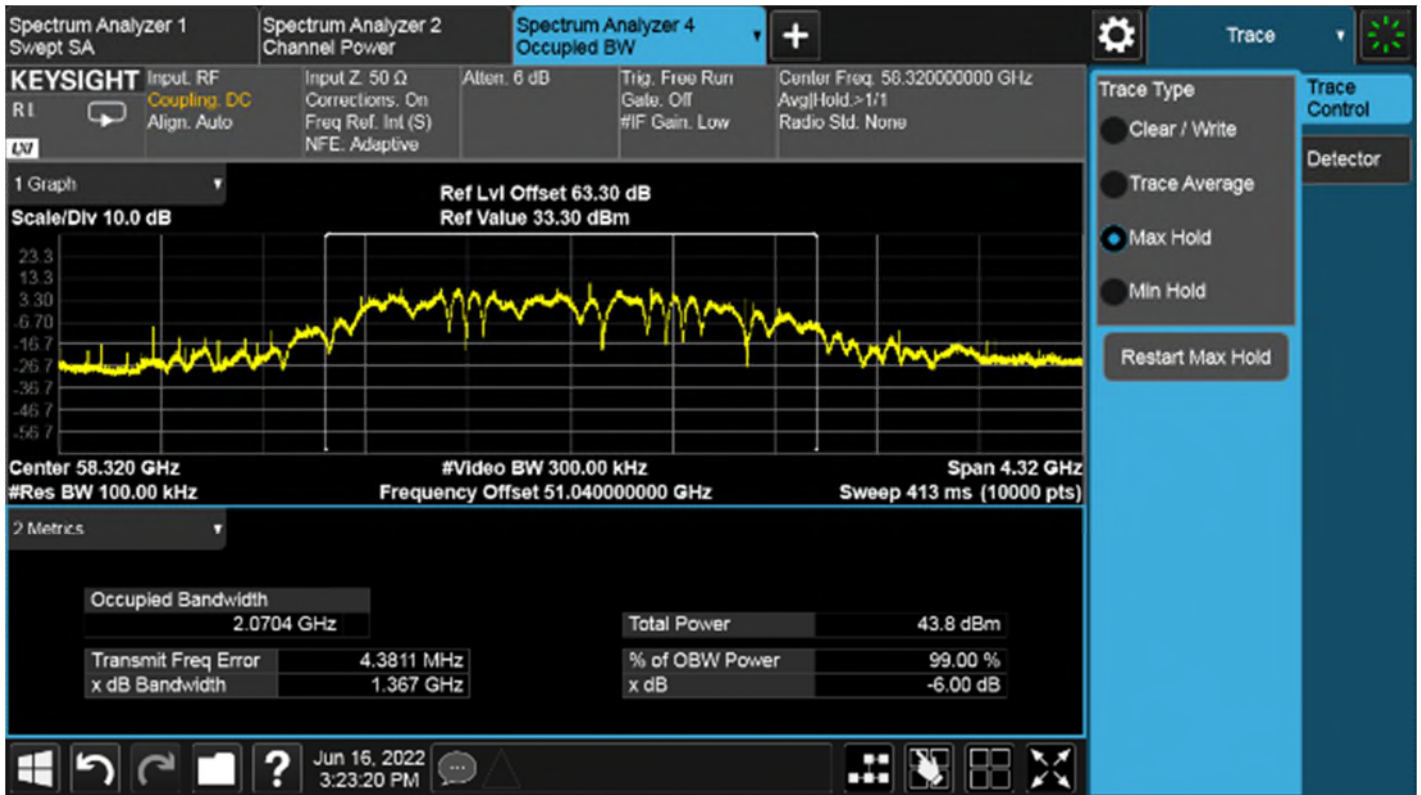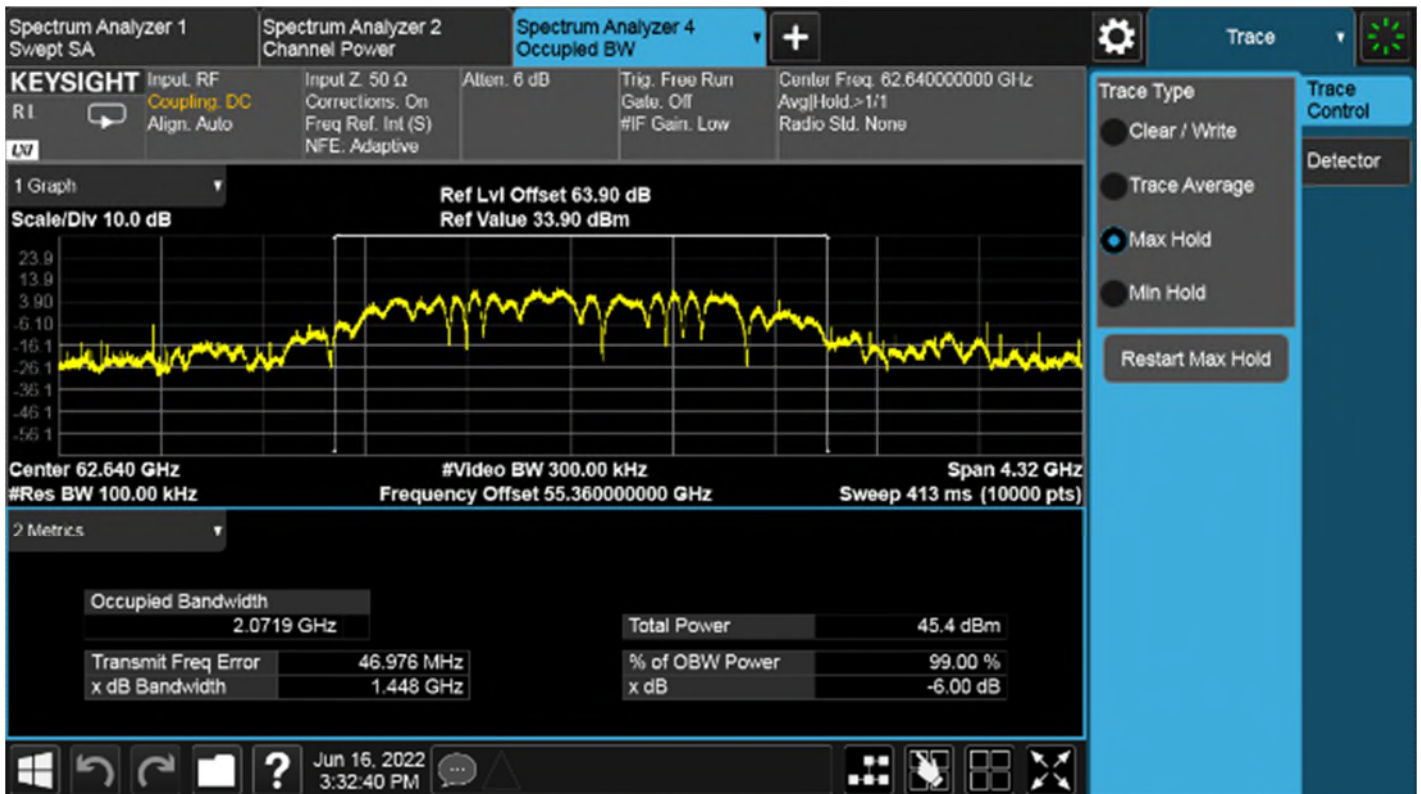## 6.6   6dB Occupied bandwidth

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS0, Channel 58.32 GHz
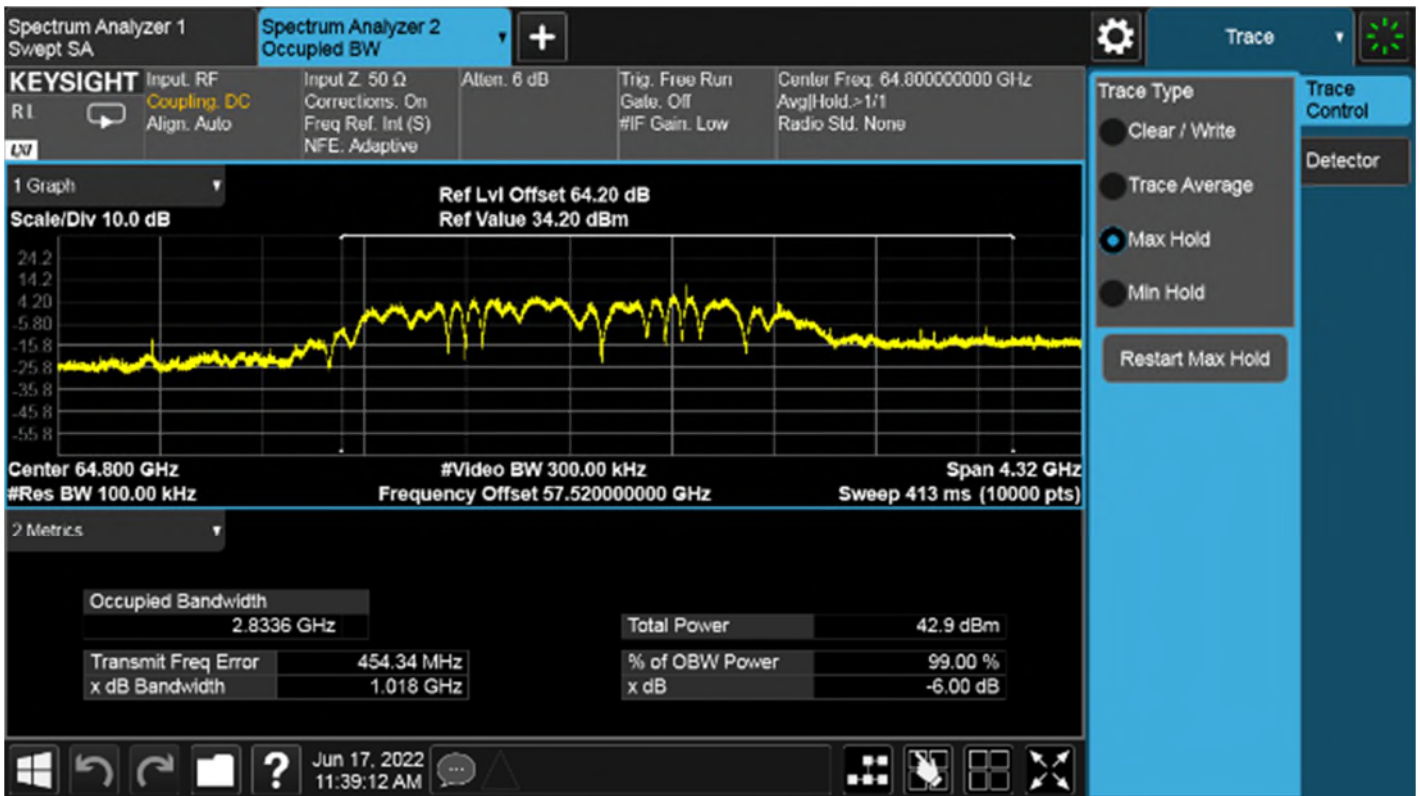

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS0, Channel 62.64 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS0, Channel 64.8 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS2, Channel 58.32 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS2, Channel 62.64 GHz
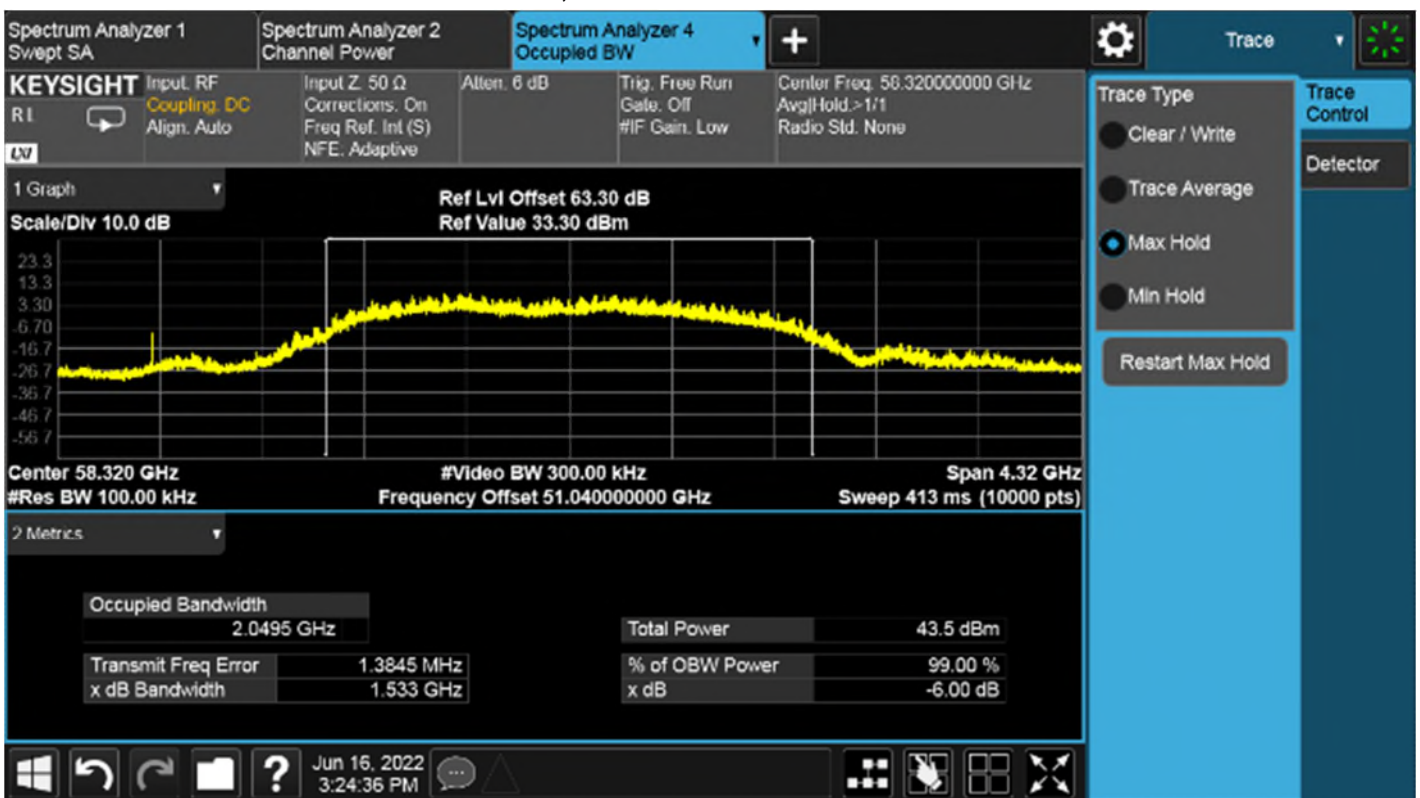

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS2, Channel 64.8 GHz
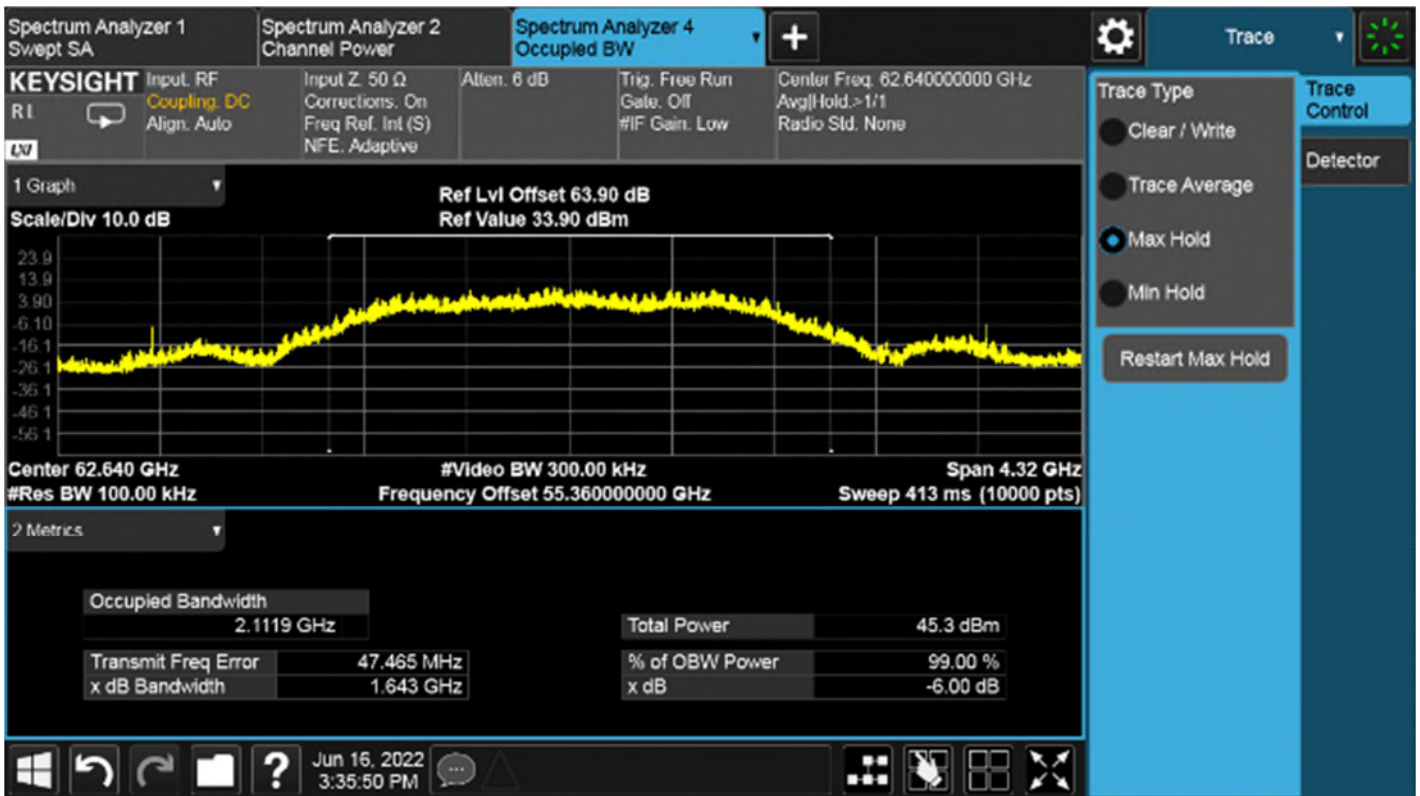

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS3, Channel 58.32 GHz
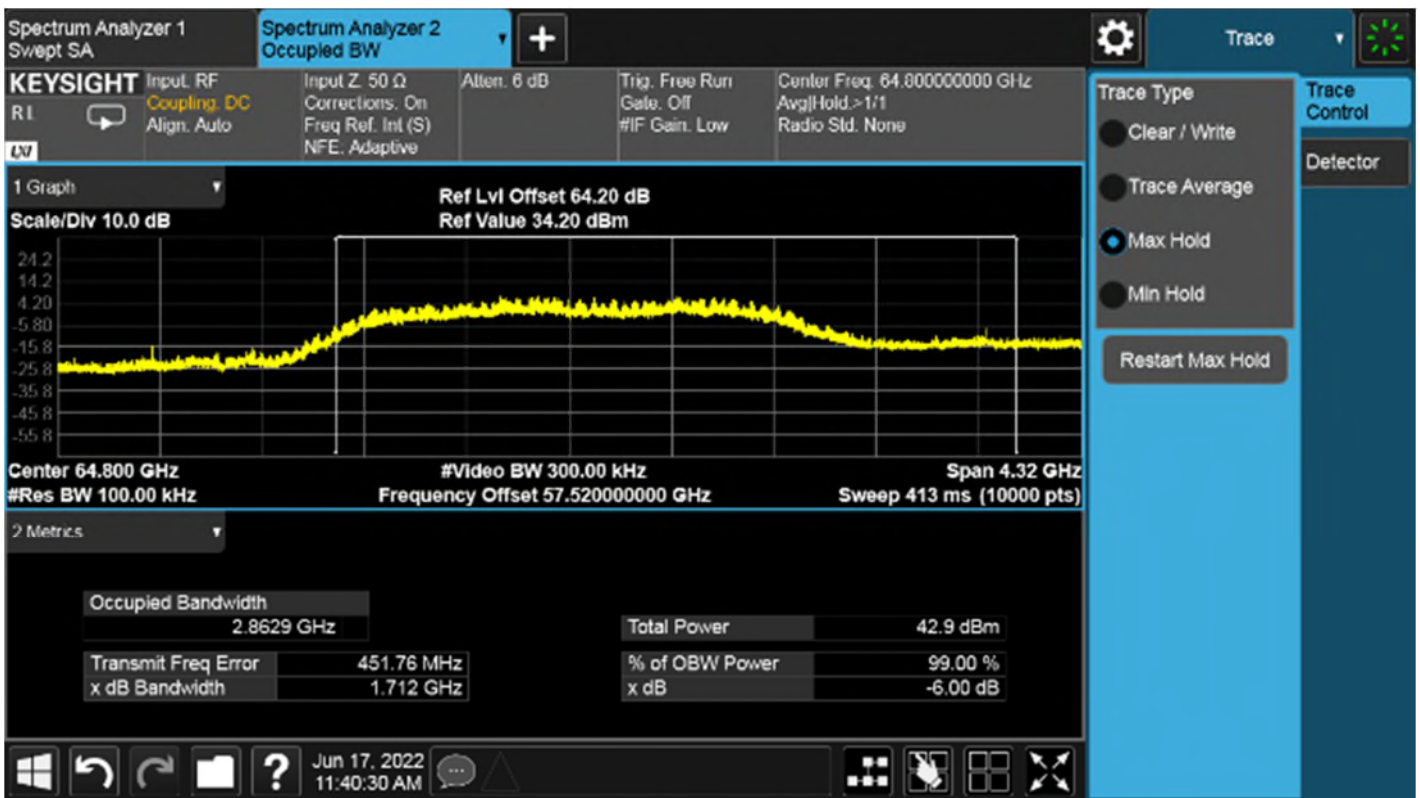

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS3, Channel 62.64 GHz
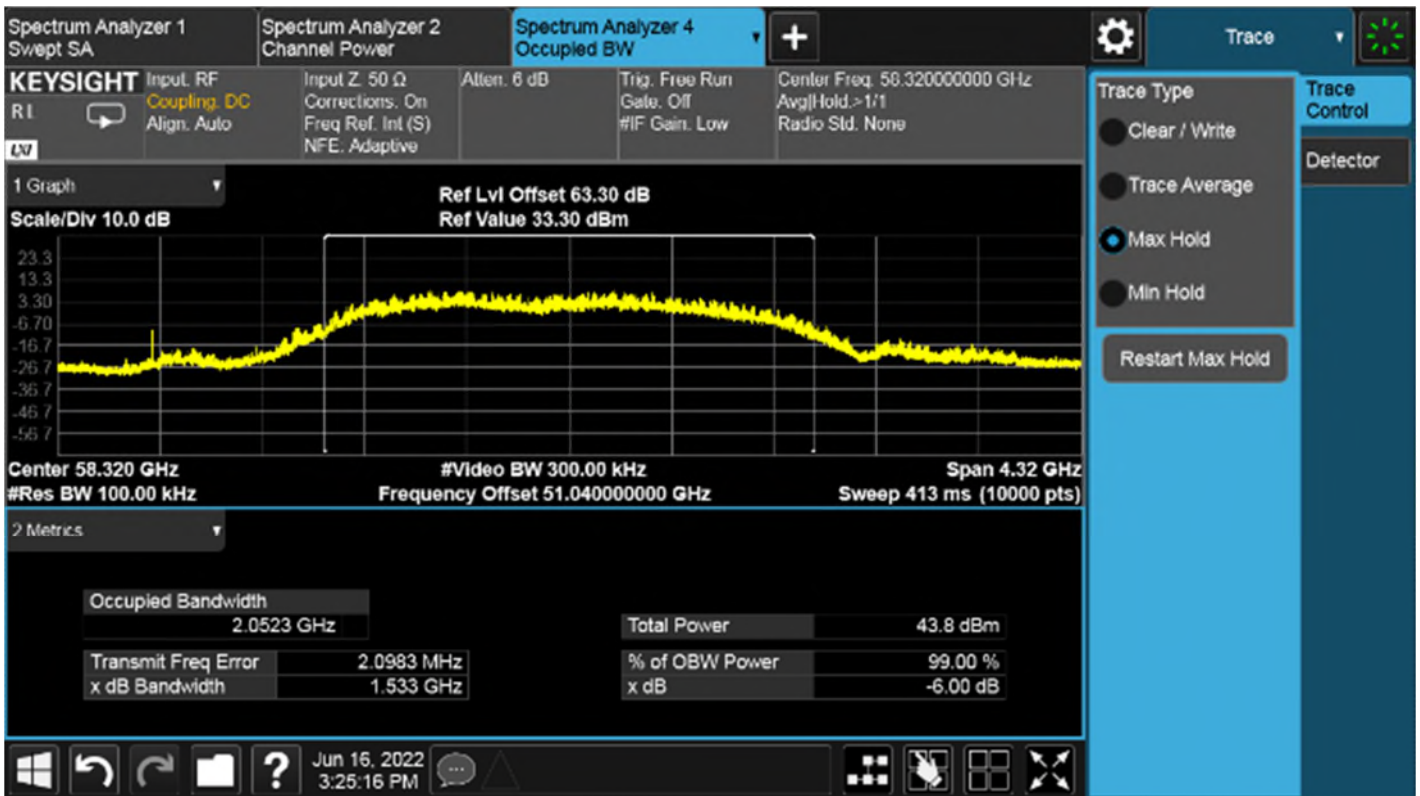

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS3, Channel 64.8 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS4, Channel 58.32 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS4, Channel 62.64 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS4, Channel 64.8 GHz
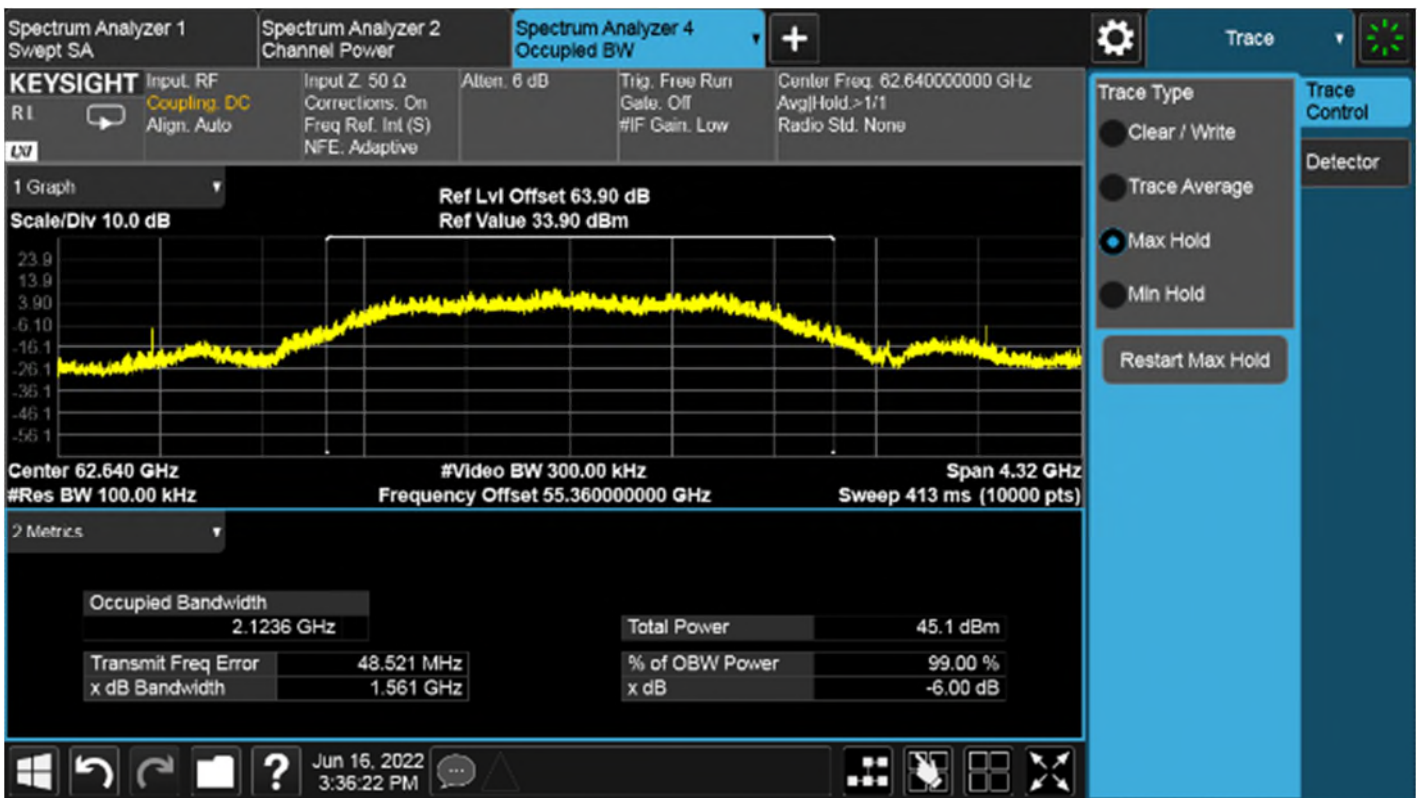

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS5, Channel 58.32 GHz
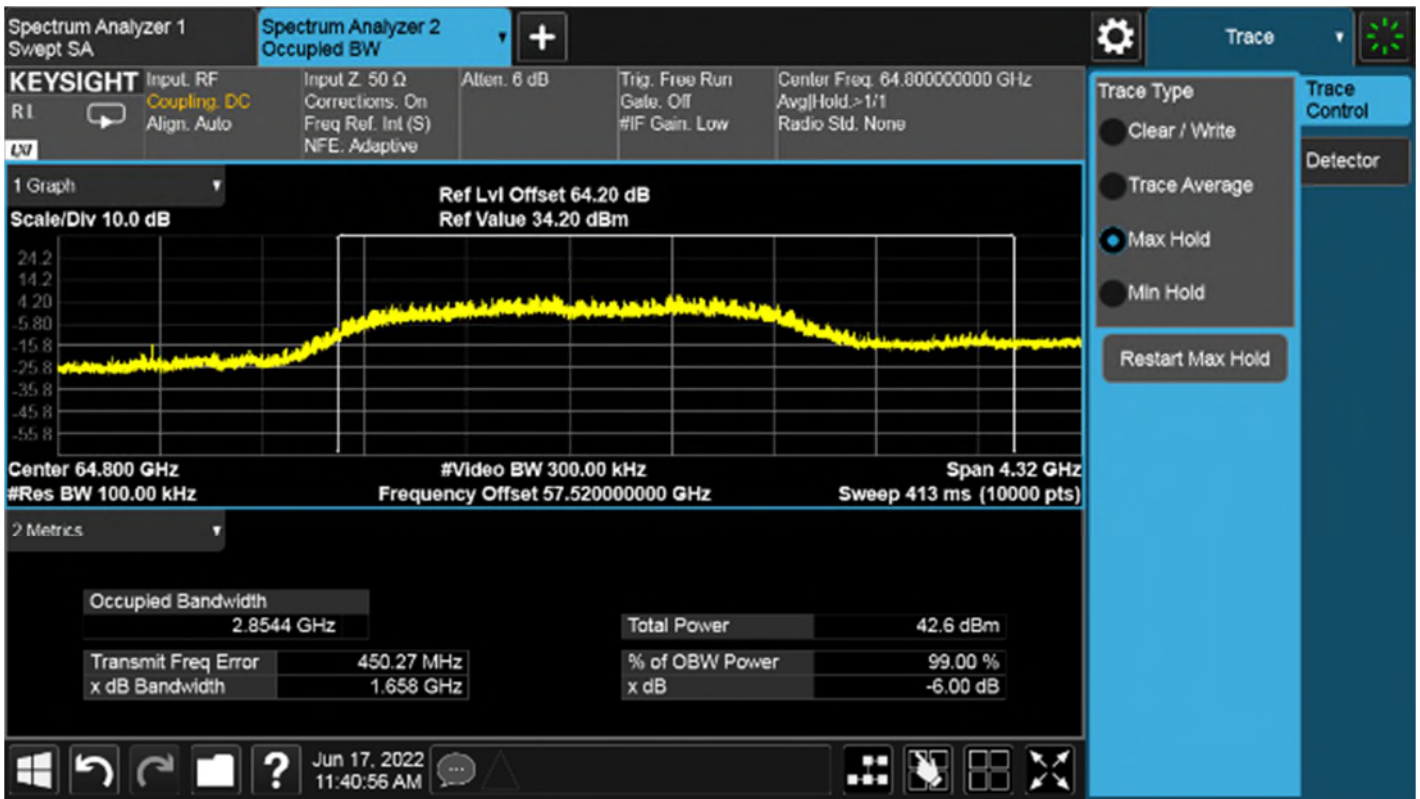

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS5, Channel 62.64 GHz
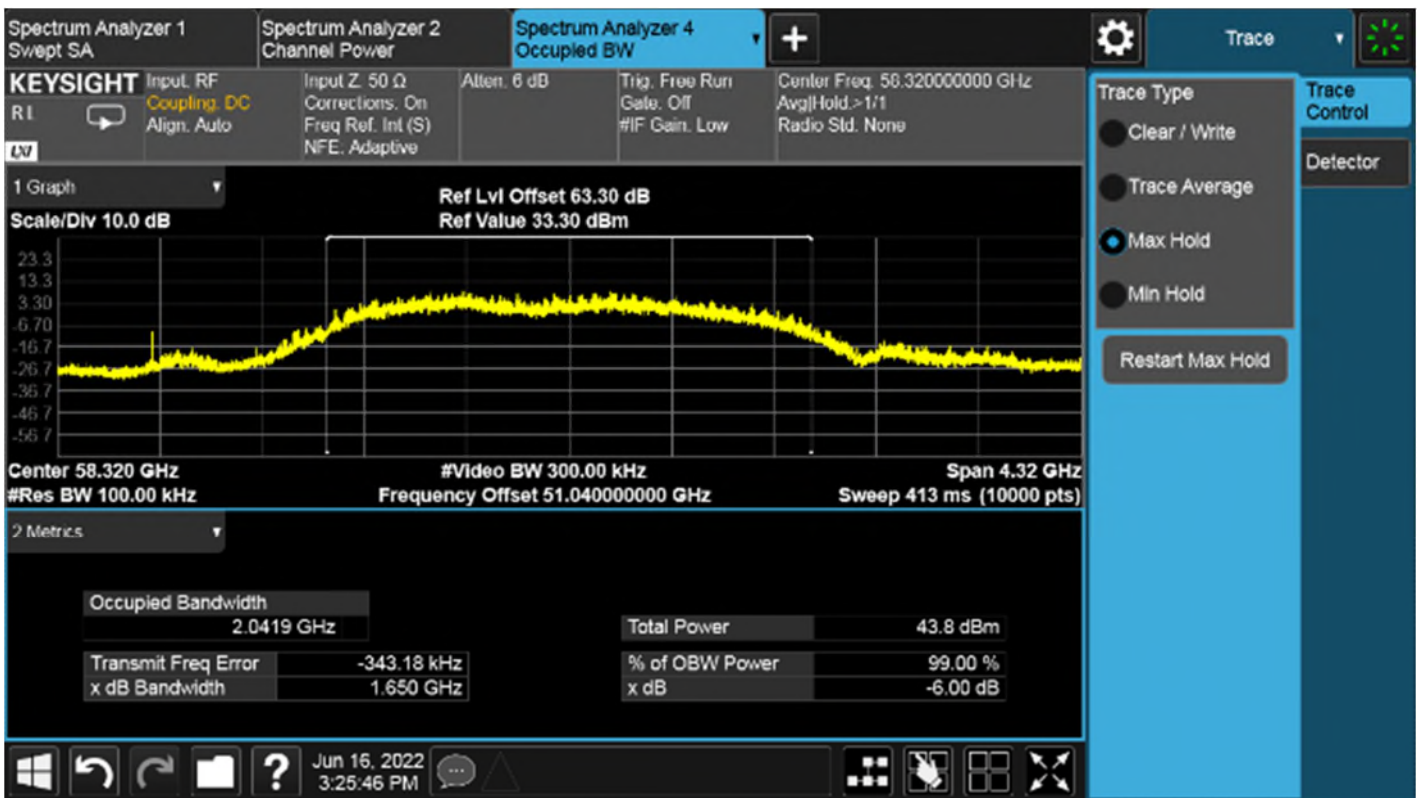

Plot of 6dB Bandwidth (GHz)

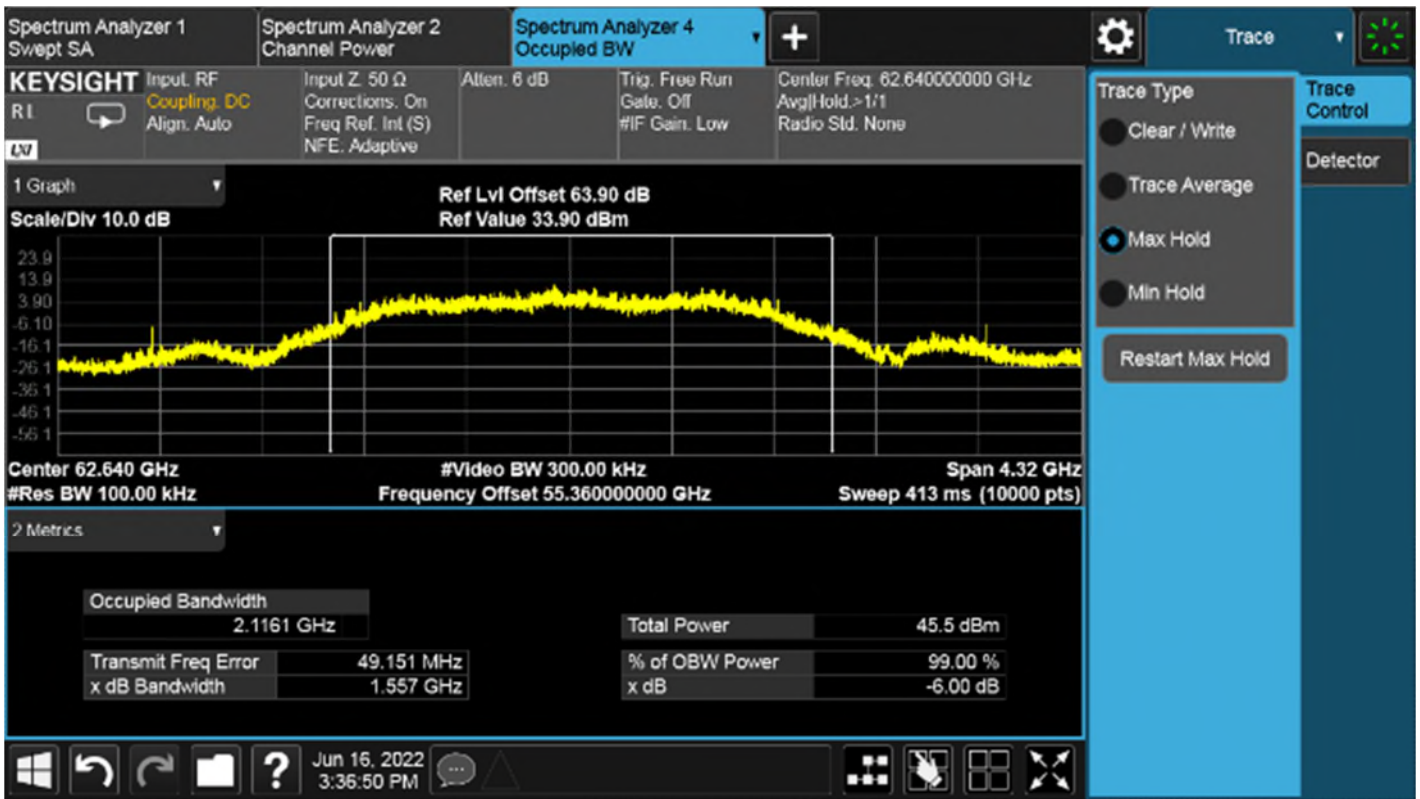RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS5, Channel 64.8 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS6, Channel 58.32 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS6, Channel 62.64 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS6, Channel 64.8 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS7, Channel 58.32 GHz
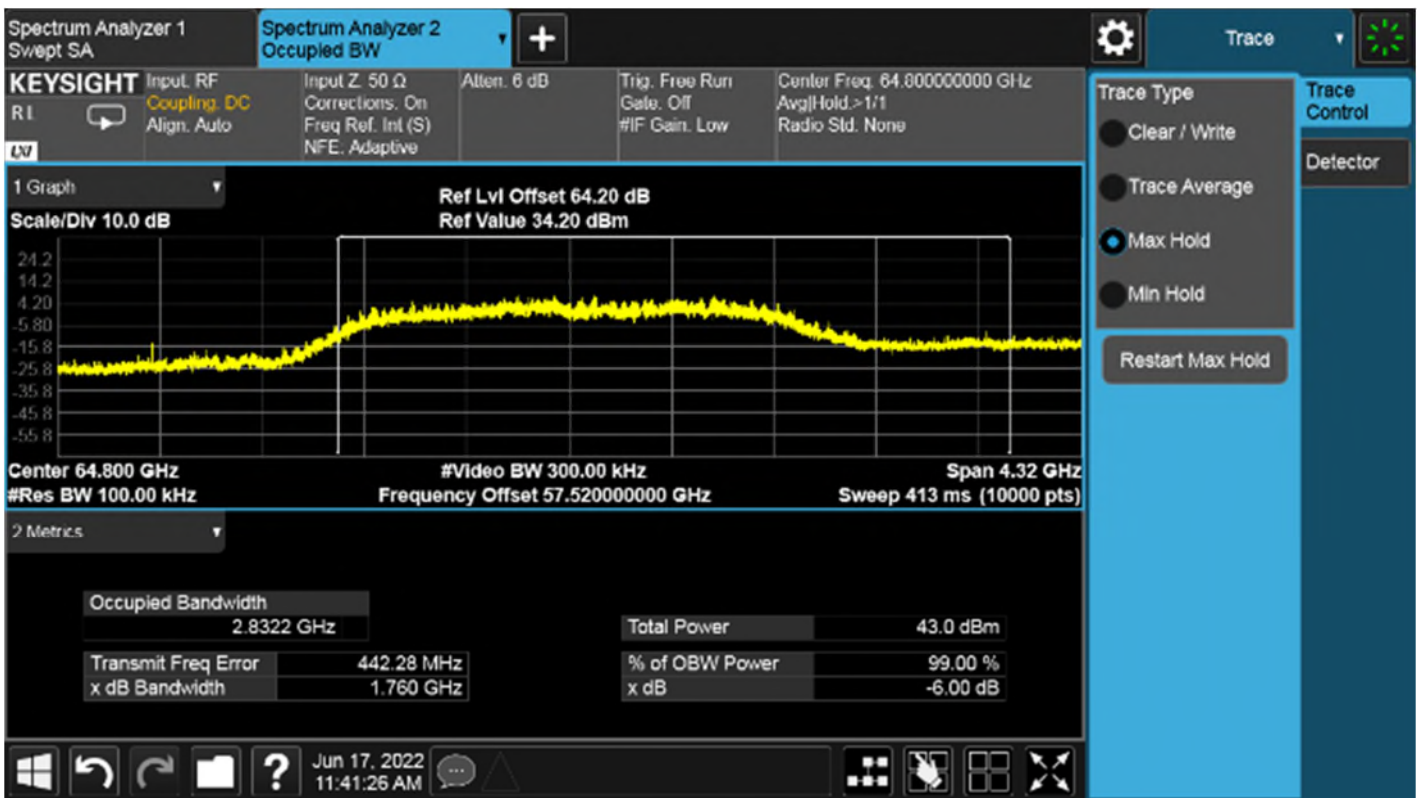

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS7, Channel 62.64 GHz
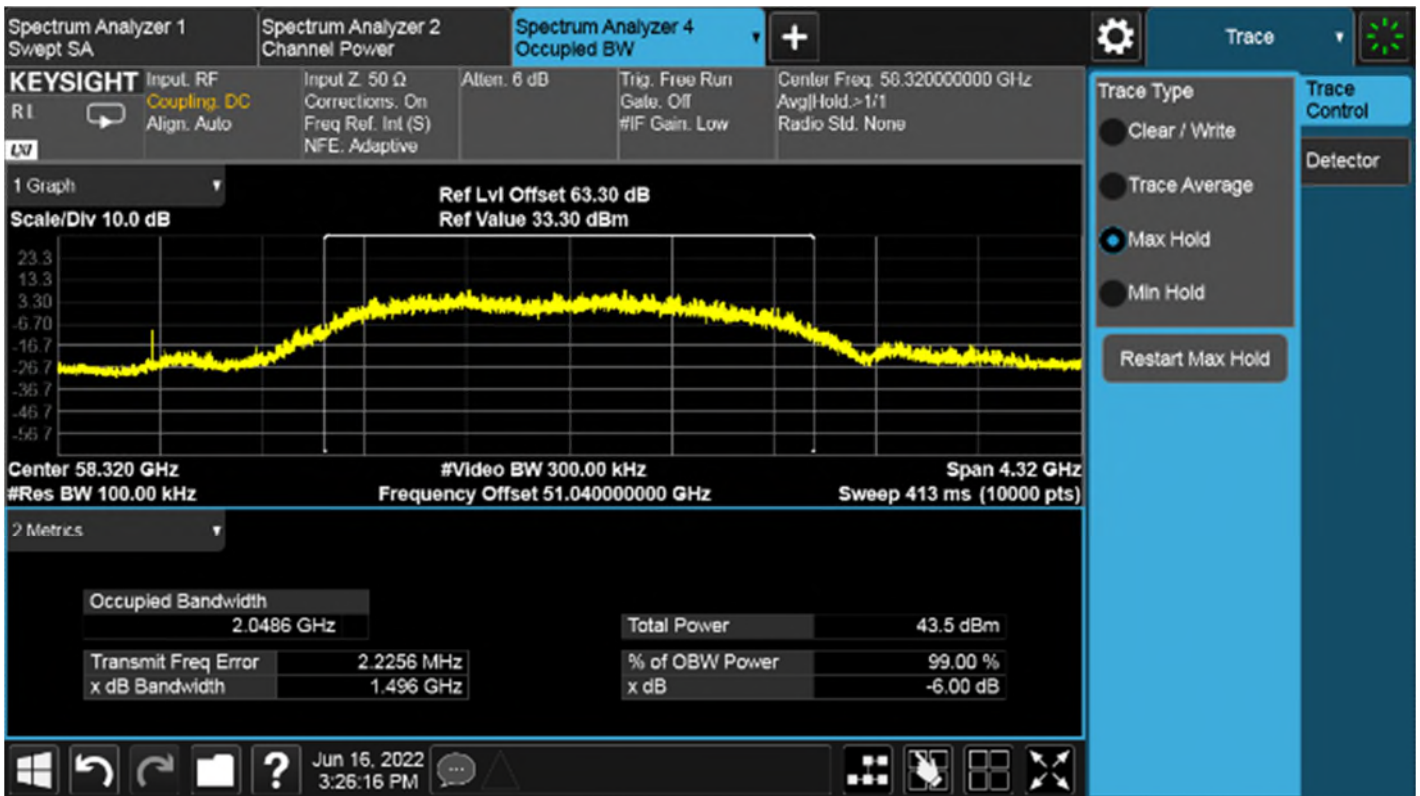

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS7, Channel 64.8 GHz
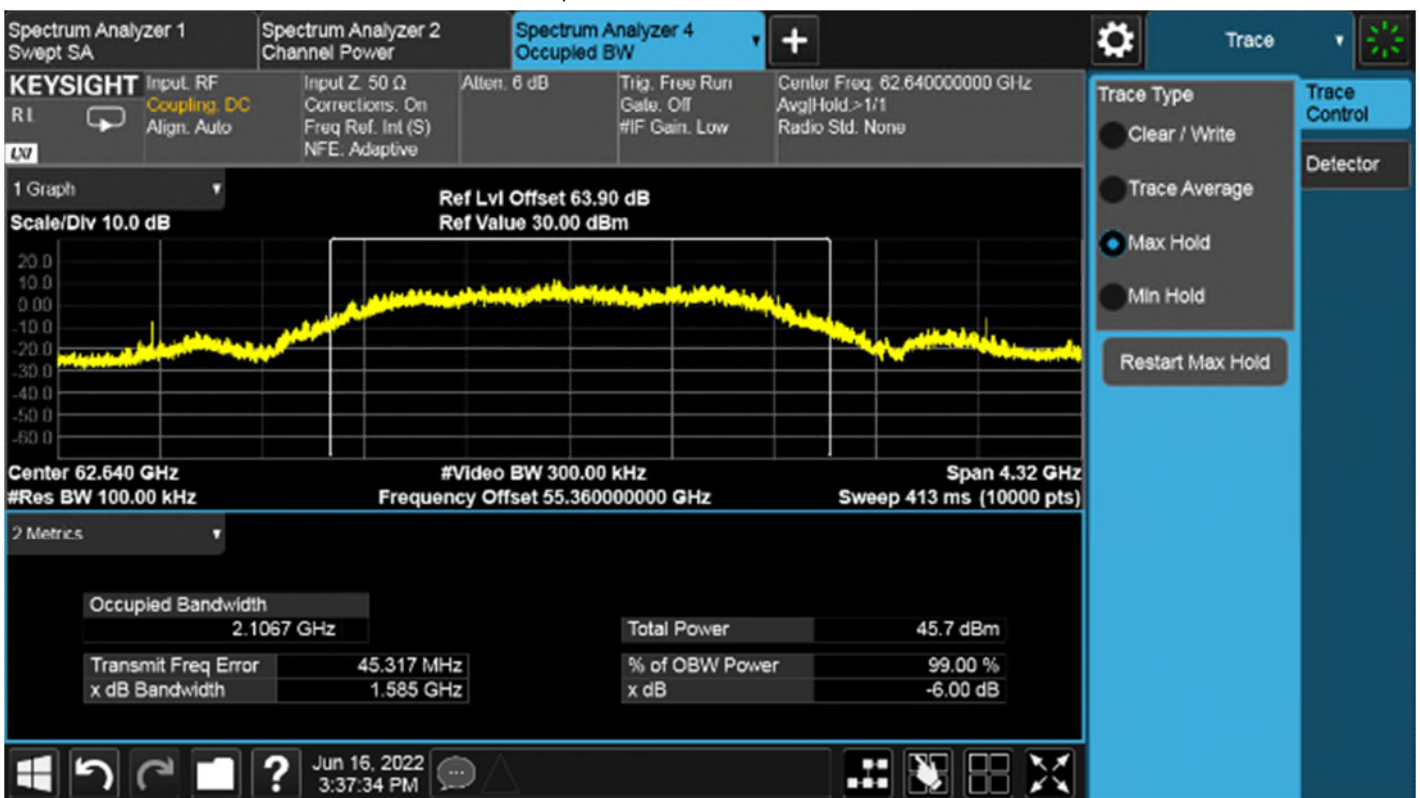

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS8, Channel 58.32 GHz
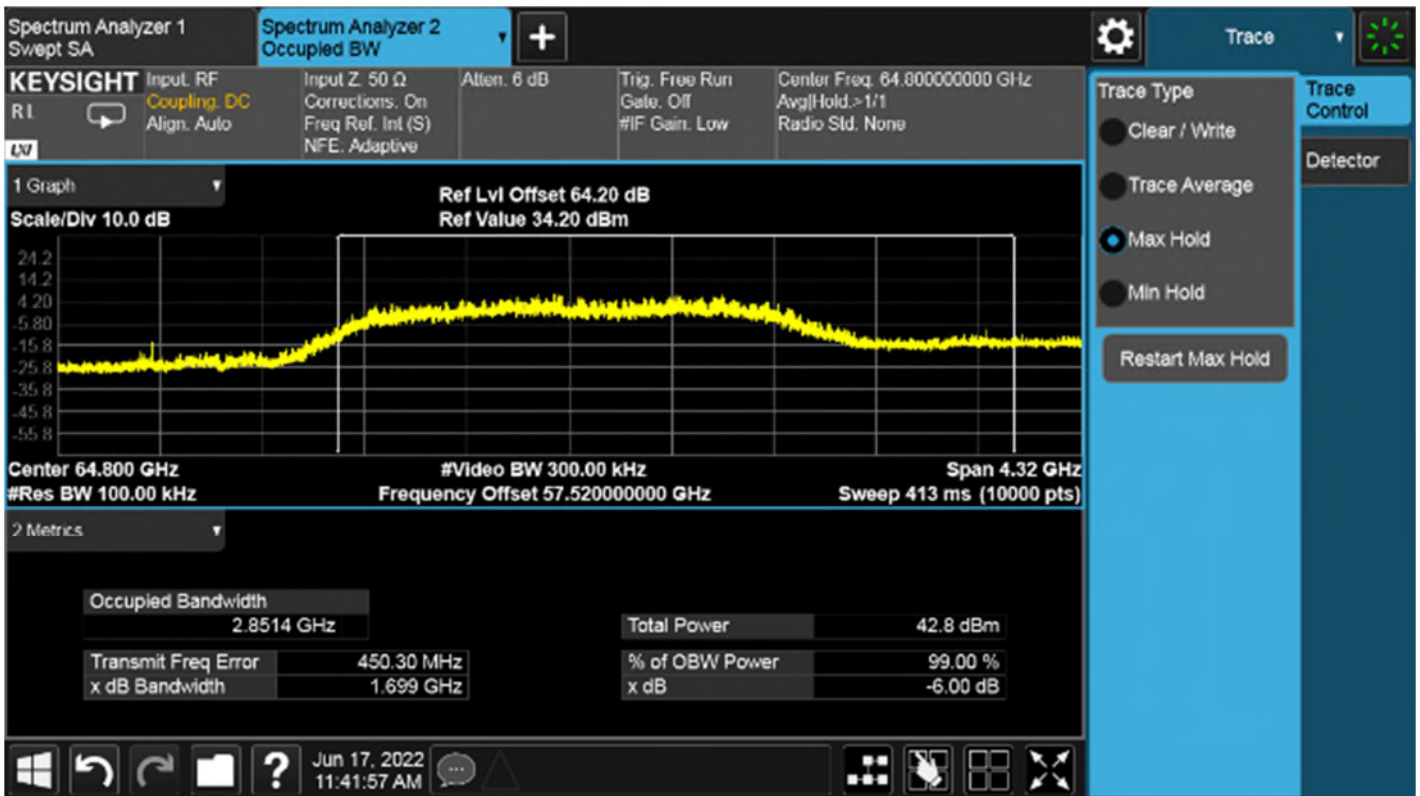

Plot of 6dB Bandwidth (GHz)

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RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS8, Channel 62.64 GHz
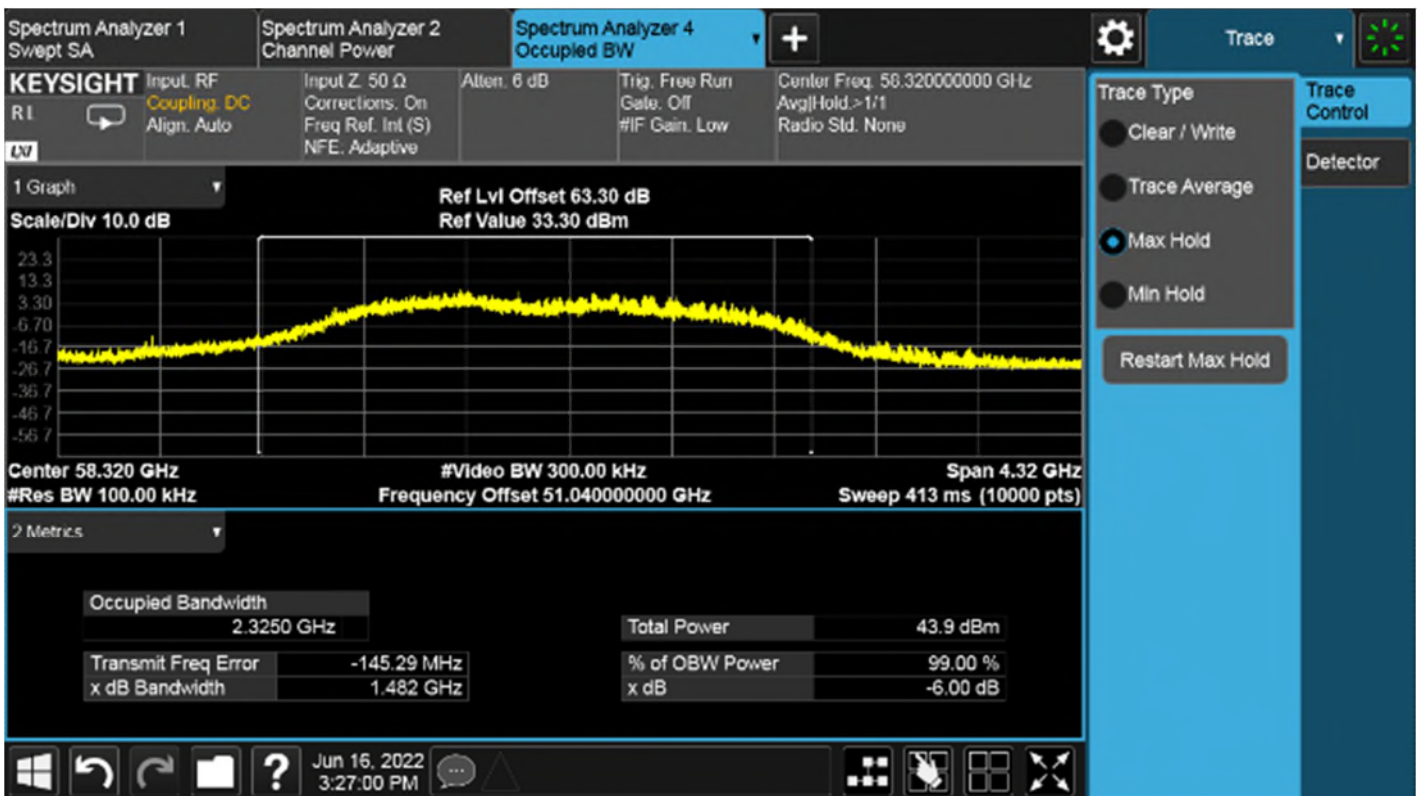

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS8, Channel 64.8 GHz
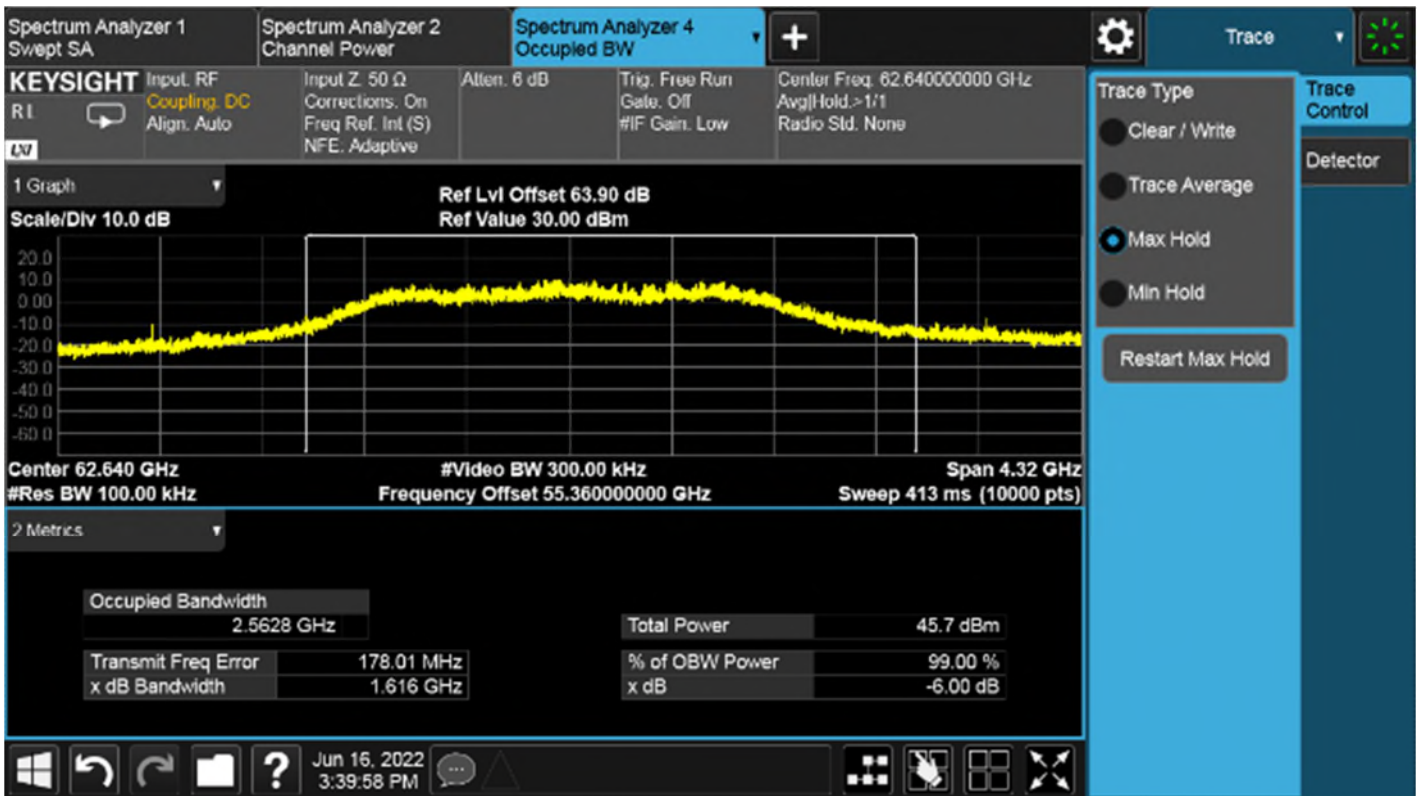

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS9, Channel 58.32 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS9, Channel 62.64 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS9, Channel 64.8 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS10, Channel 58.32 GHz
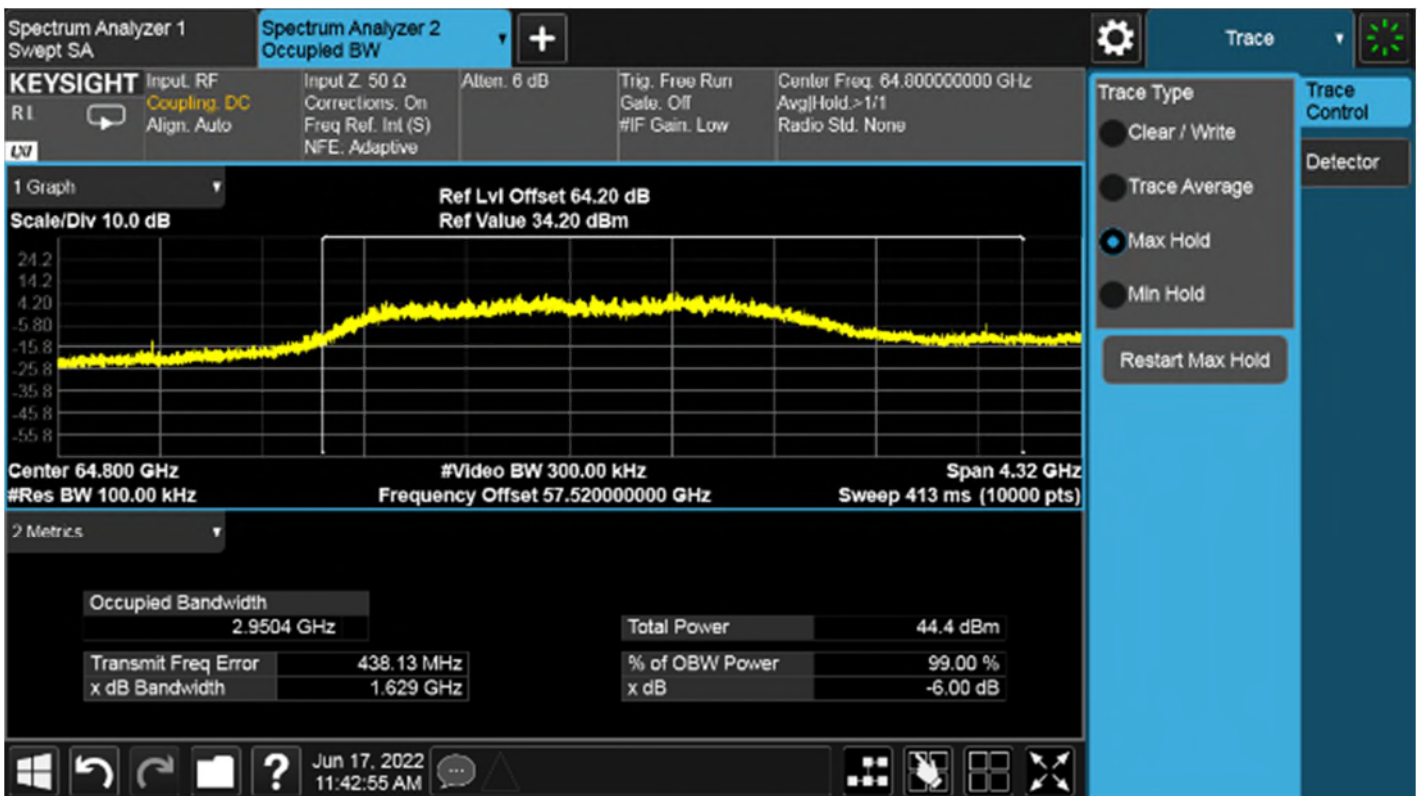

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS10, Channel 62.64 GHz
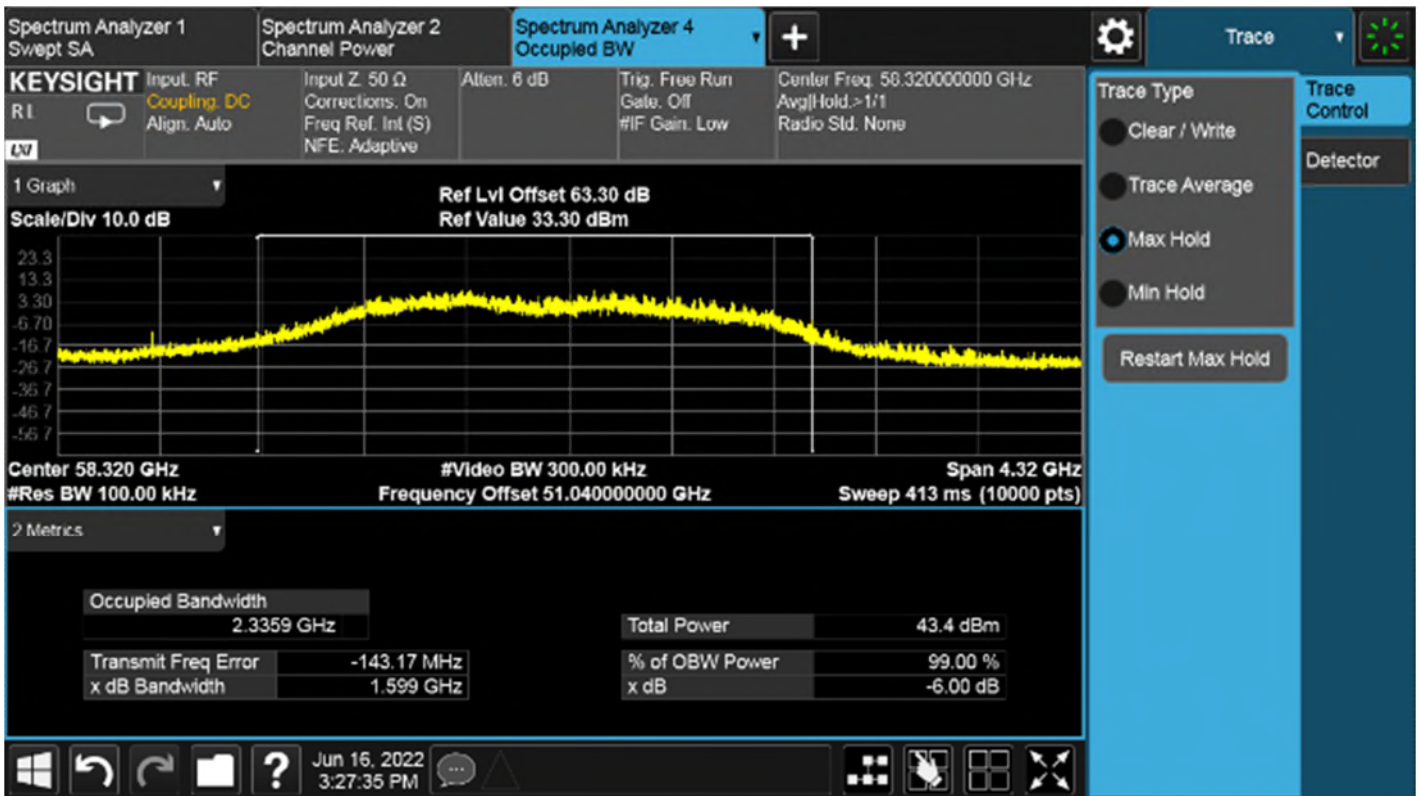

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS10, Channel 64.8 GHz
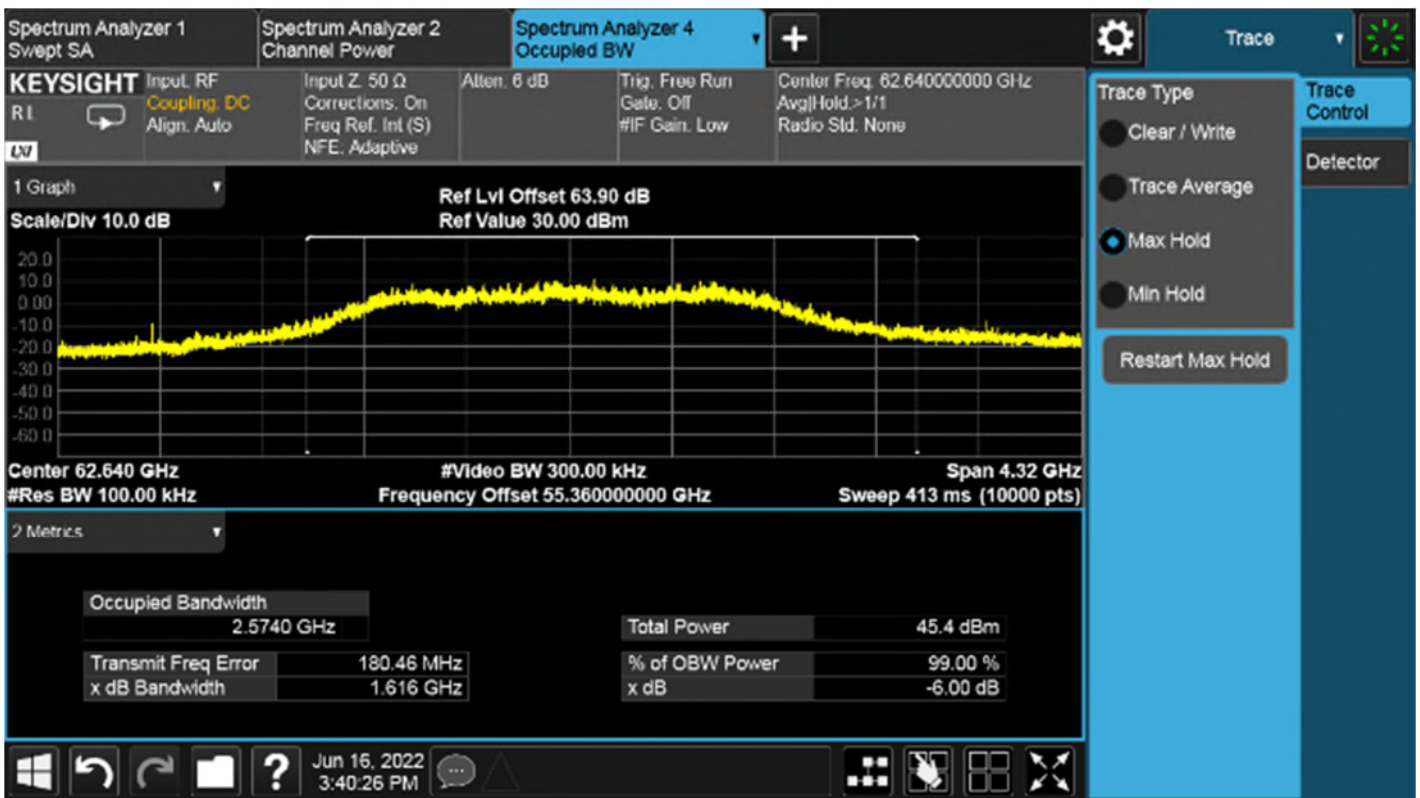

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS11, Channel 58.32 GHz
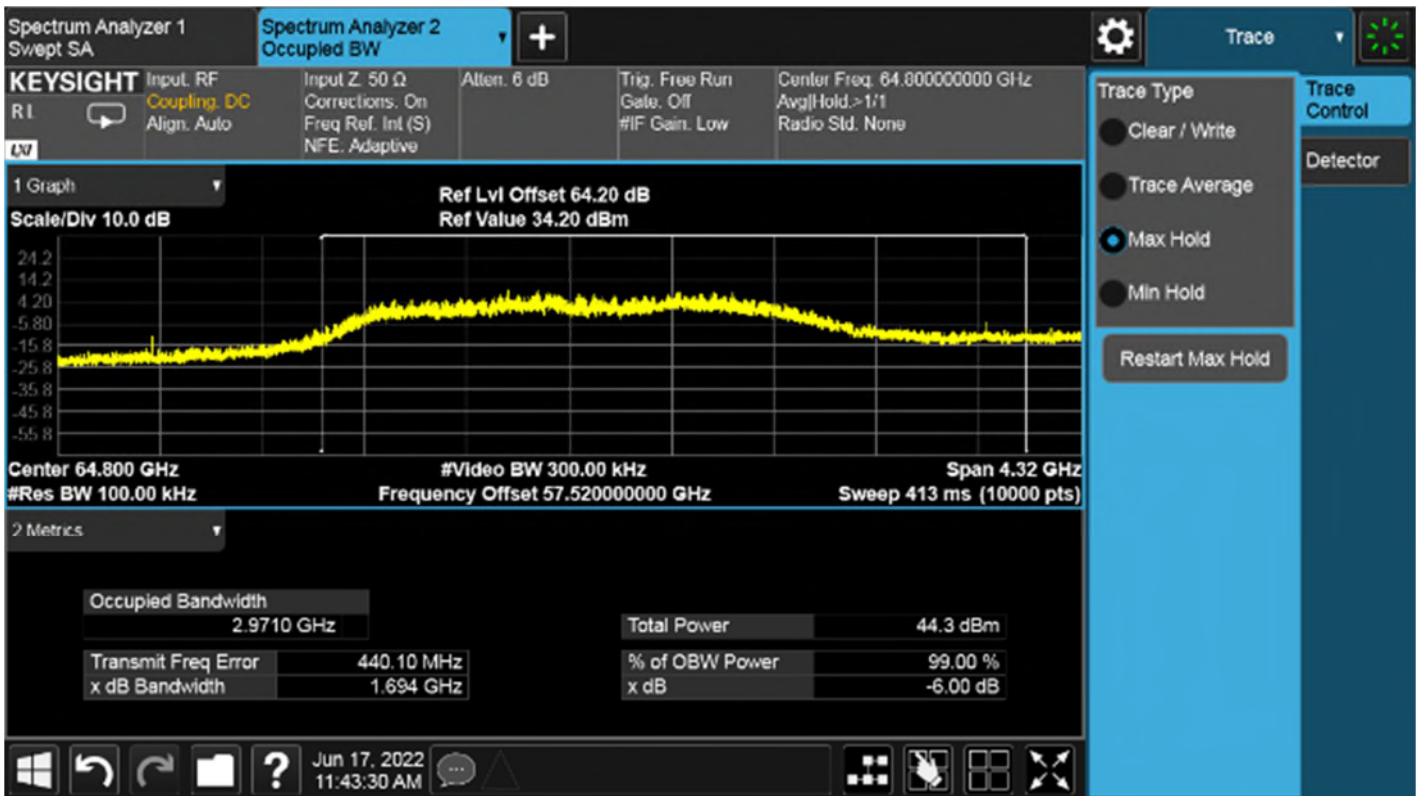

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS11, Channel 62.64 GHz

Plot of 6dB Bandwidth (GHz)

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RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS11, Channel 64.8 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS12, Channel 58.32 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS12, Channel 62.64 GHz
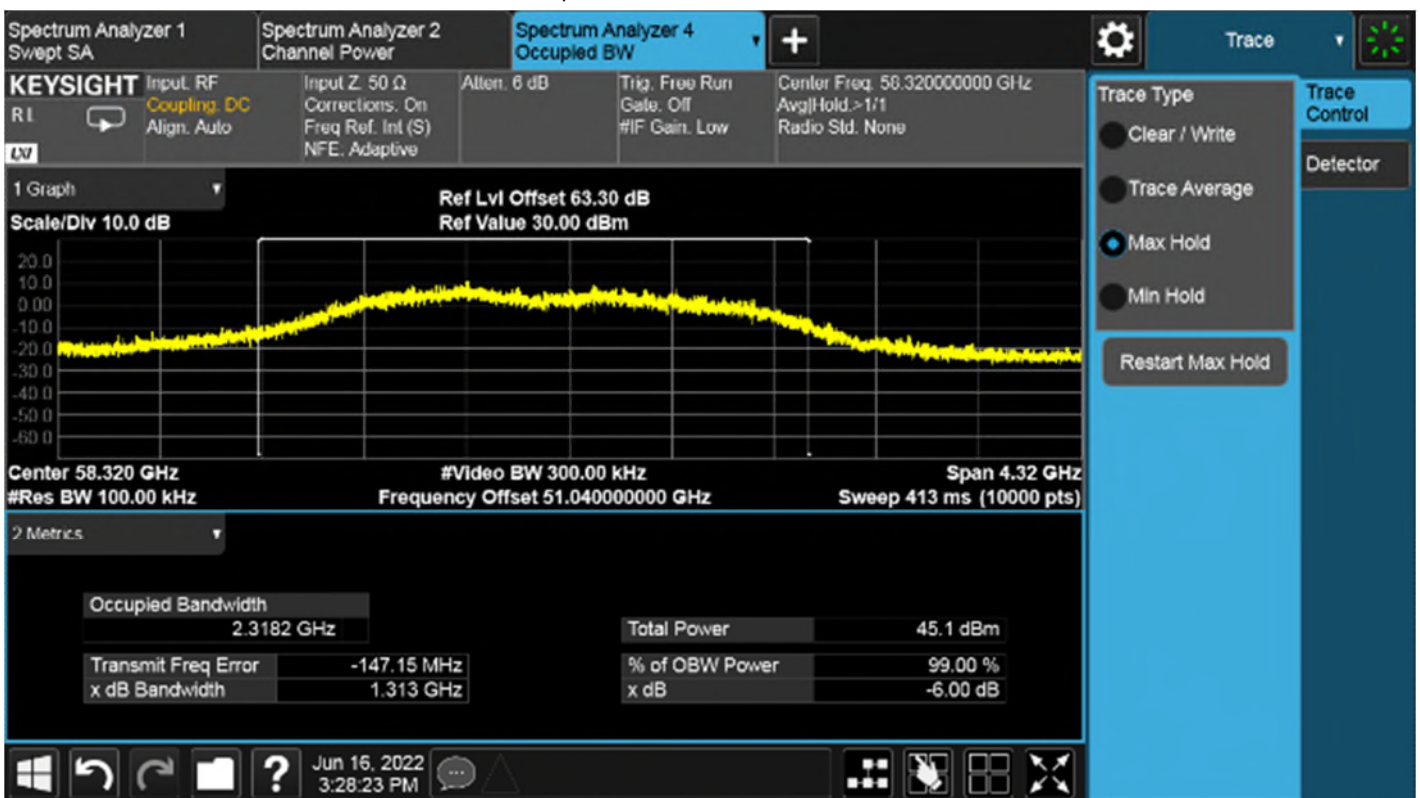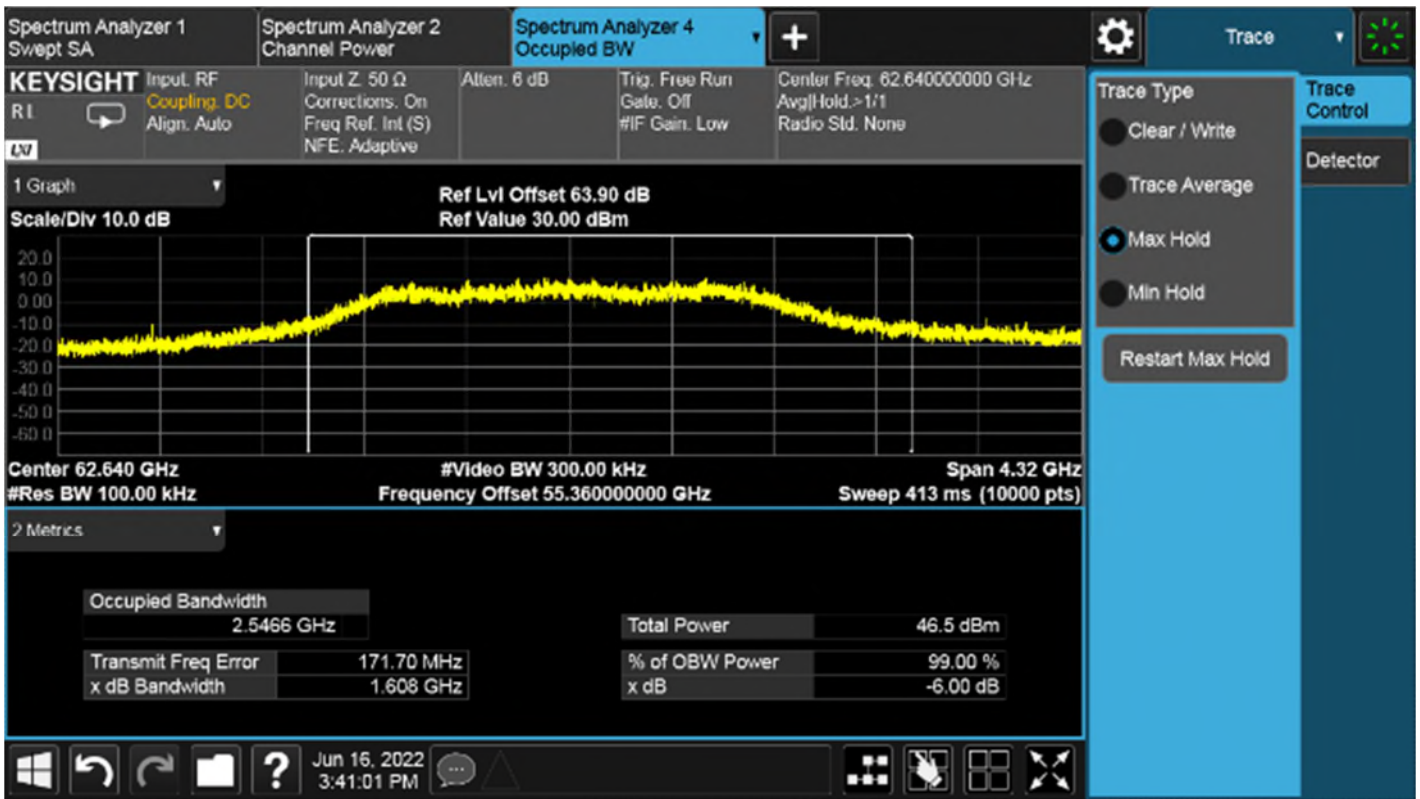

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 2.16 GHz, Modulation MCS12, Channel 64.8 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS0, Channel 59.4 GHz
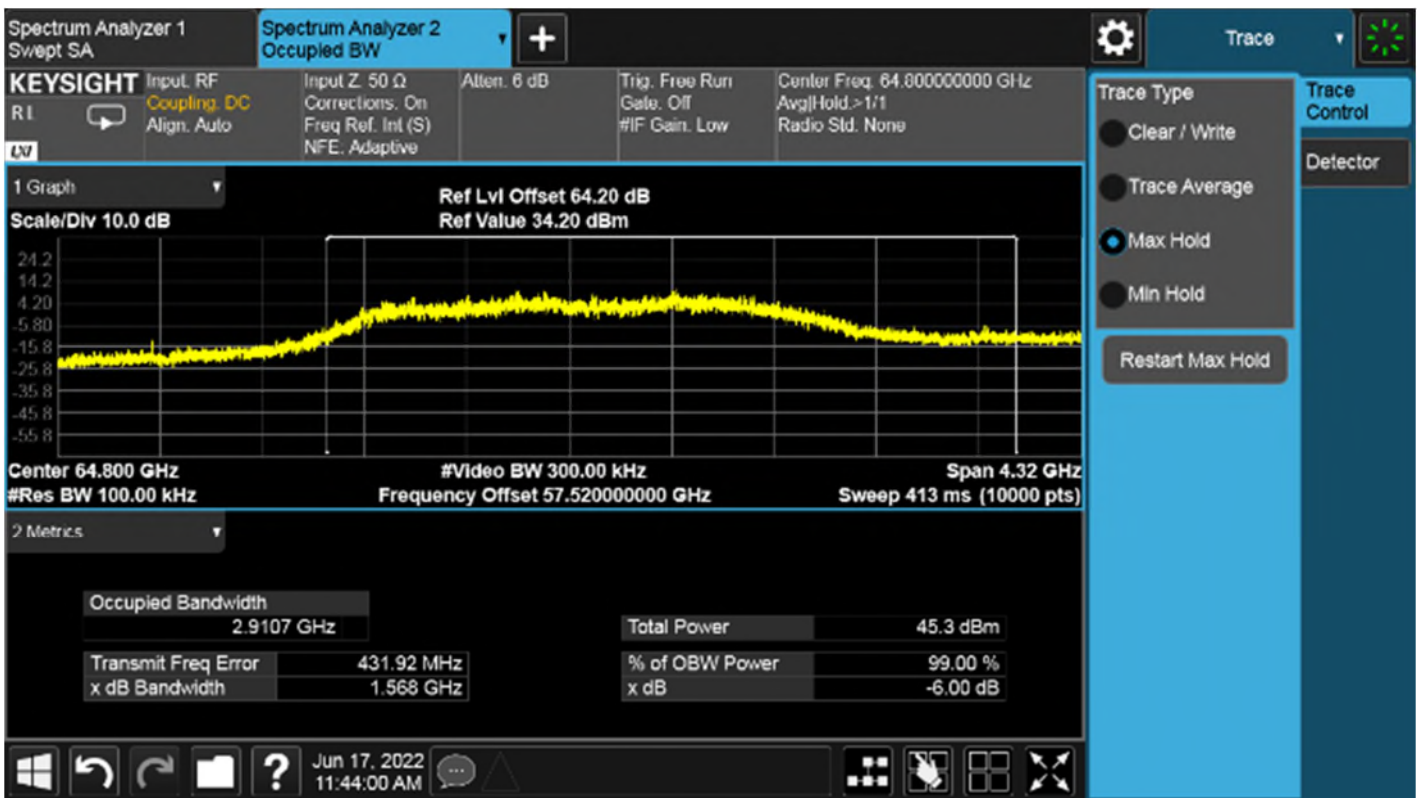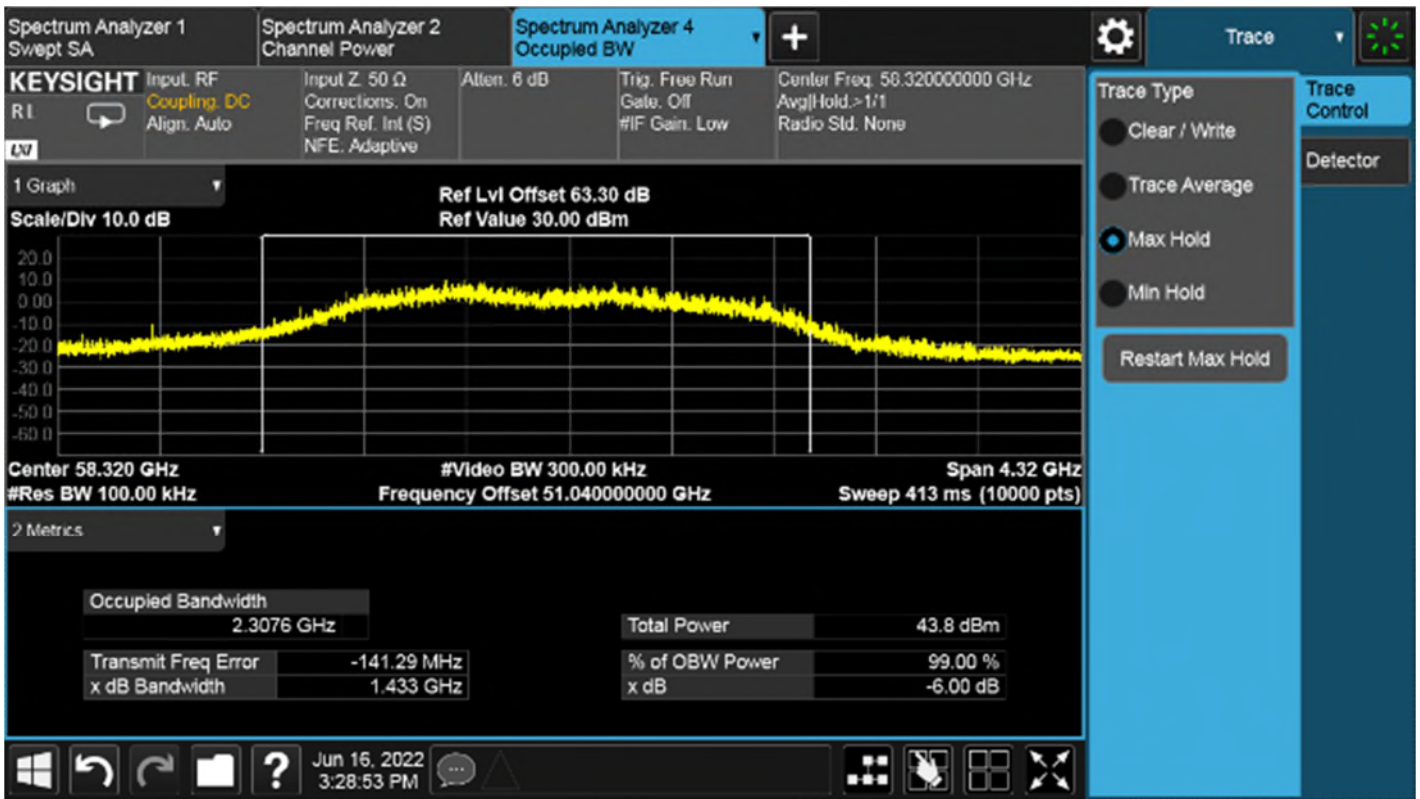

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS0, Channel 61.56 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS0, Channel 63.72 GHz

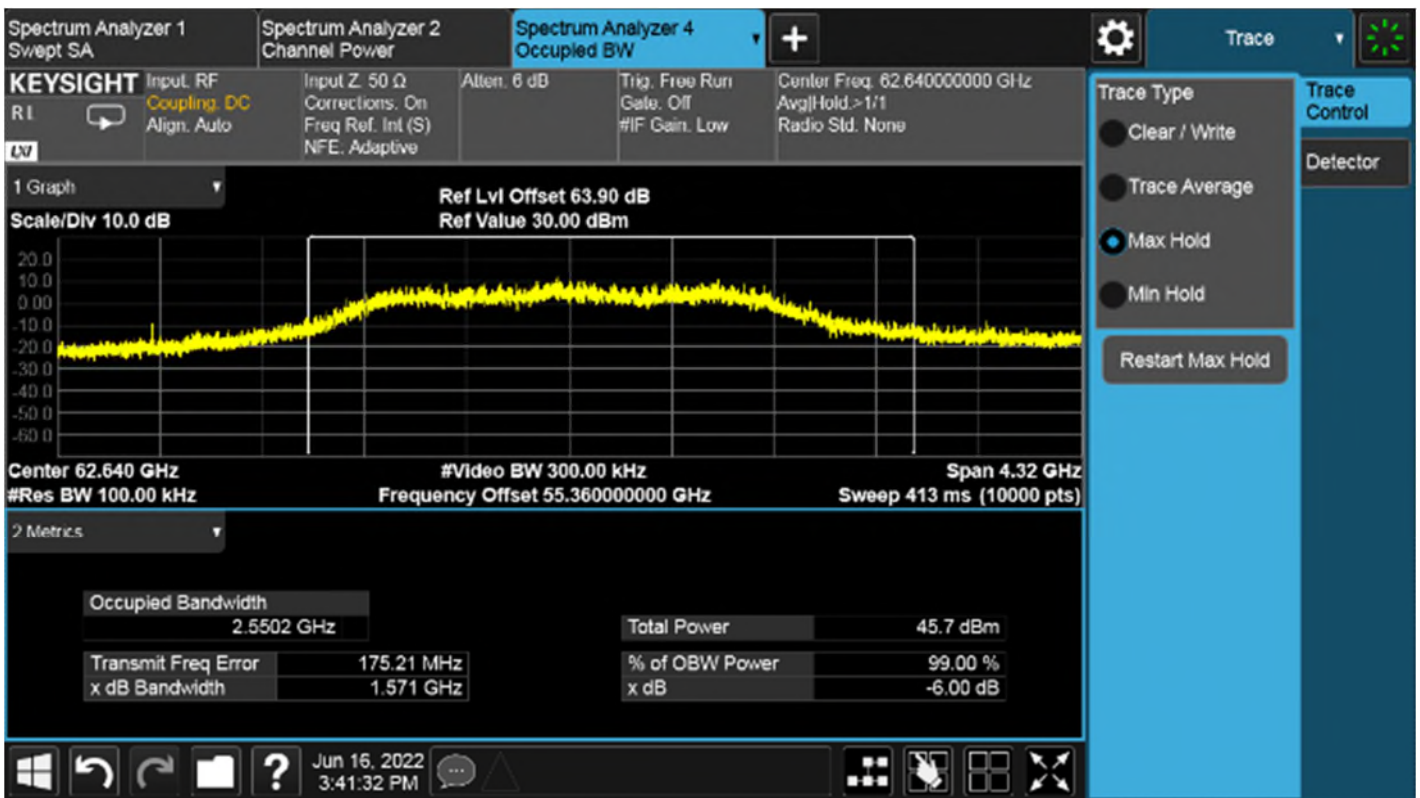Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS2, Channel 59.4 GHz
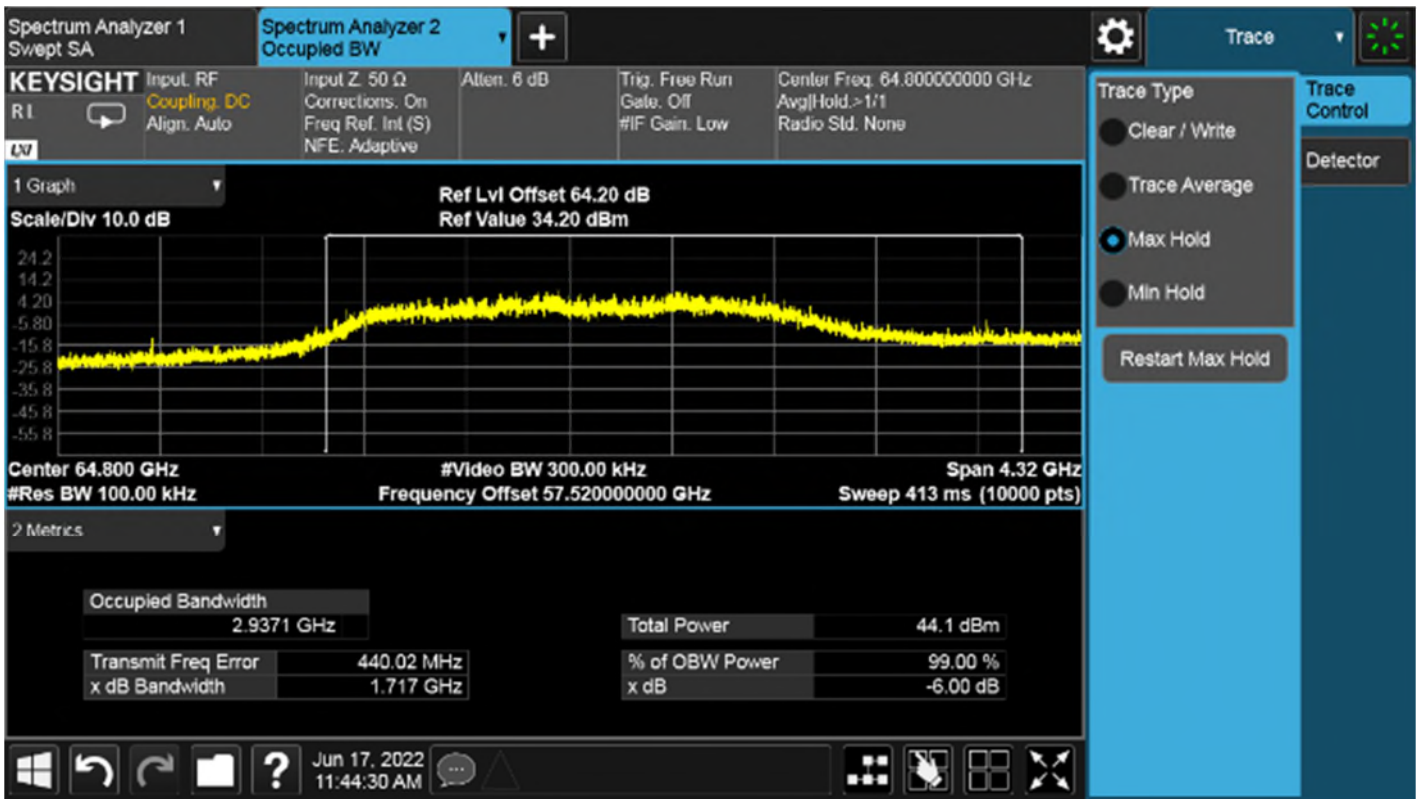

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS2, Channel 61.56 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS2, Channel 63.72 GHz
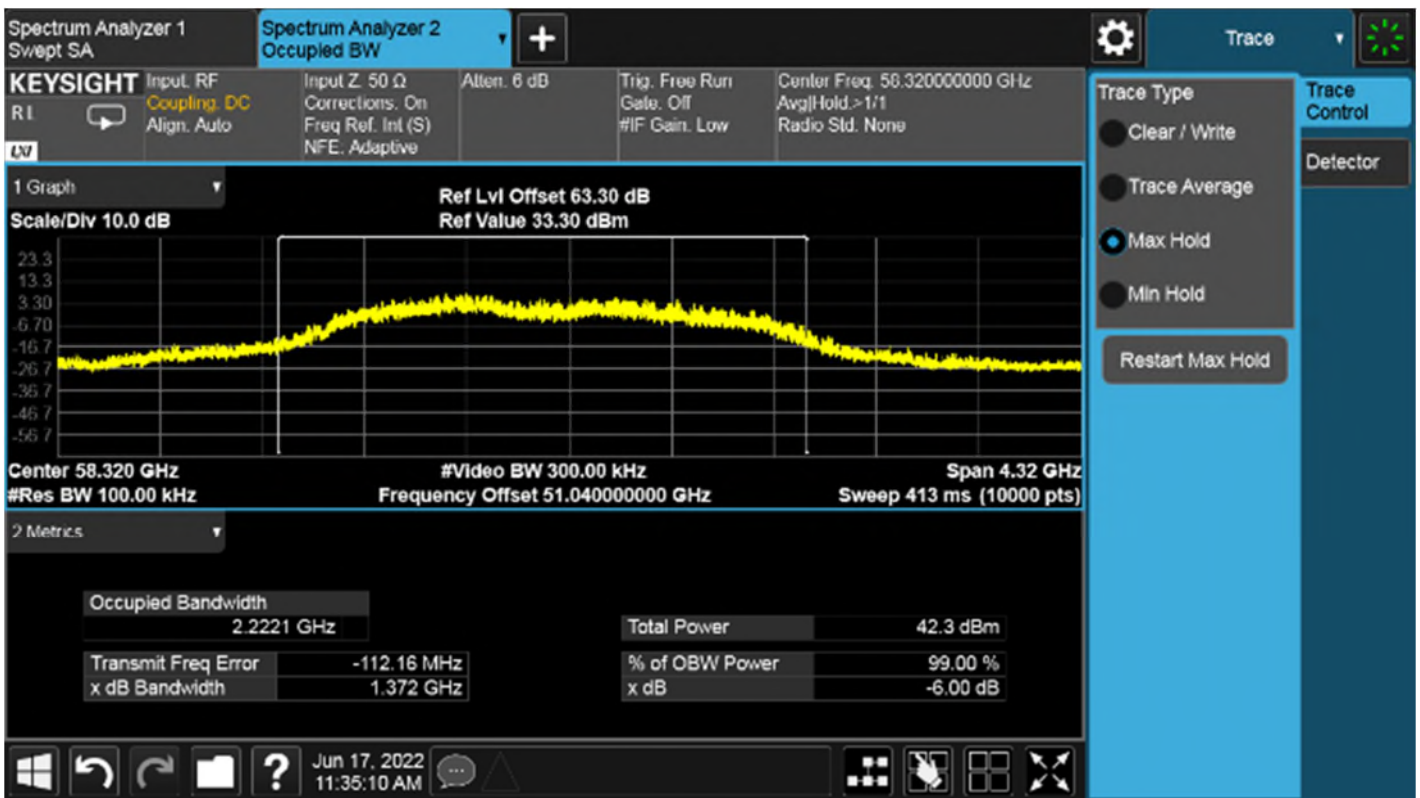

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS3, Channel 59.4 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS3, Channel 61.56 GHz
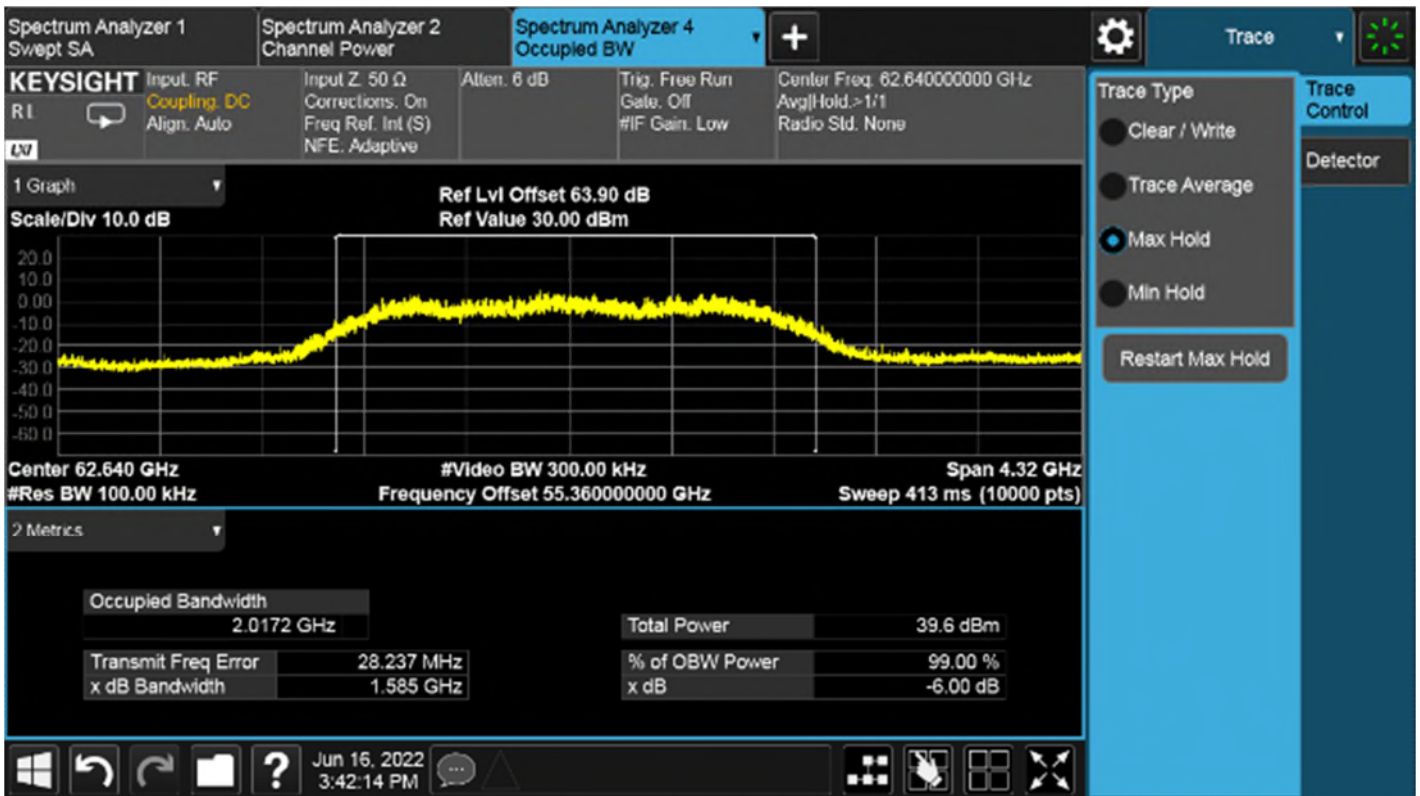

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS3, Channel 63.72 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS4, Channel 59.4 GHz
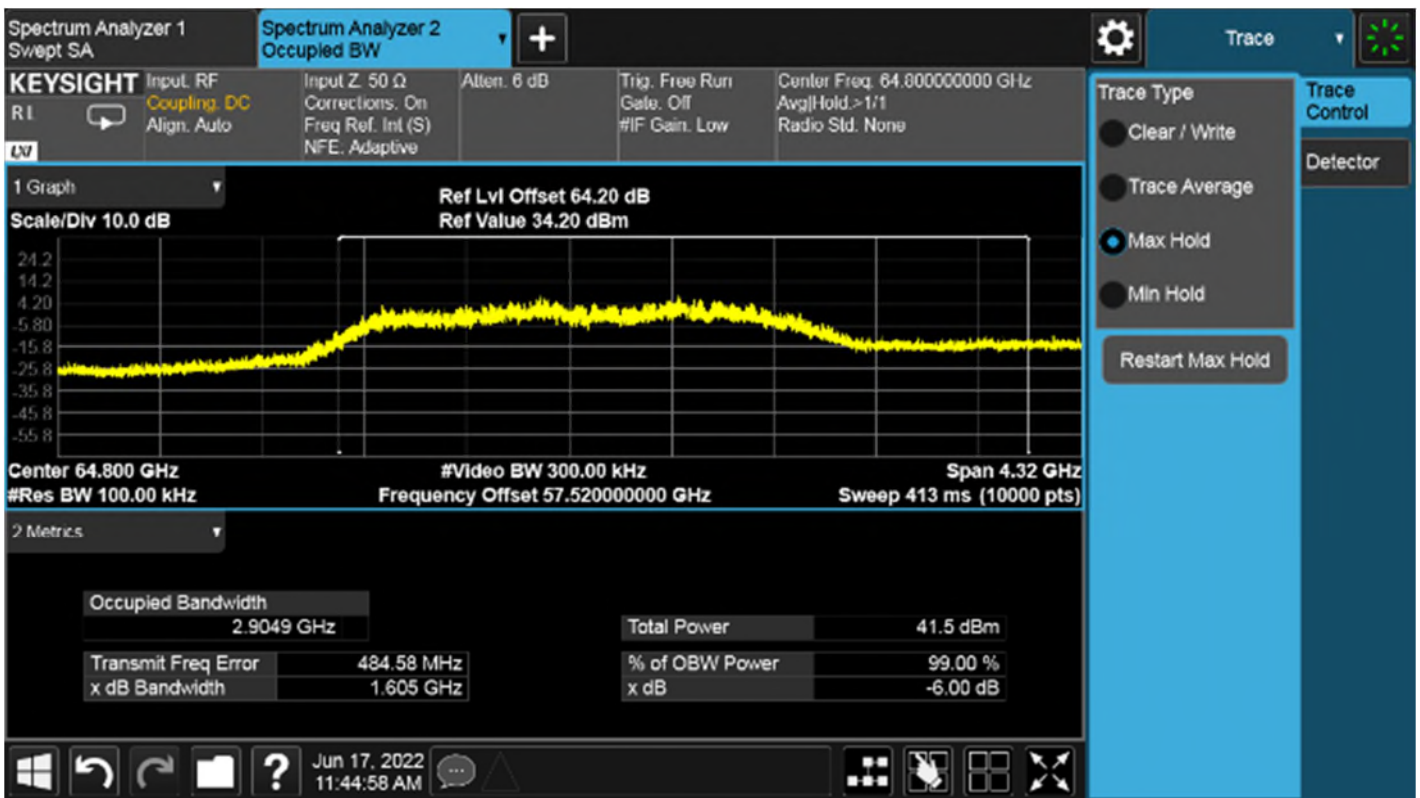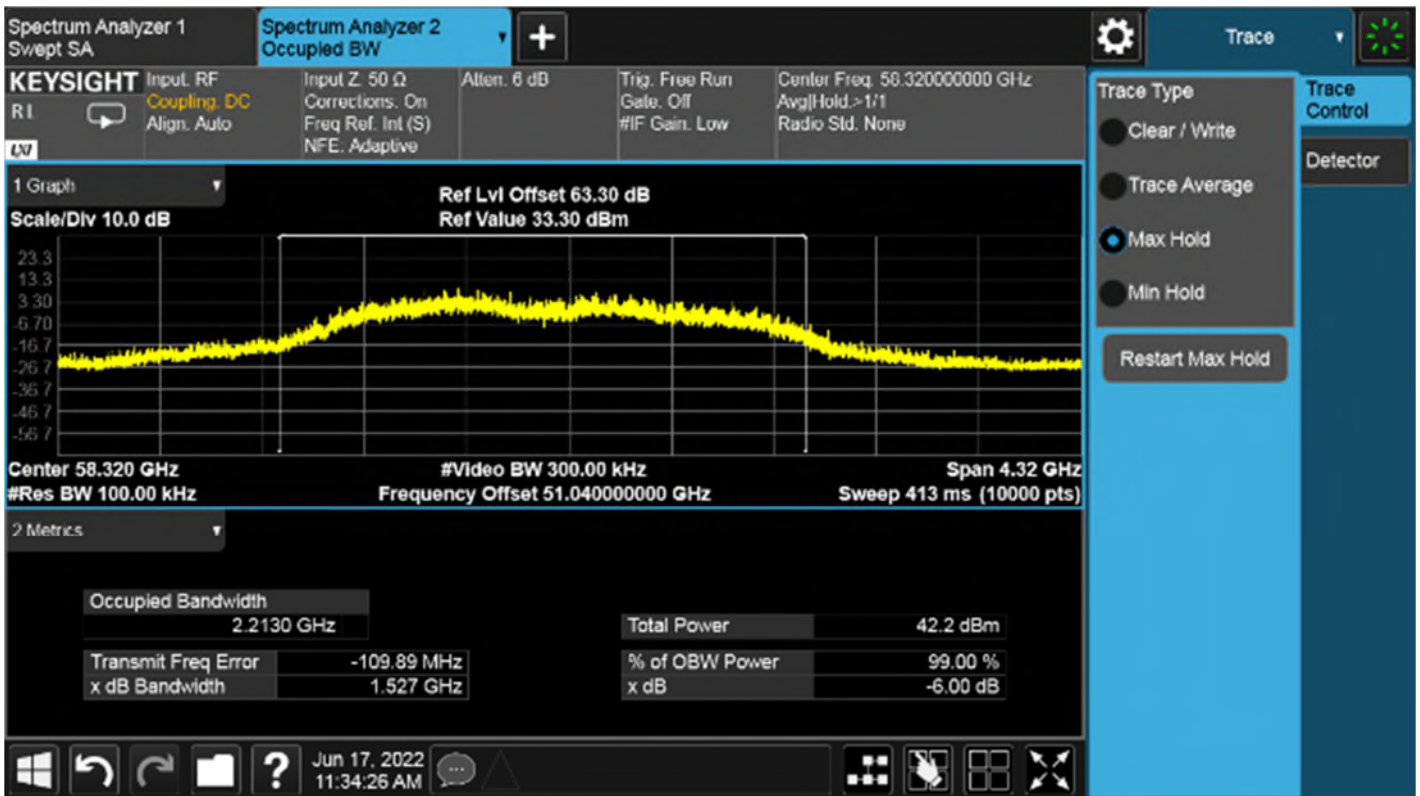

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS4, Channel 61.56 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS4, Channel 63.72 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS5, Channel 59.4 GHz

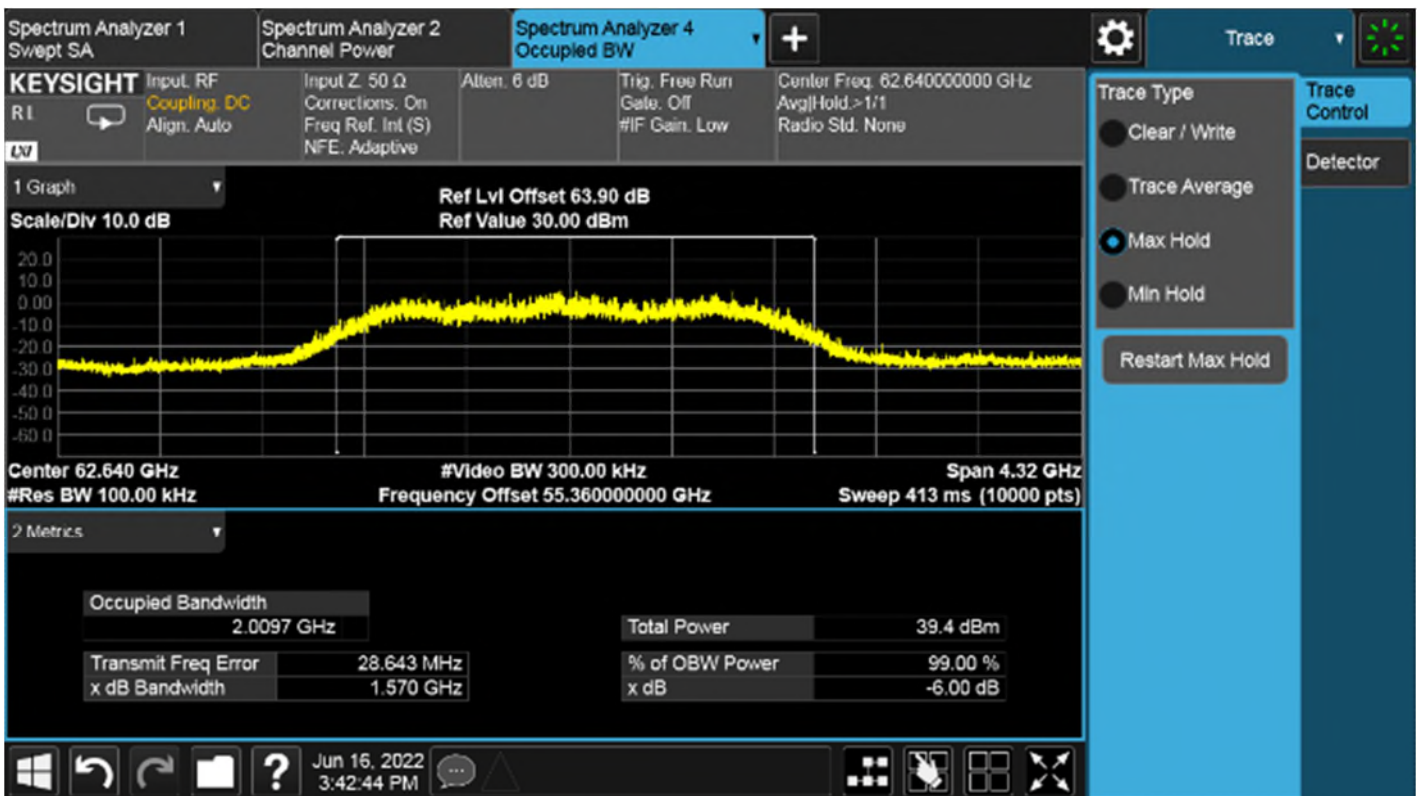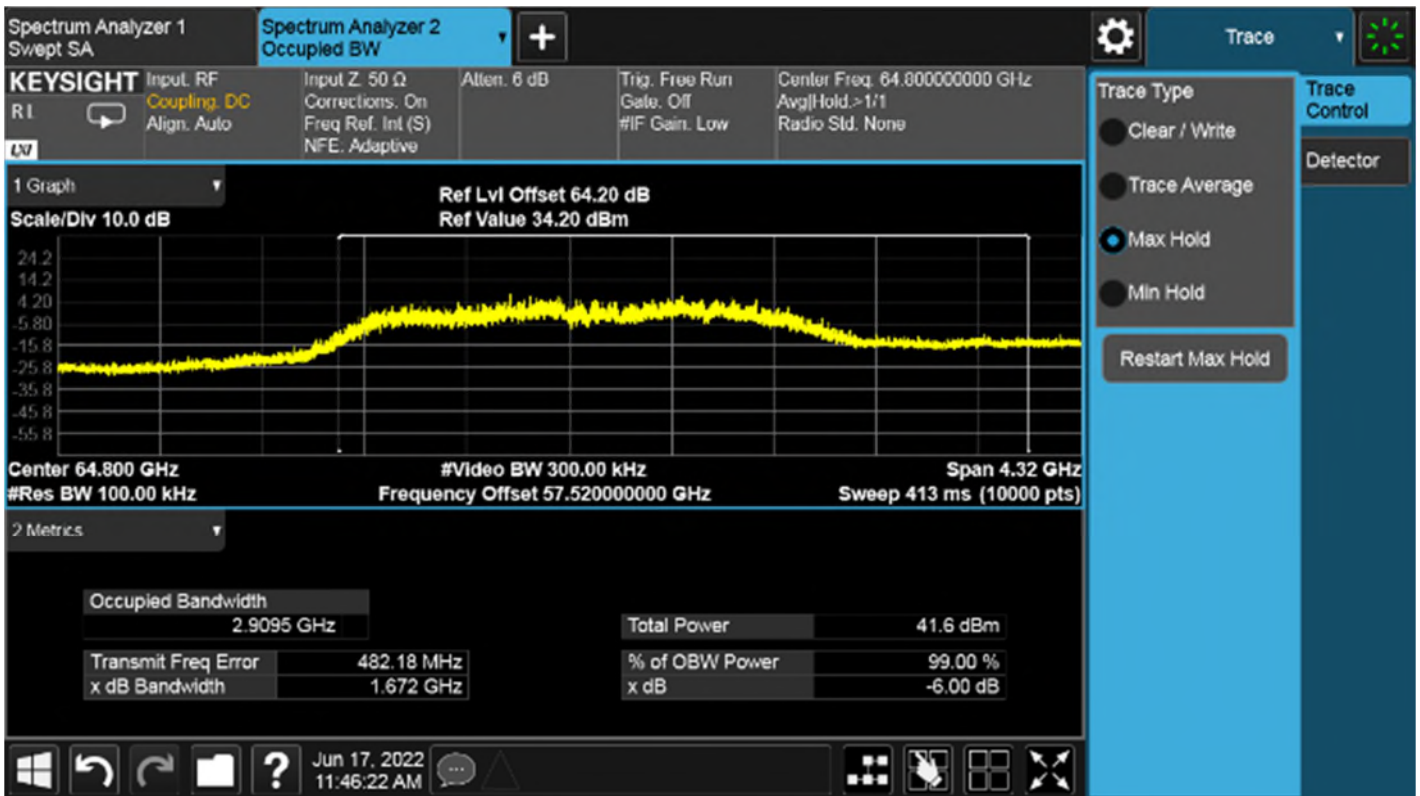Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS5, Channel 61.56 GHz

Plot of 6dB Bandwidth (GHz)

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RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS5, Channel 63.72 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS6, Channel 59.4 GHz
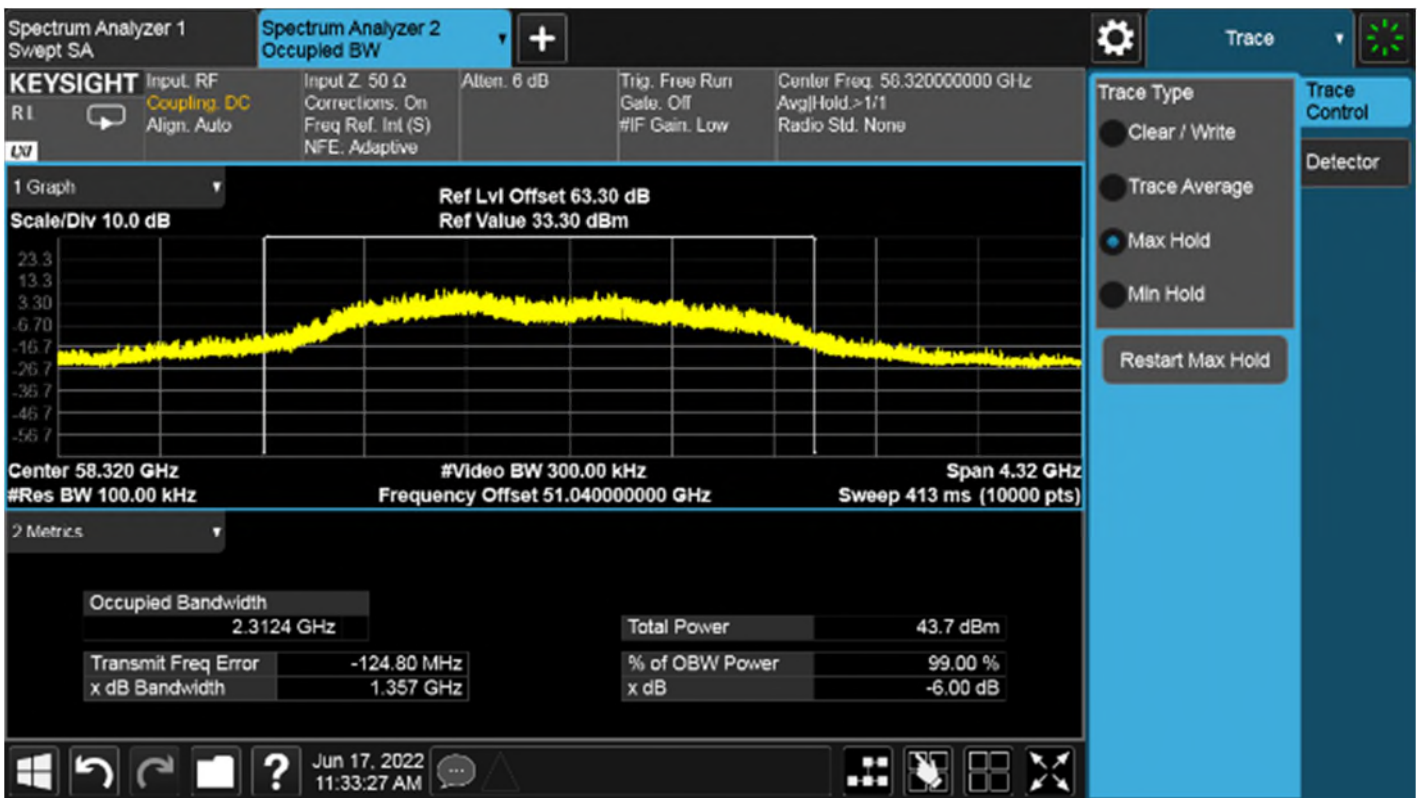

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS6, Channel 61.56 GHz

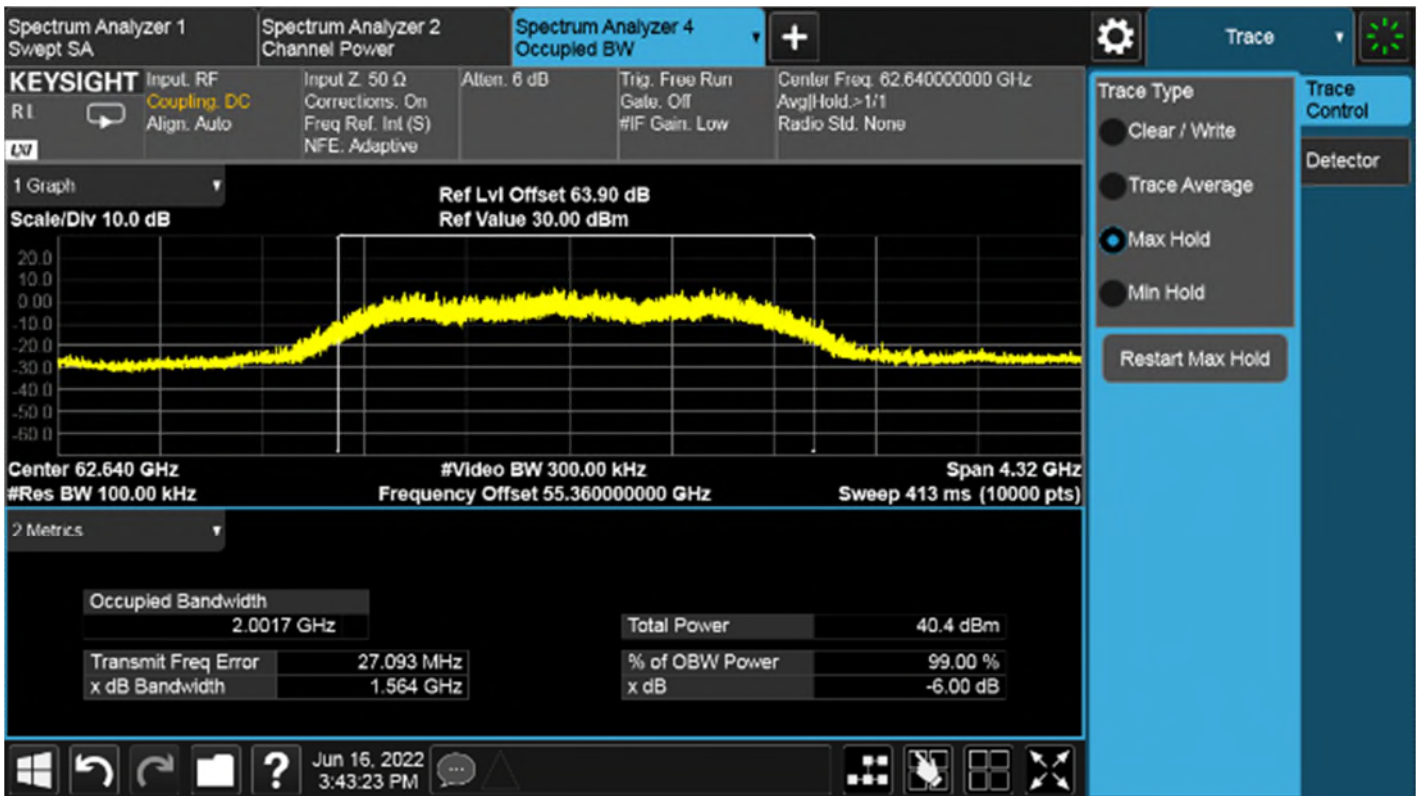Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS6, Channel 63.72 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS7, Channel 59.4 GHz
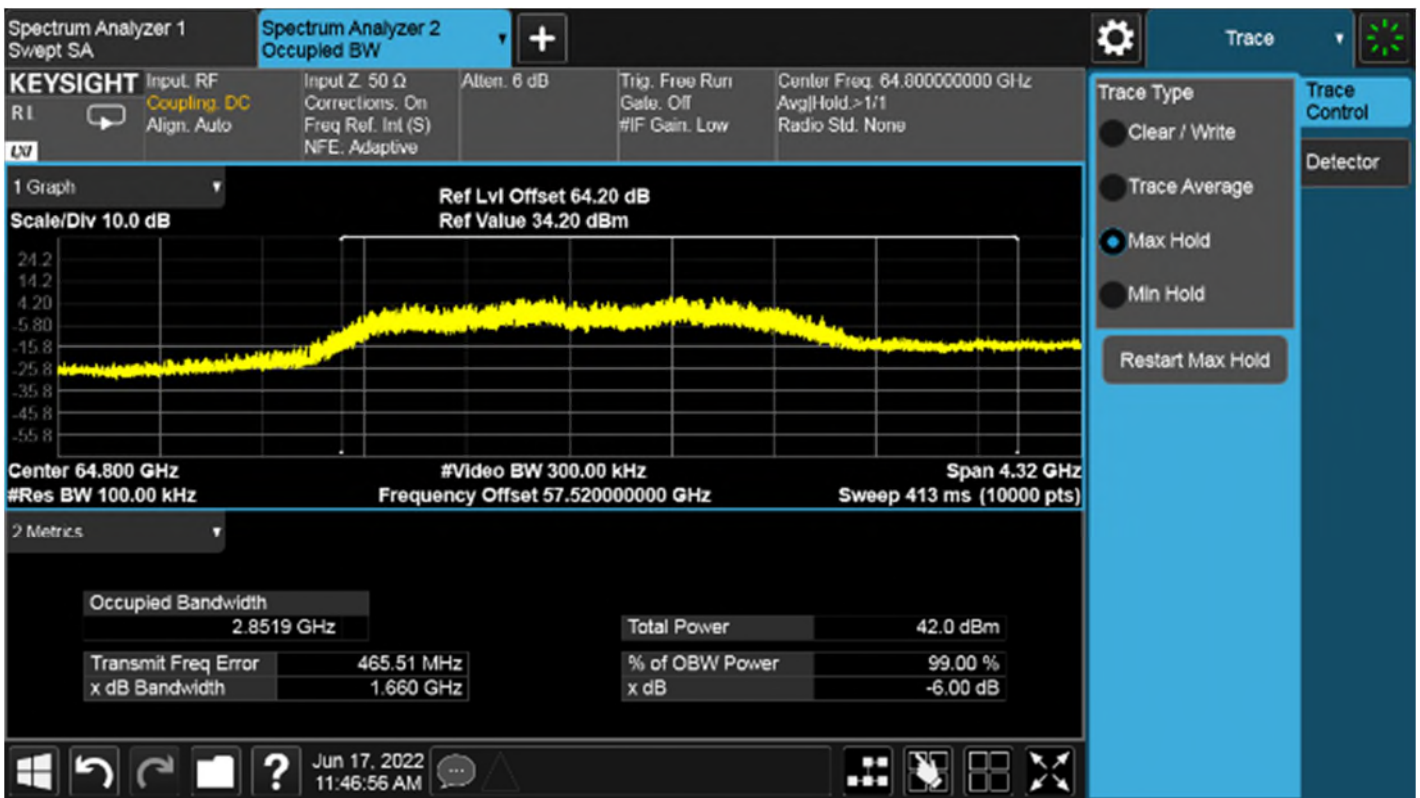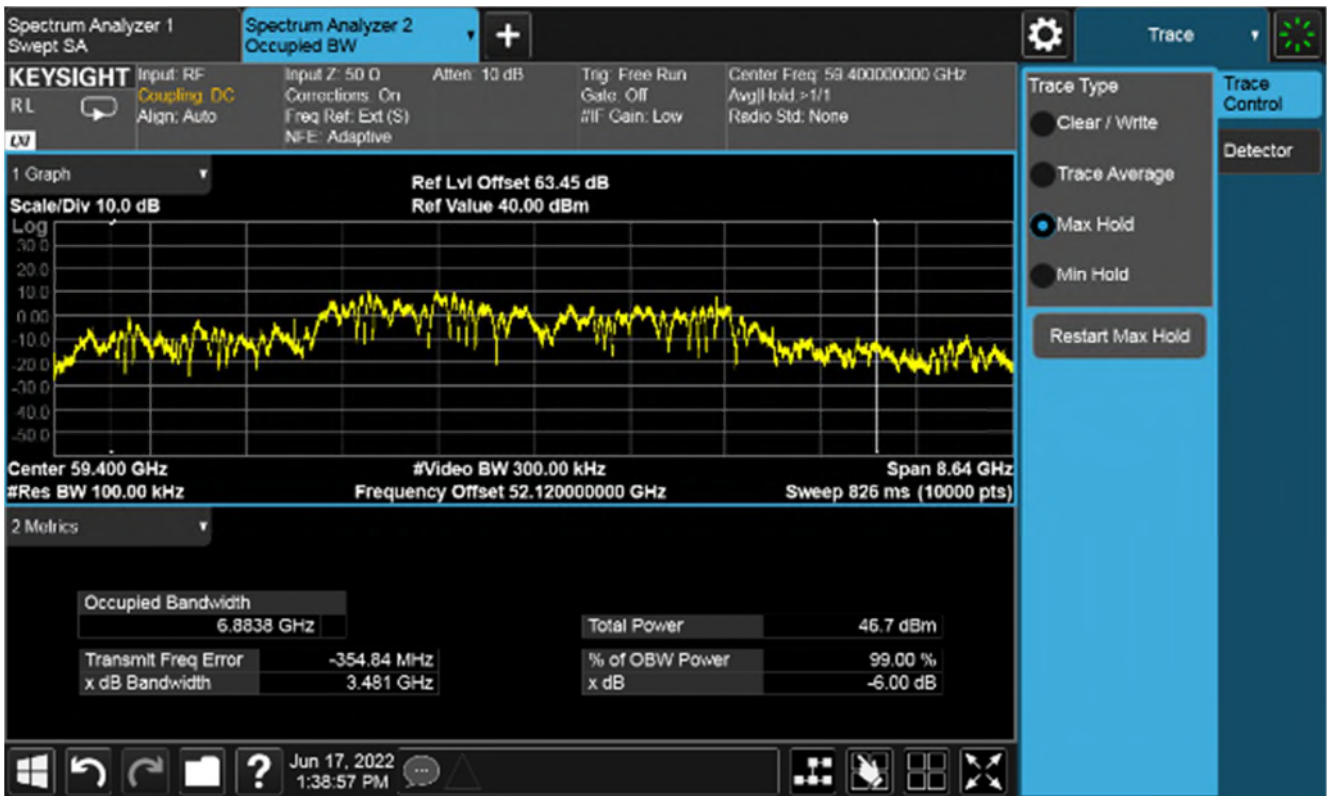

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS7, Channel 61.56 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS7, Channel 63.72 GHz
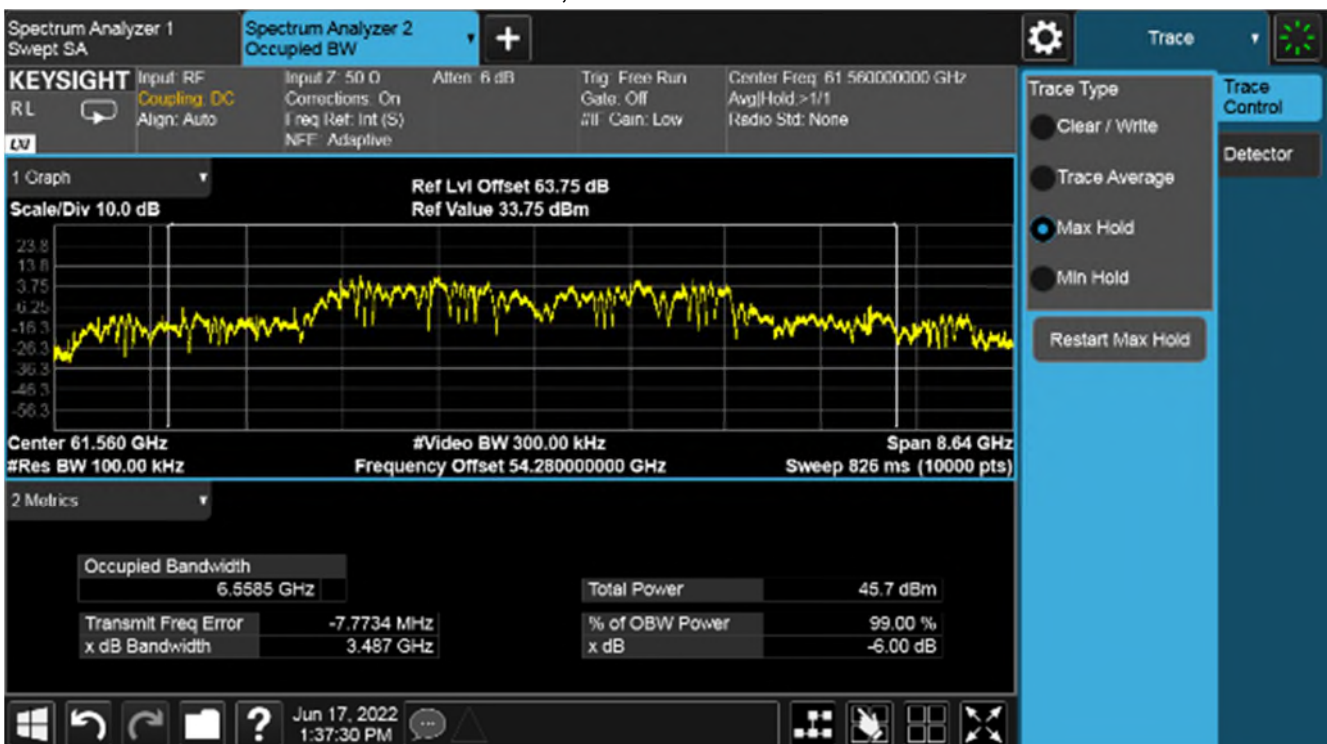

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS8, Channel 59.4 GHz
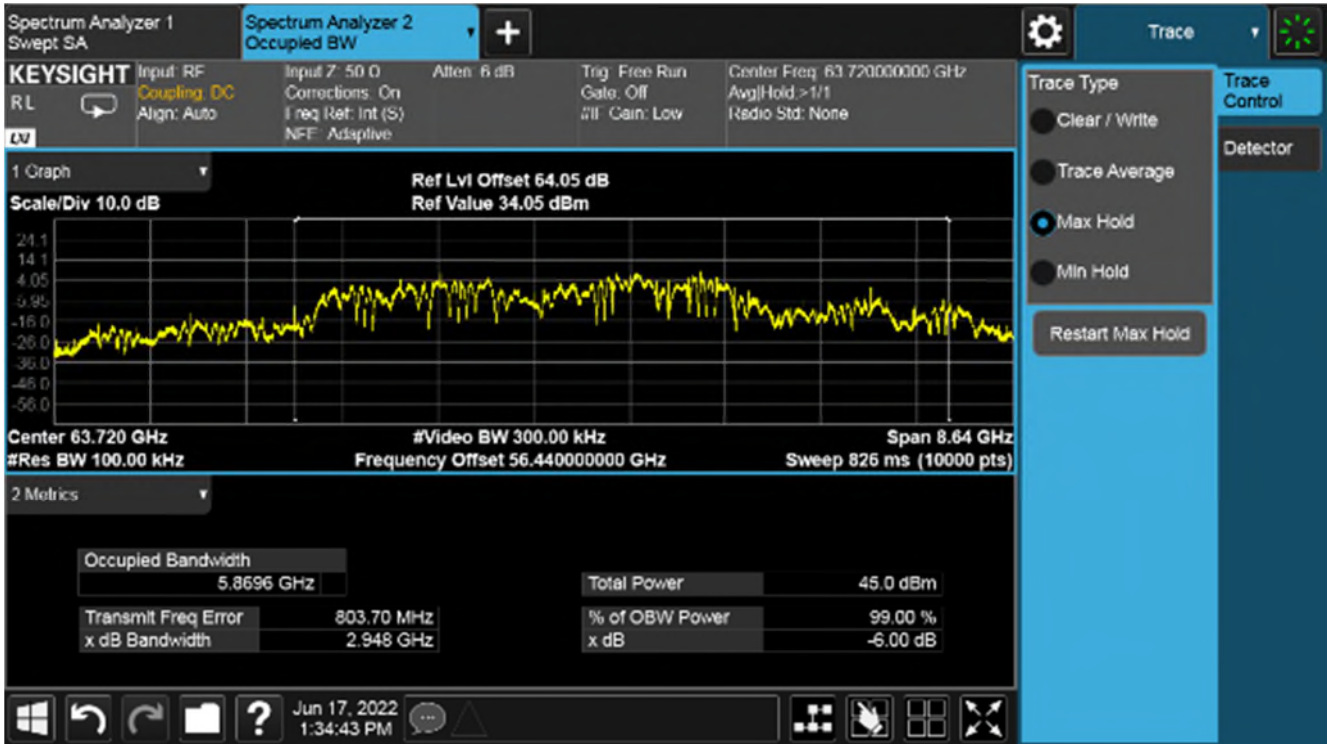

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS8, Channel 61.56 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS8, Channel 63.72 GHz

Plot of 6dB Bandwidth (GHz)

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RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS9, Channel 59.4 GHz

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS9, Channel 61.56 GHz
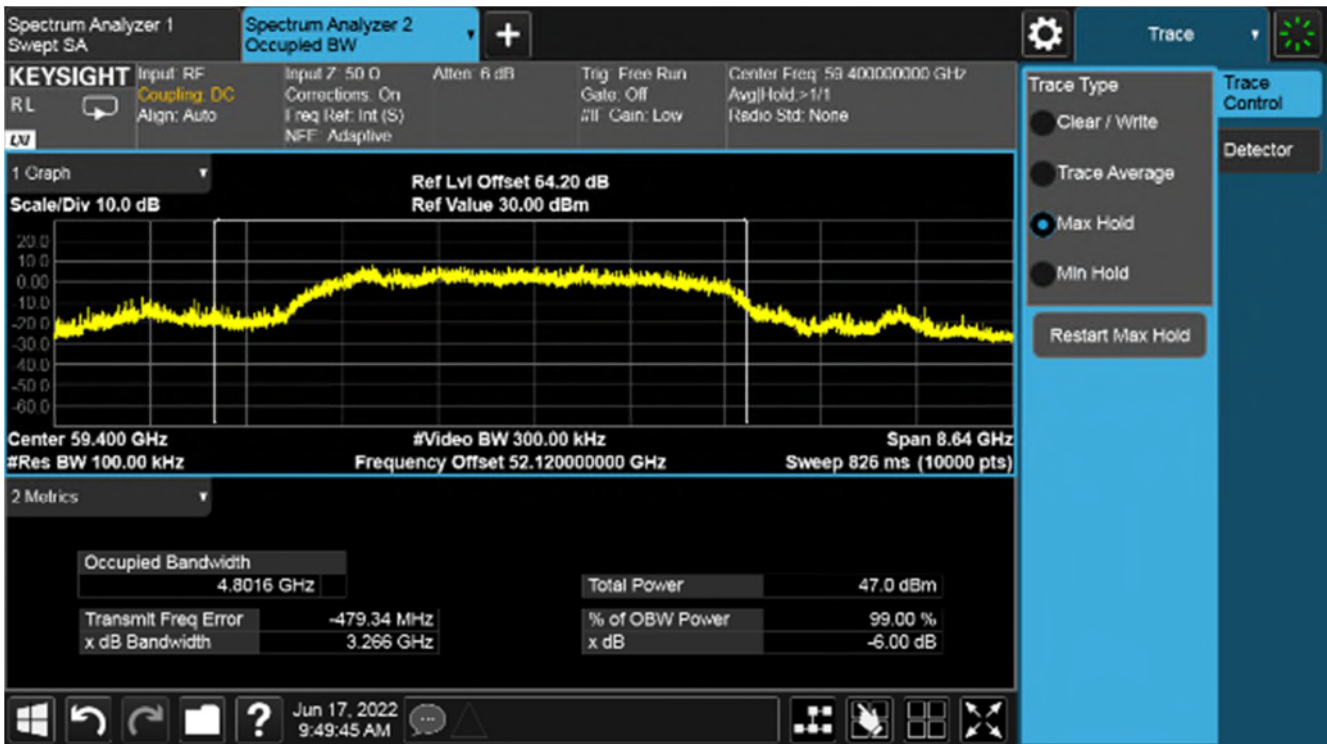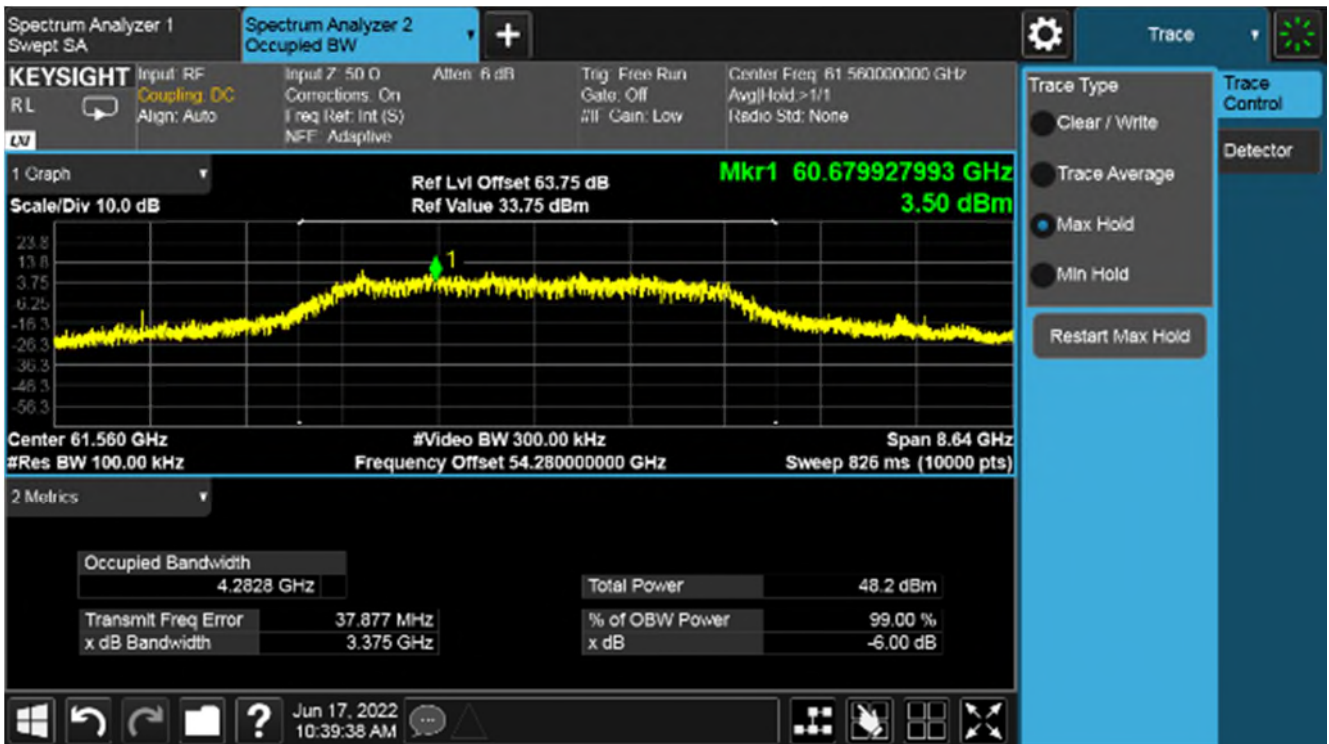

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS9, Channel 63.72 GHz
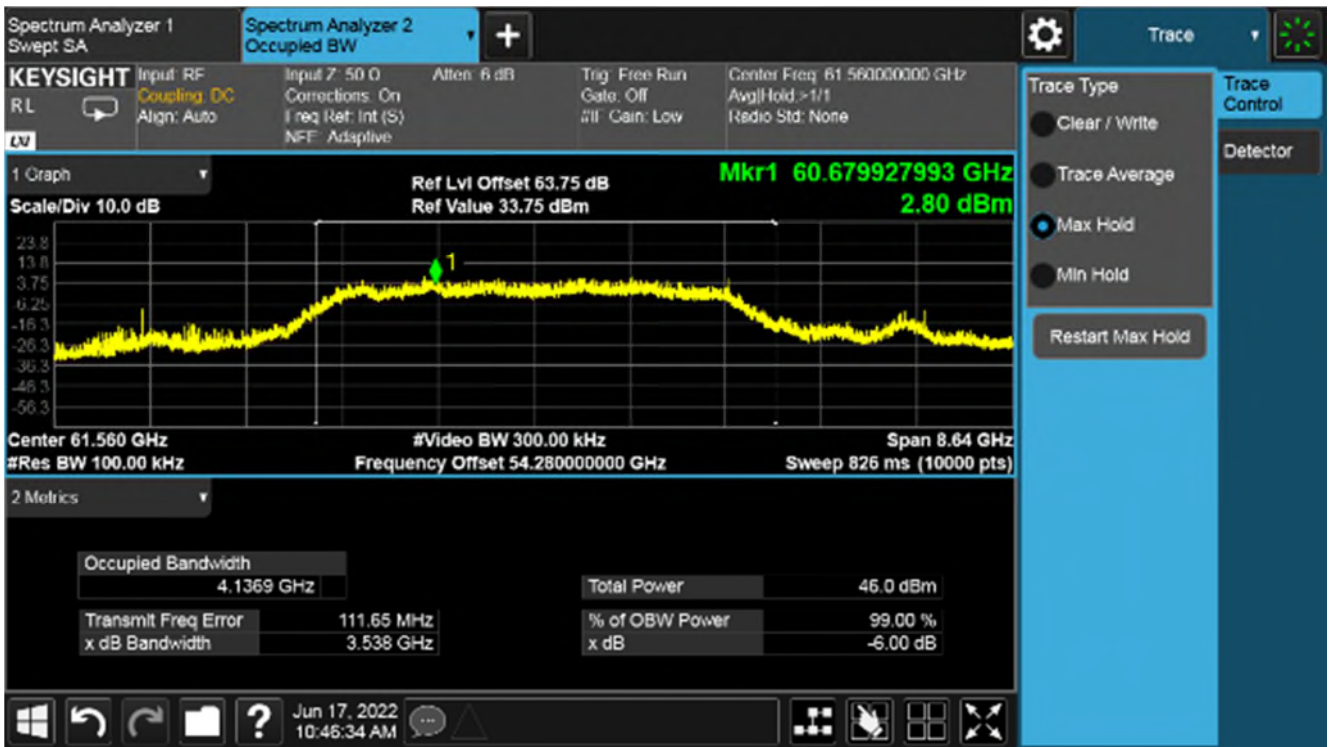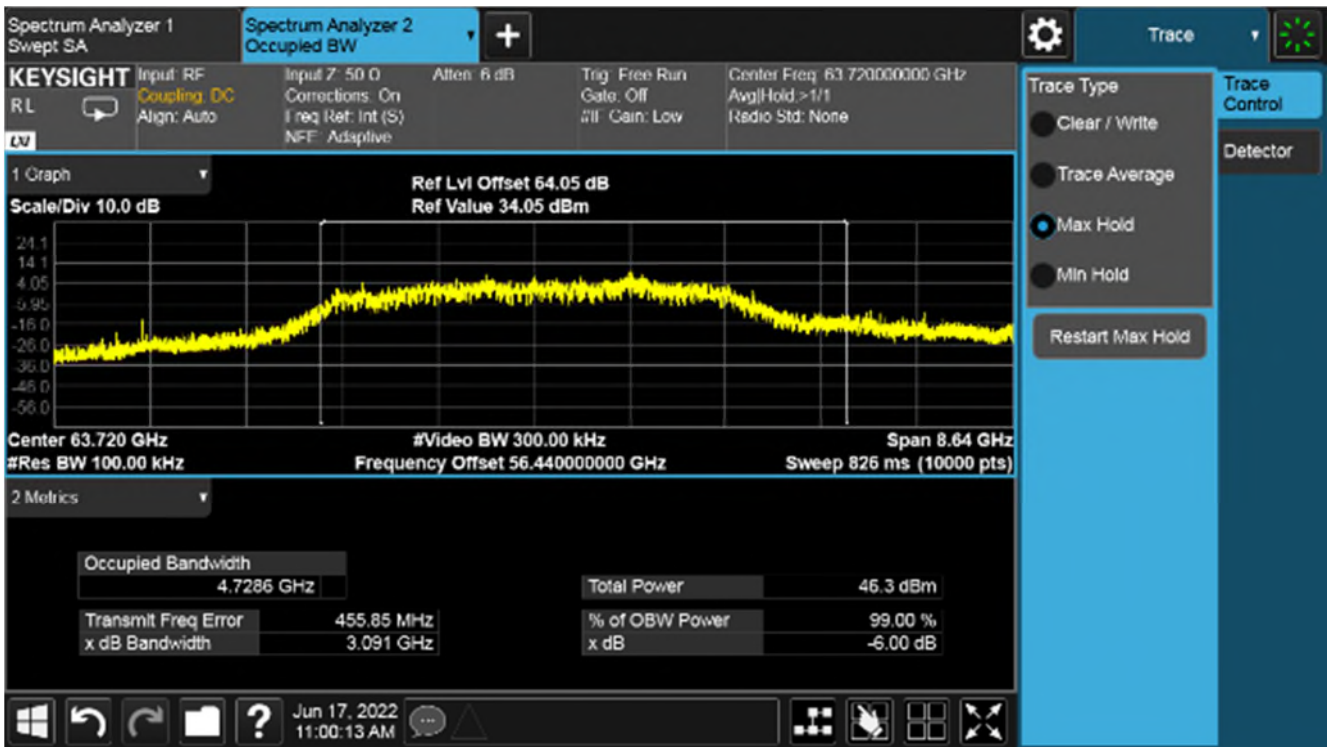

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS10, Channel 59.4 GHz
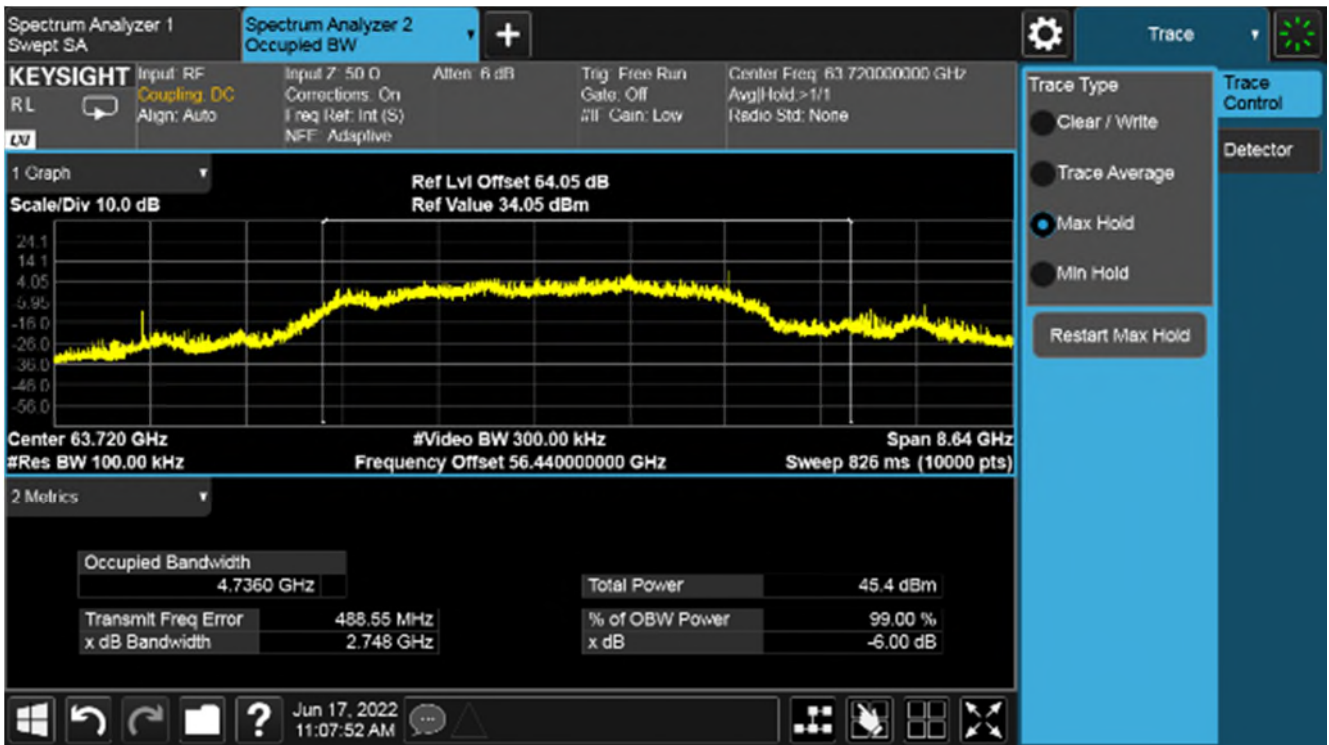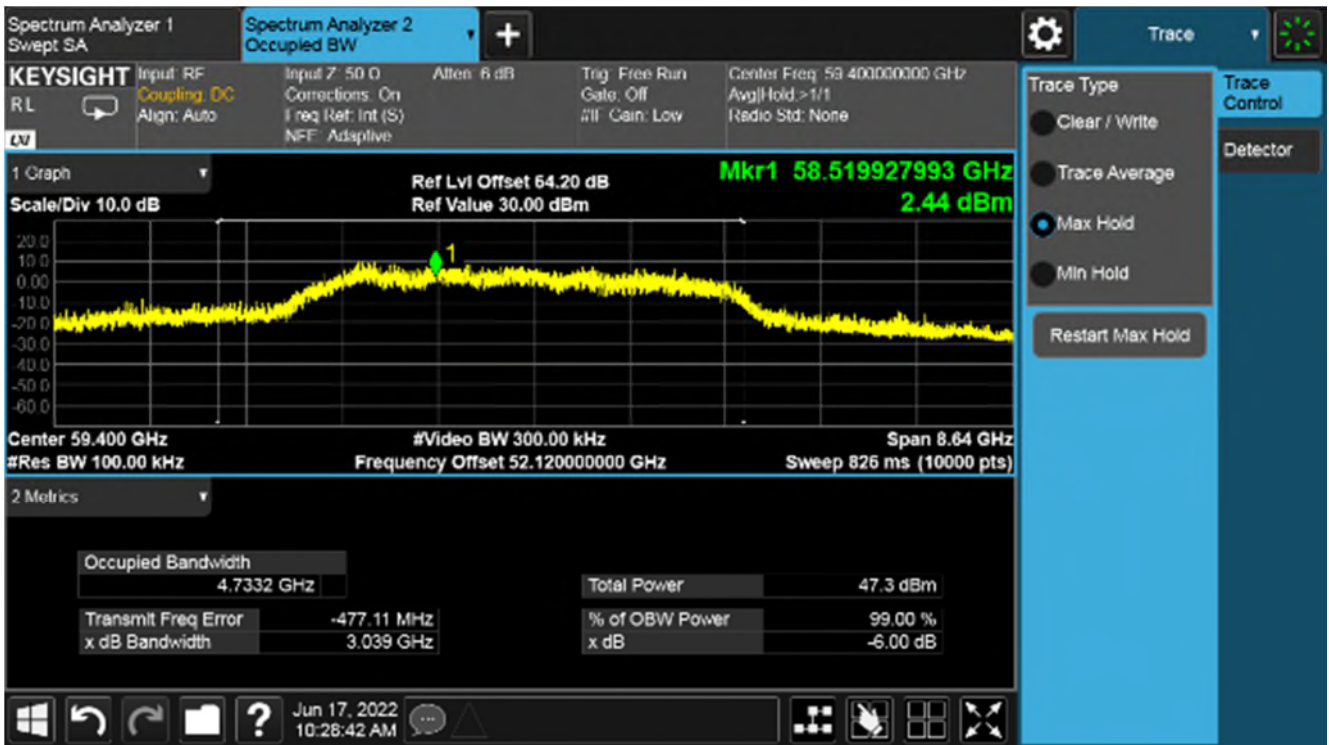

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS10, Channel 61.56 GHz
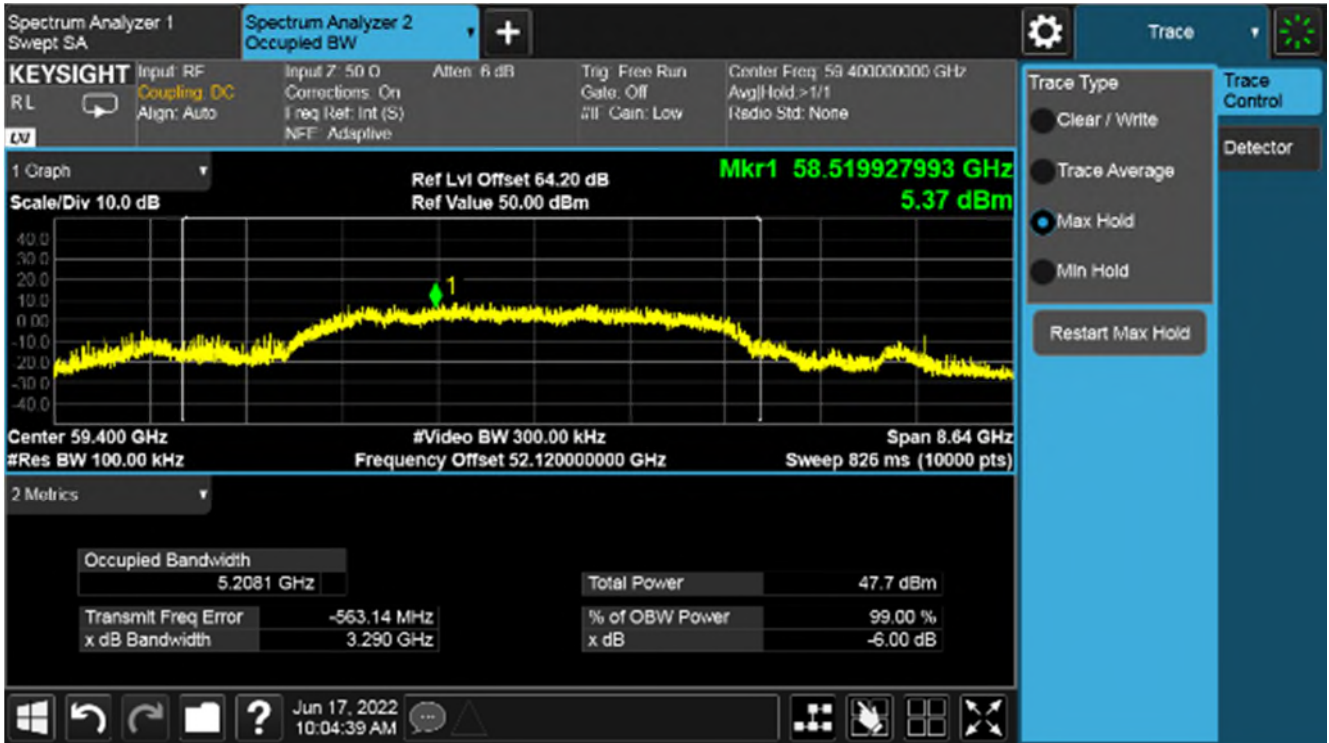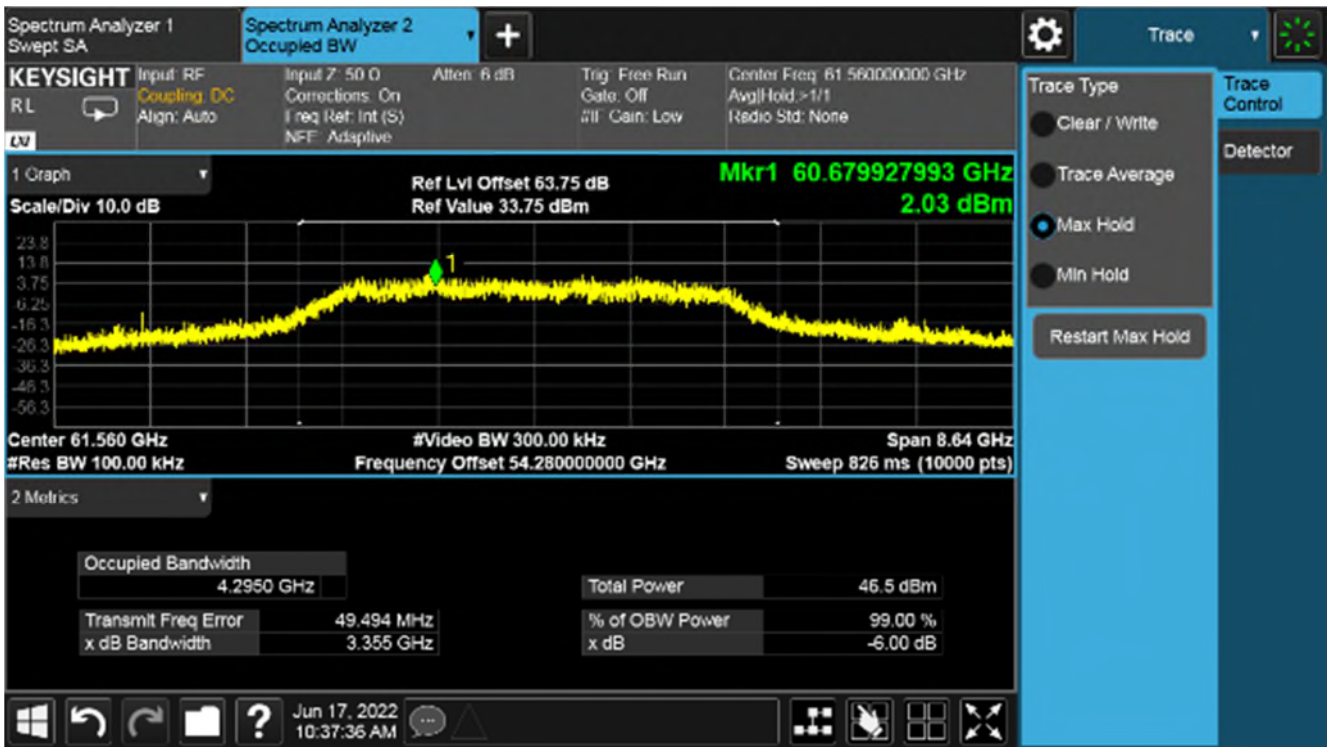

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS10, Channel 63.72 GHz
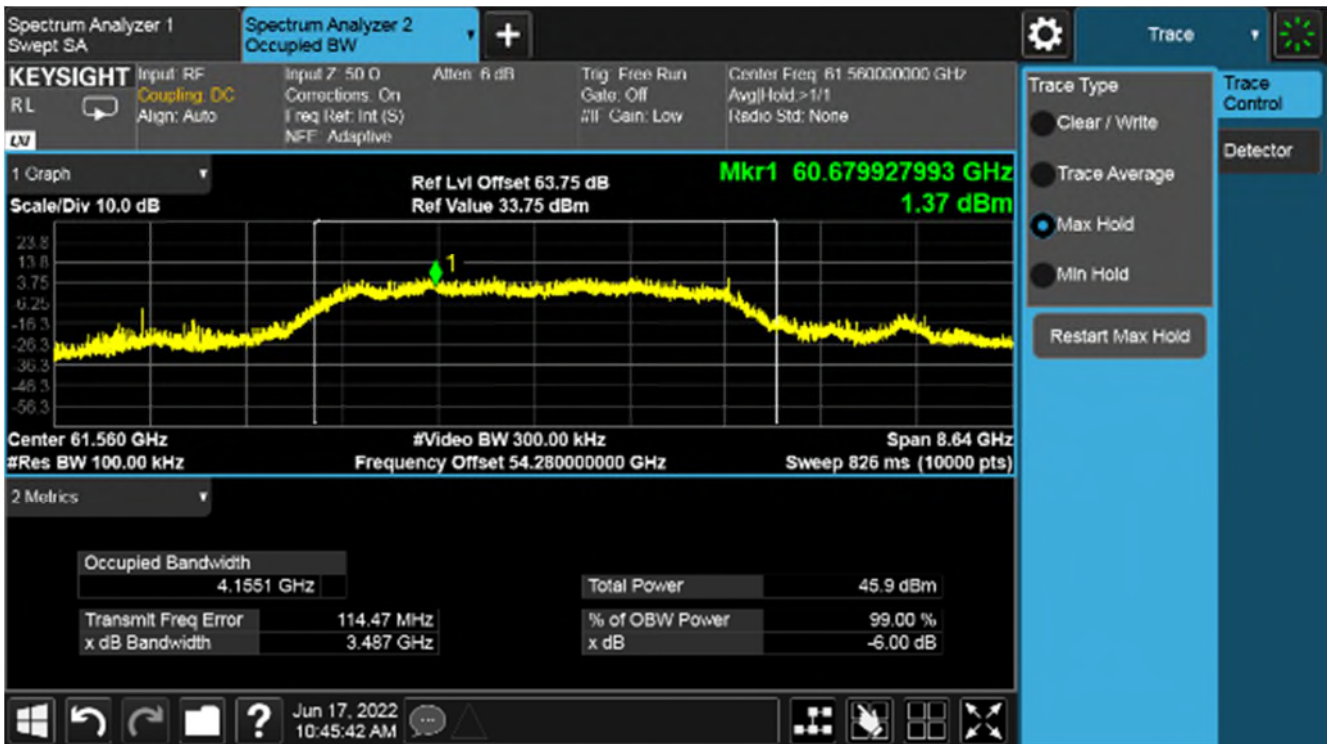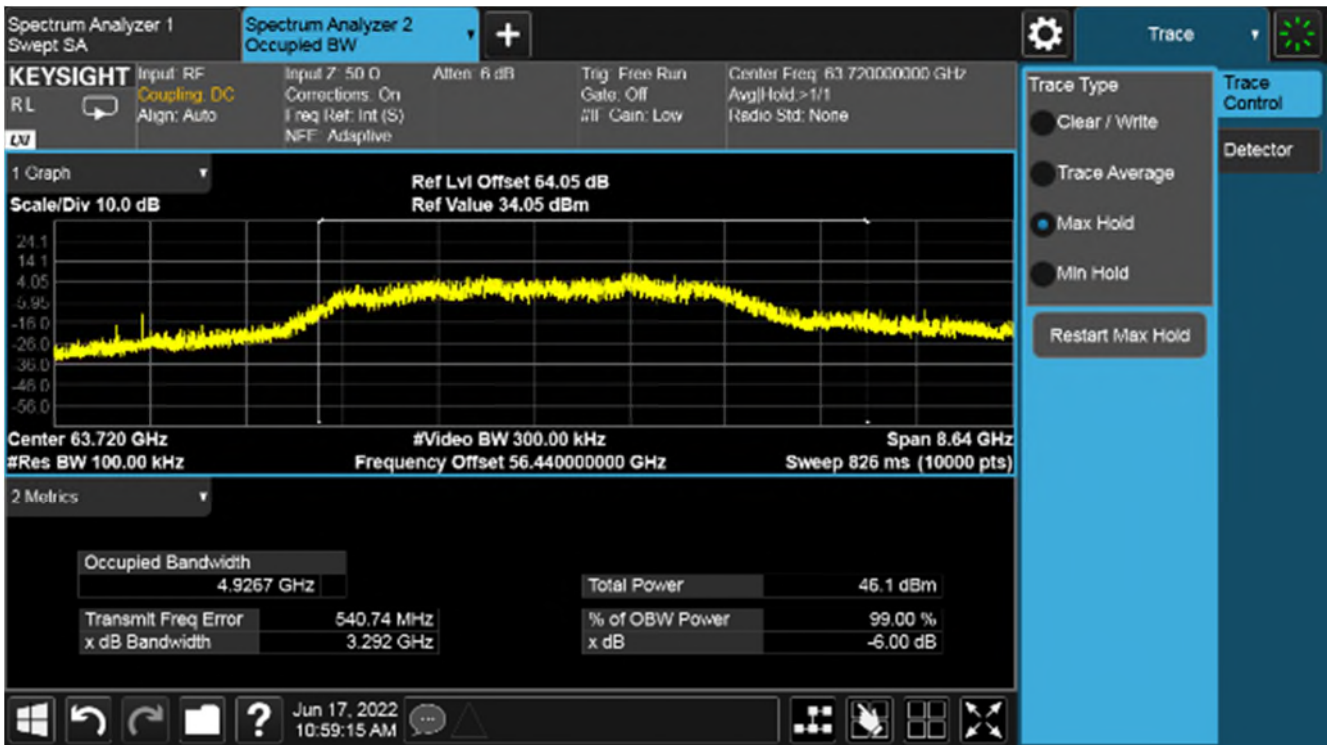

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS11, Channel 59.4 GHz
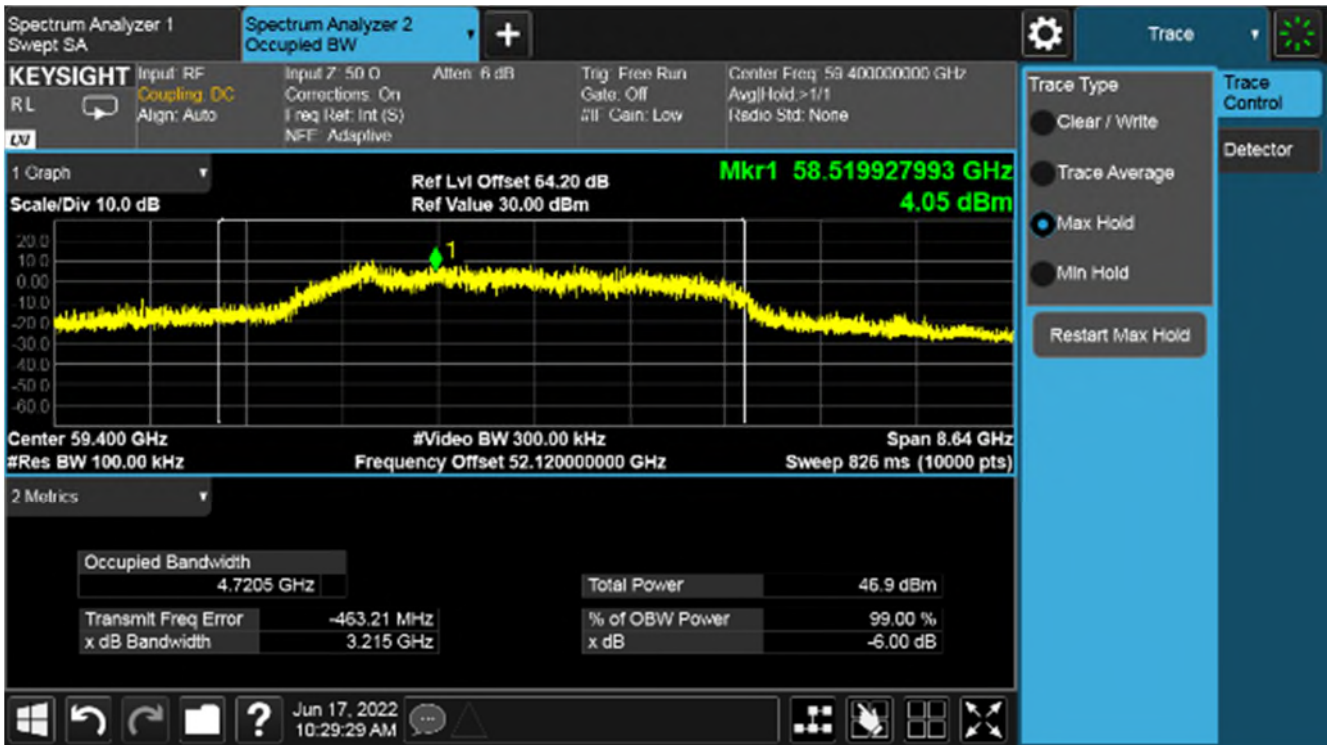
Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS11, Channel 61.56 GHz
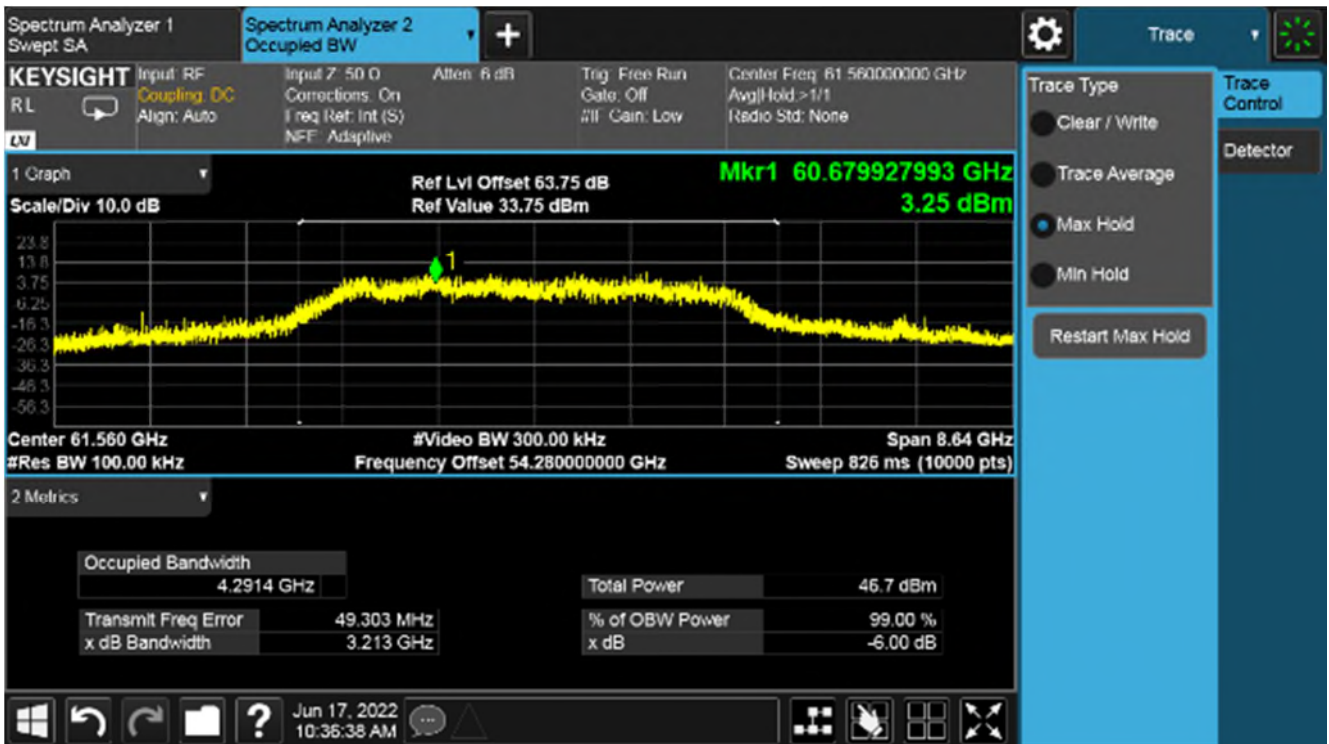
Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS11, Channel 63.72 GHz
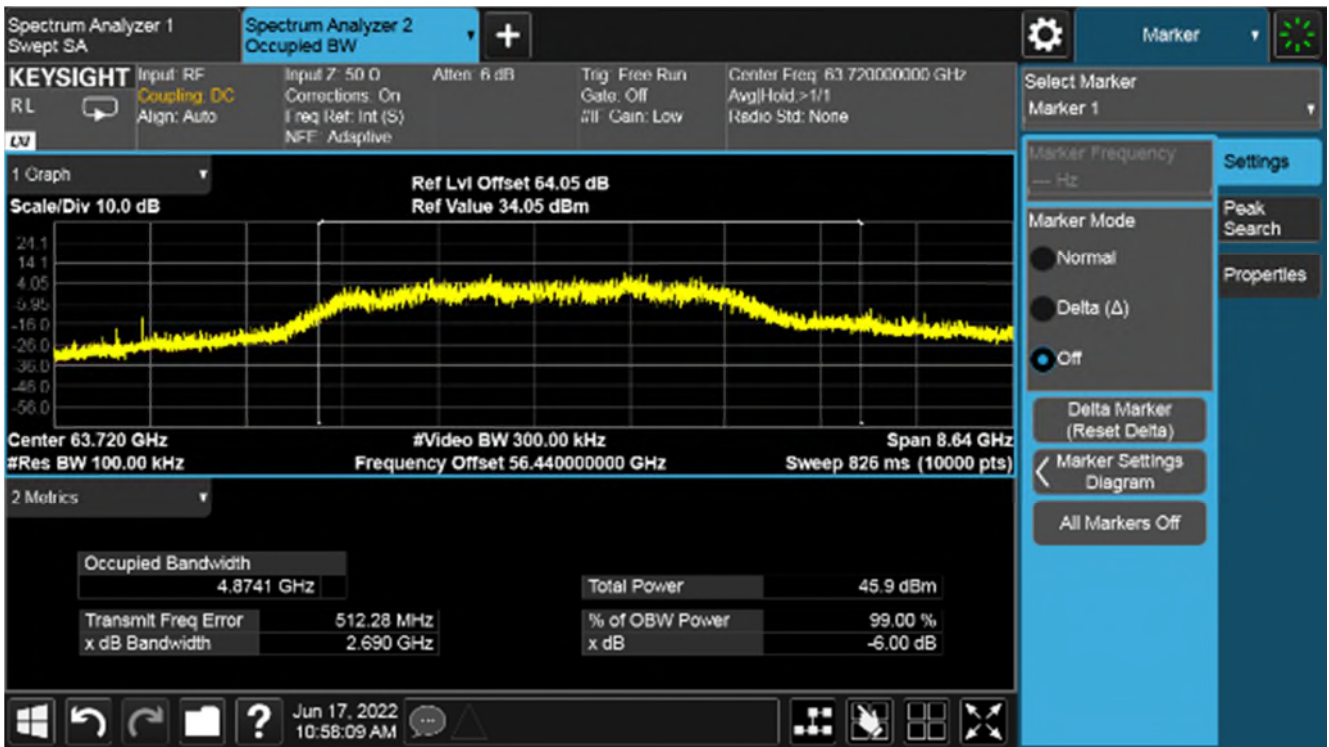
Plot of 6dB Bandwidth (GHz)

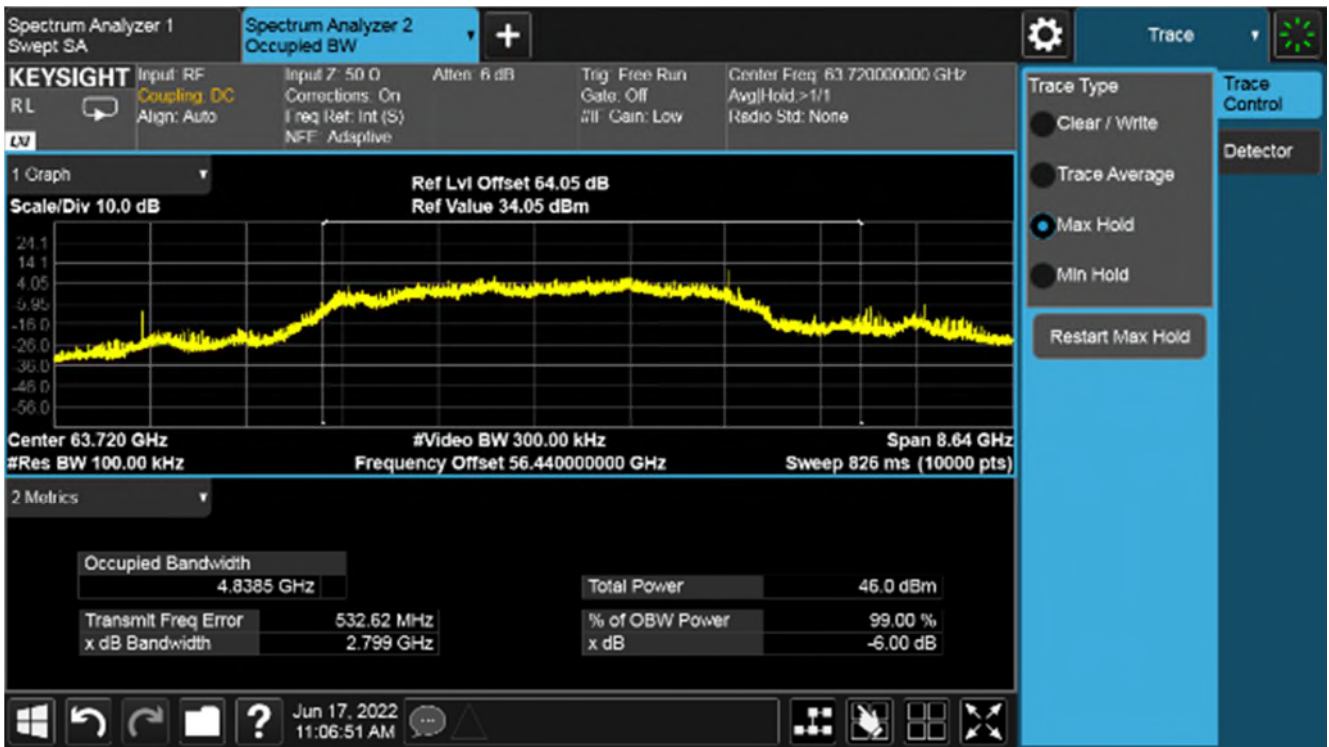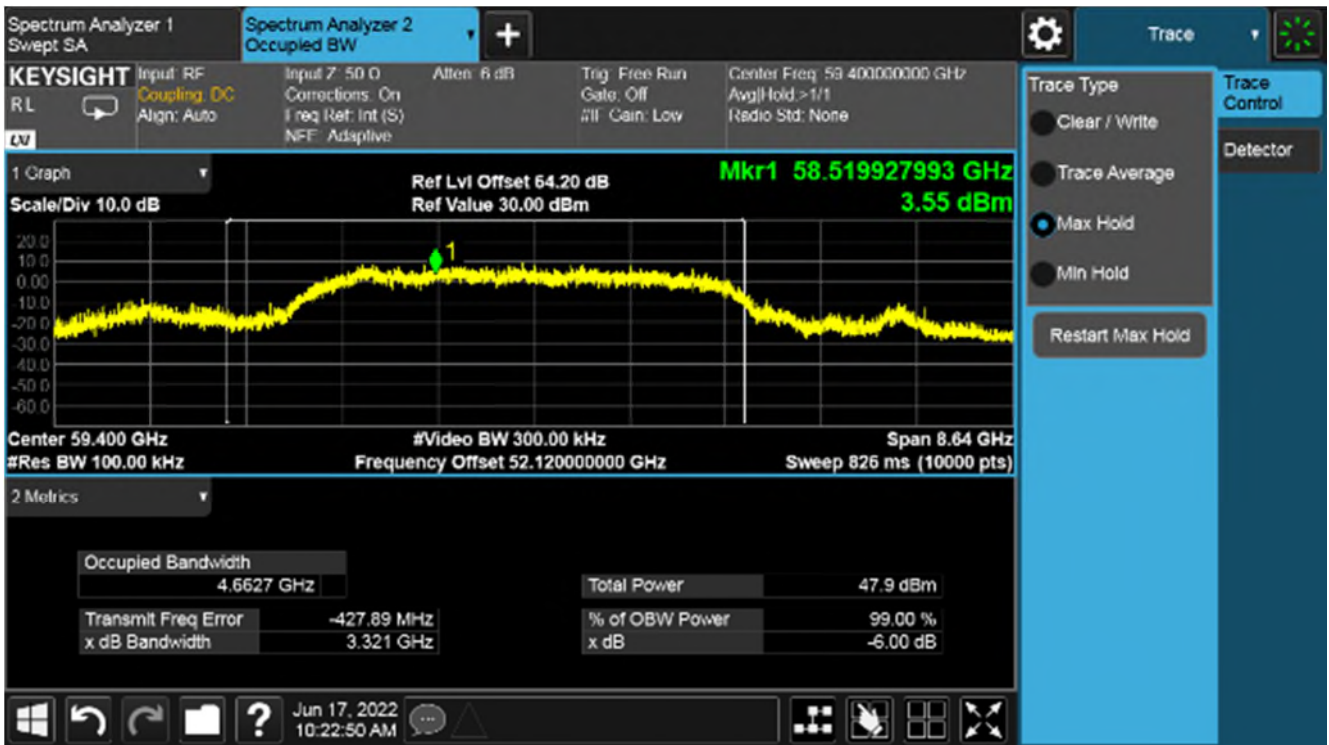RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS12, Channel 59.4 GHz
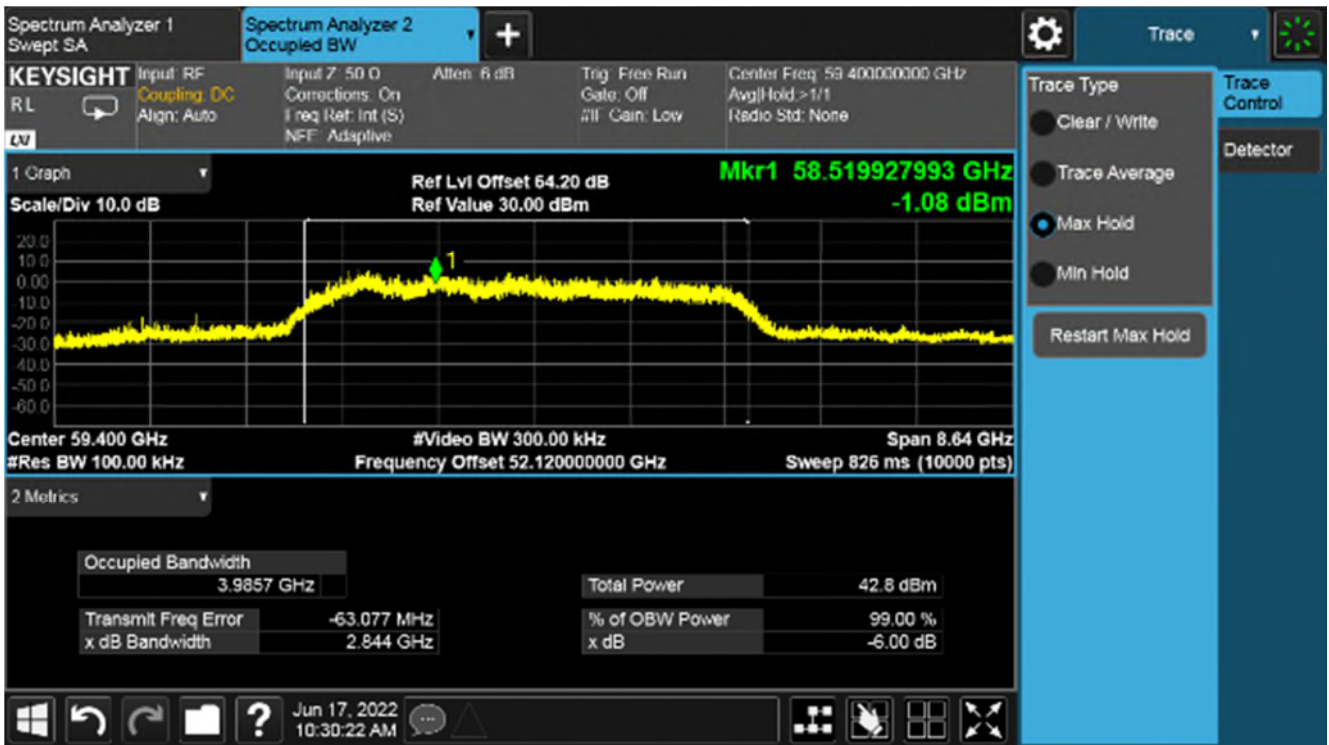
Plot of 6dB Bandwidth (GHz)

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RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS12, Channel 61.56 GHz
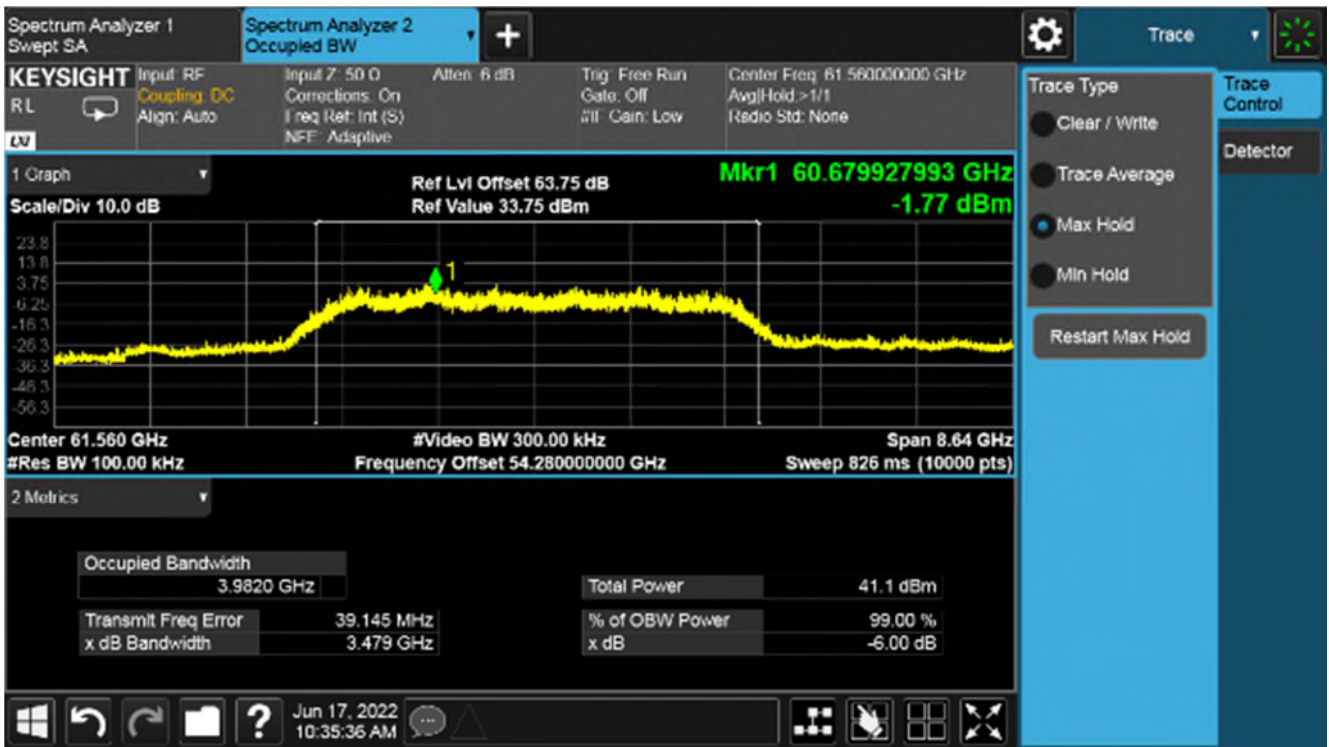
Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS12, Channel 63.72 GHz
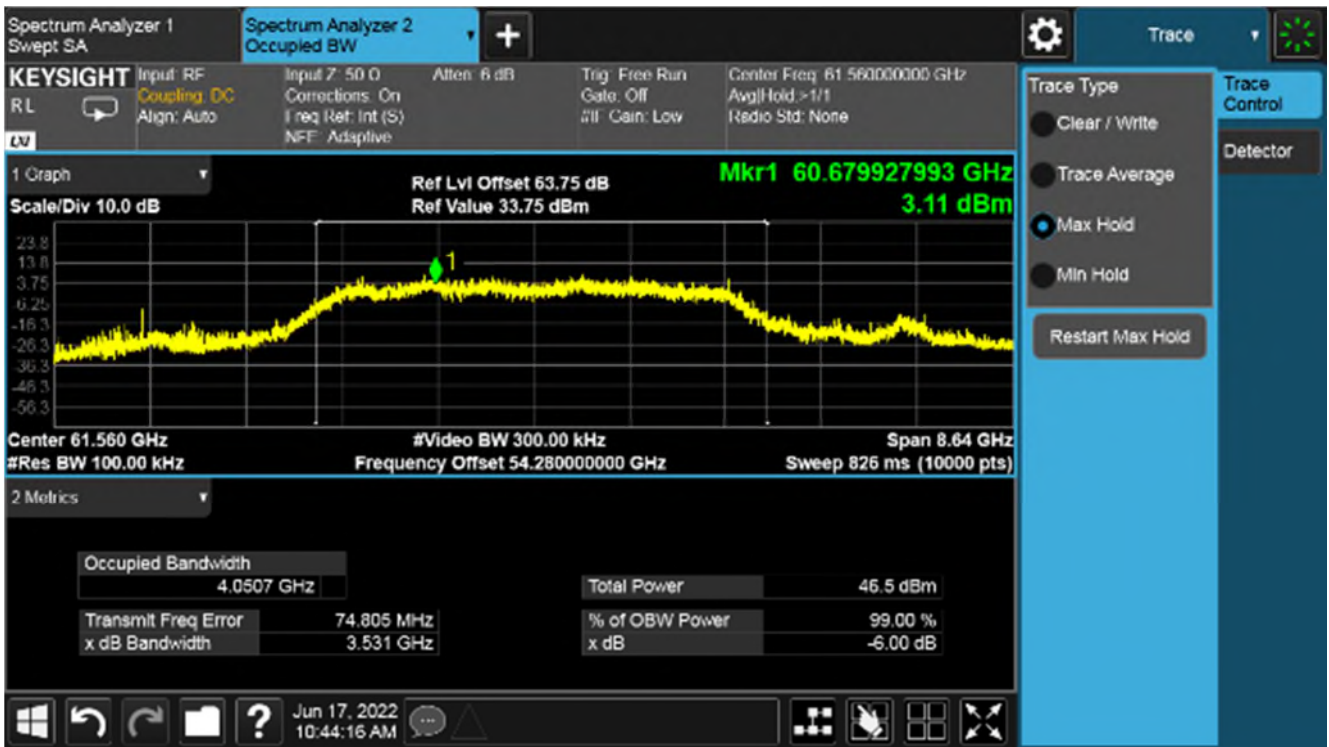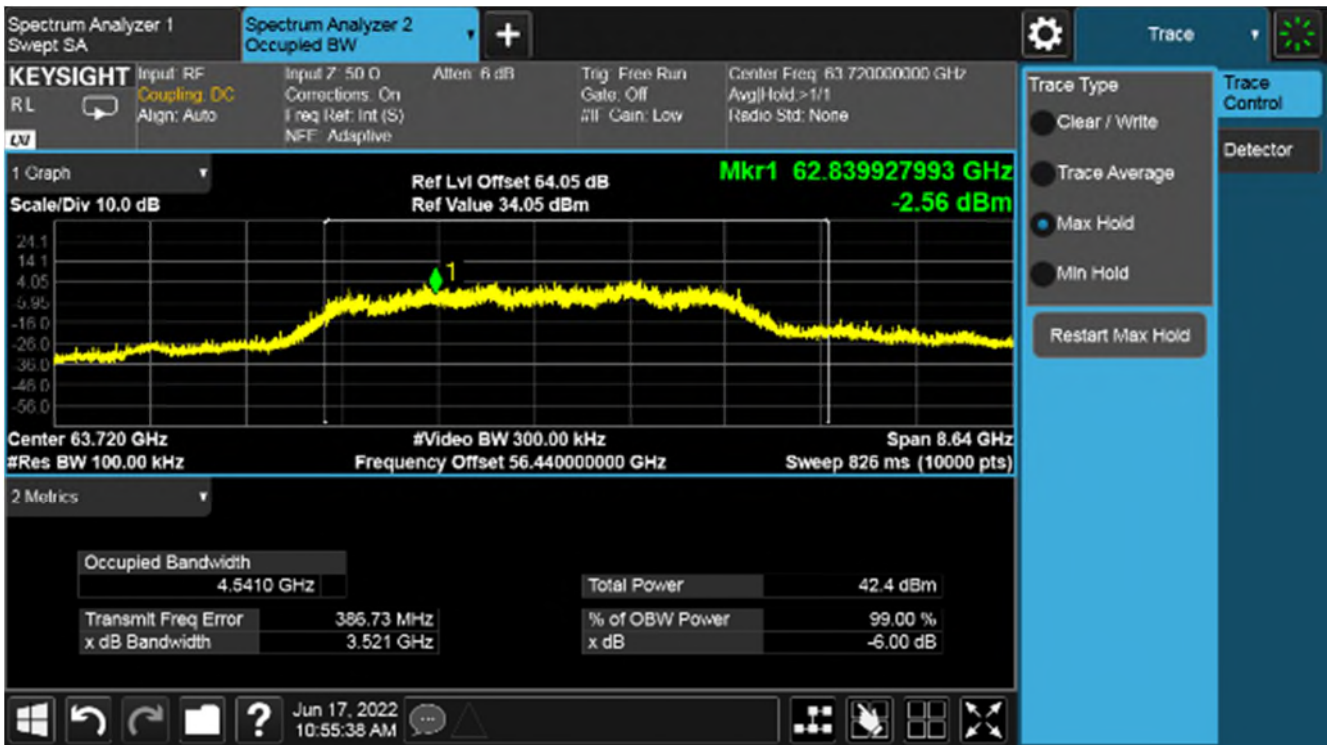

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS13, Channel 59.4 GHz
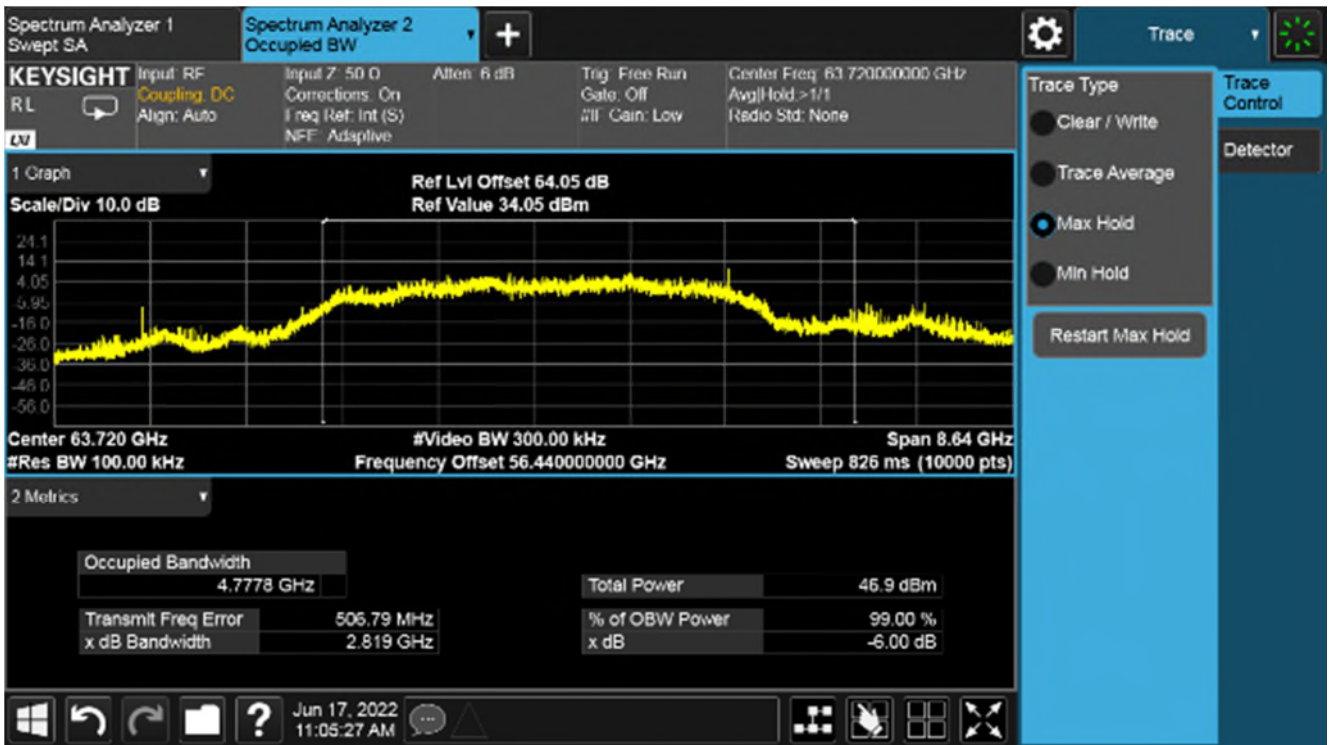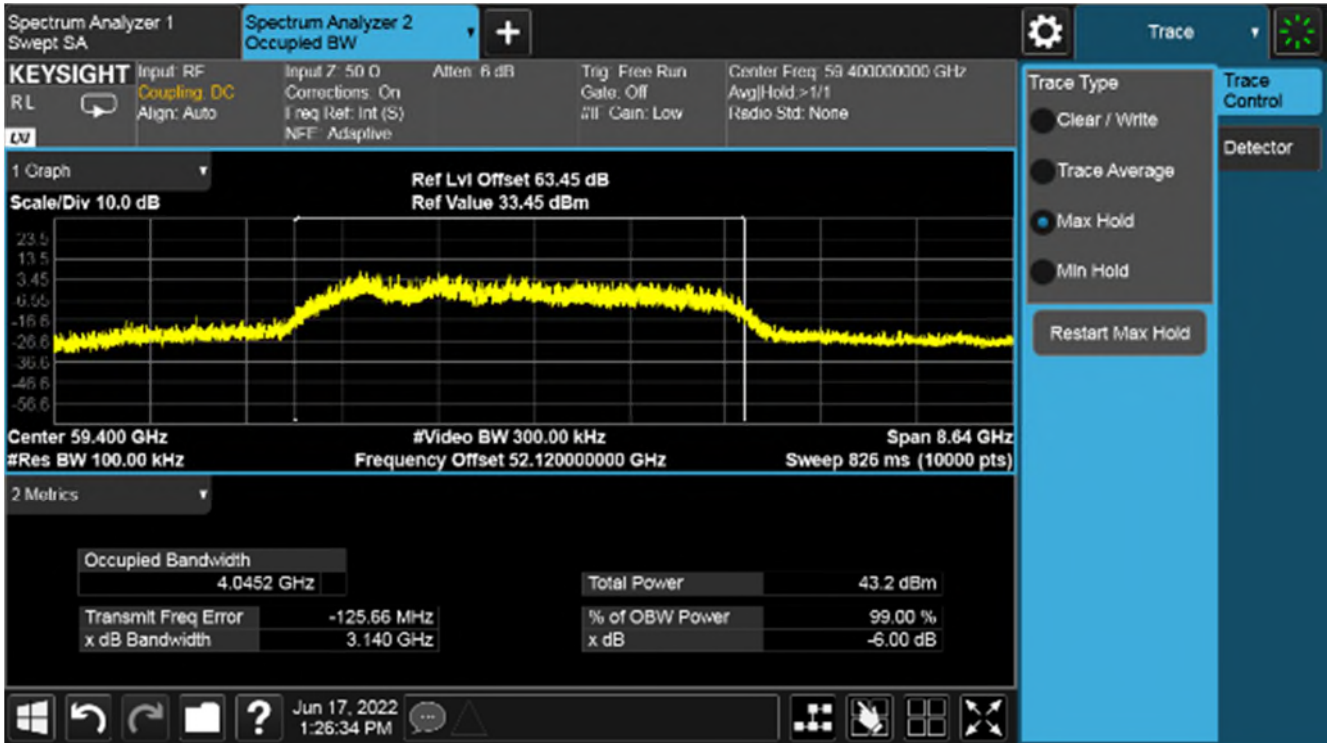

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS13, Channel 61.56 GHz
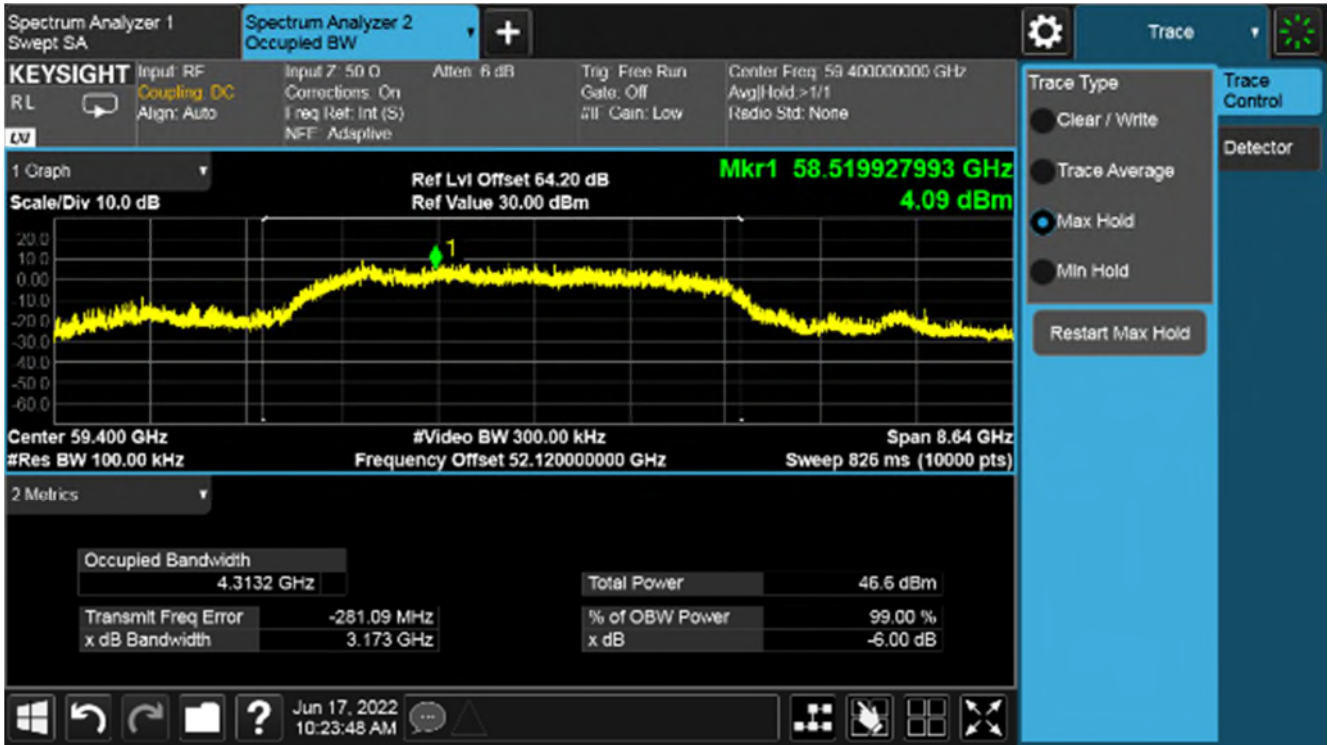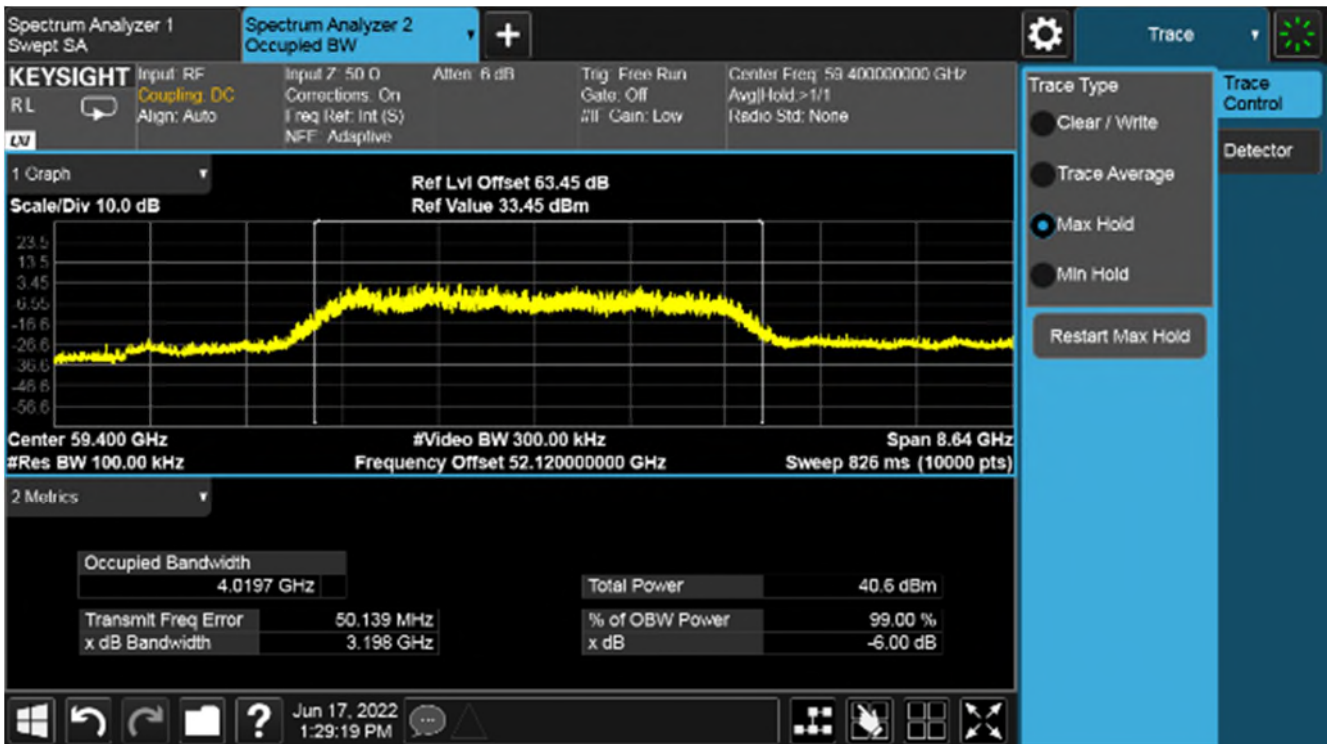

Plot of 6dB Bandwidth (GHz)

RF Parameters: Band 57-71 GHz, Power 49 dBm, Channel Bandwidth 4.32 GHz, Modulation MCS13, Channel 63.72 GHz
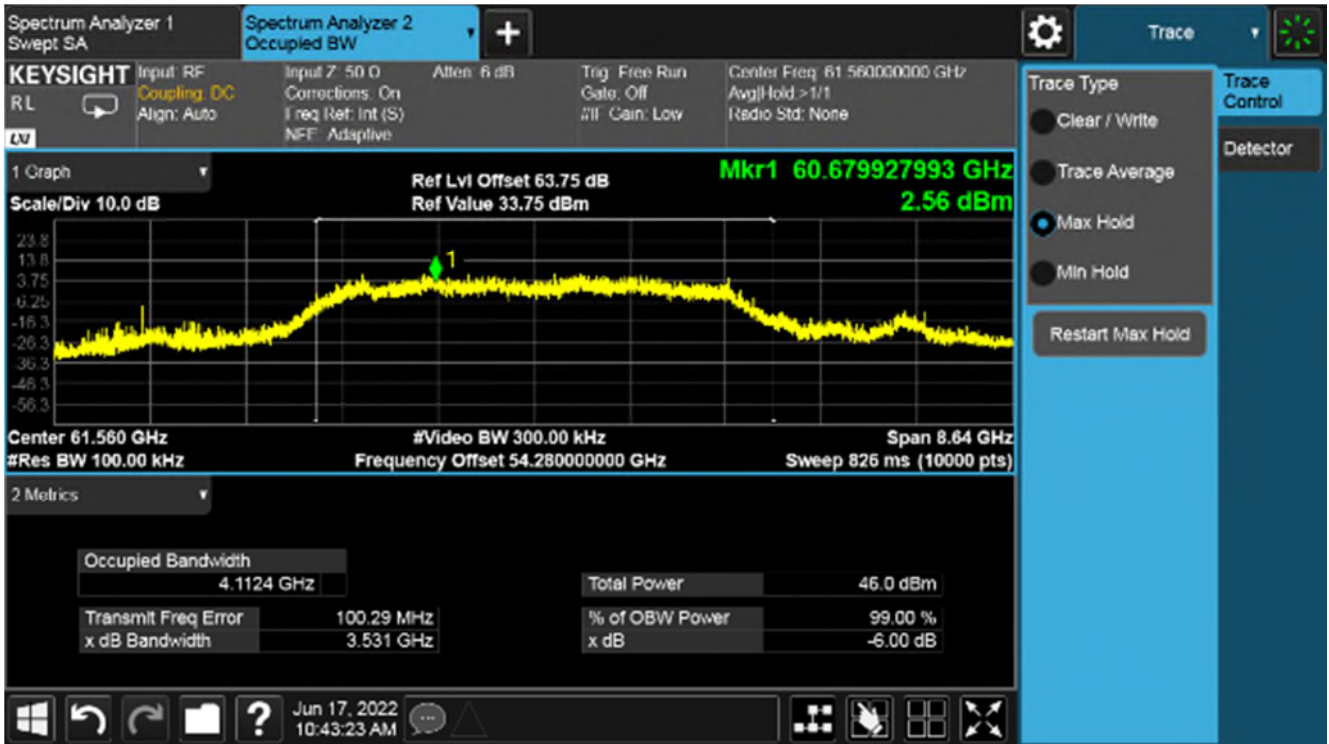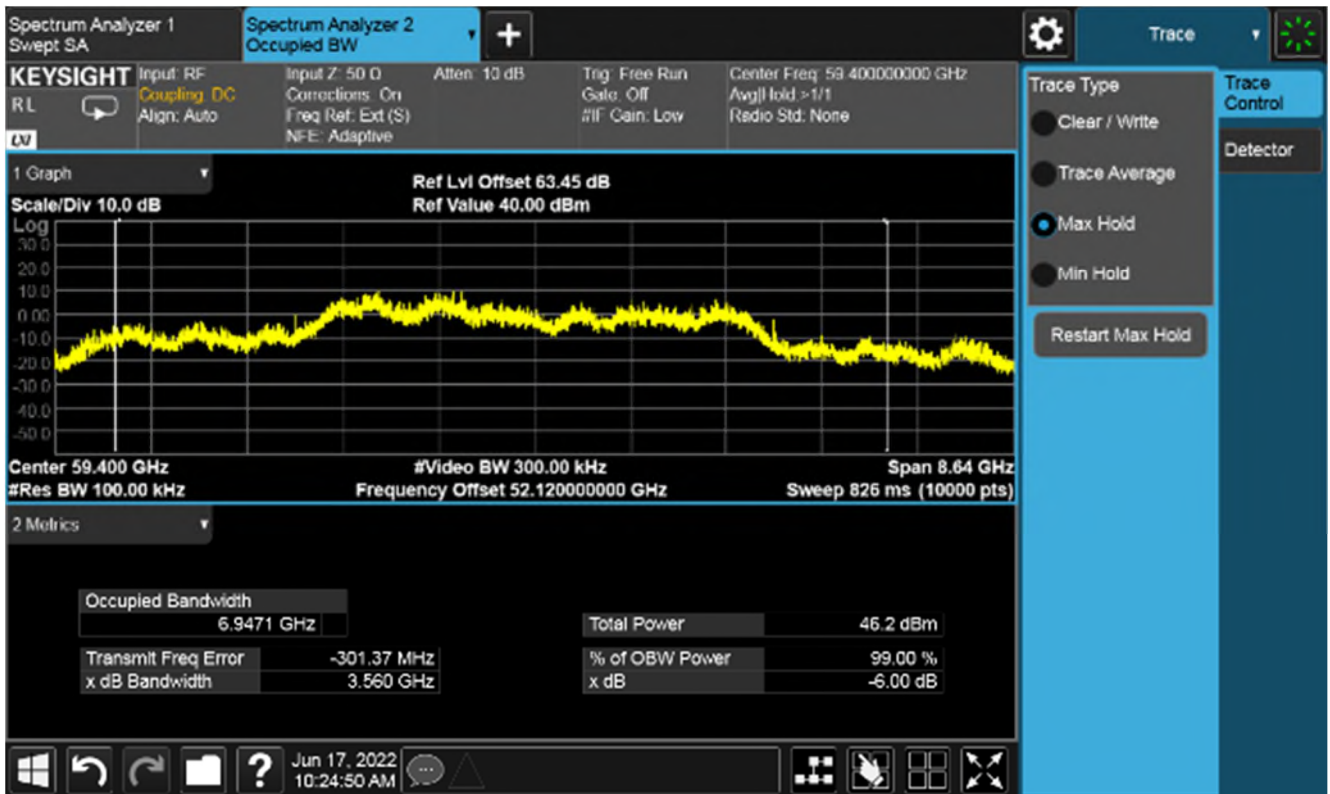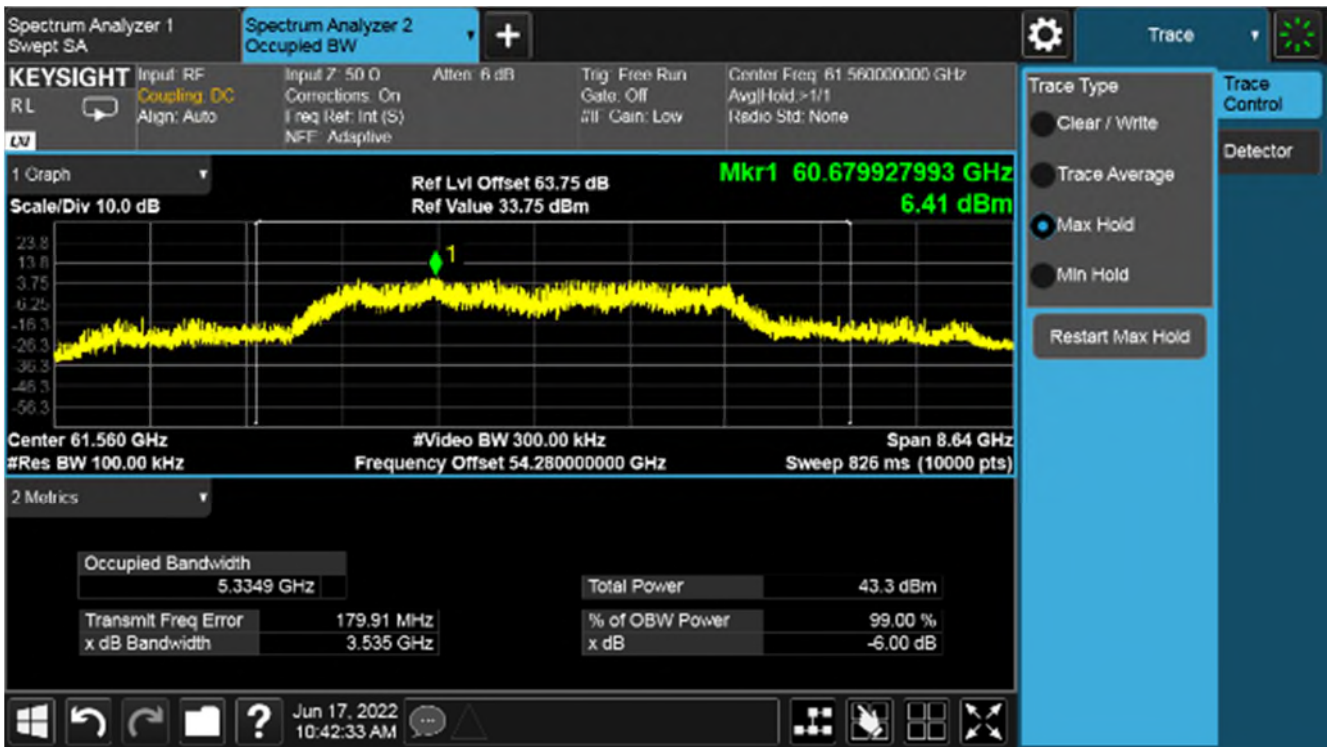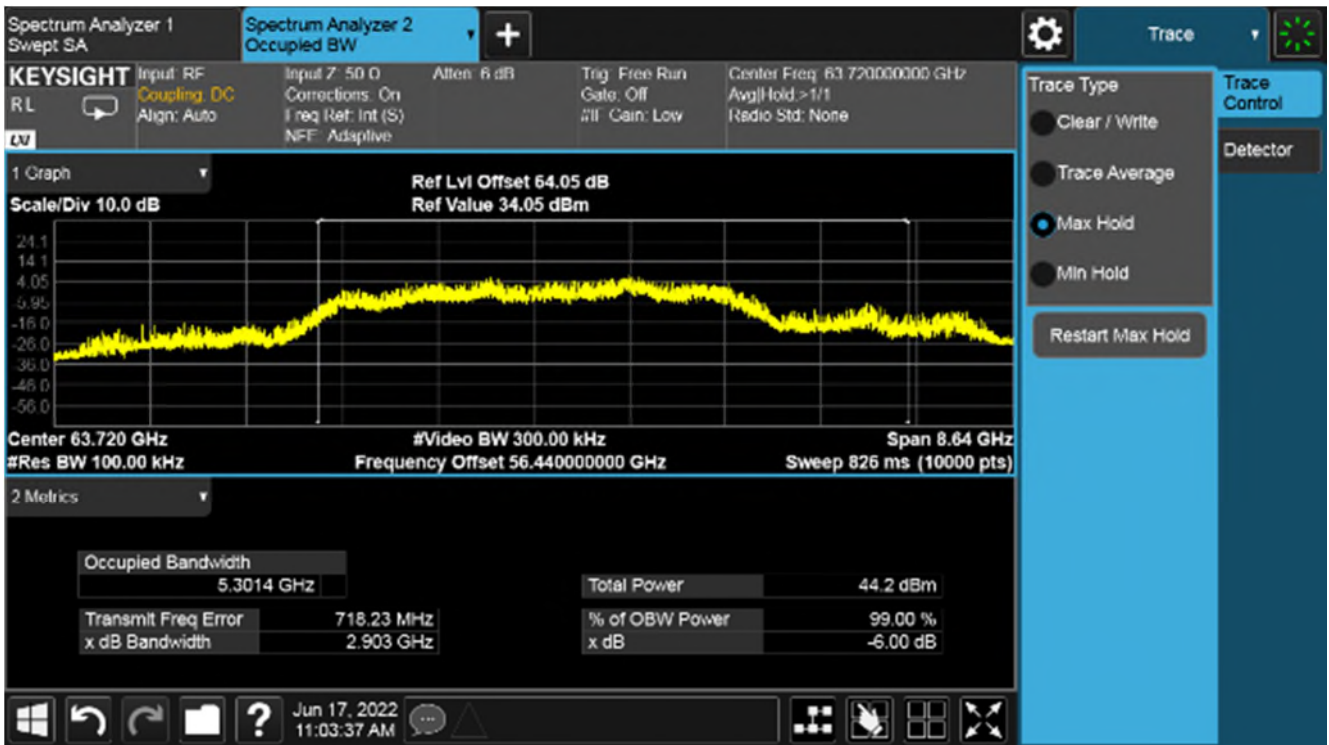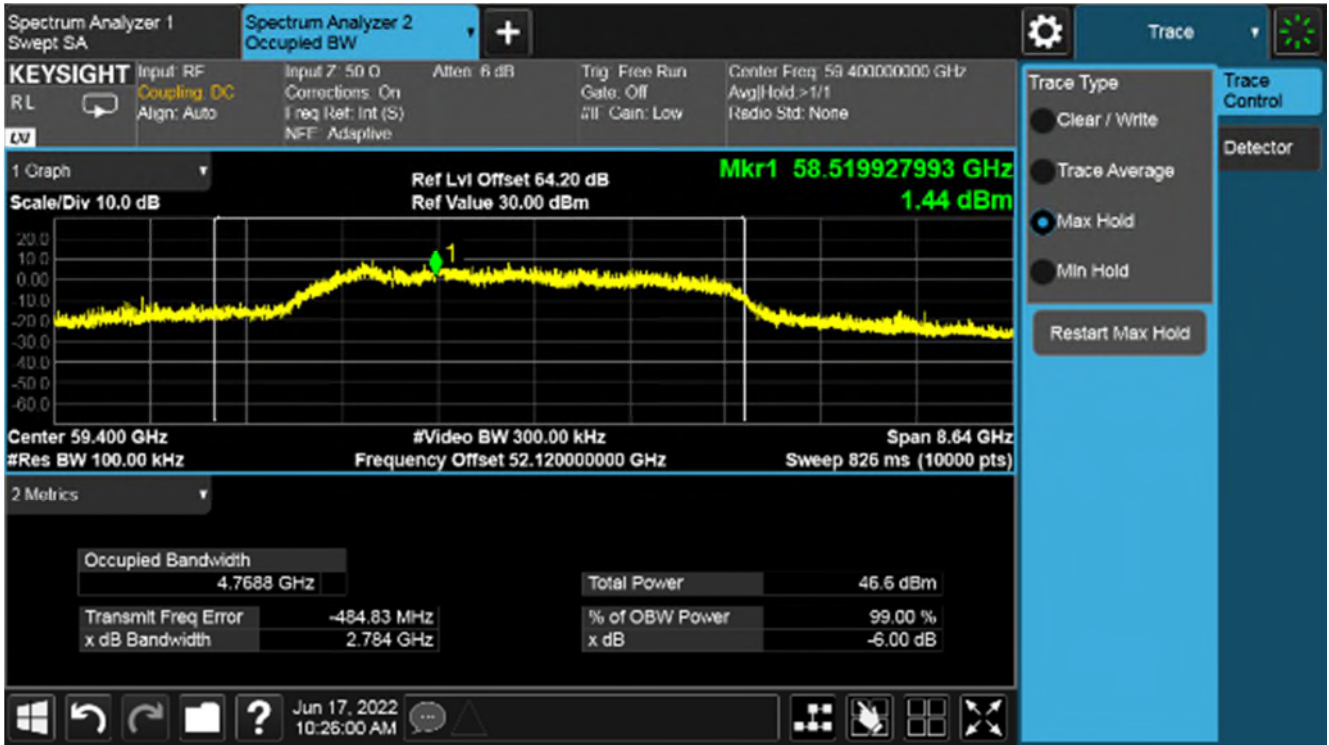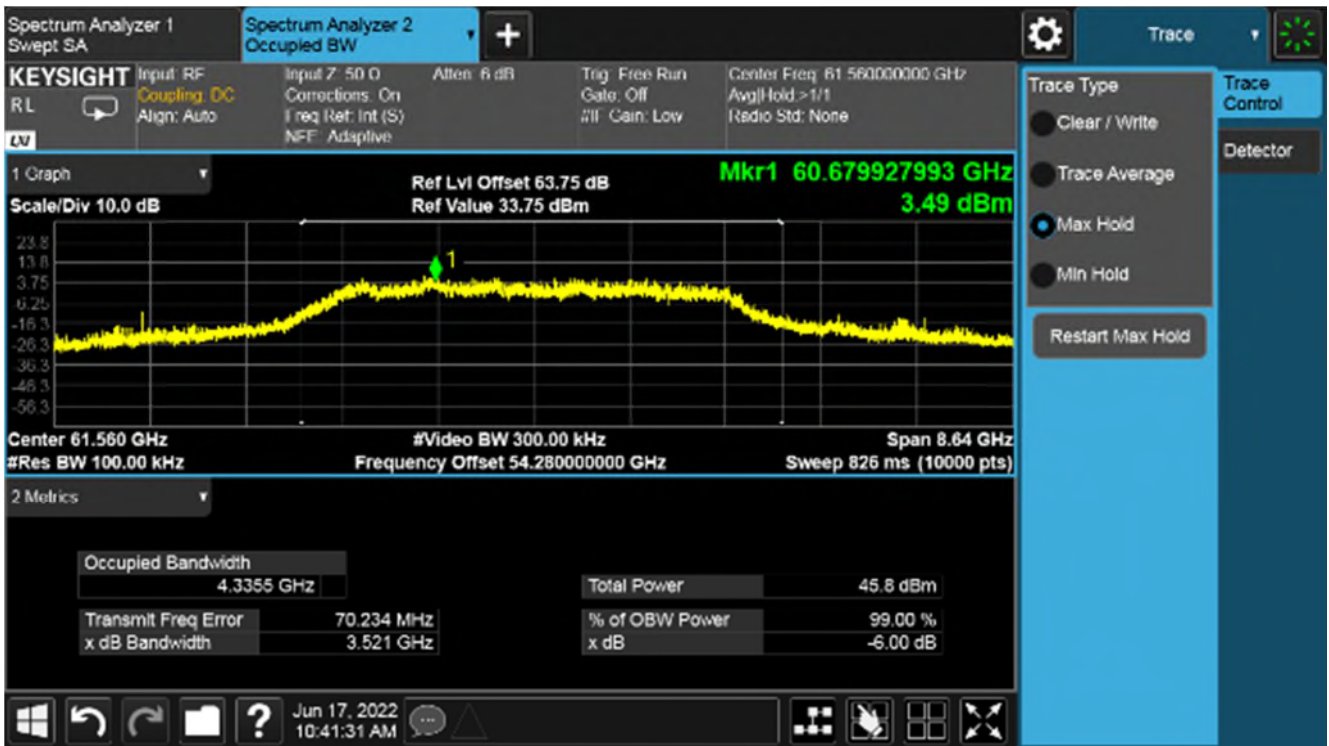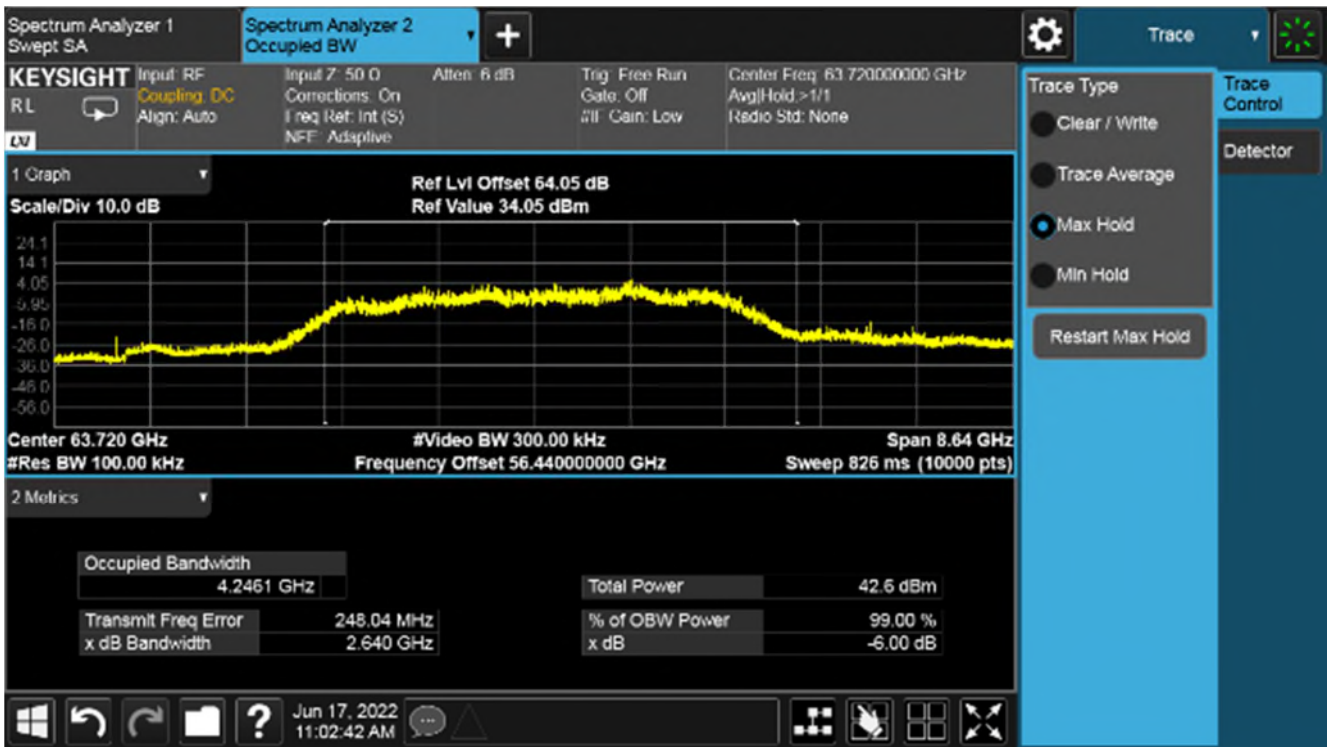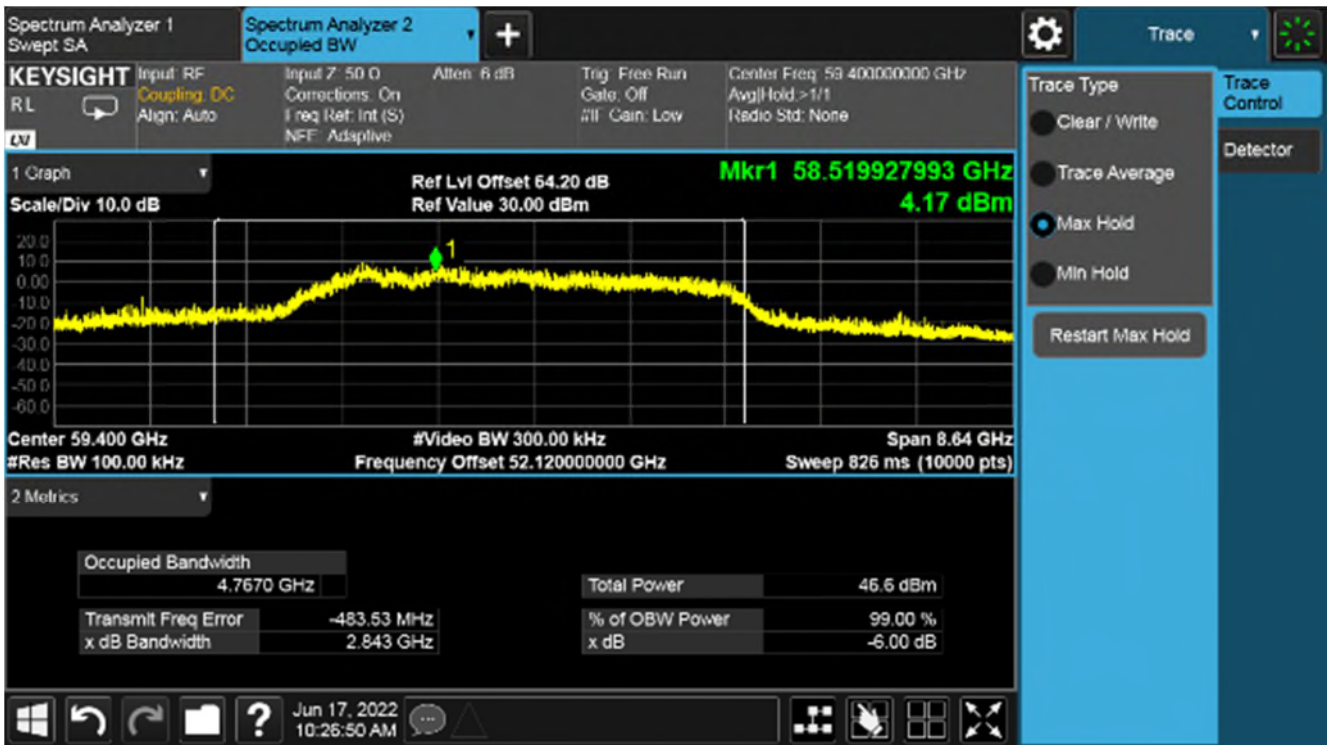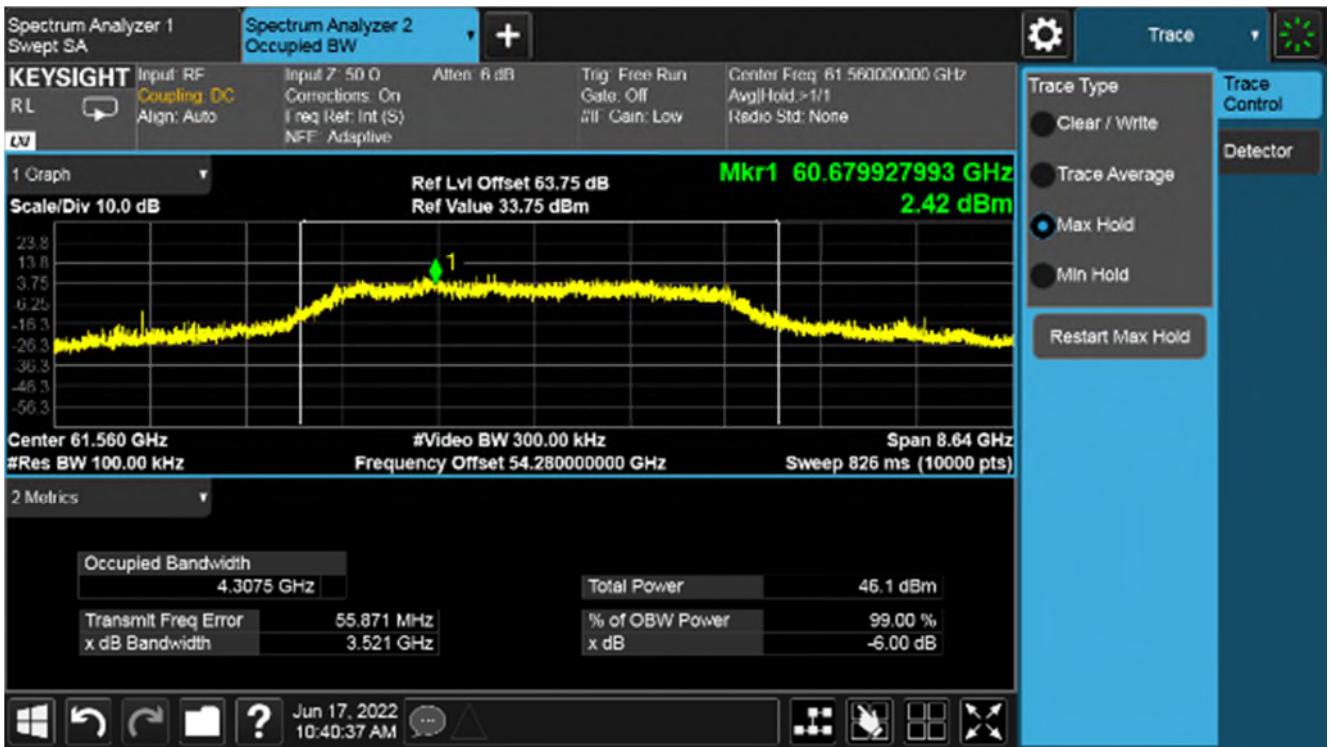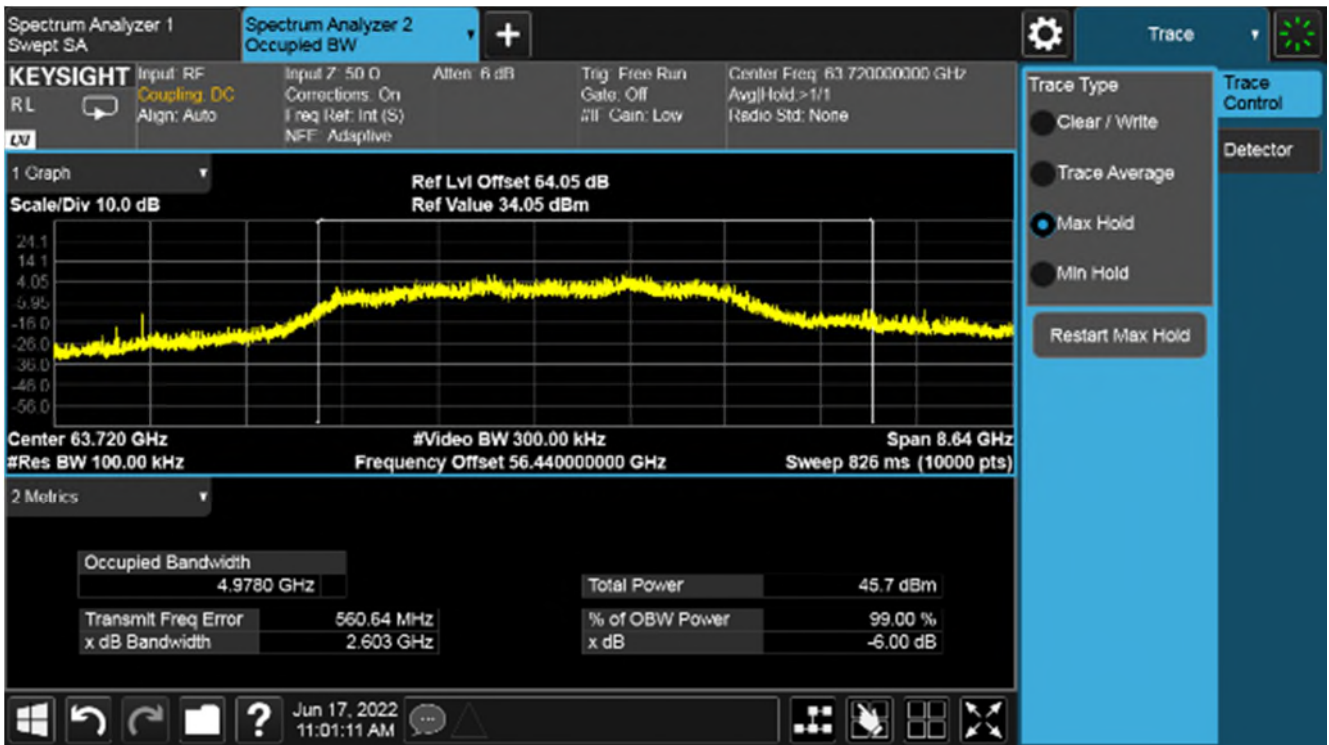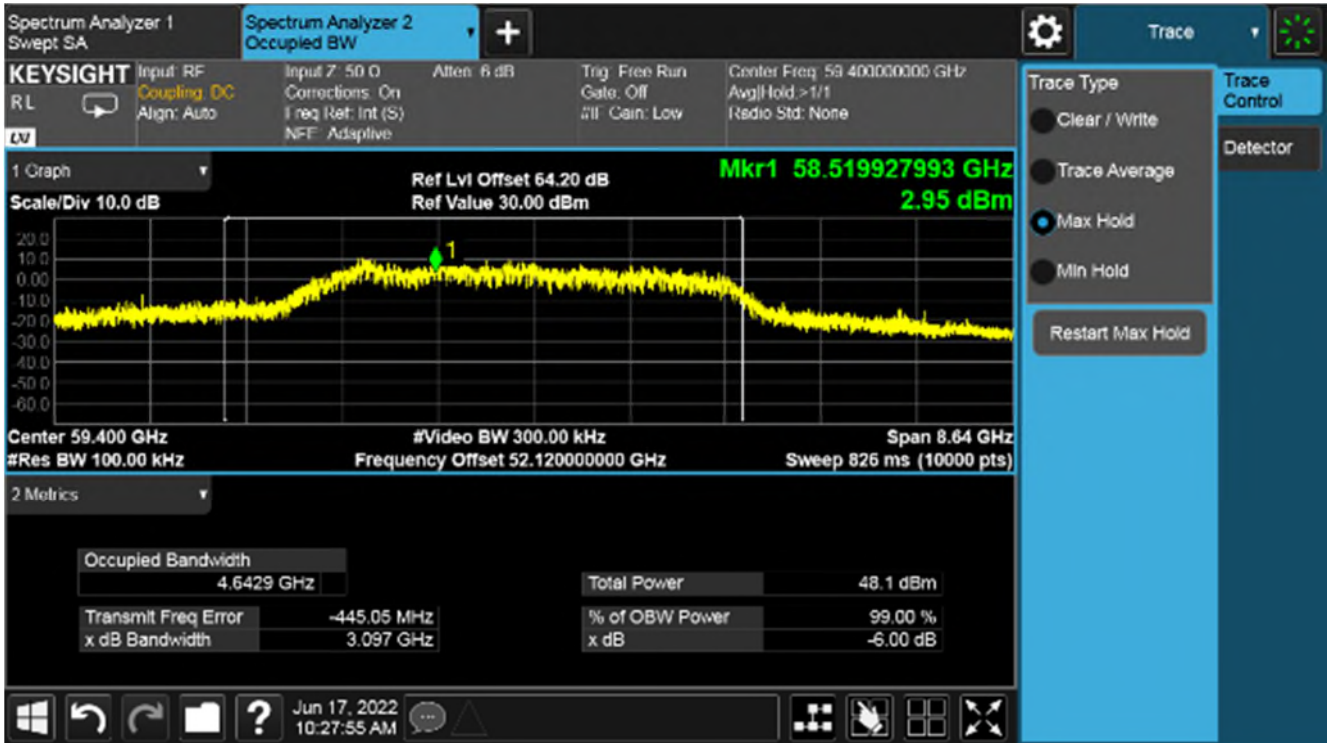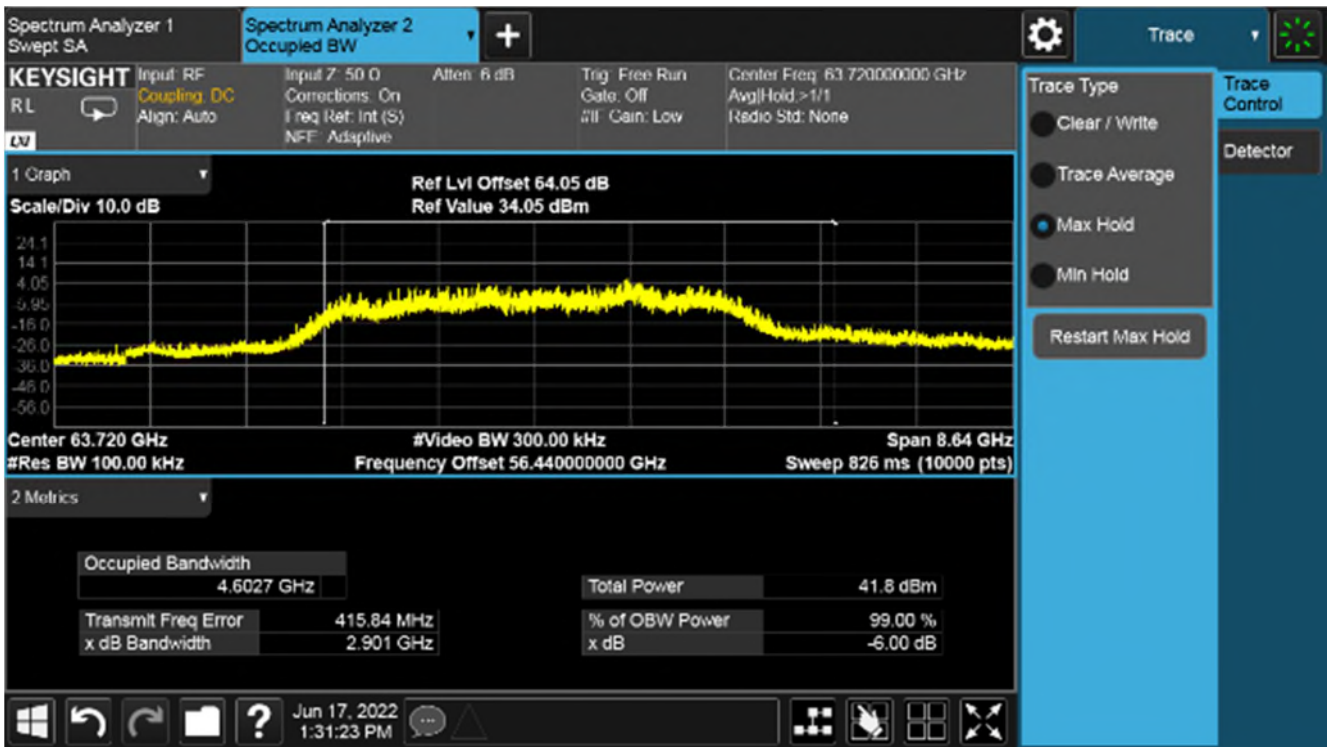

Plot of 6dB Bandwidth (GHz)

7 Explanatory Notes

7.1 Explanation of Table of Signals Measured

Measurements are made as required by the standard. These measurements are made and recorded using detectors, either peak, quasi peak or average dependant on the test. A table of results has been given following the relevant plots. This table looks similar to the one illustrated below dependant on the measurements required by the test: -

Signal No.	Freq (MHz)	Peak Amp (dBuV)	Pk – Lim 1 (dB)	QP Amp (dBuV)	QP – Lim1 (dB)	Av Amp (dBuV)	Av – Lim1 (dB)
1	12345	54.9	-10.5	48	-12.6	37.6	-14.4

Column One – Labelled Signal No. is an incremental number that the receiver has given to each signal that has been measured.

Column Two – Labelled Freq (MHz) is the approximate frequency of the signal received.

Column Three – Labelled Peak Amp (dBμV) is the level of received signal that was measured in dB above 1μV using the peak detector.

Column Four – Labelled Pk – Lim1 (dB) is the difference in level from the peak signal given to the active limit line. If this column appears in the table the peak detector measurement is required by the standard for this test. The results entered in this column indicate the signal level relative to the compliance limit required. Negative numbers indicate that the product is compliant.

Column Five – Labelled QP Amp (dBμV) is the level of received signal that was measured in dB above 1μV using the quasi-peak detector.

Column Six – Labelled QP – Lim1 (dB) is the difference in level from the quasi-peak signal given to the active limit line. If this column appears in the table the quasi-peak detector measurement is required by the standard for this test. The results entered in this column indicate the signal level relative to the compliance limit required. Negative numbers indicate that the product is compliant.

Column Seven – Labelled Av Amp (dBμV) is the level of received signal that was measured in dB above 1μV using the average detector.

Column Eight – Labelled Av – Lim1 (dB) is the difference in level from the average signal given to the active limit line. If this column appears in the table the average detector measurement is required by the standard for this test. The results entered in this column indicate the signal level relative to the compliance limit required. Negative numbers indicate that the product is compliant.

Only signals highlighted in red are deemed to exceed the limit of the detector required.

7.2 Explanation of limit line calculations for radiated measurements

The limits given in the test standard are normally expressed as absolute values (e.g. in µV/m at a specified distance), whereas the measured values are expressed as peak, quasi peak or average values in dBµV/m referenced to the measuring instrument inputs. RN Electronics calibrate the test set-up to account for any path losses, antenna gains, etc. so that the value read at the receiver relates directly to the absolute value required, except that it is expressed in dB relative to one 124icrovolt and may need to take account of any alternative measuring distance used. Examples:

(a) limit of 500 µV/m equates to 20.log (500) = 54 dB µV/m.

(b) limit of 300 µV/m at 10m equates to 20.log (300 . 10/3) = 60 dB µV/m at 3m

© limit of 30 µV/m at 30m, but below 30MHz, equates to 20.log(30) + 40.log(30/3) = 69.5 dBµV/m at 3m, as extrapolation factor below 30MHz is 40dB/decade per 15.31(f)(2).

The measurement receiver used for emissions testing, performs the field strength (FS) calculations automatically. The receiver combines the signal amplitude (RA), Antenna Factor (AF) and Cable Loss (CL) factors for the frequency to be measured.

Example calculation: - FS = RA + AF + CL.

Receiver amplitude (RA)	Antenna factor (3m) (AF)	Cable loss (CL)	Field strength result (3m) (FS)
20dBuV	25 dB	3 dB	48dBuV/m

Additional calculation examples per ANSI C63.10 clause 9.4 – 9.6 equations 21, 22, 25 & 26:

Equation 21: $E_{Linear} = 10^{((E_{log}-120)/20)}$

And therefore equation 21 transposed is: $E_{Log} = 20xLog(E_{Linear}) + 120$

Where:
E_{Linear} is the field strength of the emission in V/m
E_{Log} is the field strength of the emissions in dBµV/m

Equation 22: $EIRP = E_{Meas} + 20log(d_{Meas}) - 104.7$

Where:
EIRP is equivalent isotropically radiated power in dBm
E_{Meas} is the field strength of the emission at the measurement distance in dBµV/m
d_{Meas} is the measurement distance in metres

Equation 25: $PD = EIRP_{Linear} / 4\pi d^2$

And therefore equation 25 transposed is: $EIRP_{Linear} = PD \times 4\pi d^2$

Where:
PD is the power density at distance specified by the limit, in W/m²
$EIRP_{Linear}$ is the equivalent isotropically radiated power in Watts
d is the distance at which the power density limit is specified in metres

Equation 26: $PD = E^2_{Speclimit} / 377$

And therefore equation 26 transposed is: $E_{Spec\ limit} = \sqrt{(PD \times 377)}$

Where:
PD is the power density at distance specified by the limit, in W/m²
$E_{spec\ limit}$ is the field strength at the distance specified by the limit in V/m

Example:

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Radiated spurious emissions limit at 3metres of 90pW/cm^2.

90pW/cm^2 x 100^2 = 0.9 µW/m^2 = (EIRP Linear)

Equation 25 transposed: $0.9 \times 10^{-6} \times 4 \times \pi \times 3^2 = 0.0001017876$ W

And
Equation 26 transposed: $E_{Spec\ limit} = \sqrt{(0.9 \times 10^{-6} \times 377)} = 0.01842$ V/m.

And Equation 21 transposed: $E_{Log} = 20Log(0.01842) + 120 = 85.3$ dBµV/m @ 3m.

8   Photographs

Note: Photographs not included in the test report due to the confidentiality requested with the Certification.

8.1   Radiated emission diagrams
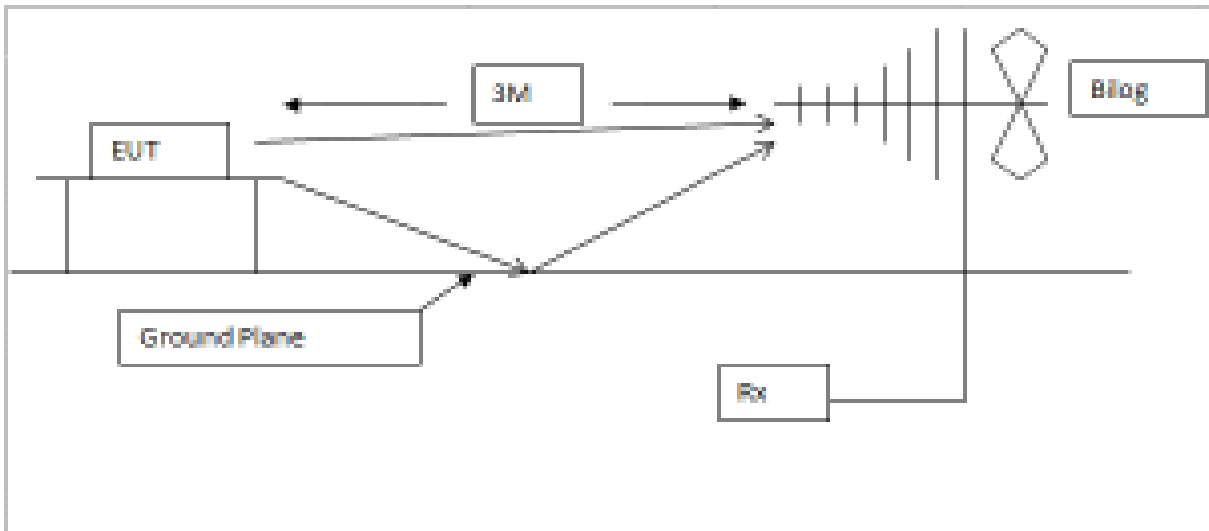
Diagram of the radiated emissions test setup 30 – 1000 MHz
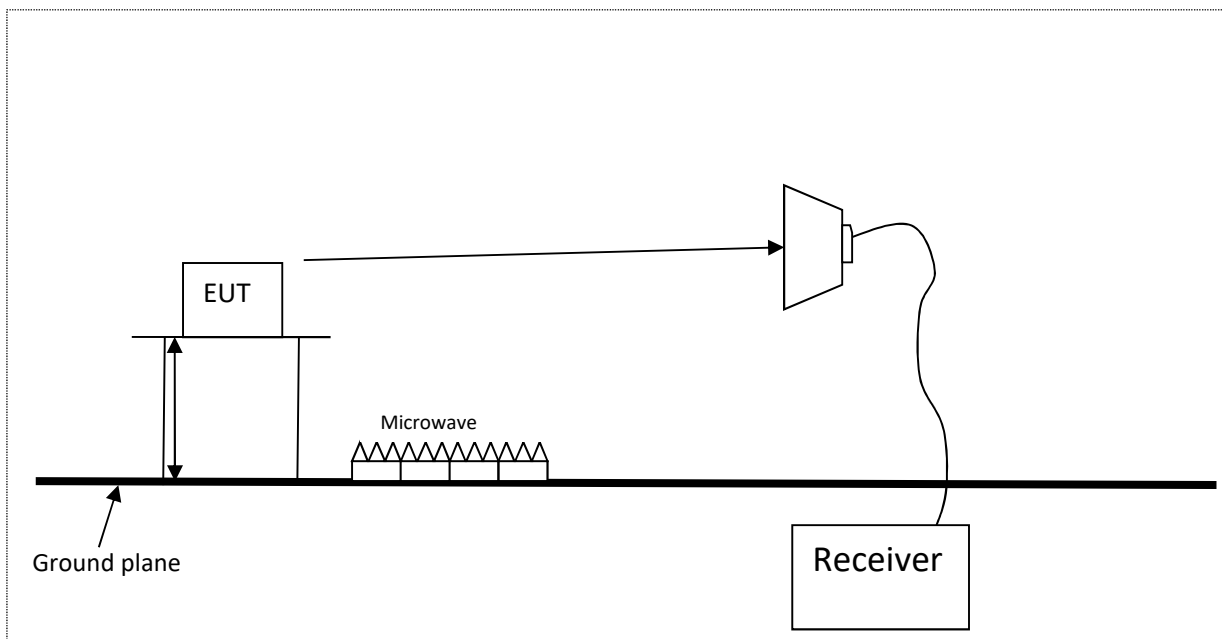
Diagram of the radiated emissions test setup above 1GHz

8.2   AC powerline conducted emission diagram
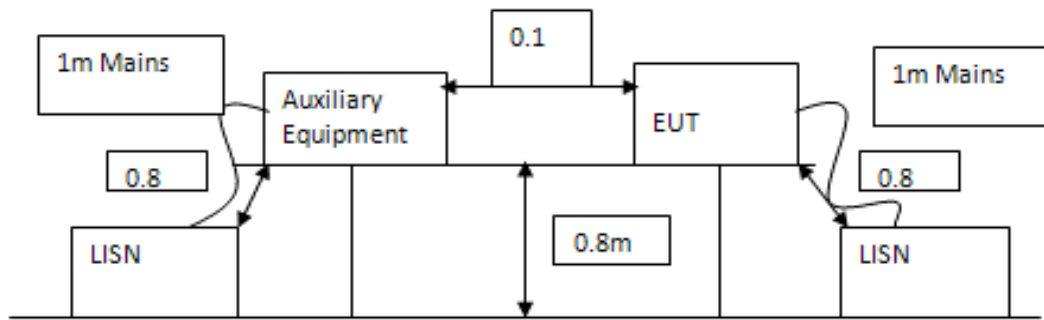
Diagram of the AC conducted emissions test setup

9 Test equipment calibration list

The following is a list of the test equipment used by R.N. Electronics Ltd to test the unit detailed within this report. In line with our procedures, the equipment was within calibration for the period during which testing was carried out.

RN No.	Model No.	Description	Manufacturer	Calibration date	Cal period
E035	11947A	Transient Limiter 9kHz – 200MHz	Hewlett Packard	14-Dec-2021	12 months
E136	3105	Horn Antenna 1 – 12.5 GHz	EMCO	02-Apr-2022	12 months
E150	MN2050	LISN 13A	Chase	25-Apr-2022	12 months
E296-2	11970A	Harmonic Mixer 26.5-40GHz	Hewlett Packard	#27-Jun-2022	12 months
E296-4	11970U	Harmonic Mixer 40-60GHz	Hewlett Packard	08-Jul-2021	24 months
E330	2224-20	Horn Antenna 26.5-40GHz	Flann (FMI)	22-Apr-2022	12 months
E411	N9039A	9 kHz – 1 GHz RF Filter Section	Agilent Technologies	08-Jul-2021	12 months
E412	E4440A	PSA 3 Hz – 26.5 GHz	Agilent Technologies	#21-Jun-2022	24 months
E433	MG3693A	Signal Generator 2 GHz – 30 GHz	Anritsu	05-Oct-2021	12 months
E485	11974-60028	Preselector PSU	Agilent Technologies	10-Feb-2022	12 months
E487	11974U	Preselect Mixer 40 – 60GHz	Agilent Technologies	17-Dec-2020	24 months
E503	2524-20	Horn Antenna 50-75GHz	Flann (FMI)	22-Apr-2022	12 months
E534	E4440A	PSA 3 Hz – 26.5 GHz	Agilent Technologies	24-Jan-2022	24 months
E535	N9039A	9 kHz – 1 GHz RF Filter Section	Agilent Technologies	25-Jan-2022	12 months
E580	24240	Horn Std Gain 40GHz – 60GHz	Flann (FMI)	22-Apr-2022	12 months
E602	MG3692A	Signal Generator 10 MHz – 20 GHz	Anritsu	21-Feb-2022	12 months
E624	E4440A	PSA 3 Hz – 26.5 GHz	Agilent Technologies	08-Jul-2021	24 months
E638	11974VE01	Preselected Mixer 50 – 80GHz	Agilent Technologies	04-Feb-2021	24 months
E642	E4440A	PSA 3 Hz – 26.5 GHz	Agilent Technologies	14-Dec-2021	24 months
E658	E4418B	Power Meter EPM series	Agilent Technologies	18-Aug-2021	12 months
E660	CBL6112	Antenna BiLog 30MHz – 2GHz	Chase	19-Jun-2021	24 months
E717	-	Horn Std Gain 50-75GHz	-	22-Apr-2022	12 months
E718	-	Horn Std Gain 75-110GHz	-	22-Apr-2022	12 months
E721	29240	Horn Std Gain 110-170GHz	Flann (FMI)	22-Apr-2022	12 months
E744	2017 4/2dB	Attenuator 4/2dB 30-1000MHz	RN Electronics	10-Feb-2022	12 months
E755	N9030B	PXA Signal Analyser 3 Hz to 50 GHz	Keysight Technologies	20-Jul-2021	12 months
E760	M05HWDX	Mixer 140-220GHz	OML Inc	06-Dec-2021	24 months
E771	861G/387	Horn Std Gain 140-220GHz WR5	Alpha Industries Inc	22-Apr-2022	12 months
E781	MX4-15-F	Multiplier 50 – 75GHz X4 WR15	MMWave Group (Quantum)	21-Aug-2020	24 months
E920	FTL 6541	Mixer 60 – 90GHz	Farran Technology	31-Jan-2022	12 months
E941	M08HWDX	Mixer 90-140GHz	OML Inc	06-Dec-2021	24 months
F015	11974A	Preselect Mixer 26.5 – 40GHz	Hewlett Packard	26-Nov-2021	12 months
F024	V8486A	Power Sensor 50-75GHz	Hewlett Packard	08-Jun-2022	12 months
F045	2511	Attenuator 50-75GHz Rotary	Flann (FMI)	06-Jan-2021	24 months

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F136	DSO5034A	Oscilloscope 300MHz 4CH	Agilent Technologies	06-Oct-2021	12 months
F091	V06VNA2-T	VNA Extender T 110-170GHz	OML Inc	12-Jan-2021	24 months
F306	DET-15-RPFA0	Detector WR15	Millitech	Not applicable	
F357	SLP-10.7+	Filter Low Pass 11 MHz	Mini-Circuits	04-Apr-2022	12 months
H070	M1970W	Waveguide Harmonic Mixer 75 - 110 GHz	Keysight Technologies	18-Feb-2022	12 months
F379	QMC-MX4-15-F	Multiplier 50 - 75GHz X4 WR15	MMWave Group (Quantum)	#25-Jul-2022	24 months
L264	DT75	Digital Thermometer	Instrotech Ltd	20-Dec-2021	24 months
LPE261	3115	Horn Antenna 1 - 18 GHz	EMCO	02-Apr-2022	12 months
LPE333	8449B	Pre-Amplifier 1GHz - 26.5GHz	Hewlett Packard	27-May-2022	12 months
N495	72A	Variac	Berco Rotary Regavolt	06-Jul-2021	12 months
NSA-H	NSA - H	NSA - Site H	RN Electronics	11-Dec-2019	36 months
S032	177	True RMS Multimeter	Fluke	09-May-2022	12 months
S036	FMH1 420	Temperature & Humidity Test Chamber	JTS Ltd	Not applicable	
TMS78	3160-08	Horn Std Gain 12.4 - 18 GHz	ETS Systems	22-Sep-2021	12 months
TMS79	3160-09	Horn Std Gain 18 - 26.5 GHz	ETS Systems	25-May-2022	12 months
TMS81	6502	Antenna Active Loop	EMCO	22-Jul-2021	24 months
TMS82	8449B	Pre-Amplifier 1GHz - 26.5GHz	Agilent Technologies	16-Dec-2021	12 months
ZSW1	V2.5.2	Measurement Software Suite	RN Electronics	Not applicable	

Equipment was within calibration dates for tests and has been re-calibrated since/during date of tests.

10 Auxiliary and peripheral equipment

10.1 Customer supplied equipment

Item No.	Model No.	Description	Manufacturer	Serial No.
1	NET-P60-56IN	PoE adapter	Cambium Networks	N000000L14A2020000672
2	Latitude E6440	Laptop PC	DELL	39K1WZ1

10.2 RN Electronics supplied equipment

RN No.	Model No.	Description	Manufacturer	Serial No
E465	PCR2000LA	AC Power Source 2kVA	Kikusui	HJ000995
E747	3001i	AC Power Source 3kVA	California Instruments	HK53902
P209	PL320	PSU 30V 2A	Thurlby	117756

11 Condition of the equipment tested

In order for the EUT to produce the results shown within this report the following modifications, if any, were implemented.

11.1 Modifications before test

Test	Modification	Time of modification
Peak and Average EIRP	In order to comply with the limit, the TPC power setting was reduced from 4 dBm to 2.9 dBm for 2.16 GHz channels using MCS0, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7, MCS8, MCS9 modulation schemes. This change was made using the provided QRCT engineering software. This modification was made at the request of the applicant.	Before testing
TX Radiated emissions	In order to comply with the limit, the local oscillator setting 'LO_GC' was changed from setting 1 to setting 3. This change was made using the provided QRCT engineering software. This modification was made at the request of the applicant.	Before testing

11.2 Modifications during test

No modifications were made during test by RN Electronics Ltd.

12 Description of test sites

Site A   Radio Laboratory and Anechoic Chamber

Site B   Semi-Anechoic Chamber and Control Room
FCC Registration No. 293246, ISED Registration No. 5612A-4

Site C   Transient Laboratory

Site D   Screened Room (Conducted Immunity)

Site E   Screened Room (Control Room for Site D)

Site F   Screened Room (Conducted Emissions)

Site G   Screened Room (Control Room for Site H)

Site H   3m Semi-Anechoic Chamber (indoor OATS)
FCC Registration No. 293246, ISED Registration No. 5612A-2, VCCI Registration No. 4065

Site J   Transient Laboratory

Site K   Screened Room (Control Room for Site M)

Site M   3m Semi-Anechoic Chamber (indoor OATS)
FCC Registration No. 293246, ISED Registration No. 5612A-3

Site N   Radio Laboratory

Site Q   Fully-Anechoic Chamber

Site OATS 3m and 10m Open Area Test Site
FCC Registration No. 293246, ISED Registration No. 5612A-1

Site R   Screened Room (Conducted Immunity)

Site S   Safety Laboratory

Site T   Transient Laboratory

RN Electronics CAB identifier as issued by Innovation, Science and Economic Development Canada is UK0002

RN Electronics CAB identifier as issued by FCC is UK0015

13   Abbreviations and units

%	Percent	dBµV	deciBels relative to 1µV
λ	Wavelength	dBµV/m	deciBels relative to 1µV/m
µA/m	microAmps per metre	dBc	deciBels relative to Carrier
µV	microVolts	dBd	deciBels relative to dipole gain
µW	microWatts	dBi	deciBels relative to isotropic gain
AC	Alternating Current	dBm	deciBels relative to 1mW
ACK	ACKnowledgement	dBr	deciBels relative to a maximum value
ACP	Adjacent Channel Power	dBW	deciBels relative to 1W
AFA	Adaptive Frequency Agility	DC	Direct Current
ALSE	Absorber Lined Screened Enclosure	DFS	Dynamic Frequency Selection
AM	Amplitude Modulation	DMO	Dynamic Modulation Order
Amb	Ambient	DSSS	Direct Sequence Spread Spectrum
ANSI	American National Standards Institute	DTA	Digital Transmission Analyser
ATPC	Automatic Transmit Power Control	EIRP	Equivalent Isotropic Radiated Power
AVG	Average	emf	electromotive force
AWGN	Additive White Gaussian Noise	ERC	European Radiocommunications Committee
BER	Bit Error Rate	ERP	Effective Radiated Power
BPSK	Binary Phase Shift Keying	ETSI	European Telecommunications Standards Institute
BT	BlueTooth	EU	European Union
BLE	BlueTooth Low Energy	EUT	Equipment Under Test
BW	Bandwidth	FCC	Federal Communications Commission
ºC	Degrees Celsius	FER	Frame Error Rate
C/I	Carrier / Interferer	FHSS	Frequency Hopping Spread Spectrum
CAC	Channel Availability Check	FM	Frequency Modulation
CCA	Clear Channel Assessment	FSK	Frequency Shift Keying
CEPT	European Conference of Postal and Telecommunications Administrations	FSS	Fixed Satellite Service
CFR	Code of Federal Regulations	g	Grams
CISPR	Comité International Spécial des Perturbations Radioélectriques	GHz	GigaHertz
cm	centimetre	GNSS	Global Navigation Satellite System
COFDM	Coherent OFDM	GPS	Global Positioning System
COT	Channel Occupancy Time	Hz	Hertz
CS	Channel Spacing	IEEE	Institute of Electrical and Electronics Engineers
CW	Continuous Wave	IF	Intermediate Frequency
DAA	Detect And Avoid	ISED	Innovation Science and Economic Development
dB	deciBels	ITU	International Telecommunications Union
dBµA/m	deciBels relative to 1µA/m	KDB	Knowledge DataBase

kg	kilogram	pW	picoWatts
kHz	kiloHertz	QAM	Quadrature Amplitude Modulation
kPa	Kilopascal	QP	Quasi Peak
LBT	Listen Before Talk	QPSK	Quadrature Phase Shift Keying
LISN	Line Impedance Stabilisation Network	RBW	Resoution Band Width
LNA	Low Noise Amplifier	RED	Radio Equipment Directive
LNB	Low Noise Block	R&TTE	Radio and Telecommunication Terminal Equipment
LO	Local Oscillator	Ref	Reference
m	metre	RF	Radio Frequency
mA	milliAmps	RFC	Remote Frequency Control
max	maximum	RFID	Radio Frequency IDentification
Mbit/s	MegaBits per second	RLAN	Radio Local Area Network
MCS	Modulation and Coding Scheme	RMS	Root Mean Square
MHz	MegaHertz	RNSS	Radio Navigation Satellite Service
mic	Microphone	RSL	Received Signal Level
MIMO	Multiple Input, Multiple Output	RSSI	Received Signal Strength Indicator
min	minimum	RTP	Room Temperature and Pressure
mm	millimetres	RTPC	Remote Transmit Power Control
ms	milliseconds	Rx	Receiver
mW	milliWatts	s	Seconds
NA	Not Applicable	SINAD	Signal to Noise And Distortion
NFC	Near Field Communications	SRD	Short Range Device
nom	Nominal	Tx	Transmitter
nW	nanoWatt	UKAS	United Kingdom Accreditation Service
OATS	Open Area Test Site	UKCA	United Kingdom Conformity Assessed
OBW	Occupied Band Width	UKRER	United Kingdom Radio Equipment Regulations
OCW	Occupied Channel Width	UHF	Ultra High Frequency
OFDM	Orthogonal Frequency Division Multiplexing	U-NII	Unlicensed National Information Infrastructure
OOB	Out Of Band	USB	Universal Serial Bus
ppm	Parts per million	UWB	Ultra Wide Band
PER	Packet Error Rate	V	Volts
PK	Peak	V/m	Volts per metre
PMR	Private Mobile Radio	VBW	Video Band Width
PRBS	Pseudo Random Bit Sequence	VHF	Very High Frequency
PRF	Pulse Repitition Frequency	VSAT	Very Small Aperture Terminal
PSD	Power Spectral Density	W	Watts
PSU	Power Supply Unit		

====== END OF TEST REPORT ======