

Tesla Motors, Inc.

EMC TEST REPORT FOR

UMC 315 MHz
Model: 1023049-02-D rev02

Tested To The Following Standards:

FCC Part 15 Subpart C Section(s)
15.207 & 15.231

Report No.: 95630-10

Date of issue: April 16, 2015



This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Tesla Motors, Inc.
3500 Deer Creek
Palo Alto, CA 94304

Representative: Robert Cooper
Customer Reference Number: 4700057777

DATE OF EQUIPMENT RECEIPT:**DATE(S) OF TESTING:****REPORT PREPARED BY:**

Morgan Tramontin
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 95630

March 25, 2015

March 25, 2015

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.

A handwritten signature in black ink that reads "Steve Behm".

Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
1120 Fulton Place
Fremont, CA 94539

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.00.14
Immunity	5.00.07

Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Fremont	US0082	SL2-IN-E-1148R	3082B-1	958979	A-0149

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C

Test Procedure	Description	Modifications*	Results
15.31(e)	Voltage Variation	NA	Pass
15.207	Conducted Emissions	NA	Pass
15.231(a)	Periodic Operation	NA	Pass
15.231(b)	RF Output Power	NA	Pass
15.231(b)	Field Strength of Radiated Spurious Emissions	NA	Pass
15.231(c)	Occupied Bandwidth	NA	Pass

Modifications* During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions
No modifications were made during testing.

*Modifications listed above must be incorporated into all production units.

Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
The EUT is an electrical vehicle charge cable handle used for UMC (Universal Mobile Connector), HPC (High Power Wall Connector), and Superchargers. The button on the handle sends a signal to the Model S to open the charge port for charging. The EUT is powered up with 3.3 VDC. The EUT is placed on the 80 cm Styrofoam table. The EUT is turn ON and OFF by an external 555 timer circuit. The EUT is set in continuously transmit mode at 50% Duty Cycle.

EQUIPMENT UNDER TEST (EUT)

EQUIPMENT UNDER TEST

UMC 315 MHz

Manuf: Tesla Motors, Inc.
Model: 1023049-02-D rev02
Serial: 0314IG0007190

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

555 Timer Circuit

Manuf: Tesla Motors, Inc.
Model: None
Serial: None

Charging Cable

Manuf: Tesla Motors, Inc.
Model: None
Serial: None

DC Power Supply

Manuf: Protek
Model: 3006B
Serial: AG4070

Note: The above DC Power Supply was supplied by CKC Laboratories.

FCC PART 15 SUBPART C

15.31(e) Voltage Variations

Test Data

Test Location: CKC Laboratories, Inc. • 1120 Fulton Places • Fremont, CA 94539 • (510) 249-1170

Customer: **Tesla Motors, Inc.**

Specification: **15.31(e)**

Work Order #: **95630**

Test Type: **Maximized Emissions**

Equipment: **UMC 315 MHz**

Manufacturer: Tesla Motors, Inc.

Model: 1023049-02-D rev02

S/N: 0314IG0007190

Date: 3/25/2015

Time: 15:49:31

Sequence#: 6

Tested By: Daniel Bertran

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00852	Biconilog Antenna	CBL 6111C	11/24/2014	11/24/2016
T2	AN00686	Preamp	8447D Opt 010	5/27/2014	5/27/2016
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP05300	Cable	RG214/U	3/25/2013	3/25/2015
T5	ANP01183	Cable	CNT-195	9/3/2013	9/3/2015
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
	AN00432	Loop Antenna	6502	4/2/2013	4/2/2015
T6	AN02157	Horn Antenna-ANSI C63.5 Calibration	3115	12/2/2014	12/2/2016
T7	ANP06712	Cable	32022-29094K-29094K-48TC	9/18/2014	9/18/2016
T8	AN02754	High Pass Filter	6IH40-500/T3000-O/O	1/15/2014	1/15/2016
T9	AN03114	Preamp	AMF-7D-00101800-30-10P	4/11/2013	4/11/2015
T10	ANP01210	Cable	FSJ1P-50A-4A	1/15/2015	1/15/2017
T11	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
UMC 315 MHz*	Tesla Motors, Inc.	1023049-02-D rev02	0314IG0007190

Support Devices:

Function	Manufacturer	Model #	S/N
555 timer circuit	Tesla Motors, Inc.	None	None
Charging cable	Tesla Motors, Inc.	None	None
DC Power Supply	Protek	3006B	AG4070

Test Conditions / Notes:

15.31e Setup Firmware Used: None Temperature: 21.4°C Humidity: 45 % Atmospheric Pressure: 102 kPa Test Method: ANSI C 63.4 (2009) Transmitting operating frequency= 315MHz RF Output= 0dBm The EUT is an electrical vehicle charge cable handle used for UMC (Universal Mobile Connector), HPC (High Power Wall Connector), and Superchargers. The button on the handle sends a signal to the Model S to open the charge port for charging. The EUT is powered up with 3.3 VDC. The EUT is placed on the 80 cm Styrofoam table. The EUT is turn ON and OFF by an external 555 timer circuit. The EUT is set in continuously transmit mode at 50% Duty Cycle. Note: No change observed on the radiated signal level of the fundamental while voltage was varied between 97% and 103% of the 3.3VDC nominal voltage specified by manufacturer.

15.207 AC Conducted Emissions

Test Data

Test Location: CKC Laboratories, Inc. • 1120 Fulton Places • Fremont, CA 94539 • (510) 249-1170

Customer: **Tesla Motors, Inc.**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **95630**
 Test Type: **Conducted Emissions**
 Equipment: **UMC 315 MHz**
 Manufacturer: Tesla Motors, Inc.
 Model: 1023049-02-D rev02
 S/N: 0314IG0007190

Date: 3/25/2015
 Time: 9:31:28 AM
 Sequence#: 1
 Tested By: Daniel Bertran
 120V 60Hz

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00493	50uH LISN-L1 (L) Loss W/O European Adapter	3816/NM	3/4/2015	3/4/2017
	AN00493	50uH LISN-L(2) N Loss W/O European Adapter	3816/NM	3/4/2015	3/4/2017
T2	ANP05258	High Pass Filter	HE9615-150K- 50-720B	11/14/2014	11/14/2016
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP05300	Cable	RG214/U	3/25/2013	3/25/2015
T5	ANP01211	Attenuator	PE7002-10	4/2/2013	4/2/2015
	AN03470	Spectrum Analyzer	E4440A	12/2/2013	12/2/2015

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
UMC 315 MHz*	Tesla Motors, Inc.	1023049-02-D rev02	0314IG0007190

Support Devices:

Function	Manufacturer	Model #	S/N
555 timer circuit	Tesla Motors, Inc.	None	None
Charging cable	Tesla Motors, Inc.	None	None
DC Power Supply	Protek	3006B	AG4070

Test Conditions / Notes:

Conducted Emissions

Frequency Range: 150kHz to 30MHz

Firmware Used: None

Temperature: 21.4°C

Humidity: 45 %

Atmospheric Pressure: 102 kPa

High Clock: 10MHz

Test Method: ANSI C 63.4 (2009)

Transmitting operating frequency= 315MHz

RF Output= 0dBm

The EUT is an electrical vehicle charge cable handle used for UMC (Universal Mobile Connector), HPC (High Power Wall Connector), and Superchargers. The button on the handle sends a signal to the Model S to open the charge port for charging. The EUT is powered up with 3.3 VDC.

The EUT is placed on the 80 cm Styrofoam table. The EUT is turn ON and OFF by an external 555 timer circuit. The EUT is set in continuously transmit mode at 50% Duty Cycle.

Ext Attn: 0 dB

Measurement Data:

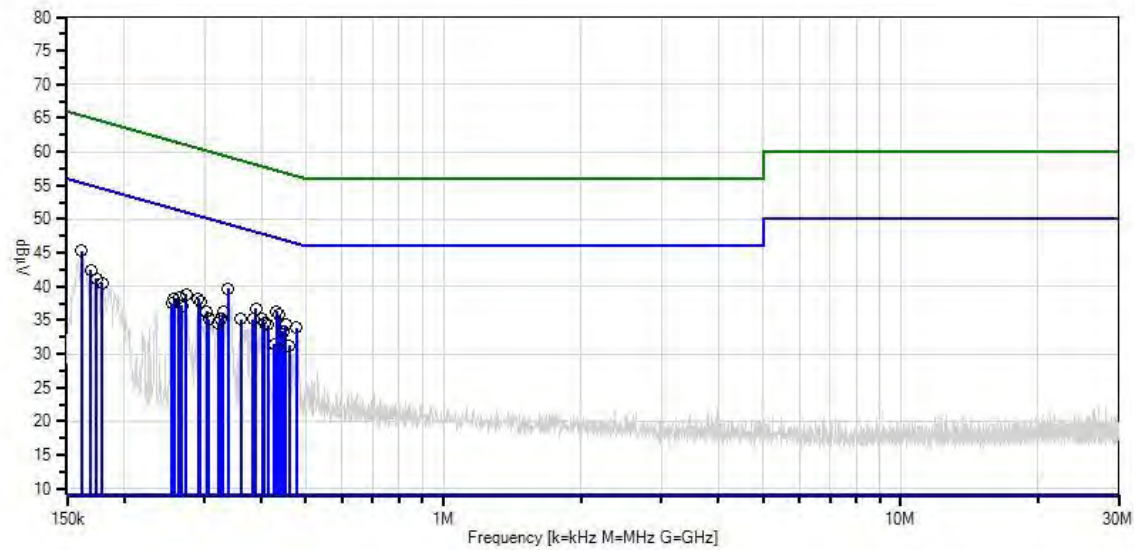
Reading listed by margin.

Test Lead: Black

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	338.346k	29.9	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	39.7	49.2	-9.5	Black
2	161.635k	35.1	+0.1 +9.6	+0.5	+0.0	+0.0	+0.0	45.3	55.4	-10.1	Black
3	431.429k	26.5	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	36.3	47.2	-10.9	Black
4	437.246k	26.0	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	35.8	47.1	-11.3	Black
5	388.524k	26.9	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	36.7	48.1	-11.4	Black
6	273.625k	29.0	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	38.8	51.0	-12.2	Black
7	290.351k	28.4	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	38.2	50.5	-12.3	Black
8	401.613k	25.5	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	35.3	47.8	-12.5	Black
9	451.790k	24.4	+0.1 +9.6	+0.2	+0.0	+0.0	+0.0	34.3	46.8	-12.5	Black
10	475.788k	24.0	+0.1 +9.6	+0.2	+0.0	+0.0	+0.0	33.9	46.4	-12.5	Black
11	168.907k	32.3	+0.1 +9.6	+0.4	+0.0	+0.0	+0.0	42.4	55.0	-12.6	Black
12	293.987k	27.9	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	37.7	50.4	-12.7	Black
13	263.444k	28.6	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	38.4	51.3	-12.9	Black

14	383.433k	25.4	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	35.2	48.2	-13.0	Black
15	405.249k	24.8	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	34.6	47.7	-13.1	Black
16	257.626k	28.4	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	38.2	51.5	-13.3	Black
17	328.893k	26.4	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	36.2	49.5	-13.3	Black
18	412.521k	24.5	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	34.3	47.6	-13.3	Black
19	173.998k	31.1	+0.1 +9.6	+0.4	+0.0	+0.0	+0.0	41.2	54.8	-13.6	Black
20	360.890k	25.3	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	35.1	48.7	-13.6	Black
21	445.246k	23.6	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	33.4	47.0	-13.6	Black
22	303.440k	26.5	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	36.3	50.1	-13.8	Black
23	179.088k	30.5	+0.1 +9.6	+0.3	+0.0	+0.0	+0.0	40.5	54.5	-14.0	Black
24	267.807k	27.4	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	37.2	51.2	-14.0	Black
25	254.718k	27.7	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	37.5	51.6	-14.1	Black
26	324.529k	25.5	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	35.3	49.6	-14.3	Black
27	307.076k	25.3	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	35.1	50.0	-14.9	Black
28	320.893k	24.7	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	34.5	49.7	-15.2	Black
29	459.063k	21.3	+0.1 +9.6	+0.2	+0.0	+0.0	+0.0	31.2	46.7	-15.5	Black
30	427.065k	21.6	+0.1 +9.6	+0.1	+0.0	+0.0	+0.0	31.4	47.3	-15.9	Black

CKC Laboratories, Inc Date: 3/25/2015 Time: 9:31:28 AM Tesla Motors, Inc WO#: 95630
 Test Lead: Black 120V 60Hz Sequence#: 1



— Sweep Data	— Readings
○ Peak Readings	× QP Readings
* Average Readings	▼ Ambient
— 1 - 15.207 AC Mains - Average	— 2 - 15.207 AC Mains - Quasi-peak

Test Location: CKC Laboratories, Inc. • 1120 Fulton Places • Fremont, CA 94539 • (510) 249-1170

Customer: **Tesla Motors, Inc.**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **95630**
 Test Type: **Conducted Emissions**
 Equipment: **UMC 315 MHz**
 Manufacturer: Tesla Motors, Inc.
 Model: 1023049-02-D rev02
 S/N: 0314IG0007190

Date: 3/25/2015
 Time: 9:35:02 AM
 Sequence#: 2
 Tested By: Daniel Bertran
 120V 60Hz

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN00493	50uH LISN-L1 (L) Loss W/O European Adapter	3816/NM	3/4/2015	3/4/2017
T1	AN00493	50uH LISN-L(2) N Loss W/O European Adapter	3816/NM	3/4/2015	3/4/2017
T2	ANP05258	High Pass Filter	HE9615-150K- 50-720B	11/14/2014	11/14/2016
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP05300	Cable	RG214/U	3/25/2013	3/25/2015
T5	ANP01211	Attenuator	PE7002-10	4/2/2013	4/2/2015
	AN03470	Spectrum Analyzer	E4440A	12/2/2013	12/2/2015

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
UMC 315 MHz*	Tesla Motors, Inc.	1023049-02-D rev02	0314IG0007190

Support Devices:

Function	Manufacturer	Model #	S/N
555 timer circuit	Tesla Motors, Inc.	None	None
Charging cable	Tesla Motors, Inc.	None	None
DC Power Supply	Protek	3006B	AG4070

Test Conditions / Notes:

Conducted Emissions Frequency Range: 150kHz to 30MHz Firmware Used: None Temperature: 21.4°C Humidity: 45 % Atmospheric Pressure: 102 kPa High Clock: 10MHz Test Method: ANSI C 63.4 (2009) Transmitting operating frequency= 315MHz RF Output= 0dBm The EUT is an electrical vehicle charge cable handle used for UMC (Universal Mobile Connector), HPC (High Power Wall Connector), and Superchargers. The button on the handle sends a signal to the Model S to open the charge port for charging. The EUT is powered up with 3.3 VDC. The EUT is placed on the 80 cm Styrofoam table. The EUT is turn ON and OFF by an external 555 timer circuit. The EUT is set in continuously transmit mode at 50% Duty Cycle.

Ext Attn: 0 dB

Measurement Data:

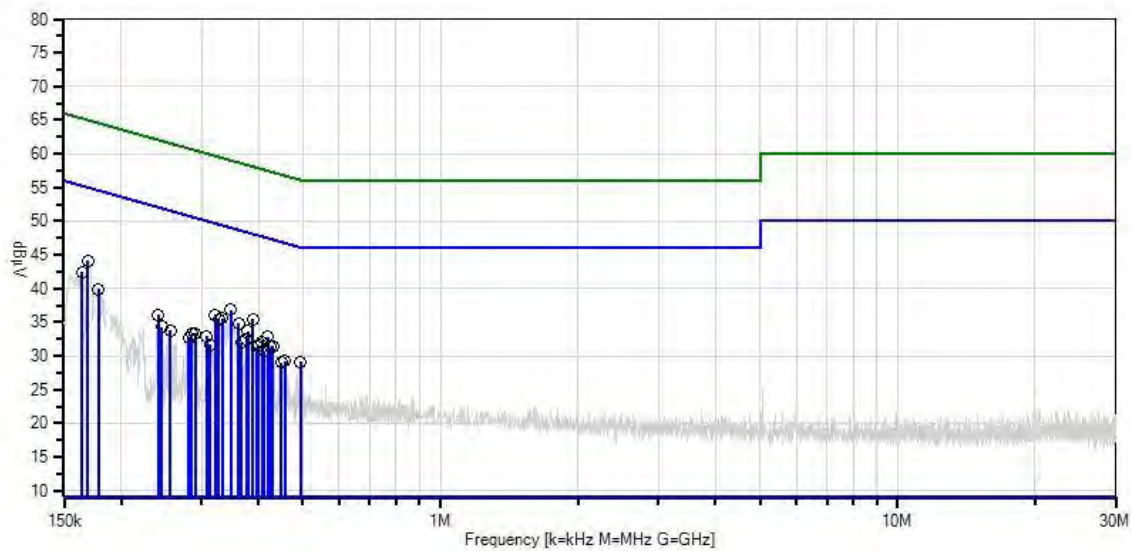
Reading listed by margin.

Test Lead: White

#	Freq MHz	Rdng dB μ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	168.907k	33.4	+0.7 +9.6	+0.4	+0.0	+0.0	+0.0	44.1	55.0	-10.9	White
2	347.800k	26.4	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	36.8	49.0	-12.2	White
3	388.524k	25.1	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	35.5	48.1	-12.6	White
4	164.544k	31.7	+0.7 +9.6	+0.4	+0.0	+0.0	+0.0	42.4	55.2	-12.8	White
5	320.893k	25.6	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	36.0	49.7	-13.7	White
6	333.256k	25.2	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	35.6	49.4	-13.8	White
7	361.617k	24.4	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	34.8	48.7	-13.9	White
8	326.711k	25.1	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	35.5	49.5	-14.0	White
9	378.343k	23.3	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	33.7	48.3	-14.6	White
10	178.361k	29.3	+0.7 +9.6	+0.3	+0.0	+0.0	+0.0	39.9	54.6	-14.7	White
11	418.339k	22.4	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	32.8	47.5	-14.7	White
12	407.431k	21.6	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	32.0	47.7	-15.7	White
13	429.247k	21.0	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	31.4	47.3	-15.9	White
14	240.901k	25.7	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	36.1	52.1	-16.0	White
15	376.161k	22.0	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	32.4	48.4	-16.0	White
16	424.157k	20.9	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	31.3	47.4	-16.1	White
17	400.159k	21.2	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	31.6	47.9	-16.3	White
18	366.707k	21.6	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	32.0	48.6	-16.6	White
19	396.523k	20.9	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	31.3	47.9	-16.6	White
20	411.794k	20.3	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	30.7	47.6	-16.9	White
21	494.696k	18.6	+0.7 +9.6	+0.2	+0.0	+0.0	+0.0	29.1	46.1	-17.0	White
22	290.351k	23.0	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	33.4	50.5	-17.1	White
23	307.804k	22.5	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	32.9	50.0	-17.1	White

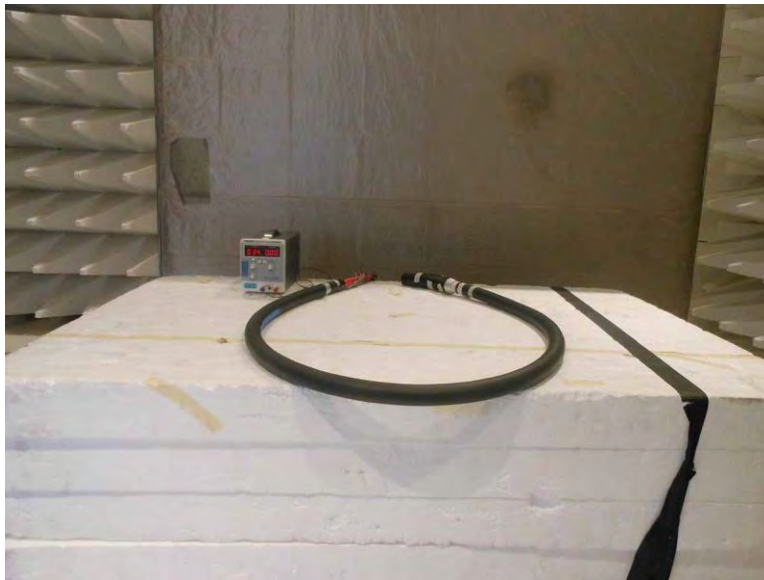
24	285.260k	22.9	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	33.3	50.7	-17.4	White
25	456.881k	18.7	+0.7 +9.6	+0.2	+0.0	+0.0	+0.0	29.2	46.7	-17.5	White
26	245.264k	23.9	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	34.3	51.9	-17.6	White
27	256.172k	23.4	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	33.8	51.6	-17.8	White
28	448.154k	18.5	+0.7 +9.6	+0.2	+0.0	+0.0	+0.0	29.0	46.9	-17.9	White
29	281.624k	22.2	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	32.6	50.8	-18.2	White
30	313.621k	21.3	+0.7 +9.6	+0.1	+0.0	+0.0	+0.0	31.7	49.9	-18.2	White

CKC Laboratories, Inc Date: 3/25/2015 Time: 9:35:02 AM Tesla Motors, Inc WO#: 95630
Test Lead: White 120V 60Hz Sequence#: 2



— Sweep Data
○ Peak Readings
* Average Readings
— Readings
× QP Readings
▼ Ambient
— 1 - 15.207 AC Mains - Average
— 2 - 15.207 AC Mains - Quasi-peak

Test Setup Photo(s)



15.231(a) Periodic Operations

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 1120 Fulton Places • Fremont, CA 94539 • (510) 249-1170

Customer: **Tesla Motors, Inc.**

Specification: **15.231(a)**

Work Order #: **95630**

Date: 3/25/2015

Test Type: **Radiated Scan**

Time: 15:49:31

Equipment: **UMC 315 MHz**

Sequence#: 6

Manufacturer: Tesla Motors, Inc.

Tested By: Daniel Bertran

Model: 1023049-02-D rev02

S/N: 0314IG0007190

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00852	Biconilog Antenna	CBL 6111C	11/24/2014	11/24/2016
T2	AN00686	Preamp	8447D Opt 010	5/27/2014	5/27/2016
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP05300	Cable	RG214/U	3/25/2013	3/25/2015
T5	ANP01183	Cable	CNT-195	9/3/2013	9/3/2015
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
	AN00432	Loop Antenna	6502	4/2/2013	4/2/2015
T6	AN02157	Horn Antenna-ANSI C63.5 Calibration	3115	12/2/2014	12/2/2016
T7	ANP06712	Cable	32022-29094K-29094K-48TC	9/18/2014	9/18/2016
T8	AN02754	High Pass Filter	6IH40-500/T3000-O/O	1/15/2014	1/15/2016
T9	AN03114	Preamp	AMF-7D-00101800-30-10P	4/11/2013	4/11/2015
T10	ANP01210	Cable	FSJ1P-50A-4A	1/15/2015	1/15/2017
T11	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
UMC 315 MHz*	Tesla Motors, Inc.	1023049-02-D rev02	0314IG0007190

Support Devices:

Function	Manufacturer	Model #	S/N
555 timer circuit	Tesla Motors, Inc.	None	None
Charging cable	Tesla Motors, Inc.	None	None
DC Power Supply	Protek	3006B	AG4070

Test Conditions / Notes:

15.231a

Temperature: 21.4°C

Humidity: 45 %

Atmospheric Pressure: 102 kPa

Test Method: ANSI C 63.4 (2009)

Transmitting operating frequency= 315MHz

RF Output= 0dBm

Firmware Used: None

The EUT is an electrical vehicle charge cable handle used for UMC (Universal Mobile Connector), HPC (High Power Wall Connector), and Superchargers. The button on the handle sends a signal to the Model S to open the charge port for charging. The EUT is powered up with 3.3 VDC.

The EUT is placed on the 80 cm Styrofoam table. The EUT is turn ON and OFF by an external 555 timer circuit.

The EUT is set in continuously transmit mode at 50% Duty Cycle.

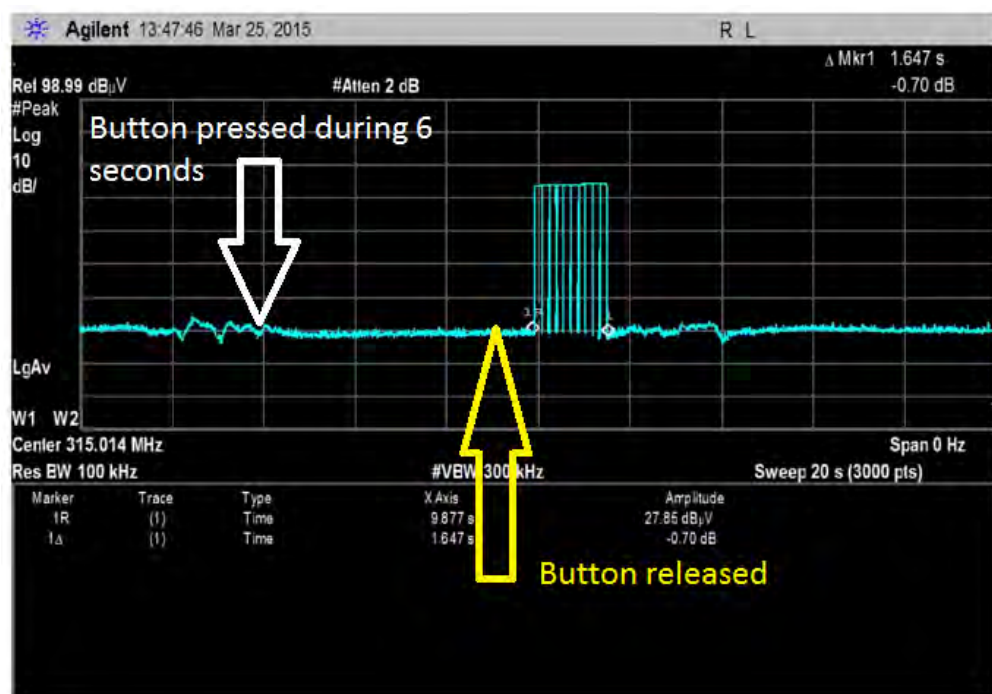
Note: No change observed on the radiated signal level of the fundamental while voltage was varied between 85% and 115% of the 3.3VDC nominal voltage specified by manufacturer.

Test Data

15.231a

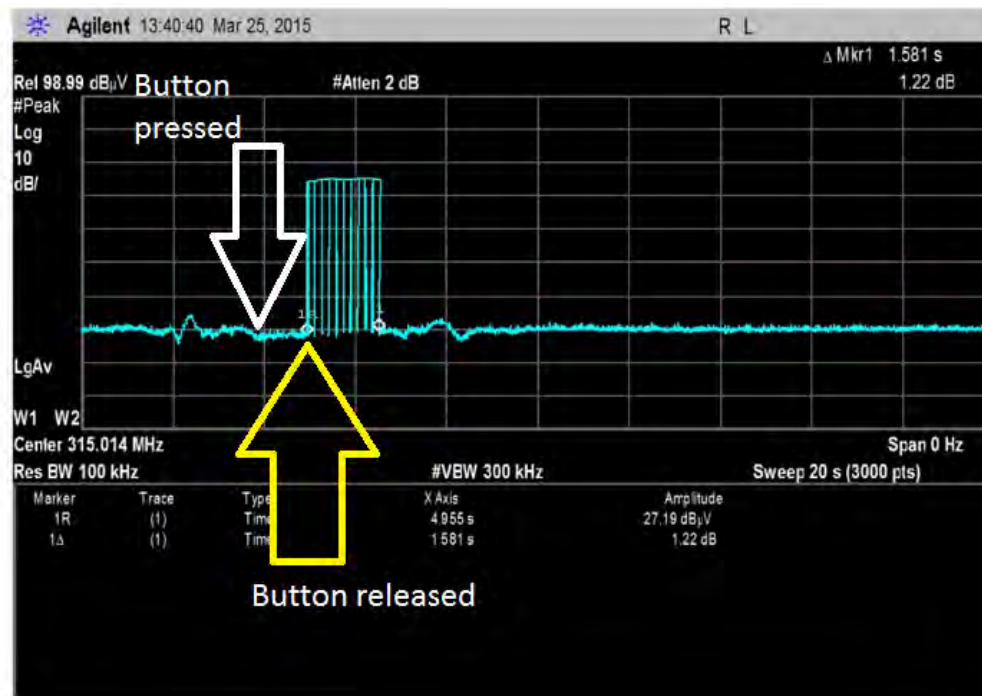
a) The provisions of this section are restricted to periodic operation within the band 40.66-40.70 MHz and above 70MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.



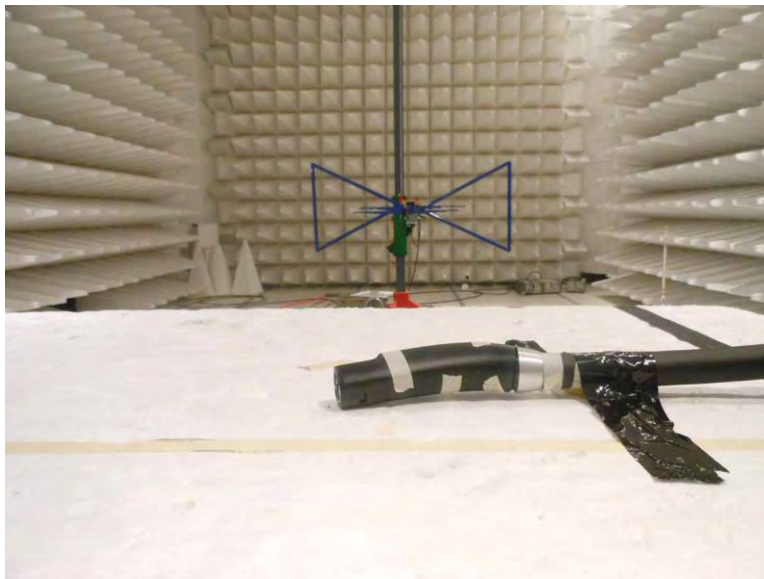
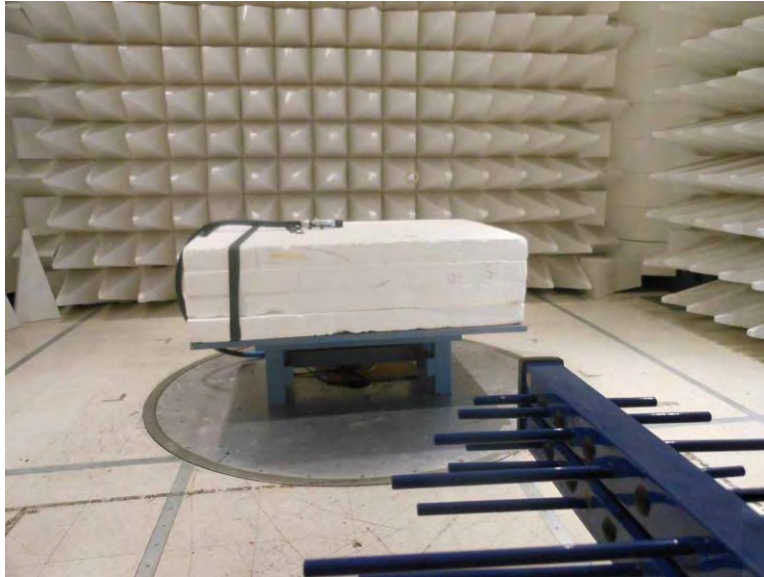
Note: Transmitter does not operate until the button is released. Transmitter operates only during 1.6 seconds.

2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.



Note: Transmitter does not operate until the button is released. Transmitter operates only during 1.6 seconds.

Test Setup Photo(s)



15.231(b) RF Output Power

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 1120 Fulton Places • Fremont, CA 94539 • (510) 249-1170

Customer: **Tesla Motors, Inc.**

Specification: **15.231(b) Fundamental Field Strength**

Work Order #: **95630**

Date: 3/25/2015

Test Type: **Maximized Emissions**

Time: 11:48:59

Equipment: **UMC 315 MHz**

Sequence#: 5

Manufacturer: Tesla Motors, Inc.

Tested By: Daniel Bertran

Model: 1023049-02-D rev02

S/N: 0314IG0007190

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00852	Biconilog Antenna	CBL 6111C	11/24/2014	11/24/2016
T2	AN00686	Preamplifier	8447D Opt 010	5/27/2014	5/27/2016
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP05300	Cable	RG214/U	3/25/2013	3/25/2015
T5	ANP01183	Cable	CNT-195	9/3/2013	9/3/2015
	AN03470	Spectrum Analyzer	E4440A	12/2/2013	12/2/2015

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
UMC 315 MHz*	Tesla Motors, Inc.	1023049-02-D rev02	0314IG0007190

Support Devices:

Function	Manufacturer	Model #	S/N
555 timer circuit	Tesla Motors, Inc.	None	None
Charging cable	Tesla Motors, Inc.	None	None
DC Power Supply	Protek	3006B	AG4070

Test Conditions / Notes:

Fundamental of the EUT

Firmware Used: None

Temperature: 21.4°C

Humidity: 45 %

Atmospheric Pressure: 102 kPa

Test Method: ANSI C 63.4 (2009)

RBW=100kHz

VBW=300kHz

Transmitting operating frequency= 315MHz

RF Output= 0dBm

The EUT is an electrical vehicle charge cable handle used for UMC (Universal Mobile Connector), HPC (High Power Wall Connector), and Superchargers. The button on the handle sends a signal to the Model S to open the charge port for charging. The EUT is powered up with 3.3 VDC.

The EUT is placed on the 80 cm Styrofoam table. The EUT is turn ON and OFF by an external 555 timer circuit.

The EUT is set in continuously transmit mode at 50% Duty Cycle.

Note: X axis

Ext Attn: 0 dB

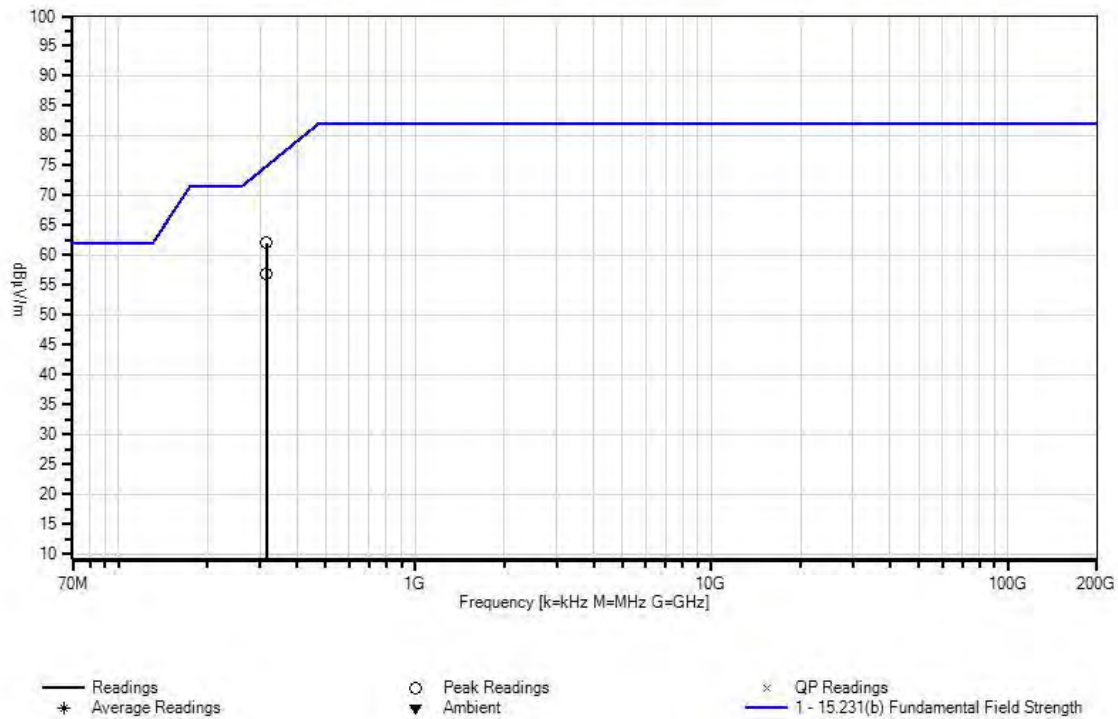
Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	315.008M	74.1	+13.8 +0.5	-28.5	+1.7	+0.5	+0.0	62.1	74.9 X	-12.8	Horiz
2	315.008M	69.0	+13.8 +0.5	-28.5	+1.7	+0.5	+0.0	57.0	74.9 X	-17.9	Vert

CKC Laboratories, Inc Date: 3/25/2015 Time: 11:48:59 Tesla Motors, Inc WO#: 95630
 Test Distance: 3 Meters Sequence#: 5



Test Location: CKC Laboratories, Inc. • 1120 Fulton Places • Fremont, CA 94539 • (510) 249-1170

Customer: **Tesla Motors, Inc.**
 Specification: **15.231(b) Fundamental Field Strength**
 Work Order #: **95630** Date: 3/25/2015
 Test Type: **Maximized Emissions** Time: 11:48:59
 Equipment: **UMC 315 MHz** Sequence#: 5
 Manufacturer: Tesla Motors, Inc. Tested By: Daniel Bertran
 Model: 1023049-02-D rev02
 S/N: 0314IG0007190

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00852	Biconilog Antenna	CBL 6111C	11/24/2014	11/24/2016
T2	AN00686	Preamplifier	8447D Opt 010	5/27/2014	5/27/2016
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP05300	Cable	RG214/U	3/25/2013	3/25/2015
T5	ANP01183	Cable	CNT-195	9/3/2013	9/3/2015
	AN03470	Spectrum Analyzer	E4440A	12/2/2013	12/2/2015

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
UMC 315 MHz*	Tesla Motors, Inc.	1023049-02-D rev02	0314IG0007190

Support Devices:

Function	Manufacturer	Model #	S/N
555 timer circuit	Tesla Motors, Inc.	None	None
Charging cable	Tesla Motors, Inc.	None	None
DC Power Supply	Protek	3006B	AG4070

Test Conditions / Notes:

Fundamental of the EUT Firmware Used: None Temperature: 21.4°C Humidity: 45 % Atmospheric Pressure: 102 kPa Test Method: ANSI C 63.4 (2009) RBW=100kHz VBW=300kHz Transmitting operating frequency= 315MHz RF Output= 0dBm The EUT is an electrical vehicle charge cable handle used for UMC (Universal Mobile Connector), HPC (High Power Wall Connector), and Superchargers. The button on the handle sends a signal to the Model S to open the charge port for charging. The EUT is powered up with 3.3 VDC. The EUT It is placed on the 80 cm Styrofoam table. The EUT is turn ON and OFF by an external 555 timer circuit. The EUT is set in continuously transmit mode at 50% Duty Cycle. Note: Y axis
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Ext Attn: 0 dB

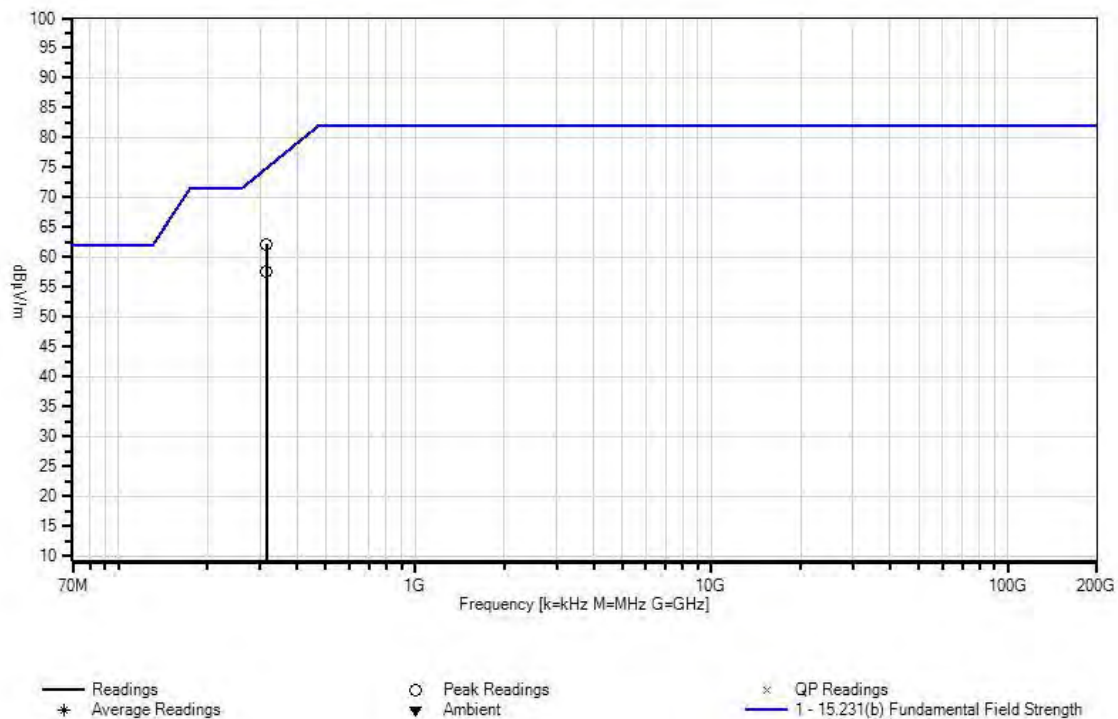
Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	315.008M	74.2	+13.8 +0.5	-28.5	+1.7	+0.5	+0.0	62.2	74.9 Y	-12.7	Horiz
2	315.008M	69.7	+13.8 +0.5	-28.5	+1.7	+0.5	+0.0	57.7	74.9 Y	-17.2	Vert

CKC Laboratories, Inc Date: 3/25/2015 Time: 11:48:59 Tesla Motors, Inc WO#: 95630
Test Distance: 3 Meters Sequence#: 5



Test Location: CKC Laboratories, Inc. • 1120 Fulton Places • Fremont, CA 94539 • (510) 249-1170

Customer: **Tesla Motors, Inc.**
 Specification: **15.231(b) Fundamental Field Strength**
 Work Order #: **95630** Date: 3/25/2015
 Test Type: **Maximized Emissions** Time: 11:48:59
 Equipment: **UMC 315 MHz** Sequence#: 5
 Manufacturer: Tesla Motors, Inc. Tested By: Daniel Bertran
 Model: 1023049-02-D rev02
 S/N: 0314IG0007190

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00852	Biconilog Antenna	CBL 6111C	11/24/2014	11/24/2016
T2	AN00686	Preamplifier	8447D Opt 010	5/27/2014	5/27/2016
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP05300	Cable	RG214/U	3/25/2013	3/25/2015
T5	ANP01183	Cable	CNT-195	9/3/2013	9/3/2015
	AN03470	Spectrum Analyzer	E4440A	12/2/2013	12/2/2015

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
UMC 315 MHz*	Tesla Motors, Inc.	1023049-02-D rev02	0314IG0007190

Support Devices:

Function	Manufacturer	Model #	S/N
555 timer circuit	Tesla Motors, Inc.	None	None
Charging cable	Tesla Motors, Inc.	None	None
DC Power Supply	Protek	3006B	AG4070

Test Conditions / Notes:

Fundamental of the EUT Firmware Used: None Temperature: 21.4°C Humidity: 45 % Atmospheric Pressure: 102 kPa Test Method: ANSI C 63.4 (2009) RBW=100kHz VBW=300kHz Transmitting operating frequency= 315MHz RF Output= 0dBm The EUT is an electrical vehicle charge cable handle used for UMC (Universal Mobile Connector), HPC (High Power Wall Connector), and Superchargers. The button on the handle sends a signal to the Model S to open the charge port for charging. The EUT is powered up with 3.3 VDC. The EUT is placed on the 80 cm Styrofoam table. The EUT is turn ON and OFF by an external 555 timer circuit. The EUT is set in continuously transmit mode at 50% Duty Cycle. Note: Z axis
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Ext Attn: 0 dB

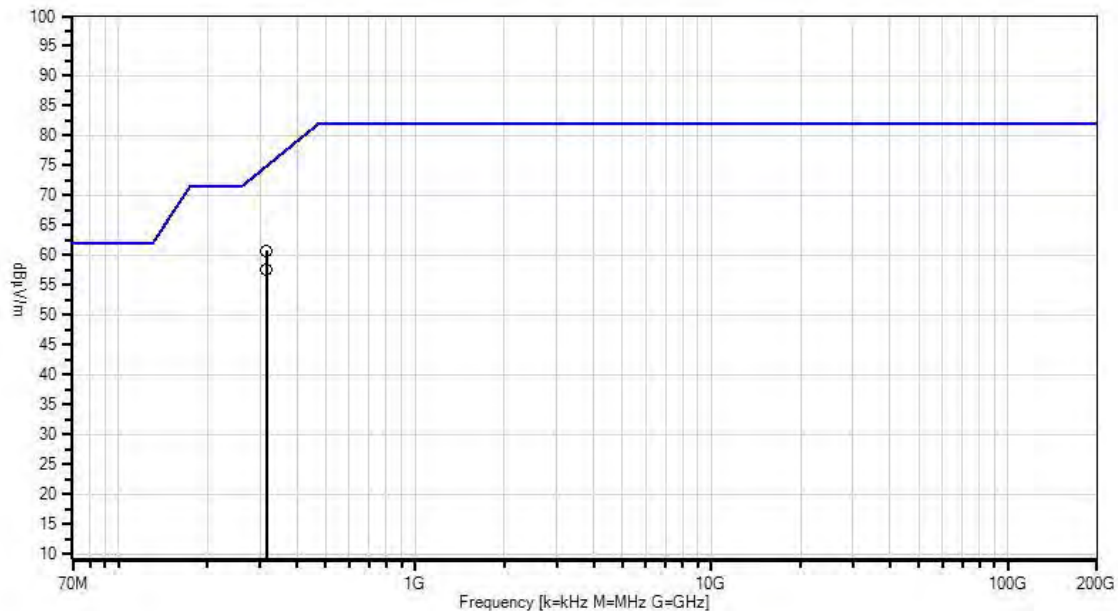
Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

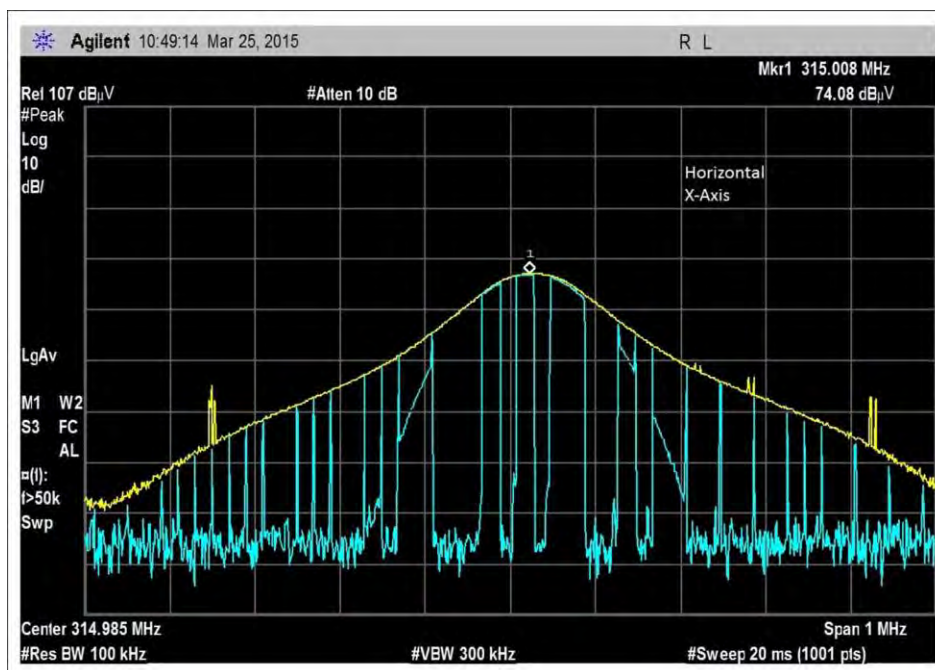
#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	315.008M	72.8	+13.8 +0.5	-28.5	+1.7	+0.5	+0.0	60.8	74.9 Z	-14.1	Vert
2	315.008M	69.6	+13.8 +0.5	-28.5	+1.7	+0.5	+0.0	57.6	74.9 Z	-17.3	Horiz

CKC Laboratories, Inc Date: 3/25/2015 Time: 11:48:59 Tesla Motors, Inc WO#: 95630
Test Distance: 3 Meters Sequence#: 5

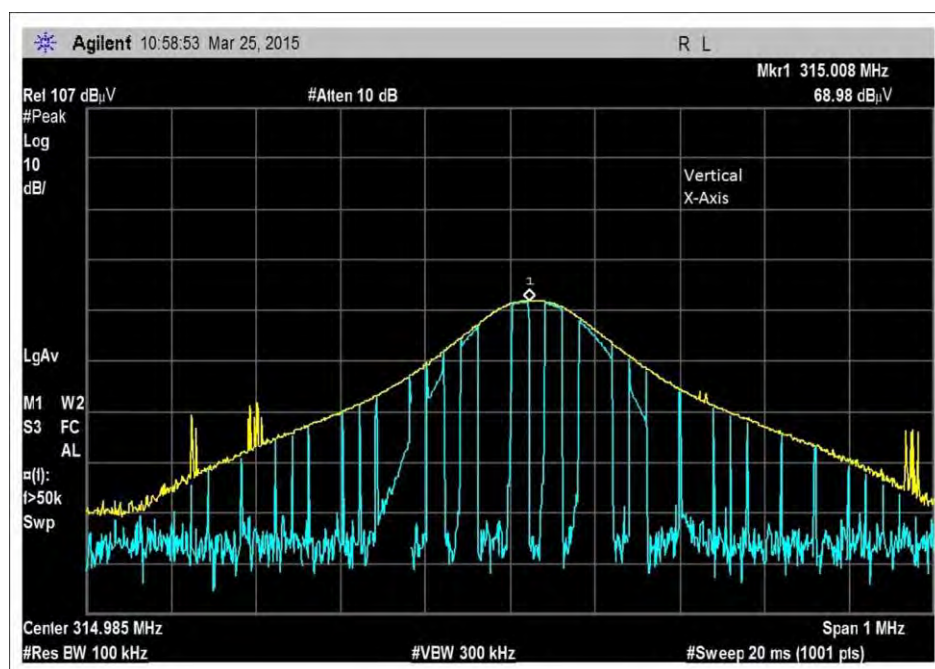


— Readings
* Average Readings
○ Peak Readings
▼ Ambient
× QP Readings
— 1 - 15.231(b) Fundamental Field Strength

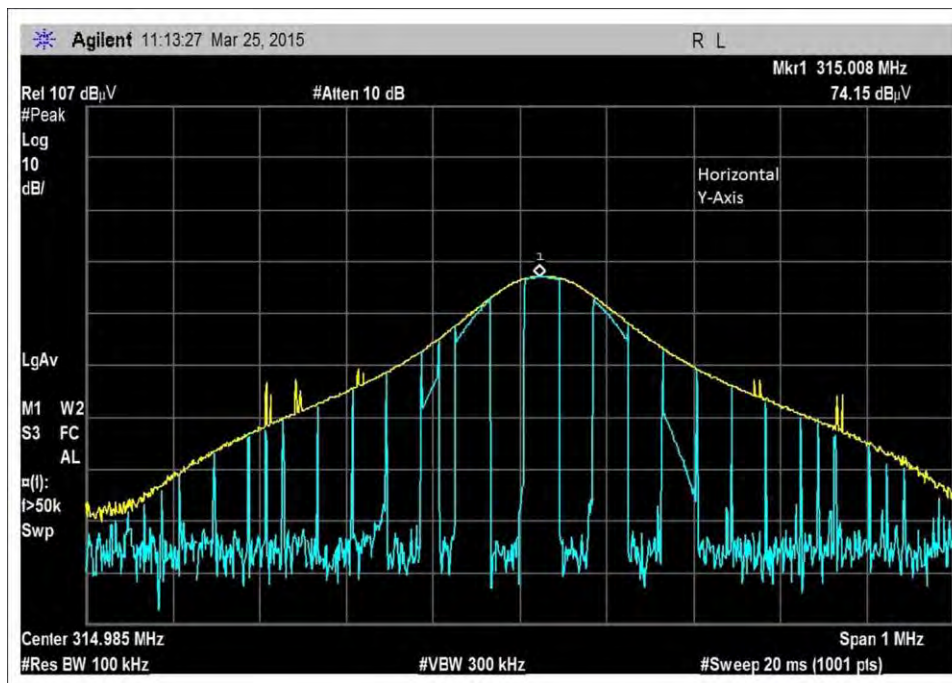
Test Data



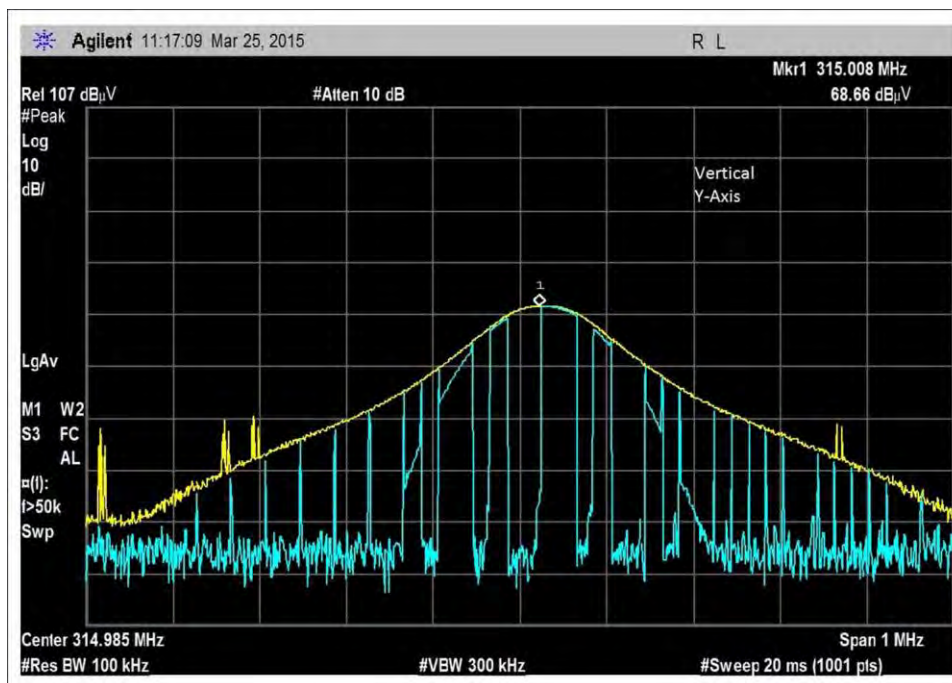
Horizontal Polarization, X-Axis



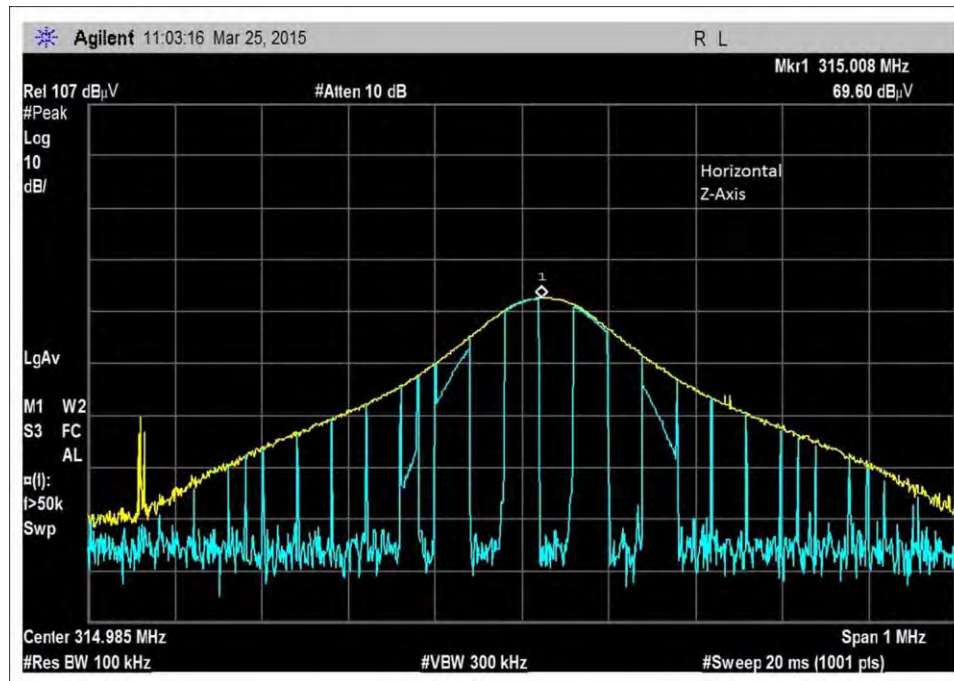
Vertical Polarization, X-Axis



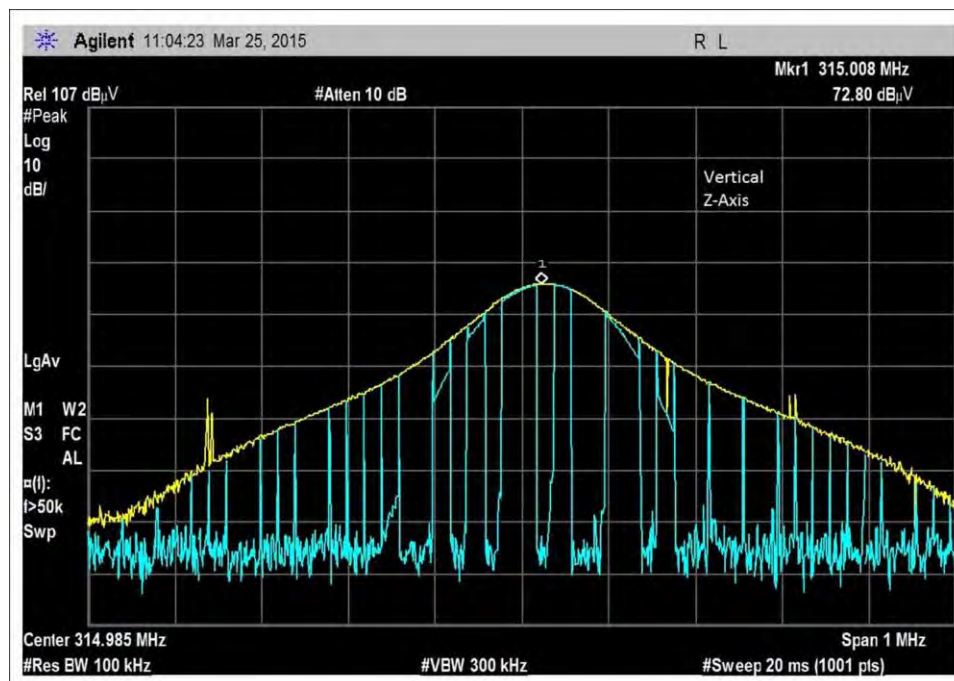
Horizontal Polarization, Y-Axis



Vertical Polarization, Y-Axis

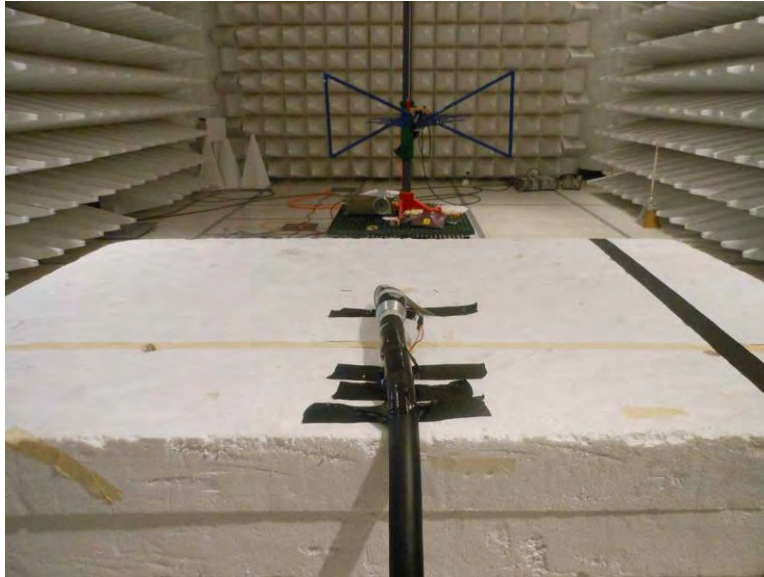


Horizontal Polarization, Z-Axis

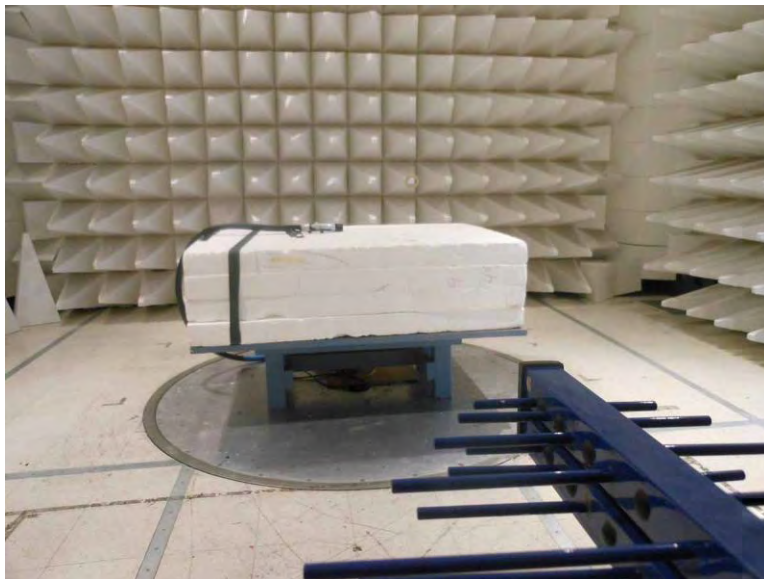


Vertical Polarization, Z-Axis

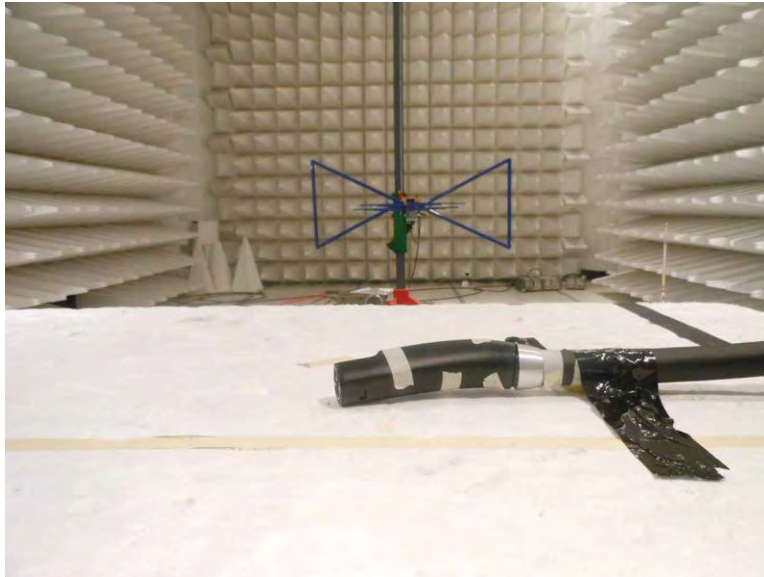
Test Setup Photo(s)



X-Axis



Front View, Y-Axis



Back View, Y-Axis



Z-Axis

15.231(b) Field Strength of Radiated Spurious Emissions

Test Data

Test Location: CKC Laboratories, Inc. • 1120 Fulton Places • Fremont, CA 94539 • (510) 249-1170

Customer: **Tesla Motors, Inc.**
 Specification: **15.231(b) Spurious Field Strength (315 MHz Transmitter)**
 Work Order #: **95630** Date: 3/25/2015
 Test Type: **Maximized Emissions** Time: 15:49:31
 Equipment: **UMC 315 MHz** Sequence#: 6
 Manufacturer: Tesla Motors, Inc. Tested By: Daniel Bertran
 Model: 1023049-02-D rev02
 S/N: 0314IG0007190

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00852	Biconilog Antenna	CBL 6111C	11/24/2014	11/24/2016
T2	AN00686	Preamp	8447D Opt 010	5/27/2014	5/27/2016
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP05300	Cable	RG214/U	3/25/2013	3/25/2015
T5	ANP01183	Cable	CNT-195	9/3/2013	9/3/2015
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
	AN00432	Loop Antenna	6502	4/2/2013	4/2/2015
T6	AN02157	Horn Antenna-ANSI C63.5 Calibration	3115	12/2/2014	12/2/2016
T7	ANP06712	Cable	32022-29094K-29094K-48TC	9/18/2014	9/18/2016
T8	AN02754	High Pass Filter	6IH40-500/T3000-O/O	1/15/2014	1/15/2016
T9	AN03114	Preamp	AMF-7D-00101800-30-10P	4/11/2013	4/11/2015
T10	ANP01210	Cable	FSJ1P-50A-4A	1/15/2015	1/15/2017
T11	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
UMC 315 MHz*	Tesla Motors, Inc.	1023049-02-D rev02	0314IG0007190

Support Devices:

Function	Manufacturer	Model #	S/N
555 timer circuit	Tesla Motors, Inc.	None	None
Charging cable	Tesla Motors, Inc.	None	None
DC Power Supply	Protek	3006B	AG4070

Test Conditions / Notes:

Radiated Emissions

Frequency Range: 9kHz-4GHz

Firmware Used: None

Temperature: 21.4°C

Humidity: 45 %

Atmospheric Pressure: 102 kPa

Test Method: ANSI C 63.4 (2009)

Transmitting operating frequency= 315MHz

RF Output= 0dBm

The EUT is an electrical vehicle charge cable handle used for UMC (Universal Mobile Connector), HPC (High Power Wall Connector), and Superchargers. The button on the handle sends a signal to the Model S to open the charge port for charging. The EUT is powered up with 3.3 VDC.

The EUT is placed on the 80 cm Styrofoam table. The EUT is turn ON and OFF by an external 555 timer circuit. The EUT is set in continuously transmit mode at 50% Duty Cycle.

Note: Worst case found on Y orientation (Tesla logo parallel to the chamber walls).

Ext Attn: 0 dB

Measurement Data:

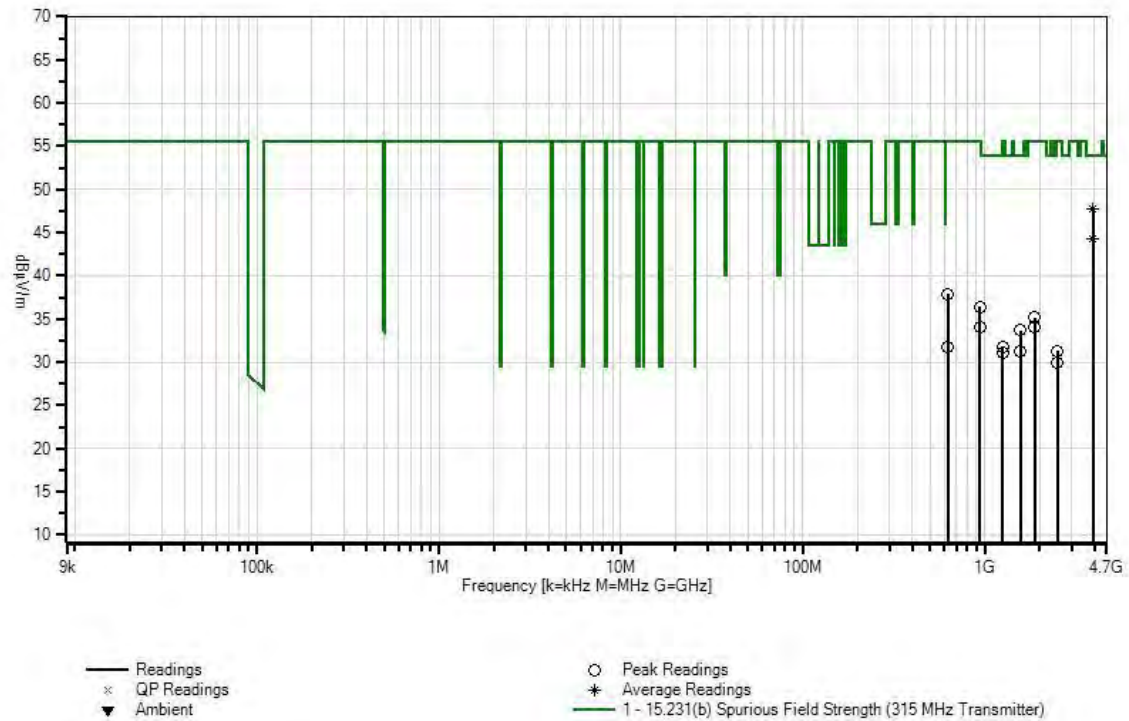
Reading listed by margin.

Test Distance: 3 Meters

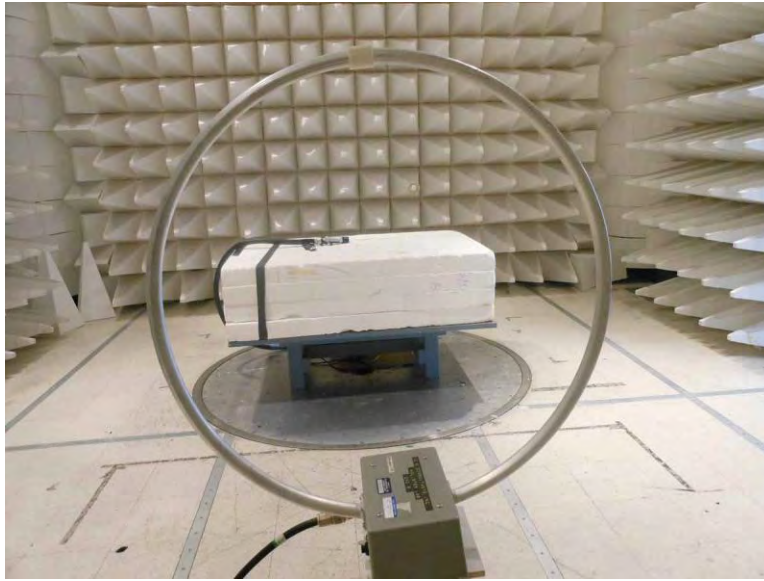
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	T5	T6	T7	T8					
			T9	T10	T11		Table	dBμV/m	dBμV/m	dB	Ant
1	3937.620M	68.9	+0.0	+0.0	+0.0	+0.0	+0.0	47.7	54.0	-6.3	Horiz
	Ave		+0.0	+32.4	+1.0	+0.3					
			-59.7	+3.3	+1.5						
^	3937.620M	75.1	+0.0	+0.0	+0.0	+0.0	+0.0	53.9	54.0	-0.1	Horiz
			+0.0	+32.4	+1.0	+0.3					
			-59.7	+3.3	+1.5						
3	3937.620M	65.5	+0.0	+0.0	+0.0	+0.0	+0.0	44.3	54.0	-9.7	Vert
	Ave		+0.0	+32.4	+1.0	+0.3					
			-59.7	+3.3	+1.5						
^	3937.620M	73.3	+0.0	+0.0	+0.0	+0.0	+0.0	52.1	54.0	-1.9	Vert
			+0.0	+32.4	+1.0	+0.3					
			-59.7	+3.3	+1.5						
^	3937.628M	72.5	+0.0	+0.0	+0.0	+0.0	+0.0	51.3	54.0	-2.7	Vert
			+0.0	+32.4	+1.0	+0.3					
			-59.7	+3.3	+1.5						
6	630.019M	43.6	+19.9	-29.8	+2.5	+0.7	+0.0	37.9	55.6	-17.7	Horiz
			+1.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
7	945.038M	36.2	+23.8	-29.0	+3.3	+0.9	+0.0	36.4	55.6	-19.2	Horiz
			+1.2	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
8	1575.003M	63.2	+0.0	+0.0	+0.0	+0.0	+0.0	33.7	54.0	-20.3	Vert
			+0.0	+25.4	+0.6	+0.4					
			-58.8	+2.0	+0.9						

9	1890.009M	62.6	+0.0	+0.0	+0.0	+0.0	+0.0	35.2	55.6	-20.4	Horiz
			+0.0	+27.3	+0.7	+0.2					
			-58.8	+2.2	+1.0						
10	945.037M	33.9	+23.8	-29.0	+3.3	+0.9	+0.0	34.1	55.6	-21.5	Vert
			+1.2	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
11	1890.008M	61.5	+0.0	+0.0	+0.0	+0.0	+0.0	34.1	55.6	-21.5	Vert
			+0.0	+27.3	+0.7	+0.2					
			-58.8	+2.2	+1.0						
12	1575.003M	60.8	+0.0	+0.0	+0.0	+0.0	+0.0	31.3	54.0	-22.7	Horiz
			+0.0	+25.4	+0.6	+0.4					
			-58.8	+2.0	+0.9						
13	1260.047M	62.4	+0.0	+0.0	+0.0	+0.0	+0.0	31.7	55.6	-23.9	Vert
			+0.0	+25.4	+0.5	+0.1					
			-59.3	+1.8	+0.8						
14	630.019M	37.4	+19.9	-29.8	+2.5	+0.7	+0.0	31.7	55.6	-23.9	Vert
			+1.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0						
15	2520.009M	56.2	+0.0	+0.0	+0.0	+0.0	+0.0	31.3	55.6	-24.3	Horiz
			+0.0	+28.9	+0.7	+0.6					
			-58.9	+2.6	+1.2						
16	1260.044M	61.8	+0.0	+0.0	+0.0	+0.0	+0.0	31.1	55.6	-24.5	Horiz
			+0.0	+25.4	+0.5	+0.1					
			-59.3	+1.8	+0.8						
17	2520.008M	54.8	+0.0	+0.0	+0.0	+0.0	+0.0	29.9	55.6	-25.7	Vert
			+0.0	+28.9	+0.7	+0.6					
			-58.9	+2.6	+1.2						

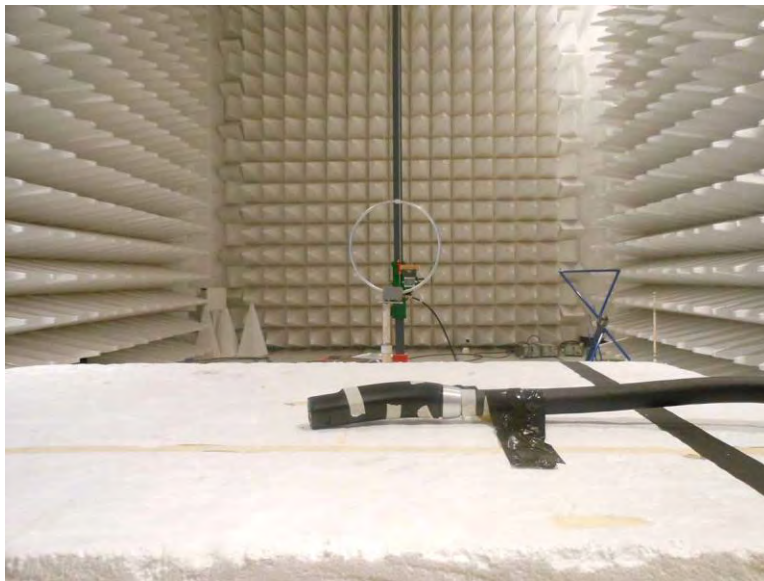
CKC Laboratories, Inc Date: 3/25/2015 Time: 15:49:31 Tesla Motors, Inc WO#: 95630
 Test Distance: 3 Meters Sequence#: 6



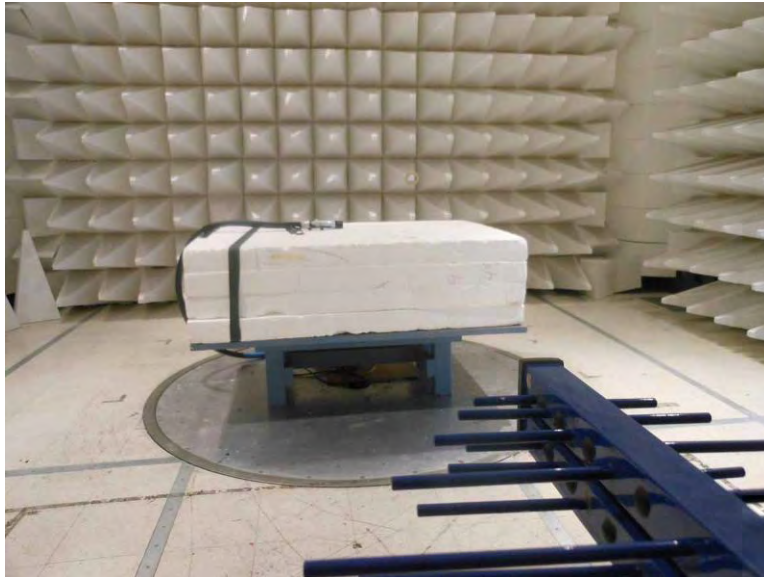
Test Setup Photo(s)



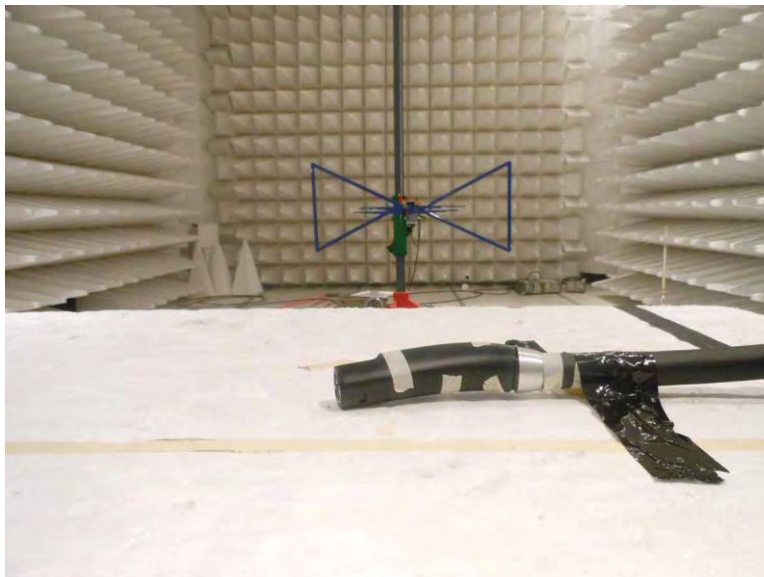
9kHz – 30MHz



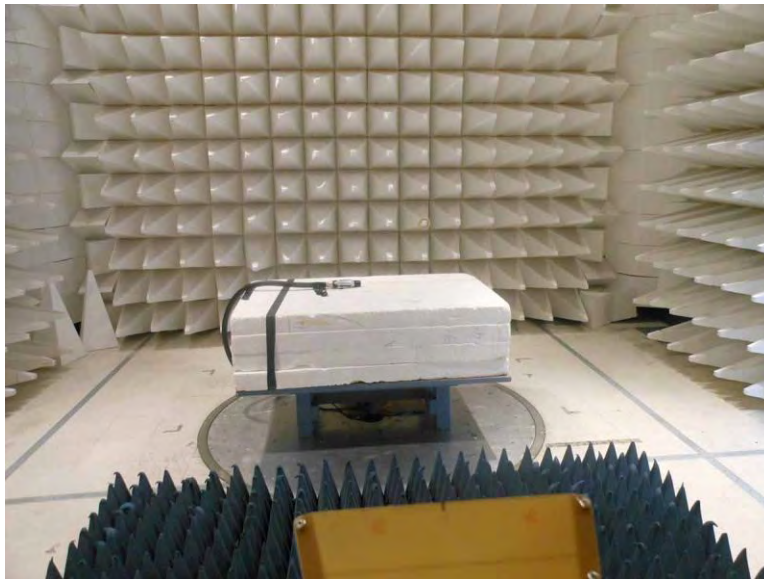
9kHz – 30MHz



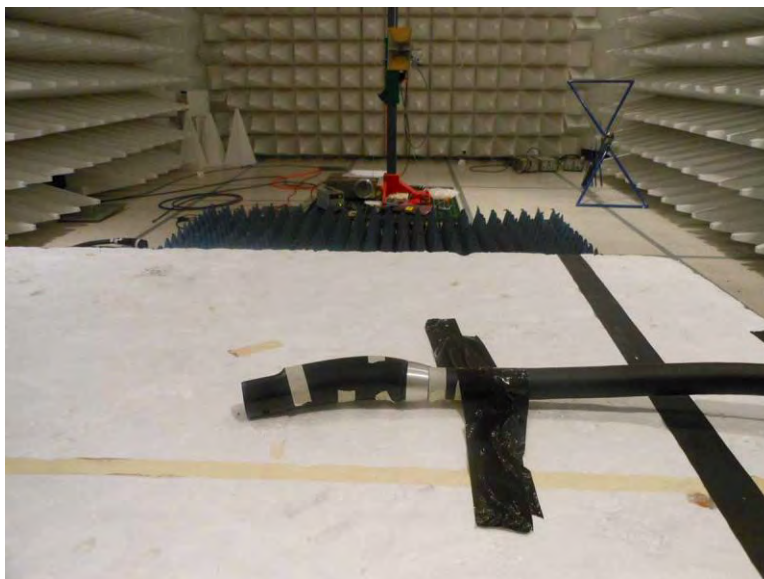
30MHz – 1GHz



30MHz – 1GHz



1 - 4GHz



1 – 4GHz

15.231(c) Occupied Bandwidth

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 1120 Fulton Places • Fremont, CA 94539 • (510) 249-1170

Customer: **Tesla Motors, Inc.**

Specification: **15.231(c)**

Work Order #: **95630**

Test Type: **Radiated Scan**

Equipment: **UMC 315 MHz**

Manufacturer: Tesla Motors, Inc.

Model: 1023049-02-D rev02

S/N: 0314IG0007190

Date: 3/25/2015

Time: 15:49:31

Sequence#: 6

Tested By: Daniel Bertran

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN00852	Biconilog Antenna	CBL 6111C	11/24/2014	11/24/2016
T2	AN00686	Preamp	8447D Opt 010	5/27/2014	5/27/2016
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP05300	Cable	RG214/U	3/25/2013	3/25/2015
T5	ANP01183	Cable	CNT-195	9/3/2013	9/3/2015
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
	AN00432	Loop Antenna	6502	4/2/2013	4/2/2015
T6	AN02157	Horn Antenna-ANSI C63.5 Calibration	3115	12/2/2014	12/2/2016
T7	ANP06712	Cable	32022-29094K-29094K-48TC	9/18/2014	9/18/2016
T8	AN02754	High Pass Filter	6IH40-500/T3000-O/O	1/15/2014	1/15/2016
T9	AN03114	Preamp	AMF-7D-00101800-30-10P	4/11/2013	4/11/2015
T10	ANP01210	Cable	FSJ1P-50A-4A	1/15/2015	1/15/2017
T11	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
UMC 315 MHz*	Tesla Motors, Inc.	1023049-02-D rev02	0314IG0007190

Support Devices:

Function	Manufacturer	Model #	S/N
555 timer circuit	Tesla Motors, Inc.	None	None
Charging cable	Tesla Motors, Inc.	None	None
DC Power Supply	Protek	3006B	AG4070

Test Conditions / Notes:

15.231c

Temperature: 21.4°C

Humidity: 45 %

Atmospheric Pressure: 102 kPa

Test Method: ANSI C 63.4 (2009)

Transmitting operating frequency= 315MHz

RF Output= 0dBm

Firmware Used: None

The EUT is an electrical vehicle charge cable handle used for UMC (Universal Mobile Connector), HPC (High Power Wall Connector), and Superchargers. The button on the handle sends a signal to the Model S to open the charge port for charging. The EUT is powered up with 3.3 VDC.

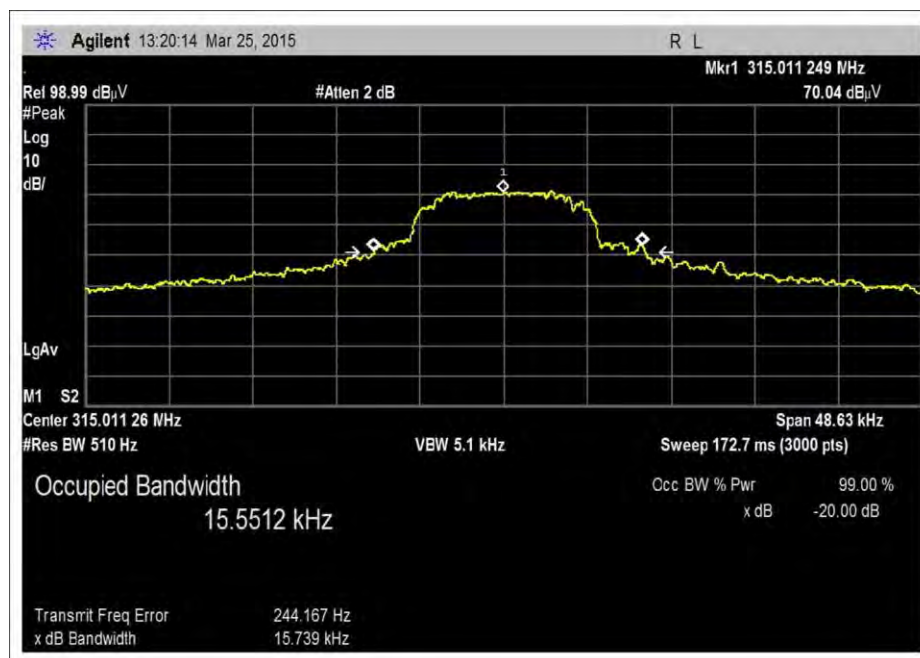
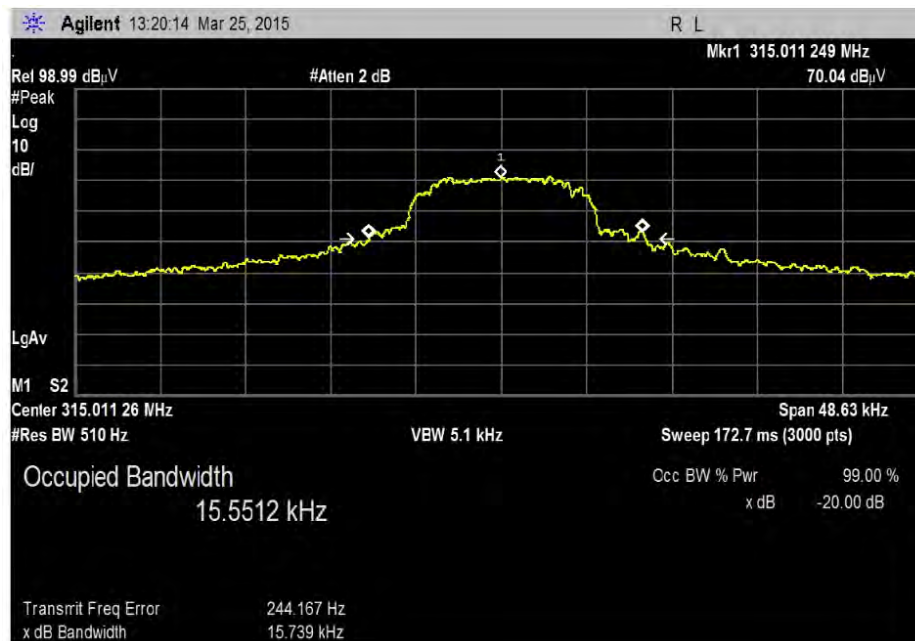
The EUT It is placed on the 80 cm Styrofoam table. The EUT is turn ON and OFF by an external 555 timer circuit. The EUT is set in continuously transmit mode at 50% Duty Cycle.

Note: No change observed on the radiated signal level of the fundamental while voltage was varied between 85% and 115% of the 3.3VDC nominal voltage specified by manufacturer.

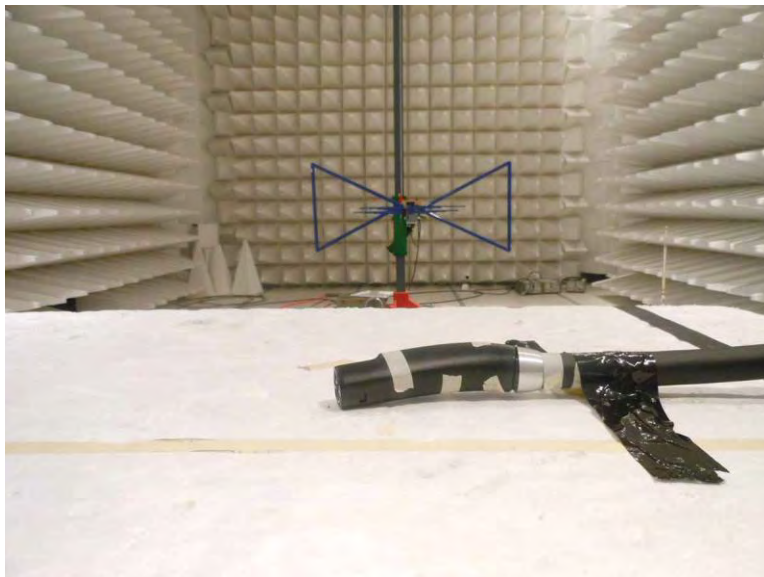
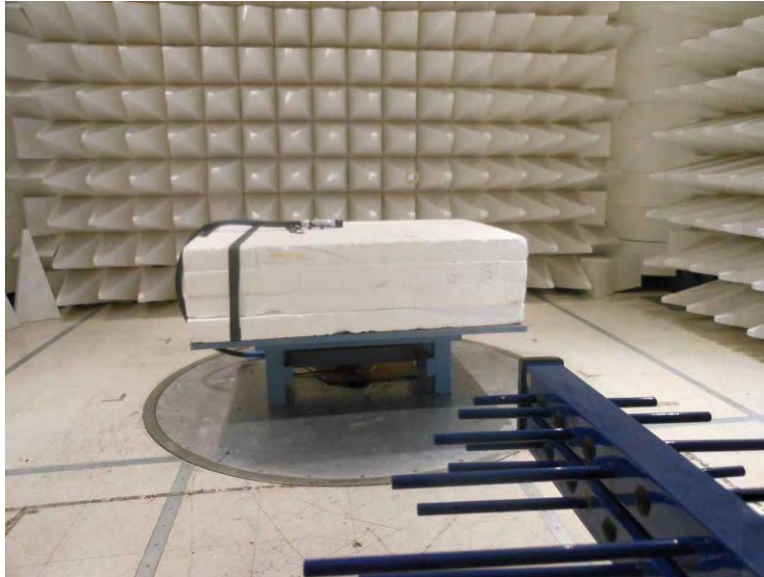
Test Data

Limit:

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.



Test Setup Photo(s)



SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dB μ V/m, the spectrum analyzer reading in dB μ V was corrected by using the following formula. This reading was then compared to the applicable specification limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBμV)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBμV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or carrot ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.