



EMC TEST REPORT

Applicant	Qboid, Inc.
FCC ID	2AYQM-M2W01
Product	Handheld 3D Dimensioning Terminal
Brand	Qboid
Model	Perceptor M2
Report No.	R2111A0948-E1
Issue Date	February 9, 2022

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC Code CFR47 Part15B (2020)/ ANSI C63.4 (2014)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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Summary of measurement results

Number	Test Case	Clause in FCC Rules	Conclusion
1	Radiated Emission	FCC Part15.109, ANSI C63.4-2014	PASS
2	Conducted Emission	FCC Part15.107, ANSI C63.4-2014	PASS
Date of Testing: December 15, 2021 ~ December 31, 2021			
Date of Sample Received: November 19, 2021			
Note: All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.			



1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform measurements.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform measurement.

1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
City: Shanghai
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E-mail: fanguangchang@ta-shanghai.com

2 General Description of Equipment under Test

2.1 Applicant and Manufacturer Information

Applicant	Qboid,Inc.
Applicant address	118 Charcot Ave, San Jose, CA, 95131
Manufacturer	Nantong Kefei Technology Co., Ltd.
Manufacturer address	Room 1604, Building 8, Xinghu 101 Square, Nantong Economic and Technological Development Zone

2.2 General information

EUT Description			
Device Type	Portable Device		
Model	Perceptor M2		
SN	FH04021A1900003		
HW Version	V1.1		
SW Version	V1.16		
Power Rating	DC 3.8V from battery or DC 3.6-6V/6-9V/9-12V from Adapter.		
Connecting I/O Port(s)	Please refer to the User's Manual.		
Antenna Type	Internal Antenna		
Frequency	Band	Tx (MHz)	Rx (MHz)
	Bluetooth	2400 ~ 2483.5	2400 ~ 2483.5
	Wi-Fi 2.4G	2400 ~ 2483.5	2400 ~ 2483.5
	Wi-Fi 5G(U-NII-1)	5150 ~ 5250	5150 ~ 5250
	Wi-Fi 5G(U-NII-2A)	5250 ~ 5350	5250 ~ 5350
	Wi-Fi 5G(U-NII-2C)	5470 ~ 5725	5470 ~ 5725
	Wi-Fi 5G(U-NII-3)	5725 ~ 5850	5725 ~ 5850
EUT Accessory			
Adapter	Manufacturer: Shenzhen Tianyin Electronics CO.,LTD. Model: TPA-10R120150UU01HS Input: 100-240V~50/60Hz 0.6A Output: 3.6-6V ---3.0A/ Output: 6-9V ---2.0A/ Output: 9-12V ---1.5A		
Battery	Manufacturer: Jiade Energy Technology (Zhuhai) Co., Ltd. Model: FH04(JKSG) DC 3.8V, 5000mAh, 19Wh		



USB Cable	Manufacturer: SUZHOU KELI SCIENCE&TECHNOLOGY DEVELOPMENT CO.,LTD. Model: KLC-5243 100cm Cable, Shielded
Auxiliary test equipment	
PC	PC Manufacturer: Microsoft Corporation Model: L20170076
Note: 1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant.	



2.3 Applied Standards

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

Test standards

FCC Code CFR47 Part15B (2020)

ANSI C63.4 (2014)

2.4 Test Mode

Test Mode	
Mode 1:	Adapter +USB cable + Front camera On
Mode 2:	Adapter +USB cable+ Rear camera On
Mode 3:	Adapter + USB cable+ Mp4
Mode4:	Adapter + USB cable + Bluetooth WLAN receiver
Mode 5:	USB Copy(EUT with PC) + USB cable
Mode 6:	Front Camera On
Mode 7:	Earphone + MP4
Mode 8:	Rear camera On
Mode 9:	Bluetooth WLAN receiver

During the test, the preliminary test was performed in all modes with all adapters, USB and battery, mode 5 is selected as the worst condition. The test data of the worst-case condition was recorded in this report.

3 Test Case Results

3.1 Radiated Emission

Ambient condition

Temperature	Relative humidity	Pressure
15°C~35°C	30%~60%	101.5kPa

Methods of Measurement

The EUT is placed on a non-metallic table 0.8m above the horizontal metal reference ground plane. The distance between EUT and receive antenna should be 3 meters. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.4-2014. Sweep the whole frequency band through the range from 30MHz to the 5th harmonic of the carrier. During the test, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees for detecting the maximum of radiated signal level.

The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing. During the test, the EUT is worked at maximum output power.

Set the spectrum analyzer in the following:

Below 1GHz:

RBW=100 kHz / VBW=300 kHz / Sweep=AUTO

Above 1GHz:

(a) PEAK Detector: RBW=1MHz / VBW=3MHz/ Sweep=AUTO

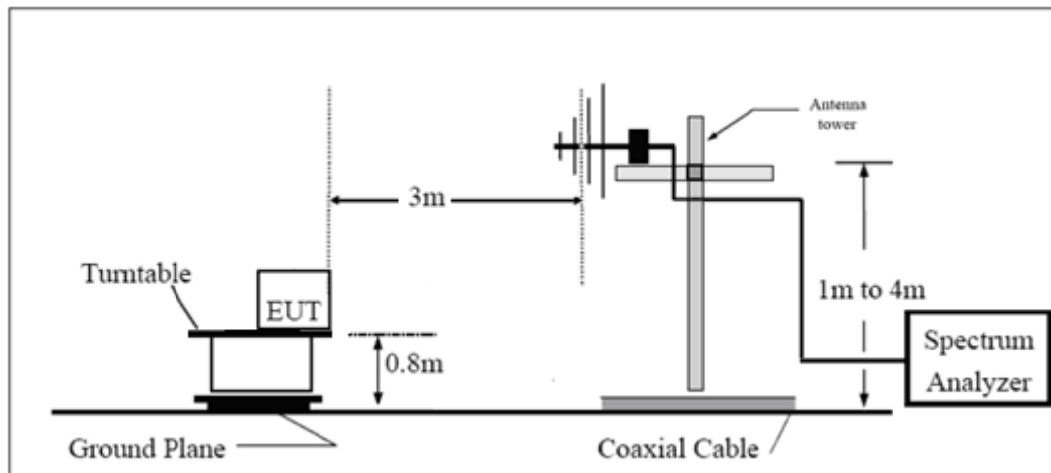
(b) AVERAGE Detector: RBW=1MHz / VBW=3MHz / Sweep=AUTO

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

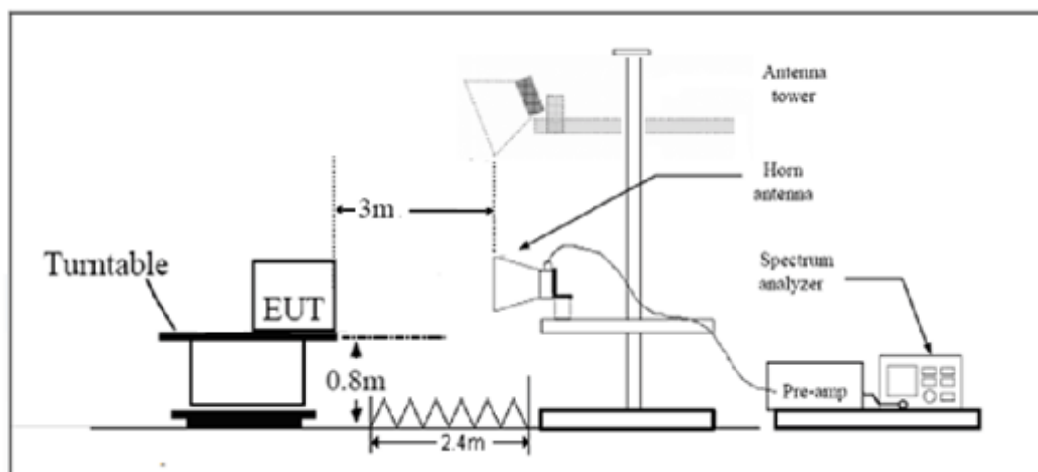
During the test, EUT is connected to a laptop via a USB cable in the case of Transfer Data mode. The EUT is used as the peripheral equipment of the PC. The data is transferred from EUT to PC;

Test Setup

Below 1GHz



Above 1GHz



Note: Area side: 2.4mX3.6m

Antenna Tower meets ANSI C63.4 requirements for measurements above 1 GHz by keeping the antenna aimed at the EUT during the antenna's ascent/ descent along the antenna mast.

Limits

Class B

Frequency (MHz)	Field Strength (dB μ V/m)	Detector
30 -88	40.0	Quasi-peak
88-216	43.5	Quasi-peak
216 – 960	46.0	Quasi-peak
960-1000	54.0	Quasi-peak
1000-5 th harmonic of the highest frequency or 40GHz, which is lower	54 74	Average Peak

Measurement Uncertainty

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

Frequency	Uncertainty
30MHz~200MHz	4.17 dB
200MHz~1000MHz	4.84 dB
1GHz~18GHz	4.35 dB

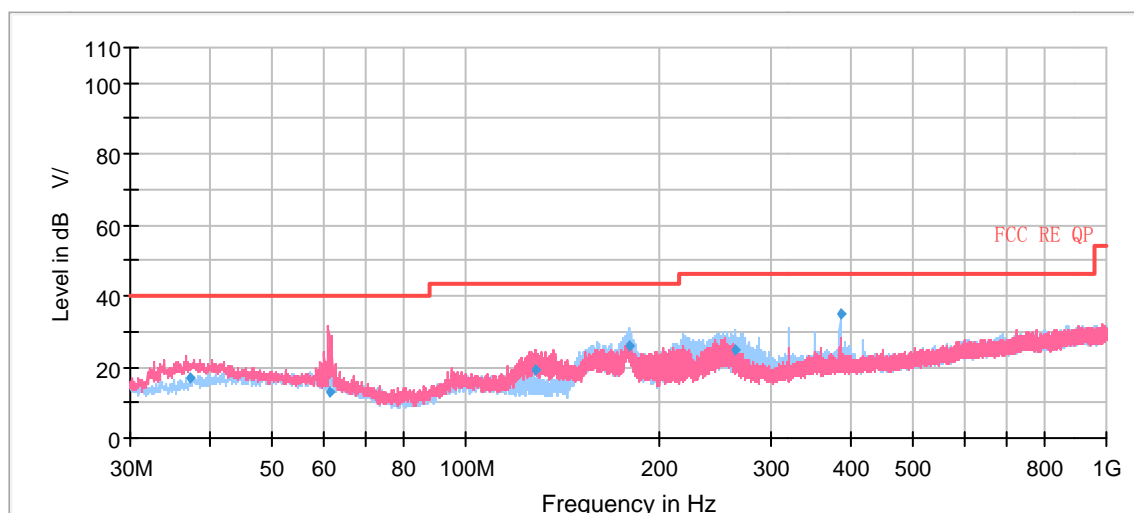
Test Results

Sweep the whole frequency band through the range from 30MHz to the 5th harmonic of the carrier.

The following graphs display the maximum values of horizontal and vertical by software.

For above 1GHz, Blue trace uses the peak detection, Green trace uses the average detection.

A font (Level in dB μ V/m) in the test plot =(level in dB μ V/m)

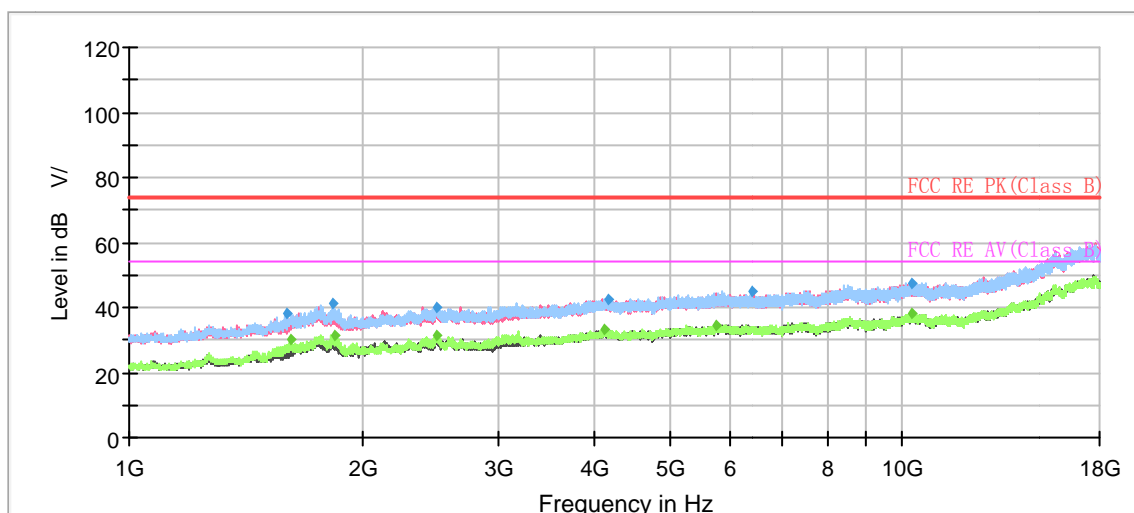


Radiated Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
37.196000	16.94	40.00	23.06	100.0	V	76.0	19
61.657000	13.23	40.00	26.77	100.0	V	262.0	19
128.430333	19.25	43.50	24.25	100.0	V	254.0	15
180.519333	26.12	43.50	17.38	209.0	H	229.0	16
262.670667	24.99	46.00	21.01	100.0	H	94.0	20
384.017667	34.79	46.00	11.21	100.0	H	1.0	23

Remark: 1. Correction Factor = Antenna factor + Insertion loss(cable loss+amplifier gain)

2. Margin = Limit – Quasi-Peak



Radiated Emission from 1GHz to 18GHz

Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1596.700000	38.45	---	74.00	35.55	100.0	H	146.0	-15
1615.400000	---	30.10	54.00	23.90	100.0	H	139.0	-15
1833.566667	41.23	---	74.00	32.77	100.0	H	139.0	-14
1847.166667	---	31.43	54.00	22.57	100.0	H	139.0	-14
2498.266667	---	31.35	54.00	22.65	200.0	H	319.0	-10
2506.200000	40.25	---	74.00	33.75	100.0	H	226.0	-10
4113.266667	---	33.00	54.00	21.00	100.0	H	346.0	-3
4155.766667	42.68	---	74.00	31.32	200.0	V	339.0	-3
5750.933333	---	34.64	54.00	19.36	200.0	V	274.0	0
6411.100000	44.72	---	74.00	29.28	200.0	V	222.0	0
10266.700000	47.64	---	74.00	26.36	100.0	H	226.0	5
10278.600000	---	37.98	54.00	16.02	200.0	H	213.0	5

3.2 Conducted Emission

Ambient condition

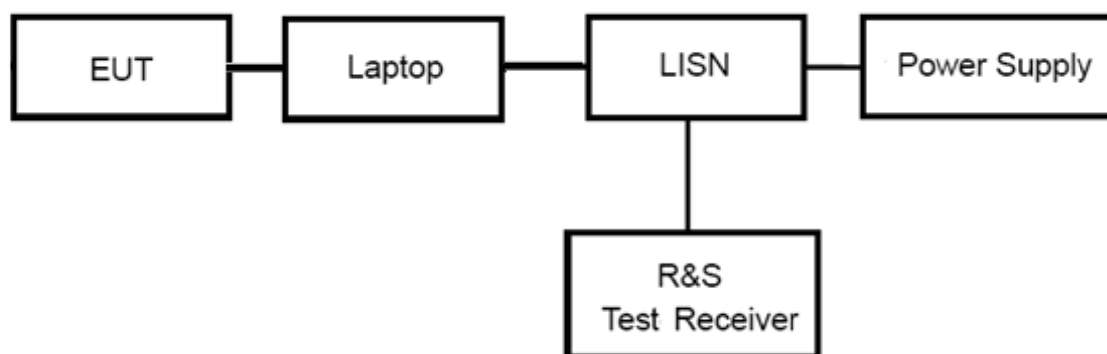
Temperature	Relative humidity	Pressure
15°C~35°C	30%~60%	101.5kPa

Methods of Measurement

The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.4-2014. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9 kHz, VBW is set to 30kHz. The measurement result should include both L line and N line.

During the test, EUT is connected to a laptop via a USB cable in the case of Transfer Data mode. The EUT is used as the peripheral equipment of the PC. The data is transferred from EUT to PC;

Test Setup



Note: Power Supply is AC Power source and it is used to change the voltage 120V/60Hz.

Limits

Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46 *
0.5 - 5	56	46
5 - 30	60	50
*: Decreases with the logarithm of the frequency.		

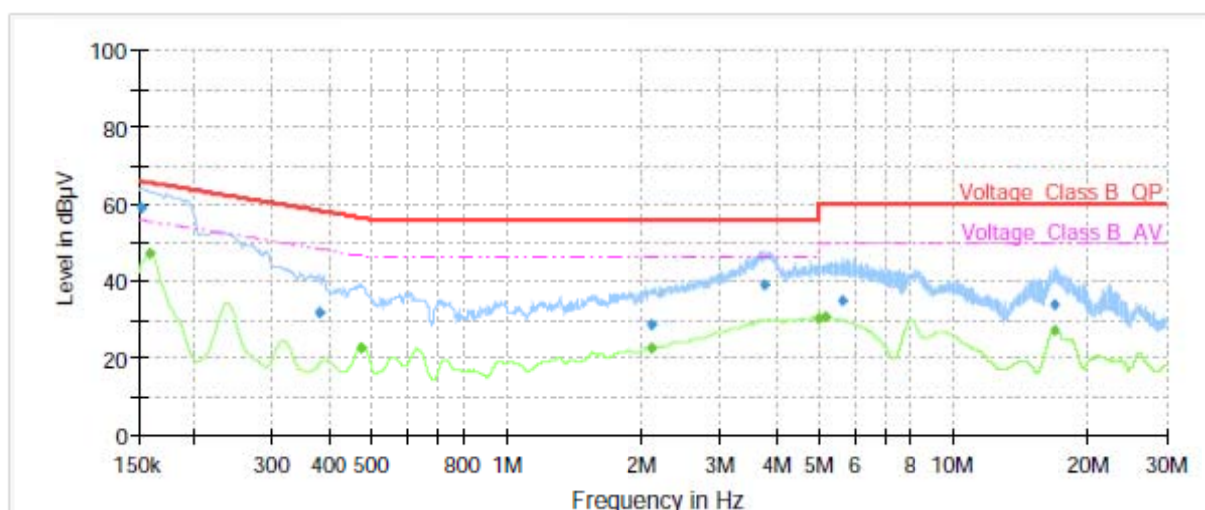
Measurement Uncertainty



The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$. $U = 2.57$ dB.

Test Results

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

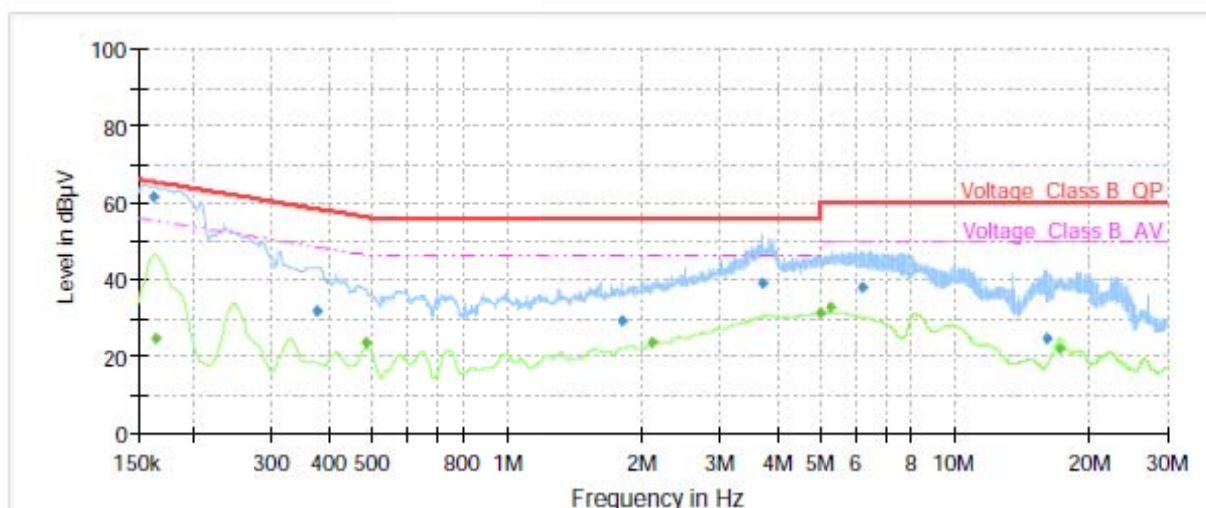


Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.15	59.03	---	65.88	6.85	70.0	9.000	L1	ON	21
0.16	---	47.40	55.52	8.12	70.0	9.000	L1	ON	21
0.38	31.74	---	58.29	26.55	70.0	9.000	L1	ON	21
0.47	---	22.58	46.44	23.87	70.0	9.000	L1	ON	20
2.10	28.89	---	56.00	27.11	70.0	9.000	L1	ON	20
2.11	---	22.79	46.00	23.21	70.0	9.000	L1	ON	20
3.75	38.78	---	56.00	17.22	70.0	9.000	L1	ON	19
5.00	---	30.09	46.00	15.91	70.0	9.000	L1	ON	19
5.14	---	30.55	50.00	19.45	70.0	9.000	L1	ON	19
5.66	35.03	---	60.00	24.97	70.0	9.000	L1	ON	19
16.88	33.60	---	60.00	26.40	70.0	9.000	L1	ON	20
16.89	---	27.11	50.00	22.89	70.0	9.000	L1	ON	20

Remark: Correct factor=cable loss + LISN factor

L line

Conducted Emission from 150 KHz to 30 MHz



Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.16	61.33	---	65.40	4.07	70.0	9.000	N	ON	21
0.16	---	24.70	55.28	30.58	70.0	9.000	N	ON	21
0.38	31.77	---	58.34	26.57	70.0	9.000	N	ON	21
0.49	---	23.40	46.25	22.85	70.0	9.000	N	ON	20
1.82	29.28	---	56.00	26.72	70.0	9.000	N	ON	20
2.11	---	23.54	46.00	22.46	70.0	9.000	N	ON	20
3.73	38.96	---	56.00	17.04	70.0	9.000	N	ON	19
4.99	---	31.04	46.00	14.96	70.0	9.000	N	ON	19
5.30	---	33.00	50.00	17.00	70.0	9.000	N	ON	19
6.25	38.05	---	60.00	21.95	70.0	9.000	N	ON	20
16.16	24.61	---	60.00	35.39	70.0	9.000	N	ON	20
17.22	---	22.13	50.00	27.87	70.0	9.000	N	ON	20

Remark: Correct factor=cable loss + LISN factor

N line

Conducted Emission from 150 KHz to 30 MHz



4 Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Time
Spectrum Analyzer	R&S	FSV40	100816	2021-05-15	2022-05-14
Trilog Antenna	SCHWARZBECK	VULB 9163	1023	2020-05-05	2023-05-04
Horn Antenna	Schwarzbeck	BBHA 9120D	430	2021-07-26	2024-07-25
EMI Test Receiver	R&S	ESR	101667	2021-05-16	2022-05-15
LISN	R&S	ENV216	102191	2020-12-13	2022-12-12
Test software	EMC32	R&S	10.35.10	/	/

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



ANNEX A: The EUT Appearance

The EUT Appearance are submitted separately.



ANNEX B: Test Setup Photos

The Test Setup Photos are submitted separately.