



**Radio Test Report**

**Application for Grant of Equipment Authorization**

**FCC Part 27 Subpart C  
IC RSS-199 Issue 2  
2496MHz – 2690MHz**

**FCC ID: 2AD8UFZMFWHT01  
IC: 109D-FZMFWHT01**

**Model: FWHT  
Product Marketing Name: FlexiZone Micro BTS**

**APPLICANT: Nokia Solutions and Networks  
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Arlington Heights, IL 60004**

**TEST SITE(S): National Technical Systems - Plano  
1701 E Plano Pkwy #150  
Plano, TX 75074**

**REPORT DATE: Sep 29, 2015**

**FINAL TEST DATES: Sep 14 – Sep 22, 2015**

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**REVISION HISTORY**

| Rev# | Date         | Comments                         | Modified By       |
|------|--------------|----------------------------------|-------------------|
| 0    | Sep 29, 2015 | (DRAFT) 1 <sup>st</sup> release  | Armando Del Angel |
| 1    | Oct 2, 2015  | Changes due to Customer Comments | Armando Del Angel |
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**TABLE OF CONTENTS**

|                                                                                                  |           |
|--------------------------------------------------------------------------------------------------|-----------|
| <b>REVISION HISTORY .....</b>                                                                    | <b>2</b>  |
| <b>TABLE OF CONTENTS .....</b>                                                                   | <b>3</b>  |
| <b>SCOPE.....</b>                                                                                | <b>4</b>  |
| <b>OBJECTIVE.....</b>                                                                            | <b>5</b>  |
| <b>STATEMENT OF COMPLIANCE .....</b>                                                             | <b>5</b>  |
| <b>DEVIATIONS FROM THE STANDARDS .....</b>                                                       | <b>5</b>  |
| <b>TEST RESULTS.....</b>                                                                         | <b>6</b>  |
| FCC PART 27 SUBPART C AND RSS-199 ISSUE 2 (BASE STATIONS OPERATING IN 2496MHZ-2690MHZ BAND)..... | 6         |
| EXTREME CONDITIONS .....                                                                         | 8         |
| MEASUREMENT UNCERTAINTIES .....                                                                  | 8         |
| <b>EQUIPMENT UNDER TEST (EUT) DETAILS .....</b>                                                  | <b>9</b>  |
| GENERAL.....                                                                                     | 9         |
| ENCLOSURE .....                                                                                  | 10        |
| AUXILLARY EQUIPMENT .....                                                                        | 10        |
| SUPPORT EQUIPMENT .....                                                                          | 10        |
| EUT INTERFACE PORTS.....                                                                         | 10        |
| EUT OPERATION .....                                                                              | 11        |
| EUT FIRMWARE/SOFTWARE.....                                                                       | 11        |
| MODIFICATIONS .....                                                                              | 11        |
| <b>TESTING .....</b>                                                                             | <b>12</b> |
| GENERAL INFORMATION .....                                                                        | 12        |
| <b>MEASUREMENT PROCEDURES .....</b>                                                              | <b>13</b> |
| <b>TEST EQUIPMENT .....</b>                                                                      | <b>15</b> |
| <b>APPENDIX A TEST DATA .....</b>                                                                | <b>16</b> |
| RF OUTPUT POWER .....                                                                            | 17        |
| EMISSION BANDWIDTHS (26dB AND 99%) .....                                                         | 34        |
| ANTENNA PORT CONDUCTED BANDEDGE .....                                                            | 47        |
| TRANSMITTER ANTENNA PORT CONDUCTED SPURIOUS EMISSIONS .....                                      | 55        |
| TRANSMITTER RADIATED SPURIOUS EMISSIONS .....                                                    | 62        |
| FREQUENCY STABILITY .....                                                                        | 72        |
| <b>END OF REPORT.....</b>                                                                        | <b>73</b> |

**SCOPE**

Tests have been performed on Nokia Solutions and Networks product FlexiZone Micro BTS Model FWHT, pursuant to the relevant requirements of the following standard(s) in order to obtain device certification against the regulatory requirements of the Federal Communications Commission.

- Code of Federal Regulations (CFR) Title 47 Part 2
- CFR Title 47 Part 27 Subpart C
- RSS-Gen Issue 4 November 2014
- RSS-199 Issue 2 October 2014

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards:

ANSI C63.4-2009  
ANSI TIA-603-C  
FCC KDB 971168 D01 v02r02

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant FCC requirements.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of Nokia Solutions and Networks product FlexiZone Micro BTS Model FWHT and therefore apply only to the tested sample. The sample was selected and prepared by Terrence Schwenk of Nokia Solutions and Networks.

**OBJECTIVE**

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, the device requires certification.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

Testing was performed only on Model FWHT. No additional models were described or supplied for testing.

**STATEMENT OF COMPLIANCE**

The tested sample of Nokia Solutions and Networks product FlexiZone Micro BTS Model FWHT complied with the requirements of the standards and frequency bands declared in the scope of this test report.

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

**DEVIATIONS FROM THE STANDARDS**

No deviations were made from the published requirements listed in the scope of this report.

**TEST RESULTS****FCC Part 27 Subpart C and RSS-199 Issue 2 (Base Stations Operating in 2496MHz-2690MHz band)**

| FCC                                                                                                                                                              | IC                  | Description               | Measured                                                                                                                                | Limit                       | Result            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------------------|
| Transmitter Modulation, output power and other characteristics                                                                                                   |                     |                           |                                                                                                                                         |                             |                   |
| §27.5(a)                                                                                                                                                         | N/A                 | Frequency range(s)        | 2498.5MHz - 2687.5MHz (5M LTE)<br>2501.0MHz – 2685.0MHz (10M LTE)<br>2503.5MHz – 2682.5MHz (15MHz LTE)<br>2506.0MHz – 2680.0MHz (20MHz) | 2496.0MHz – 2690.0MHz       | Pass              |
| §2.1033(c)(4)                                                                                                                                                    | RSS-199 Section 4.1 | Modulation Type           | QPSK, 16QAM, 64QAM (5M, 10M, 15M, and 20M for each)                                                                                     | Digital                     | Pass              |
| §27.50(a)                                                                                                                                                        | RSS-199 Section 4.4 | Output Power              | Conducted Output Power (Highest on Port 2)<br>RMS: 38.69Bm<br>EIRP will depend on antenna gain (unknown)                                | 2000W EIRP                  | Pass              |
| §27.50(a)                                                                                                                                                        | N/A                 | Peak to Average Ratio     | 10.5dB highest                                                                                                                          | 13dB                        | Pass              |
| §2.1049                                                                                                                                                          | RSS-199 Section 4.2 | Emission Bandwidth (99%)  | 4.507MHz (5M LTE)<br>9.006MHz (10M LTE)<br>13.491MHz (15M LTE)<br>17.983MHz (20MHz LTE)                                                 | Remain in Block             | Pass              |
| N/A Informational                                                                                                                                                | N/A Informational   | Emission Bandwidth (26dB) | 4.966MHz (5M LTE)<br>9.965MHz (10M LTE)<br>14.944MHz (15M LTE)<br>19.89MHz (20M LTE)                                                    | Remain in Block             | Pass              |
| Transmitter spurious emissions <sup>1</sup>                                                                                                                      |                     |                           |                                                                                                                                         |                             |                   |
| §27.53(a)                                                                                                                                                        | RSS-199 Section 4.6 | At the antenna terminals  | < -16.03dBm                                                                                                                             | -16.03 dBm (per TX chain)   | Pass              |
|                                                                                                                                                                  |                     | Field strength            | 40.0dBuV/m at 3m<br>Eq. to -55.2dBm EIRP                                                                                                | -13 dBm EIRP                | Pass              |
| Other details                                                                                                                                                    |                     |                           |                                                                                                                                         |                             |                   |
| §27.54                                                                                                                                                           | RSS-199 Section 4.3 | Frequency stability       | Low = -20.98dBm<br>High = -20.6dBm                                                                                                      | Remain in Block (-16.03dBm) | Pass              |
| §1.1310                                                                                                                                                          | RSS-102 Issue 5     | RF Exposure               | N/A                                                                                                                                     |                             | Pass <sup>2</sup> |
| Notes                                                                                                                                                            |                     |                           |                                                                                                                                         |                             |                   |
| Note 1 – Based on 1MHz RBW. In 1MHz bands immediately outside and adjacent to the frequency block an RBW of at least 1% of the emission bandwidth has been used. |                     |                           |                                                                                                                                         |                             |                   |
| Note 2 – Applicant’s declaration on a separate exhibit based on hypothetical antenna gains.                                                                      |                     |                           |                                                                                                                                         |                             |                   |

|     | Emission Designators |          |           |          |           |          |
|-----|----------------------|----------|-----------|----------|-----------|----------|
|     | LTE-QPSK             |          | LTE-16QAM |          | LTE-64QAM |          |
|     | FCC                  | IC       | FCC       | IC       | FCC       | IC       |
| 5M  | 4M93F9W              | 4M51F9W  | 4M95F9W   | 4M49F9W  | 4M97F9W   | 4M50F9W  |
| 10M | 9M94F9W              | 8M98F9W  | 9M97F9W   | 9M01F9W  | 9M96F9W   | 8M98F9W  |
| 15M | 14M87F9W             | 13M48F9W | 14M82F9W  | 13M49F9W | 14M94F9W  | 13M46F9W |
| 20M | 19M74F9W             | 17M98F9W | 19M73F9W  | 17M98F9W | 19M89F9W  | 17M98F9W |

Note: FCC based on 26dB emission bandwidth, IC based on 99% emissions bandwidth.

**EXTREME CONDITIONS**

Frequency stability is determined over extremes of temperature and voltage. The extremes of voltage were 85 to 115 percent of the nominal value.

The extremes of temperature were -30°C to +50°C as specified in FCC §2.1055(a)(1).

**MEASUREMENT UNCERTAINTIES**

Measurement uncertainties of the test facility based on a 95% confidence level are as follows,

| <b>Test</b>                  | <b>Uncertainty</b> |
|------------------------------|--------------------|
| Radio frequency              | ± 0.2ppm           |
| RF power conducted           | ±1.2 dB            |
| RF power radiated            | ±3.3 dB            |
| RF power density conducted   | ±1.2 dB            |
| Spurious emissions conducted | ±1.2 dB            |
| Adjacent channel power       | ±0.4 dB            |
| Spurious emissions radiated  | ±4 dB              |
| Temperature                  | ±1°C               |
| Humidity                     | ±1.6 %             |
| Voltage (DC)                 | ±0.2 %             |
| Voltage (AC)                 | ±0.3 %             |

**EQUIPMENT UNDER TEST (EUT) DETAILS****GENERAL**

The equipment under test (EUT) is a Nokia Solutions and Networks FlexiZone Micro Base Transceiver Station (BTS), model FWHT which operates over 3GPP frequency band 41 (BTS Tx/RX: 2496 to 2690 MHz). The FWHT has two co-located transmitters with each transmit port supporting 5 watts maximum rated RF output power. The FWHT can be operated as MIMO or as non-MIMO. Multi-carrier operation is supported.

The FWHT supports three downlink modulation types for LTE (QPSK, 16QAM and 64QAM). The FWHT supports four LTE channel bandwidths (5 MHz, 10 MHz, 15 MHz, and 20 MHz).

The FWHT has external interfaces including AC power, ground, TX/RX (Ant), Ethernet “B”, Ethernet “C”, USB port, GPS and Bluetooth. The FWHT with applicable installation kit may be pole or wall mounted. Bluetooth interface has modular FCC and IC approval.

The FWHT LTE channel numbers and frequencies are as follows:

|                     | Downlink<br>EARFCN | Downlink<br>Frequency<br>(MHz) | LTE Channel Bandwidth |            |            |            |
|---------------------|--------------------|--------------------------------|-----------------------|------------|------------|------------|
|                     |                    |                                | 5 MHz                 | 10 MHz     | 15 MHz     | 20 MHz     |
| Band 41 (Ant 1 & 2) | 39650              | 2496.0                         | Bandedge              | Bandedge   | Bandedge   | Bandedge   |
|                     | 39675              | 2498.5                         | Low Ch.               |            |            |            |
|                     | 39700              | 2501.0                         |                       | Low Ch.    |            |            |
|                     | 39725              | 2503.5                         |                       |            | Low Ch.    |            |
|                     | 39750              | 2506.0                         |                       |            |            | Low Ch.    |
|                     | 40640              | 2595.0                         | Middle Ch.            | Middle Ch. | Middle Ch. | Middle Ch. |
|                     | 41490              | 2680.0                         |                       |            |            | Top Ch.    |
|                     | 41515              | 2682.5                         |                       |            | Top Ch.    |            |
|                     | 41540              | 2685.0                         |                       | Top Ch.    |            |            |
|                     | 41565              | 2687.5                         | Top Ch.               |            |            |            |
|                     | 41589              | 2690.0                         | Bandedge              | Bandedge   | Bandedge   | Bandedge   |

FWHT Downlink LTE Frequency Channels

The samples were received on Sep 14, 2015 and tested on Sep 14 - Sep 22, 2015. The only difference between both serial numbers is the power supply used. Preliminary Pre-Scans were performed in order to determine the worst-case unit. All the results in this report were obtained from the worst case unit S/N: RY153106337. The EUT consisted of the following component(s):

| Company                      | Model | Description         | Part/Serial Number                    | FCC ID/IC Number                             |
|------------------------------|-------|---------------------|---------------------------------------|----------------------------------------------|
| Nokia Solutions and Networks | FWHT  | FlexiZone Micro BS  | Part#: 473531<br>Serial#: RY153106337 | FCC ID: 2AD8UFZMFWHT01<br>IC: 109D-FZMFWHT01 |
| Nokia Solutions and Networks | FWHT  | FlexiZone Micro BTS | Part#: 473531<br>Serial#: RY153106336 | FCC ID: 2AD8UFZMFWHT01<br>IC: 109D-FZMFWHT01 |

**ENCLOSURE**

The EUT enclosure is made of heavy duty aluminum and measures approximately 12(W) x 4(D) x 12(H) inches.

**AUXILIARY EQUIPMENT**

| Company | Model | Description | Part/Serial Number | FCC ID/IC Number |
|---------|-------|-------------|--------------------|------------------|
| N/A     | N/A   | N/A         | N/A                | N/A              |

**SUPPORT EQUIPMENT**

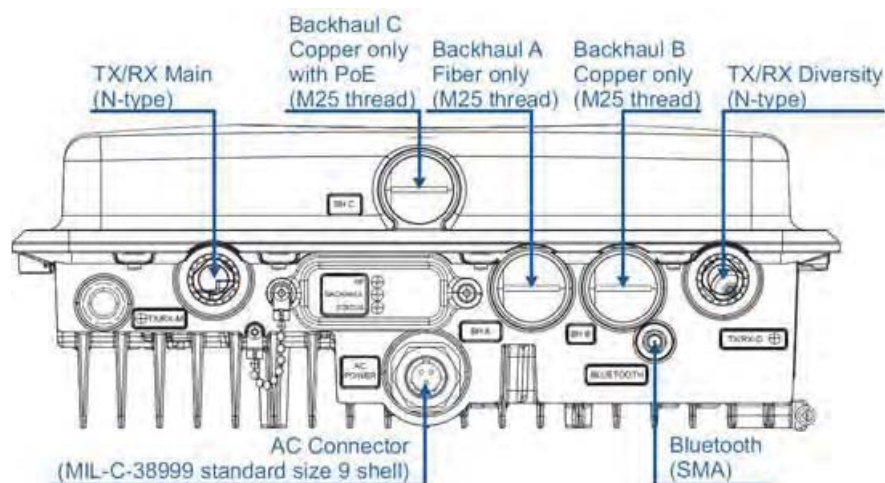
| Company                      | Model            | Description      | Part/Serial Number | FCC ID/IC Number |
|------------------------------|------------------|------------------|--------------------|------------------|
| Nokia Solutions and Networks | 086479A.X31      | Nokia Argon HDMI | RY134602016        | N/A              |
| HP                           | Elite Book 8530w | Laptop PC        | 2CE918Bk1Q         | N/A              |

**EUT INTERFACE PORTS**

The I/O cabling configuration during testing was as follows:

| Cable    | Type   | Shield | Length | Used in Test | Quantity | Termination      |
|----------|--------|--------|--------|--------------|----------|------------------|
| AC Power | Power  | No     | ~ 3 m  | Yes          | 1        | Power Supply     |
| Earth    | Earth  | No     | ~ 1 m  | Yes          | 1        | Lab earth ground |
| TX/RD D  | RF     | Yes    | ~ 1 m  | Yes          | 1        | 50Ω Load         |
| TX/RD M  | RF     | Yes    | ~ 1 m  | Yes          | 1        | 50Ω Load         |
| BH B     | Signal | Yes    | > 6 m  | Yes          | 1        | Laptop           |
| BH C     | Signal | Yes    | > 6 m  | Yes          | 1        | Laptop           |

The connector layout for FWHT is provided below:



FWHT External Interfaces:

| Port #                                                                                                                                                                               | Name         | Type* | Cable Max. >3m (Y/N) | Cable Shielded (Y/N) | Comments                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------|----------------------|----------------------|-------------------------------------------------------------------------------------|
| 0                                                                                                                                                                                    | Enclosure    | N/E   | —                    | —                    | None                                                                                |
| 1                                                                                                                                                                                    | Mains        | AC    | Y                    | Y                    | None                                                                                |
| 2                                                                                                                                                                                    | Ethernet "B" | TP    | Y                    | Y                    | BHB – Always connected                                                              |
| 3                                                                                                                                                                                    | Ethernet "C" | TP    | Y                    | Y                    | BHC – This is a technician service port and may also be used in normal operation.   |
| 4                                                                                                                                                                                    | USB          | I/O   | Y                    | Y                    | This is a technician service port only. Hooked up for monitoring data traffic only. |
| Note:<br>AC = AC Power Port      DC = DC Power Port      N/E = Non-Electrical<br>I/O = Signal Input or Output Port (Not Involved in Process Control)<br>TP = Telecommunication Ports |              |       |                      |                      |                                                                                     |

### EUT OPERATION

During testing, the EUT was transmitting continuously with 70% duty-cycle at full power on all chains.

### EUT FIRMWARE/SOFTWARE

The laptop PC connects to the EUT over the Ethernet port. The laptop is used for changing configuration settings, monitoring tests and controlling the FWHT. The following software versions are used for the FWHT testing:

- (1) LabVIEW Software: Version 2012
- (2) EUT Firmware: FB\_PS\_REL\_2014\_05\_374

### MODIFICATIONS

No modifications were made to the EUT during testing.

**TESTING****GENERAL INFORMATION**

Antenna port measurements were taken at NTS Plano branch located at 1701 E Plano Pkwy #150 Plano, TX 75074.

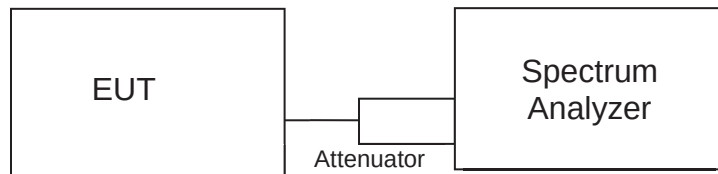
Radiated spurious emissions measurements were taken at the NTS Plano Anechoic Chamber listed below. The sites conform to the requirements of ANSI C63.4-2009 *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz* and CISPR 16-1-4:2007 - *Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus Ancillary equipment Radiated disturbances*. They are on file with the FCC and Industry Canada.

| Site      | Registration Numbers                            |          | Location                                   |
|-----------|-------------------------------------------------|----------|--------------------------------------------|
|           | FCC                                             | Canada   |                                            |
| Chamber 1 | A2LA Accredited<br>Designation<br>Number US1077 | IC 4319A | 1701 E Plano Pkwy #150<br>Plano, TX 75074. |

Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements.

## MEASUREMENT PROCEDURES

Output power, emission bandwidth, conducted spurious, conducted bandedge and carrier frequency stability measurements were all performed via a spectrum analyzer connected to the individual RF chains via a 40dB attenuator and an RF cable. The EUT was operating in 2x2 MIMO configuration at full power for all tests. While measuring one transmit chain, the other one was terminated with termination blocks. All measurements were corrected for the insertion loss of the attenuator and cable inserted between the RF port of the EUT and the spectrum analyzer. Simple test diagram is shown below.



### Test Configuration for Antenna Port Measurements

26dB emission bandwidth was measured in accordance with Section 4.1 of FCC KDB 971168 D01 v02r02. 99% occupied bandwidth was measured in accordance with Section 6.6 of RSS-Gen Issue 4. For both measurements an NTS custom software tool was used. Spectrum analyzer settings are shown on their corresponding plots in test results section.

Emissions at the band-edges were also captured with an NTS custom software tool with settings described in the corresponding sections of the FCC and IC rules. Spectrum analyzer settings are shown on their corresponding plots in test results section. A 20dB attenuator was used in place of the 40dB attenuator to measure emissions in the 5-27GHz ranges to reduce measurement instrumentation noise floor.

Peak and average output power measurements were performed in accordance with FCC KDB 971168 D01 v02r02. An NTS custom software tool was used for power integration to compensate for resolution bandwidth limitations of the spectrum analyzer and settings are shown on their corresponding plots in test results section.

Peak to average power ratio was calculated in accordance with Section 5.7.2 of FCC KDB 971168 D01 v02r02.

Conducted spurious emissions were captured with TILE6 software which corrected the readings for cable loss and attenuator loss across the 9kHz-27GHz frequency span. Settings of the spectrum analyzer are described in the corresponding test result section.

For frequency stability, the EUT was placed inside a temperature chamber with all support and test equipment located outside of the chamber. Temperature was varied across the specified range in 10 degree increments and EUT was allowed enough time to stabilize at each temperature step. A spectrum analyzer as detailed in the test equipment section has been used to measure the Low and High channels, making sure they remain inside the allocated frequency band.

Transmitter radiated spurious emissions measurements were made in accordance with ANSI C63.4-2009 by measuring the field strength of the emissions from the device at 3m test distance. The eirp limit as specified in the relevant rule part(s) is converted to a field strength at the test distance and the emissions from the EUT are then compared to that limit. Only emissions within 20dB of this limit are subjected to a substitution measurement in accordance with TIA-603-C-2004. Both preliminary and final measurements were performed at the same FCC listed test chamber. Preliminary scans were performed with TILE6 software. This software corrected the measurements for antenna factors, cable losses and pre-amplifier gains. Both polarizations of the receiving antenna were scanned from 30MHz to 27GHz with a peak detector (RBW=1MHz, VBW=3MHz, with trace max hold over multiple sweeps). Based on the preliminary scan results, frequencies of interest have been maximized via rotating the EUT 360 degrees and varying the height of the test antenna (1m to 4m). Final measurements were also taken with the peak detector as described above. A biconilog antenna was used for 30MHz-1GHz range. A double ridged waveguide horn antenna was used for 1-18GHz range and a smaller horn antenna was used for 18-27GHz range. The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height. EUT was placed on a non-conductive RF transparent structure to provide 80cm height from the ground floor. A motorized turntable allowed it to be rotated during testing to determine the angle with the highest level of emissions.

**Test Equipment**

| <b>NTS Equipment #</b> | <b>Description</b>                | <b>Manufacturer</b> | <b>Model</b>             | <b>Calibration Duration</b> | <b>Calibration Due Date</b> |
|------------------------|-----------------------------------|---------------------|--------------------------|-----------------------------|-----------------------------|
| E1529P                 | PSA                               | Agilent             | E4446A                   | 12 Months                   | 3/3/2016                    |
| E1260P                 | PreAmp<br>(1GHz-18GHz)            | MITEQ               | AFS44-01001800-45-10P-44 | 12 Months                   | 6/4/2016                    |
| E1366P                 | PreAmp (30MHz-1GHz)               | MITEQ               | AM-1431-N-1197SC         | 12 Months                   | 12/12/2015                  |
| E1009P                 | PreAmp<br>(18-27GHz)              | HP                  | 8449B                    | 12 Months                   | 1/16/2016                   |
| E1289P                 | Biconilog Antenna<br>(30MHz-1GHz) | ETS Lindgren        | 3142C                    | 12 Months                   | 3/19/2016                   |
| E1149P                 | Horn Antenna<br>(1GHz-18GHz)      | EMCO                | 3115                     | 12 Months                   | 12/10/2015                  |
| E1068P                 | Horn Antenna<br>(18GHz-40GHz)     | EMCO                | 3116                     | 12 Months                   | 6/5/2016                    |
| E1447P                 | RMS Multimeter                    | Fluke               | 87V                      | 12 Months                   | 5/27/2016                   |
| ENV1035P               | Thermometer                       | Fluke               | 52 II                    | 12 Months                   | 4/9/2016                    |
| ENV1195P               | Climatic Chamber                  | Thermotron          | SE-300-2-2               | N/A                         | NCR                         |

## ***Appendix A Test Data***

**RF Output Power**

RF output power has been measured in both Peak and RMS Average terms for each transmit chain at the center channel for all modulations and bandwidth modes. Peak to average ratio (PAR) has been calculated as described in Section 5.7.2 of KDB971168 D01 v02r02 and all results are presented in tabular form below.

|                         |     | LTE - QPSK |               |          | LTE - 16QAM |               |          | LTE - 64QAM |               |          |
|-------------------------|-----|------------|---------------|----------|-------------|---------------|----------|-------------|---------------|----------|
|                         |     | Peak (dBm) | Average (dBm) | PAR (dB) | Peak (dBm)  | Average (dBm) | PAR (dB) | Peak (dBm)  | Average (dBm) | PAR (dB) |
| Port 1 Center Channel   | 5M  | 46.9       | 38.18         | 8.72     | 46.69       | 36.19         | 10.5     | 46.14       | 38.2          | 7.94     |
|                         | 10M | 47.09      | 38.15         | 8.94     | 47.06       | 38.36         | 8.7      | 46.21       | 38.29         | 7.92     |
|                         | 15M | 46.95      | 38.35         | 8.6      | 46.98       | 37.97         | 9.01     | 46.24       | 38.18         | 8.06     |
|                         | 20M | 47.04      | 38.2          | 8.84     | 47.02       | 38.26         | 8.76     | 46.35       | 38.11         | 8.24     |
| Port 2 Center Channel   | 5M  | 47.08      | 38.15         | 8.93     | 46.8        | 38.27         | 8.53     | 46.18       | 38.31         | 7.87     |
|                         | 10M | 47.14      | 38.37         | 8.77     | 47.12       | 38.48         | 8.64     | 46.39       | 38.34         | 8.05     |
|                         | 15M | 47.08      | 38.35         | 8.73     | 47.04       | 38.1          | 8.94     | 46.49       | 38.42         | 8.07     |
|                         | 20M | 47.03      | 38.29         | 8.74     | 47.06       | 38.25         | 8.81     | 46.67       | 38.2          | 8.47     |
| Combined Center Channel | 5M  | 50         | 41.18         | 8.82     | 49.76       | 40.36         | 9.4      | 49.17       | 41.27         | 7.9      |
|                         | 10M | 50.13      | 41.27         | 8.86     | 50.1        | 41.43         | 8.67     | 49.31       | 41.33         | 7.98     |
|                         | 15M | 50.03      | 41.36         | 8.67     | 50.02       | 41.05         | 8.97     | 49.38       | 41.31         | 8.07     |
|                         | 20M | 50.05      | 41.26         | 8.79     | 50.05       | 41.27         | 8.78     | 49.52       | 41.17         | 8.35     |

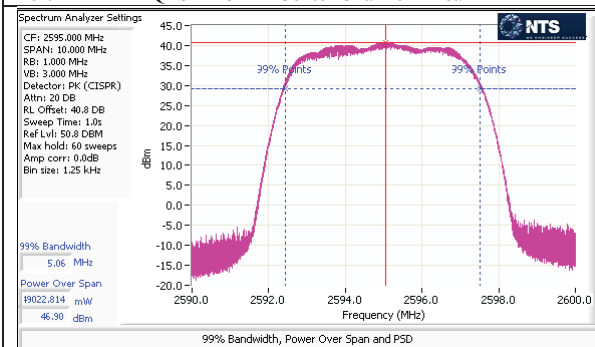
Based on the results above, Port 2 had the highest RMS average power and therefore it was selected for all the remaining antenna port tests on the product.

Subsequently output power levels on lowest and highest channels in all 4 channel bandwidths were tested only at Port 2 and results presented below.

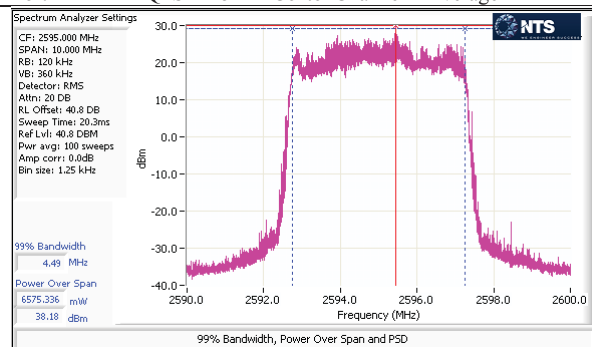
|                     |     | LTE - QPSK |               |          | LTE - 16QAM |               |          | LTE - 64QAM |               |          |
|---------------------|-----|------------|---------------|----------|-------------|---------------|----------|-------------|---------------|----------|
|                     |     | Peak (dBm) | Average (dBm) | PAR (dB) | Peak (dBm)  | Average (dBm) | PAR (dB) | Peak (dBm)  | Average (dBm) | PAR (dB) |
| Port 2 Low Channel  | 5M  | 46.97      | 37.46         | 9.51     | 46.81       | 38.05         | 8.76     | 45.06       | 38.26         | 6.8      |
|                     | 10M | 47.33      | 38.46         | 8.87     | 47.24       | 38.48         | 8.76     | 46.41       | 38.43         | 7.98     |
|                     | 15M | 47.59      | 38.66         | 8.93     | 47.83       | 38.63         | 9.2      | 46.55       | 38.51         | 8.04     |
|                     | 20M | 47.69      | 38.69         | 9        | 47.24       | 38.47         | 8.77     | 46.43       | 38.33         | 8.1      |
| Port 2 High Channel | 5M  | 47.27      | 38.23         | 9.04     | 46.92       | 38.35         | 8.57     | 45.32       | 38.41         | 6.91     |
|                     | 10M | 47.25      | 38.37         | 8.88     | 47.24       | 38.51         | 8.73     | 46.45       | 38.42         | 8.03     |
|                     | 15M | 47.48      | 38.56         | 8.92     | 47.64       | 38.41         | 9.23     | 46.5        | 38.47         | 8.03     |
|                     | 20M | 47.64      | 38.68         | 8.96     | 47.49       | 38.61         | 8.88     | 46.59       | 38.35         | 8.24     |

All corresponding plots included on the following pages. Total path loss of 40.8dB (Attenuator Loss: 40dB, RF cable loss: 0.8dB) accounted in via reference level offset to the spectrum analyzer.

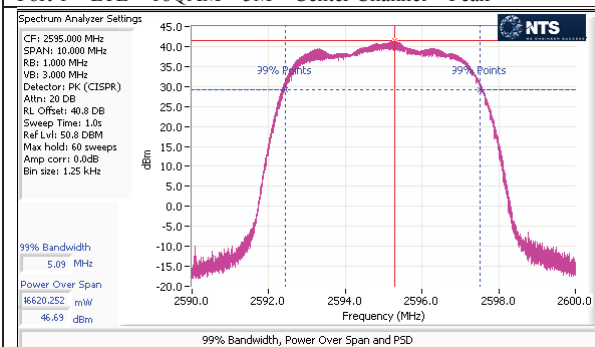
Port 1 – LTE – QPSK – 5M – Center Channel – Peak



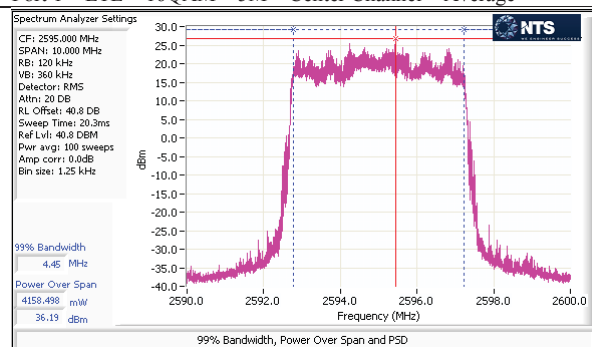
Port 1 – LTE – QPSK – 5M – Center Channel – Average



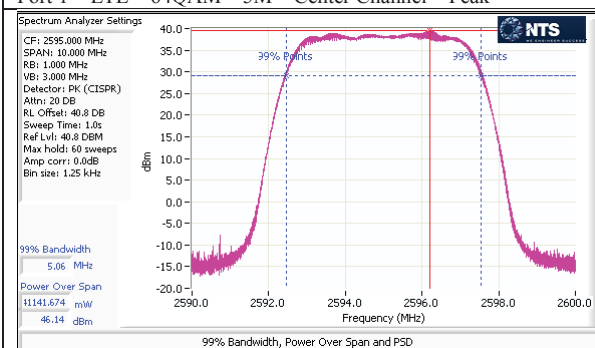
Port 1 – LTE – 16QAM – 5M – Center Channel – Peak



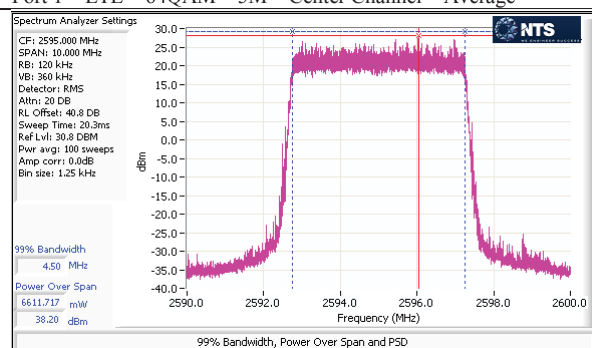
Port 1 – LTE – 16QAM – 5M – Center Channel – Average



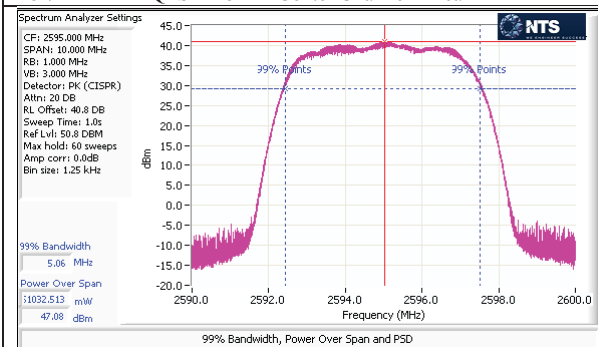
Port 1 – LTE – 64QAM – 5M – Center Channel – Peak



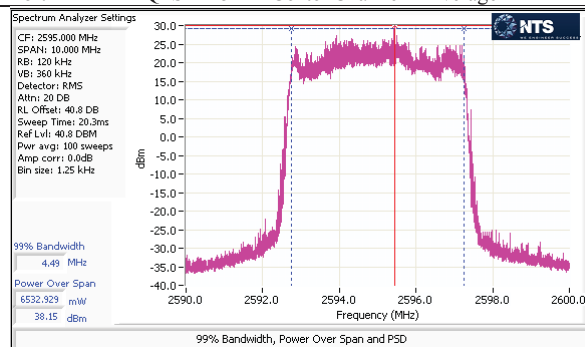
Port 1 – LTE – 64QAM – 5M – Center Channel – Average



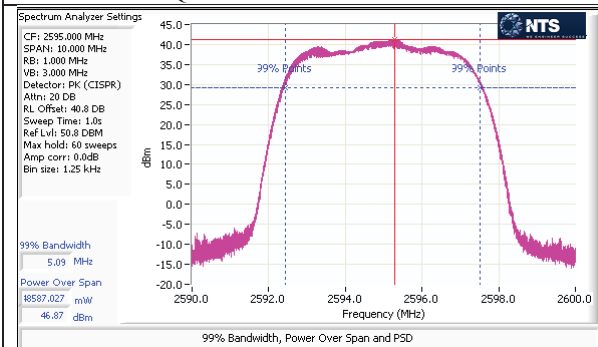
Port 2 – LTE – QPSK – 5M – Center Channel – Peak



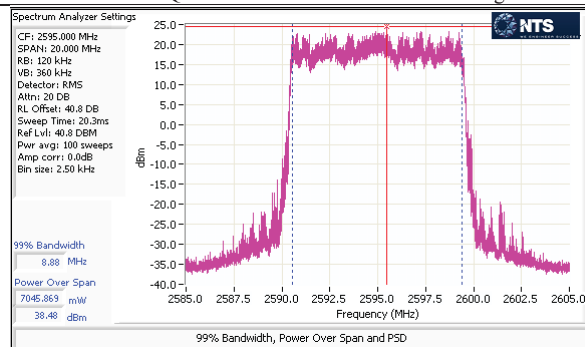
Port 2 – LTE – QPSK – 5M – Center Channel – Average



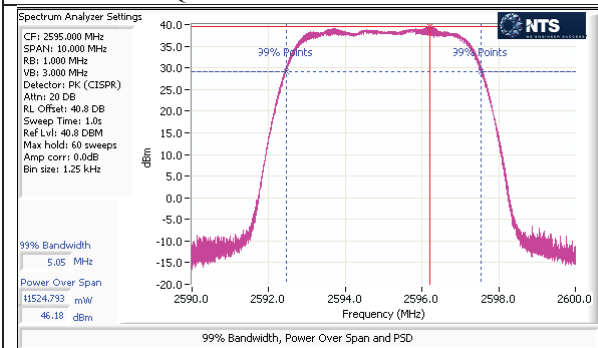
Port 2 – LTE – 16QAM – 5M – Center Channel – Peak



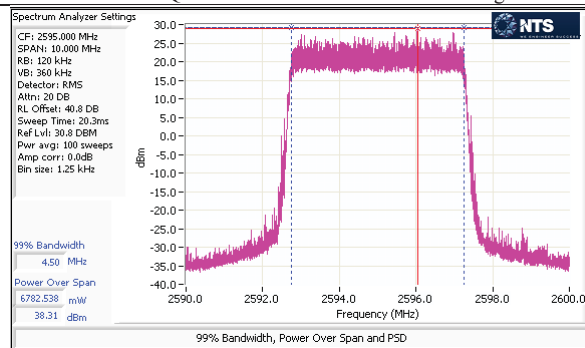
Port 2 – LTE – 16QAM – 5M – Center Channel – Average

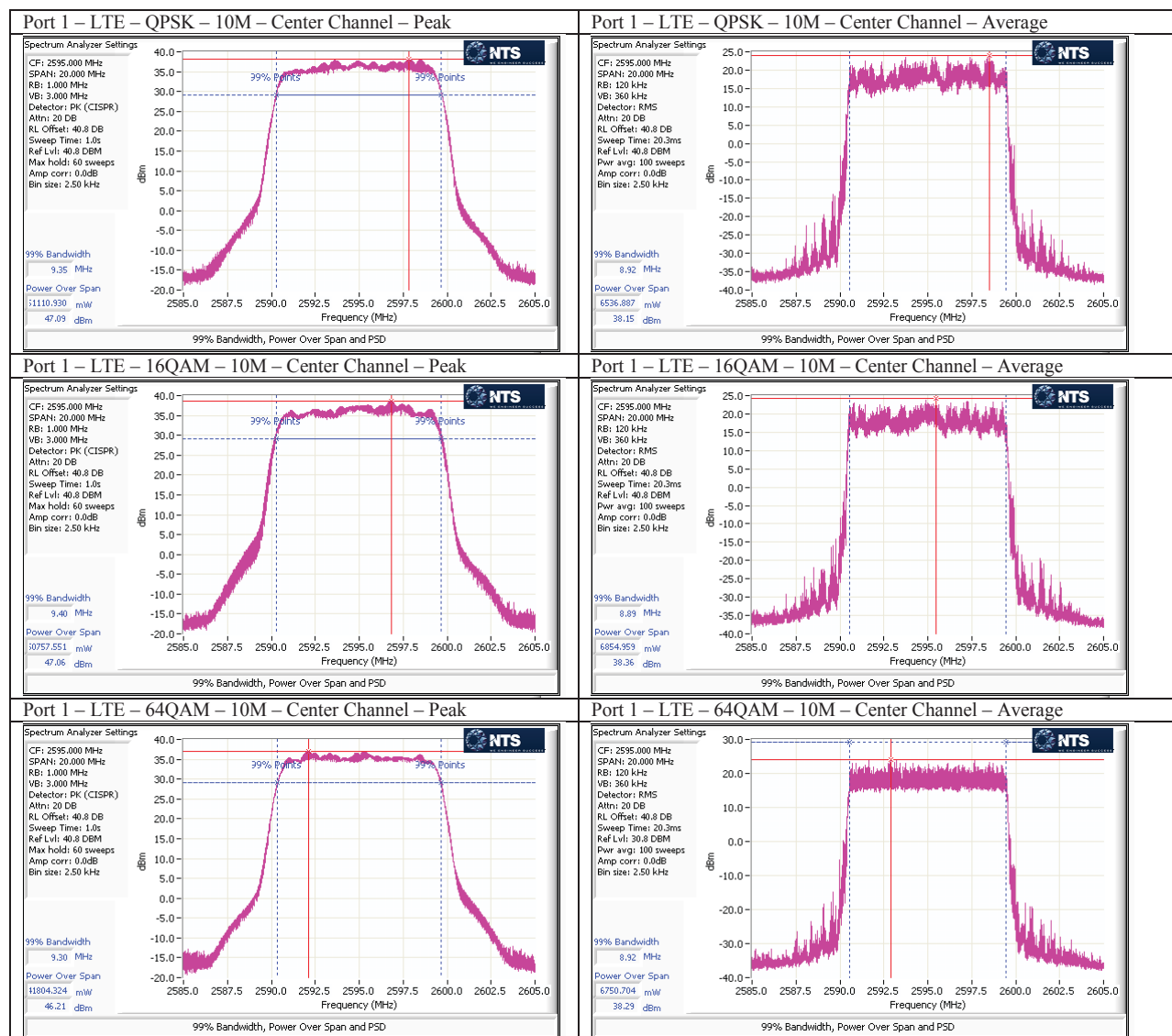


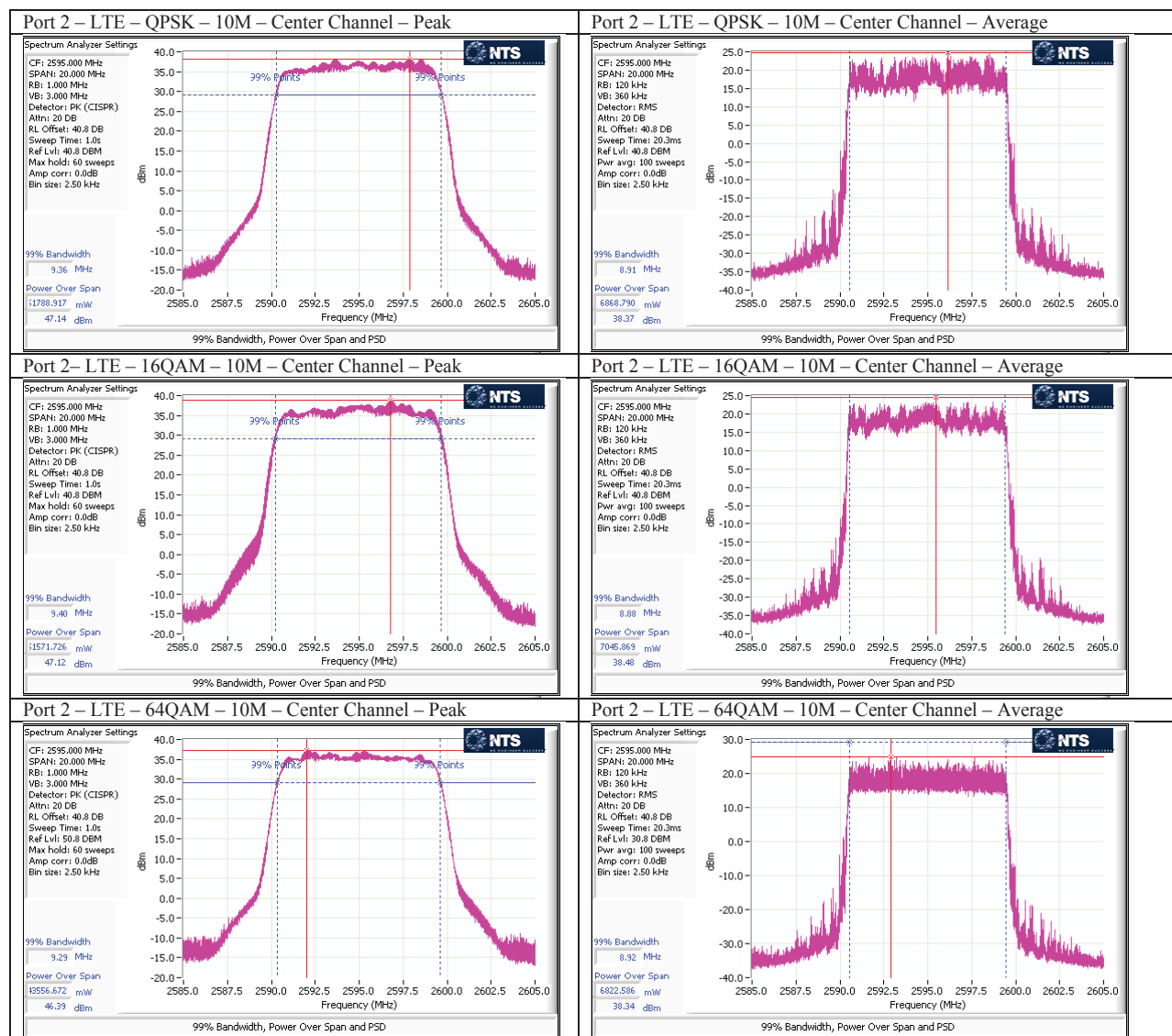
Port 2 – LTE – 64QAM – 5M – Center Channel – Peak

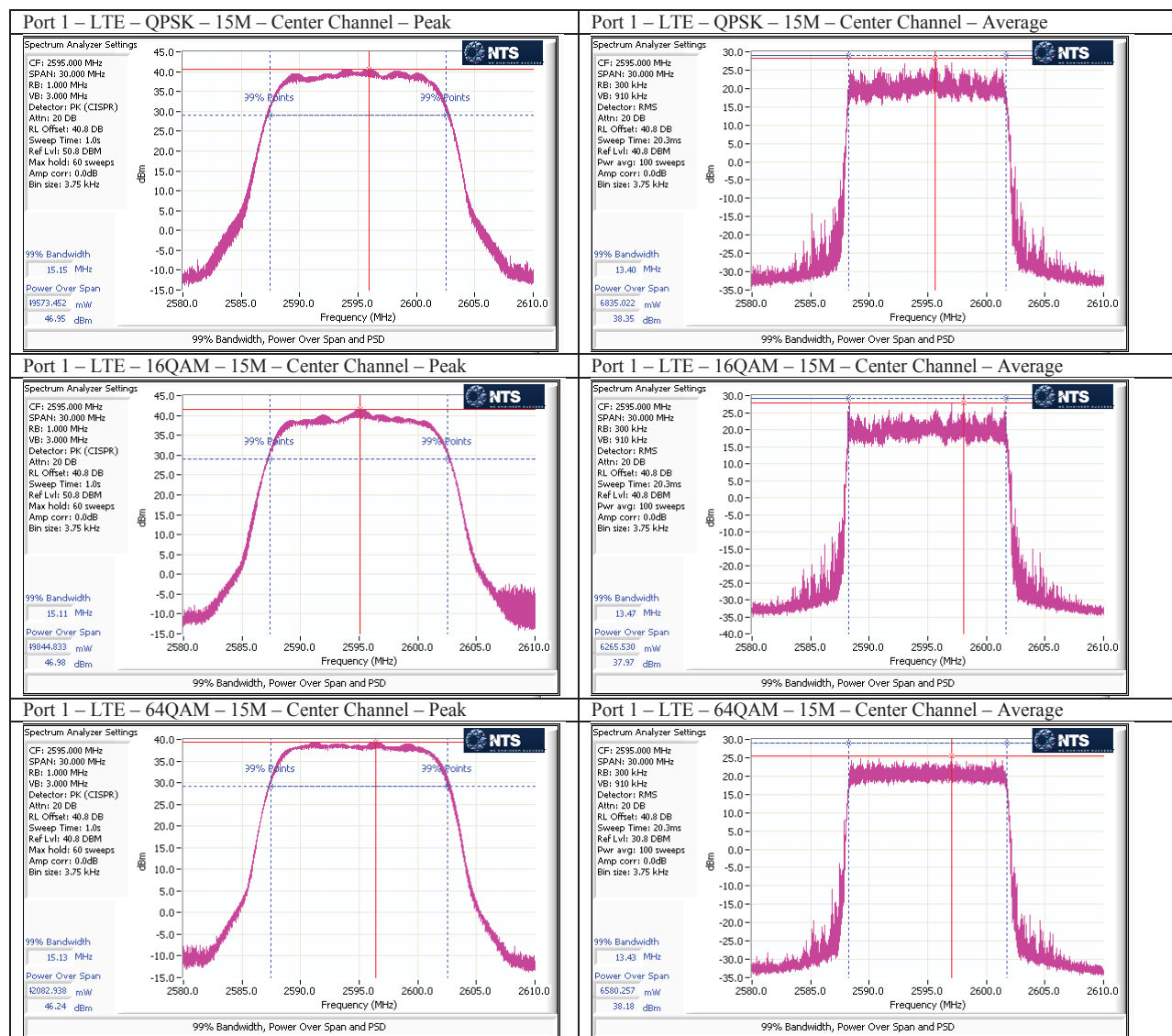


Port 2 – LTE – 64QAM – 5M – Center Channel – Average

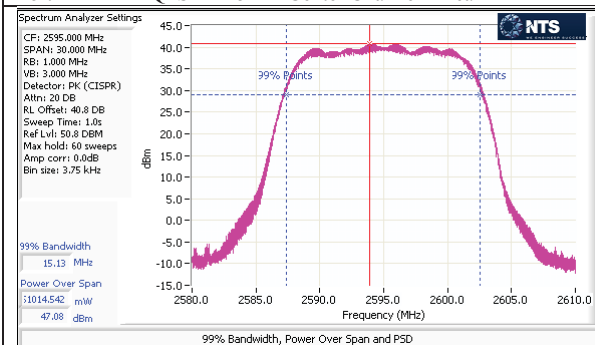




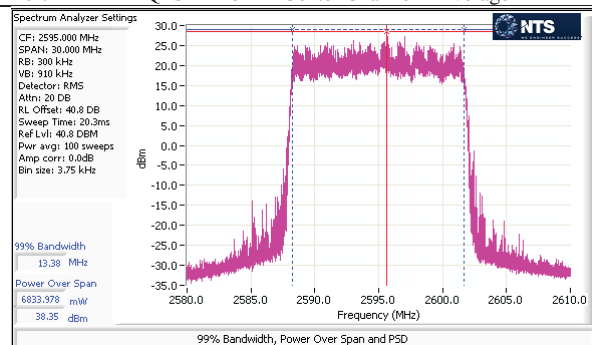




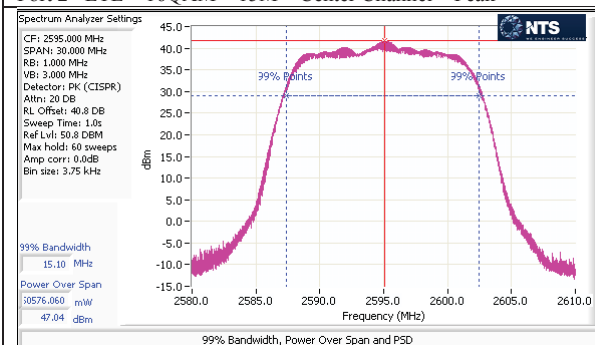
Port 2 – LTE – QPSK – 15M – Center Channel – Peak



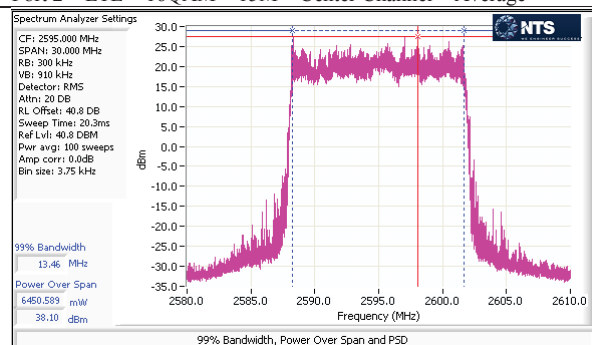
Port 2 – LTE – QPSK – 15M – Center Channel – Average



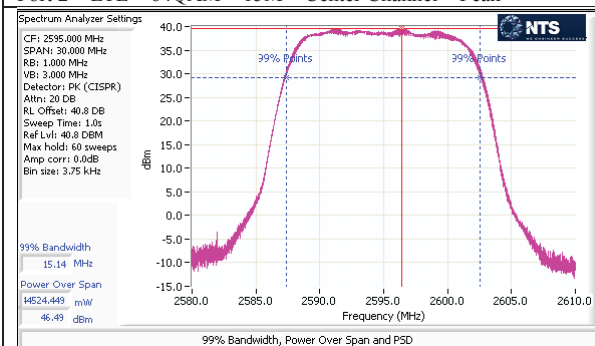
Port 2 – LTE – 16QAM – 15M – Center Channel – Peak



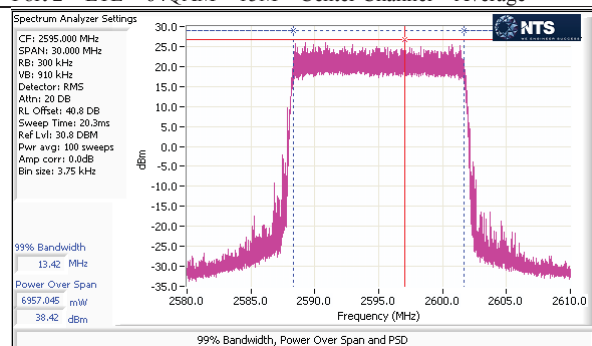
Port 2 – LTE – 16QAM – 15M – Center Channel – Average

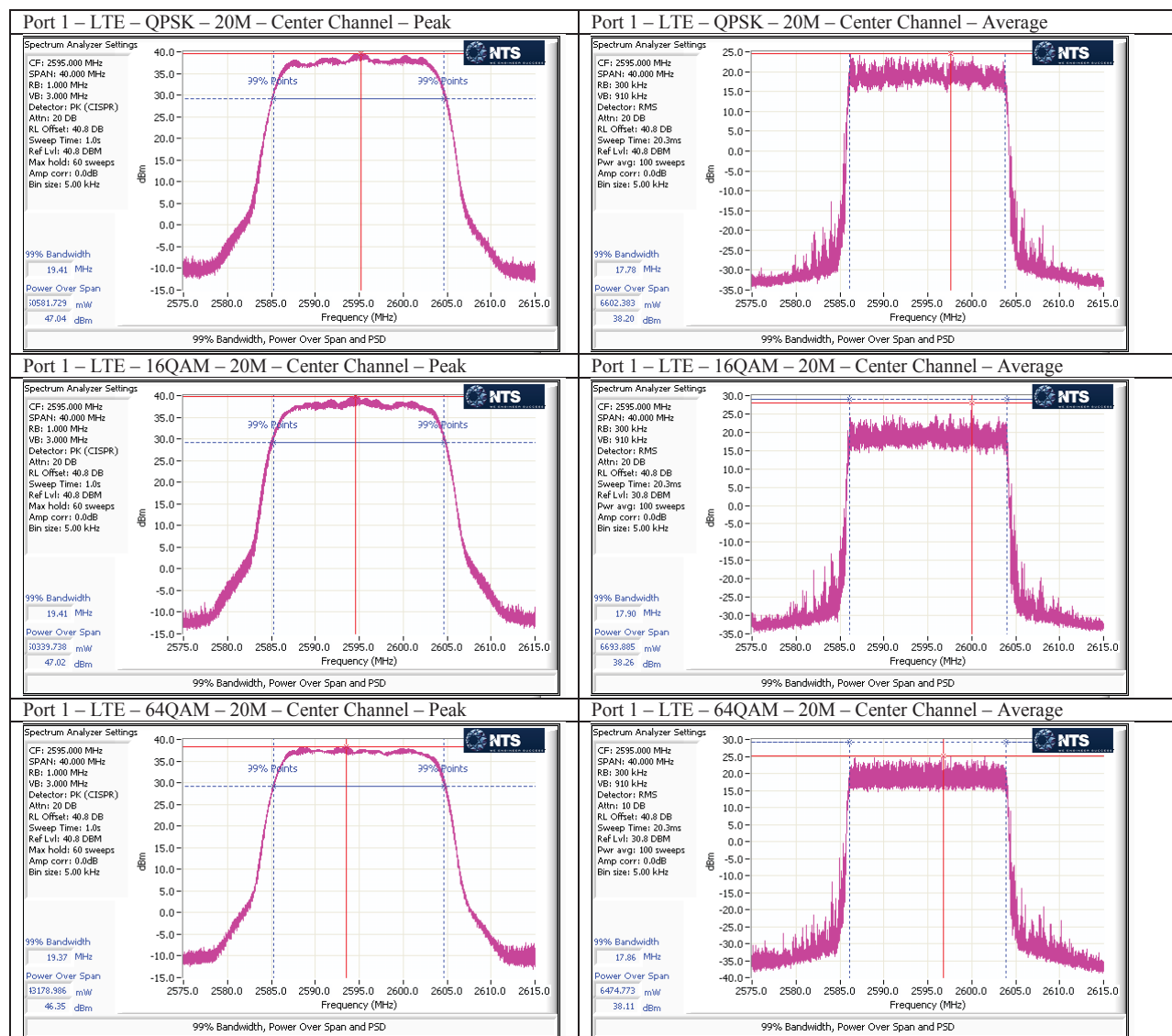


Port 2 – LTE – 64QAM – 15M – Center Channel – Peak

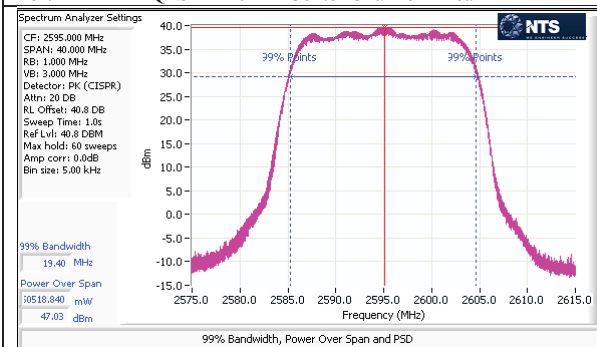


Port 2 – LTE – 64QAM – 15M – Center Channel – Average

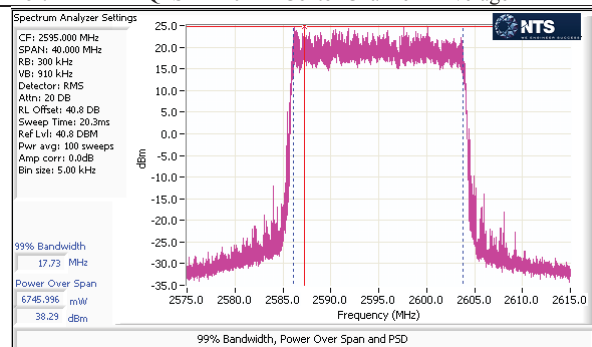




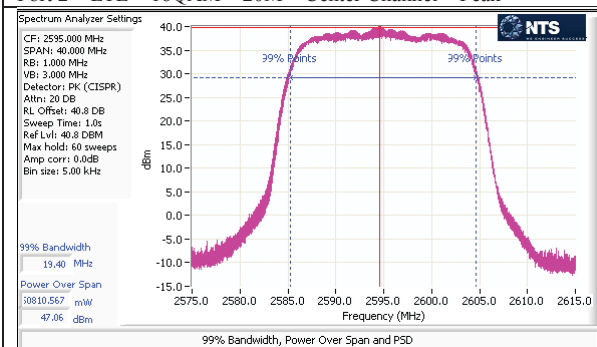
Port 2 – LTE – QPSK – 20M – Center Channel – Peak



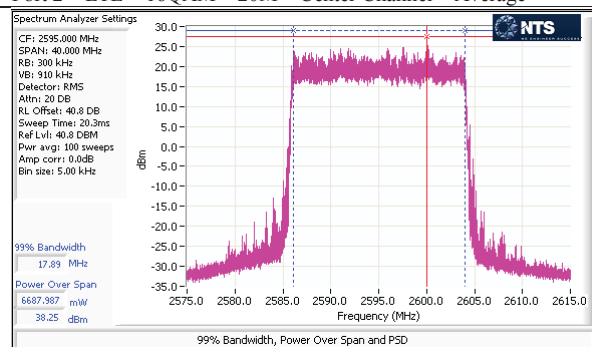
Port 2 – LTE – QPSK – 20M – Center Channel – Average



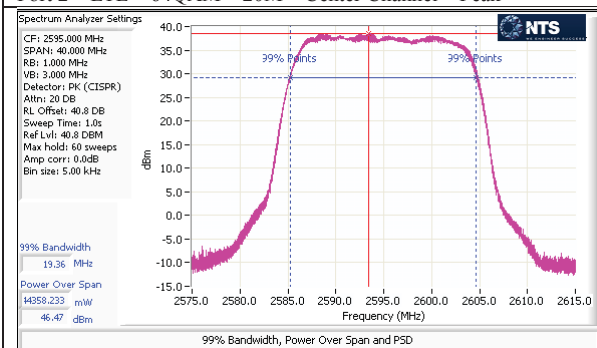
Port 2 – LTE – 16QAM – 20M – Center Channel – Peak



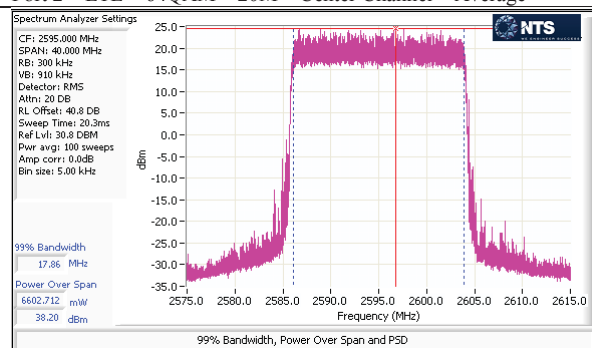
Port 2 – LTE – 16QAM – 20M – Center Channel – Average



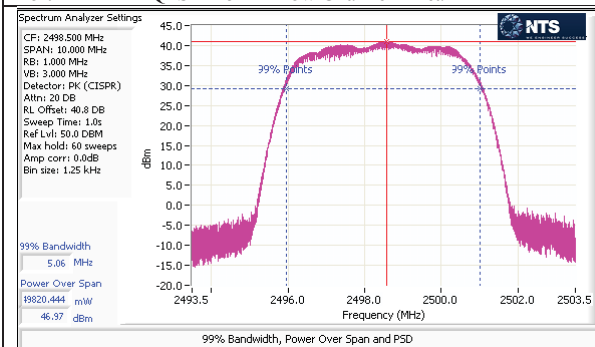
Port 2 – LTE – 64QAM – 20M – Center Channel – Peak



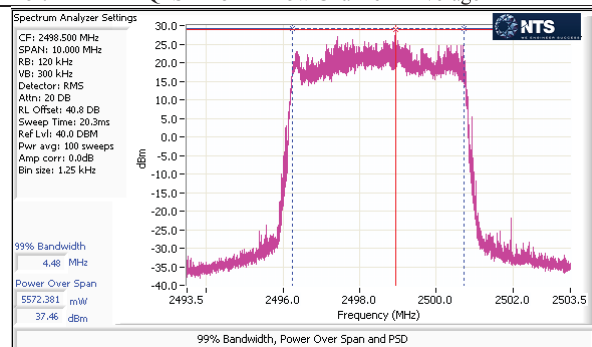
Port 2 – LTE – 64QAM – 20M – Center Channel – Average



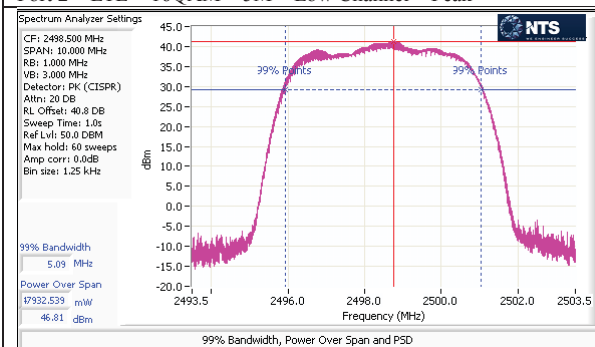
Port 2 – LTE – QPSK – 5M – Low Channel – Peak



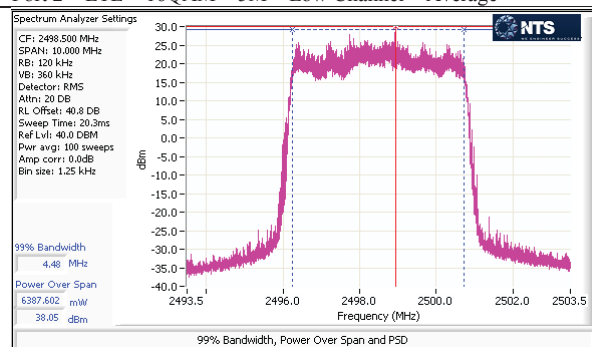
Port 2 – LTE – QPSK – 5M – Low Channel – Average



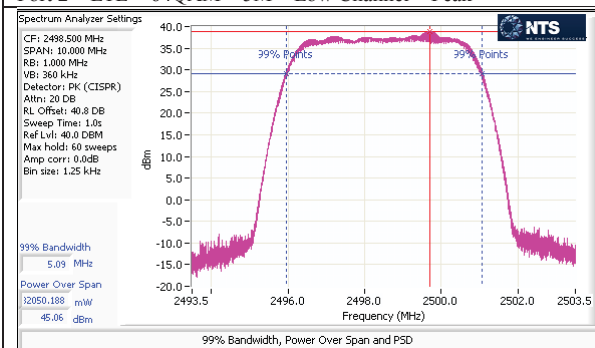
Port 2 – LTE – 16QAM – 5M – Low Channel – Peak



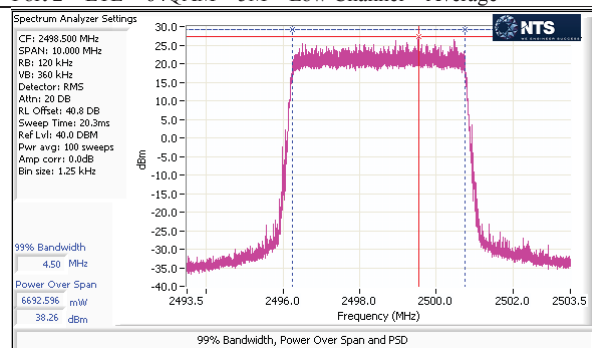
Port 2 – LTE – 16QAM – 5M – Low Channel – Average

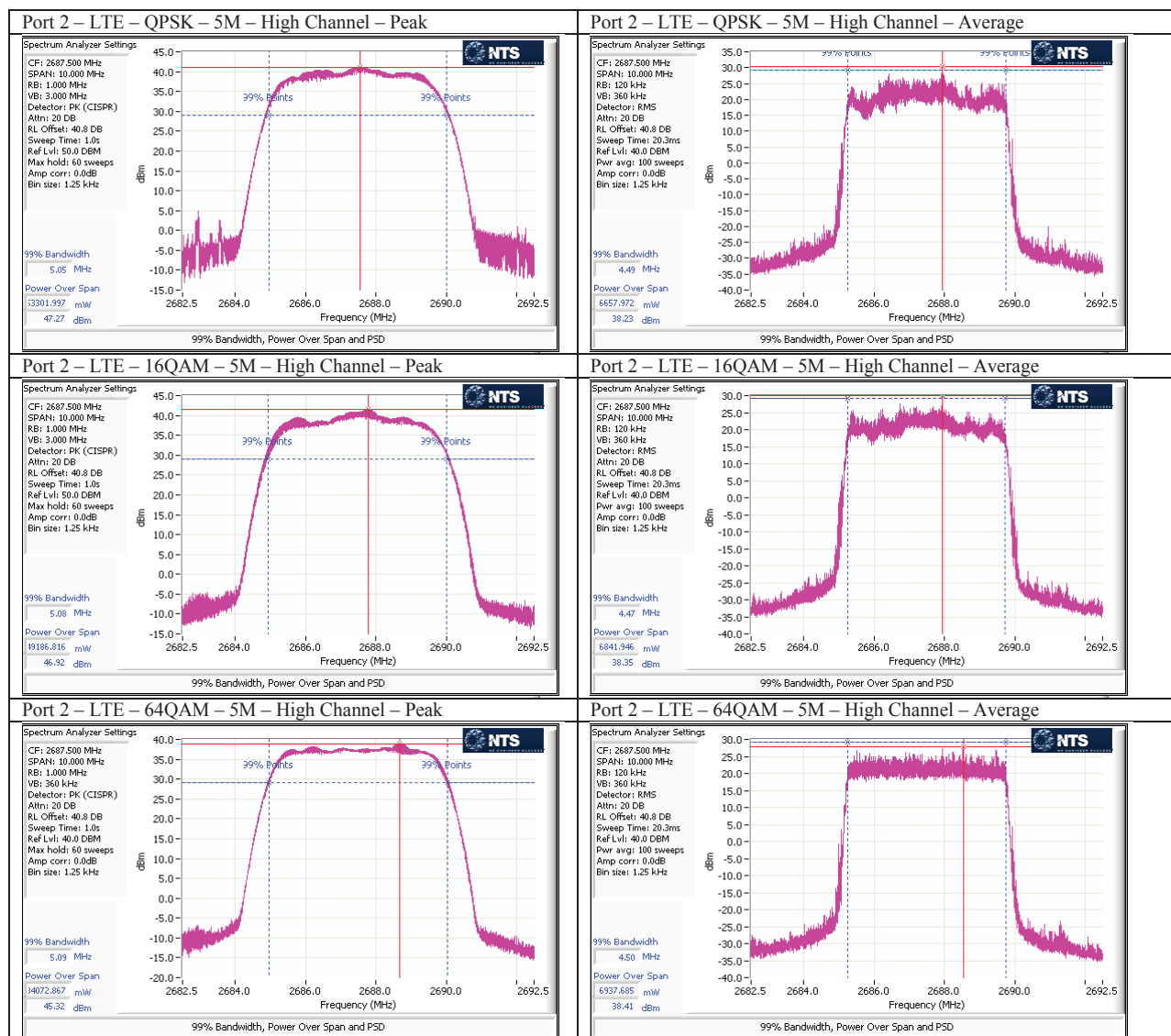


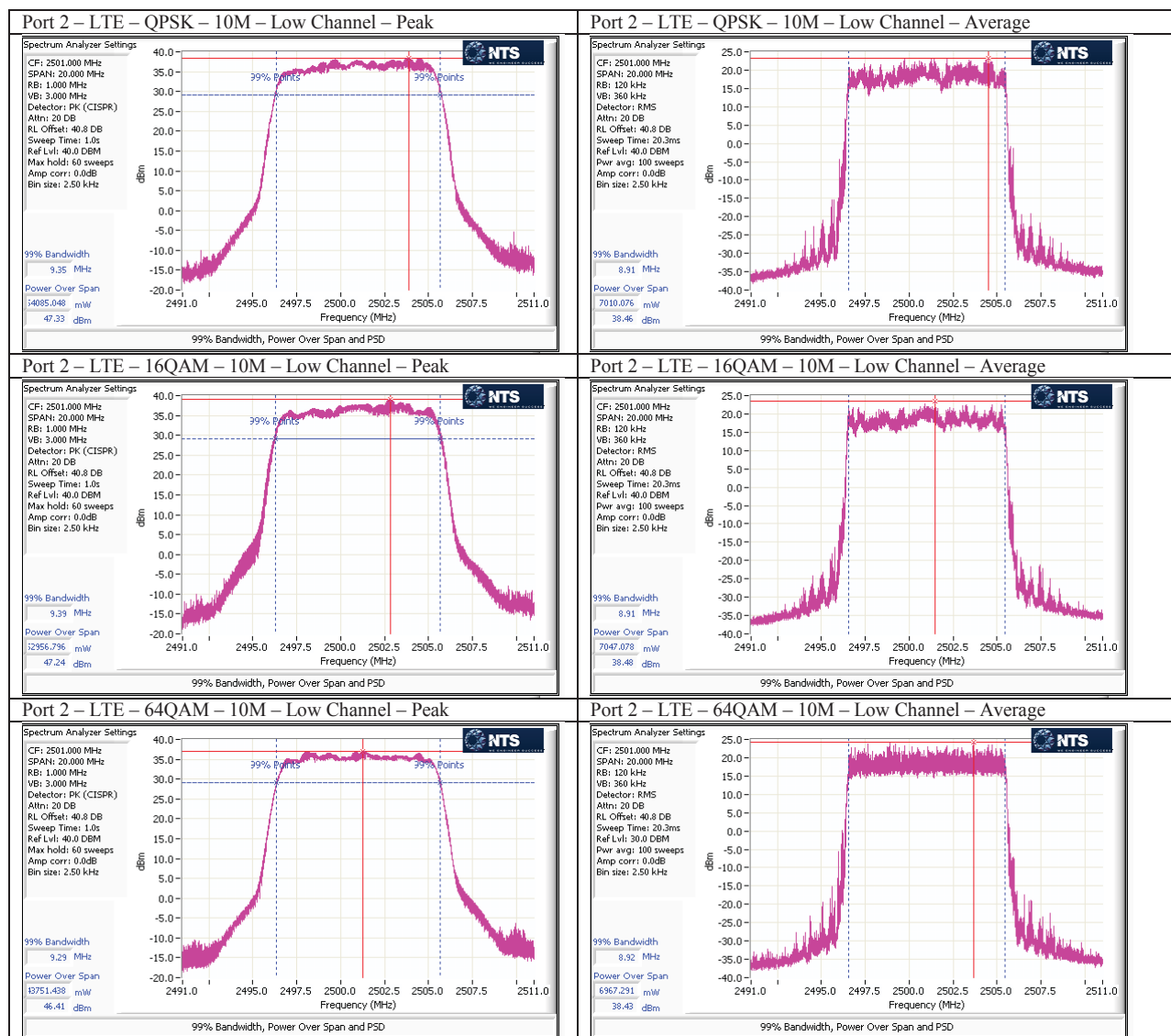
Port 2 – LTE – 64QAM – 5M – Low Channel – Peak



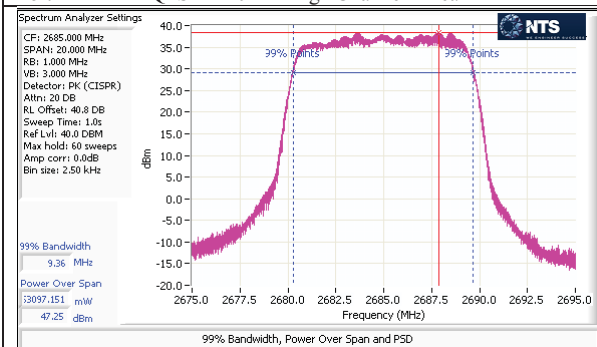
Port 2 – LTE – 64QAM – 5M – Low Channel – Average



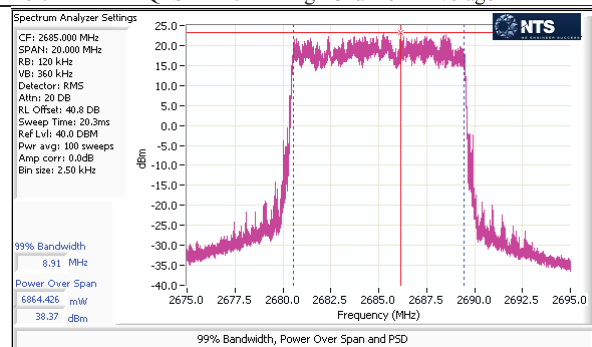




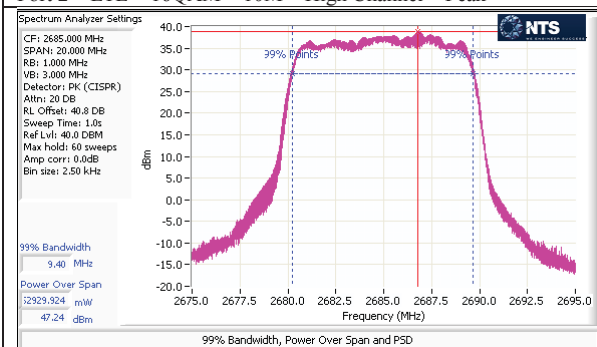
Port 2 – LTE – QPSK – 10M – High Channel – Peak



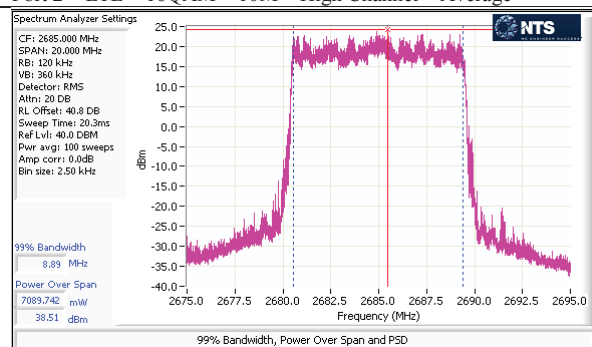
Port 2 – LTE – QPSK – 10M – High Channel – Average



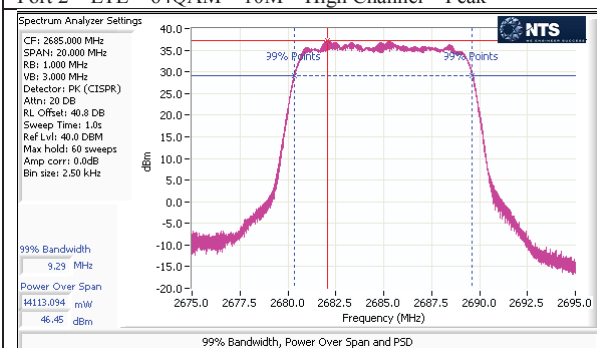
Port 2 – LTE – 16QAM – 10M – High Channel – Peak



Port 2 – LTE – 16QAM – 10M – High Channel – Average



Port 2 – LTE – 64QAM – 10M – High Channel – Peak



Port 2 – LTE – 64QAM – 10M – High Channel – Average

