RF Exposure Evaluation

FCC ID: 2A4MY-UAGRPB10

1 Measuring Standard

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines. According to §1.1310 and §2.1091 RF exposure is calculated. According KDB680106 D01: KDB 680106 D01 Wireless Power Transfer v04.

2 Requirements

According to the item 3 of KDB 680106 D01v04:

Inductive wireless power transfer applications that meet all of the following requirements are excluded from submitting an RF exposure evaluation.

(1) Mobile Device and Portable Device Configurations

(2) Equipment Authorization Procedures for Devices Operating at Frequencies Below 4 MHz

(3) The aggregate H-field strengths anywhere at or beyond 15 cm surrounding the device, and 20 cm away from the top surface.

Limits

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)

Limits for Maximum Permissible Exposure (MPE)

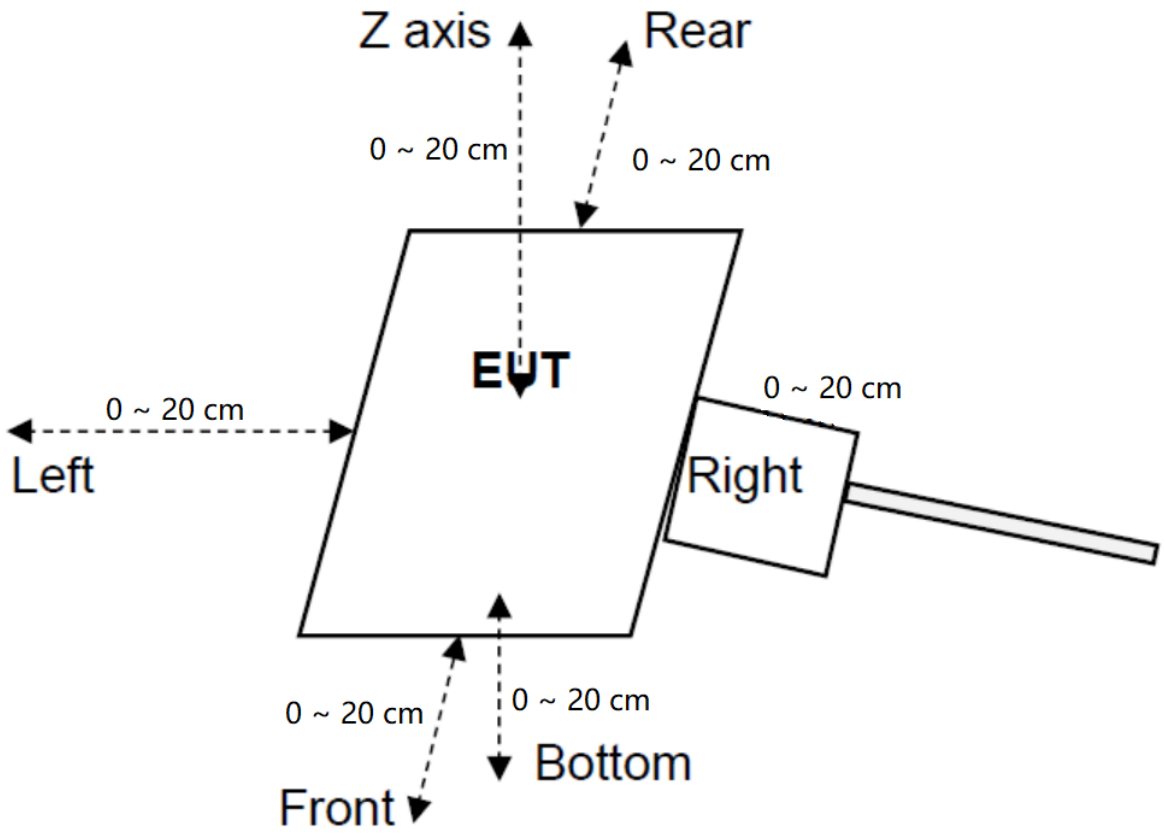
Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*($900/f^2$)	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	f/300	6
1500-100,000	/	/	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
1500-100,000	/	/	1.0	30
F=frequency in MHz *=Plane-wave equivalent power density RF exposure compliance will need to be determined with respect to 1.1307(c) and (d) of the FCC rules. The emissions should be within the limits at 300kHz in Table 1 of 1.1310(use the 300kHz limits for 150kHz:614V/m,1.63A/m).				

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 300 kHz should be assessed versus the limits at 300 kHz in 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.

3 Test Setup



4 Test Procedure

1) The RF exposure test was performed in anechoic chamber.

2) The measurement probe was placed at test distance (2cm increments from 0 ~ 20 cm for all sides) which is between the edge of the charger and the geometric edge of probe.

3) The highest emission level was recorded and compared with limit as soon as measurement of each points (A, B, C, D, E, F) were completed.

4) The EUT was measured according to the dictates of KDB 680106 D01 Wireless Power Transfer v04.

Remark：The EUT's test position A, B, C, D, E and F is valid for the E and H field measurements.

5 Equipment Approval Considerations

The EUT does comply with KDB 680106 D01 as follow table.

Requirements of section 5 of KDB 680106 D01	Yes / No	Description
Power transfer frequency is less than 1 MHz	Yes	The device operated in the frequency range112-205KHz.
Output power from each primary coil is less than or equal to 15 watts	Yse	The maximum output power of the primary coil is 10W.
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	The transfer system includes 1 primary coils.
Client device is placed directly in contact with the transmitter	Yes	Client device is placed directly in contact with the transmitter
Mobile exposure conditions only (portable exposure conditions are not covered by this exclusion)	No	EUT is a portable power bank
The aggregate H-field strengths anywhere at or beyond 15 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	The E-field and H-field strengths at 10 cm surrounding the device from all simultaneous transmitting coils are demonstrated to be less than 30% of the MPE limit.

6 Description of the test mode

Equipment under test was operated during the measurement under the following conditions:

Test Mode	Description	
Mode 1	EUT + Mobile phone	Record
Mode 2	Adapter + EUT + Mobile phone	Pre-test
Note: 1. All test modes were pre-tested, but we only recorded the worst case in this report. 2. Unfolded and folded mode were tested, but we only recorded the worst case.		

7 Peripheral List

No.	Equipment	Manufacturer	Model No.	Serial No.	Power cord	signal cable
1	Phone	Apple	iphone 14 Pro max	N/A	N/A	N/A
2	Adapter	HNT	HNT-QC530	N/A	N/A	N/A

8 Test Instruments list

Test Equipment	Manufacturer	Model No.	SN.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
Magnetic Amplitude and Gradient Probe System	SPEAG	MAGPy-8H3D+E3D V2 & MAGPy-DAS V2	SZ186-06 & 3061	04.13.2023	04.12.2024

Parameter	Specs
PROBE DESIGN	
Diameter	60 mm
8 isotropic H-field sensors	concentric loops of 1 cm^2 arranged at the corner of a cube of 22 mm side length
1 isotropic E-field sensor	orthogonal dipole/monopole (arm length: 50 mm)
Measurement center	18.5 mm from the probe tip
Temperature range	0–40 °C
Dimensions	110 × 635 × 35 mm (MAGPy-8H3D+E3D V2 & MAGPy-DAS V2)
H-FIELD SPECIFICATION	
Frequency range	3 kHz–10 MHz
Measurement range	0.1–3200 A/m, 0.12 µT–4 mT
Gradient range	0–80 T/m/T
E-FIELD SPECIFICATION	
Frequency range	3 kHz–10 MHz
Measurement range	0.08–2000 V/m

9 Test Result

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
0mm	＜ 1%	Top	13.28	0.71
0mm	＜ 1%	Bottom	12.48	0.62
0mm	＜ 1%	Left	13.01	0.59
0mm	＜ 1%	Right	12.95	0.66
0mm	＜ 1%	Front	12.57	0.64
0mm	＜ 1%	Rear	13.03	0.60
Limit			614	1.63
Margin Limit (%)			2.16%	43.56%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
0mm	＜ 50%	Top	12.41	0.65
0mm	＜ 50%	Bottom	11.43	0.54
0mm	＜ 50%	Left	11.69	0.50
0mm	＜ 50%	Right	11.93	0.54
0mm	＜ 50%	Front	12.12	0.56
0mm	＜ 50%	Rear	12.07	0.56
Limit			614	1.63
Margin Limit (%)			2.02%	39.88%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
0mm	＜ 99%	Top	12.46	0.57
0mm	＜ 99%	Bottom	12.20	0.47
0mm	＜ 99%	Left	12.41	0.46
0mm	＜ 99%	Right	12.19	0.43
0mm	＜ 99%	Front	12.36	0.50
0mm	＜ 99%	Rear	12.31	0.50
Limit			614	1.63
Margin Limit (%)			2.03%	34.97%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
2mm	＜ 1%	Top	12.78	0.67
2mm	＜ 1%	Bottom	11.77	0.64
2mm	＜ 1%	Left	12.11	0.60
2mm	＜ 1%	Right	12.21	0.61
2mm	＜ 1%	Front	12.26	0.61
2mm	＜ 1%	Rear	11.90	0.55
Limit			614	1.63
Margin Limit (%)			2.08%	41.10%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
2mm	＜ 50%	Top	12.23	0.68
2mm	＜ 50%	Bottom	11.31	0.58
2mm	＜ 50%	Left	11.87	0.50
2mm	＜ 50%	Right	11.81	0.53
2mm	＜ 50%	Front	12.00	0.58
2mm	＜ 50%	Rear	11.87	0.55
Limit			614	1.63
Margin Limit (%)			1.99%	41.72%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
2mm	＜ 99%	Top	12.19	0.54
2mm	＜ 99%	Bottom	12.13	0.40
2mm	＜ 99%	Left	12.17	0.49
2mm	＜ 99%	Right	12.00	0.48
2mm	＜ 99%	Front	12.21	0.40
2mm	＜ 99%	Rear	12.13	0.46
Limit			614	1.63
Margin Limit (%)			1.99%	33.13%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
4mm	＜ 1%	Top	12.47	0.60
4mm	＜ 1%	Bottom	11.24	0.48
4mm	＜ 1%	Left	12.19	0.46
4mm	＜ 1%	Right	12.01	0.55
4mm	＜ 1%	Front	12.03	0.46
4mm	＜ 1%	Rear	12.08	0.49
Limit			614	1.63
Margin Limit (%)			2.03%	36.81%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
4mm	＜ 50%	Top	11.87	0.52
4mm	＜ 50%	Bottom	10.67	0.37
4mm	＜ 50%	Left	11.01	0.42
4mm	＜ 50%	Right	11.17	0.40
4mm	＜ 50%	Front	11.16	0.47
4mm	＜ 50%	Rear	11.56	0.44
Limit			614	1.63
Margin Limit (%)			1.93%	31.90%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
4mm	＜ 99%	Top	11.67	0.41
4mm	＜ 99%	Bottom	11.58	0.38
4mm	＜ 99%	Left	11.64	0.31
4mm	＜ 99%	Right	11.46	0.38
4mm	＜ 99%	Front	11.60	0.33
4mm	＜ 99%	Rear	11.76	0.24
Limit			614	1.63
Margin Limit (%)			1.92%	25.15%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
6mm	＜ 1%	Top	12.44	0.58
6mm	＜ 1%	Bottom	11.28	0.47
6mm	＜ 1%	Left	12.00	0.44
6mm	＜ 1%	Right	11.98	0.46
6mm	＜ 1%	Front	11.98	0.49
6mm	＜ 1%	Rear	11.75	0.50
Limit			614	1.63
Margin Limit (%)			2.03%	35.58%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
6mm	＜ 50%	Top	11.52	0.61
6mm	＜ 50%	Bottom	10.79	0.54
6mm	＜ 50%	Left	11.16	0.48
6mm	＜ 50%	Right	11.03	0.51
6mm	＜ 50%	Front	11.17	0.46
6mm	＜ 50%	Rear	11.15	0.52
Limit			614	1.63
Margin Limit (%)			1.88%	37.42%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
6mm	＜ 99%	Top	11.57	0.55
6mm	＜ 99%	Bottom	11.28	0.36
6mm	＜ 99%	Left	11.43	0.47
6mm	＜ 99%	Right	11.66	0.38
6mm	＜ 99%	Front	11.55	0.50
6mm	＜ 99%	Rear	11.57	0.48
Limit			614	1.63
Margin Limit (%)			1.90%	33.74%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
8mm	＜ 1%	Top	12.18	0.55
8mm	＜ 1%	Bottom	11.26	0.50
8mm	＜ 1%	Left	11.55	0.40
8mm	＜ 1%	Right	11.90	0.46
8mm	＜ 1%	Front	11.92	0.43
8mm	＜ 1%	Rear	11.92	0.41
Limit			614	1.63
Margin Limit (%)			1.98%	33.74%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
8mm	＜ 50%	Top	11.42	0.50
8mm	＜ 50%	Bottom	10.51	0.38
8mm	＜ 50%	Left	10.77	0.38
8mm	＜ 50%	Right	10.94	0.43
8mm	＜ 50%	Front	10.92	0.44
8mm	＜ 50%	Rear	10.53	0.38
Limit			614	1.63
Margin Limit (%)			1.86%	30.67%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
8mm	＜ 99%	Top	11.39	0.43
8mm	＜ 99%	Bottom	11.19	0.36
8mm	＜ 99%	Left	11.42	0.29
8mm	＜ 99%	Right	11.41	0.35
8mm	＜ 99%	Front	11.39	0.30
8mm	＜ 99%	Rear	11.32	0.36
Limit			614	1.63
Margin Limit (%)			1.86%	26.38%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
10mm	＜ 1%	Top	11.43	0.52
10mm	＜ 1%	Bottom	10.68	0.46
10mm	＜ 1%	Left	11.38	0.45
10mm	＜ 1%	Right	10.86	0.37
10mm	＜ 1%	Front	11.18	0.39
10mm	＜ 1%	Rear	10.91	0.40
Limit			614	1.63
Margin Limit (%)			1.86%	31.90%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
10mm	＜ 50%	Top	10.73	0.53
10mm	＜ 50%	Bottom	9.68	0.46
10mm	＜ 50%	Left	10.15	0.40
10mm	＜ 50%	Right	10.08	0.44
10mm	＜ 50%	Front	10.30	0.49
10mm	＜ 50%	Rear	10.00	0.39
Limit			614	1.63
Margin Limit (%)			1.75%	32.52%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
10mm	＜ 99%	Top	10.82	0.40
10mm	＜ 99%	Bottom	10.63	0.28
10mm	＜ 99%	Left	10.88	0.22
10mm	＜ 99%	Right	10.94	0.27
10mm	＜ 99%	Front	11.00	0.24
10mm	＜ 99%	Rear	10.84	0.32
Limit			614	1.63
Margin Limit (%)			1.79%	24.54%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
12mm	＜ 1%	Top	11.28	0.51
12mm	＜ 1%	Bottom	9.99	0.45
12mm	＜ 1%	Left	10.45	0.40
12mm	＜ 1%	Right	10.50	0.33
12mm	＜ 1%	Front	10.42	0.35
12mm	＜ 1%	Rear	10.86	0.38
Limit			614	1.63
Margin Limit (%)			1.84%	31.29%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
12mm	＜ 50%	Top	10.35	0.54
12mm	＜ 50%	Bottom	9.47	0.37
12mm	＜ 50%	Left	9.88	0.45
12mm	＜ 50%	Right	9.73	0.49
12mm	＜ 50%	Front	9.88	0.49
12mm	＜ 50%	Rear	9.65	0.40
Limit			614	1.63
Margin Limit (%)			1.69%	33.13%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
12mm	＜ 99%	Top	10.37	0.45
12mm	＜ 99%	Bottom	10.09	0.32
12mm	＜ 99%	Left	10.12	0.32
12mm	＜ 99%	Right	10.27	0.36
12mm	＜ 99%	Front	10.29	0.35
12mm	＜ 99%	Rear	10.37	0.40
Limit			614	1.63
Margin Limit (%)			1.69%	27.61%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
14mm	＜ 1%	Top	10.63	0.49
14mm	＜ 1%	Bottom	9.61	0.35
14mm	＜ 1%	Left	10.12	0.39
14mm	＜ 1%	Right	10.15	0.29
14mm	＜ 1%	Front	10.14	0.41
14mm	＜ 1%	Rear	10.05	0.35
Limit			614	1.63
Margin Limit (%)			1.73%	30.06%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
14mm	＜ 50%	Top	10.06	0.46
14mm	＜ 50%	Bottom	9.47	0.41
14mm	＜ 50%	Left	9.56	0.33
14mm	＜ 50%	Right	9.36	0.39
14mm	＜ 50%	Front	9.51	0.36
14mm	＜ 50%	Rear	9.73	0.35
Limit			614	1.63
Margin Limit (%)			1.64%	28.22%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
14mm	＜ 99%	Top	9.84	0.29
14mm	＜ 99%	Bottom	9.73	0.23
14mm	＜ 99%	Left	9.73	0.21
14mm	＜ 99%	Right	9.94	0.13
14mm	＜ 99%	Front	9.79	0.16
14mm	＜ 99%	Rear	9.76	0.22
Limit			614	1.63
Margin Limit (%)			1.62%	17.79%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
16mm	＜ 1%	Top	9.77	0.51
16mm	＜ 1%	Bottom	9.06	0.42
16mm	＜ 1%	Left	9.52	0.41
16mm	＜ 1%	Right	9.31	0.43
16mm	＜ 1%	Front	9.25	0.45
16mm	＜ 1%	Rear	9.17	0.41
Limit			614	1.63
Margin Limit (%)			1.59%	31.29%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
16mm	＜ 50%	Top	8.91	0.50
16mm	＜ 50%	Bottom	7.89	0.35
16mm	＜ 50%	Left	7.98	0.45
16mm	＜ 50%	Right	8.14	0.36
16mm	＜ 50%	Front	8.43	0.42
16mm	＜ 50%	Rear	8.65	0.38
Limit			614	1.63
Margin Limit (%)			1.45%	30.67%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
16mm	＜ 99%	Top	9.02	0.45
16mm	＜ 99%	Bottom	8.81	0.33
16mm	＜ 99%	Left	8.99	0.36
16mm	＜ 99%	Right	8.96	0.30
16mm	＜ 99%	Front	9.07	0.29
16mm	＜ 99%	Rear	8.96	0.33
Limit			614	1.63
Margin Limit (%)			1.48%	27.61%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
18mm	＜ 1%	Top	9.01	0.48
18mm	＜ 1%	Bottom	7.94	0.45
18mm	＜ 1%	Left	8.57	0.40
18mm	＜ 1%	Right	8.38	0.33
18mm	＜ 1%	Front	8.50	0.36
18mm	＜ 1%	Rear	8.55	0.38
Limit			614	1.63
Margin Limit (%)			1.47%	29.45%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
18mm	＜ 50%	Top	7.86	0.53
18mm	＜ 50%	Bottom	6.76	0.39
18mm	＜ 50%	Left	7.17	0.45
18mm	＜ 50%	Right	7.13	0.39
18mm	＜ 50%	Front	7.01	0.48
18mm	＜ 50%	Rear	7.13	0.46
Limit			614	1.63
Margin Limit (%)			1.28%	32.52%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
18mm	＜ 99%	Top	8.08	0.35
18mm	＜ 99%	Bottom	7.63	0.27
18mm	＜ 99%	Left	7.87	0.29
18mm	＜ 99%	Right	7.85	0.24
18mm	＜ 99%	Front	8.23	0.34
18mm	＜ 99%	Rear	8.15	0.18
Limit			614	1.63
Margin Limit (%)			1.34%	21.47%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
20mm	＜ 1%	Top	8.43	0.45
20mm	＜ 1%	Bottom	7.72	0.40
20mm	＜ 1%	Left	7.68	0.36
20mm	＜ 1%	Right	7.82	0.37
20mm	＜ 1%	Front	8.18	0.40
20mm	＜ 1%	Rear	7.80	0.32
Limit			614	1.63
Margin Limit (%)			1.37%	27.61%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
20mm	＜ 50%	Top	8.02	0.48
20mm	＜ 50%	Bottom	7.03	0.33
20mm	＜ 50%	Left	7.51	0.41
20mm	＜ 50%	Right	7.60	0.44
20mm	＜ 50%	Front	7.29	0.37
20mm	＜ 50%	Rear	7.55	0.30
Limit			614	1.63
Margin Limit (%)			1.31%	29.45%

MPE				
Test distance	Battery levels	Probe from EUT Side	E-field (V/m)	H-field (A/m)
20mm	＜ 99%	Top	8.01	0.36
20mm	＜ 99%	Bottom	7.58	0.30
20mm	＜ 99%	Left	7.89	0.26
20mm	＜ 99%	Right	7.91	0.26
20mm	＜ 99%	Front	8.15	0.20
20mm	＜ 99%	Rear	8.04	0.20
Limit			614	1.63
Margin Limit (%)			1.33%	22.09%

10 Test Setup photo

0mm-Botton

0mm-Front

0mm-Left

0mm-Rear

0mm-Right

0mm-Top

End of report