

FCC Test Report

Product Name : TPMS
Trade name : Mobiletron
Model No. : TX-N002, TX-C004M, TX-C004R, TX-C001EU,
TX-C001EUK, TX-C002EU, TX-N004
FCC ID : ULZ-TXN002

Applicant : Mobiletron Electronics Co., Ltd.
Address : 85,Sec.4,Chung-Ching Rd.,Ta-Ya District, Taichung, Taiwan

Date of Receipt : May 12, 2020
Issued Date : Aug. 21, 2020
Report No. : 2050206R-E3032110105
Report Version : V1.0



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Test Report Certification

Issued Date : Aug. 21, 2020

Report No. : 2050206R-E3032110105



Product Name : TPMS

Applicant : Mobiletron Electronics Co., Ltd.

Address : 85,Sec.4,Chung-Ching Rd.,Ta-Ya District, Taichung, Taiwan

Manufacturer : Mobiletron Electronics Co., Ltd.

Model No. : TX-N002, TX-C004M, TX-C004R, TX-C001EU,
TX-C001EUK, TX-C002EU, TX-N004

Trade Name : Mobiletron

FCC ID : ULZ-TXN002

EUT Voltage : DC 3V (Power by Battery)

Testing Voltage : DC 3V (Power by Battery)

Applicable Standard : FCC CFR Title 47 Part 15 Subpart C Section 15.231(b): 2019

Laboratory Name : Hsin Chu Laboratory

Address : No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township,
Hsinchu County 310, Taiwan, R.O.C.
TEL: +886-3-582-8001 / FAX: +886-3-582-8958

Test Result : Complied

Documented By : Lyla Yang
(Lyla Yang / Engineering Adm. Specialist)

Tested By : Scott Chang
(Scott Chang / Senior Engineer)

Approved By : Louis Hsu
(Louis Hsu / Deputy Manager)

Revision History

Version	Description	Issued Date
V1.0	Initial issue of report.	Aug. 21, 2020

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1. General Information

1.1. EUT Description

Product Name	TPMS
Trade Name	Mobiletron
Model No.	TX-N002, TX-C004M, TX-C004R, TX-C001EU, TX-C001EUK, TX-C002EU, TX-N004
Frequency Range	433.92 MHz (FSK) / 433.957MHz (ASK)
Channel Number	1
Type of Modulation	FSK / ASK

Antenna Information	
Brand / Model	Mobiletron / 20010452
Antenna Type	LOOP Antenna
Antenna Gain	-10 dBi

Accessories Information	
Battery	Murata / CR2450S-MPB Rating: DC 3V

FSK

Working Frequency of Each Channel	
Channel	Frequency
01	433.92 MHz

ASK

Working Frequency of Each Channel	
Channel	Frequency
01	433.957MHz

Note:

1. This device is a TPMS including 433.92 MHz and 433.957MHz transmitting functions.
2. The different model names are for market purpose.
3. Regards to the frequency band operation; the lowest , middle and highest frequency of channel were selected to perform the test, and then shown on this report.
4. The EUT description is from the customer declaration.

1.2. Test Mode

DEKRA verified the construction and function in typical operation. All the test modes are performed in normal operation and are defined as:

Test Mode	Mode 1: Transmit_433.92MHz_FSK Mode 2: Transmit_433.957MHz_ASK
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Performed Item	Mode 1	Mode 2
Conducted Emission	NA	NA
Radiated Emission	Complies	Complies
20dB Bandwidth	Complies	Complies
Duty Cycle	Complies	Complies
Transmitter Time	Complies	Complies

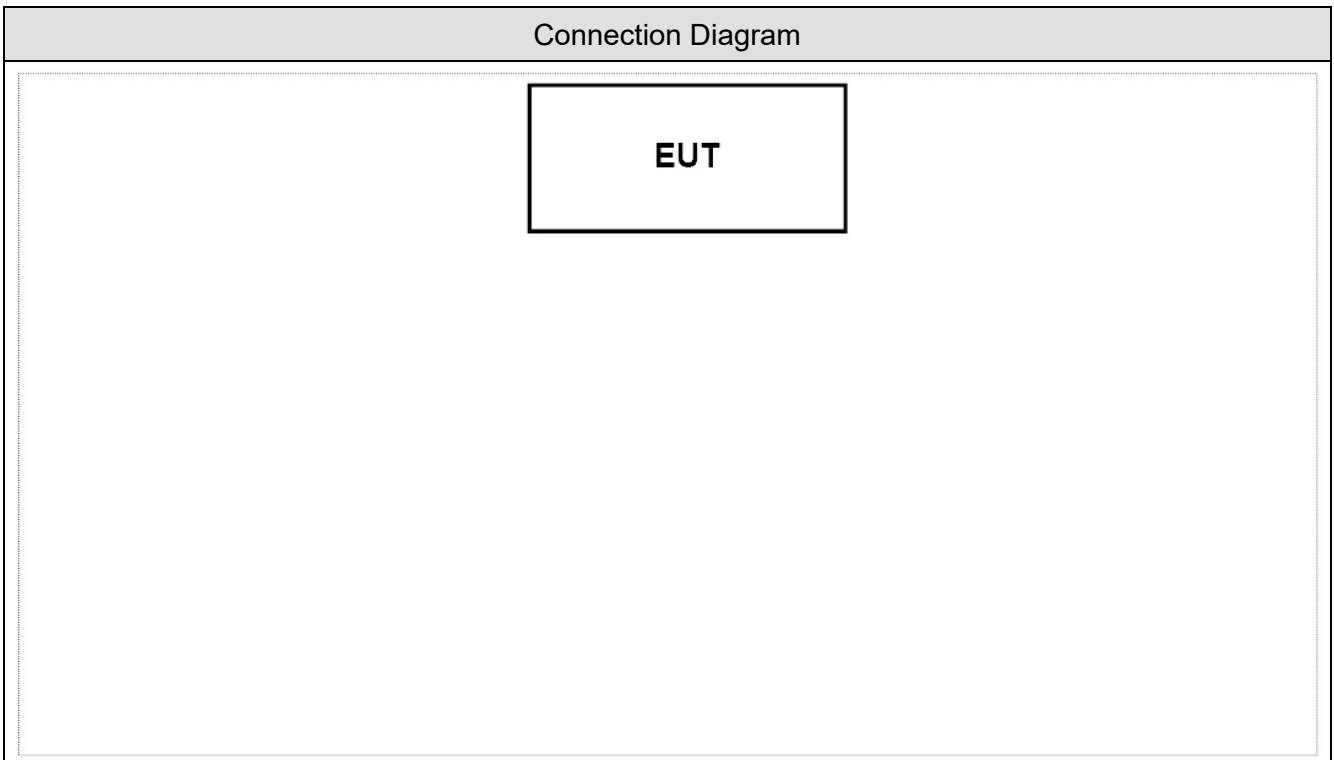
Note: Determining compliance shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
N/A				

1.4. Configuration of tested System



1.5. EUT Exercise Software

1	Setup the EUT as shown in Section 1.4.
2	Confirm that the signal is correct.
3	Verify that the EUT works properly.

1.6. Comments and Remarks

The product specification and testing instructions for the EUT declared in the report are provided by the manufacturer who will take all responsibilities for the accuracy.

1.7. Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Required	Test Site
Temperature (°C)	FCC PART 15 C 15.207	15 - 35	--
Humidity (%RH)	Conducted Emission	25 - 75	
Temperature (°C)	FCC PART 15 C 15.231	15 - 35	2
Humidity (%RH)	Radiated Emission	25 - 75	
Temperature (°C)	FCC PART 15 C 15.231	15 - 35	3
Humidity (%RH)	20dB Bandwidth	25 - 75	
Temperature (°C)	FCC PART 15 C 15.231	15 - 35	3
Humidity (%RH)	Duty Cycle	25 - 75	
Temperature (°C)	FCC PART 15 C 15.231	15 - 35	3
Humidity (%RH)	Transmitter Time	25 - 75	

Note: Test Site information refers to Laboratory Information.

USA : **FCC Registration Number: TW3024**

Canada **IC Registration Number: 22397-1 / 22397-2 / 22397-3**

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: <http://www.dekra.com.tw>

If you have any comments, please don't hesitate to contact us. Our test sites as below:

Test Laboratory	DEKRA Testing and Certification Co., Ltd.
Address	<ol style="list-style-type: none"> No. 75-2, 3rd Lin, WangYe Keng, Yonghxing Tsuen, Qionglin Shiang, Hsinchu County 307, Taiwan, R.O.C. No.372, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C. No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C.
Phone number	<ol style="list-style-type: none"> +886-3-592-8858 +886-3-582-8001 +886-3-582-8001
Fax number	<ol style="list-style-type: none"> +886-3-592-8859 +886-3-582-8958 +886-3-582-8958
E mail address	info.tw@dekra.com
Website	http://www.dekra.com.tw

1.8. List of Test Equipment

Radiated Emission / CB2-H, CB4-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Signal Analyzer	R&S	FSVA40	101455	2019/10/21	2020/10/20
Signal & Spectrum Analyzer	R&S	FSV40	101049	2020/03/30	2021/03/29
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2020/02/21	2021/02/20
Bilog Antenna	Teseq	CBL6112D	23191	2019/06/17	2020/06/16
Horn Antenna	Schwarzbeck	BBHA 9120D	639	2020/06/04	2021/06/03
Horn Antenna	Schwarzbeck	BBHA 9170	202	2019/12/27	2020/12/26
Pre-Amplifier	DEKRA	AP-025C	12183122	2019/09/24	2020/09/23
Pre-Amplifier	EMCI	EMC11830I	980366	2019/12/03	2020/12/02
Pre-Amplifier	DEKRA	AP-400C	201801231	2019/12/03	2020/12/02
Horn Antenna	Schwarzbeck	BBHA 9120D	01656	2019/10/25	2020/10/24
Band Reject Filter	Micro-Tronics	BRM50702	G192	2020/03/09	2021/03/08
Signal Analyzer	R&S	FSV40	101435	2019/07/08	2020/07/07
Coaxial Cable(16m)	Huber+Suhner	SF104	CB2-H	2019/07/25	2020/07/24
Coaxial Cable(19m)	Suhner	SF102_SF104_SF106	CB4_2	2019/07/25	2020/07/24
EMI system	DEKRA	Version 1.0	CB2-H	NA	NA
EMI system	DEKRA	Version 1.0	CB4-H	NA	NA

20dB Bandwidth / SR12-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Keysight	N9030B	MY57140404	2020/06/03	2021/06/02
Spectrum Analyzer	Keysight	N9010B	MY57110159	2020/04/15	2021/04/14
Spectrum Analyzer	Agilent	N9010A	US47140172	2019/06/28	2020/06/27
Signal & Spectrum Analyzer	R&S	FSV40	101049	2020/03/30	2021/03/29

Duty Cycle / SR12-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Keysight	N9030B	MY57140404	2020/06/03	2021/06/02
Spectrum Analyzer	Keysight	N9010B	MY57110159	2020/04/15	2021/04/14
Spectrum Analyzer	Agilent	N9010A	US47140172	2019/06/28	2020/06/27
Spectrum Analyzer	Agilent	N9010A	US47140172	2020/06/18	2021/06/17
Signal & Spectrum Analyzer	R&S	FSV40	101049	2020/03/30	2021/03/29

Transmitter Time / SR12-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Keysight	N9030B	MY57140404	2020/06/03	2021/06/02
Spectrum Analyzer	Keysight	N9010B	MY57110159	2020/04/15	2021/04/14
Spectrum Analyzer	Agilent	N9010A	US47140172	2019/06/28	2020/06/27
Spectrum Analyzer	Agilent	N9010A	US47140172	2020/06/18	2021/06/17
Signal & Spectrum Analyzer	R&S	FSV40	101049	2020/03/30	2021/03/29

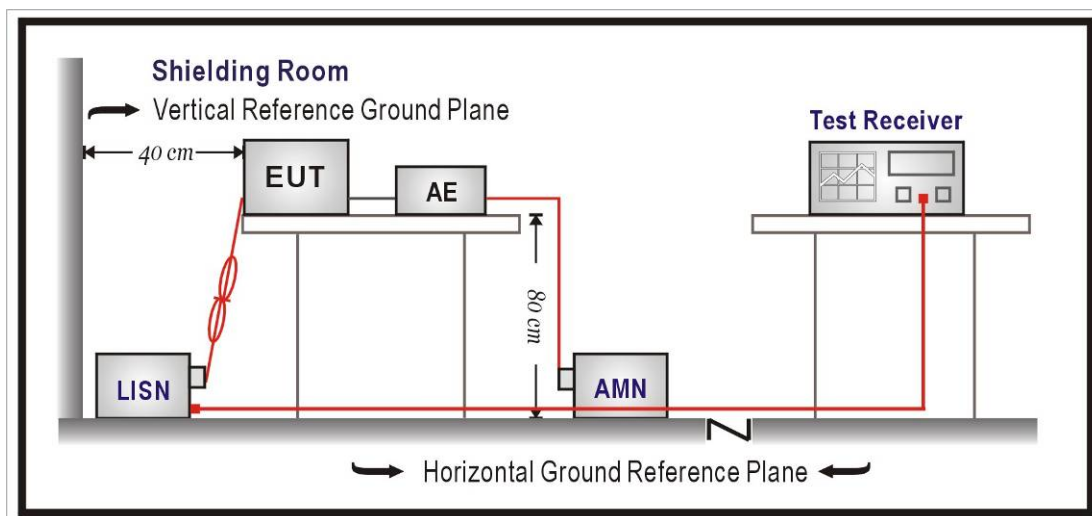
Note: All equipment upon which need to calibrated are with calibration period of 1 year.

1.9. Measurement Uncertainty

Test item	Uncertainty
Conducted Emission	$\pm 2.1\text{dB}$
Radiated Emission	$\pm 3.40\text{ dB below 1GHz}$ $\pm 3.46\text{ dB above 1GHz}$
20dB Bandwidth	$\pm 50\text{Hz}$
Duty Cycle	N/A
Transmitter Time	N/A

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207		
Frequency	QP	AV
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

2.3. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. 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.)

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 C63.4: 2014 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9KHz.

2.4. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.207

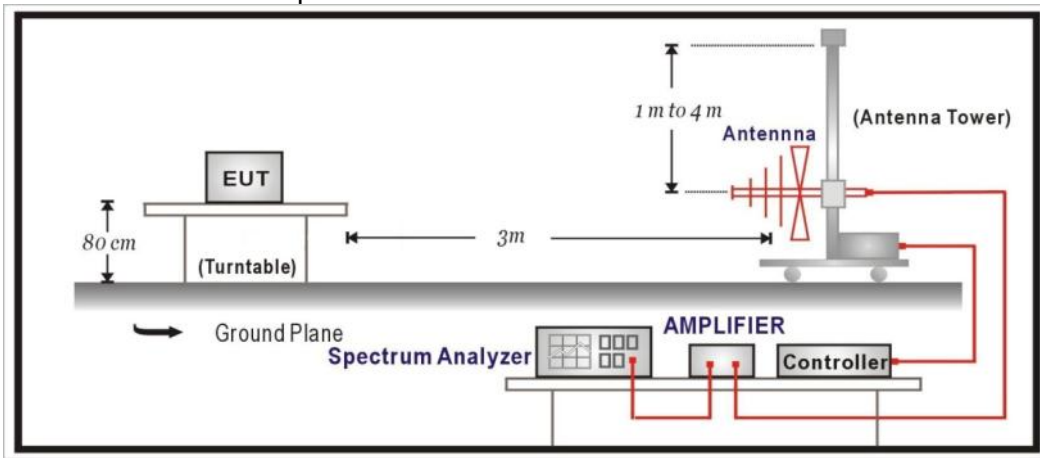
2.5. Test Result

The device is powered from DC power, so it is not necessary to perform this test item.

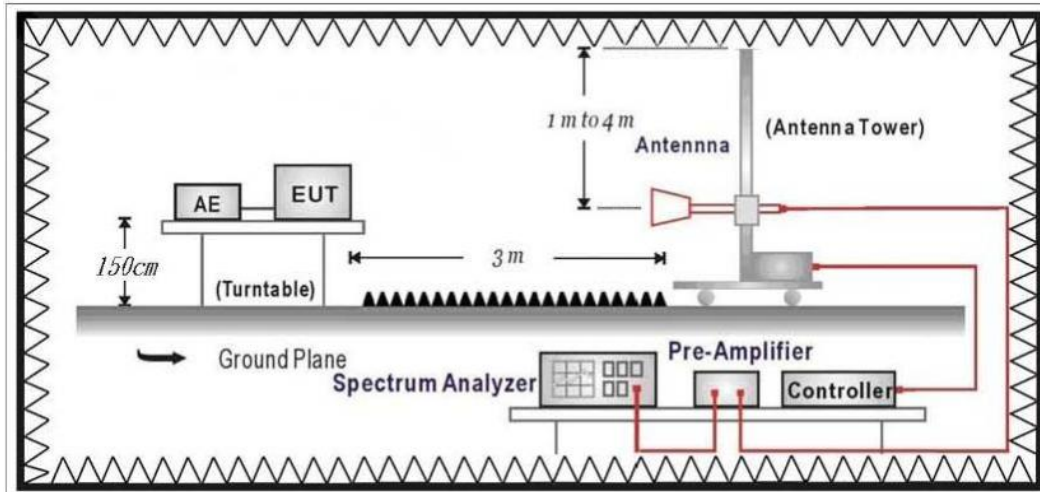
3. Radiated Emission

3.1. Test Setup

Under 1GHz Test Setup:



Above 1GHz Test Setup:



3.2. Limits

Fundamental and Harmonics Emission Limits

FCC Part 15 Subpart C Paragraph 15.231				
Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	uV/m	dBuV/m	uV/m	dBuV/m
40.66 – 40.70	2250	67.04	225	47.04
70 – 130	1250	61.94	125	41.94
130 - 174	1250 - 3750	61.94 – 71.48	125 – 375	41.94 – 51.48
174 – 260	3750	71.48	375	51.48
260 – 470	3750 – 12500	71.48 – 81.94	375 – 1250	51.48 – 61.94
Above 470	12500	81.94	1250	61.94

Remarks:

1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
3. The emission limit in this paragraph is based on measurement instrumentation employing an average detector.

Spurious electric field strength limits

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	dBuV/m	dBuV/m
1.705 - 30	30	29.5
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

Remarks:

1. E field strength (dBuV/m) = 20 log E field strength (uV/m)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3.3. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 or 1.5 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

On any frequency or frequencies from 9KHz (include The the lowest oscillator frequency generated within the device up to the 10th harmonic) to 1000 MHz, the limits shown are based on measuring equipment employing a quasi-peak detector function and on any frequency or frequencies above 1000 MHz the radiated limits shown are based upon the use of measurement instrumentation employing an average detector function. When average radiated emission measurement are included emission measurement below 1000 MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit. The bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

3.4. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231(b): 2019

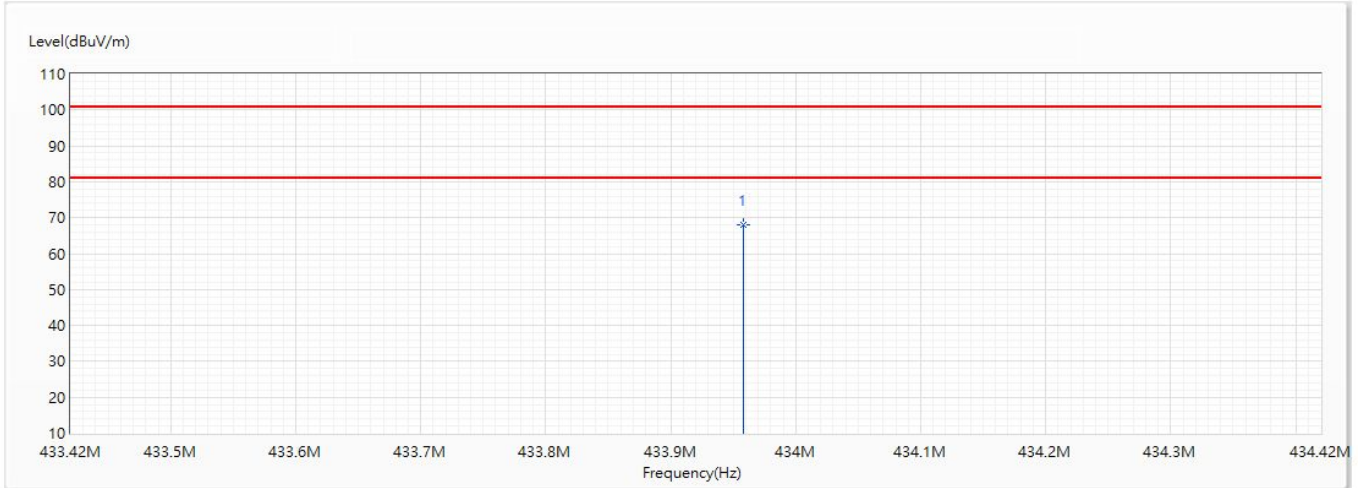
3.5. Test Result

Product	TPMS		
Test Item	Fundamental Radiated Emission		
Test Mode	Mode 1: Transmit_433.92MHz_FSK		
Date of Test	2020/05/25	Test Site	CB4-H
Temperature(°C)	25.0	Humidity (%RH)	53.0

Test Conditions	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)
Horizontal						
X-axis	433.958	68.14	100.83	-32.69	42.58	25.56
Y-axis	433.879	69.70	100.83	-31.12	44.15	25.55
Z-axis	433.883	74.24	100.83	-26.58	48.69	25.55
Vertical						
X-axis	433.887	74.16	100.83	-26.66	48.61	25.55
Y-axis	433.884	75.89	100.83	-24.94	50.34	25.55
Z-axis	433.879	68.76	100.83	-32.06	43.21	25.55

Note1: Emission Level = Reading Level +Correct factor

Model No	TX-N002	Site	CB4-H
Test Voltage	DC 3V	Test Date	2020/5/25
Test Mode	Mode 1: Transmit_433.92MHz_FSK	Engineer	Scott
Polarity	Horizontal	Temperature (°C)	25.0
Test Condition	FSK_433.92M_X axis	Humidity (%RH)	53.0

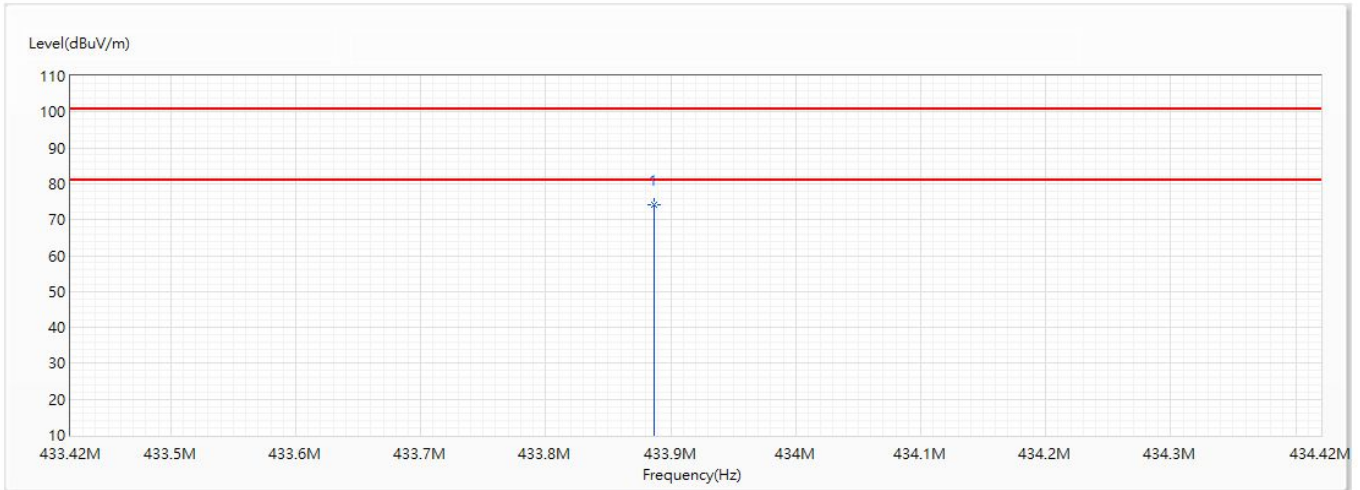


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.958	68.14	100.83	-32.69	42.58	25.56	PK

Note:

1. All reading levels is Quasi-Peak value.
2. “ * ”, means this data is the worst value.
3. Emission Level = Reading Level + Correct Factor
4. The emission under 30MHz were not included is because their levels are lower than 20dB from limit.

Model No	TX-N002	Site	CB4-H
Test Voltage	DC 3V	Test Date	2020/5/25
Test Mode	Mode 1: Transmit_433.92MHz_FSK	Engineer	Scott
Polarity	Vertical	Temperature (°C)	25.0
Test Condition	FSK_433.92M_X axis	Humidity (%RH)	53.0

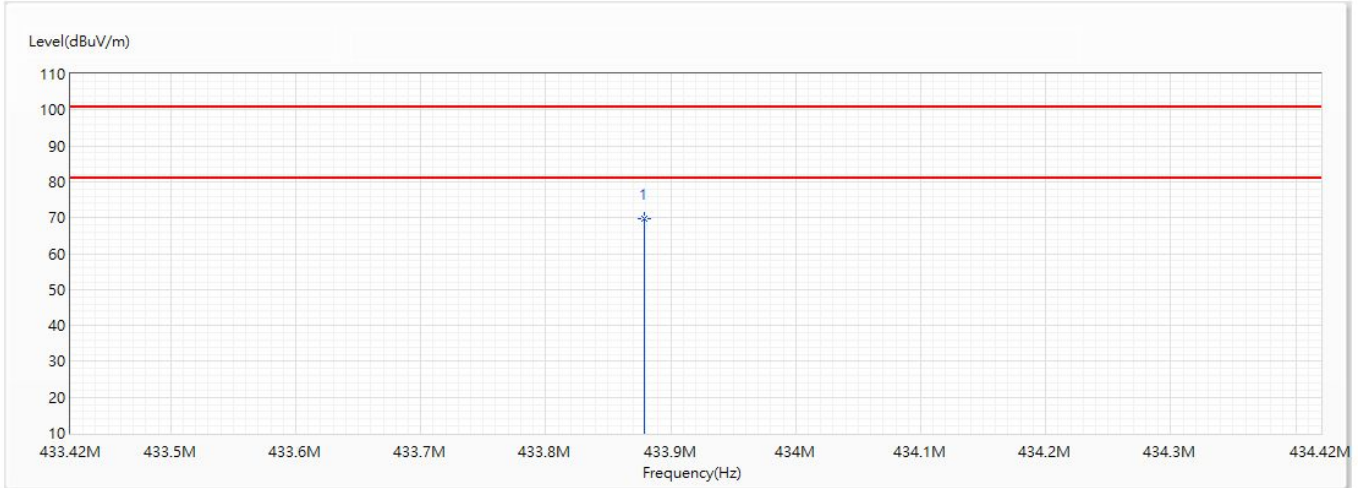


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.887	74.16	100.83	-26.66	48.61	25.55	PK

Note:

1. All reading levels is Quasi-Peak value.
2. “ * ”, means this data is the worst value.
3. Emission Level = Reading Level + Correct Factor
4. The emission under 30MHz were not included is because their levels are lower than 20dB from limit.

Model No	TX-N002	Site	CB4-H
Test Voltage	DC 3V	Test Date	2020/5/25
Test Mode	Mode 1: Transmit_433.92MHz_FSK	Engineer	Scott
Polarity	Horizontal	Temperature (°C)	25.0
Test Condition	FSK_433.92M_Y axis	Humidity (%RH)	53.0

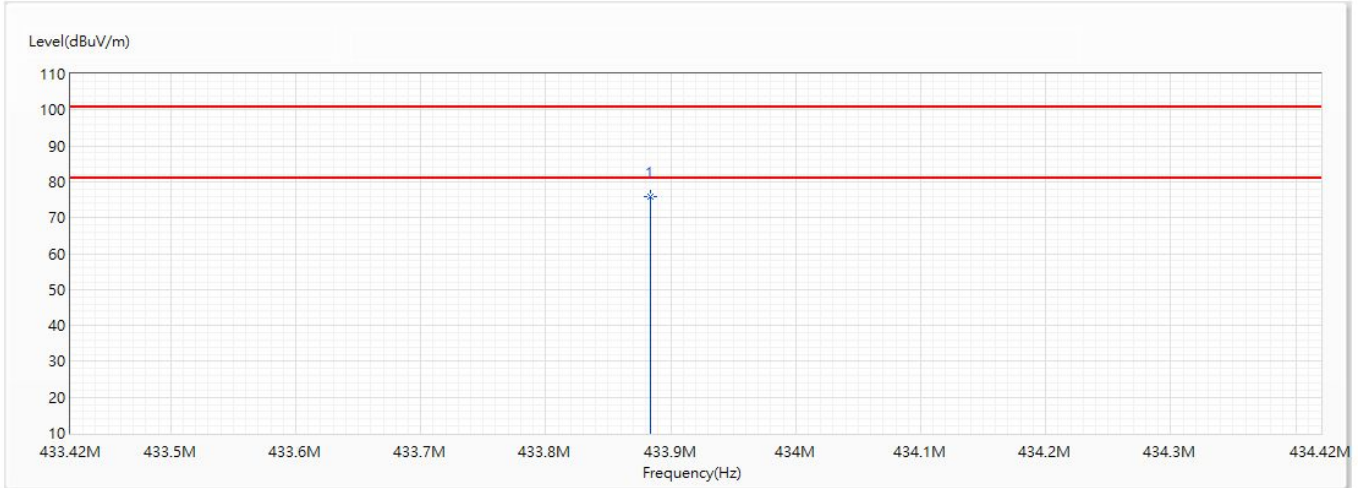


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.879	69.70	100.83	-31.12	44.15	25.55	PK

Note:

1. All reading levels is Quasi-Peak value.
2. “ * ”, means this data is the worst value.
3. Emission Level = Reading Level + Correct Factor
4. The emission under 30MHz were not included is because their levels are lower than 20dB from limit.

Model No	TX-N002	Site	CB4-H
Test Voltage	DC 3V	Test Date	2020/5/25
Test Mode	Mode 1: Transmit_433.92MHz_FSK	Engineer	Scott
Polarity	Vertical	Temperature (°C)	25.0
Test Condition	FSK_433.92M_Y axis	Humidity (%RH)	53.0

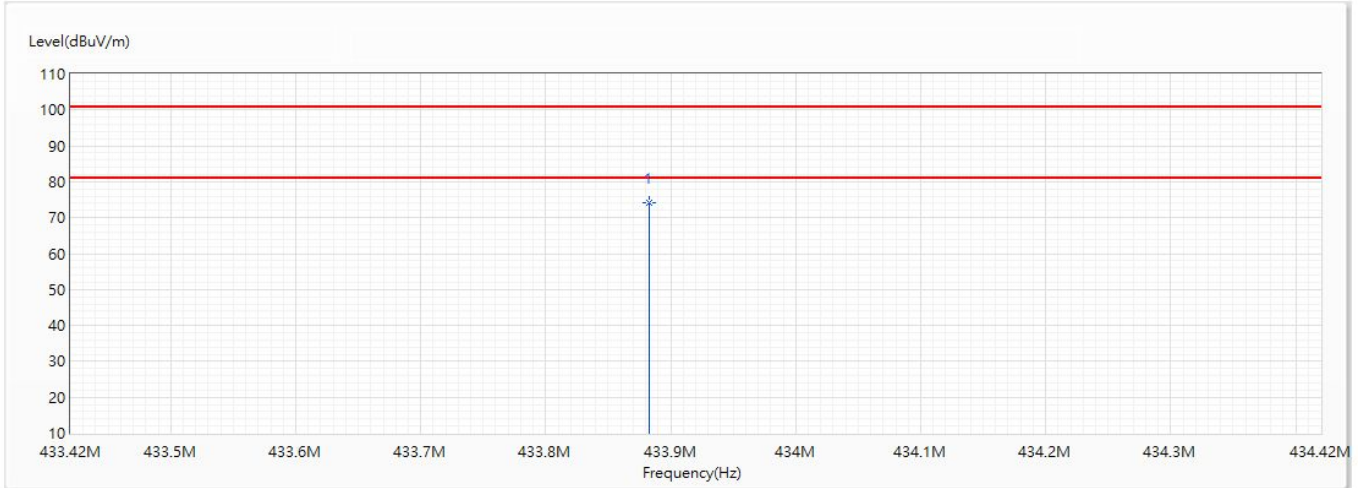


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.884	75.89	100.83	-24.94	50.34	25.55	PK

Note:

1. All reading levels is Quasi-Peak value.
2. “ * ”, means this data is the worst value.
3. Emission Level = Reading Level + Correct Factor
4. The emission under 30MHz were not included is because their levels are lower than 20dB from limit.

Model No	TX-N002	Site	CB4-H
Test Voltage	DC 3V	Test Date	2020/5/25
Test Mode	Mode 1: Transmit_433.92MHz_FSK	Engineer	Scott
Polarity	Horizontal	Temperature (°C)	25.0
Test Condition	FSK_433.92M_Z axis	Humidity (%RH)	53.0

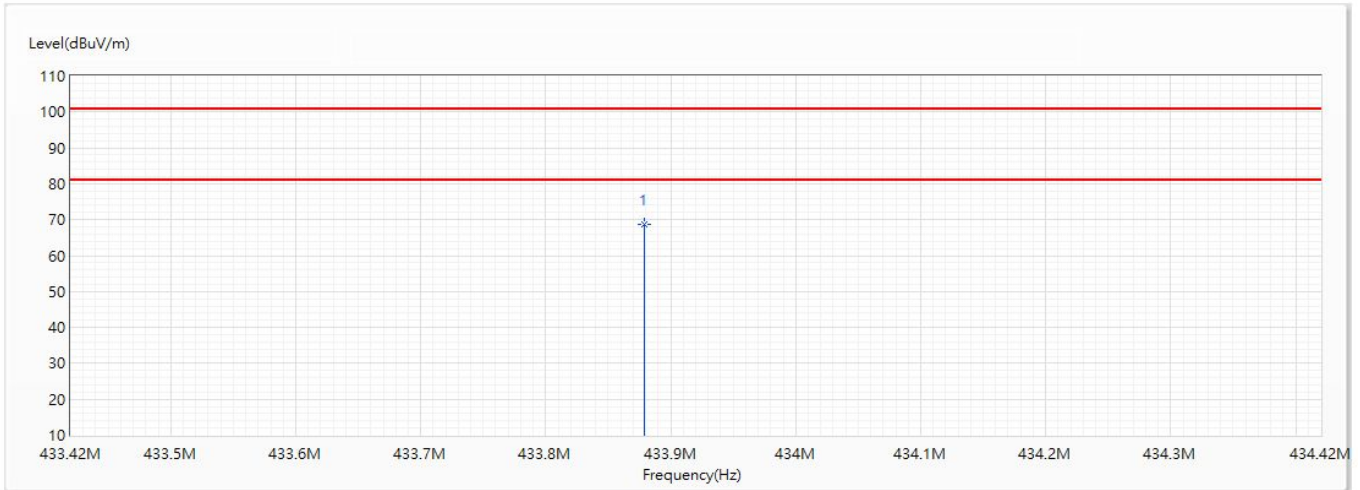


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.883	74.24	100.83	-26.58	48.69	25.55	PK

Note:

1. All reading levels is Quasi-Peak value.
2. “ * ”, means this data is the worst value.
3. Emission Level = Reading Level + Correct Factor
4. The emission under 30MHz were not included is because their levels are lower than 20dB from limit.

Model No	TX-N002	Site	CB4-H
Test Voltage	DC 3V	Test Date	2020/5/25
Test Mode	Mode 1: Transmit_433.92MHz_FSK	Engineer	Scott
Polarity	Vertical	Temperature (°C)	25.0
Test Condition	FSK_433.92M_Z axis	Humidity (%RH)	53.0



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.879	68.76	100.83	-32.06	43.21	25.55	PK

Note:

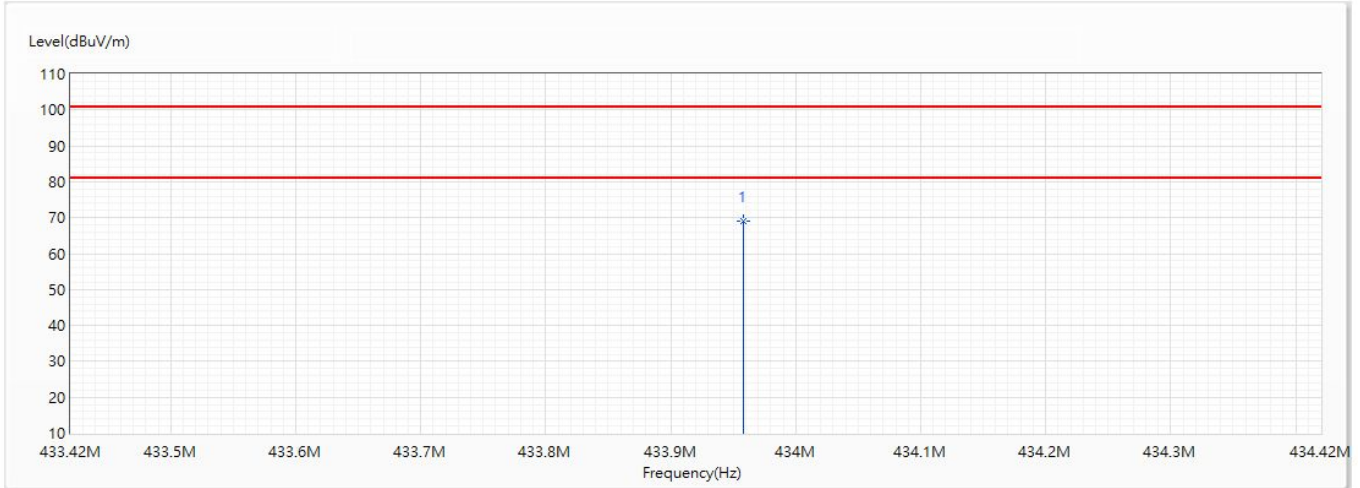
1. All reading levels is Quasi-Peak value.
2. “ * ”, means this data is the worst value.
3. Emission Level = Reading Level + Correct Factor
4. The emission under 30MHz were not included is because their levels are lower than 20dB from limit.

Product	TPMS		
Test Item	Fundamental Radiated Emission		
Test Mode	Mode 2: Transmit_433.957MHz_ASK		
Date of Test	2020/05/25	Test Site	CB4-H
Temperature(°C)	25.0	Humidity (%RH)	53.0

Test Conditions	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)
Horizontal						
X-axis	433.958	68.94	100.83	-31.89	43.38	25.56
Y-axis	433.955	71.32	100.83	-29.51	45.76	25.56
Z-axis	433.954	75.38	100.83	-25.45	49.82	25.56
Vertical						
X-axis	433.953	76.33	100.83	-24.50	51.27	25.56
Y-axis	433.961	76.83	100.83	-24.00	51.27	25.56
Z-axis	433.965	67.07	100.83	-33.76	41.51	25.56

Note1: Emission Level = Reading Level +Correct factor

Model No	TX-N002	Site	CB4-H
Test Voltage	DC 3V	Test Date	2020/5/25
Test Mode	Mode 2: Transmit_433.957MHz_ASK	Engineer	Scott
Polarity	Horizontal	Temperature (°C)	25.0
Test Condition	ASK_433.957M_X axis	Humidity (%RH)	53.0

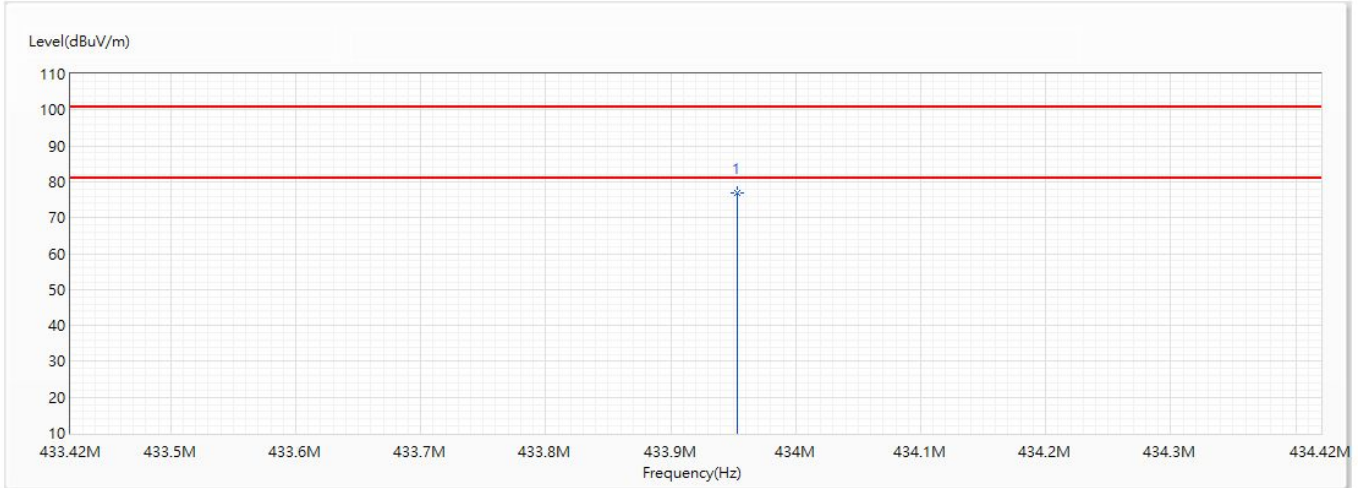


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.958	68.94	100.83	-31.89	43.38	25.56	PK

Note:

1. All reading levels is Quasi-Peak value.
2. “ * ”, means this data is the worst value.
3. Emission Level = Reading Level + Correct Factor
4. The emission under 30MHz were not included is because their levels are lower than 20dB from limit.

Model No	TX-N002	Site	CB4-H
Test Voltage	DC 3V	Test Date	2020/5/25
Test Mode	Mode 2: Transmit_433.957MHz_ASK	Engineer	Scott
Polarity	Vertical	Temperature (°C)	25.0
Test Condition	ASK_433.957M_X axis	Humidity (%RH)	53.0

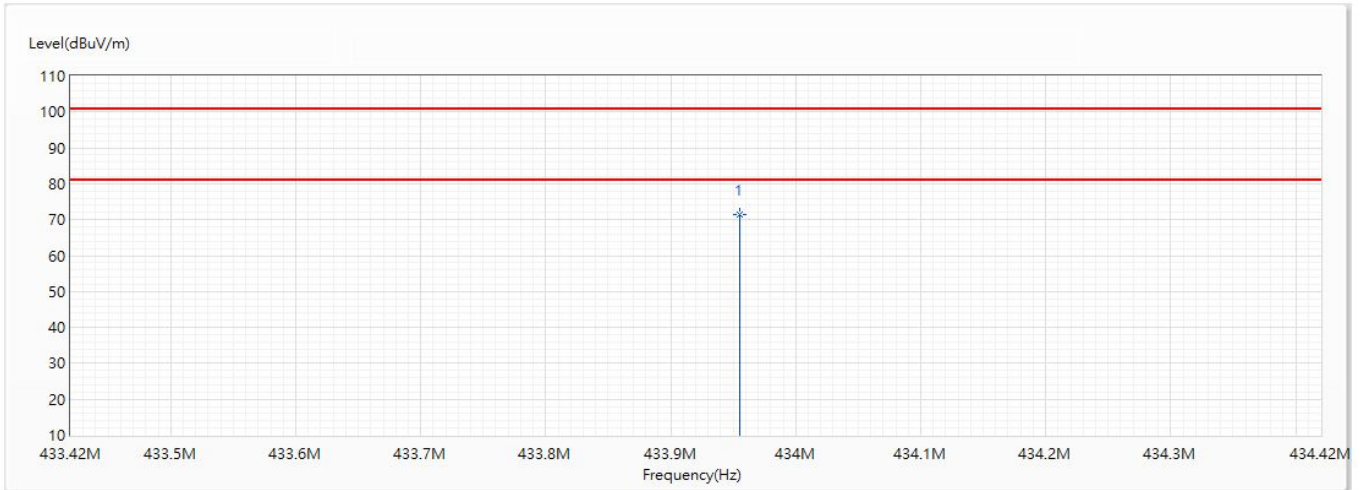


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.953	76.33	100.83	-24.50	51.27	25.56	PK

Note:

1. All reading levels is Quasi-Peak value.
2. “ * ”, means this data is the worst value.
3. Emission Level = Reading Level + Correct Factor
4. The emission under 30MHz were not included is because their levels are lower than 20dB from limit.

Model No	TX-N002	Site	CB4-H
Test Voltage	DC 3V	Test Date	2020/5/25
Test Mode	Mode 2: Transmit_433.957MHz_ASK	Engineer	Scott
Polarity	Horizontal	Temperature (°C)	25.0
Test Condition	ASK_433.957M_Y axis	Humidity (%RH)	53.0

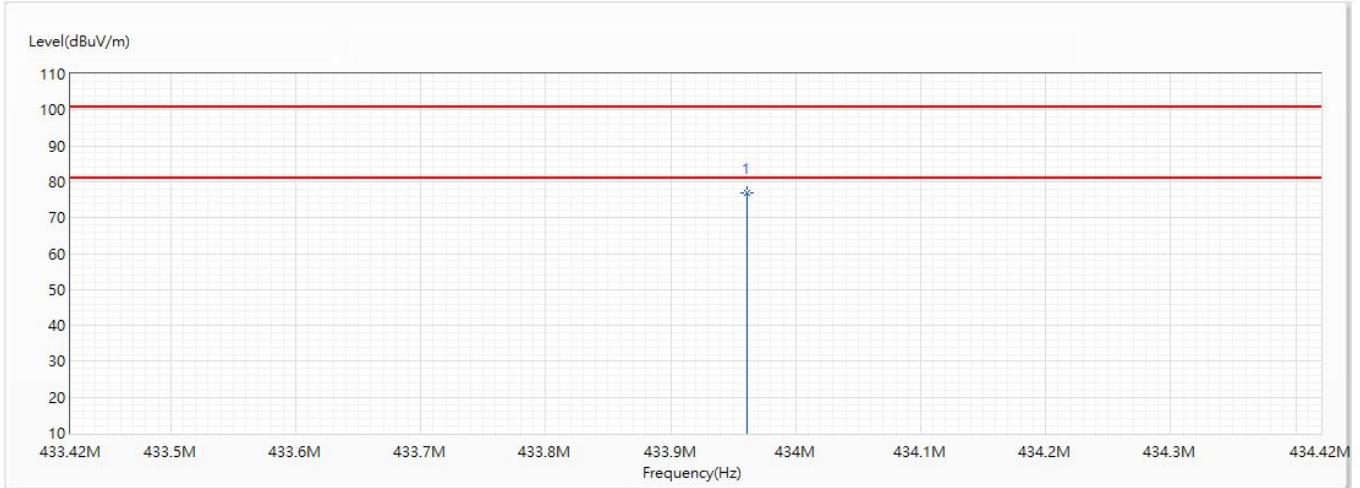


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.955	71.32	100.83	-29.51	45.76	25.56	PK

Note:

1. All reading levels is Quasi-Peak value.
2. “ * ”, means this data is the worst value.
3. Emission Level = Reading Level + Correct Factor
4. The emission under 30MHz were not included is because their levels are lower than 20dB from limit.

Model No	TX-N002	Site	CB4-H
Test Voltage	DC 3V	Test Date	2020/5/25
Test Mode	Mode 2: Transmit_433.957MHz_ASK	Engineer	Scott
Polarity	Vertical	Temperature (°C)	25.0
Test Condition	ASK_433.957M_Y axis	Humidity (%RH)	53.0

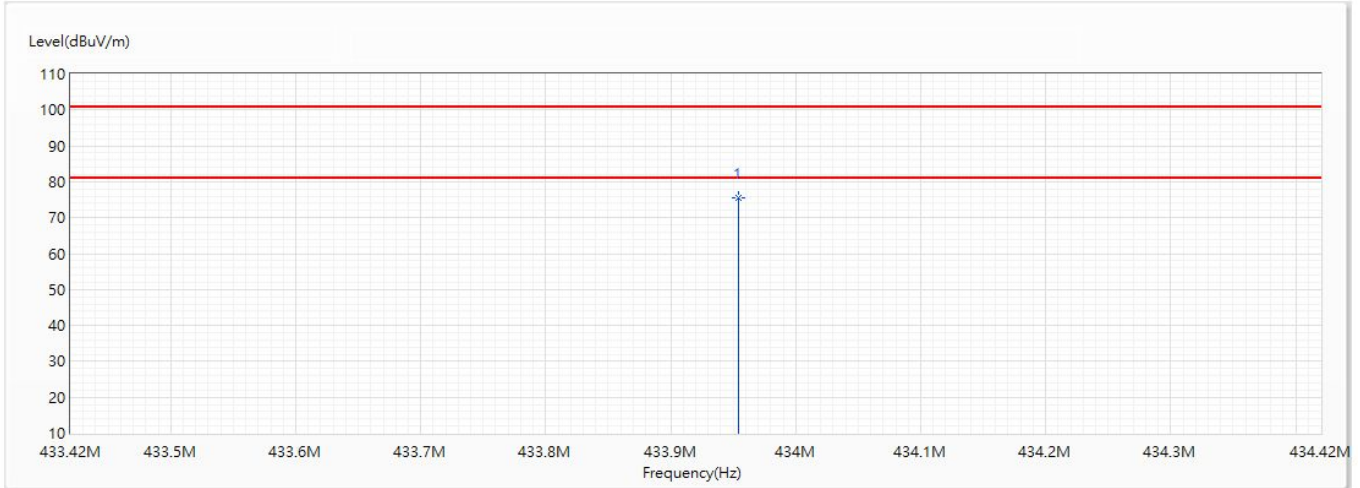


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.961	76.83	100.83	-24.00	51.27	25.56	PK

Note:

1. All reading levels is Quasi-Peak value.
2. “ * ”, means this data is the worst value.
3. Emission Level = Reading Level + Correct Factor
4. The emission under 30MHz were not included is because their levels are lower than 20dB from limit.

Model No	TX-N002	Site	CB4-H
Test Voltage	DC 3V	Test Date	2020/5/25
Test Mode	Mode 2: Transmit_433.957MHz_ASK	Engineer	Scott
Polarity	Horizontal	Temperature (°C)	25.0
Test Condition	ASK_433.957M_Z axis	Humidity (%RH)	53.0

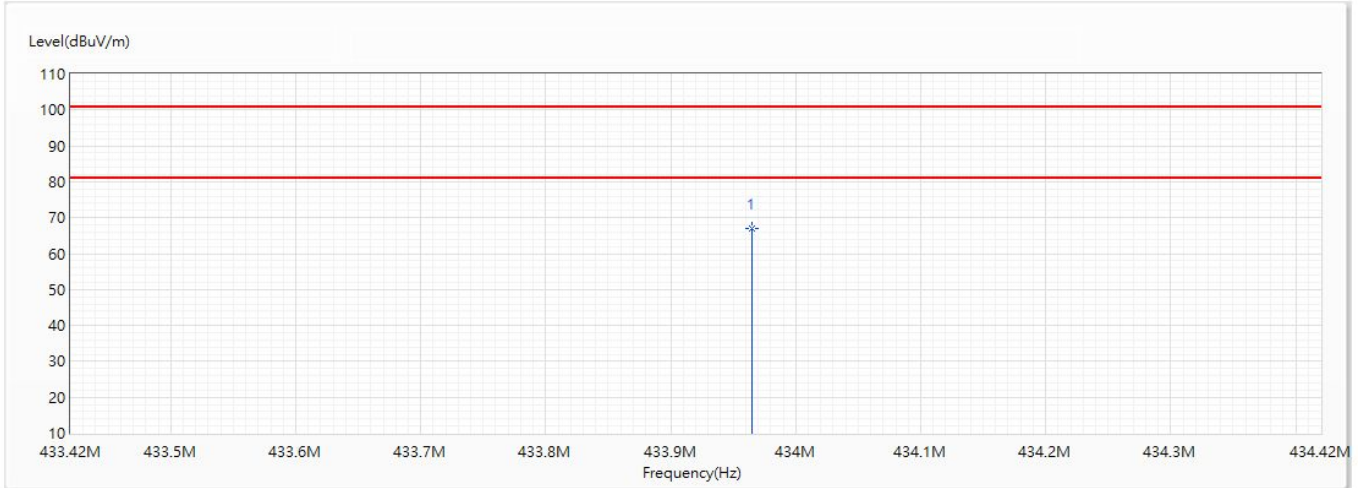


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.954	75.38	100.83	-25.45	49.82	25.56	PK

Note:

1. All reading levels is Quasi-Peak value.
2. “ * ”, means this data is the worst value.
3. Emission Level = Reading Level + Correct Factor
4. The emission under 30MHz were not included is because their levels are lower than 20dB from limit.

Model No	TX-N002	Site	CB4-H
Test Voltage	DC 3V	Test Date	2020/5/25
Test Mode	Mode 2: Transmit_433.957MHz_ASK	Engineer	Scott
Polarity	Vertical	Temperature (°C)	25.0
Test Condition	ASK_433.957M_Z axis	Humidity (%RH)	53.0



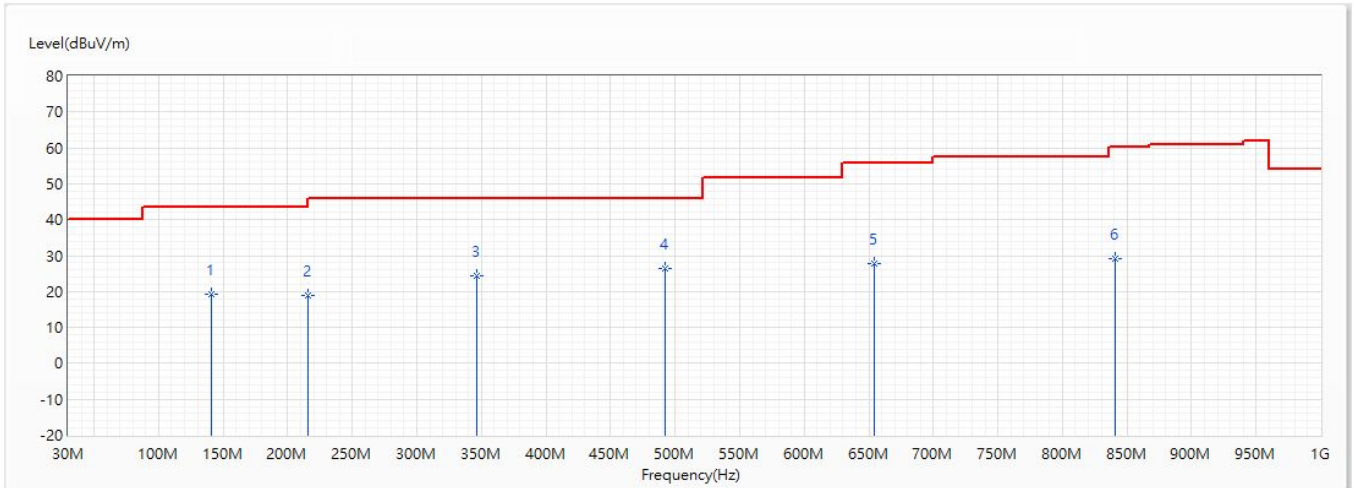
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	433.965	67.07	100.83	-33.76	41.51	25.56	PK

Note:

1. All reading levels is Quasi-Peak value.
2. “ * ”, means this data is the worst value.
3. Emission Level = Reading Level + Correct Factor
4. The emission under 30MHz were not included is because their levels are lower than 20dB from limit.

30MHz-1GHz Spurious:

Model No	TX-N002	Site	CB2-H
Test Voltage	DC 3V	Test Date	2020/6/4
Test Mode	Mode 1: Transmit_433.92MHz_FSK	Engineer	SCOTT
Polarity	Horizontal	Temperature (°C)	23.0
Test Condition	FSK_433.92M	Humidity (%RH)	59.0

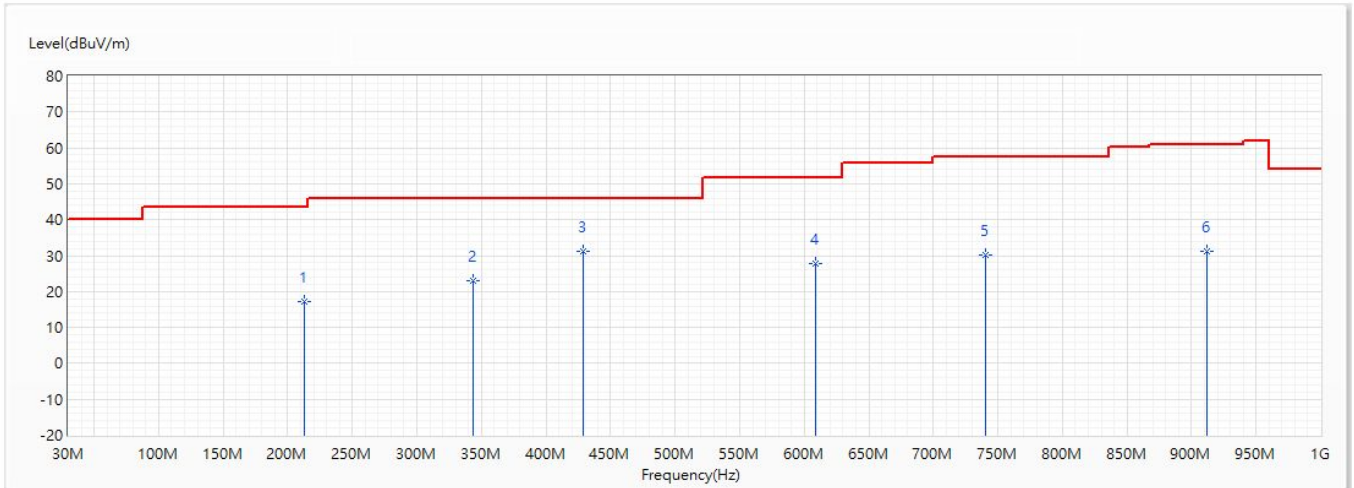


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	140.823	19.16	43.50	-24.34	21.50	-2.34	QP
2	215.27	18.86	43.50	-24.64	22.17	-3.31	QP
3	345.978	24.43	46.00	-21.57	23.33	1.10	QP
* 4	492.69	26.52	46.00	-19.48	21.98	4.54	QP
5	654.438	27.69	55.62	-27.93	21.13	6.56	QP
6	840.435	29.13	60.28	-31.15	20.33	8.80	QP

Note:

1. All reading levels is Quasi-Peak value.
2. “ * ”, means this data is the worst value.
3. Emission Level = Reading Level + Correct Factor
4. The emission under 30MHz were not included is because their levels are lower than 20dB from limit.

Model No	TX-N002	Site	CB2-H
Test Voltage	DC 3V	Test Date	2020/6/4
Test Mode	Mode 1: Transmit_433.92MHz_FSK	Engineer	SCOTT
Polarity	Vertical	Temperature (°C)	23.0
Test Condition	FSK_433.92M	Humidity (%RH)	59.0

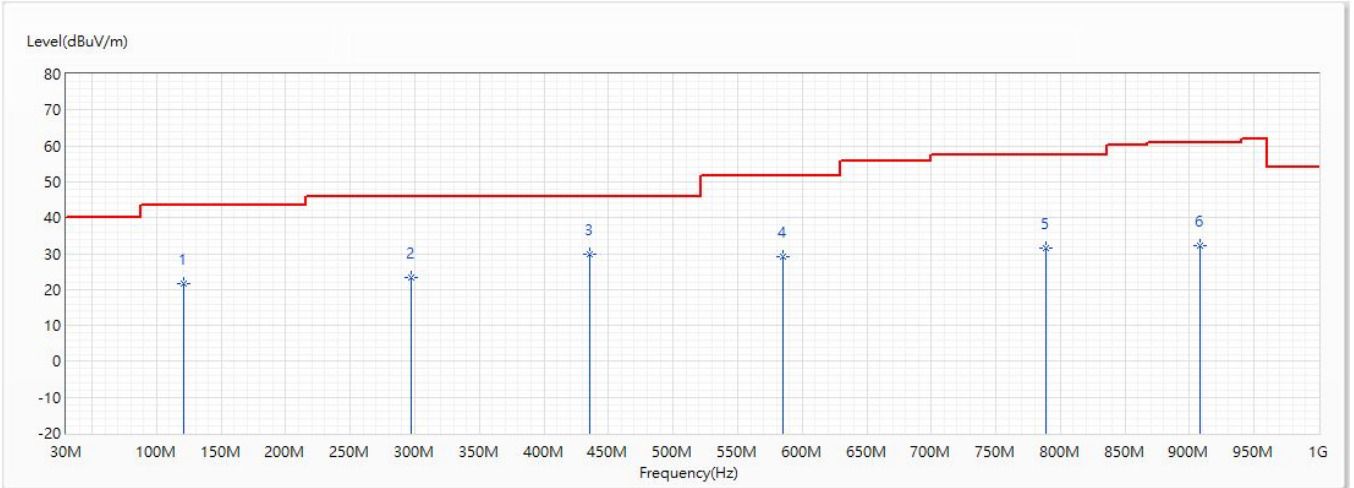


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	212.845	17.11	43.50	-26.39	20.55	-3.44	QP
2	343.795	23.01	46.00	-22.99	21.98	1.03	QP
* 3	428.913	31.05	46.00	-14.95	27.66	3.39	QP
4	608.605	27.88	51.58	-23.70	21.81	6.07	QP
5	740.525	30.18	57.50	-27.32	22.62	7.56	QP
6	912.215	31.10	60.83	-29.73	21.35	9.75	QP

Note:

1. All reading levels is Quasi-Peak value.
2. “ * ”, means this data is the worst value.
3. Emission Level = Reading Level + Correct Factor
4. The emission under 30MHz were not included is because their levels are lower than 20dB from limit.

Model No	TX-N002	Site	CB2-H
Test Voltage	DC 3V	Test Date	2020/6/4
Test Mode	Mode 2: Transmit_433.957MHz_ASK	Engineer	SCOTT
Polarity	Horizontal	Temperature (°C)	23.0
Test Condition	ASK_433.957M	Humidity (%RH)	59.0

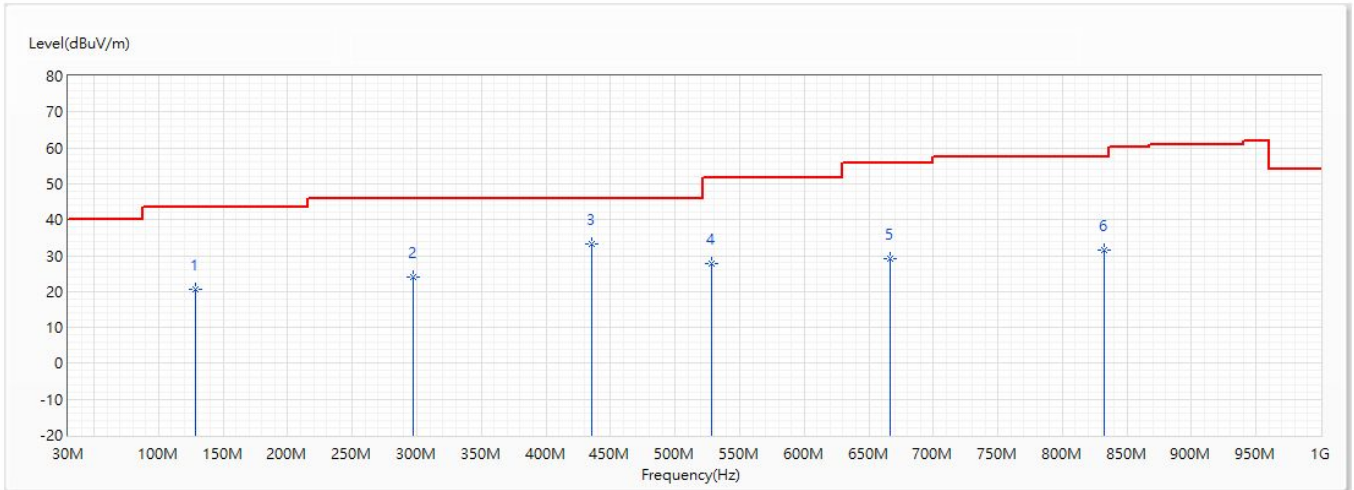


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	120.695	21.79	43.50	-21.71	23.68	-1.89	QP
2	296.993	23.29	46.00	-22.71	23.77	-0.48	QP
* 3	435.218	29.98	46.00	-16.02	26.47	3.51	QP
4	585.083	28.99	51.58	-22.59	23.18	5.81	QP
5	788.783	31.61	57.50	-25.89	23.43	8.18	QP
6	908.578	32.15	60.83	-28.68	22.45	9.70	QP

Note:

1. All reading levels is Quasi-Peak value.
2. “ * ”, means this data is the worst value.
3. Emission Level = Reading Level + Correct Factor
4. The emission under 30MHz were not included is because their levels are lower than 20dB from limit.

Model No	TX-N002	Site	CB2-H
Test Voltage	DC 3V	Test Date	2020/6/4
Test Mode	Mode 2: Transmit_433.957MHz_ASK	Engineer	SCOTT
Polarity	Vertical	Temperature (°C)	23.0
Test Condition	ASK_433.957M	Humidity (%RH)	59.0



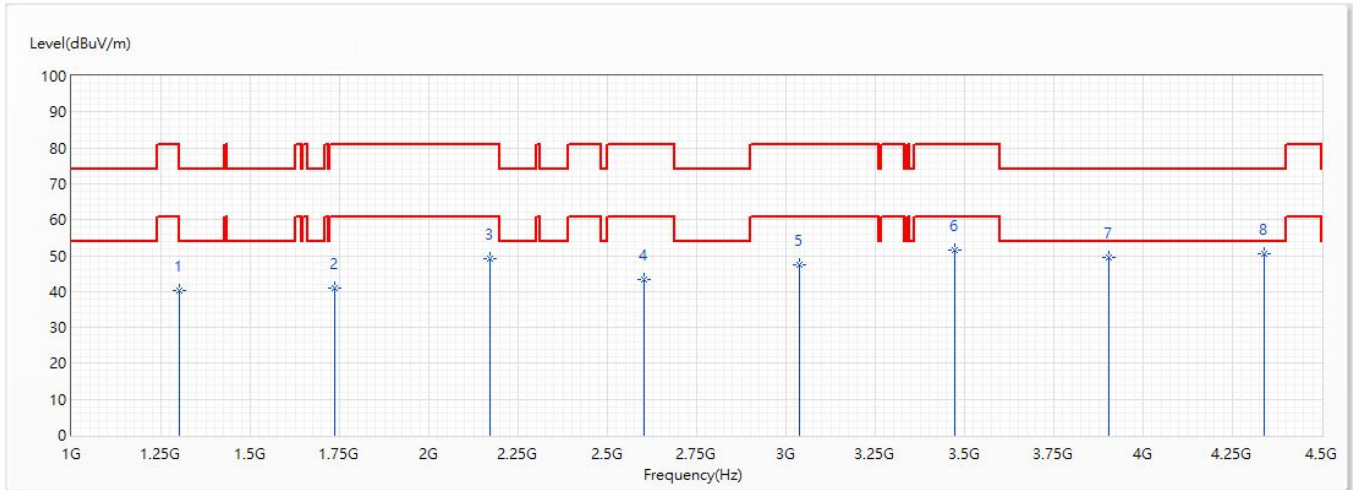
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	128.213	20.76	43.50	-22.74	22.74	-1.98	QP
2	296.993	23.88	46.00	-22.12	24.36	-0.48	QP
* 3	435.46	33.12	46.00	-12.88	29.60	3.52	QP
4	528.58	27.76	51.58	-23.82	22.71	5.05	QP
5	666.563	29.23	55.62	-26.39	22.55	6.68	QP
6	832.433	31.55	57.50	-25.95	22.85	8.70	QP

Note:

1. All reading levels is Quasi-Peak value.
2. “ * ”, means this data is the worst value.
3. Emission Level = Reading Level + Correct Factor
4. The emission under 30MHz were not included is because their levels are lower than 20dB from limit.

Above 1GHz Spurious:

Model No	TX-N002	Site	CB2-H
Test Voltage	DC 3V	Test Date	2020/6/2
Test Mode	Mode 1: Transmit_433.92MHz_FSK	Engineer	Scott
Polarity	Horizontal	Temperature (°C)	23.0
Test Condition	FSK_433.92M	Humidity (%RH)	57.0

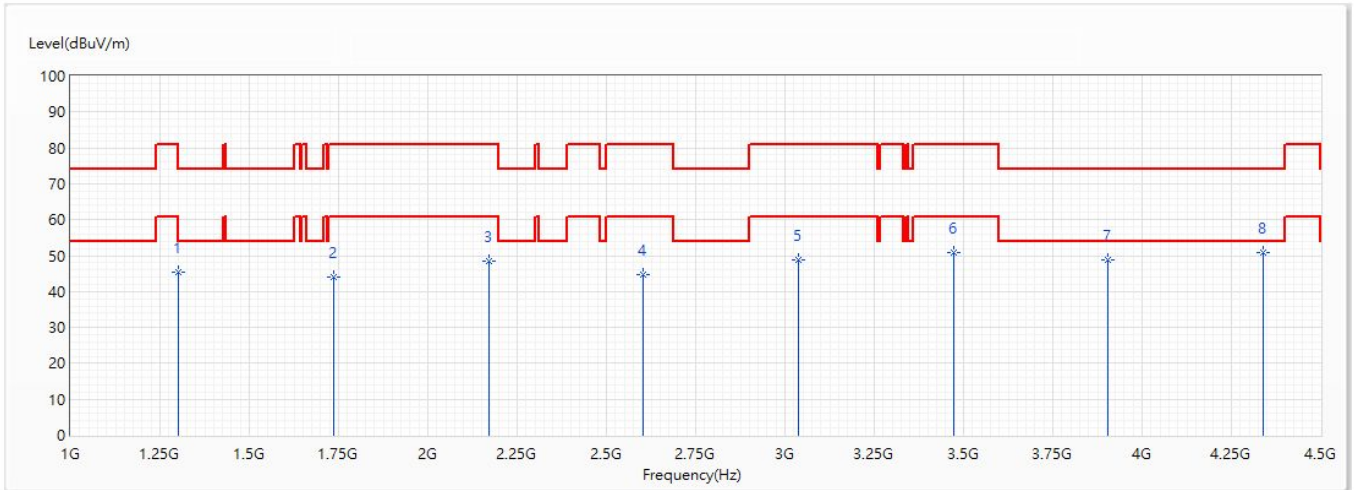


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	1301.76	40.25	74.00	-33.75	65.73	-25.48	PK
2	1735.68	40.91	80.83	-39.92	64.32	-23.41	PK
3	2169.6	49.05	80.83	-31.78	70.51	-21.46	PK
4	2603.52	43.33	80.83	-37.50	62.68	-19.35	PK
5	3037.44	47.56	80.83	-33.27	65.15	-17.59	PK
6	3471.36	51.40	80.83	-29.43	68.26	-16.86	PK
7	3905.28	49.55	74.00	-24.45	64.81	-15.26	PK
* 8	4339.2	50.56	74.00	-23.44	63.95	-13.39	PK

Note:

- 1.All reading above 1GHz is performed with peak and/or average measurements as necessary.
2. “ * ”, means this data is the worst value.
- 3.Emission Level = Reading Level + Correct Factor.
- 4.The average measurement was not performed when the peak measured data under the limit of average detection.
- 5.The emission above 13GHz were not included is because their levels are lower than 20dB form limit.

Model No	TX-N002	Site	CB2-H
Test Voltage	DC 3V	Test Date	2020/6/4
Test Mode	Mode 1: Transmit_433.92MHz_FSK	Engineer	SCOTT
Polarity	Vertical	Temperature (°C)	23.0
Test Condition	FSK_433.92M	Humidity (%RH)	59.0

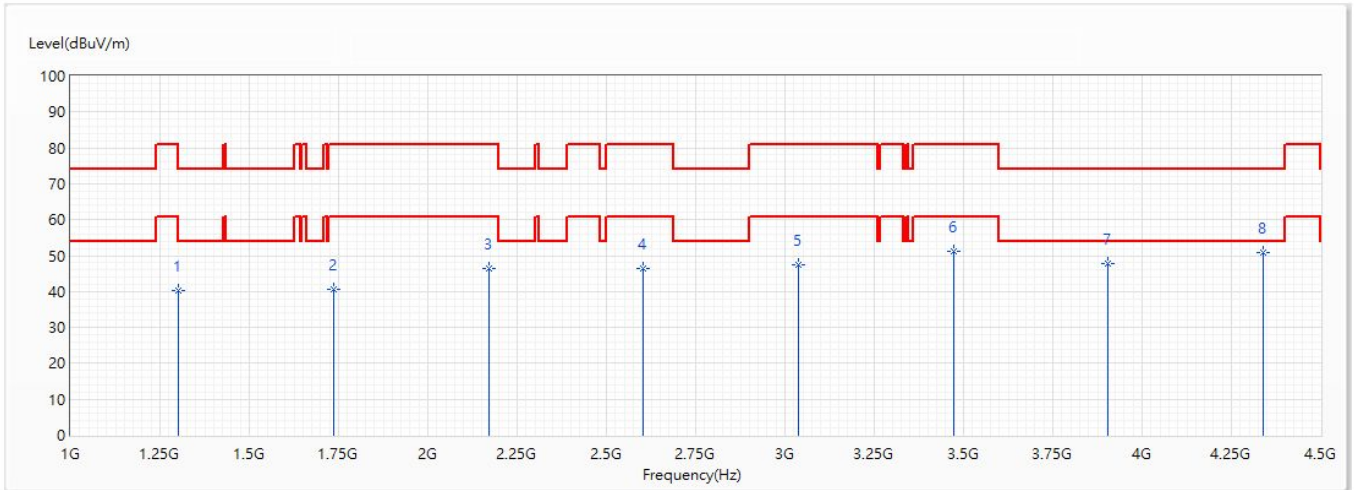


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	1301.76	45.27	74.00	-28.73	70.75	-25.48	PK
2	1735.68	44.04	80.83	-36.79	67.45	-23.41	PK
3	2169.6	48.35	80.83	-32.48	69.81	-21.46	PK
4	2603.52	44.64	80.83	-36.19	63.99	-19.35	PK
5	3037.44	48.96	80.83	-31.87	66.55	-17.59	PK
6	3471.36	50.75	80.83	-30.08	67.61	-16.86	PK
7	3905.28	48.77	74.00	-25.23	64.03	-15.26	PK
* 8	4339.2	51.01	74.00	-22.99	64.40	-13.39	PK

Note:

- 1.All reading above 1GHz is performed with peak and/or average measurements as necessary.
2. “ * ”, means this data is the worst value.
- 3.Emission Level = Reading Level + Correct Factor.
- 4.The average measurement was not performed when the peak measured data under the limit of average detection.
- 5.The emission above 13GHz were not included is because their levels are lower than 20dB form limit.

Model No	TX-N002	Site	CB2-H
Test Voltage	DC 3V	Test Date	2020/6/4
Test Mode	Mode 2: Transmit_433.957MHz_ASK	Engineer	SCOTT
Polarity	Horizontal	Temperature (°C)	23.0
Test Condition	ASK_433.957M	Humidity (%RH)	59.0

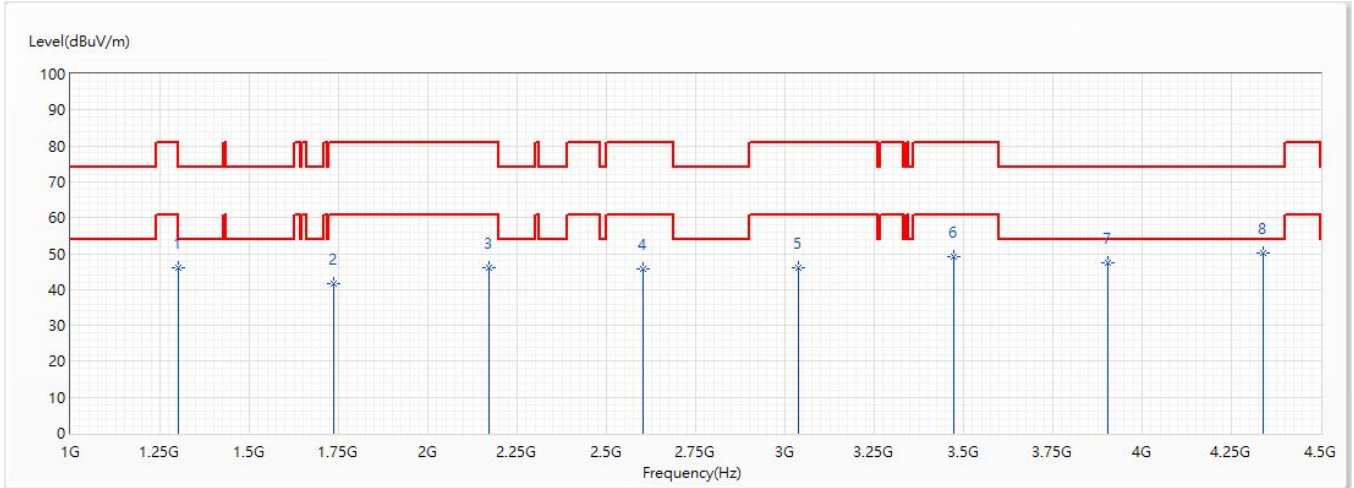


No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	1301.76	40.11	74.00	-33.89	65.59	-25.48	PK
2	1735.68	40.58	80.83	-40.25	63.99	-23.41	PK
3	2169.6	46.47	80.83	-34.36	67.93	-21.46	PK
4	2603.52	46.52	80.83	-34.30	65.87	-19.35	PK
5	3037.44	47.55	80.83	-33.28	65.14	-17.59	PK
6	3471.36	51.11	80.83	-29.72	67.97	-16.86	PK
7	3905.28	47.85	74.00	-26.15	63.11	-15.26	PK
* 8	4339.2	50.85	74.00	-23.15	64.24	-13.39	PK

Note:

- 1.All reading above 1GHz is performed with peak and/or average measurements as necessary.
2. “ * ”, means this data is the worst value.
- 3.Emission Level = Reading Level + Correct Factor.
- 4.The average measurement was not performed when the peak measured data under the limit of average detection.
- 5.The emission above 13GHz were not included is because their levels are lower than 20dB form limit.

Model No	TX-N002	Site	CB2-H
Test Voltage	DC 3V	Test Date	2020/6/4
Test Mode	Mode 2: Transmit_433.957MHz_ASK	Engineer	SCOTT
Polarity	Vertical	Temperature (°C)	23.0
Test Condition	ASK_433.957M	Humidity (%RH)	59.0



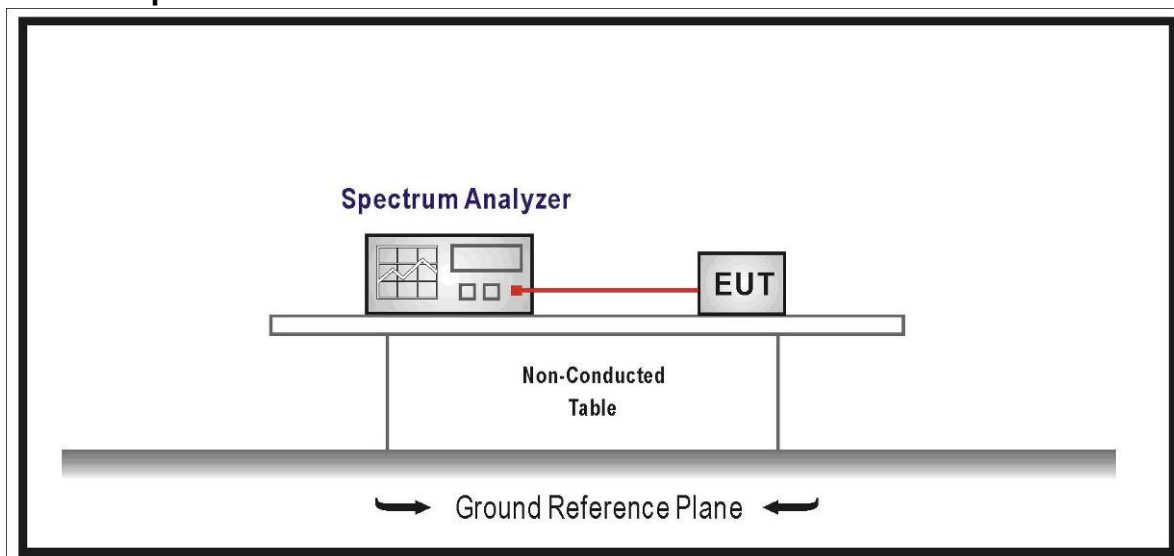
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	1301.76	46.17	74.00	-27.83	71.65	-25.48	PK
2	1735.68	41.74	80.83	-39.08	65.15	-23.41	PK
3	2169.6	46.07	80.83	-34.76	67.53	-21.46	PK
4	2603.52	45.66	80.83	-35.17	65.01	-19.35	PK
5	3037.44	46.12	80.83	-34.71	63.71	-17.59	PK
6	3471.36	49.15	80.83	-31.68	66.01	-16.86	PK
7	3905.28	47.55	74.00	-26.45	62.81	-15.26	PK
* 8	4339.2	50.11	74.00	-23.89	63.50	-13.39	PK

Note:

- 1.All reading above 1GHz is performed with peak and/or average measurements as necessary.
2. “ * ”, means this data is the worst value.
- 3.Emission Level = Reading Level + Correct Factor.
- 4.The average measurement was not performed when the peak measured data under the limit of average detection.
- 5.The emission above 13GHz were not included is because their levels are lower than 20dB form limit.

4. 20dB Bandwidth

4.1. Test Setup



4.2. Limits

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

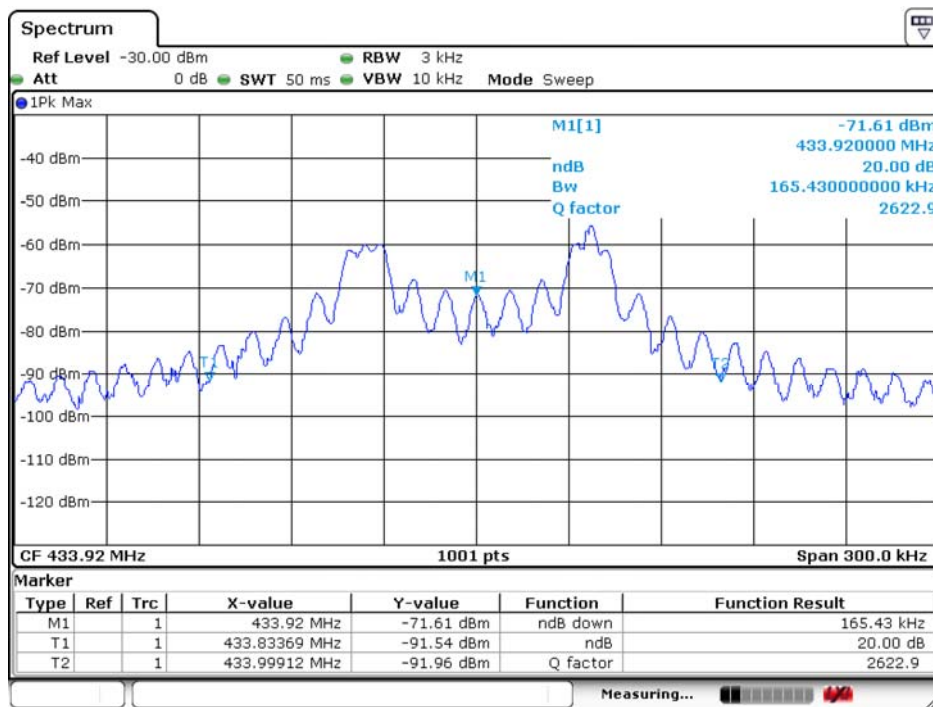
4.3. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231(b): 2019

4.4. Test Result

Product	TPMS		
Test Item	20dB Bandwidth		
Test Mode	Mode 1: Transmit_433.92MHz_FSK		
Date of Test	2020/06/02	Test Site	SR12-H
Temperature(°C)	25.0	Humidity (%RH)	55.0

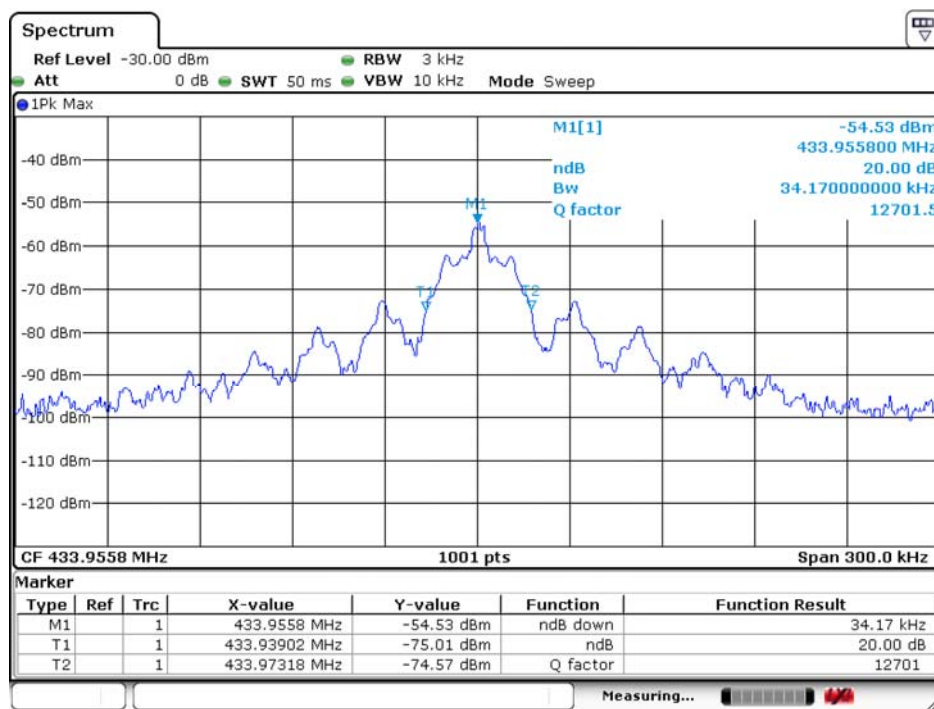
Frequency (MHz)	Measure Value (MHz)	Limit (MHz)
433.920	0.165	1.0848



Date: 2.JUN.2020 10:59:05

Product	TPMS		
Test Item	20dB Bandwidth		
Test Mode	Mode 2: Transmit_433.957MHz_ASK		
Date of Test	2020/06/02	Test Site	SR12-H
Temperature(°C)	25.0	Humidity (%RH)	55.0

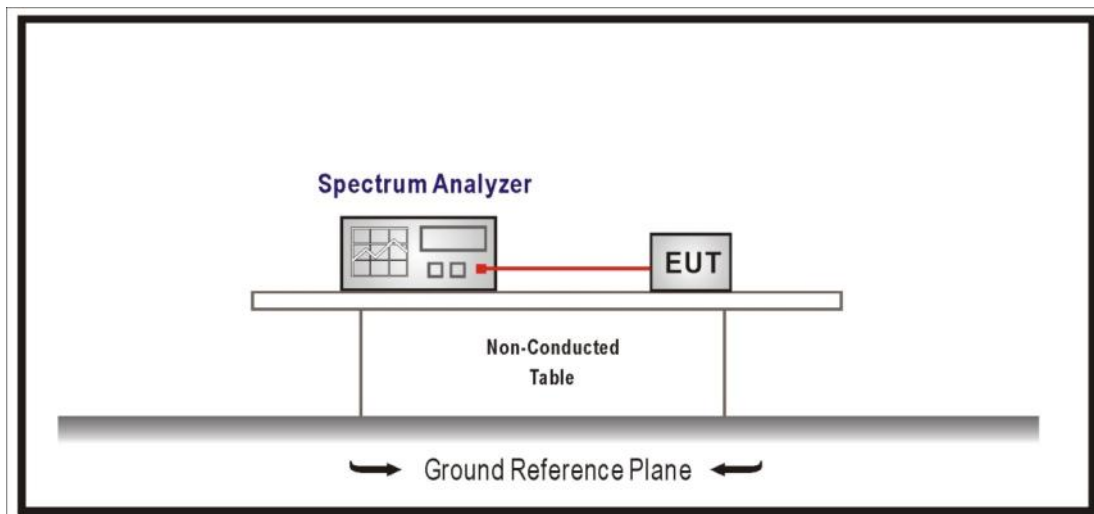
Frequency (MHz)	Measure Value (MHz)	Limit (MHz)
433.957	0.034	1.0849



Date: 2.JUN.2020 11:01:37

5. Duty Cycle

5.1. Test Setup



5.2. Limits

N/A

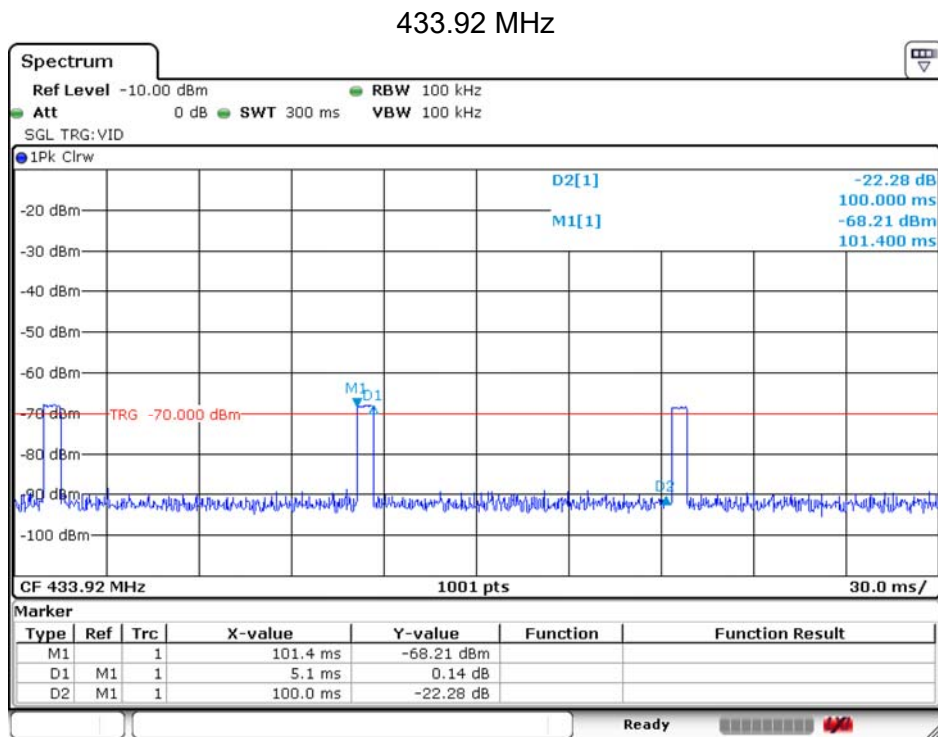
5.3. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231(b): 2019

5.4. Test Result

Product	TPMS		
Test Item	Duty Cycle		
Test Mode	Mode 1: Transmit_433.92MHz_FSK		
Date of Test	2020/06/15	Test Site	SR12-H
Temperature(°C)	24.0	Humidity (%RH)	58.0

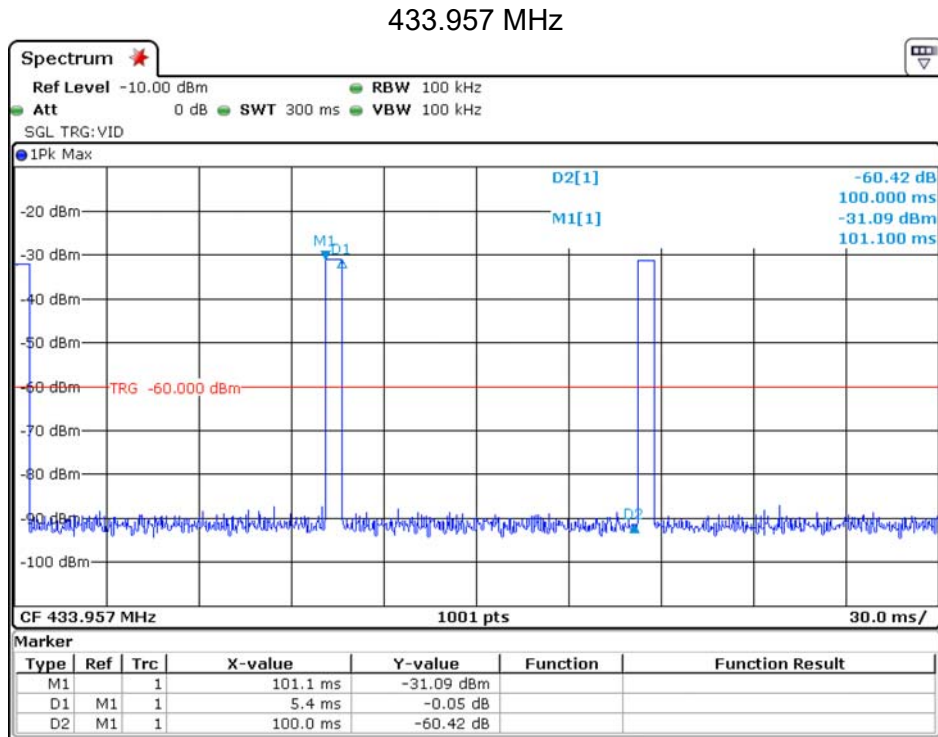
Modulation	On Time(ms)	On+Off Time(ms)	Duty Cycle(%)	Duty Factor(dB)
FSK	5.100	100.000	5.10%	-25.85



Date: 15 JUN 2020 13:58:02

Product	TPMS		
Test Item	Duty Cycle		
Test Mode	Mode 2: Transmit_433.957MHz_ASK		
Date of Test	2020/06/30	Test Site	SR12-H
Temperature(°C)	24.0	Humidity (%RH)	58.0

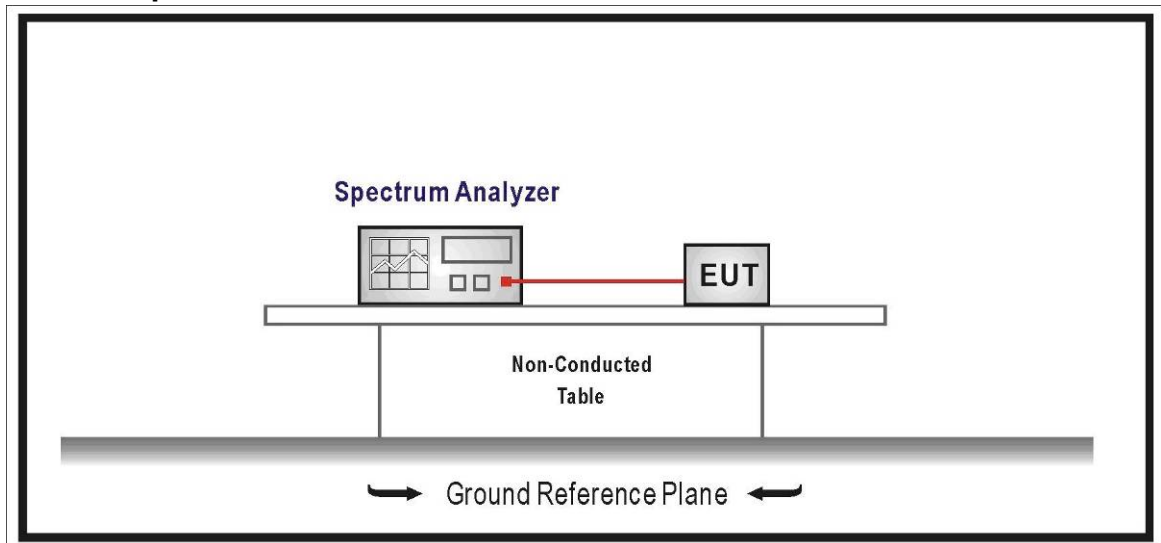
Modulation	On Time(ms)	On+Off Time(ms)	Duty Cycle(%)	Duty Factor(dB)
ASK	5.400	100.000	5.40%	-25.35



Date: 30 JUN 2020 11:19:00

6. Transmitter time

6.1. Test Setup



6.2. Limits

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released. A transmitter activated automatically shall cease transmission within 5 seconds after activation.

Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

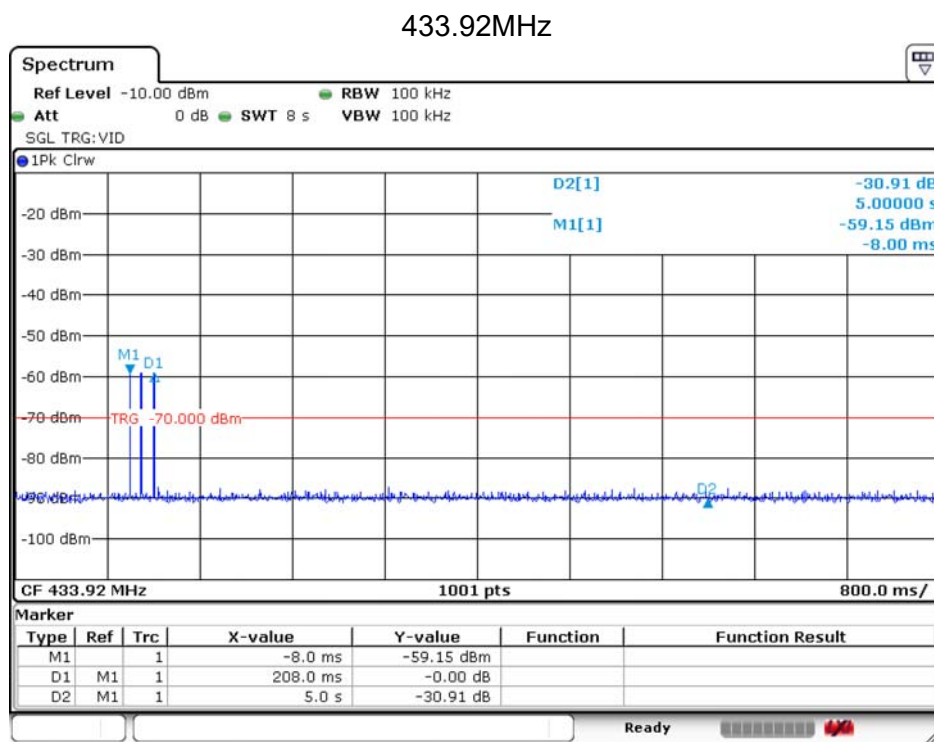
6.3. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231(b): 2019

6.4. Test Result

Product	TPMS		
Test Item	Transmitter time		
Test Mode	Mode 1: Transmit_433.92MHz_FSK		
Date of Test	2020/06/15	Test Site	SR12-H
Temperature(°C)	24.8	Humidity (%RH)	57.0

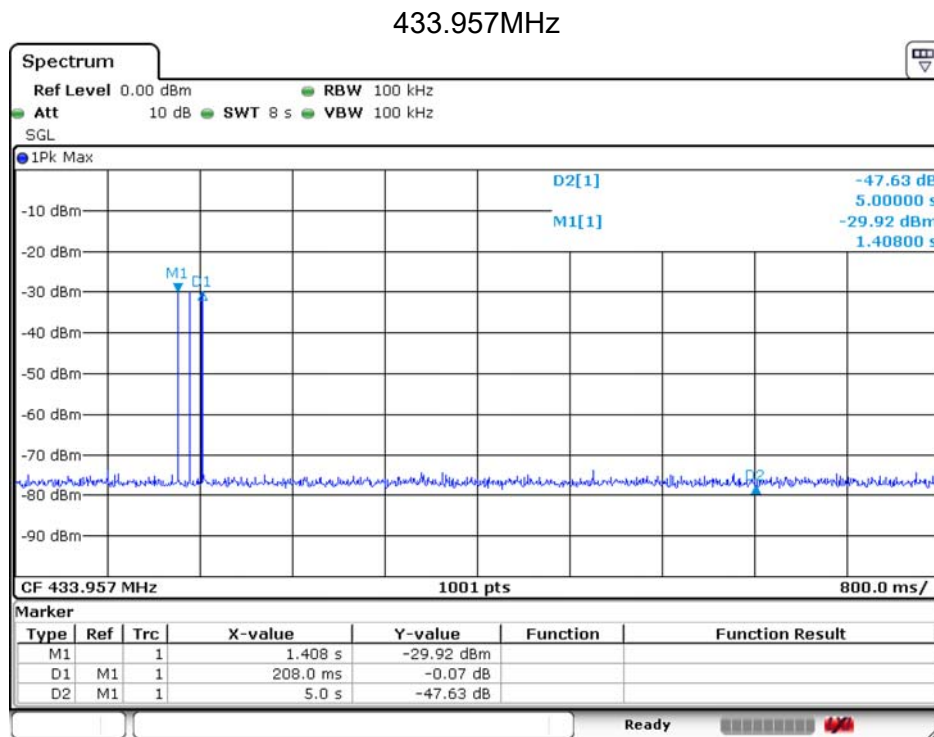
Frequency (MHz)	Measure Value (s)	Limit (s)
433.920	0.208	≤ 5



Date: 15 JUN 2020 13:46:22

Product	TPMS		
Test Item	Transmitter time		
Test Mode	Mode 2: Transmit_433.957MHz_ASK		
Date of Test	2020/06/29	Test Site	SR12-H
Temperature(°C)	24.3	Humidity (%RH)	66.0

Frequency (MHz)	Measure Value (s)	Limit (s)
433.957	0.208	≤ 5



Date: 29 JUN 2020 15:02:31