



TE	EST REPORT
Report Reference No	TRE1804023802 R/C: 92942
FCC ID:	YAMVM550
Applicant's name	Hytera Communications Corporation Limited
Address	Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan District, Shenzhen, People's Republic of China
Manufacturer	Hytera Communications Corporation Limited
Address	Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan District, Shenzhen, People's Republic of China
Test item description:	Body Worn Camera
Trade Mark	Hytera
Model/Type reference:	VM550
Listed Model(s)	
Standard:	FCC CFR Title 47 Part 15 Subpart C Section 15.247
Date of receipt of test sample	Apr.28,2018
Date of testing	Apr.29,2018-Jun.10,2018
Date of issue	Jun.11,2018
Result	PASS
Compiled by ( position+printedname+signature):	File administrators Yueming Li
Supervised by (position+printedname+signature):	Project Engineer Tom ouyang
Approved by (Position+Printed name+Signature):	RF Manager Hans Hu
Testing Laboratory Name	Shenzhen Huatongwei International Inspection Co., Ltd.
Address	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China
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The test report merely correspond to the test sample.

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# 1. TEST STANDARDS AND REPORT VERSION

### 1.1. Test Standards

The tests were performed according to following standards:

<u>FCC Rules Part 15.247:</u> Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devicese

### 1.2. Report version

Version No.	Date of issue	Description
00	Jun.11,2018	Original

# 2. TEST DESCRIPTION

Test Item	Section in CFR 47	Result	Test Engineer
Antenna Requirement	15.203/15.247 (c)	PASS	Xiaokang Tan
AC Power Line Conducted Emissions	15.207	PASS	Shower.dai
Conducted Peak Output Power	15.247 (b)(1)	PASS	Xiaokang Tan
20 dB Bandwidth	15.247 (a)(1)	PASS	Xiaokang Tan
Carrier Frequencies Separation	15.247 (a)(1)	PASS	Xiaokang Tan
Hopping Channel Number	15.247 (a)(1)	PASS	Xiaokang Tan
Dwell Time	15.247 (a)(1)	PASS	Xiaokang Tan
Pseudorandom Frequency Hopping Sequence	15.247(b)(4)	PASS	Xiaokang Tan
Restricted band	15.247(d)/15.205	PASS	Xiaokang Tan
Radiated Emissions	15.247(d)/15.209	PASS	Jiuru Pan

Note: The measurement uncertainty is not included in the test result.

# 3. <u>SUMMARY</u>

### 3.1. Client Information

Applicant:	Hytera Communications Corporation Limited	
Address:	Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan District, Shenzhen, People's Republic of China	
Manufacturer:	Hytera Communications Corporation Limited	
Address:	Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan District, Shenzhen, People's Republic of China	

# 3.2. Product Description

Name of EUT:	Body Worn Camera	
Trade Mark:	Hytera	
Model No.:	VM550	
Listed Model(s):	-	
Power supply:	DC 3.85V	
Adapter information:	Model: S005AYV0500100 Input:100-240Va.c.,50/60Hz, 200mA Output: 5Vd.c.,1000mA	
Hardware version:	С	
Software version:	V1.03.01.001	
Bluetooth		
Version:	Supported BT4.0+EDR	
Modulation:	GFSK, π/4DQPSK, 8DPSK	
Operation frequency:	2402MHz~2480MHz	
Channel number:	79	
Channel separation:	1MHz	
Antenna type:	PIFA Antenna	
Antenna gain:	0 dBi	

### 3.3. Operation state

#### Test frequency list

According to section 15.31(m), regards to the operating frequency range over 10 MHz, must select three channel which were tested. the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, please see the above gray bottom.

Channel	Frequency (MHz)
00	2402
01	2403
:	:
39	2441
:	:
77	2479
78	2480

#### > <u>TEST MODE</u>

For RF test items:

The engineering test program was provided and enabled to make EUT continuous transmit

For AC power line conducted emissions:

The EUT was set to connect with the Bluetooth instrument under large package sizes transmission.

For Radiated suprious emissions test item:

The engineering test program was provided and enabled to make EUT continuous transmit. The EUT in each of three orthogonal axis emissions had been tested ,but only the worst case (X axis) data recorded in the report.

### 3.4. EUT configuration

#### The following peripheral devices and interface cables were connected during the measurement:

- supplied by the manufacturer
- supplied by the lab

	1	Manufacturer:	/
	·	Model No.:	/
,	1	Manufacturer:	/
	1	Model No.:	/

### 3.5. Modifications

No modifications were implemented to meet testing criteria.

# 4. TEST ENVIRONMENT

### 4.1. Address of the test laboratory

Laboratory: Shenzhen Huatongwei International Inspection Co., Ltd. Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

### 4.2. Test Facility

#### CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

#### A2LA-Lab Cert. No.: 3902.01

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

#### FCC-Registration No.: 762235

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files.

#### IC-Registration No.:5377B-1

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No.: 5377B-1.

#### ACA

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

### 4.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba

### 4.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors in calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd. quality system according to ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Here after the best measurement capability for Shenzhen Huatongwei International Inspection Co., Ltd. is reported:

Test Items	Measurement Uncertainty	Notes	
Transmitter power conducted	0.57 dB	(1)	
Transmitter power Radiated	2.20 dB	(1)	
Conducted spurious emissions 9kHz~40GHz	1.60 dB	(1)	
Radiated spurious emissions 9kHz~40GHz	2.20 dB	(1)	
Conducted Emissions 9kHz~30MHz	3.39 dB	(1)	
Radiated Emissions 30~1000MHz	4.24 dB	(1)	
Radiated Emissions 1~18GHz	5.16 dB	(1)	
Radiated Emissions 18~40GHz	5.54 dB	(1)	
Occupied Bandwidth		(1)	

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

#### **Conducted Emissions** Last Cal. Next Cal. Test Item Model No. Serial No. Manufacturer Equipment (mm-dd-yy) (mm-dd-yy) **EMI** Test R&S ESCI 101247 11/11/2017 11/10/2018 1 Receiver 2 Artificial Mains SCHWARZBECK **NNLK 8121** 11/11/2017 11/10/2018 573 2-Line V-3 R&S 11/11/2017 ESH3-Z5 100049 11/10/2018 Network **Pulse Limiter** ESH3-Z2 11/11/2017 4 R&S 101488 11/10/2018 RF 5 Connection HUBER+SUHNER EF400 N/A 11/21/2017 11/20/2018 Cable 6 **Test Software** R&S ES-K1 N/A N/A N/A Radiated Emissions Last Cal. Next Cal. Test Item Manufacturer Model No. Serial No. Equipment (mm-dd-yy) (mm-dd-yy) Semi-Anechoic C11121 1 Albatross projects SAC-3m-01 10/16/2016 10/15/2019 Chamber **EMI** Test 2 R&S ESCI 100900 11/11/2017 11/10/2018 Receiver 11/19/2020 3 HFH2-Z2 100020 11/20/2017 Loop Antenna R&S Ultra-4 Broadband SCHWARZBECK **VULB9163** 538 4/5/2017 4/4/2020 Antenna Horn Antenna 5 SCHWARZBECK 9120D 1011 3/27/2017 3/26/2020 Broadband **BBHA9170** 6 SCHWARZBECK **BBHA9170** 3/27/2017 3/26/2020 Horn Antenna 472 7 BBV 9743 Pre-amplifier SCHWARZBECK 9743-0022 10/17/2018 10/18/2017 Broadband 8 SCHWARZBECK BBV 9718 9718-248 10/18/2017 10/17/2018 Pre-amplifier Spectrum 9 R&S FSP40 100597 11/11/2017 11/10/2018 Analyzer **RF** Connection HUBER+SUHNE 10 RE-7-FL N/A 11/21/2017 11/20/2018 Cable R **RF** Connection HUBER+SUHNE 11/20/2018 RE-7-FH N/A 11/21/2017 11 Cable R 12 **Test Software** Audix E3 N/A N/A N/A 13 **Test Software** N/A R&S ES-K1 N/A N/A 14 N/A N/A N/A Turntable Maturo Germany TT2.0-1T 15 Antenna Mast CAM-4.0-P-12 N/A N/A N/A Maturo Germany

### 4.5. Equipments Used during the Test

RF Con	RF Conducted Test					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. (mm-dd-yy)	Next Cal. (mm-dd-yy)
1	Spectrum Analyzer	R&S	FSV40	100048	11/11/2017	11/10/2018
2	EXA Signal Analyzer	Agilent	N9020A	184247	9/22/2017	9/21/2018
3	OSP	R&S	OSP120	101317	N/A	N/A

# 5. TEST CONDITIONS AND RESULTS

### 5.1. Antenna requirement

#### <u>Requirement</u>

#### FCC CFR Title 47 Part 15 Subpart C Section 15.203:

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 anantenna that uses a unique coupling to the intentional radiator, 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 connector is prohibited.

#### FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

### Test Result:

### ☑ Passed □ Not Applicable

The directional gain of the antenna less than 6 dBi, please refer to the below antenna photo.



## 5.2. Conducted Emissions (AC Main)

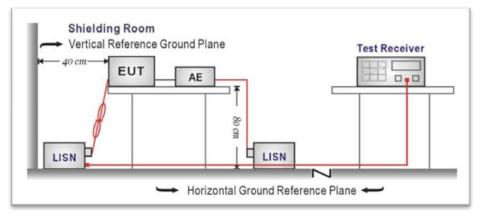
### <u>LIMIT</u>

FCC CFR Title 47 Part 15 Subpart C Section 15.207

	Limit (dBuV)		
Frequency range (MHz)	Quasi-peak	Average	
0.15-0.5	66 to 56*	56 to 46*	
0.5-5	56	46	
5-30	60	50	

\* Decreases with the logarithm of the frequency.

### **TEST CONFIGURATION**



#### TEST PROCEDURE

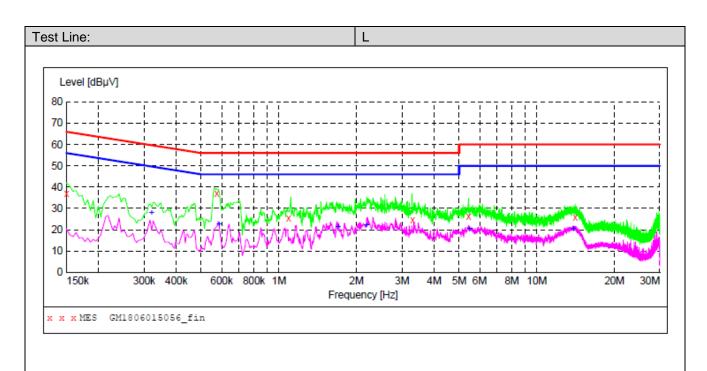
- 1. The EUT was setup according to ANSI C63.10:2013 requirements.
- 2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
- 3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment.
- 4. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
- 5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
- 6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
- 7. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
- 8. During the above scans, the emissions were maximized by cable manipulation.

### TEST RESULTS

#### ☑ Passed □ Not Applicable

Note:

- 1) Transd= Cable lose + Pulse Limiter Factor + Artificial Mains Factor
- 2) Margin= Limit Level



#### MEASUREMENT RESULT: "GM1806015056 fin"

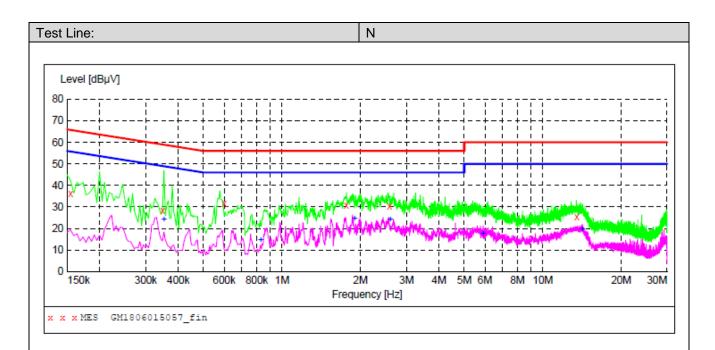
6/1/2018 3:44PM Frequency Level Transd Limit Margin Detector Line PE dBµV dB dBµV dB MHz 
 37.10
 10.0
 66

 37.20
 10.0
 56

 25.30
 10.1
 56
 0.150000 28.9 QP ь1 GND 18.8 QP 0.573000 L1 GND 30.7 QP 1.090500 56 ь1 GND 25.30 10.1 56 26.20 10.2 60 3.295500 56 31.6 QP L1 GND 33.8 QP 5.433000 ь1 GND 14.091000 25.80 10.5 60 34.2 QP ь1 GND

#### MEASUREMENT RESULT: "GM1806015056\_fin2"

6/1/2018 3:44PM							
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.321000	27.70	9.9	50	22.0	AV	L1	GND
0.586500	22.70	10.0	46	23.3	AV	ь1	GND
1.693500	21.30	10.1	46	24.7	AV	ь1	GND
2.188500	22.20	10.1	46	23.8	AV	L1	GND
5.482500	20.50	10.2	50	29.5	AV	ь1	GND
13.866000	20.60	10.5	50	29.4	AV	ь1	GND



#### MEASUREMENT RESULT: "GM1806015057\_fin"

6/1/2018 3:48PM Level Transd Limit Margin Detector Line Frequency PE dB dBµV dBµV dBMHz 0.154500 36.20 10.0 66 29.6 QP GND Ν 0.348000 28.50 9.9 59 30.5 QP Ν GND 0.600000 31.80 10.0 56 24.2 QP N GND 10.0 10.1 10.1 10.5 1.765500 30.80 56 25.2 QP N GND 30.40 25.40 25.6 QP 34.6 QP 56 2.584500 Ν GND 13.497000 10.5 60 Ν GND

#### MEASUREMENT RESULT: "GM1806015057 fin2"

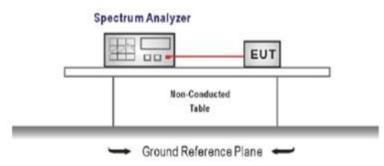
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.352500	24.30	9.9	49	24.6	AV	N	GND
0.829500	14.60	10.0	46	31.4	AV	N	GND
1.896000	24.50	10.1	46	21.5	AV	N	GND
2.602500	24.30	10.1	46	21.7	AV	N	GND
5.910000	17.60	10.2	50	32.4	AV	N	GND
14.185500	19.70	10.5	50	30.3	AV	N	GND

### 5.3. Conducted Peak Output Power

#### <u>LIMIT</u>

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(1): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 nonoverlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

#### **TEST CONFIGURATION**



#### TEST PROCEDURE

- 1. The transmitter output was connected to the spectrum analyzer through an attenuator, the pathloss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously
- Use the following spectrum analyzer settings: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel RBW≥ the 20 dB bandwidth of the emission being measured, VBW≥RBW Sweep = auto, Detector function = peak, Trace = max hold
- 4. Measure and record the results in the test report.

#### TEST MODE:

Please refer to the clause 3.3

#### TEST RESULTS

#### ☑ Passed □ Not Applicable

Modulation type	Channel	Output power (dBm)	Limit (dBm)	Result
	00	1.44		
GFSK	39	1.82	≤ 30.00	Pass
	78	2.11		
	00	0.99		
π/4DQPSK	39	1.32	≤ 21.00	Pass
	78	1.16		
	00	1.52		
8DPSK	39	1.86	≤ 21.00	Pass
	78	1.79		

Modulation Type:	GFSK
Modulation Type:	
	Spectrum 🕎
	RefLevel 20.00 dBm Offset 1.00 dB  RBW 1 MHz Att 30 dB SWT 1 ms  VBW 3 MHz Mode Auto Sweep
	Count 500/500
	M1[1] 1.44 dBm
	10 dBm 2.40216640 GHz
	-10 d8m
	-20 dBm
CH00	
	-30 dBm
	-40 d8m
	-50 dBm
	-60 d8m
	-70 dBm
	CF 2.402 GHz 691 pts Span 5.0 MHz
	Measuring
	Spectrum (♥)
	Ref Level 20.00 dBm Offset 1.00 dB  RBW 1 MHz
	Att 30 dB SWT 1 ms
	IPk View
	M1[1] 1.82 dBm 2.44084080 GHz
	0 dBm
	10.40
	-10 dBm
01100	-20 dBm
CH39	_30.d8m
	-40 dBm
	-50 d8m
	-60 d8m-
	-00 uuni
	-70 dBm
	CF 2.441 GHz 691 pts Span 5.0 MHz
	Spectrum
	RefLevel 20.00 dBm Offset 1.00 dB  RBW 1 MHz Att 30 dB SWT 1 ms VBW 3 MHz Mode Auto Sweep
	Count 500/500
	M1[1] 2.11 dBm
	10 dBm 2.47984080 GHz
	0 dBm
	-10 dBm
	-20 dBm
CH78	
	.30.dBm
	-40 d8m
	-50 dBm-
	-60 d8m-
	-70 d8m-
	CF 2.48 GHz         691 pts         Span 5.0 MHz
	Measuring ((111111))

Modulation Tuno	
Modulation Type:	π/4DQPSK
	Spectrum         Image: Constraint of the sector of th
	PIk View      10 dBm      10 dBm
CH00	-10 dBm
	-30 dBm
	-50 dBm
	-70 d8m
	CF 2.402 CHz         691 pts         Span 5.0 MHz
	Spectrum         Image: Constraint of the sector of th
	PIk View      M1[1]     1.32 dBm     2.44079740 GHz
	D dBm
СН39	-20 d8m
	-30 dBm
	-50 dBm
	CF 2.441 CHz 691 pts Span 5.0 MHz
	Spectrum RefLevel 20.00 dBm Offset 1.00 dB RBW 2 MHz Att 30 dB SWT 1 ms VBW 5 MHz Mode Auto Sweep Count S00/500
	●1Pk View M1[1] 1.16 dBm
	10 dBm M1
	-10,d8m
CH78	-20 dBm
	-40 dBm
	-60 d8m
	CF 2.48 GHz 691 pts Span 5.0 MHz

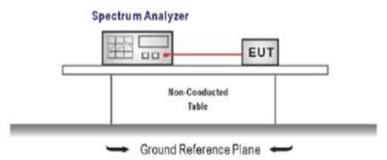
Modulation Type:	8DPSK
	Spectrum         Image: Constraint of the second seco
	10 dBm     10 dBm
	0 dBm
	-10 dam
CH00	-20 dBm
	-40 dBm
	-50 dBm-
	-60 d8m
	CF 2.402 GHz 691 pts Span 5.0 MHz
	Spectrum         Image: Constraint of the second seco
	●1Pk View M1[1] 1.86 dBm 2.44097830 GHz
	10 dBm ML
	-10.dem
CH39	-20 dBm
	-20 UBIII -40 dBm
	-50 dBm
	-60 dBm
	-70 dBm CF 2.441 GHz 691 pts Span 5.0 MHz
	Spectrum     (100)       Ref Level 20.00 dbm     Offset 1.00 db ● RBW 2 MHz
	Att 30 dB SWT 1 ms ● VBW 5 MHz Mode Auto Sweep Count 500/500      PPk View
	10 dBm
	0 dBm
	-10 Jam
CH78	-30 dBm
	-40 dBm
	-50 d8m
	-70 dsm
	CF 2.48 GHz         691 pts         Span 5.0 MHz

### 5.4. 20 dB Bandwidth

### LIMIT

N/A

### **TEST CONFIGURATION**



### TEST PROCEDURE

- 1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously
- 3. Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel RBW  $\ge$  1% of the 20 dB bandwidth, VBW  $\ge$  RBW

Sweep = auto, Detector function = peak, Trace = max hold

4. Measure and record the results in the test report.

#### TEST MODE:

Please refer to the clause 3.3

#### TEST RESULTS

🛛 Passed

#### Not Applicable

Modulation type	Channel	20 dB Bandwidth (MHz)	Limit (MHz)	Result
	00	0.92		
GFSK	39	0.93	-	Pass
	78	0.92		
	00	1.23		
π/4DQPSK	39	1.22	-	Pass
	78	1.23		
	00	1.25		
8DPSK	39	1.25	-	Pass
	78	1.25		

Modulation Type:	GFSK
	Spectrum         Tmm           Ref Level 20.00 dBm         Offset 1.00 dB         RBW 10 kHz           Att         30 dB         SWT         189.6 µs         VBW 30 kHz           SGL Count 500/S00         VBM         VBM         Note Auto FFT
	Sdc Court Source         M1[1]         -24.47 dBm           10 dBm         M2[1]         -4.42 dBm           0 dBm         M2         2.40205250 GHz
CH00	-10 dBm
	-40 dBm
	Type         Ref         Trc         X-value         Function         Function Result           M1         1         2.401545 GHz         -224.47 dBm         -224.47 dBm         -224.47 dBm           M2         1         2.40202525 GHz         -4.42 dBm         -224.47 dBm         -224.47 dBm           D3         M1         1         922.5 kHz         -0.14 dB         -0.14 dB         -0.14 dB
	Spectrum Ref Level 20.00 dBm Offset 1.00 dB • RBW 10 kHz
CH39	Att         30 dB         SWT         189.6 µs         VBW         30 kHz         Mode         Auto FFT           SGL Count 500/500         Image: SGL Count 500/
	-30 dBm
	CF 2.441 GHz         1001 pts         Span 2.5 MHz           Marker         Type Ref Trc         X-value         Function         Function Result           M1         1         2.44054 GHz         -24.39 dBm            M2         1         2.44105 GHz         -4.15 dBm            03         M1         925.0 kHz         0.08 dB
	Spectrum         Image: Constraint of the sector of t
CH78	M1[1]         -24.09 dbm           10 dbm         2.47954250 GHz           0 dbm         3.82 dBm           0 dbm         2.48005250 GHz           -10 dbm
	0 dBm
	-60 d8m         -60 d8m           -70 d8m         -70 d8m           CF 2.48 GHz         1001 pts           Span 2.5 MHz           Marker
	Type         Ref         Trc         X-value         Y-value         Function         Function Result           M1         1         2.4795425 GHz         -24.09 dBm

Modulation Type:	π/4DQPSK
	Spectrum 🕎
	RefLevel 20.00 dBm Offset 1.00 dB ● RBW 30 kHz ● Att 30 dB SWT 63.1 µs ● VBW 100 kHz Mode Auto FFT SGL Count 500/500
	(1Pk View     (1)     (2,34 dBm     (2,40136750 GHz
	10 dsm M2[1] -2.17 dBm
	-10 dBm
	-20 dBm
CH00	
	-50 dBm
	-60 d8m
	-70 dBm
	CF 2.402 GHz         1001 pts         Span 2.5 MHz
	Marker Type Ref Trc X-value Y-value Function Function Result
	M1         1         2.4013675 GHz         -22.34 dBm           M2         1         2.402 GHz         -2.17 dBm
	D3 M1 1 1.2275 MHz 0.11 dB
	Spectrum         Image: Spectrum           Ref Level 20.00 dBm         Offset 1.00 dB ● RBW 30 kHz
	Att 30 dB SWT 63.1 µs VBW 100 kHz Mode Auto FFT SGL Count 500/500
	P1Pk View     M1[1] -22.31 dBm
	10 dBm 2.44036500 GHz M2[1] -1.81 dBm
	0 dBm 2.44099750 GHz
	-10 dBm
	-20 dBm 01 -21.810 dBm 01 -21.810 dBm 2
СН39	
61139	
	-50 dBm
	-70 dBm
	CF 2.441 GHz         1001 pts         Span 2.5 MHz
	Marker
	Type         Ref         Trc         X-value         Y-value         Function         Function Result           M1         1         2.440365 GHz         -22.31 dBm              M2         1         2.4403975 GHz         -1.81 dBm
	D3 M1 1 1.22 MHz 0.37 dB
	Spectrum 🕎
	RefLevel 20.00 dBm Offset 1.00 dB ● RBW 30 kHz ● Att 30 dB SWT 63.1 µs ● VBW 100 kHz Mode Auto FFT SGL Count 500/500
	Gle Count 30/300     Glek View     M1[1] -21.84 dBm
	10 dBm M2[1] -1.79 dBm
	0 dBm
	-10 dBm
	-20 dBm D1 -21.795 dBm 2 2 2
01170	-30 dBm
CH78	
	-50 dBm
	-60 d8m
	-70 dBm-
	CF 2.48 GHz 1001 pts Span 2.5 MHz Marker
	Type         Ref         Trc         X-value         Y-value         Function         Function Result           M1         1         2.4793675 GHz         -21.84 dBm
	M2 1 2.49 GHz -1.79 GPm
	D3 M1 1 1.2325 MHz -0.28 dB Prode

Modulation Type:	8DPSK
	Spectrum         Image: Constraint of the sector of t
	SGL Count 500/500 <ul></ul>
CH00	-10 dBm -20 dBm -20 dBm -30
	-50 dBm -60 dBm -70 dBm -70 dBm CF 2.402 GHz 1001 pts Span 2.5 MHz Marker
	Type         Ref         Trc         X-volue         Y-volue         Function         Function Result           M1         1         2:40136 GHz         -2:261 dBm              M2         1         2:40126 GHz         -2:261 dBm              O3         M1         1         2:402 GHz         -2:41 dBm
	Spectrum         Imp           Ref Level 20.00 dBm         Offset 1.00 dB ● RBW 30 kHz           Att         30 dB         SWT         63.1 µs         VBW 100 kHz         Mode Auto FFT           SGL Count 500/500         SWT         63.1 µs         VBW 100 kHz         Mode Auto FFT
	M1[1]         -22.22 dBm           10 dBm         M1[1]         2.44036000 GHz           0 dBm         M2[1]         -1.89 dBm           -10 dBm         -0 dBm         -0 dBm
CH39	-20 dBm D1 -21.890 dBm
	-50 dBm
	CF 2.441 GHz         Span 2.5 MHz           Marker         Type         Ref         Trc         X-value         Function         Function Result           M1         1         2.44036 GHz         -22.22 dBm         -22.22 dB
	Spectrum         Image: Constraint of the sector of th
CH78	SGL Count 500/500           @1Pk View           10 dBm           0 dBm
	-10 dBm -20 dBm -30 dBm -30 dBm
	-50 dBm
	Type         Ref         Trc         X-value         Function         Function Result           M1         1         2.4793575 GHz         -22.11 dBm         -22.11 dBm         -22.11 dBm
	D3 M1 1 1.2525 MHz -0.03 dB Prode AMA

### 5.5. Carrier Frequencies Separation

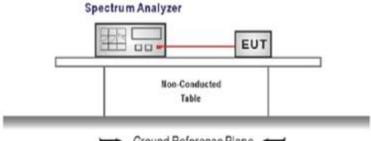
#### LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively,

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

#### **TEST CONFIGURATION**



- Ground Reference Plane

#### TEST PROCEDURE

- 1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously
- Use the following spectrum analyzer settings: Span = wide enough to capture the peaks of two adjacent channels RBW ≥ 1% of the span, VBW ≥ RBW Sweep = auto, Detector function = peak, Trace = max hold
- 4. Measure and record the results in the test report.

#### TEST MODE:

Please refer to the clause 3.3

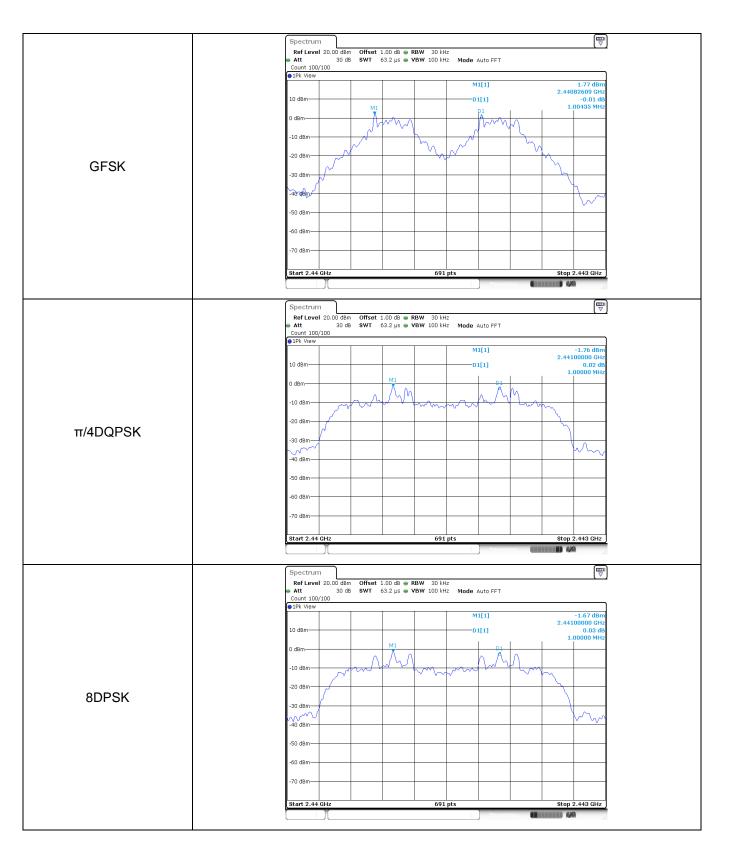
#### TEST RESULTS

#### ☑ Passed □ Not Applicable

Modulation type	Channel	Carrier Frequencies Separation (MHz)	Limit (MHz) *	Result
GFSK	39	1.00	≥0.93	Pass
π/4DQPSK	39	1.00	≥0.82	Pass
8DPSK	39	1.00	≥0.84	Pass

Note:

\*: GFSK limit = The maximum 20 dB Bandwidth for GFSK modulation on the section 5.4.  $\pi$ /4DQPSK limit = 2/3 \* The maximum 20 dB Bandwidth for  $\pi$ /4DQPSK modulation on the section 5.4. 8DPSK limit = 2/3 \* The maximum 20 dB Bandwidth for 8DPSK modulation on the section 5.4

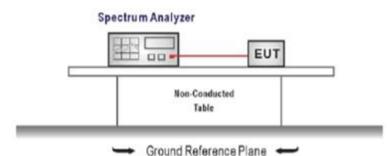


### 5.6. Hopping Channel Number

#### LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):Frequency hopping systems in the 2400–2483.5 MHz band shall use at least **15** channels.

#### **TEST CONFIGURATION**



#### TEST PROCEDURE

- 1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously
- Use the following spectrum analyzer settings: Span = the frequency band of operation RBW ≥ 1% of the span, VBW ≥ RBW Sweep = auto, Detector function = peak, Trace = max hold
- 4. Measure and record the results in the test report.

#### TEST MODE:

Please refer to the clause 3.3

#### TEST RESULTS

☑ Passed □ Not Applicable

Modulation type	Channel number	Limit	Result
GFSK	79		
π/4DQPSK	79	≥15.00	Pass
8DPSK	79		

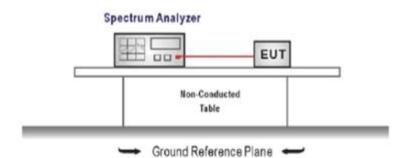
	Spectrum         (77)           Ref Level 20.00 dBm         Offset 1.00 dB ● RBW 100 kHz
	Att 30 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep     IPk View
	10 dBm
	0@### <u>#################################</u>
	-14 <del>08///11////////////////////////////////</del>
	-20 dBm
GFSK	
	-B0 dBm
	40 dBm
	-50 dBm
	-60 dBm-
	-70 dBm
	Start 2.4 GHz 691 pts Stop 2.4835 GHz
	Spectrum 🕎
	RefLevel 20.00 dBm Offset 1.00 dB   RefW 100 kHz  Att 30 dB SWT 1 ms  VBW 300 kHz Mode Auto Sweep
	IPk View
	10 dBm
	. Warman management of the second sec
	-to gen
(15050)	-20 dBm
π/4DQPSK	d30 dBm
	-40 dBm
	-50 dBm
	-60 dBm
	-70 dBm
	Start 2.4 GHz         691 pts         Stop 2.4835 GHz
	Measuring (1) HEREED 4/0
	Con a shee was
	Spectrum         Image: Construction of the sector of
	Att 30 dB SWT 1 ms • VBW 300 kHz Mode Auto Sweep
	10 dBm
	° mananananananananananananananananananan
	-10 dBm
	-20 dBm-
8DPSK	
OUFON	7 <sup>30</sup> d8m
	-40 dBm
	-50 d8m
	-60 d8m
	-70 d8m
	Start 2.4 GHz         691 pts         Stop 2.4835 GHz

### 5.7. Dwell Time

#### <u>LIMIT</u>

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):The average time of occupancy on any channel shall not be greater than 0.4 seconds within a pe-riod of 0.4 seconds multiplied by the number of hopping channels employed.

#### **TEST CONFIGURATION**



#### TEST PROCEDURE

- 1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously
- Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel, RBW= 1 MHz, VBW ≥ RBW Sweep = as necessary to capture the entire dwell time per hopping channel, Detector function = peak, Trace = max hold
- 4. Measure and record the results in the test report.

#### TEST MODE:

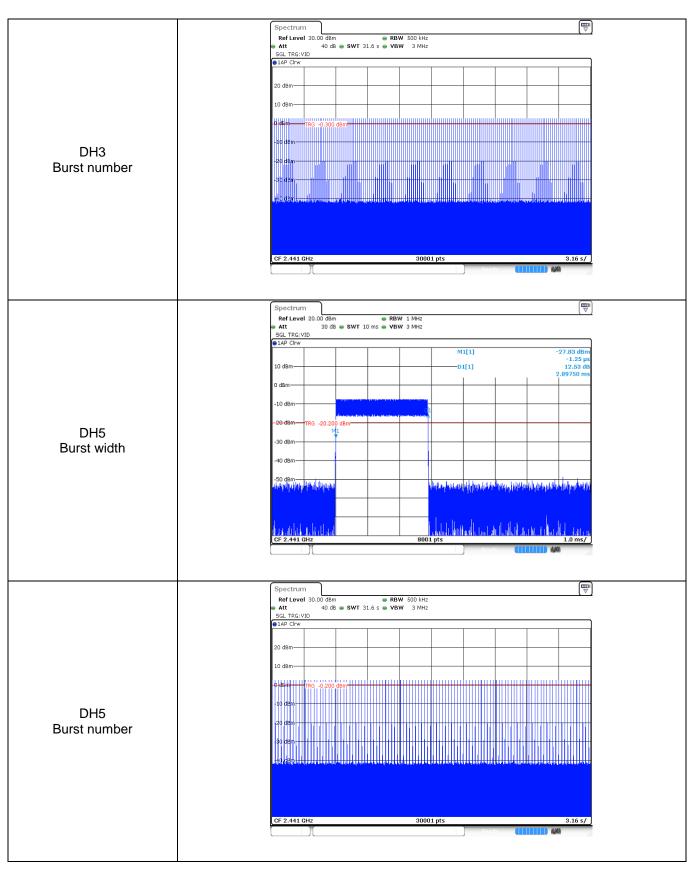
Please refer to the clause 3.3

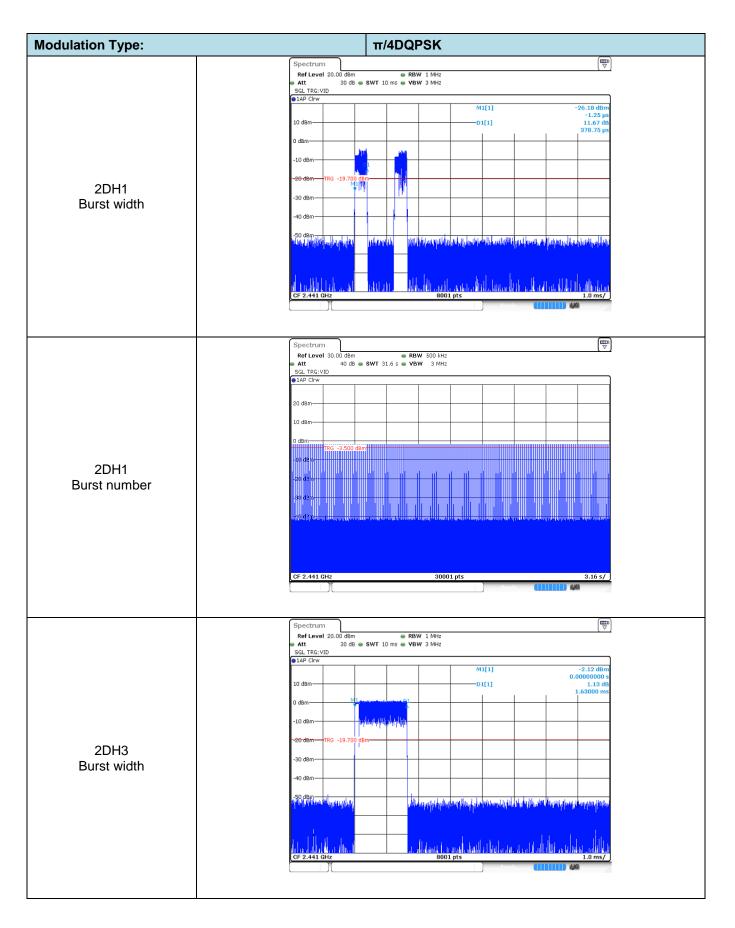
#### TEST RESULTS

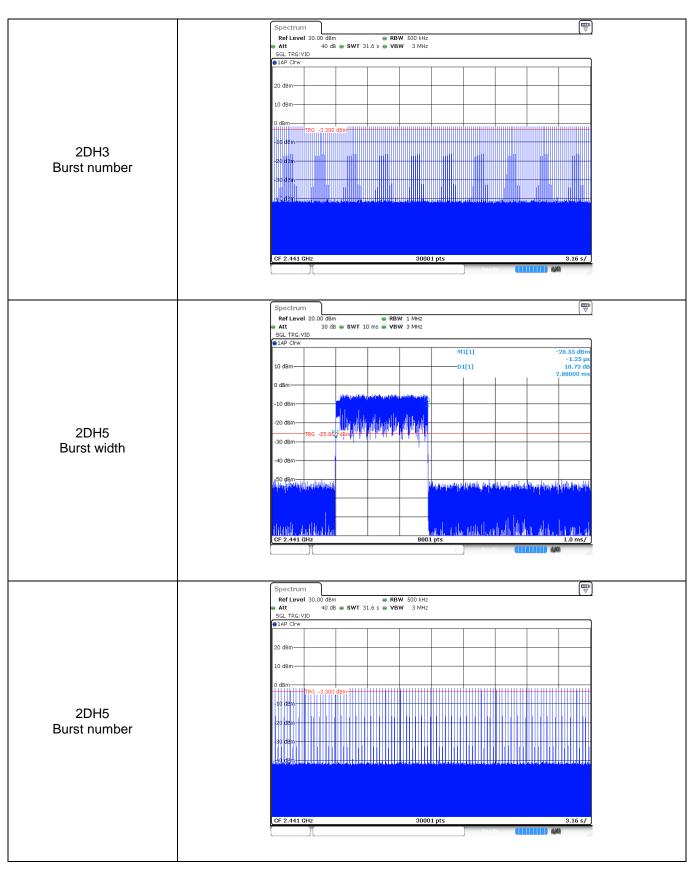
#### ☑ Passed □ Not Applicable

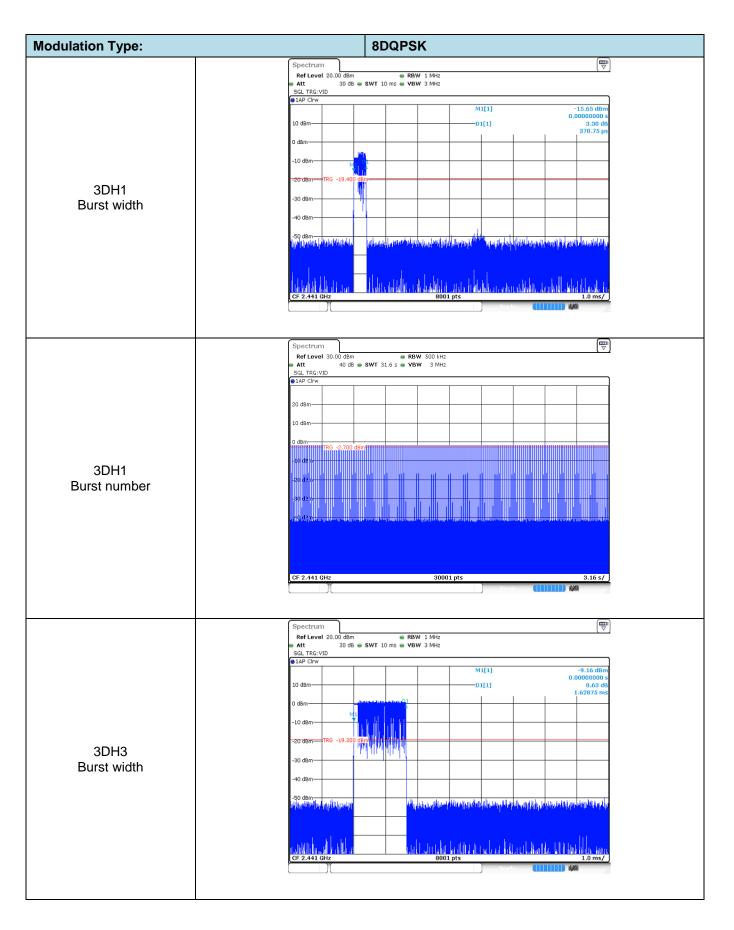
Modulation type	Channel	el Burst Width Total [ms/hop/ch] Hops[hop*ch]		Dwell time (Second)	Limit (Second)	Result
	DH1	0.39	314.00	0.12		
GFSK	DH3	1.65	159.00	0.26	≤ 0.40	Pass
	DH5	2.90	106.00	0.31		
	2DH1	0.38	315.00	0.12		
π/4DQPSK	QPSK 2DH3	1.63	163.00	0.27	≤ 0.40	Pass
	2DH5	2.88	106.00	0.31		
	3DH1	0.38	315.00	0.12		
8DPSK	PSK 3DH3 1.63		157.00	0.26	≤ 0.40	Pass
	3DH5	2.88	109.00	0.31		

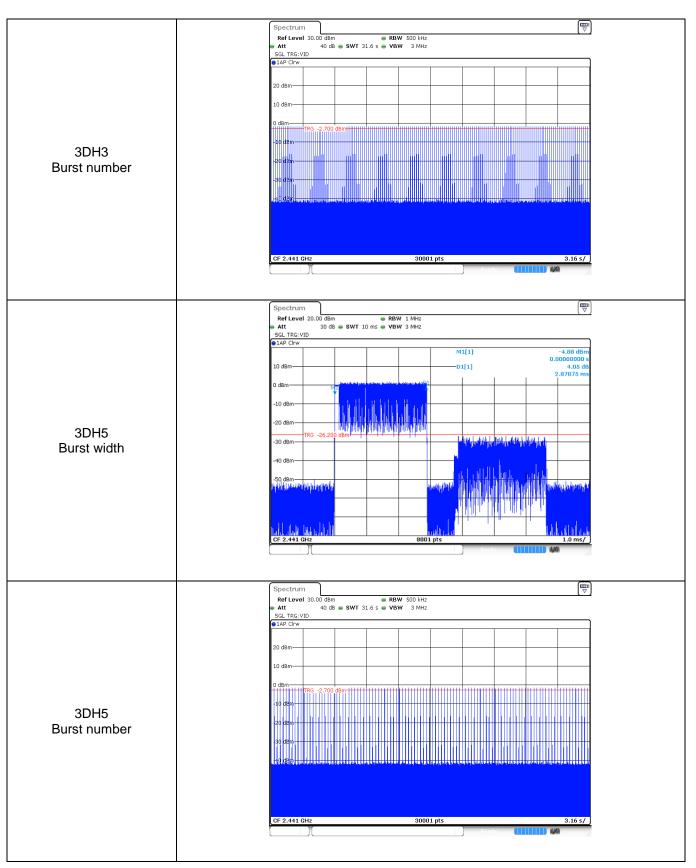
Modulation Type:	GFSK
DH1 Burst width	Spectrum       Image: Spectrum         Ref Level 20.00 dbm       RBW 1 MHz         Att       30 dB       SWT 10 ms       VBW 3 MHz         SGL TRG: VD       Image: Spectrum       0.000000000       0.00000000000000000000000000000000000
DH1 Burst number	Spectrum       Image: Spectrum         Ref Level 30.00 dBm       • RBW 500 kHz         Att       40 dB       • SWT 31.6 s         Sct. TRG:VID       Image: Spectrum         0 dBm       Image: Spectrum         10 dBm       Image: Spectrum         0 dBm       Image: Spectrum         10 dBm       Image: Spectrum         0 dBm       Image: Spectrum         10 dBm       Image: Spectrum
DH3 Burst width	Spectrum       Image: Spectrum         Ref Level 20.00 dBm       RBW 1 MHz         Att       30 dB Instruction S VBW 3 MHz         SGL TRG:VD       Image: Spectrum         I JP Cinv       Image: Spectrum         I J0 dBm       D1[1]         0 dBm       D1[1]         0 dBm       D1         -10 dBm       D1         -30 dBm       0











### 5.8. Pseudorandom Frequency Hopping Sequence

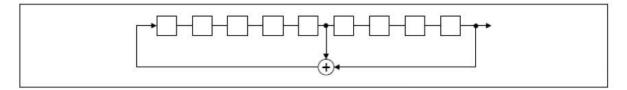
#### <u>LIMIT</u>

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):Frequency hopping systems shall have hopping channel carrier fre-quencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Al-ternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier fre-quencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to chan-nel frequencies that are selected at the system hopping rate from a pseudo ran-domly ordered list of hopping fre-quencies. Each frequency must be used equally on the average by each trans-mitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their cor-responding transmitters and shall shift frequencies in synchronization with the transmitted signals.

#### TEST RESULTS

The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5<sup>th</sup> and 9<sup>th</sup> stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the friststage. The sequence begins with the frist one of 9 consecutive ones, for example: the shift register is initialized with nine ones.

- Number of shift register stages: 9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An explame of pseudorandom frequency hopping sequence as follows:

0	2	4	6	62	64	-	78	1	73	75 7
٦				 ·····			1			П
							i i			
				1			1			
				 			<u>i</u>		 _Ĺ_	

Each frequency used equally one the average by each transmitter.

The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

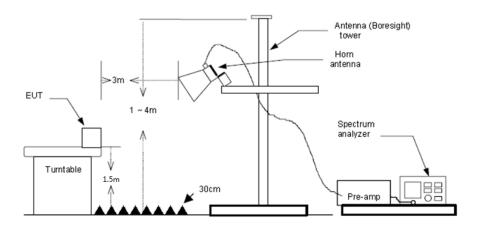
### 5.9. Restricted band (radiated)

#### <u>LIMIT</u>

#### FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, Radiated Emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the Radiated Emissions limits specified in §15.209(a) (see §15.205(c)).

#### **TEST CONFIGURATION**



#### TEST PROCEDURE

- 1. The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
- 2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- 3. The EUT waspositioned such that the distance from antenna to the EUT was 3 meters.
- 4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
- The receiver set as follow: RBW=1 MHz, VBW=3 MHz Peak detector for Peak value RBW=1 MHz, VBW=10 Hz Peak detector for Average value.

#### TEST MODE:

Please refer to the clause 3.3

#### TEST RESULTS

☑ Passed □ Not Applicable

Note:

- 1) Final level= Read level + Antenna Factor+ Cable Loss- Preamp Factor
- 2) Have pre-scan all modulation mode, found the GFSK modulation which it was worst case, so only the worst case's data on the test report.
- 3) The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.

Test channel:					CH00					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value	
2310.00	31.30	28.05	6.62	37.59	28.38	74.00	-45.62	Vertical	Peak	
2375.92	38.10	27.72	6.73	37.59	34.96	74.00	-39.04	Vertical	Peak	
2390.03	31.82	27.65	6.75	37.59	28.63	74.00	-45.37	Vertical	Peak	
2310.00	31.79	28.05	6.62	37.59	28.87	74.00	-45.13	Horizontal	Peak	
2376.11	42.21	27.72	6.73	37.59	39.07	74.00	-34.93	Horizontal	Peak	
2390.03	34.42	27.65	6.75	37.59	31.23	74.00	-42.77	Horizontal	Peak	

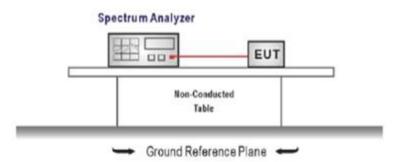
Test channel:					CH78					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value	
2483.50	61.38	27.26	6.83	37.59	57.88	74.00	-16.12	Vertical	Peak	
2500.00	36.36	27.20	6.84	37.59	32.81	74.00	-41.19	Vertical	Peak	
2483.50	64.09	27.26	6.83	37.59	60.59	74.00	-13.41	Horizontal	Peak	
2500.00	33.30	27.20	6.84	37.59	29.75	74.00	-44.25	Horizontal	Peak	
2483.50	31.80	27.26	6.83	37.59	28.30	54.00	-25.70	Vertical	Average	
2500.00	20.46	27.20	6.84	37.59	16.91	54.00	-37.09	Vertical	Average	
2483.50	32.07	27.26	6.83	37.59	28.57	54.00	-25.43	Horizontal	Average	
2500.00	20.14	27.20	6.84	37.59	16.59	54.00	-37.41	Horizontal	Average	

### 5.10. Band edge and Spurious Emissions (conducted)

### LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

### TEST CONFIGURATION



### TEST PROCEDURE

- 1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously
- Use the following spectrum analyzer settings: RBW = 100 kHz, VBW ≥ RBW, scan up through 10<sup>th</sup> harmonic. Sweep = auto, Detector function = peak, Trace = max hold
- 4. Measure and record the results in the test report.

### TEST MODE:

Please refer to the clause 3.3

### TEST RESULTS

☑ Passed □ Not Applicable

Test Item:	Band edge		Modula	ation type:	GFSK	
		<ul> <li>Att 30 dB</li> <li>Count 500/500</li> </ul>	Offset 1.00 dB e I			
		1Pk Max     10 dBm     0 dBm		M1[1] M2[1]	0.96 dBm 2.402180 GHz -44.06 dBm 2.400000 dHz	
CH00		-10 dBm D1 -19.040 dB -20 dBm D1 -19.040 dB -30 dBm	n		and the second s	
No hopping mode		-50 dBm -50 dBm #60 dBm		an and a start	M3	
		Start 2.31 GHz           Marker           Type         Ref         Trc           M1         1           M2         1	X-value 2.40218 GHz 2.4 GHz	691 pts Y-value Function 0.96 dBm -44.06 dBm	Stop 2.405 GHz	
		M2 1 M3 1 M4 1 M5 1	2.39 GHz 2.31 GHz 2.399217 GHz	-58.46 dBm -59.94 dBm -43.90 dBm	(IIIIIII) 44	
		<ul> <li>Att 30 dB Count 500/500</li> </ul>	Offset 1.00 dB ● I SWT 1.1 ms ● Y	RBW 100 kHz VBW 300 kHz Mode Auto Sweej		
		1Pk Max     10 dBm     0 dBm		M1[1] M2[1]	2.44 dBm 2.404930 GHz -52.25 dBm 2.400000 GHz	
CH00		-10 dBm D1 -17.560 dB -20 dBm D1 -17.560 dB	n			
Hopping mode		-50 dBm -50 dBm -50 dBm -70 dBm	munic	gun hur an	MS) M3 M3	
		M1 1	X-value 2.40493 GHz	691 pts Y-value Function 2.44 dBm	Stop 2.405 GHz Function Result	
		M2         1           M3         1           M4         1           M5         1	2.4 GHz 2.39 GHz 2.31 GHz 2.399217 GHz	-52.25 dBm -56.79 dBm -57.31 dBm -47.82 dBm Notem		
		Spectrum           Ref Level 20.00 dBm           Att         30 dB           Count 500/500	Offset 1.00 dB	RBW 100 kHz VBW 300 kHz Mode Auto FFT	Ē	
		1Pk Max     10 dBm     10 dBm     1     0 dBm     1		M1[1] M2[1]	1.84 dBm 2.4798310 GHz -56.03 dBm 2.4835000 GHz	
CH78 No hopping mode		-10 dBm D1 -18.160 dB	n			
		-60 dBm-	W. M.	an ter attende and the second s	17 ~ 20 0 9 - 20 - 20 - 20 - 20 - 20 - 20 -	
		-70 dBm Start 2.478 GHz Marker		691 pts	Stop 2.5 GHz	
		Type         Ref         Trc           M1         1           M2         1           M3         1	X-value 2.479831 GHz 2.4835 GHz 2.5 GHz 2.4841217 GHz	Y-value         Function           1.84 dBm         -           -56.03 dBm         -           -58.29 dBm         -           -54.74 dBm         -	Function Result	
				Measu	ina 🚺 🗰	

### Report No.: TRE1804023802

	Count 500/500	• RBW 100 kHz • VBW 300 kHz Mode Auto F	FT
	1Pk Max		
	10 dBm	M1[1]	0.61 dBm 2.4780480 GHz -59.42 dBm 2.4835000 GHz
	-10 dBm		
CH78	-20 dBm		
CH78 lopping mode	-40 d8m50 d8m50 d8m50 d8m		Mini Mini
	-60 dBm	han han han	the manufacture of the second s
	Start 2.478 GHz	691 pts	Stop 2.5 GHz
	Marker	091 pcs	300p 2.3 GH2
	Type Ref Trc X-value	Y-value Function	Function Result
	M1 1 2.478048 GHz	0.61 dBm	
	M2         1         2.4835 GHz           M3         1         2.5 GHz	-59.42 dBm -55.72 dBm	
	M4 1 2.4940377 GHz	-55.69 dBm	

est Item:	Band edge		Modula	ation type	e:	π/4D	QPSK
		Spectrum					
		RefLevel 20.00 dBm Att 30 dB	Offset 1.00 dB  SWT 1.1 ms		de Auto Sweep		
		Count 500/500 Pk Max					
					M1[1]		-1.38 dBm .402040 GHz
		10 dBm			M2[1]		-36.15 dBm
		0 dBm			_	2	.400000 Hz
		-10 dBm					
		-20 dBm D1 -21.380 c	Bm				
CH00		-30 dBm					1
		-40 dBm					
No hopping mode		-50 dBm 4	made and the second	design the surface has been a		M3	. And
		-70 dBm					
		Start 2.31 GHz Marker		691 pts		Sto	p 2.405 GHz
		Type Ref Trc	X-value	Y-value F	unction	Function Res	ult
		M1 1 M2 1	2.40204 GHz 2.4 GHz	-1.38 dBm -36.15 dBm			
		M3 1 M4 1	2.39 GHz 2.31 GHz	-58.17 dBm -58.29 dBm			
		M5 1	2.39963 GHz	-36.84 dBm		and the second s	1.56
					Meastirin		11
		Spectrum	0#	DDW 100.111			
		RefLevel 20.00 dBm Att 30 dB	Offset 1.00 dB  SWT 1.1 ms	NBW 100 kHz VBW 300 kHz Mo	de Auto Sweep		
		Count 500/500					
					M1[1]		-0.39 dBm .404110 GHz
		10 dBm			M2[1]		-42.07 dBpp
		0 dBm			_	2	.400000 GH
		-10 dBm					
		20 dBm D1 -20.400 d	Bm				
CH00		-30 dBm					MS/ ME
		-40 dBm					
Hopping mode		-50 dBm				MB	und l
		-60 dBm					
		-70 dBm					
		Start 2.31 GHz Marker		691 pts		Sto	p 2.405 GHz
		Type Ref Trc	X-value		unction	Function Res	ult
		M1 1 M2 1	2.40411 GHz 2.4 GHz	-0.39 dBm -42.07 dBm			
		M3 1 M4 1	2.39 GHz 2.31 GHz	-58.50 dBm -56.94 dBm			
		M5 1	2.39963 GHz	-37.22 dBm	Measurin		1341
							/
		Spectrum	Offect 1 00 dp -	PPW 100 50-			
			SWT 56.9 µs 🖷		de Auto FFT		
		Count 500/500 1Pk Max					
					M1[1]	2.	-0.86 dBm 4799900 GHz
		10 dBm			M2[1]		-55.98 dBm 4835000 GHz
		0 dBm			_	2.	
		-10 dBm					
		20 dBm	Bm				+
CH78		-30 dBm					
		40 dBm		+ +			-
o hopping mode		-50 dBm		+			
		-60 dBm	manna	<u>440000040000</u>	<u>~~~~~~</u>		<u>~~~~~</u> ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
		-70 dBm		<u>                                      </u>			
		Start 2.478 GHz		691 pts		s	top 2.5 GHz
		Marker	V uslug 1		unation 1		
		Type Ref Trc M1 1	X-value 2.47999 GHz	-0.86 dBm	unction	Function Res	uit
		M2 1 M3 1	2.4835 GHz 2.5 GHz	-55.98 dBm -59.23 dBm			
		M4 1	2.4836116 GHz	-57.07 dBm			1.143
	1				Méasurin		age all

### Report No.: TRE1804023802

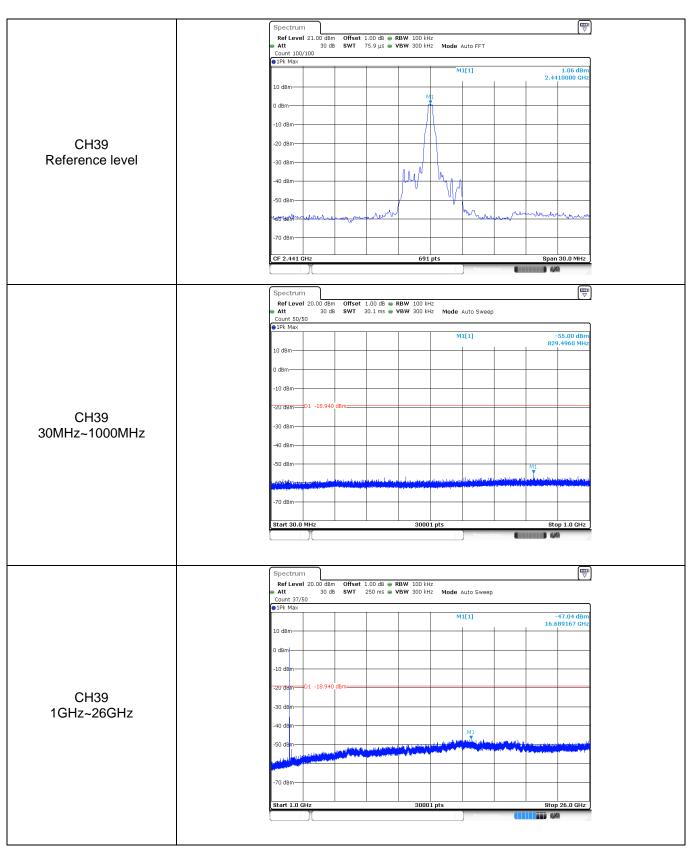
	Spectrum           Ref Level 20.00 dBm         Offset 1.00 dB           Att         30 dB         SWT         56.9 µs           Count 500/500         SWT         56.9 µs         State	RBW 100 kHz VBW 300 kHz Mode Auto FF	т
	1Pk Max		J
	10 dBm	M1[1] M2[1]	-1.79 dBm 2.4780160 GHz -57.06 dBm 2.4835000 GHz
	-20 dBm D1 -21.790 dBm		
CH78 Hopping mode	-40 dBm		
	-50 dBm60 dBm60 dBm60 dBm	ang manua an faits and marked and	Ma
	-70 dBm		
	Start 2.478 GHz Marker	691 pts	Stop 2.5 GHz
	Type Ref Trc X-value	Y-value Function	Function Result
	M1         1         2.478016 GHz           M2         1         2.4835 GHz           M3         1         2.5 GHz	-1.79 dBm -57.06 dBm -59.15 dBm	
	M4 1 2.4954087 GHz	-56.80 dBm	
		Me	asuring 🗰 🖬 🚧

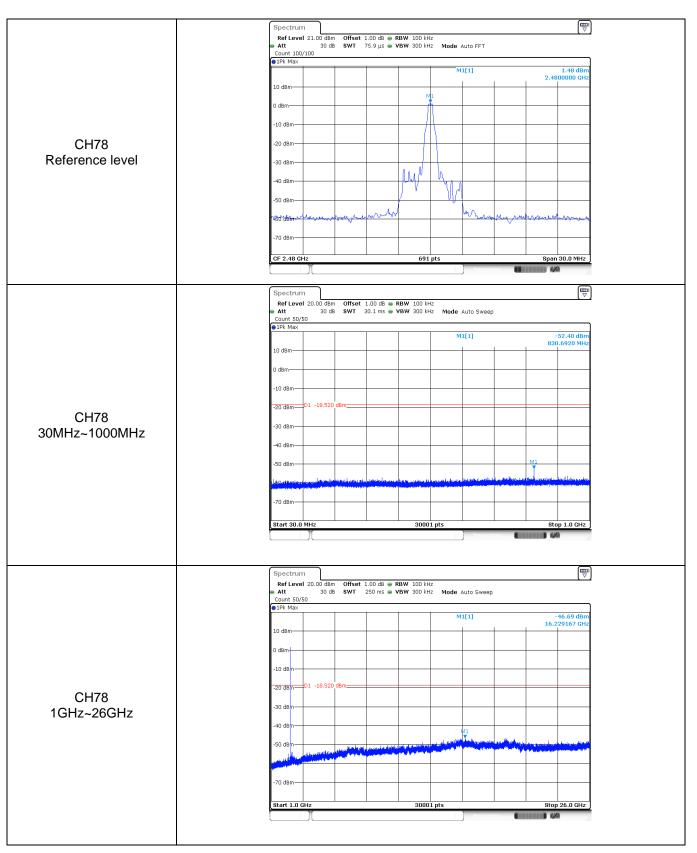
est Item:	Band edge	Modulation type:	8DPSK
	Spectrum		
	Ref Level 2 Att	30 dB SWT 1.1 ms 👄 VBW 300 kHz Mode Auto Swe	ep
	Count 500/50		
	10 dBm	M1[1]	-1.20 dBm 2.401770 GHz
	0 dBm	M2[1]	-36.00 dBm 2.400000 eHz
	-10 dBm		
		-21.200_dBm	
01100	-30 dBm		IN 19
CH00	-40 dBm		
No hopping mode	-50 dBm		M3
	₩ <b>60 dem</b>		
	Start 2.31 GH Marker	iz 691 pts	Stop 2.405 GHz
	Type Ref M1	Trc         X-value         Y-value         Function           1         2.40177 GHz         -1.20 dBm	Function Result
	M2 M3	1 2.4 GHz -36.00 dBm 1 2.39 GHz -59.52 dBm	
	M4 M5	1 2.31 GHz -57.81 dBm 1 2.39963 GHz -36.32 dBm	
		Nea	suring
	Spectrum Ref Level 2	0.00 dBm Offset 1.00 dB  RBW 100 kHz	
	<ul> <li>Att Count 500/50</li> </ul>	30 dB SWT 1.1 ms - VBW 300 kHz Mode Auto Swe	ep
	● 1Pk Max	M1[1]	-0.46 dBm
	10 dBm	M2[1]	2.403010 GHz -40.31 dឩ្ណm
	0 dBm		2.400000 GMz
	-10 dBm		
		-20.460 dBm	
CH00	-30 dBm		200
Hopping mode	-40 dBm		
Hopping mode	-50 dBm 4 -60 dBm	uprungenessus provinsities and an and an and an and and and and an	M3
	-70 dBm		
	Start 2.31 GH	iz 691 pts	Stop 2.405 GHz
	Marker		
	Type Ref M1	1 2.40301 GHz -0.46 dBm	Function Result
	M2 M3	1 2.4 GHz -40.31 dBm 1 2.39 GHz -58.15 dBm 1 2.31 GHz -58.22 dBm	
	M4 M5	1         2.31 GHz         -58.22 dBm           1         2.399768 GHz         -40.34 dBm	
		Mea	suring
	Spectrum		
		L 0.00 dBm Offset 1.00 dB ● RBW 100 kHz 30 dB SWT 56.9 µs ● YBW 300 kHz Mode Auto FFT	
	Count 500/50		
	IPk Max	M1[1]	-0.61 dBm
	10 dBm 	M2[1]	2.4798310 GHz -54.58 dBm
	0 dBm		2.4835000 GHz
	-10 dBm		
	20 dBmD1	-20.610 dBm	
CH78	-30 dBm	M	
No hopping mode	-40 dBm	We we	
	-50 dBm		
	-60 dBm		
	-70 dBm		
	Start 2.478 G Marker	Hz 691 pts	Stop 2.5 GHz
	Type Ref		Function Result
	M2 M3	1         2.479831 GHz         -0.61 dBm           1         2.4835 GHz         -54.58 dBm           1         2.5 GHz         -59.13 dBm	
	M4	1 2.4835478 GHz -55.88 dBm	
			uning

### Report No.: TRE1804023802

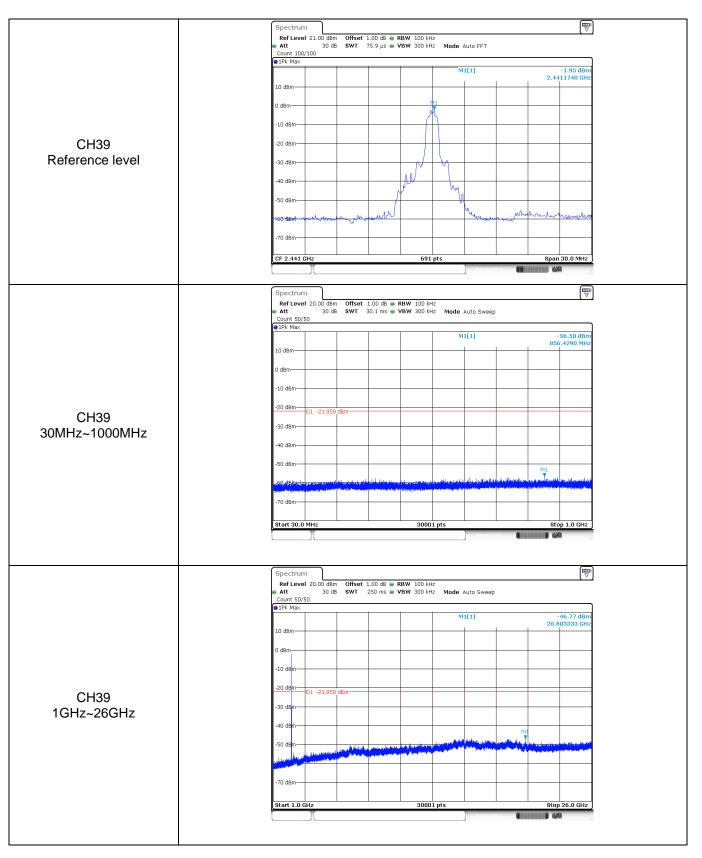
	Spectrum         Image: Constraint of the second seco
CH78 Hoppig mode	• IPK Max               • M1[1]             • 1.73 dBm                 10 dBm               2.4799900 GH2                 0 dBm               • M2[1]             • -57.20 dBm                 0 dBm               • M2[1]             • -57.20 dBm                 0 dBm               • 10 dBm                 -10 dBm               • 10                 -10 dBm               -1                 -10 dBm               -1                 -10 dBm                   -10 dBm                   -20 dBm                   -30 dBm                   -30 dBm                   -60 dBm                   -50 dBm                   -70 dBm
	Start 2.478 GHz         691 pts         Stop 2.5 GHz
	Marker         Type         Ref         Trc         X-value         Y-value         Function         Function Result           M1         1         2.47999 GHz         -1.73 dBm         -<

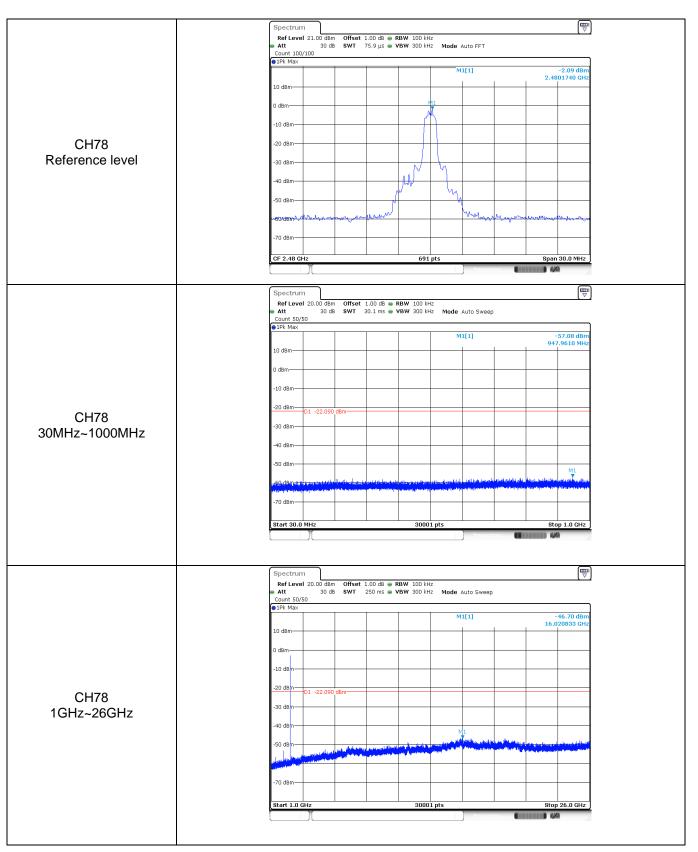
est Item:	SE		Modu	lation ty	pe:	G	FSK	
		Spectrum RefLevel 21.00 dBm Att 30 dB		RBW 100 kHz				
		Count 100/100 Pk Max			M1[1]			0.80 dBm
		10 dBm				+ +	2.40	21740 GHz
		0 dBm		111				
		-10 dBm						
CH00		-20 dBm		+ $+$				
Reference level		-30 dBm		+ / \	M			
		-40 dBm						
		-50 dBm		-hV				
		v60 dBm	and the second second	un -	When	annor and	سکم <i>ی</i> میکرد	p-4-1000 gallerad
		-70 dBm						
		CF 2.402 GHz		691 pts			Span	30.0 MHz
					Measur			
		Spectrum						(IIII)
		RefLevel 20.00 dBm Att 30 dB		<ul> <li>RBW 100 kHz</li> <li>VBW 300 kHz</li> </ul>	Mode Auto Swee	p		(•)
		Count 50/50 1Pk Max		1 1				
		10 dBm			M1[1]	++		51.59 dBm .3020 MHz
		0 dBm						
		-10 dBm						
		-20 dBm-D1 -19.200	dBm					
CH00 30MHz~1000MHz		-30 dBm						
301VIT12~10001VIT12		-40 dBm						
		-50 dBm					M1	
		-50/dR material designability	house have the state of the sta	ali an an air an	ali ya adadaanii	n I. Leisten Agbender.		alaan <mark>ilaan ini daad daala</mark> Mana waxa inaana aan
		-70 dBm						
		Start 30.0 MHz		30001 pt	s			p 1.0 GHz
		[][			Measur	ting		
								Ē
		Spectrum Ref Level 20.00 dBm Att 30 dB	Offset 1.00 dB		Mode Auto Sursa			
		Count 36/50	. 3141 250 MS	- TOTT SUU KHZ		,		
		10 dBm			M1[1]		15.5	46.37 dBm 85000 GHz
		0 dBm						
		-10 dBm						
		-20 dem-D1 -19.200	dBm					
CH00		-30 dEm						
1GHz~26GHz		-40 dem						
		-50 dem	لىقىرىلىغان ومومغورى ور	A. C. A. S. State fit with	M1 To Lot of the		a la caracteria da la cara	مىرىلىرىيى ئەرىپىرى ئالىيىنى ئىرىيى
		to all the second second second					an an ann dùar a'	ten for big so get de fijde
		-70 dBm						
		Start 1.0 GHz		30001 pt	s		Stop	26.0 GHz
	1				<u>,</u>			



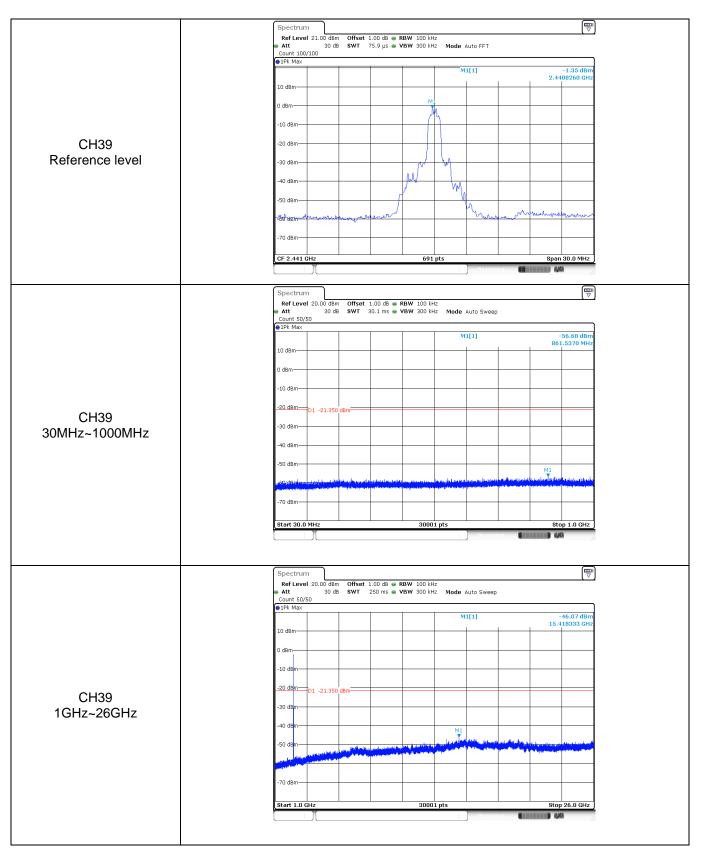


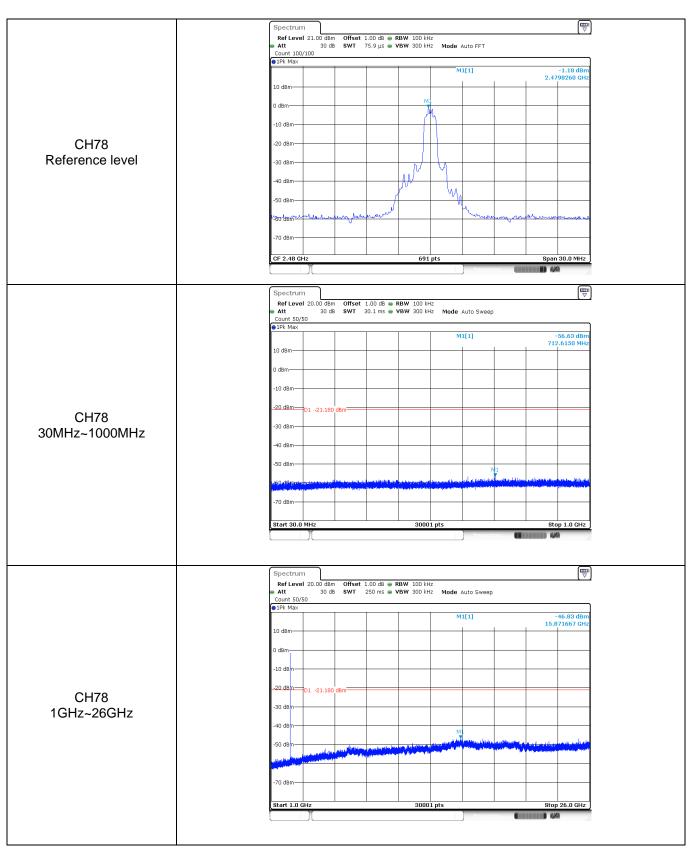
est Item:	SE		Modula	ation type:		π/4DQPSI
		Spectrum				
		Ref Level 21.00 dB Att 30 c Count 100/100	m Offset 1.00 dB ● dB SWT 75.9 µs ●	RBW 100 kHz VBW 300 kHz Mode Au	to FFT	
		●1Pk Max		M1[	1	-2.27 dBi
		10 dBm		MIL		2.4021740 GF
				M11		
		0 dBm		<u> </u>		
		-10 dBm				
CH00		-20 dBm				
Reference level		-30 dBm				
		-40 dBm				
		-50 dBm		A - M		
		1-89dBm~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	myman	h h	map may man pour	-
		-70 dBm	v			
		CF 2.402 GHz		691 pts	Measuring	Span 30.0 MHz
		Spectrum				Ē
		Ref Level 20.00 dB	um Offset 1.00 dB 👄 dB SWT 30.1 ms 👄	RBW 100 kHz VBW 300 kHz Mode Au	to Sweep	
		Count 50/50				
				M1[	1]	-56.95 dBi 365.0750 MH
		10 dBm				
		0 dBm				
		-10 dBm				
		-20 dBmD1 -22.27	70 dBm			
CH00		-30 dBm				
30MHz~1000MHz		-40 dBm				
		-50 dBm				
			M1		. La companya da angla da ang	
		, 60.08mm	An	a la la contraction angle and printing and		a host and the second second second
		-70 dBm				
		Start 30.0 MHz		30001 pts		Stop 1.0 GHz
					Measuring	<b>II</b> 499
						~
		Ref Level 20.00 dB	im Offset 1.00 dB 👄	RBW 100 kHz		
		Att 30 c _Count 21/50	dB SWT 250 ms 🕳	VBW 300 kHz Mode Au	to Sweep	
		●1Pk Max		M1[	1]	-45.90 dBi
		10 dBm				16.679167 GF
		0 dBm				
		-10 dBm				
CH00		-20 dBm-D1 -22.27	70 dBm			
1GHz~26GHz		-30 dBm				
		-40 dBm			11 T	
		-50 dBm		and the second data with the second sec	In the second	alarta da ante da ante
		instant dia managementant				A MAR AND AND A MARKAN
		-70 dBm				
		Start 1.0 GHz		30001 pts	Measuring	Stop 26.0 GHz
	1					





Fest Item:	SE		Modulation	type:	8DPSK	
		Spectrum <b>Ref Level</b> 21.00 dBr <b>Att</b> 30 dl Count 100/100	n Offset 1.00 dB 🖷 RBW 100	:Hz	(The second seco	
		10/100     10/100     10/100     10/100     10/100		M1[1]	-2.05 dBm 2.4018260 GHz	
CH00 Reference level		0 dBm				
		-30 dBm		- W		
		-50 dBm	and gradient	- U Nurana	بغرب بيريدة فكرمت معالي بالعربي بكعر	
		CF 2.402 GHz	69	1 pts Measure	Span 30.0 MHz	
			n <b>Offset</b> 1.00 dB <b>e RBW</b> 100 B <b>SWT</b> 30.1 ms <b>e VBW</b> 300			
		Count 50/50 PIPk Max 10 dBm		M1[1]	-56.71 dBm 888.4700 MHz	
		0 dBm				
CH00 30MHz~1000MHz		-20 dBmD1 -22.050 -30 dBm	) dBm			
		-50 dBm	The second s	e dan sen a a sa a da sa a san a san a sa a sa a	M1 IndiAline for all plants as the answer the start	
		-70 dBm	300	01 pts	Stop 1.0 GHz	
		Spectrum		de asure		
		Ref Level 20.00 dBr	n Offset 1.00 dB  RBW 100   SWT 250 ms VBW 300	Hz Mode Auto Sweep		
		10 dBm		M1[1]	-45.87 dBm 1.952500 GHz	
CH00		-10 dEm	0 dBm			
1GHz~26GHz		-30 dem		a second s	A State of Land and	
		Start 1.0 GHz	300	01 pts Measurin	Stop 26.0 GHz	





## 5.11. Spurious Emissions (radiated)

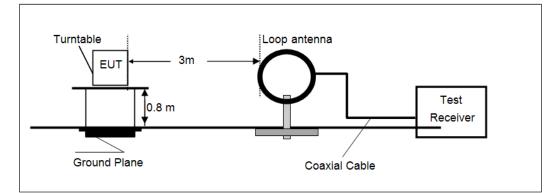
### <u>LIMIT</u>

### FCC CFR Title 47 Part 15 Subpart C Section 15.209

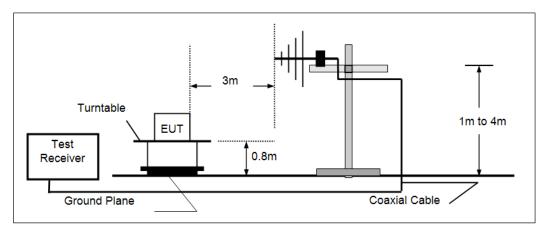
Frequency	Limit (dBuV/m @3m)	Value
30 MHz ~ 88 MHz	40.00	Quasi-peak
88 MHz ~ 216 MHz	43.50	Quasi-peak
216 MHz ~ 960 MHz	46.00	Quasi-peak
960 MHz ~ 1 GHz	54.00	Quasi-peak
Above 1 GHz	54.00	Average
	74.00	Peak

### **TEST CONFIGURATION**

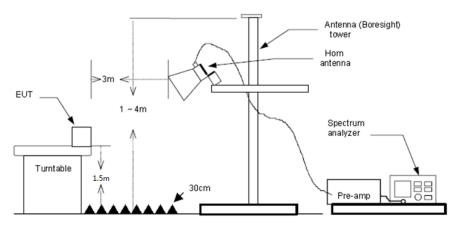
Below 30 MHz



### > 30 MHz ~1000 MHz



> Above 1 GHz



### TEST PROCEDURE

- 1. The EUT was tested according to ANSI C63.10:2013.
- 2. The EUT is placed on a turn table with 0.8 meter above ground for below 1GHz, 1.5 meter above ground for above 1GHz.
- 3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
- 4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
- 5. Set to the maximum power setting and enable the EUT transmit continuously.
- 6. Use the following spectrum analyzer settings
  - (1) Span shall wide enough to fully capture the emission being measured;
    - (2) Below 1 GHz:

RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold; If the emission level of the EUT measured by the peak detectoris 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

 (3) From 1 GHz to 10<sup>th</sup> harmonic: RBW=1 MHz, VBW=3 MHz Peak detector for Peak value RBW=1 MHz, VBW=10 Hz Peak detector for Average value.

### TEST MODE:

Please refer to the clause 3.3

### TEST RESULTS

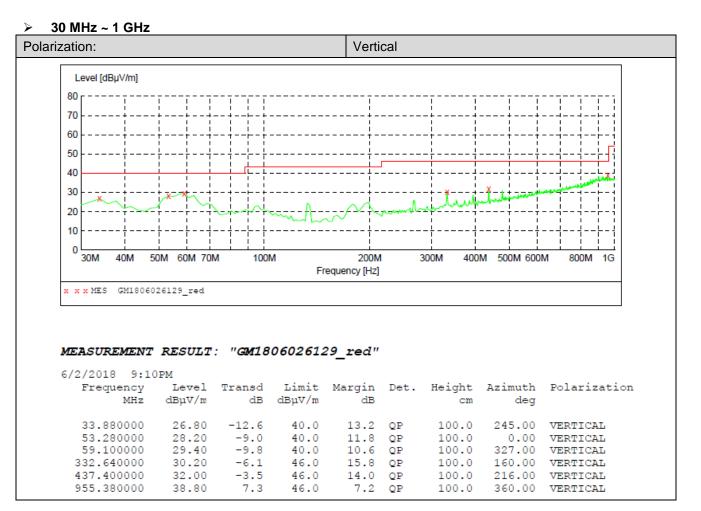
☑ Passed □ Not Applicable

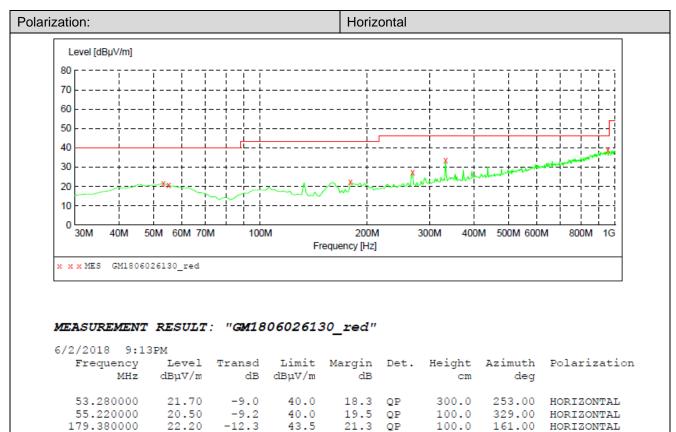
#### Note:

- 1) Final Level = Receiver Read level + Antenna Factor + Cable Loss Preamplifier Factor
- 2) The emission levels of other frequencies are very lower than the limit and not show in test report.
- 3) Below 1 GHz, Have pre-scan all modulation mode, found the GFSK modulation High channel which it was worst case, so only the worst case's data on the test report.
- 4) Above 1 GHz, Have pre-scan all modulation mode, found the GFSK modulation which it was worst case, so only the worst case's data on the test report
- 5) The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.

### ➢ 9 kHz ~ 30 MHz

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.





43.5

46.0

46.0

46.0

21.3 QP

18.9 QP

12.6 QP

QP

7.1

100.0

300.0

100.0

100.0

Shenzhen Huatongwei International Inspection Co., Ltd.

22.20

27.10

33.40

38.90

-12.3

-8.0

-6.1

7.3

179.380000

268.620000

332.640000

953.440000

300.00

356.00

73.00 HORIZONTAL

HORIZONTAL

HORIZONTAL

### ➢ 1 GHz ~ 25 GHz

	CH00												
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value				
2995.54	46.20	28.60	7.48	37.58	44.70	74.00	-29.30	Vertical	Peak				
4809.50	43.73	31.58	9.55	35.72	49.14	74.00	-24.86	Vertical	Peak				
4983.99	47.16	31.48	9.66	35.41	52.89	74.00	-21.11	Vertical	Peak				
7209.02	37.08	36.21	11.87	33.51	51.65	74.00	-22.35	Vertical	Peak				
2995.54	38.78	28.60	7.48	37.58	37.28	74.00	-36.72	Horizontal	Peak				
4809.50	47.99	31.58	9.55	35.72	53.40	74.00	-20.60	Horizontal	Peak				
4983.99	38.89	31.48	9.66	35.41	44.62	74.00	-29.38	Horizontal	Peak				
7209.02	39.25	36.21	11.87	33.51	53.82	74.00	-20.18	Horizontal	Peak				

	CH39													
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value					
2995.54	42.49	28.60	7.48	37.58	40.99	74.00	-33.01	Vertical	Peak					
4883.52	44.03	31.43	9.59	35.58	49.47	74.00	-24.53	Vertical	Peak					
4983.99	42.46	31.48	9.66	35.41	48.19	74.00	-25.81	Vertical	Peak					
7319.96	36.81	36.30	11.99	33.32	51.78	74.00	-22.22	Vertical	Peak					
2995.54	37.51	28.60	7.48	37.58	36.01	74.00	-37.99	Horizontal	Peak					
4883.52	45.20	31.43	9.59	35.58	50.64	74.00	-23.36	Horizontal	Peak					
4996.69	38.96	31.50	9.67	35.39	44.74	74.00	-29.26	Horizontal	Peak					
7319.96	40.56	36.30	11.99	33.32	55.53	74.00	-18.47	Horizontal	Peak					
4883.52	30.25	31.43	9.59	35.58	35.69	54.00	-18.31	Horizontal	Average					
7319.96	23.51	36.30	11.99	33.32	38.48	54.00	-15.52	Horizontal	Average					

CH78									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2987.92	45.05	28.59	7.47	37.58	43.53	74.00	-30.47	Vertical	Peak
4267.18	39.74	30.13	9.00	36.50	42.37	74.00	-31.63	Vertical	Peak
4958.68	42.89	31.46	9.64	35.45	48.54	74.00	-25.46	Vertical	Peak
7451.57	36.54	36.20	12.24	33.10	51.88	74.00	-22.12	Vertical	Peak
1192.01	36.86	26.24	4.64	37.23	30.51	74.00	-43.49	Horizontal	Peak
2995.54	38.71	28.60	7.48	37.58	37.21	74.00	-36.79	Horizontal	Peak
4958.68	44.24	31.46	9.64	35.45	49.89	74.00	-24.11	Horizontal	Peak
7451.57	38.59	36.20	12.24	33.10	53.93	74.00	-20.07	Horizontal	Peak

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss - Preamplifier Factor

2. The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.

3. The emission levels of other frequencies are very lower than the limit and not show in test report.

# 6. TEST SETUP PHOTOS

Conducted Emissions (AC Mains)



Radiated Emissions







## 7. EXTERANAL AND INTERNAL PHOTOS

Reference to the test report No.: TRE1804023801.

-----End of Report------