**FCC CFR47 PART 15 SUBPART C**

**Bluetooth**

**CERTIFICATION TEST REPORT**

**FOR**

**GSM/WCDMA/LTE Phone + BT/BLE, DTS b/g/n**

**MODEL NUMBER : SM-J320F/DS, SM-J320F, SM-J320G/DS**

**FCC ID: A3LSMJ320F**

**REPORT NUMBER: 15K22425-E3**

**ISSUE DATE: JAN 11, 2016**

*Prepared for*
**SAMSUNG ELECTRONICS CO., LTD.**
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ACCREDITED
TL-637

Revision History

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| -- | 01/05/16 | Initial issue | SungGil Park |


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# 1. ATTESTATION OF TEST RESULTS

| | |
|---|---|
| **COMPANY NAME:** | SAMSUNG ELECTRONICS CO., LTD. |
| **EUT DESCRIPTION:** | GSM/WCDMA/LTE Phone + BT/BLE, DTS b/g/n |
| **MODEL NUMBER:** | SM-J320F/DS, SM-J320F, SM-J320G/DS |
| **SERIAL NUMBER:** | 4200636ACE09A200 (RADIATED); 42006DBED0E0A200 (CONDUCTED) |
| **DATE TESTED:** | DEC 03, 2015 – JAN 11, 2016 |

| APPLICABLE STANDARDS | |
|---|---|
| **STANDARD** | **TEST RESULTS** |
| CFR 47 Part 15 Subpart C | Pass |

UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

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CY Choi
Suwon Lab Engineer
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Tested By:

SungGil Park
Suwon Lab Engineer
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# 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

# 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

| 218 Maeyeong-ro |
|---|
| ☒ Chamber 1 |
| ☒ Chamber 2 |

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# 4. CALIBRATION AND UNCERTAINTY

## 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

## 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

## 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| PARAMETER | UNCERTAINTY |
|---|---|
| Conducted Disturbance, 0.15 to 30 MHz | 2.32 dB |
| Radiated Disturbance, Below 1GHz | 4.14 dB |
| Radiated Disturbance, Above 1 GHz | 5.97 dB |

Uncertainty figures are valid to a confidence level of 95%.


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# 5. EQUIPMENT UNDER TEST

## 5.1. DESCRIPTION OF EUT

The EUT is GSM/WCDMA/LTE Phone + BT/BLE, DTS b/g/n.
This test report addresses the DSS (BT) operational mode.

SM-J320F, SM-J320F/DS and SM-J320G/DS are same hardware but for different number of SIM card slot. SM-J320F has one slot. SM-J320F/DS and SM-J320G/DS are dual SIM version.

Also SM-J320F and SM-J320G/DS didn't support non-USA LTE band(disabled by SW).

SM-J320F/DS was used for the test.

## 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

| Frequency Range [MHz] | Mode | Power Mode | Output Power [dBm] | Output Power [mW] |
|---|---|---|---|---|
| 2402 - 2480 | Basic GFSK | Average | 10.17 | 10.39 |
| | | Peak | 10.47 | 11.15 |
| | Enhanced Pi/4-DPSK | Average | 9.68 | 9.29 |
| | | Peak | 11.71 | 14.83 |
| | Enhanced 8PSK | Average | 9.69 | 9.31 |
| | | Peak | 11.97 | 15.72 |

Note: GFSK, Pi/4-DQPSK, 8PSK average Power are all investigated, The GFSK & 8PSK Power are the worst case. Testing is based on this mode to showing compliance. For average power data please refer to section 8.6.

## 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -5.37 dBi.

## 5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.


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## 5.5. DESCRIPTION OF TEST SETUP

**SUPPORT EQUIPMENT**

| Support Equipment List | | | | |
|---|---|---|---|---|
| Description | Manufacturer | Model | Serial Number | FCC ID |
| Charger | SAMSUNG | ETA0U83EWE | DW1FC09KS/A-E | N/A |
| Data Cable | SAMSUNG | ECB-DU68WE | N/A | N/A |
| Earphone | SAMSUNG | EHS61ASFWE | N/A | N/A |

**I/O CABLES**

| I/O Cable List | | | | | | |
|---|---|---|---|---|---|---|
| Cable No | Port | # of identical ports | Connector Type | Cable Type | Cable Length (m) | Remarks |
| 1 | DC Power | 1 | Mini-USB | Shielded | 0.8m | N/A |
| 1 | Audio | 1 | Mini-Jack | Unshielded | 1.0m | N/A |

**TEST SETUP**

The EUT is continuously communicating to the Bluetooth tester during the tests.
EUT was set in the Hidden menu mode to enable BT communications.


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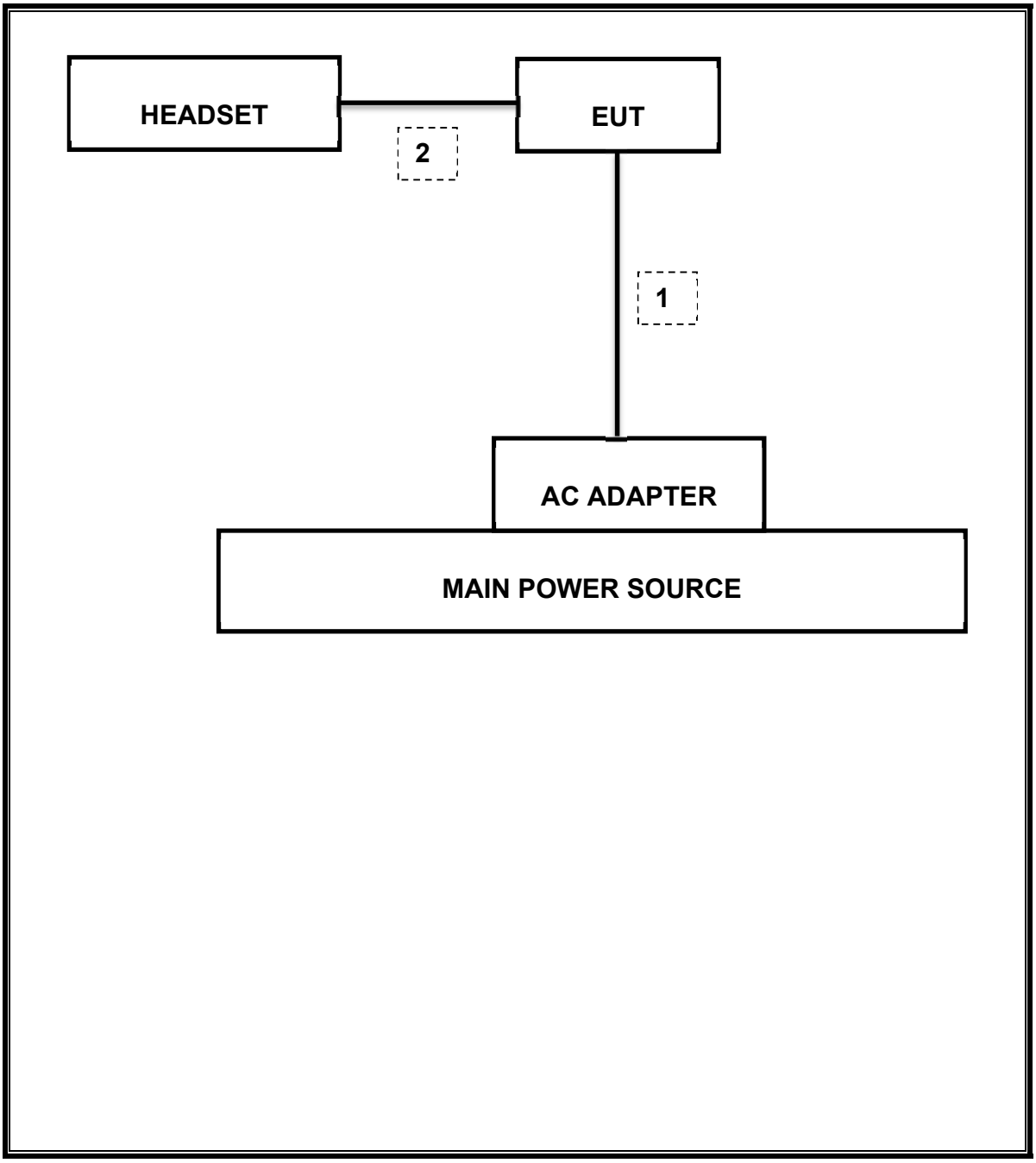
**SETUP DIAGRAM FOR TESTS**





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# 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

| Test Equipment List | | | | |
|---|---|---|---|---|
| Description | Manufacturer | Model | S/N | Cal Due |
| Antenna, Bilog, 30MHz-1GHz | SCHWARZBECK | VULB9163 | 750 | 11-17-16 |
| Antenna, Bilog, 30MHz-1GHz | SCHWARZBECK | VULB9163 | 749 | 04-25-17 |
| Antenna, Horn, 18 GHz | ETS | 3115 | 00167211 | 09-26-16 |
| Antenna, Horn, 18 GHz | ETS | 3115 | 00161451 | 05-17-17 |
| Antenna, Horn, 18 GHz | ETS | 3117 | 00168724 | 06-17-17 |
| Antenna, Horn, 18 GHz | ETS | 3117 | 00168717 | 06-17-17 |
| Antenna, Horn, 40 GHz | ETS | 3116C | 00166155 | 09-23-16 |
| Antenna, Horn, 40 GHz | ETS | 3116C-PA | 00168841 | 08-24-17 |
| Preamplifier, 1000 MHz | Sonoma | 310N | 341282 | 08-18-16 |
| Preamplifier, 1000 MHz | Sonoma | 310N | 351741 | 08-18-16 |
| Preamplifier, 18 GHz | Miteq | AFS42-00101800-25-S-42 | 1876511 | 08-18-16 |
| Preamplifier, 18 GHz | Miteq | AFS42-00101800-25-S-42 | 1896138 | 08-18-16 |
| Spectrum Analyzer, 44 GHz | Agilent / HP | N9030A | MY54170614 | 08-19-16 |
| Spectrum Analyzer, 44 GHz | Agilent / HP | N9030A | MY54490312 | 08-19-16 |
| Bluetooth Tester | TESCOM | TC-3000C | 3000C000546 | 08-18-16 |
| Average Power Sensor | R&S | NRZ-Z91 | 102681 | 08-18-16 |
| Average Power Sensor | Agilent / HP | U2000 | MY54270007 | 08-18-16 |
| EMI Test Receive, 40 GHz | R&S | ESU40 | 100439 | 08-19-16 |
| EMI Test Receive, 40 GHz | R&S | ESU40 | 100457 | 08-19-16 |
| EMI Test Receive, 3 GHz | R&S | ESR3 | 101832 | 08-19-16 |
| Attenuator / Switch driver | HP | 11713A | 3748A04272 | N/A |
| Low Pass Filter 3GHz | Micro-Tronics | LPS17541 | 009 | 08-18-16 |
| Low Pass Filter 3GHz | Micro-Tronics | LPS17541 | 015 | 08-18-16 |
| High Pass Filter 5GHz | Micro-Tronics | HPS17542 | 009 | 08-18-16 |
| High Pass Filter 6GHz | Micro-Tronics | HPM17543 | 010 | 08-18-16 |
| High Pass Filter 5GHz | Micro-Tronics | HPS17542 | 016 | 08-18-16 |
| High Pass Filter 6GHz | Micro-Tronics | HPM17543 | 015 | 08-18-16 |
| LISN | R&S | ENV-216 | 101836 | 08-19-16 |
| LISN | R&S | ENV-216 | 101837 | 08-19-16 |
| Combiner | WEINSCHEL | 1575 | 2151 | 08-20-16 |


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# 7. SUMMARY TABLE

| FCC Part Section | Test Description | Test Limit | Test Condition | Test Result | Worst Case |
|---|---|---|---|---|---|
| 2.1049 | Occupied Band width (99%) | N/A | Conducted | Pass | 1.194 MHz |
| 2.1051, 15.247 (d) | Band Edge / Conducted Spurious Emission | -20dBc | | Pass | -44.558 dBm |
| 15.247 (b)(1) | TX conducted output power | <21dBm | | Pass | 11.965 dBm (Peak) |
| 15.247 (a)(1) | Hopping frequency separation | > 25KHz | | Pass | 1 MHz |
| 15.247 (a)(1)(iii) | Number of Hopping channels | More than 15 non-overlapping channels | | Pass | 79 |
| 15.247 (a)(1)(iii) | Avg Time of Occupancy | < 0.4sec | | Pass | 0.349 sec |
| 15.207 (a) | AC Power Line conducted emissions | Section 10 | Power Line conducted | Pass | 46.93 dBuV (QP) |
| 15.205, 15.209 | Radiated Spurious Emission | < 54dBuV/m | Radiated | Pass | 43.52 dBuV/m (AV) |


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# 8. ANTENNA PORT TEST RESULTS

## 8.1. 20 dB AND 99% BANDWIDTH

**LIMITS**

None; for reporting purposes only.

**TEST PROCEDURE**

DA 00-705: The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

**RESULTS**

### 8.1.1. BASIC DATA RATE GFSK MODULATION

| Channel | Frequency [MHz] | 20 dB Bandwidth [MHz] | 99% Bandwidth [MHz] |
|---|---|---|---|
| Low | 2402 | 0.894 | 0.830 |
| Mid | 2441 | 0.824 | 0.828 |
| High | 2480 | 0.827 | 0.857 |
| Worst | | 0.894 | 0.857 |

### 8.1.2. ENHANCED DATA RATE Pi/4-DQPSK MODULATION

| Channel | Frequency [MHz] | 20 dB Bandwidth [MHz] | 99% Bandwidth [MHz] |
|---|---|---|---|
| Low | 2402 | 1.255 | 1.164 |
| Mid | 2441 | 1.256 | 1.164 |
| High | 2480 | 1.256 | 1.164 |
| Worst | | 1.256 | 1.164 |

### 8.1.3. ENHANCED DATA RATE 8PSK MODULATION

| Channel | Frequency [MHz] | 20 dB Bandwidth [MHz] | 99% Bandwidth [MHz] |
|---|---|---|---|
| Low | 2402 | 1.241 | 1.164 |
| Mid | 2441 | 1.222 | 1.194 |
| High | 2480 | 1.222 | 1.164 |
| Worst | | 1.241 | 1.194 |


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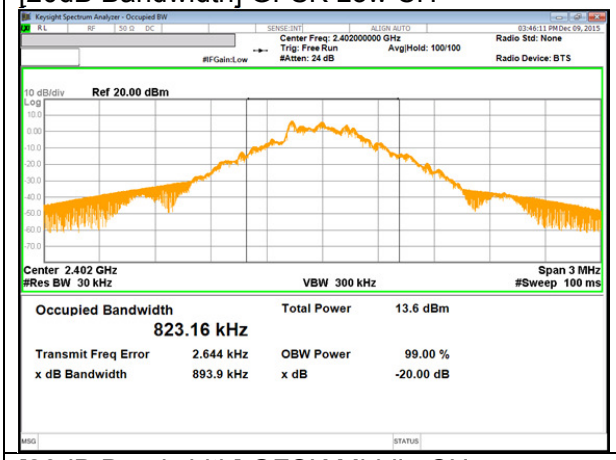
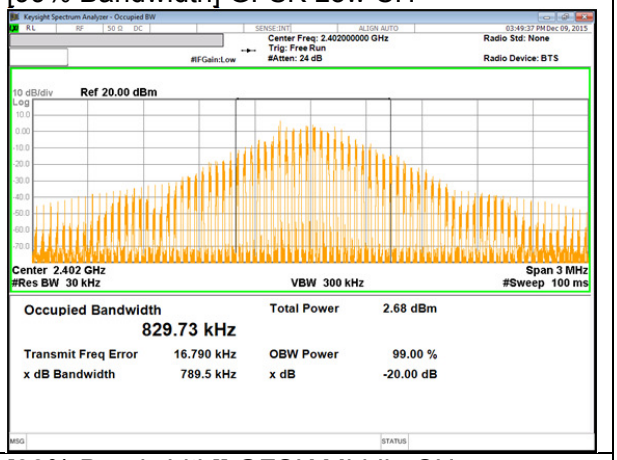
## 8.1.4. 20 dB AND 99% BANDWIDTH PLOTS

**GFSK BANDWIDTH**

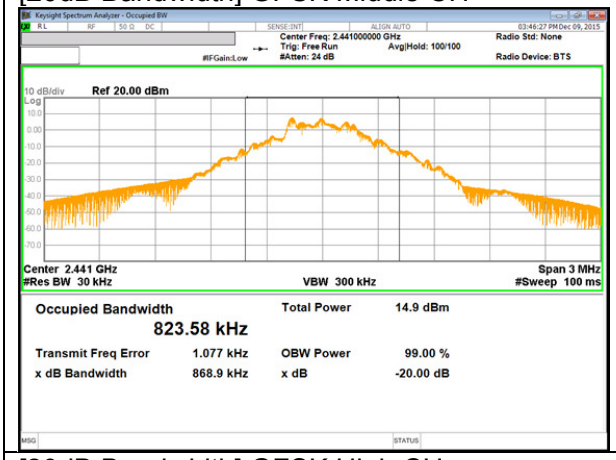
[20dB Bandwidth] GFSK Low CH



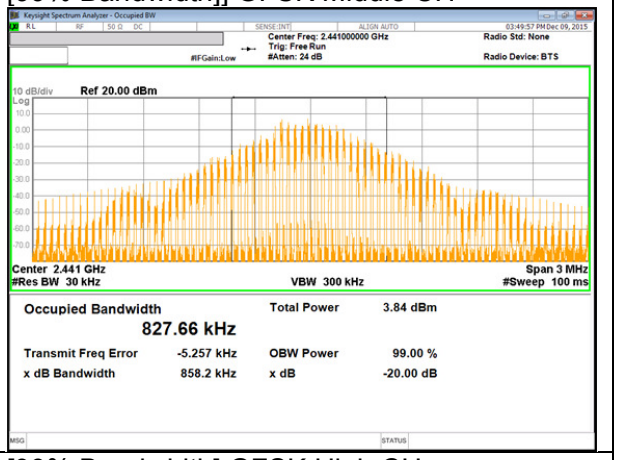

[99% Bandwidth] GFSK Low CH



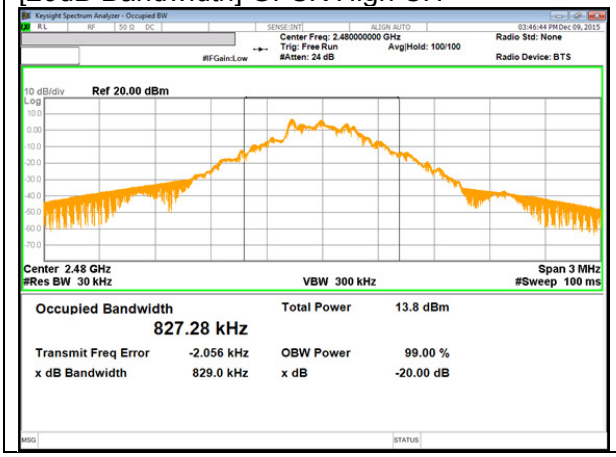

[20dB Bandwidth] GFSK Middle CH



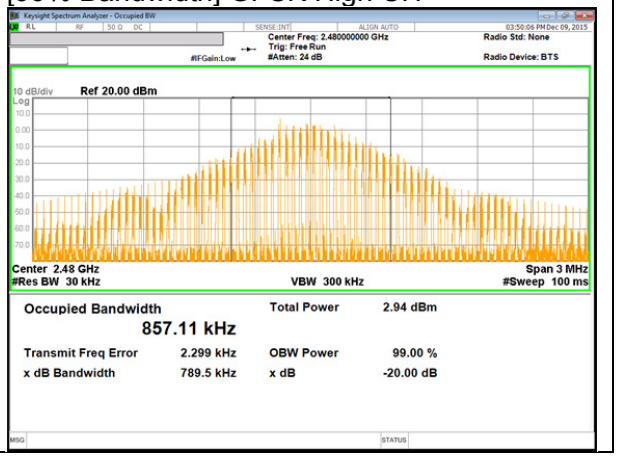

[99% Bandwidth]] GFSK Middle CH




[20dB Bandwidth] GFSK High CH




[99% Bandwidth] GFSK High CH





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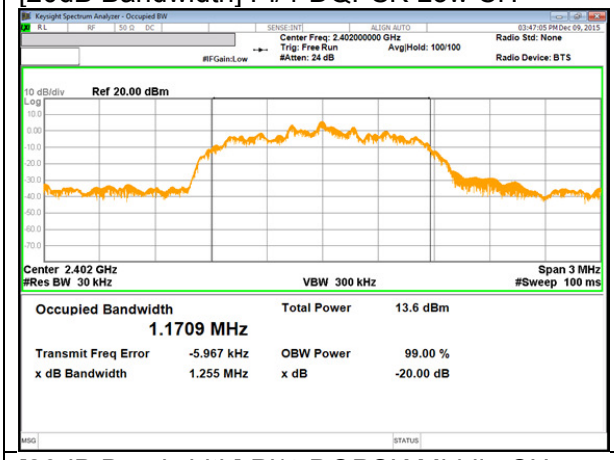
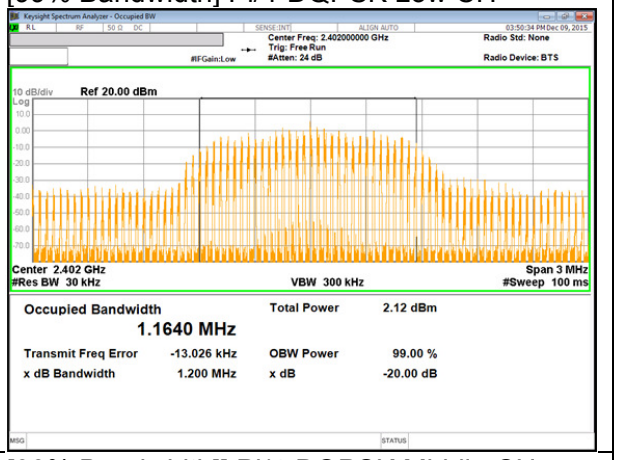
**Pi/4-DQPSK BANDWIDTH**

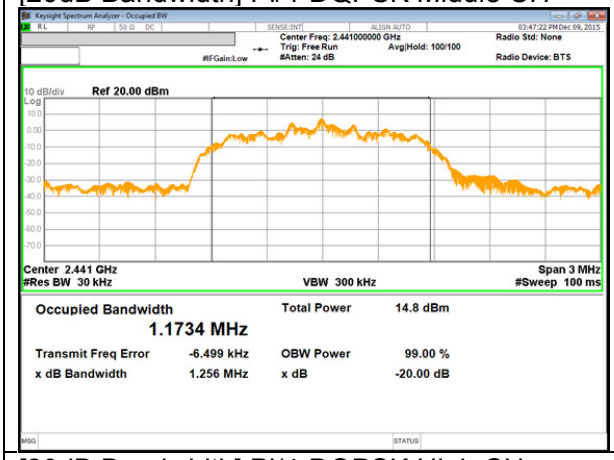
[20dB Bandwidth] Pi/4-DQPSK Low CH



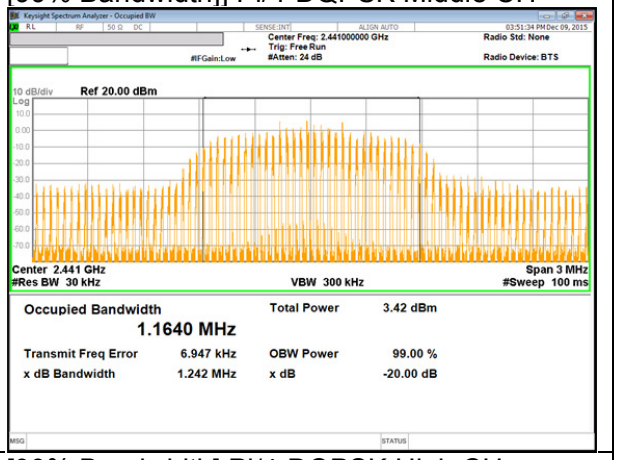

[99% Bandwidth] Pi/4-DQPSK Low CH



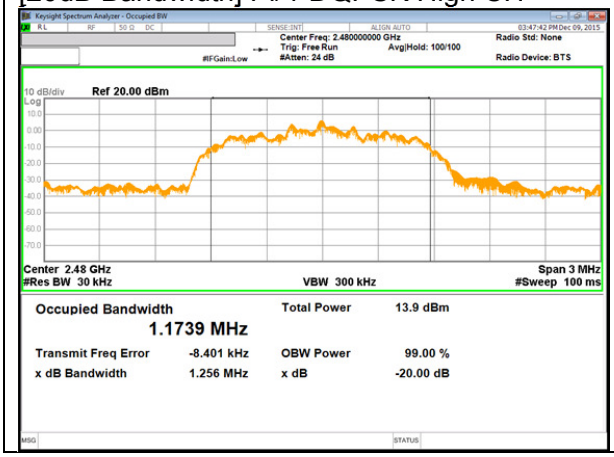

[20dB Bandwidth] Pi/4-DQPSK Middle CH



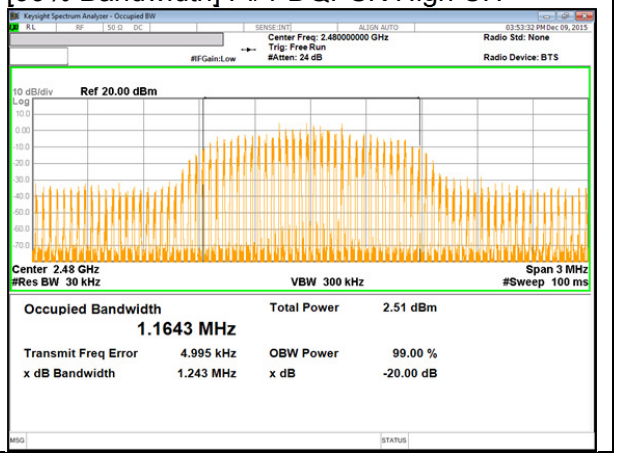

[99% Bandwidth]] Pi/4-DQPSK Middle CH




[20dB Bandwidth] Pi/4-DQPSK High CH




[99% Bandwidth] Pi/4-DQPSK High CH



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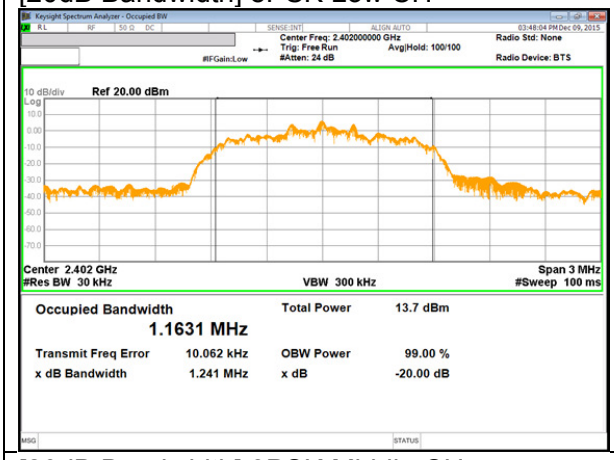
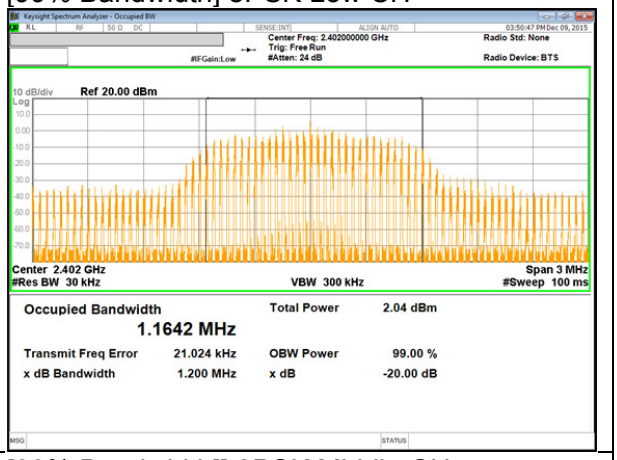
**8PSK BANDWIDTH**

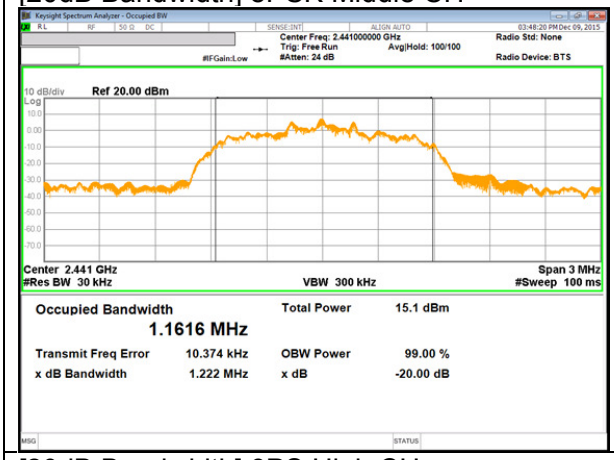
[20dB Bandwidth] 8PSK Low CH



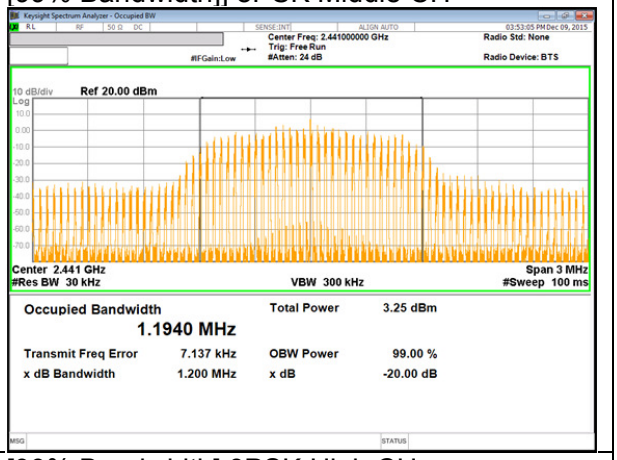

[99% Bandwidth] 8PSK Low CH



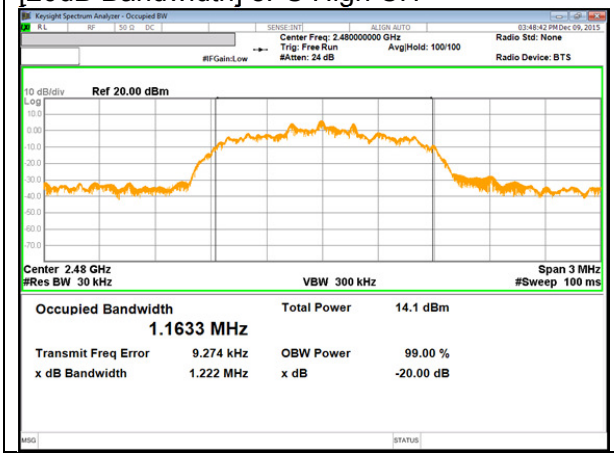

[20dB Bandwidth] 8PSK Middle CH



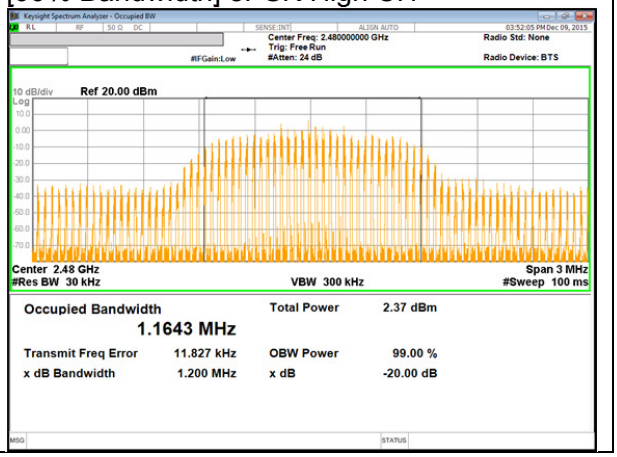

[99% Bandwidth]] 8PSK Middle CH




[20dB Bandwidth] 8PS High CH




[99% Bandwidth] 8PSK High CH



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## 8.2. HOPPING FREQUENCY SEPARATION

**LIMIT**

FCC §15.247 (a) (1)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

**TEST PROCEDURE**

DA 00-705: The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

**RESULTS**


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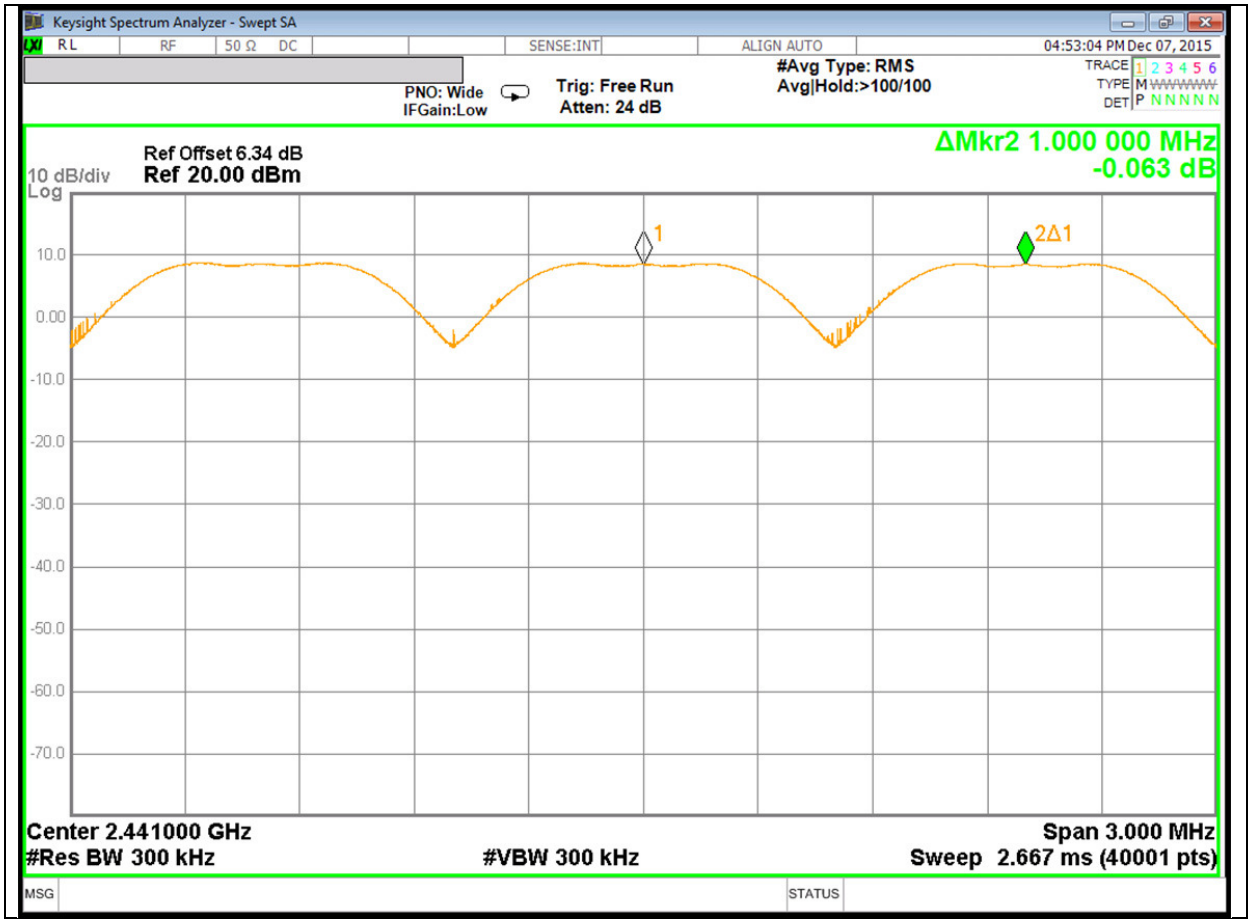
**HOPPING FREQUENCY SEPARATION PLOT**



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## 8.3. NUMBER OF HOPPING CHANNELS

**LIMIT**

FCC §15.247 (a) (1) (iii)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

**TEST PROCEDURE**

DA 00-705: The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

**RESULTS**

Normal Mode: 79 Channels observed.


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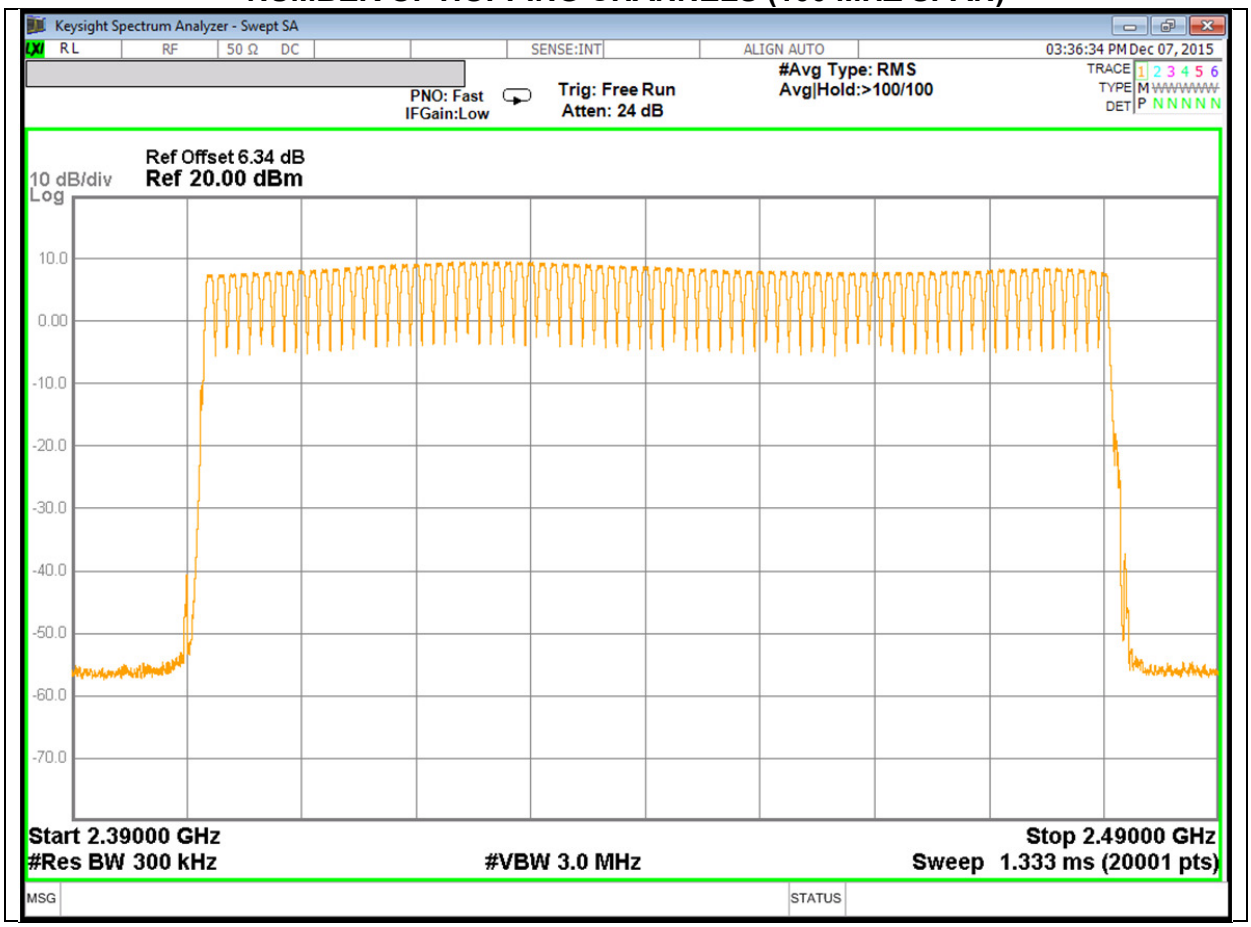
**NUMBER OF HOPPING CHANNELS PLOTS**

## NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)





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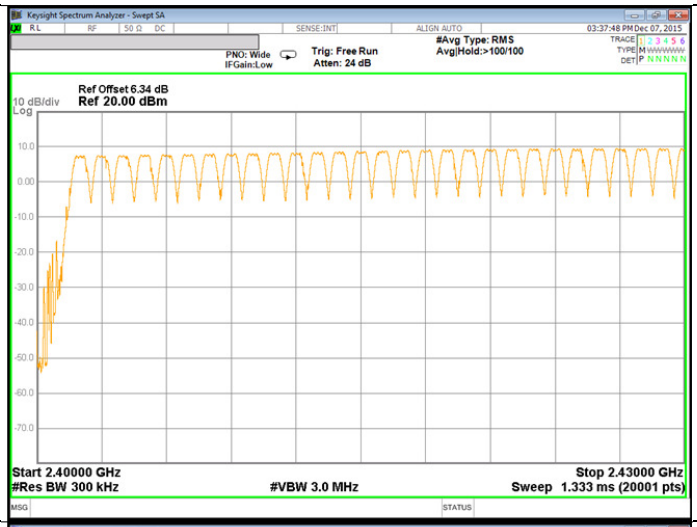
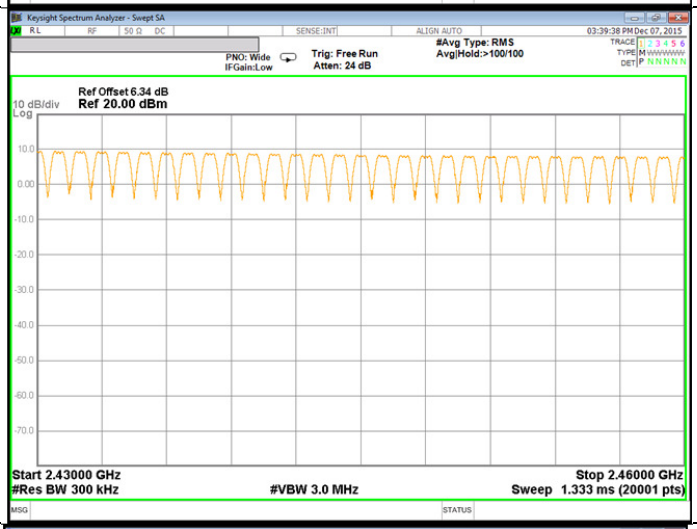
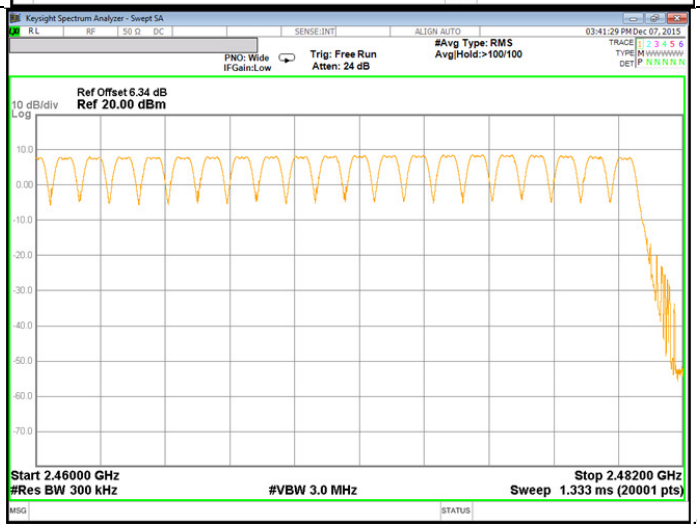
| | | |
|---|---|---|
| 1st SEGMENT<br>2400 to 2430 MHz | |  |
| 2nd SEGMENT<br>2430 to 2460 MHz | |  |
| 3rd SEGMENT<br>2460 to 2482 MHz | |  |



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## 8.4. AVERAGE TIME OF OCCUPANCY

**LIMIT**

FCC §15.247 (a) (1) (iii)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to 10 * (# of pulses in 0.8 s) * pulse width.

**RESULTS**

| DH Packet | Pulse Width [msec] | Number of Pulses in 3.16 seconds | Average Time of Occupancy [sec] | Limit [sec] | Margin [sec] |
|---|---|---|---|---|---|
| GFSK Normal | | | | | |
| DH1 | 0.411 | 32 | 0.131456 | 0.4 | -0.2685 |
| DH3 | 1.667 | 17 | 0.283390 | 0.4 | -0.1166 |
| DH5 | 2.915 | 12 | 0.349800 | 0.4 | -0.0502 |
| | | | | | |
| DH Packet | Pulse Width [msec] | Number of Pulses in 0.8 seconds | Average Time of Occupancy [sec] | Limit [sec] | Margin [sec] |
| GFSK AFH | | | | | |
| DH1 | 0.411 | 8 | 0.032864 | 0.4 | -0.36714 |
| DH3 | 1.667 | 4.25 | 0.070848 | 0.4 | -0.32915 |
| DH5 | 2.915 | 3 | 0.087450 | 0.4 | -0.31255 |


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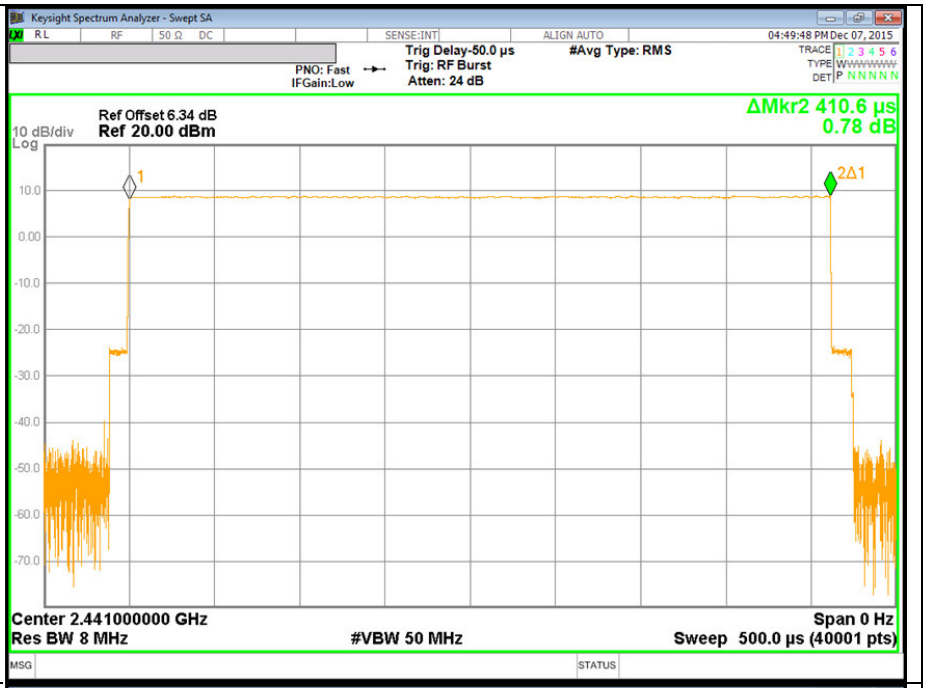
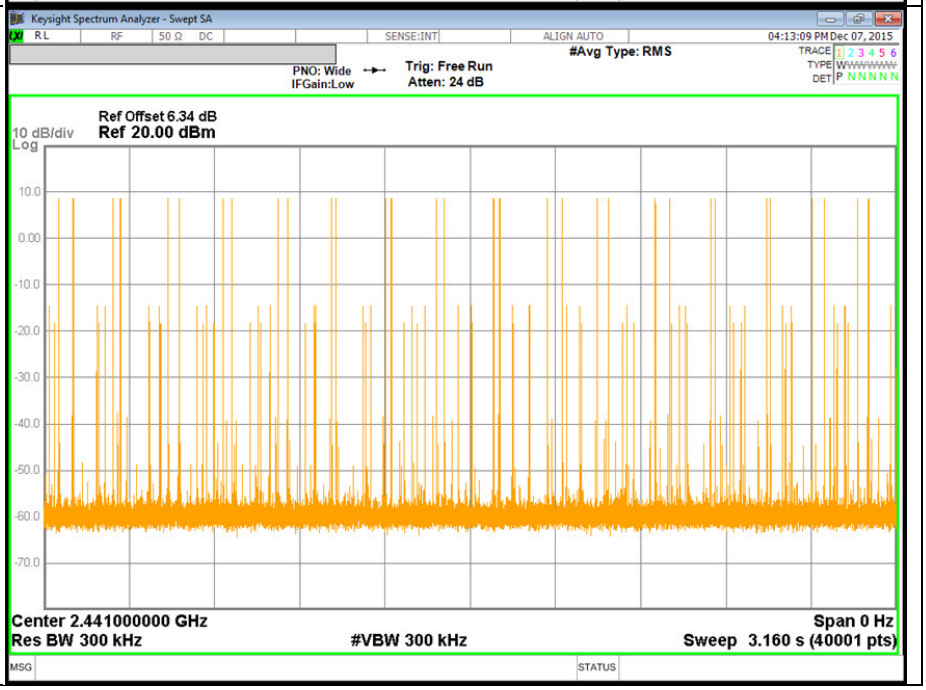
## DH1

| | |
|---|---|
| DH1<br><br>Pulse Width |  |
| DH1<br><br>NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD |  |



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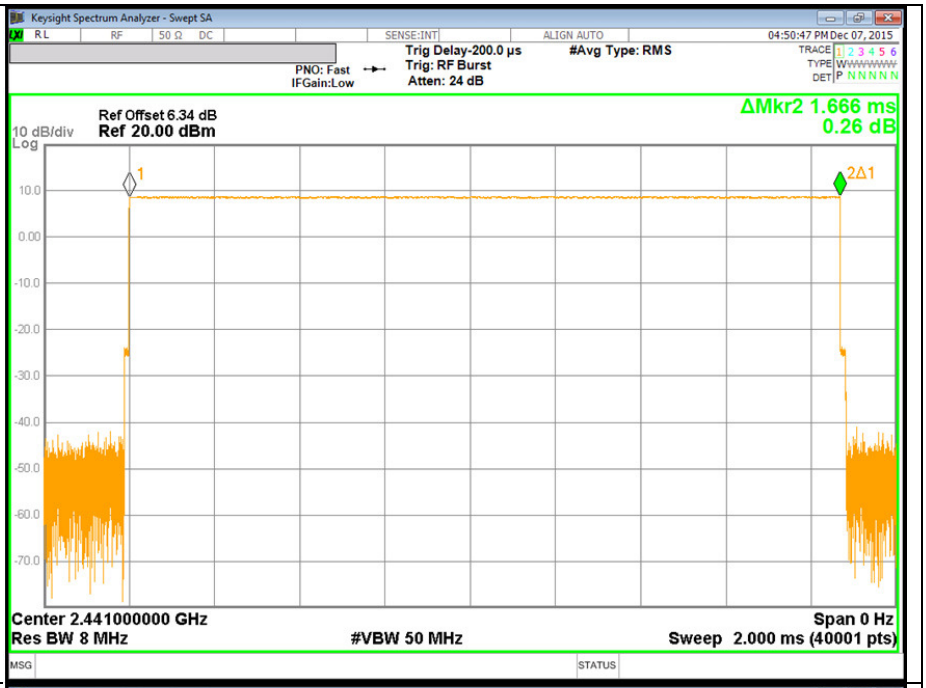
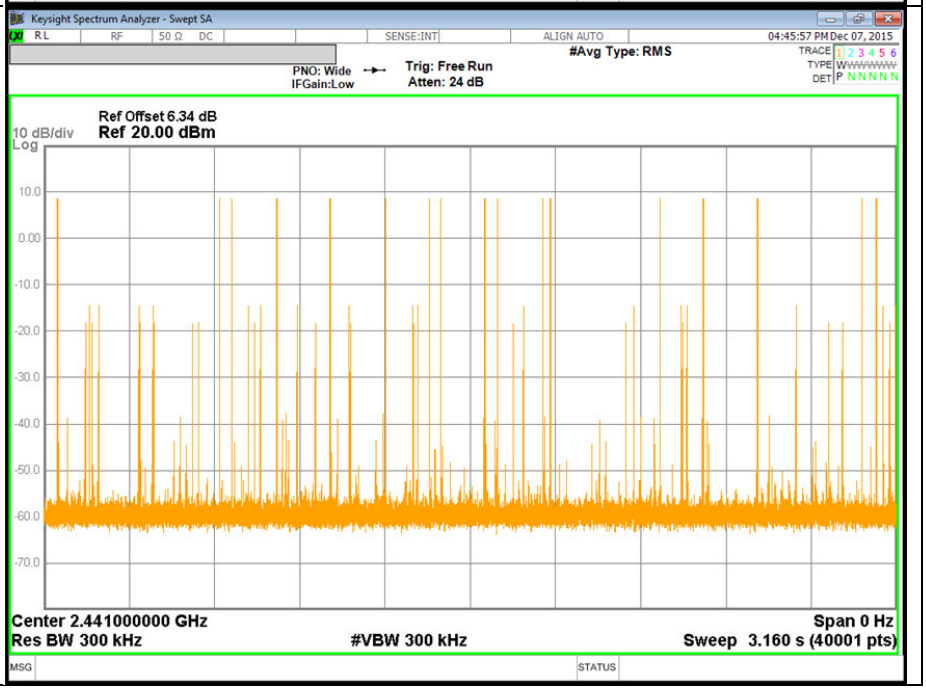
## DH3

| | |
|---|---|
| DH3<br><br>Pulse Width |  |
| DH3<br><br>NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD |  |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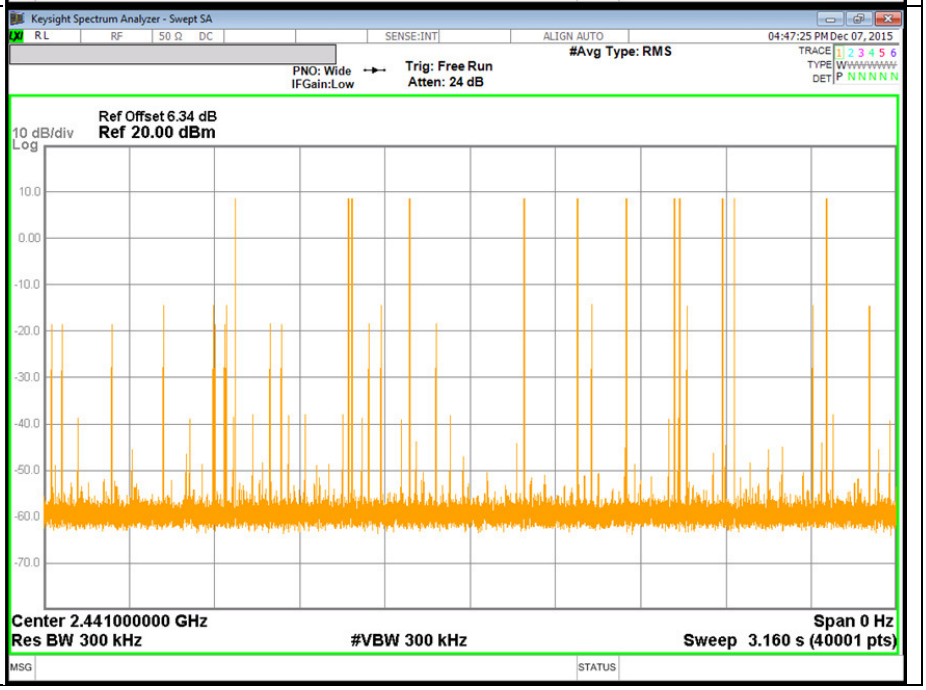
## DH5

| | |
|---|---|
| DH5<br><br>Pulse Width |  |
| DH5<br><br>NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD |  |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## 8.5. OUTPUT POWER

**LIMIT**

§15.247 (b) (1)

The maximum antenna gain is less than 6 dBi, therefore the limit is 21 dBm.

**TEST PROCEDURE**

DA 00-705: The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

**RESULTS**

### 8.5.1. BASIC DATA RATE GFSK MODULATION

| Channel | Frequency [MHz] | Output Power [dBm] | Limit [dBm] | Margin [dB] |
|---|---|---|---|---|
| Low | 2402 | 9.435 | 21 | -11.565 |
| Middle | 2441 | 10.473 | 21 | -10.527 |
| High | 2480 | 8.969 | 21 | -12.031 |
| Worst | | 10.473 | 21 | -10.527 |

### 8.5.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

| Channel | Frequency [MHz] | Output Power [dBm] | Limit [dBm] | Margin [dB] |
|---|---|---|---|---|
| Low | 2402 | 10.820 | 21 | -10.180 |
| Middle | 2441 | 11.711 | 21 | -9.289 |
| High | 2480 | 9.984 | 21 | -11.016 |
| Worst | | 11.711 | 21 | -9.289 |

### 8.5.3. ENHANCED DATA RATE 8PSK MODULATION

| Channel | Frequency [MHz] | Output Power [dBm] | Limit [dBm] | Margin [dB] |
|---|---|---|---|---|
| Low | 2402 | 11.123 | 21 | -9.877 |
| Middle | 2441 | 11.965 | 21 | -9.035 |
| High | 2480 | 10.134 | 21 | -10.866 |
| Worst | | 11.965 | 21 | -9.035 |


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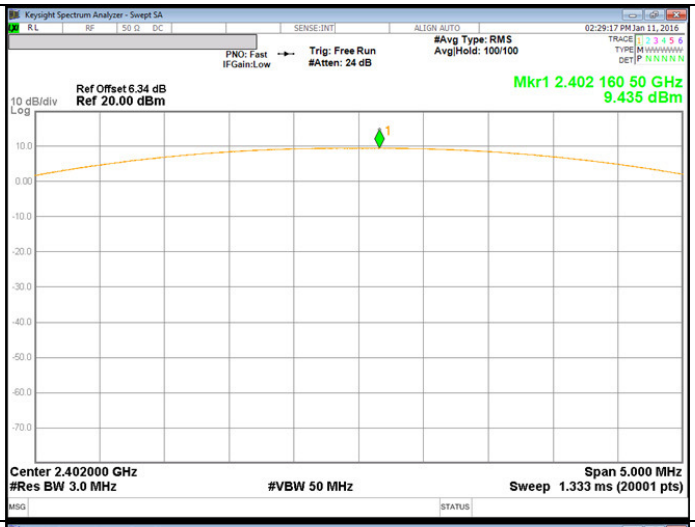
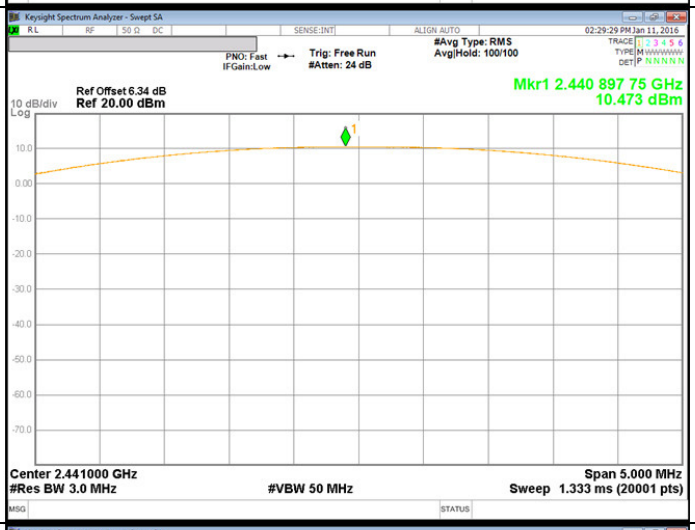
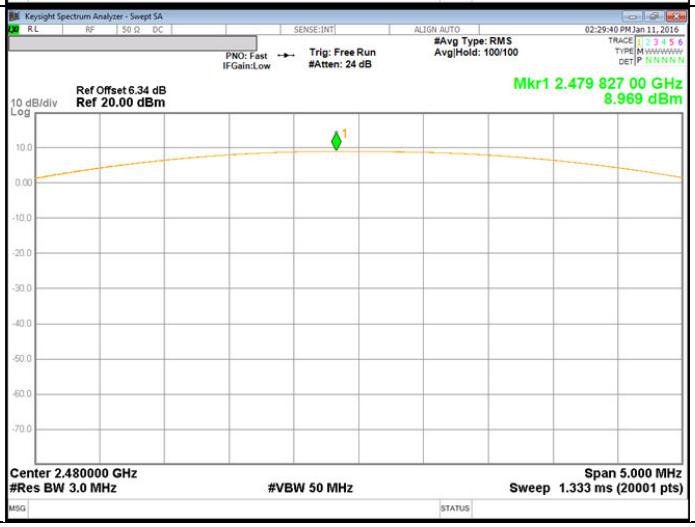
## 8.5.4. OUTPUT POWER PLOTS

**GFSK OUTPUT POWER**

| | | |
|---|---|---|
| GFSK<br>Low CH | |  | |
| GFSK<br>Middle CH | |  | |
| GFSK<br>High CH | |  | |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