

TEST REPORT

No. I22N02450-BT

for

Realme Chongqing Mobile Telecommunications Corp., Ltd.

Mobile Phone

Model Name: RMX3710

with

Hardware Version: 11

Software Version: ColorOS 13.0

FCC ID: 2AUYFRMX3710

Issued Date: 2022-12-19

Designation Number: CN1210

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of SAICT.

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I22N02450-BT	Rev.0	1st edition	2022-12-19

Note: the latest revision of the test report supersedes all previous versions.



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1. Summary of Test Report

1.1. Test Items

Description	Mobile Phone
Model Name	RMX3710
Applicant's name	Realme Chongqing Mobile Telecommunications Corp., Ltd.
Manufacturer's Name	Realme Chongqing Mobile Telecommunications Corp., Ltd.

1.2. Test Standards

FCC Part15-2021; ANSI C63.10-2013.

1.3. Test Result

Pass

Please refer to "5.2.Test Results"

1.4. Testing Location

Address: Building G, Shenzhen International Innovation Center, No.1006 Shennan Road, Futian District, Shenzhen, Guangdong, P. R. China 518000

1.5. Project data

Testing Start Date:	2022-11-23
Testing End Date:	2022-12-13

1.6. Signature

有可见

Lin Zechuang (Prepared this test report)

An Ran (Reviewed this test report)

Zhang Bojun (Approved this test report)



2. Client Information

2.1. Applicant Information

Company Name:	Realme Chongqing Mobile Telecommunications Corp., Ltd.
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Contact Person	Yang LiangPing
E-Mail	ylp@realme.net
Telephone:	(86)13798864426
Fax:	1

2.2. Manufacturer Information

Company Name:	Realme Chongqing Mobile Telecommunications Corp., Ltd.
Address:	No.178 Yulong Avenue, Yufengshan, Yubei District, Chongqing, China
Contact Person	Yang LiangPing
E-Mail	ylp@realme.net
Telephone:	(86)13798864426
Fax:	/



3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description	Mobile Phone
Model Name	RMX3710
Frequency Band	ISM 2400MHz~2483.5MHz
Equipment type	Bluetooth [®] BR/EDR
Type of Modulation	GFSK/π/4 DQPSK/8DPSK
Number of Channels	79
Antenna Type	Integrated antenna
Antenna Gain	-1.11dBi
Power Supply	3.87V DC by Battery
FCC ID	2AUYFRMX3710
Condition of EUT as received	No abnormality in appearance

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of Shenzhen Academy of Information and Communications Technology.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of Receipt
UT07aa	863851060019793	11	ColorOS 13.0	2022-11-22
010788	863851060019785		000100 13.0	2022-11-22
UT01aa	863851060019934	11	ColorOS 13.0	2022-11-22
UTUTAA	863851060019926	11	000100 10.0	2022-11-22

*EUT ID: is used to identify the test sample in the lab internally.

UT07aa is used for conduction test, UT01aa is used for radiation test and AC Power line Conducted Emission test.

3.3. Internal Identification of AE used during the test

AE No.	Description	AE ID*
AE1	Battery	/
AE2	Charger	/
AE3	USB Cable	/
AE4	Headset	/

AE1

Model	BLP875
Manufacturer	Sunwoda Electronic Co.Ltd.
Capacity	4880mAh
Nominal Voltage	3.87 V
AE2	
Model	VCB3HDUH
Manufacturer	Shenzhen Huntkey Chiyuan Electric Co., LTD

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Specification AE3	American Standard Charger
Model	DL150
Manufacturer	1
AE4	
Model	MH156
Manufacturer	1

*AE ID and AE Label: is used to identify the test sample in the lab internally.

3.4. <u>General Description</u>

The Equipment under Test (EUT) is a model of Mobile Phone with integrated antenna and battery. It consists of normal options: Lithium Battery, Charger, USB Cable and Headset. Manual and specifications of the EUT were provided to fulfil the test. Samples undergoing test were selected by the client.



4. <u>Reference Documents</u>

4.1. Documents supplied by applicant

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 15	FCC CFR 47, Part 15, Subpart C:	2021
	15.205 Restricted bands of operation;	
	15.209 Radiated emission limits, general requirements;	
	15.247 Operation within the bands 902–928MHz,	
	2400–2483.5 MHz, and 5725–5850 MHz	
ANSI C63.10	American National Standard of Procedures for Compliance	2013
	Testing of Unlicensed Wireless Devices	



5. Test Results

5.1. <u>Testing Environment</u>

Normal Temperature:	15~35°C
Relative Humidity:	20~75%

5.2. Test Results

No	Test cases	Sub-clause of Part 15C	Verdict
0	Antenna Requirement	15.203	Р
1	Maximum Peak Output Power	15.247 (b)	Р
2	Band Edges Compliance	15.247 (d)	Р
3	Conducted Spurious Emission	15.247 (d)	Р
4	Radiated Spurious Emission	15.247,15.205,15.209	Р
5	Occupied 20dB bandwidth	15.247(a)	1
6	Time of Occupancy(Dwell Time)	15.247(a)	Р
7	Number of Hopping Channel	15.247(a)	Р
8	Carrier Frequency Separation	15.247(a)	Р
9	AC Power line Conducted Emission	15.107,15.207	Р

See **ANNEX A** for details.

5.3. Statements

SAICT has evaluated the test cases requested by the applicant/manufacturer as listed in section 5.2 of this report, for the EUT specified in section 3, according to the standards or reference documents listed in section 4.2.

Disclaimer:

A. After confirmation with the customer, the sample information provided by the customer may affect the validity of the measurement results in this report, and the impact and consequences arising therefrom shall be borne by the customer.

B. The samples in this report are provided by the customer, and the test results are only applicable to the samples received.



6. Test Equipments Utilized

Conducted test system

No.	Equipment	Model	Model	Aodel Serial Number Manufacturer Calibrati		Calibration	Calibration
NO.	Equipment	woder	Senai Number	Manufacturer	Due date	Period	
1	Vector Signal	FSV40	100903	Rohde &	2022-12-29	1.000	
	Analyzer	F3V40	100903	Schwarz	2022-12-29	1 year	
2	Power Sensor	U2021XA	MY55430013	Keysight	2022-12-29	1 year	
3	Data Acquisition	U2531A	TW55443507	Keysight	/	/	
4	RF Control Unit	JS0806-2	21C8060398	Tonscend	2023-05-08	1 year	
5	Wireless	CMW270	100540	Rohde &	2023-03-13	1.voor	
5	Connective Tester		100540	Schwarz	2023-03-13	1 year	
6	Shielding Room	S81	CT000986-1344	ETS-Lindgren	2026-09-12	5 years	

Radiated test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date	Calibration Period
			Number		Due uale	renou
1	Test Receiver	ESR7	101676	Rohde & Schwarz	2023-11-23	1 year
2	BiLog Antenna	3142E	0224831	ETS-Lindgren	2024-05-27	3 years
3	Horn Antenna	3117	00066577	ETS-Lindgren	2025-04-17	3 years
4	Anechoic		4005	ETO L'AL	0000 05 00	0
4	Chamber	FACT3-2.0	1285	ETS-Lindgren	2023-05-29	2 years
-	Spectrum	F0)/40	404400	Dahda 8 Caburan	0000 04 40	1
5	Analyzer	FSV40	101192	Rohde & Schwarz	2023-01-12	1 year
6	Loop Antenna	HLA6120	35779	TESEQ	2025-05-10	3 years
-		QSH-SL-1		0000 04 00		
7	Horn Antenna	8-26-S-20	17013	Q-par	2023-01-06	3 years
8	Test Receiver	ESCI	100702	Rohde & Schwarz	2023-01-12	1 year
9	LISN	ENV216	102067	Rohde & Schwarz	2023-07-14	1 year

Test software

No.	Equipment	Manufacturer	Version
1	JS1120-3	Tonscend	3.2
2	EMC32	Rohde & Schwarz	10.50.40

EUT is engineering software provided by the customer to control the transmitting signal. The EUT was programmed to be in continuously transmitting mode.



7. Laboratory Environment

Shielded room

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	> 2MΩ
Ground system resistance	< 4 Ω

Anechoic chamber

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	> 2MΩ
Ground system resistance	< 4 Ω
Normalised site attenuation (NSA)	<±4 dB, 3 m distance, from 30 to 1000 MHz
Voltage Standing Wave Ratio (VSWR)	≤ 6 dB, from 1 to 18 GHz, 3m distance
Uniformity of field strength	Between 0 and 6 dB, from 80 to 6000 MHz



8. <u>Measurement Uncertainty</u>

Test Name	Uncertainty (<i>k</i> =2)	
1. Maximum Peak Output Power	1.32	dB
2. Band Edges Compliance	1.92	dB
	30MHz≤f<1GHz	1.41dB
2 Transmitter Spurious Emission Conducted	1GHz≤f<7GHz	1.92dB
3. Transmitter Spurious Emission - Conducted	7GHz≤f<13GHz	2.31dB
	13GHz≤f≤26GHz	2.61dB
	9kHz≤f<30MHz	1.79dB
4. Transmitter Courieus Emission - Dedicted	30MHz≤f<1GHz	4.86dB
4 Transmitter Spurious Emission - Radiated	1GHz≤f<18GHz	4.82dB
	18GHz≤f≤40GHz	2.90dB
5. 20dB Bandwidth	4.56k	:Hz
6. Time of Occupancy (Dwell Time) & Number	0.58ms	
of Hopping Channels		
7. Carrier Frequency Separation	4.56k	Ήz
8. AC Power line Conducted Emission	150kHz≤f≤30MHz	2.62dB



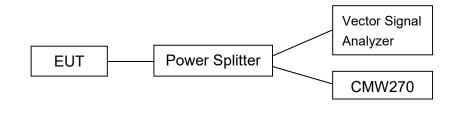
ANNEX A: Detailed Test Results

Test Configuration

The measurement is made according to ANSI C63.10.

1) Conducted Measurements

- 1. Connect the EUT to the test system correctly.
- 2. Set the EUT to the required work mode.
- 3. Set the EUT to the required channel.
- 4. Set the EUT hopping mode (hopping on or hopping off).
- 5. Set the spectrum analyzer to start measurement.
- 6. Record the values.

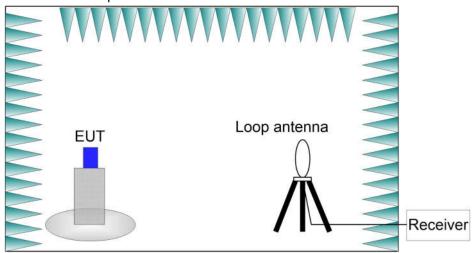


2) Radiated Measurements

Test setup:

9kHz-30MHz:

The EUT are measured in a anechoic chamber. The EUT is placed on a non-conductive stand of 80cm high, and at a measurement distance of 3m from the receiving antenna. The center of the receiving loop antenna is 1.0 meter above the ground. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT and adjusting the receiver antenna polarization.

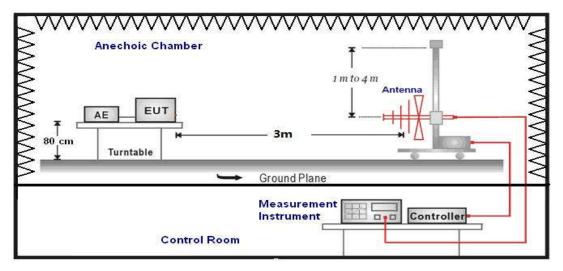




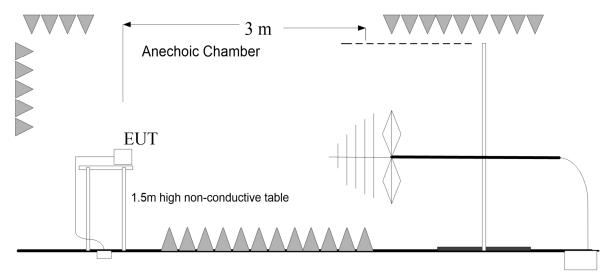
30MHz-26.5GHz:

The EUT are measured in a anechoic chamber. The EUT is placed on a non-conductive stand of 80cm high, and at a measurement distance of 3m from the receiving antenna. The center of the receiving antenna is 1.0 meter to 4.0 meter above the ground. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT and adjusting the receiver antenna polarization.

30MHz-1GHz:

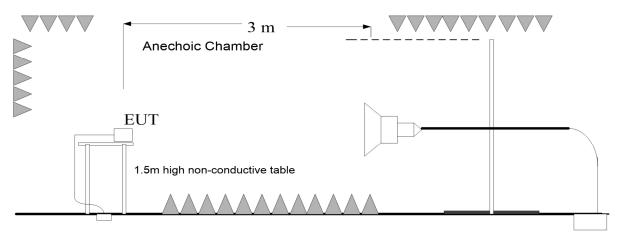


1GHz-3GHz:



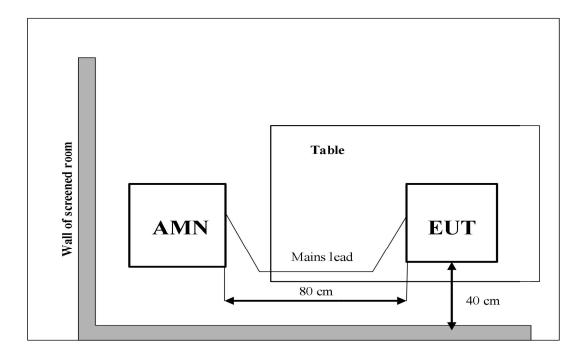


3GHz-26.5GHz:



3) AC Power line Conducted Emission Measurement

The EUT is working as Bluetooth terminal. A communication link of Bluetooth is set up with a System Simulator (SS). The EUT is commanded to operate at maximum transmitting power.





A.0 Antenna requirement

Measurement Limit:

Standard	Requirement
Standard	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can
FCC CRF Part 15.203	be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Conclusion: The Directional gains of antenna used for transmitting is -1.11dBi. The RF transmitter uses an integrate antenna without connector.



A.1 Maximum Peak Output Power

Method of Measurement: See ANSI C63.10-clause 7.8.5.

A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

Measurement Limit:

Standard	Limit (dBm)
FCC CRF Part 15.247(b)	< 30

Measurement Results:

Mada	Peak Cor	nducted Output Pov	ver (dBm)	Conclusion
Mode	2402MHz (CH0)	2441MHz (CH39)	2480MHz (CH78)	Conclusion
GFSK	10.13	10.05	10.89	Р
π/4 DQPSK	9.92	9.71	9.95	Р
8DPSK	9.86	9.56	10.12	Р

Conclusion: Pass



A.2 Band Edges Compliance

Method of Measurement: See ANSI C63.10-clause 7.8.6.

Measurement Limit:

Standard	Limit (dBc)
FCC 47 CFR Part 15.247 (d)	> 20

Measurement Result:

Mode	Frequency (MHz)	Hopping	Test Results	Conclusion
	2402(CH0)	OFF	Fig.1	Р
GFSK	2480(CH78)	OFF	Fig.2	Р
Gran	2402(CH0)	ON	Fig.3	Р
	2480(CH78)	ON	Fig.4	Р
	2402(CH0)	OFF	Fig.5	Р
	2480(CH78)	OFF	Fig.6	Р
π/4 DQPSK	2402(CH0)	ON	Fig.7	Р
	2480(CH78)	ON	Fig.8	Р
	2402(CH0)	OFF	Fig.9	Р
8DPSK	2480(CH78)	OFF	Fig.10	Р
ODROK	2402(CH0)	ON	Fig.11	Р
	2480(CH78)	ON	Fig.12	Р

See below for test graphs.

Conclusion: Pass



At Cou	f Leve t int 300		00 dB 30 (4 dB 💿 RBW 1 ms 💿 VBW 3		le Auto Swe	еер	
1 P	< View								
							M1[1]		8.23 dBr 2.40217 0 GH
10.0	Bm	-					M2[1]		-48.4/ dBr
) dB	m						Intel al		2.4000000 GH
1.00								1 1	
10	dBm	D1 -	11.77	0 dBm			_	-	
20	dBm	7.7		The Million of					
20	ubiii				1				
-30	dBm	-						-	
40	dBm								
		MH						MB	M2/ 4
50	dBm	astar	ment	man and man	mounder	monumen	meneryminer	mound	prentigential in
60	dBm								
-00	ubin-								
-70	dBm	-				-	-		
Sta	rt 2.35	GHz		115 (A)	- 0 j	691 pts	10	10 - D	Stop 2.405 GHz
	rker								
	Type	Ref		Stimulus	Response	Function		Function	Result
No			1	2.402174 GHz	8.23 dBm				
No 1	N1			2.4 GHz	-48.41 dBm				
No	N1 N2 N3		1	2.39 GHz	-48.10 dBm				



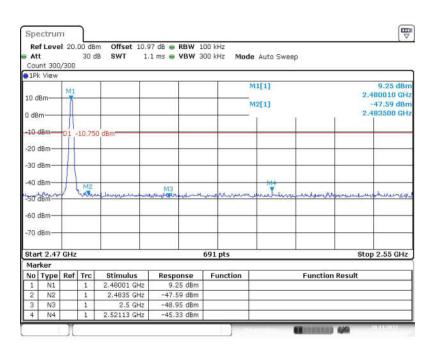


Fig. 2 Band Edges (GFSK, CH78, Hopping OFF)



At	f Leve t int 300		00 dB 30 (9 dB ee RBW 1 ms ee VBW 3		de Auto Sweep	
)1P	k View							
10 d	IBm——						M1[1] M2[1]	8.36 dB 2.4040050 d -49.01 dB
d dB	m			-			-	2.400000
10	dBm	01	11 64	0 dBm				
20	dBm							
30	dBm							
40	dBm	-	_	-		014	M3	
501	dem-1	mun	work	monormen	nounmul	howman	Inmonut	munpartited
60	dBm							
70	dBm	-						
Sta	rt 2.35	GHz				691 pts		Stop 2.405 GHz
	rker							
	Туре	Ref		Stimulus	Response	Function	Fu	inction Result
1	N1 N2		1	2.404005 GHz 2.4 GHz	8.36 dBm -49.01 dBm			
6	N3		1	2.39 GHz	-47.66 dBm	-		
3								



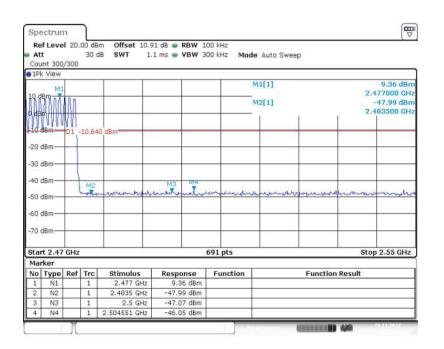


Fig. 4 Band Edges (GFSK, CH78, Hopping ON)



View				1 ms 🖷 VBW 3	00 kHz Moo	le Auto Swee	^s p	
						and the second se		
3m						M1[1]		8.46 dBr 2.4021740 GH -41.28 dBr
m——	-		-		-		а – т	2.4000000 GH
Bm	01	11 54	D dBm			_		
IBm	01	11.04	C COM					
IBm								mind 4
	-						ма	by h
Bm	en an	www	and the second second	manun	en gon have	monder	motherentiates	Mysteher
iBm—	-				-	-		
iBm	-				-			
_	GHz				691 pts			Stop 2.405 GHz
	Pof	Tec	Stimulus	Posnonso	Eunction		Function	Pacult
N1	Ner	1	2.402174 GHz	8.46 dBm	runction		runction	xesur.
N2		1	2.4 GHz	-41.24 dBm				
N3 N4		1	2.39 GHz 2.3996594 GHz	-47.64 dBm -40.85 dBm				
	n Bm Bm Bm Bm Bm Bm Bm Bm C 2.35 ker Type N1 N2	Bm 01 - Bm 01 - Bm Bm - Bm - Bm - Bm - C 2.35 GHz ker Type Ref N1 N2	D1 -11.54 Bm D1 -11.54 Bm Bm B	Bm 01 -11.540 dBm Bm B	Bm D1 -11.540 dBm Bm Bm Bm Bm Interview Statution Statution Statution Statution Statution Statution Statution N1 1 2.4 GHz -41.24 dBm N2 1 2.4 GHz -41.24 dBm	Bm 01 -11.540 dBm Bm 01 -11.540 dBm Bm Bm Bm Bm Stimulus Response Function N1 1 2.4 GHz -41.24 dBm	M2[1] Bm Bm <	M2[1] Bm D1 -11.540 dBm Bm Bm State Bm State State State State State State <



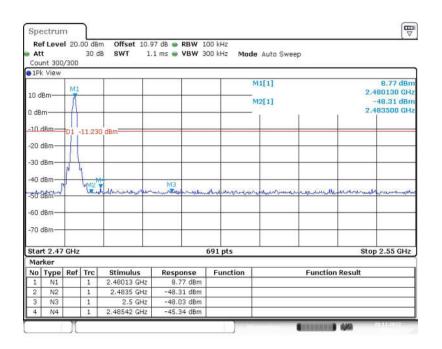


Fig. 6 Band Edges (π/4 DQPSK, CH78, Hopping OFF)



At Cou	nt 300		00 dB 30 d		9 dB \cdots RBW 1 1 ms 😁 VBW 3		e Auto Swee	p	
10 d							M1[1] M2[1]		8.06 dBi 2.4020150 Gi -43.75 dBj 2.40000009/04
-10	dBm	D1 -	11.94	0 dBm					
-20	dBm	-							
-30	dBm	-							
-40				undududuch	914 T			мз	, M
-90	Bm	men	www.	- manufacture		hand the state of	manner	manne	and the second
-60	dBm	-							
-70	dBm	-			0		-		
	t 2.35	GHz				691 pts	1		Stop 2.405 GHz
	ker Type	Rof	Trc	Stimulus	Response	Function		Function	Result
1	N1	1.07	1	2.402015 GHz	8.06 dBm	. anation		, and the	
2	N2		1	2.4 GHz	-43.75 dBm				
3	N3		1	2.39 GHz	-48.79 dBm				
4	N4		1	2.3726377 GHz	-46.32 dBm				



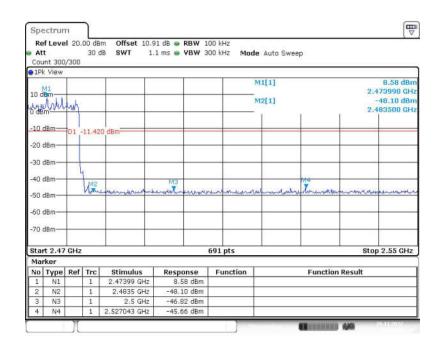


Fig. 8 Band Edges (π/4 DQPSK, CH78, Hopping ON)



At	f Leve t int 300		00 dB 30 (4 dB 🐽 RBW 1 . ms 👜 VBW 3		le Auto Sweep		
) 1P	k View								
10 d	IBm					_	M1[1] M2[1]		8.59 dBn 2.4021740 GH -42.05 dBn
0 dB	Im	-					1 1	r.	2.4000000 GH
-10	dBm	D1 -	-11.41	0 dBm					
-20	dBm								
-30	dBm	-							N WEN
40	dBm	-		-				13	h h
sð	dBm	in	when	rawanen		monorman	uchumuth	1 wanter and	working
60	dBm								
-70	dBm								
-	rt 2.35	GHz				691 pts			Stop 2.405 GHz
	rker		-						
NO 1	Type N1	Ref	Trc 1	Stimulus 2.402174 GHz	Response 8.59 dBm	Function		Function Res	sult
2	N2		1	2.4 GHz	-42.01 dBm				
	N3		1	2.39 GHz	-48.91 dBm				
3									



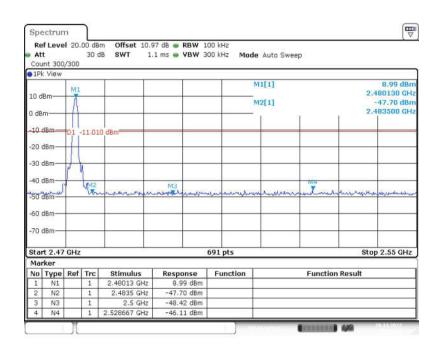


Fig. 10 Band Edges (8DPSK, CH78, Hopping OFF)



At Cou	nt 300		00 dB 30 (9 dB 👳 RBW 1 1 ms 🖷 VBW 3	507 (10 A 10	le Auto Sweep	10	
10 d 0 dB							M1[1] M2[1]		7.85 dBi 2.4030500 Gi -44.13 dBj 2.400000000
-10 (dBm	D1 -	12.15	iū dBm		_			
-20 (dBm	-							
-30 (dBm	-		-					
-40 (walker	what	maronoutrootes	under mark	mound	-	MB	
	dBm								
-70 (dBm	-							
	t 2.35	GHz				691 pts			Stop 2.405 GHz
	ker Type	Ref	Trc	Stimulus	Response	Function		Function	Result
1	N1		1	2.40305 GHz	7.85 dBm				
2	N2		1	2.4 GHz	-44.13 dBm				
3	N3		1	2.39 GHz	-48.51 dBm				
4	N4		1	2.3671377 GHz	-45.93 dBm				



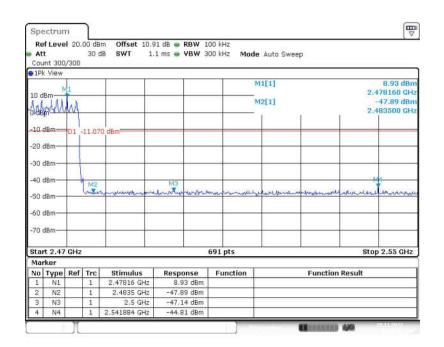


Fig. 12 Band Edges (8DPSK, CH78, Hopping ON)



A.3 Conducted Emission

Method of Measurement: See ANSI C63.10-clause 7.8.8.

Measurement Limit:

Standard	Limit (dBm)
ECC 47 CEP Dort 15 247 (d)	20dBm below peak output power in 100kHz
FCC 47 CFR Part 15.247 (d)	bandwidth

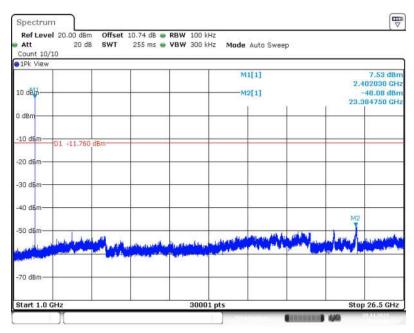
Measurement Results:

Mode	Frequency (MHz)	Frequency Range	Test Results	Conclusion
	2402(CH0)	1GHz-26.5GHz	Fig.13	Р
GFSK	2441(CH39)	1GHz-26.5GHz	Fig.14	Р
	2480(CH78)	1GHz-26.5GHz	Fig.15	Р
/4	2402(CH0)	1GHz-26.5GHz	Fig.16	Р
π/4 DQPSK	2441(CH39)	1GHz-26.5GHz	Fig.17	Р
DQFSK	2480(CH78)	1GHz-26.5GHz	Fig.18	Р
	2402(CH0)	1GHz-26.5GHz	Fig.19	Р
8DPSK	2441(CH39)	1GHz-26.5GHz	Fig.20	Р
	2480(CH78)	1GHz-26.5GHz	Fig.21	Р
/	All channels	30MHz -1GHz	Fig.22	Р

See below for test graphs.

Conclusion: Pass







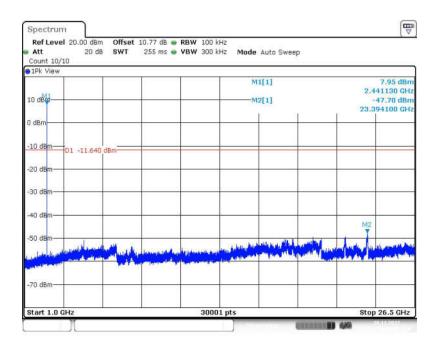


Fig. 14 Conducted Spurious Emission (GFSK, CH39, 1GHz-26.5GHz)



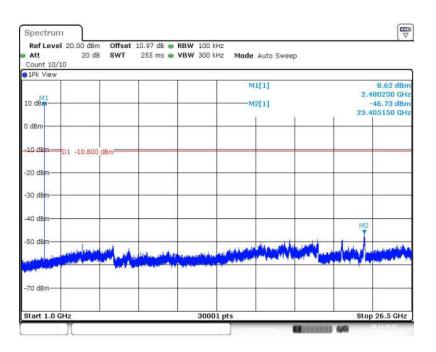


Fig. 15 Conducted Spurious Emission (GFSK, CH78, 1GHz-26.5GHz)

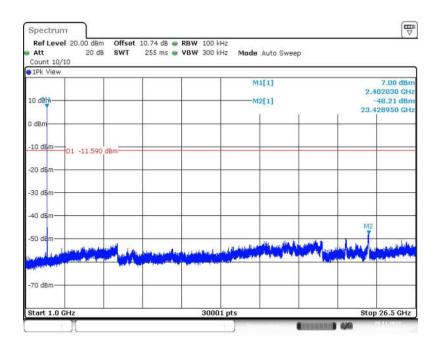


Fig. 16 Conducted Spurious Emission (π/4 DQPSK, CH0, 1GHz-26.5GHz)



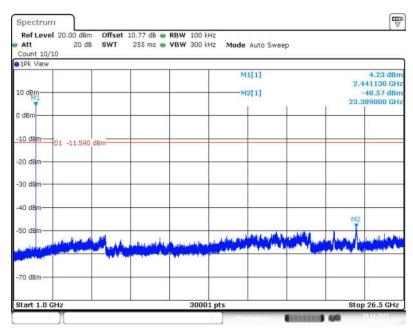


Fig. 17 Conducted Spurious Emission (π/4 DQPSK, CH39, 1GHz-26.5GHz)

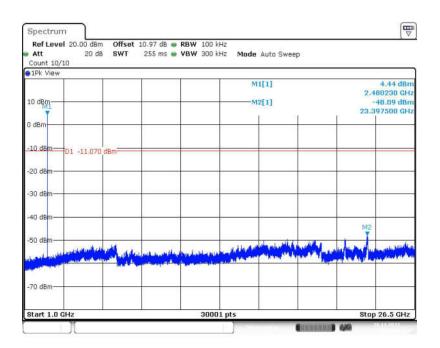
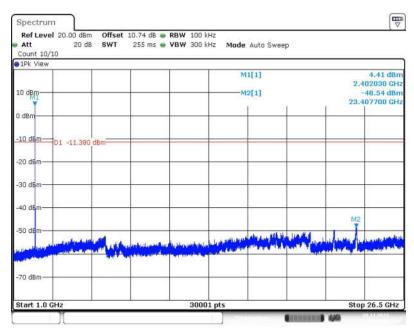


Fig. 18 Conducted Spurious Emission (π/4 DQPSK, CH78, 1GHz-26.5GHz)







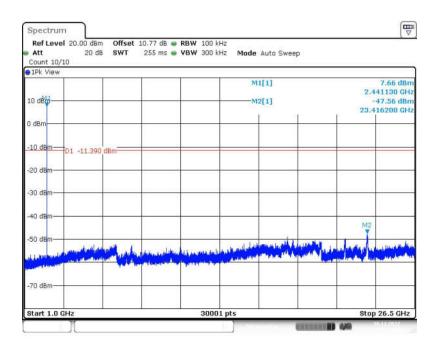


Fig. 20 Conducted Spurious Emission (8DPSK, CH39, 1GHz-26.5GHz)



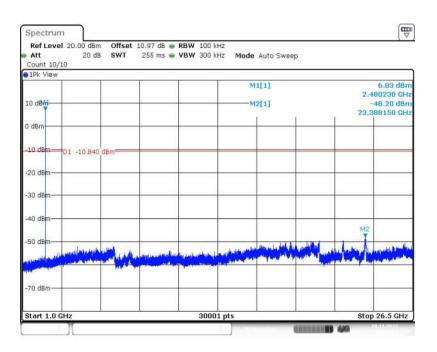


Fig. 21 Conducted Spurious Emission (8DPSK, CH78, 1GHz-26.5GHz)

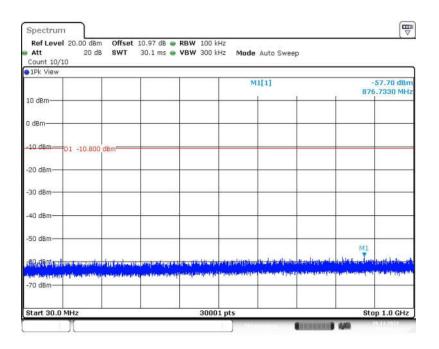


Fig. 22 Conducted Spurious Emission (All Channels, 30MHz -1GHz)



A.4 Radiated Emission

Method of Measurement: See ANSI C63.10-clause 6.3&6.4&6.5&6.6.

Measurement Limit:

Standard	Limit (dBm)
FCC 47 CFR Part 15.247, 15.205, 15.209	20dBm below peak output power

In addition, radiated 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) (see § 15.205(c)).

Frequency of emission (MHz)	Field strength(µV/m)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Limit in restricted band:

Test Condition:

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

Frequency of emission (MHz)	RBW/VBW	Sweep Time(s)
30-1000	120kHz/300kHz	5
1000-4000	1MHz/3MHz	15
4000-18000	1MHz/3MHz	40
18000-26500	1MHz/3MHz	20

Note: According to the performance evaluation, the radiated emission margin of EUT is over 20dB in the band from 9kHz to 30MHz. Therefore, the measurement starts from 30MHz to tenth harmonic. The measurement results include the horizontal polarization and vertical polarization measurements. For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report.



Measurement Results:

Mode	Frequency (MHz)	Frequency Range	Test Results	Conclusion
GFSK	2402(CH0)	1 GHz ~18 GHz	Fig.23	Р
	2441(CH39)	1 GHz ~18 GHz	Fig.24	Р
	2480(CH78)	1 GHz ~18 GHz	Fig.25	Р
	Restricted Band (CH0)	2.38 GHz ~ 2.45 GHz	Fig.26	Р
	Restricted Band (CH78)	2.45 GHz ~ 2.5 GHz	Fig.27	Р
	2402(CH0)	1 GHz ~18 GHz	Fig.28	Р
	2441(CH39)	1 GHz ~18 GHz	Fig.29	Р
π/4 DQPSK	2480(CH78)	1 GHz ~18 GHz	Fig.30	Р
DQFSK	Restricted Band (CH0)	2.38 GHz ~ 2.45 GHz	Fig.31	Р
	Restricted Band (CH78)	2.45 GHz ~ 2.5 GHz	Fig.32	Р
	2402(CH0)	1 GHz ~18 GHz	Fig.33	Р
	2441(CH39)	1 GHz ~18 GHz	Fig.34	Р
8DPSK	2480(CH78)	1 GHz ~18 GHz	Fig.35	Р
	Restricted Band (CH0)	2.38 GHz ~ 2.45 GHz	Fig.36	Р
	Restricted Band (CH78)	2.45 GHz ~ 2.5 GHz	Fig.37	Р
		9 kHz ~30 MHz	Fig.38	Р
/	All channels	30 MHz ~1 GHz	Fig.39	Р
		18 GHz ~26.5 GHz	Fig.40	Р

Worst Case Result GFSK CH78 (1-18GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
4297.200000	45.66	74.00	28.34	V	2.9
5798.100000	48.08	74.00	25.92	Н	4.4
8894.142857	45.48	74.00	28.52	Н	6.5
12174.428572	48.12	74.00	25.88	Н	10.8
17031.000000	54.35	74.00	19.65	V	18.4
17942.142857	54.71	74.00	19.29	V	19.0

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
4297.200000	34.47	54.00	20.53	V	2.9
5798.100000	36.51	54.00	18.49	Н	4.4
8894.142857	34.21	54.00	20.79	Н	6.5
12174.428572	36.83	54.00	18.17	Н	10.8
17031.000000	43.20	54.00	11.80	V	18.4
17942.142857	42.53	54.00	11.47	V	19.0

π/4 DQPSK CH78 (1-18GHz)

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Frequency	MaxPeak	Limit	Margin	Pol	Corr.
(MHz)	(dBµV/m)	(dBµV/m)	(dB)		(dB/m)
4568.700000	46.79	74.00	27.21	V	4.5
5986.800000	48.84	74.00	25.16	V	5.0
10413.857143	47.11	74.00	26.89	Н	9.1
12209.142857	48.07	74.00	25.93	V	10.8
17032.285714	54.69	74.00	19.31	V	18.4
17932.285714	55.02	74.00	18.98	V	18.9

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
4568.700000	34.61	54.00	19.39	V	4.5
5986.800000	35.91	54.00	18.09	V	5.0
10413.857143	35.08	54.00	18.92	Н	9.1
12209.142857	35.49	54.00	18.51	V	10.8
17032.285714	42.18	54.00	11.82	V	18.4
17932.285714	42.50	54.00	11.50	V	18.9

8DPSK CH78 (1-18GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
10419.428572	45.89	74.00	28.11	Н	9.0
11178.857143	46.90	74.00	27.10	Н	9.7
12612.000000	48.15	74.00	25.85	Н	11.2
14200.714286	48.73	74.00	25.27	V	11.1
15853.285714	50.08	74.00	23.92	V	14.0
16920.000000	52.55	74.00	21.45	Н	18.1

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
10419.428572	37.08	54.00	16.92	Н	9.0
11178.857143	37.52	54.00	16.48	Н	9.7
12612.000000	37.61	54.00	16.39	Н	11.2
14200.714286	37.93	54.00	16.07	V	11.1
15853.285714	41.94	54.00	12.06	V	14.0
16920.000000	44.21	54.00	9.80	Н	18.1

Note:

A "reference path loss" is established and the A_{Rpl} is the attenuation of "reference path loss", and Antenna Factor, the gain of the preamplifier, the cable loss. P_{Mea} is the field strength recorded from the instrument. The measurement results are obtained as described below:

Result= P_{Mea} +Cable Loss +Antenna Factor-Gain of the preamplifier.

See below for test graphs.

Conclusion: Pass



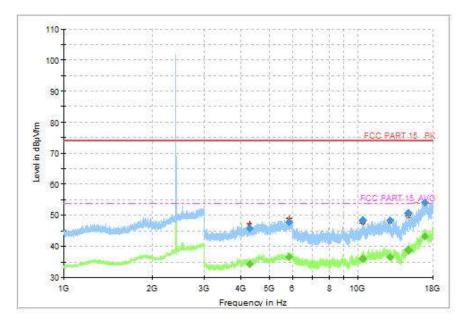


Fig. 23 Radiated Spurious Emission (GFSK, CH0, 1GHz ~18GHz)

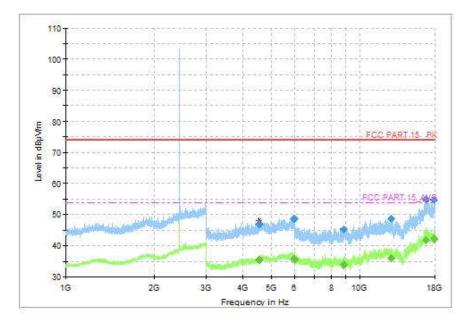


Fig. 24 Radiated Spurious Emission (GFSK, CH39, 1GHz ~18GHz)



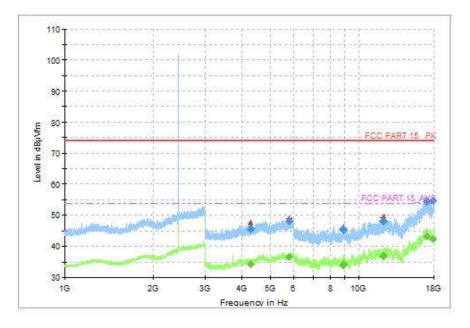


Fig. 25 Radiated Spurious Emission (GFSK, CH78, 1GHz ~18GHz)

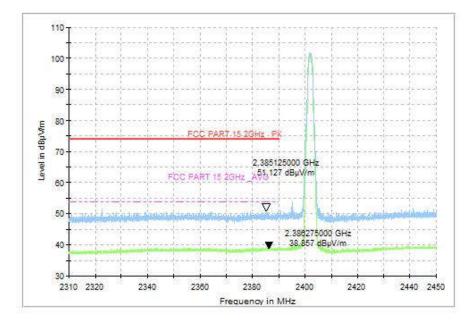


Fig. 26 Radiated Band Edges (GFSK, CH0, 2.38GHz~2.45GHz)



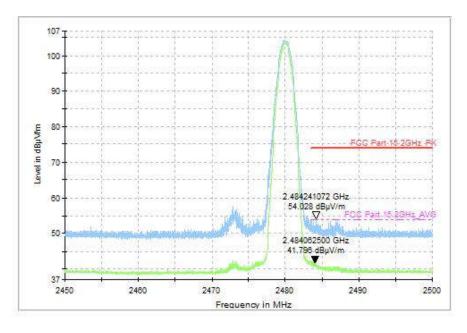


Fig. 27 Radiated Band Edges (GFSK, CH78, 2.45GHz~2.50GHz)

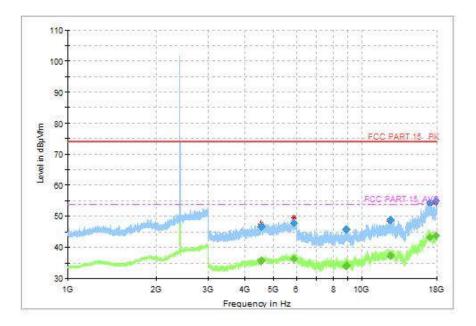


Fig. 28 Radiated Spurious Emission (π/4 DQPSK, CH0, 1GHz ~18GHz)



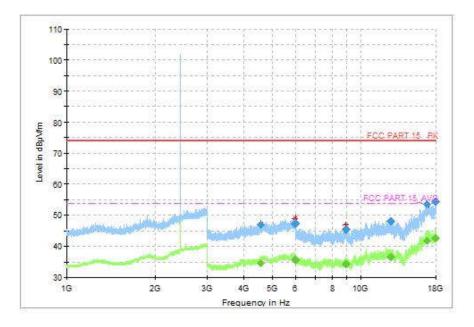


Fig. 29 Radiated Spurious Emission ($\pi/4$ DQPSK, CH39, 1GHz ~18GHz)

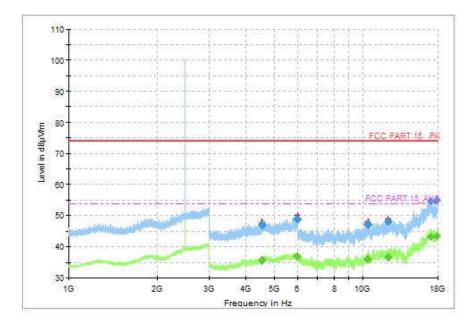


Fig. 30 Radiated Spurious Emission (π/4 DQPSK, CH78, 1GHz ~18GHz)



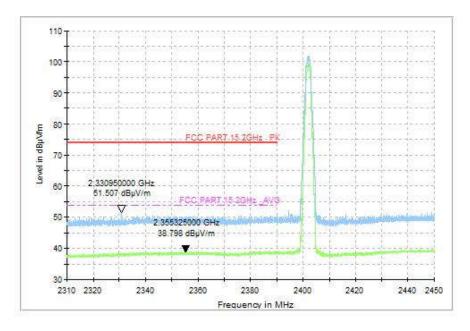


Fig. 31 Radiated Band Edges (π/4 DQPSK, CH0, 2.38GHz~2.45GHz)

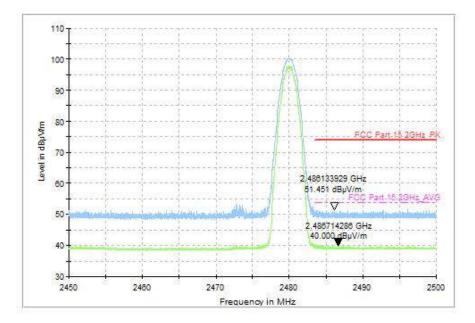


Fig. 32 Radiated Band Edges (π/4 DQPSK, CH78, 2.45GHz~2.50GHz)



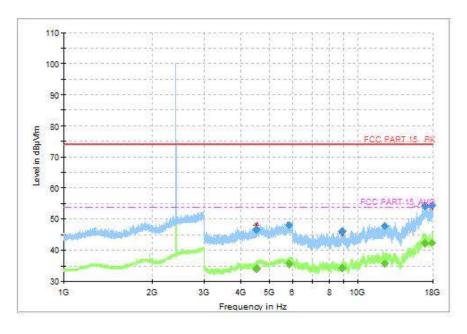


Fig. 33 Radiated Spurious Emission (8DPSK, CH0, 1GHz ~18GHz)

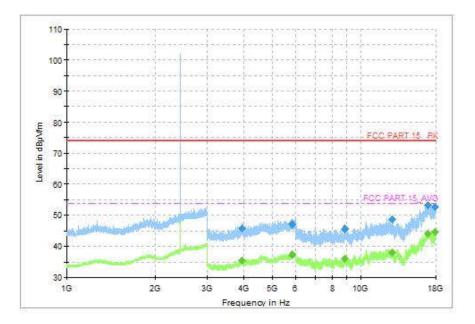


Fig. 34 Radiated Spurious Emission (8DPSK, CH39, 1GHz ~18GHz)



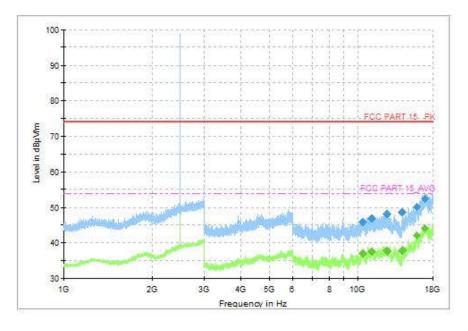


Fig. 35 Radiated Spurious Emission (8DPSK, CH78, 1GHz ~18GHz)

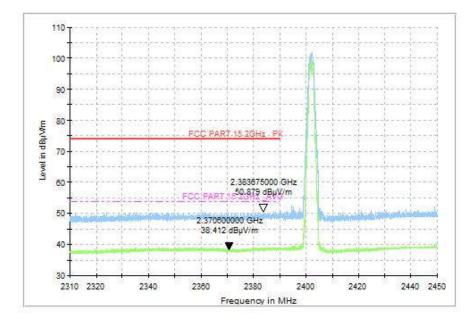


Fig. 36 Radiated Band Edges (8DPSK, CH0, 2.38GHz~2.45GHz)



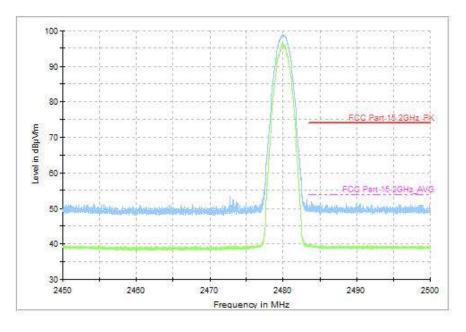


Fig. 37 Radiated Band Edges (8DPSK, CH78, 2.45GHz~2.50GHz)

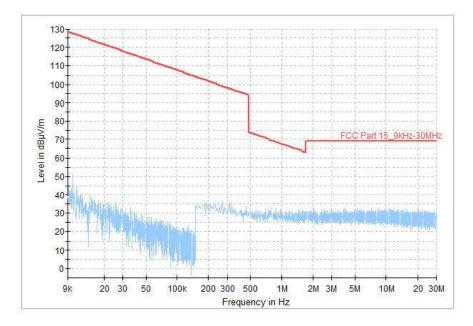


Fig. 38 Radiated Spurious Emission (All Channels, 9kHz ~30MHz)



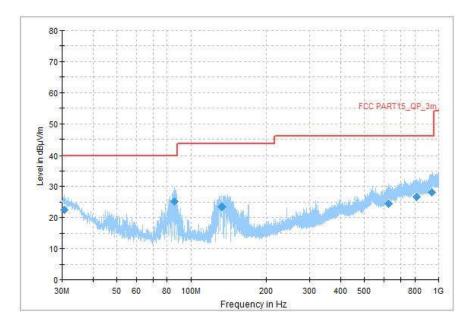


Fig. 39 Radiated Spurious Emission (All Channels, 30MHz ~1GHz)

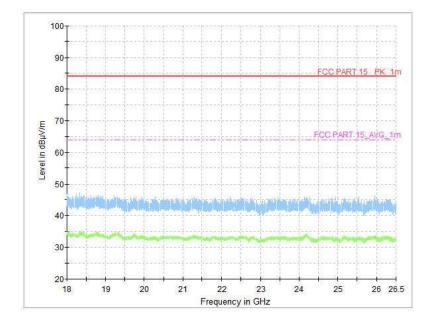


Fig. 40 Radiated Spurious Emission (All Channels, 18GHz ~26.5GHz)



A.5 20dB Bandwidth

Method of Measurement: See ANSI C63.10-clause 7.8.7.

Measurement Limit:

Standard	Limit (MHz)
FCC 47 CFR Part 15.247 (a)	/

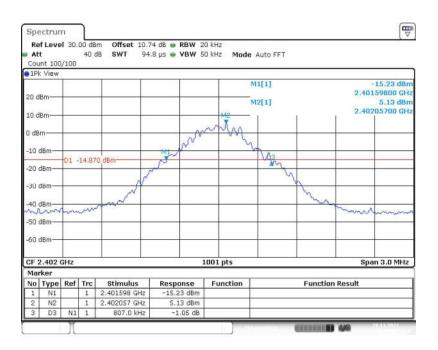
Measurement Result:

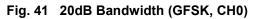
Mode	Frequency (MHz)		indwidth IHz)	Conclusion
	2402(CH0)	Fig.41	0.81	
GFSK	2441(CH39)	Fig.42	0.80	/
	2480(CH78)	Fig.43	0.81	
	2402(CH0)	Fig.44	1.26	
π/4 DQPSK	2441(CH39)	Fig.45	1.26	/
	2480(CH78)	Fig.46	1.26	
	2402(CH0)	Fig.47	1.26	
8DPSK	2441(CH39)	Fig.48	1.26	/
	2480(CH78)	Fig.49	1.26	

See below for test graphs.

Conclusion: PASS







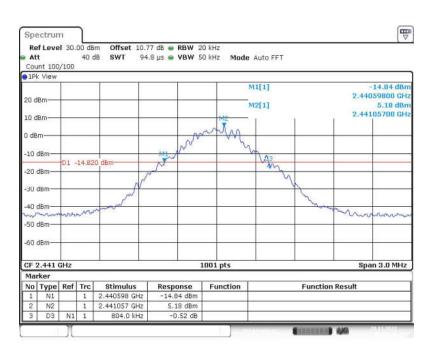


Fig. 42 20dB Bandwidth (GFSK, CH39)



At	f Leve t int 100		00 dB 40 (97 dB 🐽 RBW 20 .8 µs 👄 VBW 5		Auto FFT	
1 P	< View	_					INVESTIGATION IN THE REPORT OF THE REPORT	an a
20 d	Bm	-					M1[1] M2[1]	-14.68 dBr 2.47959500 GH 6.07 dBr
10 d	iBm	-				M2	P 1	2.48005700 GH
0 dB	m	-			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	MM		
-10	dBm	01	10.00	10 dBm	Man		103	
-20	dBm	- 101	13.93	U ubm	A l		Any	
	dBm	-		N		_	1	
	dBm-		~~	- man		-	· · ·	monorman
	dBm—		1.00000					
-60	dBm							
CF :	2.48 G	Hz			1	001 pts		Span 3.0 MHz
Mar	rker							
mai	Туре	Ref		Stimulus	Response	Function	Fun	ction Result
No			1	2.479595 GHz	-14.68 dBm			
	N1 N2		1	2.480057 GHz	6.07 dBm			



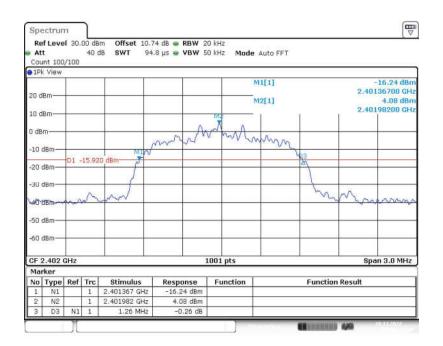


Fig. 44 20dB Bandwidth (π /4 DQPSK, CH0)



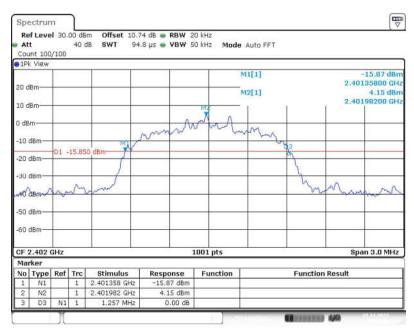
At	f Leve t nt 100		00 dB 40 (77 dB 👳 RBW 20 1.8 µs 🖷 VBW 50		Auto FFT	2
D1P	View	-		1		1 1	M1[1]	-16.31 dBr
20 d	Bm	-					M2[1]	2.44036700 GH 4.08 dBr
10 d	Bm	-		-		M2	1 1	2.44098200 GH
0 dB	m	-			n A	Ant	man	
-10 (iBm	in .	WALK	INTE O	munu	100 194	1 VO3	
-20 (dBm	D1 -	15.92	20 dBm			A1	
-30 (18m-	-	1.2					
401	18na-	m	m	mil				hannon
-50 4	dBm							
-60 (iBm				_		-	
-	2.441	GHz		dik - M	1	001 pts	18. IS	Span 3.0 MHz
Mar								
	Type	Ref		Stimulus 2.440367 GHz	Response -16.31 dBm	Function	Funct	ion Result
1	N1 N2		1	2.440367 GHz	-16.31 dBm 4.08 dBm			
2					-1.00 UDIII			

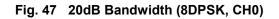




Fig. 46 20dB Bandwidth (π /4 DQPSK, CH78)







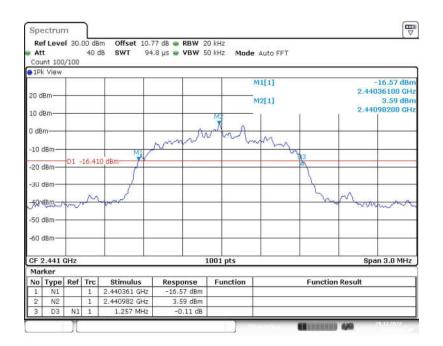


Fig. 48 20dB Bandwidth (8DPSK, CH39)



At Cou	nt 100		40 (7 dB 📻 RBW 20 .8 µs 👄 VBW 50		Auto FFT		
0 1P							M1[1] M2[1]	r	-15.47 dB 2.47935800 GF 4.62 dB 2.47998200 GF
0 dB	m	_			mante	And	my		
-10	iBm—	D1 -	15.38				1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1		
-30 (0.0			_		har	1
	iBm	p.~							
-60 (JBm−−−	-			-				
_	2.48 G	Hz			1	001 pts			Span 3.0 MHz
Mar	ker Type	Pof	Tec	Stimulus	Response	Function		Function Re	cult
1	N1	NCI	1	2.479358 GHz	-15.47 dBm	Function		unction Re	Jun
2	N2		1	2.479982 GHz	4.62 dBm				
3	D3	N1	1	1.257 MHz	-0.23 dB				

Fig. 49 20dB Bandwidth (8DPSK, CH78)



A.6 Time of Occupancy (Dwell Time)

Method of Measurement: See ANSI C63.10-clause 7.8.4.

Measurement Limit:

Standard	Limit (s)
FCC 47 CFR Part 15.247(a)	< 0.4

Measurement Results:

Mode	Frequency (MHz)	Packet	Burst (m		Total I (Nu	•	Result (s)	Conclusion
GFSK	2441(CH39)	DH5	Fig.50	2.86	Fig.51	90	0.26	Р
π/4 DQPSK	2441(CH39)	2-DH5	Fig.52	2.87	Fig.53	70	0.20	Р
8DPSK	2441(CH39)	3-DH5	Fig.54	2.87	Fig.55	90	0.26	Р

See below for test graphs.

Conclusion: Pass



1Pk Clrw					1	10.00			
0 dBm		Party States of the party	TO DE LE TIE	THUR DOLLARS	M	1[1]		2	12.17 dB
	TRG -5.030	dBm	lick will cole	it little	D	2[1]			4.67 d
-10 dBm		Ť		Ĩ	<u> </u>	ľ í	1	1	.00200 n
-20 dBm					-				
-30 dBm									
40 dBm									
50 dBm									
Whatshaa	and the second second				Liphpanta	manakaad	ANDANIA	handhand	handant
-70 dBm	n Hillehille				ay a plan	adamin Altra	politica policies	and realist	her-
80 dBm									
-90 dBm			1 1				-	1 2	



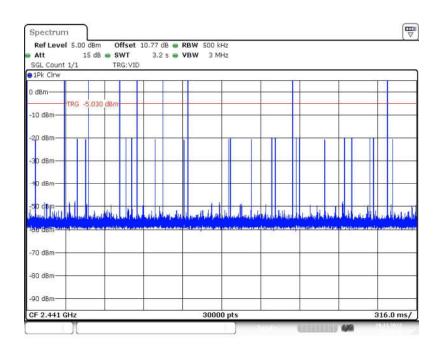


Fig. 51 Number of Burst in Observation Period (Dwell Time) (GFSK, CH39)



1Pk Clrw									
			- the set of		M	1[1]			11.34 dB
0 dBm-	TRG -5.030	dam India				2[1]			4.00
-10 dBm	Ma -0.050	an in the	idea de la facta a cua	a haraster frah				2	.86500 r
		2							
20 dBm									
30 dBm									
40 dBm									
50 dBm									
challbadaas	All with how the				dilles dent	lupped alle	bulat building	Hendbalal	tech bitro
, thinked a	dis du sheltet				n at a third	mille Astanti, No	in David South	ALMAN NO.14	hudasa terd
70 dBm-	on hall his				Ind had to 1.	1 1	10.0	a_1, \dots, b_k	. 1111
					1				
-80 dBm									
					1				



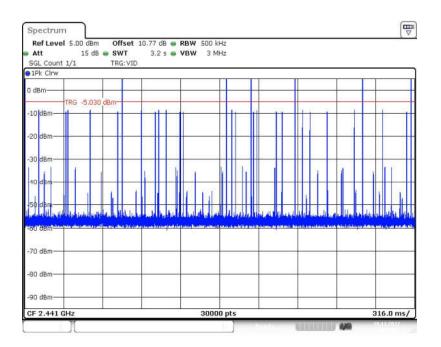


Fig. 53 Number of Burst in Observation Period (Dwell Time) (π /4 DQPSK, CH39)



A Malaket 15		hasfel.		
A Malaket I		M1[1]		-11.51 dB
				4.00
3 -5.030 dBm fbm	Little a built a built a built	D2[1]		2.86800 r
Ť.			1 1	1.00000,
				-
			10.000 Pr. 1000	-
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		*		
		.1.	1 k	-



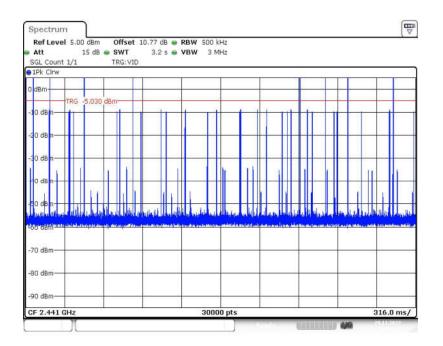


Fig. 55 Number of Burst in Observation Period (Dwell Time) (8DPSK, CH39)



A.7 Number of Hopping Channels

Method of Measurement: See ANSI C63.10-clause 7.8.3.

Measurement Limit:

Standard	Limit (Num)
FCC 47 CFR Part 15.247(a)	At least 15 non-overlapping channels

Measurement Results:

Mode	Packet	Number of Hopping Channels	Test results (Num)	Conclusion
GFSK	DH5	Fig.56	79	Р
π/4 DQPSK	2-DH5	Fig.57	79	Р
8DPSK	3-DH5	Fig.58	79	Р

See below for test graphs.

Conclusion: Pass

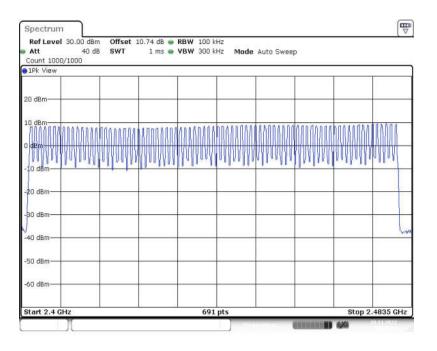


Fig. 56 Number of Hopping Channels (GFSK, Hopping)



Ref Level 30.00 dBr Att 40 d		10.74 dB 🖷 1 ms 🖷	RBW 100 k		Auto Swee	p		
Count 1000/1000 1Pk View		T	1	T	1			
20 dBm								
	ANNAKAA	KANAANN	MARAAAA	MALATAA	MAAAAAA	MANAN	ANARARA	ANNA
dBm	64440464	18808 KAAB						
20 dBm								
30 dBm								
40 dBm								1
50 dBm								
60 dBm								
Start 2.4 GHz			691	pts			Stop 2	.4835 GHz



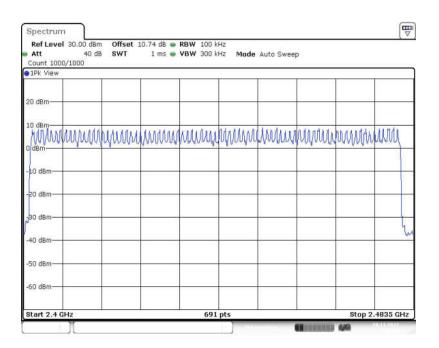


Fig. 58 Number of Hopping Channels (8DPSK, Hopping)



A.8 Carrier Frequency Separation

Method of Measurement: See ANSI C63.10-clause 7.8.2.

Measurement Limit:

Standard	Limit (kHz)
	By a minimum of 25 kHz or two-thirds of the 20 dB
FCC 47 CFR Part 15.247(a)	bandwidth of the hopping channel, whichever is
	greater

Measurement Results:

Mode	Frequency (MHz)	Packet	Separation of hopping channels	Test result (kHz)	Conclusion
GFSK	2441(CH39)	DH5	Fig.59	1000.00	Р
π/4 DQPSK	2441(CH39)	2-DH5	Fig.60	1003.00	Р
8DPSK	2441(CH39)	3-DH5	Fig.61	1003.00	Р

See below for test graphs.

Conclusion: Pass

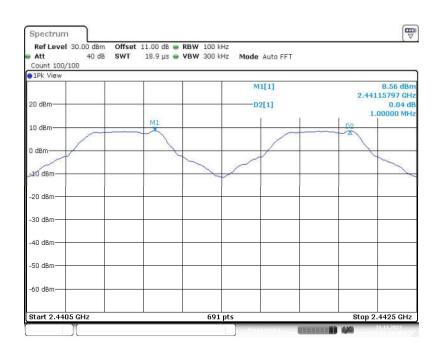
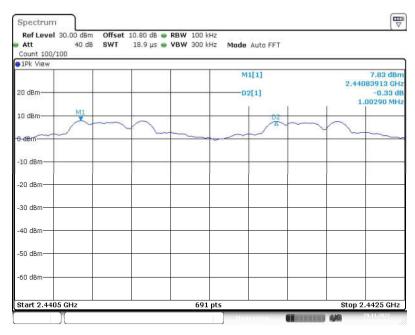


Fig. 59 Carrier Frequency Separation (GFSK, CH39)







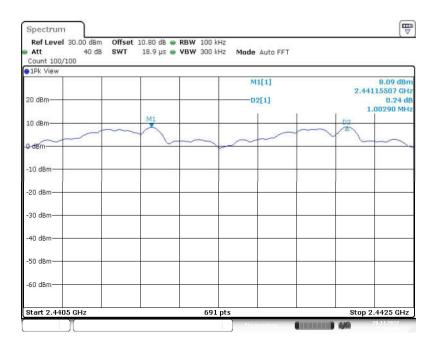


Fig. 61 Carrier Frequency Separation (8DPSK, CH39)



A.9 AC Power line Conducted Emission

Method of Measurement: See ANSI C63.10-clause 6.2.

Test Condition:

Voltage (V)	Frequency (Hz)
120	60

Measurement Result and limit:

Frequency range	Quasi-peak	Average-peak	Result (dBµV)		Conclusion		
(MHz)	Limit (dBµV)	Limit (dBµV)	Traffic	Idle	Conclusion		
0.15 to 0.5	66 to 56	56 to 46					
0.5 to 5	56	46	Fig.62	Fig.63	Р		
5 to 30	60	50					
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15							
MHz to 0.5 MHz.							

Note: The measurement results include the L1 and N measurements.

See below for test graphs. Conclusion: Pass



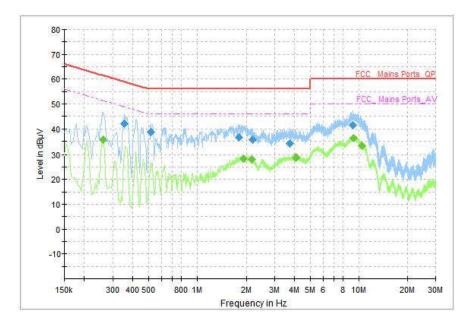


Fig. 62 AC Power line Conducted Emission (Traffic)

Frequency	Quasi Peak	Limit	Margin	Line	Filter	Corr.
(MHz)	(dBµV)	(dBµV)	(dB)			(dB)
0.354000	42.18	58.87	16.69	N	ON	10
0.518000	38.84	56.00	17.16	N	ON	10
1.802000	36.68	56.00	19.32	N	ON	10
2.186000	35.81	56.00	20.19	N	ON	10
3.726000	34.08	56.00	21.92	N	ON	10
9.202000	41.50	60.00	18.50	N	ON	10

Measurement Results: Quasi Peak

Measurement Results: Average

Frequency	Average	Limit	Margin	Line	Line Filter	Corr.
(MHz)	(dBµV)	(dBµV)	(dB)			(dB)
0.262000	35.78	51.37	15.59	N	ON	10
1.914000	28.39	46.00	17.61	N	ON	10
2.170000	28.03	46.00	17.97	N	ON	10
4.058000	28.69	46.00	17.31	L1	ON	10
9.254000	36.25	50.00	13.75	N	ON	10
10.438000	33.24	50.00	16.76	N	ON	10



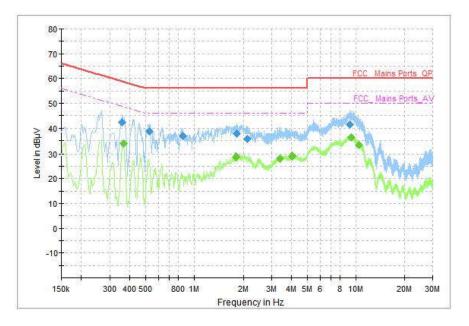


Fig. 63 AC Power line Conducted Emission (Idle)

Measurement Results: Quasi Po

Frequency	Quasi Peak	Limit	Margin	Line	Filter	Corr.
(MHz)	(dBµV)	(dBµV)	(dB)	Line	Filler	(dB)
0.358000	42.39	58.78	16.39	N	ON	10
0.530000	38.74	56.00	17.26	N	ON	10
0.854000	36.95	56.00	19.05	N	ON	10
1.818000	37.80	56.00	18.20	N	ON	10
2.122000	35.54	56.00	20.46	N	ON	10
9.194000	41.58	60.00	18.42	N	ON	10

Measurement Results: Average

Frequency	Average	Limit	Margin	Line	Filter	Corr.
(MHz)	(dBµV)	(dBµV)	(dB)	Lille	Filler	(dB)
0.366000	33.79	48.59	14.80	N	ON	10
1.810000	28.51	46.00	17.49	N	ON	10
3.382000	28.11	46.00	17.89	N	ON	10
4.046000	28.95	46.00	17.05	L1	ON	10
9.366000	36.18	50.00	13.82	N	ON	10
10.426000	33.29	50.00	16.71	N	ON	10

END OF REPORT