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FCC SDoC Test Report

Manufacturer:	INDUKTIV INC 7675 Formula Place Suite D San Diego, California 92121 USA
Applicant:	Same as Above
Product Description:	Standard Coil used in all applications
Operating Voltage/Freq. of EUT During Testing:	120V/60 Hz
Equipment Under Test:	Wireless charger for phone Trade Name: INDUKTIV INC Model: E9X BMW* <i>*Denotes identification on unit physically tested. Manufacturer states BMW E9X Wireless Charger housing used for testing Standard INDUKTIV SPEC coil. INDUKTIV SPEC coil is used in the following INDUKTIV applications: BMW E36, BMW E39, BMW E46, BMW E8X, BMW E9X, BMW F3X, BMW F8X, BMW G8X BMW Z4, BMW F1X, FORD F150, FORD Maverick, Porsche 911, Range Rover, Toyota Supra.</i>
Equipment Category:	Digital Device
Measurement Location:	F2 Labs in Middlefield, Ohio. Site description and attenuation data are on file with the FCC's Sampling and Measurement Branch at the FCC Laboratory in Columbia, MD.
Measurement Procedure:	In accordance with ANSI C63.4:2014. A list of the measurement equipment is included with the test data.
Applicable Rules:	Federal Register CFR 47, Part 15, subpart B • Radiated Emissions, Part 15.109(a), Class B
Testing Commenced:	2022-12-07
Testing Completed:	2022-12-07

Summary of Results:

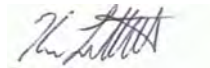
In Compliance

The EUT complies with the EMC requirements when manufactured identically as the unit tested in this report, including any required modifications and/or manufacturer's statement. Any changes to the design or build of this unit subsequent to this testing may deem it non-compliant.



Evaluation Conducted by:

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Note: Complies/Does Not Comply criteria are based upon the following condition: Where the results are compared to published test standard or manufacturer specified limits, the Complies or Does Not Comply opinion is considered without applying the stated measurement of uncertainty.

This report shall not be duplicated except in full without the written approval of F2 Labs.
Reports noted as a revision replace all previously issued reports and/or antecedent report revisions issued under this job number.

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Document History:

Document Number	Description	Issue Date	Approved By
F2P28962A-01E	First Issue	2023-02-03	K. Littell

Exhibit I

Test Procedure and Data Calculation

Test Item Condition:

The equipment to be tested was received in good condition.

Testing Algorithm:

EUT was tested in the Idle mode. Function was verified before and after testing. The highest emissions were recorded in the data tables.

Radiated Emissions:

The EUT was tested at a distance of 3 meters. The emissions were maximized by rotating the table and raising/lowering the antenna mounted on a 4-meter mast. Cable and peripheral positions were also varied to produce maximum emissions. Both horizontal and vertical field components were measured. The output of the antenna was connected to the input of the receiver and emissions were measured in the range 30 MHz to 1000 MHz. For emissions measured below 1 GHz, a resolution bandwidth of 120kHz and a quasi-peak detector were used. If applicable, measurements above 1 GHz were made with a resolution bandwidth of 1 MHz and peak and average detectors. The raw measurements were corrected to allow for antenna factor and cable loss. All data for radiated emissions can be found in Exhibit III.

Calculation of Data:

Radiated Emissions - The antenna factors of the biconilog antennas used, and the cable losses are added to the field strength reading recorded from the measurement receiver. The resultant field strength can then be compared to the FCC limits in dB μ V/m.

The following equation is used to convert to μ V/m: $E_{\mu V/m} = \text{antilog}(E_{dB\mu V/m} / 20)$

Sample of Field Strength calculation: $E_a = V_a + AF + A_e - AG$

Where E_a = Field Strength (dB μ V/m)

$V_a = 20 \times \log_{10}$ (Measure RF voltage, μ V)

A_e = Cable Loss Factor, dB

AF = Antenna Factor dB (m⁻¹)

AG = Amplifier Gain

I.e., If the reading is 57.0 dB μ V, the antenna factor 8.0 dB, cable loss factor 1.0 dB and Amplifier gain is 25.0 dB, the field strength will be:

$$E_a(\text{dB}\mu\text{V}/\text{m}) = 57 + 8 + 1 + (-25) = 41 \text{ dB}\mu\text{V}/\text{m} \text{ or}$$

$$E_a(\mu\text{V}/\text{m}) = 10^{(41/20)} = 112.20 \mu\text{V}/\text{m}$$

Uncertainty Budget:

The uncertainty in EMC measurements arises from several factors which affect the results, some associated with environmental conditions in the measurement room, the test equipment being used, and the measurement techniques adopted.

The measurement uncertainty budgets detailed below are calculated from the test and calibration data and are expressed with a 95% confidence factor using a coverage factor of $k=2$. The Uncertainty for a laboratory is referred to as U_{lab} . For Radiated and Conducted Emissions, the Expanded Uncertainty is compared to the U_{cispr} values to determine if a specific margin is required to deem compliance.

U_{lab}

Measurement Range	Combined Uncertainty	Expanded Uncertainty
Radiated Emissions <1 GHz @ 3m	2.54	5.07dB
Radiated Emissions <1 GHz @ 10m	2.55	5.09dB
Radiated Emissions 1 GHz to 2.7 GHz	1.81	3.62dB
Radiated Emissions 2.7 GHz to 18 GHz	1.55	3.10dB
AC Power Line Conducted Emissions, 150kHz to 30 MHz	1.38	2.76dB
AC Power Line Conducted Emissions, 9kHz to 150kHz	1.66	3.32dB

U_{cispr}

Measurement Range	Expanded Uncertainty
Radiated Emissions <1 GHz @ 3m	5.2dB
Radiated Emissions <1 GHz @ 10m	5.2dB
Radiated Emissions 1 GHz to 2.7 GHz	Under Consideration
Radiated Emissions 2.7 GHz to 18 GHz	Under Consideration
AC Power Line Conducted Emissions, 150kHz to 30 MHz	3.6dB
AC Power Line Conducted Emissions, 9kHz to 150kHz	4.0dB

If U_{lab} is less than or equal to U_{cispr} , then:

- compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

If U_{lab} is greater than U_{cispr} in table 1, then:

- compliance is deemed to occur if no measured disturbance, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit.

Note: Only measurements listed in the tables above that relate to tests included in this Test Report are applicable.

Exhibit II

EUT Configuration and Cables

Equipment Under Test (EUT):

Product Description: Standard Coil used in all applications

Device	Manufacturer	Model Number	Serial Number
Wireless charger for phone	INDUKTIV INC	E9X BMW*	None Specified

**Denotes identification on unit physically tested. Manufacturer states BMW E9X Wireless Charger housing used for testing Standard INDUKTIV SPEC coil. INDUKTIV SPEC coil is used in the following INDUKTIV applications: BMW E36, BMW E39, BMW E46, BMW E8X, BMW E9X, BMW F3X, BMW F8X, BMW G8X BMW Z4, BMW F1X, FORD F150, FORD Maverick, Porsche 911, Range Rover, Toyota Supra.*



The EUT complies with the EMC requirements when manufactured identically as the unit tested in this report, including any required modifications and/or manufacturer's statement. Any changes to the design or build of this unit subsequent to this testing may deem it non-compliant.

Accessories (Support Equipment):

Device	Manufacturer	Model Number	Serial Number
DC Supply*	BK Precision	1685B	346F17303

**Indicates F2 Labs-supplied equipment.*

Cables:

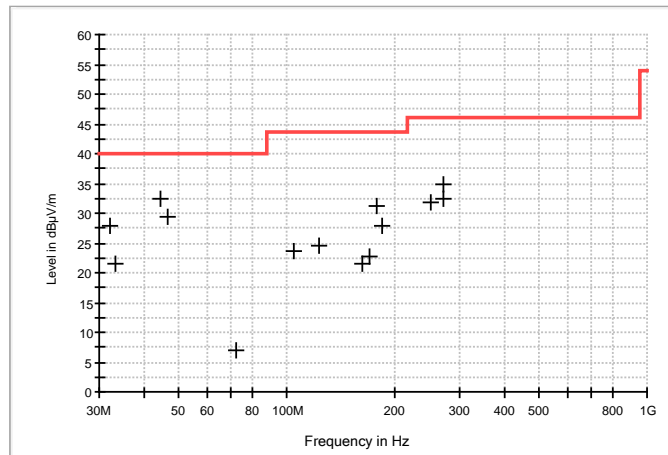
Cable Function	Length	Shielded
DC Input	<3m	No

Exhibit III

Radiated Emissions

Test Date(s):	2022-12-07	Test Engineer(s):	J. Chiller
Rule:	FCC CFR 47, Part 15, subpart B, Radiated Emissions, Part 15.109(a), Class B	Air Temperature:	22.6° C
Distance:	3m	Relative Humidity:	34%
Test Results:	Complies per Manu. Stmt.		

Frequency (MHz)	Ant. Pol.	Antenna Height (cm)	Azimuth (degrees)	Reading (dBµV)	Correction Factors (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
32.120000	V	100.00	123.00	30.6	-2.8	27.80	40.00	-12.2
33.120000	H	100.00	11.00	25.1	-3.6	21.50	40.00	-18.5
44.160000	V	100.00	316.00	44.3	-11.7	32.60	40.00	-7.4
46.480000	V	100.00	342.00	42.4	-12.9	29.50	40.00	-10.5
71.720000	H	100.00	0.00	21.2	-14.2	7.00	40.00	-33.0
103.920000	V	100.00	16.00	34.5	-11.0	23.50	43.50	-20.0
122.160000	V	100.00	224.00	32.8	-8.2	24.60	43.50	-18.9
162.320000	H	100.00	0.00	30.9	-9.4	21.50	43.50	-22.0
169.680000	H	100.00	303.00	32.7	-9.9	22.80	43.50	-20.7
176.280000	V	100.00	320.00	41.4	-10.3	31.10	43.50	-12.4
183.440000	V	100.00	304.00	38.1	-10.2	27.90	43.50	-15.6
250.960000	H	100.00	242.00	41.2	-9.4	31.80	46.00	-14.2
270.160000	H	100.00	176.00	40.3	-7.8	32.50	46.00	-13.5
270.160000	V	100.00	241.00	42.7	-7.8	34.90	46.00	-11.1



Test Equipment Used:

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Shielded Chamber 2014	CL166-E	AlbatrossProjects	B83117-DF435- T261	US140023	2023-08-22
Receiver	CL151	Rohde & Schwarz	ESU40	100319	2023-03-31
Antenna, JB3 Combination	CL175	Sunol Sciences	JB3	A030315	2023-09-22
Preamplifier	CL285	A.H. Systems, Inc.	PAM-0207	322	2023-03-30
Software:	EMC 32, Version 8.53.0		Software Verified: 2022-12-07		
Temp/Hum. Recorder	CL294	Thermpro	TP50	2	2023-04-15

Exhibit IV

Modifications

No modifications were made to the EUT.

Exhibit V

Photographs

Radiated Emissions



Exhibit VI

Labeling

It will be the responsibility of the manufacturer or importer to permanently affix the appropriate label when marketing the equipment.

The label shall bear the following statement per FCC 15.19(a)(1)-(5):

- (1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under part 73 of this chapter, land mobile operation under part 90 of this chapter, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

- (2) A stand-alone cable input selector switch shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules for use with cable television service.

- (3) **All other devices shall bear the following statement in a conspicuous location on the device:**

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

- (4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

- (5) When the device is so small or for such use that it is impracticable to label it with the statement specified under paragraph (a) of this section in a font that is four-point or larger, and the device does not have a display that can show electronic labeling, then the information required by this paragraph shall be placed in the user manual and must also either be placed on the device packaging or on a removable label attached to the device.

Note: If the product contains a pre-approved wireless module, a label is also required to show the product contains an approved wireless module. The following is an example of what the label should state:

Contains FCC ID: XXXXXXXX

§2.1074 Identification.

Devices subject to authorization under Supplier's Declaration of Conformity may be labeled with the following logo on a voluntary basis as a visual indication that the product complies with the applicable FCC requirements. The use of the logo on the device does not alleviate the requirement to provide the compliance information required by §2.1077.



§2.1077 Compliance information.

(a) If a product must be tested and authorized under Supplier's Declaration of Conformity, a compliance information statement shall be supplied with the product at the time of marketing or importation, containing the following information:

(1) Identification of the product, *e.g.*, name and model number;

(2) A compliance statement as applicable, *e.g.*, for devices subject to part 15 of this chapter as specified in §15.19(a)(3) of this chapter, that the product complies with the rules; and

(3) The identification, by name, address and telephone number or Internet contact information, of the responsible party, as defined in §2.909. The responsible party for Supplier's Declaration of Conformity must be located within the United States.

Exhibit VII

Manual Requirements

FCC Manual Statement: §15.21 Information to user.

Note: This requirement applies to all devices unless exempted by 15.103:

The user's manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Manual Statement: §15.105 Digital Devices Statement

For all Class A Digital Devices, the following statement must be included in the manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

For all Class B Digital Devices, the following statement must be included in the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.