Test Report

Client Information:

Applicant:	Autel Intelligent Tech.Corp., Ltd
Applicant add.:	7th-8th,10th Floor, Bldg. B1, Zhiyuan, Xueyuan Rd., Xili, Nanshan, Shenzhen, China

Product Information:

Product Name:	MX-Sensor
Model No.:	1 SENSOR E, 1 SENSOR EK, 1 SENSOR SE
Brand Name:	AUTEL
FCC ID:	WQ8TPMSDFA21

Standards: FCC 47 CFR PART 15 SUBPART C 15.231

Prepared By:

Dongguan Yaxu (AiT) Technology Limited

Add. : No.22, Jinqianling Third Street, Jitigang, Huangjiang, Dongguan, Guangdong, China

Date of Receipt:	Oct. 13, 2022	Date of Test:	Oct. 13, 2022~Oct. 28, 2022
Date of Issue:	Oct. 28, 2022	Test Result:	Pass

This device described above has been tested by Dongguan Yaxu (AiT) Technology Limited, and 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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Reviewed by: Simba Huang

Approved by: Seal chen

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Revision History

Revision	Issue Date	Revisions	Revised By
000	Oct. 28, 2022	Initial Issue	Seal Chen

2 Test Summary

FCC Rule	Description of Test	Result
Section 15.203 RSS- Gen section 6.8	Antenna Requirement	Pass
Section 15.207(a) RSS-Gen clause 8.8	Conduction Emissions	N/A
Section 15.209,15.231(e) RSS-210 A.1.4	Radiated Emissions	Pass
Section 15.231(c) RSS-Gen clause 6.7 &RSS-210 A.1.3	Occupied Bandwidth	Pass
Section 15.231(e) RSS 210 Issue 10 A.1.4（b）	Transmit time	Pass

Note

1. *Test according to ANSI C63.10:2013 and RSS-Gen.*
2. *The measurement uncertainty is not included in the test result.*
3. *Test results in other test report (RF Exposure Evaluation Report)*

2.1 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 AiT 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.

2.2 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	0.009MHz-30MHz	3.10dB	(1)
Radiated Emission	30MHz-1GHz	3.75dB	(1)
Radiated Emission	1GHz-18GHz	3.88dB	(1)
Radiated Emission	18GHz-40GHz	3.88dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	1.20dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

3 Test Facility

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

.CNAS- Registration No: L6177

Dongguan Yaxu (AiT) technology Limited is accredited to ISO/IEC 17025:2017 general Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the competence of testing and calibration laboratories) on Aug.04, 2020

FCC-Registration No.: 703111 Designation Number: CCH-205313

Dongguan Yaxu (AiT) technology Limited has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

IC —Registration No.: 6819A CAB identifier: CN0122

The 3m Semi-anechoic chamber of Dongguan Yaxu (AiT) technology Limited has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 6819A

A2LA-Lab Cert. No.: 6317.01

Dongguan Yaxu (AiT) technology Limited has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

3.1 Deviation from standard

None

3.2 Abnormalities from standard conditions

None

3.3 Test Location

Dongguan Yaxu (AiT) Technology Limited

Address: No.22, Jinqianling 3rd Street, Jitigang, Huangjiang,Dongguan, Guangdong, China

Tel.: +86-769-8202 0499

Fax.: +86-769-8202 0495

4 General Information

4.1 General Description of EUT

Manufacturer:	Autel Intelligent Tech.Corp., Ltd
Manufacturer Address:	7th-8th,10th Floor, Bldg. B1, Zhiyuan, Xueyuan Rd., Xili, Nanshan, Shenzhen, China
EUT Name:	MX-Sensor
Model No.:	1 SENSOR E
Serial Model No.:	1 SENSOR EK, 1 SENSOR SE
Operation frequency:	315MHz,434MHz
Modulation Technology:	ASK, FSK
Antenna Type:	Spring antenna
Antenna Gain:	-1.5dBi Max
Brand Name:	AUTEL
H/W No.:	PS2121_AC5121_V3
S/W No.:	V01.00.10
Serial No.:	C7701L9N9E001735
Power Supply Range:	DC 3.0V from battery
Power Supply:	The same as above
Power Cord:	N/A
Model difference:	PCB board, structure and internal of these model(s) are the same, only the model names are different.

Description of Channel:	
Channel	Frequency (MHz)
00	315
01	434

5 Description of Test conditions

5.1 E.U.T. Operation

Power supply:	DC 3.0V from battery (New battery)
Temperature:	20.0 -25.0 °C
Humidity:	38-50 % RH
Atmospheric Pressure:	1000 -1010 mbar
Test frequencies and frequency range:	(i) Except where otherwise specified, measurements shall be performed for each frequency band of operation for which the radio apparatus is to be certified, with the device operating at the frequencies in each band of operation shown in the table below: In measuring unwanted emissions, the spectrum shall be investigated from 30 MHz or the lowest radio frequency signal generated in the equipment, whichever is lower, without going below 9 kHz, up to at least the frequency given in the table below:

Number of fundamental frequencies to be tested in EUT transmit band

Frequency range in which device operates	Number of frequencies	Location in frequency range of operation
1 MHz or less	1	Middle
1 MHz to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom

Frequency range of radiated emission measurements

Lowest frequency generated in the device	Upper frequency range of measurement
9 kHz to below 10 GHz	10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower
At or above 10 GHz to below 30 GHz	5th harmonic of highest fundamental frequency or to 100 GHz, whichever is lower
At or above 30 GHz	5th harmonic of highest fundamental frequency or to 200 GHz, whichever is lower, unless otherwise specified

Remark: Test frequency is315MHz& 434MHz.

5.2 EUT Peripheral List

No.	Equipment	Manufacturer	Model No.	Serial No.	Power cord	signal cable
1	N/A	N/A	N/A	N/A	N/A	N/A

5.3 Test Peripheral List

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	Remark
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A

6 Equipments List for All Test Items

No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	Spectrum Analyzer	R&S	FSV40	101470	2022.09.02	2023.09.01
2	EMI Measuring Receiver	R&S	ESR	101660	2022.09.02	2023.09.01
3	Low Noise Pre Amplifier	HP	HP8447E	1937A01855	2022.09.02	2023.09.01
4	Low Noise Pre Amplifier	Tsj	MLA-0120-A02-34	2648A04738	2022.09.02	2023.09.01
5	Passive Loop	ETS	6512	00165355	2022.09.04	2024.09.03
6	TRILOG Super Broadband test Antenna	SCHWARZBECK	VULB9160	9160-3206	2021.08.29	2024.08.28
7	Broadband Horn Antenna	SCHWARZBECK	BBHA9120D	452	2021.08.29	2024.08.28
8	SHF-EHF Horn Antenna 15-40GHz	SCHWARZBECK	BBHA9170	BBHA9170367d	2020.11.24	2023.11.23
9	EMI Test Receiver	R&S	ESCI	100124	2022.09.02	2023.09.01
10	LISN	Kyoritsu	KNW-242	8-837-4	2022.09.02	2023.09.01
11	LISN	R&S	ESH3-Z2	0357.8810.54-101161-S2	2022.09.02	2023.09.01
12	Pro.Temp&Humi.chamber	MENTEK	MHP-150-1C	MAA08112501	2022.09.02	2023.09.01
13	RF Automatic Test system	MW	MW100-RFCB	21033016	2022.09.02	2023.09.01
14	Signal Generator	Agilent	N5182A	MY50143009	2022.09.02	2023.09.01
15	Wideband Radio communication tester	R&S	CMW500	1201.0002K50	2022.09.02	2023.09.01
16	RF Automatic Test system	MW	MW100-RFCB	21033016	2022.09.02	2023.09.01
17	DC power supply	ZHAOXIN	RXN-305D-2	28070002559	N/A	N/A
18	RE Software	EZ	EZ-EMC_RE	Ver.AIT-03A	N/A	N/A
19	CE Software	EZ	EZ-EMC_CE	Ver.AIT-03A	N/A	N/A
20	RF Software	MW	MTS 8310	2.0.0.0	N/A	N/A
21	temporary antenna connector(Note)	NTS	R001	N/A	N/A	N/A
Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.						

7 Test Result

7.1 Antenna Requirement

Standard requirement

For intentional device, according to FCC 47 CFR Section 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

RSS-GEN section 6.8

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.8 When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

EUT Antenna

The antenna is Spring antenna. The maximum gain of the antenna is -1.5 dBi.

Test result: The unit does meet the FCC &RSS requirements.

7.2 Transmit time

7.2.1 Applied procedures / Limit

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

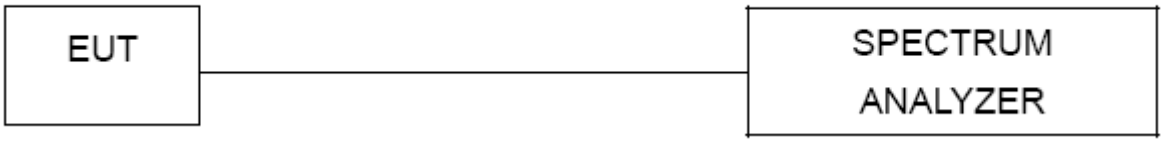
7.2.2 Test procedure

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. Spectrum Setting: RBW=1MHz, VBW≧RBW, Sweep time=20s, Detector Function=Peak.

7.2.3 Deviation from standard

No deviation.

7.2.4 Test setup



7.2.5 Test results

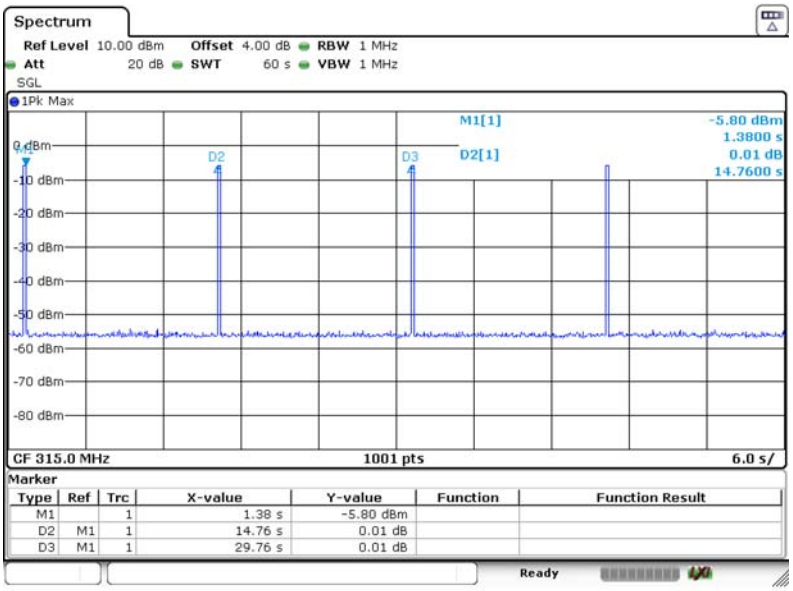
Test Date: 2022-10-20 Temperature: 26℃

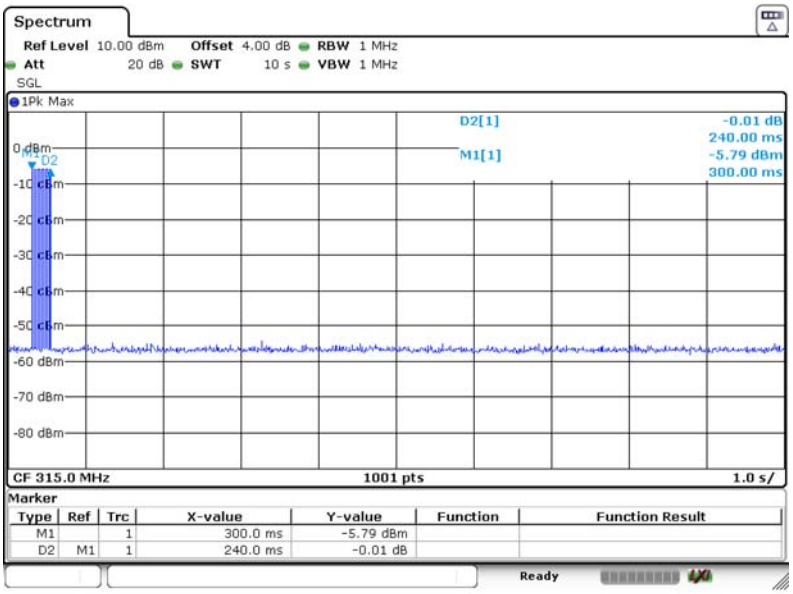
Atmospheric pressure: 1000 pha Humidity: 60%

315MHz(ASK)

Item	Duration of each transmission (Td)	Silent period between transmissions(Ts)
Time	0.240s	14.76s
Limit	≤1 s	≥10 s and 30*Td

315MHz

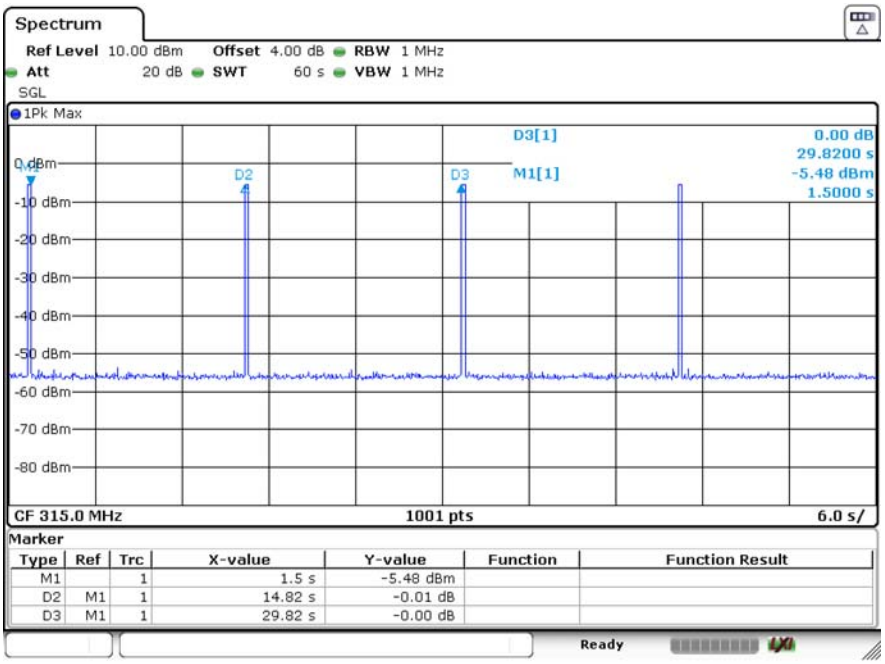


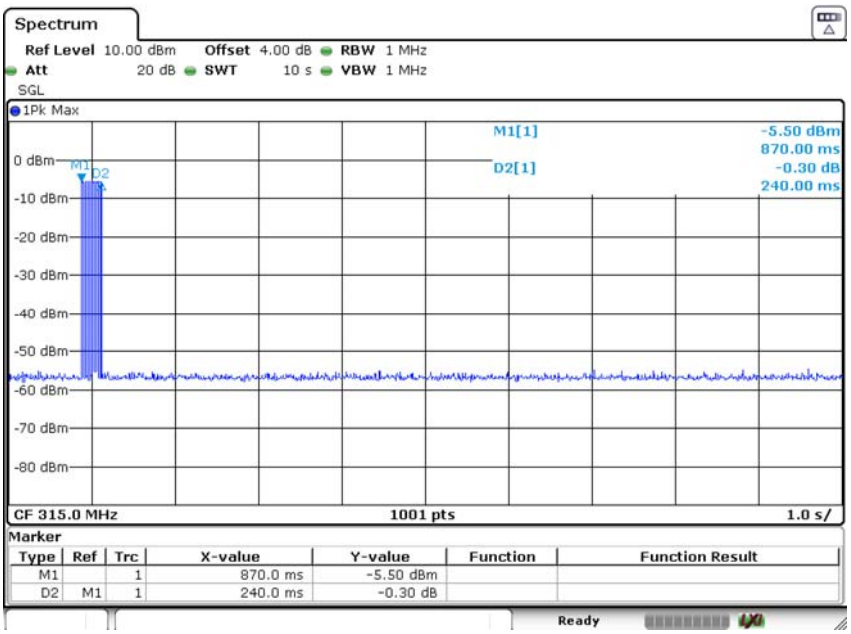


315MHz(FSK)

Item	Duration of each transmission (Td)	Silent period between transmissions(Ts)
Time	0.240s	14.82s
Limit	≤1 s	≥10 s and 30*Td

315MHz

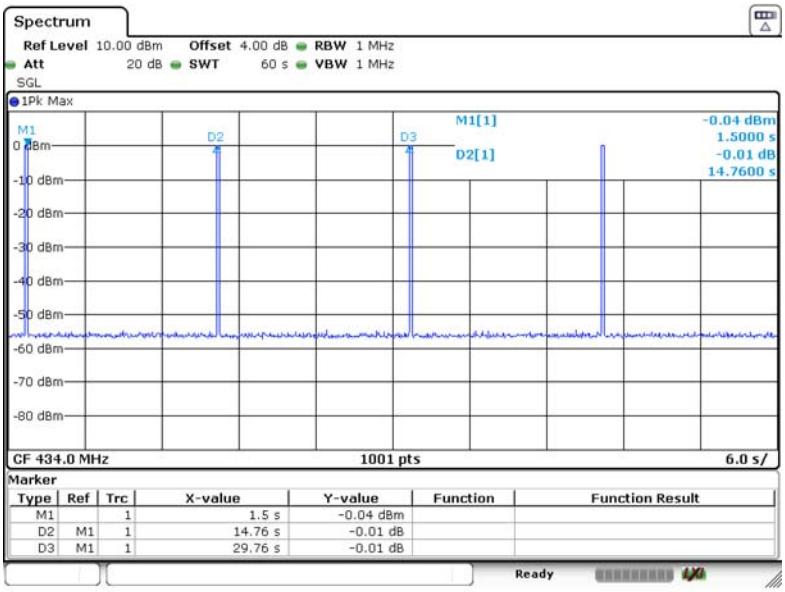


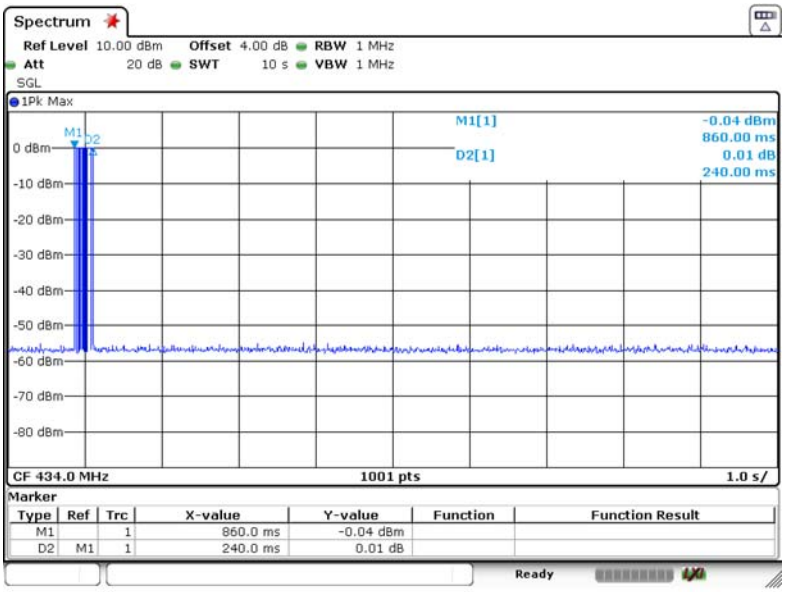


434MHz(ASK)

Item	Duration of each transmission (Td)	Silent period between transmissions(Ts)
Time	0.240s	14.76s
Limit	≤1 s	≥10 s and 30*Td

434MHz

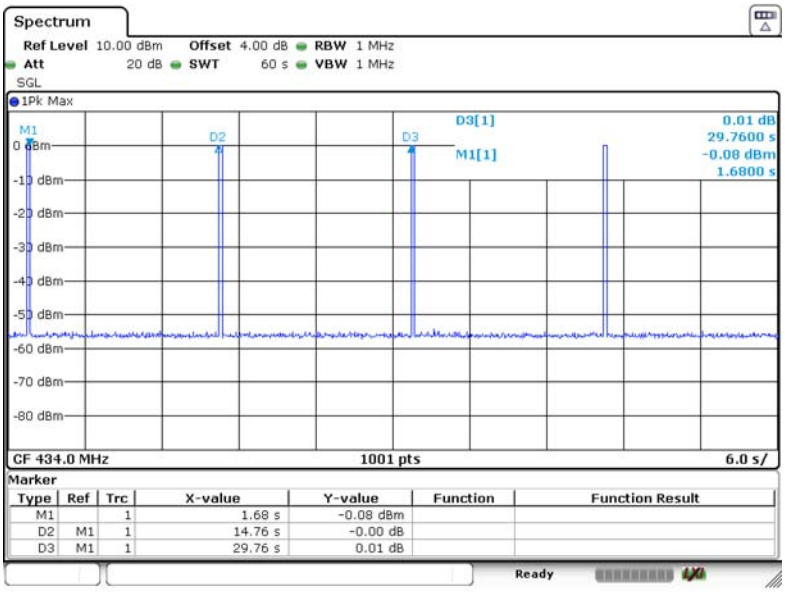


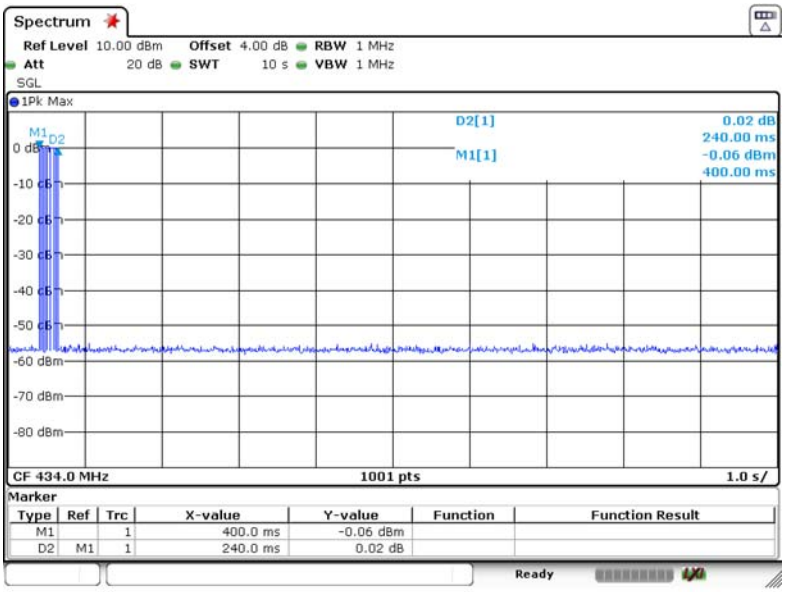


434MHz(FSK)

Item	Duration of each transmission (Td)	Silent period between transmissions(Ts)
Time	0.240s	14.76s
Limit	≤1 s	≥10 s and 30*Td

434MHz





7.3 Field Strength of Fundamental& Field Strength of Unwanted Emissions

Test Requirement:	Section 15.209,15.231(e) RSS-210 A1.4	
Test Method:	ANSI C63.10: Clause 6.4, 6.5 and 6.6	
Measurement Distance:	3 m (Semi-Anechoic Chamber)	
Test Status:	Test in transmitting mode.	
Requirements:	the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:	
Fundamental Frequency MHz	Field Strength of Fundamental (dBμV/m@3m)	Field Strength of Spurious Emissions (dBμV/m@3m)
40.66 to 40.70	60.00	40.00
70 to 130	53.98	33.98
130 to 174	53.98 to 63.52	33.98 to 43.52
174 to 260	63.52	43.52
260 to 470	63.52 to 73.98	43.52 to 53.98
Above 470	73.98	53.98
Detector:	Peak for pre-scan	
	QP for 30MHz to1000 MHz:120 kHz resolution bandwidth Peak for Above 1 GHz: 1 MHz resolution bandwidth	

** linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174MHz，μV/m at 3 meters = 22.73(F) -2454.55. for the band 260-470 MHz, μV/m at 3 meters = 16.67(F) – 2833.33. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level

The fundamental frequency of the EUT is 315 MHz

The limit for Peak field strength dBμV/m for the fundamental emission= 87.67 dBμV/m

No fundamental is allowed in the restricted bands.

The limit for average field strength dBuv/m for the spurious emission= 67.67 dBuV/m.

Spurious in the restricted bands must be less than average field strength, whichever limit permits a higher field strength.

The fundamental frequency of the EUT is 434 MHz

The limit for Peak field strength dBuv/m for the fundamental emission= 92.87 dBμV/m

No fundamental is allowed in the restricted bands.

The limit for average field strength dBuv/m for the spurious emission= 72.87 dBuV/m.

Spurious in the restricted bands must be less than average field strength, whichever limit permits a higher field strength.

On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrument using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Interference (CISPR) of the International Electrotechnical Commission. As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, as long as the same bandwidths as indicated for CISPR quasi-peak measurements are employed.

Note: For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance with the regulations shall be demonstrated using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements.

Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, e.g., the total peak power level. Note that the use of a pulse desensitization correction factor may be needed to determine the total peak emission level. The instruction manual or application note for the measurement instrument should be consulted for determining pulse desensitization factors, as necessary.

The average correction factor is computed by analyzing the on time in 100ms over one complete pulse train. Analysis of the remote transmitter on time in one complete pulse train, therefore the average value of fundamental frequency is: Average = Peak value + 20log (Duty cycle), where the duty factor is calculated from following formula:

For 315 MHz(ASK):

20log (Duty cycle) = 20log(T_{pulse}/100) =20log(0.328)= -9.68dB

Here T_{pulse}=8.2*4 (ms)=32.8(ms)

For 315 MHz(FSK):

20log (Duty cycle) = 20log(T_{pulse}/100) =20log(0.34)= -9.37dB

Here T_{pulse}=8.5*4 (ms)=34(ms)

For 434(ASK) MHz:

20log (Duty cycle) = 20log(T_{pulse}/100) =20log(0.332)= -9.58dB

Here T_{pulse}=8.3 * 4(ms)=33.2(ms)

For 434(FSK) MHz:

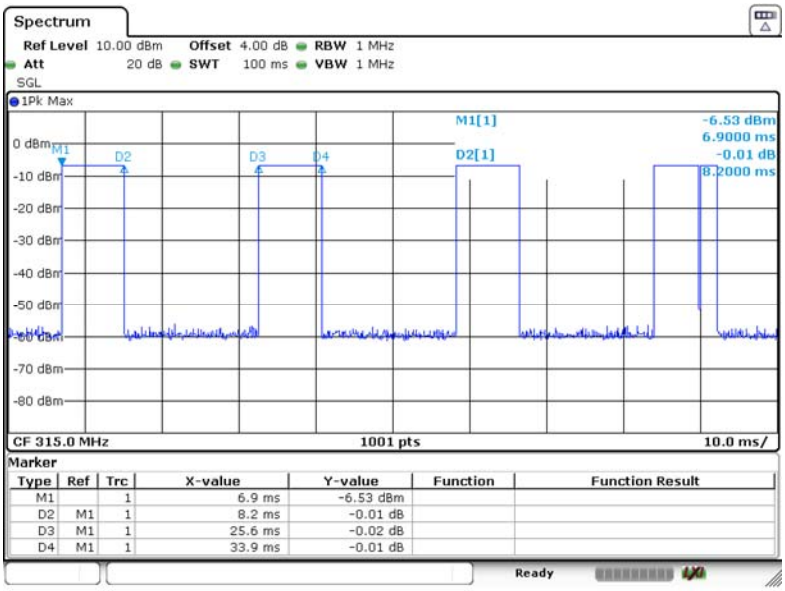
20log (Duty cycle) = 20log(T_{pulse} /100) =20log(0.34)= -9.37dB

Here T_{pulse} =8.5*4 (ms)=34(ms)

Please refer to below plots for more details.

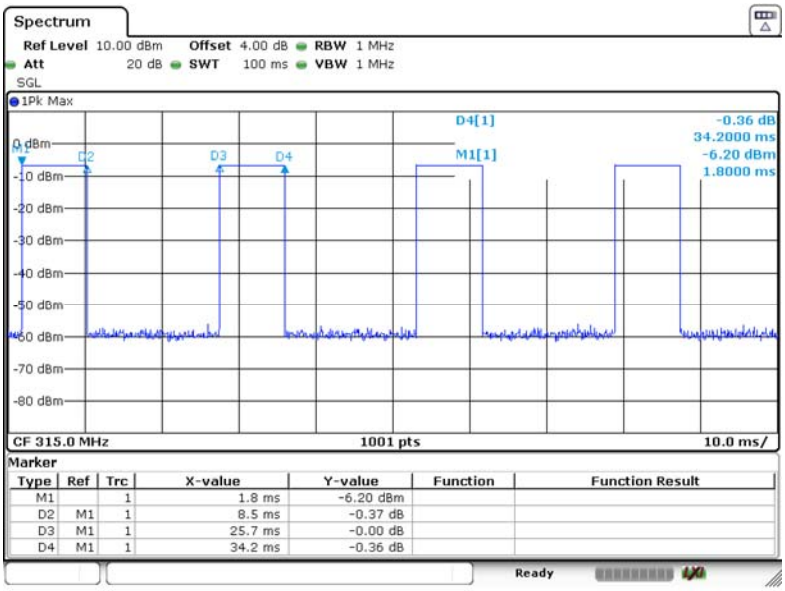
315MHz(ASK)

EUT：	MX-Sensor	Model Name ：	1 SENSOR E
Temperature：	26 ℃	Test Data	2022-10-20
Pressure：	1010 hPa	Relative Humidity：	60%
Test Mode ：	TX CH00	Test Voltage ：	DC 3.0V



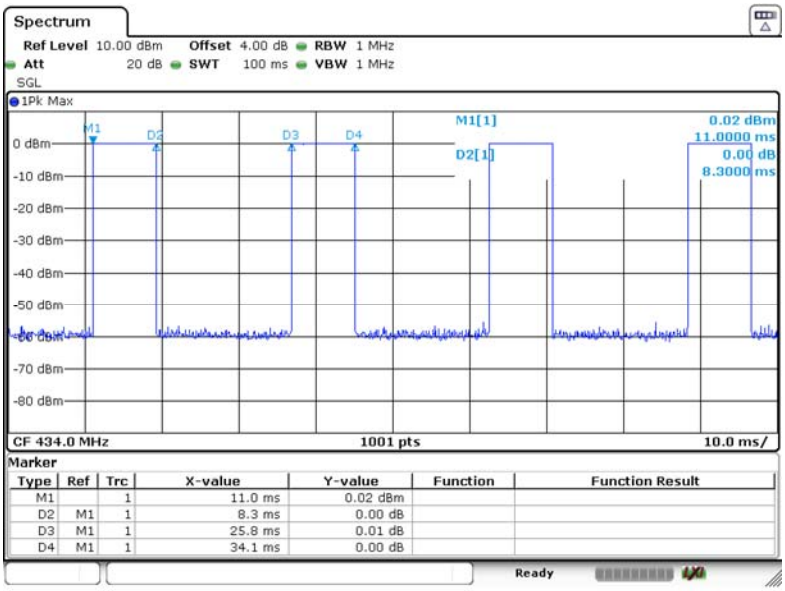
315MHz(FSK)

EUT：	MX-Sensor	Model Name ：	1 SENSOR E
Temperature：	26 ℃	Test Data	2022-10-20
Pressure：	1010 hPa	Relative Humidity：	60%
Test Mode ：	TX CH00	Test Voltage ：	DC 3.0V



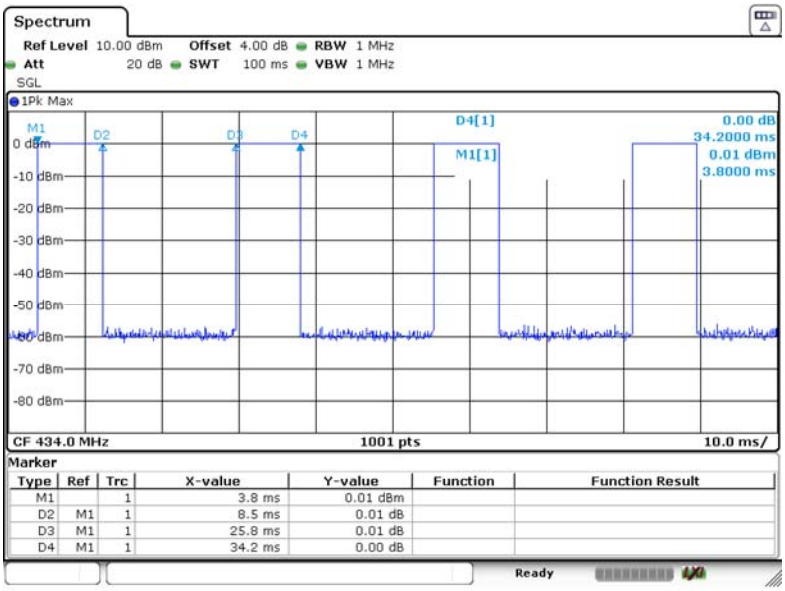
434MHz(ASK)

EUT：	MX-Sensor	Model Name ：	1 SENSOR E
Temperature：	26 ℃	Test Data	2022-10-20
Pressure：	1010 hPa	Relative Humidity：	60%
Test Mode ：	TX CH01	Test Voltage ：	DC 3.0V



434MHz(FSK)

EUT：	MX-Sensor	Model Name ：	1 SENSOR E
Temperature：	26 ℃	Test Data	2022-10-20
Pressure：	1010 hPa	Relative Humidity：	60%
Test Mode ：	TX CH01	Test Voltage ：	DC 3.0V



7.3.1 Test procedure

Test Procedure:

1)9 kHz to 30 MHz emissions:

For testing performed with the loop antenna, testing was performed in accordance to ANSI C63.10. The centre of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT, During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane.

2)30 MHz to 1 GHz emissions:

For testing performed with the bi-log type antenna, testing was performed in accordance to ANSI C63.10. The measurement is performed with the EUT rotated 360º, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurement for both the horizontal and vertical antenna polarizations.

3)1 GHz to 5 GHz emissions:

Test site with RF absorbing material covering the ground plane that met the site validation criterion called out in CISPR 16-1-4:2007 was used to perform radiated emission test above 1 GHz.

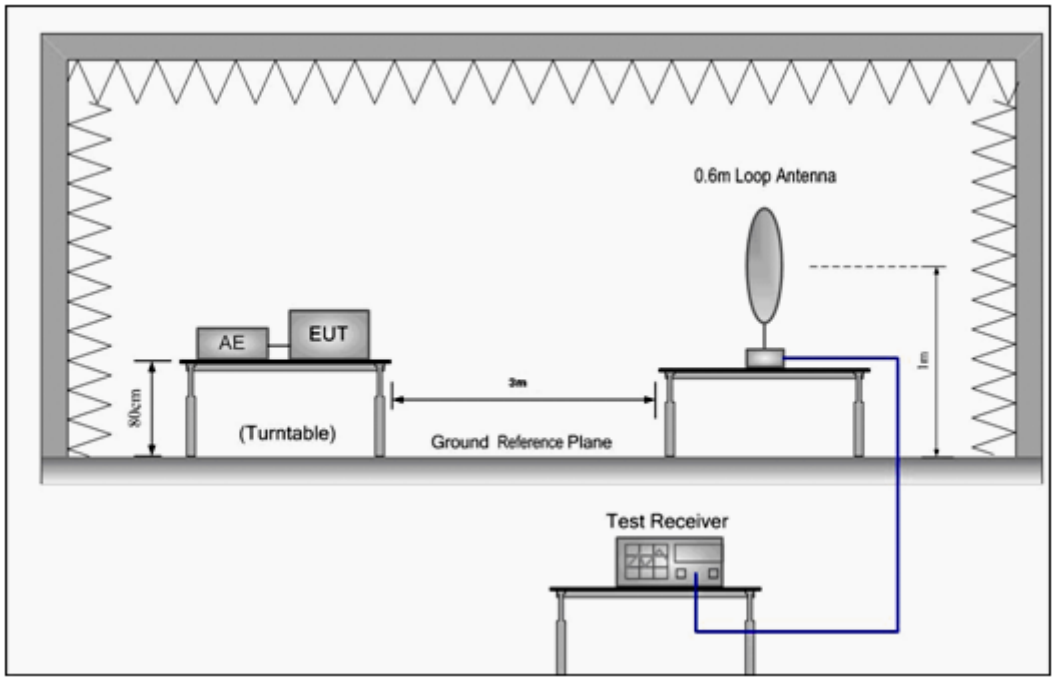
For testing performed with the horn antenna, testing was performed in accordance to ANSI C63.10. The measurement is performed with the EUT rotated 360º, the antenna height scan between 1m and 4m, and the antenna rotated to repeat the measurement for both the horizontal and vertical antenna polarizations.

For the radiated emission test above 1GHz:

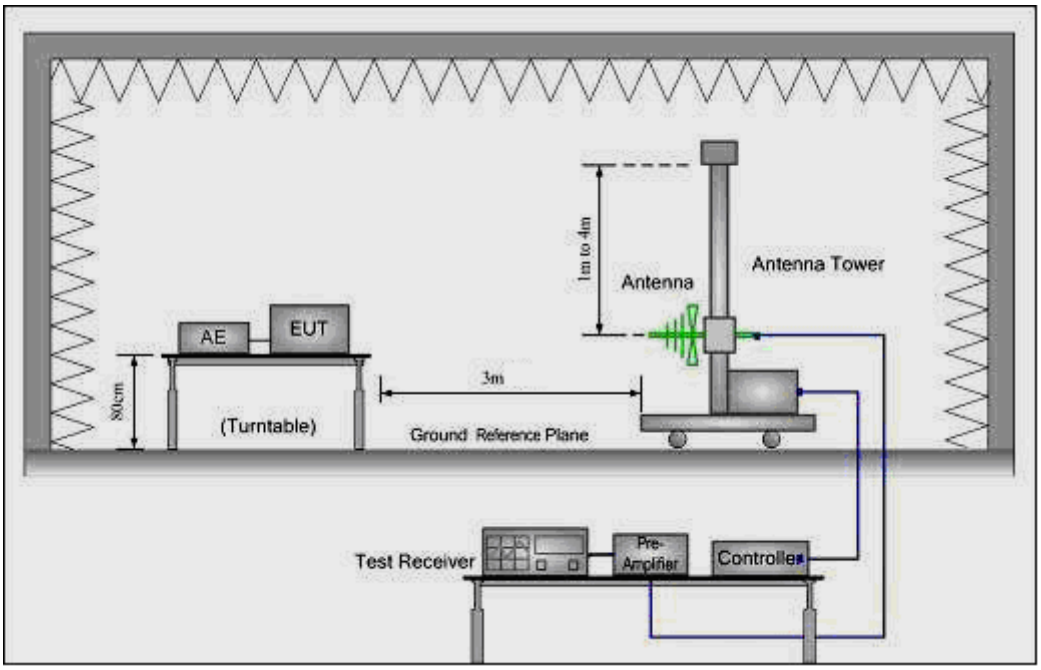
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission 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.

Test Configuration:

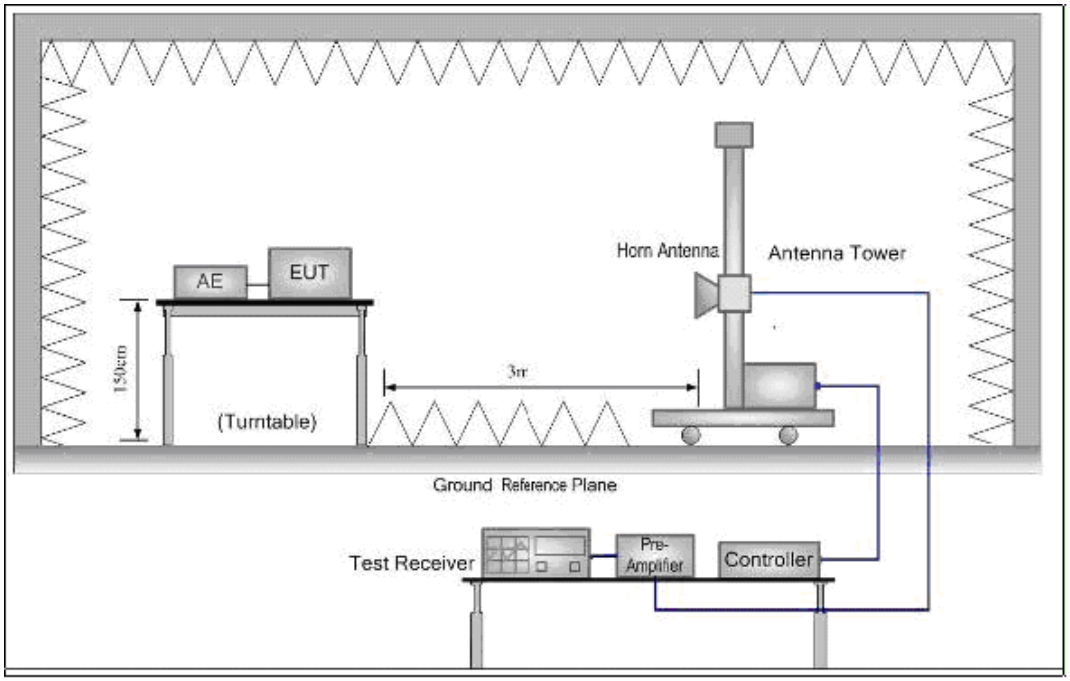
1) 9 kHz to 30 MHz emissions:



2) 30 MHz to 1 GHz emissions:



3) 1 GHz to 5 GHz emissions:



The field strength is calculated by adding the Antenna Factor, Cable Loss & Per-amplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna, Factor + Cable Loss – Preamplifier Factor

EUT：	MX-Sensor	Model Name ：	1 SENSOR E
Temperature：	23 ℃	Test Data	2022-10-20
Pressure：	1010 hPa	Relative Humidity：	60%
Test Mode ：	TX 315MHz (ASK)	Test Voltage ：	DC 3.0V
Measurement Distance	3 m	Frenqucy Range	Fundamental+ Harmonics+ Above 1GHz Spurious
RBW/VBW	100KHz / 300KHz for spectrum, RBW=120KHz for receiver.		

Antenna polarization: Horizontal:

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
315.4808	67.02	-4.18	62.84	87.67	-21.72	Peak
631.6881	--	--	--	67.67	--	Peak
945.4492	--	--	--	67.67	--	Peak

Frequency (MHz)	20log (Duty cycle) (dB)	Peak Level (dBμV/m)	Average Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector Type
315.4806	-9.68	62.84	53.16	67.67	-14.51	AVG
631.6881	--	--	--	47.67	--	AVG
945.4492	--	--	--	47.67	--	AVG

Antenna polarization: Vertical:

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
315.4808	55.36	-3.31	52.05	87.67	-35.62	Peak
631.6881	--	--	--	67.67	--	Peak
945.4492	--	--	--	67.67	--	Peak

Frequency (MHz)	20log (Duty cycle) (dB)	Peak Level (dBμV/m)	Average Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector Type
315.4806	-9.68	52.05	42.37	67.67	-25.30	AVG
631.6881	--	--	--	47.67	--	AVG
945.4492	--	--	--	47.67	--	AVG

Note: Other emissions of harmonics are attenuated 20dB below the limits, so it does not recorded in report.

EUT：	MX-Sensor	Model Name ：	1 SENSOR E
Temperature：	23 ℃	Test Data	2022-10-20
Pressure：	1010 hPa	Relative Humidity：	60%
Test Mode ：	TX 315MHz (FSK)	Test Voltage ：	DC 3.0V
Measurement Distance	3 m	Frenqucy Range	Fundamental+ Harmonics+ Above 1GHz Spurious
RBW/VBW	100KHz / 300KHz for spectrum, RBW=120KHz for receiver.		

Antenna polarization: Horizontal:

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
315.4806	69.73	-4.18	65.55	87.67	-22.12	Peak
631.6881	--	--	--	67.67	--	Peak
945.4492	--	--	--	67.67	--	Peak

Frequency (MHz)	20log (Duty cycle) (dB)	Peak Level (dBμV/m)	Average Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector Type
315.4806	-9.37	65.55	56.18	67.67	-11.49	AVG
631.6881	--	--	--	47.67	--	AVG
945.4492	--	--	--	47.67	--	AVG

Antenna polarization: Vertical:

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
315.4806	60.15	-3.31	56.84	87.67	-30.83	Peak
631.6881	--	--	--	67.67	--	Peak
945.4492	--	--	--	67.67	--	Peak

Frequency (MHz)	20log (Duty cycle) (dB)	Peak Level (dBμV/m)	Average Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector Type
315.4806	-9.37	56.84	47.47	67.67	-20.20	AVG
631.6881	--	--	--	47.67	--	AVG
945.4492	--	--	--	47.67	--	AVG

EUT：	MX-Sensor	Model Name ：	1 SENSOR E
Temperature：	23 ℃	Test Data	2022-10-20
Pressure：	1010 hPa	Relative Humidity：	60%
Test Mode ：	TX 434MHz (ASK)	Test Voltage ：	DC 3.0V
Measurement Distance	3 m	Frenqucy Range	Fundamental+ Harmonics+ Above 1GHz Spurious
RBW/VBW	100KHz / 300KHz for spectrum, RBW=120KHz for receiver.		

Antenna polarization: Horizontal:

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
434.0650	69.90	1.46	71.36	92.87	-21.51	Peak
869.1299	--	--	--	72.87	--	Peak
1302.062	--	--	--	72.87	--	Peak
1733.995	--	--	--	72.87	--	Peak

Frequency (MHz)	20log (Duty cycle) (dB)	Peak Level (dBμV/m)	Average Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector Type
434.0649	-9.58	71.36	61.78	72.87	-11.09	AVG
869.1299	--	--	--	52.87	--	AVG
1302.062	--	--	--	52.87	--	AVG
1733.995	--	--	--	52.87	--	AVG

Antenna polarization: Vertical:

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
434.0650	63.32	-1.12	62.20	92.87	-30.67	Peak
869.1299	--	--	--	72.87	--	Peak
1302.062	--	--	--	72.87	--	Peak
1733.995	--	--	--	72.87	--	Peak

Frequency (MHz)	20log (Duty cycle) (dB)	Peak Level (dBμV/m)	Average Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector Type
434.0649	-9.58	62.20	52.62	72.87	-20.25	AVG
869.1299	--	--	--	52.87	--	AVG
1302.062	--	--	--	52.87	--	AVG
1733.995	--	--	--	52.87	--	AVG

Remark: Other emissions of harmonics are attenuated 20dB below the limits, so it does not recorded in report.

EUT：	MX-Sensor	Model Name ：	1 SENSOR E
Temperature：	23 ℃	Test Data	2022-10-20
Pressure：	1010 hPa	Relative Humidity：	60%
Test Mode ：	TX 434MHz (FSK)	Test Voltage ：	DC 3.0V
Measurement Distance	3 m	Frenqucy Range	Fundamental+ Harmonics+ Above 1GHz Spurious
RBW/VBW	100KHz / 300KHz for spectrum, RBW=120KHz for receiver.		

Antenna polarization: Horizontal:

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
434.0650	65.89	1.46	67.35	92.87	-25.52	Peak
869.1299	--	--	--	72.87	--	Peak
1302.062	--	--	--	72.87	--	Peak
1733.995	--	--	--	72.87	--	Peak

Frequency (MHz)	20log (Duty cycle) (dB)	Peak Level (dBμV/m)	Average Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector Type
434.0649	-9.37	67.35	57.98	72.87	-14.89	AVG
869.1299	--	--	--	52.87	--	AVG
1302.062	--	--	--	52.87	--	AVG
1733.995	--	--	--	52.87	--	AVG

Antenna polarization: Vertical:

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
434.0649	67.07	-1.12	65.95	92.87	-26.92	Peak
869.1299	--	--	--	72.87	--	Peak
1302.062	--	--	--	72.87	--	Peak
1733.995	--	--	--	72.87	--	Peak

Frequency (MHz)	20log (Duty cycle) (dB)	Peak Level (dBμV/m)	Average Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector Type
434.0649	-9.37	65.95	56.58	72.87	-16.29	AVG
869.1299	--	--	--	52.87	--	AVG
1302.062	--	--	--	52.87	--	AVG
1733.995	--	--	--	52.87	--	AVG

Remark: Other emissions of harmonics are attenuated 20dB below the limits, so it does not recorded in report.

Y: rotate EUT by 90° vertically.

X: rotate EUT by 90° clockwise.

Z: EUT as Radiated Emission test setup photograph of this report.

Other emissions:

The receive was scanned from the lowest frequency generated within the EUT to 5 GHz.When an emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. The worst case emissions were reported.

An initial pre-scan was performed in the 3 m chamber using the spectrum analyzer in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bilog antenna with 2 orthogonal polarities.

The field strength is calculated by adding the Antenna Factor, Cable Factor & Peramplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor –Peramplifier Factor.

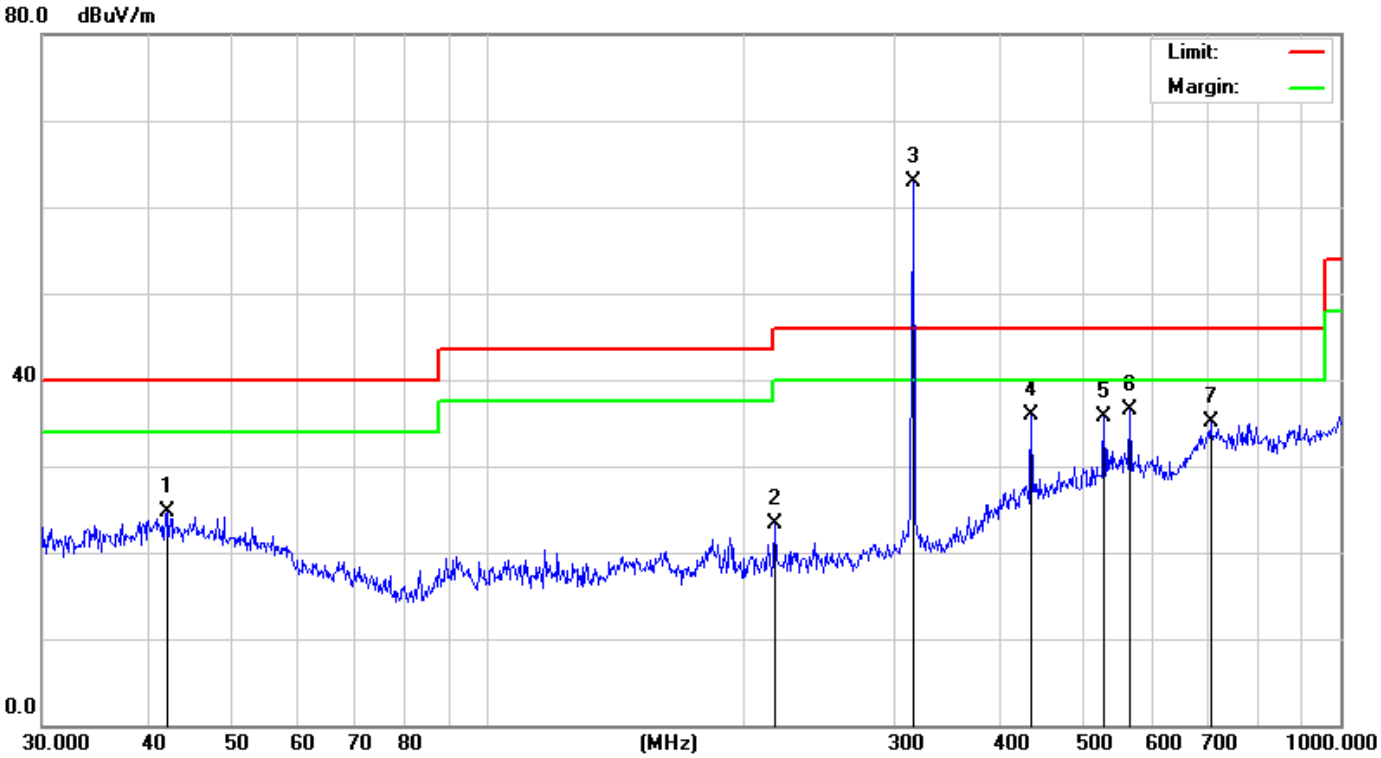
The following test results were performed on the EUT.

Since the peak emission level is lower than the average limit, the average emission level does not need to show.

Test the EUT in transmitting mode.

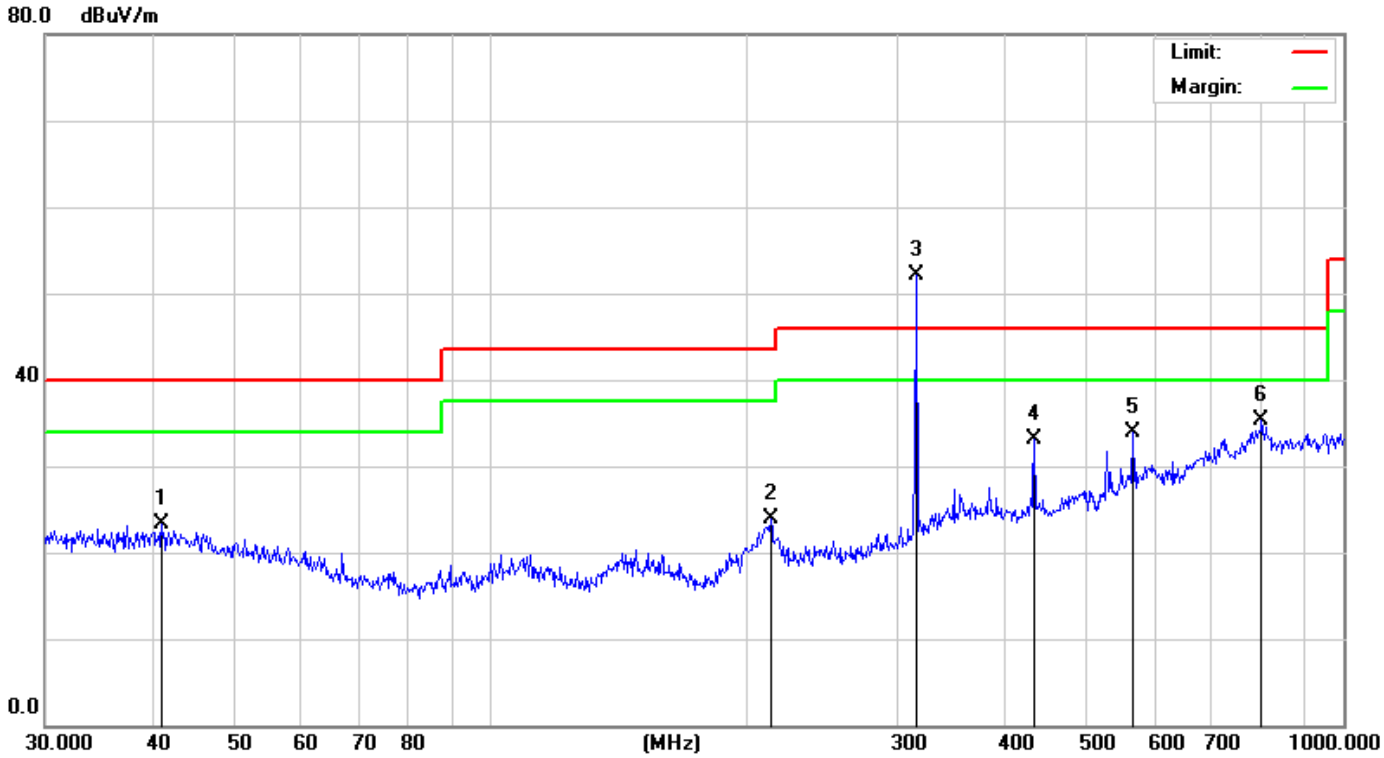
315MHz (ASK)

Power	:	DC 3.0V from battery	Pol/Phase	:	HORIZONTAL
Test Mode 1	:	TX CH00	Temperature	:	22 °C
Memo	:		Humidity	:	59%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		42.1542	26.55	-1.93	24.62	40.00	-15.38	QP
2		216.7828	30.37	-7.07	23.30	46.00	-22.70	QP
3	*	315.4808	67.02	-4.18	62.84	-	-	peak
4		434.0649	34.52	1.46	35.98	46.00	-10.02	QP
5		528.2458	32.26	3.46	35.72	46.00	-10.28	QP
6		566.6221	32.99	3.57	36.56	46.00	-9.44	QP
7		704.2259	28.67	6.34	35.01	46.00	-10.99	QP

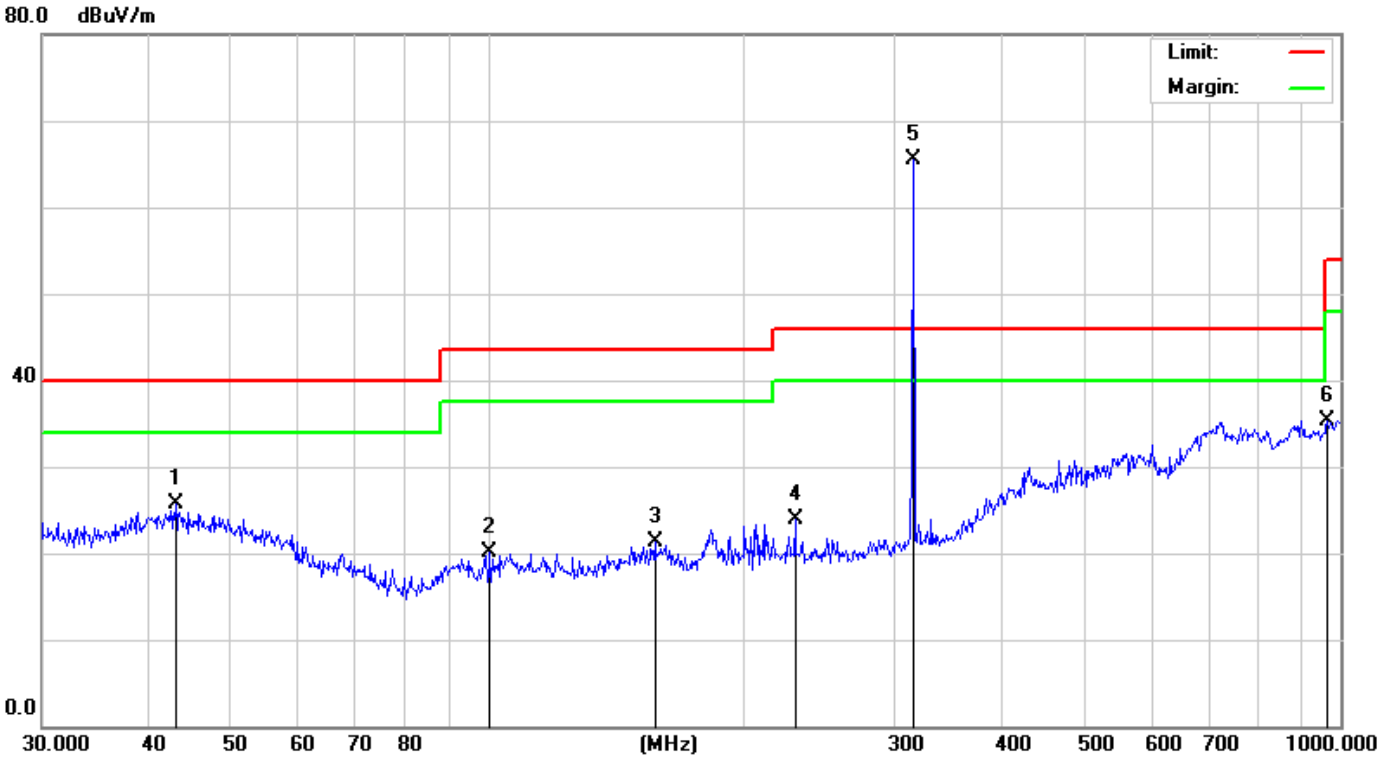
Power :	DC 3.0V from battery	Pol/Phase :	VERTICAL
Test Mode 1 :	TX CH00	Temperature :	22 °C
Memo :		Humidity :	59 %



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		41.1319	27.61	-4.32	23.29	40.00	-16.71	QP
2		213.0150	28.63	-4.82	23.81	43.50	-19.69	QP
3	*	315.4808	55.36	-3.31	52.05	-	-	peak
4		434.0649	34.23	-1.12	33.11	46.00	-12.89	QP
5		566.6221	32.81	1.04	33.85	46.00	-12.15	QP
6		801.7862	28.52	6.82	35.34	46.00	-10.66	QP

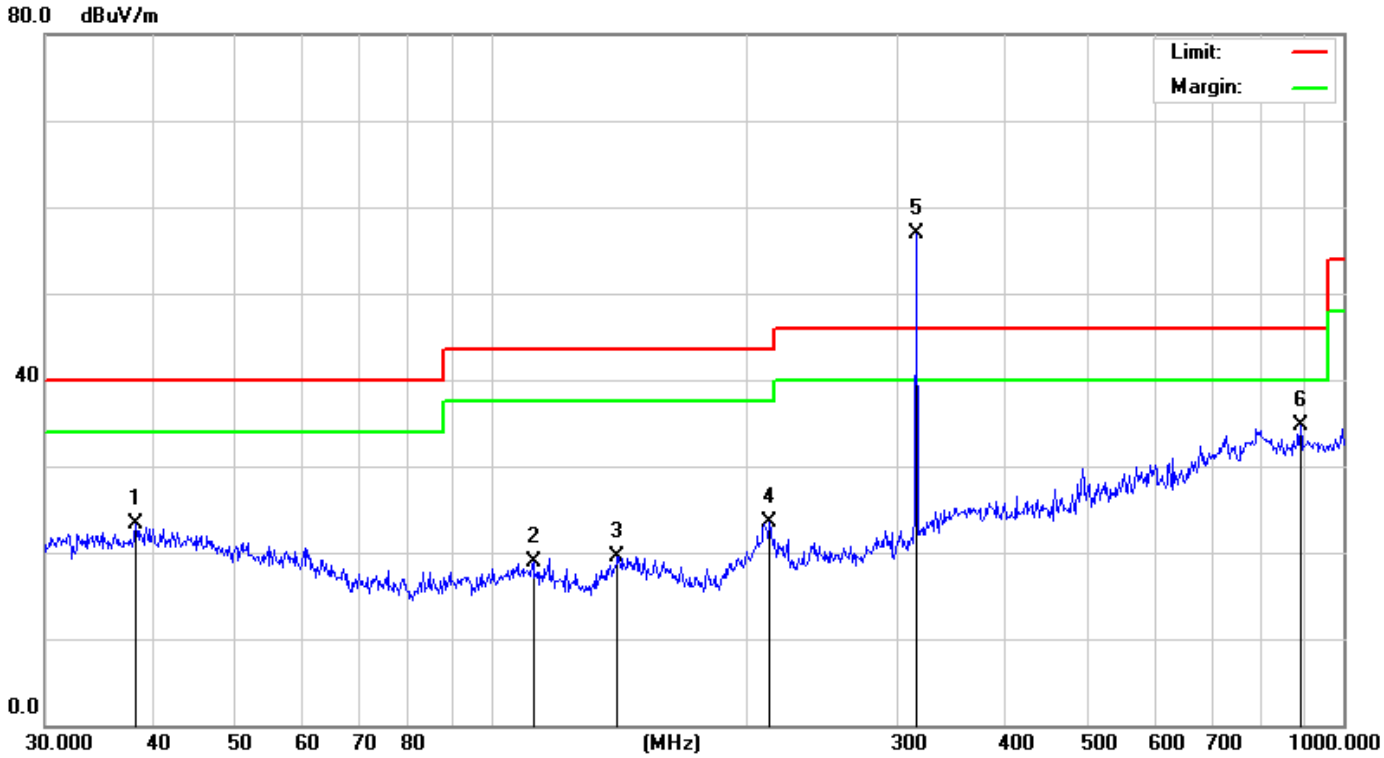
315MHz (FSK)

Power :	DC 3.0V from battery	Pol/Phase :	HORIZONTAL
Test Mode 1 :	TX CH00	Temperature :	22 °C
Memo :		Humidity :	59%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		43.0504	27.67	-2.05	25.62	40.00	-14.38	QP
2		100.5806	27.93	-7.83	20.10	43.50	-23.40	QP
3		157.0073	27.94	-6.70	21.24	43.50	-22.26	QP
4		229.2931	30.52	-6.70	23.82	46.00	-22.18	QP
5	*	315.4806	69.73	-4.18	65.55	-	-	peak
6		965.5421	28.12	7.22	35.34	54.00	-18.66	QP

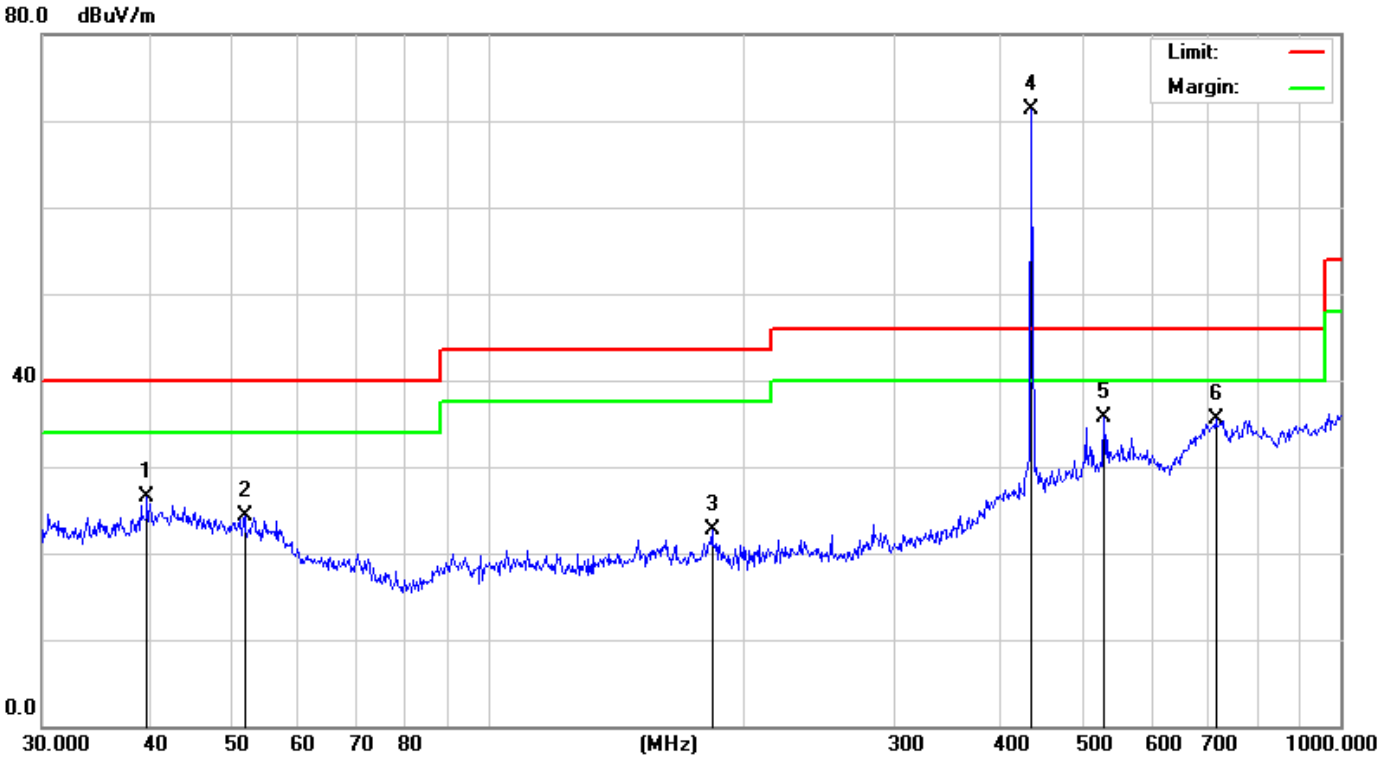
Power :	DC 3.0V from battery	Pol/Phase :	VERTICAL
Test Mode 1 :	TX CH00	Temperature :	22 °C
Memo :		Humidity :	59 %



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		38.3462	27.83	-4.43	23.40	40.00	-16.60	QP
2		112.1304	27.00	-8.03	18.97	43.50	-24.53	QP
3		140.8351	27.17	-7.60	19.57	43.50	-23.93	QP
4		212.2694	28.17	-4.60	23.57	43.50	-19.93	QP
5	*	315.4806	60.15	-3.31	56.84	-	-	peak
6		890.7278	29.62	5.18	34.80	46.00	-11.20	QP

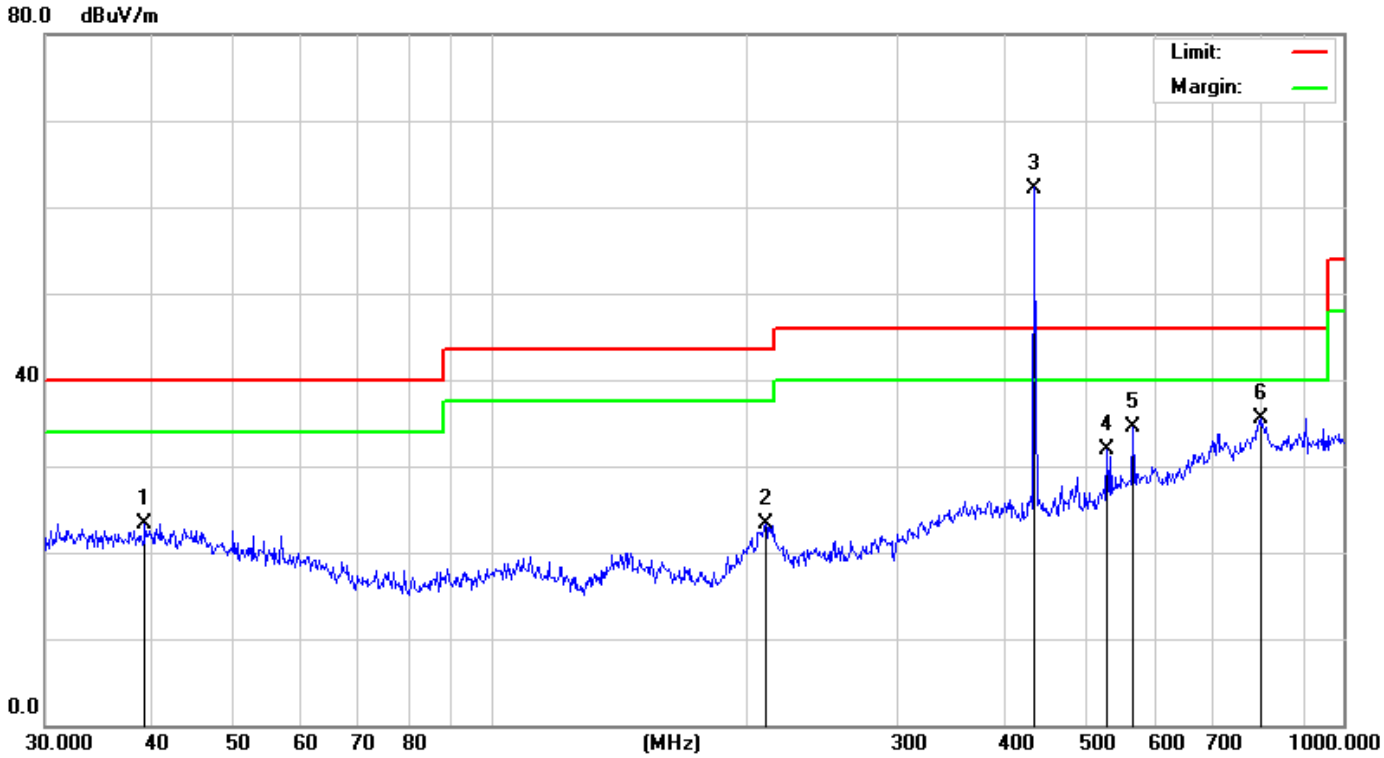
434MHz (ASK)

Power :	DC 3.0V from battery	Pol/Phase :	HORIZONTAL
Test Mode 1 :	TX CH01	Temperature :	22 °C
Memo :		Humidity :	59%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		39.8541	28.52	-2.02	26.50	40.00	-13.50	QP
2		51.8430	28.05	-3.70	24.35	40.00	-15.65	QP
3		183.2005	28.10	-5.39	22.71	43.50	-20.79	QP
4	*	434.0650	69.90	1.46	71.36	-	-	peak
5		528.2458	32.31	3.46	35.77	46.00	-10.23	QP
6		714.1734	29.01	6.43	35.44	46.00	-10.56	QP

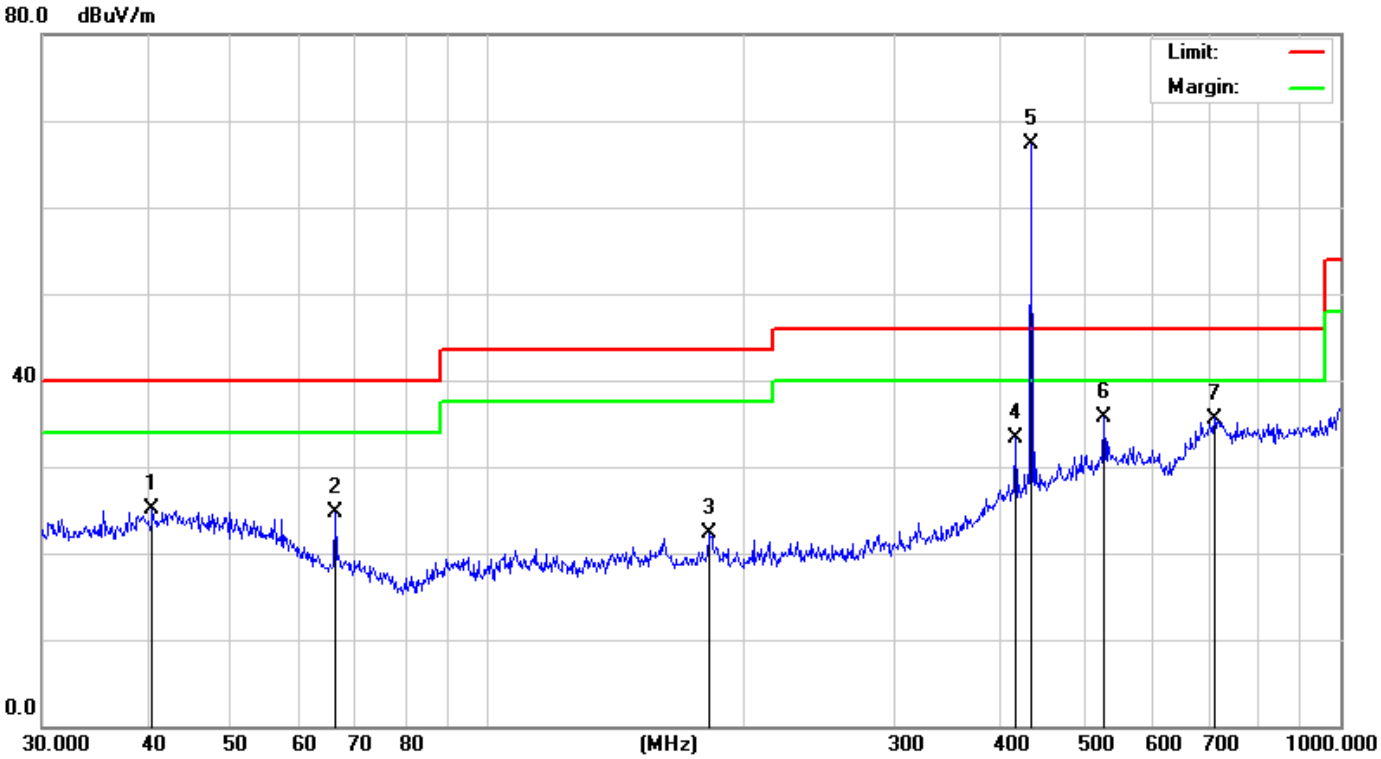
Power :	DC 3.0V from battery	Pol/Phase :	VERTICAL
Test Mode 1 :	TX CH01	Temperature :	22 °C
Memo :		Humidity :	59 %



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		39.2991	27.60	-4.33	23.27	40.00	-16.73	QP
2		210.0482	27.16	-3.93	23.23	43.50	-20.27	QP
3	*	434.0650	63.32	-1.12	62.20	-	-	peak
4		528.2458	32.00	-0.05	31.95	46.00	-14.05	QP
5		566.6221	33.46	1.04	34.50	46.00	-11.50	QP
6		798.9796	28.72	6.85	35.57	46.00	-10.43	QP

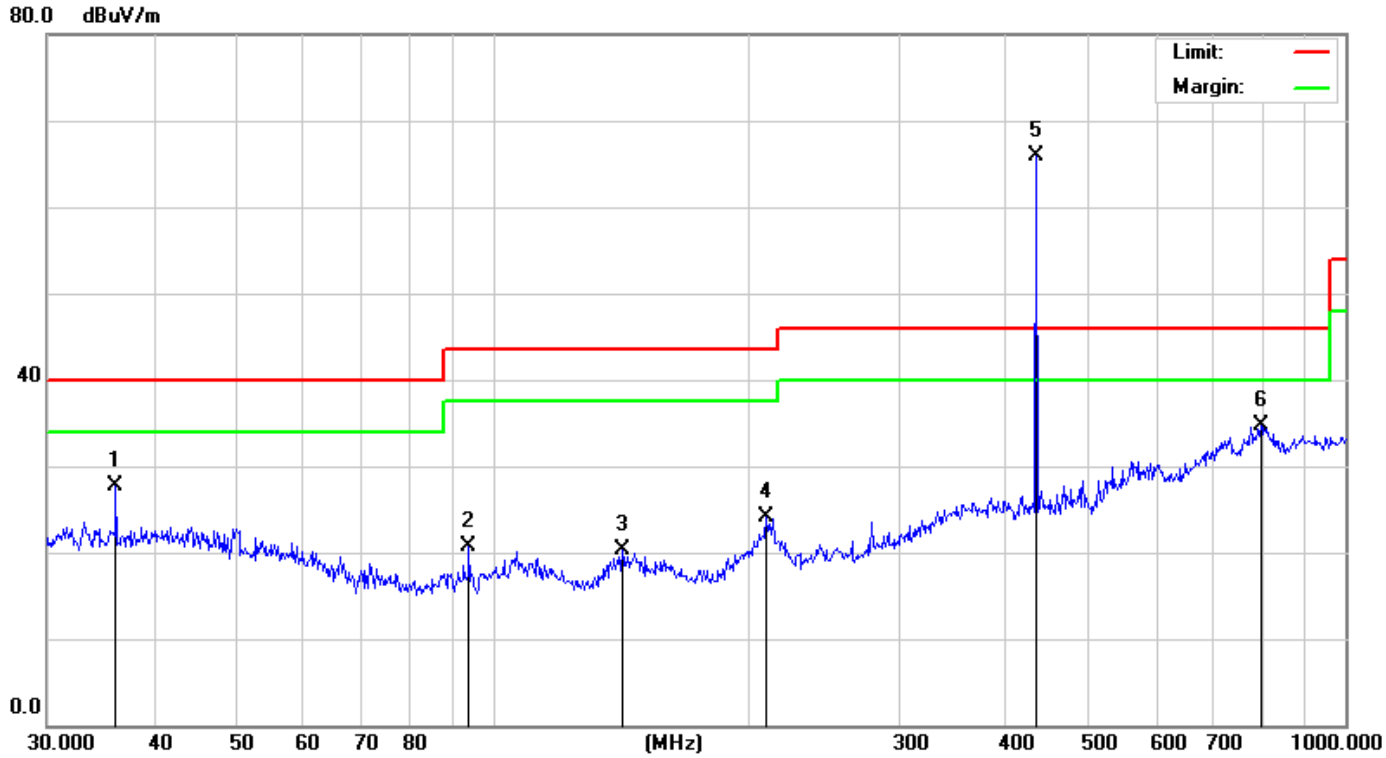
434MHz (FSK)

Power :	DC 3.0V from battery	Pol/Phase :	HORIZONTAL
Test Mode 1 :	TX CH01	Temperature :	22 °C
Memo :		Humidity :	59%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		40.4172	26.98	-1.95	25.03	40.00	-14.97	QP
2		66.2660	33.03	-8.42	24.61	40.00	-15.39	QP
3		181.9201	28.12	-5.76	22.36	43.50	-21.14	QP
4		416.1791	32.31	1.04	33.35	46.00	-12.65	QP
5	*	434.0650	65.89	1.46	67.35	-	-	peak
6		528.2458	32.31	3.46	35.77	46.00	-10.23	QP
7		711.6734	29.23	6.37	35.60	46.00	-10.40	QP

Power :	DC 3.0V from battery	Pol/Phase :	VERTICAL
Test Mode 1 :	TX CH01	Temperature :	22 °C
Memo :		Humidity :	59 %



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		36.1272	32.30	-4.66	27.64	40.00	-12.36	QP
2		93.7685	30.77	-10.01	20.76	43.50	-22.74	QP
3		141.8262	27.79	-7.53	20.26	43.50	-23.24	QP
4		209.3129	28.30	-4.14	24.16	43.50	-19.34	QP
5	*	434.0649	67.07	-1.12	65.95	-	-	peak
6		796.1829	27.93	6.84	34.77	46.00	-11.23	QP

All the modulation modes were tested, the data of the worst mode are recorded in the above pages and the others modulation methods do not exceed the limits.

Remark:

1). The field strength is calculated by adding the Antenna Factor. Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Measurement Level = Reading Level + Factor

Average Correct Factor= Ant Factor + Cable Loss+ Averaging factor

Factor=Ant Factor + Cable Loss

2). As shown in Section, for frequencies above 1000 MHz. the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

3). The test only perform the EUT in transmitting status since the test frequencies were over 1GHz only required transmitting status.

Test result: The unit does meet the requirements.

Remark:

1). The field strength is calculated by adding the Antenna Factor. Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Measurement Level = Reading Level + Factor

Average Correct Factor= Ant Factor + Cable Loss+ Averaging factor

Factor=Ant Factor + Cable Loss

2). As shown in Section, for frequencies above 1000 MHz. the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

3). The test only perform the EUT in transmitting status since the test frequencies were over 1GHz only required transmitting status.

Test result: The unit does meet the requirements.

7.4 Occupied Bandwidth & Band Edge

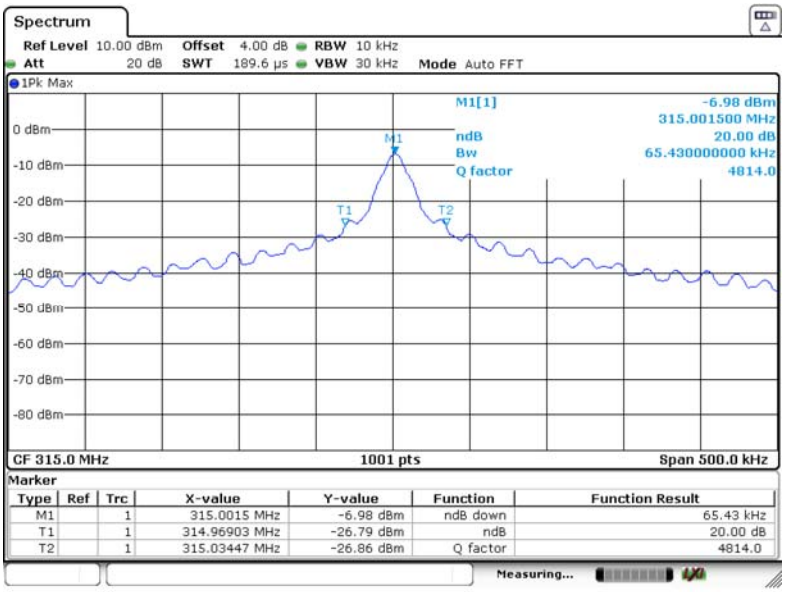
Test Requirement:	Section 15.231(c)& RSS-Gen clause 6.7 & RSS-210 A.1.3
	For the purpose of Section A1.1, the 20dB bandwidth shall be no wider than 0.25% of the centre frequency for devices operating between 70 MHz and 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the centre frequency. Bandwidth (20dB) Limit = 0.25% * f(MHz) = 0.25% * 315MHz = 787.5 kHz Bandwidth (20dB) Limit = 0.25% * f(MHz) = 0.25% * 434MHz = 1085kHz
Test Method:	Section 15.231(c) RSS-Gen clause 6.7 & ANSI C63.10: Clause 6.9, RSS-210 A.1.3 & ANSI C63.10: Clause 6.4, 6.5, 6.6
	Operation within the band 315MHz, 434 MHz
Method of measurement:	A small sample of the transmitter output was fed into the Spectrum Analyzer and the attached plot was taken.

315MHz(ASK)

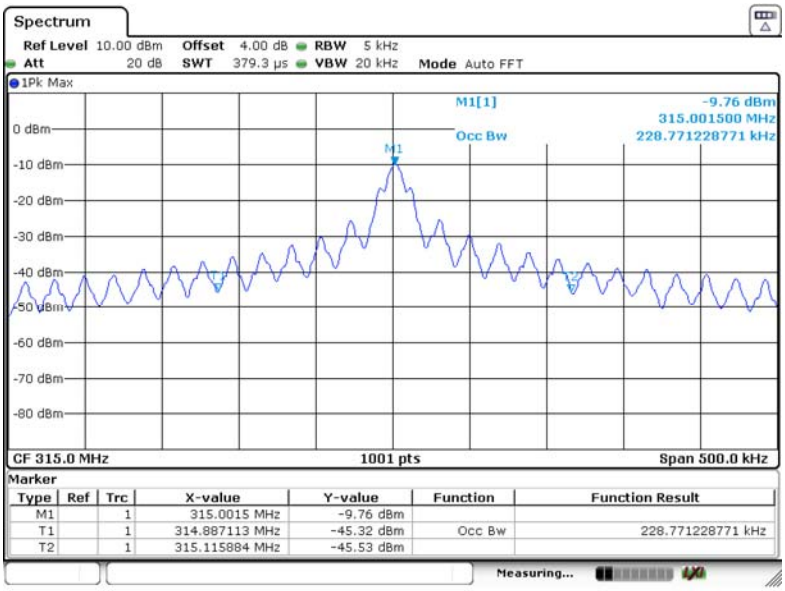
EUT：	MX-Sensor	Model Name ：	1 SENSOR E
Temperature：	26 ℃	Relative Humidity：	60%
Pressure：	1010 hPa	Test Power ：	DC 3.0V
Test Mode ：	TX (Normal mode)		

Test Mode	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
TX	315MHz	65.43	228.77

20dB bandwidth



99% bandwidth

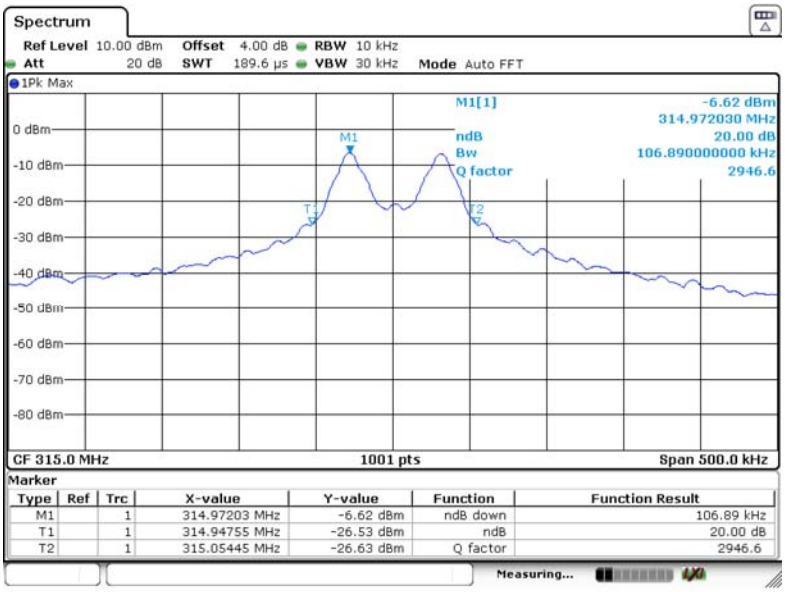


315MHz(FSK)

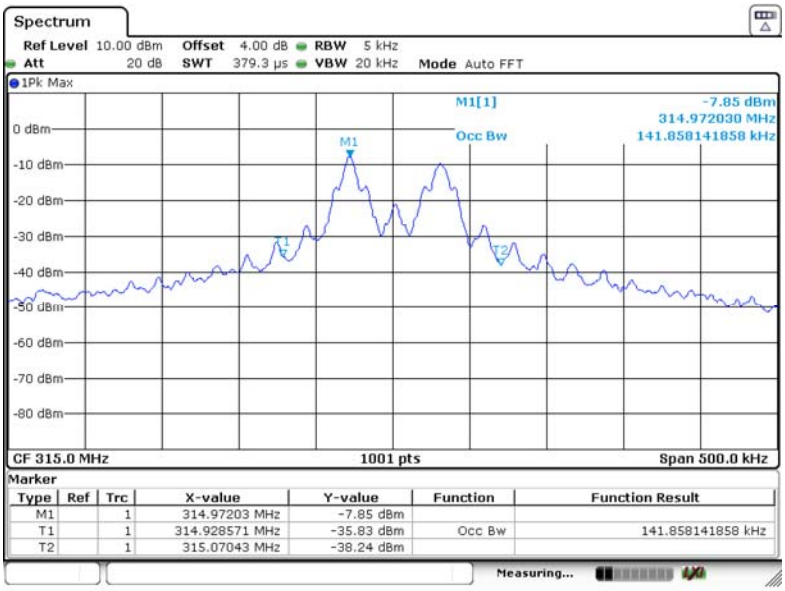
EUT：	MX-Sensor	Model Name ：	1 SENSOR E
Temperature：	26 ℃	Relative Humidity：	60%
Pressure：	1010 hPa	Test Power ：	DC 3.0V
Test Mode ：	TX (Normal mode)		

Test Mode	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
TX	315MHz	106.89	141.86

20dB bandwidth



99% bandwidth

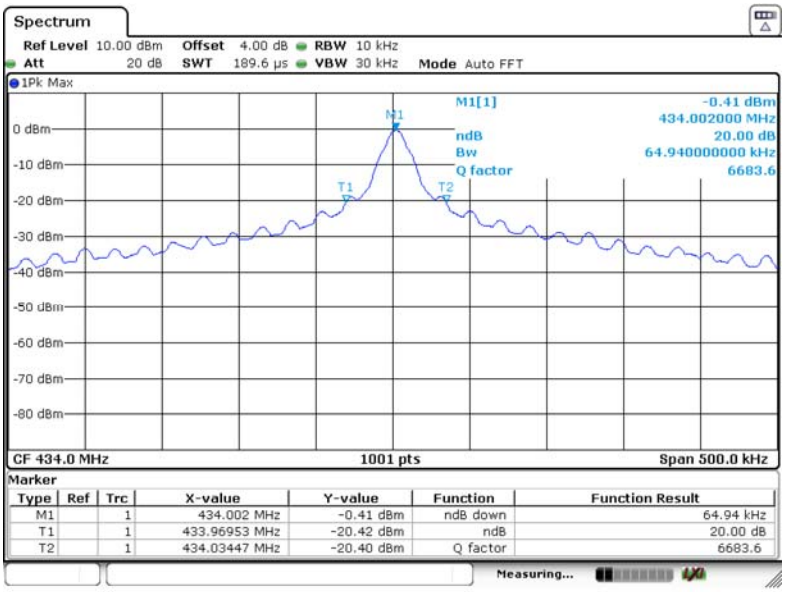


434MHz(ASK)

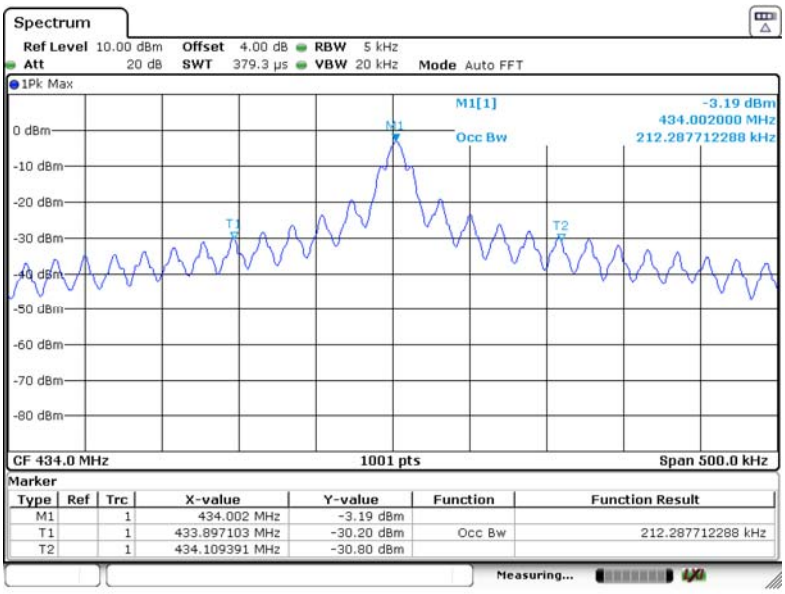
EUT：	MX-Sensor	Model Name ：	1 SENSOR E
Temperature：	26 ℃	Relative Humidity：	60%
Pressure：	1010 hPa	Test Power ：	DC 3.0V
Test Mode ：	TX (Normal mode)		

Test Mode	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
TX	434	64.94	212.29

20dB bandwidth



99% bandwidth

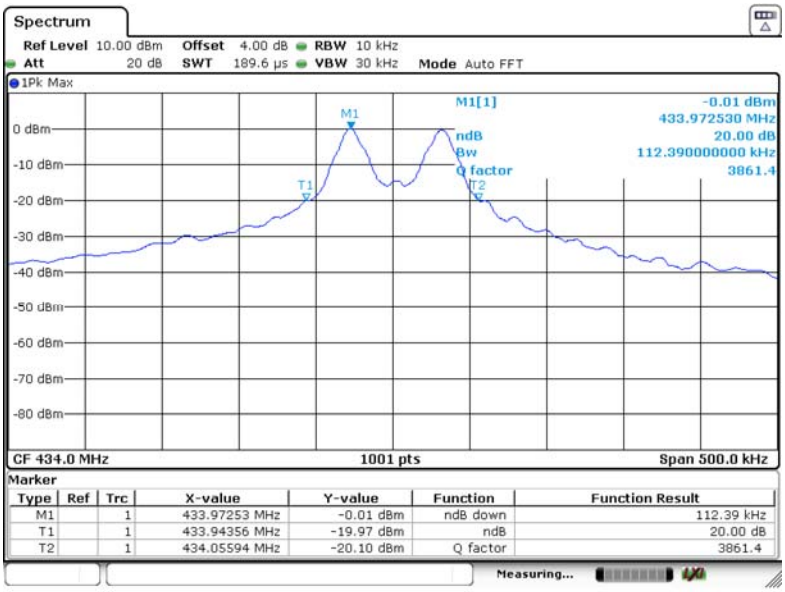


434MHz(FSK)

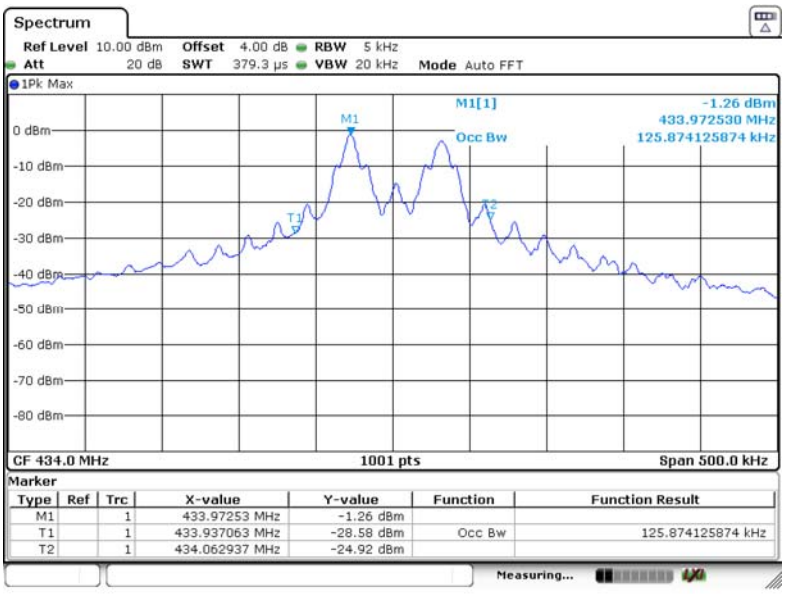
EUT：	MX-Sensor	Model Name ：	1 SENSOR E
Temperature：	26 ℃	Relative Humidity：	60%
Pressure：	1010 hPa	Test Power ：	DC 3.0V
Test Mode ：	TX (Normal mode)		

Test Mode	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
TX	434	112.39	125.87

20dB bandwidth



99% bandwidth



7.5 Conducted Emissions at Mains Terminals 150 kHz to 30 MHz

Test Requirement: Section 15.207(a)&RSS-Gen 8.8

TEST METHOD: Section 15.207(a)&RSS-Gen clause 8.8 & ANSI C63.10: Clause 6.2

Frequency Range: 150 kHz to 30 MHz

Detector: for pre-scan (9 kHz Resolution Bandwidth)

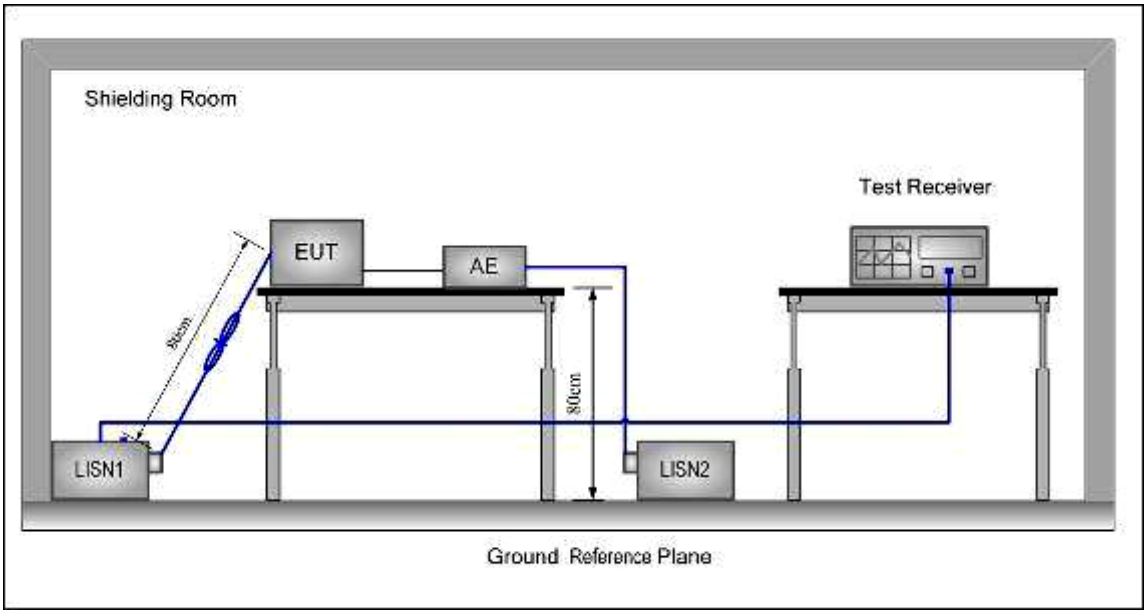
Test Limit

Limits for conducted disturbance at the mains ports of class B

Frequency Range (MHz)	**Class B Limit dB(μV)**	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
NOTE 1 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.		

EUT Operation: Test in normal operating mode. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

Test Configuration:



Test procedure:

1. The mains terminal disturbance voltage test was conducted in a shielded room.

2. The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.

4. The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.

7.5.1 Test Result

N/A

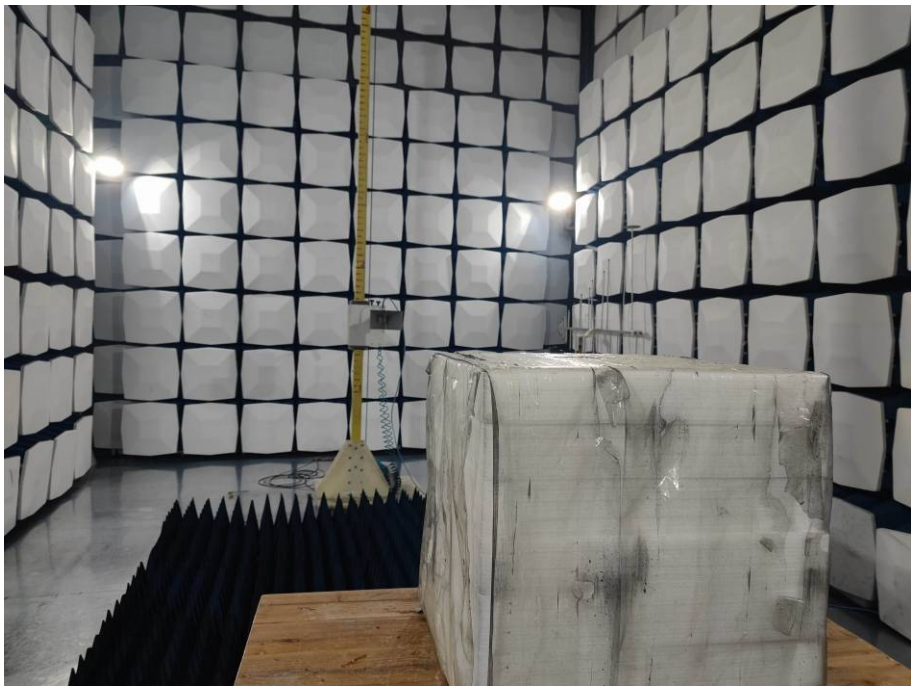
The EUT is powered by DC power.

8 Photographs

8.1 Radiated Emission Test Setup

Below 1G

Above 1G



End of Report