



Product Service

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Report On

FCC Testing of the ip.access Ltd
S6x Family Access Point Base Station, Model: 435R
Band 2 (1900 MHz) (LTE)
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 24

COMMERCIAL-IN-CONFIDENCE

FCC ID: QGGIPA435R

PREPARED BY

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Project Manager – RF
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APPROVED BY

Nic Forsyth
Authorised Signatory

DATED

23 October 2017

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October 2017



Product Service

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SECTION 1

REPORT INFORMATION



Product Service

1.1 REPORT DETAILS

| | |
|-------------------------------|---|
| Manufacturer | ip.access Ltd |
| Address | Building 2020 Cambourne Business Park Cambourne CB23 6DW United Kingdom |
| Product Name | S6x Family Access Point Base Station |
| Product Number | 435R |
| Serial Number(s) | 000295-0200004122 |
| Software Version | 2.0.0 9770 (lte_s60_230.X) |
| Hardware Version | Rev C |
| Test Specification/Issue/Date | FCC CFR 47 Part 2: 2016 FCC CFR 47 Part 24: 2016 |
| Start of Test | 24 August 2017 |
| Finish of Test | 17 October 2017 |
| Name of Engineer(s) | Mohamed Toubella Graeme Lawler Matthew Russell |
| Related Document(s) | KDB 971168 D01 v02r02 KDB 662911 D01 v02r01 |

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 2 and FCC 47 CFR Part 24. The sample tested was found to comply with the requirements defined in the applied rules.

Mohamed Toubella

Graeme Lawler

Matthew Russell



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1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results for each configuration, in accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 24 is shown below.

| Section | Specification Clause | | Test Description | Result |
|---------|----------------------|--------------------|---|--------|
| | FCC CFR 47 Part 2 | FCC CFR 47 Part 24 | | |
| 2.1 | 2.1046 | 24.232 (a) | Maximum Peak Output Power and Peak to Average Ratio - Conducted | Pass |
| 2.2 | 2.1049 | 24.238 (b) | Occupied Bandwidth | Pass |
| 2.3 | 2.1051 | 24.238 (b) | Radiated Spurious Emissions | Pass |
| 2.4 | 2.1051 | 24.238 (b) | Band Edge | Pass |
| 2.5 | 2.1051 | 24.238 (a) | Transmitter Spurious Emissions | Pass |
| 2.6 | 2.1055 | 24.235 | Frequency Stability | Pass |



1.3 CONFIGURATION DESCRIPTION

| Configuration Code | Carrier(s) | Configuration Description |
|--------------------|------------|---------------------------|
| 1 | 1C | LTE Single Carrier |

The settings below were deemed representative for all traffic scenarios when settings with different modulations, channel bandwidths, number of carriers and RF configurations has been tested to find the worst case setting. The settings below were used for all measurements if not otherwise noted:

LTE:

MIMO mode single carrier: E-TM1.1, E-TM3.2, E-TM3.1

The complete testing was performed with the EUT transmitting at maximum RF power unless otherwise stated.

The EUT consists of 2 antenna ports. All measurements were performed on transmit antenna port A and B. Test result limits for Band Edge and Conducted Spurious were based on a 2 port MIMO system. Therefore, a worst case limit accounting for an effective 2 port MIMO configuration was employed and corrected in accordance with FCC KDB 662911, $(10\log_2)$.

The RDS B41– KRY 901 405/1 supports LTE Band 2 – 1930 – 1990 MHz, (downlink), and 1850 – 1910 MHz, (uplink), frequency bands.

Test Models as defined in 3GPP TS 25.141 and TS 36.141 were used to represent the required modulation for test.

The EUT was powered by an external 12 V DC Supply.



1.4 APPLICATION FORM

| EQUIPMENT DESCRIPTION | |
|---|----------------------------|
| Model Name/Number | S60 Band 2 |
| Part Number | 435R |
| Hardware Version | Rev C |
| Software Version | 2.0.0 9770 (lte_s60_230.X) |
| FCC ID (if applicable) | QGGIPA435R |
| Industry Canada ID (if applicable) | |
| Technical Description (Please provide a brief description of the intended use of the equipment) | LTE Indoor Small Cell |

| INTENTIONAL RADIATORS | | | | | | | | | |
|-----------------------|----------------------|---------------------------------------|--------------------|-------------------------------|----------------------|-------------------------|---------------------|--------|--------|
| Technology | Frequency Band (MHz) | Conducted Declared Output Power (dBm) | Antenna Gain (dBi) | Supported Bandwidth (s) (MHz) | Modulation Scheme(s) | ITU Emission Designator | Test Channels (MHz) | | |
| | | | | | | | Bottom | Middle | Top |
| LTE | 1900 | 20 | 0.5 | 3 | QAM | 20M00D1 WEC | 1931.5 | 1960.0 | 1988.5 |
| LTE | 1900 | 20 | 0.5 | 5 | QAM | 20M00D1 WEC | 1932.5 | 1960.0 | 1987.5 |
| LTE | 1900 | 20 | 0.5 | 10 | QAM | 20M00D1 WEC | 1935.0 | 1960.0 | 1985.0 |
| LTE | 1900 | 20 | 0.5 | 15 | QAM | 20M00D1 WEC | 1937.5 | 1960.0 | 1982.5 |
| LTE | 1900 | 20 | 0.5 | 20 | QAM | 20M00D1 WEC | 1940.0 | 1960.0 | 1980.0 |

| UN-INTENTIONAL RADIATOR | |
|--|----------|
| Highest frequency generated or used in the device or on which the device operates or tunes | 1990 MHz |

| Power Source | | | |
|--|-----------------|-------------|--|
| AC | Single Phase | Three Phase | Nominal Voltage |
| | | | |
| External DC | Nominal Voltage | | Maximum Current |
| | 12V | | 2A |
| Battery | Nominal Voltage | | Battery Operating End Point Voltage |
| | | | |
| Can EUT transmit whilst being charged? | | | Yes <input type="checkbox"/> No <input type="checkbox"/> |

| EXTREME CONDITIONS | | | |
|---------------------|----|----|---------------------|
| Maximum temperature | 45 | °C | Minimum temperature |
| | | | 0 °C |

| Ancillaries | |
|---|----|
| Please list all ancillaries which will be used with the device. | |
| AC/DC Adaptor 12V output | Or |
| PoE+ Splitter with 12V output | |



Product Service

| ANTENNA CHARACTERISTICS | | | |
|-------------------------------------|-----------------------------|-----------------|-----|
| <input type="checkbox"/> | Antenna connector | State impedance | Ohm |
| <input type="checkbox"/> | Temporary antenna connector | State impedance | Ohm |
| <input checked="" type="checkbox"/> | Integral antenna | Type PCB Mount | |
| <input type="checkbox"/> | External antenna | Type | |

I hereby declare that the information supplied is correct and complete.

Name: Costa Panayi

Position held: Product Design and Development Engineer

Date: 09/08/2017

1.5 PRODUCT INFORMATION

1.5.1 Technical Description

The Equipment Under Test (EUT) was an ip.access Ltd, S6x Family Access Point, Model: 435R

The Equipment Under Test (EUT) is shown in the photograph below. A full technical description can be found in the Manufacturer's documentation.



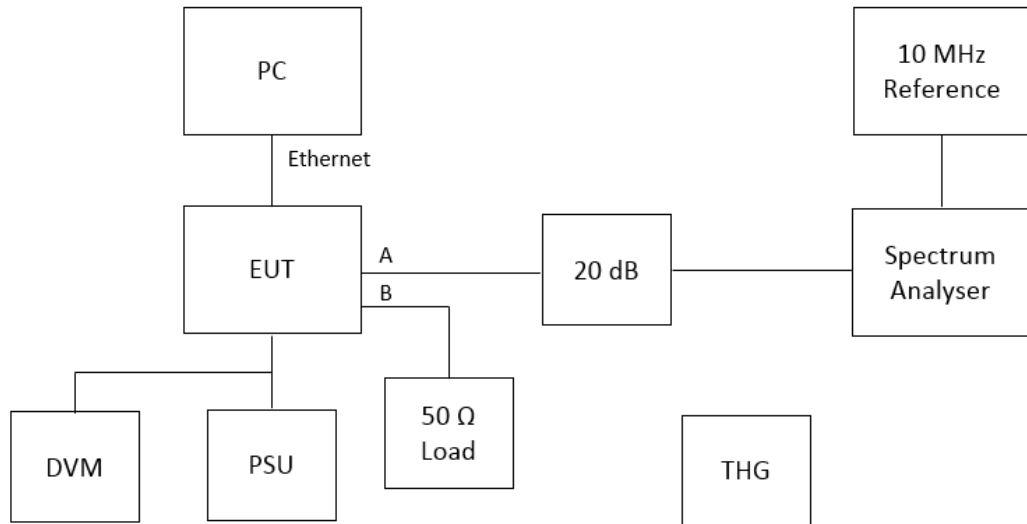
Equipment Under Test



Equipment Under Test



1.6 TEST SETUP





Product Service

1.7 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratories or a chamber as appropriate.

The EUT was powered from a 12 V DC supply.

FCC Measurement Facility Registration Number
90987 Octagon House, Fareham Test Laboratory

1.8 DEVIATION FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.9 MODIFICATION RECORD

No modifications were made to the EUT during testing.

1.10 TEST SITE

Under our group UKAS Accreditation, TÜV SÜD Product Service conducted the following tests at our Fareham, UK site.

| Test Name | Name of Engineer(s) |
|---|---------------------|
| Maximum Peak Output Power and Peak to Average Ratio – Conducted | Mohamed Toubella |
| Occupied Bandwidth | Mohamed Toubella |
| Radiated Spurious Emissions | Graeme Lawler |
| Band Edge | Mohamed Toubella |
| Transmitter Spurious Emissions | Mohamed Toubella |
| Frequency Stability | Matthew Russell |



Product Service

SECTION 2

TEST DETAILS



Product Service

2.1 MAXIMUM PEAK OUTPUT POWER AND PEAK TO AVERAGE RATIO - CONDUCTED

2.1.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR 47 Part 24, Clause 24.232 (a)

2.1.2 Date of Test and Modification State

20 September to 12 October 2017 - Modification State 0

2.1.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.4 Environmental Conditions

| | |
|---------------------|---------------|
| Ambient Temperature | 22.5 - 23.3°C |
| Relative Humidity | 55.2 - 41.9% |

2.1.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01, clause 5.2.1 and summed in accordance with FCC KDB 662911 D01.



2.1.6 Test Results

Configuration 1

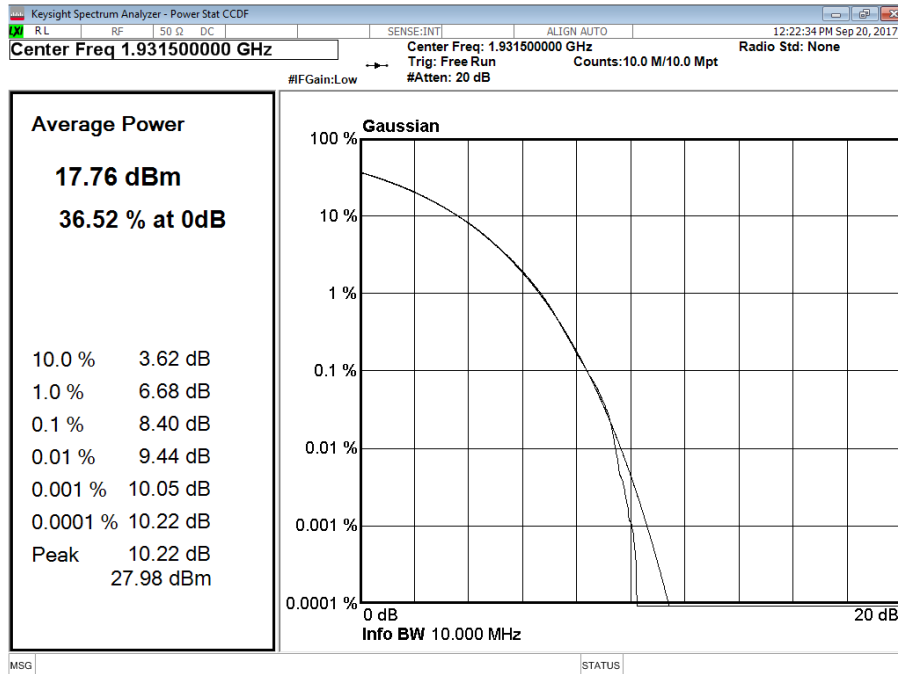
Maximum Output Power 20 dBm

| Antenna | LTE Modulation | LTE Carrier Bandwidth | Peak to Average Ratio (PAR) / Output Power | | |
|---------|----------------|-----------------------|--|---------------|-------|
| | | | Channel Position B | | |
| | | | PAR (dB) | Average Power | |
| dBm | dBm/MHz | | | | |
| A | QPSK | 3.0 MHz | 8.40 | 17.73 | 14.04 |
| B | QPSK | 3.0 MHz | 8.40 | 18.05 | 14.41 |
| Total | | | - | 20.90 | 17.24 |
| A | 16QAM | 3.0 MHz | 8.43 | 17.70 | 14.28 |
| B | 16QAM | 3.0 MHz | 8.36 | 17.92 | 14.61 |
| Total | | | - | 20.82 | 17.46 |
| A | 64QAM | 3.0 MHz | 8.41 | 17.72 | 14.01 |
| B | 64QAM | 3.0 MHz | 8.38 | 18.05 | 14.27 |
| Total | | | - | 20.90 | 17.15 |
| A | QPSK | 5.0 MHz | 8.49 | 16.68 | 10.89 |
| B | QPSK | 5.0 MHz | 8.61 | 16.27 | 10.44 |
| Total | | | - | 19.49 | 13.68 |
| A | 16QAM | 5.0 MHz | 8.38 | 16.62 | 11.19 |
| B | 16QAM | 5.0 MHz | 8.45 | 16.15 | 10.68 |
| Total | | | - | 19.40 | 13.95 |
| A | 64QAM | 5.0 MHz | 8.43 | 16.65 | 11.53 |
| B | 64QAM | 5.0 MHz | 8.54 | 16.23 | 10.50 |
| Total | | | - | 19.46 | 14.06 |
| A | QPSK | 10.0 MHz | 8.46 | 17.70 | 9.32 |
| B | QPSK | 10.0 MHz | 8.45 | 17.69 | 9.14 |
| Total | | | - | 20.71 | 12.24 |
| A | 16QAM | 10.0 MHz | 8.50 | 17.69 | 9.56 |
| B | 16QAM | 10.0 MHz | 8.49 | 17.86 | 9.59 |
| Total | | | - | 20.79 | 12.59 |
| A | 64QAM | 10.0 MHz | 8.49 | 17.81 | 9.25 |
| B | 64QAM | 10.0 MHz | 8.50 | 17.78 | 9.26 |
| Total | | | - | 20.81 | 12.27 |
| A | QPSK | 15.0 MHz | 9.74 | 16.63 | 6.51 |
| B | QPSK | 15.0 MHz | 10.70 | 16.16 | 6.01 |
| Total | | | - | 19.41 | 9.28 |
| A | 16QAM | 15.0 MHz | 10.62 | 16.73 | 7.24 |
| B | 16QAM | 15.0 MHz | 11.31 | 16.64 | 7.31 |
| Total | | | - | 19.70 | 10.29 |
| A | 64QAM | 15.0 MHz | 11.03 | 17.04 | 6.98 |
| B | 64QAM | 15.0 MHz | 11.25 | 16.91 | 7.38 |
| Total | | | - | 19.99 | 10.19 |
| A | QPSK | 20.0 MHz | 10.79 | 18.35 | 7.32 |
| B | QPSK | 20.0 MHz | 10.77 | 18.44 | 7.08 |
| Total | | | - | 21.41 | 10.21 |
| A | 16QAM | 20.0 MHz | 10.84 | 17.77 | 6.39 |
| B | 16QAM | 20.0 MHz | 10.54 | 18.81 | 8.36 |
| Total | | | - | 21.33 | 10.50 |
| A | 64QAM | 20.0 MHz | 10.66 | 18.61 | 8.06 |
| B | 64QAM | 20.0 MHz | 10.45 | 18.97 | 8.59 |
| Total | | | - | 21.80 | 11.34 |

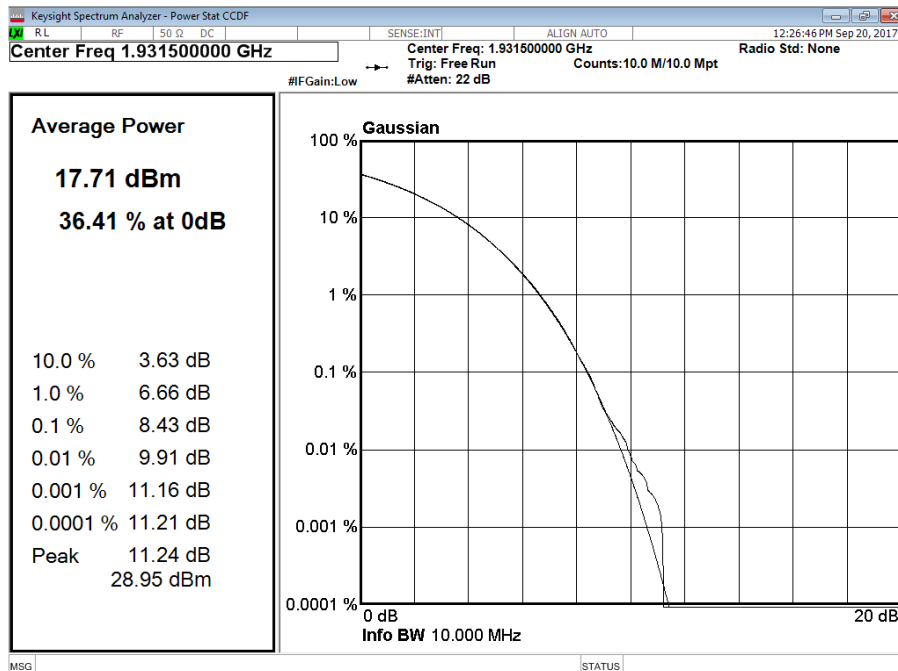


Product Service

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position B



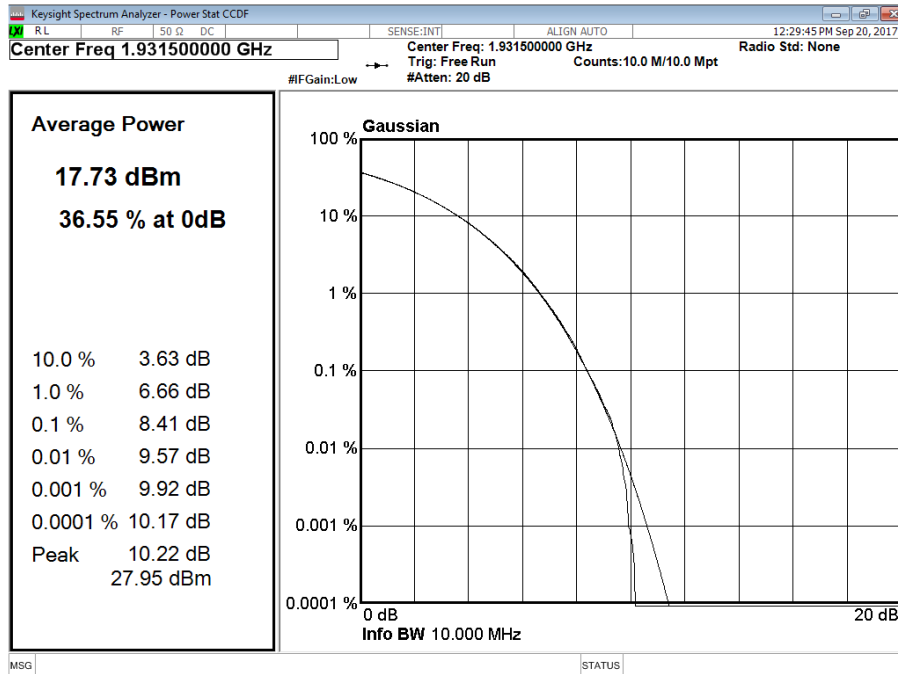
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position B



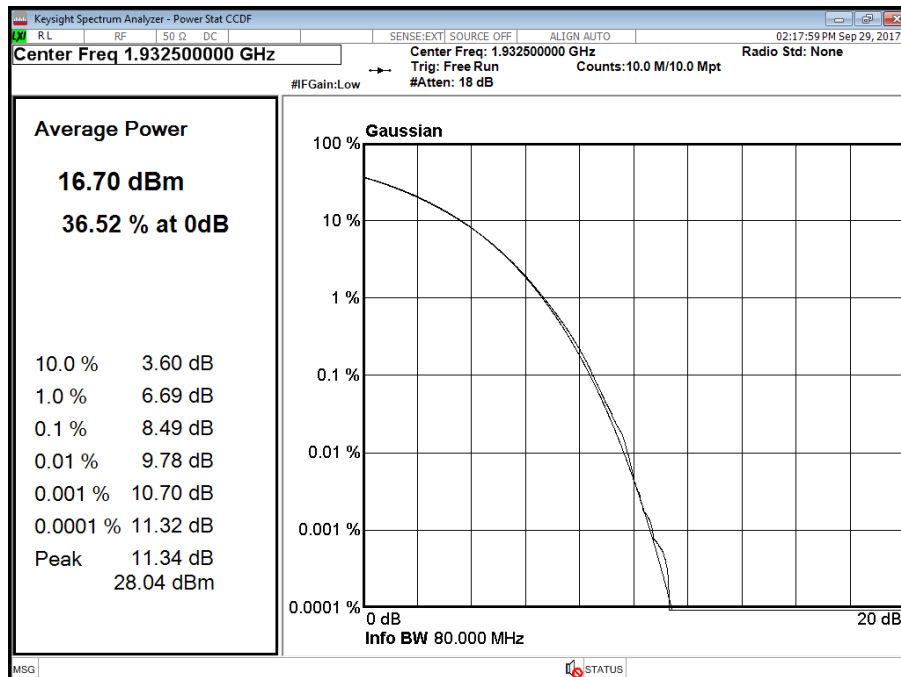


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position B



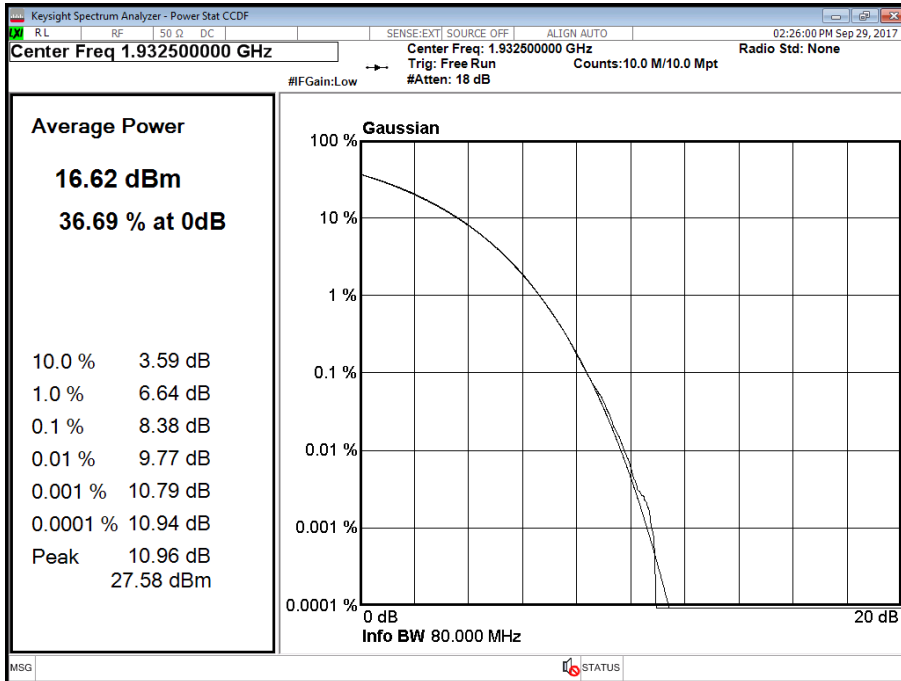
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



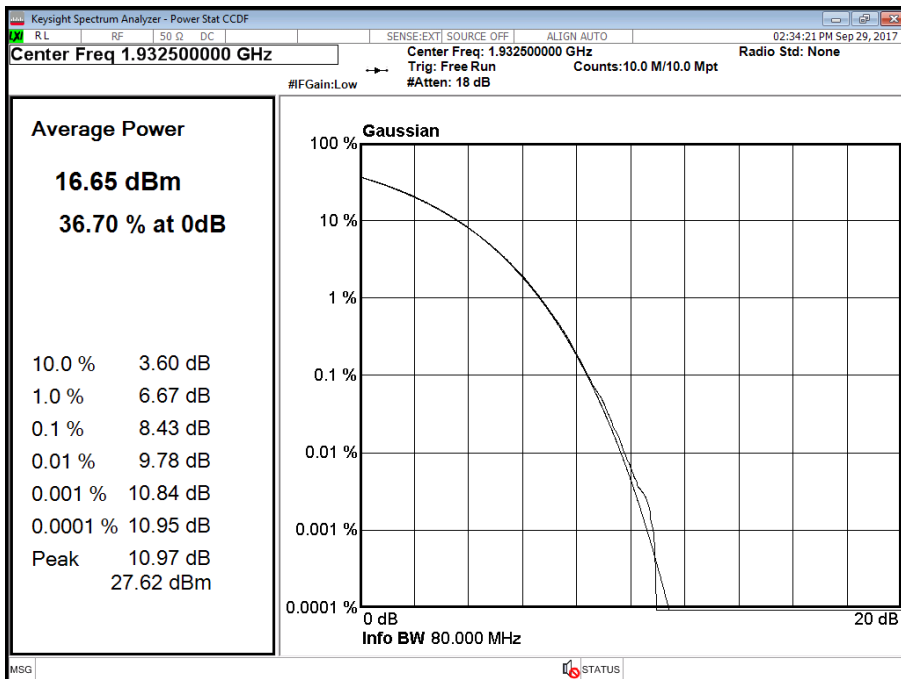


Product Service

Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



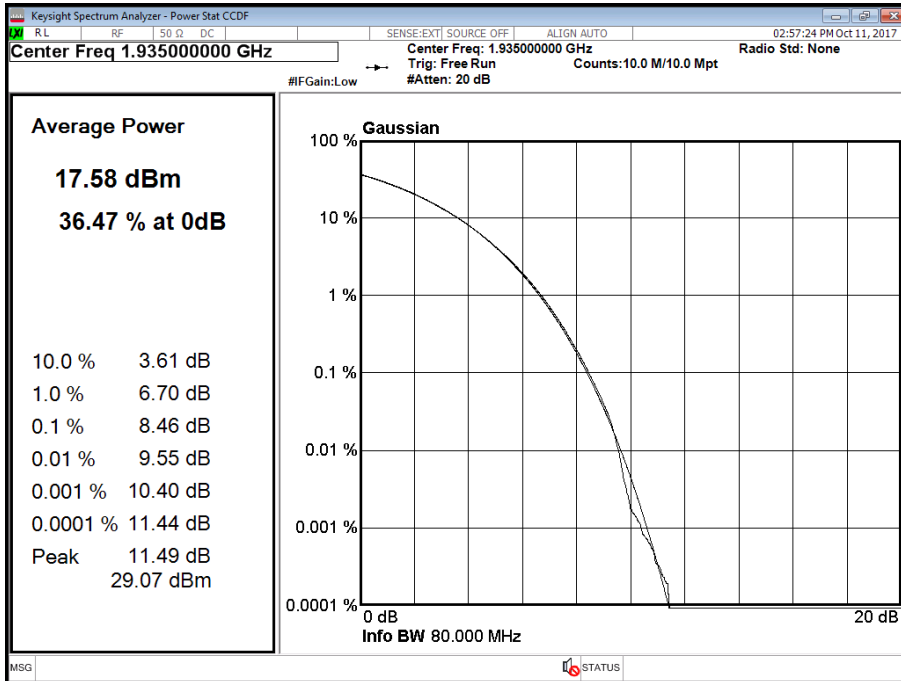
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



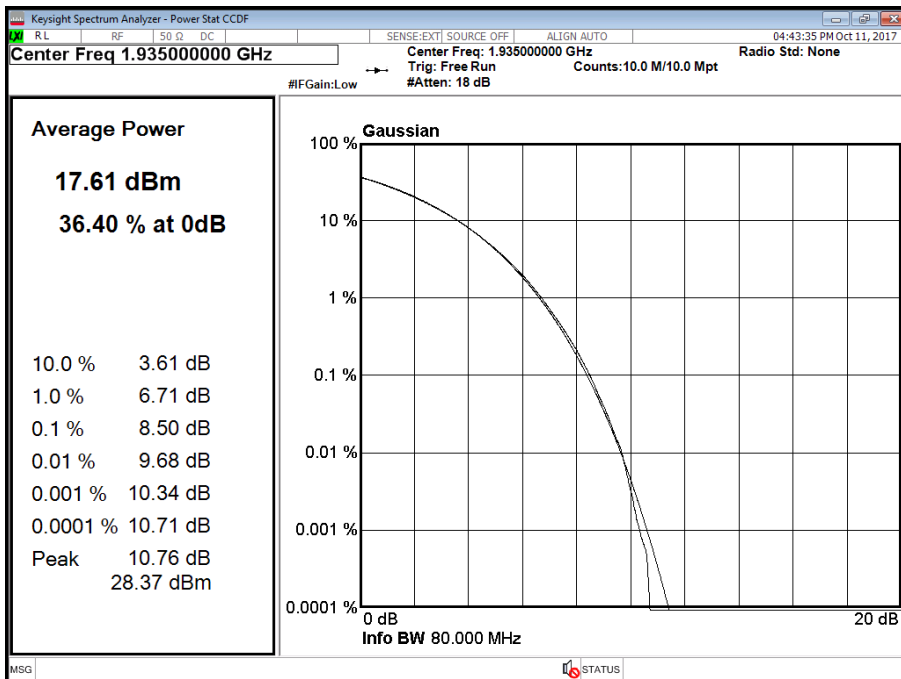


Product Service

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B



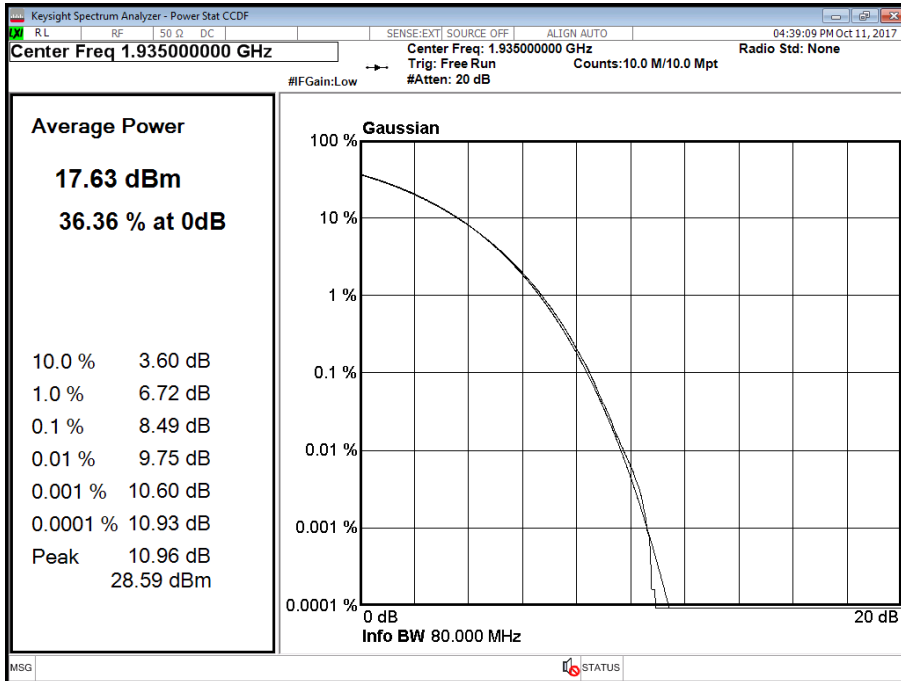
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B



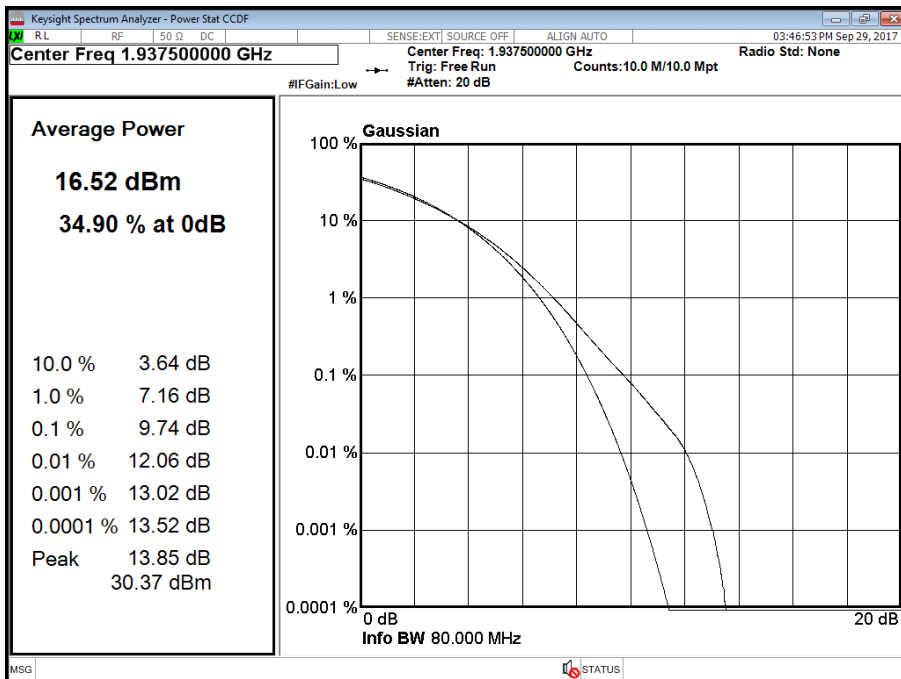


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B



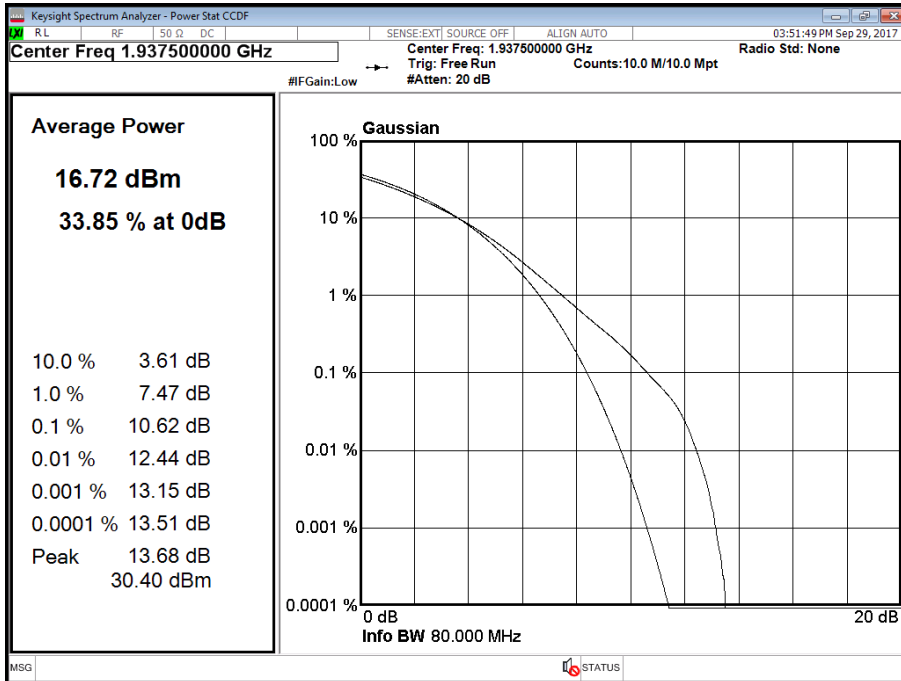
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 15.0 MHz - Channel Position B



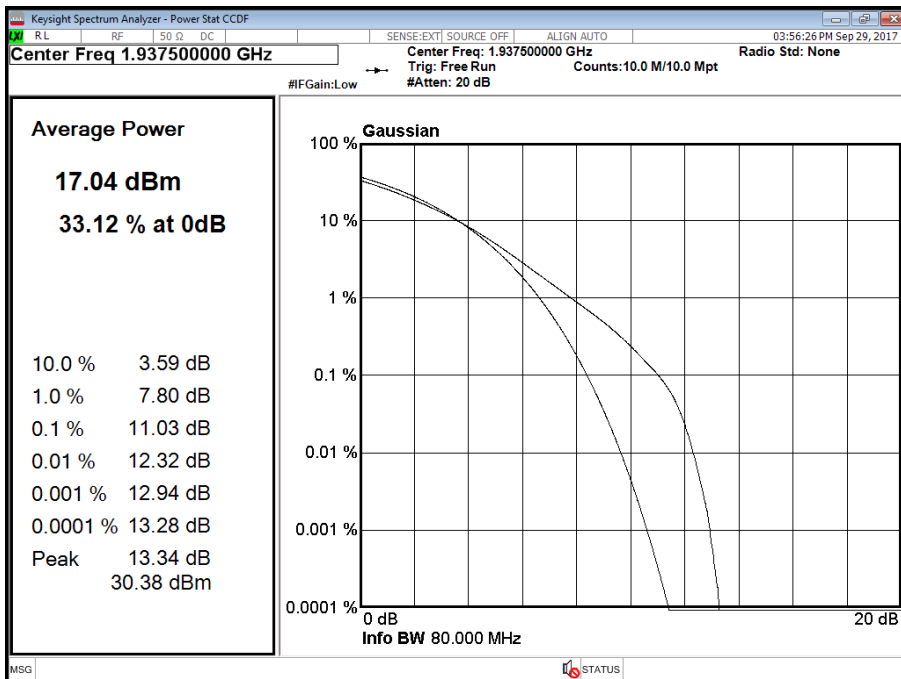


Product Service

Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position B



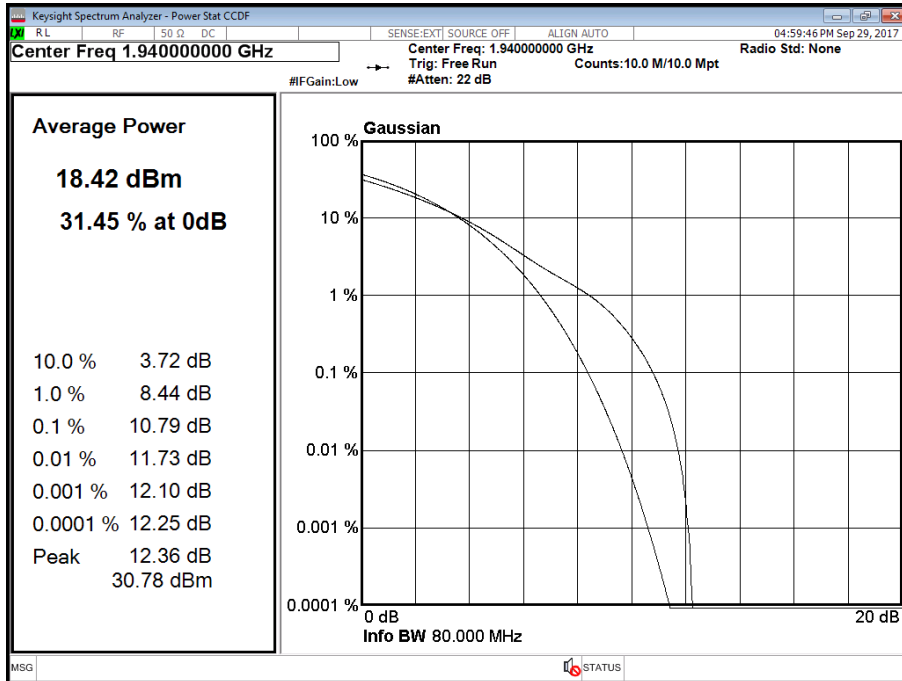
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position B



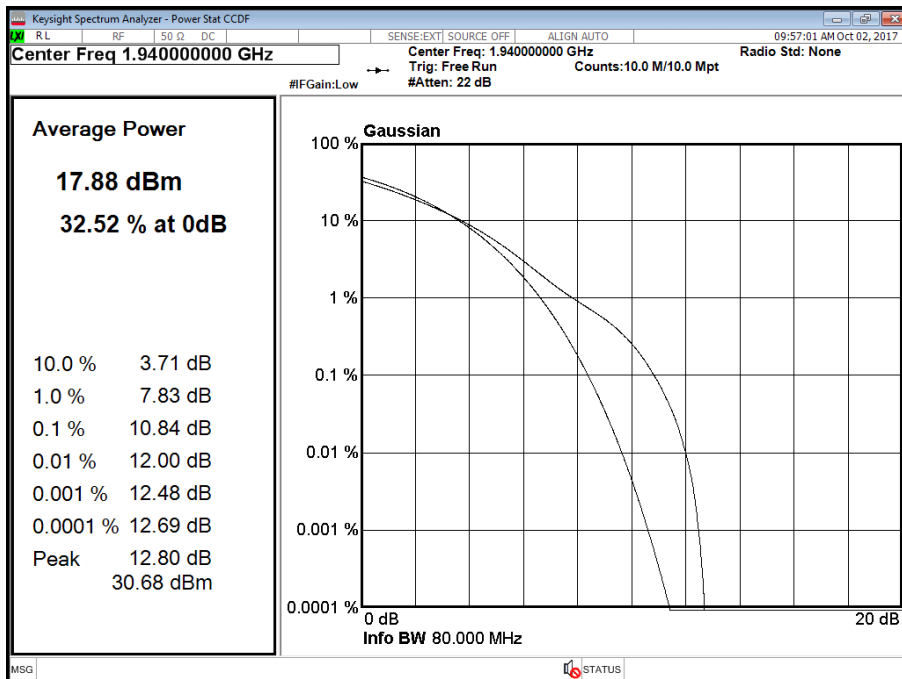


Product Service

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B



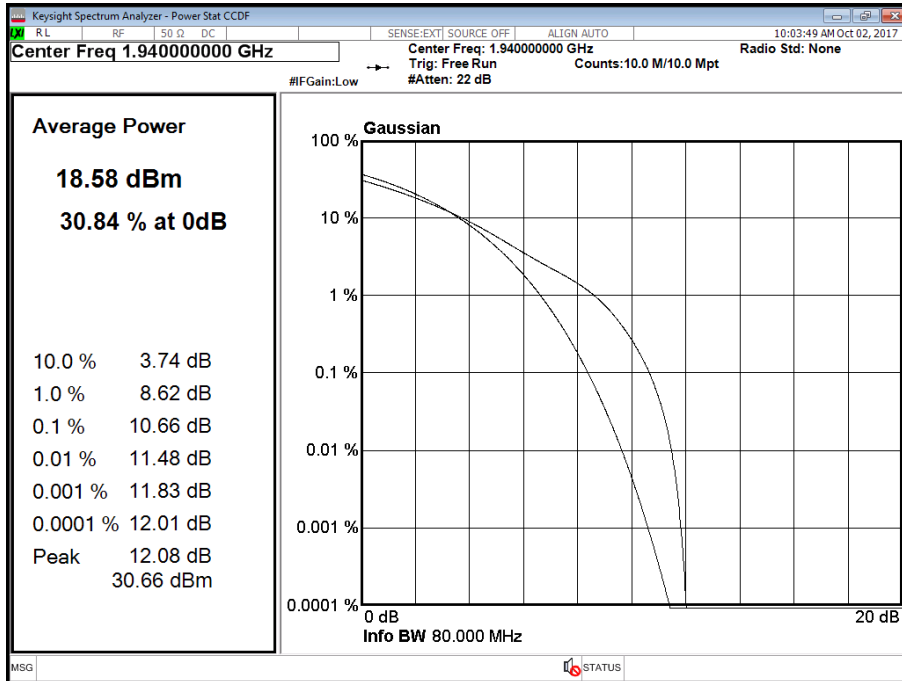
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position B



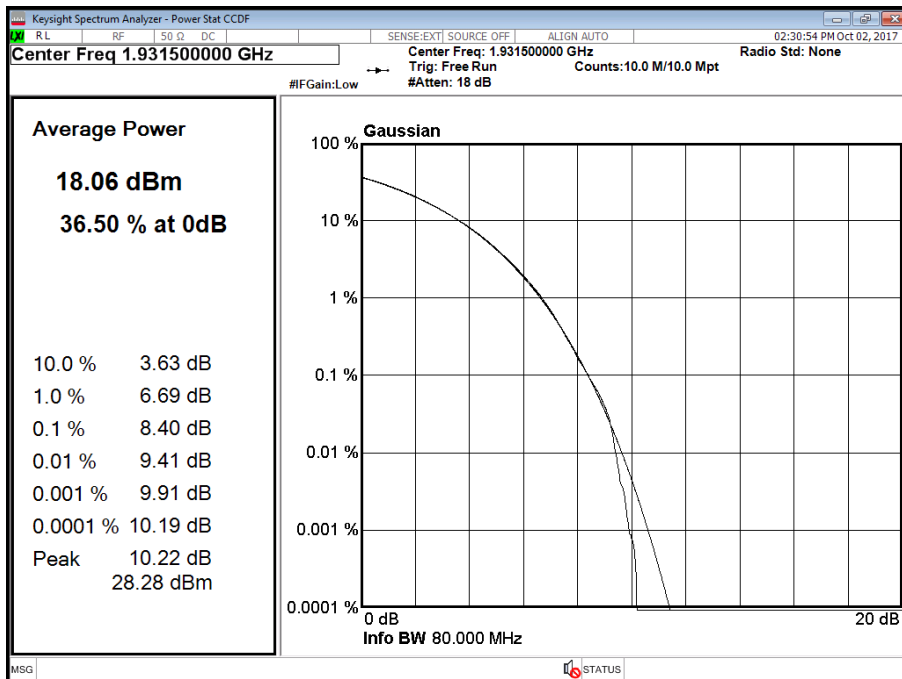


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position B



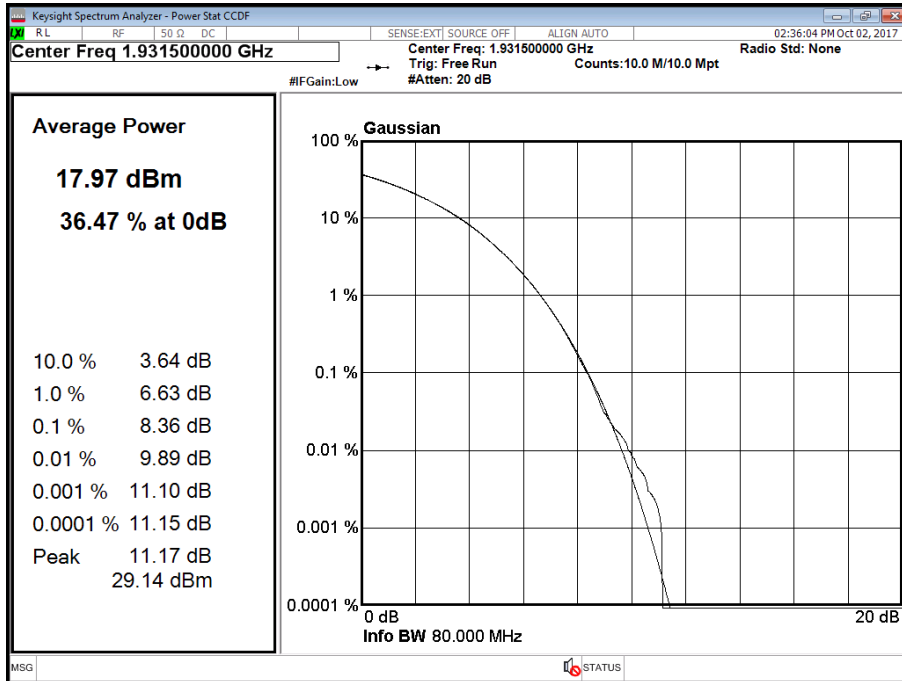
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position B



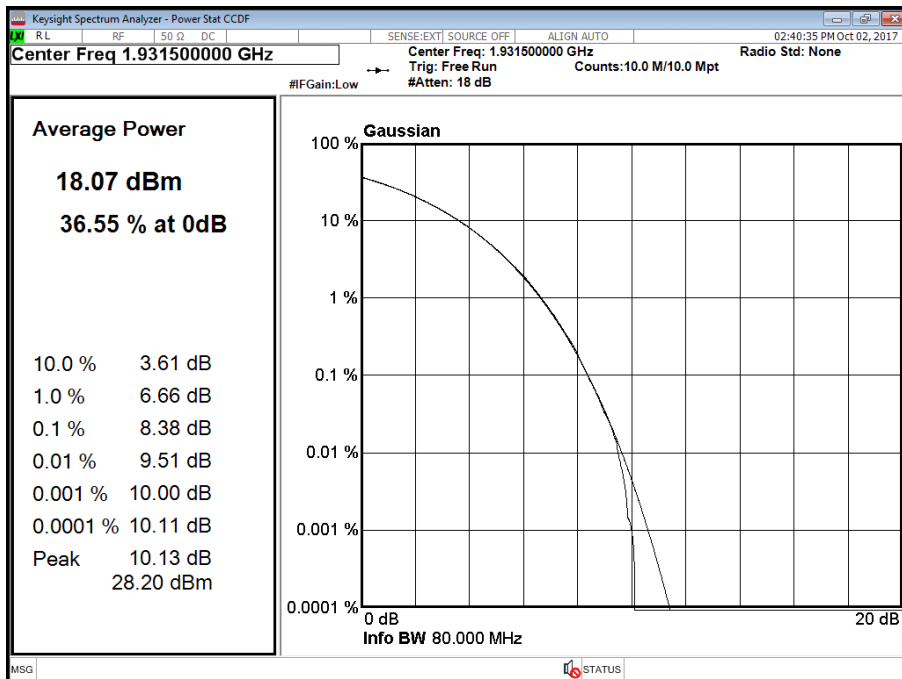


Product Service

Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position B



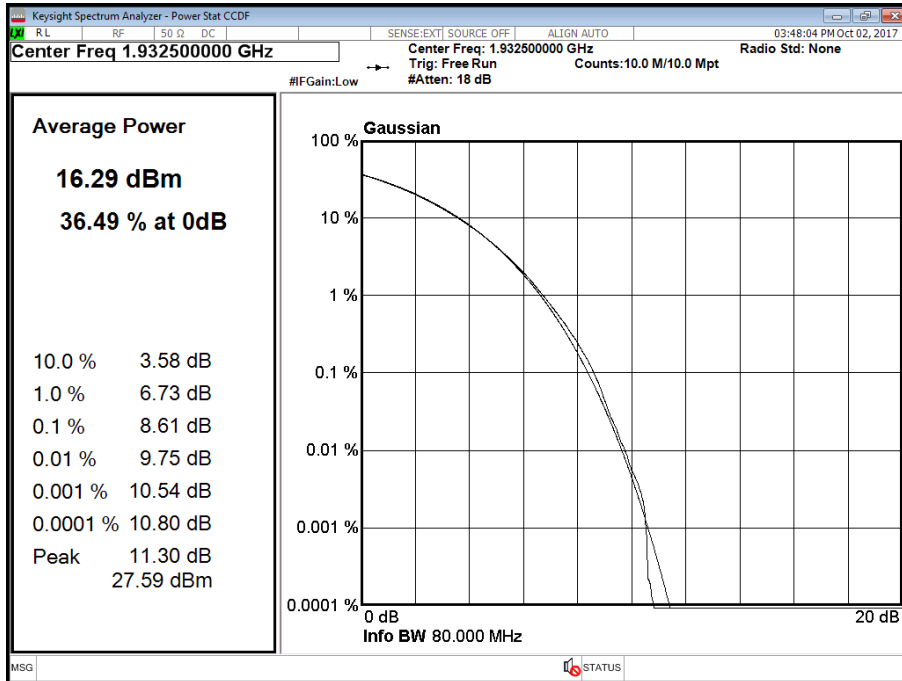
Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position B



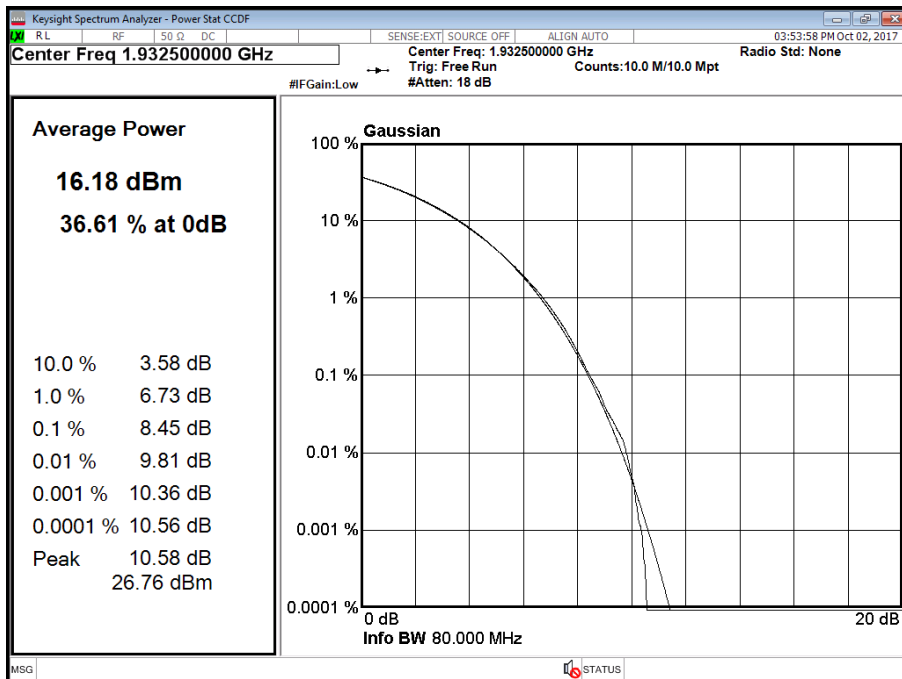


Product Service

Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



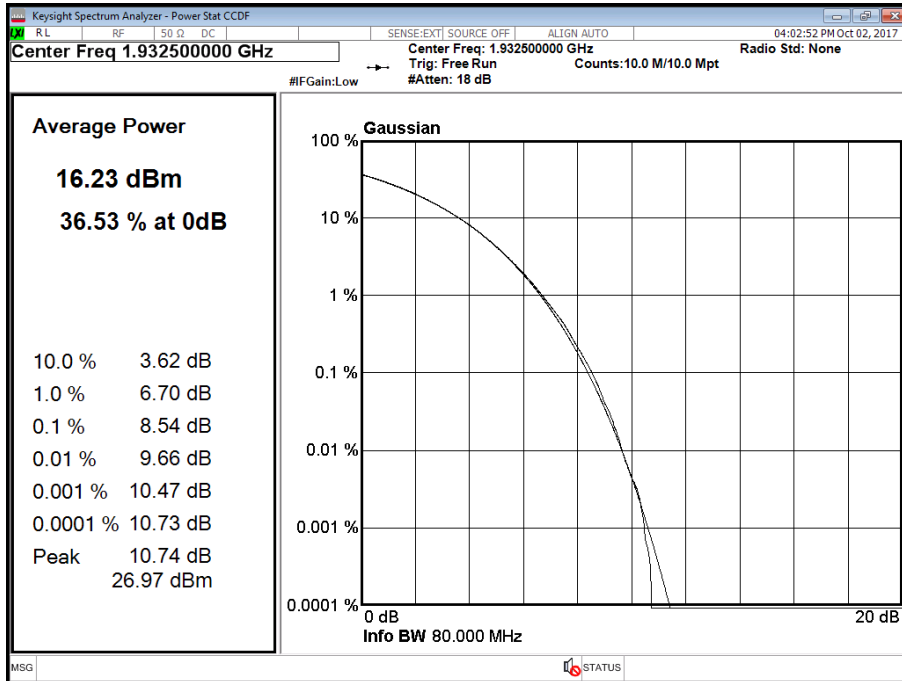
Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



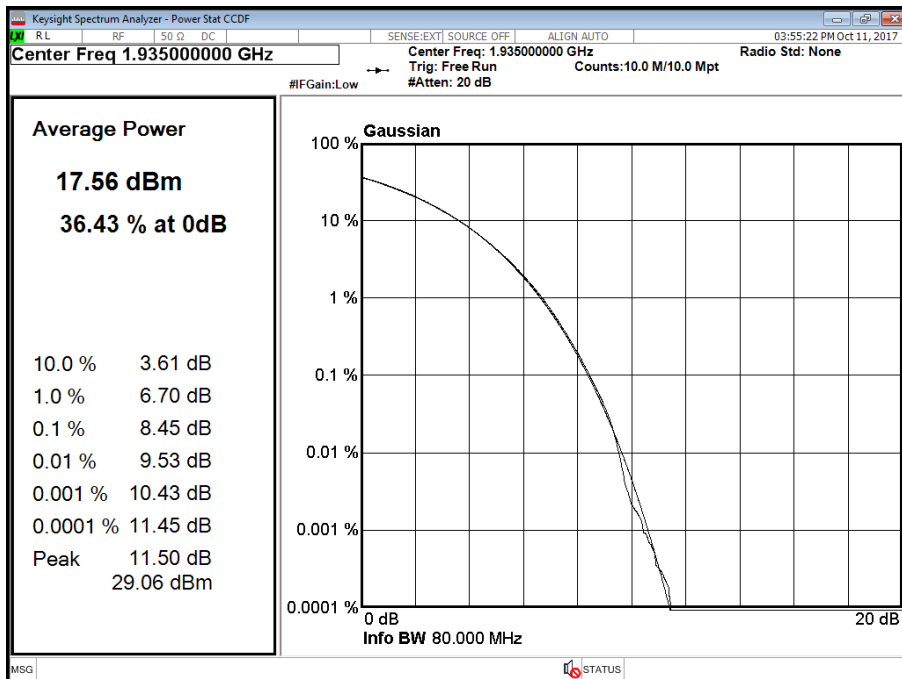


Product Service

Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



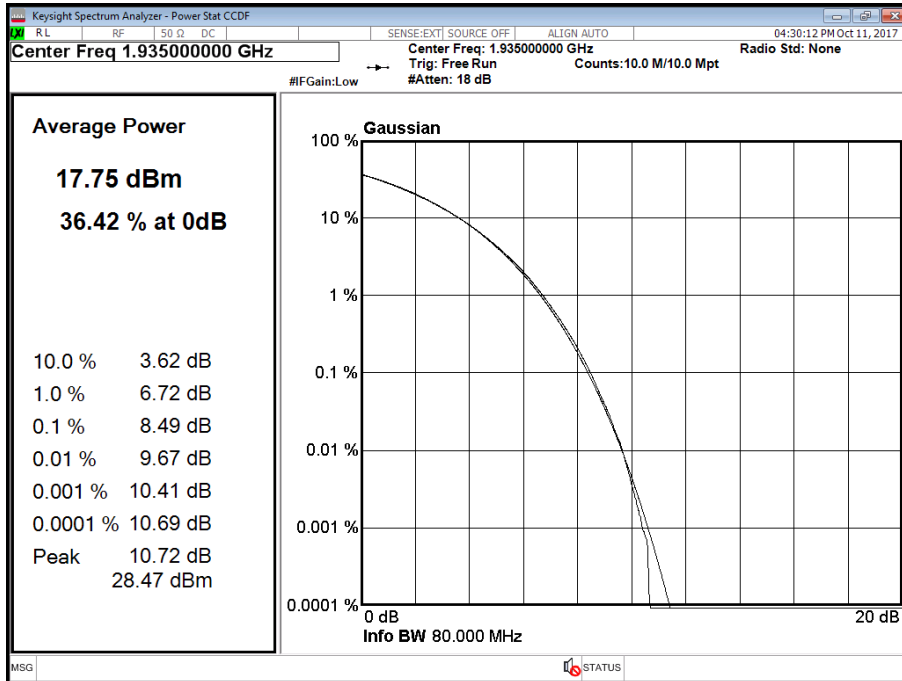
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B



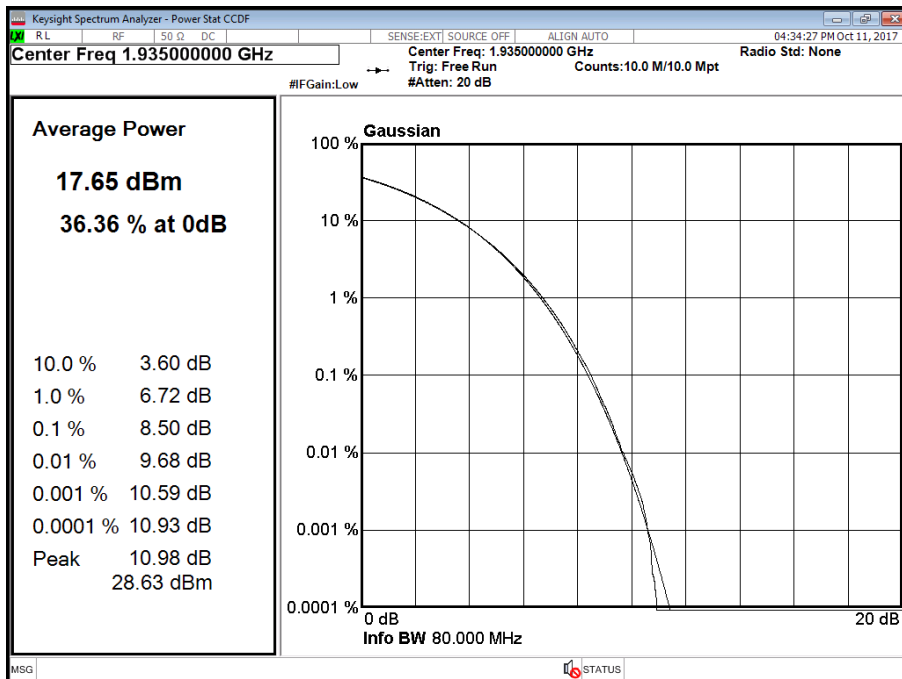


Product Service

Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B



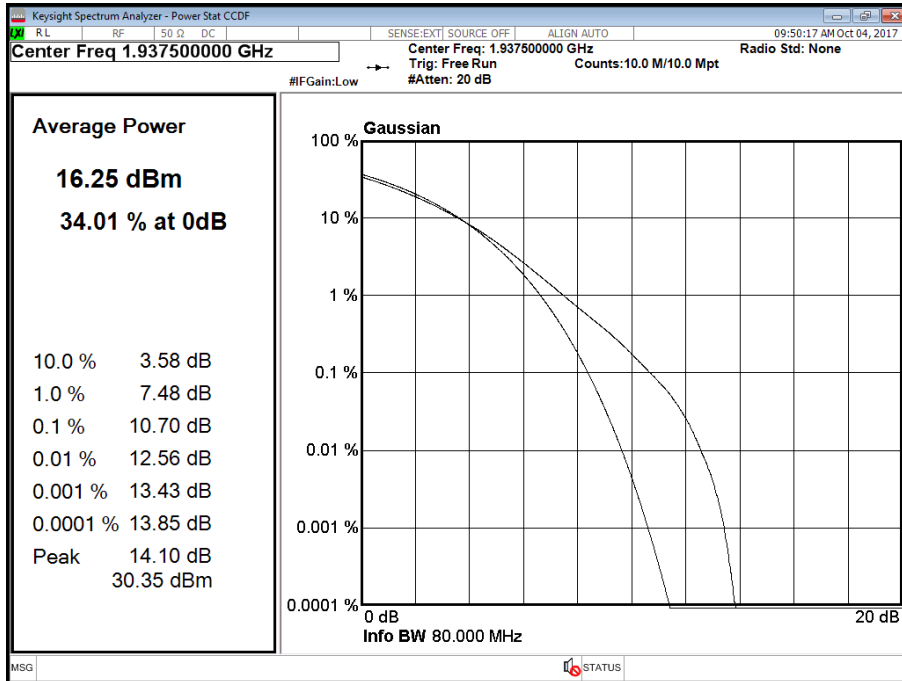
Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B



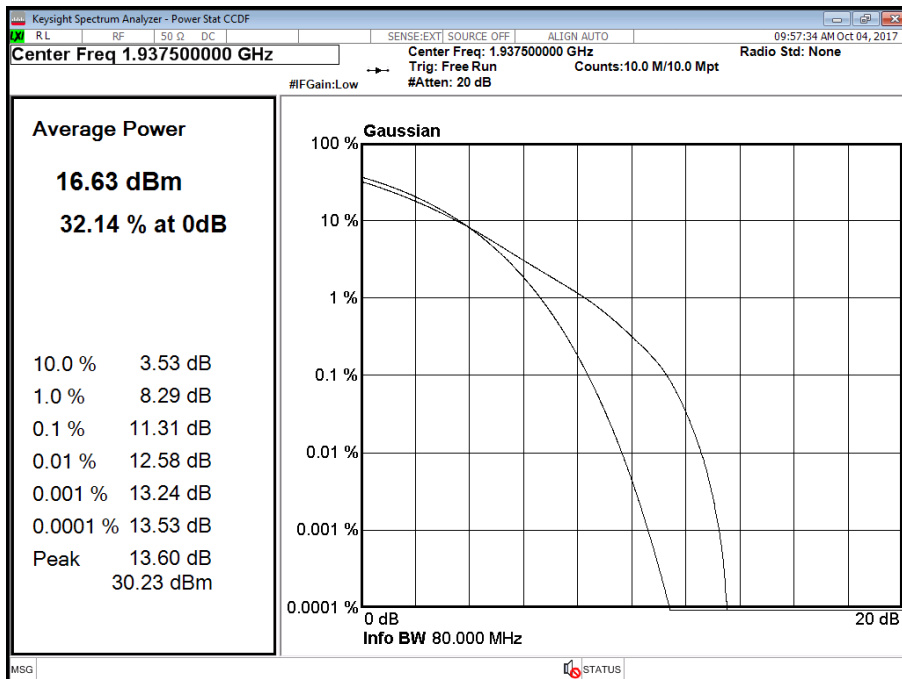


Product Service

Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 15.0 MHz - Channel Position B



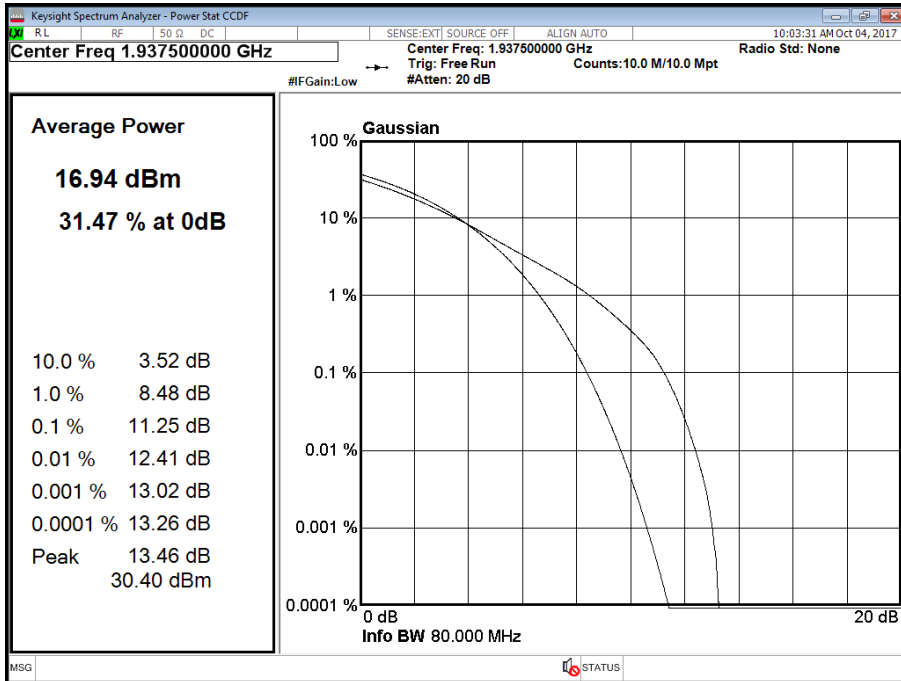
Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position B



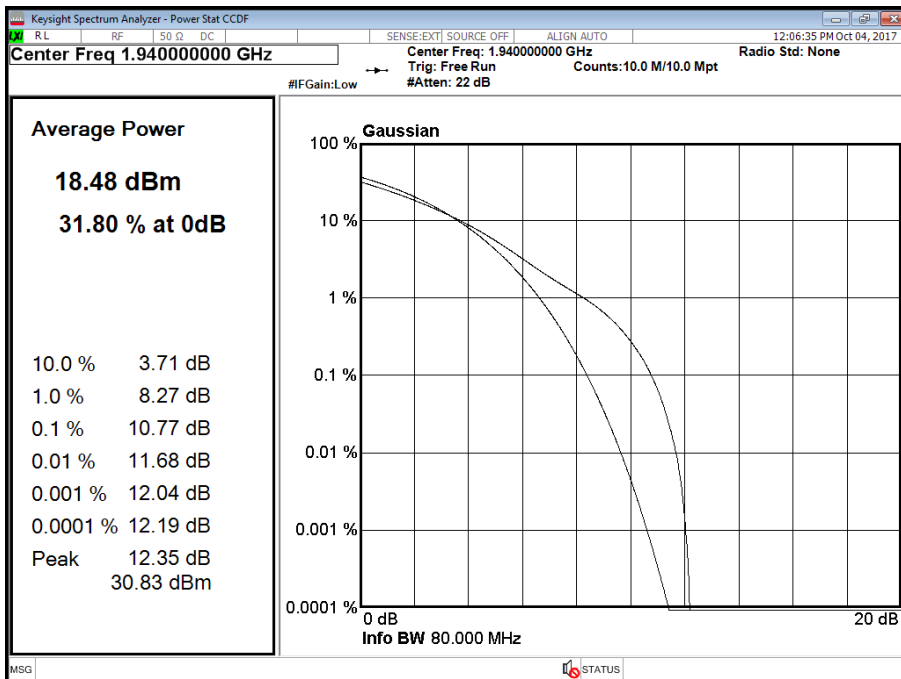


Product Service

Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position B



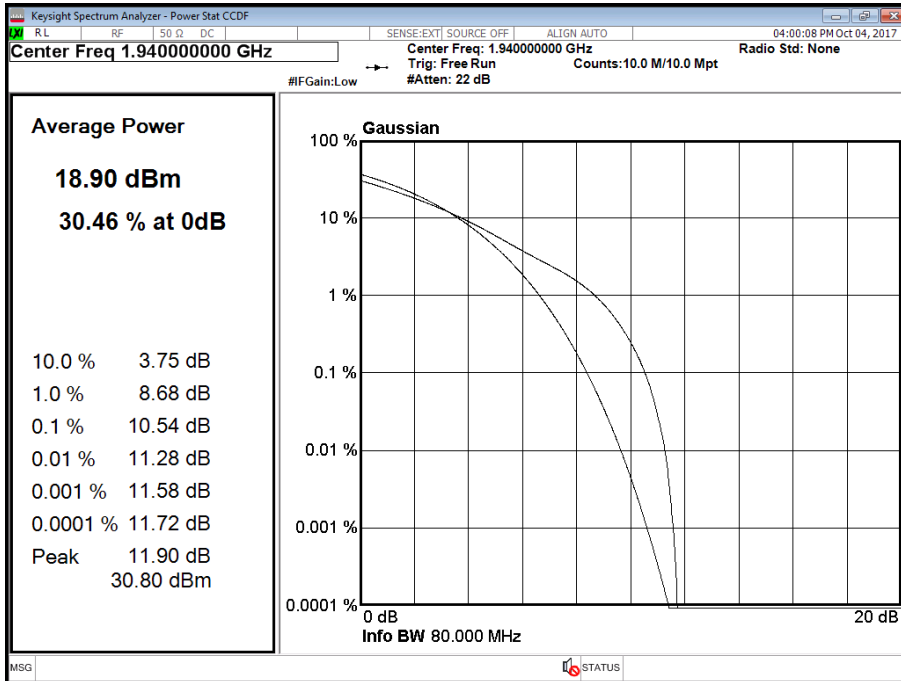
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B



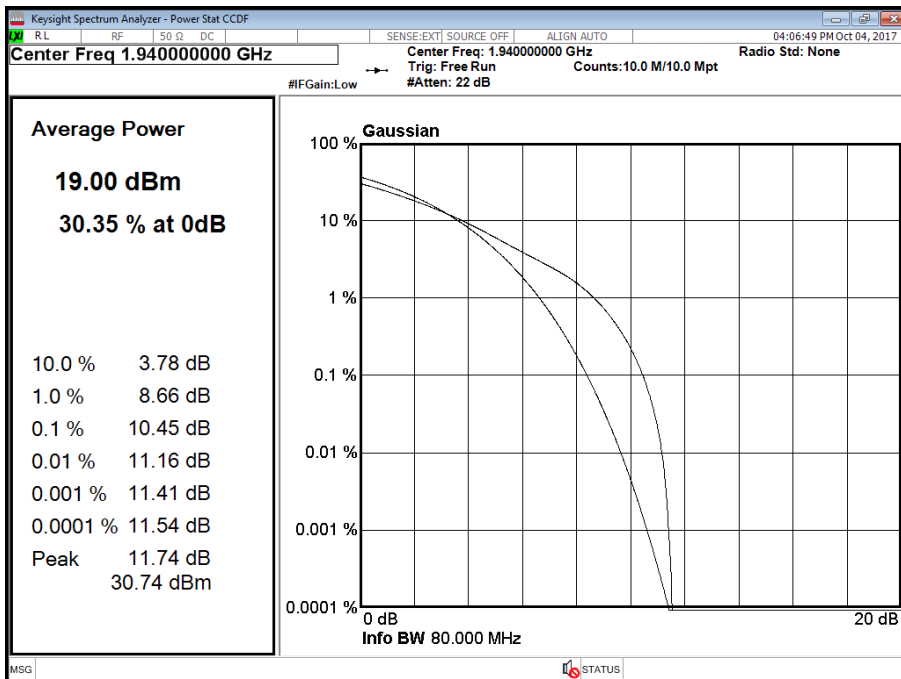


Product Service

Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position B



Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position B





Product Service

Configuration 1

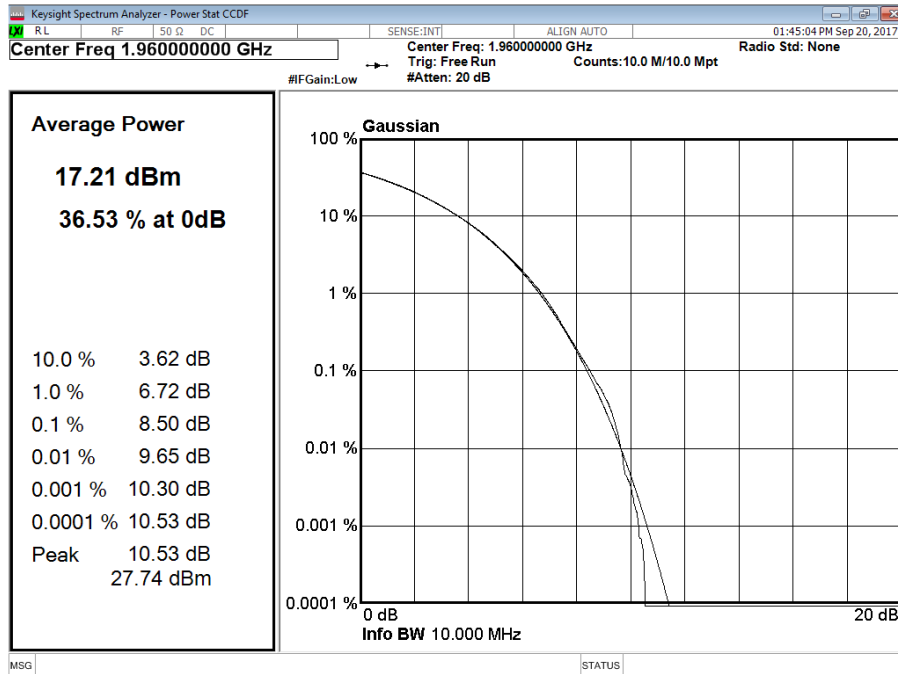
Maximum Output Power 20 dBm

| Antenna | LTE Modulation | LTE Carrier Bandwidth | Peak to Average Ratio (PAR) / Output Power | | |
|---------|----------------|-----------------------|--|---------------|-------|
| | | | Channel Position M | | |
| | | | PAR (dB) | Average Power | |
| dBm | dBm/MHz | | | | |
| A | QPSK | 3.0 MHz | 8.50 | 17.22 | 13.49 |
| B | QPSK | 3.0 MHz | 8.53 | 17.77 | 14.03 |
| Total | | | - | 20.51 | 16.78 |
| A | 16QAM | 3.0 MHz | 8.52 | 17.22 | 13.77 |
| B | 16QAM | 3.0 MHz | 8.54 | 17.81 | 14.34 |
| Total | | | - | 20.54 | 17.07 |
| A | 64QAM | 3.0 MHz | 8.49 | 17.26 | 13.41 |
| B | 64QAM | 3.0 MHz | 8.48 | 17.62 | 13.83 |
| Total | | | - | 20.45 | 16.64 |
| A | QPSK | 5.0 MHz | 8.53 | 17.68 | 11.77 |
| B | QPSK | 5.0 MHz | 8.59 | 17.29 | 11.30 |
| Total | | | - | 20.50 | 14.55 |
| A | 16QAM | 5.0 MHz | 8.44 | 17.52 | 12.00 |
| B | 16QAM | 5.0 MHz | 8.48 | 17.12 | 11.48 |
| Total | | | - | 20.33 | 14.76 |
| A | 64QAM | 5.0 MHz | 8.43 | 17.69 | 11.63 |
| B | 64QAM | 5.0 MHz | 8.55 | 17.22 | 11.25 |
| Total | | | - | 20.47 | 14.45 |
| A | QPSK | 10.0 MHz | 8.55 | 16.44 | 7.72 |
| B | QPSK | 10.0 MHz | 8.56 | 16.15 | 7.64 |
| Total | | | - | 19.31 | 10.69 |
| A | 16QAM | 10.0 MHz | 8.55 | 16.04 | 7.61 |
| B | 16QAM | 10.0 MHz | 8.56 | 16.08 | 7.65 |
| Total | | | - | 19.07 | 10.64 |
| A | 64QAM | 10.0 MHz | 8.58 | 16.17 | 7.52 |
| B | 64QAM | 10.0 MHz | 8.57 | 16.06 | 7.45 |
| Total | | | - | 19.13 | 10.50 |
| A | QPSK | 15.0 MHz | 8.61 | 16.17 | 5.80 |
| B | QPSK | 15.0 MHz | 11.20 | 17.71 | 8.02 |
| Total | | | - | 20.02 | 10.06 |
| A | 16QAM | 15.0 MHz | 11.04 | 16.74 | 7.24 |
| B | 16QAM | 15.0 MHz | 11.22 | 17.76 | 8.98 |
| Total | | | - | 20.29 | 11.21 |
| A | 64QAM | 15.0 MHz | 11.25 | 17.13 | 6.99 |
| B | 64QAM | 15.0 MHz | 11.18 | 17.75 | 8.31 |
| Total | | | - | 20.46 | 10.71 |
| A | QPSK | 20.0 MHz | 10.75 | 18.37 | 7.09 |
| B | QPSK | 20.0 MHz | 8.67 | 16.85 | 5.26 |
| Total | | | - | 20.69 | 9.28 |
| A | 16QAM | 20.0 MHz | 10.57 | 18.73 | 7.97 |
| B | 16QAM | 20.0 MHz | 10.96 | 17.99 | 6.60 |
| Total | | | - | 21.39 | 10.35 |
| A | 64QAM | 20.0 MHz | 10.46 | 18.90 | 8.21 |
| B | 64QAM | 20.0 MHz | 10.64 | 18.47 | 8.27 |
| Total | | | - | 21.70 | 11.25 |

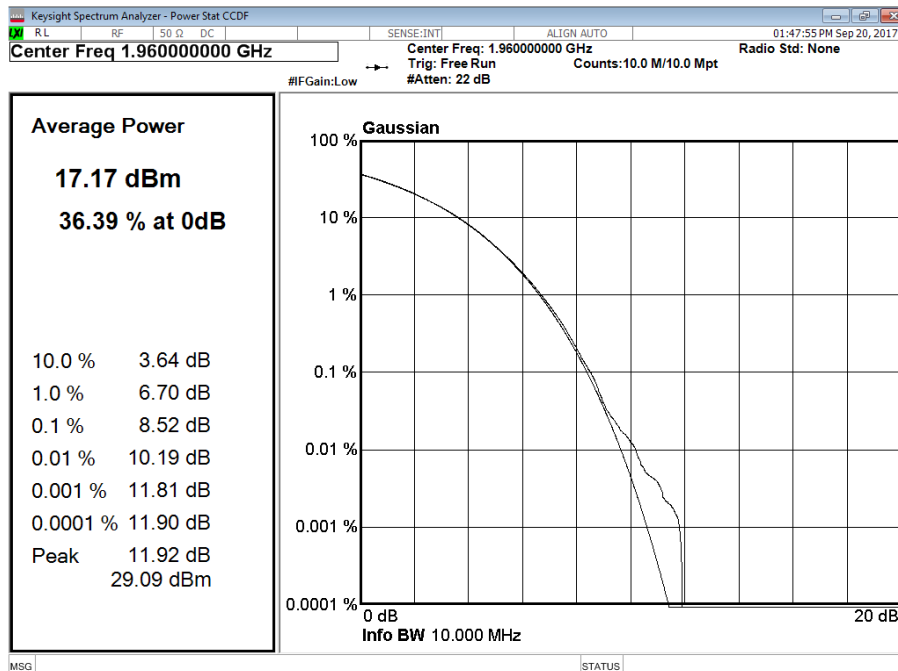


Product Service

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position M



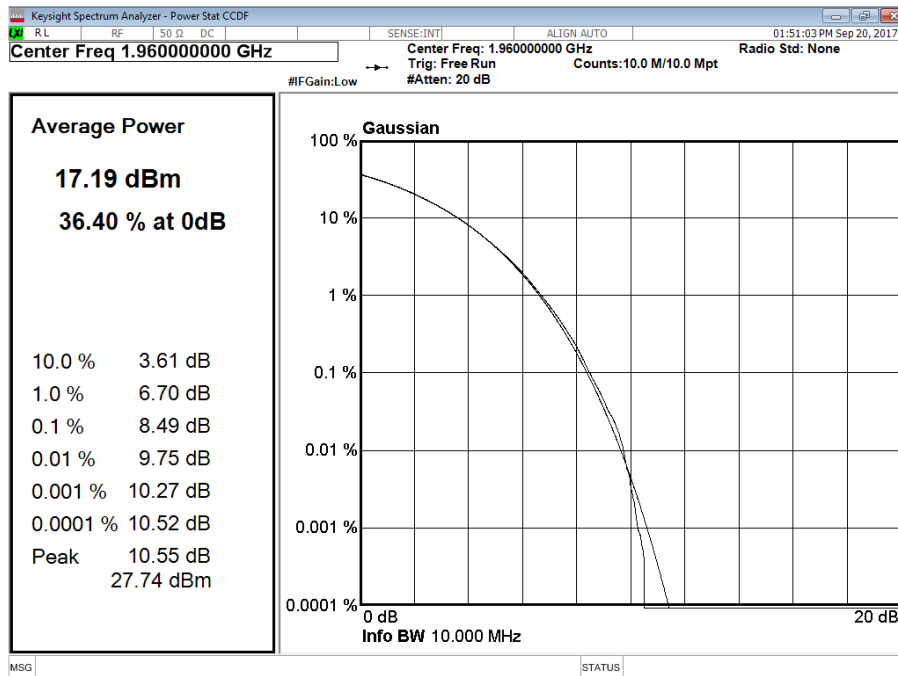
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position M



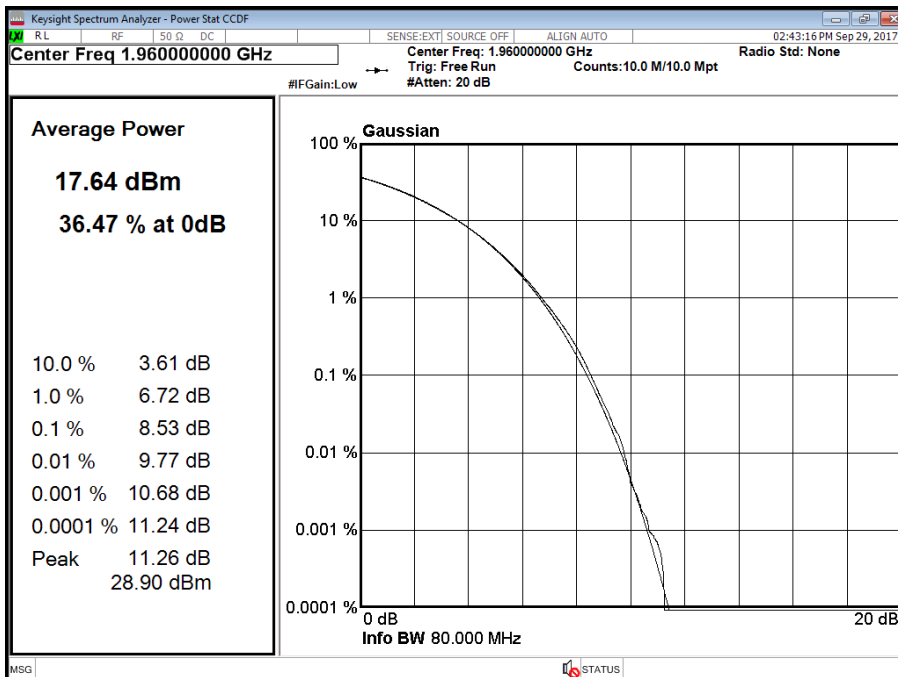


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position M



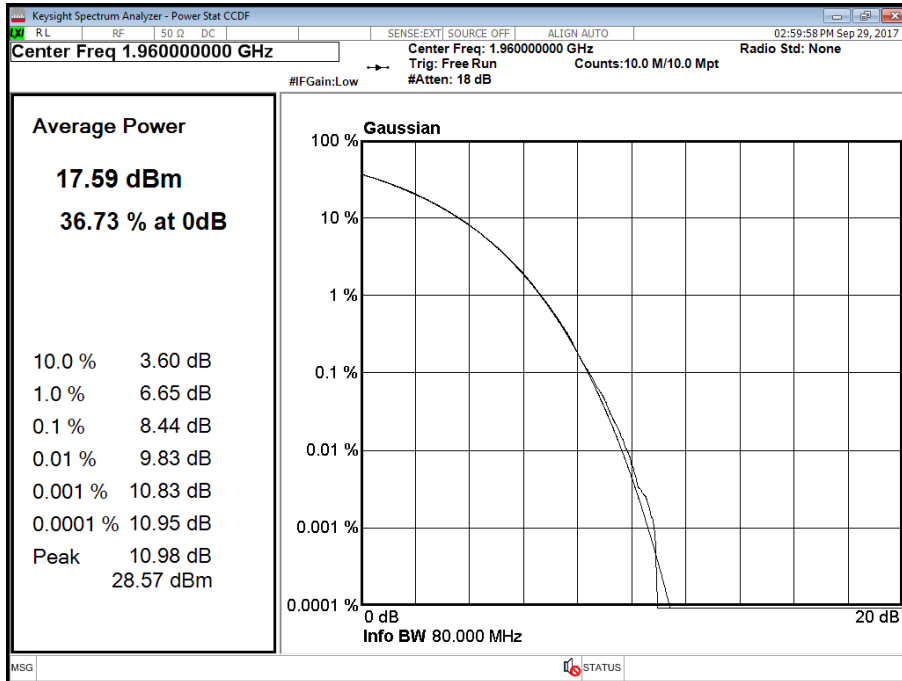
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



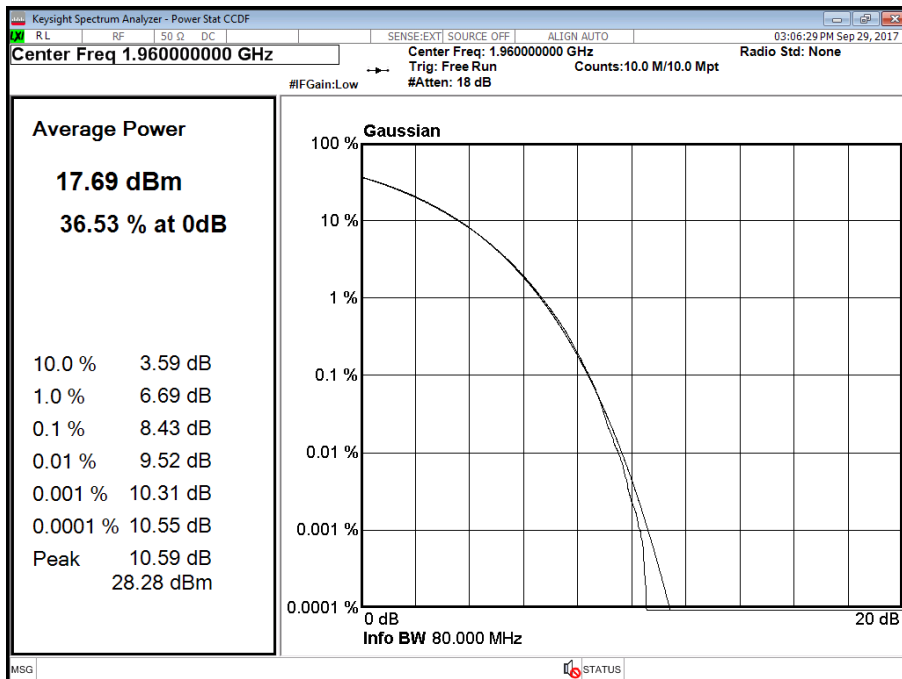


Product Service

Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



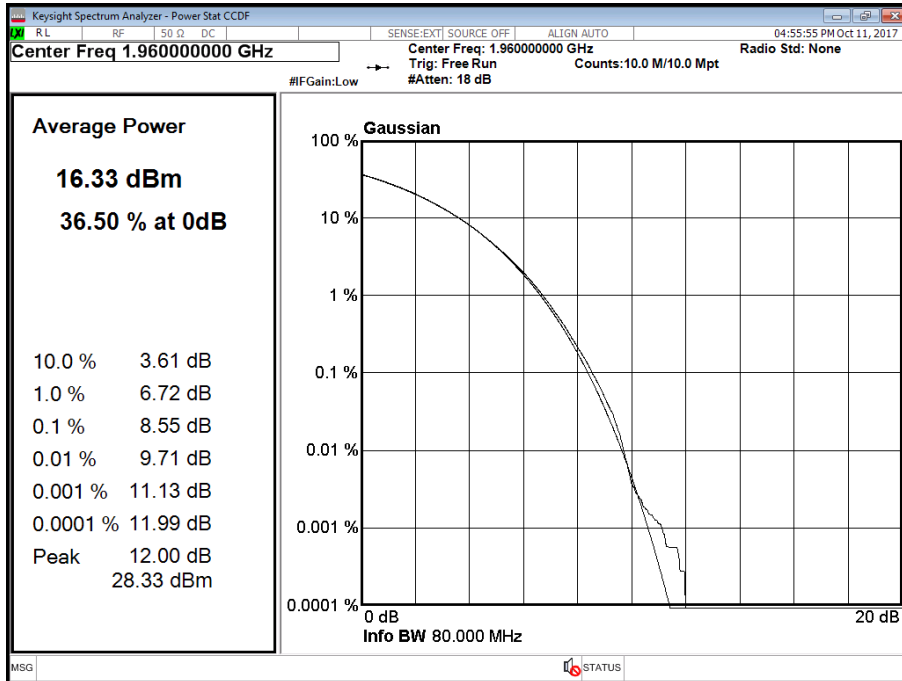
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



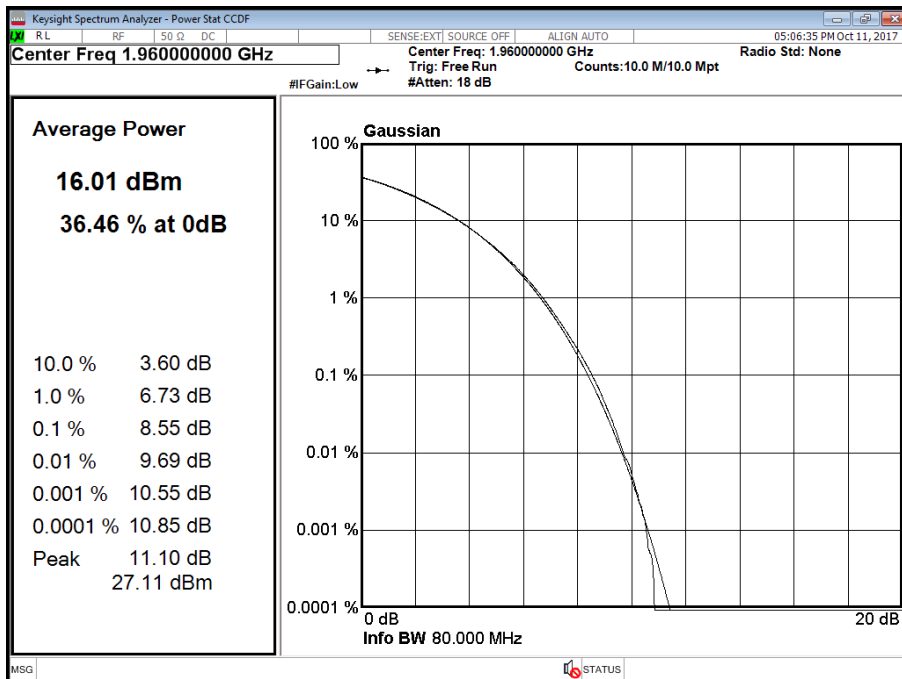


Product Service

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



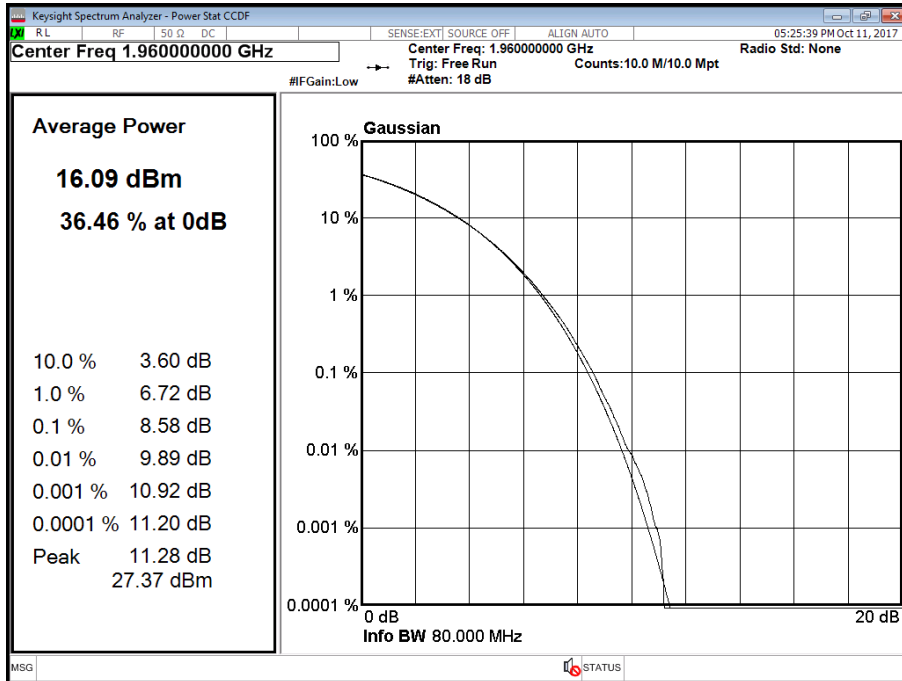
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



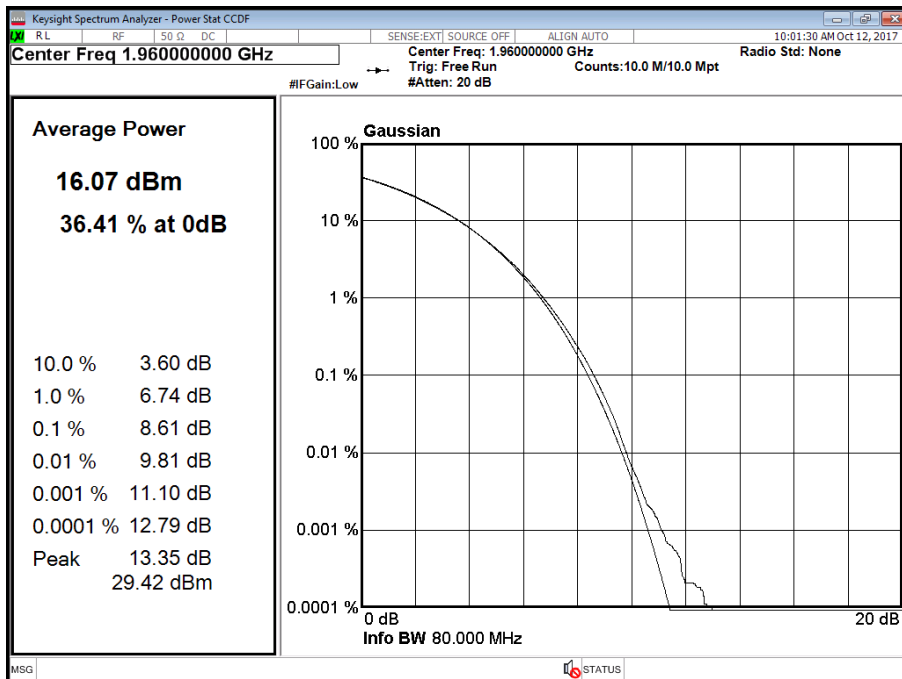


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



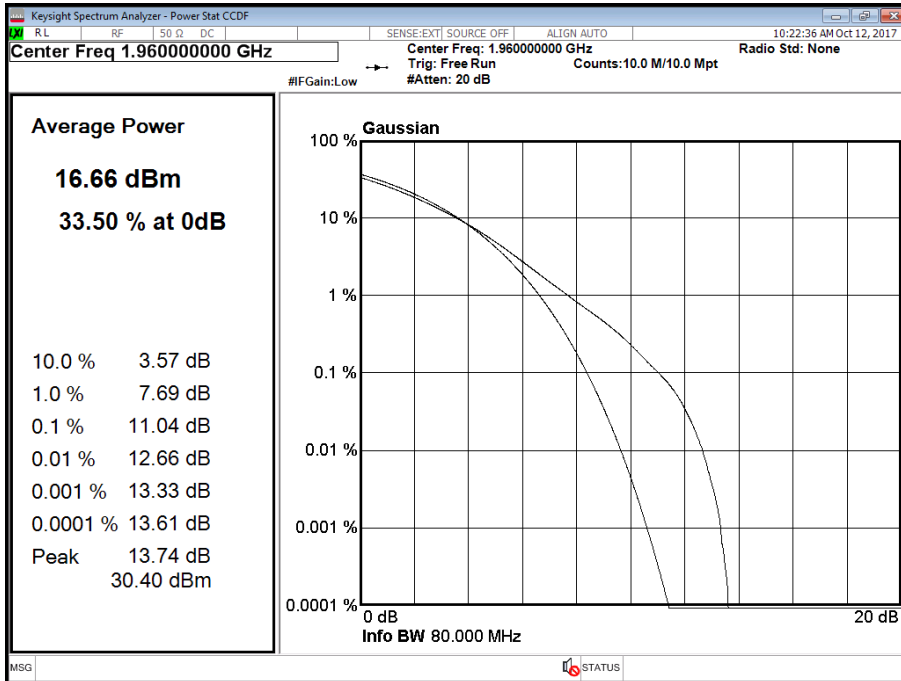
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 15.0 MHz - Channel Position M



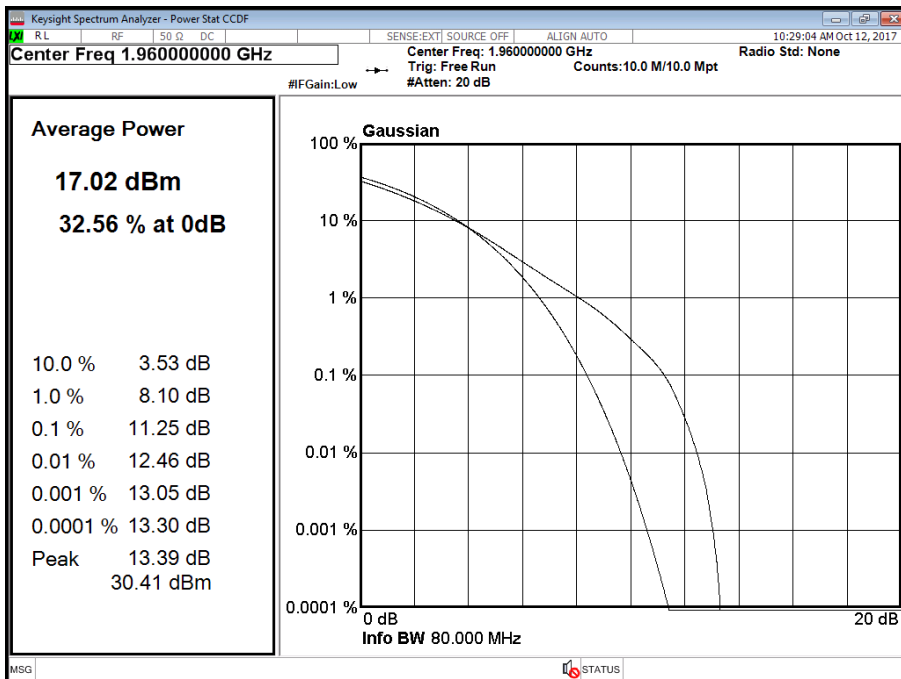


Product Service

Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position M



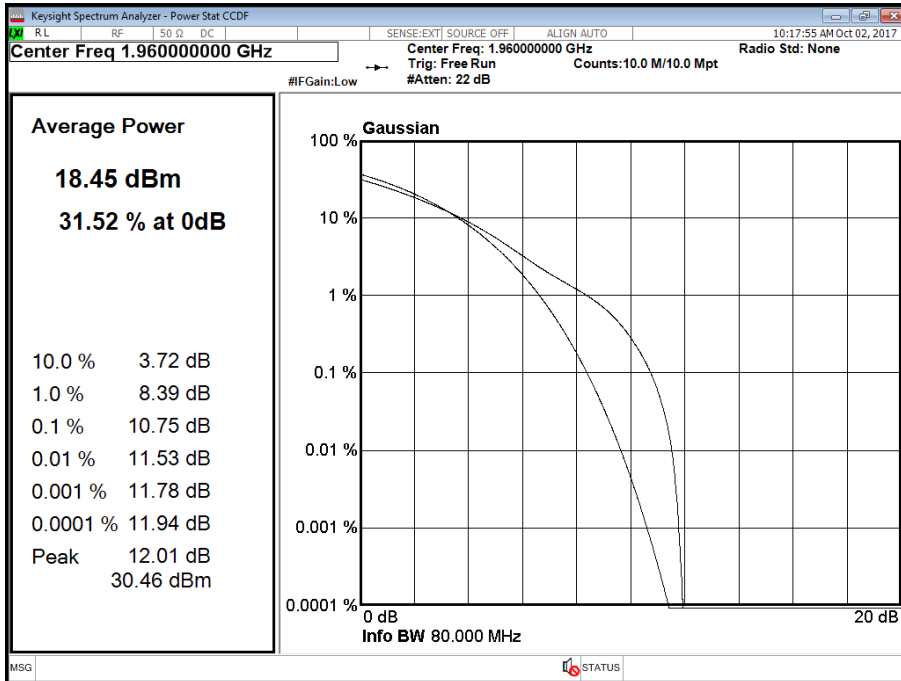
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position M



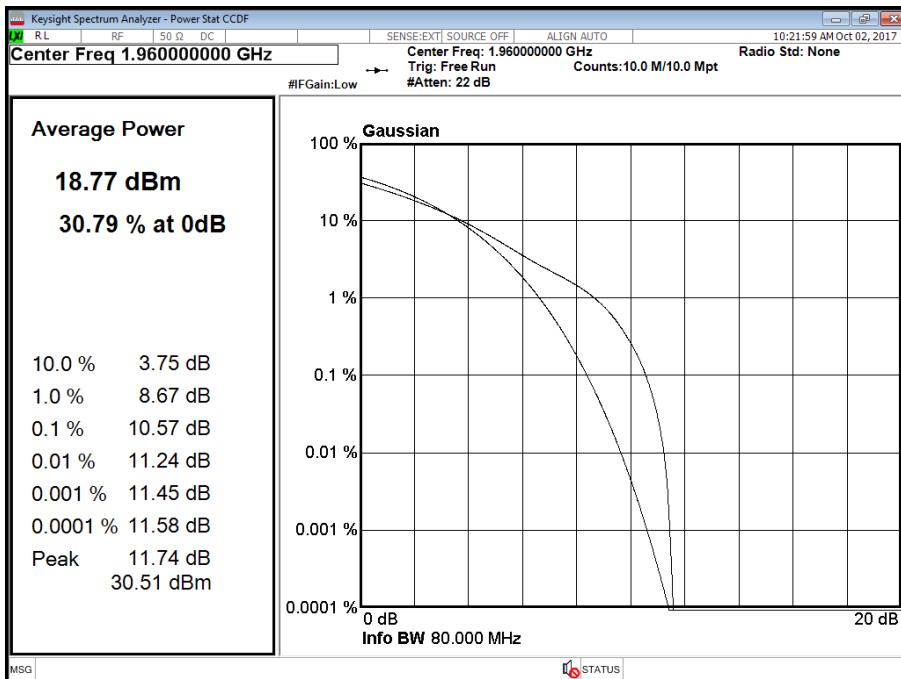


Product Service

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M



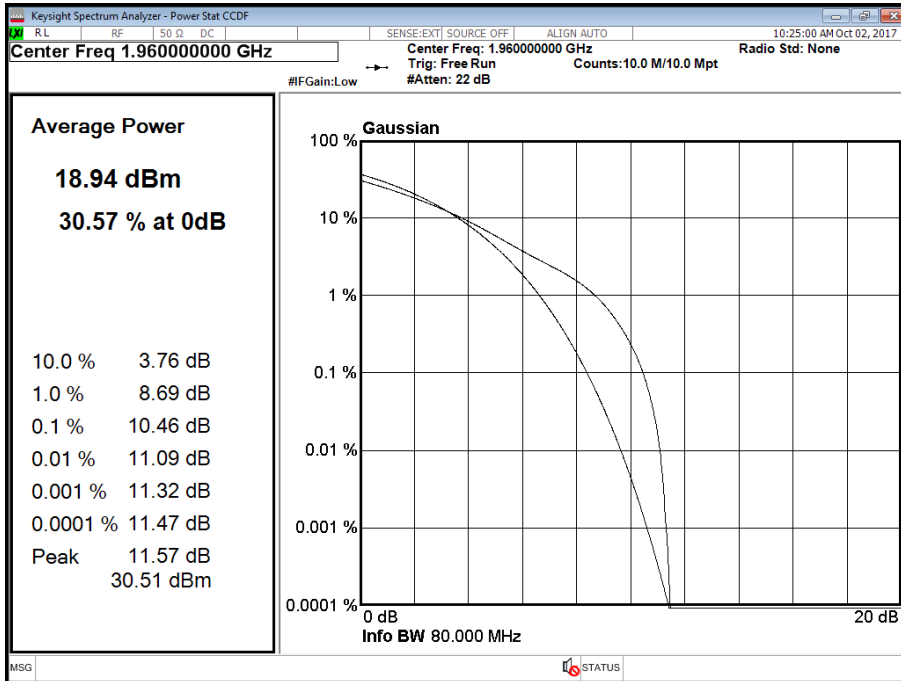
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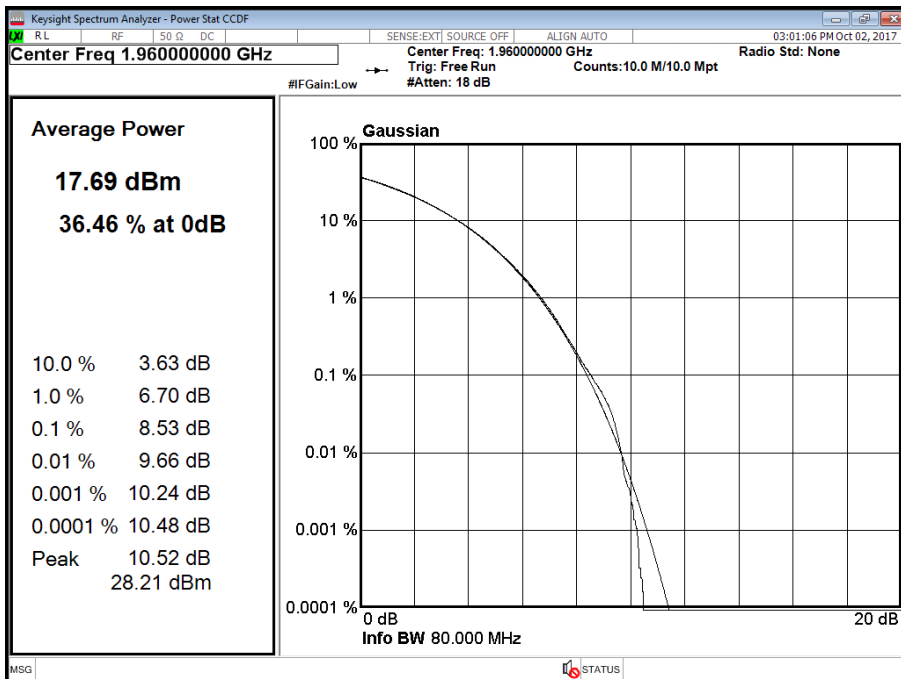


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position M



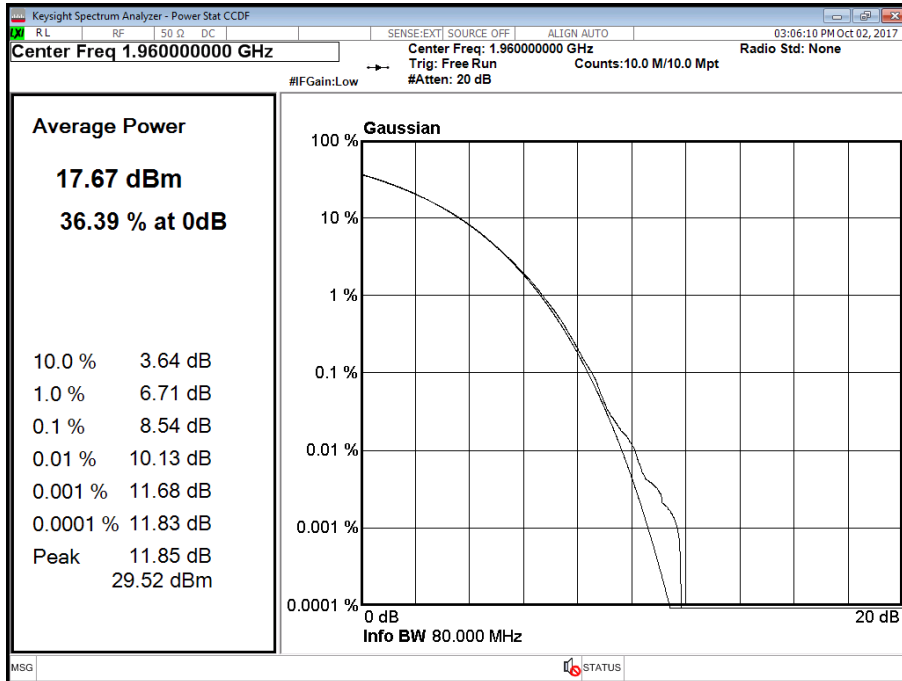
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position M



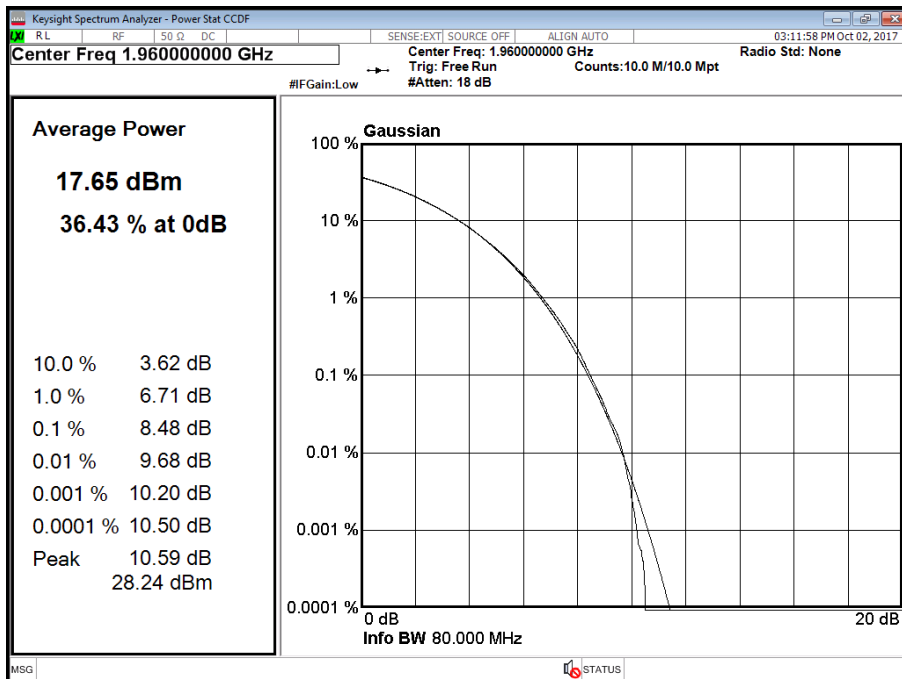


Product Service

Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position M



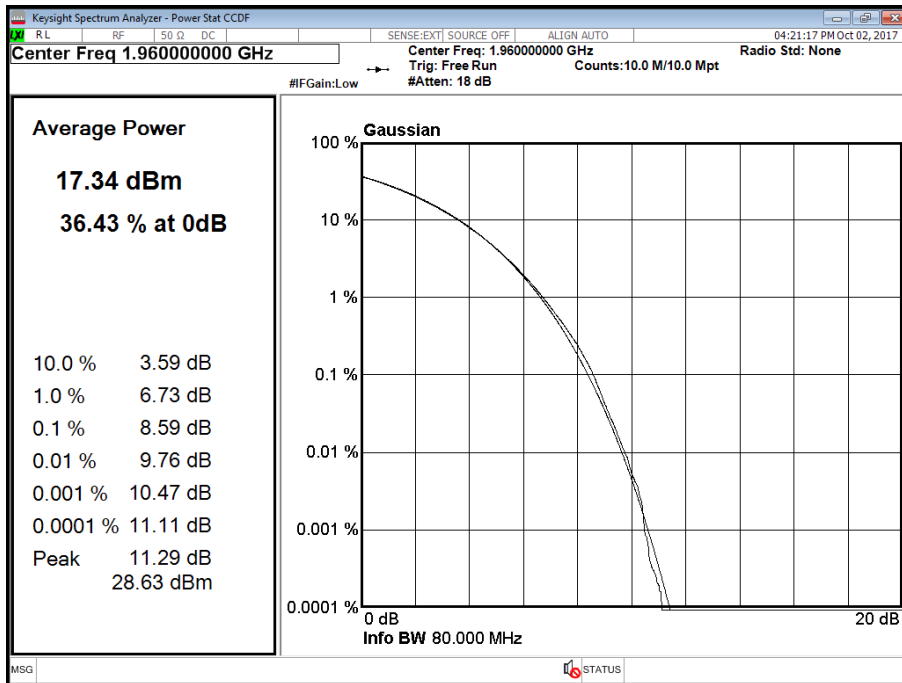
Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position M



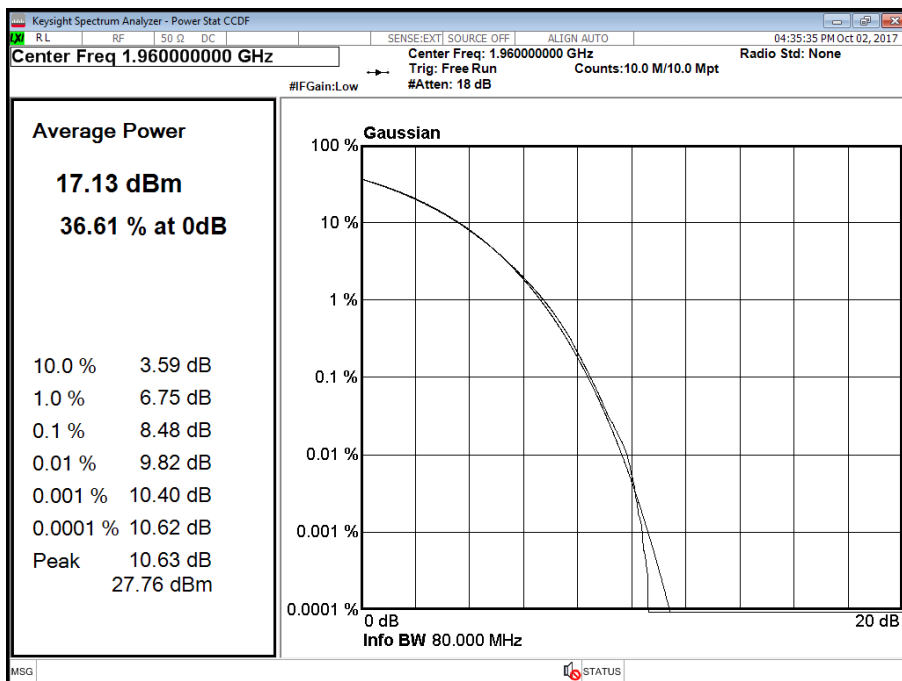


Product Service

Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



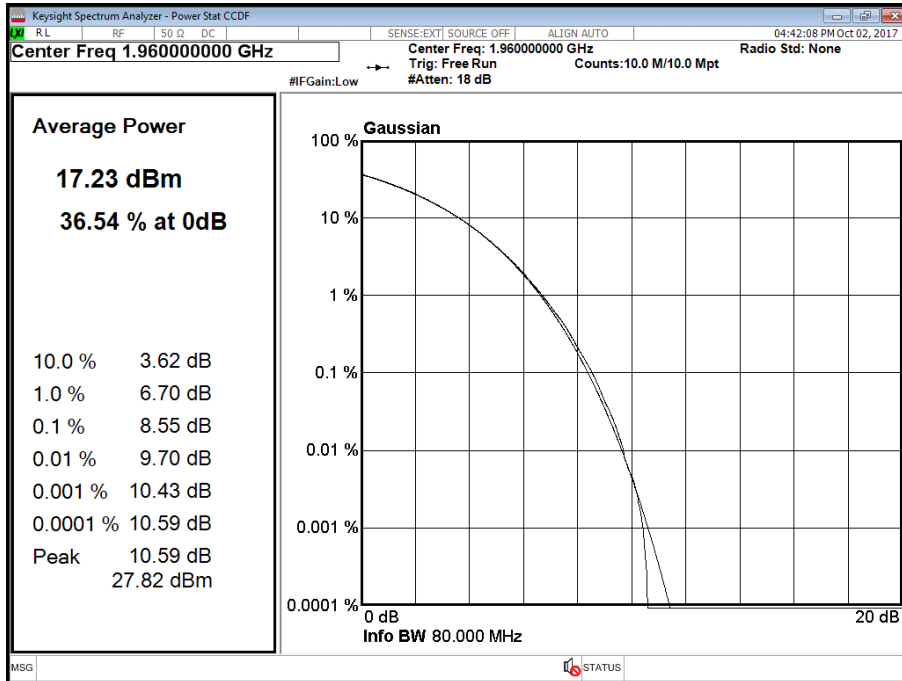
Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



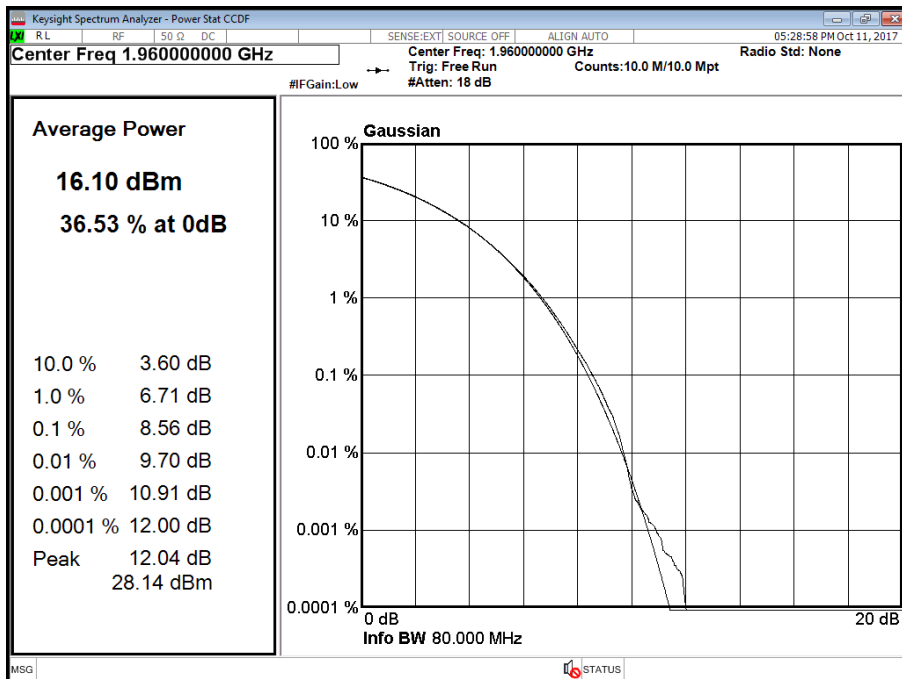


Product Service

Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



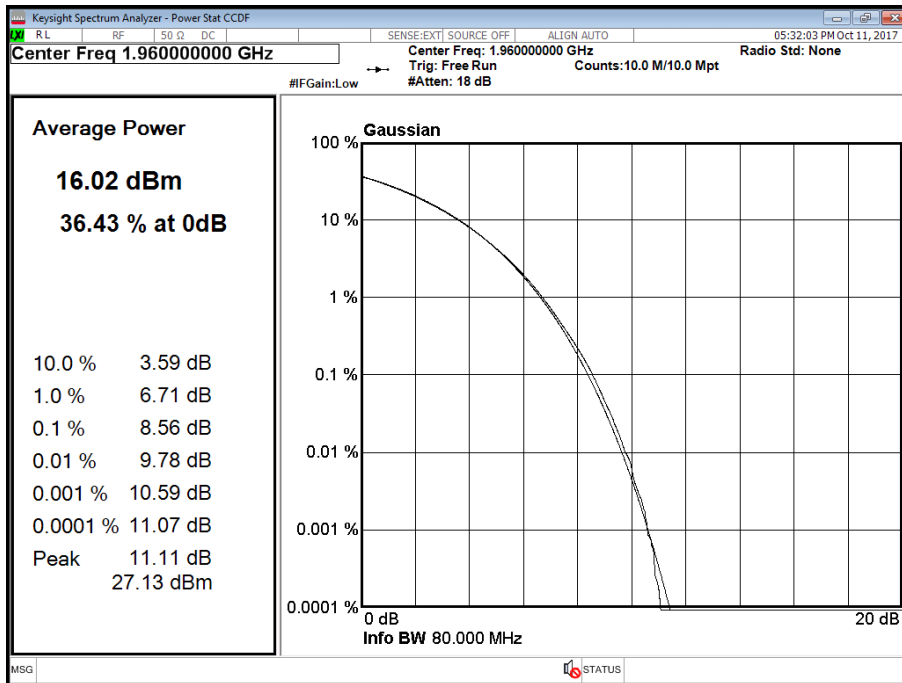
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



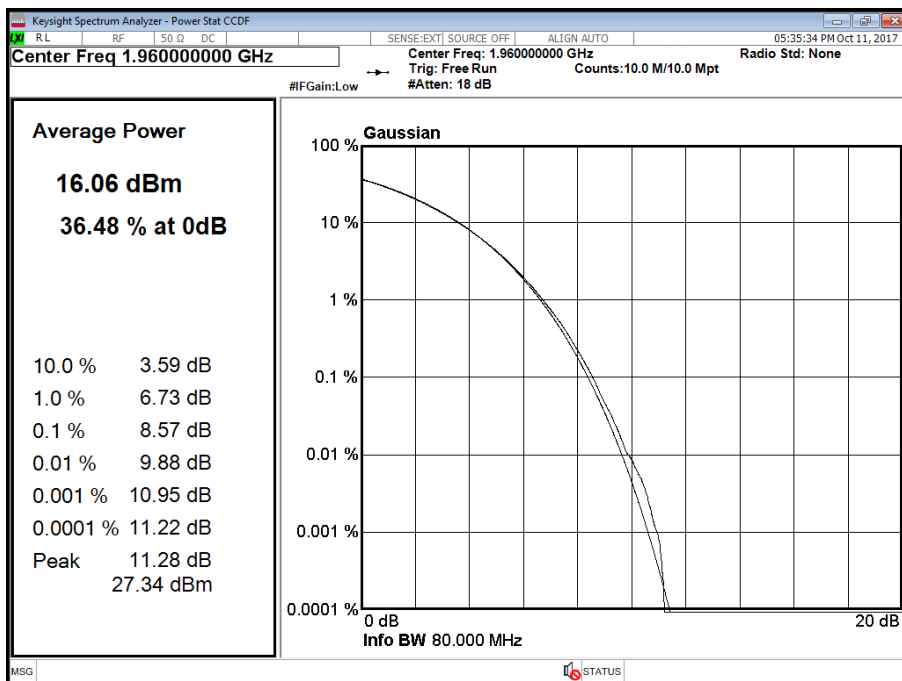


Product Service

Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



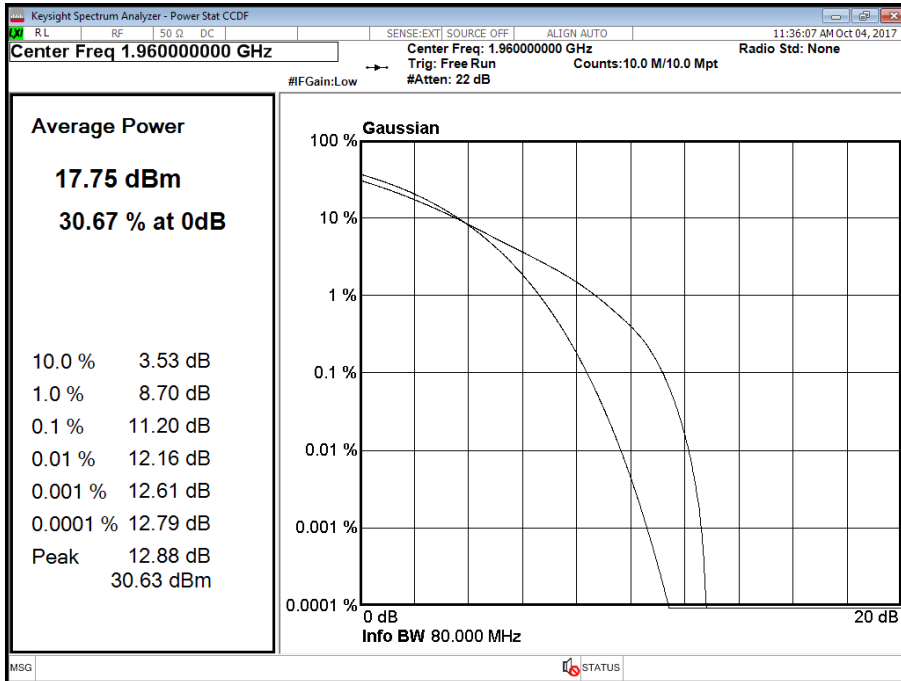
Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



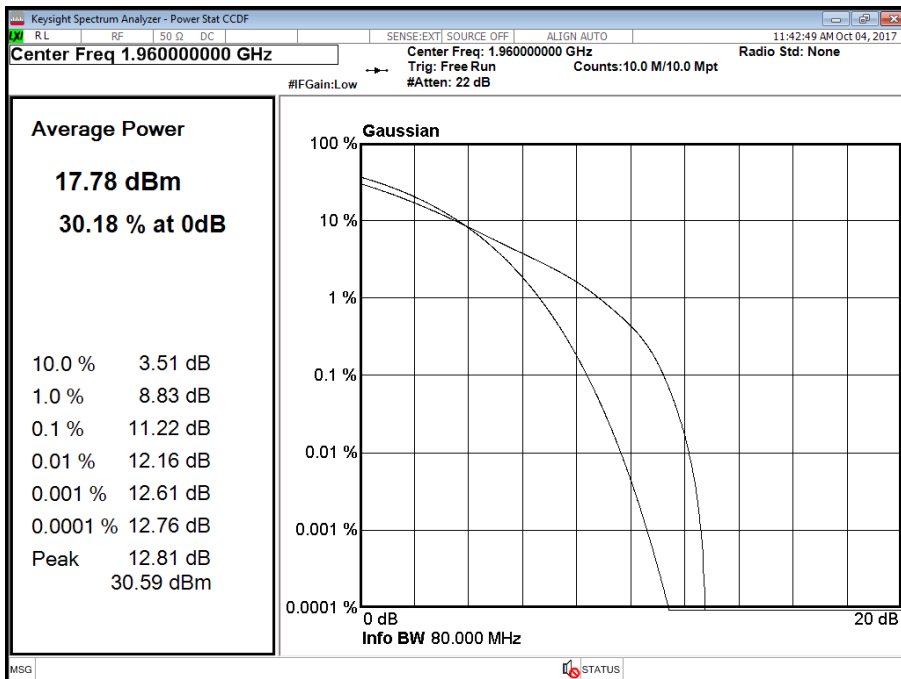


Product Service

Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 15.0 MHz - Channel Position M



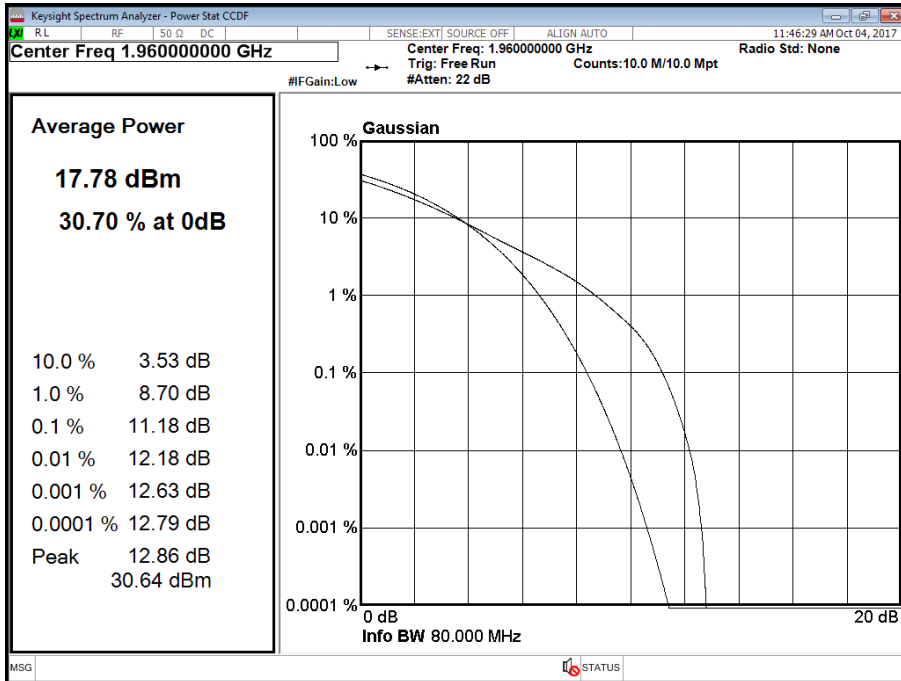
Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position M



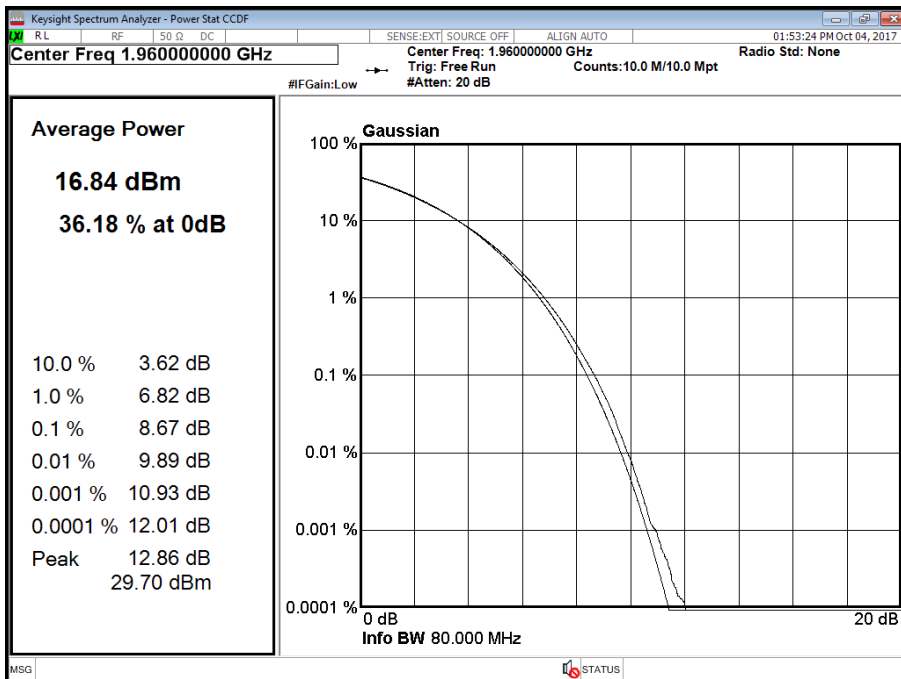


Product Service

Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position M



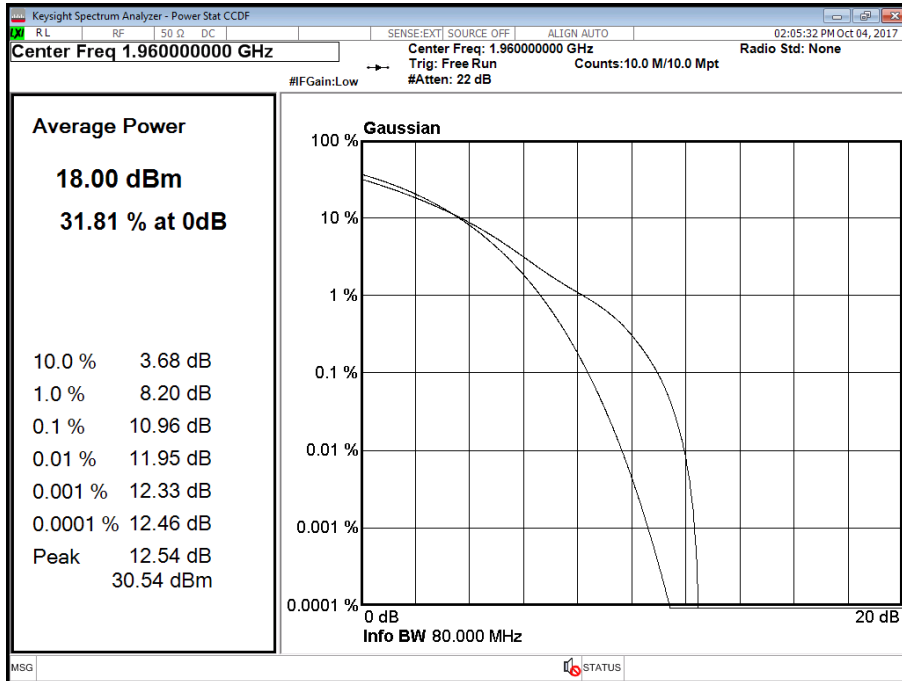
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M



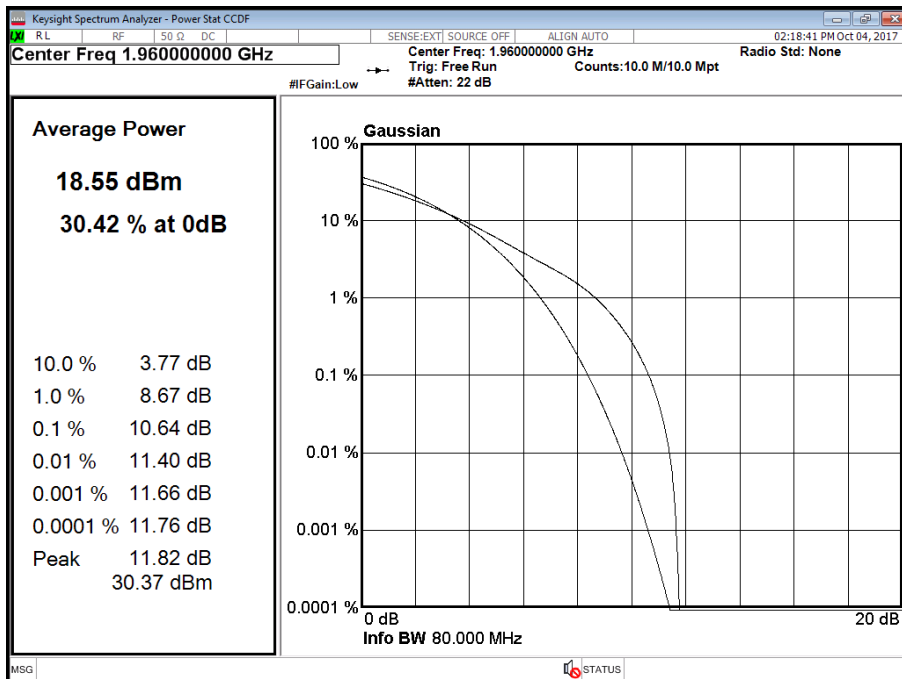


Product Service

Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position M



Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position M





Configuration 1

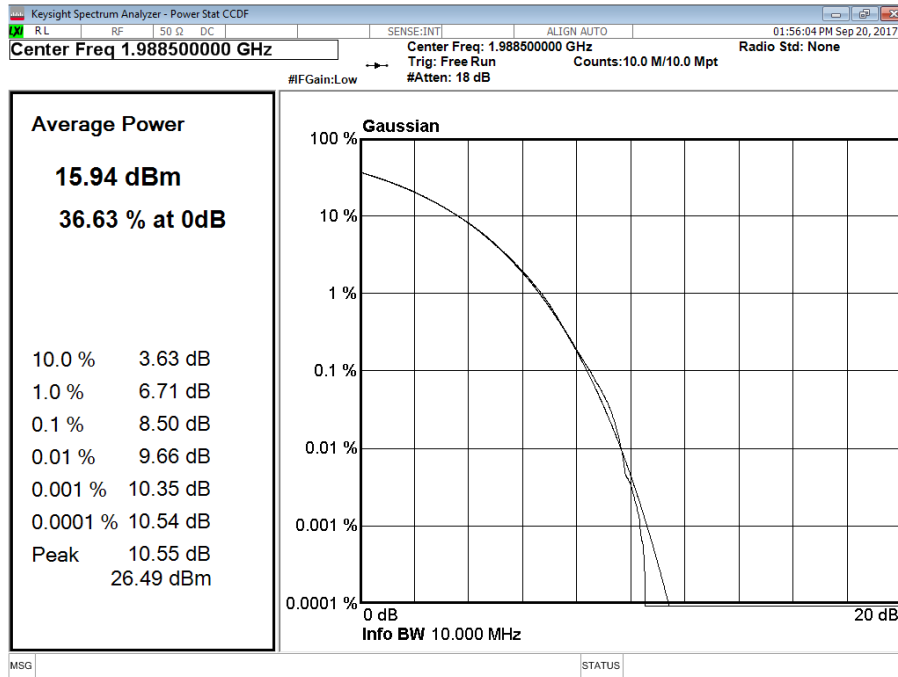
Maximum Output Power 20 dBm

| Antenna | LTE Modulation | LTE Carrier Bandwidth | Peak to Average Ratio (PAR) / Output Power | | |
|---------|----------------|-----------------------|--|---------------|-------|
| | | | Channel Position T | | |
| | | | PAR (dB) | Average Power | |
| dBm | dBm/MHz | | | | |
| A | QPSK | 3.0 MHz | 8.50 | 15.93 | 12.12 |
| B | QPSK | 3.0 MHz | 8.53 | 16.75 | 13.06 |
| Total | | | - | 19.37 | 15.63 |
| A | 16QAM | 3.0 MHz | 8.52 | 15.89 | 12.55 |
| B | 16QAM | 3.0 MHz | 8.54 | 16.78 | 13.43 |
| Total | | | - | 19.37 | 16.02 |
| A | 64QAM | 3.0 MHz | 8.47 | 15.91 | 12.19 |
| B | 64QAM | 3.0 MHz | 8.50 | 16.89 | 13.01 |
| Total | | | - | 19.44 | 15.63 |
| A | QPSK | 5.0 MHz | 8.52 | 17.25 | 11.32 |
| B | QPSK | 5.0 MHz | 8.52 | 16.55 | 10.79 |
| Total | | | - | 19.92 | 14.07 |
| A | 16QAM | 5.0 MHz | 8.46 | 16.96 | 11.35 |
| B | 16QAM | 5.0 MHz | 8.46 | 16.32 | 10.70 |
| Total | | | - | 19.66 | 14.05 |
| A | 64QAM | 5.0 MHz | 8.42 | 17.04 | 11.12 |
| B | 64QAM | 5.0 MHz | 8.49 | 16.50 | 10.70 |
| Total | | | - | 19.79 | 13.93 |
| A | QPSK | 10.0 MHz | 8.48 | 17.87 | 9.38 |
| B | QPSK | 10.0 MHz | 8.49 | 17.98 | 9.45 |
| Total | | | - | 20.94 | 12.43 |
| A | 16QAM | 10.0 MHz | 8.50 | 17.78 | 9.51 |
| B | 16QAM | 10.0 MHz | 8.50 | 17.82 | 9.47 |
| Total | | | - | 20.81 | 12.50 |
| A | 64QAM | 10.0 MHz | 8.50 | 17.91 | 9.45 |
| B | 64QAM | 10.0 MHz | 8.49 | 17.88 | 9.42 |
| Total | | | - | 20.91 | 12.45 |
| A | QPSK | 15.0 MHz | 11.05 | 16.54 | 6.74 |
| B | QPSK | 15.0 MHz | 11.25 | 17.37 | 8.08 |
| Total | | | - | 19.99 | 10.47 |
| A | 16QAM | 15.0 MHz | 11.42 | 17.01 | 7.87 |
| B | 16QAM | 15.0 MHz | 11.24 | 17.52 | 8.79 |
| Total | | | - | 20.28 | 11.36 |
| A | 64QAM | 15.0 MHz | 11.23 | 17.27 | 7.86 |
| B | 64QAM | 15.0 MHz | 11.12 | 17.60 | 8.61 |
| Total | | | - | 20.45 | 11.26 |
| A | QPSK | 20.0 MHz | 10.57 | 19.20 | 8.87 |
| B | QPSK | 20.0 MHz | 10.85 | 18.49 | 7.87 |
| Total | | | - | 21.87 | 11.41 |
| A | 16QAM | 20.0 MHz | 10.26 | 19.50 | 10.08 |
| B | 16QAM | 20.0 MHz | 10.57 | 18.78 | 8.82 |
| Total | | | - | 22.17 | 12.51 |
| A | 64QAM | 20.0 MHz | 10.24 | 19.51 | 10.41 |
| B | 64QAM | 20.0 MHz | 10.56 | 18.85 | 8.82 |
| Total | | | - | 22.20 | 12.70 |

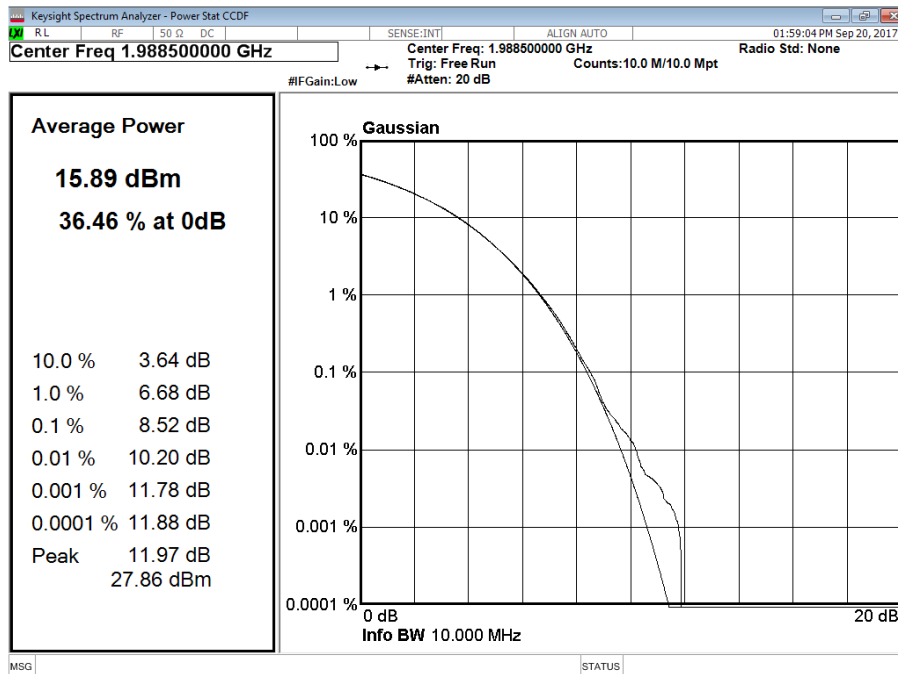


Product Service

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position T



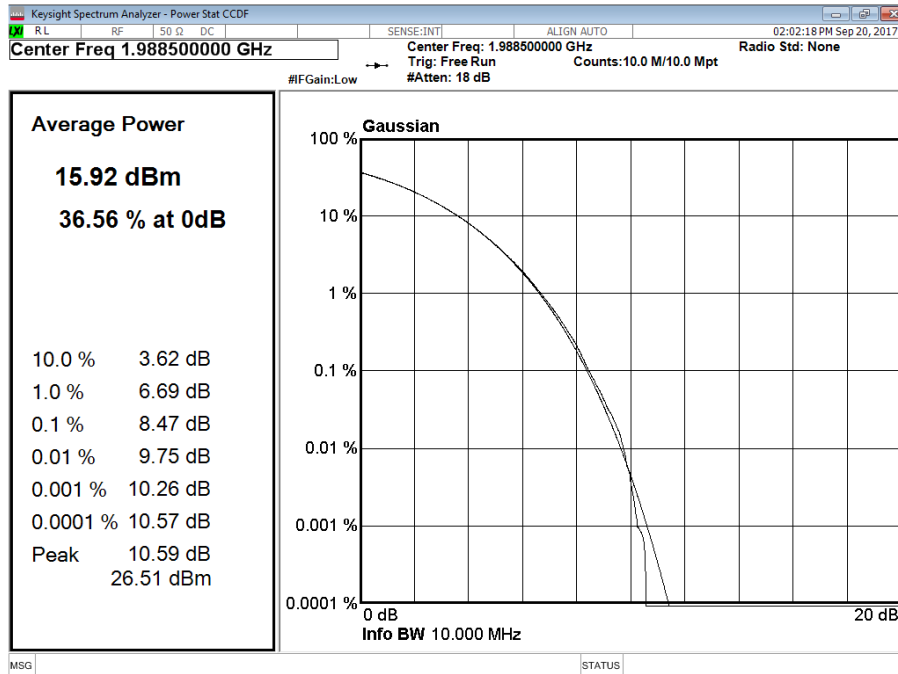
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position T



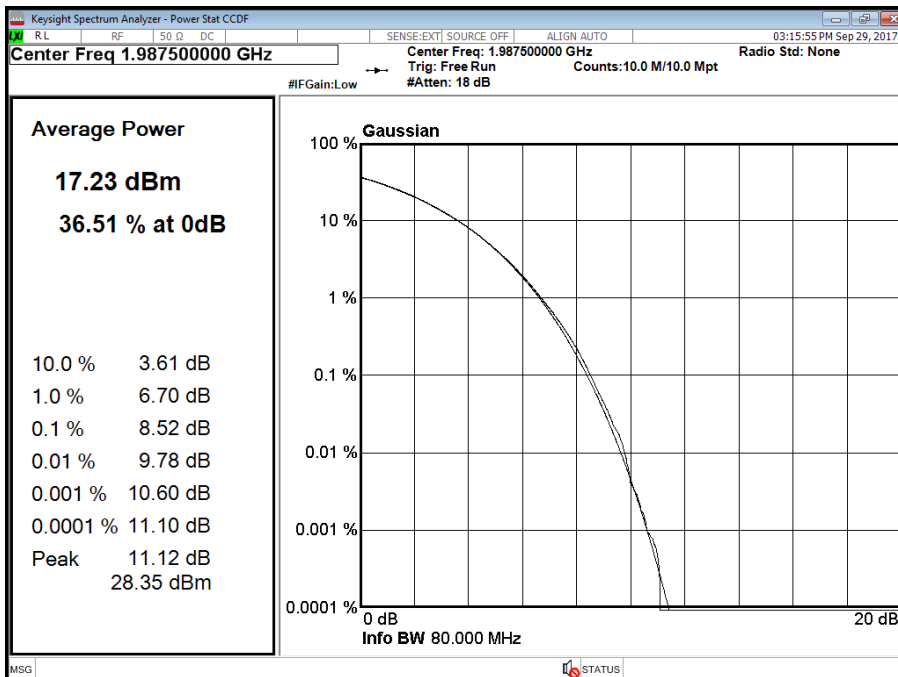


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position T



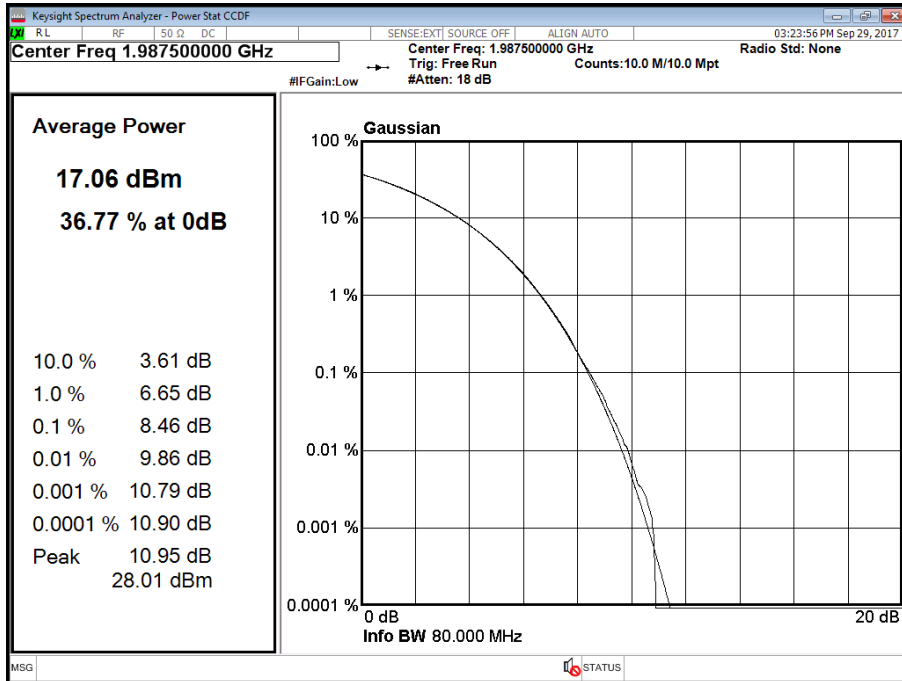
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



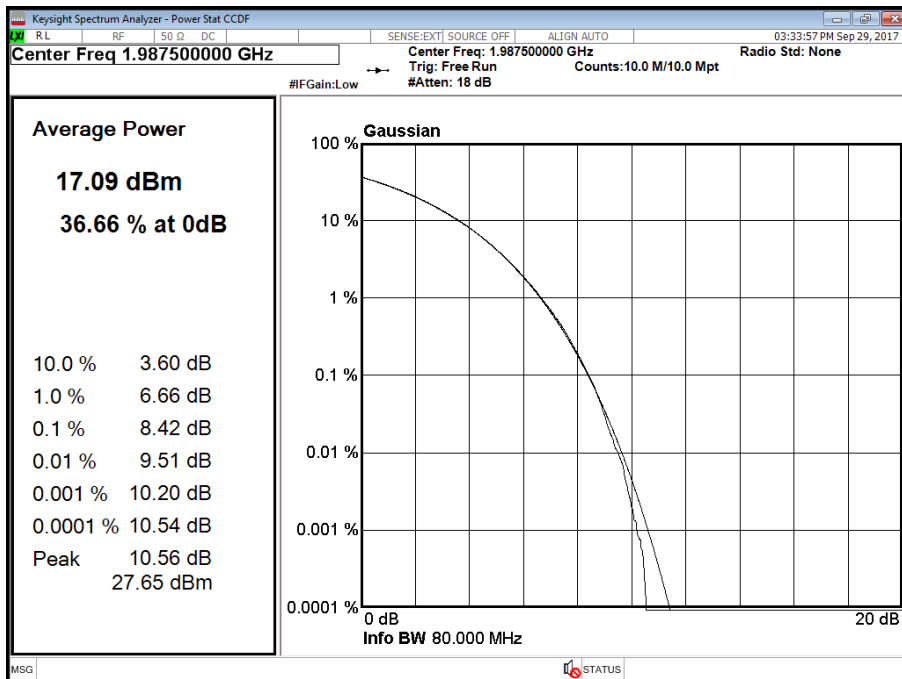


Product Service

Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



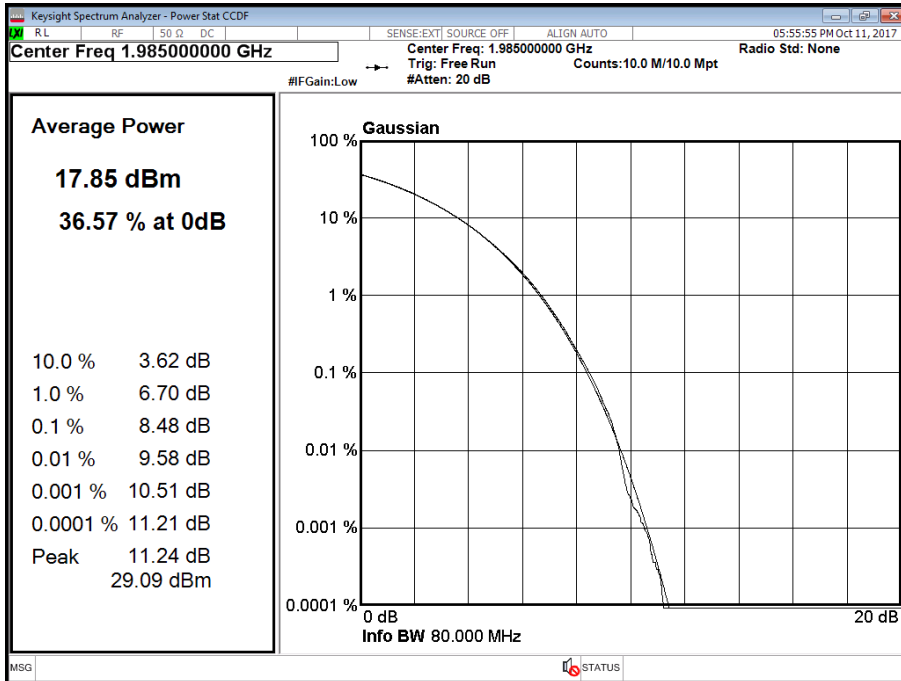
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



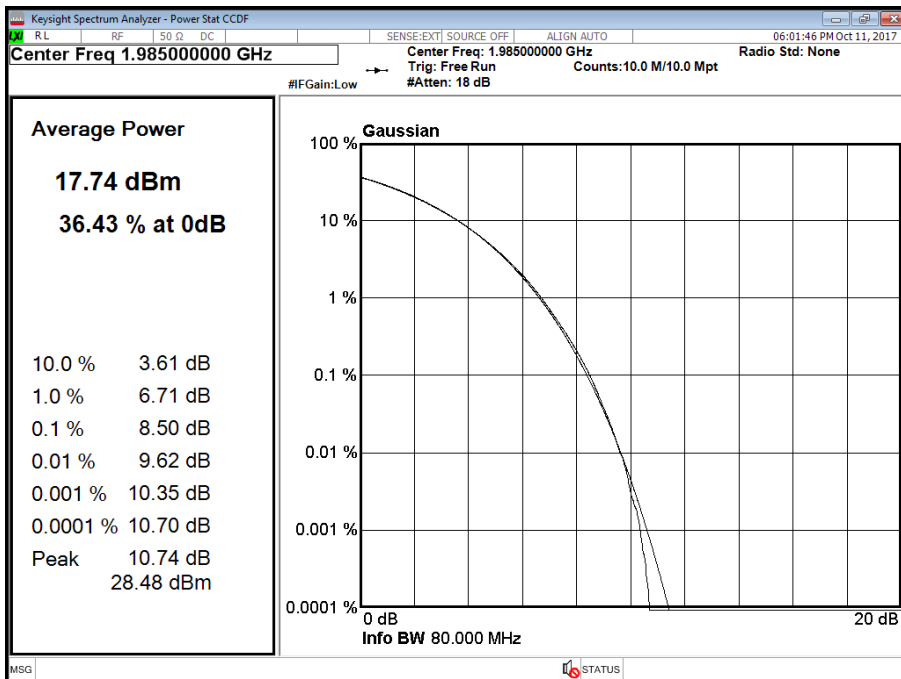


Product Service

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T



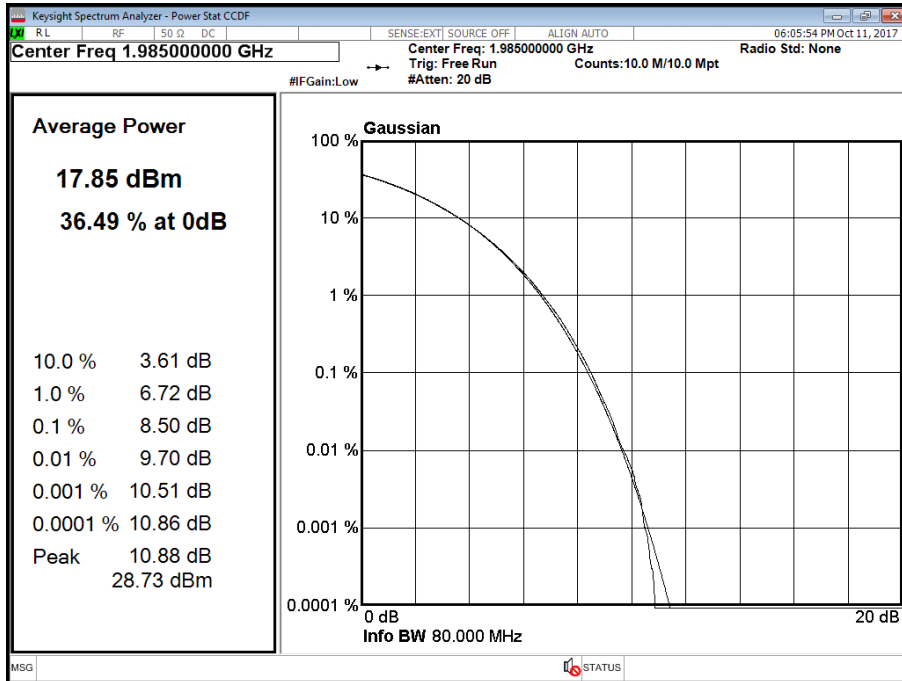
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T



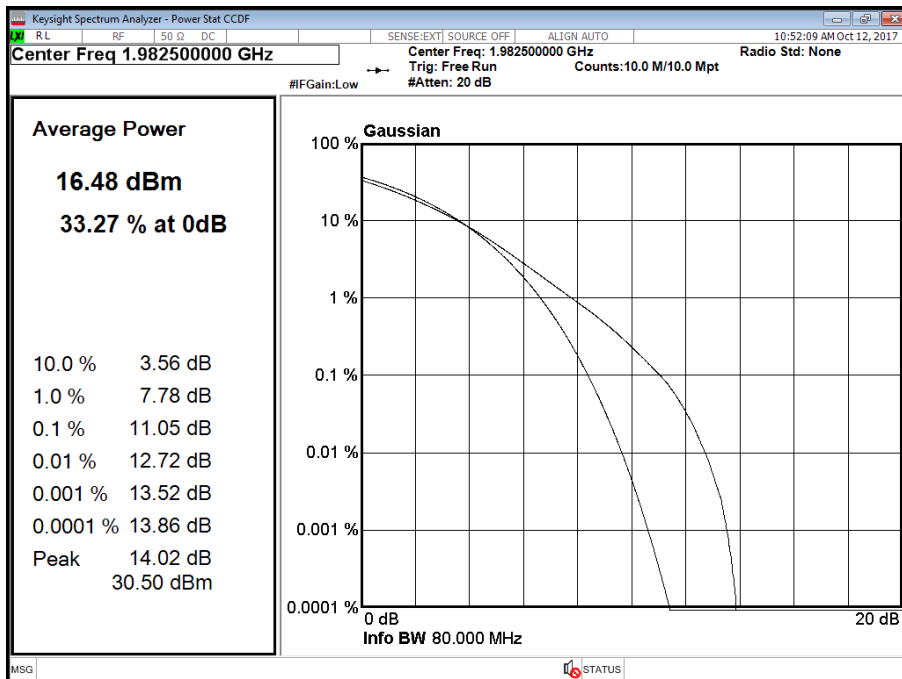


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T



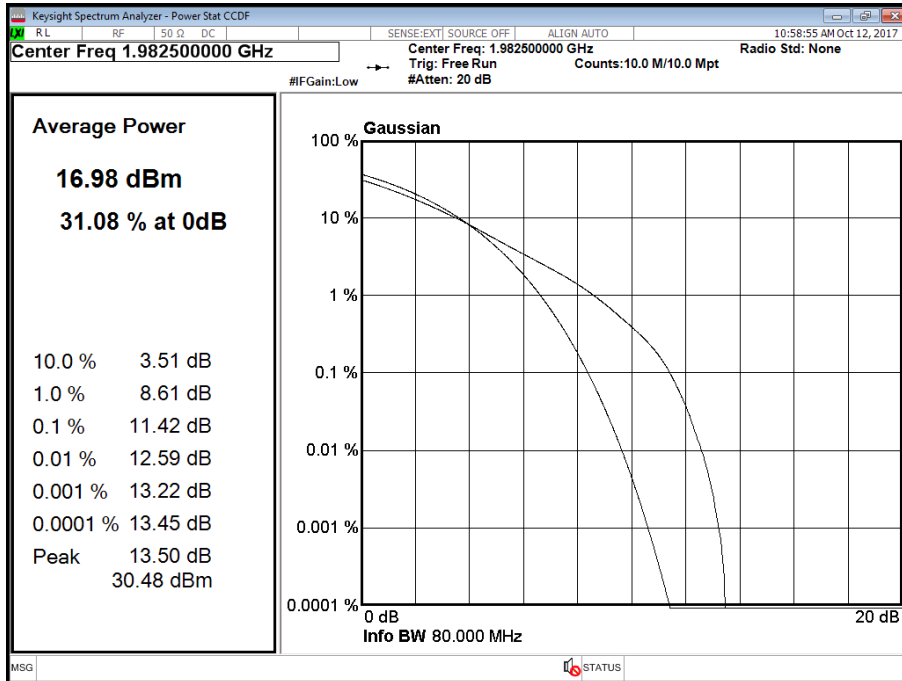
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 15.0 MHz - Channel Position T



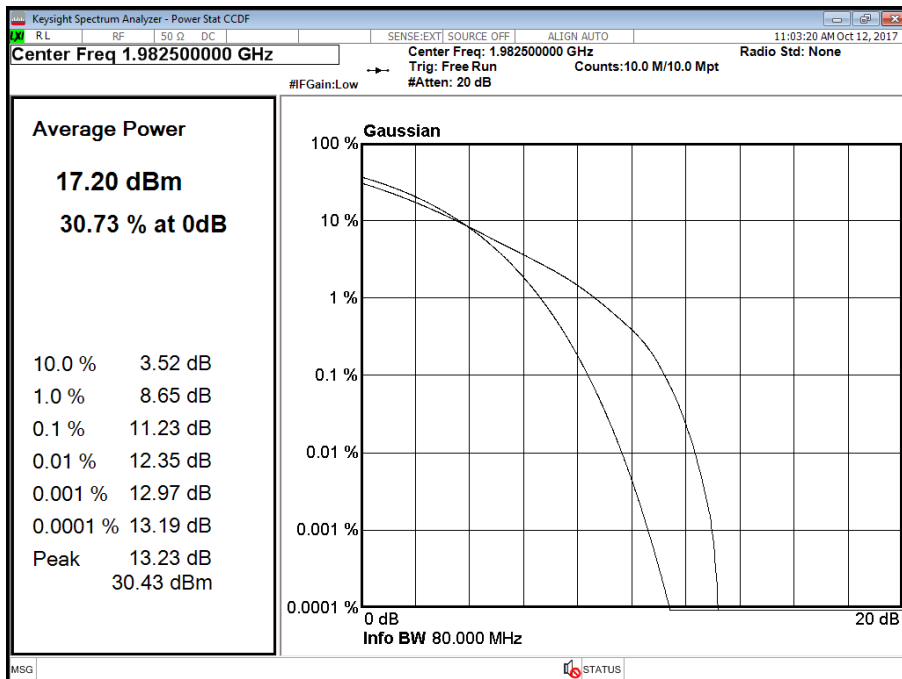


Product Service

Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position T



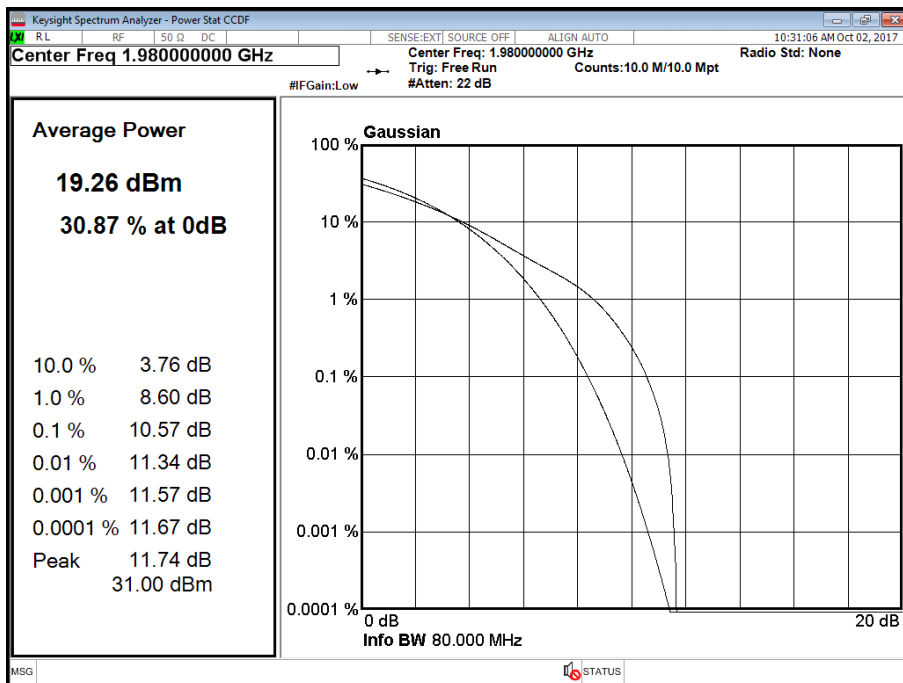
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position T



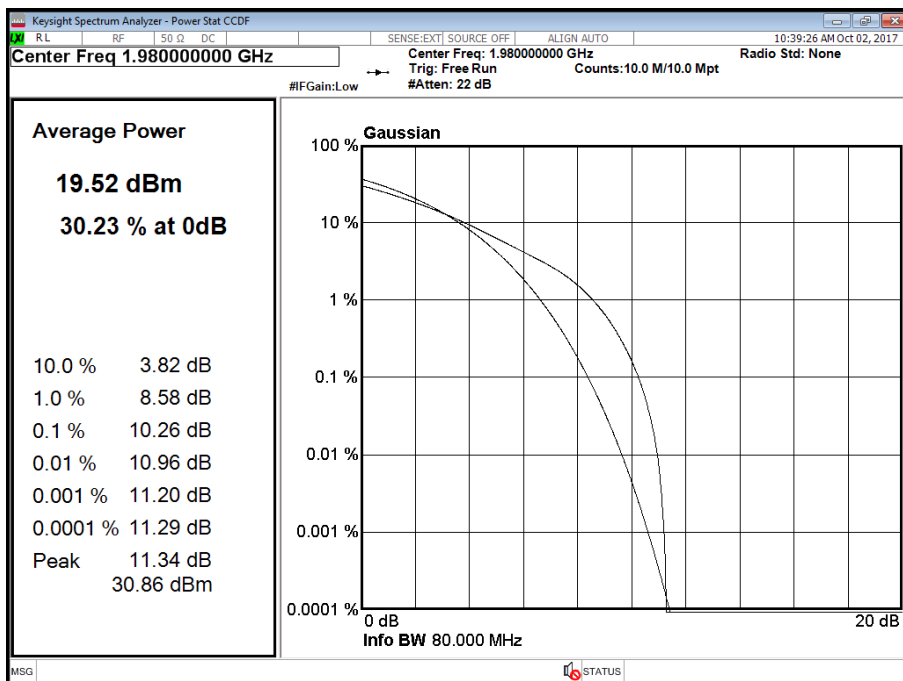


Product Service

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T



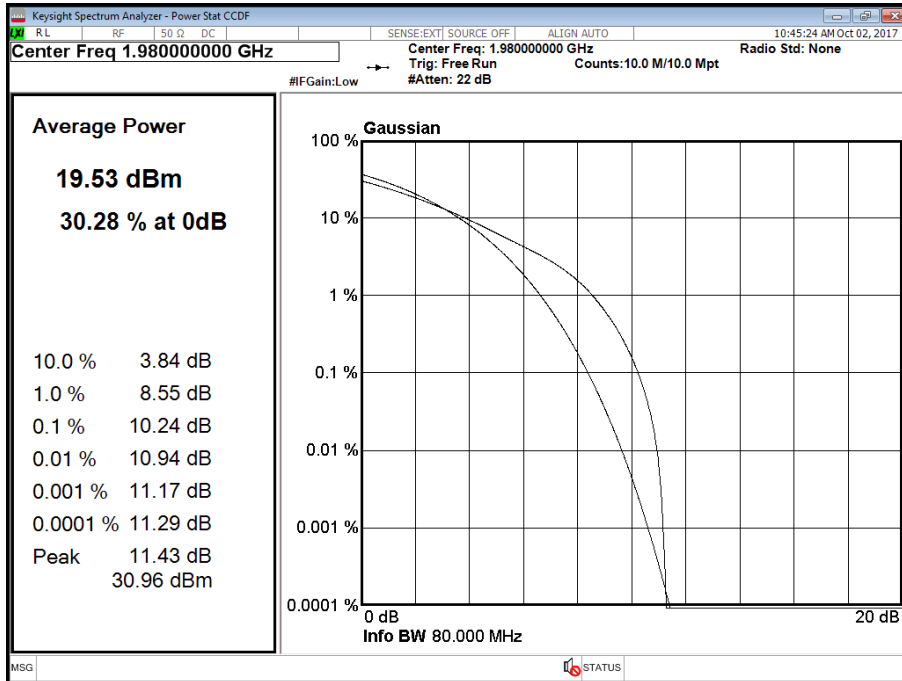
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position T



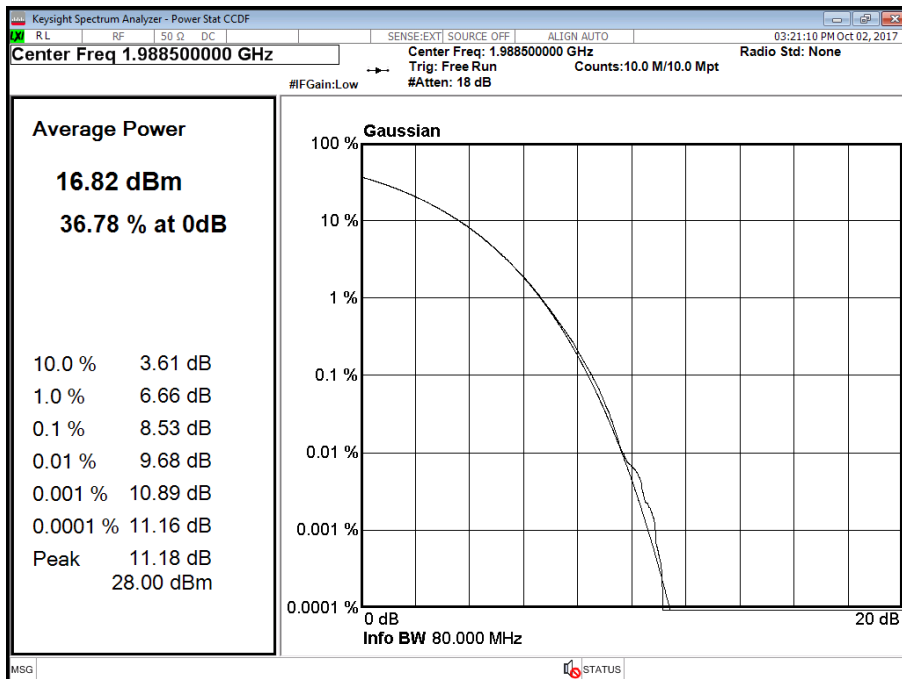


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position T



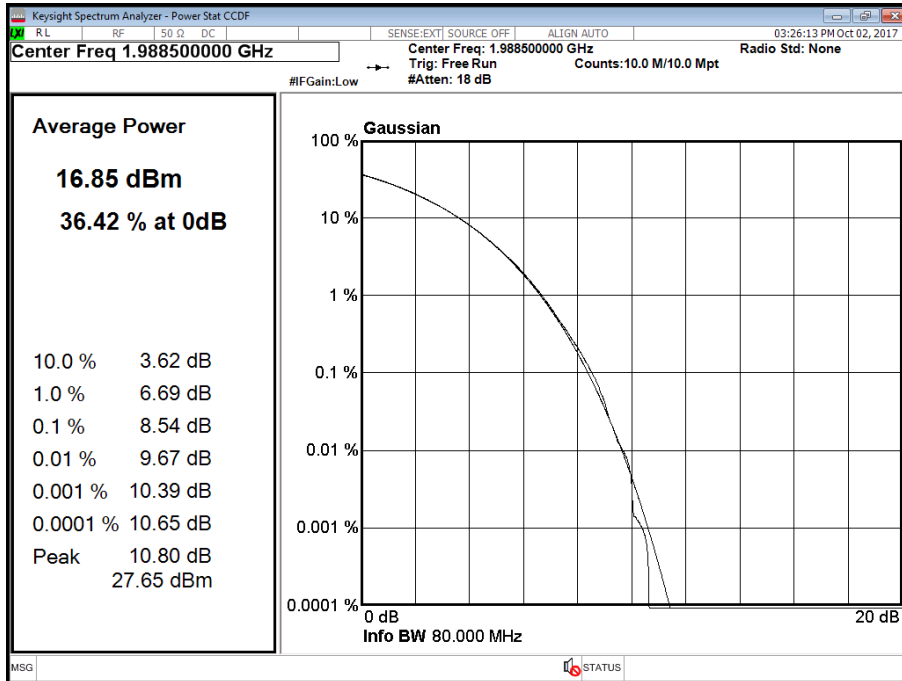
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position T



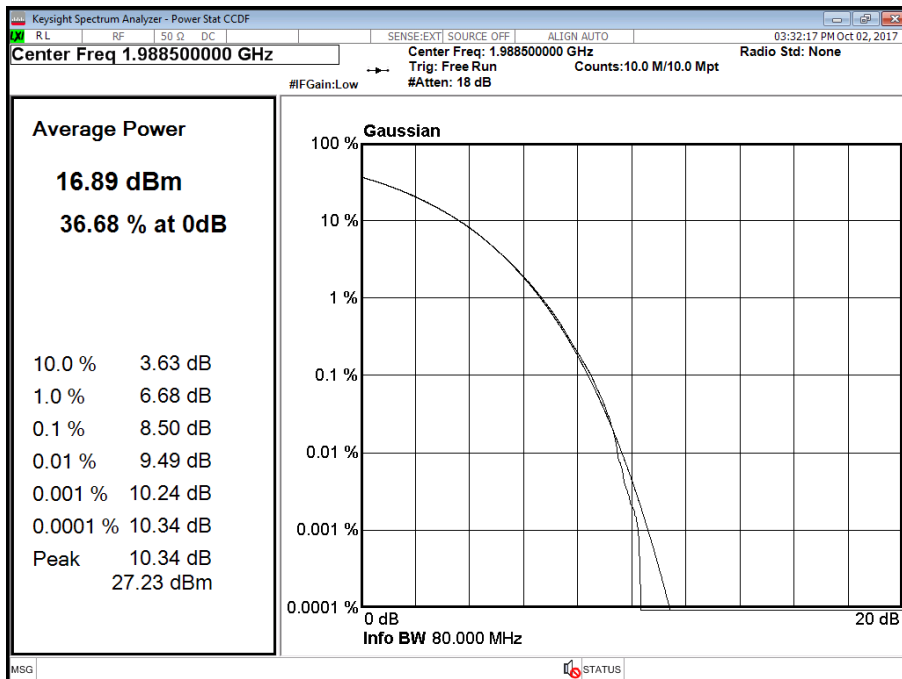


Product Service

Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position T



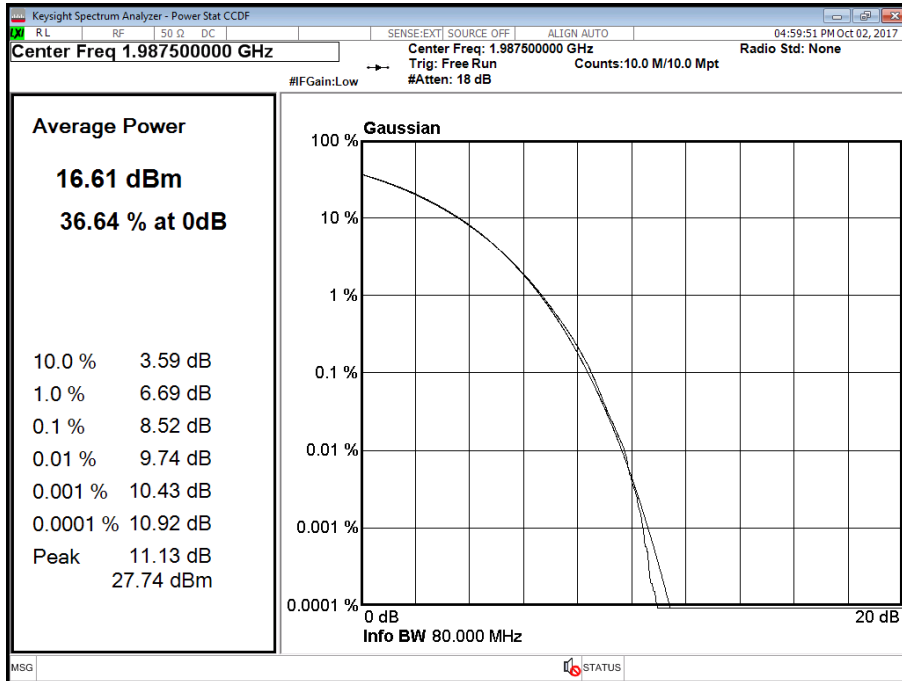
Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position T



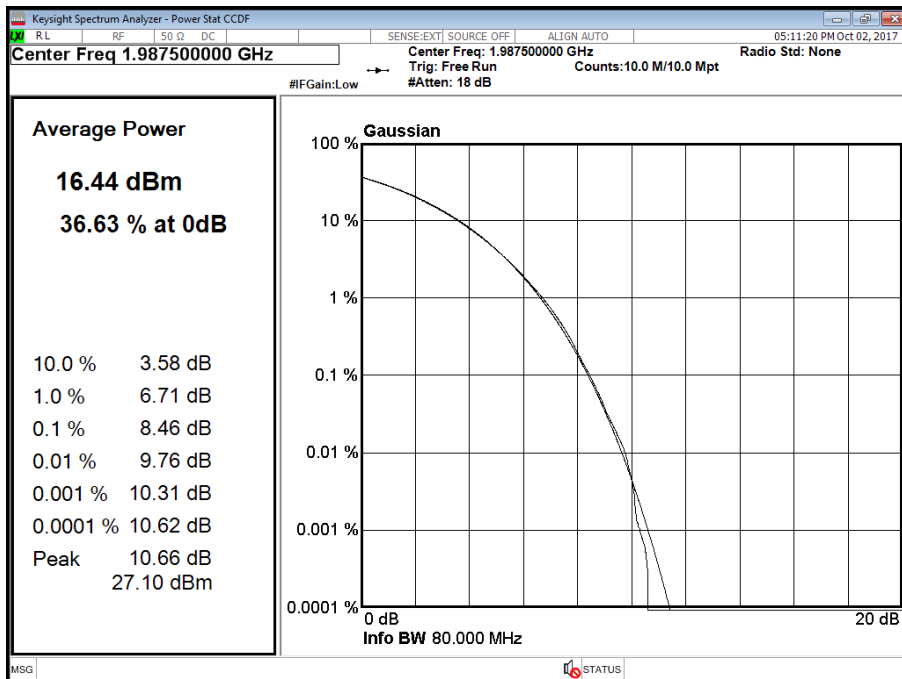


Product Service

Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



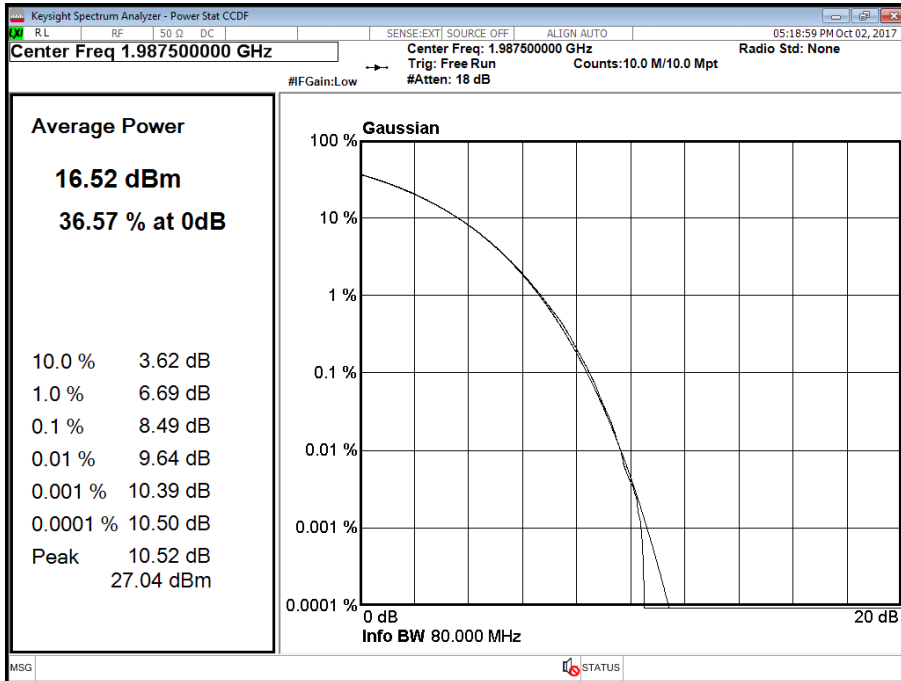
Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



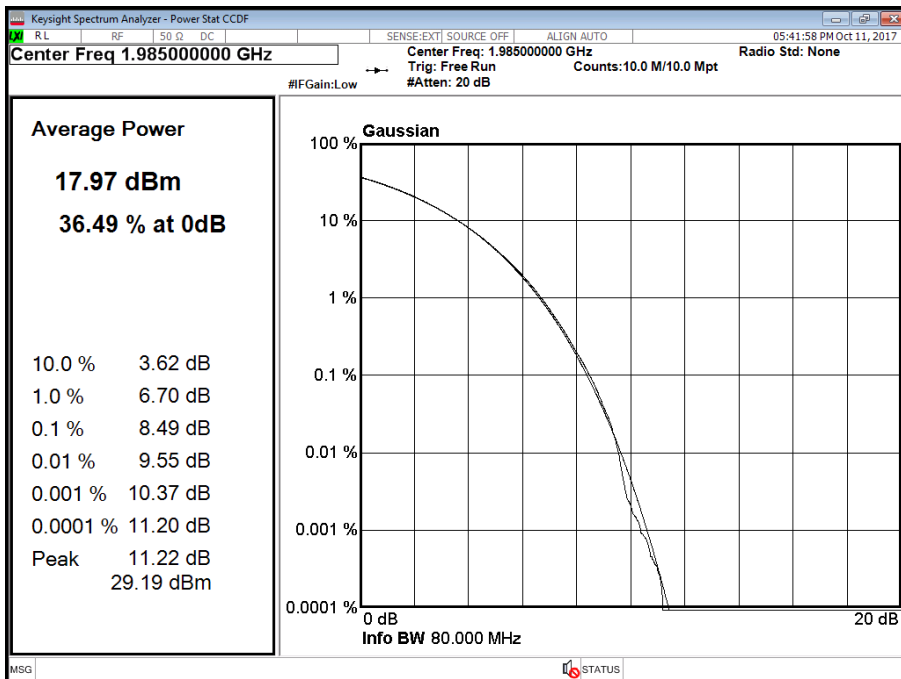


Product Service

Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



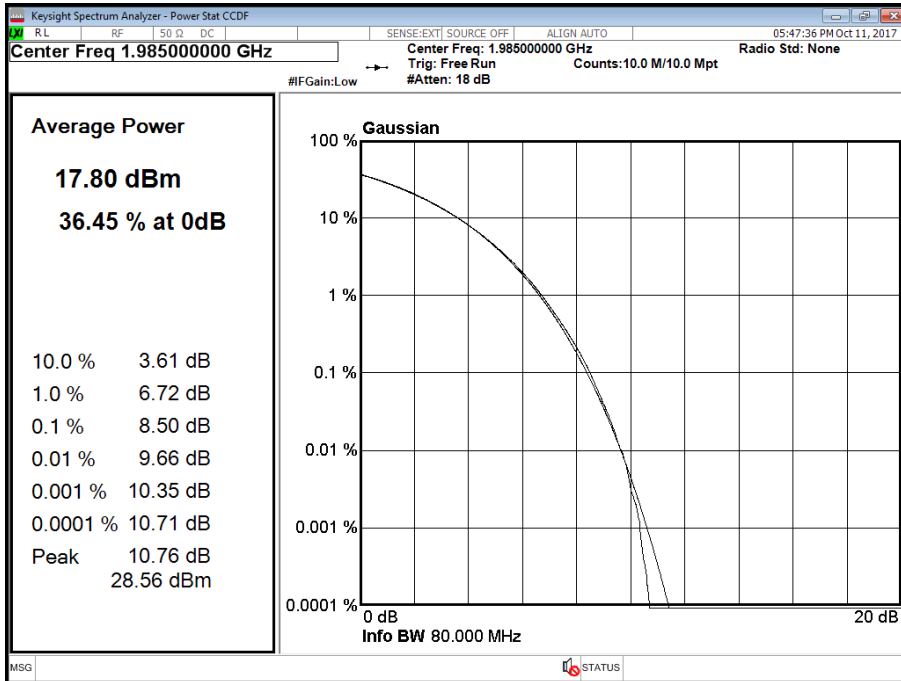
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T



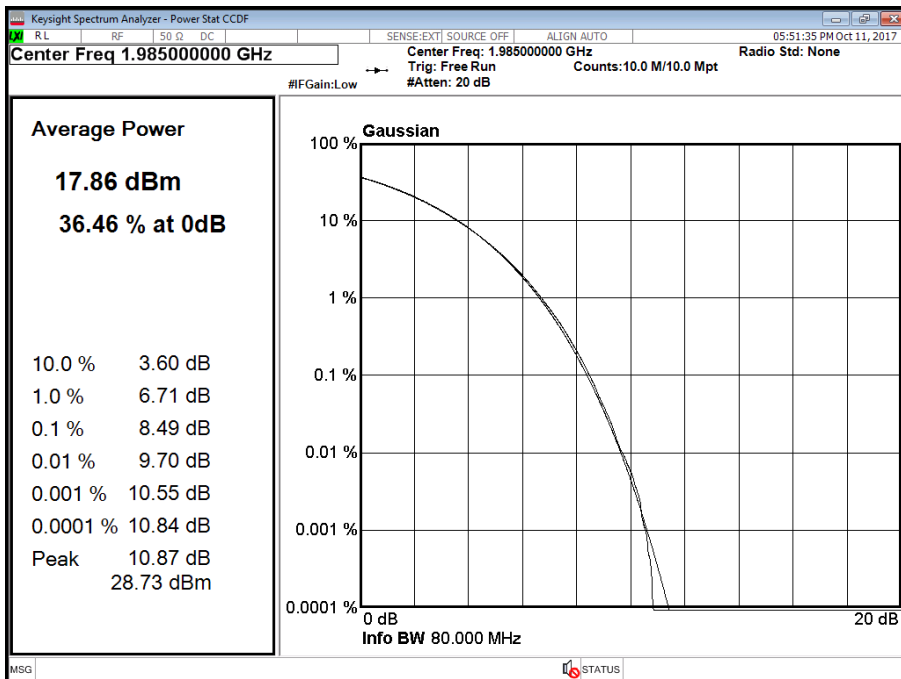


Product Service

Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T



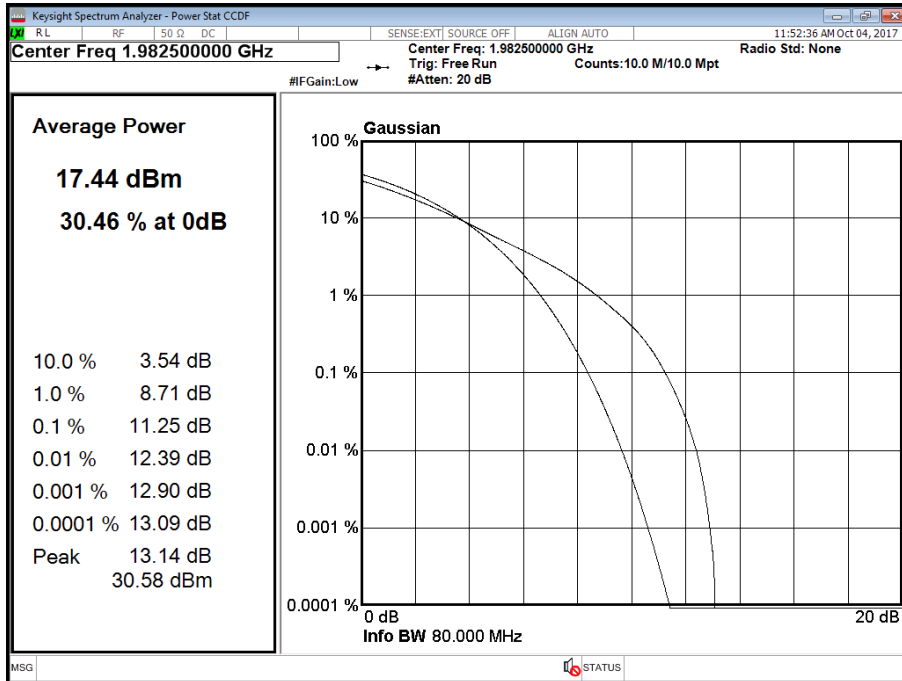
Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T



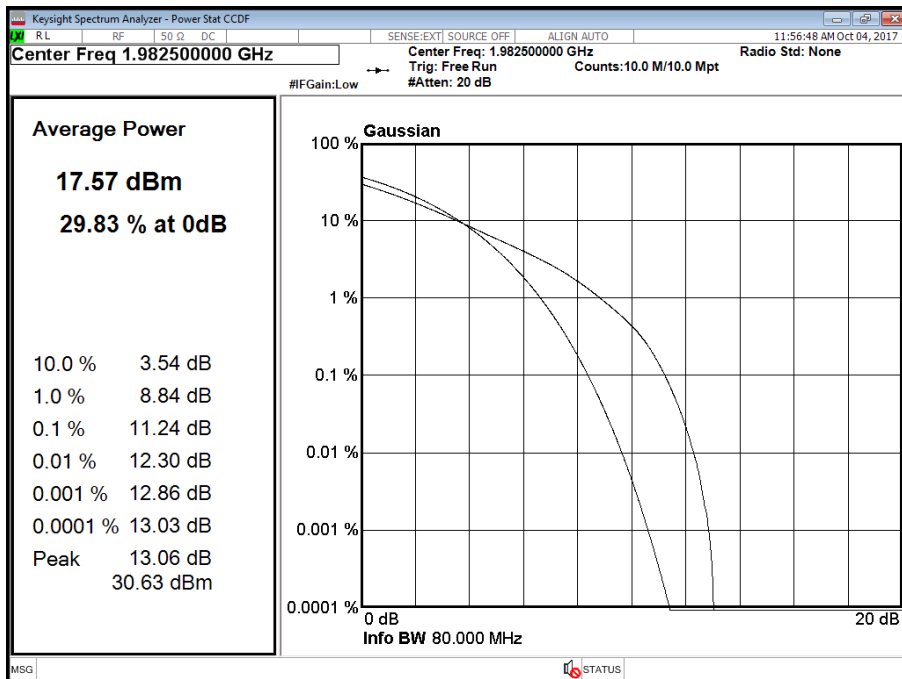


Product Service

Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 15.0 MHz - Channel Position T



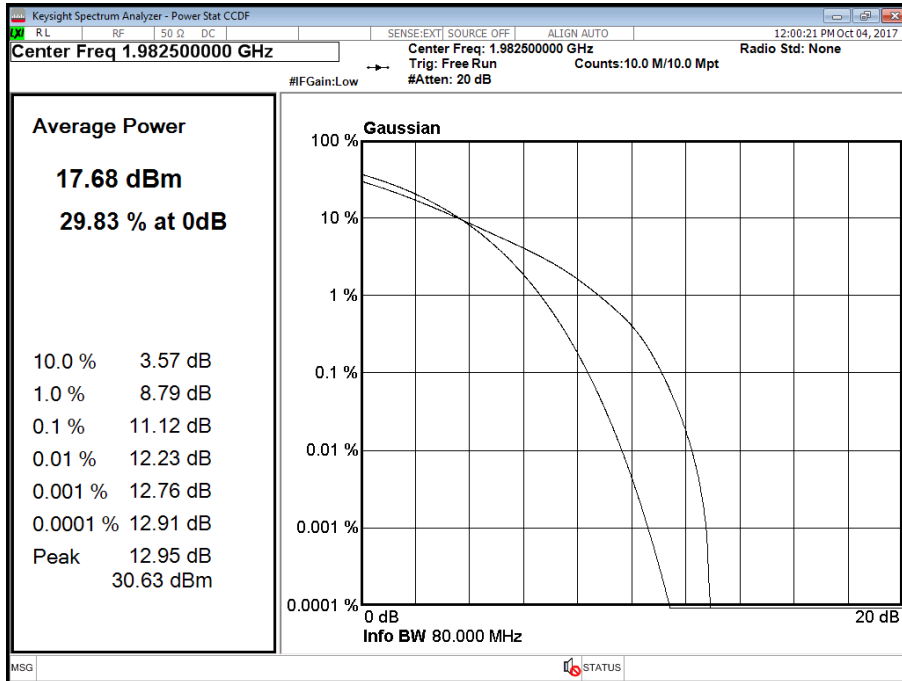
Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position T



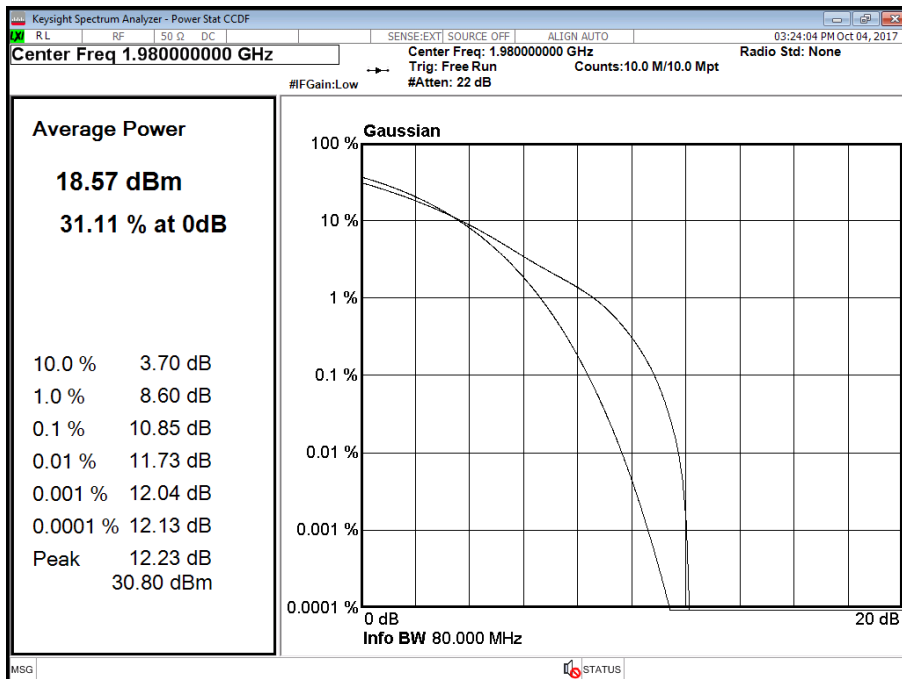


Product Service

Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 15.0 MHz - Channel Position T



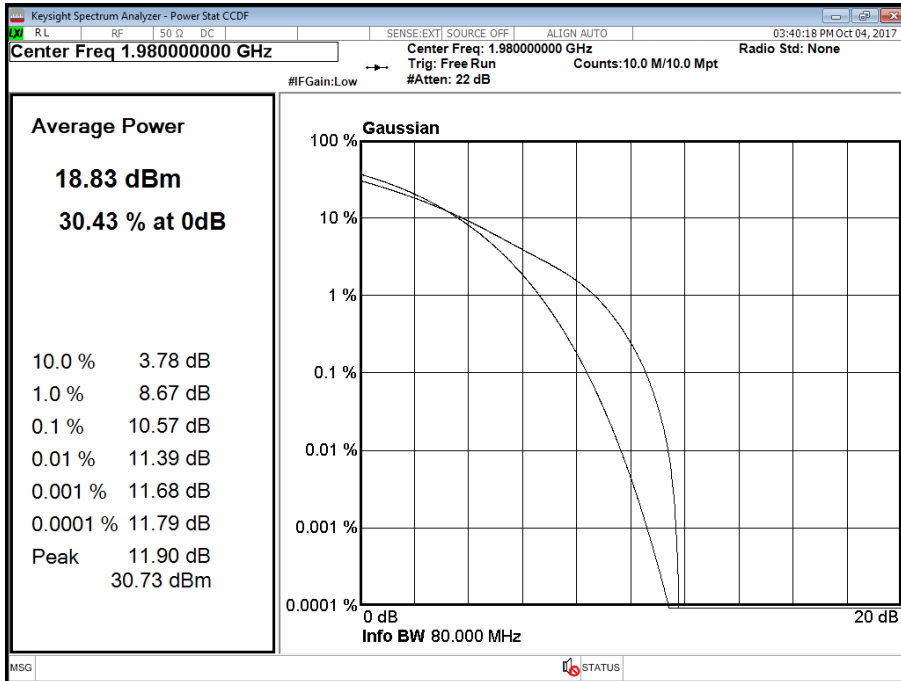
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T



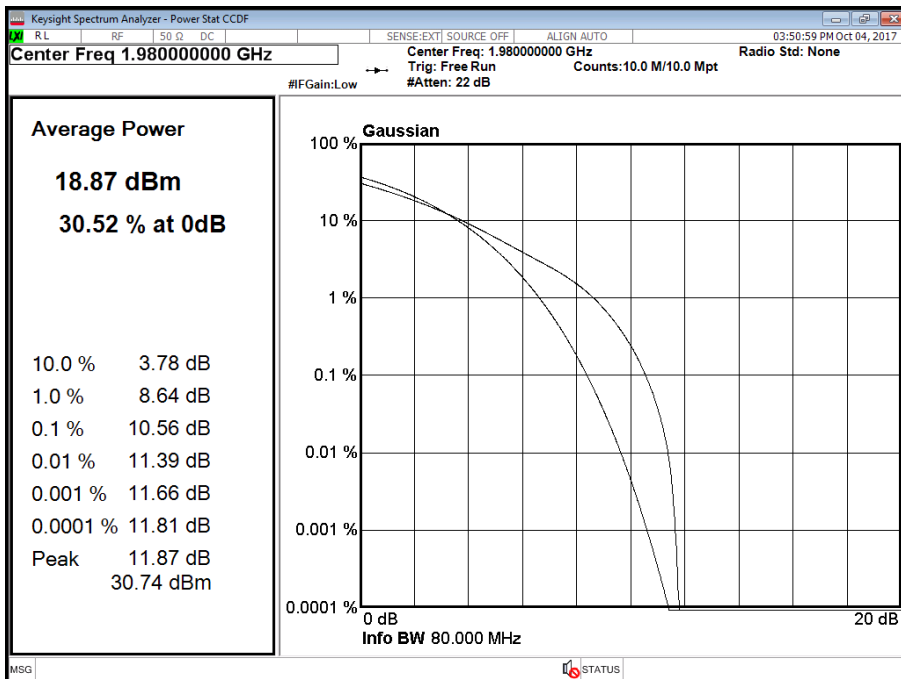


Product Service

Antenna B - LTE Modulation 16QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position T



Antenna B - LTE Modulation 64QAM - LTE Carrier Bandwidth 20.0 MHz - Channel Position T



| Limit | |
|-----------------------|---|
| Peak Power | ≤ 160 W or $\leq +52$ dBm (worst case limit from 24.232(a) >1 MHz bandwidth) |
| Peak to Average Ratio | 13 dB |



2.2 OCCUPIED BANDWIDTH

2.2.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1049
 FCC CFR 47 Part 24, Clause 24.238 (b)

2.2.2 Date of Test and Modification State

20 September to 12 October 2017 - Modification State 0

2.2.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.4 Environmental Conditions

Ambient Temperature 22.5 - 23.3°C
 Relative Humidity 55.2 - 41.9%

2.2.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01.

2.2.6 Test Results

Configuration 1

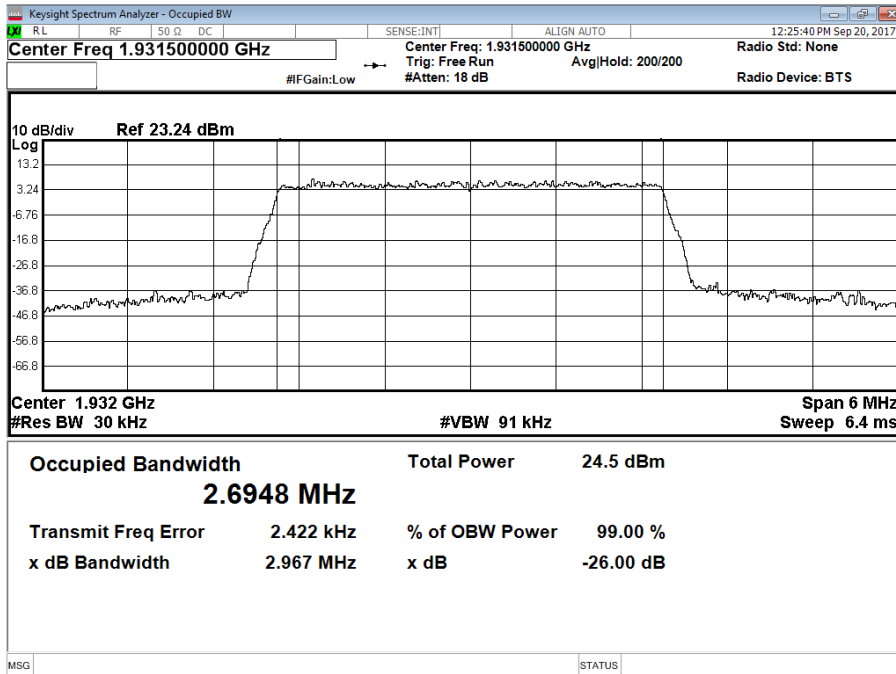
Maximum Output Power 20 dBm

| Antenna | LTE Modulation | LTE Carrier Bandwidth | Result (kHz) | | | | | |
|---------|----------------|-----------------------|--------------------|------------------|--------------------|------------------|--------------------|------------------|
| | | | Channel Position B | | Channel Position M | | Channel Position T | |
| | | | Occupied Bandwidth | -26 dB Bandwidth | Occupied Bandwidth | -26 dB Bandwidth | Occupied Bandwidth | -26 dB Bandwidth |
| A | QPSK | 3.0 MHz | 2,694.79 | 2,966.73 | 2,693.44 | 2,958.41 | 2,694.19 | 2,958.08 |
| A | 16QAM | 3.0 MHz | 2,692.46 | 2,939.77 | 2,699.01 | 2,957.32 | 2,695.06 | 2,956.48 |
| A | 64QAM | 3.0 MHz | 2,702.57 | 2,960.05 | 2,702.13 | 2,954.04 | 2,700.89 | 2,958.62 |
| A | QPSK | 5.0 MHz | 4,479.35 | 4,905.77 | 4,481.77 | 4,887.98 | 4,483.03 | 4,944.51 |
| A | 16QAM | 5.0 MHz | 4,466.63 | 4,821.11 | 4,474.57 | 4,859.39 | 4,464.27 | 4,845.30 |
| A | 64QAM | 5.0 MHz | 4,469.91 | 4,834.07 | 4,496.41 | 4,876.64 | 4,486.90 | 4,875.93 |
| A | QPSK | 10.0 MHz | 8,932.45 | 9,728.71 | 8,964.19 | 9,684.43 | 8,961.79 | 9,779.06 |
| A | 16QAM | 10.0 MHz | 8,936.49 | 9,651.40 | 8,953.18 | 9,563.14 | 8,945.84 | 9,699.17 |
| A | 64QAM | 10.0 MHz | 8,945.77 | 9,712.02 | 8,932.74 | 9,735.97 | 8,940.88 | 9,646.36 |
| A | QPSK | 15.0 MHz | 13,730.19 | 15,231.59 | 13,415.02 | 14,544.20 | 13,790.93 | 15,229.94 |
| A | 16QAM | 15.0 MHz | 13,625.58 | 15,072.57 | 13,735.17 | 15,271.29 | 13,776.03 | 15,183.15 |
| A | 64QAM | 15.0 MHz | 13,844.98 | 15,253.41 | 13,846.49 | 15,285.32 | 13,800.56 | 15,172.28 |
| A | QPSK | 20.0 MHz | 18,831.09 | 20,394.84 | 18,839.24 | 20,478.70 | 18,892.71 | 20,437.76 |
| A | 16QAM | 20.0 MHz | 18,767.76 | 20,604.19 | 18,782.45 | 20,474.36 | 18,874.16 | 20,546.03 |
| A | 64QAM | 20.0 MHz | 18,838.80 | 20,464.20 | 18,825.07 | 20,437.18 | 18,972.91 | 20,357.67 |

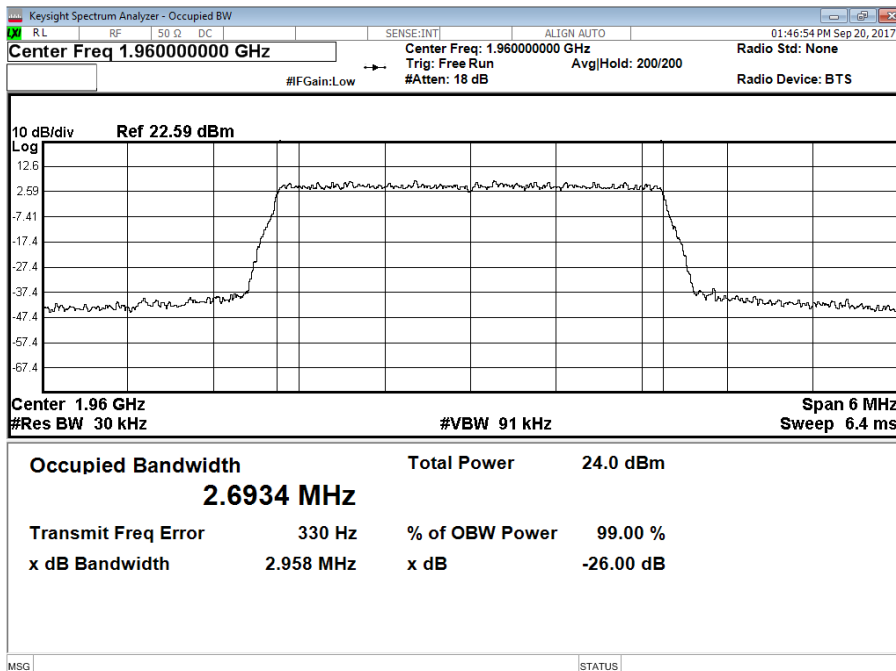


Product Service

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position B



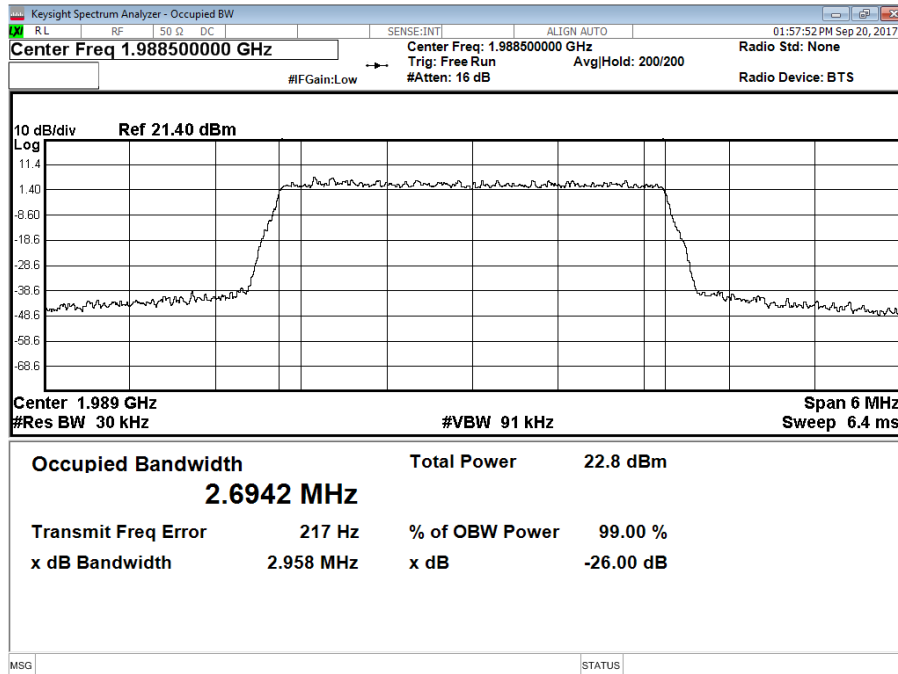
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position M



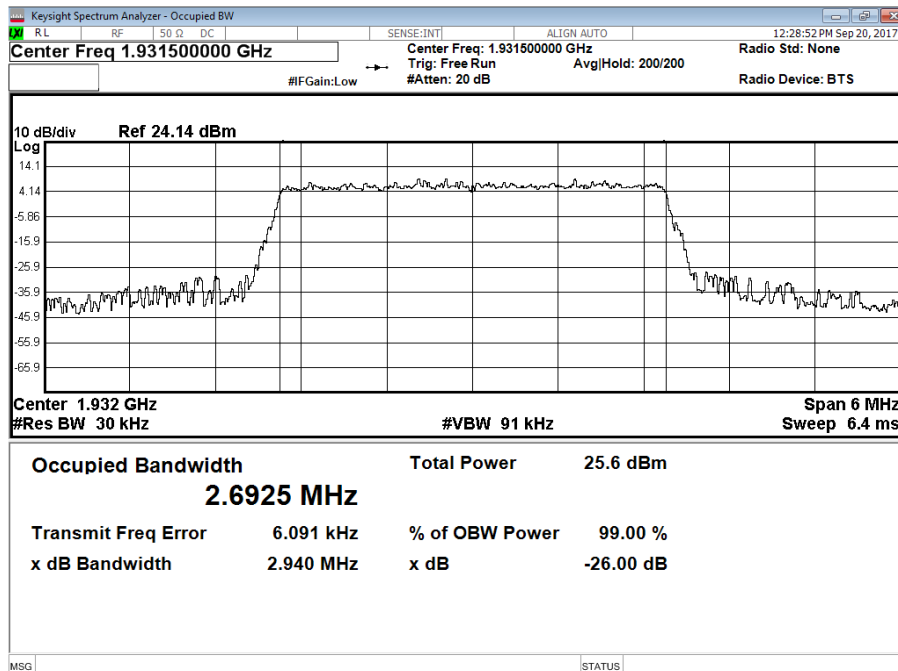


Product Service

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 3.0 MHz - Channel Position T



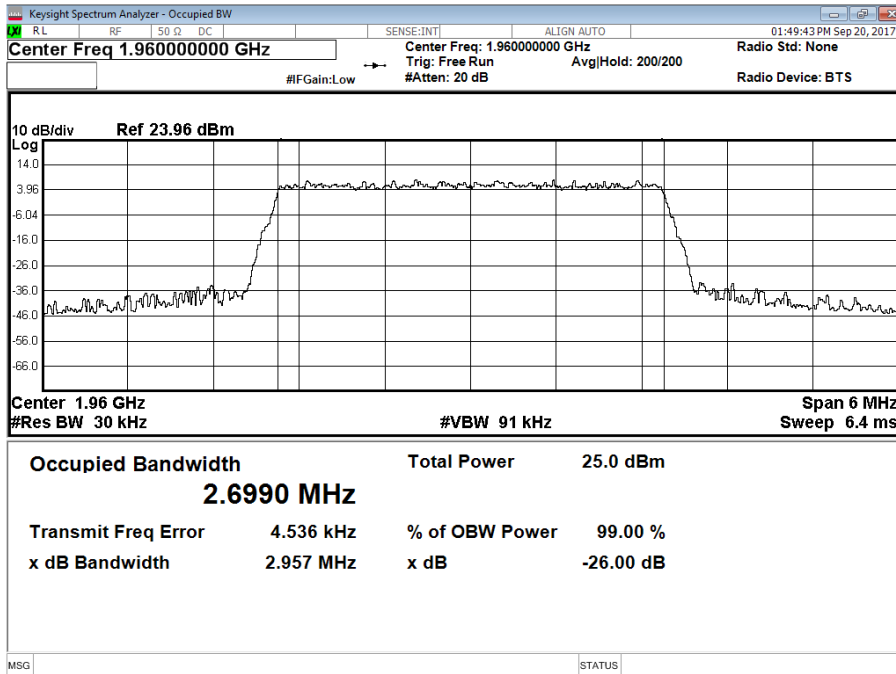
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position B



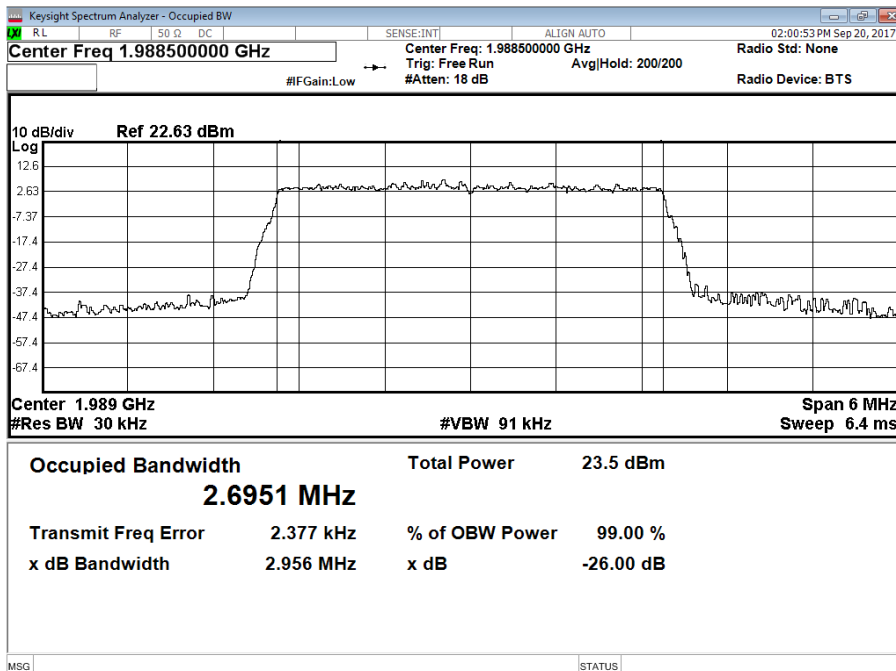


Product Service

Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position M



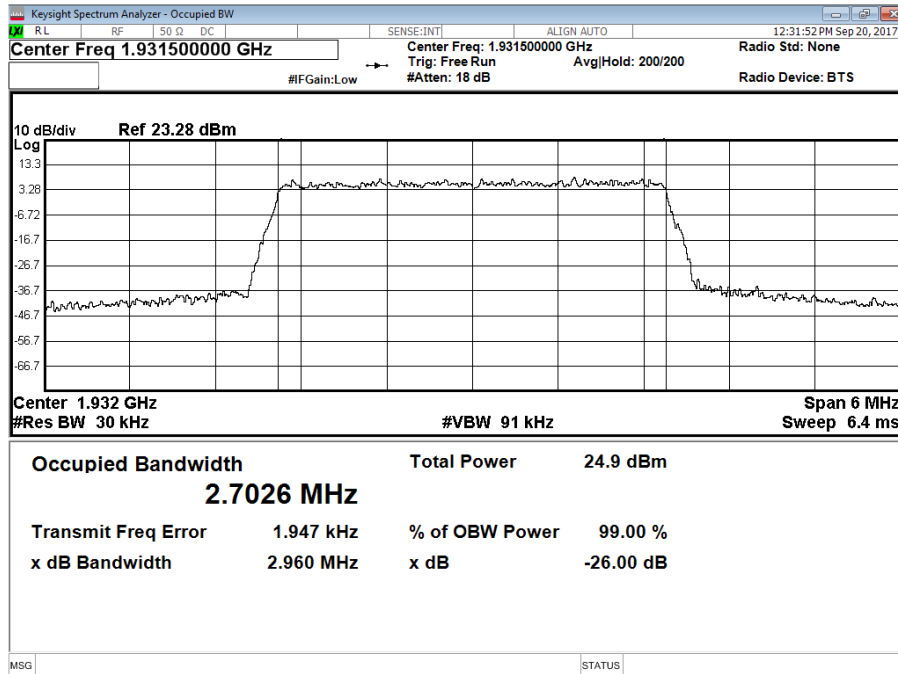
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position T



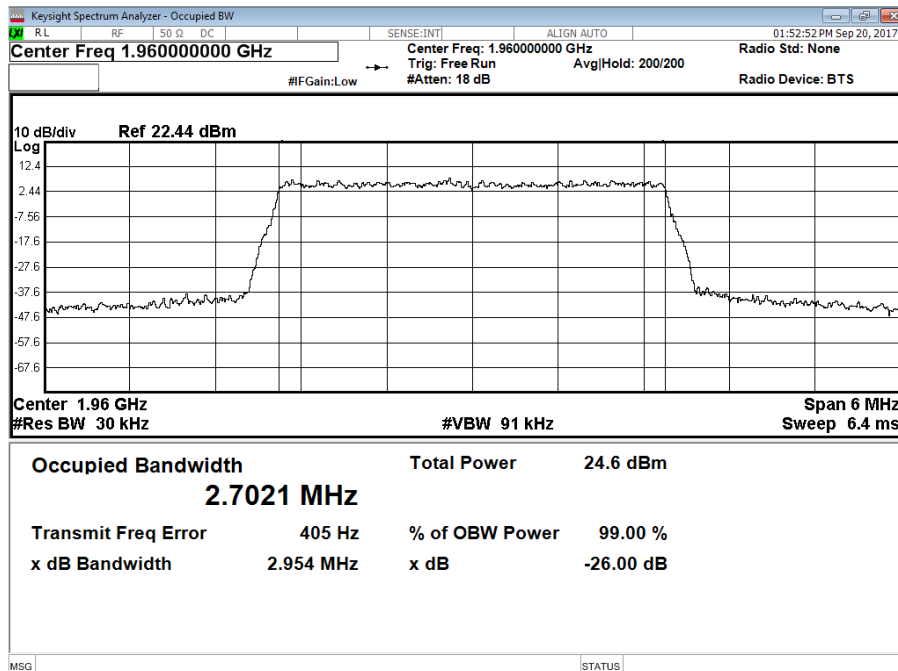


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position B



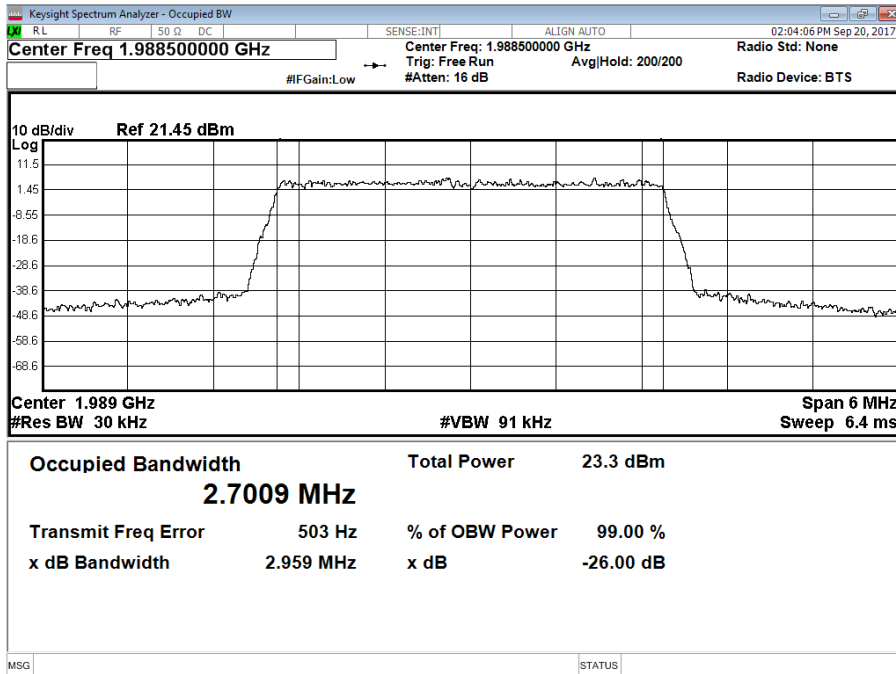
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position M



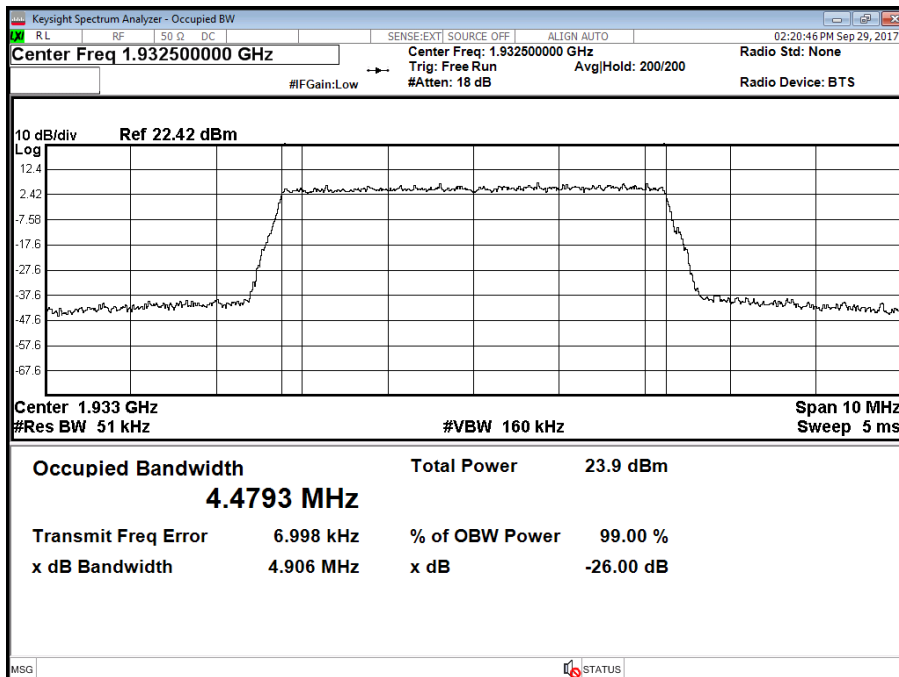


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 3.0 MHz - Channel Position T



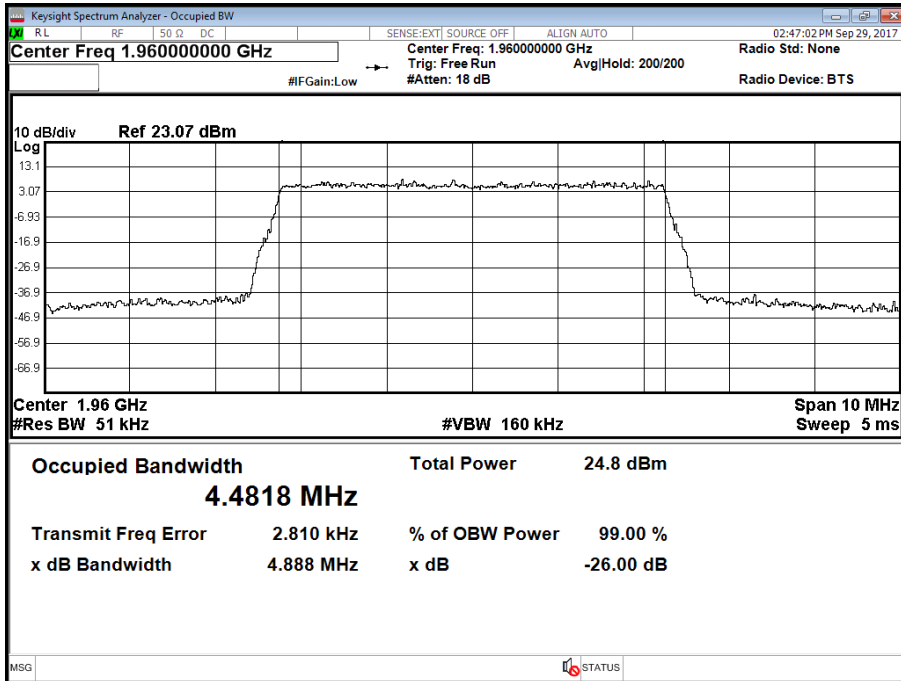
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



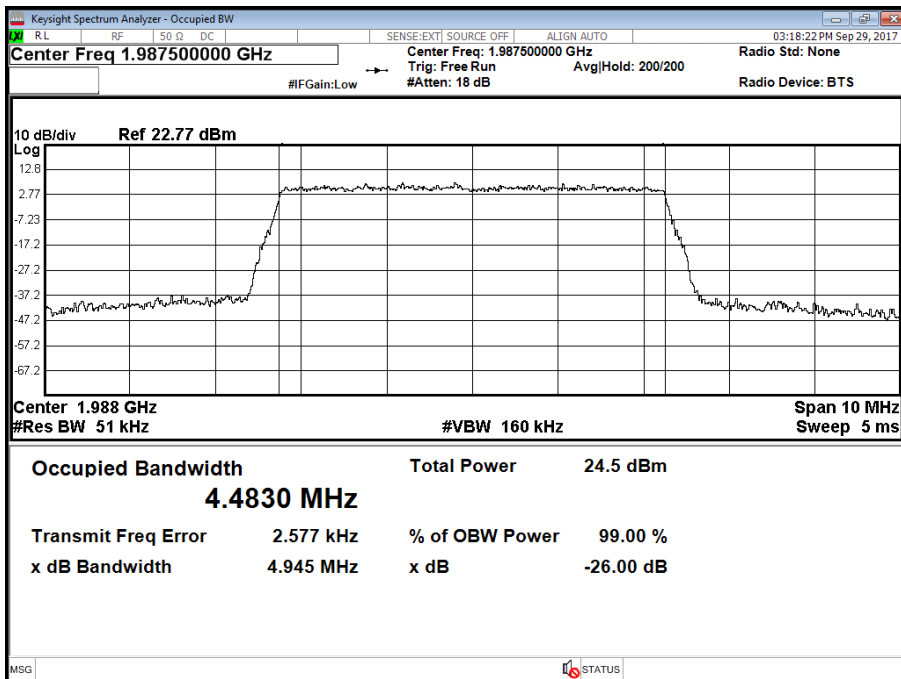


Product Service

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



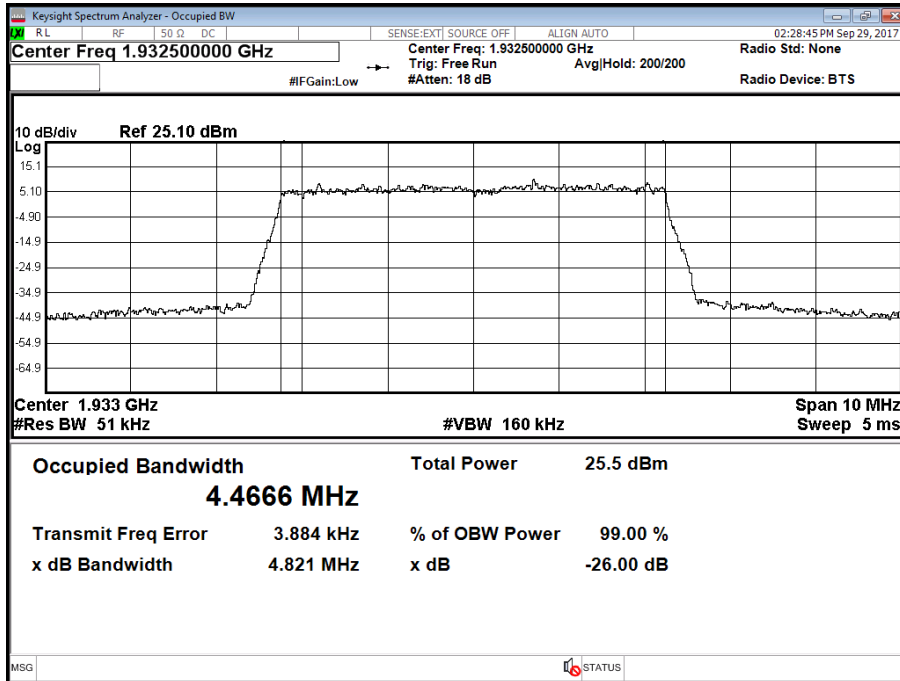
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



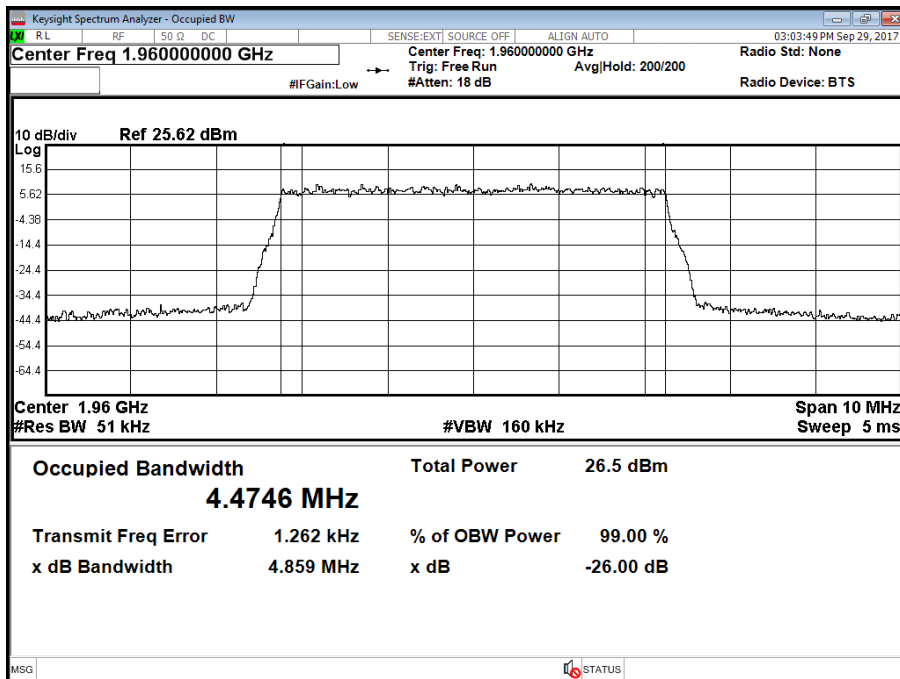


Product Service

Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



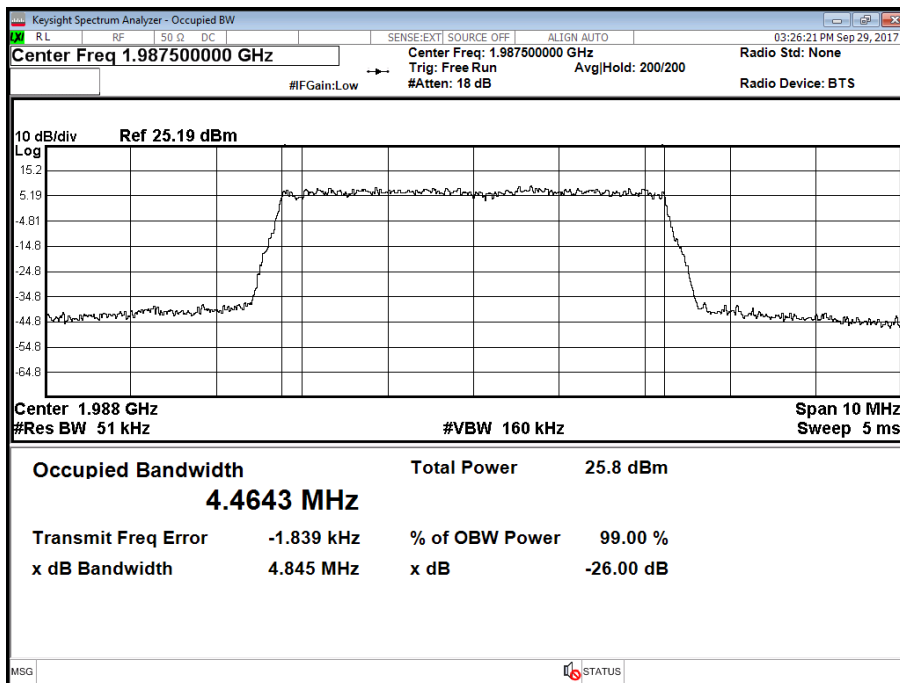
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



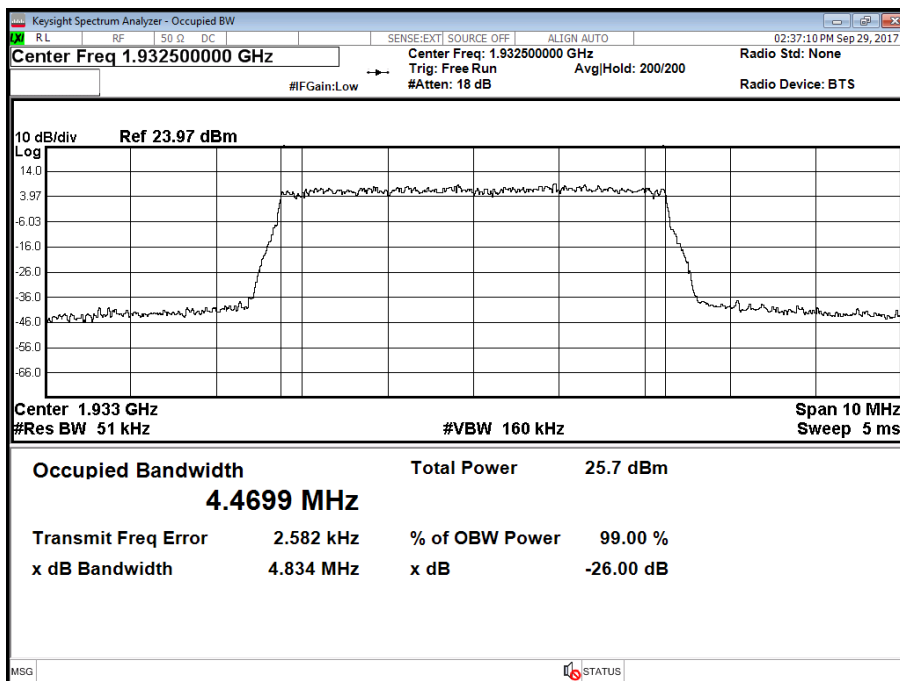


Product Service

Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



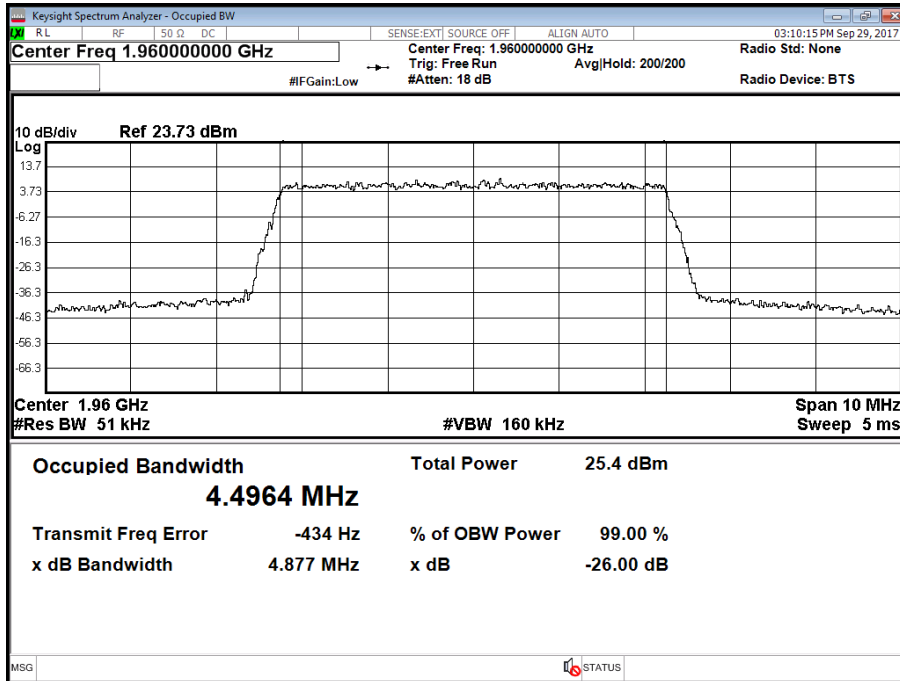
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position B



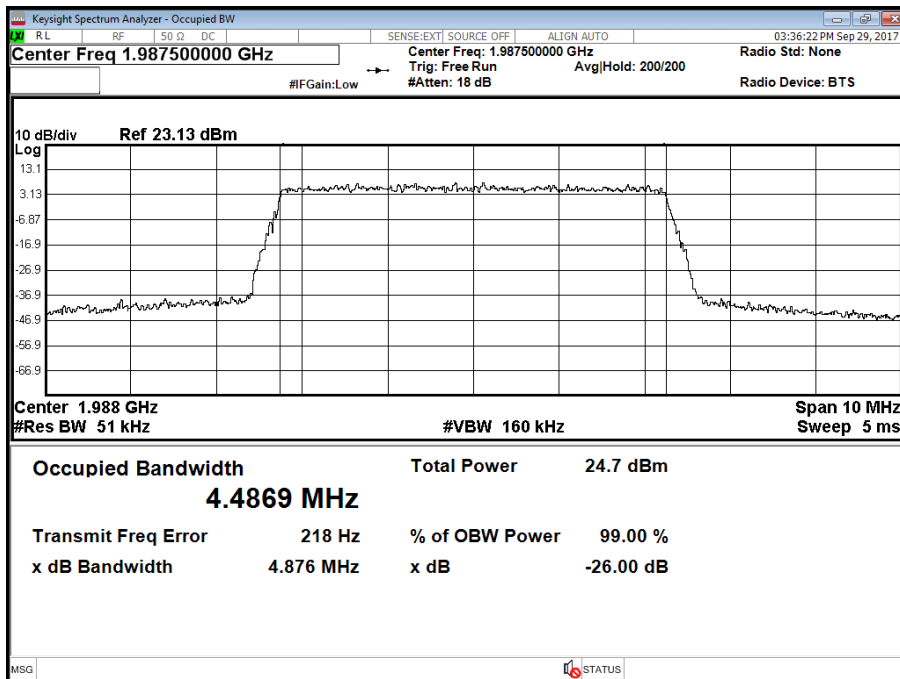


Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position M



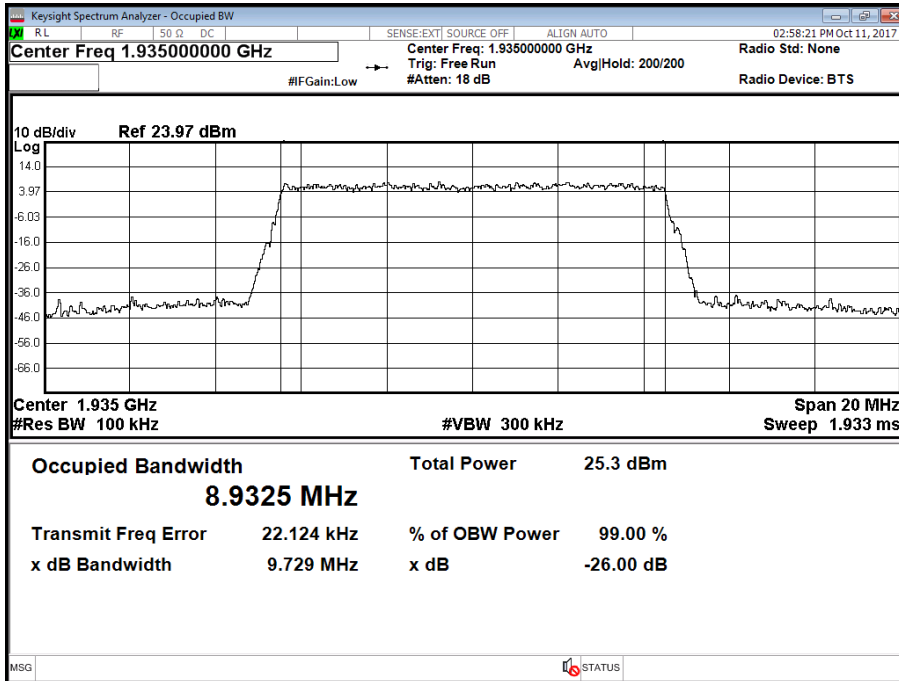
Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 5.0 MHz - Channel Position T



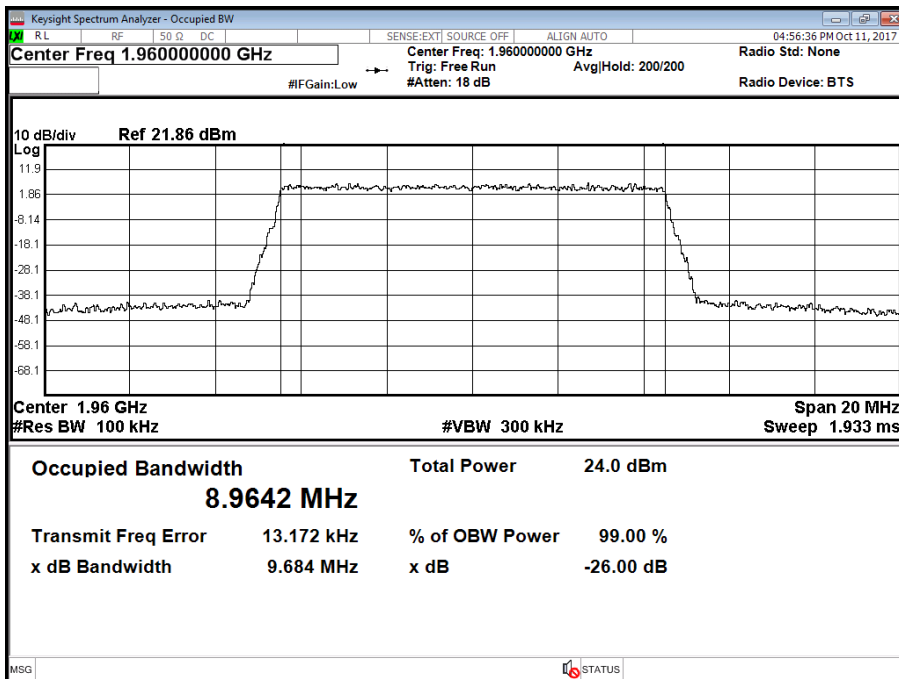


Product Service

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B



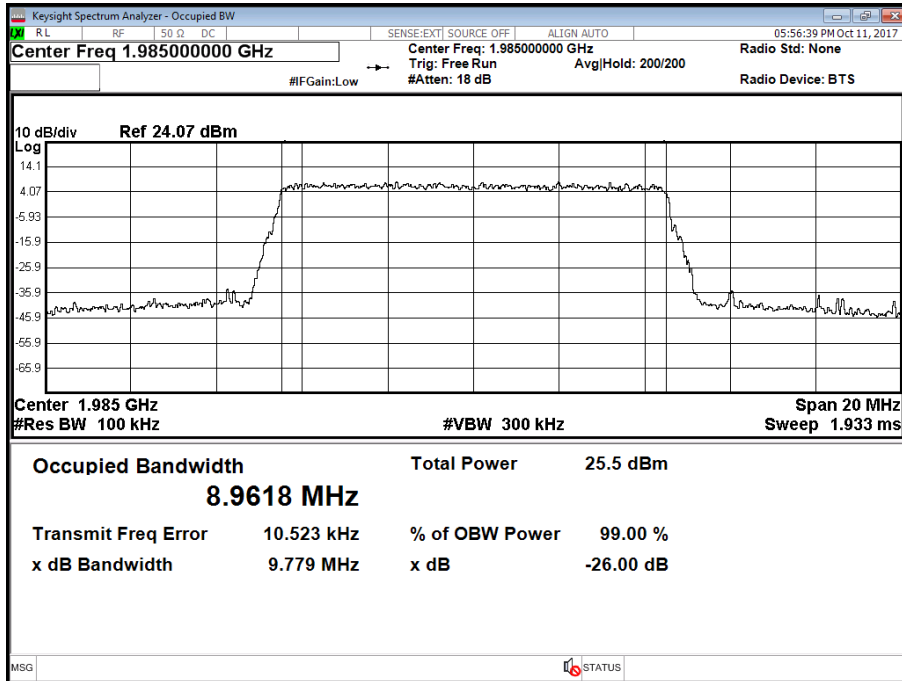
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



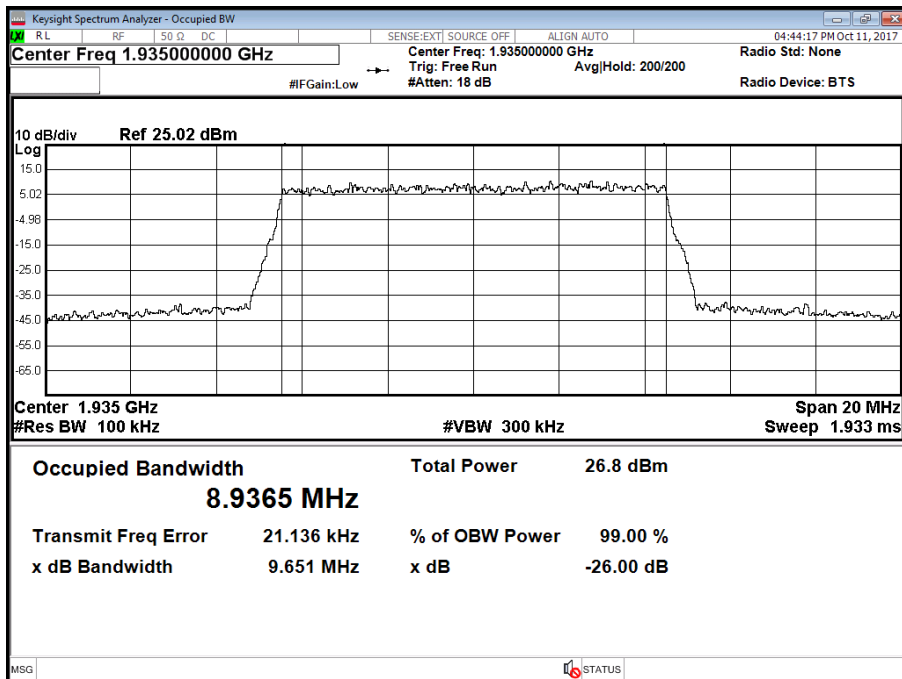


Product Service

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T



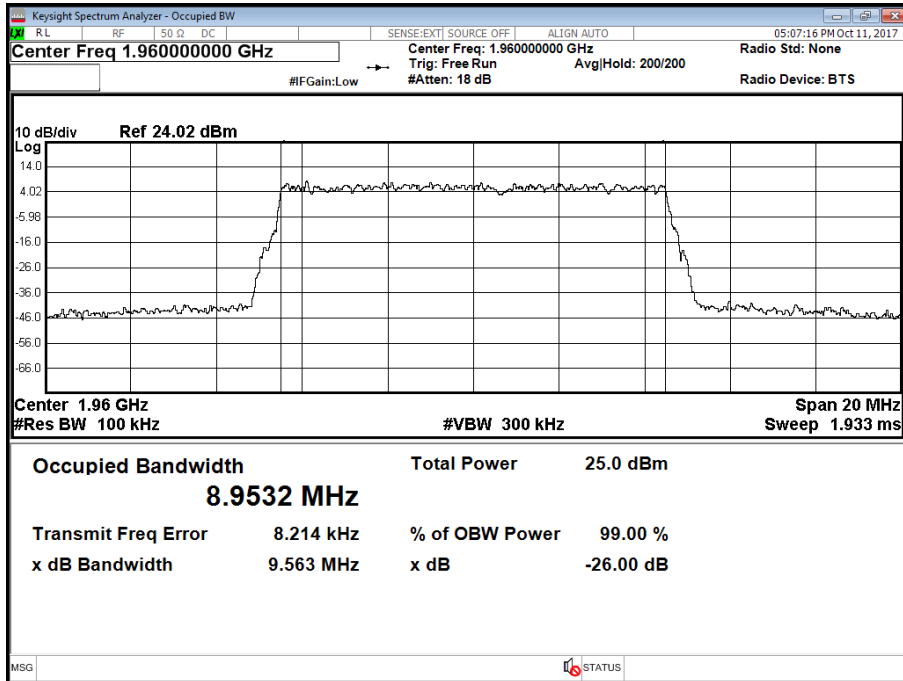
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B



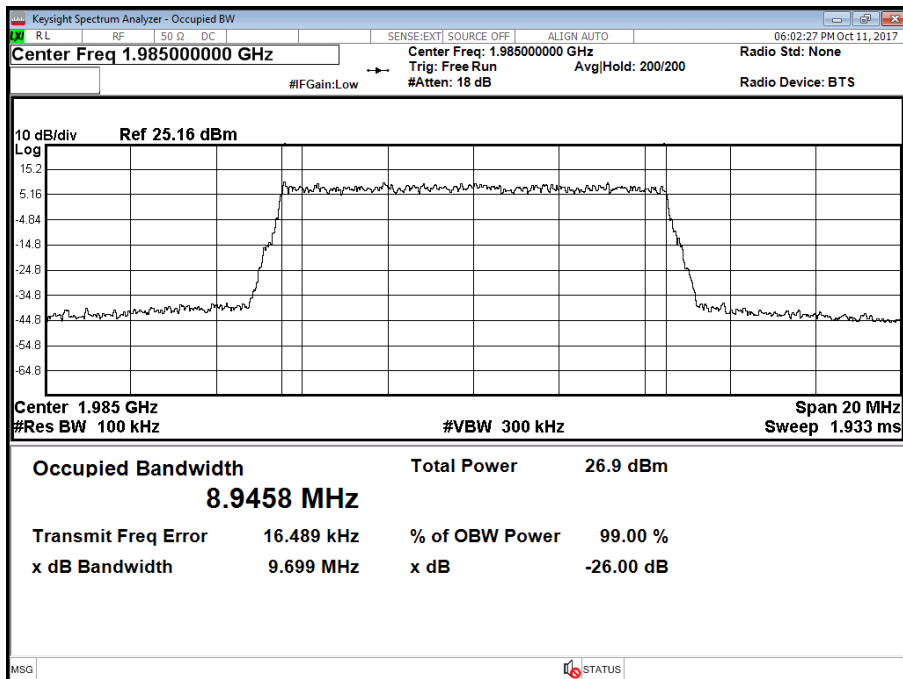


Product Service

Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



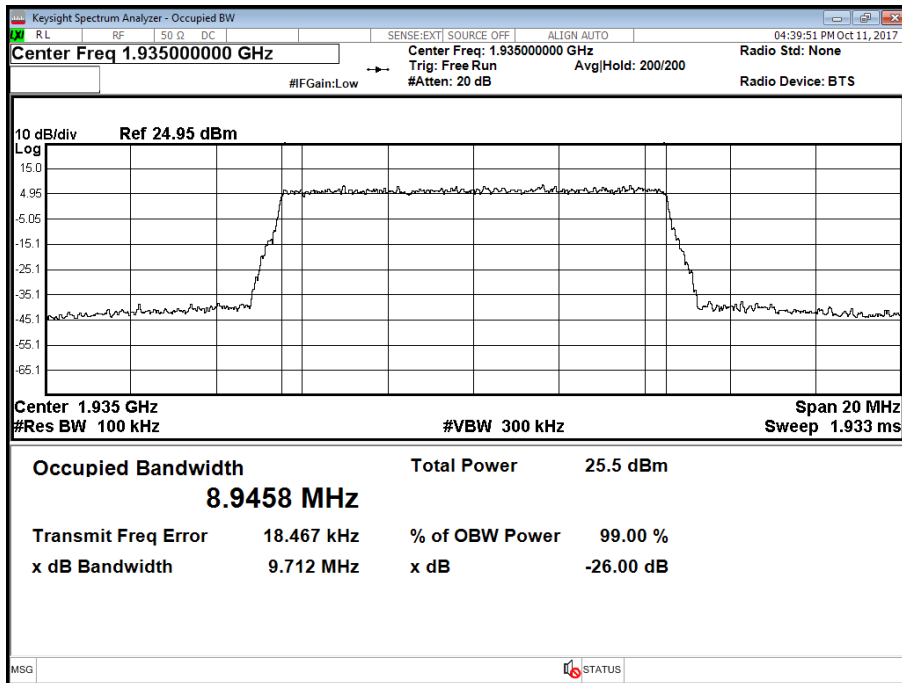
Antenna A - LTE Modulation 16QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position T





Product Service

Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position B



Antenna A - LTE Modulation 64QAM - LTE Carrier Bandwidth 10.0 MHz - Channel Position M

