

# AVERAGE POWER - BAND 3.7G

## TEST DESCRIPTION

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The fundamental emission Output Power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

RF conducted emissions testing was performed only on one port. The AVQQA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i and 6.4.

The RMS average power measurement method for FCC/IC is detailed in section 5.2 of KDB 971168 D01v03r01 and ANSI C63.26-2015 section 5.2.4.4. This method uses trace averaging across the ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding  $[10 \log (1/D)]$ , where D is the duty cycle in decimal, to the measured power to compute the average power during the actual transmission times.

The output power was measured for a single carrier over the carrier channel bandwidth. The power was measured for a single carrier over the channel bandwidth indicated in the table. The total power for multi-port (64x64 MIMO) operation was based upon ANSI C63.26 clauses 6.4.3.1 and 6.4.3.2.4 ( $10 \log N_{out}$ ). The total output power for Sixty-Four port operation is single power +18.1 dB [i.e.  $10 \cdot \log(64)$ ].

## TEST EQUIPMENT

| Description                  | Manufacturer       | Model  | ID  | Last Cal.  | Cal. Due   |
|------------------------------|--------------------|--------|-----|------------|------------|
| Analyzer - Spectrum Analyzer | Keysight           | N9010A | AFQ | 2024-03-12 | 2025-03-12 |
| Generator - Signal           | Agilent            | N5173B | TIW | 2023-08-07 | 2026-08-07 |
| Block - DC                   | Fairview Microwave | SD3239 | ANE | 2024-02-14 | 2025-02-14 |

# AVERAGE POWER - BAND 3.7G

|                   |                              |                       |            |
|-------------------|------------------------------|-----------------------|------------|
| EUT:              | AVQQA Remote Radio Head      | Work Order:           | NOKI0075   |
| Serial Number:    | L1242403137                  | Date:                 | 2024-08-15 |
| Customer:         | Nokia Solutions and Networks | Temperature:          | 23.3°C     |
| Attendees:        | David Le, John Rattanaovong  | Relative Humidity:    | 52.1%      |
| Customer Project: | None                         | Bar. Pressure (PMSL): | 1016 mbar  |
| Tested By:        | Jarrold Brenden              | Job Site:             | PT14       |
| Power:            | 54VDC                        | Configuration:        | NOKI0075-4 |

## TEST SPECIFICATIONS

|                |                  |
|----------------|------------------|
| Specification: | Method:          |
| FCC 27:2024    | ANSI C63.26:2015 |

## COMMENTS

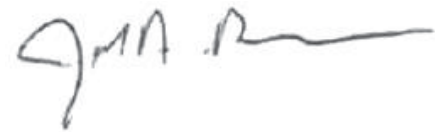
All losses in the measurement path were accounted for in the reference level offset; attenuators, filters, cables, and DC blocks. Band n77 carriers were enabled at maximum power levels for the 3.7 GHz band in the single carrier operating mode configuration. All measured power values are within tolerance (i.e.: Rated Power  $\pm 2.0$  dB).

## DEVIATIONS FROM TEST STANDARD

None

## CONCLUSION

Pass



Tested By

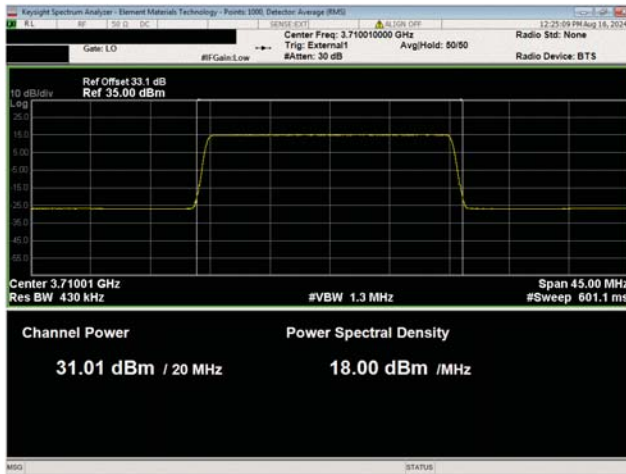
## TEST RESULTS

|                           | Avg Cond<br>Pwr (dBm) | Duty Cycle<br>Factor (dB) | Single Port<br>dBm/Carrier BW | Sixty-four Port (64x64 MIMO)<br>dBm/carrier BW |
|---------------------------|-----------------------|---------------------------|-------------------------------|------------------------------------------------|
| Port 1                    |                       |                           |                               |                                                |
| 20 MHz Channel Bandwidth  |                       |                           |                               |                                                |
| QPSK Modulation           |                       |                           |                               |                                                |
| Low Channel, 3710.01 MHz  | 31.007                | 0                         | 31.0                          | 49.1                                           |
| Mid Channel, 3840.00 MHz  | 31.787                | 0                         | 31.8                          | 49.9                                           |
| High Channel, 3969.99 MHz | 30.693                | 0                         | 30.7                          | 48.8                                           |
| 40 MHz Channel Bandwidth  |                       |                           |                               |                                                |
| QPSK Modulation           |                       |                           |                               |                                                |
| Low Channel, 3720.00 MHz  | 34.073                | 0                         | 34.1                          | 52.2                                           |
| Mid Channel, 3840.00 MHz  | 34.735                | 0                         | 34.7                          | 52.8                                           |
| High Channel, 3960.00 MHz | 34.066                | 0                         | 34.1                          | 52.2                                           |
| 60 MHz Channel Bandwidth  |                       |                           |                               |                                                |
| QPSK Modulation           |                       |                           |                               |                                                |
| Low Channel, 3730.02 MHz  | 36.483                | 0                         | 36.5                          | 54.6                                           |
| Mid Channel, 3840.00 MHz  | 36.911                | 0                         | 36.9                          | 55.0                                           |
| High Channel, 3949.98 MHz | 36.582                | 0                         | 36.6                          | 54.7                                           |
| 80 MHz Channel Bandwidth  |                       |                           |                               |                                                |
| QPSK Modulation           |                       |                           |                               |                                                |
| Low Channel, 3740.01 MHz  | 36.394                | 0                         | 36.4                          | 54.5                                           |
| Mid Channel, 3840.00 MHz  | 36.713                | 0                         | 36.7                          | 54.8                                           |
| High Channel, 3939.99 MHz | 36.342                | 0                         | 36.3                          | 54.4                                           |

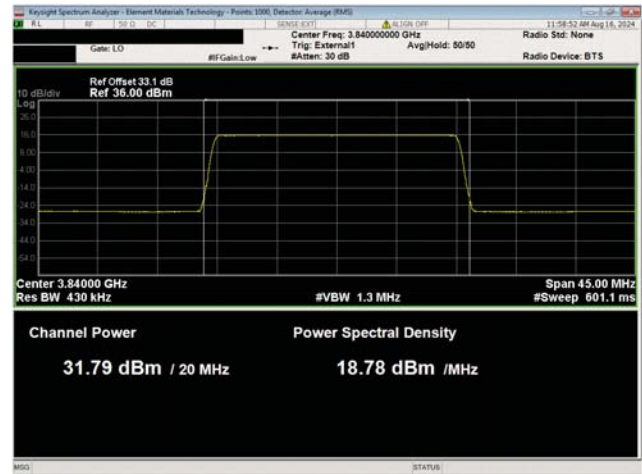
# AVERAGE POWER - BAND 3.7G

|                           | Avg Cond<br>Pwr (dBm) | Duty Cycle<br>Factor (dB) | Single Port<br>dBm/Carrier BW | Sixty-four Port (64x64 MIMO)<br>dBm/carrier BW |
|---------------------------|-----------------------|---------------------------|-------------------------------|------------------------------------------------|
| 100 MHz Channel Bandwidth |                       |                           |                               |                                                |
| QPSK Modulation           |                       |                           |                               |                                                |
| Low Channel, 3750.00 MHz  | 36.15                 | 0                         | 36.2                          | 54.3                                           |
| Mid Channel, 3840.00 MHz  | 36.611                | 0                         | 36.6                          | 54.7                                           |
| High Channel, 3930.00 MHz | 36.444                | 0                         | 36.4                          | 54.5                                           |
| 16QAM Modulation          |                       |                           |                               |                                                |
| Mid Channel, 3840.00 MHz  | 36.689                | 0                         | 36.7                          | 54.8                                           |
| 64QAM Modulation          |                       |                           |                               |                                                |
| Mid Channel, 3840.00 MHz  | 36.742                | 0                         | 36.7                          | 54.8                                           |
| 256QAM Modulation         |                       |                           |                               |                                                |
| Mid Channel, 3840.00 MHz  | 36.783                | 0                         | 36.8                          | 54.9                                           |

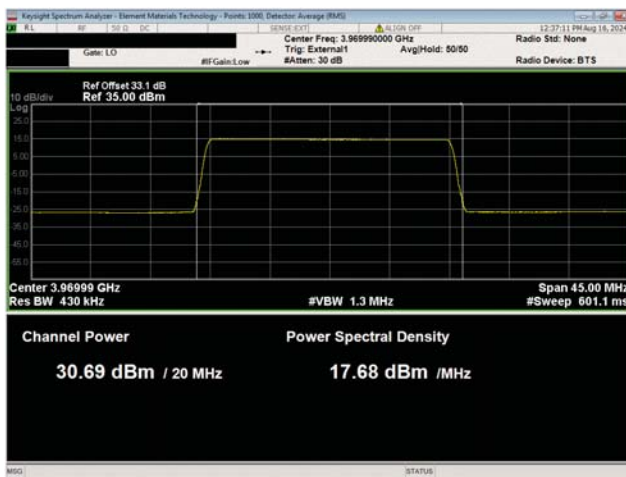
# AVERAGE POWER - BAND 3.7G



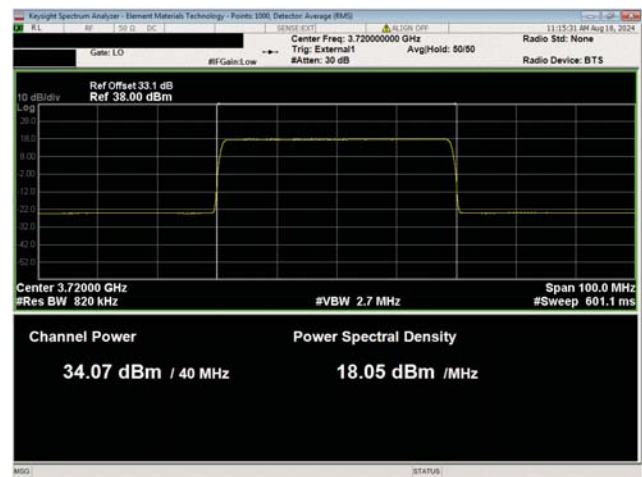
**Port 1**  
20 MHz Channel Bandwidth  
QPSK Modulation  
Low Channel, 3710.01 MHz



**Port 1**  
20 MHz Channel Bandwidth  
QPSK Modulation  
Mid Channel, 3840.00 MHz

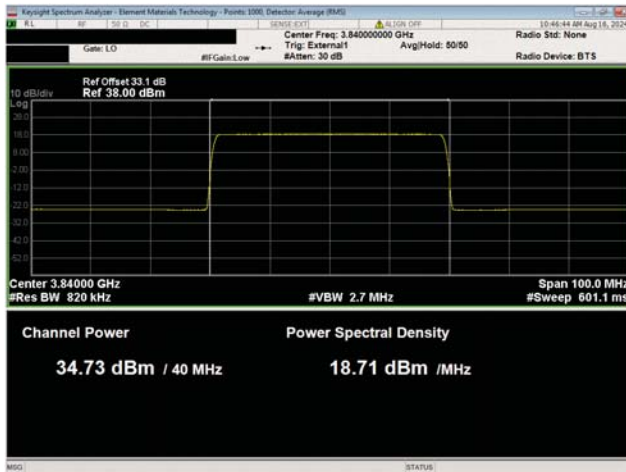


**Port 1**  
20 MHz Channel Bandwidth  
QPSK Modulation  
High Channel, 3969.99 MHz

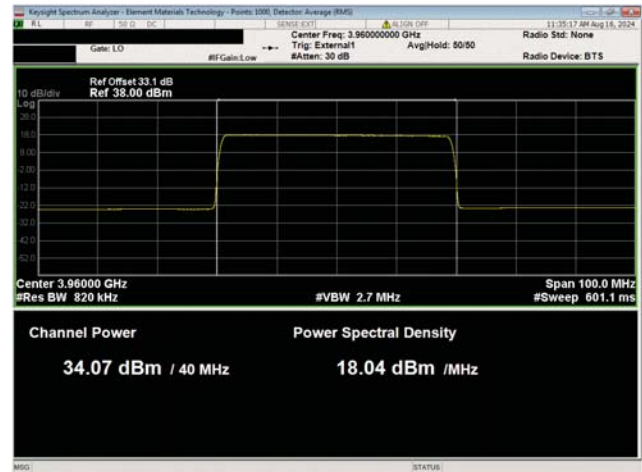


**Port 1**  
40 MHz Channel Bandwidth  
QPSK Modulation  
Low Channel, 3720.00 MHz

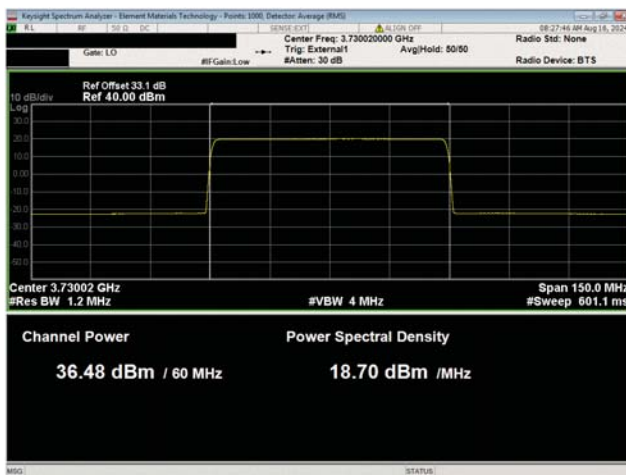
# AVERAGE POWER - BAND 3.7G



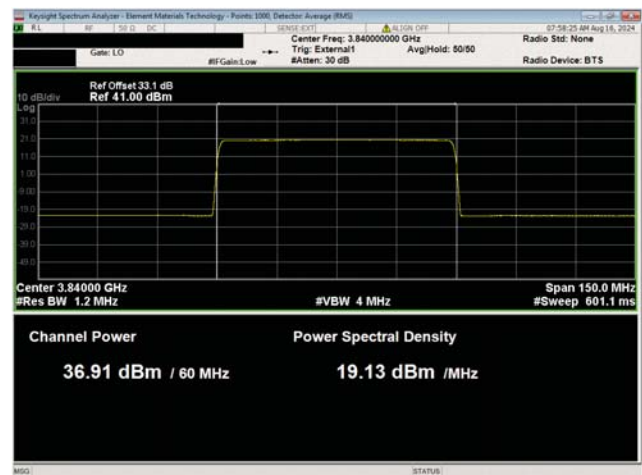
Port 1  
40 MHz Channel Bandwidth  
QPSK Modulation  
Mid Channel, 3840.00 MHz



Port 1  
40 MHz Channel Bandwidth  
QPSK Modulation  
High Channel, 3960.00 MHz

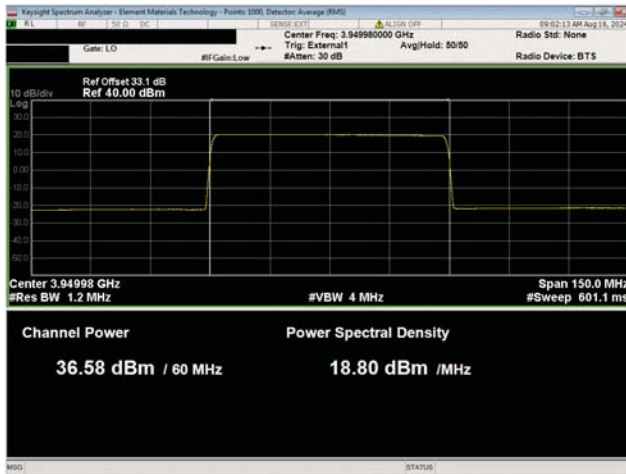


Port 1  
60 MHz Channel Bandwidth  
QPSK Modulation  
Low Channel, 3730.02 MHz

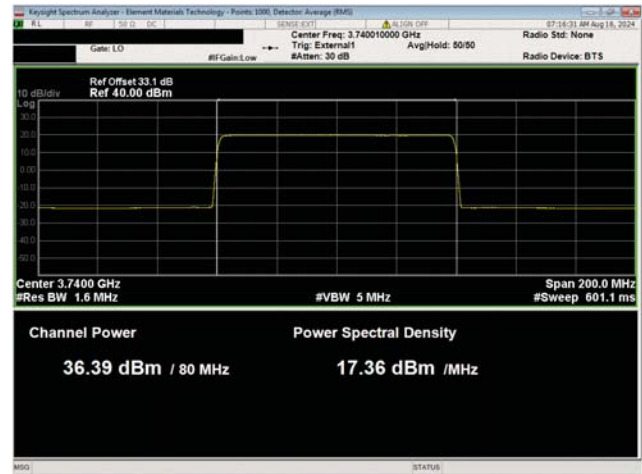


Port 1  
60 MHz Channel Bandwidth  
QPSK Modulation  
Mid Channel, 3840.00 MHz

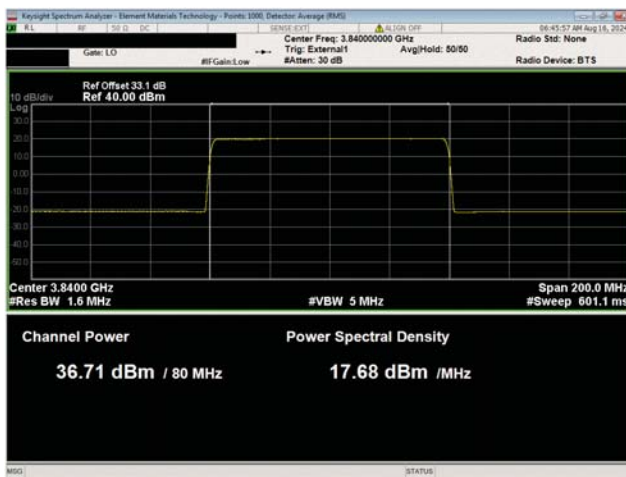
# AVERAGE POWER - BAND 3.7G



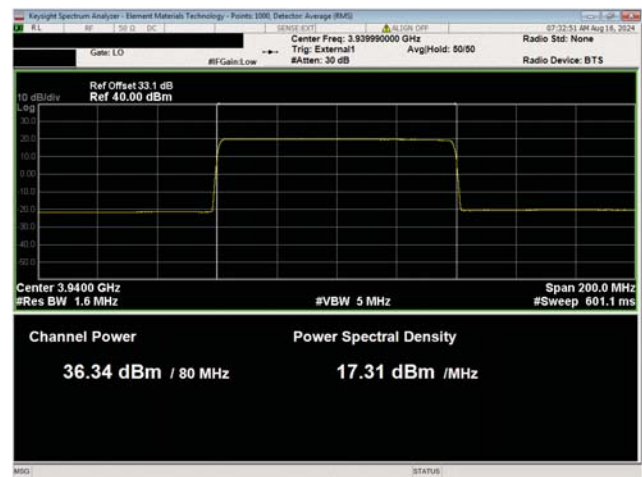
Port 1  
60 MHz Channel Bandwidth  
QPSK Modulation  
High Channel, 3949.98 MHz



Port 1  
80 MHz Channel Bandwidth  
QPSK Modulation  
Low Channel, 3740.01 MHz

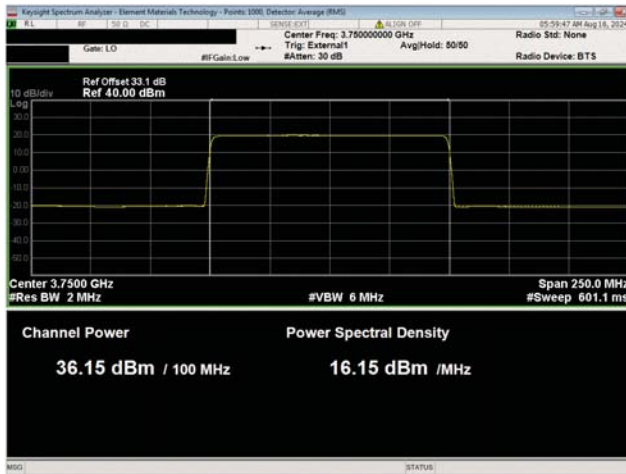


Port 1  
80 MHz Channel Bandwidth  
QPSK Modulation  
Mid Channel, 3840.00 MHz

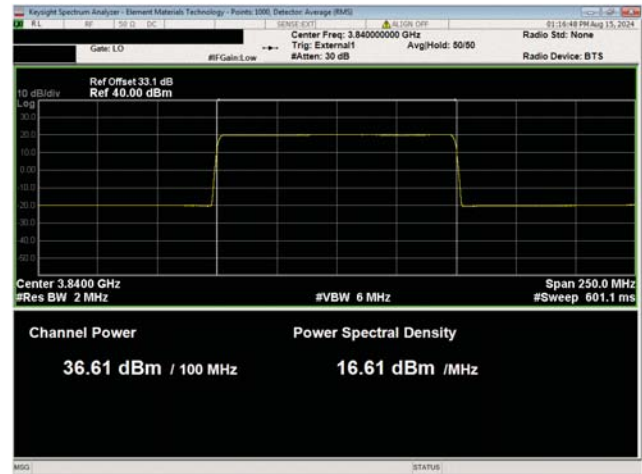


Port 1  
80 MHz Channel Bandwidth  
QPSK Modulation  
High Channel, 3939.99 MHz

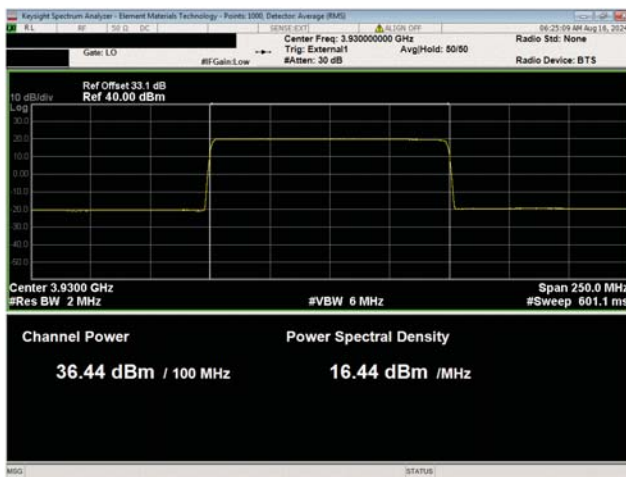
# AVERAGE POWER - BAND 3.7G



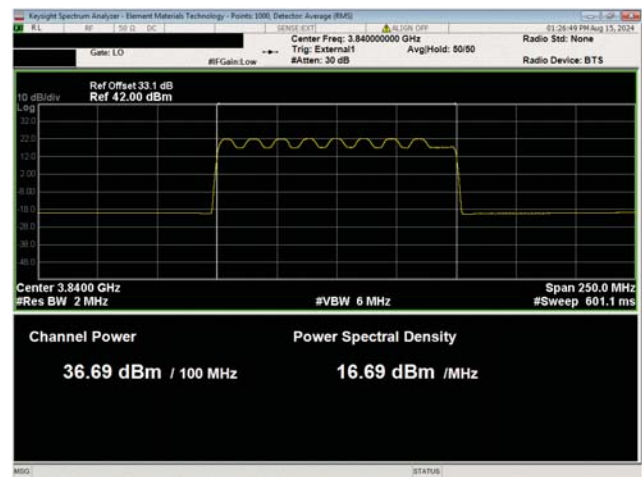
Port 1  
100 MHz Channel Bandwidth  
QPSK Modulation  
Low Channel, 3750.00 MHz



Port 1  
100 MHz Channel Bandwidth  
QPSK Modulation  
Mid Channel, 3840.00 MHz

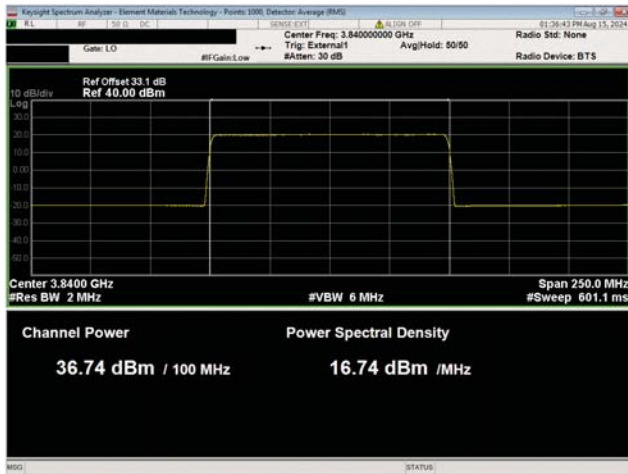


Port 1  
100 MHz Channel Bandwidth  
QPSK Modulation  
High Channel, 3930.00 MHz

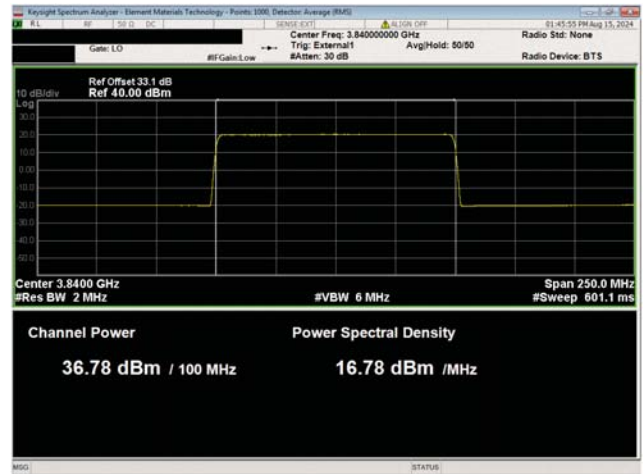


Port 1  
100 MHz Channel Bandwidth  
16QAM Modulation  
Mid Channel, 3840.00 MHz

# AVERAGE POWER - BAND 3.7G



Port 1  
100 MHz Channel Bandwidth  
64QAM Modulation  
Mid Channel, 3840.00 MHz



Port 1  
100 MHz Channel Bandwidth  
256QAM Modulation  
Mid Channel, 3840.00 MHz

# AVERAGE POWER - DUAL BAND

## TEST DESCRIPTION

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The fundamental emission Output Power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

RF conducted emissions testing was performed only on one port. The AVQQA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i and 6.4.

The RMS average power measurement method for FCC/IC is detailed in section 5.2 of KDB 971168 D01v03r01 and ANSI C63.26-2015 section 5.2.4.4. This method uses trace averaging across the ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding  $[10 \log (1/D)]$ , where D is the duty cycle in decimal, to the measured power to compute the average power during the actual transmission times.

The output power was measured for a single carrier over the carrier channel bandwidth on the antenna port 1. The total output power for all port (64x64 MIMO) operation was determined based upon ANSI 63.26 clauses 6.4.3.1 and 6.4.3.2.4 (10 log Nout). The total output power for a Sixty-Four port operation is single port power +18.1 dB [i.e.  $10\log(64)$ ].

### Dual band with 3.45G and 3.7G Band carriers operations test cases using QPSK only:

- Test Case 1.* 3.7GHz Band NR20 Carrier at maximum power at the Top channel. 3.45GHz Band NR20 Carrier at maximum power at the bottom channel operating simultaneously. Both carriers are operating at the same power level (1.56W/carrier). Total radio power is 200W.
- Test Case 2.* 3.7GHz Band NR20 Carrier at maximum power at the Bottom channel. 3.45GHz Band NR20 Carrier at maximum power at the top channel operating simultaneously. Both carriers are operating at the same power level (1.56W/carrier). Total radio power is 200W.
- Test Case 3.* 3.7GHz Band NR100 Carrier at the top channel. 3.45GHz Band NR40 Carrier at the bottom channel operating simultaneously. Both carriers are operating at the same PSD level (3.75W/carrier for NR100 carrier or PSD level at 2.4W/MHz and 1.56W/carrier for NR40 carrier or PSD level at 2.5W/MHz). Total radio power is 340W.

## TEST EQUIPMENT

| Description                  | Manufacturer       | Model  | ID  | Last Cal.  | Cal. Due   |
|------------------------------|--------------------|--------|-----|------------|------------|
| Analyzer - Spectrum Analyzer | Keysight           | N9010A | AFQ | 2024-03-12 | 2025-03-12 |
| Generator - Signal           | Agilent            | N5173B | TIW | 2023-08-07 | 2026-08-07 |
| Block - DC                   | Fairview Microwave | SD3239 | ANE | 2024-02-14 | 2025-02-14 |

# AVERAGE POWER - DUAL BAND

|                   |                              |                       |            |
|-------------------|------------------------------|-----------------------|------------|
| EUT:              | AVQQA Remote Radio Head      | Work Order:           | NOKI0075   |
| Serial Number:    | L1242403137                  | Date:                 | 2024-08-16 |
| Customer:         | Nokia Solutions and Networks | Temperature:          | 23.3°C     |
| Attendees:        | David Le, John Rattanaovong  | Relative Humidity:    | 52.1%      |
| Customer Project: | None                         | Bar. Pressure (PMSL): | 1016 mbar  |
| Tested By:        | Jarrold Brenden              | Job Site:             | PT14       |
| Power:            | 54VDC                        | Configuration:        | NOKI0075-4 |

## TEST SPECIFICATIONS

|                |                  |
|----------------|------------------|
| Specification: | Method:          |
| FCC 27:2024    | ANSI C63.26:2015 |

## COMMENTS

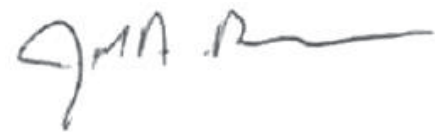
All losses in the measurement path were accounted for in the reference level offset; attenuators, filters, cables, and DC blocks. All measured power values are within tolerance (i.e.: Rated Power  $\pm 2.0$  dB).

## DEVIATIONS FROM TEST STANDARD

None

## CONCLUSION

Pass

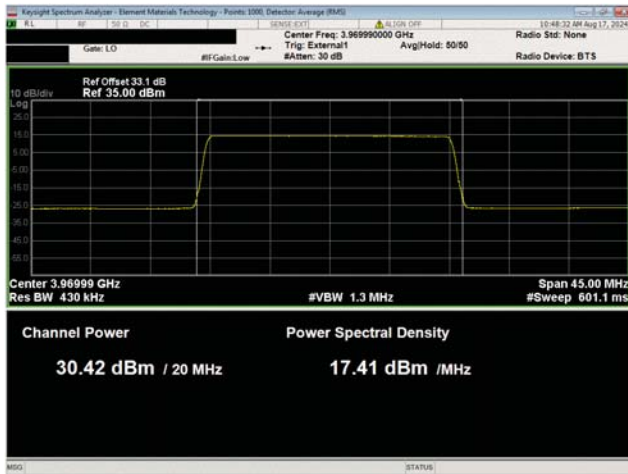


Tested By

## TEST RESULTS

|                                                         | Avg Cond Pwr<br>(dBm) | Single Port<br>(dBm) | Single Port<br>(W) | 64x64 MIMO<br>(dBm) | Result |
|---------------------------------------------------------|-----------------------|----------------------|--------------------|---------------------|--------|
| Port 1                                                  |                       |                      |                    |                     |        |
| QPSK Modulation                                         |                       |                      |                    |                     |        |
| Test Case 1                                             |                       |                      |                    |                     |        |
| 3.7G Band, 20 MHz Bandwidth, High Channel, 3969.99 MHz  | 30.417                | 30.4                 | 1.10               | 48.5                | Pass   |
| 3.45G Band, 20 MHz Bandwidth, Low Channel, 3460.02 MHz  | 30.572                | 30.6                 | 1.15               | 48.7                | Pass   |
| Dual Band Power                                         | N/A                   | N/A                  | 2.24               | 51.6                | Pass   |
| Test Case 2                                             |                       |                      |                    |                     |        |
| 3.7G Band, 20 MHz Bandwidth, Low Channel, 3710.01 MHz   | 30.775                | 30.8                 | 1.20               | 48.9                | Pass   |
| 3.45G Band, 20 MHz Bandwidth, High Channel, 3540.00 MHz | 30.527                | 30.5                 | 1.12               | 48.6                | Pass   |
| Dual Band Power                                         | N/A                   | N/A                  | 2.32               | 51.7                | Pass   |
| Test Case 3                                             |                       |                      |                    |                     |        |
| 3.7G Band, 100 MHz Bandwidth, High Channel, 3930.00 MHz | 34.801                | 34.8                 | 3.02               | 52.9                | Pass   |
| 3.45G Band, 40 MHz Bandwidth, Low Channel, 3470.01 MHz  | 30.873                | 30.9                 | 1.23               | 49                  | Pass   |
| Dual Band Power                                         | N/A                   | N/A                  | 4.25               | 54.4                | Pass   |

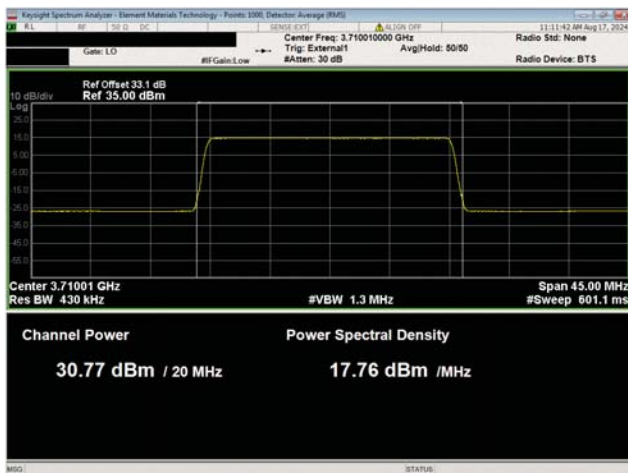
# AVERAGE POWER - DUAL BAND



Port 1  
QPSK Modulation  
Test Case 1



Port 1  
QPSK Modulation  
Test Case 1

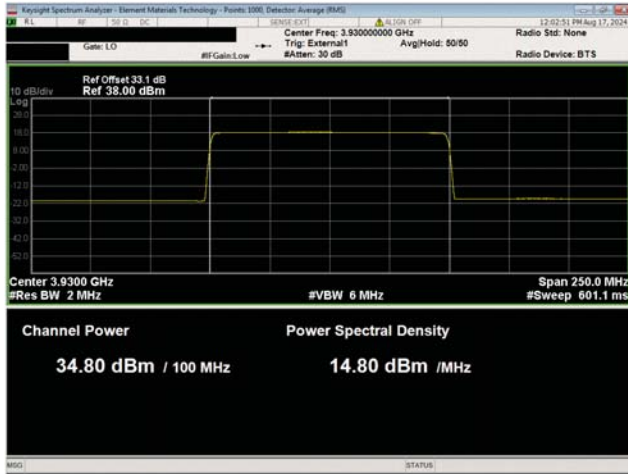


Port 1  
QPSK Modulation  
Test Case 2

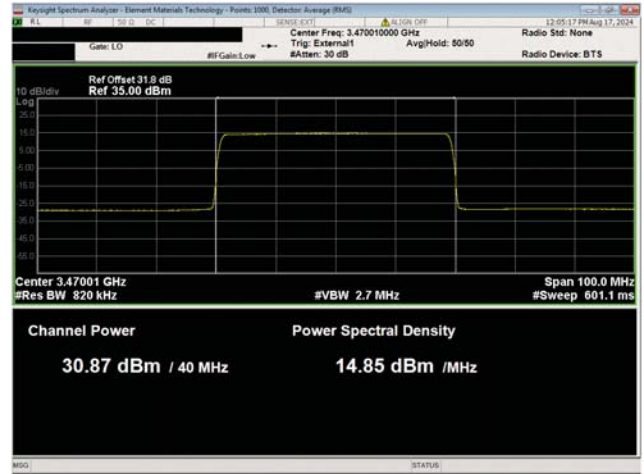


Port 1  
QPSK Modulation  
Test Case 2

# AVERAGE POWER - DUAL BAND



Port 1  
QPSK Modulation  
Test Case 3



Port 1  
QPSK Modulation  
Test Case 3

# AVERAGE POWER – MULTICARRIER, BAND 3.7G



## TEST DESCRIPTION

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

RF conducted emissions testing was performed only on one port. The AVQQA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i and 6.4.

The RMS average power measurement method for FCC is detailed in section 5.2 of KDB 971168 D01v03r01 and ANSI C63.26-2015 section 5.2.4.4. The CCDF measurement method for FCC/IC is detailed in section 5.7.2 of KDB971168 D01v03r01 and ANSI C63.26-2015 section 5.2.3.4. The average power spectral density measurement method for the FCC is detailed in section 5.4 of KDB 971168 D01v03r01 and ANSI C63.26-2015 section 5.2.4.5.

### Multicarrier test cases have been developed as shown below:

- a. *3.7G Band Multicarrier Test Case 1:* Two contiguous NR20 carriers with minimum spacing between carrier frequencies at the lower band edge (3710.01 & 3730.02MHz). The smallest channel bandwidth is selected to maximize carrier power spectral density. The carriers are operated at maximum power (~1.56W/carrier) with a total radio power of 200 watts.
- b. *3.7G Band Multicarrier Test Case 2:* Two contiguous NR20 carriers with minimum spacing between carrier frequencies at the upper band edge (3949.98 & 3969.99 MHz). The smallest channel bandwidth is selected to maximize carrier power spectral density. The carriers are operated at maximum power (~1.56W/carrier) with a total radio power of 200 watts.
- c. *3.7G Band Multicarrier Test Case 3:* Two contiguous NR100 carriers with minimum spacing between carrier frequencies at the lower band edge (3750.00 & 3850.02MHz). The largest channel bandwidth is selected to maximize radio power. The carrier power for NR100 is ~2.65W/carrier. The total radio power is 340 watts.
- d. *3.7G Band Multicarrier Test Case 4:* Two contiguous NR100 carriers with minimum spacing between carrier frequencies at the upper band edge (3830.01 & 3930.00 MHz). The largest channel bandwidth is selected to maximize radio power. The carrier power for NR100 is ~2.65W/carrier. The total radio power is 340 watts.
- e. *3.7G Band Multicarrier Test Case 5:* Two non-contiguous NR20 carriers with maximum spacing between carrier frequencies at the lower band edge (3710.01 & 3889.995MHz). The smallest channel bandwidth is selected to maximize carrier power spectral density. The carriers are operated at maximum power (~1.56W/carrier) with a total radio power of 200 watts.
- f. *3.7G Band Multicarrier Test Case 6:* Two non-contiguous NR20 carriers with maximum spacing between carrier frequencies at the upper band edge (3789.99 & 3969.99MHz). The smallest channel bandwidth is selected to maximize carrier power spectral density. The carriers are operated at maximum power (~1.56W/carrier) with a total radio power of 200 watts.

## TEST EQUIPMENT

| Description                  | Manufacturer       | Model  | ID  | Last Cal.  | Cal. Due   |
|------------------------------|--------------------|--------|-----|------------|------------|
| Analyzer - Spectrum Analyzer | Keysight           | N9010A | AFQ | 2024-03-12 | 2025-03-12 |
| Generator - Signal           | Agilent            | N5173B | TIW | 2023-08-07 | 2026-08-07 |
| Block - DC                   | Fairview Microwave | SD3239 | ANE | 2024-02-14 | 2025-02-14 |

# AVERAGE POWER – MULTICARRIER, BAND 3.7G



|                   |                              |                       |            |
|-------------------|------------------------------|-----------------------|------------|
| EUT:              | AVQQA Remote Radio Head      | Work Order:           | NOKI0075   |
| Serial Number:    | L1242403137                  | Date:                 | 2024-08-21 |
| Customer:         | Nokia Solutions and Networks | Temperature:          | 23.3°C     |
| Attendees:        | David Le, John Rattanavong   | Relative Humidity:    | 52.1%      |
| Customer Project: | None                         | Bar. Pressure (PMSL): | 1016 mbar  |
| Tested By:        | Jarrold Brenden              | Job Site:             | PT14       |
| Power:            | 54VDC                        | Configuration:        | NOKI0075-4 |

## TEST SPECIFICATIONS

|                |                  |
|----------------|------------------|
| Specification: | Method:          |
| FCC 27:2024    | ANSI C63.26:2015 |

## COMMENTS

All losses in the measurement path were accounted for in the reference level offset; attenuators, filters, cables, and DC blocks. Band n77 carriers were enabled at maximum power levels for the 3.7 GHz band per the Multicarrier test cases. All measured power values are within tolerance (i.e.: Rated Power  $\pm 2.0$  dB).

## DEVIATIONS FROM TEST STANDARD

None

## CONCLUSION

Pass

Tested By

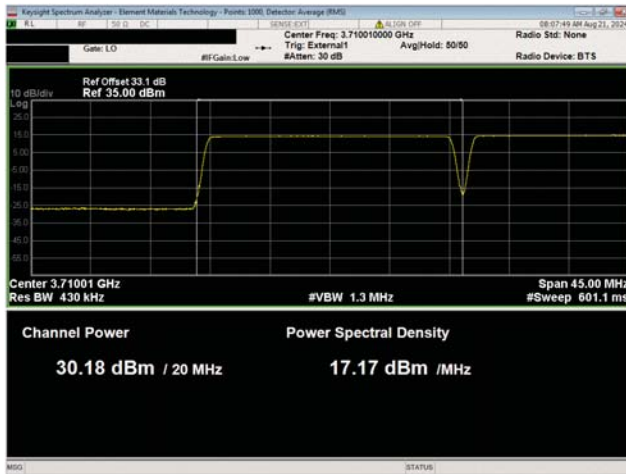
## TEST RESULTS

|                                 | Avg Cond Pwr<br>(dBm) | Single Port<br>(dBm) | Single Port<br>(W) | Single Port, Band<br>(dBm) | 64x64 MIMO Pwr<br>(dBm) | Results |
|---------------------------------|-----------------------|----------------------|--------------------|----------------------------|-------------------------|---------|
| Port 1                          |                       |                      |                    |                            |                         |         |
| QPSK Modulation                 |                       |                      |                    |                            |                         |         |
| Test Case 1                     |                       |                      |                    |                            |                         |         |
| NR20, Low Channel, 3710.01 MHz  | 30.18                 | 30                   | 1.00               | N/A                        | 48.1                    | Pass    |
| NR20, Low Channel 3730.02 MHz   | 30.57                 | 30.6                 | 1.15               | N/A                        | 48.7                    | Pass    |
| Dual Carrier Power              | N/A                   | N/A                  | 2.15               | 33.3                       | 51.4                    | Pass    |
| Test Case 2                     |                       |                      |                    |                            |                         |         |
| NR20, High Channel 3949.98 MHz  | 30.548                | 30.5                 | 1.12               | N/A                        | 48.6                    | Pass    |
| NR20, High Channel 3969.99 MHz  | 30.44                 | 30.4                 | 1.10               | N/A                        | 48.5                    | Pass    |
| Dual Carrier Power              | N/A                   | N/A                  | 2.22               | 33.5                       | 51.6                    | Pass    |
| Test Case 3                     |                       |                      |                    |                            |                         |         |
| NR100, Low Channel 3750.00 MHz  | 32.7                  | 32.7                 | 1.86               | N/A                        | 50.8                    | Pass    |
| NR100, Low Channel 3850.02 MHz  | 33.149                | 33.1                 | 2.04               | N/A                        | 51.2                    | Pass    |
| Dual Carrier Power              | N/A                   | N/A                  | 3.90               | 35.9                       | 54                      | Pass    |
| Test Case 4                     |                       |                      |                    |                            |                         |         |
| NR100, High Channel 3830.01 MHz | 33.186                | 33.2                 | 2.09               | N/A                        | 51.3                    | Pass    |
| NR100, High Channel 3930.00 MHz | 32.827                | 32.8                 | 1.91               | N/A                        | 50.9                    | Pass    |
| Dual Carrier Power              | N/A                   | N/A                  | 3.99               | 36.0                       | 54.1                    | Pass    |
| Test Case 5                     |                       |                      |                    |                            |                         |         |
| NR20, Low Channel 3710.01 MHz   | 30.315                | 30.3                 | 1.07               | N/A                        | 48.4                    | Pass    |
| NR20, Low Channel, 3889.995 MHz | 30.931                | 30.9                 | 1.23               | N/A                        | 49                      | Pass    |

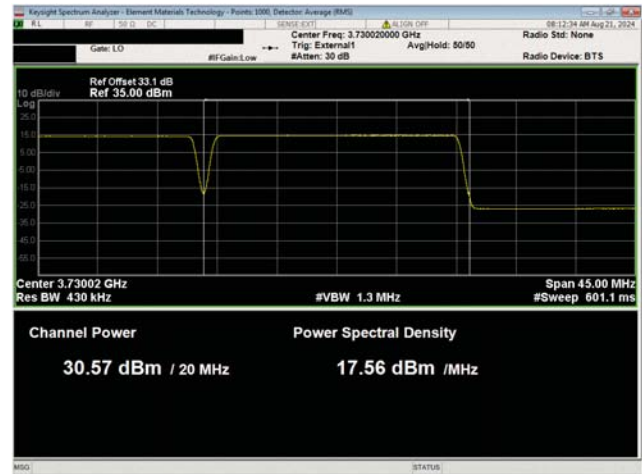
# AVERAGE POWER – MULTICARRIER, BAND 3.7G

|                                | Avg Cond Pwr<br>(dBm) | Single Port<br>(dBm) | Single Port<br>(W) | Single Port, Band<br>(dBm) | 64x64 MIMO Pwr<br>(dBm) | Results |
|--------------------------------|-----------------------|----------------------|--------------------|----------------------------|-------------------------|---------|
| Dual Carrier Power             | N/A                   | N/A                  | 2.30               | 33.6                       | 51.7                    | Pass    |
| Test Case 6                    |                       |                      |                    |                            |                         |         |
| NR20, High Channel 3789.99 MHz | 30.642                | 30.6                 | 1.15               | N/A                        | 48.7                    | Pass    |
| NR20, High Channel 3969.99 MHz | 30.137                | 30.1                 | 1.02               | N/A                        | 48.2                    | Pass    |
| Dual Carrier Power             | N/A                   | N/A                  | 2.17               | 33.4                       | 51.5                    | Pass    |

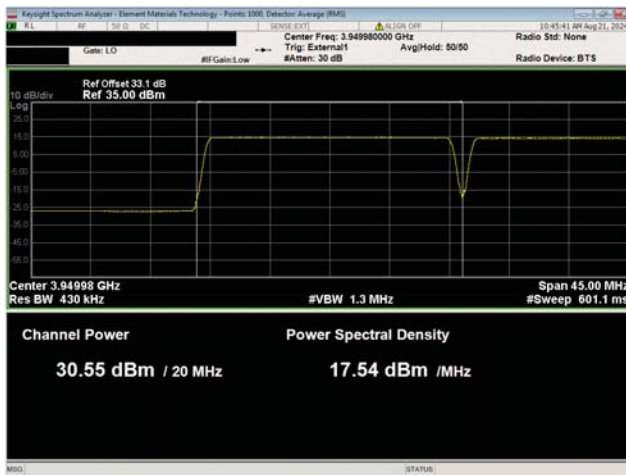
# AVERAGE POWER – MULTICARRIER, BAND 3.7G



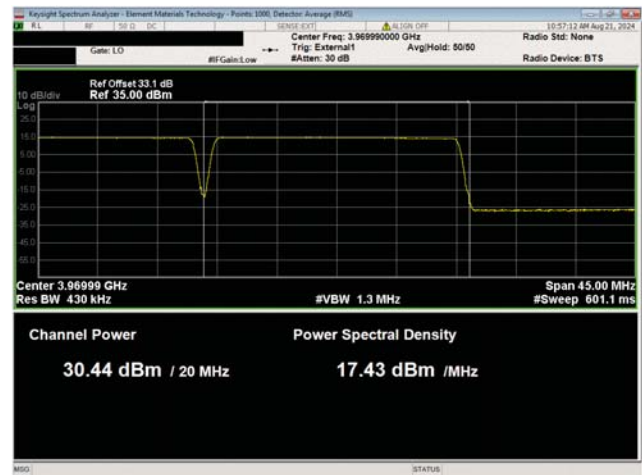
Port 1  
QPSK Modulation  
Test Case 1  
NR20, Low Channel, 3710.01 MHz



Port 1  
QPSK Modulation  
Test Case 1  
NR20, Low Channel 3730.02 MHz

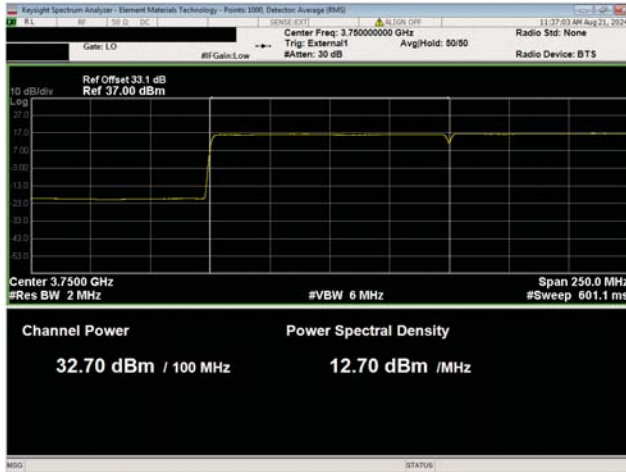


Port 1  
QPSK Modulation  
Test Case 2  
NR20, High Channel 3949.98 MHz

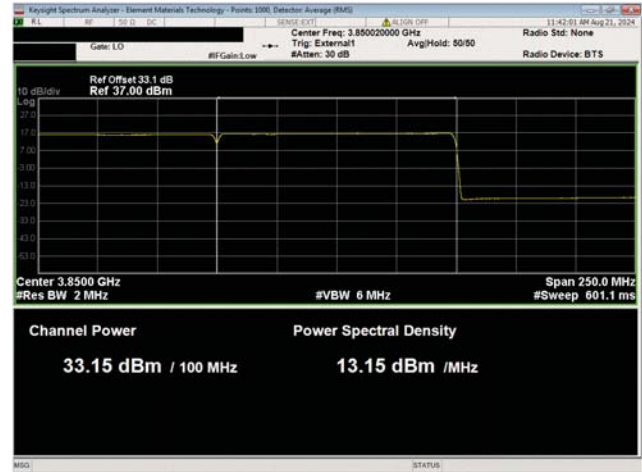


Port 1  
QPSK Modulation  
Test Case 2  
NR20, High Channel 3969.99 MHz

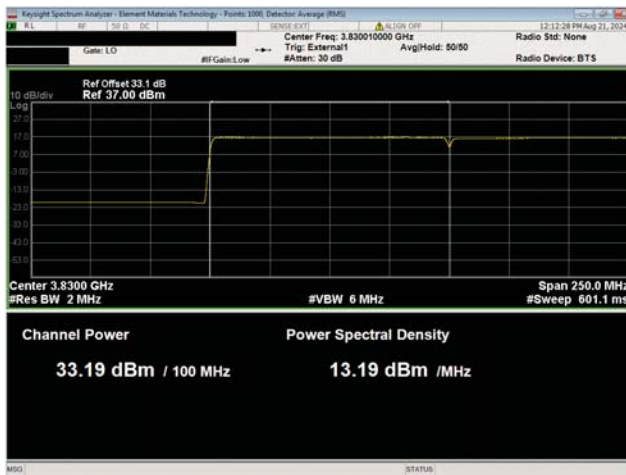
# AVERAGE POWER – MULTICARRIER, BAND 3.7G



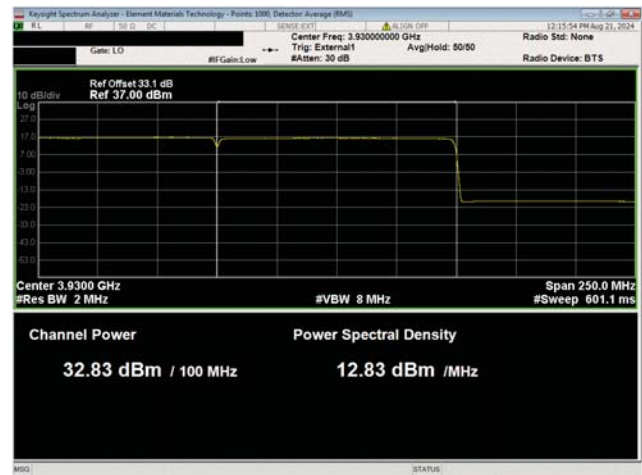
Port 1  
QPSK Modulation  
Test Case 3  
NR100, Low Channel 3750.00 MHz



Port 1  
QPSK Modulation  
Test Case 3  
NR100, Low Channel 3850.02 MHz

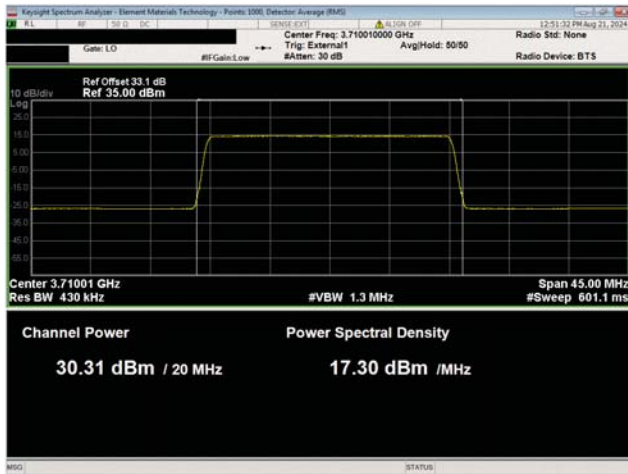


Port 1  
QPSK Modulation  
Test Case 4  
NR100, High Channel 3830.02 MHz

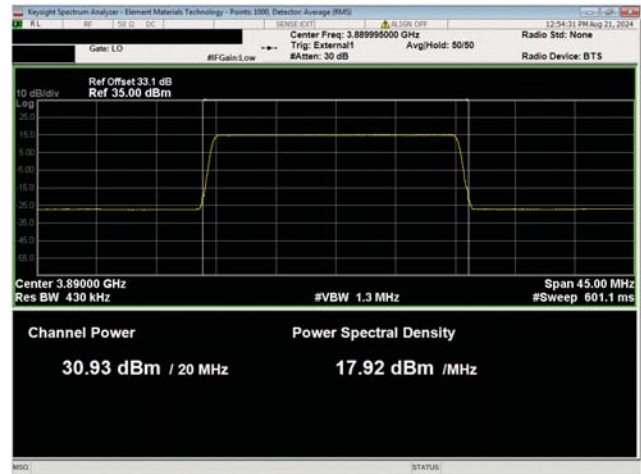


Port 1  
QPSK Modulation  
Test Case 4  
NR100, High Channel 3930.00 MHz

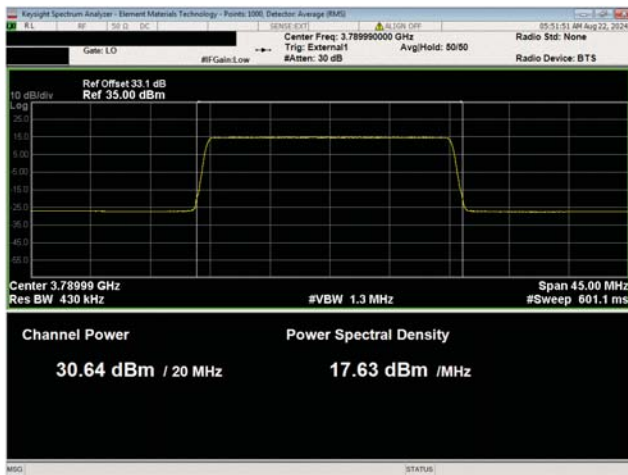
# AVERAGE POWER – MULTICARRIER, BAND 3.7G



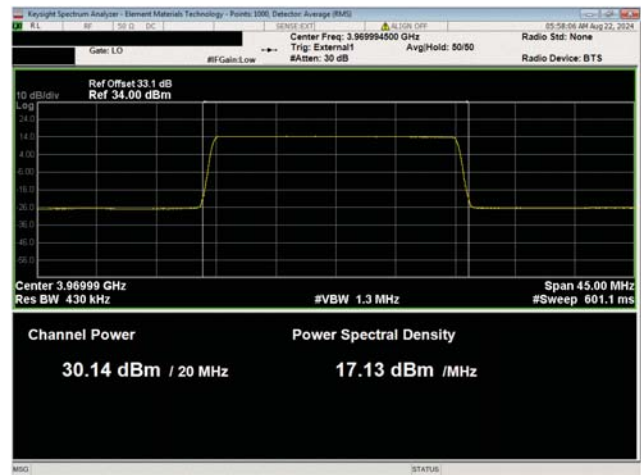
Port 1  
QPSK Modulation  
Test Case 5  
NR20, Low Channel 3710.01 MHz



Port 1  
QPSK Modulation  
Test Case 5  
NR20, Low Channel, 3899.995 MHz



Port 1  
QPSK Modulation  
Test Case 6  
NR20, High Channel 3789.99 MHz



Port 1  
QPSK Modulation  
Test Case 6  
NR20, High Channel 3969.99 MHz

# POWER SPECTRAL DENSITY - BAND 3.45G



## TEST DESCRIPTION

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The RF conducted emission testing was performed on one port. The AVQQA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the "Output Power" report section) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

The fundamental emission Power Spectral Density (PSD) was measured using the channels and modes as called out on the following data sheets.

The method of ANSI C63.26-2015 section 5.2.4.5 was used to make this measurement.

The Power Spectral Density was measured while transmitting on one carrier. The total PSD for multiport operation was determined based upon ANSI C63.26 clause 6.4.3.2.4 (10 Log  $N_{out}$ ). The EIRP calculations are based upon ANSI C63.26-2015 paragraphs 6.4 and 6.4.6.3.

## FCC Requirements: §27.50 Power limits and duty cycle.

27.50 (k) The following power requirements apply to stations transmitting in the 3450-3550 MHz band:

- (1) The power of each fixed or base station transmitting in the 3450-3550 MHz band and located in any county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, is limited to an equivalent isotropically radiated power (EIRP) of 3280 Watts/MHz. This limit applies to the aggregate power of all antenna elements in any given sector of a base station.
- (2) The power of each fixed or base station transmitting in the 3450-3550 MHz band and situated in any geographic location other than that described in paragraph (k)(1) of this section is limited to an EIRP of 1640 Watts/MHz. This limit applies to the aggregate power of all antenna elements in any given sector of a base station

## TEST EQUIPMENT

| Description                  | Manufacturer       | Model  | ID  | Last Cal.  | Cal. Due   |
|------------------------------|--------------------|--------|-----|------------|------------|
| Analyzer - Spectrum Analyzer | Keysight           | N9010A | AFQ | 2024-03-12 | 2025-03-12 |
| Generator - Signal           | Agilent            | N5173B | TIW | 2023-08-07 | 2026-08-07 |
| Block - DC                   | Fairview Microwave | SD3239 | ANE | 2024-02-14 | 2025-02-14 |

# POWER SPECTRAL DENSITY - BAND 3.45G

## 5G NR EIRP Calculations for Sixty-Four Port MIMO Operations

EIRP calculations are needed at each transmitter location to optimize base station operational performance while meeting regulatory requirements. Each cell site installation needs to consider the power measurements in the radio certification report as well as site specific regulatory requirements (such as antenna height, population density, etc.), site installation parameters (line loss between antenna and radio, antenna parameters, etc.) and base station operational parameters (MIMO operational setup, carrier power level, channel bandwidth, modulation type, etc.) to optimize performance. Transmitter output power may be reduced (from maximum) by base station setup parameters.

The AVQQA antenna assembly has an array of 4 rows and 8 columns of (+45°) cross-polarized (orthogonal) radiators. This antenna assembly has a beamforming gain of 25.0dBi ± 1.0dB. The sixty-four AVQQA transmitter outputs are connected to the antenna array (thirty-two are connected to +45° radiators/antennas and thirty-two are connected to the -45° radiators/antennas).

Equivalent Isotropically Radiated Power (EIRP) is calculated (as specified in ANSI C63.26-2015 section 6.4 for a system of correlated output signals) from the results of power measurements (highest measured PSD for each channel bandwidth type). The maximum antenna assembly beamforming gain was used for this calculation. Calculations of worst-case EIRP for sixty-four port MIMO are as follows:

| Parameter                                            | 10 MHz Ch BW                          | 20 MHz Ch BW                          | 30 MHz Ch BW  | 40 MHz Ch BW  |
|------------------------------------------------------|---------------------------------------|---------------------------------------|---------------|---------------|
| Worst Case PSD/Antenna Port                          | 20.5 dBm/MHz                          | 20.8 dBm/MHz                          | 21.3 dBm/MHz  | 21.3 dBm/MHz  |
| Cable Loss                                           | 0 dB                                  | 0 dB                                  | 0 dB          | 0 dB          |
| Number of Ant Ports per Polarization                 | 32                                    | 32                                    | 32            | 32            |
| Total PSD per Polarization<br>10 Log 32 = +15.1 dB   | 35.6 dBm/MHz                          | 35.9 dBm/MHz                          | 36.4 dBm/MHz  | 36.4 dBm/MHz  |
| Maximum Antenna Beamforming Gain<br>per Polarization | 26 dBi                                | 26 dBi                                | 26 dBi        | 26 dBi        |
| EIRP per Polarization                                | 61.6 dBm/MHz                          | 61.9 dBm/MHz                          | 62.4 dBm/MHz  | 62.4 dBm/MHz  |
| Number of Polarizations                              | 2                                     | 2                                     | 2             | 2             |
| EIRP Total (See Note 1)                              | 61.6 dBm/MHz                          | 61.9 dBm/MHz                          | 62.4 dBm/MHz  | 62.4 dBm/MHz  |
| Passing EIRP Limit                                   | 62.15 dBm/MHz<br>and<br>65.16 dBm/MHz | 62.15 dBm/MHz<br>and<br>65.16 dBm/MHz | 65.16 dBm/MHz | 65.16 dBm/MHz |

Note 1: The EIRP per antenna polarization is required to be below the regulatory limit as described in ANSI C63.26-2015 section 6.4.6.3 b)2) and KDB 662911 D02v01 page 3 example (2) since the two transmitter outputs to each antenna are 90 degree-phase shifted relative to each other (cross-polarized radiators).

## Calculation Summary for the 3.45G Band

- (1) The worst case AVQQA sixty-four port MIMO EIRP levels for all 5G NR channel bandwidths (10MHz, 20MHz, 30MHz & 40MHz) are less than the 3280 W/MHz (65.16 dBm/MHz) FCC regulatory limit.
- (2) The worst case AVQQA sixty-four port MIMO EIRP levels for the 5G NR 10MHz & 20MHz channel bandwidths are less than the 1640 W/MHz (62.15 dBm/MHz) FCC regulatory limit.
- (3) The worst case AVQQA sixty-four port MIMO EIRP levels for the 5G NR 30MHz & 40MHz channel bandwidths exceed the 1640 W/MHz (62.15 dBm/MHz) FCC regulatory limit by 0.25 dB (62.4 dBm/MHz - 62.15 dBm/MHz). The AVQQA 5G NR 30MHz & 40MHz channel bandwidth carrier power levels using sixty-four port MIMO operation need to be reduced to meet the 1640 W/MHz (62.15 dBm/MHz) FCC regulatory limit.

# POWER SPECTRAL DENSITY - BAND 3.45G



|                   |                              |                       |            |
|-------------------|------------------------------|-----------------------|------------|
| EUT:              | AVQQA Remote Radio Head      | Work Order:           | NOKI0075   |
| Serial Number:    | L1242403137                  | Date:                 | 2024-08-09 |
| Customer:         | Nokia Solutions and Networks | Temperature:          | 23.3°C     |
| Attendees:        | David Le, John Rattanaovong  | Relative Humidity:    | 52.8%      |
| Customer Project: | None                         | Bar. Pressure (PMSL): | 1016 mbar  |
| Tested By:        | Jarrold Brenden              | Job Site:             | PT14       |
| Power:            | 54VDC                        | Configuration:        | NOKI0075-4 |

## TEST SPECIFICATIONS

|                |                  |
|----------------|------------------|
| Specification: | Method:          |
| FCC 27:2024    | ANSI C63.26:2015 |

## COMMENTS

All losses in the measurement path were accounted for in the reference level offset; attenuators, filters, cables, and DC blocks. Band n77 carriers were enabled at maximum power levels for the 3.45 GHz band in single carrier operating mode configuration.

## DEVIATIONS FROM TEST STANDARD

None

## CONCLUSION

Pass

Tested By

## TEST RESULTS

|                          | Initial Value<br>dBm/MHz | Duty cycle<br>Factor (dB) | Single Port<br>dBm/MHz == PSD | Sixty-four Port (64x64 MIMO)<br>dBm/MHz == PSD |
|--------------------------|--------------------------|---------------------------|-------------------------------|------------------------------------------------|
| Port 1                   |                          |                           |                               |                                                |
| 10 MHz Channel Bandwidth |                          |                           |                               |                                                |
| QPSK Modulation          |                          |                           |                               |                                                |
| Mid Channel, 3500.01 MHz | 19.68                    | 0                         | 19.7                          | 37.8                                           |
| 16QAM Modulation         |                          |                           |                               |                                                |
| Mid Channel, 3500.01 MHz | 20.545                   | 0                         | 20.5                          | 38.6                                           |
| 64QAM Modulation         |                          |                           |                               |                                                |
| Mid Channel, 3500.01 MHz | 19.814                   | 0                         | 19.8                          | 37.9                                           |
| 256QAM Modulation        |                          |                           |                               |                                                |
| Mid Channel, 3500.01 MHz | 19.805                   | 0                         | 19.8                          | 37.9                                           |
| 20 MHz Channel Bandwidth |                          |                           |                               |                                                |
| QPSK Modulation          |                          |                           |                               |                                                |
| Mid Channel, 3500.01 MHz | 19.322                   | 0                         | 19.3                          | 37.4                                           |
| 16QAM Modulation         |                          |                           |                               |                                                |
| Mid Channel, 3500.01 MHz | 20.833                   | 0                         | 20.8                          | 38.9                                           |
| 64QAM Modulation         |                          |                           |                               |                                                |
| Mid Channel, 3500.01 MHz | 19.545                   | 0                         | 19.5                          | 37.6                                           |
| 256QAM Modulation        |                          |                           |                               |                                                |
| Mid Channel, 3500.01 MHz | 19.471                   | 0                         | 19.5                          | 37.6                                           |
| 30 MHz Channel Bandwidth |                          |                           |                               |                                                |
| QPSK Modulation          |                          |                           |                               |                                                |
| Mid Channel, 3500.01 MHz | 19.403                   | 0                         | 19.4                          | 37.5                                           |

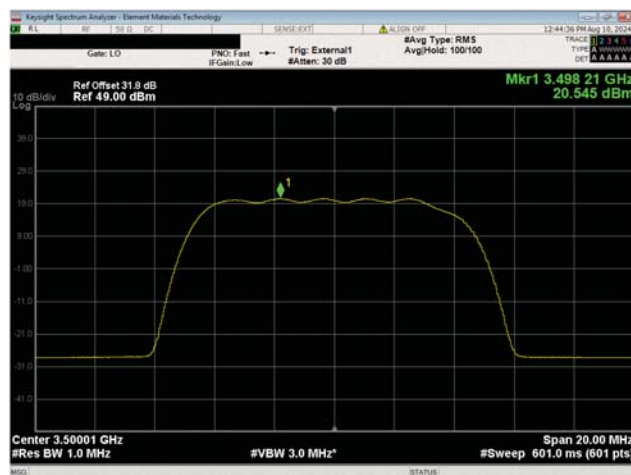
# POWER SPECTRAL DENSITY - BAND 3.45G

|                           | Initial Value<br>dBm/MHz | Duty cycle<br>Factor (dB) | Single Port<br>dBm/MHz == PSD | Sixty-four Port (64x64 MIMO)<br>dBm/MHz == PSD |
|---------------------------|--------------------------|---------------------------|-------------------------------|------------------------------------------------|
| 16QAM Modulation          |                          |                           |                               |                                                |
| Mid Channel, 3500.01 MHz  | 21.327                   | 0                         | 21.3                          | 39.4                                           |
| 64QAM Modulation          |                          |                           |                               |                                                |
| Mid Channel, 3500.01 MHz  | 19.607                   | 0                         | 19.6                          | 37.7                                           |
| 256QAM Modulation         |                          |                           |                               |                                                |
| Mid Channel, 3500.01 MHz  | 19.587                   | 0                         | 19.6                          | 37.7                                           |
| 40 MHz Channel Bandwidth  |                          |                           |                               |                                                |
| QPSK Modulation           |                          |                           |                               |                                                |
| Low Channel, 3470.01 MHz  | 18.645                   | 0                         | 18.6                          | 36.7                                           |
| Mid Channel, 3500.01 MHz  | 19.207                   | 0                         | 19.2                          | 37.3                                           |
| High Channel, 3529.98 MHz | 18.522                   | 0                         | 18.5                          | 36.6                                           |
| 16QAM Modulation          |                          |                           |                               |                                                |
| Low Channel, 3470.01 MHz  | 20.477                   | 0                         | 20.5                          | 38.6                                           |
| Mid Channel, 3500.01 MHz  | 21.334                   | 0                         | 21.3                          | 39.4                                           |
| High Channel, 3529.98 MHz | 17.475                   | 0                         | 17.5                          | 35.6                                           |
| 64QAM Modulation          |                          |                           |                               |                                                |
| Low Channel, 3470.01 MHz  | 18.762                   | 0                         | 18.8                          | 36.9                                           |
| Mid Channel, 3500.01 MHz  | 19.487                   | 0                         | 19.5                          | 37.6                                           |
| High Channel, 3529.98 MHz | 15.585                   | 0                         | 15.6                          | 33.7                                           |
| 256QAM Modulation         |                          |                           |                               |                                                |
| Low Channel, 3470.01 MHz  | 18.758                   | 0                         | 18.8                          | 36.9                                           |
| Mid Channel, 3500.01 MHz  | 19.533                   | 0                         | 19.5                          | 37.6                                           |
| High Channel, 3529.98 MHz | 15.771                   | 0                         | 15.8                          | 33.9                                           |

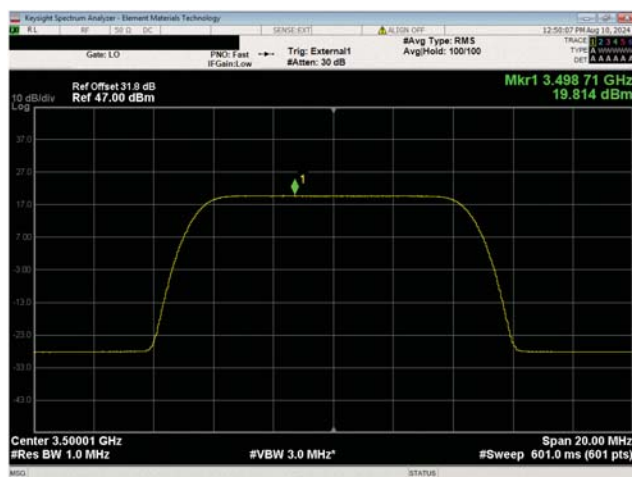
# POWER SPECTRAL DENSITY - BAND 3.45G



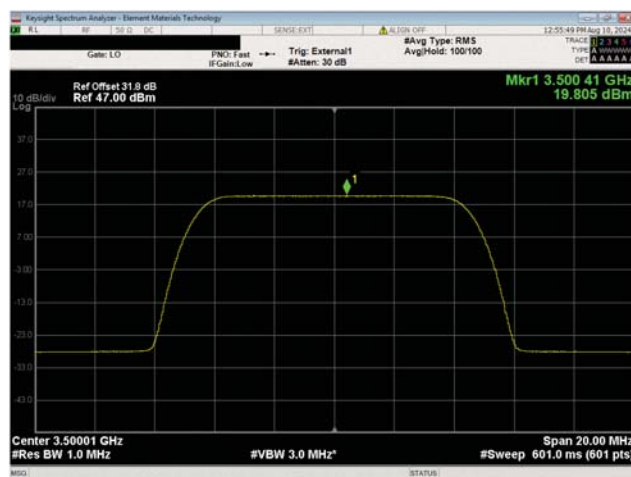
**Port 1**  
**10 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Mid Channel, 3500.01 MHz**



**Port 1**  
**10 MHz Channel Bandwidth**  
**16QAM Modulation**  
**Mid Channel, 3500.01 MHz**

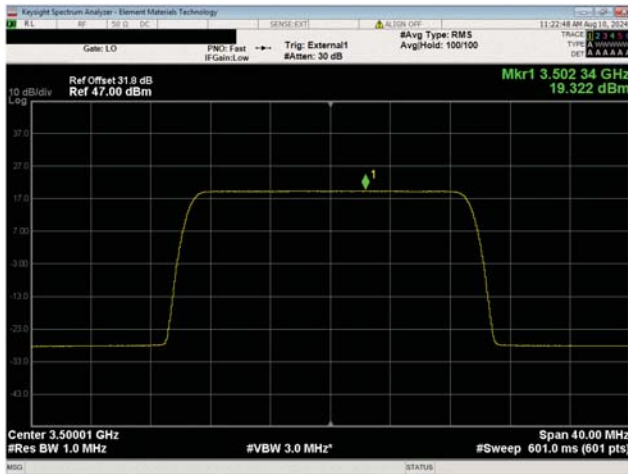


**Port 1**  
**10 MHz Channel Bandwidth**  
**64QAM Modulation**  
**Mid Channel, 3500.01 MHz**

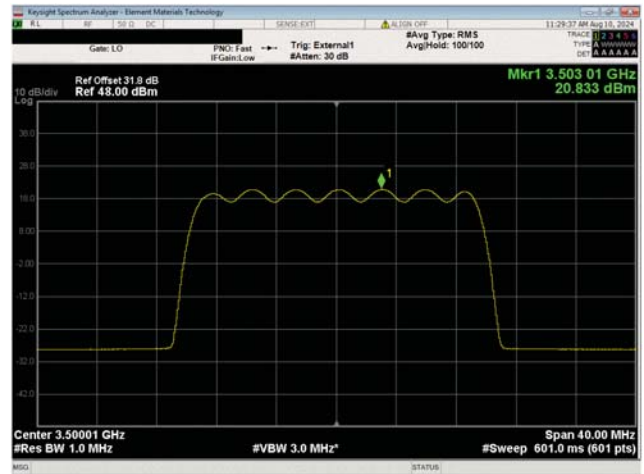


**Port 1**  
**10 MHz Channel Bandwidth**  
**256QAM Modulation**  
**Mid Channel, 3500.01 MHz**

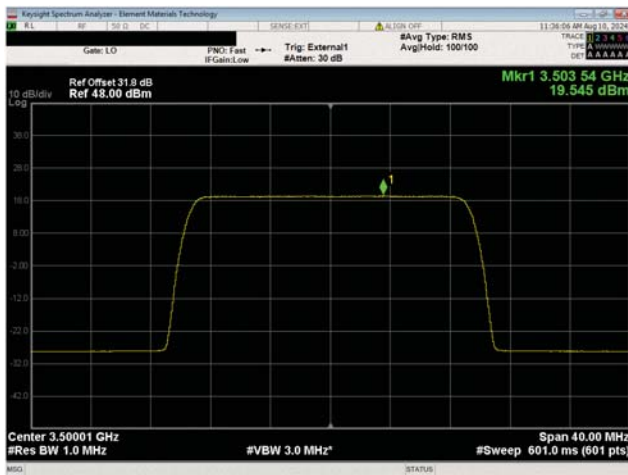
# POWER SPECTRAL DENSITY - BAND 3.45G



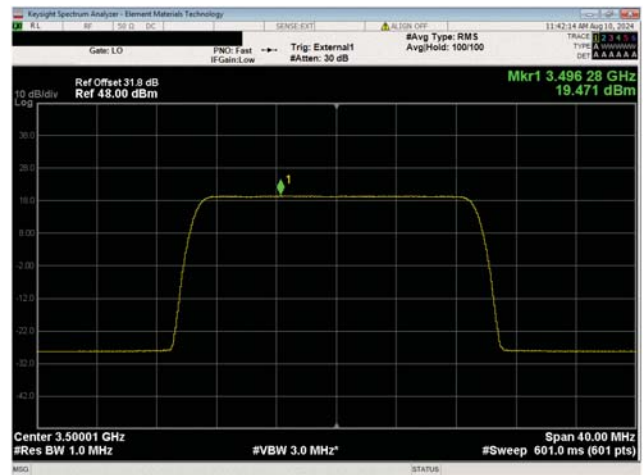
**Port 1**  
20 MHz Channel Bandwidth  
QPSK Modulation  
Mid Channel, 3500.01 MHz



**Port 1**  
20 MHz Channel Bandwidth  
16QAM Modulation  
Mid Channel, 3500.01 MHz

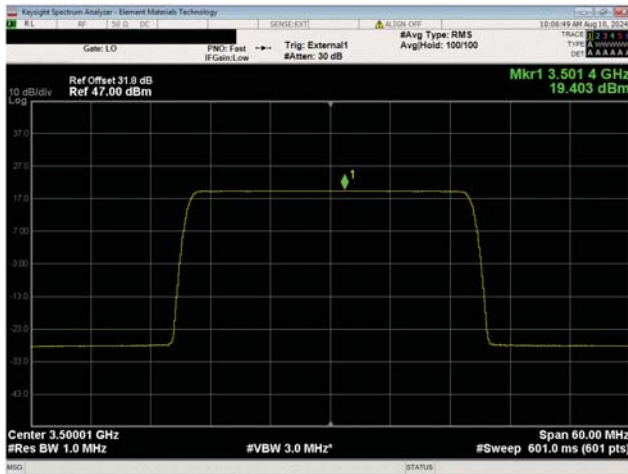


**Port 1**  
20 MHz Channel Bandwidth  
64QAM Modulation  
Mid Channel, 3500.01 MHz

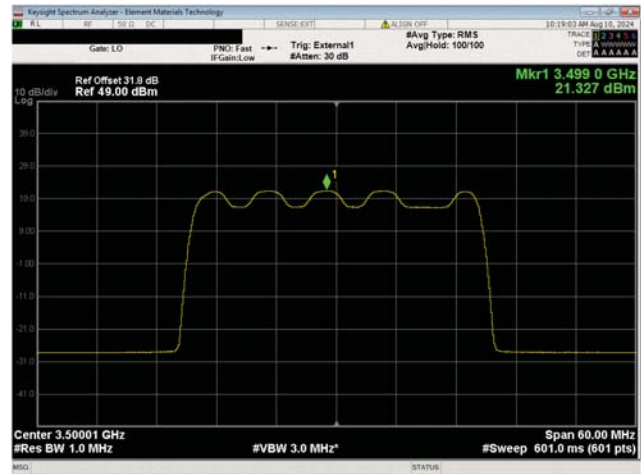


**Port 1**  
20 MHz Channel Bandwidth  
256QAM Modulation  
Mid Channel, 3500.01 MHz

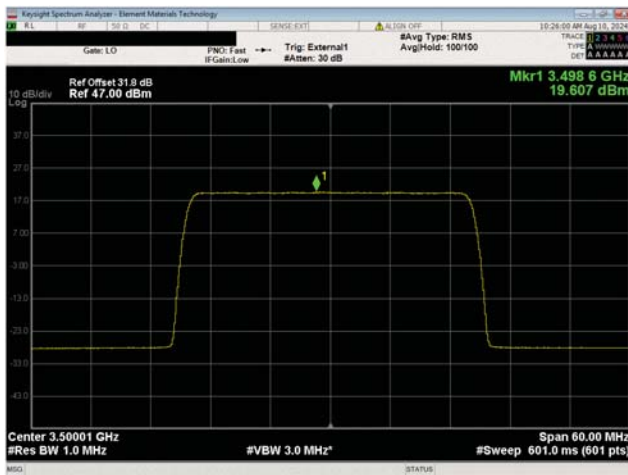
# POWER SPECTRAL DENSITY - BAND 3.45G



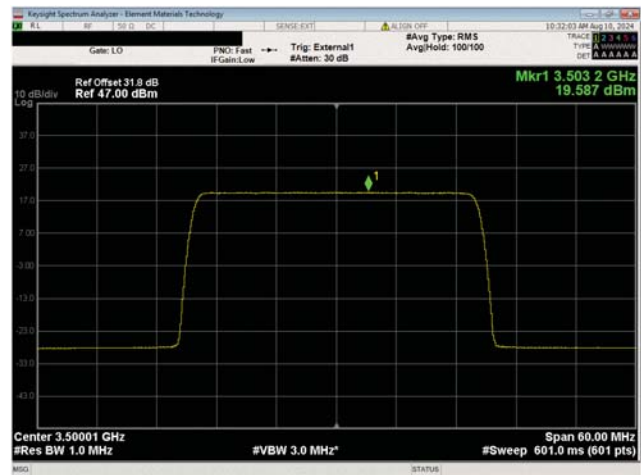
**Port 1**  
30 MHz Channel Bandwidth  
QPSK Modulation  
Mid Channel, 3500.01 MHz



**Port 1**  
30 MHz Channel Bandwidth  
16QAM Modulation  
Mid Channel, 3500.01 MHz

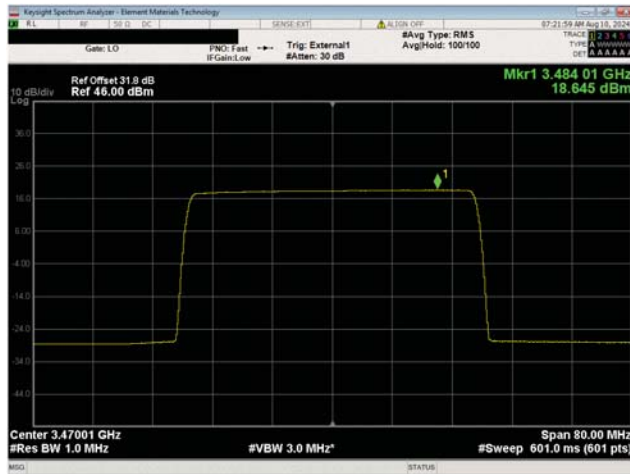


**Port 1**  
30 MHz Channel Bandwidth  
64QAM Modulation  
Mid Channel, 3500.01 MHz

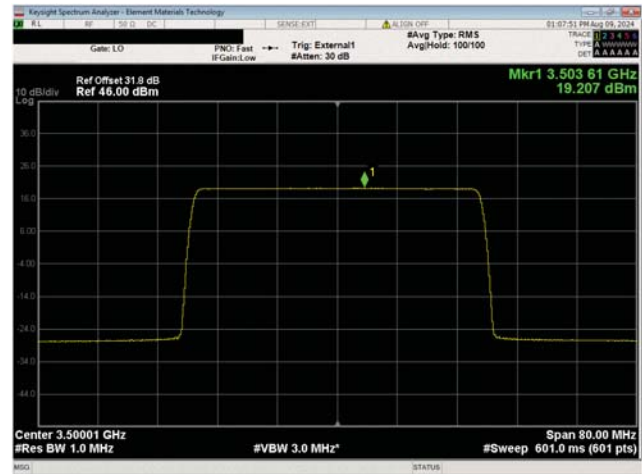


**Port 1**  
30 MHz Channel Bandwidth  
256QAM Modulation  
Mid Channel, 3500.01 MHz

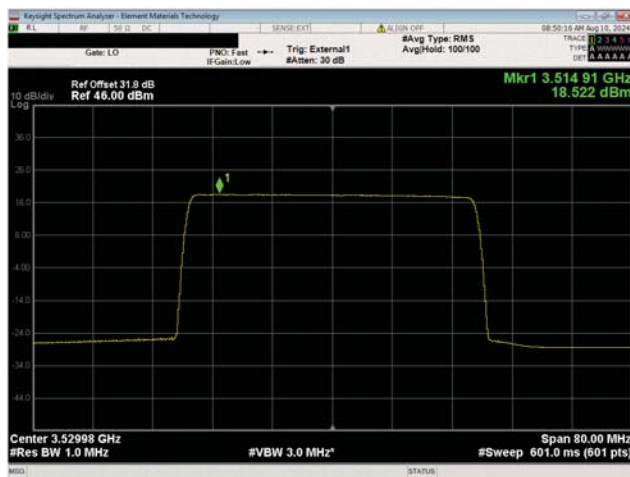
# POWER SPECTRAL DENSITY - BAND 3.45G



**Port 1**  
40 MHz Channel Bandwidth  
QPSK Modulation  
Low Channel, 3470.01 MHz



**Port 1**  
40 MHz Channel Bandwidth  
QPSK Modulation  
Mid Channel, 3500.01 MHz



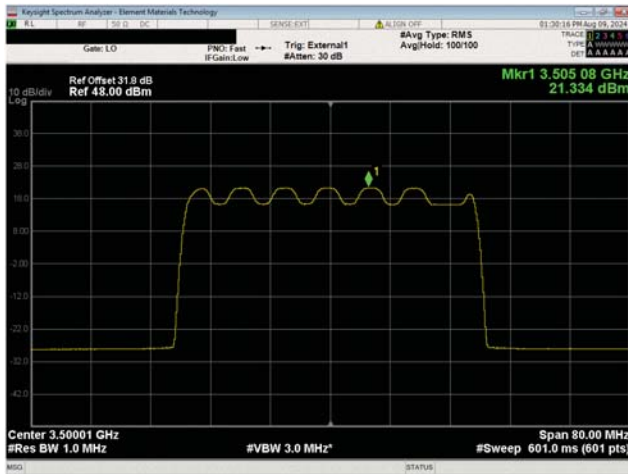
**Port 1**  
40 MHz Channel Bandwidth  
QPSK Modulation  
High Channel, 3529.98 MHz



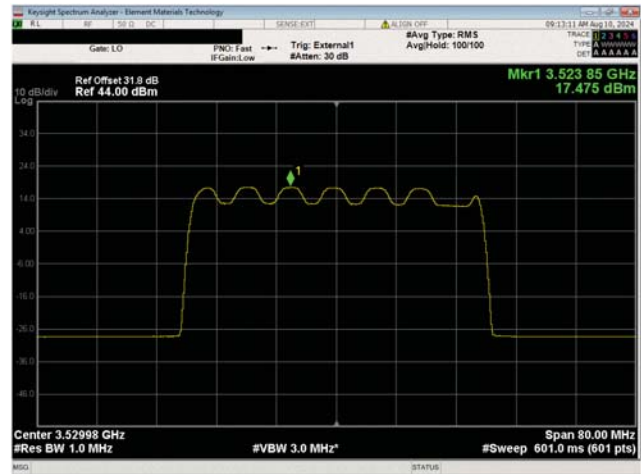
**Port 1**  
40 MHz Channel Bandwidth  
16QAM Modulation  
Low Channel, 3470.01 MHz

# POWER SPECTRAL DENSITY - BAND

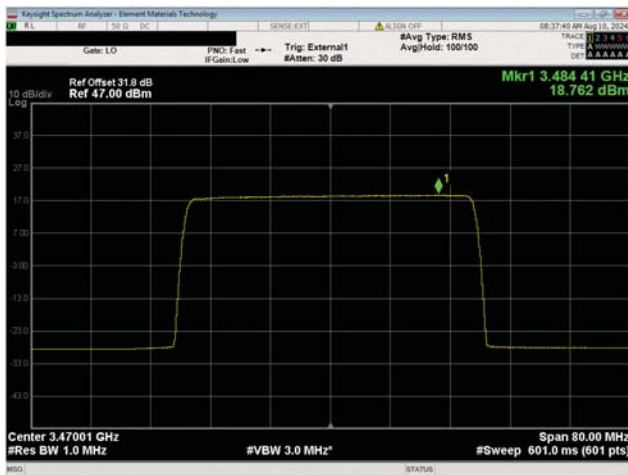
## 3.45G



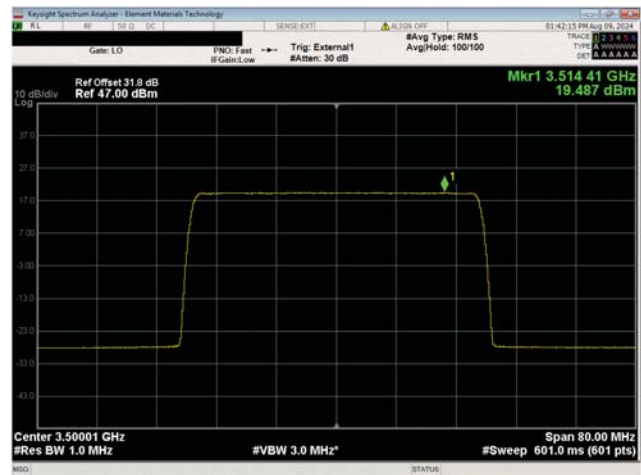
**Port 1**  
40 MHz Channel Bandwidth  
16QAM Modulation  
Mid Channel, 3500.01 MHz



**Port 1**  
40 MHz Channel Bandwidth  
16QAM Modulation  
High Channel, 3529.98 MHz



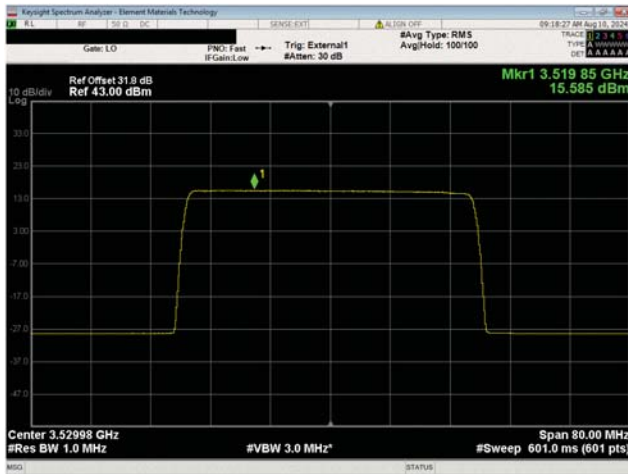
**Port 1**  
40 MHz Channel Bandwidth  
64QAM Modulation  
Low Channel, 3470.01 MHz



**Port 1**  
40 MHz Channel Bandwidth  
64QAM Modulation  
Mid Channel, 3500.01 MHz

# POWER SPECTRAL DENSITY - BAND

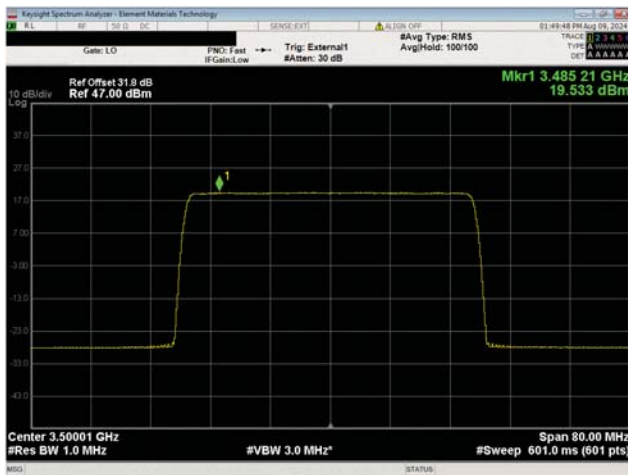
## 3.45G



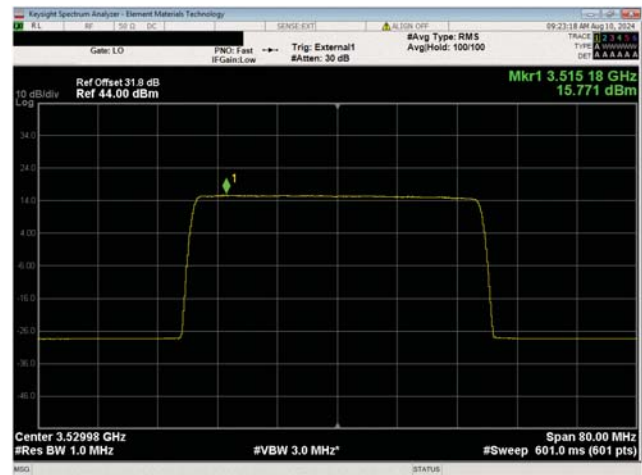
**Port 1**  
40 MHz Channel Bandwidth  
64QAM Modulation  
High Channel, 3529.98 MHz



**Port 1**  
40 MHz Channel Bandwidth  
256QAM Modulation  
Low Channel, 3470.01 MHz



**Port 1**  
40 MHz Channel Bandwidth  
256QAM Modulation  
Mid Channel, 3500.01 MHz



**Port 1**  
40 MHz Channel Bandwidth  
256QAM Modulation  
High Channel, 3529.98 MHz

# POWER SPECTRAL DENSITY - BAND 3.7G



## TEST DESCRIPTION

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The RF conducted emission testing was performed on one port. The AVQQA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the "Output Power" report section) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

The fundamental emission Power Spectral Density (PSD) was measured using the channels and modes as called out on the following data sheets.

The method of ANSI C63.26-2015 section 5.2.4.5 was used to make this measurement.

The Power Spectral Density was measured while transmitting on one carrier. The total PSD for multiport operation was determined based upon ANSI C63.26 clause 6.4.3.2.4 (10 Log  $N_{out}$ ). The EIRP calculations are based upon ANSI C63.26-2015 paragraphs 6.4 and 6.4.6.3.

## FCC Requirements: §27.50 Power limits and duty cycle.

27.50 (j) The following power requirements apply to stations transmitting in the 3700-3980 MHz band:

- (1) The power of each fixed or base station transmitting in the 3700-3980 MHz band and located in any county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, is limited to an equivalent isotropically radiated power (EIRP) of 3280 Watts/MHz. This limit applies to the aggregate power of all antenna elements in any given sector of a base station.
- (2) The power of each fixed or base station transmitting in the 3700-3980 MHz band and situated in any geographic location other than that described in paragraph (j)(1) of this section is limited to an EIRP of 1640 Watts/MHz. This limit applies to the aggregate power of all antenna elements in any given sector of a base station.

## TEST EQUIPMENT

| Description                  | Manufacturer       | Model  | ID  | Last Cal.  | Cal. Due   |
|------------------------------|--------------------|--------|-----|------------|------------|
| Analyzer - Spectrum Analyzer | Keysight           | N9010A | AFQ | 2024-03-12 | 2025-03-12 |
| Generator - Signal           | Agilent            | N5173B | TIW | 2023-08-07 | 2026-08-07 |
| Block - DC                   | Fairview Microwave | SD3239 | ANE | 2024-02-14 | 2025-02-14 |

# POWER SPECTRAL DENSITY - BAND 3.7G

## 5G NR EIRP Calculations for Sixty-Four Port MIMO Operations

EIRP calculations are needed at each transmitter location to optimize base station operational performance while meeting regulatory requirements. Each cell site installation needs to consider the power measurements in the radio certification report as well as site specific regulatory requirements (such as antenna height, population density, etc.), site installation parameters (line loss between antenna and radio, antenna parameters, etc.) and base station operational parameters (MIMO operational setup, carrier power level, channel bandwidth, modulation type, etc.) to optimize performance. Transmitter output power may be reduced (from maximum) by base station setup parameters.

The AVQQA antenna assembly has an array of 4 rows and 8 columns of ( $\pm 45^\circ$ ) cross-polarized (orthogonal) radiators. This antenna assembly has a beamforming gain of  $25.0\text{dBi} \pm 1.0\text{dB}$ . The sixty-four AVQQA transmitter outputs are connected to the antenna array (thirty-two are connected to  $+45^\circ$  radiators/antennas and thirty-two are connected to the  $-45^\circ$  radiators/antennas).

Equivalent Isotropically Radiated Power (EIRP) is calculated (as specified in ANSI C63.26-2015 section 6.4 for a system of correlated output signals) from the results of power measurements (highest measured PSD for each channel bandwidth type). The maximum antenna assembly beamforming gain was used for this calculation. Calculations of worst-case EIRP for sixty-four port MIMO are as follows:

| Parameter                                            | 20 MHz Ch BW                          | 40 MHz Ch BW  | 60 MHz Ch BW  | 80 MHz Ch BW                          | 100 MHz Ch BW                         |
|------------------------------------------------------|---------------------------------------|---------------|---------------|---------------------------------------|---------------------------------------|
| Worst Case PSD/Antenna Port                          | 21.0 dBm/MHz                          | 21.3 dBm/MHz  | 21.5 dBm/MHz  | 20.1 dBm/MHz                          | 19.3 dBm/MHz                          |
| Cable Loss                                           | 0 dB                                  | 0 dB          | 0 dB          | 0 dB                                  | 0 dB                                  |
| Number of Ant Ports per Polarization                 | 32                                    | 32            | 32            | 32                                    | 32                                    |
| Total PSD per Polarization<br>10 Log 32 = +15.1 dB   | 36.1 dBm/MHz                          | 36.4 dBm/MHz  | 36.6 dBm/MHz  | 35.2 dBm/MHz                          | 34.4 dBm/MHz                          |
| Maximum Antenna Beamforming Gain<br>per Polarization | 26 dBi                                | 26 dBi        | 26 dBi        | 26 dBi                                | 26 dBi                                |
| EIRP per Polarization                                | 62.1 dBm/MHz                          | 62.4 dBm/MHz  | 62.6 dBm/MHz  | 61.2 dBm/MHz                          | 60.4 dBm/MHz                          |
| Number of Polarizations                              | 2                                     | 2             | 2             | 2                                     | 2                                     |
| EIRP Total (See Note 1)                              | 62.1 dBm/MHz                          | 62.4 dBm/MHz  | 62.6 dBm/MHz  | 61.2 dBm/MHz                          | 60.4 dBm/MHz                          |
| Passing EIRP Limit                                   | 62.15 dBm/MHz<br>and<br>65.16 dBm/MHz | 65.16 dBm/MHz | 65.16 dBm/MHz | 62.15 dBm/MHz<br>and<br>65.16 dBm/MHz | 62.15 dBm/MHz<br>and<br>65.16 dBm/MHz |

Note 1: The EIRP per antenna polarization is required to be below the regulatory limit as described in ANSI C63.26-2015 section 6.4.6.3 b)2) and KDB 662911 D02v01 page 3 example (2) since the two transmitter outputs to each antenna are 90 degree-phase shifted relative to each other (cross-polarized radiators).

## Calculation Summary

- (1) The worst case AVQQA sixty-four port MIMO EIRP levels for all 5G NR channel bandwidths (20MHz, 40MHz, 60MHz, 80MHz, & 100MHz) are less than the 3280 W/MHz (65.16 dBm/MHz) FCC regulatory limit.
- (2) The worst case AVQQA sixty-four port MIMO EIRP levels for the 5G NR 20MHz, 80MHz & 100MHz channel bandwidths are less than the 1640 W/MHz (62.15 dBm/MHz) FCC regulatory limit.
- (3) The worst case AVQQA sixty-four port MIMO EIRP levels for the 5G NR 40MHz & 60MHz channel bandwidths exceed the 1640 W/MHz (62.15 dBm/MHz) FCC regulatory limit by 0.25 dB (62.4 dBm/MHz - 62.15 dBm/MHz) and 0.45 dB (62.6 dBm/MHz - 62.15 dBm/MHz), respectively. The AVQQA 5G NR 40MHz & 60MHz channel bandwidths carrier power levels using sixty-four port MIMO operation need to be reduced to meet the 1640 W/MHz (62.15 dBm/MHz) FCC regulatory limit.

# POWER SPECTRAL DENSITY - BAND 3.7G

|                   |                              |                       |            |
|-------------------|------------------------------|-----------------------|------------|
| EUT:              | AVQQA Remote Radio Head      | Work Order:           | NOKI0075   |
| Serial Number:    | L1242403137                  | Date:                 | 2024-08-15 |
| Customer:         | Nokia Solutions and Networks | Temperature:          | 23.3°C     |
| Attendees:        | David Le, John Rattanaovong  | Relative Humidity:    | 52.1%      |
| Customer Project: | None                         | Bar. Pressure (PMSL): | 1016 mbar  |
| Tested By:        | Jarrod Brenden               | Job Site:             | PT14       |
| Power:            | 54VDC                        | Configuration:        | NOKI0075-4 |

## TEST SPECIFICATIONS

|                |                  |
|----------------|------------------|
| Specification: | Method:          |
| FCC 27:2024    | ANSI C63.26:2015 |

## COMMENTS

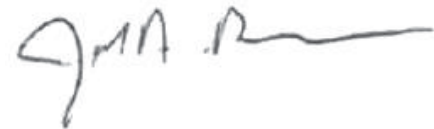
All losses in the measurement path were accounted for in the reference level offset; attenuators, filters, cables, and DC blocks. Band n77 carriers were enabled at maximum power levels for the 3.7 GHz band in the single carrier operating mode configuration.

## DEVIATIONS FROM TEST STANDARD

None

## CONCLUSION

Pass



Tested By

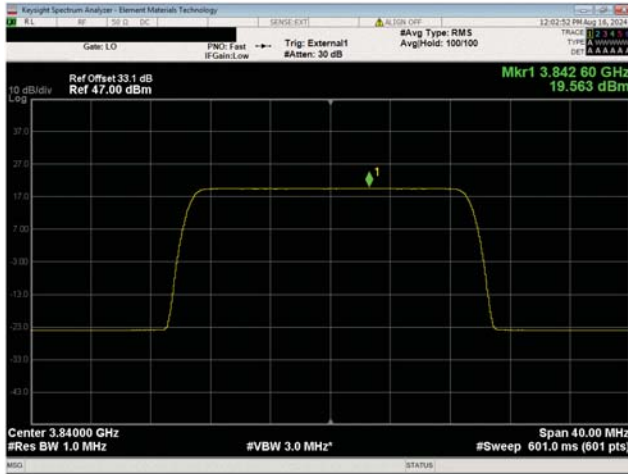
## TEST RESULTS

|                          | Initial Value<br>dBm/MHz | Duty cycle<br>Factor (dB) | Single Port<br>dBm/MHz == PSD | Sixty-four Port (64x64 MIMO)<br>dBm/MHz == PSD |
|--------------------------|--------------------------|---------------------------|-------------------------------|------------------------------------------------|
| Port 1                   |                          |                           |                               |                                                |
| 20 MHz Channel Bandwidth |                          |                           |                               |                                                |
| QPSK Modulation          |                          |                           |                               |                                                |
| Mid Channel, 3840.00 MHz | 19.563                   | 0                         | 19.6                          | 37.7                                           |
| 16QAM Modulation         |                          |                           |                               |                                                |
| Mid Channel, 3840.00 MHz | 21.037                   | 0                         | 21.0                          | 39.1                                           |
| 64QAM Modulation         |                          |                           |                               |                                                |
| Mid Channel, 3840.00 MHz | 19.627                   | 0                         | 19.6                          | 37.7                                           |
| 256QAM Modulation        |                          |                           |                               |                                                |
| Mid Channel, 3840.00 MHz | 19.605                   | 0                         | 19.6                          | 37.7                                           |
| 40 MHz Channel Bandwidth |                          |                           |                               |                                                |
| QPSK Modulation          |                          |                           |                               |                                                |
| Mid Channel, 3840.00 MHz | 19.359                   | 0                         | 19.4                          | 37.5                                           |
| 16QAM Modulation         |                          |                           |                               |                                                |
| Mid Channel, 3840.00 MHz | 21.336                   | 0                         | 21.3                          | 39.4                                           |
| 64QAM Modulation         |                          |                           |                               |                                                |
| Mid Channel, 3840.00 MHz | 19.47                    | 0                         | 19.5                          | 37.6                                           |
| 256QAM Modulation        |                          |                           |                               |                                                |
| Mid Channel, 3840.00 MHz | 19.507                   | 0                         | 19.5                          | 37.6                                           |

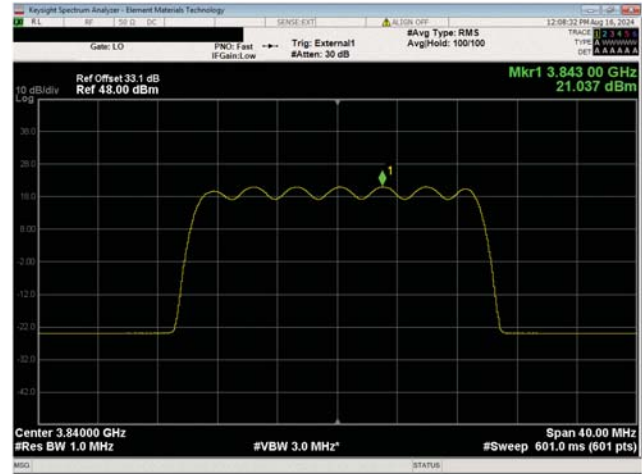
# POWER SPECTRAL DENSITY - BAND 3.7G

|                           | Initial Value<br>dBm/MHz | Duty cycle<br>Factor (dB) | Single Port<br>dBm/MHz == PSD | Sixty-four Port (64x64 MIMO)<br>dBm/MHz == PSD |
|---------------------------|--------------------------|---------------------------|-------------------------------|------------------------------------------------|
| 60 MHz Channel Bandwidth  |                          |                           |                               |                                                |
| QPSK Modulation           |                          |                           |                               |                                                |
| Low Channel, 3730.02 MHz  | 19.324                   | 0                         | 19.3                          | 37.4                                           |
| Mid Channel, 3840.00 MHz  | 19.747                   | 0                         | 19.7                          | 37.8                                           |
| High Channel, 3949.98 MHz | 19.476                   | 0                         | 19.5                          | 37.6                                           |
| 16QAM Modulation          |                          |                           |                               |                                                |
| Low Channel, 3730.02 MHz  | 21.242                   | 0                         | 21.2                          | 39.3                                           |
| Mid Channel, 3840.00 MHz  | 21.481                   | 0                         | 21.5                          | 39.6                                           |
| High Channel, 3949.98 MHz | 21.209                   | 0                         | 21.2                          | 39.3                                           |
| 64QAM Modulation          |                          |                           |                               |                                                |
| Low Channel, 3730.02 MHz  | 19.593                   | 0                         | 19.6                          | 37.7                                           |
| Mid Channel, 3840.00 MHz  | 19.859                   | 0                         | 19.9                          | 38.0                                           |
| High Channel, 3949.98 MHz | 19.524                   | 0                         | 19.5                          | 37.6                                           |
| 256QAM Modulation         |                          |                           |                               |                                                |
| Low Channel, 3730.02 MHz  | 19.581                   | 0                         | 19.6                          | 37.7                                           |
| Mid Channel, 3840.00 MHz  | 19.872                   | 0                         | 19.9                          | 38.0                                           |
| High Channel, 3949.98 MHz | 19.487                   | 0                         | 19.5                          | 37.6                                           |
| 80 MHz Channel Bandwidth  |                          |                           |                               |                                                |
| QPSK Modulation           |                          |                           |                               |                                                |
| Mid Channel, 3840.00 MHz  | 18.289                   | 0                         | 18.3                          | 36.4                                           |
| 16QAM Modulation          |                          |                           |                               |                                                |
| Mid Channel, 3840.00 MHz  | 20.142                   | 0                         | 20.1                          | 38.2                                           |
| 64QAM Modulation          |                          |                           |                               |                                                |
| Mid Channel, 3840.00 MHz  | 18.427                   | 0                         | 18.4                          | 36.5                                           |
| 256QAM Modulation         |                          |                           |                               |                                                |
| Mid Channel, 3840.00 MHz  | 18.381                   | 0                         | 18.4                          | 36.5                                           |
| 100 MHz Channel Bandwidth |                          |                           |                               |                                                |
| QPSK Modulation           |                          |                           |                               |                                                |
| Mid Channel, 3840.00 MHz  | 17.163                   | 0                         | 17.2                          | 35.3                                           |
| 16QAM Modulation          |                          |                           |                               |                                                |
| Mid Channel, 3840.00 MHz  | 19.253                   | 0                         | 19.3                          | 37.4                                           |
| 64QAM Modulation          |                          |                           |                               |                                                |
| Mid Channel, 3840.00 MHz  | 17.448                   | 0                         | 17.4                          | 35.5                                           |
| 256QAM Modulation         |                          |                           |                               |                                                |
| Mid Channel, 3840.00 MHz  | 17.42                    | 0                         | 17.4                          | 35.5                                           |

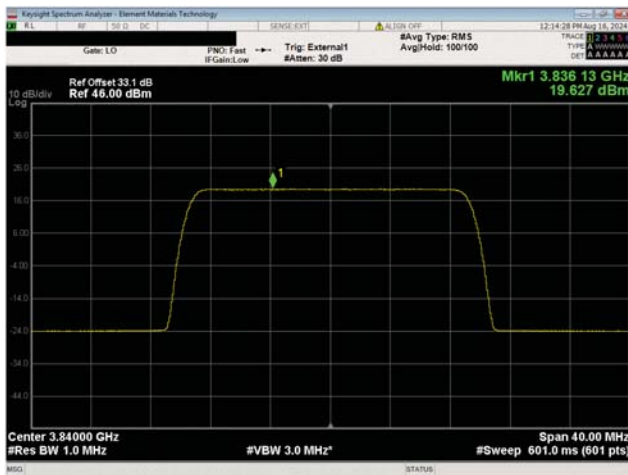
# POWER SPECTRAL DENSITY - BAND 3.7G



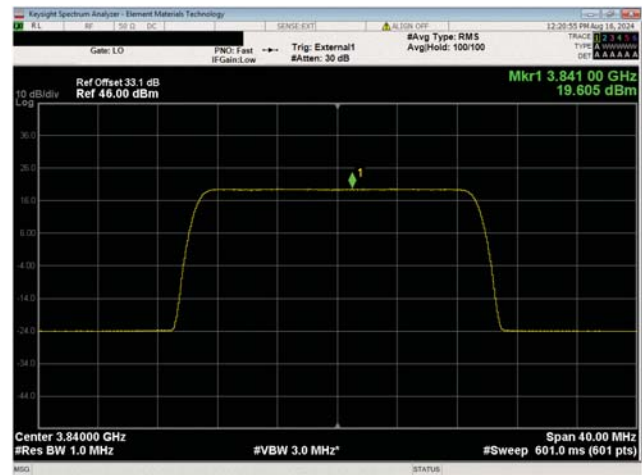
Port 1  
20 MHz Channel Bandwidth  
QPSK Modulation  
Mid Channel, 3840.00 MHz



Port 1  
20 MHz Channel Bandwidth  
16QAM Modulation  
Mid Channel, 3840.00 MHz

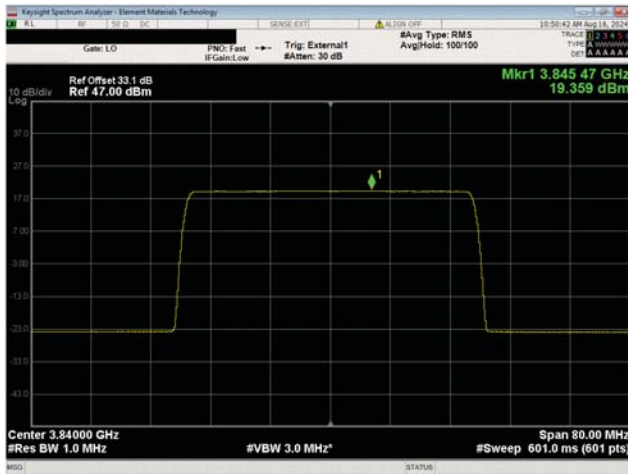


Port 1  
20 MHz Channel Bandwidth  
64QAM Modulation  
Mid Channel, 3840.00 MHz

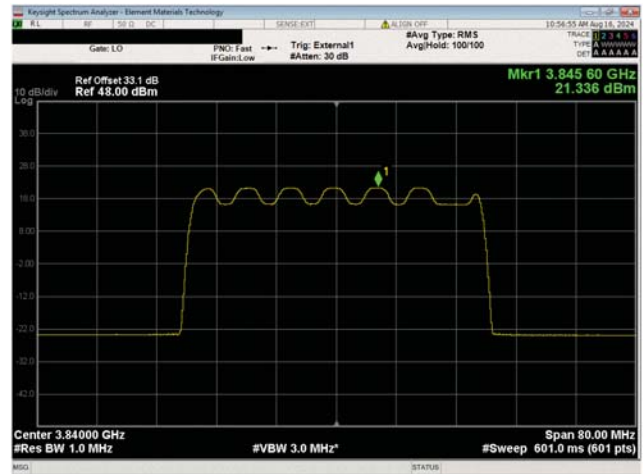


Port 1  
20 MHz Channel Bandwidth  
256QAM Modulation  
Mid Channel, 3840.00 MHz

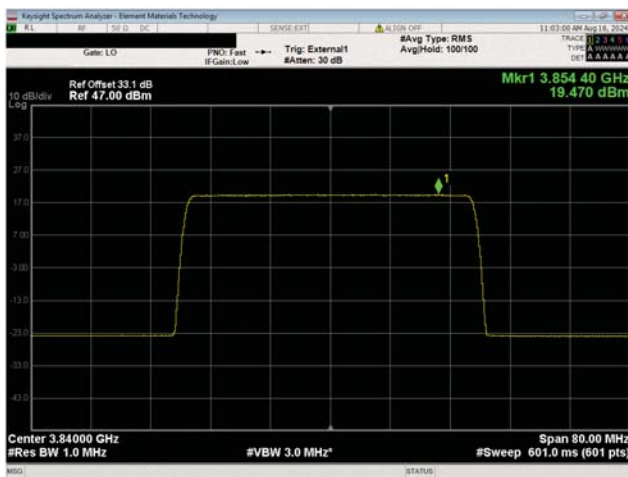
# POWER SPECTRAL DENSITY - BAND 3.7G



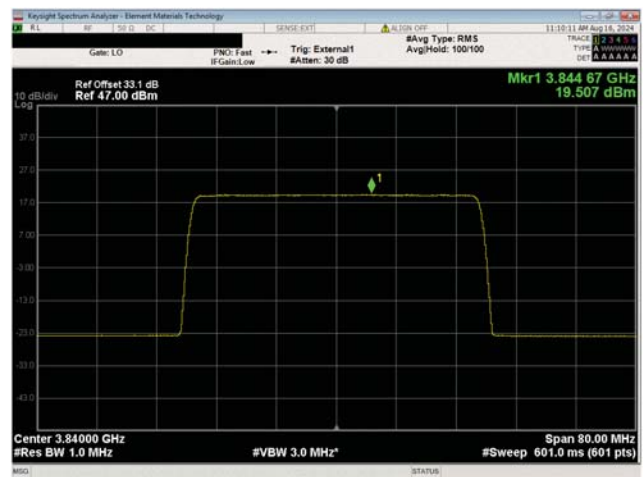
**Port 1**  
40 MHz Channel Bandwidth  
QPSK Modulation  
Mid Channel, 3840.00 MHz



**Port 1**  
40 MHz Channel Bandwidth  
16QAM Modulation  
Mid Channel, 3840.00 MHz



**Port 1**  
40 MHz Channel Bandwidth  
64QAM Modulation  
Mid Channel, 3840.00 MHz



**Port 1**  
40 MHz Channel Bandwidth  
256QAM Modulation  
Mid Channel, 3840.00 MHz

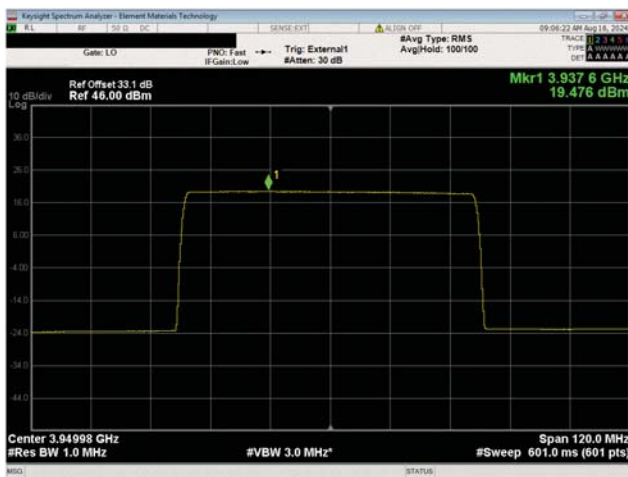
# POWER SPECTRAL DENSITY - BAND 3.7G



**Port 1**  
60 MHz Channel Bandwidth  
QPSK Modulation  
Low Channel, 3730.02 MHz



**Port 1**  
60 MHz Channel Bandwidth  
QPSK Modulation  
Mid Channel, 3840.00 MHz

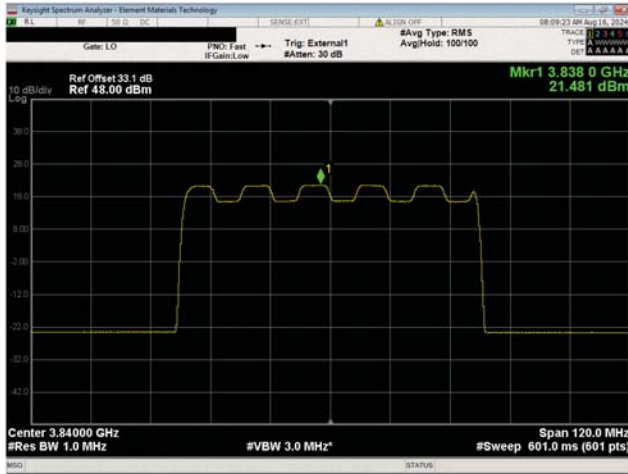


**Port 1**  
60 MHz Channel Bandwidth  
QPSK Modulation  
High Channel, 3949.98 MHz



**Port 1**  
60 MHz Channel Bandwidth  
16QAM Modulation  
Low Channel, 3730.02 MHz

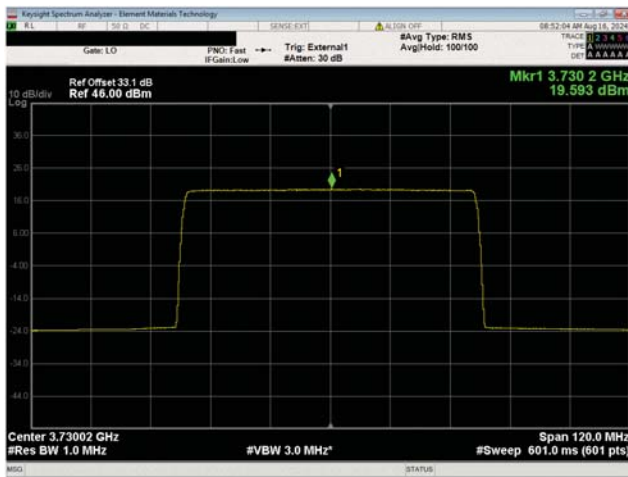
# POWER SPECTRAL DENSITY - BAND 3.7G



**Port 1**  
60 MHz Channel Bandwidth  
16QAM Modulation  
Mid Channel, 3840.00 MHz



**Port 1**  
60 MHz Channel Bandwidth  
16QAM Modulation  
High Channel, 3949.98 MHz



**Port 1**  
60 MHz Channel Bandwidth  
64QAM Modulation  
Low Channel, 3730.02 MHz



**Port 1**  
60 MHz Channel Bandwidth  
64QAM Modulation  
Mid Channel, 3840.00 MHz

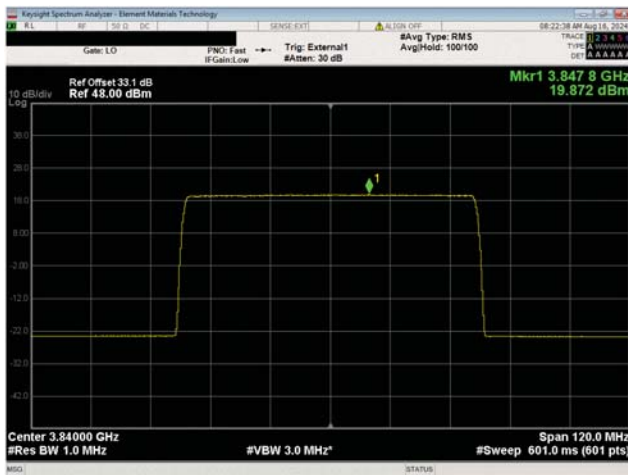
# POWER SPECTRAL DENSITY - BAND 3.7G



Port 1  
60 MHz Channel Bandwidth  
64QAM Modulation  
High Channel, 3949.98 MHz



Port 1  
60 MHz Channel Bandwidth  
256QAM Modulation  
Low Channel, 3730.02 MHz



Port 1  
60 MHz Channel Bandwidth  
256QAM Modulation  
Mid Channel, 3840.00 MHz

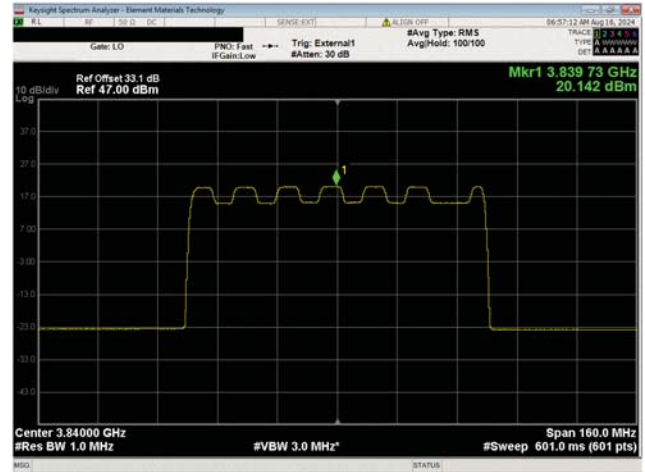


Port 1  
60 MHz Channel Bandwidth  
256QAM Modulation  
High Channel, 3949.98 MHz

# POWER SPECTRAL DENSITY - BAND 3.7G



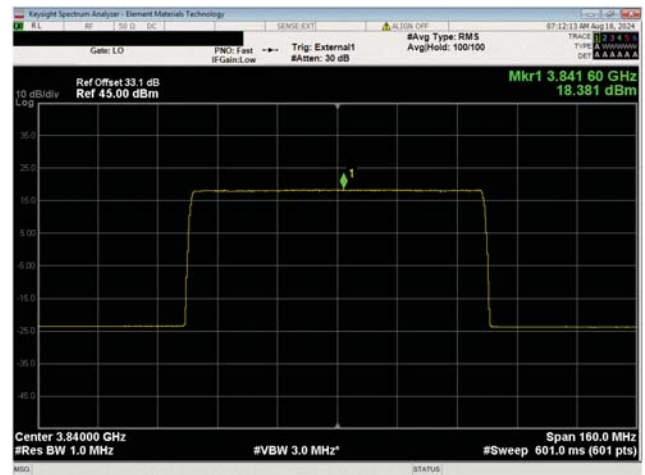
Port 1  
80 MHz Channel Bandwidth  
QPSK Modulation  
Mid Channel, 3840.00 MHz



Port 1  
80 MHz Channel Bandwidth  
16QAM Modulation  
Mid Channel, 3840.00 MHz



Port 1  
80 MHz Channel Bandwidth  
64QAM Modulation  
Mid Channel, 3840.00 MHz

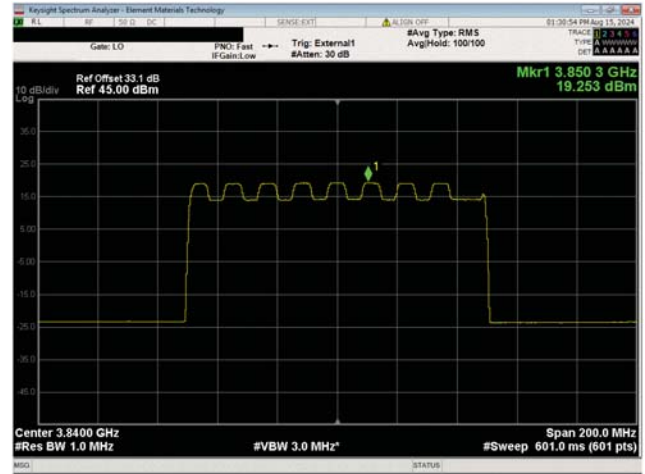


Port 1  
80 MHz Channel Bandwidth  
256QAM Modulation  
Mid Channel, 3840.00 MHz

# POWER SPECTRAL DENSITY - BAND 3.7G



Port 1  
100 MHz Channel Bandwidth  
QPSK Modulation  
Mid Channel, 3840.00 MHz



Port 1  
100 MHz Channel Bandwidth  
16QAM Modulation  
Mid Channel, 3840.00 MHz



Port 1  
100 MHz Channel Bandwidth  
64QAM Modulation  
Mid Channel, 3840.00 MHz



Port 1  
100 MHz Channel Bandwidth  
256QAM Modulation  
Mid Channel, 3840.00 MHz

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.45G



## TEST DESCRIPTION

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The fundamental emission Peak to Average Power was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

RF conducted emissions testing was performed only on one port. The AVQQA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

Because the conducted Output Power was measured using a RMS Average detector, the Peak to Average Power Ratio (PAPR) was measured to show that the maximum peak-max-hold spectrum to the maximum of the average spectrum does not exceed the rule part defined limit.

The PAPR measurement method is described in ANSI C63.26 section 5.2.3.4.

The PAPR was measured using the CCDF function of the spectrum analyzer.

Per FCC 27.50(k) (4), the peak to average ratio may not exceed 13dB for more than the ANSI described 0.1% of the time.

## TEST EQUIPMENT

| Description       | Manufacturer                | Model  | ID   | Last Cal.  | Cal. Due   |
|-------------------|-----------------------------|--------|------|------------|------------|
| Spectrum Analyzer | Keysight Technologies, Inc. | N9030B | R336 | 2023-10-03 | 2024-10-03 |

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.45G



|                   |                              |                       |            |
|-------------------|------------------------------|-----------------------|------------|
| EUT:              | AVQQA Remote Radio Head      | Work Order:           | NOKI0075   |
| Serial Number:    | L1242403137                  | Date:                 | 2024-08-12 |
| Customer:         | Nokia Solutions and Networks | Temperature:          | 23.3°C     |
| Attendees:        | David Le, John Rattanaovong  | Relative Humidity:    | 57.2%      |
| Customer Project: | None                         | Bar. Pressure (PMSL): | 1020 mbar  |
| Tested By:        | Jarrold Brenden              | Job Site:             | PT14       |
| Power:            | 54VDC                        | Configuration:        | NOKI0075-4 |

## TEST SPECIFICATIONS

|                |                  |
|----------------|------------------|
| Specification: | Method:          |
| FCC 27:2024    | ANSI C63.26:2015 |

## COMMENTS

All losses in the measurement path were accounted for in the reference level offset; attenuators, filters, cables, and DC blocks. Band n77 carriers were enabled at maximum power levels for the 3.45 GHz band in single carrier operating mode configuration.

## DEVIATIONS FROM TEST STANDARD

None

## CONCLUSION

Pass

Tested By

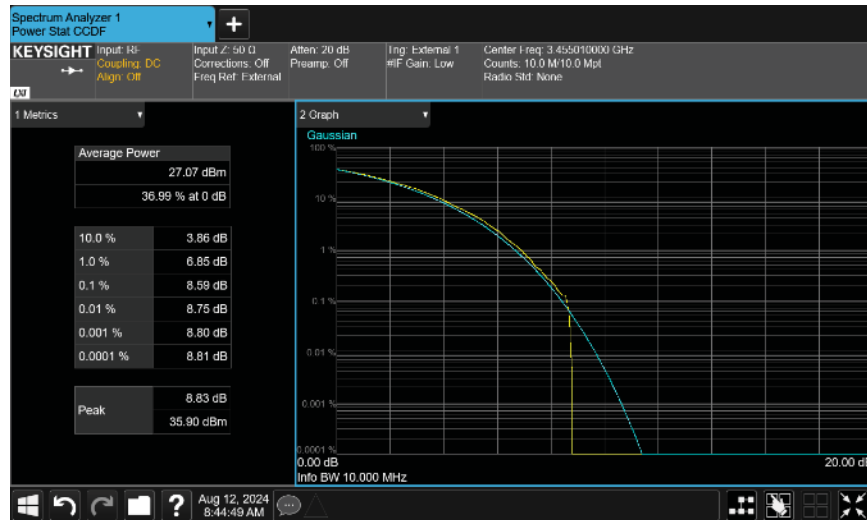
## TEST RESULTS

|                            |  | 0.1% PAPR<br>Value (dB) | 0.1% PAPR<br>Limit (dB) | Results |
|----------------------------|--|-------------------------|-------------------------|---------|
| Port 1                     |  |                         |                         |         |
| 10 MHz Channel Bandwidth   |  |                         |                         |         |
| QPSK Modulation            |  |                         |                         |         |
| Low Channel, 3455.01 MHz   |  | 8.59                    | 13                      | Pass    |
| Mid Channel, 3500.01 MHz   |  | 8.54                    | 13                      | Pass    |
| High Channel, 3544.995 MHz |  | 8.55                    | 13                      | Pass    |
| 20 MHz Channel Bandwidth   |  |                         |                         |         |
| QPSK Modulation            |  |                         |                         |         |
| Low Channel, 3460.02 MHz   |  | 8.54                    | 13                      | Pass    |
| Mid Channel, 3500.01 MHz   |  | 8.4                     | 13                      | Pass    |
| High Channel, 3540.00 MHz  |  | 8.3                     | 13                      | Pass    |
| 30 MHz Channel Bandwidth   |  |                         |                         |         |
| QPSK Modulation            |  |                         |                         |         |
| Low Channel, 3465.00 MHz   |  | 8.49                    | 13                      | Pass    |
| Mid Channel, 3500.01 MHz   |  | 8.56                    | 13                      | Pass    |
| High Channel, 3534.99 MHz  |  | 8.41                    | 13                      | Pass    |
| 40 MHz Channel Bandwidth   |  |                         |                         |         |
| QPSK Modulation            |  |                         |                         |         |
| Low Channel, 3470.01 MHz   |  | 8.44                    | 13                      | Pass    |
| Mid Channel, 3500.01 MHz   |  | 8.4                     | 13                      | Pass    |
| High Channel, 3529.98 MHz  |  | 8.41                    | 13                      | Pass    |
| 16QAM Modulation           |  |                         |                         |         |

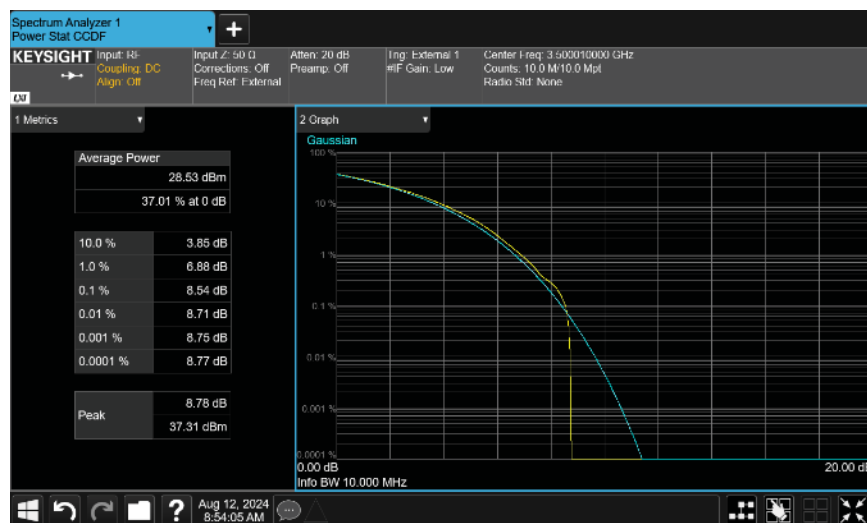
# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.45G

|                   |                          | 0.1% PAPR<br>Value (dB) | 0.1% PAPR<br>Limit (dB) | Results |
|-------------------|--------------------------|-------------------------|-------------------------|---------|
| 64QAM Modulation  | Mid Channel, 3500.01 MHz | 8.4                     | 13                      | Pass    |
|                   |                          |                         |                         |         |
| 256QAM Modulation | Mid Channel, 3500.01 MHz | 8.56                    | 13                      | Pass    |
|                   |                          |                         |                         |         |
|                   | Mid Channel, 3500.01 MHz | 8.58                    | 13                      | Pass    |

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.45G

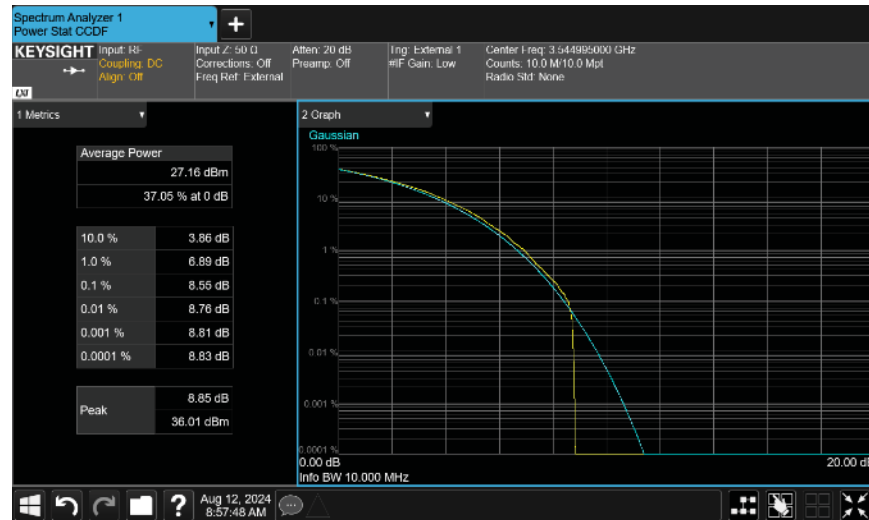


**Port 1**  
**10 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Low Channel, 3455.01 MHz**

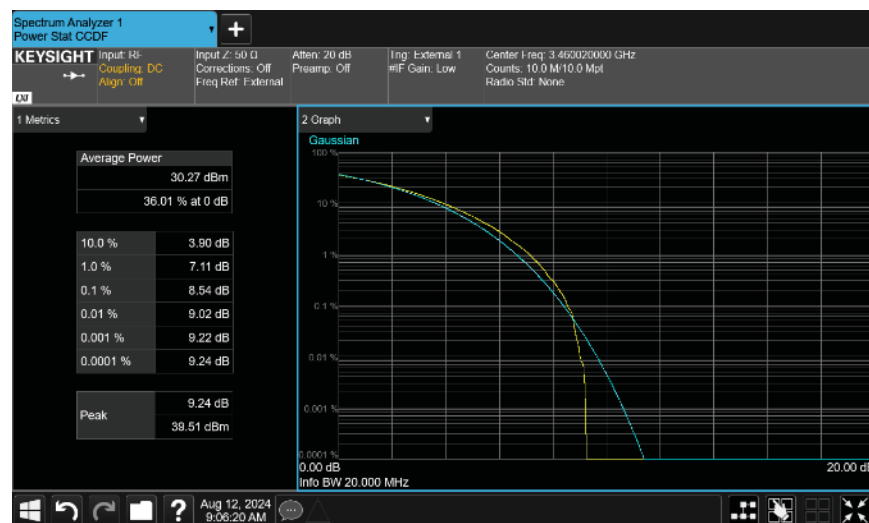


**Port 1**  
**10 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Mid Channel, 3500.01 MHz**

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.45G

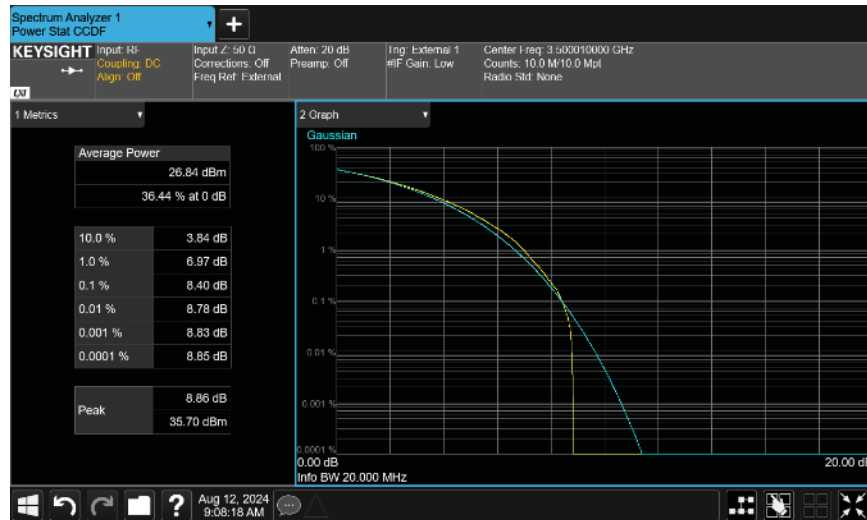


**Port 1**  
**10 MHz Channel Bandwidth**  
**QPSK Modulation**  
**High Channel, 3544.995 MHz**

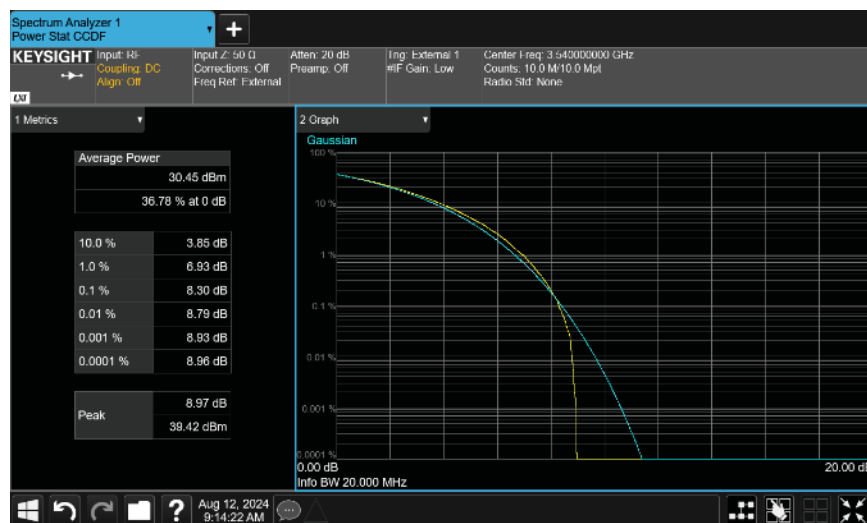


**Port 1**  
**20 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Low Channel, 3460.02 MHz**

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.45G

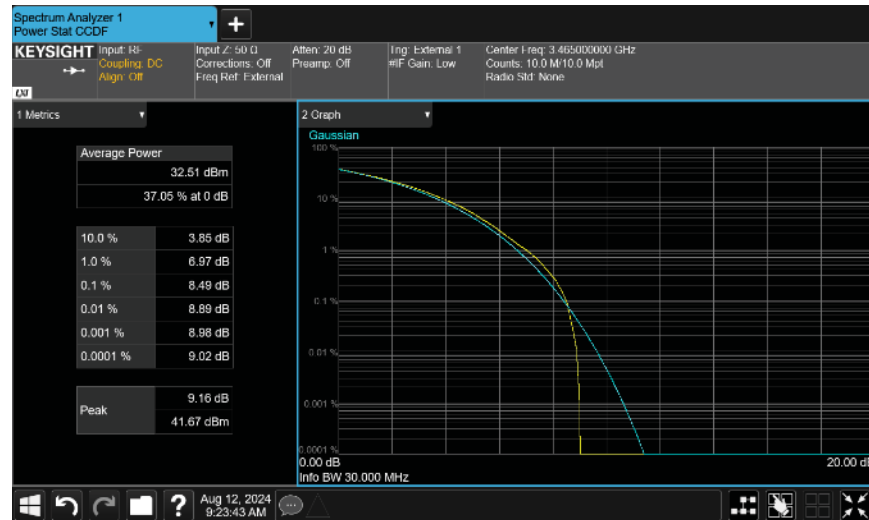


**Port 1**  
**20 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Mid Channel, 3500.01 MHz**

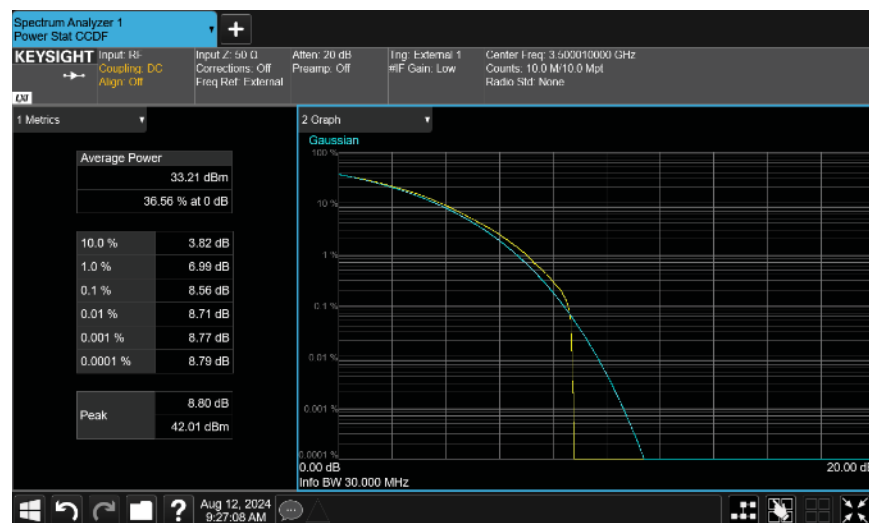


**Port 1**  
**20 MHz Channel Bandwidth**  
**QPSK Modulation**  
**High Channel, 3540.00 MHz**

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.45G

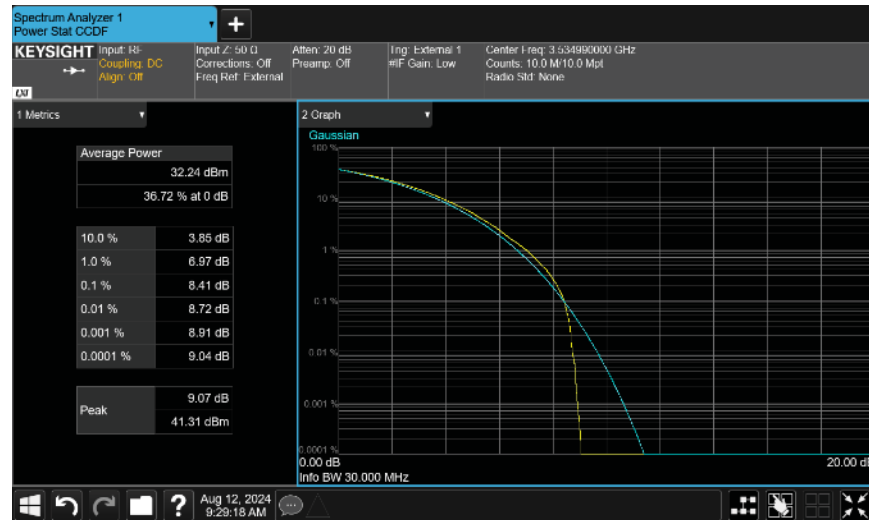


**Port 1**  
**30 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Low Channel, 3465.00 MHz**

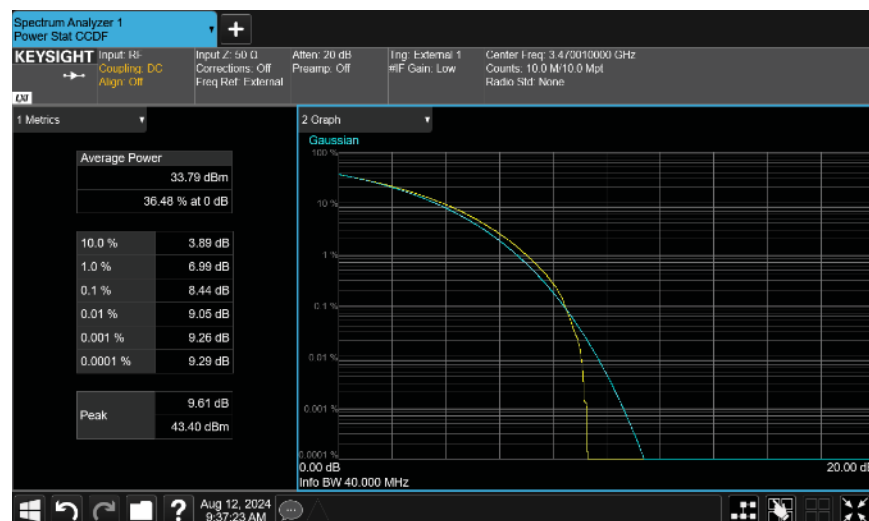


**Port 1**  
**30 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Mid Channel, 3500.01 MHz**

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.45G

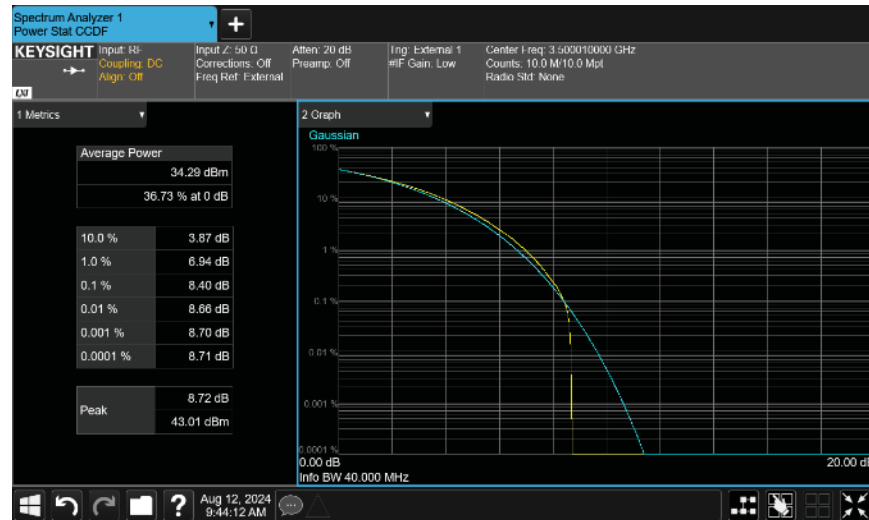


**Port 1**  
**30 MHz Channel Bandwidth**  
**QPSK Modulation**  
**High Channel, 3534.99 MHz**

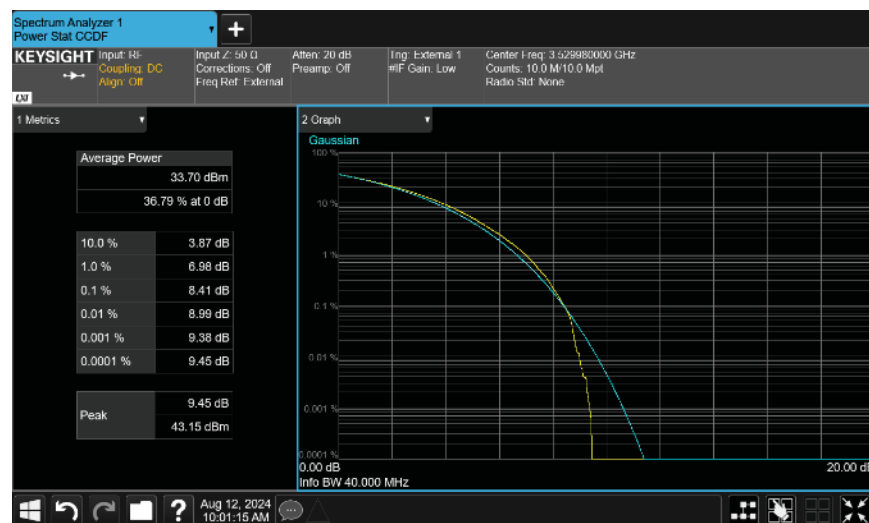


**Port 1**  
**40 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Low Channel, 3470.01 MHz**

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.45G

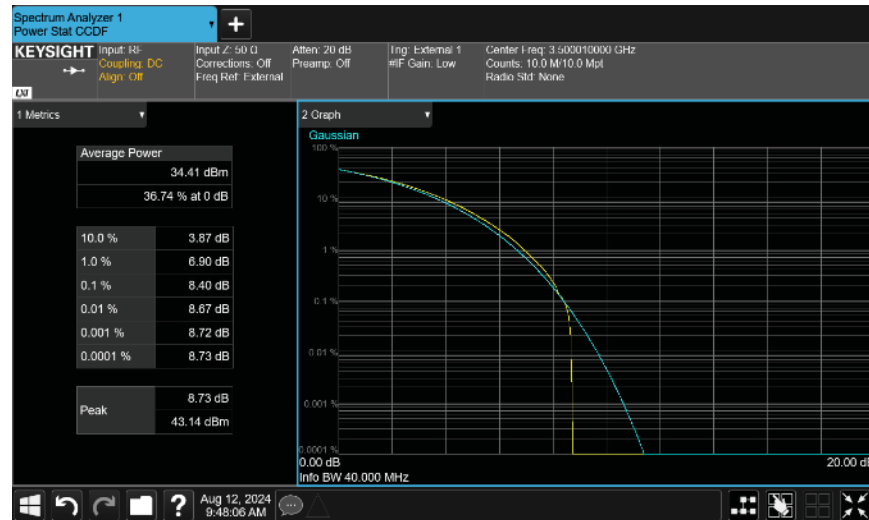


**Port 1**  
**40 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Mid Channel, 3500.01 MHz**

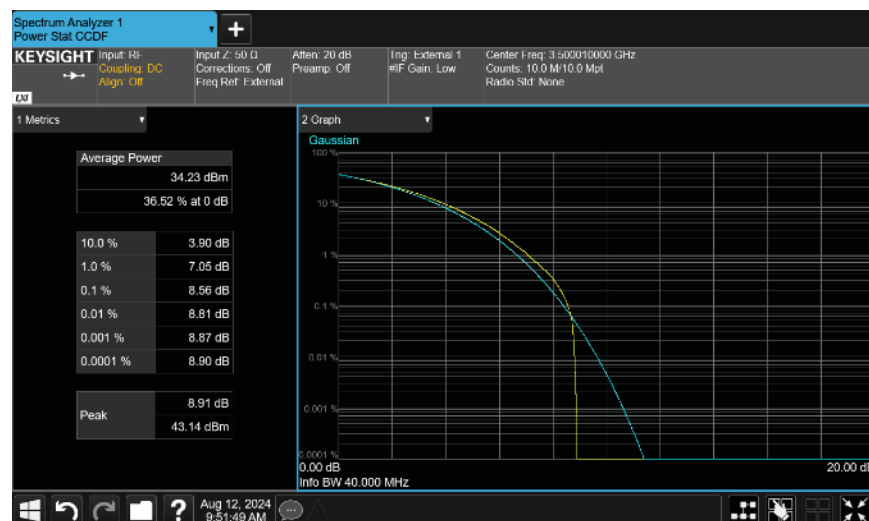


**Port 1**  
**40 MHz Channel Bandwidth**  
**QPSK Modulation**  
**High Channel, 3529.98 MHz**

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.45G

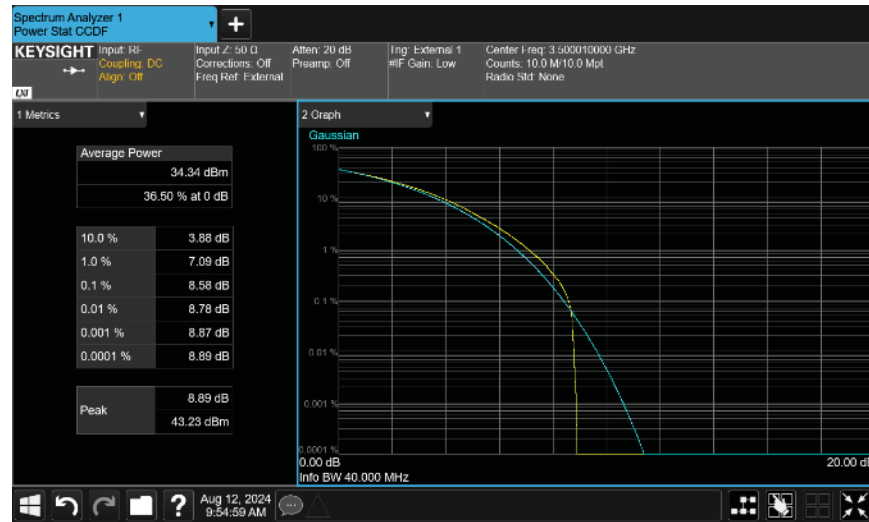


**Port 1**  
**40 MHz Channel Bandwidth**  
**16QAM Modulation**  
**Mid Channel, 3500.01 MHz**



**Port 1**  
**40 MHz Channel Bandwidth**  
**64QAM Modulation**  
**Mid Channel, 3500.01 MHz**

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.45G



Port 1  
40 MHz Channel Bandwidth  
256QAM Modulation  
Mid Channel, 3500.01 MHz

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.7G



## TEST DESCRIPTION

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The fundamental emission Peak to Average Power was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

RF conducted emissions testing was performed only on one port. The AVQQA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

Because the conducted Output Power was measured using a RMS Average detector, the Peak to Average Power Ratio (PAPR) was measured to show that the maximum peak-max-hold spectrum to the maximum of the average spectrum does not exceed the rule part defined limit.

The PAPR measurement method is described in ANSI C63.26 section 5.2.3.4.

The PAPR was measured using the CCDF function of the spectrum analyzer.

Per FCC 27.50(j) (4), the peak to average ratio may not exceed 13dB for more than the ANSI described 0.1% of the time.

## TEST EQUIPMENT

| Description       | Manufacturer                | Model  | ID   | Last Cal.  | Cal. Due   |
|-------------------|-----------------------------|--------|------|------------|------------|
| Spectrum Analyzer | Keysight Technologies, Inc. | N9030B | R336 | 2023-10-03 | 2024-10-03 |

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.7G



|                   |                              |                       |            |
|-------------------|------------------------------|-----------------------|------------|
| EUT:              | AVQQA Remote Radio Head      | Work Order:           | NOKI0075   |
| Serial Number:    | L1242403137                  | Date:                 | 2024-08-19 |
| Customer:         | Nokia Solutions and Networks | Temperature:          | 23.3°C     |
| Attendees:        | David Le, John Rattanaovong  | Relative Humidity:    | 52.1%      |
| Customer Project: | None                         | Bar. Pressure (PMSL): | 1016 mbar  |
| Tested By:        | Jarrold Brenden              | Job Site:             | PT14       |
| Power:            | 54VDC                        | Configuration:        | NOKI0075-4 |

## TEST SPECIFICATIONS

|                |                  |
|----------------|------------------|
| Specification: | Method:          |
| FCC 27:2024    | ANSI C63.26:2015 |

## COMMENTS

All losses in the measurement path were accounted for in the reference level offset; attenuators, filters, cables, and DC blocks. Band n77 carriers were enabled at maximum power levels for the 3.7 GHz band in the single carrier operating mode configuration.

## DEVIATIONS FROM TEST STANDARD

None

## CONCLUSION

Pass

Tested By

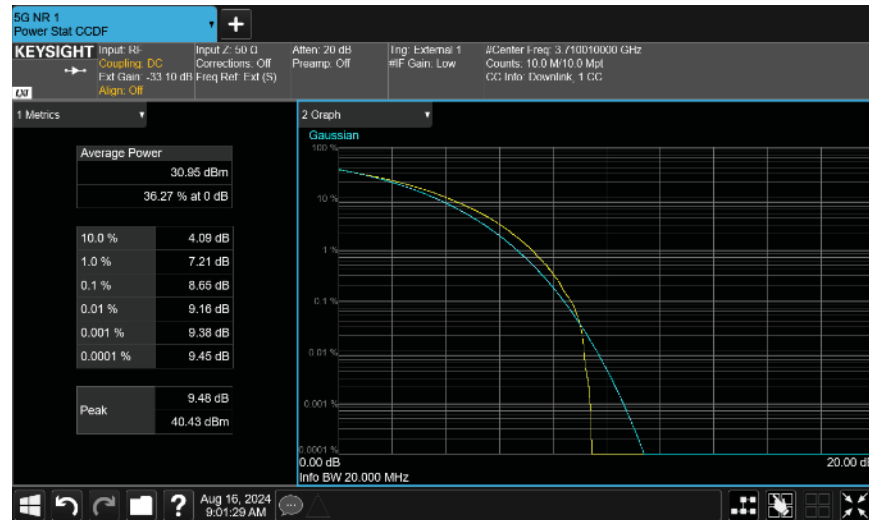
## TEST RESULTS

|                           |  | 0.1% PAPR<br>Value (dB) | 0.1% PAPR<br>Limit (dB) | Results |
|---------------------------|--|-------------------------|-------------------------|---------|
| Port 1                    |  |                         |                         |         |
| 20 MHz Channel Bandwidth  |  |                         |                         |         |
| QPSK Modulation           |  |                         |                         |         |
| Low Channel, 3710.01 MHz  |  | 8.65                    | 13                      | Pass    |
| Mid Channel, 3840.00 MHz  |  | 8.74                    | 13                      | Pass    |
| High Channel, 3969.99 MHz |  | 8.69                    | 13                      | Pass    |
| 40 MHz Channel Bandwidth  |  |                         |                         |         |
| QPSK Modulation           |  |                         |                         |         |
| Low Channel, 3720.00 MHz  |  | 8.55                    | 13                      | Pass    |
| Mid Channel, 3840.00 MHz  |  | 8.82                    | 13                      | Pass    |
| High Channel, 3960.00 MHz |  | 8.91                    | 13                      | Pass    |
| 60 MHz Channel Bandwidth  |  |                         |                         |         |
| QPSK Modulation           |  |                         |                         |         |
| Low Channel, 3730.02 MHz  |  | 8.85                    | 13                      | Pass    |
| Mid Channel, 3840.00 MHz  |  | 8.86                    | 13                      | Pass    |
| High Channel, 3949.98 MHz |  | 8.79                    | 13                      | Pass    |
| 80 MHz Channel Bandwidth  |  |                         |                         |         |
| QPSK Modulation           |  |                         |                         |         |
| Low Channel, 3740.01 MHz  |  | 8.89                    | 13                      | Pass    |
| Mid Channel, 3840.00 MHz  |  | 8.78                    | 13                      | Pass    |
| High Channel, 3939.99 MHz |  | 8.8                     | 13                      | Pass    |

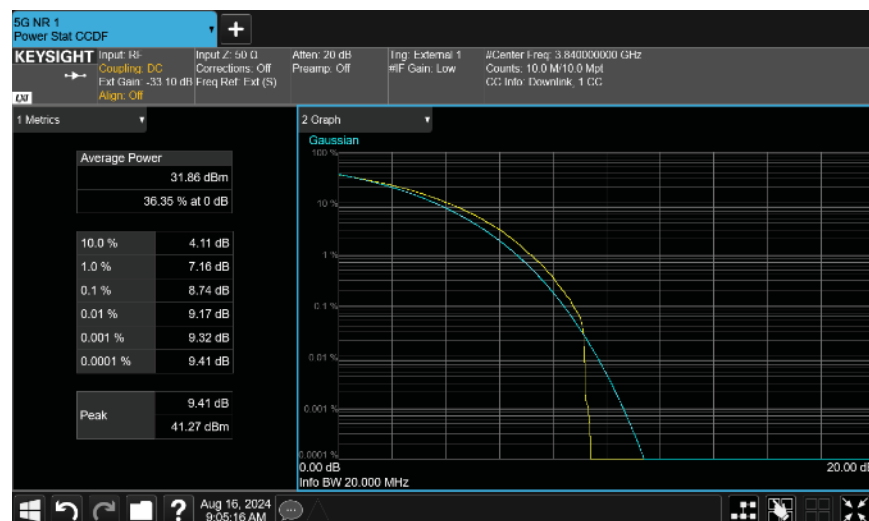
# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.7G

|                           | 0.1% PAPR<br>Value (dB) | 0.1% PAPR<br>Limit (dB) | Results |
|---------------------------|-------------------------|-------------------------|---------|
| 100 MHz Channel Bandwidth |                         |                         |         |
| QPSK Modulation           |                         |                         |         |
| Low Channel, 3750.00 MHz  | 8.85                    | 13                      | Pass    |
| Mid Channel, 3840.00 MHz  | 8.59                    | 13                      | Pass    |
| High Channel, 3930.00 MHz | 8.79                    | 13                      | Pass    |
| 16QAM Modulation          |                         |                         |         |
| Mid Channel, 3840.00 MHz  | 8.4                     | 13                      | Pass    |
| 64QAM Modulation          |                         |                         |         |
| Mid Channel, 3840.00 MHz  | 8.52                    | 13                      | Pass    |
| 256QAM Modulation         |                         |                         |         |
| Mid Channel, 3840.00 MHz  | 8.53                    | 13                      | Pass    |

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.7G

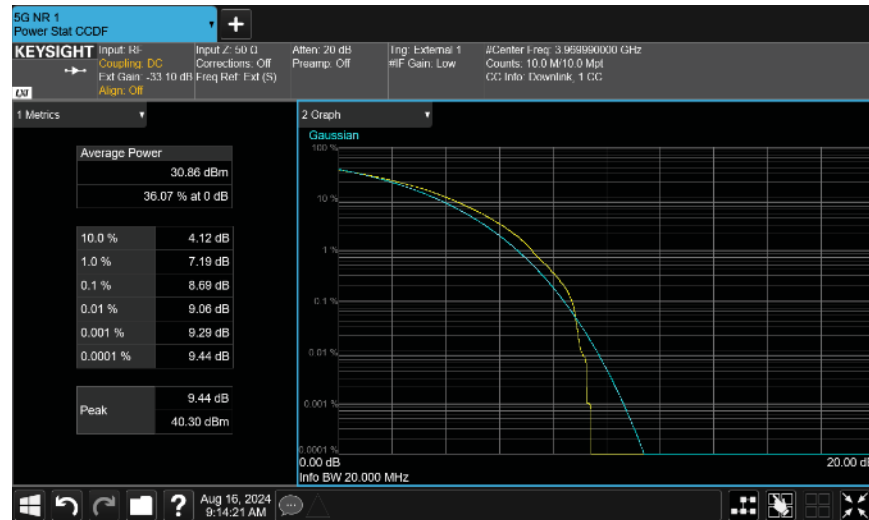


**Port 1**  
**20 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Low Channel, 3710.01 MHz**

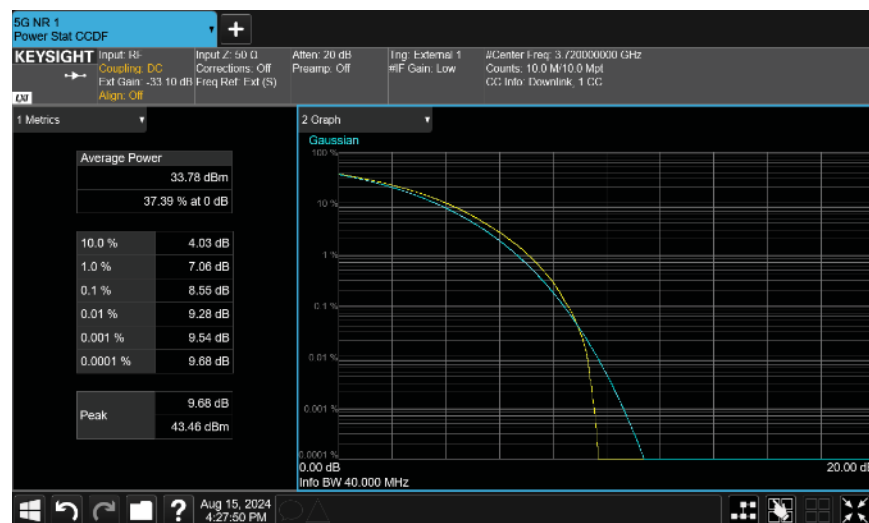


**Port 1**  
**20 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Mid Channel, 3840.00 MHz**

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.7G

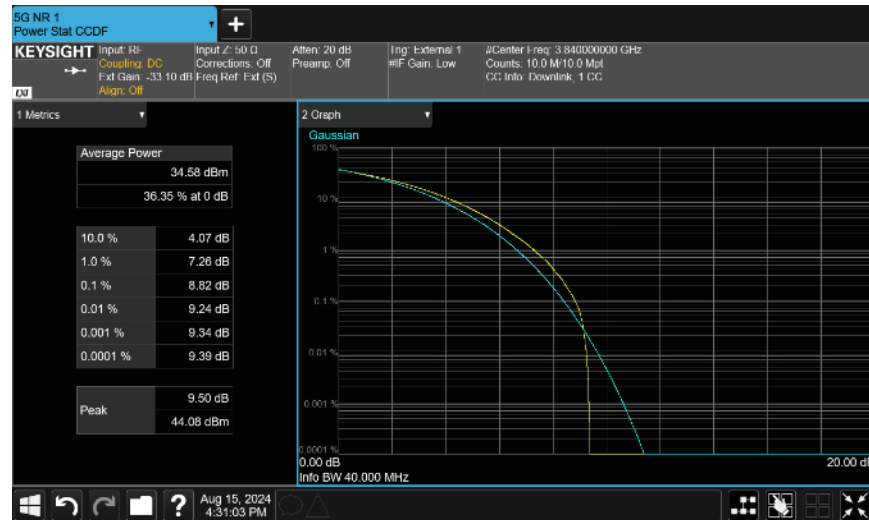


Port 1  
20 MHz Channel Bandwidth  
QPSK Modulation  
High Channel, 3969.99 MHz

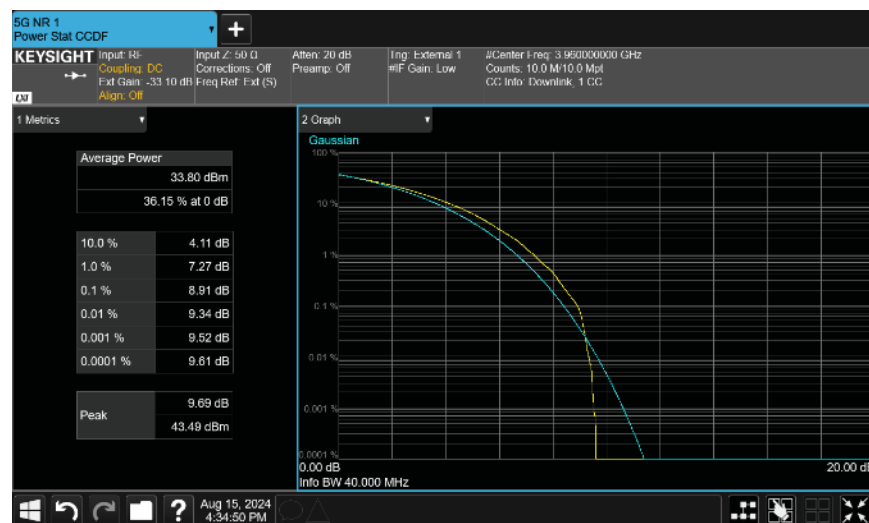


Port 1  
40 MHz Channel Bandwidth  
QPSK Modulation  
Low Channel, 3720.00 MHz

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.7G

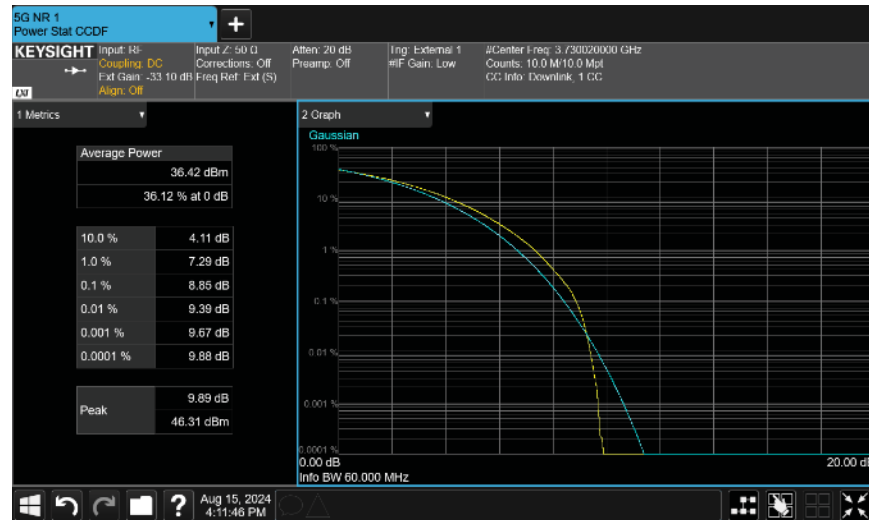


**Port 1**  
**40 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Mid Channel, 3840.00 MHz**

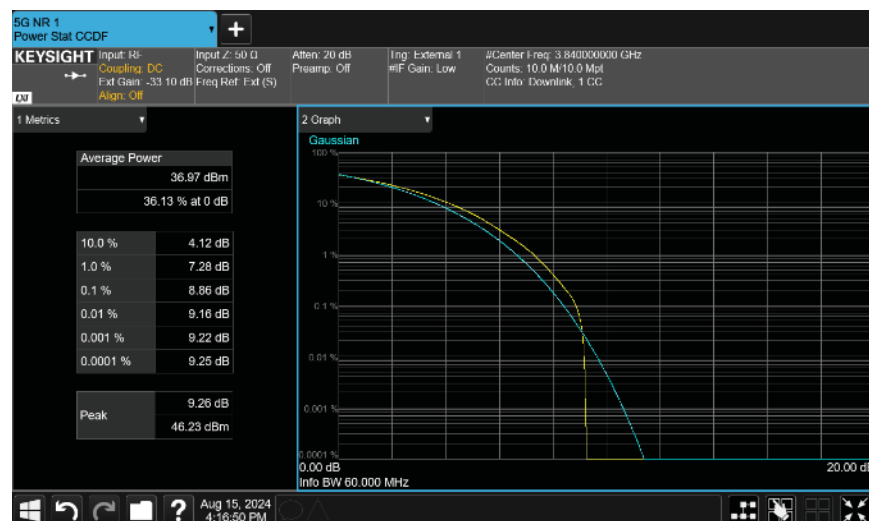


**Port 1**  
**40 MHz Channel Bandwidth**  
**QPSK Modulation**  
**High Channel, 3960.00 MHz**

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.7G

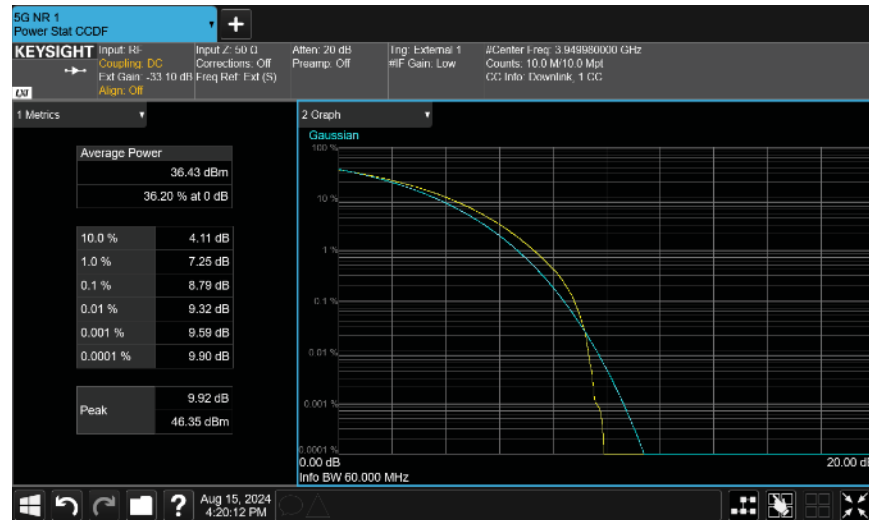


**Port 1**  
**60 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Low Channel, 3730.02 MHz**

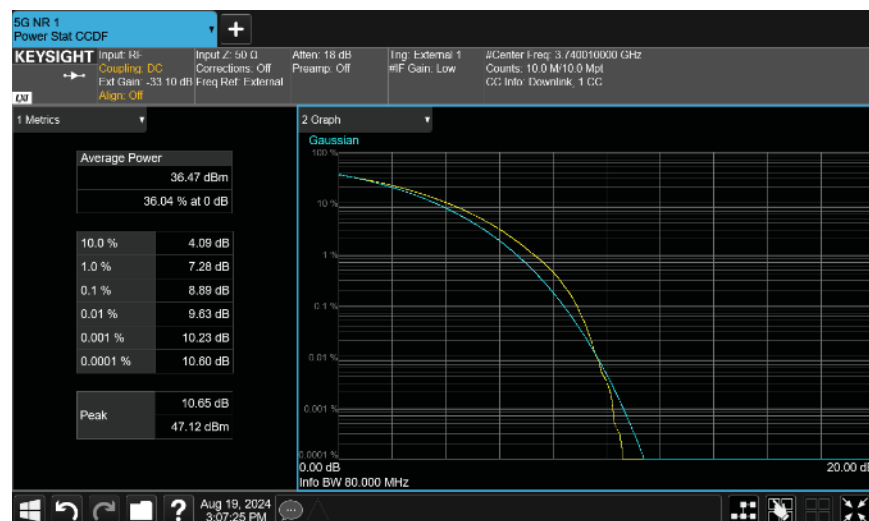


**Port 1**  
**60 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Mid Channel, 3840.00 MHz**

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.7G

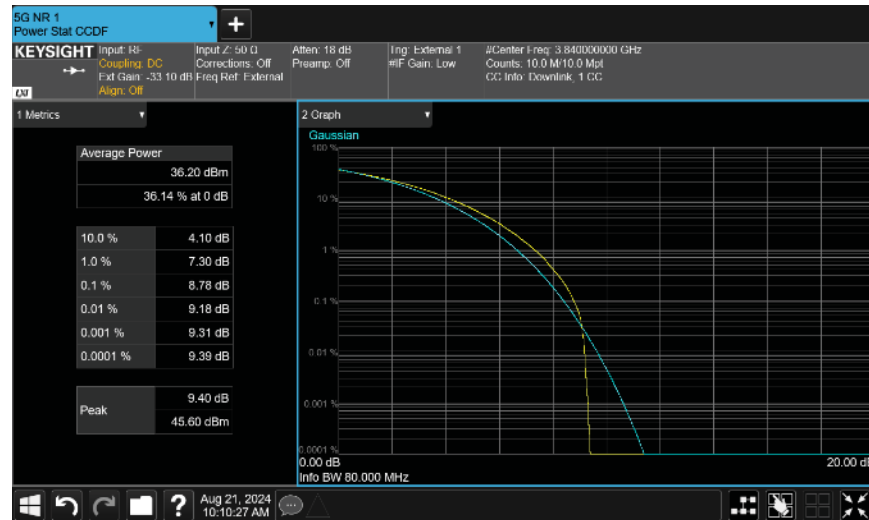


**Port 1**  
**60 MHz Channel Bandwidth**  
**QPSK Modulation**  
**High Channel, 3949.98 MHz**

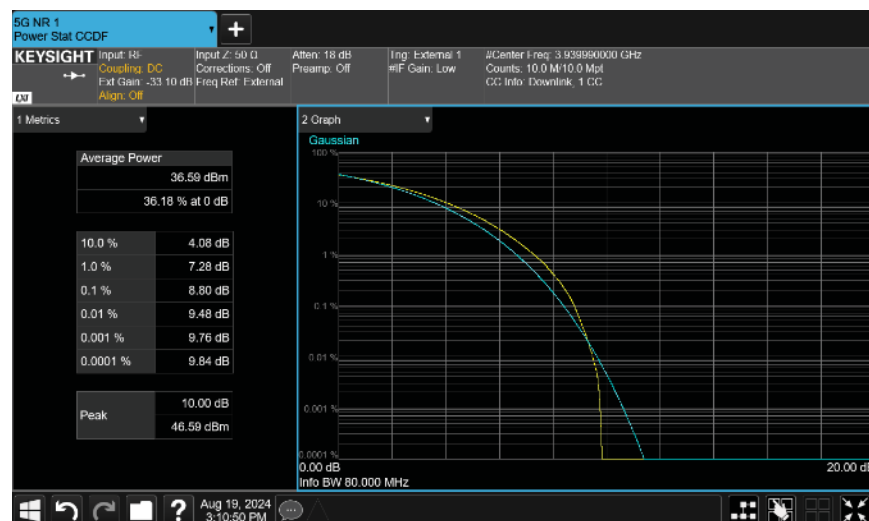


**Port 1**  
**80 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Low Channel, 3740.01 MHz**

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.7G

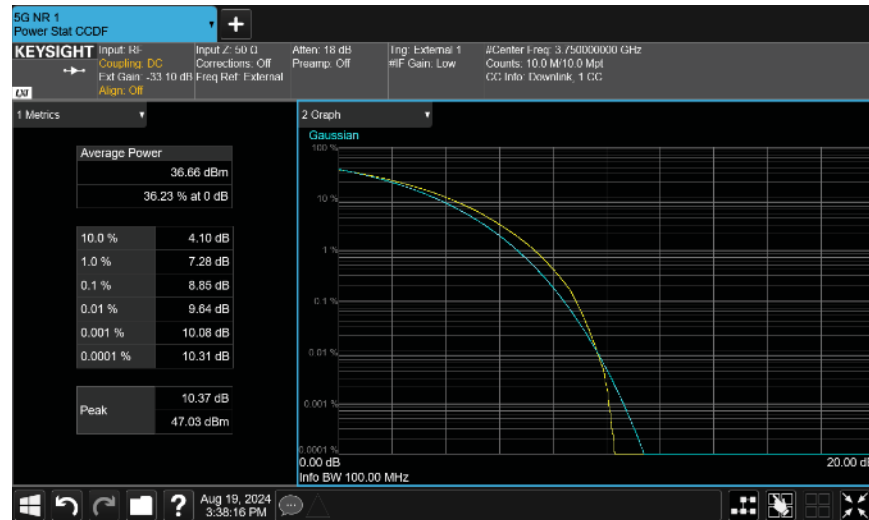


**Port 1**  
**80 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Mid Channel, 3840.00 MHz**

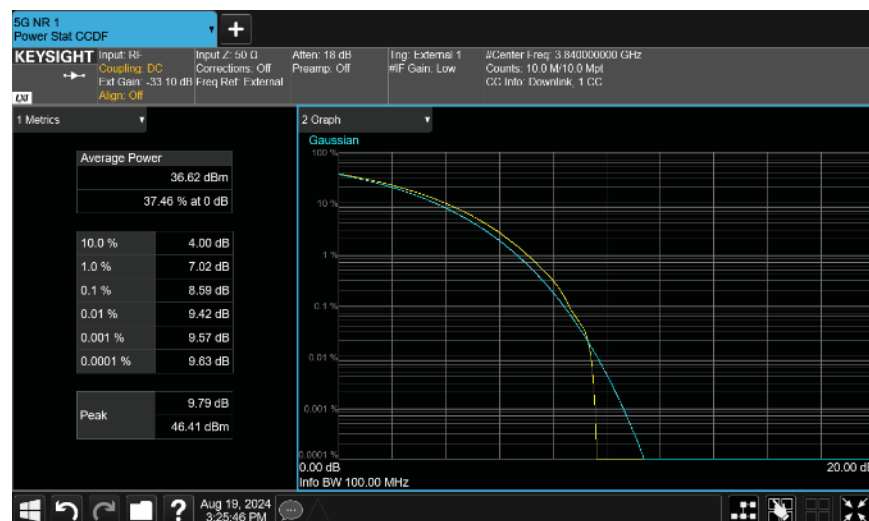


**Port 1**  
**80 MHz Channel Bandwidth**  
**QPSK Modulation**  
**High Channel, 3939.99 MHz**

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.7G

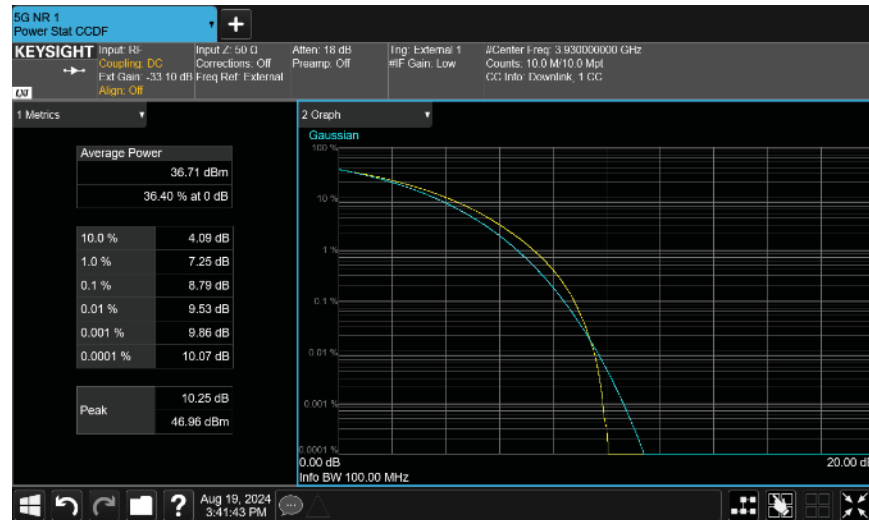


**Port 1**  
**100 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Low Channel, 3750.00 MHz**

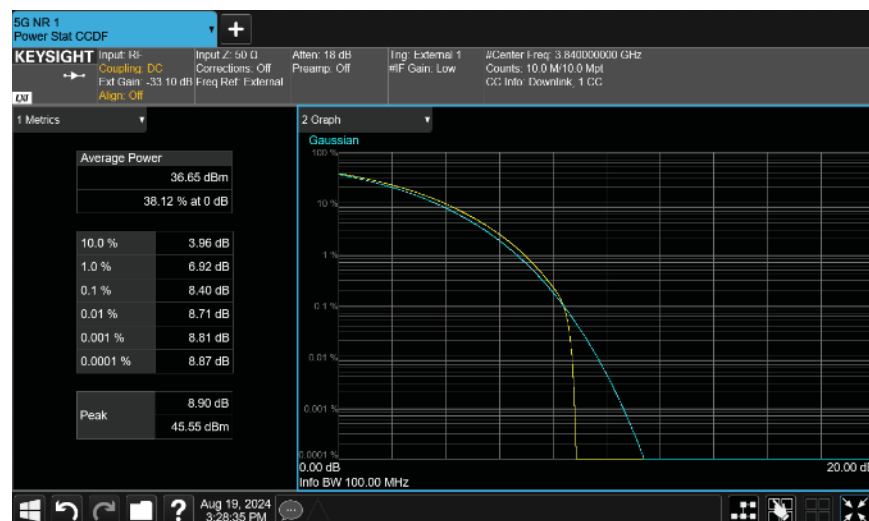


**Port 1**  
**100 MHz Channel Bandwidth**  
**QPSK Modulation**  
**Mid Channel, 3840.00 MHz**

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.7G

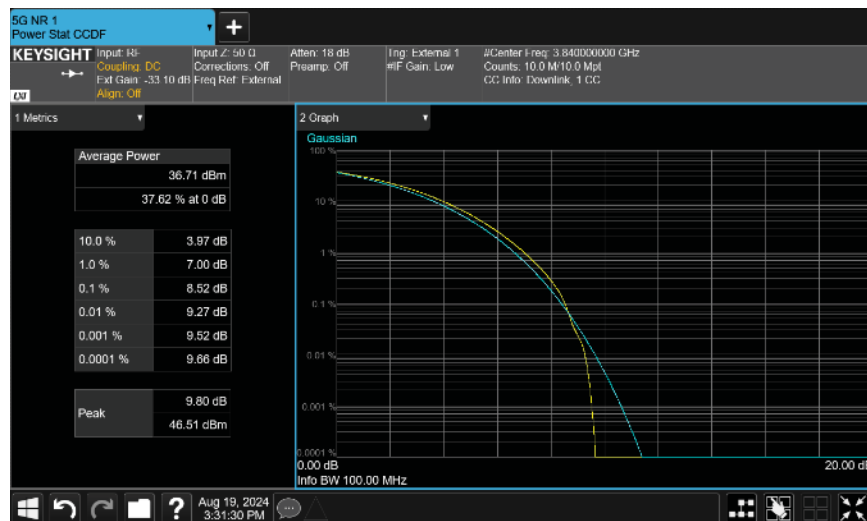


**Port 1**  
**100 MHz Channel Bandwidth**  
**QPSK Modulation**  
**High Channel, 3930.00 MHz**

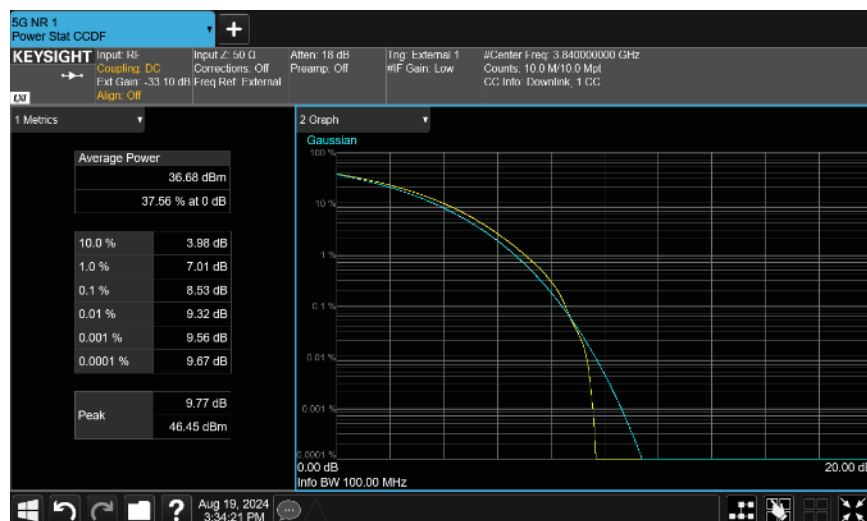


**Port 1**  
**100 MHz Channel Bandwidth**  
**16QAM Modulation**  
**Mid Channel, 3840.00 MHz**

# PEAK AND AVERAGE (PAPR) CCDF - BAND 3.7G



Port 1  
100 MHz Channel Bandwidth  
64QAM Modulation  
Mid Channel, 3840.00 MHz



Port 1  
100 MHz Channel Bandwidth  
256QAM Modulation  
Mid Channel, 3840.00 MHz

# OCCUPIED BANDWIDTH - BAND 3.45G

## TEST DESCRIPTION

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The fundamental emission Occupied Bandwidth was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

RF conducted emissions testing was performed only on one port. The AVQQA antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in this certification testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

The method in section 5.4 of ANSI C63.26 was used to make this measurement. The spectrum analyzer settings were as follows:

- RBW is 1% - 5% of the occupied bandwidth
- VBW is  $\geq 3x$  the RBW
- Peak Detector was used
- Trace max hold was used

The 26dB emission bandwidth is measured in accordance with section 4 of FCC KDB 971168 D01v03r01 and ANSI C63.26 section 5.4. FCC 2.1049 requires an emission bandwidth measurement. FCC 27.53(n)(1) defines the emission bandwidth to be used as 26 dB down.

| FCC 5G Emission Designators for 3.45G Band (3450MHz to 3550MHz) |               |             |              |              |               |
|-----------------------------------------------------------------|---------------|-------------|--------------|--------------|---------------|
| Channel Bandwidth                                               | Radio Channel | 5G-NR: QPSK | 5G-NR: 16QAM | 5G-NR: 64QAM | 5G-NR: 256QAM |
| 10MHz                                                           | Low           | 9M75G7W     |              |              |               |
|                                                                 | Mid           | 9M76G7W     | 9M69G7W      | 9M74G7W      | 9M75G7W       |
|                                                                 | High          | 9M76G7W     |              |              |               |
| 20MHz                                                           | Low           | 19M8G7W     |              |              |               |
|                                                                 | Mid           | 19M9G7W     | 19M8G7W      | 19M8G7W      | 19M8G7W       |
|                                                                 | High          | 19M8G7W     |              |              |               |
| 30MHz                                                           | Low           | 30M0G7W     |              |              |               |
|                                                                 | Mid           | 30M0G7W     | 29M9G7W      | 30M0G7W      | 29M9G7W       |
|                                                                 | High          | 29M9G7W     |              |              |               |
| 40MHz                                                           | Low           | 40M2G7W     |              |              |               |
|                                                                 | Mid           | 40M4G7W     | 40M2G7W      | 40M3G7W      | 40M3G7W       |
|                                                                 | High          | 40M4G7W     |              |              |               |

Note: FCC emission designators are based on 26dB emission bandwidth measurement data.

## TEST EQUIPMENT

| Description                  | Manufacturer       | Model  | ID  | Last Cal.  | Cal. Due   |
|------------------------------|--------------------|--------|-----|------------|------------|
| Analyzer - Spectrum Analyzer | Keysight           | N9010A | AFQ | 2024-03-12 | 2025-03-12 |
| Generator - Signal           | Agilent            | N5173B | TIW | 2023-08-07 | 2026-08-07 |
| Block - DC                   | Fairview Microwave | SD3239 | ANE | 2024-02-14 | 2025-02-14 |

# OCCUPIED BANDWIDTH - BAND 3.45G



|                   |                              |                       |            |
|-------------------|------------------------------|-----------------------|------------|
| EUT:              | AVQQA Remote Radio Head      | Work Order:           | NOKI0075   |
| Serial Number:    | L1242403137                  | Date:                 | 2024-08-09 |
| Customer:         | Nokia Solutions and Networks | Temperature:          | 23.3°C     |
| Attendees:        | David Le, John Rattanaovong  | Relative Humidity:    | 52.7%      |
| Customer Project: | None                         | Bar. Pressure (PMSL): | 1020 mbar  |
| Tested By:        | Jarrold Brenden              | Job Site:             | PT14       |
| Power:            | 54VDC                        | Configuration:        | NOKI0075-4 |

## TEST SPECIFICATIONS

|                |                  |
|----------------|------------------|
| Specification: | Method:          |
| FCC 27:2024    | ANSI C63.26:2015 |

## COMMENTS

All losses in the measurement path were accounted for in the reference level offset; attenuators, filters, cables, and DC blocks. Band n77 carriers were enabled at maximum power levels for the 3.45 GHz band in single carrier operating mode configuration.

## DEVIATIONS FROM TEST STANDARD

None

## CONCLUSION

Pass

Tested By

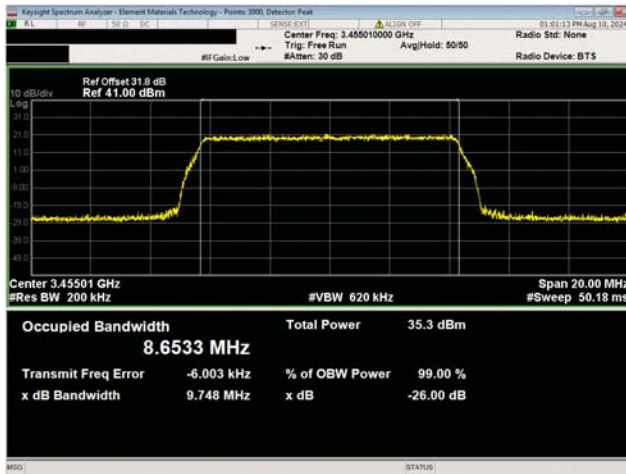
## TEST RESULTS

|                            |  | Value<br>99% (MHz) | Value<br>26dB (MHz) | Limit       | Result |
|----------------------------|--|--------------------|---------------------|-------------|--------|
| Port 1                     |  |                    |                     |             |        |
| 10 MHz Channel Bandwidth   |  |                    |                     |             |        |
| QPSK Modulation            |  |                    |                     |             |        |
| Low Channel, 3455.01 MHz   |  | 8.6533 MHz         | 9.748 MHz           | Within Band | Pass   |
| Mid Channel, 3500.01 MHz   |  | 8.6592 MHz         | 9.758 MHz           | Within Band | Pass   |
| High Channel, 3544.995 MHz |  | 8.6701 MHz         | 9.756 MHz           | Within Band | Pass   |
| 16QAM Modulation           |  |                    |                     |             |        |
| Mid Channel, 3500.01 MHz   |  | 8.6103 MHz         | 9.69 MHz            | Within Band | Pass   |
| 64QAM Modulation           |  |                    |                     |             |        |
| Mid Channel, 3500.01 MHz   |  | 8.6567 MHz         | 9.738 MHz           | Within Band | Pass   |
| 256QAM Modulation          |  |                    |                     |             |        |
| Mid Channel, 3500.01 MHz   |  | 8.6643 MHz         | 9.749 MHz           | Within Band | Pass   |
| 20 MHz Channel Bandwidth   |  |                    |                     |             |        |
| QPSK Modulation            |  |                    |                     |             |        |
| Low Channel, 3460.02 MHz   |  | 18.316 MHz         | 19.813 MHz          | Within Band | Pass   |
| Mid Channel, 3500.01 MHz   |  | 18.310 MHz         | 19.897 MHz          | Within Band | Pass   |
| High Channel, 3540.00 MHz  |  | 18.306 MHz         | 19.81 MHz           | Within Band | Pass   |
| 16QAM Modulation           |  |                    |                     |             |        |
| Mid Channel, 3500.01 MHz   |  | 18.382 MHz         | 19.823 MHz          | Within Band | Pass   |
| 64QAM Modulation           |  |                    |                     |             |        |
| Mid Channel, 3500.01 MHz   |  | 18.314 MHz         | 19.848 MHz          | Within Band | Pass   |

# OCCUPIED BANDWIDTH - BAND 3.45G

|                           | Value<br>99% (MHz) | Value<br>26dB (MHz) | Limit       | Result |
|---------------------------|--------------------|---------------------|-------------|--------|
| 256QAM Modulation         |                    |                     |             |        |
| Mid Channel, 3500.01 MHz  | 18.329 MHz         | 19.781 MHz          | Within Band | Pass   |
| 30 MHz Channel Bandwidth  |                    |                     |             |        |
| QPSK Modulation           |                    |                     |             |        |
| Low Channel, 3465.00 MHz  | 27.904 MHz         | 29.984 MHz          | Within Band | Pass   |
| Mid Channel, 3500.01 MHz  | 27.933 MHz         | 29.958 MHz          | Within Band | Pass   |
| High Channel, 3534.99 MHz | 27.918 MHz         | 29.879 MHz          | Within Band | Pass   |
| 16QAM Modulation          |                    |                     |             |        |
| Mid Channel, 3500.01 MHz  | 28.046 MHz         | 29.855 MHz          | Within Band | Pass   |
| 64QAM Modulation          |                    |                     |             |        |
| Mid Channel, 3500.01 MHz  | 27.931 MHz         | 29.95 MHz           | Within Band | Pass   |
| 256QAM Modulation         |                    |                     |             |        |
| Mid Channel, 3500.01 MHz  | 27.901 MHz         | 29.932 MHz          | Within Band | Pass   |
| 40 MHz Channel Bandwidth  |                    |                     |             |        |
| QPSK Modulation           |                    |                     |             |        |
| Low Channel, 3470.01 MHz  | 37.855 MHz         | 40.247 MHz          | Within Band | Pass   |
| Mid Channel, 3500.01 MHz  | 37.922 MHz         | 40.419 MHz          | Within Band | Pass   |
| High Channel, 3529.98 MHz | 37.876 MHz         | 40.356 MHz          | Within Band | Pass   |
| 16QAM Modulation          |                    |                     |             |        |
| Mid Channel, 3500.01 MHz  | 38.036 MHz         | 40.231 MHz          | Within Band | Pass   |
| 64QAM Modulation          |                    |                     |             |        |
| Mid Channel, 3500.01 MHz  | 38.022 MHz         | 40.279 MHz          | Within Band | Pass   |
| 256QAM Modulation         |                    |                     |             |        |
| Mid Channel, 3500.01 MHz  | 37.930 MHz         | 40.296 MHz          | Within Band | Pass   |

# OCCUPIED BANDWIDTH - BAND 3.45G



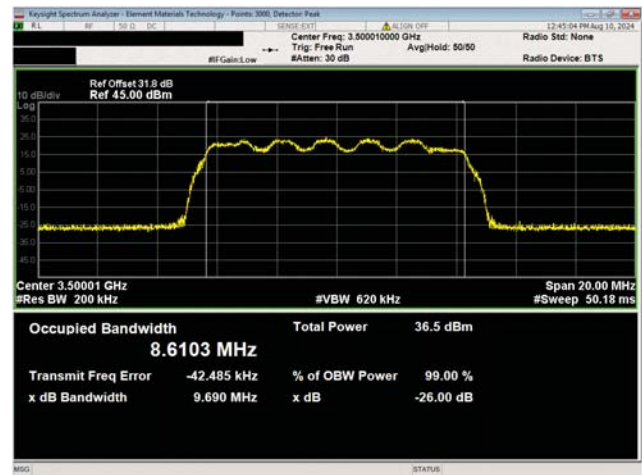
Port 1  
10 MHz Channel Bandwidth  
QPSK Modulation  
Low Channel, 3455.01 MHz



Port 1  
10 MHz Channel Bandwidth  
QPSK Modulation  
Mid Channel, 3500.01 MHz



Port 1  
10 MHz Channel Bandwidth  
QPSK Modulation  
High Channel, 3544.995 MHz

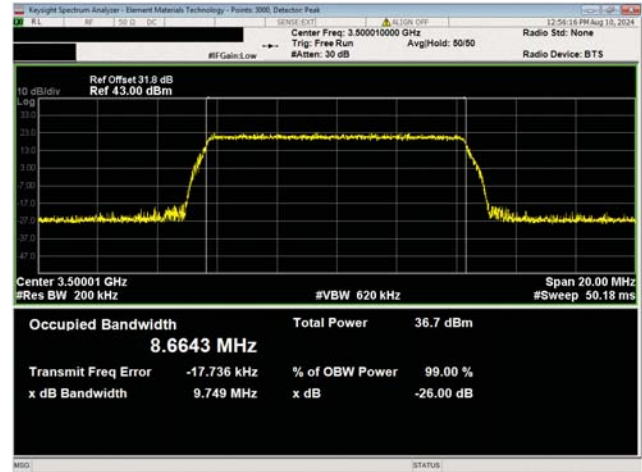


Port 1  
10 MHz Channel Bandwidth  
16QAM Modulation  
Mid Channel, 3500.01 MHz

# OCCUPIED BANDWIDTH - BAND 3.45G



Port 1  
10 MHz Channel Bandwidth  
64QAM Modulation  
Mid Channel, 3500.01 MHz



Port 1  
10 MHz Channel Bandwidth  
256QAM Modulation  
Mid Channel, 3500.01 MHz



Port 1  
20 MHz Channel Bandwidth  
QPSK Modulation  
Low Channel, 3460.02 MHz

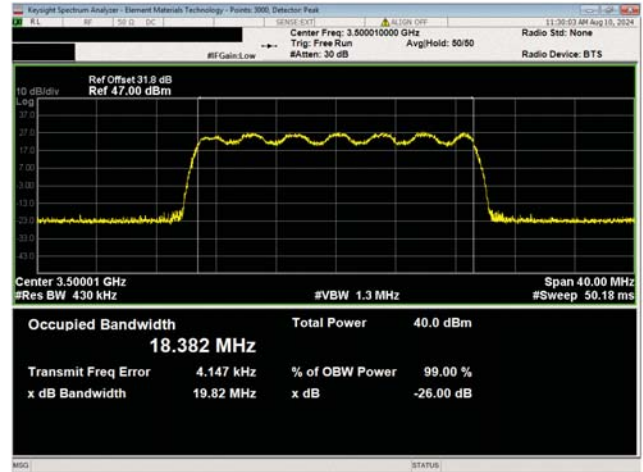


Port 1  
20 MHz Channel Bandwidth  
QPSK Modulation  
Mid Channel, 3500.01 MHz

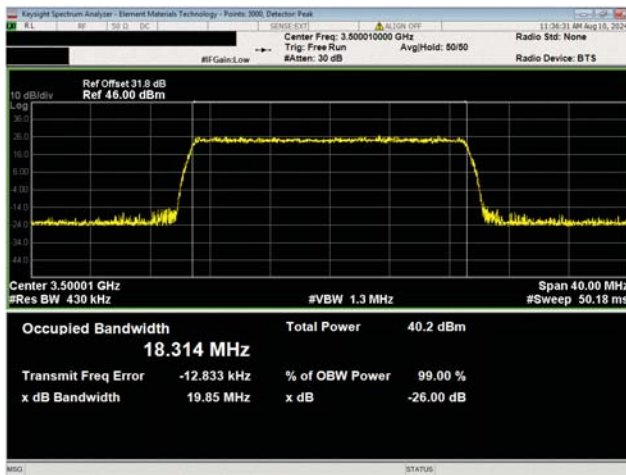
# OCCUPIED BANDWIDTH - BAND 3.45G



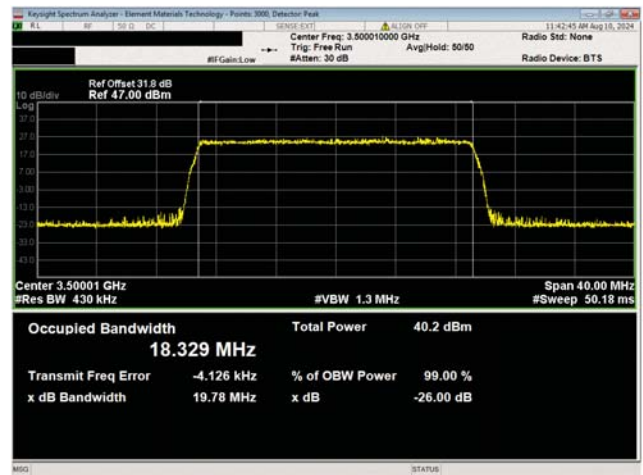
Port 1  
20 MHz Channel Bandwidth  
QPSK Modulation  
High Channel, 3540.00 MHz



Port 1  
20 MHz Channel Bandwidth  
16QAM Modulation  
Mid Channel, 3500.01 MHz

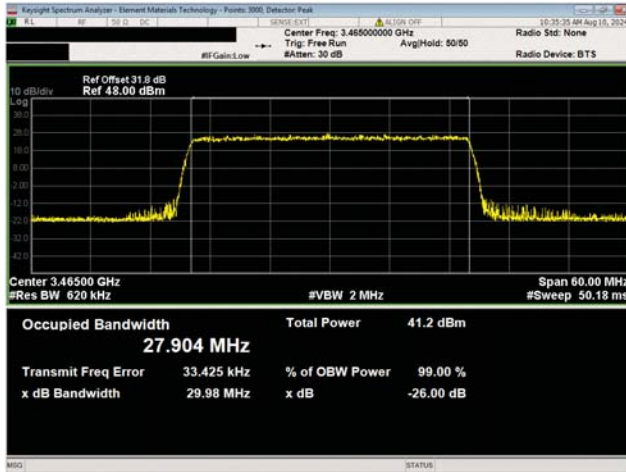


Port 1  
20 MHz Channel Bandwidth  
64QAM Modulation  
Mid Channel, 3500.01 MHz

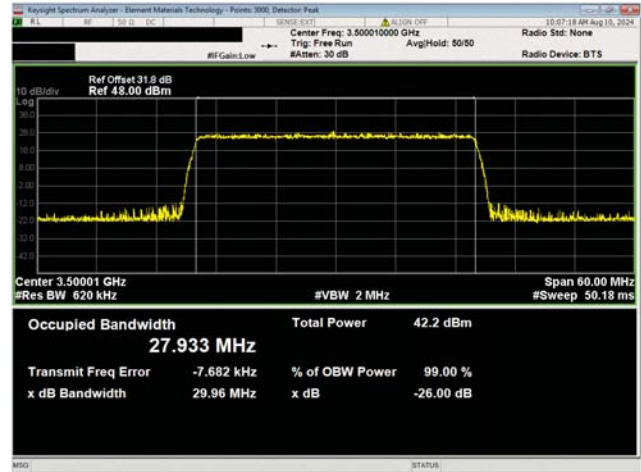


Port 1  
20 MHz Channel Bandwidth  
256QAM Modulation  
Mid Channel, 3500.01 MHz

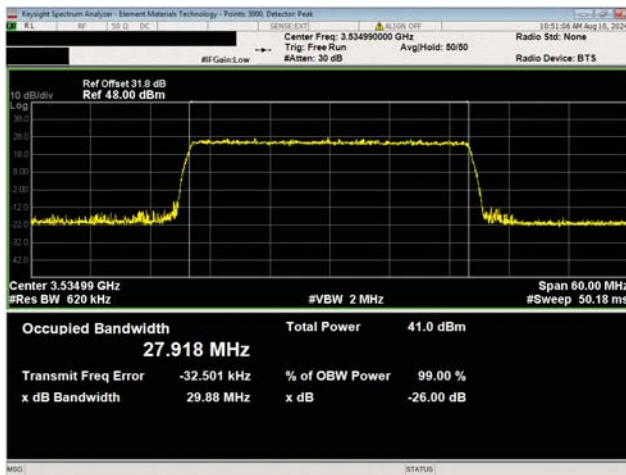
# OCCUPIED BANDWIDTH - BAND 3.45G



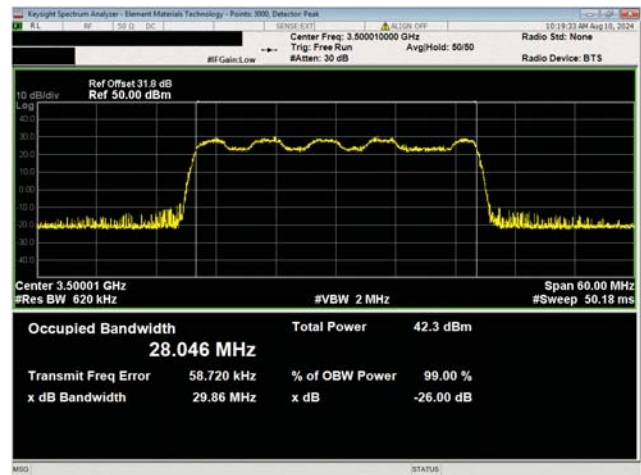
Port 1  
30 MHz Channel Bandwidth  
QPSK Modulation  
Low Channel, 3465.00 MHz



Port 1  
30 MHz Channel Bandwidth  
QPSK Modulation  
Mid Channel, 3500.01 MHz

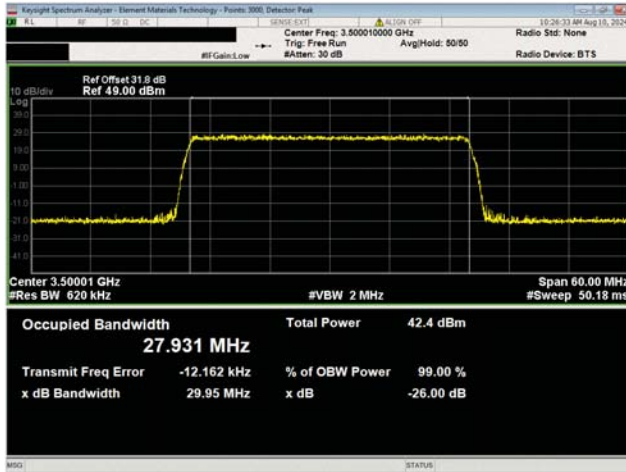


Port 1  
30 MHz Channel Bandwidth  
QPSK Modulation  
High Channel, 3534.99 MHz

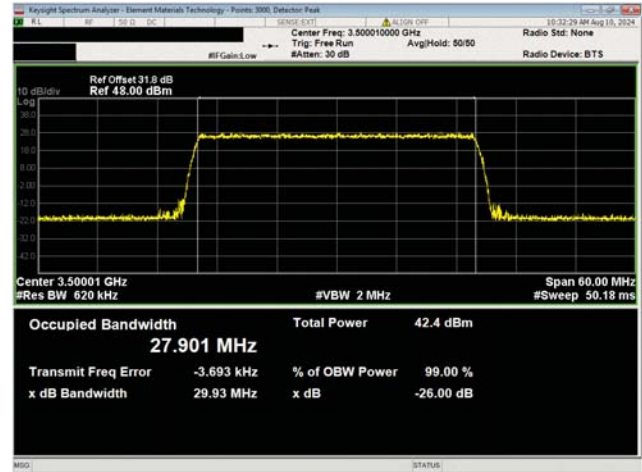


Port 1  
30 MHz Channel Bandwidth  
16QAM Modulation  
Mid Channel, 3500.01 MHz

# OCCUPIED BANDWIDTH - BAND 3.45G



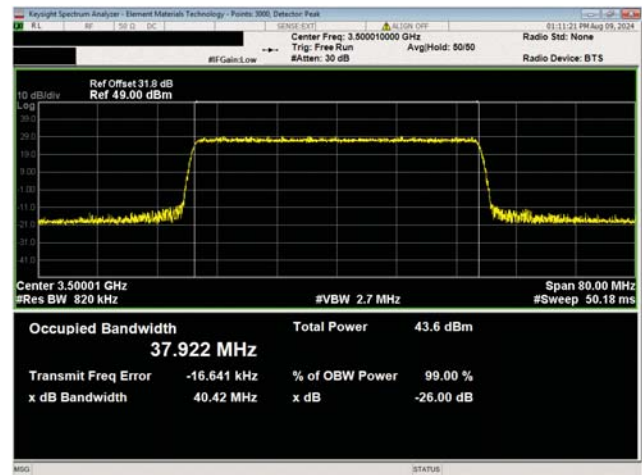
Port 1  
30 MHz Channel Bandwidth  
64QAM Modulation  
Mid Channel, 3500.01 MHz



Port 1  
30 MHz Channel Bandwidth  
256QAM Modulation  
Mid Channel, 3500.01 MHz

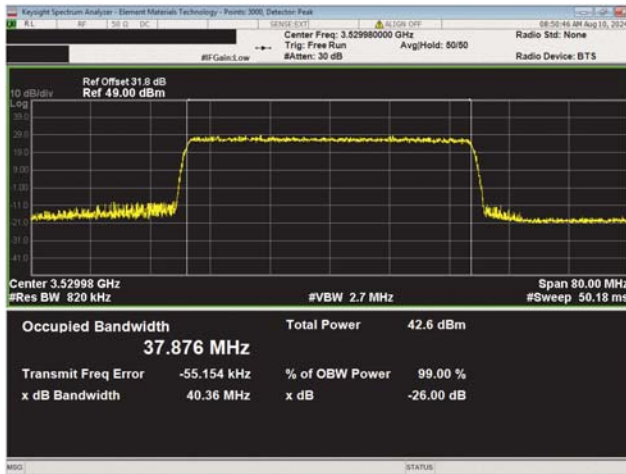


Port 1  
40 MHz Channel Bandwidth  
QPSK Modulation  
Low Channel, 3470.01 MHz

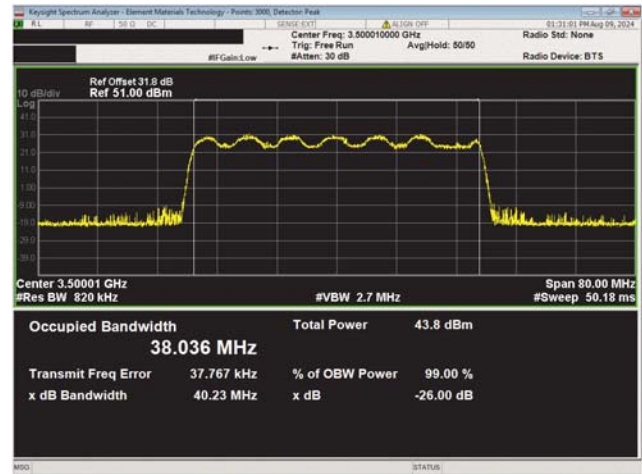


Port 1  
40 MHz Channel Bandwidth  
QPSK Modulation  
Mid Channel, 3500.01 MHz

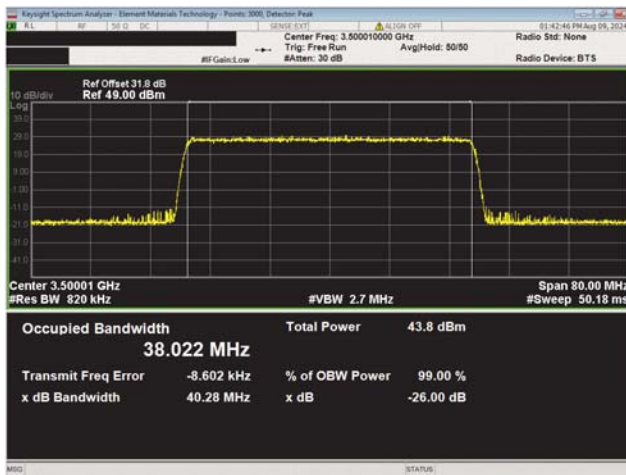
# OCCUPIED BANDWIDTH - BAND 3.45G



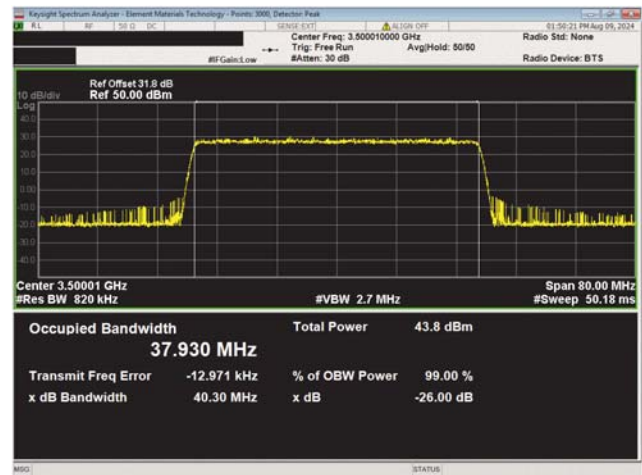
Port 1  
40 MHz Channel Bandwidth  
QPSK Modulation  
High Channel, 3529.98 MHz



Port 1  
40 MHz Channel Bandwidth  
16QAM Modulation  
Mid Channel, 3500.01 MHz



Port 1  
40 MHz Channel Bandwidth  
64QAM Modulation  
Mid Channel, 3500.01 MHz



Port 1  
40 MHz Channel Bandwidth  
256QAM Modulation  
Mid Channel, 3500.01 MHz