

FCC - TEST REPORT

Report Number : **68.950.19.2759.01** Date of Issue: Sept 9, 2019

Model : **HVN: ED100, HVN: MD44014**

Product Type : Mobile POS System

Applicant : NumberFour AG

Address : Schoenhauser Allee 8, 10119 Berlin, Germany

Manufacturer : NumberFour AG

Address : Schoenhauser Allee 8, 10119 Berlin, Germany

Test Result : ☒ **Positive** ☐ **Negative**

Total pages including Appendices : 21

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

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FCC Registration Number: 514049

IC Registration Number: 10320A

Telephone: 86 755 8828 6998

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3 Description of the Equipment Under Test

| | |
|----------------------------|--|
| Product: | Mobile POS System |
| Model no.: | HVN: ED100, HVN: MD44014 |
| FCC ID: | 2ANTM-MD44014 |
| Options and accessories: | Charger and power Cable |
| Rating: | 3.85VDC, 2810mAh, (Supplied by Rechargeable Li-ion Battery) or 5VDC (Supplied by external adapter for Charging rechargeable battery) |
| Adapter information: | Model: DSA-18QFB FUS A Input:100-240VAC 50/60Hz, 0.8A, Output:5VDC,3A or 9V 2A or 12V 1.5A Manufacturer: Dee Van Enterprise Co., Ltd |
| RF Transmission Frequency: | 13.56MHz for NFC 2402MHz-2480MHz for Bluetooth 2412MHz-2462MHz for 802.11b/g/n20/n40 (WIFI) 5150-5350, 5470-5825MHz for 802.11a/n20/n40/ac20/ac40/ac80 (WIFI) |
| No. of Operated Channel: | 1 for NFC 79 for Bluetooth 11 for 802.11b/g/n20/n40 (WIFI) 43 for 802.11a/n20/n40/ac20/ac40/ac80 (WIFI) |
| Modulation: | ASK for NFC GFSK, $\pi/4$ -DQPSK, 8DPSK for Bluetooth DSSS, OFDM for WIFI |
| Antenna Type: | Loop antenna |
| Antenna Gain: | 1.2dBi max for 2.4GHz 2.0dBi max for 5GHz |
| Description of the EUT: | The Equipment Under Test (EUT) is a Mobile POS System which support WIFI at 2.4GHz and 5GHz, Bluetooth function operated at 2.4GHz |

4 Summary of Test Standards

| Test Standards | |
|--|--|
| FCC Part 15 Subpart C 10-1-2018 Edition | PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators |

All the test methods were according to ANSI C63.4 (2014).

5 Summary of Test Results

| Technical Requirements | | | | |
|---|----------------------------------|------------|-----------|-------------|
| Test Condition | | Pages | Test Site | Test Result |
| FCC Rules | Test Item | 11 | 1 | Pass |
| §15.207 | Conducted emission AC power port | | | |
| §15.225(a), (b), (c), (d), 15.209, 15.205 | Filed Strength Measurement | 14 | 1 | Pass |
| §15.225 (e) | Frequency Stability | 18 | 1 | Pass |
| §15.215(c) | Occupied Bandwidth | 19 | 1 | Pass |
| §15.203 | Antenna requirement | See note 1 | -- | Pass |

Note 1: The EUT uses a loop Antenna. According to §15.203, it is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2ANTM-MD44014, complies with Section 15.207, 15.209, 15.205, 15.225 of the FCC Part 15, Subpart C.

HVN: ED100 is a Mobile POS System with Bluetooth Low Energy/Bluetooth BDR+EDR/WIFI/NFC/GPS/UMTS/LTE function. HVN: ED100 with camera models HZPV4197(Manufacturer: SHENZHEN HEZHONG IMAGE TECHNOLOGY CO. Ltd) and YGA0711(Manufacturer: Shenzhen Yigao Photoelectric Technology Limited), with internal storage models KMQE60013M-B318 (Manufacturer: Sumsung) and H9TQ17ABJTCCUR-KUM (Manufacturer: hynix).

HVN: MD44014 is identical with model: HVN: ED100 except model name and trademark (HVN: MD44014 for MEDION, HVN: ED100 for enforeDonner), unless otherwise Specification the model: HVN: ED100 was choose as representative model to perform all test items, and model: HVN: MD44014 was deemed to fulfil relevant EMC requirements without further testing.

This report is for the NFC part.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: August 15, 2019

Testing Start Date: August 15, 2019

Testing End Date: September 6, 2019

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:

Prepared by:

Tested by:



John Zhi
EMC Project Manager



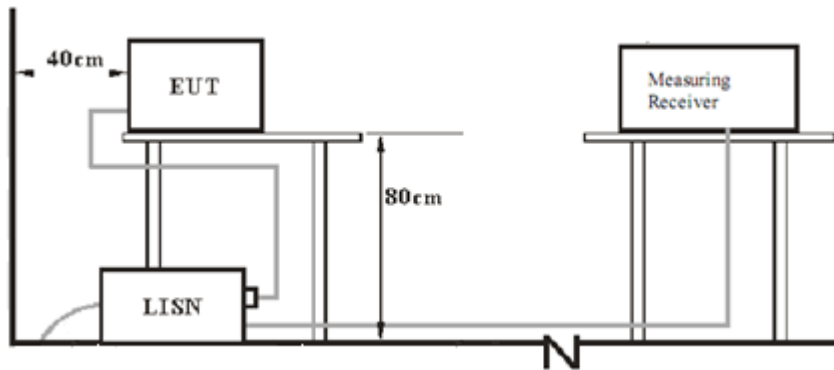
Joe Gu
EMC Project Engineer



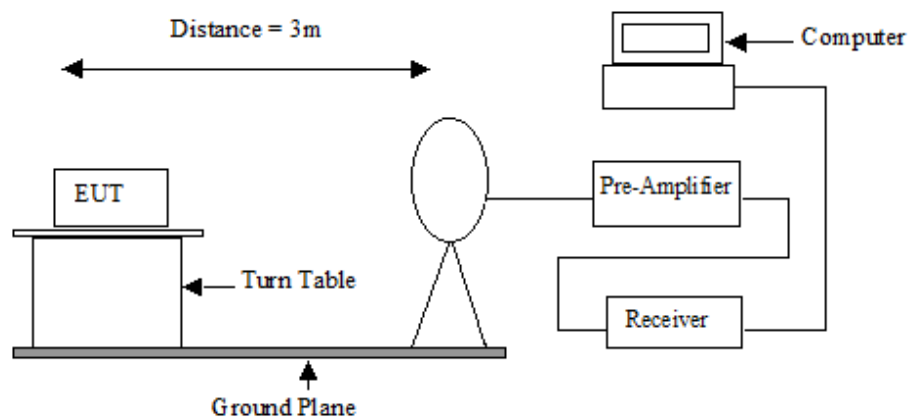
Tree Zhan
EMC Test Engineer

7 Test Setups

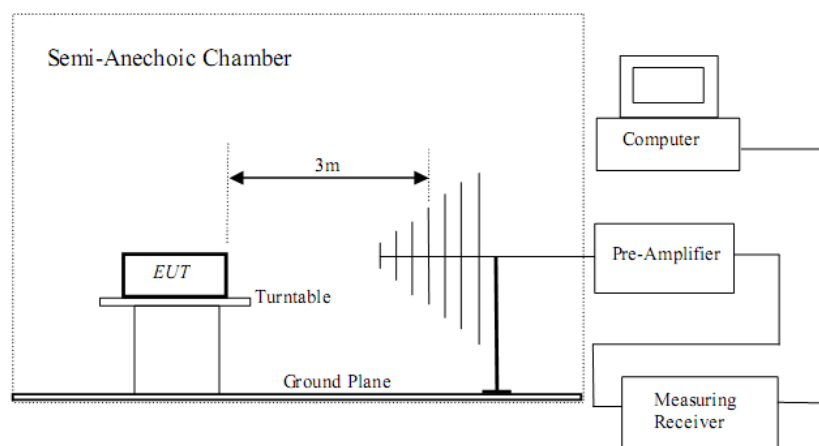
7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups

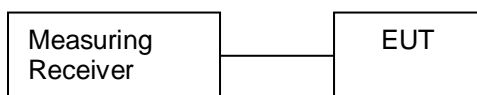


(For 9KHz-30MHz)



(For 30MHz-1GHz)

7.3 Conducted RF test setups



8 Test Methodology

8.1 Conducted Emission

The EUT was placed on a table, which is 0.8m above ground plane, the power line of the EUT is connected to the AC mains through an Artificial Mains Network (A.M.N.).

Maximum procedure was performed to ensure EUT compliance, An EMI test receiver is used to test the emissions from both sides of AC line.

8.2 Radiated Emission

The sample was placed 0.8m above the ground plane on a standard emission test site *. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, considered typical configuration, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

*On a standard emission test site with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules.

8.3 Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

$$FS = R + \text{System Factor}$$

$$\text{System Factor} = AF + CF + FA - PA$$

Where FS = Net Field Strength in dBuV/m at 3 meters.

R = Reading of Spectrum Analyzer / Test Receiver in dBuV.

AF = Antenna Factor in dB.

CF = Cable Attenuation Factor in dB.

FA = Filter Attenuation Factor in dB.

PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

9 Systems test configuration

Auxiliary Equipment Used during Test:

| DESCRIPTION | MANUFACTURER | MODEL NO. | S/N |
|-------------|--------------|-----------|-----|
| Card | Wanlida | --- | --- |

10 Technical Requirement

10.1 Conducted Emission Measurement

Test Requirement:

FCC part 15 section 15.207

Limits of 15.207:

| Frequency (MHz) | Conducted limit(dBμV) | |
|-----------------|-----------------------|------------|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56 * | 56 to 46 * |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

* Decreases with the logarithm of the frequency.

Test Method:

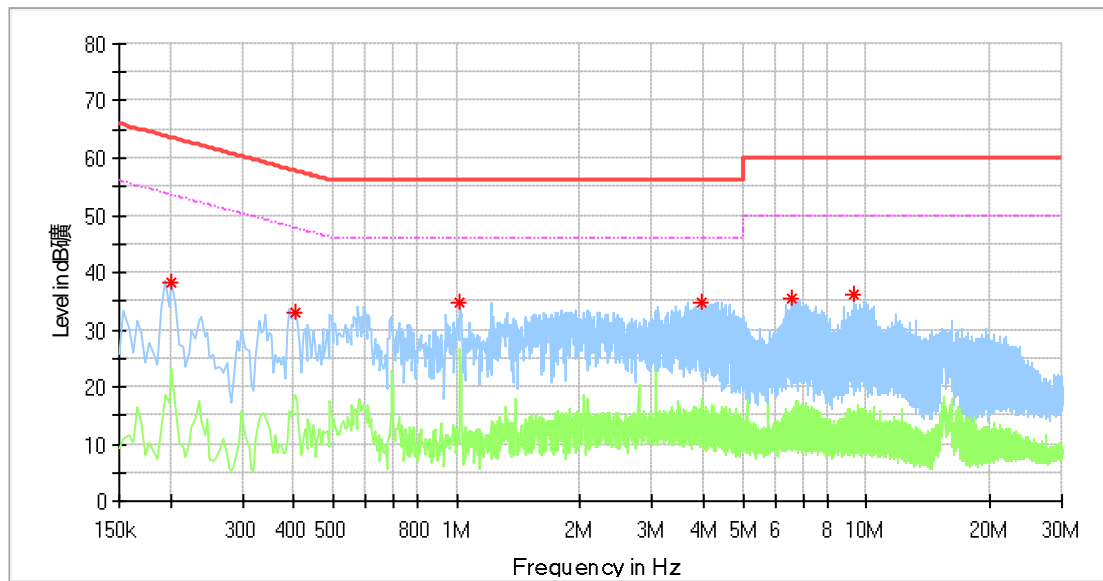
ANSI C63.4:2014

Mode of Operation:

Continuously transmitting mode.

Detector Function

Quasi-peak and Average



| Frequency (MHz) | MaxPeak* (dBμV) | Average* (dBμV) | Limit (dBμV) | Margin (dB) | Line | Corr.** (dB) |
|-----------------|-----------------|-----------------|--------------|-------------|------|--------------|
| 0.202000 | 38.29 | --- | 63.53 | 25.23 | L1 | 10.2 |
| 0.402000 | 32.96 | --- | 57.81 | 24.85 | L1 | 10.3 |
| 1.018000 | 34.64 | --- | 56.00 | 21.36 | L1 | 10.3 |
| 3.954000 | 34.76 | --- | 56.00 | 21.24 | L1 | 10.4 |
| 6.582000 | 35.43 | --- | 60.00 | 24.57 | L1 | 10.5 |
| 9.326000 | 35.98 | --- | 60.00 | 24.02 | L1 | 10.6 |

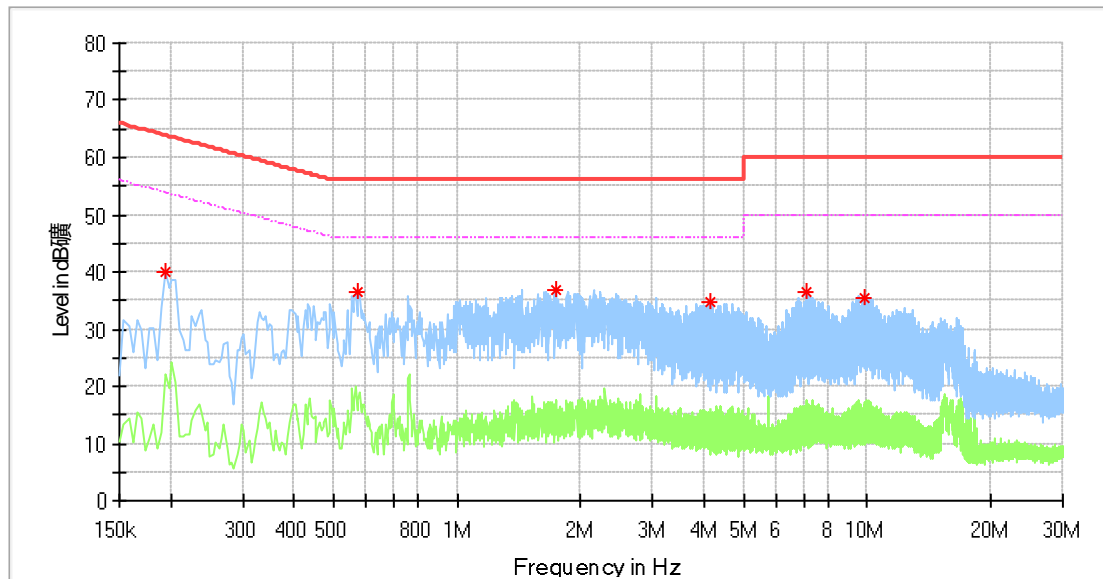
Remark :

*Level=Reading Level + Correction Factor

**Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

Conducted Emission



| Frequency (MHz) | MaxPeak* (dBμV) | Average* (dBμV) | Limit (dBμV) | Margin (dB) | Line | Corr.** (dB) |
|-----------------|-----------------|-----------------|--------------|-------------|------|--------------|
| 0.194000 | 40.01 | --- | 63.86 | 23.86 | N | 10.2 |
| 0.574000 | 36.56 | --- | 56.00 | 19.44 | N | 10.3 |
| 1.734000 | 36.99 | --- | 56.00 | 19.01 | N | 10.3 |
| 4.166000 | 34.77 | --- | 56.00 | 21.23 | N | 10.4 |
| 7.094000 | 36.62 | --- | 60.00 | 23.38 | N | 10.6 |
| 9.874000 | 35.33 | --- | 60.00 | 24.67 | N | 10.7 |

Remark :

*Level=Reading Level + Correction Factor

**Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

10.2 Field Strength Measurement

Test Requirement:

FCC part 15 section 15.225 (a),(b),(c),(d), 15.205
 (a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters. (124 dB μ V/m@3m)
 (b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters. (90.5 dB μ V/m@3m)
 (c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters. (80.5 dB μ V/m@3m)
 (d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

Limits of 15.209:

| 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 |
| 1.705–30.0 | 30 | 30 |
| 30–88 | 100 | 3 |
| 88–216 | 150 | 3 |
| 216–960 | 200 | 3 |
| Above 960 | 500 | 3 |

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

Test Method:

Mode of Operation:

Detector Function

Measurement BW

ANSI C63.4:2014

Continuously transmitting mode.

Quasi-peak (Below 1000 MHz)

Average and Peak (Above 1000 MHz)

200Hz(9KHz-150KHz)

9KHz(150KHz-30MHz)

120 kHz (30MHz-1000 MHz)

1 MHz (Above 1000 MHz)

Test data:

Emission 9KHz-30MHz

| Frequency (MHz) | MaxPeak* (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Pol | Corr.** (dB/m) |
|-----------------|-------------------|----------------|-------------|-----|----------------|
| 0.135994 | 43.29 | 105.22 | 61.93 | H | 19.9 |
| 0.179850 | 52.68 | 102.78 | 50.10 | H | 19.9 |
| 0.214675 | 52.01 | 101.23 | 49.21 | H | 19.9 |
| 0.358950 | 51.19 | 96.73 | 45.53 | H | 20.0 |
| 0.503225 | 40.72 | 73.77 | 33.05 | H | 20.2 |
| 1.115150 | 35.65 | 66.75 | 31.09 | H | 20.3 |
| 1.627575 | 35.24 | 63.41 | 28.17 | H | 20.3 |
| 13.56 | 62.23 | 124 | 7.77 | H | 20.2 |

Remark :

*Level=Reading Level + Correction Factor

**Correction Factor=Antenna Factor + Cable Loss

(The Reading Level is recorded by software which is not shown in the sheet)

| Frequency (MHz) | MaxPeak* (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Pol | Corr.** (dB/m) |
|-----------------|-------------------|----------------|-------------|-----|----------------|
| 0.056000 | 47.16 | 112.99 | 65.83 | V | 20.3 |
| 0.164925 | 45.29 | 103.53 | 58.24 | V | 19.9 |
| 0.027659 | 57.39 | 119.17 | 61.78 | V | 20.4 |
| 0.493275 | 37.52 | 73.94 | 36.42 | V | 20.2 |
| 1.627575 | 35.67 | 63.41 | 27.74 | V | 20.3 |
| 0.055342 | 50.96 | 113.10 | 62.14 | V | 20.3 |
| 4.886200 | 34.70 | 70.00 | 35.30 | V | 20.2 |
| 6.776700 | 35.08 | 70.00 | 34.92 | V | 20.2 |
| 13.56 | 62.15 | 124 | 7.85 | V | 20.2 |

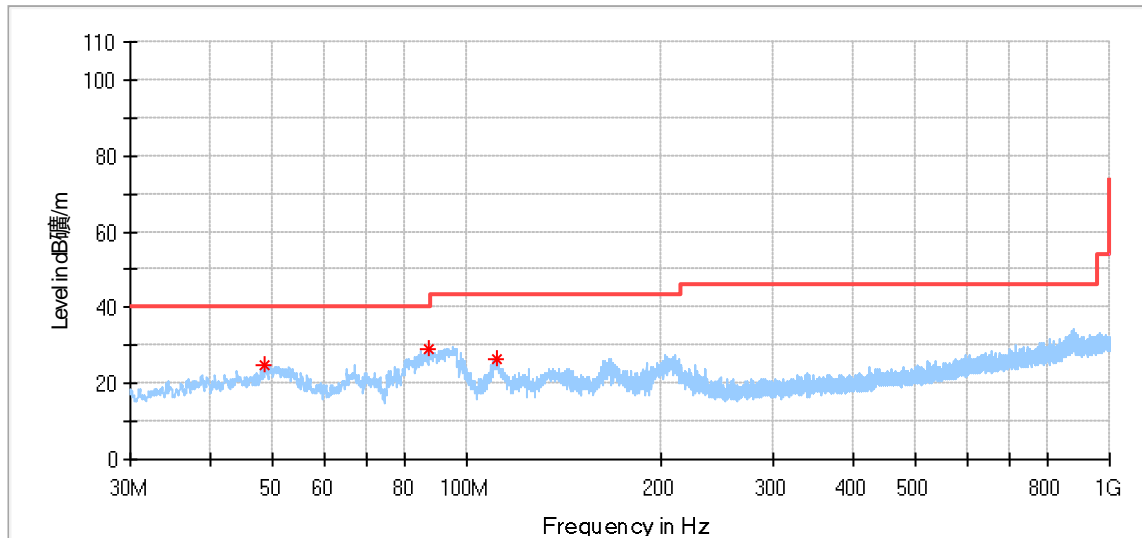
Remark :

*Level=Reading Level + Correction Factor

**Correction Factor=Antenna Factor + Cable Loss

(The Reading Level is recorded by software which is not shown in the sheet)

Emission 30MHz -1GHz



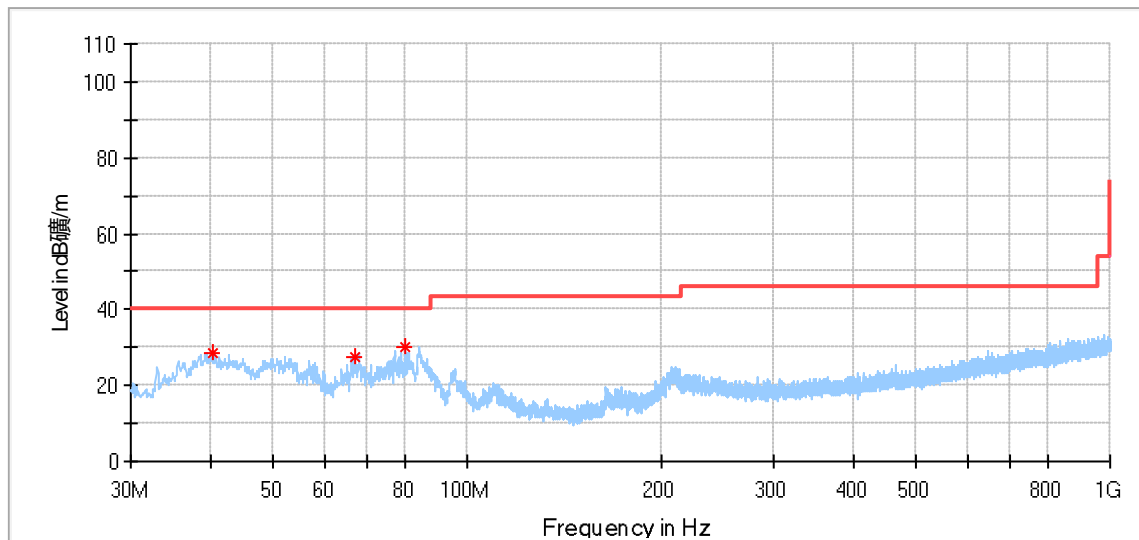
| Frequency (MHz) | MaxPeak* (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr.** (dB/m) |
|-----------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|----------------|
| 48.537778 | 24.96 | 40.00 | 15.04 | --- | --- | 154.0 | H | 170.0 | -24.0 |
| 87.283889 | 28.99 | 40.00 | 11.01 | --- | --- | 154.0 | H | 354.0 | -30.6 |
| 111.210556 | 26.26 | 43.50 | 17.24 | --- | --- | 154.0 | H | 355.0 | -28.6 |

Remark :

*Level=Reading Level + Correction Factor

**Correction Factor=Antenna Factor + Cable Loss

(The Reading Level is recorded by software which is not shown in the sheet)



| Frequency (MHz) | MaxPeak* (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr.** (dB/m) |
|-----------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|----------------|
| 40.131111 | 28.34 | 40.00 | 11.66 | --- | --- | 154.0 | V | 321.0 | -25.1 |
| 66.967778 | 27.71 | 40.00 | 12.29 | --- | --- | 154.0 | V | 301.0 | -28.1 |
| 80.062778 | 30.30 | 40.00 | 9.70 | --- | --- | 154.0 | V | 308.0 | -31.6 |

Remark :

*Level=Reading Level + Correction Factor

**Correction Factor=Antenna Factor + Cable Loss

(The Reading Level is recorded by software which is not shown in the sheet)

Test result: PASS

10.3 Frequency Stability

| | |
|--------------------|--|
| Test Requirement: | FCC Part 15 C Section 15.225(e) The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery. |
| Test Method: | ANSI C63.4:2014 |
| Mode of Operation: | Continuously transmitting mode. |
| Detector Function | Maxpeak |
| Measurement BW | RBW:1KHz VBW:3KHz |

Test data:

Nominal Operating Frequency: 13.56MHz,
Limit: within +/- 1.356KHz of the operating frequency.

| Frequency stability vs. temperature | | |
|-------------------------------------|--------------------------|-----------------------|
| Temperature (°C) | Measured Frequency (MHz) | Frequency error (KHz) |
| 40 | 13.56006 | 0.06 |
| 30 | 13.56004 | 0.04 |
| 20 | 13.56006 | 0.06 |
| 10 | 13.56006 | 0.06 |
| 0 | 13.56006 | 0.06 |

| Frequency stability vs. voltage | | |
|---------------------------------|--------------------------|-----------------------|
| Voltage (VDC) | Measured Frequency (MHz) | Frequency error (KHz) |
| 3.27 | 13.56006 | 0.06 |
| 3.47 | 13.56006 | 0.06 |
| 3.67 | 13.56006 | 0.06 |
| 3.85 | 13.56006 | 0.06 |
| 3.97 | 13.56006 | 0.06 |
| 4.17 | 13.56004 | 0.04 |
| 4.37 | 13.56006 | 0.06 |

Result: PASS

10.4 Occupied Bandwidth

Test Requirement:

FCC Part 15 C Section 15.215 (c)

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Test Method:

ANSI C63.4:2014

Mode of Operation:

Continuously transmitting mode.

Detector Function

Maxpeak

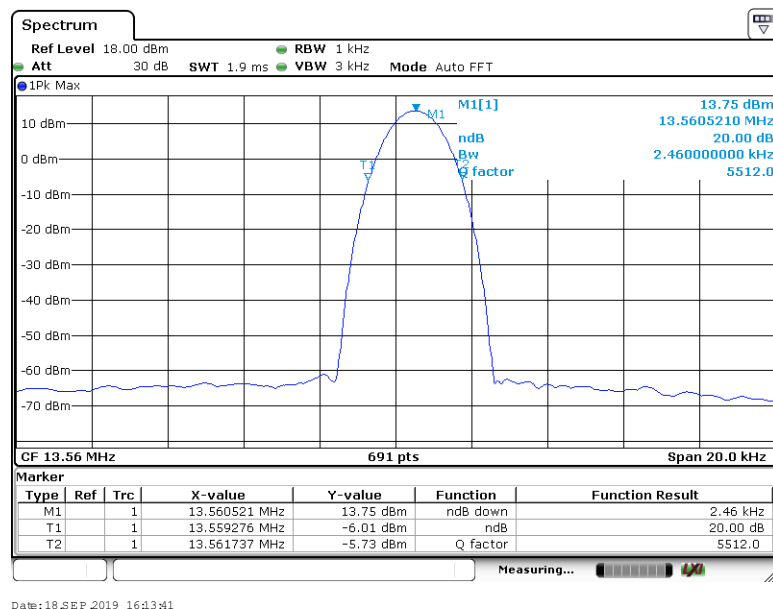
Measurement BW

RBW:1KHz

VBW:3KHz

Test data:

20dB bandwidth:



Result: PASS

11 Test Equipment List

List of Test Instruments

| | DESCRIPTION | MANUFACTURER | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|----|-------------------------------------|-----------------|-----------|-----------------|---------------|
| C | Signal Analyzer | Rohde & Schwarz | FSV40 | 101030 | 2019-7-6 |
| | DC power supply | INSTEK | GPR-30600 | EH873394 | N/A |
| CE | EMI Test Receiver | Rohde & Schwarz | ESR 3 | 101782 | 2020-6-28 |
| | LISN | Rohde & Schwarz | ENV432 | 101318 | 2019-7-6 |
| RE | EMI Test Receiver | Rohde & Schwarz | ESR 26 | 101269 | 2020-6-28 |
| | Trilog Super Broadband Test Antenna | Schwarzbeck | VULB 9163 | 707 | 2020-8-20 |
| | Horn Antenna | Rohde & Schwarz | HF907 | 102294 | 2020-6-22 |
| | Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100398 | 2020-7-7 |
| | Pre-amplifier | Rohde & Schwarz | SCU 18 | 102230 | 2020-6-28 |
| | Signal Generator | Rohde & Schwarz | SMY01 | 839369/005 | 2020-6-28 |
| | Attenuator | Agilent | 8491A | MY39264334 | 2020-6-28 |
| | 3m Semi-anechoic chamber | TDK | 9X6X6 | ---- | 2020-7-7 |
| | Test software | Rohde & Schwarz | EMC32 | Version 9.15.00 | N/A |

C - Conducted RF tests

- Occupied bandwidth
- Frequency Stability

12 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty

| Items | Extended Uncertainty |
|--|--|
| Uncertainty for Conducted Emission 150kHz-30MHz (for test using AMN ENV432 or ENV4200) | 3.21dB |
| Uncertainty for Radiated Emission in 3m chamber 9kHz-30MHz | 4.46dB |
| Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz | Horizontal: 4.91dB; Vertical: 4.89dB; |
| Uncertainty for Conducted RF test with TS 8997 | RF Power Conducted: 1.16dB Frequency test involved: 0.6×10^{-7} or 1% |