

Test report no.: <i>Prüfbericht-Nr.:</i>	CN2413E3 005	Order No.: <i>Auftragsnr.:</i>	168487318	Page 1 of 16 <i>Seite 1 von 16</i>
Client reference no.: <i>Kunden-Referenz-Nr.:</i>	N/A	Order date: <i>Auftragsdatum:</i>	2024-07-04	
Client: <i>Auftraggeber:</i>	BCS Automotive Interface Solutions (Suzhou) Co., Ltd. No. 2052, Taidong Road, Caohu Street, Xiangcheng Economic Development District, Suzhou, Jiangsu, P.R. China			
Test item: <i>Prüfgegenstand:</i>	WPC			
Identification / Type no.: <i>Bezeichnung / Typ-Nr.:</i>	524B/525A WPC			
Order content: <i>Auftrags-Inhalt:</i>	Test Report			
Test specification <i>Prüfgrundlage:</i>	FCC CFR 47 PART 1, § 1.1310 KDB 680106 D01 Wireless Power Transfer v04			
Date of sample receipt: <i>Wareneingangsdatum:</i>	2024-07-05	Please refer to Photo Document		
Test sample no: <i>Prüfmuster-Nr.:</i>	A003750411-001~005 A003752463-001~005			
Testing period: <i>Prüfzeitraum:</i>	2024-07-08 to 2024-07-24			
Place of testing: <i>Ort der Prüfung:</i>	Refer to section 2.1			
Testing laboratory: <i>Prüflaboratorium:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Test result*: <i>Prüfergebnis*:</i>	Pass			
tested by: <i>geprüft von:</i>	authorized by: <i>genehmigt von:</i>			
Date: 2024-10-09 <i>Datum:</i>	Issue date: 2024-10-09 <i>Ausstellungsdatum:</i>			
Position / Stellung:	Expert/Sachverständige(r)	Position / Stellung:	Expert/Sachverständige(r)	
Other: <i>Sonstiges:</i>	FCC ID: 2AXPS524B525AWPC This report is for WPT EMF.			
Condition of the test item at delivery: <i>Zustand des Prüfgegenstandes bei Anlieferung:</i>	Test item complete and undamaged Prüfmuster vollständig und unbeschädigt			
* Legend:	P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested
* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
This test report only relates to the above mentioned test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark. <i>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</i>				

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Remarks
Anmerkungen

- | | |
|---|--|
| 1 | <p>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</p> <p><i>Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben.</i></p> <p><i>Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.</i></p> |
| 2 | <p>As contractually agreed, this document has been signed digitally only. TÜV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TÜV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged.</p> <p><i>Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben.</i></p> |
| 3 | <p>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report. Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</p> <p><i>Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.</i></p> |
| 4 | <p>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</p> <p><i>Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019.</i></p> |

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1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A setup photos

2 Test Sites

2.1 Test Facilities

Location: Shenzhen Microtest Co., Ltd.

Address: 101, No.7, Zone 2, Xinxing Industrial Park, Fuhai Avenue, Xinhe Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
CNAS Registration No.: CNAS L5868
FCC Registration No.: 448573

The tests at the test sites have been conducted under the supervision of a TÜV engineer.

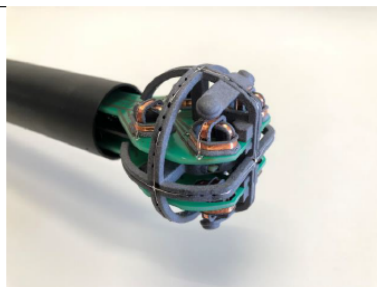
2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

EMF					
Equip. No.	Description	Manufacturer	Model	Serial No.	Calibrated until (DD.MM.YYYY)
MTI-E143	Near-field Electric and Magnetic Field Sensor System	Speag	MAGPy-8H3D+ED3 V2	3101	2027/3/11
MTI-E016S	MPE test software	Speag	MAGPY 2.4	2.4.1	/

Test equipment: MAGPy-8H3D+ED3

Diameter	60mm
8 isotropic H-field sensors	Concentric loops of 1cm ² arranged at the corner of a cube of 22mm side length
1 isotropic E-field sensor	Orthogonal dipole/monopole (arm length:50mm)
Measurement center	18.5mm from the probe tip
Dimensions	110*635*35mm (MAGPy-8H3D+E3D V2 & MAGPy-DAS V2)



Test probe, without the casing

Item	Requirement	Specification
Test frequency range:	3kHz ~ 10MHz	3kHz ~ 10MHz
Probe sensitivity	≤ 1 V/m for E-field measurements ≤ 1 A/m for H-field measurements against the NS-based reference level $\leq 0.1/f_{MHz}$ A/m for H-field measurements against the SAR-based reference level	E-field: 0.08-2000 V/m H-field: 0.1-3200 A/m
Probe level response	± 1 dB	E-field: ± 1 dB H-field: ± 1 dB
Probe linear range	-10dB ~ 5dB	E-field: 0.08-2000 V/m H-field: 0.1-3200 A/m
linearity error	± 0.5 dB	E-field: ± 0.3 dB H-field: ± 0.3 dB
Antenna size	Dp(E-field): 50mm Dp(H-field): 1mm	
Isotropy	± 1 dB	E-field: ± 0.8 dB H-field: ± 0.6 dB

2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally, all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Table 2: Measurement Uncertainty

Parameter	Uncertainty
Magnetic field measurements(3kHz~10MHz)	$\pm 14.8\%$
Electric field measurements(3kHz~10MHz)	$\pm 17.5\%$
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.	

3 General Product Information

3.1 Product Function and Intended Use

The Product is wireless charger with NFC function, vehicle use.
This report is for WPT EMF.
For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 3: Technical Specification of EUT

General Information of EUT	Description
Kind of Equipment:	WPC
Type Designation:	524B/525A WPC
Operating Voltage:	9~16V DC
Testing Voltage:	DC 12V (Rated)
Temperature Range:	-40°C ~85°C
FCC ID:	2AXPS524B525AWPC
Technical Specification of WPC	
Frequency Range:	111-148kHz
Type of Modulation:	FSK
Antenna Type	Induction coil
Wireless output	Wireless 5W/7.5W/10W/15W
Technical Specification of NFC	
Frequency Range:	13.553-13.567MHz
Operating frequency	13.56MHz
Type of Modulation:	ASK
Antenna Type	Induction coil

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, Wireless output(15W) Max
- B. On, Stand by

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- Application Form
- ID Label and Location Info

3.6 Test Setup Diagram

Diagram of Measurement Configuration (10cm distance):

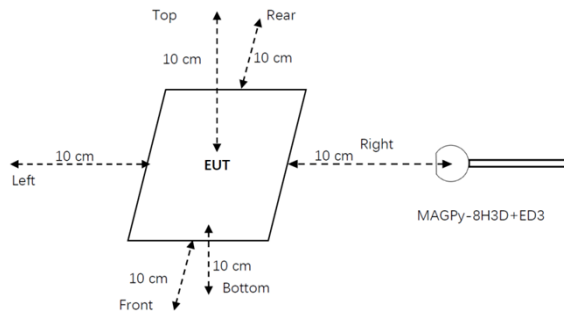
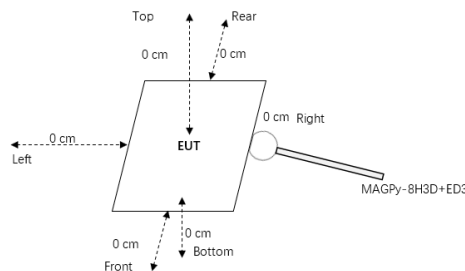


Diagram of Measurement Configuration (0cm distance):



Note: For H-Field measurement, tips mode of the test probe is used. For E-Field measurement the center mode of the probe is used, and curve-fitting method refer to ISED Notice 2024-DRS0004.

3.7 Test Procedures

- The RF exposure test was performed in anechoic chamber.
- E and H-field measurements performed under the § 2.1093-Portable conditions, as a conservative evaluation. (This WPT will be fixed installed on the vehicle)
- The highest emission level was recorded and compared with limit.
- The EUT was measured according to the dictates of KDB 680106 D01 Wireless Power Transfer v04.

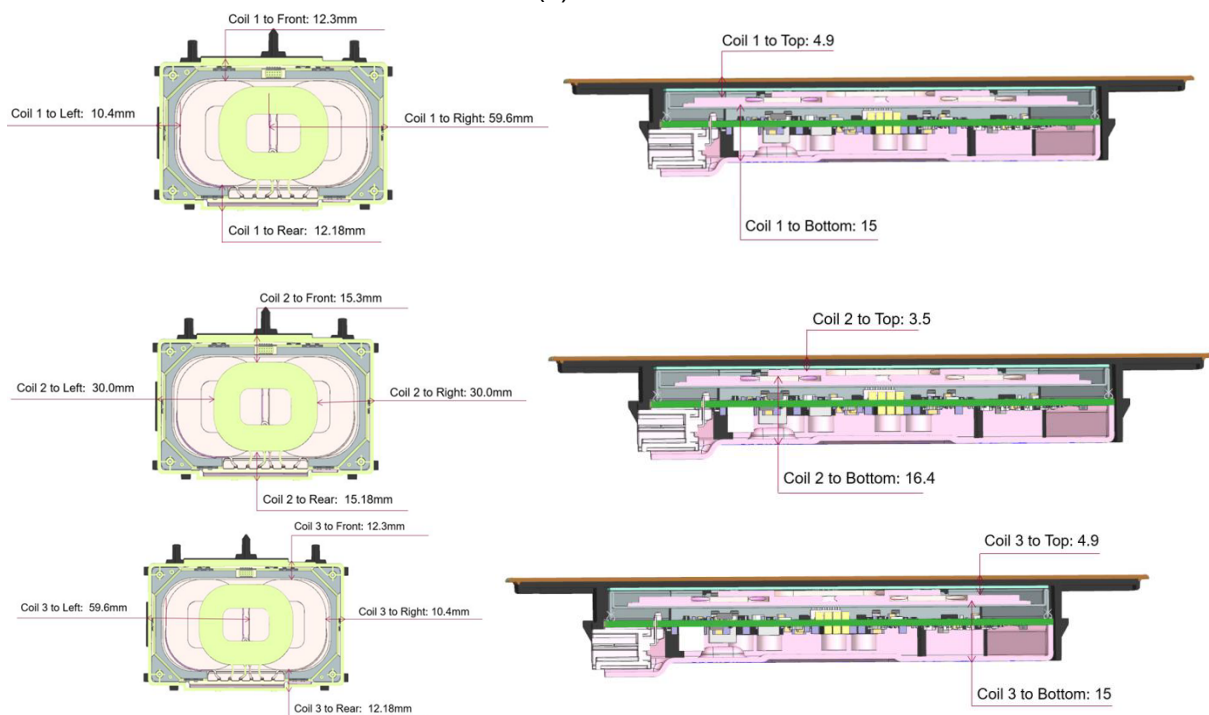
3.8 Special Accessories and Auxiliary Equipment

Name	Model No.	Manufacturer	Remark
DC power source	RNX-305D	SHENZHEN ZHAOXIN ELECTRONIC INSTRUMENT EQUIPMENT CO., LTD..	/
Smart phone	Find X3	OPPO	/

3.9 Coil Description

1	Antenna number:	Primary coil*3
2	Input inductance:	Coil1: 11.5uH±10% Coil2: 12.5uH±10% Coil3: 11.5uH±10%
3	Method(s) of shielding	Passive shielding
4	Coil diameter:	Coil1: Outer radius: 53.2*45.2 ± 0.5 mm Inner radius: 27.5*19.5 ± 0.5mm Coil 2: Outer radius: 53.2*45.2 ± 0.5 mm Inner radius: 27.5*19.5 ± 0.5mm Coil 3: Outer radius: 53.2*45.2 ± 0.5 mm Inner radius: 27.5*19.5 ± 0.5mm

Coil to the outer surface of the enclosure(s)



4 RF exposure information

4.1 Test procedures according to the technical standards:

§1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of FCC part 2.1093 of this chapter.

Table 1 to §1.1310(e)(1) - Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*(900/f ²)	<6
30-300	61.4	0.163	1.0	<6
300-1500			f/300	<6
1500-100000			5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f ²)	<30
30-300	27.5	0.073	0.2	<30
300-1500			f/1500	<30
1500-100000			1.0	<30

f = frequency in MHz

* = Plane-wave equivalent power density

Note 1: Occupational/controlled exposure limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure.

Note 2: General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

4.2 Test result

Operating mode with client device (0mm)

Notes: The H-field results is directly tested with the probe using the Tips mode. The E-field results is used the curve-fitting method, please refer to the curve-fitting test report. All modes are tested, the result only shown the worst test mode.

Mode 1: Charging mode:

Probe Position	H-field(V/m)		
	Measurement (Maximum)	Limit	Verdict
Top	1.13	1.63	Pass
Left			
Right			
Front			
Rear			
bottom			

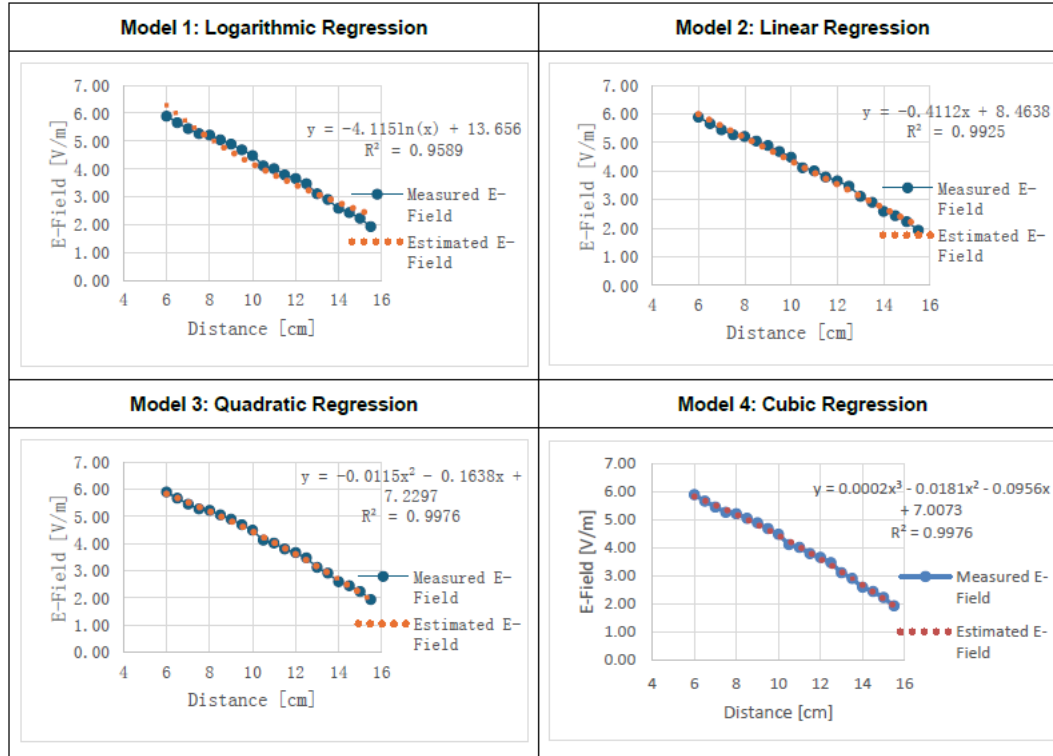
Probe Position	E -field(V/m)		
	Measurement (Maximum)	Limit	Verdict
Top	7.23	614	Pass
Left			
Right			
Front			
Rear			
bottom			

Data Collecting Process, Performing Curve-fitting and Analyzing the Results

Data collecting:

Measured distance (cm)	E-field strength (V/m)
6	5.89
6.5	5.66
7	5.45
7.5	5.27
8	5.21
8.5	5.05
9	4.89
9.5	4.69
10	4.49
10.5	4.12
11	4.01
11.5	3.79
12	3.66
12.5	3.47
13	3.12
13.5	2.91
14	2.59
14.5	2.44
15	2.23
15.5	1.93
Calculate at 0cm	7.23

Performing Curve-fitting :



Analyzing the Results

Parameter	Logarithmic Regression Model	Linear Regression Model	Quadratic Regression Model	Cubic Regression Model
Multiple R	0.979	0.996	0.999	0.999
R Square	0.959	0.992	0.998	0.998
Adjusted R Square	0.957	0.992	0.997	0.997
Standard Error (S)	0.254	0.109	0.063	0.065
Number of data point used	20	20	20	20
Estimated electric field strength at touch position [V/m]	13.66	8.46	7.23	7.01

As shown in table above, the Quadratic Regression Model produced the Lowest standard error, and is below the minimum standard error threshold of 15% that ISED prescribes. These results indicate that the prediction value presents the lowest variance between the lower and upper bounds (6.78 V/m to 7.68 V/m). The regression analysis utilized a confidence level of 95%, which is the minimum value that should be used by applicants.

Note1: the Cubic Regression Model, Cubic Regression Model and higher order models were not selected as evidence of overfit were shown by the increase of S.

Note2: the lower bound and upper bound calculated by the model.

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Mode 2: Standby mode

Probe Position	H-field(V/m)		
	Measurement (Maximum)	Limit	Verdict
Top	1.36	1.63	Pass
Left			
Right			
Front			
Rear			
bottom			

Probe Position	E -field(V/m)		
	Measurement (Maximum)	Limit	Verdict
Top	24.13	83	Pass
Left			
Right			
Front			
Rear			
bottom			

Data Collecting Process, Performing Curve-fitting and Analyzing the Results

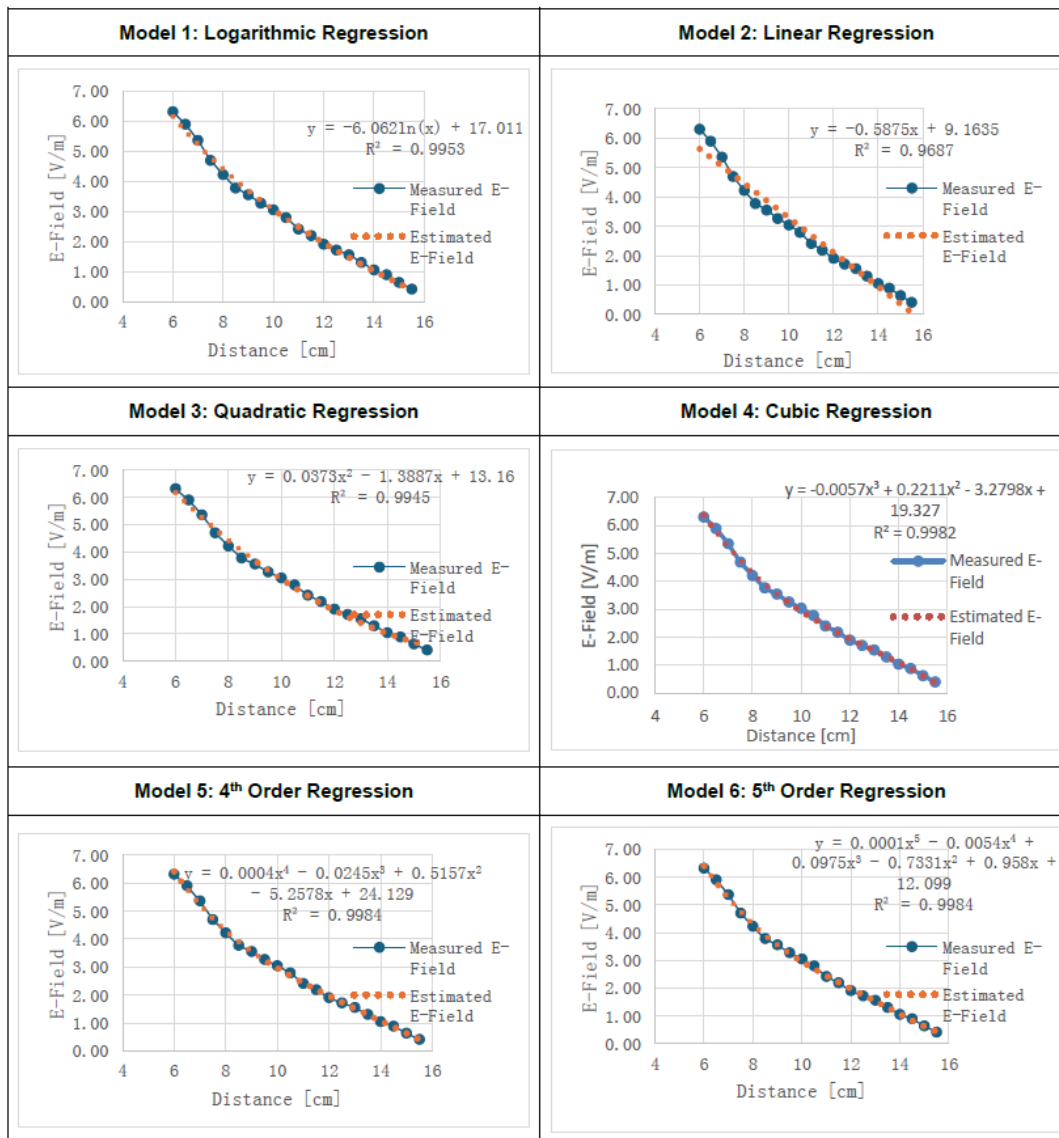
Note: MFS is located, the 20 measurement points at varying (z-direction) that be used to build the predictive model.

Data collecting:

Measured distance (cm)	E-field strength (V/m)
6	6.31
6.5	5.90
7	5.36
7.5	4.69
8	4.22
8.5	3.77
9	3.55
9.5	3.27
10	3.04
10.5	2.79
11	2.41
11.5	2.19
12	1.90
12.5	1.71
13	1.55
13.5	1.30
14	1.05
14.5	0.89
15	0.63
15.5	0.41
Calculate at 0cm	24.13

Performing Curve-fitting :

Performing Curve-fitting :



Analyzing the Results

Parameter	Logarithmic Regression Model	Linear Regression Model	Quadratic Regression Model
Multiple R	0.998	0.984	0.997
R Square	0.995	0.969	0.994
Adjusted R Square	0.995	0.967	0.994
Standard Error (S)	0.124	0.321	0.139
Number of data point used	20	20	20
Estimated electric field strength at touch position [V/m]	17.01	9.16	13.16

Parameter	Cubic Regression Model	4 th Order Regression Model	5 th Order Regression Model
Multiple R	0.999	0.999	0.999
R Square	0.998	0.998	0.998
Adjusted R Square	0.998	0.998	0.998
Standard Error (S)	0.081	0.080	0.081
Number of data point used	20	20	20
Estimated electric field strength at touch position [V/m]	19.33	24.13	12.10

As shown in table above, the 4th Order Regression Model produced the Lowest standard error, and is below the minimum standard error threshold of 15% that ISED prescribes. These results indicate that the prediction value presents the lowest variance between the lower and upper bounds (14.74 V/m to 33.52 V/m). The regression analysis utilized a confidence level of 95%, which is the minimum value that should be used by applicants.

Note1: the 5th Order Regression Model and higher order models were not selected as evidence of overfit were shown by the increase of S.

Note2: the lower bound and upper bound calculated by the model.

5 Photographs of the Test Set-Up

Refer to Appendix A.

-----END OF REPORT-----