FCC TEST REPORT

Metra Electronics

Parking sensor

Test Model: TE-8PSK

Additional Model No.: Please Refer to Page 6

Prepared for	:	Metra Electronics
Address	:	460 Walker St, Holly Hill, Florida 32117, United States
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample	:	July 05, 2021
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	July 05, 2021 ~ July 20, 2021
Date of Report	:	July 20, 2021

FCC TEST REPORT

FCC CFR 47 PART 15 C

Report Reference No.	**:**	**LCS210629056AEA**
Date of Issue.....	:	July 19, 2021
Testing Laboratory Name.....	**:**	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address.....	:	101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Shajing Street, Baoan District, Shenzhen, China
Testing Location/ Procedure.....	:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name.....	**:**	**Metra Electronics**
Address.....	:	460 Walker St, Holly Hill, Florida 32117, United States
Test Specification		
Standard.....	:	FCC CFR 47 PART 15 C / ANSI C63.10: 2013
Test Report Form No.....	:	LCSEMC-1.0
TRF Originator.....	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF.....	:	Dated 2011-03

Test Item Description.....	**:**	**Parking sensor**
Trade Mark.....	:	N/A
Test Model.....	:	TE-8PSK
Ratings.....	:	DC 9-16V, 20-200mA
Result	**:**	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Diamond.Lu/ Administrators	Jin Wang / Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : **LCS210629056AEA**	July 19, 2021 Date of issue

Test Model.....	: TE-8PSK
EUT.....	: Parking sensor
Applicant.....	**: Metra Electronics**
Address.....	: 460 Walker St, Holly Hill, Florida 32117, United States
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: Shenzhen Chelide Technology Co., Ltd**
Address.....	: Fl 4, Bld 2, Caifa Indurstrial Park, Renmin Road No.181, Longhua District, Shenzhen, Guangdong, 518110.
Telephone.....	: /
Fax.....	: /
Factory.....	**: Shenzhen Chelide Technology Co., Ltd**
Address.....	: Fl 4, Bld 2, Caifa Indurstrial Park, Renmin Road No.181, Longhua District, Shenzhen, Guangdong, 518110.
Telephone.....	: /
Fax.....	: /

Test Result	**Positive**

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	July 19, 2021	Initial Issue	Gavin Liang

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	Parking sensor
Test Model	TE-8PSK
Additional Model No.	TE-4PSK,TE-4PSKRUB,TE-B4PSK,TE-BR4PSK,TE-ES, TE-RES
Model Declaration	PCB board, structure and internal of these model(s) are the same, So no additional models were tested
Hardware Version	/
Software Version	/
Power Supply	DC 9-16V, 20-200mA
Wireless technology	
Ultrasonic Frequency	40KHz
Channel Spacing	N/A
Channel Number	1 channel
Modulation Type	AM
Antenna Description	Internal Antenna, 0dBi (Max.)

1.2. Support Equipment List

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

1.3. External I/O

I/O Port Description	Quantity	Cable
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1.4. Description of Test Facility

NVLAP Accreditation Code is 600167-0.

FCC Designation Number is CN5024.

CAB identifier is CN0071.

CNAS Registration Number is L4595.

Test Firm Registration Number: 254912

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

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1.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.6. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	3.10dB	(1)
		30MHz~200MHz	2.96dB	(1)
		200MHz~1000MHz	3.10dB	(1)
		1GHz~26.5GHz	4.00dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	1.63dB	(1)
Power disturbance	:	30MHz~300MHz	1.60dB	(1)

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

1.7. Description of Test Modes

The EUT operates at 40 KHz. The following operating modes were applied for the related test items.

All test modes were tested, only the result of the worst case was recorded in the report.

It was pre-tested on the positioned of each 3 axis. The worst case was found positioned on X-plane.

Mode of Operations	Transmitting Frequency (MHz)
AM	0.04
For Conducted Emission	
Test Mode	TX Mode
For Radiated Emission	
Test Mode	TX Mode

***Note: Using a temporary antenna connector for the EUT when the conducted measurements are performed.

2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10: 2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd.

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.201, 15.203, 15.205, 15.207, 15.209 under the FCC Rules Part 15 Subpart C.

2.3. General Test Procedures

2.3.1 Conducted Emissions

According to the requirements in Section 6.2 of ANSI C63.10: 2013, AC power-line conducted emissions shall be measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table and the turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10: 2013.

3. CONNECTION DIAGRAM OF TEST SYSTEM

3.1. Justification

The system was configured for testing in a continuous transmitting condition.

3.2. EUT Exercise Software

Powered on the EUT then the EUT will transmit at 40 KHz.

3.3. Special Accessories

N/A

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

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

3.6. Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart C		
FCC Rules	Description Of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207(a)	Power Line Conducted Emissions	N/A
§15.201(a), §15.205(a), §15.209(a), §15.215(a)	Radiated Emissions Measurement	Compliant
§2.1049 §15.215	99% and 20dB Bandwidth	Compliant

Remark:

Note 1 --- Test results inside test report.

5. POWER LINE CONDUCTED EMISSIONS

5.1 Requirements

Since the EUT powered by batteries and has no connections for AC power ,no conducted emissions Tests are required.

6. RADIATED EMISSION MEASUREMENT

6.1. Standard Applicable

According to FCC §15.201 (a) “Intentional radiators operated as carrier current systems, devices operated under the provisions of §§15.211, 15.213, and 15.221, and devices operating below 490 kHz in which all emissions are at least 40 dB below the limits in §15.209 are subject to Suppliers Declaration of Conformity pursuant to the procedures in subpart J of part 2 of this chapter prior to marketing.”

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

6.2. Instruments Setting

Please refer to of equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

6.3. Test Procedure

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 1 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

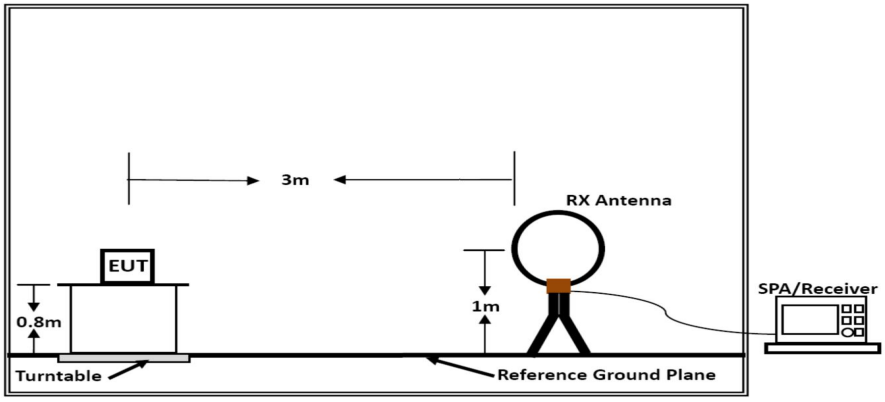
--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

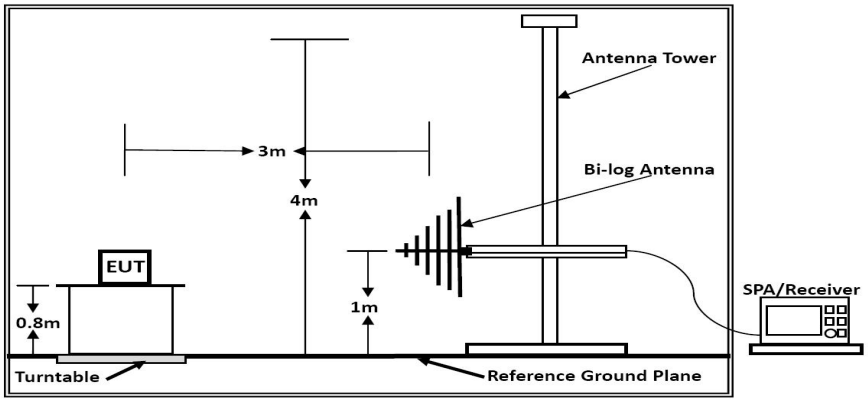
--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

6.4. Block Diagram of Test Setup



Below 30MHz



Below 1GHz

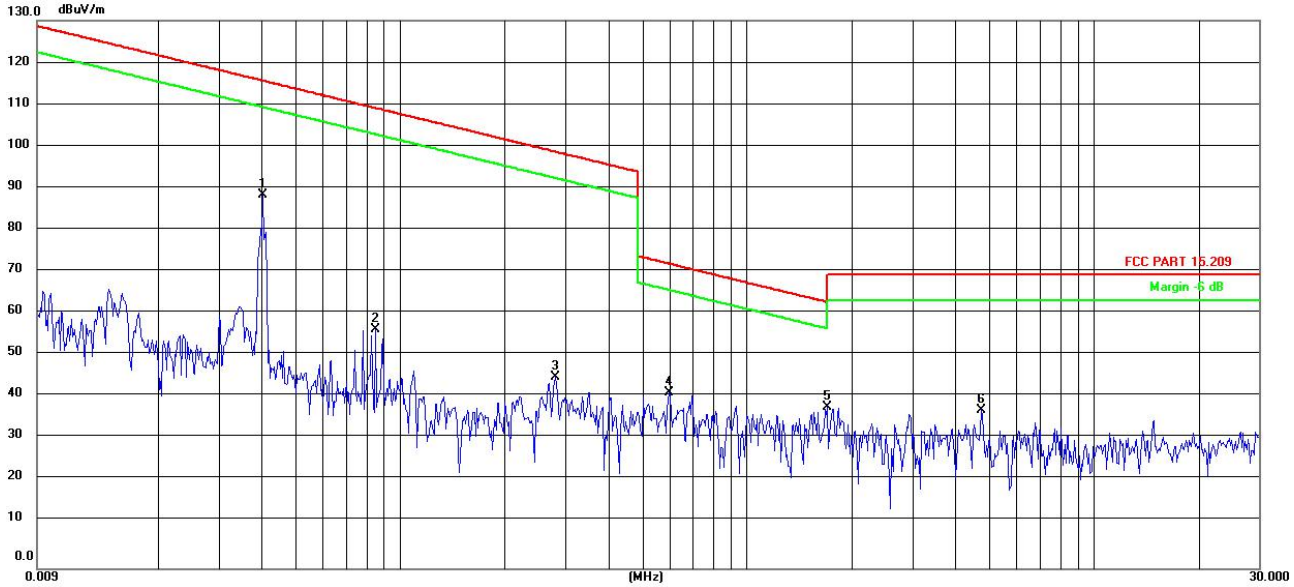
Distance extrapolation factor = 20 log (specific distanc [3m] / test distance [1m]) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

6.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.6. Results of Radiated Emissions (9 KHz~30MHz)

Temperature	21.6℃	Humidity	52.7%
Test Engineer	Carl Fu	Test Mode	TX



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1 *	0.0403	67.75	20.88	88.63	115.44	-26.81	QP
2	0.0851	36.10	20.78	56.88	108.96	-52.08	QP
3	0.2805	24.95	20.49	45.44	98.63	-53.19	QP
4	0.5964	21.26	20.51	41.77	72.09	-30.32	QP
5	1.7121	17.99	20.49	38.48	69.54	-31.06	QP
6	4.7580	17.07	20.51	37.58	69.54	-31.96	QP

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

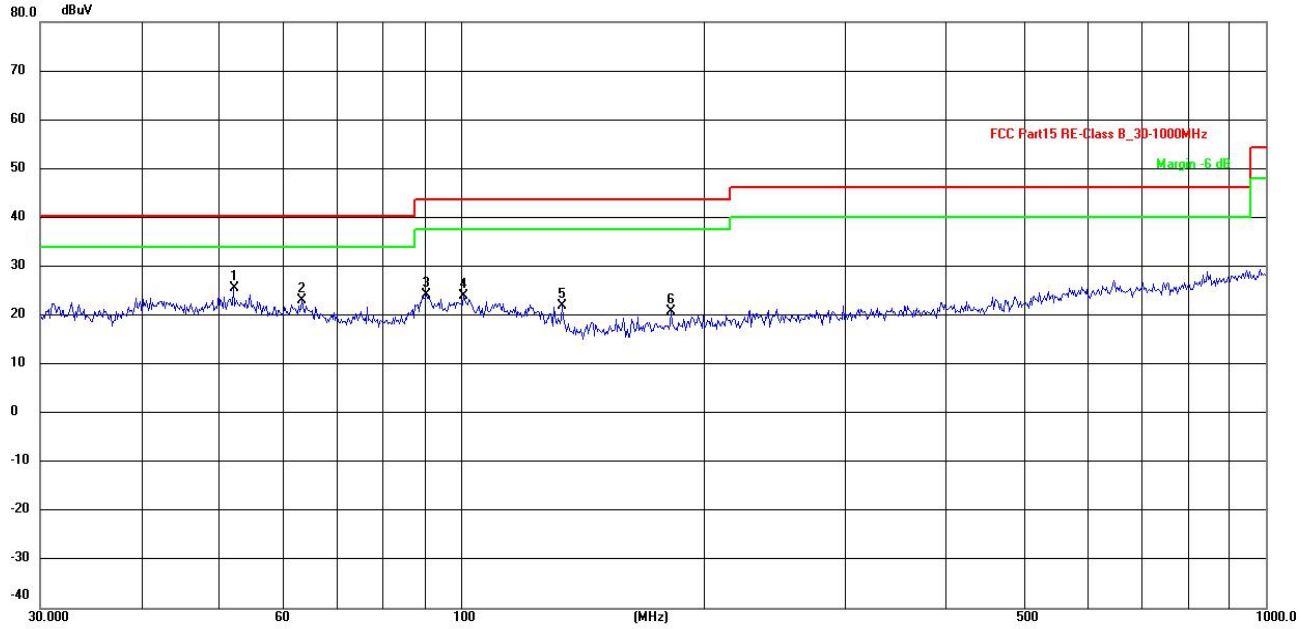
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

6.7. Results of Radiated Emissions (30 MHz~1000 MHz)

Temperature	21.6℃	Humidity	52.7%
Test Engineer	Carl Fu	Test Mode	TX

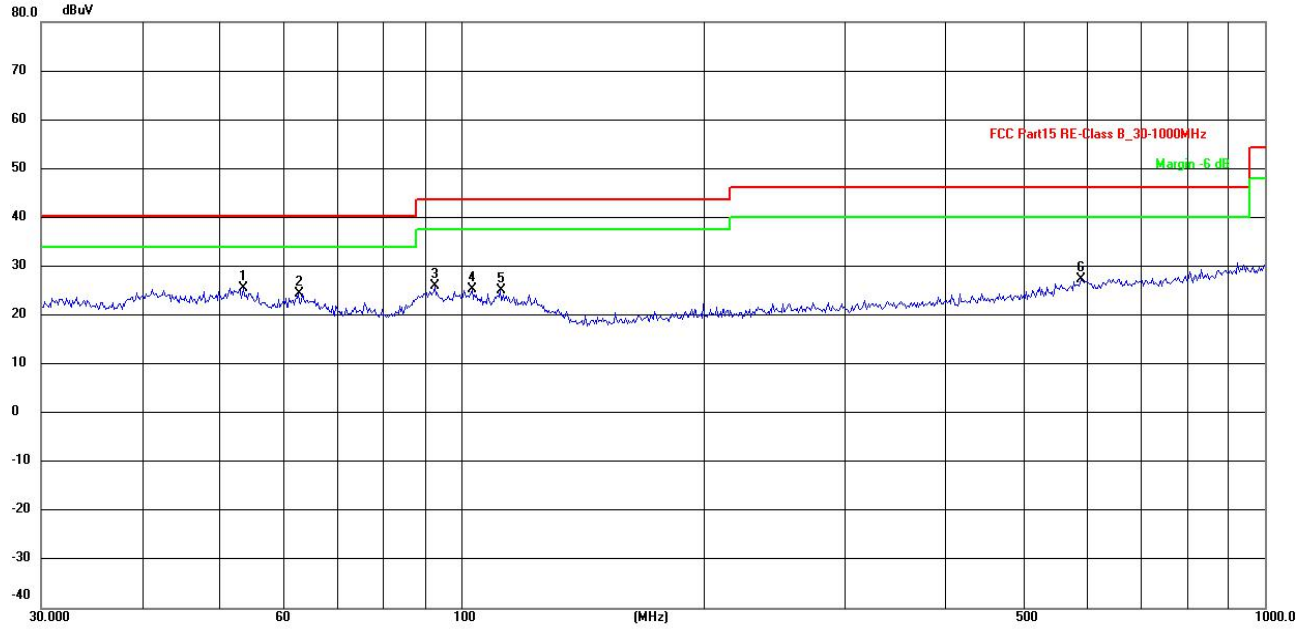
PASS.

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Det.
1 *	52.2079	46.62	-20.97	25.65	40.00	-14.35	QP
2	63.5356	45.73	-22.70	23.03	40.00	-16.97	QP
3	90.5374	45.05	-20.83	24.22	43.50	-19.28	QP
4	100.9339	43.28	-19.24	24.04	43.50	-19.46	QP
5	133.6188	46.06	-24.22	21.84	43.50	-21.66	QP
6	182.5592	44.89	-24.03	20.86	43.50	-22.64	QP

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Det.
1 *	53.5052	46.64	-21.14	25.50	40.00	-14.50	QP
2	62.6507	46.94	-22.56	24.38	40.00	-15.62	QP
3	92.7871	46.27	-20.26	26.01	43.50	-17.49	QP
4	103.0800	44.72	-19.30	25.42	43.50	-18.08	QP
5	111.7380	44.98	-19.82	25.16	43.50	-18.34	QP
6	590.9737	43.07	-15.66	27.41	46.00	-18.59	QP

****Note:*

1). Pre-scan all modes and recorded the worst case results in this report (TX).

2). Emission level (dBuV/m) = 20 log Emission level (uV/m).

3). Level=Reading level + Factor

Margin=Level – Limit

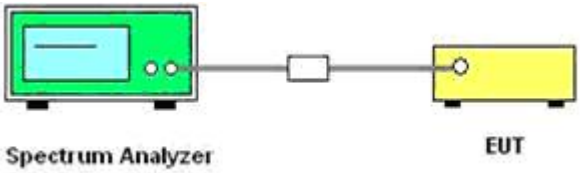
7. 99% AND 20 DB BANDWIDTH MEASUREMENT

7.1. Standard Applicable

According to §15.215, device must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

According to §2.1049, The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable.

7.2. Block Diagram of Test Setup



7.3. Test Procedure

Use the following spectrum analyzer settings:

Span = 20 KHz

RBW≥1% 20 db bandwidth

VBW = 3*RBW

Sweep = auto

Detector function = peak

Trace = max hold

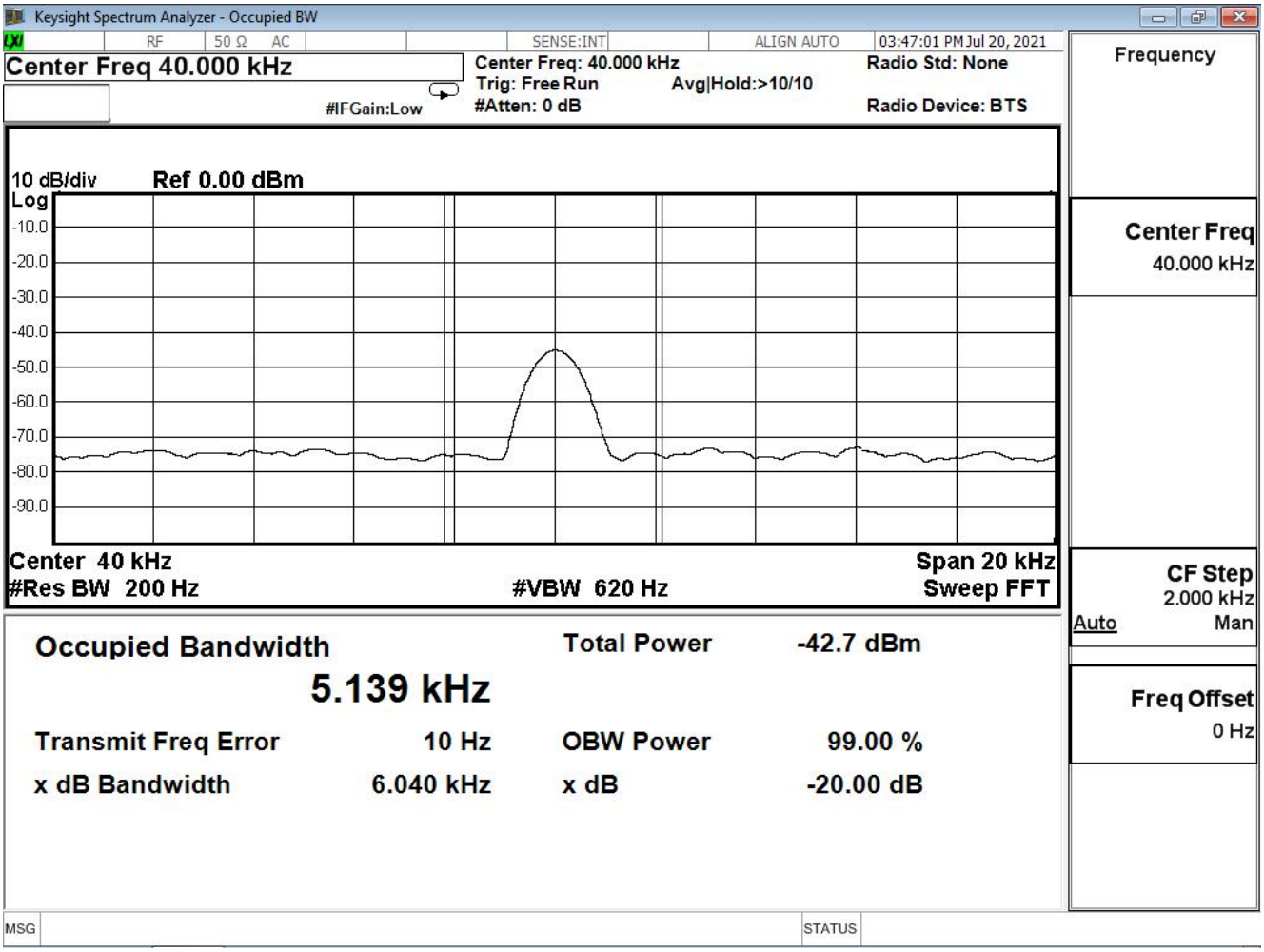
The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

7.4. Test Results

Test Result Of 99% and 20dB Bandwidth Measurement			
Test Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)	Limit (MHz)
0.04	5.139	6.040	No Limit

Remark:

1. *Test results including cable loss;*
2. *Please refer to following test plots;*


Keysight Spectrum Analyzer - Occupied BW
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
03:47:01 PM Jul 20, 2021
Center Freq 40.000 kHz
Center Freq: 40.000 kHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 0 dB
Radio Std: None
Radio Device: BTS
Frequency
10 dB/div
Log
Ref 0.00 dBm
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
Center 40 kHz
#Res BW 200 Hz
#VBW 620 Hz
Span 20 kHz
Sweep FFT
Center Freq
40.000 kHz
CF Step
2.000 kHz
Auto
Man
Freq Offset
0 Hz
Occupied Bandwidth
5.139 kHz
Total Power
-42.7 dBm
Transmit Freq Error
10 Hz
OBW Power
99.00 %
x dB Bandwidth
6.040 kHz
x dB
-20.00 dB
MSG
STATUS

8. ANTENNA REQUIREMENTS

8.1 Standard Applicable

According to antenna requirement of §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

8.2 Antenna Connected Construction

8.2.1. Standard Applicable

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.

8.2.2. Antenna Connector Construction

The directional gains of internal antenna used for transmitting is 0dBi, and the antenna is connect to PCB board and no consideration of replacement, meet FCC §15.203 antenna requirement.

8.2.3. Results: Compliance.

9. LIST OF MEASURING EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	MXA Signal Analyzer	Agilent	N9020A	MY49100040	2021-06-16	2022-06-15
2	SPECTRUM ANALYZER	R&S	FSP40	100503	2020-11-17	2021-11-16
3	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2021-06-21	2022-06-20
4	Positioning Controller	MF	MF7082	MF78020803	2021-06-21	2022-06-20
5	EMI Test Software	AUDIX	E3	/	N/A	N/A
6	EMI Test Receiver	R&S	ESR 7	101181	2021-06-21	2022-06-20
7	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2018-07-26	2021-07-25
8	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2018-07-26	2021-07-25
9	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2021-07-01	2024-06-30
10	RF Cable-R03m	Jye Bao	RG142	CB021	2021-06-21	2022-06-20
11	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2021-06-21	2022-06-20
12	EMI Test Receiver	R&S	ESPI	101840	2021-06-21	2022-06-20
13	Artificial Mains	R&S	ENV216	101288	2021-06-21	2022-06-20
14	10dB Attenuator	SCHWARZBECK	MTS-IMP-136	261115-001-0032	2021-06-21	2022-06-20

10. TEST SETUP PHOTOGRAPHS

Please refer to separated files for Test Setup Photos of the EUT.

11. EXTERIOR PHOTOGRAPHS

Please refer to separated files for External Photos of the EUT.

12. INTERIOR PHOTOGRAPHS

Please refer to separated files for Internal Photos of the EUT.

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