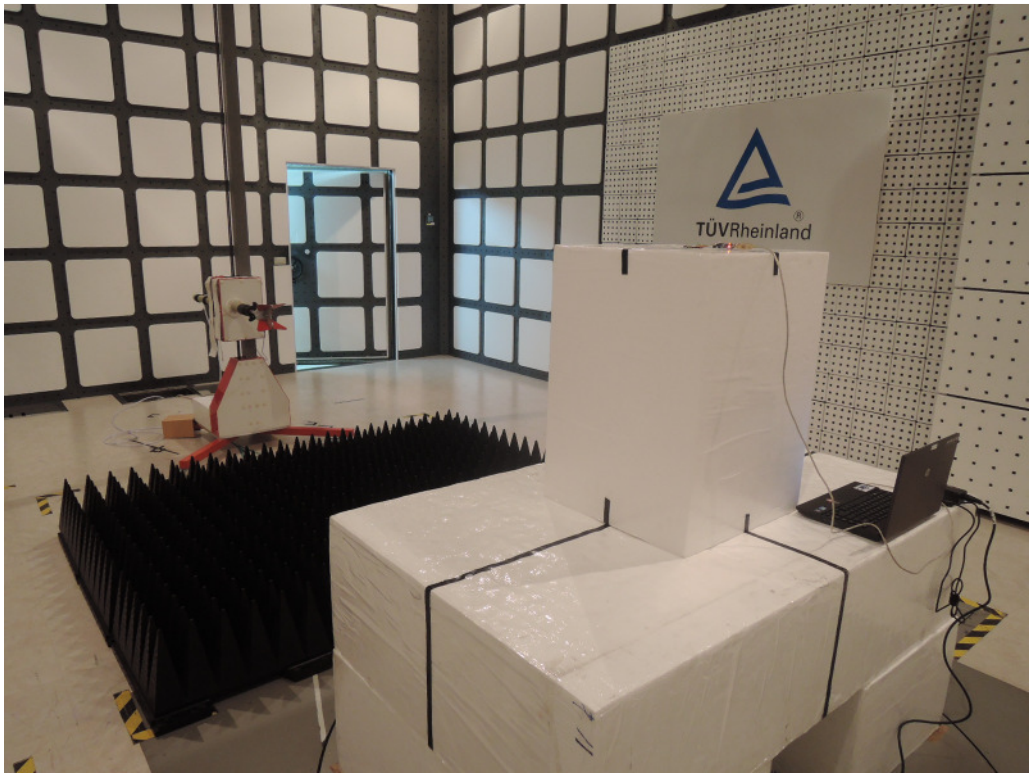
Since maximum peak output power of the transmitter is <1mW, hence the EUT is excluded from SAR evaluation according to FCC KDB publication 447498 D01: Mobile Portable RF Exposure..

# 7. Photographs of the Test Set-Up

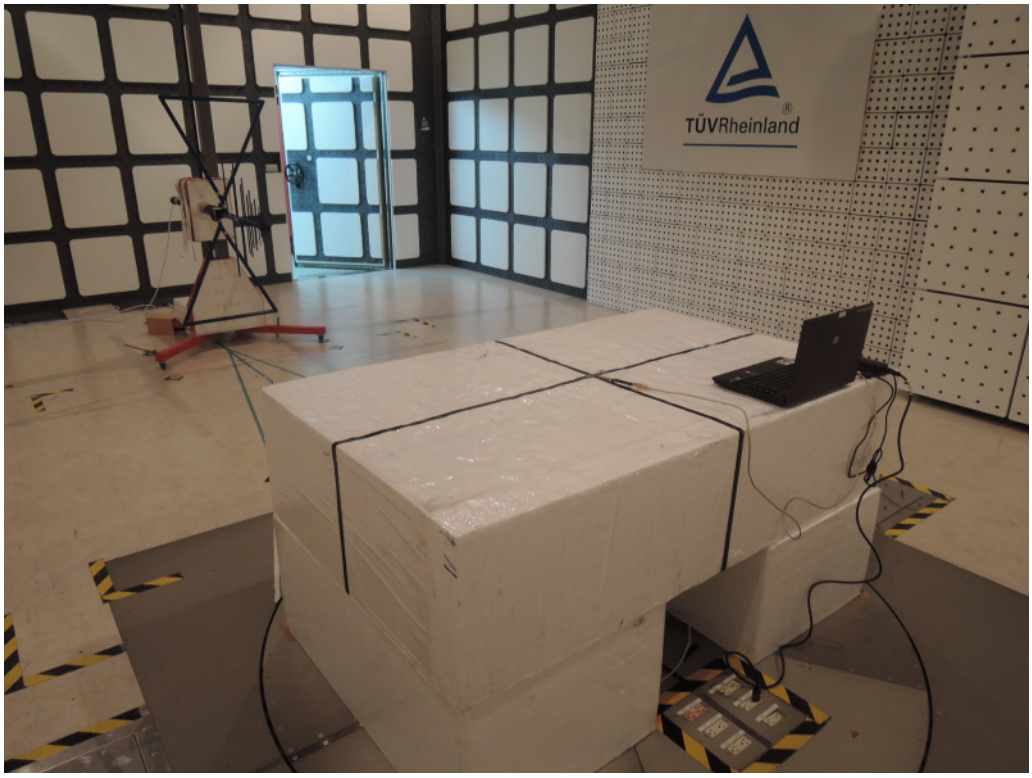
**Photograph 1: Set-up for Spurious Emissions (Front View)**



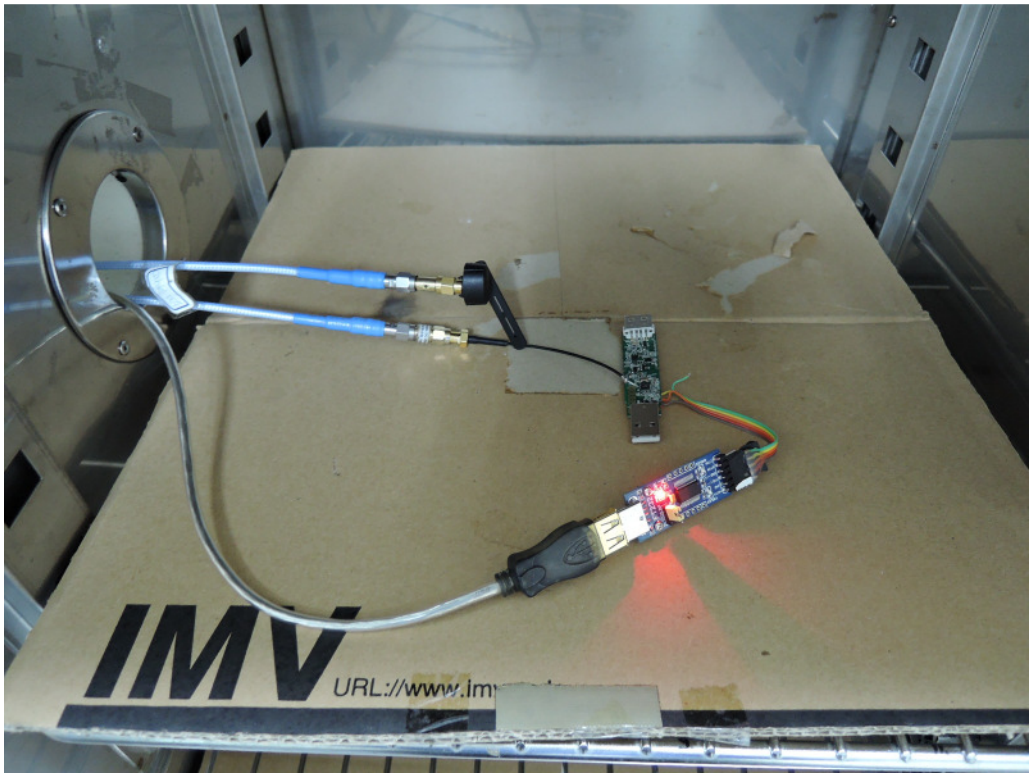
## Photograph 2: Set-up for Spurious Emissions (Back View 1)



## Photograph 3: Set-up for Spurious Emissions (Back View 2)




## Photograph 4: Set-up for Conducted testing



## Photograph 5: Set-up for for Mains Conducted testing Back

## Photograph 6: Set-up for for Mains Conducted testing Front

# 8. List of Tables



# 9. List of Photographs