# 9. Peak Output Power (ESMR)

## 9.1 Test Specification

FCC Rule Part 20.21

## 9.2 Test Procedure

(Temperature (22°C)/ Humidity (38%RH))

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (loss = 31.0 dB). The E.U.T. RF output was modulated with W-CDMA, GSM and LTE 64QAM. Special attention was taken to prevent Spectrum Analyzer RF input overload.

## 9.3 Test Results

| Modulation | Operation Frequency | Reading |
|---|---|---|
| | (MHz) | (dBm) |
| LTE 64QAM | 864.5 | 16.4 |
| | 866.5 | 16.7 |
| GSM | 863.2 | 15.7 |
| | 867.8 | 16.4 |
| W-CDMA | 864.5 | 16.2 |
| | 866.5 | 16.7 |

**Figure 61 Peak Output Power ESMR**

JUDGEMENT: Passed

See additional information in *Figure 62* to *Figure 67*.

# Peak Output Power (ESMR)

| | |
|---|---|
| E.U.T Description | ONE - Optical Network Evolution DAS |
| Type | RAU-5 Remote Antenna Unit |
| Serial Number: | 05144900098 |

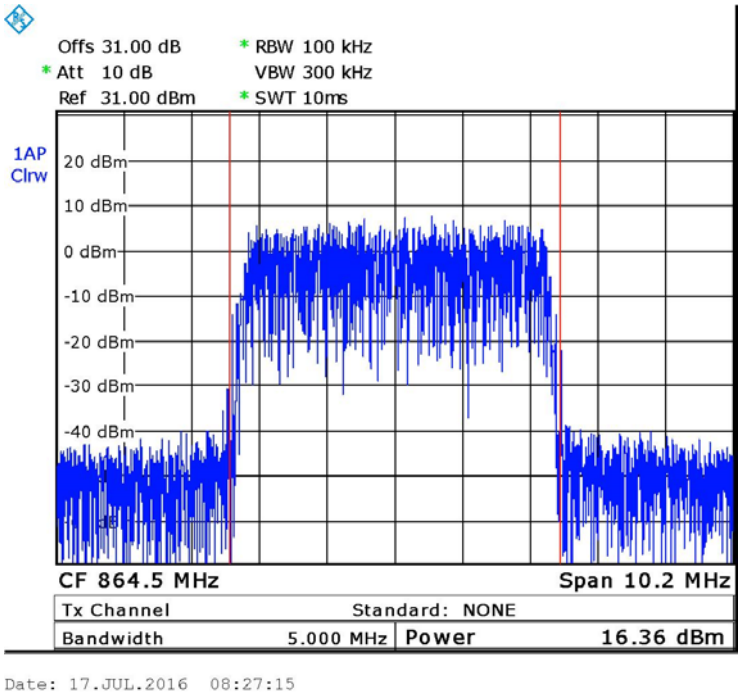


**Figure 62. — 864.5 MHz – LTE 64QAM**

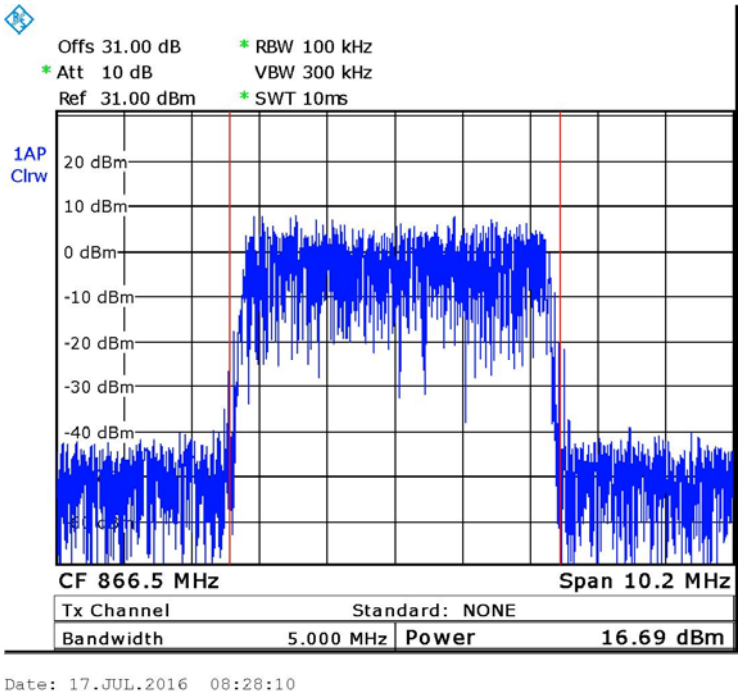


**Figure 63. — 866.5 MHz – LTE 64QAM**

# Peak Output Power (ESMR)

E.U.T Description ONE - Optical Network Evolution DAS
Type RAU-5 Remote Antenna Unit

Serial Number: 05144900098

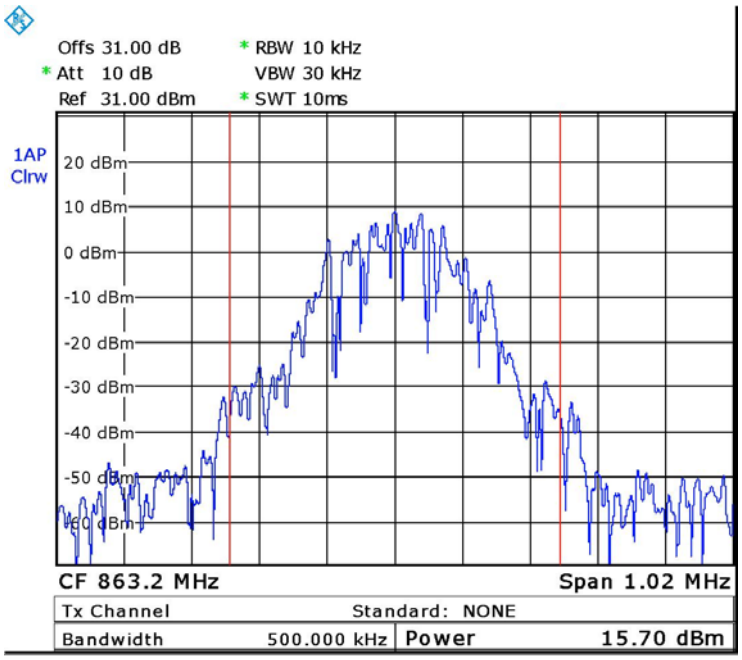


**Figure 64. — 863.2 MHz – GSM**

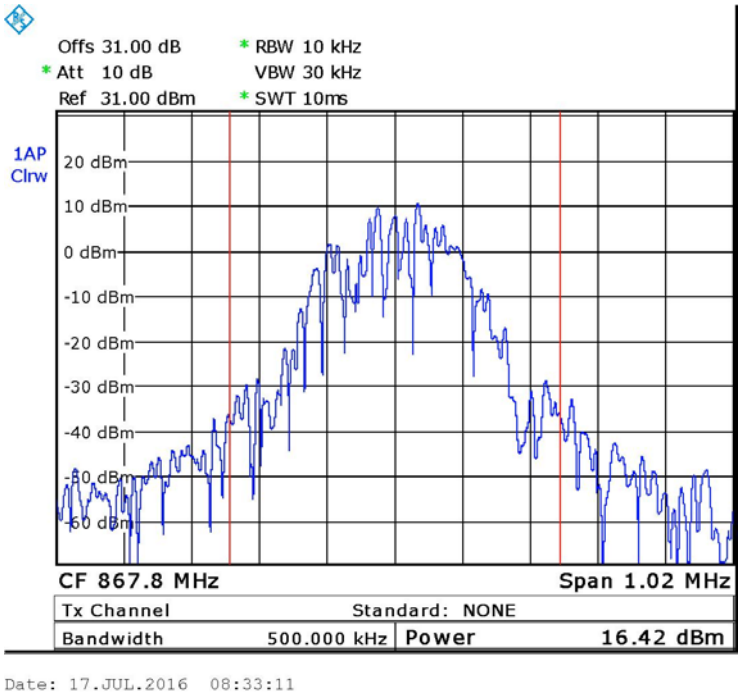


**Figure 65. — 867.8 MHz – GSM**

# Peak Output Power (ESMR)

| | |
|---|---|
| E.U.T Description | ONE - Optical Network Evolution DAS |
| Type | RAU-5 Remote Antenna Unit |
| Serial Number: | 05144900098 |

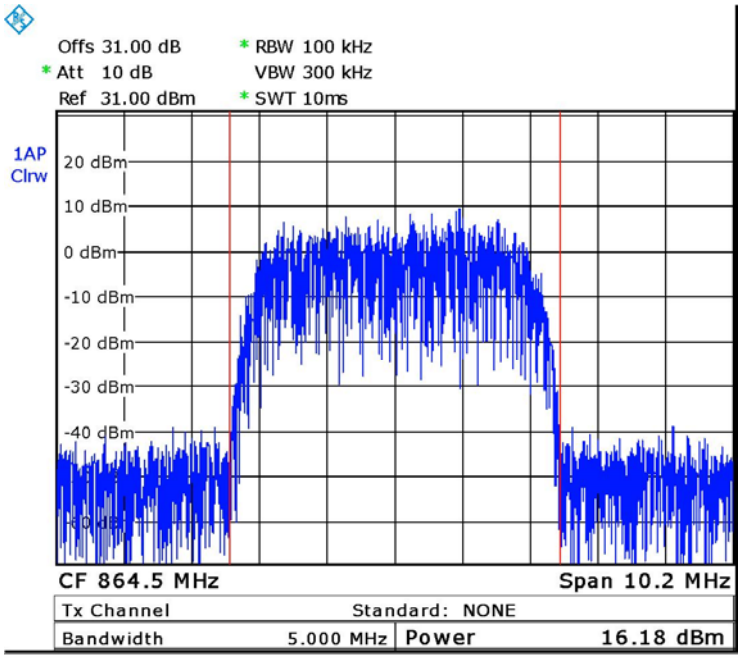


**Figure 66.—864.5 MHz – WCDMA**

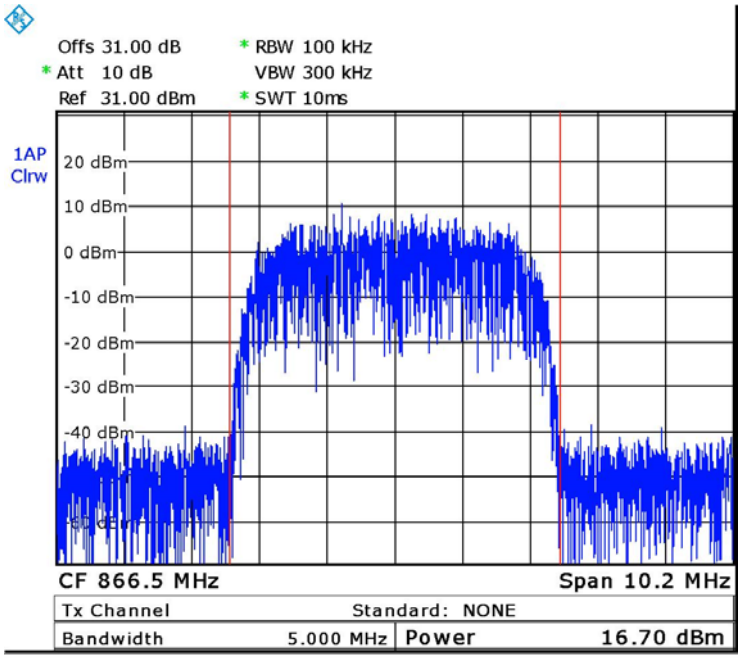


**Figure 67.— 866.5 MHz – WCDMA**

### 9.4 Test Equipment Used; Peak Power (ESMR)

| Instrument | Manufacturer | Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Calibration Date | Next Calibration Due |
| Spectrum Analyzer | R&S | FSL6 | 100194 | February 29, 2016 | March 1, 2017 |
| Vector Signal Generator | Agilent | N5172B | MY51350584 | July 1, 2016 | July 1, 2017 |
| 30 dB Attenuator | MCL | BW-S30W5 | 533 | July 5, 2016 | July 5, 2017 |

**Figure 68 Test Equipment Used Peak Output Power (ESMR)**

# 10. Occupied Bandwidth (ESMR)

## 10.1 Test Specification

FCC Parts 2.1049; 90.2.09

## 10.2 Test Procedure

(Temperature (22°C)/ Humidity (38%RH))

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (loss=31.0 dB). The spectrum analyzer was set to proper resolution B.W.

OBW function (99%) was employed for this evaluation
Occupied bandwidth measured was repeated in the input terminal of the E.U.T.

## 10.3 Test Limit

N/A

## 10.4 Test Results

| Modulation | Port | Operating Frequency | Reading |
|---|---|---|---|
| | (Input/ Output) | (MHz) | (MHz) |
| LTE 64QAM | Input | 864.5 | 4.5 |
| | Output | 864.5 | 4.5 |
| | Input | 866.5 | 4.5 |
| | Output | 866.5 | 4.5 |
| W-CDMA | Input | 864.5 | 4.1 |
| | Output | 864.5 | 4.1 |
| | Input | 866.5 | 4.1 |
| | Output | 866.5 | 4.1 |
| GSM | Input | 863.2 | 0.2 |
| | Output | 863.2 | 0.2 |
| | Input | 867.8 | 0.2 |
| | Output | 867.8 | 0.2 |

**Figure 69 Occupied Bandwidth Test Results Table**

See additional information in *Figure 70* to *Figure 81*.

# Occupied Bandwidth (ESMR)

| | |
|---|---|
| E.U.T Description | ONE - Optical Network Evolution DAS |
| Type | RAU-5 Remote Antenna Unit |
| Serial Number: | 05144900098 |

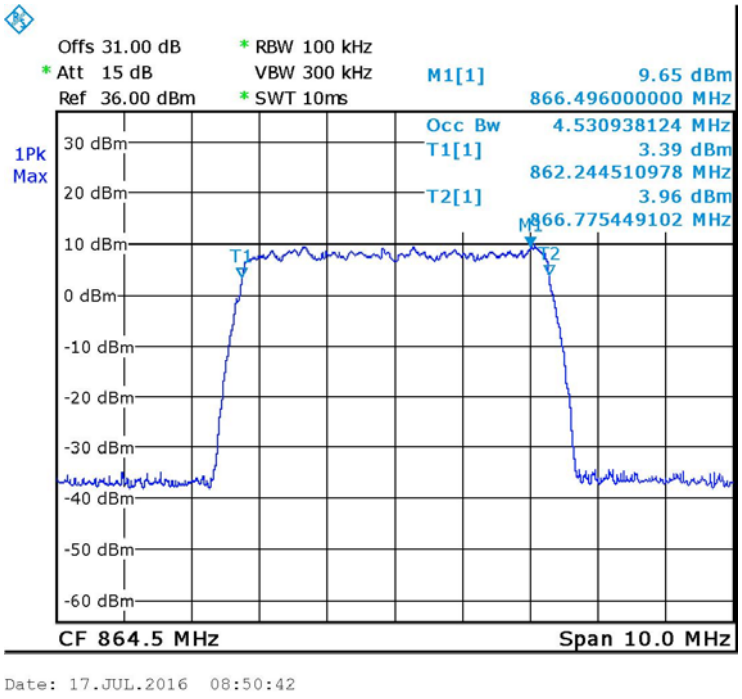


**Figure 70. — 864.5MHz LTE 64QAM Input**

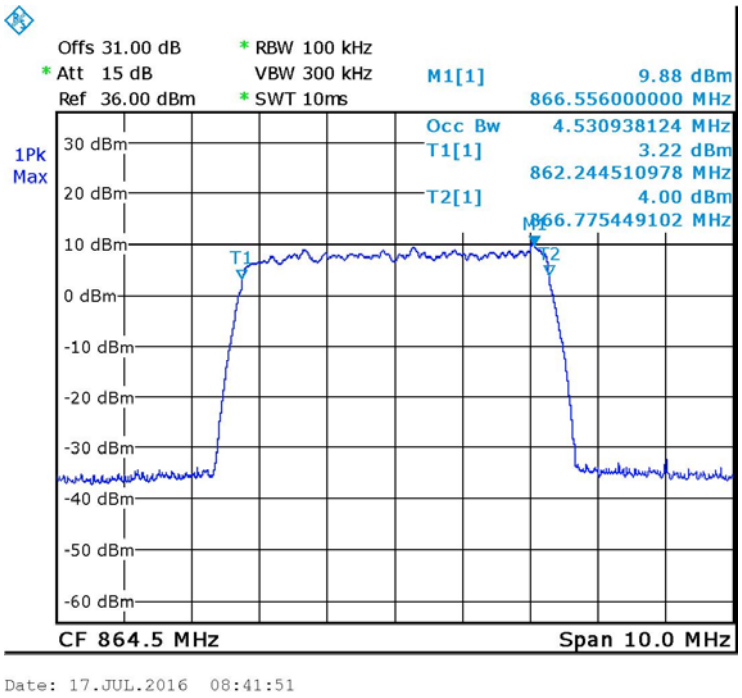


**Figure 71. — 864.5MHz LTE 64QAM Output**

# Occupied Bandwidth (ESMR)

| | |
|---|---|
| E.U.T Description | ONE - Optical Network Evolution DAS |
| Type | RAU-5 Remote Antenna Unit |
| Serial Number: | 05144900098 |

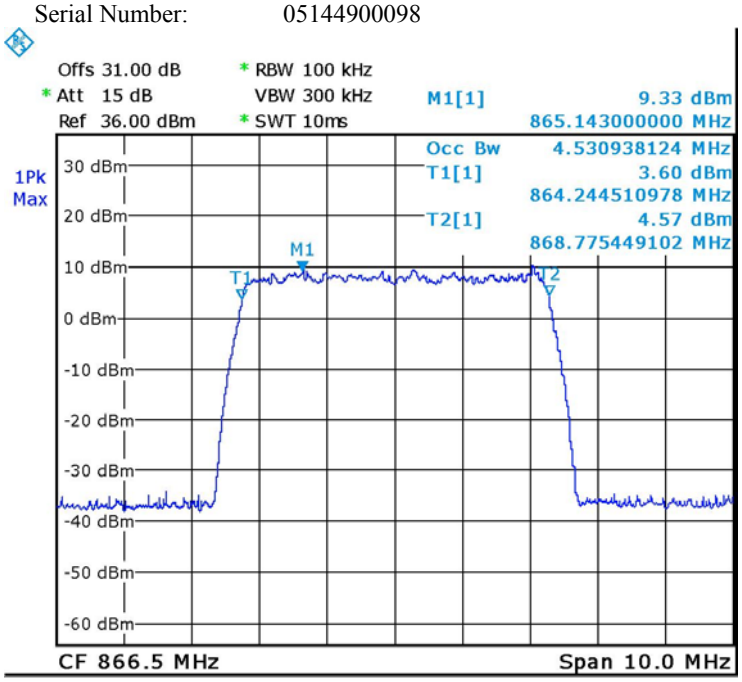


**Figure 72. — 866.5MHz LTE 64QAM Input**

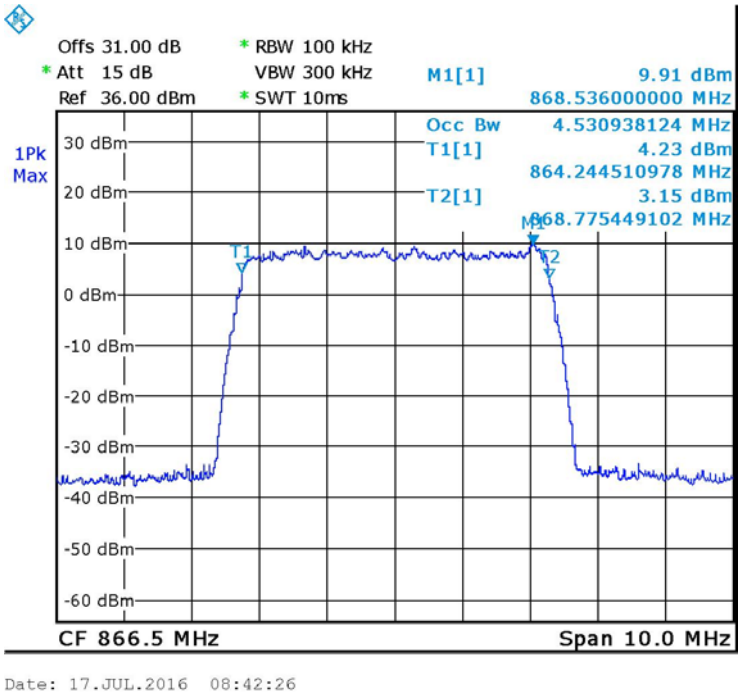


**Figure 73. — 866.5MHz LTE 64QAM Output**

# Occupied Bandwidth (ESMR)

| | |
|---|---|
| E.U.T Description | ONE - Optical Network Evolution DAS |
| Type | RAU-5 Remote Antenna Unit |
| Serial Number: | 05144900098 |

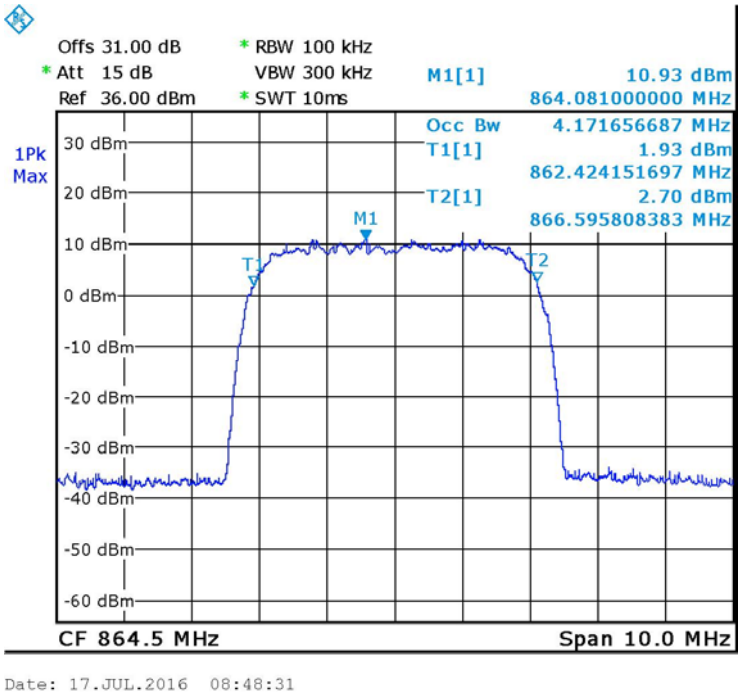


**Figure 74. — 864.5MHz WCDMA Input**

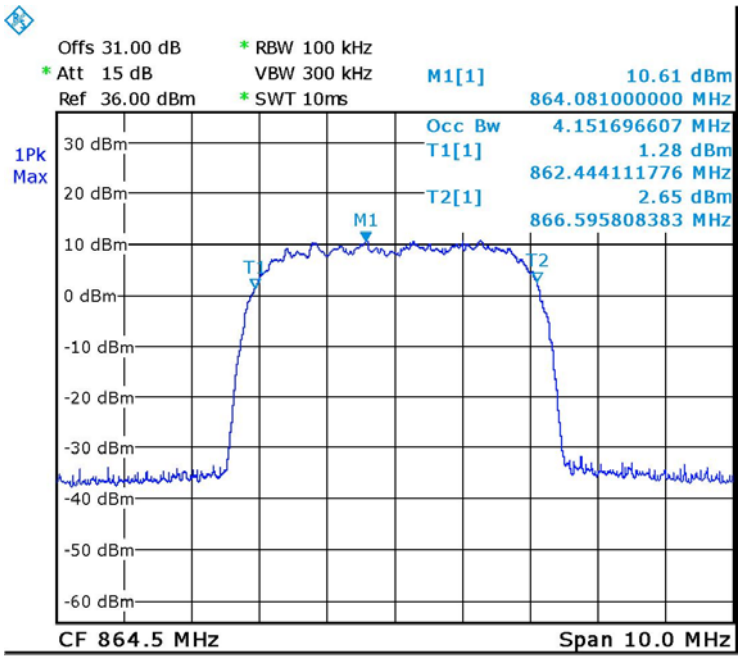


**Figure 75. — 864.5MHz WCDMA Output**

# Occupied Bandwidth (ESMR)

| | |
|---|---|
| E.U.T Description | ONE - Optical Network Evolution DAS |
| Type | RAU-5 Remote Antenna Unit |
| Serial Number: | 05144900098 |

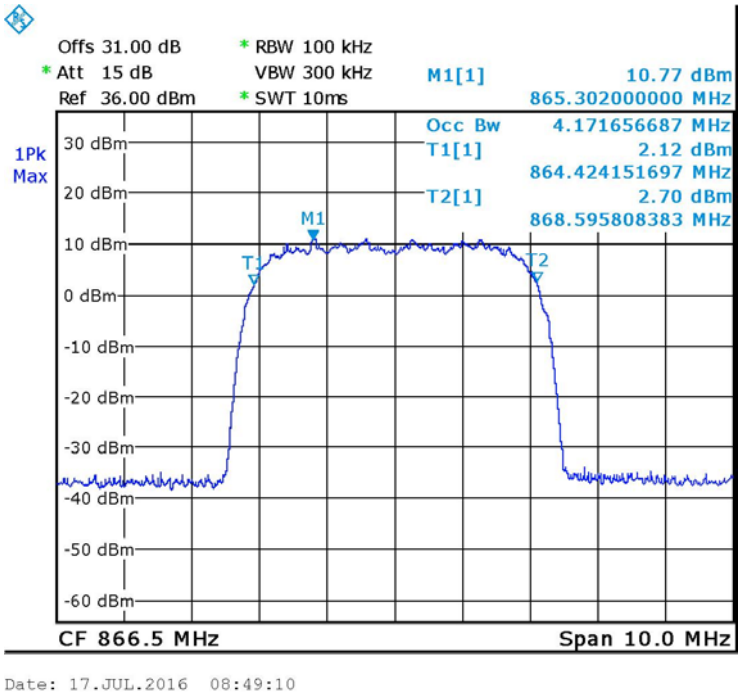


**Figure 76. — 866.5MHz WCDMA Input**

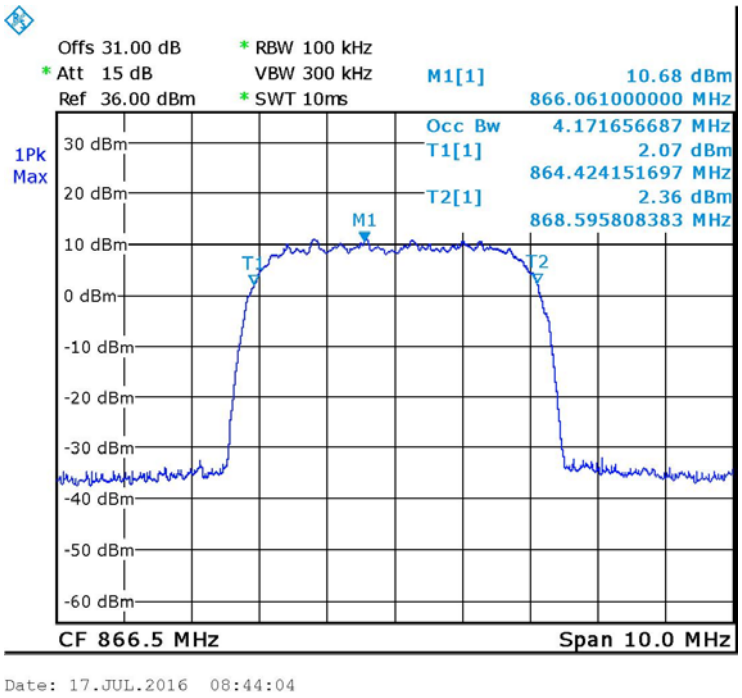


**Figure 77. — 866.5MHz WCDMA Output**

# Occupied Bandwidth (ESMR)

| | |
|---|---|
| E.U.T Description | ONE - Optical Network Evolution DAS |
| Type | RAU-5 Remote Antenna Unit |
| Serial Number: | 05144900098 |

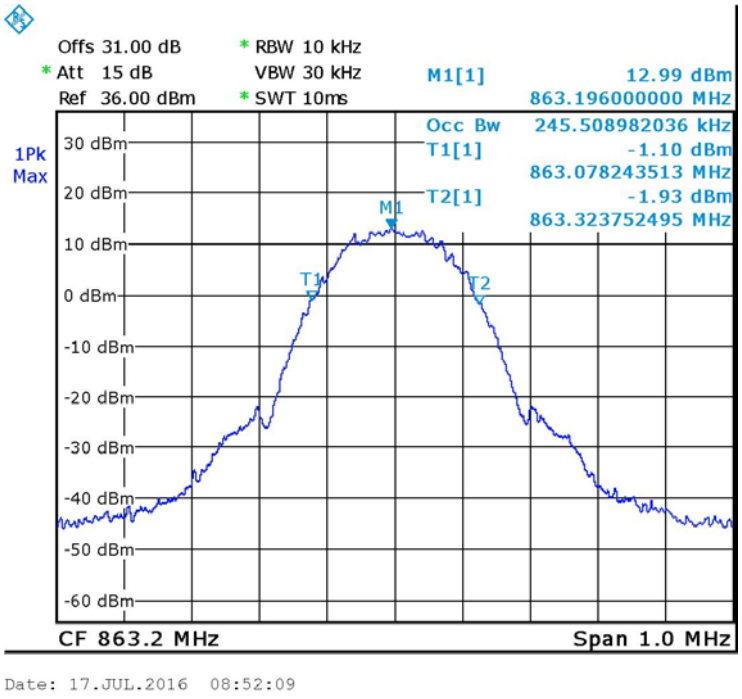


**Figure 78. — 863.2MHz GSM Input**

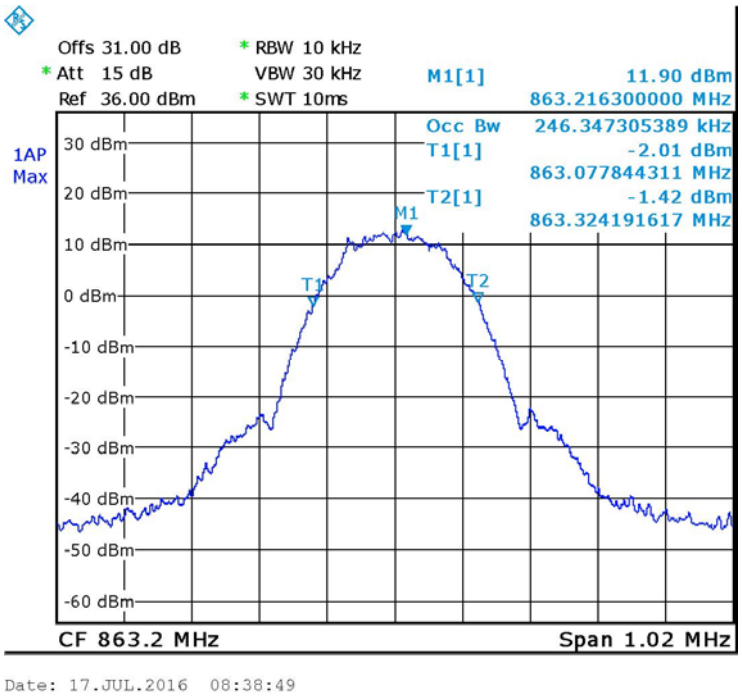


**Figure 79. — 863.2MHz GSM Output**

# Occupied Bandwidth (ESMR)

| | |
|---|---|
| E.U.T Description | ONE - Optical Network Evolution DAS |
| Type | RAU-5 Remote Antenna Unit |
| Serial Number: | 05144900098 |

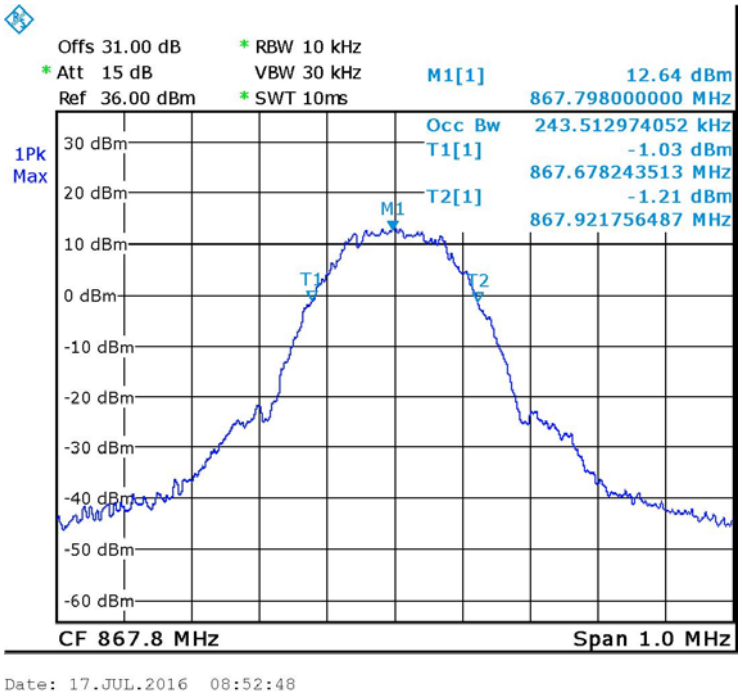


**Figure 80. — 867.8MHz GSM Input**

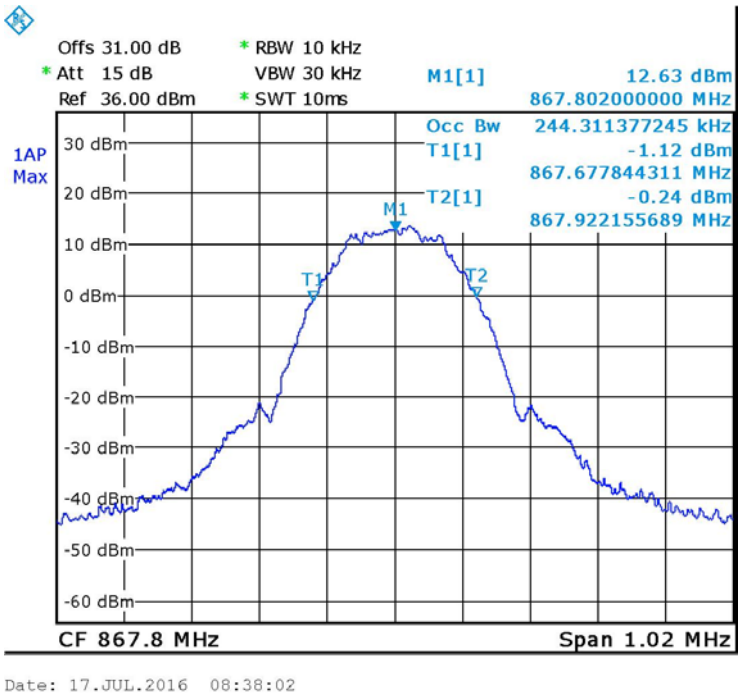


**Figure 81. — 867.8MHz GSM Output**

### *10.5 Test Equipment Used; Occupied Bandwidth (ESMR)*

| Instrument | Manufacturer | Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Calibration Date | Next Calibration Due |
| Spectrum Analyzer | R&S | FSL6 | 100194 | February 29, 2016 | March 1, 2017 |
| Vector Signal Generator | Agilent | N5172B | MY51350584 | July 1, 2016 | July 1, 2017 |
| 30 dB Attenuator | MCL | BW-S30W5 | 533 | July 5, 2016 | July 5, 2017 |

**Figure 82 Test Equipment Used Occupied Bandwidth (ESMR)**

# 11. Spurious Emissions at Antenna Terminals (ESMR)

## 11.1 Test Specification

FCC Part 90, Section 90.210

## 11.2 Test Procedure

(Temperature (22°C)/ Humidity (35%RH))

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (max Loss= 31.5 dB).

The resolution bandwidth was set to 1.0 kHz for the frequency range 9 kHz – 1 MHz, 100 kHz for the frequency range 1 MHz to 1 GHz, and 1 MHz in the frequency range 1.0 – 10.0 GHz.

## 11.3 Test Limit

The power of any emission outside of the authorized operating frequency ranges(862-867MHz) must be attenuated below the transmitting power (P) by a factor of at least 43 + log (P) dB, yielding –13dBm.

## 11.4 Test Results

JUDGEMENT: Passed

See additional information in *Figure 83* to *Figure 88.*

# Spurious Emissions at Antenna Terminals (ESMR)

| | |
|---|---|
| E.U.T Description | ONE - Optical Network Evolution DAS |
| Type | RAU-5 Remote Antenna Unit |
| Serial Number: | 05144900098 |

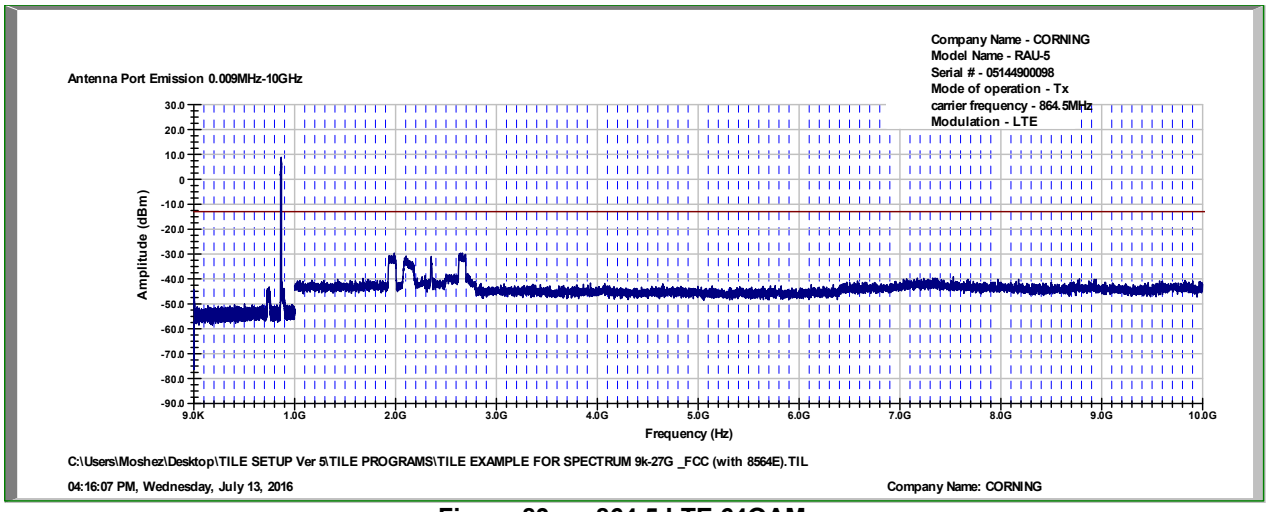


**Figure 83. — 864.5 LTE 64QAM**

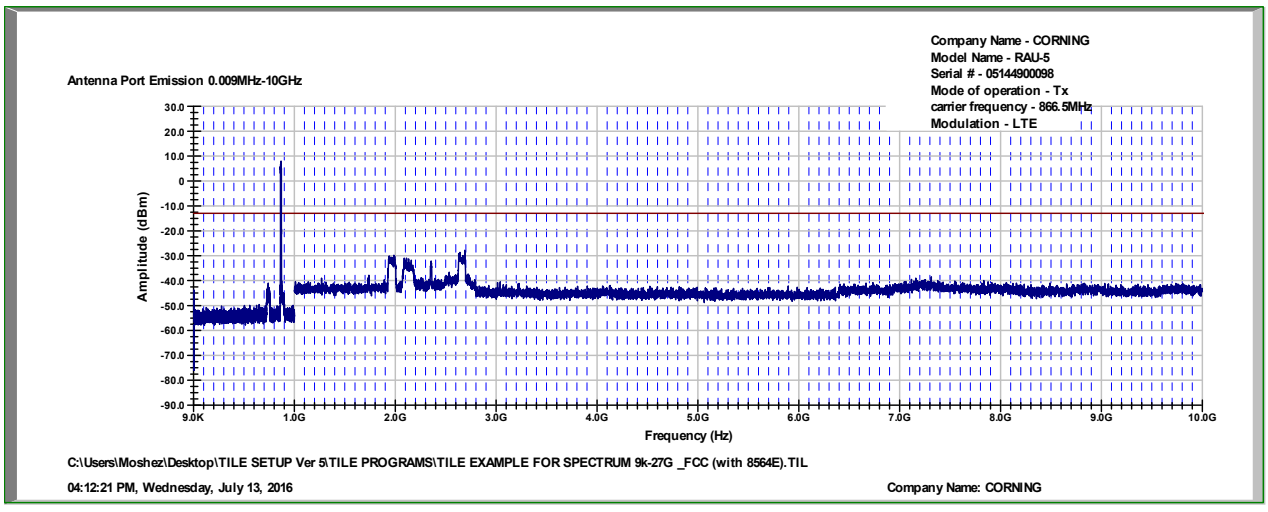


**Figure 84. — 866.5 LTE 64QAM**

# Spurious Emissions at Antenna Terminals (ESMR)

| | |
|---|---|
| E.U.T Description | ONE - Optical Network Evolution DAS |
| Type | RAU-5 Remote Antenna Unit |
| Serial Number: | 05144900098 |

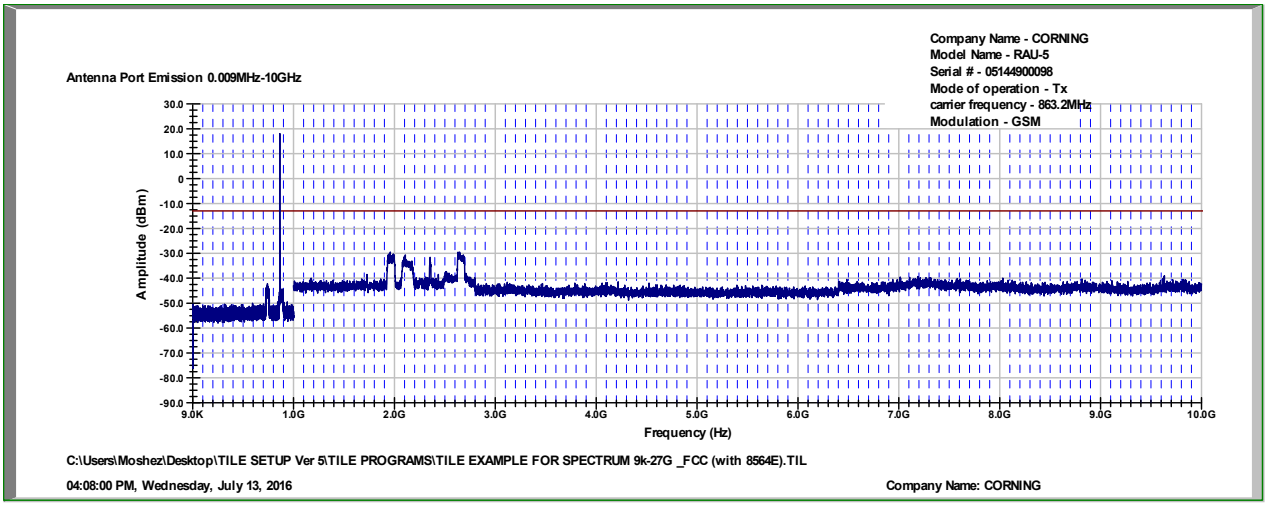


**Figure 85. — 863.2 GSM**

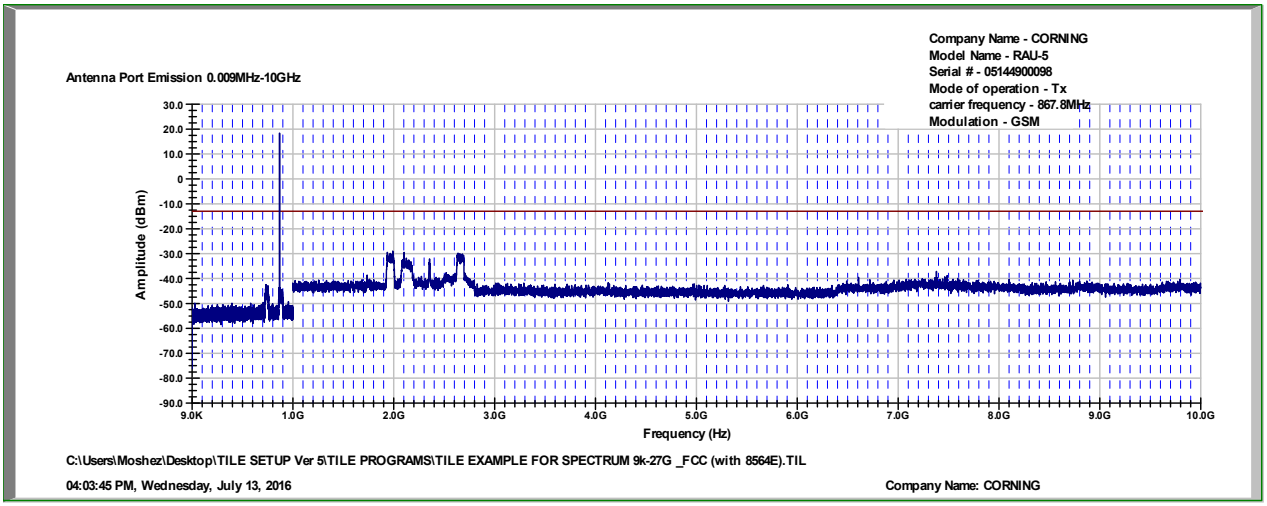


**Figure 86. — 867.8 GSM**

# Spurious Emissions at Antenna Terminals (ESMR)

| | |
|---|---|
| E.U.T Description | ONE - Optical Network Evolution DAS |
| Type | RAU-5 Remote Antenna Unit |
| Serial Number: | 05144900098 |

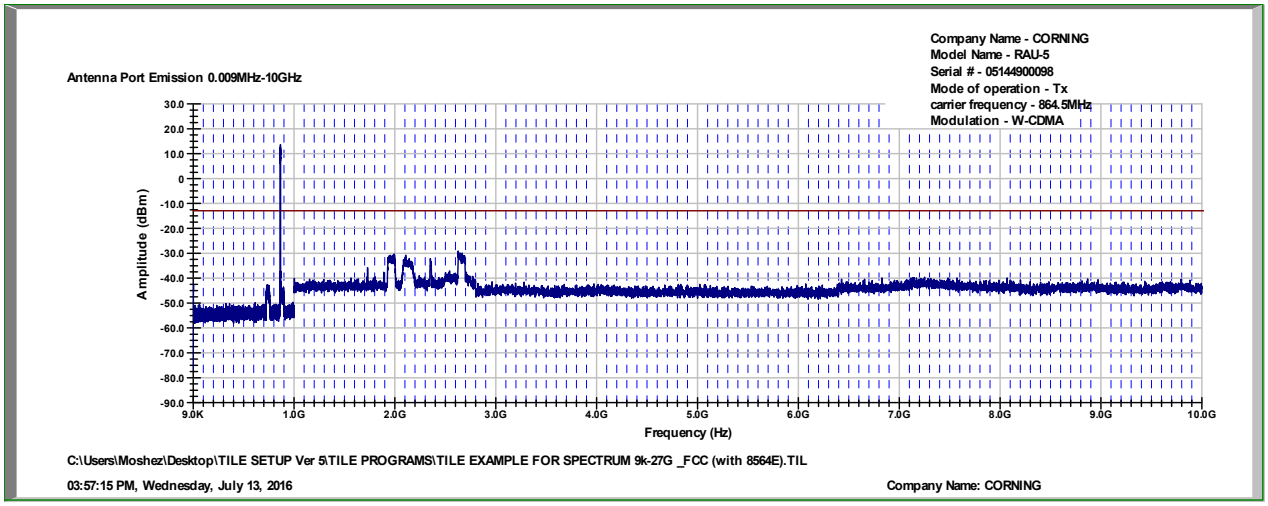


**Figure 87. — 864.5 WCDMA**

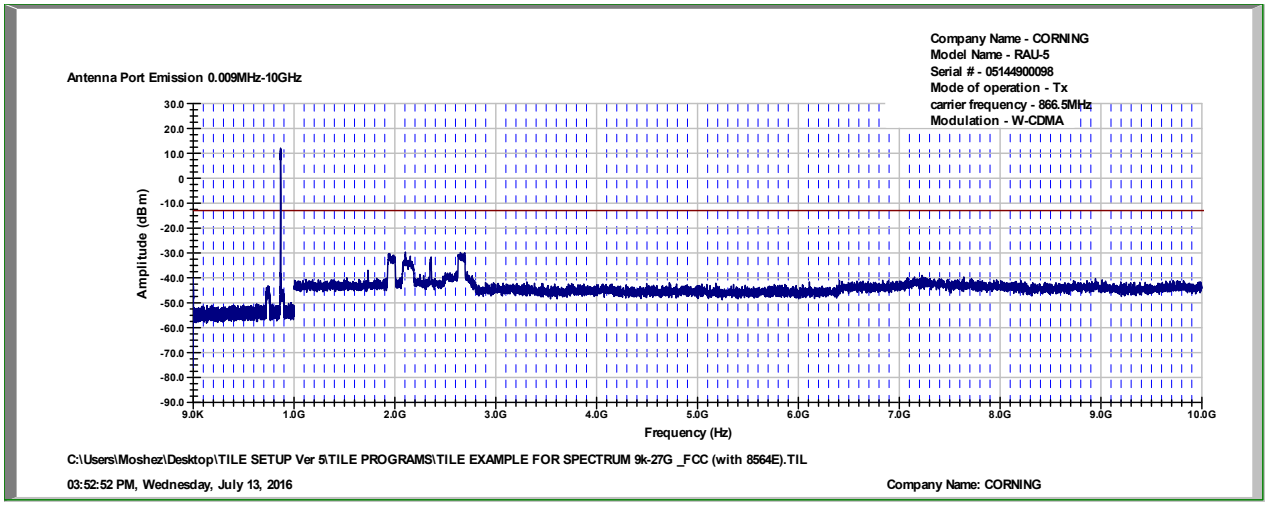


**Figure 88. — 866.5 WCDMA**

## *11.5 Test Equipment Used; Spurious Emissions at Antenna Terminals (ESMR)*

| Instrument | Manufacturer | Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Calibration Date | Next Calibration Due |
| Spectrum Analyzer | R&S | FSL6 | 100194 | February 29, 2016 | March 1, 2017 |
| Vector Signal Generator | Agilent | N5172B | MY51350584 | July 1, 2016 | July 1, 2017 |
| 30 dB Attenuator | MCL | BW-S30W5 | 533 | July 5, 2016 | July 5, 2017 |

**Figure 89 Test Equipment Used**

# 12. Band Edge Spectrum ESMR

## 12.1 Test Specification

FCC Part 2.1051

## 12.2 Test Procedure

(Temperature (22°C)/ Humidity (38%RH))
The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (31.0 dB).The spectrum analyzer was set to 100 kHz R.B.W.

## 12.3 Test Limit

The power of any emission outside of the authorized operating frequency ranges (862 - 869MHz) must be attenuated below the transmitting power (P) by a factor of at least 43 + log (P) dB, yielding –13dBm.

## 12.4 Test Results

| Modulation | Operation Frequency | Band Edge Frequency | Reading | Limit | Margin |
|---|---|---|---|---|---|
| | (MHz) | (MHz) | (dBm) | (dBm) | (dB) |
| LTE 64QAM | 864.5 | 862.0 | -28.7 | -13.0 | -15.7 |
| | 866.5 | 869.0 | -27.2 | -13.0 | -14.2 |
| GSM | 863.2 | 862.0 | -37.0 | -13.0 | -24.0 |
| | 867.8 | 869.0 | -34.5 | -13.0 | -21.5 |
| W-CDMA | 864.5 | 862.0 | -35.8 | -13.0 | -22.8 |
| | 866.5 | 869.0 | -33.3 | -13.0 | -20.3 |

**Figure 90 Band Edge Spectrum Results ESMR**

JUDGEMENT: Passed by 14.2 dB

See additional information in *Figure 91* to *Figure 96*.

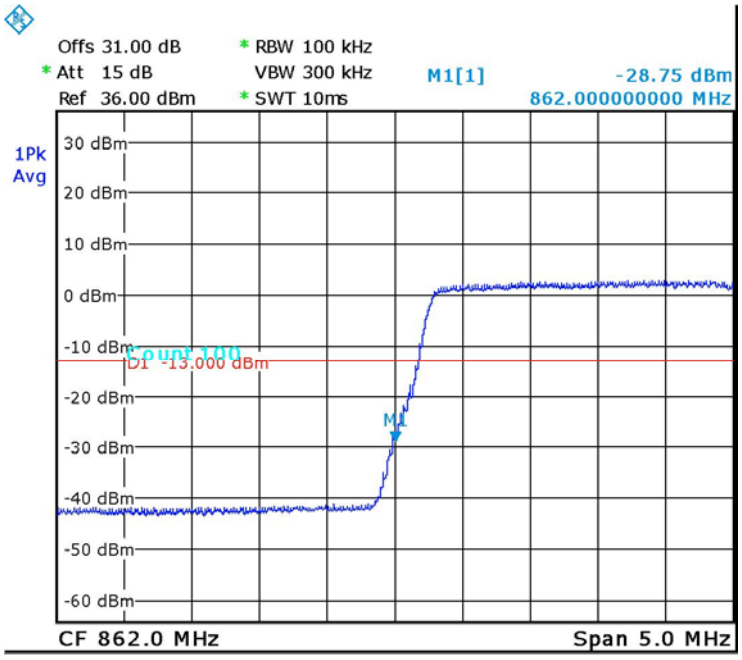


**Figure 91. — LTE 64QAM 864.5MHz**

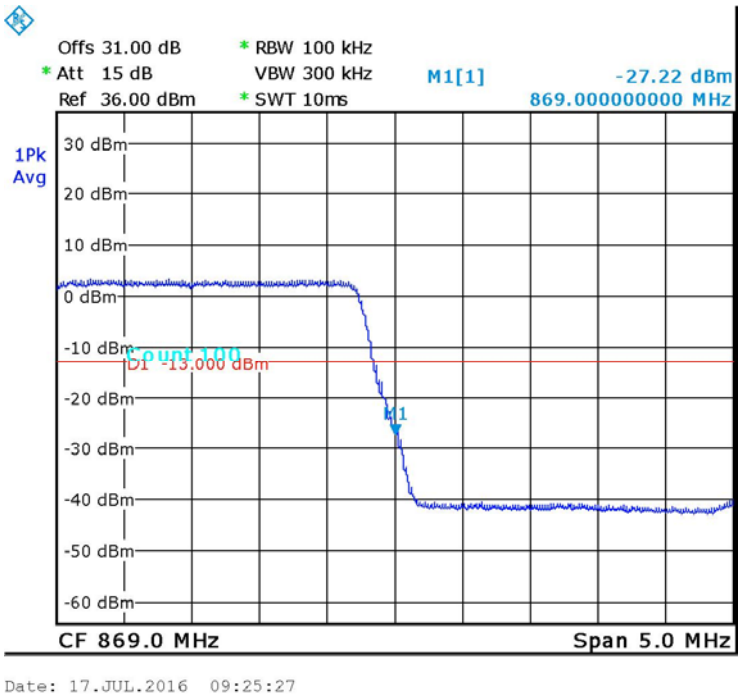


**Figure 92. — LTE 64QAM 866.5 MHz**

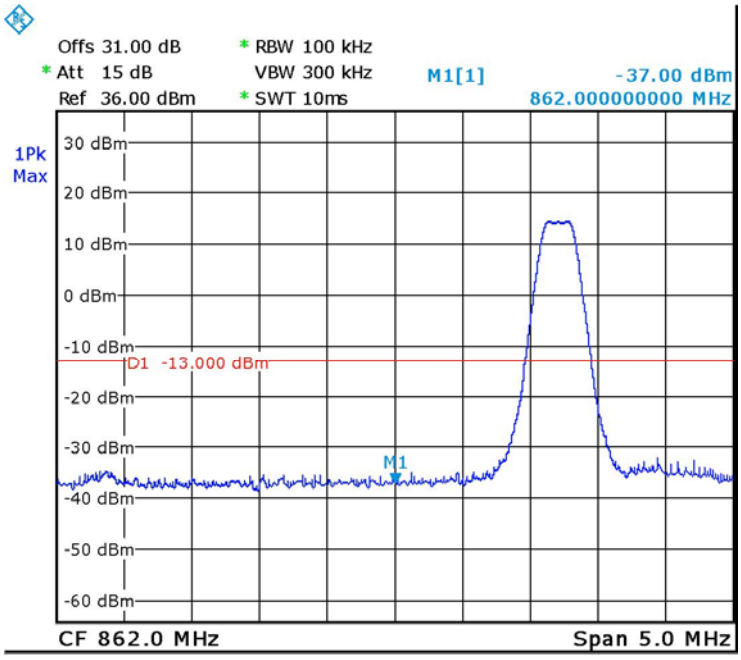


**Figure 93. — GSM - 863.2MHz**

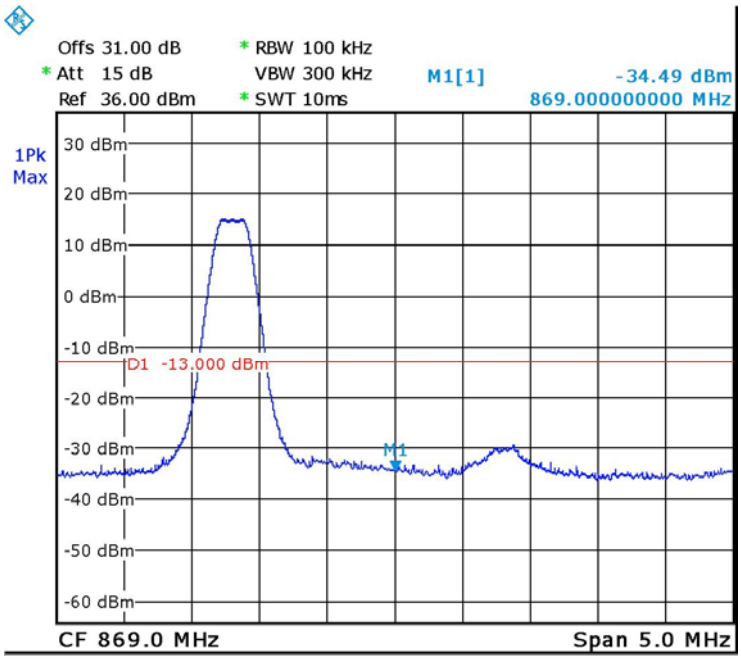


**Figure 94. — GSM - 867.8 MHz**

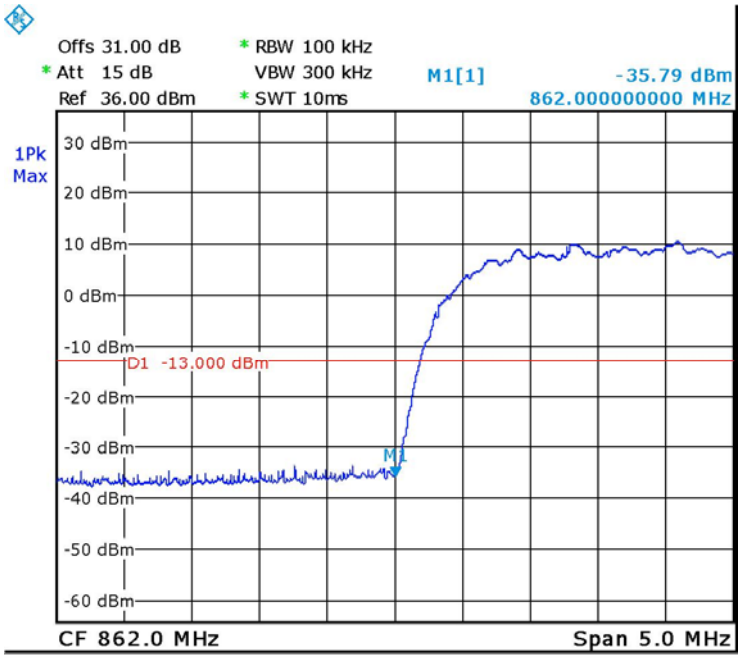


**Figure 95. — W-CDMA - 864.5 MHz**

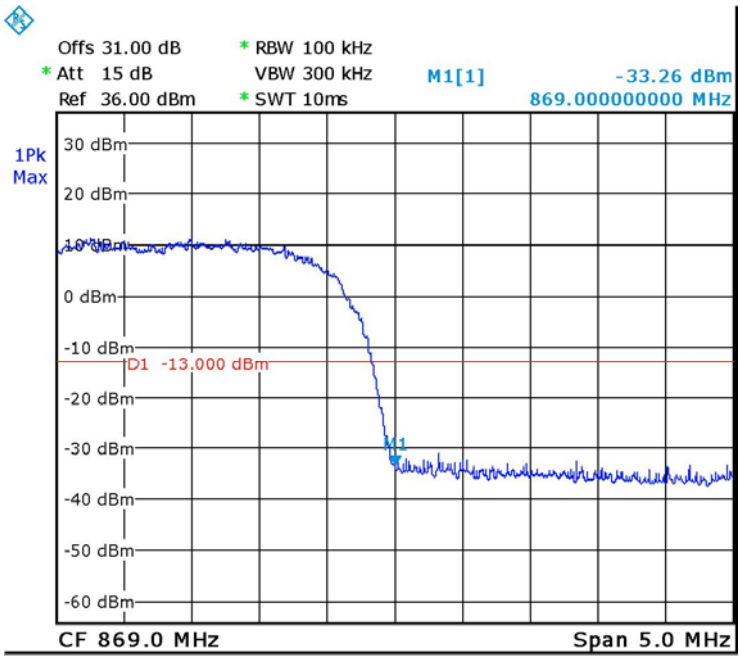


**Figure 96. — W-CDMA - 866.5 MHz**

### *12.5 Test Equipment Used; Band Edge Spectrum ESMR*

| Instrument | Manufacturer | Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Calibration Date | Next Calibration Due |
| Spectrum Analyzer | R&S | FSL6 | 100194 | February 29, 2016 | March 1, 2017 |
| Vector Signal Generator | Agilent | N5172B | MY51350584 | July 1, 2016 | July 1, 2017 |
| 30 dB Attenuator | MCL | BW-S30W5 | 533 | July 5, 2016 | July 5, 2017 |

**Figure 97 Test Equipment Used**

# 13. Spurious Emissions (Radiated) (ESMR)

## *13.1 Test Specification*

FCC, Part 90, Section 90.210

## *13.2 Test Procedure*

(Temperature (23°C)/ Humidity (47%RH))
The test method was based on ANSI/TIA-603-D: 2010, Section 2.2.12
Unwanted Emissions: Radiated Spurious.

**For measurements between 0.009MHz-30MHz:**

The E.U.T was tested inside the shielded room at a distance of 3 meters and the E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The frequency range 0.009MHz-30MHz was scanned. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

**For measurements between 30.0MHz-1.0GHz**:
A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The frequency range 30.0MHz -1.0GHz was scanned and the list of the highest emissions was verified and updated accordingly.
The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

**For measurements between 1.0GHz-10.0GHz:**

The E.U.T was tested inside the shielded room at a distance of 3 meters and the E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The frequency range 1.0GHz -10.0GHz was scanned. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

The E.U.T. was replaced by a substitution antenna (dipole 30MHz-1GHz, Horn Antenna above 1GHz) driven by a signal generator.
The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver as in step (a).
The signals observed in step (a) were converted to radiated power using:

$$P\ (dBm) = P_g(dBm) - \text{Cable Loss (dB)} + \text{Substitution Antenna Gain (dBd)}$$

P = Equivalent Isotropic Radiated Power.
$P_g$ = Signal Generator Output Level.

A Peak detector was used for this test.
The test was performed in 3 operation frequencies: low, mid and high.
Testing was performed when the RF port was connected to 50 Ω termination.
The table below describe only results with the highest radiation.

### *13.3 Test Results*

JUDGEMENT: Passed 30.0 dB

The E.U.T met the requirements of the FCC, Part 90, Section 90.210 specifications.

| Channel | Freq. | Antenna Pol. | Maximum Peak Level | Signal Generator RF Output | Cable Loss | Antenna Gain | Effective Radiated Power Level | Limit. | Margin |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (MHz) | (V/H) | (dBµV/m) | (dBm) | (dB) | (dBd) | (dBm) | (dBm) | (dB) |
| 863.2 | 1726.4 | V | 50.4 | -50.2 | 0.5 | 7.0 | -43.7 | -13.0 | -30.7 |
| | 1726.4 | H | 50.5 | -49.5 | 0.5 | 7.0 | -43.0 | -13.0 | -30.0 |
| 867.8 | 1735.9 | V | 50.5 | -50.2 | 0.5 | 7.0 | -43.7 | -13.0 | -30.7 |
| | 1735.9 | H | 50.5 | -49.5 | 0.5 | 7.0 | -43.0 | -13.0 | -30.0 |

**Figure 98 Spurious Emission (Radiated) (ESMR) Test Results Table**

### 13.4 Test Equipment Used; Spurious Emissions (Radiated) (ESMR)

| Instrument | Manufacturer | Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Calibration Date | Next Calibration Due |
| EMI Receiver | HP | 85422E | 3906A00276 | March 3, 2016 | March 3, 2017 |
| RF Filter Section | HP | 85420E | 3705A00248 | March 3, 2016 | March 3, 2017 |
| EMI Receiver | R&S | ESCI7 | 100724 | February 29, 2016 | March 1, 2017 |
| Spectrum Analyzer | HP | 8593EM | 3536A00120ADI | March 10, 2016 | March 10, 2017 |
| Active Loop Antenna | EMCO | 6502 | 9506-2950 | November 5, 2015 | November 30, 2016 |
| Antenna Biconical | EMCO | 3110B | 9912-3337 | March 24, 2016 | March 24, 2018 |
| Antenna Log Periodic | EMCO | 3146 | 9505-4081 | April 23, 2016 | April 23, 2017 |
| Horn Antenna 1G-18G | ETS | 3115 | 29845 | May 19, 2015 | May 19, 2018 |
| Horn Antenna 18G-26G | ARA | SWH-28 | 1007 | March 30, 2014 | September 30, 2016 |
| Low Noise Amplifier | Narda | LNA-DBS-0411N313 | 013 | March 1, 2015 | September 30, 2016 |
| Low Noise Amplifier | Sophia Wireless | LNA 28-B | 232 | March 1, 2015 | September 30, 2016 |
| MXG Vector Signal Generator | Agilent | N5182A | MY49060440 | July 1, 2016 | July 1, 2017 |
| Semi Anechoic Civil Chamber | ETS | S81 | SL 11643 | N/A | N/A |
| Antenna Mast | ETS | 2070-2 | - | N/A | N/A |
| Turntable | ETS | 2087 | - | N/A | N/A |
| Mast & Table Controller | ETS/EMCO | 2090 | 9608-1456 | N/A | N/A |

**Figure 99 Test Equipment Spurious Emissions (Radiated) (ESMR)**

# 14. Intermodulation Conducted

## 14.1 Test Procedure

(Temperature (22°C)/ Humidity (37%RH))

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (max loss = 40.0dB). The spectrum analyzer was set to 1 kHz resolution BW for the frequency range 9.0-150.0 kHz, 10 kHz for the frequency range 150 kHz–1.0 MHz, 100 kHz for the frequency range 1.0 MHz – 30 MHz, and 1MHz for the frequency range 30 MHz - 24GHz.

6 input signals were sent simultaneously to the E.U.T. as follows:

LTE band: 742.0 MHz, 0 dBm

CELL&ESMR band: 878.0 MHz, 0 dBm

PCS band: 1962.5 MHz, 0 dBm

AWS band: 2132.5 MHz, 0 dBm

WCS band: 2355.0MHz, 0 dBm

TDD 2.5G band: 2593.0MHz, 0 dBm

The frequency range of 9 kHz – 24.0 GHz was scanned for unwanted signals.

## 14.2 Test Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB, yielding –13dBm.

## 14.3 Test Results

JUDGEMENT: Passed

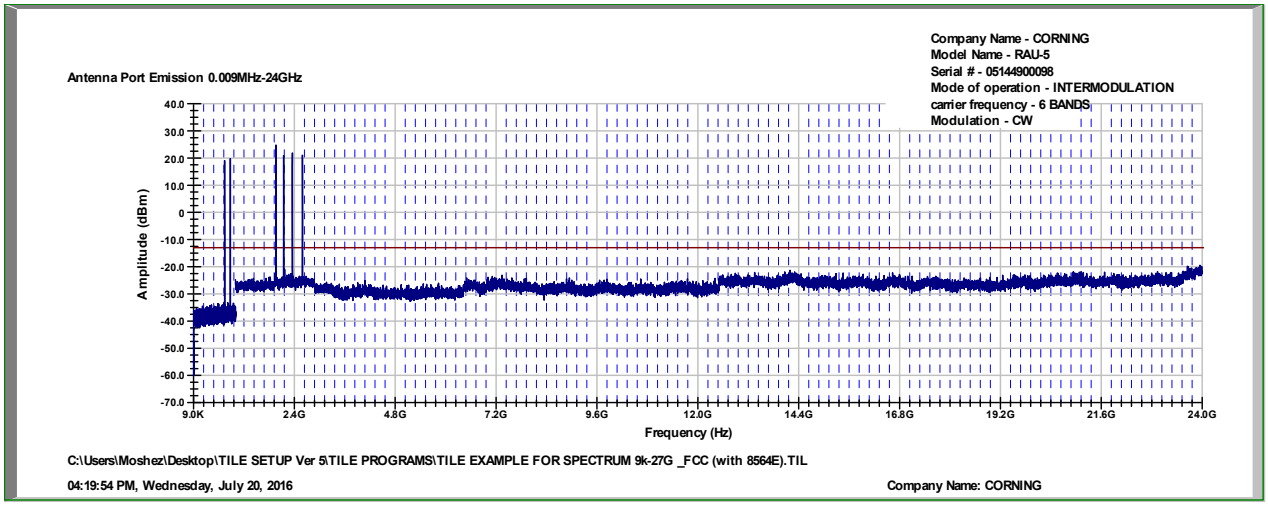


**Figure 100 Intermodulation Conducted**

### 14.4 Test Equipment Used; Intermodulation Conducted

| Instrument | Manufacturer | Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Calibration Date | Next Calibration Due |
| Spectrum Analyzer | HP | 8564E | 3442A00275 | March 10, 2016 | March 10, 2017 |
| EXG Vector Signal Generator | Agilent | N5172B | TE4384 | July 1, 2016 | July 1, 2017 |
| EXG Vector Signal Generator | Agilent | N5172B | MY513500584 | July 1, 2016 | July 1, 2017 |
| MXG Vector Signal Generator | Agilent | N5182A | MY48180244 | July 1, 2016 | July 1, 2017 |
| MXG Vector Signal Generator | Agilent | N5182A | MY49060440 | July 1, 2016 | July 1, 2017 |
| Signal Generator | HP | E4432B | GB40050998 | July 1, 2016 | July 1, 2017 |
| ESG Vector Signal Generator | Agilent | E4438C | MY45094064 | July 1, 2016 | July 1, 2017 |
| 30 dB Attenuator | MCL | BW-S30W5 | 533 | July 5, 2016 | July 5, 2017 |
| 6 dB Attenuator | Weinschel Associates | WA 40-6-34 | 568 | July 6, 2016 | July 6, 2017 |

**Figure 101 Test Equipment Used**

# 15. Intermodulation Radiated

## *15.1 Test Procedure*

(Temperature (23°C)/ Humidity (47%RH))

The test method was based on ANSI/TIA-603-D: 2010, Section 2.2.12 Unwanted Emissions: Radiated Spurious.

**For measurements between 0.009MHz-30MHz:**

The E.U.T was tested inside the shielded room at a distance of 3 meters and the E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The frequency range 0.009MHz-30MHz was scanned. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

**For measurements between 30.0MHz-1.0GHz**:
A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The frequency range 30.0MHz -1.0GHz was scanned and the list of the highest emissions was verified and updated accordingly.
The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

**For measurements between 1.0GHz-24.0GHz:**

The E.U.T was tested inside the shielded room at a distance of 3 meters and the E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The frequency range 1.0GHz -24.0GHz was scanned. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

The E.U.T. was replaced by a substitution antenna (dipole 30MHz-1GHz, Horn Antenna above 1GHz) driven by a signal generator. The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver as in step (a).
The signals observed in step (a) were converted to radiated power using:

$P_d(dBm) = P_g(dBm) – Cable\ Loss\ (dB) + Substitution\ Antenna\ Gain\ (dBd)$

$P_d$ = Dipole equivalent power (result).
$P_g$ = Signal generator output level.

6 input signals were sent simultaneously to the E.U.T. as follows:
LTE band: 742.0 MHz, 0 dBm
CELL band: 878.0 MHz, 0 dBm
PCS band: 1962.5 MHz, 0 dBm
AWS band: 2132.5 MHz, 0 dBm
WCS band: 2355.0MHz, 0 dBm
TDD 2.5G band: 2593.0MHz, 0 dBm

A Peak detector was used for this test.
The test was performed in 3 operation frequencies: low, mid and high.
Testing was performed when the RF port was connected to 50 Ω termination.
The table below describe only results with the highest radiation.

### *15.2 Test Limit*

The power of any emission outside of the authorized operating frequency ranges (728-758; 869-894; 1930-1990; 2110-2155 MHz;2350-2360MHz) must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB, yielding –13dBm.

### *15.3 Test Results*

JUDGEMENT: Passed

| Freq. | Antenna Pol. | Maximum Peak Level | Signal Generator RF Output | Cable Loss | Antenna Gain | Effective Radiated Power Level | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| (MHz) | (V/H) | (dBµV/m) | (dBm) | (dB) | (dBd) | (dBm) | (dBm) | (dB) |
| 1792.5 | V | 51.9 | -48.7 | 0.5 | 7.0 | -42.2 | -13.0 | -29.2 |
| 1792.5 | H | 52.5 | -47.5 | 0.5 | 7.0 | -41.0 | -13.0 | -28.0 |
| 2219.0 | V | 54.6 | -46.1 | 0.5 | 7.0 | -39.6 | -13.0 | -26.6 |
| 2219.0 | H | 54.5 | -45.5 | 0.5 | 7.0 | -39.0 | -13.0 | -26.0 |
| 3223.5 | V | 56.1 | -48.8 | 0.5 | 10.0 | -39.3 | -13.0 | -26.3 |
| 3223.5 | H | 56.1 | -48.4 | 0.5 | 10.0 | -38.9 | -13.0 | -25.9 |
| 3854.0 | V | 56.3 | -42.8 | 0.5 | 9.5 | -33.8 | -13.0 | -20.8 |
| 3854.0 | H | 56.4 | -42.3 | 0.5 | 9.5 | -33.3 | -13.0 | -20.3 |
| 3978.5 | V | 56.3 | -42.8 | 0.5 | 9.5 | -33.8 | -13.0 | -20.8 |
| 3978.5 | H | 56.3 | -42.3 | 0.5 | 9.5 | -33.3 | -13.0 | -20.3 |
| 4104.0 | V | 56.3 | -42.8 | 0.5 | 9.5 | -33.8 | -13.0 | -20.8 |
| 4104.0 | H | 56.2 | -42.3 | 0.5 | 9.5 | -33.3 | -13.0 | -20.3 |
| 4201.0 | V | 56.4 | -42.6 | 0.5 | 9.5 | -33.6 | -13.0 | -20.6 |
| 4201.0 | H | 56.5 | -42.3 | 0.5 | 9.5 | -33.3 | -13.0 | -20.3 |
| 4308.0 | V | 56.2 | -42.6 | 0.5 | 9.5 | -33.6 | -13.0 | -20.6 |
| 4308.0 | H | 56.4 | -42.3 | 0.5 | 9.5 | -33.3 | -13.0 | -20.3 |
| 4439.0 | V | 56.3 | -42.8 | 0.5 | 9.5 | -33.8 | -13.0 | -20.8 |
| 4439.0 | H | 56.4 | -42.3 | 0.5 | 9.5 | -33.3 | -13.0 | -20.3 |
| 5445.0 | V | 57.1 | -46.2 | 0.5 | 10.8 | -35.9 | -13.0 | -22.9 |
| 5445.0 | H | 57.0 | -45.0 | 0.5 | 10.8 | -34.7 | -13.0 | -21.7 |

**Figure 102 Intermodulation Radiated Results**

### 15.4 Test Instrumentation Used; Radiated Measurements Intermodulation

| Instrument | Manufacturer | Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Calibration Date | Next Calibration Due |
| EMI Receiver | HP | 85422E | 3906A00276 | March 3, 2016 | March 3, 2017 |
| RF Filter Section | HP | 85420E | 3705A00248 | March 3, 2016 | March 3, 2017 |
| EMI Receiver | R&S | ESCI7 | 100724 | February 29, 2016 | March 1, 2017 |
| Spectrum Analyzer | HP | 8593EM | 3536A00120ADI | March 10, 2016 | March 10, 2017 |
| Active Loop Antenna | EMCO | 6502 | 9506-2950 | November 5, 2015 | November 30, 2016 |
| Antenna Biconical | EMCO | 3110B | 9912-3337 | March 24, 2016 | March 24, 2018 |
| Antenna Log Periodic | EMCO | 3146 | 9505-4081 | April 23, 2016 | April 23, 2017 |
| Horn Antenna 1G-18G | ETS | 3115 | 29845 | May 19, 2015 | May 19, 2018 |
| Horn Antenna 18G-26G | ARA | SWH-28 | 1007 | March 30, 2014 | September 30, 2016 |
| Low Noise Amplifier | Narda | LNA-DBS-0411N313 | 013 | March 1, 2015 | September 30, 2016 |
| Low Noise Amplifier | Sophia Wireless | LNA 28-B | 232 | March 1, 2015 | September 30, 2016 |
| Signal Generator | Marconi | 2022D | 119196015 | March 1, 2016 | March 1, 2017 |
| Signal Generator | HP | 8648C | 3623A04126 | February 29, 2016 | March 1, 2017 |
| Signal Generator | HP | ESG-4000A/E4422A | US36220118 | February 29, 2016 | March 1, 2017 |
| MXG Vector Signal Generator | Agilent | N5182A | MY49060440 | July 1, 2016 | July 1, 2017 |
| ESG Vector Signal Generator | Agilent | E4438C | MY45094064 | July 1, 2016 | July 1, 2017 |
| Signal Generator | Agilent | E4432B | GB40050998 | July 1, 2016 | July 1, 2017 |
| Semi Anechoic Civil Chamber | ETS | S81 | SL 11643 | N/A | N/A |
| Antenna Mast | ETS | 2070-2 | - | N/A | N/A |
| Turntable | ETS | 2087 | - | N/A | N/A |
| Mast & Table Controller | ETS/EMCO | 2090 | 9608-1456 | N/A | N/A |

**Figure 103 Test Equipment Used**

# 16. Out-of-Band Rejection (CELL&ESMR)

## 16.1 Test Specification

KDB 935210 D05 v01r01, Section 3.3

## 16.2 Test Procedure

(Temperature (21°C)/ Humidity (35%RH))

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (max Loss= 31.0 dB).

The signal and spectrum analyzer frequency range was set to ±250% of the passband, Dwell time set to approximately 10msec.

RBW was set between 1% to 5% of the E.U.T passband and VBW set to ≥3*RBW.

The test was done both for CELL and ESMR bands because they are consecutive bands.

## 16.3 Test Limit

N/A

## 16.4 Test Results

JUDGEMENT: Passed

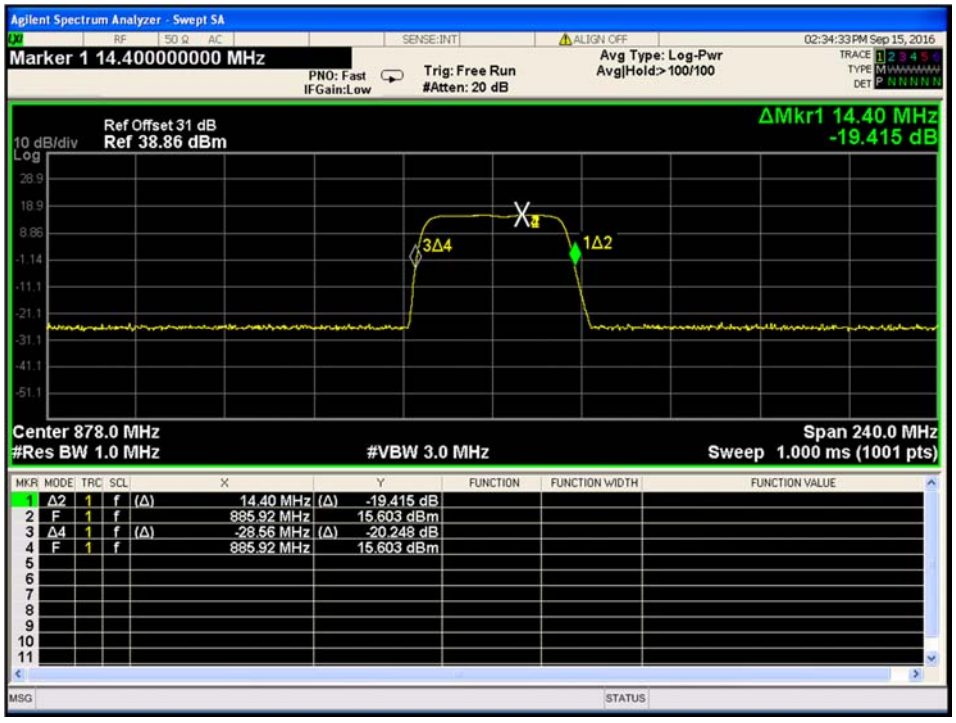


**Figure 104. — Out-of-Band Rejection Plot**

### *16.5 Test Equipment Used; Out-of-Band Rejection*

| Instrument | Manufacturer | Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Calibration Date | Next Calibration Date |
| EXA Spectrum Analyzer | Agilent | N9010A | MY48030391 | March 16, 2016 | March 16, 2018 |
| EXG Vector Signal Generator | Agilent | N5172B | MY49060440 | November 19, 2014 | November 19, 2017 |
| 30 dB Attenuator | Itl:1776 | BW-S30W5 | 533 | July 5, 2016 | July 5, 2017 |

**Figure 105 Test Equipment Used**

# 17. APPENDIX A - CORRECTION FACTORS

## *17.1 Correction factors for RF OATS Cable 35m ITL #1784*

| Frequency ( MHz) | Cable loss (dB) |
|---|---|
| 10.0 | 0.3 |
| 20.0 | 0.2 |
| 50.0 | -0.1 |
| 100.0 | -0.6 |
| 200.0 | -1.2 |
| 500.0 | -2.3 |
| 1000.0 | -3.6 |

## *17.2 Correction factors for RF OATS Cable 10m*

***ITL #1794***

| Frequency(MHz) | Cable loss(dB) |
|---|---|
| 10.0 | -0.3 |
| 20.0 | -0.3 |
| 50.0 | -0.5 |
| 100.0 | -0.7 |
| 200.0 | -1.1 |
| 500.0 | -1.8 |
| 1000.0 | -2.7 |

### *17.3 Correction factors for Horn Antenna*

**Model: SWH-28**
**at 1 meter range.**

| FREQUENCY (GHz) | AFE (dB /m) | Gain (dB1) |
|---|---|---|
| 18.0 | 40.3 | 16.1 |
| 19.0 | 40.3 | 16.3 |
| 20.0 | 40.3 | 16.1 |
| 21.0 | 40.3 | 16.3 |
| 22.0 | 40.4 | 16.8 |
| 23.0 | 40.5 | 16.4 |
| 24.0 | 40.5 | 16.6 |
| 25.0 | 40.5 | 16.7 |
| 26.0 | 40.6 | 16.4 |

## *17.4 Correction factors for Horn ANTENNA*

***Model: 3115***

***Antenna serial number: 29845***

**3 meter range**

| f(GHz) | AF(dB/m) | GA(dB) |
|---|---|---|
| 0.75 | 25 | 3 |
| 1G | 23.5 | 7 |
| 1.5G | 26 | 8 |
| 2G | 29 | 7 |
| 2.5G | 27.5 | 10 |
| 3G | 30 | 10 |
| 3.5G | 31.5 | 10 |
| 4G | 32.5 | 9.5 |
| 4.5G | 32.5 | 10.5 |
| 5G | 33 | 10.5 |
| 5.5G | 35 | 10.5 |
| 6G | 36.5 | 9.5 |
| 6.5G | 36.5 | 10 |
| 7G | 37.5 | 10 |
| 7.5G | 37.5 | 10 |
| 8G | 37.5 | 11 |
| 8.5G | 38 | 11 |
| 9G | 37.5 | 11.5 |
| 9.5G | 38 | 11.5 |
| 10G | 38.5 | 11.5 |
| 10.5G | 38.5 | 12 |
| 11G | 38.5 | 12.5 |
| 11.5G | 38.5 | 13 |
| 12G | 38 | 13.5 |
| 12.5G | 38.5 | 13 |
| 13G | 40 | 12 |
| 13.5G | 41 | 12 |
| 14G | 40 | 13 |
| 14.5G | 39 | 14 |
| 15G | 38 | 15.5 |
| 15.5G | 37.5 | 16 |
| 16G | 37.5 | 16 |
| 16.5G | 39 | 15 |
| 17G | 40 | 15 |
| 17.5G | 42 | 13.5 |
| 18G | 42.5 | 13 |

### *17.5 Correction factors for Log Periodic Antenna EMCO, Model 3146, Serial #9505-4081*

| Frequency [MHz] | AF [dB/m] |
|---|---|
| 200.0 | 11.47 |
| 250.0 | 12.06 |
| 300.0 | 14.77 |
| 400.0 | 15.77 |
| 500.0 | 18.01 |
| 600.0 | 18.84 |
| 700.0 | 20.93 |
| 800.0 | 21.27 |
| 900.0 | 22.44 |
| 1000.0 | 24.10 |

## *17.6 Correction factors for Biconical Antenna EMCO, Model 3110B, Serial #9912-3337*

| Frequency [MHz] | AF [dB/m] |
|---|---|
| 30.0 | 14.18 |
| 35.0 | 13.95 |
| 40.0 | 12.84 |
| 45.0 | 11.23 |
| 50.0 | 11.10 |
| 60.0 | 10.39 |
| 70.0 | 9.34 |
| 80.0 | 9.02 |
| 90.0 | 9.31 |
| 100.0 | 8.95 |
| 120.0 | 11.53 |
| 140.0 | 12.20 |
| 160.0 | 12.56 |
| 180.0 | 13.49 |
| 200.0 | 15.27 |

## *17.7 Correction factors for ACTIVE LOOP ANTENNA*

## Model 6502
## S/N 9506-2950

| f(MHz) | MAF(dBs/m) | AF(dB/m) |
|---|---|---|
| 0.01 | -33.1 | 18.4 |
| 0.02 | -37.2 | 14.3 |
| 0.03 | -38.2 | 13.3 |
| 0.05 | -39.8 | 11.7 |
| 0.1 | -40.1 | 11.4 |
| 0.2 | -40.3 | 11.2 |
| 0.3 | -40.3 | 11.2 |
| 0.5 | -40.3 | 11.2 |
| 0.7 | -40.3 | 11.2 |
| 1 | -40.1 | 11.4 |
| 2 | -40 | 11.5 |
| 3 | -40 | 11.5 |
| 4 | -40.1 | 11.4 |
| 5 | -40.2 | 11.3 |
| 6 | -40.4 | 11.1 |
| 7 | -40.4 | 11.1 |
| 8 | -40.4 | 11.1 |
| 9 | -40.5 | 11 |
| 10 | -40.5 | 11 |
| 20 | -41.5 | 10 |
| 30 | -43.5 | 8 |