**CMC Centro Misure Compatibilità S.r.l.**
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Independent Testing Laboratory

# TEST REPORT nr. R14137801

## Federal Communication Commission (FCC)

**Test item**

Description .....: R1270C – QUARK UP - 500 mW UHF RFID ULTRA COMPACT MODULE
Trademark .....: CAEN RFID
Model/Type .....: R1270C

**Test Specification**

Standard .....: FCC Rules & Regulations, Title 47:2013
Part 15 paragraph(s): 203, 204, 207, 209 and 247

**Client's name** .....: CAEN RFID S.r.l.
Address .....: Via Vetraia, 11 – 55049 Viareggio (LU) – ITALY

**Manufacturer's name** : Same as client
Address .....: --

**Report**

Tested by .....: G. Gandini – *Technician*

Approved by .....: R. Beghetto – *Laboratory Manager*

Date of issue .....: 03.10.14
Contents .....: 58 pages

## Index

# 1. Summary

*Standard:*

FCC Rules & Regulations, Title 47:2013
Part 15 paragraph(s): 203, 204, 207, 209 and 247

| *Test specifications* | *Environmental Phenomena* | *Tests sequence* | *Result* |
|---|---|---|---|
| Part 15.203 | Antenna requirements | 1 | Complies |
| Part 15.207 | Conducted emissions | 2 | Complies |
| Part 15.209 | Radiated emissions | 3 | Complies |
| Part 15.247 | 20dB Bandwidth | 4 | Complies |
| Part 15.247 | Channel Separation | 5 | Complies |
| Part 15.247 | Number of Hopping Channel | 6 | Complies |
| Part 15.247 | Time of occupancy | 7 | Complies |
| Part 15.209 and 15.247 | Peak Output Power | 8 | Complies |
| Part 15.247 | Band edge | 9 | Complies |
| Part 15.209 | Spurious emission | 10 | Complies |

*The Test Report was given to the Client representatives for necessary documentation of ratification of the tested equipment and it is valid for the FCC certification*

## 2. Description of Equipment under test (EUT)

| | | |
|---|---|---|
| Power supply | : | 5 Vdc from USB port |
| Serial Number | : | -- |
| Type of equipment | : | ☑ Transceiver Unit |
| Type of station | : | ❑ Fixed station |
| | | ☑ Portable station |
| | | ❑ Mobile station |
| Frequency band | : | 902 – 928 MHz |
| FCC ID | : | UVECAENRFID015 |

### *2.1 Test Site*

| | | |
|---|---|---|
| Company | : | CMC Centro Misure Compatibilità S.r.l. |
| Address | : | Via dell'Elettronica, 12/C |
| | | 36016 Thiene (VI) – ITALY |

## 3. Testing and sampling

| | | |
|---|---|---|
| Date of receipt of test item | : | 08.07.14 |
| Testing start date | : | 25.07.14 |
| Testing end date | : | 29.09.14 |
| Samples tested nr. | : | 1 |
| Sampling procedure. | : | Equipment used for testing was picked up by the manufacturer, at the end of the production process with random criterion |
| Internal identification | : | adhesive label with the product number P140778 |

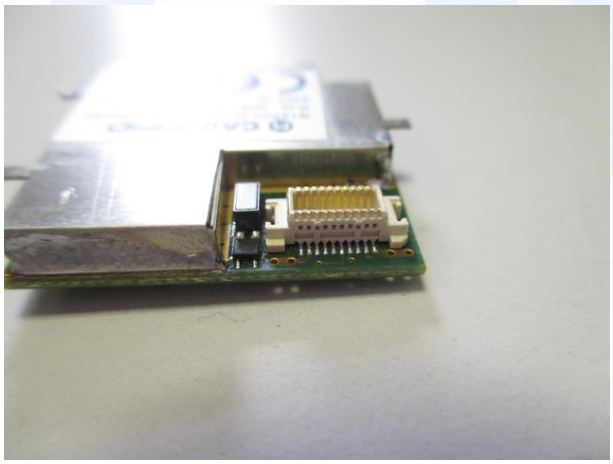
## 4. Operative conditions

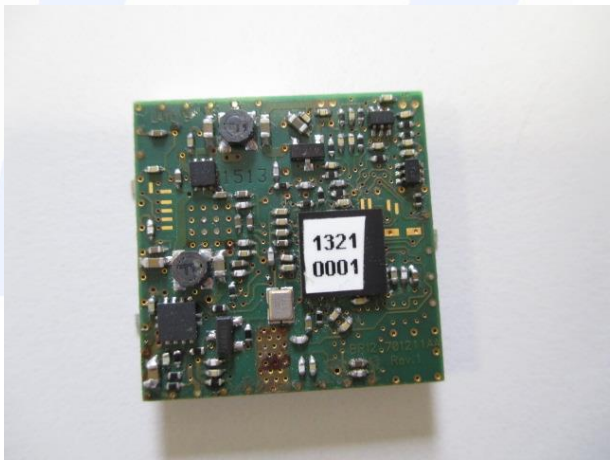
| | | |
|---|---|---|
| EUT exercising | : | EUT in continuous transmission at maximum power |
| Auxiliary Equipment | : | - USB interface model R1270CEVB |
| | | - Personal computer |

# 5. Photograph(s) of EUT

## *5.1 Photograph(s) of EUT*







## 6. Equipment list

| *Id. number* | *Manufacturer* | *Model* | *Description* | *Serial number* | *Last calibration* | *Due date calibration* |
|---|---|---|---|---|---|---|
| CMC S010 | Rohde & Schwarz | ESH3-Z2 | Impulses Limiting Device | - - - | January '14 | January '15 |
| CMC S108 | EMCO | 3115 | Horn Antenna | 9811-5622 | May '13 | May '16 |
| CMC S127 | Schaffner | HLA6120 | Loop Antenna | 1191 | January '13 | January '16 |
| CMC S129 | Rohde & Schwarz | ESPI7 | Receiver | 836.914/004 | January '14 | January '15 |
| CMC S136 | Schwarzbeck | VULB 9163 | Broadband Antenna | 9136-205 | May '13 | May '16 |
| CMC S164 | Rohde & Schwarz | ESU26 | EMC interference receiver | 100052 | January '14 | January '15 |
| CMC S200 | Schwarzbeck | NSLK 8128 | V-LISN | 8128-273 | January '14 | January '15 |
| CMC S227 | Rohde & Schwarz | ESR7 | EMI Test Receiver 7GHz | 101121 | January '14 | January '15 |

# 7. Measurement uncertainty

| *Test* | Expanded Uncertainty | note |
|---|---|---|
| **Conducted Emission** | | |
| (50Ω/50µH AMN) - (9 kHz – 150 kHz) | ±3.8 dB | 1 |
| (50Ω/50µH AMN) - (150 kHz – 30 MHz) | ±3.3 dB | 1 |
| (Voltage probe) - (150 kHz – 30 MHz) | ±3.3 dB | 1 |
| (50Ω/5µH AMN) - (150 kHz – 108 MHz) | ±2.8 dB | 1 |
| **Discontinuous Conducted Emission** | | |
| Conducted Emission (50Ω/50µH AMN) - (150 kHz – 30 MHz) | ±3.3 dB | 1 |
| | | |
| **Disturbance Power** (30 MHz – 300 MHz) | ±3.9 dB | 1 |
| **Radiated Emission** | | |
| (0,150 MHz – 30 MHz) | ±4.3 dB | 1 |
| (30 MHz – 1000 MHz) | ±4.4 dB | 1 |
| (1 GHz – 6 GHz) | ±4.6 dB | 1 |
| | | |
| **Electromagnetic field EMF** | ±15.0 % | 1 |
| | | |
| **Harmonic current emissions test** | ±2.7 % | 1 |
| **Voltage fluctuation and flicker test** | ±2.9 % | 1 |
| | | |
| **Insertion loss test** | ±2.7 dB | 1 |
| **Radiated electromagnetic disturbance test (loop antenna)** | ±2.7 dB | 1 |
| | | |
| **Radiated electromagnetic field immunity test** | 0.77 V/m at 3V/m | 1 |
| **Pulse modulated radiated electromagnetic field immunity test** | 0.77 V/m at 3V/m | 1 |
| **Injected currents immunity test** | 0.48 V at 3V | 1 |
| **Bulk current** | 5.3 mA at 60 mA | 1 |
| **Power frequency magnetic field immunity test** | 0.1 A/m at 10 A/m | 1 |
| | | |
| **Effective radiated power (F < 1GHz)** | ±4.4 dB | 1 |
| **Effective radiated power (F > 1GHz)** | ±3.9 dB | 1 |
| **Frequency error** | < 1x10-7 | 1 |
| **Modulation bandwidth** | < 1x10-7 | 1 |
| **Adjacent channel power** | ±2.6 dB | 1 |
| **Blocking** | ±2.6 dB | 1 |
| | | |
| **Electrostatic discharge immunity test** | | 2 |
| **Electrical fast transients / burst immunity test** | | 2 |
| **Surge immunity test** | | 2 |
| **Pulse magnetic field immunity test** | | 2 |
| **Damped oscillatory magnetic field immunity test** | | 2 |
| **Short interruption immunity test** | | 2 |
| | | |
| **Voltage transient emission test** | ±2.2 % | 1 |
| **Transient immunity test** | | 2 |

**Notes**

*Note 1:*
The expanded uncertainty reported according to EN55016-4-2:2011 is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of p = 95%

*Note 2:*

It has been demonstrated that the used test equipment meets the specified requirements in the standard with at least a 95% confidence, covering factor k = 2.

# 8. Reference documents

| *Reference no.* | *Description* |
|---|---|
| FCC Rules and Regulation Title 47 part 15:2013 | -- |
| ANSI C63.4 | American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz – 40 GHz |
| Internal Procedure PM001 rev. 2.0 (Quality Manual) | Measure Procedure |
| Internal procedure INC_M rev. 8.2 (Quality Manual) | Measurement uncertainty calculation |

## 9. Deviation from test specification

In agreement with the client, emission tests were performed with peak detector.

At the frequencies where the measures exceed the limit or within 6 dB from it, the test was repeated with quasi-peak detector and/or average detector.

## 10. Test case verdicts

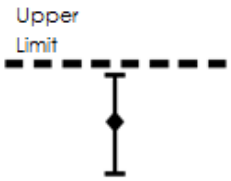
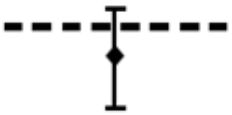
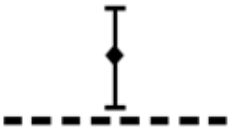
Test case does not apply to the test object ..... : N.A.
Test item does meet the requirement ..... : Complies
Test item does not meet the requirement..... : Does not comply
Test not performed ..... : N.E.

## 11. Results

In this clause tests results are reported.

Measurement uncertainty is in accordance with document CMC INC_M rev. 8.2.

*Judgement of compliance:*

| Case 1 | Case 2 | Case 3 | Case 4 |
|---|---|---|---|
|  |  |  |  |
| The sample is Complies. | The sample is Complies. | The sample is Not Complies. | The sample is Not Complies. |
| The measurement results is within the specification limit when the measurement uncertainty is taken into account. | It is not possible to state compliance using a 95% coverage probability for the expanded uncertainty although the measurement result is below the limit. | It is not possible to state compliance using a 95% coverage probability for the expanded uncertainty also the measurement result is upper the limit. | The measurement results is outside the specification limit when the measurement uncertainty is taken into account. |

In agreement with ILAC-G8: 03/2009 Guidelines on the Reporting of Compliance with Specification.

## 11.1 Antenna requirements

### Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.203 and 15.204
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

### Test configuration and test method

*Test site:*
Laboratory

*Auxiliary equipment:*
See clause 4 of this test report

### EUT exercising

See clause 4 of this test report

### Test equipment used

--
Measurement uncertainty: See clause 7 of this test report

### Test specification

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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded

### Environmental conditions

| *Temperature (°C)* | *Atmospheric pressure (kPa)* | *Relative humidity (%)* |
|---|---|---|
| 22 | 100 | 45 |

### Result

| *Antenna Type* | *External R.F. power amplifier* | *Gain* | *Remarks* | *Results* |
|---|---|---|---|---|
| External antenna | Not Present | 0,7dBi | -- | Complies |

**Result:** The requirements are met

## 11.2 Conducted emissions

### Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.207
- Internal procedure PM001
- See clause 4 of this test report

### Test configuration and test method

*Test site:*
Shielded chamber

*Auxiliary equipment:*
See clause 4 of this test report

### EUT exercising

See clause 4 of this test report

### Test equipment used

CMC S010, CMC S200, CMC S206
Measurement uncertainty: See clause 7 of this test report

### Test specification

Port: Main port
Frequency range: 150 kHz – 30 MHz

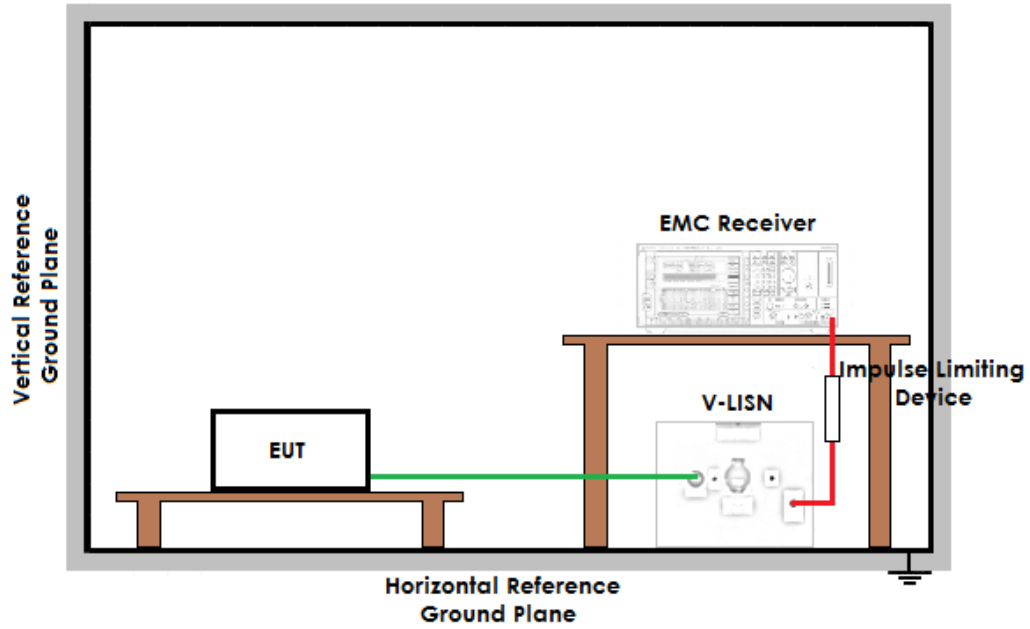
### Environmental conditions

| *Temperature (°C)* | *Atmospheric pressure (kPa)* | *Relative humidity (%)* |
|---|---|---|
| 22 | 100 | 42 |

### Acceptance limits

| *Frequency range (MHz)* | *dB(µV) Quasi-peak* | *dB(µV) Average* |
|---|---|---|
| 0,15 to 0,50 | 66 to 56 | 56 to 46 |
| 0,50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

## Setup



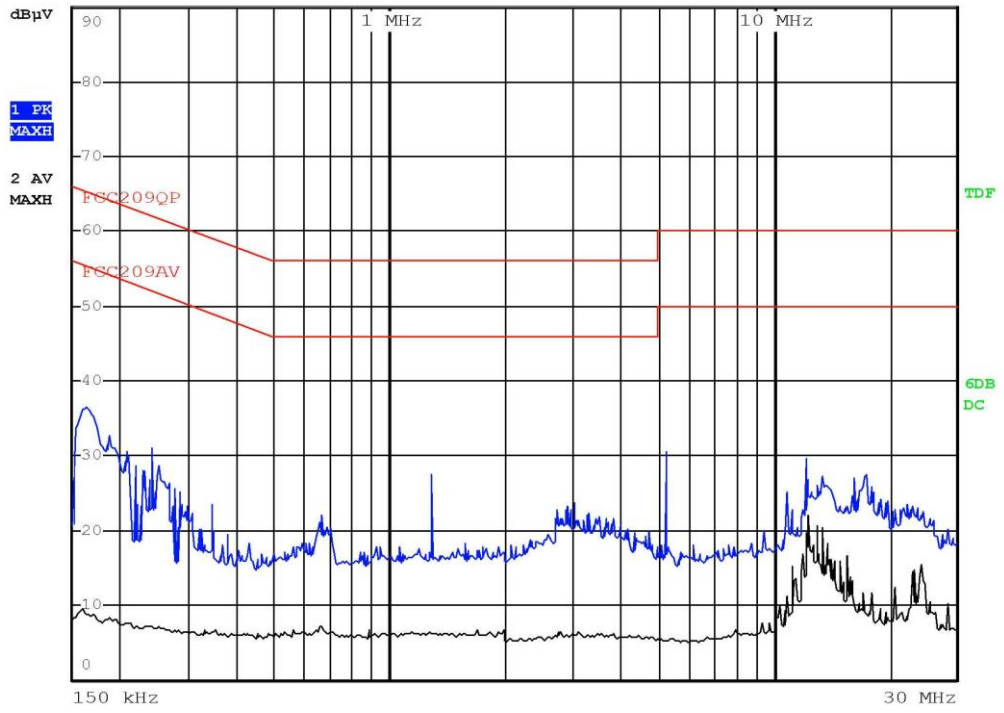

## Result

| *Line* | *Graphs* | *Remarks* | *Result* |
|---|---|---|---|
| USB - | G14137843 | -- | Complies |
| USB + | G14137844 | -- | Complies |
| **Remarks:** -- | | | |

*Graphs Legend*
PK: Peak; QP [1s] (quasi-peak at 1 second) values are marked with a +
AV: Average; AV [1s] (average at 1 second) values are marked with a X

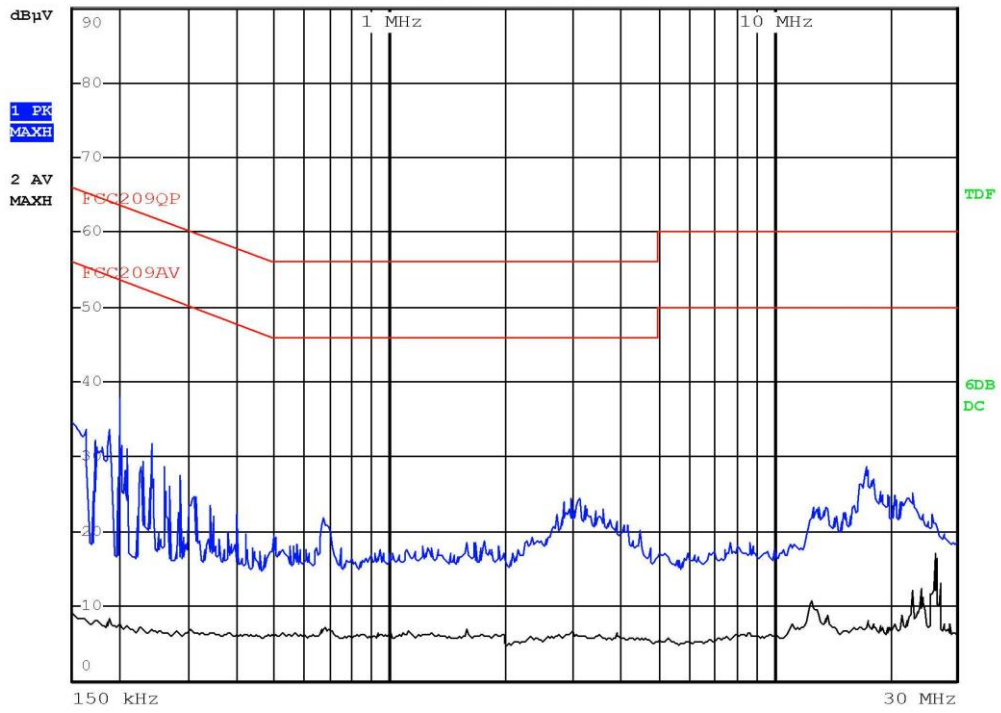
## Graphs

G14137843




Gandini 14137843-Line L-Tx

G14137844




Gandini 14137844-Line N-Tx

**Result:** The requirements are met

## 11.3 Radiated emissions

### Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part. 15.209
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

### Test configuration and test method

*Test site:*
Semi-anechoic chamber

*Auxiliary equipment:*
See clause 4 of this test report

### EUT exercising

See clause 4 of this test report

### Test equipment used

CMC S108, CMC S127, CMC S136, CMC S164
Measurement uncertainty: See clause 7 of this test report

### Test specification

Port: Enclosure
Frequency range: 0,009 MHz – 1000 MHz
Antenna polarization: Horizontal (H) – Vertical (V)
EUT – Antenna distance: 3 m

### Environmental conditions

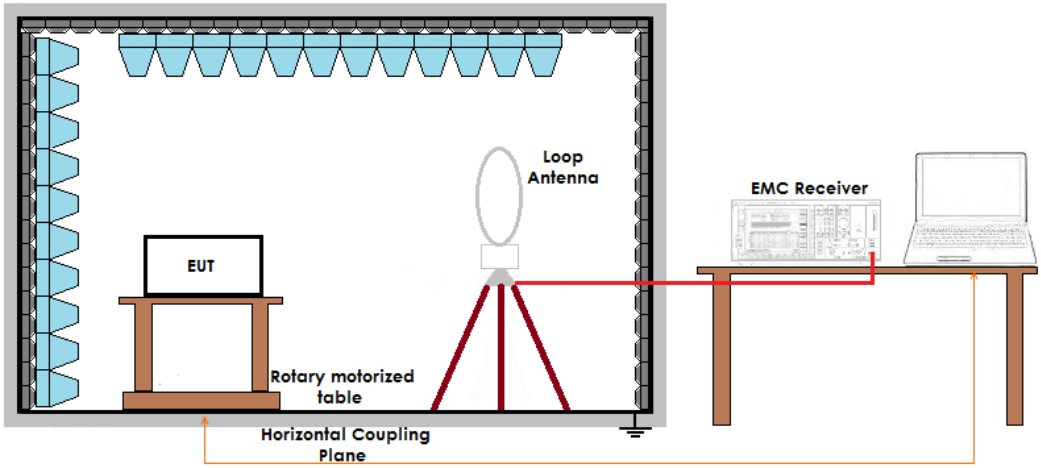
| *Temperature (°C)* | *Atmospheric pressure (kPa)* | *Relative humidity (%)* |
|---|---|---|
| 22 | 100 | 45 |

### Acceptance limits

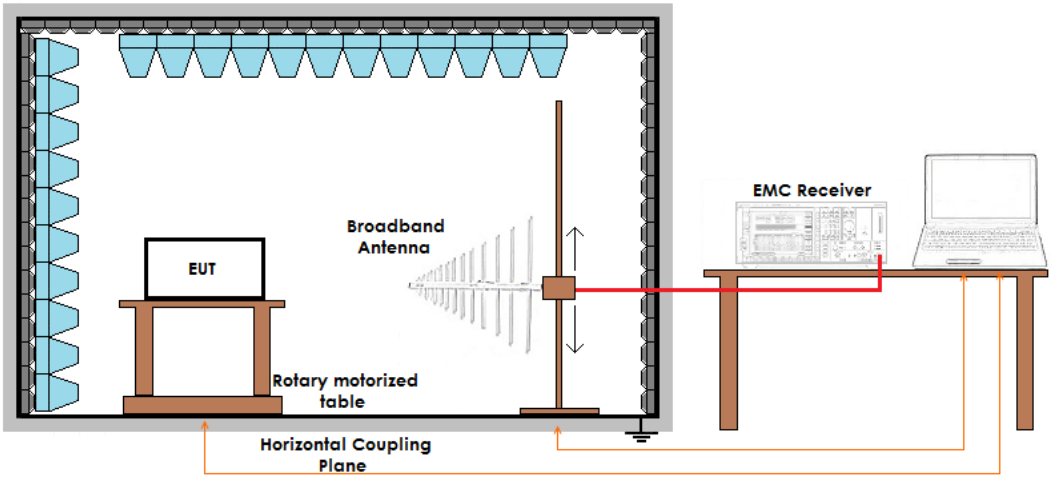
| *Frequency range (MHz)* | *Limits [dB(µV/m)]* |
|---|---|
| 0,009 to 0,490 | 128,51 to 93,80 |
| 0,490 to 1,705 | 73,80 to 62,97 |
| 1,705 to 30 | 69,54 |
| 30 to 88 | 40 |
| 88 to 216 | 43,52 |
| 216 to 960 | 46,02 |
| Above 960 | 53,98 |
| **Remarks:** The emission limits shown in the above table 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. | |

## Setup

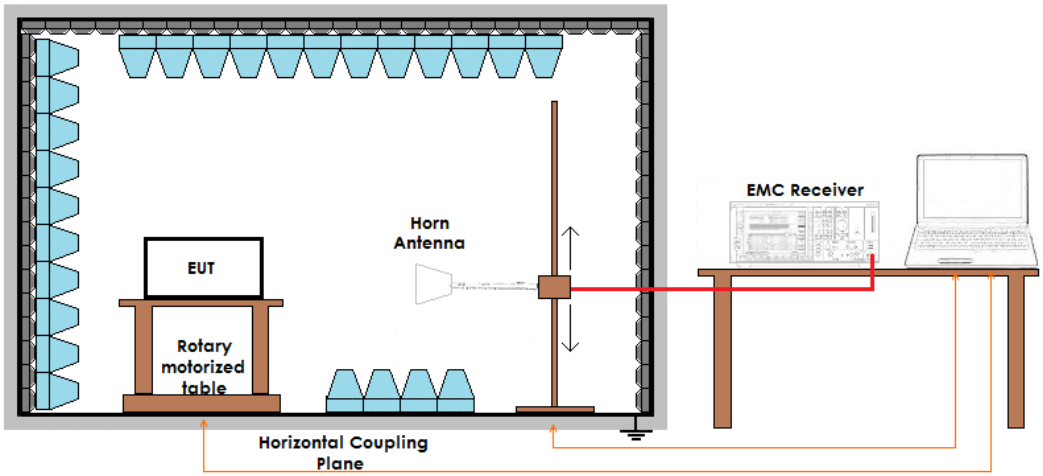
### Frequency ≤ 30 MHz




### Frequency ≤ 1 GHz




### Frequency > 1 GHz



**Result**

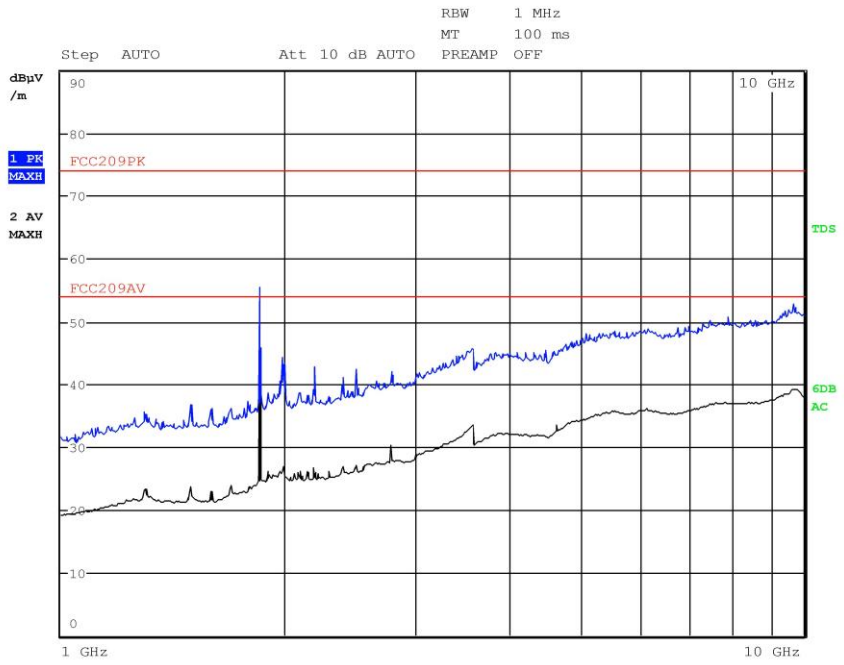
| *Channel* | *Polarization* | *Frequency Range (MHz)* | *Graphs* | *Remarks* | *Result* |
|---|---|---|---|---|---|
| -- | H | 1000 – 10000 | G14137826 | -- | Complies |
| -- | V | 1000 – 10000 | G14137827 | -- | Complies |
| 927,25 MHz | V | 30 – 1000 | G14137836 | -- | Complies |
| 927,25 MHz | H | 30 – 1000 | G14137837 | -- | Complies |
| 914,75 MHz | H | 30 – 1000 | G14137838 | -- | Complies |
| 914,75 MHz | V | 30 – 1000 | G14137839 | -- | Complies |
| 902,75 MHz | V | 30 – 1000 | G14137840 | -- | Complies |
| 902,75 MHz | H | 30 – 1000 | G14137841 | -- | Complies |
| -- | Loop | 0,009 – 30 | G14137842 | -- | Complies |
| **Remarks:** -- | | | | | |

*Graphs Legend*
PK: Peak; QP [1s] (quasi-peak at 1 second) values are marked with a +
AV: Average; AV [1s] (average at 1 second) values are marked with a x

## Graphs

G14137826

**Meas Type** Emission
**Equipment under Test**
**Manufacturer**
**OP Condition** Tx
**Operator** Gandini 14137826
**Test Spec**
Horiz

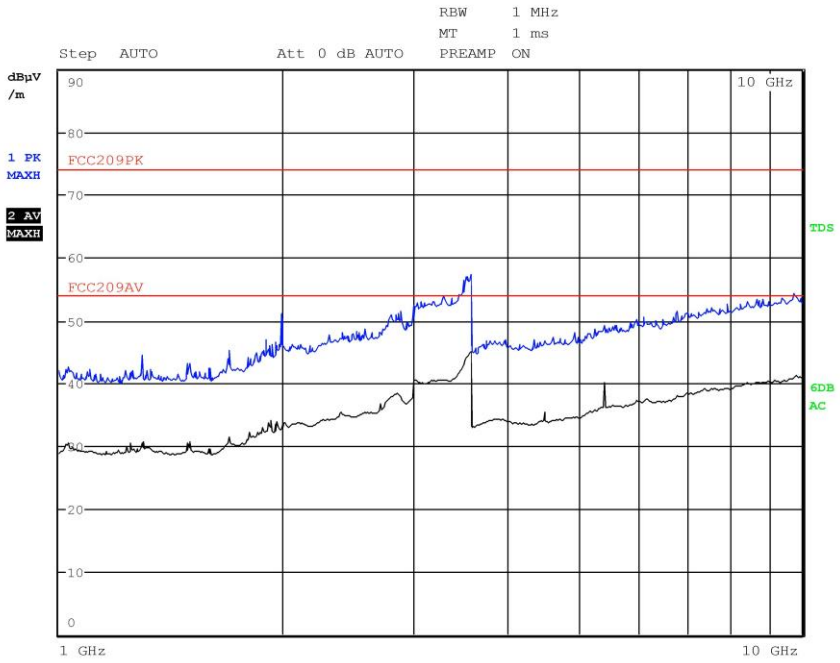



**Final Measurement**

Meas Time: 1 s
Margin: 6 dB
Peaks: 0

G14137827

**Meas Type** Emission
**Equipment under Test**
**Manufacturer**
**OP Condition** Tx
**Operator** Gandini 14137827
**Test Spec**
Vert



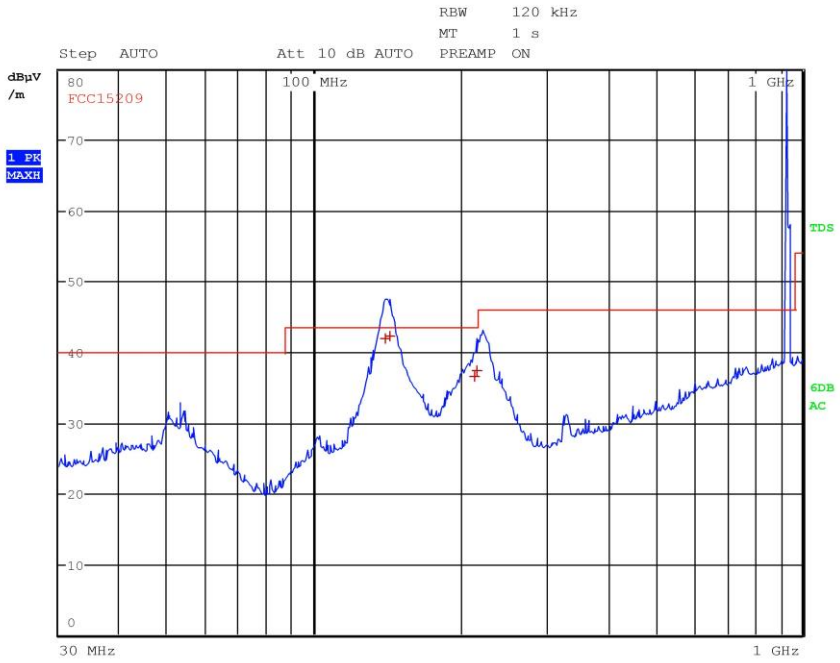

## Final Measurement

Meas Time: 1 s
Margin: 6 dB
Subranges: 3

| Trace | Frequency | Level (dBµV/m) | Detector | Delta Limit/dB |
|---|---|---|---|---|
| 1 | 140.200000000 MHz | 43.03 | Quasi Peak | 3.03 |
| 1 | 141.600000000 MHz | 42.95 | Quasi Peak | 2.95 |
| 1 | 222.160000000 MHz | 37.38 | Quasi Peak | -2.62 |

G14137836

**Meas Type** Emission
**Equipment under Test**
**Manufacturer**
**OP Condition** Tx - Fmax
**Operator** Gandini 14137836
**Test Spec**
Vert



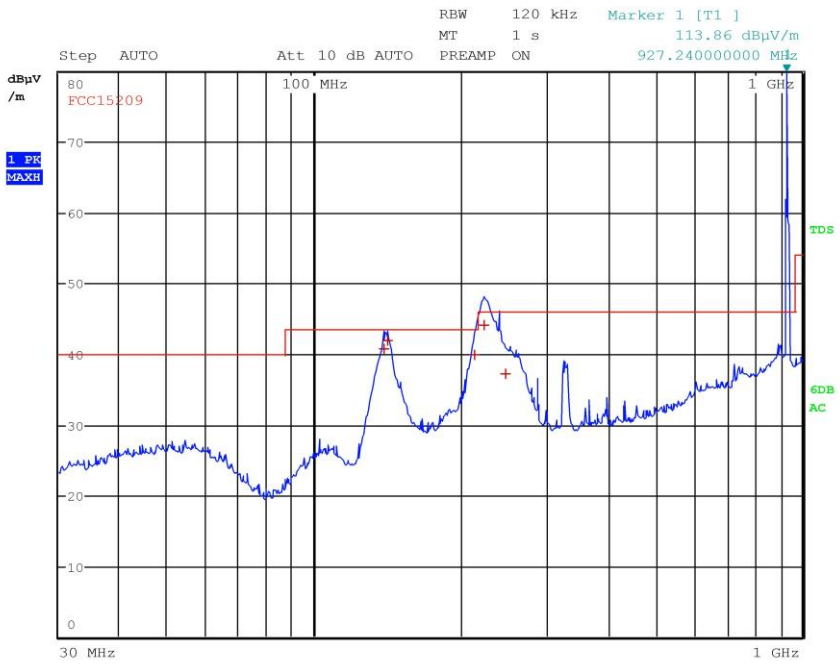

## Final Measurement

Meas Time: 1 s
Margin: 6 dB
Subranges: 4

| Trace | Frequency | Level (dBµV/m) | Detector | Delta Limit/dB |
|---|---|---|---|---|
| 1 | 140.200000000 MHz | 41.99 | Quasi Peak | -1.53 |
| 1 | 142.760000000 MHz | 42.27 | Quasi Peak | -1.25 |
| 1 | 213.640000000 MHz | 36.55 | Quasi Peak | -6.97 |
| 1 | 215.360000000 MHz | 37.32 | Quasi Peak | -6.20 |

G14137837

**Meas Type** Emission
**Equipment under Test**
**Manufacturer**
**OP Condition** Tx - Fmax
**Operator** Gandini 14137837
**Test Spec**
Horiz



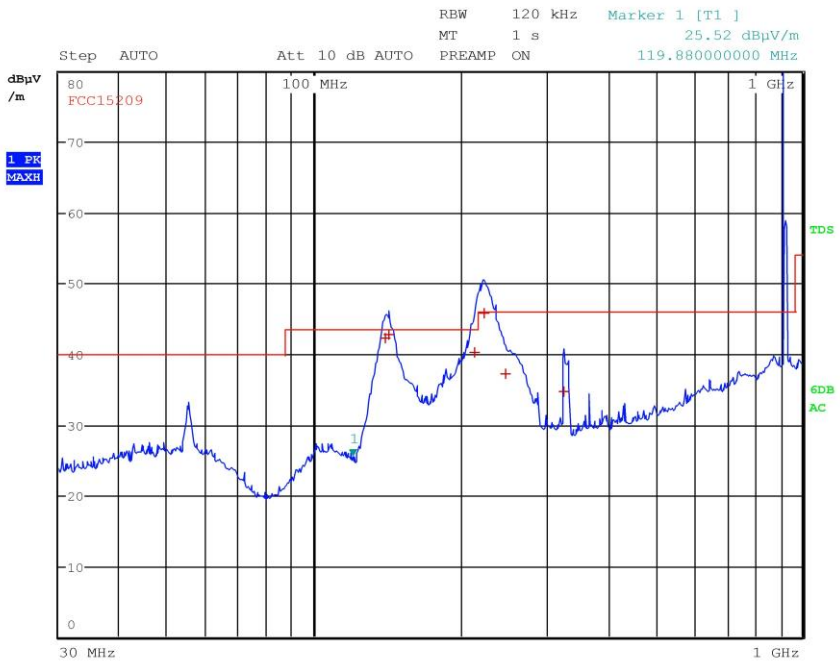

## Final Measurement

Meas Time: 1 s
Margin: 6 dB
Subranges: 5

| Trace | Frequency | Level (dBµV/m) | Detector | Delta Limit/dB |
|---|---|---|---|---|
| 1 | 139.120000000 MHz | 40.75 | Quasi Peak | -2.77 |
| 1 | 141.160000000 MHz | 41.87 | Quasi Peak | -1.65 |
| 1 | 213.640000000 MHz | 39.89 | Quasi Peak | -3.63 |
| 1 | 222.600000000 MHz | 44.08 | Quasi Peak | -1.94 |
| 1 | 247.040000000 MHz | 37.25 | Quasi Peak | -8.77 |

G14137838

**Meas Type** Emission
**Equipment under Test**
**Manufacturer**
**OP Condition** Tx - Fmed
**Operator** Gandini 14137838
**Test Spec**
Horiz



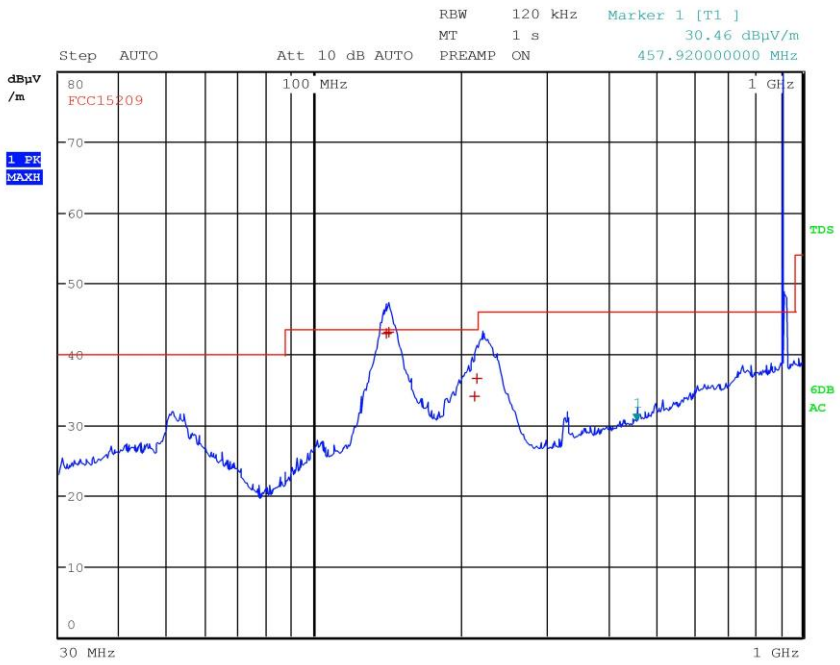

## Final Measurement

Meas Time: 1 s
Margin: 6 dB
Subranges: 6

| Trace | Frequency | Level (dBµV/m) | Detector | Delta Limit/dB |
|---|---|---|---|---|
| 1 | 140.240000000 MHz | 42.29 | Quasi Peak | -1.23 |
| 1 | 141.920000000 MHz | 42.80 | Quasi Peak | -0.72 |
| 1 | 213.560000000 MHz | 40.30 | Quasi Peak | -3.22 |
| 1 | 223.400000000 MHz | 45.88 | Quasi Peak | -0.14 |
| 1 | 246.920000000 MHz | 37.28 | Quasi Peak | -8.74 |
| 1 | 325.240000000 MHz | 34.65 | Quasi Peak | -11.37 |

G14137839

**Meas Type** Emission
**Equipment under Test**
**Manufacturer**
**OP Condition** Tx - Fmed
**Operator** Gandini 14137839
**Test Spec**
Vert



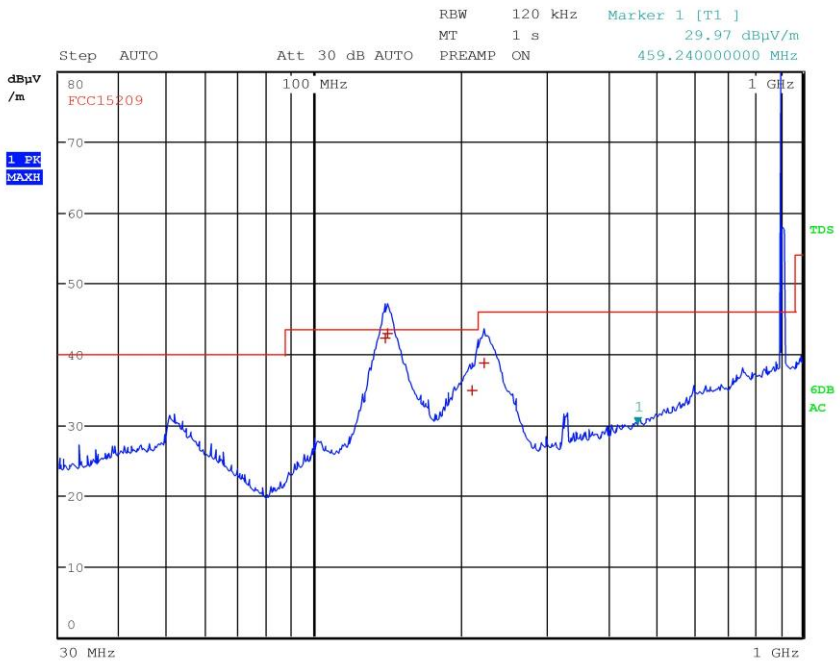

## Final Measurement

Meas Time: 1 s
Margin: 6 dB
Subranges: 4

| Trace | Frequency | Level (dBµV/m) | Detector | Delta Limit/dB |
|---|---|---|---|---|
| 1 | 140.320000000 MHz | 43.01 | Quasi Peak | -0.51 |
| 1 | 142.080000000 MHz | 43.03 | Quasi Peak | -0.49 |
| 1 | 213.080000000 MHz | 34.11 | Quasi Peak | -9.41 |
| 1 | 215.960000000 MHz | 36.58 | Quasi Peak | -6.94 |

G14137840

**Meas Type** Emission
**Equipment under Test**
**Manufacturer**
**OP Condition** Tx - Fmin
**Operator** Gandini 14137840
**Test Spec**
Vert



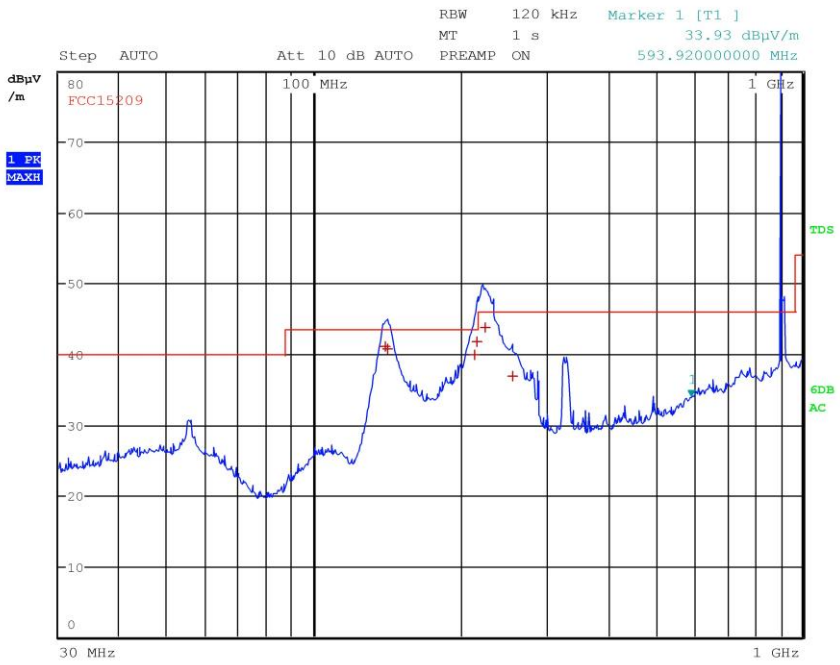

## Final Measurement

Meas Time: 1 s
Margin: 6 dB
Subranges: 4

| Trace | Frequency | Level (dBµV/m) | Detector | Delta Limit/dB |
|---|---|---|---|---|
| 1 | 139.880000000 MHz | 42.23 | Quasi Peak | -1.29 |
| 1 | 141.480000000 MHz | 42.86 | Quasi Peak | -0.66 |
| 1 | 210.680000000 MHz | 34.93 | Quasi Peak | -8.59 |
| 1 | 223.560000000 MHz | 38.69 | Quasi Peak | -7.33 |

G14137841

**Meas Type** Emission
**Equipment under Test**
**Manufacturer**
**OP Condition** Tx - Fmin
**Operator** Gandini 14137841
**Test Spec**
Horiz




## Final Measurement

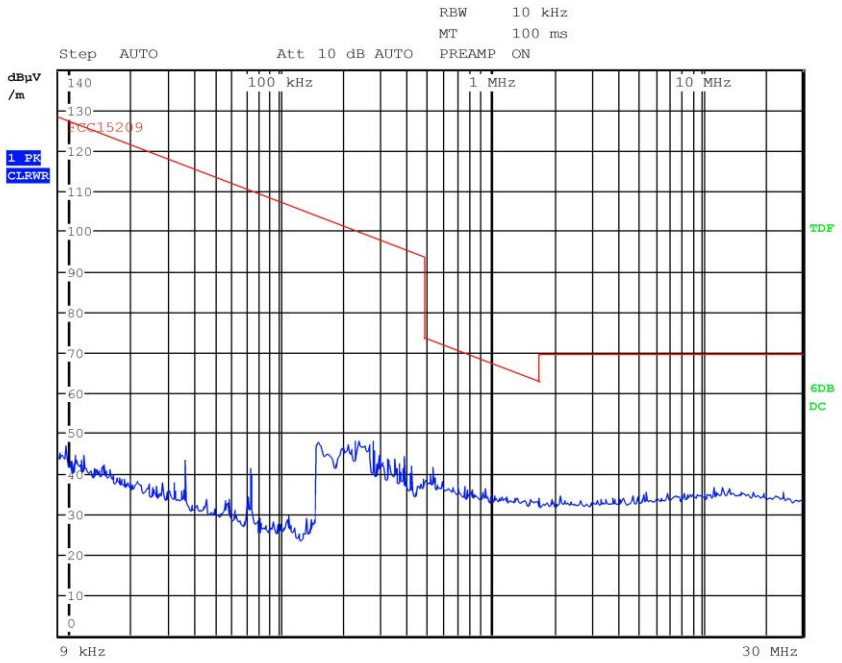
Meas Time: 1 s
Margin: 6 dB
Subranges: 6

| Trace | Frequency | Level (dBµV/m) | Detector | Delta Limit/dB |
|---|---|---|---|---|
| 1 | 140.080000000 MHz | 41.11 | Quasi Peak | -2.41 |
| 1 | 141.600000000 MHz | 40.83 | Quasi Peak | -2.69 |
| 1 | 213.720000000 MHz | 39.85 | Quasi Peak | -3.67 |
| 1 | 215.320000000 MHz | 41.85 | Quasi Peak | -1.67 |
| 1 | 224.160000000 MHz | 43.81 | Quasi Peak | -2.21 |
| 1 | 255.480000000 MHz | 36.84 | Quasi Peak | -9.18 |

G14137842

| | |
|---|---|
| **Meas Type** | Emission |
| **Equipment under Test** | |
| **Manufacturer** | |
| **OP Condition** | Tx |
| **Operator** | Gandini 14137842 |
| **Test Spec** | |

Loop




## Final Measurement

| | |
|---|---|
| Meas Time: | 1 s |
| Margin: | 6 dB |
| Peaks: | 0 |

**Result:** The requirements are met

## *11.4 20 dB bandwidth*

### Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

### Test configuration and test method

*Test site:*
Laboratory

*Auxiliary equipment:*
See clause 4 of this test report

### EUT exercising

See clause 4 of this test report

### Test equipment used

CMC S108, CMC S136, CMC S227
Measurement uncertainty: See clause 7 of this test report

### Test specification

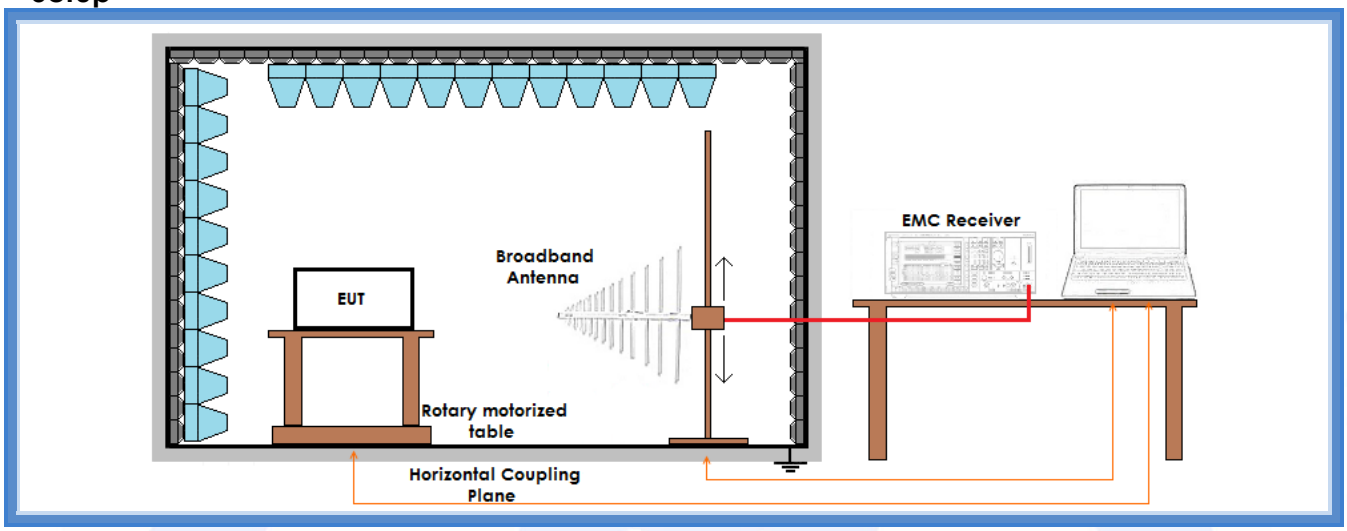
See FCC Part 15.247

### Environmental conditions

| *Temperature (°C)* | *Atmospheric pressure (kPa)* | *Relative humidity (%)* |
|---|---|---|
| 22 | 100 | 45 |

**Acceptance limits:** The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz

## Setup

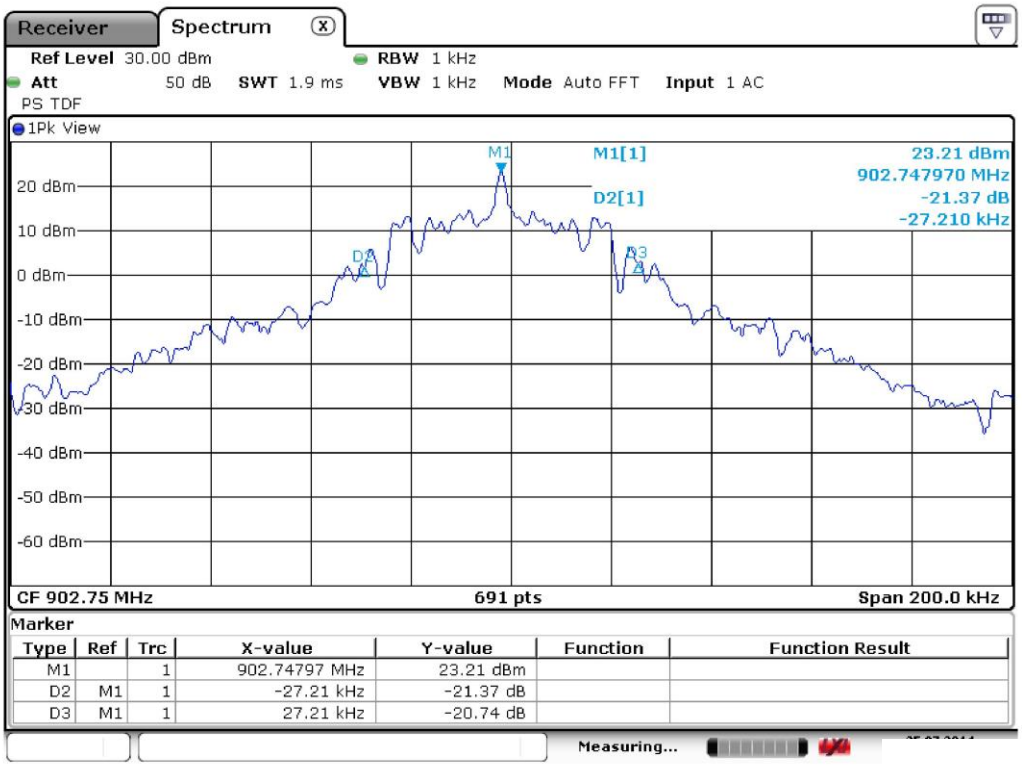



## Result

| *Frequency (MHz)* | *Graphs* | *20 dB bandwidth (kHz)* | *Results* |
|---|---|---|---|
| 902,75 | G14137802 | 54,42 | Complies |
| 914,75 | G14137807 | 58,12 | Complies |
| 927,25 | G14137815 | 52,10 | Complies |

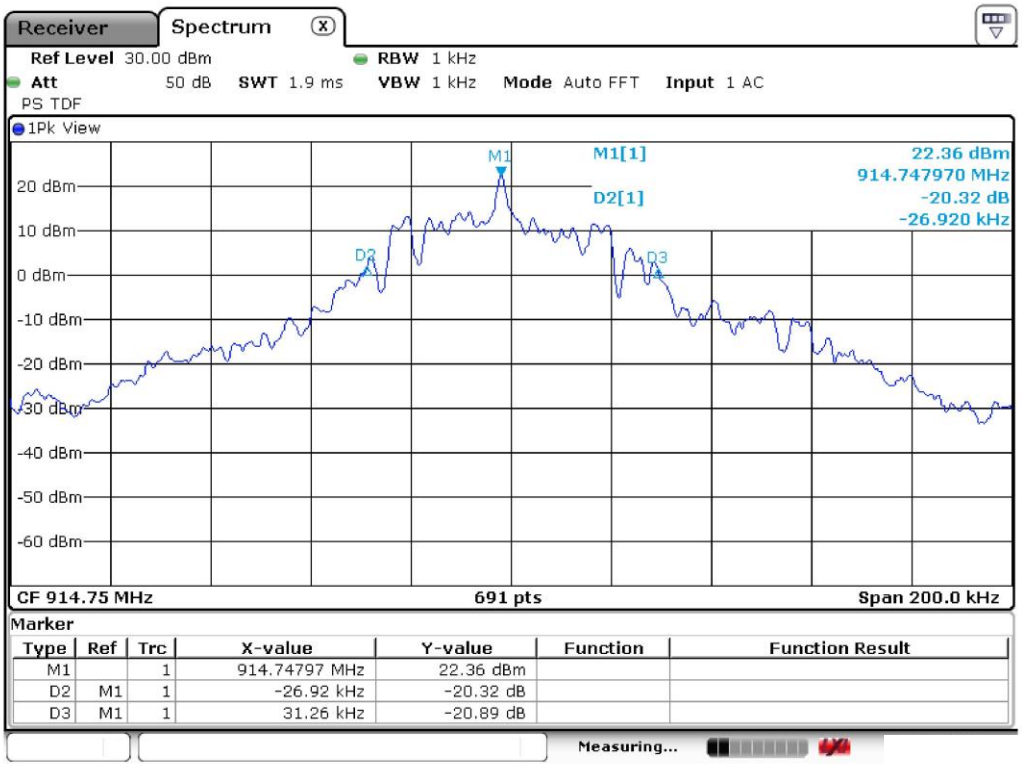
## Graphs

G14137802



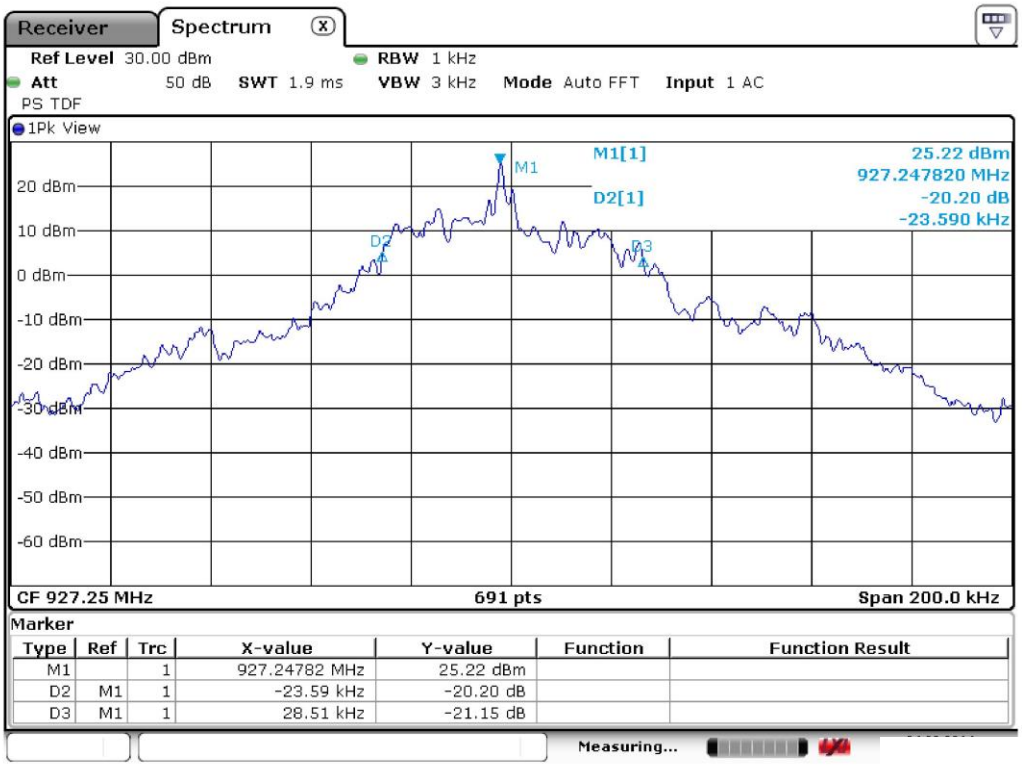

Gandini 14137802-Tx-Fmin

G14137807




Gandini 14137807-Tx-Fmed

G14137815




Gandini 14137815-Tx-Fmax

**Result:** The requirements are met