



# RF TEST REPORT

**Applicant** Shanghai Suisheng Information Technology Co., LTD

**FCC ID** 2AWSH-M700

**Product** MTPMS

**Brand** Michelin®

**Model** MST700

**Report No.** R2006A0358-R1

**Issue Date** August 17, 2020

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 15C (2019)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Performed by: Peng Tao

Approved by: Kai Xu

**TA Technology (Shanghai) Co., Ltd.**

No.145, Jintang Rd, Tianshen Industry Park, Pudong, Shanghai, China

TEL: +86-021-50791141/2/3

FAX: +86-021-50791141/2/3-8010





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## Summary of measurement results

Number	Test Case	Clause in FCC rules	Verdict
1	Deactivation Time Measurement	15.231(a)	PASS
2	Radiated Emissions	15.231(b),15.209 § 15.240 Operation in the band 433.5-434.5MHz.	PASS
3	Occupied bandwidth	15.231(c)	PASS
Date of Testing: June 23, 2020 ~ July 16, 2020			
Note: All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.			



## 1. Test Laboratory

### 1.1. Notes of the test report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

### 1.2. Test facility

#### **FCC (Designation number: CN1179, Test Firm Registration Number: 446626)**

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

#### **A2LA (Certificate Number: 3857.01)**

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

### 1.3. Testing Location

Company: TA Technology (Shanghai) Co., Ltd.  
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong  
City: Shanghai  
Post code: 201201  
Country: P. R. China  
Contact: Xu Kai  
Telephone: +86-021-50791141/2/3  
Fax: +86-021-50791141/2/3-8000  
Website: <http://www.ta-shanghai.com>  
E-mail: [xukai@ta-shanghai.com](mailto:xukai@ta-shanghai.com)



## 2. General Description of Equipment under Test

### 2.1. Applicant and Manufacturer Information

Applicant	Shanghai Suisheng Information Technology Co., LTD
Applicant address	Room 1003 1F,Block 7,518 Fuquan Bei Road, Shanghai China
Manufacturer	Shanghai Suisheng Information Technology Co., LTD
Manufacturer address	Room 1003 1F,Block 7,518 Fuquan Bei Road, Shanghai China

### 2.2. General information

EUT Description	
Model	MST700
SN	1#
Hardware Version	v3.4
Software Version	v0.6.0
Power Supply	Battery
Antenna Type	Internal Antenna
Antenna Connector	A permanently attached antenna (meet with the standard FCC Part 15.203 requirement)
Antenna Gain	0.79dBi
Modulation Type	/
Operating Frequency Range(s)	433.175MHz ~434.575MHz

Note: The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant.



### 3. Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**Test standards:**

**FCC CFR47 Part 15C (2019) Radio Frequency Devices**

**ANSI C63.10 (2013)**



## 4. Test Configuration

### Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

## 5. Test Case Results

### 5.1. Deactivation Time Measurement

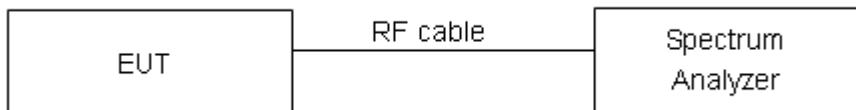
#### Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

#### Methods of Measurement

- a. The EUT was placed on the turning table.
- b. The signal was coupled to the spectrum analyzer through an cable.
- c. Set the resolution bandwidth to 1MHz and video bandwidth to 3MHz. The spectrum analyser was turned to the centre frequency of the transmitter's and the analyser's marker function was used to determine the duration of transmission.
- d. The transmission duration was measured and recorded.

#### Test Setup



#### Limits

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

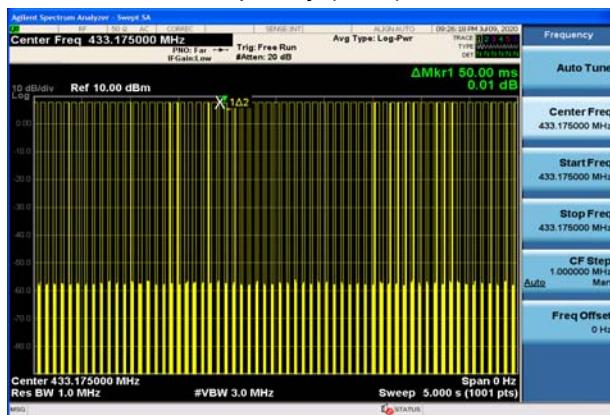
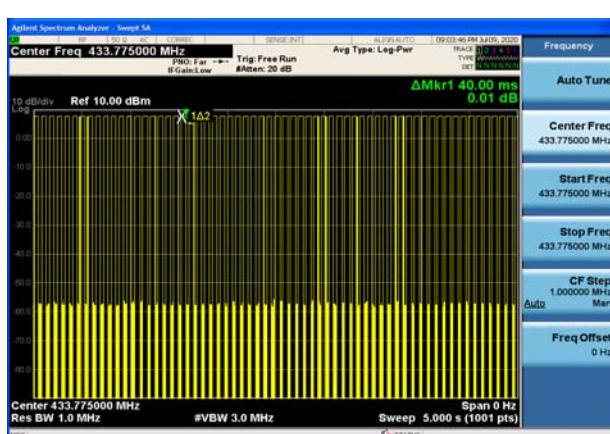
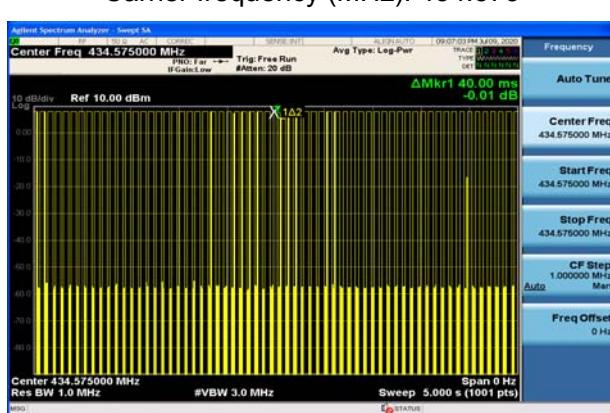
#### Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 2$ .

**Test Results**

Frequency (MHz)	Acvitation Time (S)	Limit (S)	Conclusion
433.175	3.15	5	Pass
433.775	2.52	5	Pass
434.575	2.52	5	Pass

Note: Acvitation Time (S) = Ton\*PLUSE

**Carrier frequency (MHz): 433.175****Carrier frequency (MHz): 433.775****Carrier frequency (MHz): 434.575**

## 5.2. Radiates Emission

### Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	102.5kPa

### Method of Measurement

The test set-up was made in accordance to the general provisions of ANSI C63.10-2013. The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The radiated emissions measurements were made in a typical installation configuration.

During the test, below 30MHz, the center of the loop shall be 1 meters; above 30MHz, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.

Set the spectrum analyzer in the following:

For Peak value:

RBW=100 kHz for  $f < 1\text{GHz}$ , 1MHz for  $f \geq 1\text{GHz}$

VBW $\geq$ RBW

Sweep=auto

Detector function=Peak

Trance=max hold

For AV value:

For harmonic emission:

Average = Peak value + 20log(Duty cycle),

For other unwanted emissions:

RBW=100 kHz for  $f < 1\text{GHz}$ , 1MHz for  $f \geq 1\text{GHz}$

Sweep=auto

VBW=10Hz

Detector function=Peak

Trance=max hold

The receiver was scanned from the lowest frequency generated within the EUT TO 5GHz. 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 was recorded.

An initial pre-scan was performed



The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

An initial pre-scan was performed in the 3m 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 calculated is as follows:

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

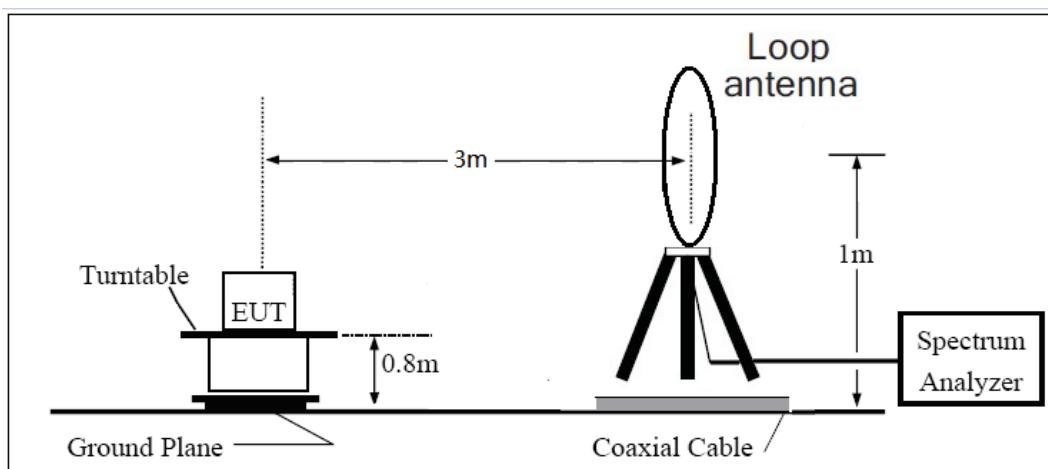
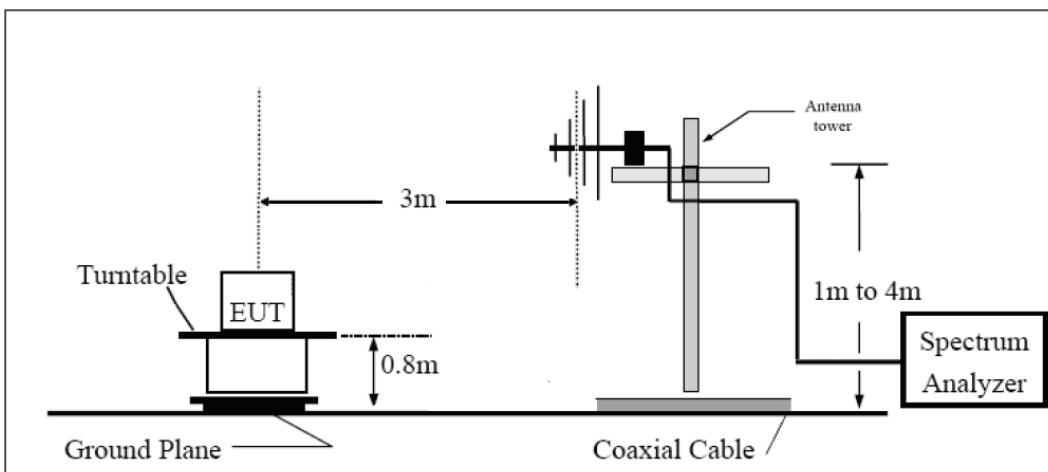
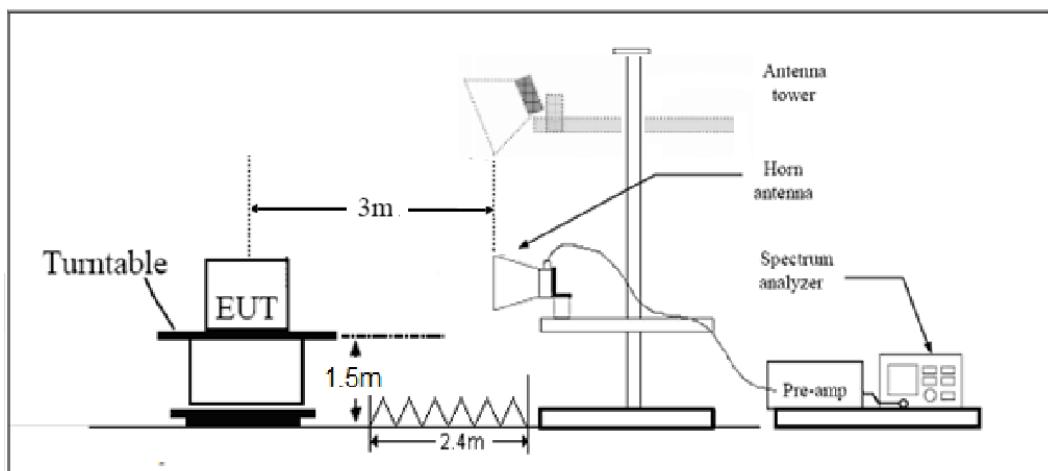
The following test results were performed on the EUT.

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

15.35(a) 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 instrumentation using the CISPR quasi-peak detector can be found in ANSI C63.4-2014, clause 4 (incorporated by reference, see §15.38). 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 as long as the same bandwidth as indicated for CISPR quasi-peak measurements are employed.

15.35(b) 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, e.g., see §§15.250, 15.252, 15.253(d), 15.255, 15.256, and 15.509 through 15.519, 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 test is in transmitting mode.

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).

**Test setup****9KHz ~ 30MHz****30MHz ~ 1GHz****1GHz ~ 18GHz**

Note: Area side:2.4mX3.6m

**Limits**

The limit for peak field strength dBuV/m for the fundamental emission=94.8dBuV/m

No fundamental is allowed in the restricted bands.

The limit for average field strength dBuV/m for the spurious emission=80.8dBuV/m. The field strength of emissions radiated on any frequency outside of the specified band shall not exceed the general radiated emission limits in §15.209

**§15.35(b)**

There is also 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.

**Measurement Uncertainty**

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 1.96$ .

Frequency	Uncertainty
9KHz-30MHz	3.55 dB
30MHz-200MHz	4.02 dB
200MHz-1GHz	3.28 dB
Above 1GHz	3.70 dB

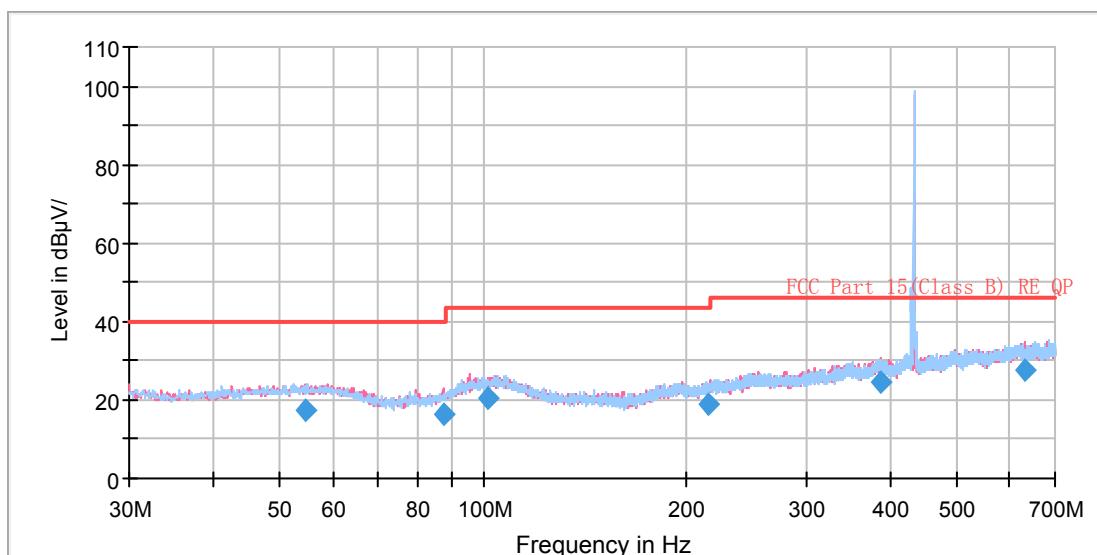
## Test Results

### Unwanted Emissions:

Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions more than 20 dB below the limit are not reported.

The following graphs display the maximum values of horizontal and vertical by software.

**433.175MHz**



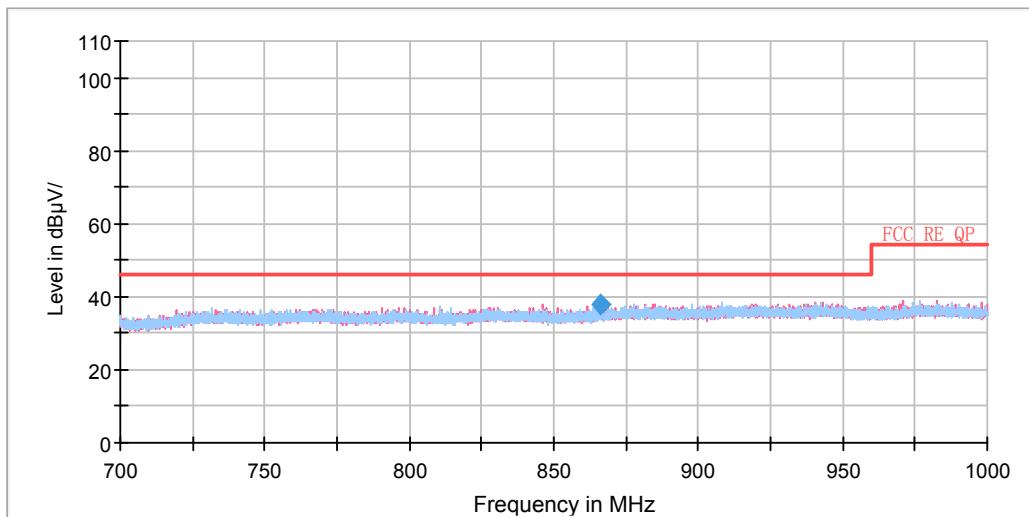
Note: The signal beyond the limit is carrier.

Radiates Emission from 30MHz to 700MHz

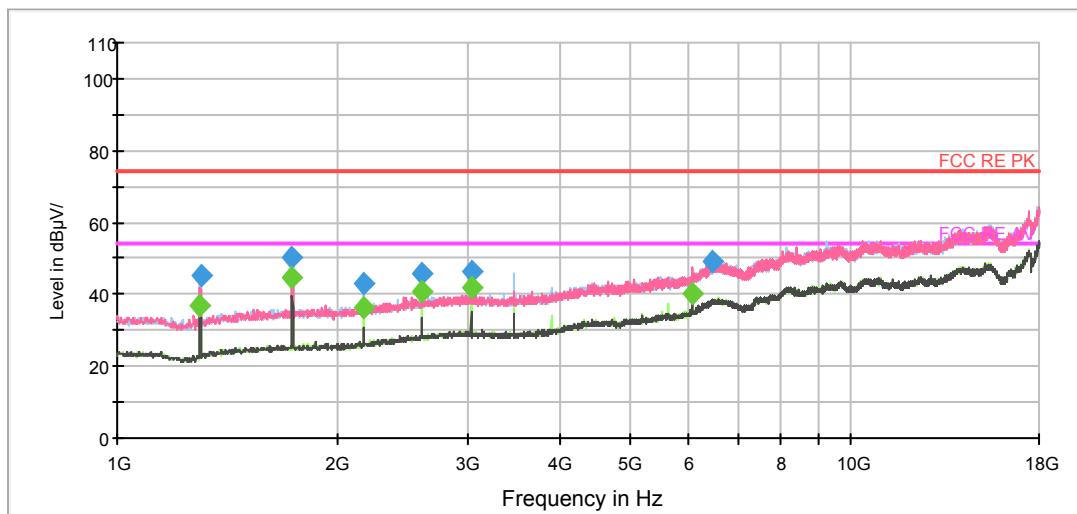
Frequency (MHz)	Quasi-Peak (dB $\mu$ V/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
54.841250	17.45	221.0	H	35.0	-5.4	22.55	40.00
87.721250	16.57	109.0	V	120.0	-7.4	23.43	40.00
101.701250	20.29	109.0	V	72.0	-4.6	23.21	43.50
214.730000	19.00	184.0	H	134.0	-6.1	24.50	43.50
385.665000	24.41	125.0	V	129.0	-0.5	21.59	46.00
631.347500	27.59	109.0	V	324.0	3.8	18.41	46.00

**Remark: 1. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)**

**2. Margin = Limit – Quasi-Peak**



Radiates Emission from 700MHz to 1GHz



Radiates Emission from 1GHz to 18GHz

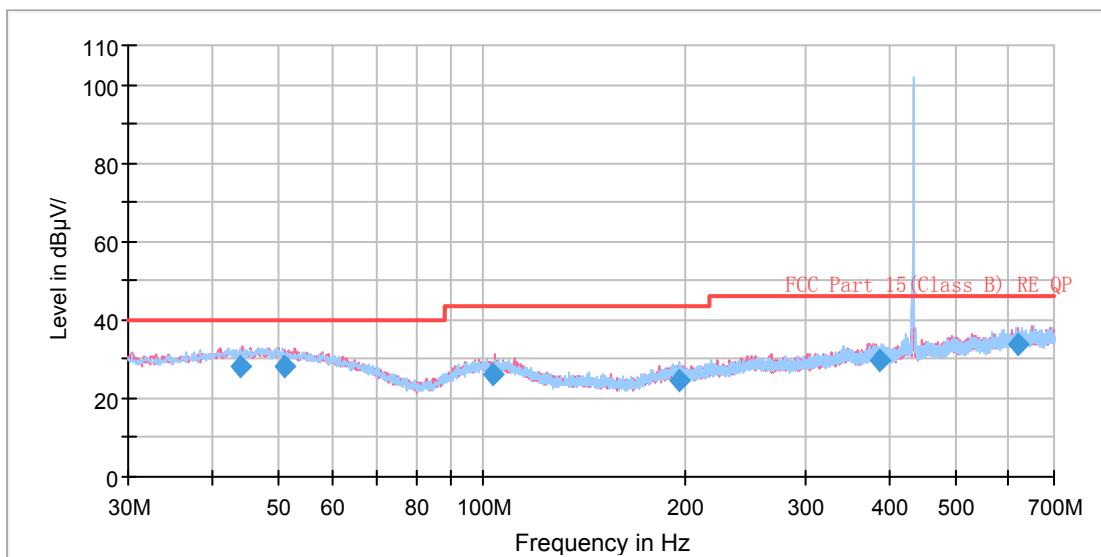


Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1299.625000	45.1	100.0	H	334.0	-11.0	28.9	74.0
1731.000000	50.2	100.0	H	0.0	-9.5	23.8	74.0
2164.500000	42.7	100.0	H	234.0	-8.0	31.3	74.0
2598.000000	46.0	100.0	H	215.0	-6.2	28.0	74.0
3031.500000	46.5	100.0	H	215.0	-5.2	27.5	74.0
6480.375000	49.0	200.0	V	334.0	4.7	25.0	74.0

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1297.500000	36.8	100.0	H	323.0	-11.0	17.2	54.0
1731.000000	44.9	100.0	H	0.0	-9.5	9.1	54.0
2164.500000	36.3	100.0	H	234.0	-8.0	17.7	54.0
2598.000000	40.5	100.0	H	215.0	-6.2	13.5	54.0
3031.500000	41.7	100.0	H	215.0	-5.2	12.3	54.0
6063.875000	40.2	100.0	H	194.0	2.4	13.8	54.0

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)



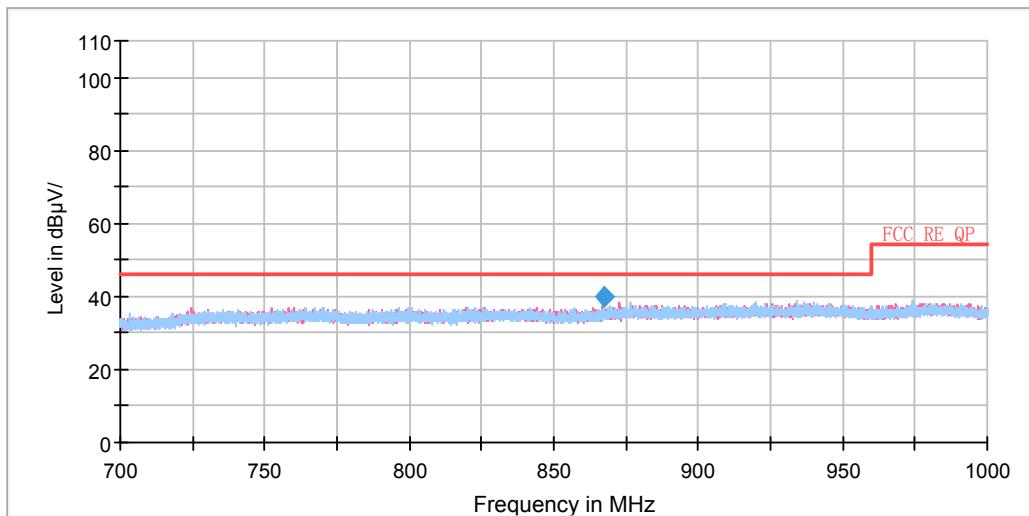
Note: The signal beyond the limit is carrier.

Radiates Emission from 30MHz to 700MHz

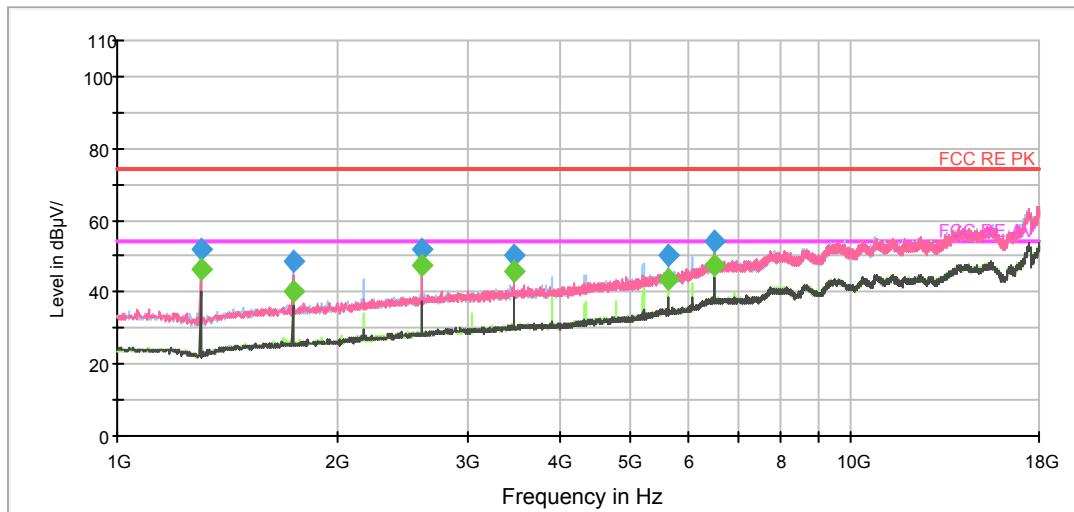
Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
44.033750	28.32	109.0	V	44.0	4.1	11.68	40.00
50.933750	28.20	210.0	H	188.0	3.4	11.80	40.00
103.977500	25.95	175.0	V	300.0	-0.5	17.55	43.50
195.231250	24.55	184.0	H	16.0	-1.2	18.95	43.50
387.850000	29.73	100.0	H	0.0	2.9	16.27	46.00
619.782500	33.57	212.0	V	317.0	6.8	12.43	46.00

Remark: 1. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

2. Margin = Limit – Quasi-Peak



Radiates Emission from 700MHz to 1GHz



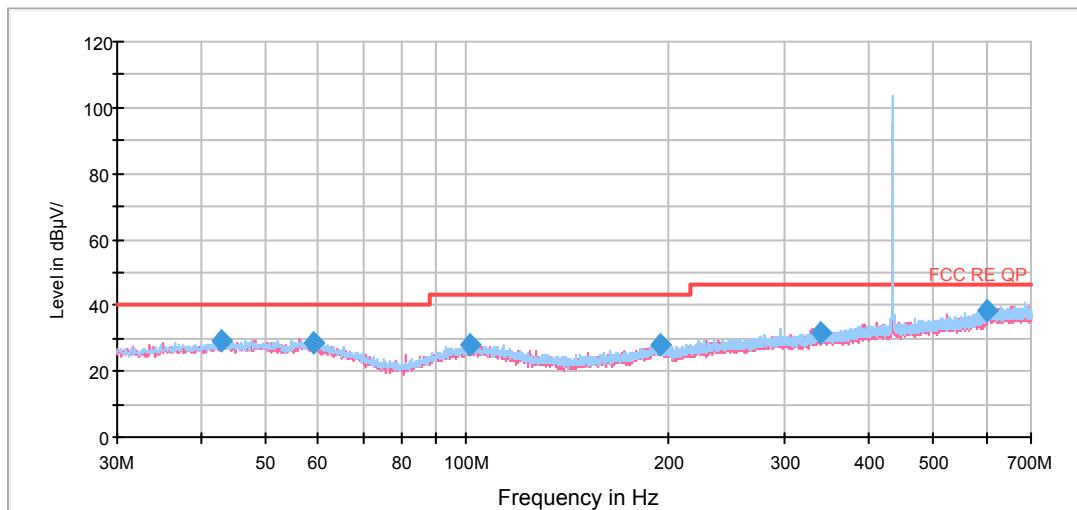
Radiates Emission from 1GHz to 18GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1299.625000	51.8	200.0	H	202.0	-11.0	22.2	74.0
1735.250000	48.5	100.0	H	224.0	-9.5	25.5	74.0
2602.250000	51.8	100.0	H	276.0	-6.2	22.2	74.0
3469.250000	50.4	100.0	H	322.0	-4.0	23.6	74.0
5638.875000	50.4	100.0	H	353.0	1.4	23.6	74.0
6505.875000	54.4	100.0	H	38.0	4.9	19.6	74.0

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1299.625000	46.1	200.0	H	202.0	-11.0	7.9	54.0
1733.125000	40.5	100.0	H	224.0	-9.5	13.5	54.0
2602.250000	47.3	100.0	H	276.0	-6.2	6.7	54.0
3469.250000	45.7	100.0	H	322.0	-4.0	8.3	54.0
5638.875000	43.8	100.0	H	353.0	1.4	10.2	54.0
6505.875000	47.4	100.0	H	38.0	4.9	6.6	54.0

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable



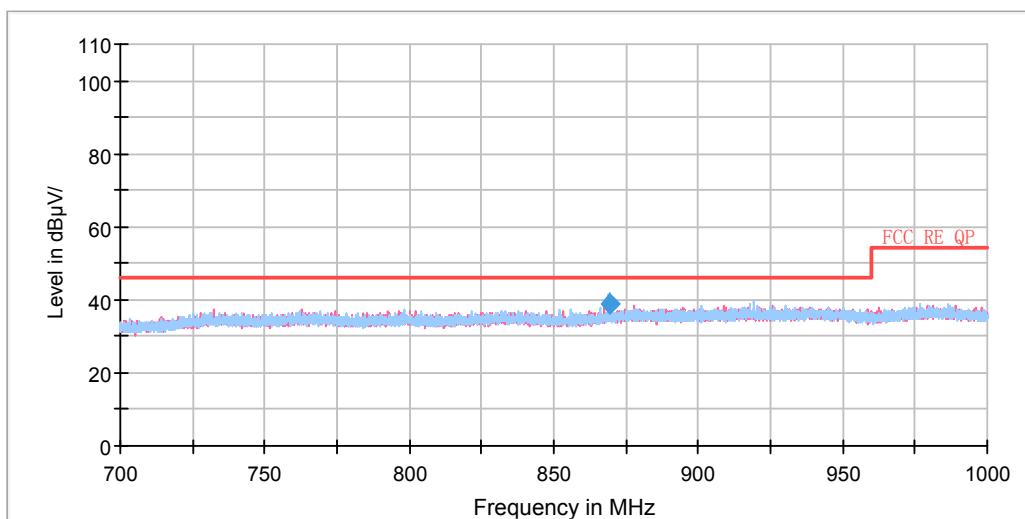
Note: The signal beyond the limit is carrier.

Radiates Emission from 30MHz to 700MHz

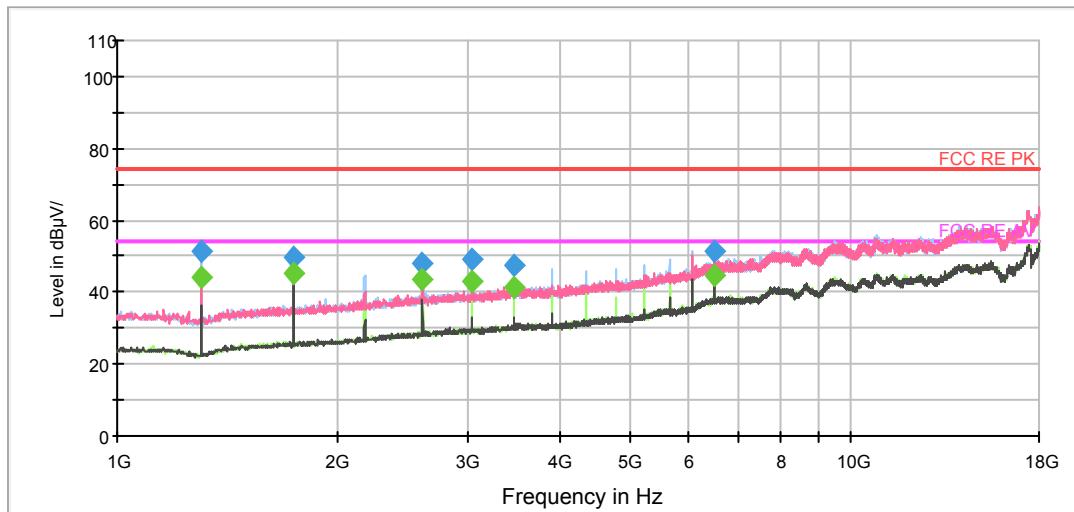
Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
42.981250	29.4	200.0	V	160.0	14.6	10.6	40.0
59.061250	28.9	175.0	V	264.0	14.6	11.1	40.0
100.936250	28.3	225.0	H	258.0	13.6	15.2	43.5
195.155000	28.0	225.0	H	22.0	13.3	15.0	43.5
337.948750	31.8	175.0	V	46.0	17.2	14.2	46.0
601.845000	38.4	175.0	V	179.0	22.5	7.6	46.0

Remark: 1. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

2. Margin = Limit – Quasi-Peak



Radiates Emission from 700MHz to 1GHz



Radiates Emission from 1GHz to 18GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1301.750000	51.2	100.0	H	220.0	-11.0	22.8	74.0
1737.375000	49.5	100.0	H	202.0	-9.5	24.5	74.0
2606.500000	48.0	100.0	H	340.0	-6.2	26.0	74.0
3042.125000	49.0	100.0	H	331.0	-5.2	25.0	74.0
3475.625000	47.6	100.0	H	352.0	-4.0	26.4	74.0
6518.625000	51.5	100.0	H	92.0	4.9	22.5	74.0

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1301.750000	43.8	100.0	H	220.0	-11.0	10.2	54.0
1737.375000	45.2	100.0	H	202.0	-9.5	8.8	54.0
2606.500000	43.6	100.0	H	340.0	-6.2	10.4	54.0
3042.125000	43.1	100.0	H	331.0	-5.2	10.9	54.0
3475.625000	41.5	100.0	H	352.0	-4.0	12.5	54.0
6518.625000	44.4	100.0	H	92.0	4.9	9.6	54.0

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable

### 5.3. Occupied Bandwidth

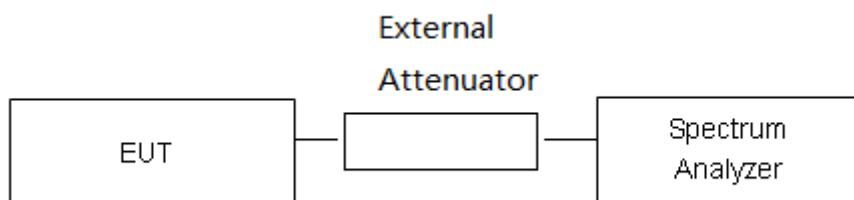
#### Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

#### Method of Measurement

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable. RBW is set to 10 kHz; VBW is set to 30 kHz on spectrum analyzer. Dector=Peak, Trace mode=max hold.

#### Test Setup



#### Limits

Rule Part 15.230 (c) specifies that “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.”

Limits	<1.0848MHz
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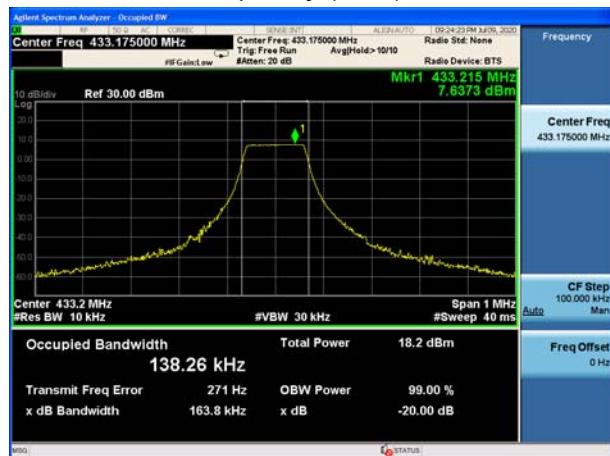
#### Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 2$ ,  $U = 936$  Hz.

**Test Results:**

Carrier frequency (MHz)	20dBm bandwidth (kHz)	99% bandwidth (kHz)	Limit (kHz)	Conclusion
433.175	163.8	138.26	1082.9375	PASS
433.775	162.4	137.62	1084.4375	PASS
434.575	163.3	137.39	1086.4375	PASS

## Carrier frequency (MHz): 433.175



## Carrier frequency (MHz): 433.775



## Carrier frequency (MHz): 434.575





## 6. Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Spectrum Analyzer	R&S	FSV30	100815	2019-12-15	2020-12-14
EMI Test Receiver	R&S	ESCI	100948	2020-05-18	2021-05-17
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2017-09-26	2020-09-25
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	9163-201	2017-11-18	2020-11-17
Horn Antenna	R&S	HF907	102723	2018-08-11	2021-08-10
Horn Antenna	ETS-Lindgren	3160-09	00102643	2018-06-20	2021-06-19
Spectrum Analyzer	Agilent	N9010A	MY47191109	2020-05-18	2021-05-17
RF Cable	Agilent	SMA 15cm	0001	2019-12-13	2020-12-13
Software	R&S	EMC32	9.26.0	/	/

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