

# TEST REPORT

**Reference No.**..... : WTS19S05028978W001  
**FCC ID** ..... : 2AFMLBMTX-1000  
**Applicant**..... : BRIGHTON TECHNOLOGIES GROUP  
**Address**..... : 8/31 Maclaurin Ave, East Hills NSW 2213 | PO Box 284, Panania NSW 2213  
**Manufacturer** ..... : Group Sense Mobile-Tech Limited  
**Address**..... : Room 13-24, 2/F., Sino Industrial Plaza, 9 Kai Cheung Road, Kowloon Bay, Hong Kong  
**Product**..... : Paging Transmitter  
**Model(s)** ..... : BMTX-1000  
**Brand Name**..... : N/A  
**Standards**..... : FCC CFR Title 47 Part 90 Subpart I  
**Date of Receipt sample** .... : 2019-05-09  
**Date of Test** ..... : 2019-05-10 to 2019-06-06  
**Date of Issue**..... : 2019-06-11  
**Test Result**..... : **Pass**

**Remarks:**

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

**Prepared By:**

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Approved by:



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## 2 Laboratories Introduction

**Waltek Services (Shenzhen) Co., Ltd** is a professional third-party testing and certification laboratory with multi-year product testing and certification experience, established strictly in accordance with ISO/IEC 17025 requirements, and accredited by ILAC (International Laboratory Accreditation Cooperation) member. A2LA (American Association for Laboratory Accreditation, the certification number is 4243.01) of USA, CNAS (China National Accreditation Service for Conformity Assessment, the registration number is L3110) of China. Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC (The Federal Communications Commission), CEC (California energy efficiency), ISED (Innovation, Science and Economic Development Canada). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as Intertek (ETL-SEMKO), TÜV Rheinland, TÜV SÜD, etc.



Waltek Services (Shenzhen) Co., Ltd is one of the largest and the most comprehensive third party testing laboratory in China. Our test capability covered four large fields: safety test. Electro Magnetic Compatibility (EMC), and energy performance, wireless radio. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.

**Test Facility:****A. Accreditations for Conformity Assessment (International)**

Country/Region	Scope Covered By	Scope	Note
USA	ISO/IEC 17025	FCC ID \ DOC \ VOC	1
Canada		IC ID \ VOC	2
Japan		MIC-T \ MIC-R	-
Europe		EMCD \ RED	-
Taiwan		NCC	-
Hong Kong		OFCA	-
Australia		RCM	-
India		WPC	-
Thailand		NTC	-
Singapore		IDA	-
Note:			
1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476.			
2. ISED CAB identifier: CN0013			

**B. TCBs and Notify Bodies Recognized Testing Laboratory.**

Recognized Testing Laboratory of ...	Notify body number
TUV Rheinland	Optional.
Intertek	
TUV SUD	
SGS	
Phoenix Testlab GmbH	0700
Element Materials Technology Warwick Ltd	0891
Timco Engineering, Inc.	1177
Eurofins Product Service GmbH	0681

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#### 4 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS19S05028 978W001	2019-05-09	2019-05-10 to 2019-06-06	2019-06-11	original	-	Valid

## 5 General Information

### 5.1 General Description of E.U.T.

Product: Paging Transmitter  
Model(s): BMTX-1000  
Model Description: N/A

### 5.2 Details of E.U.T.

Operation Frequency: 430MHz~470MHz  
Type of Modulation: FSK  
Antenna installation: External antenna  
Antenna Gain: 2.0dBi  
Ratings: Input: AC 100-240V 50/60Hz 600mA from adapter  
Output: 12V, 2.0A

### 5.3 Channel List

Channel	Frequency (MHz)
Low	433.050
Middle	450.375
High	469.125

## 6 Test Summary

Test Items	Test Requirement	Result
RF Output Power	Part 2.1046&Part 90.205	PASS
Occupied Bandwidth	Part 2.1049&Part 90.209	PASS
Emission Mask	Part 2.1049&Part 90.209	PASS
Spurious Emissions at Antenna Terminal	Part 2.1051&Part 90.210	PASS
Field Strength of Spurious Radiation	Part 2.1053&Part 90.210	PASS
Frequency stability	Part 2.106&Part 90.214	PASS

Pass: The EUT complies with the essential requirements in the standard.

## 7 Equipment Used during Test

### 7.1 Equipments List

3m Semi-anechoic Chamber for Radiation Emissions Test site 1#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Spectrum Analyzer	R&S	FSP	100091	2019-04-29	2020-04-28
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	2019-04-09	2020-04-08
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2019-04-09	2020-04-08
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2018-09-12	2019-09-11
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2018-04-09	2019-04-08
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2019-04-09	2020-04-08
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2019-04-09	2020-04-08
8	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	2019-04-13	2020-04-12
9	Universal Radio Communication Tester	R&S	CMU 200	112461	2019-04-13	2020-04-12
10	Signal Generator	R&S	SMR20	100046	2018-09-12	2019-09-11
11	Smart Antenna	SCHWARZBECK	HA08	-	2019-04-09	2020-04-08
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	Equipment	Manufacturer	Model No.	Serial No	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	2019-04-13	2020-04-12
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2019-04-09	2020-04-08
3	Amplifier	Compliance pirection systems inc	PAP-0203	22024	2019-04-13	2020-04-12
4	Cable	HUBER+SUHNER	CBL2	525178	2019-04-13	2020-04-12
RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	2018-09-12	2019-09-11
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	2018-09-12	2019-09-11



3.	Universal Radio Communication Tester	R&S	CMU 200	112461	2019-04-13	2020-04-12
4	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	2018-09-12	2019-09-11

## 7.2 Measurement Uncertainty

Parameter	Uncertainty
Conducted Emission	$\pm 3.64$ dB(AC mains 150KHz~30MHz)
Radiated Spurious Emissions	$\pm 5.08$ dB (Bilog antenna 30M~1000MHz)
	$\pm 5.47$ dB (Horn antenna 1000M~25000MHz)
Radio Frequency	$\pm 1 \times 10^{-7}$ Hz
RF Power	$\pm 0.42$ dB
RF Power Density	$\pm 0.7$ dB
Conducted Spurious Emissions	$\pm 2.76$ dB (9kHz~26500MHz)
Confidence interval: 95%. Confidence factor:k=2	

## 7.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

## 8 RF Output Power

Test Requirement: FCC part90.205  
Test Method: TIA/EIA 603-E  
Test Mode: Transmitting mode

### 8.1 EUT Operation

Operating Environment :

Temperature: 22.5 °C  
Humidity: 52.1 % RH  
Atmospheric Pressure: 101.2kPa

### 8.2 Test Procedure

The RF output of the transceiver was connected to a power meter through appropriate attenuation.

### 8.3 Test Result

Band (MHz)	Frequency(MHz)	Conducted Output Power(dBm)
430-470	433.050	35.45
	450.375	34.80
	469.125	34.31

## 9 Occupied Bandwidth

Test Requirement: FCC part 90.210  
Test Method: TIA/EIA 603-E  
Test Mode: Transmitting mode

### 9.1 EUT Operation

Operating Environment :

Temperature: 22.5 °C  
Humidity: 52.3% RH  
Atmospheric Pressure: 101.2kPa

### 9.2 Test Procedure

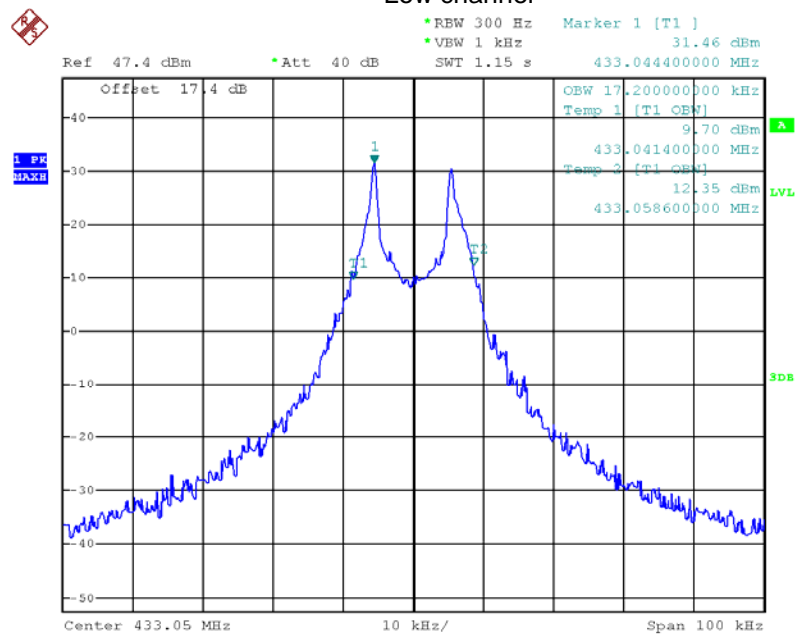
1. The EUT's output RF connector was connected with a short cable to the spectrum analyzer through appropriate attenuation..
2. The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
3. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
4. The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

### 9.3 Test Result

Band (MHz)	Frequency(MHz)	Occupied Bandwidth(kHz)
430-470	433.050	17.2
	450.375	17.2
	469.125	17.8

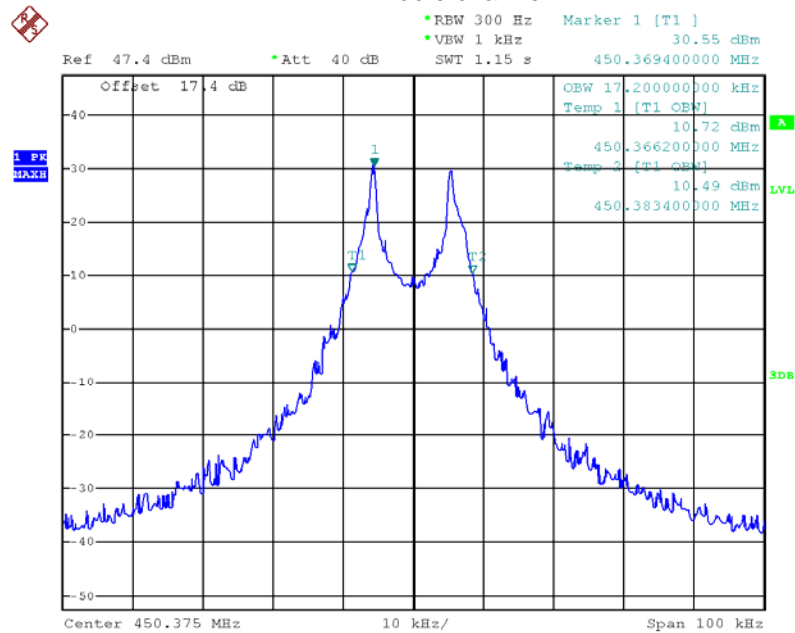
Test plots

Low channel

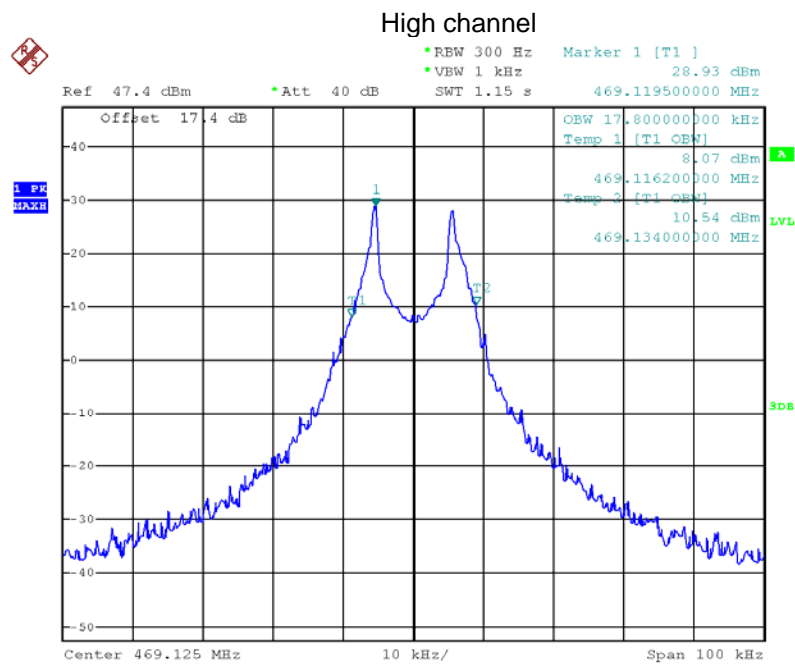


Date: 4.JUN.2019 21:33:31

Middle channel



Date: 4.JUN.2019 21:11:17



Date: 4.JUN.2019 20:59:57

## 10 Emission Mask

Test Requirement:	FCC part 90.210
Test Method:	TIA/EIA 603-E
Test Mode:	Transmitting mode
Limit:	Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows: (1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB. (2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB. (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB

### 10.1 EUT Operation

Operating Environment :	
Temperature:	22.5 °C
Humidity:	52.3% RH
Atmospheric Pressure:	101.2kPa

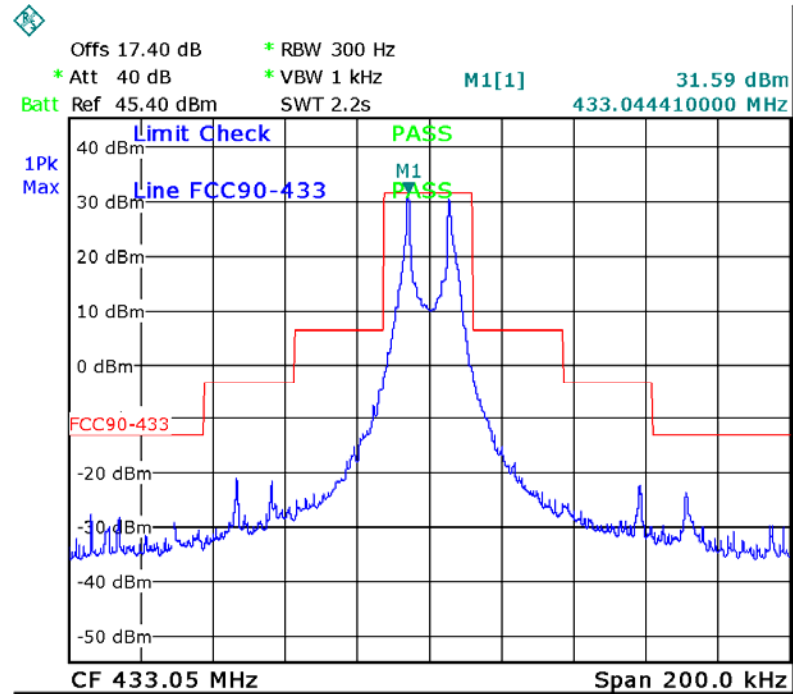
### 10.2 Test Procedure

1. The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.
  2. RBW=300Hz, VBW=1kHz
- Trace mode: Power averaging over 100 sweeps

### 10.3 Test Result

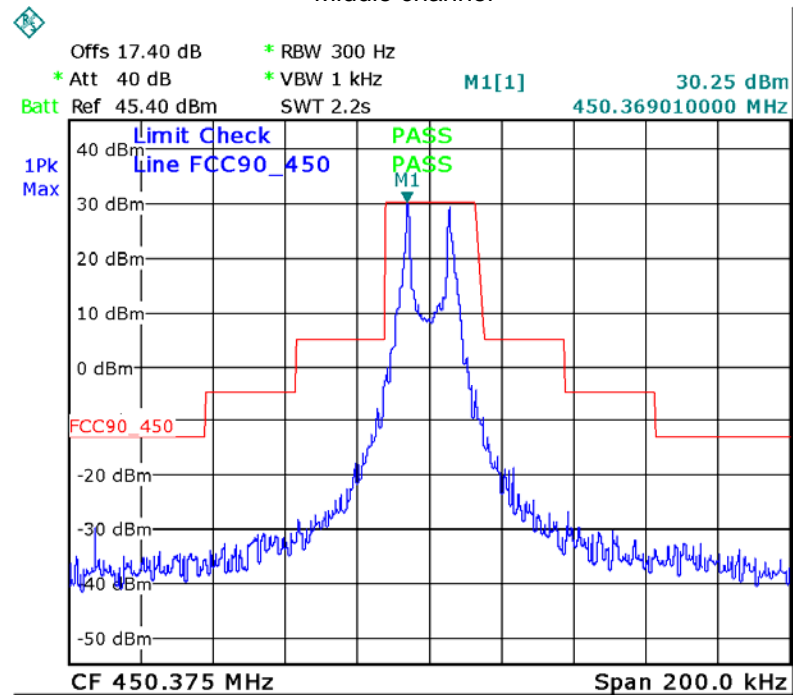
#### Test Plots

##### Low channel

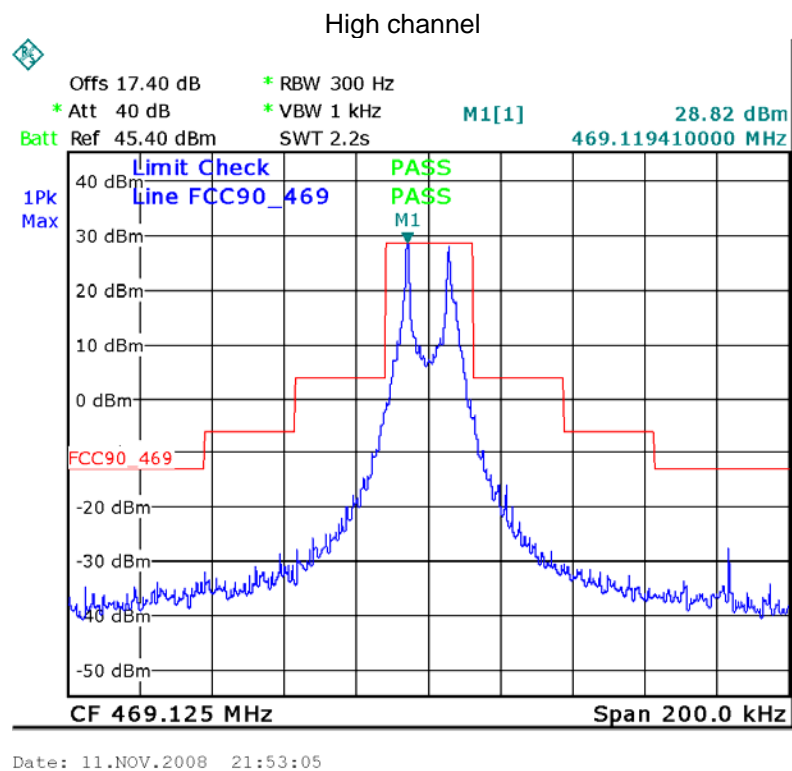


Date: 11.NOV.2008 21:58:44

##### Middle channel



Date: 11.NOV.2008 22:02:40





## **11 Out of band emission at antenna terminals**

Test Requirement:	FCC part90.210
Test Method:	TIA/EIA 603-E
Test Mode:	Transmitting mode
Limit:	-25dBm

### **11.1 EUT Operation**

Operating Environment :

Temperature:	23.5 °C
Humidity:	52.1 % RH
Atmospheric Pressure:	101.3kPa

### **11.2 Test Procedure**

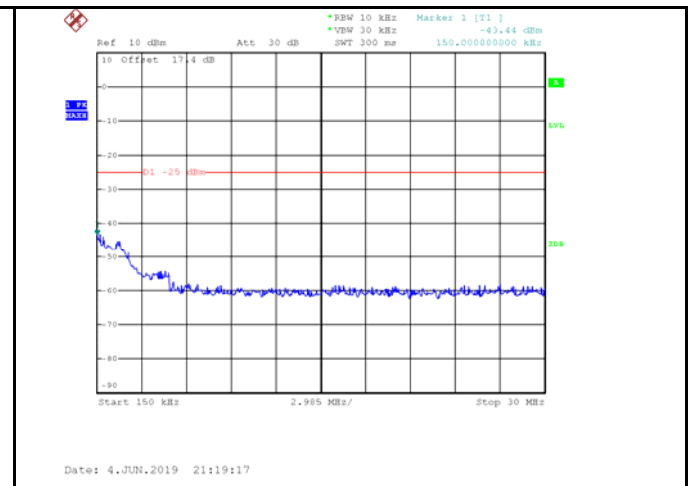
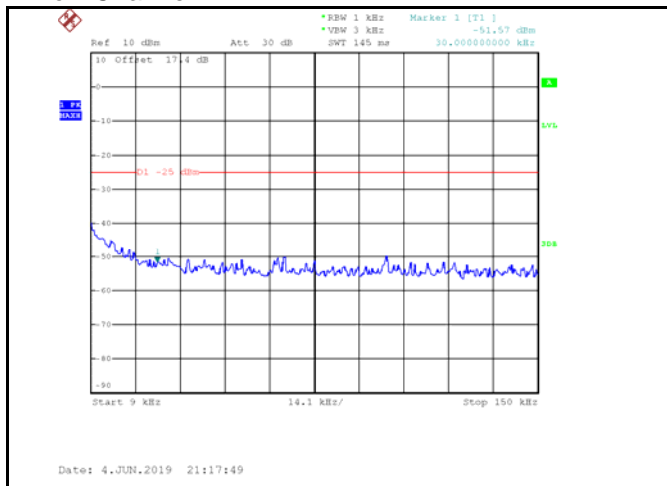
The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.

### **11.3 Test Result**

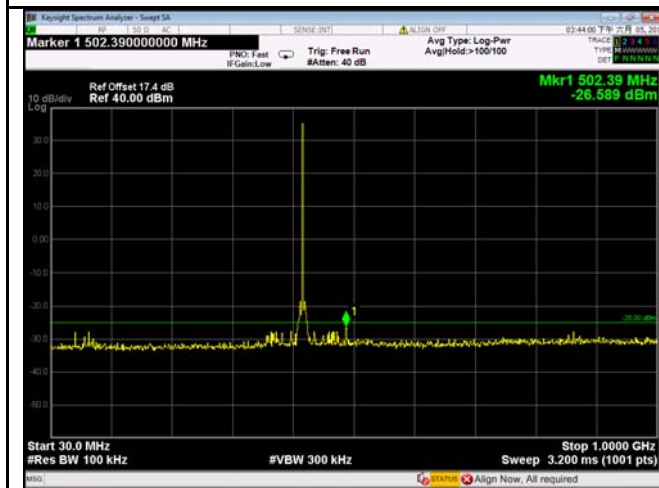
Result:PASS.

## Test Plots

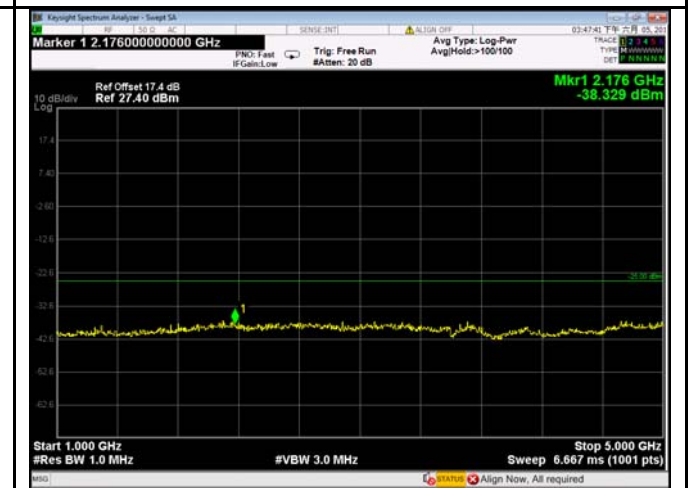
## Low Channel



## Low Channel – 9kHz~150kHz



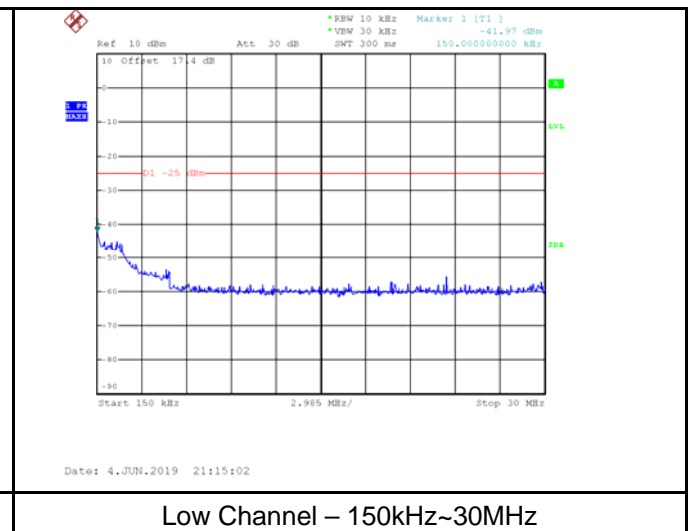
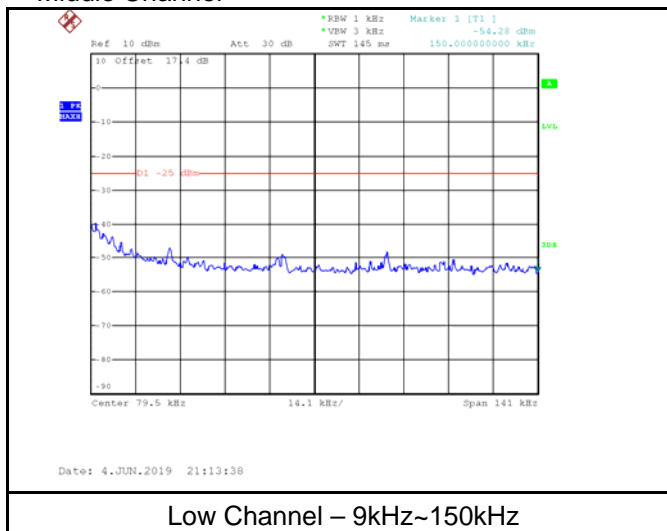
## Low Channel – 150kHz~30MHz



## Low Channel - 30MHz~1GHz

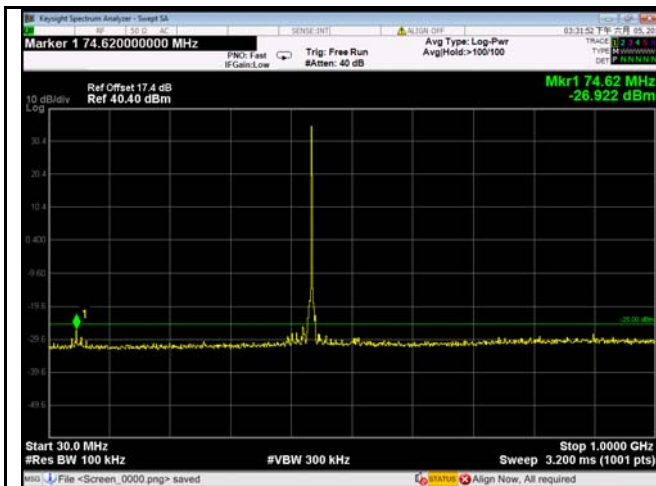
## Low Channel - 1GHz~5GHz

## Middle Channel

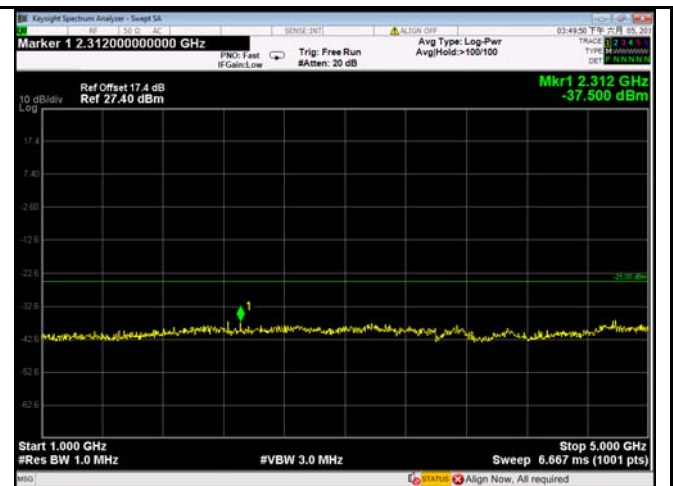


## Low Channel – 9kHz~150kHz

## Low Channel – 150kHz~30MHz

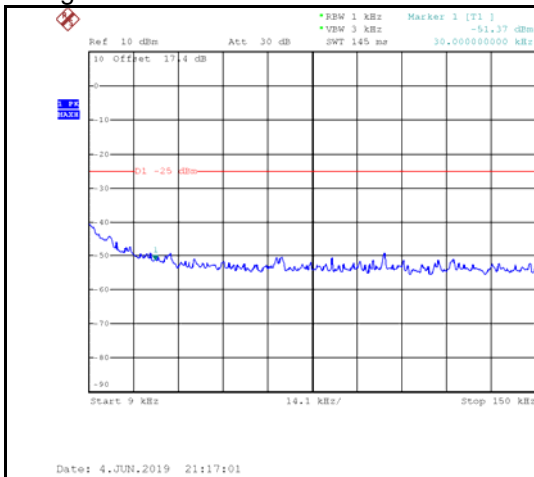


Low Channel - 30MHz~1GHz

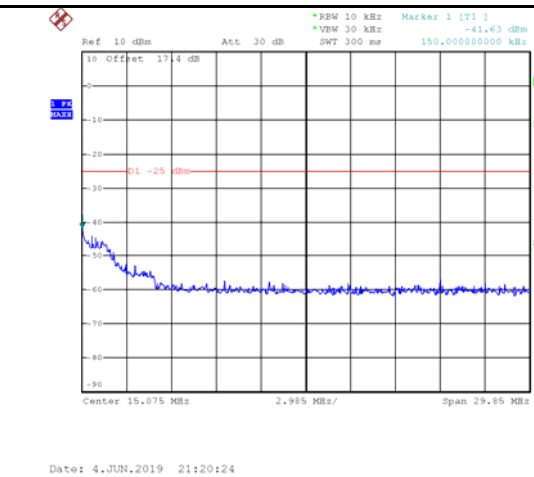


Low Channel - 1GHz~5GHz

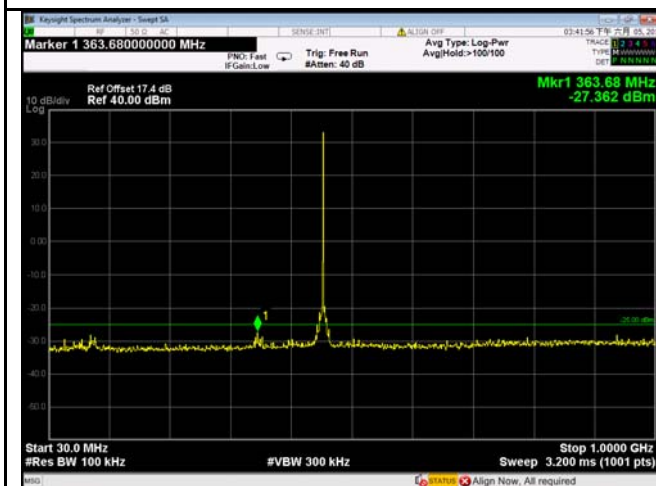
## High Channel



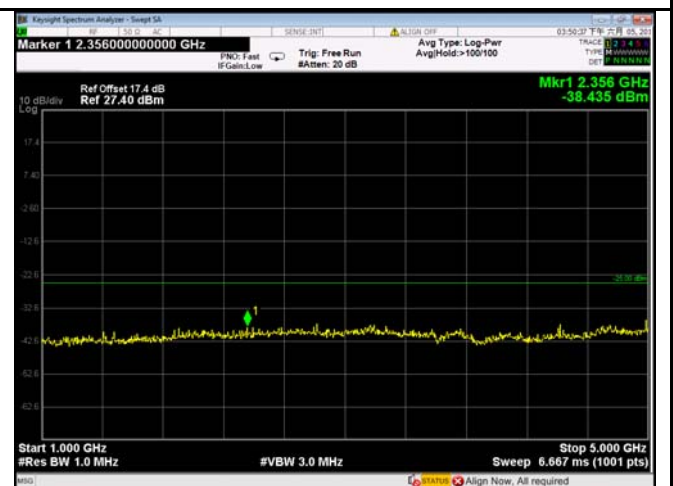
Low Channel - 9kHz~150kHz



Low Channel - 150kHz~30MHz



Low Channel - 30MHz~1GHz



Low Channel - 1GHz~5GHz

## 12 Field strength of spurious radiation measurement

Test Requirement:	FCC part90.210
Test Method:	TIA/EIA 603-E
Test Mode:	Transmitting mode
Limit:	-25dBm

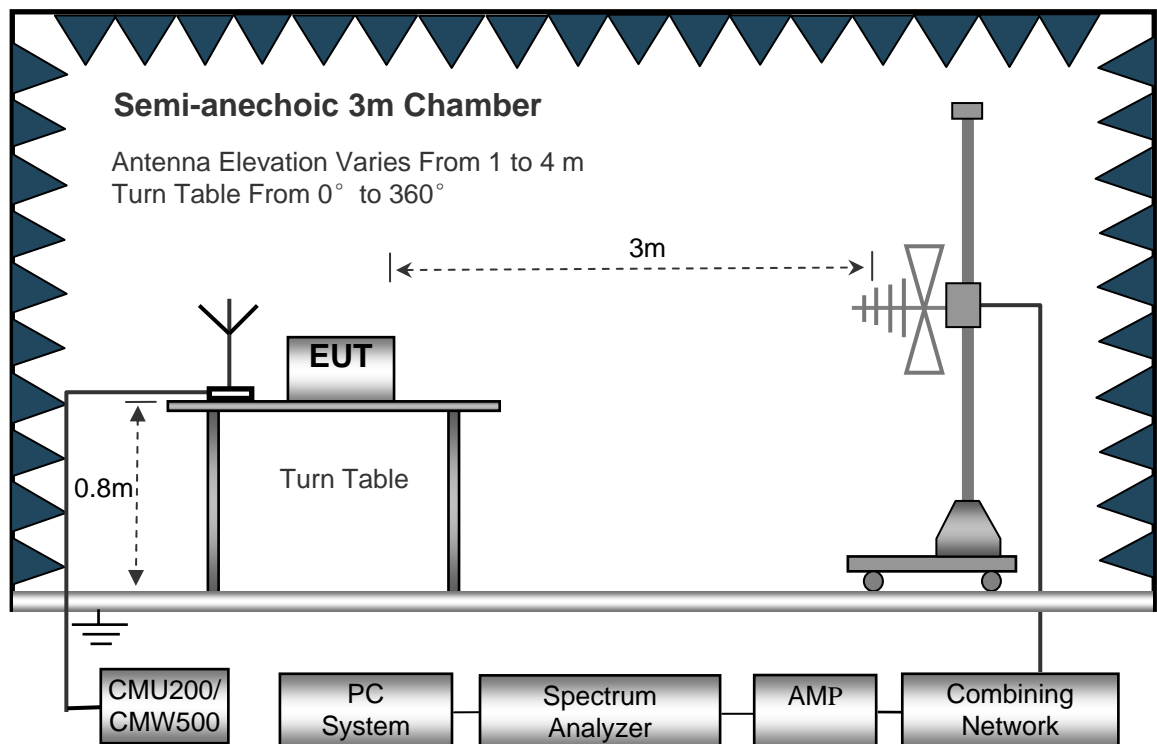
### 12.1 EUT Operation

Operating Environment :

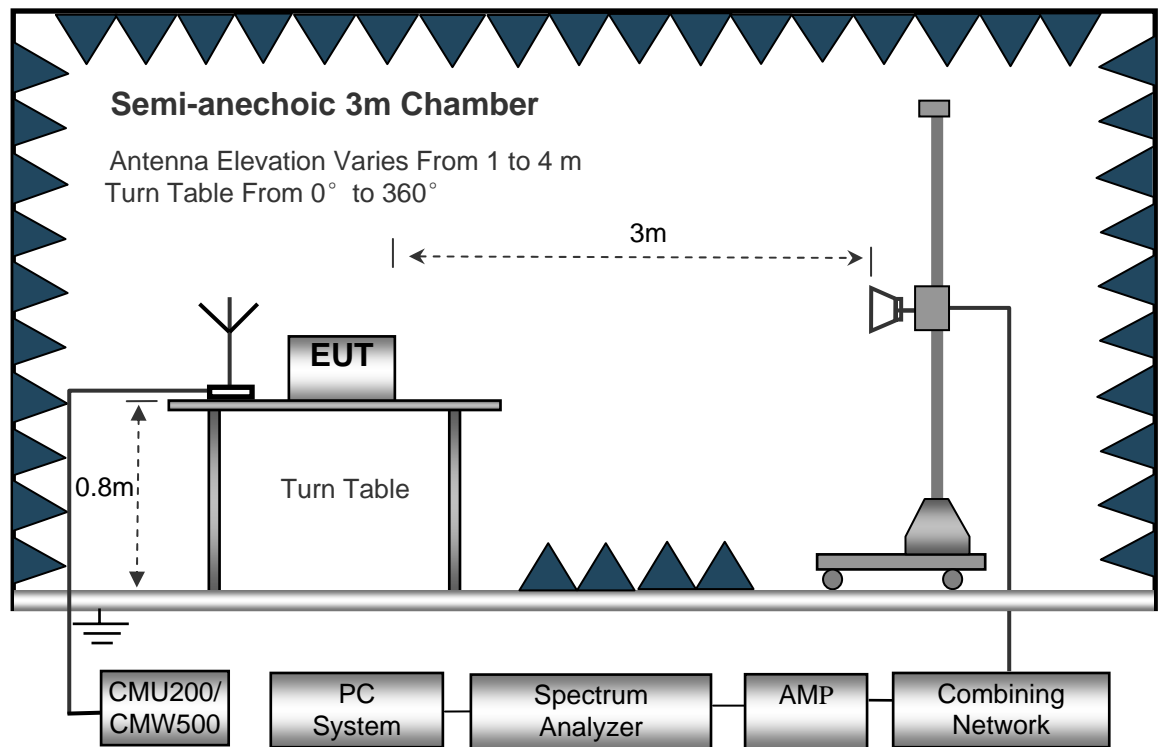
Temperature:	23.5 °C
Humidity:	52.1 % RH
Atmospheric Pressure:	101.2kPa

### 12.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site. The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



12.3 Spectrum Analyzer Setup

30MHz ~ 1GHz

Sweep Speed ..... Auto  
Detector ..... PK  
Resolution Bandwidth..... 100kHz  
Video Bandwidth..... 300kHz

Above 1GHz

Sweep Speed ..... Auto  
Detector ..... PK  
Resolution Bandwidth..... 1MHz  
Video Bandwidth..... 3MHz  
Detector ..... Ave.  
Resolution Bandwidth..... 1MHz  
Video Bandwidth..... 10Hz

## 12.4 Test Procedure

1. The EUT was placed on a non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer.
2. 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.
3. The frequency range up to tenth harmonic was investigated for each of three fundamental frequency (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method.
4. The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency.

$$\text{ERP / EIRP} = \text{S.G. output (dBm)} + \text{Antenna Gain(dB/dBi)} - \text{Cable Loss (dB)}$$

**12.5 Test Result**

Test Mode	Test Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
			Polarization	Level (dBm)		
10MHz QPSK	Low	866.1	Vertical	-31.03	-25.0	PASS
		1299.15	V	-38.16		
		866.1	Horizontal	-29.89		
		1299.15	H	-40.02		
	Middle	900.75	Vertical	-32.77		
		1351.125	V	-41.51		
		900.75	Horizontal	-33.52		
		1351.125	H	-40.47		
	High	938.25	Vertical	-30.01		
		1407.375	V	-40.65		
		938.25	Horizontal	-34.19		
		1407.375	H	-40.78		

### 13 Frequency stability V.S. Temperature measurement

Test Requirement: FCC Part90.213  
 Test Method: TIA/EIA 603-E  
 Test Mode: Transmitting mode  
 Limit:

Frequency range (MHz)	Fixed and base stations (±ppm)	Mobile stations (±ppm)	
		Over 2 watts output power	2 watts or less output power
Below 25	100	100	200
25-50	20	20	50
72-76	5		50
150-174	5	5	50
216-220	1.0		1.0
220-222	0.1	1.5	1.5
421-512	2.5	5	5
806-809	1.0	1.5	1.5
809-824	1.5	2.5	2.5
851-854	1.0	1.5	1.5
854-869	1.5	2.5	2.5
896-901	0.1	1.5	1.5
902-928	2.5	2.5	2.5
902-928	2.5	2.5	2.5
929-930	1.5		
935-940	0.1	1.5	1.5
1427-1435	300	300	300
Above 2450			

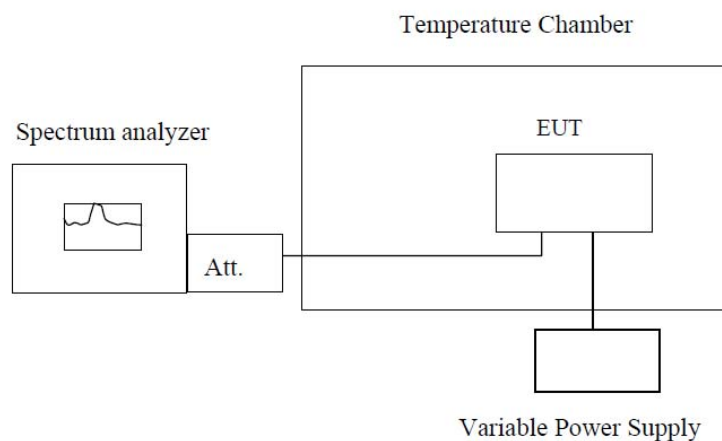
#### 13.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C  
 Humidity: 52.3 % RH  
 Atmospheric Pressure: 101.3kPa

#### 13.2 Test Procedure

1. The equipment under test was connected to an external DC power supply and input rated voltage.
2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.
3. The EUT was placed inside the temperature chamber.
4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency.
5. Turn EUT off and set the chamber temperature to -30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency.
6. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.



**Note :** Measurement setup for testing on Antenna connector



### 13.3 Test Result

Remark: All three channels of all modulations have been tested, but only the worst channel and the worst modulation show in this test item.

Low channel			
Power supplied (Vdc)	Temperature (°C)	Frequency error	
		Hz	ppm
48.00	-40	199	0.0544
	-25	187	0.0512
	-10	155	0.0424
	0	163	0.0446
	10	132	0.0361
	20	144	0.0394
	30	171	0.0468
	40	108	0.0295
	55	128	0.0350

14 Frequency stability V.S. Voltage measurement

Test Requirement: FCC Part90.213  
Test Method: TIA/EIA 603-E  
Test Mode: Transmitting mode  
Limit:

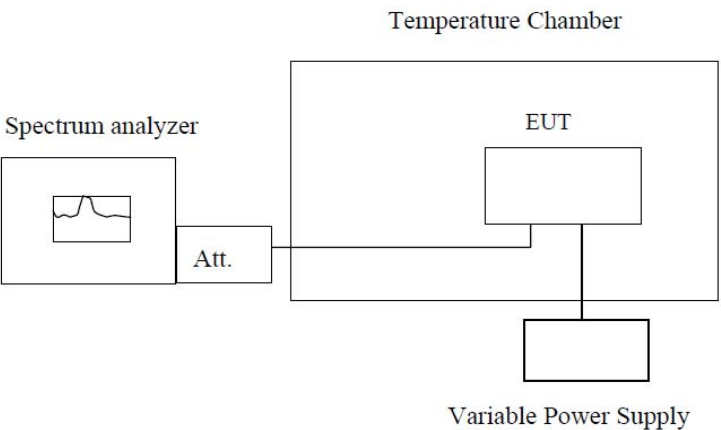
Frequency range (MHz)	Fixed and base stations (±ppm)	Mobile stations (±ppm)	
		Over 2 watts output power	2 watts or less output power
Below 25	100	100	200
25-50	20	20	50
72-76	5		50
150-174	5	5	50
216-220	1.0		1.0
220-222	0.1	1.5	1.5
421-512	2.5	5	5
806-809	1.0	1.5	1.5
809-824	1.5	2.5	2.5
851-854	1.0	1.5	1.5
854-869	1.5	2.5	2.5
896-901	0.1	1.5	1.5
902-928	2.5	2.5	2.5
902-928	2.5	2.5	2.5
929-930	1.5		
935-940	0.1	1.5	1.5
1427-1435	300	300	300
Above 2450			

14.1 EUT Operation

Operating Environment :  
Temperature: 22.9 °C  
Humidity: 52.0 % RH  
Atmospheric Pressure: 101.3kPa

14.2 Test Procedure

1. Set chamber temperature to 25°C. Use a variable DC power source to power the EUT and set the voltage to rated voltage.
2. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.
3. Reduce the input voltage to specify extreme voltage variation (+/- 15%) and endpoint, record the maximum frequency change.



**Note :** Measurement setup for testing on Antenna connector

### 14.3 Test Result

Remark: All three channels of all modulations have been tested, but only the worst channel and the worst modulation show in this test item.

Lowchannel			
Temperature (°C)	Power supplied (Vdc)	Frequency error	
		Hz	ppm
25	42	98	0.0268
	48	76	0.0208
	58	90	0.0246