Application for FCC Certificate
On Behalf of
Freescale Semiconductor, Inc.

Qi Wireless Charging Transmitter

Model No.: WCT-5WTXAUTO

FCC ID : RUN-WCT-5WTXAUTO

Prepared For : Freescale Semiconductor, Inc.
Corporate Headquarters, 6501 William Cannon Drive
West Austin, Texas 78735 USA

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Report No. : ACI-F14071
Date of Test : Apr 21 – 28, 2014
Date of Report : Apr 29, 2014

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TEST REPORT FOR FCC CERTIFICATE

Applicant	:	Freescale Semiconductor, Inc.
Manufacturer	:	Freescale Semiconductor (China) Limited Shanghai Branch Office
Factory	:	Trivo (Taicang) Technologies Co., Ltd.

EUT Description : Qi Wireless Charging Transmitter
(A) Model No. : WCT-5WTXAUTO
(B) Power Supply : AC100~240V/50-60Hz
(C) Test Voltage : AC 120V/60Hz

Test Procedure Used:

FCC RULES AND REGULATIONS PART 18 SUBPART C OCTOBER 2013 AND FCC OST/MP-5:1986

The device described above is tested by Audix Technology (Shanghai) Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 18 limits both radiated and conducted emissions.

The test results are contained in this test report and Audix Technology (Shanghai) Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. This report shows that the EUT (M/N: Refer to Sec 2.1) which was tested in 3m anechoic chamber Apr 21 – 28, 2014 is technically compliance with the FCC official limits also.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Audix Technology (Shanghai) Co., Ltd.

This report contains data that are not covered by the NVLAP accreditation.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

Date of Test : Apr 21 – 28, 2014 Date of Report : Apr 29, 2014

Producer : Emily Zhu
EMILY ZHU / Assistant

Review : Dio Yang
DIO YANG / Deputy Manager

AUDIX® For and on behalf of
Audix Technology (Shanghai) Co., Ltd.

Signatory : Sammy Chen
Authorized Signature EMC SAMMY CHEN / Deputy Manager

1 SUMMARY OF STANDARDS AND RESULTS

1.1 Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

Description of Test Item	Standard	Limits	Results
EMISSION			
Conducted Emission	FCC RULES AND REGULATIONS PART 18 OCTOBER 2013 AND FCC OST/MP-5:1986	18.307(b)	Pass
Radiated Emission	FCC RULES AND REGULATIONS PART 18 OCTOBER 2013 AND FCC OST/MP-5:1986	18.305(b)	Pass

2 GENERAL INFORMATION

2.1 Description of Equipment Under Test

Description	:	Qi Wireless Charging Transmitter
Type of EUT	:	☑ Production ☐ Pre-product ☐ Pro-type
Model No.	:	WCT-5WTXAUTO
Charge Frequency	:	110kHz
Applicant	:	Freescale Semiconductor, Inc. Corporate Headquarters, 6501 William Cannon Drive West Austin, Texas 78735 USA
Manufacturer	:	Freescale Semiconductor (China) Limited Shanghai Branch No. 192 Liangjing Rd., Pudong New Area, Shanghai 201203, P.R. China
Factory	:	Trivo (Taicang) Technologies Co., Ltd. Building A10, Taicang Foreign Industry Park, No.105 East Shanghai Road, Taicang, Jiangsu, China, 215400

Remark:
The EUT is a Qi Wireless Charging Transmitter which input/output ports as follows:

(1) One Power Port : Connected with Adapter

2.2 Peripherals

2.2.1 Adapter

Manufacturer	:	SCEPTRE POWER
Model Number	:	XA024AM1200200
Input	:	100-240V~, 50-60Hz 0.6A
Output	:	12.0V ⎓ 2.0A
Output Cable	:	Unshielded, Undetachable, 0.9m

2.2.2 Load

Manufacturer	:	Texas Instruments
Model Number	:	BQ51013EVM-764

2.3 Description of Test Facility

Site Description (No.3 3m Chamber)	:	Sept. 17, 1998 file on Mar 16, 2012 Renewed Federal Communications Commission FCC Engineering Laboratory 7435 Oakland Mills Road Columbia, MD 21046, USA
Name of Firm	:	Audix Technology (Shanghai) Co., Ltd.
Site Location	:	3F 34Bldg 680 Guiping Rd, Caohejing Hi-Tech Park, Shanghai 200233, China
NVLAP Lab Code	:	200371-0

2.4 Measurement Uncertainty

Conducted Emission Expanded Uncertainty: U = 2.77 dB
Radiated Emission Expanded Uncertainty (30-200MHz):
U = 4.17 dB (Horizontal)
U = 4.02 dB (Vertical)
Radiated Emission Expanded Uncertainty (200M-1GHz):
U = 3.38 dB (Horizontal)
U = 3.28 dB (Vertical)

3 CONDUCTED EMISSION TEST

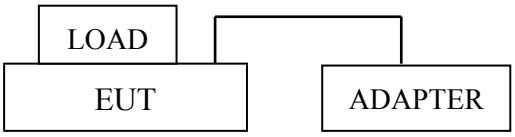
3.1 Test Equipment

The following test equipments are used during the conducted emission test in a shielded room:

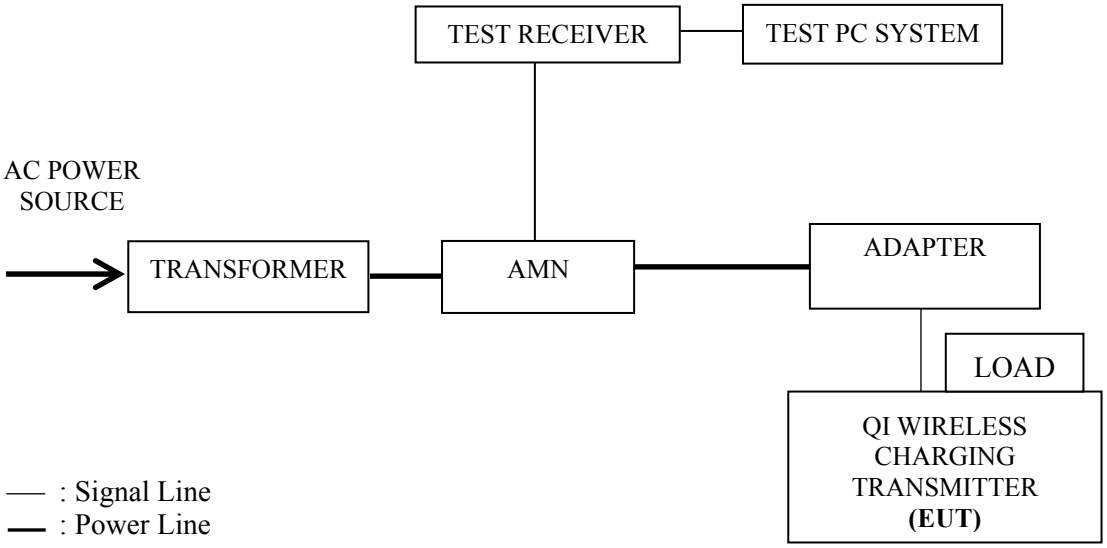
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Test Receiver	R&S	ESCI	101303	Sep 11, 2013	Sep 10, 2014
2.	Artificial Mains Network (AMN)	R&S	ENV4200	100125	Jun 27, 2013	Jun 26, 2014
3.	Pulse Limiter	Yalian	TTS-1	001	Nov 26, 2013	May 25, 2014
4.	Software	Audix	E3	6.111206	--	--

3.2 Block Diagram of Test Setup

3.2.1 EUT & Peripherals



3.2.2 Conducted Disturbance Test Setup



3.3 Conducted Emission Limit [FCC Part 18 Subpart C 18.307(b)]

Frequency Range (MHz)	Limits dB (μV)	
	Quasi-peak	Average
0.15 ~ 0.5	66~56	56~46
0.5 ~ 5	56	46
5 ~ 30	60	50
NOTE 1 – The lower limit shall apply at the transition frequencies. NOTE 2 – The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz~0.50 MHz		

3.4 Test Configuration

The EUT (listed in Sec.2.1) and the peripherals (listed in Sec 2.2) were installed as shown on Sec.3.2 to meet FCC requirement and operating in a manner that tends to maximize its emission level in a normal application.

3.5 Operating Condition of EUT

3.5.1 Setup the EUT and peripherals as shown in Sec. 3.2.

3.5.2 Turn on the power of all equipments and the EUT.

3.5.3 Set the EUT on the test mode and then test.

3.6 Test Procedures

The EUT and peripherals were connected to the power mains through an Artificial Mains Network (AMN). This provided a 50 ohm coupling impedance for the measuring equipment.

Both sides of AC line (Line & Neutral) were checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables were changed or manipulated according to MP-5:1986 during conducted emission test.

The bandwidth of R&S Test Receiver ESCI was set at 9 kHz.

The frequency range from 150 kHz to 30 MHz was checked.

The EUT was performed on Charging (no load/ half load/full load) test modes for conducted disturbance test and the worst test results are listed in Sec.3.7.

3.7 Test Results

< PASS >

The frequency and amplitude of the highest conducted emission relative to the limit is reported. All emissions not reported below are too low against the prescribed limits.

Test Mode	Data Page
Charging (full load)	P10

NOTE 1 – Factor = Cable Loss + AMN Factor.
NOTE 2 – Emission Level = Meter Reading + Factor.
NOTE 3 – "QP" means "Quasi-Peak" values, "AV" means "Average" values.
NOTE 4 – The worst emission is detected at 0.414 MHz (Average Value) with corrected signal level of 41.34 dB (μV) (limit is 47.56 dB (μV)), when the Neutral of the Adapter is connected to AMN.

EUT	:	Qi Wireless Charging Transmitter	Temperature :	23℃	
Model No.	:	WCT-5WTXAUTO	Humidity	:	52% RH
Test Mode	:	Charging (full load)	Date of Test	:	Apr 21, 2014

Test Line	Frequency (MHz)	Meter Reading dB(μV)	Factor (dB)	Emission Level dB(μV)	Limits dB(μV)	Margin (dB)	Remark
Line	0.152	30.30	20.12	50.42	65.90	15.48	QP
	0.417	25.69	19.96	45.65	57.50	11.85	
	0.935	19.50	19.91	39.41	56.00	16.59	
	1.241	19.30	19.92	39.22	56.00	16.78	
	2.037	18.80	19.94	38.74	56.00	17.26	
	8.284	20.70	20.08	40.78	60.00	19.22	
	0.152	18.40	20.12	38.52	55.90	17.38	AV
	0.417	16.79	19.96	36.75	47.50	10.75	
	0.935	12.10	19.91	32.01	46.00	13.99	
	1.241	11.40	19.92	31.32	46.00	14.68	
	2.037	12.10	19.94	32.04	46.00	13.96	
	8.284	18.80	20.08	38.88	50.00	11.12	
Neutral	0.152	28.60	20.12	48.72	65.89	17.17	QP
	0.414	28.49	19.95	48.44	57.56	9.12	
	0.729	20.10	19.91	40.01	56.00	15.99	
	1.246	16.30	19.93	36.23	56.00	19.77	
	2.079	15.80	19.97	35.77	56.00	20.23	
	8.275	20.30	20.16	40.46	60.00	19.54	
	0.152	21.20	20.12	41.32	55.89	14.57	AV
	0.414	**21.39**	**19.95**	**41.34**	**47.56**	**6.22**	
	0.729	12.40	19.91	32.31	46.00	13.69	
	1.246	8.40	19.93	28.33	46.00	17.67	
	2.079	8.70	19.97	28.67	46.00	17.33	
	8.275	17.90	20.16	38.06	50.00	11.94	

TEST ENGINEER: ERIC TANG

4 RADIATED EMISSION TEST

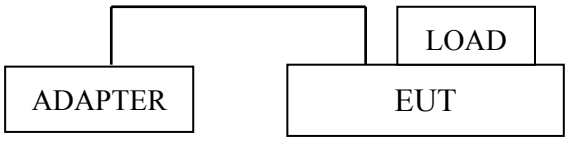
4.1 Test Equipment

The following test equipments are used during the radiated emission test in a semi-anechoic chamber:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Test Receiver	R&S	ESCI	101302	Sep 03, 2013	Sep 02, 2014
2.	Preamplifier	Agilent	8447D	2944A10548	Mar 17, 2014	Sep 17, 2014
3.	Loop Antenna	Schaffner	HLA6120	1193	Apr 25, 2014	Apr 24, 2015
4.	Bi-log Antenna	TESEQ	CBL6112D	23193	May 03, 2013	May 02, 2014
5.	Spectrum Analyzer	Agilent	E7405A	MY45106600	Nov 11, 2013	Nov 10, 2014
6.	50Ω Coaxial Switch	Anritsu	MP59B	6200426390	Mar 17, 2014	Sep 17, 2014
7.	Software	Audix	E3	6.2007-9-10	--	--

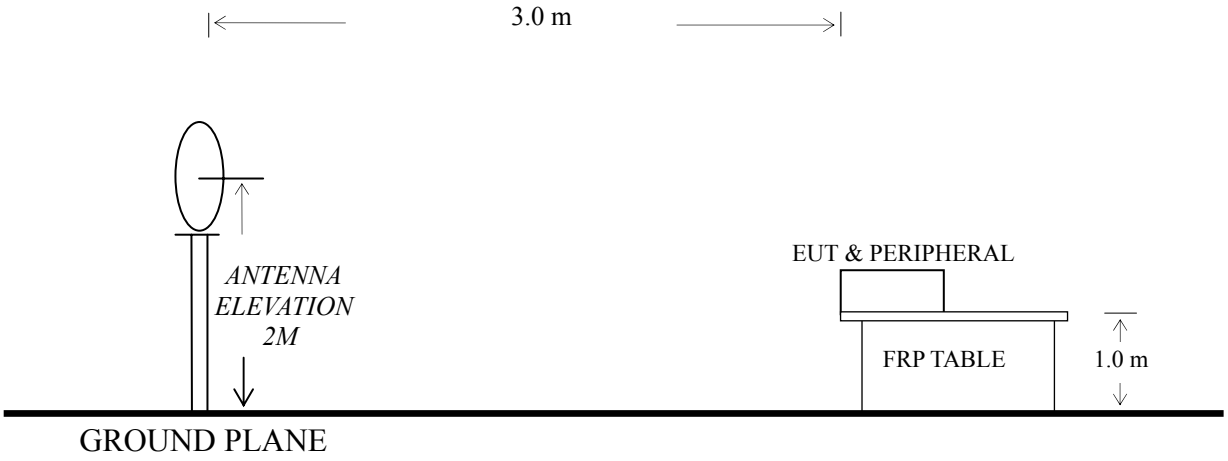
4.2 Block Diagram of Test Setup

4.2.1 EUT & Peripherals

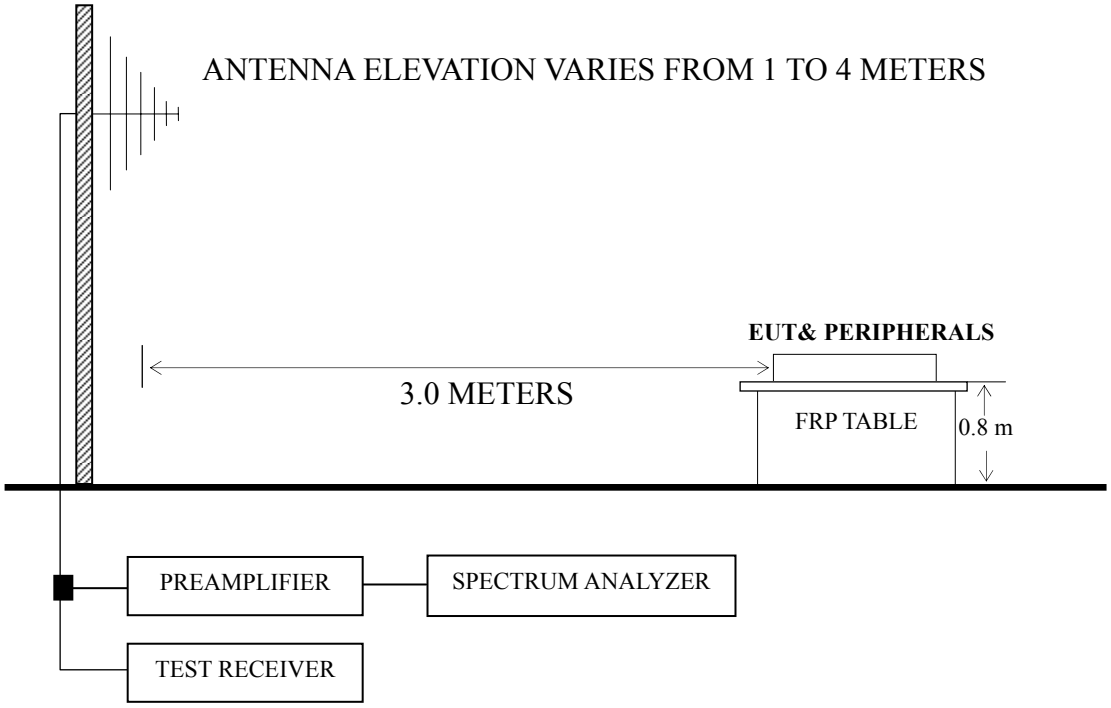


4.2.2 Radiated emission test setup

For 9kHz to 30MHz



For 30MHz to 1000MHz



■ : 50 ohm Coaxial Switch

4.3 Radiated Emission Limit [FCC Part 18 Subpart C 18.305(b)]

All emanations from Non-ISM frequency devices or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified below:

Frequency (MHz)	Distance (m)	Field Strength Limits (μV/m)	Converted Field Strength Limits By 3 Meters Measuring Distance dB (μV/m)
0.009~1000	300	15	63.5

NOTE 1 - Distance refers to the distance in meters between the test antenna and the closed point of any part of the EUT.

NOTE 2 - Audix Technology (Shanghai) Co., Ltd. only has a 3 meters Semi-anechoic Chamber to do the radiated disturbance test, therefore, Audix Shanghai used 3 meters measuring distance and converted limits to judge the EUT compliance with or not.

4.4 Test Configuration

The configuration of the EUT and peripherals are same as those used in conducted emission test.

Please refer to Sec.3.4.

4.5 Operating Condition of EUT

Same as conducted emission test which is listed in Sec.3.5, except for the test setup replaced by Sec.4.2.

4.6 Test Procedures

For 9kHz to 30MHz:
The EUT and peripherals were placed on a table, which is 1.0 meter above ground. Measurements are performed at distance 3.0m with a 0.6m loop antenna as described in 2.2.4 of MP-5. The antenna shall be height 2m above the floor. Both horizontal and vertical polarizations of the antenna were set on measurement.

The bandwidth setting on the test receiver is 200Hz from 9kHz to 150kHz and 9kHz from 150kHz to 30MHz.

For 30MHz to 1000MHz:
The EUT and peripherals were placed on a FRP turntable that is 0.8 meter above ground. The FRP turntable rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. Broadband antenna (Calibrated Bilog Antenna) was used as receiving antenna. The antenna moved up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarizations of the antenna were set on measurement.

The I.F. bandwidth of Test Receiver R&S ESCI was set at 120 kHz.

The frequency range from 9kHz to 1000MHz was checked for all test modes.

The EUT was performed on Charging (no load/ half load/full load) test modes for radiated disturbance test and the worst test results are listed in Sec.4.7.

4.7 Test Results

<PASS>

The frequency and amplitude of the highest radiated emission relative the limit is reported. All the emissions not reported below are too low against the FCC limit.

Test Mode	Data Page
Charging (full load)	P15

NOTE 1 – Emission Level = Antenna Factor + Cable Loss + Meter Reading.
NOTE 2 – All readings are Quasi-Peak values.
NOTE 3 – 0° was the table front facing the antenna. Degree is calculated from 0° clockwise facing the antenna.
NOTE 4 – The worst emission was detected at 3.553 MHz with corrected signal level of 60.99 dB (μV/m) (limit is 63.50 dB (μV/m)), when the antenna was at vertical polarization

EUT	:	Qi Wireless Charging Transmitter	Temperature :	22℃
Model No.	:	WCT-5WTXAUTO	Humidity :	45% RH
Test Mode	:	Charging (full load)	Date of Test :	Apr 28, 2014

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)
Horizontal	0.014	38.45	20.49	0.03	58.97	63.50	4.53
	0.062	31.51	20.56	0.03	52.10	63.50	11.40
	0.110	36.32	20.08	0.03	56.43	63.50	7.07
	0.431	34.99	19.97	0.03	54.99	63.50	8.51
	0.663	**38.71**	**20.29**	**0.04**	**59.04**	**63.50**	**4.46**
	3.524	30.43	20.59	0.05	51.07	63.50	12.43
	30.970	0.75	18.10	0.64	19.49	40.00	20.51
	54.250	4.83	6.74	0.86	12.43	40.00	27.57
	117.300	2.70	11.95	1.34	15.99	43.50	27.51
	206.540	11.54	8.55	1.85	21.94	43.50	21.56
	289.960	11.44	12.90	2.41	26.75	46.00	19.25
	416.060	0.78	17.00	2.72	20.50	46.00	25.50
Vertical	0.015	38.16	20.49	0.03	58.68	63.50	4.82
	0.031	37.50	20.49	0.03	58.02	63.50	5.48
	0.110	28.63	20.44	0.03	49.10	63.50	14.40
	0.431	38.10	19.97	0.03	58.10	63.50	5.40
	0.663	38.95	20.29	0.04	59.28	63.50	4.22
	3.553	**40.36**	**20.58**	**0.05**	**60.99**	**63.50**	**2.51**
	31.940	9.24	17.10	0.65	26.99	40.00	13.01
	39.700	15.61	12.16	0.75	28.52	40.00	11.48
	54.250	15.40	6.74	0.86	23.00	40.00	17.00
	117.300	5.98	11.95	1.34	19.27	40.00	20.73
	214.300	16.71	8.32	1.91	26.94	40.00	13.06
	313.240	3.80	13.42	2.53	19.75	47.00	27.25

TEST ENGINEER: NEAL WANG

5 DEVIATION TO TEST SPECIFICATIONS

None.