

# TEST REPORT

of

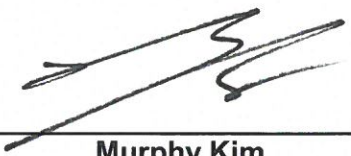
FCC Part 15 Subpart C §15.209

FCC ID: OSLOKA-211W

Equipment Under Test : UNIT ASSY - WIRELESS CHARGING  
Model Name : OKA-211W  
Variant Model Name : OKA-213W  
Applicant : Omron Automotive Electronics Korea Co., Ltd.  
Manufacturer : Omron Automotive Electronics Korea Co., Ltd.  
Date of Receipt : 2019.05.07  
Date of Test(s) : 2019.07.01 ~ 2019.07.29  
Date of Issue : 2019.08.19

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

Tested By:

  
\_\_\_\_\_  
Murphy Kim

Date:

2019.08.19

Technical  
Manager:

  
\_\_\_\_\_  
Jungmin Yang

Date:

2019.08.19

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RTT5041-19(2019.04.24)(1)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

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## 1. General Information

### 1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- Designation number: KR0150

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Phone No. : +82 31 688 0901

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### 1.2. Details of Applicant

Applicant : Omron Automotive Electronics Korea Co., Ltd.

Address : 790-12, Bogaewonsam-ro, Bogae-myeon, Anseong-si, Gyeonggi-do, South Korea, 17507

Contact Person : Nam, Sang-Il

Phone No. : +82 2 850 5789

### 1.3. Details of Manufacturer

Company : Same as applicant

Address : Same as applicant

### 1.4. Description of EUT

|                    |                               |
|--------------------|-------------------------------|
| Kind of Product    | UNIT ASSY - WIRELESS CHARGING |
| Model Name         | OKA-211W                      |
| Variant Model Name | OKA-213W                      |
| Power Supply       | DC 12.0 V                     |
| Frequency Range    | 112 kHz                       |
| Antenna Type       | Inductive loop coil antenna   |

### 1.5. Declaration by the Manufacturer

- The EUT has 3 loop coil antennas with one amplifier, and only one antenna can transmit at once.

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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                                | 103210                    | Dec. 05, 2018 | Annual        | Dec. 05, 2019 |
| Signal Generator  | R&S                         | SMBV100A                             | 259067                    | Jun. 10, 2019 | Annual        | Jun. 10, 2020 |
| Test Receiver     | R&S                         | ESU26                                | 100109                    | Jan. 31, 2019 | Annual        | Jan. 31, 2020 |
| Amplifier         | H.P.                        | 8447F                                | 2944A03909                | Aug. 07, 2018 | Annual        | Aug. 07, 2019 |
| Loop Antenna      | Schwarzbeck Mess-Elektronik | FMZB 1519                            | 1519-039                  | Aug. 23, 2017 | Biennial      | Aug. 23, 2019 |
| Bilog Antenna     | Schwarzbeck Mess-Elektronik | VULB9163                             | 01126                     | Mar. 26, 2018 | Biennial      | Mar. 26, 2020 |
| Antenna Master    | Innco systems GmbH          | MA4640-XP-ET                         | MA4640/536/3<br>8330516/L | N.C.R.        | N/A           | N.C.R.        |
| Turn Table        | Innco systems GmbH          | DS 1200 S                            | N/A                       | N.C.R.        | N/A           | N.C.R.        |
| Controller        | Innco systems GmbH          | CONTROLLER<br>CO3000-4P              | CO3000/963/3<br>8330516/L | N.C.R.        | N/A           | N.C.R.        |
| 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.        |
| Coaxial Cable     | SUCOFLEX                    | 104 (3 m)                            | MY3258414                 | Jul. 04, 2019 | Semi-annual   | Jan. 04, 2020 |
| Coaxial Cable     | SUCOFLEX                    | 104 (10 m)                           | MY3145814                 | Jul. 04, 2019 | Semi-annual   | Jan. 04, 2020 |

### ► Support Equipment

| Description          | Manufacturer                  | Model    | FCC ID     |
|----------------------|-------------------------------|----------|------------|
| Samsung Mobile Phone | Samsung Electronics Co., Ltd. | SM-G955N | A3LSMG955N |

## 1.7. Sample Calculation

Where relevant, the following sample calculation is provided:

Field strength level (dB $\mu$ V/m) = Measured level (dB $\mu$ V) + Antenna factor (dB) + Cable loss (dB)

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## 1.8. Worst Case of Test Configurations

| EUT Configuration                                                               | Description     |
|---------------------------------------------------------------------------------|-----------------|
| Charging Mode<br>With Client Device<br>(Model: SM-G955N,<br>FCC ID: A3LSMG955N) | 1 % of battery  |
|                                                                                 | 50 % of battery |
|                                                                                 | 99 % of battery |

### Note;

EUT was investigated with client device under normal charging condition as above then worst value was only reported.

## 1.9. Summary of Test Result

The EUT has been tested according to the following specification:

| APPLIED STANDARD: FCC Part 15 Subpart C |                                                                        |          |
|-----------------------------------------|------------------------------------------------------------------------|----------|
| Section                                 | Test Item                                                              | Result   |
| 15.209                                  | Radiated emission, Spurious Emission and Field Strength of Fundamental | Complied |
| 2.1049                                  | 20 dB Bandwidth                                                        | Complied |

## 1.10. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| Parameter                             | Uncertainty    |
|---------------------------------------|----------------|
| Occupied Bandwidth                    | $\pm 9.66$ kHz |
| Radiated Disturbance, 9 kHz to 30 MHz | $\pm 3.59$ dB  |
| Radiated Disturbance, below 1 GHz     | $\pm 5.88$ dB  |

Uncertainty figures are valid to a confidence level of 95 %.

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### 1.11. Test Report Revision

| Revision | Report Number          | Date of Issue | Description                               |
|----------|------------------------|---------------|-------------------------------------------|
| 0        | F690501/RF-RTL014157   | 2019.08.01    | Initial                                   |
| 1        | F690501/RF-RTL014157-1 | 2019.08.19    | Revised the spurious emission test result |

### 1.12. Information of Variant Model

| Model Name    |          | Description                                  |
|---------------|----------|----------------------------------------------|
| Basic Model   | OKA-211W | - Basic model                                |
| Variant Model | OKA-213W | - Same to basic model except the cover case. |

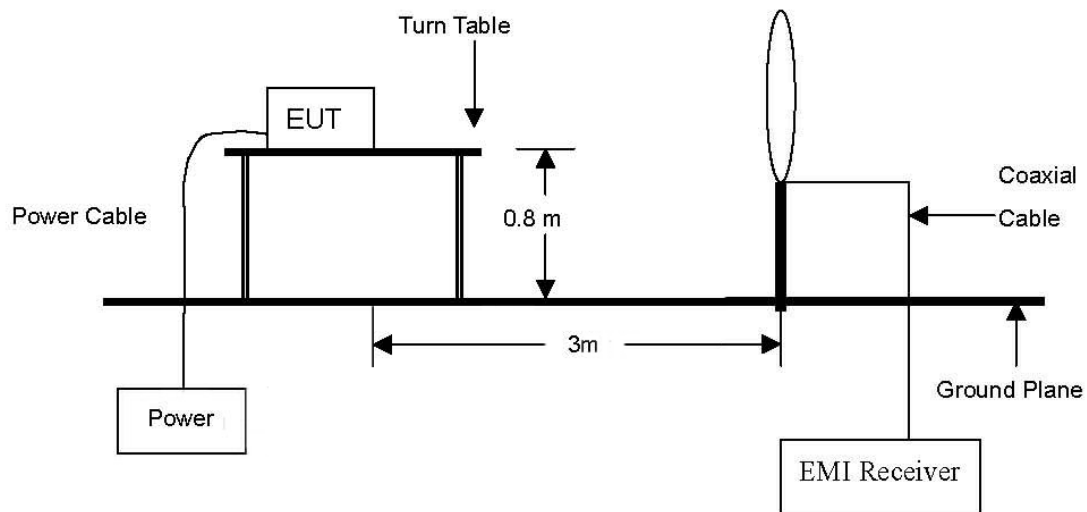
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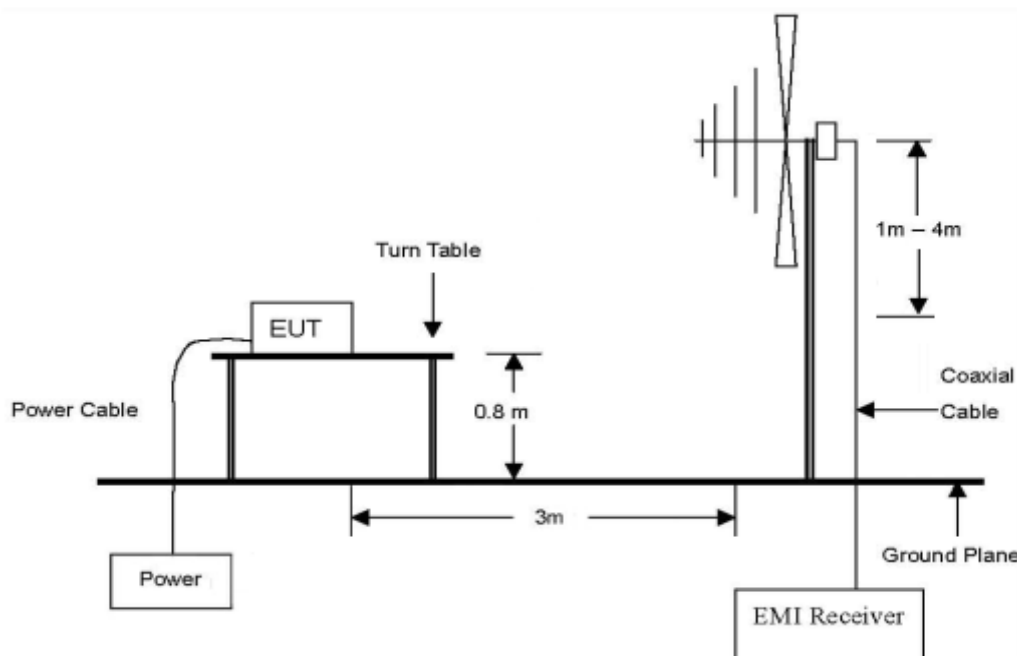
## 2. Field Strength of Fundamental and Spurious Emission

### 2.1. Test Setup

The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz.



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## 2.2. Limit

### 2.2.1. Radiated emission limits, general requirements

According to §15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency<br>(MHz) | Field Strength<br>(microvolts/meter) | Measurement Distance<br>(meter) |
|--------------------|--------------------------------------|---------------------------------|
| 0.009-0.490        | 2 400/F(kHz)                         | 300                             |
| 0.490-1.705        | 24 000/F(kHz)                        | 30                              |
| 1.705-30.0         | 30                                   | 30                              |
| 30-88              | 100**                                | 3                               |
| 88-216             | 150**                                | 3                               |
| 216-960            | 200**                                | 3                               |
| Above 960          | 500                                  | 3                               |

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. however, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

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## 2.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.10:2013.

### 2.3.1. Test Procedures for emission from 9 kHz to 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
- c. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- d. The test-receiver system was set to Quasi Peak and Average Detect Function and Specified Bandwidth with Maximum Hold Mode.

### 2.3.2. Test Procedures for emission from 30 MHz to 1 000 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

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## 2.4. Field Strength of Fundamental Test Result

Ambient temperature : (23 ± 1) °C  
Relative humidity : 47 % R.H.

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

### Test Condition: Operating Mode with Client Device (1 % Battery Status of Client Device)

| Radiated Emissions |                |             | Ant. | Correction Factors |            | Total                  |                          | Limit                   |             |
|--------------------|----------------|-------------|------|--------------------|------------|------------------------|--------------------------|-------------------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | Ant. (dB/m)        | Cable (dB) | Actual (dBμV/m) at 3 m | Actual (dBμV/m) at 300 m | Limit (dBμV/m) at 300 m | Margin (dB) |
| Ant. 1             |                |             |      |                    |            |                        |                          |                         |             |
| 0.112              | 70.62          | Average     | H    | 19.69              | 0.05       | 90.36                  | 10.36                    | 26.62                   | 16.26       |
| Ant. 2             |                |             |      |                    |            |                        |                          |                         |             |
| 0.112              | 68.80          | Average     | H    | 19.69              | 0.05       | 88.54                  | 8.54                     | 26.62                   | 18.08       |
| Ant. 3             |                |             |      |                    |            |                        |                          |                         |             |
| 0.112              | 69.10          | Average     | H    | 19.69              | 0.05       | 88.84                  | 8.84                     | 26.62                   | 17.78       |

### Remark;

- According to §15.31(f)(2),  
- 300 m Result (dBμV/m) = 3 m Result (dBμV/m) - 40log (300/3) (dBμV/m).
- According to field strength table of general requirement in §15.209(a), field strength limits below 1.705 MHz were calculated as below.  
- 9 kHz to 490 kHz: 20 log (2 400 / F (kHz)) at 300 m (dBμV/m)  
- 490 kHz to 1.705 MHz: 20log (24 000/F (kHz)) at 30 m (dBμV/m)
- According to §15.209(d), the measurements were tested by using Quasi peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1 GHz in these three bands on measurements employing an average detector.
- The limit above was calculated based on table of §15.209(a).

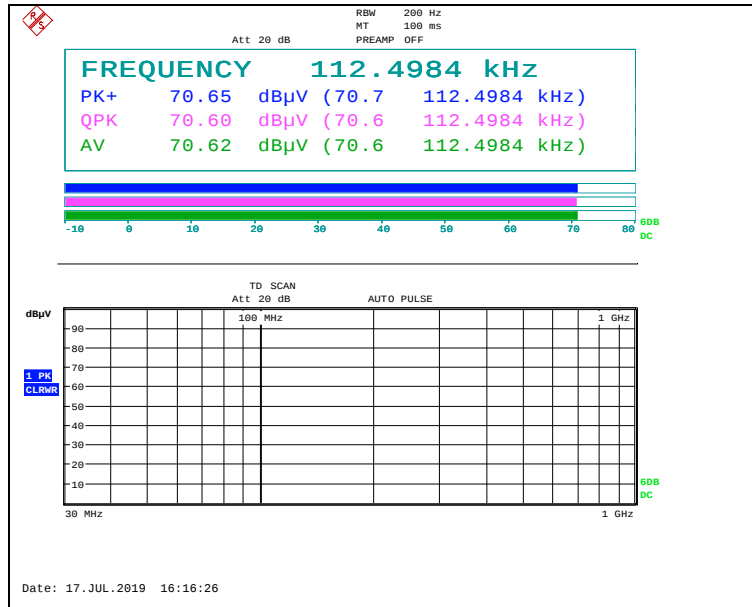
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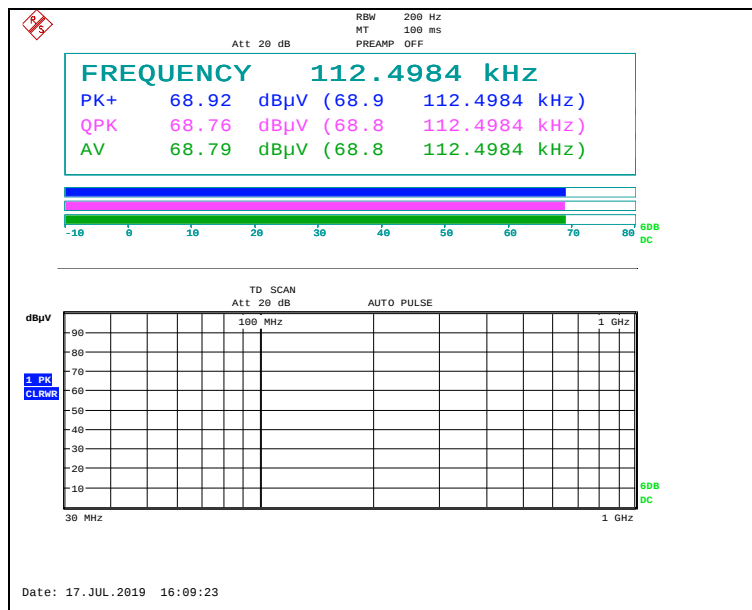
## - Test plots

Test Condition: Operating Mode with Client Device (1 % Battery Status of Client Device)

### Ant. 1



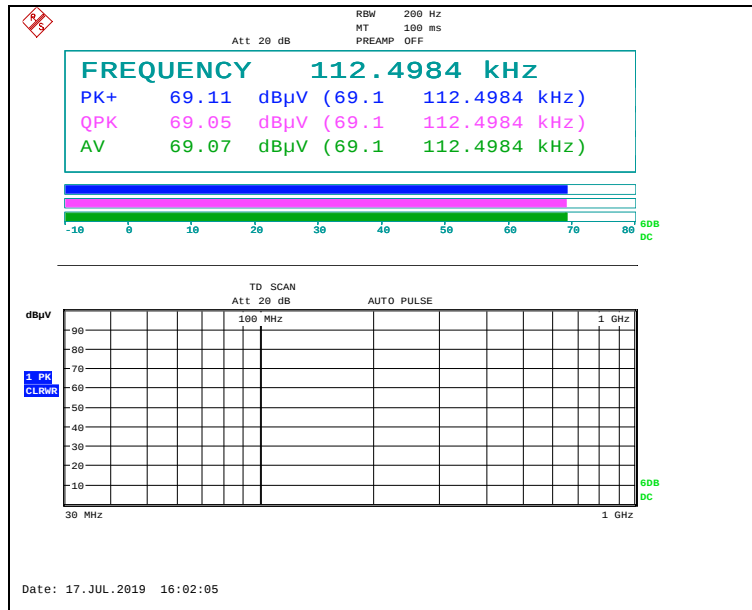
### Ant. 2



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## Ant. 3



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## 2.5. Spurious Emission Test Result

Ambient temperature : (23 ± 1) °C  
Relative humidity : 47 % R.H.

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

**Test Condition: Operating Mode with Client Device (1 % Battery Status of Client Device)**

**Ant. 1**

**Below 30 MHz**

| Radiated Emissions |                |             | Ant. | Correction Factors |         | Total                  |                                  | Limit                           |             |
|--------------------|----------------|-------------|------|--------------------|---------|------------------------|----------------------------------|---------------------------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | CL (dB) | Actual (dBμV/m) at 3 m | Actual (dBμV/m) at 300 m or 30 m | Limit (dBμV/m) at 300 m or 30 m | Margin (dB) |
| 0.019              | 25.60          | Average     | H    | 19.97              | 0.01    | 45.58                  | -34.42                           | 42.03                           | 76.45       |
| 0.049              | 25.80          | Average     | H    | 19.77              | 0.02    | 45.59                  | -34.41                           | 33.80                           | 68.21       |
| 0.084              | 11.00          | Average     | H    | 19.72              | 0.03    | 30.75                  | -49.25                           | 29.12                           | 78.37       |
| 0.339              | 29.70          | Average     | H    | 19.60              | 0.22    | 49.52                  | -30.48                           | 17.00                           | 47.48       |
| Above 1.000        | Not detected   | -           | -    | -                  | -       | -                      | -                                | -                               | -           |

**Above 30 MHz**

| Radiated Emissions |                |             | Ant  | Correction Factors |               | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|---------------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP + CL (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 264.94             | 35.40          | Peak        | H    | 18.50              | -25.18        | 28.72           | 46.00          | 17.28       |
| 275.77             | 34.20          | Peak        | H    | 18.72              | -25.27        | 27.65           | 46.00          | 18.35       |
| 307.50             | 33.20          | Peak        | H    | 19.25              | -25.04        | 27.41           | 46.00          | 18.59       |
| 365.30             | 32.30          | Peak        | H    | 20.31              | -24.79        | 27.82           | 46.00          | 18.18       |
| Above 400.00       | Not detected   | -           | -    | -                  | -             | -               | -              | -           |

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## Ant. 2

### Below 30 MHz

| Radiated Emissions |                      |             | Ant. | Correction Factors |         | Total                        |                                        | Limit                                 |             |
|--------------------|----------------------|-------------|------|--------------------|---------|------------------------------|----------------------------------------|---------------------------------------|-------------|
| Frequency (MHz)    | Reading (dB $\mu$ V) | Detect Mode | Pol. | AF (dB/m)          | CL (dB) | Actual (dB $\mu$ V/m) at 3 m | Actual (dB $\mu$ V/m) at 300 m or 30 m | Limit (dB $\mu$ V/m) at 300 m or 30 m | Margin (dB) |
| 0.018              | 24.60                | Average     | H    | 19.98              | 0.01    | 44.59                        | -35.41                                 | 42.50                                 | 77.91       |
| 0.067              | 17.00                | Average     | H    | 19.75              | 0.03    | 36.78                        | -43.22                                 | 31.08                                 | 74.30       |
| 0.084              | 13.40                | Average     | H    | 19.72              | 0.03    | 33.15                        | -46.85                                 | 29.12                                 | 75.97       |
| 0.338              | 35.50                | Average     | H    | 19.60              | 0.22    | 55.32                        | -24.68                                 | 17.03                                 | 41.71       |
| 0.564              | 27.70                | Quasi Peak  | H    | 19.61              | 0.35    | 47.66                        | 7.66                                   | 32.58                                 | 24.92       |
| Above 1.000        | Not detected         | -           | -    | -                  | -       | -                            | -                                      | -                                     | -           |

### Above 30 MHz

| Radiated Emissions |                      |             | Ant. | Correction Factors |               | Total                 | Limit                |             |
|--------------------|----------------------|-------------|------|--------------------|---------------|-----------------------|----------------------|-------------|
| Frequency (MHz)    | Reading (dB $\mu$ V) | Detect Mode | Pol. | AF (dB/m)          | AMP + CL (dB) | Actual (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) |
| 109.99             | 34.90                | Peak        | H    | 16.50              | -25.36        | 26.04                 | 43.50                | 17.46       |
| 128.98             | 37.40                | Peak        | V    | 14.60              | -25.38        | 26.62                 | 43.50                | 16.88       |
| 50.93              | 32.30                | Peak        | H    | 20.11              | -26.38        | 26.03                 | 40.00                | 13.97       |
| 226.43             | 34.40                | Peak        | H    | 17.63              | -25.24        | 26.79                 | 46.00                | 19.21       |
| 283.25             | 37.70                | Peak        | H    | 18.87              | -25.26        | 31.31                 | 46.00                | 14.69       |
| 352.04             | 34.20                | Peak        | H    | 20.98              | -25.08        | 30.10                 | 46.00                | 15.90       |
| Above 400.00       | Not detected         | -           | -    | -                  | -             | -                     | -                    | -           |

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### Ant. 3

#### Below 30 MHz

| Radiated Emissions |                      |             | Ant. | Correction Factors |         | Total                        |                                        | Limit                                 |             |
|--------------------|----------------------|-------------|------|--------------------|---------|------------------------------|----------------------------------------|---------------------------------------|-------------|
| Frequency (MHz)    | Reading (dB $\mu$ V) | Detect Mode | Pol. | AF (dB/m)          | CL (dB) | Actual (dB $\mu$ V/m) at 3 m | Actual (dB $\mu$ V/m) at 300 m or 30 m | Limit (dB $\mu$ V/m) at 300 m or 30 m | Margin (dB) |
| 0.020              | 23.10                | Average     | H    | 19.95              | 0.01    | 43.06                        | -36.94                                 | 41.58                                 | 78.52       |
| 0.070              | 14.90                | Average     | H    | 19.74              | 0.03    | 34.67                        | -45.33                                 | 30.70                                 | 76.03       |
| 0.098              | 15.00                | Quasi Peak  | H    | 19.70              | 0.04    | 34.74                        | -45.26                                 | 27.78                                 | 73.04       |
| 0.337              | 29.80                | Average     | H    | 19.60              | 0.22    | 49.62                        | -30.38                                 | 17.05                                 | 47.43       |
| Above 1.000        | Not detected         | -           | -    | -                  | -       | -                            | -                                      | -                                     | -           |

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### Above 30 MHz

| Radiated Emissions |                |             | Ant  | Correction Factors |               | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------|---------------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBμV) | Detect Mode | Pol. | AF (dB/m)          | AMP + CL (dB) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 226.51             | 34.10          | Peak        | H    | 17.63              | -25.24        | 26.49           | 46.00          | 19.51       |
| 252.90             | 33.80          | Peak        | H    | 18.32              | -25.24        | 26.88           | 46.00          | 19.12       |
| 277.03             | 34.50          | Peak        | H    | 18.74              | -25.29        | 27.95           | 46.00          | 18.05       |
| 305.80             | 33.40          | Peak        | H    | 19.22              | -25.08        | 27.54           | 46.00          | 18.46       |
| 352.32             | 32.90          | Peak        | H    | 20.96              | -25.07        | 28.79           | 46.00          | 17.21       |
| Above 400.00       | Not detected   | -           | -    | -                  | -             | -               | -              | -           |

### Remark;

- According to §15.31(f)(2)
  - 300 m Result (dBμV/m) = 3 m Result (dBμV/m) - 40log(300/3) (dBμV/m)
  - 30 m Result (dBμV/m) = 3 m Result (dBμV/m) - 40log(30/3) (dBμV/m)
- According to field strength table of general requirement in §15.209 (a), field strength limits below 1.705 MHz were calculated as below.
  - 9 kHz to 490 kHz: 20log (2 400 / F (kHz)) at 300 m (dBμV/m)
  - 490 kHz to 1.705 MHz: 20log (24 000 / F (kHz)) at 30 m (dBμV/m)
- According to §15.209(d), the measurements were tested by using Quasi peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1 GHz in these three bands on measurements employing an average detector.
- The limit above was calculated based on table of §15.209(a).

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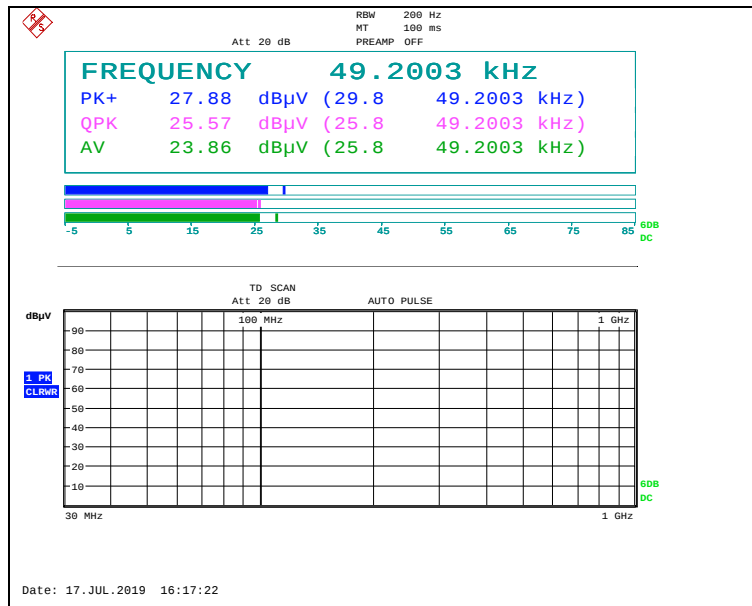
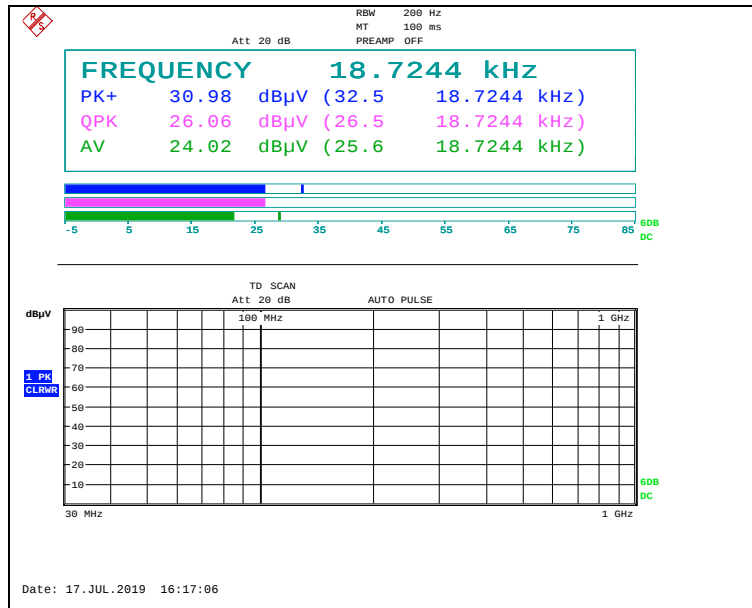
A4(210 mm x 297 mm)

## Test Condition: Operating Mode with Client Device (1 % Battery Status of Client Device)

### - Test plots

#### Ant. 1

#### Below 30 MHz



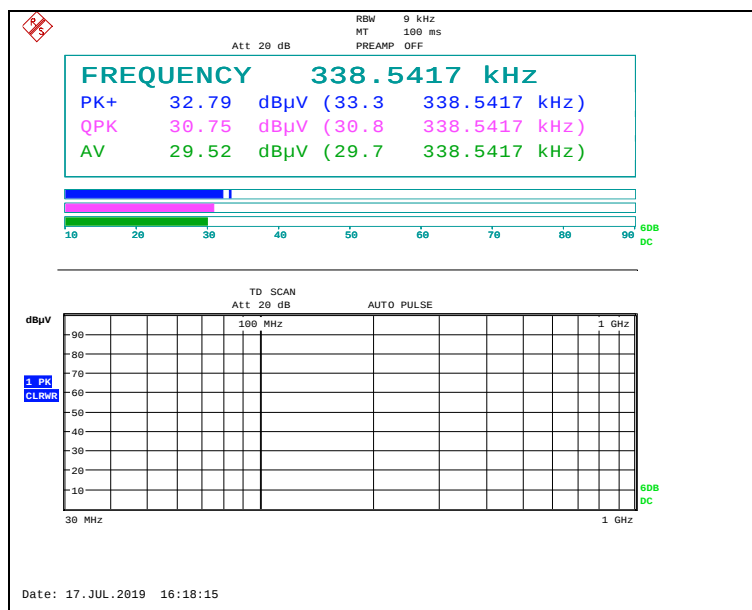
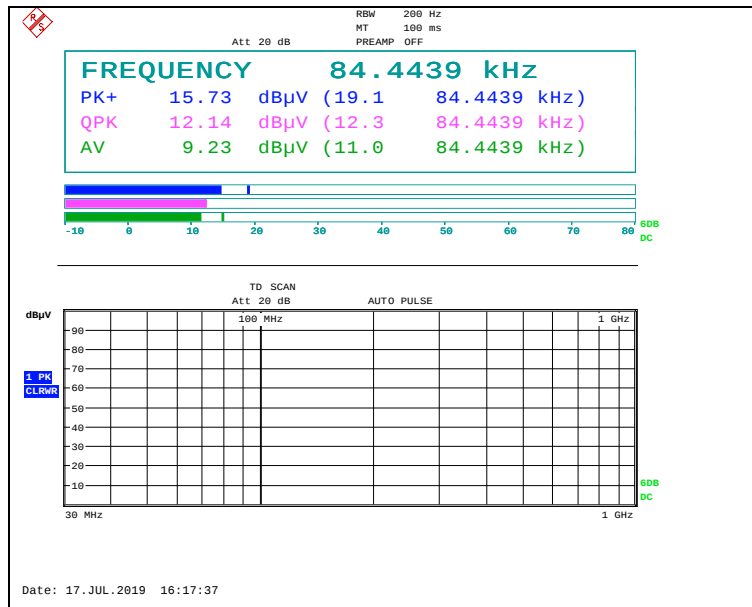
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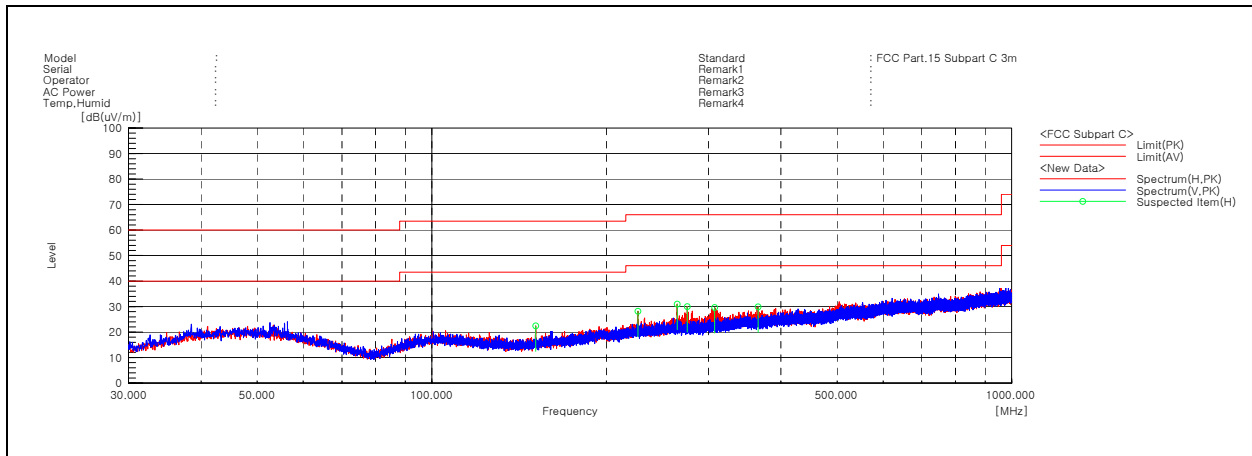
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## Above 30 MHz



## Remark;

- Traces shown in the plot were made by using a peak detector.

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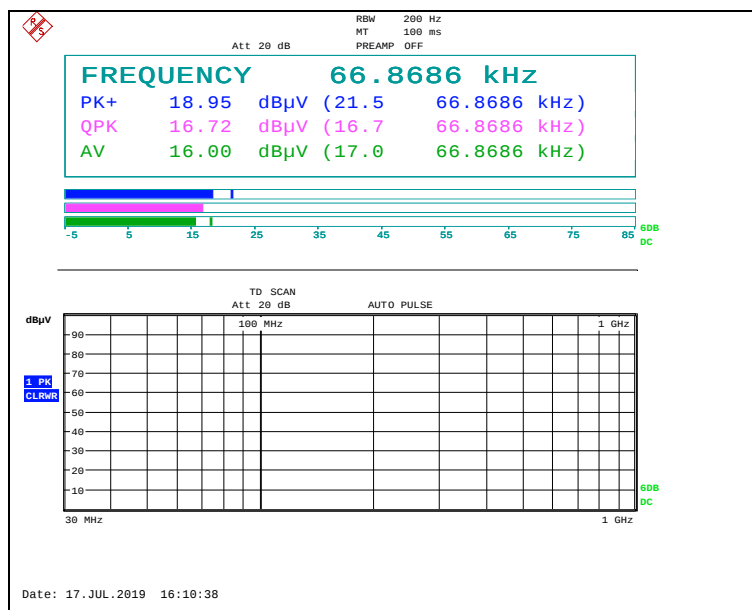
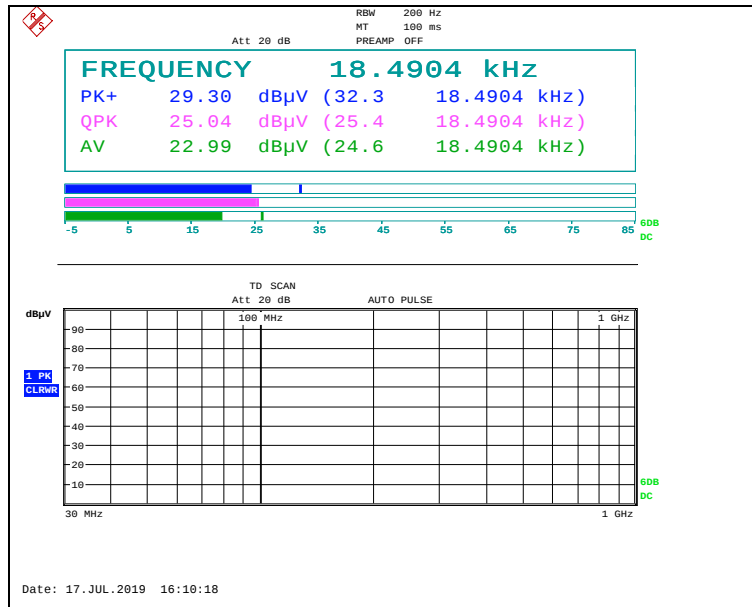
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## Ant. 2

Below 30 MHz



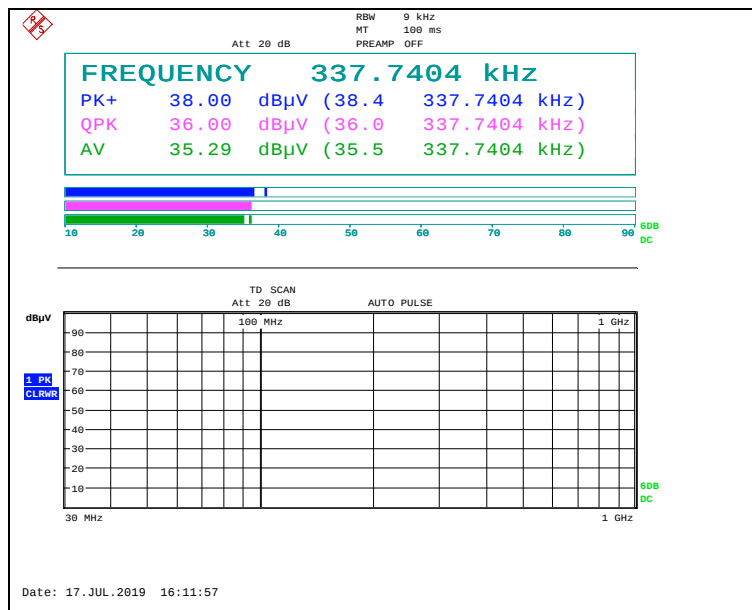
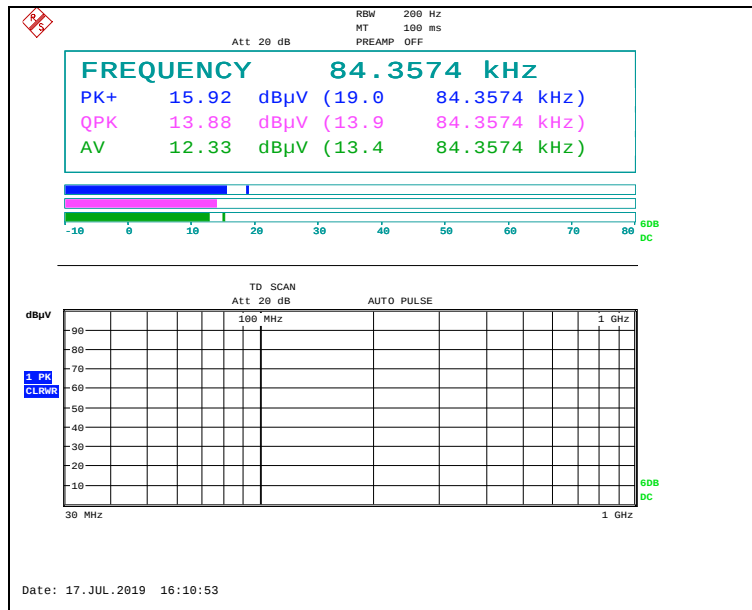
The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

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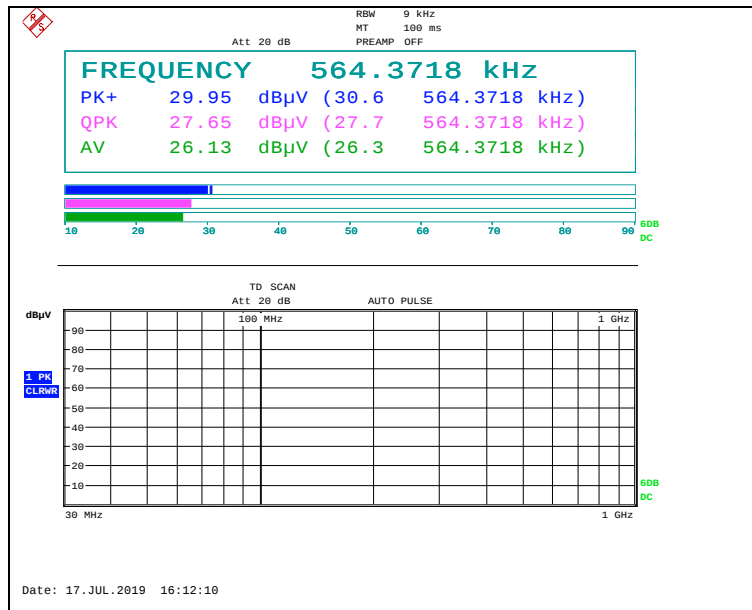
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A4(210 mm x 297 mm)

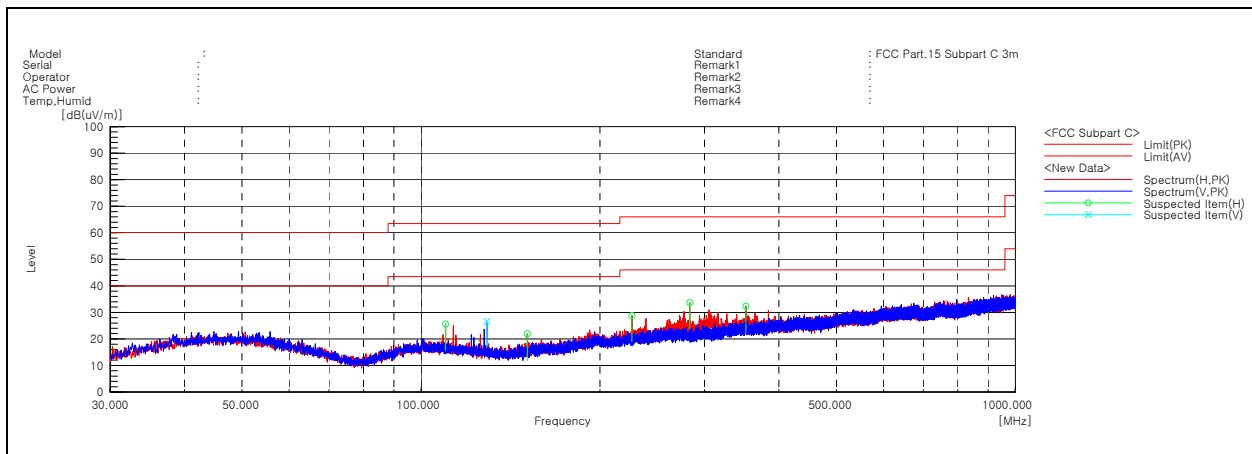


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Above 30 MHz



Remark;

- Traces shown in the plot were made by using a peak detector.

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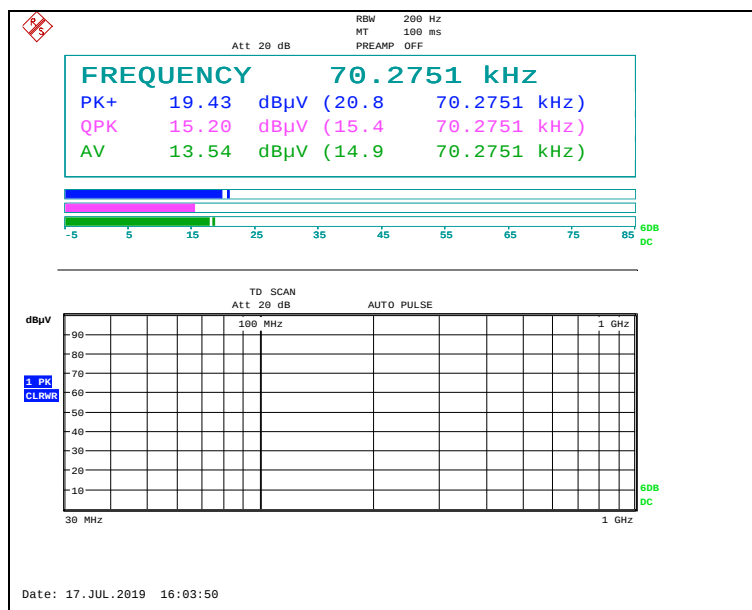
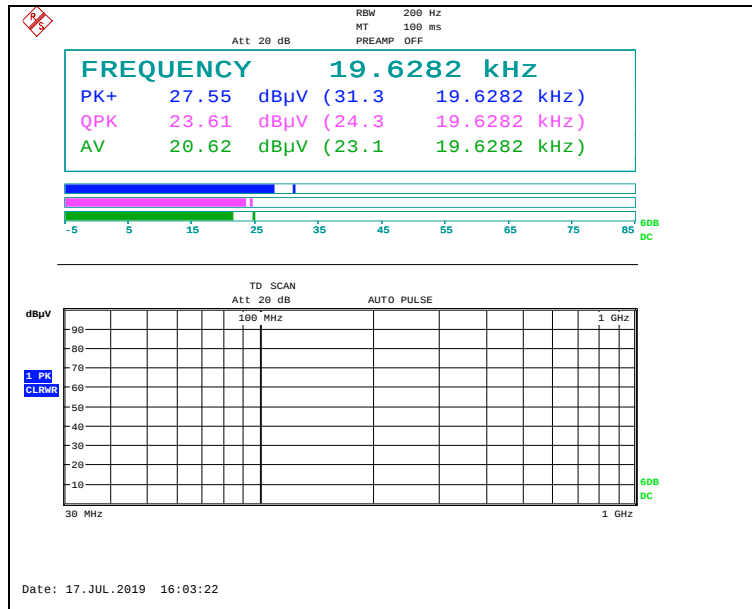
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## Ant. 3

### Below 30 MHz



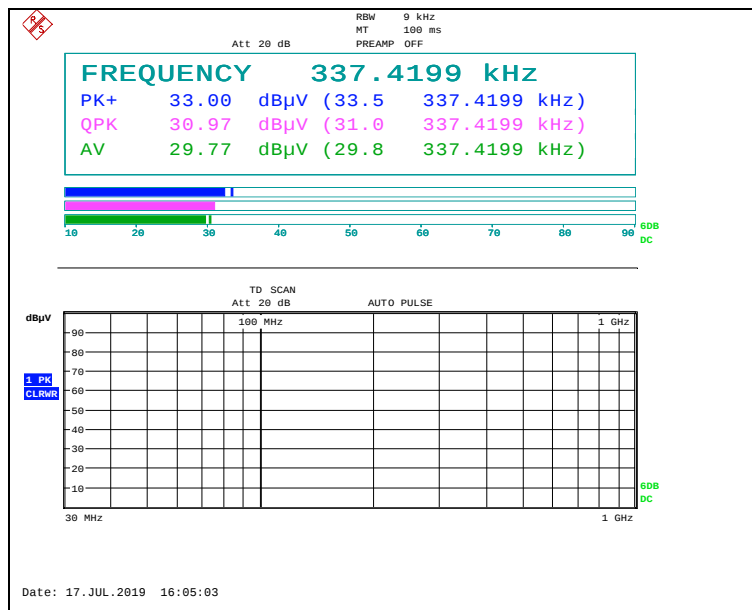
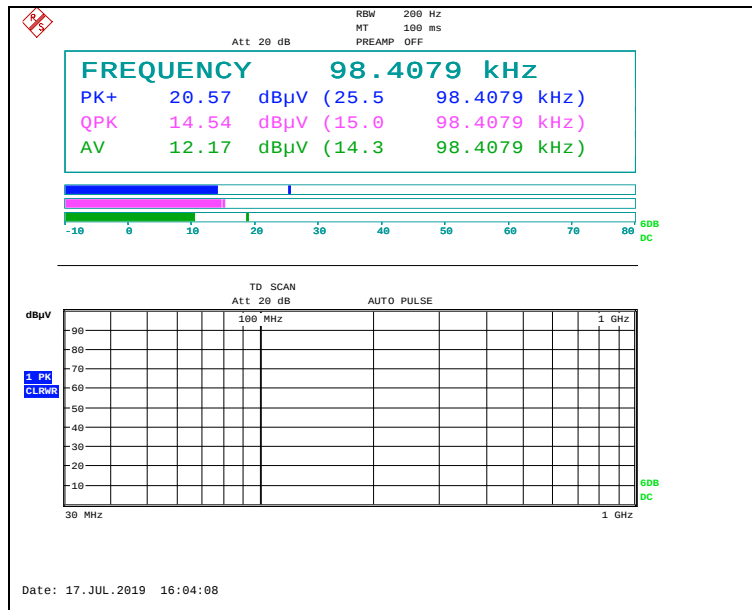
The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

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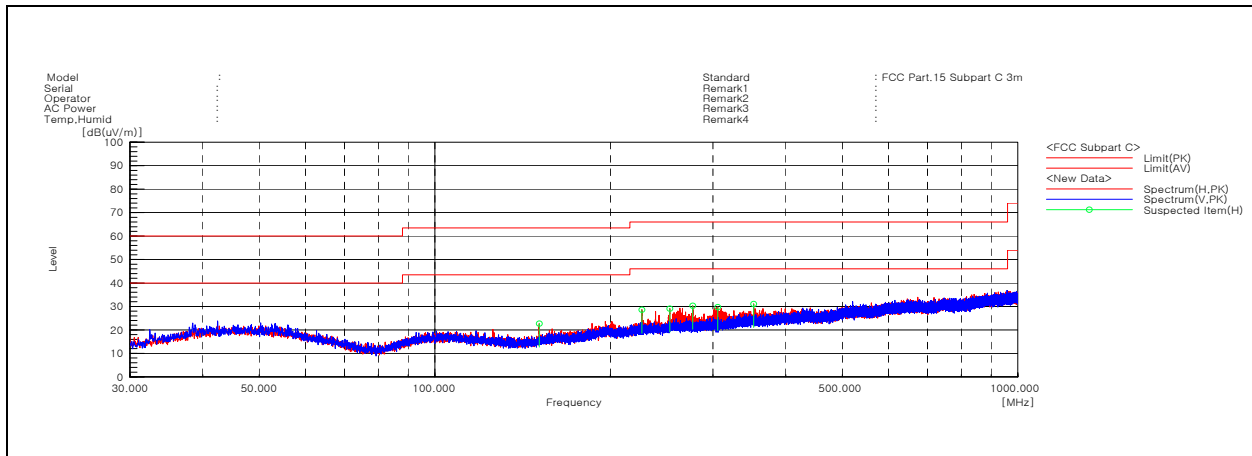
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## Above 30 MHz



## Remark;

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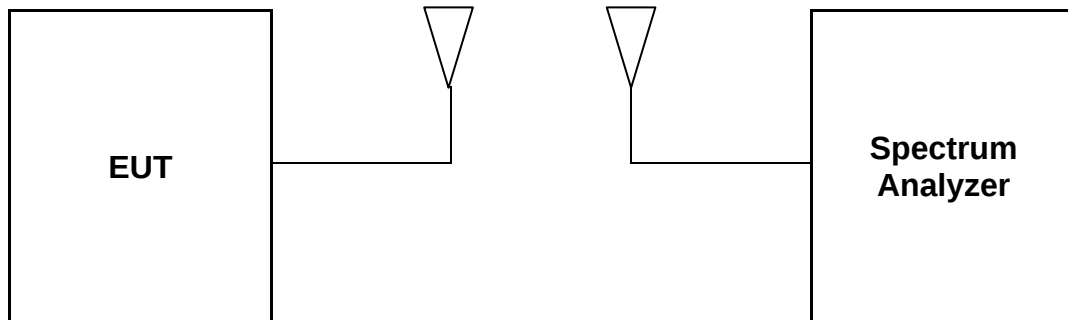
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### 3. 20 dB Bandwidth

#### 3.1. Test Setup



#### 3.2. Limit

None; for reporting purposed only

#### 3.3. Test Procedure

- a. Span = set to capture all products of the modulation process, including the emission skirts.  
RBW = 200 Hz, VBW = 200 Hz, Sweep = auto, Detector = peak, Trace = max hold.
- b. The marker-to-peak function to set the mark to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is 20 dB bandwidth of the emission.

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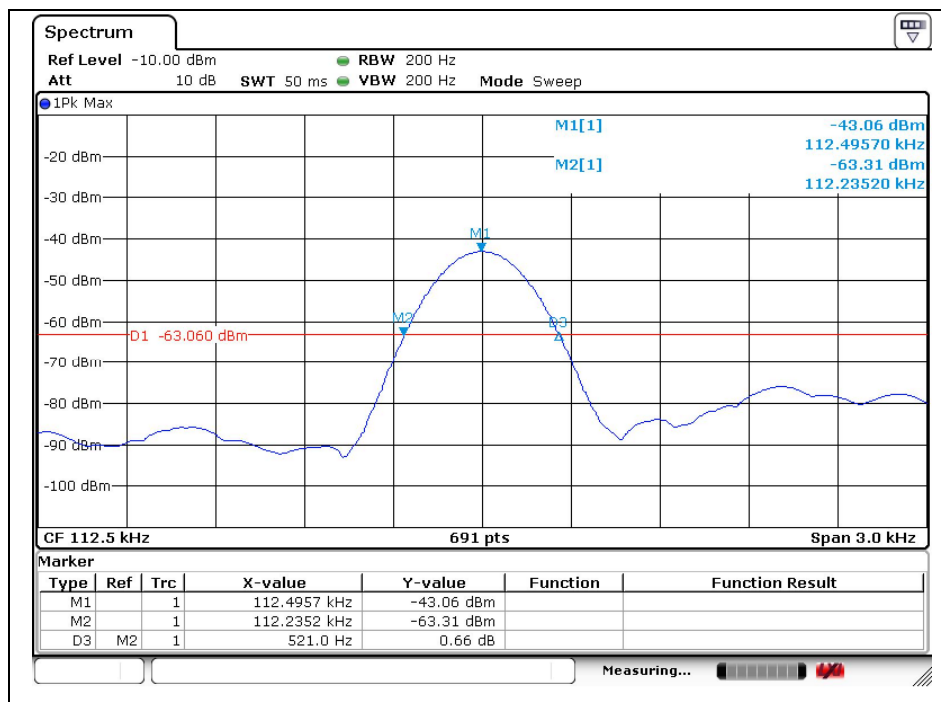
### 3.4. Test Result

Ambient temperature : (23 ± 1) °C  
Relative humidity : 47 % R.H.

| Test condition | EUT status                                                  | 20 dB Bandwidth (kHz) | Limit                   |
|----------------|-------------------------------------------------------------|-----------------------|-------------------------|
| Ant. 1         | With client device<br>(1 % battery status of client device) | 0.521                 | Reporting proposed only |
| Ant. 2         |                                                             | 0.521                 |                         |
| Ant. 3         |                                                             | 0.521                 |                         |

#### - Test plots

##### Ant. 1



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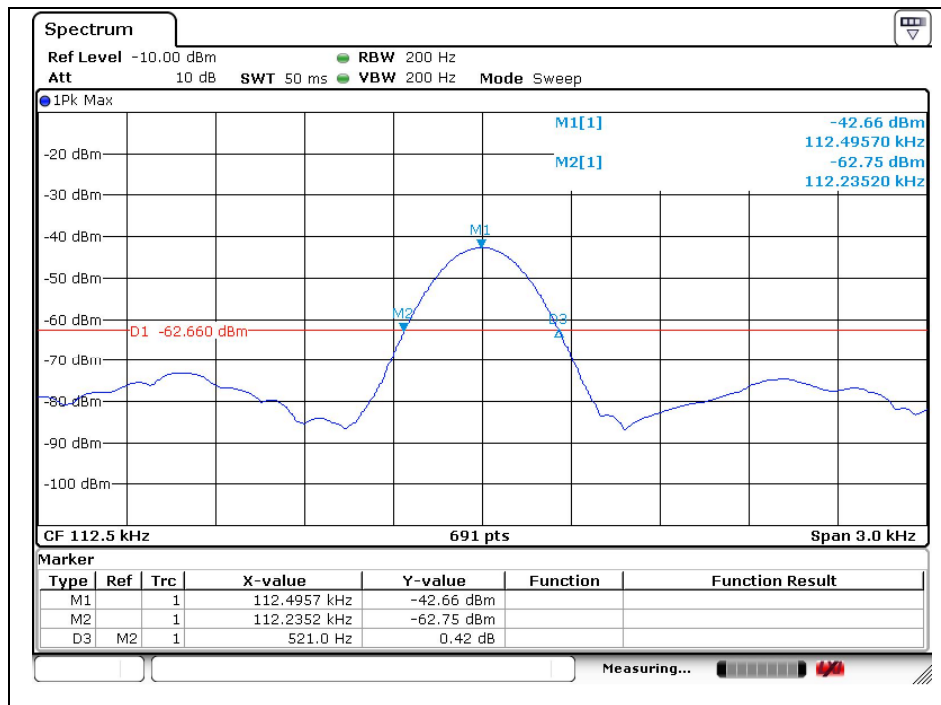
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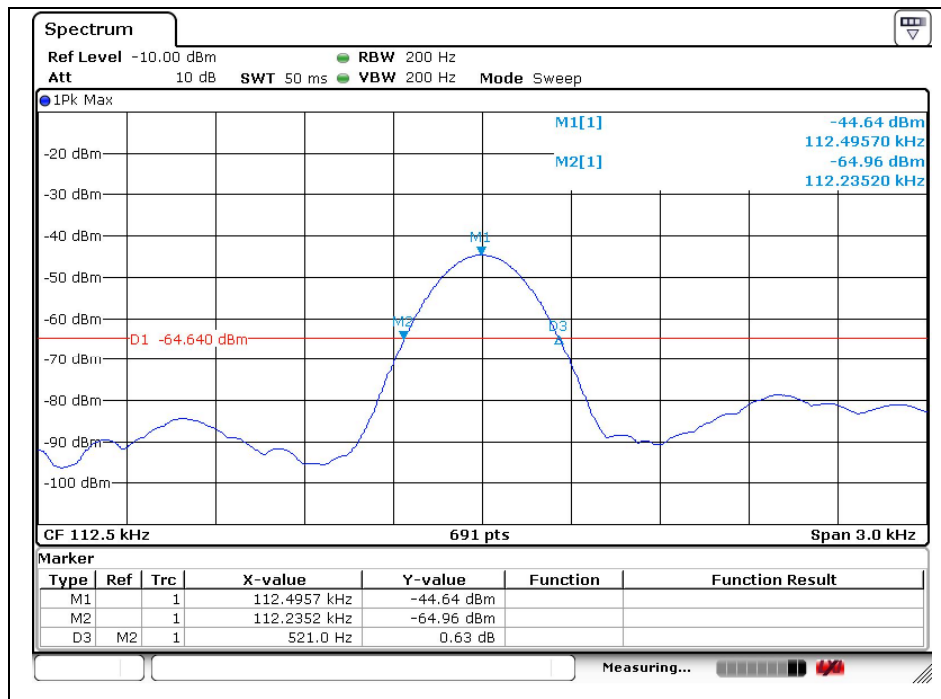
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## Ant. 2



## Ant. 3



- End of the Test Report -

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