RF TEST REPORT

Applicant	Huawei Technologies Co., Ltd
FCC ID	QISATU-L11
Product	Smart Phone
Model	ATU-L11
Report No.	R1802H0028-R4
Issue Date	March 13, 2018

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 15C (2018)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Performed by: Xianqing Li *Reviewed by: Kai Xu*

TA Technology (Shanghai) Co., Ltd.

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Summary of measurement results

Number	Summary of measurements of results	Clause in FCC rules	Verdict
1	20 dB bandwidth	2.1049	PASS
2	Frequency Stability Tolerance	15.225(e)	PASS
3	Radiated Emissions	15.225 (a) (b) (c) (d) and 15.209	PASS
4	Conducted Emissions	15.207	PASS
Date of Testing: February 24, 2018 ~ March 6, 2018			

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. This report must not be used by the client to claim product certification, approval, or endorsement by any government agencies.

1.2. Test facility

CNAS (accreditation number: L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

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.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

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
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2. General Description of Equipment under Test

Client Information

Applicant	Huawei Technologies Co., Ltd.
Applicant address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China.
Manufacturer	Huawei Technologies Co., Ltd.
Manufacturer address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China.

General information

EUT Description				
Model:	ATU-L11			
IMEI	867269030027497			
Hardware Version:	HL1ATUM			
Software Version:	ATU-L11 8.0.1.44(SP1C900)			
Power Supply:	Battery			
Antenna Type:	Internal Antenna			
Test Mode:	NFC-A	NFC-B	NFC-F	NFC-V
Modulation Type:	ASK	ASK, BPSK	ASK	ASK
Operating Frequency Range(s)	13.56MHz			

EUT Accessory	
Adapter 1- EU	Manufacturer: SHENZHEN HUNTKEY ELECTRIC CO., LTD Model: HW-050100E01
Adapter 2- EU	Manufacturer: HUIZHOU BYD ELECTRONIC CO., LTD. Model: HW-050100E01
Adapter 3- EU	Manufacturer: DONG GUAN PHITEK ELECTRONICS CO., LTD. Model: HW-050100E01
Adapter 4- UK	Manufacturer: SHENZHEN HUNTKEY ELECTRIC CO., LTD Model: HW-050100B01
Adapter 5- UK	Manufacturer: HUIZHOU BYD ELECTRONIC CO., LTD. Model: HW-050100B01
Adapter 6- UK	Manufacturer: DONG GUAN PHITEK ELECTRONICS CO., LTD. Model: HW-050100B01
Adapter 7- US	Manufacturer: SHENZHEN HUNTKEY ELECTRIC CO., LTD Model: HW-050100U01
Adapter 8- US	Manufacturer: HUIZHOU BYD ELECTRONIC CO., LTD. Model: HW-050100U01
Adapter 9- US	Manufacturer: DONG GUAN PHITEK ELECTRONICS CO., LTD. Model: HW-050100U01
Adapter 10- AU	Manufacturer: SHENZHEN HUNTKEY ELECTRIC CO., LTD Model: HW-050100A01
Adapter 11- AU	Manufacturer: HUIZHOU BYD ELECTRONIC CO., LTD. Model: HW-050100A01
Adapter 12- AU	Manufacturer: DONG GUAN PHITEK ELECTRONICS CO., LTD. Model: HW-050100A01
Battery 1	Manufacturer: SCUD(FUJIAN) Electronics Co.,Ltd Model: HB366481ECW-11
Battery 2	Manufacturer: Sunwoda Electronics Co.,Ltd Model: HB366481ECW-11
Battery 3	Manufacturer: Desay battery Co.,LTD Model: HB366481ECW-11
Earphone 1	Manufacturer: BOLUO COUNTY QUANCHENG ELECTRONIC CO.,LTD Model: 1293-3283-3.5MM-300
Earphone 2	Manufacturer: GoerTek Inc Model: HA1-3W
Earphone 3	Manufacturer: Jiangxi Lianchuang Hongsheng Electronic Co.,LTD Model: MEMD1532B528A00
Earphone 4	Manufacturer: BOLUO COUNTY QUANCHENG ELECTRONIC CO.,LTD Model: 1293#+3283# 3.5MM-150
Earphone 5	Manufacturer: GoerTek Inc Model: HA1-3
Earphone 6	Manufacturer: Jiangxi Lianchuang Hongsheng Electronic Co.,LTD

	Model: MEMD1532B528000
Earphone 7	Manufacturer: FOXCONN Model: EPAB542-2WH03-DH
USB Extend Cable	100cm Cable, Shielded
Note: The information of the EUT is declared by the manufacturer. 2. There are more than one Adapters, Batteries, Earphones; each one should be applied throughout the compliance test respectively, however, only the worst case (Adapter 5, Battery 1, Earphone 2) will be recorded in this report.	

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 2 (2018)**
- **FCC CFR47 Part 15C (2018)**
- **ANSI C63.10 (2013)**

4. Test Configuration

Test Mode

The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

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

5. Test Case Results

5.1. 20dB Bandwidth

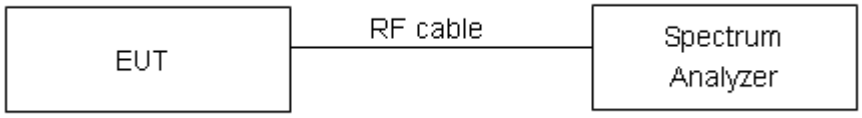
Ambient condition

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 3 times thw RBW on spectrum analyzer.

Test Setup



Limits

No specific occupied bandwidth requirements in part 2.1049.

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:

NFC-A

Carrier frequency (MHz)	99% Bandwidth (kHz)	20dB Bandwidth (kHz)	Conclusion
13.56MHz	21.407	25.22	PASS

NFC-B

Carrier frequency (MHz)	99% Bandwidth (kHz)	20dB Bandwidth (kHz)	Conclusion
13.56MHz	21.391	25.22	PASS

NFC-F

Carrier frequency (MHz)	99% Bandwidth (kHz)	20dB Bandwidth (kHz)	Conclusion
13.56MHz	21.357	25.20	PASS

NFC-V

Carrier frequency (MHz)	99% Bandwidth (kHz)	20dB Bandwidth (kHz)	Conclusion
13.56MHz	21.436	25.25	PASS

5.2. Frequency Stability

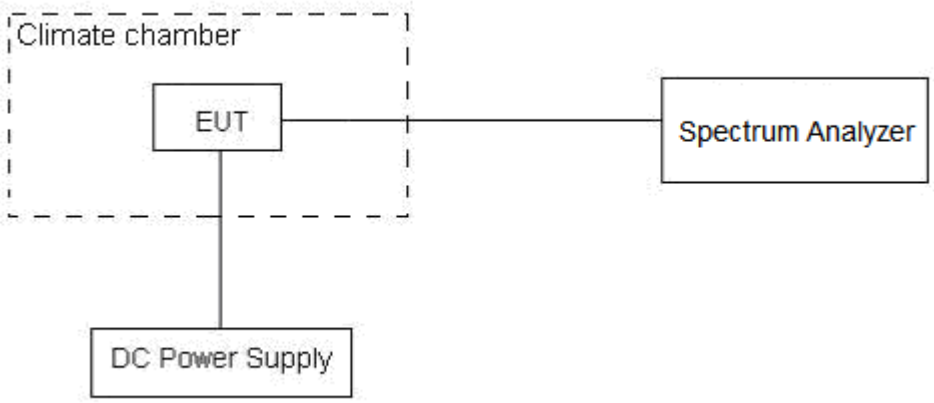
Ambient condition

Temperature	Relative humidity
21°C ~25°C	40%~60%

Method of Measurement

1. Frequency Stability (Temperature Variation)
   The temperature inside the climate chamber is varied from -20°C to +50°C in 10°C step size,
   (1) With all power removed, the temperature was decreased to 0°C and permitted to stabilize for three hours.
   (2) Measure the carrier frequency with the test equipment in a “call mode”. These measurements should be made within 1 minute of powering up the mobile station, to prevent significant self warming.
   (3) Repeat the above measurements at 10°C increments from -20°C to +50°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements.
2. Frequency Stability (Voltage Variation)
   The frequency stability shall be measured with variation of primary supply voltage as follows:
   (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
   (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery-operating end point which shall be specified by the manufacturer.
   This transceiver is specified to operate with an input voltage of between 3.6 V and 4.4 V, with a nominal voltage of 3.82V.

Test setup



Limits

Rule Part 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.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75％ confidence level for the normal distribution is with the coverage factor k = 3, U= 0.01ppm.

Test Result

NFC-A

Test status	Frequency				Tolerance (MHz)			
	13.56MHz							
	1min	2min	5min	10min	1min	2min	5min	10min
-20°C/3.82 V	13.559338	13.559334	13.559350	13.559346	0.000662	0.000666	0.000650	0.000654
-10°C/3.82 V	13.559337	13.559327	13.559350	13.559344	0.000663	0.000673	0.000650	0.000656
0°C/3.82 V	13.559334	13.559320	13.559347	13.559336	0.000666	0.000680	0.000653	0.000664
10°C/3.82 V	13.559326	13.559312	13.559338	13.559327	0.000674	0.000688	0.000662	0.000673
20°C/3.82 V	13.559325	13.559312	13.559329	13.559326	0.000675	0.000688	0.000671	0.000674
30°C/3.82 V	13.559323	13.559311	13.559323	13.559325	0.000677	0.000689	0.000677	0.000675
40°C/3.82 V	13.559322	13.559309	13.559320	13.559321	0.000678	0.000691	0.000680	0.000679
50°C/3.82 V	13.559314	13.559300	13.559314	13.559318	0.000686	0.000700	0.000686	0.000682
20°C/3.6 V	13.559307	13.559291	13.559312	13.559316	0.000693	0.000709	0.000688	0.000684
20°C/4.4 V	13.559300	13.559291	13.559311	13.559313	0.000700	0.000709	0.000689	0.000687

Test status	Tolerance (%)				Limit (%)	Conclusion
	1min	2min	5min	10min		
-20°C/3.82 V	0.004882	0.004912	0.004793	0.004825	0.01	PASS
-10°C/3.82 V	0.004891	0.004963	0.004795	0.004840	0.01	PASS
0°C/3.82 V	0.004915	0.005013	0.004813	0.004900	0.01	PASS
10°C/3.82 V	0.004969	0.005073	0.004884	0.004962	0.01	PASS
20°C/3.82 V	0.004981	0.005074	0.004946	0.004974	0.01	PASS
30°C/3.82 V	0.004994	0.005084	0.004995	0.004979	0.01	PASS
40°C/3.82 V	0.005002	0.005094	0.005018	0.005010	0.01	PASS
50°C/3.82 V	0.005056	0.005164	0.005062	0.005027	0.01	PASS
20°C/3.6 V	0.005112	0.005228	0.005074	0.005044	0.01	PASS
20°C/4.4 V	0.005164	0.005231	0.005081	0.005064	0.01	PASS

NFC-B

Test status	Frequency				Tolerance (MHz)			
	13.56MHz							
	1min	2min	5min	10min	1min	2min	5min	10min
-20°C/3.82 V	13.559341	13.559341	13.559339	13.559339	0.000659	0.000659	0.000661	0.000661
-10°C/3.82 V	13.559340	13.559333	13.559338	13.559333	0.000660	0.000667	0.000662	0.000667
0°C/3.82 V	13.559330	13.559330	13.559337	13.559331	0.000670	0.000670	0.000663	0.000669
10°C/3.82 V	13.559321	13.559322	13.559329	13.559326	0.000679	0.000678	0.000671	0.000674
20°C/3.82 V	13.559318	13.559320	13.559326	13.559317	0.000682	0.000680	0.000674	0.000683
30°C/3.82 V	13.559310	13.559317	13.559321	13.559311	0.000690	0.000683	0.000679	0.000689
40°C/3.82 V	13.559306	13.559314	13.559315	13.559305	0.000694	0.000686	0.000685	0.000695
50°C/3.82 V	13.559303	13.559306	13.559308	13.559296	0.000697	0.000694	0.000692	0.000704
20°C/3.6 V	13.559295	13.559296	13.559302	13.559295	0.000705	0.000704	0.000698	0.000705
20°C/4.4 V	13.559287	13.559289	13.559295	13.559289	0.000713	0.000711	0.000705	0.000711

Test status	Tolerance (%)				Limit(%)	Conclusion
	1min	2min	5min	10min		
-20°C/3.82 V	0.004862	0.004858	0.004875	0.004874	0.01	PASS
-10°C/3.82 V	0.004869	0.004920	0.004884	0.004916	0.01	PASS
0°C/3.82 V	0.004940	0.004943	0.004893	0.004937	0.01	PASS
10°C/3.82 V	0.005006	0.004997	0.004951	0.004973	0.01	PASS
20°C/3.82 V	0.005028	0.005017	0.004968	0.005036	0.01	PASS
30°C/3.82 V	0.005092	0.005039	0.005006	0.005081	0.01	PASS
40°C/3.82 V	0.005116	0.005055	0.005053	0.005122	0.01	PASS
50°C/3.82 V	0.005143	0.005121	0.005107	0.005191	0.01	PASS
20°C/3.6 V	0.005198	0.005194	0.005149	0.005196	0.01	PASS
20°C/4.4 V	0.005259	0.005240	0.005199	0.005242	0.01	PASS

NFC-F

Test status	Frequency				Tolerance (MHz)			
	13.56MHz							
	1min	2min	5min	10min	1min	2min	5min	10min
-20°C/3.82 V	13.559343	13.559349	13.559342	13.559335	0.000657	0.000651	0.000658	0.000665
-10°C/3.82 V	13.559337	13.559342	13.559334	13.559330	0.000663	0.000658	0.000666	0.000670
0°C/3.82 V	13.559329	13.559336	13.559324	13.559323	0.000671	0.000664	0.000676	0.000677
10°C/3.82 V	13.559325	13.559332	13.559320	13.559320	0.000675	0.000668	0.000680	0.000680
20°C/3.82 V	13.559318	13.559323	13.559317	13.559316	0.000682	0.000677	0.000683	0.000684
30°C/3.82 V	13.559313	13.559314	13.559316	13.559310	0.000687	0.000686	0.000684	0.000690
40°C/3.82 V	13.559304	13.559312	13.559311	13.559306	0.000696	0.000688	0.000689	0.000694
50°C/3.82 V	13.559298	13.559305	13.559310	13.559300	0.000702	0.000695	0.000690	0.000700
20°C/3.6 V	13.559294	13.559298	13.559302	13.559290	0.000706	0.000702	0.000698	0.000710
20°C/4.4 V	13.559290	13.559292	13.559302	13.559283	0.000710	0.000708	0.000698	0.000717

Test status	Tolerance (%)				Limit (%)	Conclusion
	1min	2min	5min	10min		
-20°C/3.82 V	0.004843	0.004801	0.004852	0.004902	0.01	PASS
-10°C/3.82 V	0.004886	0.004853	0.004915	0.004942	0.01	PASS
0°C/3.82 V	0.004951	0.004899	0.004983	0.004994	0.01	PASS
10°C/3.82 V	0.004978	0.004925	0.005014	0.005018	0.01	PASS
20°C/3.82 V	0.005032	0.004990	0.005040	0.005045	0.01	PASS
30°C/3.82 V	0.005069	0.005057	0.005041	0.005088	0.01	PASS
40°C/3.82 V	0.005135	0.005073	0.005084	0.005115	0.01	PASS
50°C/3.82 V	0.005174	0.005123	0.005090	0.005165	0.01	PASS
20°C/3.6 V	0.005203	0.005178	0.005146	0.005235	0.01	PASS
20°C/4.4 V	0.005236	0.005222	0.005150	0.005291	0.01	PASS

NFC-V

Test status	Frequency				Tolerance (MHz)			
	13.56MHz							
	1min	2min	5min	10min	1min	2min	5min	10min
-20°C/3.82 V	13.559349	13.559349	13.559344	13.559338	0.000651	0.000651	0.000656	0.000662
-10°C/3.82 V	13.559349	13.559339	13.559337	13.559329	0.000651	0.000661	0.000663	0.000671
0°C/3.82 V	13.559347	13.559334	13.559335	13.559326	0.000653	0.000666	0.000665	0.000674
10°C/3.82 V	13.559338	13.559334	13.559332	13.559323	0.000662	0.000666	0.000668	0.000677
20°C/3.82 V	13.559338	13.559324	13.559324	13.559319	0.000662	0.000676	0.000676	0.000681
30°C/3.82 V	13.559335	13.559321	13.559316	13.559316	0.000665	0.000679	0.000684	0.000684
40°C/3.82 V	13.559331	13.559320	13.559313	13.559309	0.000669	0.000680	0.000687	0.000691
50°C/3.82 V	13.559330	13.559316	13.559313	13.559300	0.000670	0.000684	0.000687	0.000700
20°C/3.6 V	13.559320	13.559307	13.559303	13.559300	0.000680	0.000693	0.000697	0.000700
20°C/4.4 V	13.559317	13.559306	13.559302	13.559297	0.000683	0.000694	0.000698	0.000703

Test status	Tolerance (%)				Limit (%)	Conclusion
	1min	2min	5min	10min		
-20°C/3.82 V	0.004798	0.004802	0.004841	0.004886	0.01	PASS
-10°C/3.82 V	0.004800	0.004872	0.004887	0.004950	0.01	PASS
0°C/3.82 V	0.004815	0.004909	0.004901	0.004968	0.01	PASS
10°C/3.82 V	0.004882	0.004912	0.004927	0.004991	0.01	PASS
20°C/3.82 V	0.004883	0.004985	0.004985	0.005019	0.01	PASS
30°C/3.82 V	0.004904	0.005005	0.005041	0.005043	0.01	PASS
40°C/3.82 V	0.004932	0.005013	0.005067	0.005096	0.01	PASS
50°C/3.82 V	0.004938	0.005045	0.005070	0.005159	0.01	PASS
20°C/3.6 V	0.005011	0.005109	0.005138	0.005164	0.01	PASS
20°C/4.4 V	0.005039	0.005116	0.005148	0.005186	0.01	PASS

5.3. 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.
Sweep the whole frequency band through the range from 9 kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

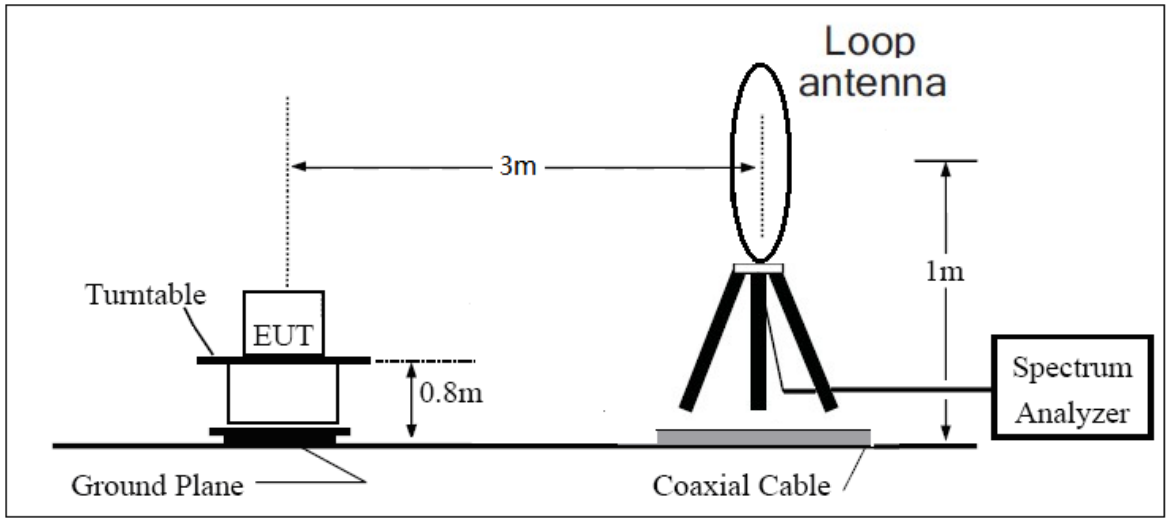
During the test, below 30MHz, the center of the loop shall be 1 meters; above 30MHz, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum 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:
Below 1GHz (detector: Peak and Quasi-Peak)
RBW=100 kHz / VBW=300 kHz / Sweep=AUTO
Above 1GHz (detector: Peak):
(a) PEAK: RBW=1MHz VBW=3MHz/ Sweep=AUTO
(b) AVERAGE: RBW=1MHz / VBW=3MHz / Sweep=AUTO

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 stand-up position (Z axis) and the worst case was recorded.

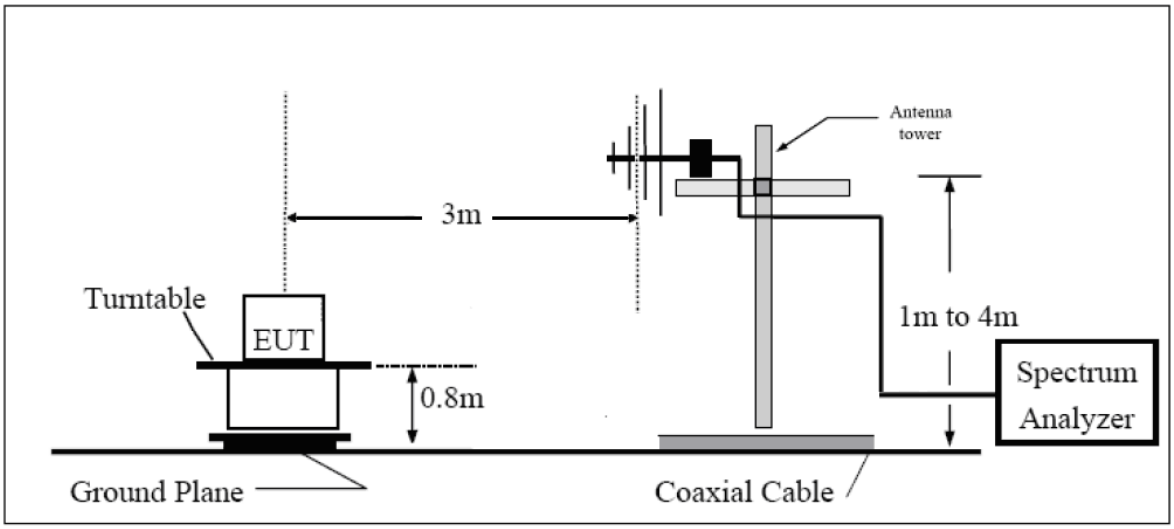
The test is in transmitting mode NFC-A, NFC-B, NFC-F and NFC-V, choose worst mode NFC-A in report.

Test setup

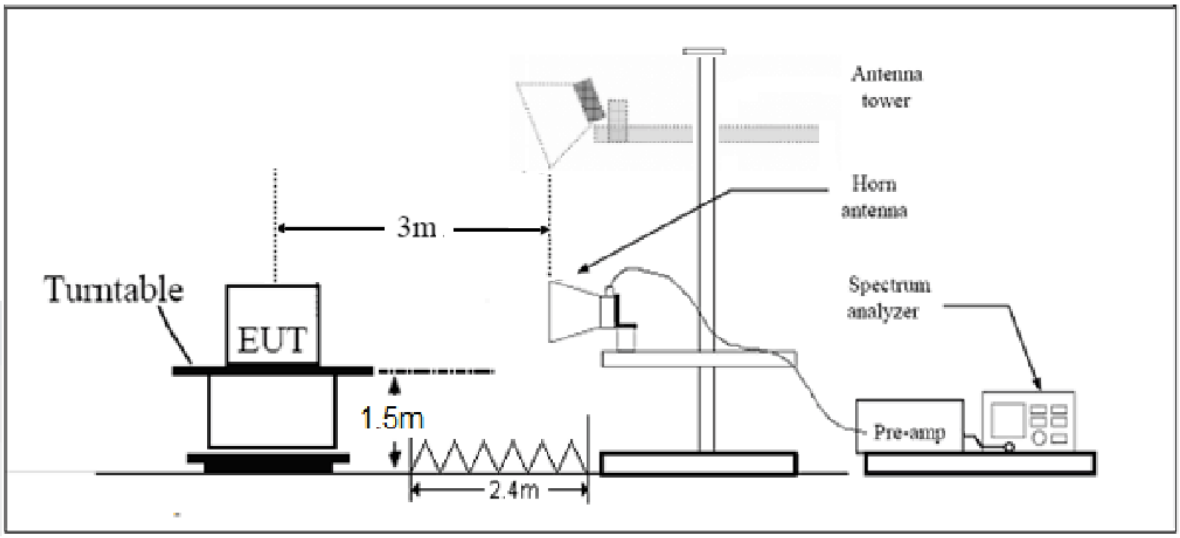
9kHz~~~ 30MHz



30MHz~~~ 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

Limits

Clause 15.225(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.
Clause 15.225(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.
Clause 15.225(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.
Clause 15.225(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.
§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency of emission (MHz)	Field strength(uV/m)	Field strength(dBuV/m)
0.009–0.490	2400/F(kHz)	128.519dBuV/m -93.8dBuV/m
0.490–1.705	24000/F(kHz)	73.8dBuV/m -62.969dBuV/m
1.705–30.0	30	69.5 dBuV/m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above960	500	54

All measurements were performed using a loop antenna. The antenna was positioned in three orthogonal positions (X front, Y side, Z top) and the position with the highest emission level was recorded.
When using other measurement distance, according to the standard C63.10, If that point is closer to the EUT than λ/2π and the limit distance is greater than λ/2π, the data was extrapolated to the specified measurement distance of 30m using extrapolation factor as specified in §6.4.4.2. Extrapolation Factor = 40log(d near filed/ d measure)+20log(d limit / d near filed)
**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permItted under other sections of this part, e.g., §§15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

§15.209 (d) 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.

Measurement Uncertainty

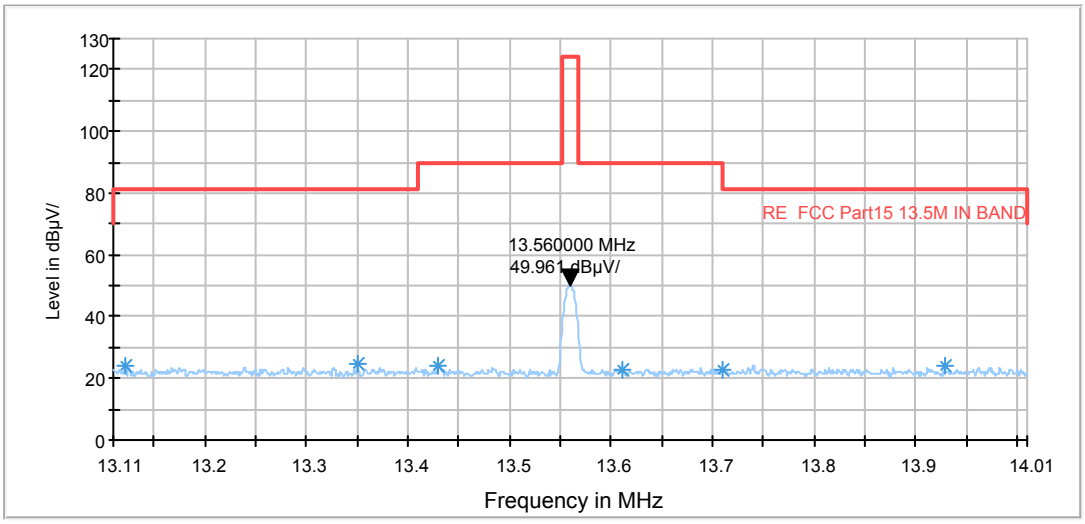
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96.

Frequency	Uncertainty
9kHz-30MHz	3.55 dB
30MHz-200MHz	4.19 dB
200MHz-1GHz	3.63 dB
Above 1GHz	3.68 dB

Test result

In-band

FCC RE Part15C 13.56M



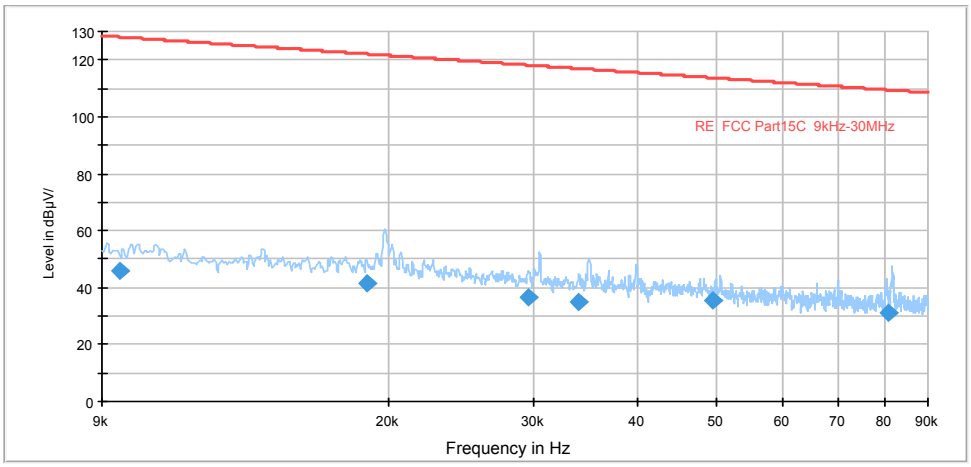
Radiates Emission from 13.11MHz to 14.01MHz

Note: This graph displays the maximum values of horizontal and vertical by software

Out-of-band

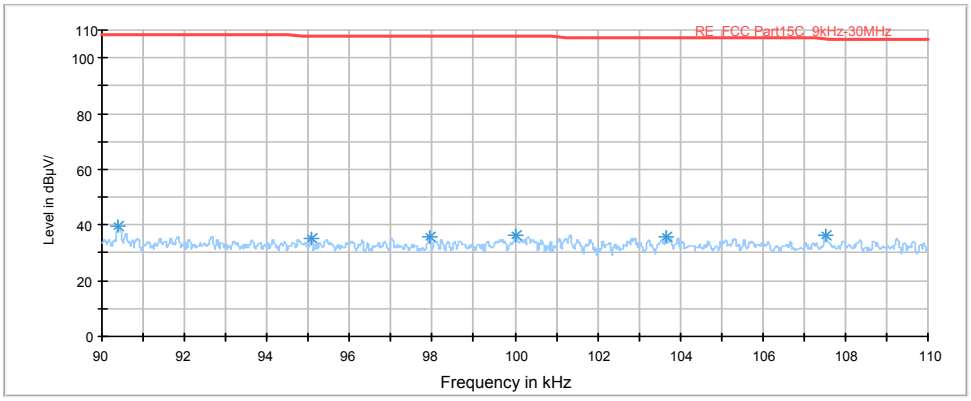
The following graphs display the maximum values of horizontal and vertical by software.
For above 1GHz, Blue trace uses the peak detection, Green trace uses the average detection.

FCC RE 9K-90KHz AV



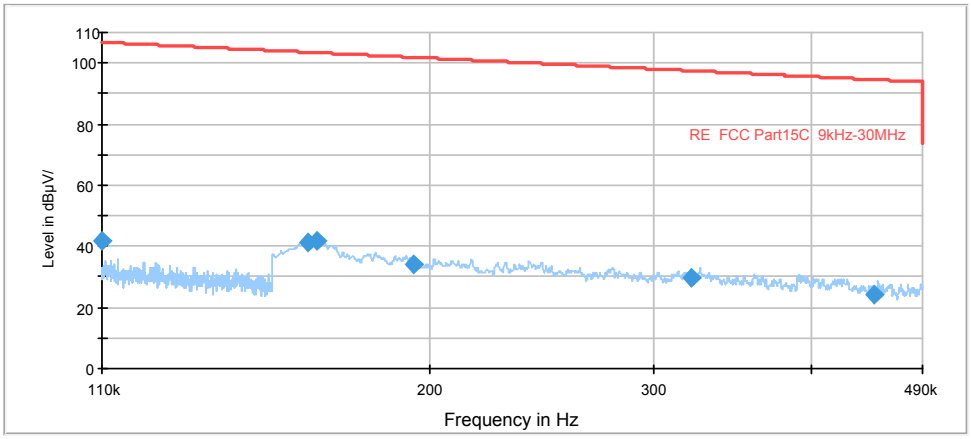
Radiates Emission from 9kHz to 90kHz

FCC RE 90K-110KHz QP



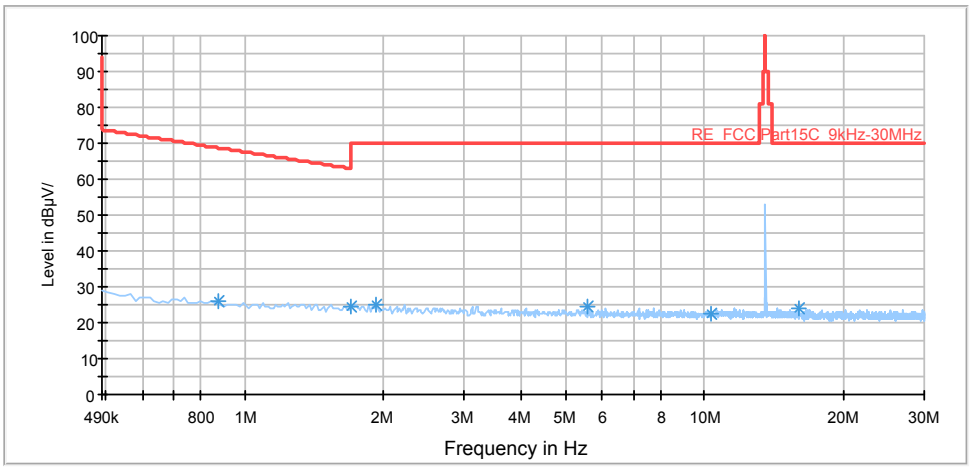
Radiates Emission from 90kHz to 110kHz

FCC RE 110K-490KHz AV



Radiates Emission from 110kHz to 490kHz

FCC RE 490K-30MHz QP



Radiates Emission from 490kHz to 30MHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
0.873630	26.0	100.0	V	0.0	6.6	19.4	42.2	68.16
1.699910	24.3	100.0	V	134.0	5.1	19.2	43.7	68.00
1.935990	25.2	100.0	V	0.0	6.1	19.1	44.3	69.5
5.580475	24.6	100.0	V	0.0	5.4	19.2	44.9	69.5
15.997505	23.9	100.0	V	0.0	4.4	19.5	45.6	69.5
10.361095	22.7	100.0	V	0.0	3.2	19.5	46.8	69.5

Remark: 1. Quasi-Peak = Reading value + Correction factor

2. Correction Factor = Antenna factor+ Insertion loss (cable loss+amplifier gain)

3. Margin = Limit – Quasi-Peak

5.4. Conducted Emission

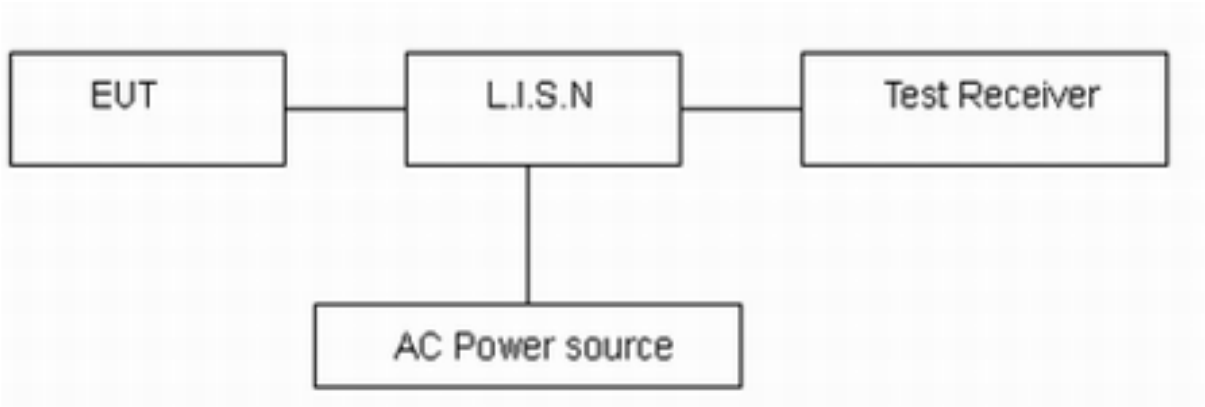
Ambient condition

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

Methods of Measurement

The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.10-2013. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9 kHz, VBW is set to 30kHz. The measurement result should include both L line and N line.
The test is in transmitting mode.

Test Setup



Note: AC Power source is used to change the voltage 110V/60Hz.

Limits

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency (MHz)	Conducted Limits(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.		

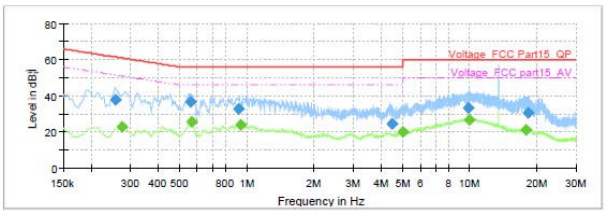
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96, U= 2.69 dB.

Test Results:

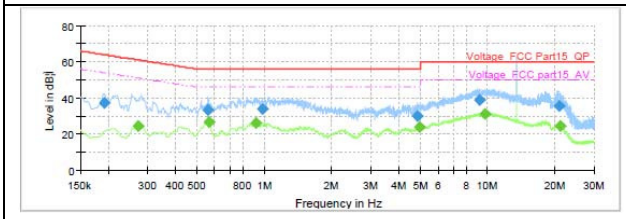
Following plots, Blue trace uses the peak detection and Green trace uses the average detection.

L Line



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.258000	37.53	---	61.50	23.96	1000.0	9.000	L1	ON	19.7
0.276000	---	22.51	50.94	28.42	1000.0	9.000	L1	ON	19.6
0.561750	36.79	---	56.00	19.21	1000.0	9.000	L1	ON	19.6
0.564000	---	25.40	46.00	20.60	1000.0	9.000	L1	ON	19.6
0.912750	32.92	---	56.00	23.08	1000.0	9.000	L1	ON	19.6
0.935250	---	23.80	46.00	22.20	1000.0	9.000	L1	ON	19.6
4.458750	24.52	---	56.00	31.48	1000.0	9.000	L1	ON	19.7
5.030250	---	20.02	50.00	29.98	1000.0	9.000	L1	ON	19.7
9.906000	33.47	---	60.00	26.53	1000.0	9.000	L1	ON	19.9
9.957750	---	26.72	50.00	23.28	1000.0	9.000	L1	ON	19.9
17.979000	---	21.06	50.00	28.94	1000.0	9.000	L1	ON	20.0
18.244500	30.44	---	60.00	29.56	1000.0	9.000	L1	ON	20.0

N Line



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.192750	36.98	---	63.92	26.93	1000.0	9.000	N	ON	19.7
0.273750	---	24.67	51.00	26.33	1000.0	9.000	N	ON	19.6
0.557250	33.07	---	56.00	22.93	1000.0	9.000	N	ON	19.6
0.564000	---	26.90	46.00	19.10	1000.0	9.000	N	ON	19.6
0.912750	---	26.08	46.00	19.92	1000.0	9.000	N	ON	19.6
0.978000	34.13	---	56.00	21.87	1000.0	9.000	N	ON	19.6
4.827750	29.91	---	56.00	26.10	1000.0	9.000	N	ON	19.7
4.962750	---	24.08	46.00	21.92	1000.0	9.000	N	ON	19.7
9.217500	38.98	---	60.00	21.02	1000.0	9.000	N	ON	19.9
9.701250	---	31.07	50.00	18.93	1000.0	9.000	N	ON	19.9
20.971500	35.53	---	60.00	24.47	1000.0	9.000	N	ON	19.9
21.113250	---	24.66	50.00	25.34	1000.0	9.000	N	ON	19.9

6. Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Time
Spectrum Analyzer	R&S	FSV30	100815	2017-12-15	2018-12-14
EMI Test Receiver	R&S	ESCI	100948	2017-05-20	2018-05-19
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	9163-201	2017-11-18	2020-11-17
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2014-12-06	2019-12-05
EMI Test Receiver	R&S	ESCS30	100138	2017-12-15	2018-12-14
LISN	R&S	ENV216	101171	2016-12-16	2019-12-15
Spectrum Analyzer	Agilent	N9020A	MY52330084	2017-05-14	2018-05-13
RF Cable	Agilent	SMA 15cm	0001	/	/

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