

## FCC PART 15.249

### TEST REPORT

For

**DewertOkin GmbH**

Weststr. 1, 32278 Kirchlingern, Germany

**FCC ID: O3YF105820**

|                                                                                                                                                                                                                                                                                                                             |                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <b>Report Type:</b><br>Original Report                                                                                                                                                                                                                                                                                      | <b>Product Type:</b><br>RF-1058 |
| <b>Report Number:</b> RSZ200303551-00                                                                                                                                                                                                                                                                                       |                                 |
| <b>Report Date:</b> 2020-03-31                                                                                                                                                                                                                                                                                              |                                 |
| <b>Reviewed By:</b> Jimmy Xiao<br>RF Engineer                                                                                                                                                                                                                                                                               |                                 |
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## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

|                        |                                                 |
|------------------------|-------------------------------------------------|
| Product                | RF-1058                                         |
| Tested Model           | RF1058F-20                                      |
| Multiple Model         | RF1058F-18, RF1058F-16                          |
| Model different        | Refer to the DOS                                |
| Frequency Range        | 2403-2480MHz                                    |
| Maximum Field Strength | 92.43dBuV/m@3m                                  |
| Modulation Technique   | GFSK                                            |
| Antenna Specification  | 1.09dBi                                         |
| Voltage Range          | DC 1.5V*3 AAA batteries                         |
| Date of Test           | 2020-03-25 to 2020-03-26                        |
| Sample serial number   | RSZ200303551-RF-S1 (Assigned by BACL, Shenzhen) |
| Received date          | 2020-03-05                                      |
| Sample/EUT Status      | Good condition                                  |

### Objective

This type approval report is prepared on behalf of **DewertOkin GmbH** in accordance with Part 2-Subpart J, and Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.249 rules.

### Related Submittal(s)/Grant(s)

No related submittal(s)/Grant(s)

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## Measurement Uncertainty

| Parameter                          |            | Uncertainty           |
|------------------------------------|------------|-----------------------|
| Occupied Channel Bandwidth         |            | $\pm 5\%$             |
| RF Output Power with Power meter   |            | $\pm 0.73\text{dB}$   |
| RF conducted test with spectrum    |            | $\pm 1.6\text{dB}$    |
| AC Power Lines Conducted Emissions |            | $\pm 1.95\text{dB}$   |
| Emissions,<br>Radiated             | Below 1GHz | $\pm 4.75\text{dB}$   |
|                                    | Above 1GHz | $\pm 4.88\text{dB}$   |
| Temperature                        |            | $\pm 1^\circ\text{C}$ |
| Humidity                           |            | $\pm 6\%$             |
| Supply voltages                    |            | $\pm 0.4\%$           |

*Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.*

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

## SYSTEM TEST CONFIGURATION

### Justification

The system was configured for testing by manufacturer, and the power level is default.

### Frequency List

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 1       | 2403            | 40      | 2442            |
| 2       | 2404            | 41      | 2443            |
| ...     |                 | ...     |                 |
| 38      | 2440            | 77      | 2479            |
| 39      | 2441            | 78      | 2480            |

Channel 1, 38, 78 were tested.

### EUT Exercise Software

No software was used.

### Equipment Modifications

No modifications were made to the unit tested.

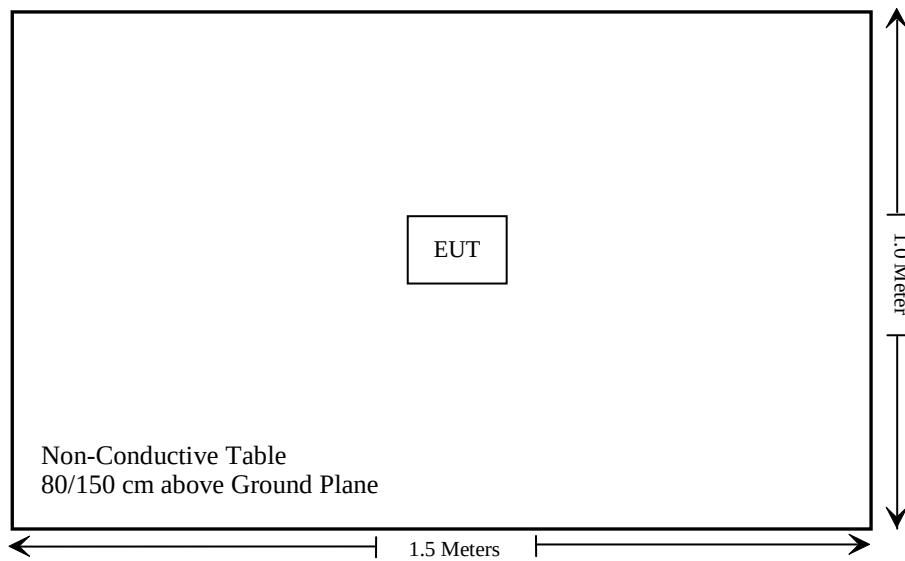
### Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number |
|--------------|-------------|-------|---------------|
| N/A          | N/A         | N/A   | N/A           |

### Support Cable Descriptions

| Cable Description | Length (m) | From/Port | To  |
|-------------------|------------|-----------|-----|
| N/A               | N/A        | N/A       | N/A |

## Block Diagram of Test Setup



## SUMMARY OF TEST RESULTS

| FCC Rules                   | Description of Test                          | Result         |
|-----------------------------|----------------------------------------------|----------------|
| §15.203                     | Antenna Requirement                          | Compliance     |
| §15.207(a)                  | Conduction Emissions                         | Not Applicable |
| 15.205, §15.209, §15.249(d) | Radiated Emissions& Outside of Band Emission | Compliance     |
| §15.215 (c)                 | 20 dB Bandwidth                              | Compliance     |

Not Applicable: The EUT was powered by battery.

## TEST EQUIPMENT LIST

| Manufacturer          | Description        | Model                   | Serial Number   | Calibration Date | Calibration Due Date |
|-----------------------|--------------------|-------------------------|-----------------|------------------|----------------------|
| R&S                   | EMI Test Receiver  | ESR3                    | 102455          | 2019/7/9         | 2020/7/8             |
| Sonoma instrument     | Pre-amplifier      | 310 N                   | 186238          | 2019/4/20        | 2020/4/20            |
| Sunol Sciences        | Broadband Antenna  | JB1                     | A040904-1       | 2017/12/22       | 2020/12/21           |
| Unknown               | Cable 2            | RF Cable 2              | F-03-EM197      | 2019/11/29       | 2020/11/28           |
| Unknown               | Cable              | Chamber Cable 1         | F-03-EM236      | 2019/11/29       | 2020/11/28           |
| Rohde & Schwarz       | Auto test software | EMC 32                  | V9.10           | NCR              | NCR                  |
| Rohde & Schwarz       | Spectrum Analyzer  | FSV40-N                 | 102259          | 2019/7/22        | 2020/07/21           |
| COM-POWER             | Pre-amplifier      | PA-122                  | 181919          | 2019/11/29       | 2020/11/28           |
| Quinstar              | Amplifier          | QLW-18405536-J0         | 15964001002     | 2019/11/29       | 2020/11/28           |
| Sunol Sciences        | Horn Antenna       | DRH-118                 | A052604         | 2017/12/22       | 2020/12/21           |
| Insulted Wire Inc.    | RF Cable           | SPS-2503-3150           | 02222010        | 2019/11/29       | 2020/11/28           |
| Unknown               | RF Cable           | W1101-EQ1 OUT           | F-19-EM005      | 2019/11/29       | 2020/11/28           |
| SNSD                  | Band Reject filter | BSF2402-2480MN-0898-001 | 2.4G filter     | 2019/4/20        | 2020/4/20            |
| Ducommun Technologies | Horn antenna       | ARH-4223-02             | 1007726-02 1304 | 2017/12/6        | 2020/12/5            |

**\* Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).



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## **FCC §15.203 - ANTENNA REQUIREMENT**

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### **Applicable Standard**

According to FCC §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

### **Antenna Connector Construction**

The EUT has one internal PCB antenna which was permanently attached and the antenna gain is 1.09dBi, fulfill the requirement of this section. Please refer to the EUT photos.

**Result:** Compliance.

**FCC §15.205, §15.209 & §15.249(d) - RADIATED EMISSIONS****Applicable Standard**

As per FCC §15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| <b>Fundamental frequency</b> | <b>Field strength of fundamental (millivolts/meter)</b> | <b>Field strength of harmonics (microvolts/meter)</b> |
|------------------------------|---------------------------------------------------------|-------------------------------------------------------|
| 902–928 MHz                  | 50                                                      | 500                                                   |
| 2400–2483.5 MHz              | 50                                                      | 500                                                   |
| 5725–5875 MHz                | 50                                                      | 500                                                   |
| 24.0–24.25 GHz               | 250                                                     | 2500                                                  |

As per FCC §15.249 (c), Field strength limits are specified at a distance of 3 meters.

As per FCC §15.249 (d), Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

**Test Equipment Setup**

The spectrum analyzer or receiver is set as:

Below 1000MHz:

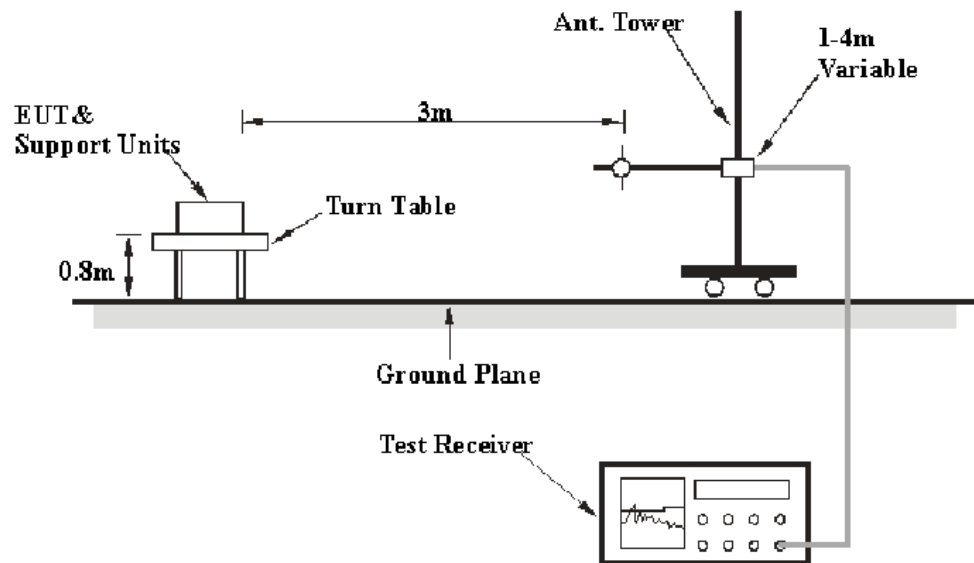
RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000MHz:

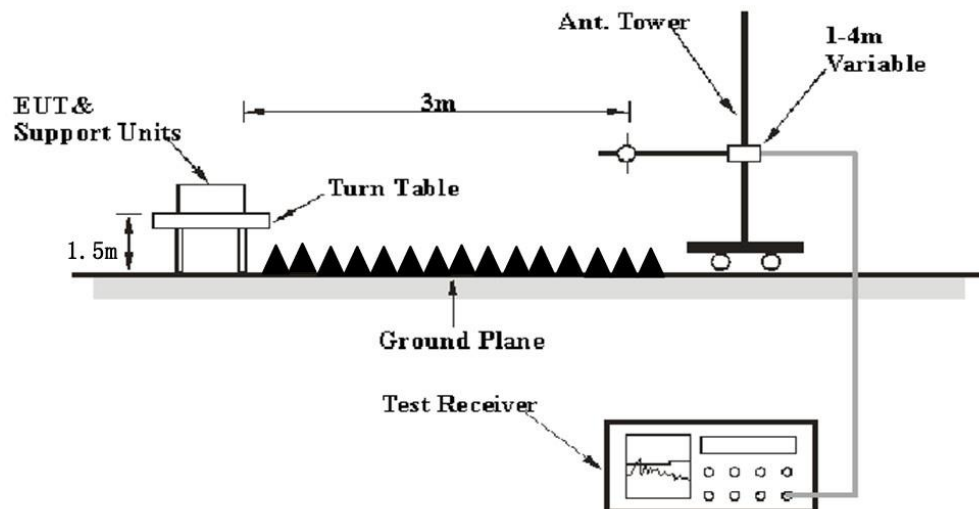
Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto  
Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

## EUT Setup

### Below 1GHz:



### Above 1GHz:



The radiated emission and out of band emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209/15.205 and FCC 15.249 limits.

## Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 mete, and the EUT is placed on a turntable, which is 0.8 meter above ground plane for below 1GHz or 1.5 meter for above 1GHz, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Results Summary

According to the EUT complied with the FCC Part 15.205, 15.209 & §15.249

## Test Data

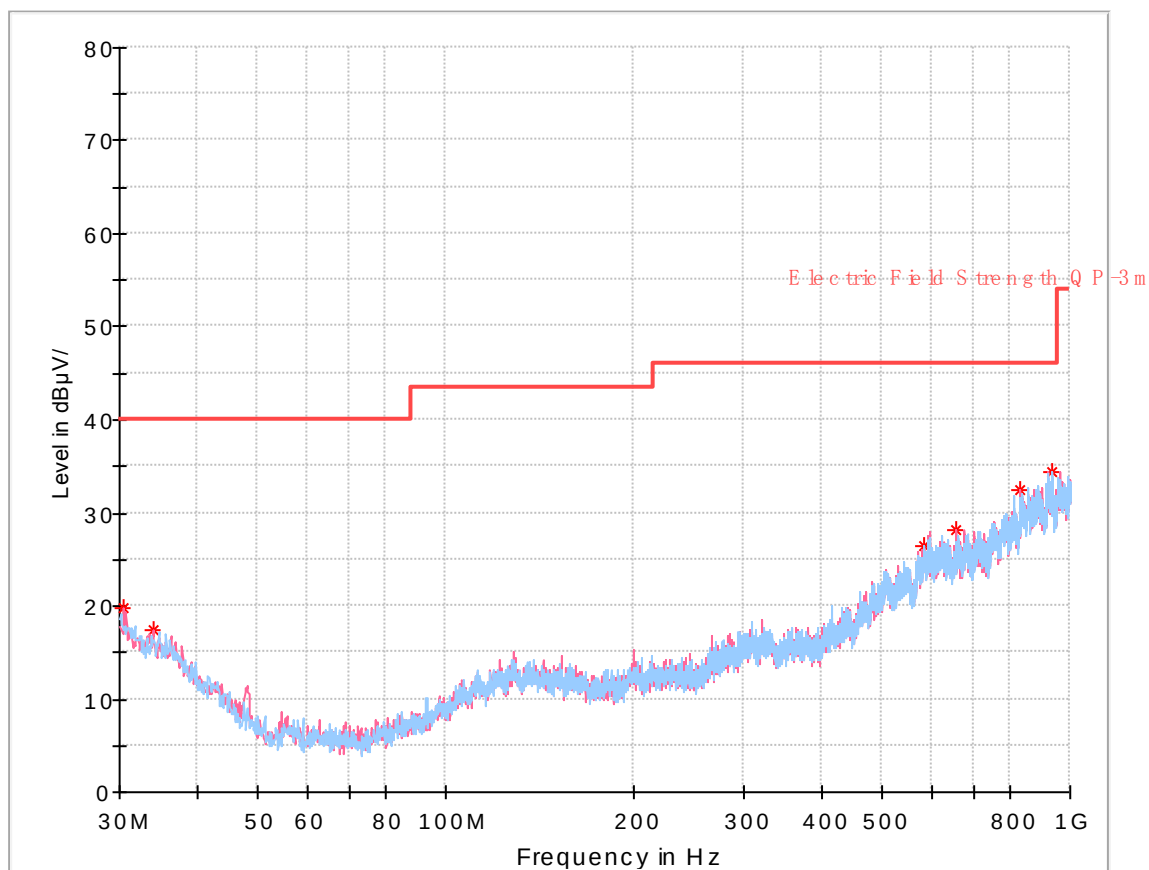
### Environmental Conditions

|                           |                |
|---------------------------|----------------|
| <b>Temperature:</b>       | 25~27 °C       |
| <b>Relative Humidity:</b> | 53~60 %        |
| <b>ATM Pressure:</b>      | 100.9~101.0kPa |

*The testing was performed by Zero Yan on 2020-03-25 for Below 1GHz and Charlie Cha on 2020-03-26 for Above 1GHz*

*Test Mode: Transmitting*

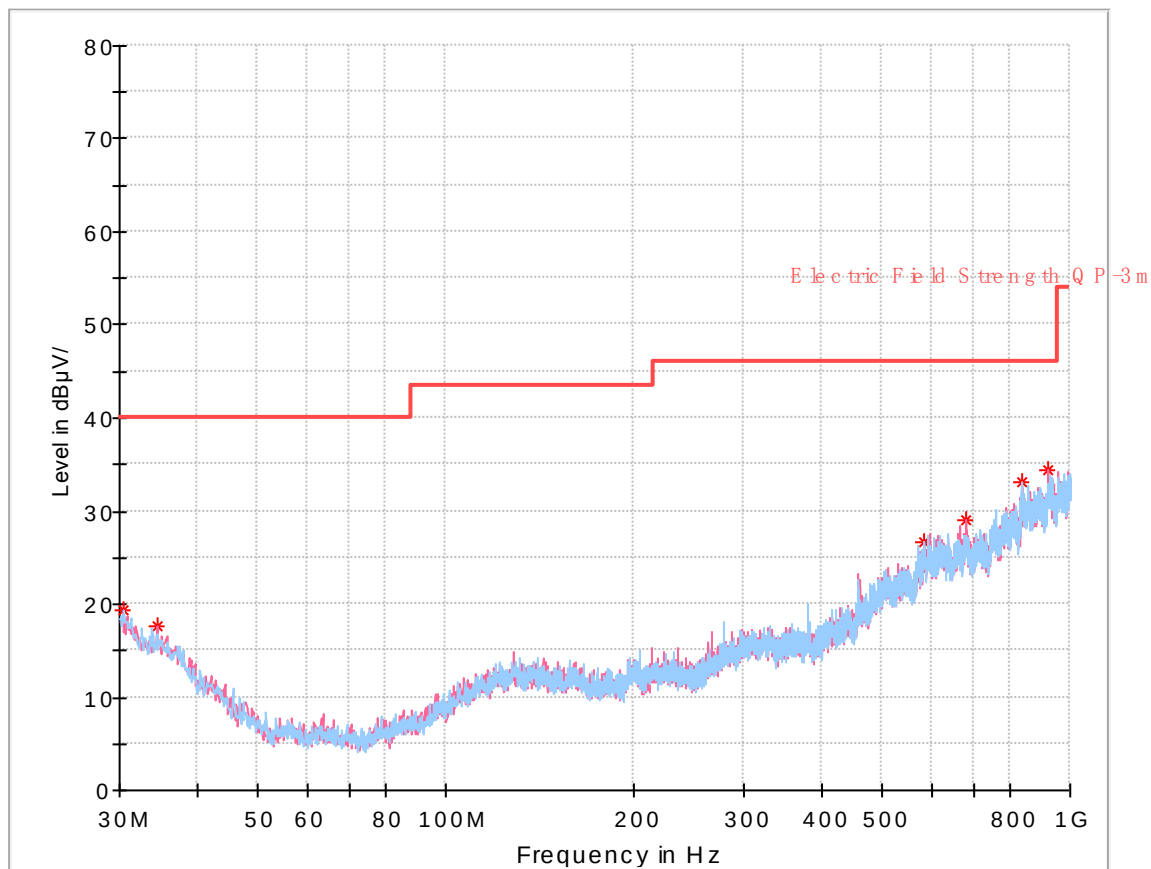
For Model: RF1058F-20

**30MHz – 1 GHz: Worst case at High Channel**

| Frequency (MHz) | Corrected Amplitude (dBμV/m) | Antenna height (cm) | Antenna Polarity | Turntable position (degree) | Correction Factor (dB/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|------------------------------|---------------------|------------------|-----------------------------|--------------------------|----------------|-------------|
| 30.485000       | 19.69                        | 305.0               | V                | 82.0                        | -7.9                     | 40.00          | 20.31       |
| 34.001250       | 17.45                        | 105.0               | V                | 252.0                       | -10.0                    | 40.00          | 22.55       |
| 583.021250      | 26.49                        | 390.0               | V                | 172.0                       | -2.4                     | 46.00          | 19.51       |
| 658.802500      | 28.27                        | 205.0               | V                | 214.0                       | -1.6                     | 46.00          | 17.73       |
| 834.130000      | 32.55                        | 390.0               | V                | 236.0                       | 2.7                      | 46.00          | 13.45       |
| 934.646250      | 34.49                        | 105.0               | H                | 55.0                        | 4.8                      | 46.00          | 11.51       |

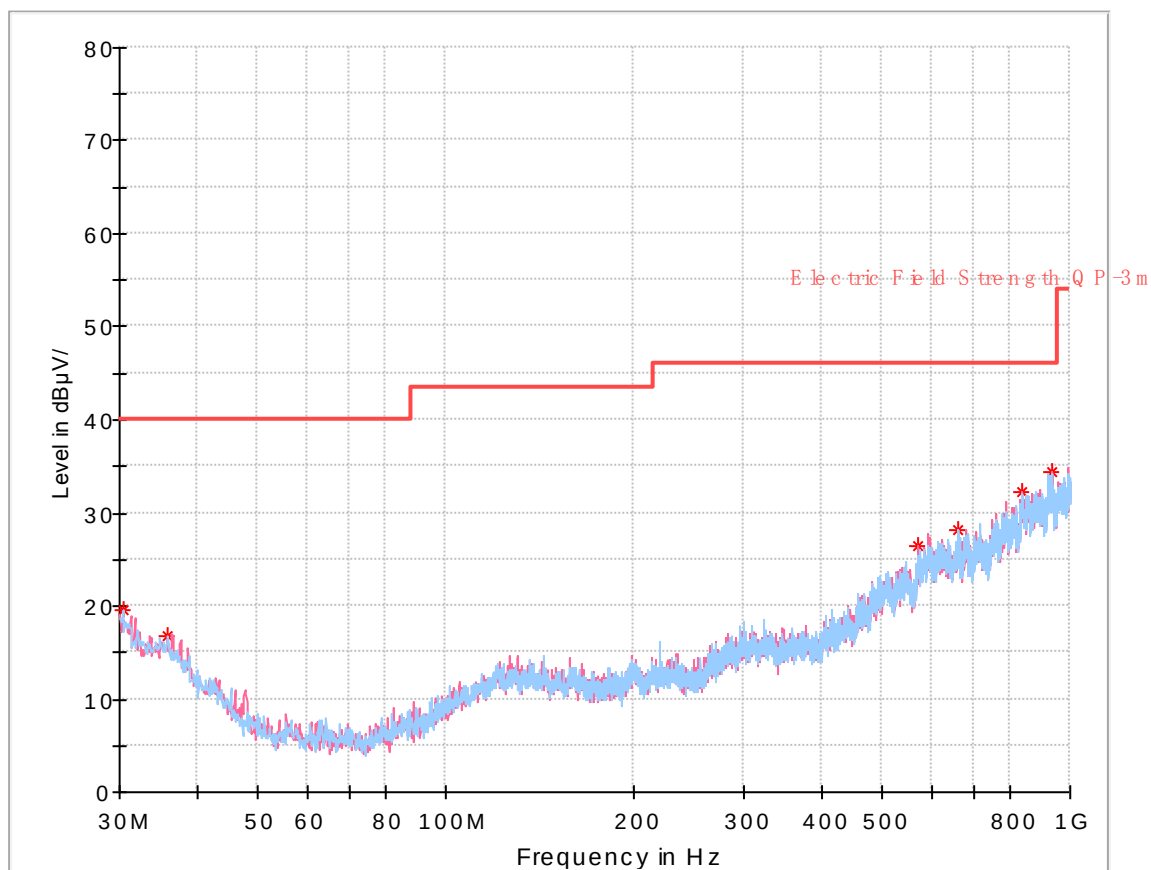
For Model: RF1058F-18

### 30MHz – 1 GHz: Worst case at High Channel



| Frequency (MHz) | Corrected Amplitude (dBμV/m) | Antenna height (cm) | Antenna Polarity | Turntable position (degree) | Correction Factor (dB/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|------------------------------|---------------------|------------------|-----------------------------|--------------------------|----------------|-------------|
| 30.485000       | 19.36                        | 105.0               | H                | 322.0                       | -7.9                     | 40.00          | 20.64       |
| 34.486250       | 17.67                        | 105.0               | V                | 254.0                       | -10.2                    | 40.00          | 22.33       |
| 584.840000      | 26.65                        | 305.0               | H                | 19.0                        | -2.3                     | 46.00          | 19.35       |
| 681.233750      | 29.13                        | 105.0               | V                | 320.0                       | -1.4                     | 46.00          | 16.87       |
| 834.615000      | 33.11                        | 105.0               | H                | 0.0                         | 2.7                      | 46.00          | 12.89       |
| 922.278750      | 34.42                        | 305.0               | V                | 277.0                       | 4.6                      | 46.00          | 11.58       |

For Model: RF1058F-16

**30MHz – 1 GHz: Worst case at High Channel**

| Frequency (MHz) | Corrected Amplitude (dBμV/m) | Antenna height (cm) | Antenna Polarity | Turntable position (degree) | Correction Factor (dB/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|------------------------------|---------------------|------------------|-----------------------------|--------------------------|----------------|-------------|
| 30.363750       | 19.49                        | 205.0               | H                | 351.0                       | -7.9                     | 40.00          | 20.51       |
| 35.820000       | 16.72                        | 390.0               | H                | 230.0                       | -11.1                    | 40.00          | 23.28       |
| 570.653750      | 26.36                        | 205.0               | V                | 0.0                         | -3.1                     | 46.00          | 19.64       |
| 662.076250      | 28.28                        | 390.0               | H                | 63.0                        | -1.6                     | 46.00          | 17.72       |
| 836.555000      | 32.15                        | 305.0               | V                | 122.0                       | 2.7                      | 46.00          | 13.85       |
| 935.131250      | 34.41                        | 205.0               | V                | 48.0                        | 4.8                      | 46.00          | 11.59       |

**1 GHz - 25 GHz:** (Worst case for Model: RF1058F-20)

| Frequency<br>(MHz)       | Receiver          |            | Turntable<br>Degree | Rx Antenna    |                | Corrected<br>Factor<br>(dB/m) | Corrected<br>Amplitude<br>(dBµV/m) | FCC Part<br>15.249&15.209 |                |
|--------------------------|-------------------|------------|---------------------|---------------|----------------|-------------------------------|------------------------------------|---------------------------|----------------|
|                          | Reading<br>(dBµV) | PK/QP/Ave. |                     | Height<br>(m) | Polar<br>(H/V) |                               |                                    | Limit<br>(dBµV/m)         | Margin<br>(dB) |
| Low Channel (2403 MHz)   |                   |            |                     |               |                |                               |                                    |                           |                |
| 2403.00                  | 89.24             | PK         | 284                 | 2.1           | H              | -0.36                         | 88.88                              | 114                       | 25.12          |
| 2403.00                  | 85.78             | Ave.       | 284                 | 2.1           | H              | -0.36                         | 85.42                              | 94                        | 8.58           |
| 2403.00                  | 87.56             | PK         | 136                 | 1.1           | V              | -0.36                         | 87.20                              | 114                       | 26.80          |
| 2403.00                  | 83.28             | Ave.       | 136                 | 1.1           | V              | -0.36                         | 82.92                              | 94                        | 11.08          |
| 2387.75                  | 54.44             | PK         | 354                 | 2.0           | H              | -0.36                         | 54.08                              | 74                        | 19.92          |
| 2387.75                  | 31.62             | Ave.       | 354                 | 2.0           | H              | -0.36                         | 31.26                              | 54                        | 22.74          |
| 2484.68                  | 44.26             | PK         | 122                 | 2.1           | H              | -0.15                         | 44.11                              | 74                        | 29.89          |
| 2484.68                  | 30.59             | Ave.       | 122                 | 2.1           | H              | -0.15                         | 30.44                              | 54                        | 23.56          |
| 4806.00                  | 53.72             | PK         | 1                   | 2.3           | H              | 6.28                          | 60.00                              | 74                        | 14.00          |
| 4806.00                  | 46.53             | Ave.       | 1                   | 2.3           | H              | 6.28                          | 52.81                              | 54                        | 1.19           |
| 7209.00                  | 45.33             | PK         | 139                 | 2.1           | H              | 11.93                         | 57.26                              | 74                        | 16.74          |
| 7209.00                  | 32.59             | Ave.       | 48                  | 2.1           | H              | 11.93                         | 44.52                              | 54                        | 9.48           |
| Middle Channel (2440MHz) |                   |            |                     |               |                |                               |                                    |                           |                |
| 2440.00                  | 92.69             | PK         | 52                  | 2.1           | H              | -0.26                         | 92.43                              | 114                       | 21.57          |
| 2440.00                  | 86.16             | Ave.       | 52                  | 2.1           | H              | -0.26                         | 85.90                              | 94                        | 8.10           |
| 2440.00                  | 91.81             | PK         | 213                 | 1.8           | V              | -0.26                         | 91.55                              | 114                       | 22.45          |
| 2440.00                  | 84.31             | Ave.       | 213                 | 1.8           | V              | -0.26                         | 84.05                              | 94                        | 9.95           |
| 4880.00                  | 54.37             | PK         | 191                 | 1.7           | H              | 6.76                          | 61.13                              | 74                        | 12.87          |
| 4880.00                  | 46.21             | Ave.       | 191                 | 1.7           | H              | 6.76                          | 52.97                              | 54                        | 1.03           |
| 7320.00                  | 46.27             | PK         | 50                  | 1.7           | H              | 11.56                         | 57.83                              | 74                        | 16.17          |
| 7320.00                  | 34.58             | Ave.       | 50                  | 1.7           | H              | 11.56                         | 46.14                              | 54                        | 7.86           |
| High Channel (2480 MHz)  |                   |            |                     |               |                |                               |                                    |                           |                |
| 2480.00                  | 91.34             | PK         | 263                 | 2.2           | H              | -0.15                         | 91.19                              | 114                       | 22.81          |
| 2480.00                  | 86.12             | Ave.       | 263                 | 2.2           | H              | -0.15                         | 85.97                              | 94                        | 8.03           |
| 2480.00                  | 89.89             | PK         | 87                  | 1.2           | V              | -0.15                         | 89.74                              | 114                       | 24.26          |
| 2480.00                  | 84.67             | Ave.       | 87                  | 1.2           | V              | -0.15                         | 84.52                              | 94                        | 9.48           |
| 2325.22                  | 42.16             | PK         | 262                 | 1.9           | H              | -1.05                         | 41.11                              | 74                        | 32.89          |
| 2325.22                  | 30.54             | Ave.       | 262                 | 1.9           | H              | -1.05                         | 29.49                              | 54                        | 24.51          |
| 2483.67                  | 67.66             | PK         | 309                 | 1.6           | H              | -0.15                         | 67.51                              | 74                        | 6.49           |
| 2483.67                  | 34.68             | Ave.       | 309                 | 1.6           | H              | -0.15                         | 34.53                              | 54                        | 19.47          |
| 4960.00                  | 54.79             | PK         | 152                 | 1.7           | H              | 6.80                          | 61.59                              | 74                        | 12.41          |
| 4960.00                  | 46.37             | Ave.       | 152                 | 1.7           | H              | 6.80                          | 53.17                              | 54                        | 0.83           |
| 7440.00                  | 46.68             | PK         | 142                 | 1.5           | H              | 12.39                         | 59.07                              | 74                        | 14.93          |
| 7440.00                  | 36.46             | Ave.       | 142                 | 1.5           | H              | 12.39                         | 48.85                              | 54                        | 5.15           |

**Note:**

Corrected Amplitude = Corrected Factor + Reading

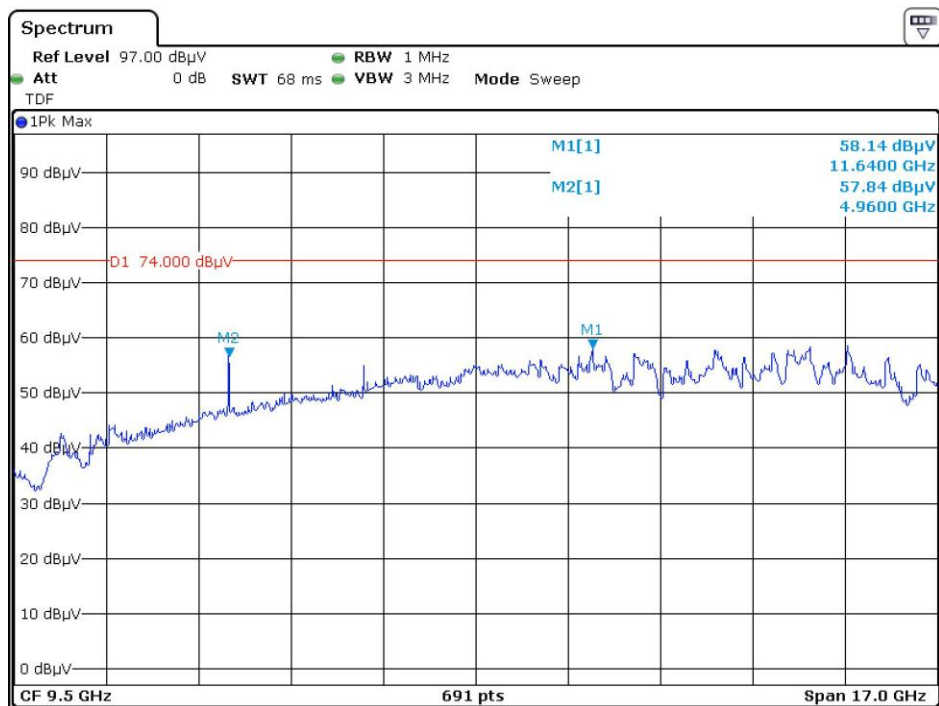
Corrected Factor=Antenna factor (RX) +cable loss – amplifier factor

Margin = Limit- Corr. Amplitude

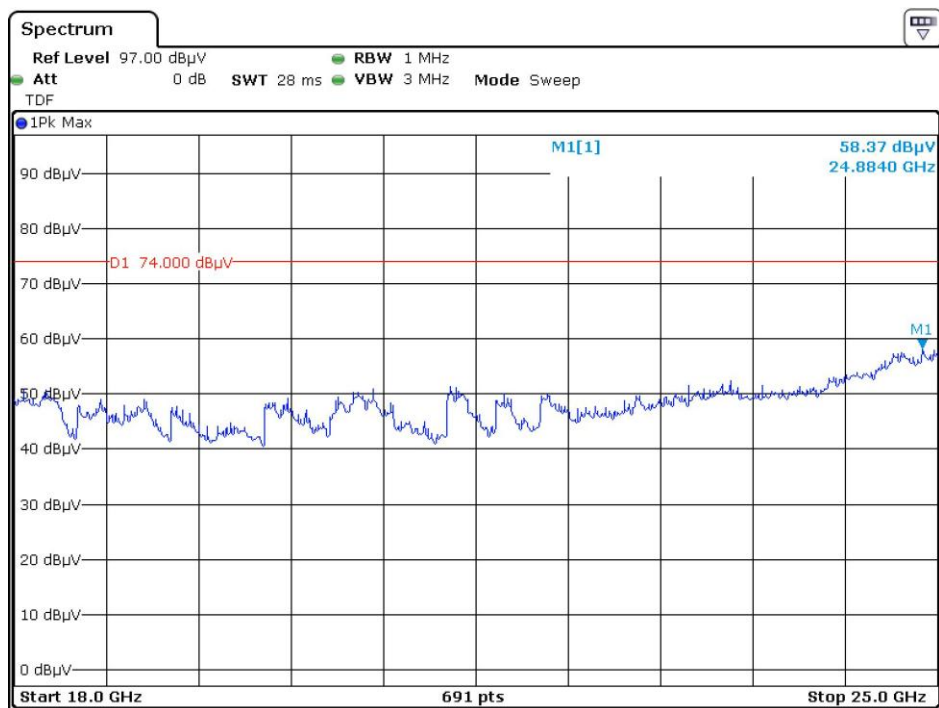
The emission more than 20dB below the limit was not required to be recorded.



### Pre-scan with High channel Peak Horizontal

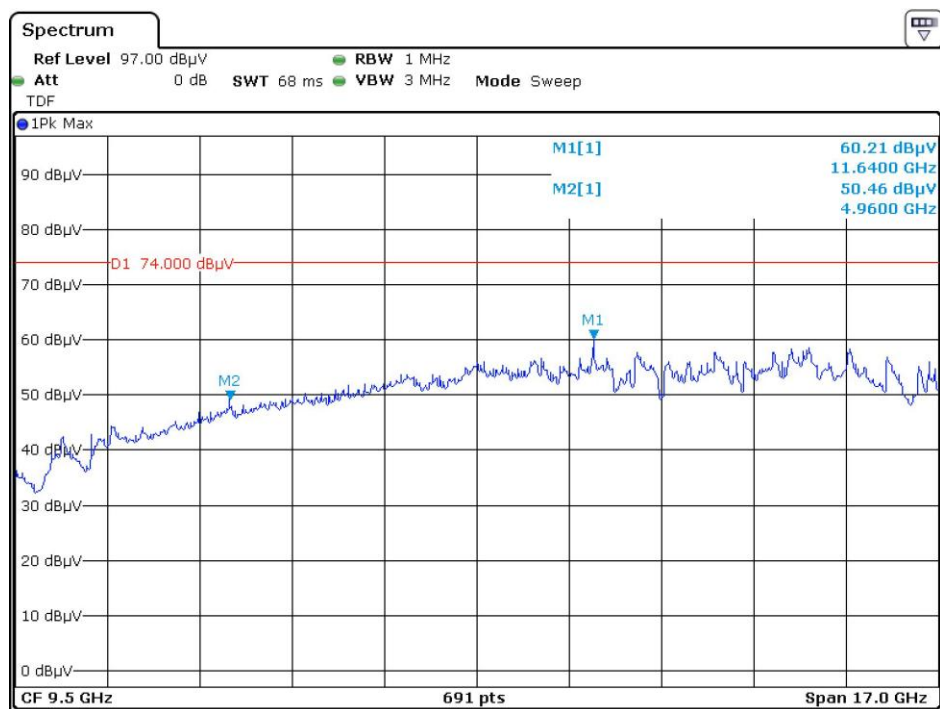


Date: 26.MAR.2020 20:05:21

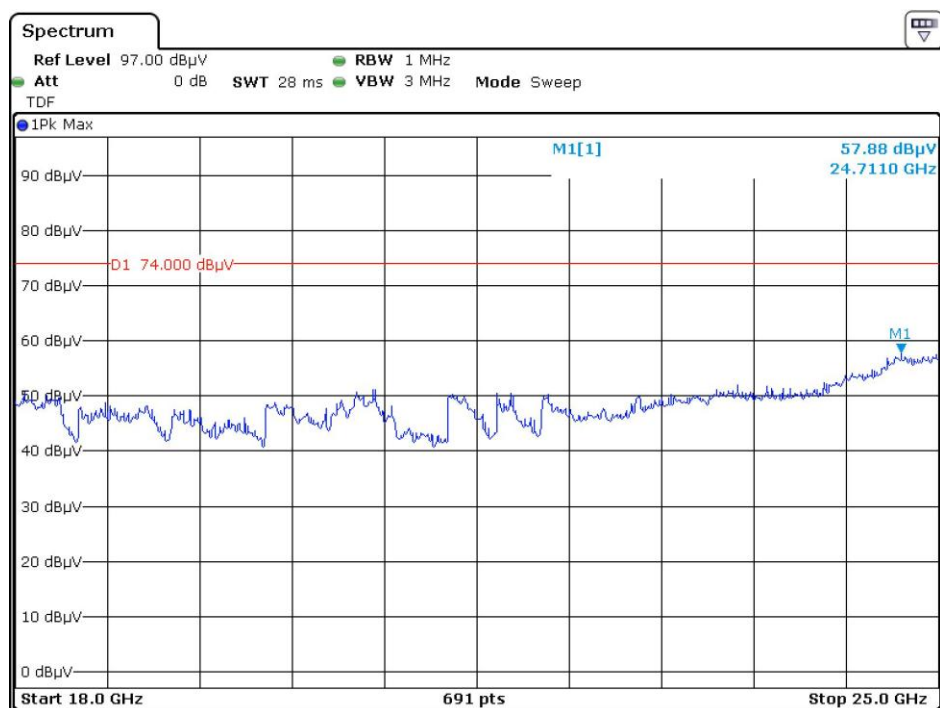


Date: 26.MAR.2020 21:16:04

## Vertical

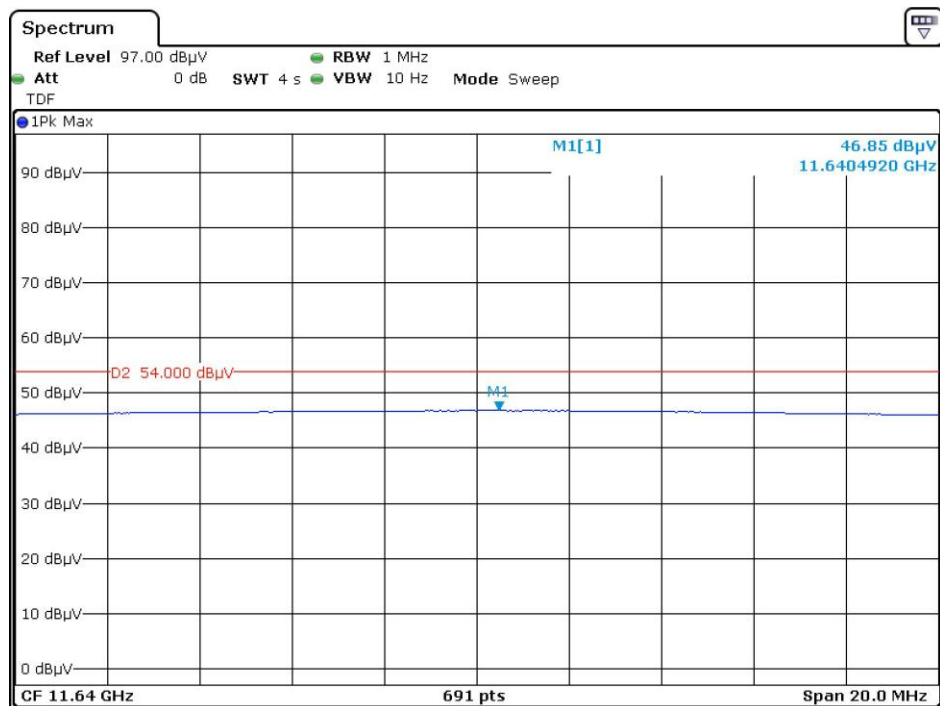


Date: 26.MAR.2020 20:21:07

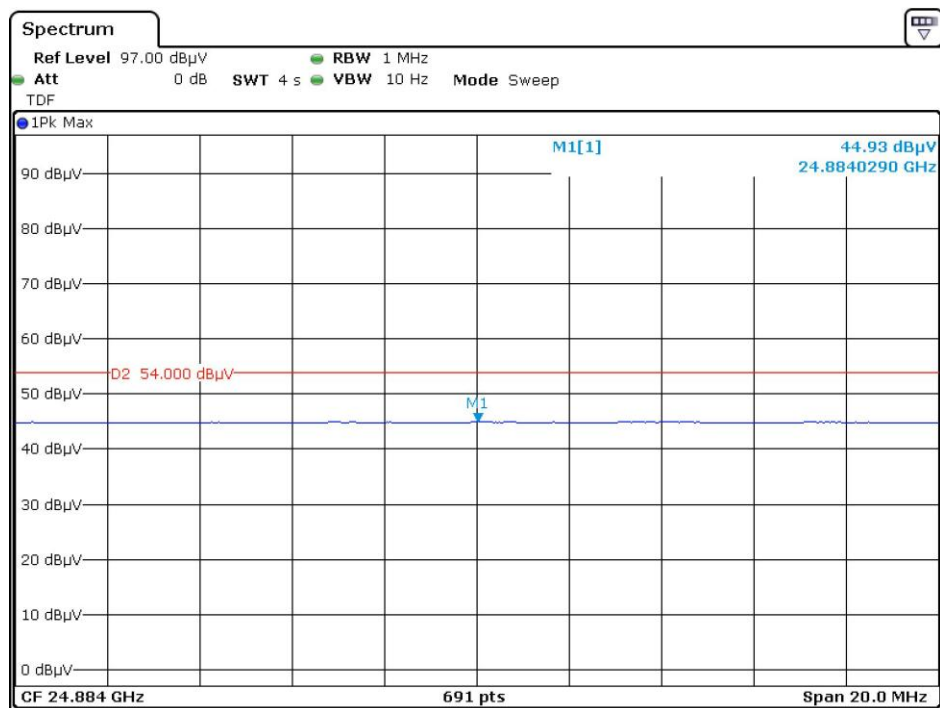


Date: 26.MAR.2020 21:31:34

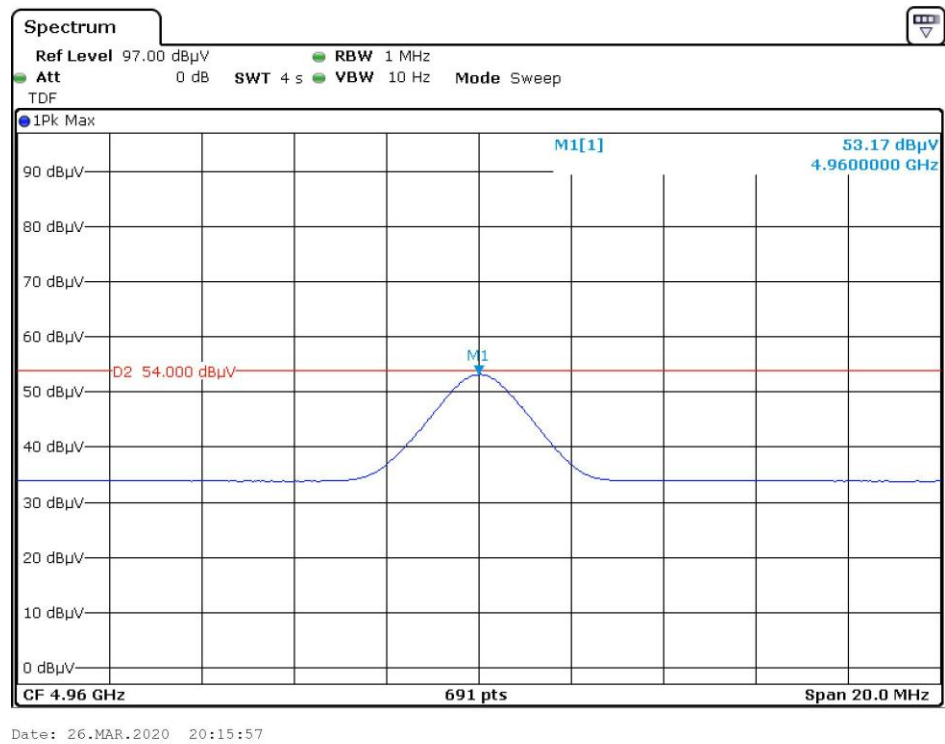
**Average value for the peak point at pre-scan  
Horizontal**



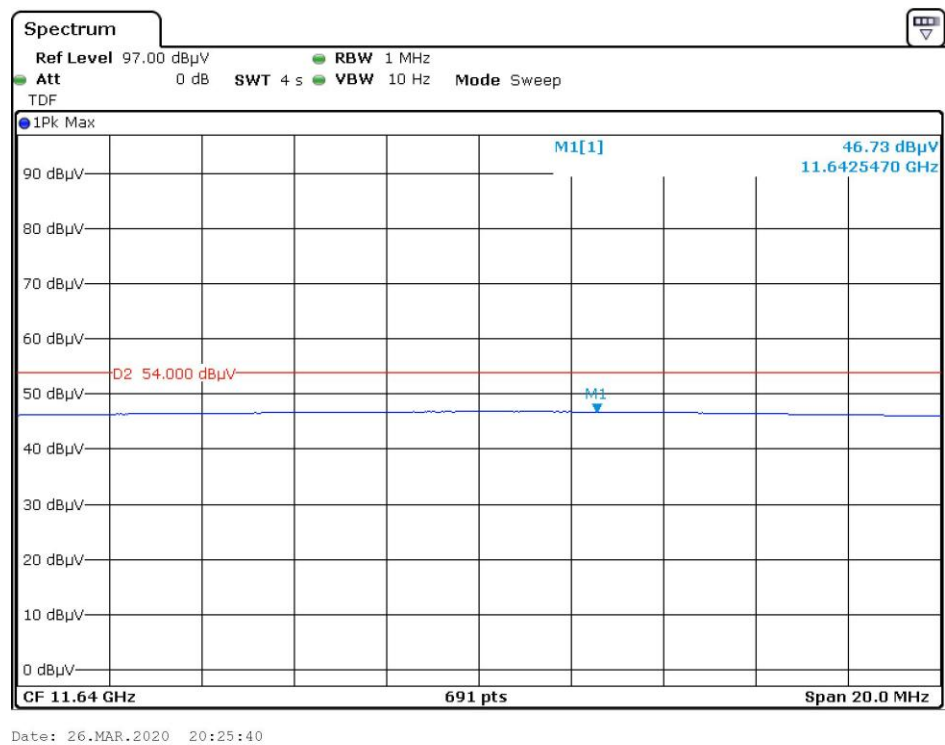
Date: 26.MAR.2020 20:10:19

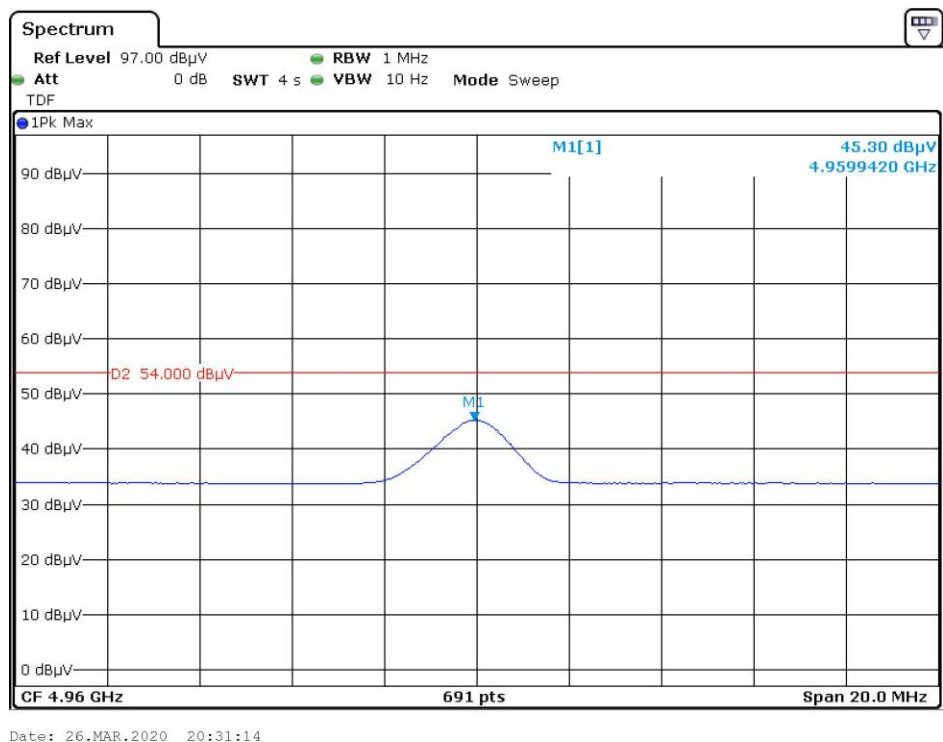
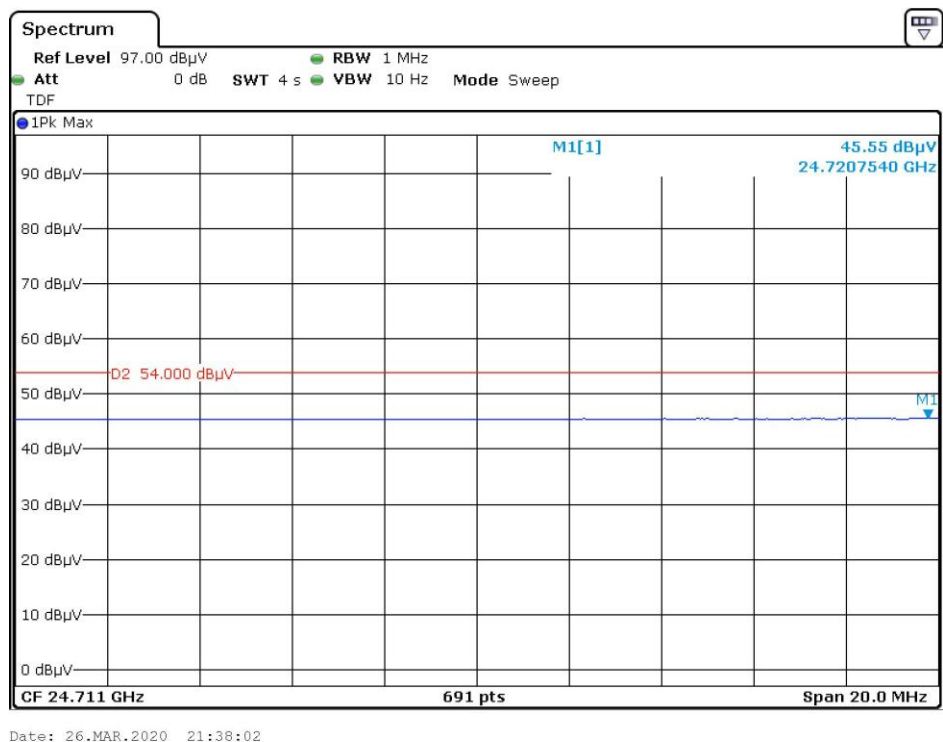


Date: 26.MAR.2020 21:20:35



### Vertical





## FCC §15.215(c) - 20dB EMISSION BANDWIDTH

### Applicable Standard

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

### Test Procedure

Per ANSI C63.10-2013 §6.4 & §6.9.

### Test Data

#### Environmental Conditions

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 27 °C     |
| <b>Relative Humidity:</b> | 53 %      |
| <b>ATM Pressure:</b>      | 101.0 kPa |

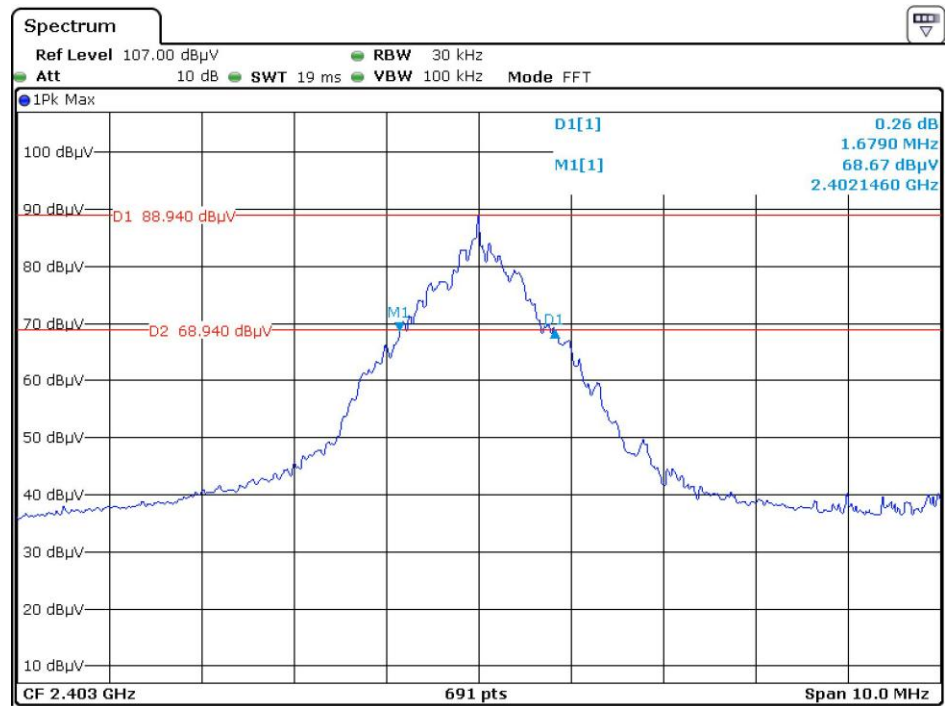
*The testing was performed by Zero Yan and Charlie Cha on 2020-03-26.*

*Test Mode: Transmitting*

*Please refer to the following table and plots.*

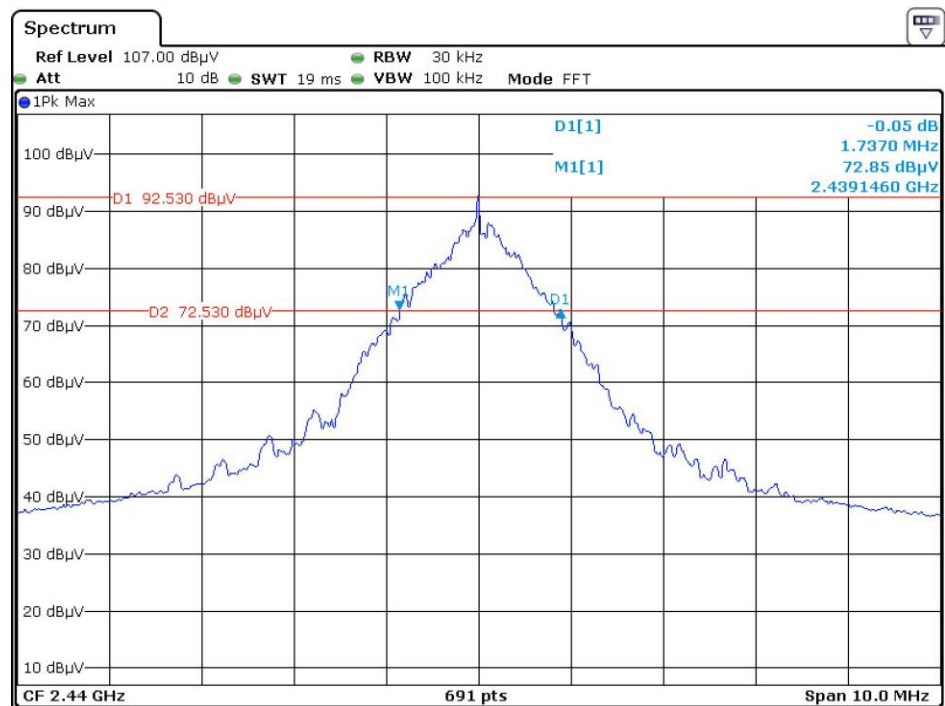
| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) |
|---------|-----------------|----------------------|
| Low     | 2403            | 1.679                |
| Middle  | 2440            | 1.737                |
| High    | 2480            | 1.823                |

## Low Channel



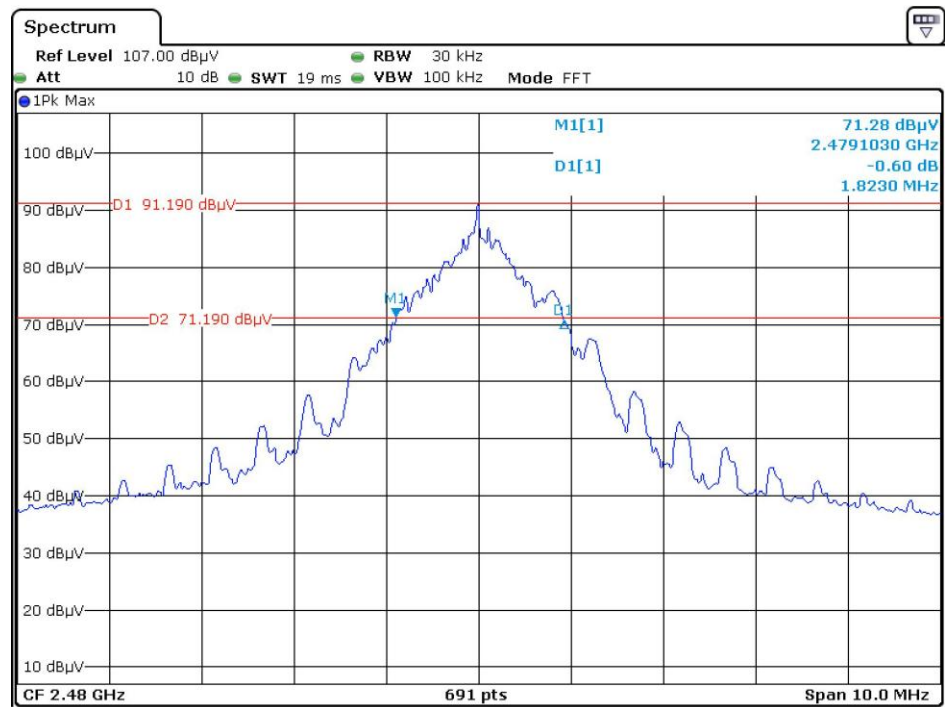
Date: 26.MAR.2020 16:31:42

## Middle Channel



Date: 26.MAR.2020 16:43:29

## High Channel



Date: 26.MAR.2020 16:57:06

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