

RF EXPOSURE Test Report

Product: Anker 621 Magnetic Battery (MagGo)

Trade Mark: N/A

Model Number: A1610

FCC ID: 2AOKB-1610B

Prepared for

Anker Innovations Limited

Unit 56, 8th Floor, Tower 2, Admiralty Centre, 18 Harcourt Road, Hong Kong

Prepared by

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TEST RESULT CERTIFICATION

Applicant's Name Anker Innovations Limited

Address Unit 56, 8th Floor, Tower 2, Admiralty Centre, 18 Harcourt Road, Hong Kong

Manufacturer's Name Anker Innovations Limited

Address Unit 56, 8th Floor, Tower 2, Admiralty Centre, 18 Harcourt Road, Hong Kong

Product description

Product name Anker 621 Magnetic Battery (MagGo)

Model Number A1610

Standards FCC CFR 47 PART 1 , 1.1310

Test procedure KDB 680106 D01 Wireless Power Transfer v04

This device described above has been tested by Shenzhen HongBiao Certification& Testing Co., Ltd and the test results show that the equipment under test (EUT) is in compliance with the EMC requirements. And it is applicable only to the tested sample identified in the report.

Date of Test

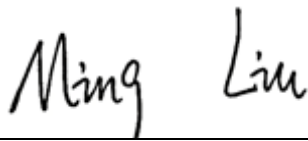
Date (s) of performance of tests ... May 27, 2024~July 30, 2024

Test Result..... **Pass**

Testing Engineer :


(Z o e S u)

Technical Manager :


(M i n g L i u)

Authorized Signatory :


(L e o S u)

[illegible]

1 General Description

1.1 Description of EUT

Product name:	Anker 621 Magnetic Battery (MagGo)
Model name:	A1610
Series Model:	N/A
Different of series model:	N/A
Operation frequency:	111kHz–205kHz
Operational mode:	Wireless charging
Modulation type:	ASK
Antenna type:	Coil Antenna
Battery:	DC 3.85V,5000mAh,19.25Wh
Power supply:	USB-C Input: DC5V/2.4A USB-C Output: DC5V/2.4A Wireless Output: 5W/7.5W Total Output:12W
Adapter information:	N/A

1.2 Test Mode

Pretest Test Mode	Description of Mode
1	EUT + Mobile Phone(Battery Status: <10%)
2	EUT + Mobile Phone(Battery Status: <50%)
3	EUT + Mobile Phone(Battery Status: <90%)
4	Stand-by mode
5	Direct exposure during device removal

Test Item	Final Test Mode
Duty cycle	1/4
H-field	1/2/3/4/5
E-field	1/2/3/4/5

Test Setup

See photographs of the test setup in the report for the actual setup and connections between EUT and support equipment.

1.3 Ancillary Equipment

Equipment	Model	S/N	Manufacturer
Phone	iPhone 12 Pro	DNPF9UL20 D9L	Apple Inc.
Adapter	TA65B	2S36003438 PL97T09582	Powerland Technology Inc.

2 Test Facilities and Accreditations

2.1 Test Laboratory

Test Site	Shenzhen HongBiao Certification& Testing Co., Ltd
Test Site Location	Room 102, 201, Building 2, Yuanwanggu RFID Industrial Park, Tongguan Road, Tianliao Community, Yutang Street, Guangming District, Shenzhen, China
Telephone:	(86-755) 2998 9321
Fax:	(86-755) 2998 5110
FCC Registration No.:	CN1341
A2LA Certificate No.:	6765.01

2.2 Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15°C~35°C
Relative Humidity:	20%~75%
Air Pressure:	98kPa~101kPa

2.3 Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

Measurement Frequency Range	U , (dB)	Note
RF frequency	2×10^{-5}	
E-field	± 1.06 dB	
H-field	± 0.7 dB	
Temperature	± 1 degree	
Humidity	± 5 %	

2.4 Test Software

Software name	Manufacturer	Model	Version
MAGPy V2.6	Schmid & Partner Engineering AG	MAGPy V2.6	V2.6

3 List of Test Equipment

Item	Equipment No.	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	HB-E077	Magnetic Amplitude and Gradient Probe System	Schmid & Partner Engineering AG	MAGPy -8H3D+E3D	3107	2024-03-15	2025-03-16
2	HB-E078	Magnetic Amplitude and Gradient Probe System	Schmid & Partner Engineering AG	MAGPy-DAS	3097	2024-03-15	2025-03-16

Note: the calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

4 RF Exposure

4.1 Maximum Permissible Exposure

4.1.1. Limit

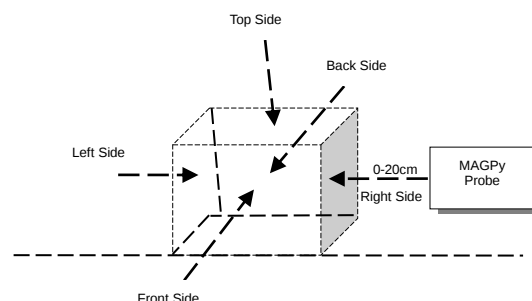
Frequency range(MHz)	Electric field strength(V/m)	Magnetic field strength(A/m)	Power density(mW/cm ²)	Averaging time(minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0 6	6
300-1500			f/300	6
1500-100000			5	6
(B) 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	30

f = frequency in MHz * = Plane-wave equivalent power density

4.1.2. Test Procedures

- The RF exposure test was performed in anechoic chamber.
- Perform H-field measurements for each edge/top surface of the host/client pair at every 2 cm, starting from as close as possible out to 20 cm.
- The highest emission level was recorded and compared with limit.
- The EUT was measured according to the dictates of TCB Workshop "41-Part-18-&-Wireless-Power-Transfer - April 27, 2022"

4.1.3. Test Setup



4.1.4. Equipment Approval Considerations item 5 b) of KDB 680106 D01 Wireless Power Transfer v04

Requirement	Device
1. Power transfer frequency is less than 1 MHz.	Yes. The operating frequencies are: Operating Frequency: 111kHz–205kHz
2. Output power from each primary coil is less than or equal to 15 watts.	Yes. The maximum output power is: Wireless Output: 7.5W
3. The system may consist of more than one source primary coils, charging one or more clients. If more than one primary coil is present, the coil pairs may be powered on at the same time.	Yes. EUT has a source primary coil.
4. Client device is placed directly in contact with the transmitter.	Yes. The client device is placed directly in contact with the transmitter.
5. Mobile exposure conditions only (portable exposure conditions are not covered by this exclusion).	No, EUT includes portable conditions.
6. The aggregate H-field strengths anywhere at or beyond 20 cm surrounding the device, and 20 cm away from the surface from all coils that by design can simultaneously transmit, and while those coils are simultaneously energized, are demonstrated to be less than 50% of the applicable MPE limit.	Yes. See the test result in item 4.1.5

4.1.5. H-field Test Result

For portable exposure condition:

Operating modes with client device (10 %, 50%, 90% battery status of client device) have been test, only show the data of worst case of 1% battery status of client device.

H-field measurements taken every 2 cm (starting as close to 20 cm as possible) on each edge/top surface of the host/client pair were also evaluated for portable use conditions. The report reflects data for the worst 0 cm test distance mode only.

Test condition 1: Mode 1 operating mode with client device (10 % battery status of client device).

When using the testing instrument MAGPy for testing, when selecting compliance location as probe tip in the settings, the measured value is extrapolated to 0mm

Measurement results directly tested using MAGPy.

Battery levels	Test sides	Test distance(cm)	E -field(V/m)
<1%	Top	0	0.65
<1%	Left	0	0.54
<1%	Right	0	0.42
<1%	Front	0	0.41
<1%	Back	0	0.47
<1%	Bottom	0	0.59
Limit			1.63
Margin Limit (%)			39.88%

When setting MAGPy to select compliance location as probe tip, the measured value is extrapolated to 0mm as the result.

Battery levels	Test sides	Test distance(cm)	E -field(V/m)
<1%	Top	0	0.75
<1%	Left	0	0.62
<1%	Right	0	0.58
<1%	Front	0	0.57
<1%	Back	0	0.55
<1%	Bottom	0	0.68
Limit			1.63
Margin Limit (%)			46.01%

Measurement results directly tested using MAGPy.

Battery levels	Test sides	Test distance(cm)	E -field(V/m)
<1%	Top	2	0.57
<1%	Left	2	0.52
<1%	Right	2	0.38
<1%	Front	2	0.37
<1%	Back	2	0.45
<1%	Bottom	2	0.56
Limit			1.63
Margin Limit (%)			34.97%

When setting MAGPy to select compliance location as probe tip, the measured value is extrapolated to 0mm as the result.

Battery levels	Test sides	Test distance(cm)	E -field(V/m)
<1%	Top	2	0.73
<1%	Left	2	0.58
<1%	Right	2	0.54
<1%	Front	2	0.52
<1%	Back	2	0.51
<1%	Bottom	2	0.62
Limit			1.63
Margin Limit (%)			44.79%

Measurement results directly tested using MAGPy.

Battery levels	Test sides	Test distance(cm)	E -field(V/m)
<1%	Top	4	0.52
<1%	Left	4	0.47
<1%	Right	4	0.35
<1%	Front	4	0.33
<1%	Back	4	0.41
<1%	Bottom	4	0.52
Limit			1.63
Margin Limit (%)			31.90%

When setting MAGPy to select compliance location as probe tip, the measured value is extrapolated to 0mm as the result.

Battery levels	Test sides	Test distance(cm)	E -field(V/m)
<1%	Top	4	0.68
<1%	Left	4	0.54
<1%	Right	4	0.51
<1%	Front	4	0.48
<1%	Back	4	0.46
<1%	Bottom	4	0.59
Limit			1.63
Margin Limit (%)			41.72%

Measurement results directly tested using MAGPy.

Battery levels	Test sides	Test distance(cm)	E -field(V/m)
<1%	Top	6	0.46
<1%	Left	6	0.42
<1%	Right	6	0.31
<1%	Front	6	0.29
<1%	Back	6	0.36
<1%	Bottom	6	0.41
Limit			1.63
Margin Limit (%)			28.22%

When setting MAGPy to select compliance location as probe tip, the measured value is extrapolated to 0mm as the result.

Battery levels	Test sides	Test distance(cm)	E -field(V/m)
<1%	Top	6	0.62
<1%	Left	6	0.48
<1%	Right	6	0.45
<1%	Front	6	0.43
<1%	Back	6	0.41
<1%	Bottom	6	0.55
Limit			1.63
Margin Limit (%)			38.04%

When setting MAGPy to select compliance location as probe tip, the measured value is extrapolated to 0mm as the result.

Battery levels	Test sides	Test distance(cm)	E -field(V/m)
<1%	Top	8	0.57
<1%	Left	8	0.44
<1%	Right	8	0.41
<1%	Front	8	0.36
<1%	Back	8	0.38
<1%	Bottom	8	0.52
Limit			1.63
Margin Limit (%)			34.97%

When setting MAGPy to select compliance location as probe tip, the measured value is extrapolated to 0mm as the result.

Battery levels	Test sides	Test distance(cm)	E -field(V/m)
<1%	Top	10	0.56
<1%	Left	10	0.42
<1%	Right	10	0.36
<1%	Front	10	0.33
<1%	Back	10	0.34
<1%	Bottom	10	0.49
Limit			1.63
Margin Limit (%)			34.36%

When setting MAGPy to select compliance location as probe tip, the measured value is extrapolated to 0mm as the result.

Battery levels	Test sides	Test distance(cm)	E -field(V/m)
<1%	Top	12	0.55
<1%	Left	12	0.38
<1%	Right	12	0.32
<1%	Front	12	0.30
<1%	Back	12	0.31
<1%	Bottom	12	0.45
Limit			1.63
Margin Limit (%)			33.74%

When setting MAGPy to select compliance location as probe tip, the measured value is extrapolated to 0mm as the result.

Battery levels	Test sides	Test distance(cm)	E -field(V/m)
<1%	Top	14	0.47
<1%	Left	14	0.33
<1%	Right	14	0.29
<1%	Front	14	0.26
<1%	Back	14	0.27
<1%	Bottom	14	0.42
Limit			1.63
Margin Limit (%)			28.83%

When setting MAGPy to select compliance location as probe tip, the measured value is extrapolated to 0mm as the result.

Battery levels	Test sides	Test distance(cm)	E -field(V/m)
<1%	Top	16	0.43
<1%	Left	16	0.31
<1%	Right	16	0.25
<1%	Front	16	0.21
<1%	Back	16	0.23
<1%	Bottom	16	0.38
Limit			1.63
Margin Limit (%)			26.38%

When setting MAGPy to select compliance location as probe tip, the measured value is extrapolated to 0mm as the result.

Battery levels	Test sides	Test distance(cm)	E -field(V/m)
<1%	Top	18	0.37
<1%	Left	18	0.29
<1%	Right	18	0.23
<1%	Front	18	0.18
<1%	Back	18	0.22
<1%	Bottom	18	0.31
Limit			1.63
Margin Limit (%)			22.70%

When setting MAGPy to select compliance location as probe tip, the measured value is extrapolated to 0mm as the result.

Battery levels	Test sides	Test distance(cm)	E -field(V/m)
<1%	Top	20	0.32
<1%	Left	20	0.25
<1%	Right	20	0.19
<1%	Front	20	0.13
<1%	Back	20	0.17
<1%	Bottom	20	0.25
Limit			1.63
Margin Limit (%)			19.63%

4.1.6. E-field Test Procedures

Curve-fitting Analysis

1. Locating the MFS

EUT will be a coil with the following parameters:

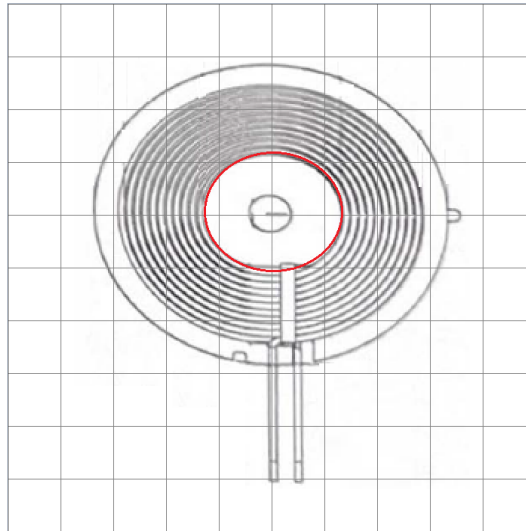
Outer radius: 17 mm

Inner radius: 8 mm

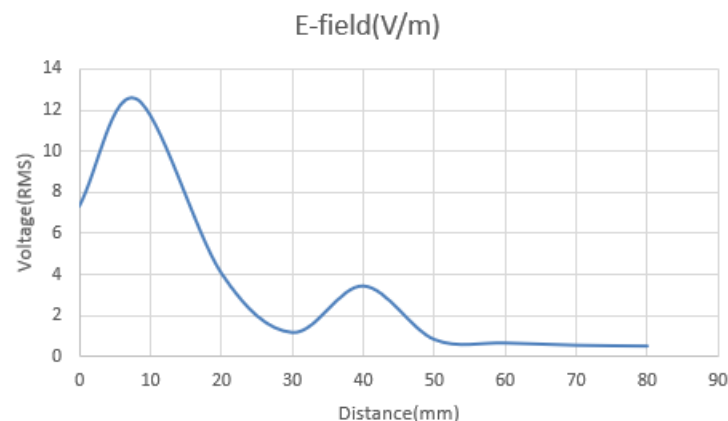
Number of turns: 11

Current: 1 A rms

Frequency: 111kHz-205kHz



1. A grid of 3mm by 3mm is used due to the size of the EUT and the probe.
2. A probe MAGPy Version 2.6 Handheld System: MAGPy-8H3D+E3D is used to measure the E- and stemming from the EUT.
3. These initial measurements are made at Z = 55 mm from the surface of the XY plane.
4. An Red circle is shown to represent the location of the MFS which is 8 mm from the centre of the coil(12.52 V/m).



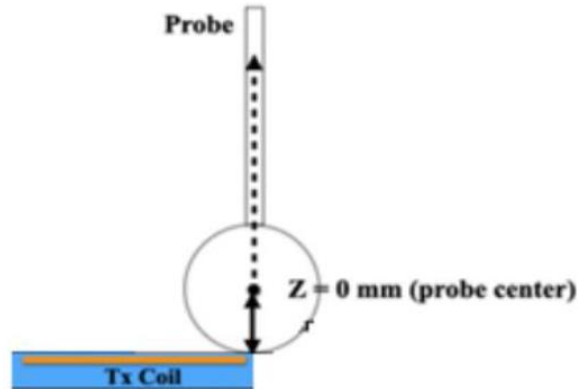
2. Methodology

Start gathering the data;

Measurements are made perpendicular to the XY plane;

Locate the MFS in the XY plane;

3.Probe located in the MFS location



4.Data Collecting Process

Distance (mm)	E-Field (V/m)		
	EUT+Mobile Phone (battery status: <10%)	Stand-by mode	Direct exposure during device removal mode
55	12.52	7.25	11.52
65	8.22	4.25	7.32
75	6.12	2.56	5.42
85	4.88	1.42	3.65
95	3.52	0.82	2.44
105	2.41	0.64	1.34
115	1.14	0.51	0.95
125	0.87	0.42	0.74
135	0.68	0.31	0.68
145	0.59	0.28	0.51
155	0.41	0.14	0.39

Modes 1-3 use the same test method, only the power of the test load is changed. The data only reflects the worst mode EUT+Mobile Phone (battery status: <10%), so we use four (4) regression techniques to verify the model error of three modes: EUT+Mobile Phone (battery status: <10%) mode, standby mode, and direct exposure mode when the device is removed.

5.Performing Curve-fitting

we use Four (4) regression techniques to validate their model errors.

Model 1: Linear Regression

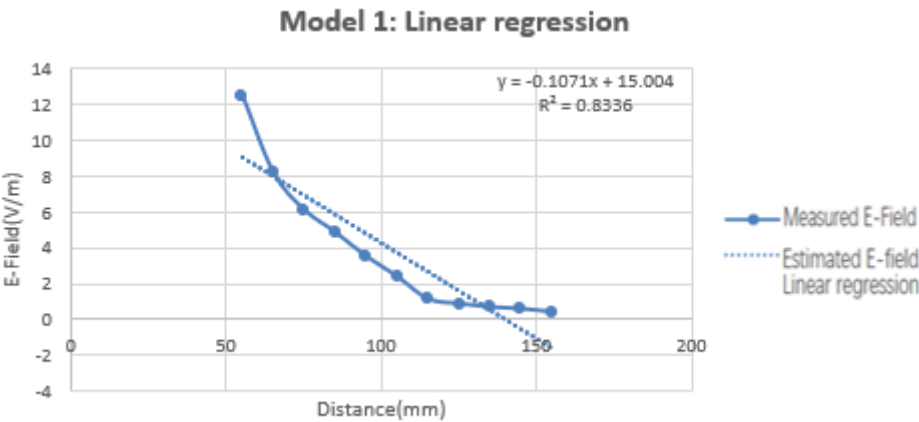
Model 2: Quadratic Regression

Model 3: Cubic Regression

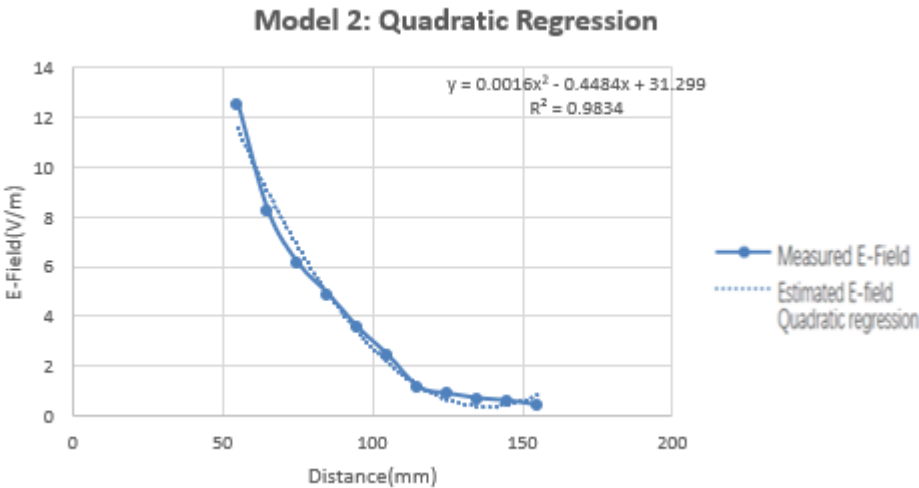
Model 4: Quartic polynomial

Each regression model will use the 11 data points from chapter 4.1.5 In this example, the Data Analysis package included in MS Excel was used to perform the regression analyses.

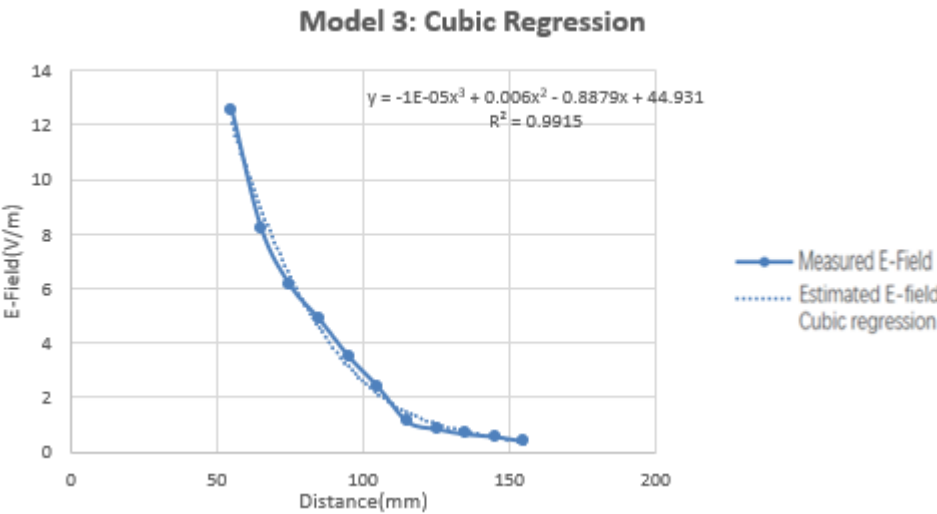
EUT+Mobile Phone (battery status: <10%):
Model 1: Linear Regression



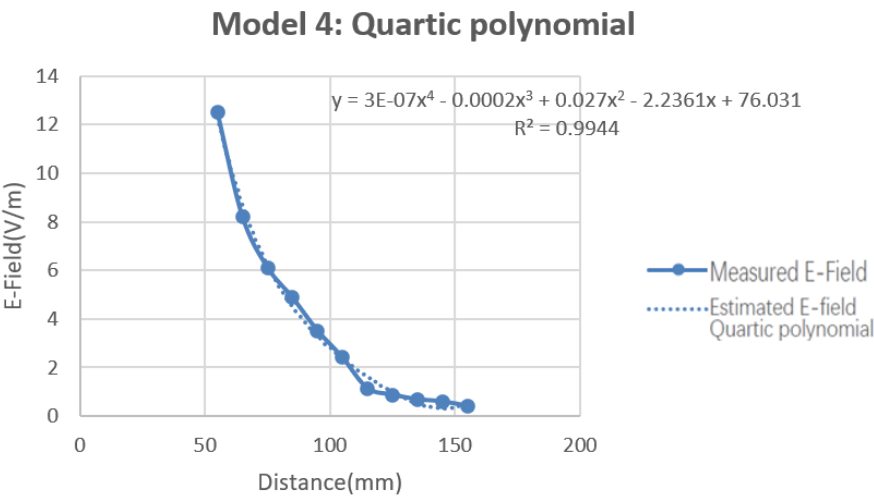
Model 2: Quadratic Regression



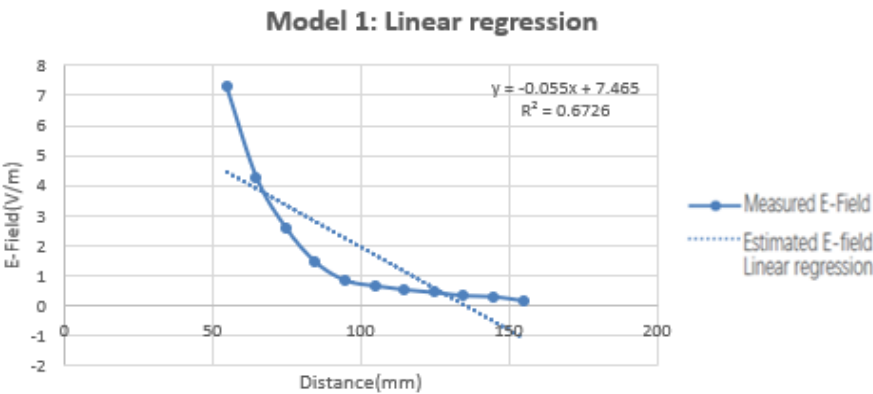
Model 3: Cubic Regression



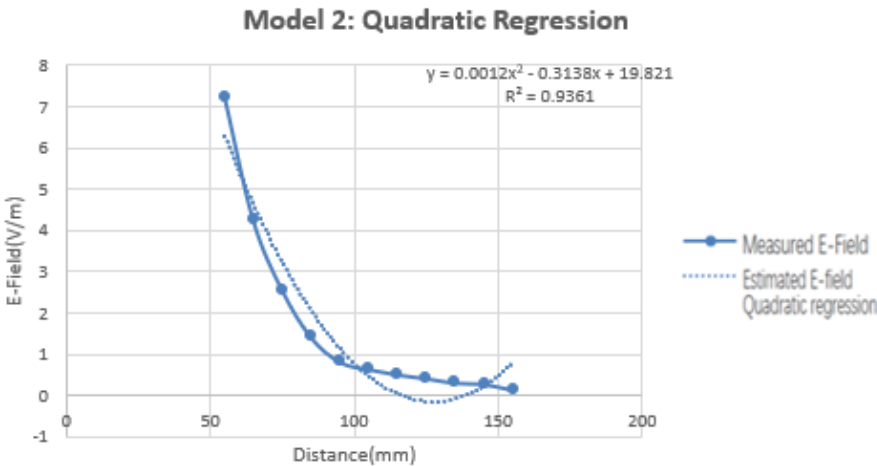
Model 4: Quartic polynomial



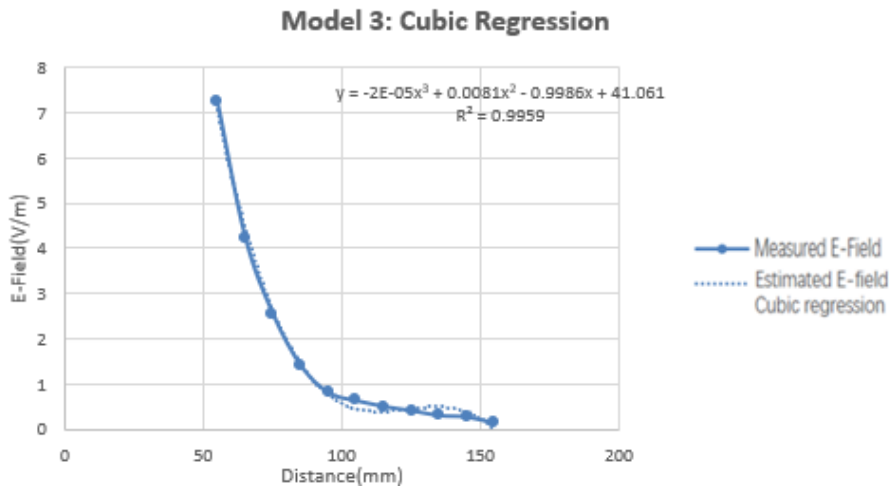
Stand-by mode:
Model 1: Linear Regression



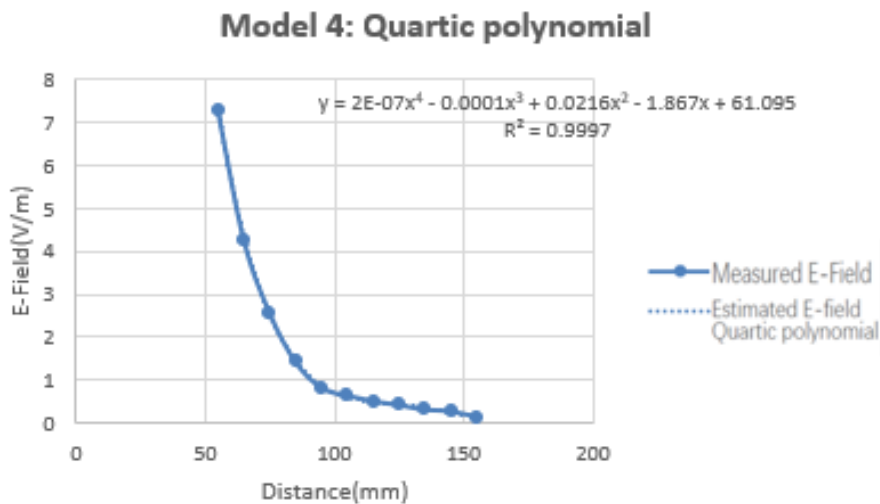
Model 2: Quadratic Regression



Model 3: Cubic Regression

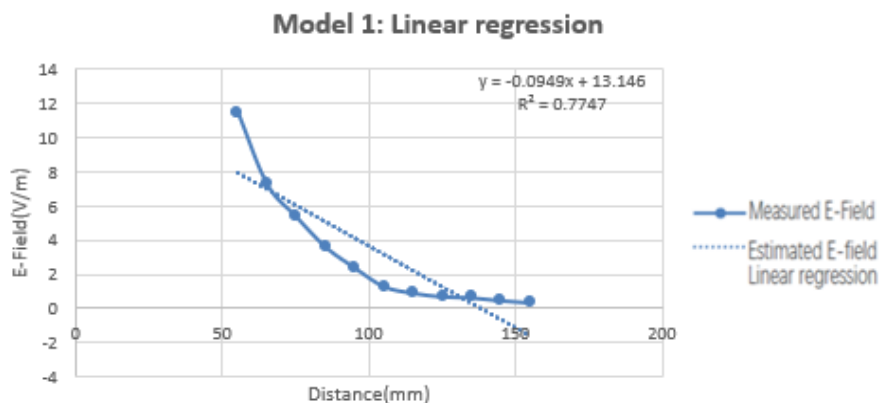


Model 4: Quartic polynomial

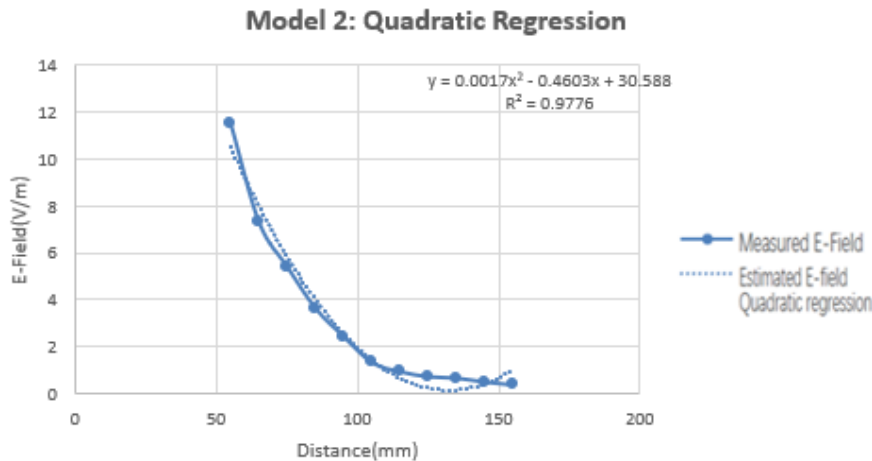


Direct exposure during device removal mode:

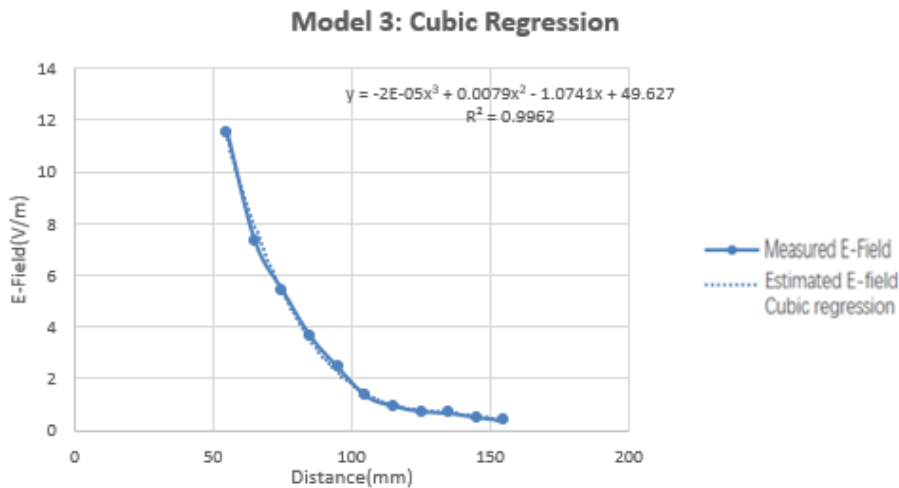
Model 1: Linear Regression



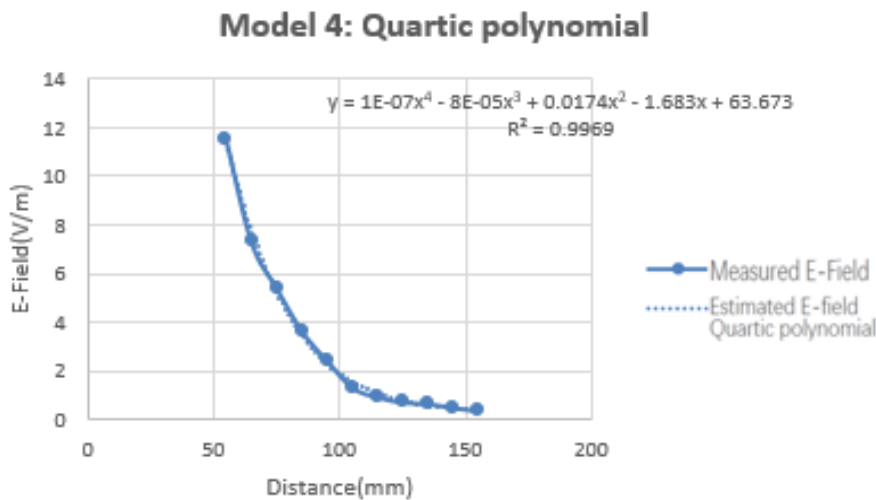
Model 2: Quadratic Regression



Model 3: Cubic Regression



Model 4: Quartic polynomial



Analyzing Results

EUT + Mobile Phone Mode (battery status: <10%):

Parameter	Linear Regression Model	Quadratic Regression Model	Cubic Regression Model	Quartic polynomial
Multiple R	0.913	0.992	0.996	0.997
R Square	0.834	0.983	0.991	0.994
Adjusted R Square	0.815	0.979	0.988	0.990
Standard Error (S)	1.673	0.560	0.429	0.375
Number of data points used	11	11	11	11
Estimated magnetic field strength at touch position (V/m)	15.004	31.299	44.931	76.031

Stand-by mode:

Parameter	Linear Regression Model	Quadratic Regression Model	Cubic Regression Model	Quartic polynomial
Multiple R	0.820	0.968	0.998	1.000
R Square	0.673	0.936	0.996	1.000
Adjusted R Square	0.636	0.920	0.994	1.000
Standard Error (S)	1.341	0.628	0.170	0.053
Number of data points used	11	11	11	11
Estimated magnetic field strength at touch position (V/m)	7.465	19.821	41.061	61.095

Direct exposure during device removal mode:

Parameter	Linear Regression Model	Quadratic Regression Model	Cubic Regression Model	Quartic polynomial
Multiple R	0.880	0.989	0.998	0.998
R Square	0.775	0.978	0.996	0.997
Adjusted R Square	0.750	0.972	0.994	0.994
Standard Error (S)	1.790	0.598	0.263	0.256
Number of data points used	11	11	11	11
Estimated magnetic field strength at touch position (V/m)	13.146	30.588	49.627	63.673

4.1.7. E-field Test Result

As shown in Section 4.1.6, the standard error of the fourth model is the smallest among all the models, which is lower than the minimum standard error threshold of 15% specified. The confidence level used in the regression analysis is 95%, which is the minimum value that the applicant should use. By using curve fitting technology for modeling and calculation, it can be inferred that the electric field at a distance of 0 mm is 76.031 V/m, which is less than the limit of 614 V/m. The judgment result is passed.

***** END OF REPORT *****