

# FCC Test Report

Product Name	15W Qi EPP Automotive Wireless Charging System
Model No.	240000-01-043, 240000-01-101, IF 240000-01-036, IF 240000-01-037
FCC ID.	2AQWT24000001043

Applicant	acv GmbH
Address	Strassburger Allee 10-12, 41812 Erkelenz, Germany

Date of Receipt	Sep. 20, 2019
Issued Date	Oct. 22, 2019
Report No.	1990293R-RFUSP20V00
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

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# Test Report

Issued Date: Oct. 22, 2019

Report No.: 1990293R-RFUSP20V00



Product Name	15W Qi EPP Automotive Wireless Charging System
Applicant	acv GmbH
Address	Strassburger Allee 10-12, 41812 Erkelenz, Germany
Manufacturer	Santek Overseas Corp.
Model No.	240000-01-043, 240000-01-101, IF 240000-01-036, IF 240000-01-037
FCC ID.	2AQWT24000001043
EUT Rated Voltage	DC 9-16V
EUT Test Voltage	DC 12V
Trade Name	Inbay
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By : Rita Huang

( Senior Adm. Specialist / Rita Huang )

Tested By : Boris Hsu

( Engineer / Boris Hsu )

Approved By : Vincent Lin

( Director / Vincent Lin )

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## 1. GENERAL INFORMATION

### 1.1. EUT Description

Product Name	15W Qi EPP Automotive Wireless Charging System
Trade Name	Inbay
FCC ID.	2AQWT24000001043
Model No.	240000-01-043, 240000-01-101, IF 240000-01-036, IF 240000-01-037
Frequency Range	127.05 ~128.45kHz (127.75 ± 0.7 kHz)
Type of Modulation	ASK Modulation
Type of antenna	Coil Antenna

Frequency of Channel:

Channel	Frequency
Channel 1:	127.75kHz

Note:

- The EUT is an 15W Qi EPP Automotive Wireless Charging System with a built-in 127.05 ~128.45kHz transceiver.
- The different of the four model is shown as below:

Model Number	Description
240000-01-043	Subsystem Without USB
240000-01-101	Subsystem With USB
IF 240000-01-036	Main Board Without USB
IF 240000-01-037	Main Board With USB

- The data are tested in each mode. Only worst case(IF 240000-01-036) is shown in the report.
- These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.209
- Only the higher Fundamental Radiated Emission channel was tested and recorded in this report.

Test Mode	Mode 1: Transmit
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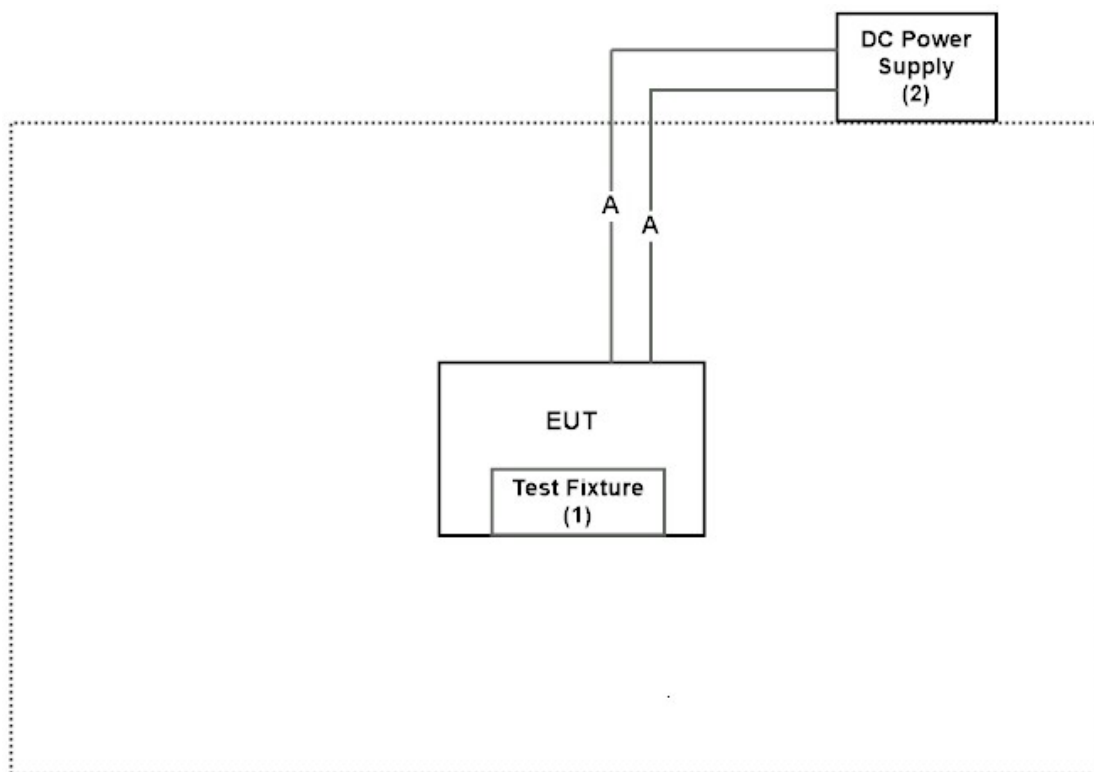
### 1.3. Test System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord	
1	Test Fixture	N/A	N/A	N/A	
2	DC Power Supply	GW	GPC-6030D	D921006	Non-Shielded, 1.8m

Signal Cable Type	Signal cable Description
A	Power Cable
	Non-shielded, 1.5m, two PCS.

### 1.4. Configuration of Test System



### 1.5. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.4
- (2) Turn on the power of all equipment.
- (3) Start the continuous transmitter.
- (4) Verify that the EUT works properly.

## 1.6. Test Facility

Ambient conditions in the laboratory:

Performed Item	Items	Required	Actual
Radiated Emission	Temperature (°C)	10~40 °C	25 °C
	Humidity (%RH)	10~90 %	65 %

**USA : FCC Registration Number: TW3023**

**Canada : IC Registration Number: 4075A**

Site Description: Accredited by TAF  
Accredited Number: 3023

Test Laboratory: DEKRA Testing and Certification Co., Ltd  
Address: No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451,  
Taiwan, R.O.C.

Phone number: 886-2-8601-3788

Fax number: 886-2-8601-3789

Email address: [info.tw@dekra.com](mailto:info.tw@dekra.com)

Website: <http://www.dekra.com.tw>

## 1.7. List of Test Equipment

### For Conducted measurements /CB3/SR8

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
	Temperature Chamber	WIT GROUP	TH-1S-B	EQ-201-00146	2019/02/12	2020/02/11
X	Spectrum Analyzer	Agilent	N9010A	MY48030495	2019/10/13	2020/10/12
	Peak Power Analyzer	Keysight	8990B	MY51000410	2019/08/01	2020/07/31
	Wideband Power Sensor	Keysight	N1923A	MY56080003	2019/07/25	2020/07/24
	Wideband Power Sensor	Keysight	N1923A	MY56080004	2019/07/25	2020/07/24
X	EMI Test Receiver	R&S	ESCS 30	100369	2018/11/07	2019/11/06
X	LISN	R&S	ESH3-Z5	836679/017	2019/02/09	2020/02/08
X	LISN	R&S	ENV216	100097	2019/02/09	2020/02/08
X	Coaxial Cable	DEKRA	RG 400	LC018-RG	2019/06/21	2020/06/20

### For Radiated measurements /Site3/CB8

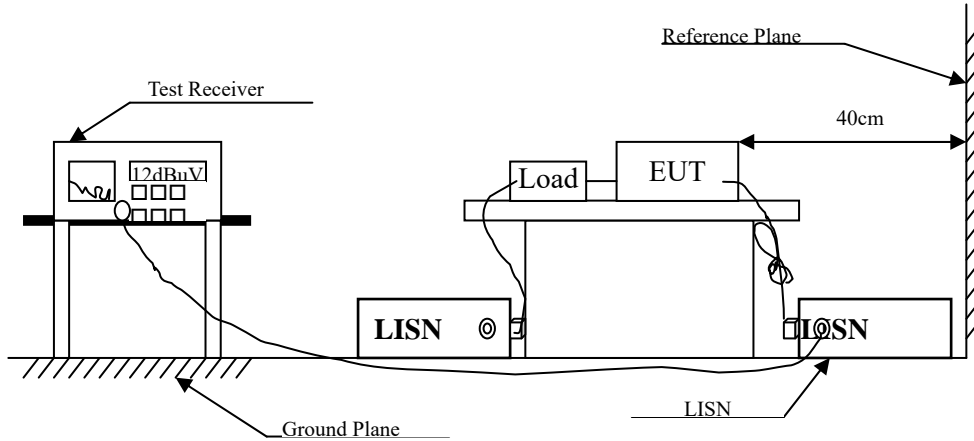
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
X	Spectrum Analyzer	R&S	FSP40	100170	2019/03/12	2020/03/11
X	Loop Antenna	Teseq	HLA6121	37133	2019/10/13	2020/10/12
X	Bilog Antenna	Schaffner Chase	CBL6112B	2707	2019/06/24	2020/06/23
X	Coaxial Cable	DEKRA	RG 214	LC003-RG	2019/06/14	2020/06/13
X	Pre-Amplifier	Jet-Power	JPA-10M1G33	170101000330010	2019/06/14	2020/06/13
	Horn Antenna	ETS-Lindgren	3117	00135205	2019/05/03	2020/05/02
	Horn Antenna	SCHWARZBECK	9120D	576	2018/11/30	2019/11/29
	Pre-Amplifier	EMCI	EMC012630SE	980210	2019/04/10	2020/04/09
	Horn Antenna	Com-Power	AH-840	101043	2019/01/09	2020/01/08
	Amplifier + Cable	EMCI	EMC184045SE	980370	2019/03/21	2020/03/20
	Filter	MICRO-TRONICS	BRM50702	G270	2019/08/06	2020/08/05
	Filter	MICRO-TRONICS	BRM50716	G196	2019/08/06	2020/08/05

#### Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113.

## 2. Conducted Emission

### 2.1. Test Setup



### 2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56 <sup>(註)</sup>	56-46 <sup>(註)</sup>
0.50-5.0	56	46
5.0 - 30	60	50

### 2.3. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

### 2.4. Uncertainty

± 2.26 dB



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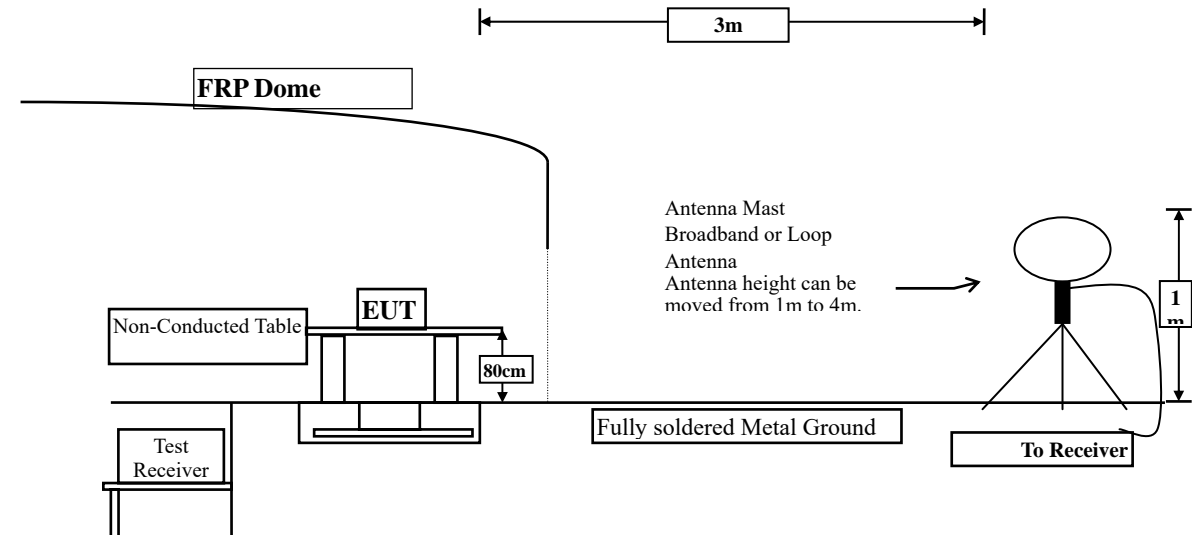
## **2.5. Test Result of Conducted Emission**

Owing to the DC operation of EUT, this test item is not performed.

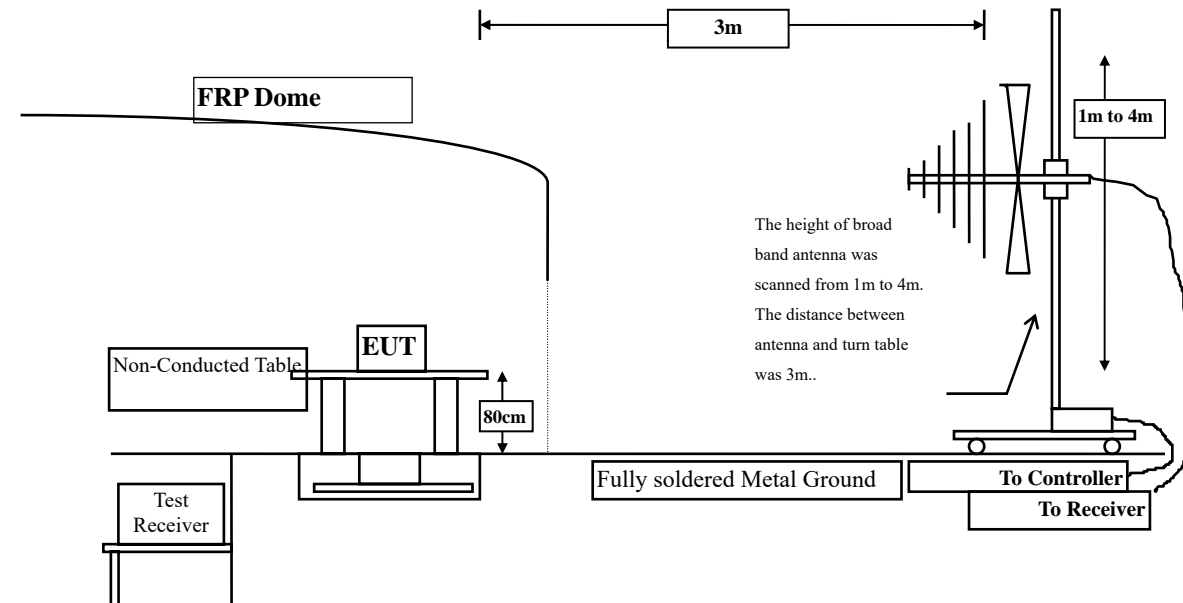
### 3. Radiated Emission

#### 3.1. Test Setup

Under 30MHz Test Setup



Radiated Emission Below 1GHz



### 3.2. Limits

FCC Part 15 Subpart B Paragraph 15.209 Limits		
Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2,400/F(kHz)	300
0.490– 1.705	24,000/F(kHz)	30
1.705 – 30	30	30
30 – 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

- Remarks :
1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
  2. In the Above Table, the tighter limit applies at the band edges.
  3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

### 3.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested compliance to FCC 47CFR 15.209 requirements.

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz. Radiated emission measurements below 1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured on the Final Measurement.

The measurement frequency range form 9kHz - 10th Harmonic of fundamental was investigated.

### 3.4. Uncertainty

± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

### 3.5. Test Result of Radiated Emission

Product : 15W Qi EPP Automotive Wireless Charging System  
 Test Item : Fundamental Radiated Emission  
 Test Site : No.3 OATS  
 Test date : 2019/10/17  
 Test Mode : Mode 1: Transmit (X axis)

#### Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	0.12775	19.991	51.200	71.191	-34.269	105.46	Average

#### Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	0.12775	19.991	49.200	69.191	-36.269	105.46	Average

Note:

1. Limit=25.46 dBuV/300m + 40\*Log (300(m)/3(m))= 105.46dBuV/3m (Average).
2. Measurement Level = Reading Level + Correct Factor.

Product : 15W Qi EPP Automotive Wireless Charging System  
 Test Item : Fundamental Radiated Emission  
 Test Site : No.3 OATS  
 Test date : 2019/10/17  
 Test Mode : Mode 1: Transmit (Y axis)

**Horizontal**

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	0.12775	19.991	52.900	72.891	-32.569	105.46	Average

**Vertical**

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	0.12775	19.991	51.800	71.791	-33.669	105.46	Average

## Note:

1. Limit=25.46 dBuV/300m + 40\*Log (300(m)/3(m))= 105.46dBuV/3m (Average).
2. Measurement Level = Reading Level + Correct Factor.

Product : 15W Qi EPP Automotive Wireless Charging System  
 Test Item : Fundamental Radiated Emission  
 Test Site : No.3 OATS  
 Test date : 2019/10/17  
 Test Mode : Mode 1: Transmit (Z axis)

**Horizontal**

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	0.12775	19.991	55.100	75.091	-30.369	105.46	Average

**Vertical**

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	0.12775	19.991	52.900	72.891	-32.569	105.46	Average

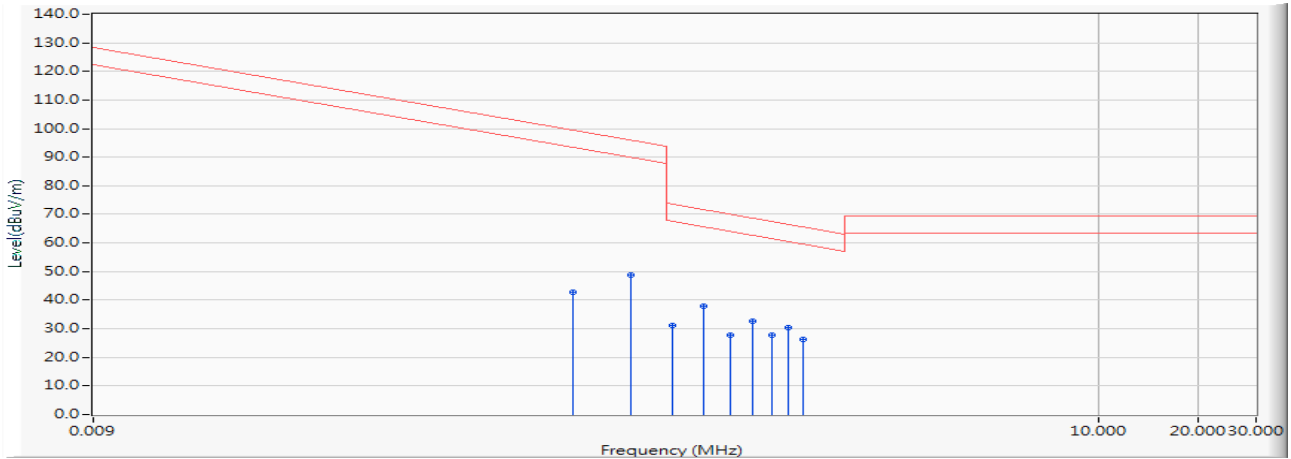
## Note:

1. Limit=25.46 dBuV/300m + 40\*Log (300(m)/3(m))= 105.46dBuV/3m (Average).
2. Measurement Level = Reading Level + Correct Factor.

Product : 15W Qi EPP Automotive Wireless Charging System  
 Test Item : General Radiated Emission  
 Test Site : No.3 OATS  
 Test date : 2019/10/15  
 Test Mode : Mode 1: Transmit (9k-30M)

**9kHz~30MHz**

**Horizontal**



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		0.256	19.925	22.900	42.825	-56.614	99.439	AVERAGE
2		0.383	19.900	28.900	48.800	-47.140	95.940	AVERAGE
3		0.511	19.900	11.200	31.100	-42.336	73.436	QUASIPeAK
4	*	0.639	19.900	17.900	37.800	-33.694	71.494	QUASIPeAK
5		0.767	19.900	7.800	27.700	-42.208	69.908	QUASIPeAK
6		0.894	19.900	12.800	32.700	-35.877	68.577	QUASIPeAK
7		1.022	19.892	7.700	27.592	-39.823	67.415	QUASIPeAK
8		1.150	19.860	10.500	30.360	-36.030	66.390	QUASIPeAK
9		1.278	19.830	6.600	26.430	-39.044	65.474	QUASIPeAK

Note:

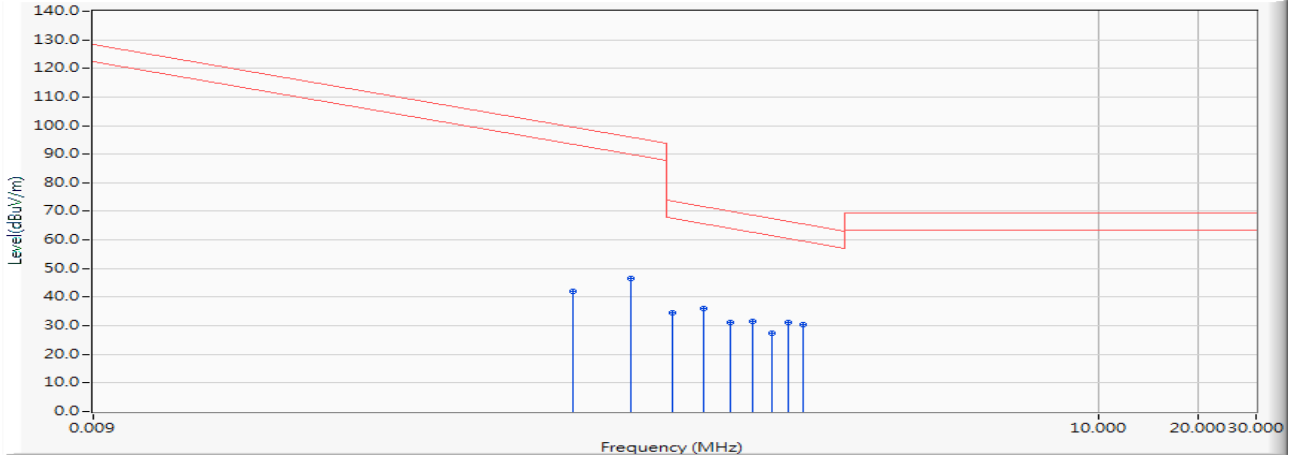
1. All Readings below 1GHz are Quasi-Peak.
2. Measurement Level = Reading Level + Correct Factor.
3. “\*” means the worst emission level.
4. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.



Product : 15W Qi EPP Automotive Wireless Charging System  
 Test Item : General Radiated Emission  
 Test Site : No.3 OATS  
 Test date : 2019/10/15  
 Test Mode : Mode 1: Transmit (9k-30M)

**9kHz~30MHz**

**Vertical**



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		0.256	19.925	22.100	42.025	-57.414	99.439	AVERAGE
2		0.383	19.900	26.700	46.600	-49.340	95.940	AVERAGE
3		0.511	19.900	14.700	34.600	-38.836	73.436	QUASIPeAK
4	*	0.639	19.900	16.300	36.200	-35.294	71.494	QUASIPeAK
5		0.767	19.900	11.300	31.200	-38.708	69.908	QUASIPeAK
6		0.894	19.900	11.800	31.700	-36.877	68.577	QUASIPeAK
7		1.022	19.892	7.600	27.492	-39.923	67.415	QUASIPeAK
8		1.150	19.860	11.200	31.060	-35.330	66.390	QUASIPeAK
9		1.278	19.830	10.500	30.330	-35.144	65.474	QUASIPeAK

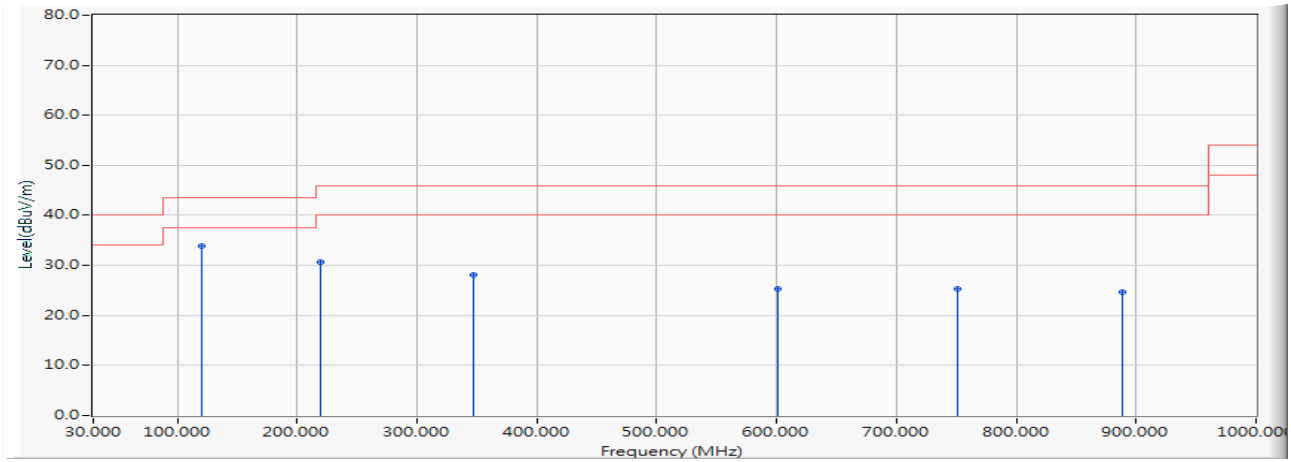
Note:

1. All Readings below 1GHz are Quasi-Peak.
2. Measurement Level = Reading Level + Correct Factor.
3. “\*” means the worst emission level.
4. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : 15W Qi EPP Automotive Wireless Charging System  
 Test Item : General Radiated Emission  
 Test Site : No.3 OATS  
 Test date : 2019/10/14  
 Test Mode : Mode 1: Transmit (30M-1G)

**30MHz~1GHz**

**Horizontal**



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	119.971	-15.617	49.532	33.915	-9.585	43.500	QUASIPeAK
2		219.783	-16.841	47.545	30.705	-15.295	46.000	QUASIPeAK
3		347.710	-11.000	39.066	28.066	-17.934	46.000	QUASIPeAK
4		600.754	-6.021	31.252	25.232	-20.768	46.000	QUASIPeAK
5		751.174	-6.158	31.548	25.390	-20.610	46.000	QUASIPeAK
6		888.942	-6.812	31.384	24.572	-21.428	46.000	QUASIPeAK

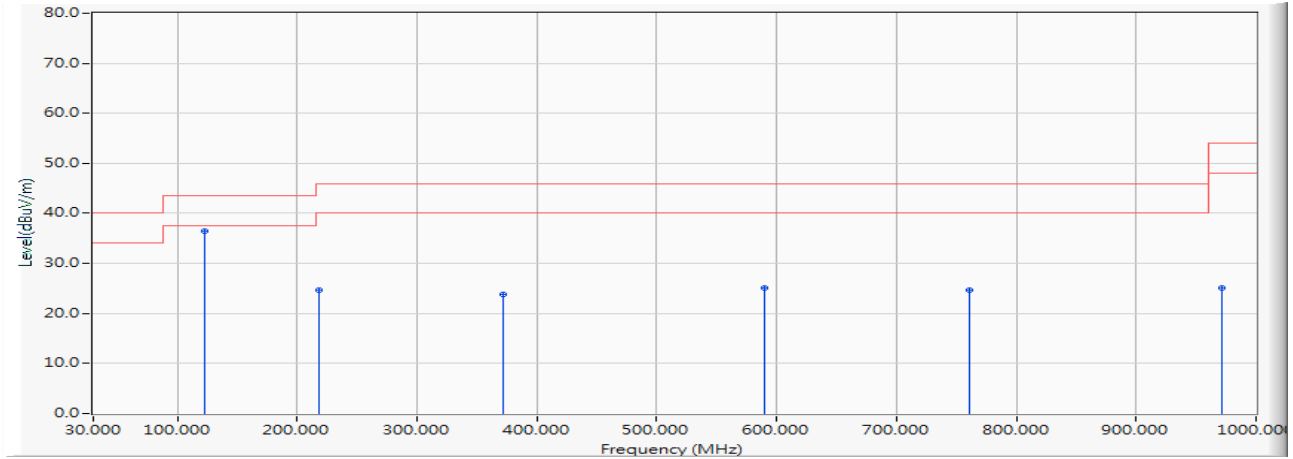
Note:

1. The reading levels below 1GHz are quasi-peak values.
2. “█” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The radiated emissions below 1GHz of the lowest, middle, highest frequency are pretested. Only the worst case is shown on the report.

Product : 15W Qi EPP Automotive Wireless Charging System  
 Test Item : General Radiated Emission  
 Test Site : No.3 OATS  
 Test date : 2019/10/14  
 Test Mode : Mode 1: Transmit (30M-1G)

**30MHz~1GHz**

**Vertical**



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	122.783	-15.264	51.742	36.478	-7.022	43.500	QUASIPeAK
2		218.377	-16.830	41.554	24.724	-21.276	46.000	QUASIPeAK
3		371.609	-10.475	34.242	23.768	-22.232	46.000	QUASIPeAK
4		589.507	-6.147	31.211	25.064	-20.936	46.000	QUASIPeAK
5		761.014	-5.560	30.261	24.701	-21.299	46.000	QUASIPeAK
6		971.884	-5.834	30.839	25.004	-28.996	54.000	QUASIPeAK

Note:

1. The reading levels below 1GHz are quasi-peak values.
2. “█” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The radiated emissions below 1GHz of the lowest, middle, highest frequency are pretested. Only the worst case is shown on the report.

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#### **4. EMI Reduction Method During Compliance Testing**

No modification was made during testing.