RF TEST REPORT

Report No.: 17070855-FCC-R5

Supersede Report No.:N/A

Applicant	i.safe MOBILE GmbH
Product Name	WCDMA DIGITAL MOBILE PHONE
Model No.	IS320.1
Serial No.	N/A
Test Standard	FCC Part 15.225: 2015; ANSI C63.10: 2013
Test Date	September 07 to 24, 2017
Issue Date	September 25, 2017
Test Result	☑ Pass ☐ Fail
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Loren Luo	David Huang	
Loren Luo Test Engineer	David Huang Checked By	

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Test result presented in this test report is applicable to the tested sample only

Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

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Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC, RF/Wireless, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
17070855-FCC-R5	NONE	Original	September 25, 2017

2. Customer information

Applicant Name	i.safe MOBILE GmbH
Applicant Add	I_PARK TAUBERFRANKEN 10 97922 Lauda-Koenigshofen Germany
Manufacturer	i.safe MOBILE GmbH
Manufacturer Add	I_PARK TAUBERFRANKEN 10 97922 Lauda-Koenigshofen Germany

3. Test site information

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES
Lab Address	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108
FCC Test Site No.	535293
IC Test Site No.	4842E-1
Test Software	Radiated Emission Program-To Shenzhen v2.0

4. Equipment under Test(EUT) Information

Description of EUT:	WCDMA DIGITAL MOBILE PHONE
Main Model:	IS320.1
Serial Model:	N/A
Date EUT received:	September 06, 2017
Test Date(s):	September 07 to 24, 2017
Equipment Category :	DXX
Antenna Gain:	GSM850: -0.9dBi PCS1900: 0.72dBi UMTS-FDD Band V: -0.9dBi UMTS-FDD Band II: 0.72dBi WIFI: 1.14dBi Bluetooth/BLE: 1.14dBi GPS: 15dBi
Type of Modulation:	GSM / GPRS: GMSK EGPRS: GMSK,8PSK UMTS-FDD: QPSK 802.11b/g/n: DSSS, OFDM Bluetooth: GFSK, π /4DQPSK, 8DPSK BLE: GFSK GPS:BPSK RFID: ASK
RF Operating Frequency (ies):	GSM850 TX: 824.2 ~ 848.8 MHz; RX: 869.2 ~ 893.8 MHz PCS1900 TX: 1850.2 ~ 1909.8 MHz; RX: 1930.2 ~ 1989.8 MHz UMTS-FDD Band V TX: 826.4 ~ 846.6 MHz; RX: 871.4 ~ 891.6 MHz UMTS-FDD Band II TX:1852.4 ~ 1907.6 MHz; RX: 1932.4 ~ 1987.6 MHz WIFI: 802.11b/g/n(20M): 2412-2462 MHz WIFI: 802.11n(40M): 2422-2452 MHz Bluetooth& BLE: 2402-2480 MHz

	GPS: 1575.42 MHz RFID: 13.56MHz
Port:	USB Port, Earphone Port
Number of Channels:	GSM 850: 124CH PCS1900: 299CH UMTS-FDD Band V: 102CH UMTS-FDD Band II: 277CH WIFI :802.11b/g/n(20M): 11CH WIFI :802.11n(40M): 7CH Bluetooth: 79CH BLE: 40CH GPS:1CH RFID: 1CH (ASK)
Input Power:	Adapter: Model: ICP12-050-2000B Input: AC100-240V~50/60Hz,0.3A Output: DC 6.0V,2000mA Battery: Spec: 3.7V, 1900mAh, 7.03Wh Voltage: 4.2V
Trade Name :	N/A
GPRS/ EGPRS Multi-slot class	8/10/11/12
FCC ID:	2AACZ-IS3201

4. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

FCC Rules	Description of Test	Result
15.203	Antenna Requirement	Pass
15.215(c)	20 dB Bandwidth&99% Occupied Bandwidth	Pass
15.225(a), 15.225(b), 15.225(c)	Field Strength Measurement	Pass
15.207(a)	Conducted Emissions	Pass
15.225(d),15.209	Radiated Emissions(Tx)	Pass
15.225(e)	Frequency Stability	Pass

5. Measurements, Examination And Derived Results

5.1 Antenna Requirement

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.
The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.

b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.
And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has 3 antennas:
A permanently attached PIFA antenna for GSM/PCS/ UMTS-FDD Band II, the gain is -0.9dBi for GSM850, the gain is 0.72dBi for PCS1900/UMTS-FDD Band II.
A permanently attached PIFA antenna for Bluetooth/BLE/WIFI/GPS, the gain is 1.14dBi for WIFI/Bluetooth/BLE, the gain is 15dBi for GPS.

Result: Compliance.

5. 2 20 dB Bandwidth&99% Occupied Bandwidth

Temperature	25 °C
Relative Humidity	57%
Atmospheric Pressure	1018mbar
Test date :	September 19, 2017
Tested By :	Loren Luo

1. Conducted Measurement
   EUT was set for low, mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 9kHz – 40GHz is ±1.5dB.

Standard Requirement:

The bandwidth of a frequency hopping channel is the 20 dB emission bandwidth, measured with the hopping stopped. The system RF bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The hopset shall be such that the near-term distribution of frequencies appears random, with sequential hops randomly distributed in both direction and magnitude of change in the hopset while the long-term distribution appears evenly distributed.

Procedures:

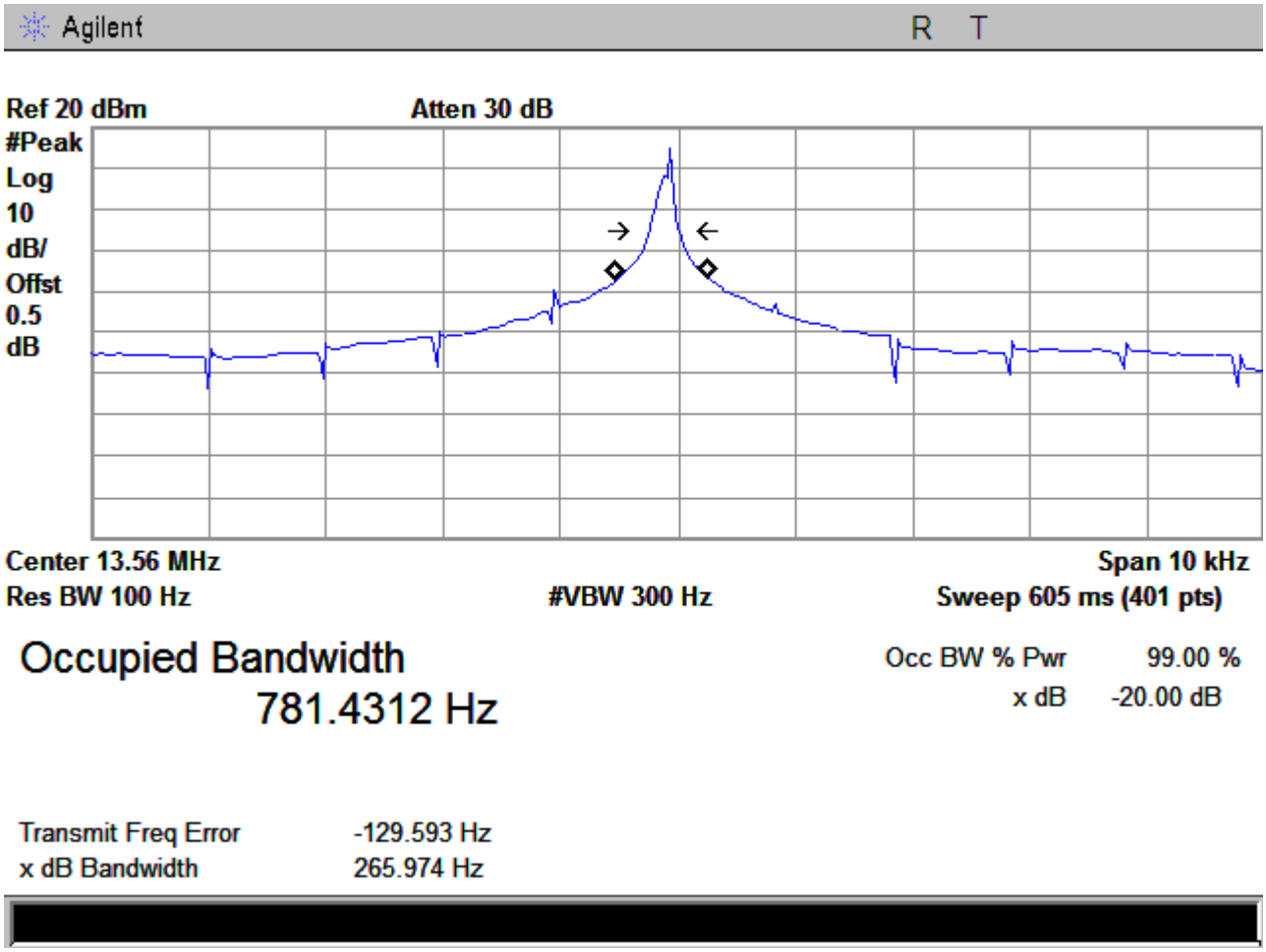
1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel, RBW ≥ 1% of the 20 dB bandwidth, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold.
4. Set the measured low, middle and high frequency and test 20dB bandwidth with spectrum analyzer.

Test Result: Pass

Test Mode:	Transmitting

Frequency (MHz)	20dB Bandwidth (KHz)	Test Result
13.56	265.974	PASS

The 20dB&99% bandwidth:



13.56MHz

5. 3 Field Strength Measurement

Temperature	27 °C
Relative Humidity	55%
Atmospheric Pressure	1023mbar
Test date :	September 22, 2017
Tested By :	Loren Luo

1. Radiated Measurement

   EUT was set for low, mid, high channel with modulated mode and highest RF output power.

2. Radiated Emissions Measurement Uncertainty

   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 9KHz – 40GHz is ±1.5dB.

Test Requirement:

The field strength of any emission shall not exceed the following limits:

a. 15.848 microvolts/m (84 dBμ V/m) at 30 m, within the band 13.553– 13.567 MHz.

b. 334 microvolts/m (50.5 dBμ V/m) at 30 m, within the bands 13.410– 13.553 MHz and 13.567– 13.710 MHz.

c. 106 microvolts/m (40.5 dBμ V/m) at 30 m, within the bands 13.110– 13.410 MHz and 13.710– 14.010 MHz.

d. 30 microvolts/m (29.5 dBμ V/m) at 30 m, outside the band 13.110– 14.010 MHz.

Carrier frequency stability shall be maintained to ±0.01% (±100 ppm).

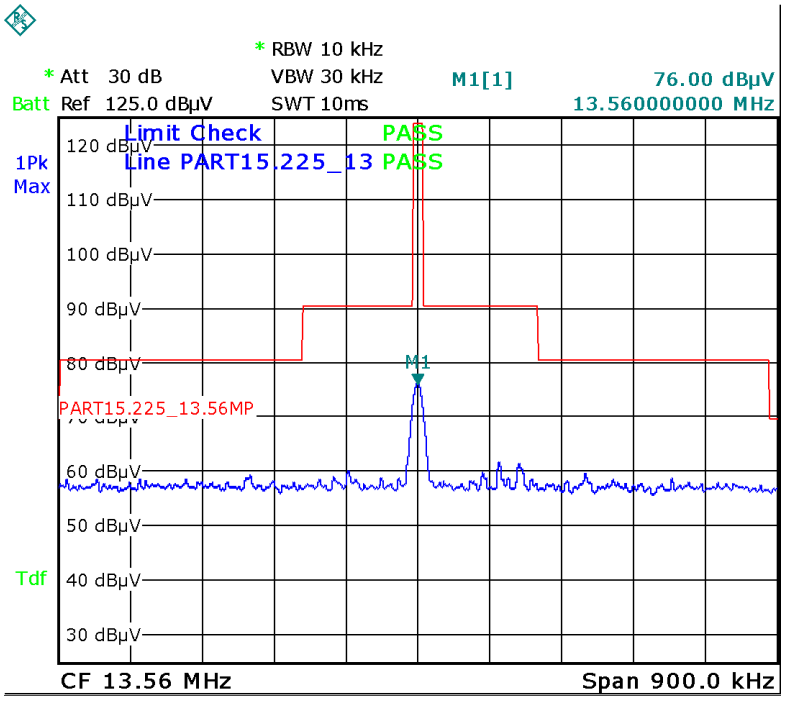
Test Result: Pass

Test Mode:	Transmitting

Fundamental Field Strength:

1 MHz- 30 MHz

Loop Antenna at 0 degree：



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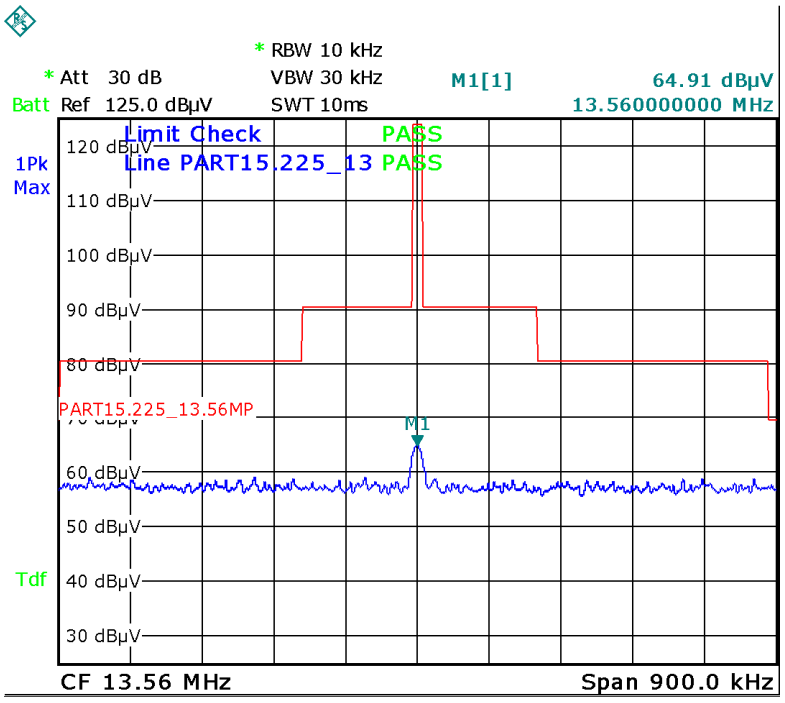
Loop Antenna at 90 degree：



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5. 4 Conducted emissions Test Result

Temperature	25 °C
Relative Humidity	51%
Atmospheric Pressure	1020mbar
Test date :	September 14, 2017
Tested By :	Loren Luo

Standard Requirement:

Frequency of emission (MHz)	Conducted limit (dBμ V)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

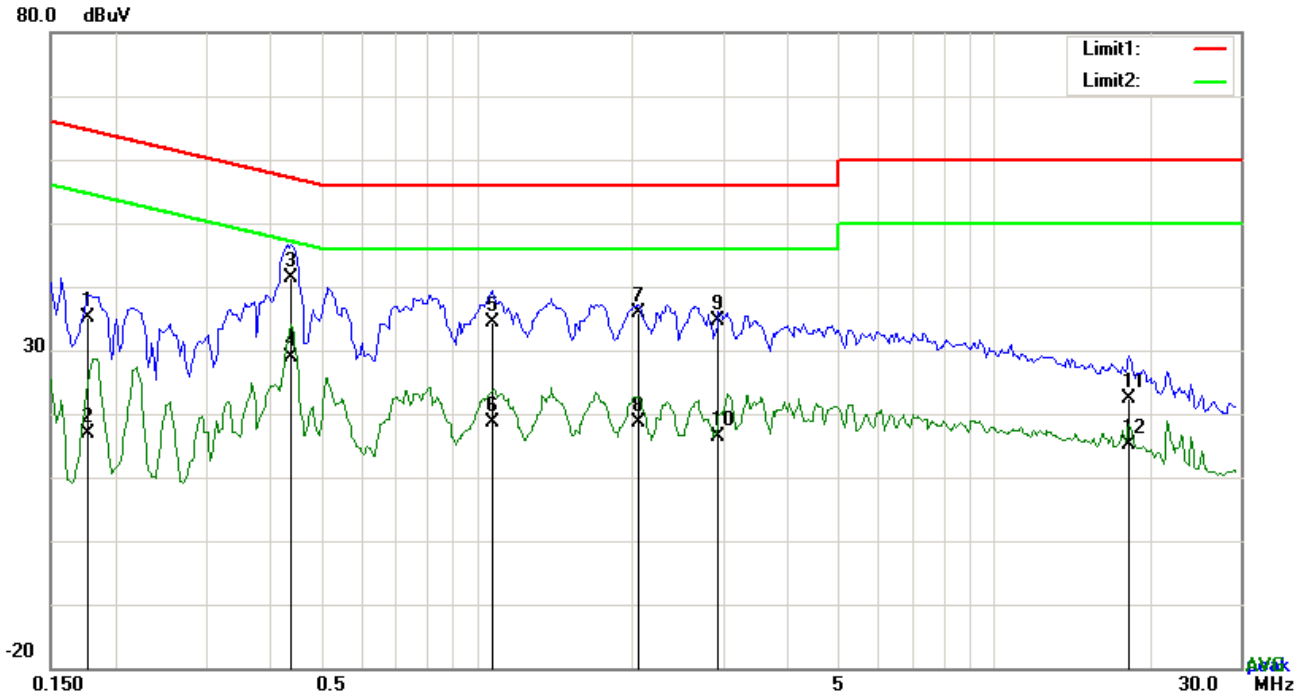
*Decreases with the logarithm of the frequency.

Procedures:

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR and Average detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 9kHz – 30MHz (Average & Quasi-peak) is ±3.5dB.

Test Result: Pass

Test Mode:	Running

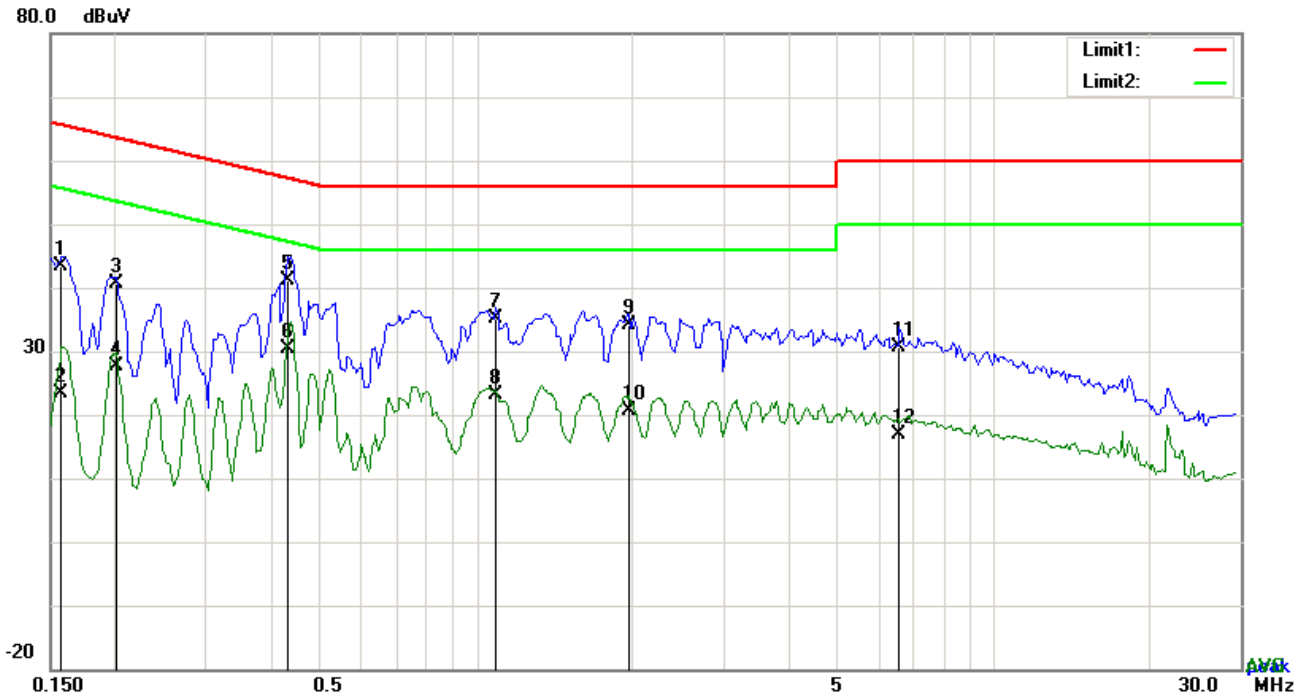


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	L1	0.1773	25.16	QP	10.02	35.18	64.61	-29.43
2	L1	0.1773	6.93	AVG	10.02	16.95	54.61	-37.66
3	L1	0.4386	31.29	QP	10.02	41.31	57.09	-15.78
4	L1	0.4386	18.75	AVG	10.02	28.77	47.09	-18.32
5	L1	1.0743	24.26	QP	10.03	34.29	56.00	-21.71
6	L1	1.0743	8.54	AVG	10.03	18.57	46.00	-27.43
7	L1	2.0610	25.76	QP	10.04	35.80	56.00	-20.20
8	L1	2.0610	8.52	AVG	10.04	18.56	46.00	-27.44
9	L1	2.9307	24.51	QP	10.05	34.56	56.00	-21.44
10	L1	2.9307	6.42	AVG	10.05	16.47	46.00	-29.53
11	L1	18.2412	12.13	QP	10.24	22.37	60.00	-37.63
12	L1	18.2412	4.80	AVG	10.24	15.04	50.00	-34.96

Test Mode:	Running

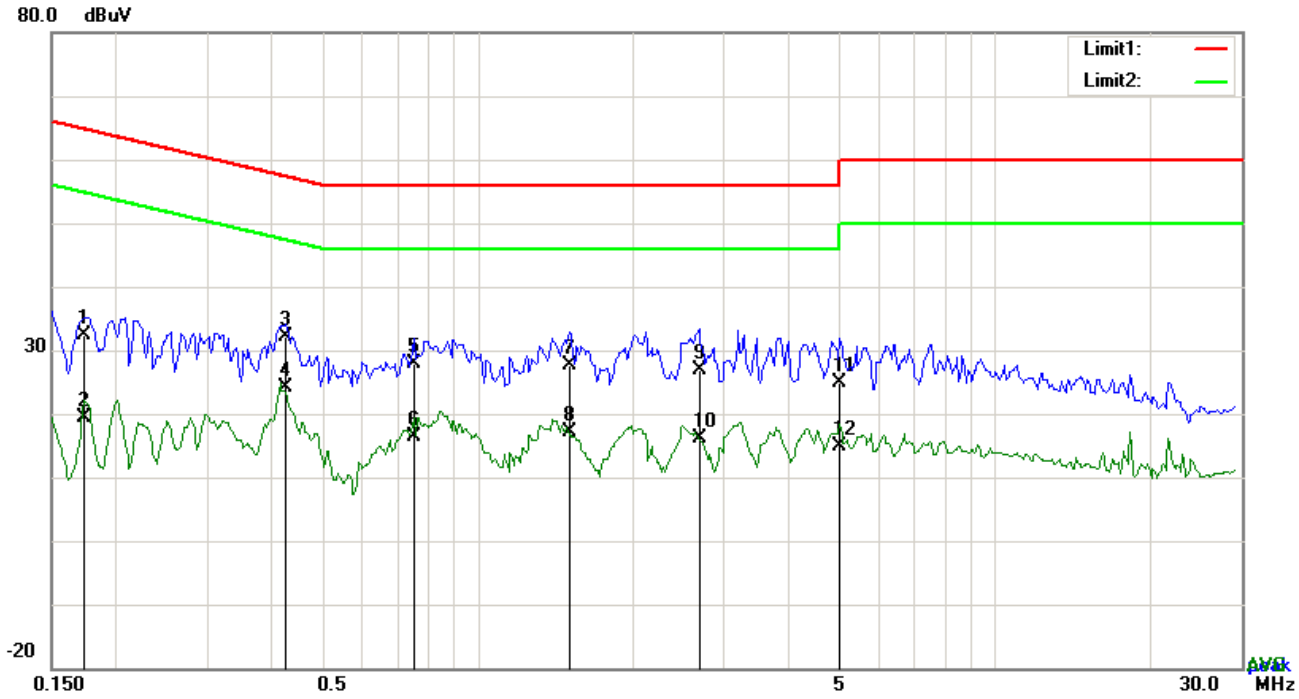


Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	N	0.1578	33.48	QP	10.02	43.50	65.58	-22.08
2	N	0.1578	13.44	AVG	10.02	23.46	55.58	-32.12
3	N	0.2007	30.63	QP	10.02	40.65	63.58	-22.93
4	N	0.2007	17.57	AVG	10.02	27.59	53.58	-25.99
5	N	0.4308	31.07	QP	10.02	41.09	57.24	-16.15
6	N	0.4308	20.27	AVG	10.02	30.29	47.24	-16.95
7	N	1.0899	25.05	QP	10.03	35.08	56.00	-20.92
8	N	1.0899	13.06	AVG	10.03	23.09	46.00	-22.91
9	N	1.9713	23.98	QP	10.04	34.02	56.00	-21.98
10	N	1.9713	10.47	AVG	10.04	20.51	46.00	-25.49
11	N	6.5763	20.56	QP	10.09	30.65	60.00	-29.35
12	N	6.5763	6.68	AVG	10.09	16.77	50.00	-33.23

Test Mode:	Running

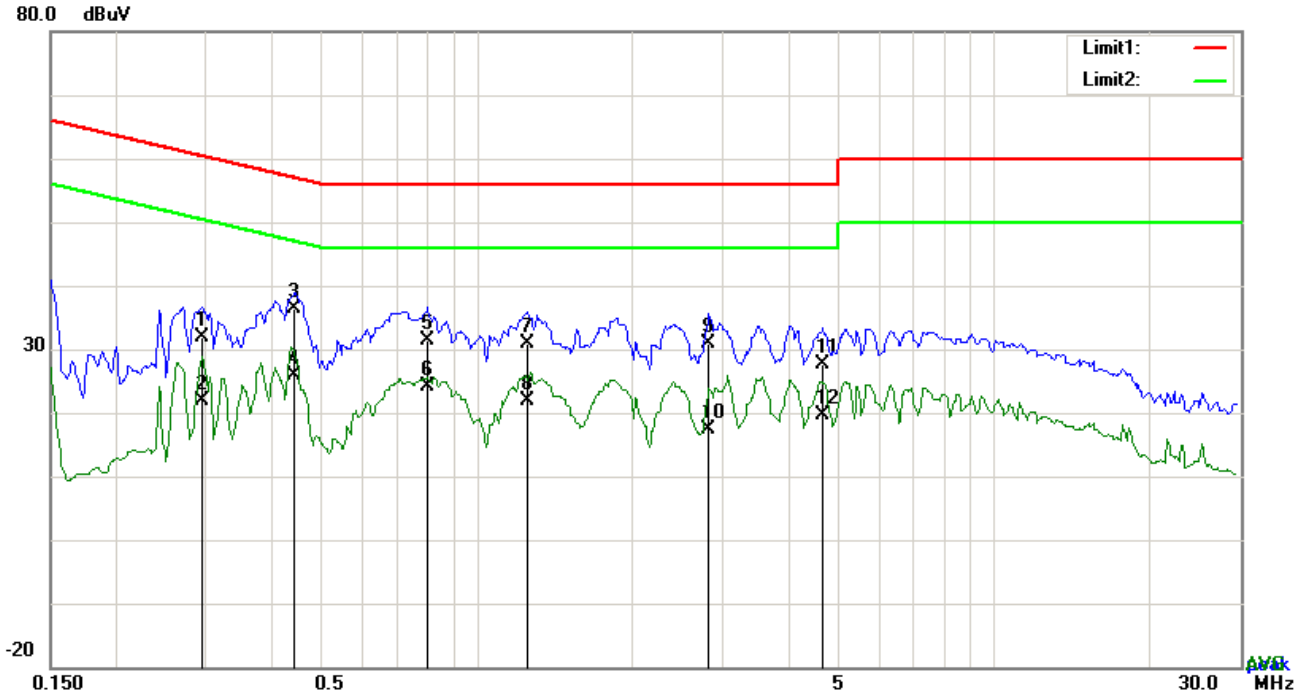


Test Data

Phase Line Plot at 240Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	L1	0.1734	22.36	QP	10.02	32.38	64.80	-32.42
2	L1	0.1734	9.39	AVG	10.02	19.41	54.80	-35.39
3	L1	0.4269	22.16	QP	10.02	32.18	57.31	-25.13
4	L1	0.4269	14.00	AVG	10.02	24.02	47.31	-23.29
5	L1	0.7545	17.88	QP	10.03	27.91	56.00	-28.09
6	L1	0.7545	6.23	AVG	10.03	16.26	46.00	-29.74
7	L1	1.5111	17.60	QP	10.04	27.64	56.00	-28.36
8	L1	1.5111	7.04	AVG	10.04	17.08	46.00	-28.92
9	L1	2.6811	16.85	QP	10.05	26.90	56.00	-29.10
10	L1	2.6811	6.13	AVG	10.05	16.18	46.00	-29.82
11	L1	5.0163	14.93	QP	10.07	25.00	60.00	-35.00
12	L1	5.0163	4.85	AVG	10.07	14.92	50.00	-35.08

Test Mode:	Running



Test Data

Phase Neutral Plot at 240Vac, 60Hz

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	N	0.2943	21.77	QP	10.02	31.79	60.40	-28.61
2	N	0.2943	11.84	AVG	10.02	21.86	50.40	-28.54
3	N	0.4464	26.37	QP	10.02	36.39	56.94	-20.55
4	N	0.4464	15.93	AVG	10.02	25.95	46.94	-20.99
5	N	0.8052	21.25	QP	10.03	31.28	56.00	-24.72
6	N	0.8052	14.21	AVG	10.03	24.24	46.00	-21.76
7	N	1.2537	20.89	QP	10.03	30.92	56.00	-25.08
8	N	1.2537	11.86	AVG	10.03	21.89	46.00	-24.11
9	N	2.8137	20.87	QP	10.05	30.92	56.00	-25.08
10	N	2.8137	7.42	AVG	10.05	17.47	46.00	-28.53
11	N	4.6887	17.53	QP	10.07	27.60	56.00	-28.40
12	N	4.6887	9.61	AVG	10.07	19.68	46.00	-26.32

5. 5 Radiated Emissions (TX)

Temperature	25 °C
Relative Humidity	51%
Atmospheric Pressure	1020mbar
Test date :	September 14, 2017
Tested By :	Loren Luo

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 1 MHz – 1GHz (3m & 10m) & 1GHz above (3m) is +5.6/-4.5dB.

Standard Requirement:

The emissions from the Low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges.

The spurious emission scanned frequency range is 1MHz - 1000 MHz.

Test Result: Pass

1 MHz-30 MHz

Loop Antenna at 0 degree:

@ 3M

Test Conditions (℃)	Frequency (MHz)	Peak (Corrected) (dBuV/m)	Factor (dB)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
T Min(0 ℃)	13.56MHz	75.42	16.24	315	124	-48.58
T Normal (23 ℃)	13.56MHz	76	16.32	75	124	-48
T Max(40 ℃)	13.56MHz	74.13	16.75	119	124	-49.87

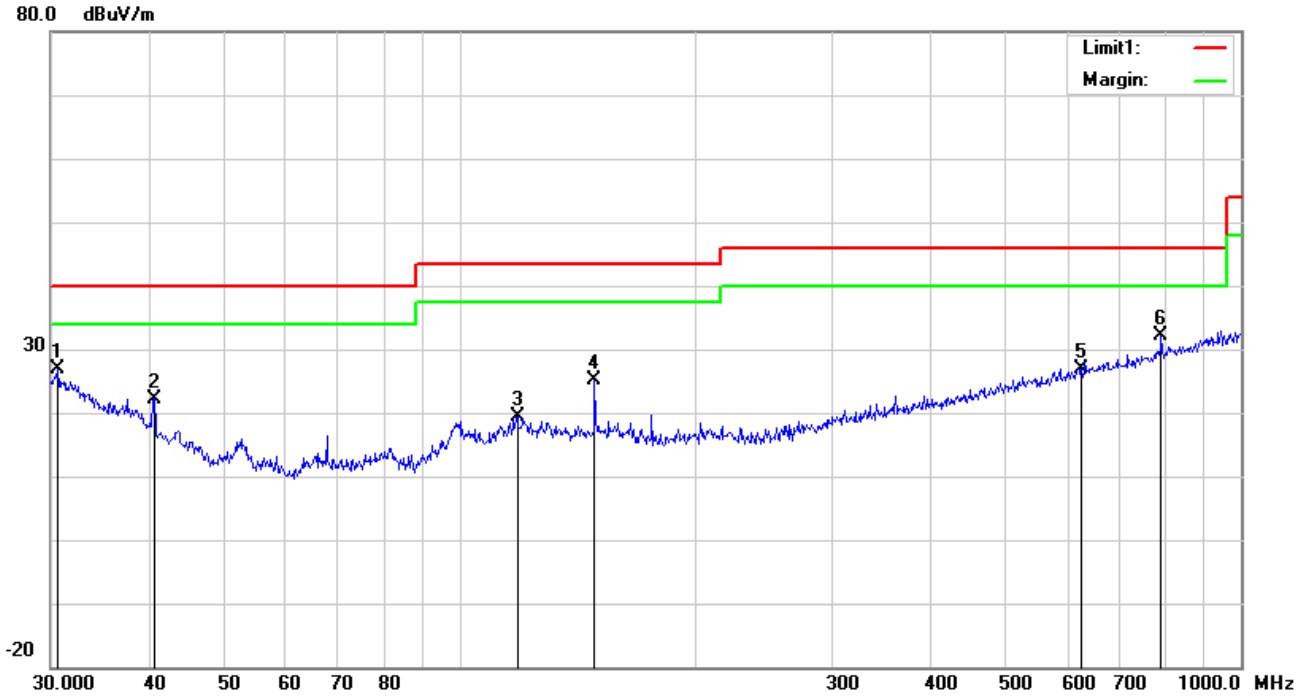
Loop Antenna at 90 degree:

@ 3M

Test Conditions (℃)	Frequency (MHz)	Peak (Corrected) (dBuV/m)	Factor (dB)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
T Min(0 ℃)	13.56MHz	62.85	16.21	174	124	-61.15
T Normal (23 ℃)	13.56MHz	64.91	16.42	11	124	-59.09
T Max(40 ℃)	13.56MHz	63.27	16.57	264	124	-60.73

Test Mode:	Transmitting

30-1GHz

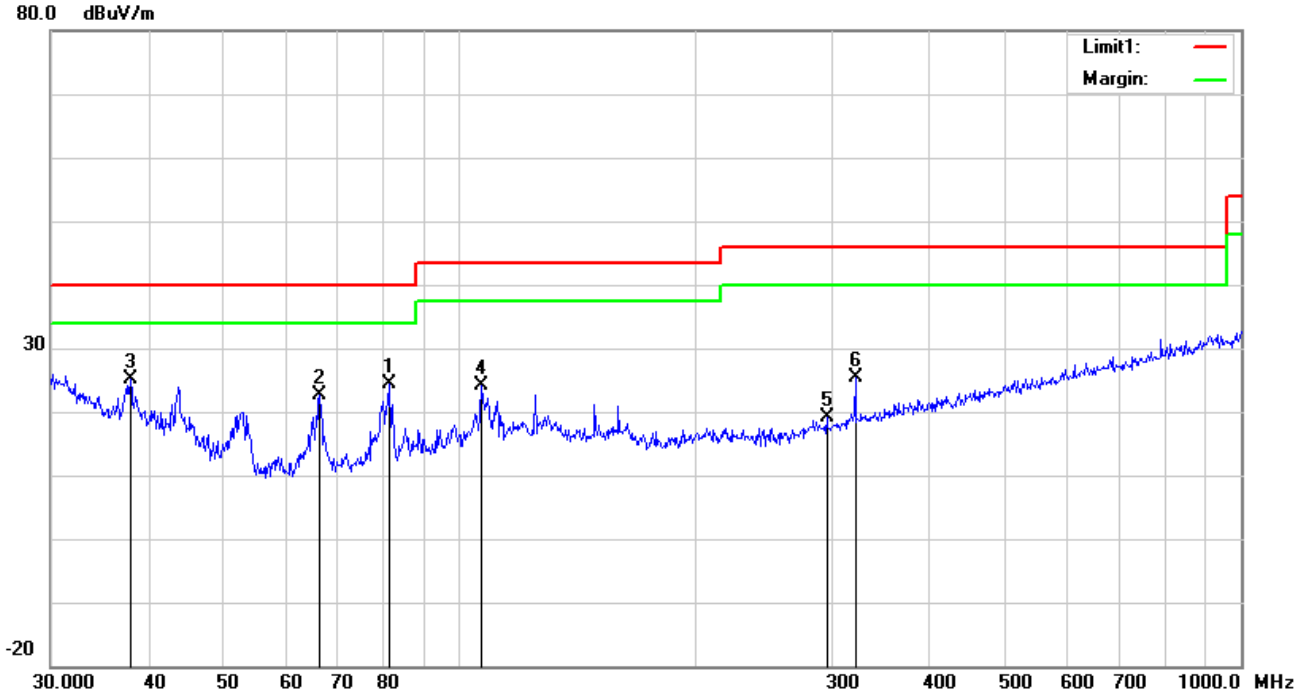


Test Data

Horizontal Polarity Plot @3m

No.	P/L	Frequency	Reading	Detector	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
		(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( )
1	H	30.6379	27.54	peak	20.91	22.28	0.64	26.81	40.00	-13.19	100	51
2	H	40.7016	30.25	peak	13.44	22.28	0.78	22.19	40.00	-17.81	100	168
3	H	118.6014	27.00	peak	13.66	22.36	1.16	19.46	43.50	-24.04	100	336
4	H	148.9625	33.49	peak	12.60	22.35	1.33	25.07	43.50	-18.43	100	256
5	H	625.0780	26.58	peak	19.38	21.52	2.56	27.00	46.00	-19.00	100	28
6	H	790.6188	29.06	peak	21.29	21.17	2.94	32.12	46.00	-13.88	100	187

30-1GHz



Test Data

Vertical Polarity Plot @3m

No.	P/L	Frequency	Reading	Detector	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
		(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( )
1	V	81.2117	38.04	peak	7.65	22.41	1.05	24.33	40.00	-15.67	100	104
2	V	66.2662	36.56	peak	7.61	22.39	0.91	22.69	40.00	-17.31	100	66
3	V	37.9450	31.14	peak	15.40	22.27	0.78	25.05	40.00	-14.95	100	350
4	V	106.7587	33.78	peak	11.58	22.33	1.15	24.18	43.50	-19.32	100	42
5	V	295.1469	26.19	peak	13.39	22.29	1.78	19.07	46.00	-26.93	100	80
6	V	321.0608	31.68	peak	14.04	22.23	1.90	25.39	46.00	-20.61	100	281

5. 6 Frequency Stability

Temperature	25 °C
Relative Humidity	57%
Atmospheric Pressure	1018mbar
Test date :	September 19, 2017
Tested By :	Loren Luo

Requirement(s): 47 CFR §15.225(e)

Procedures: Frequency Stability was measured according to 47 CFR§2.1055. Measurement was taken with spectrum analyzer. The spectrum analyzer bandwidth and span was set to read in hertz. A voltmeter was used to monitor when varying the voltage.

Limit: ±0.01% of 13.56MHz=1356Hz

The result: Pass

Frequency Stability versus Temperature: The Frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of -20oC to +50oC at normal supply voltage.

Reference Frequency: 13.56MHz at -20°C to +50°C 3.7V AC

Temperature (°C)	Measured Freq. (MHz)	Freq. Drift (Hz)	Freq. Deviation (Limit: 0.01%)	Pass/Fail
50	13.5602	300	< 0.01	Pass
40	13.5606	400	< 0.01	Pass
30	13.5604	600	< 0.01	Pass
20	13.5607	500	< 0.01	Pass
10	13.5605	600	< 0.01	Pass
0	13.5605	300	< 0.01	Pass
-10	13.5603	400	< 0.01	Pass
-20	13.5608	200	< 0.01	Pass

Frequency Stability versus Input Voltage: The frequency tolerance of the carrier signal shall be maintained within ±0.01%, the frequency of the transmitter was measured at 85% and at 115% of the rated power supply voltage at 20°C environmental temperature.

Carrier Frequency: 13.56MHz at 20°C at 3.7 V AC

Measured Voltage ±15% of nominal(DC)	Measured Freq. (MHz)	Freq. Drift (Hz)	Freq. Deviation (Limit: 0.01%)	Pass/Fail
10.8	13.5605	400	< 0.01	Pass
13.2	13.5602	700	< 0.01	Pass

Annex A. TEST INSTRUMENT

Annex A. i.EST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted					
EMI test receiver	ESCS30	8471241027	09/16/2016	09/15/2017	☑
Line Impedance	LI-125A	191106	09/24/2016	09/23/2017	☑
Line Impedance	LI-125A	191107	09/24/2016	09/23/2017	☑
LISN	ISN T800	34373	09/24/2016	09/23/2017	☑
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/23/2016	09/22/2017	☑
Transient Limiter	LIT-153	531118	08/30/2017	08/29/2018	☑
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/16/2016	09/15/2017	☑
Power Splitter	1#	1#	08/30/2017	08/29/2018	☑
DC Power Supply	E3640A	MY40004013	09/16/2016	09/15/2017	☑
Temperature/Humidity	UHL-270	001	10/08/2016	10/07/2017	☑
Radiated Emissions					
EMI test receiver	ESL6	100262	09/16/2016	09/15/2017	☑
Positioning Controller	UC3000	MF780208282	11/18/2016	11/17/2017	☑
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	08/30/2017	08/29/2018	☑
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/23/2017	03/22/2018	☑
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/20/2016	09/19/2017	☑
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/23/2016	09/22/2017	☑
Universal Radio Communication Tester	CMU200	121393	09/23/2016	09/22/2017	☑
Active loop antenna	AL-130	121031	08/14/2016	08/13/2017	☑

Annex A. ii RADIATED EMISSIONS TEST DESCRIPTION

Limit

1. 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 (MHz)	Field Strength (mV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

Remark: 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., Sections 15.231 and 15.241.

2. In the above emission table, the tighter limit applies at the band edges.

Frequency (Hz)	Field Strength (μ V/m at 3-meter)	Field Strength (dBμ V/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

EUT Characterisation

EUT characterisation, over the frequency range from 30MHz to 10th Harmonic, was done in order to minimise radiated emissions testing time while still maintaining high confidence in the test results.

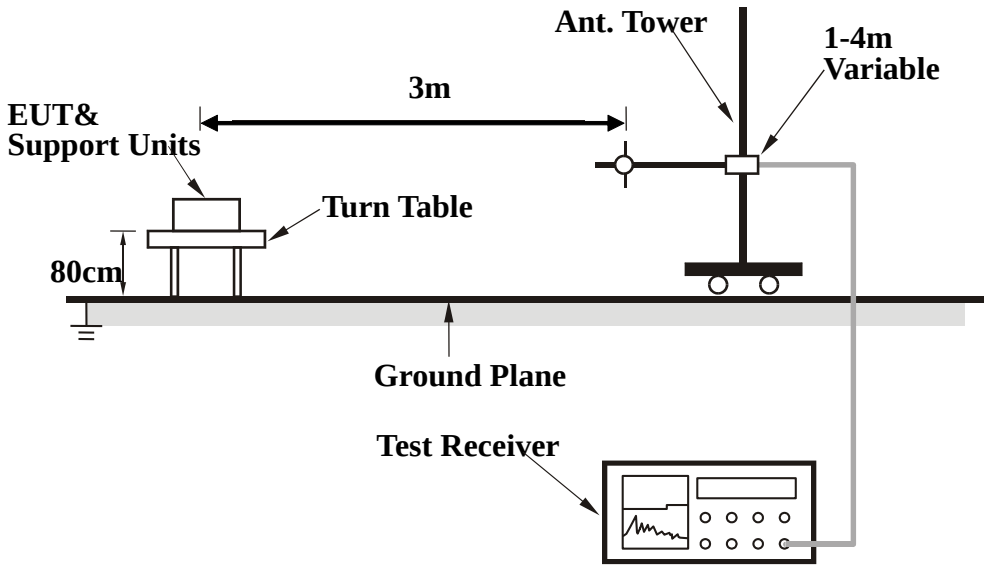
The EUT was placed in the chamber, at a height of about 0.8m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer /receiver with the appropriate broadband antenna placed 3m away from the EUT. Radiated emissions from the EUT were maximised by rotating the turntable manually, changing the antenna polarisation and manipulating the EUT cables while observing the frequency profile on the spectrum analyzer / receiver. Frequency points at which maximum emissions occurred, clock frequencies and operating frequencies were then noted for the formal radiated emissions test at the Open Area Test Site (OATS) or 3m EMC chamber.

Test Set-up

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.

2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.

3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.



Test Method

The following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

Final Radiated Emission Measurement

1. Setup the configuration according to figure 1. Turn on EUT and make sure that it is in normal function.

2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.

3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.

4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0。 to 360。with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading.

5. Repeat step 4 until all frequencies need to be measured was complete.

6. Repeat step 5 with search antenna in vertical polarized orientations.

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	Peak	100 kHz	100 kHz
Above 1000	Peak	1 MHz	1 MHz
	Average	1 MHz	10 Hz

Description of Radiated Emissions Program

This EMC Measurement software run LabView automation software and offers a common user interface for electromagnetic interference (EMI) measurements. This software is a modern and powerful tool for controlling and monitoring EMI test receivers and EMC test systems. It guarantees reliable collection, evaluation, and documentation of measurement results. Basically, this program will run a pre-scan measurement before it proceeds with the final measurement. The pre-scan routine will run the scan on four different antenna heights, 2 antenna polarity, and 360 degrees table rotation. For example, the program was set to run 30 MHz to 1 GHz scan; the program will first start from a meter antenna height and divide the 30 MHz to 1 GHz into 10 separate parts of maximum hold sweeps. Each parts of maximum hold sweep, the program will collect the data from 0 degree to 360 degrees table rotation. After the program complete the 1m scan, the antenna continues to rise to 2m and continue the scan. The step will repeated for all specified antenna height and polarity. This program will perform the Quasi Peak measurement after the signal maximization process and pre-scan routine. The final measurement will be base on the pre-scan data reduction result.

Sample Calculation Example

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

Peak = Reading + Corrected Factor

where

Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)

And the average value is

Average = Peak Value + Duty Factor or

Set RBW = 1MHz, VBW = 10Hz.

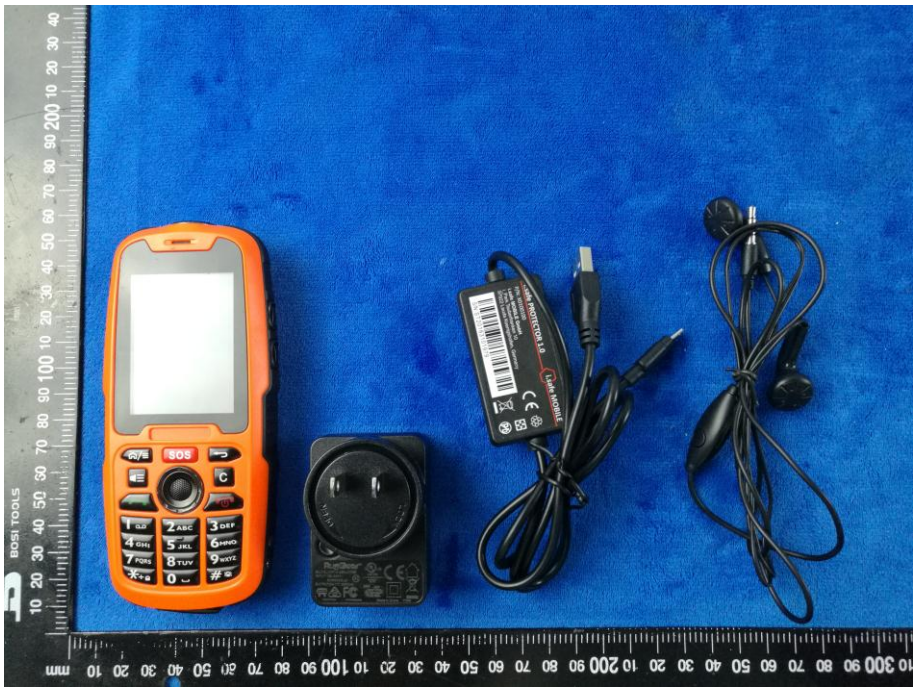
Note:

If the measured frequencies are fall in the restricted frequency band, the limit employed must be quasi peak value when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function.

Annex B. EUT AND TEST SETUP PHOTOGRAPHS

Annex B.i. Photograph: EUT External Photo

Whole Package View

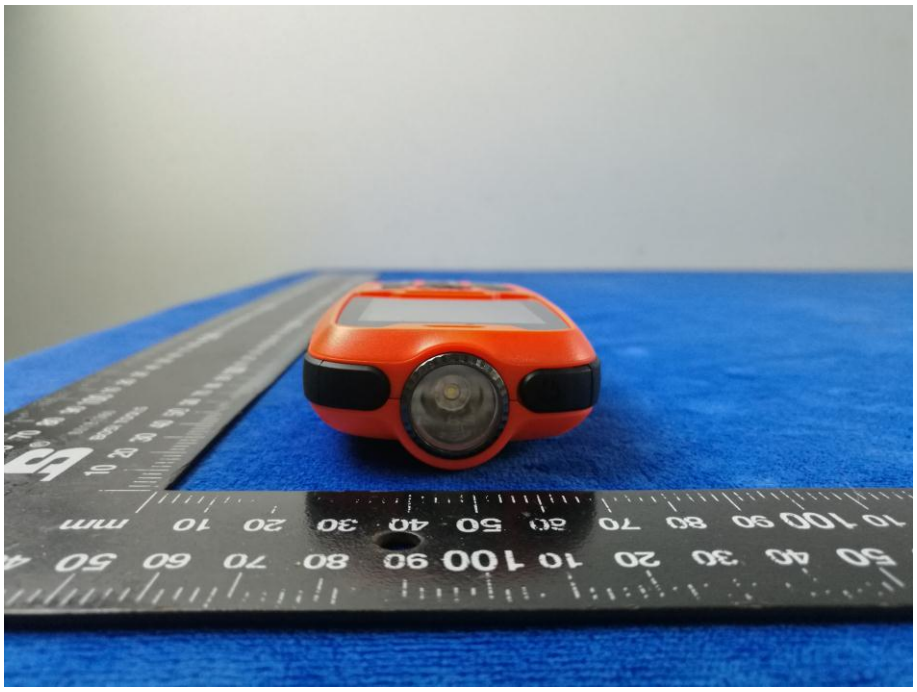


Adapter - Lable View

EUT - Front View

EUT - Rear View

EUT - Top View



EUT - Bottom View

EUT - Left View

EUT - Right View

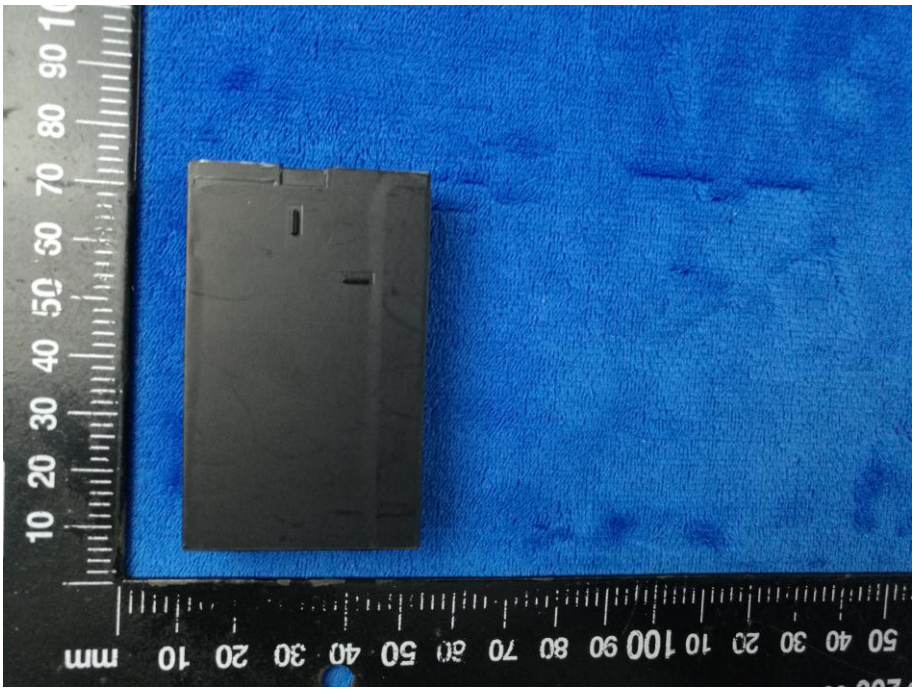
Annex B.ii. Photograph: EUT Internal Photo

Cover Off - Top View 1

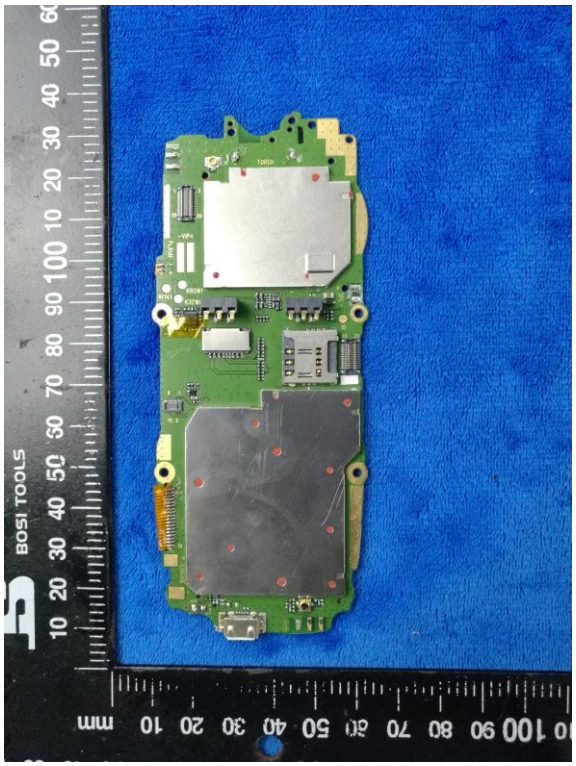
Cover Off - Top View 2

Battery - Front View

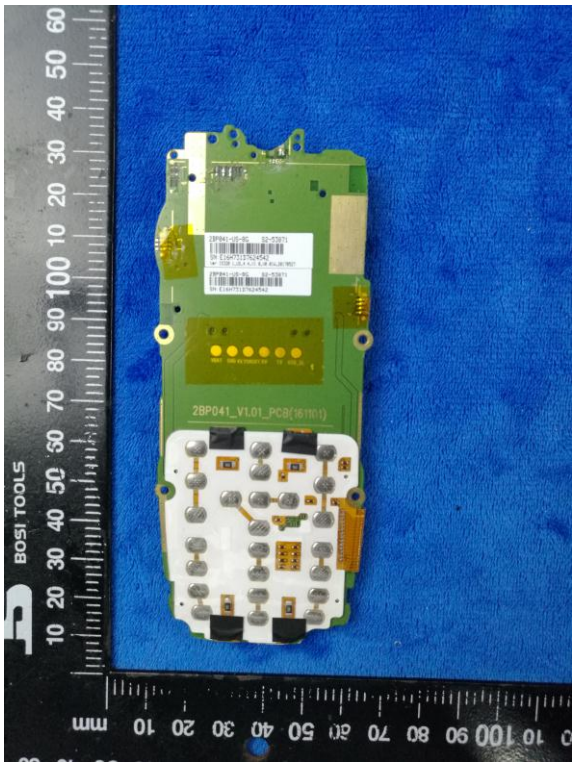
Battery - Rear View



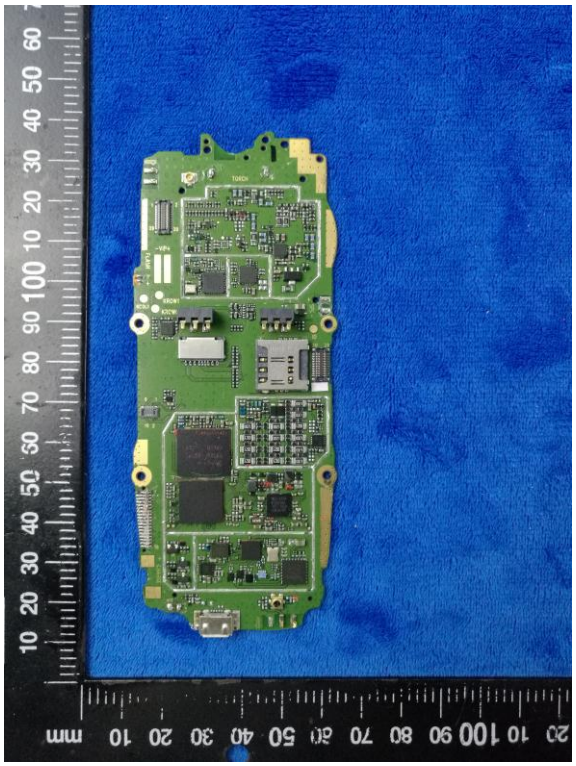
Mainboard with Shielding – Front View



Mainboard with Shielding – Rear View

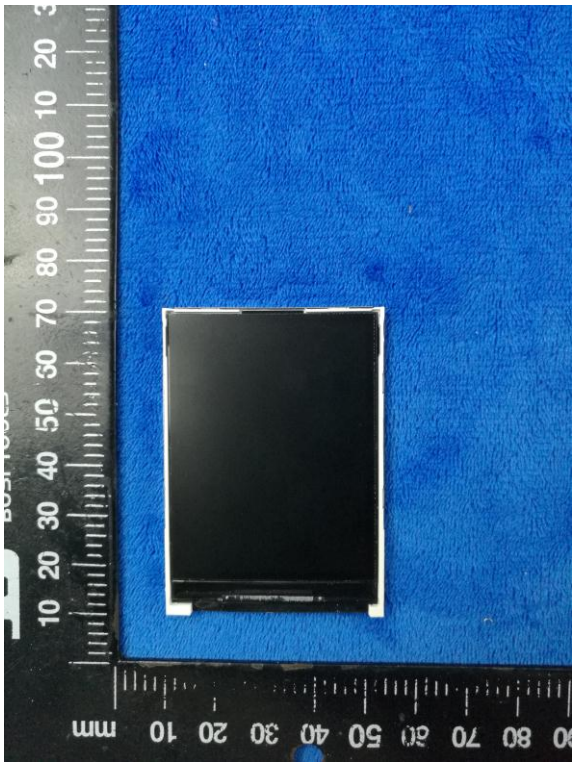


Mainboard without Shielding – Front View

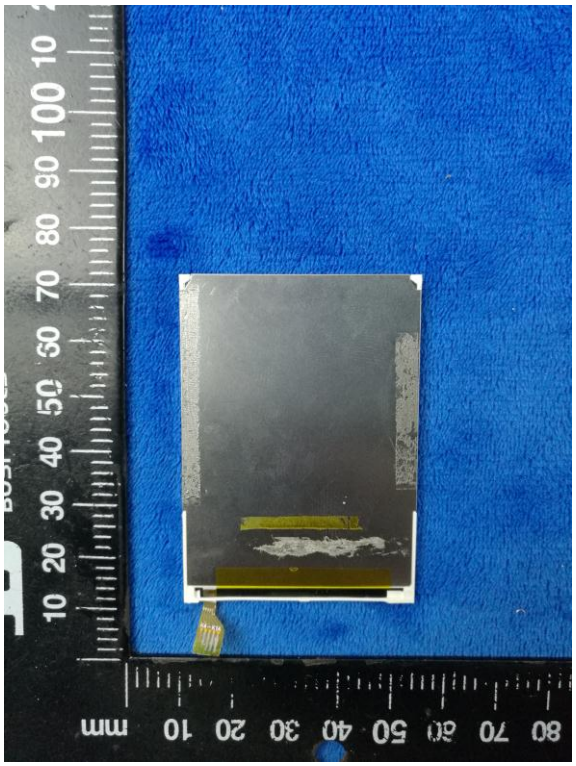


Mainboard without Shielding – Rear View

LCD – Front View

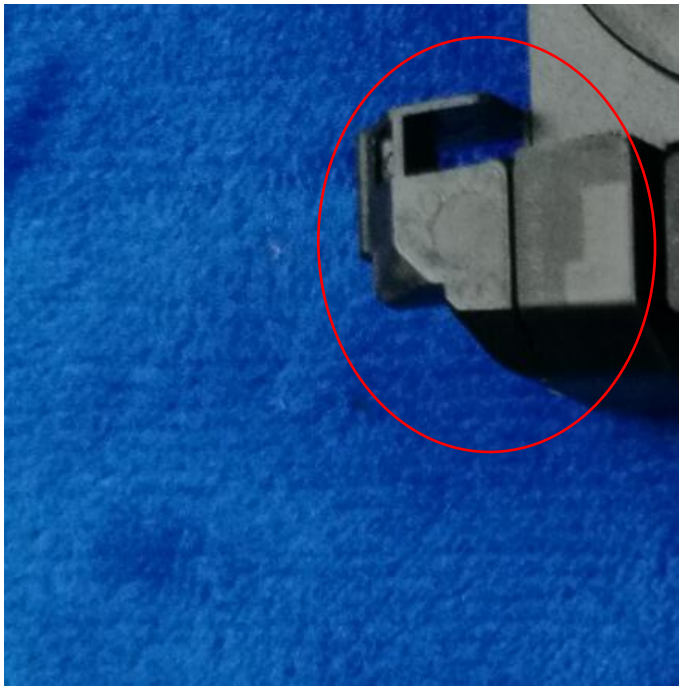


LCD – Rear View

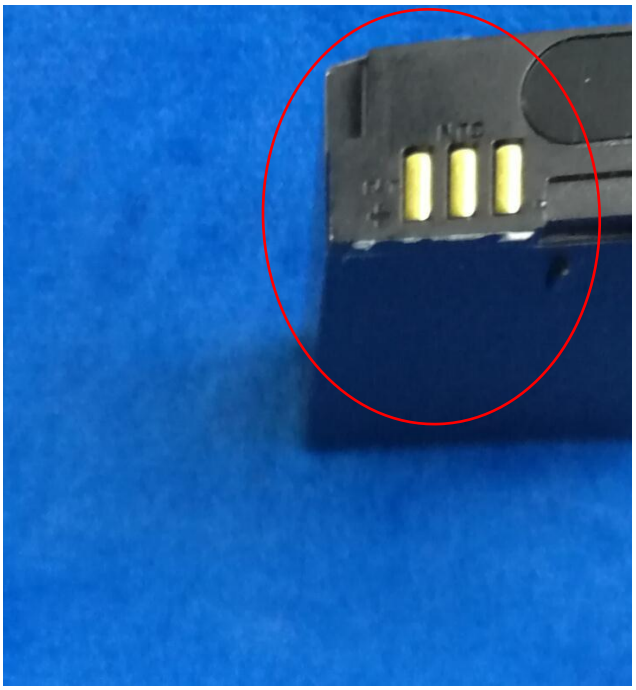


GSM/PCS/UMTS-FDD - Antenna View

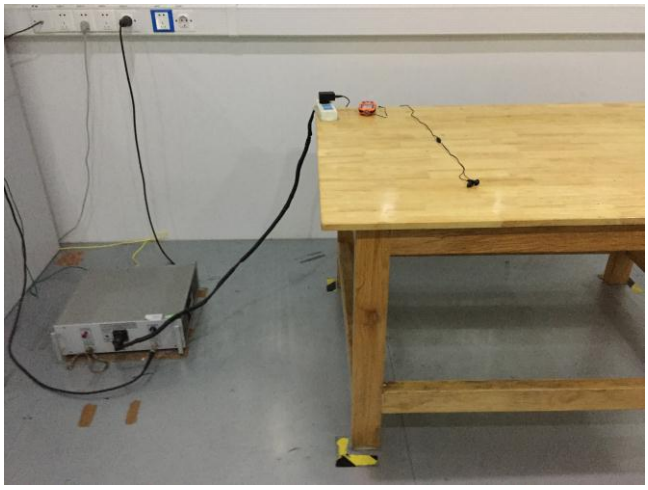
WIFI/BT/BLE/GPS - Antenna View



NFC - Antenna View



Annex B.iii. Photograph: Test Setup Photo

	
Conducted Emissions Test Setup – Front View	Conducted Emissions Test Setup – Side View
	
Radiated Emissions Test Setup 1MHz-30MHz	Radiated Emissions Test Setup 30MHz-1GHz

Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

EUT TEST CONDITIONS

Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

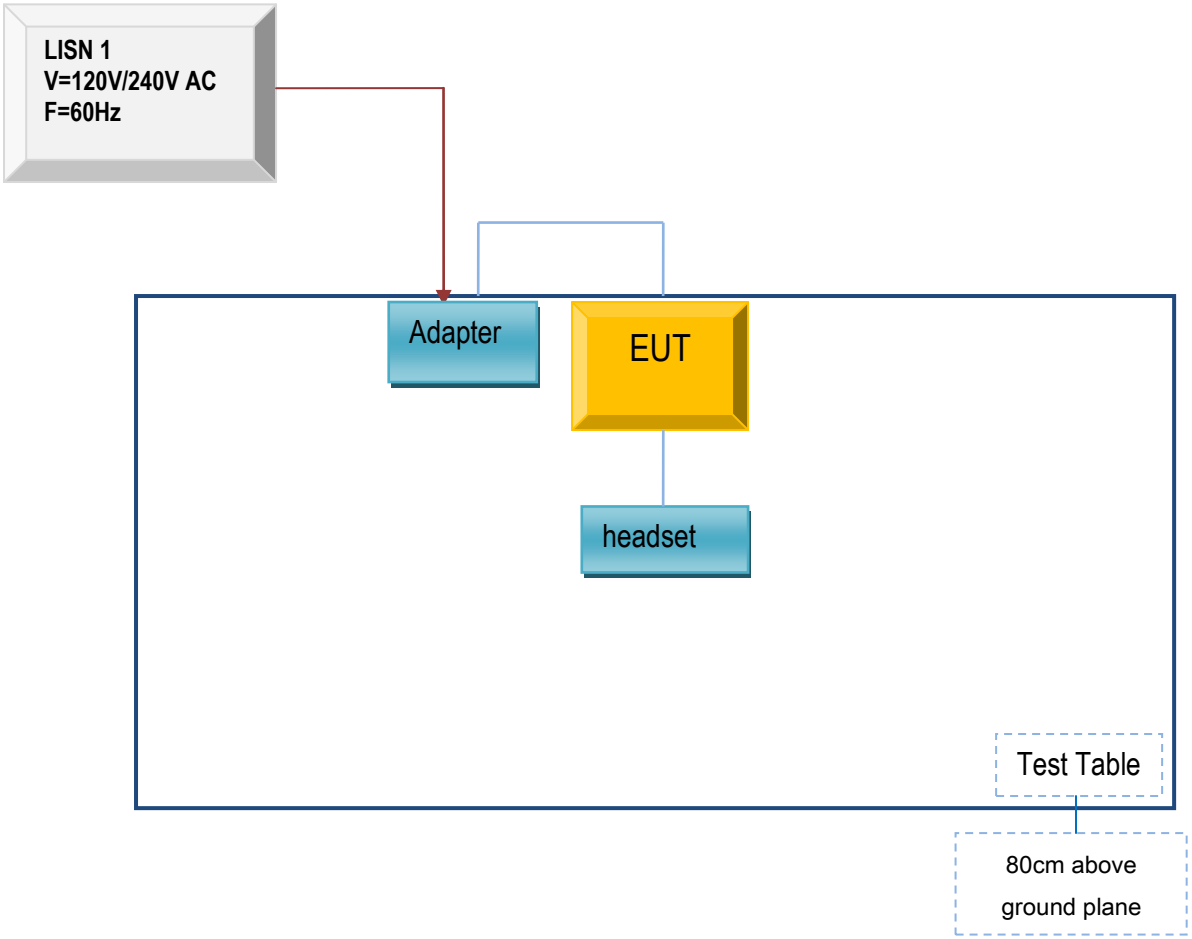
Supporting Equipment:

Manufacturer	Equipment Description	Model	Serial No
i.safe MOBILE GmbH	Adapter	ICP12-050-2000B	N/A
i.safe MOBILE GmbH	headset	IS320.1	N/A

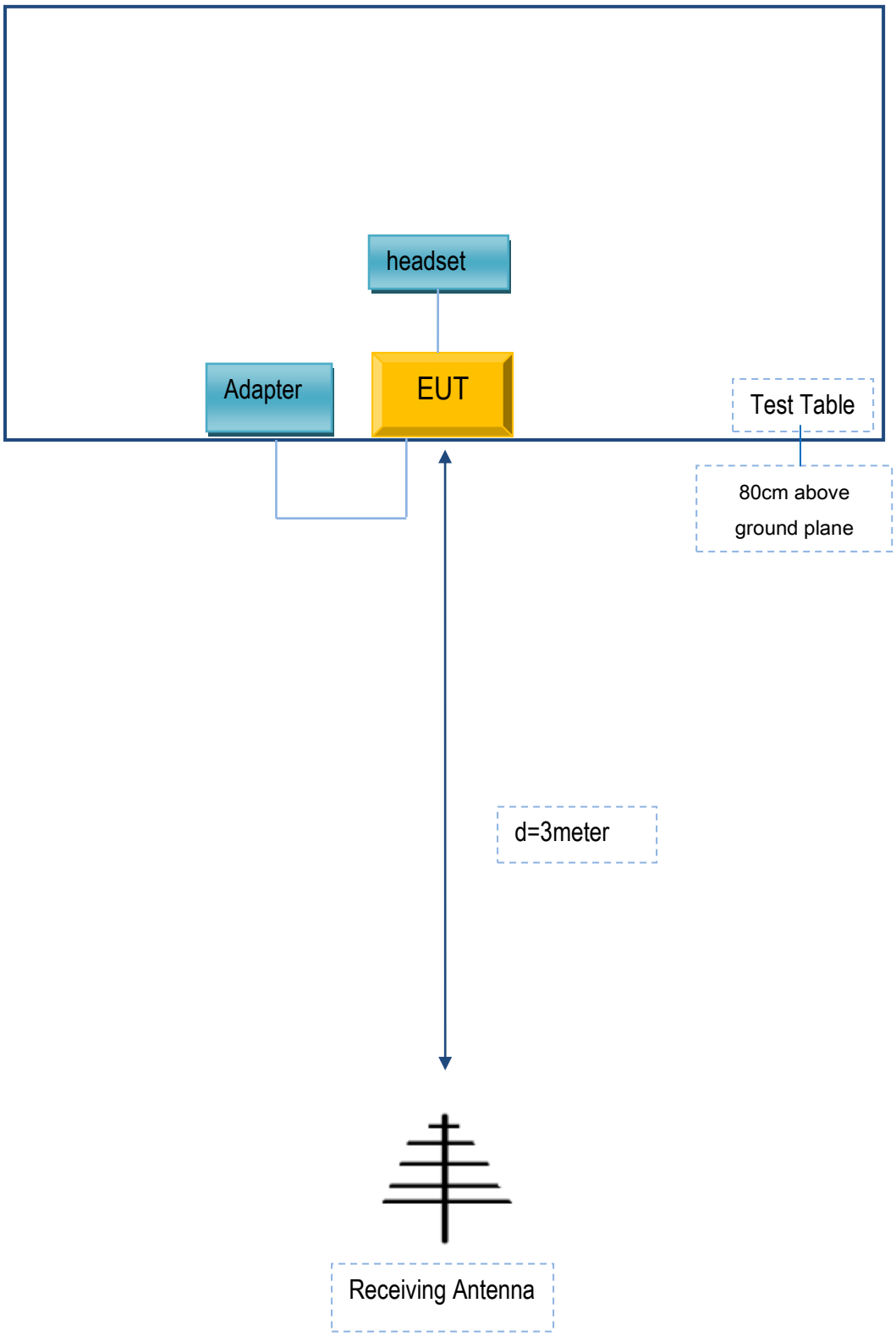
Supporting Cable:

Cable type	Shield Type	Ferrite Core	Length	Serial No
Power Cable	Un-shielding	No	0.8m	N/A

Block Configuration Diagram for Conducted Emissions



Block Configuration Diagram for Radiated Emissions



Annex C.ii. EUT OPERATING CONDITIONS

The following is the description of how the EUT is exercised during testing.

Test	Description Of Operation
Emissions Testing	The EUT was continuously transmitting to stimulate the worst case.

Annex D. User Manual / Block Diagram / Schematics / Partlist

Please see attachment

Annex E. DECLARATION OF SIMILARITY

N/A