

# MPE TEST REPORT

## OF

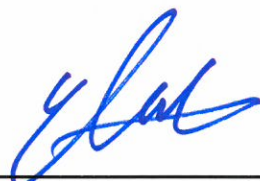
FCC CFR 47 part 1, 1.1307(b), 1.1310

FCC ID: A3LEP-PN915IWU  
IC Certification: 649E-EPPN915IWU

Equipment Under Test : S CHARGER PAD WIDE  
Model Name : EP-PN915IWU  
Applicant : Samsung Electronics Co., Ltd.  
Manufacturer : Samsung Electronics Co., Ltd.  
Date of Test(s) : 2014.09.04 ~ 2014.09.23  
Date of Issue : 2014.09.23

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Harim Lee

Date:

2014.09.23

Approved By:



Hyunchae You

Date:

2014.09.23

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## 1. General information

### 1.1. Testing laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- Wireless Div. 2FL, 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 435-837

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

Phone No. : +82 31 688 0901

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### 1.2. Details of applicant

Applicant : Samsung Electronics Co., Ltd.

Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Republic of Korea

Contact Person : Kim, Jae Man

Phone No. : +82 31 301 6864

### 1.3. Description of EUT

|                      |                             |
|----------------------|-----------------------------|
| Kind of Product      | S CHARGER PAD WIDE          |
| Model Name           | EP-HN915IWU                 |
| Power Supply         | DC 5 V                      |
| Frequency Range      | 115 kHz ~ 205 kHz           |
| Operating Conditions | -20 °C ~ 50 °C              |
| Antenna Type         | Inductive loop coil antenna |

### 1.4. Declarations by the manufacturer

- Operation temperature: -20 °C ~ 50 °C

### 1.5. Test report revision

| Revision | Report number        | Date of Issue | Description |
|----------|----------------------|---------------|-------------|
| 0        | F690501/RF-RTL008050 | 2014.09.23    | Initial     |

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## 1.6. Test Equipment List

| Equipment            | Manufacturer                   | Model                                | S/N           | Cal Date      | Cal Interval | Cal Due.      |
|----------------------|--------------------------------|--------------------------------------|---------------|---------------|--------------|---------------|
| Spectrum Analyzer    | R&S                            | FSV30                                | 100768        | Mar. 27, 2014 | Annual       | Mar. 27, 2015 |
| Loop Antenna         | Schwarzbeck<br>Mess-Elektronik | FMZB 1519                            | 1519-039      | Jul. 29, 2013 | Biennial     | Jul. 29, 2015 |
| DC Power Supply      | Agilent                        | U8002A                               | MY48490027    | Jan. 03, 2014 | Annual       | Jan. 03, 2015 |
| E-Field Probe        | D.A.R.E!!<br>Instruments       | RadiSense 4                          | 13I00444SNO04 | Apr. 29, 2014 | Annual       | Apr. 29, 2015 |
| B-Field Probe        | Narda                          | BN 2300/90.10                        | J-0025        | Jan. 28, 2014 | Annual       | Jan. 28, 2015 |
| Exposure Level Meter | Narda                          | ELT-400                              | J-0015        | Jan. 28, 2014 | Annual       | Jan. 28, 2015 |
| Anechoic Chamber     | SY Corporation                 | L × W × H<br>(9.6 m × 6.4 m × 6.6 m) | N/A           | N.C.R.        | N/A          | N.C.R.        |
| Mobile Test Unit     | R&S                            | CMW500                               | 144035        | Mar. 03, 2014 | Annual       | Mar. 03, 2015 |

## 1.7. Worst case of test configurations

In order to check all kinds of possible configurations, EUT was evaluated with appropriate client and under each charging condition as below table.

| EUT configuration                                                          | Charging current (mA) | Mobile phone | Description                    |
|----------------------------------------------------------------------------|-----------------------|--------------|--------------------------------|
| Charging Mode <sup>1)</sup><br>with resistive load                         | 145                   |              | Maximum resistive load         |
|                                                                            | 350                   |              | Medium resistive load          |
|                                                                            | 645                   |              | Minimum resistive load         |
| Charging Mode <sup>2)</sup><br>with client device<br>(FCC ID : A3LSPHL720) |                       | SPH-L720     | Less than 1 % of battery       |
|                                                                            |                       | SPH-L720     | Less than 50 % of battery      |
|                                                                            |                       | SPH-L720     | 100 % full charging of battery |

1) Test Jig was used during the test to satisfy each current status by using resistive loads.

Output voltage = 5 V, Output current = 145 mA / 350 mA / 645 mA

- (Maximum load)  $34.48 \Omega = 5 \text{ V} / 0.145 \text{ A}$
- (Medium load)  $14.29 \Omega = 5 \text{ V} / 0.350 \text{ A}$
- (Minimum load)  $7.75 \Omega = 5 \text{ V} / 0.645 \text{ A}$

2) WPC device with client device was investigated each battery status and compared in two operating configurations.

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Battery status during charging condition :

- Less than 1 % of battery
- Less than 50 % of battery
- 100 % of battery

Galaxy S4 (SPH-L720)



Plot#1 – less than 1 % of battery

Plot#2 – less than 50 % of battery

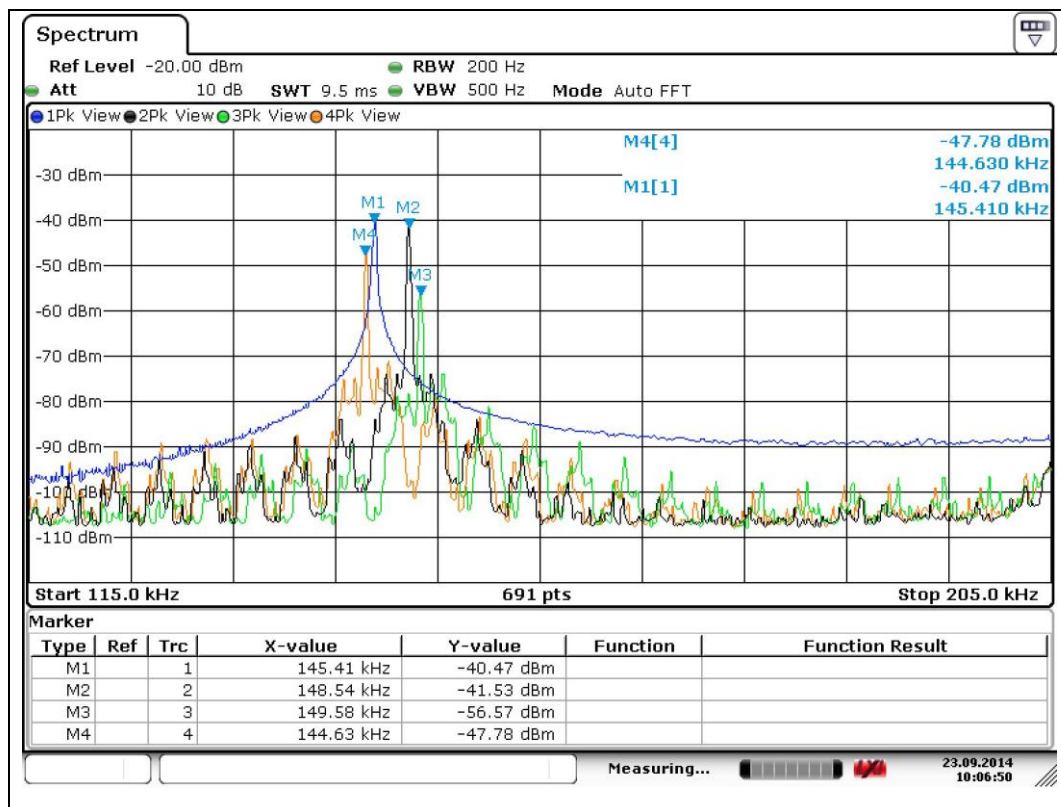
Plot#3 – 100 % of battery

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## Operating configurations :

### Galaxy S4 (SPH-L720)

- While the client device was in airplane mode (Trace#1 "M2")
- While the client device was connected to an active data connection (Trace#2 "M4")  
The device was tested under all modes and bands like 2G and 3G.  
In the result, **GSM1 900 / GPRS / 1 TX** was found in **Low channel**.
- While the wireless charger is charging without the client device. (Trace#3 "M1")
- While the wireless charger is charging with the client device turned off. (Trace#4 "M3")



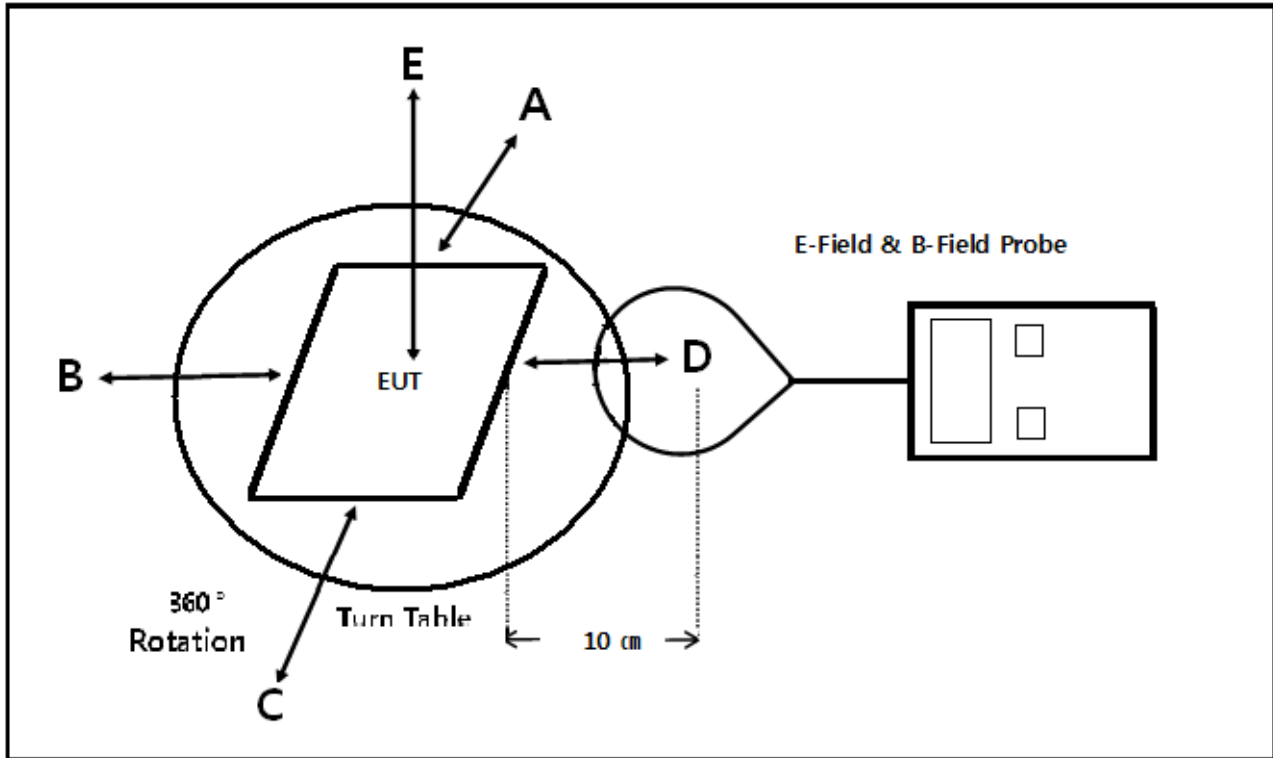
Plot – fundamental emission comparison

- The level of Trace#2 was more than Trace#1, 3 and 4 so Trace#2 was selected.
- Trace#2 as **GSM1 900 / GPRS / 1 TX** which was found in **Low channel** should be tested with the client device as a worst case.

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## 2. Test Result

### 2.1. Test Setup



### 2.2. Measurement procedure

- The RF exposure test was performed on 360 degree turn table in anechoic chamber.
- The measurement probe was placed at test distance (10 cm) which is between the edge of the charger and the geometric center of probe.
- The turn table was rotated 360 degree to search of highest strength
- the highest emission level was recorded and compared with limit as soon as measurement of each points (A, B, C, D, E) were completed.
- The EUT were measured according to the dictates of KDB 680106 D01v02.

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### 2.3. Equipment Approval Considerations.

The EUT does comply with item 5.2 of KDB 680106 D01v02.

a) Power transfer frequency is less than 1 MHz.

- The device operate in the frequency range from 115 kHz to 205 kHz.

b) Output power from each primary coil is less than 5 watts.

- The maximum field strength of fundamental : 83.30 dB $\mu$ V/m at 3 m. The EIRP calculation is reference to KDB 789033.

$$* \text{EIRP[dB m]} = E[\text{dB}\mu\text{V/m}] + 20\log(d[\text{meters}]) - 104.77 - 4.8 \text{ dB, } d = 3 \text{ m}$$

$$* 83.30 \text{ dB}\mu\text{V/m} - 95.23 - 4.80 = -16.73 \text{ dB m EIRP.}$$

$$* \text{The output power from primary coil is } 0.021 \text{ mW.}$$

c) The transfer system includes only single primary and secondary coils. This includes charging systems that may have multiple primary coils and clients that are able to detect and allow coupling only between individual pairs of coils.

- The transfer system includes only single primary and secondary coils.

d) Client device is inserted in or placed directly in contact with the transmitter.

- Client device is placed directly in contact with the transmitter.
- Refer to an Internal Photo.

e) The maximum coupling surface area of the transmit (charging) device:

- The EUT coupling surface area : 9.0 cm(W)  $\times$  16.5 cm(H) = 148.5 cm<sup>2</sup>, 60 cm<sup>2</sup> < 148.5 cm<sup>2</sup> < 400 cm<sup>2</sup>

f) Aggregate leakage fields at 10 cm surrounding the device from all simultaneous transmitting coils are demonstrated to be less than 30 % of the MPE limit.

- The EUT field strength levels are 30 %  $\times$  MPE limit < Level < MPE limit. Refer to following test results.  
0.489 A/m < 1.30 A/m (max.) < 1.63 A/m.

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## 2.4. Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

§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 - LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

| Frequency Range (MHz)                                   | Electric Field Strength(V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Average Time (minutes) |
|---------------------------------------------------------|------------------------------|-------------------------------|-------------------------------------|------------------------|
| (A) Limits for Occupational /Control Exposures          |                              |                               |                                     |                        |
| 0.3 – 3.0                                               | 614                          | 1.63                          | *(100)                              | 6                      |
| 3.0 – 30                                                | 1842/f                       | 4.89/f                        | *(900/f <sup>2</sup> )              | 6                      |
| 30 – 300                                                | 61.4                         | 0.163                         | 1.0                                 | 6                      |
| 300 – 1 500                                             |                              |                               | f/300                               | 6                      |
| 1 500 – 100 000                                         |                              |                               | 5                                   | 6                      |
| (B) Limits for General Population / Uncontrol Exposures |                              |                               |                                     |                        |
| <b><u>0.3 – 1.34</u></b>                                | <b><u>614</u></b>            | <b><u>1.63</u></b>            | *(100)                              | 30                     |
| 1.34 – 30                                               | 824/f                        | 2.19/f                        | *(180/f <sup>2</sup> )              | 30                     |
| 30 – 300                                                | 27.5                         | 0.073                         | 0.2                                 | 30                     |
| 300 – 1 500                                             |                              |                               | f/1 500                             | 30                     |
| 1 500 – 100 000                                         |                              |                               | 1.0                                 | 30                     |

f = frequency in MHz

\* = Plane wave equivalent power density

Note 1 to Table 1: Occupational/controlled 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. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

Note 2 to Table 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

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## 2.5. E and H field strength

Ambient temperature :  $(24 \pm 1) ^\circ\text{C}$

Relative humidity : 47 % R.H.

Test Mode : Charging mode with resistive loads

### 2.5.1. E-Field Strength at 10 cm from the edges surrounding the EUT

Test condition: Charging mode with resistive load (145 mA status)

| Frequency Range (kHz) | Probe Position A (V/m) | Probe Position B (V/m) | Probe Position C (V/m) | Probe Position D (V/m) | Probe Position E (V/m) | Limits (V/m) |
|-----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--------------|
| 115 ~ 205             | 13.66                  | 5.25                   | 1.22                   | 5.08                   | 10.05                  | 614.00       |

### 2.5.2. E-Field Strength at 10 cm from the edges surrounding the EUT

Test condition: Charging mode with resistive load (350 mA status)

| Frequency Range (kHz) | Probe Position A (V/m) | Probe Position B (V/m) | Probe Position C (V/m) | Probe Position D (V/m) | Probe Position E (V/m) | Limits (V/m) |
|-----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--------------|
| 115 ~ 205             | 13.98                  | 5.21                   | 1.25                   | 5.40                   | 12.82                  | 614.00       |

### 2.5.3. E-Field Strength at 10 cm from the edges surrounding the EUT

Test condition: Charging mode with resistive load (645 mA status)

| Frequency Range (kHz) | Probe Position A (V/m) | Probe Position B (V/m) | Probe Position C (V/m) | Probe Position D (V/m) | Probe Position E (V/m) | Limits (V/m) |
|-----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--------------|
| 115 ~ 205             | 12.32                  | 5.63                   | 0.53                   | 5.11                   | 9.63                   | 614.00       |

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Test Mode : Charging mode with client device \_Galaxy S4(SPH-L720)

#### 2.5.4. E-Field Strength at 10 cm from the edges surrounding the EUT

Test condition: Charging mode with client (less than 1 % battery status)

| Frequency Range (kHz) | Probe Position A (V/m) | Probe Position B (V/m) | Probe Position C (V/m) | Probe Position D (V/m) | Probe Position E (V/m) | Limits (V/m) |
|-----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--------------|
| 115 ~ 205             | 13.26                  | 8.01                   | 8.96                   | 8.75                   | 12.23                  | 614.00       |

#### 2.5.5. E-Field Strength at 10 cm from the edges surrounding the EUT

Test condition: Charging mode with client (less than 50 % battery status)

| Frequency Range (kHz) | Probe Position A (V/m) | Probe Position B (V/m) | Probe Position C (V/m) | Probe Position D (V/m) | Probe Position E (V/m) | Limits (V/m) |
|-----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--------------|
| 115 ~ 205             | 13.12                  | 7.99                   | 8.68                   | 8.62                   | 11.93                  | 614.00       |

#### 2.5.6. E-Field Strength at 10 cm from the edges surrounding the EUT

Test condition: Charging mode with client (100 % battery status)

| Frequency Range (kHz) | Probe Position A (V/m) | Probe Position B (V/m) | Probe Position C (V/m) | Probe Position D (V/m) | Probe Position E (V/m) | Limits (V/m) |
|-----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--------------|
| 115 ~ 205             | 13.00                  | 7.63                   | 6.32                   | 8.12                   | 10.68                  | 614.00       |

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Test Mode : Charging mode with resistive loads

### 2.5.7. H-Field Strength at 10 cm from the edges surrounding the EUT

Test condition: Charging mode with resistive load (145 mA status)

| Frequency Range (kHz) | Probe Position A (A/m) | Probe Position B (A/m) | Probe Position C (A/m) | Probe Position D (A/m) | Probe Position E (A/m) | Limits (A/m) |
|-----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--------------|
| 115 ~ 205             | 0.13                   | 0.18                   | 0.16                   | 0.29                   | 1.07                   | 1.63         |

### 2.5.8. H-Field Strength at 10 cm from the edges surrounding the EUT

Test condition: Charging mode with resistive load (350 mA status)

| Frequency Range (kHz) | Probe Position A (A/m) | Probe Position B (A/m) | Probe Position C (A/m) | Probe Position D (A/m) | Probe Position E (A/m) | Limits (A/m) |
|-----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--------------|
| 115 ~ 205             | 0.14                   | 0.18                   | 0.16                   | 0.20                   | 0.98                   | 1.63         |

### 2.5.9. H-Field Strength at 10 cm from the edges surrounding the EUT

Test condition: Charging mode with resistive load (645 mA status)

| Frequency Range (kHz) | Probe Position A (A/m) | Probe Position B (A/m) | Probe Position C (A/m) | Probe Position D (A/m) | Probe Position E (A/m) | Limits (A/m) |
|-----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--------------|
| 115 ~ 205             | 0.13                   | 0.22                   | 0.14                   | 0.22                   | 1.30                   | 1.63         |

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Test Mode : Charging mode with client device \_Galaxy S4(SPH-L720)

#### 2.5.10. H-Field Strength at 10 cm from the edges surrounding the EUT

Test condition: Charging mode with client (less than 1 % battery status)

| Frequency Range (kHz) | Probe Position A (A/m) | Probe Position B (A/m) | Probe Position C (A/m) | Probe Position D (A/m) | Probe Position E (A/m) | Limits (A/m) |
|-----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--------------|
| 115 ~ 205             | 0.06                   | 0.10                   | 0.05                   | 0.10                   | 0.20                   | 1.63         |

#### 2.5.11. H-Field Strength at 10 cm from the edges surrounding the EUT

Test condition: Charging mode with client (less than 50 % battery status)

| Frequency Range (kHz) | Probe Position A (A/m) | Probe Position B (A/m) | Probe Position C (A/m) | Probe Position D (A/m) | Probe Position E (A/m) | Limits (A/m) |
|-----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--------------|
| 115 ~ 205             | 0.06                   | 0.09                   | 0.04                   | 0.09                   | 0.18                   | 1.63         |

#### 2.5.12. H-Field Strength at 10 cm from the edges surrounding the EUT

Test condition: Charging mode with client (100 % battery status)

| Frequency Range (kHz) | Probe Position A (A/m) | Probe Position B (A/m) | Probe Position C (A/m) | Probe Position D (A/m) | Probe Position E (A/m) | Limits (A/m) |
|-----------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--------------|
| 115 ~ 205             | 0.06                   | 0.07                   | 0.05                   | 0.10                   | 0.14                   | 1.63         |

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