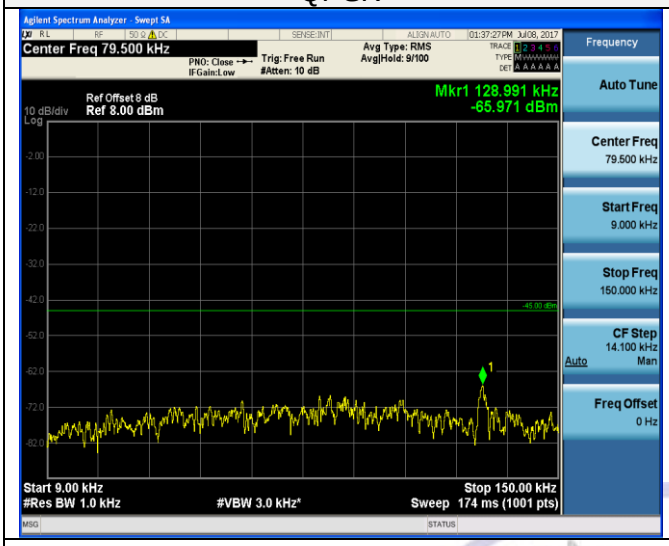
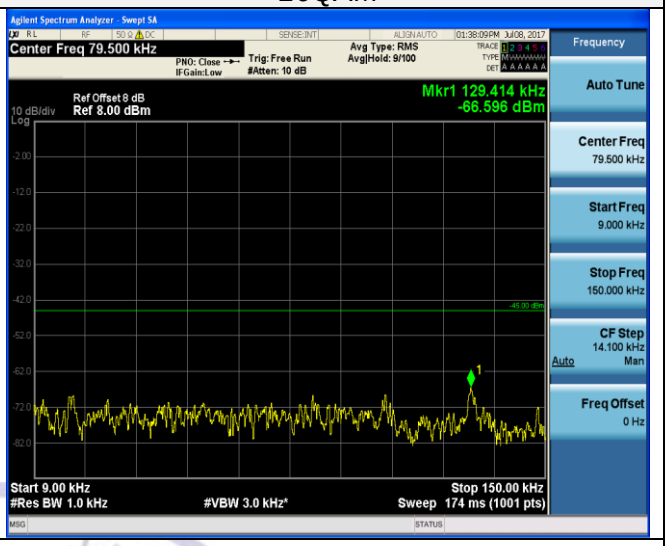
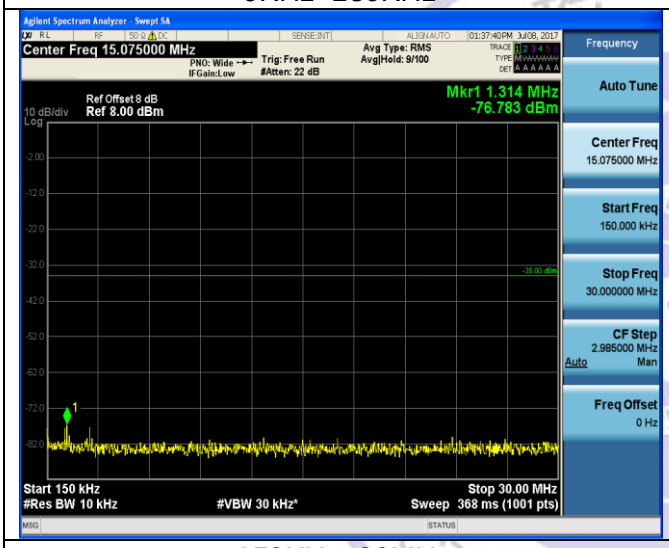
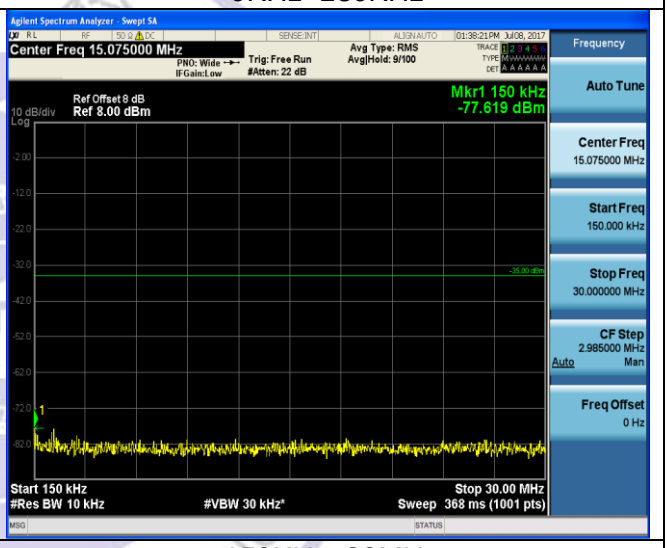
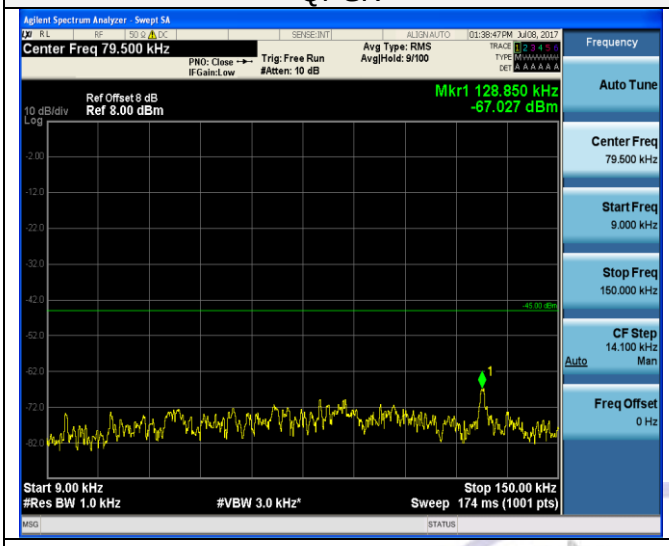
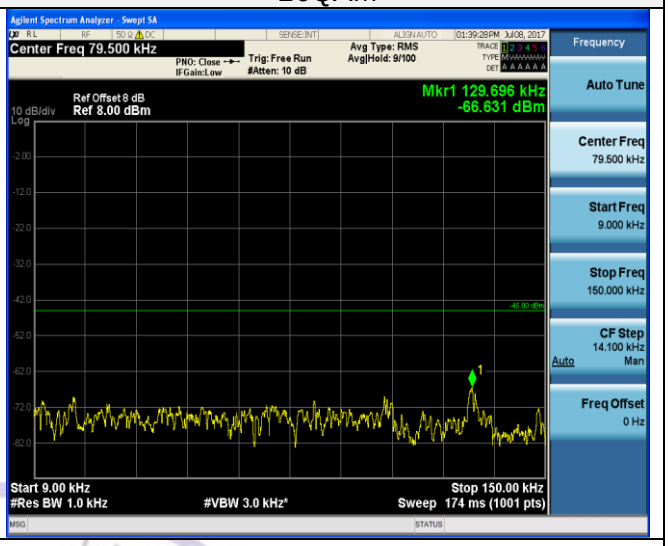
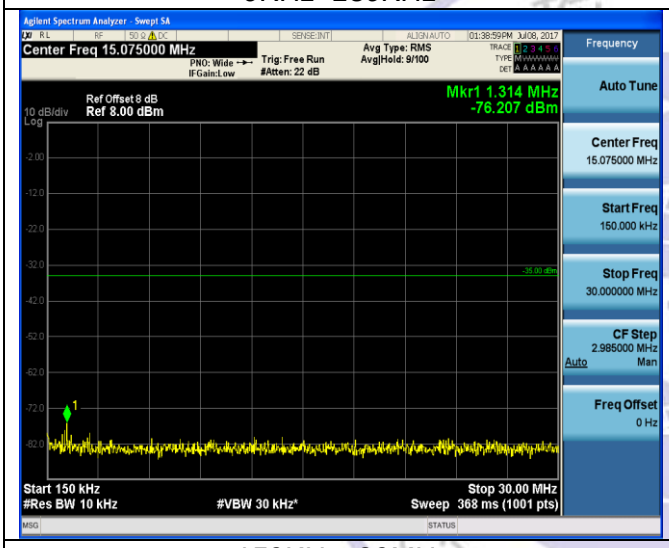
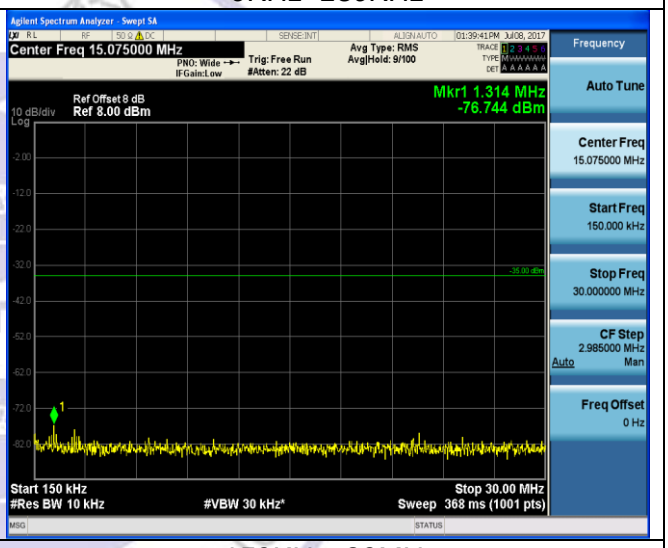
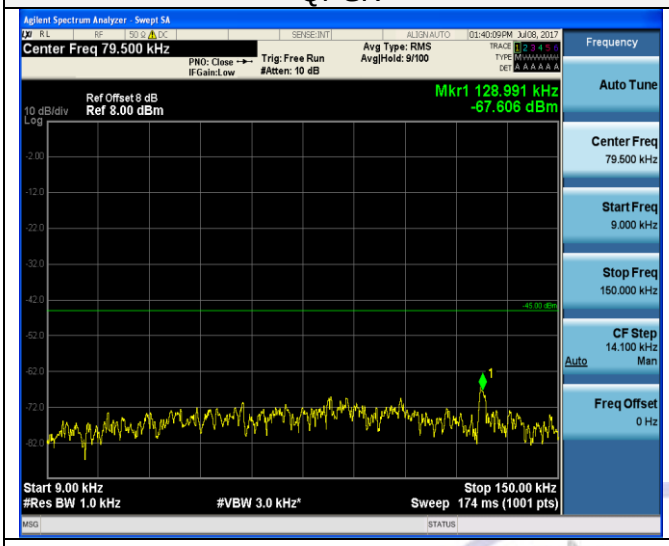
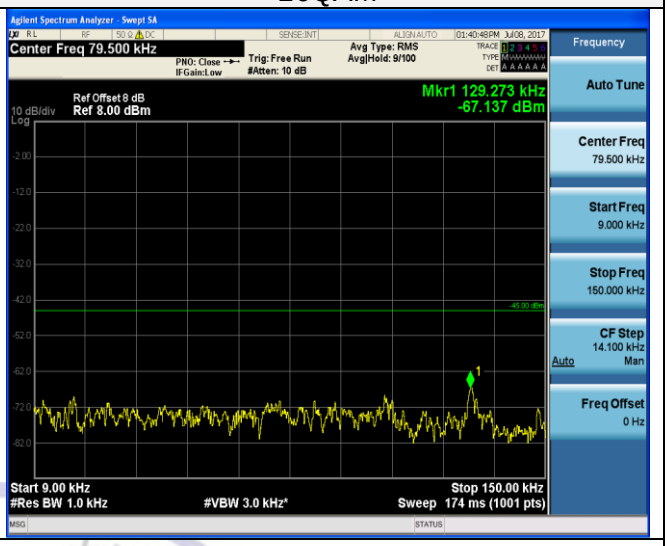
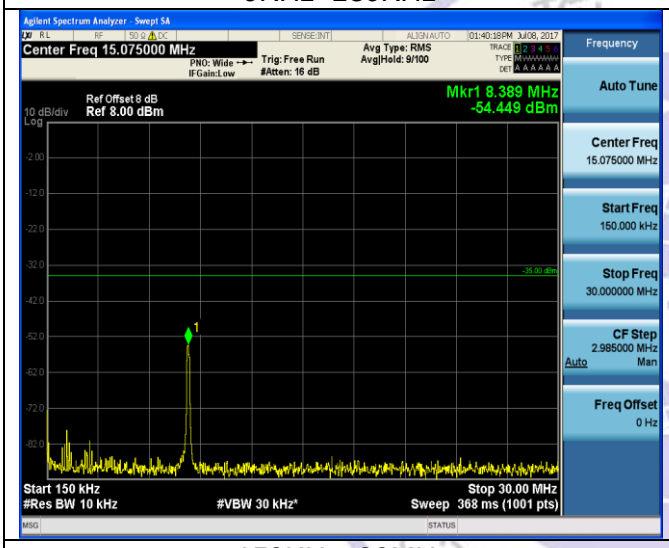
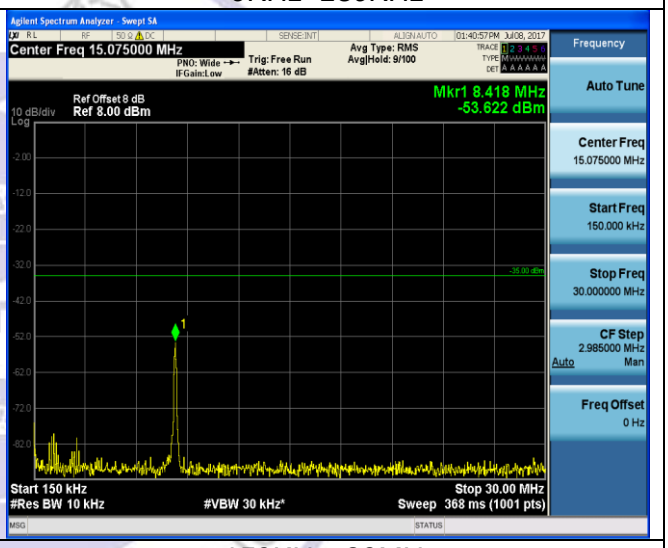
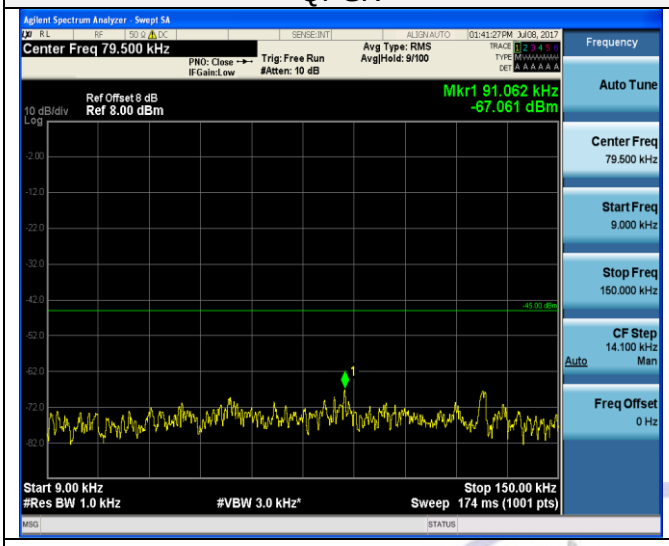
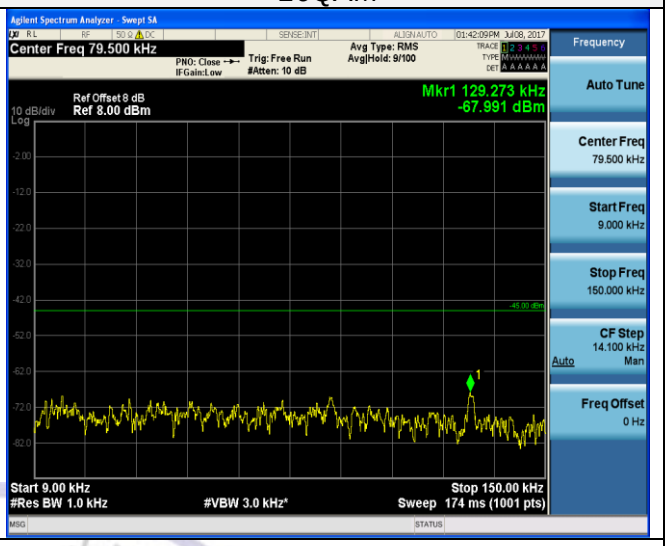
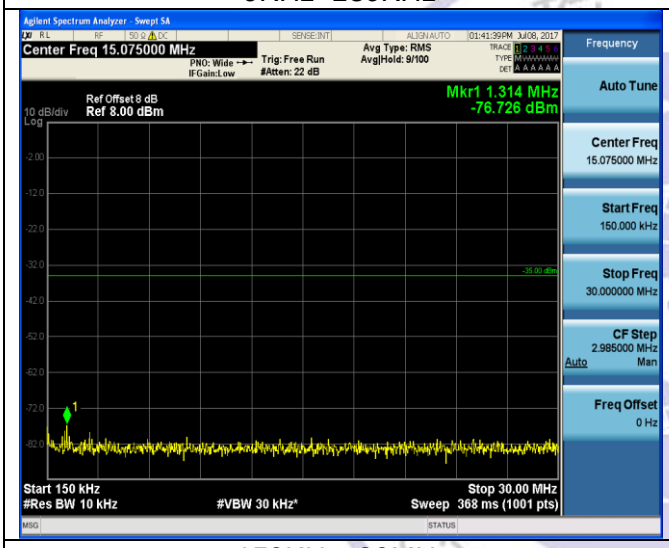
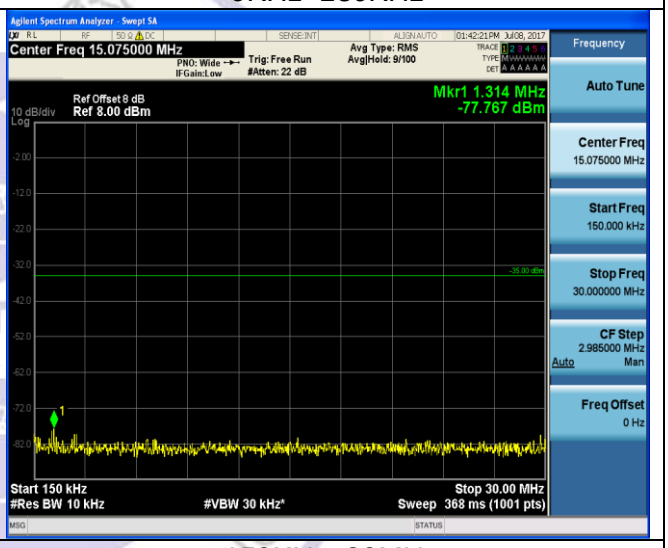
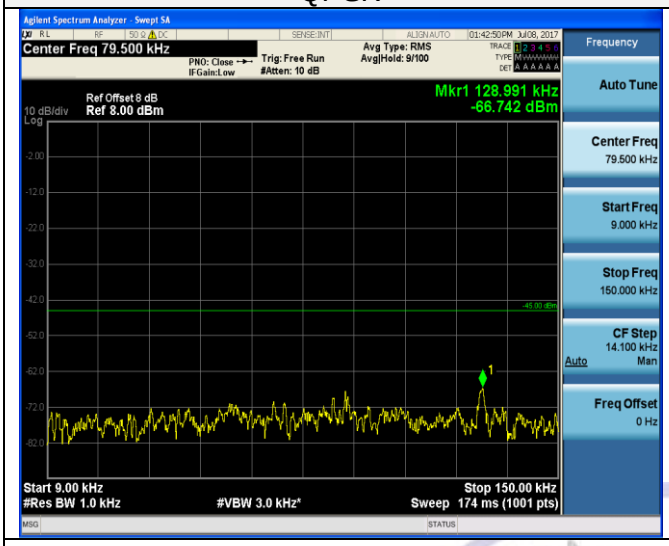
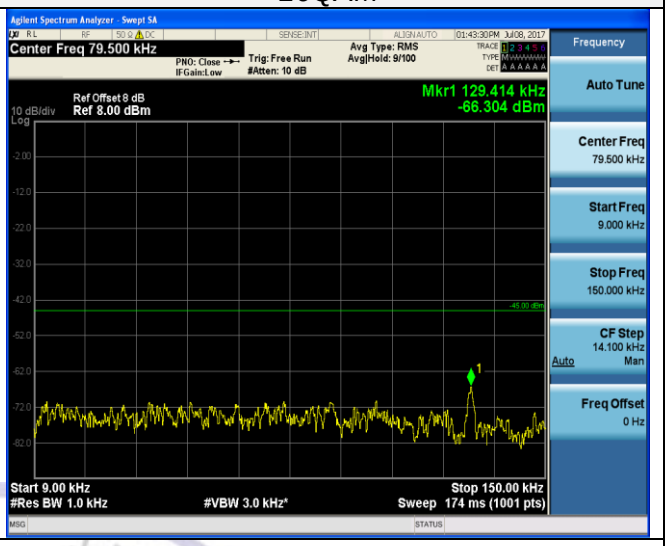
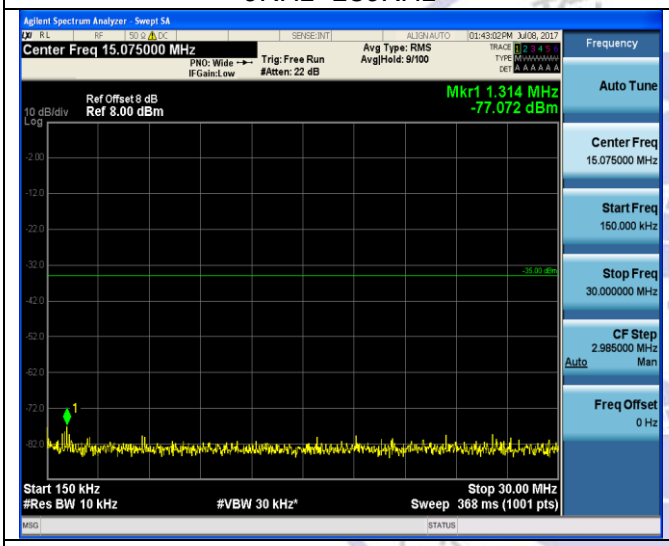
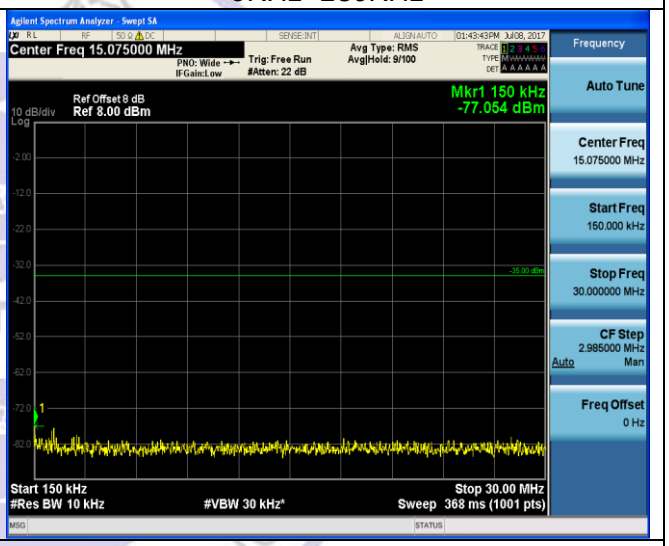
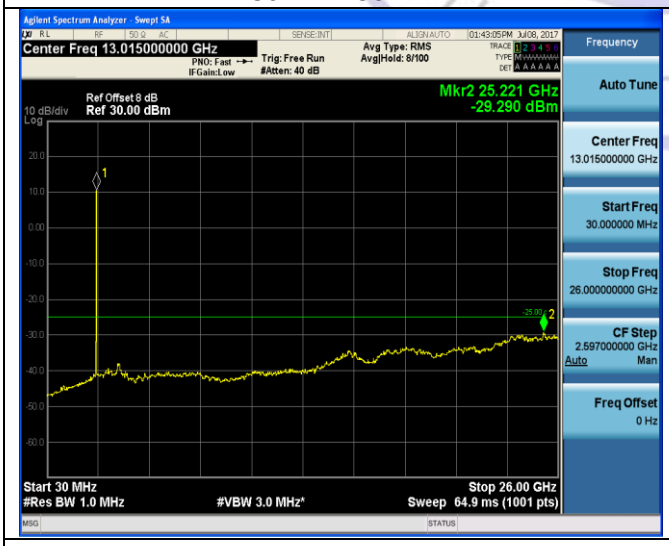
**Conducted Measurement:**

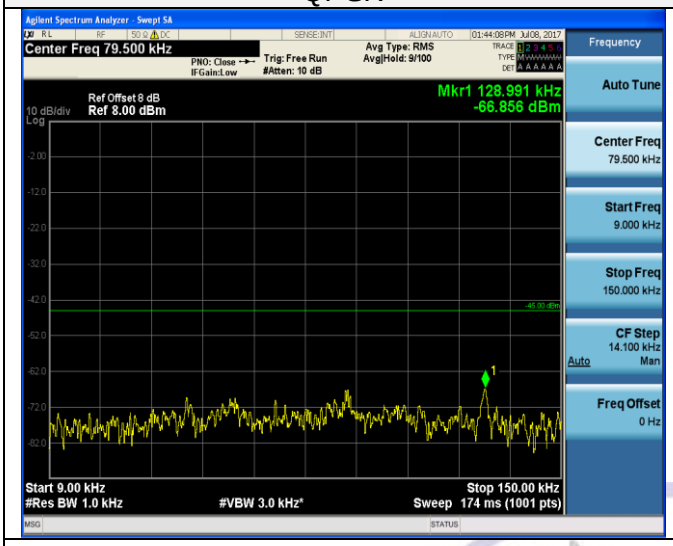
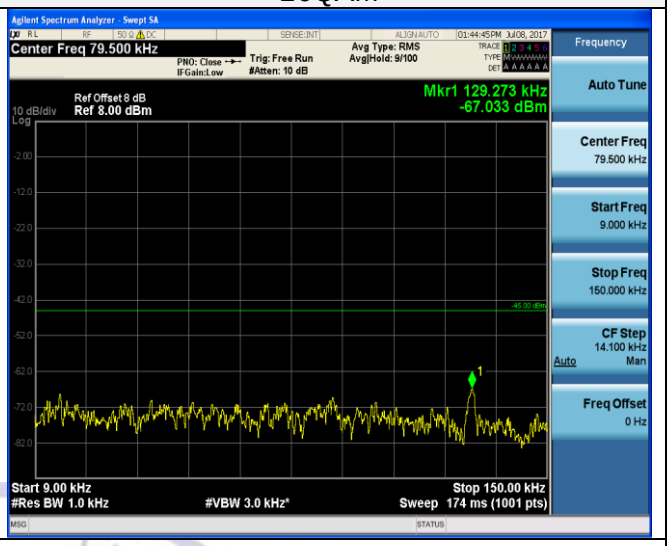
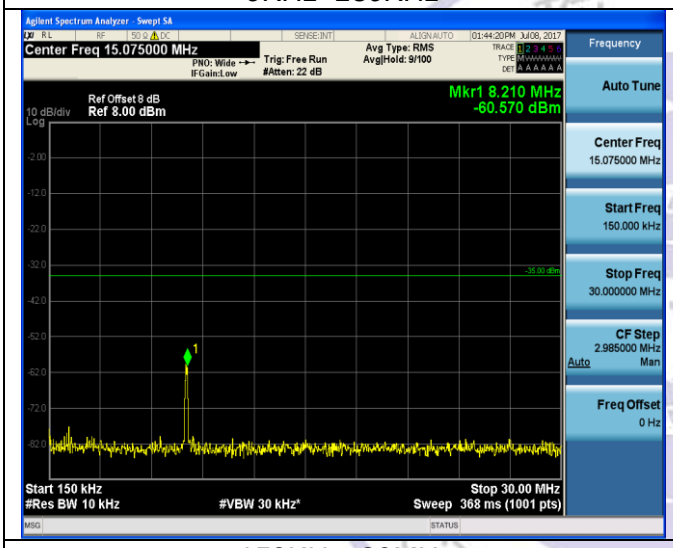
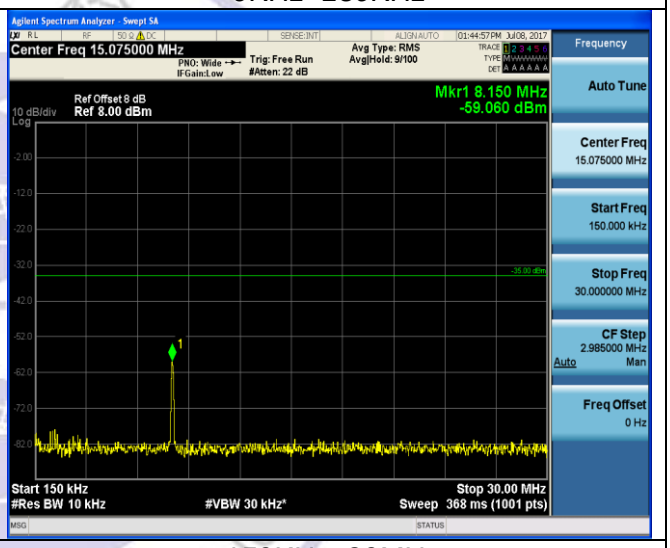
| LTE FDD Band 7-5MHz Channel Bandwidth | |
|---|---|
| Low Channel | |
| QPSK | 16QAM |
|  |  |
| 9KHz~150KHz | 9KHz~150KHz |
|  |  |
| 150KHz~30MHz | 150KHz~30MHz |
| | |
| 30MHz~26.5GHz | 30MHz~26.5GHz |
| 1RB#0 | 1RB#0 |

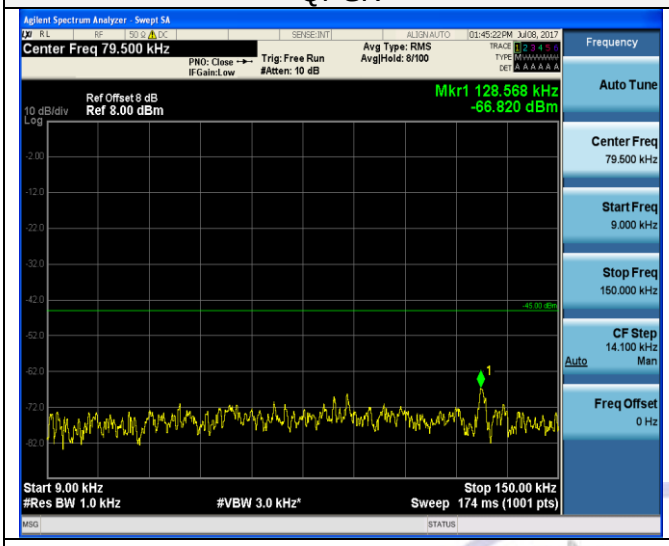
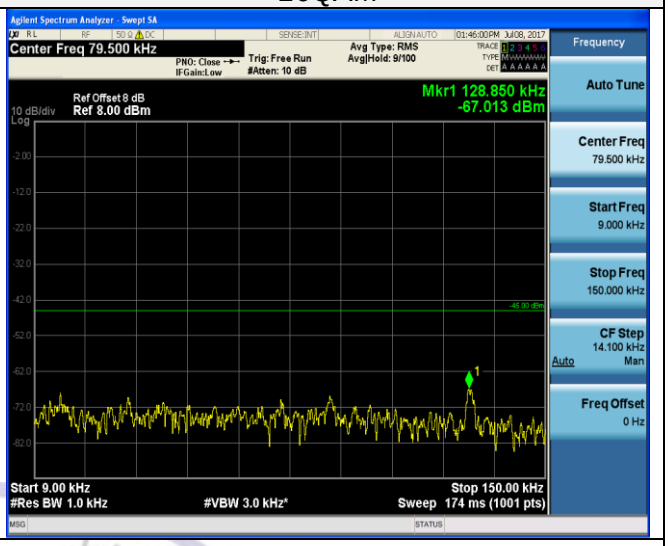
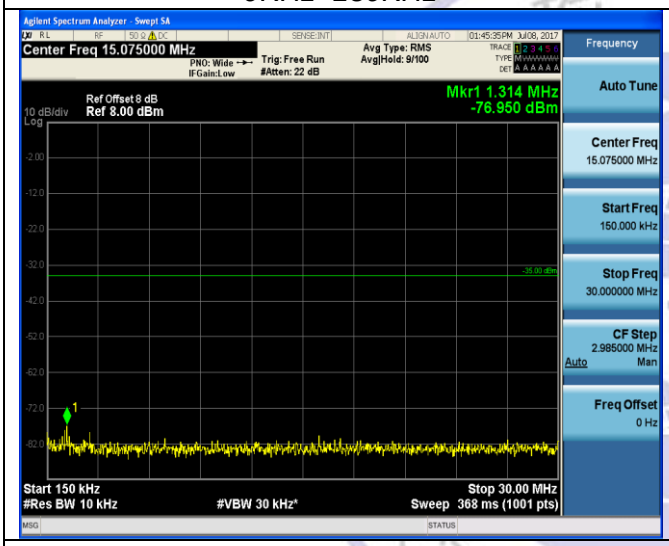
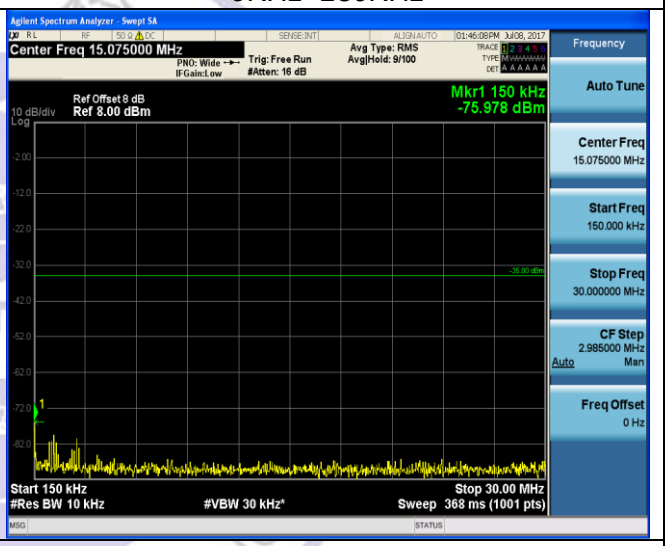
| LTE FDD Band 7-5MHz Channel Bandwidth | |
|---|---|
| Middle Channel | |
| QPSK | 16QAM |
|  |  |
| 9KHz~150KHz | 9KHz~150KHz |
|  |  |
| 150KHz~30MHz | 150KHz~30MHz |
| | |
| 30MHz~26.5GHz | 30MHz~26.5GHz |
| QPSK | 1RB#0 |

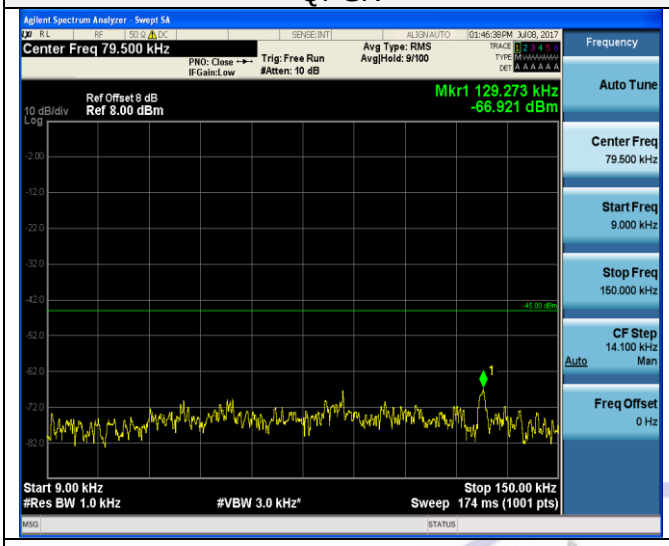
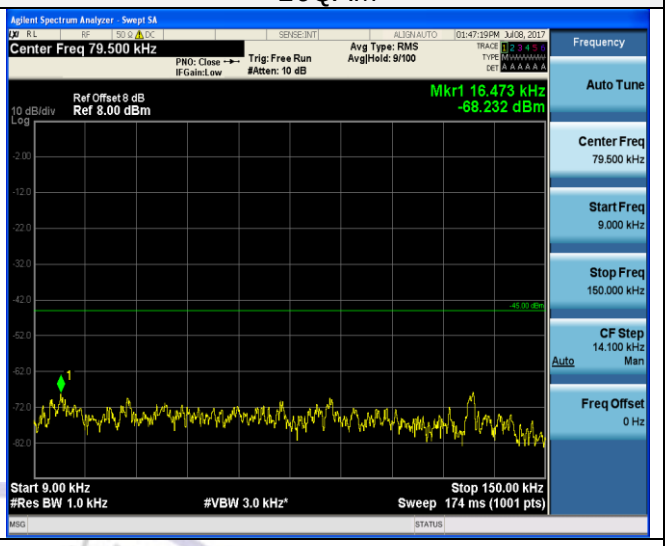
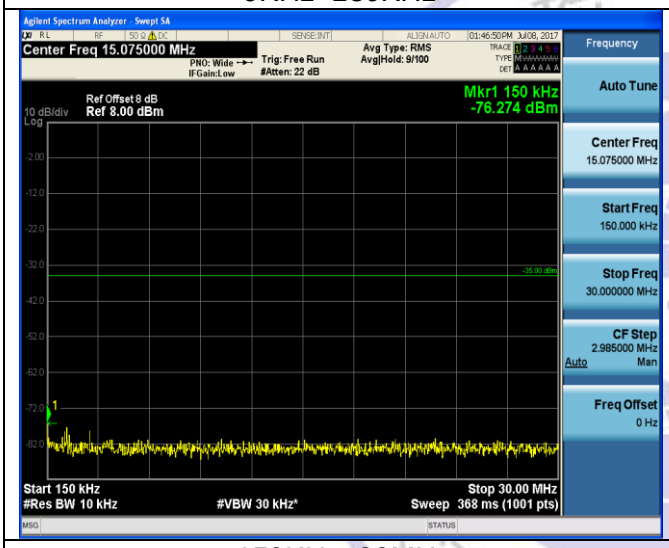
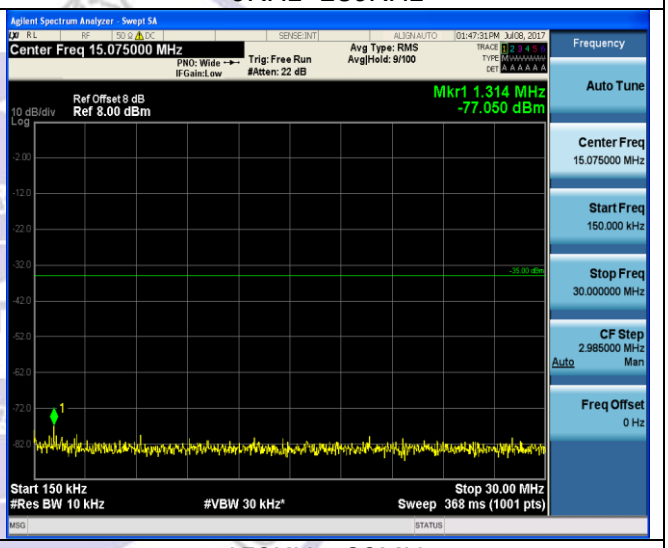
| LTE FDD Band 7-5MHz Channel Bandwidth | |
|---|---|
| High Channel | |
| QPSK | 16QAM |
|  |  |
| 9KHz~150KHz | 9KHz~150KHz |
|  |  |
| 150KHz~30MHz | 150KHz~30MHz |
| | |
| 30MHz~26.5GHz | 30MHz~26.5GHz |
| 1RB#0 | 1RB#0 |

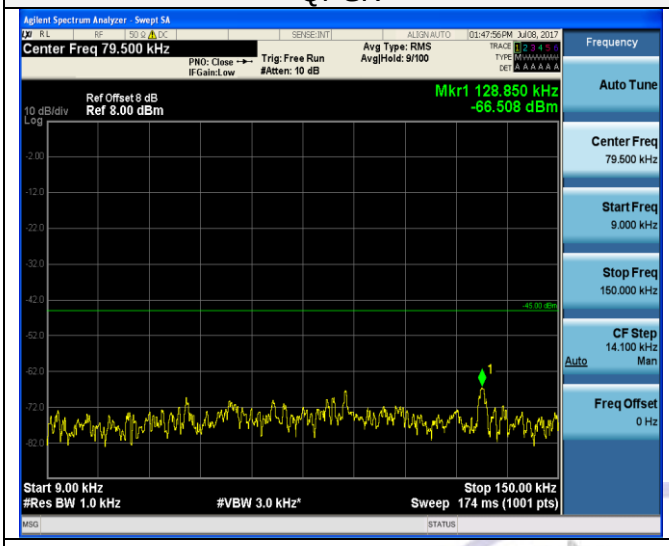
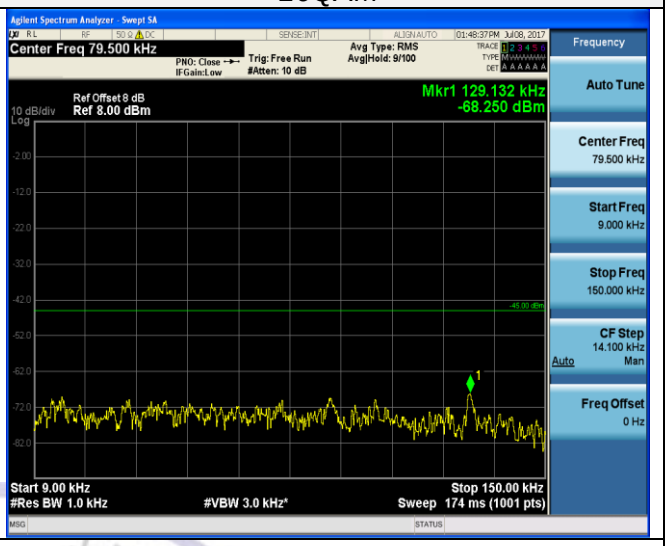
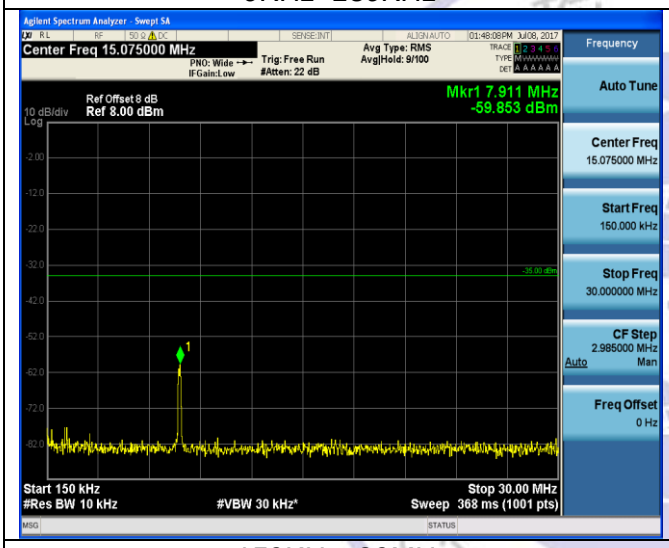
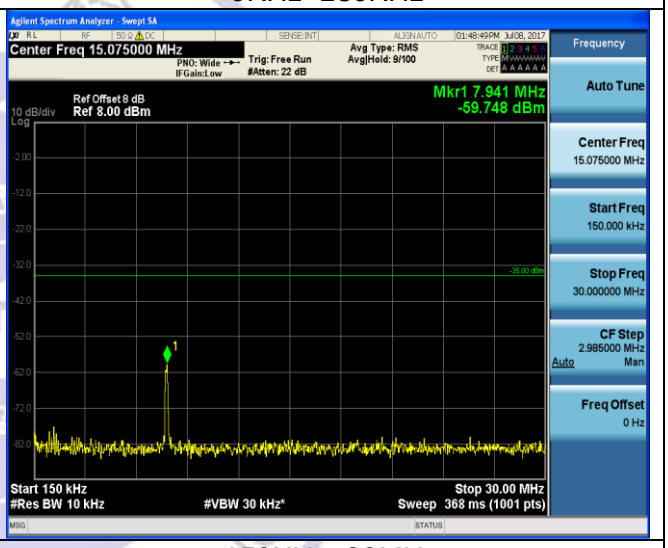
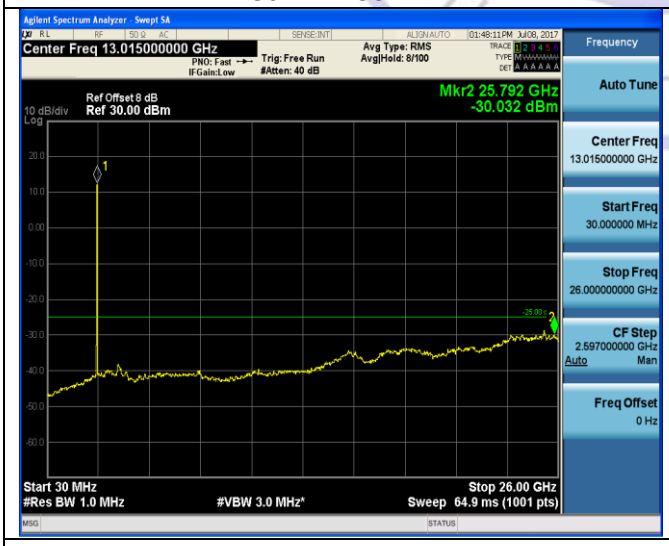
| LTE FDD Band 7-10MHz Channel Bandwidth | |
|---|---|
| Low Channel | |
| QPSK | 16QAM |
|  |  |
| 9KHz~150KHz | 9KHz~150KHz |
|  |  |
| 150KHz~30MHz | 150KHz~30MHz |
| | |
| 30MHz~26.5GHz | 30MHz~26.5GHz |
| 1RB#0 | 1RB#0 |

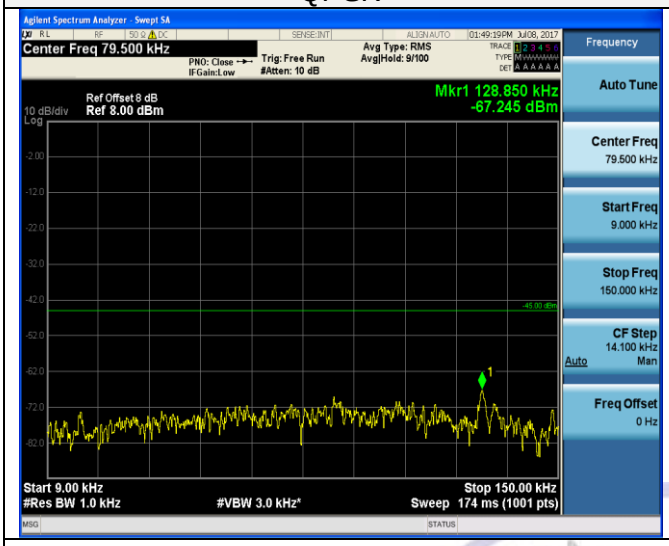
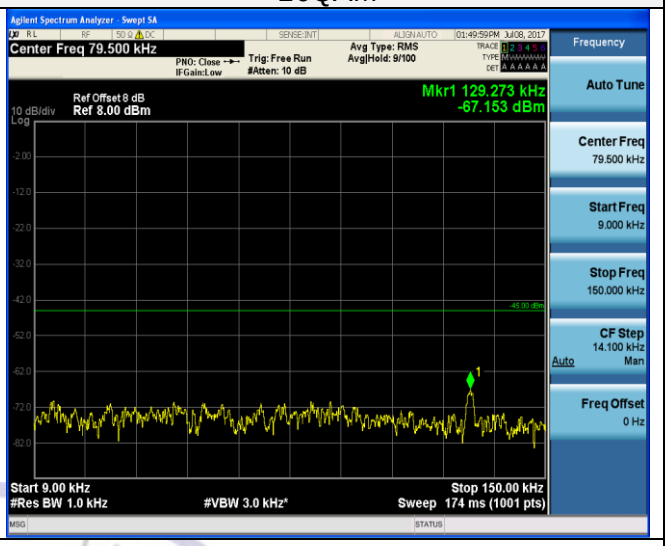
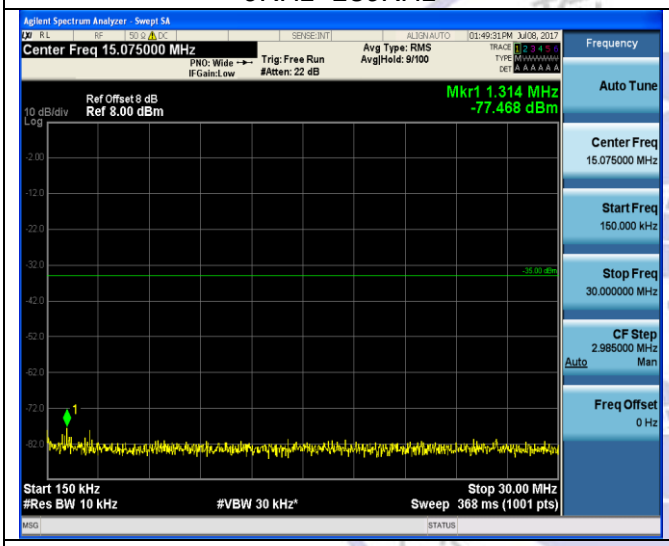
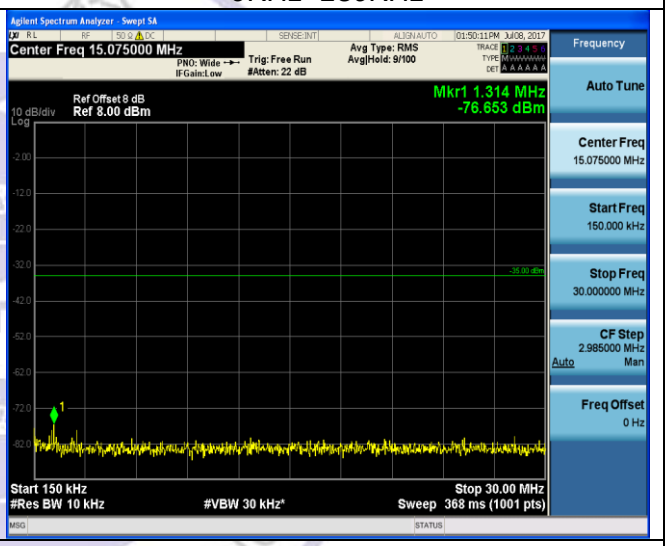
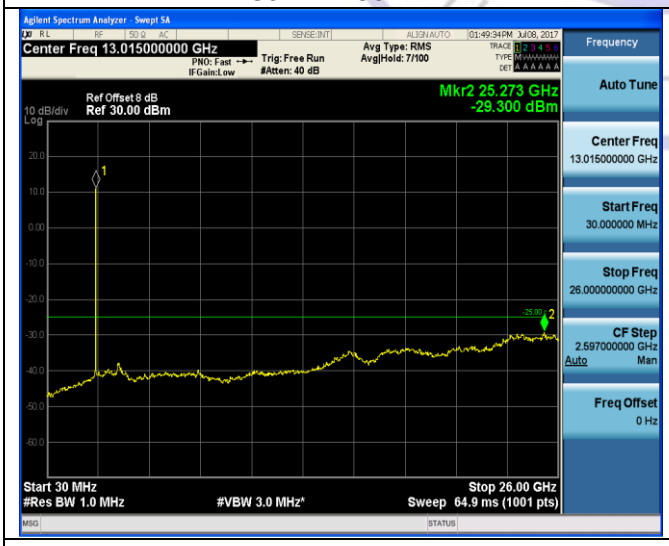
| LTE FDD Band 7-10MHz Channel Bandwidth | |
|---|---|
| Middle Channel | |
| QPSK | 16QAM |
|   |   |
| 9KHz~150KHz | 9KHz~150KHz |
|   |   |
| 150KHz~30MHz | 150KHz~30MHz |
|   | |
| 30MHz~26.5GHz | 30MHz~26.5GHz |
| 1RB#0 | 1RB#0 |

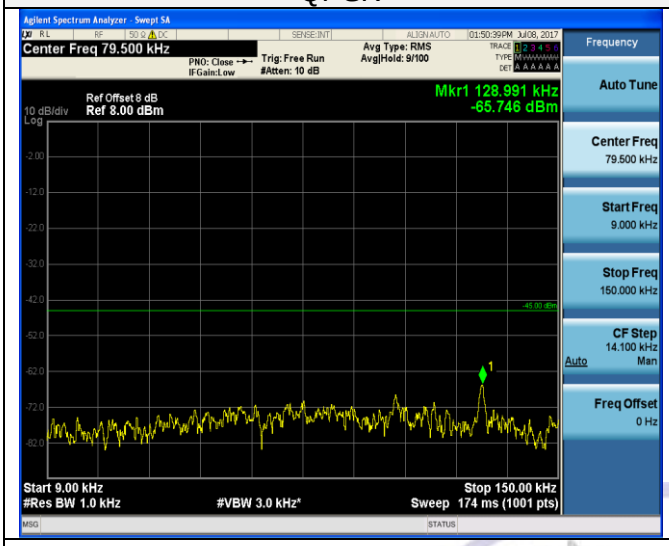
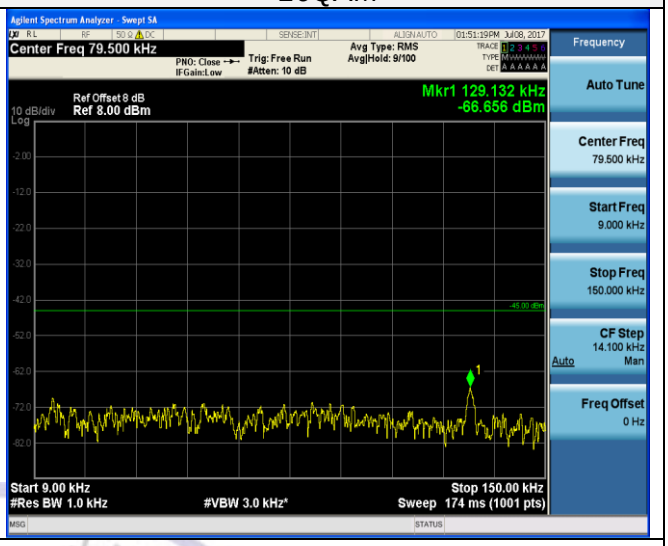
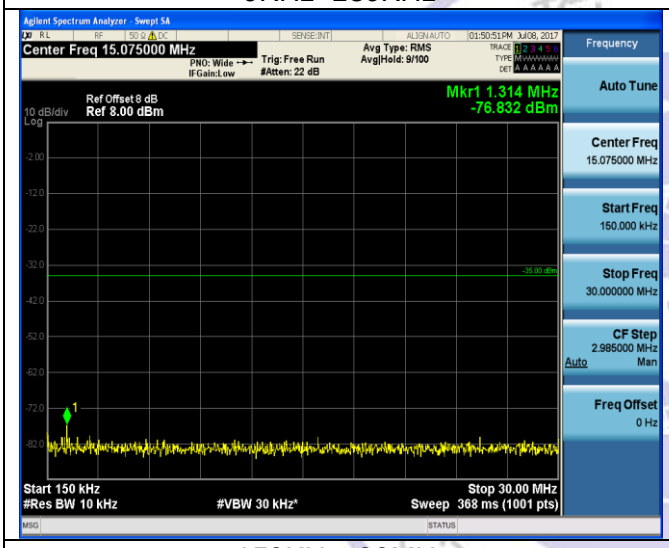
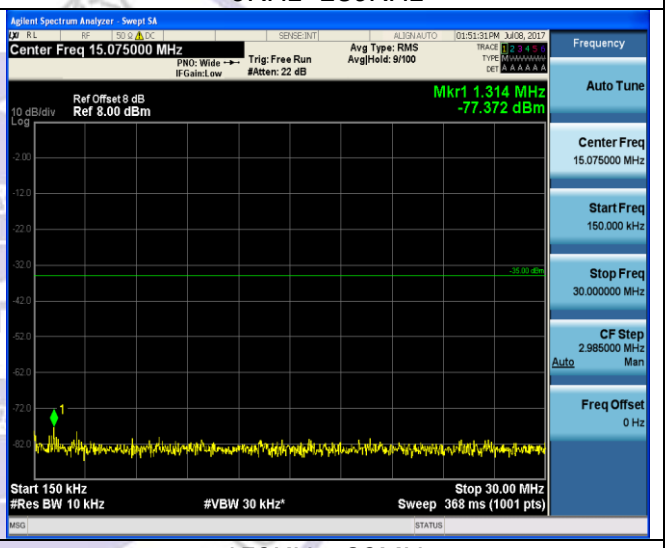
| LTE FDD Band 7-10MHz Channel Bandwidth | |
|---|---|
| High Channel | |
| QPSK | 16QAM |
|   |   |
| 9KHz~150KHz | 9KHz~150KHz |
|   |   |
| 150KHz~30MHz | 150KHz~30MHz |
| | |
| 30MHz~26.5GHz | 30MHz~26.5GHz |
| 1RB#0 | 1RB#0 |

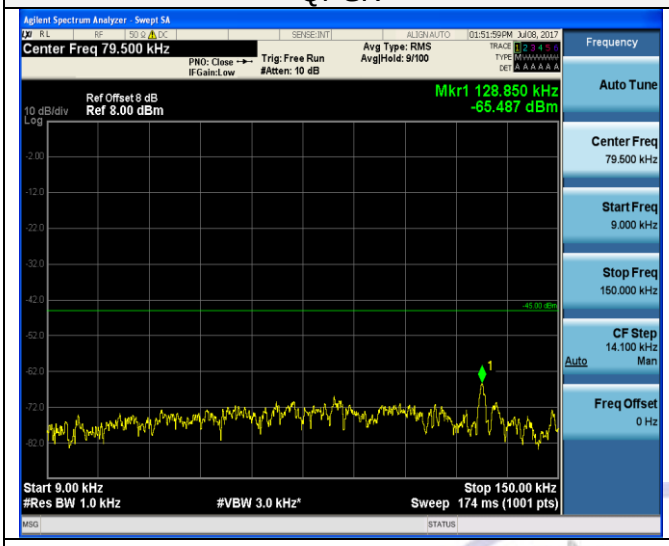
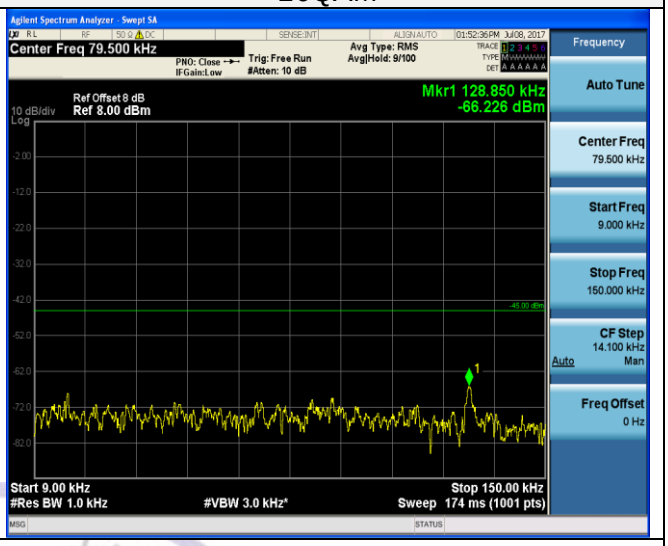
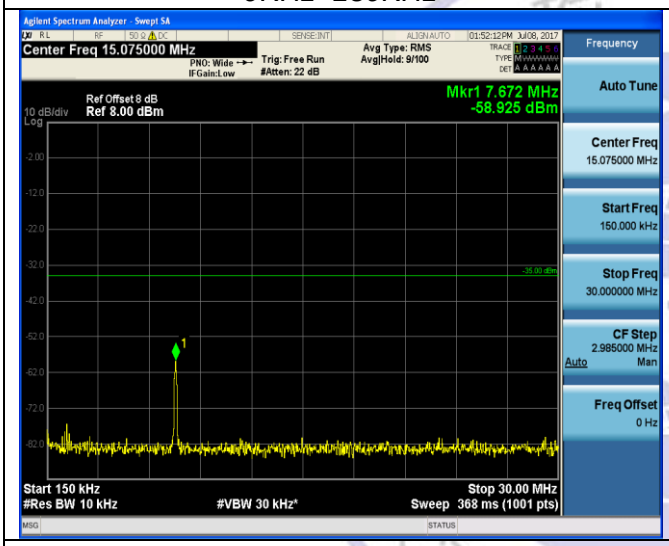
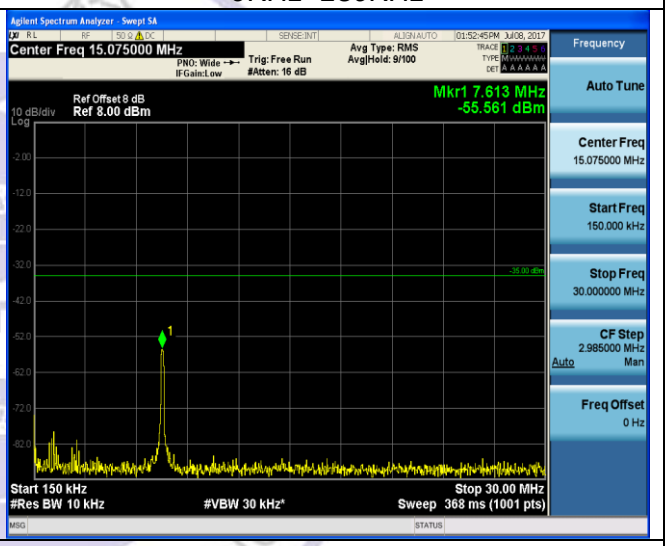
| LTE FDD Band 7-15MHz Channel Bandwidth | |
|---|---|
| Low Channel | |
| QPSK | 16QAM |
|  |  |
| 9KHz~150KHz | 9KHz~150KHz |
|  |  |
| 150KHz~30MHz | 150KHz~30MHz |
| | |
| 30MHz~26.5GHz | 30MHz~26.5GHz |
| 1RB#0 | 1RB#0 |

| LTE FDD Band 7-15MHz Channel Bandwidth | |
|---|---|
| Middle Channel | |
| QPSK | 16QAM |
|  |  |
| 9KHz~150KHz | 9KHz~150KHz |
|  |  |
| 150KHz~30MHz | 150KHz~30MHz |
| | |
| 30MHz~26.5GHz | 30MHz~26.5GHz |
| 1RB#0 | 1RB#0 |

| LTE FDD Band 7-15MHz Channel Bandwidth | |
|---|---|
| High Channel | |
| QPSK | 16QAM |
|  |  |
| 9KHz~150KHz | 9KHz~150KHz |
|  |  |
| 150KHz~30MHz | 150KHz~30MHz |
|  | |
| 30MHz~26.5GHz | 30MHz~26.5GHz |
| 1RB#0 | 1RB#0 |

| LTE FDD Band 4-20MHz Channel Bandwidth | |
|---|---|
| Low Channel | |
| QPSK | 16QAM |
|  |  |
| 9KHz~150KHz | 9KHz~150KHz |
|  |  |
| 150KHz~30MHz | 150KHz~30MHz |
|  | |
| 30MHz~26.5GHz | 30MHz~26.5GHz |
| 1RB#0 | 1RB#0 |

| LTE FDD Band 4-20MHz Channel Bandwidth | |
|---|---|
| Middle Channel | |
| QPSK | 16QAM |
|  |  |
| 9KHz~150KHz | 9KHz~150KHz |
|  |  |
| 150KHz~30MHz | 150KHz~30MHz |
| | |
| 30MHz~26.5GHz | 30MHz~26.5GHz |
| 1RB#0 | 1RB#0 |

| LTE FDD Band 4-20MHz Channel Bandwidth | |
|---|---|
| High Channel | |
| QPSK | 16QAM |
|  |  |
| 9KHz~150KHz | 9KHz~150KHz |
|  |  |
| 150KHz~30MHz | 150KHz~30MHz |
| | |
| 30MHz~26.5GHz | 30MHz~26.5GHz |
| 1RB#0 | 1RB#0 |

**Radiated Measurement:**

*Remark:*
1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 7; recorded worst case for each Channel Bandwidth of LTE FDD Band 7 @ QPSK.*
2. *EIRP=$P_{Mea}$(dBm)-$P_{cl}$(dB) +$G_a$(dBi)*
3. *We were not recorded other points as values lower than limits.*
4. *Margin = Limit - EIRP*

*LTE FDD Band 7_Channel Bandwidth 5MHz_QPSK_ Low Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Distance (m) | Ga Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 5005 | -42.83 | 5.11 | 3 | 13.38 | -34.56 | -25 | 9.56 | H |
| 7507.5 | -44.21 | 6.02 | 3 | 13.98 | -36.25 | -25 | 11.25 | H |
| 5005 | -40.82 | 5.11 | 3 | 13.38 | -32.55 | -25 | 7.55 | V |
| 7507.5 | -43.32 | 6.02 | 3 | 13.98 | -35.36 | -25 | 10.36 | V |

*LTE FDD Band 7_Channel Bandwidth 5MHz_QPSK_ Middle Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Distance (m) | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 5070 | -41.68 | 5.21 | 3 | 13.54 | -33.35 | -25 | 8.35 | H |
| 7605 | -45.14 | 6.14 | 3 | 14.13 | -37.15 | -25 | 12.15 | H |
| 5070 | -40.55 | 5.21 | 3 | 13.54 | -32.22 | -25 | 7.22 | V |
| 7605 | -44.47 | 6.14 | 3 | 14.13 | -36.48 | -25 | 11.48 | V |

*LTE FDD Band 7_Channel Bandwidth 5MHz_QPSK_ High Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Distance (m) | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 5135 | -42.92 | 5.30 | 3 | 13.69 | -34.53 | -25 | 9.53 | H |
| 7702.5 | -45.68 | 6.25 | 3 | 14.25 | -37.68 | -25 | 12.68 | H |
| 5135 | -41.04 | 5.30 | 3 | 13.69 | -32.65 | -25 | 7.65 | V |
| 7702.5 | -43.80 | 6.25 | 3 | 14.25 | -35.80 | -25 | 10.80 | V |

*LTE FDD Band 7_Channel Bandwidth 10MHz_QPSK_ Low Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Distance (m) | Ga Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 5010 | -42.32 | 5.11 | 3 | 13.38 | -34.05 | -25 | 9.05 | H |
| 7515 | -45.11 | 6.02 | 3 | 13.98 | -37.15 | -25 | 12.15 | H |
| 5010 | -40.63 | 5.11 | 3 | 13.38 | -32.36 | -25 | 7.36 | V |
| 7515 | -43.43 | 6.02 | 3 | 13.98 | -35.47 | -25 | 10.47 | V |

*LTE FDD Band 7_Channel Bandwidth 10MHz_QPSK_ Middle Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Distance (m) | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 5070 | -42.66 | 5.21 | 3 | 13.54 | -34.33 | -25 | 9.33 | H |
| 7605 | -44.73 | 6.14 | 3 | 14.13 | -36.74 | -25 | 11.74 | H |
| 5070 | -40.92 | 5.21 | 3 | 13.54 | -32.59 | -25 | 7.59 | V |
| 7605 | -44.00 | 6.14 | 3 | 14.13 | -36.01 | -25 | 11.01 | V |

*LTE FDD Band 7_Channel Bandwidth 10MHz_QPSK_ High Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Distance (m) | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 5130 | -42.72 | 5.30 | 3 | 13.69 | -34.33 | -25 | 9.33 | H |
| 7695 | -45.89 | 6.25 | 3 | 14.25 | -37.89 | -25 | 12.89 | H |
| 5130 | -40.80 | 5.30 | 3 | 13.69 | -32.41 | -25 | 7.41 | V |
| 7695 | -44.47 | 6.25 | 3 | 14.25 | -36.47 | -25 | 11.47 | V |

*LTE FDD Band 7_Channel Bandwidth 15MHz_QPSK_ Low Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Distance (m) | Ga Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 5015 | -42.25 | 5.11 | 3 | 13.38 | -33.98 | -25 | 8.98 | H |
| 7522.5 | -45.37 | 6.02 | 3 | 13.98 | -37.41 | -25 | 12.41 | H |
| 5015 | -40.96 | 5.11 | 3 | 13.38 | -32.69 | -25 | 7.69 | V |
| 7522.5 | -43.43 | 6.02 | 3 | 13.98 | -35.47 | -25 | 10.47 | V |

*LTE FDD Band 7_Channel Bandwidth 15MHz_QPSK_ Middle Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Distance (m) | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 5070 | -42.87 | 5.21 | 3 | 13.54 | -34.54 | -25 | 9.54 | H |
| 7605 | -45.04 | 6.14 | 3 | 14.13 | -37.05 | -25 | 12.05 | H |
| 5070 | -41.47 | 5.21 | 3 | 13.54 | -33.14 | -25 | 8.14 | V |
| 7605 | -43.40 | 6.14 | 3 | 14.13 | -35.41 | -25 | 10.41 | V |

*LTE FDD Band 7_Channel Bandwidth 15MHz_QPSK_ High Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Distance (m) | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 5125 | -42.61 | 5.30 | 3 | 13.69 | -34.22 | -25 | 9.22 | H |
| 7687.5 | -45.53 | 6.25 | 3 | 14.25 | -37.53 | -25 | 12.53 | H |
| 5125 | -41.24 | 5.30 | 3 | 13.69 | -32.85 | -25 | 7.85 | V |
| 7687.5 | -43.98 | 6.25 | 3 | 14.25 | -35.98 | -25 | 10.98 | V |

*LTE FDD Band 7_Channel Bandwidth 20MHz_QPSK_ Low Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Distance (m) | Ga Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 5020 | -41.92 | 5.11 | 3 | 13.38 | -33.65 | -25 | 8.65 | H |
| 7530 | -44.40 | 6.02 | 3 | 13.98 | -36.44 | -25 | 11.44 | H |
| 5020 | -41.12 | 5.11 | 3 | 13.38 | -32.85 | -25 | 7.85 | V |
| 7530 | -43.47 | 6.02 | 3 | 13.98 | -35.51 | -25 | 10.51 | V |

*LTE FDD Band 7_Channel Bandwidth 20MHz_QPSK_ Middle Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Distance (m) | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 5070 | -42.74 | 5.21 | 3 | 13.54 | -34.41 | -25 | 9.41 | H |
| 7605 | -45.35 | 6.14 | 3 | 14.13 | -37.36 | -25 | 12.36 | H |
| 5070 | -41.21 | 5.21 | 3 | 13.54 | -32.88 | -25 | 7.88 | V |
| 7605 | -43.44 | 6.14 | 3 | 14.13 | -35.45 | -25 | 10.45 | V |

*LTE FDD 7_Channel Bandwidth 20MHz_QPSK_ High Channel*

| Frequency (MHz) | PMea (dBm) | Pcl (dB) | Distance (m) | Ga Antenna Gain(dB) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 5120 | -41.65 | 5.30 | 3 | 13.69 | -33.26 | -25 | 8.26 | H |
| 7680 | -44.52 | 6.25 | 3 | 14.25 | -36.52 | -25 | 11.52 | H |
| 5120 | -41.37 | 5.30 | 3 | 13.69 | -32.98 | -25 | 7.98 | V |
| 7680 | -43.22 | 6.25 | 3 | 14.25 | -35.22 | -25 | 10.22 | V |

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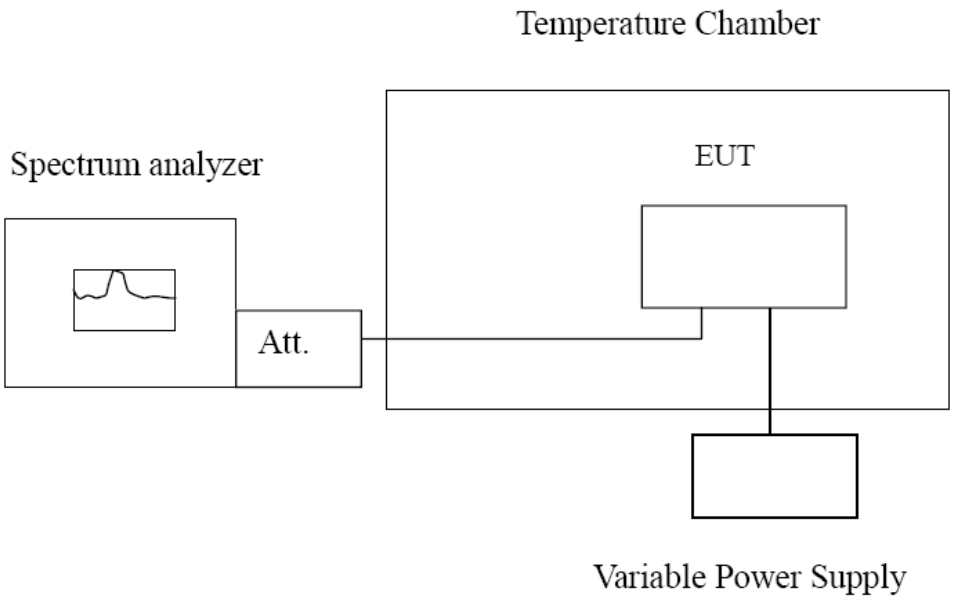
## 3.6. Frequency Stability under Temperature & Voltage Variations

**LIMIT**

According to §27.54, §2.1055 requirement, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation and should not exceed 2.5ppm.

**TEST CONFIGURATION**




**TEST PROCEDURE**

The EUT was setup according to EIA/TIA 603D

**Frequency Stability under Temperature Variations:**
In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMW500 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30℃.
3. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on middle channel for LTE band 7, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10℃ increments from -30℃ to +50℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1.5 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50℃.
7. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 ℃ increments from +50℃ to -30℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

**Frequency Stability under Voltage Variations:**
Set chamber temperature to 20℃. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.
Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, record the maximum frequency change.

**TEST RESULTS**

*Remark:*
*1. We tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 7; recorded worst case.*

LTE Band 7, 5MHz bandwidth (worst case of all bandwidths)

***Frequency Error vs Voltage***

| Voltage (V) | Frequency error (Hz) | | Frequency error (ppm) | | Limit (ppm) |
|---|---|---|---|---|---|
| | QPSK | 16QAM | QPSK | 16QAM | |
| 3.15 | -5.86 | 8.56 | -0.00231 | 0.00338 | 2.50 |
| 3.70 | -6.31 | -8.96 | -0.00249 | -0.00353 | 2.50 |
| 4.26 | 1.56 | 5.62 | 0.00062 | 0.00222 | 2.50 |

***Frequency Error vs Temperature***

| Temperature (℃) | Frequency error (Hz) | | Frequency error (ppm) | | Limit (ppm) |
|---|---|---|---|---|---|
| | QPSK | 16QAM | QPSK | 16QAM | |
| -30° | -9.78 | 3.13 | -0.00386 | 0.00123 | 2.50 |
| -20° | -0.76 | -4.99 | -0.00030 | -0.00197 | 2.50 |
| -10° | 2.83 | -2.22 | 0.00112 | -0.00088 | 2.50 |
| 0° | 1.52 | 3.12 | 0.00060 | 0.00123 | 2.50 |
| 10° | 3.67 | -1.87 | 0.00145 | -0.00074 | 2.50 |
| 20° | 8.52 | -7.03 | 0.00336 | -0.00277 | 2.50 |
| 30° | -1.27 | -7.04 | -0.00050 | -0.00278 | 2.50 |
| 40° | -2.32 | -8.38 | -0.00092 | -0.00331 | 2.50 |
| 50° | 1.41 | 3.75 | 0.00056 | 0.00148 | 2.50 |

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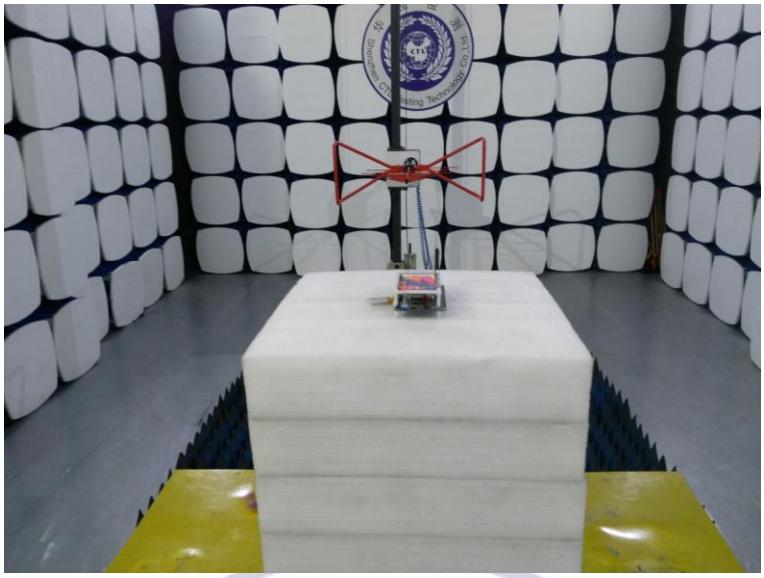
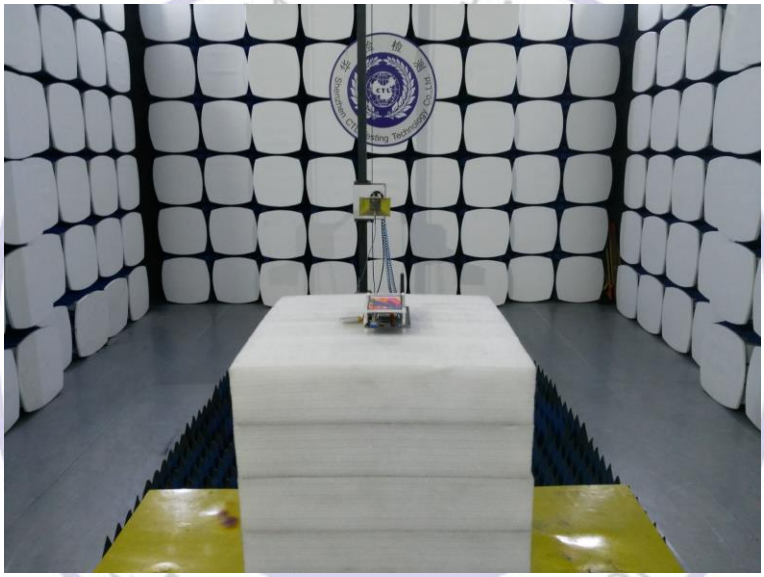
# 4. Test Setup Photos of the EUT





# 5. Photos of the EUT

Reference to the test report No. CTL1706302041-WF01

**********End of Report**********

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