FCC RF Test Report

APPLICANT : Motorola Mobility LLC EQUIPMENT : Mobile Cellular Phone

BRAND NAME : Motorola

MODEL NAME : XT2301-4

FCC ID : IHDT56AH3

STANDARD : FCC Part 15 Subpart C §15.209

CLASSIFICATION: (DCD) Part 15 Low Power Transmitter Below 1705 kHz

TEST DATE(S) : Sep. 20, 2022 ~ Oct. 15, 2022

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

JasonJia

Approved by: Jason Jia





Report No.: FR282619E

Sporton International Inc. (Kunshan)

No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China

Sporton International Inc. (Kunshan)

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History of this test report

Report No.	Version	Description	Issued Date
FR282619E	01	Initial issue of report	Oct. 19, 2022

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Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	2.1049	20dB Bandwidth	Reporting Only	-
3.1	2.1049	99% Occupied Bandwidth	Reporting Only	-
3.2	15.209	Radiated Emission	Pass	Under limit 3.82 dB at 46.490 MHz for Quasi-peak
3.3	15.207	AC Conducted Emission	Pass	Under limit 8.68 dB at 0.155 MHz
3.4	15.203	Antenna Requirements	Pass	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

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1 General Description

1.1 Applicant

Motorola Mobility LLC

222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

1.2 Manufacturer

Motorola Mobility LLC

222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

1.3 Product Feature of Equipment Under Test

Product Feature					
Equipment	Mobile Cellular Phone				
Brand Name	Motorola				
Model Name	XT2301-4				
FCC ID	IHDT56AH3				
	Conducted: 354336350016499/354336360016507				
IMEI Code	Conduction: 354336350016432/354336350016440				
	Radiation: 354336350016333/354336350016341				
HW Version	DVT2				
SW Version	TTR33.76				
WPT Frequency Range	111 ~ 148kHz				
WPT Type of Modulation	ASK				
WPT Antenna Type	FPC Antenna				
EUT Stage	Identical Prototype				

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

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1.4 Specification of Accessory

Specification of Accessory						
AC Adapter 1 (US)	Brand Name	Motorola(Chenyang)	Model Name	MC-1251		
AC Adapter 1 (EU)	Brand Name	Motorola(Chenyang)	Model Name	MC-1252		
AC Adapter 1 (UK)	Brand Name	Motorola(Chenyang)	Model Name	MC-1253		
AC Adapter 1 (AU)	Brand Name	Motorola(Chenyang)	Model Name	MC-1255		
AC Adapter 1 (AR)	Brand Name	Motorola(Chenyang)	Model Name	MC-1256		
AC Adapter 1 (BR)	Brand Name	Motorola(Chenyang)	Model Name	MC-1257		
AC Adapter 2 (US)	Brand Name	Motorola(AOHAI)	Model Name	MC-1251		
AC Adapter 2 (EU)	Brand Name	Motorola(AOHAI)	Model Name	MC-1252		
AC Adapter 2 (UK)	Brand Name	Motorola(AOHAI)	Model Name	MC-1253		
AC Adapter 2 (IN)	Brand Name	Motorola(AOHAI)	Model Name	MC-1254		
AC Adapter 2 (AU)	Brand Name	Motorola(AOHAI)	Model Name	MC-1255		
AC Adapter 2 (AR)	Brand Name	Motorola(AOHAI)	Model Name	MC-1256		
AC Adapter 2 (BR)	Brand Name	Motorola(AOHAI)	Model Name	MC-1257		
AC Adapter 2 (CHILE)	Brand Name	Motorola(AOHAI)	Model Name	MC-1259		
Battery	Brand Name	Motorola(ATL)	Model Name	PF46		
Earphone	Brand Name	Motorola(Lyand)	Model Name	MI181C(SH38D62338)		
USB Cable	Brand Name	Motorola (Saibao)	Model Name	SC18D24968		
C to HDMI HDMI/USBC Cable 1	Brand Name	Motorola (Linxee)	Model Name	SC18D02146		
C to HDMI HDMI/USBC Cable 2	Brand Name	Motorola (Linxee)	Model Name	SC18D38847		

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

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1.6 Test Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

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Test Firm	Sporton International Inc. (Kunshan)						
	No. 1098, Pengxi North	n Road, Kunshan Econom	ic Development Zone				
Test Site Location	Jiangsu Province 215300 People's Republic of China						
rest Site Location	TEL: +86-512-57900158						
	FAX: +86-512-57900958						
	Sporton Sito No	ECC Designation No.	FCC Test Firm				
Test Site No.	Sporton Site No.	FCC Designation No.	Registration No.				
rest one NO.	CO01-KS 03CH02-KS TH01-KS	CN1257	314309				

1.7 Test Software

Item	Site	Manufacture	Name	Version	
1.	03CH02-KS	AUDIX	E3	6.2009-8-24a	
2.	CO01-KS	AUDIX	E3	6.2009-8-24	

1.8 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.209, §15.207
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- ANSI C63.10-2013

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

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2 Test Configuration of Equipment Under Test

2.1 Test Mode

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 1000 MHz).

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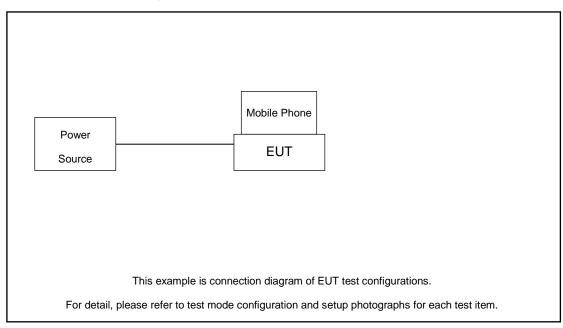
b. AC power line Conducted Emission was tested under maximum output power.

Test Items	Function Type
AC Conducted Emission	Mode 1: Wireless Charging(Reverse charging for other phone)
Radiated Fmission	Mode 1: Wireless Charging(Reverse charging for other phone) at Low Frequency Mode 2: Wireless Charging(Reverse charging for other phone) at Mid Frequency Mode 3: Wireless Charging(Reverse charging for other phone) at high Frequency

Remark:

- 1. The worst case of radiated emission is mode 2; only the test data of it was reported.
- 2. The tests were performed with Adapter 1 and USB Cable.

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration and system

lt	tem	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
	1.	Mobile Phone	N/A	N/A	N/A	N/A	N/A

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3 Test Result

3.1 20dB and 99% Occupied Bandwidth Measurement

3.1.1 Limit of 20dB and 99% Occupied Bandwidth

Reporting only

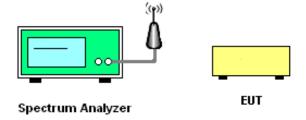
3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

- 1. The 20dB bandwidth is measured with a spectrum analyzer connected via a receiver antenna placed near the EUT while wirelessly charging a charging board.
- 2. Use the following spectrum analyzer settings for 99 % Bandwidth measurement.
- 3. Measure and record the results in the test report.

3.1.4 Test Setup



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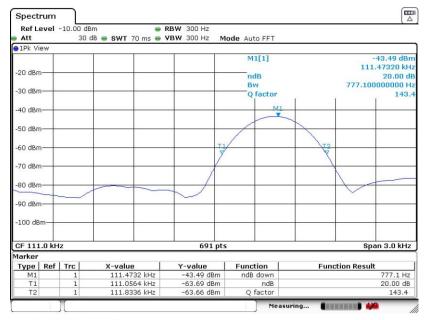
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3.1.5 Test Result of 20dB and 99% Bandwidth

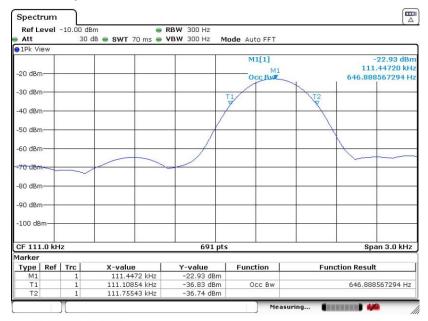
Mode 1

20 dB Bandwidth Plot



Date: 20.SEP.2022 01:57:39

99% Occupied Bandwidth Plot



Date: 20.SEP.2022 01:59:04

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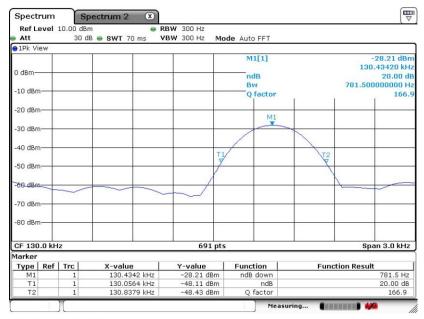
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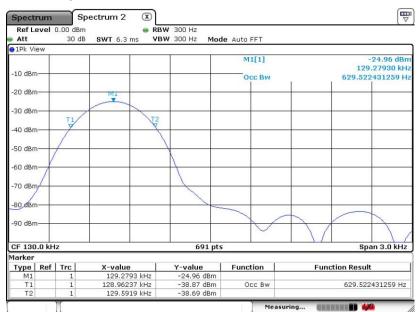
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Mode 2 20 dB Bandwidth Plot



Date: 15.0CT.2022 12:02:06

99% Occupied Bandwidth Plot



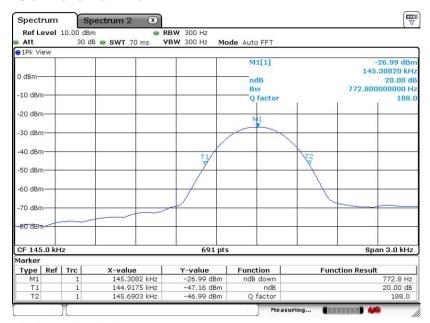
Date: 15.0CT.2022 11:55:34

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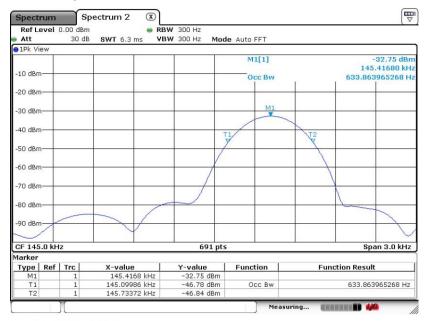
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Mode 3 20 dB Bandwidth Plot



Date: 15.0CT.2022 12:04:17

99% Occupied Bandwidth Plot



Date: 15.0CT.2022 12:04:55

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3.2 Radiated Emission Measurement

3.2.1 Limit of Radiated Emission

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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Frequency	Field Strength	Measurement Distance
(MHz)	(microvolts/meter)	(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

Receiver Parameter	Setting
Frequency Range: 9kHz~150kHz	RBW 200Hz for QP
Frequency Range: 150kHz~30MHz	RBW 9kHz for QP
Frequency Range: 30MHz~1000MHz	RBW 120kHz for Peak

Note: 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. Radiated emission limits in these two bands are based on measurements employing an average detector.

For radiated emissions from 9kHz to 1GHz test distance is 3m

For 9kHz ~ 30MHz

- 1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
- 2. Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
- 3. specific line $(dB\mu V/m) = 20 \log Emission level (\mu V/m)$
- 4. Limit line = specific limits $(dB\mu V/m)$ + distance extrapolation factor.

3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

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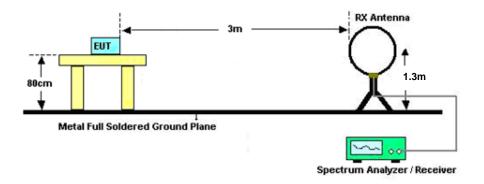
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3.2.3 Measuring Instrument Setting

Follow the guidelines in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission for three EUT orthogonal planes, and adjusting the measurement antenna height and polarization. A pre-amp and a high pass filter are used for this test in order to get the good signal level.

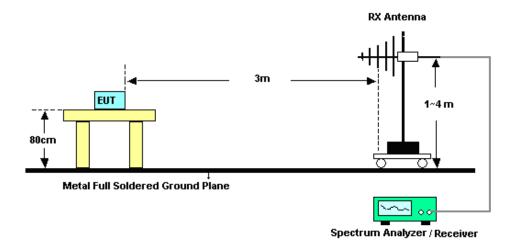
3.2.4 Test Setup of Radiated Emission

For radiated emissions below 30MHz



Note: There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

For radiated emissions above 30MHz



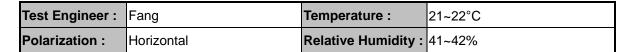
Sporton International Inc. (Kunshan)

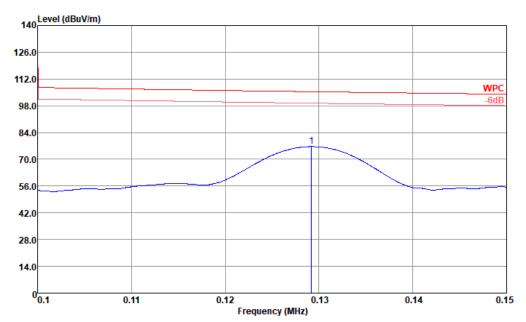
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3.2.5 Test Result of Fundamental Emission





Site : 03CH02-KS

Condition : WPC 3m NFC-ANTENNA HORIZONTAL

Freq	Level				Antenna Factor		A/Pos		Remark
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	cm	deg	

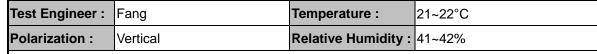
1 0.1292 76.65 -28.72 105.37 56.29 20.27 0.09 --- --- Peak

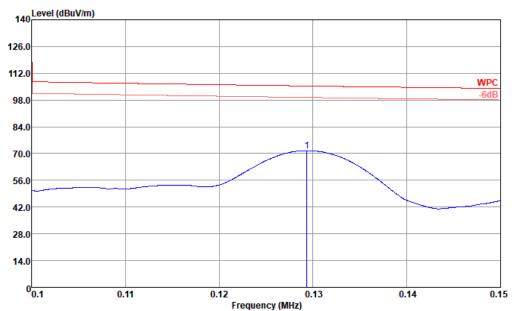
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Site : 03CH02-KS

Condition : WPC 3m NFC-ANTENNA VERTICAL

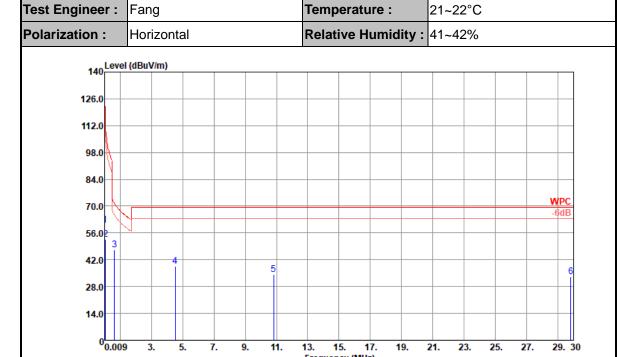
	Freq	Level		Limit Line				A/Pos		Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	cm	deg	
1	0 1294	71 56	-33 80	105 36	51 20	20 27	0 00			Deak

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Test Result of Radiated Emission (9kHz ~ 30MHz) 3.2.6



Frequency (MHz)

: 03CH02-KS Site

Condition : WPC 3m NFC-ANTENNA HORIZONTAL

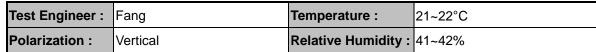
	Freq	Level		Limit Line				A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	cm	deg	
1	0.0299	60.06	-58.03	118.09	38.97	21.00	0.09			Average
2	0.0588	52.70	-59.51	112.21	32.01	20.60	0.09			Average
3	0.6458	47.29	-24.09	71.38	26.48	20.71	0.10			QP
4	4.5200	38.74	-30.80	69.54	18.28	20.32	0.14			QP
5	10.8220	34.21	-35.33	69.54	13.71	20.25	0.25			QP
6	29.8250	33.05	-36.49	69.54	12.83	19.68	0.54			QP
6	29.8250	33.05	-36.49	69.54	12.83	19.68	0.54			QP

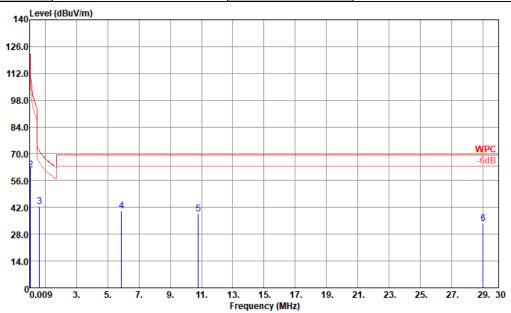
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Site : 03CH02-KS

Condition : WPC 3m NFC-ANTENNA VERTICAL

	Freq	Level		Limit Line				-	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	cm	deg	
1	0.0299	58.28	-59.81	118.09	37.19	21.00	0.09			Average
2	0.0588	61.43	-50.78	112.21	40.74	20.60	0.09			Average
3	0.6458	42.58	-28.80	71.38	21.77	20.71	0.10			QP _
4	5.8820	40.01	-29.53	69.54	19.72	20.12	0.17			QP
5	10.7880	38.57	-30.97	69.54	18.06	20.26	0.25			QP
6	29.0200	33.47	-36.07	69.54	13.36	19.58	0.53			OP

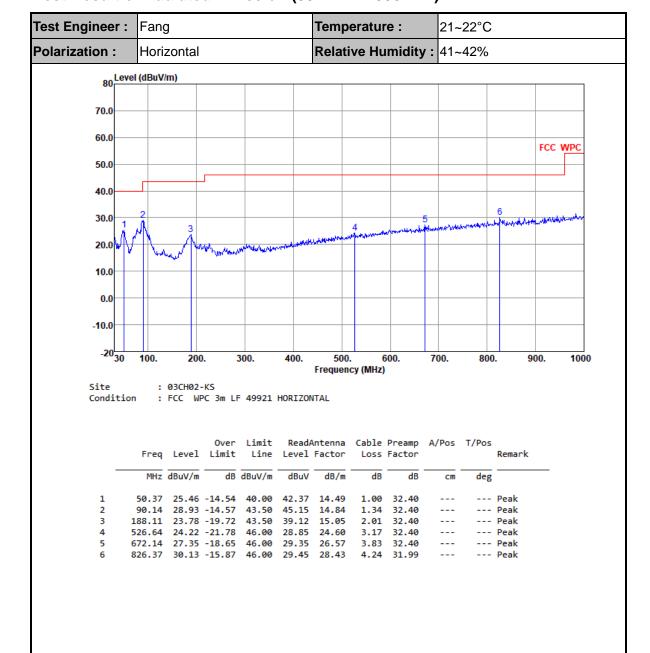
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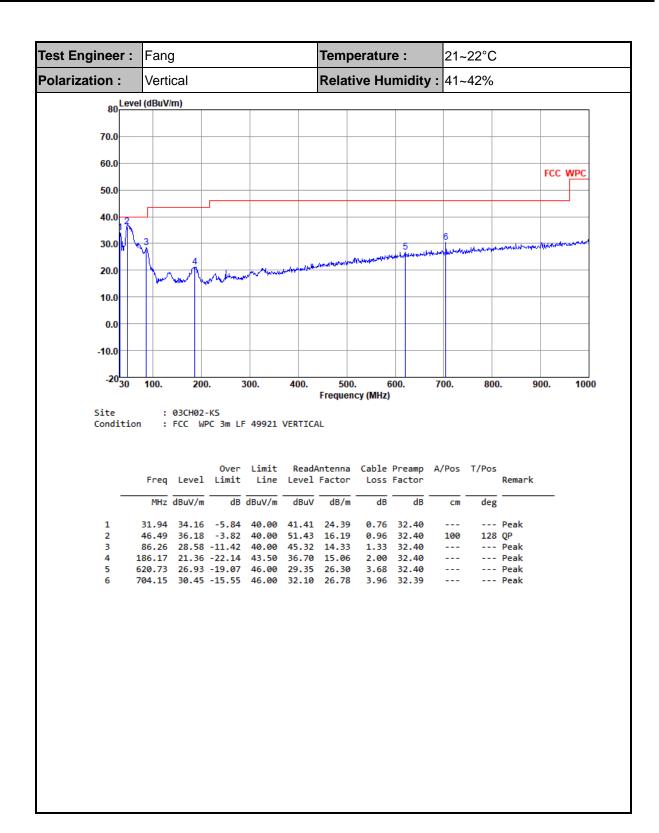
Test Result of Radiated Emission (30MHz ~ 1000MHz) 3.2.7



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3.3 AC Conducted Emission Measurement

3.3.1 Limits of AC Conducted Emission

For equipment 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.

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Frequency of Emission	Conducted Limit (dBµV)				
(MHz)	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.

3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

3.3.3 Test Procedure

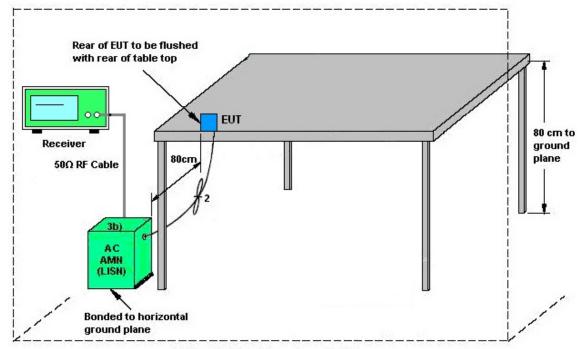
- 1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- 2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- 3. All the support units are connecting to the other LISN.
- 4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- 5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
- 6. Both sides of AC line were checked for maximum conducted interference.
- 7. The frequency range from 150 kHz to 30 MHz was searched.
- 8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

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3.3.4 Test Setup



AMN = Artificial mains network (LISN)

AE = Associated equipment

EUT = Equipment under test

ISN = Impedance stabilization network

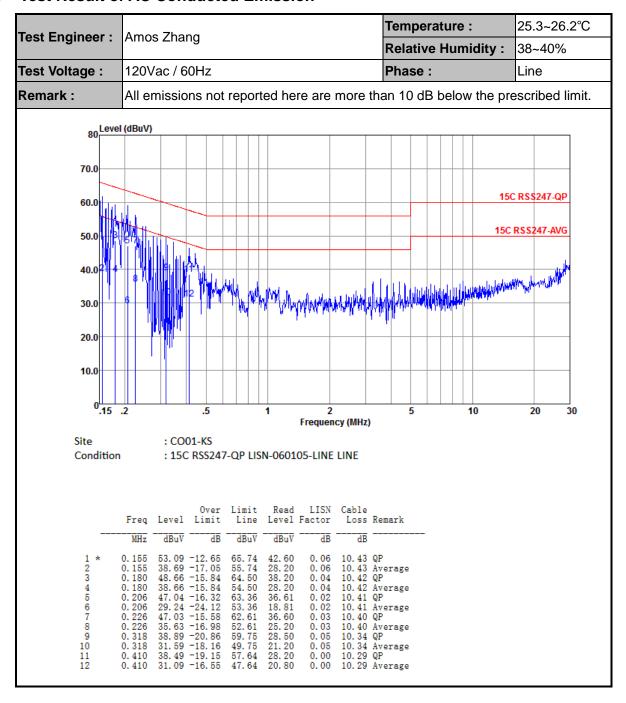
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3.3.5 Test Result of AC Conducted Emission



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Test Engineer: Amos Zhang

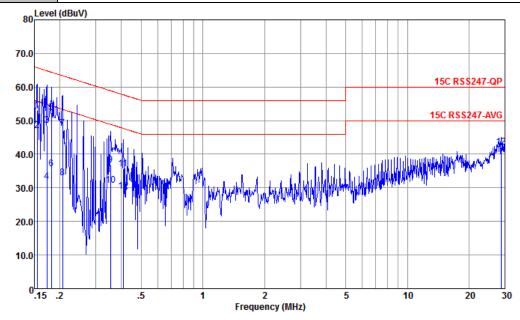
Temperature: 25.3~26.2°C

Relative Humidity: 38~40%

Test Voltage: 120Vac / 60Hz

Phase: Neutral

Remark: All emissions not reported here are more than 10 dB below the prescribed limit.



Site : CO01-KS

Condition : 15C RSS247-QP LISN-060105-NEUTRAL NEUTRAL

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 2 * 3 4 5 6 7 8 9	0. 155 0. 155 0. 173 0. 173 0. 182 0. 182 0. 206 0. 206 0. 354 0. 354	47. 06 48. 66 31. 96 52. 37 35. 57 47. 66 33. 06 36. 86 30. 76	-12. 78 -8. 68 -16. 15 -22. 85 -12. 05 -18. 85 -15. 70 -20. 30 -22. 01 -18. 11	65. 74 55. 74 64. 81 54. 81 64. 42 54. 42 63. 36 53. 36 58. 87 48. 87	42.50 36.60 38.19 21.49 41.91 25.11 37.21 22.61 26.60 20.50	0. 03 0. 03 0. 04 0. 04 0. 04 0. 04 0. 04 -0. 06 -0. 06	10. 43 10. 42 10. 42 10. 41 10. 41 10. 32 10. 32	Average QP Average QP Average QP Average QP Average
11 12 13 14	0. 408 0. 408 28. 755 28. 755	29. 02 42. 20	-21.96 -18.66 -17.80 -10.10	57. 68 47. 68 60. 00 50. 00	25. 50 18. 80 30. 90 28. 60	-0. 07 -0. 07 -0. 40 -0. 40	11.70	Average

Note:

- 1. Level($dB\mu V$) = Read Level($dB\mu V$) + LISN Factor(dB) + Cable Loss(dB)
- 2. Over Limit(dB) = Level(dB μ V) Limit Line(dB μ V)

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3.4 Antenna Requirements

3.4.1 Standard Applicable

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. 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 the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.

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 rule.

3.4.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

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4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV30	101338	10Hz~30GHz	Apr. 12, 2022	Sep. 20, 2022~ Oct. 15, 2022	Apr. 11, 2023	Conducted (TH01-KS)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz;Ma x 30dBm	Oct. 16, 2021	Oct. 12, 2022	Oct. 15, 2022	Radiation (03CH02-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 30, 2021	Oct. 12, 2022	Oct. 29, 2022	Radiation (03CH02-KS)
Bilog Antenna	TeseQ	CBL6111D	44483	30MHz-1GHz	Dec. 22, 2021	Oct. 12, 2022	Dec. 21, 2022	Radiation (03CH02-KS)
Amplifier	SONOMA	310N	413741	9KHz-1GHz	Jan. 05, 2022	Oct. 12, 2022	Jan. 04, 2023	Radiation (03CH02-KS)
AC Power Source	Chroma	61601	616010002 473	N/A	NCR	Oct. 12, 2022	NCR	Radiation (03CH02-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Oct. 12, 2022	NCR	Radiation (03CH02-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Oct. 12, 2022	NCR	Radiation (03CH02-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	May 24, 2022	Sep. 26, 2022	May 23, 2023	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 14, 2021	Sep. 26, 2022	Oct. 13, 2022	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	May 24, 2022	Sep. 26, 2022	May 23, 2023	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000 0811	AC 0V~300V, 45Hz~1000Hz	Oct. 14, 2021	Sep. 26, 2022	Oct. 13, 2022	Conduction (CO01-KS)

NCR: No Calibration Required

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Uncertainty of Evaluation 5

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence	2.78dB
of 95% (U = 2Uc(y))	2.7005

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Uncertainty of Radiated Emission Measurement (9 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence	4 04B
of 95% (U = 2Uc(y))	4.0dB

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence	4.0dB
of 95% (U = 2Uc(y))	4.006

----- THE END -----

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