

Prüfbericht-Nr.: <i>Test report no.:</i>	60415352 003	Auftrags-Nr.: <i>Order no.:</i>	168279564	Seite 1 von 23 Page 1 of 23
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2020-11-01	
Auftraggeber: <i>Client:</i>	SPECTRA Technologies Holdings Co., Ltd. Unit 1301-09, 19-20, Tower II, Grand Century Place, Kowloon, Hong Kong			
Prüfgegenstand: <i>Test item:</i>	Android POS			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	APOLLO			
Auftrags-Inhalt: <i>Order content:</i>	Test Report			
Prüfgrundlage: <i>Test specification:</i>	CFR47 FCC Part 15: Subpart C Section 15.225 CFR47 FCC Part 15: Subpart C Section 15.207 CFR47 FCC Part 15: Subpart C Section 15.209			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2020-10-13	Please refer to photo documents		
Prüfmuster-Nr.: <i>Test sample no.:</i>	A002920755-001			
Prüfzeitraum: <i>Testing period:</i>	2020-10-14 – 2020-12-28			
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	 Lin Lin		genehmigt von: <i>authorized by:</i>	Winni e Hou
Datum: <i>Date:</i> 2020-12-28			Ausstellungsdatum: <i>Issue date:</i> 2020-12-28	
Stellung / Position:	Senior Project Manager		Stellung / Position:	
Sonstiges / Other: FCC ID: VWZTA10Q				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet * Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

Test Summary

5.1.1 Antenna Requirement

RESULT: Pass

5.1.2 99% and 20dB Bandwidth

RESULT: Pass

5.1.3 Radiated Spurious Emission

RESULT: Pass

5.1.4 Frequency Stability

RESULT: Pass

5.1.5 Conducted Emission on AC Mains

RESULT: Pass

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1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: Setup Photos

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

362 Huanguan Road Middle Longhua District, Shenzhen 518110 People's Republic of China

FCC Registration No.: CN1260

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

TÜV Rheinland (Shenzhen) Co., Ltd.

Radio Spectrum Testing (TS8997)				
Equipment	Manufacturer	Model	Serial No.	Cal. until
Signal Analyzer	R&S	FSV 40	101441	19.08.2021
Humid & Temp Programmable Tester	BOST	NTH090-60	19040801	10.04.2021
Shielding Room 8#	Albatross	SR8	APC17151-SR8	22.07.2021
Radiated Emission Testing (TS9975)				
Equipment	Manufacturer	Model	Serial No.	Cal. until
EMI Test Receiver	R&S	ESR 7	102021	18.08.2021
System Controller Interface	R&S	SCI-100	S10010038	N/A
Filterbank	R&S	Wlan	100759	20.08.2021
OSP	R&S	OSP 120	102040	N/A
Pre-amplifier	R&S	SCU08F1	08320031	19.08.2021
Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	193	01.09.2021
Wideband Ridged Horn Antenna (18-40 GHz)	Steatite	QMS-00880	19067	01.09.2021
Active Loop Antenna	Schwarzbeck	FMZB 1513	302	31.08.2021
Test software	R&S	EMC32 (V10.60.10)	N/A	N/A
Control PC	Dell	OptiPlex 7050	36NV9P2	N/A
3m Semi-Anechoic Chamber	Albatross	SAC-3m	APC17151-SAC	05.07.2021

Conducted Emission on AC Mains				
Equipment	Manufacturer	Model No.	Serial No.	Cali. until
EMI Test Receiver	R&S	ESR3	102680	19.02.2021
Artificial Mains Network	R&S	ENV216	101445	19.02.2021
EMC32 test software	R&S	EMC32(Ver.10.50.01)	N/A	N/A

2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-7}$
Conducted Emission, (9kHz to 150kHz)/(150kHz to 30MHz)	$\pm 3.70 \text{ dB} / \pm 3.30 \text{ dB}$
Radiated Emission (3m SAC), Up to 1000MHz	$\pm 4.52 \text{ dB}$
Radiated Emission (3m SAC), above 1000MHz	$\pm 4.37 \text{ dB}$
Temperature	$\pm 1 \text{ }^{\circ}\text{C}$
Humidity	$\pm 5 \text{ } \%$
Voltage (DC)	$\pm 1 \text{ } \%$
Voltage (AC, <10kHz)	$\pm 2 \text{ } \%$

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached in this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) Co., Ltd. file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at 362 Huanguan Road Middle Longhua District, Shenzhen 518110 People's Republic of China is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3 General Product Information

3.1 Product Function and Intended Use

The EUT is an Android POS which supports Bluetooth, 2.4G Wi-Fi 802.11 b/g/n, 5G Wi-Fi 802.11a/n, NFC and GSM/WCDMA/LTE wireless technology.

For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment	Android POS
Type Designation	APOLLO
FCC ID	VWZTA10Q
Operating Voltage:	DC 5V@2A input via power adapter
Testing Voltage	Fully Charged Battery and AC 120V@60Hz
Antenna Type	Integral Antenna
Power Adapter	Model: UWP-10W-0520S Input: AC 100-240V~50/60Hz, 0.3A Output: DC5V@2A
Battery	Model: LARGE18650 Power Rating: 7.2Vdc, 2600mAh Type: Li-ion
USB Cable	Shielding, Length: 1m
Technical Specification	
Operating Frequency	13.56MHz
Type of Modulation	ASK

3.3 Independent Operation Modes

The basic operation modes is:

- A. On, Transmitting mode

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- Application Form

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All tests were performed according to the procedures in ANSI C63.10: 2013 and ANSI C63.4: 2014.

4.3 Special Accessories and Auxiliary Equipment

None.

4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

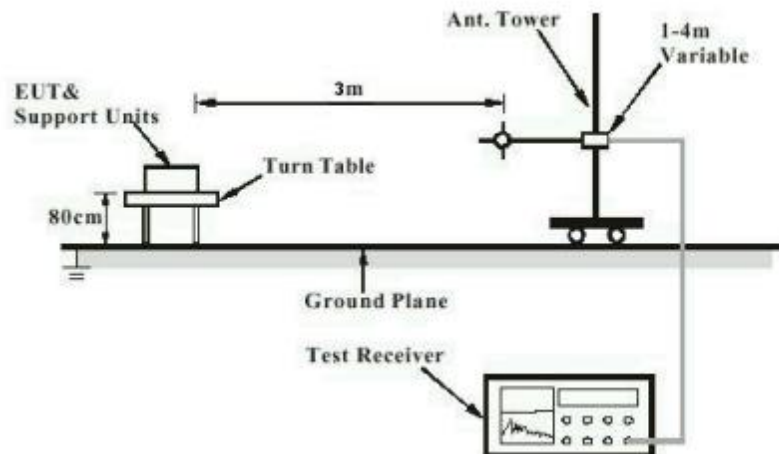


Diagram of Measurement Configuration for Mains Conduction Measurement

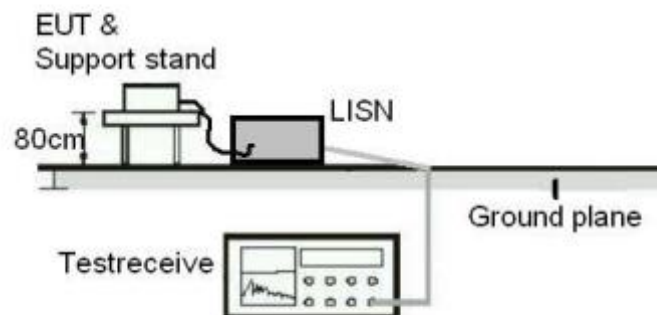
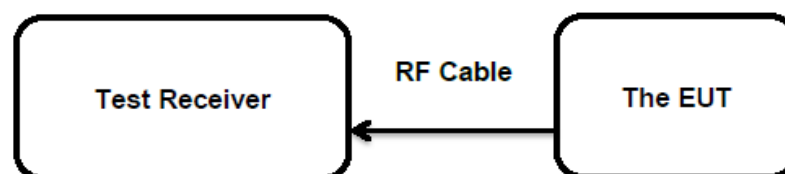


Diagram of Measurement Configuration for Conducted Transmitter Measurement



5 Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT:**Pass**

According to the manufacturer declared, the EUT has an internal antenna and the antenna connector is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

Therefore the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

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*Page 11 of 23***5.1.2 99% and 20dB Bandwidth****RESULT:****Pass****Test Specification**

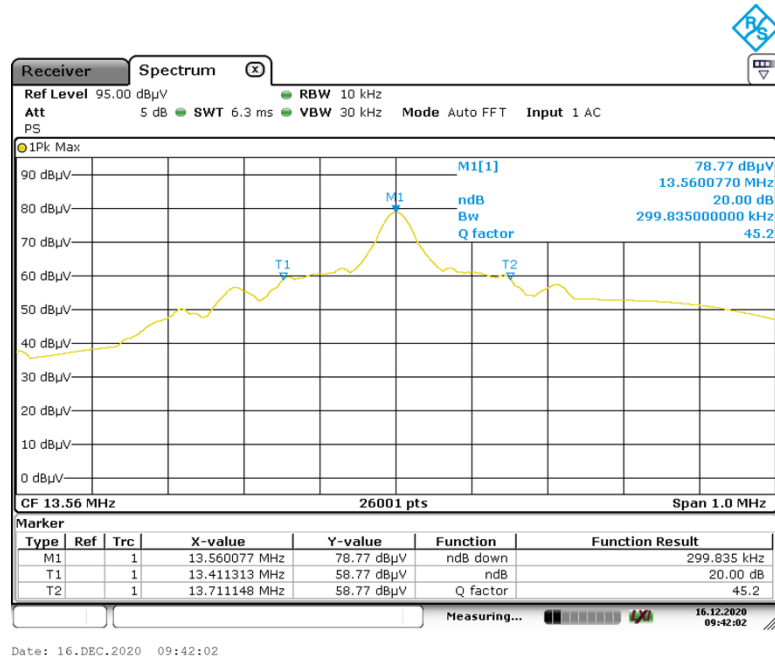
Test standard : FCC Part 15.215
Basic standard : ANSI C63.10: 2013
Kind of test site : Shielded Room

Test Setup

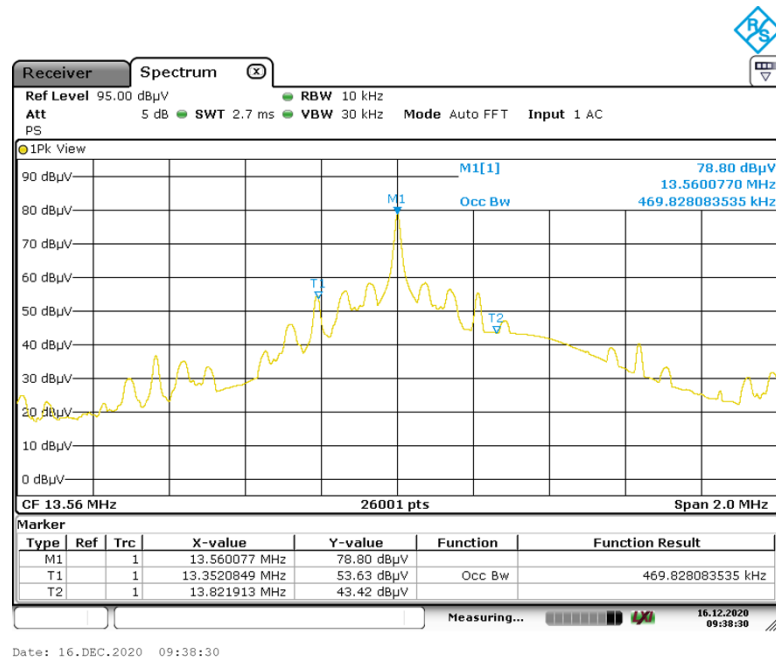
Date of testing : 2020-12-16
Input voltage : Fully Charged Battery and AC 120V@60Hz
Operation mode : A
Ambient temperature : 24 °C
Relative humidity : 53 %
Atmospheric pressure : 101 kPa

Refer to next page for the measurement records

20dB Bandwidth



99% OBW



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Test standard : FCC Part 15.225 (a) (b) (c) (d) & FCC Part 15.205
Basic standard : ANSI C63.10: 2013
Limits : Refer to 15.209(a) & 15.225
Kind of test site : 3m Semi-anechoic Chamber

Test Setup

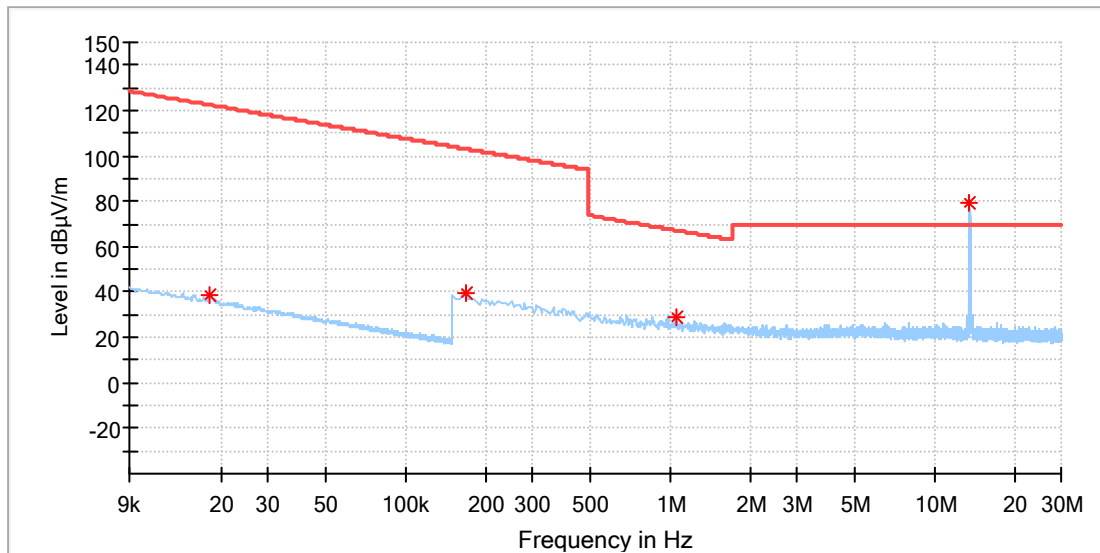
Date of testing : 2020-12-15
Input voltage : Fully Charged Battery and AC 120V@60Hz
Operation mode : A
Ambient temperature : 25 °C
Relative humidity : 56 %
Atmospheric pressure : 101 kPa

Remark:

Testing was carried out within frequency range 9kHz to the tenth harmonics. Only the worst case spurious emissions configuration of the each mode were reported.

Refer to next page for the measurement records

X AXIS

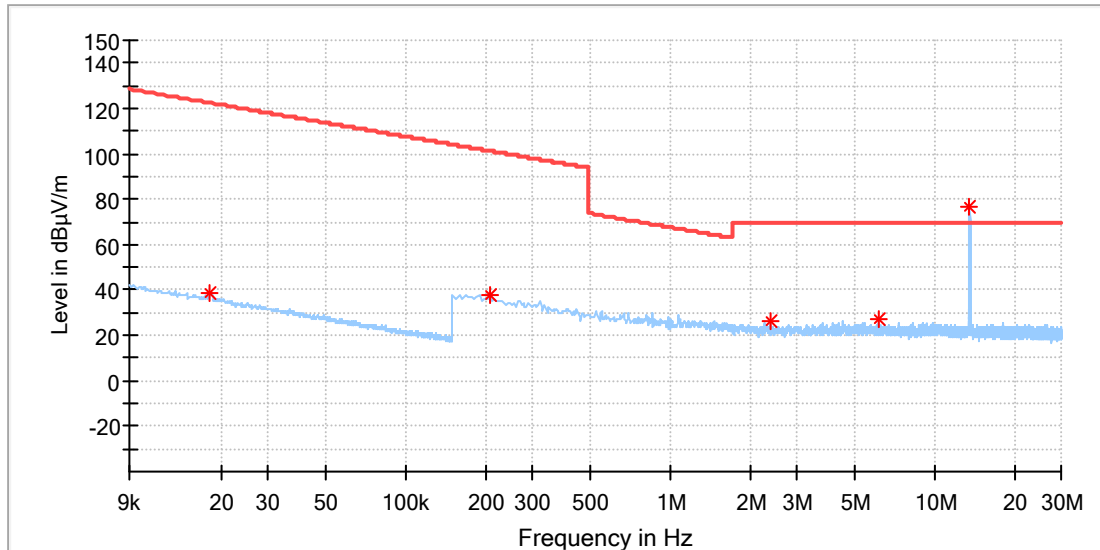


Critical_Freqs

Frequency (MHz)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Preamp (dB)	Trd Corr. (dB/m)
0.018165	38.98	122.40	83.42	100.0	X	291.0	20.0	0.0	20.0
0.167559	39.45	103.12	63.66	100.0	X	231.0	20.0	0.0	20.0
1.045500	29.20	67.24	38.04	100.0	X	0.0	20.0	0.0	20.0
13.560552	79.01	69.50	-9.51	100.0	X	2.0	20.0	0.0	20.0

Note: The emission exceed the limit is the fundamental emission.

Y AXIS

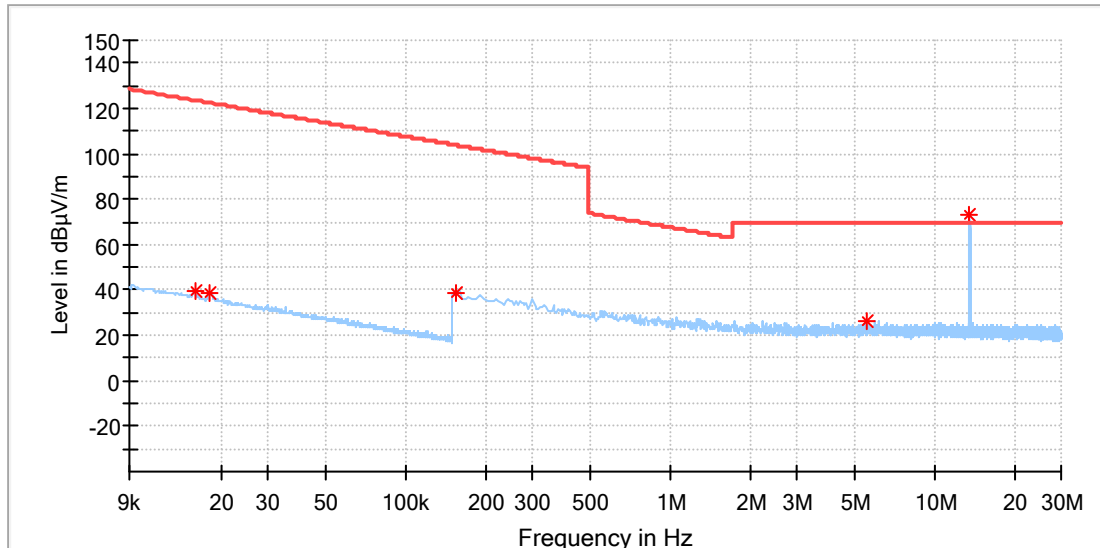


Critical Freqs

Frequency (MHz)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Preamp (dB)	Trd Corr. (dB/m)
0.018165	38.54	122.40	83.87	100.0	Y	137.0	20.0	0.0	20.0
0.207066	38.08	101.28	63.20	100.0	Y	255.0	20.0	0.0	20.0
2.379971	25.98	69.50	43.52	100.0	Y	178.0	20.0	0.0	20.0
6.124390	26.74	69.50	42.76	100.0	Y	183.0	20.0	0.0	20.0
13.560552	76.76	69.50	-7.26	100.0	Y	274.0	20.0	0.0	20.0

Note: The emission exceed the limit is the fundamental emission.

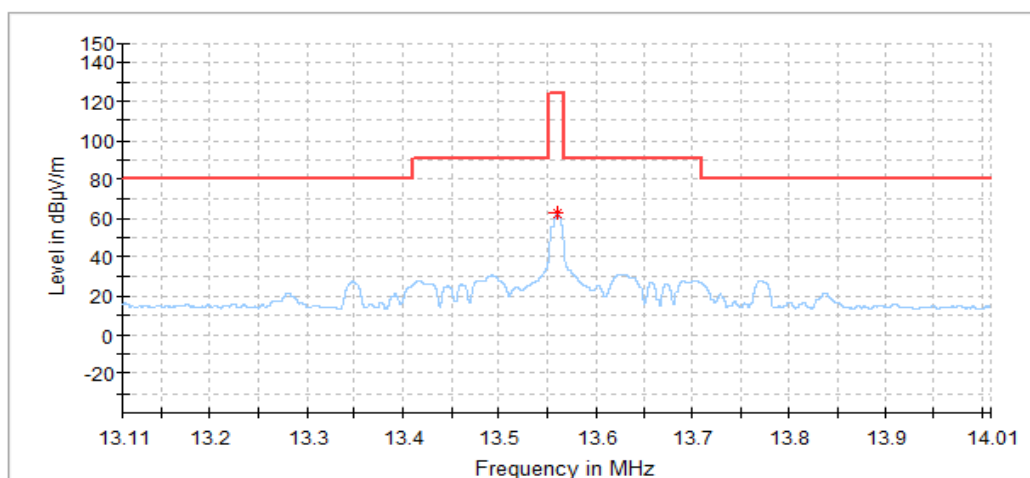
Z AXIS



Critical Freqs

Frequency (MHz)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Preamp (dB)	Trd Corr. (dB/m)
0.015949	39.86	123.53	83.67	100.0	Z	71.0	20.0	0.0	20.0
0.018165	38.91	122.40	83.49	100.0	Z	188.0	20.0	0.0	20.0
0.154390	38.70	103.83	65.12	100.0	Z	147.0	20.0	0.0	20.0
5.487882	26.58	69.50	42.92	100.0	Z	36.0	20.0	0.0	20.0
13.560552	73.14	69.50	-3.64	100.0	Z	188.0	20.0	0.0	20.0

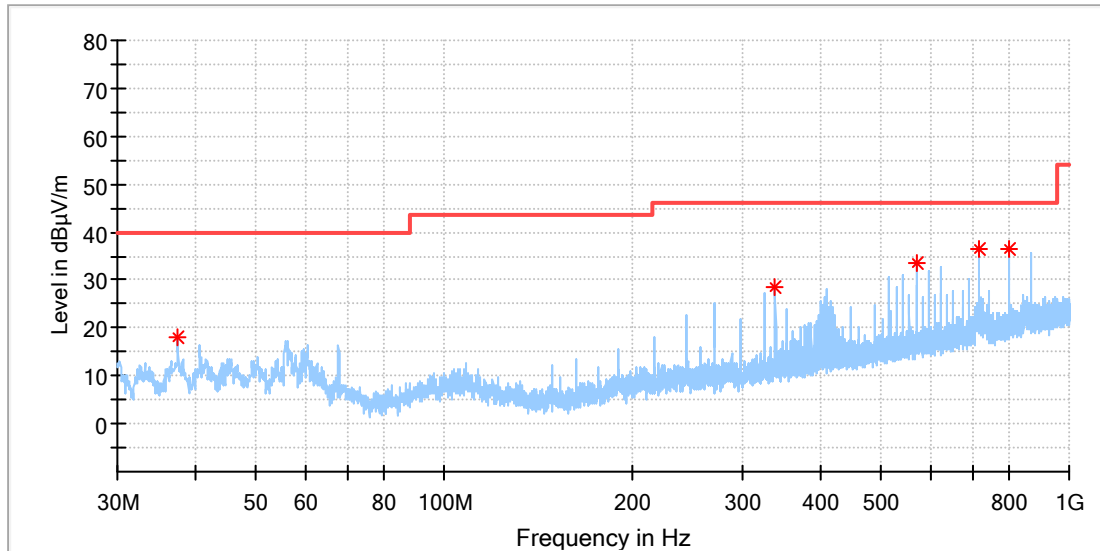
Note: The emission exceed the limit is the fundamental emission.



Critical Freqs

Frequency (MHz)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Preamp (dB)	Trd Corr. (dB/m)
13.560397	62.92	124.00	61.08	100.0	V	0.0	20.0	0.0	20.0

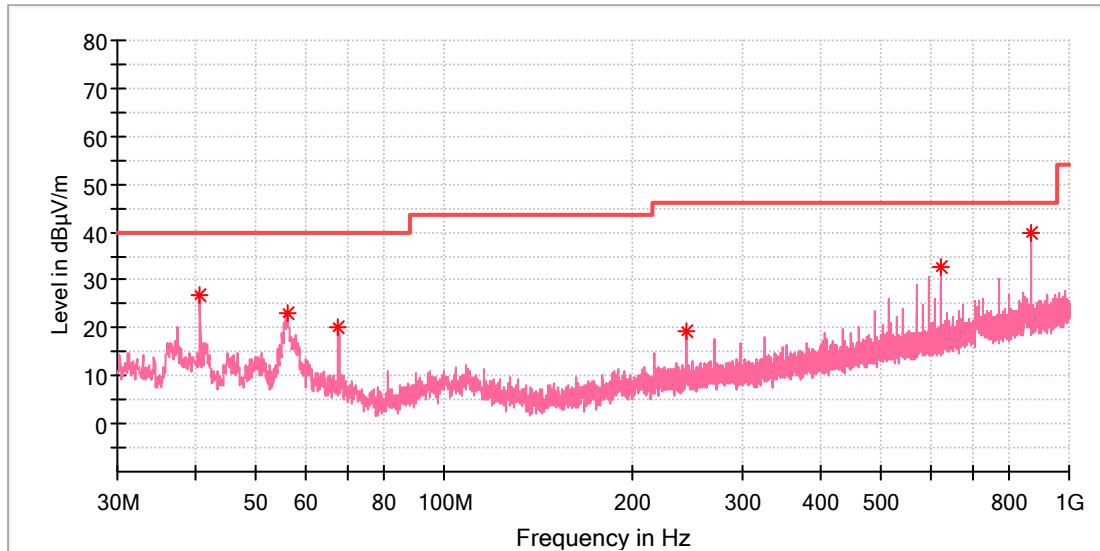
Horizontal



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
37.517500	17.90	---	40.00	22.10	100.0	H	277.0	-21.2
338.993500	28.48	---	46.00	17.52	100.0	H	298.0	-15.4
569.514000	33.44	---	46.00	12.56	100.0	H	261.0	-10.8
718.700000	36.45	---	46.00	9.55	100.0	H	86.0	-8.1
800.034500	36.46	---	46.00	9.54	100.0	H	252.0	-6.8

Vertical



Critical_Freqs

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
40.670000	26.70	---	40.00	13.30	100.0	V	272.0	-20.2
56.190000	23.22	---	40.00	16.78	100.0	V	177.0	-18.9
67.781500	20.16	---	40.00	19.84	100.0	V	307.0	-21.4
244.079000	19.47	---	46.00	26.53	100.0	V	0.0	-17.9
622.039500	32.64	---	46.00	13.36	100.0	V	177.0	-9.8
869.292500	39.96	---	46.00	6.04	100.0	V	34.0	-5.7

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5.1.4 Frequency Stability
RESULT:
Pass
Test Specification

Test standard : FCC Part 15.225(e)
 Basic standard : ANSI C63.10:2013
 Limits : 0.01% of Operating Frequency (100ppm)
 Kind of test site : Shielded Room

Test Setup

Date of testing : 2020-12-16
 Operation mode : A
 Relative humidity : 56 %
 Atmospheric pressure : 101 kPa

Test Mode: Transmitting					
Frequency (MHz)	Voltage (Vdc)	Temperature (°C)	Measurement Frequency (Hz)	Frequency deviation (Hz)	Max. Deviation (%)
13.56	7.2	-30	13559989	-11	-0.00000155
		-20	13559979	-21	
		-10	13559983	-17	
		0	13559997	-3	
		10	13560013	13	
		20	13560015	15	
		30	13560009	9	
		40	13560012	12	
		50	13560016	16	
		55	13560019	19	
	6.48	25	13560010	10	
	7.92	25	13560011	11	

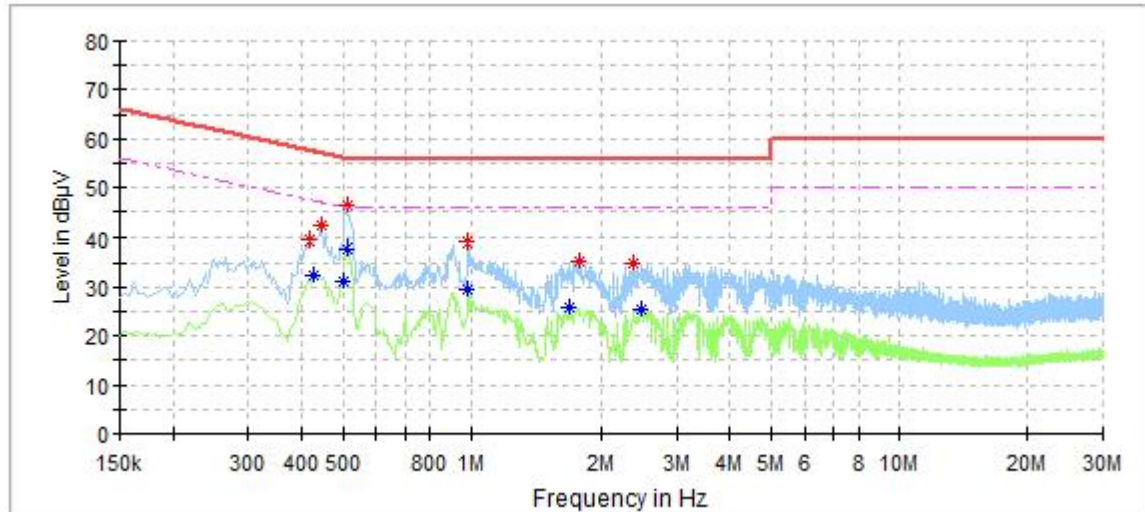
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*Page 20 of 23***5.1.5 Conducted Emission on AC Mains****RESULT:****Pass****Test Specification**

Test standard	: FCC Part 15.207(a)
Basic standard	: ANSI C63.10: 2013
Frequency range	: 0.15 – 30MHz
Limits	: FCC Part 15.207(a)
Kind of test site	: Shielded Room

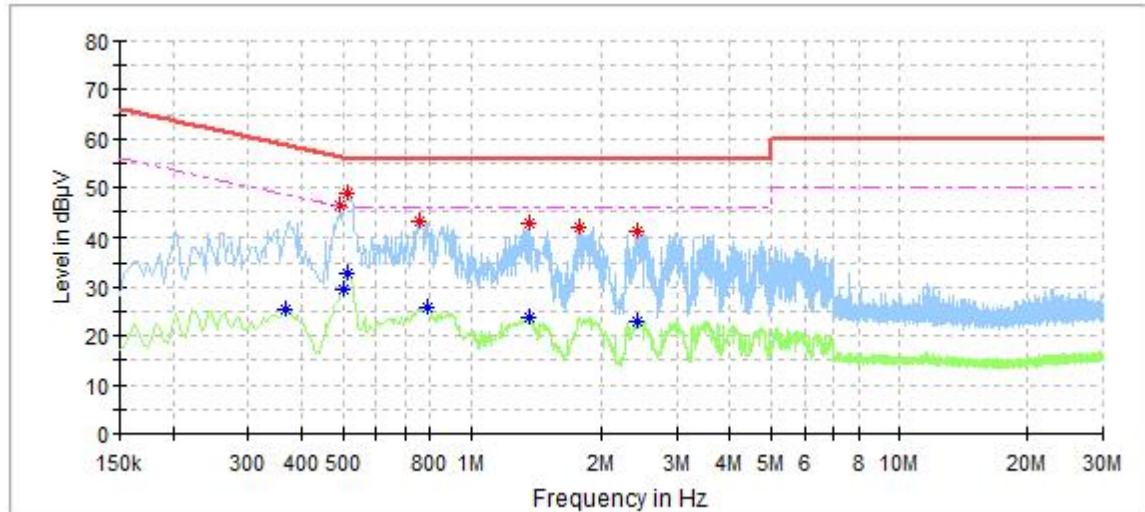
Test Setup

Date of testing	: 2020-10-19 ~ 2020-10-22
Input voltage	: AC 120V@60Hz
Operation mode	: A
Earthing	: Not connected
Ambient temperature	: 24 °C
Relative humidity	: 53 %
Atmospheric pressure	: 101 kPa

Refer to next page for the measurement records



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.418000	39.57	---	57.49	17.92	L1	9.7
0.426000	---	32.23	47.33	15.10	L1	9.7
0.446000	42.15	---	56.95	14.80	L1	9.7
0.500000	---	31.31	46.00	14.69	L1	9.7
0.512000	46.27	---	56.00	9.73	L1	9.7
0.516000	---	37.59	46.00	8.41	L1	9.7
0.984000	---	29.52	46.00	16.48	L1	9.7
0.984000	38.80	---	56.00	17.20	L1	9.7
1.684000	---	25.95	46.00	20.05	L1	9.7
1.776000	35.18	---	56.00	20.82	L1	9.7
2.380000	34.98	---	56.00	21.02	L1	9.7
2.480000	---	25.38	46.00	20.62	L1	9.8



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.366000	---	25.53	48.59	23.07	N	9.7
0.494000	46.51	---	56.10	9.59	N	9.7
0.500000	---	29.74	46.00	16.26	N	9.7
0.516000	48.87	---	56.00	7.13	N	9.7
0.516000	---	32.86	46.00	13.14	N	9.7
0.760000	43.14	---	56.00	12.86	N	9.7
0.788000	---	25.99	46.00	20.01	N	9.7
1.368000	---	23.86	46.00	22.14	N	9.7
1.376000	42.69	---	56.00	13.31	N	9.7
1.780000	41.85	---	56.00	14.15	N	9.7
2.416000	41.07	---	56.00	14.93	N	9.8
2.436000	---	23.16	46.00	22.84	N	9.8

6 Photographs of the Test Set-Up

For photographs of the test set-up, refer to the appendix A.

7 List of Tables

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