

FCC - TEST REPORT

Report Number : **68.950.19.0643.01** Date of Issue: **July 27, 2019**

Model : **TC03**

Product Type : **Wireless charger**

Applicant : **Matrix Industries, Inc.**

Address : **1455 Adams Dr, Suite 1190 Menlo Park, CA 94025, USA**

Production Facility : **Matrix Industries, Inc.**

Address : **1455 Adams Dr, Suite 1190 Menlo Park, CA 94025, USA**

Test Result : ☒ **Positive** ☐ **Negative**

Total pages including
Appendices

: **19**

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
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FCC Registration No.: 514049

FCC Designation Number: CA5009

IC Registration No.: 10320A

3 Description of the Equipment Under Test

Product:	Wireless charger
Model no.:	TC03
FCC ID:	2ANY2MTC03
Options and accessories:	N/A
Rating:	5Vdc 1.0A Max supplied by an external adapter
RF Transmission Frequency:	117-175KHz
Antenna Type:	Integrated coil antenna
Description of the EUT:	The Equipment Under Test (EUT) is a wireless charger which operated at 117-175kHz.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2018 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to ANSI C63.10 (2013).

5 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart C						
Test Condition		Pages	Test Site	Test Result		
				Pass	Fail	N/A
§15.207	Conducted emission AC power port	10	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--	20dB bandwidth	13	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.205	Restricted bands of operation	13	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.209	Radiated emission	14	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.203	Antenna requirement	See note 1		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note 1: The EUT uses an Integrated coil antenna, which gain is 0dBi. In accordance to §15.203, it is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2ANY2MTC03, complies with Section 15.207, 15.209, 15.205 of the FCC Part 15, Subpart C rules.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: June 20, 2019

Testing Start Date: July 2, 2019

Testing End Date: July 24, 2019

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:



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Project Engineer

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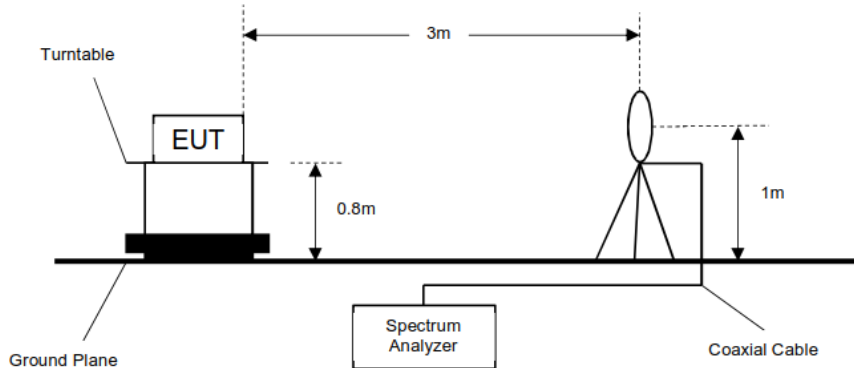


Tree Zhan
Test Engineer

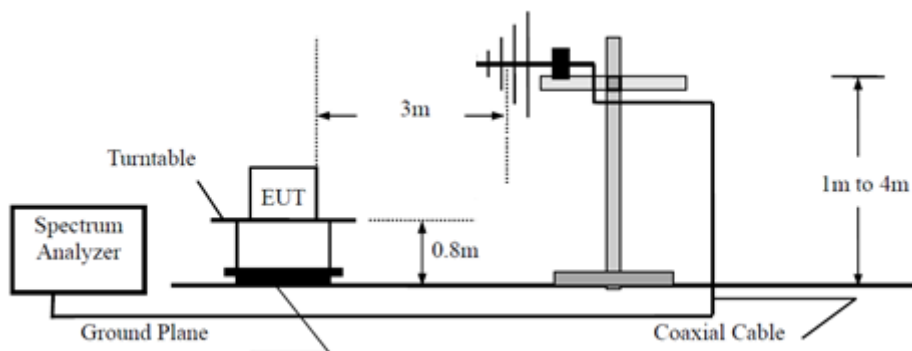
7 Test Setups

7.1 Radiated test setups

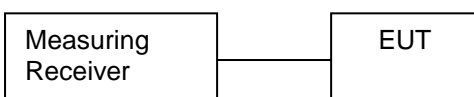
Below 30MHz



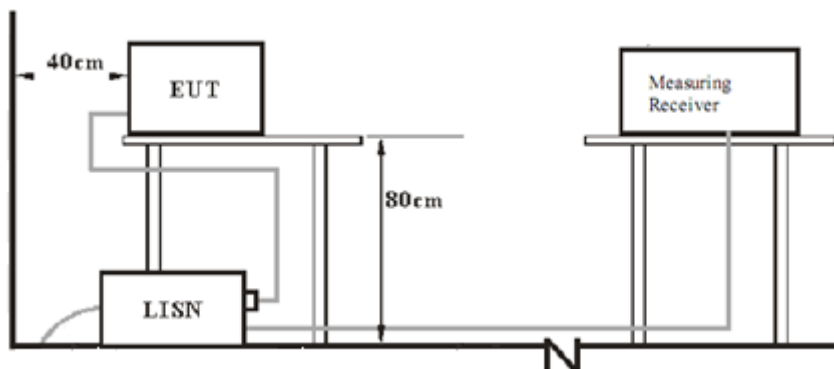
30MHz-1GHz



7.2 Conducted RF test setups



7.3 AC Power Line Conducted Emission test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

Description	Manufacturer	Model NO.	S/N
PowerWatch Series 2	Matrix	PW07	---
Adapter	Apple	A1357	---

Description	Length	Shielded/unshielded	With / without ferrite
USB Cable	0.15m	Shielded	Without ferrite

9 Technical Requirement

9.1 Conducted Emission Test

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through an Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

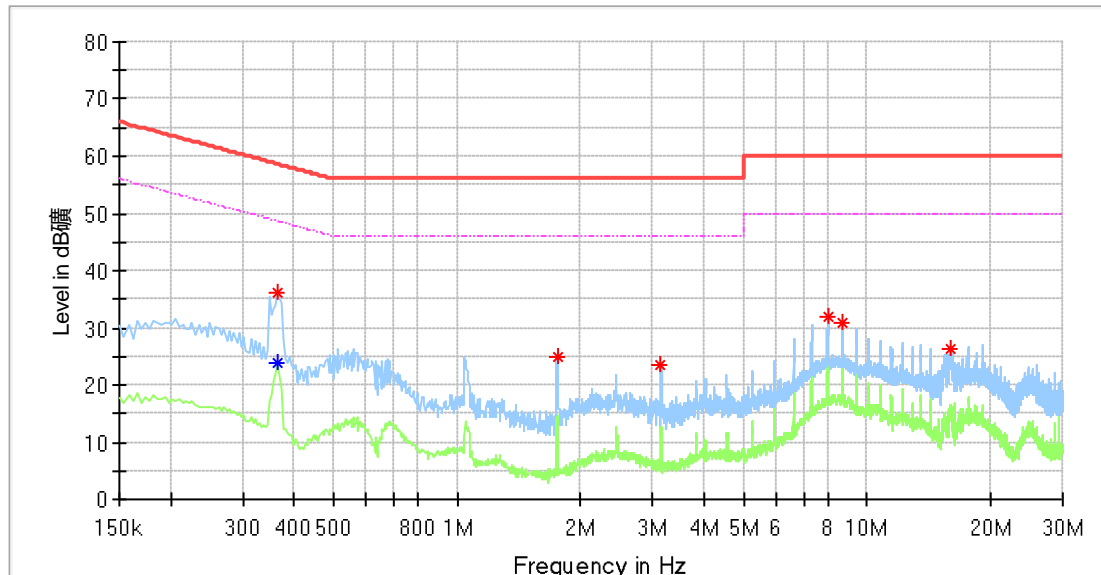
According to §15.207, conducted emissions limit as below:

Frequency MHz	QP Limit dB μ V	AV Limit dB μ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

*Decreasing linearly with logarithm of the frequency

Conducted Emission

Product Type : Wireless charger
 M/N : TC03
 Operating Condition : Charging Mode
 Test Specification : Line
 Comment : AC 120V/60Hz



Frequency (MHz)	MaxPeak (dBμV)*	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)**
0.366000	---	23.70	48.59	24.89	L1	10.3
0.366000	36.19	---	58.59	22.40	L1	10.3
1.754000	24.77	---	56.00	31.23	L1	10.3
3.134000	23.48	---	56.00	32.52	L1	10.4
8.022000	32.05	---	60.00	27.95	L1	10.6
8.718000	30.83	---	60.00	29.17	L1	10.6
16.014000	26.16	---	60.00	33.84	L1	10.8

Remark :

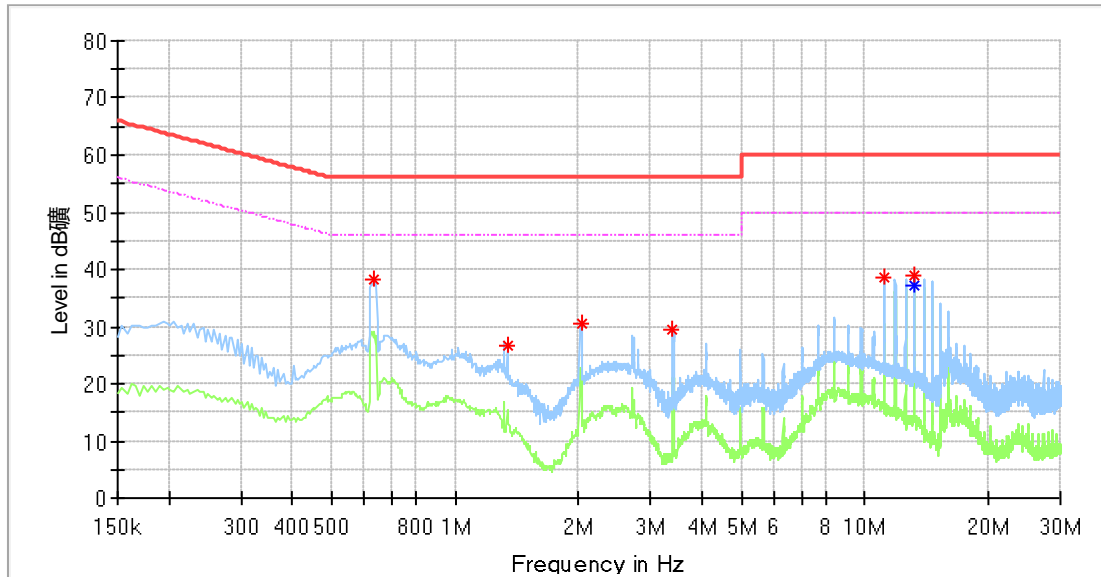
* Max Peak=Reading Level + Correction Factor

**Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

Conducted Emission

Product Type : Wireless charger
 M/N : TC03
 Operating Condition : Charging Mode
 Test Specification : Neutral
 Comment : AC 120V/60Hz



Frequency (MHz)	MaxPeak (dBμV) *	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB) **
0.634000	38.19	---	56.00	17.81	N	10.3
1.338000	26.68	---	56.00	29.32	N	10.3
2.030000	30.49	---	56.00	25.51	N	10.3
3.402000	29.41	---	56.00	26.59	N	10.4
11.162000	38.72	---	60.00	21.28	N	10.7
13.254000	38.88	---	60.00	21.12	N	10.8
13.254000	---	37.24	50.00	12.76	N	10.8

Remark :

* Max Peak=Reading Level + Correction Factor

**Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

9.2 20 dB Bandwidth and 99% Occupied Bandwidth

Test Method

1. Use the following spectrum analyzer settings:
RBW=200Hz, VBW \geq 3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 20 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be \geq 20 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

Limit [kHz]

No Limit

Test result:

Charging Mode:

Frequency KHz	20dB bandwidth KHz	99% bandwidth KHz	Result		Result
			F _L (KHz)	F _H (KHz)	
118KHz	2.55	2.08	117	--	Pass
158KHz	2.43	2.24	--	159	Pass

Standby Mode:

Frequency KHz	20dB bandwidth KHz	99% bandwidth Hz	Result		Result
			F _L (KHz)	F _H (KHz)	
174.5KHz	1.00	2.46	173.2	175.7	Pass

The fundamental frequency is outside the restricted bands of 15.205 section.

9.3 Radiated Emission Test

Test Method

- 1: The EUT was placed on a turn table which is 0.8m above ground for below 1GHz at 3 meters chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5: Use the following spectrum analyzer settings According to C63.10:

Limit

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

Frequency MHz	Field Strength μ V/m	Field Strength dB μ V/m	Detector	Measurement distance meters
0.009-0.490	2400/F(kHz)	48.5-13.8	QP	300
0.490-1.705	24000/F(kHz)	33.8-23.0	QP	30
1.705-30	30	29.5	QP	30
30-88	100	40	QP	3
88-216	150	43.5	QP	3
216-960	200	46	QP	3
960-1000	500	54	QP	3
Above 1000	500	54	AV	3
Above 1000	5000	74	PK	3

Note 1: Limit 3m(dB μ V/m)=Limit 300m(dB μ V/m)+40Log(300m/3m) (Below 30MHz)

Note 2: Limit 3m(dB μ V/m)=Limit 30m(dB μ V/m)+40Log(30m/3m) (Below 30MHz)

Radiated emissions test (9KHz-30MHz)

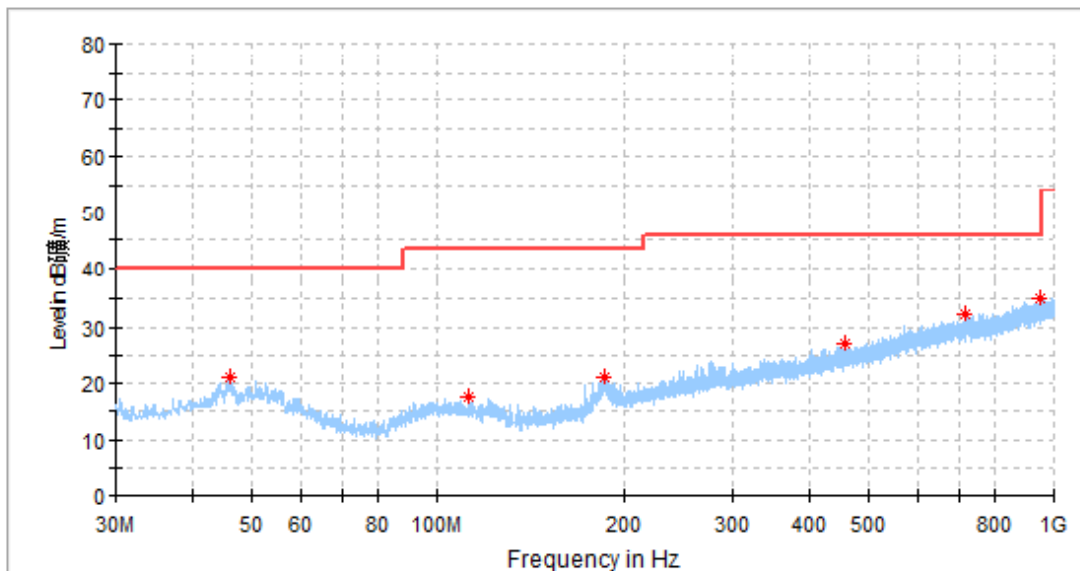
Frequency Band	Frequency MHz	Emission Level* dBμV/m	Polarization	Limit dBμV/m	Detector	Margin dBμV/m	Correct factor** (dB)	Result
9KHz-30MHz	0.119120	60.05	H	93.8	QP	32.75	19.7	Pass
	0.154975	50.35	H	93.8	QP	43.45	19.7	Pass
	0.164925	44.36	H	93.8	QP	49.44	19.7	Pass
	0.199750	44.39	H	93.8	QP	49.41	19.7	Pass
	0.229600	44.42	H	93.8	QP	49.38	19.7	Pass
	0.294275	44.35	H	93.8	QP	49.45	19.7	Pass
	0.324125	44.59	H	93.8	QP	49.21	19.8	Pass
	Other frequency	--	H	93.8	QP	--	--	Pass
	0.119120	55.05	V	93.8	QP	37.75	19.7	Pass
	0.154975	47.77	V	93.8	QP	46.03	20.8	Pass
	0.179850	32.89	V	93.8	QP	60.91	19.7	Pass
	0.214675	30.35	V	93.8	QP	63.45	19.7	Pass
	Other frequency	--	V	93.8	QP	--	--	Pass

Remark:

- (1) *Level=Reading Level + Correction Factor
 **Correction Factor=Cable Loss + LISN Factor
 (The Reading Level is recorded by software which is not shown in the sheet)
- (2) Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
 Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
- (4) All tested frequencies comply for the strictest limit (93.8dBμV/m). so the test result can considered as Pass.
- (5) Tested were performed at charging mode and standby mode, only worse case record in this report.

Radiated emissions test (30MHz-1000MHz)

Product Type : Wireless charger
 M/N : TC03
 Operating Condition : Charging Mode
 Test Specification : Horizontal
 Comment : 30MHz-1000MHz



Frequency (MHz)	MaxPeak* (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr.** (dB)
46.065625	20.97	40.00	19.03	100.0	H	328.0	17.4
112.268125	17.47	43.50	26.03	100.0	H	179.0	15.3
185.988125	21.04	43.50	22.46	200.0	H	131.0	15.0
457.042500	27.14	46.00	18.86	100.0	H	109.0	23.2
719.609375	32.26	46.00	13.74	200.0	H	30.0	27.6
949.256875	35.12	46.00	10.88	100.0	H	320.0	30.8

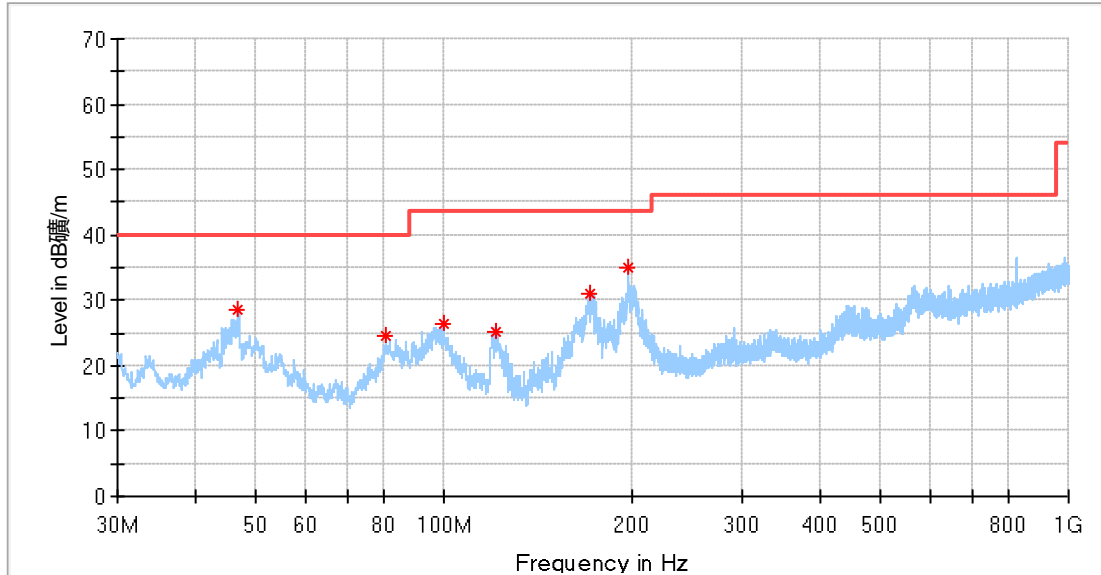
Remark :

*Level=Reading Level + Correction Factor

**Correction Factor=Antenna Factor + Cable Loss

(The Reading Level is recorded by software which is not shown in the sheet)

Product Type : Wireless charger
 M/N : TC03
 Operating Condition : Charging Mode
 Test Specification : Vertical
 Comment : 30MHz-1000MHz



Frequency (MHz)	MaxPeak* (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr.** (dB)
46.853750	28.58	40.00	11.42	100.0	V	38.0	18.0
80.500625	24.42	40.00	15.58	200.0	V	227.0	11.9
99.961250	26.29	43.50	17.21	100.0	V	218.0	16.4
120.998125	25.26	43.50	18.24	100.0	V	124.0	14.5
170.710625	31.13	43.50	12.37	100.0	V	109.0	13.9
196.900625	35.09	43.50	8.41	100.0	V	148.0	16.2

Remark :

*Level=Reading Level + Correction Factor

**Correction Factor=Antenna Factor + Cable Loss

(The Reading Level is recorded by software which is not shown in the sheet)

10 Test Equipment List

List of Test Instruments

Radiated Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2020-6-28
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2020-6-28
Horn Antenna	Rohde & Schwarz	HF907	102294	2020-6-22
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100398	2020-7-7
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2020-6-28
Signal Generator	Rohde & Schwarz	SMY01	839369/005	2020-6-28
Attenuator	Agilent	8491A	MY39264334	2020-6-28
3m Semi-anechoic chamber	TDK	9X6X6	----	2020-7-7

Conducted Emission Test

Description	Manufacturer	Model no.	Serial no.	cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2020-6-28
LISN	Rohde & Schwarz	ENV432	101318	2020-3-20
Attenuator	Shanghai Huaxiang	TS2-26-3	080928189	2020-6-28
Test software	Rohde & Schwarz	EMC32	Version9.15.00	N/A

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Conducted Emission 150kHz-30MHz (for test using AMN ENV432 or ENV4200)	3.21dB
Uncertainty for Radiated Emission in 3m chamber 9kHz-30MHz	4.46dB
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 4.91dB; Vertical: 4.89dB;