Registration
No.788871

# TEST REPORT
# FOR SRD TESTING

Report No: SRTC2018-9004(F)-18082703(N)

Product Name: Passive Car Key

Product Model: HUF2725

Applicant: Huf Hülsbeck & Fürst GmbH & Co. KG

Manufacturer: Huf Hülsbeck & Fürst GmbH & Co. KG

Specification: FCC Part 15 Subpart C § 15.231

FCC ID: YGOHUF2725

The State Radio_monitoring_center Testing Center (SRTC)

15th Building, No.30, Shixing Street, Shijingshan District, Beijing, P.R.China

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# 1. GENERAL INFORMATION

## 1.1 Notes of the test report

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The test results relate only to individual items of the samples which have been tested.

## 1.2 Information about the testing laboratory

| | |
|---|---|
| Company: | The State Radio_monitoring_center Testing Center (SRTC) |
| Address: | 15th Building, No.30 Shixing Street, Shijingshan District |
| City: | Beijing |
| Country or Region: | P.R.China |
| Contacted person: | Liu Jia |
| Tel: | +86 10 57996183 |
| Fax: | +86 10 57996388 |
| Email: | liujiaf@srtc.org.cn |

## 1.3 Applicant's details

| | |
|---|---|
| Company: | Huf Hülsbeck & Fürst GmbH & Co. KG |
| Address: | Steeger Straße 17  42551 Velbert |
| City: | Velbert |
| Country or Region: | Germany |
| Contacted person: | Thomas Herzog |
| Tel: | +49 (0)2051 272-877 |
| Fax: | +49 (0)2051 272-700-877 |
| Email: | Thomas.Herzog@huf-group.com |

## 1.4 Manufacturer's details

| | |
|---|---|
| Company: | Huf Hülsbeck & Fürst GmbH & Co. KG |
| Address: | Steeger Straße 17  42551 Velbert |
| City: | Velbert |
| Country or Region: | Germany |
| Contacted person: | Thomas Herzog |
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| Fax: | +49 (0)2051 272-700-877 |
| Email: | Thomas.Herzog@huf-group.com |

## 1.5 Test environment

| | |
|---|---|
| Date of Receipt of test sample at SRTC: | 2018-08-27 |
| Testing Start Date: | 2018-08-28 |
| Testing End Date: | 2018-08-31 |

| Environmental Data: | Temperature (°C) | Humidity (%) |
|---|---|---|
| Ambient | 22-25 | 30-45 |

| | |
|---|---|
| Normal Supply Voltage (V d.c.): | 3.30 |

# 2. DETAILS OF EQUIPMENT UNDER TEST

## 2.1 Final equipment builds status

| | |
|---|---|
| Equipment Number | 1 |
| Operating Frequency | 433.92MHz (TX)<br>125KHz (receiver) |
| Antenna Type | PCB Printed loop Antenna<br>3D coil antenna(receiver) |
| Antenna Gain | -15dBi |
| Modulation Type | FSK(TX)<br>ASK(receiver) |
| Power Supply | Battery |
| Software Revision | 1.08 |
| Hardware Revision | 004 |
| SN | Sample1: 1# |

Note: This model contains two styles, one is 3 buttons and the other is 2 buttons. The PCB, antenna, chip and modulation are all the same except for the quantity of button.

## 2.2 Support equipment

The following support equipment was used to exercise the EUT during testing:

| | |
|---|---|
| Equipment | Battery / Button cell |
| Manufacturer | Panasonic |
| Model Number | CR 2032 |
| Serial Number | --- |

## 2.3 Test Mode Applicability and Tested Channel Detail

| EUT CONFIGURE MODE | APPLICABLE TO | | | | | DESCRIPTION |
|---|---|---|---|---|---|---|
| | RE ≥ 1G | RE<1G | PLC | EB | DT | - |
| - | √ | √ | - | √ | √ | Power by New Battery |

Where: RE ≥ 1G: Radiated Emission above 1GHz
RE < 1G: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission
EB: 20dB Bandwidth measurement

DT: Deactivation Time measurement

**Radiated Emission Test (Above 1GHz):**

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|---|---|---|
| 1 | 1 | FSK |

**Radiated Emission Test (Below 1GHz):**

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|---|---|---|
| 1 | 1 | FSK |

**Emission Band Width Measurement:**

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.

Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|---|---|---|
| 1 | 1 | FSK |

**Deactivation Time Measurement:**

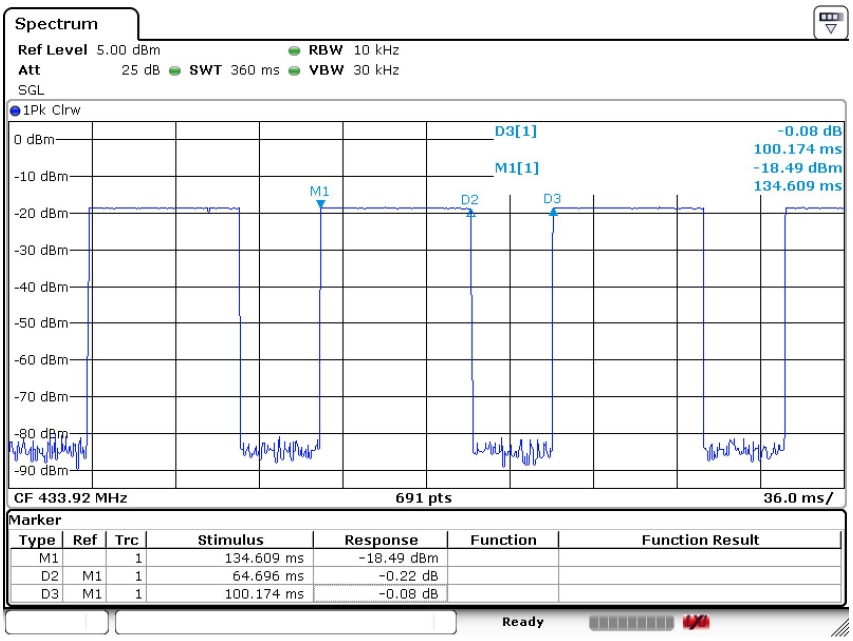
Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.

Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|---|---|---|
| 1 | 1 | FSK |

## 2.4 Duty Cycle of Test Signal

FSK:
Duty cycle of test signal is < 98 %, duty factor shall be considered.
Duty cycle = 64 ms/100 ms = 0.64 * 100 % = 64%
Factor = 20* log (duty cycle) =20 * log (0.64) = -3.87 dB



## 3. REFERENCE SPECIFICATION

| Specification | Version | Title |
|---|---|---|
| 15.203 | 2018 | Antenna Requirement |
| 15.231(a) | 2018 | Deactivation time measurement |
| 15.231(b) | 2018 | Field Strength Of Emissions |
| 15.231(c) | 2018 | Bandwidth Requirement |
| ANSI C63.10 | 2013 | Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices |

## 4. KEY TO NOTES AND RESULT CODES

| Code | Meaning |
|---|---|
| PASS | Test result shows that the requirements of the relevant specification have been met. |
| FAIL | Test result shows that the requirements of the relevant specification have not been met. |
| N/A | Test case is not applicable. |
| N/T | Test case is not tested. |

## 5. RESULT SUMMARY

The following tables reflect the requirements of the relevant specification and show the tests performed. Result files verifying these verdicts are available for inspection at SRTC.

| NO. | Item | Results |
|---|---|---|
| 1 | Antenna Requirement | PASS<br>(No antenna connector is used) |
| 2 | Deactivation time measurement | PASS |
| 3 | Field Strength of Emissions | PASS |
| 4 | Bandwidth Requirement | PASS |
| 5 | Antenna Requirement | PASS |

| | |
|---|---|
| This Test Report Is Issued by:<br>Mr. Peng Zhen | Checked by:<br>Mr. Li Bin |
| Tested by:<br>Mr. Chang Taosha | Issued date:<br>20180907 |

# 6. TEST RESULTS

## 6.1 Deactivation time measurement

### 6.1.1 Ambient condition

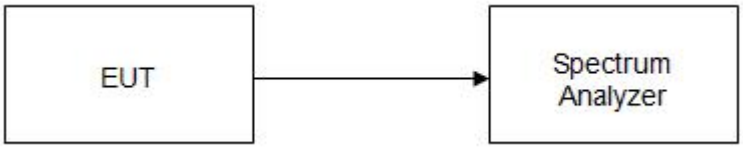
| Temperature | Relative humidity | Pressure |
|---|---|---|
| 23.0°C | 32.0% | 101.5kPa |

### 6.1.2 Test conditions and test configuration

(a) The provisions of this section are restricted to periodic operation within the band 40.66-40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

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

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.




### 6.1.3 Test limit

≤5s

### 6.1.4 Test data

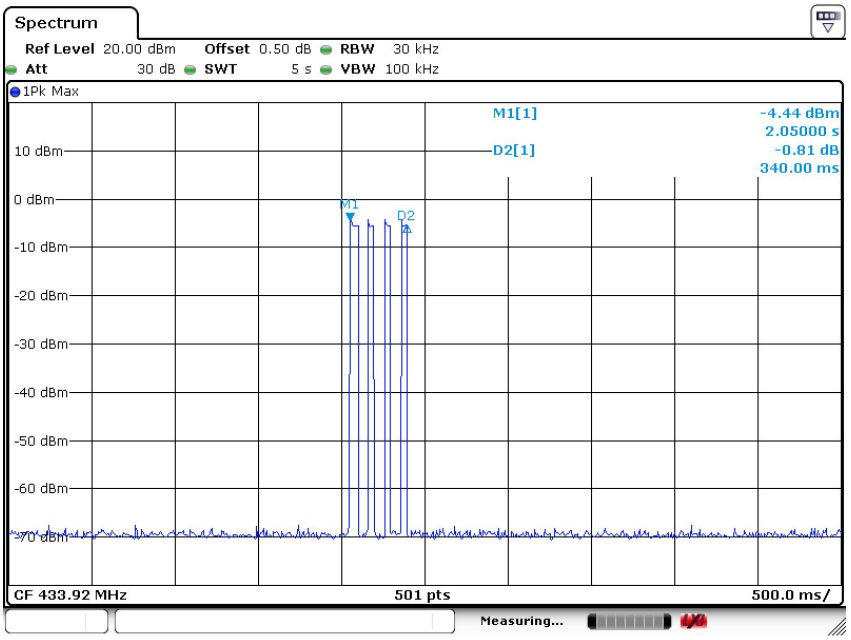
The EUT is a remote switch without audio or video transmitted.

The EUT meets the requirements of this section (a).

Deactivation time:

| Modulation Type | Frequency (MHz) | Transmission Time (Second) | Limit (Second) | Results |
|---|---|---|---|---|
| FSK | 433.92 | 0.34 | 5.0 | Pass |

FSK


Spectrum
Ref Level 20.00 dBm Offset 0.50 dB RBW 30 kHz
Att 30 dB SWT 5 s VBW 100 kHz
1Pk Max
M1[1] -4.44 dBm
2.05000 s
D2[1] -0.81 dB
340.00 ms
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
D2
CF 433.92 MHz
501 pts
500.0 ms/
Measuring...

## 6.2 Field Strength of Emissions

### 6.2.1 Ambient condition

| Temperature | Relative humidity | Pressure |
|---|---|---|
| 24.8°C | 42.4% | 100.9kPa |

### 6.2.2 Test conditions and test configuration

This is a radiated test. The spectrum was searched from 30MHz to the 10th harmonic (4.34GHz), up to 6GHz presented.
The EUT was evaluated in 3 Axis (X, Y, Z) being the “Z” Axis the worst test configuration and presented in this test report.
There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.
Only the considered worst case configuration presented for radiated emissions above 1GHz.
Measurement was done using EMC32 automated software. Reported level is the actual level with all the correction factors factored in.
The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter far distance for test. The table was rotated 360 degrees to determine the position of the highest radiation.

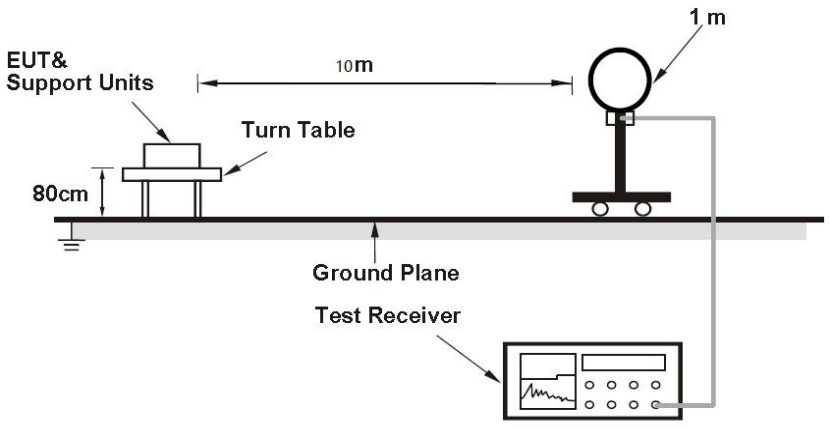
**For the radiated emission test below 30MHz:**
a. The EUT was set 10 meters away from the interference-receiving antenna, which was Loop antenna with 1m height above the metal ground.
b. For each suspected emission, the EUT was arranged to its worst case the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
c. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 30MHz.
The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 200Hz for frequency 9kHz-150kHz and 10kHz for the frequency 150KHz-30MHz with Quasi-peak detection (QP) at frequency below 30MHz.

**For the radiated emission test below 1GHz:**
a. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
b. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
c. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
d. The test-receiver system was set to quasi-peak detect function and specified bandwidth

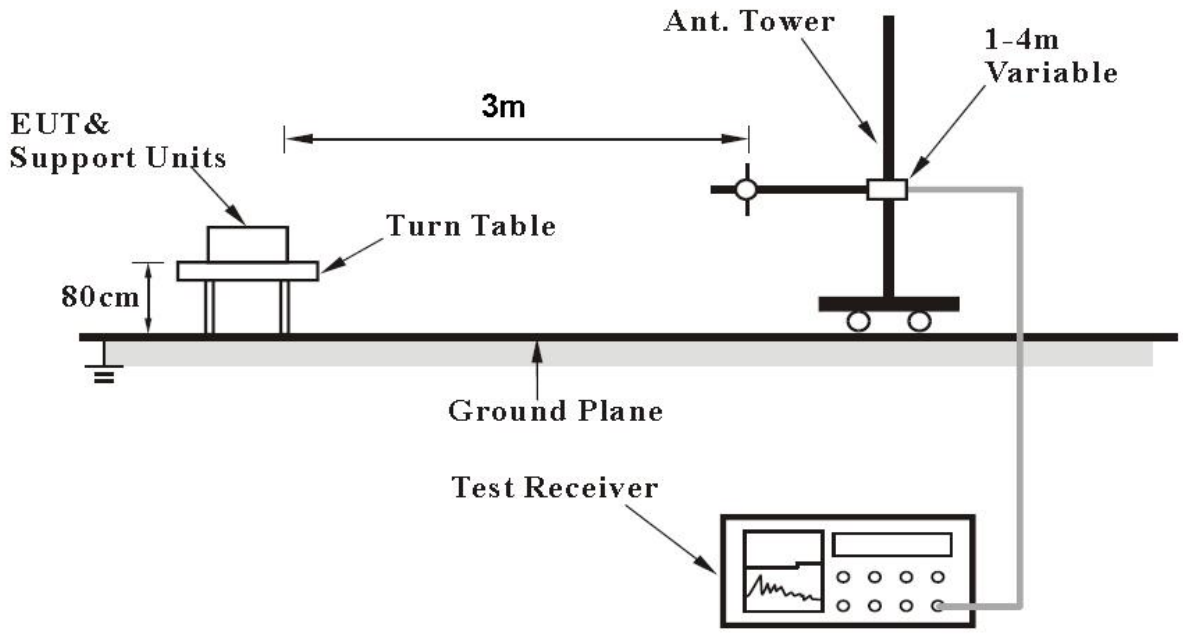
with maximum hold mode when the test frequency is below 1 GHz.
The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1GHz.

**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.
NOTE:
The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Average detection (AV) at frequency above 1GHz. If duty cycle of test signal is < 98%, the duty factor need added to measured value.
AVERAGE: Peak Level + Duty Factor
All modes of operation were investigated and the worst-case emissions are reported.
The test-receiver system was set to peak and average detection function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.
A “reference path loss” is established and the ARpl is the attenuation of “reference path loss”, and including the gain of receive antenna, the gain of the preamplifier, the cable loss.
The measurement results are obtained as described below: Result= Pmea + ARpl

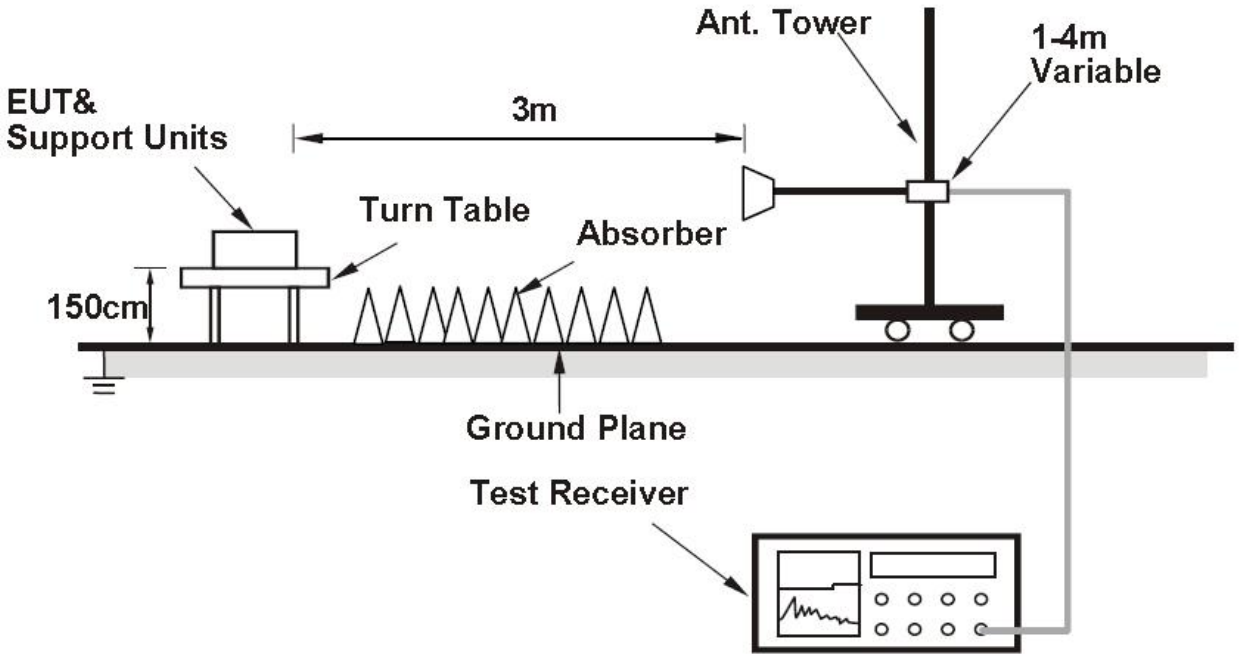
**For radiated emission test below 30MHz**



**For radiated emission test below 1GHz**




**For radiated emission test above 1GHz**



### 6.2.3 Test limit

(b) In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

For the fundamental emission and harmonic spurious emission

| Fundamental frequency (MHz) | Field strength of fundamental (microvolts/meter) | Field strength of spurious emissions (microvolts/meter) |
|---|---|---|
| 40.66-40.70 | 2,250 | 225 |
| 70-130 | 1,250 | 125 |
| 130-174 | [1]1,250 to 3,750 | [1]125 to 375 |
| 174-260 | 3,750 | 375 |
| 260-470 | [1]3,750 to 12,500 | [1]375 to 1,250 |
| Above 470 | 12,500 | 1,250 |

1Linear interpolations.

Others emission Limit:

| Frequency (MHz) | Field strength (microvolts/meter) | Measurement distance (meters) |
|---|---|---|
| 0.009～0.490 | 2400/F(kHz) | 300 |
| 0.490～1.705 | 24000/F(kHz) | 30 |
| 1.705～30 | 30 | 30 |
| 30～88 | 100 | 3 |
| 88～216 | 150 | 3 |
| 216～960 | 200 | 3 |
| Above 960 | 500 | 3 |

| Frequency of Emission(MHz) | Limits | |
|---|---|---|
| | Detector | Unit (dBμV/m) |
| 0.009～0.490 | Quasi-peak | 107.6-72.9 |
| 0.490～1.705 | Quasi-peak | 52.9-42 |
| 1.705～30 | Quasi-peak | 48.5 |

Note：The above field strength limits are specified at a distance of 10 meters.
RF Voltage (dBuV) = 20 log RF Voltage (uV)

| | | |
|---|---|---|
| 30～88 | Quasi-peak | 40 |
| 88～216 | Quasi-peak | 43.5 |
| 216～960 | Quasi-peak | 46 |
| 960～1000 | Quasi-peak | 54 |
| 1000～5th harmonic of the highest frequency or | Average | 54 |

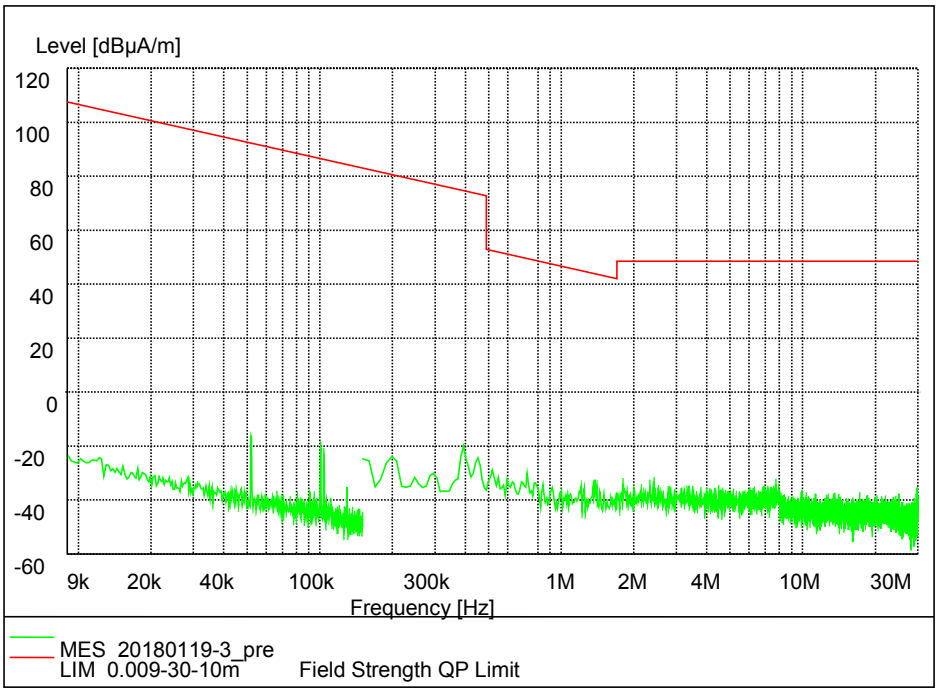
Note：The above field strength limits are specified at a distance of 3 meters.
RF Voltage (dBuV) = 20 log RF Voltage (uV)
Average (dBuV/m) = Peak (dBuV/m) – Duty Cycle Factor (dB)

### 6.2.4 Test data

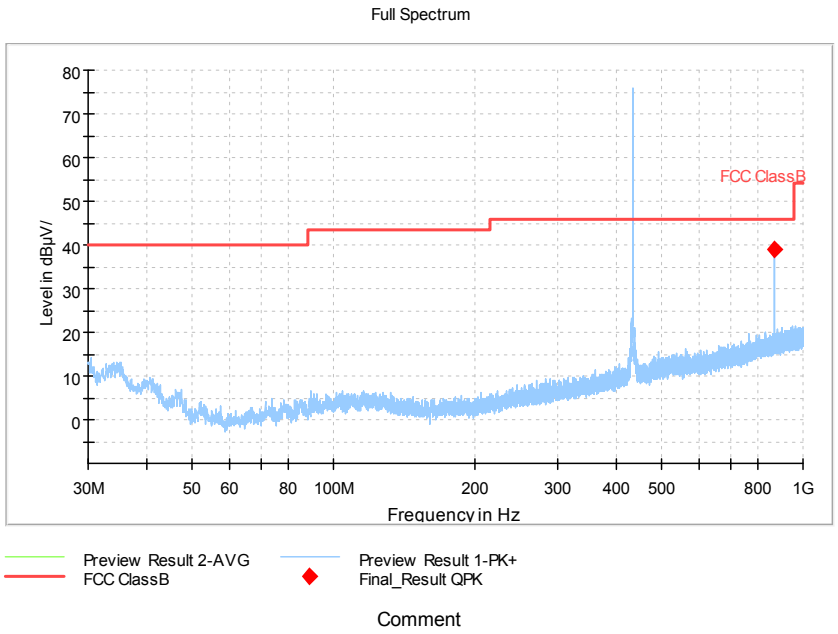
FSK

| Frequency(MHz) | Result(dBuV/m) | ARpl (dB) | Pmea (dBuV/m) | Polarity |
|---|---|---|---|---|
| 433.92 | 76.64 | -3.50 | 80.14 | Vertical |
| 867.89 | 39.14 | -6.10 | 45.24 | Vertical |

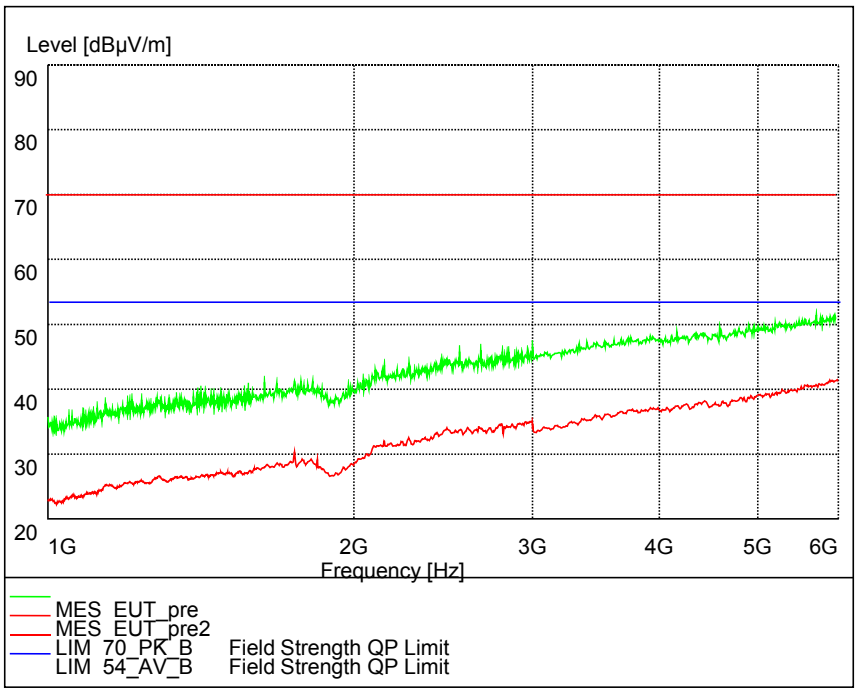
FSK




Radiated emission (0.009MHz – 30MHz)




Radiated emission (30MHz – 1GHz)




Radiated emission (1GHz – 6GHz)

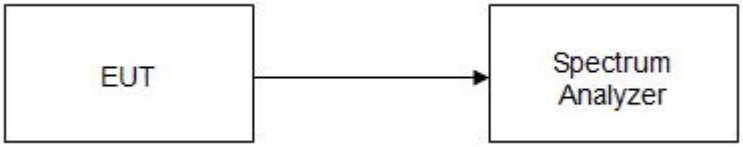
## 6.3 Bandwidth Requirement

### 6.3.1 Ambient condition

| Temperature | Relative humidity | Pressure |
|---|---|---|
| 23.0°C | 32.0% | 101.5kPa |

### 6.3.2 Test conditions and test configuration

(c) 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.



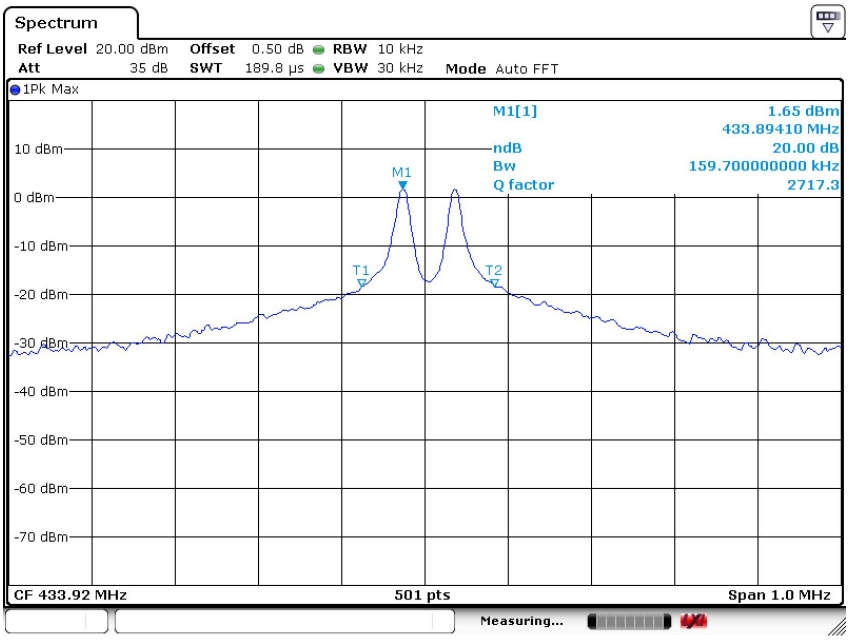

### 6.3.3 Test limit

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
Bandwidth limit: 433.92MHz*0.25%=1.0848MHz

### 6.3.4 Test data

| Modulation Type | Transmitter Frequency (MHz) | Measured 20dB Bandwidth (kHz) | 0.25% of the centre frequency requirement (kHz) | Results |
|---|---|---|---|---|
| FSK | 433.92 | 159.70 | 1084.8 | Pass |

FSK


Spectrum
Ref Level 20.00 dBm Offset 0.50 dB RBW 10 kHz
Att 35 dB SWT 189.8 µs VBW 30 kHz Mode Auto FFT
1Pk Max
M1[1] 1.65 dBm
433.89410 MHz
ndB 20.00 dB
Bw 159.700000000 kHz
Q factor 2717.3
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
T1
T2
CF 433.92 MHz
501 pts
Span 1.0 MHz
Measuring...

# 7. MEASUREMENT UNCERTAINTIES

| Item | Uncertainty |
|---|---|
| Deactivation time measurement | 0.045 ms |
| Modulation bandwidth | 0.30 kHz |
| Radiated Emission Measurements 30MHz～1GHz | 4.88 dB |
| Radiated Emission Measurements 1GHz～18GHz | 4.86 dB |

Uncertainty figures are valid to a confidence level of 95%, k=2

# 8. TEST EQUIPMENT

Conformance testing was performed using test equipment calibrated in accordance with CNAS accreditation requirements. Calibration, configuration records and equipment details used for conformance testing are available for inspection at SRTC if required.

| No. | Equipment Name<br>Model | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| 1. | FSV-SIGNAL ANALYZER | R&S | 101065 | 2018.08.20 | 2019.08.19 |
| 2. | Cable 104EA | SUCOFLEX | 9272/4EA | 2018.08.20 | 2019.08.19 |
| 3. | 23.18m×16.88m×9.60m Semi-Anechoic Chamber | FRANKONIA | --- | ----- | ----- |
| 4. | Turn table Diameter:5m | HD | ----- | ----- | ----- |
| 5. | Antenna master SAC(MA4.0) | MATURO | ----- | ----- | ----- |
| 6. | 9.080m×5.255m×3.525m Shielding room | FRANKONIA | ----- | ----- | ----- |
| 7. | HF 906 Double-Ridged Waveguide Horn Antenna | R&S | 100030 | 2018.08.20 | 2019.08.19 |
| 8. | HL562 Ultra log antenna | R&S | 100016 | 2018.08.20 | 2019.08.19 |
| 9. | 3160-09 Receive antenna | SCHWARZ-BECK | 002058-002 | 2018.08.20 | 2019.08.19 |
| 10. | ESI 40 EMI test receiver | R&S | 100015 | 2018.08.20 | 2019.08.19 |
| 11. | ESCS30 EMI test receiver | R&S | 100029 | 2018.08.20 | 2019.08.19 |
| 12. | ESH3-Z5 LISN | R&S | 100020 | 2018.08.20 | 2019.08.19 |
| 13. | HFH2-Z2 | R&S | 100340 | 2018.08.20 | 2019.08.19 |

---End of Test Report---