FCC Test Report

Report No.: AGC09966200404FE06

FCC ID	:	2AWFM-MARAPHONES-Z1
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	Smart Phone
BRAND NAME	:	Mara Phones
MODEL NAME	:	Mara Phones Z1
APPLICANT	:	Mara Phones Limited
DATE OF ISSUE	:	May 18, 2020
STANDARD(S)	:	FCC Rules and Regulations Part 15 Subpart C Section 15.225, RSS-210 issue 9 Annex B.6 ANSI C63.10: 2013
REPORT VERSION	:	V1.0

Attestation of ***G***lobal ***C***ompliance (Shenzhen) Co., Ltd

REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	May 18, 2020	Valid	Initial Release

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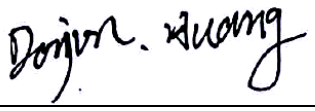
1. GENERAL INFORMATION

1.1. GENERAL DESCRIPTION OF EUT

Applicant	Mara Phones Limited
Address	C/O SAFYR UTILIS LTD, 7th Floor, Tower 1, Nexteracom, Cybercity Ebene, 72201, Mauritius
Manufacturer	Mara Phones Rwanda Limited
Address	Plot No 2166, Kigali Special Economic Zone, Masoro, Ndera, Gasabo District, Kigali, Rwanda
Factory 1	Mara Phones Rwanda Limited
Address 1	Plot no 2166, Kigali Special Economic Zone, Masoro Ndera, Gasabo District, Kigali, Rwanda
Factory 2	Mara Phones South Africa (PTY) Limited
Address 2	Dube Trade Port, No.5 Umkhomazi Drive, ERF 618 La Mercy Durban, KwaZulu-Natal, 4399, South Africa
Product Designation	Smart Phone
Brand Name	Mara Phones
Test Model	Mara Phones Z1
Date of test	Apr. 09, 2020~May 15, 2020
Operating Frequency(NFC)	13.56MHz
Modulation(NFC)	ASK
Antenna Type(NFC)	Integral antenna
Antenna Gain(NFC)	0dBi
Hardware Version	K6503N_01
Software Version	Mara_Z1_d_V1.0_20200609
Power Supply:	DC 3.85V
Test Result	Pass

Prepared By

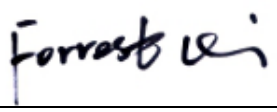


Donjon Huang
(Project Engineer)
Apr. 20, 2020

Reviewed By

Max Zhang
(Reviewer)
Apr. 20, 2020

Approved By



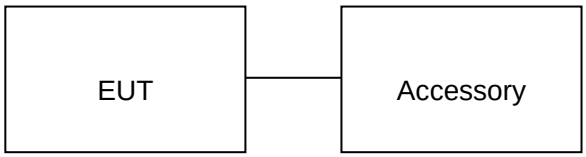
Forrest Lei
(Authorized Officer)
Apr. 20, 2020

1.2. OPERATION OF EUT DURING TESTING

NO.	TEST MODE DESCRIPTION
1	Transmitting
Note: 1. All the test had been tested with full charging, only the result of the worst case was recorded in the report, if no other cases. 2.For Radiated Emission, 3axis were chosen for testing for each applicable mode.	

1.3. DESCRIPTION OF TEST SETUP

Configure :



Item	Equipment	Model No.	ID or Specification	Remark
1	Smart Phone	Mara Phones Z1	FCC ID: 2AWFM-MARAPHONES-Z1	EUT
2	Adapter(US)	HJ-0502000N2-US	Input: 100-240V 50~60Hz, 0.3A Output: DC 5.0V 2A	AE
3	Adapter(EU)	Mara-5V2.0A	Input: 100-240V 50~60Hz, 0.3A Output: DC 5.0V 2A	AE
4	Battery	MPX1Z1	DC 3.85V 3900mAh	AE
5	USB Cable	N/A	N/A	AE
6	Earphone	N/A	N/A	AE

1.4. MEASUREMENT INSTRUMENTS LIST

NAME OF EQUIPMENT	MANUFACTURER	MODEL	S/N	Cal. Date	Cal. Due
EMI Test Receiver	R&S	ESCI	100694	June 12, 2019	June 11,2020
Amplifier	Schwarzbeck	BBV 9718	9718-205	June 12, 2019	June 11,2020
WIDEBAND REQUENCY ANTENNA	SCHWARZBECK	VULB9168	VULB9168-494	Jan. 09, 2019	Jan. 08, 2021
WIDEBAND REQUENCY ANTENNA	SCHWARZBECK	VULB9168	VULB9168-D69250	Sep. 20, 2019	Sep. 19, 2020
LOOP ANTENNA	A.H	SAS-562B	/	Feb.27, 2020	Feb.26, 2022
EMI Test Receiver	R&S	ESCI	100694	June 12, 2019	June 11,2020
Amplifier	Schwarzbeck	BBV 9718	9718-205	June 12, 2019	June 11,2020

3. RADIATED EMISSION

3.1. TEST LIMIT

Within the 13.110MHz-14.010MHz band

Frequencies (MHz)	Field Strength at 30m (microvolts/meter)	Field Strength at 30m (dBuV/m)	Field Strength at 3m (dBuV/m)
13.553~13.567	15.848	84	124
13.410~13.553 13.567~13.710	334	50.5	90.5
13.110~13.410 13.710~14.010	106	40.5	80.5

According to 15.35, on any frequency or frequencies below or equal to 1000 MHz, the limits Shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test.

Outside of the 13.110MHz-14.010MHz band

Frequency (MHz)	Distance Meters	Field Strengths Limit	
		μV/m	dB(μV)/m
0.009 ~ 0.490	300	2400/F(kHz)	---
0.490 ~ 1.705	30	24000/F(kHz)	---
1.705 ~ 30	30	30	---
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	Other:74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

Remark: (1) Emission level dBμV = 20 log Emission level μV/m
(2) The smaller limit shall apply at the cross point between two frequency bands.
(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

3.2. MEASUREMENT PROCEDURE

1. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

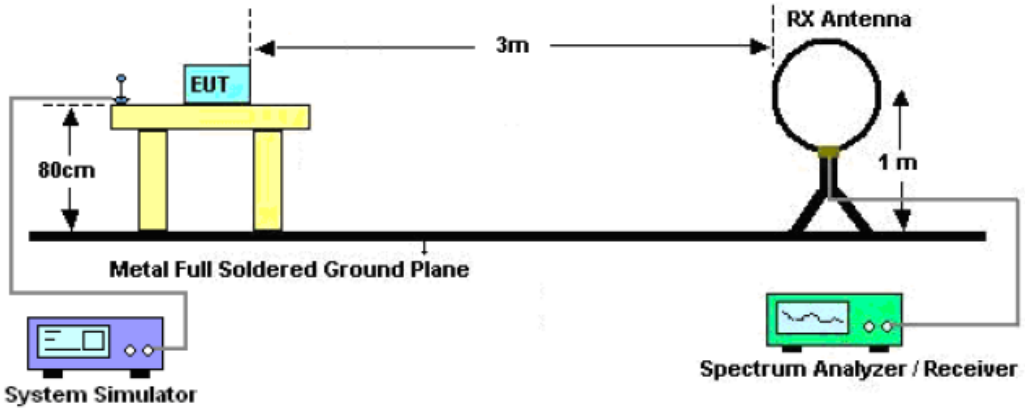
The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP
Start ~Stop Frequency	1GHz~26.5GHz 1MHz/1MHz for Peak, 1MHz/10Hz for Average

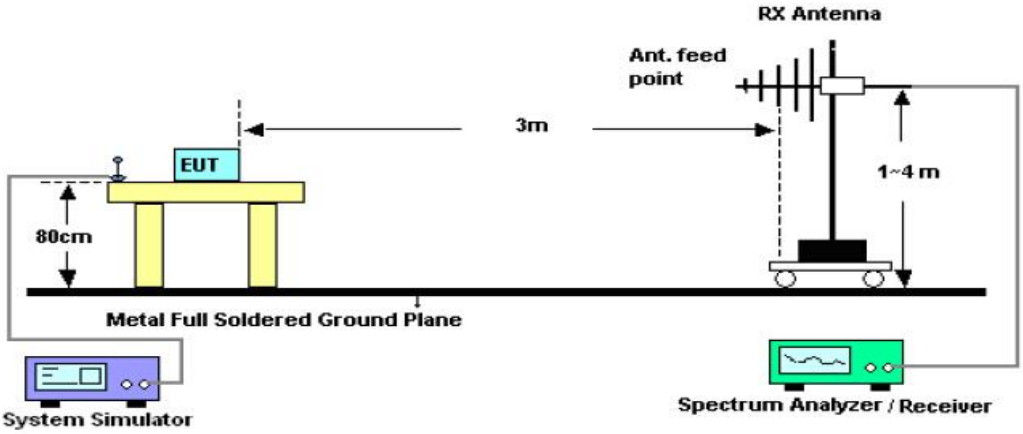
Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

3.3. TEST SETUP

Radiated Emission Test-Setup Frequency Below 30MHz



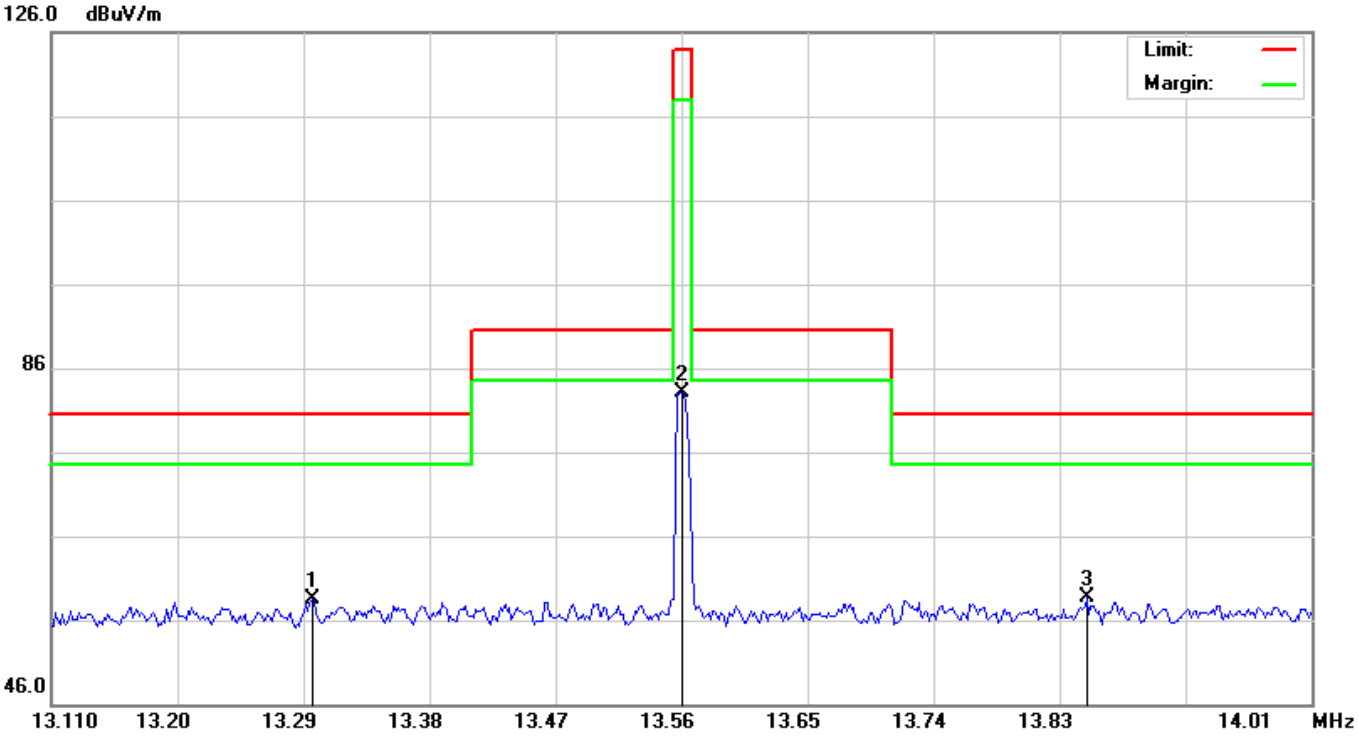
RADIATED EMISSION TEST SETUP 30MHz-1000MHz



3.4. TEST RESULT

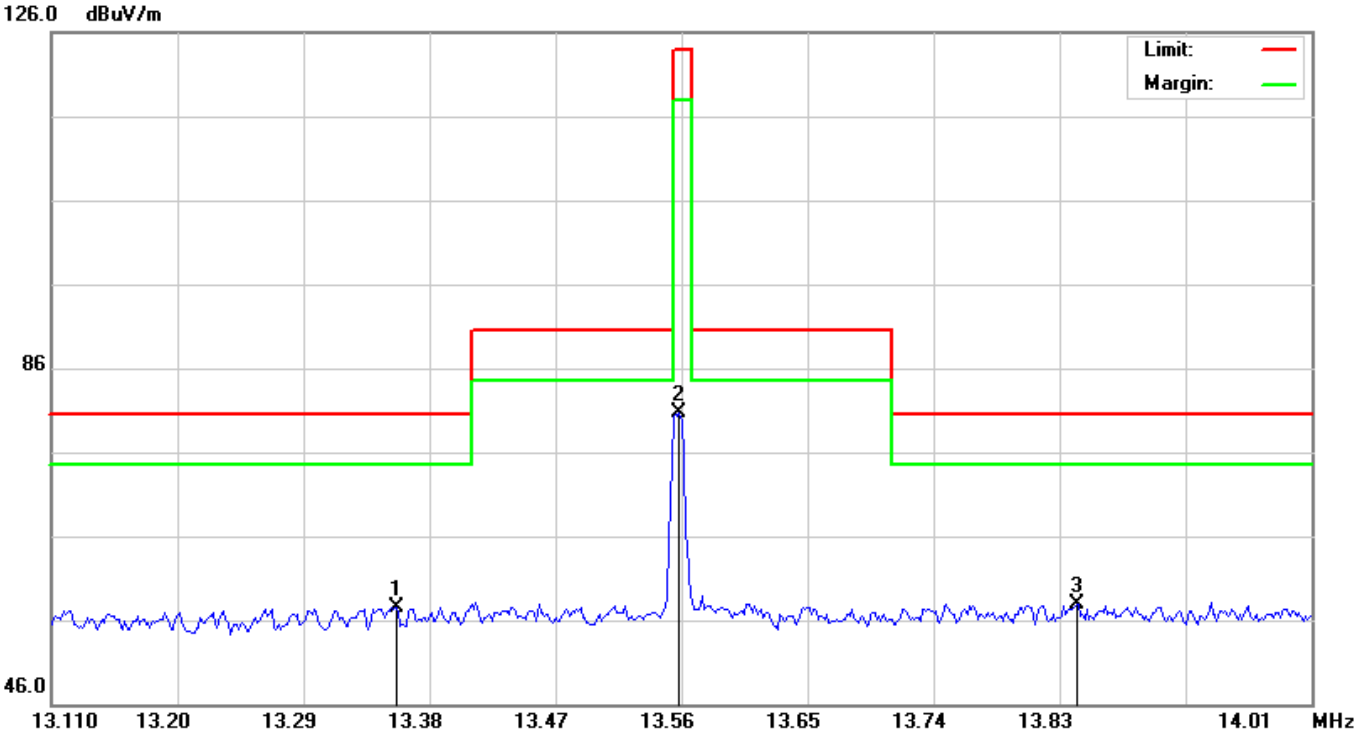
RADIATED EMISSION BELOW 30MHZ

EUT：	Smart Phone	Model Name	Mara Phones Z1
Temperature：	20 ℃	Relative Humidtity：	48%
Pressure：	1010hPa	Test Voltage ：	DC3.85V
Test Mode ：	Mode 1	Polarization :	Face



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dBuV/m	dBuV/m	dBuV/m	dB		cm	degree	
1		13.2958	-6.51	65.00	58.49	80.50	-22.01	peak			
2		13.5600	18.07	65.00	83.07	124.00	-40.93	peak			
3	*	13.8493	-6.36	65.00	58.64	80.50	-21.86	peak			

EUT：	Smart Phone	Model Name	Mara Phones Z1
Temperature：	20 ℃	Relative Humidtity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC3.85V
Test Mode ：	Mode 1	Polarization :	Side

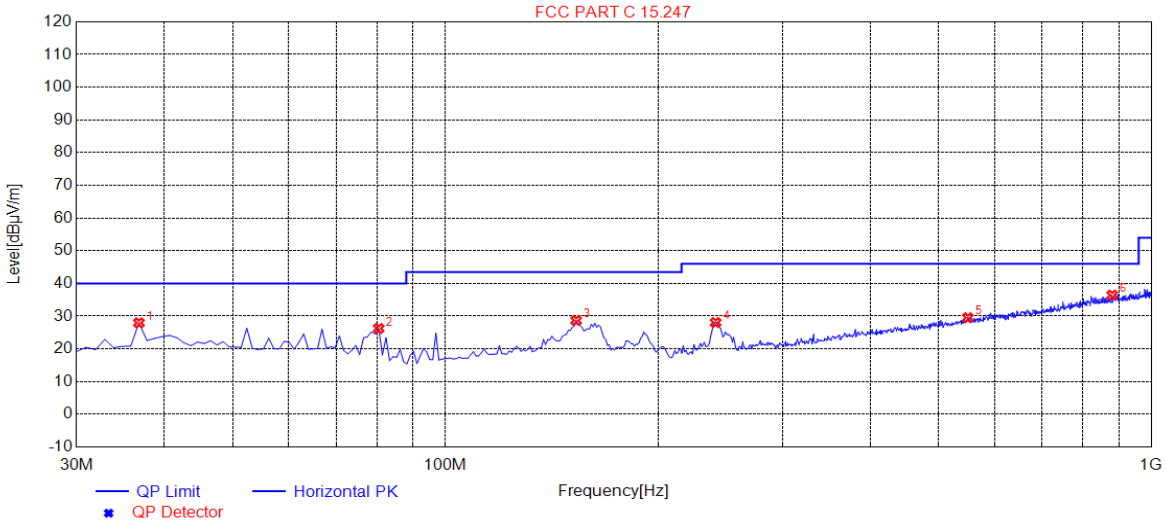


No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dBuV/m	dBuV/m	dBuV/m	dB		cm	degree	
1		13.3556	-7.42	65.00	57.58	80.50	-22.92	peak			
2		13.5585	15.74	65.00	80.74	124.00	-43.26	peak			
3	*	13.8420	-7.16	65.00	57.84	80.50	-22.66	peak			

Note: Other emissions from 9 kHz to 30 MHz are considered as ambient noise. No recording in the test report.

RADIATED EMISSION 30MHz- 1GHZ

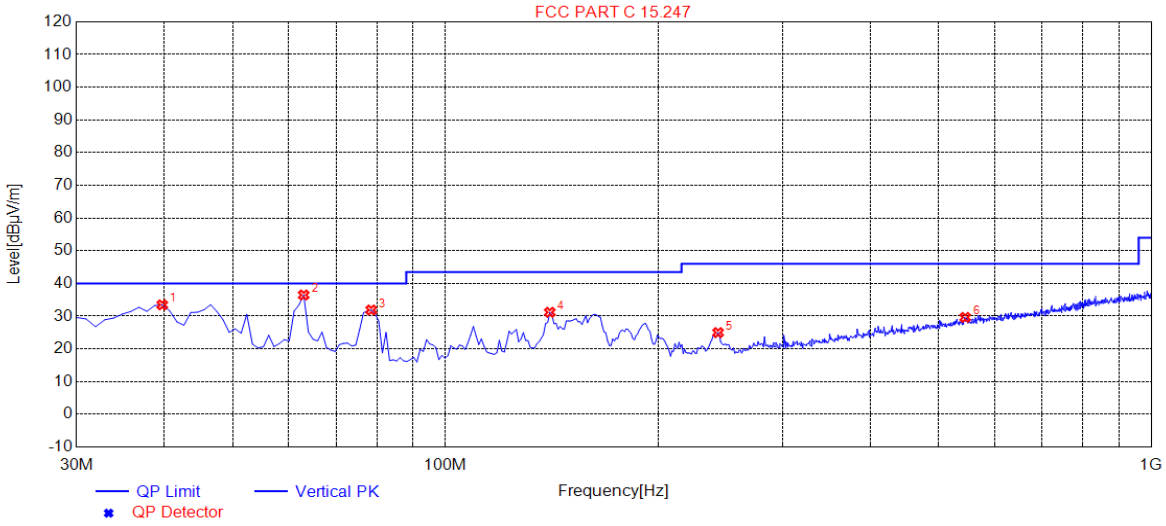
EUT：	Smart Phone	Model Name	Mara Phones Z1
Temperature：	20 ℃	Relative Humidtity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC3.85V
Test Mode ：	Mode 1	Polarization :	Horizontal



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	36.7900	27.98	14.16	40.00	12.02	100	298	Horizontal
2	80.4400	26.25	10.15	40.00	13.75	200	220	Horizontal
3	153.190	28.69	14.91	43.50	14.81	200	112	Horizontal
4	241.460	28.06	14.83	46.00	17.94	200	147	Horizontal
5	549.920	29.54	23.26	46.00	16.46	200	6	Horizontal
6	880.690	36.46	29.75	46.00	9.54	100	300	Horizontal

RESULT: PASS

EUT：	Smart Phone	Model Name	Mara Phones Z1
Temperature：	20 ℃	Relative Humidtity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC3.85V
Test Mode ：	Mode 1	Polarization :	Vertical



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39.7000	33.47	14.86	40.00	6.53	100	275	Vertical
2	62.9800	36.49	13.42	40.00	3.51	100	148	Vertical
3	78.5000	31.89	10.46	40.00	8.11	100	154	Vertical
4	140.580	31.19	14.88	43.50	12.31	100	140	Vertical
5	243.400	24.99	14.80	46.00	21.01	100	327	Vertical
6	545.070	29.63	23.17	46.00	16.37	100	18	Vertical

RESULT: PASS

Note:

Factor=Antenna Factor + Cable loss, Margin=Result-Limit.

The “Factor” value can be calculated automatically by software of measurement system.

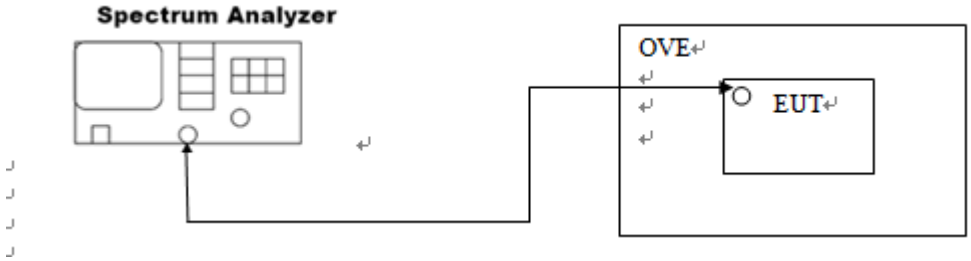
The mode 1 is the worst case, and only the data of the worst case recorded in this test report.

4. FREQUENCY STABILITY

4.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the operation frequency.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 1 KHz, VBW≥3×RBW.
4. Set SPA Trace 1 Max hold, then View.
5. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
6. Extreme temperature rule is -20°C~40°C.

4.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



4.3. MEASUREMENT RESULTS

Operating frequency: 13.56MHz

Voltage vs. Frequency Stability (Test Temperature: 20℃)

Voltage(V)	Measurement Frequency (MHz)	Max. Deviation (MHz)	Limit(MHz)	Conclusion
3.85	13.56084	0.00086	0.001356	PASS
3.45	13.56086			
4.40	13.56083			

Temperature vs. Frequency Stability (Test Voltage: 12V)

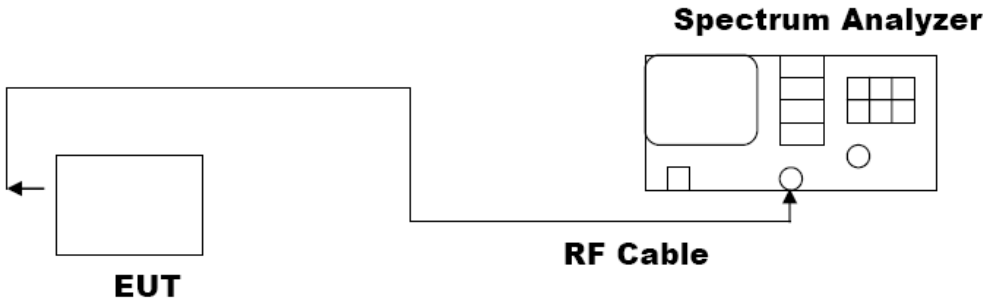
Temperature	Measurement Frequency (MHz)	Max. Deviation (MHz)	Limit(MHz)	Conclusion
- 20℃	13.56084	0.00085	0.001356	PASS
-10℃	13.56082			
0℃	13.56082			
10℃	13.56085			
20℃	13.56081			
30℃	13.56082			
40℃	13.56082			

5. BANDWIDTH

5.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the operation frequency.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 10 KHz, VBW≥3×RBW.
4. Set SPA Trace 1 Max hold, then View.

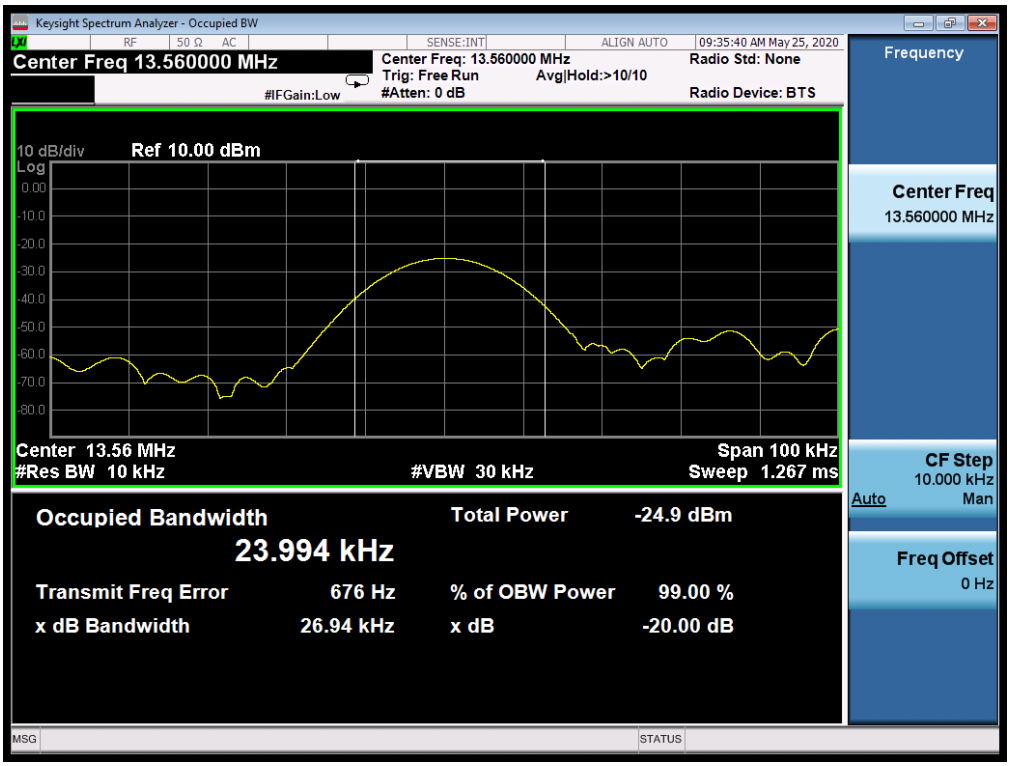
5.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



5.3. MEASUREMENT RESULTS

TEST ITEM	BANDWIDTH
TEST MODE	Mode1

Test Data (kHz)		Criteria
Occupied Bandwidth	23.994	PASS
-20dB Bandwidth	26.94	PASS



6. LINE CONDUCTED EMISSION TEST

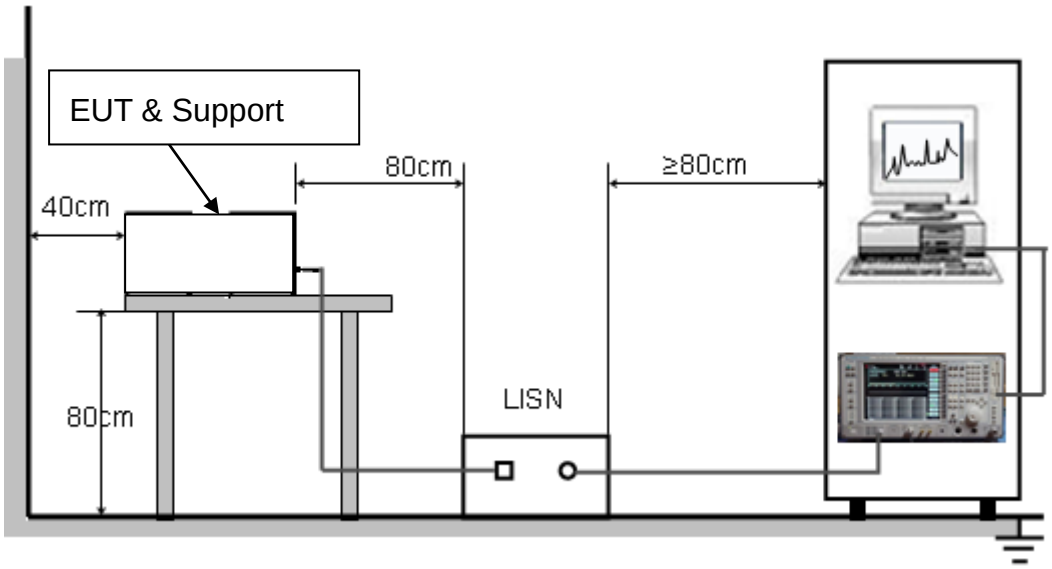
6.1. LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage	
	Q.P.(dBuV)	Average(dBuV)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Note:

1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

6.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



6.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. All support equipments received AC120V/60Hz power from a LISN, if any.
5. The EUT received charging voltage by adapter which received 120V/60Hzpower by a LISN..
6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.
9. The test mode(s) were scanned during the preliminary test.

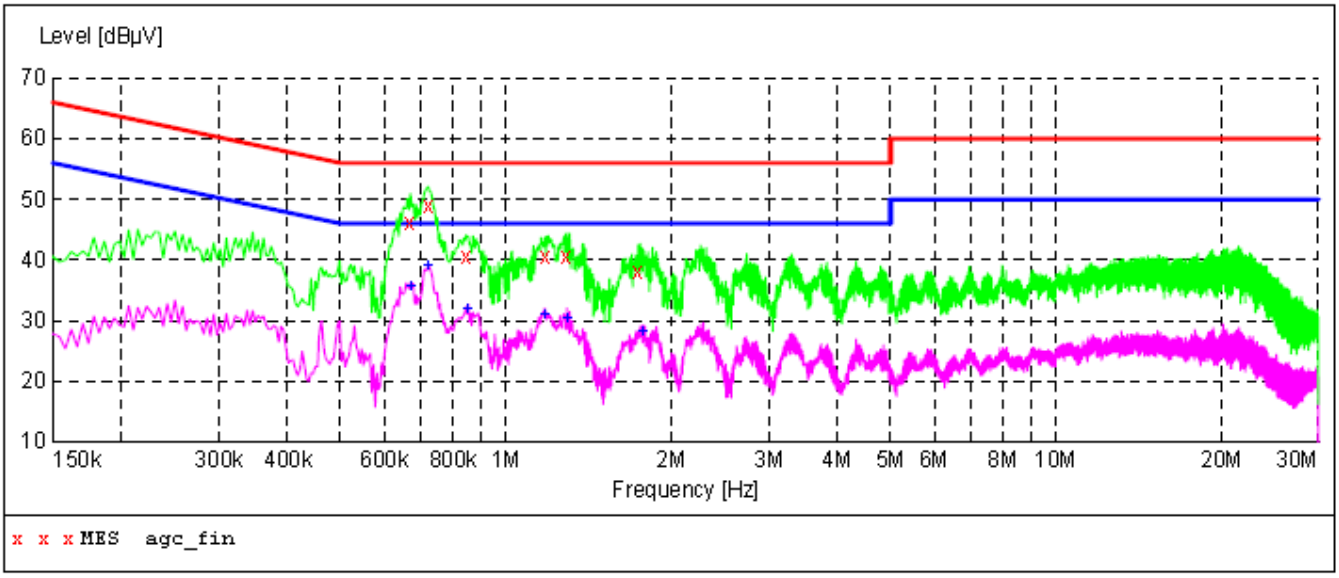
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

6.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less –2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
3. The test data of the worst case condition(s) was reported on the Summary Data page.

6.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

LINE CONDUCTED EMISSION TEST LINE 1-L



MEASUREMENT RESULT: "agc_fin"

2020/4/18 0:07

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.670000	46.00	11.3	56	10.0	QP	L1	FLO
0.722000	49.00	11.3	56	7.0	QP	L1	FLO
0.846000	40.60	11.3	56	15.4	QP	L1	FLO
1.178000	40.50	11.3	56	15.5	QP	L1	FLO
1.290000	40.40	11.3	56	15.6	QP	L1	FLO
1.738000	38.00	11.3	56	18.0	QP	L1	FLO

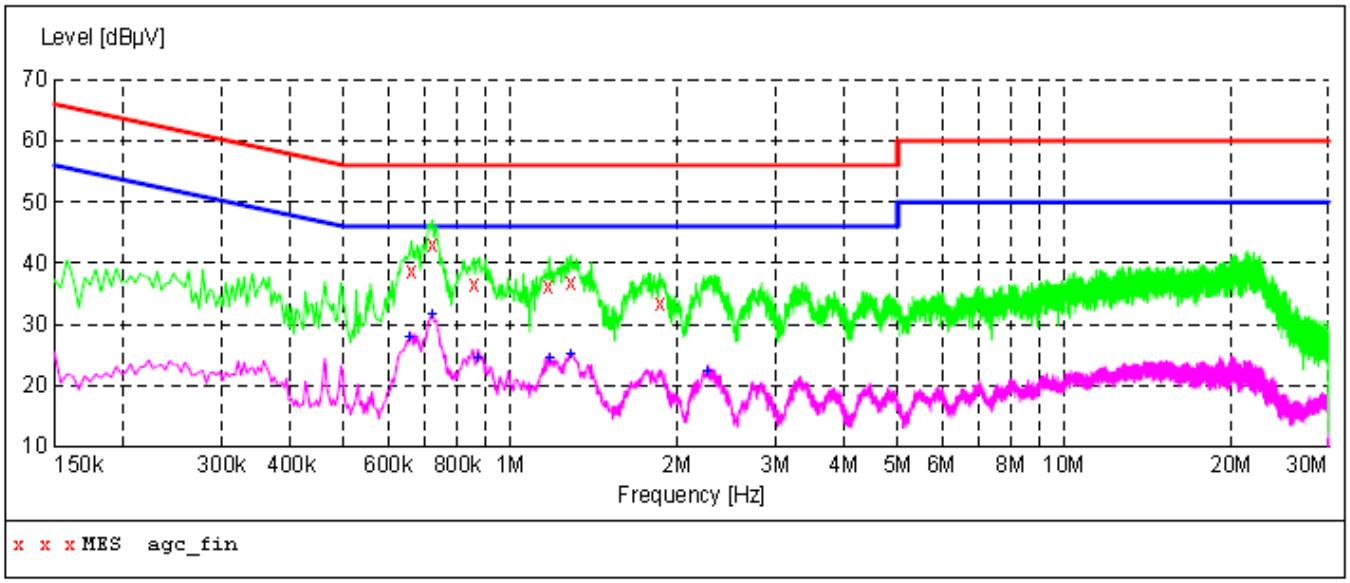
MEASUREMENT RESULT: "agc_fin2"

2020/4/18 0:07

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.670000	35.70	11.3	46	10.3	AV	L1	FLO
0.722000	38.90	11.3	46	7.1	AV	L1	FLO
0.854000	31.70	11.3	46	14.3	AV	L1	FLO
1.178000	31.00	11.3	46	15.0	AV	L1	FLO
1.290000	30.40	11.3	46	15.6	AV	L1	FLO
1.774000	28.20	11.3	46	17.8	AV	L1	FLO

RESULT: PASS

Line Conducted Emission Test Line 2-N



MEASUREMENT RESULT: "agc_fin"

2020/4/18 0:11

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.662000	38.70	11.3	56	17.3	QP	N	FLO
0.722000	43.00	11.3	56	13.0	QP	N	FLO
0.858000	36.60	11.3	56	19.4	QP	N	FLO
1.174000	36.20	11.3	56	19.8	QP	N	FLO
1.286000	36.90	11.3	56	19.1	QP	N	FLO
1.858000	33.40	11.3	56	22.6	QP	N	FLO

MEASUREMENT RESULT: "agc_fin2"

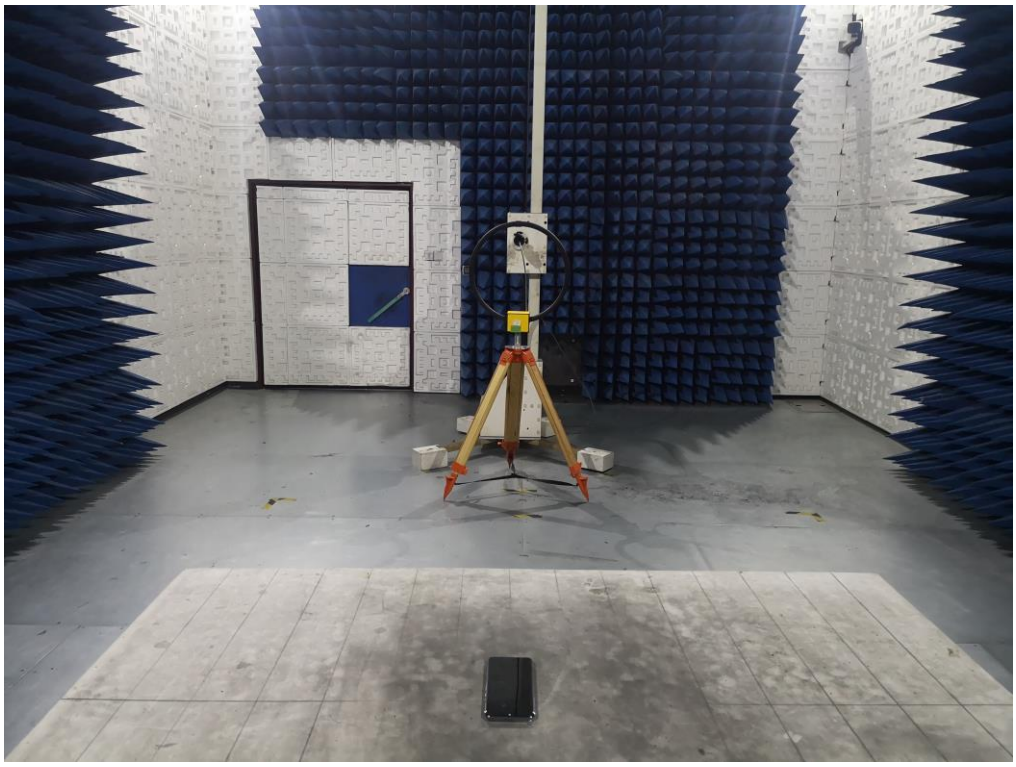
2020/4/18 0:11

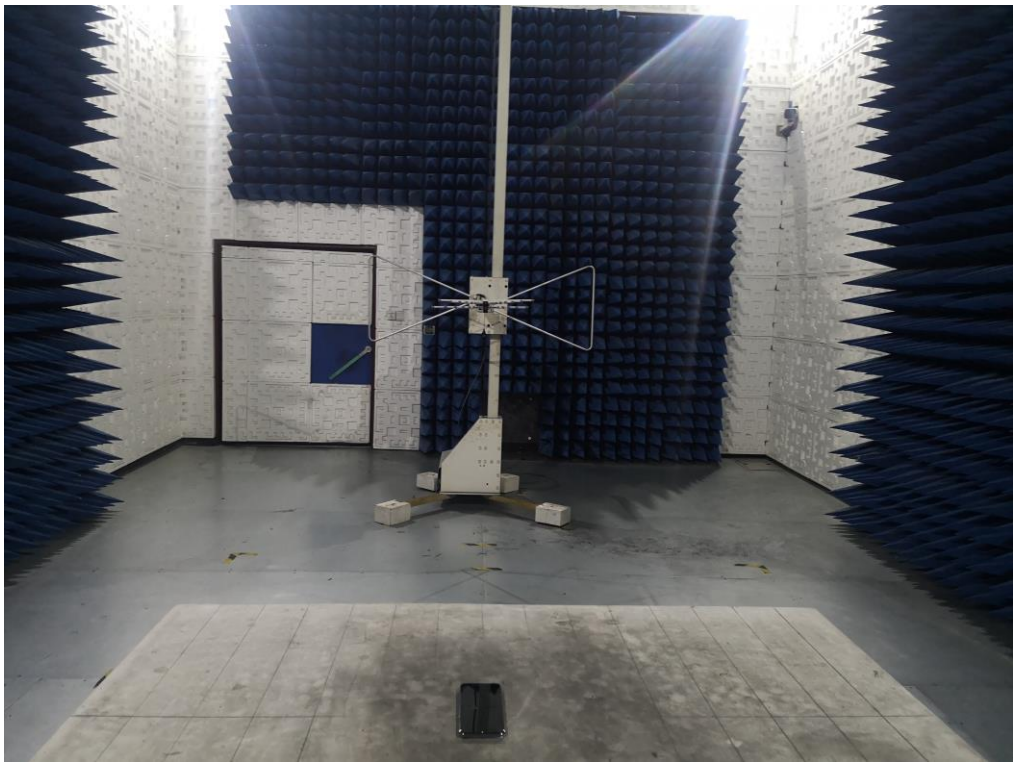
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.658000	27.80	11.3	46	18.2	AV	N	FLO
0.722000	31.60	11.3	46	14.4	AV	N	FLO
0.874000	24.50	11.3	46	21.5	AV	N	FLO
1.174000	24.40	11.3	46	21.6	AV	N	FLO
1.286000	25.00	11.3	46	21.0	AV	N	FLO
2.270000	22.20	11.3	46	23.8	AV	N	FLO

RESULT: PASS

APPENDIX A: PHOTOGRAPHS OF TEST SETUP

RADIATED EMISSION TEST SETUP BELOW 1GHz





FCC LINE CONDUCTED EMISSION TEST SETUP

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