

10.7.3 Test procedures

- (1) Connect the device as illustrated Figure, when the output power is over the maximum value of the Noise meter, add the attenuator to avoid destroying;
- (2) Set the EUT operating band and maximum gain;
- (3) Set the relevant parameters for 700MHz of device and connect the dotted line to calibrate;
- (4) After calibrating , According to the solid line connecting and testing Noise figure and record data;
- (5) Repeat RF channels to be tested for 800MHz of device and Repeat steps (2) to (4);

10.7.4 Test results

Test Date (yy-mm-dd): 2021-06-22

Normal condition: Temp: 24.3°C, Humid: 47%, Atmospheric Pressure:101kpa

Supply Voltage: AC 110V, 60Hz

10.7.4.1 700MHz Band

| Frequency(MHz) | Max. Limit (dB) | Noise figure data (dB) | Margin (dB) | Result |
|---|-----------------|------------------------|-------------|--------|
| Downlink: 758~775 | 9 | 4.84 | 4.16 | PASS |
| Uplink: 788~805 | 9 | 3.65 | 5.35 | PASS |
| NOTE : Margin= specification limit - Noise figure data. | | | | |

10.7.4.2 800MHz Band

| Frequency(MHz) | Max.Limit (dB) | Noise figure data (dB) | Margin (dB) | Result |
|---|----------------|------------------------|-------------|--------|
| Downlink: 851~861 | 9 | 4.32 | 4.68 | PASS |
| Uplink: 806~816 | 9 | 4.02 | 4.98 | PASS |
| NOTE : Margin= specification limit - Noise figure data. | | | | |

10.7.5 Test screenshot

10.7.5.1 700MHz Band

Fixed 31.0000 dB DUT: Amplifier Atten: 0 dB

| Frequency | Noise Figure | Gain |
|----------------|--------------|-----------|
| 758.000000 MHz | 4.3393 dB | 79.619 dB |
| 758.894737 MHz | 4.2434 dB | 79.868 dB |
| 759.789474 MHz | 4.2135 dB | 79.985 dB |
| 760.684211 MHz | 4.0522 dB | 80.233 dB |
| 761.578947 MHz | 4.0237 dB | 80.512 dB |
| 762.473684 MHz | 3.9806 dB | 80.852 dB |
| 763.368421 MHz | 3.9470 dB | 81.212 dB |
| 764.263158 MHz | 3.9282 dB | 81.486 dB |
| 765.157895 MHz | 3.9351 dB | 81.642 dB |
| 766.052632 MHz | 3.9629 dB | 81.657 dB |
| 766.947368 MHz | 4.0098 dB | 81.480 dB |
| 767.842105 MHz | 4.0106 dB | 81.307 dB |
| 768.736842 MHz | 4.1156 dB | 81.042 dB |
| 769.631579 MHz | 4.1991 dB | 80.710 dB |
| 770.526316 MHz | 4.2831 dB | 80.307 dB |
| 771.421053 MHz | 4.3599 dB | 79.878 dB |
| 772.315789 MHz | 4.4619 dB | 79.307 dB |
| 773.210526 MHz | 4.6036 dB | 78.599 dB |
| 774.105263 MHz | 4.6737 dB | 77.740 dB |
| 775.000000 MHz | 4.8399 dB | 76.627 dB |

Start Freq 758.00000 MHz Stop Freq 775.00000 MHz
 BW 4.0 MHz T cold 296.50 K (Default) Noise Source: Norm Points 20

Downlink: 758MHz~775MHz

Fixed 30.8000 dB DUT: Amplifier Atten: 0 dB

| Frequency | Noise Figure | Gain |
|----------------|--------------|-----------|
| 788.000000 MHz | 3.6135 dB | 75.461 dB |
| 789.473684 MHz | 3.6526 dB | 77.105 dB |
| 790.947368 MHz | 3.6071 dB | 78.242 dB |
| 792.421053 MHz | 3.6297 dB | 79.157 dB |
| 793.894737 MHz | 3.5600 dB | 79.834 dB |
| 795.368421 MHz | 3.5652 dB | 80.169 dB |
| 796.842105 MHz | 3.5368 dB | 80.270 dB |
| 798.315789 MHz | 3.5477 dB | 80.325 dB |
| 799.789474 MHz | 3.5409 dB | 80.356 dB |
| 801.263158 MHz | 3.5862 dB | 80.405 dB |
| 802.736842 MHz | 3.5528 dB | 80.401 dB |
| 804.210526 MHz | 3.5822 dB | 80.273 dB |
| 805.684211 MHz | 3.5794 dB | 79.972 dB |
| 807.157895 MHz | 3.5968 dB | 79.514 dB |
| 808.631579 MHz | 3.6149 dB | 78.854 dB |
| 810.105263 MHz | 3.6775 dB | 78.077 dB |
| 811.578947 MHz | 3.7720 dB | 77.388 dB |
| 813.052632 MHz | 3.8634 dB | 76.581 dB |
| 814.526316 MHz | 3.9237 dB | 75.393 dB |
| 816.000000 MHz | 4.0249 dB | 73.426 dB |

Start Freq 788.00000 MHz Stop Freq 816.00000 MHz
 BW 4.0 MHz T cold 296.50 K (Default) Noise Source: Norm Points 20

Uplink: 788MHz~805MHz

10.7.5.2 800MHz Band

Fixed 31.0000 dB DUT: Amplifier Atten: 0 dB

| Frequency | Noise Figure | Gain |
|----------------|--------------|-----------|
| 851.000000 MHz | 4.3228 dB | 82.613 dB |
| 851.526316 MHz | 4.2431 dB | 82.737 dB |
| 852.052632 MHz | 4.2200 dB | 82.836 dB |
| 852.578947 MHz | 4.1384 dB | 82.936 dB |
| 853.105263 MHz | 4.1057 dB | 83.001 dB |
| 853.631579 MHz | 4.0449 dB | 83.037 dB |
| 854.157895 MHz | 4.0095 dB | 83.006 dB |
| 854.684211 MHz | 3.9907 dB | 82.926 dB |
| 855.210526 MHz | 3.9793 dB | 82.778 dB |
| 855.736842 MHz | 3.9596 dB | 82.518 dB |
| 856.263158 MHz | 3.9135 dB | 82.257 dB |
| 856.789474 MHz | 3.9311 dB | 81.828 dB |
| 857.315789 MHz | 3.9867 dB | 81.276 dB |
| 857.842105 MHz | 3.9410 dB | 80.656 dB |
| 858.368421 MHz | 3.9895 dB | 79.973 dB |
| 858.894737 MHz | 3.9762 dB | 79.218 dB |
| 859.421053 MHz | 4.0451 dB | 78.379 dB |
| 859.947368 MHz | 4.1382 dB | 77.506 dB |
| 860.473684 MHz | 4.1487 dB | 76.634 dB |
| 861.000000 MHz | 4.2454 dB | 75.798 dB |

Start Freq 851.00000 MHz Stop Freq 861.00000 MHz

Downlink: 851MHz~861MHz

Fixed 30.8000 dB DUT: Amplifier Atten: 0 dB

| Frequency | Noise Figure | Gain |
|----------------|--------------|-----------|
| 788.000000 MHz | 3.6135 dB | 75.461 dB |
| 789.473684 MHz | 3.6526 dB | 77.105 dB |
| 790.947368 MHz | 3.6071 dB | 78.242 dB |
| 792.421053 MHz | 3.6297 dB | 79.157 dB |
| 793.894737 MHz | 3.5600 dB | 79.834 dB |
| 795.368421 MHz | 3.5652 dB | 80.169 dB |
| 796.842105 MHz | 3.5368 dB | 80.270 dB |
| 798.315789 MHz | 3.5477 dB | 80.325 dB |
| 799.789474 MHz | 3.5409 dB | 80.356 dB |
| 801.263158 MHz | 3.5862 dB | 80.405 dB |
| 802.736842 MHz | 3.5528 dB | 80.401 dB |
| 804.210526 MHz | 3.5822 dB | 80.273 dB |
| 805.684211 MHz | 3.5794 dB | 79.972 dB |
| 807.157895 MHz | 3.5968 dB | 79.514 dB |
| 808.631579 MHz | 3.6149 dB | 78.854 dB |
| 810.105263 MHz | 3.6775 dB | 78.077 dB |
| 811.578947 MHz | 3.7720 dB | 77.388 dB |
| 813.052632 MHz | 3.8634 dB | 76.581 dB |
| 814.526316 MHz | 3.9237 dB | 75.393 dB |
| 816.000000 MHz | 4.0249 dB | 73.426 dB |

Start Freq 788.00000 MHz Stop Freq 816.00000 MHz

BW 4.0 MHz T cold 296.50 K (Default) Noise Source: Norm Points 20

Uplink: 806MHz~816MHz

10.8 Out-of-band/out-of-block emissions

Test requirement: KDB 935210 D05 clause 4.7.2
FCC PART 2.1051
FCC PART 90.219 (d)(6)(i)
FCC PART 90.219 (e)(3)

Test Method: KDB 935210 D05/4.7.1 and 4.7.2

10.8.1 Requirements

The EUT shall comply with sections 4.7.2 of KDB 935210 D05.

Refer to the applicable rule part(s) for specified limits on unwanted (out-of-band/out-of-block and spurious) emissions (e.g., Section 90.210).

Spurious emissions shall be measured using a single test signal sequentially tuned to the low, middle, and high channels or frequencies within each authorized frequency band of operation.

Intermodulation products shall be measured using two CW signals with all available channel spacings (e.g., 12.5 kHz and 6.25 kHz) with the center between these channels being equal to the center frequency f_0 as determined from 4.3.

NOTE—Intermodulation-product spurious emission measurements are not required for single-channel boosters that cannot accommodate two simultaneous signals within the passband.

For a multi-channel enhancer, any intermodulation product level must be attenuated, relative to P, by at least: $43 + 10 \cdot \log_{10} P$ is less stringent than 70dB, that limit was used.

Spurious emissions shall be measured using a single test signal sequentially tuned to the low, middle, and high channels or frequencies within each authorized frequency band of operation.

Out-of-band/out-of-block emissions (including intermodulation products) shall be measured under each of the following two stimulus conditions:

- a) two adjacent test signals sequentially tuned to the lower and upper frequency band/block edges;
- b) a single test signal, sequentially tuned to the lowest and highest frequencies or channels within the frequency band/block under examination.

NOTE—Single-channel boosters that cannot accommodate two simultaneous signals within the passband may be excluded from the test stipulated in step a).

10.8.2 Test configuration

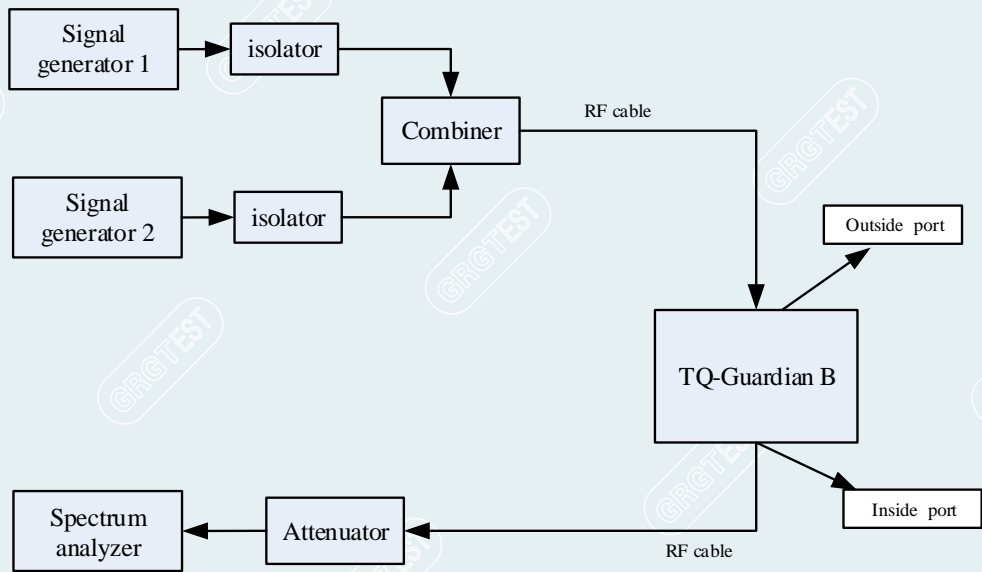


Figure 10.8-1 Downlink connection diagram

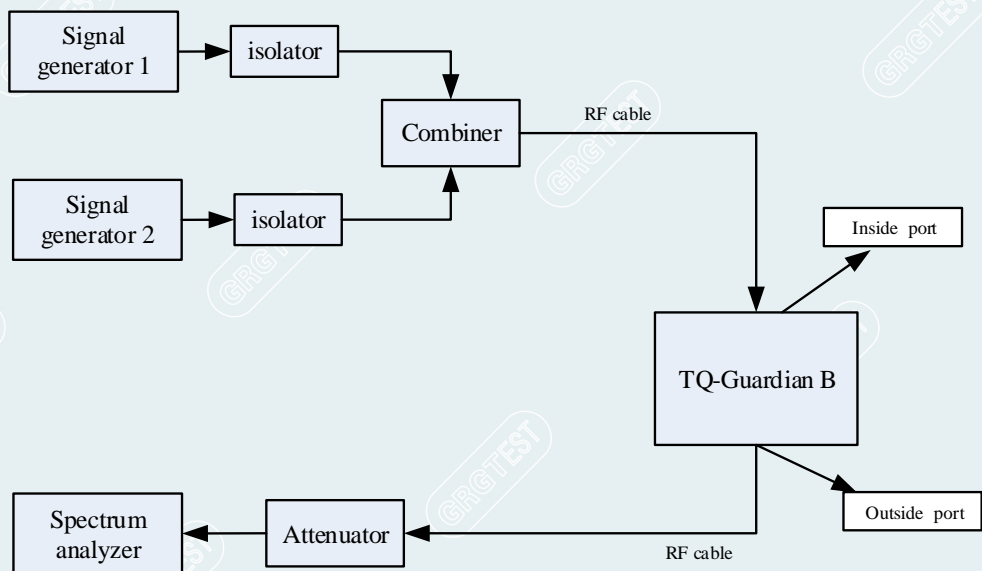


Figure 10.8-2 Uplink connection diagram

10.8.3 Test procedures

- a) Connect a signal generator to the input of the EUT.
If the signal generator is not capable of producing two independent modulated carriers simultaneously, then two discrete signal generators can be connected, with an appropriate combining network to support the two-signal test.
- b) Configure the two signal generators to produce CW on frequencies spaced consistent with 4.7.1, with amplitude levels set to just below the AGC threshold (see 4.2). Set the signal generator amplitudes so that the power from each into the EUT is equivalent.
- c) Connect a spectrum analyzer to the EUT output.
- d) Set the span to 100 kHz.
- e) Set RBW = 300 Hz with VBW $\geq 3 \times$ RBW.
- f) Set the detector to power averaging (rms).
- g) Place a marker on highest intermodulation product amplitude.
- h) Capture the plot for inclusion in the test report.
- i) Repeat steps c) to h) with the composite input power level set to 3 dB above the AGC threshold.
- j) Repeat steps b) to i) for all operational bands.

Any frequency outside the authorized bandwidth was attenuated by at least $43+10*\log(P)$ dB. This corresponds to an absolute level of $-13\text{dBm} (P_{\text{dBm}}-(43+10*\log(P_w)))$.

10.8.4 Test results

Test Date (yy-mm-dd): 2021-06-25
 Normal condition: Temp: 24.5°C, Humid:48%, Atmospheric Pressure:101kpa
 Supply Voltage: AC 110V, 60Hz

10.8.4.1 700MHz Band

10.8.4.1.1 Downlink transmit mode

| Test frequency | Intermodulation product Limit (dBm) | Max. intermodulation product (dBm) | Margin (dB) | Result | |
|---|---|------------------------------------|-------------|--------|------|
| (1) Frequency range: 768MHz~775MHz | | | | | |
| (1.1) With the ALC threshold level | | | | | |
| Channel Bandwidth: 12.5kHz | Low frequency: f1:768.00625MHz f2:768.01875MHz | -13 | -19.1 | 6.1 | PASS |
| | Mid frequency: f1:771.50MHz f2:771.5125MHz | -13 | -18.4 | 5.4 | PASS |
| | High frequency: f1:774.98125MHz f2:774.99375MHz | -13 | -17.8 | 4.8 | PASS |
| Channel Bandwidth: 25kHz | Low frequency: f1:768.0125MHz f2:768.0375MHz | -13 | -19.7 | 6.7 | PASS |
| | Mid frequency: f1:771.5MHz f2:771.525MHz | -13 | -20.2 | 7.2 | PASS |
| | High frequency: f1:774.9625MHz f2:774.9875MHz | -13 | -20.6 | 7.6 | PASS |
| (1.2) With the input signal amplitude set 3 dB above the AGC threshold | | | | | |
| Channel Bandwidth: 12.5kHz | Low frequency: f1:768.00625MHz f2:768.01875MHz | -13 | -18.8 | 5.8 | PASS |
| | Mid frequency: f1:771.50MHz f2:771.5125MHz | -13 | -18.9 | 5.9 | PASS |
| | High frequency: f1:774.98125MHz f2:774.99375MHz | -13 | -18.9 | 5.9 | PASS |
| Channel Bandwidth: 25kHz | Low frequency: f1:768.0125MHz f2:768.0375MHz | -13 | -19.8 | 6.8 | PASS |
| | Mid frequency: f1:771.5MHz f2:771.525MHz | -13 | -20.8 | 7.8 | PASS |
| | High frequency: f1:774.9625MHz f2:774.9875MHz | -13 | -20.7 | 7.7 | PASS |
| NOTE 1: Intermodulation products select the worst data record. | | | | | |
| NOTE 2: Margin= specification limit -Maximum mark level. | | | | | |

10.8.4.1.2 Uplink transmit mode

| Test frequency | Intermodulation product Limit (dBm) | Max. intermodulation product (dBm) | Margin (dB) | Result | |
|--|---|------------------------------------|-------------|--------|------|
| (2) Frequency range: 798MHz~805MHz | | | | | |
| (2.1) With the ALC threshold level | | | | | |
| Channel Bandwidth: 12.5kHz | Low frequency: f1:798.00625MHz f2:798.01875MHz | -13 | -22.7 | 9.7 | PASS |
| | Mid frequency: f1:801.5MHz f2:801.5125MHz | -13 | -22.5 | 9.5 | PASS |
| | High frequency: f1:804.98125MHz f2:804.99375MHz | -13 | -22.6 | 9.6 | PASS |
| Channel Bandwidth: 25kHz | Low frequency: f1:798.0125MHz f2:798.0375MHz | -13 | -24.1 | 11.1 | PASS |
| | Mid frequency: f1:801.5MHz f2:801.525MHz | -13 | -24.8 | 11.8 | PASS |
| | High frequency: f1:804.9625MHz f2:804.9875MHz | -13 | -24.7 | 11.7 | PASS |
| (2.2) With the input signal amplitude set 3 dB above the AGC threshold | | | | | |
| Channel Bandwidth: 12.5kHz | Low frequency: f1:798.00625MHz f2:798.01875MHz | -13 | -22.8 | 9.8 | PASS |
| | Mid frequency: f1:801.5MHz f2:801.5125MHz | -13 | -22.8 | 9.8 | PASS |
| | High frequency: f1:804.98125MHz f2:804.99375MHz | -13 | -23.1 | 10.1 | PASS |
| Channel Bandwidth: 25kHz | Low frequency: f1:798.0125MHz f2:798.0375MHz | -13 | -24.7 | 11.7 | PASS |
| | Mid frequency: f1:801.5MHz f2:801.525MHz | -13 | -25.0 | 12.0 | PASS |
| | High frequency: f1:804.9625MHz f2:804.9875MHz | -13 | -25.1 | 12.1 | PASS |
| NOTE 1: Intermodulation products select the worst data record. | | | | | |
| NOTE 2: Margin= specification limit -Maximum mark level. | | | | | |

10.8.4.2 800MHz Band

10.8.4.2.1 Downlink transmit mode

| Frequency range | Intermodulation product Limit (dBm) | Max. intermodulation product (dBm) | Margin (dB) | Result | |
|--|---|------------------------------------|-------------|--------|------|
| (1) Frequency range: 851MHz~861MHz | | | | | |
| (1.1) With the ALC threshold level | | | | | |
| Channel Bandwidth: 12.5kHz | Low frequency: f1:851.00625MHz f2:851.01875MHz | -13 | -27.3 | 14.3 | PASS |
| | Mid frequency: f1:856.0MHz f2:856.0125MHz | -13 | -28.1 | 15.1 | PASS |
| | High frequency: f1:860.98125MHz f2:860.99375MHz | -13 | -30.0 | 17.0 | PASS |
| Channel Bandwidth: 25kHz | Low frequency: f1:861.0125MHz f2:851.0375MHz | -13 | -28.4 | 15.4 | PASS |
| | Mid frequency: f1:856.0MHz f2:856.025MHz | -13 | -29.6 | 16.6 | PASS |
| | High frequency: f1:860.9625MHz f2:860.9875MHz | -13 | -36.2 | 23.2 | PASS |
| (1.2) With the input signal amplitude set 3 dB above the AGC threshold | | | | | |
| Channel Bandwidth: 12.5kHz | Low frequency: f1:851.00625MHz f2:851.01875MHz | -13 | -27.5 | 14.5 | PASS |
| | Mid frequency: f1:856.0MHz f2:856.0125MHz | -13 | -28.9 | 15.9 | PASS |
| | High frequency: f1:860.98125MHz f2:860.99375MHz | -13 | -33.9 | 20.9 | PASS |
| Channel Bandwidth: 25kHz | Low frequency: f1:861.0125MHz f2:851.0375MHz | -13 | -29.1 | 16.1 | PASS |
| | Mid frequency: f1:856.0MHz f2:856.025MHz | -13 | -31.1 | 18.1 | PASS |
| | High frequency: f1:860.9625MHz f2:860.9875MHz | -13 | -36.0 | 23.0 | PASS |
| NOTE 1: Intermodulation products select the worst data record. | | | | | |
| NOTE 2: Margin= specification limit -Maximum mark level. | | | | | |

10.8.4.2.2 Uplink transmit mode

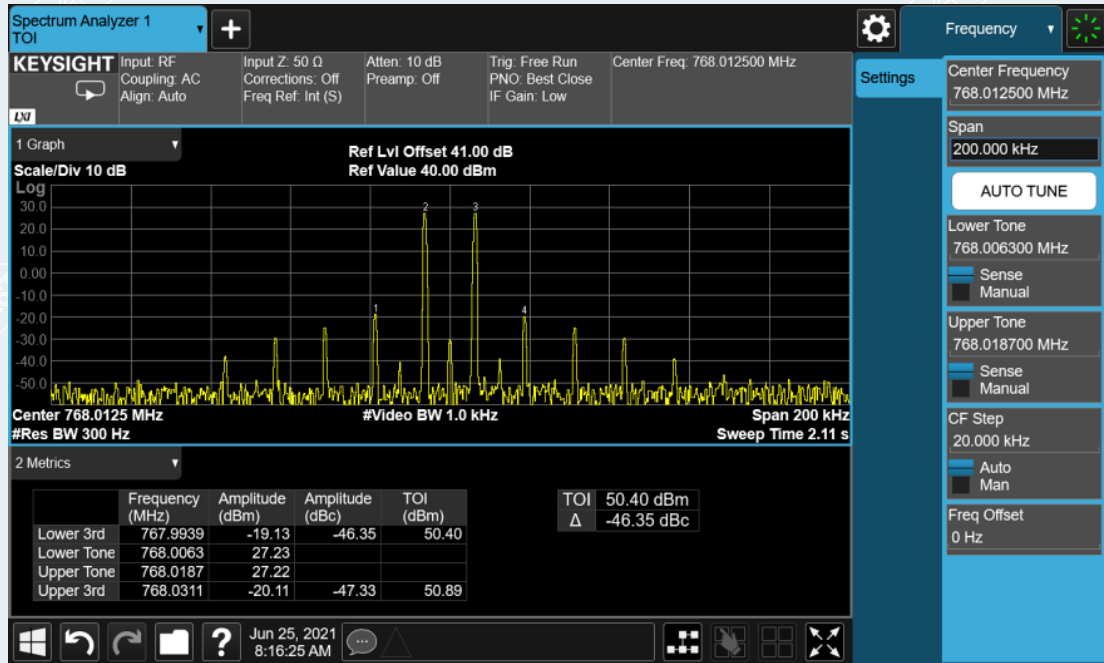
| Frequency range | Intermodulation product Limit (dBm) | Max. intermodulation product (dBm) | Margin (dB) | Result | |
|--|---|------------------------------------|-------------|--------|------|
| (2) Frequency range: 806MHz~816MHz | | | | | |
| (2.1) With the ALC threshold level | | | | | |
| Channel Bandwidth: 12.5kHz | Low frequency: f1:806.00625MHz f2:806.01875MHz | -13 | -23.4 | 10.4 | PASS |
| | Mid frequency: f1:811.0MHz f2:811.0125MHz | -13 | -25.0 | 12.0 | PASS |
| | High frequency: f1:815.98125MHz f2:815.99375MHz | -13 | -32.1 | 19.1 | PASS |
| Channel Bandwidth: 25kHz | Low frequency: f1:806.0125MHz f2:806.0875MHz | -13 | -25.3 | 12.3 | PASS |
| | Mid frequency: f1:811.0MHz f2:811.025MHz | -13 | -23.9 | 10.9 | PASS |
| | High frequency: f1:815.9625MHz f2:815.9875MHz | -13 | -34.0 | 21.0 | PASS |
| (2.2) | | | | | |
| Channel Bandwidth: 12.5kHz | Low frequency: f1:806.00625MHz f2:806.01875MHz | -13 | -23.3 | 10.3 | PASS |
| | Mid frequency: f1:811.0MHz f2:811.0125MHz | -13 | -25.1 | 12.1 | PASS |
| | High frequency: f1:815.98125MHz f2:815.99375MHz | -13 | -33.8 | 20.8 | PASS |
| Channel Bandwidth: 25kHz | Low frequency: f1:806.0125MHz f2:806.0875MHz | -13 | -25.1 | 12.1 | PASS |
| | Mid frequency: f1:811.0MHz f2:811.025MHz | -13 | -27.5 | 14.5 | PASS |
| | High frequency: f1:815.9625MHz f2:815.9875MHz | -13 | -35.6 | 22.6 | PASS |
| NOTE 1: Intermodulation products select the worst data record. | | | | | |
| NOTE 2: Margin= specification limit -Maximum mark level. | | | | | |

10.8.5 Test screenshot

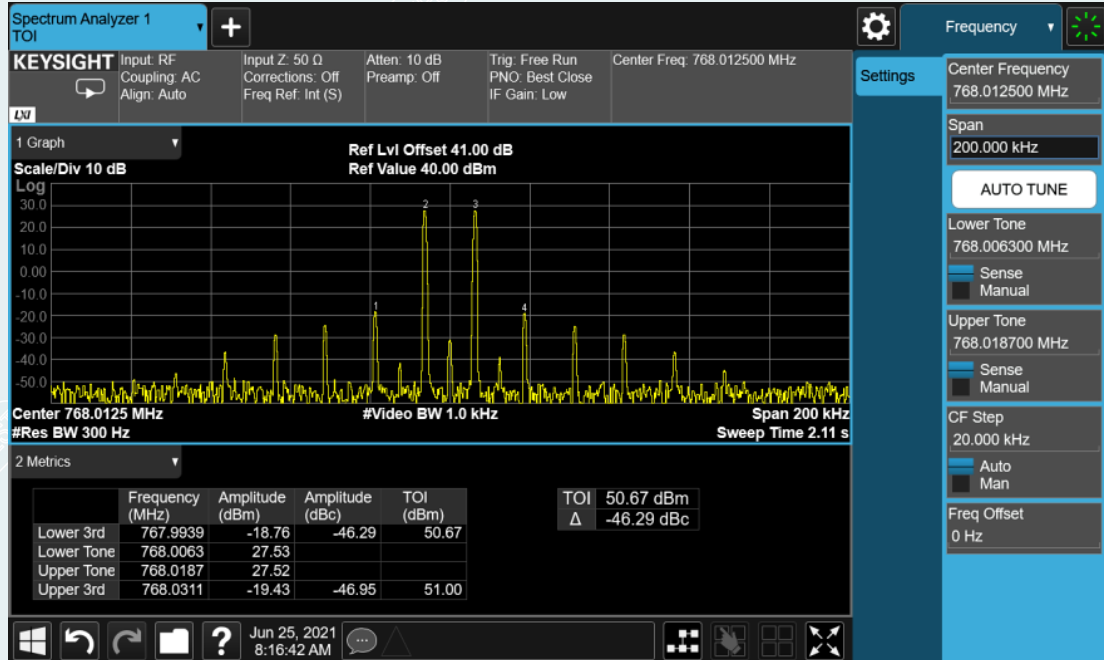
10.8.5.1 700MHz Band

10.8.5.1.1 Channel bandwidth 12.5kHz

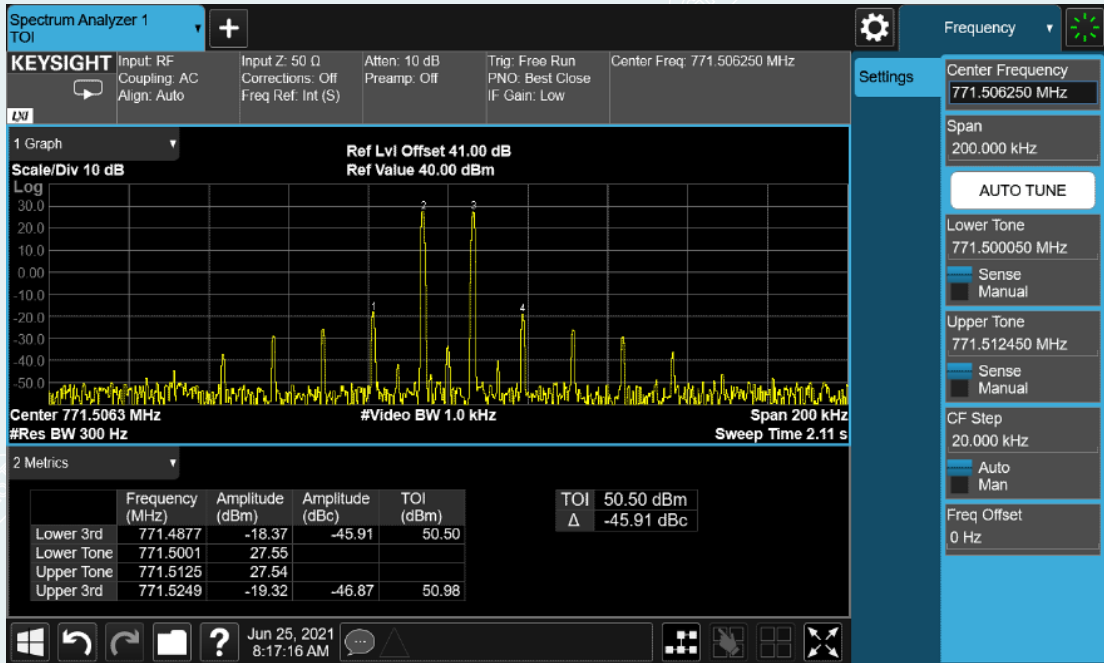
10.8.5.1.1.1 Downlink



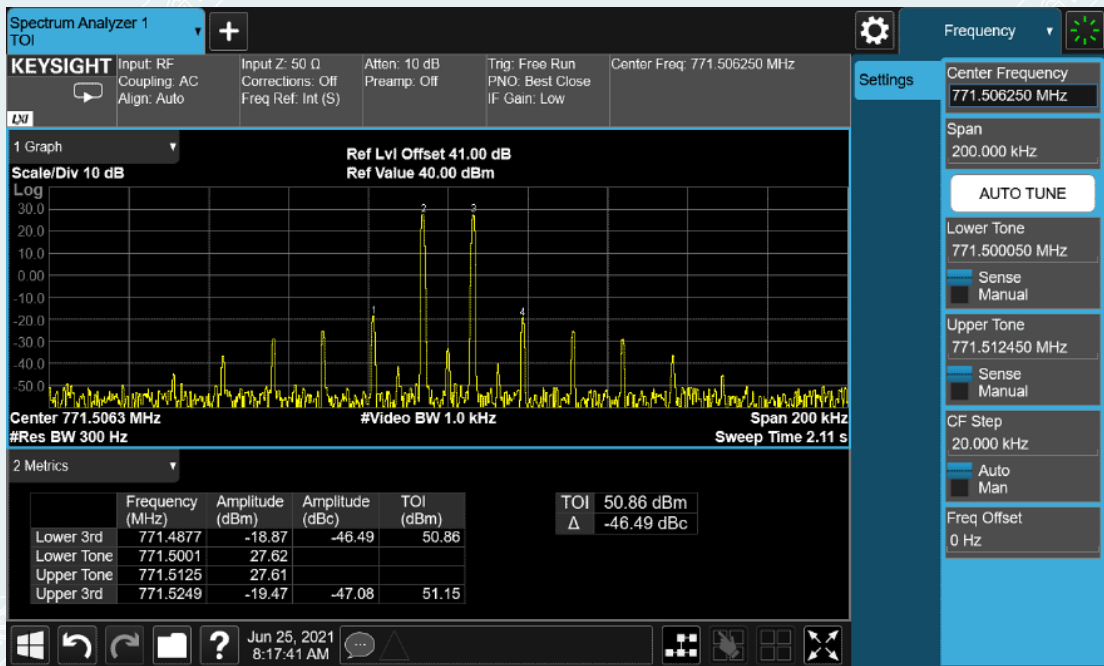
Low Frequency and With the ALC threshold level



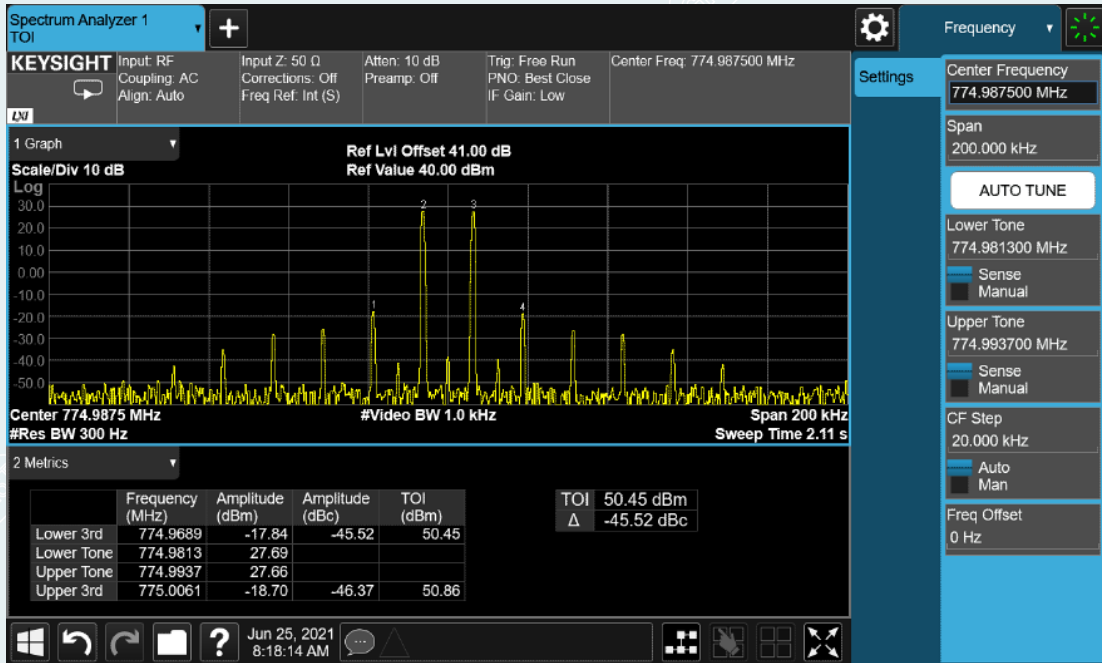
Low Frequency and With the input signal amplitude set 3 dB above the ALC threshold



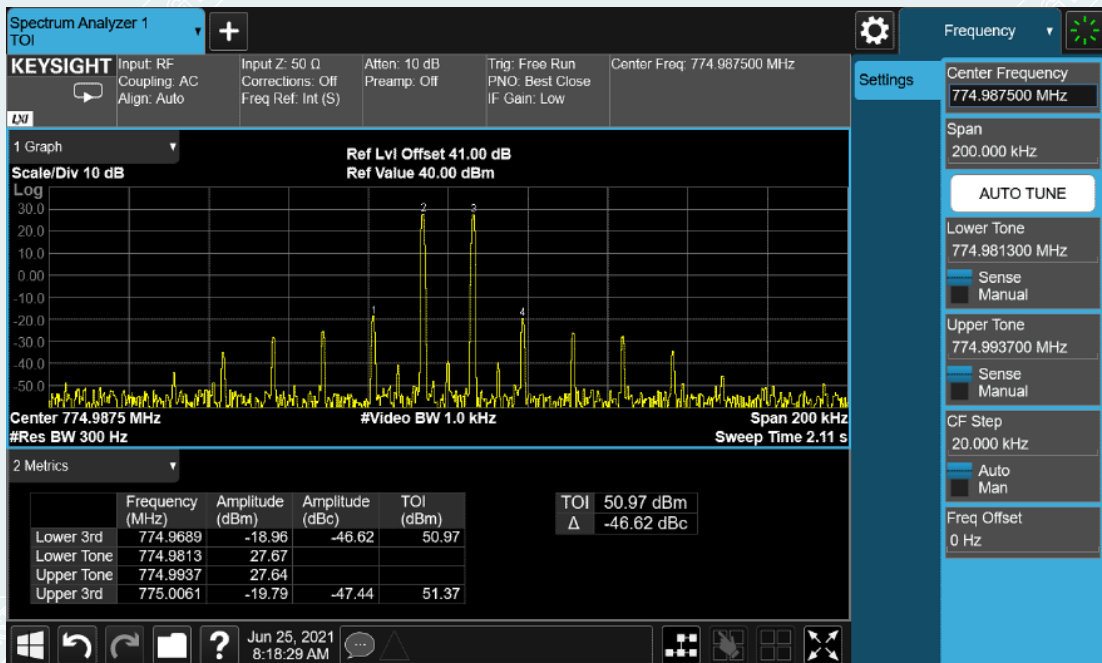
Mid Frequency and With the ALC threshold level



Mid Frequency and With the input signal amplitude set 3 dB above the ALC threshold

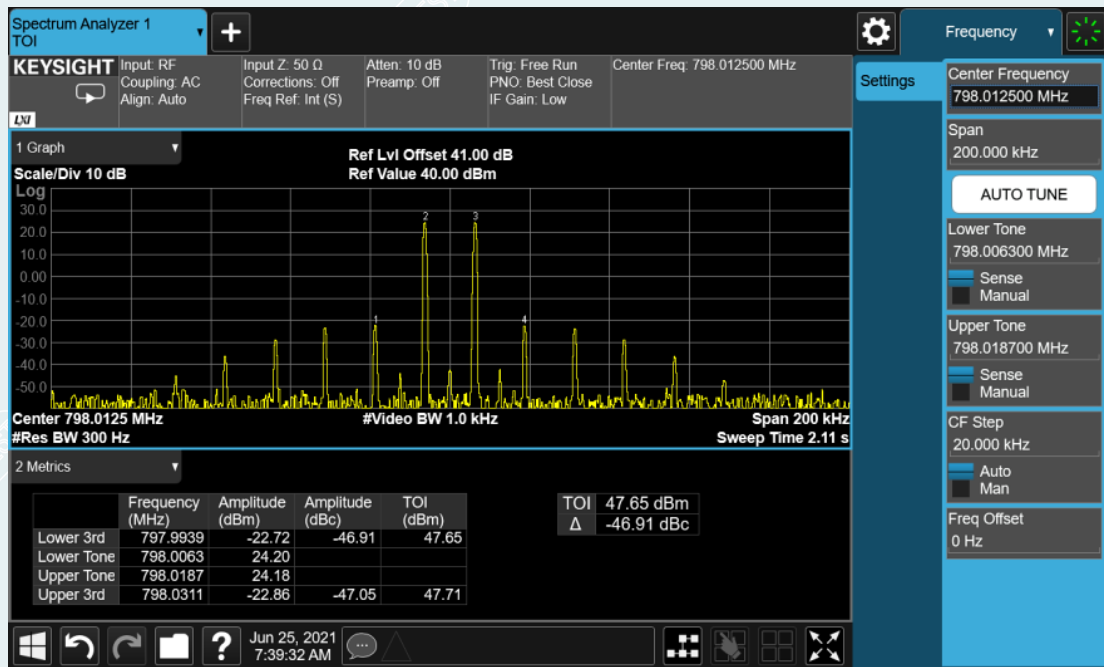


High Frequency and With the ALC threshold level

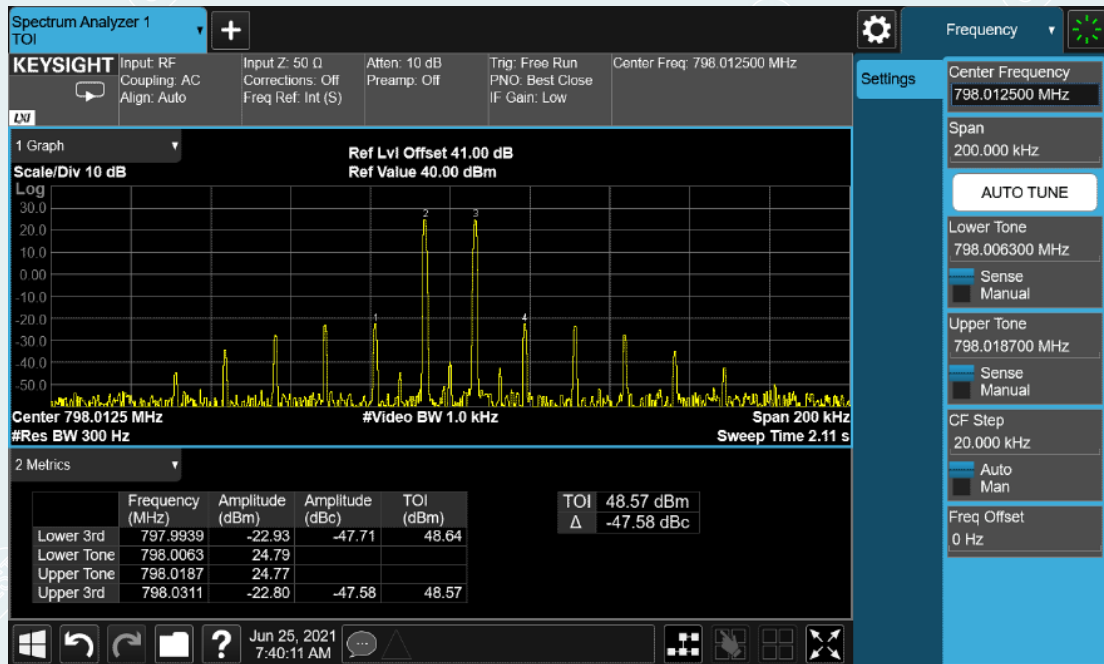


High Frequency and With the input signal amplitude set 3 dB above the ALC threshold

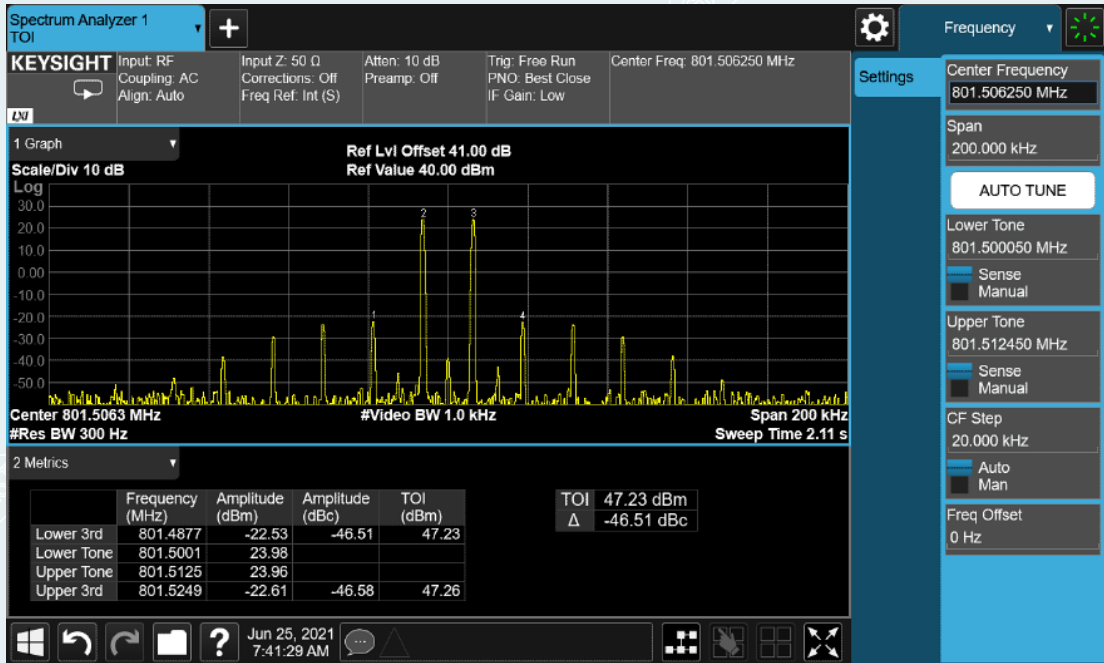
10.8.5.1.1.2 Uplink



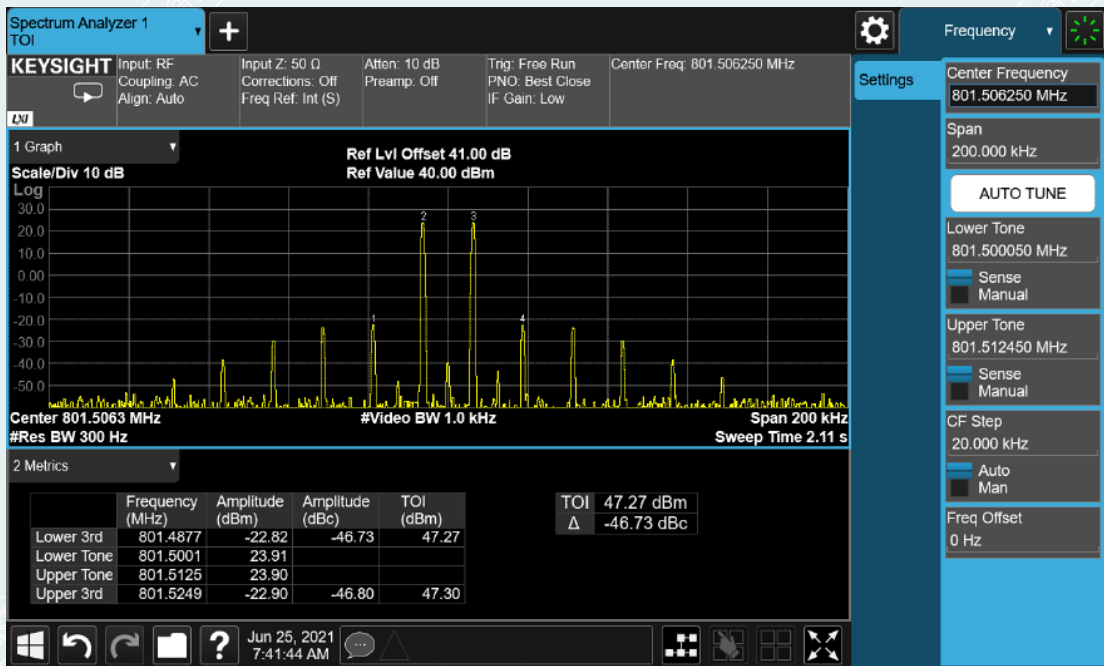
Low Frequency and With the ALC threshold level



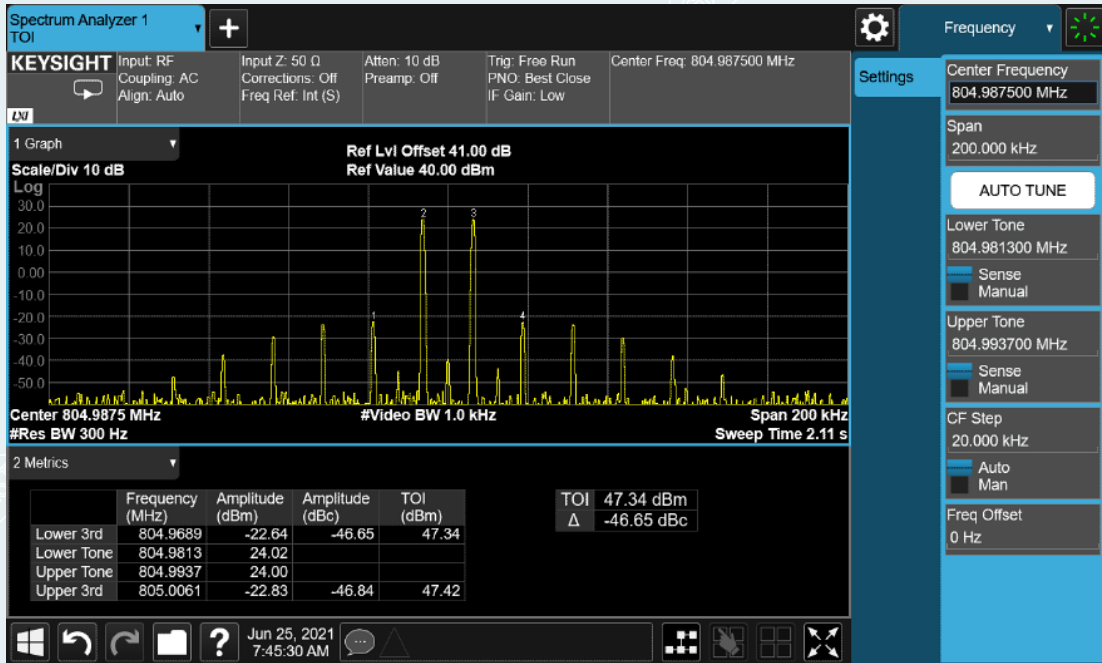
Low Frequency and With the input signal amplitude set 3 dB above the ALC threshold



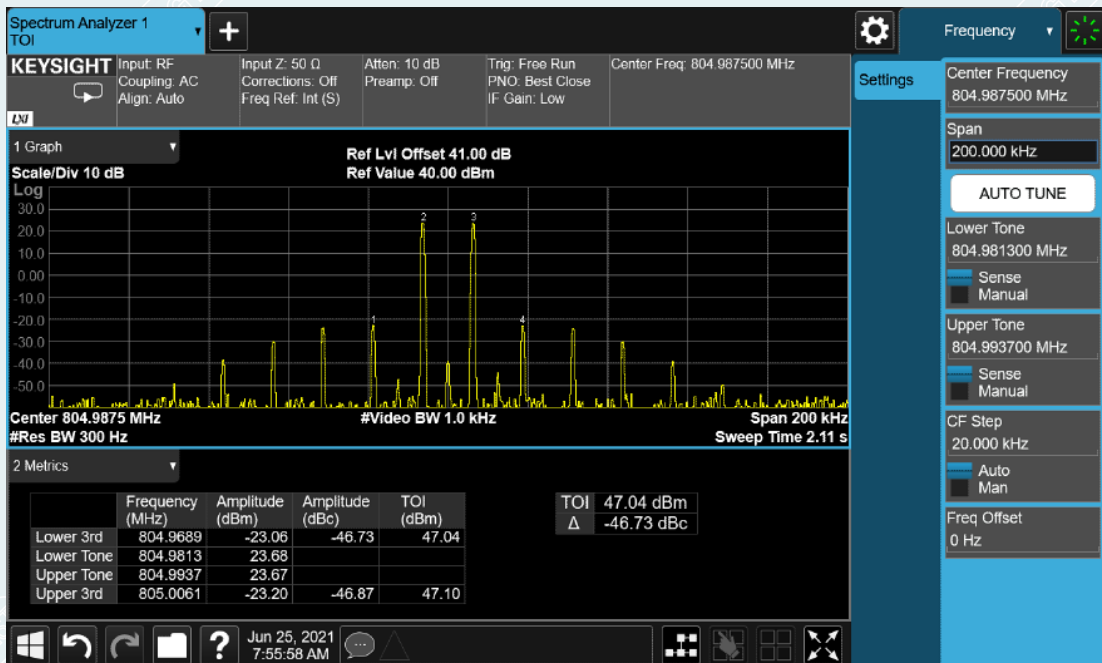
Mid Frequency and With the ALC threshold level



Mid Frequency and With the input signal amplitude set 3 dB above the ALC threshold



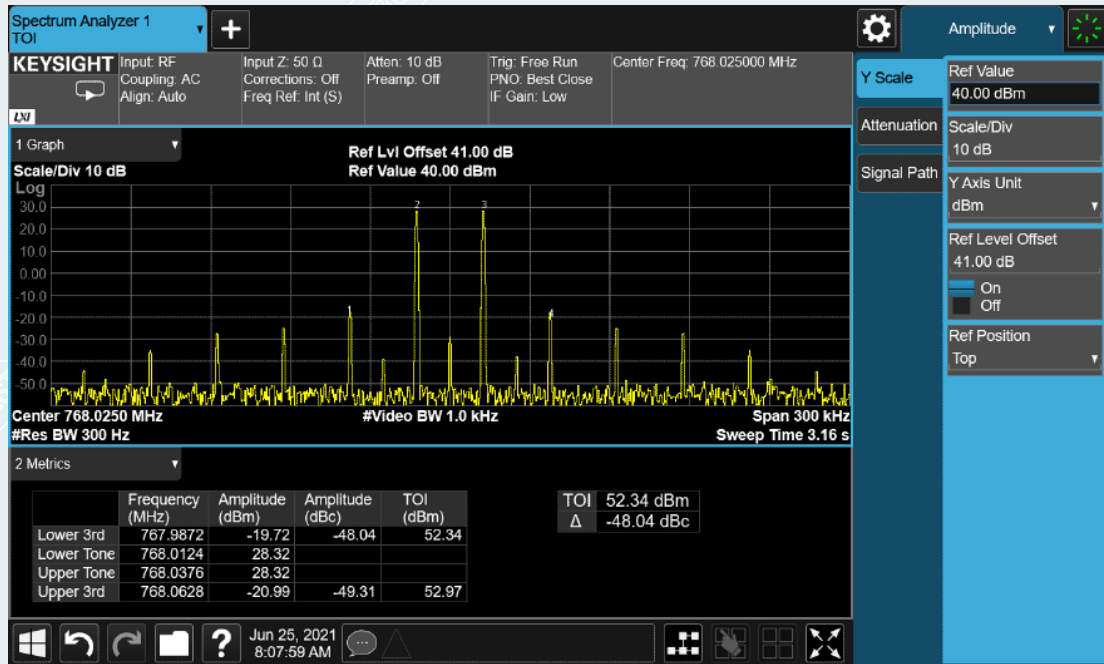
High Frequency and With the ALC threshold level



High Frequency and With the input signal amplitude set 3 dB above the ALC threshold

10.8.5.1.2 Channel bandwidth 25kHz

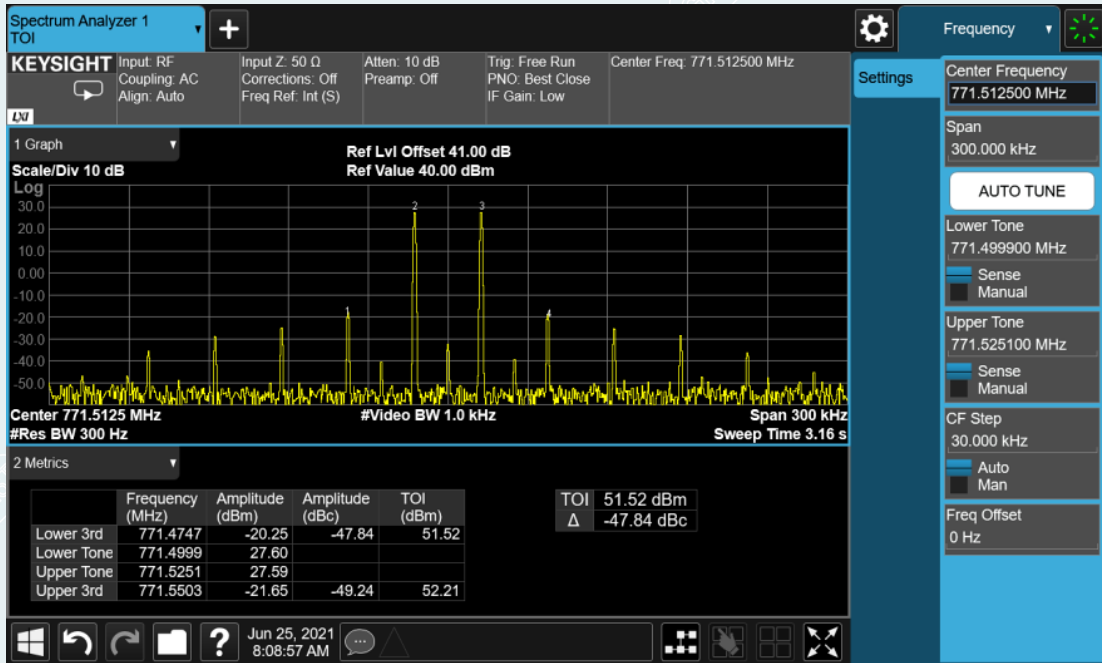
10.8.5.1.2.1 Downlink



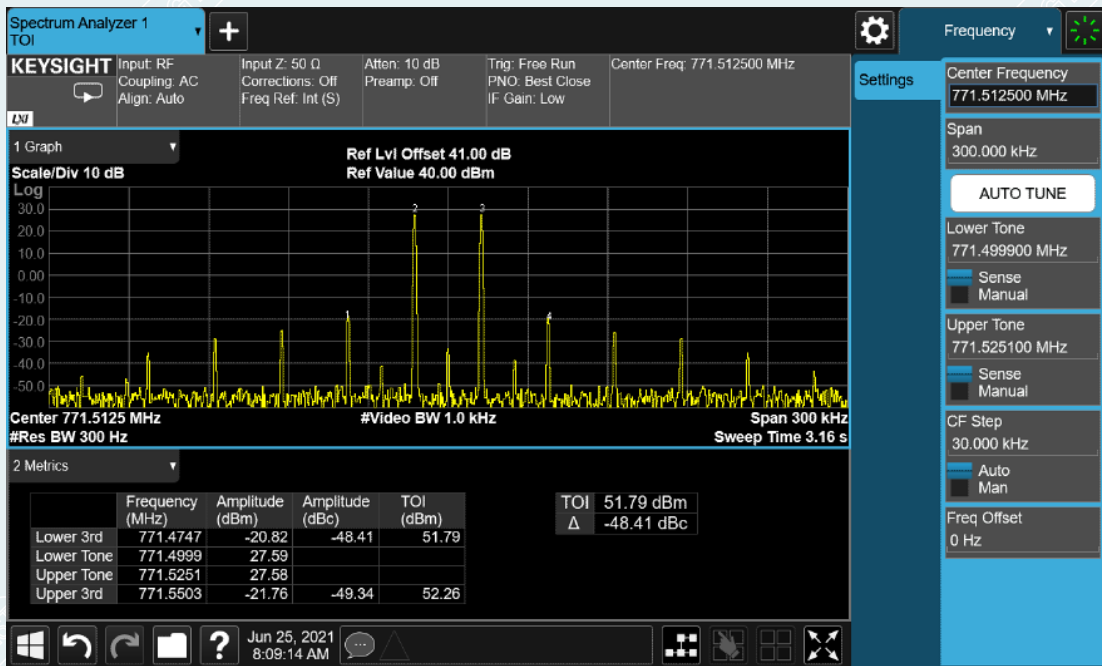
Low Frequency and With the ALC threshold level



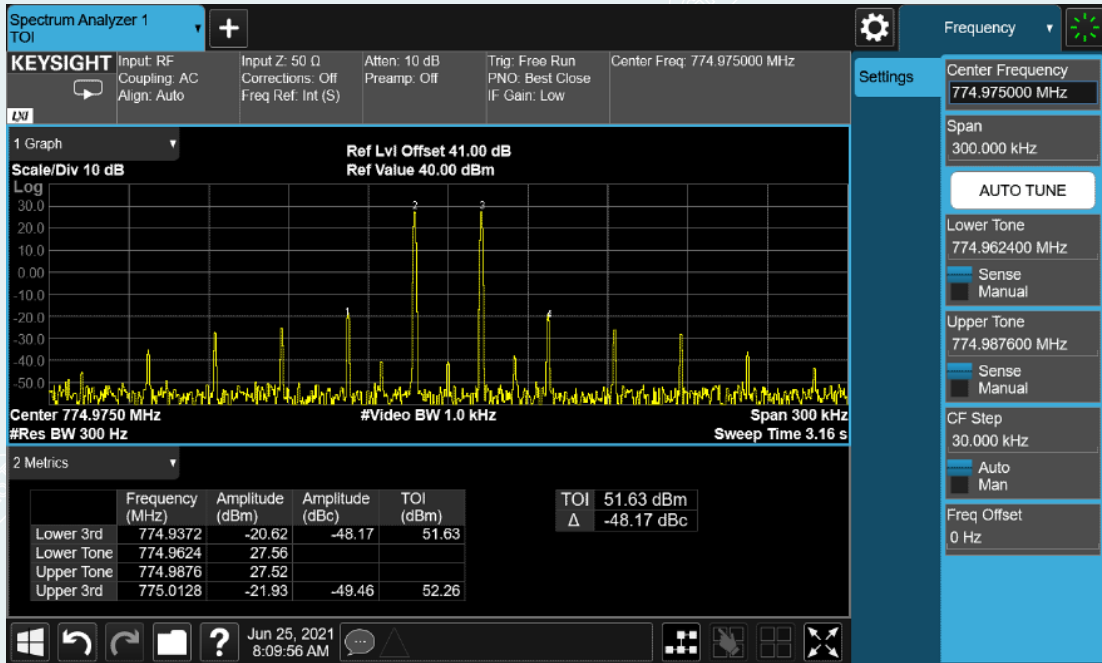
Low Frequency and With the input signal amplitude set 3 dB above the ALC threshold



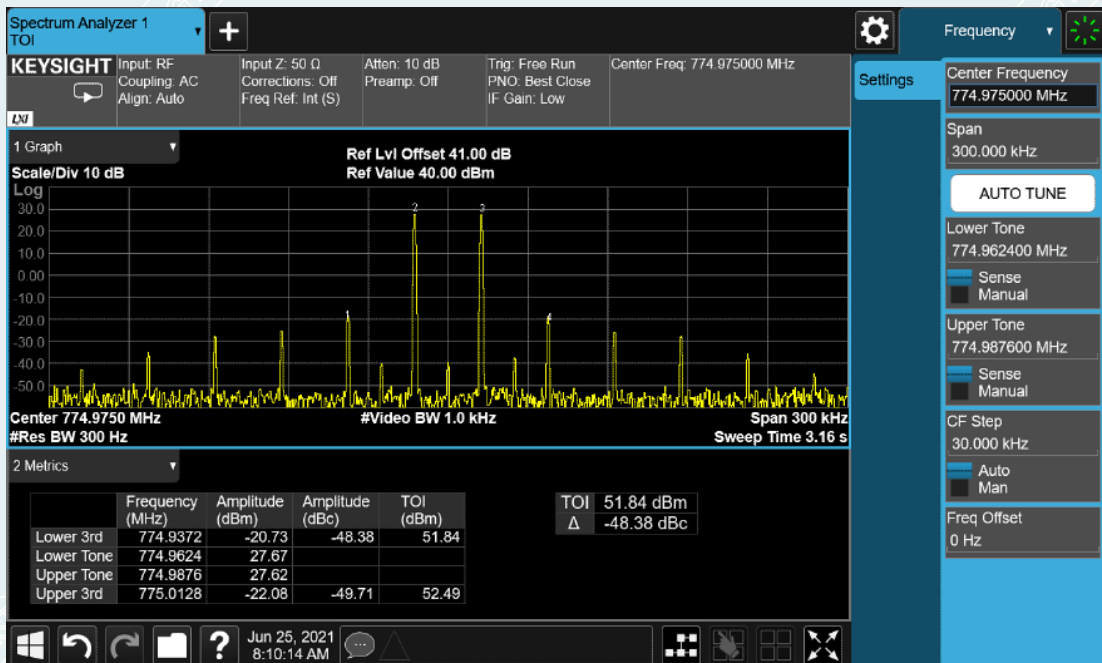
Mid Frequency and With the ALC threshold level



Mid Frequency and With the input signal amplitude set 3 dB above the ALC threshold

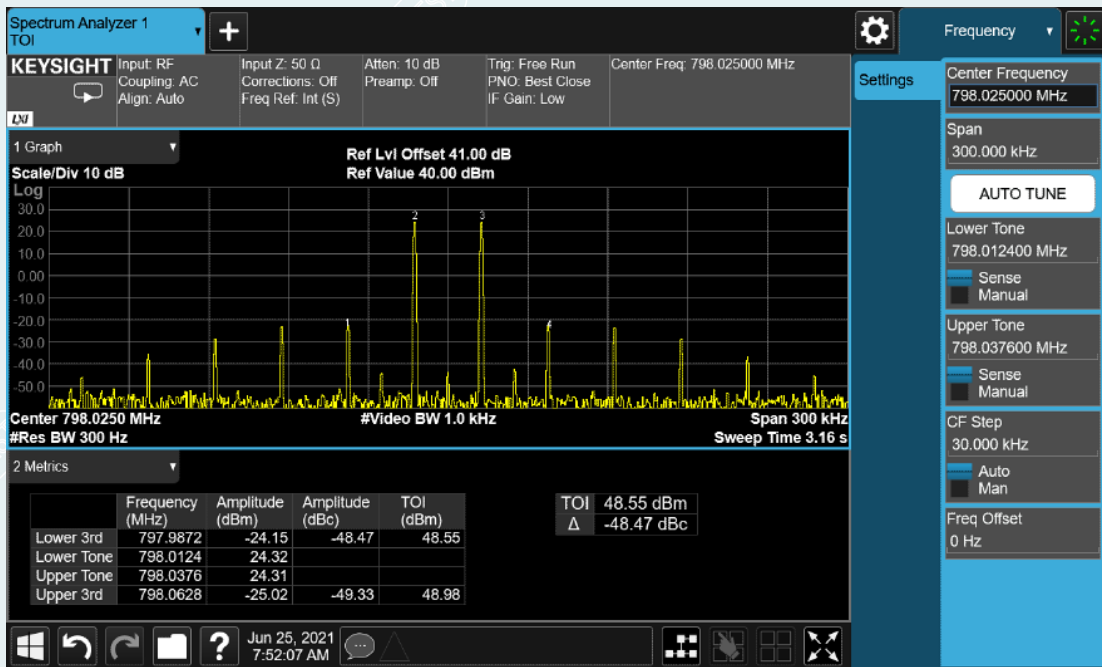


High Frequency and With the ALC threshold level

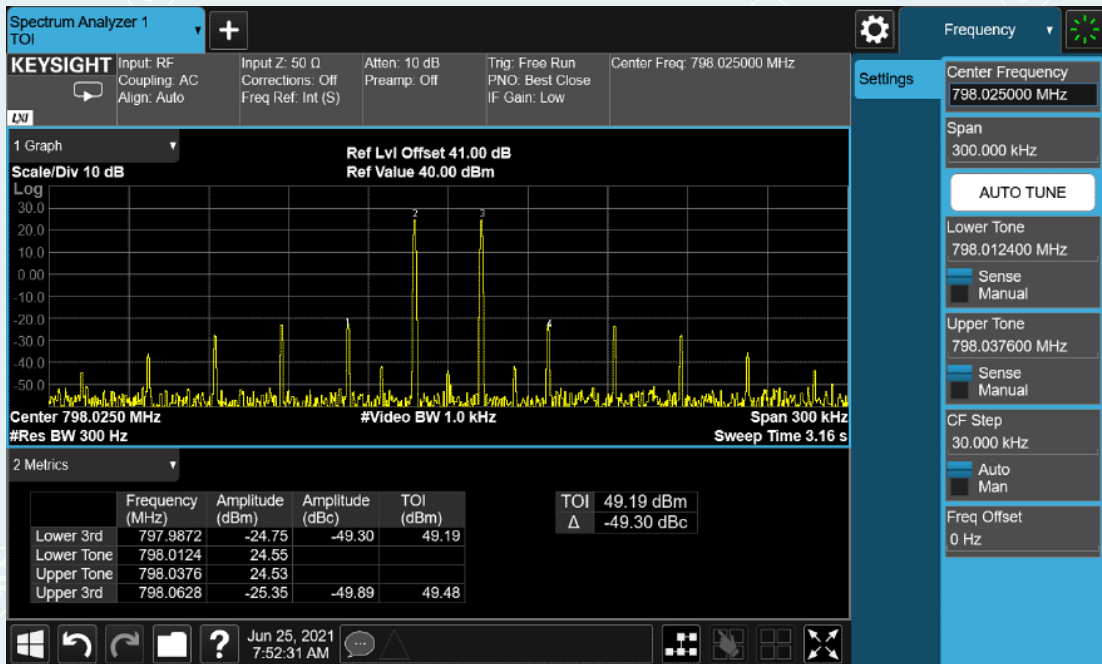


High Frequency and With the input signal amplitude set 3 dB above the ALC threshold

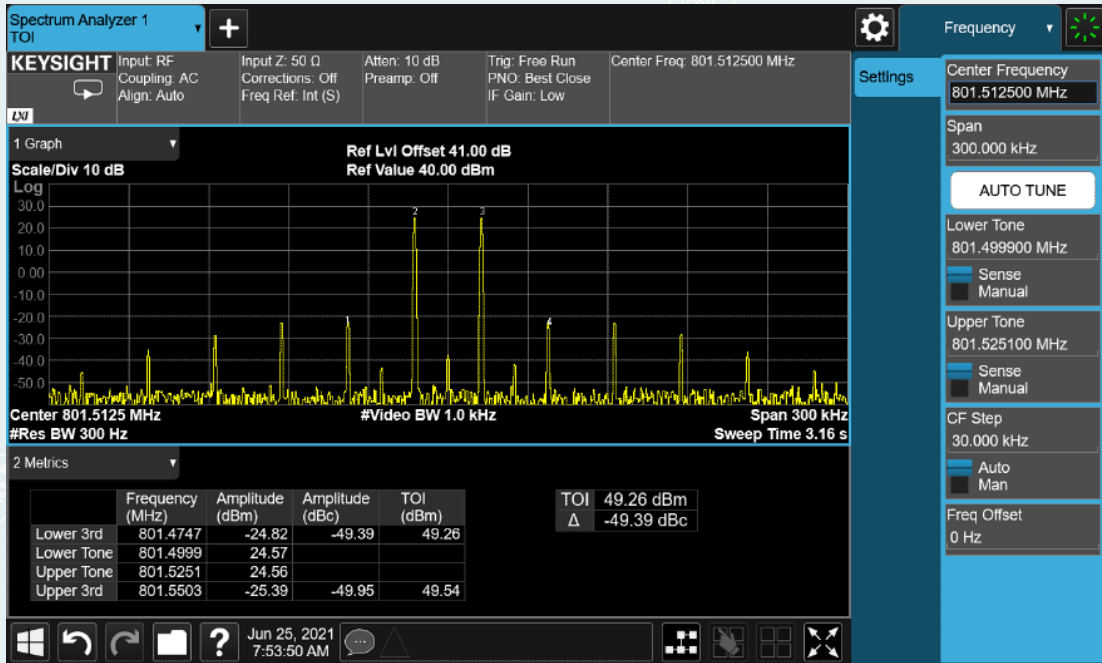
10.8.5.1.2.2 Uplink



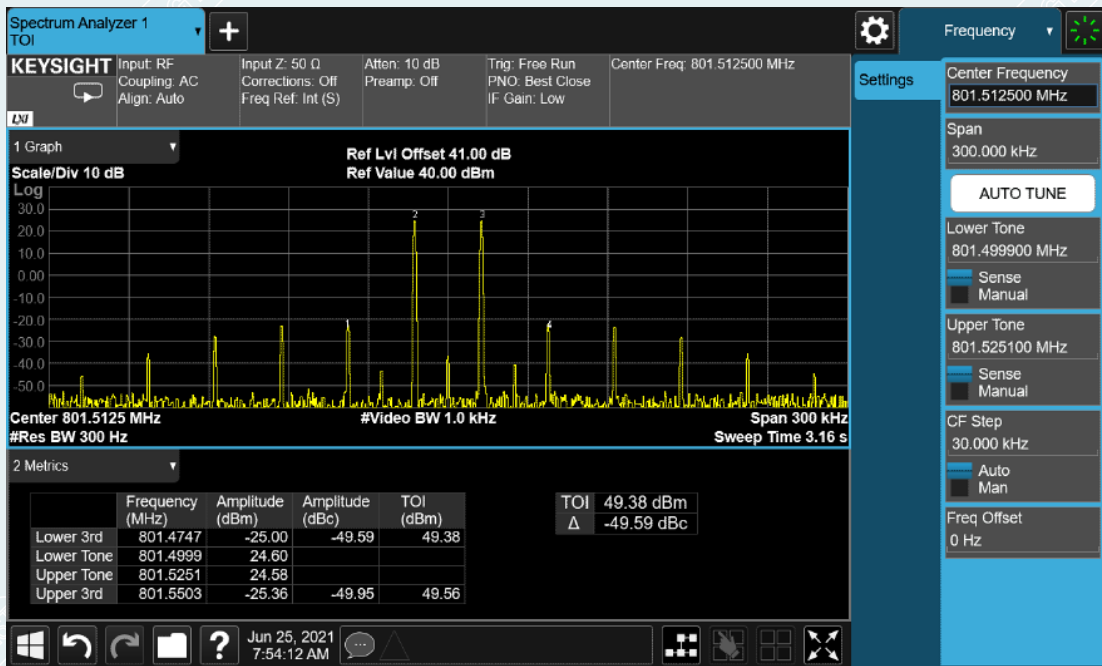
Low Frequency and With the ALC threshold level



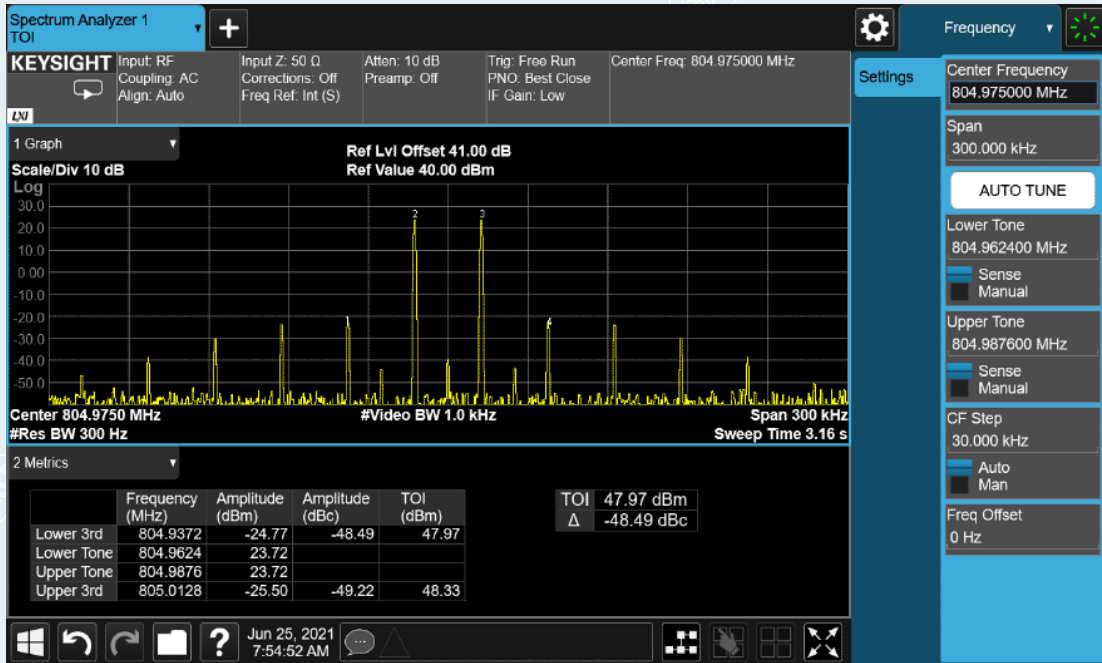
Low Frequency and With the input signal amplitude set 3 dB above the ALC threshold



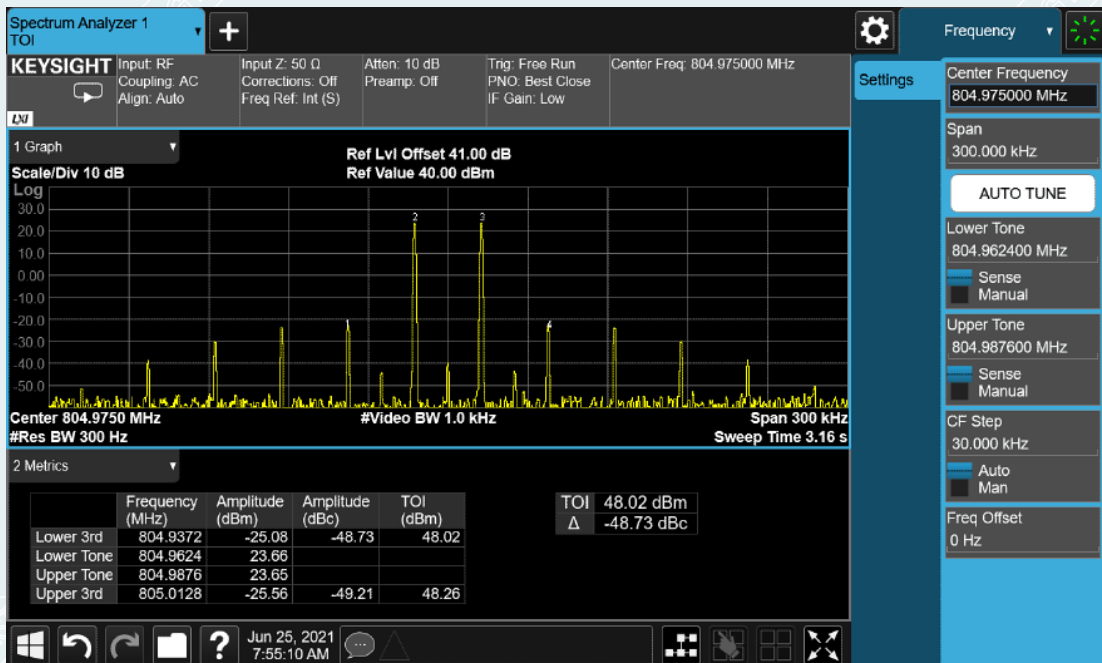
Mid Frequency and With the ALC threshold level



Mid Frequency and With the input signal amplitude set 3 dB above the ALC threshold



High Frequency and With the ALC threshold level

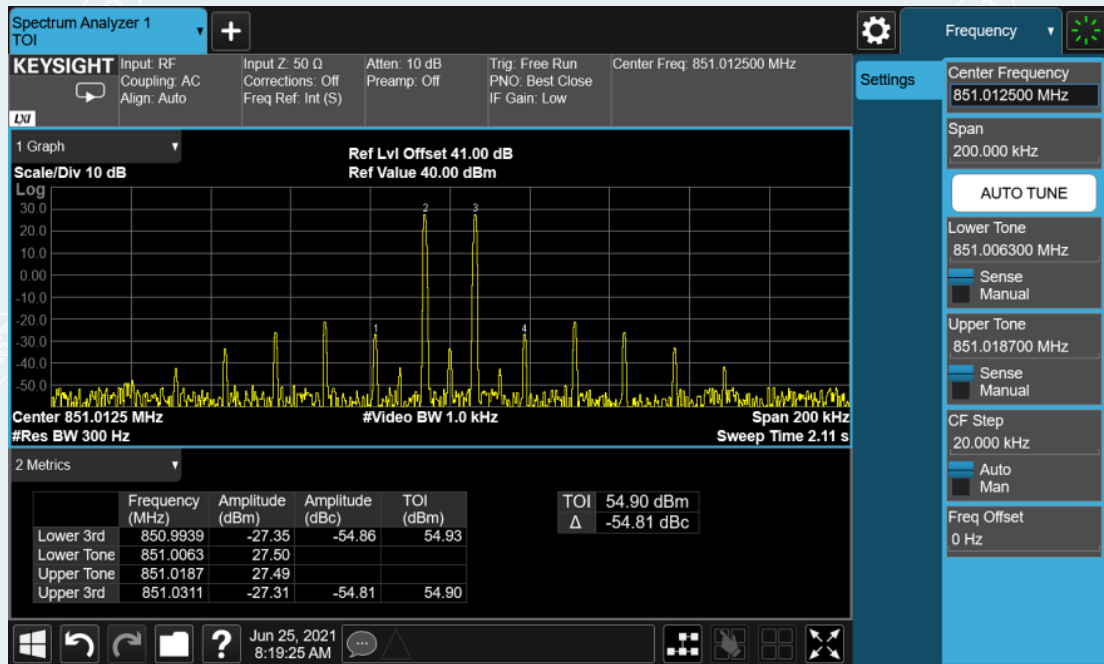


High Frequency and With the input signal amplitude set 3 dB above the ALC threshold

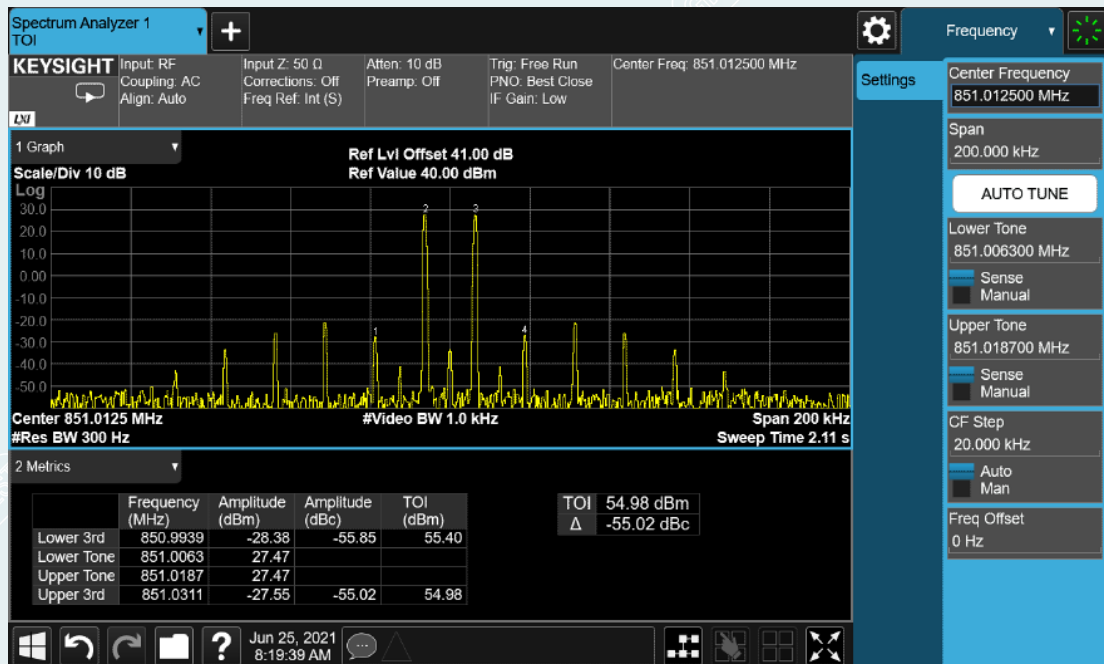
10.8.5.2 800MHz Band

10.8.5.2.1 Channel bandwidth 12.5kHz

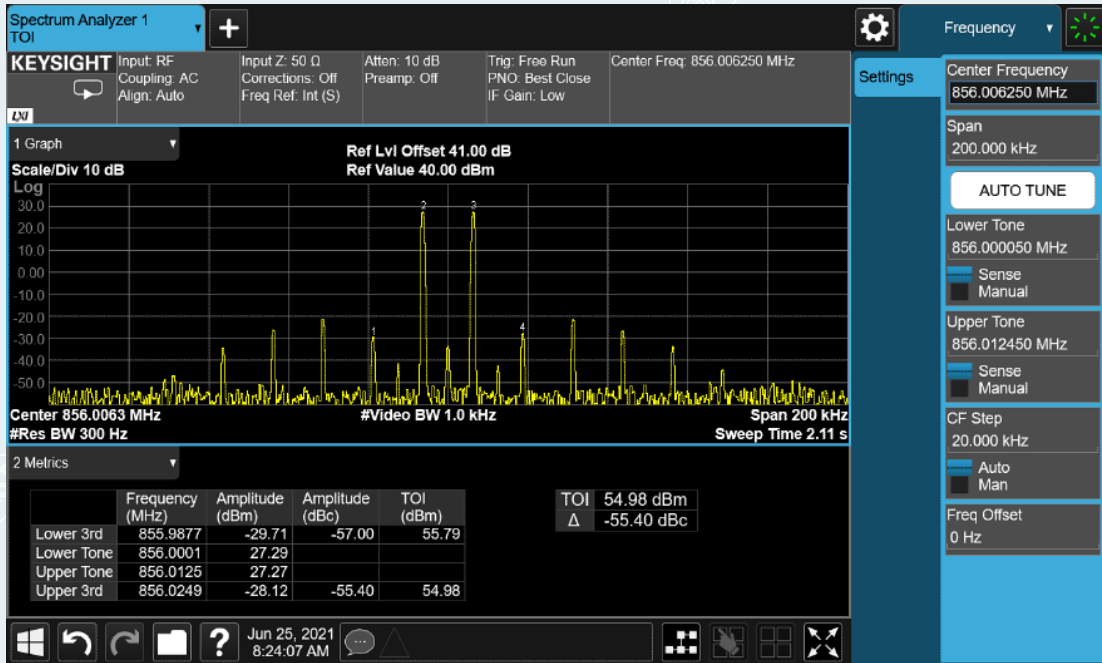
10.8.5.2.1.1 Downlink



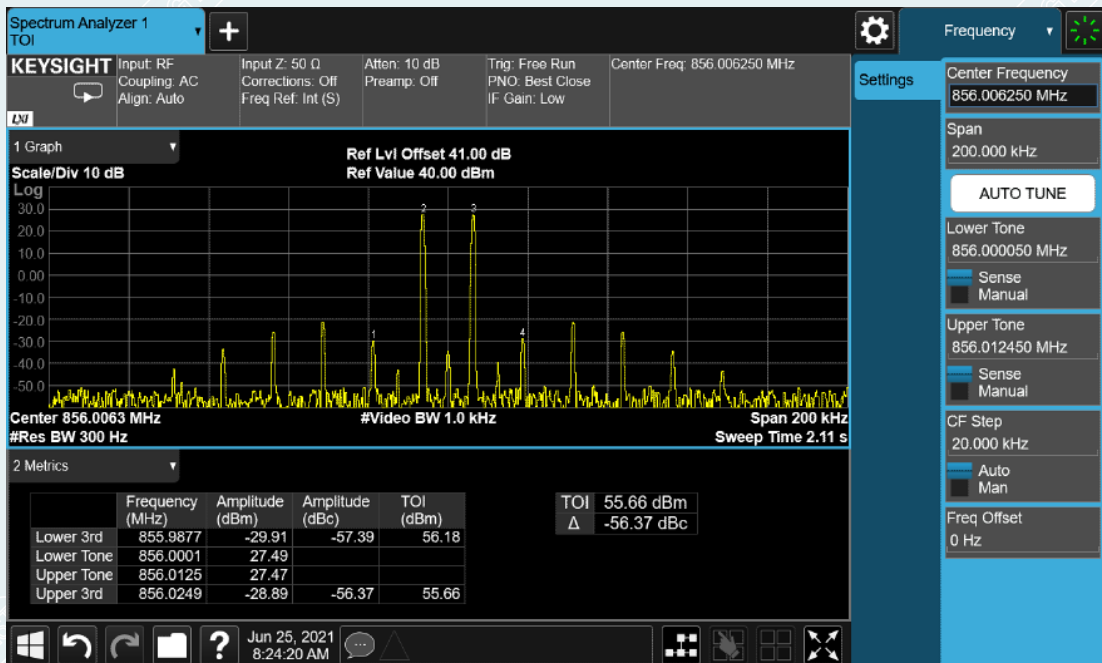
Low Frequency and With the ALC threshold level



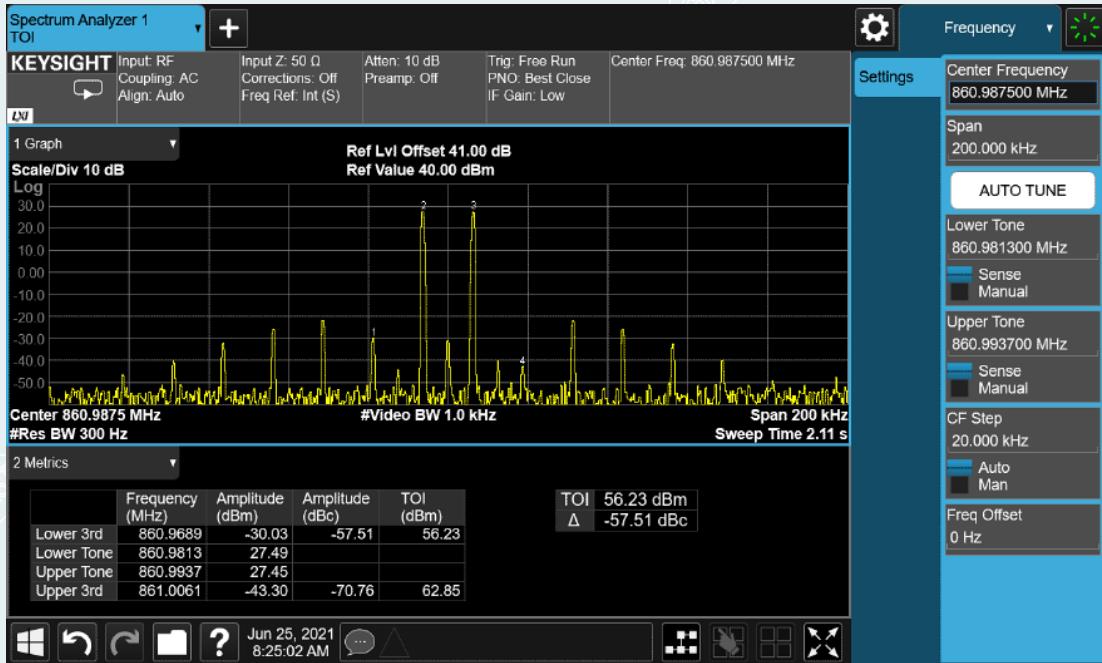
Low Frequency and With the input signal amplitude set 3 dB above the ALC threshold



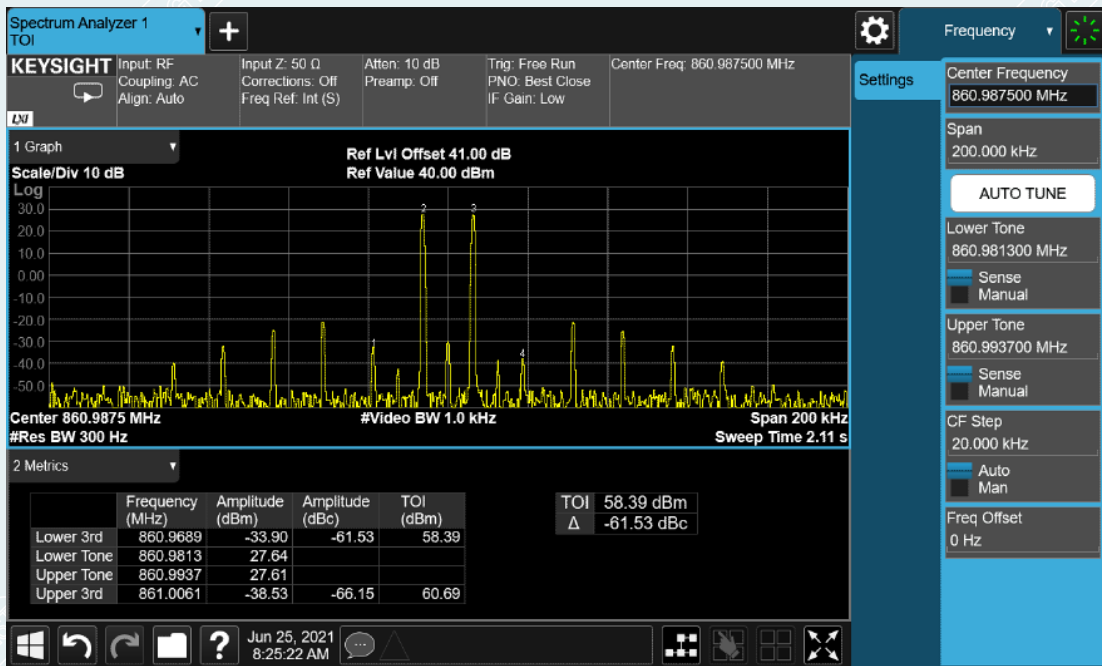
Mid Frequency and With the ALC threshold level



Mid Frequency and With the input signal amplitude set 3 dB above the ALC threshold

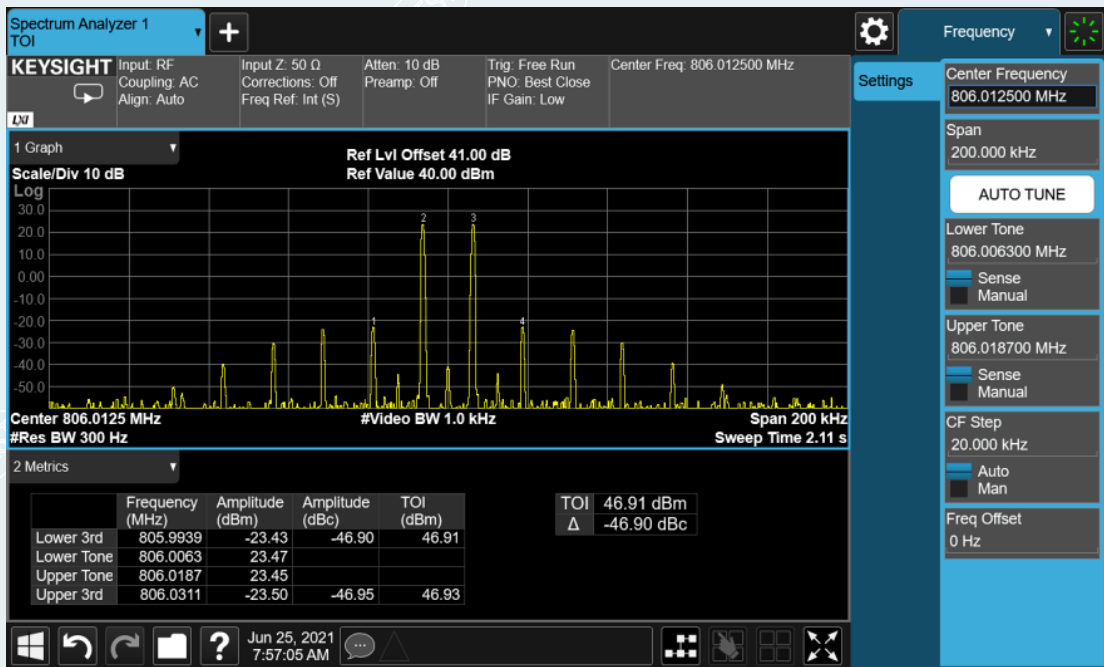


High Frequency and With the ALC threshold level

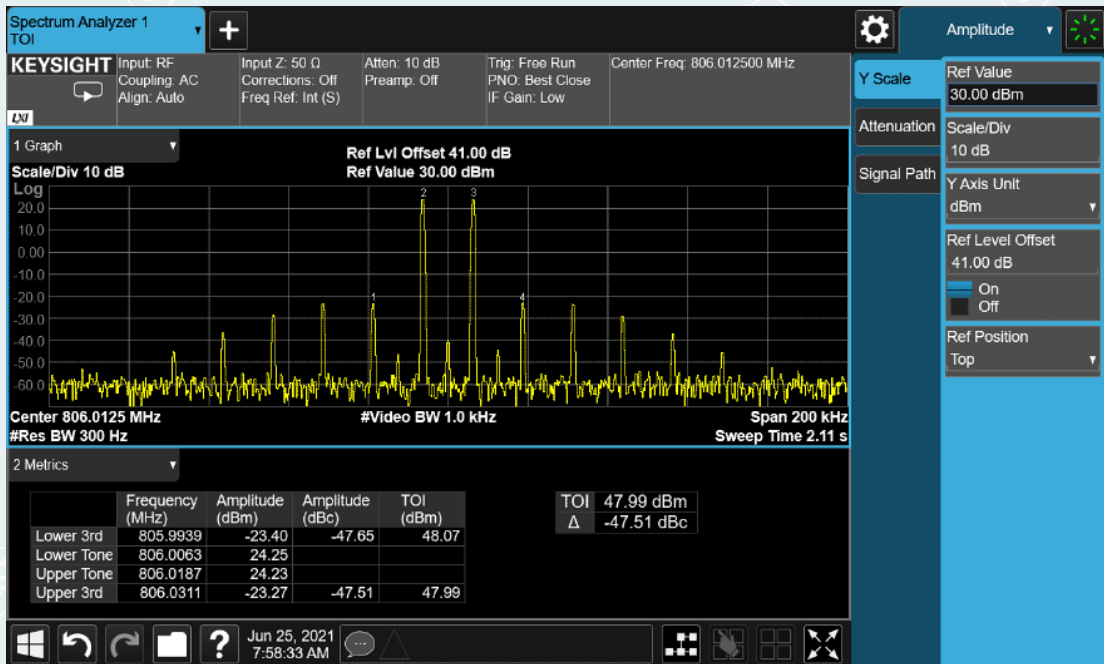


High Frequency and With the input signal amplitude set 3 dB above the ALC threshold

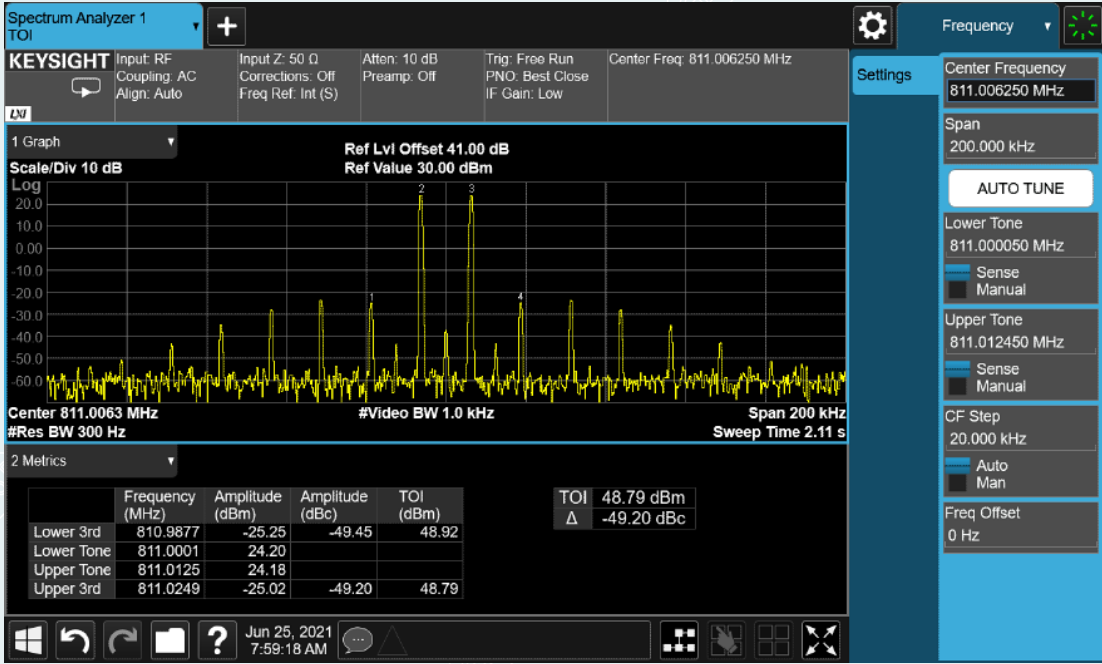
10.8.5.2.1.2 Uplink



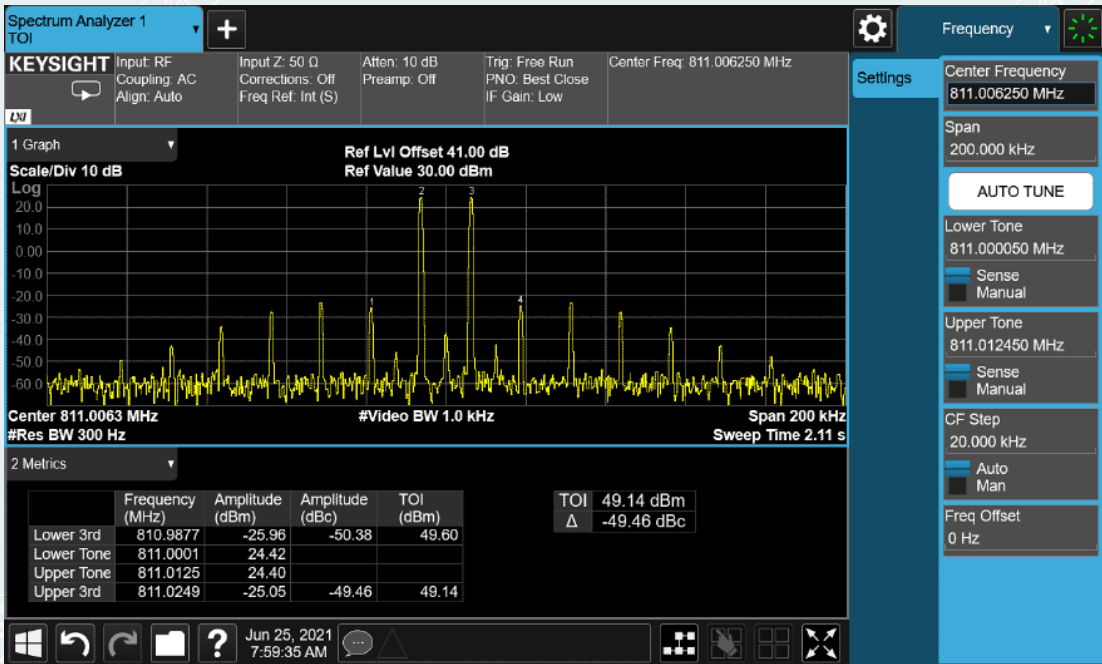
Low Frequency and With the ALC threshold level



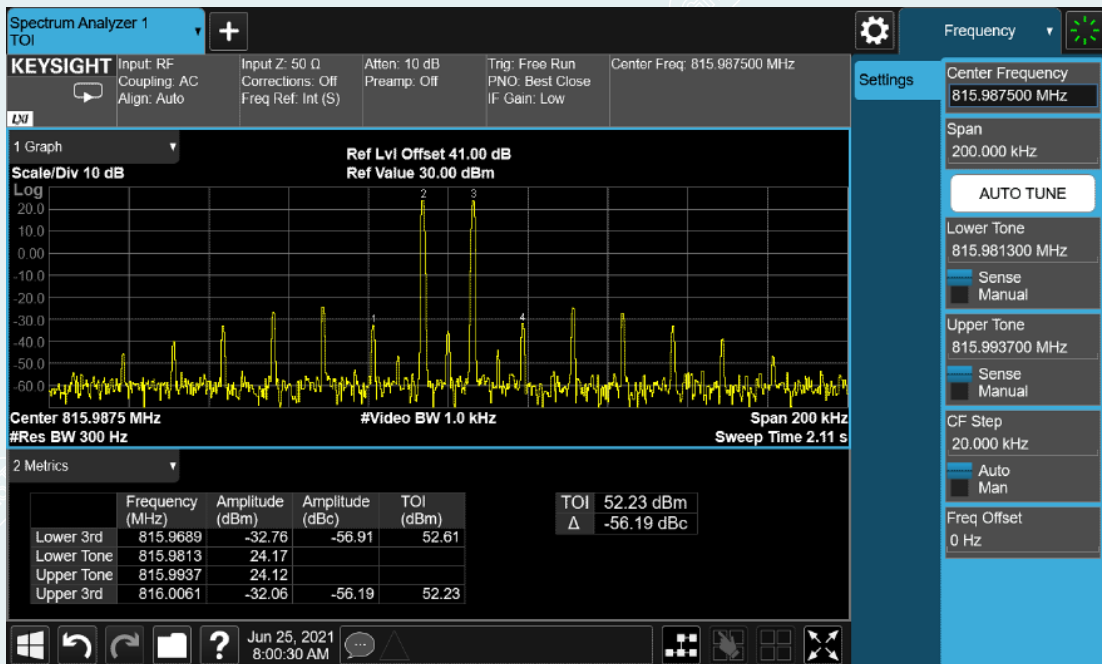
Low Frequency and With the input signal amplitude set 3 dB above the ALC threshold



Mid Frequency and With the ALC threshold level



Mid Frequency and With the input signal amplitude set 3 dB above the ALC threshold



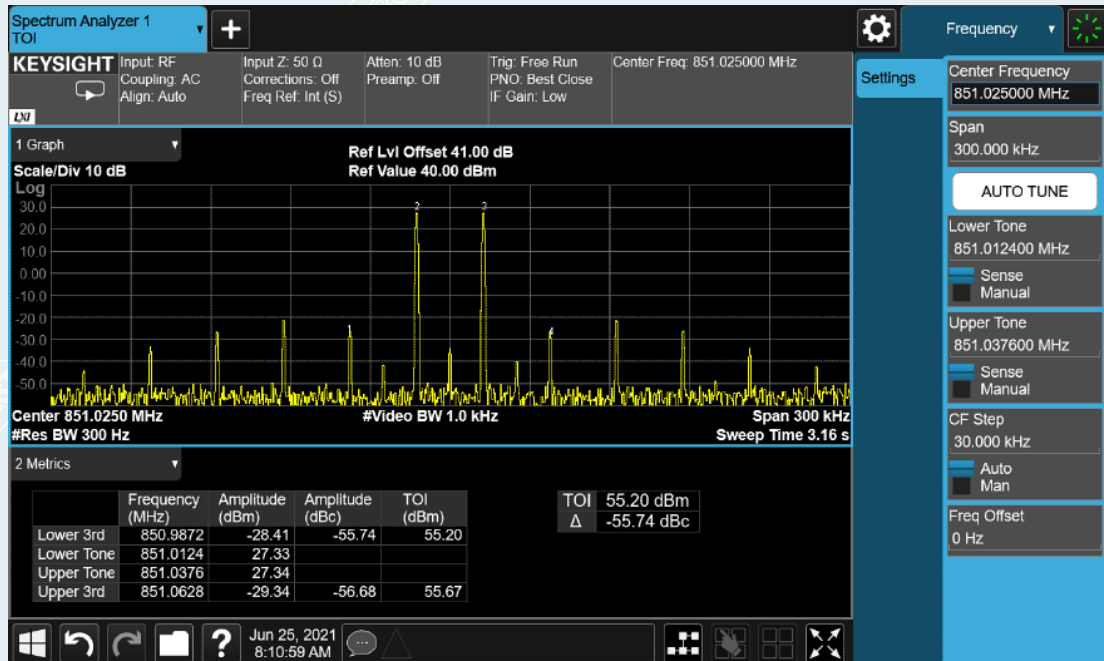
High Frequency and With the ALC threshold level



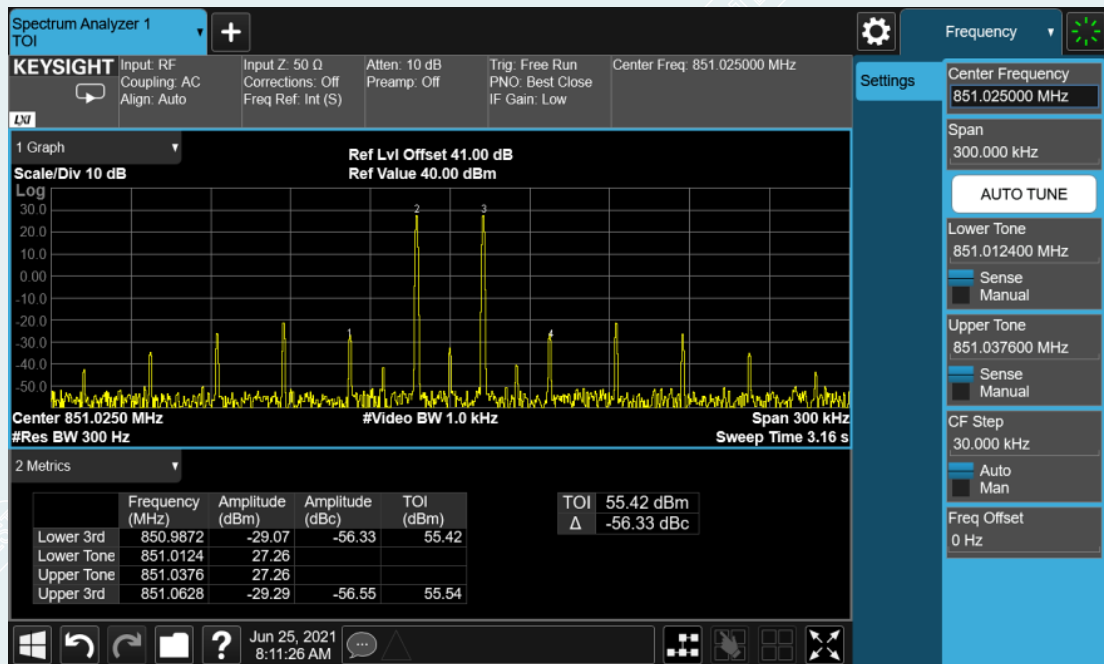
High Frequency and With the input signal amplitude set 3 dB above the ALC threshold

10.8.5.2.2 Channel bandwidth 25kHz

10.8.5.2.2.1 Downlink



Low Frequency and With the ALC threshold level



Low Frequency and With the input signal amplitude set 3 dB above the ALC threshold