



FCC PART 18

TEST AND MEASUREMENT REPORT

For

Flextronics International

677 Gibraltar Ct.,
Milpitas, CA 95035, USA

FCC ID: 2AF5R-QD10

Report Type: Original Report	Product Type: Wireless Charger
Prepared By: Leonard Gray Associate Engineer	
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Reviewed By: Simon Ma RF Lead	
Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: 1 (408) 732-9162 Fax: 1 (408) 732-9164	

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* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk “*” (Rev. 0)

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1509236-18	Initial	2015-11-30

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report has been compiled on behalf of *Flextronics International* and their product, *FCC ID: 2AF5R-QD10*, model number: *Wi-Viva QD10*, which henceforth is referred to as the EUT (Equipment under Test.) The EUT is a wireless charger for smart phones.

1.2 Mechanical Description of EUT

The EUT measures approximately 168 mm (L), 115 mm (W), 7 mm (H), and weighs approximately 0.2 kg.

The data gathered are from a typical production sample provided by the manufacturer with serial number: R15090236-1, assigned by BACL.

1.3 Objective

This report is prepared on behalf of *Flextronics International*, in accordance with Part 2, Subpart J, and Part 18, Subparts B and C of the Federal Communication Commission's rules. The objective is to determine compliance with FCC Part 18.305 and FCC Part 18.307 rules for AC Line Conducted Emissions and Radiated Spurious Emissions.

1.4 Related Submittal(s)/Grant(s)

N/A

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz, and FCC Measurement Procedure MP-5, Methods of Measurements of Radio Noise Emissions from ISM equipment.

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR16-4-2:2011, The Treatment of Uncertainty in EMC Measurements, the values ranging from ± 2.0 dB for Conducted Emissions tests and ± 4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

1.7 Test Facility

Bay area compliance Laboratories Corp. (BACL) is:

1- An independent Commercial Test Laboratory accredited to **ISO 17025: 2005** by **A2LA**, in the fields of: Electromagnetic Compatibility & Telecommunications covering Emissions, Immunity, Radio, RF Exposure, Safety and Telecom. This includes NEBS (Network Equipment Building System), Wireless RF, Telecommunications Terminal Equipment (TTE); Network Equipment; Information Technology Equipment (ITE); Medical Electrical Equipment; Industrial, Commercial, and Medical Test Equipment; Professional Audio and Video Equipment; Electronic (Digital) Products; Industrial and Scientific Instruments; Cabled Distribution Systems and Energy Efficiency Lighting.

2- An ENERGY STAR Recognized Laboratory, for the LM80 Testing, a wide variety of Luminaires and Computers.

3- A NIST Designated Phase-I and Phase-II CAB including: ACMA (Australian Communication and Media Authority), BSMI (Bureau of Standards, Metrology and Inspection of Taiwan), IDA (Infocomm Development Authority of Singapore), IC(Industry Canada), Korea (Ministry of Communications Radio Research Laboratory), NCC (Formerly DGT; Directorate General of Telecommunication of Chinese Taipei) OFTA (Office of the Telecommunications Authority of Hong Kong), Vietnam, VCCI - Voluntary Control Council for Interference of Japan and a designated EU CAB (Conformity Assessment Body) (Notified Body) for the EMC and R&TTE Directives.

4- A Product Certification Body accredited to **ISO Guide 65: 1996** by **A2LA** to certify:

2. Radio Standards Specifications (RSS) in the Category I Equipment Standards List and All Broadcasting Technical Standards (BETS) in Category I Equipment Standards List for Industry Canada.

3. Radio Communication Equipment for Singapore.

4. Radio Equipment Specifications, GMDSS Marine Radio Equipment Specifications, and Fixed Network Equipment Specifications for Hong Kong.

5. Japan MIC Telecommunication Business Law (A1, A2) and Radio Law (B1, B2 and B3).

6. Audio/Video, Battery Charging Systems, Computers, Displays, Enterprise Servers, Imaging Equipment, Set-Top Boxes, Telephony, Televisions, Ceiling Fans, CFLs (Including GU24s), Decorative Light Strings, Integral LED Lamps, Luminaires, Residential Ventilating Fans.

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.3-2013, ANSI C63.4-2014, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is an American Association for Laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at

<http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b>

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2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI C63.4-2014 and FCC Measurement Procedure MP-5, Methods of Measurements of Radio Noise Emissions from ISM equipment.

2.2 EUT Exercise Software

N/A

2.3 Equipment Modifications

N/A

2.4 Local Support Equipment

Manufacturer	Description	Model No.	Serial No.
Samsung/Apple	Phone	-	-
Unknown	USB Cable	-	-

2.5 EUT Internal Configuration Details

Manufacturer/Product Type	Model/Rev.	Crystals (MHz)
Powerstream/Battery	B500AE	-
Texas Instrument/Transmitter	BQ500212ARGZT	-
TDK/Charging coil 6.3uH	WT505090-10K2-A11-G	-

2.6 Power Supply and Line Filter

Manufacturer	Description	Model No.	Serial No.
Samsung	AC/DC Adapter	-	-

2.7 Interface Ports and Cabling

Cable Description	Length (m)	To	From
USB Cable	<1m	EUT	Wall Charger

3 Summary of Test Results

Results reported relate only to the product tested.

FCC Rules	Description of Test	Results
§18.305(b)	Radiated Spurious Emissions	Compliant
§18.307(b)	AC Line conducted emission	Compliant

4 FCC §18.305(b) – Spurious Radiated Emissions

4.1 Applicable Standards

As per FCC §18.305(b):

The field strength levels of emissions which lie outside the bands specified in §18.301, unless otherwise indicated, shall not exceed the following:

Equipment	Operating Frequency	RF Power generated by equipment (Watts)	Field Strength limit (uV/m)	Measurement Distance (meters)
Any type unless otherwise specified (miscellaneous)	Any ISM frequency	Below 500 500 or more	25 $25 \times \text{SQRT}(\text{power}/500)$	300 ¹ 300
	Any non-ISM frequency	Below 500 500 or more	15 $15 \times \text{SQRT}(\text{power}/500)$	300 ¹ 300
Industrial heaters and RF stabilized arc welders	On or below 5,725 MHz Above 5,725 MHz	Any Any	10 (²)	1,600 (²)
Medical diathermy	Any ISM frequency	Any	25	300
	Any non-ISM frequency	Any	15	300
Ultrasonic	Below 490 kHz	Below 500 500 or more	$2,400/\text{F}(\text{kHz})$ $2,400/\text{F}(\text{kHz}) \times \text{SQRT}(\text{power}/500)$	300 ³ 300
	490 to 1,600 kHz	Any	$24,000/\text{F}(\text{kHz})$	30
	Above 1,600 kHz	Any	15	30
Induction cooking ranges	Below 90 kHz	Any	1,500	⁴ 30
	On or above 90 kHz	Any	300	⁴ 30

¹Field strength may not exceed 10 µV/m at 1600 meters. Consumer equipment operating below 1000 MHz is not permitted the increase in field strength otherwise permitted here for power over 500 watts.

²Reduced to the greatest extent possible.

³Field strength may not exceed 10 µV/m at 1600 meters. Consumer equipment is not permitted the increase in field strength otherwise permitted here for over 500 watts.

⁴Induction cooking ranges manufactured prior to February 1, 1980, shall be subject to the field strength limits for miscellaneous ISM equipment.

4.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.4-2014 and FCC Measurement Procedure MP-5, “Methods of Measurements of Radio Noise Emissions from ISM equipment” (FCC §18.311). The specification utilized was the FCC 18 Subpart C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

4.3 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which was fixed at around 2 meters, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of perpendicular and parallel.

The spectrum analyzer or receiver is set as:

Below 150 kHz:

$$RBW = 200 \text{ Hz} / VBW = 600 \text{ kHz} / \text{Sweep} = \text{Auto} / \text{Average}$$

From 150 kHz to 30 MHz:

$$RBW = 9 \text{ kHz} / VBW = 27 \text{ kHz} / \text{Sweep} = \text{Auto} / \text{Average}$$

4.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

$$CA = Ai + AF + CL + \text{Atten} - Ga$$

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

4.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2015-06-22	1 year
Sunol Science Corp	System Controller	SC99V	011003-1	N/R	N/R
EMCO	Antenna, Loop Passive	6512	34167	2014-04-30	2 years
Suirong	30 ft conductive emission cable	LMR 400	-	2015-03-05	1 year
Sonoma Instrument	Amplifier	315	303125	2015-07-23	1 year
Mini Circuit	Precision Fixed Attenuator, 10 dB	BW-S10W5	-	Each Time ¹	N/A

Note¹: cable and attenuator included in the test set-up will be checked each time before testing.

Statement of Traceability: *BACL attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.*

4.6 Test Environmental Conditions

Temperature:	20-25° C
Relative Humidity:	40-45 %
ATM Pressure:	101.2-103.5 kPa

The testing was performed by Leonard Gray on 2015-10-20 in 5m2.

4.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 18C standard's radiated emissions limits, and had the worst margin of:

9 kHz – 30 MHz:

Mode: Transmitting			
Margin (dB)	Frequency (kHz)	Polarization (Parallel/Perpendicular)	Mode, Channel
-28.09	132.6	Perpendicular	At 100% Charged

Please refer to the following table and plots for specific test result details

4.8 Radiated Emissions Test Data and Plots

9 kHz to 30 MHz:

Frequency (kHz)	S.A. Reading (dBμV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre- Amp. (dB)	Cord. Reading (dBμV/m)	FCC		Comments
			Height (cm)	Polarity	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	
At 1% Charged											
166.5	46.24	150	200	Perp.	59.900	10.00	52.15	63.99	103.52	-39.53	Ave
166.5	46.43	331	200	Parallel	59.900	10.00	52.15	64.18	103.52	-39.34	Ave
333	30.23	288	200	Perp.	56.300	10.00	52.15	44.38	103.52	-59.14	Ave
333	27.71	0	200	Parallel	56.300	10.00	52.15	41.86	103.52	-61.66	Ave
499.5	35.7	150	200	Perp.	52.100	10.00	52.15	45.65	103.52	-57.87	Ave
499.5	36.29	331	200	Parallel	52.100	10.00	52.15	46.24	103.52	-57.28	Ave
666	29.33	0	200	Perp.	49.100	10.00	52.15	36.28	103.52	-67.24	Ave
666	27.21	0	200	Parallel	49.100	10.00	52.15	34.16	103.52	-69.36	Ave
At 50% Charged											
151.1	49.61	198	200	Perp.	59.900	10.000	52.15	67.36	103.52	-36.16	Ave
151.1	48.9	293	200	Parallel	59.900	10.000	52.15	66.65	103.52	-36.87	Ave
302.2	28.37	0	200	Perp.	56.30	10.000	52.15	42.52	103.52	-61	Ave
302.2	28.15	0	200	Parallel	56.30	10.000	52.15	42.30	103.52	-61.22	Ave
453.3	38.91	191	200	Perp.	52.100	10.000	52.15	48.86	103.52	-54.66	Ave
453.3	38.07	266	200	Parallel	52.100	10.000	52.15	48.02	103.52	-55.5	Ave
604.4	29.86	110	200	Perp.	50.500	10.000	52.15	38.21	103.52	-65.31	Ave
604.4	27.67	0	200	Parallel	50.500	10.000	52.15	36.02	103.52	-67.5	Ave
At 100% Charged											
132.6	51.78	124	200	Perp.	65.80	10.00	52.15	75.43	103.52	-28.09	Ave
132.6	48.58	231	200	Parallel	65.80	10.00	52.15	72.23	103.52	-31.29	Ave
265.2	27.07	0	200	Perp.	56.30	10.00	52.15	41.22	103.52	-62.3	Ave
265.2	26.61	0	200	Parallel	56.30	10.00	52.15	40.76	103.52	-62.76	Ave
397.8	39.48	124	200	Perp.	53.80	10.00	52.15	51.13	103.52	-52.39	Ave
397.8	36.64	245	200	Parallel	53.80	10.00	52.15	48.29	103.52	-55.23	Ave
530.4	27.22	0	200	Perp.	52.10	10.00	52.15	37.17	103.52	-66.35	Ave
530.4	25.61	0	200	Parallel	52.10	10.00	52.15	35.56	103.52	-67.96	Ave

Note: The measurement was made at 3 meter while the FCC limit was made at 300 meter. According to MP-5: 1986 Section 2.2.6, the distance correction factor was applied to the FCC limitation by applying the following equation,

$$\text{Limit in dB}\mu\text{V/m @ 3 meter} = \text{Limit in dB}\mu\text{V/m @ 300 meter} + 40 \cdot \log(300/3)$$

5 FCC §18.307(b) – AC Line Conducted Emissions

5.1 Applicable Standards

As per FCC §18.307(b):

For the following equipment, when 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 shall not exceed the limits in the following tables. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal using a 50 μ H/50 ohms line impedance stabilization network (LISN).

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

5.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4-2014 and FCC Measurement Procedure MP-5, “Methods of Measurements of Radio Noise Emissions from ISM equipment” (FCC §18.311). The specification utilized was the FCC 18 Subpart C limits (FCC §18.307(b)).

External I/O cables were draped along the edge of the test table and bundle when necessary.

The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V/ 60 Hz AC power.

5.3 Test Procedure

During the conducted emission test, the power cord of the EUT host system was connected to the mains outlet of the LISN-1 and the power cord of the support equipment was connected to LISN-2.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the peak detection mode, quasi-peak and average. Quasi-Peak readings are distinguished with a “QP”. Average reading is distinguished with an “Ave”.

5.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

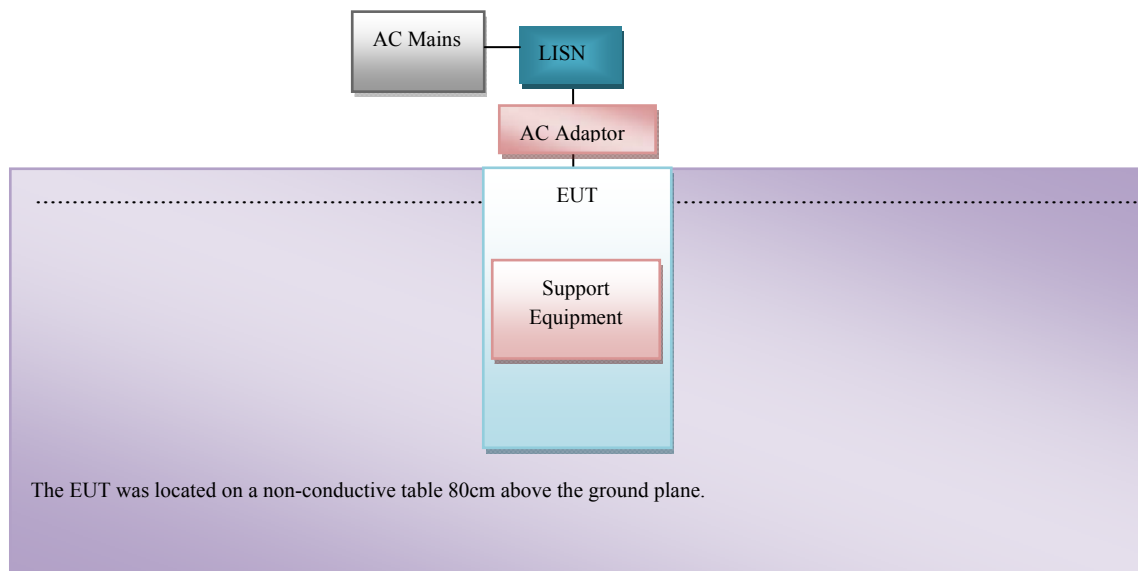
$$CA = Ai + AF + CL + Atten - Ga$$

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

5.5 Test Setup Block Diagram



5.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Solar Electronics Company	High Pass Filter	Type 7930-100	7930150203	2015-02-26	1 year
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100338	2014-01-20	2 year
Rohde & Schwarz	Impulse Limiter	ESH3-Z2	101962	2015-07-15	1 year
Wierless Solutions	Conducted Emission Cable	LMR 400	690	Cal. Not required	Cal. Not Required
FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160132	2015-04-07	1year

5.7 Test Environmental Conditions

Temperature:	25° C
Relative Humidity:	42%
ATM Pressure:	101.6 kPa

The testing was performed by Kevin Wang on 2015-09-30 in 5M chamber2.

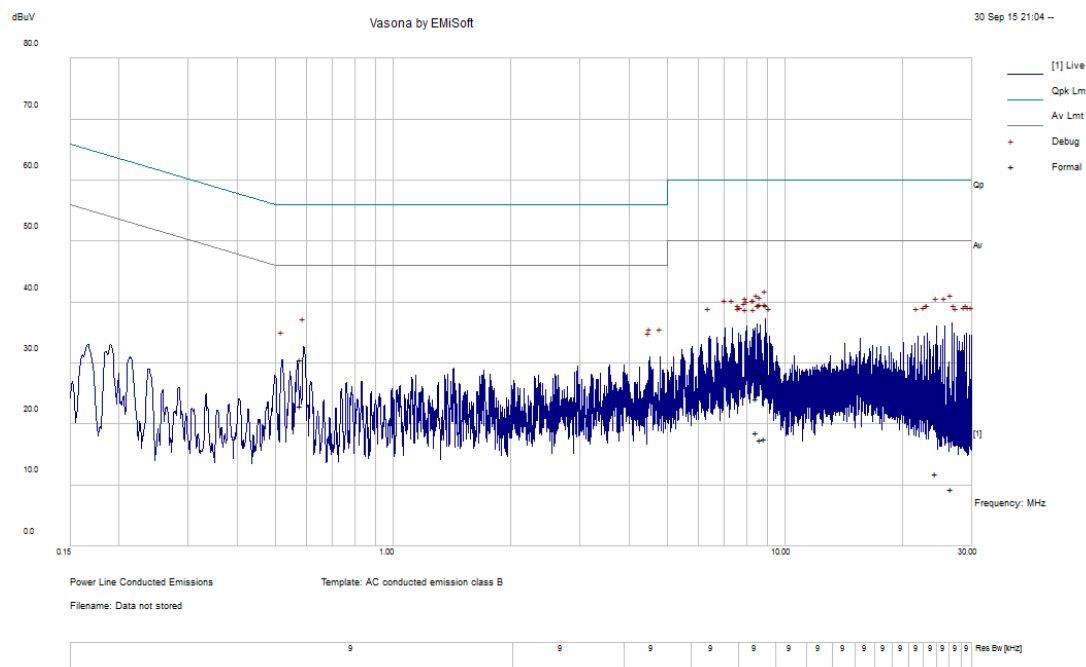
5.8 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 18C standard's radiated emissions limits, and had the worst margin of:

Connection: AC/DC adapter connected to 120 V/ 60 Hz, AC			
Margin (dB)	Frequency (MHz)	Conductor Mode (Live/Neutral)	Range (MHz)
-22.99	0.581664	Live	0.15-30

Please refer to the following table and plots for specific test result details

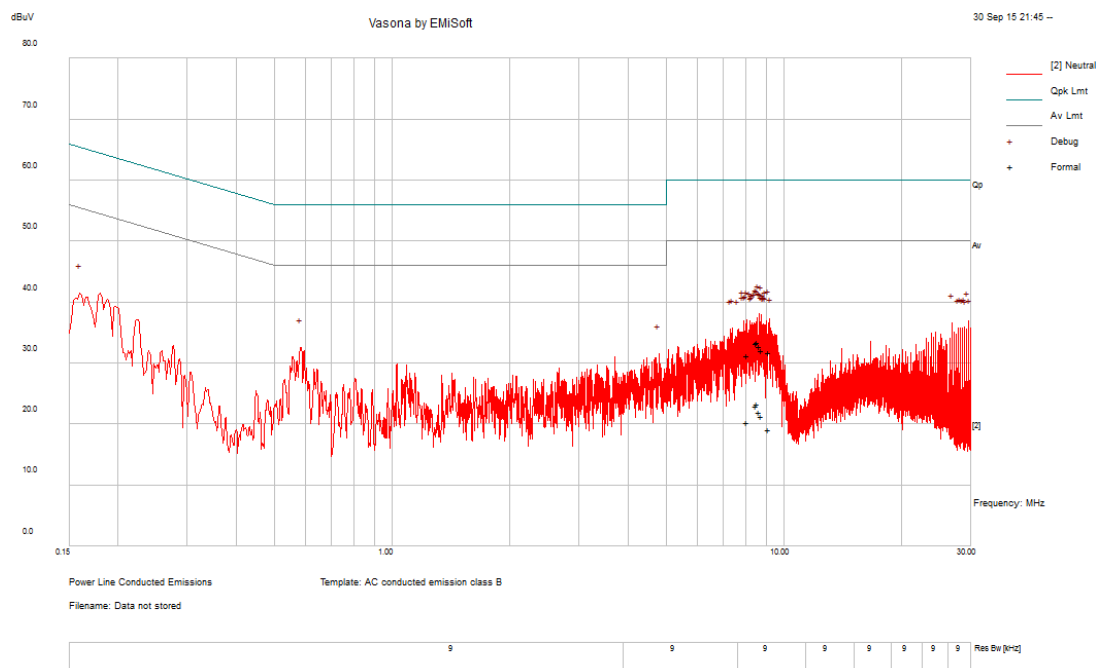
120VAC/60Hz Line



Frequency (MHz)	Cord. Reading (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
0.581664	30.60	Line	56	-25.40	QP
8.65202	28.24	Line	60	-31.76	QP
8.898138	27.57	Line	60	-32.43	QP
8.463158	24.33	Line	60	-35.67	QP
24.3238	20.34	Line	60	-39.66	QP
26.64721	18.69	Line	60	-41.31	QP

Frequency (MHz)	Cord. Reading (dBUV)	Conductor (Line/Neutral)	Limit (dBUV)	Margin (dB)	Detector (QP/Ave.)
0.581664	23.01	Line	46	-22.99	Ave.
8.463158	18.73	Line	50	-31.27	Ave.
8.898138	17.69	Line	50	-32.31	Ave.
8.65202	17.58	Line	50	-32.42	Ave.
24.3238	11.95	Line	50	-38.05	Ave.
26.64721	9.44	Line	50	-40.56	Ave.

120VAC/60Hz Neutral



Frequency (MHz)	Cord. Reading (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
8.536436	33.46	Neutral	60	-26.54	QP
8.514521	33.35	Neutral	60	-26.65	QP
8.646809	32.85	Neutral	60	-27.15	QP
8.754673	32.19	Neutral	60	-27.81	QP
9.16694	31.83	Neutral	60	-28.17	QP
8.035096	31.31	Neutral	60	-28.69	QP

Frequency (MHz)	Cord. Reading (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
8.536436	23.45	Neutral	50	-26.55	Ave.
8.514521	23.10	Neutral	50	-26.90	Ave.
8.646809	22.04	Neutral	50	-27.96	Ave.
8.754673	21.31	Neutral	50	-28.69	Ave.
8.035096	20.39	Neutral	50	-29.61	Ave.
9.16694	19.18	Neutral	50	-30.82	Ave.