

10.6.4.2.5. 25kHz Analog FM mode

Test link	Freq. (MHz)	EUT Max. output power (dBm)	Max. Ant Gain(dBi)	Duty Cycle (%)	ERP (W)	ERP Limit (W)	AGC Mode
Down	450.0125	36.2	0	100	4.2	5.0	-0.5dB Below
	450.0125	36.2	0	100	4.2	5.0	+3.0dB above
	479.0	36.6	0	100	4.6	5.0	-0.5dB Below
	479.0	36.6	0	100	4.6	5.0	+3.0dB above
	508.9875	35.8	0	100	3.8	5.0	-0.5dB Below
	508.9875	35.8	0	100	3.8	5.0	+3.0dB above
Up	455.0125	27.3	9.0	100	4.3	5.0	-0.5dB Below
	455.0125	27.4	9.0	100	4.4	5.0	+3.0dB above
	484.0	27.0	9.0	100	4.0	5.0	-0.5dB Below
	484.0	27.1	9.0	100	4.1	5.0	+3.0dB above
	511.9875	26.9	9.0	100	3.9	5.0	-0.5dB Below
	511.9875	26.9	9.0	100	3.9	5.0	+3.0dB above

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10.7. Noise figure

Test requirement: KDB 935210 D05 clause 4.6
 FCC PART 90.219 (e)(2)
 Test Method: KDB 935210 D05/4.6

10.7.1. Requirements

According to FCC PART 90§90.219 (e) (2) requirement, the noise figure limit of a signal booster must is given in table 10.7-1.

Table 10.7-1 Noise figure limits

frequency range(MHz)	Max. Noise figure limit(dB)
450~512	9

10.7.2. Test configuration

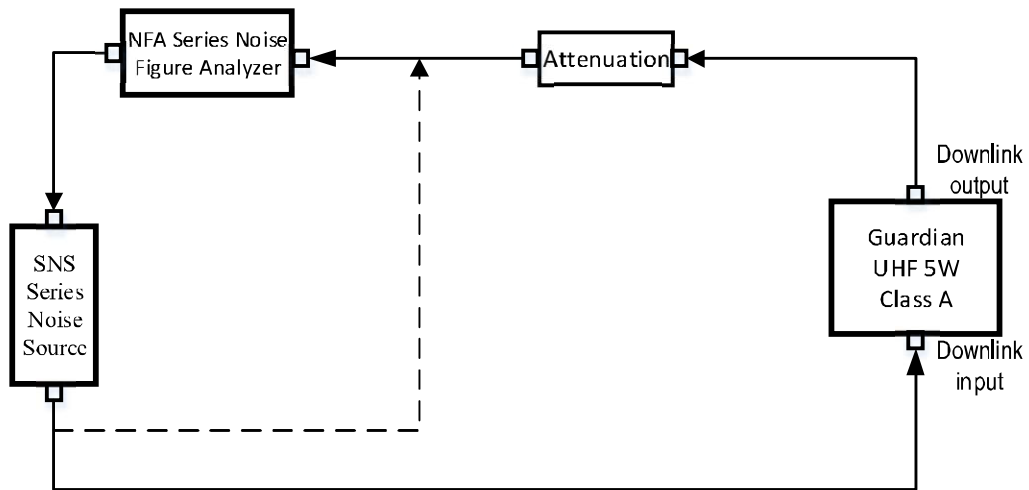


Figure 10.7-1 Downlink test connection diagram

NOTE: The green dotted line is the instrument calibration path.

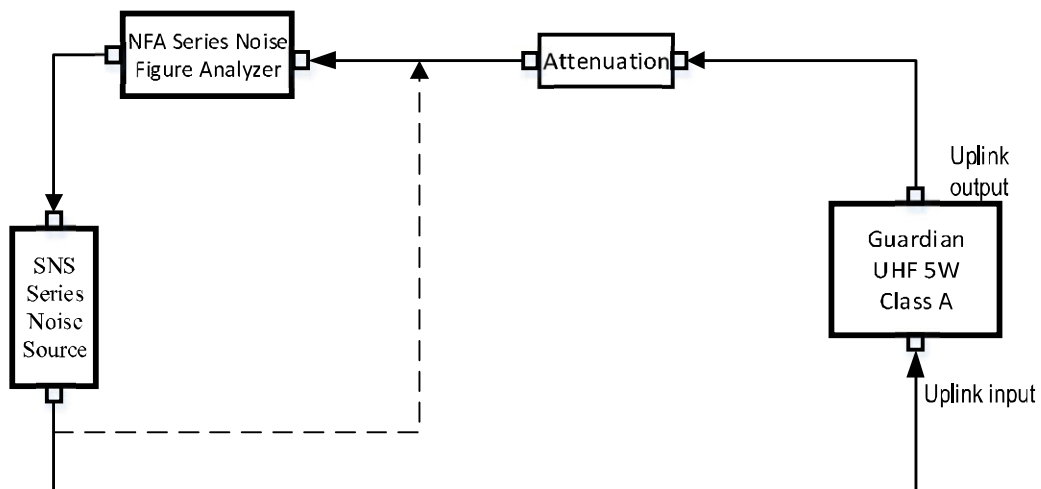


Figure 10.7-2 Uplink test diagram

NOTE: The green dotted line is the instrument calibration path.

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 400MHz 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 Low, middle and high frequency to be tested and Repeat steps (2) to (4);

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10.7.4. Test results

Test Date (yy-mm-dd): 2024-02-22

Normal condition: Temp: 24.4°C, Humid: 42%, Atmospheric Pressure:101kpa

Supply Voltage: DC +24V

Test link	Test frequency range (MHz)	Max. Limit (dB)	Noise figure data(dB)	Margin (dB)	Result
Downlink	450~512	9.0	3.04	5.96	PASS
Uplink	450~512	9.0	2.19	6.81	PASS

NOTE: Margin= specification limit - Noise figure data.

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10.7.5. Test screenshot

10.7.5.1. Downlink

Agilent 14:18:38 Feb 22, 2024

DUT Amplifier Sys Downconv Off

Freq	NoiseFig dB	Gain dB
450.0000 MHz	1.655	87.151
451.0000 MHz	1.913	89.760
452.0000 MHz	1.742	90.092
453.0000 MHz	1.789	90.203
454.0000 MHz	1.636	90.436
455.0000 MHz	1.736	90.817
456.0000 MHz	1.800	90.882
457.0000 MHz	1.758	90.975
458.0000 MHz	1.789	91.155
459.0000 MHz	1.829	91.366
460.0000 MHz	1.739	91.371
461.0000 MHz	2.630	91.662
462.0000 MHz	1.788	91.475
463.0000 MHz	1.854	91.888
464.0000 MHz	1.942	91.739

Start 450.00 MHz BW 1 MHz Points 63 Stop 512.00 MHz
 Tcold 296.50 K Avgs Off Att 5/-- dB Loss On Corr

Agilent 14:19:11 Feb 22, 2024

DUT Amplifier Sys Downconv Off

Freq	NoiseFig dB	Gain dB
463.0000 MHz	1.854	91.888
464.0000 MHz	1.942	91.739
465.0000 MHz	1.904	91.525
466.0000 MHz	1.892	91.899
467.0000 MHz	1.851	91.772
468.0000 MHz	1.768	91.901
469.0000 MHz	1.701	91.808
470.0000 MHz	1.962	91.658
471.0000 MHz	1.941	91.718
472.0000 MHz	1.857	91.947
473.0000 MHz	2.025	91.695
474.0000 MHz	2.129	89.250

DUT Amplifier Sys Downconv Off

Freq	NoiseFig dB	Gain dB
470.0000 MHz	1.993	90.854
471.0000 MHz	1.854	90.915
472.0000 MHz	1.997	90.983
473.0000 MHz	1.869	90.945
474.0000 MHz	1.846	91.016
475.0000 MHz	2.033	90.745
476.0000 MHz	2.087	90.904
477.0000 MHz	1.796	91.112
478.0000 MHz	2.023	90.638
479.0000 MHz	1.893	91.000
480.0000 MHz	2.022	91.088
481.0000 MHz	2.131	90.663
482.0000 MHz	2.026	90.982
483.0000 MHz	2.238	90.674
484.0000 MHz	2.341	90.640

DUT Amplifier Sys Downconv Off

Freq	NoiseFig dB	Gain dB
484.0000 MHz	2.341	90.640
485.0000 MHz	2.099	90.580
486.0000 MHz	2.312	90.577
487.0000 MHz	2.189	90.531
488.0000 MHz	2.230	90.598
489.0000 MHz	2.366	90.364
490.0000 MHz	2.352	90.506
491.0000 MHz	2.410	87.972

490.0000 MHz	2.357	87.968
491.0000 MHz	2.319	90.247
492.0000 MHz	2.444	90.363
493.0000 MHz	2.459	90.464
494.0000 MHz	2.448	90.212
495.0000 MHz	2.369	90.558
496.0000 MHz	2.387	90.257
497.0000 MHz	2.571	90.215
498.0000 MHz	2.515	90.201

Freq	NoiseFig dB	Gain dB
498.0000 MHz	2.515	90.201
499.0000 MHz	2.450	89.902
500.0000 MHz	2.740	89.583
501.0000 MHz	2.532	89.505
502.0000 MHz	2.575	89.323
503.0000 MHz	2.692	89.168
504.0000 MHz	2.534	89.188
505.0000 MHz	2.802	88.839
506.0000 MHz	2.772	88.927
507.0000 MHz	3.033	88.322
508.0000 MHz	2.722	88.431
509.0000 MHz	2.872	87.847
510.0000 MHz	2.931	87.178
511.0000 MHz	3.038	86.706
512.0000 MHz	3.032	85.234

10.7.5.2. Uplink

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DUT Amplifier Sys Downconv Off

Freq	NoiseFig dB	Gain dB
450.0000 MHz	1.394	86.582
451.0000 MHz	1.249	89.146
452.0000 MHz	1.217	89.203
453.0000 MHz	1.187	89.253
454.0000 MHz	1.349	89.187
455.0000 MHz	1.219	89.423
456.0000 MHz	1.304	89.490
457.0000 MHz	1.274	89.551
458.0000 MHz	1.313	89.583
459.0000 MHz	1.421	89.350
460.0000 MHz	1.325	89.729
461.0000 MHz	1.337	89.738
462.0000 MHz	1.207	89.850
463.0000 MHz	2.190	90.016
464.0000 MHz	1.253	90.218

Start 450.00 MHz BW 1 MHz Points 63 Stop 512.00 MHz
Tcold 296.50 K Avgs Off Att 0/-- dB Loss On Corr

472.0000 MHz	1.423	87.818
473.0000 MHz	1.389	90.070
474.0000 MHz	1.159	89.897
475.0000 MHz	1.596	89.888
476.0000 MHz	1.394	89.796
477.0000 MHz	1.418	90.152
478.0000 MHz	1.412	89.889
479.0000 MHz	1.422	90.050
480.0000 MHz	1.367	89.875
481.0000 MHz	1.445	89.757
482.0000 MHz	1.250	89.673
483.0000 MHz	1.331	89.451
484.0000 MHz	1.454	89.150

Start 450.00 MHz BW 1 MHz Points 63 Stop 512.00 MHz
 Tcold 296.50 K Aavg Off Att 0/-- dB Loss On Corr

Freq	NoiseFig dB	Gain dB
484.0000 MHz	1.454	89.150
485.0000 MHz	1.558	89.097
486.0000 MHz	1.417	88.927
487.0000 MHz	1.522	88.922
488.0000 MHz	1.495	88.617
489.0000 MHz	1.670	88.589
490.0000 MHz	1.474	88.538
491.0000 MHz	1.700	88.220
492.0000 MHz	1.451	88.462
493.0000 MHz	1.642	88.373
494.0000 MHz	1.265	88.457
495.0000 MHz	1.665	88.306
496.0000 MHz	1.740	85.480

490.0000 MHz	1.758	86.948
491.0000 MHz	1.495	89.313
492.0000 MHz	1.394	89.372
493.0000 MHz	1.701	89.162
494.0000 MHz	1.550	89.074
495.0000 MHz	1.741	88.997
496.0000 MHz	1.421	88.904
497.0000 MHz	1.703	88.899
498.0000 MHz	1.388	88.887

498.0000 MHz	1.388	88.887
499.0000 MHz	1.480	88.648
500.0000 MHz	1.649	88.395
501.0000 MHz	1.629	88.289
502.0000 MHz	1.678	88.096
503.0000 MHz	1.532	88.185
504.0000 MHz	1.734	87.939
505.0000 MHz	1.760	87.973
506.0000 MHz	1.584	87.975
507.0000 MHz	1.731	87.654
508.0000 MHz	1.784	87.576
509.0000 MHz	1.674	87.225
510.0000 MHz	2.036	85.536
511.0000 MHz	1.729	86.349
512.0000 MHz	1.930	85.552

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).

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10.8.2. Test configuration

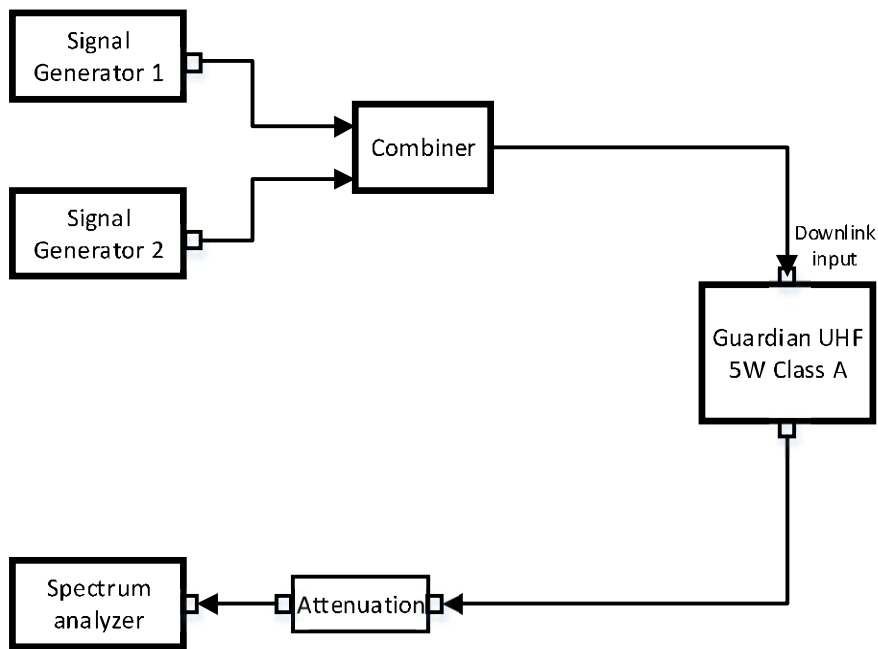


Figure 10.8-1 Downlink test connection diagram

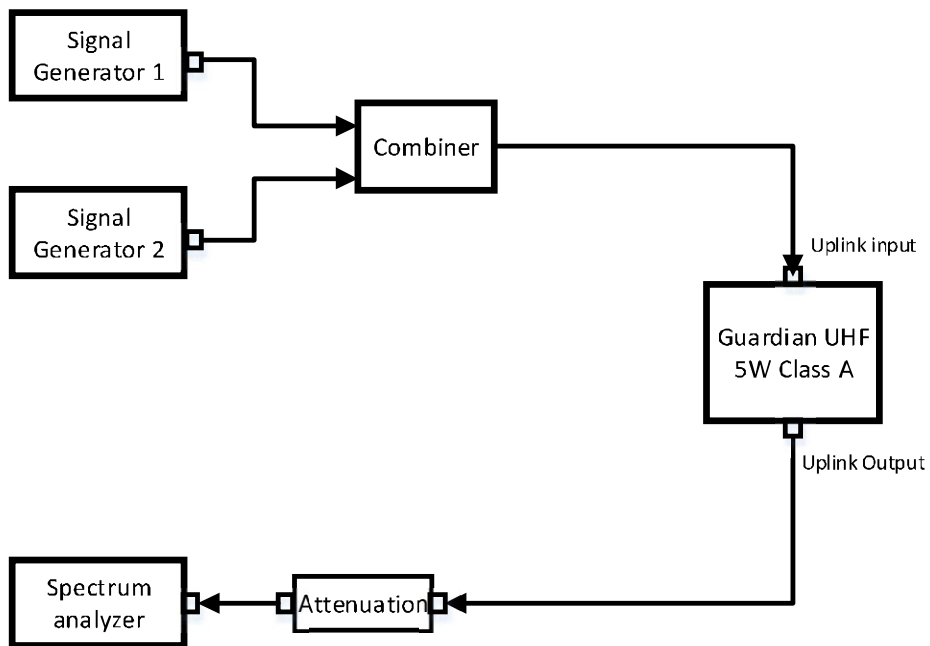


Figure 10.8-2 Uplink test connection diagram

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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 -13dBm ($P_{(dBm)}=(43+10*\log(P_{(W)}))$).

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10.8.4. Test results

Test Date (yy-mm-dd): 2024-02-02

Normal condition: Temp: 22.8°C, Humid: 36%, Atmospheric Pressure:101kpa

Supply Voltage: DC +24V

10.8.4.1. Downlink transmit mode

Test frequency		Intermodulaiton product Limit (dBm)	Max. intermodulation product (dBm)	Margin (dB)	Result
(1) With the ALC threshold level					
Channel Bandwidth: 6.25kHz	Low frequency: f1:450.00313MHz f2:450.00938MHz	-13.0	-18.6	5.6	PASS
	Mid frequency: f1:479.0MHz f2:479.00625MHz	-13.0	-17.9	4.9	PASS
	High frequency: f1:508.99063MHz f2:508.99688MHz	-13.0	-21.4	8.4	PASS
Channel Bandwidth: 12.5kHz	Low frequency: f1:450.00625MHz f2:450.01875MHz	-13.0	-21.4	8.4	PASS
	Mid frequency: f1:479.0MHz f2:479.0125MHz	-13.0	-18.1	5.1	PASS
	High frequency: f1:508.98125MHz f2:508.99375MHz	-13.0	-19.3	6.3	PASS
Channel Bandwidth: 25kHz	Low frequency: f1:450.0125MHz f2:450.0375MHz	-13.0	-22.3	9.3	PASS
	Mid frequency: f1:479.0MHz f2:479.025MHz	-13.0	-18.6	5.6	PASS
	High frequency: f1:508.9625MHz f2:508.9875MHz	-13.0	-25.7	12.7	PASS
(2) With the input signal amplitude set 3 dB above the AGC threshold					
Channel Bandwidth: 6.25kHz	Low frequency: f1:450.00313MHz f2:450.00938MHz	-13.0	-18.8	5.8	PASS
	Mid frequency: f1:479.0MHz f2:479.00625MHz	-13.0	-18.1	5.1	PASS
	High frequency: f1:508.99063MHz f2:508.99688MHz	-13.0	-20.9	7.9	PASS
Channel Bandwidth: 12.5kHz	Low frequency: f1:450.00625MHz f2:450.01875MHz	-13.0	-23.0	10.0	PASS
	Mid frequency: f1:479.0MHz f2:479.0125MHz	-13.0	-18.9	5.9	PASS
	High frequency: f1:508.98125MHz f2:508.99375MHz	-13.0	-20.5	7.5	PASS
Channel Bandwidth: 25kHz	Low frequency: f1:450.0125MHz f2:450.0375MHz	-13.0	-23.7	10.7	PASS

	Mid frequency: f1:479.0MHz f2:479.025MHz	-13.0	-19.0	6.0	PASS
	High frequency: f1:508.9625MHz f2:508.9875MHz	-13.0	-18.6	5.6	PASS
NOTE 1: Intermodulation products select the worst data record. NOTE 2: Margin= specification limit -Maximum mark level.					

10.8.4.2. Uplink transmit mode

Test frequency	Intermodulation product Limit (dBm)	Max. intermodulation product (dBm)	Margin (dB)	Result	
(3) With the ALC threshold level					
Channel Bandwidth: 6.25kHz	Low frequency: f1:455.00313MHz f2:455.00938MHz	-13.0	-20.6	7.6	PASS
	Mid frequency: f1:484.0MHz f2:484.00625MHz	-13.0	-23.4	10.4	PASS
	High frequency: f1:511.99063MHz f2:511.99688MHz	-13.0	-21.8	8.8	PASS
Channel Bandwidth: 12.5kHz	Low frequency: f1:455.00625MHz f2:455.01875MHz	-13.0	-22.3	9.3	PASS
	Mid frequency: f1:484.0MHz f2:484.0125MHz	-13.0	-24.5	11.5	PASS
	High frequency: f1:511.98125MHz f2:511.99375MHz	-13.0	-24.7	11.7	PASS
Channel Bandwidth: 25kHz	Low frequency: f1:455.0125MHz f2:455.0375MHz	-13.0	-21.9	8.9	PASS
	Mid frequency: f1:484.0MHz f2:484.025MHz	-13.0	-24.2	11.2	PASS
	High frequency: f1:511.9625MHz f2:511.9875MHz	-13.0	-24.1	11.1	PASS
(4) With the input signal amplitude set 3 dB above the AGC threshold					
Channel Bandwidth: 6.25kHz	Low frequency: f1:455.00313MHz f2:455.00938MHz	-13.0	-20.6	7.6	PASS
	Mid frequency: f1:484.0MHz f2:484.00625MHz	-13.0	-23.1	10.1	PASS
	High frequency: f1:511.99063MHz f2:511.99688MHz	-13.0	-24.1	11.1	PASS
Channel Bandwidth: 12.5kHz	Low frequency: f1:455.00625MHz f2:455.01875MHz	-13.0	-22.2	9.2	PASS
	Mid frequency: f1:484.0MHz f2:484.0125MHz	-13.0	-24.3	11.3	PASS
	High frequency: f1:511.98125MHz f2:511.99375MHz	-13.0	-34.7	21.7	PASS

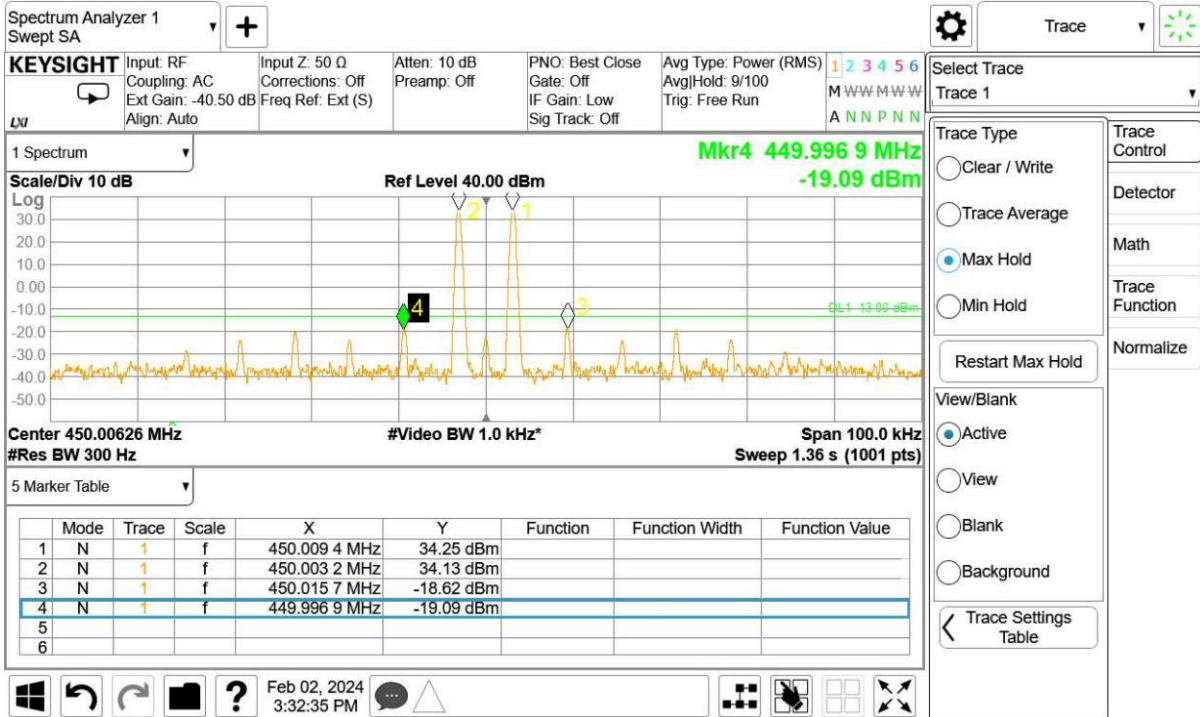
Channel Bandwidth: 25kHz	Low frequency: f1:455.0125MHz f2:455.0375MHz	-13.0	-22.3	9.3	PASS
	Mid frequency: f1:484.0MHz f2:484.025MHz	-13.0	-23.7	10.7	PASS
	High frequency: f1:511.9625MHz f2:511.9875MHz	-13.0	-24.3	11.3	PASS
NOTE 1: Intermodulation products select the worst data record. NOTE 2: Margin= specification limit -Maximum mark level.					

———— The following blanks ————

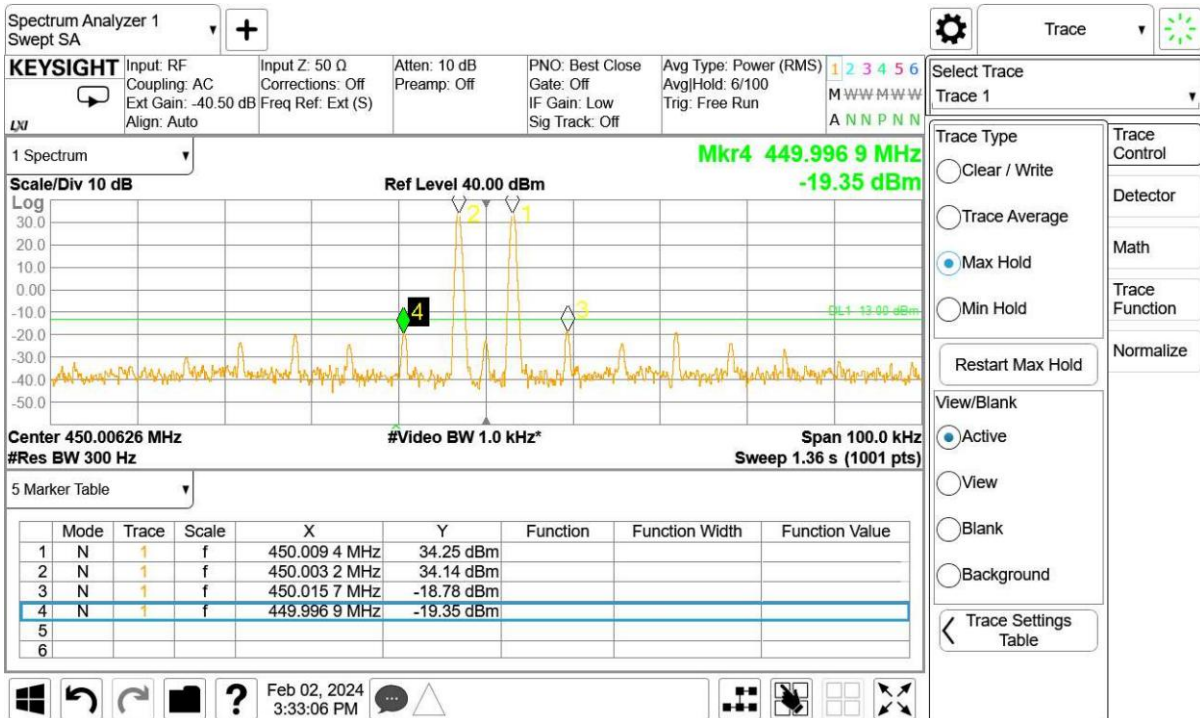
10.8.5. Test screenshot

10.8.5.1. Downlink transmit mode

10.8.5.1.1. Channel Bandwidth:6.25kHz



Low Frequency and With the ALC threshold level



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