

# TEST REPORT

OF

FCC Part 15 Subpart C §15.209

FCC ID : OSLOKA-100W

Equipment Under Test : UNIT ASSY – WIRELESS CHARGING  
Model Name : OKA-100W  
Variant Model Name : OKA-102W  
Applicant : Omron Automotive Electronics Korea Co., Ltd.  
Manufacturer : Omron Automotive Electronics Korea Co., Ltd.  
Date of Test(s) : 2015.12.01 ~ 2015.12.08  
Date of Issue : 2015.12.30

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

Tested By:

  
Jaeha Chung

Date:

2015.12.30

Approved By:

  
Hyunchae You

Date:

2015.12.30

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# INDEX

| <u>TABLE OF CONTENTS</u>                                     | Page |
|--------------------------------------------------------------|------|
| 1. General Information -----                                 | 3    |
| 2. Field Strength of Fundamental and Spurious Emission ----- | 6    |
| 3. 20 dB Bandwidth -----                                     | 11   |

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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, 15807

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 : Omron Automotive Electronics Korea Co., Ltd.

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

Contact Person : Nam, Sang-Il

Phone No. : +82 2 850 5789

### 1.3. Description of EUT

|                      |                                  |
|----------------------|----------------------------------|
| Kind of Product      | UNIT ASSY – WIRELESS CHARGING    |
| Model Name           | OKA-100W                         |
| Variant Model Name   | OKA-102W                         |
| Power Supply         | DC 12.0 V (Used vehicle battery) |
| Frequency Range      | 111 kHz (WPC)                    |
| Operating Conditions | -30 °C ~ 75 °C                   |
| Antenna Type         | Inductive loop coil antenna      |
| H/W Version          | A1.00                            |
| S/W Version          | A1.00                            |

### 1.4. Declarations by the manufacturer

- Operation temperature: -30 °C ~ 75 °C
- The EUT has 3 loop coil antennas with one amplifier, and only one antenna can transmit at once.

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## 1.5. Test Equipment List

| Equipment         | Manufacturer   | Model                                | S/N        | Cal. Date     | Cal. Interval | Cal. Due      |
|-------------------|----------------|--------------------------------------|------------|---------------|---------------|---------------|
| Spectrum Analyzer | R&S            | FSV30                                | 100768     | Mar. 24, 2015 | Annual        | Mar. 24, 2016 |
| Signal Generator  | Agilent        | 8648D                                | 3847M00534 | Mar. 23, 2015 | Annual        | Mar. 23, 2016 |
| DC Power Supply   | Agilent        | U8002A                               | MY50060028 | Mar. 23, 2015 | Annual        | Mar. 23, 2016 |
| Test Receiver     | R&S            | ESU26                                | 100109     | Mar. 03, 2015 | Annual        | Mar. 03, 2016 |
| Loop Antenna      | R&S            | HFH2-Z2                              | 100118     | Jun. 04, 2015 | Biennial      | Jun. 04, 2017 |
| Antenna Master    | INN-CO         | MM4000                               | N/A        | N.C.R.        | N/A           | N.C.R.        |
| Turn Table        | INN-CO         | DS 1200 S                            | N/A        | 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.        |

## 1.6. 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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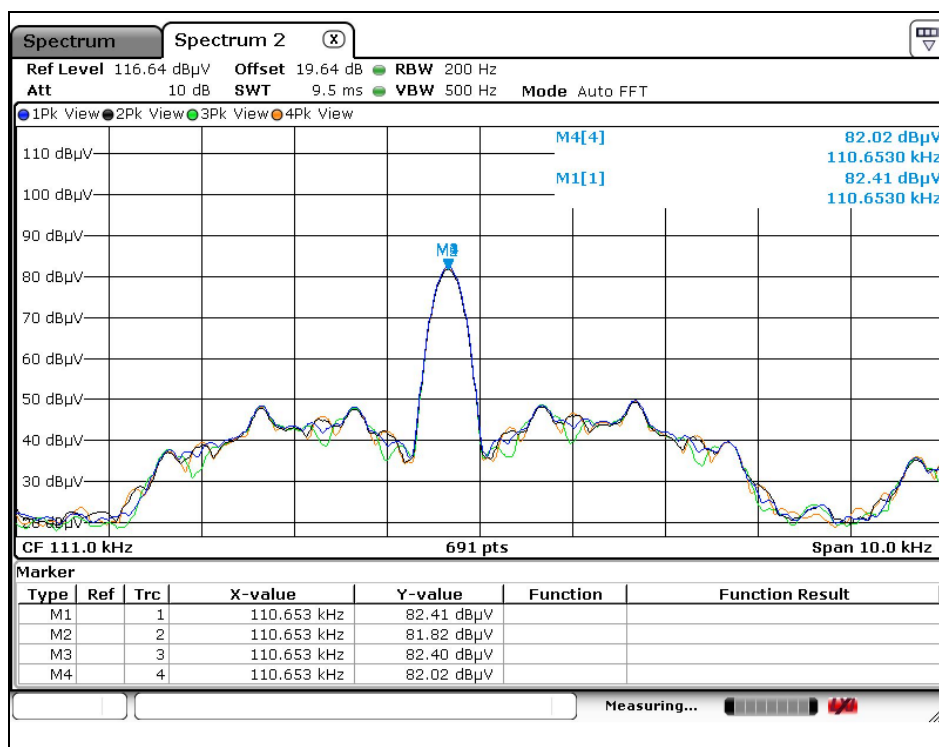
## 1.7. Worst case of test configurations

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                                                                    | Description                    |
|--------------------------------------------------------------------------------------|--------------------------------|
| Charging Mode<br>with client device<br>(Galaxy S5 : SM-G900L<br>FCC ID : A3LSMG900S) | Less than 1 % of battery       |
|                                                                                      | Less than 50 % of battery      |
|                                                                                      | 100 % full charging of battery |

Client device (SM-G900L)

- While the client device was connected to an active data connection (Trace#1 "M1")  
The device was tested under all modes and bands like 2G and 3G.  
In the result, **PCS GSM / GPRS1900 / 1 TX** was found in **Middle channel**.
- While the client device was in airplane mode (Trace#2 "M2")
- While the wireless charger is charging without the client device. (Trace#3 "M3")
- While the wireless charger is charging with the client device turned off. (Trace#4 "M4")



Plot – fundamental emission comparison

- The level of Trace#1 was higher than Trace#2, 3 and 4, so Trace#1 was selected.
- Trace#1 as **PCS GSM / GPRS1900 / 1 TX** which was found in **Middle channel** should be tested with the client device as a worst case.

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## 1.8. Summary of Test Results

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC Part 15 Subpart C §15.209 |                                                                              |          |
|-------------------------------------------------|------------------------------------------------------------------------------|----------|
| Section in FCC Part 15 Subpart C                | Test Item                                                                    | Result   |
| 15.209<br>15.209(a)                             | Radiated emission,<br>Spurious Emission and<br>Field Strength of Fundamental | Complied |
| 2.1049                                          | 20 dB Bandwidth                                                              | Complied |

## 1.9. Test Report Revision

| Revision | Report number          | Date of Issue | Description                                                                              |
|----------|------------------------|---------------|------------------------------------------------------------------------------------------|
| 0        | F690501/RF-RTL009338   | 2015.12.23    | Initial                                                                                  |
| 1        | F690501/RF-RTL009338-1 | 2015.12.30    | Added EMC performance considering all the transmitters of the associated cellular device |

## 1.10. Information of Variant model

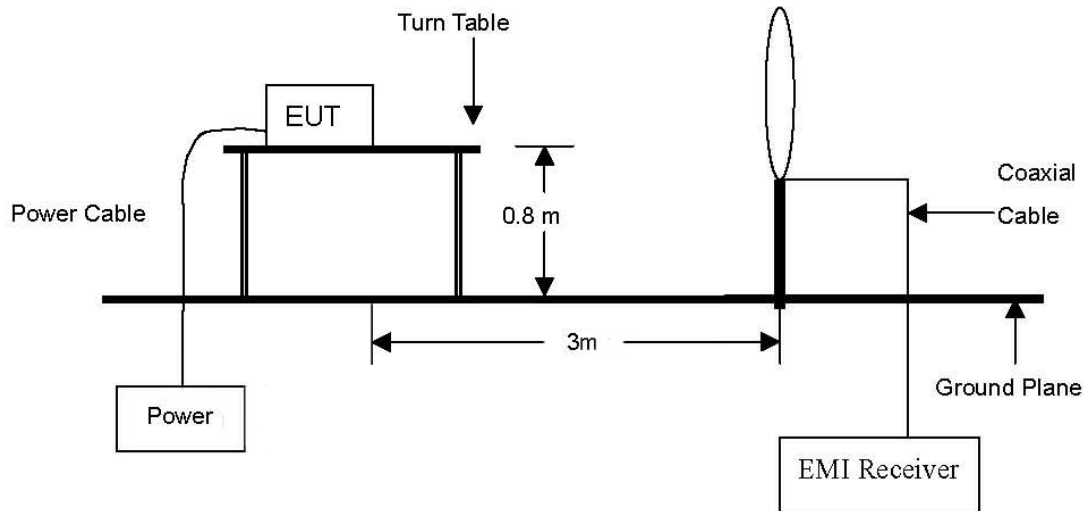
| Model name | Information                                |
|------------|--------------------------------------------|
| OKA-100W   | Basic Model.                               |
| OKA-102W   | Exterior was changed from the basic model. |

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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 Emissions.



### 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 (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meter) |
|-----------------|-----------------------------------|------------------------------|
| 0.009 - 0.490   | $2400/F(\text{kHz})$              | 300                          |
| 0.490 - 1.705   | $24000/F(\text{kHz})$             | 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., Sections §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 C63.10-2009

### 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

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## 2.4. Field Strength of Fundamental Test Result

Ambient temperature : (24 ± 1) °C  
Relative humidity : 47 % R.H.

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical. The field strength of spurious emission was measured in one orthogonal EUT position (x-axis). Definition of DUT for a orthogonal plane was described in the test setup photo.

| Radiated Emissions                                        |                |             | Ant. | Correction Factors |            | Total                  |                          | FCC 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) |
| Charging mode with client (less than 1 % battery status)  |                |             |      |                    |            |                        |                          |                         |             |
| 0.111                                                     | 60.20          | Average     | H    | 19.59              | 0.05       | 79.84                  | -0.16                    | 26.70                   | 26.86       |
| Charging mode with client (less than 50 % battery status) |                |             |      |                    |            |                        |                          |                         |             |
| 0.111                                                     | 60.01          | Average     | H    | 19.59              | 0.05       | 79.65                  | -0.35                    | 26.70                   | 27.05       |
| Charging mode with client (100 % battery status)          |                |             |      |                    |            |                        |                          |                         |             |
| 0.111                                                     | 60.50          | Average     | H    | 19.59              | 0.05       | 80.14                  | 0.14                     | 26.70                   | 26.56       |

### Note;

1. According to §15.31 (f)(2) 300 m Result(dBμV/m) = 3 m Result(dBμV/m) – 40log(300/3) (dBμV/m).
2. 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.
3. The limit above was calculated based on table of §15.209 (a).
4. All antennas of operation were investigated and the worst-case antenna was reported considering the highest levels of radiated emissions.

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## 2.5. Spurious Emission Test Result

Ambient temperature : (24 ± 1) °C  
Relative humidity : 47 % R.H.

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

### Charging mode with client device (less than 1 % battery status)

| Radiated Emissions |                |             | Ant. | Correction Factors |            | Total                  |                          | FCC 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) |
| 0.035              | 25.10          | Average     | H    | 19.70              | 0.02       | 44.82                  | -35.18                   | 36.72                   | 71.90       |
| 0.094              | 30.50          | Quasi Peak  | H    | 19.61              | 0.05       | 50.16                  | -29.84                   | 28.14                   | 57.98       |
| 0.110              | 4.10           | Average     | H    | 19.60              | 0.05       | 23.75                  | -56.25                   | 26.78                   | 83.03       |
| 0.331              | 30.70          | Average     | H    | 19.48              | 0.04       | 50.22                  | -29.78                   | 17.21                   | 46.99       |
| Above 0.400        | Not detected   | -           | -    | -                  | -          | -                      | -                        | -                       | -           |

### Charging mode with client device (less than 50 % battery status)

| Radiated Emissions |                |             | Ant. | Correction Factors |            | Total                  |                          | FCC 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) |
| 0.035              | 27.60          | Average     | H    | 19.70              | 0.02       | 47.32                  | -32.68                   | 36.72                   | 69.40       |
| 0.094              | 30.40          | Quasi Peak  | H    | 19.61              | 0.05       | 50.06                  | -29.94                   | 28.14                   | 58.08       |
| 0.110              | -1.20          | Average     | H    | 19.60              | 0.05       | 18.45                  | -61.55                   | 26.78                   | 88.33       |
| 0.331              | 31.40          | Average     | H    | 19.48              | 0.04       | 50.92                  | -29.08                   | 17.21                   | 46.29       |
| Above 0.400        | Not detected   | -           | -    | -                  | -          | -                      | -                        | -                       | -           |

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**Charging mode with client device (100 % battery status)**

| Radiated Emissions |                      |             | Ant. | Correction Factors |            | Total                        |                                | FCC Limit                     |             |
|--------------------|----------------------|-------------|------|--------------------|------------|------------------------------|--------------------------------|-------------------------------|-------------|
| Frequency (MHz)    | Reading (dB $\mu$ V) | Detect Mode | Pol. | Ant. (dB/m)        | Cable (dB) | Actual (dB $\mu$ V/m) at 3 m | Actual (dB $\mu$ V/m) at 300 m | Limit (dB $\mu$ V/m) at 300 m | Margin (dB) |
| 0.035              | 28.00                | Average     | H    | 19.70              | 0.02       | 47.72                        | -32.28                         | 36.72                         | 69.00       |
| 0.094              | 30.22                | Quasi Peak  | H    | 19.61              | 0.05       | 49.88                        | -30.12                         | 28.14                         | 58.26       |
| 0.110              | 3.60                 | Average     | H    | 19.60              | 0.05       | 23.25                        | -56.75                         | 26.78                         | 83.53       |
| 0.331              | 38.10                | Average     | H    | 19.48              | 0.04       | 57.62                        | -22.38                         | 17.21                         | 39.59       |
| Above 0.400        | Not detected         | -           | -    | -                  | -          | -                            | -                              | -                             | -           |

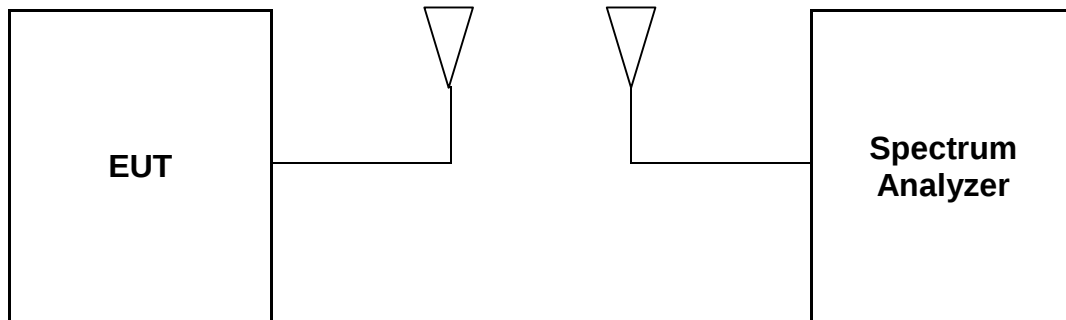
**Note;**

- According to §15.31 (f)(2)
  - 300 m Result(dB $\mu$ V/m) = 3 m Result(dB $\mu$ V/m) – 40log(300/3) (dB $\mu$ V/m)
  - 30 m Result(dB $\mu$ V/m) = 3 m Result(dB $\mu$ V/m) – 40log(30/3) (dB $\mu$ V/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 (dB $\mu$ V/m)
  - 490 kHz to 1 705 kHz : 20log(24 000 / F (kHz)) at 30 m (dB $\mu$ V/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.
- All antennas of operation were investigated and the worst-case antenna was reported considering the highest levels of radiated emissions.

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### 3. 20 dB Bandwidth

#### 3.1. Test Setup



#### 3.2. Limit

None; for reporting purposed only

#### 3.3. Test Procedure

##### 20 dB Bandwidth

- Span = approximately 2 to 3 times the 20 dB bandwidth, RBW = greater than 1 % of the 20 dB bandwidth, VBW = RBW, Sweep = auto, Detector = peak, Trace = max hold.
- 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.

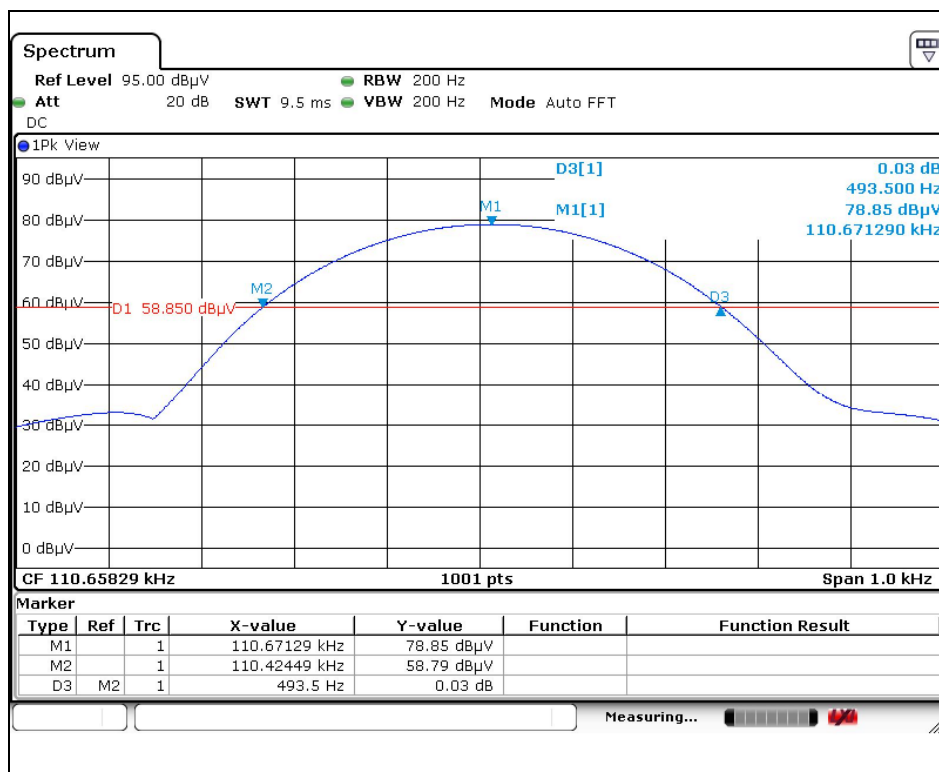
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### 3.4. Test Result

Ambient temperature : (24 ± 1) °C  
Relative humidity : 47 % R.H.

| EUT status                               | 20 dB Bandwidth (kHz) | Limit                   |
|------------------------------------------|-----------------------|-------------------------|
| With client device<br>(100 % of battery) | 0.494                 | Reporting proposed only |

#### 20 dB Bandwidth



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