

TEST REPORT

No.24T04N002645-007-BT

for

Shanghai Sunmi Technology Co.,Ltd.

Wireless data POS System

Model Name: T5F1A

with

Hardware Version: SM03_MB_V1.1

Software Version: QSC625VPBCJ10R01A03_BA01BP01GLM03V01

FCC ID: 2AH25T5F1A

Issued Date: 2025-02-17

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.

Test Laboratory:

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
24T04N002645-007-BT	Rev.0	1st edition	2025-02-17

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	Wireless data POS System
Model Name	T5F1A
Applicant's name	Shanghai Sunmi Technology Co.,Ltd.
Manufacturer's Name	Shanghai Sunmi Technology Co.,Ltd.

1.2. Test Standards

FCC Part15-2023; 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 51800

1.5. Project data

Testing Start Date:	2024-11-07
Testing End Date:	2024-12-10

1.6. Signature

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:	Shanghai Sunmi Technology Co.,Ltd.		
Address:	Room 505, NO.388 Song Hu Road, Yang Pu District, Shanghai		
	200433, China		
Contact Person	Emma Yang		
E-Mail	chan.yang@sunmi.com		
Telephone:	13510126210		
Fax:	1		

2.2. Manufacturer Information

Company Name:	Shanghai Sunmi Technology Co.,Ltd.		
Address:	Room 505, NO.388 Song Hu Road, Yang Pu District, Shanghai 200433, China		
Contact Person	Emma Yang		
E-Mail	chan.yang@sunmi.com		
Telephone:	13510126210		
Fax:	1		



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

3.1.<u>About EUT</u>

Description	Wireless data POS System
Model Name	T5F1A
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	-0.18dBi
Power Supply	7.7V DC by Battery
FCC ID	2AH25T5F1A
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
			QSC625VPBCJ10	
UT13aa	869233070014219	SM03_MB_V1.1	R01A03_BA01BP0	2024-11-06
			1GLM03V01	
			QSC625VPBCJ10	
UT01aa	869233070014896	SM03_MB_V1.1	R01A03_BA01BP0 1GLM03V01	2024-11-04

*EUT ID: is used to identify the test sample in the lab internally. UT13aa is used for conduction test, UT01aa is used for radiation test and AC Power line Conducted Emission test.

AE No.	Description	AE ID*
AE1	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 Wireless data POS System with integrated antenna and battery.

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:	2023
	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. Testing Environment

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. <u>Statements</u>

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	Sorial Numbor	Serial Number Manufacturer Calibration		Calibration	
NO.	Equipment			Due date	Period		
1	Vector Signal	FSV40	100903	Rohde & Schwarz	2024-12-27	1.000	
	Analyzer	F3V40	100903		2024-12-27	1 year	
2	Power Sensor	U2021XA	MY55430013	Keysight	2024-12-27	1 year	
3	RF Control Unit	JS0806-2	21C8060398	Tonscend	2025-05-06	1 year	
4	Wireless	CMW270	400540		Rohde & Schwarz	2025-03-11	1.000
4	Connective Tester	CIVIVZ70	100540		2025-03-11	1 year	
5	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
1	Test Receiver	ESR7	101676	Rohde & Schwarz	2025-11-21	1 year
2	Hybrid Antenna	VULB 9163	330	Schwarzbeck	2027-04-21	3 years
3	Horn Antenna	3117	00066577	ETS-Lindgren	2025-04-17	3 years
4	Anechoic Chamber	FACT3-2.0	1285	ETS-Lindgren	2025-05-28	2 years
5	Spectrum Analyzer	FSV40	101192	Rohde & Schwarz	2025-01-12	1 year
6	Loop Antenna	HLA6120	35779	TESEQ	2025-05-10	3 years
7	Horn Antenna	QSH-SL-1 8-26-S-20	17013	Q-par	2026-02-01	3 years
8	Test Receiver	ESCI	100702	Rohde & Schwarz	2025-01-10	1 year
9	LISN	ENV216	102067	Rohde & Schwarz	2024-10-07	1 year

Test software

No.	Equipment	Manufacturer	Version
1	JS1120-3	Tonscend	3.5
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)	< \pm 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	
3. Transmitter Spurious Emission - Conducted	1GHz≤f<7GHz	1.92dB	
	7GHz≤f<13GHz	2.31dB	
	13GHz≤f≤26GHz	2.61dB	
	9kHz≤f<30MHz	1.70dB	
4 Transmitter Sourieus Emission Dedicted	30MHz≤f<1GHz	4.80dB	
4 Transmitter Spurious Emission - Radiated	1GHz≤f<18GHz	4.82dB	
	$\frac{1.32 dB}{1.92 dB}$ $\frac{30 MHz \le f < 1 GHz}{1 GHz \le f < 7 GHz} = 1.41$ $\frac{30 MHz \le f < 1 GHz}{7 GHz \le f < 7 GHz} = 1.92$ $\frac{7 GHz \le f < 7 GHz}{7 GHz \le f < 13 GHz} = 2.31$ $\frac{13 GHz \le f < 26 GHz}{13 GHz} = 2.61$ $\frac{9 kHz \le f < 30 MHz}{1.70}$ $\frac{30 MHz \le f < 1 GHz}{1 GHz} = 4.80$ $\frac{10 Hz \le f < 16 Hz}{1.6 Hz} = 4.82$ $\frac{4.56 kHz}{1.56 kHz}$	2.90dB	
5. 20dB Bandwidth	4.56kHz		
6. Time of Occupancy (Dwell Time) & Number	0.58ms		
of Hopping Channels			
7. Carrier Frequency Separation	4.56kHz		
8. AC Power line Conducted Emission	150kHz≤f≤30MHz	2.68dB	



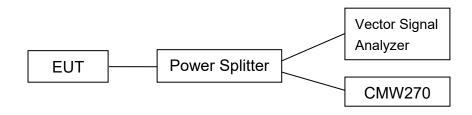
ANNEX A: Detailed Test Results

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.

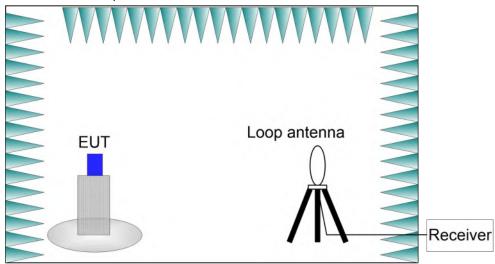


2) Radiated Measurements

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.

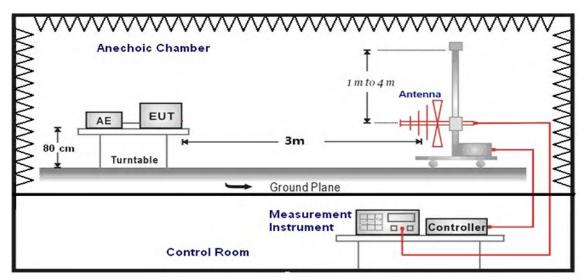




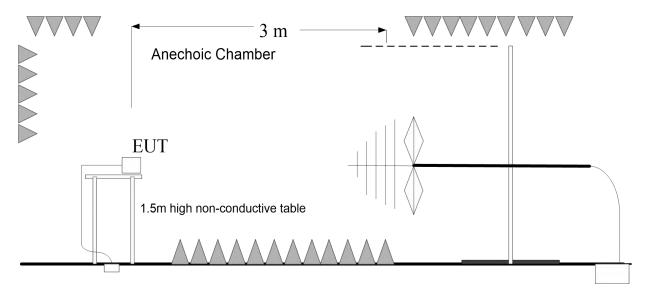
30MHz-26.5GHz:

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:

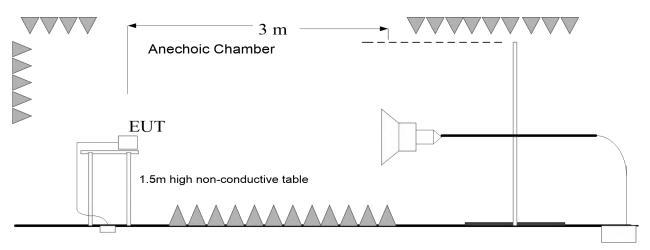


1GHz-3GHz:



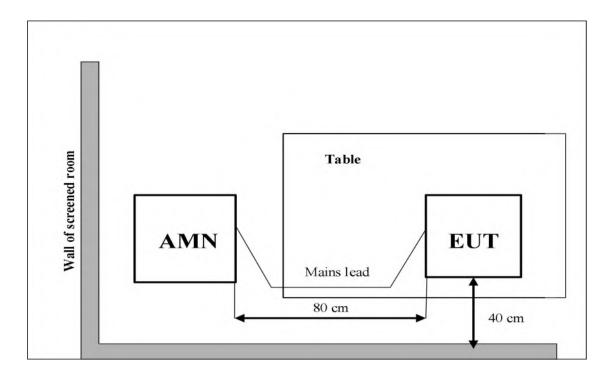


3GHz-26.5GHz:



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.



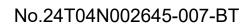


A.0 Antenna requirement

Measurement Limit:

Standard	Requirement
	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
	be replaced by the user, but the use of a standard antenna jack or electrical
FCC CRF Part	connector is prohibited. This requirement does not apply to carrier current devices
15.203	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 -0.18dBi. 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:

Mode	Peak Co	nducted Output Pow	, ,		
	2402MHz (CH0)	2441MHz (CH39)	2480MHz (CH78)		
GFSK	7.05	6.69	6.87		
π/4 DQPSK	8.73	8.70	8.54		
8DPSK	9.23	9.15	8.93		

Conclusion: Pass



A.2 Band Edges Compliance

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

Measurement Limit:

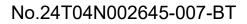
Standard	Limit (dBc)
FCC 47 CFR Part 15.247 (d)	> 20

Measurement Result:

Mode	Frequency (MHz)	Hopping	Test Res	Test Results (dBc)	
	2402(CH0)	OFF	Fig.1	51.85	Р
GFSK	2480(CH78)	OFF	Fig.2	51.95	Р
GFSK	2402(CH0)	ON	Fig.3	52.36	Р
	2480(CH78)	ON	Fig.4	52.20	Р
	2402(CH0)	OFF	Fig.5	52.24	Р
π/4 DQPSK	2480(CH78)	OFF	Fig.6	52.01	Р
11/4 DQPSK	2402(CH0)	ON	Fig.7	52.13	Р
	2480(CH78)	ON	Fig.8	52.02	Р
	2402(CH0)	OFF	Fig.9	50.87	Р
0Dek	2480(CH78)	OFF	Fig.10	52.05	Р
8DPSK	2402(CH0)	ON	Fig.11	50.15	Р
	2480(CH78)	ON	Fig.12	52.01	Р

See below for test graphs.

Conclusion: Pass



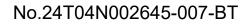


At	f Leve t int 300		00 dB 30 (4 dB 👄 RBW 1 1 ms 👄 VBW 3		le Auto Swe	ер	
9 1P	< View	_							
10 d	Bm						M1[1]		6.85 dBr 2.4020150 GH -45.44 dBr
O dB	m	-					1	1	2.400000 GH
-10	dBm-					_	-		$ \Lambda $
-20	dBm-	-01 -	13.15	iO dBm					
-30	dBm—	-							
	dBm—	-					-	M3	
-50	dBm-	me	Hiraha	annahr	unumunut	mound	mountimore	ombarra	musered t
-60	dBm-					_			
-70	dBm-	-					-		
Sta	rt 2.35	GHz				691 pts			Stop 2.405 GHz
	rker		-						
1	Type N1	Ref	Trc 1	Stimulus 2.402015 GHz	Response 6.85 dBm	Function		Function	Result
2	N2		1	2.4 GHz	-45.45 dBm				
3	N3		1	2.39 GHz	-47.23 dBm				
4	N4		1	2.3998986 GHz	-45.00 dBm				



At	f Leve t int 300		00 dB 30 d		97 dB 🥌 🖡 1 ms 🖷 🍾			e Auto Swe	ер		
10 d		MI						M1[1] M2[1]			6.66 dBn 180010 GH: 46.27 dBn 183500 GH:
-10 (dBm	01	13.34	0 dBm							
-20 (dBm—	H									
30 (dBm—	H	-								
	dBm-	1	LM2	manuhahahahaha	MB	maratal	a second	Mandarahara	analban	Themaline way	- Anderen Labor
60 (dBm—										
70 (dBm							-			
_	rt 2.47	GHz			-		691 pts			Stop	2.55 GHz
	rker		-								
1	Type N1	Ker	1	Stimulus 2.48001 GHz	Respon 6.66	i dBm	Function		Function	Result	
2	N2	-	1	2.4835 GHz	-46.27						
3	N3		1	2.5 GHz	-47.95	dBm					-
4	N4		1	2.534348 GHz	-45.29	dBm					

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





At	f Leve t int 300		00 dB 30 (9 dB = RBW 1 1 ms = VBW 3		le Auto Sv	weep	
1 P	< View								
							M1[1]		6.62 dBr 2.4049600 GH
10 0	Bm						M2[1]		-47.31 dB
o de	m	-				_			2.400000 61
1									100
-10	dBm-	D1 -	13.38	IO dBm			-		
-20	dBm-						-		
-	dBm								
-30	aum-								
-40	dBm-	114	_				-	M3	12
the	dBm	ml	ment	manual	munshow	alumper commen	mon		aurreburnet
-30	ubili								
-60	dBm—	-					-		
-70	dBm						-		
10	abin								
Sta	rt 2.35	GHz				691 pts			Stop 2.405 GHz
	rker								
_	Туре	Ref	_	Stimulus	Response	Function		Function	Result
1	N1	-	1	2.40496 GHz	6.62 dBm				
2	N2 N3	-	1	2.4 GHz 2.39 GHz	-47.31 dBm -47.26 dBm				
4	N4	_	1	2.3569348 GHz	-47.26 dBm -45.74 dBm				



t nt 300		00 dB 30 (e Auto Swee	p	
Bm-	MA								6.74 dBn 2.471910 GH -48.08 dBn 2.483500 GH
	01 -	13.26	i0 dBm	_					
		M2		МЗ					manufacture
					and and the				
dBm					_				
	GHz					691 pts			Stop 2.55 GHz
	Ref	Trc	Stimulus	Respo	nse	Function		Function	Result
N1		1	2.47191 GHz	6.7	4 dBm				
N2		1	2.4835 GHz						
N3 N4	_	1	2.5 GHz 2.543739 GHz	-47.0					
	View Bm Bm BBm BBm BBm BBm BBm BBm BBm BBm	nt 300/300 View Bm Bm D1 Bm D1 Bm Bm Bm Bm Bm Bm Bm Bm Bm Bm	nt 300/300 View Bm Bm 01 -13.22 dBm 01 -13.22 dBm dBm dBm dBm dBm t 2.47 GHz ker Type Ref Trc N1 1 N2 1 N3 1	nt 300/300 View Bm Bm O1 -13.260 dBm dBm dBm dBm dBm dBm dBm t 2.4719 GHz ker Type Ref Trc Stimulus N1 1 2.47191 GHz N2 1 2.4835 GHz N2 1 2.4835 GHz N3 1 2.5 GHz	nt 300/300 View Bm Bm 18m 18m 18m 18m 18m 18m 18m 18	nt 300/300 View Bm Bm O1 -13.260 dBm HBm O1 -13.260 dBm HBm HBm HC HBm HC HBm HC HBm HC	nt 300/300 View Bm Bm O1 -13.260 dBm H Bm M2 Bm Bm A	M1 M2 M3 Bm M1 Bm M2 Bm M2 Bm M2 Bm M2 Bm M3 Bm M3 Bm M3 Bm M3 Bm M3 Bm M3 I 2.47191 GHZ 6.74 dBm M3 N2 1 2.4825 GH2 -48.08 dBm N3 1 2.5 GH2 -47.01 dBm	M1 M2 M3 1 2.47 GHz 691 pts

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



At			00 dB 30 (4 dB 🖷 RBW 1 ms 🖷 VBW		de Auto Swee	ep	
_	int 300 k View	/300	_			_			
10 d							M1[1] M2[1]		6.88 dB 2.4020150 GF -45.3 dB 2.4000000 GF
	dBm—		10.10	0 dBm			-		
-20	dBm-	. 10	13.12	O GBM					
-30	dBm—	-							p 4
	dBm-						M4	MB	19
	dBm— dBm—	h	www	maraketheter			Jan mar mar		under and the second
-70	dBm	-					-		
_	rt 2.35	GHz				691 pts			Stop 2.405 GH
	rker Type	Ref	Trc	Stimulus	Response	Function	1	Function I	Result
1	N1		1	2.402015 GHz	6.88 dBm				
2	N2		1	2.4 GHz	-45.31 dBm	1			
3	N3		1	2.39 GHz	-47.92 dBm				
4	N4		1	2.3856304 GHz	-45.36 dBm				

Fig. 5 Band Edges ($\pi/4$ DQPSK, CH0, Hopping OFF)

At	int 300		00 dB 30 d		7 dB 🖶 R 1 ms 🖷 V			le Auto Swe	еер	
10 d		MI						M1[1] M2[1]		6.66 dBn 2.480010 GH -47.24 dBn 2.483500 GH
-10	dBm	Ш					_	_	_	
20	dBm-	D1 -	13.34	0 dBm						
-30	dBm-	1	1						-	
40	dBm-	_	M2	104	M3					
Lyn	man	1		-		men	hourse	memeriko	man manung where	inghanesumanyahan
-50	dBm—									
-60	dBm-	-		-					-	
-	10									
-70	dBm—									
Sta	rt 2.47	GHz			_	-	691 pts	-		Stop 2.55 GHz
	rker	_								
	Type	Ref		Stimulus	Respon		Function		Function	Result
1	N1		1	2.48001 GHz		dBm				
2	N2 N3		1	2.4835 GHz	-47.24					
3			1	2.5 GHz	-47.36	dBm				

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



COL	t int 300	/300	30 (dB SWT 1.	l ms 🖷	VBW 3	00 kHz Mod	le Auto Swe	вер		
1P	< View	_									
10 0	iBm							M1[1] M2[1]			7.04 dBr 49600 GH 47.79 dBr
o de	m	-							1	2.40	00000 04
-10	dBm										
	dBm-	01 -	12.96	i0 dBm							
-30	dBm				_				_		
40	dBm-										4
		m	m	minanum	merm	mone	mentionen	ulaman	M3	mound	12
	dBm										
-70	dBm	-						-	-		
Sta	rt 2.35	GHz	-				691 pts			Stop 2	2.405 GHz
Ma	rker										
	Туре	Ref		Stimulus	Respo		Function		Function	Result	
2	N1 N2		1	2.40496 GHz 2.4 GHz		4 dBm 9 dBm					
3	N2 N3		1	2.4 GHz 2.39 GHz		9 dBm 2 dBm					
4	N4		1	2.39 GHZ 2.3980652 GHz		9 dBm					

Fig. 7 Band Edges (π /4 DQPSK, CH0, Hopping ON)

Re	f Leve t	1 20.	00 dB 30 d		1 dB 🖷			de Auto Swe	ер	
_	nt 300 View	/300								
10 0		han						M1[1] M2[1]		7.07 dBr 2.475040 GH -47.75 dBr 2.483500 GH
-10	dBm-		_							
	dBm	01	-12.93	0 dBm						
-30	dBm—		_				_			
40	dBm		M2			-	14	_	_	
-50	dBm			manulundersetal	M3	nenterren	manne	munner	munimental	unnummen
60	dBm	_					_	_		
-70	dBm	-								
Sta	rt 2.47	GHz					691 pts			Stop 2.55 GHz
	rker									
1	Type N1	Ref	Trc 1	Stimulus 2.47504 GHz	Respo	nse 7 dBm	Function		Function	Result
2	N2	-	1	2.47504 GHz		5 dBm		-		
3	N3	-	1	2.5 GHz	-48.6					
4	N4		1	2.508377 GHz	-44.9	E dBm		-		





At	-		00 dB 30 (4 dB 🖷 RBW 1 ms 🖷 VBW		Mode	e Auto Sw	eep	
	nt 300 View	/300	_			-	_	_		
10 d								M1[1] M2[1]		6.91 dB 2.40201 90 GF -45.44 dB 2.4000090 GF
	dBm-		10.00	IO dBm						
-20	dBm	01 -	13.09	O dBm	_					
-30	dBm	-								
	dBm-								M3	
-50 -60		h	honym	and a start and a start and a start a st	un and a second	Mulm	hodrow		Land Marine Carlos and C	
-70	dBm	-				-		-		
_	rt 2.35	GHz				691 pt:	5			Stop 2.405 GH
	rker Type	Ref	Trc	Stimulus	Response	Func	tion		Function	Result
1	N1		1	2.402015 GHz	6.91 dBm					
2	N2		1	2.4 GHz	-45.45 dBm					
3	N3		1	2.39 GHz	-47.60 dBm	-				
4	N4		1	2.3998986 GHz	-43.96 dBm					



At			00 dB 30 d		7 dB 🖷 RBV 1 ms 🖷 VBV			le Auto Sweep	
_	nt 300 K View	/300				-			
10 d	Bm-	MI						M1[1] M2[1]	6.68 d 2.480010 (-47.19 d 2.483500 (
-10	dBm-								
		D1 -	13.32	0 dBm				-	
20	dBm								
30	dBm-				-	_			
		r i							
40	dBm-		M2	100	M3			-	
So'	dBm-	1	the	unmundered	motura	north	alenour	Monnevenion	damak granded by the market
60	dBm	-		+ + +					
70	dBm-								
	aun								
_	t 2.47	GHz				691	pts		Stop 2.55 G
	rker	_							
Mo	Туре	Ref		Stimulus	Response		unction	FU	unction Result
	N1 N2	-	1	2.48001 GHz	6.68 di				
1			1	2.4835 GHz 2.5 GHz	-47.19 di				
	N3		1						

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



	nt 300	/300	30 d	B SWT 1.	1 ms 🖶 VBW	300 kHz N	lode Auto Sw	еер	
D1P	(View	_							
10 d	Bm—	-					M1[1]		4.53 dBr 2.4029700 GH -48.05 #Br
O dB	m	-							2.4000098/4H
-10	dBm-		15.47	a dan					
-20	dBm-	01 -	15.4/	J dBm					
-30	dBm-								
	10								p ⁿ
	dBm-				1014			MB	M2
-50	dBm	Mich	whend	moundated	moun	and the second second	mathaman	man mark	- marine and the second
-60	dBm	-	_					_	
-70	dBm	-				_		_	
Sta	t 2.35	GHz				691 pts			Stop 2.405 GHz
Ma	ker						-		
No	Туре	Ref	Trc	Stimulus	Response	Function	n	Function	Result
1	N1	-	1	2.40297 GHz	4.53 dBn				
2	N2		1	2.4 GHz	-48.05 dBn		1		
3	N3		1	2.39 GHz	-47.75 dBn	_	-		
4	N4		1	2.3707246 GHz	-45.62 dBn	n			



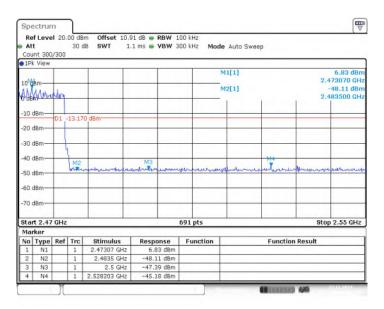


Fig. 12 Band Edges (8DPSK, CH78, Hopping ON)



A.3 Conducted Emission

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

Measurement Limit:

Standard	Limit (dBm)
FCC 47 CFR Part 15.247 (d)	20dBm below peak output power in 100kHz
FCC 47 CFR Fait 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
_//	2402(CH0)	1GHz-26.5GHz	Fig.16	Р
π/4	2441(CH39)	1GHz-26.5GHz	Fig.17	Р
DQPSK	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



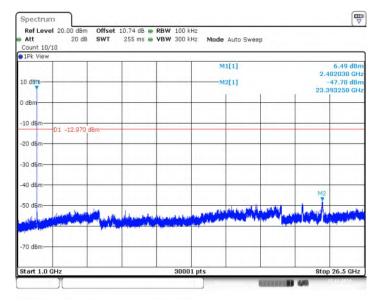


Fig. 13 Conducted Spurious Emission (GFSK, CH0, 1GHz-26.5GHz)

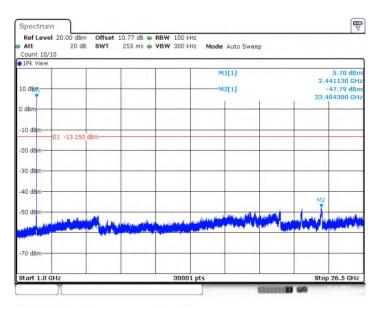
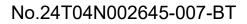


Fig. 14 Conducted Spurious Emission (GFSK, CH39, 1GHz-26.5GHz)





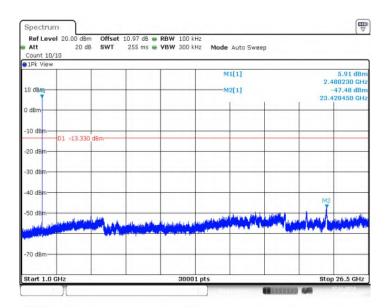


Fig. 15 Conducted Spurious Emission (GFSK, CH78, 1GHz-26.5GHz)

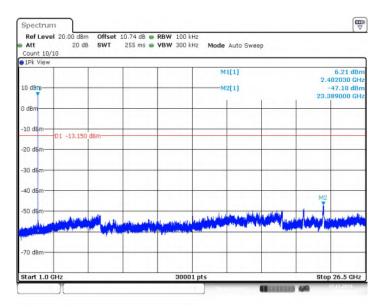


Fig. 16 Conducted Spurious Emission (π/4 DQPSK, CH0, 1GHz-26.5GHz)



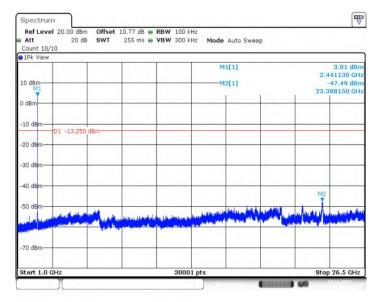


Fig. 17 Conducted Spurious Emission (π/4 DQPSK, CH39, 1GHz-26.5GHz)

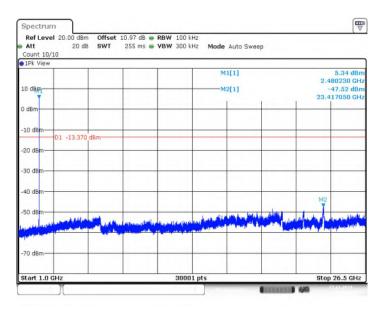


Fig. 18 Conducted Spurious Emission (π/4 DQPSK, CH78, 1GHz-26.5GHz)



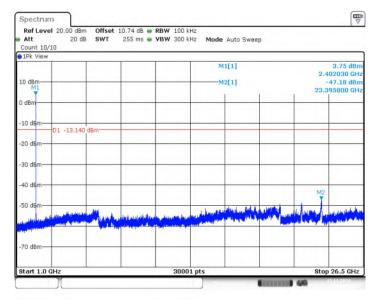


Fig. 19 Conducted Spurious Emission (8DPSK, CH0, 1GHz-26.5GHz)

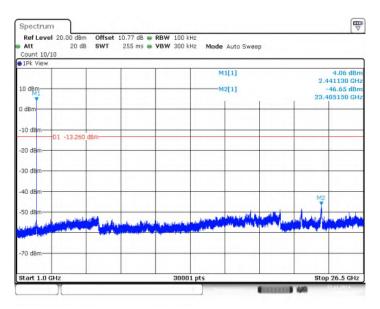
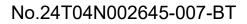


Fig. 20 Conducted Spurious Emission (8DPSK, CH39, 1GHz-26.5GHz)





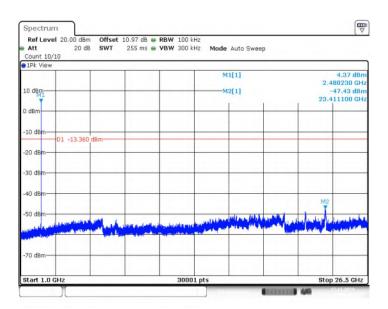


Fig. 21 Conducted Spurious Emission (8DPSK, CH78, 1GHz-26.5GHz)

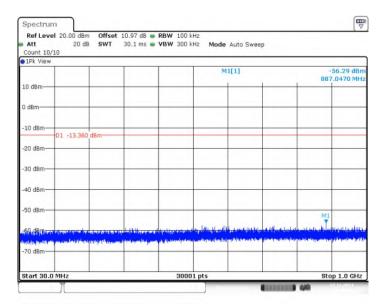


Fig. 22 Conducted Spurious Emission (All Channels, 30MHz -1GHz)



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)).

Limit in restricted band:

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

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 were recorded in this report.



Measurement Results:

Mode	Frequency (MHz)	Frequency Range	Test Results	Conclusion
	2402(CH0)	1 GHz ~18 GHz	Fig.23	Р
	2441(CH39)	1 GHz ~18 GHz	Fig.24	Р
GFSK	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
π/4	2441(CH39)	1 GHz ~18 GHz	Fig.29	Р
DQPSK	2480(CH78)	1 GHz ~18 GHz	Fig.30	Р
DQFON	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 CH0 (1-18GHz)

Frequency	MaxPeak	Limit	Margin	Pol	Corr.
(MHz)	(dBµV/m)	(dBµV/m)	(dB)		(dB/m)
10926.000000	47.41	74.00	26.59	V	9.5
12572.571429	47.92	74.00	26.08	V	11.3
14870.142857	51.48	74.00	22.52	Н	13.0
15934.714286	52.69	74.00	21.31	V	14.1
16863.857143	54.24	74.00	19.76	Н	18.0
17921.142857	55.06	74.00	18.94	Н	18.9

Frequency	Average	Limit	Margin	Pol	Corr.
(MHz)	(dBµV/m)	(dBµV/m)	(dB)		(dB/m)
10926.000000	35.23	54.00	18.77	V	9.5
12572.571429	35.79	54.00	18.21	V	11.3
14870.142857	38.65	54.00	15.35	Н	13.0
15934.714286	39.99	54.00	14.01	V	14.1
16863.857143	41.96	54.00	12.04	Н	18.0
17921.142857	42.70	54.00	11.30	Н	18.9



π/4 DQPSK CH0 (1-18GHz)

Frequency	MaxPeak	Limit	Margin	Pol	Corr.
(MHz)	(dBµV/m)	(dBµV/m)	(dB)		(dB/m)
10400.142857	47.68	74.00	26.32	Н	9.1
12252.857143	49.50	74.00	24.50	V	10.9
14850.428572	50.61	74.00	23.39	V	13.0
15912.428571	53.26	74.00	20.74	V	14.1
17035.714286	55.13	74.00	18.87	V	18.4
17907.857143	54.54	74.00	19.46	V	18.9

Frequency	Average	Limit	Margin	Pol	Corr.
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	FOI	(dB/m)
10400.142857	35.19	54.00	18.81	Н	9.1
12252.857143	36.06	54.00	17.94	V	10.9
14850.428572	38.30	54.00	15.70	V	13.0
15912.428571	40.13	54.00	13.87	V	14.1
17035.714286	42.40	54.00	11.60	V	18.4
17907.857143	42.55	54.00	11.45	V	18.9

8DPSK CH0 (1-18GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
11593.714286	47.13	74.00	26.87	Н	10.0
12866.142857	48.86	74.00	25.14	Н	11.0
14207.571429	48.57	74.00	25.43	V	11.1
15966.000000	51.81	74.00	22.19	V	14.1
16851.428571	53.80	74.00	20.20	V	17.9
17908.285714	55.24	74.00	18.76	V	18.9

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
11593.714286	35.38	54.00	18.62	Н	10.0
12866.142857	36.37	54.00	17.63	Н	11.0
14207.571429	36.17	54.00	17.83	V	11.1
15966.000000	39.41	54.00	14.59	V	14.1
16851.428571	41.83	54.00	12.17	V	17.9
17908.285714	42.58	54.00	11.42	V	18.9

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



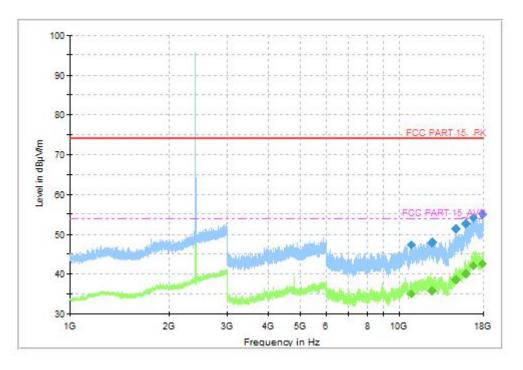


Fig. 23 Radiated Spurious Emission (GFSK, CH0, 1GHz ~18GHz)

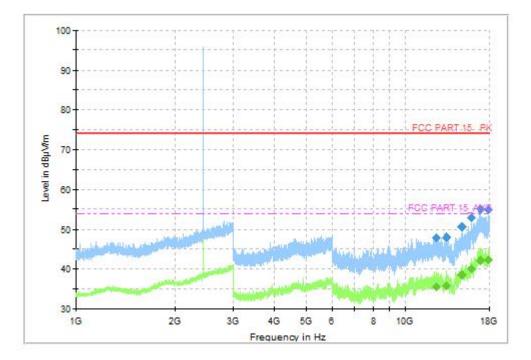


Fig. 24 Radiated Spurious Emission (GFSK, CH39, 1GHz ~18GHz)



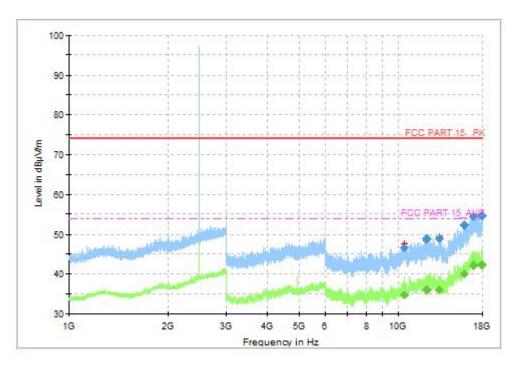


Fig. 25 Radiated Spurious Emission (GFSK, CH78, 1GHz ~18GHz)

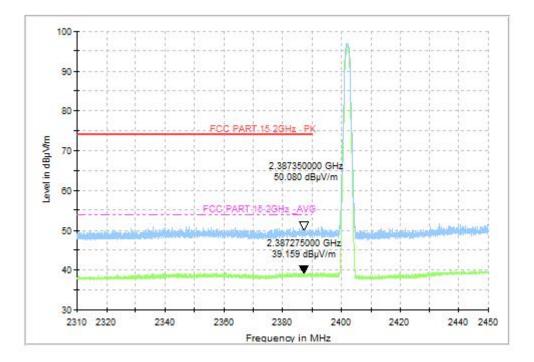


Fig. 26 Radiated Band Edges (GFSK, CH0, 2.38GHz~2.45GHz)



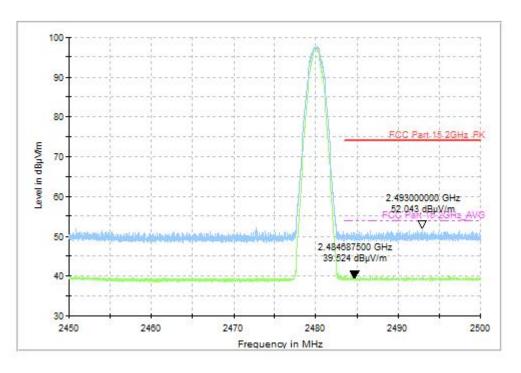


Fig. 27 Radiated Band Edges (GFSK, CH78, 2.45GHz~2.50GHz)

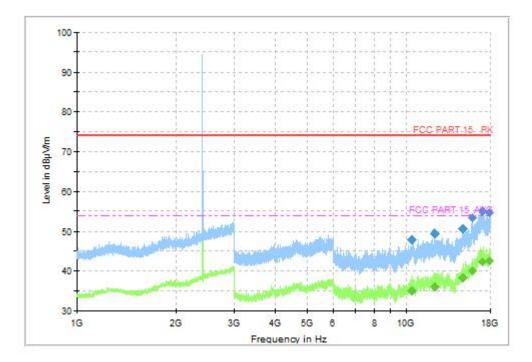


Fig. 28 Radiated Spurious Emission (π/4 DQPSK, CH0, 1GHz ~18GHz)



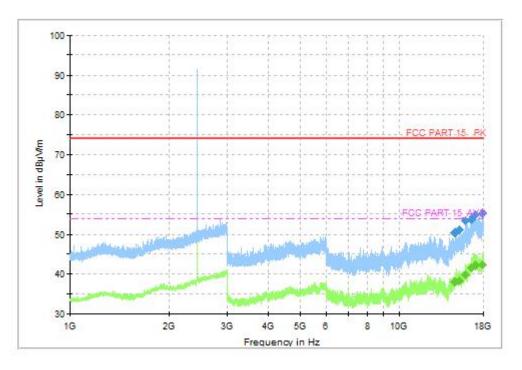


Fig. 29 Radiated Spurious Emission (π/4 DQPSK, CH39, 1GHz ~18GHz)

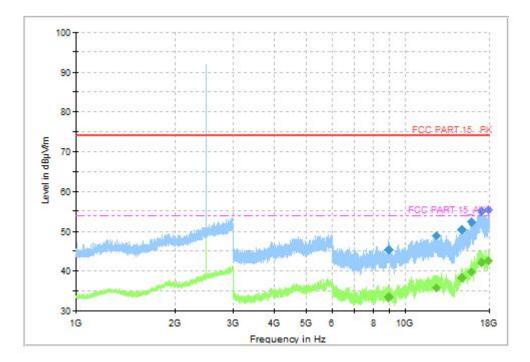


Fig. 30 Radiated Spurious Emission (π/4 DQPSK, CH78, 1GHz ~18GHz)



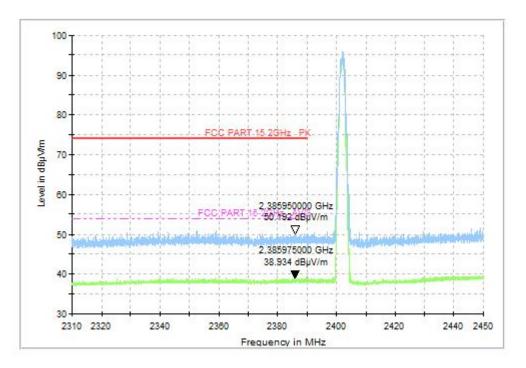


Fig. 31 Radiated Band Edges (π/4 DQPSK, CH0, 2.38GHz~2.45GHz)

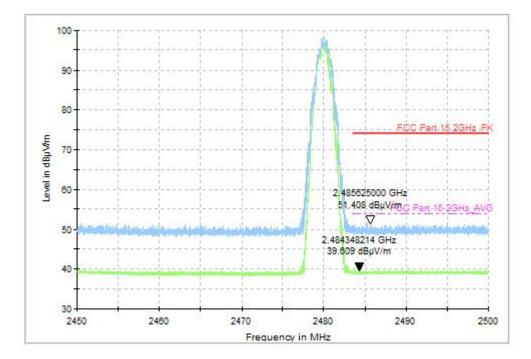


Fig. 32 Radiated Band Edges (π/4 DQPSK, CH78, 2.45GHz~2.50GHz)



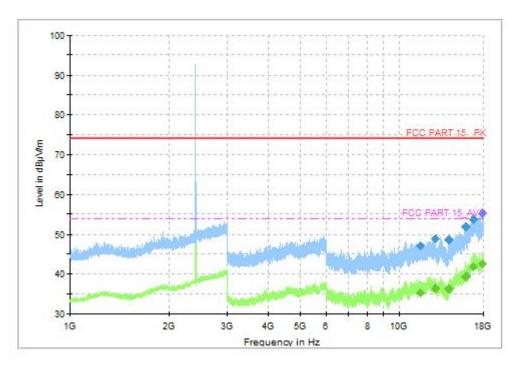


Fig. 33 Radiated Spurious Emission (8DPSK, CH0, 1GHz ~18GHz)

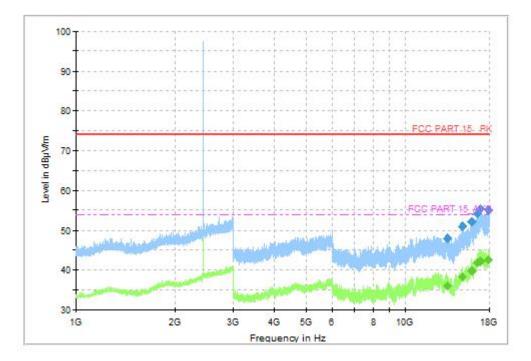


Fig. 34 Radiated Spurious Emission (8DPSK, CH39, 1GHz ~18GHz)



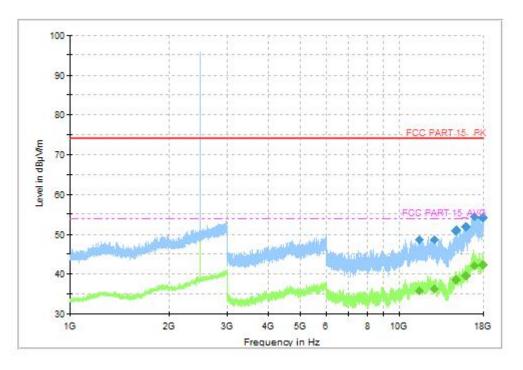


Fig. 35 Radiated Spurious Emission (8DPSK, CH78, 1GHz ~18GHz)

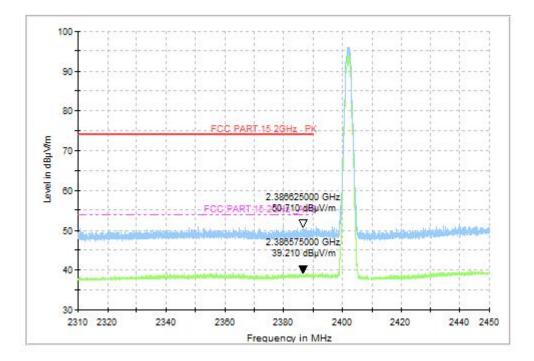
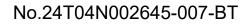


Fig. 36 Radiated Band Edges (8DPSK, CH0, 2.38GHz~2.45GHz)





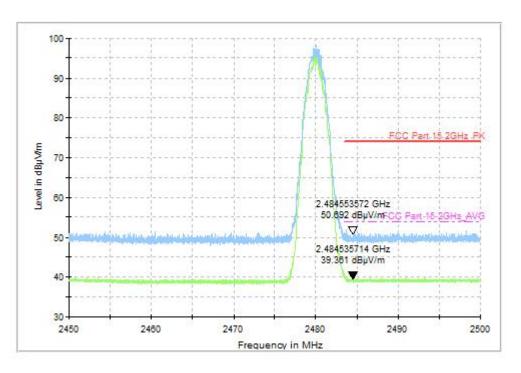


Fig. 37 Radiated Band Edges (8DPSK, CH78, 2.45GHz~2.50GHz)

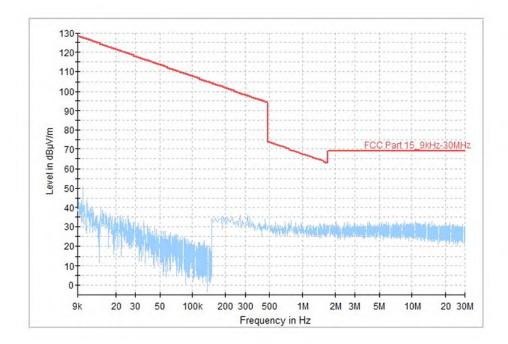


Fig. 38 Radiated Spurious Emission (All Channels, 9kHz ~30MHz)



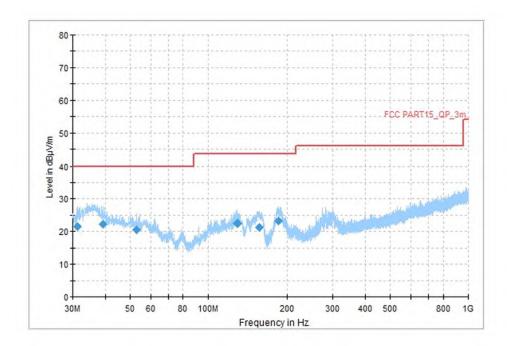


Fig. 39 Radiated Spurious Emission (All Channels, 30MHz ~1GHz)

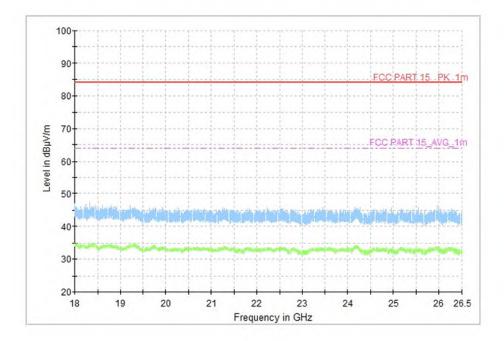


Fig. 40 Radiated Spurious Emission (All Channels, 18GHz ~26.5GHz)



A.5 20dB Bandwidth

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

Measurement Limit:

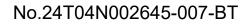
Standard	Limit (MHz)
FCC 47 CFR Part 15.247 (a)	/

Measurement Result:

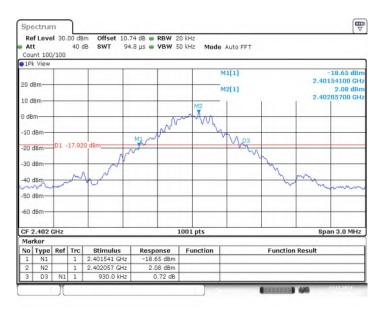
Mode	Frequency (MHz)		ndwidth Hz)	Conclusion
	2402(CH0)	Fig.41	0.93	
GFSK	2441(CH39)	Fig.42	0.93	/
	2480(CH78)	Fig.43	0.93	
	2402(CH0)	Fig.44	1.32	
π/4 DQPSK	2441(CH39)	Fig.45	1.32	/
	2480(CH78)	Fig.46	1.32	
	2402(CH0)	Fig.47	1.29	
8DPSK	2441(CH39)	Fig.48	1.29	/
	2480(CH78)	Fig.49	1.29	

See below for test graphs.

Conclusion: PASS









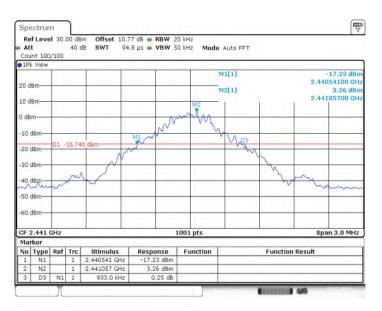
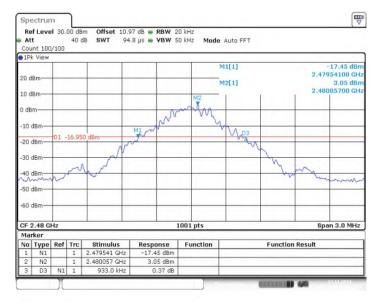


Fig. 42 20dB Bandwidth (GFSK, CH39)







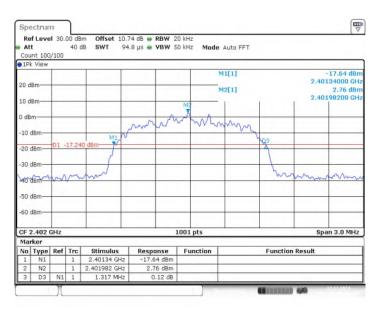
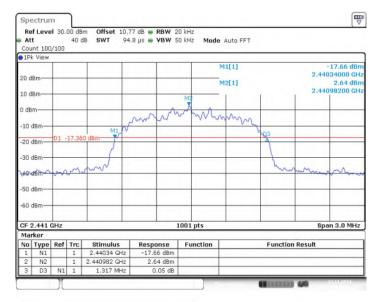


Fig. 44 20dB Bandwidth (π /4 DQPSK, CH0)







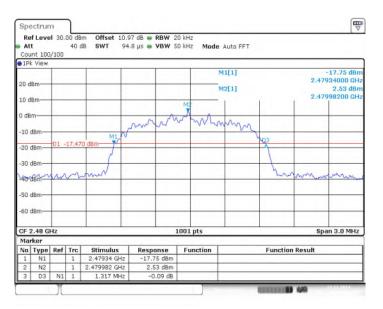
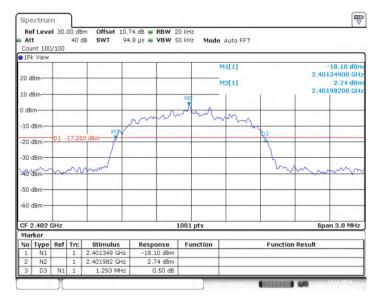


Fig. 46 20dB Bandwidth (π /4 DQPSK, CH78)







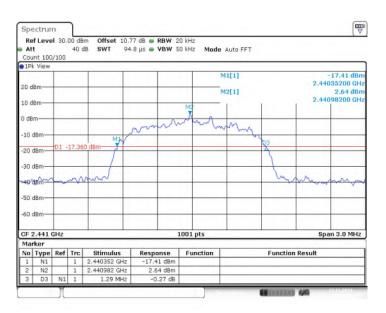


Fig. 48 20dB Bandwidth (8DPSK, CH39)



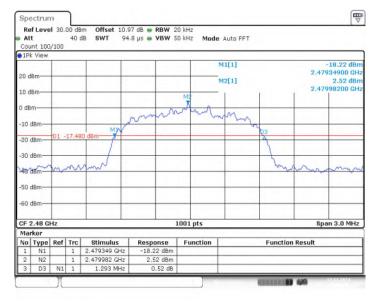


Fig. 49 20dB Bandwidth (8DPSK, CH78)



A.6 Time of Occupancy (Dwell Time)

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

Measurement Limit:

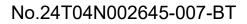
Standard	Limit (s)
FCC 47 CFR Part 15.247(a)	< 0.4

Measurement Results:

Mode	Frequency (MHz)	Packet	Bursť (m		Totall (Nu	•	Result (s)	Conclusion
GFSK	2441(CH39)	DH5	Fig.50	2.87	Fig.51	100	0.287	Р
π/4 DQPSK	2441(CH39)	2-DH5	Fig.52	2.87	Fig.53	110	0.316	Р
8DPSK	2441(CH39)	3-DH5	Fig.54	2.87	Fig.55	110	0.316	Р

See below for test graphs.

Conclusion: Pass





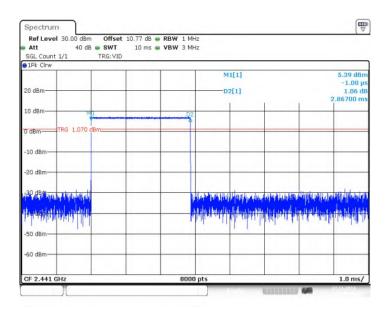


Fig. 50 BurstWidth (Dwell Time) (GFSK, CH39)

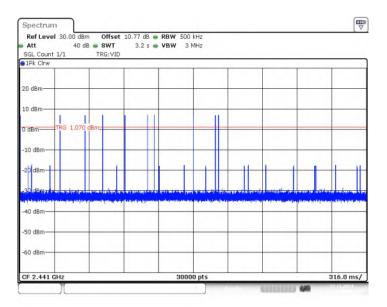


Fig. 51 Number of Burst in Observation Period (Dwell Time) (GFSK, CH39)



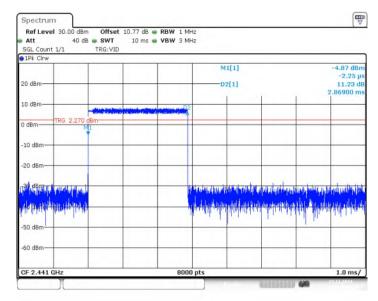


Fig. 52 BurstWidth (Dwell Time) (π/4 DQPSK, CH39)

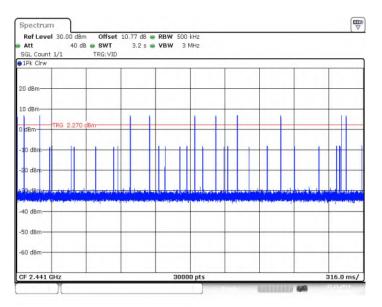


Fig. 53 Number of Burst in Observation Period (Dwell Time) (π /4 DQPSK, CH39)



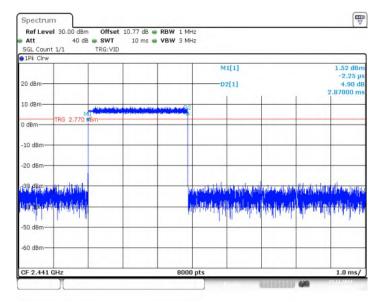


Fig. 54 BurstWidth (Dwell Time) (8DPSK, CH39)

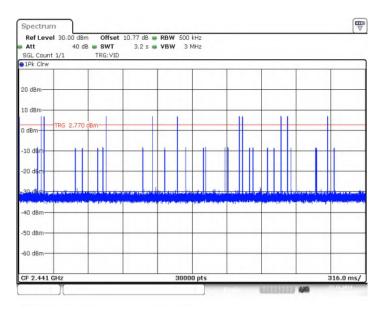


Fig. 55 Number of Burst in Observation Period (Dwell Time) (8DPSK, CH39)



A.7 Number of Hopping Channels

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

Measurement Limit:

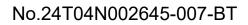
Standard	Limit (Num)
FCC 47 CFR Part 15.247(a)	At least 15 non-overlapping channels

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





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_	-	-					_	
								1

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

	30.00 dBm		10.74 dB 🖷		kHz	1.5.1.			
Att Count 1000	40 dB	SWT	1 ms 🖷	VBW 300	kHz Mode	Auto Swee	р		
1Pk View	J/1000							_	
	-	-							
20 dBm		_							
10 dBm-					_				
MUNIA	MANAA	MMMM	WWW	MAMM	AMMAN	MMM	MAMA	MMM	MMM
0 dBm									
10 dBm			-					_	
-20 dBm									
30 dBm-	_								Ч
-40 dBm		-							l
-50 dBm									
-60 dBm									
Start 2.4 G					1 pts				.4835 GHz

Fig. 57 Number of Hopping Channels ($\pi/4$ DQPSK, Hopping)



1Pk View		-			-					_
20 dBm		-								
10 dBm		08481.4.								
	nunn	anarana	www	mmm	mm	mm	hann	MMAP	unn	-
-10 dBm—										
-20 dBm		_						_		
30 dBm-										h
40 dBm-										
-50 dBm—										_
-60 dBm										_

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:

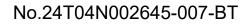
Standard	Limit (kHz)
	By a minimum of 25 kHz or two-thirds of the 20 dB
FCC 47 CFR Part 15.247(a)	bandwidth of the hopping channel, whichever is
	greater

Measurement Results:

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

See below for test graphs.

Conclusion: Pass





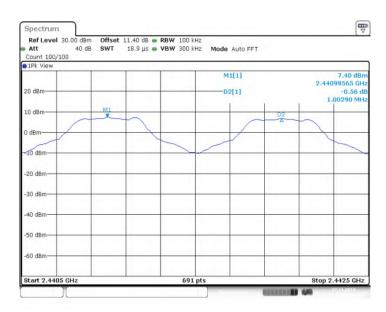


Fig. 59 Carrier Frequency Separation (GFSK, CH39)

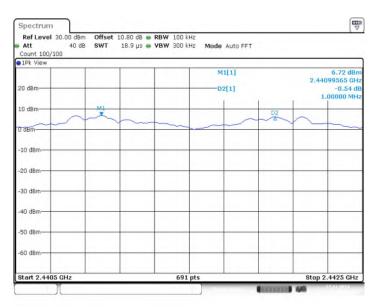


Fig. 60 Carrier Frequency Separation (π/4 DQPSK, CH39)



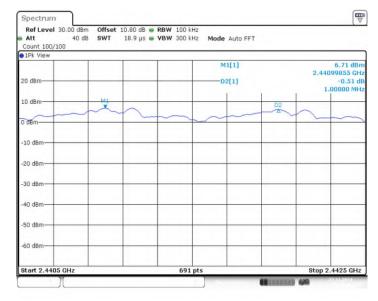


Fig. 61 Carrier Frequency Separation (8DPSK, CH39)



A.9 AC Power line Conducted Emission

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

Test Condition:

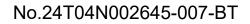
Voltage (V)	Frequency (Hz)
120	60

Measurement Result and limit:

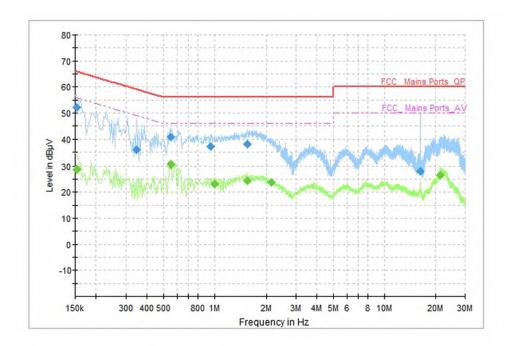
Frequency range	Quasi-peak	Average-peak Res		(dBµV)	Conclusion			
(MHz)	Limit (dBµV)	Limit (dBµV)	Traffic	ldle	Conclusion			
0.15 to 0.5	66 to 56	56 to 46		Fig.63				
0.5 to 5	56	46	Fig.62		Р			
5 to 30	60	50						
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15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

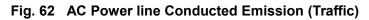
Note: The measurement results include the L1 and N measurements.

See below for test graphs. Conclusion: Pass









Frequency	Quasi Peak	Limit	Margin	Line	Filter	Corr.	
(MHz)	(dBµV)	(dBµV)	(dB)			(dB)	
0.154000	52.10	65.78	13.69	N	ON	7	
0.346000	36.08	59.06	22.97	N	ON	10	
0.554000	40.98	56.00	15.02	L1	ON	10	
0.954000	37.11	56.00	18.89	N	ON	10	
1.554000	38.10	56.00	17.90	L1	ON	10	
16.250000	28.08	60.00	31.92	L1	ON	10	

Measurement Results: Quasi Peak

Measurement Results: Average

Frequency	Average	Limit	Margin	Line	Filter	Corr.
(MHz)	(dBµV)	(dBµV)	(dB)			(dB)
0.154000	28.49	55.78	27.29	L1	ON	10
0.550000	30.38	46.00	15.62	N	ON	10
0.998000	23.02	46.00	22.98	N	ON	10
1.554000	24.45	46.00	21.55	L1	ON	10
2.138000	23.87	46.00	22.13	L1	ON	10
21.534000	26.40	50.00	23.60	N	ON	10



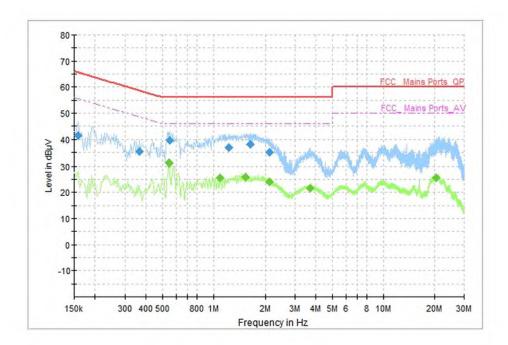


Fig. 63 AC Power line Conducted Emission (Idle)

Measurement Results: Quasi Peak						
Frequency	Quasi Peak	Limit				

Frequency	Quasi Peak	Limit	Margin	Line	Filter	Corr.
(MHz)	(dBµV)	(dBµV)	(dB)			(dB)
0.158000	41.53	65.57	24.04	L1	ON	10
0.366000	35.44	58.59	23.15	N	ON	10
0.550000	39.65	56.00	16.35	N	ON	10
1.230000	36.97	56.00	19.03	L1	ON	10
1.642000	38.04	56.00	17.96	L1	ON	10
2.122000	35.19	56.00	20.81	N	ON	10

Measurement Results: Average

Frequency	Average	Limit	Margin	Line	Filter	Corr.
(MHz)	(dBµV)	(dBµV)	(dB)			(dB)
0.546000	31.09	46.00	14.91	N	ON	10
1.098000	25.66	46.00	20.34	N	ON	10
1.538000	26.02	46.00	19.98	N	ON	10
2.122000	24.04	46.00	21.96	N	ON	10
3.674000	21.45	46.00	24.55	L1	ON	10
20.590000	25.63	50.00	24.37	N	ON	10

END OF REPORT