

Test report no.: <i>Prüfbericht-Nr.:</i>	CN24MI98 003	Order No.: <i>Auftragsnr.:</i>	168505531	Page 1 of 19 <i>Seite 1 von 19</i>
Client reference no.: <i>Kunden-Referenz-Nr.:</i>	N/A	Order date: <i>Auftragsdatum:</i>	2024-09-24	
Client: <i>Auftraggeber:</i>	NINGBO FUERDA SMARTECH CO., LTD No. 1493-1569 Xiaolin Avenue, Xiaolin Town, Cixi City, Zhejiang, P.R. China			
Test item: <i>Prüfgegenstand:</i>	Cradle Mobile Wireless Charger			
Identification / Type no.: <i>Bezeichnung / Typ-Nr.:</i>	TWLC001, TWLC002			
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>	2024-10-11	Please refer to Photo Document		
Test sample no: <i>Prüfmuster-Nr.:</i>	A003829057-001~005			
Testing period: <i>Prüfzeitraum:</i>	2024-11-10 - 2024-11-11			
Place of testing: <i>Ort der Prüfung:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
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: 2024-12-03 <i>Datum:</i>	Signed by: Bell Hu		Issue date: 2024-12-03 <i>Ausstellungsdatum:</i>	Signed by: Jonathan Li
Position / Stellung:	Expert/Sachverständige(r)	Position / Stellung:	Expert/Sachverständige(r)	
Other: <i>Sonstiges:</i>	FCC ID: 2BLYG-TWLC001 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>				

v05

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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

TÜV Rheinland (Shenzhen) Co., Ltd.

No.362, Huanguan Middle Road, Songyuansha Community, Guanhu Subdistrict, Longhua District, Shenzhen 518110, Guangdong, China

FCC Accreditation Designation No.: CN1260

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)
9050046	Electric and Magnetic Field Analyzer	Narda	EHP200A	180ZX20517	21.09.2024

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, vehicle use.

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	Value
Kind of Equipment:	Cradle Mobile Wireless Charger
Type Designation:	TWLC001, TWLC002*
FCC ID:	2BLYG-TWLC001
Operating Voltage:	10.5-16 V DC
Testing Voltage:	DC 12V (Rated)
Operating Temperature Range:	-20°C ~ +65 °C
Technical Specification of WPT	
Frequency Range:	111-148 kHz
Operating Frequency:	120.3 kHz, 127.0 kHz, 127.5 kHz
Type of Modulation:	FSK, ASK
Antenna Type:	Induction coil antenna
Wireless output:	Wireless 5W/7.5W/10W/15W

*The two models are electrically identical, the only difference is that TWLC001 has the CAN terminal resistance, which not included in TWLC002. Refer to the model differences letter for details.
There are two configurations on port locations for TWLC001 and TWLC002, one is at the bottom and the other is on the side, which has no impacts on EMC and RF characteristics.

Based on above changes, full test performed on TWLC001 with the port locating on the bottom.

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, Wireless output Max
- B. On, Stand by

3.4 Noise Generating and Noise Suppressing Parts

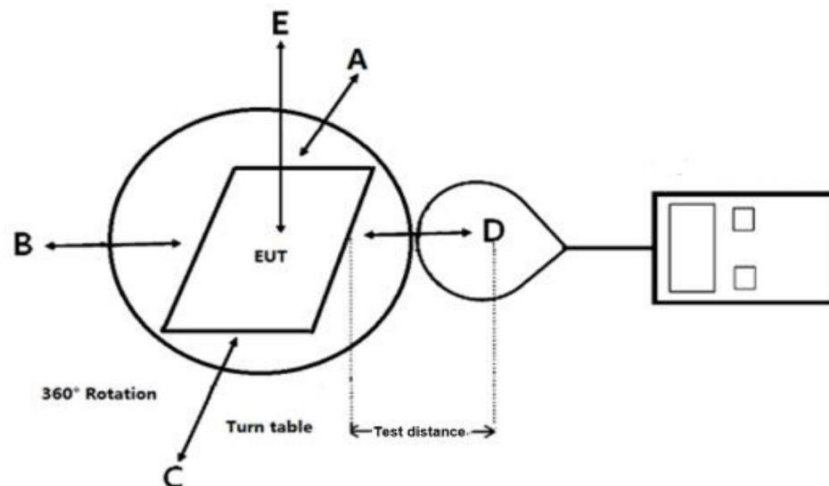
Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- Application Form
- ID Label and Location Info

3.6 Test Setup Diagram

Diagram of Measurement Configuration:



Note: The Curve-fitting method refer to ISCED 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.

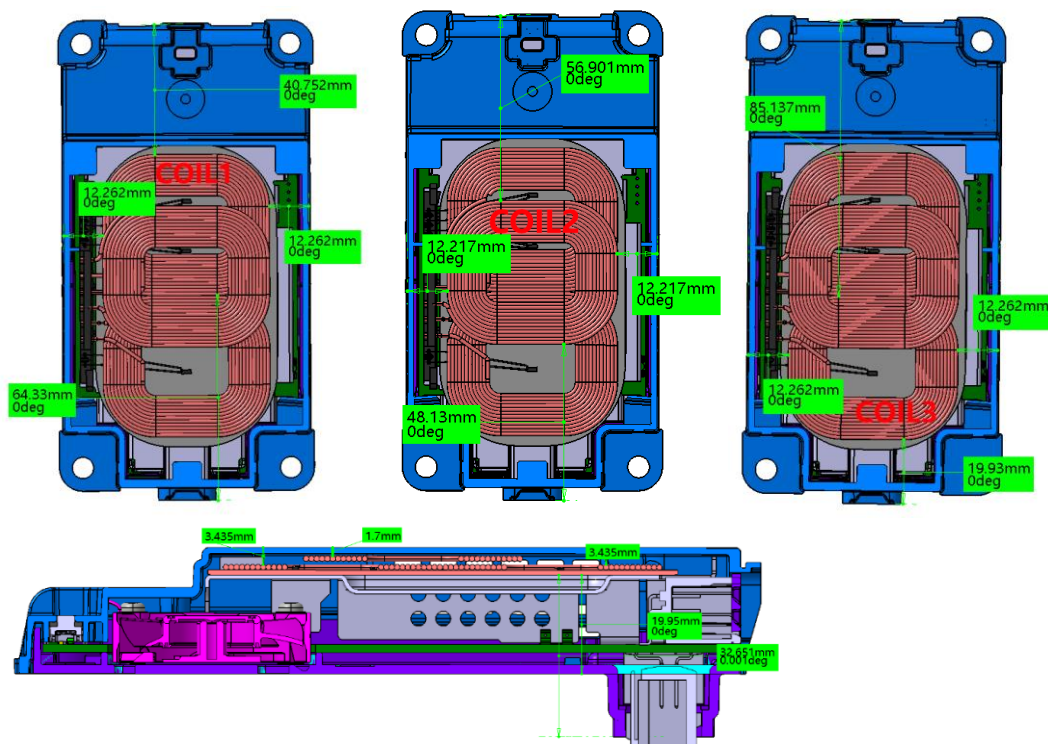
3.8 Special Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N	Rating
Wireless charging load	YBZ	YBZ1.1	/	5W/7.5W/10W/15W
DC power Supply	Topward	3303D	809332	0-30 Volts, 0-3 Amps

3.9 Coil Description

1	Antenna number:	Primary coil*3
2	Input inductance:	Coil1: 12.5uH±10% Coil2: 11.5uH±10% Coil3: 12.5uH±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

Coli to the outer surface of the enclosure(s)



4 RF exposure information

4.1 Test procedures according to the technical standards:

FCC KDB 680106 D01 RF Exposure Wireless Charging Apps v03

Standard Section	Test Item	Judgment	Remark
FCC CFR 47 part1, 1.1310 KDB680106 D01v03	Electric Field Strength (E) (V/m)	PASS	
	Magnetic Field Strength (H) (A/m)	PASS	

4.2 Limit of Maximum Permissible Exposure

Limit of Maximum Permissible Exposure

Limits for Occupational / Controlled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

Limits for General Population / Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180 / f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1	30

Note 1: f = frequency in MHz ; *Plane-wave equivalent power density

Note 2: For the applicable limit, see FCC 1.1310, 680106 D01 RF Exposure Wireless Charging Apps v03

Note 3: Emissions between 100 kHz to 1340 kHz should be assessed versus the limits in above Table 1 of Section 1.1310: 614 V/m and 1.63 A/m. A KDB inquiry is required to determine the applicable exposure limits below 100 kHz.

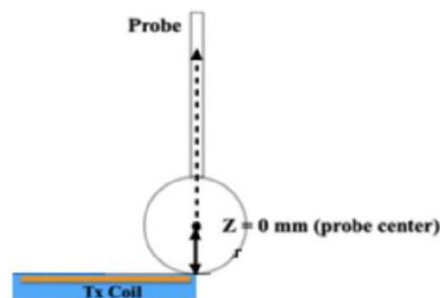
4.3 Test result

The Probe parameters as below:

Probe: EHP-200AC	Probe Center to edge	46mm
	E-field Sensor Dp	52mm
	H-field Sensor Dp	76mm
	1.7Dp E-field	88mm
	1.7Dp H-field	129mm

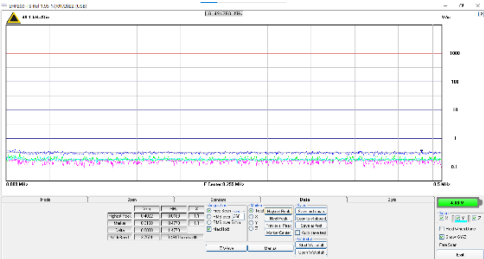
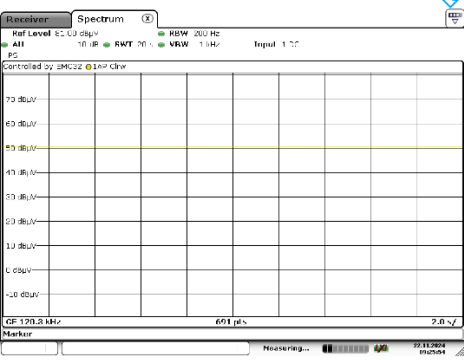
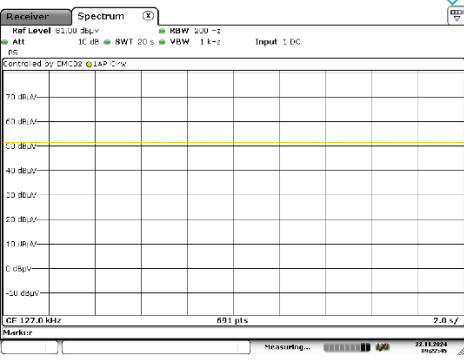
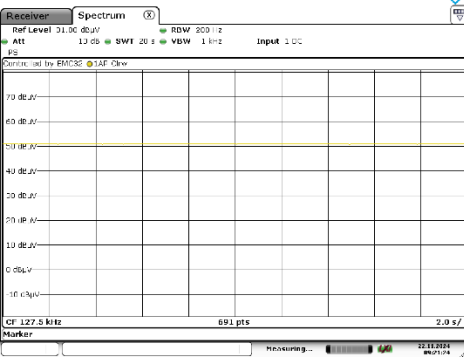
E-field and H-field Test Procedures

1. The grid of 10mm by 10mm is used as the size between the EUT and the probe when measurement.
2. The probe is used to measure the E-field and H-field from the EUT;
3. These initial measurements are made at $Z = 70$ mm from the surface of the XY plane;
4. Measurements are made perpendicular to the XY plane;
5. Locate the MFS in the XY plane;
6. Probe located in the MFS location



7. Test was performed on operating mode with client device, 1 %, 50%, 99% battery status of client device, here the worst-case status data are shown)
8. The test were performed all the test mode, and the worst case mode E mode was recorded.

Duty Cycle

Mode	Duty Cycle [%]	Remark
Standby	0%	There are no emissions found other than noise-floor. 
Operating (111-148kHz)	100%	120.3kHz:  127kHz:  127.5kHz: 

Note: ON Time = Pulse_Type1

A. Operating, 15W max

Curve-fitting Analysis.

1) Locating the MFS

The coil parameters as below:

Outer radius: 53.2*45.2 ± 0.5 mm

Inner radius: 27.5*19.5 ± 0.5mm

Number of turns: 12

Frequency: 120.3 kHz, 127.0 kHz, 127.5 kHz

The test was performed on Top/Front/Rear/Left/Right position from the edge of coils of the EUT and found the position of the MFS.

E-field / H-field Data Collecting Process, all modes tested, only worst-case reported.

Test Distance (mm)	Operating mode E-Field (V/m)	Operating mode H-Field (A/m)
70	15.313	0.922
80	14.247	0.845
90	13.029	0.814
100	11.592	0.741
110	10.385	0.701
120	9.787	0.603
130	8.876	0.521
140	7.855	0.455
150	6.786	0.366
160	6.151	0.334
170	5.822	0.311
180	5.125	0.273
190	4.814	0.241
200	4.239	0.198

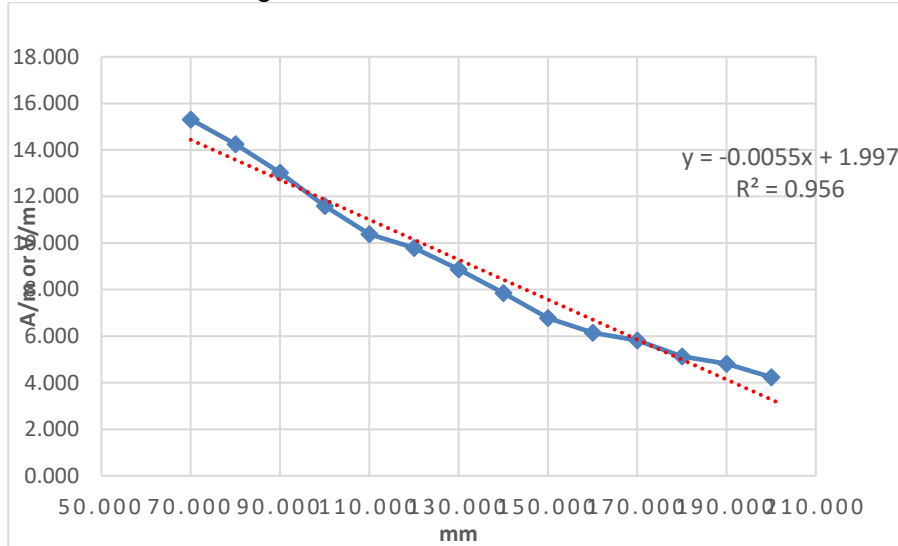
1) Performing Curve-fitting

we use regression techniques to validate their model errors.

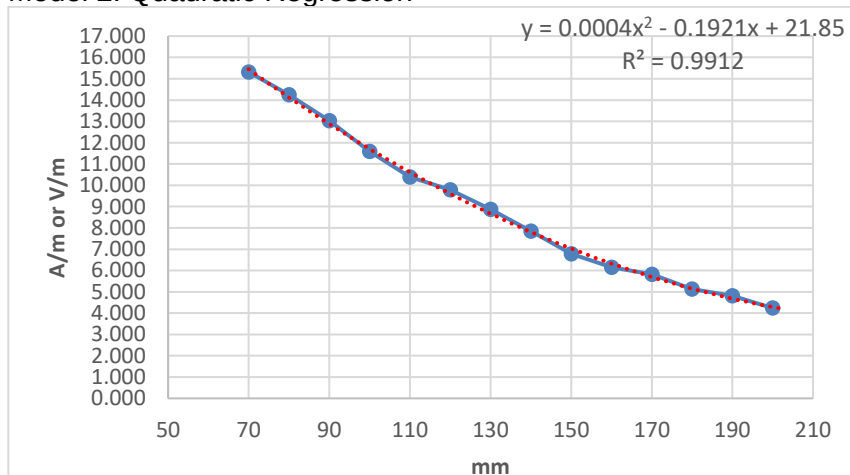
The Data Analysis package included in MS Excel was used to perform the regression analyses.

E-field Data

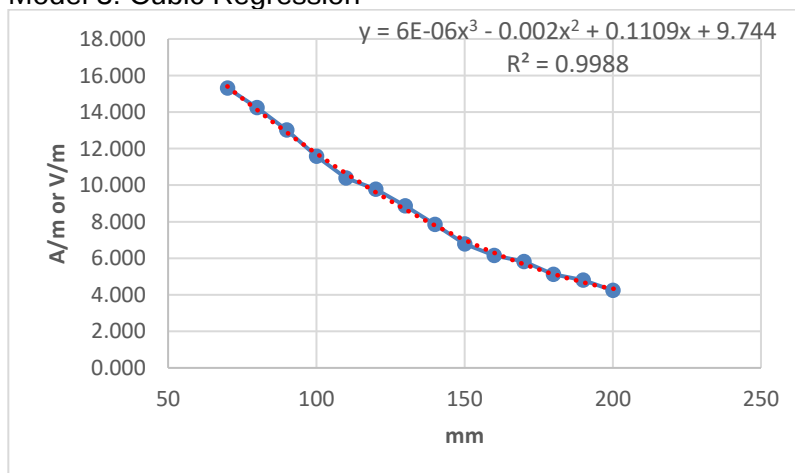
Model 1: Linear Regression



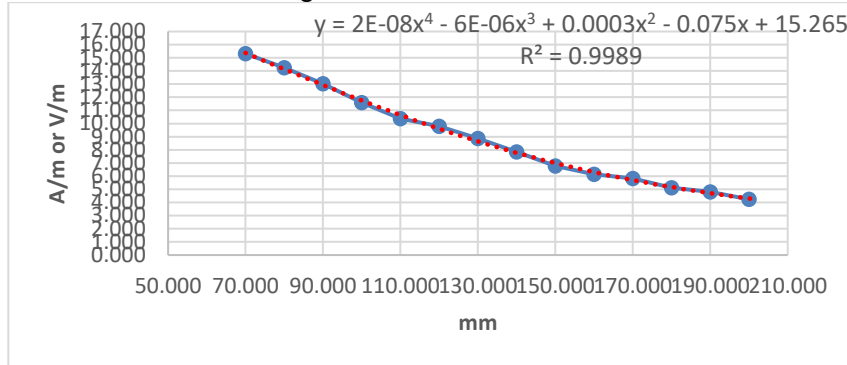
Model 2: Quadratic Regression



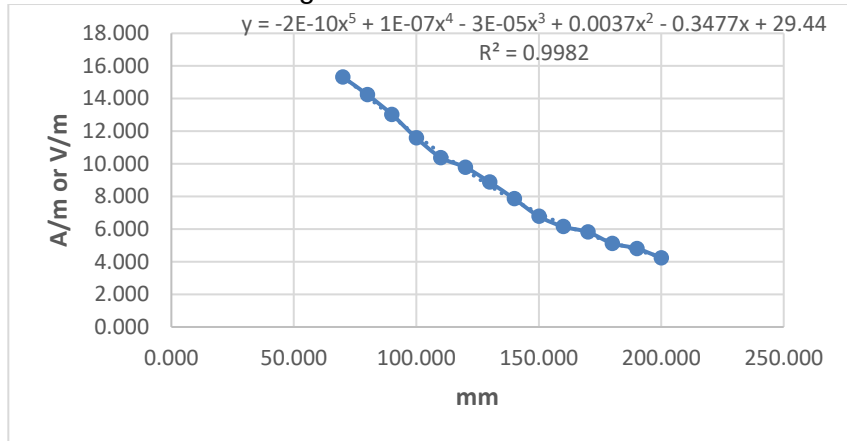
Model 3: Cubic Regression



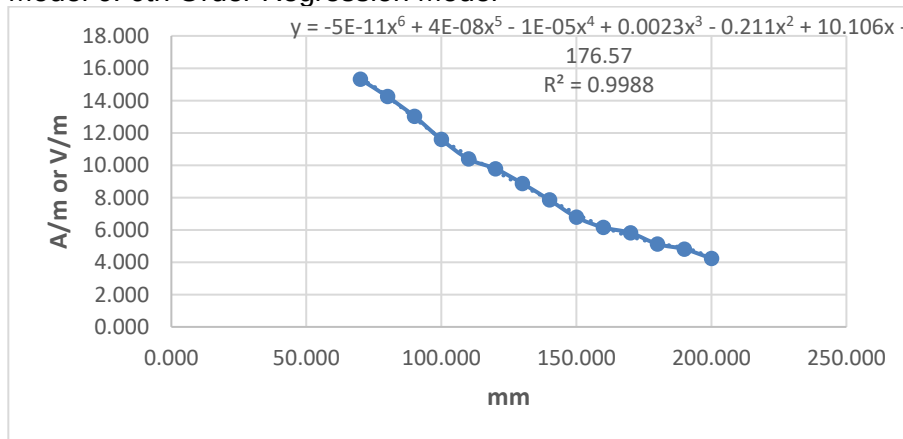
Model 4: 4th Order Regression Model



Model 5: 5th Order Regression Model



Model 6: 6th Order Regression Model



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Analyzing the Results E-field

Parameter	Linear Regression Model	Quadratic Regression Model	Cubic Regression Model
Multiple R	0.986	0.999	0.999
R Square	0.973	0.998	0.998
Adjusted R Square	0.970	0.998	0.998
Standard Error (S)	0.627	0.172	0.179
Estimated electric field strength at touch position [V/m]	20.44	26.88	25.91

Parameter	4th Order Regression Model	5th Order Regression Model	6th Order Regression Model
Multiple R	0.999	0.999	0.999
R Square	0.998	0.998	0.999
Adjusted R Square	0.997	0.997	0.998
Standard Error (S)	0.186	0.196	0.169
Estimated electric field strength at touch position [V/m]	22.12	29.44	-176
Limit[V/m]	614		

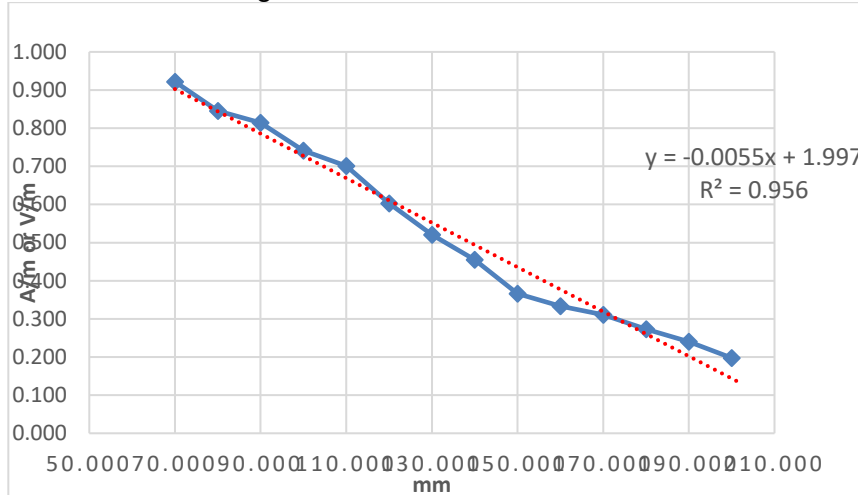
As shown in table above, the 5th Order Regression Model produced the Lowest standard error, and is below the minimum standard error threshold of 15% that ISED prescribes. There results indicate that the prediction value presents the lowest variance between the lower and upper bounds. The regression analysis utilized a confidence level of 95%, which is the minimum value that should be used by applicants.

Note1: the 6th Order Regression Model and higher order models were not selected as evidence of overfit.

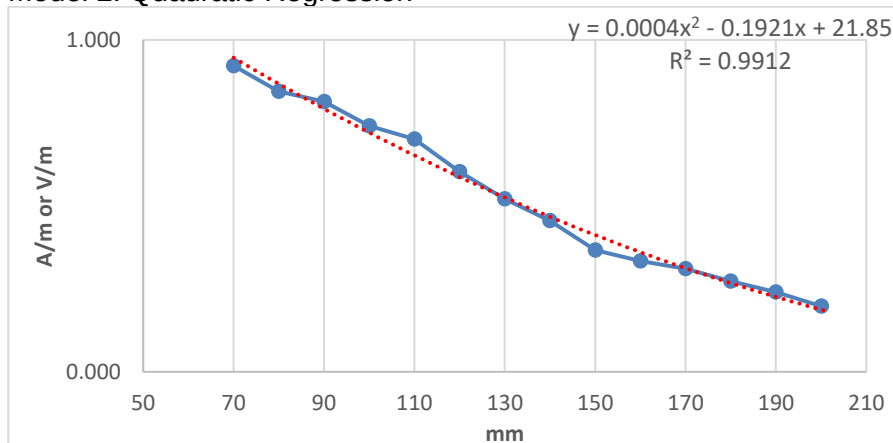
Note2: the lower bound and upper bound calculated by the model.

H-field Data

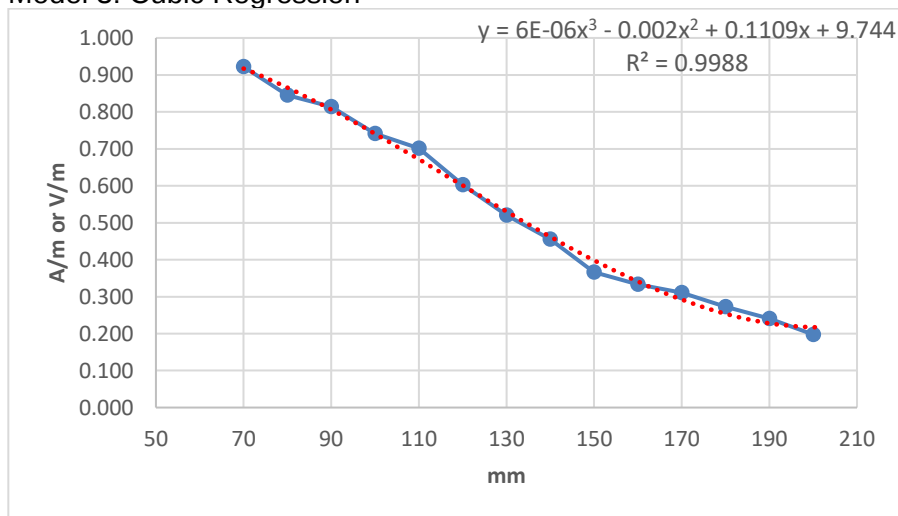
Model 1: Linear Regression



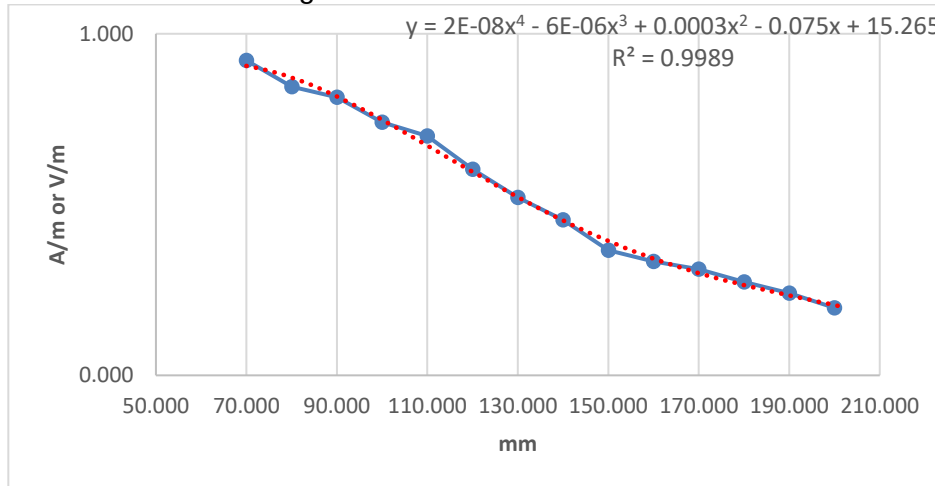
Model 2: Quadratic Regression



Model 3: Cubic Regression



Model 4: 4th Order Regression Model



Analyzing the Results E-field

Parameter	Linear Regression Model	Quadratic Regression Model	Cubic Regression Model
Multiple R	0.990	0.995	0.998
R Square	0.979	0.990	0.995
Adjusted R Square	0.978	0.988	0.994
Standard Error (S)	0.037	0.027	0.020
Estimated electric field strength at touch position [A/m]	1.311	1.59	0.884
Limit (A/m)	1.63		

Parameter	4th Order Regression Model
Multiple R	0.998
R Square	0.996
Adjusted R Square	0.995
Standard Error (S)	0.018
Estimated electric field strength at touch position [A/m]	-0.308

As shown in table above, the 2nd Order Regression Model produced the Lowest standard error, and is below the minimum standard error threshold of 15% that ISED prescribes. There results indicate that the prediction value presents the lowest variance between the lower and upper bounds. The regression analysis utilized a confidence level of 95%, which is the minimum value that should be used by applicants.

Note1: the 3rd and 4th Order Regression Model and higher order models were not selected as evidence of overfit and get distorted.

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

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5 Photographs of the Test Set-Up

Refer to Appendix A.

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