# FCC Test Report

Report No.: AGC03576180501FE03

| | | |
|---|---|---|
| **FCC ID** | : | 2APJY-TT201 |
| **APPLICATION PURPOSE** | : | Original Equipment |
| **PRODUCT DESIGNATION** | : | Travis Touch |
| **BRAND NAME** | : | Travis |
| **MODEL NAME** | : | TT201 |
| **CLIENT** | : | Travis GT b.v. |
| **DATE OF ISSUE** | : | July 03, 2018 |
| **STANDARD(S)**<br>**TEST PROCEDURE(S)** | : | FCC Part 15 Rules<br>ANSI C63.10 (2013) |
| **REPORT VERSION** | : | V1.0 |

***A***ttestation of ***G***lobal ***C***ompliance (Shenzhen) Co., Ltd

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## REPORT REVISE RECORD

| Report Version | Revise Time | Issued Date | Valid Version | Notes |
|---|---|---|---|---|
| V1.0 | / | July 03, 2018 | Valid | Initial Release |

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## 1. VERIFICATION OF CONFORMITY

| | |
|---|---|
| **Applicant** | Travis GT b.v. |
| **Address** | Stationsplein 45, 3013 AK Rotterdam, The Netherlands, Rotterdam, Netherlands |
| **Manufacturer** | Huano International Technology Limited |
| **Address** | 29th Floor, Yinglong Building, # 6025 ShenNan Road, FuTian District, Shenzhen, China |
| **Product Designation** | Travis Touch |
| **Brand Name** | Travis |
| **Test Model** | TT201 |
| **Date of test** | June 13, 2018~July 03, 2018 |
| **Deviation** | None |
| **Condition of Test Sample** | Normal |
| **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 Rules Part 15.247.
The test results of this report relate only to the tested sample identified in this report.

| | | |
|---|---|---|
| Tested By | Nice.xie | |
| | Nice Xie(Xie xiaosong) | July 03, 2018 |
| Reviewed By | Bart xie | |
| | Bart Xie(Xie Xiaobin) | July 03, 2018 |
| Approved By | Forrest Lei | |
| | Forrest Lei(Lei Yonggang)<br>Authorized Officer | July 03, 2018 |

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# 2. GENERAL INFORMATION

## 2.1. PRODUCT DESCRIPTION

The EUT is “Travis Touch” designed as a “Communication Device”. It is designed by way of utilizing the FHSS technology to achieve the system operation.

A major technical description of EUT is described as following:

| | |
|---|---|
| **Operation Frequency** | 2.402 GHz to 2.480GHz |
| **Bluetooth Version** | V4.0 |
| **Modulation** | GFSK, π /4-DQPSK, 8DPSK |
| **Number of channels** | 79(For BR/EDR) |
| **Hardware Version** | F01_MB_V1.11 |
| **Software Version** | V2.0.0 |
| **Antenna Designation** | Built - in antenna |
| **Antenna Gain** | 1.0dBi |
| **Power Supply** | DC3.8V by Battery |

## 2.2. TABLE OF CARRIER FREQUENCYS

| Frequency Band | Channel Number | Frequency |
|---|---|---|
| 2400~2483.5MHZ | 0 | 2402MHZ |
| | 1 | 2403MHZ |
| | : | : |
| | 38 | 2440 MHZ |
| | 39 | 2441 MHZ |
| | 40 | 2442 MHZ |
| | : | : |
| | 77 | 2479 MHZ |
| | 78 | 2480 MHZ |

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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: 2APJY-TT201** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

## 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

-Uncertainty of Conducted Emission, Uc=±3.2dB

- Uncertainty of Radiated Emission below 1GHz, Uc±3.9dB

- Uncertainty of Radiated Emission above 1GHz, Uc±4.8dB

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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 | Normal Hopping |

Note:
1. All the test modes can be supply by Built-in Li-ion battery, 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.

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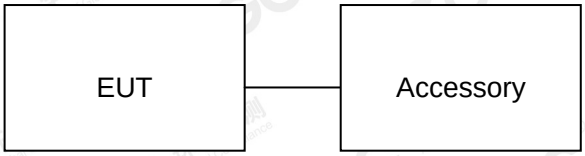
# 5. SYSTEM TEST CONFIGURATION

## 5.1. CONFIGURATION OF EUT SYSTEM

**Configuration:**




## 5.2. EQUIPMENT USED IN EUT SYSTEM

| Item | Equipment | Model No. | ID or Specification | Remark |
|---|---|---|---|---|
| 1 | Travis Touch | TT201 | 2APJY-TT201 | EUT |
| 2 | Battery | FHP K664060P | DC3.8V/ 2500mAh | Accessory |
| 3 | USB | N/A | N/A | Accessory |

## 5.3. SUMMARY OF TEST RESULTS

| FCC RULES | DESCRIPTION OF TEST | RESULT |
|---|---|---|
| §15.247 | Peak Output Power | Compliant |
| §15.247 | 20 dB Bandwidth | Compliant |
| §15.247 | Spurious Emission | Compliant |
| §15.209 | Radiated Emission | Compliant |
| §15.247 | Band Edges | Compliant |
| §15.207 | Power Line Conduction Emission | Compliant |
| §15.247 | Number of Hopping Frequency | Compliant |
| §15.247 | Time of Occupancy | Compliant |
| §15.247 | Frequency Separation | Compliant |

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## 6. TEST FACILITY

| | |
|---|---|
| **Site** | Attestation of Global Compliance (Shenzhen) Co., Ltd |
| **Location** | 1-2F., Bldg.2, No.1-4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District B112-B113, Bldg.12, Baoan Bldg Materials Center, No.1 of Xixiang Inner Ring Road, Baoan District, Shenzhen 518012 |
| **NVLAP LAB CODE** | 600153-0 |
| **Designation Number** | CN5028 |
| **Description** | Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by National Voluntary Laboratory Accreditation program, NVLAP Code 600153-0 |

### ALL TEST EQUIPMENT LIST

| Equipment | Manufacturer | Model | S/N | Cal. Date | Cal. Due |
|---|---|---|---|---|---|
| TEST RECEIVER | R&S | ESPI | 101206 | Jun.12, 2018 | Jun.11, 2019 |
| LISN | R&S | ESH2-Z5 | 100086 | Aug.21, 2017 | Aug.20, 2018 |
| TEST RECEIVER | R&S | ESCI | 10096 | Jun.12, 2018 | Jun.11, 2019 |
| EXA Signal Analyzer | Aglient | N9010A | MY53470504 | Dec.08, 2017 | Dec.07, 2018 |
| Horn antenna | SCHWARZBECK | BBHA 9170 | #768 | Sep.20, 2017 | Sep.19, 2018 |
| preamplifier | ChengYi | EMC184045SE | 980508 | Sep.15, 2017 | Sep.14, 2018 |
| Double-Ridged Waveguide Horn | ETS LINDGREN | 3117 | 00034609 | May.18, 2017 | May.17, 2019 |
| Broadband Preamplifier | SCHWARZBECK | BBV 9718 | 9718-205 | Jun.12, 2018 | Jun.11, 2019 |
| ANTENNA | SCHWARZBECK | VULB9168 | D69250 | Sep.28, 2017 | Sep.27, 2018 |
| SIGNAL ANALYZER | Agilent | N9020A | MY52090123 | Sep. 21, 2017 | Sep. 20, 2018 |
| LOOP ANTENNA | A.H | SAS-562B | / | Mar.01,2018 | Feb.28,2019 |

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# 7. PEAK OUTPUT POWER

## 7.1. MEASUREMENT PROCEDURE

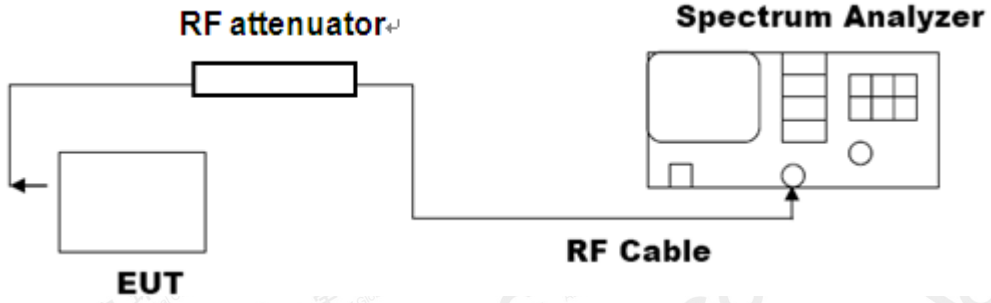
For peak power test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, middle and the bottom operation frequency individually.
3. Use the following spectrum analyzer settings:
   1) Span : Approximately five times the 20 dB bandwidth, centered on a hopping channel.
   2) RBW > 20 dB bandwidth of the emission being measured.
   3) VBW ≧ RBW.
   4) Sweep: Auto.
   5) Detector function: Peak.
   6) Trace: Max hold.
4. Record the maximum power from the Spectrum Analyzer.

**Note**：The EUT was tested according for compliance ANSI C63.10 (2013) requirements.

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

**PEAK POWER TEST SETUP**

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## 7.3. LIMITS AND MEASUREMENT RESULT

| Mode | Frequency (GHz) | Peak Power (dBm) | Applicable Limits (dBm) | Pass or Fail |
|---|---|---|---|---|
| GFSK | 2.402 | -3.245 | 30 | Pass |
| | 2.441 | -4.180 | 30 | Pass |
| | 2.480 | -2.782 | 30 | Pass |

| Mode | Frequency (GHz) | Peak Power (dBm) | Applicable Limits (dBm) | Pass or Fail |
|---|---|---|---|---|
| π /4-DQPSK | 2.402 | -4.002 | 30 | Pass |
| | 2.441 | -5.172 | 30 | Pass |
| | 2.480 | -4.304 | 30 | Pass |

| Mode | Frequency (GHz) | Peak Power (dBm) | Applicable Limits (dBm) | Pass or Fail |
|---|---|---|---|---|
| 8DPSK | 2.402 | -4.145 | 30 | Pass |
| | 2.441 | -5.261 | 30 | Pass |
| | 2.480 | -4.528 | 30 | Pass |

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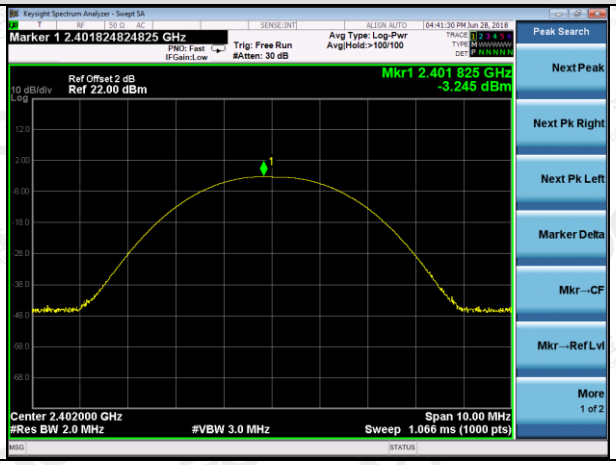
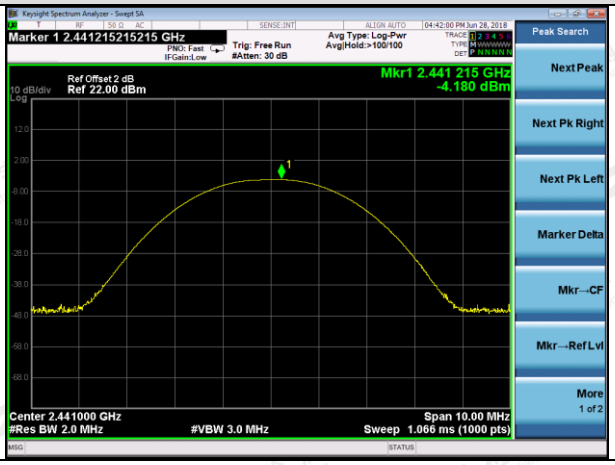
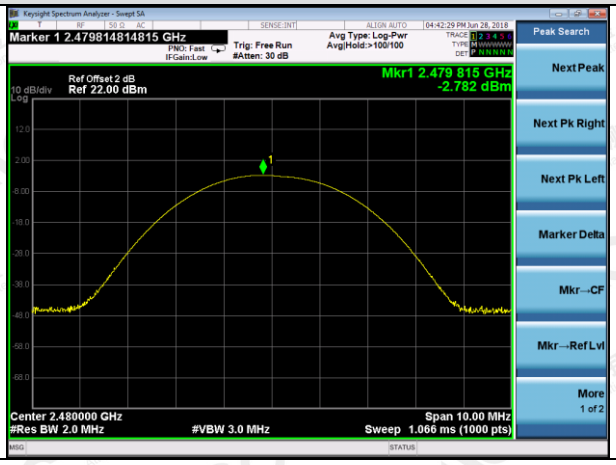
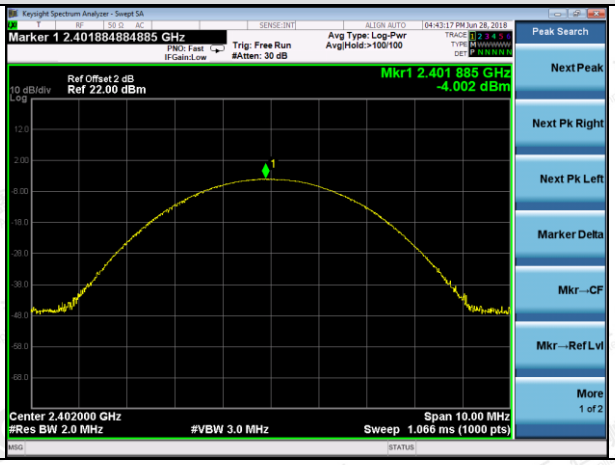
## Test Graph

| GFSK-LCH | GFSK-MCH |
|---|---|
|  |  |

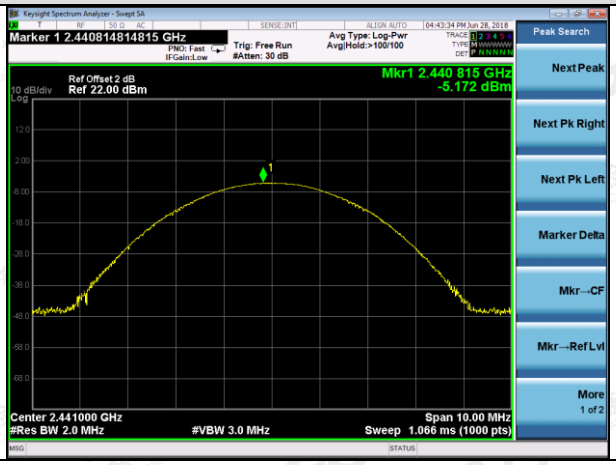
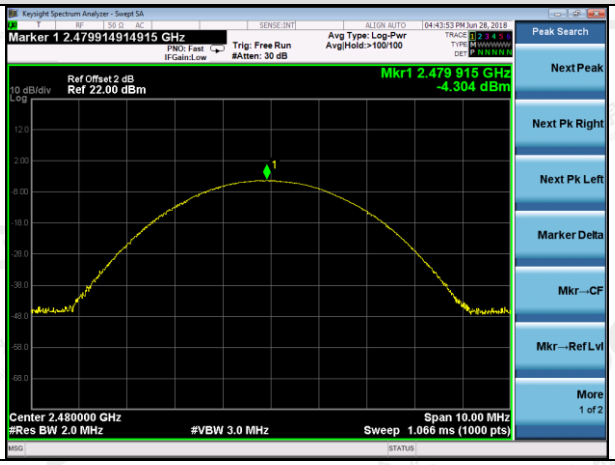




| GFSK-HCH | π/4DQPSK-LCH |
|---|---|
|  |  |





| π/4DQPSK-MCH | π/4DQPSK-HCH |
|---|---|
|  |  |





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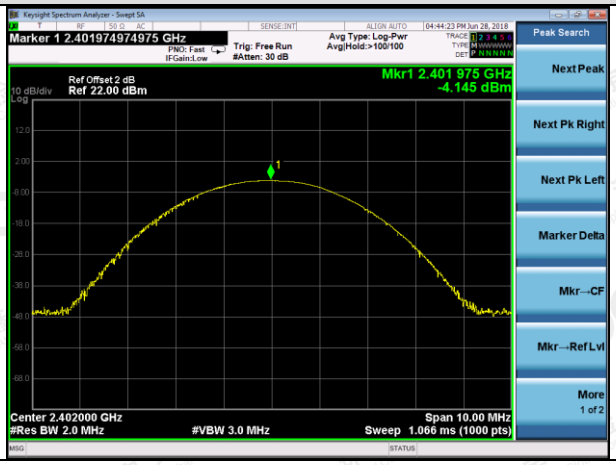
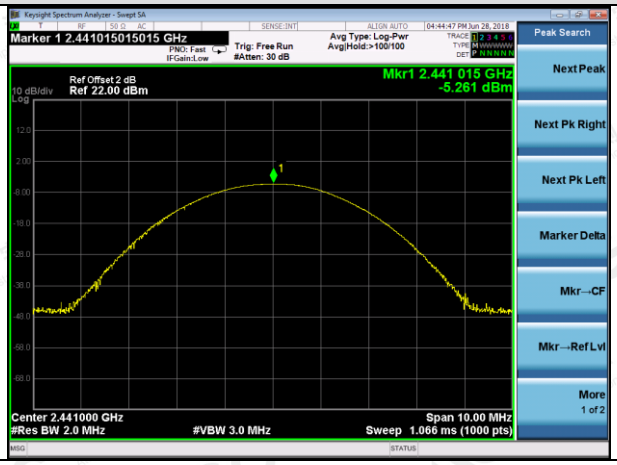
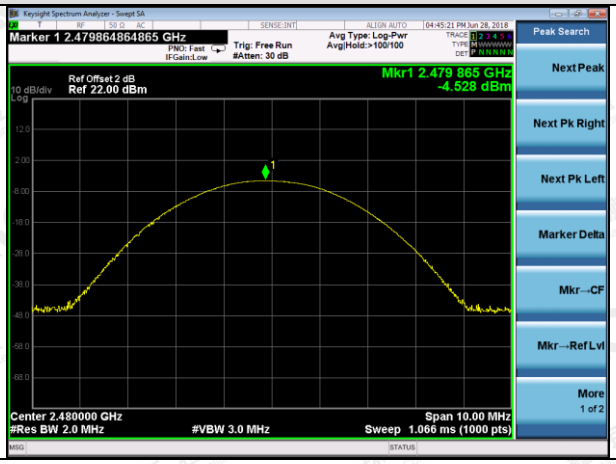
| 8DPSK-LCH | 8DPSK-MCH |
|---|---|
|  |  |





| 8DPSK-HCH | |
|---|---|
|  | |



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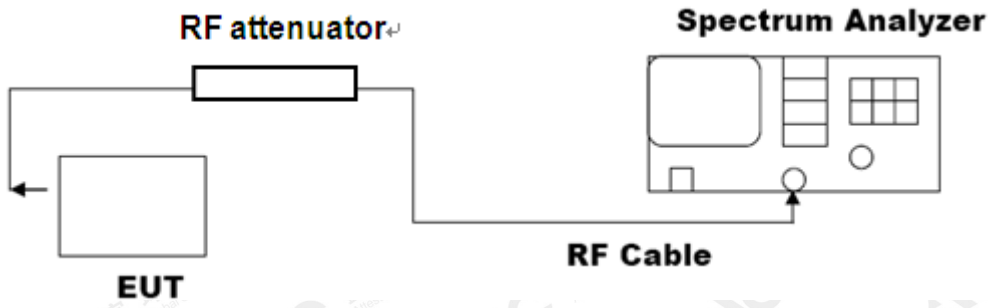
# 8. 20DB BANDWIDTH

## 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 3 times the 20 dB bandwidth, centered on a hoping channel RBW ≥ 1% of the 20 dB bandwidth, VBW ≥ RBW; Sweep = auto; Detector function = peak
4. Set SPA Trace 1 Max hold, then View.

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




## 8.3. LIMITS AND MEASUREMENT RESULTS

| Mode | Channel. | 20dB Bandwidth [KHz] | Verdict |
|---|---|---|---|
| GFSK | LCH | 736.6 | PASS |
| GFSK | MCH | 749.6 | PASS |
| GFSK | HCH | 819.0 | PASS |
| π/4DQPSK | LCH | 1135 | PASS |
| π/4DQPSK | MCH | 1130 | PASS |
| π/4DQPSK | HCH | 1134 | PASS |
| 8DPSK | LCH | 1128 | PASS |
| 8DPSK | MCH | 1124 | PASS |
| 8DPSK | HCH | 1119 | PASS |

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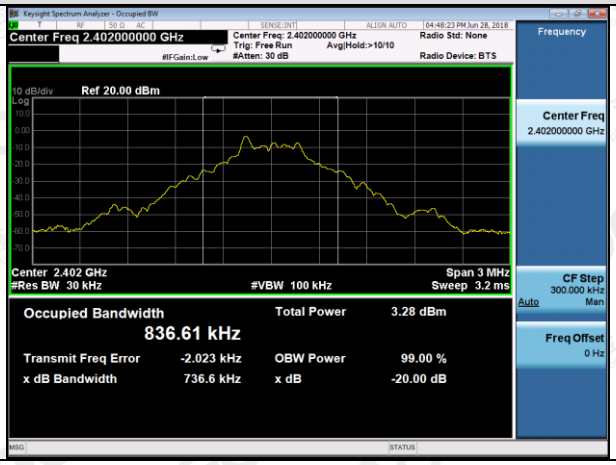
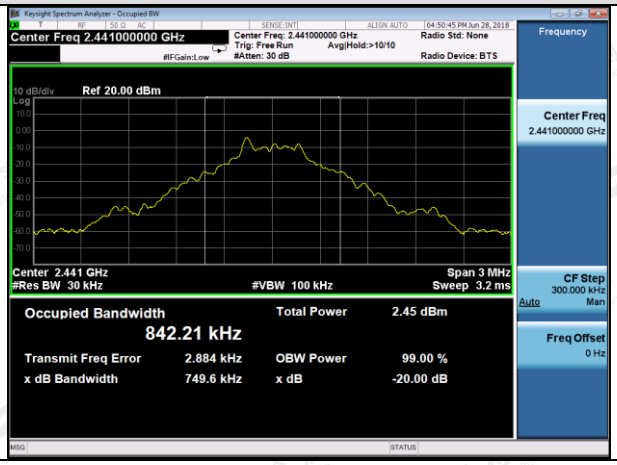
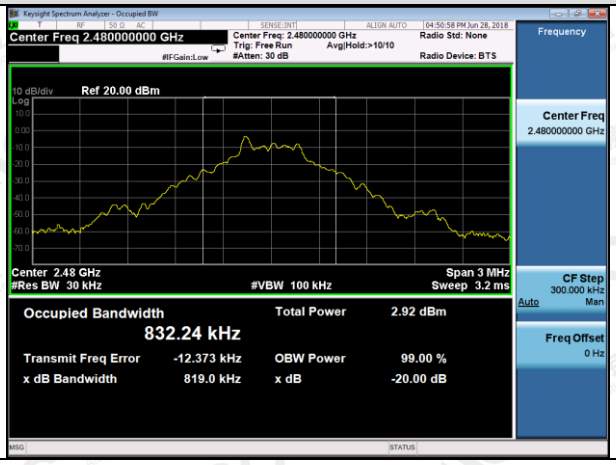
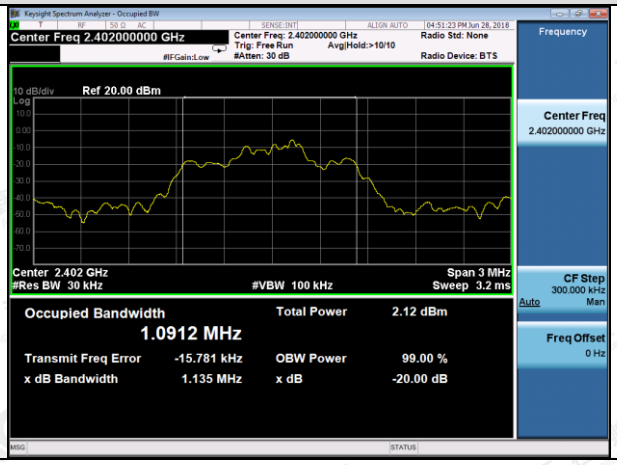
## Test Graph

| GFSK-LCH | GFSK-MCH |
|---|---|
|  |  |

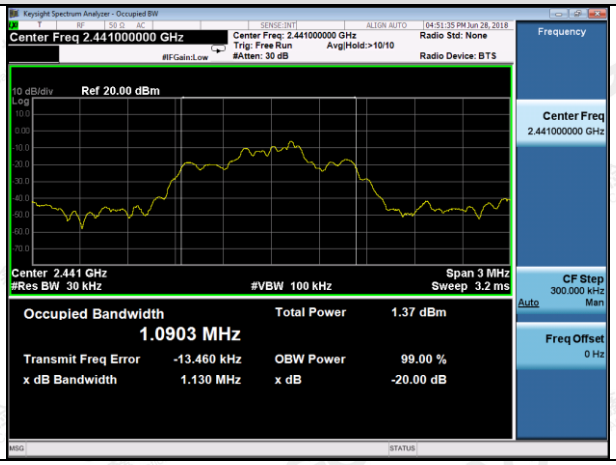
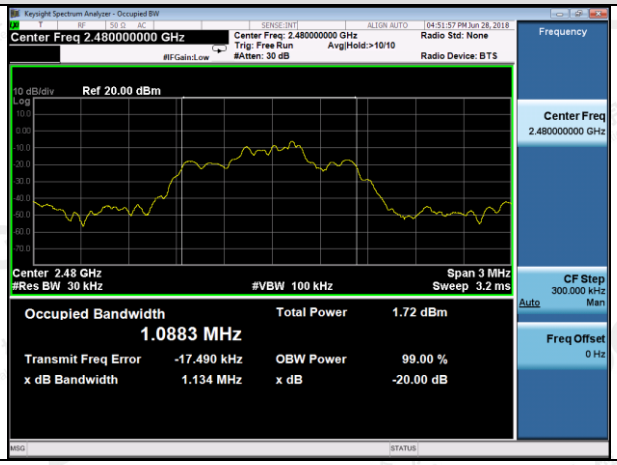




| GFSK-HCH | π/4DQPSK-LCH |
|---|---|
|  |  |





| π/4DQPSK-MCH | π/4DQPSK-HCH |
|---|---|
|  |  |





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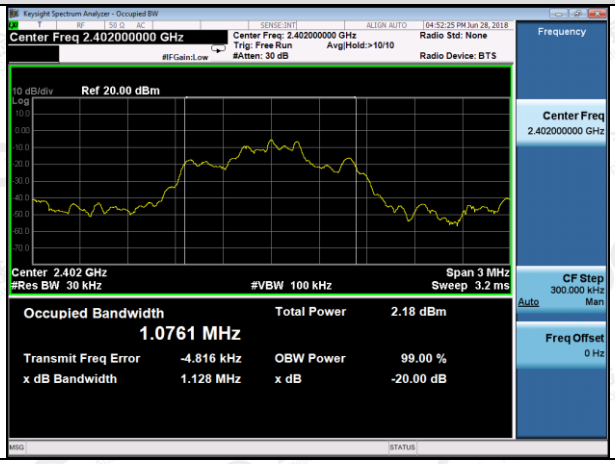
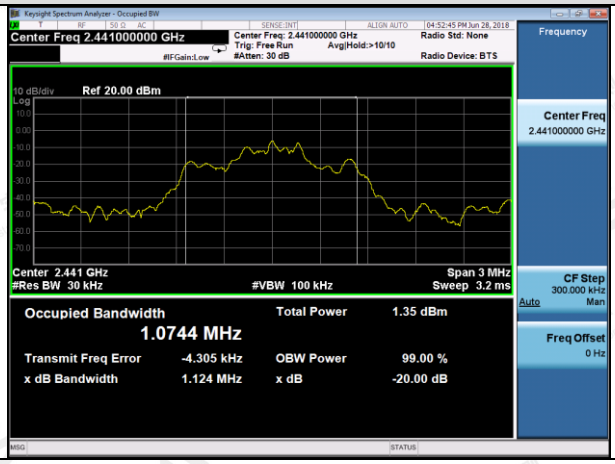
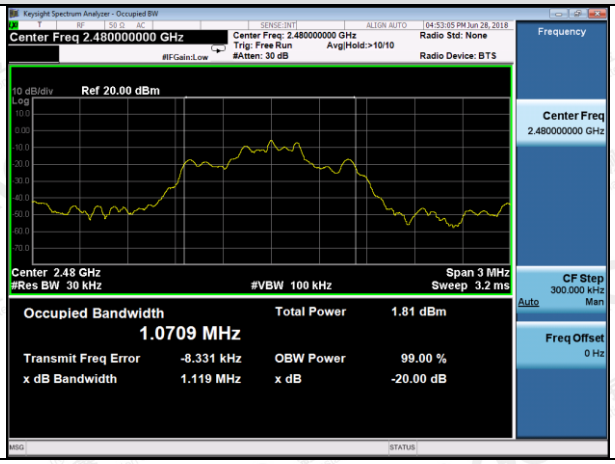
| 8DPSK-LCH | 8DPSK-MCH |
|---|---|
|  |  |





| 8DPSK-HCH | |
|---|---|
|  | |



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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 ≥ RBW; Sweep = auto; Detector function = peak.
4. Set SPA Trace 1 Max hold, then View.

**Note:** The EUT was tested according for compliance ANSI C63.10 (2013) requirements. Owing to satisfy the requirements of the number of measurement points, we set the RBW=1MHz, VBW＞RBW, scan up through 10th harmonic, and consider the tested results as the worst case, if the tested results conform to the requirement, we can deem that the real tested results(set the RBW=100KHz, VBW＞RBW) are conform to the requirement.

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

The same as described in section 8.2

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## 9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

## 9.4. LIMITS AND MEASUREMENT RESULT

| LIMITS AND MEASUREMENT RESULT | | |
|---|---|---|
| Applicable Limits | Measurement Result | |
| | Test Data | Criteria |
| In any 100 KHz Bandwidth Outside the frequency band in which the spread spectrum 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.<br>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 BOTTOM Channel | PASS |
| | At least -20dBc than the limit Specified on the TOP Channel | PASS |

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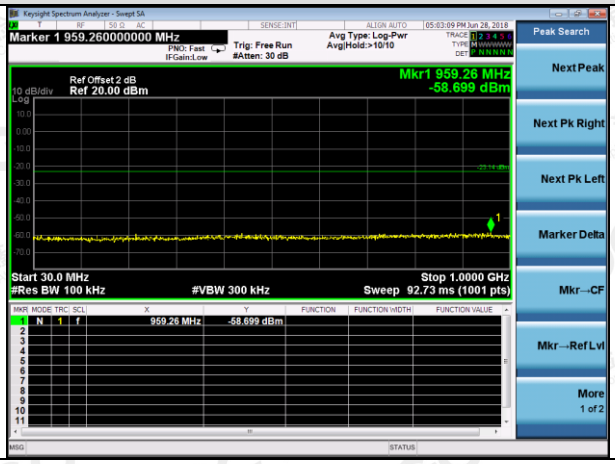
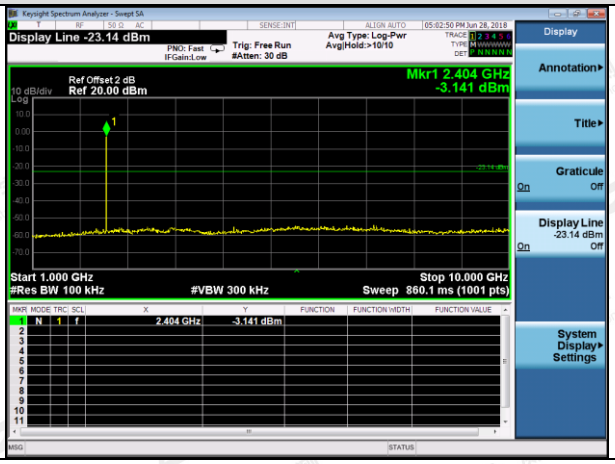
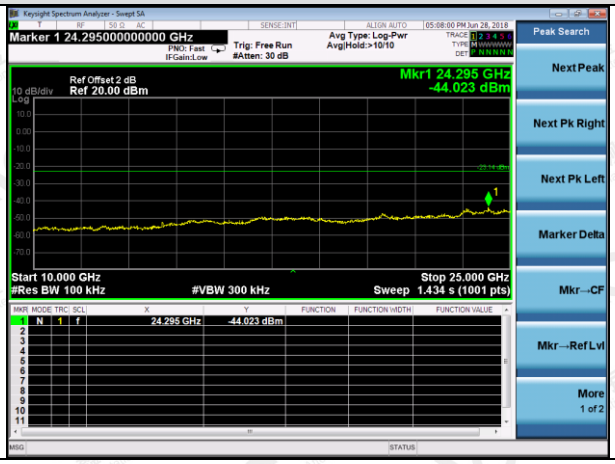
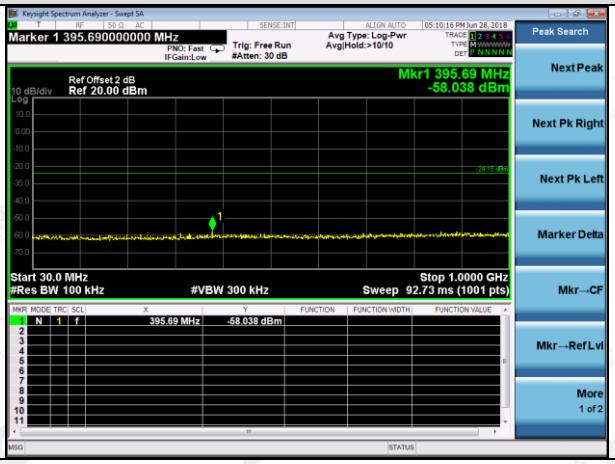
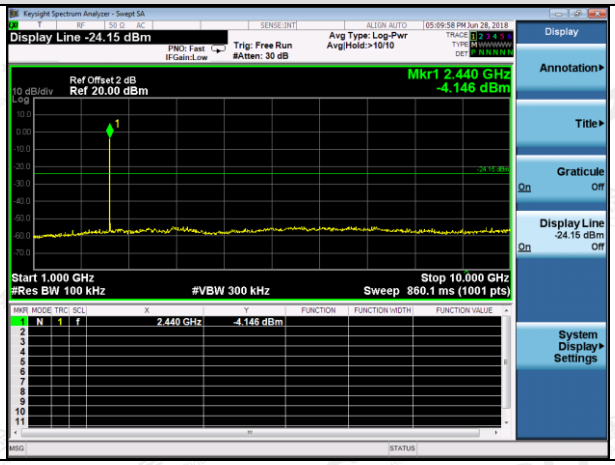
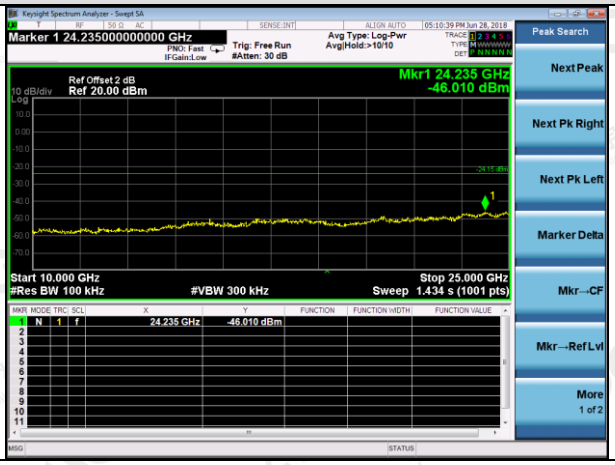
## Test Graph

| GFSK-LCH | GFSK-LCH |
|---|---|
|  |  |

| GFSK-LCH | GFSK-MCH |
|---|---|
|  |  |

| GFSK-MCH | GFSK-MCH |
|---|---|
|  |  |

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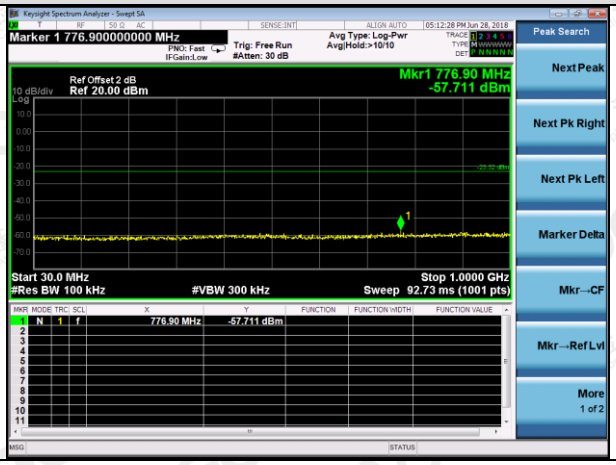
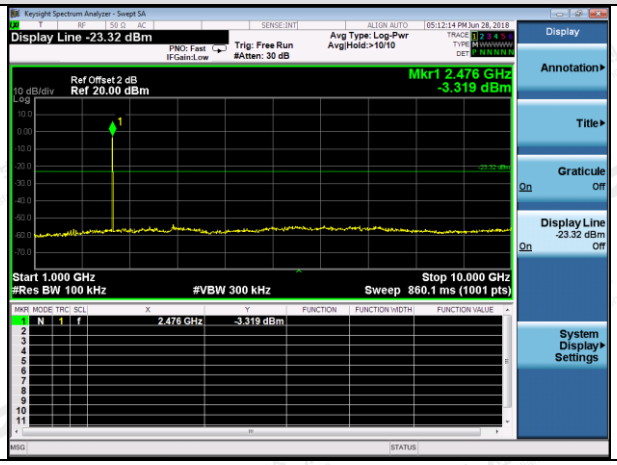
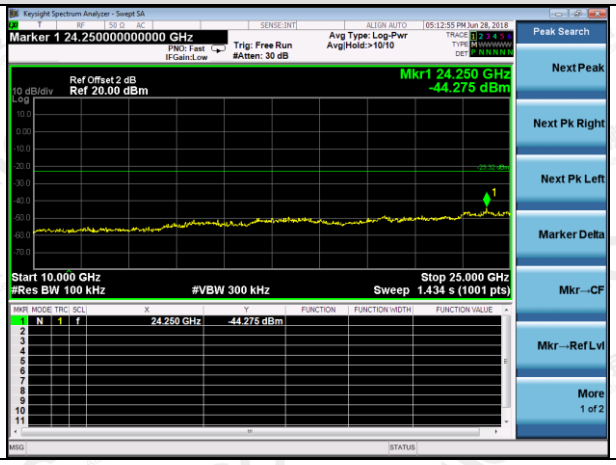
GFSK-HCH



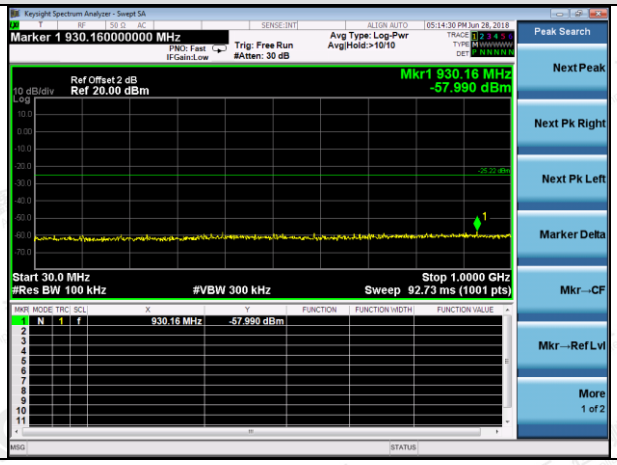

GFSK-HCH



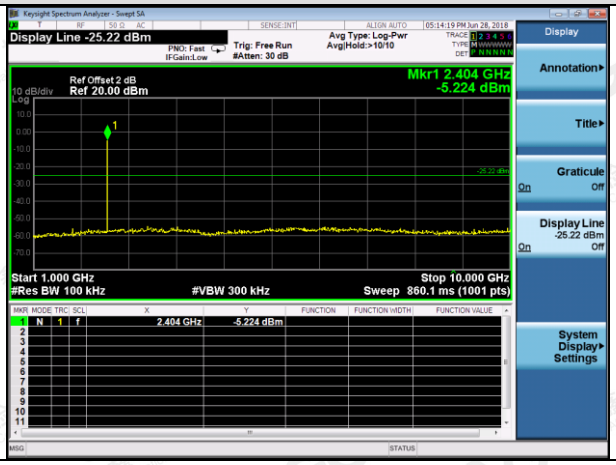

GFSK-HCH



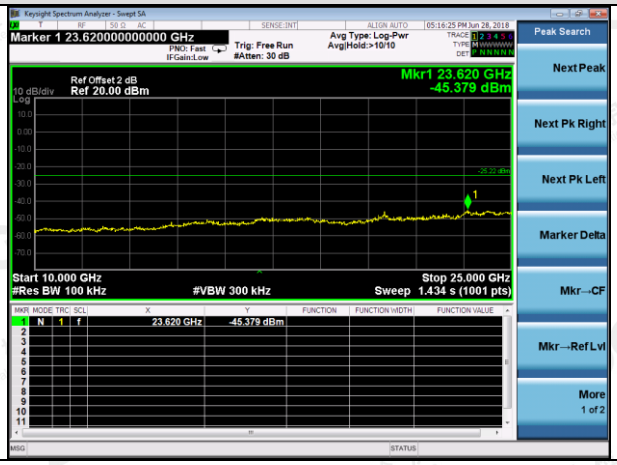

π/4DQPSK-LCH




π/4DQPSK-LCH




π/4DQPSK-LCH

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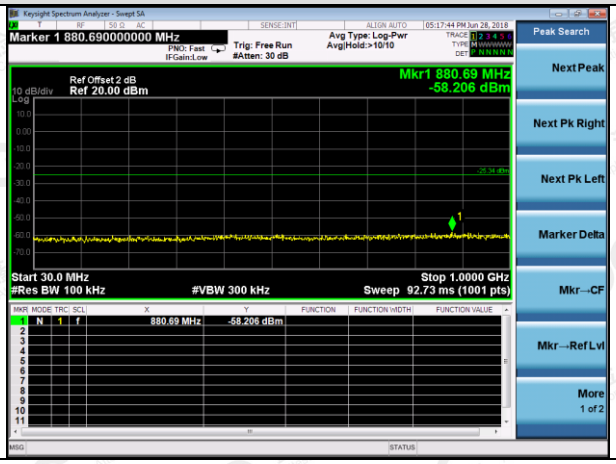
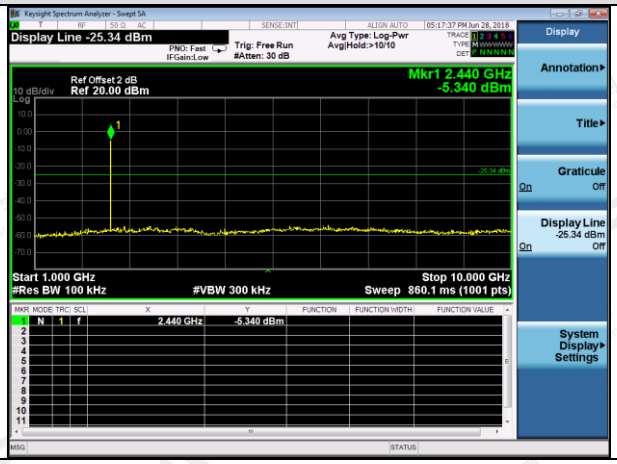
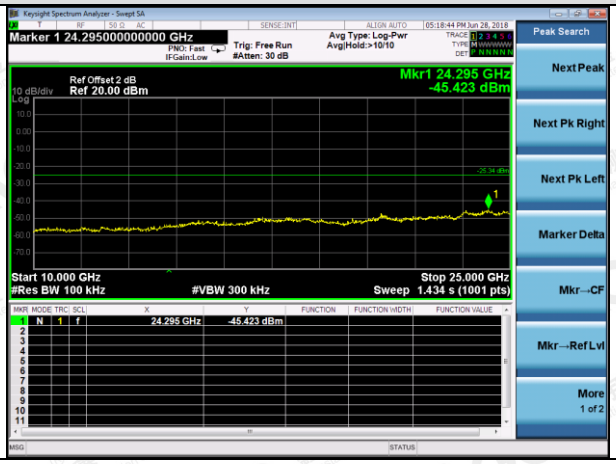
π/4DQPSK-MCH



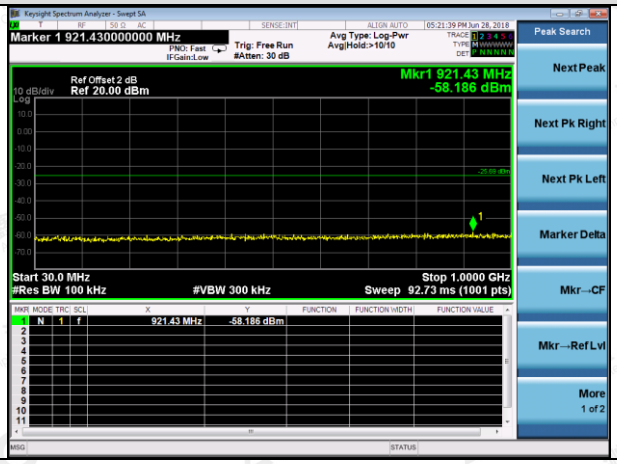

π/4DQPSK-MCH



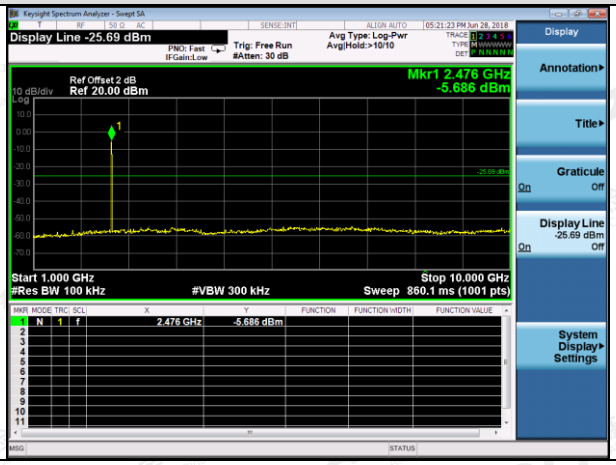

π/4DQPSK-MCH



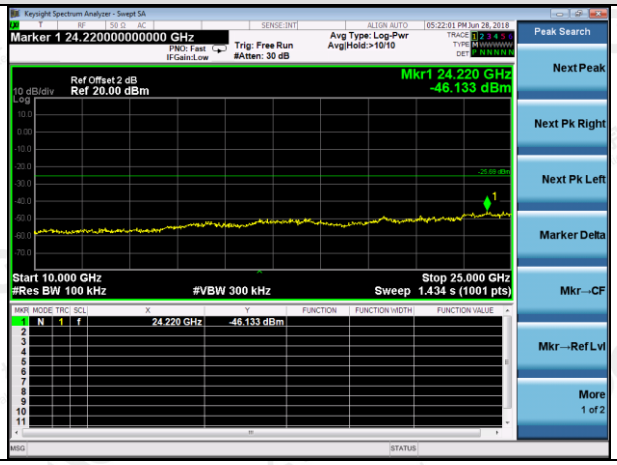

π/4DQPSK-HCH




π/4DQPSK-HCH




π/4DQPSK-HCH

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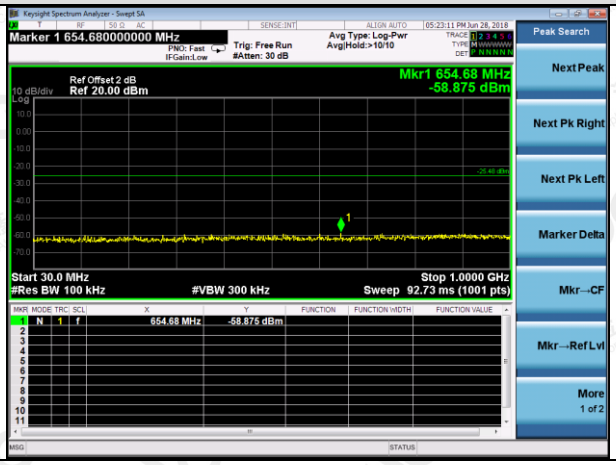
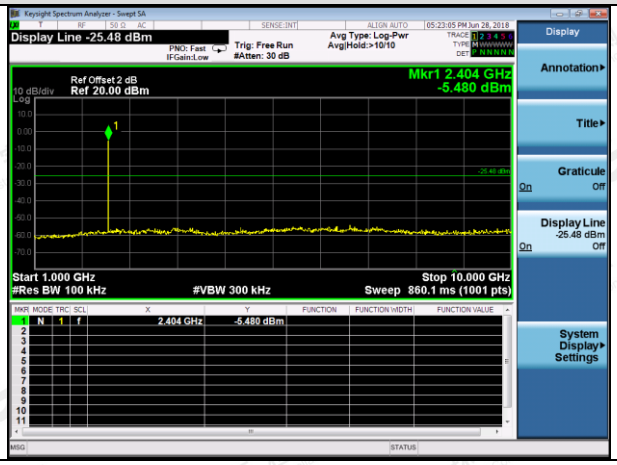
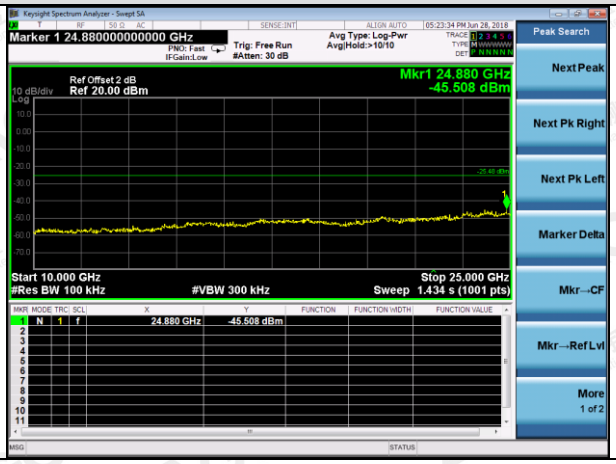
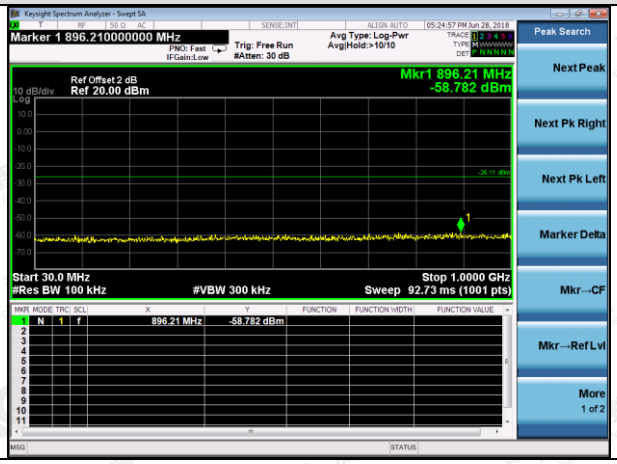
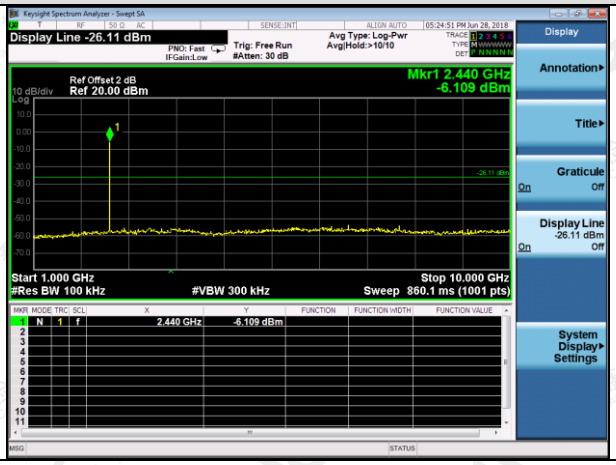
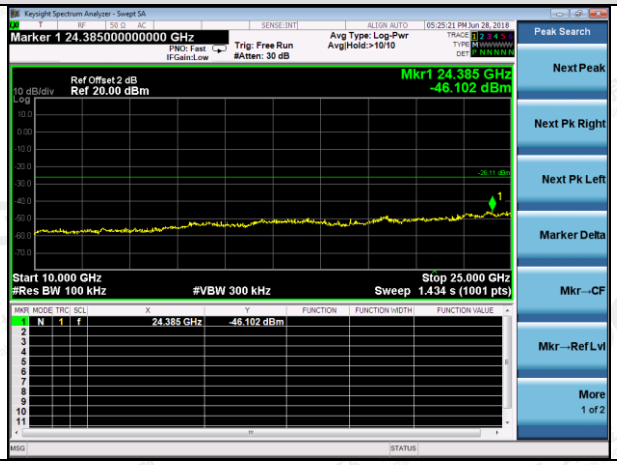
| 8DPSK-LCH | 8DPSK-LCH |
|---|---|
|  |  |

| 8DPSK-LCH | 8DPSK-MCH |
|---|---|
|  |  |

| 8DPSK-MCH | 8DPSK-MCH |
|---|---|
|  |  |

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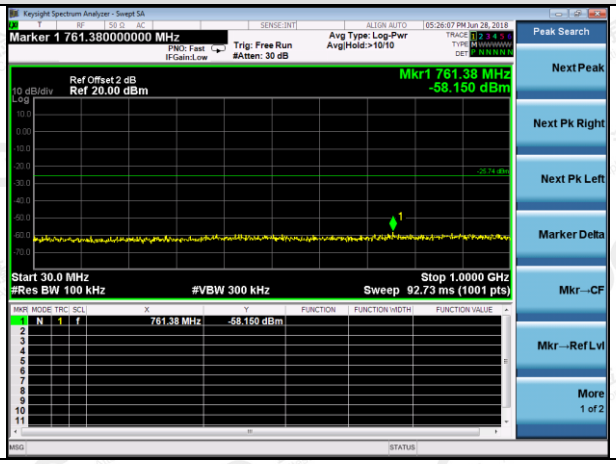
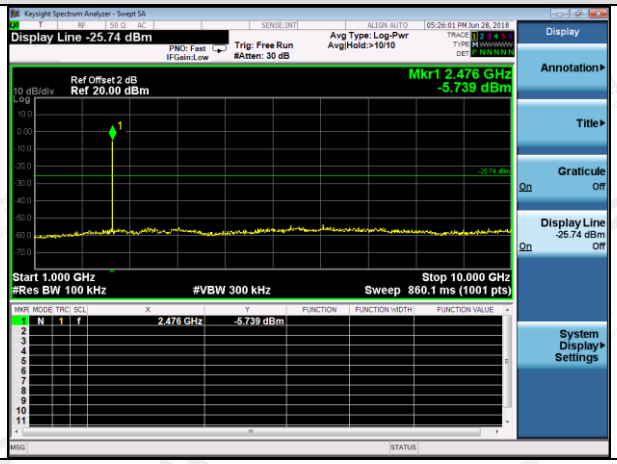
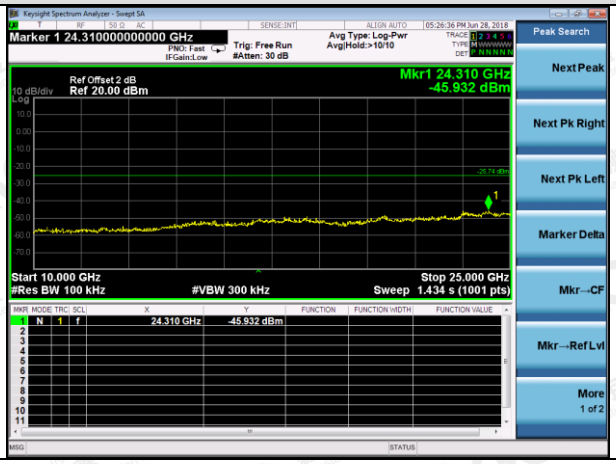
| 8DPSK-HCH | 8DPSK-HCH |
|---|---|
|  |  |

| 8DPSK-HCH | |
|---|---|
|  | |

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