

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

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
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Shenzhen City, 518052,
P. R. China

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



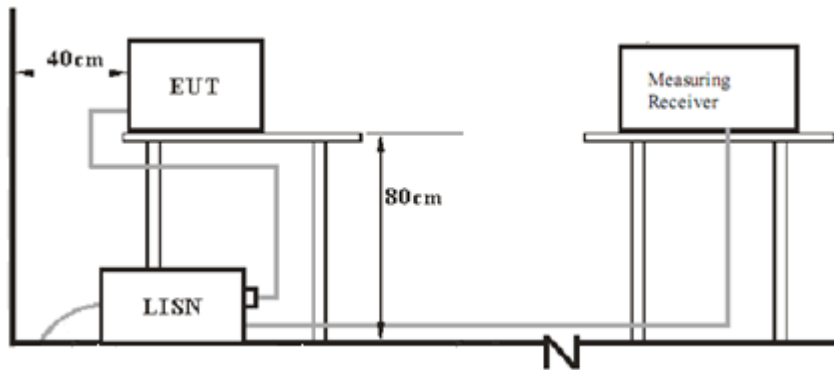
Joe Gu
EMC Project Engineer



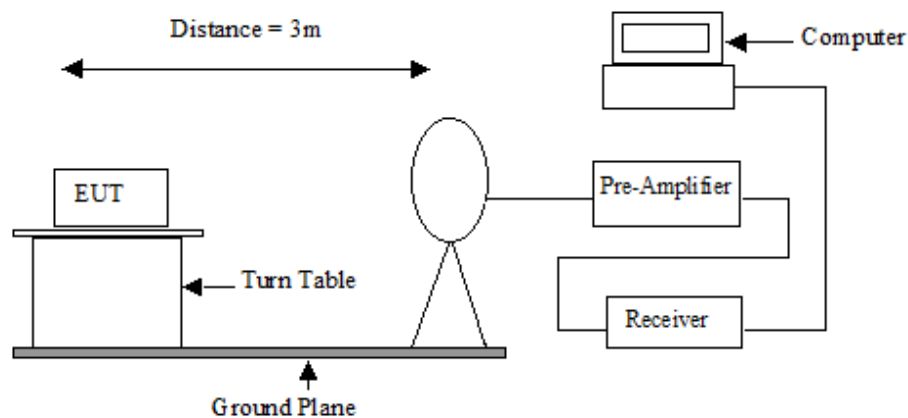
Tree Zhan
EMC Test Engineer

7 Test Setups

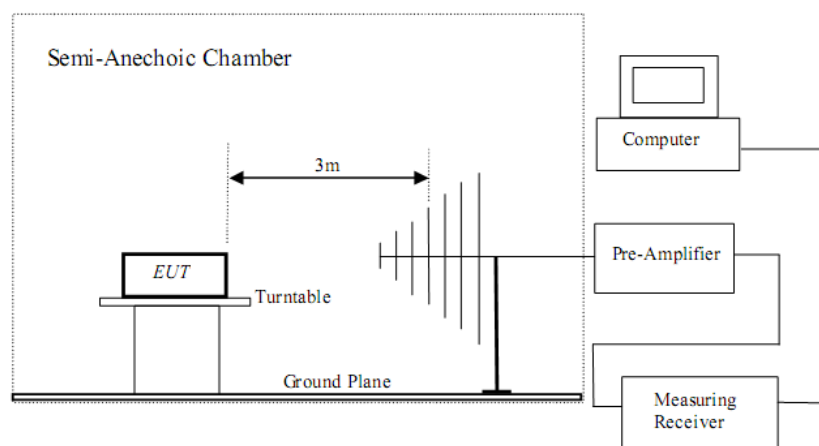
7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups

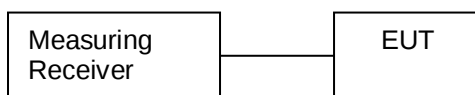


(For 9KHz-30MHz)



(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:

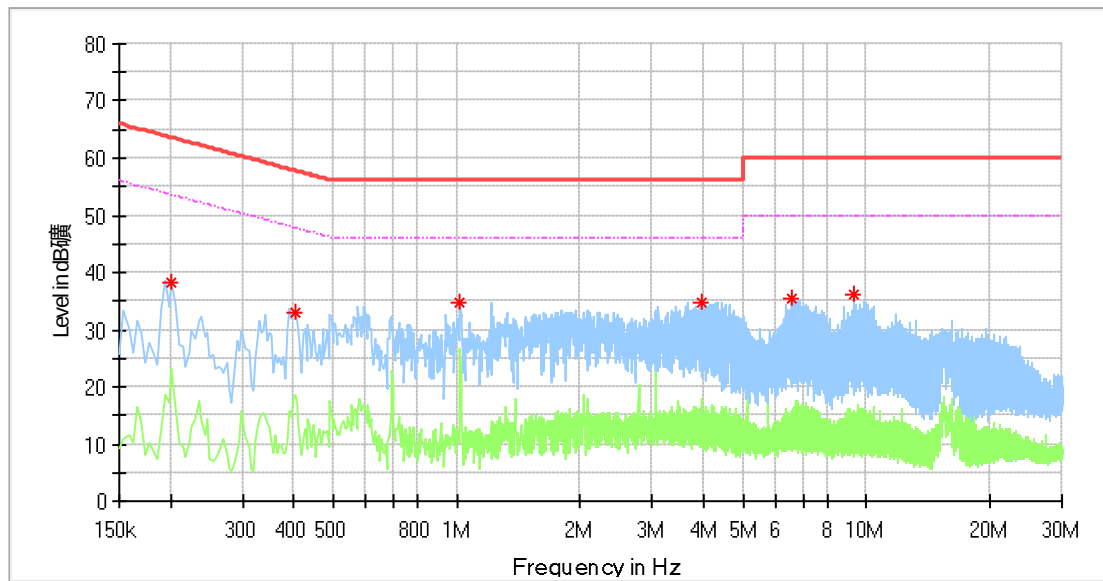
ANSI C63.4:2014

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

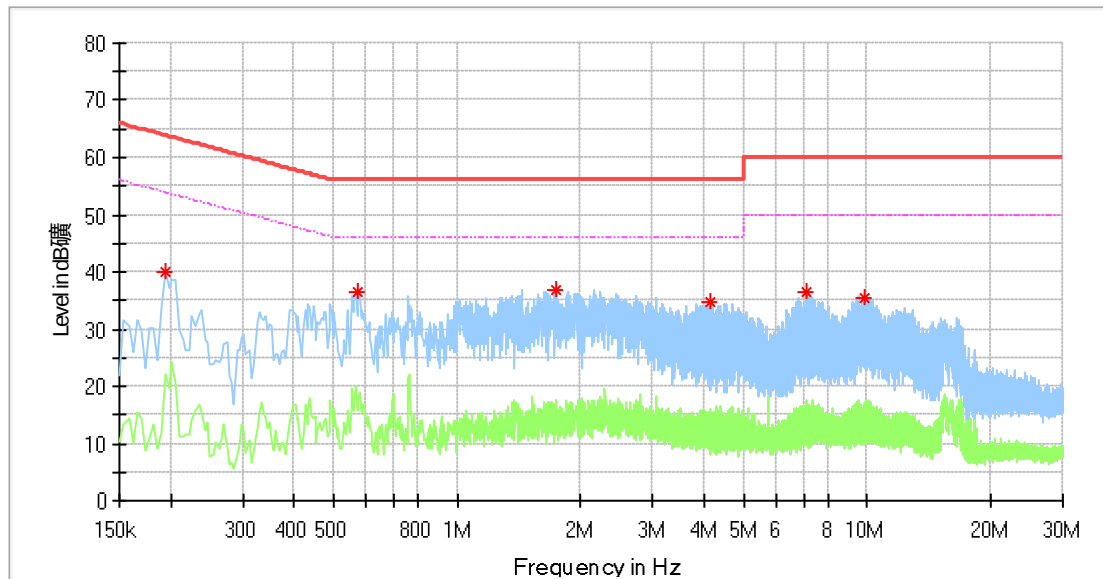
Remark :

*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

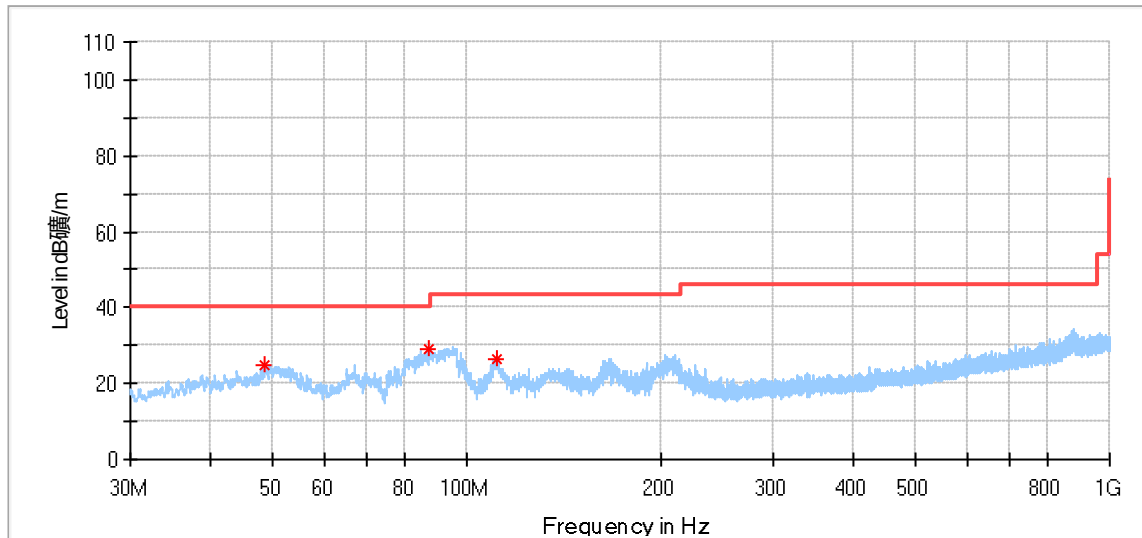
Remark :

*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



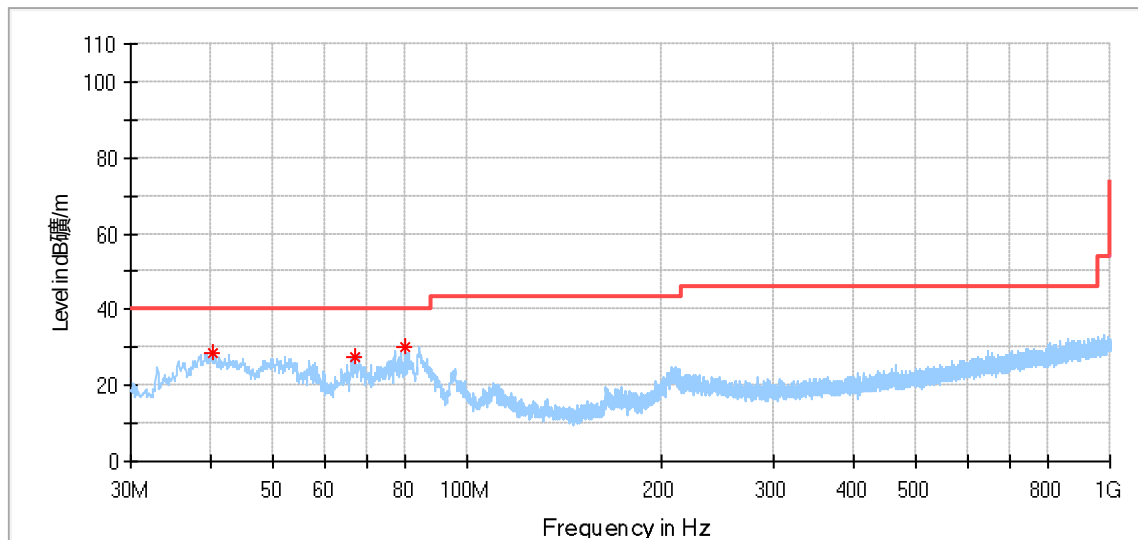
Frequency (MHz)	MaxPeak* (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr.** (dB/m)
48.537778	24.96	40.00	15.04	---	---	154.0	H	170.0	-24.0
87.283889	28.99	40.00	11.01	---	---	154.0	H	354.0	-30.6
111.210556	26.26	43.50	17.24	---	---	154.0	H	355.0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

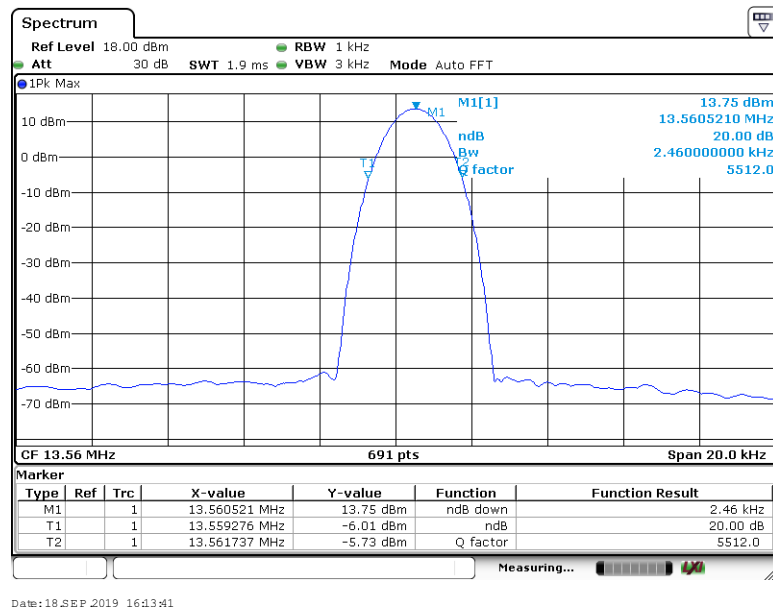
Measurement BW

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%