

Report No.: SZEM190901838502

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# TEST REPORT

Application No.: SZEM1909018385CR

**Applicant:** ALOGIC Corporation Pty Ltd.

Address of Applicant: Level 40, 140 William Street, Melbourne, VIC, 3000, Australia.

Manufacturer: SHENZHEN DBK ELECTRONICS CO., LTD

Address of Manufacturer: Room No.208-1, 308, 404-408 in Building Five, 2-4 Floor in Building Three,

No.8 Qinghua Road, Zhu Village, Fucheng New Community, Guanlan Street, Longhua District, Shenzhen City, Guangdong Province, China

Factory: Dongguan DBK Energy Technology Co., Ltd

Address of Factory: No.51 Zhangshen Middle Road, Xuzhen Community, Zhangmutou Town,

Dongguan City, Guangdong Province P.R. China

**Equipment Under Test (EUT):** 

EUT Name: USB-C Dock Wave 3-in-1

Model No.: ULDWAV
Trade mark: ALOGIC

FCC ID: 2ATCAULDWAV

Standard(s): 47 CFR Part 15, Subpart C

**Date of Receipt:** 2019-09-10

**Date of Test:** 2019-09-29 to 2019-10-28

**Date of Issue:** 2019-11-06

Test Result: Pass\*

Keny Xu EMC Laboratory Manager

Ceny. Ku



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<sup>\*</sup> In the configuration tested, the EUT complied with the standards specified above.



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	Revision Record						
Version	Version Chapter Date Modifier Rema						
01		2019-11-06		Original			

Authorized for issue by:		
	Co. 61	
	Leo Li /Project Engineer	
	EvicFu	
	Eric Fu /Reviewer	



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### **Test Summary**

Radio Spectrum Technical Requirement						
Item	Standard	Method	Requirement	Result		
Antenna Requirement	47 CFR Part 15, Subpart C	N/A	47 CFR Part 15, Subpart C 15.203	Pass		

Radio Spectrum Matter Part						
Item	Standard	Method	Requirement	Result		
20dB Bandwidth	47 CFR Part 15, Subpart C	ANSI C63.10 (2013) Section 6.9.2	47 CFR Part 15, Subpart C 15.215	Pass		
Restricted Bands	47 CFR Part 15, Subpart C	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205	Pass		
Radiated Emissions (9kHz-30MHz)	47 CFR Part 15, Subpart C	ANSI C63.10 (2013) Section 6.4	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass		
Radiated Emissions (30MHz-1GHz)	47 CFR Part 15, Subpart C	ANSI C63.10 (2013) Section 6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass		



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### **General Information**

#### Details of E.U.T.

Power Supply:	Capacity: 5000mAh/18.5Wh
	Input: Type-C Port DC 5V/2.4A
	Output:
	USB A Port*2: DC5V/2.4A
	Type-C Port: DC 5V/2.4A
	WPC: 5W (DC 5V/1A)
Cable:	Type-C cable: 15cm shielded
Operation frequency:	114.42-194.39kHz
Antenna Type:	Loop Antenna
Modulation Type:	Load Modulation
Antenna Gain:	0dBi

### 4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
iPhone 8	Apple	A1863	F4GVQ656JC6D

### 4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	± 7.25 x 10 <sup>-8</sup>
2	Occupied Bandwidth	± 3%
0	Dadiated Courieus emission test	± 4.5dB (Below 1GHz)
3	Radiated Spurious emission test	± 4.8dB (Above 1GHz)
4	Temperature test	± 1 ℃
5	Humidity test	± 3%
6	Supply voltages	± 1.5%
7	Time	± 3%



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#### 4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

#### 4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

#### A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

#### · VCC

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

#### • FCC -Designation Number: CN1178

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

#### Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

#### 4.6 Deviation from Standards

None

#### 4.7 Abnormalities from Standard Conditions

None



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### **Equipment List**

20dB Bandwidth						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
Shielding Room	SAEMC	MSR733	SEM001-09	2019-06-13	2022-06-12	
DC Power Supply	Zhao Xin	KXN-6020D	SEM011-08	2019-09-24	2020-09-23	
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2019-09-24	2020-09-23	
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A	
Coaxial Cable	SGS	N/A	SEM031-02	2019-07-11	2020-07-10	
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A	
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019-09-24	2020-09-23	
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019-09-24	2020-09-23	
Electric and Magnetic Field Analyzer	Narda	NBM- 550/EHP-50F	EMC2143	2018-02-07	2020-02-06	
Electric Field Probe(100KHz-3GHz)	WANDEL & GOLTERMANN	EMR-20	EMC0907	2019-05-21	2020-05-20	
EMF Tester	Narda	ELT-400	SZE039-4	2019-07-08	2020-07-07	

Restricted band						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
Shielding Room	SAEMC	MSR733	SEM001-09	2019-06-13	2022-06-12	
DC Power Supply	Zhao Xin	KXN-6020D	SEM011-08	2019-09-24	2020-09-23	
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2019-09-24	2020-09-23	
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A	
Coaxial Cable	SGS	N/A	SEM031-02	2019-07-11	2020-07-10	
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A	
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019-09-24	2020-09-23	
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019-09-24	2020-09-23	
Electric and Magnetic Field Analyzer	Narda	NBM- 550/EHP-50F	EMC2143	2018-02-07	2020-02-06	
Electric Field Probe(100KHz-3GHz)	WANDEL & GOLTERMANN	EMR-20	EMC0907	2019-05-21	2020-05-20	
EMF Tester	Narda	ELT-400	SZE039-4	2019-07-08	2020-07-07	



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Radiated Emissions (9kHz-30MHz)							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2018-03-31	2021-03-30		
Measurement Software	AUDIX	e3 V8.2014-6- 27	N/A	N/A	N/A		
Coaxial Cable	SGS	N/A	SEM029-01	2019-07-11	2020-07-10		
EMI Test Receiver (9kHz-7GHz)	Rohde & Schwarz	ESR	SEM004-03	2019-04-01	2020-03-31		
Trilog-Broadband Antenna (30MHz-1GHz)	Schwarzbeck	VULB9168	SEM003-18	2019-08-08	2022-08-07		
Pre-amplifier	Sonoma Instrument Co	310N	SEM005-04	2019-04-12	2020-04-11		
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21		

Radiated Emissions (30MHz-1GHz)							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2018-03-31	2021-03-30		
Measurement Software	AUDIX	e3 V8.2014-6- 27	N/A	N/A	N/A		
Coaxial Cable	SGS	N/A	SEM029-01	2019-07-11	2020-07-10		
EMI Test Receiver (9kHz-7GHz)	Rohde & Schwarz	ESR	SEM004-03	2019-04-01	2020-03-31		
Trilog-Broadband Antenna (30MHz-1GHz)	Schwarzbeck	VULB9168	SEM003-18	2019-08-08	2022-08-07		
Pre-amplifier	Sonoma Instrument Co	310N	SEM005-04	2019-04-12	2020-04-11		
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21		



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General used equipment										
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date					
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-03	2019-09-26	2020-09-25					
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2019-09-26	2020-09-25					
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2019-09-26	2020-09-25					
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2019-04-04	2020-04-03					



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#### Radio Spectrum Technical Requirement 6

### **Antenna Requirement**

#### 6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 Limit:

#### Standard Requirement:

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 antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

#### EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi.

Antenna location: Refer to Appendix(Internal photos)



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### 7 Radio Spectrum Matter Test Results

#### 7.1 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215 Test Method: ANSI C63.10 (2013) Section 6.9.2

Limit:

For report reference only

#### 7.1.1 E.U.T. Operation

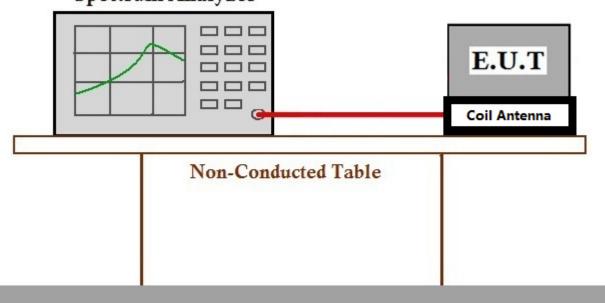
Operating Environment:

Temperature: 27.4 °C Humidity: 38.1 % RH Atmospheric Pressure: 1015 mbar

Test mode e:Charging\_Keep the EUT working in charge mode.

#### 7.1.2 Test Setup Diagram

### Spectrum Analyzer



### Ground Reference Plane

#### 7.1.3 Measurement Procedure and Data

Test Frequency(KHz)	20dB bandwidth (KHz)	Limit (KHz)	Results
114.8	0.026	N/A	Pass



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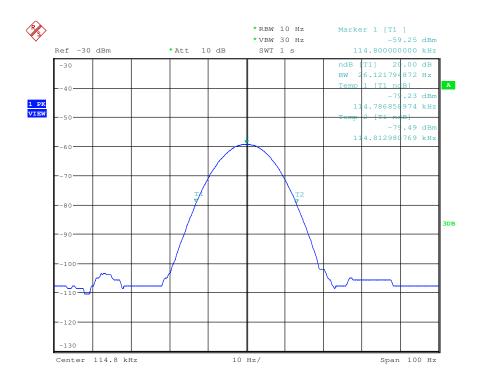
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#### 7.2 Restricted Bands

**Test Requirement** 47 CFR Part 15, Subpart C 15.205 Test Method: ANSI C63.10 (2013) Section 6.10.5

Limit: The fundamental wave can not fall in the restricted band 90KHz-110KHz

#### 7.2.1 E.U.T. Operation

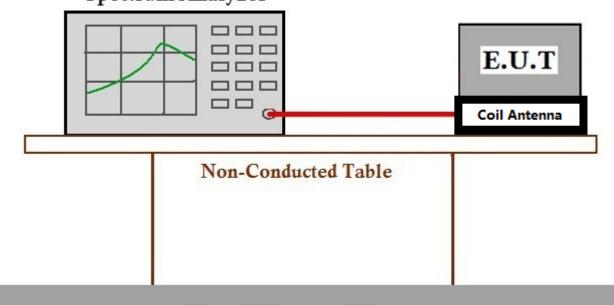
Operating Environment:

Temperature: Humidity: 38.1 % RH Atmospheric Pressure: 1015 mbar

Test mode e:Charging\_Keep the EUT working in charge mode.

#### 7.2.2 Test Setup Diagram

## Spectrum Analyzer



#### Ground Reference Plane

#### 7.2.3 Measurement Procedure and Data



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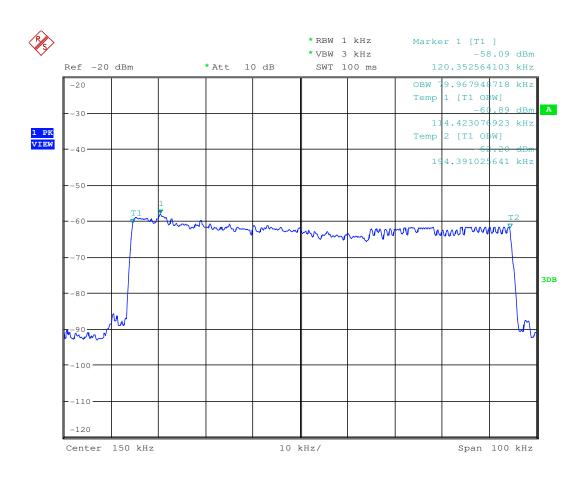
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According the test data above, the fundamental wave is not fall in the restricted band 90KHz-110KHz, the field strength also meet the 15.209 requirement, please refer to clause 7.3.



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#### 7.3 Radiated Emissions (9kHz-30MHz)

**Test Requirement** 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4

Measurement Distance: 3m

Limit:

	Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
	0.009-0.490	2400/F(kHz)	300
Ī	0.490-1.705	24000/F(kHz)	30
ſ	1.705-30.0	30	30

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

If field strength is measured at only a single point, then that point shall be at the radial from the EUT that produces the maximum emission at the frequency being measured, as described in 5.4. If that point is closer to the EUT than  $N2\pi$  and the limit distance is greater than  $N2\pi$ , the measurement shall be extrapolated to the limit distance by conservatively presuming that the field strength decreases at a 40 dB/decade of distance rate to the  $\lambda/2\pi$  distance, and at a 20 dB/decade of distance rate beyond  $\lambda/2\pi$ . This shall be accomplished using Equation (2):

$$FS_{(10m)} = FS_{(30/300m)} + 40log\{d_{(near field)}/d_{(10m)}\} + 20log\{d_{(30/300m)}/d_{(near field)}\}$$
 (2)

If the single point measured is at a distance greater than  $\lambda/2\pi$ , then extrapolation to the limit distance shall be calculated using Equation (3):

$$FS_{(10m)} = FS_{(30/300m)} + 20log\{d_{(30/300m)}/d_{(10m)}\}$$
(3)

If both the single point and the limit distance are equal to or closer to the EUT than  $\lambda/2\pi$ , then extrapolation to the limit distance shall be calculated using Equation (4):

$$FS_{(10m)} = FS_{(30/300m)} + 40log\{d_{(30/300m)}/d_{(10m)}\}$$
(4)

Remark:

 $d_{near field} = 47.77 / f_{MHz}$ 

where f<sub>MHz</sub> is the frequency of the emission being measured in MHz.



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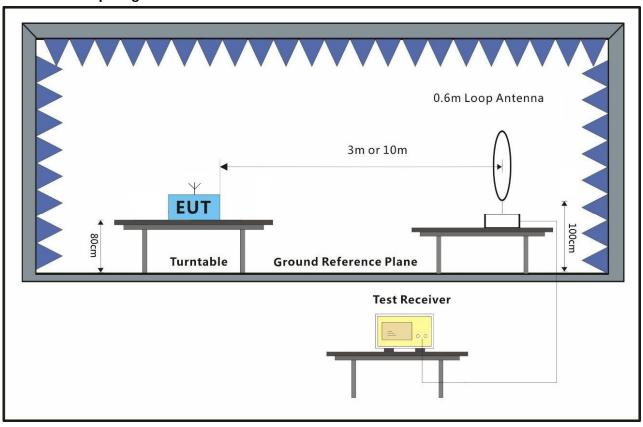
#### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature: Humidity: 55 % RH Atmospheric Pressure: 1015 mbar

Test mode e:Charging Keep the EUT working in charge mode.

#### 7.3.2 Test Setup Diagram



#### 7.3.3 Measurement Procedure and Data

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of vertical was shown in the report.

Note: the final results are QP values.



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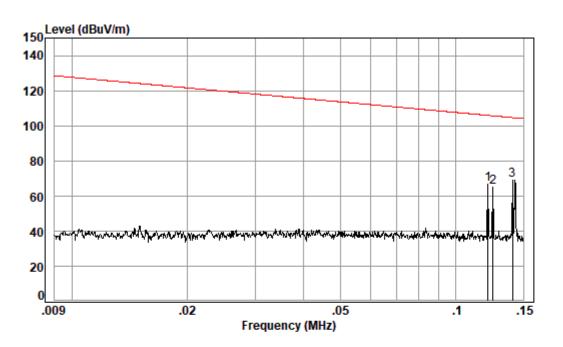
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Mode e: 9KHz-150KHz



Condition: 3m

Job No. : 18385CR

Test Mode: e

	Freq		Preamp Factor						Remark	
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		-
1	0.121	11.86	32.20	0.01	87.06	66.73	105.94	-39.21	Average	
2	0.125	11.84	32.20	0.02	85.48	65.14	105.67	-40.53	Average	
3 pp	0.141	11.75	32.20	0.02	89.64	69.21	104.64	-35.43	Average	



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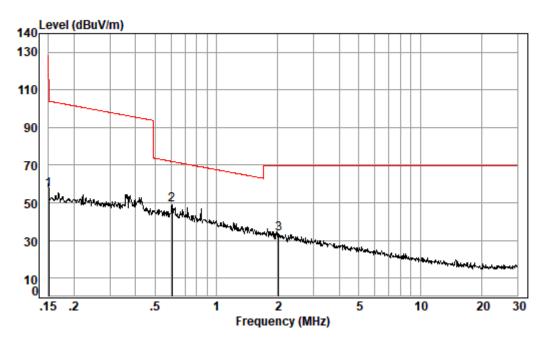
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150KHz-30MHz



Condition: 3m

Job No. : 18385CR

Test Mode: e

	Freq		Preamp Factor						Remark
_	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1 av	0.151	11.70	32.20	0.02	77.39	56.91	104.04	-47.13	Average
2 pp	0.604	11.84	32.25	0.07	69.24	48.90	71.98	-23.08	QP
3	2.023	12.10	32.30	0.21	53.55	33.56	69.54	-35.98	QP



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#### 7.4 Radiated Emissions (30MHz-1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.5

Measurement Distance: 10m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.



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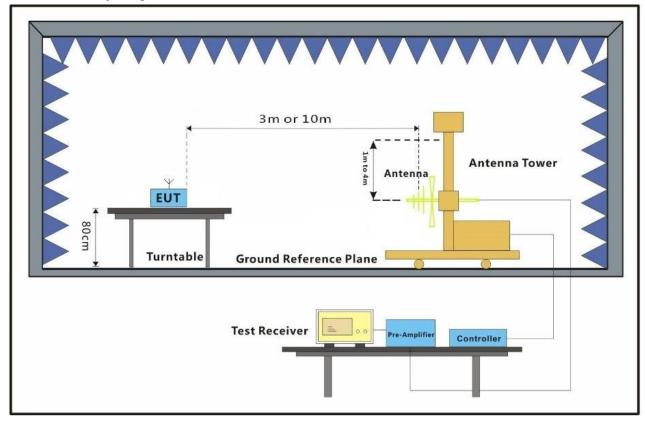
#### 7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 45 % RH Atmospheric Pressure: 1005 mbar

Test mode e:Charge mode Keep the EUT charging other device

#### 7.4.2 Test Setup Diagram





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#### 7.4.3 Measurement Procedure and Data

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground for below 1GHz at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height 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.
- d. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel
- h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case.
- i. Repeat above procedures until all frequencies measured was complete.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Note: the final results are QP values.

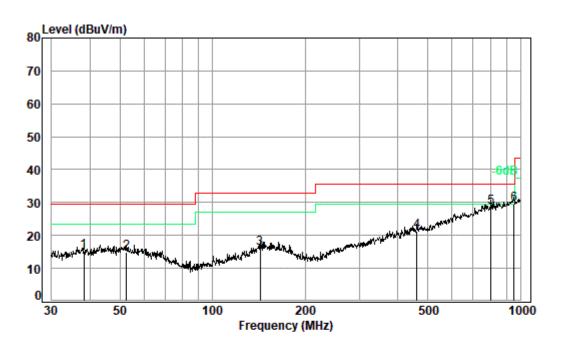




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Mode:e; Polarization:Horizontal



Condition: 10m HORIZONTAL

Job No. : 18385CR

Test Mode: e

		Cable	Δnt	Preamp	Read		limit	Over	
	Freq			Factor					Remark
-	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	38.212	0.91	20.00	32.42	26.77	15.26	29.50	-14.24	QP
2	52.575	1.00	19.96	32.45	26.44	14.95	29.50	-14.55	QP
3	142.824	1.45	19.84	32.30	27.14	16.13	33.00	-16.87	QP
4	460.727	2.75	23.61	32.33	27.41	21.44	35.60	-14.16	QP
5	801.786	3.28	28.60	31.91	28.68	28.65	35.60	-6.95	QP
6 nn	952.094	3.50	29.86	31.24	27.38	29.50	35.60	-6.10	OP



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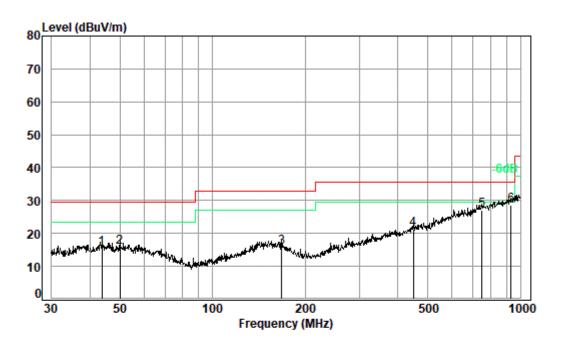
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Mode:e; Polarization:Vertical



Condition: 10m VERTICAL

Job No. : 18385CR

Test Mode: e

	Freq			Preamp Factor					Remark
-	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	43.812	0.95	20.31	32.44	26.64	15.46	29.50	-14.04	QP
2	50.057	0.99	20.29	32.46	26.98	15.80	29.50	-13.70	QP
3	167.824	1.52	19.41	32.30	27.18	15.81	33.00	-17.19	QP
4	449.556	2.70	23.48	32.29	27.55	21.44	35.60	-14.16	QP
5	750.108	3.27	28.30	32.08	27.53	27.02	35.60	-8.58	QP
6 pp	932,272	3.46	29.80	31.35	26.72	28.63	35.60	-6.97	OP



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The test was performed at a 10m test site. According to below formulate and the test data at 10m test distance,

 $L_3 / L_{10} = D_{10} / D_3$ 

Note:

L<sub>3</sub>: Level @ 3m distance. Unit: uV/m; L<sub>10</sub>: Level @ 10m distance. Unit: uV/m;

D<sub>3</sub>: 3m distance. Unit: m D<sub>10</sub>: 10m distance. Unit: m

The level at 3m test distance is below:

Frequency (MHz)	Level @ 10m (dBuV/m)	Level @ 10m (uV/m)	Level @ 3m (uV/m)	Level @ 3m (dBuV/m)	Limit @ 3m (dBuV/m)	Margin (dB)	Ant. Polarization
43.81	15.46	5.93	19.76	25.92	40.00	-14.08	V
50.06	15.80	6.17	20.55	26.26	40.00	-13.74	V
167.82	15.81	6.17	20.58	26.27	43.50	-17.23	V
449.56	21.44	11.80	39.34	31.90	46.00	-14.10	V
750.11	27.02	22.44	74.80	37.48	46.00	-8.52	V
932.27	28.63	27.01	90.03	39.09	46.00	-6.91	V
38.21	15.26	5.79	19.31	25.72	40.00	-14.28	Н
52.58	14.95	5.59	18.64	25.41	40.00	-14.59	Н
142.82	16.13	6.40	21.35	26.59	43.50	-16.91	Н
460.73	21.44	11.80	39.34	31.90	46.00	-14.10	Н
801.79	28.65	27.07	90.24	39.11	46.00	-6.89	Н
952.09	29.50	29.85	99.51	39.96	46.00	-6.04	Н



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#### 8 **Photographs**

#### 8.1 **Test Setup**

Please refer to setup photos.

#### 8.2 EUT Constructional Details (EUT Photos)

Please refer to external and internal photos for details.

- End of the Report -



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