

## RADIO TEST REPORT

For

Shenzhen Wesion Technology Co., Ltd.

VIM3

Test Model: VIM3 Basic

Additional model: Please refer to page 6

Prepared for : Shenzhen Wesion Technology Co., Ltd.  
Address : A#511, Mingyou Purchasing Center, Baoyuan Rd., Xixiang St.,  
Bao'an Dis., Shenzhen, China.

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Date of receipt of test sample : March 27, 2020  
Number of tested samples : 1  
Serial number : Prototype  
Date of Test : March 27, 2020 ~ April 08, 2020  
Date of Report : April 17, 2020

**RADIO TEST REPORT****MIC Notice No.88 Appendix No. 43**

Second-Generation Low-Power Data Communication System/Wireless LAN System

**Report Reference No. .... : LCS200319044AEA**

Date of Issue ..... : April 17, 2020

**Testing Laboratory Name..... : Shenzhen LCS Compliance Testing Laboratory Ltd.**

Address ..... : Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao' an District, Shenzhen, Guangdong, China

Testing Location/ Procedure..... : Full application of Harmonised standards ☒  
Partial application of Harmonised standards ☐  
Other standard testing method ☐**Applicant's Name ..... : Shenzhen Wesion Technology Co., Ltd.**

Address ..... : A#511, Mingyou Purchasing Center, Baoyuan Rd., Xixiang St., Bao'an Dis., Shenzhen, China.

**Test Specification**

Standard ..... : MIC Notice No.88 Appendix No.43

**Test Report Form No. .... : LCSEMC-1.0**

TRF Originator ..... : Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF ..... : Dated 2011-03

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**Test Item Description..... : VIM3**

Trade Mark ..... : Khadas

Test Model..... : VIM3 Basic

Ratings..... : Input: 5V=3A, 9V=2.67A, 12V=2A

Result ..... : **Positive****Compiled by:**

Jayden Zhuo

**Supervised by:**

Jin Wang

**Approved by:**

Jayden Zhuo/ File administrators

Jin Wang/ Technique principal

Gavin Liang/ Manager

**RADIO -- TEST REPORT**

<b>Test Report No. : LCS200319044AEA</b>	<u>April 17, 2020</u> Date of issue
--	--

Test Model.....	: VIM3 Basic
EUT.....	: VIM3
<b>Applicant.....</b>	<b>: Shenzhen Wesion Technology Co., Ltd.</b>
Address.....	: A#511, Mingyou Purchasing Center, Baoyuan Rd., Xixiang St., Bao'an Dis., Shenzhen, China.
Telephone.....	: /
Fax.....	: /
<b>Manufacturer.....</b>	<b>: Shenzhen Wesion Technology Co., Ltd.</b>
Address.....	: A#511, Mingyou Purchasing Center, Baoyuan Rd., Xixiang St., Bao'an Dis., Shenzhen, China.
Telephone.....	: /
Fax.....	: /
<b>Factory.....</b>	<b>: /</b>
Address.....	: /
Telephone.....	: /
Fax.....	: /

<b>Test Result</b>	<b>Positive</b>
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

**Revision History**

Revision	Issue Date	Revisions	Revised By
000	April 17, 2020	Initial Issue	Gavin Liang



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# 1. GENERAL INFORMATION

## 1.1. Description of Device (EUT)

EUT	: VIM3
Test Model	: VIM3 Basic
Additional Model No:	: VIM3 Pro, VIM3L
Model Declaration:	: PCB board, structure and internal of these model(s) are the same, : So no additional models were tested
Hardware Version	: V12
Software Version	: Android 9.0
Power Supply	: Input: 5V=3A, 9V=2.67A, 12V=2A

### Bluetooth

Frequency Range	2402-2480MHz for Bluetooth (79 channels for Bluetooth V5.0(BDR/EDR) : 40 channels for Bluetooth V5.0(BT LE) Channel Frequency=2402+(K-1), K=1, 2, 3 .....79 Channel Frequency=2402+2(K-1), K=1, 2, 3 .....40
Declared Antenna Power	: Bluetooth V5.0(BDR/EDR): 0.03mW/MHz : Bluetooth V5.0(BT LE): 0.7mW
Modulation Technology	: Bluetooth V5.0(BDR/EDR): GFSK, $\pi/4$ -DQPSK, 8-DPSK : Bluetooth V5.0(BT LE): GFSK
Data Rate	: Bluetooth V5.0(BDR/EDR): 1/2/3Mbps : Bluetooth V5.0(BT LE): 2Mbps
Antenna Description	: FPC Antenna, 2.00dBi

### WIFI(2.4G Band)

Frequency Range	: 2412-2472MHz
Channel Spacing	: 5MHz
Channel Number	: 2412-2472MHz: 13 channels for 20MHz bandwidth(2412~2472MHz) IEEE 802.11b: 1.5mW/MHz
Declared Antenna Power	: IEEE 802.11g: 1.5mW/MHz IEEE 802.11n HT20: 4.5mW/MHz
Modulation Type	: IEEE 802.11b: DSSS (CCK,DQPSK,DBPSK); : IEEE 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11b: 11/5.5/2/1Mbps.
Data Rate	: IEEE 802.11g: 54/48/36/24/18/12/9/6Mbps. IEEE 802.11n HT20: 65.0/58.5/52.0/39.0/26.0/19.5/13.0/6.5Mbps
Antenna Description	: ANT 0: FPC Antenna, 2.00dBi : ANT 1: FPC Antenna, 2.00dBi

### WIFI(5.2G Band)

Frequency Range	: 5180-5240MHz 4 channels for 20MHz bandwidth(5180~5240MHz)
Channel Number	: 2 channels for 40MHz bandwidth(5190~5230MHz) 1 channels for 80MHz bandwidth(5210MHz)
Declared Antenna Power	: IEEE 802.11a: 2.0mW/MHz : IEEE 802.11n HT20: 2.0mW/MHz

	IEEE 802.11n HT40: 1.0mW/MHz
	IEEE 802.11ac VHT20: 2.0mW/MHz
	IEEE 802.11ac VHT40: 1.0mW/MHz
	IEEE 802.11ac VHT80: 1.0mW/MHz
Modulation Type	: IEEE 802.11a/n/ac: OFDM(64QAM, 16QAM, QPSK, BPSK)
Antenna Description	: ANT 0: FPC Antenna, 2.00dBi
	: ANT 1: FPC Antenna, 2.00dBi

## 1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
--	--	--	--	--

## 1.3. External I/O Cable

I/O Port Description	Quantity	Cable
HDMI Port	1	USB Cable: 1m, unshielded
Type C Port	1	USB Cable: 1m, unshielded
USB Cable	2	USB Cable: 0.8m, unshielded

## 1.4. Description of Test Facility

FCC Registration Number is 254912.  
 Industry Canada Registration Number is 9642A-1.  
 EMSD Registration Number is ARCB0108.  
 UL Registration Number is 100571-492.  
 TUV SUD Registration Number is SCN1081.  
 TUV RH Registration Number is UA 50296516-001.  
 NVLAP Accreditation Code is 600167-0.  
 FCC Designation Number is CN5024  
 CAB identifier: CN0071

## 1.5. Test Conditions

<b>Temperature Range</b>	:	21-25℃
<b>Humidity Range</b>	:	45-85%
<b>Pressure Range</b>	:	86-106kPa

## 1.6. Frequency of Channels

### Bluetooth V5.0 (BDR/EDR)

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	2402	41	2442
2	2403	42	2443
--	--	--	--
38	2439	78	2479
39	2440	79	2480
40	2441		

## 2. TEST METHODOLOGY

### 2.1. EUT Exercise

The EUT was tested while in a continuous transmitter/receiver mode.

The EUT was tuned to a low, middle, and high channel for the purpose of the measurements.

For all test case pre/scans were completed in all Modes to determine worst case levels.

According to its specifications, the EUT must comply with the requirements of MIC Notice No.88 Appendix No. 43.

### 2.2. Measurement Uncertainty

Test Item		MU	Remark
Bandwidth	:	+/- 0.2 E-6	/
Antenna Power	:	+/-0.33dB	/
Frequency Tolerance	:	+/- 0.3 E-6	/
Conducted spurious emission	:	+/-0.13dB	/
DC Power	:	+/-1%	/

- (1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

### 2.3. Table for Parameters of Test Software Setting

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Power Parameters:

Test Software Version	RF_Tool_V5.2.1.21		
Frequency	2402MHz	2441MHz	2480MHz
Bluetooth V5.0	Default	Default	Default

### 2.4. Description of Test Modes

Tested channel, Frequency and Modulation Information		
CH1	2402MHz	GFSK(1Mbps), $\pi$ /4-DQPSK(2Mbps), 8-DPSK(3Mbps)
CH40	2441MHz	GFSK(1Mbps), $\pi$ /4-DQPSK(2Mbps), 8-DPSK(3Mbps)
CH79	2480MHz	GFSK(1Mbps), $\pi$ /4-DQPSK(2Mbps), 8-DPSK(3Mbps)
Hopping Mode		GFSK(1Mbps), $\pi$ /4-DQPSK(2Mbps), 8-DPSK(3Mbps)
Note: According exploratory test, EUT has maximum output power for GFSK modulation, All the test modes were tested, but only the worst case was recorded in this report.		

### 2.5. Test Voltage

#### POWER SUPPLY VOLTAGE FLUCTUATION TEST

Environment	Input Voltage(DC)
-10%	DC 10.8V
Normal	DC 12V
+10%	DC 13.2V

### **3. SYSTEM TEST CONFIGURATION**

#### **3.1. Justification**

The system was configured for testing in a typical fashion.

#### **3.2. EUT Exercise Software**

N/A.

#### **3.3. Special Accessories**

N/A.

#### **3.4. Block Diagram/Schematics**

Please refer to the report.

#### **3.5. Equipment Modifications**

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

## 4. SUMMARY OF TEST RESULTS

MIC Notice No.88 Appendix No.43 Article 2 Paragraph 1 Item 19		
Clause	Description of Test (Transmitter Parameters)	Result
6	Antenna Power	PASS
6	Tolerances for Antenna Power	PASS
3	Frequency Tolerance	PASS
4	Transmission Rate	PASS
4	Occupied Frequency Bandwidth	PASS
4	Spread Bandwidth	PASS
13	Dwell Time	PASS
5	Spurious Emissions	PASS
10	Transmission Antenna Gain (EIRP Antenna Power)	N/A
11	Transmission Radiated Angle Width (3dB Beam width)	N/A
12	Interference prevention function	PASS
8	Carrier Sensing function	N/A
Receiver Parameters		
7	Secondary Radiated Emissions	PASS
(1) N/A is an abbreviation for Not Applicable.		

## 5. TEST RESULT

### 5.1. Antenna Power

#### 5.1.1. Standard Applicable

Type	Limit
Antenna Power	3mW/MHz
Tolerance	+20%,-80%

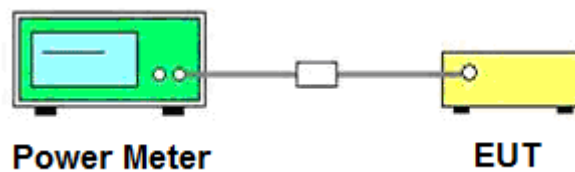
#### 5.1.2. Measuring Instruments

Please refer to section 6 of equipments list in this report.

#### 5.1.2. Test Procedures

- EUT have transmitted continuous maximum power
- Antenna Power Error is definition that actual measure antenna power tolerance between +20% to -80% power range that base on manufacturer declare the conducted power density.

#### 5.1.3. Test Setup



#### 5.1.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

## 5.1.5. Test Result

Temperature	22.5℃	Humidity	53.1%
Test Engineer	David Luo	Voltage	Normal Voltage

Mode	Declared power	Result	Tolerance	Limit
	(mW/MHz)	(mW/MHz)	/	/
Hopping-Tx (1Mbps)	0.03	0.025	-17.66%	+20%,-80%
Hopping-Tx (2Mbps)	0.03	0.019	-36.90%	+20%,-80%
Hopping-Tx (3Mbps)	0.03	0.021	-28.50%	+20%,-80%
<b>Conclusion: PASS</b>				

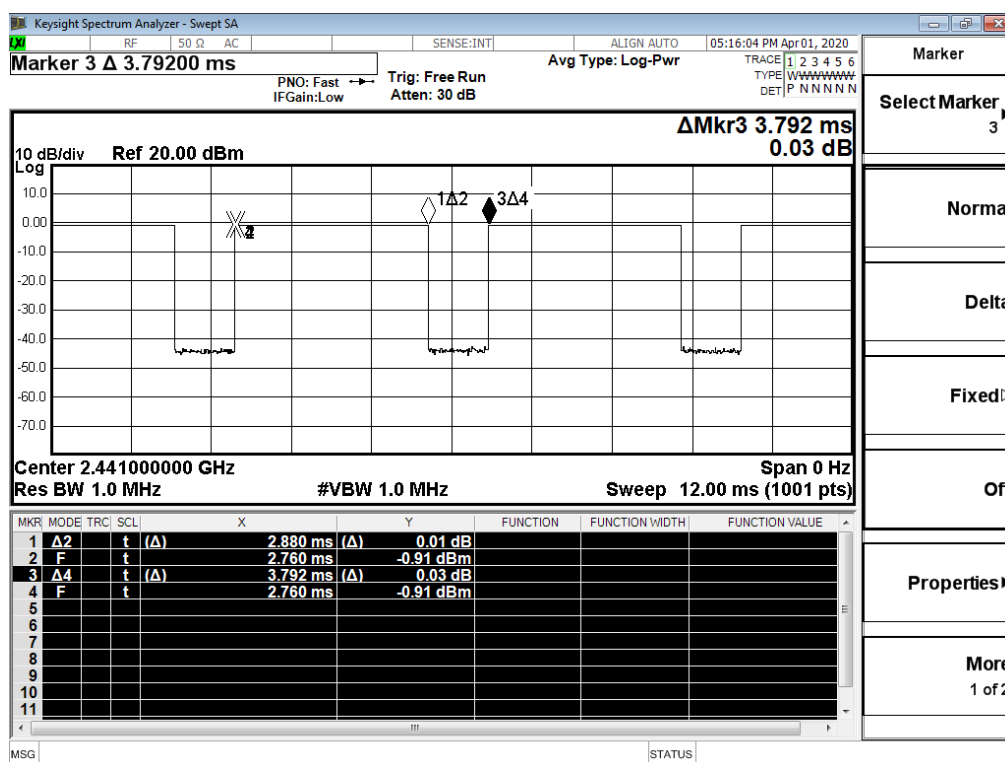
Result power= Average value / (Duty Cycle \* Spreading bandwidth)

Spread Bandwidth (DH5) =69.957MHz, Spread Bandwidth (2DH5) =70.283MHz,

Spread Bandwidth (3DH5) =69.688MHz

Duty cycle=75.9%

Duty cycle= [Ton/ (Ton+Toff)]\*100%=2.880/3.792\*100%=75.9%





Temperature	22.5℃	Humidity	53.1%
Test Engineer	David Luo	Voltage	Low Voltage

Mode	Declared power	Result	Tolerance	Limit
	(mW/MHz)	(mW/MHz)	/	/
Hopping-Tx (1Mbps)	0.03	0.025	-17.99%	+20%,-80%
Hopping-Tx (2Mbps)	0.03	0.019	-36.17%	+20%,-80%
Hopping-Tx (3Mbps)	0.03	0.021	-28.67%	+20%,-80%
<b>Conclusion: PASS</b>				

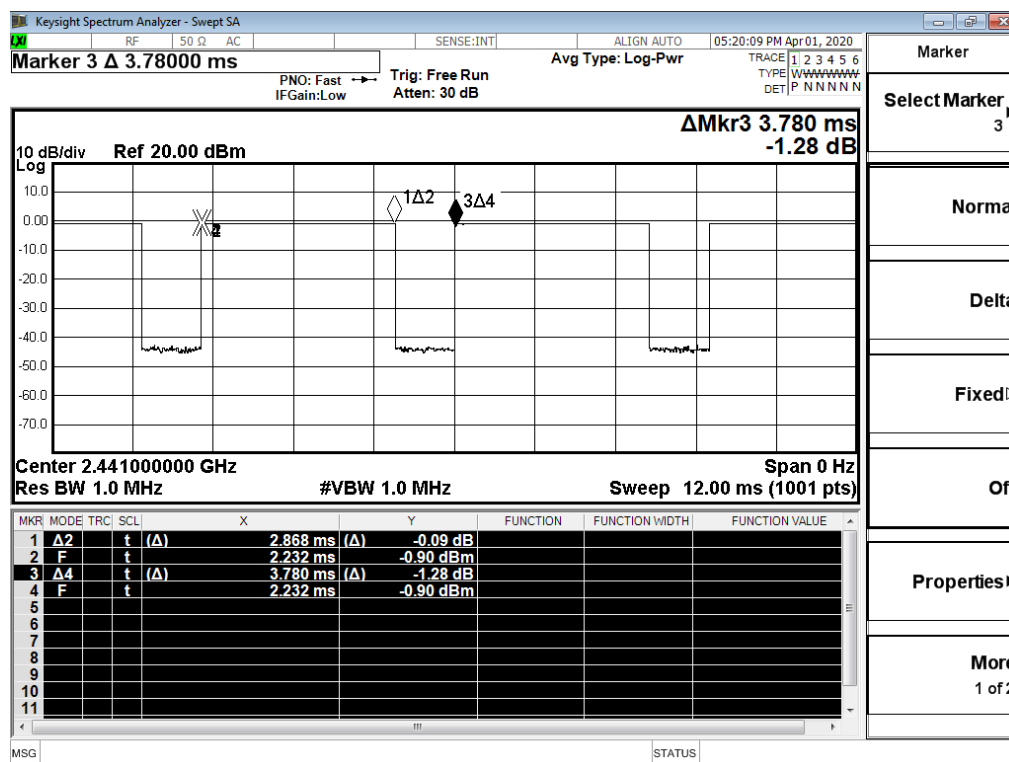
Result power= Average value / (Duty Cycle \* Spreading bandwidth)

Spread Bandwidth (DH5) =69.743MHz, Spread Bandwidth (2DH5) =69.613MHz,

Spread Bandwidth (3DH5) =69.653MHz

Duty cycle=75.9%

Duty cycle= [Ton/ (Ton+Toff)]\*100%=2.868/3.780\*100%=75.9%



Temperature	22.5℃	Humidity	53.1%
Test Engineer	David Luo	Voltage	High Voltage

Mode	Declared power	Result	Tolerance	Limit
	(mW/MHz)	(mW/MHz)	/	/
Hopping-Tx (1Mbps)	0.03	0.025	-18.21%	+20%,-80%
Hopping-Tx (2Mbps)	0.03	0.019	-36.78%	+20%,-80%
Hopping-Tx (3Mbps)	0.03	0.021	-28.40%	+20%,-80%
<b>Conclusion: PASS</b>				

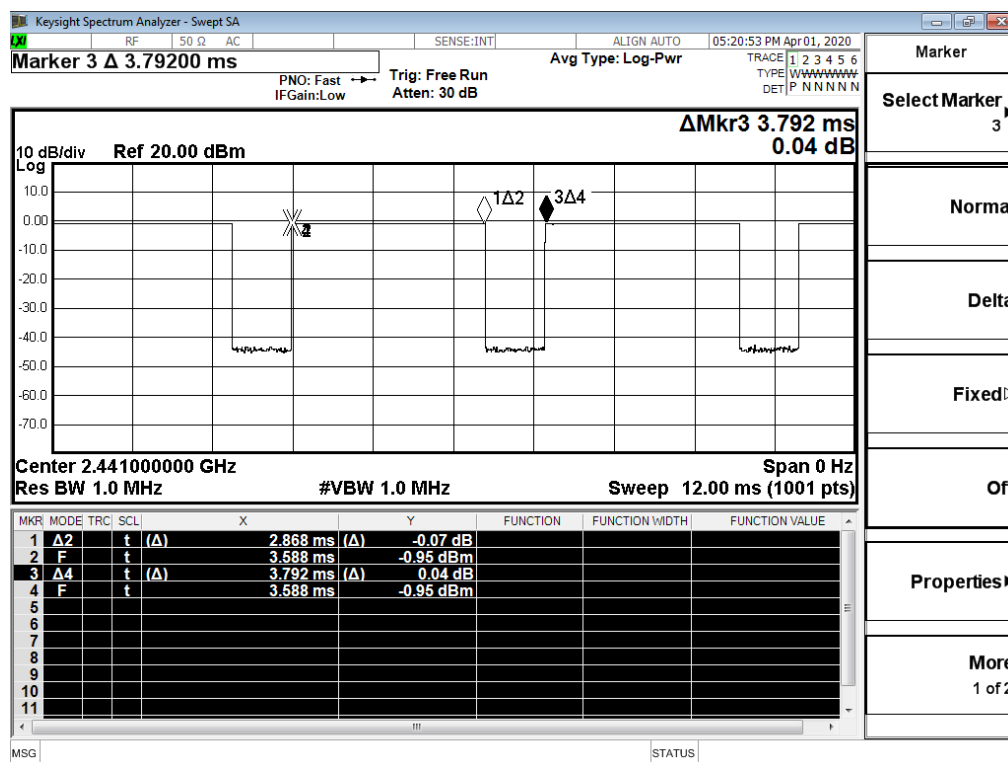
Result power= Average value / (Duty Cycle \* Spreading bandwidth)

Spread Bandwidth (DH5) =69.863MHz, Spread Bandwidth (2DH5) =70.356MHz,

Spread Bandwidth (3DH5) =69.881MHz

Duty cycle=75.6%

Duty cycle= [Ton/ (Ton+Toff)]\*100%=2.868/3.792\*100%=75.6%



## 5.2. Frequency Tolerance

### 5.2.1. Standard Applicable

Tolerance of frequency shall be  $\pm 50\text{ppm}$

### 5.2.2. Test Procedures

- Set EUT work in test mode as described in clause 2.4.
- Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

Centre Frequency: The centre frequency of the channel under test.

Resolution BW: 10 KHz.

Video BW: 10 KHz.

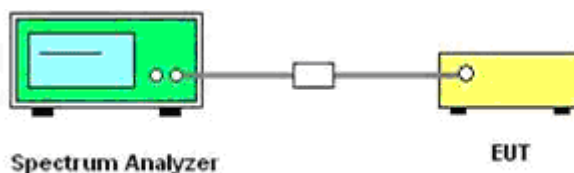
Span: 1MHz.

Detector: Peak.

Trace Mode: Max Hold.

- When the trace is complete, find the peak value of the power envelope and record.

### 5.2.3. Test Setup Layout



### 5.2.4. EUT Operation during Test

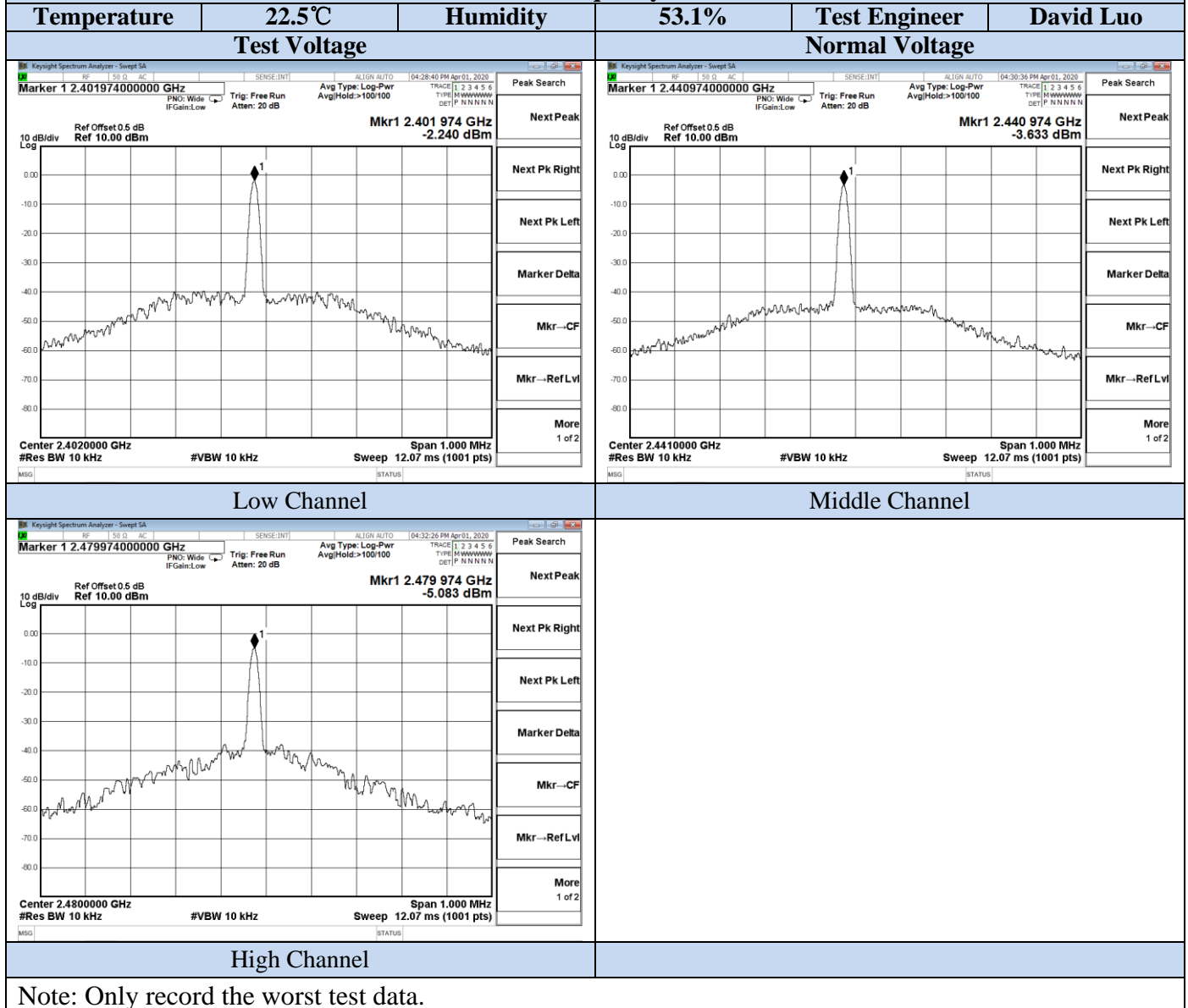
The EUT was programmed to be in continuously transmitting mode.

### 5.2.5. Test Result

Temperature	22.5℃	Humidity	53.1%
Test Engineer	David Luo	Voltage	Normal Voltage

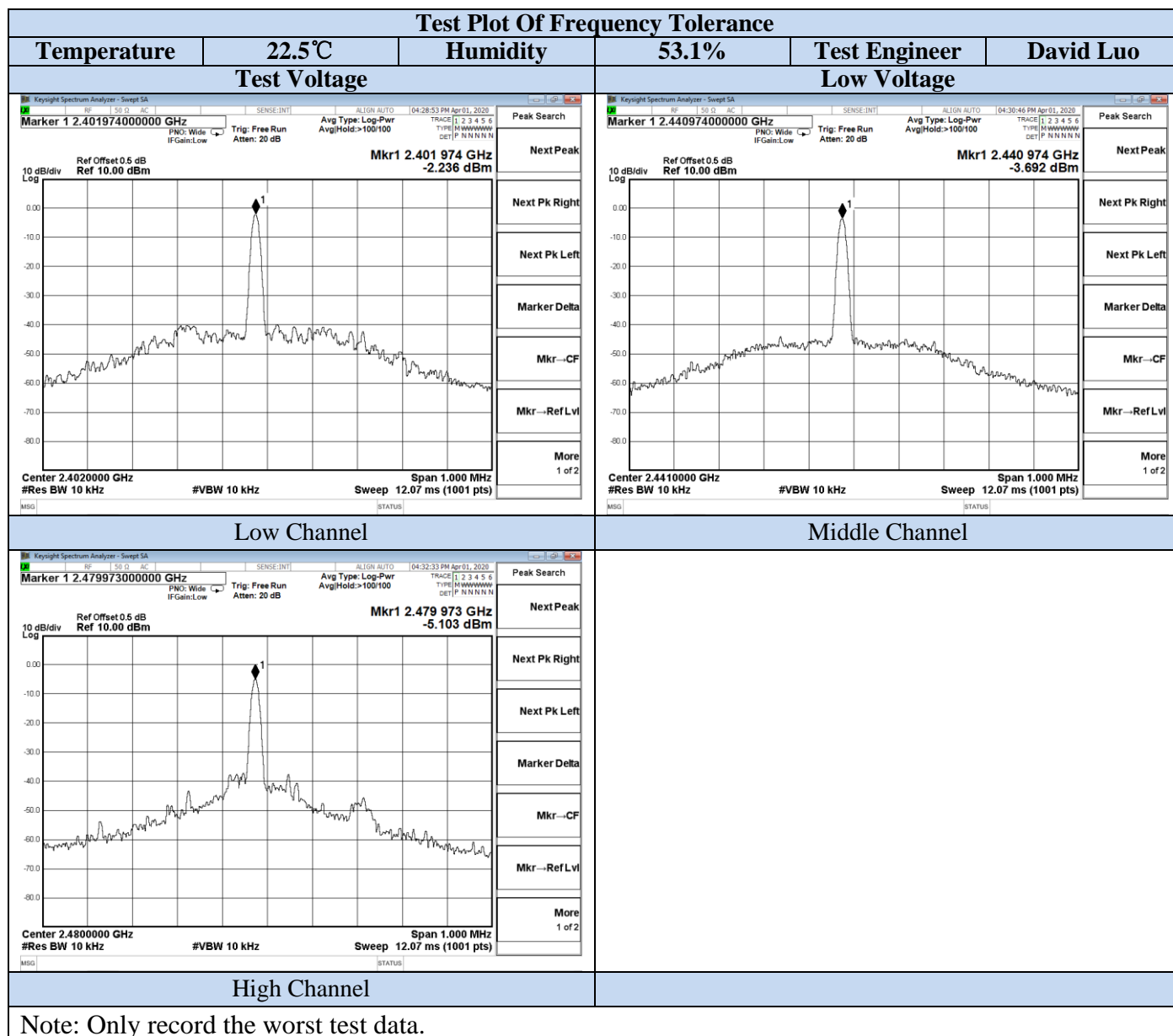
Mode	Channel	Frequency MHz	Measured MHz	Tolerance KHz	Result ppm	Limit ppm
Carrier Tx Mode	1	2402	2401.974	-26	-10.82	$\pm 50$
	40	2441	2440.974	-26	-10.65	$\pm 50$
	79	2480	2479.974	-26	-10.48	$\pm 50$

## Test Plot Of Frequency Tolerance



Temperature	22.5°C	Humidity	53.1%
Test Engineer	David Luo	Voltage	Low Voltage

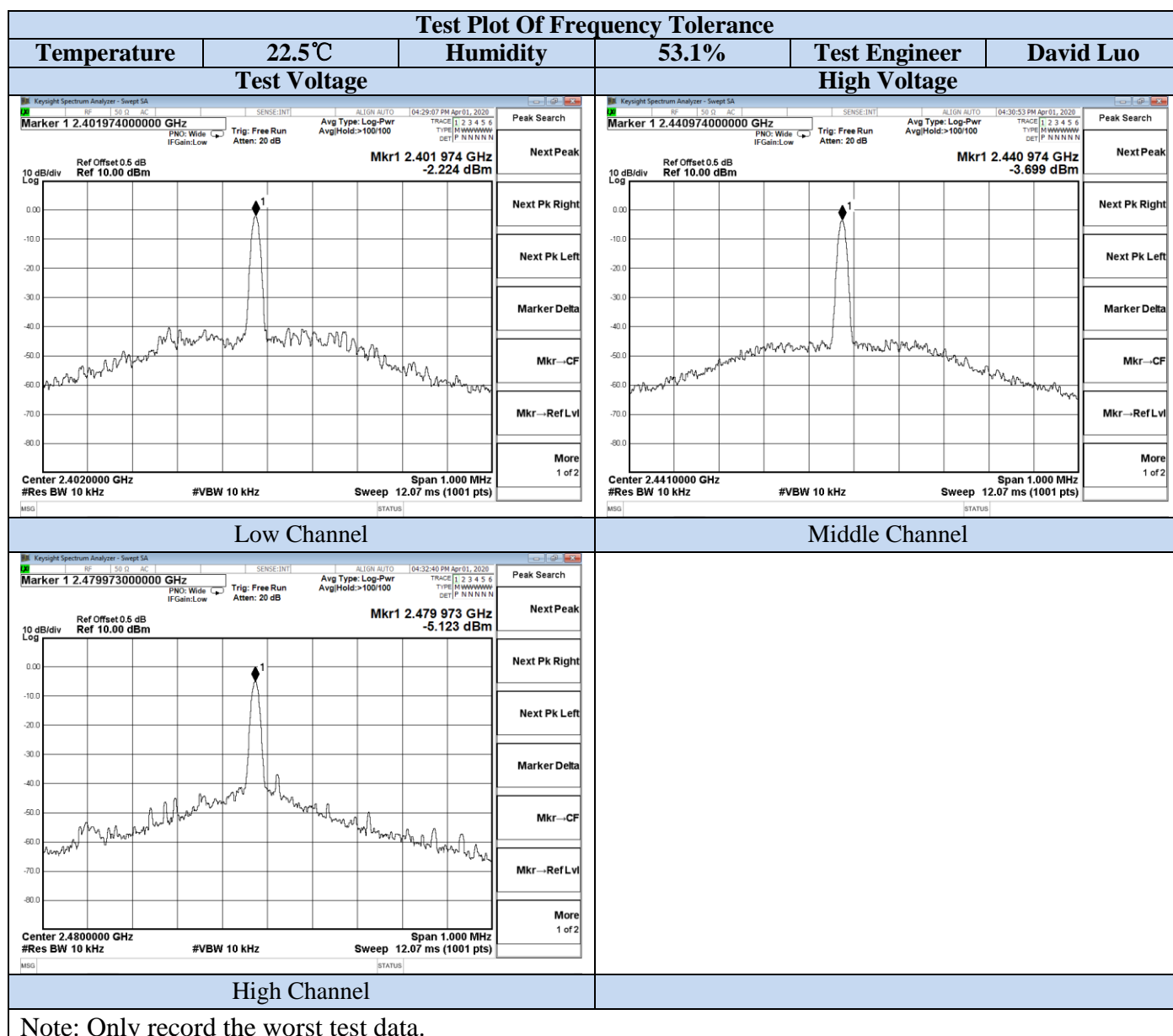
Mode	Channel	Frequency MHz	Measured MHz	Tolerance KHz	Result ppm	Limit ppm
Carrier Tx Mode	1	2402	2401.974	-26	-10.82	± 50
	40	2441	2440.974	-26	-10.65	± 50
	79	2480	2479.973	-27	-10.89	± 50



Note: Only record the worst test data.

Temperature	22.5°C	Humidity	53.1%
Test Engineer	David Luo	Voltage	High Voltage

Mode	Channel	Frequency MHz	Measured MHz	Tolerance KHz	Result ppm	Limit ppm
Carrier Tx Mode	1	2402	2401.974	-26	-10.82	± 50
	40	2441	2440.974	-26	-10.65	± 50
	79	2480	2479.973	-27	-10.89	± 50



### 5.3. Occupied Frequency Bandwidth

#### 5.3.1. Standard Applicable

Permissible value for occupied bandwidth using the FH system, a hybrid system combining DS and FH systems, or a hybrid system combining FH and OFDM systems shall be 83.5 MHz or less, while necessary bandwidth (minimum occupied bandwidth sufficient to ensure information transmission of required quality at a required transmission rate for the system used under specified conditions for a given emission type) using a system other than any of the above shall be 26 MHz or less.

#### 5.3.2. Test Procedures

- a. Set EUT work in test mode as described in clause 2.4.
- b. Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

Centre Frequency: The centre frequency of the channel under test.

Resolution BW: 1MHz.

Video BW: 1MHz.

Span: Wide enough to cover the complete power envelope of the signal of the EUT.

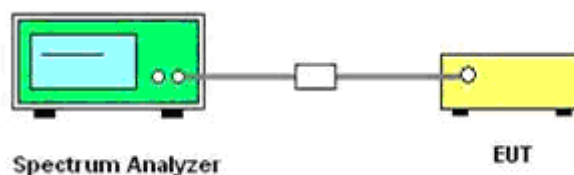
Sweep mode: Continuous sweeping.

Detector: Peak.

Trace Mode: Max Hold.

- c. When the trace is complete, measure the occupied bandwidth (99% bandwidth) with spectrum analyzer's bandwidth measure function.

#### 5.3.3. Test Setup Layout



#### 5.3.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

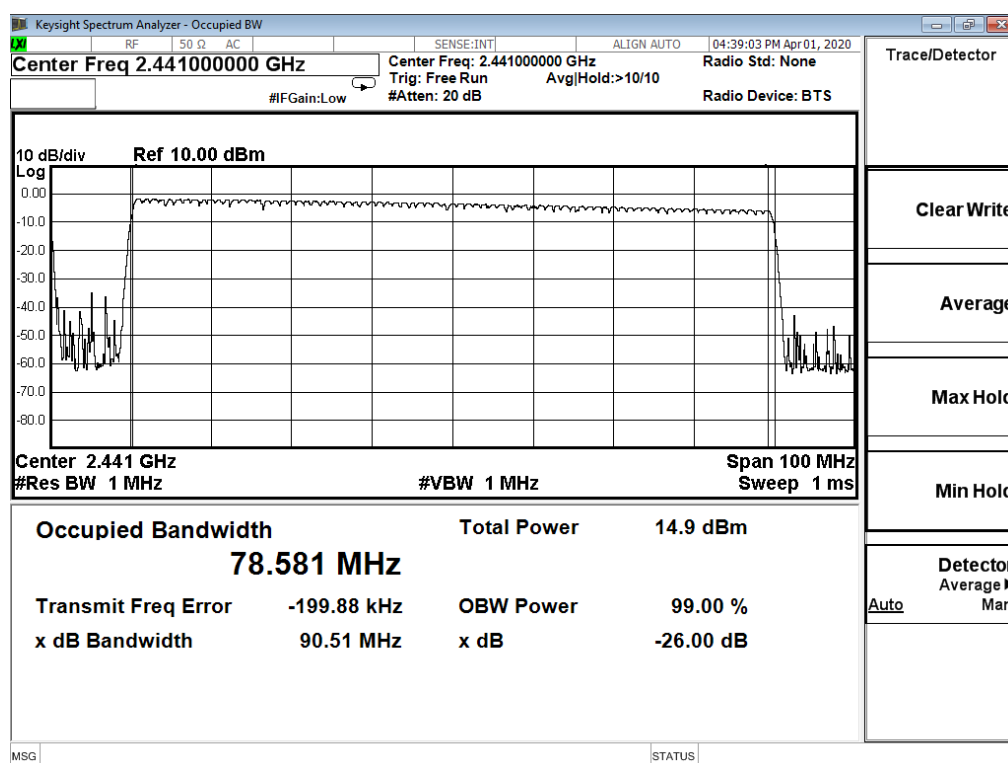
## 5.3.5. Test Result of Occupied Bandwidth

Temperature	22.5℃	Humidity	53.1%
Test Engineer	David Luo	Voltage	Normal Voltage

Mode	CH	Frequency MHz	Result	Limit
			(MHz)	(MHz)
Hopping (1Mbps)	All	2402-2480	78.581	$\leq 83.5$
Hopping (2Mbps)	All	2402-2480	78.501	$\leq 83.5$
Hopping (3Mbps)	All	2402-2480	78.546	$\leq 83.5$
<b>Conclusion: PASS</b>				

## Test Plots of Worst case mode

Max Occupied Frequency Bandwidth for 1Mbps, Detail please refers to below plot:



Note: Only record the worst result.

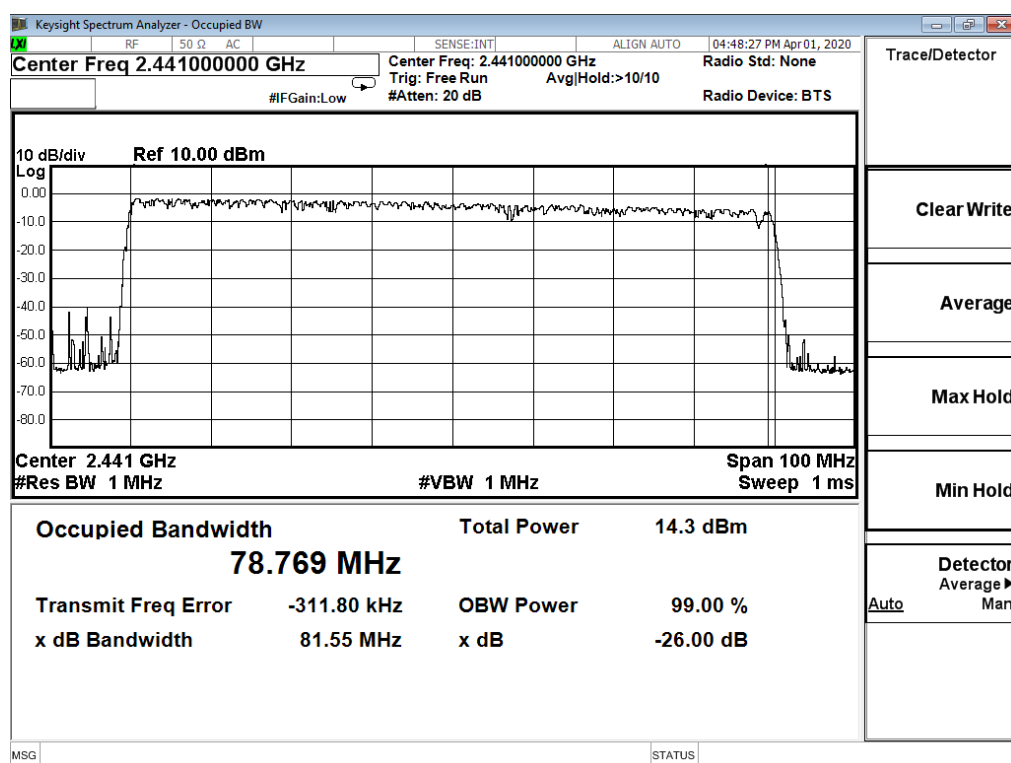


Temperature	22.5°C	Humidity	53.1%
Test Engineer	David Luo	Voltage	Low Voltage

Mode	CH	Frequency MHz	Result	Limit
			(MHz)	(MHz)
Hopping (1Mbps)	All	2402-2480	78.459	$\leq 83.5$
Hopping (2Mbps)	All	2402-2480	78.769	$\leq 83.5$
Hopping (3Mbps)	All	2402-2480	78.619	$\leq 83.5$
<b>Conclusion: PASS</b>				

### Test Plots of Worst case mode

Max Occupied Frequency Bandwidth for 2Mbps, Detail please refers to below plot:



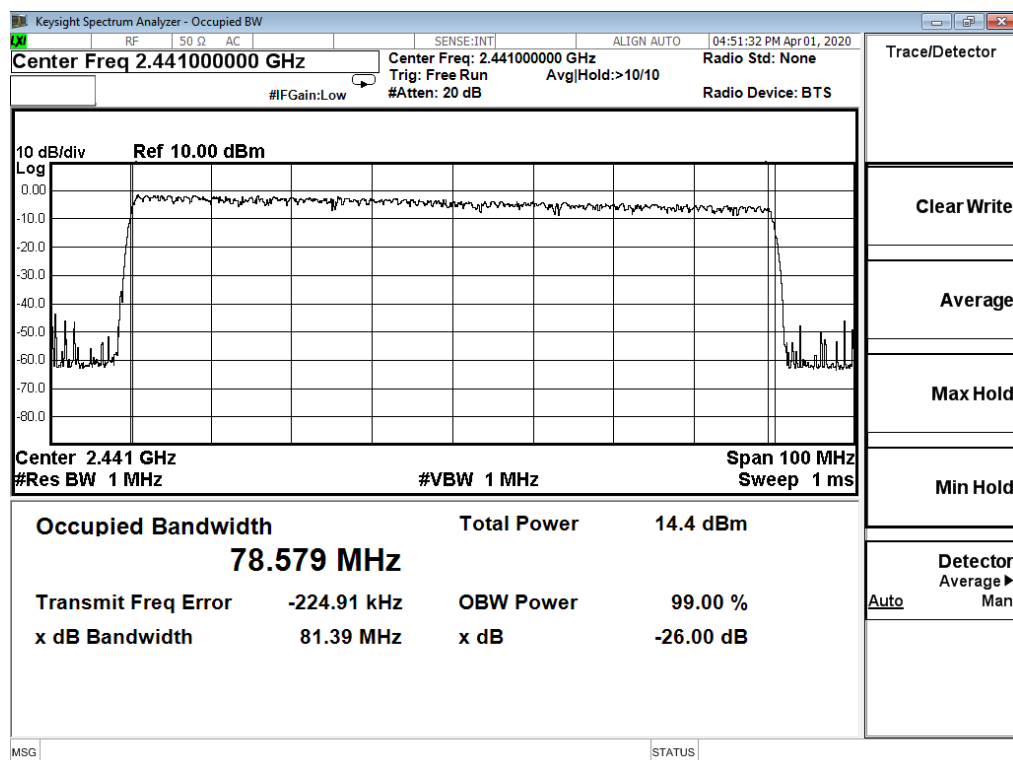
Note: Only record the worst result.

Temperature	22.5°C	Humidity	53.1%
Test Engineer	David Luo	Voltage	High Voltage

Mode	CH	Frequency MHz	Result	Limit
			(MHz)	(MHz)
Hopping (1Mbps)	All	2402-2480	78.481	$\leq 83.5$
Hopping (2Mbps)	All	2402-2480	78.382	$\leq 83.5$
Hopping (3Mbps)	All	2402-2480	78.579	$\leq 83.5$
<b>Conclusion: PASS</b>				

### Test Plots of Worst case mode

Max Occupied Frequency Bandwidth for 3Mbps, Detail please refers to below plot:



Note: Only record the worst result.

## 5.4. Spread Bandwidth

### 5.4.1. Standard Applicable

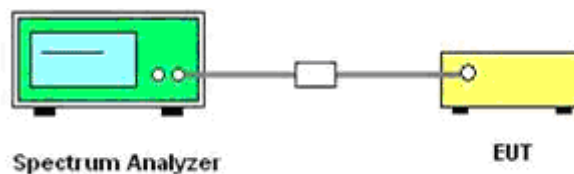
In spread spectrum systems, spread bandwidth (which refers to a frequency bandwidth with an upper limit and lower limit such that each of the mean powers radiated above the upper frequency limit and below the lower frequency limit is equal to 5 % of the total mean power radiated; this also applies hereafter) shall be 500 kHz or more.

The OFDM system shall have one or more carriers per 1 MHz bandwidth.

### 5.4.2. Test Procedures

- a. Set EUT work in test mode as described in clause 2.4.
- b. Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:  
Centre Frequency: The centre frequency of the channel under test.  
Resolution BW: 1MHz.  
Video BW: 1MHz.  
Span: Wide enough to cover the complete power envelope of the signal of the EUT.  
Detector: Peak.  
Trace Mode: Max Hold.
- c. When the trace is complete, measure the spread bandwidth (90% bandwidth) with spectrum analyzer's bandwidth measure function.

### 5.4.3. Test Setup Layout



### 5.4.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

## 5.4.5. Test Result of Spectrum Bandwidth

Temperature	22.5℃	Humidity	53.1%
Test Engineer	David Luo	Voltage	Normal Voltage

Mode	CH	Frequency MHz	Result	Limit
			(MHz)	(MHz)
Hopping (1Mbps)	All	2402-2480	69.957	>0.5
Hopping (2Mbps)	All	2402-2480	70.283	>0.5
Hopping (3Mbps)	All	2402-2480	69.688	>0.5

**Conclusion: PASS**

Temperature	22.5℃	Humidity	53.1%
Test Engineer	David Luo	Voltage	Low Voltage

Mode	CH	Frequency MHz	Result	Limit
			(MHz)	(MHz)
Hopping (1Mbps)	All	2402-2480	69.743	>0.5
Hopping (2Mbps)	All	2402-2480	69.613	>0.5
Hopping (3Mbps)	All	2402-2480	69.653	>0.5

**Conclusion: PASS**

Temperature	22.5℃	Humidity	53.1%
Test Engineer	David Luo	Voltage	High Voltage

Mode	CH	Frequency MHz	Result	Limit
			(MHz)	(MHz)
Hopping (1Mbps)	All	2402-2480	69.863	>0.5
Hopping (2Mbps)	All	2402-2480	70.356	>0.5
Hopping (3Mbps)	All	2402-2480	69.881	>0.5

**Conclusion: PASS**

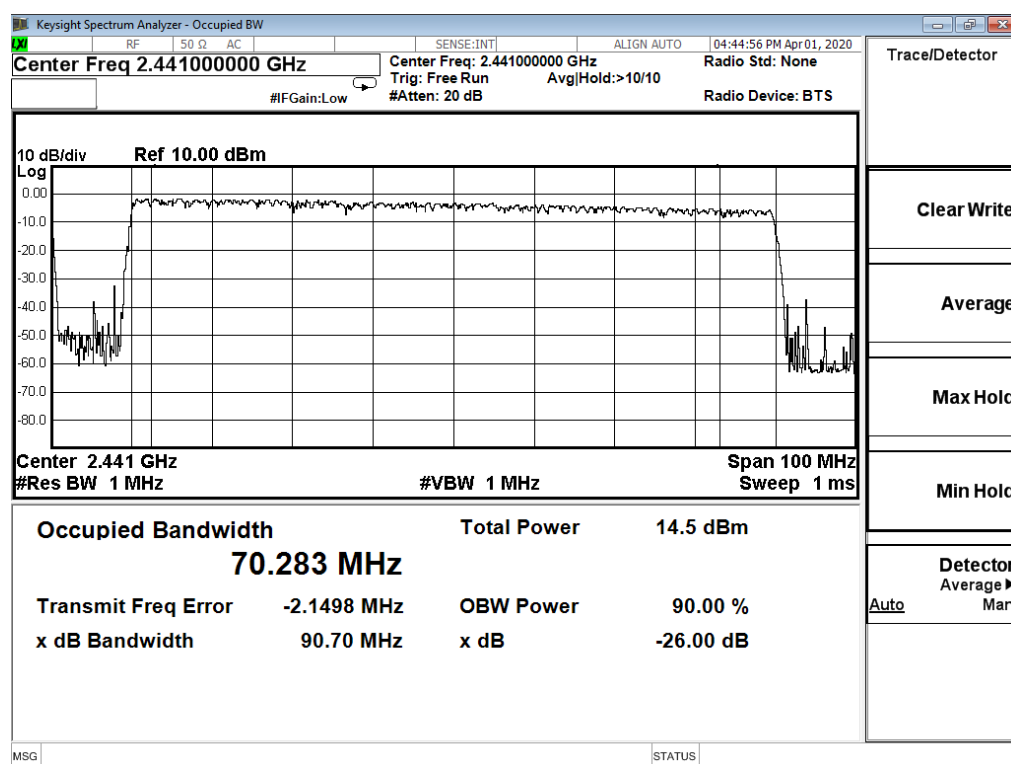
## 5.4.6. Test Result of Spread Spectrum Factor

Temperature	22.5℃	Humidity	53.1%
Test Engineer	David Luo	Test Voltage	Normal Voltage

Mode	CH	Result	Modulation Rate	Spread Factor	Limit
		(MHz)	(MHz)		
Hopping (1Mbps)	All	69.957	1.00	69.957	$\geq 5$
Hopping (2Mbps)	All	70.283	2.00	35.142	$\geq 5$
Hopping (3Mbps)	All	69.688	3.00	23.229	$\geq 5$

Test Plots of Worst case mode

Max Spread bandwidth for 2Mbps, Detail please refers to below plot.



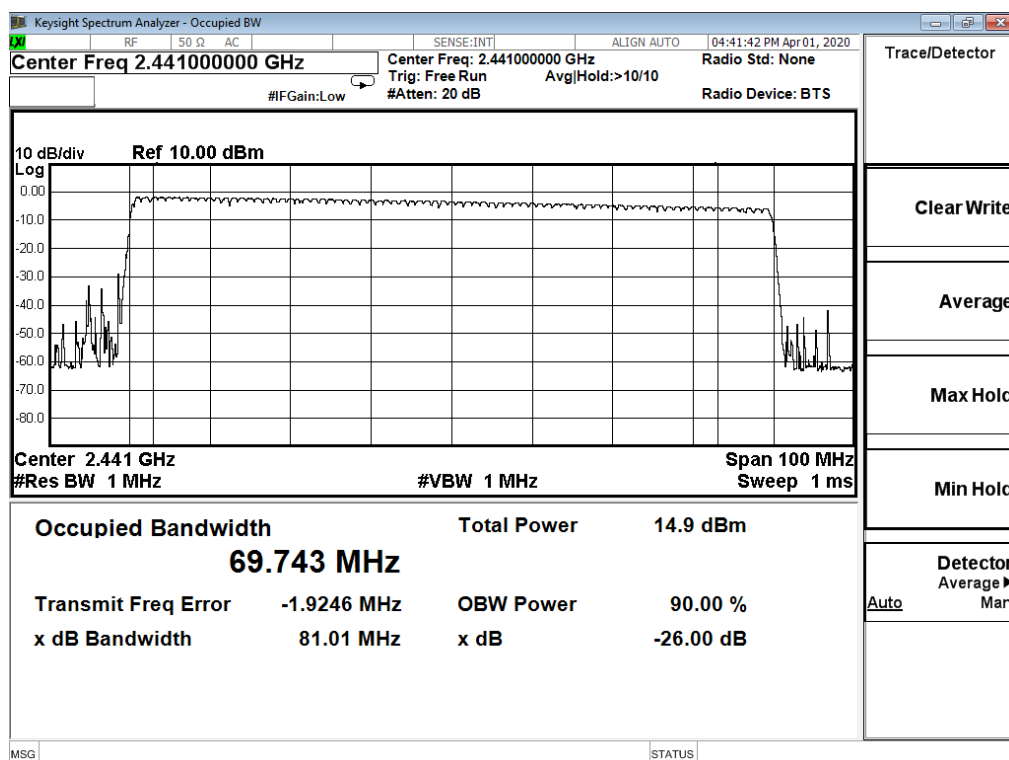
Note: Only record the worst result.

Temperature	22.5°C	Humidity	53.1%
Test Engineer	David Luo	Test Voltage	Low Voltage

Mode	CH	Result	Modulation Rate	Spread Factor	Limit
		(MHz)	(MHz)		
Hopping (1Mbps)	All	69.743	1.00	69.743	$\geq 5$
Hopping (2Mbps)	All	69.613	2.00	34.807	$\geq 5$
Hopping (3Mbps)	All	69.653	3.00	23.218	$\geq 5$

### Test Plots of Worst case mode

Max Spread bandwidth for 1Mbps. Detail please refers to below plot.



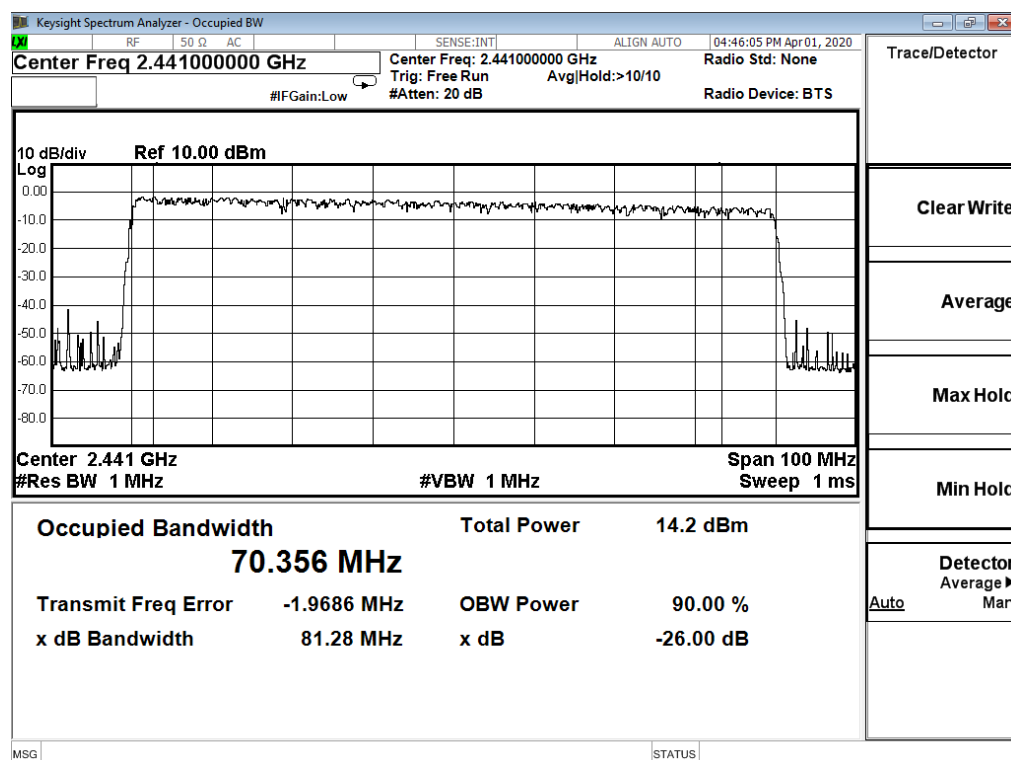
Note: Only record the worst result.

Temperature	22.5°C	Humidity	53.1%
Test Engineer	David Luo	Test Voltage	High Voltage

Mode	CH	Result	Modulation Rate	Spread Factor	Limit
		(MHz)	(MHz)		
Hopping (1Mbps)	All	69.863	1.00	69.863	$\geq 5$
Hopping (2Mbps)	All	70.356	2.00	35.178	$\geq 5$
Hopping (3Mbps)	All	69.881	3.00	23.294	$\geq 5$

### Test Plots of Worst case mode

Max Spread bandwidth for 2Mbps. Detail please refers to below plot.



Note: Only record the worst result.

## 5.5. Dwell Time

### 5.5.1. Standard Applicable

Frequency dwell time (time during which radio waves continue to be emitted at a specified frequency) of a transmitting equipment using the FH system shall be 0.4 seconds or less.

### 5.5.2. Test Procedures

- a. Set EUT work in test mode as described in clause 2.4.
- b. Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

Centre Frequency: The centre frequency of the channel under test.

Resolution BW: 1MHz.

Video BW: 1MHz.

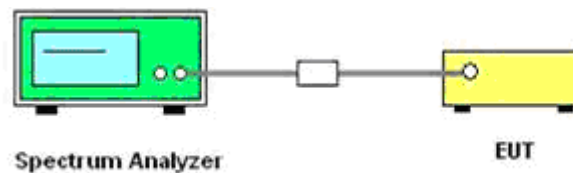
Span: Zero MHz

Detector: Peak.

Trace Mode: Max Hold.

- c. When the trace is complete, measure the sending time of 1 burst and the duty cycle of 1 burst cycle.

### 5.5.3. Test Setup Layout



### 5.5.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

### 5.5.5. Test Results

Worst test result of Low Channel for GFSK(1Mbps) Modulation								
Mode	Frequency	Hopping number	Spreading Bandwidth	On time (ms)	Cycle Time (ms)	Dwell time (second)	Limit (second)	result
1DH1	2441	79	69.863	0.378	1.284	0.1041	0.4	Pass
1DH3	2441	79	69.743	1.638	2.538	0.2279		
1DH5	2441	79	69.957	2.880	3.780	0.2699		

\*Note 1: \*Note 1: Dwell time= (0.4(s) x spreading rate x sending time of 1burst (s))/(burst cycle(s) x No. of hopping channel)

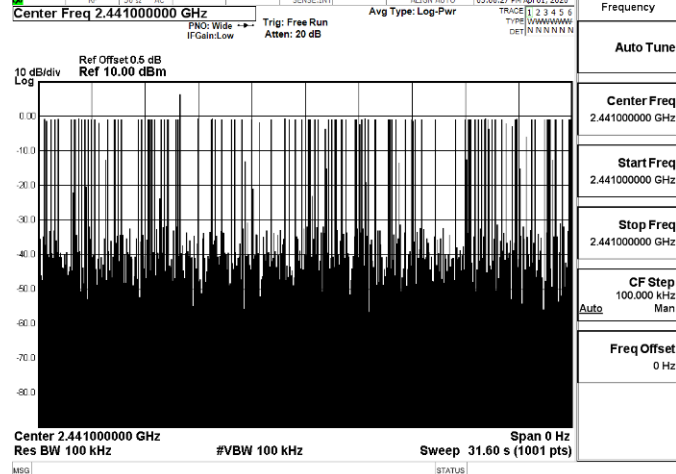
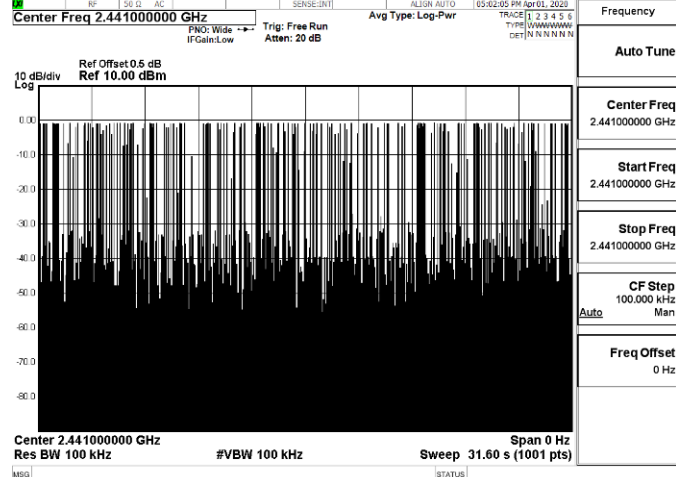
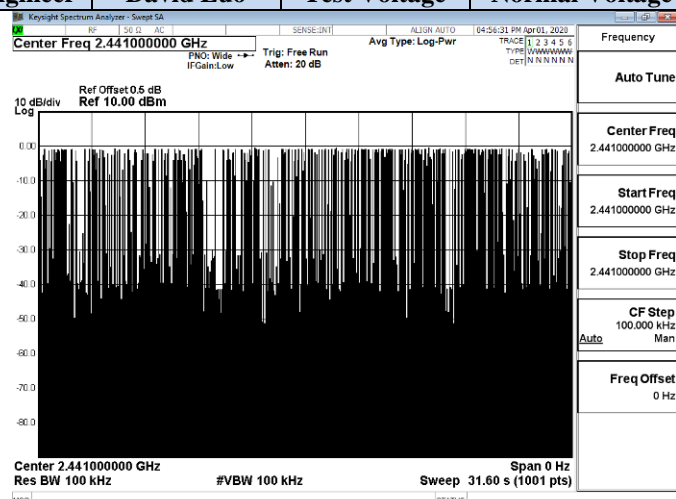
Spreading rate: Spreading Bandwidth/transmission rate

Note 2: Only record the worst result.

*The test data refer to the following:*



Temperature	22.5℃	Humidity	53.1%	Test Engineer	David Luo	Test Voltage	Normal Voltage
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## 5.6. Transmitter Spurious Emissions (conducted)

### 5.6.1. Standard Applicable

Permissible mean power of spurious emission of each frequency supplied to a feeder, that is, mean power of spurious emission in the 1 MHz bandwidth at frequency  $f$  other than frequency band used shall be as follows:

- |   |                            |
|---|----------------------------|
| a. $30\text{MHz} \leq f \leq 1,000\text{MHz}$   | 0.25 $\mu\text{W}$ or less |
| b. $2,387\text{MHz} \leq f \leq 2,400\text{MHz}$ and $2,483.5\text{MHz} < f \leq 2,496.5\text{MHz}$ | 25 $\mu\text{W}$ or less   |
| c. $2,387\text{MHz} > f$ and $2,496.5\text{MHz} < f$  | 2.5 $\mu\text{W}$ or less  |

### 5.6.2. Test Procedures

- Set EUT work in test mode as described in clause 2.4.
- Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

Centre Frequency: The centre frequency of the channel under test.

Below 1GHz: RBW/VBW= 100 KHz/ 100KHz

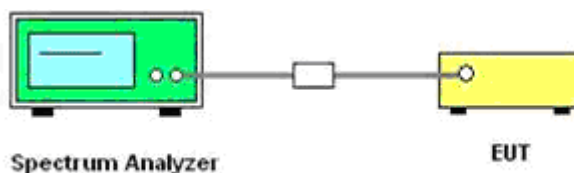
Above 1GHz: RBW/VBW= 1MHz / 1MHz.

Detector: Peak.

Trace Mode: Max Hold.

- All the emissions from 30MHz to 13GHz were measured and record.

### 5.6.3. Test Setup Layout



### 5.6.4. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

### 5.6.5. Test Results

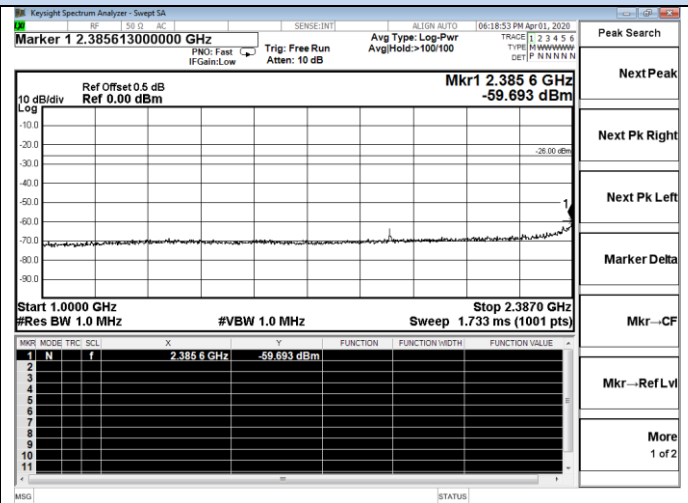
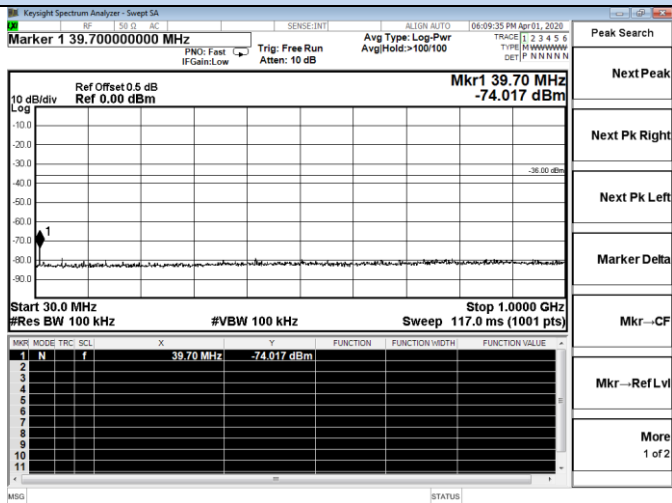
Pass.

\*\*\*Note: We found that TX by GFSK (1Mbps) modulation when input nominal voltage was the worst case through pre-scan, so this condition was recorded.

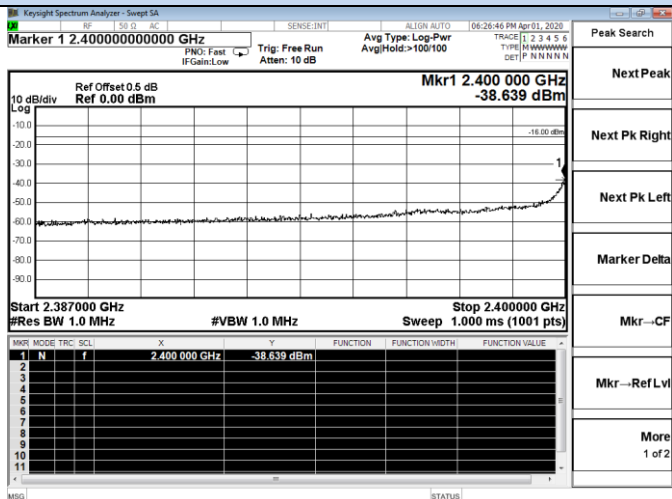
### Test Plot Of Transmitter Spurious Emissions (conducted)

Temperature 22.5°C Humidity 53.1% Test Engineer David Luo Test Voltage Normal Voltage

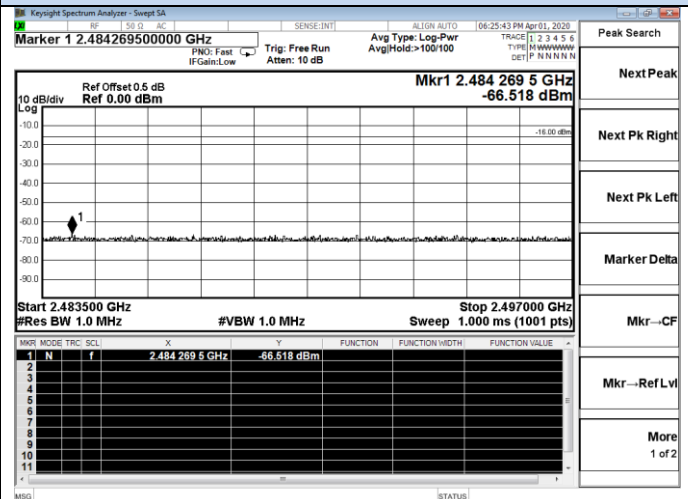
#### TX CH1



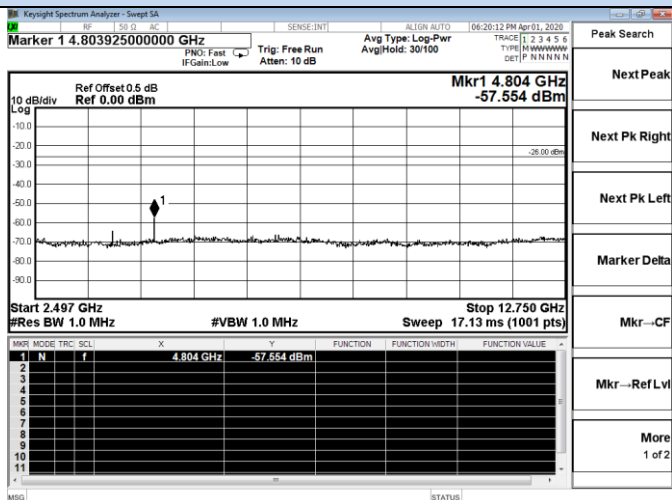
#### 30MHz-1000MHz



#### 1000MHz-2387MHz



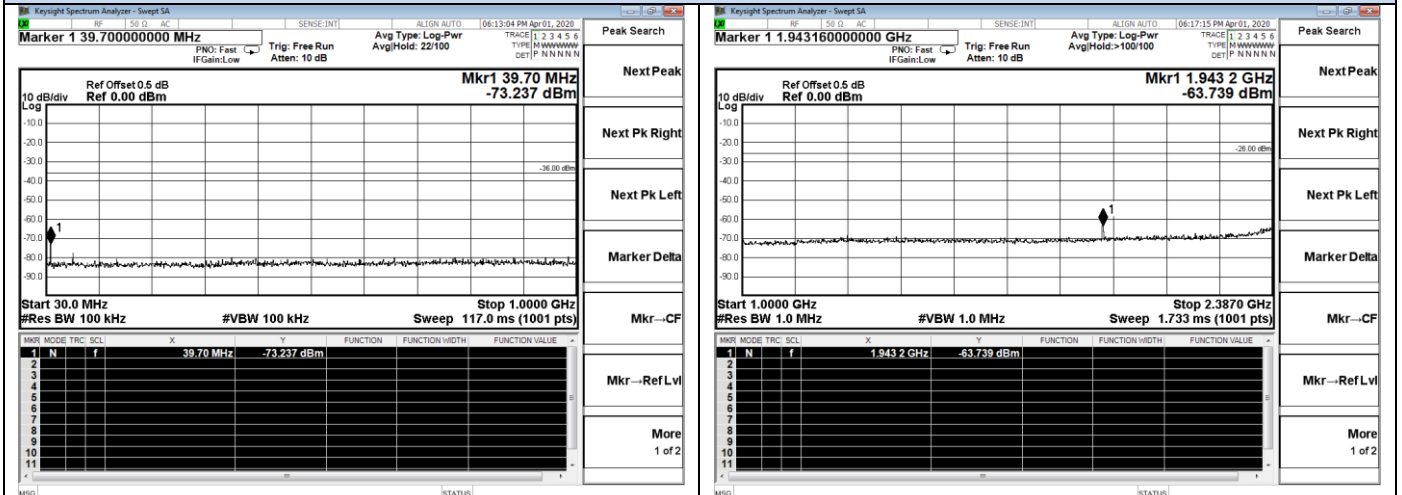
#### 2387MHz-2400MHz



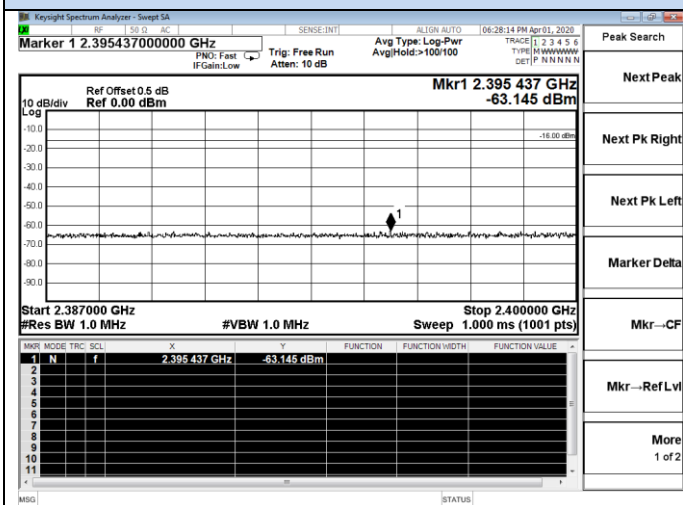
#### 2483.5MHz-2497MHz

#### 2497MHz-12.75GHz

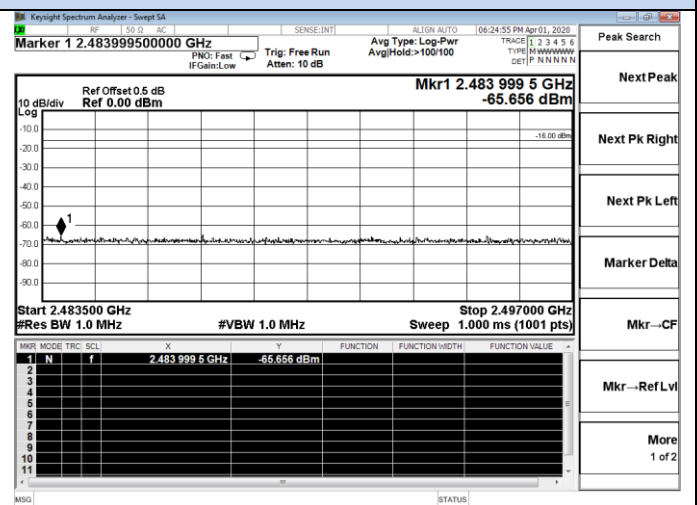
## TX CH40



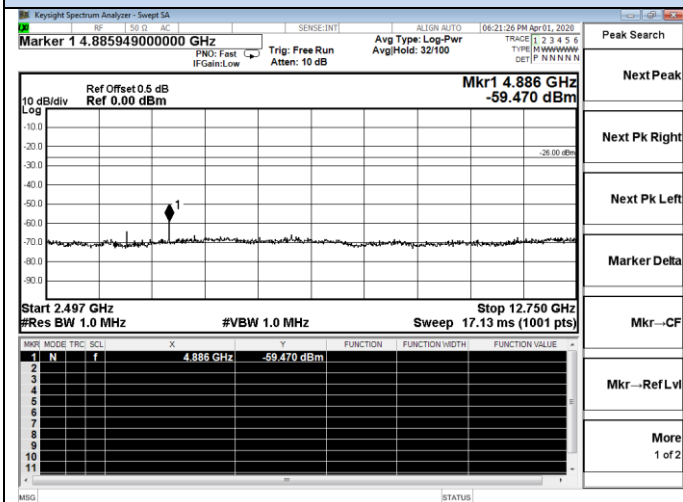
## 30MHz-1000MHz



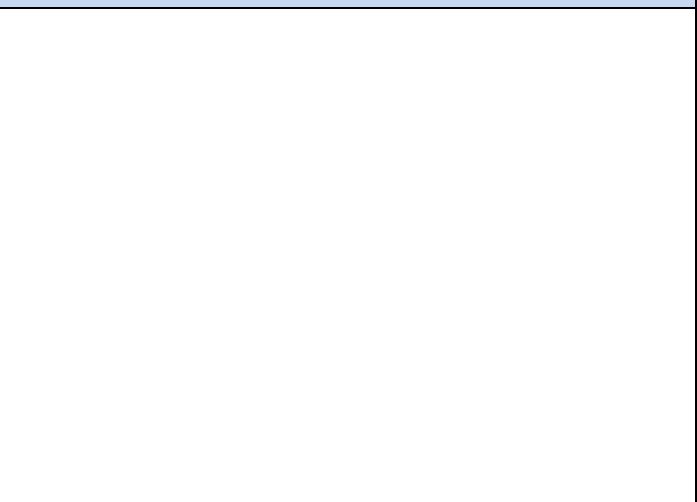
## 1000MHz-2387MHz



## 2387MHz-2400MHz

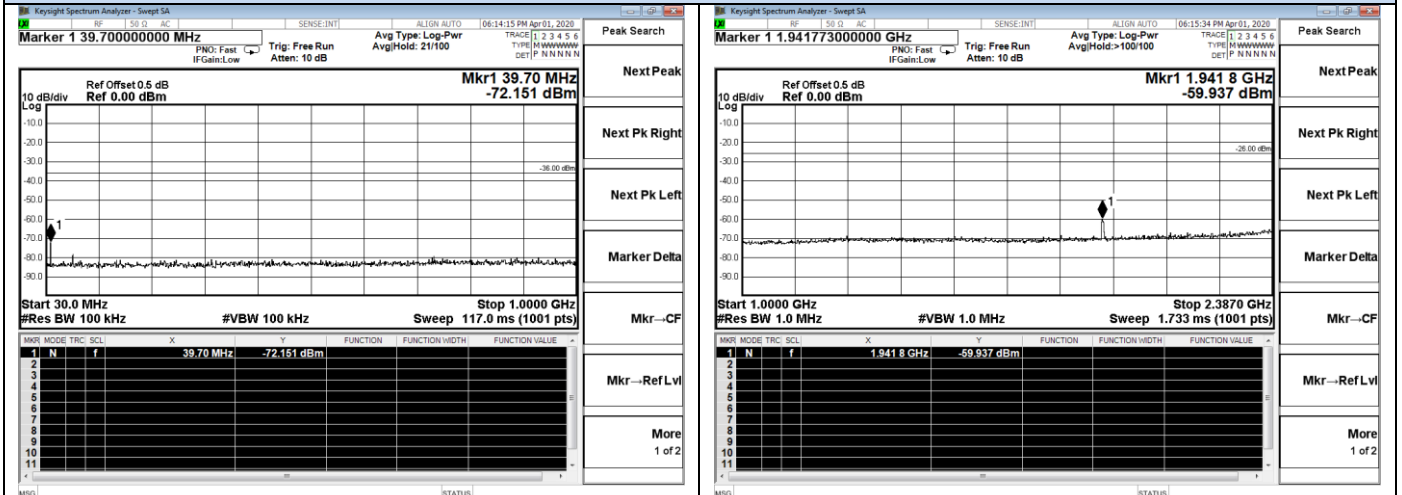


## 2483.5MHz-2497MHz

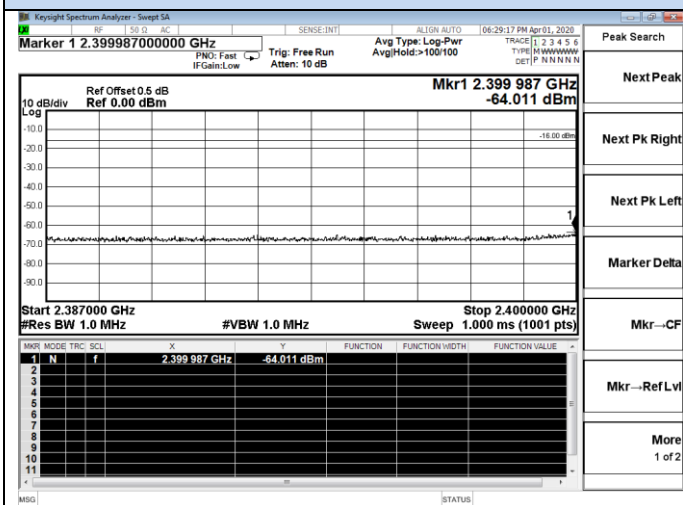


## 2497MHz-12.75GHz

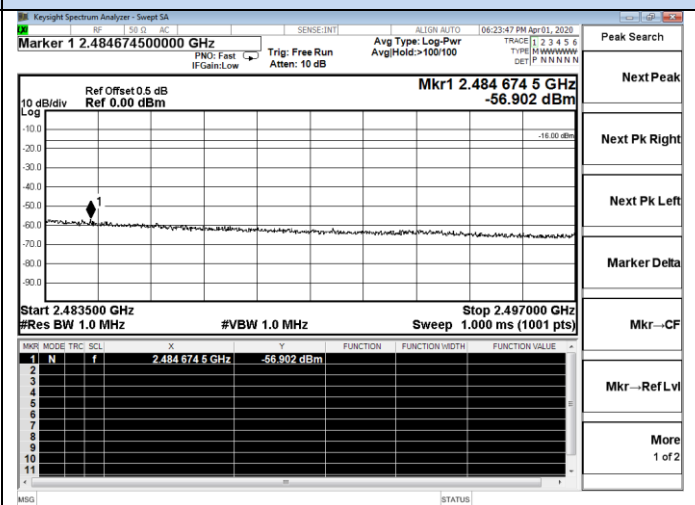
## TX CH79



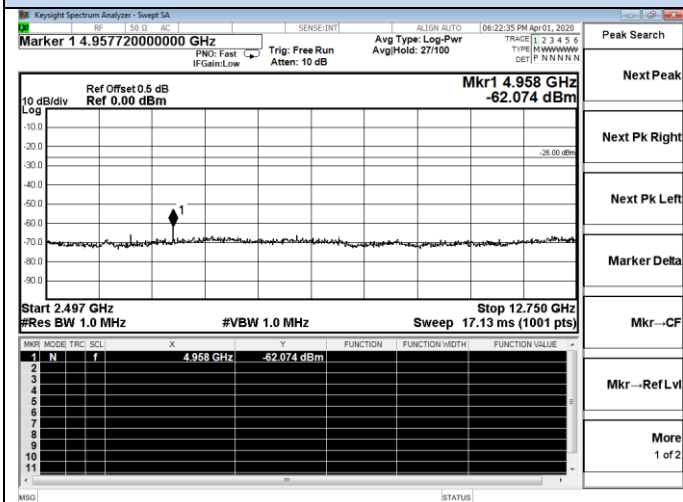
## 30MHz-1000MHz



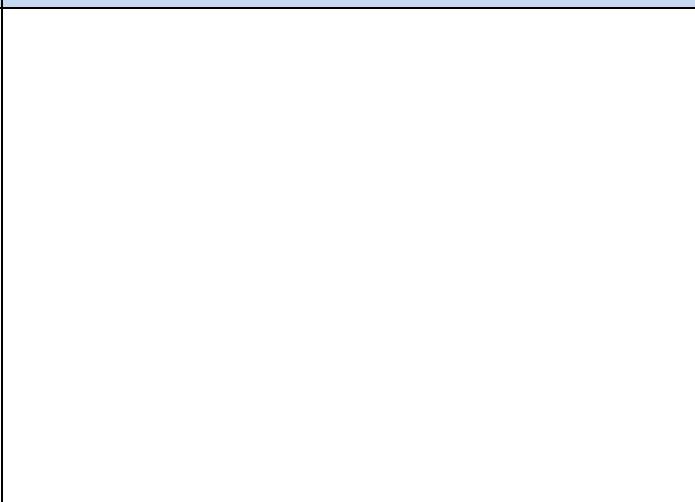
## 1000MHz-2387MHz



## 2387MHz-2400MHz



## 2483.5MHz-2497MHz



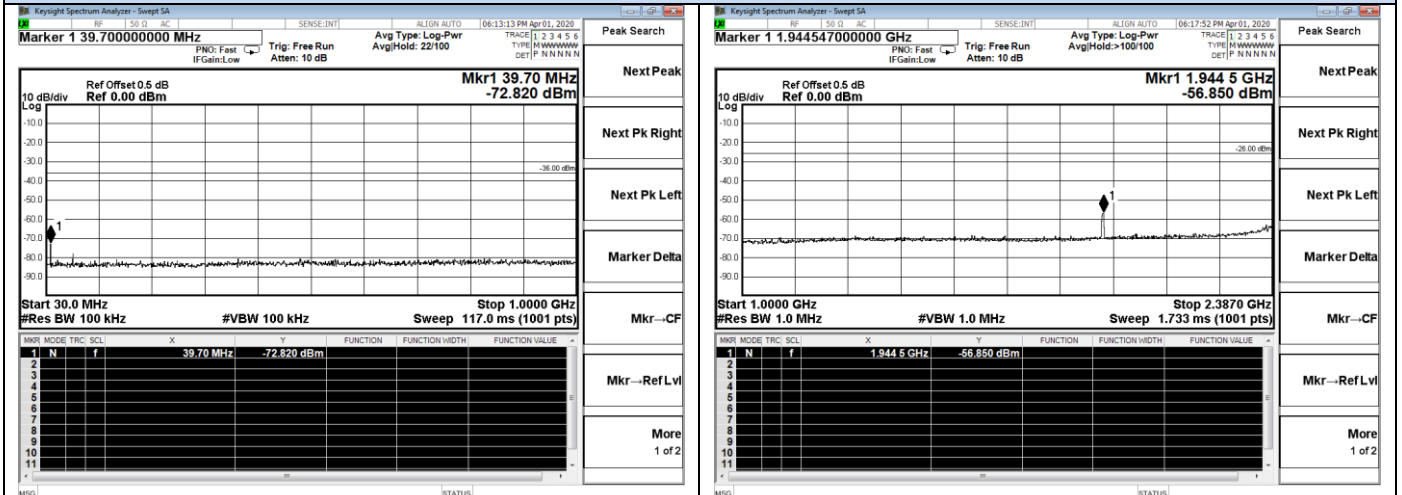
## 2497MHz-12.75GHz

\*\*\*Note: We found that TX by GFSK (1Mbps) modulation when input 90% nominal voltage was the worst case through pre-scan, so this condition was recorded.

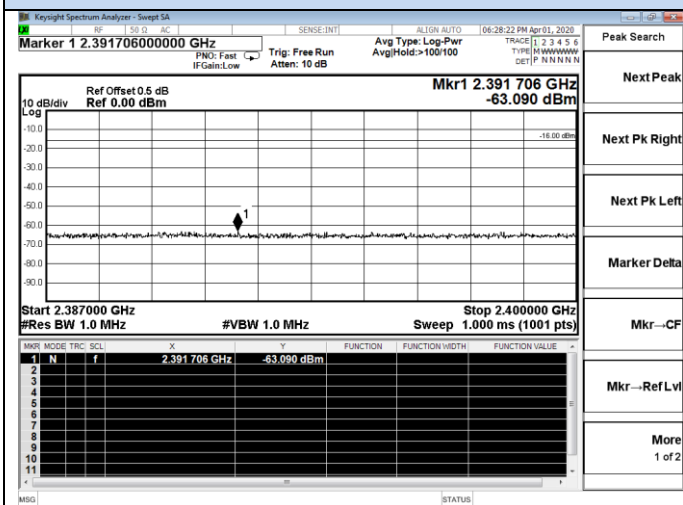
### Test Plot Of Transmitter Spurious Emissions (conducted)



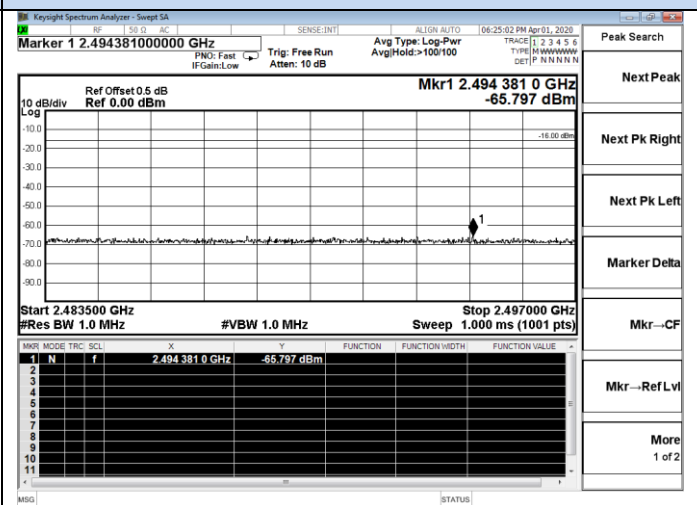
## TX CH40



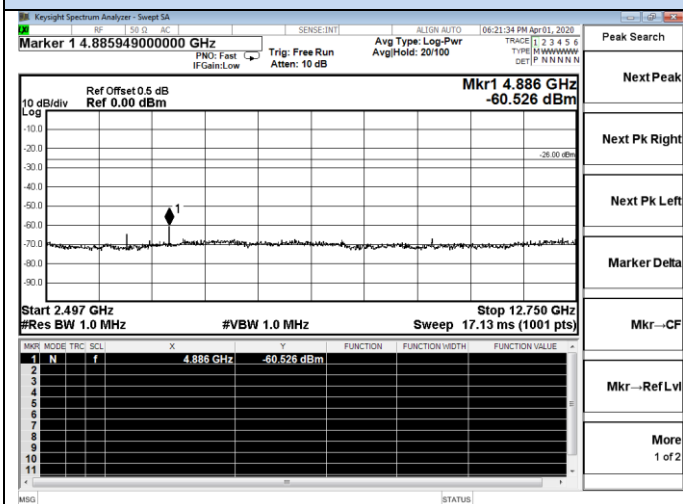
## 30MHz-1000MHz



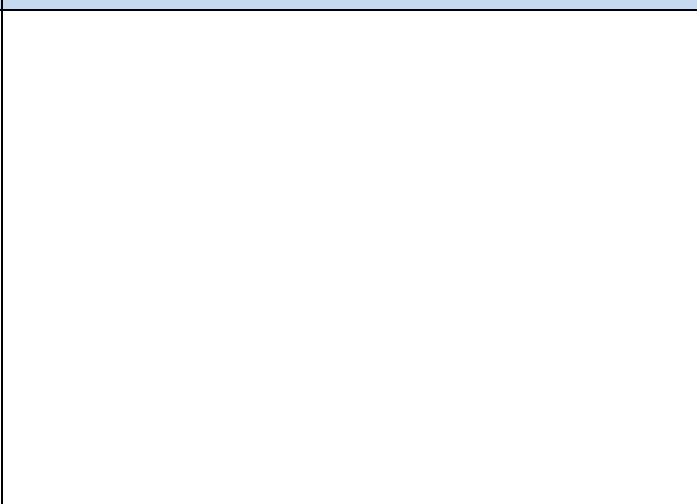
## 1000MHz-2387MHz



## 2387MHz-2400MHz

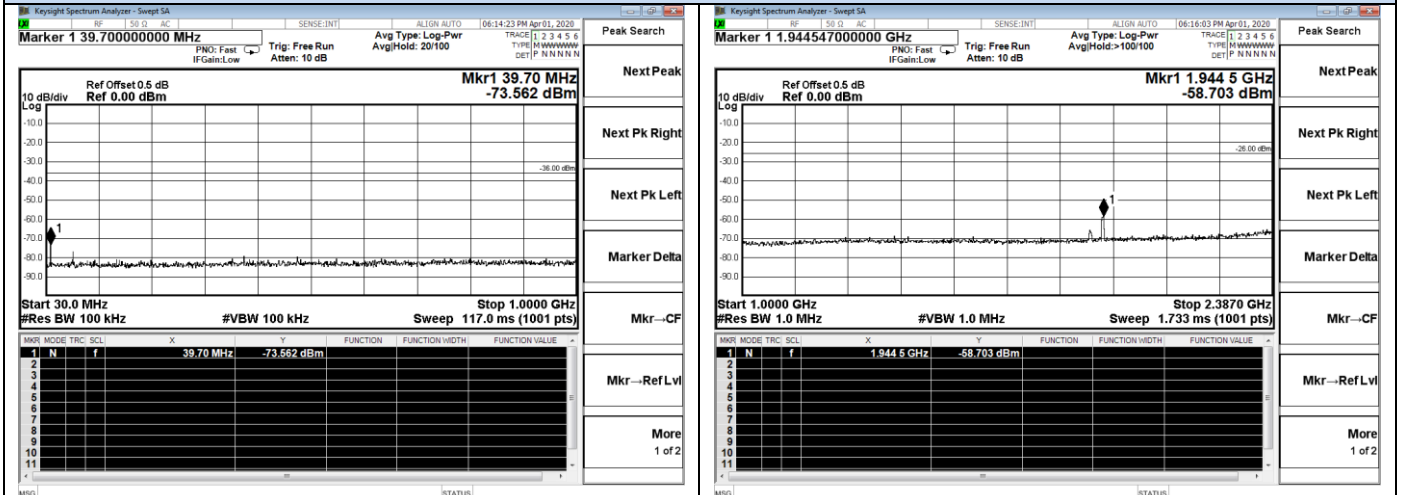


## 2483.5MHz-2497MHz

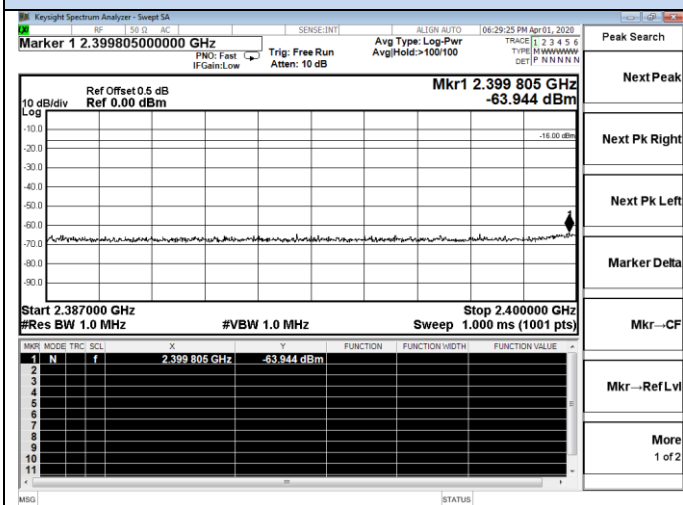


## 2497MHz-12.75GHz

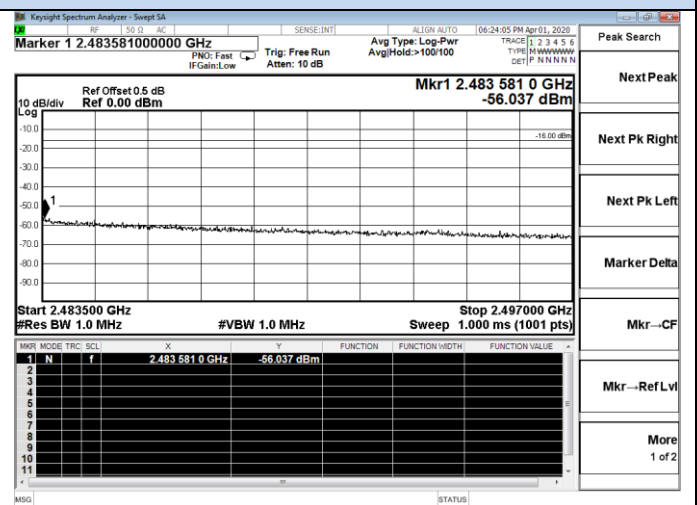
## TX CH79



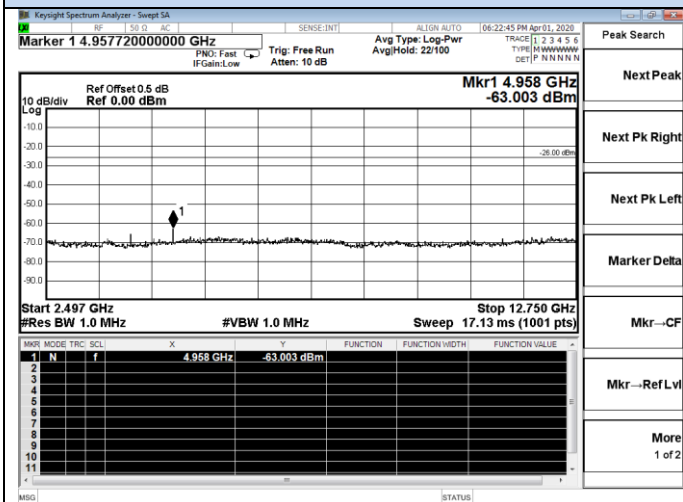
## 30MHz-1000MHz



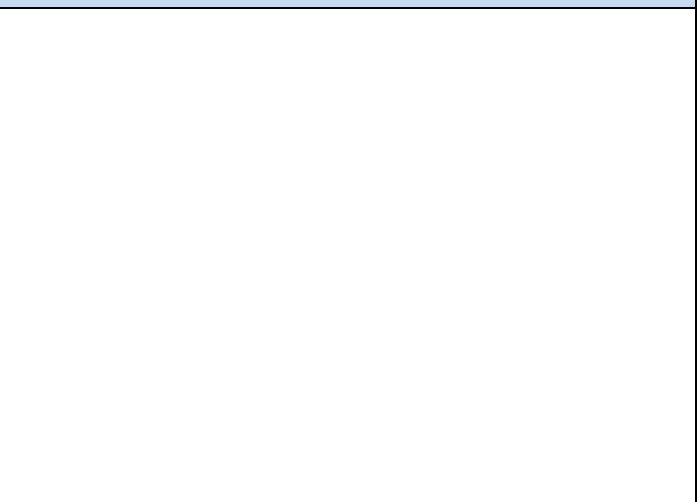
## 1000MHz-2387MHz



## 2387MHz-2400MHz



## 2483.5MHz-2497MHz



## 2497MHz-12.75GHz

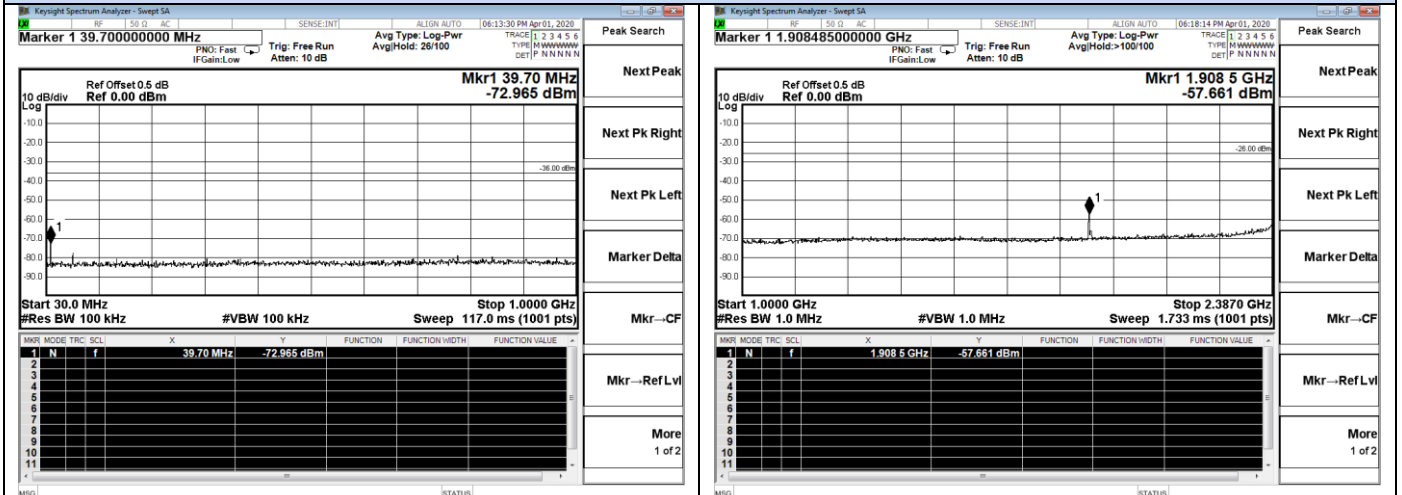


\*\*\*Note: We found that TX by GFSK (1Mbps) modulation when input 110% nominal voltage was the worst case through pre-scan, so this condition was recorded.

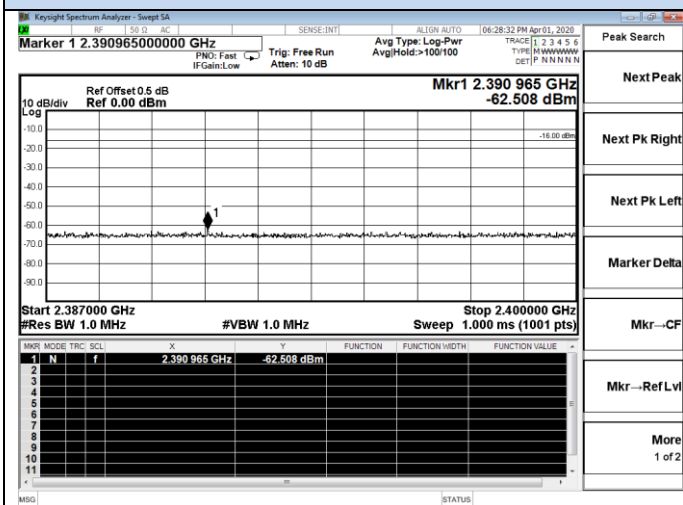
### Test Plot Of Transmitter Spurious Emissions (conducted)



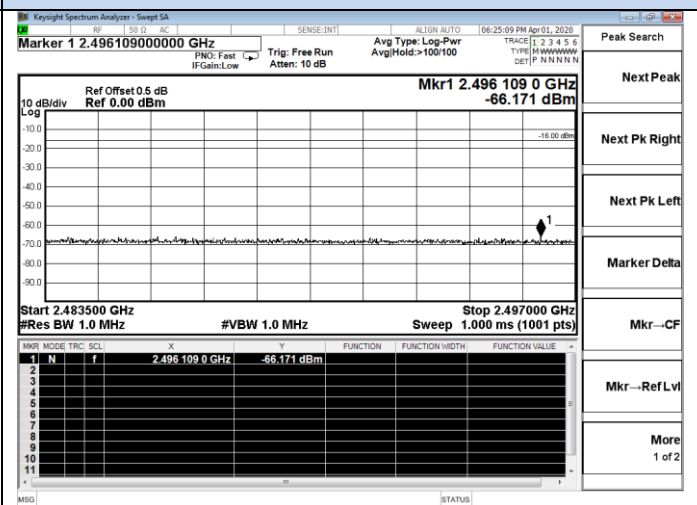
## TX CH40



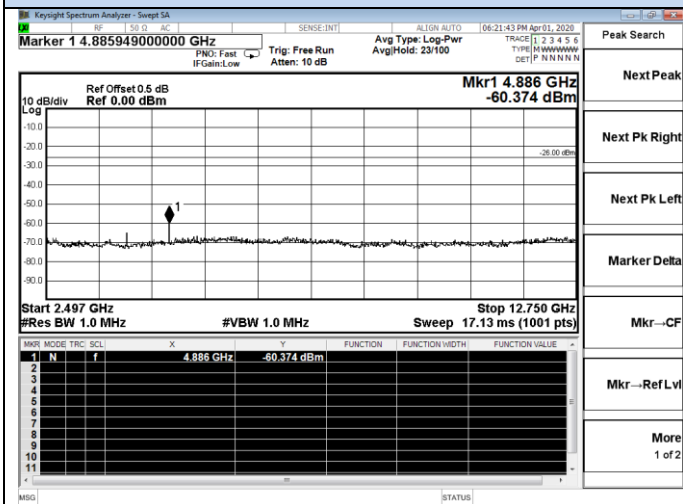
## 30MHz-1000MHz



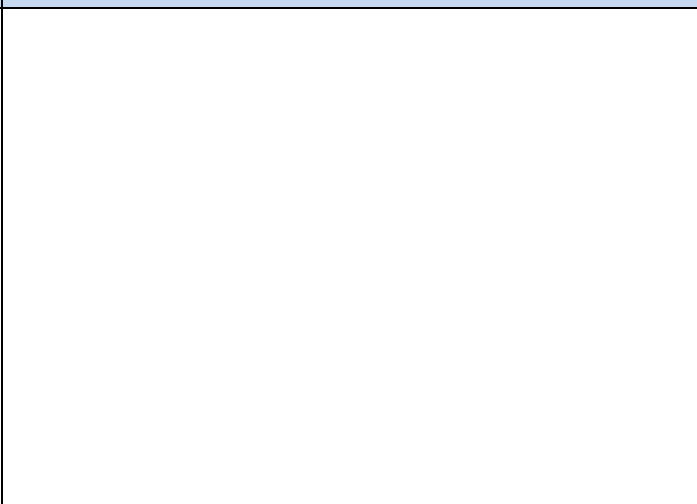
## 1000MHz-2387MHz



## 2387MHz-2400MHz

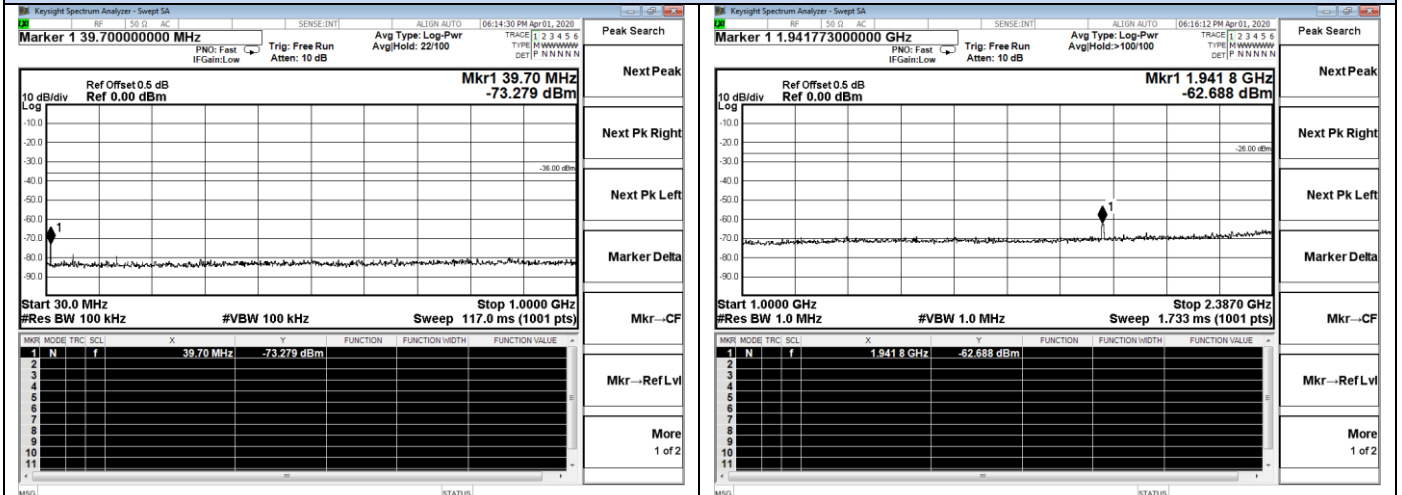


## 2483.5MHz-2497MHz

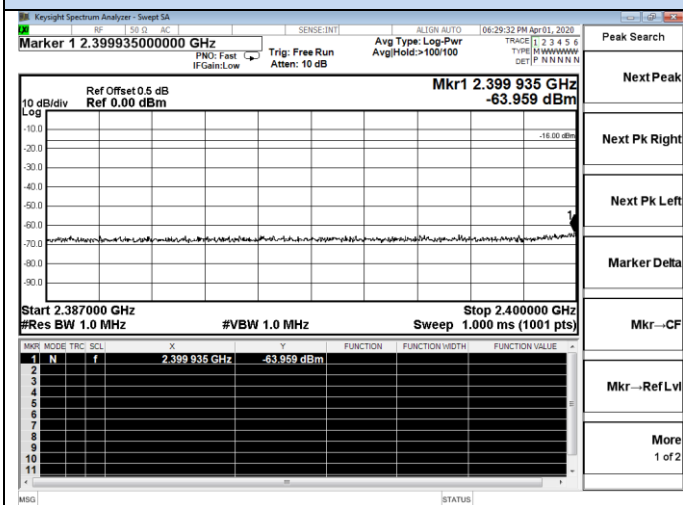


## 2497MHz-12.75GHz

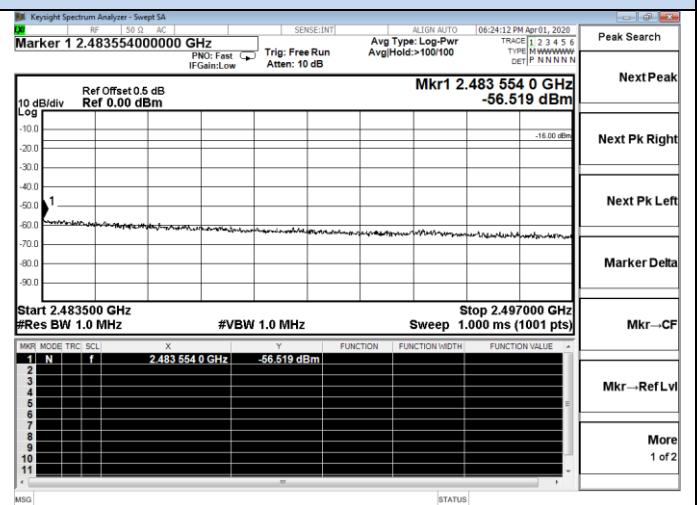
## TX CH79



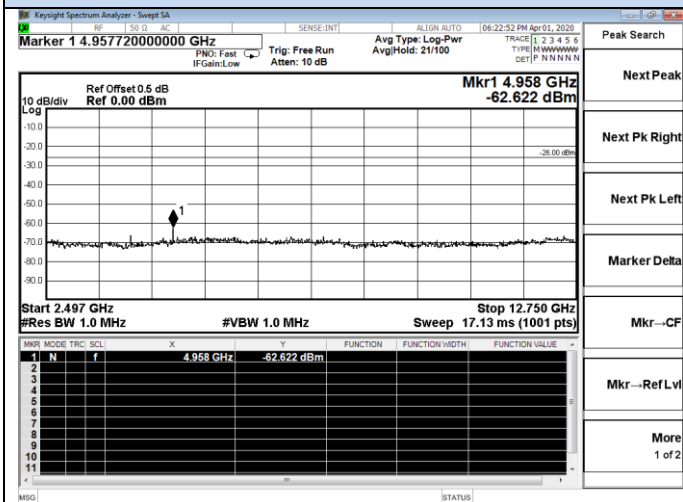
## 30MHz-1000MHz



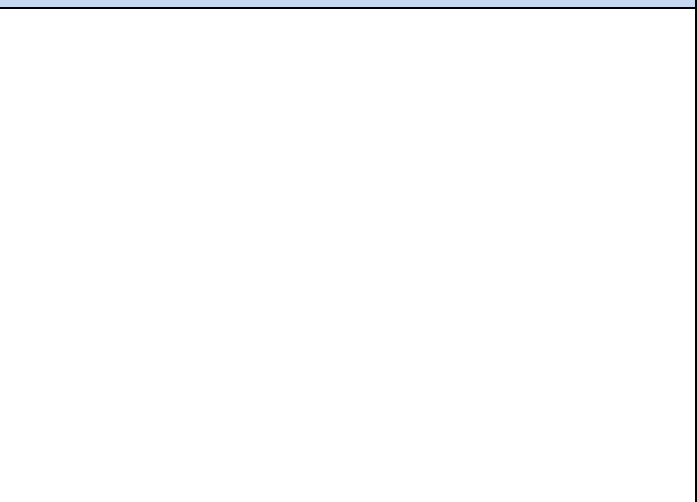
## 1000MHz-2387MHz



## 2387MHz-2400MHz



## 2483.5MHz-2497MHz



## 2497MHz-12.75GHz

## 5.7. Carrier sensing function

### 5.7.1. Standard Applicable

Item	Limits
Carrier Sense	Good - EUT stop RF transmission signal after carrier inject to EUT. (On $22.79 + Gr - 20 \cdot \log(f)$ [dBm] (Gr: dBi; f: MHz) or 100mV/m)

### 5.7.2. Instruments Setting

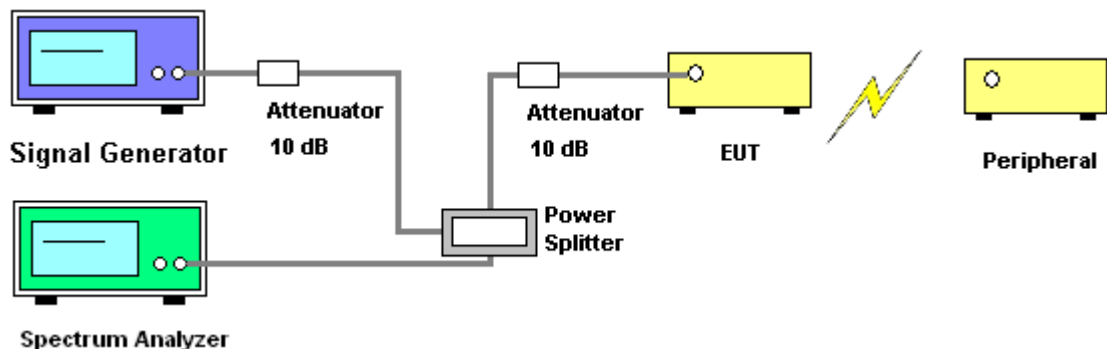
The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
RB / VB	1 MHz
Span	0 MHz
Sweep	Continuous
Detector	Peak
Trigger mode	Video

### 5.7.3. Test Procedures

1. SSG adjusted the frequency as same as the EUT transmitted signal and emitted the absence of modulation from SSG and power level is (On  $22.79 + Gr - 20 \cdot \log(f)$  [dBm] (Gr: dBi; f: MHz). Then turn off the RF signal of SSG.
2. EUT have transmitted the maximum modulation signal and fixed channelize.
3. Setting of SA is following as: RB: 1MHz / VB: 1MHz / SPAN: 50MHz / AT: 10dB / Ref: 0dBm / Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Positive peak.
4. SSG RF Signal On.
5. EUT shall be stop the transmitted any signal and SSG RF Signal Off. Then EUT will be continuous transmitted signal.

### 5.7.4. Test Setup Layout



### 5.7.5. EUT Operation during Test

The EUT was programmed to be in normal transmitting mode.

### 5.7.6. Test Result

Not Applicable.

## 5.8. Interference prevention function

### 5.8.1. Standard Applicable

Item	Limits
Identification code	$\geq$ 48 bits

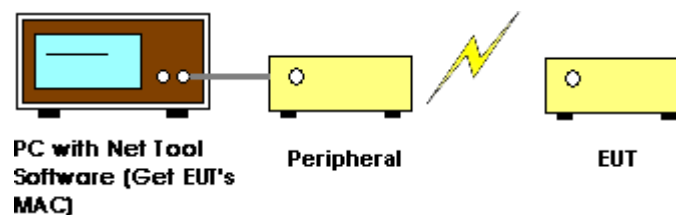
### 5.8.2. Measuring ID Code Software

PC with NetTool	Setting
MAC IP List	MAC Scan

### 5.8.3. Test Procedures

- In the case that the EUT has the function of automatically transmitting the identification code:
  - Transmit the predetermined identification codes from EUT.
  - Check the transmitted identification codes with the demodulator.
- In the case of receiving the identification code:
  - Transmit the predetermined identification codes from the counterpart.
  - Check if communication is normal.
  - Transmit the other signals than predetermined ID codes from the counterpart.
  - check if the EUT stops the transmission, or if it displays that identification codes are different from the predetermined ones.

### 5.8.4. Test Setup Layout



### 5.8.5. EUT Operation during Test

The EUT was programmed to be in normal transmitting mode.

### 5.8.6. Test Result

EUT ID	Performance index
60:ab:67:70:90:fc	Good

## 5.9. Secondary Radiated Emissions

### 5.9.1. Standard Applicable

The limit on secondary emissions radiated from the receiving equipment within which the function of other radio equipment will not be impaired shall be, in terms of the power of a dummy antenna circuit that has the same electrical constant as the receiving antenna, 4nW or less at a frequency below 1 GHz and 20nW or less at a frequency of 1 GHz or higher as measured using the circuit

### 5.9.2. Test Procedures

- a. Set EUT work in test mode as described in clause 2.4.
- b. Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

Resolution BW: 100 KHz for frequency below 1GHz and

1MHz for frequency above 1GHz

Video BW: 100 KHz for frequency below 1GHz and

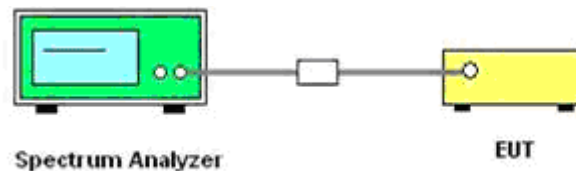
1MHz for frequency above 1GHz

Detector: Peak.

Trace Mode: Max Hold.

- c. All the emissions from 30MHz to 13GHz were measured and record.

### 5.9.3. Test Setup



### 5.9.4. EUT Operation during Test

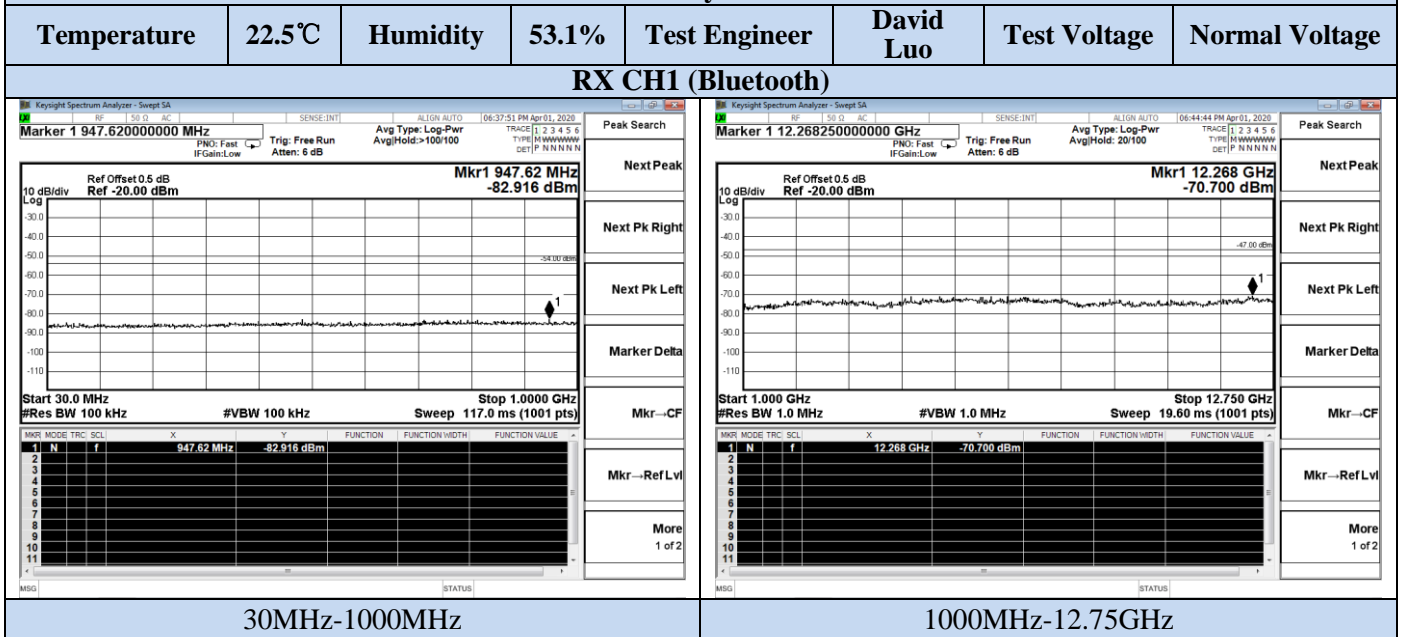
The EUT was programmed to be in continuously transmitting mode.

### 5.9.5. Test Results

Pass.

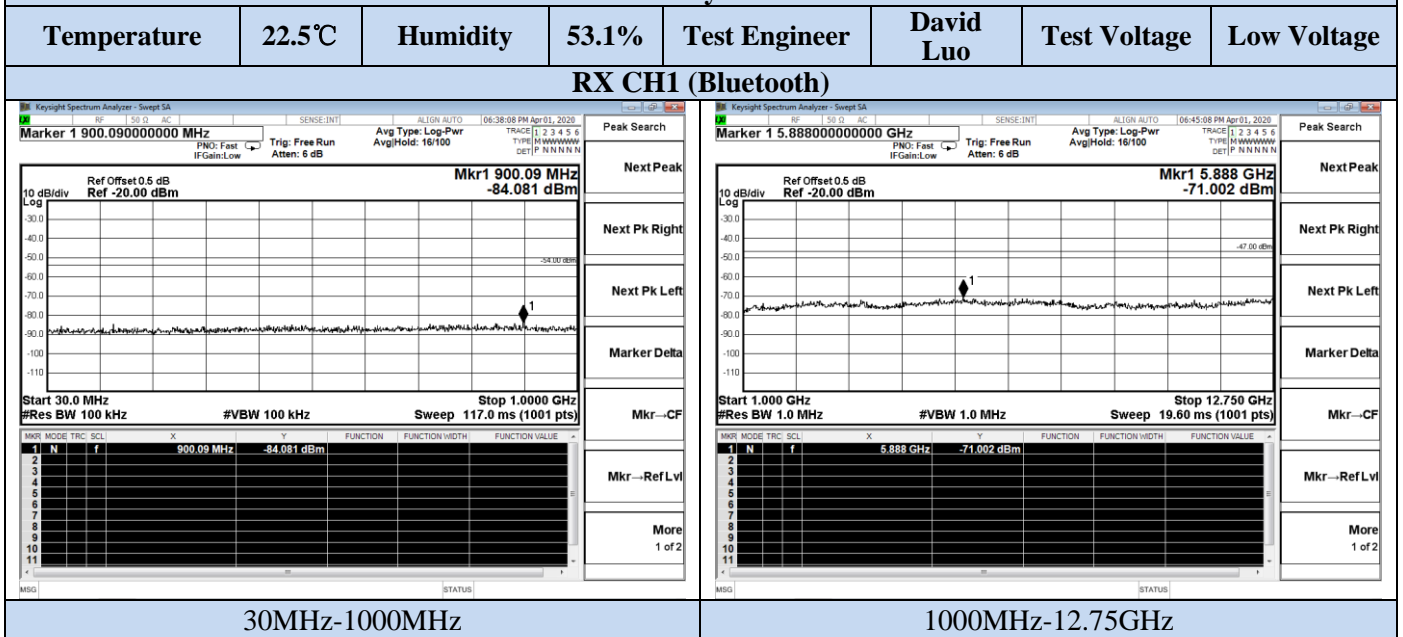
\*\*\*Note: We found that RX (Low Channel) when input nominal voltage was the worst case through pre-scan, so this condition was recorded.

## Test Plot Of Secondary Radiated Emissions



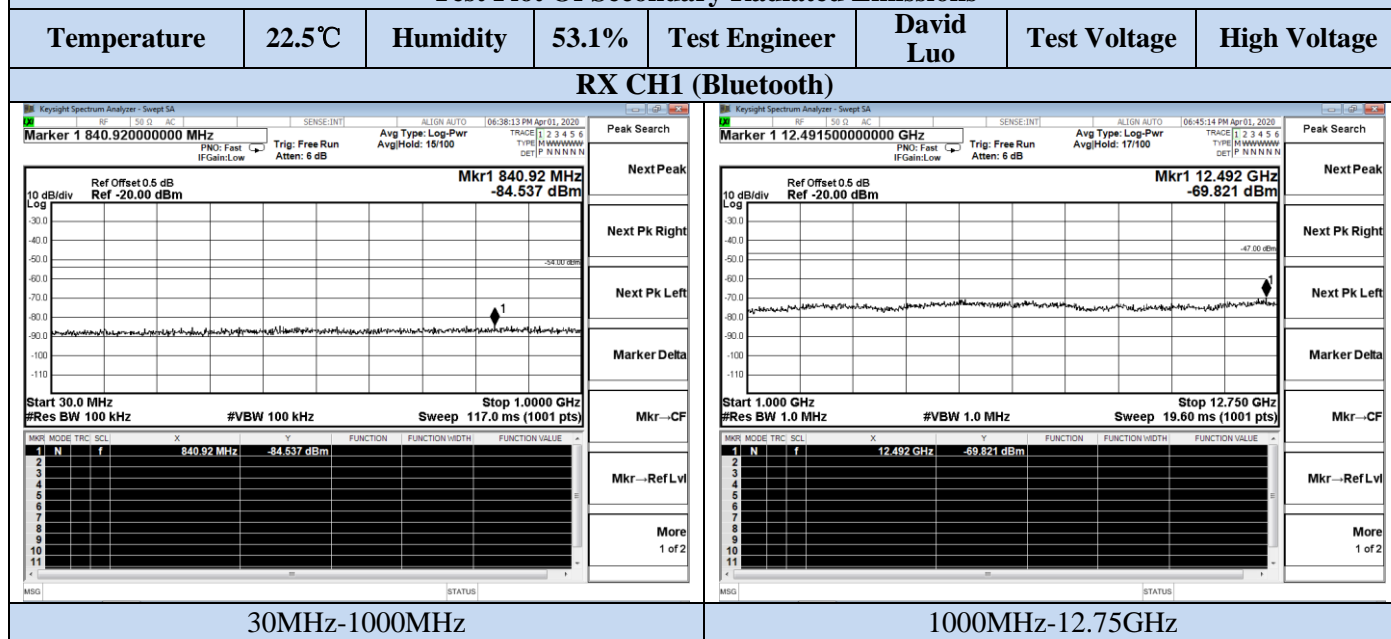
\*\*\*Note: We found that RX (Low Channel) when input 90% nominal voltage was the worst case through pre-scan, so this condition was recorded.

## Test Plot Of Secondary Radiated Emissions



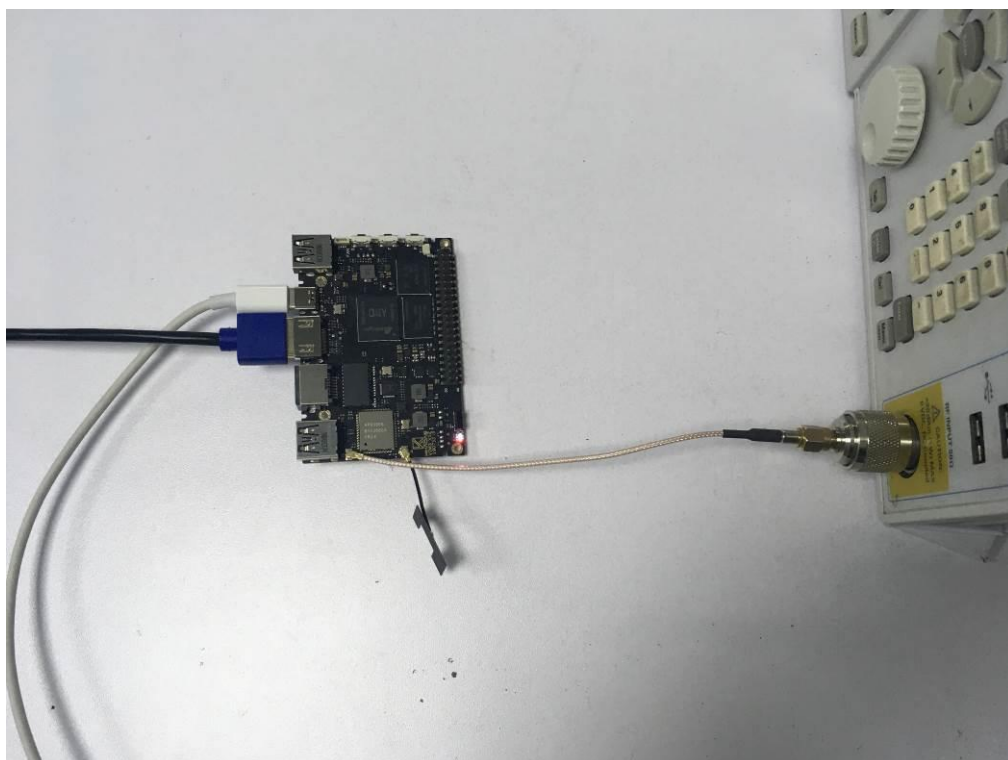
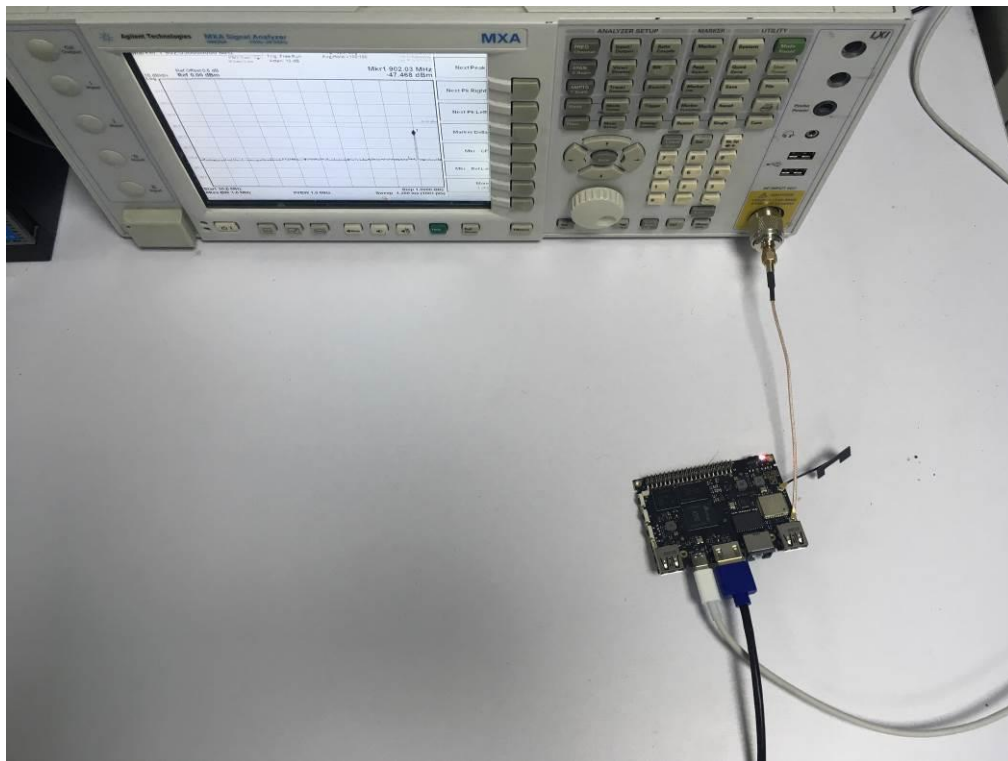
\*\*\*Note: We found that RX (Low Channel) when input 110% nominal voltage was the worst case through pre-scan, so this condition was recorded.

## Test Plot Of Secondary Radiated Emissions





## 6. PHOTOGRAPHS OF TEST SETUP



Note: The RF cable is 50 ohm.

## 7. EXTERNAL PHOTOGRAPHS OF THE EUT

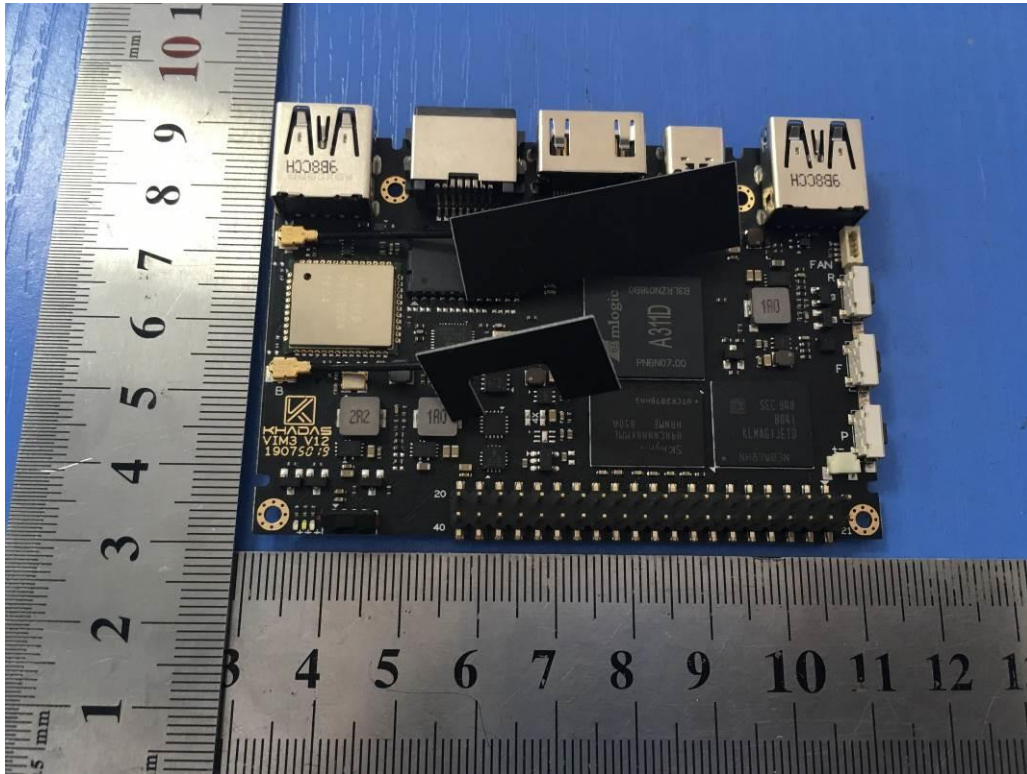


Fig. 1

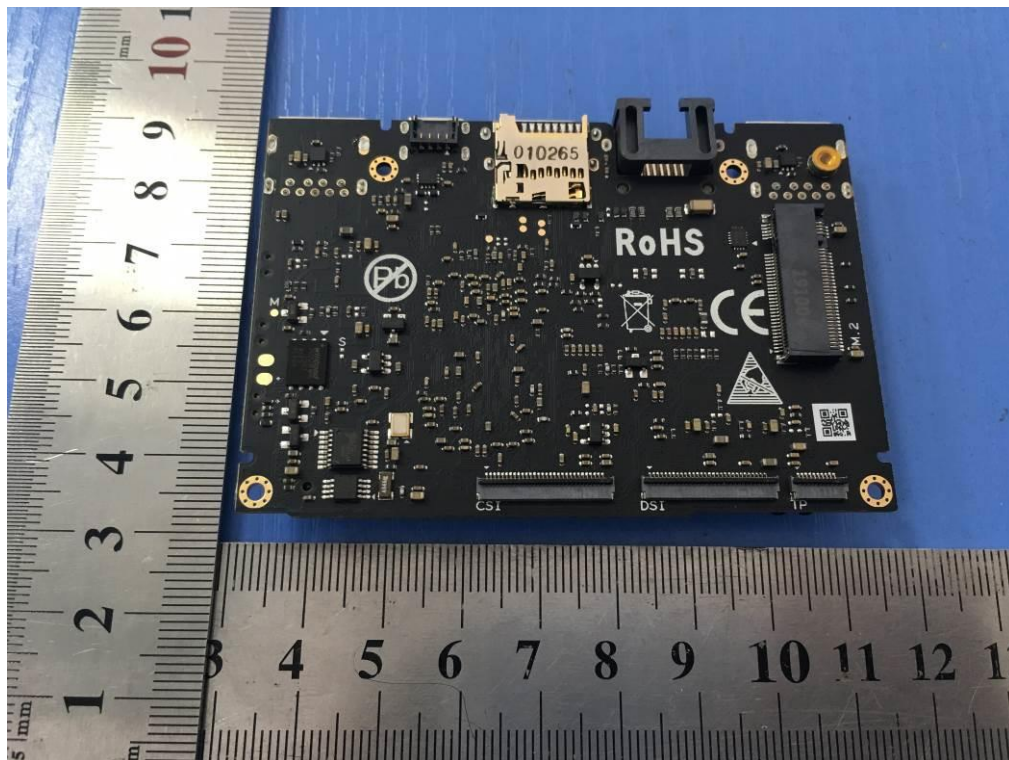


Fig. 2

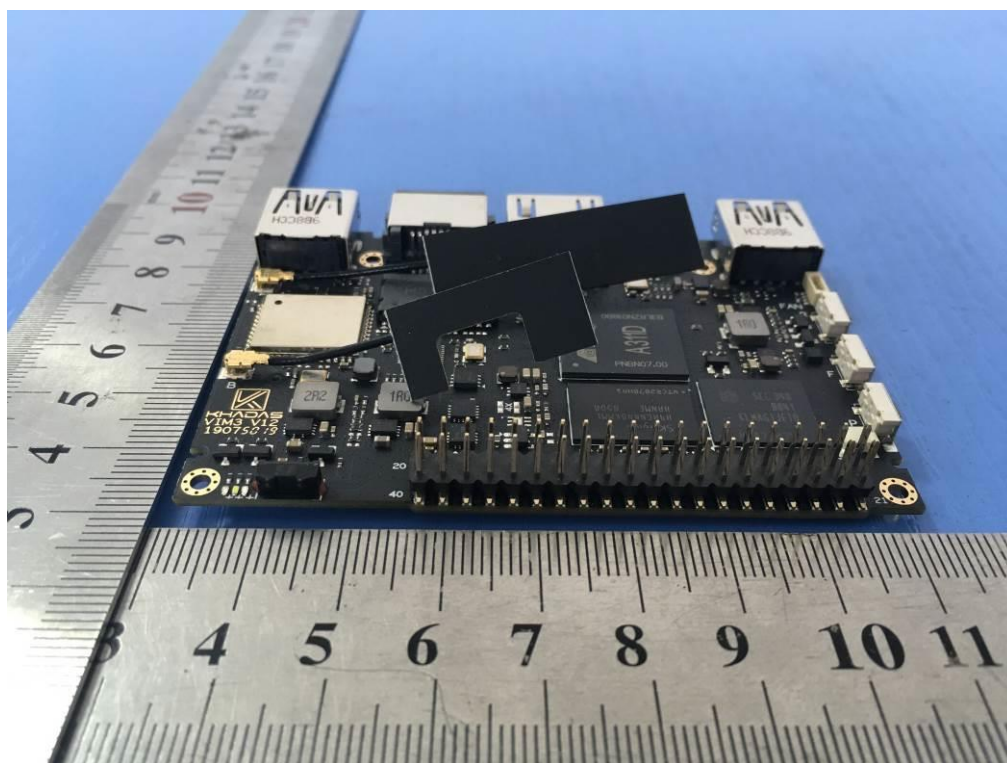


Fig. 3



Fig. 4



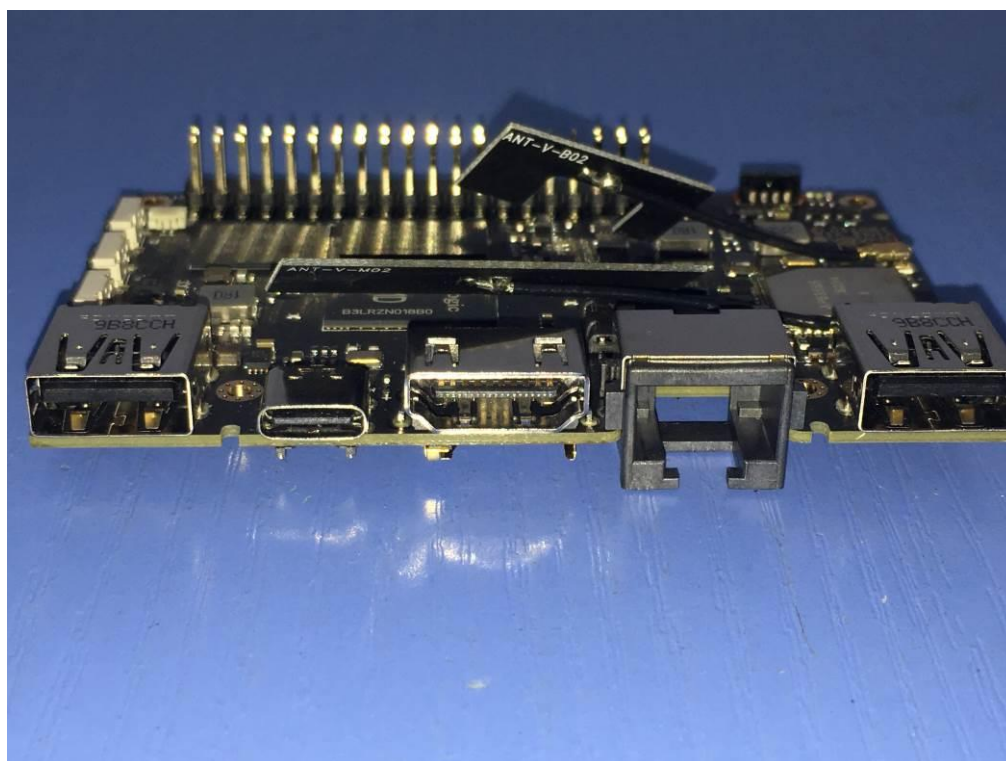


Fig. 5

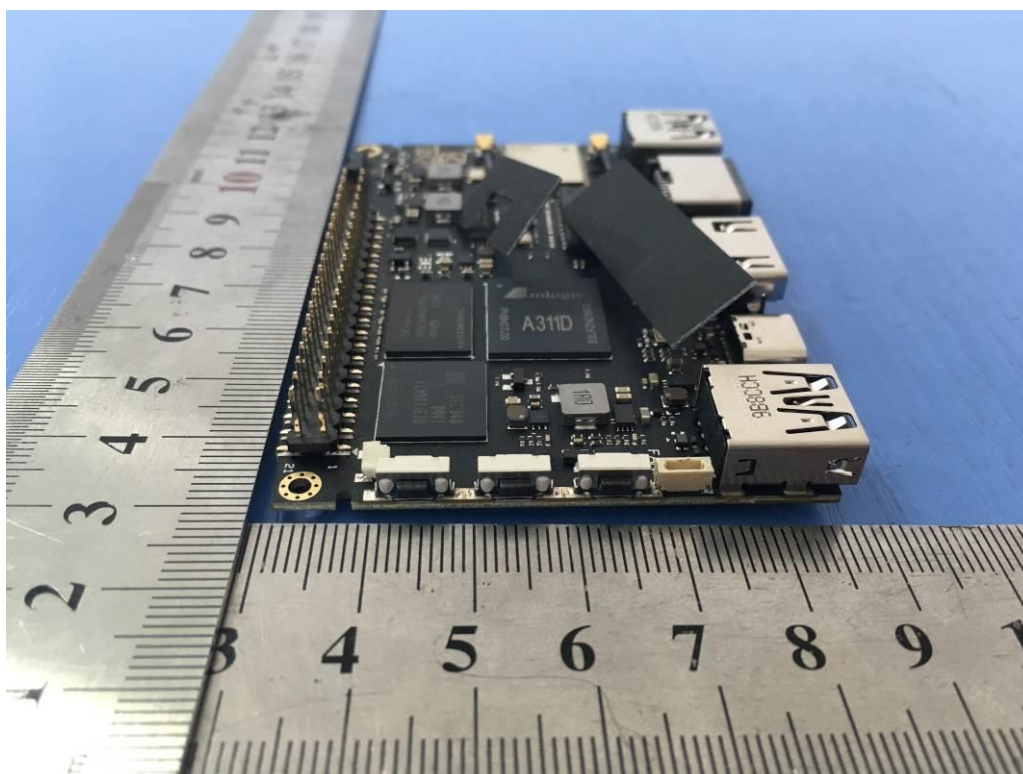


Fig. 6



Fig. 7



## 8. INTERNAL PHOTOGRAPHS OF THE EUT

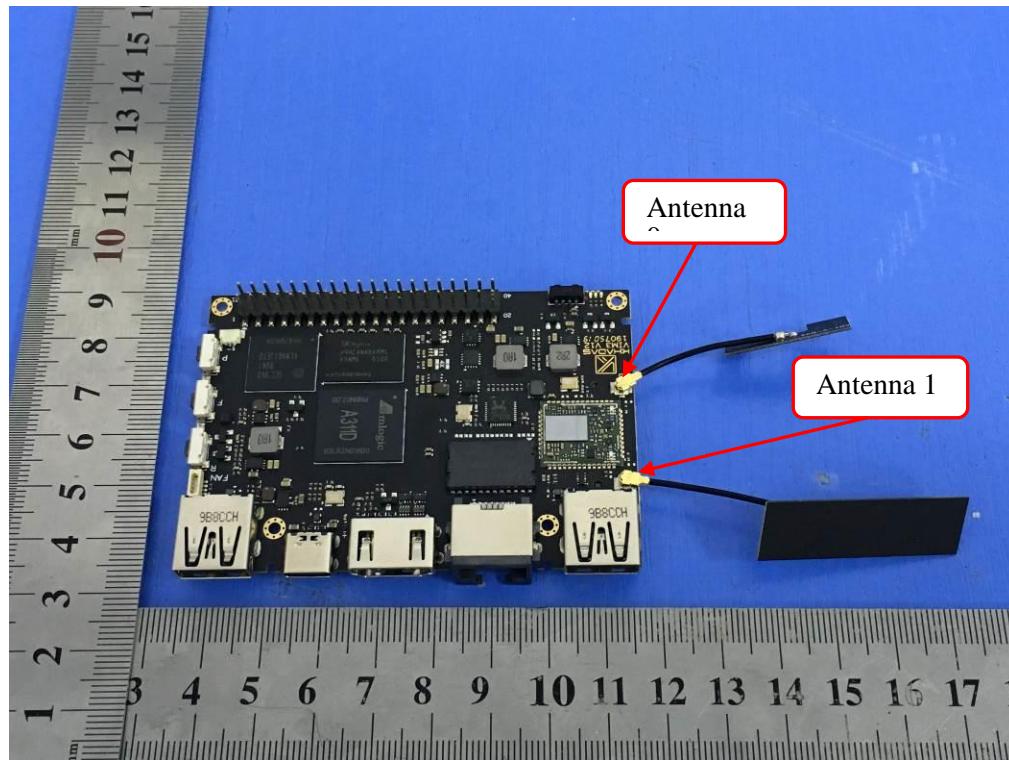


Fig.1

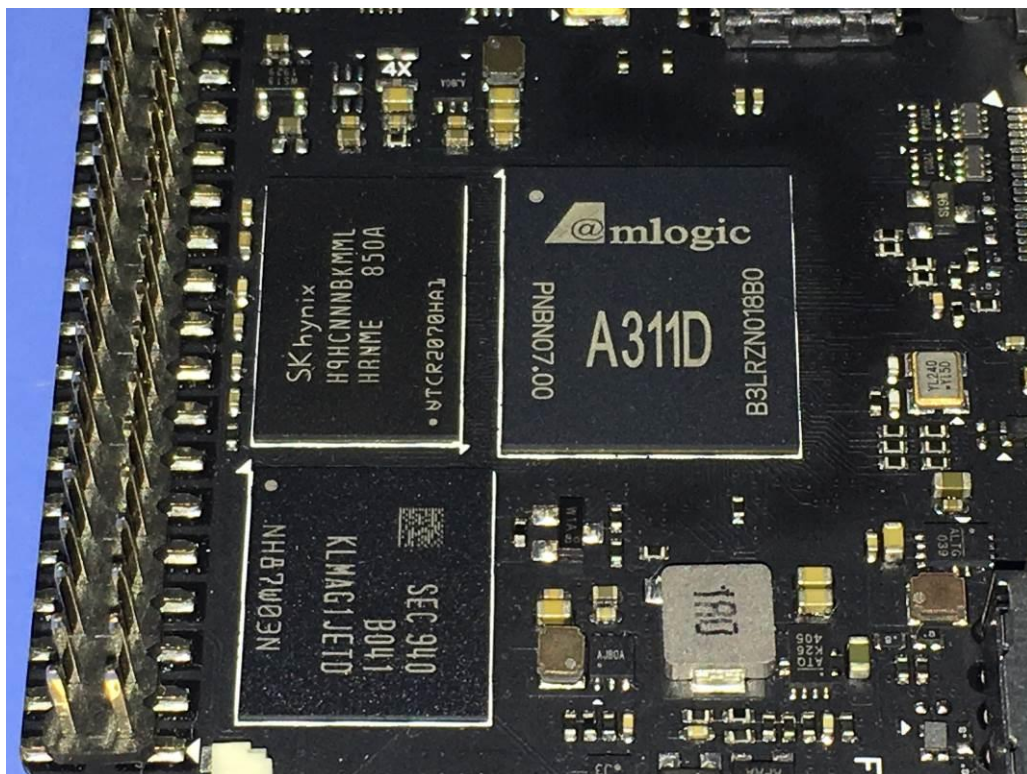


Fig.2

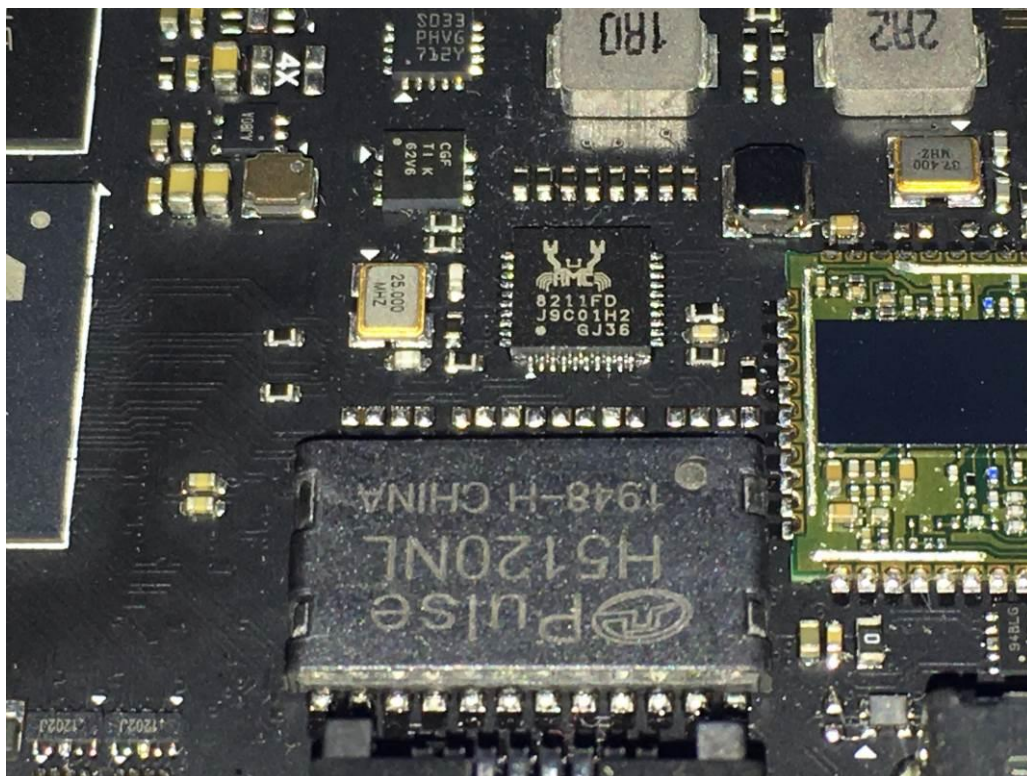


Fig.3

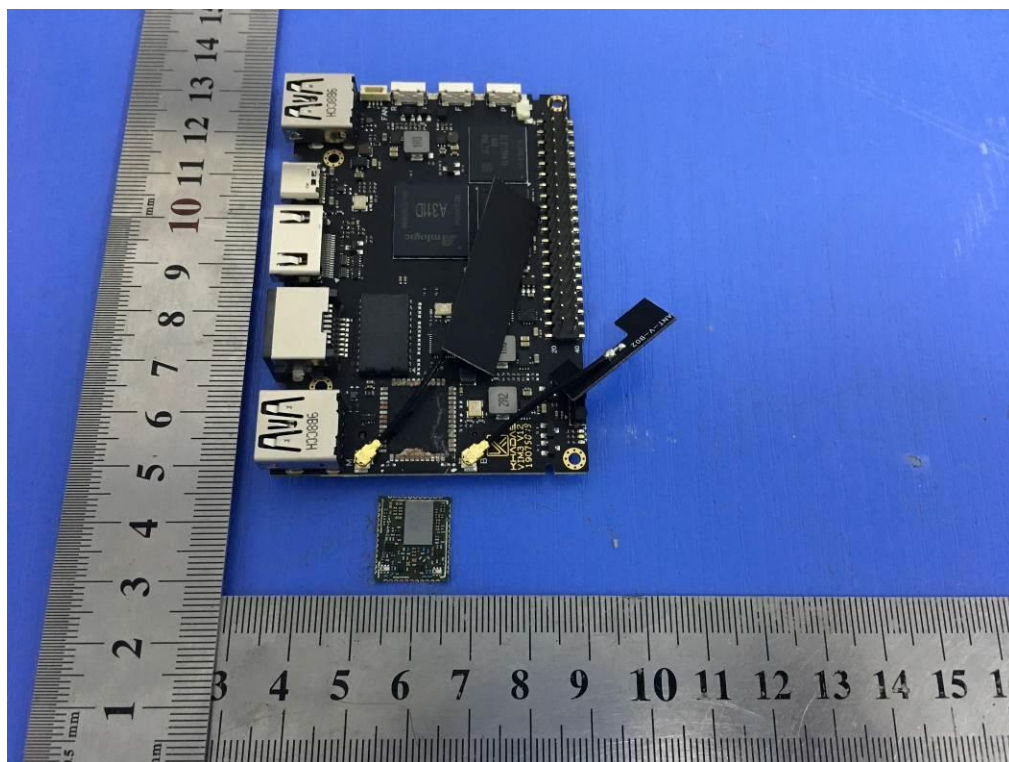


Fig.4



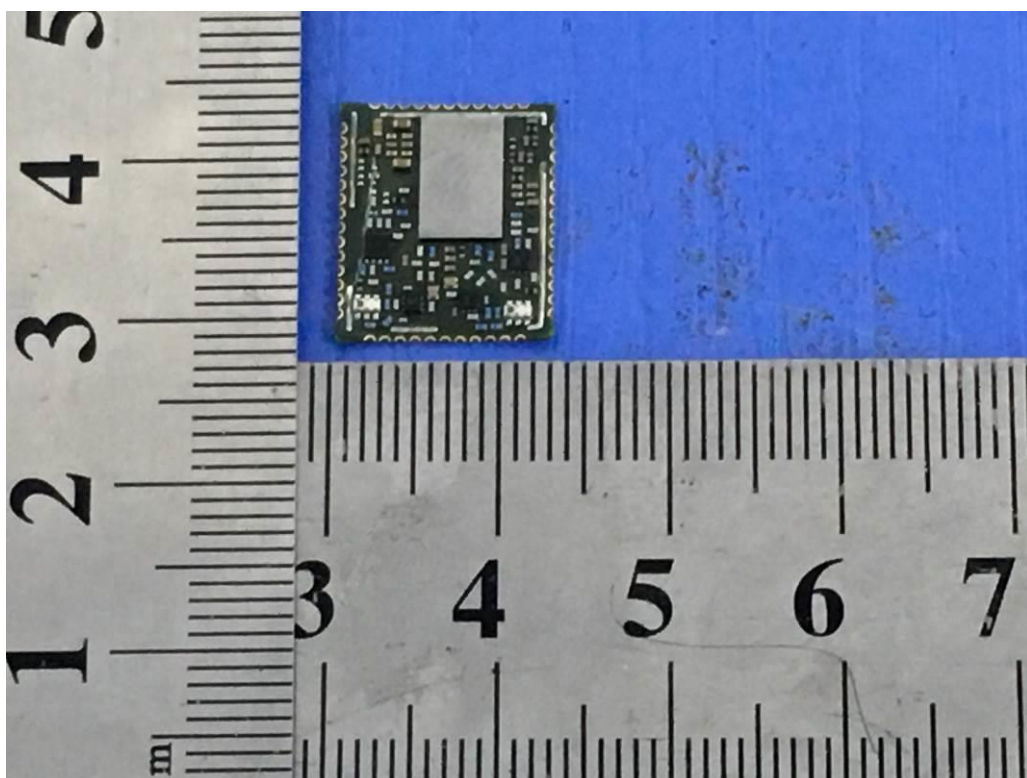


Fig.5

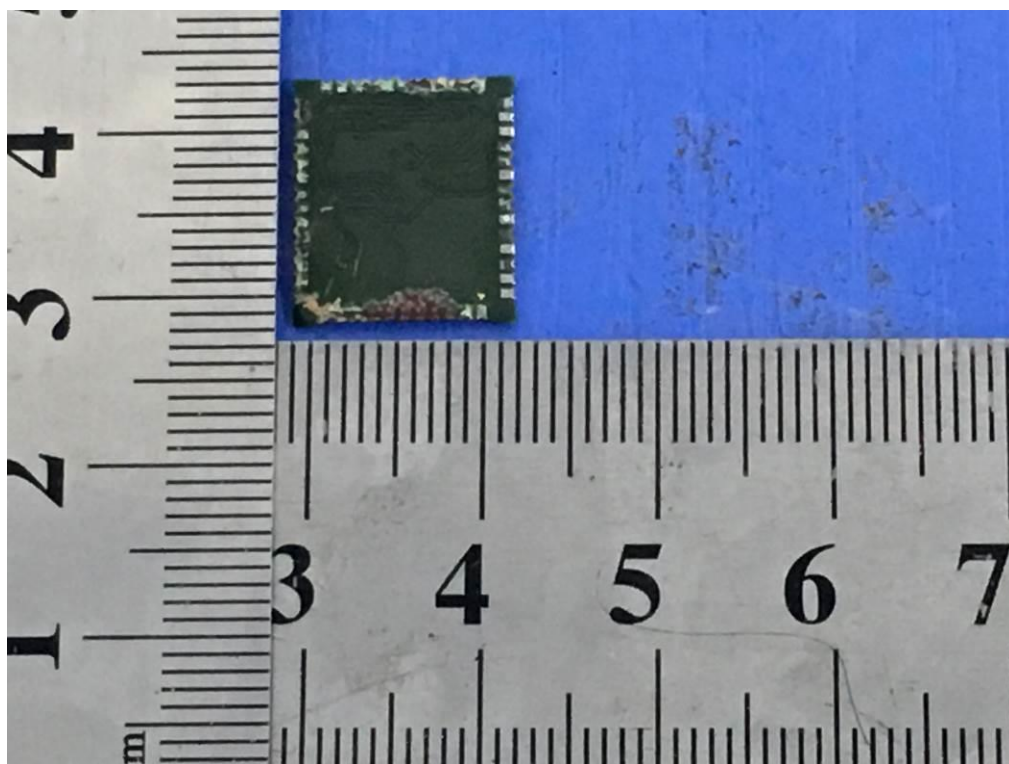


Fig.6



## 9. LIST OF MEASURING EQUIPMENTS

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Power Meter	R&S	NRVS	100444	2019-06-11	2020-06-10
2	Power Sensor	R&S	NRV-Z81	100458	2019-06-11	2020-06-10
3	Power Sensor	R&S	NRV-Z32	10057	2019-06-11	2020-06-10
4	MXA Signal Analyzer	Agilent	N9020A	MY49100060	2019-11-22	2020-11-21
5	DC Power Supply	Agilent	E3642A	N/A	2019-11-14	2020-11-13

Note: All equipment is calibrated through CHINA CEPREI LABORATORY and GUANGZHOU LISAI CALIBRATION AND TEST CO., LTD.

-----THE END OF REPORT-----