

FCC Test Report

Report No.: AGC08506200703FE03

| FCC ID | |
|---------------------|--|
| APPLICATION PURPOSE | : Original Equipment |
| PRODUCT DESIGNATION | : HUSH ANC EVT |
| BRAND NAME | : 233621 |
| MODEL NAME | : 233621 Hush |
| APPLICANT | : Shenzhen Grandsun Electronic Co., Ltd. |
| DATE OF ISSUE | : July 31, 2020 |
| STANDARD(S) | : FCC Part 15.247 |
| REPORT VERSION | : V1.0 |

Attestation of Global Compliance (Shenzhen) Co., Ltd

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REPORT REVISE RECORD

| Report Version | Revise Time | Issued Date | Valid Version | Notes |
|-----------------------|-------------|---------------|---------------|-----------------|
| V1.0 | | July 31, 2020 | Valid | Initial Release |

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1. VERIFICATION OF CONFORMITY

| Applicant | Shenzhen Grandsun Electronic Co., Ltd. | | | | |
|--------------------------|---|--|--|--|--|
| Address | Gaoqiao Industry Zone, Pingdi Town, Longgang District, Shenzhen, China (PC:518117) | | | | |
| Manufacturer | Shenzhen Grandsun Electronic Co., Ltd. | | | | |
| Address | Gaoqiao Industry Zone, Pingdi Town, Longgang District, Shenzhen, China (PC:518117) | | | | |
| Factory | Shenzhen Grandsun Electronic Co., Ltd. | | | | |
| Address | Gaoqiao Industry Zone, Pingdi Town, Longgang District, Shenzhen, China (PC:518117) | | | | |
| Product Designation | HUSH ANC EVT | | | | |
| Brand Name | 233621 | | | | |
| Test Model | 233621 Hush | | | | |
| Date of test | July 20, 2020 to July 31, 2020 | | | | |
| Deviation | No any deviation from the test method | | | | |
| Condition of Test Sample | Normal | | | | |
| Test Result | Pass | | | | |
| Report Template | AGCRT-US-BR/RF | | | | |

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC PART 15.247.

Prepared By

Jonjon Aucorg

Donjon Huang Project Engineer

July 31, 2020

Reviewed By

Max Zhan

Max Zhang Reviewer

July 31, 2020

Approved By

Lower

Forrest Lei Authorized Officer

July 31, 2020

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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as "HUSH ANC EVT". It is designed by way of utilizing the GFSK, Pi/4 DQPSK and 8DPSK technology to achieve the system operation.

A major technical description of EUT is described as following

| Operation Frequency | 2.402GHz to 2.480GHz |
|---------------------|--|
| RF Output Power | 2.599dBm(Max) |
| Bluetooth Version | V5.0 |
| Modulation | BR ⊠GFSK, EDR ⊠π /4-DQPSK, ⊠8DPSK BLE ⊠GFSK 1Mbps □GFSK 2Mbps |
| Number of Channels | 79 Channels |
| Hardware Version | V03 |
| Software Version | V1.1.8 |
| Antenna Designation | PCB Antenna(Comply with requirements of the FCC part 15.203) |
| Antenna Gain | 3dBi |
| Power Supply | DC 3.7V by battery |

2.2. TABLE OF CARRIER FREQUENCYS

| Channel Number | Frequency |
|----------------|--|
| 0 | 2402MHZ |
| | 2403MHZ |
| | |
| 38 | 2440 MHZ |
| 39 | 2441 MHZ |
| 40 | 2442 MHZ |
| | |
| 77 | 2479 MHZ |
| 78 | 2480 MHZ |
| | 0 1 : 38 39 40 : 77 |

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2.3. RECEIVER INPUT BANDWIDTH

The input bandwidth of the receiver is 1.3MHZ, In every connection one Bluetooth device is the master and the other one is 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. Additionally the type of connection(e.g. single of multislot packet) 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.

Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

2.4. EXAMPLE OF A HOPPING SEQUENCY IN DATA MODE

Example of a 79 hopping sequence in data mode: 40,21,44,23,42,53,46,55,48,33,52,35,50,65,54,67 56,37,60,39,58,69,62,71,64,25,68,27,66,57,70,59 72,29,76,31,74,61,78,63,01,41,05,43,03,73,07,75 09,45,13,47,11,77,15,00,64,49,66,53,68,02,70,06 01, 51, 03, 55, 05, 04

2.5. EQUALLY AVERAGE USE OF FREQUENCIES AND BEHAVIOUR

The generation of the hopping sequence in connection mode depends essentially on two input values: 1. LAP/UAP of the master of the connection.

2. Internal master clock

The LAP(lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP(upper address part) are the 24MSB's of the 48BD_ADDRESS

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For ehavior zation with other units only offset are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5us.The clock has a cycle of about one day(23h30).In most case it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire. LAP(24 bits),4LSB's(4bits)(Input 1) and the 27MSB's of the clock(Input 2) are used. With this input values different mathematical procedures(permutations, additions, XOR-operations)are performed to generate te Sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following ehavior:

The first connection between the two devices is established, a hopping sequence was generated. For Transmitting the wanted data the complete hopping sequence was not used. The connection ended. The second connection will be established. A new hopping sequence is generated. Due to the fact the Bluetooth clock has a different value, because the period between the two transmission is longer(and it Cannot be shorter) than the minimum resolution of the clock(312.5us).The hopping sequence will always Differ from the first one.

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2.6. RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for FCC ID: filing to comply with the FCC PART 15.247 requirements.

2.7. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013). Radiated testing was performed at an antenna to EUT distance 3 meters.

2.8. SPECIAL ACCESSORIES

Refer to section 5.2.

2.9. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

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3. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ±U, where expended uncertainty U is based on a standard

uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

- Uncertainty of Conducted Emission, Uc = ±3.1 dB
- Uncertainty of Radiated Emission below 1GHz, Uc = ±4.0 dB
- Uncertainty of Radiated Emission above 1GHz, Uc = ±4.8 dB
- Uncertainty of total RF power, conducted, $Uc = \pm 0.8$ dB
- Uncertainty of spurious emissions, conducted, Uc = ±2.7dB
- Uncertainty of Occupied Channel Bandwidth: Uc = ± 2 %
- Uncertainty of Dwell Time: $Uc = \pm 2\%$
- Uncertainty of Frequency: $Uc = \pm 2\%$

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4. DESCRIPTION OF TEST MODES

| NO. | TEST MODE DESCRIPTION |
|-----|--------------------------|
| 1 | Low channel GFSK |
| 2 | Middle channel GFSK |
| 3 | High channel GFSK |
| 4 | Low channel π/4-DQPSK |
| 5 | Middle channel π/4-DQPSK |
| 6 | High channel π/4-DQPSK |
| 7 | Low channel 8DPSK |
| 8 | Middle channel 8DPSK |
| 9 | High channel 8DPSK |
| 10 | Hopping mode GFSK |
| 11 | Hopping mode π/4-DQPSK |
| 12 | Hopping mode 8DPSK |

Note: 1. Only the result of the worst case was recorded in the report, if no other cases.

2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.

3. For Conducted Test method, a temporary antenna connector is provided by the manufacture.

Software Setting

| | ices | | | | | | | | - |
|------|--------------|----------|-----------|-------------|------------|-----------|---------------|---------|-----|
| | rt ID Add | Add Pla | | Address Typ | State | Role | Authenticatic | Version | |
| | | | | vice | | | | | |
| | | Name DUT | rt Interf | ace | | | | | |
| | | COM Num | | | 💠 Baudr | ate (bps) | 115200 🔻 | | |
| Tra | ces | | | Auto Deteo | | | | | |
| | Local Device | Chip Ve | ersion [1 | 000 | - C | onnect | Stop | | |
| G | | 🔽 RST E | nable | | | OK | Cancel | | - 0 |
| | | | | | | | | | |
| 0 | | | | | | | | | |
| C II | | | | | | | | | |
| | | | | | | | | | |
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5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM

Radiated Emission Configure :



Conducted Emission Configure :

| | 3 | | |
|-----|---|----|---|
| EUT | 0 | AE | Ξ |
| | | | |

5.2. EQUIPMENT USED IN TESTED SYSTEM

| ltem | Equipment | Model No. | ID or Specification | Remark |
|------|--------------|-------------|---------------------|--------|
| 1 | HUSH ANC EVT | 233621 Hush | | EUT |
| 2 | Control Box | N/A | USB-TTL | AE |

5.3. SUMMARY OF TEST RESULTS

| FCC RULES | DESCRIPTION OF TEST | RESULT |
|--------------------|-----------------------------|-----------|
| 15.247 (b)(1) | Peak Output Power | Compliant |
| 15.247 (a)(1) | 20 dB Bandwidth | Compliant |
| 15.247 (d) | Conducted Spurious Emission | Compliant |
| 15.209 | Radiated Emission | Compliant |
| 15.247 (a)(1)(iii) | Number of Hopping Frequency | Compliant |
| 15.247 (a)(1)(iii) | Time of Occupancy | Compliant |
| 15.247 (a)(1) | Frequency Separation | Compliant |
| 15.207 | Conducted Emission | N/A |

Note: 1.N/A means not applicable in this report.

2.The EUT is powered by battery.

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6. TEST FACILITY

| Test Site | Attestation of Global Compliance (Shenzhen) Co., Ltd |
|--------------------------------------|---|
| Location | 1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China |
| Designation Number | CN1259 |
| FCC Test Firm Registration Number | 975832 |
| A2LA Cert. No. | 5054.02 |
| Description | Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by A2LA |

TEST EQUIPMENT OF RADIATED EMISSION TEST

| Equipment | Manufacturer | Model | S/N | Cal. Date | Cal. Due |
|-----------------------------------|-----------------|----------------------|------------|---------------|---------------|
| TEST RECEIVER | R&S | ESCI | 10096 | May 15, 2020 | May 14, 2022 |
| EXA Signal Analyzer | Aglient | N9010A | MY53470504 | Dec. 12, 2019 | Dec. 11, 2020 |
| 2.4GHz Fliter | EM Electronics | 2400-2500MHz | N/A | Mar. 23, 2020 | Mar. 22, 2022 |
| Attenuator | ZHINAN | E-002 | N/A | Sep. 09, 2019 | Sep. 08, 2020 |
| Horn antenna | SCHWARZBE CK | BBHA 9170 | #768 | Sep. 09, 2019 | Sep. 08, 2021 |
| Active loop antenna (9K-30MHz) | ZHINAN | ZN30900C | 18051 | May 22, 2020 | May 21, 2022 |
| Double-Ridged Waveguide Horn | ETS LINDGREN | 3117 | 00034609 | May 17, 2019 | May 16, 2021 |
| Broadband Preamplifier | ETS LINDGREN | 3117PA | 00225134 | Oct. 15, 2019 | Oct. 14, 2020 |
| ANTENNA | SCHWARZBE CK | VULB9168 | 494 | Jan. 09, 2019 | Jan. 08, 2021 |
| Test software | Tonscend | JS32-RE (Ver.2.5) | N/A | N/A | N/A |

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7. PEAK OUTPUT POWER

7.1. MEASUREMENT PROCEDURE

For peak power test:

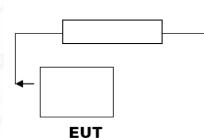
- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2. Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
- 3. RBW > 20 dB bandwidth of the emission being measured.
- 4. VBW ≥RBW.
- 5. Sweep: Auto.
- 6. Detector function: Peak.
- 7. Trace: Max hold.

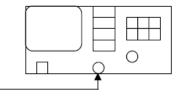
Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

RF Attenuator

PEAK POWER TEST SETUP





Spectrum Analyzer

RF Cable

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7.3. LIMITS AND MEASUREMENT RESULT

| Frequency (GHz) | FOR GFSK MOUE Peak Power (dBm) | Applicable Limits (dBm) | Pass or Fail |
|--------------------|--------------------------------------|----------------------------|--------------|
| 2.402 | 2.599 | 21 | Pass |
| 2.441 | 2.542 | 21 | Pass |
| 2.480 | 2.306 | 21 | Pass |





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| | PEAK OUTPUT POWER MEA FOR II /4-DQPSK M | | |
|--------------------|--|----------------------------|--------------|
| Frequency (GHz) | Peak Power (dBm) | Applicable Limits (dBm) | Pass or Fail |
| 2.402 | 2.562 | 21 | Pass |
| 2.441 | 2.506 | 21 | Pass |
| 2.480 | 2.295 | 21 | Pass |

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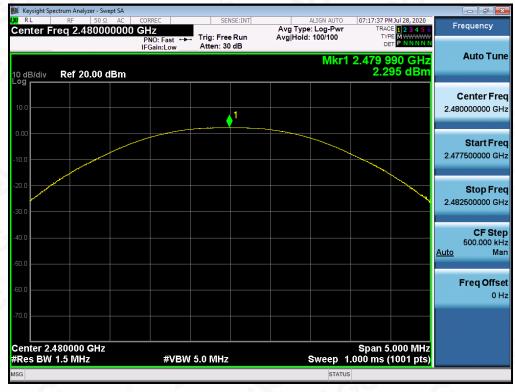
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CH78

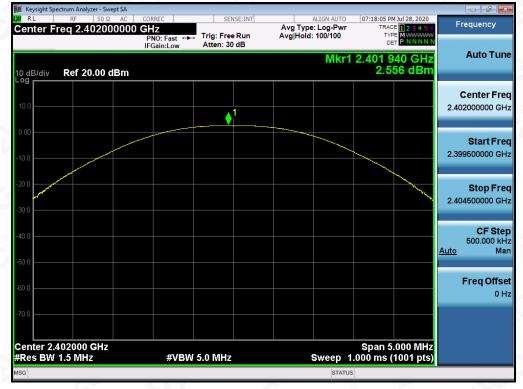


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| | PEAK OUTPUT POWER MEA FOR 8DPSK MOD | | |
|--------------------|--|----------------------------|--------------|
| Frequency (GHz) | Peak Power (dBm) | Applicable Limits (dBm) | Pass or Fail |
| 2.402 | 2.556 | 21 | Pass |
| 2.441 | 2.518 | 21 | Pass |
| 2.480 | 2.301 | 21 | Pass |

CH0



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CH78



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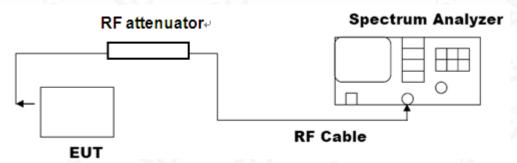


8. 20DB BANDWIDTH

8.1. MEASUREMENT PROCEDURE

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hoping channel The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
- 4. Set SPA Trace 1 Max hold, then View.

8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



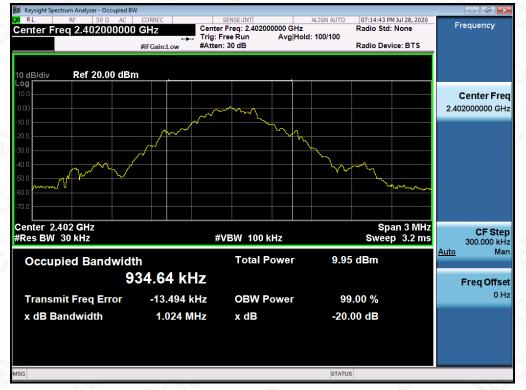
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8.3. LIMITS AND MEASUREMENT RESULTS

| MEASURE | EMENT RESULT FOR GF | SK MOUDULATION | |
|-------------------|---------------------|------------------|------|
| Angliachte Limite | | Measurement Resu | lt |
| Applicable Limits | Test Data | Criteria | |
| | Low Channel | 1.024 | PASS |
| N/A | Middle Channel | 1.049 | PASS |
| | High Channel | 1.049 | PASS |

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



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TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

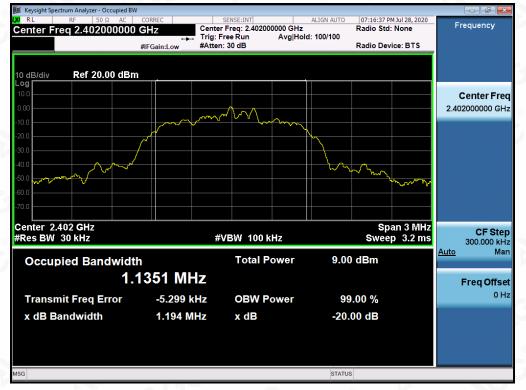
TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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| MEASUREME | ENT RESULT FOR II /4- | DQPSK MODULATIO | N |
|-------------------|-----------------------|-------------------|------|
| Annlinghla Limita | | Measurement Resul | lt |
| Applicable Limits | Test Data | Criteria | |
| | Low Channel | 1.194 | PASS |
| N/A | Middle Channel | 1.193 | PASS |
| | High Channel | 1.203 | PASS |

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



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TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

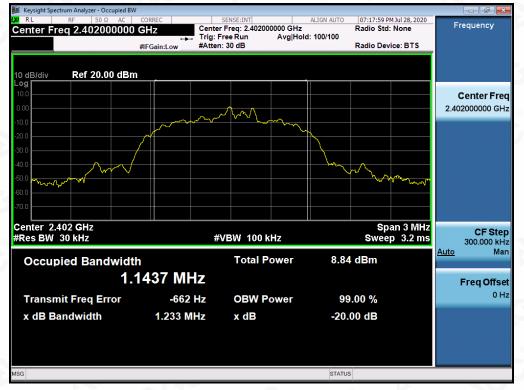


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| MEASURE | MENT RESULT FOR 8D | PSK MODULATION | |
|-------------------|--------------------|--------------------|----------|
| Applicable Limite | | Measurement Result | |
| Applicable Limits | Test Data | (MHz) | Criteria |
| | Low Channel | 1.233 | PASS |
| N/A | Middle Channel | 1.200 | PASS |
| | High Channel | 1.202 | PASS |

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



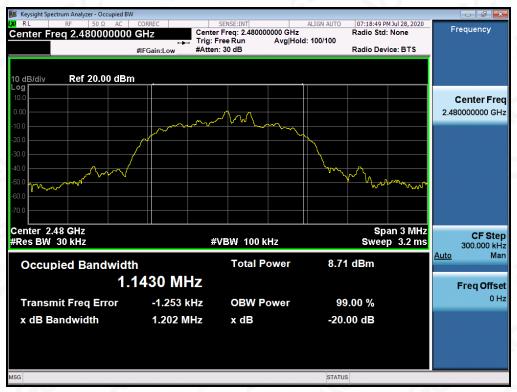
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TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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9. CONDUCTED SPURIOUS EMISSION

9.1. MEASUREMENT PROCEDURE

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2. Set the EUT Work on the top, the Middle and the bottom operation frequency individually.
- 3. Set the Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic.
 RBW = 100 kHz; VBW= 300 kHz; Sweep = auto; Detector function = peak.
- 4. Set SPA Trace 1 Max hold, then View.

9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 8.2

9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

9.4. LIMITS AND MEASUREMENT RESULT

| LIMITS AND MEA | ASUREMENT RESULT | |
|---|---|----------|
| Appliachte Limite | Measurement Res | sult |
| Applicable Limits | Test Data | Criteria |
| In any 100 KHz Bandwidth Outside the frequency band in which the spread spectrum | At least -20dBc than the limit Specified on the BOTTOM Channel | PASS |
| intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a)) | At least -20dBc than the limit Specified on the TOP Channel | PASS |

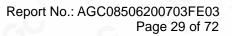
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TEST RESULT FOR ENTIRE FREQUENCY RANGE TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE OF 8DPSK MODULATION IN LOW CHANNEL



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| 🊺 Keysight Sp | | | | | | | | | | |
|--|---------|-------------------|-------------------------|--------------------------------|---------|----------|--------------------------|---------------|--|--|
| Center F | | 50Ω AC 4175000 | CORREC | | | Avg Type | ALIGN AUTO E: Log-Pwr | TRAC | M Jul 28, 2020 E 1 2 3 4 5 6 | Frequency |
| 10 dB/div | Ref 20. | 00 dBm | PNO: Fast IFGain:Low | | | Avg Hold | | DI 1 24.32 | 7 5 GHz 45 dBm | Auto Tune |
| Log | | | | | | | | | | Center Freq 13.741750000 GHz |
| -20.0 | | | | | | | | | -17.71 dBm | Start Freq 2.483500000 GHz |
| -50.0 -60.0 | | | | lahan atau 22 Milandar atau 31 | | | | | | Stop Freq 25.000000000 GHz |
| Start 2.48 #Res BW | 100 kHz | X | | BW 300 kHz | FUNCTIO | DN FUI | Sweep 2 | 2.152 s (3 | 5.00 GHz 0000 pts) DN VALUE | CF Step 2.251650000 GHz <u>Auto</u> Man |
| 1 N 7 2 3 4 5 6 7 8 9 9 9 9 10 11 11 | | 24. | 327 5 GHz | -45.445 df | 3m | | | | | Freq Offset 0 Hz |
| MSG | | | | | | | STATUS | 5 | | |

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 Attestation of Global Compliance(Shenzhen)Std & Tech Co., Ltd

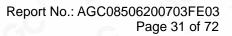
 Tel: +86-755 2523 4088
 E-mail: agc@agc-cert.com



📕 Keysight Spectrum Analyzer - Swept SA D 1 55 PM Jul 28, 2020 Center Freq 2.441000000 GHz Frequency Avg Type: Log-Pwi Avg|Hold: 10/10 Trig: Free Run Atten: 30 dB түр PNO: Wide IFGain:Low Auto Tune Mkr1 2.441 165 9 2.275 dBm Ref 20.00 dBm Center Frea 2.441000000 GHz Start Freq 2.439500000 GHz n a man wall with 1 Martin Stop Freq 2.442500000 GHz Center 2.441000 GHz #Res BW 100 kHz Span 3.000 MHz Sweep 2.000 ms (30000 pts) CF Step 300.000 kHz #VBW 300 kHz Man <u>Auto</u> EUNCTION 2.441 165 9 GHz 2.275 dBm Freq Offset $0 H_{2}$ 🚺 Keysight Spe 07:24:04 PM Jul 28, 2020 Frequency Center Freq 1.215000000 GHz Avg Type: Log-Pwr Avg|Hold: 10/10 Trig: Free Run PNO: Fast IFGain:Low Atten: 30 dB Auto Tune 1.891 93 GHz -45.146 dBm Mkr1 Ref 20.00 dBm 10 dB/div **Center Freq** 1.215000000 GHz Start Fred 30.000000 MHz **Stop Freq** 2.40000000 GHz Start 30 MHz Stop 2.400 GHz CF Step BW 100 kHz #VBW 300 kHz Sweep 228.0 ms (30000 pts) 237.000000 M Auto Mar 1.891 93 GHz -45.146 dBm **Freq Offset** 0 Hz STATUS

TEST PLOT OF OUT OF BAND EMISSIONS OF 8DPSK MODULATION IN MIDDLE CHANNEL

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| | ectrum Analyzer - S | | | | | | | | |
|-----------------------|---------------------|--------|-----------------------|----------------|----------|-----------------------|---------------------|------------|--|
| Center F | RF 50 req 13.741 | | REC | SENS | Av | aLIGN AUTO | 07:24:30 PM TRAC | 123456 | Frequency |
| | | PN | NO:Fast ← Gain:Low | Atten: 30 d | | gjHold: 10/10 Mikt | DE 1 24.873 | 9 GHz | Auto Tune |
| 10 dB/div | Ref 20.00 | dBm | | | | | -45.23 | 33 dBm | |
| Log 10.00 0.00 | | | | | | | | | Center Freq 13.741750000 GHz |
| | | | | | | | | -17.73 dBm | |
| -20.0 | | | | | | | | 1. | Start Freq 2.483500000 GHz |
| -40.0 | | | | | | | | | |
| -50.0 -60.0 | | | | | | | | | Stop Freq 25.000000000 GHz |
| Start 2.44 #Res BW | 100 kHz | × | #VB\ | W 300 kHz Y | FUNCTION | Sweep | 2.152 s (3 | | CF Step 2.251650000 GHz <u>Auto</u> Man |
| 1 N | 1 f | 24.873 | 9 GHz | -45.233 dBn | | | | | |
| 2 3 4 5 | | | | | | | | | Freq Offset 0 Hz |
| 6 7 8 9 | | | | | | | | | |
| 10 11 | | | | III | | | | | |
| MSG | | | | | | STATU | s | | |

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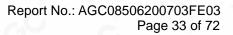
 Tel: +86-755 2523 4088
 E-mail: agc@agc-cert.com



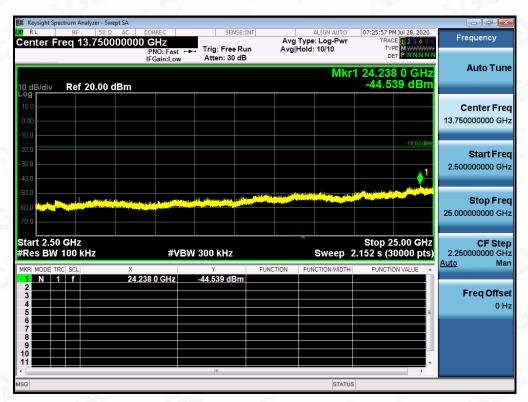
| Keysight Spectrum Analyze RL RF | 50 Ω AC CORREC | SENSE:INT | ALIGN AUTO | 07:25:22 PM Jul 28, 2020 | |
|--|--|--|---|--|---|
| enter Freq 2.48 | 0000000 GHz PNO: W IFGain:L | ide 🔸 Trig: Free Run | Avg Type: Log-Pwr Avg Hold: 10/10 | TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNNN | Frequency |
| | IFGaill.L | -ow Atten: oo dB | Mkr1 2 | .480 154 9 GHz | Auto Tu |
| 10 dB/div Ref 20. | 00 dBm | | | 1.972 dBm | |
| 10.0 | | | 1 | | Center Fr |
| 0.00 | | | | | 2.48000000 G |
| -10.0 | ممہر | and the second s | " Martin Martin | | 2.4000000000 |
| -20.0 | | | | | |
| -30.0 | | | | | Start Fr 2.478500000 G |
| -40.0 | Maryman | | www. | MARINA AND AND AND AND AND AND AND AND AND A | 2.478300000 G |
| -50.0 AMALANNA MV | | | | WILLI' WILLI'' T | |
| -60.0 | | | | | Stop Fr |
| -70.0 | | | | | 2.481500000 G |
| Center 2.480000 G | | | | Span 3.000 MHz | 05.05 |
| #Res BW 100 kHz | | #VBW 300 kHz | Sweep 2.0 | 3000 MH2 (30000 pts) | CF St 300.000 k |
| MKR MODE TRC SCL | X | Y | FUNCTION FUNCTION WIDTH | FUNCTION VALUE | <u>Auto</u> M |
| 1 N 1 f | 2.480 154 9 GH | | | | |
| 3 | | | | | Freq Offs |
| 4 5 | | | | | 0 |
| 6 7 | | | | | |
| 8 | | | | | |
| 10 | | | | | |
| 11 | | | | | |
| • | | III | | • | |
| ISG | | m | STATUS | 4 | |
| | er - Swent SΔ | m | STATUS | 3 | |
| Keysight Spectrum Analyze | 50 Ω AC CORREC | III SENSE:INT | ALIGN AUTO | 07:25:32 PM Jul 28, 2020 | |
| Keysight Spectrum Analyze | 50 Ω AC CORREC | SENSE:INT | | 07:25:32 PM Jul 28, 2020 TRACE 1 2 3 4 5 6 | Frequency |
| Keysight Spectrum Analyze | 50 Ω AC CORREC | sense:int ast →→ Trig: Free Run | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 | 07:25:32 PM Jul 28, 2020 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P.NNNN | Frequency |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 | 50 Ω AC CORREC 5000000 GHZ PNO: Fr IFGain:L | sense:int ast →→ Trig: Free Run | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 | 07:25:32 PMJul 28, 2020 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNNN 1 1.890 51 GHZ | Frequency |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 | 50 Ω AC CORREC 5000000 GHz PNO: Fo | sense:int ast →→ Trig: Free Run | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 | 07:25:32 PM Jul 28, 2020 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P.NNNN | Frequency |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 | 50 Ω AC CORREC 5000000 GHZ PNO: Fr IFGain:L | sense:int ast →→ Trig: Free Run | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 | 07:25:32 PMJul 28, 2020 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNNN 1 1.890 51 GHZ | Frequency Auto Tu |
| Keysight Spectrum Analyze RE RE Center Freq 1.21 0 dB/div Ref 20. | 50 Ω AC CORREC 5000000 GHZ PNO: Fr IFGain:L | sense:int ast →→ Trig: Free Run | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 | 07:25:32 PMJul 28, 2020 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNNN 1 1.890 51 GHZ | Frequency Auto Tu Center Fr |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 | 50 Ω AC CORREC 5000000 GHZ PNO: Fr IFGain:L | sense:int ast →→ Trig: Free Run | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 | 07:25:32 PM Jul 28, 2020 TRACE 1 2 3 4 5 6 TYPE MINIMUM DET MINIMUM 1 1.890 51 GHz -38.558 dBm | Frequency Auto Tu Center Fr |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 | 50 Ω AC CORREC 5000000 GHZ PNO: Fr IFGain:L | sense:int ast →→ Trig: Free Run | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 | 07:25:32 PMJul 28, 2020 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNNN 1 1.890 51 GHZ | Frequency Auto Tu Center Fr 1.215000000 G |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 0 dB/div Ref 20. 0 dB/div Ref 20. 0 dB/div Ref 20. 0 dB/div Ref 20. | 50 Ω AC CORREC 5000000 GHZ PNO: Fr IFGain:L | sense:int ast →→ Trig: Free Run | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 | 07:25:32 PM Jul 28, 2020 TRACE 1 2 3 4 5 6 TYPE MINIMUM DET MINIMUM 1 1.890 51 GHz -38.558 dBm | Frequency Auto Tu Center Fr 1.215000000 G Start Fr |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 | 50 Ω AC CORREC 5000000 GHZ PNO: Fr IFGain:L | sense:int ast →→ Trig: Free Run | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 | 07:25:32 PM Jul 28, 2020 TRACE 1 2 3 4 5 6 TYPE MINIMUM DET MINIMUM 1 1.890 51 GHz -38.558 dBm | Frequency Auto Tu Center Fr 1.215000000 G Start Fr |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 0 dB/div Ref 20. 0 0 0.00 10.0 0.00 30.0 0.00 40.0 0.00 50.0 0.00 | 50 Ω AC CORREC 5000000 GHZ PNO: Fr IFGain:L | sense:int ast →→ Trig: Free Run | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 | 07:25:32 PM Jul 28, 2020 TRACE 1 2 3 4 5 6 TYPE MINIMUM DET MINIMUM 1 1.890 51 GHz -38.558 dBm | Frequency Auto Tu Center Fr 1.21500000 G Start Fr 30.000000 M |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 10 dB/div Ref 20. 9 10.0 10.0 10.0 9 10.0 10.0 <t< td=""><td>50 Ω AC CORREC 5000000 GHZ PNO: Fr IFGain:L</td><td>sense:int ast →→ Trig: Free Run</td><td>ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10</td><td>07:25:32 PM Jul 28, 2020 TRACE 1 2 3 4 5 6 TYPE MINIMUM DET MINIMUM 1 1.890 51 GHz -38.558 dBm</td><td>Frequency Auto Tu Center Fr 1.215000000 G Start Fr 30.000000 M Stop Fr</td></t<> | 50 Ω AC CORREC 5000000 GHZ PNO: Fr IFGain:L | sense:int ast →→ Trig: Free Run | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 | 07:25:32 PM Jul 28, 2020 TRACE 1 2 3 4 5 6 TYPE MINIMUM DET MINIMUM 1 1.890 51 GHz -38.558 dBm | Frequency Auto Tu Center Fr 1.215000000 G Start Fr 30.000000 M Stop Fr |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 IO dB/div Ref 20. O O 10 dB/div Ref 20. 20 dB/div Ref 20. 20 dB/div Ref 20. 30 dB/div Ref 20. 30 dB/div Ref 20. 50 dB/div Ref 20. | 50 Ω AC CORREC 5000000 GHZ PNO: Fr IFGain:L | sense:int ast →→ Trig: Free Run | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 | 07:25:32 PM Jul 28, 2020 TRACE 1 2 3 4 5 6 TYPE MINIMUM DET MINIMUM 1 1.890 51 GHz -38.558 dBm | Frequency Auto Tu Center Fr 1.215000000 G Start Fr 30.000000 M Stop Fr |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 IO dB/div Ref 20. 00 | 50 Ω AC CORREC 5000000 GHZ PNO: F, IFGain:L 00 dBm | ast Trig: Free Run Atten: 30 dB | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 MKr | 07:25:32 PM Jul 28, 2020 TRACE 1 2 3 4 5 6 TYPE MINIMUM DET P NNNNN 1 1.890 51 GHz -38.558 dBm -1000 dbm -18.09 dbm 1 | Frequency Auto Tu Center Fr 1.215000000 G Start Fr 30.000000 M Stop Fr 2.400000000 G CF Str |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 10 dB/div Ref 20. 90 | 50 Ω AC CORREC 5000000 GHZ PNO: F, IFGain:L 00 dBm | sense:int ast →→ Trig: Free Run | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 MKr | 07:25:32 PM Jul 28, 2020 TRACE 12 3 4 5 6 TYPE M DET P NINNW 1 1.890 51 GHz -38.558 dBm -18.03 d | Frequency Auto Tu Center Fr 1.215000000 G Start Fr 30.000000 M Stop Fr 2.400000000 G CF St 237.000000 M |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 10 dB/div Ref 20. 9 | 50 Ω AC CORREC 5000000 GHZ PNO: F, IFGain:L 00 dBm | SENSE:INT ast →→→ Trig: Free Run Atten: 30 dB | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 MKr | 07:25:32 PM Jul 28, 2020 TRACE 1 2 3 4 5 6 TYPE MINIMUM DET P NNNNN 1 1.890 51 GHz -38.558 dBm -1000 dbm -18.09 dbm 1 | Frequency Auto Tu Center Fr 1.215000000 G Start Fr 30.000000 M Stop Fr 2.400000000 G CF St 237.000000 M |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 OddB/div Ref 20. Og | 50 Ω AC CORREC 5000000 GHZ PNO: F, IFGain: 00 dBm | SENSE:INT ast →→→ Trig: Free Run Atten: 30 dB | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 MKr | 07:25:32 PM Jul 28, 2020 TRACE 12 3 4 5 6 TYPE M DET P NINNW 1 1.890 51 GHz -38.558 dBm -18.03 d | Frequency Auto Tu Center Fr 1.215000000 G Start Fr 30.000000 M Stop Fr 2.400000000 G CF St 237.000000 M Auto Tu |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 Center Freq 1.21 RF Center Freq 1.21 O dB/div Ref 20. Ref 20. O d0 Ref 20. Ref 20. Start 30 MHz Ref 20. Ref 20. Start 30 MHz Res BW 100 kHz Ref 20. MKR MODE TRC SCL MI T | 50 Ω AC CORREC 5000000 GHZ PNO: F, IFGain:L 00 dBm | SENSE:INT ast →→→ Trig: Free Run Atten: 30 dB | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 MKr | 07:25:32 PM Jul 28, 2020 TRACE 12 3 4 5 6 TYPE M DET P NINNW 1 1.890 51 GHz -38.558 dBm -18.03 d | Frequency Auto Tu Center Fr 1.215000000 G Start Fr 30.000000 M Stop Fr 2.400000000 G CF St 237.000000 M Auto Auto Tu Freq Offs |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 IO dB/div Ref 20. Og Io IO dB/div Ref 20. Og Io IO dB/div Ref 20. Og Io Io dB/div Ref 20. | 50 Ω AC CORREC 5000000 GHZ PNO: F, IFGain:L 00 dBm | SENSE:INT ast →→→ Trig: Free Run Atten: 30 dB | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 MKr | 07:25:32 PM Jul 28, 2020 TRACE 12 3 4 5 6 TYPE M DET P NINNW 1 1.890 51 GHz -38.558 dBm -18.03 d | Frequency Auto Tu Center Fr 1.215000000 G Start Fr 30.000000 M Stop Fr 2.400000000 G CF Str 237.000000 M Auto Auto Tu Freq Offs |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 OddB/div Ref 20. Og Image: Context of the second s | 50 Ω AC CORREC 5000000 GHZ PNO: F, IFGain:L 00 dBm | SENSE:INT ast →→→ Trig: Free Run Atten: 30 dB | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 MKr | 07:25:32 PM Jul 28, 2020 TRACE 12 3 4 5 6 TYPE MULLER DET NINNIN 1 1.890 51 GHz -38.558 dBm 18.03 dBm 1 18.03 dBm 1 | Frequency Auto Tu Center Fr 1.215000000 G Start Fr 30.000000 M Stop Fr 2.400000000 G CF St 237.000000 M Auto Auto Tu Freq Offs |
| Keysight Spectrum Analyze RF Center Freq 1.21 Conter Freq 1.21 | 50 Ω AC CORREC 5000000 GHZ PNO: F, IFGain:L 00 dBm | SENSE:INT ast →→→ Trig: Free Run Atten: 30 dB | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 MKr | 07:25:32 PM Jul 28, 2020 TRACE 12 3 4 5 6 TYPE MULLER DET NINNIN 1 1.890 51 GHz -38.558 dBm 18.03 dBm 1 18.03 dBm 1 | Frequency Auto Tu Center Fr 1.215000000 G Start Fr 30.000000 M Stop Fr 2.400000000 G CF St 237.000000 M Auto Auto Tu Freq Offs |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 IO Bit | 50 Ω AC CORREC 5000000 GHZ PNO: F, IFGain:L 00 dBm | SENSE:INT ast →→→ Trig: Free Run Atten: 30 dB | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 MKr | 07:25:32 PM Jul 28, 2020 TRACE 12 3 4 5 6 TYPE MULLER DET NINNIN 1 1.890 51 GHz -38.558 dBm 18.03 dBm 1 18.03 dBm 1 | Frequency Auto Tu Center Fr 1.215000000 G Start Fr 30.000000 M Stop Fr 2.400000000 G CF Str 237.000000 M Auto Auto Tu Freq Offs |
| Keysight Spectrum Analyze RL RF Center Freq 1.21 O dB/div Ref 20. O data D data Start 30 MHz Res BW 100 kHz RKR MODE TRC SCL T I T T I T T I T T I T T I T T I T T I T T I <tht< th=""></tht<> | 50 Ω AC CORREC 5000000 GHZ PNO: F, IFGain:L 00 dBm | SENSE:INT ast →→→ Trig: Free Run Atten: 30 dB | ALIGN AUTO Avg Type: Log-Pwr Avg Hold: 10/10 MKr | 07:25:32 PM Jul 28, 2020 TRACE 12 3 4 5 6 TYPE MULLER DET NINNIN 1 1.890 51 GHz -38.558 dBm 18.03 dBm 1 18.03 dBm 1 | Auto Tur Center Fr 1.215000000 G Start Fr 30.000000 M Stop Fr 2.400000000 G |

TEST PLOT OF OUT OF BAND EMISSIONS OF 8DPSK MODULATION IN HIGH CHANNEL

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Note: The 8DPSK modulation is the worst case and only those data recorded in the report.

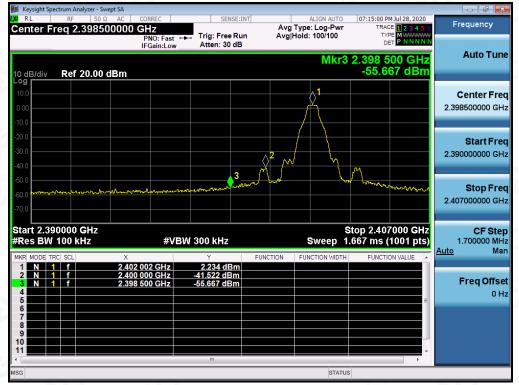
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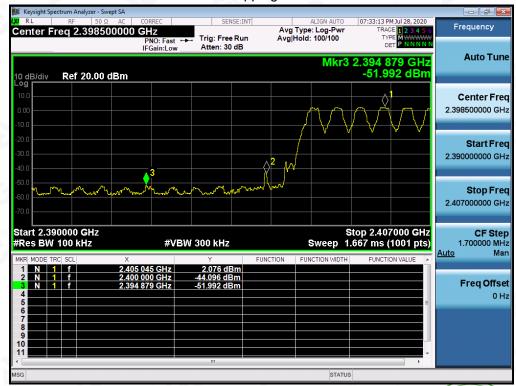
TEST RESULT FOR BAND EDGE

GFSK MODULATION IN LOW CHANNEL

Hopping off



Hopping on



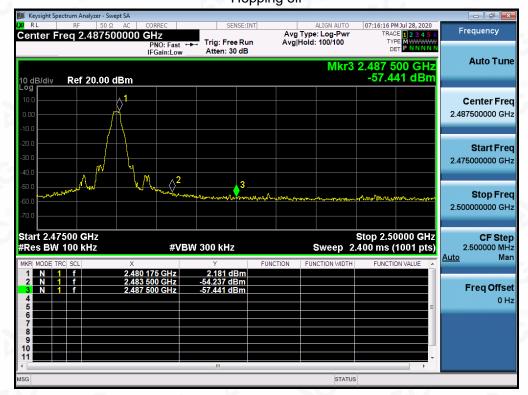
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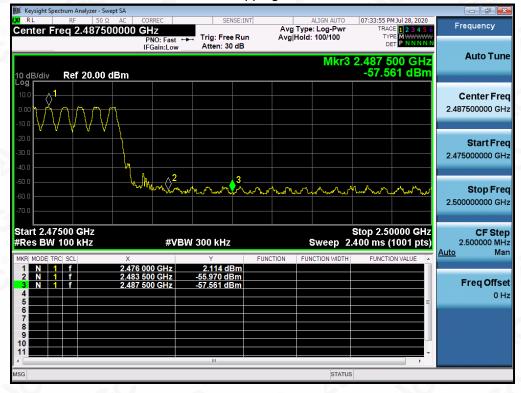
 Tel: +86-755 2523 4088
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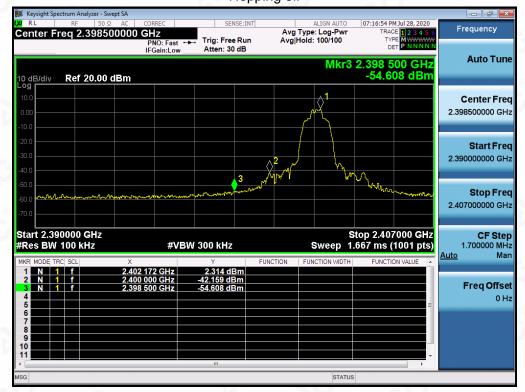
GFSK MODULATION IN HIGH CHANNEL Hopping off

Hopping on



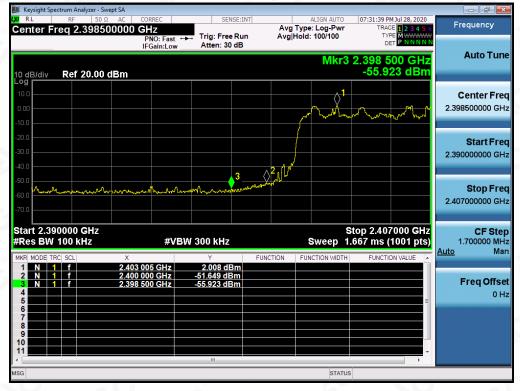
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π /4-DQPSK MODULATION IN LOW CHANNEL Hopping off

Hopping on



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