

# Test Report



## INTENTIONAL RADIATOR TESTS ACCORDING TO FCC PART 15 C AND INDUSTRY CANADA REQUIREMENTS

|                          |                                                               |
|--------------------------|---------------------------------------------------------------|
| Equipment Under Test:    | RFID reader unit                                              |
| Type:                    | MIFCM 2.10 12VDC                                              |
| Customer / Manufacturer: | Idesco Oy<br>Teknologiantie 9<br>FI-90570 Oulu<br>Finland     |
| FCC Rule Part:           | 15.209: 2018<br>15.225: 2018                                  |
| IC Rule Part:            | RSS-210, Issue 9, 2016<br>RSS-GEN, Issue 5, Amendment 1, 2019 |

Date: 27 March 2020

Issued by:

Henri Mäki  
Testing Engineer

Date: 27 March 2020

Checked by:

Rauno Repo  
Senior EMC/RF Specialist

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## Equipment Under Test (EUT)

MIFARE (Idesco MIFCM) RFID reader module and antenna used in Thermo Fisher TCAutomation modules.

|                   | <b>EUT1</b>      | <b>EUT2</b>      |
|-------------------|------------------|------------------|
| Product:          | RFID reader unit | RFID reader unit |
| Type:             | MIFCM 2.10 12VDC | MIFCM 2.10 12VDC |
| Serial Number:    | 706952           | 706953           |
| Software version: | S00629           | S00629           |

## Classification of the device

|                                              |                                     |
|----------------------------------------------|-------------------------------------|
| Fixed device                                 | <input checked="" type="checkbox"/> |
| Mobile Device (Human body distance > 20cm)   | <input type="checkbox"/>            |
| Portable Device (Human body distance < 20cm) | <input type="checkbox"/>            |

## Description of the EUT

13.56 MHz circuit board RFID reader unit. Two different RF antenna holder types to mount antenna to TCA modules.

EUT1 has a round shaped plastic holder with antenna grounding wire attached to a metal plate.

EUT2 has a rectangular metallic holder with antenna grounding via metal holder.

## Ratings and declarations, HF

|                                        |                    |
|----------------------------------------|--------------------|
| Operating Frequency Range (OFR):       | 13.56 MHz          |
| Channels:                              | 1 transmit channel |
| Effective radiated or conducted power: | -                  |
| Modulation:                            | -                  |
| Antenna:                               | -                  |

## Power Supply

|                                         |                                                     |
|-----------------------------------------|-----------------------------------------------------|
| Operating voltage (module):             | 11.5 – 12.5 VDC                                     |
| Operating voltage (AC/DC power supply): | input 115 V 60 Hz, output 24 VDC for the host unit  |
| type: TDK-Lambda, model HWS300-24       | (used in conducted emissions 150 kHz – 30 MHz test) |
| type: SINPRO, model MPU60A-108          | (used in all other tests)                           |

## Cables

| <b>Cable:</b> | <b>Length:</b> | <b>Type:</b>                               |
|---------------|----------------|--------------------------------------------|
| Data cable    | 0.7 m          | unshielded cable, 4 x 0.25 mm <sup>2</sup> |
| Antenna cable | 0.6 m          | shielded triaxial cable                    |
| Ethernet      | 2.0 m          | shielded, CAT6                             |

## Mechanical size of the EUT

|               |               |               |                  |
|---------------|---------------|---------------|------------------|
| Height: 14 mm | Width: 110 mm | Length: 55 mm | Weight: 0.040 kg |
|---------------|---------------|---------------|------------------|

## Disclaimer

*This document is issued by the Company under its General Conditions of service accessible at [http://www.sgs.com/terms\\_and\\_conditions.htm](http://www.sgs.com/terms_and_conditions.htm). attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.*

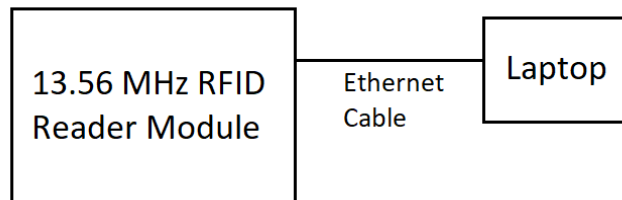
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*Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only. This document cannot be reproduced except in full, without prior approval of the Company.*

## Summary of Testing

| Test Specification        | Description of Test                         | Result |
|---------------------------|---------------------------------------------|--------|
| §15.207, RSS-210, RSS-GEN | Conducted Emissions 150 kHz to 30 MHz       | PASS   |
| §15.209, RSS-210, RSS-GEN | Radiated Emissions 9 kHz to 1 GHz           | PASS   |
| §15.225, RSS-210          | Operation within the band 13.110-14.010 MHz | PASS   |
| §15.225, RSS-210          | Frequency Stability                         | PASS   |
| RSS-GEN                   | Occupied Bandwidth                          | PASS   |

## Block Diagram



## EUT Test Conditions During Testing

Configuration of the EUT was made to correspond to the actual assembling conditions as far as possible. During tests the EUT was connected to AC/DC power supply and to a test laptop with an ethernet cable.

**Table 1. Normal and extreme test conditions**

| Test conditions: |         | Temperature [°C]: | Voltage [V]:           | Frequency [Hz]: |
|------------------|---------|-------------------|------------------------|-----------------|
| Normal           |         | 20 – 25           | 115 V <sub>AC</sub>    | 60              |
| Extreme          | Minimum | -20               | 97.75 V <sub>AC</sub>  |                 |
|                  | Maximum | +50               | 132.25 V <sub>AC</sub> |                 |

## Test Facility

|                                                                                                            |                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Testing Laboratory / address:<br>FCC designation number: <b>FI0002</b><br>ISED CAB identifier: <b>T004</b> | SGS Fimko Ltd<br>Takomotie 8<br>FI-00380, HELSINKI<br>FINLAND                                                                                                                                                                |
| Test Site:                                                                                                 | <input checked="" type="checkbox"/> K10LAB, ISED Canada registration number: <b>8708A-1</b><br><input checked="" type="checkbox"/> K5LAB, ISED Canada registration number: <b>8708A-2</b><br><input type="checkbox"/> T10LAB |

## Conducted Emissions In The Frequency Range 150 kHz – 30 MHz

**Standard:** ANSI C63.10  
**Tested by:** JSU  
**Date:** 26 March 2020  
**Temperature:** 20 °C  
**Humidity:** 27 %RH  
**Measurement uncertainty**  $\pm 2.9$  dB

Level of confidence 95 % (k = 2)

### FCC Rule: 15.207 (a)

Conducted disturbance voltage was measured with an artificial main network from 150 kHz to 30 MHz with 4.5 kHz steps and a resolution bandwidth of 9 kHz. Measurements were carried out with peak and average detectors.

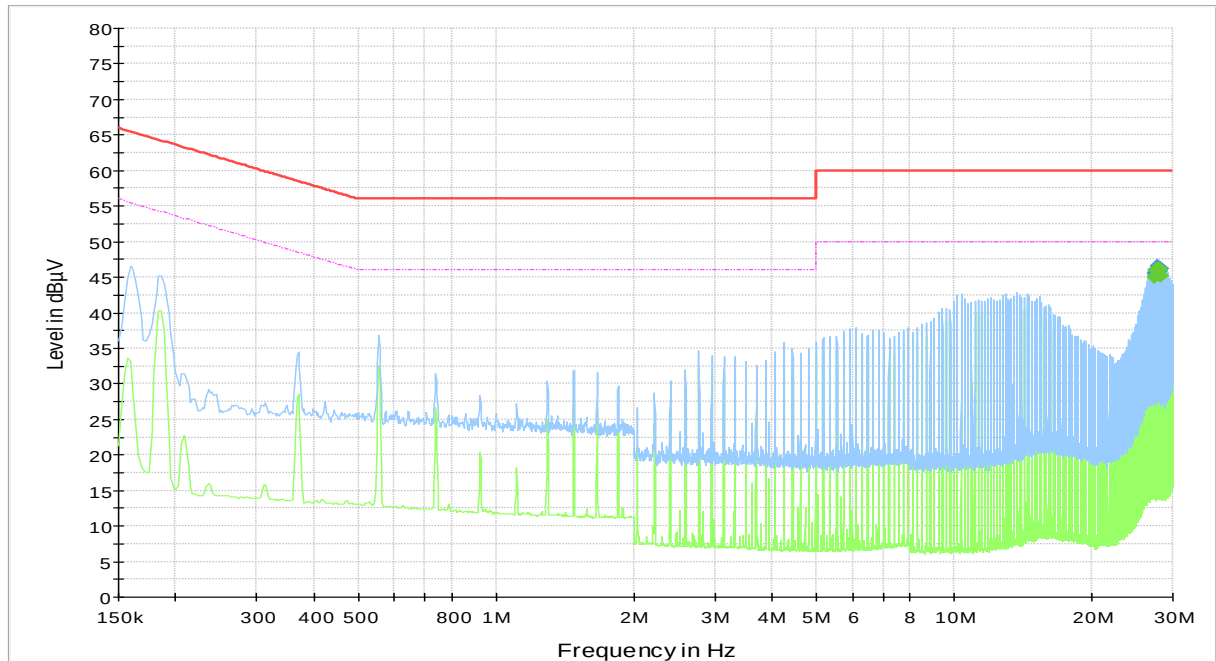
| Frequency of emission (MHz) | Conducted limit (dB $\mu$ V) |           |
|-----------------------------|------------------------------|-----------|
|                             | Quasi-peak                   | Average   |
| 0.15-0.5                    | 66 to 56*                    | 56 to 46* |
| 0.5-5                       | 56                           | 46        |
| 5-30                        | 60                           | 50        |

\*Decreases with the logarithm of the frequency.

## Test results

### EUT1

Full Spectrum



**Figure 1:** The measured curves with peak- and average detector

**Table 2:** Final QuasiPeak measurements from the worst frequencies

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE  | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 27.354750       | 45.53            | 1000.0          | 9.000           | GND | L1   | 11.5       | 14.47       | 60.00        |
| 27.541500       | 46.07            | 1000.0          | 9.000           | GND | L1   | 11.5       | 13.93       | 60.00        |
| 27.726000       | 46.47            | 1000.0          | 9.000           | GND | L1   | 11.5       | 13.53       | 60.00        |
| 27.910500       | 46.22            | 1000.0          | 9.000           | GND | L1   | 11.5       | 13.78       | 60.00        |
| 28.095000       | 45.86            | 1000.0          | 9.000           | GND | L1   | 11.5       | 14.14       | 60.00        |
| 28.279500       | 46.18            | 1000.0          | 9.000           | GND | L1   | 11.5       | 13.82       | 60.00        |

**Table 3:** Final Average measurements from the worst frequencies

| Frequency (MHz) | Average (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE  | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|----------------|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 27.354750       | 44.93          | 1000.0          | 9.000           | GND | L1   | 11.5       | 5.07        | 50.00        |
| 27.541500       | 46.03          | 1000.0          | 9.000           | GND | L1   | 11.5       | 3.97        | 50.00        |
| 27.726000       | 46.11          | 1000.0          | 9.000           | GND | L1   | 11.5       | 3.89        | 50.00        |
| 27.910500       | 46.09          | 1000.0          | 9.000           | GND | L1   | 11.5       | 3.91        | 50.00        |
| 28.095000       | 46.16          | 1000.0          | 9.000           | GND | L1   | 11.5       | 3.84        | 50.00        |
| 28.279500       | 45.24          | 1000.0          | 9.000           | GND | L1   | 11.5       | 4.76        | 50.00        |

The correction factor in the final result table contains the sum of the transducers (transient limiter + cables).  
The result value is the measured value corrected with the correction factor.

## EUT2

Full Spectrum

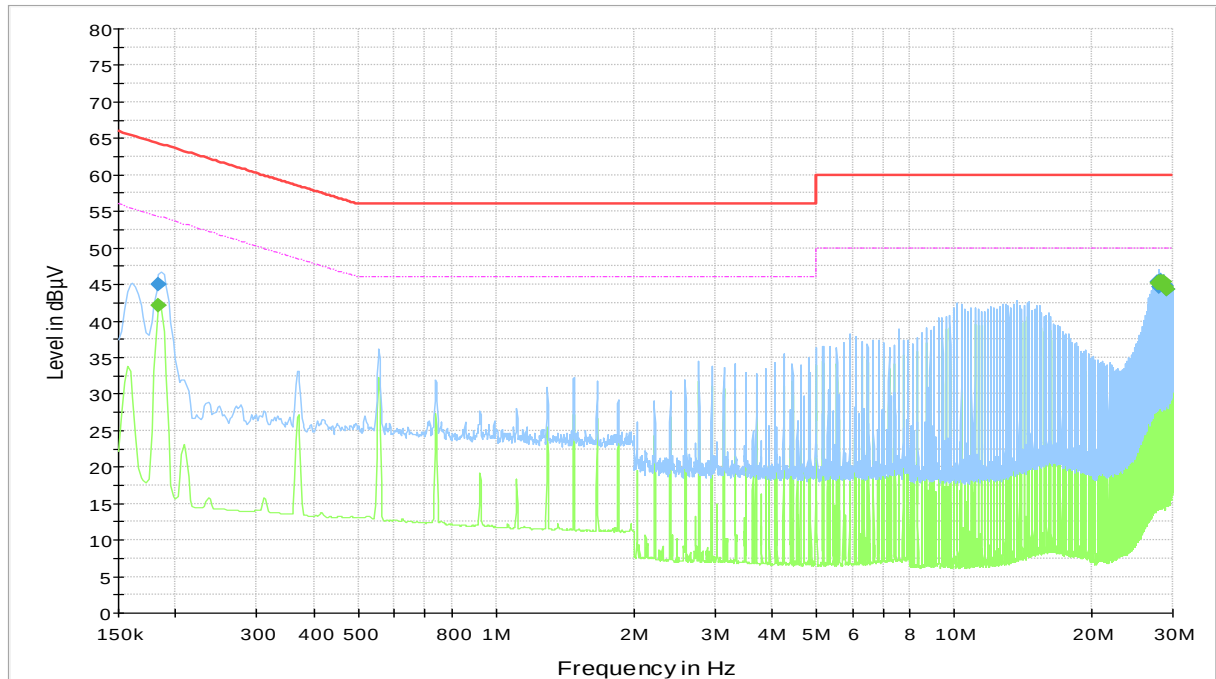


Figure 2: The measured curves with peak- and average detector

Table 4: Final QuasiPeak measurements from the worst frequencies

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE  | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 0.183750        | 45.08            | 1000.0          | 9.000           | GND | L1   | 10.0       | 19.23       | 64.31        |
| 27.723750       | 45.34            | 1000.0          | 9.000           | GND | L1   | 11.5       | 14.66       | 60.00        |
| 27.906000       | 44.64            | 1000.0          | 9.000           | GND | L1   | 11.5       | 15.36       | 60.00        |
| 28.092750       | 45.43            | 1000.0          | 9.000           | GND | L1   | 11.5       | 14.57       | 60.00        |
| 28.277250       | 45.55            | 1000.0          | 9.000           | GND | L1   | 11.5       | 14.45       | 60.00        |
| 28.461750       | 45.34            | 1000.0          | 9.000           | GND | L1   | 11.5       | 14.66       | 60.00        |
| 28.648500       | 45.02            | 1000.0          | 9.000           | GND | N    | 11.5       | 14.98       | 60.00        |
| 28.833000       | 44.77            | 1000.0          | 9.000           | GND | N    | 11.5       | 15.23       | 60.00        |
| 29.017500       | 44.37            | 1000.0          | 9.000           | GND | N    | 11.5       | 15.63       | 60.00        |

Table 5: Final Average measurements from the worst frequencies

| Frequency (MHz) | Average (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE  | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|----------------|-----------------|-----------------|-----|------|------------|-------------|--------------|
| 0.183750        | 42.10          | 1000.0          | 9.000           | GND | L1   | 10.0       | 12.21       | 54.31        |
| 27.723750       | 45.10          | 1000.0          | 9.000           | GND | L1   | 11.5       | 4.90        | 50.00        |
| 27.910500       | 45.25          | 1000.0          | 9.000           | GND | L1   | 11.5       | 4.75        | 50.00        |
| 28.095000       | 45.34          | 1000.0          | 9.000           | GND | L1   | 11.5       | 4.66        | 50.00        |
| 28.279500       | 45.40          | 1000.0          | 9.000           | GND | L1   | 11.5       | 4.60        | 50.00        |
| 28.464000       | 45.43          | 1000.0          | 9.000           | GND | L1   | 11.5       | 4.57        | 50.00        |
| 28.648500       | 45.28          | 1000.0          | 9.000           | GND | L1   | 11.5       | 4.72        | 50.00        |
| 28.833000       | 44.66          | 1000.0          | 9.000           | GND | L1   | 11.5       | 5.34        | 50.00        |
| 29.017500       | 44.29          | 1000.0          | 9.000           | GND | L1   | 11.5       | 5.71        | 50.00        |

The correction factor in the final result table contains the sum of the transducers (transient limiter + cables).  
The result value is the measured value corrected with the correction factor.



## Radiated Emissions In The Frequency Range 9 kHz – 1 GHz

**Standard:** ANSI C63.10  
**Tested by:** HEM  
**Date:** 25 April 2019  
**Temperature:** 21 °C  
**Humidity:** 41 % RH  
**Measurement uncertainty** ± 4.5 dB

Level of confidence 95 % (k = 2)

### FCC Rule: 15.209

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 (meters) |
|-----------------|-----------------------------------|-------------------------------|
| 0.009-0.490     | 2400/F(kHz)                       | 300                           |
| 0.490-1.705     | 24000/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                             |

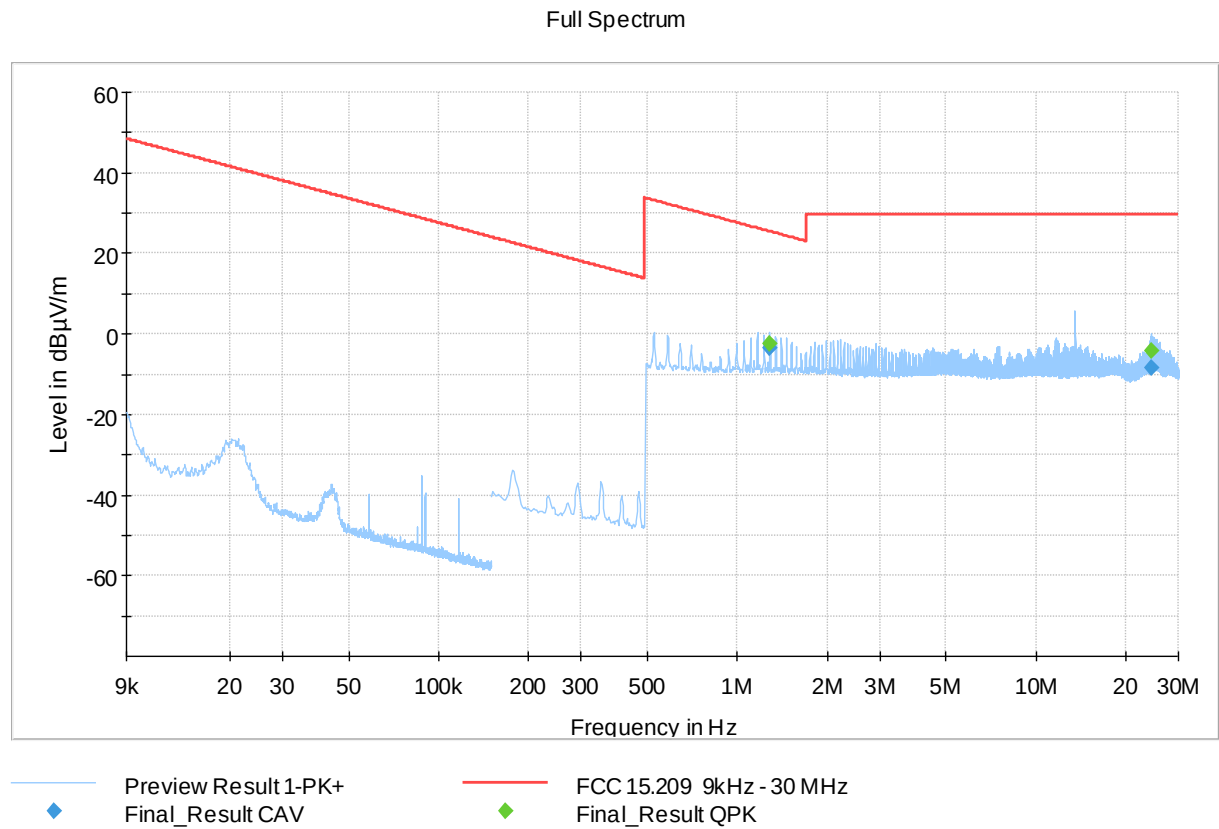
The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

According to ANSI C63.10 (clause 5.3.2) and RSS-Gen (Clause 4.11) the measurements below 30 MHz can be performed at a closer distance than the EUT limit distance, the results shall be extrapolated to limit distance by using the square of an inverse linear distance extrapolation factor (40 dB/ decade). This method was used when performing measurements at a distance of 3 m instead of limit distances 300 m or 30 m.

The correction factor in the final result table contains the sum of the transducers (antenna + cables + distance). The result value is the measured value corrected with the correction factor.

## Test results

### EUT1

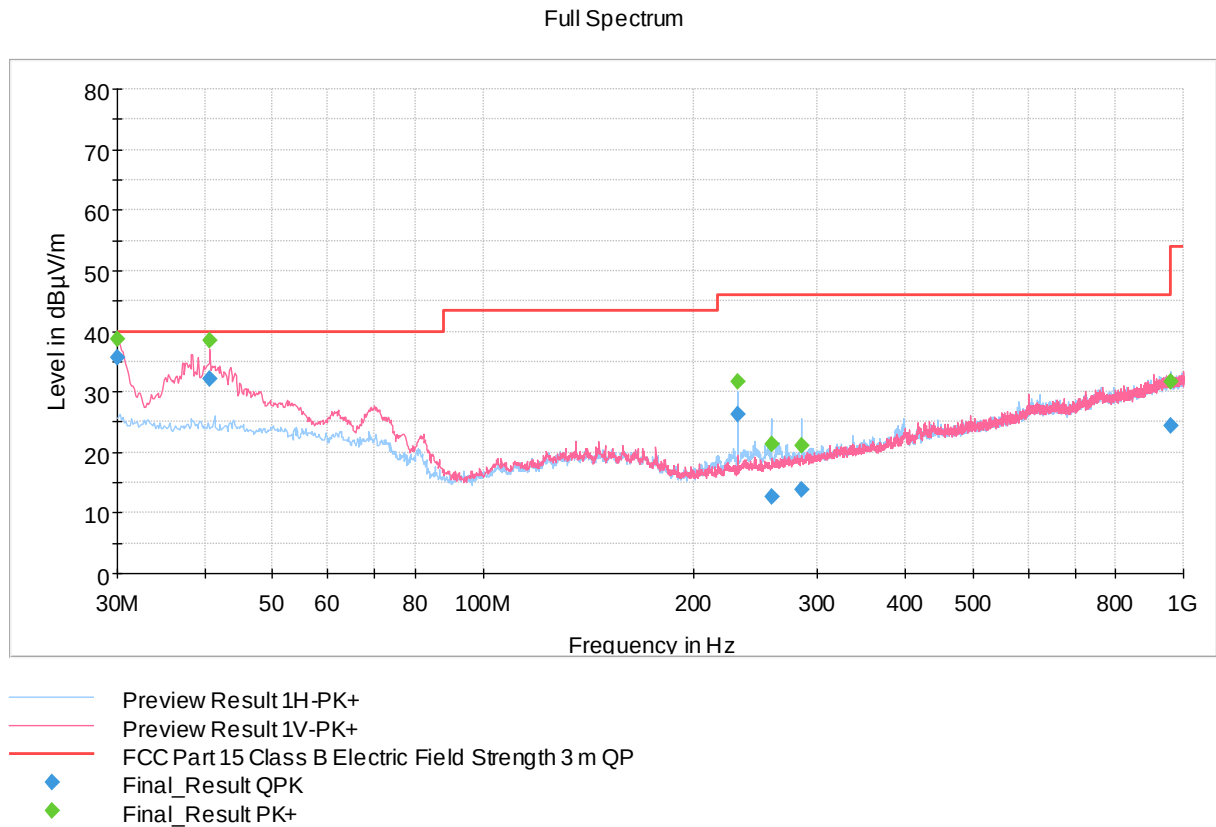


**Figure 3.** EUT1 TX radiated emission 9 kHz to 30MHz

### Final measurements from the worst frequencies

**Table 6.** The final results with quasi-peak detector

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-----|---------------|--------------|
| 1.285250        | -2.46              | 25.45          | 27.91       | 1000.0          | 9.000           | V   | 154.0         | -20.3        |
| 24.316750       | -4.02              | 29.50          | 33.52       | 1000.0          | 9.000           | V   | 180.0         | -19.5        |



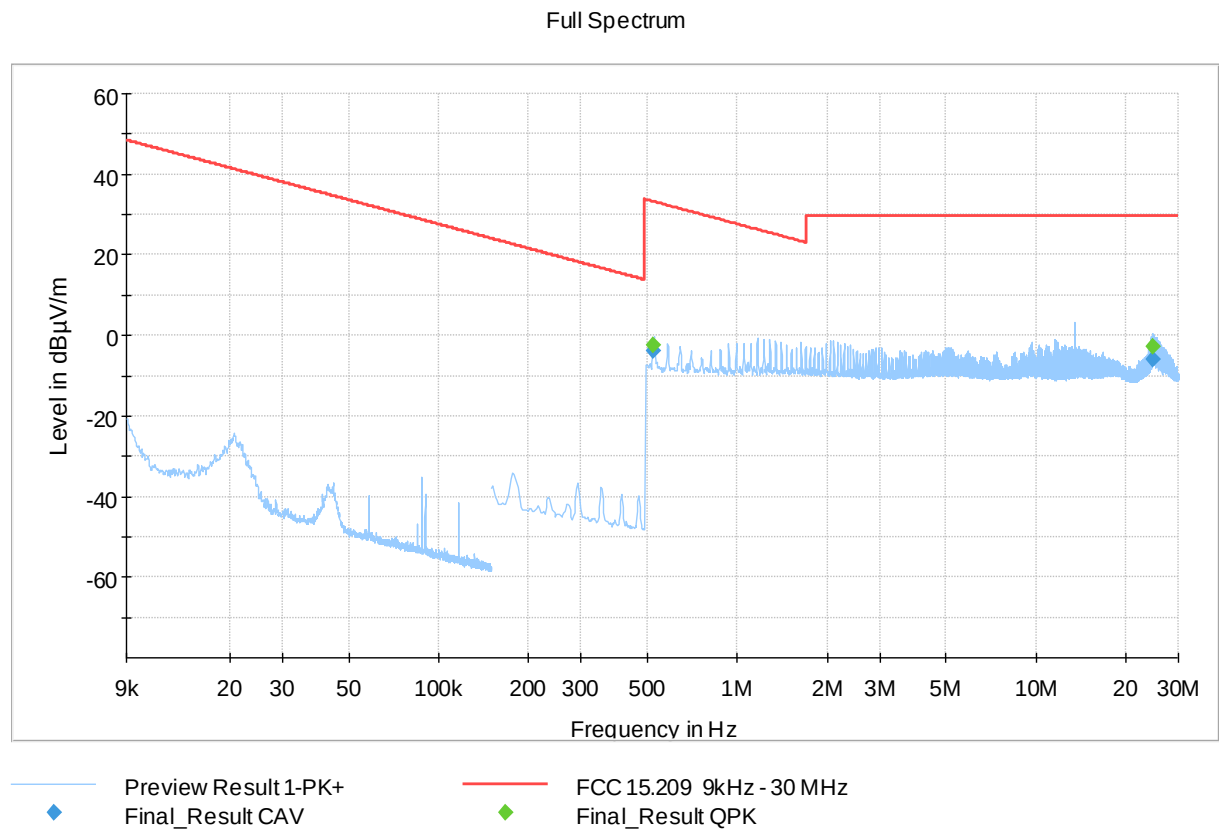
**Figure 4.** EUT1 TX radiated emission 30 MHz to 1000 MHz

#### Final measurements from the worst frequencies

**Table 7.** The final results with quasi-peak detector

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-----|---------------|--------------|
| 30.040000       | 35.75              | 40.00          | 4.25        | 1000.0          | 120.000         | V   | 114.0         | 16.9         |
| 40.645000       | 32.13              | 40.00          | 7.87        | 1000.0          | 120.000         | V   | 59.0          | 18.1         |
| 230.515000      | 26.19              | 46.00          | 19.81       | 1000.0          | 120.000         | H   | 329.0         | 16.0         |
| 257.745000      | 12.67              | 46.00          | 33.33       | 1000.0          | 120.000         | H   | 1.0           | 17.7         |
| 284.835000      | 13.83              | 46.00          | 32.17       | 1000.0          | 120.000         | H   | 326.0         | 18.8         |
| 957.695000      | 24.46              | 46.00          | 21.54       | 1000.0          | 120.000         | H   | 190.0         | 31.3         |

## EUT2

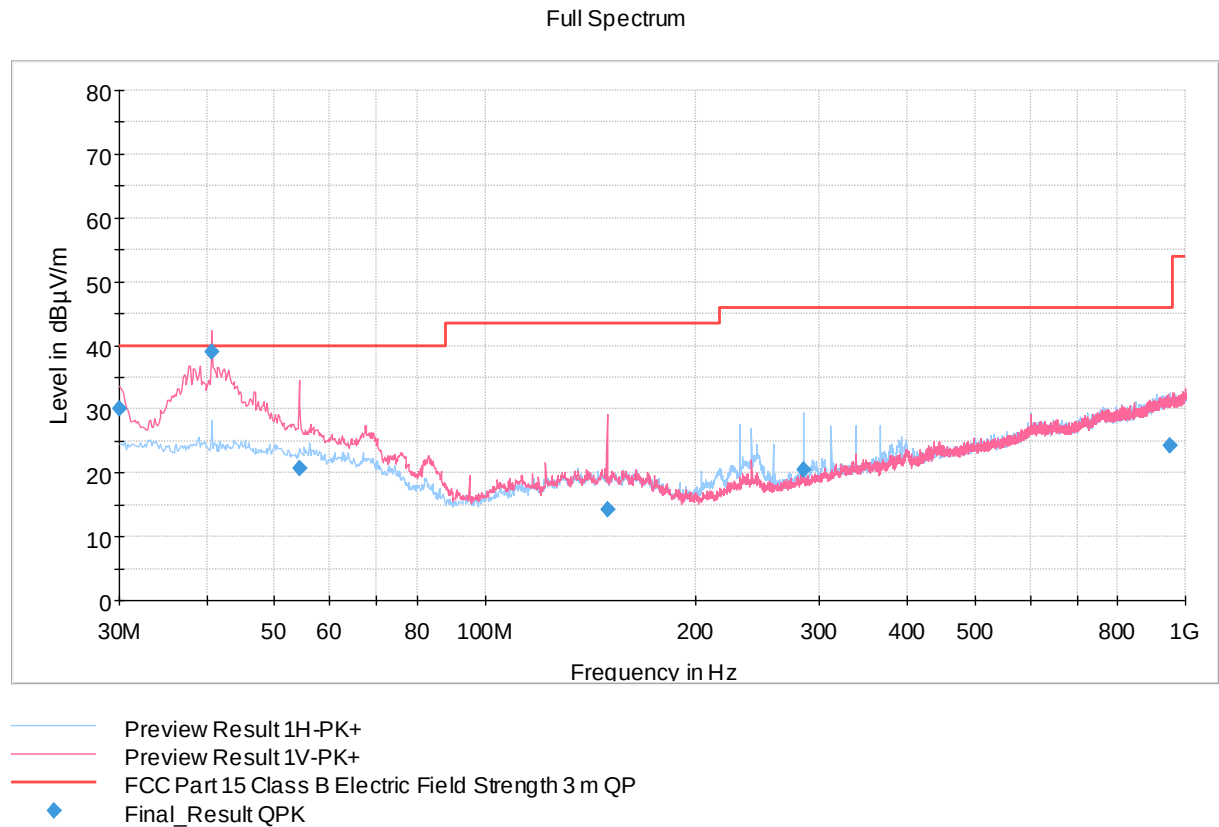


**Figure 5.** EUT2 TX radiated emission 9 kHz to 30MHz

### Final measurements from the worst frequencies

**Table 8.** The final results with quasi-peak detector

| Frequency (MHz) | QuasiPeak (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------------|----------------------|-------------|-----------------|-----------------|-----|---------------|--------------|
| 0.524750        | -2.48                    | 33.21                | 35.69       | 1000.0          | 9.000           | V   | 143.0         | -20.3        |
| 24.615000       | -2.63                    | 29.50                | 32.13       | 1000.0          | 9.000           | V   | 250.0         | -19.5        |



**Figure 6.** EUT2 TX radiated emission 30 MHz to 1000 MHz

#### Final measurements from the worst frequencies

**Table 9.** The final results with quasi-peak detector

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-----|---------------|--------------|
| 30.000000       | 30.16              | 40.00          | 9.84        | 1000.0          | 120.000         | V   | 32.0          | 16.9         |
| 40.705000       | 39.09              | 40.00          | 0.91        | 1000.0          | 120.000         | V   | 199.0         | 18.1         |
| 54.365000       | 20.73              | 40.00          | 19.27       | 1000.0          | 120.000         | V   | 222.0         | 18.5         |
| 149.295000      | 14.21              | 43.50          | 29.29       | 1000.0          | 120.000         | V   | 204.0         | 18.6         |
| 284.695000      | 20.53              | 46.00          | 25.47       | 1000.0          | 120.000         | H   | 107.0         | 18.8         |
| 948.625000      | 24.37              | 46.00          | 21.63       | 1000.0          | 120.000         | H   | 58.0          | 31.3         |

## Operation within the band 13.110 – 14.010 MHz

**Standard:** ANSI C63.10  
**Tested by:** HEM  
**Date:** 25 April 2019  
**Temperature:** 21 °C  
**Humidity:** 41 % RH  
**Measurement uncertainty** ± 4.5 dB

Level of confidence 95 % (k = 2)

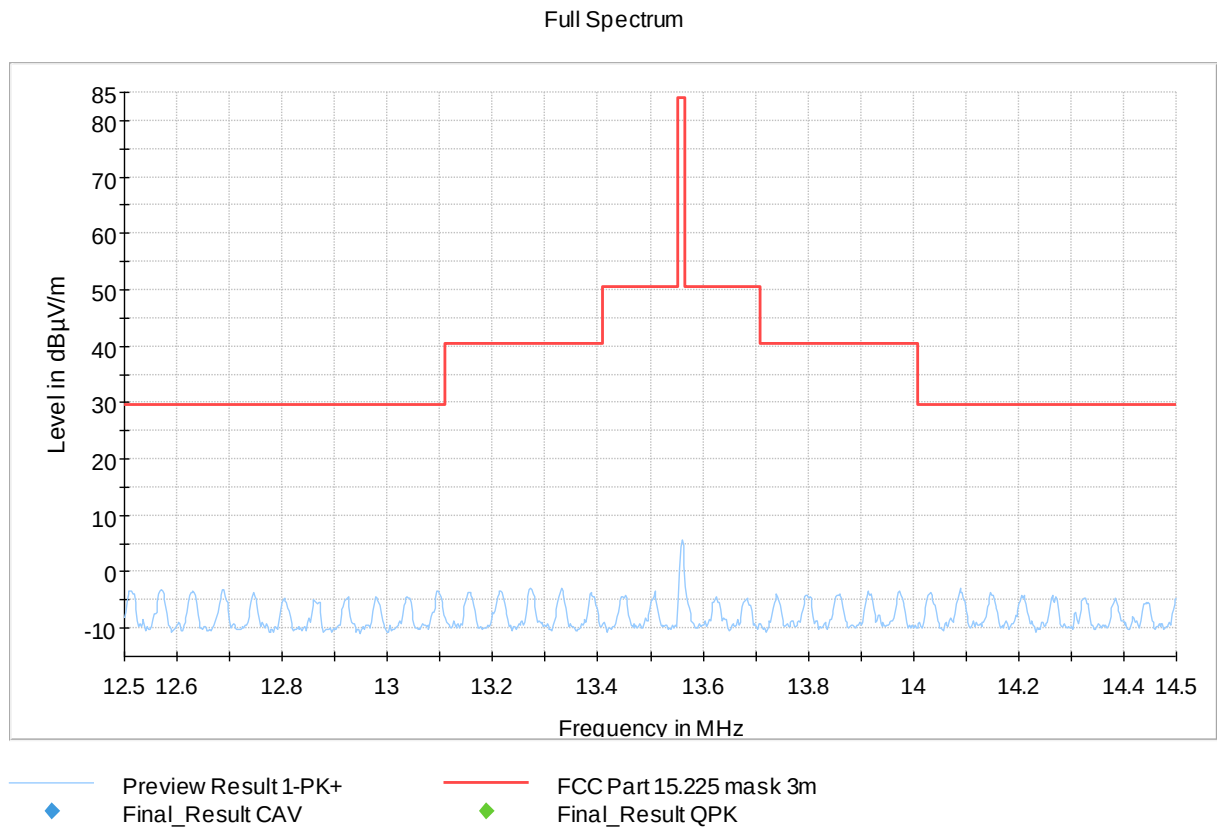
### FCC Rule: 15.225

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength (dBµV/m) | Measurement Distance (m) |
|-----------------|-------------------------|--------------------------|
| 13.110 – 13.410 | 40.5                    | 30                       |
| 13.410 – 13.553 | 50.5                    | 30                       |
| 13.553 – 13.567 | 84.0                    | 30                       |
| 13.567 – 13.710 | 50.5                    | 30                       |
| 13.710 – 14.010 | 40.5                    | 30                       |

## Test results

### EUT1



**Figure 7.** EUT1 TX radiated emission within the band 13.110 to 14.010 MHz

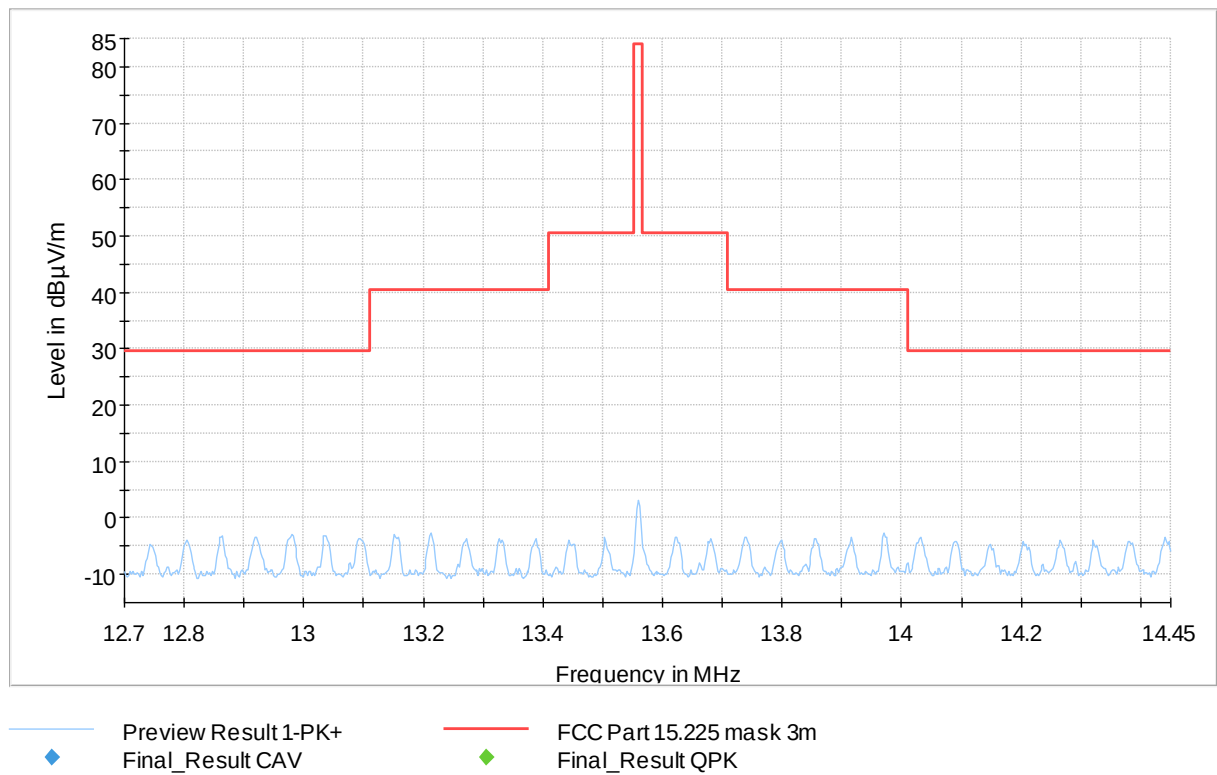
No final measurements were made due to the margin being more than 20 dB.

**Table 10.** The preliminary results with peak detector

| Frequency (MHz) | Peak (dBμV/m) | QuasiPeak Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|---------------|--------------------------|-------------|-----------------|-----------------|-----|---------------|--------------|
| 13.56           | 5.771         | 84.0                     | -           | -               | -               | -   | -             | -            |

## EUT2

Full Spectrum



**Figure 8.** EUT2 TX radiated emission within the band 13.110 to 14.010 MHz

No final measurements were made due to the margin being more than 20 dB.

**Table 11.** The preliminary results with peak detector

| Frequency (MHz) | Peak (dBμV/m) | QuasiPeak Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|---------------|--------------------------|-------------|-----------------|-----------------|-----|---------------|--------------|
| 13.56           | 3.153         | 84.0                     | -           | -               | -               | -   | -             | -            |



## Frequency Stability

|                     |               |               |
|---------------------|---------------|---------------|
| <b>Standard:</b>    | ANSI C63.10   |               |
| <b>Tested by:</b>   | HEM           |               |
| <b>Date:</b>        | 26 April 2019 | 29 April 2019 |
| <b>Temperature:</b> | 22 °C         | 22 °C         |
| <b>Humidity:</b>    | 30 % RH       | 23 % RH       |

**FCC Rule: 15.225©**

**IC Rule: RSS-210, RS-GEN (6.11)**

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency over a temperature variation of  $-20\text{ }^{\circ}\text{C}$  to  $+50\text{ }^{\circ}\text{C}$  at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of  $20^{\circ}\text{C}$ . For battery operated equipment, the equipment tests shall be performed using a new battery.

## Test results

### EUT1

**Table 12.** Frequency stability test, extreme conditions

| Test conditions |                        | Frequency<br>(MHz) | deviation<br>from nominal<br>(%) | Result |
|-----------------|------------------------|--------------------|----------------------------------|--------|
| Temperature     | Voltage                |                    |                                  |        |
| -20 °C          | 115 V <sub>AC</sub>    | 13.56012300        | 0.00090708                       | PASS   |
| -10 °C          | 115 V <sub>AC</sub>    | 13.56013750        | 0.00101401                       | PASS   |
| 0 °C            | 115 V <sub>AC</sub>    | 13.56013020        | 0.00096018                       | PASS   |
| +10 °C          | 115 V <sub>AC</sub>    | 13.56010130        | 0.00074705                       | PASS   |
| +20 °C          | 97.75 V <sub>AC</sub>  | 13.56005070        | 0.00037389                       | PASS   |
| +20 °C          | 115 V <sub>AC</sub>    | 13.56005790        | 0.00042699                       | PASS   |
| +20 °C          | 132.25 V <sub>AC</sub> | 13.56005070        | 0.00037389                       | PASS   |
| +30 °C          | 115 V <sub>AC</sub>    | 13.56000720        | 0.00005310                       | PASS   |
| +40 °C          | 115 V <sub>AC</sub>    | 13.55995660        | -0.00032006                      | PASS   |
| +50 °C          | 115 V <sub>AC</sub>    | 13.55991320        | -0.00064012                      | PASS   |

### EUT2

**Table 13.** Frequency stability test, extreme conditions

| Test conditions |                        | Frequency<br>(MHz) | deviation<br>from nominal<br>(%) | Result |
|-----------------|------------------------|--------------------|----------------------------------|--------|
| Temperature     | Voltage                |                    |                                  |        |
| -20 °C          | 115 V <sub>AC</sub>    | 13.56015200        | 0.00112109                       | PASS   |
| -10 °C          | 115 V <sub>AC</sub>    | 13.56017370        | 0.00128097                       | PASS   |
| 0 °C            | 115 V <sub>AC</sub>    | 13.56016640        | 0.00122713                       | PASS   |
| +10 °C          | 115 V <sub>AC</sub>    | 13.56014470        | 0.00106711                       | PASS   |
| +20 °C          | 97.75 V <sub>AC</sub>  | 13.56010130        | 0.00074705                       | PASS   |
| +20 °C          | 115 V <sub>AC</sub>    | 13.56010130        | 0.00074705                       | PASS   |
| +20 °C          | 132.25 V <sub>AC</sub> | 13.56010130        | 0.00074705                       | PASS   |
| +30 °C          | 115 V <sub>AC</sub>    | 13.56005790        | 0.00042699                       | PASS   |
| +40 °C          | 115 V <sub>AC</sub>    | 13.56000720        | 0.00005310                       | PASS   |
| +50 °C          | 115 V <sub>AC</sub>    | 13.55997110        | -0.00021313                      | PASS   |

## Occupied Bandwidth

Standard:  
Tested by: HEM  
Date: 24 May 2019  
Temperature: 22 °C  
Humidity: 39 %RH

FCC Rule: 15.215©

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in Sections 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 is contained within the frequency band designated in the rule.

## Test results

### EUT1

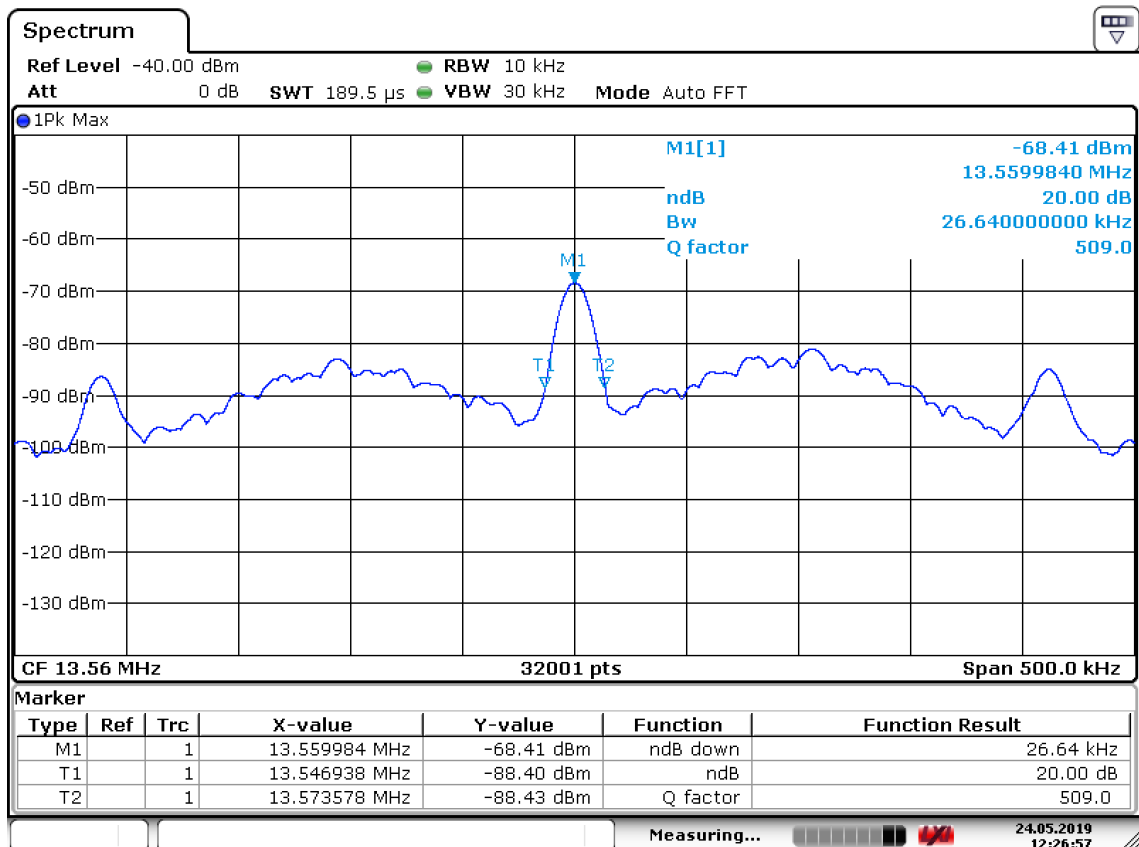
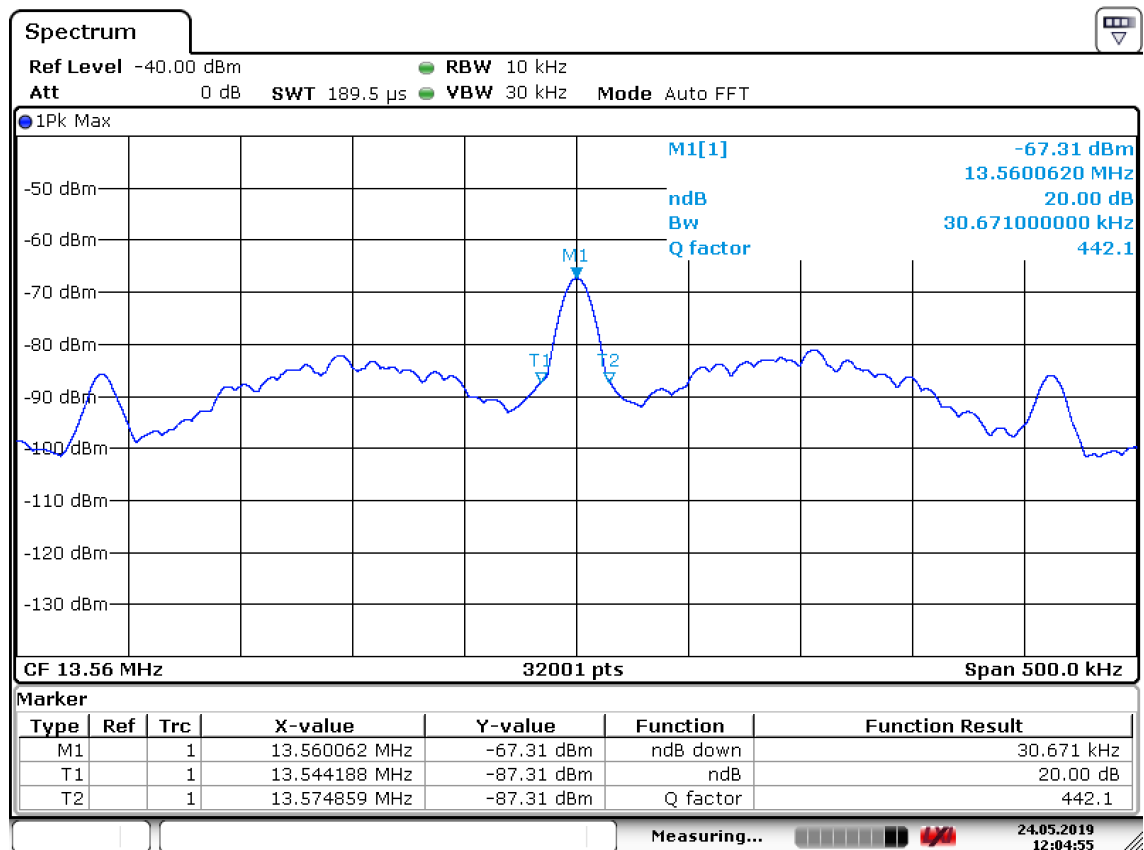


Figure 9: The EUT1 20 dB bandwidth

The obtained 20 dB bandwidth is 26.64 kHz, and is contained within the frequency band 13.110–14.010 MHz.

## EUT2



**Figure 10:** The EUT2 20 dB bandwidth

The obtained 20 dB bandwidth is 30.671 kHz, and is contained within the frequency band 13.110–14.010 MHz.

## 99% Power Bandwidth

|                     |             |
|---------------------|-------------|
| <b>Standard:</b>    | RSS-GEN     |
| <b>Tested by:</b>   | HEM         |
| <b>Date:</b>        | 24 May 2019 |
| <b>Temperature:</b> | 22 °C       |
| <b>Humidity:</b>    | 39 %RH      |

### IC Rule: RSS-GEN (6.7)

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

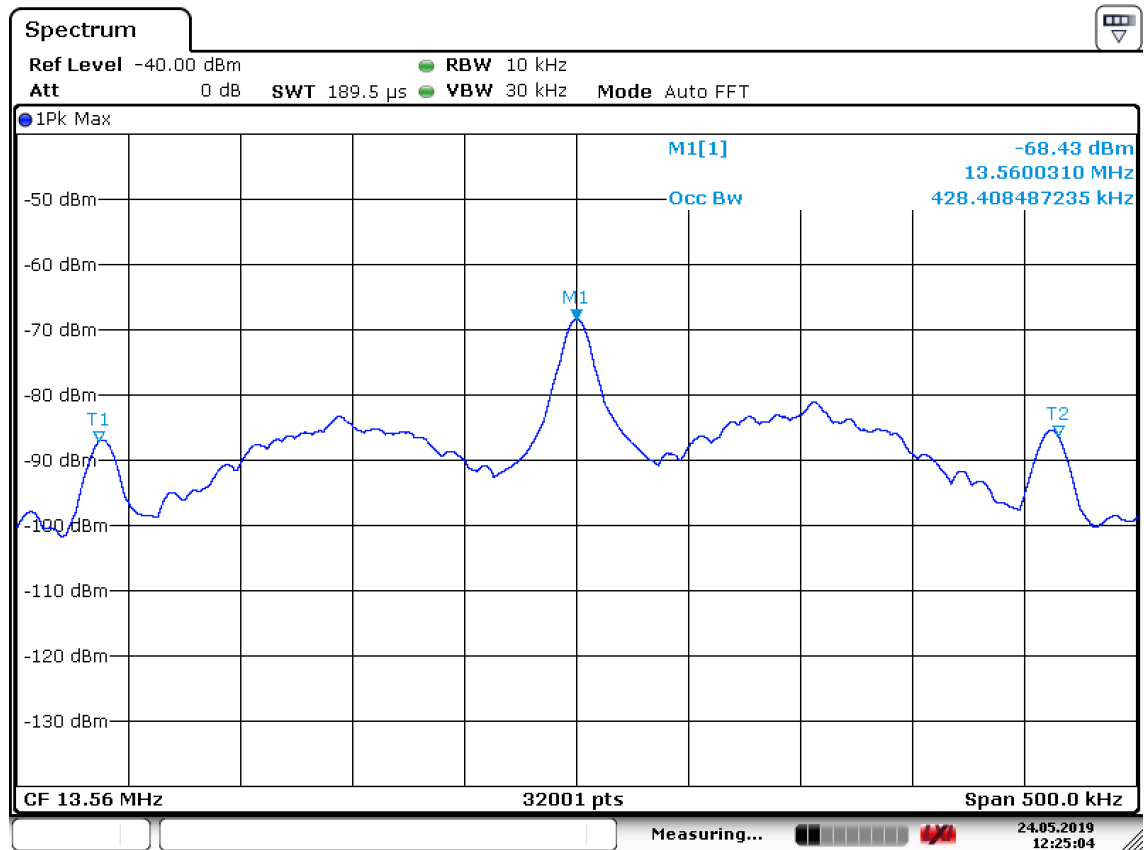
The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value.

## Test results

### EUT1

**Table 14.** EUT1 99% Power Bandwidth

| 99% Power Bandwidth | Resolution Bandwidth | Video Bandwidth |
|---------------------|----------------------|-----------------|
| 428.408 kHz         | 10 kHz               | 30 kHz          |

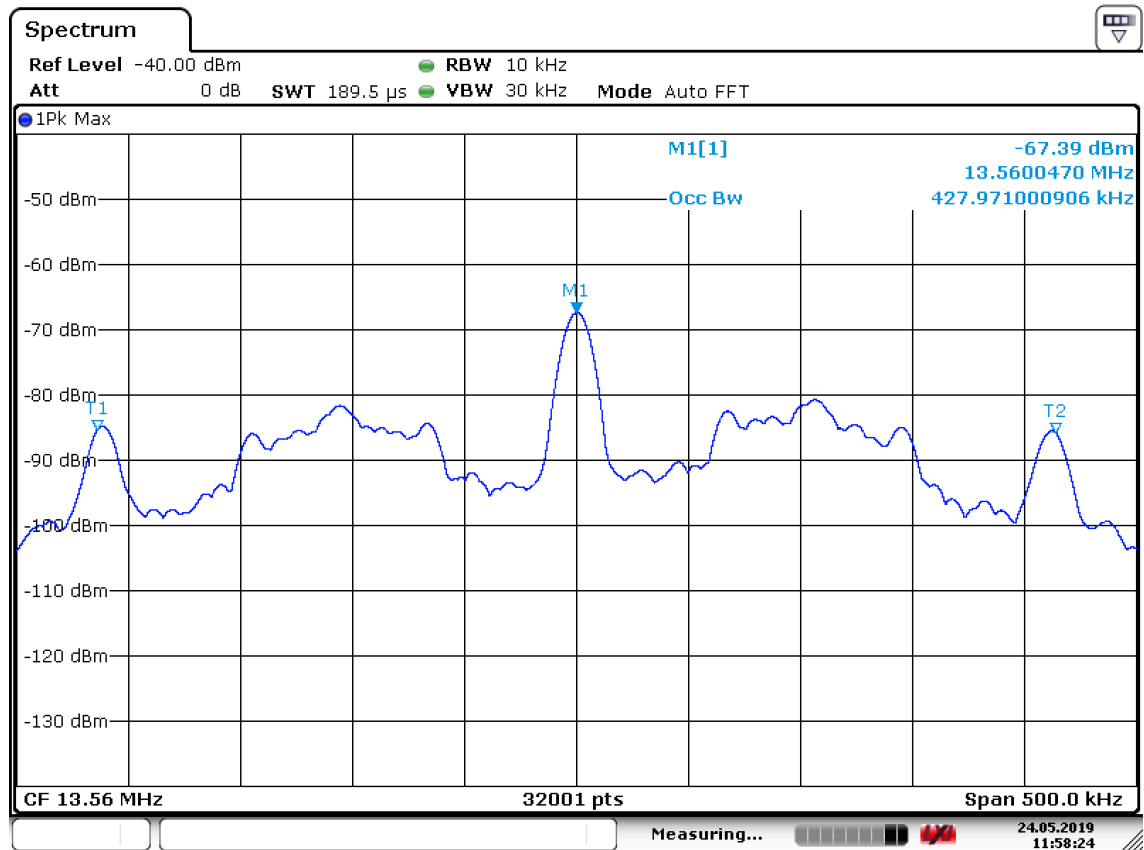


**Figure 11.** EUT1 99% Power Bandwidth

## EUT2

**Table 15.** EUT2 99% Power Bandwidth

| 99% Power Bandwidth | Resolution Bandwidth | Video Bandwidth |
|---------------------|----------------------|-----------------|
| 427.971 kHz         | 10 kHz               | 30 kHz          |



**Figure 12.** EUT2 99% Power Bandwidth

**TEST EQUIPMENT**

| EQUIPMENT                      | MANUFACTURER      | TYPE               | INV OR SERIAL | PREV. CALIB. | NEXT CALIB. |
|--------------------------------|-------------------|--------------------|---------------|--------------|-------------|
| POWER SUPPLY                   | CALIFORNIA INSTR. | 5001 iX Series II  | inv:7826      | -            | -           |
| ANTENNA                        | ROHDE & SCHWARZ   | HFH2-Z2            | inv:8013      | 2018-03-23   | 2020-03-23  |
| ANTENNA                        | SCHWARZBECK       | VULB 9168          | inv:8911      | 2018-10-25   | 2020-10-25  |
| TURNTABLE                      | MATURO            | DS430 UPGRADED     | inv:10182     | -            | -           |
| MAST & TURNTABLE<br>CONTROLLER | MATURO            | NCD                | inv:10183     | -            | -           |
| ANTENNA MAST                   | MATURO            | TAM 4.0E           | inv:10181     | -            | -           |
| ATTENUATOR                     | PASTERNAK         | PE 7004-4          | inv:10126     | -            | -           |
| TEST SOFTWARE                  | ROHDE & SCHWARZ   | EMC-32             | -             | -            | -           |
| EMI TEST RECEIVER              | ROHDE & SCHWARZ   | ESW26              | inv:10679     | 2018-06-26   | 2019-06-26  |
| EMI TEST RECEIVER              | ROHDE & SCHWARZ   | ESU 26             | inv:8453      | 2019-06-26   | 2020-06-25  |
| LISN                           | ROHDE & SCHWARZ   | ESH3-Z5            | inv:7923      | 2019-05-28   | 2020-05-28  |
| LISN                           | ROHDE & SCHWARZ   | ESH3-Z5            | inv:7971      | 2019-05-28   | 2020-05-28  |
| TRANSIENT LIMITER              | ROHDE & SCHWARZ   | ESH3-Z2            | inv:10967     | 2019-08-09   | 2020-08-09  |
| SIGNAL ANALYZER                | ROHDE & SCHWARZ   | FSV40              | inv:9093      | 2018-06-28   | 2020-06-28  |
| TEMPERATURE/<br>HUMIDITY METER | VAISALA           | HMT 333            | inv:8638      | 2019-04-10   | 2020-04-10  |
| TEMPERATURE<br>CHAMBER         | VÖTSCH            | VC4033             | inv:10412     | -            | -           |
| NEAR-FIELD PROBE               | ROHDE & SCHWARZ   | HZ-14 1026.7744.02 | inv:7883      | -            | -           |