



# FCC Test Report

Report No: FCS202206097W01

Issued for

Applicant:	INTRO UNION ELECTRONICS CO,LIMITED
Address:	6F, F BUILDING ,EAST AREA NO.8, SHANGXUE TECH-CITY,BANTIAN,LONGGANG,SHENZHEN
Product Name:	Car FM Transmitter
Brand Name:	N/A
Model Name:	T01
Series Model:	2MNCA0116B0A2
FCC ID:	2AM87AV-83
Issued By: Flux Compliance Service Laboratory Add: Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan Tel: 769-27280901 Fax:769-27280901 <a href="http://www.fcs-lab.com">http://www.fcs-lab.com</a>	



### TEST REPORT CERTIFICATION

**Applicant's name**.....: INTRO UNION ELECTRONICS CO,LIMITED  
**Address**.....: 6F, F BUILDING ,EAST AREA NO.8, SHANGXUE  
 TECH-CITY,BANTIAN, LONGGANG, SHENZHEN  
**Manufacture's Name**.....: INTRO UNION ELECTRONICS CO,LIMITED  
**Address**.....: 501,2 Building , NO.280-2, Dabutou Village, Songyuansha  
 Community, Guanhu Sub-district, Longhua District, Shenzhen, China

#### Product description

**Product Name**.....: Car FM Transmitter  
**Brand Name** .....: N/A  
**Model Name**.....: T01  
**Series Model**.....: 2MNCA0116B0A2  
**Test Standards**.....: FCC Part15.239

**Test procedure**.....: ANSI C63.10: 2013,ANSI C63.4: 2014

This device described above has been tested by FCS, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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#### Date of Test..... :

**Date (s) of performance of tests**.....: 16 Jun. 2022~24 Jun. 2022

**Date of Issue**.....: 24 Jun. 2022

**Test Result**.....: **Pass**

**Tested by** : Scott Shen  
 (Scott Shen)  
**Reviewed by** : Duke Qian  
 (Duke Qian)  
**Approved by** : Jack Wang  
 (Jack Wang)

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### 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 15.239			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	N/A	--
15.209 15.239(b) (c)	Radiated Emission	PASS	--
15.239(b)	field strength emission	PASS	--
15.203	Antenna Requirement	PASS	--
15.239(a)	20dB Bandwidth	PASS	--

NOTE: (1) "N/A" denotes test is not applicable in this Test Report

(2) All tests are according to ANSI C63.4-2014 and ANSI C63.10-2013

#### 1.1 TEST FACTORY

Company Name:	Flux Compliance Service Laboratory
Address:	Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan
Telephone:	+86-769-27280901
Fax:	+86-769-27280901
FCC Test Firm Registration Number: 514908 Designation number: CN0127 A2LA accreditation number: 5545.01	

## 1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $y \pm U$ , where expanded 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	Uncertainty
1	Conducted Emission (9KHz-150KHz)	$\pm 2.88\text{dB}$
2	Conducted Emission (150KHz-30MHz)	$\pm 2.67\text{dB}$
3	RF power,conducted	$\pm 0.71\text{dB}$
4	Spurious emissions,conducted	$\pm 0.63\text{dB}$
5	All emissions,radiated (9KHz-30MHz)	$\pm 3.02\text{dB}$
6	All emissions,radiated (30MHz-200MHz)	$\pm 3.80\text{dB}$
7	All emissions,radiated (200MHz-1000MHz)	$\pm 3.97\text{dB}$

## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

Product Name	Car FM Transmitter
Trade Name	N/A
Model Name	T01
Serial Model	2MNCA0116B0A2
Model Difference	The above product with same circuit, PCB layout, electrical parts, materials and wiring structures, Appearance shape, the materials of decorative accessories is same, only different color.
Product Description	The EUT is a Car FM Transmitter
	Operation Frequency: 88.1MHz ~107.9MHz
	Modulation Type: FM
	Antenna Designation: Please see Note 3.
Antenna Gain (dBi)	1.0dBi
Power supply	Input:12-24V Output:5V/9V/12V
Battery	N/A
Hardware version number	V1.0
Software version number	V1.0
Connecting I/O Port(s)	Please refer to the User's Manual

Note:

- For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- Table for filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
2	N/A	FTGG	internal antenna	N/A	1.0	FM ANT



Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	88.1	67	95.7	133	102.5
02	88.2	68	95.8	134	102.6
03	88.3	69	95.9	135	102.7
04	88.4	70	96.0	136	102.8
05	88.5	71	96.1	137	102.9
06	88.6	72	96.2	138	103.0
07	88.7	73	96.3	139	103.1
08	88.8	74	96.4	140	103.2
09	88.9	75	96.5	141	103.3
10	89.0	76	96.7	142	103.4
...		...		...	
...		...		...	
...		...		...	
...		...		...	
64	94.4	130	102.2	196	107.8
65	94.5	131	102.3	197	107.9
66	94.6	132	102.4		

## 2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX Mode(Low channel)
Mode 2	TX Mode(Middle channel)
Mode 3	TX Mode(High channel)

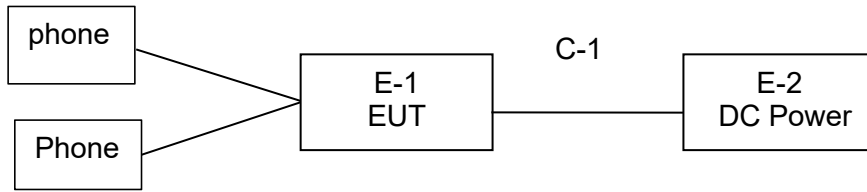
	<b>For Radiated Emission</b>
Final Test Mode	Description
Mode 1	TX Mode(Low channel)
Mode 2	TX Mode(Middle channel)
Mode 3	TX Mode(High channel)

**Note:**

- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported



**2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED**



**2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)**

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.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
1	Phone	HW	Mate 20	N/A	This phone is for testing only in report.
2	Phone	HW	Mate 30	N/A	This phone is for testing only in report.
3	DC Power	N/A	GFD586	N/A	This DC Power is for testing only in report.

Item	Shielded Type	Ferrite Core	Length	Note
C-1	unshielded	NO	100cm	N/A

Note:

- (1)The support equipment was authorized by Declaration of Confirmation.
- (2)For detachable type I/O cable should be specified the length in cm in 『Length』 column.

## 2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

### Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
EMI Test Receiver	R&S	ESW	101535	2022.02.10	2023.02.09
Bilog Antenna	TESEQ	CBL6111D	34678	2022.02.10	2023.02.09
Horn Antenna	Schwarzbeck	BBHA 9120D (1201)	9120D-1343	2022.02.10	2023.02.09
Passive Loop (9K--30MHz)	ZHNAN	ZN3090C	16035	2022.02.10	2023.02.09
Pre-mpifier (0.1M-3GHz)	EM	EM330	60538	2022.02.10	2023.02.09
PreAmplifier	Agilent	8449B	60538	2022.02.10	2023.02.09
USB RF power sensor	DARE	RPR3006W	15I00041SNO03	2022.02.10	2023.02.09
Semi-anechoic chamber	Changling	966	N/A	2022.02.10	2023.02.09
Spectrum Analyzer	R&S	FPC1500	N/A	2022.02.10	2023.02.09
DC Power	N/A	GFD586	N/A	2022.02.10	2023.02.09

### Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2022.02.10	2023.02.09
LISN	R&S	ENV216	101242	2022.02.10	2023.02.09
conduction Cable	EM	C01	N/A	2022.02.10	2023.02.09
Temperature & Humitidy	Mieo	HH660	N/A	2022.02.10	2023.02.09
Signal Analyzer	Agilent	N9020A	MY49100060	2022.02.10	2023.02.09

### 3. RADIATED EMISSION MEASUREMENT

#### 3.1 RADIATED EMISSION LIMITS

##### RADIATED EMISSION LIMITS (FCC 15.209 )

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micovolts/meter)	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

**NOTE:**

- Field Strength (dB $\mu$ V/m) = 20\*log[Field Strength ( $\mu$ V/m)].
- In the emission tables above, the tighter limit applies at the Band edge.

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

### 3.2 TEST PROCEDURE

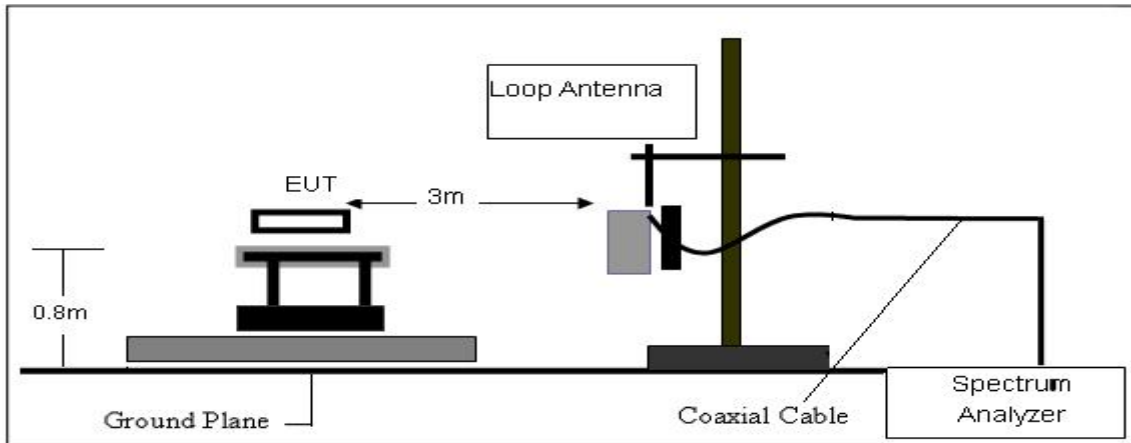
- a. The test is performed in a 3m Semi-Anechoic Chamber; the antenna factor, cable loss and so on of the site (factors) is calculated to correct the reading. The EUT is placed on a 0.8m high insulating Turn Table, and keeps 3m away from the Test Antenna, which is mounted on a variable-height antenna master tower. For the test Antenna
- b. In the frequency range of 9KHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- c. In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.
- f. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- h. For the actual test configuration, please refer to the related Item –EUT Test Photos.

#### NOTE:

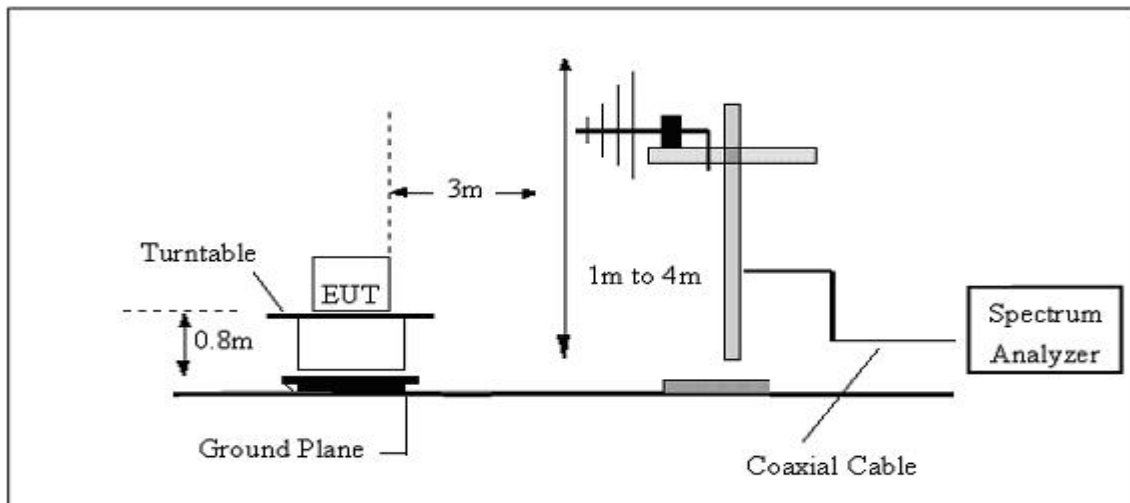
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

### 3.3 TEST SETUP

#### (A) Radiated Emission Test-Up Frequency Below 30MHz



#### (B) Radiated Emission Test-Up Frequency 30MHz~1GHz



### 3.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

### 3.5 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where

FS = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

For example

Frequency (MHz)	FS (dB $\mu$ V/m)	RA (dB $\mu$ V/m)	AF (dB)	CL (dB)	AG (dB)	Factor (dB)
300	40	58.1	12.2	1.6	31.9	-18.1

$$\text{Factor} = \text{AF} + \text{CL} - \text{AG}$$

### 3.6 TEST RESULTS

(Radiated Emission<30MHz (9KHz-30MHz, vertical))

No emission found between lowest internal used/generated frequencies to 30MHz.

#### Between 30-1000MHz

Temperature:	26 °C	Relative Humidity:	54%
Test Voltage:	DC 24V	Phase:	Horizontal
Test Mode:	Mode 1(Worst)		

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
69.3568	36.91	-20.21	16.70	40.00	-23.30	QP
105.6414	31.99	-17.98	14.01	43.50	-29.49	QP
251.1802	43.20	-17.70	25.50	46.00	-20.50	QP
312.1792	42.33	-15.77	26.56	46.00	-19.44	QP
435.5898	54.31	-14.44	39.87	46.00	-6.13	QP
599.3211	34.68	-11.36	23.32	46.00	-22.68	QP

Remark:

1. Margin = Result (Result =Reading + Factor )–Limit



Temperature:	26 °C	Relative Humidity:	54%
Test Voltage:	DC 24V	Phase:	Vertical
Test Mode:	Mode 1(Worst)		

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
51.3005	68.52	-40.24	28.28	40.00	-11.72	QP
74.1351	59.79	-40.24	19.55	40.00	-20.45	QP
109.4116	58.68	-40.24	18.44	43.50	-25.06	QP
134.5592	60.70	-40.24	20.46	43.50	-23.04	QP
242.5252	66.08	-40.24	25.84	46.00	-20.16	QP
435.5898	82.33	-40.24	42.09	46.00	-3.91	QP

Remark:

1. Margin = Result (Result =Reading + Factor )–Limit





## Restricted bands around fundamental frequency(Radiated)

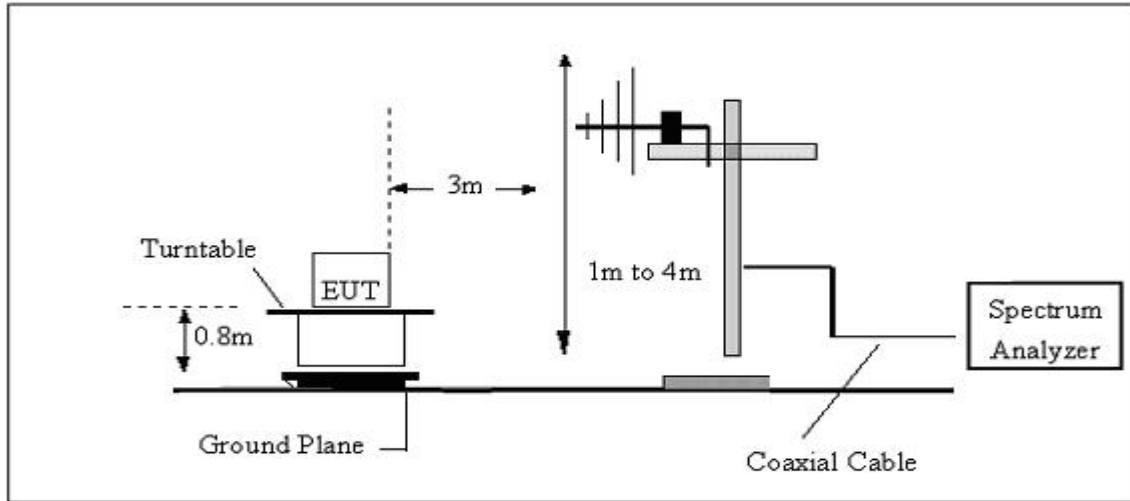
Frequency MHz	Polarization	Level dB(uV/m) QP	Limit dB(uV/m) QP	Margin dB	Pass/Fail	Detector
88.000	H	23.42	40	16.58	Pass	QP
88.000	V	25.18	40	14.82	Pass	QP
108.000	H	23.63	43.5	19.87	Pass	QP
108.000	V	25.52	43.5	17.98	Pass	QP

## 4. FIELD STRENGTH EMISSION

### 4.1 REQUIREMENT

The field strength of any emissions within the permitted 200 kHz band shall not exceed 250 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

### 4.2 TEST SETUP



### 4.3 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



## 4.4 TEST RESULTS

Temperature:	25 °C	Relative Humidity:	50%
Test Voltage:	DC 24V	Test Mode:	TX Mode

3m distance measured

Test frequency (MHz)	detector	Reading (dBuV/m)	factor dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
88.10	Peak	50.13	-15.24	34.89	68.00	-33.11
	Avg	40.26	-14.29	25.97	48.00	-22.03
98.10	Peak	55.18	-15.36	39.82	68.00	-28.18
	Avg	45.33	-15.01	30.32	48.00	-17.68
107.90	Peak	52.25	-16.42	35.83	68.00	-32.17
	Avg	42.41	-15.95	26.46	48.00	-21.54

## 5. 20DB BANDWIDTH

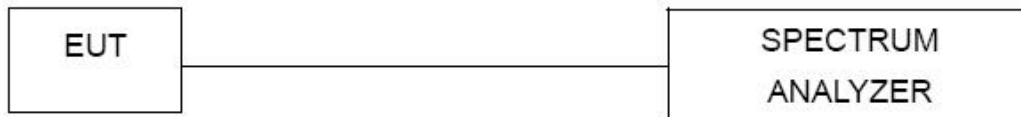
### 5.1 APPLIED PROCEDURES / LIMIT

Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88-108 MHz.

### 5.2 TEST PROCEDURE

1. Set RBW = 3kHz.
2. Set the video Mobile Phonewidth (VBW)  $\geq 3$  RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### 5.3 TEST SETUP



### 5.4 EUT OPERATION CONDITIONS

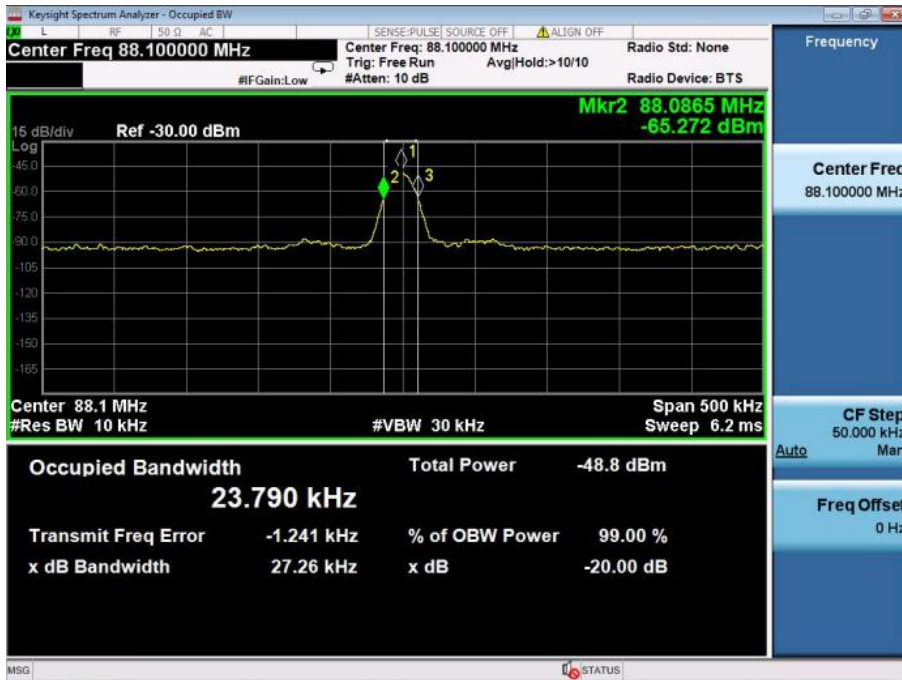
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

5.5 TEST RESULTS

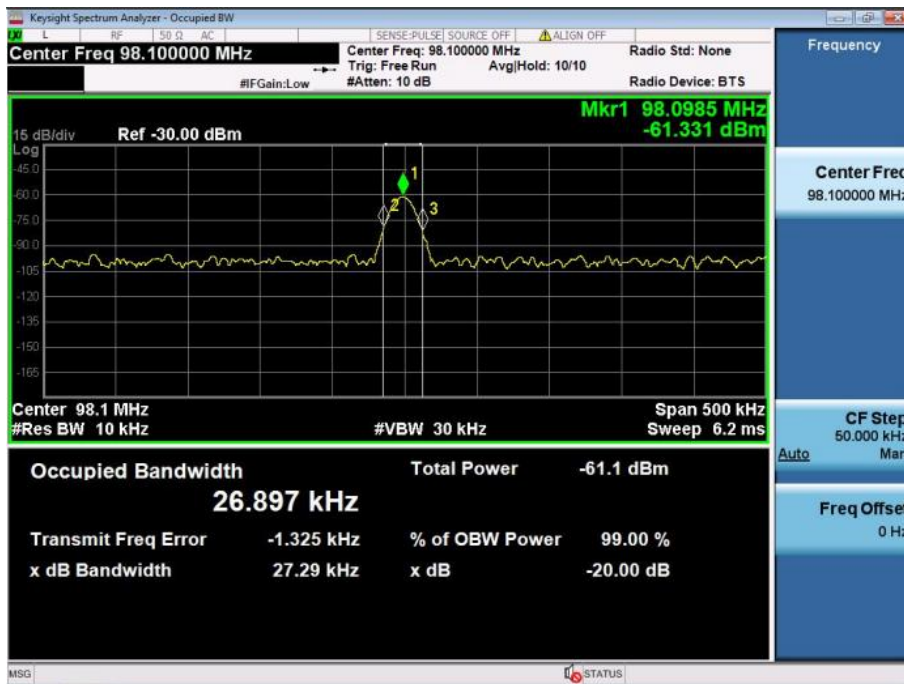
Temperature:	25 °C	Relative Humidity:	60%
Test Voltage:	DC 24V	Test Mode:	TX Mode

Centre Frequency	Measurement	
	20dB Bandwidth (KHz)	Frequency Range (KHz)
88.10	27.26	200
98.10	27.29	200
107.90	27.42	200

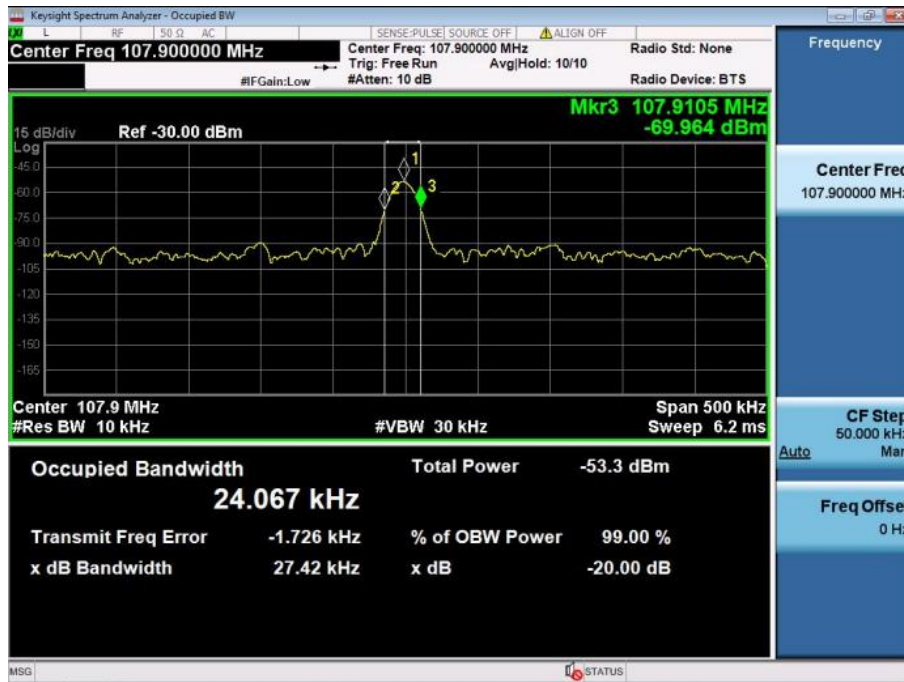
Low channel



Mid channel



High channel





## 7. ANTENNA REQUIREMENT

### 7.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

### 7.2 EUT ANTENNA

The EUT antenna is PCB Antenna. It comply with the standard requirement.

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