FCC Test Report

Report No.: AGC03866180501FE03

FCC ID	:	2APR9-DIAMOND
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	FEATURE PHONE
BRAND NAME	:	DITEC
MODEL NAME	:	DIAMOND
CLIENT	:	HERMANOS GARCIA ROMERO S.A.S.
DATE OF ISSUE	:	May. 21, 2018
STANDARD(S) **TEST PROCEDURE(S)**	:	FCC Part 15 Rules ANSI C63.10 (2013)
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	/	May. 21, 2018	Valid	Original Report

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TABLE OF CONTENTS

1. VERIFICATION OF CONFORMITY 5
2. GENERAL INFORMATION 6
2.1. PRODUCT DESCRIPTION 6
2.2. TABLE OF CARRIER FREQUENCYS 6
2.3. RECEIVER INPUT BANDWIDTH 7
2.4. EXAMPLE OF A HOPPING SEQUENCY IN DATA MODE 7
2.5. EQUALLY AVERAGE USE OF FREQUENCIES AND BEHAVIOUR 7
2.6. RELATED SUBMITTAL(S) / GRANT (S) 8
2.7. TEST METHODOLOGY 8
2.8. SPECIAL ACCESSORIES 8
2.9. EQUIPMENT MODIFICATIONS 8
3. MEASUREMENT UNCERTAINTY 9
4. DESCRIPTION OF TEST MODES 10
5. SYSTEM TEST CONFIGURATION 11
5.1. CONFIGURATION OF EUT SYSTEM 11
5.2. EQUIPMENT USED IN EUT SYSTEM 11
5.3. SUMMARY OF TEST RESULTS 11
6. TEST FACILITY 12
7. PEAK OUTPUT POWER 13
7.1. MEASUREMENT PROCEDURE 13
7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 13
7.3. LIMITS AND MEASUREMENT RESULT 14
8. 20DB BANDWIDTH 17
8.1. MEASUREMENT PROCEDURE 17
8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 17
8.3. LIMITS AND MEASUREMENT RESULTS 17
9. CONDUCTED SPURIOUS EMISSION 20
9.1. MEASUREMENT PROCEDURE 20
9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 20
9.3. MEASUREMENT EQUIPMENT USED 21
9.4. LIMITS AND MEASUREMENT RESULT 21
10. RADIATED EMISSION 27
10.1. MEASUREMENT PROCEDURE 27
10.2. TEST SETUP 28
10.3. LIMITS AND MEASUREMENT RESULT 29

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10.4. TEST RESULT 30
11. BAND EDGE EMISSION 35
11.1. MEASUREMENT PROCEDURE 35
11.2. TEST SET-UP 35
11.3. RADIATED TEST RESULT 36
11.4 CONDUCTED TEST RESULT 37
12. NUMBER OF HOPPING FREQUENCY 39
12.1. MEASUREMENT PROCEDURE 39
12.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION) 39
12.3. MEASUREMENT EQUIPMENT USED 39
12.4. LIMITS AND MEASUREMENT RESULT 39
13. TIME OF OCCUPANCY (DWELL TIME) 40
13.1. MEASUREMENT PROCEDURE 40
13.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION) 40
13.3. MEASUREMENT EQUIPMENT USED 40
13.4. LIMITS AND MEASUREMENT RESULT 41
14. FREQUENCY SEPARATION 42
14.1. MEASUREMENT PROCEDURE 42
14.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION) 42
14.3. MEASUREMENT EQUIPMENT USED 42
14.4. LIMITS AND MEASUREMENT RESULT 42
15. FCC LINE CONDUCTED EMISSION TEST 43
15.1. LIMITS OF LINE CONDUCTED EMISSION TEST 43
15.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST 43
15.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST 44
15.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST 44
15.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST 45
APPENDIX A: PHOTOGRAPHS OF TEST SETUP 47

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1. VERIFICATION OF CONFORMITY

Applicant	HERMANOS GARCIA ROMERO S.A.S.
Address	Calle 13 No. 19-71 Edificio Sabana Plaza, piso 3 Of. M01 Bogotá -Colombia
Manufacturer	HONGKONG RANGEN TRADE CO., LIMITED
Address	FLAT/RM 502 ARION COMM CENTER 2-12 QUEEN'S RD WEST SHEUNG WAN HONGKONG, CHINA
Product Designation	FEATURE PHONE
Brand Name	DITEC
Test Model	DIAMOND
Date of test	May. 02, 2018~May. 21, 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	Donjon Huang(Huang Dongyang)	May. 21, 2018
Reviewed By	Bart Xie(Xie Xiaobin)	May. 21, 2018
Approved By	Forrest Lei(Lei Yonggang) Authorized Officer	May. 21, 2018

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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is “PPNN” 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	V2.1+EDR
Modulation	GFSK, π /4-DQPSK, 8DPSK
Number of channels	79(For BR/EDR)
Hardware Version	Spreadtrum 6531E
Software Version	E06_SHX_C91_Ditec_V01_20180508.pac
Antenna Designation	Monopole Antenna
Antenna Gain	1.0dBi
Power Supply	DC3.7V 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 multi slot 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: 2APR9-DIAMOND** 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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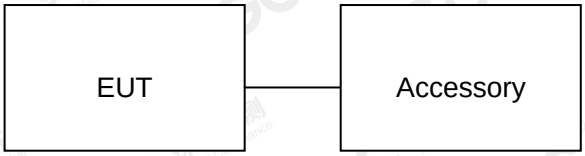
5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM

Configuration:



5.2. EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	FEATURE PHONE	DIAMOND	2APR9-DIAMOND	EUT
2	Adapter	XT-107A-5050N	DC 5.0V 500mA	Accessory
3	Battery	BL-25Bl	DC3.7V/ 2200mAh	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.20, 2017	Jun.19, 2018
LISN	R&S	ESH2-Z5	100086	Aug.21, 2017	Aug.20, 2018
TEST RECEIVER	R&S	ESCI	10096	Jun.20, 2017	Jun.19, 2018
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.20, 2017	Jun.19, 2018
ANTENNA	SCHWARZBECK	VULB9168	D69250	Sep.28, 2017	Sep.27, 2018
SIGNAL ANALYZER	Agilent	N9020A	MY52090123	Sep. 21, 2017	Sep. 20, 2018
USB Wideband Power Sensor	Agilent	U2021XA	MY54110007	Sep. 21, 2017	Sep. 20, 2018
LOOP ANTENNA	A.H	SAS-562B	/	Mar.01,2018	Feb.28,2020

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7. PEAK OUTPUT POWER

7.1. MEASUREMENT PROCEDURE

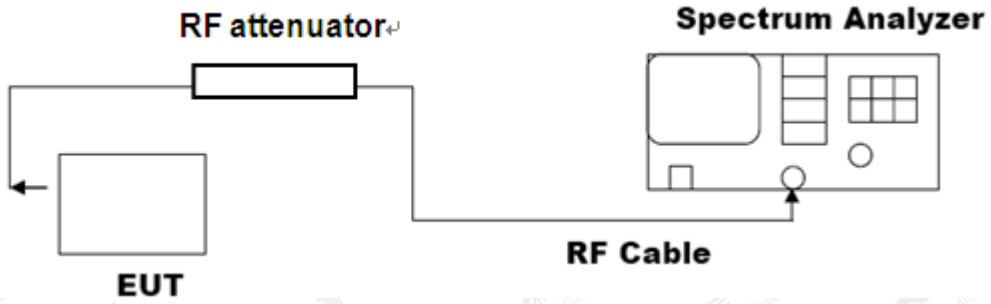
For peak power test:

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. RBW > the 20 dB bandwidth of the emission being measured, VBW ≥ RBW.
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	0.284	30	Pass
	2.441	1.377	30	Pass
	2.480	2.494	30	Pass

Mode	Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
π /4-DQPSK	2.402	1.013	30	Pass
	2.441	2.103	30	Pass
	2.480	2.652	30	Pass

Mode	Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
8DPSK	2.402	1.613	30	Pass
	2.441	2.684	30	Pass
	2.480	3.233	30	Pass

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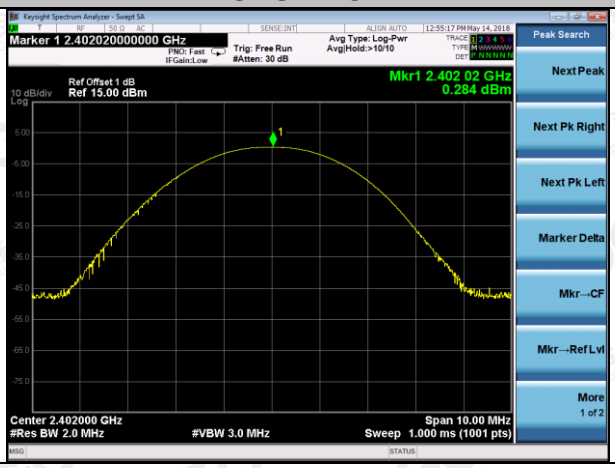
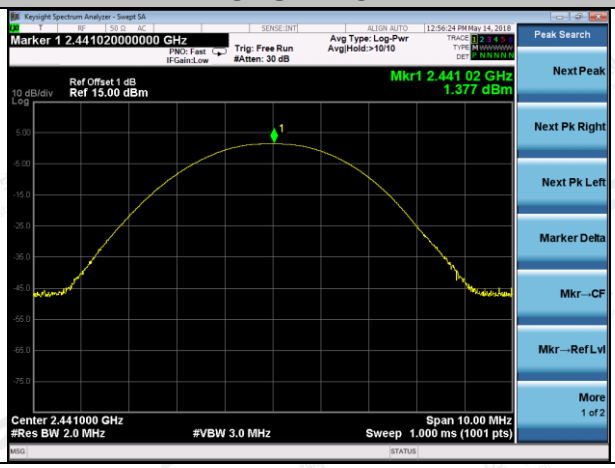
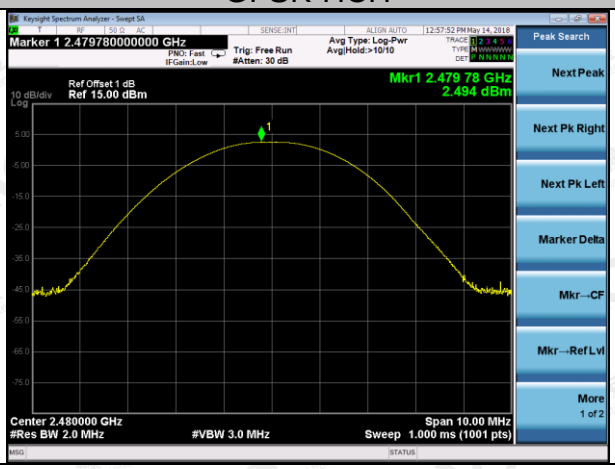
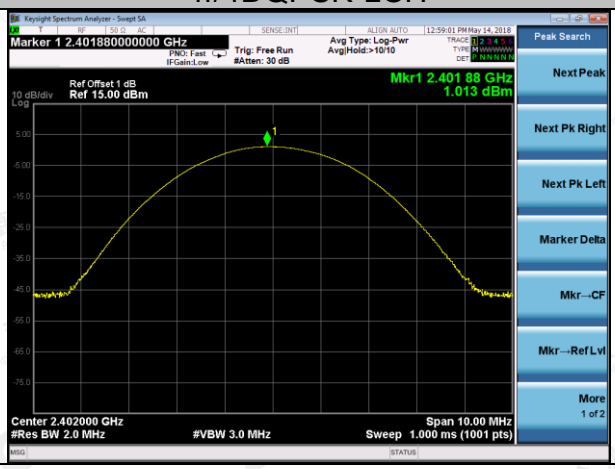
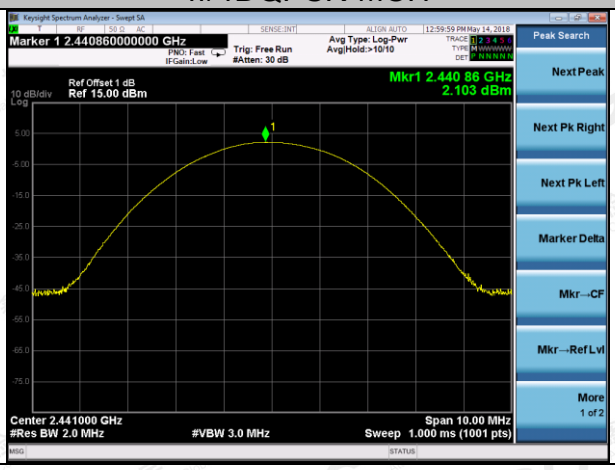
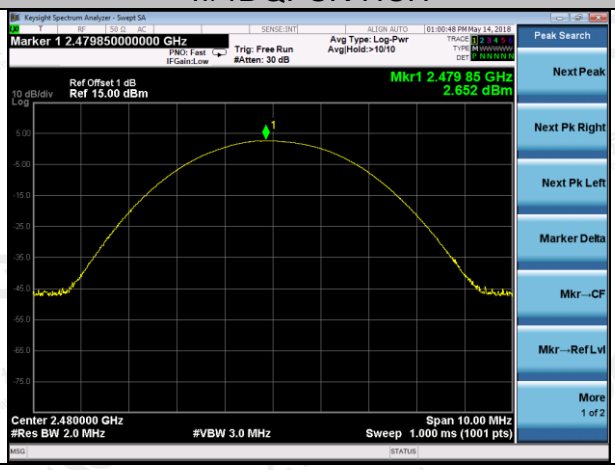
Test Graph

GFSK-LCH	GFSK-MCH
	

GFSK-HCH	π/4DQPSK-LCH
	

π/4DQPSK-MCH	π/4DQPSK-HCH
	

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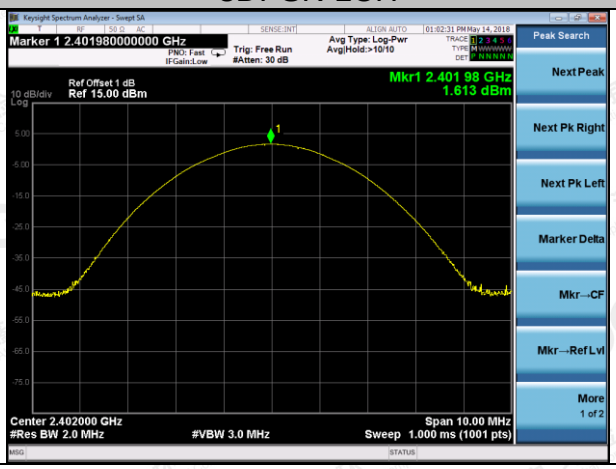
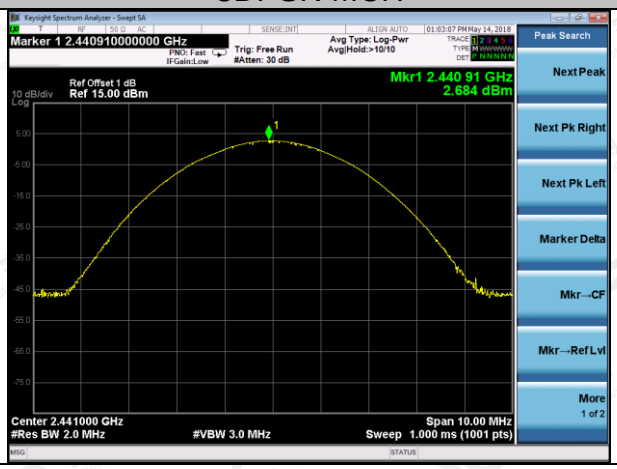
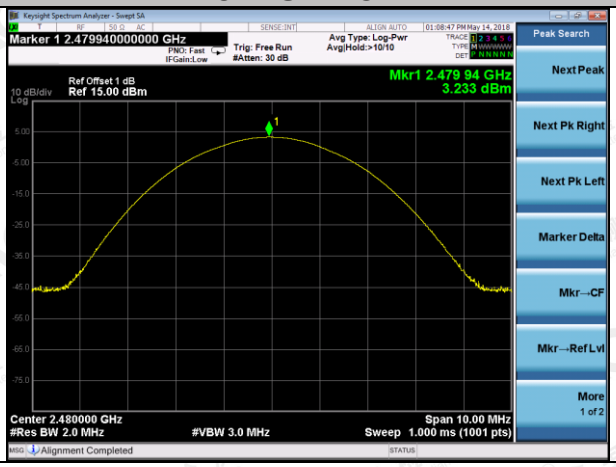
8DPSK-LCH	8DPSK-MCH
	

8DPSK-HCH	
	

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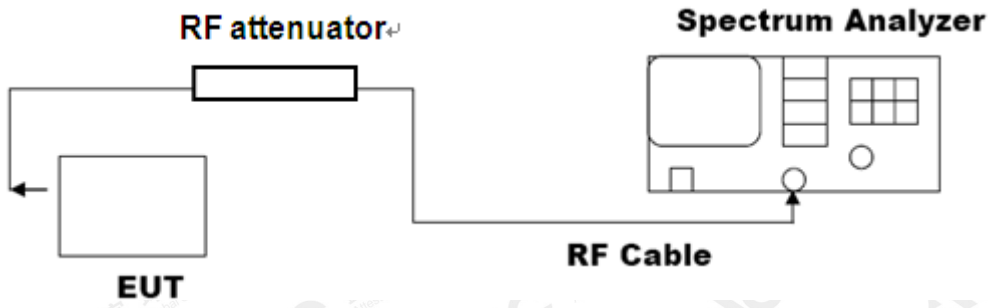
8. 20DB BANDWIDTH

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	783.1	PASS
GFSK	MCH	741.4	PASS
GFSK	HCH	740.2	PASS
π/4DQPSK	LCH	1177	PASS
π/4DQPSK	MCH	1178	PASS
π/4DQPSK	HCH	1186	PASS
8DPSK	LCH	1157	PASS
8DPSK	MCH	1156	PASS
8DPSK	HCH	1158	PASS

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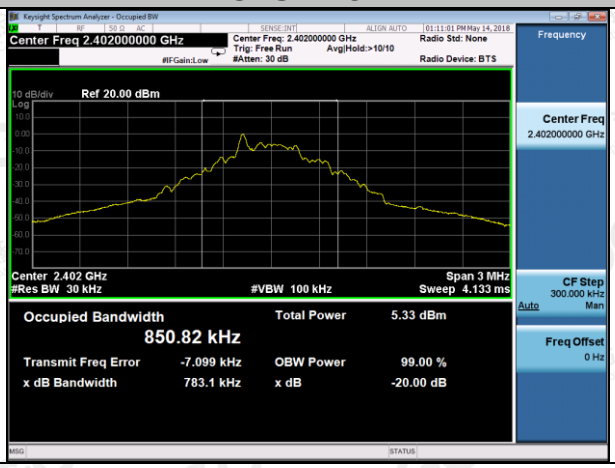
Test Graph

GFSK-LCH

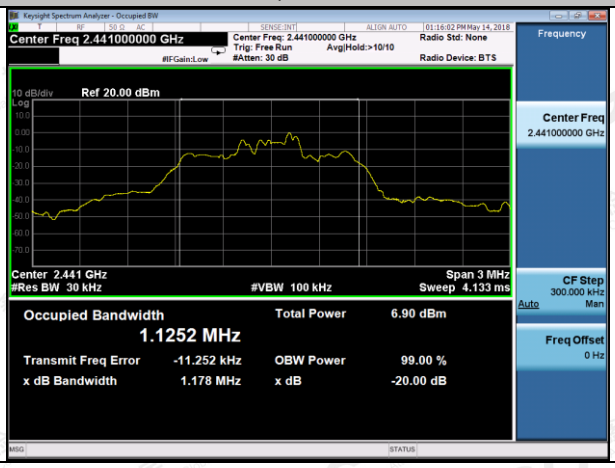


GFSK-MCH

GFSK-HCH

π/4DQPSK-LCH

π/4DQPSK-MCH



π/4DQPSK-HCH

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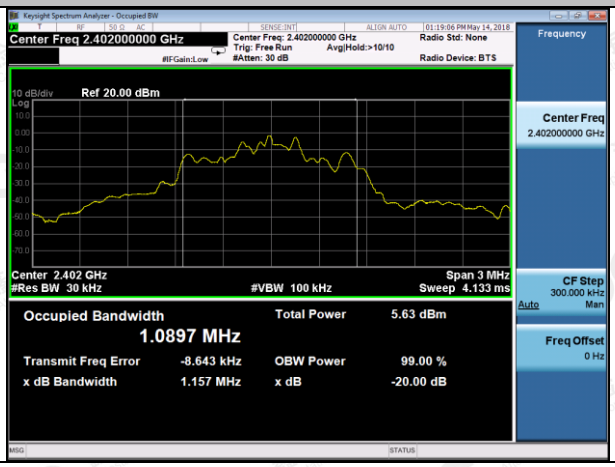
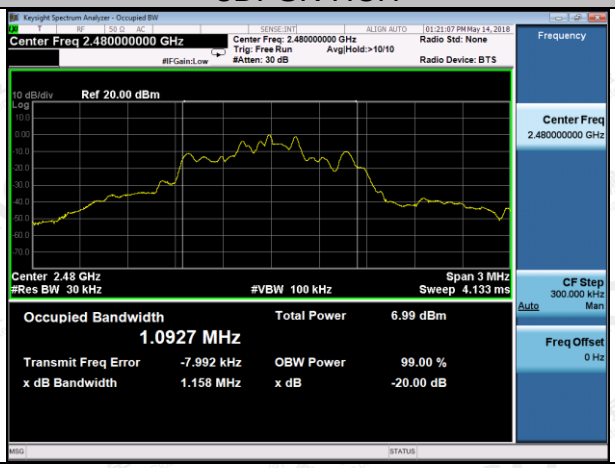
8DPSK-LCH	8DPSK-MCH
	

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. 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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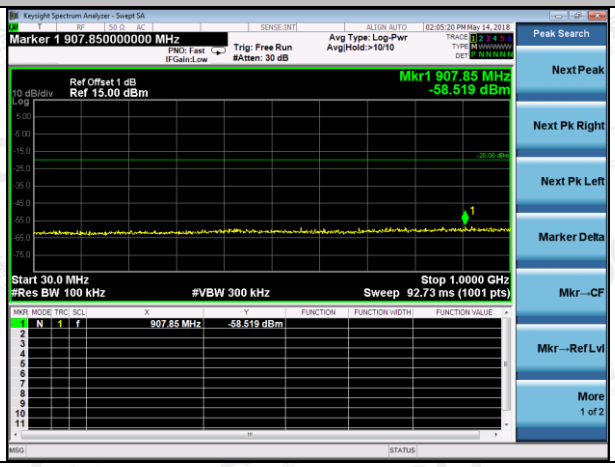
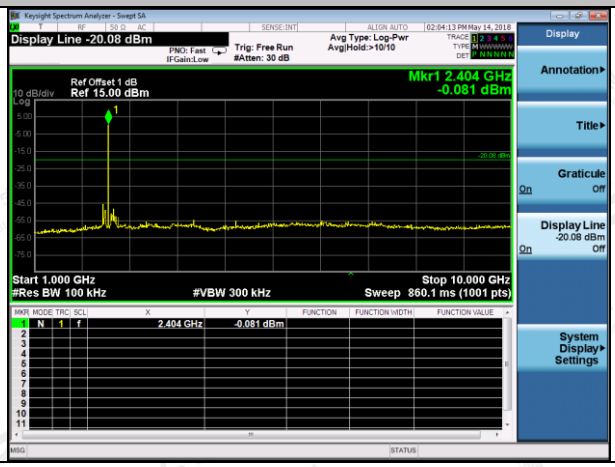
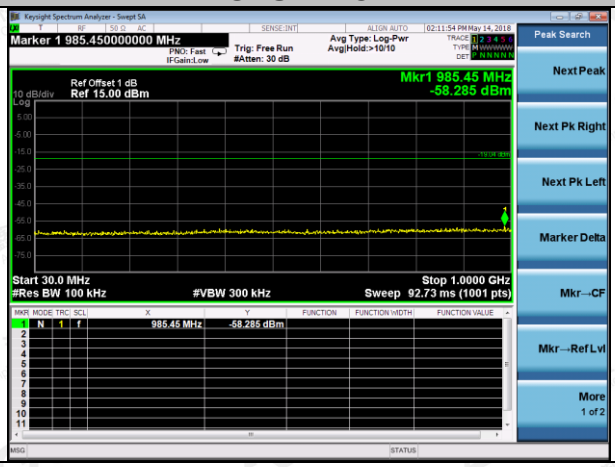
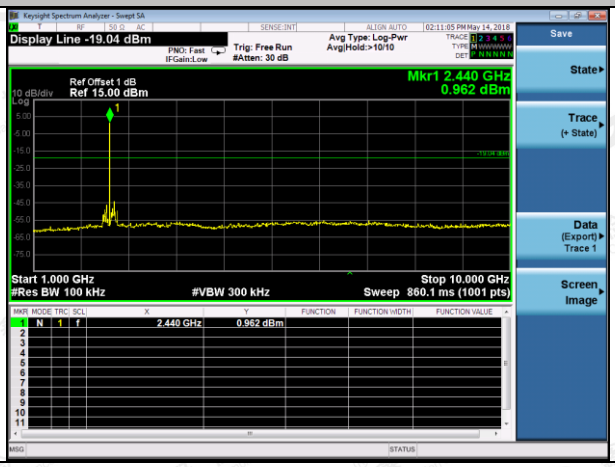
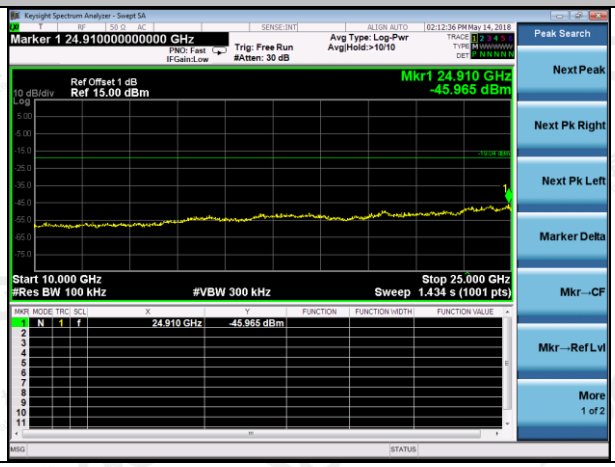
Test Graph

GFSK-LCH	GFSK-LCH
	

GFSK-LCH	GFSK-MCH
	

GFSK-MCH	GFSK-MCH
	

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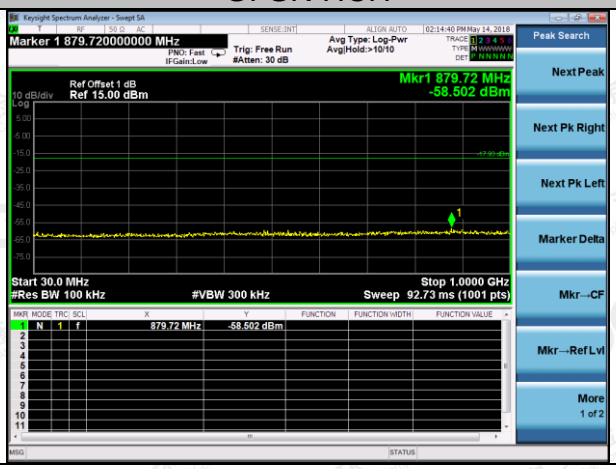
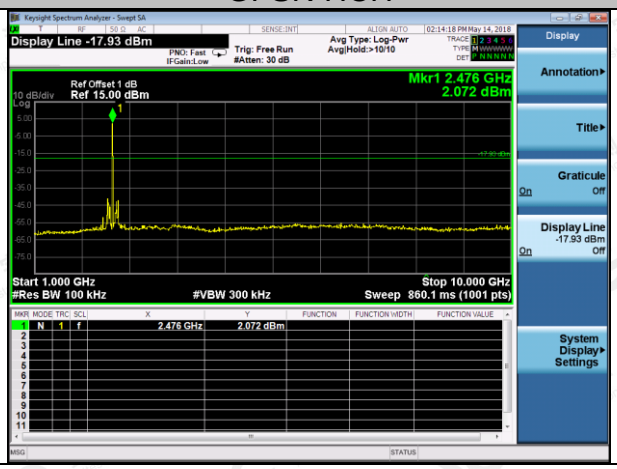
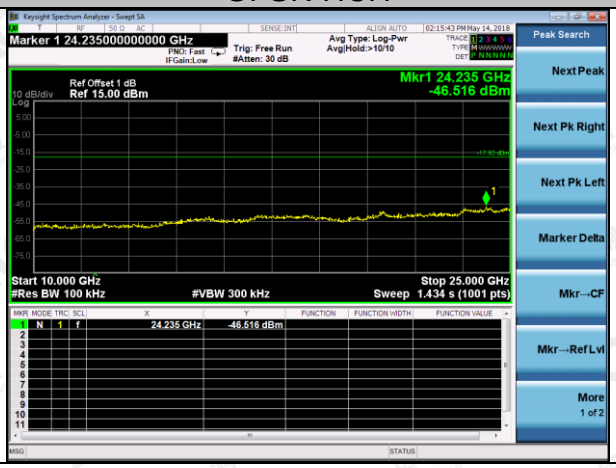
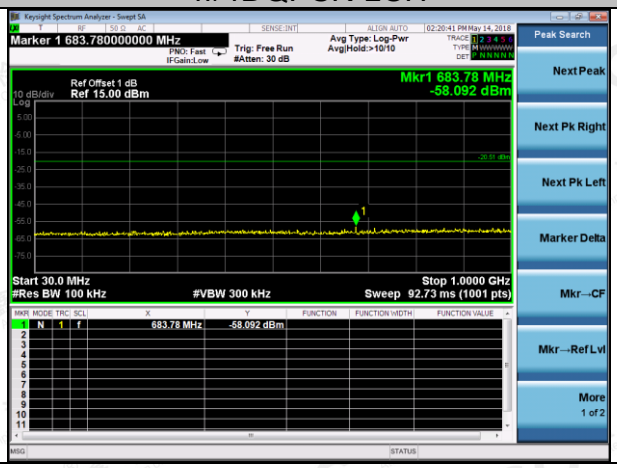
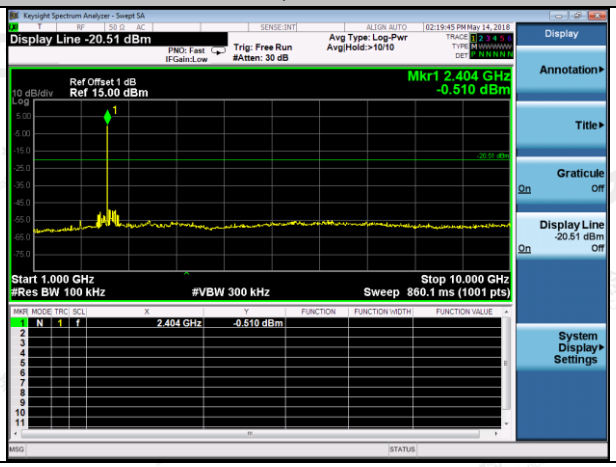
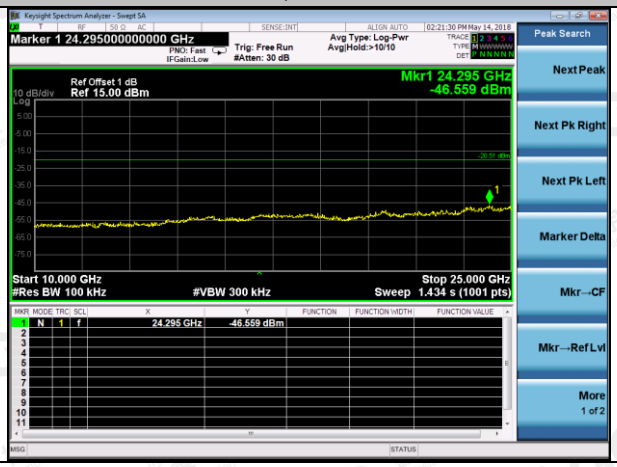
GFSK-HCH	GFSK-HCH
	

GFSK-HCH	π/4DQPSK-LCH
	

π/4DQPSK-LCH	π/4DQPSK-LCH
	

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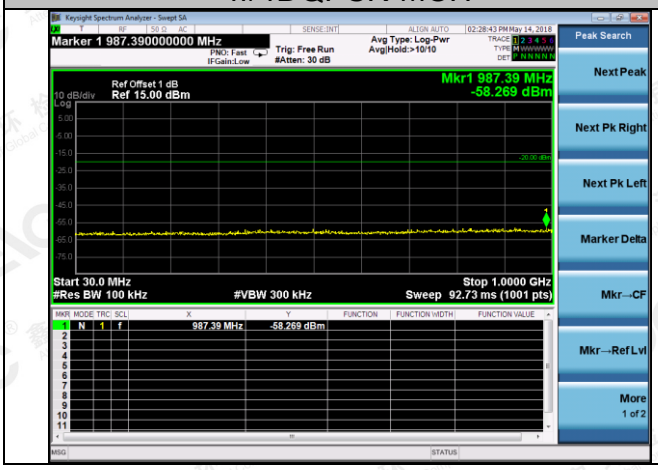
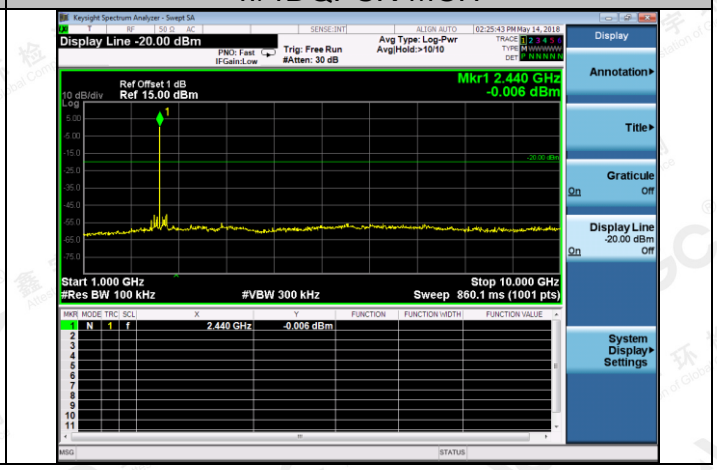
π/4DQPSK-MCH



π/4DQPSK-MCH



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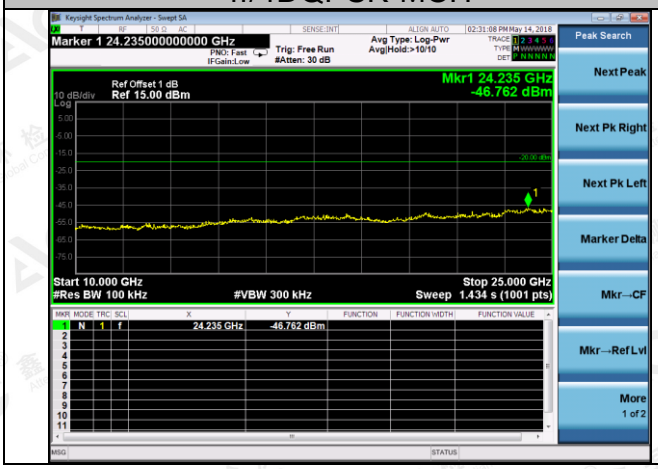

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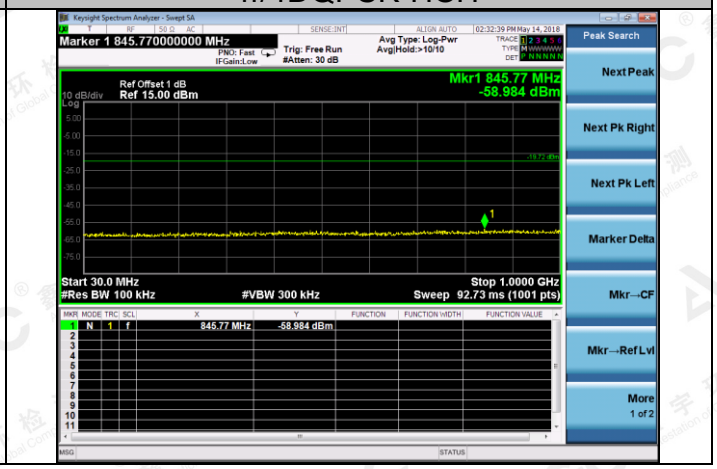
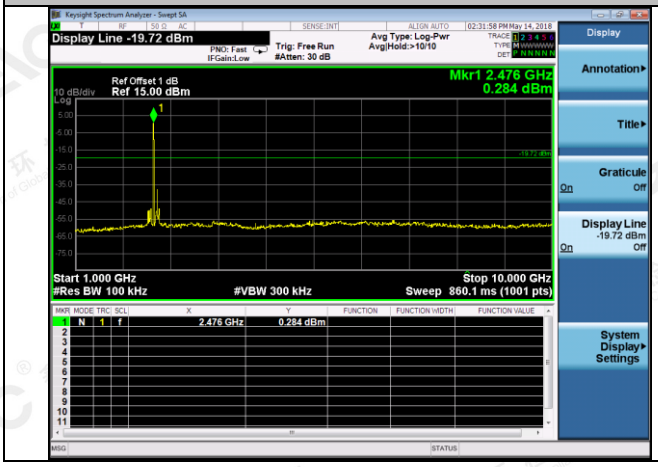
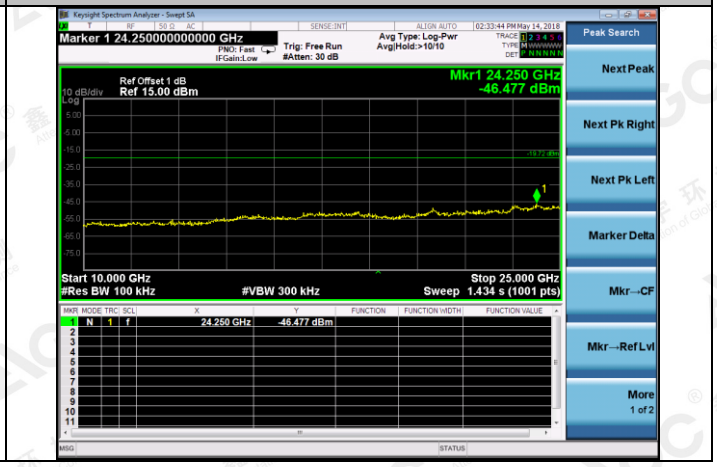


π/4DQPSK-HCH



π/4DQPSK-HCH



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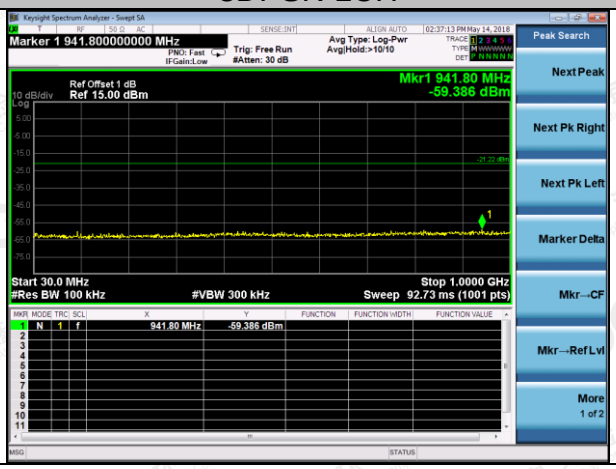
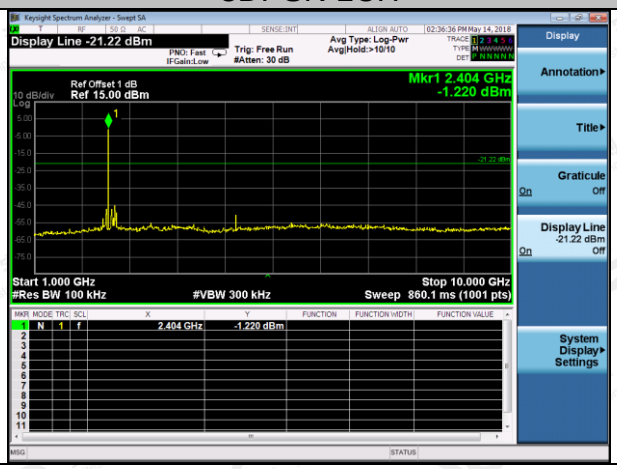
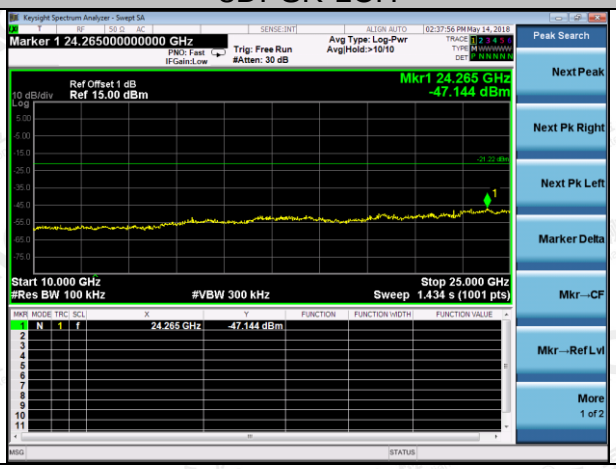
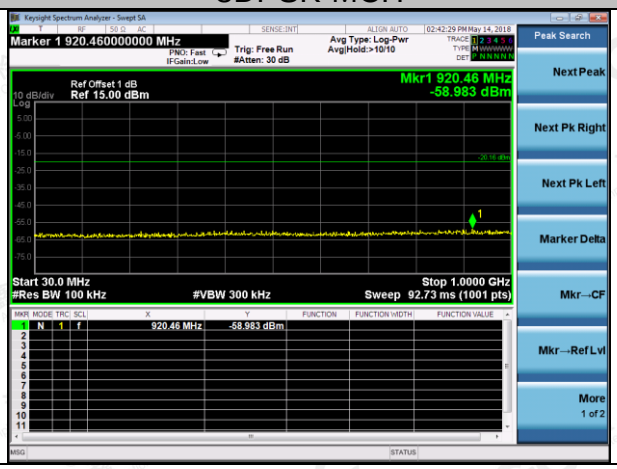
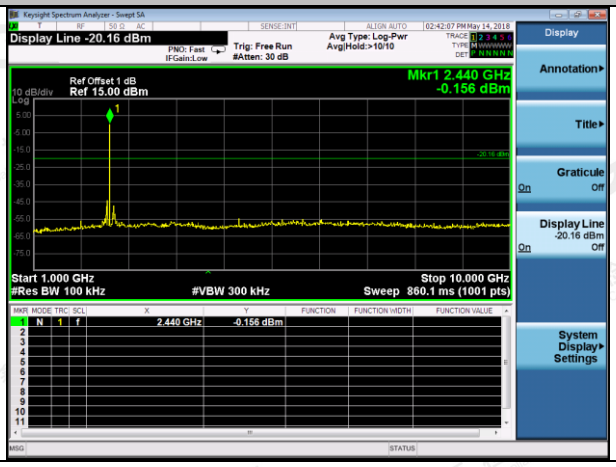
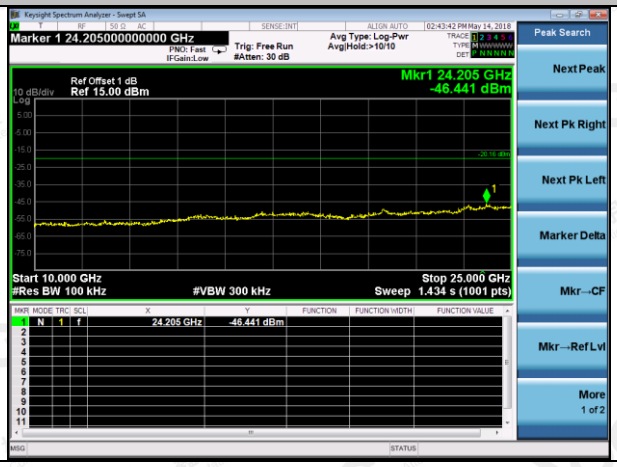
8DPSK-LCH	8DPSK-LCH
	

8DPSK-LCH	8DPSK-MCH
	

8DPSK-MCH	8DPSK-MCH
	

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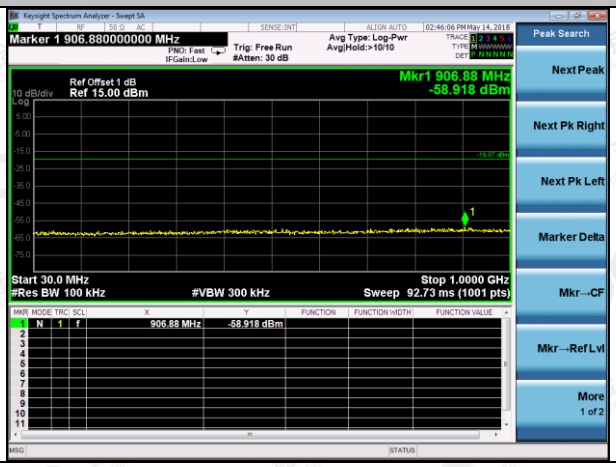
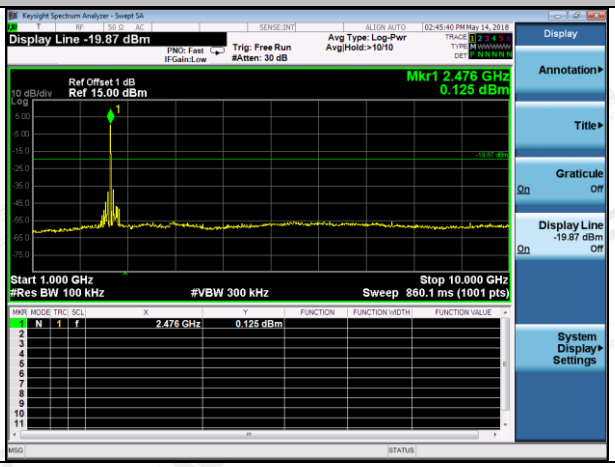
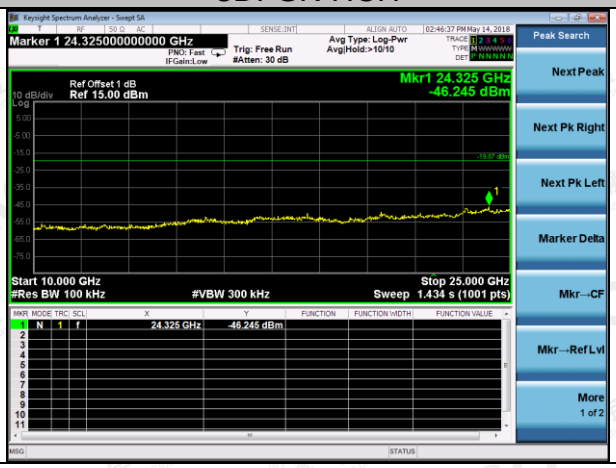
8DPSK-HCH	8DPSK-HCH
	
8DPSK-HCH	
	

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