

# Test report

356782-1TRFWL

Date of issue: October 22, 2018

Applicant:F  
CalAmp

Product:  
Vehicle Device

Model:  
TTU4530LAW

FCC ID: APV-4530LAW  
IC: 5843C-4530LAW

Specifications:

- ◆ FCC 47 CFR Part 15, Subpart C – §15.207 Conducted limits.
- ◆ FCC 47 CFR Part 15, Subpart C – §15.209 Radiated emission; general requirements.

#### Lab and test locations

|                 |                                                                  |
|-----------------|------------------------------------------------------------------|
| Company name    | Nemko USA Inc.                                                   |
| Address         | 2210 Faraday Ave, Suite 150                                      |
| City            | Carlsbad                                                         |
| State           | California                                                       |
| Postal code     | 92008                                                            |
| Country         | USA                                                              |
| Telephone       | +1 760 444 3500                                                  |
| Website         | www.nemko.com                                                    |
| FCC Site Number | Test Firm Registration Number: 392943 Designation Number: US5058 |
| ISED Test Site  | 2040B-3                                                          |

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| Tested by          | Martha Espinoza                                                                    |
| Reviewed by        | Juan Manuel Gonzalez/Business Development Manager                                  |
| Review date        | 10/22/18                                                                           |
| Reviewer signature |  |

#### Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko USA's ISO/IEC 17025 accreditation.

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# Table of Contents

|                                                                |           |
|----------------------------------------------------------------|-----------|
| <b>Table of Contents .....</b>                                 | <b>3</b>  |
| <b>Section 1      Report summary .....</b>                     | <b>4</b>  |
| 1.1    Test specifications .....                               | 4         |
| 1.2    Test methods .....                                      | 4         |
| 1.3    Exclusions .....                                        | 4         |
| 1.4    Statement of compliance.....                            | 4         |
| 1.5    Test report revision history.....                       | 4         |
| <b>Section 2      Summary of test results .....</b>            | <b>5</b>  |
| 2.1    Radiated Emissions in simultaneous transmission.....    | 5         |
| <b>Section 3      Equipment under test (EUT) details .....</b> | <b>6</b>  |
| 3.1    Applicant.....                                          | 6         |
| 3.2    Manufacturer.....                                       | 6         |
| 3.3    Sample information .....                                | 6         |
| 3.4    EUT information .....                                   | 6         |
| 3.5    EUT exercise and monitoring details .....               | 6         |
| 3.6    EUT setup details .....                                 | 7         |
| <b>Section 4      Engineering considerations .....</b>         | <b>8</b>  |
| 4.1    Modifications incorporated in the EUT .....             | 8         |
| 4.2    Technical judgment .....                                | 8         |
| 4.3    Deviations from laboratory tests procedures .....       | 8         |
| <b>Section 5      Test conditions .....</b>                    | <b>9</b>  |
| 5.1    Atmospheric conditions .....                            | 9         |
| 5.2    Power supply range .....                                | 9         |
| <b>Section 6      Measurement uncertainty .....</b>            | <b>10</b> |
| 6.1    Uncertainty of measurement .....                        | 10        |
| <b>Section 7      Terms and definitions .....</b>              | <b>11</b> |
| <b>Section 8      Testing data .....</b>                       | <b>13</b> |
| 8.1    Radiated emission limits; Intentional Radiators.....    | 13        |
| 8.2    Conducted limits .....                                  | 25        |
| <b>Section 9      Block diagrams of test set-ups.....</b>      | <b>32</b> |
| 9.1    Radiated emissions set-up .....                         | 32        |
| 9.2    Conducted emissions set-up .....                        | 33        |

# Section 1 Report summary

## 1.1 Test specifications

|                                         |                                          |
|-----------------------------------------|------------------------------------------|
| FCC 47 CFR Part 15, Subpart C – §15.207 | Conducted limits.                        |
| FCC 47 CFR Part 15, Subpart C – §15.209 | Radiated emission; general requirements. |

## 1.2 Test methods

|                  |                                                                                                |
|------------------|------------------------------------------------------------------------------------------------|
| ANSI C64.10-2013 | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices |
|------------------|------------------------------------------------------------------------------------------------|

## 1.3 Exclusions

None

## 1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See “Summary of test results” for full details.

## 1.5 Test report revision history

Table 1.5-1: Test report revision history

| Revision #    | Details of changes made to test report |
|---------------|----------------------------------------|
| 362578-1TRFWL | Original report issued                 |

Notes:

## Section 2 Summary of test results

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### 2.1 Radiated Emissions in simultaneous transmission.

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**Table 2.1-1:** FCC 47 CFR Part 15, Subpart C §15.207 & §15.209

| Test description                   | Verdict |
|------------------------------------|---------|
| FCC 15.209 - Radiated disturbance  | Pass    |
| FCC 15.207 - Conducted disturbance | Pass    |

Notes:

## Section 3 Equipment under test (EUT) details

---

### 3.1 Applicant

---

|                 |                             |
|-----------------|-----------------------------|
| Company name    | CalAmp                      |
| Address         | 2177 Salk Avenue, Suite 200 |
| City            | Carlsbad                    |
| Province/State  | CA                          |
| Postal/Zip code | 92008                       |
| Country         | USA                         |

### 3.2 Manufacturer

---

|                 |                             |
|-----------------|-----------------------------|
| Company name    | CalAmp                      |
| Address         | 2177 Salk Avenue, Suite 200 |
| City            | Carlsbad                    |
| Province/State  | CA                          |
| Postal/Zip code | 92008                       |
| Country         | USA                         |

### 3.3 Sample information

---

|                        |                  |
|------------------------|------------------|
| Receipt date           | October 12, 2018 |
| Nemko sample ID number | 362578           |

### 3.4 EUT information

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|                                 |                                                                                                                                                                                                                               |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product name                    | Vehicle device                                                                                                                                                                                                                |
| Model                           | TTU4530LAW                                                                                                                                                                                                                    |
| Model variant                   | N/A                                                                                                                                                                                                                           |
| Serial number                   | IMEI: 123456789012345                                                                                                                                                                                                         |
| Power requirements              | 12 VDC                                                                                                                                                                                                                        |
| Description/theory of operation | This telematic gateway provide various connectivity options (Wi-fi, LTE, W-CDMA, GPS) for different applications, including expanded access into vehicle networks. EUT contains FCC ID #1: QIPELS61-US & FCC ID #2: PVH0965 . |
| Operational frequencies         | Wi-fi 2432 GHz & 5.2 GHz, W-CDMA 1852.4 MHz, LTE 1850-1910 MHz                                                                                                                                                                |
| Software details                | N/A                                                                                                                                                                                                                           |

### 3.5 EUT exercise and monitoring details

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For this test the telematic gateway (EUT) was set to transmit in a continuous with Wi-Fi (2.4GHz or 5 GHz) and cellular (LTE or W-CDMA). The Wi-Fi signal was enabled by Ublox tool while the cellular was controlled with a R&S wideband radio communication tester(CMW500). LTE, W-CDMA and Wi-fi signals were monitoring through a spectrum analyzer.

### 3.6 EUT setup details

**Table 3.6-1: EUT interface ports**

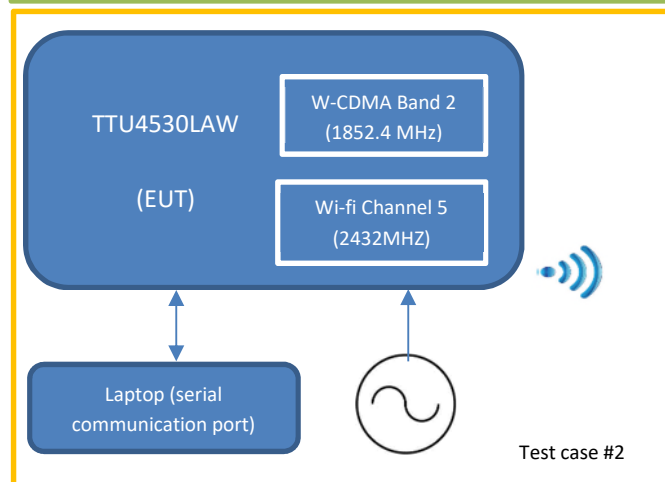
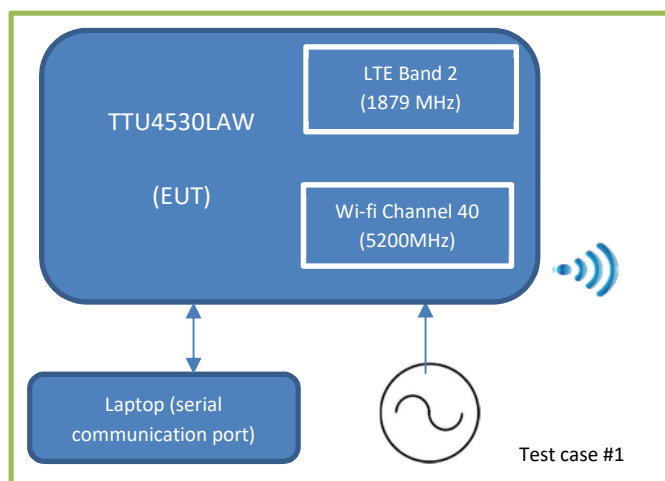
| Description | Qty. |
|-------------|------|
| Serial port | 2    |

**Table 3.6-2: Support equipment**

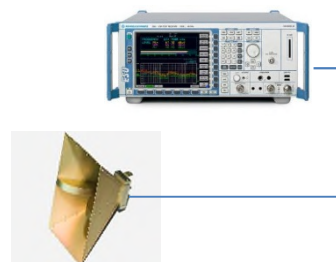
| Description                              | Brand name   | Model/Part number | Serial number | Rev. |
|------------------------------------------|--------------|-------------------|---------------|------|
| Laptop                                   | Dell         | Inspiron          | 15-5548       | N/A  |
| AC Adapter                               | Dell         | LA90PE1-01        | N/A           | N/A  |
| Switching mode DC regulated power Supply | BK Precision | 1697              | 260G13306     | N/A  |

**Table 3.6-3: Inter-connection cables**

| Cable description | From   | To              | Length (m) |
|-------------------|--------|-----------------|------------|
| Serial cable      | EUT    | Laptop          | 0.5        |
| AC-DC Cable       | Laptop | AC Main Network | 1.5        |



Wideband radio  
communication tester



**Figure 3.6-1: EUT Test Setup**

## Section 4 Engineering considerations

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### 4.1 Modifications incorporated in the EUT

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None

### 4.2 Technical judgment

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None

### 4.3 Deviations from laboratory tests procedures

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No deviations were made from laboratory procedures.

## Section 5 Test conditions

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### 5.1 Atmospheric conditions

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|                   |            |
|-------------------|------------|
| Temperature       | 21.4 °C    |
| Relative humidity | 55.7 %     |
| Air pressure      | 86–106 kPa |

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

### 5.2 Power supply range

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The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages  $\pm 5\%$ , for which the equipment was designed.

## Section 6 Measurement uncertainty

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### 6.1 Uncertainty of measurement

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Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of  $K = 2$  with 95% certainty.

| Test name                         | Measurement uncertainty, dB |
|-----------------------------------|-----------------------------|
| All antenna port measurements     | 0.55                        |
| Conducted spurious emissions      | 1.13                        |
| Radiated spurious emissions       | 3.78                        |
| AC power line conducted emissions | 3.55                        |

## Section 7 Terms and definitions

---

### 7.1.1 Equipment type

---

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Multimedia Equipment (MME)               | Equipment that is information technology equipment, audio equipment, video equipment, broadcast receiver equipment, entertainment lighting control equipment or combinations of these.                                                                                                                                                                                                                                                                               |
| Information technology equipment [ITE]   | Equipment having a primary function of either (or a combination of) entry, storage, display, retrieval, transmission, processing, switching, or control of data and/or telecommunication messages and which may be equipped with one or more ports typically for information transfer. <ul style="list-style-type: none"><li>- Examples include data processing equipment, office machines, electronic business equipment and telecommunication equipment.</li></ul> |
| Audio equipment                          | Equipment which has a primary function of either (or a combination of) generation, input, storage, play, retrieval, transmission, reception, amplification, processing, switching or control of audio signals                                                                                                                                                                                                                                                        |
| Video equipment                          | Equipment which has a primary function of either (or a combination of) generation, input, storage, display, play, retrieval, transmission, reception, amplification, processing, switching, or control of video signals.                                                                                                                                                                                                                                             |
| Broadcast receiver equipment             | Equipment containing a tuner that is intended for the reception of broadcast services <ul style="list-style-type: none"><li>- These broadcast services are typically television and radio services, including terrestrial broadcast, satellite broadcast and/or cable transmission.</li></ul>                                                                                                                                                                        |
| Entertainment lighting control equipment | Equipment generating or processing electrical signals for controlling the intensity, color, nature or direction of the light from a luminaire, where the intention is to create artistic effects in theatrical, televisual or musical productions and visual presentations.                                                                                                                                                                                          |

## 7.2 General definitions, continued

### 7.1.2 Port type

|                               |                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AC mains power port           | Port used to connect to the mains supply network                                                                                                                                                                                                                                                                                                            |
| Antenna port                  | <ul style="list-style-type: none"> <li>- Equipment with a DC power port which is powered by a dedicated AC/DC power converter is defined as AC mains powered equipment</li> </ul>                                                                                                                                                                           |
| Broadcast receiver tuner port | Port, other than a broadcast receiver tuner port (3.1.8), for connection of an antenna used for intentional transmission and/or reception of radiated RF energy.                                                                                                                                                                                            |
|                               | Port intended for the reception of a modulated RF signal carrying terrestrial, satellite and/or cable transmissions of audio and/or video broadcast and similar services                                                                                                                                                                                    |
|                               | <ul style="list-style-type: none"> <li>- This port may be connected to an antenna, a cable distribution system, a VCR or similar device.</li> </ul>                                                                                                                                                                                                         |
| DC network power port         | Port, not powered by a dedicated AC/DC power converter and not supporting communication, that connects to a DC supply network.                                                                                                                                                                                                                              |
|                               | <ul style="list-style-type: none"> <li>- Equipment with a DC power port which is powered by a dedicated AC/DC power converter is considered to be AC mains powered equipment.</li> <li>- DC power ports supporting communications are considered to be wired networks ports, for example Ethernet ports which include Power Over Ethernet (POE).</li> </ul> |
| Enclosure port                | Physical boundary of the EUT through which electromagnetic fields may radiate.                                                                                                                                                                                                                                                                              |
| Optical fiber port            | Port at which an optical fiber is connected to an equipment.                                                                                                                                                                                                                                                                                                |
| RF modulator output port      | Port intended to be connected to a broadcast receiver tuner port to transmit a signal to the broadcast receiver.                                                                                                                                                                                                                                            |
| Signal/control port           | Port intended for the interconnection of components of an equipment under test, or between an equipment under test and local associated equipment and used in accordance with relevant functional specifications (for example for the maximum length of cable connected to it)                                                                              |
|                               | <ul style="list-style-type: none"> <li>- Examples include RS-232, Universal Serial Bus (USB), High-Definition Multimedia Interface (HDMI), IEEE Standard 1394 ("Fire Wire")</li> </ul>                                                                                                                                                                      |
| Wired network port            | Point of connection for voice, data and signaling transfers intended to interconnect widely-dispersed systems by direct connection to a single-user or multi-user communication network (for example CATV, PSTN, ISDN, xDSL, LAN and similar networks)                                                                                                      |
|                               | <ul style="list-style-type: none"> <li>- These ports may support screened or unscreened cables and may also carry AC or DC power where this is an integral part of the telecommunication specification.</li> </ul>                                                                                                                                          |

## Section 8 Testing data

### 8.1 Radiated emission limits; Intentional Radiators.

#### 8.1.1 References

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.209 / ANSI C63.4: 2014

- (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:
- (b)

| 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                             |

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

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) 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.

(e) The provisions in §§15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

(f) In accordance with §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in §15.109 that are applicable to the incorporated digital device.

### 8.1.2 Test summary

|               |                           |                   |                  |
|---------------|---------------------------|-------------------|------------------|
| Verdict       | Pass                      |                   |                  |
| Test date     | October 15, 2016          | Temperature       | 22- 23°C         |
| Test engineer | Martha Espinoza           | Air pressure      | 1005 - 1004 mbar |
| Test location | 10m semi anechoic chamber | Relative humidity | 33 – 26 %        |

### 8.1.3 Notes

The spectrum was searched from 30 MHz to the 10th harmonic. No considerable EUT emissions were observed above 18 GHz (when the LTE and Wi-Fi 5.2 GHz signals were transmitting at same time), so, the measurement until 26 GHz in the case when the W-CDMA and Wi-Fi signal at 2.432 GHz were transmitting at same time was not done.

### 8.1.4 Setup details

|                          |                                                                                                                                                                                                                                                                                                                                    |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EUT setup configuration  | Table top                                                                                                                                                                                                                                                                                                                          |
| Test facility            | 10 m Semi anechoic chamber                                                                                                                                                                                                                                                                                                         |
| Measuring distance       | 3 m                                                                                                                                                                                                                                                                                                                                |
| Antenna height variation | 1–4 m                                                                                                                                                                                                                                                                                                                              |
| Turn table position      | 0–360°                                                                                                                                                                                                                                                                                                                             |
| Measurement details      | A preview measurement was generated with receiver in continuous scan or sweep mode while the EUT was rotated and antenna adjusted to maximize radiated emission. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement. |

Receiver/spectrum analyzer settings for frequencies below 1 GHz:

|                      |                                                                                 |
|----------------------|---------------------------------------------------------------------------------|
| Resolution bandwidth | 120 kHz                                                                         |
| Video bandwidth      | 300 kHz                                                                         |
| Detector mode        | – Peak (Preview measurement)<br>– Quasi-peak (Final measurement)                |
| Trace mode           | Max Hold                                                                        |
| Measurement time     | – 100 ms (Peak preview measurement)<br>– 1000 ms (Quasi-peak final measurement) |

Receiver/spectrum analyzer settings for frequencies above 1 GHz:

|                      |                                                                                       |
|----------------------|---------------------------------------------------------------------------------------|
| Resolution bandwidth | 1 MHz                                                                                 |
| Video bandwidth      | 3 MHz                                                                                 |
| Detector mode        | Peak (Preview measurement)<br>Peak and CAverage (Final measurement)                   |
| Trace mode           | Max Hold                                                                              |
| Measurement time     | – 100 ms (Peak preview measurement)<br>– 100 ms (Peak and CAverage final measurement) |

## 8.1.5 Setup details, continued

**Table 8.1-1: Radiated disturbance equipment list**

| Equipment         | Manufacturer    | Model no.      | Asset no. | Cal cycle | Next cal.  |
|-------------------|-----------------|----------------|-----------|-----------|------------|
| EMC Test Receiver | Rohde & Schwarz | ESU 40         | E1121     | 1 yr.     | 4/28/2019  |
| Antenna, Bilog    | Schaffner-Chase | CBL6111C       | 1763      | 2 yr.     | 11/28/2018 |
| Antenna, Horn     | ETS             | 3117-PA        | E1139     | 2 yr.     | 1/25/2020  |
| Antenna, Horn     | Sage            | SAR-2309-42-S2 | E1143     | 2 yr.     | 03/05/2020 |
| Antenna, Horn     | Sage            | SAR-2309-28-S2 | E1148     | 2 yr.     | 03/13/2020 |

Notes: None

**Table 8.1-2: Radiated disturbance test software details**

| Manufacturer of Software | Details         |
|--------------------------|-----------------|
| R&S                      | EMC32 V10.00.00 |

Notes: None

Full Spectrum

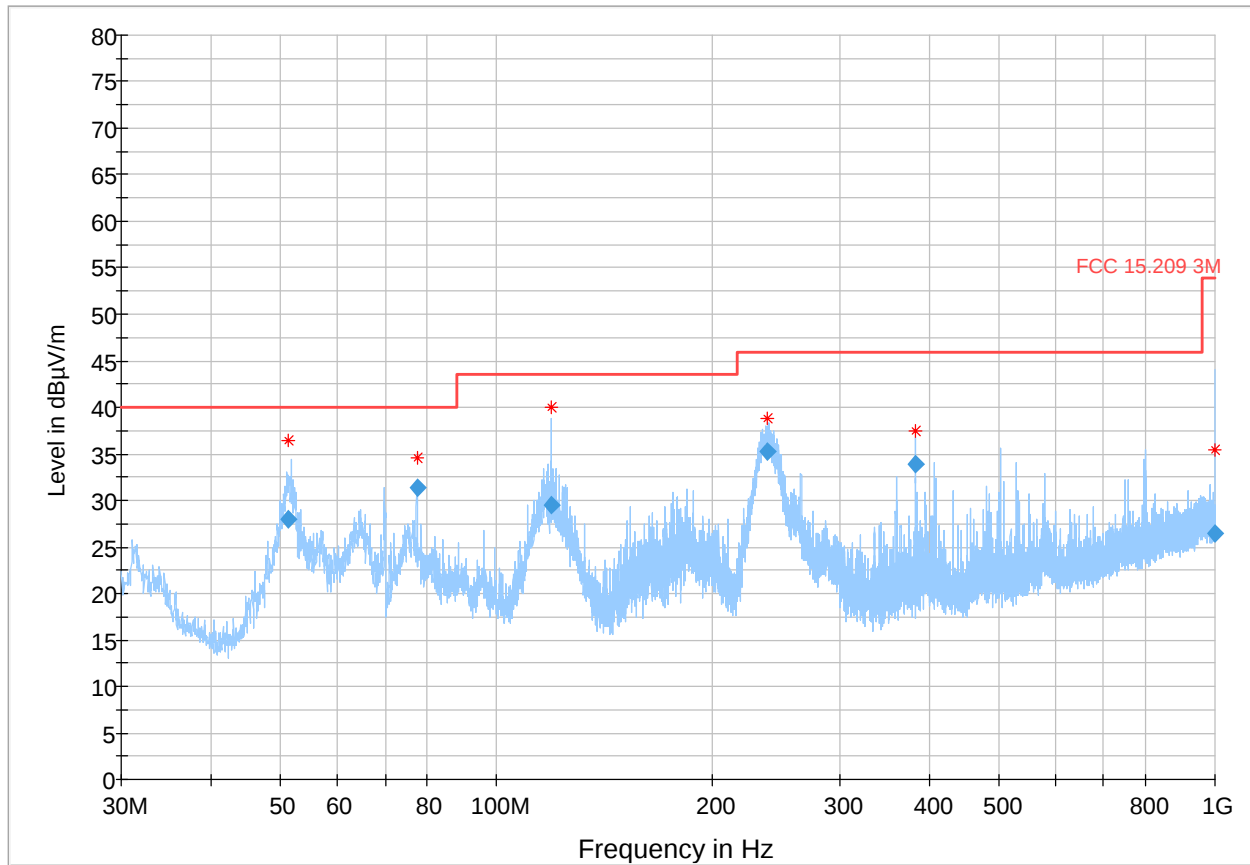


Figure 8.1.1: Radiated spurious emissions, from 30 to 1000 MHz

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 51.228000       | 27.95              | 40.00          | 12.05       | 5000.0          | 120.000         | 124.6       | V   | 161.0         | 9.3        |
| 77.424500       | 31.30              | 40.00          | 8.70        | 5000.0          | 120.000         | 136.0       | V   | 218.0         | 8.8        |
| 119.271500      | 29.47              | 43.50          | 14.03       | 5000.0          | 120.000         | 127.4       | V   | 204.0         | 13.4       |
| 238.489500      | 35.28              | 46.00          | 10.72       | 5000.0          | 120.000         | 100.0       | V   | 356.0         | 13.7       |
| 383.565000      | 33.91              | 46.00          | 12.09       | 5000.0          | 120.000         | 134.7       | V   | 162.0         | 18.6       |
| 999.920000      | 26.52              | 53.90          | 27.38       | 5000.0          | 120.000         | 176.2       | V   | 312.0         | 28.3       |

Table 8.1.3: Radiated field strength measurement results (30 MHz -1000 MHz)

- Notes:
- <sup>1</sup> Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
  - <sup>2</sup> Correction factors = antenna factor ACF (dB) + cable loss (dB)
  - <sup>3</sup> The maximum measured value observed over a period of 15 seconds was recorded.
  - <sup>4</sup> The spectral plot is a summation of a vertical and horizontal scan.

# 8.1.6 Test data Radiated Emissions 30 MHz-40 GHz (LTE & Wi-Fi 5.2 GHz signals), continued

Full Spectrum

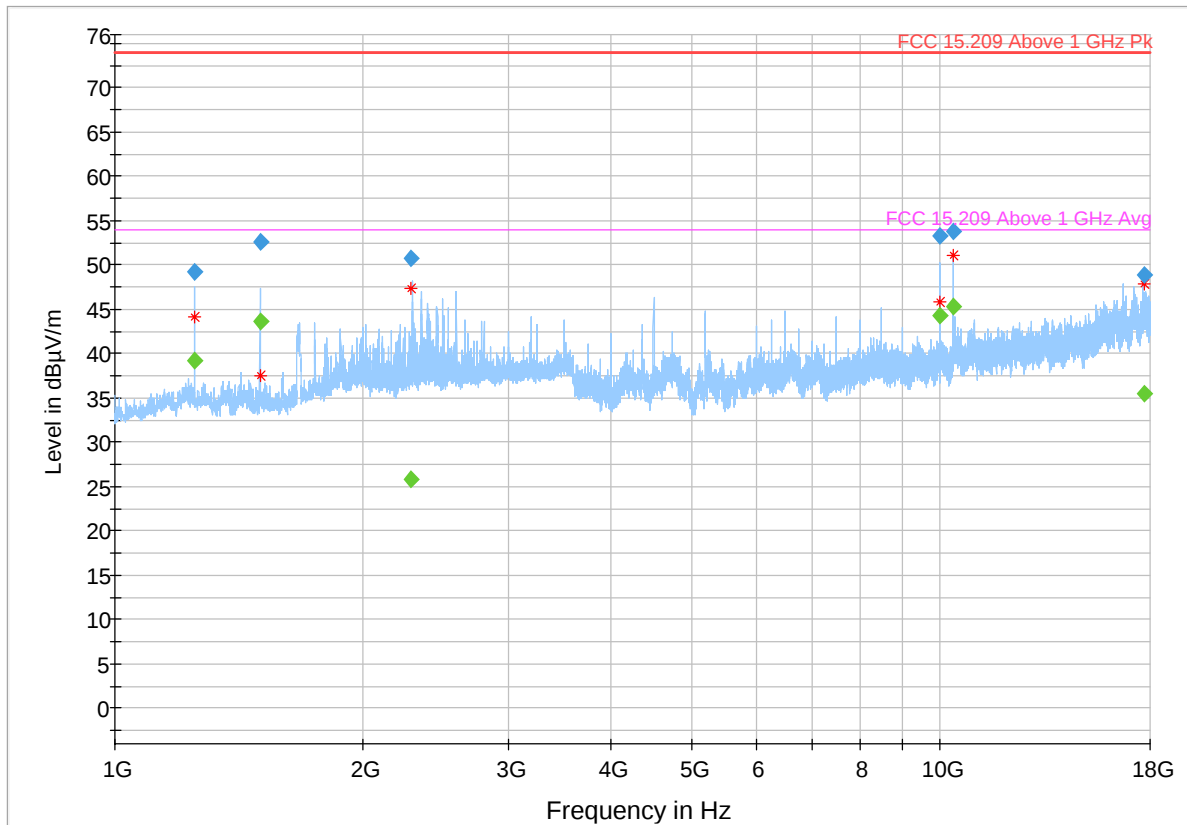


Figure 8.1.2: Radiated spurious emissions, from 1 to 18 GHz

| Frequency (MHz) | MaxPeak (dBμV/m) | CAverage (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 1249.933333     | ---              | 39.16             | 53.90          | 14.74       | 5000.0          | 1000.000        | 111.0       | V   | 206.0         | -13.5      |
| 1249.933333     | 49.18            | ---               | 73.90          | 24.72       | 5000.0          | 1000.000        | 111.0       | V   | 206.0         | -13.5      |
| 1500.000000     | 52.56            | ---               | 73.90          | 21.34       | 5000.0          | 1000.000        | 170.8       | H   | 55.0          | -14.4      |
| 1500.000000     | ---              | 43.66             | 53.90          | 10.24       | 5000.0          | 1000.000        | 170.8       | H   | 55.0          | -14.4      |
| 2285.266667     | 50.74            | ---               | 73.90          | 23.16       | 5000.0          | 1000.000        | 111.2       | V   | 94.0          | -10.3      |
| 2285.266667     | ---              | 25.83             | 53.90          | 28.07       | 5000.0          | 1000.000        | 111.2       | V   | 94.0          | -10.3      |
| 10000.000000    | ---              | 44.24             | 53.90          | 9.66        | 5000.0          | 1000.000        | 100.0       | H   | 41.0          | 3.1        |
| 10000.000000    | 53.32            | ---               | 73.90          | 20.58       | 5000.0          | 1000.000        | 100.0       | H   | 41.0          | 3.1        |
| 10400.066667    | 53.83            | ---               | 73.90          | 20.07       | 5000.0          | 1000.000        | 195.7       | H   | 26.0          | 3.4        |
| 10400.066667    | ---              | 45.27             | 53.90          | 8.63        | 5000.0          | 1000.000        | 195.7       | H   | 26.0          | 3.4        |
| 17670.433333    | 48.92            | ---               | 73.90          | 24.98       | 5000.0          | 1000.000        | 184.7       | H   | 351.0         | 12.3       |
| 17670.433333    | ---              | 35.48             | 53.90          | 18.42       | 5000.0          | 1000.000        | 184.7       | H   | 351.0         | 12.3       |

Table 8.1.4: Radiated field strength measurement results (1 - 18 GHz)

- Notes:
- <sup>1</sup> Field strength (dBμV/m) = receiver/spectrum analyzer value (dBμV) + correction factor (dB)
  - <sup>2</sup> Correction factors = antenna factor ACF (dB) + cable loss (dB)
  - <sup>3</sup> The maximum measured value observed over a period of 15 seconds was recorded.
  - <sup>4</sup> The spectral plot is a summation of a vertical and horizontal scan.
- A notch Filter was used for this test

### Full Spectrum

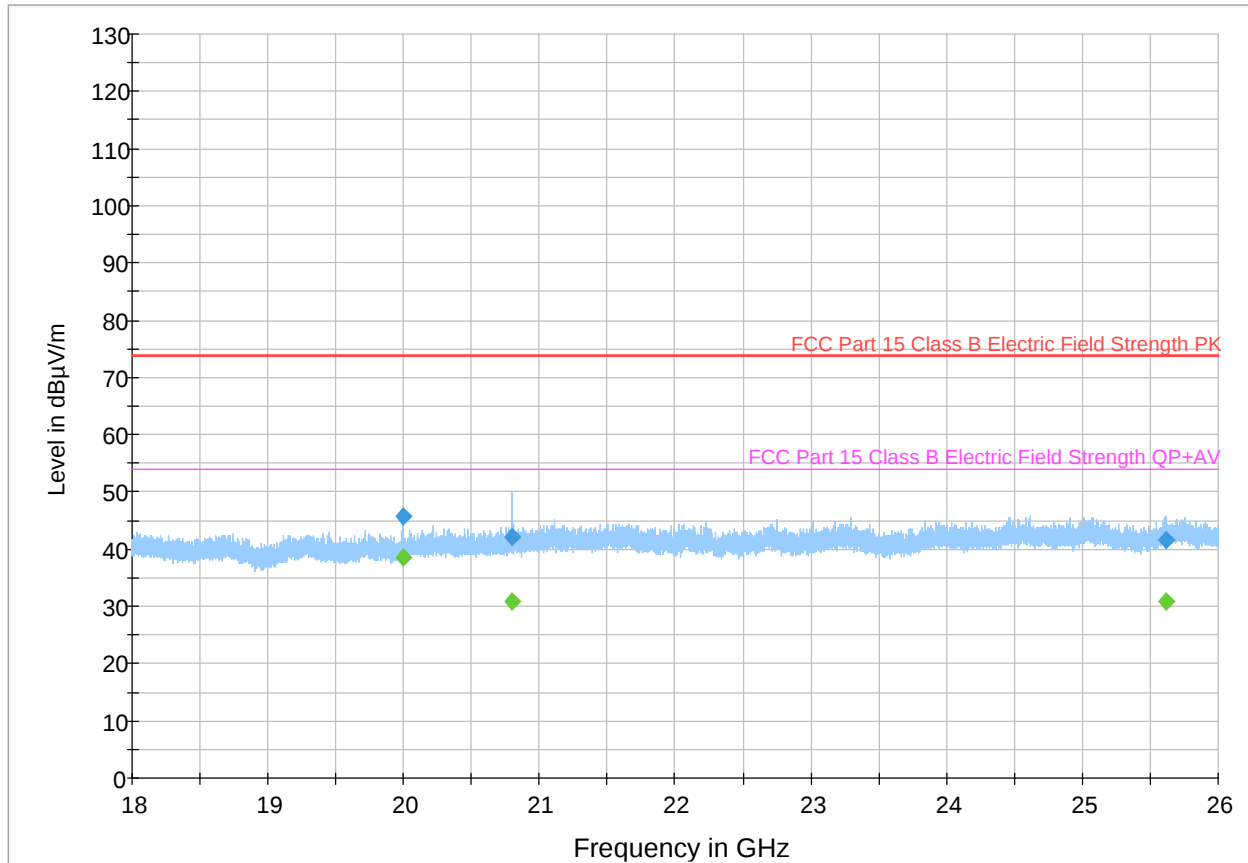


Figure 8.1.3: Radiated spurious emissions, from 18 to 26 GHz

| Frequency (MHz) | MaxPeak (dBμV/m) | Average (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|------------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 20000.266667    | 45.74            | ---              | 73.90          | 28.16       | 10.0            | 1000.000        | 168.2       | V   | 91.0          | 1.7        |
| 20000.266667    | ---              | 38.68            | 53.90          | 15.22       | 10.0            | 1000.000        | 168.2       | V   | 91.0          | 1.7        |
| 20800.000000    | 42.08            | ---              | 73.90          | 31.82       | 10.0            | 1000.000        | 155.8       | V   | 289.0         | 2.1        |
| 20800.000000    | ---              | 30.90            | 53.90          | 23.00       | 10.0            | 1000.000        | 155.8       | V   | 289.0         | 2.1        |
| 25620.000000    | ---              | 30.97            | 53.90          | 22.93       | 10.0            | 1000.000        | 175.3       | H   | 10.0          | 3.6        |
| 25620.000000    | 41.70            | ---              | 73.90          | 32.20       | 10.0            | 1000.000        | 175.3       | H   | 10.0          | 3.6        |

Table 8.1.5: Radiated field strength measurement results (18 - 26 GHz)

- Notes:
- <sup>1</sup> Field strength (dBμV/m) = receiver/spectrum analyzer value (dBμV) + correction factor (dB)
  - <sup>2</sup> Correction factors = antenna factor ACF (dB) + cable loss (dB)
  - <sup>3</sup> The maximum measured value observed over a period of 15 seconds was recorded.
  - <sup>4</sup> The spectral plot is a summation of a vertical and horizontal scan.

# 8.1.6 Test data Radiated Emissions 30 MHz-40 GHz (LTE & Wi-Fi 5.2 GHz signals), continued

Full Spectrum

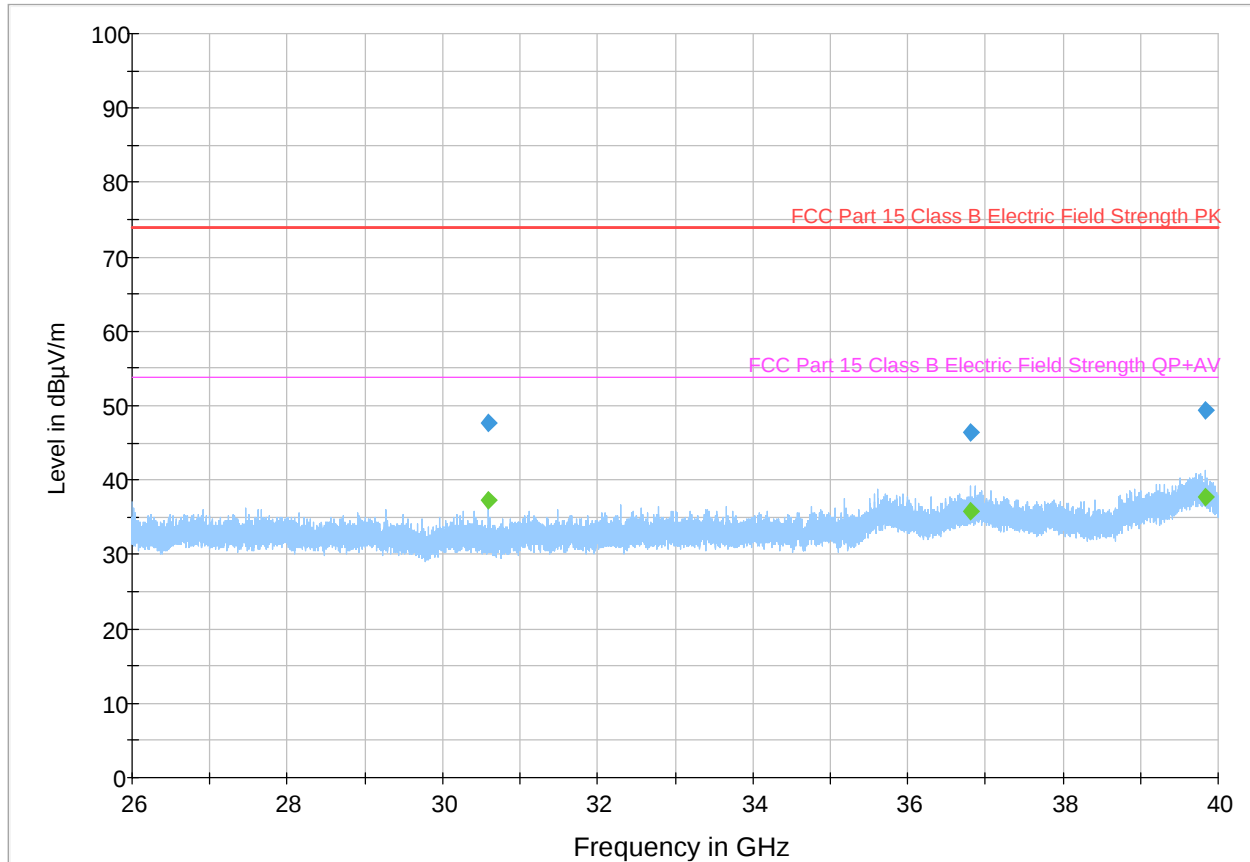


Figure 8.1.4: Radiated spurious emissions, from 26 to 40 GHz

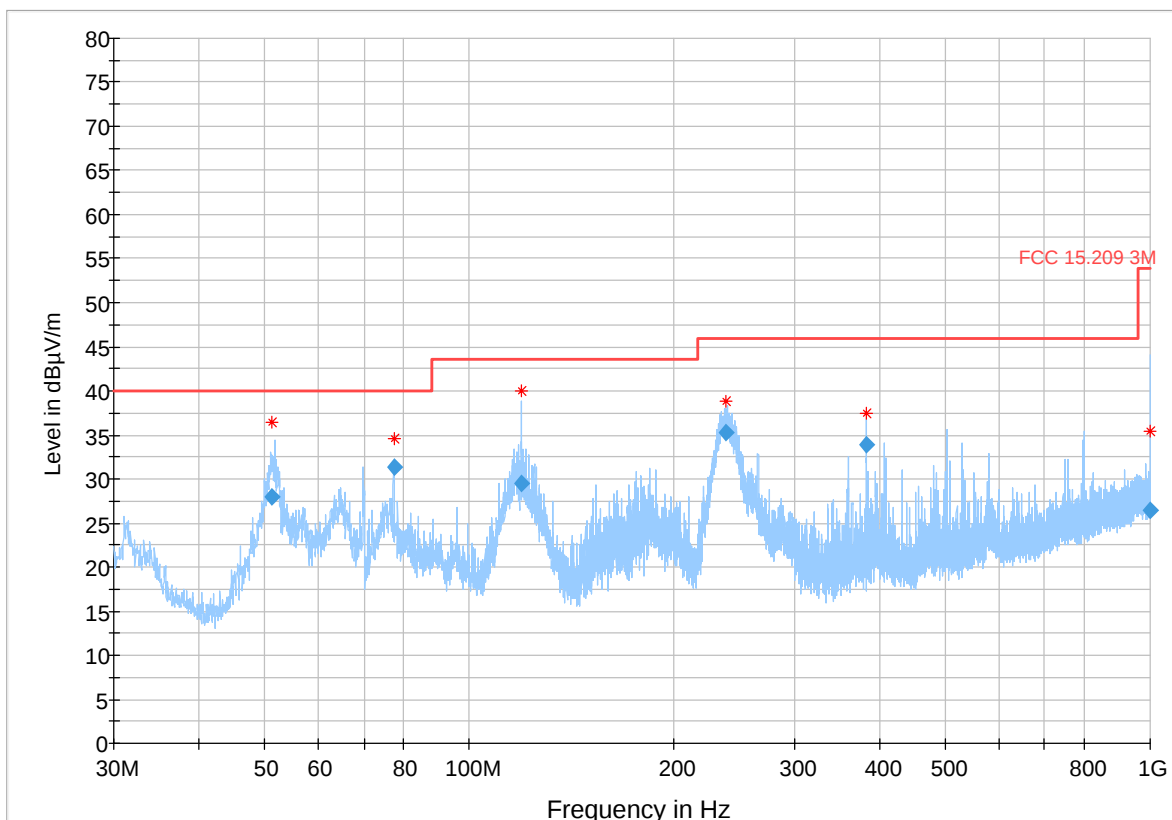
| Frequency (MHz) | MaxPeak (dBμV/m) | Average (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|------------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 30599.933333    | 47.76            | ---              | 73.90          | 26.14       | 10.0            | 1000.000        | 132.6       | V   | 283.0         | 8.1        |
| 30599.933333    | ---              | 37.35            | 53.90          | 16.55       | 10.0            | 1000.000        | 132.6       | V   | 283.0         | 8.1        |
| 36813.133333    | 46.42            | ---              | 73.90          | 27.48       | 10.0            | 1000.000        | 175.0       | V   | 144.0         | 12.9       |
| 36813.133333    | ---              | 35.86            | 53.90          | 18.04       | 10.0            | 1000.000        | 175.0       | V   | 144.0         | 12.9       |
| 39832.000000    | ---              | 37.78            | 53.90          | 16.13       | 10.0            | 1000.000        | 175.0       | V   | 14.0          | 15.7       |
| 39832.000000    | 49.40            | ---              | 73.90          | 24.50       | 10.0            | 1000.000        | 175.0       | V   | 14.0          | 15.7       |

Table 8.1.6: Radiated field strength measurement results (26 - 40 GHz)

- Notes:
- <sup>1</sup> Field strength (dBμV/m) = receiver/spectrum analyzer value (dBμV) + correction factor (dB)
  - <sup>2</sup> Correction factors = antenna factor ACF (dB) + cable loss (dB)
  - <sup>3</sup> The maximum measured value observed over a period of 15 seconds was recorded.
  - <sup>4</sup> The spectral plot is a summation of a vertical and horizontal scan.

# 8.1.7 Test data Radiated Emissions 30 MHz-26 GHz (W-CDMA & Wi-Fi 2.432 GHz signals)

## Full Spectrum



**Table 8.1.5:** Radiated field strength measurement results (30 MHz -1000 MHz)

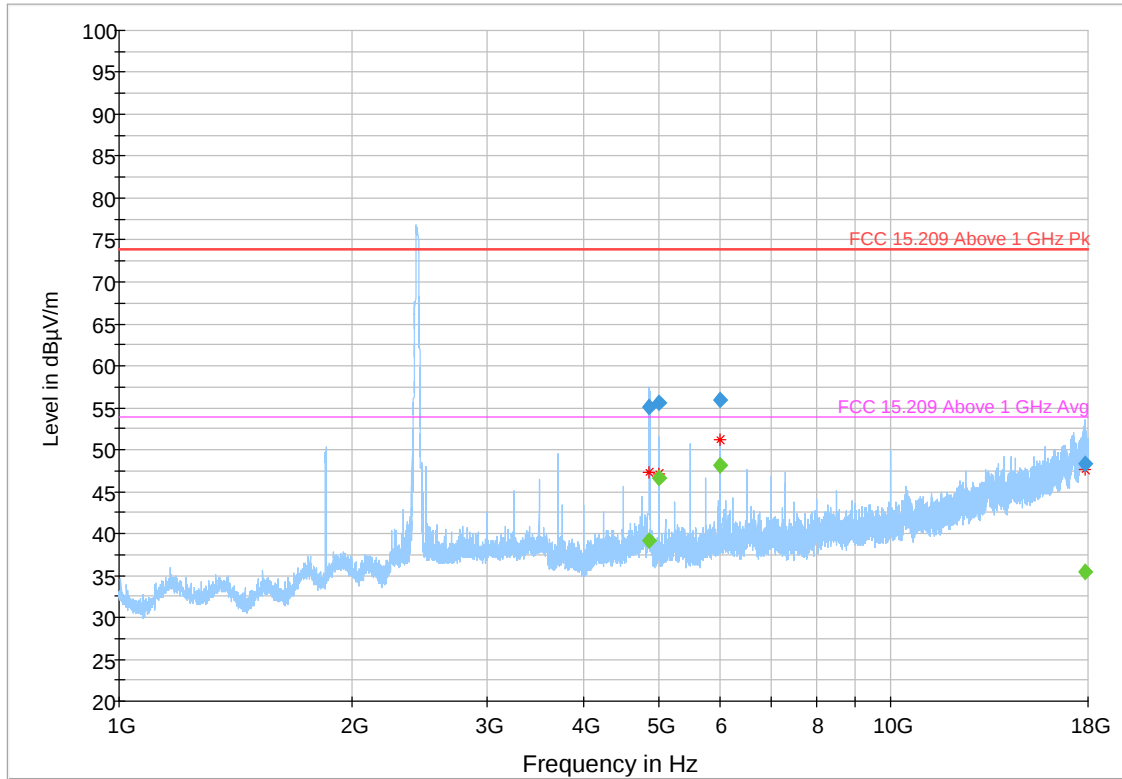
| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 51.228000       | 27.95              | 40.00          | 12.05       | 5000.0          | 120.000         | 124.6       | V   | 161.0         | 9.3        |
| 77.424500       | 31.30              | 40.00          | 8.70        | 5000.0          | 120.000         | 136.0       | V   | 218.0         | 8.8        |
| 119.271500      | 29.47              | 43.50          | 14.03       | 5000.0          | 120.000         | 127.4       | V   | 204.0         | 13.4       |
| 238.489500      | 35.28              | 46.00          | 10.72       | 5000.0          | 120.000         | 100.0       | V   | 356.0         | 13.7       |
| 383.565000      | 33.91              | 46.00          | 12.09       | 5000.0          | 120.000         | 134.7       | V   | 162.0         | 18.6       |
| 999.920000      | 26.52              | 53.90          | 27.38       | 5000.0          | 120.000         | 176.2       | V   | 312.0         | 28.3       |

**Table 8.1.7:** Radiated field strength measurement results (30 - 1000 MHz)

- Notes:
- <sup>1</sup> Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
  - <sup>2</sup> Correction factors = antenna factor ACF (dB) + cable loss (dB)
  - <sup>3</sup> The maximum measured value observed over a period of 15 seconds was recorded.
  - <sup>4</sup> The spectral plot is a summation of a vertical and horizontal scan.

# 8.1.7 Test data Radiated Emissions 30 MHz-26 GHz (W-CDMA & Wi-Fi 2.432 GHz signals), continued

## Full Spectrum



**Figure 8.1.6:** Radiated spurious emissions, 1-18 GHz

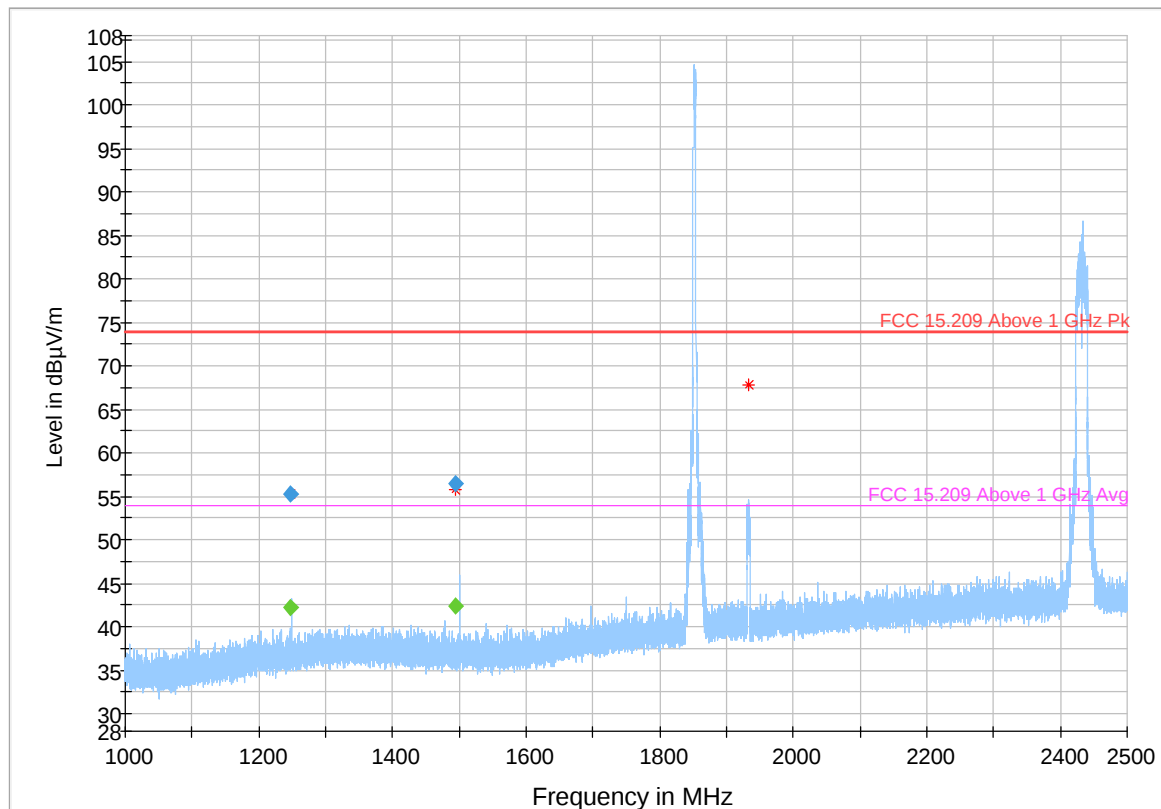
| Frequency (MHz) | MaxPeak (dBµV/m) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 4861.566667     | ---              | 39.07             | 53.90          | 14.83       | 5000.0          | 1000.000        | 218.6       | H   | 0.0           | -2.2       |
| 4861.566667     | 55.04            | ---               | 73.90          | 18.86       | 5000.0          | 1000.000        | 218.6       | H   | 0.0           | -2.2       |
| 5000.133333     | 55.55            | ---               | 73.90          | 18.35       | 5000.0          | 1000.000        | 100.0       | V   | 342.0         | -2.5       |
| 5000.133333     | ---              | 46.65             | 53.90          | 7.25        | 5000.0          | 1000.000        | 100.0       | V   | 342.0         | -2.5       |
| 5999.900000     | ---              | 48.18             | 53.90          | 5.72        | 5000.0          | 1000.000        | 142.3       | V   | 60.0          | -1.2       |
| 5999.900000     | 55.93            | ---               | 73.90          | 17.97       | 5000.0          | 1000.000        | 142.3       | V   | 60.0          | -1.2       |
| 17828.633333    | 48.29            | ---               | 73.90          | 25.61       | 5000.0          | 1000.000        | 114.7       | V   | 242.0         | 13.2       |
| 17828.633333    | ---              | 35.36             | 53.90          | 18.54       | 5000.0          | 1000.000        | 114.7       | V   | 242.0         | 13.2       |

**Table 8.1.8:** Radiated field strength measurement results (1 -18 GHz)

- Notes:
- <sup>1</sup> Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
  - <sup>2</sup> Correction factors = antenna factor ACF (dB) + cable loss (dB)
  - <sup>3</sup> The maximum measured value observed over a period of 15 seconds was recorded.
  - <sup>4</sup> The spectral plot is a summation of a vertical and horizontal scan.
  - <sup>5</sup> A 2.7 GHz High pass filter was used for the scan of 1-18GHz to avoid an PA overload.

## 8.1.7 Test data Radiated Emissions 30 MHz-26 GHz (W-CDMA & Wi-Fi 2.432 GHz signals), continued

### Full Spectrum



**Figure 8.1.7:** Radiated spurious emissions, 1-2.5 GHz without power amplifier/high pass filter

| Frequency (MHz) | MaxPeak (dBμV/m) | CAverage (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 1246.150000     | ---              | 42.26             | 53.90          | 11.64       | 5000.0          | 1000.000        | 214.2       | H   | 310.0         | 33.0       |
| 1246.150000     | 55.32            | ---               | 73.90          | 18.58       | 5000.0          | 1000.000        | 214.2       | H   | 310.0         | 33.0       |
| 1494.950000     | ---              | 42.46             | 53.90          | 11.44       | 5000.0          | 1000.000        | 211.8       | H   | 252.0         | 33.0       |
| 1494.950000     | 56.55            | ---               | 73.90          | 17.35       | 5000.0          | 1000.000        | 211.8       | H   | 252.0         | 33.0       |

**Table 8.1.9:** Radiated field strength measurement results (1-2.5 GHz)

- Notes:
- <sup>1</sup> Field strength (dBμV/m) = receiver/spectrum analyzer value (dBμV) + correction factor (dB)
  - <sup>2</sup> Correction factors = antenna factor ACF (dB) + cable loss (dB)
  - <sup>3</sup> The maximum measured value observed over a period of 15 seconds was recorded.
  - <sup>4</sup> The spectral plot is a summation of a vertical and horizontal scan.
  - <sup>5</sup> A 2.7 GHz high pass filter/PA were eliminated for the scan of 1-2.5 GHz.

## 8.1.8 Radiated Emissions Setup photos



**Figure 8.1.10** Radiated emissions setup from 30-1000 MHz



**Figure 8.1.11** Radiated emissions setup from 1-18 GHz

#### 8.1.8 Radiated Emissions Setup photos, continued

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**Figure 8.1.12** Radiated emissions setup from 18 - 40 GHz

## 8.2 Conducted limits.

### 8.2.1 References

Title 47 → Chapter I → Subchapter A → Part 15 → Subpart C → §15.207 / ANSI C63.4: 2014

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

| 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        |

b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current system containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000  $\mu$ V within the frequency band 535-1705 kHz, as measured using a 50  $\mu$ H/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in §15.205, §15.209, §15.221, §15.223, or §15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

## 8.2.2 8.2.2 Conducted Emissions Test summary

|               |                  |                   |           |
|---------------|------------------|-------------------|-----------|
| Verdict       | Pass             |                   |           |
| Test date     | October 17, 2018 | Temperature       | 23 °C     |
| Test engineer | Martha Espinoza  | Air pressure      | 1007 mbar |
| Test location | Ground Plane     | Relative humidity | 28 %      |

## 8.2.3 Notes

Two cases were object of study:

Case one. - LTE (Band 2) and Wi-fi (channel 40, 5.2 GHz).

Case two. - W-CDMA (Band 2) and Wi-fi (channel 5, 2.432 GHz) s

L1 and N measurements were done by separately for both cases.

## 8.2.4 Setup details

|                         |                                                                                                                                                                                                                                                  |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port under test         | DC Mains Input                                                                                                                                                                                                                                   |
| EUT setup configuration | Table top                                                                                                                                                                                                                                        |
| Measurement details     | A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement. |

Receiver settings:

|                      |                                                                                                                                                                                                    |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Resolution bandwidth | 9 kHz                                                                                                                                                                                              |
| Video bandwidth      | 30 kHz                                                                                                                                                                                             |
| Detector mode        | <ul style="list-style-type: none"> <li>– Peak and Average (Preview measurement)</li> <li>– Quasi-peak and CAverage (Final measurement)</li> </ul>                                                  |
| Trace mode           | Max Hold                                                                                                                                                                                           |
| Measurement time     | <ul style="list-style-type: none"> <li>– 100 ms (Peak and Average preview measurement)</li> <li>– 1000 ms (Quasi-peak final measurement)</li> <li>– 160 ms (CAverage final measurement)</li> </ul> |

**Table 8.2-1:** Conducted disturbance at mains port equipment list

| Equipment                      | Manufacturer    | Model no. | Asset no. | Cal cycle | Next cal. |
|--------------------------------|-----------------|-----------|-----------|-----------|-----------|
| EMI Test Receiver 9kHz to 7GHz | Rohde & Schwarz | ESCI 7    | E1026     | 5/23/2017 | 5/23/2019 |
| Two Line V-Network             | Rohde & Schwarz | ENV216    | E1019     | 6/27/2017 | 6/27/2019 |

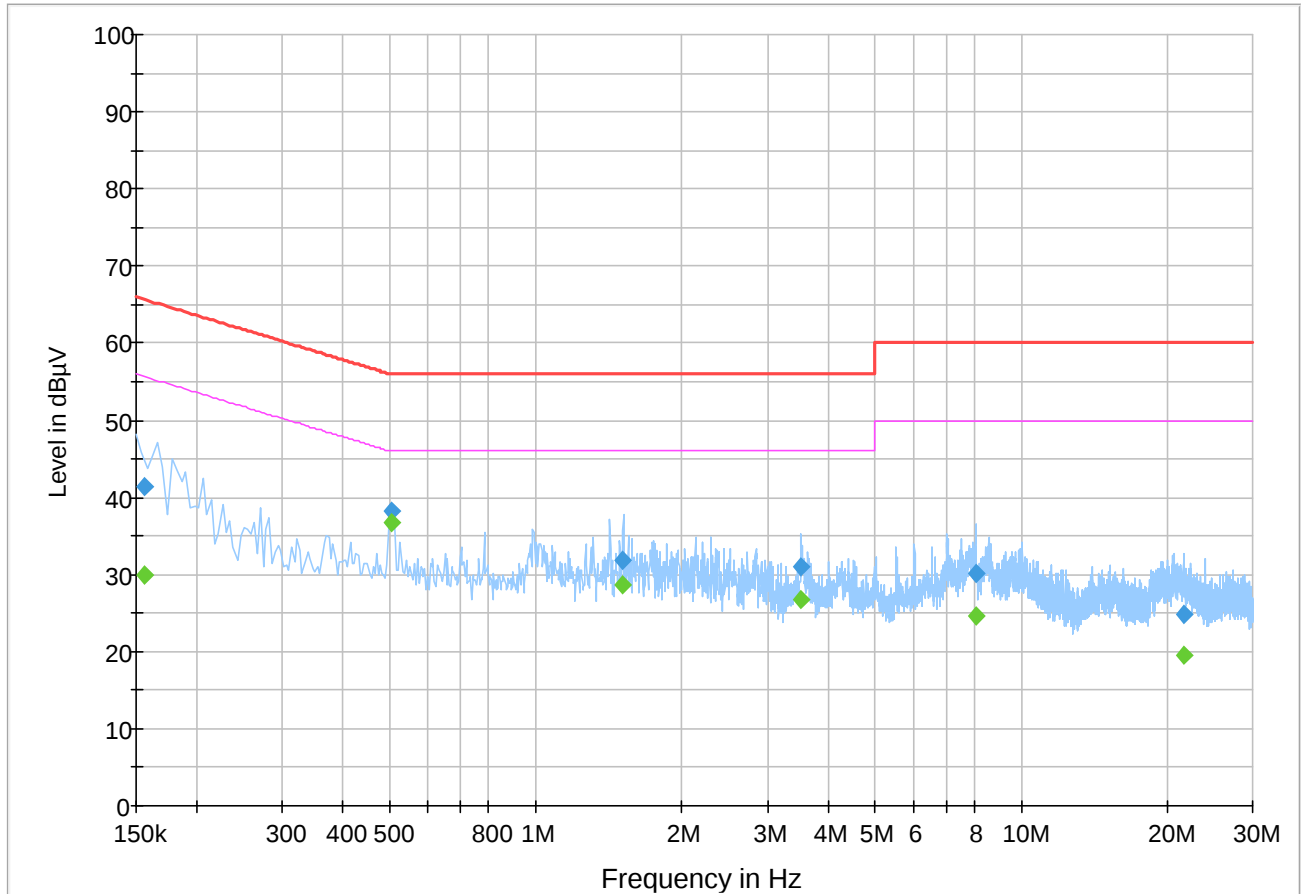
Notes: None

**Table 8.2-2:** Conducted disturbance at mains port test software details

| Manufacturer of Software | Details      |
|--------------------------|--------------|
| Rohde-Schwarz            | EMC 32 V10.0 |

Notes: None

## Full Spectrum



The spectral plot has been corrected with transducer factors. (i.e. cable loss, LISN factors, and attenuators)

**Figure 8.2.1:** Conducted spurious emissions, from 0.150 – 30 MHz. Signals activates: LTE (Band 2) and Wi-Fi 5.2 GHz. Line 1 plot (L1)

**Table 8.2-3:** Conducted disturbance at DC mains results (Quasi-Peak and Average)

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|--------|------------|
| 0.156500        | ---              | 29.97           | 55.65        | 25.68       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 0.156500        | 41.44            | ---             | 65.65        | 24.20       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 0.504500        | ---              | 36.66           | 46.00        | 9.34        | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 0.504500        | 38.22            | ---             | 56.00        | 17.78       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 1.512500        | ---              | 28.74           | 46.00        | 17.26       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 1.512500        | 31.90            | ---             | 56.00        | 24.10       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 3.524500        | ---              | 26.85           | 46.00        | 19.15       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 3.524500        | 30.98            | ---             | 56.00        | 25.02       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 8.056500        | ---              | 24.62           | 50.00        | 25.38       | 5000.0          | 9.000           | L1   | ON     | 19.6       |
| 8.056500        | 30.22            | ---             | 60.00        | 29.78       | 5000.0          | 9.000           | L1   | ON     | 19.6       |
| 21.632500       | ---              | 19.49           | 50.00        | 30.51       | 5000.0          | 9.000           | L1   | ON     | 19.9       |
| 21.632500       | 24.94            | ---             | 60.00        | 35.06       | 5000.0          | 9.000           | L1   | ON     | 19.9       |

Notes: <sup>1</sup> Result (dBμV) = receiver/spectrum analyzer value (dBμV) + correction factor (dB)

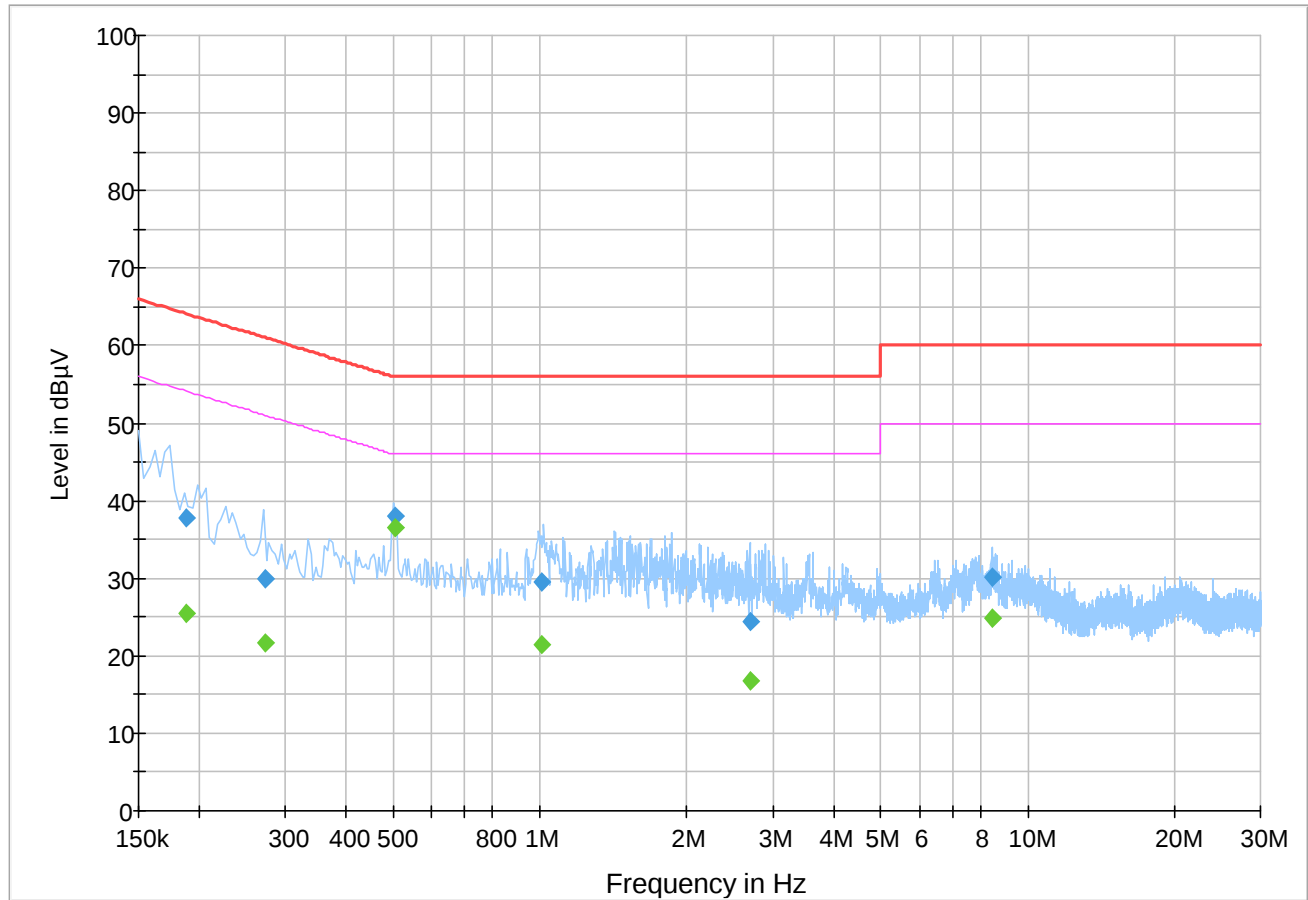
<sup>2</sup> Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + attenuator (dB)

<sup>3</sup> The maximum measured value observed over a period of 15 seconds was recorded.

<sup>4</sup> As per KDB 174176 D01, EUT was tested with a dummy load in lieu of the antenna to determine compliance within the transmitter's fundamental emission band.

Sample calculation: 63.5 dBμV (result) = 44 dBμV (receiver reading) + 19.5 dB (Correction factor)

## Full Spectrum



The spectral plot has been corrected with transducer factors. (i.e. cable loss, LISN factors, and attenuators)

**Figure 8.2.2:** Conducted spurious emissions, from 0.150 – 30 MHz. Signals activates: LTE (Band 2) and Wifi 5.2 GHz. Line N plot (N)

**Table 8.2-3:** Conducted disturbance at DC mains results (Quasi-Peak and Average)

| Frequency (MHz) | QuasiPeak (dBµV) | CAverage (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|--------|------------|
| 0.187500        | ---              | 25.38           | 54.15        | 28.77       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 0.187500        | 37.85            | ---             | 64.15        | 26.29       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 0.272500        | ---              | 21.57           | 51.04        | 29.47       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 0.272500        | 29.98            | ---             | 61.04        | 31.07       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 0.504500        | ---              | 36.52           | 46.00        | 9.48        | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 0.504500        | 38.06            | ---             | 56.00        | 17.94       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 1.004500        | ---              | 21.39           | 46.00        | 24.61       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 1.004500        | 29.56            | ---             | 56.00        | 26.44       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 2.692500        | ---              | 16.84           | 46.00        | 29.16       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 2.692500        | 24.51            | ---             | 56.00        | 31.49       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 8.436500        | ---              | 24.79           | 50.00        | 25.21       | 5000.0          | 9.000           | N    | ON     | 19.6       |
| 8.436500        | 30.10            | ---             | 60.00        | 29.90       | 5000.0          | 9.000           | N    | ON     | 19.6       |

Notes: <sup>1</sup> Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

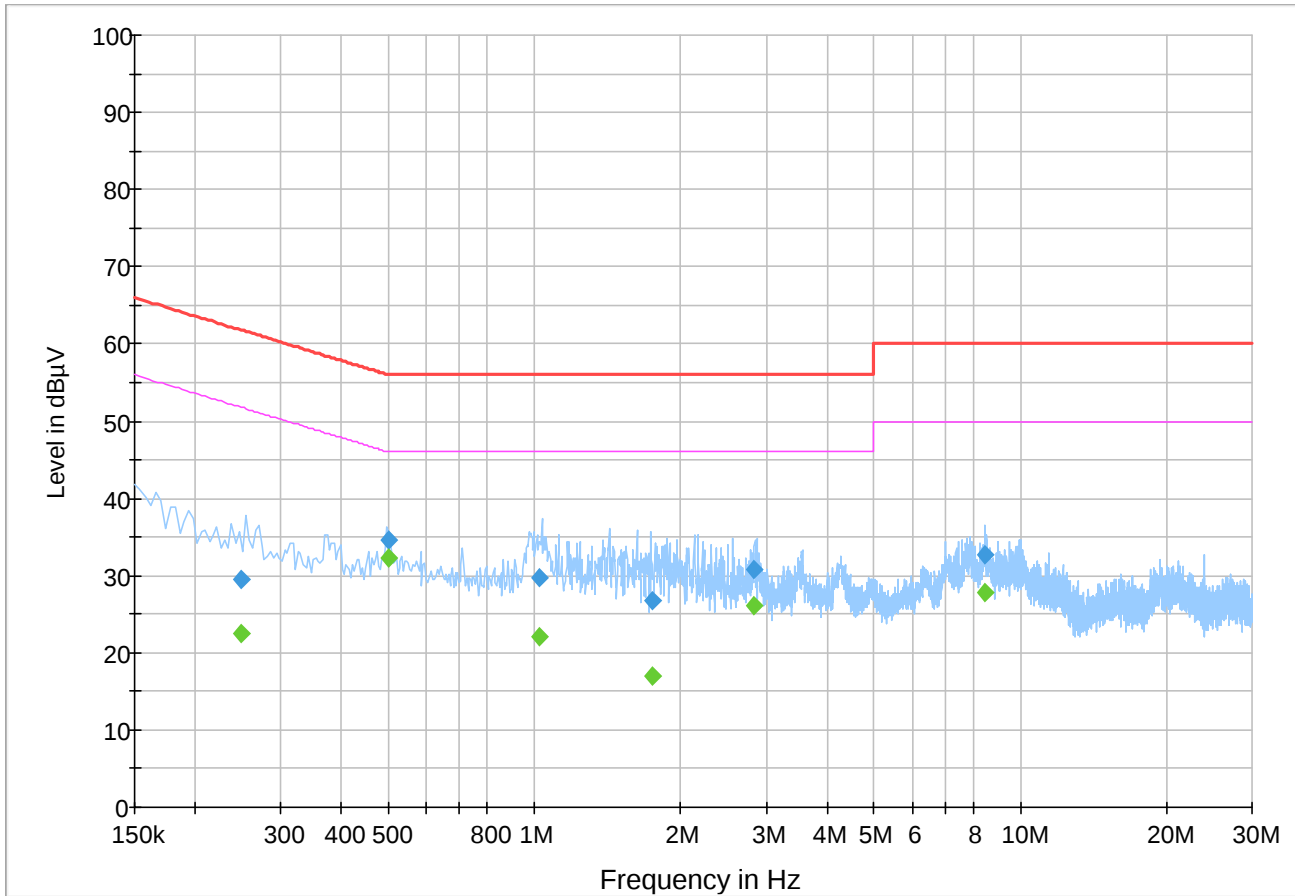
<sup>2</sup> Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + attenuator (dB)

<sup>3</sup> The maximum measured value observed over a period of 15 seconds was recorded.

<sup>4</sup> As per KDB 174176 D01, EUT was tested with a dummy load in lieu of the antenna to determine compliance within the transmitter's fundamental emission band.

Sample calculation: 63.5 dBµV (result) = 44 dBµV (receiver reading) + 19.5 dB (Correction factor)

### Full Spectrum



The spectral plot has been corrected with transducer factors. (i.e. cable loss, LISN factors, and attenuators)

**Figure 8.2.3:** Conducted spurious emissions, from 0.150 – 30 MHz. Signals activates: W-CDMA (Band 2) and Wifi 2.432 GHz. Line 1 plot (L1)

**Table 8.2-4:** Conducted disturbance at DC mains results (Quasi-Peak and Average)

| Frequency (MHz) | QuasiPeak (dBµV) | CAverage (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|--------|------------|
| 0.248500        | ---              | 22.58           | 51.81        | 29.22       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 0.248500        | 29.55            | ---             | 61.81        | 32.26       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 0.500500        | ---              | 32.26           | 46.00        | 13.74       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 0.500500        | 34.66            | ---             | 56.00        | 21.34       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 1.024500        | ---              | 22.18           | 46.00        | 23.82       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 1.024500        | 29.75            | ---             | 56.00        | 26.25       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 1.747500        | ---              | 16.97           | 46.00        | 29.03       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 1.747500        | 26.85            | ---             | 56.00        | 29.15       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 2.836500        | ---              | 26.09           | 46.00        | 19.91       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 2.836500        | 30.72            | ---             | 56.00        | 25.28       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 8.436500        | ---              | 27.77           | 50.00        | 22.23       | 5000.0          | 9.000           | L1   | ON     | 19.6       |
| 8.436500        | 32.71            | ---             | 60.00        | 27.29       | 5000.0          | 9.000           | L1   | ON     | 19.6       |

Notes: <sup>1</sup> Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

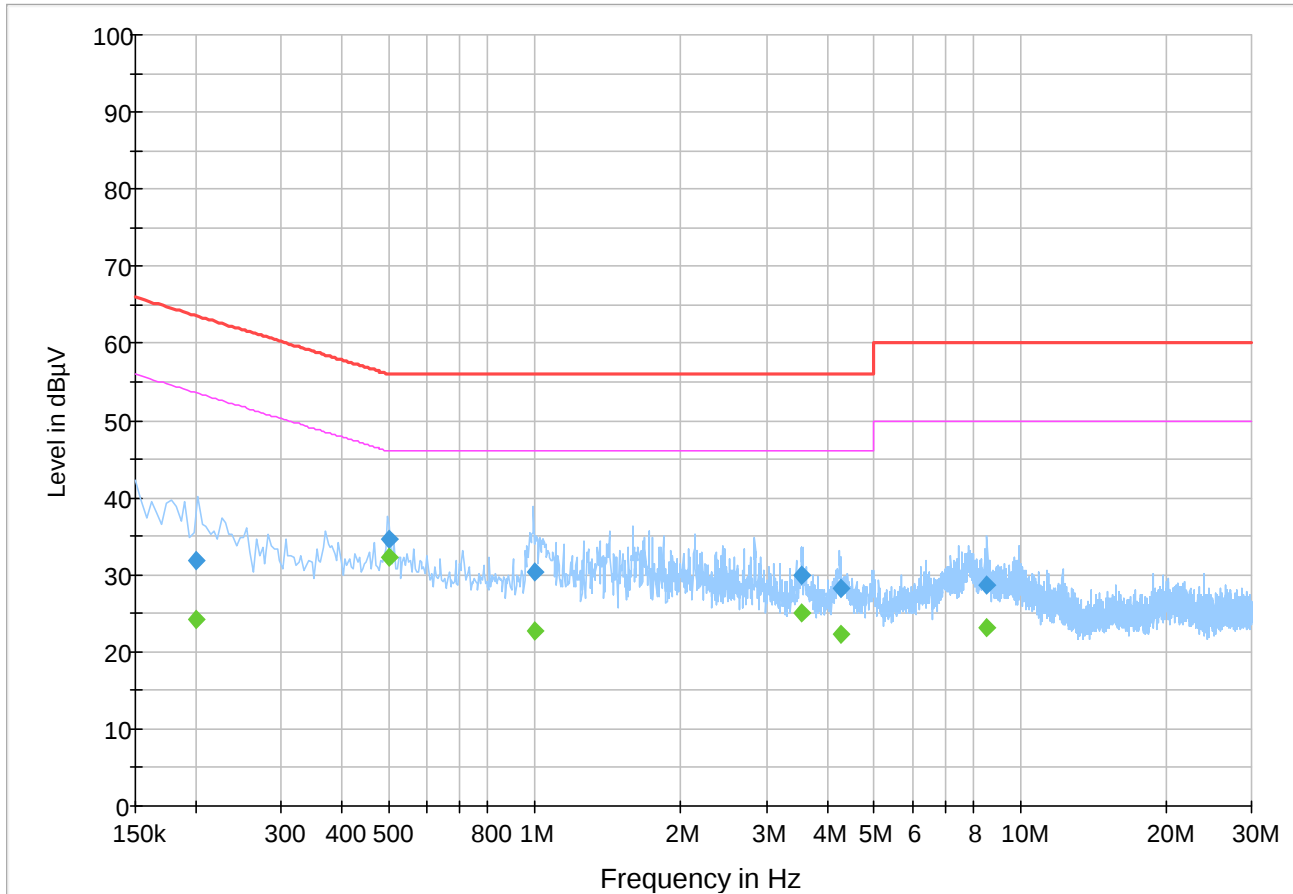
<sup>2</sup> Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + attenuator (dB)

<sup>3</sup> The maximum measured value observed over a period of 15 seconds was recorded.

<sup>4</sup> As per KDB 174176 D01, EUT was tested with a dummy load in lieu of the antenna to determine compliance within the transmitter's fundamental emission band.

Sample calculation: 63.5 dBµV (result) = 44 dBµV (receiver reading) + 19.5 dB (Correction factor)

## Full Spectrum



The spectral plot has been corrected with transducer factors. (i.e. cable loss, LISN factors, and attenuators)

**Figure 8.2.4:** Conducted spurious emissions, from 0.150 – 30 MHz. Signals activates: W-CDMA (Band 2) and Wifi 2.432 GHz. Line N plot (N)

**Table 8.2-5:** Conducted disturbance at DC mains results (Quasi-Peak and Average)

| Frequency (MHz) | QuasiPeak (dBµV) | CAverage (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|--------|------------|
| 0.200500        | ---              | 24.19           | 53.59        | 29.40       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 0.200500        | 31.89            | ---             | 63.59        | 31.70       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 0.500500        | ---              | 32.19           | 46.00        | 13.81       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 0.500500        | 34.64            | ---             | 56.00        | 21.36       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 0.996500        | ---              | 22.70           | 46.00        | 23.30       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 0.996500        | 30.35            | ---             | 56.00        | 25.65       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 3.552500        | ---              | 25.13           | 46.00        | 20.87       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 3.552500        | 29.87            | ---             | 56.00        | 26.13       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 4.252500        | ---              | 22.37           | 46.00        | 23.63       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 4.252500        | 28.15            | ---             | 56.00        | 27.85       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 8.552500        | ---              | 23.09           | 50.00        | 26.91       | 5000.0          | 9.000           | N    | ON     | 19.6       |
| 8.552500        | 28.56            | ---             | 60.00        | 31.44       | 5000.0          | 9.000           | N    | ON     | 19.6       |

Notes: <sup>1</sup> Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

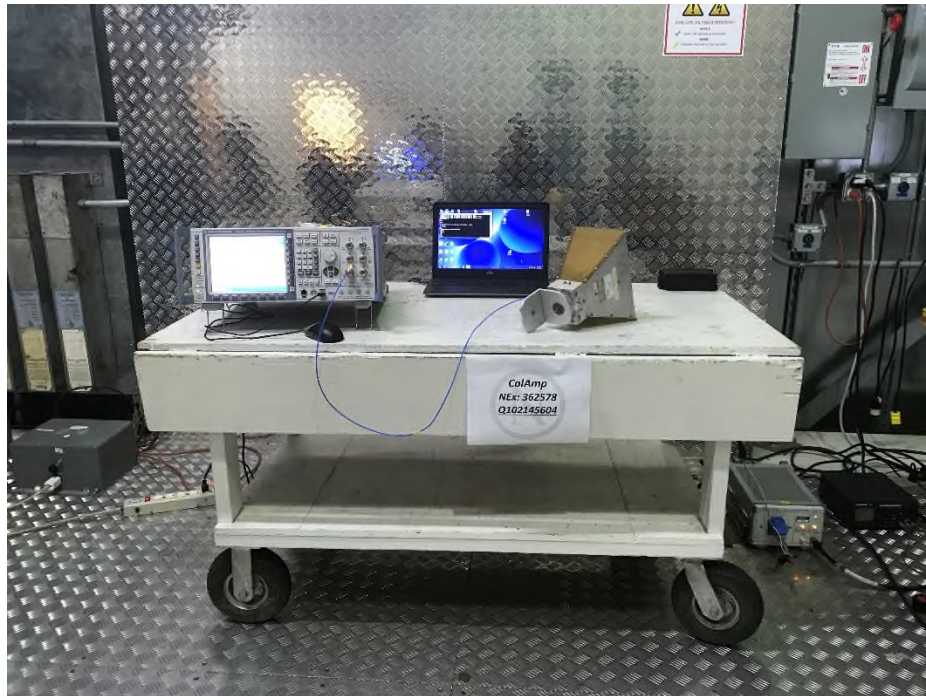
<sup>2</sup> Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + attenuator (dB)

<sup>3</sup> The maximum measured value observed over a period of 15 seconds was recorded.

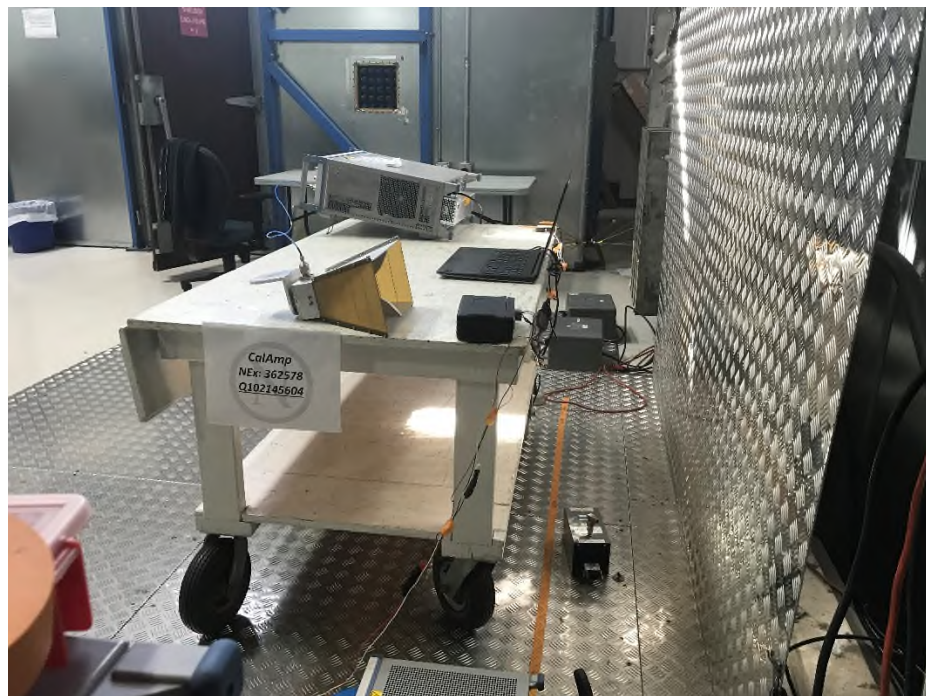
<sup>4</sup> As per KDB 174176 D01, EUT was tested with a dummy load in lieu of the antenna to determine compliance within the transmitter's fundamental emission band.

Sample calculation: 63.5 dBµV (result) = 44 dBµV (receiver reading) + 19.5 dB (Correction factor)

## 8.2.6 Conducted Emissions Setup photos



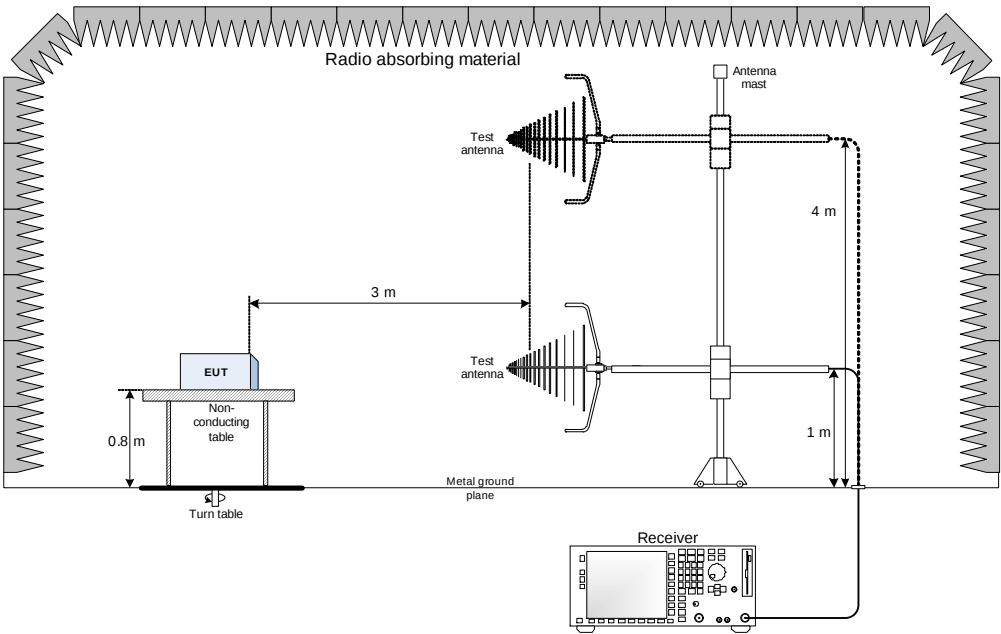
**Figure 8.2.5** Conducted disturbance at DC mains port setup photo



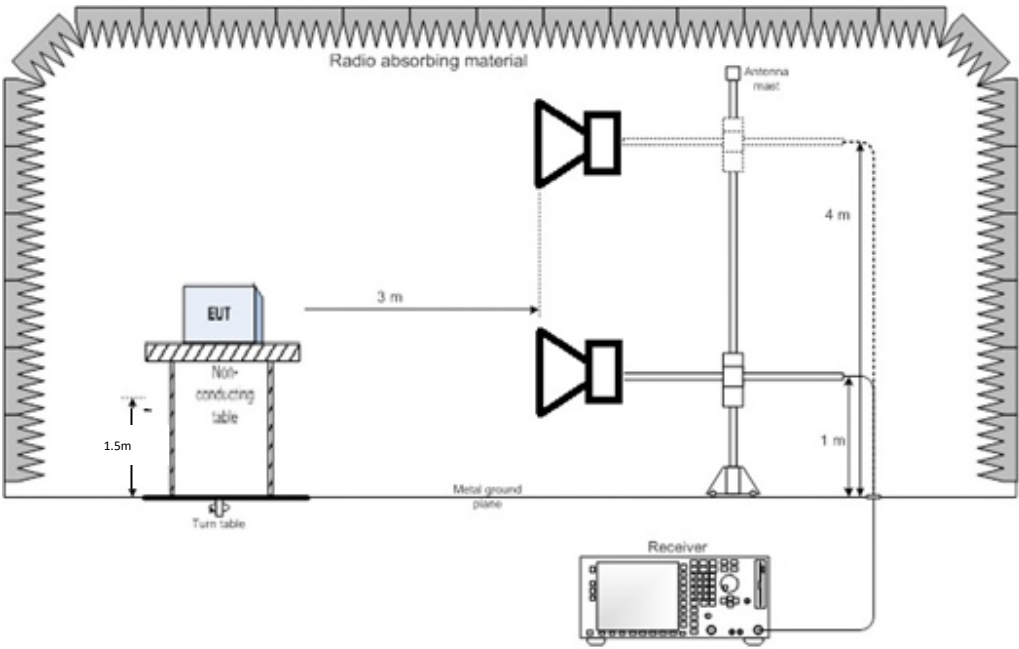
**Figure 8.2.6** Conducted disturbance at DC mains port setup photo

Section 9    Block diagrams of test set-ups

9.1    Radiated emissions set-up

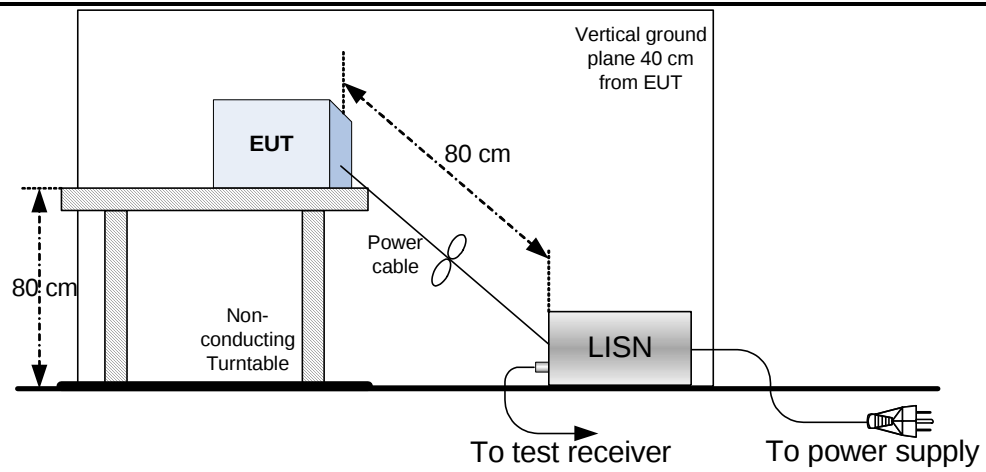


30-1000MHz Setup



Above 1GHz Setup

## 9.2 Conducted emissions set-up



Thank you for choosing

