

# TEST REPORT

**FCC ID: 2ATJZ-WSU43**

**Product: Wireless solar rear view system**

**Model No.: WSU43**

**Additional Model No.: WSE43, SC43, WSU50, WSE50, SC50, SC70**

**Trade Mark: SUNWAYI, CAR GENERAL**

**Report No.: TCT190605E016**

**Issued Date: Apr. 02, 2020**

Issued for:

**Shenzhen Sunway Industry Co., Ltd**

**The first, third and fourth floors. Bldg 17, Industry Zone 5, Shiyan Town,  
Baoan District, Shenzhen, Guangdong, China**

Issued By:

**Shenzhen Tongce Testing Lab.**

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**Appendix A: Photographs of Test Setup****Appendix B: Photographs of EUT**

## 1. Test Certification

<b>Product:</b>	Wireless solar rear view system
<b>Model No.:</b>	WSU43
<b>Additional Model No.:</b>	WSE43, SC43, WSU50, WSE50, SC50, SC70
<b>Trade Mark:</b>	<b>SUNWAYI, CAR GENERAL</b>
<b>Applicant:</b>	Shenzhen Sunway Industry Co., Ltd
<b>Address:</b>	The first, third and fourth floors. Bldg 17, Industry Zone 5, Shiyan Town, Baoan District, Shenzhen, Guangdong, China
<b>Manufacturer:</b>	Shenzhen Sunway Industry Co., Ltd
<b>Address:</b>	The first, third and fourth floors. Bldg 17, Industry Zone 5, Shiyan Town, Baoan District, Shenzhen, Guangdong, China
<b>Date of Test:</b>	Jun. 06, 2019 – Apr. 01, 2020
<b>Applicable Standards:</b>	FCC CFR Title 47 Part 15 Subpart C Section 15.247 FCC KDB 558074 D01 15.247 Meas Guidance v05r02 ANSI C63.10:2013

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By: Kevin Huang

Date: Apr. 01, 2020

Kevin Huang

Reviewed By: Beryl Zhao

Date: Apr. 02, 2020



Approved By: Tomsin

Date: Apr. 02, 2020

## 2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna Requirement	§15.203/§15.247 (c)	PASS
AC Power Line Conducted Emission	§15.207	PASS
Conducted Peak Output Power	§15.247 (b)(1)	PASS
20dB Occupied Bandwidth	§15.247 (a)(1)	PASS
Carrier Frequencies Separation	§15.247 (a)(1)	PASS
Hopping Channel Number	§15.247 (a)(1)	PASS
Dwell Time	§15.247 (a)(1)	PASS
Radiated Emission	§15.205/§15.209	PASS
Band Edge	§15.247(d)	PASS

**Note:**

1. PASS: *Test item meets the requirement.*
2. Fail: *Test item does not meet the requirement.*
3. N/A: *Test case does not apply to the test object.*
4. *The test result judgment is decided by the limit of test standard.*

### 3. EUT Description

<b>Product:</b>	Wireless solar rear view system
<b>Model No.:</b>	WSU43
<b>Additional Model No.:</b>	WSE43, SC43, WSU50, WSE50, SC50, SC70
<b>Trade Mark:</b>	<b>SUNWAYI, CAR GENERAL</b>
<b>Operation Frequency:</b>	2406MHz~2475MHz
<b>Number of Channel:</b>	24
<b>Modulation Type:</b>	GFSK
<b>Modulation Technology:</b>	FHSS
<b>Antenna Type:</b>	Integral Antenna
<b>Antenna Gain:</b>	0dBi
<b>Power Supply:</b>	Rechargeable Li-ion Battery DC 7.4V
<b>Remark:</b>	All models above are identical in interior structure, electrical circuits and components, and just model names are different for the marketing requirement.

#### Operation Frequency each of channel

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2406MHz	6	2424MHz	12	2443MHz	18	2461MHz
1	2409MHz	7	2427MHz	13	2446MHz	19	2464MHz
2	2412MHz	8	2430MHz	14	2449MHz	20	2467MHz
3	2415MHz	9	2433MHz	15	2452MHz	21	2470MHz
4	2418MHz	10	2437MHz	16	2455MHz	22	2473MHz
5	2421MHz	11	2440MHz	17	2458MHz	23	2475MHz

**Note:**

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2406MHz
The middle channel	2449MHz
The Highest channel	2475MHz

## 4. General Information

### 4.1. Test environment and mode

Operating Environment:		
Condition	Conducted Emission	Radiated Emission
Temperature:	25.0 °C	25.0 °C
Humidity:	55 % RH	55 % RH
Atmospheric Pressure:	1010 mbar	1010 mbar
Test Mode:		
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations with Fully-charged battery	
<p>The sample was placed 0.8m &amp; 1.5m for the measurement below &amp; above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y &amp; Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case( Z axis) are shown in Test Results of the following pages.</p>		

### 4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

#### Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. For conducted measurements (Output Power, 20dB Occupied Bandwidth, Carrier Frequencies Separation, Hopping Channel Number, Dwell Time, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

## 5. Facilities and Accreditations

### 5.1. Facilities

The test facility is recognized, certified, or accredited by the following organizations:

- FCC - Registration No.: 645098

Shenzhen Tongce Testing Lab.

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

### 5.2. Location

Shenzhen Tongce Testing Lab.

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

Tel: 86-755-27673339

### 5.3. Measurement Uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expended uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

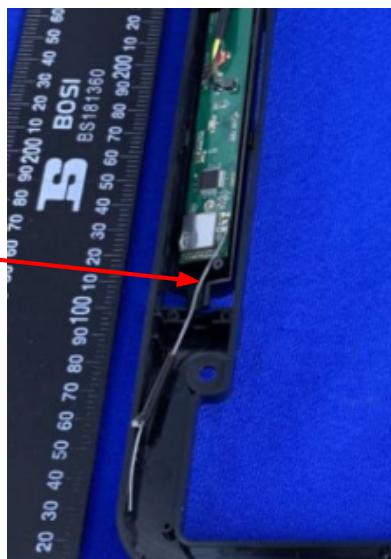
No.	Item	MU
1	Conducted Emission	$\pm 2.56\text{dB}$
2	RF power, conducted	$\pm 0.12\text{dB}$
3	Spurious emissions, conducted	$\pm 0.11\text{dB}$
4	All emissions, radiated(<1G)	$\pm 3.92\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^\circ\text{C}$
7	Humidity	$\pm 1.0\%$

## 6. Test Results and Measurement Data

### 6.1. Antenna requirement

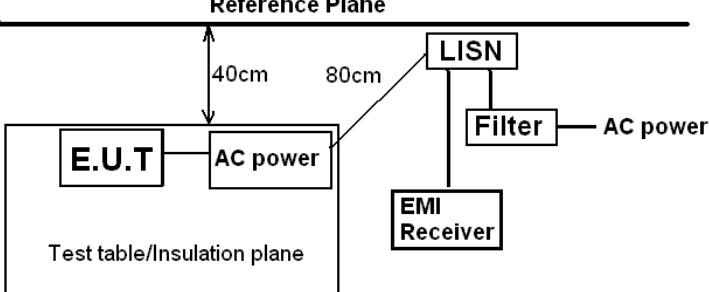
<b>Standard requirement:</b>	FCC Part15 C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, 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.	
15.247(c) (1)(i) requirement: (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 6dBi 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 6dBi.	
<b>E.U.T Antenna:</b>	
The EUT antenna is integral antenna which permanently attached, and the best case gain of the antenna is 0dBi.	

Antenna



## 6.2. Conducted Emission

### 6.2.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.207														
<b>Test Method:</b>	ANSI C63.10:2013														
<b>Frequency Range:</b>	150 kHz to 30 MHz														
<b>Receiver setup:</b>	RBW=9 kHz, VBW=30 kHz, Sweep time=auto														
<b>Limits:</b>	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>	Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)														
	Quasi-peak	Average													
0.15-0.5	66 to 56*	56 to 46*													
0.5-5	56	46													
5-30	60	50													
<b>Test Setup:</b>	<p>Reference Plane</p>  <p>Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>														
<b>Test Mode:</b>	Refer to item 4.1														
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The E.U.T is connected to an adapter through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.</li> <li>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).</li> <li>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.</li> </ol>														
<b>Test Result:</b>	PASS														

### 6.2.2. Test Instruments

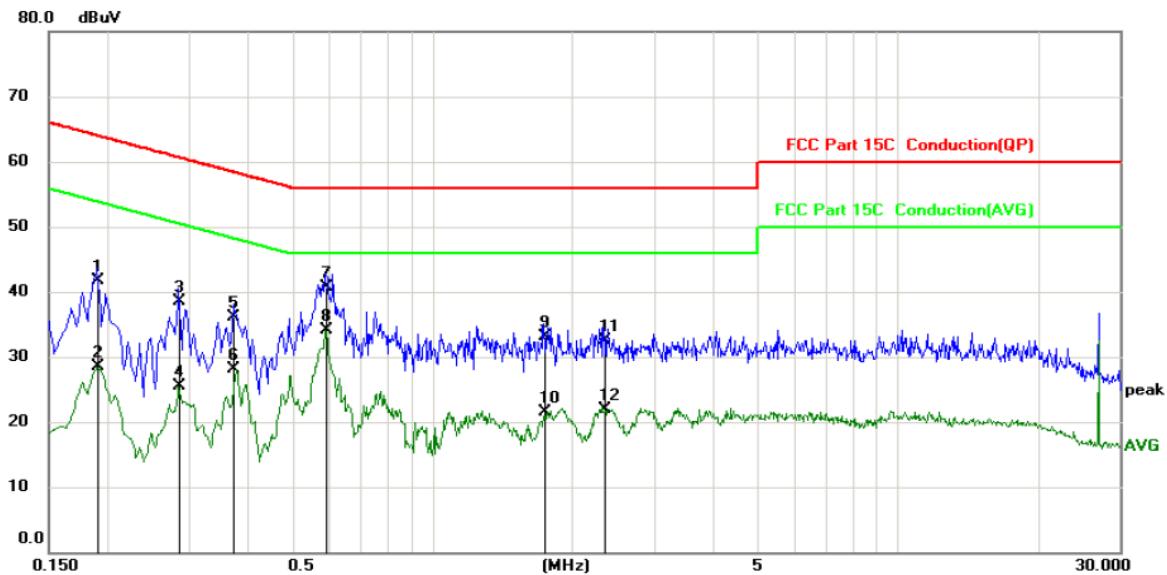
Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	R&S	ESPI	101402	Jul. 29, 2020
LISN	Schwarzbeck	NSLK 8126	8126453	Sep. 11, 2020
Coax cable (9KHz-30MHz)	TCT	CE-05	N/A	Sep. 08, 2020
EMI Test Software	Shurples Technology	EZ-EMC	N/A	N/A

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

### 6.2.3. Test data

Please refer to following diagram for individual

#### Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



Site				Phase:	L1		Temperature:	25
Limit: FCC Part 15C Conduction(QP)				Power:				Humidity: 55 %
No.	Mk.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dB $\mu$ V	dB	dB $\mu$ V	dB	Detector	Comment
1	0.1905	31.48	10.22	41.70	64.01	-22.31	-	QP
2	0.1905	18.26	10.22	28.48	54.01	-25.53	-	AVG
3	0.2850	28.29	10.23	38.52	60.67	-22.15	-	QP
4	0.2850	15.30	10.23	25.53	50.67	-25.14	-	AVG
5	0.3750	25.97	10.22	36.19	58.39	-22.20	-	QP
6	0.3750	17.91	10.22	28.13	48.39	-20.26	-	AVG
7	0.5910	30.55	10.23	40.78	56.00	-15.22	-	QP
8 *	0.5910	23.93	10.23	34.16	46.00	-11.84	-	AVG
9	1.7430	22.74	10.43	33.17	56.00	-22.83	-	QP
10	1.7430	11.05	10.43	21.48	46.00	-24.52	-	AVG
11	2.3370	22.10	10.45	32.55	56.00	-23.45	-	QP
12	2.3370	11.53	10.45	21.98	46.00	-24.02	-	AVG

**Note:**

Freq. = Emission frequency in MHz

Reading level (dB $\mu$ V) = Receiver reading

Corr. Factor (dB) = LISN factor + Cable loss

Measurement (dB $\mu$ V) = Reading level (dB $\mu$ V) + Corr. Factor (dB)

Limit (dB $\mu$ V) = Limit stated in standard

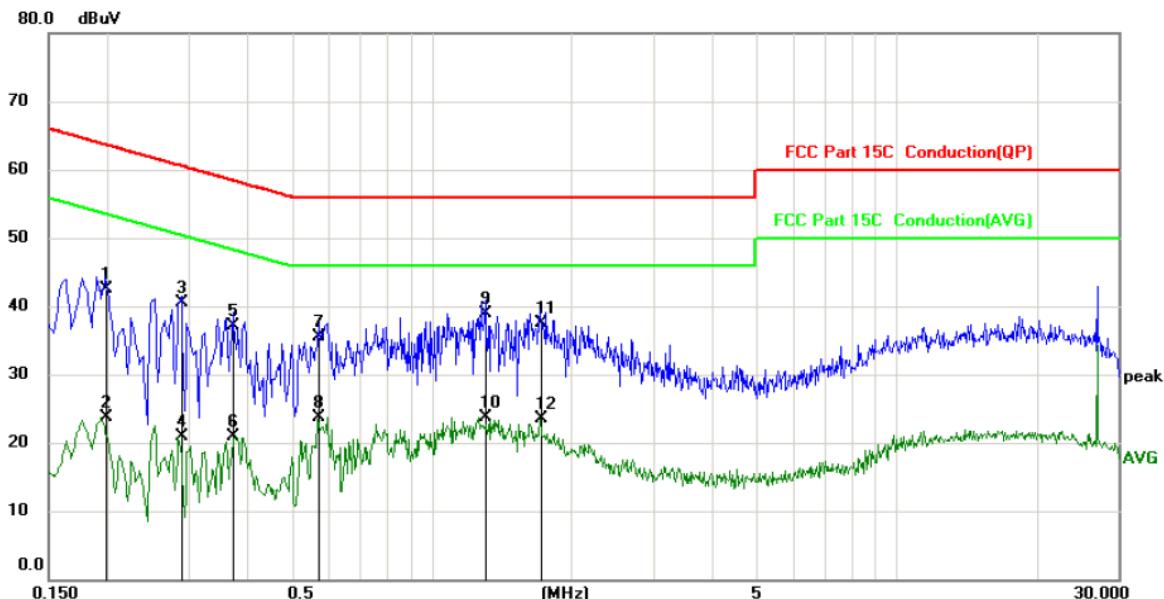
Margin (dB) = Measurement (dB $\mu$ V) - Limits (dB $\mu$ V)

Q.P. = Quasi-Peak

AVG = average

\* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz

**Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)**



Site				Phase:	<i>N</i>	Temperature:	25	
Limit: FCC Part 15C Conduction(QP)				Power:		Humidity:	55 %	
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dB $\mu$ V	dB	dB $\mu$ V	dB $\mu$ V	dB	Detector
1		0.1995	32.37	10.22	42.59	63.63	-21.04	QP
2		0.1995	13.40	10.22	23.62	53.63	-30.01	AVG
3		0.2895	30.33	10.23	40.56	60.54	-19.98	QP
4		0.2895	10.70	10.23	20.93	50.54	-29.61	AVG
5		0.3750	26.93	10.22	37.15	58.39	-21.24	QP
6		0.3750	10.65	10.22	20.87	48.39	-27.52	AVG
7		0.5730	25.26	10.23	35.49	56.00	-20.51	QP
8		0.5730	13.55	10.23	23.78	46.00	-22.22	AVG
9	*	1.3065	28.48	10.39	38.87	56.00	-17.13	QP
10		1.3065	13.29	10.39	23.68	46.00	-22.32	AVG
11		1.7160	27.00	10.42	37.42	56.00	-18.58	QP
12		1.7160	13.09	10.42	23.51	46.00	-22.49	AVG

**Note1:**

Freq. = Emission frequency in MHz

Reading level (dB $\mu$ V) = Receiver reading

Corr. Factor (dB) = LISN factor + Cable loss

Measurement (dB $\mu$ V) = Reading level (dB $\mu$ V) + Corr. Factor (dB)

Limit (dB $\mu$ V) = Limit stated in standard

Margin (dB) = Measurement (dB $\mu$ V) – Limits (dB $\mu$ V)

Q.P. =Quasi-Peak AVG =average

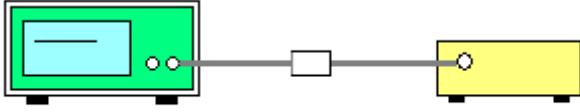
\* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.

**Note2:**

Measurements were conducted in all three channels (high, middle, low) and the worst case Mode (Lowest channel) was submitted only.

### 6.3. Conducted Output Power

#### 6.3.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.247 (b)(1)
<b>Test Method:</b>	KDB 558074 D01 v05r02
<b>Limit:</b>	Section 15.247 (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping 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.
<b>Test Setup:</b>	 <p><b>Spectrum Analyzer</b>      <b>EUT</b></p>
<b>Test Mode:</b>	Transmitting mode with modulation
<b>Test Procedure:</b>	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 $VBW \geq RBW$ Sweep = auto Detector function = peak Trace = max hold Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission.
<b>Test Result:</b>	PASS

#### 6.3.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Sep. 11, 2020
RF cable (9kHz-26.5GHz)	TCT	RE-06	N/A	Sep. 11, 2020
Antenna Connector	TCT	RFC-01	N/A	Sep. 11, 2020

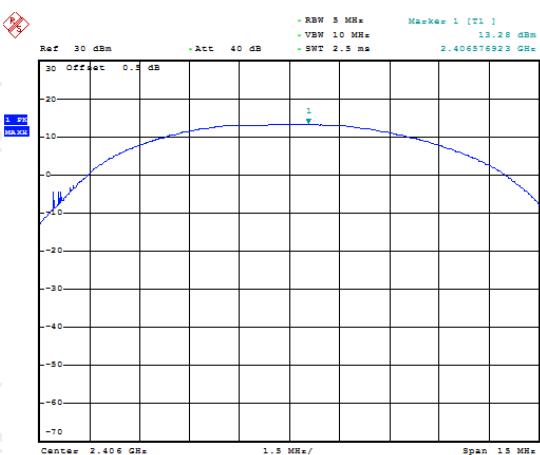
**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

**6.3.3. Test Data**

GFSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	13.28	21.00	PASS
Middle	12.98	21.00	PASS
Highest	12.97	21.00	PASS

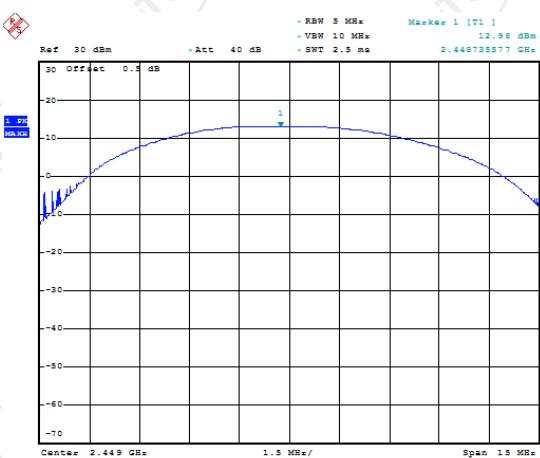
**Test plots as follows:**

Lowest channel



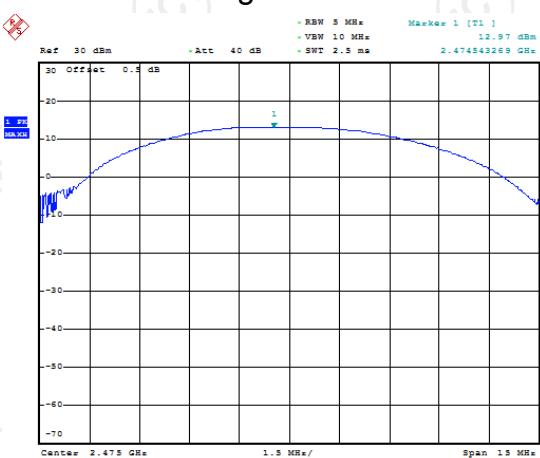
Date: 27.MAR.2020 13:10:03

Middle channel



Date: 27.MAR.2020 13:10:46

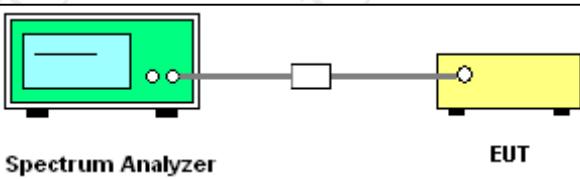
Highest channel



Date: 27.MAR.2020 13:13:26

## 6.4. 20dB Occupy Bandwidth

### 6.4.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.247 (a)(1)
<b>Test Method:</b>	KDB 558074 D01 v05r02
<b>Limit:</b>	N/A
<b>Test Setup:</b>	 <p style="text-align: center;"><b>Spectrum Analyzer</b>                                   <b>EUT</b></p>
<b>Test Mode:</b>	Transmitting mode with modulation
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>2. Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>3. Use the following spectrum analyzer settings for 20dB Bandwidth measurement. Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel; <math>1\% \leq RBW \leq 5\%</math> of the 20 dB bandwidth; <math>VBW \geq 3RBW</math>; Sweep = auto; Detector function = peak; Trace = max hold.</li> <li>4. Measure and record the results in the test report.</li> </ol>
<b>Test Result:</b>	PASS

### 6.4.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Sep. 11, 2020
RF cable (9kHz-26.5GHz)	TCT	RE-06	N/A	Sep. 11, 2020
Antenna Connector	TCT	RFC-01	N/A	Sep. 11, 2020

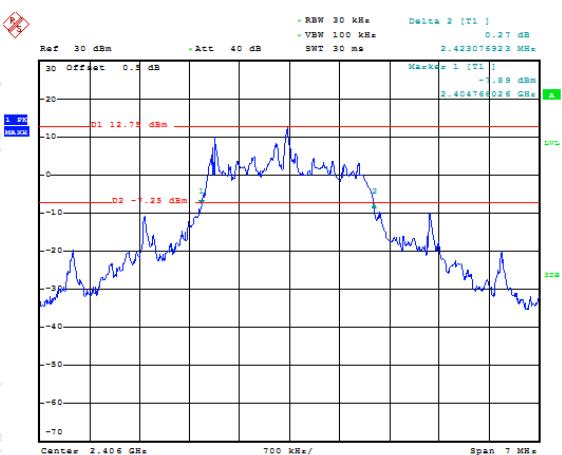
**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

**6.4.3. Test data**

Test channel	20dB Occupy Bandwidth (kHz)	
	GFSK	Conclusion
Lowest	2423.08	PASS
Middle	2411.86	PASS
Highest	2434.29	PASS

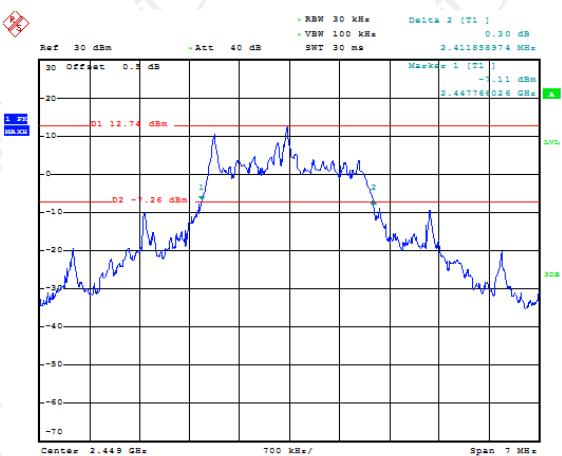
**Test plots as follows:**

Lowest channel



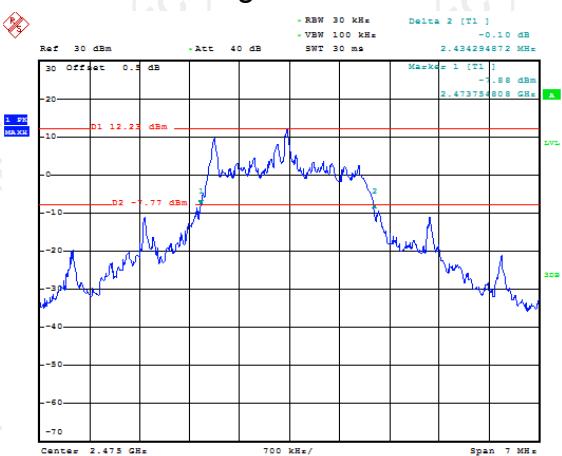
Date: 27.MAR.2020 13:18:06

Middle channel



Date: 27.MAR.2020 13:50:39

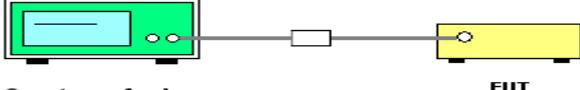
Highest channel



Date: 27.MAR.2020 13:54:44

## 6.5. Carrier Frequencies Separation

### 6.5.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.247 (a)(1)
<b>Test Method:</b>	KDB 558074 D01 v05r02
<b>Limit:</b>	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.
<b>Test Setup:</b>	 <p><b>Spectrum Analyzer</b>      <b>EUT</b></p>
<b>Test Mode:</b>	Hopping mode
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>2. Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>3. Enable the EUT hopping function.</li> <li>4. Use the following spectrum analyzer settings: Span = wide enough to capture the peaks of two adjacent channels; RBW is set to approximately 30% of the channel spacing, adjust as necessary to best identify the center of each individual channel; <math>VBW \geq RBW</math>; Sweep = auto; Detector function = peak; Trace = max hold.</li> <li>5. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Record the value in report.</li> </ol>
<b>Test Result:</b>	PASS

### 6.5.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Sep. 11, 2020
RF cable (9kHz-26.5GHz)	TCT	RE-06	N/A	Sep. 11, 2020
Antenna Connector	TCT	RFC-01	N/A	Sep. 11, 2020

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

**6.5.3. Test data**

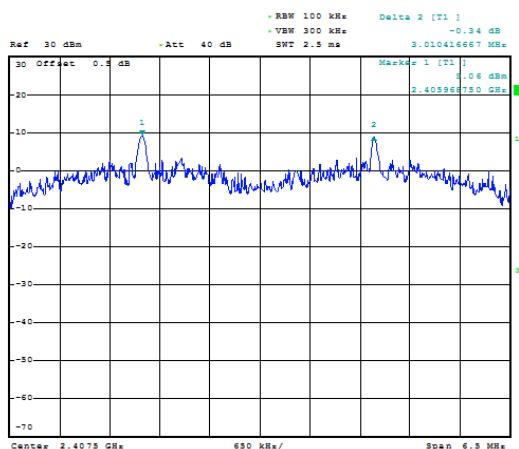
GFSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	3010.42	1622.86	PASS
Middle	2989.58	1622.86	PASS
Highest	3000.00	1622.86	PASS

**Note: According to section 6.4**

Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GFSK	2434.29	1622.86

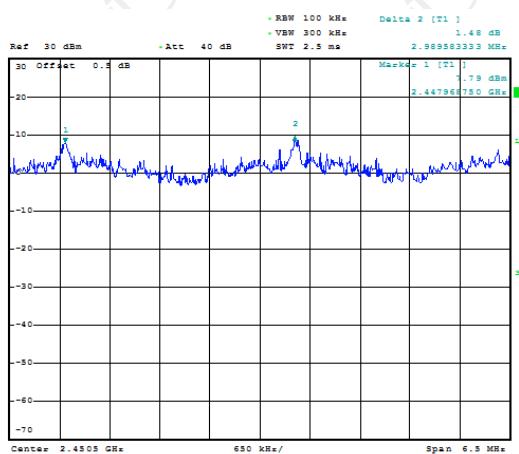
**Test plots as follows:**

### Lowest channel



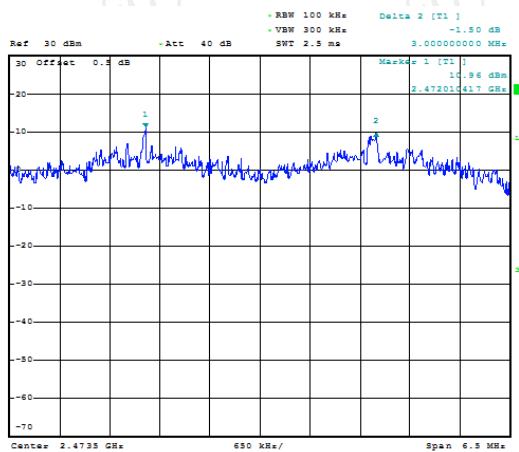
Date: 27.MAR.2020 12:28:57

### Middle channel



Date: 27.MAR.2020 12:23:45

### Highest channel



Date: 27.MAR.2020 12:27:18

## 6.6. Hopping Channel Number

### 6.6.1. Test Specification

## 6.6.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Sep. 11, 2020
RF cable (9kHz-26.5GHz)	TCT	RE-06	N/A	Sep. 11, 2020
Antenna Connector	TCT	RFC-01	N/A	Sep. 11, 2020

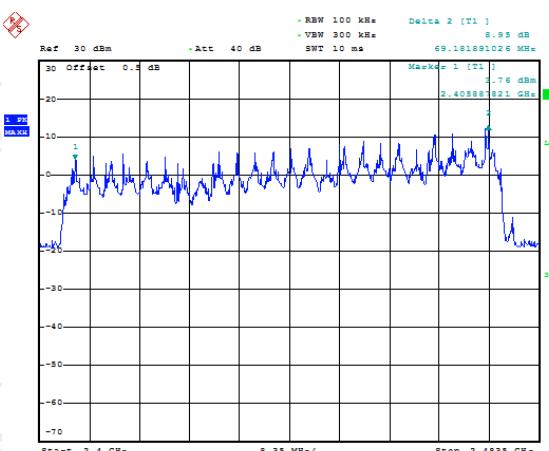
**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

**6.6.3. Test data**

Mode	Hopping channel numbers	Limit	Result
GFSK	24	15	PASS

**Test plots as follows:**

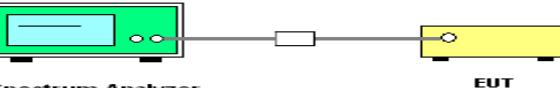
## GFSK



Date: 27.MAR.2020 14:30:52

## 6.7. Dwell Time

### 6.7.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.247 (a)(1)
<b>Test Method:</b>	KDB 558074 D01 v05r02
<b>Limit:</b>	The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.
<b>Test Setup:</b>	
<b>Test Mode:</b>	Hopping mode
<b>Test Procedure:</b>	<ol style="list-style-type: none"><li>1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li><li>2. Set to the maximum power setting and enable the EUT transmit continuously.</li><li>3. Enable the EUT hopping function.</li><li>4. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW shall be <math>\leq</math> channel spacing and where possible RBW should be set <math>\gg 1 / T</math>, where T is the expected dwell time per channel; VBW<math>\geq</math>RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.</li><li>5. Measure and record the results in the test report.</li></ol>
<b>Test Result:</b>	PASS

## 6.7.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Sep. 11, 2020
RF cable (9kHz-26.5GHz)	TCT	RE-06	N/A	Sep. 11, 2020
Antenna Connector	TCT	RFC-01	N/A	Sep. 11, 2020

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

**6.7.3. Test Data**

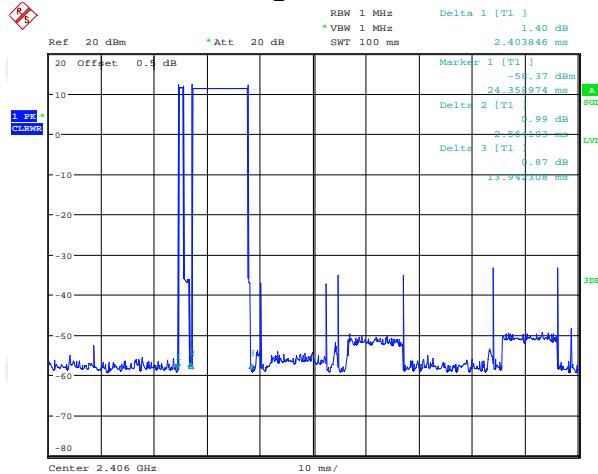
Mode	Hops Over Occupancy Time (hops)	Package Transfer Time (ms)	Dwell time (second)	Limit (second)	Result
GFSK	27	13.78	0.37	0.4	PASS

**Note:** 1. Measure Time=400ms\* minimum number of hopping frequencies=400 ms \*24=9600 ms;

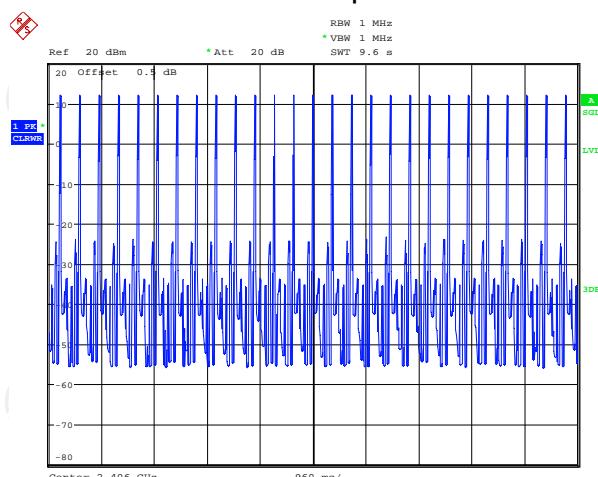
2. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

**Test plots as follows:**

**GFSK**  
**Package Transfer Time**



**Hops**



## 6.8. Pseudorandom Frequency Hopping Sequence

<b>Test Requirement:</b>	<b>FCC Part15 C Section 15.247 (a)(1) requirement:</b>
--------------------------	--

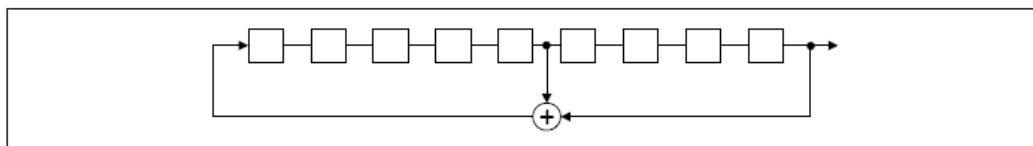
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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. The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

<b>EUT Pseudorandom Frequency Hopping Sequence</b>
--

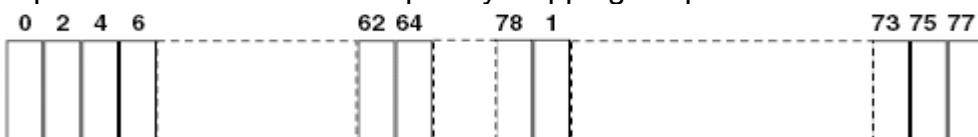
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones; i.e. the shift register is initialized with nine ones.

- Number of shift register stages: 9
- Length of pseudo-random sequence:  $2^9 - 1 = 511$  bits
- Longest sequence of zeros: 8 (non-inverted signal)



*Linear Feedback Shift Register for Generation of the PRBS sequence*

An example of Pseudorandom Frequency Hopping Sequence as follow:

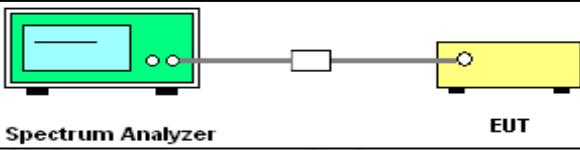


Each frequency used equally on the average by each transmitter.

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

## 6.9. Conducted Band Edge Measurement

### 6.9.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.247 (d)
<b>Test Method:</b>	KDB 558074 D01 v05r02
<b>Limit:</b>	In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.
<b>Test Setup:</b>	 <p><b>Spectrum Analyzer</b>                                    <b>EUT</b></p>
<b>Test Mode:</b>	Transmitting mode with modulation
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>Set RBW = 100 kHz (<math>\geq 1\%</math> span=10MHz), VBW = 300 kHz (<math>\geq</math>RBW). Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.</li> <li>Enable hopping function of the EUT and then repeat step 2 and 3.</li> <li>Measure and record the results in the test report.</li> </ol>
<b>Test Result:</b>	PASS

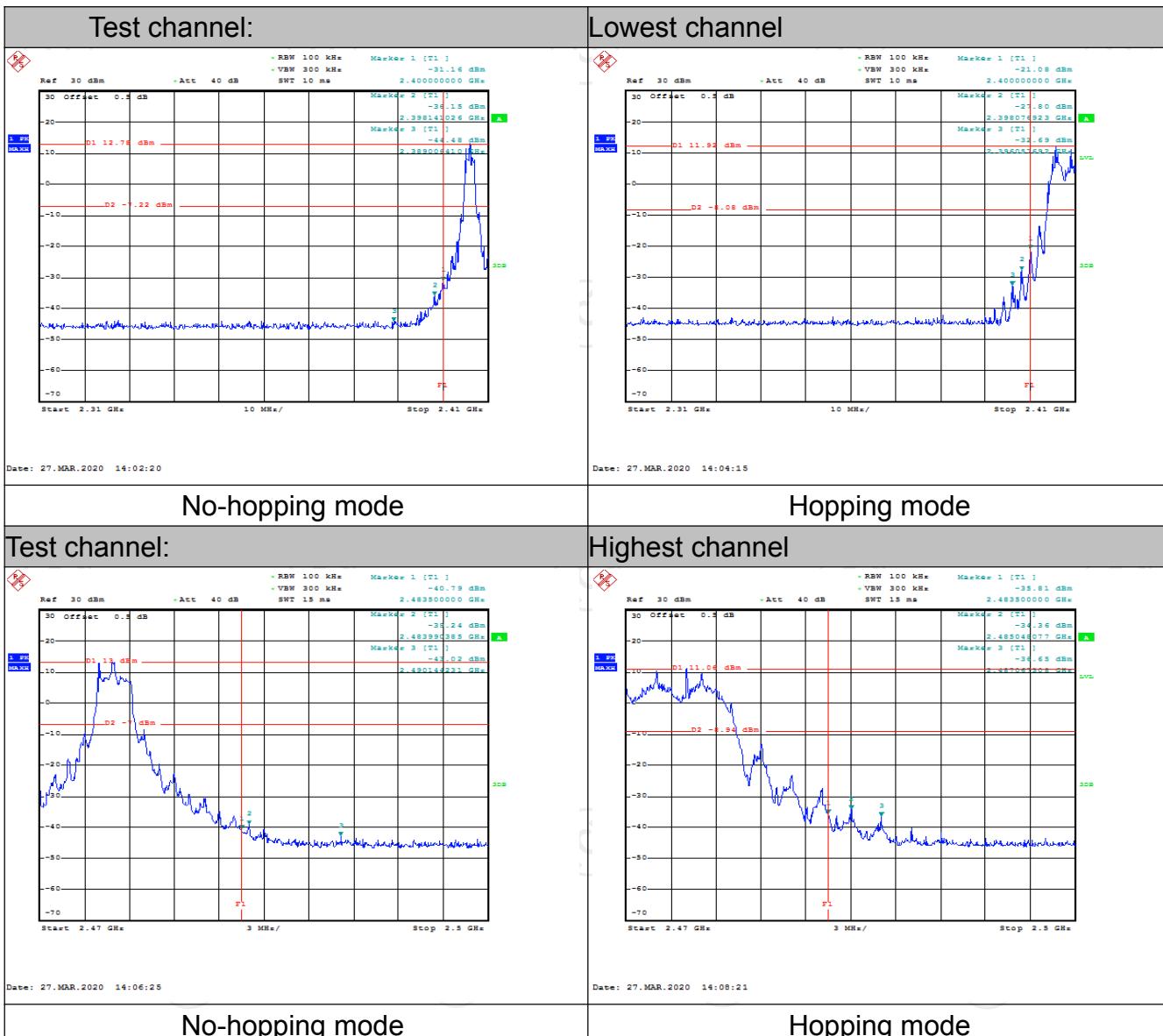
### 6.9.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Sep. 11, 2020
RF cable (9kHz-26.5GHz)	TCT	RE-06	N/A	Sep. 11, 2020
Antenna Connector	TCT	RFC-01	N/A	Sep. 11, 2020

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

### 6.9.3. Test Data

#### GFSK Modulation



## 6.10. Conducted Spurious Emission Measurement

### 6.10.1. Test Specification

## 6.10.2. Test Instruments

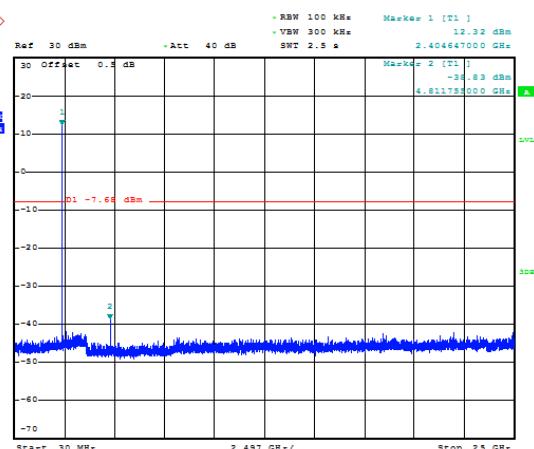
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Sep. 11, 2020
Spectrum Analyzer	ROHDE&SCHWARZ	FSQ40	200061	Sep. 11, 2020
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 11, 2020
Antenna Connector	TCT	RFC-01	N/A	Sep. 11, 2020

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

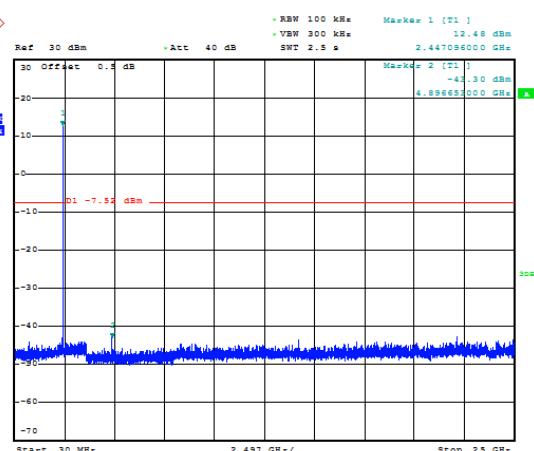
### 6.10.3. Test Data

GFSK mode

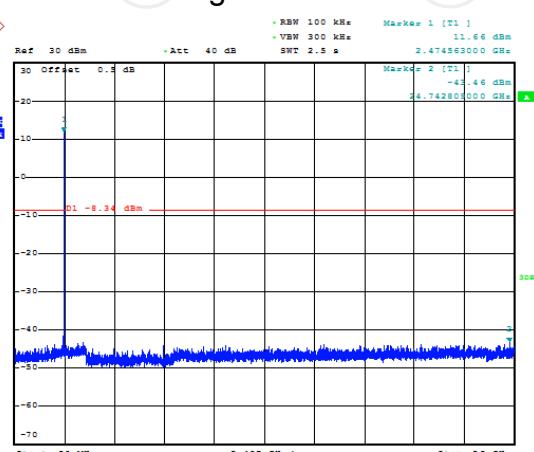
Lowest Channel



Middle Channel

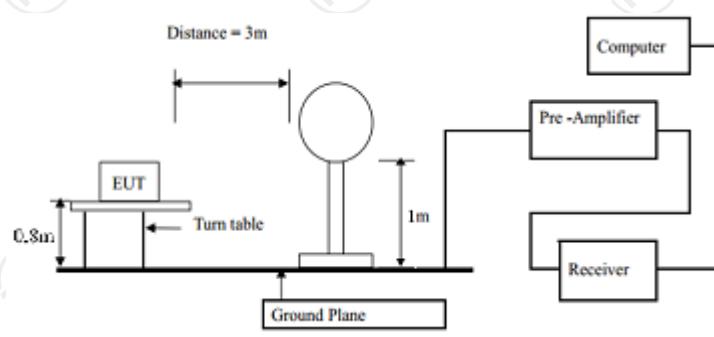


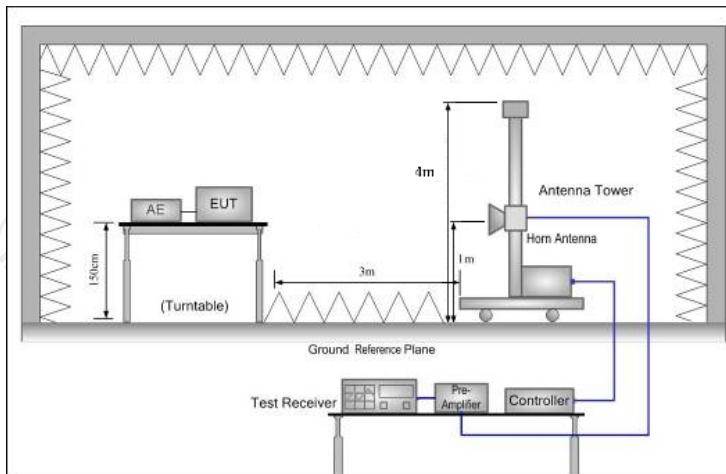
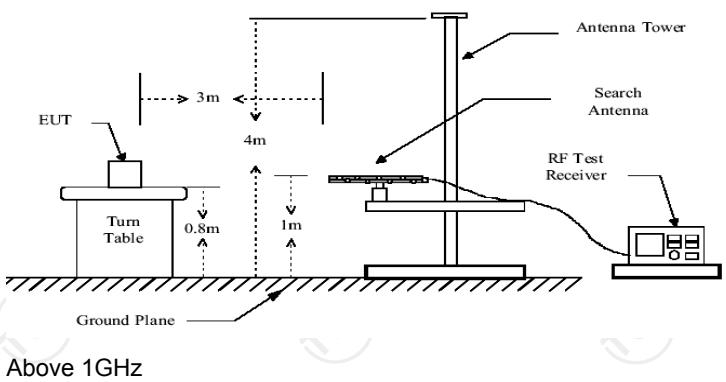
Highest Channel



## 6.11. Radiated Spurious Emission Measurement

### 6.11.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.209				
<b>Test Method:</b>	ANSI C63.10:2013				
<b>Frequency Range:</b>	9 kHz to 25 GHz				
<b>Measurement Distance:</b>	3 m				
<b>Antenna Polarization:</b>	Horizontal & Vertical				
<b>Receiver Setup:</b>	Frequency	Detector	RBW	VBW	Remark
	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value
	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		Peak	1MHz	10Hz	Average Value
<b>Limit:</b>	Frequency	Field Strength (microvolts/meter)		Measurement Distance (meters)	
	0.009-0.490	2400/F(KHz)		300	
	0.490-1.705	24000/F(KHz)		30	
	1.705-30	30		30	
	30-88	100		3	
	88-216	150		3	
	216-960	200		3	
	Above 960	500		3	
<b>Test setup:</b>	For radiated emissions below 30MHz  30MHz to 1GHz				



<b>Test Mode:</b>	Transmitting mode with modulation
<b>Test Procedure:</b>	<p>1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10:2013 Measurement Guidelines.</p> <p>2. For the radiated emission test below 1GHz:          The EUT was placed on a turntable with 0.8 meter above ground. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. 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.</p> <p>For the radiated emission test above 1GHz:          Place the measurement antenna on a turntable with 1.5 meter above ground, which is away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission</p>

	<p>and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.</p> <p>3. Set to the maximum power setting and enable the EUT transmit continuously.</p> <p>4. Use the following spectrum analyzer settings:</p> <ol style="list-style-type: none"> <li>(1) Span shall wide enough to fully capture the emission being measured;</li> <li>(2) Set RBW=120 kHz for <math>f &lt; 1</math> GHz, RBW=1MHz for <math>f &gt; 1</math> GHz ; <math>VBW \geq RBW</math>; Sweep = auto; Detector function = peak; Trace = max hold for peak</li> <li>(3) For average measurement: use duty cycle correction factor method per 15.35(c). Duty cycle = On time/100 milliseconds On time = <math>N_1 \cdot L_1 + N_2 \cdot L_2 + \dots + N_{n-1} \cdot L_{n-1} + N_n \cdot L_n</math> Where <math>N_1</math> is number of type 1 pulses, <math>L_1</math> is length of type 1 pulses, etc. Average Emission Level = Peak Emission Level + <math>20 \cdot \log(\text{Duty cycle})</math> Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level</li> </ol>
<b>Test results:</b>	PASS

**6.11.2. Test Instruments**

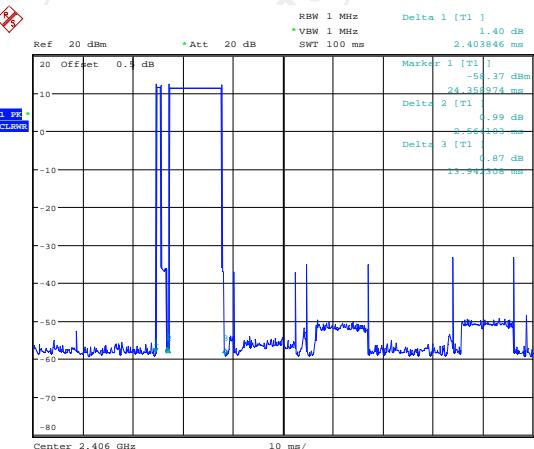
Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	ROHDE&SCHW ARZ	ESIB7	100197	Jul. 29, 2020
Spectrum Analyzer	ROHDE&SCHW ARZ	FSQ40	200061	Sep. 11, 2020
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep. 08, 2020
Pre-amplifier	HP	8447D	2727A05017	Sep. 08, 2020
Loop antenna	ZHINAN	ZN30900A	12024	Sep. 11, 2020
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 06, 2020
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 06, 2020
Horn Antenna	A-INFO	LB-180400-KF	J211020657	Sep. 06, 2020
Antenna Mast	Keleto	RE-AM	N/A	N/A
Coax cable (9KHz-40GHz)	TCT	RE-high-02	N/A	Sep. 08, 2020
Coax cable (9KHz-40GHz)	TCT	RE-high-04	N/A	Sep. 08, 2020
EMI Test Software	Shurples Technology	EZ-EMC	N/A	N/A

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

### 6.11.3. Test Data

#### Duty cycle correction factor for average measurement

##### GFSK on time (One Pulse) Plot on Channel 00



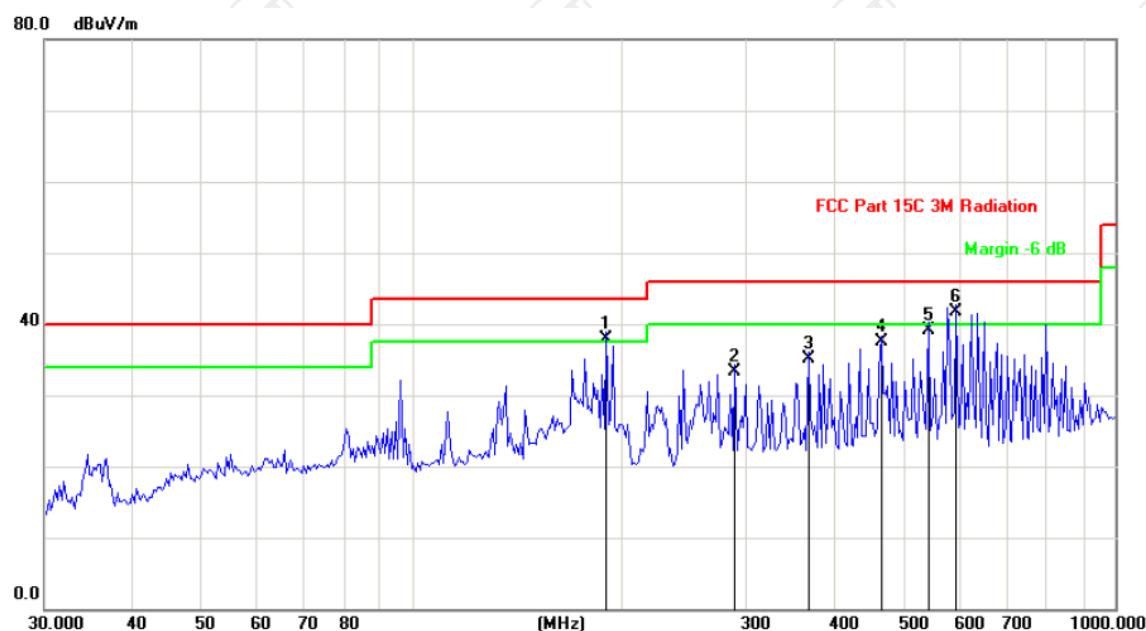
##### Note:

1. Worst case Duty cycle = on time/100 milliseconds =  $13.78/100=0.1378$
2. Worst case Duty cycle correction factor =  $20*\log(\text{Duty cycle}) = -17.22\text{dB}$
3. The highest duty cycle worst case and is reported.
4. The average levels were calculated from the peak level corrected with duty cycle correction factor (-17.22dB) derived from  $20\log(\text{dwell time}/100\text{ms})$ . This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

Please refer to following diagram for individual

Below 1GHz

Horizontal:



Site

Limit: FCC Part 15C 3M Radiation

Polarization: **Horizontal**

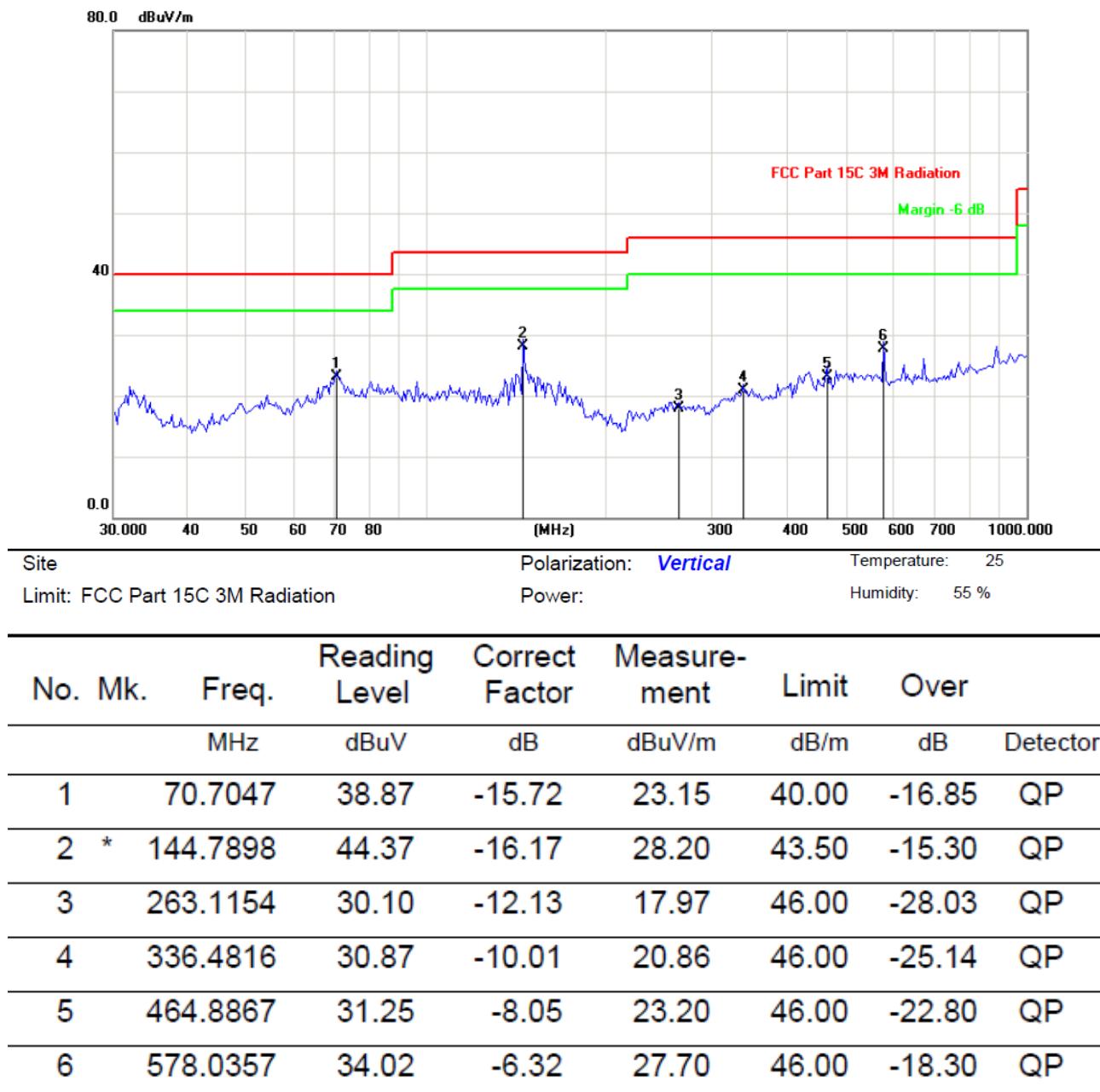
Power:

Temperature: 25

Humidity: 55 %

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over		
			Level	Factor	ment				
			MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	!	189.1074	52.43	-14.50	37.93	43.50	-5.57	QP	
2		288.2839	44.68	-11.31	33.37	46.00	-12.63	QP	
3		366.0865	44.57	-9.45	35.12	46.00	-10.88	QP	
4		464.8867	45.63	-8.05	37.58	46.00	-8.42	QP	
5		542.6104	46.25	-7.06	39.19	46.00	-6.81	QP	
6	*	594.5143	47.65	-5.92	41.73	46.00	-4.27	QP	

Vertical:



**Note:** 1. The low frequency, which started from 9KHz~30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported

2. Measurements were conducted in all three channels (high, middle, low) and the worst case Mode (Lowest channel) was submitted only.

3. Freq. = Emission frequency in MHz

Measurement (dB $\mu$ V/m) = Reading level (dB $\mu$ V) + Corr. Factor (dB)

Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

Limit (dB $\mu$ V/m) = Limit stated in standard

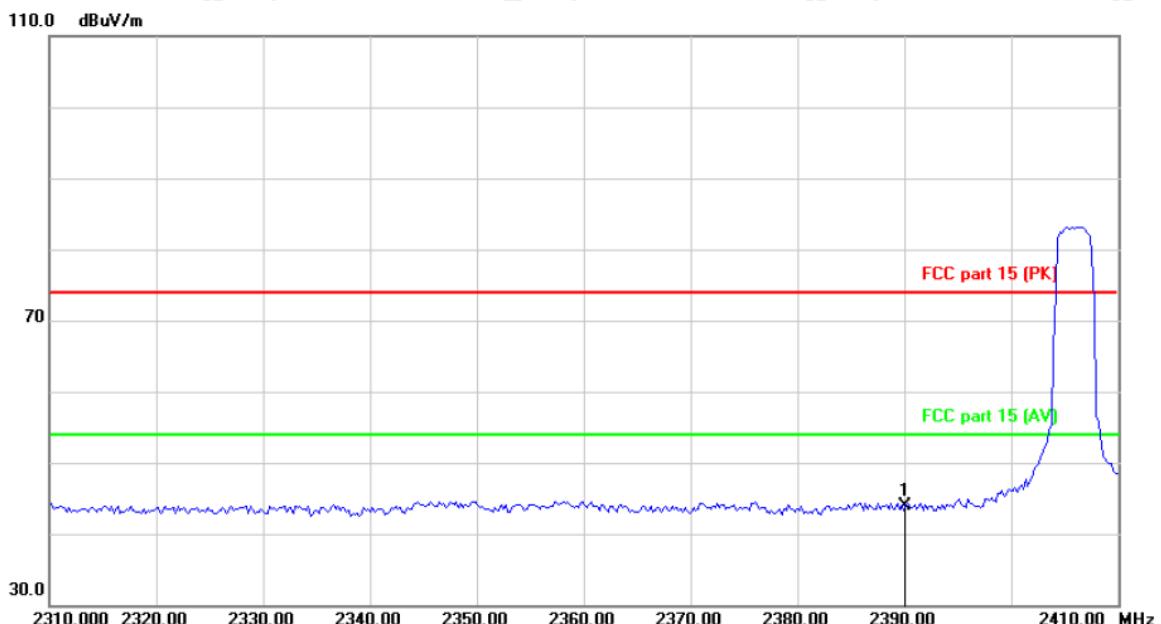
Margin (dB) = Measurement (dB $\mu$ V/m) – Limits (dB $\mu$ V/m)

\* is meaning the worst frequency has been tested in the test frequency range

**Test Result of Radiated Spurious at Band edges**

Lowest channel 2406:

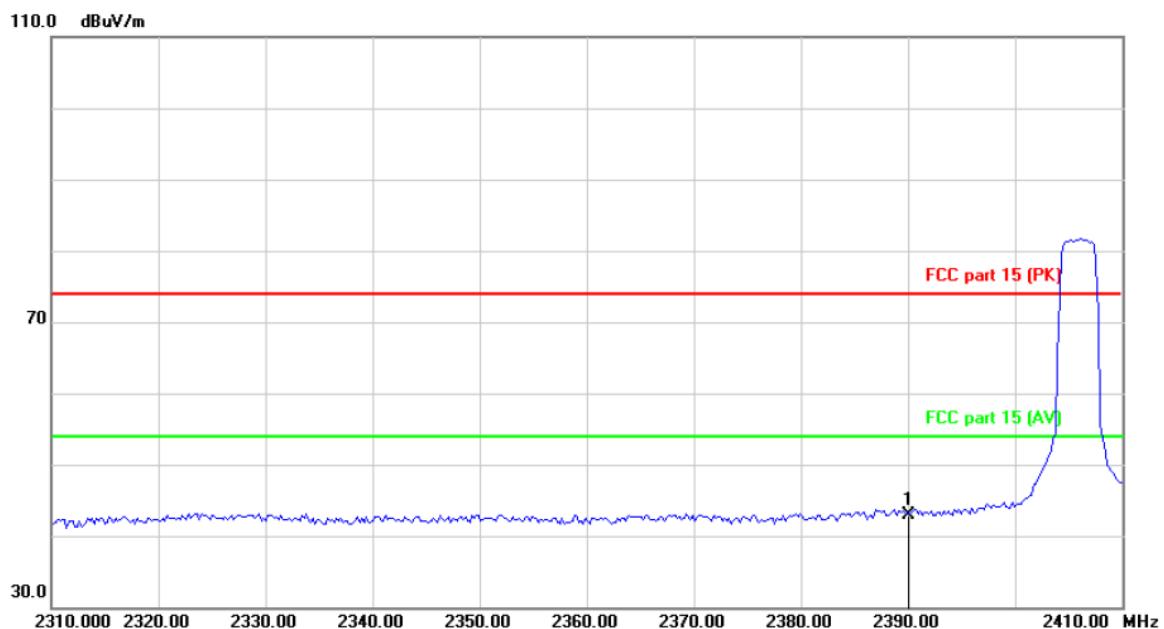
Horizontal:



Site Polarization: *Horizontal* Temperature: 25  
Limit: FCC part 15 (PK) Power: Humidity: 55 %

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	*	2390.000	41.34	2.66	44.00	74.00	-30.00	peak

Vertical:

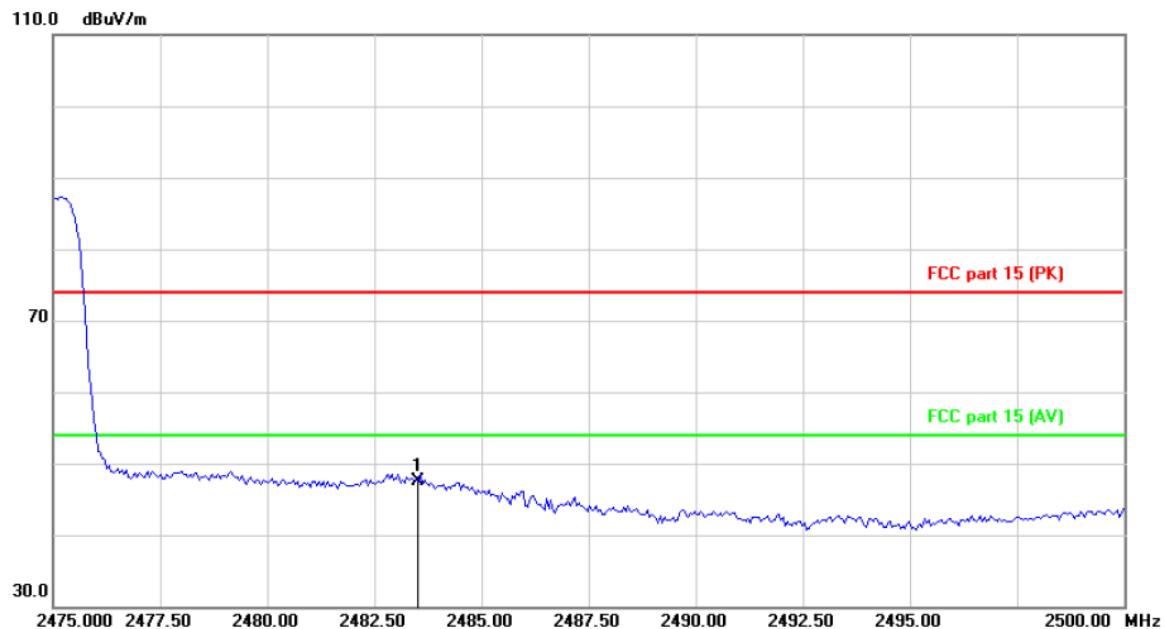


Site Polarization: **Vertical** Temperature: 25  
 Limit: FCC part 15 (PK) Power: Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over
		MHz	dBuV	dB	dBuV/m	dB/m	dB Detector
1	*	2390.000	40.34	2.66	43.00	74.00	-31.00 peak

Highest channel 2475:

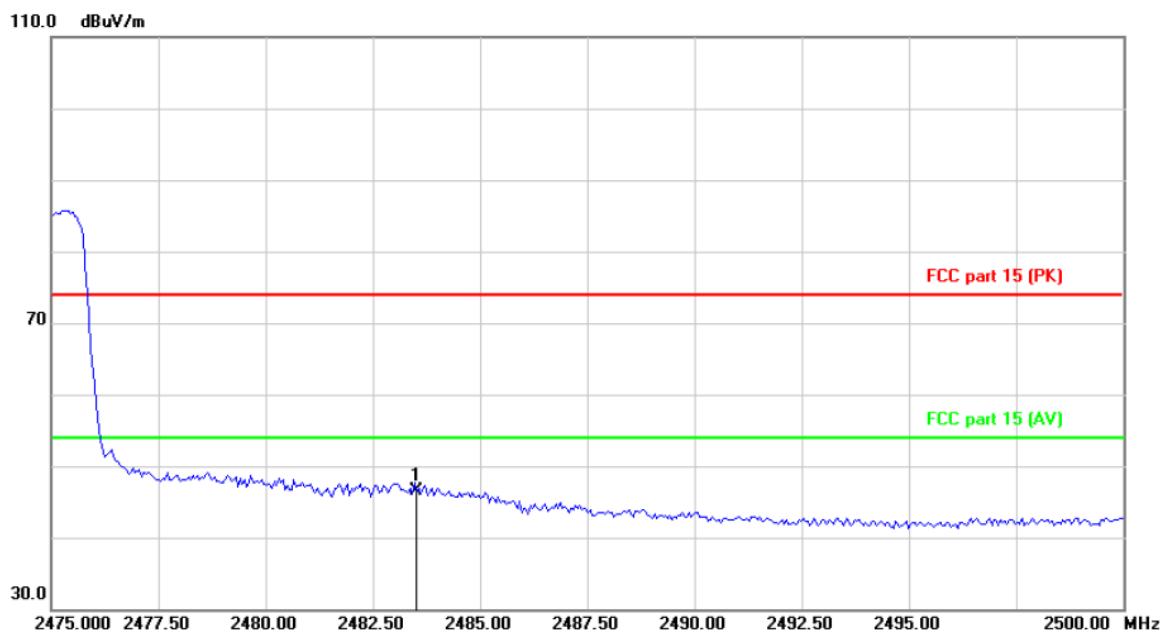
Horizontal:



Site: Polarization: *Horizontal* Temperature: 25  
Limit: FCC part 15 (PK) Power: Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over
		MHz	dBuV	dB	dBuV/m	dB/m	dB
1	*	2483.500	44.87	2.67	47.54	74.00	-26.46 peak

Vertical:



Site Polarization: *Vertical* Temperature: 25  
Limit: FCC part 15 (PK) Power: Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over
		MHz	dBuV	dB	dBuV/m	dB/m	dB
1	*	2483.500	43.87	2.67	46.54	74.00	-27.46 peak

**Note:** Measurements were conducted in all three channels (high, middle, low) and the worst case Mode (Lowest channel) was submitted only.

**Above 1GHz**

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB $\mu$ V)	AV reading (dB $\mu$ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB $\mu$ V/m)	AV limit (dB $\mu$ V/m)	Margin (dB)
					Peak (dB $\mu$ V/m)	AV (dB $\mu$ V/m)			
4812.00	H	49.57	---	-3.94	45.63	---	74	54	-8.37
7218.00	H	44.13	---	0.52	44.65	---	74	54	-9.35
---	---	---	---	---	---	---	---	---	---
4812.00	V	48.31	---	-3.94	44.37	---	74	54	-9.63
7218.00	V	43.64	---	0.52	44.16	---	74	54	-9.84
---	---	---	---	---	---	---	---	---	---

**Middle channel: 2449MHz**

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB $\mu$ V)	AV reading (dB $\mu$ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB $\mu$ V/m)	AV limit (dB $\mu$ V/m)	Margin (dB)
					Peak (dB $\mu$ V/m)	AV (dB $\mu$ V/m)			
4898.00	H	50.97	---	-3.98	46.99	---	74	54	-7.01
7347.00	H	46.01	---	0.57	46.58	---	74	54	-7.42
---	---	---	---	---	---	---	---	---	---
4898.00	V	51.25	---	-3.98	47.27	---	74	54	-6.73
7347.00	V	46.54	---	0.57	47.11	---	74	54	-6.89
---	---	---	---	---	---	---	---	---	---

**High channel: 2475MHz**

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB $\mu$ V)	AV reading (dB $\mu$ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB $\mu$ V/m)	AV limit (dB $\mu$ V/m)	Margin (dB)
					Peak (dB $\mu$ V/m)	AV (dB $\mu$ V/m)			
4950.00	H	50.83	---	-3.98	46.85	---	74	54	-7.15
7425.00	H	45.02	---	0.57	45.59	---	74	54	-8.41
---	---	---	---	---	---	---	---	---	---
4950.00	V	51.56	---	-3.98	47.58	---	74	54	-6.42
7425.00	V	46.94	---	0.57	47.51	---	74	54	-6.49
---	---	---	---	---	---	---	---	---	---

**Note:**

1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss –Pre-amplifier
2. Margin (dB) = Emission Level (Peak) (dB $\mu$ V/m)-Average limit (dB $\mu$ V/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
5. Data of measurement shown “---”in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

All the restriction bands are compliance with the limit of 15.209

## Appendix A: Photographs of Test Setup

Product: Wireless solar rear view system

Model: WSU43

Radiated Emission

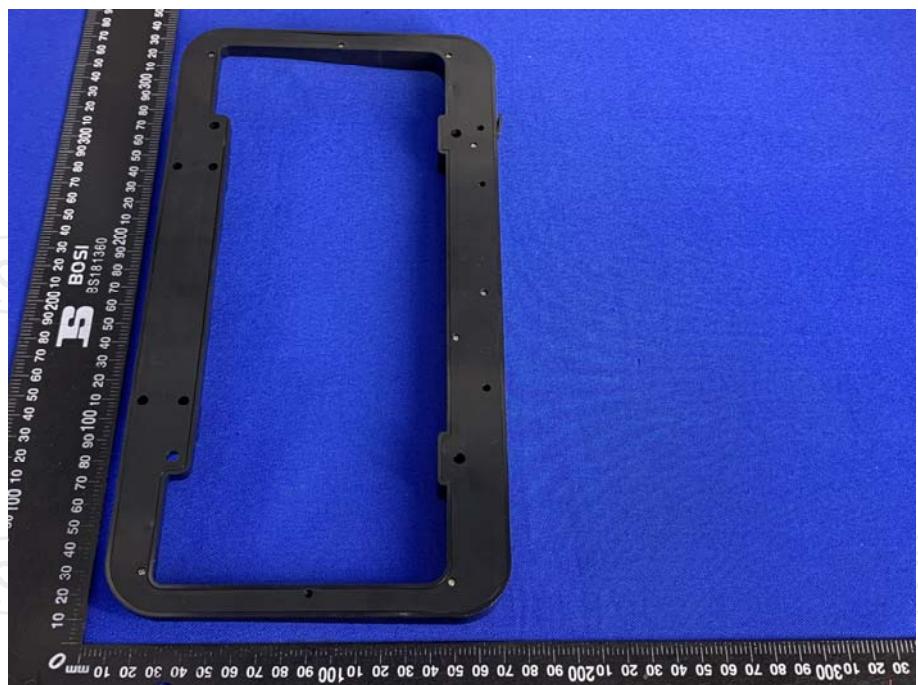


Conducted Emission



**Appendix B: Photographs of EUT**  
**Product: Wireless solar rear view system**  
**Model: WSU43**  
**External Photos**



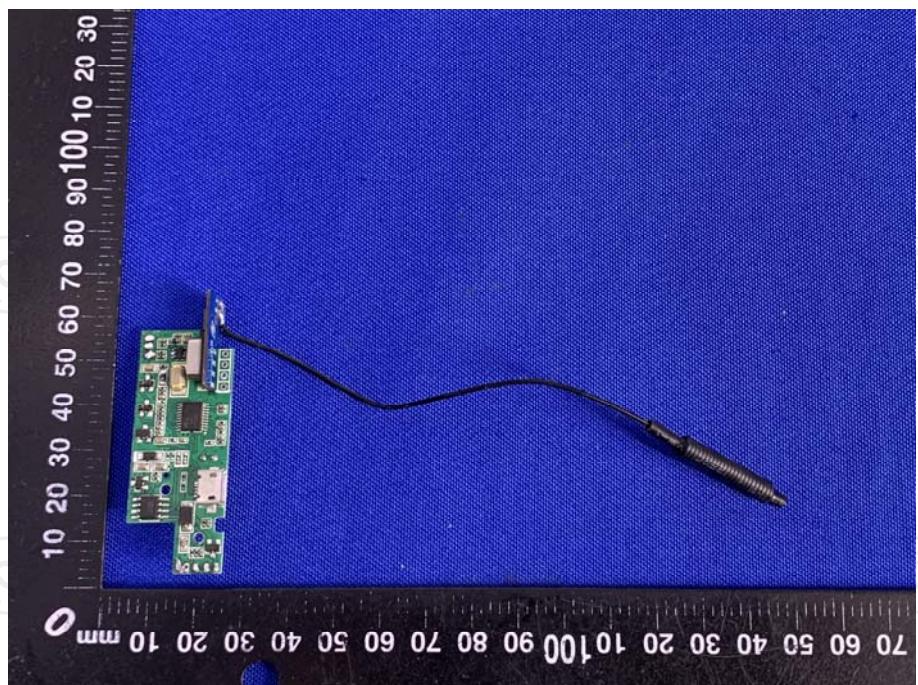


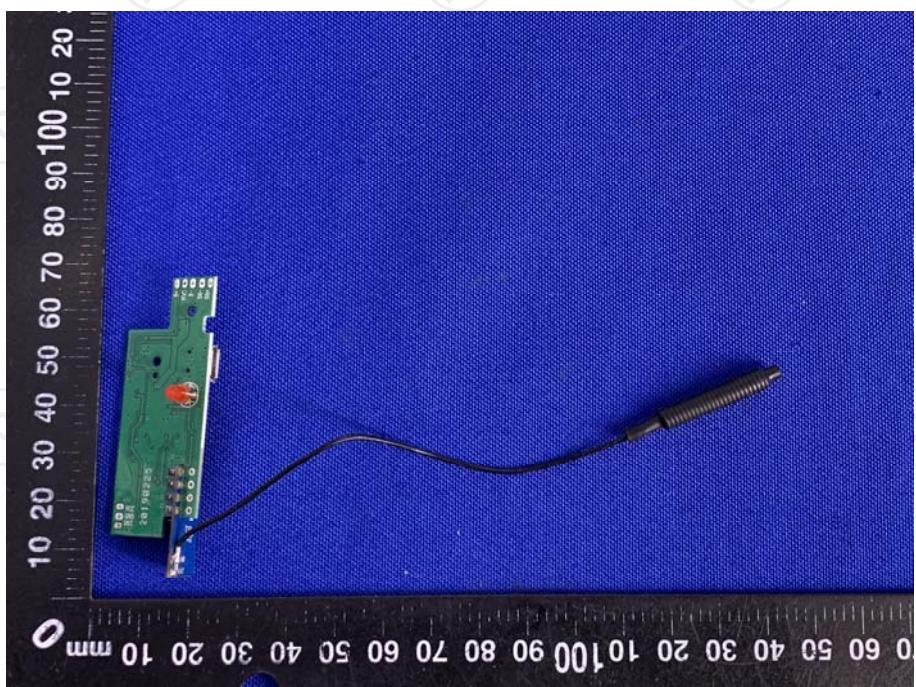
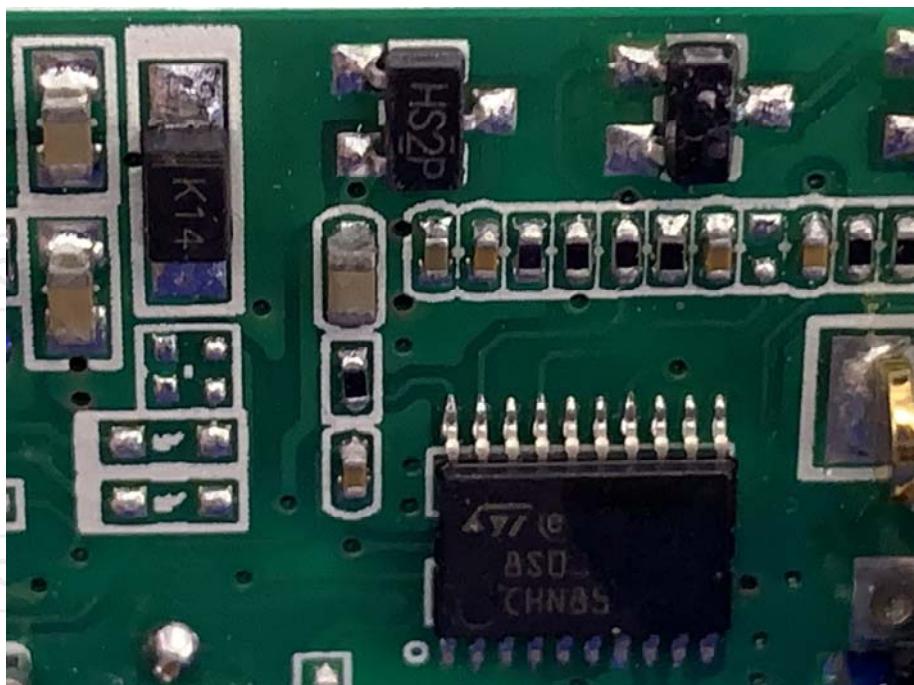


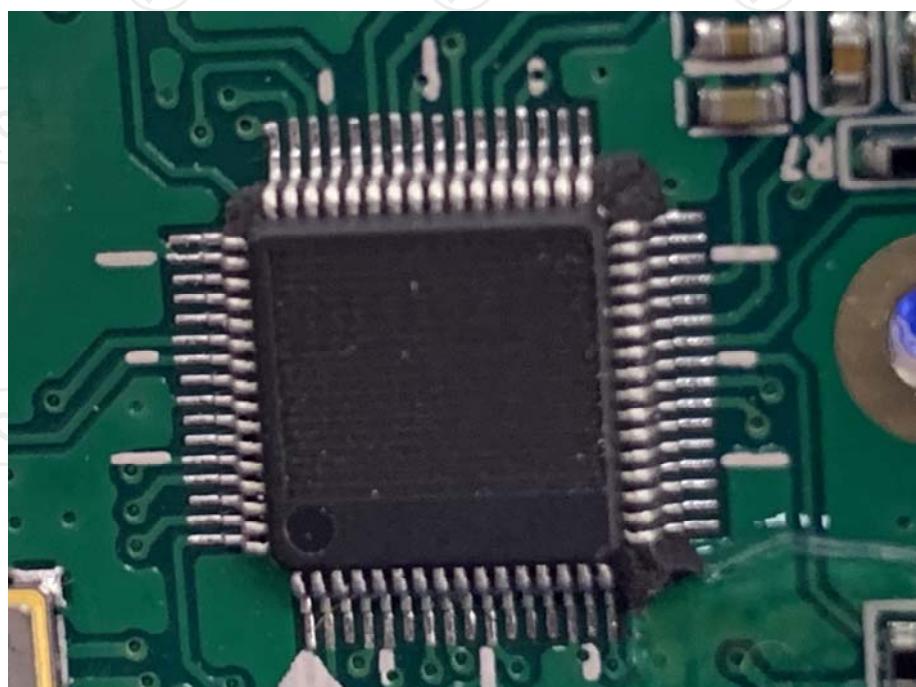
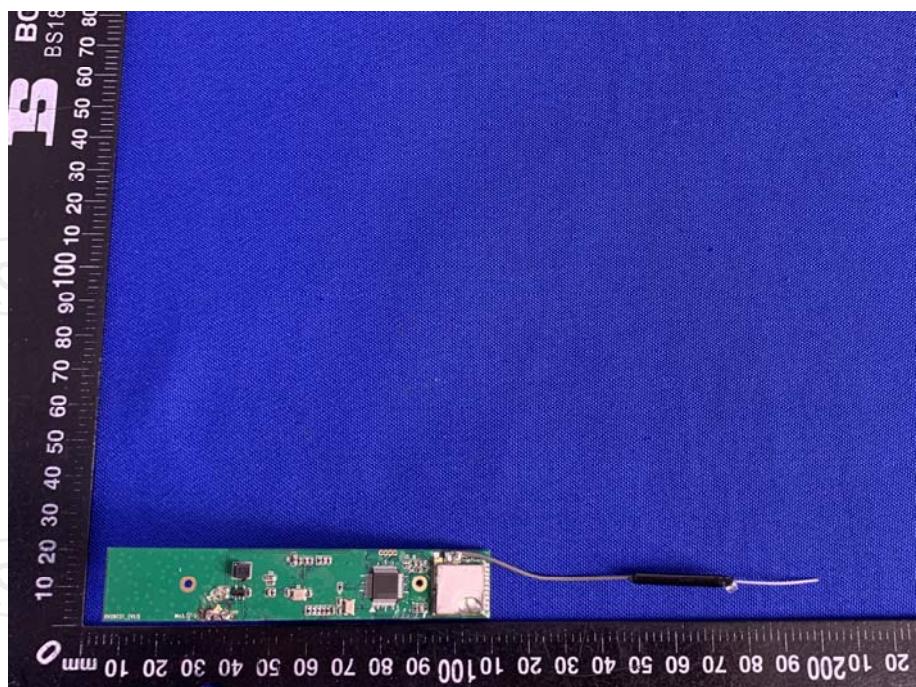


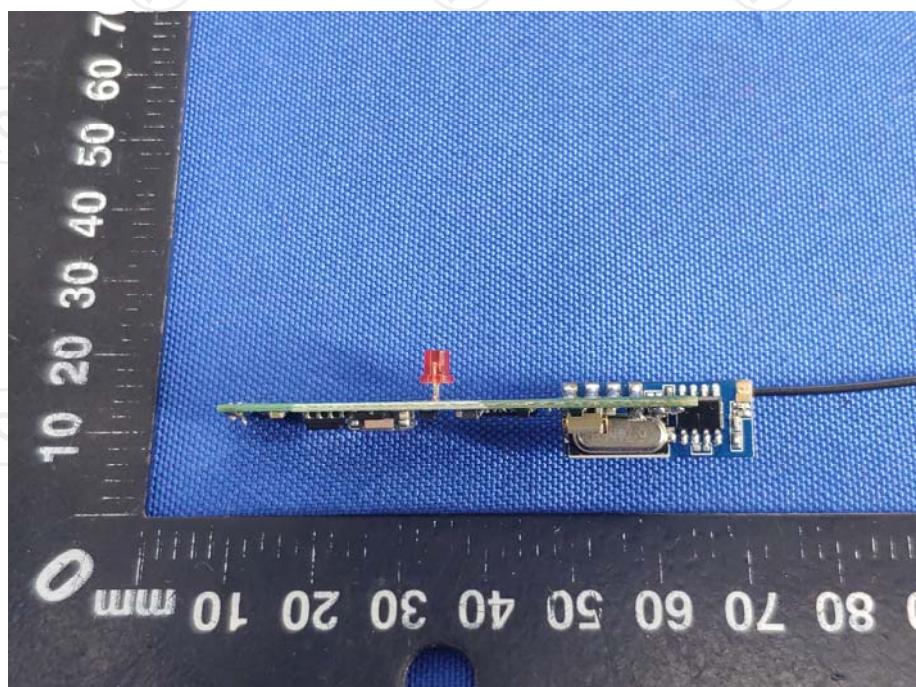
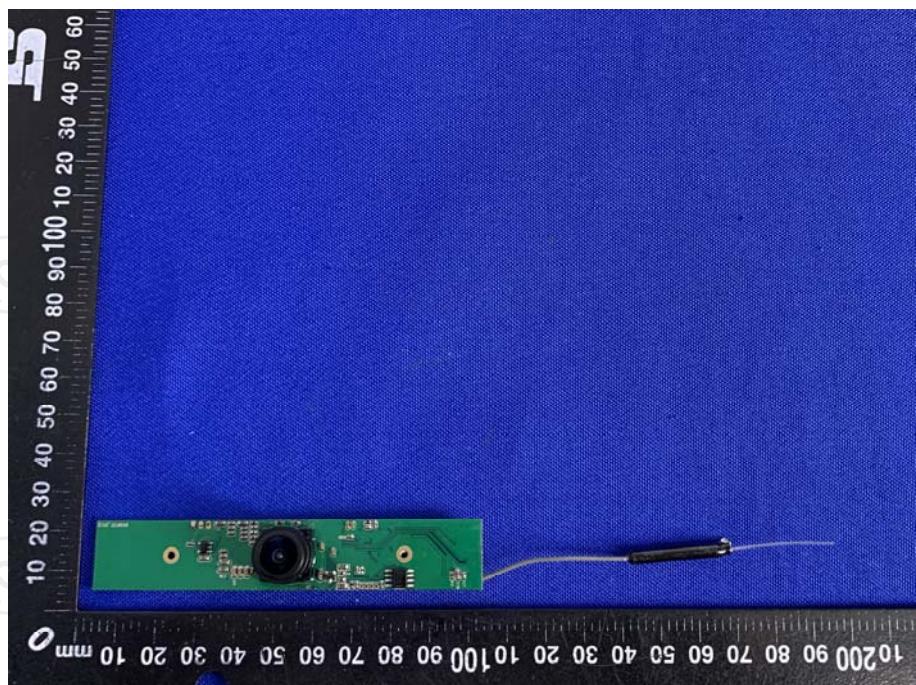
**Product: Wireless solar rear view system  
Model: WSU43  
Internal Photos**

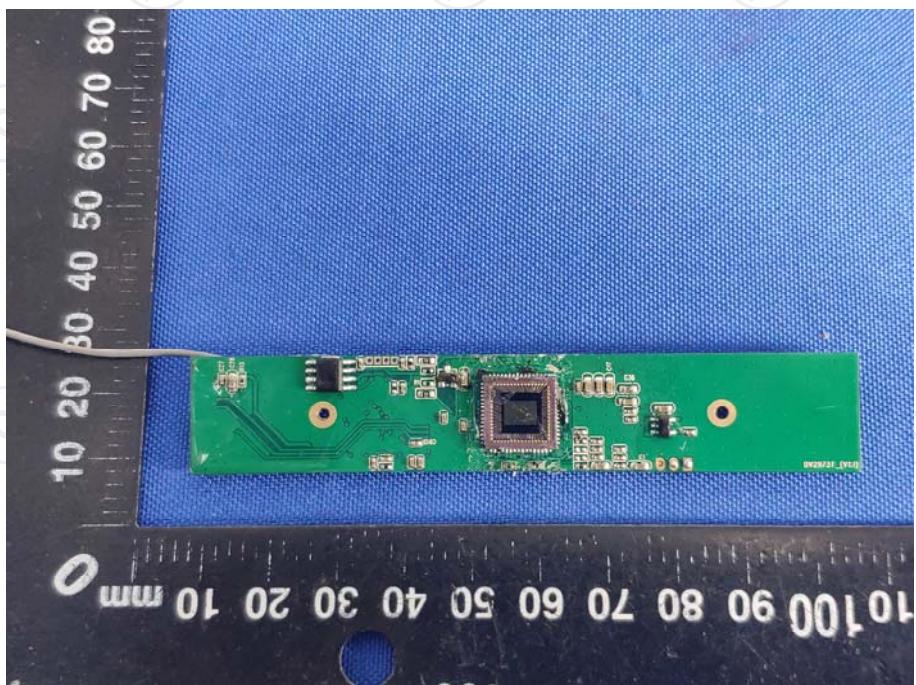
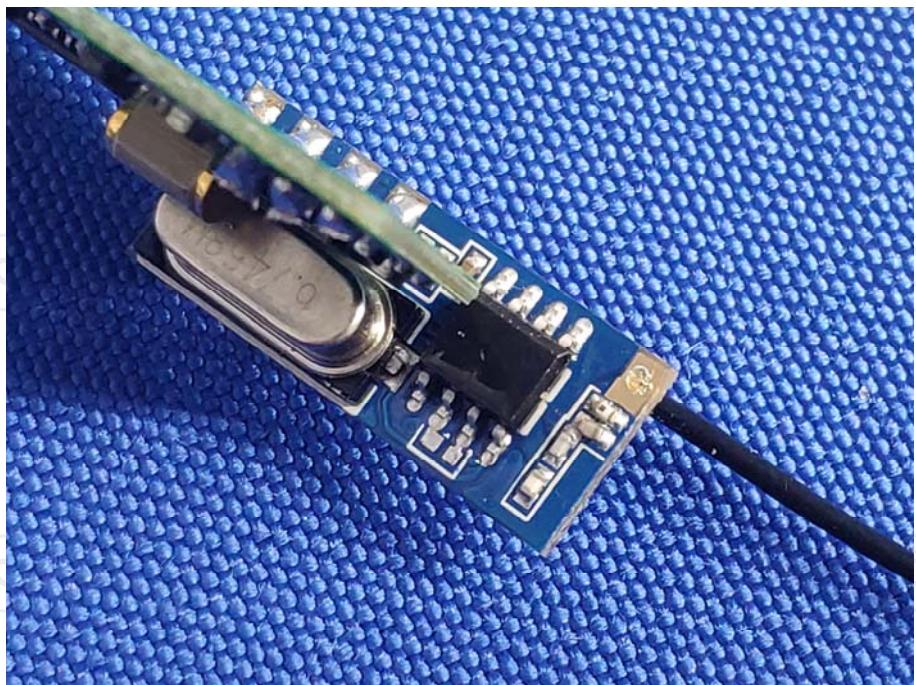


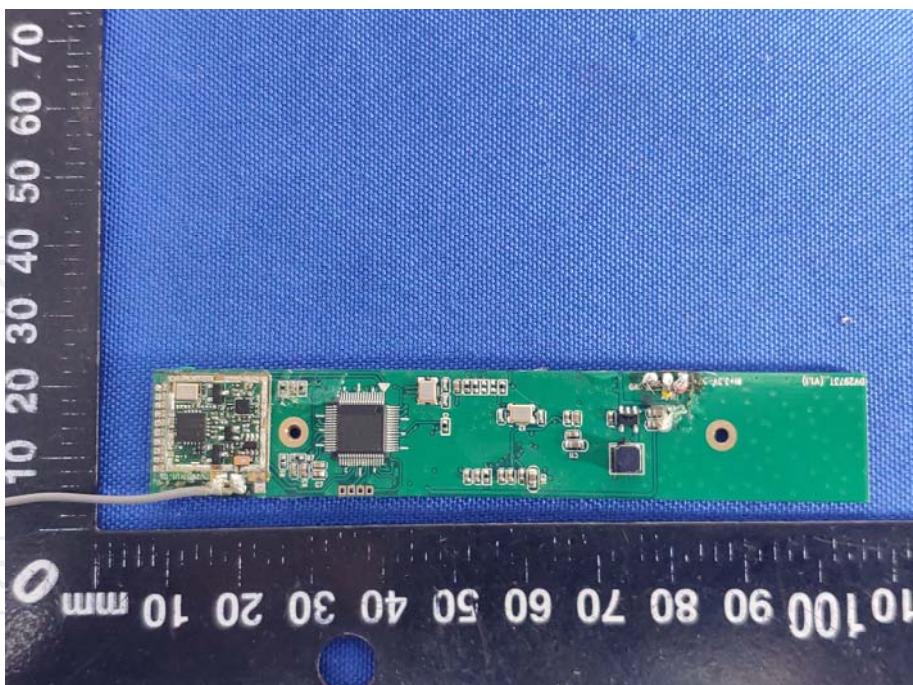


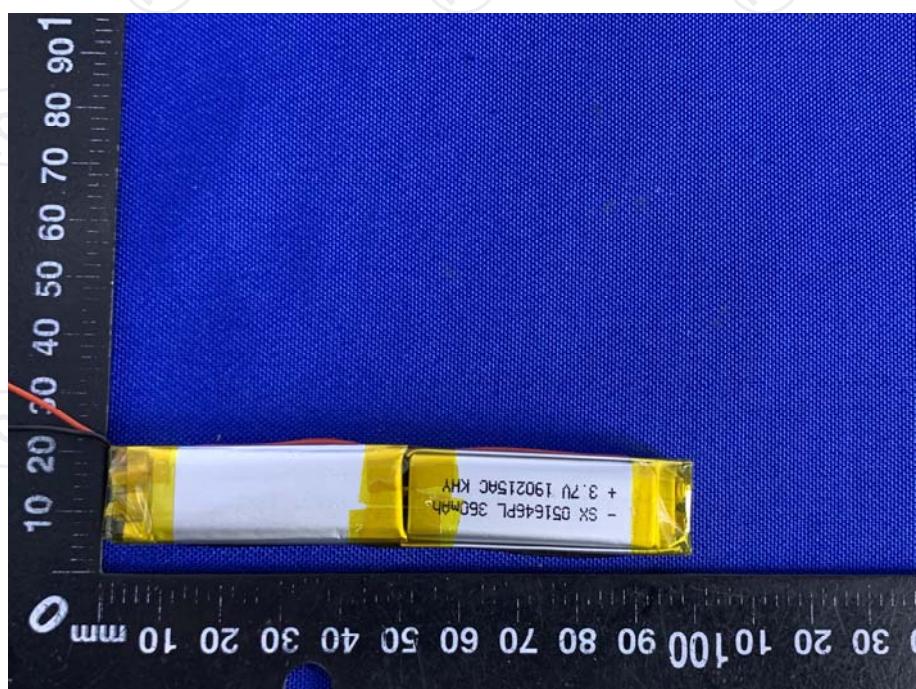












\*\*\*\*\***END OF REPORT**\*\*\*\*\*