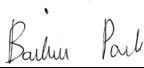


|                      |               |
|----------------------|---------------|
| Report Reference ID: | 372719-5TRFWL |
|----------------------|---------------|

|                     |                                                                                                                                                                                                                               |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test specification: | <b>Title 47 – Telecommunication</b><br>Chapter I – Federal Communications Commission<br>Subchapter D – Safety and special radio services<br>Part 90 – Private land mobile services<br>Subpart I – General technical standards |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|            |                                                                                      |
|------------|--------------------------------------------------------------------------------------|
| Applicant: | TEKO Telecom Srl.<br>Via Meucci, 24/a<br>I-40024 Castel S. Pietro Terme (BO) (Italy) |
| Apparatus: | Medium Power Remote Unit                                                             |
| Model:     | TRU67E8AEWM/AC-WT                                                                    |
| FCC ID:    | XM2-MP67E8AE                                                                         |

|                     |                                                                                                                                           |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Testing laboratory: | <b>Nemko Italy Spa</b><br>Via del Carroccio, 4<br>20853 Biassono (MB) – Italy<br>Telephone: +39 039 2201201<br>Facsimile: +39 039 2201221 |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------|

|              | Name and title                                                                                                                      | Date       |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------|------------|
| Tested by:   | <br><hr/> P. Barbieri, Wireless/EMC Specialist   | 06/24/2019 |
| Reviewed by: | <br><hr/> R. Giampaglia, Wireless/EMC Specialist | 06/24/2019 |

**Nemko Spa, 20853 Biassono (MB) - Italy. All rights reserved.**

This publication may be reproduced in whole for non-commercial purposes as long as Nemko Spa is acknowledged as copyright owner and source of the material. Nemko Spa takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context. Nemko Spa accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This test report may not be partially reproduced, except with the prior written permission of Nemko Spa. The test report merely corresponds to the test sample. The phase of sampling / collection of equipment under test is carried out by the customer.

This Test Report, when bearing the Nemko name and logo is only valid when issued by a Nemko laboratory, or by a laboratory having special agreement with Nemko.

## Table of contents

|                                                                           |           |
|---------------------------------------------------------------------------|-----------|
| <b>Section 1: Report summary .....</b>                                    | <b>4</b>  |
| 1.1 Test specification.....                                               | 4         |
| 1.2 Statement of compliance .....                                         | 4         |
| 1.3 Exclusions .....                                                      | 4         |
| 1.4 Registration number .....                                             | 4         |
| 1.5 Test report revision history .....                                    | 4         |
| 1.6 Limits of responsibility.....                                         | 4         |
| <b>Section 2: Summary of test results .....</b>                           | <b>5</b>  |
| 2.1 FCC Part 90, test results .....                                       | 5         |
| <b>Section 3: Equipment under test (EUT) and application details.....</b> | <b>6</b>  |
| 3.1 Applicant details .....                                               | 6         |
| 3.2 Modular equipment.....                                                | 6         |
| 3.3 Product details.....                                                  | 6         |
| 3.4 Application purpose .....                                             | 6         |
| 3.5 Composite/related equipment.....                                      | 7         |
| 3.6 Sample information.....                                               | 7         |
| 3.7 EUT technical specifications .....                                    | 7         |
| 3.8 Accessories and support equipment.....                                | 8         |
| 3.9 Operation of the EUT during testing.....                              | 9         |
| 3.10 EUT setup diagram.....                                               | 9         |
| <b>Section 4: Engineering considerations .....</b>                        | <b>10</b> |
| 4.1 Modifications incorporated in the EUT .....                           | 10        |
| 4.2 Deviations from laboratory tests procedures.....                      | 10        |
| 4.3 Technical judgment .....                                              | 10        |
| <b>Section 5: Test conditions .....</b>                                   | <b>11</b> |
| 5.1 Deviations from laboratory tests procedures.....                      | 11        |
| 5.2 Test conditions, power source and ambient temperatures .....          | 11        |
| 5.3 Measurement uncertainty .....                                         | 12        |
| 5.4 Test equipment.....                                                   | 13        |
| <b>Appendix A: Test results.....</b>                                      | <b>14</b> |
| Clause 935210 D05v01 (3.2) AGC threshold .....                            | 14        |
| Clause 935210 D05v01 (3.3) Out of band rejection .....                    | 15        |
| Clause 90.209 Occupied bandwidth.....                                     | 16        |
| Clause 90.205 Peak output power at RF antenna connector .....             | 19        |
| Clause 90.210 Spurious emissions at RF antenna connector .....            | 24        |

|                                                         |           |
|---------------------------------------------------------|-----------|
| Clause 90.210 Radiated Spurious emissions.....          | 31        |
| <b>Appendix B: Block diagrams of test set-ups .....</b> | <b>37</b> |
| <b>Appendix C: EUT Photos.....</b>                      | <b>38</b> |



## Section 1: Report summary

### 1.1 Test specification

|                       |                                               |
|-----------------------|-----------------------------------------------|
| <b>Specifications</b> | <b>Part 90 – Private land mobile services</b> |
|-----------------------|-----------------------------------------------|

### 1.2 Statement of compliance

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Compliance</b> | <p>In the configuration tested the EUT was found compliant</p> <p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> <p>This report contains an assessment of apparatus against specifications based upon tests carried out on samples submitted at Nemko Spa. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 90. Radiated tests were conducted in accordance with ANSI C63.26-2015.</p> |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 1.3 Exclusions

|                   |      |
|-------------------|------|
| <b>Exclusions</b> | None |
|-------------------|------|

### 1.4 Registration number

|                                |        |
|--------------------------------|--------|
| <b>Test site FCC ID number</b> | 682159 |
|--------------------------------|--------|

### 1.5 Test report revision history

| Revision # | Details of changes made to test report |
|------------|----------------------------------------|
| TRF        | Original report issued                 |
| R1TRF      | ----                                   |

### 1.6 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. Nemko Spa authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

Nemko Spa accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

## Section 2: Summary of test results

### 2.1 FCC Part 90, test results

| Part    | Methods                     | Test description                           | Verdict |
|---------|-----------------------------|--------------------------------------------|---------|
|         | § 935210<br>D05v01r03 (3.2) | AGC threshold                              | Pass    |
|         | § 935210<br>D05v01r03 (3.3) | Out of band rejection                      | Pass    |
| §90.209 | § 935210<br>D05v01r03 (3.4) | Occupied bandwidth                         | Pass    |
| §90.205 | § 935210<br>D05v01r03 (3.5) | Peak output power at RF antenna connector  | Pass    |
| §90.210 | § 935210<br>D05v01r03 (3.6) | Spurious emissions at RF antenna connector | Pass    |
| §90.210 | § 935210<br>D05v01r03 (3.8) | Radiated spurious emissions                | Pass    |
| §90.213 | § 935210<br>D05v01r03 (3.7) | Frequency stability                        | N/A a)  |

Notes:

- a) NOT APPLICABLE: Modulation/frequency conversion circuitry not in use. No frequency change in EUT (input and output have same frequency)

## Section 3: Equipment under test (EUT) and application details

### 3.1 Applicant details

|                                         |                                    |                        |
|-----------------------------------------|------------------------------------|------------------------|
| <b>Applicant complete business name</b> | Name:                              | Teko Telecom Srl       |
|                                         | Federal Registration Number (FRN): | 0018963462             |
|                                         | Grantee code                       | XM2                    |
| <b>Mailing address</b>                  | Address:                           | Via Meucci, 24/a       |
|                                         | City:                              | Castel S. Pietro Terme |
|                                         | Province/State:                    | Bologna                |
|                                         | Post code:                         | 40024                  |
|                                         | Country:                           | Italy                  |

### 3.2 Modular equipment

|                                           |                                                                                                        |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------|
| <b>a) Single modular approval</b>         | Single modular approval<br>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>         |
| <b>b) Limited single modular approval</b> | Limited single modular approval<br>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |

### 3.3 Product details

|                                                 |                    |                   |
|-------------------------------------------------|--------------------|-------------------|
| <b>FCC ID</b>                                   | Grantee code:      | XM2               |
|                                                 | Product code:      | -MP67E8AE         |
| <b>Equipment class</b>                          | B2I                |                   |
| <b>Description of product as it is marketed</b> | Booster            |                   |
|                                                 | Model name/number: | TRU67E8AEWM/AC-WT |
|                                                 | Serial number:     | 1012791001        |

### 3.4 Application purpose

|                            |                                     |                                                                              |
|----------------------------|-------------------------------------|------------------------------------------------------------------------------|
| <b>Type of application</b> | <input checked="" type="checkbox"/> | Original certification                                                       |
|                            | <input type="checkbox"/>            | Change in identification of presently authorized equipment                   |
|                            |                                     | Original FCC ID: Grant date:                                                 |
|                            | <input type="checkbox"/>            | Class II permissive change or modification of presently authorized equipment |

## Section 3: Equipment under test

### 3.5 Composite/related equipment

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>a) Composite equipment</b> | The EUT is a composite device subject to an additional equipment authorization<br>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>                                                                                                                                                                                                                                                                                   |
| <b>b) Related equipment</b>   | The EUT is part of a system that operates with, or is marketed with, another device that requires an equipment authorization<br>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>                                                                                                                                                                                                                                     |
| <b>c) Related FCC ID</b>      | If either of the above is "yes":<br><input type="checkbox"/> has been granted under the FCC ID(s) listed below:<br><input type="checkbox"/> is in the process of being filled under the FCC ID(s) listed below:<br><input type="checkbox"/> is pending with the FCC ID(s) listed below:<br><input type="checkbox"/> has a mix of pending and granted statuses under the FCC ID(s) listed below:<br>i FCC ID: XM2-MP67E8AE<br>ii FCC ID: |

### 3.6 Sample information

|                                |            |
|--------------------------------|------------|
| <b>Receipt date:</b>           | 05/27/2019 |
| <b>Nemko sample ID number:</b> | -----      |

### 3.7 EUT technical specifications

|                             |                                                                                                          |
|-----------------------------|----------------------------------------------------------------------------------------------------------|
| <b>Operating band:</b>      | Down Link: 858.5–869 MHz, Up Link: 813.5-824 MHz                                                         |
| <b>Operating frequency:</b> | Wideband                                                                                                 |
| <b>Modulation type:</b>     | iDEN, GSM, EDGE, CDMA, WCDMA, LTE (QAM and QPSK)                                                         |
| <b>Occupied bandwidth:</b>  | Standard                                                                                                 |
| <b>Channel spacing:</b>     | standard                                                                                                 |
| <b>Emission designator:</b> | iDEN: D7W<br>GSM and EDGE: GXW;<br>CDMA, WCDMA: F9W,<br>LTE: D7W                                         |
| <b>RF Output</b>            | Down Link: 33dBm (2W)<br>Up Link: N.A. (The EUT does not transmit over the air in the up-link direction) |
| <b>Gain</b>                 | Down Link: 38dB<br>Up Link: N.A. (The EUT does not transmit over the air in the up-link direction)       |
| <b>Antenna type:</b>        | External Antenna is not provided, equipment that has an external 50 $\Omega$ RF connector                |
| <b>Power source:</b>        | 100-240 Vac                                                                                              |

## Section 3: Equipment under test

### 3.8 Accessories and support equipment

The following information identifies accessories used to exercise the EUT during testing:

|                        |                                                                                                 |
|------------------------|-------------------------------------------------------------------------------------------------|
| Item # 1               |                                                                                                 |
| Type of equipment:     | Master Unit - Subrack                                                                           |
| Brand name:            | Teko Telecom srl                                                                                |
| Model name or number:  | SUB-TRX-PSU                                                                                     |
| Serial number:         | 101083001                                                                                       |
| Nemko sample number:   | -----                                                                                           |
| Connection port:       | -----                                                                                           |
| Cable length and type: | -----                                                                                           |
| Item # 2               |                                                                                                 |
| Type of equipment:     | Master Unit – Management Module                                                                 |
| Brand name:            | Teko Telecom srl                                                                                |
| Model name or number:  | TSPV-R                                                                                          |
| Serial number:         | 110942253                                                                                       |
| Nemko sample number:   | -----                                                                                           |
| Connection port:       | LAN port                                                                                        |
| Cable length and type: | -----                                                                                           |
| Item # 3               |                                                                                                 |
| Type of equipment:     | Master Unit – Optical Module                                                                    |
| Brand name:            | Teko Telecom srl                                                                                |
| Model name or number:  | TTRU4W-S-M                                                                                      |
| Serial number:         | 110679007                                                                                       |
| Nemko sample number:   | -----                                                                                           |
| Connection port:       | DL/UL RF connector (to connect to the base station)<br>Optical port (to connect to remote unit) |
| Cable length and type: | -----                                                                                           |
| Item # 4               |                                                                                                 |
| Type of equipment:     | Master Unit – Power Supply                                                                      |
| Brand name:            | Teko Telecom srl                                                                                |
| Model name or number:  | TPSU/AC                                                                                         |
| Serial number:         | 081063004                                                                                       |
| Nemko sample number:   | -----                                                                                           |
| Connection port:       | -----                                                                                           |
| Cable length and type: | -----                                                                                           |
|                        |                                                                                                 |



### 3.9 Operation of the EUT during testing

|                 |                                                                              |
|-----------------|------------------------------------------------------------------------------|
| <b>Details:</b> | In down-link direction, normal working at max gain with max RF power output. |
|-----------------|------------------------------------------------------------------------------|

### 3.10 EUT setup diagram

In this system, Remote Unit is the EUT. Master Unit includes only management module and optical module (to convert RF signal in optical signal in down link direction and viceversa optical signal in RF signal in up link direction). As described in "Operational description", master unit is connected directly to base station, so the system doesn't use another equipment (under another FCC ID) to exercise the EUT. Signal generator is linked directly to the RF connector of optical module in the Master Unit.

#### Test setup for output power, occupied bandwidth, spurious emissions:



#### Procedure

Connect the signal modulated generator to the input of the EUT, so that the EUT works at the max gain. Raise the input level to the EUT until reach the maximum output power. Connect the spectrum analyzer to the RF output connector of the EUT.

## Section 4: Engineering considerations

### 4.1 Modifications incorporated in the EUT

**Modifications**

Modifications performed to the EUT during this assessment  
None ☒ Yes ☐, performed by Client ☐ or Nemko ☐  
Details:

### 4.2 Deviations from laboratory tests procedures

**Deviations**

Deviations from laboratory test procedures  
None ☒ Yes ☐ - details are listed below:

### 4.3 Technical judgment

**Judgment**

None

## Section 5: Test conditions

### 5.1 Deviations from laboratory tests procedures

No deviations were made from laboratory test procedures.

### 5.2 Test conditions, power source and ambient temperatures

|                                                               |                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Normal temperature, humidity and air pressure test conditions | <p>Temperature: 15–30 °C<br/>Relative humidity: 20–75 %<br/>Air pressure: 86–106 kPa</p> <p>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.</p>        |
| Power supply range:                                           | <p>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 <math>\pm 5\%</math>, for which the equipment was designed.</p> |

## Section 5: Test conditions, continued

## 5.3 Measurement uncertainty

| EUT         | Type      | Test                                                                                    | Range and Setup features | Measurement Uncertainty | Notes |
|-------------|-----------|-----------------------------------------------------------------------------------------|--------------------------|-------------------------|-------|
| Transmitter | Conducted | Frequency error                                                                         | 0.001 MHz ÷ 40 GHz       | 0.08 ppm                | (1)   |
|             |           | Carrier power<br>RF Output Power                                                        | 10 kHz ÷ 30 MHz          | 1.0 dB                  | (1)   |
|             |           |                                                                                         | 30 MHz ÷ 18 GHz          | 1.5 dB                  | (1)   |
|             |           |                                                                                         | 18 MHz ÷ 40 GHz          | 3.0 dB                  | (1)   |
|             |           | Adjacent channel power                                                                  | 1 MHz ÷ 18 GHz           | 1.6 dB                  | (1)   |
|             |           | Conducted spurious emissions                                                            | 10 kHz ÷ 26 GHz          | 3.0 dB                  | (1)   |
|             |           |                                                                                         | 26 GHz ÷ 40 GHz          | 4.5 dB                  | (1)   |
|             |           | Intermodulation attenuation                                                             | 1 MHz ÷ 18 GHz           | 2.2 dB                  | (1)   |
|             |           | Attack time – frequency behaviour                                                       | 1 MHz ÷ 18 GHz           | 2.0 ms                  | (1)   |
|             |           | Attack time – power behaviour                                                           | 1 MHz ÷ 18 GHz           | 2.5 ms                  | (1)   |
|             |           | Release time – frequency behaviour                                                      | 1 MHz ÷ 18 GHz           | 2.0 ms                  | (1)   |
|             |           | Release time – power behaviour                                                          | 1 MHz ÷ 18 GHz           | 2.5 ms                  | (1)   |
|             |           | Transient behaviour of the transmitter– Transient frequency behaviour                   | 1 MHz ÷ 18 GHz           | 0.2 kHz                 | (1)   |
|             |           | Transient behaviour of the transmitter – Power level slope                              | 1 MHz ÷ 18 GHz           | 9%                      | (1)   |
|             |           | Frequency deviation - Maximum permissible frequency deviation                           | 0.001 MHz ÷ 18 GHz       | 1.3%                    | (1)   |
|             |           | Frequency deviation - Response of the transmitter to modulation frequencies above 3 kHz | 0.001 MHz ÷ 18 GHz       | 0.5 dB                  | (1)   |
|             |           | Dwell time                                                                              | -                        | 3%                      | (1)   |
|             |           | Hopping Frequency Separation                                                            | 0.01 MHz ÷ 18 GHz        | 1%                      | (1)   |
|             |           | Occupied Channel Bandwidth                                                              | 0.01 MHz ÷ 18 GHz        | 2%                      | (1)   |
|             |           | Modulation Bandwidth                                                                    | 0.01 MHz ÷ 18 GHz        | 2%                      | (1)   |
| Receiver    | Radiated  | Radiated spurious emissions                                                             | 10 kHz ÷ 26.5 GHz        | 6.0 dB                  | (1)   |
|             |           |                                                                                         | 26.5 GHz ÷ 40 GHz        | 8.0 dB                  | (1)   |
|             |           | Effective radiated power transmitter                                                    | 10 kHz ÷ 26.5 GHz        | 6.0 dB                  | (1)   |
|             |           |                                                                                         | 26,5 GHz ÷ 40 GHz        | 8.0 dB                  | (1)   |
|             | Conducted | Conducted spurious emissions                                                            | 1 MHz ÷ 18 GHz           | 6.0 dB                  | (1)   |
|             |           |                                                                                         | 10 kHz ÷ 26 GHz          | 3.0 dB                  | (1)   |
|             |           |                                                                                         | 26 GHz ÷ 40 GHz          | 4.5 dB                  | (1)   |

(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2$  which has been derived from the assumed normal probability distribution with infinite degrees of freedom and for a coverage probability of 95 %

## 5.4 Test equipment

| Equipment                                                                                                       | Manufacturer | Model No.                 | Asset/Serial No. | Next cal. |
|-----------------------------------------------------------------------------------------------------------------|--------------|---------------------------|------------------|-----------|
| Vector Signal Generator                                                                                         | Agilent      | N5172B EXG                | MY53051238       | 05/2021   |
| Vector Signal Generator                                                                                         | Agilent      | E4438C ESG                | MY45094485       | 08/2019   |
| Spectrum Analyzer                                                                                               | Agilent      | N9030A PXA                | MY53120882       | 12/2019   |
| Trilog Broad Band Antenna 25-8000 MHz                                                                           | Schwarzbeck  | VULB 9162                 | VULB 9162-25     | 07/2021   |
| Antenna 1-18 GHz                                                                                                | Schwarzbeck  | STLP 9148                 | STPL 9148-123    | 07/2021   |
| Double ridge horn antenna (4 ÷ 40 GHz)                                                                          | RFSpin       | DRH40                     | 061106A40        | 02/2020   |
| Broadband preamplifier (18 ÷ 40 GHz)                                                                            | Miteq        | JS44-18004000-35-8P-R     | 1.627            | 09/2019   |
| Broadband preamplifier 1-18 GHz                                                                                 | Schwarzbeck  | BBV 9718                  | 9718-137         | 08/2019   |
| EMI receiver 20 Hz ÷ 8 GHz                                                                                      | R&S          | ESU8                      | 100202           | 01/2020   |
| EMI receiver 2 Hz ÷ 44 GHz                                                                                      | R&S          | ESW44                     | 101620           | 05/2019   |
| Hydraulic revolving platform                                                                                    | Nemko        | RTPL 01                   | 4.233            | NCR       |
| Turning-table                                                                                                   | R&S          | HCT                       | 835 803/03       | NCR       |
| Antenna mast                                                                                                    | R&S          | HCM                       | 836 529/05       | NCR       |
| Controller                                                                                                      | R&S          | HCC                       | 836 620/7        | NCR       |
| Semi-anechoic chamber                                                                                           | Nemko        | 10m semi-anechoic chamber | 530              | 09/2021   |
| Shielded room                                                                                                   | Siemens      | 10m control room          | 1947             | NCR       |
| Semi-anechoic chamber                                                                                           | Nemko        | 10m semi-anechoic chamber | 70               | NCR       |
| Shielded Room                                                                                                   | Siemens      | 3m semi-anechoic chamber  | 3                | NCR       |
| Motor controller                                                                                                | Emco         | 1051-25                   | 9012-1559        | NCR       |
| Motor controller                                                                                                | Emco         | 1061-1.521                | 9012-1508        | NCR       |
| Antenna Tower                                                                                                   | Emco         | 2071-2                    | 9601-1940        | NCR       |
| Controller pole/table                                                                                           | Emco         | 2090                      | 9511-1099        | NCR       |
| Note: N/A = Not Applicable, NCR = No Cal Required, COU = CAL On Use<br>(*) Equipment supplied by manufacturer's |              |                           |                  |           |

## Appendix A: Test results

### Clause 935210 D05v01 (3.2) AGC threshold

Measure of EUT AGC Threshold

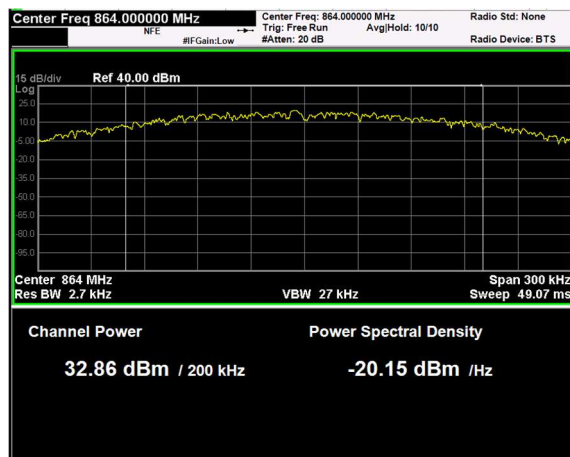
Test date: 05/27/2019 to 06/24/2019

Test results: Pass

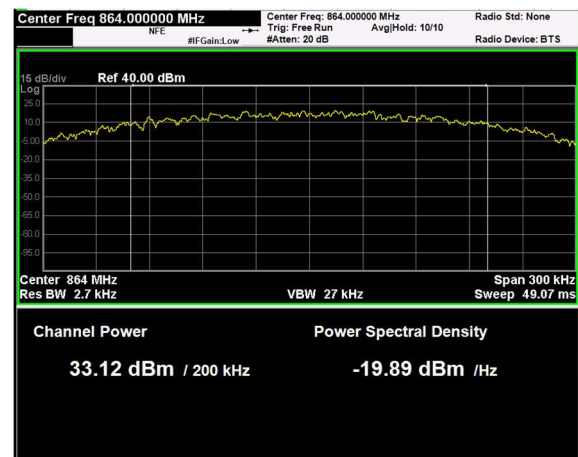
### Special notes

- Narrowband amplifiers: MSK test signal used (GSM-TDMA signal)
- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)

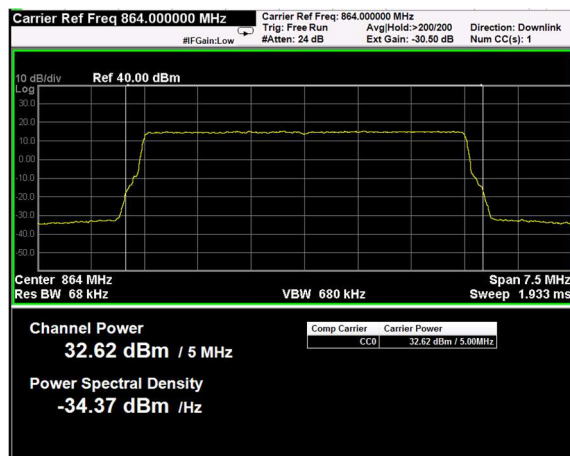
### Test data



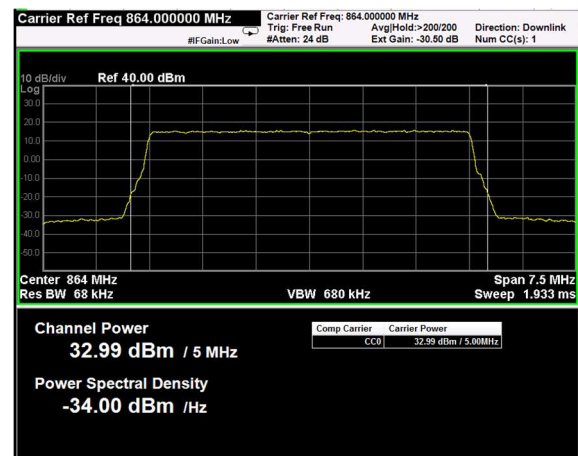
MSK signal, nominal input signal



MSK signal, nominal input signal + 1 dB



AWGN signal, nominal input signal



AWGN signal, nominal input signal + 1 dB

## Clause 935210 D05v01 (3.3) Out of band rejection

Out of Band Rejection – Test for rejection of out of band signals.

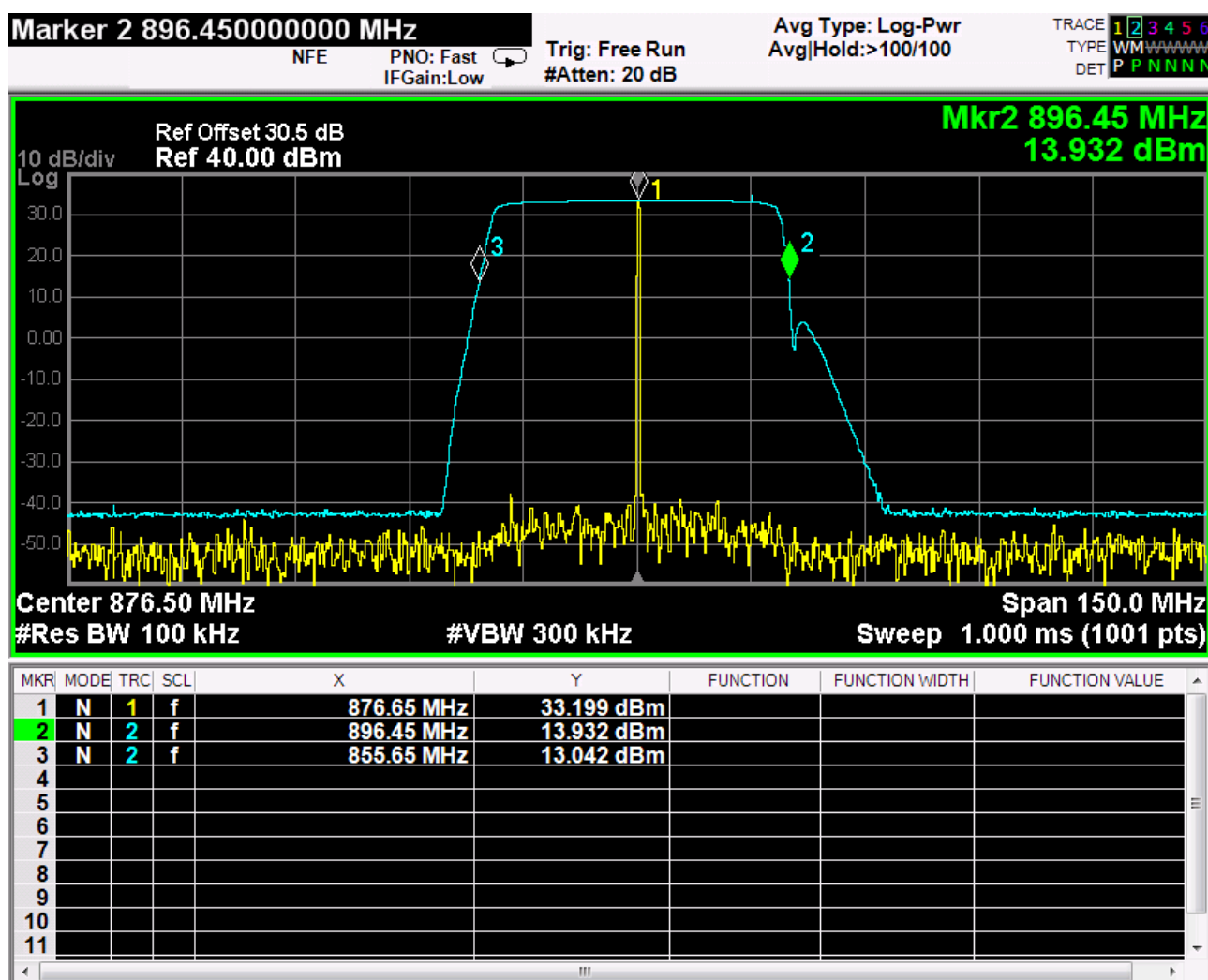
Test date: 05/27/2019 to 06/24/2019

Test results: Pass

### Special notes

—

### Test data



## Clause 90.209 Occupied bandwidth

### §90.209(b)(7)

Economic Area (EA)-based licensees in frequencies 817-824/862-869 MHz (813.5-824/858.5-869 MHz in the counties listed in §90.614(c)) may exceed the standard channel spacing and authorized bandwidth listed in paragraph (b)(5) of this section in any National Public Safety Planning Advisory Committee Region when all 800 MHz public safety licensees in the Region have completed band reconfiguration consistent with this part. In any National Public Safety Planning Advisory Committee Region where the 800 MHz band reconfiguration is incomplete, EA-based licensees in frequencies 817-821/862-866 MHz (813.5-821/858.5-866 MHz in the counties listed in §90.614(c)) may exceed the standard channel spacing and authorized bandwidth listed in paragraph (b)(5) of this section. Upon all 800 MHz public safety licensees in a National Public Safety Planning Advisory Committee Region completing band reconfiguration, EA-based 800 MHz SMR licensees in the 821-824/866-869 MHz band may exceed the channel spacing and authorized bandwidth in paragraph (b)(5) of this section. Licensees authorized to exceed the standard channel spacing and authorized bandwidth under this paragraph must provide at least 30 days written notice prior to initiating such service in the bands listed herein to every 800 MHz public safety licensee with a base station in an affected National Public Safety Planning Advisory Committee Region, and every 800 MHz public safety licensee with a base station within 113 kilometers (70 miles) of an affected National Public Safety Planning Advisory Committee Region. Such notice shall include the estimated date upon which the EA-based 800 MHz SMR licensee intends to begin operations that exceed the channel spacing and authorized bandwidth in paragraph (b)(5) of this section.

Test date: 05/27/2019 to 06/24/2019

Test results: Pass

### Special notes

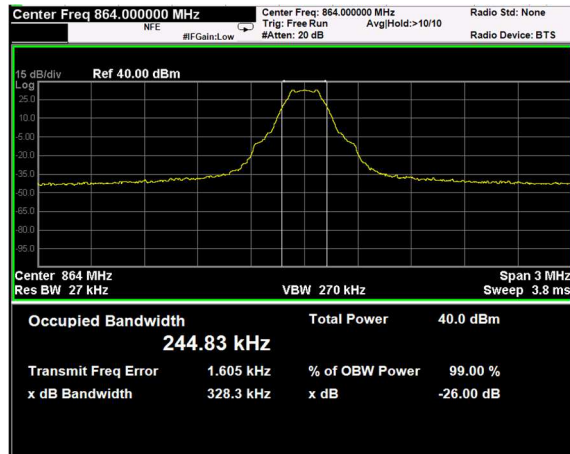
- Narrowband amplifiers: MSK test signal used (GSM-TDMA signal)
- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)



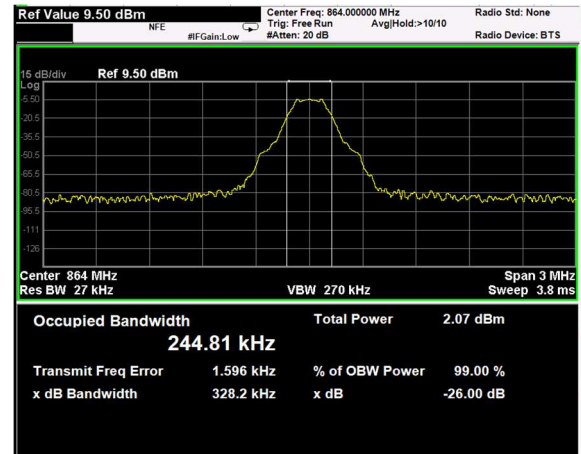
## Clause 90.209 Occupied bandwidth, continued

### Test data

#### MSK signal, nominal input signal

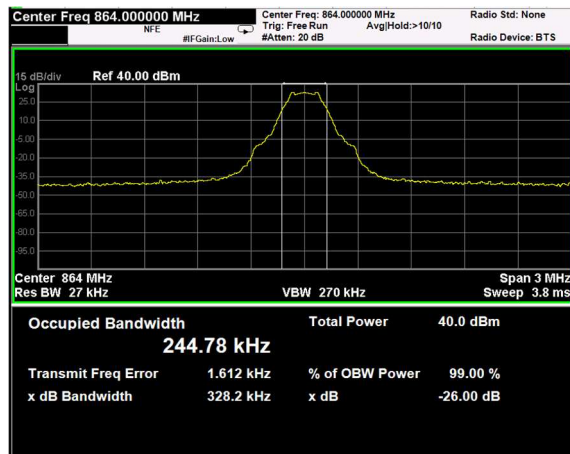


Output

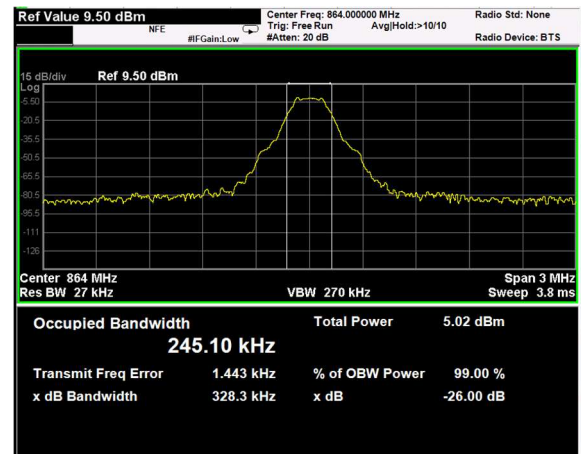


Input

#### MSK signal, nominal input signal + 3dB

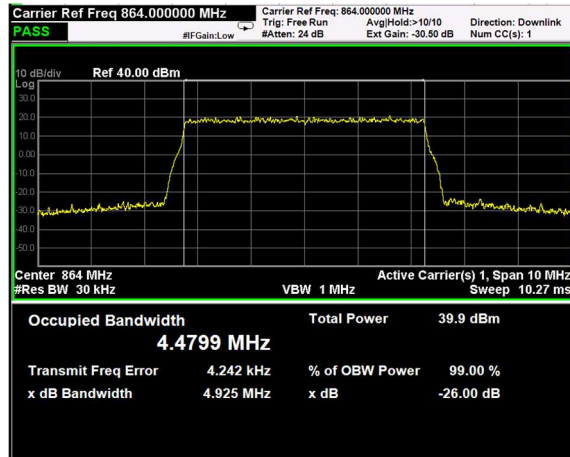


Output

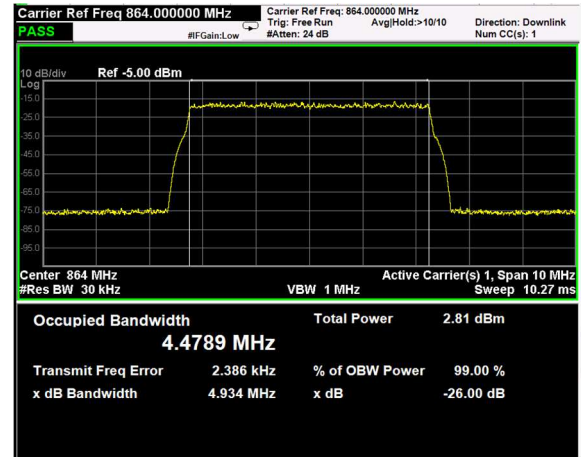


Input

## AWGN signal, nominal input signal

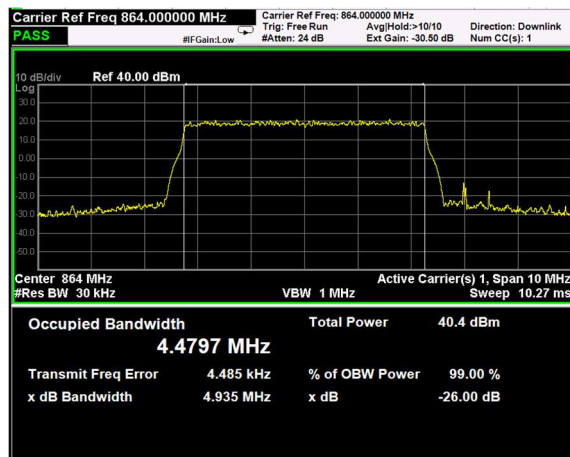


Output

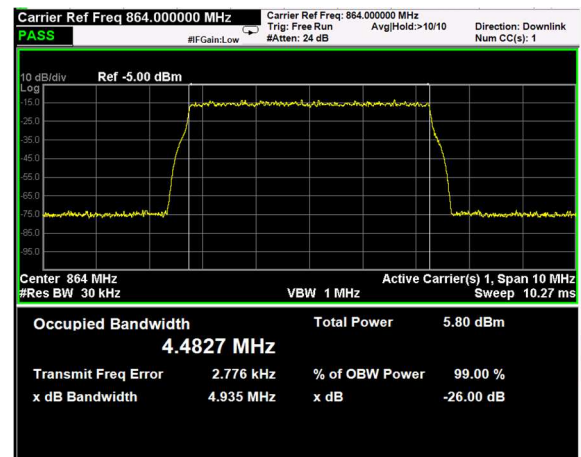


Input

## AWGN signal, nominal input signal + 3dB



Output



Input

## Clause 90.205 Peak output power at RF antenna connector

Applicants for licenses must request and use no more power than the actual power necessary for satisfactory operation. Except where otherwise specifically provided for, the maximum power that will be authorized to applicants whose license applications for new stations are filed after August 18, 1995 is as follows:

(k) 806-824 MHz, 851-869 MHz, 896-901 MHz and 935-940 MHz. Power and height limitations are specified in §90.635

### §90.635 Limitations on power and antenna height.

(a) The effective radiated power and antenna height for base stations may not exceed 1 kilowatt (30 dBw) and 304 m. (1,000 ft.) above average terrain (AAT), respectively, or the equivalent thereof as determined from the Table. These are maximum values, and applicants will be required to justify power levels and antenna heights requested.

For measurements conducted pursuant to paragraphs (a) and (b) of § 2.1046, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

Test date: 05/27/2019 to 06/24/2019

Test results: Pass

### Special notes

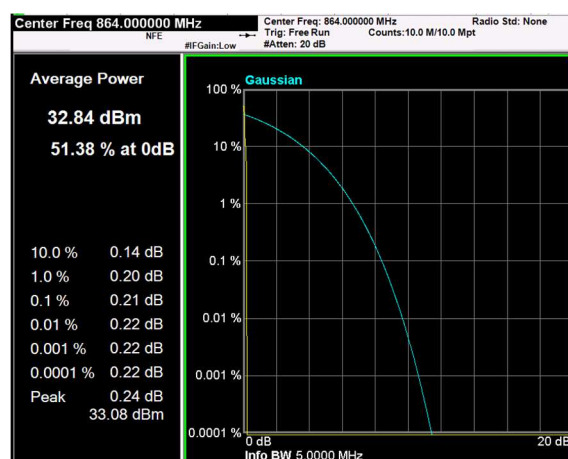
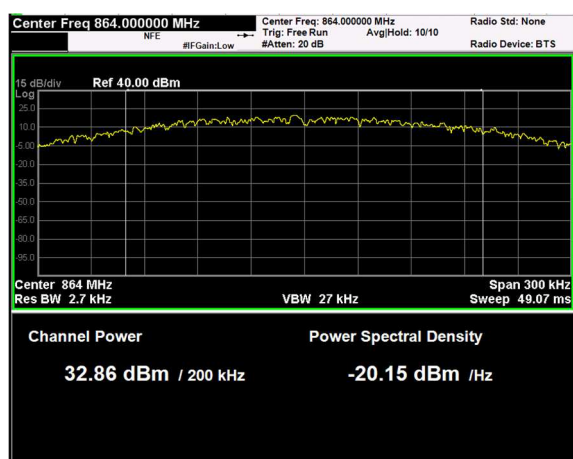
- Narrowband amplifiers: MSK test signal used (GSM-TDMA signal)
- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)

## Clause 90.205 Peak output power at RF antenna connector

### Test data

### MSK signal, nominal input signal

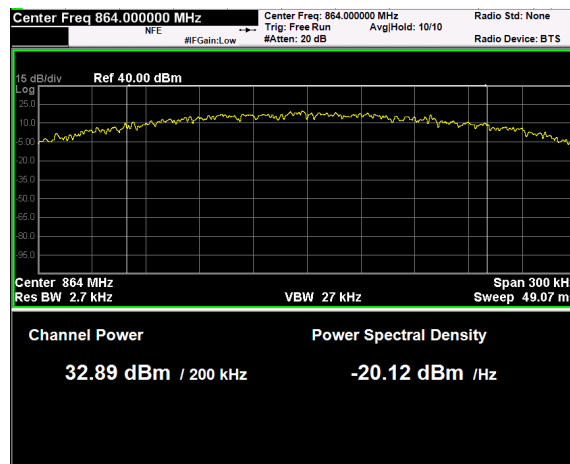
| Test data |                   |                 |                       |                             |          |
|-----------|-------------------|-----------------|-----------------------|-----------------------------|----------|
| Direction | Modulation        | Frequency (MHz) | RF output Power (dBm) | RF output channel Power (W) | PAR (dB) |
| Down-link | MSK (GSM, 200kHz) | 864.0           | 32.86                 | 1.92                        | 0,24     |



PAR measure is performed by the “CCDF” function installed on Spectrum analyzer that provides average power (the same measured with “Channel power” function), peak power and PAR.

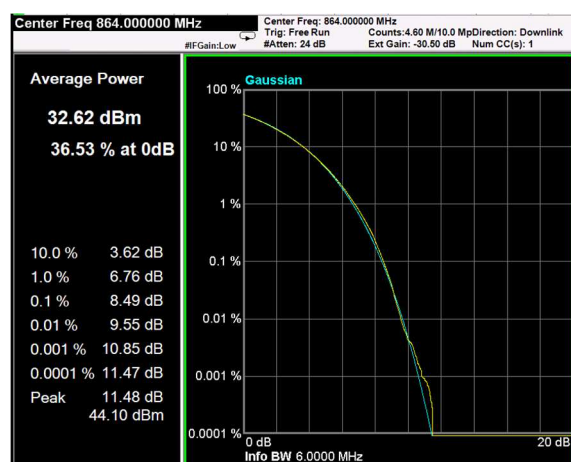
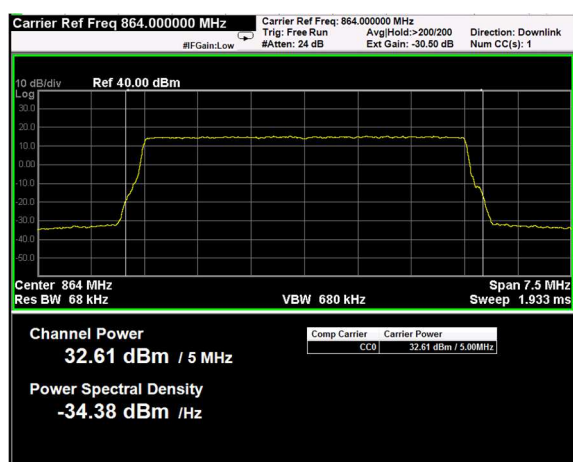
## MSK signal, nominal input signal + 3dB

| Test data |                   |                 |                       |                             |
|-----------|-------------------|-----------------|-----------------------|-----------------------------|
| Direction | Modulation        | Frequency (MHz) | RF output Power (dBm) | RF output channel Power (W) |
| Down-link | MSK (GSM, 200kHz) | 864.0           | 32.89                 | 1.95                        |



## AWGN signal, nominal input signal

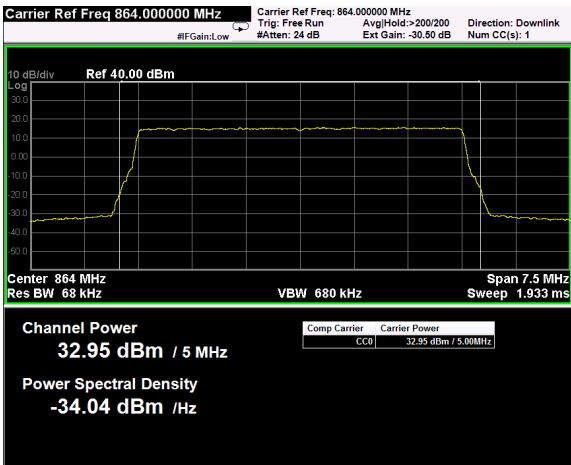
| Test data |                  |                 |                       |                             |          |
|-----------|------------------|-----------------|-----------------------|-----------------------------|----------|
| Direction | Modulation       | Frequency (MHz) | RF output Power (dBm) | RF output channel Power (W) | PAR (dB) |
| Down-link | AWGN (LTE, 5MHz) | 864.0           | 32.61                 | 1.82                        | 11.48    |



PAR measure is performed by the “CCDF” function installed on Spectrum analyzer that provides average power (the same measured with “Channel power” function), peak power and PAR.

AWGN signal, nominal input signal + 3dB

| Test data |                  |                 |                       |                             |
|-----------|------------------|-----------------|-----------------------|-----------------------------|
| Direction | Modulation       | Frequency (MHz) | RF output Power (dBm) | RF output channel Power (W) |
| Down-link | AWGN (LTE, 5MHz) | 864.0           | 32.95                 | 1.97                        |



## Clause 90.210 Spurious emissions at RF antenna connector

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.

(g) Emission Mask G. For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

- (2) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least  $43 + 10 \log (P)$  dB.

Test date: 05/27/2019 to 06/24/2019

Test results: Pass

### Special notes

- Narrowband amplifiers: MSK test signal used (GSM-TDMA signal)
- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)



## Clause 90.210 Spurious emissions at RF antenna connector, continued

## Test data

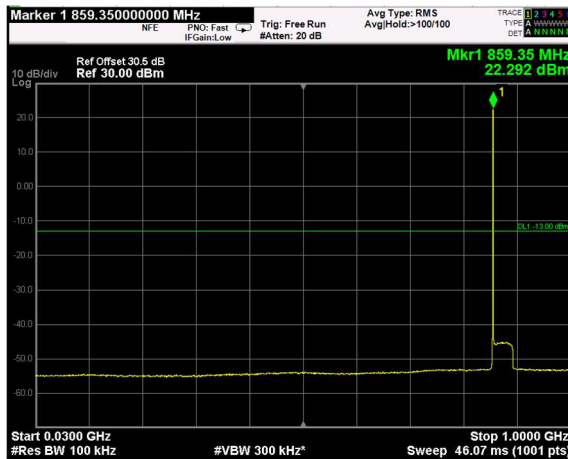
**See Plots below**

## Spurious emissions measurement results:

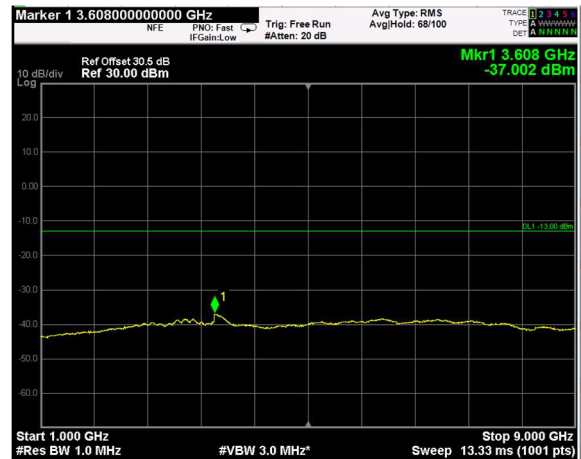
| Frequency<br>(MHz) | Spurious emission<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|--------------------|----------------------------|----------------|----------------|
| Low channel        |                            |                |                |
| First channel      | Negligible                 | -13            |                |
|                    |                            |                |                |
|                    |                            |                |                |
| Mid channel        |                            |                |                |
| 864,0 MHz          | Negligible                 | -13            |                |
|                    |                            |                |                |
|                    |                            |                |                |
| High channel       |                            |                |                |
| Last channel       | Negligible                 | -13            |                |
|                    |                            |                |                |
|                    |                            |                |                |

## Test data: spurious emissions at antenna terminal

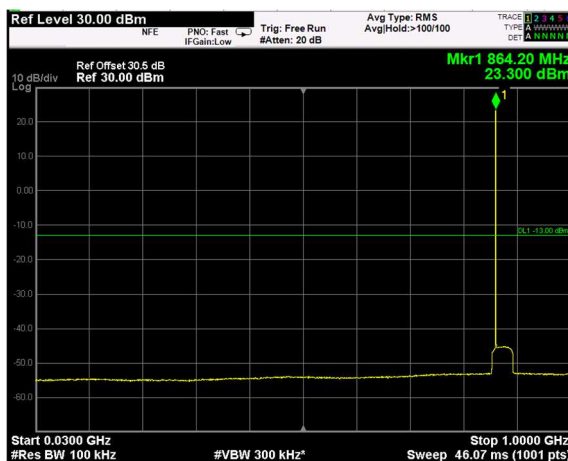
## MSK signal



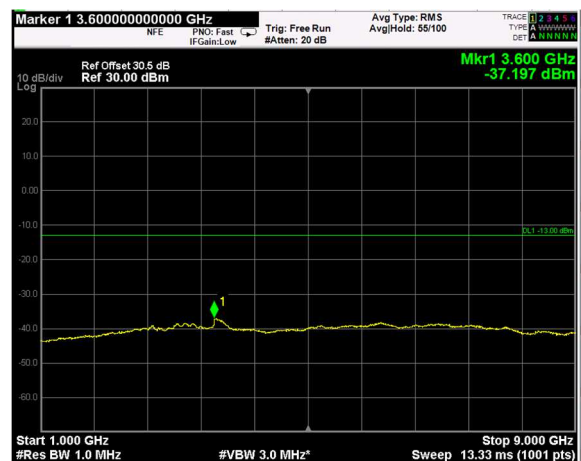
30MHz-1GHz, First Channel



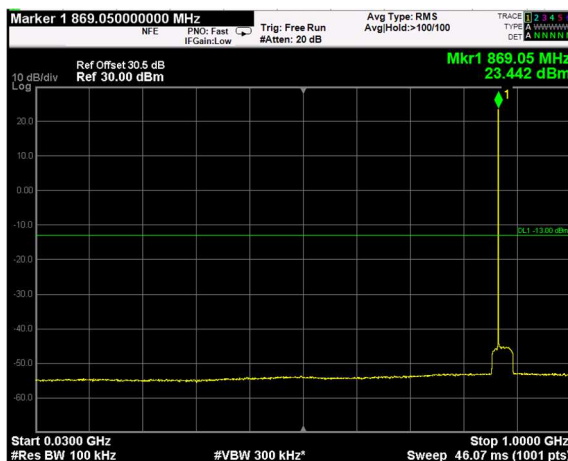
1GHz-9GHz, First Channel



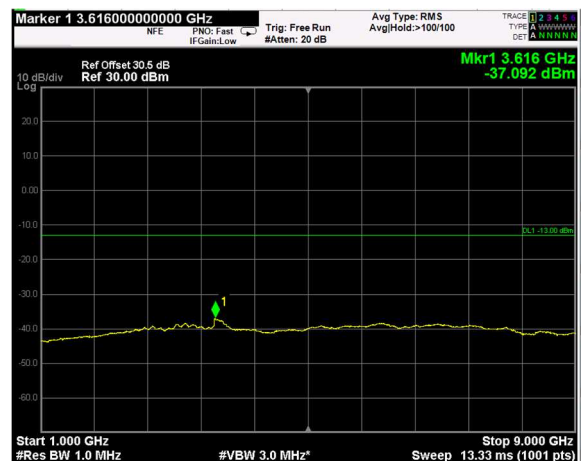
30MHz-1GHz, Middle Channel



1GHz-9GHz, Middle Channel

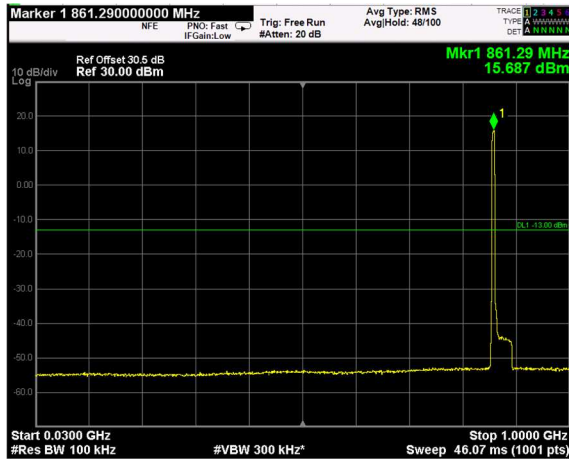


30MHz-1GHz, Last Channel

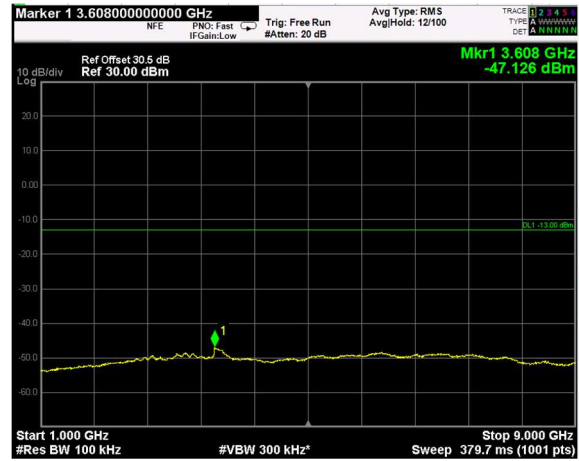


1GHz-9GHz, Last Channel

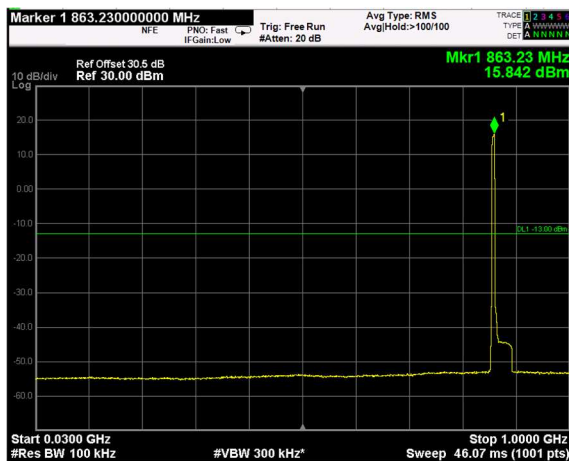
## AWGN signal



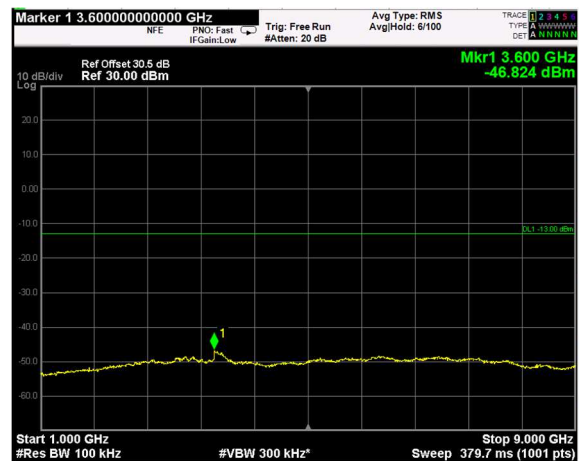
30MHz-1GHz, First Channel



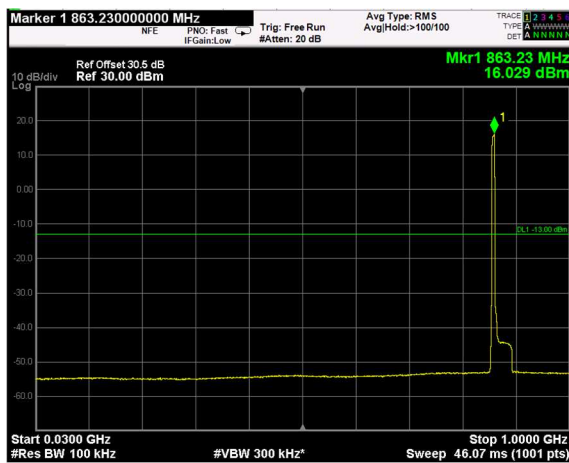
1GHz-9GHz, First Channel



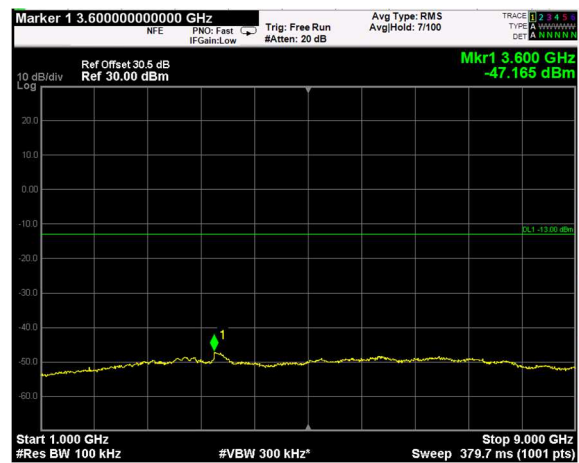
30MHz-1GHz, Middle Channel



1GHz-9GHz, Middle Channel



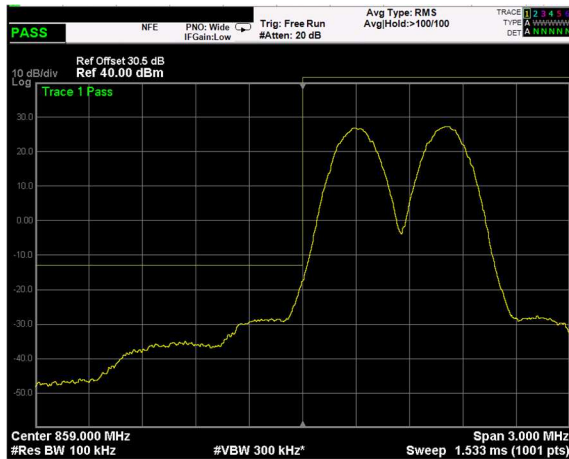
30MHz-1GHz, Last Channel



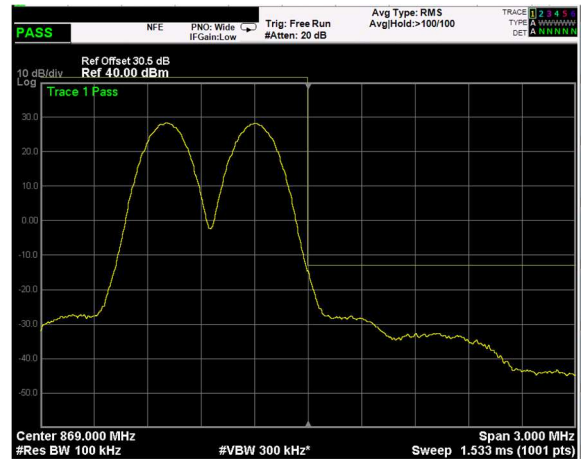
1GHz-9GHz, Last Channel

## Test data, continued: band edges Inter modulation

## MSK signal, nominal input signal

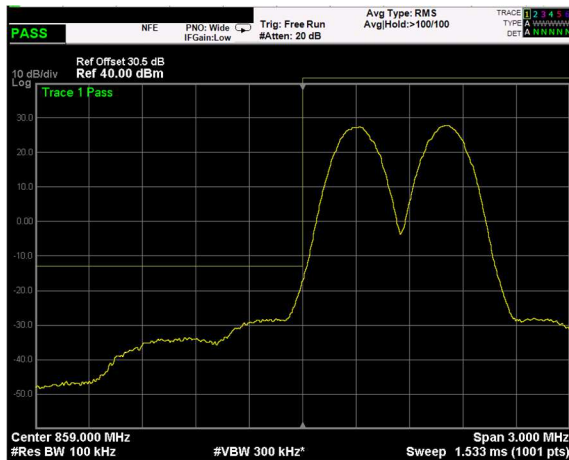


Low Band Edge

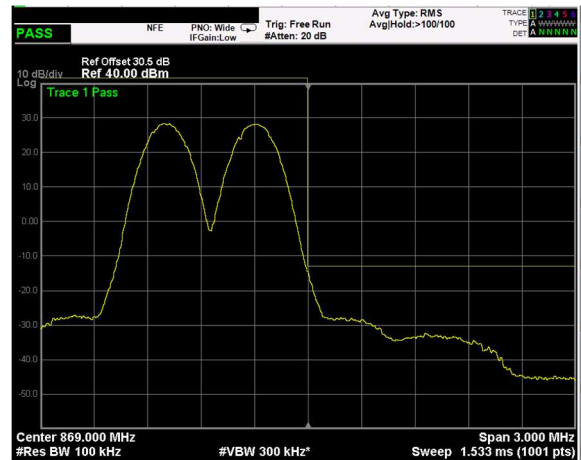


High Band Edge

## MSK signal, nominal input signal + 3dB

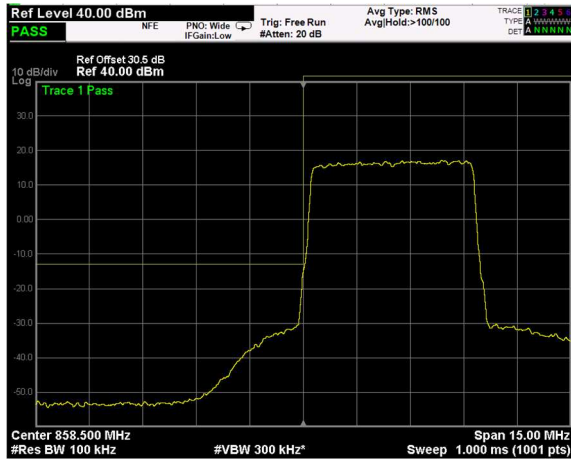


Low Band Edge

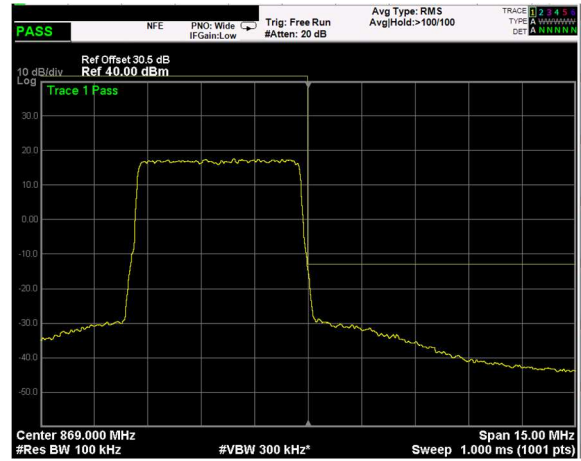


High Band Edge

### AWGN signal, 1 Carrier, Nominal input signal

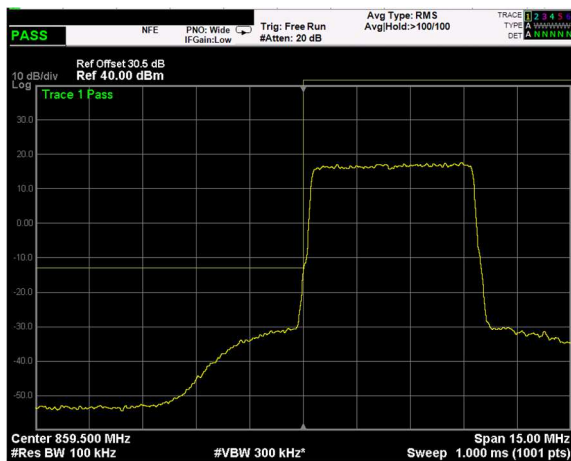


Output

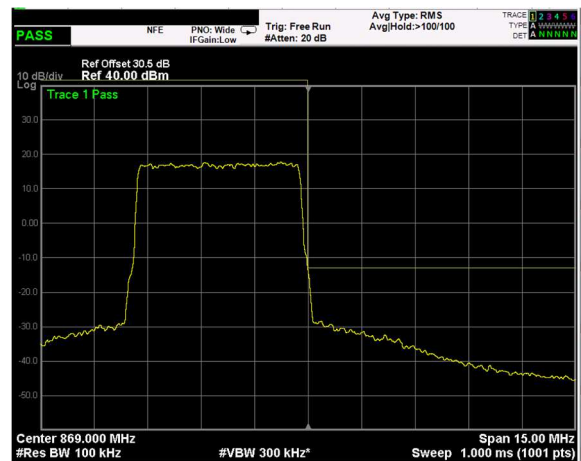


Input

### AWGN signal, 1 Carrier, Nominal input signal + 3dB

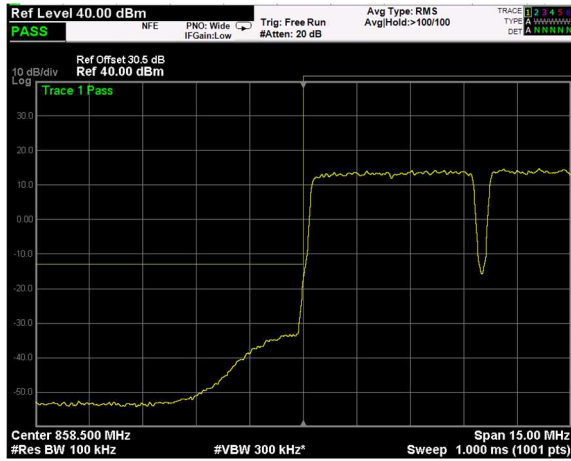


Output

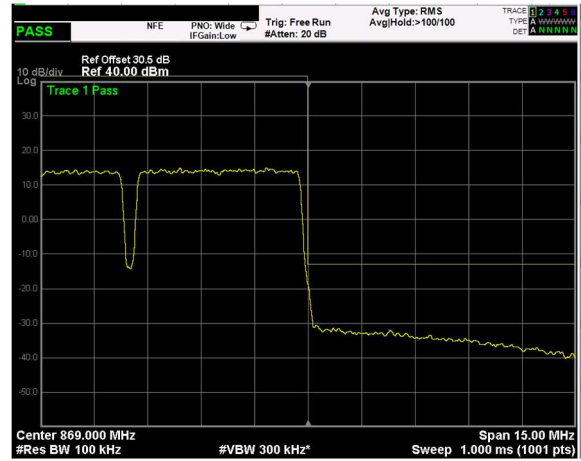


Input

### AWGN signal, 2 Carrier, Nominal input signal

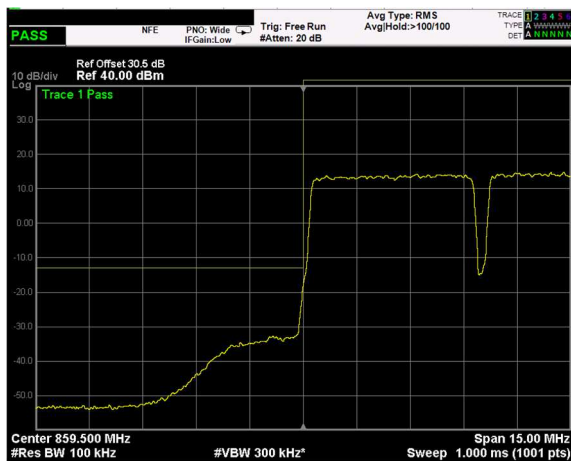


Output

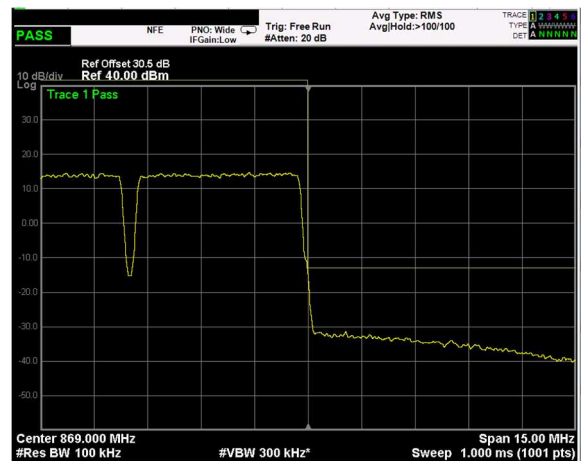


Input

### AWGN signal, 2 Carrier, Nominal input signal + 3dB



Output



Input

## Clause 90.210 Radiated Spurious emissions

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.

- (g) Emission Mask G. For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:
- (2) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least  $43 + 10 \log (P)$  dB.

Test date: 05/27/2019 to 06/24/2019

Test results: Pass

## Special notes

## Clause 90.210 Radiated spurious emissions, continued

## Test data

The D.U.T. was positioned according to the radiated emissions set-up

The D.U.T. antenna connector was terminated by a 50  $\Omega$  shielded dummy load.

The spectrum was searched from 30 MHz to 1 GHz (RBW 100 kHz) & 1 GHz (RBW 1 MHz) to the tenth harmonic of the carrier.

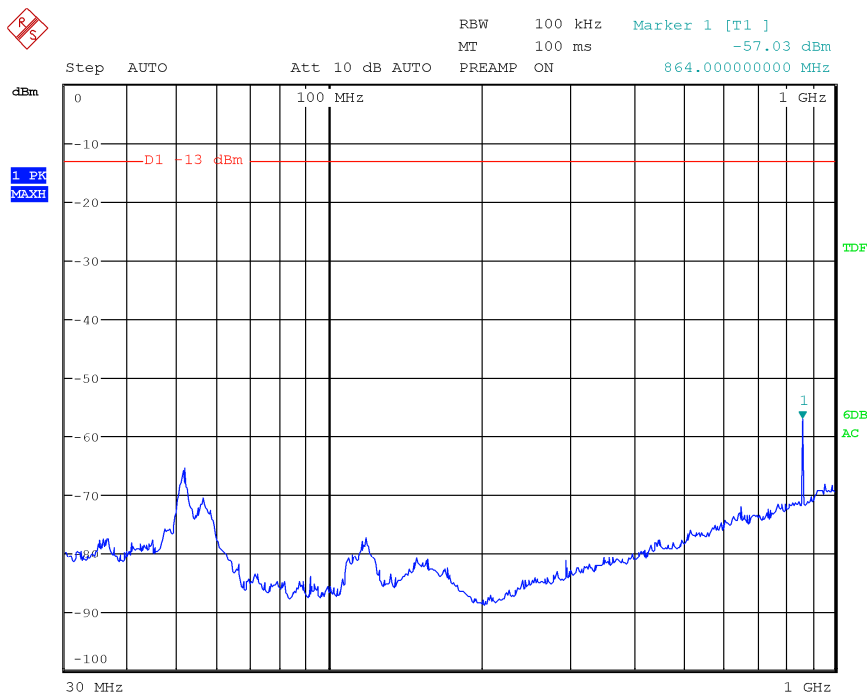
There were no emissions detected above the noise floor which was at least 20 dB below the specification limit.

## Spurious emissions measurement results:

| Frequency (MHz) | Polarization. V/H | Field strength (dBm) | Limit (dBm) | Margin (dB) |
|-----------------|-------------------|----------------------|-------------|-------------|
| Low channel     |                   |                      |             |             |
| First Channel   | V/H               | Negligible           | -13         |             |
| Mid channel     |                   |                      |             |             |
| 864.0           | V/H               | Negligible           | -13         |             |
| High channel    |                   |                      |             |             |
| Last Channel    | V/H               | Negligible           | -13         |             |

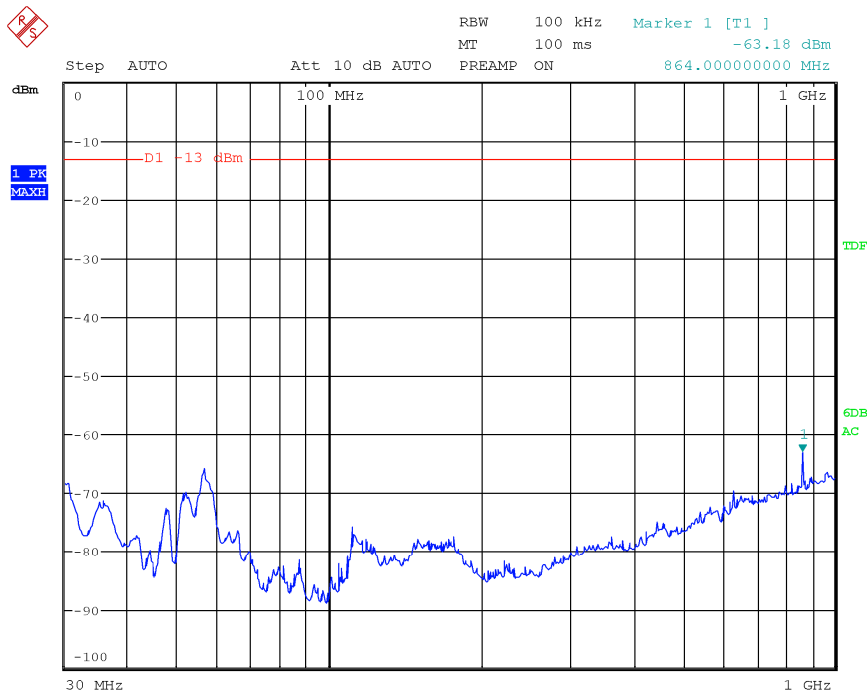
Note: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.





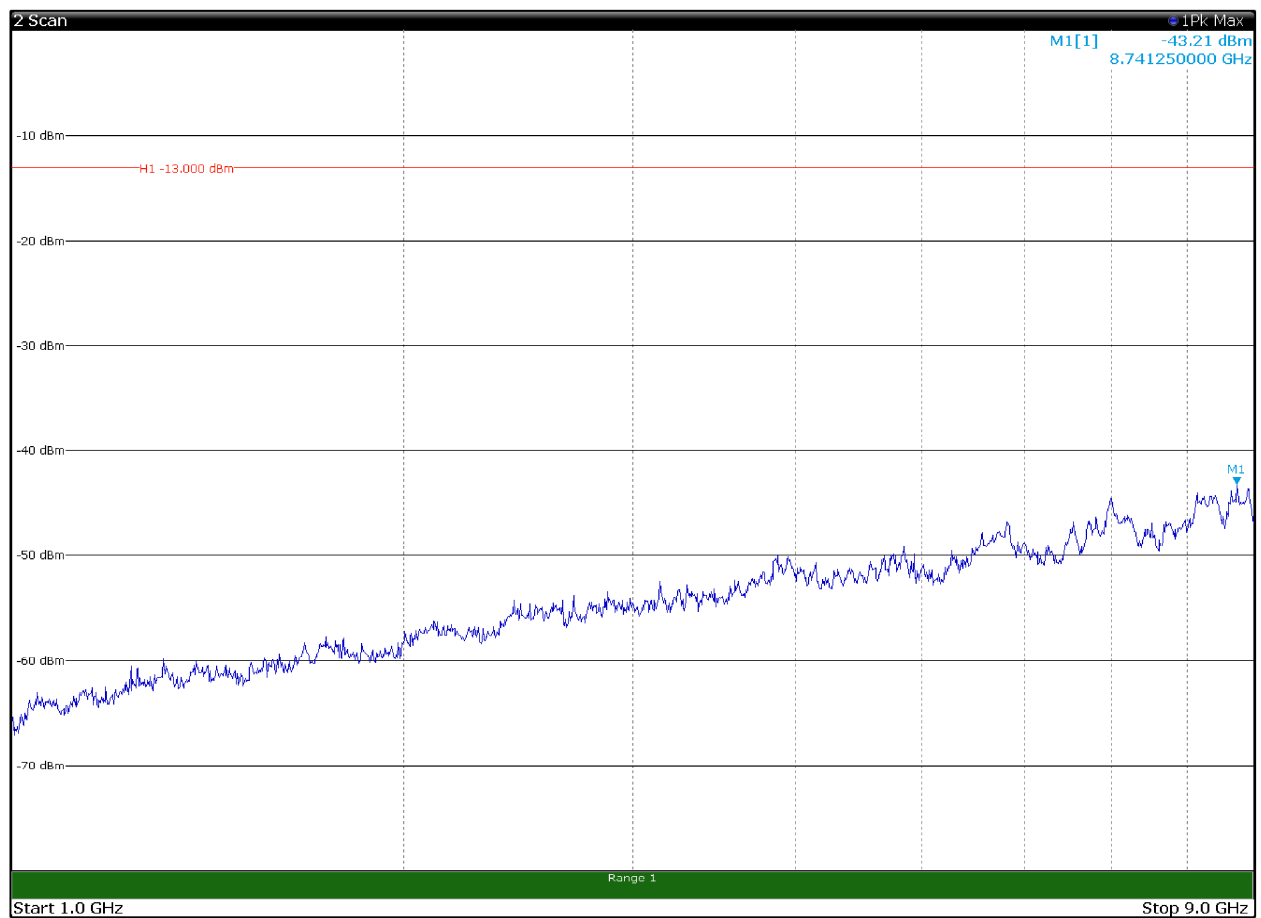
Date: 19.JUN.2019 10:55:41

30MHz-1GHz – H Pol



Date: 19.JUN.2019 10:53:17

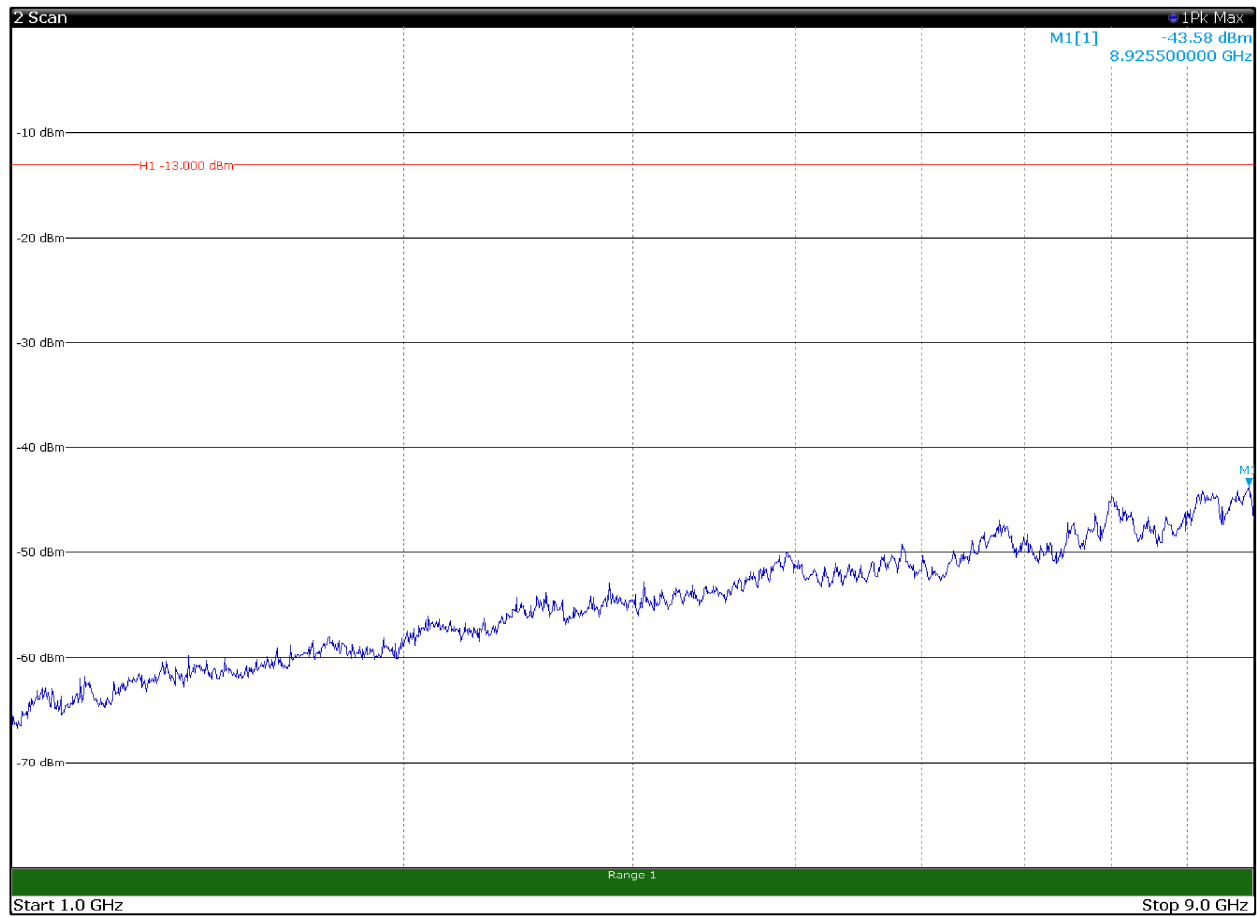
30MHz-1GHz – V Pol



08:52:15 18.06.2019

Page 1/1

1GHz-9GHz – H Pol



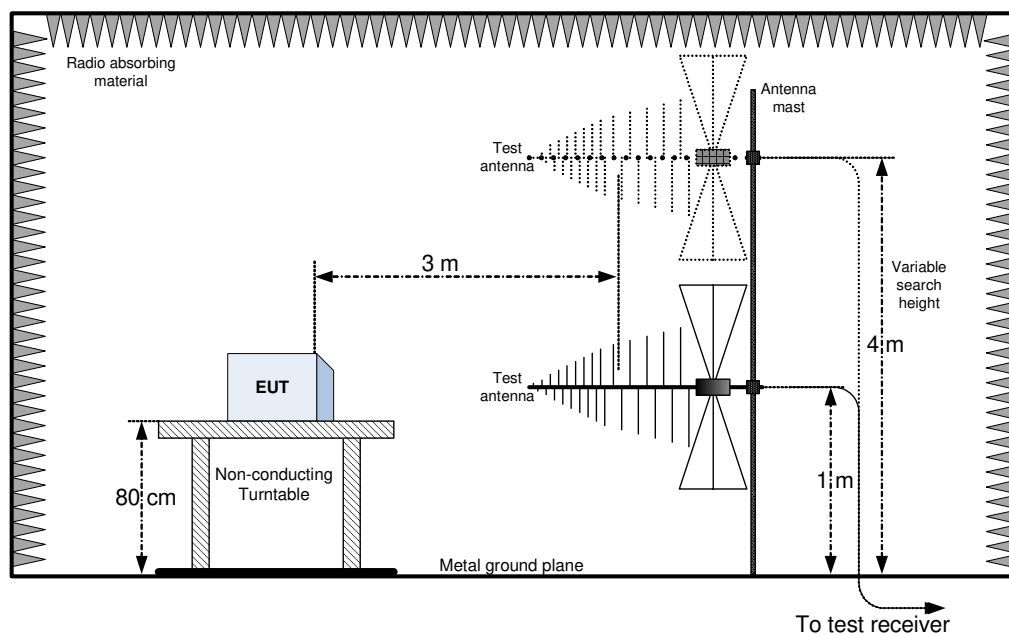
08:52:37 18.06.2019

Page 1/1

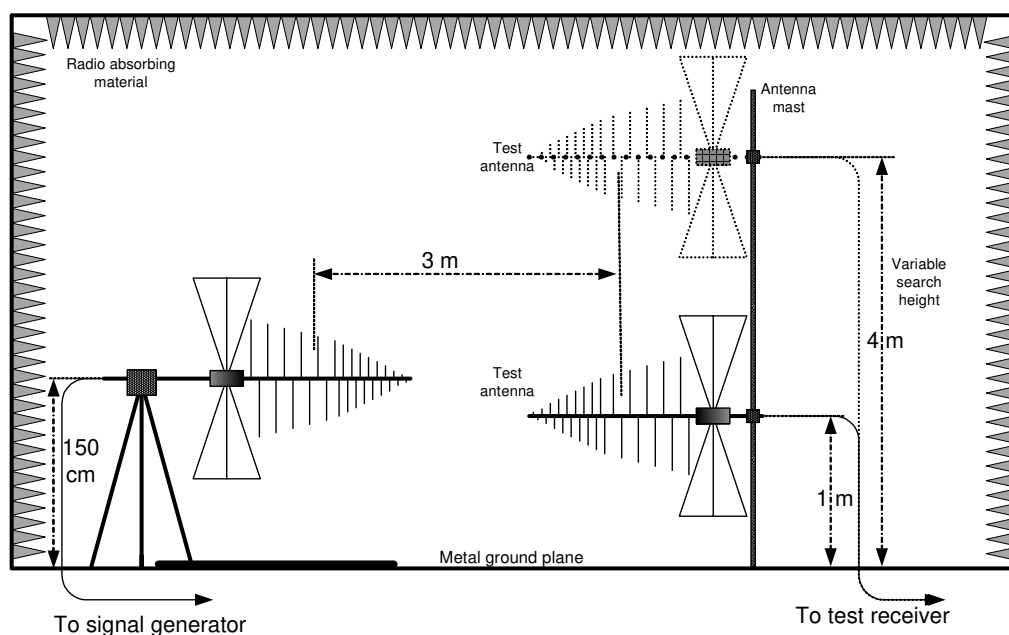
1GHz-9GHz – V Pol

## Appendix B: Block diagrams of test set-ups

### Radiated emissions set-up



### Substitution method set-up



## Appendix C: EUT Photos

### Photo Set up

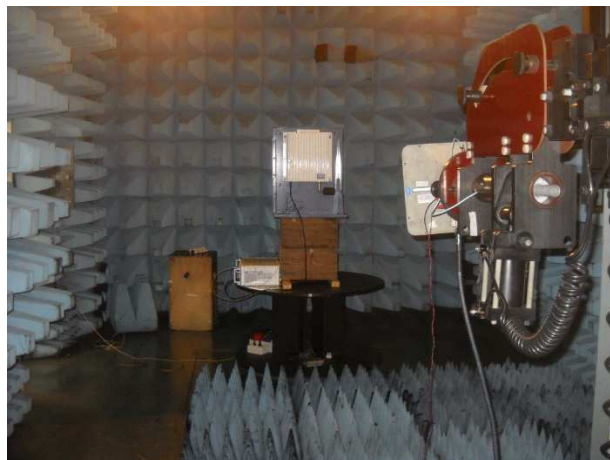
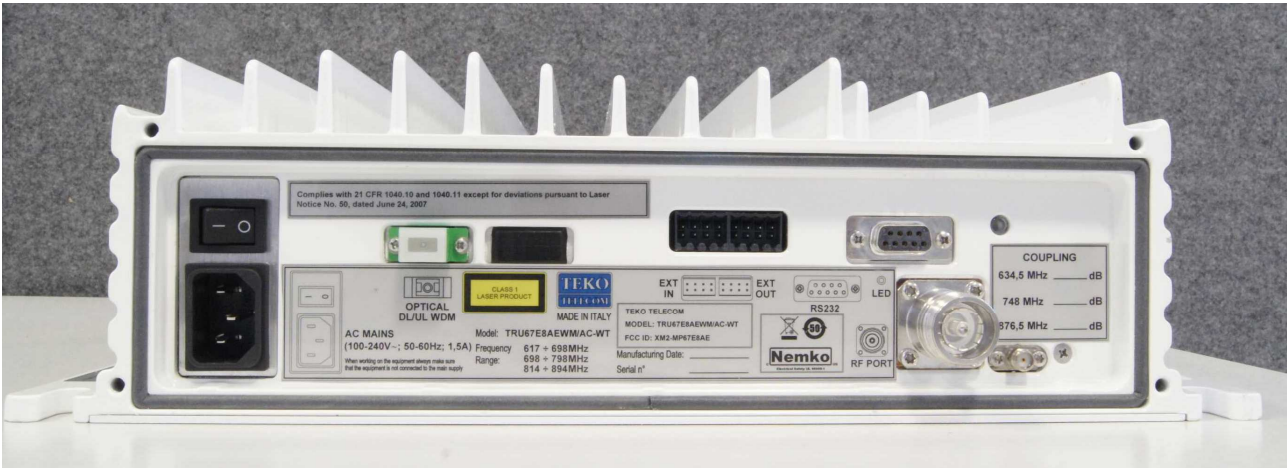


Photo EUT







END OF REPORT