

7 Test Equipment List

Manufacturer	Description	Model #	Asset #	Calibration Due
Rohde & Schwarz	EMI Test Receiver	ESU40	RF-192	4/5/2021
Rohde & Schwarz	EMI Test Receiver	ESU40	RF-248	4/5/2021
Keysight	Spectrum Analyzer	N9020B	RF-997	8/5/2020
ETS-Lindgren	Antenna – Passive Loop	6512	RF-202	2/21/2021
Sunol Sciences	Antenna - Broadband Hybrid	JB6	EMC-640	1/28/2021
ETS-Lindgren	Antenna - Horn	3117	RF-139	6/14/2020
ETS-Lindgren	Antenna – Standard Gain Horn	3160-09	EMC-452	N/A
ETS-Lindgren	Antenna – Standard Gain Horn	3160-10	EMC-601	N/A
Rohde & Schwarz	Custom Filter Bank+PreAmp	SFUNIT RX	RF-323	N/A
Rohde & Schwarz	Pre-Amp	TS-PR26	RF-199	N/A
Rohde & Schwarz	Pre-Amp	TS-PR40	RF-258	N/A
Rohde & Schwarz	Switch and Control Unit	OSP130	RF-018	N/A
Rohde & Schwarz	Switch and Control Unit	OSP150	RF-019	N/A
Rohde & Schwarz	Switch and Control Unit	OSP130	RF-249	N/A
Rohde & Schwarz	Switch and Control Unit	OSP150	RF-250	N/A
Teledyne	RF Cable	PR90-198-276	RF-1036	N/A
Micro-Coax	RF Cable	UFB311A-1-0787-50U50U	EMC-351	N/A

Manufacturer	Description	Model #	Asset #	Calibration Due
Teledyne	RF Cable	PR90-198-276	RF-1035	N/A
Huber & Suhner	RF Cable	SucoFlex 106A	RF-599	N/A
Micro-Coax	RF Cable	UTI Flex	RF-354	N/A
Huber & Suhner	RF Cable	Sucoflex 102A	RF-269	N/A
Murata	RF Cable	MXJA01JA1000	RF-885	N/A
Madge Tech	THP Monitor	PRH Temp 2000	EMC-167	8/19/2020
PCE	Climate Meter	PCE-THB 40	EMC-1205	10/21/2020
Madge Tech	THP Monitor	PRHT Temp 2000	EMC-167	8/19/2020
Pasternack	Attenuator	PE7087-6	RF-563	N/A
Pasternack	Attenuator	PE7004-6	EMC-954	N/A

Equipment used for AC Line Conducted Emissions Measurement				
Manufacturer	Description	Model #	Asset #	Calibration Due
Rohde & Schwarz	EMI Test Receiver	ESR3	EMC-669	4/12/2021
Teseq	Test LISN	NNB 051	EMC-056	7/23/2020
EMCO	AE LISN	3810/2 LISN	EMC-281	5/31/2020
Micro-Coax	RF Cable	CA HFK	EMC-887	7/15/2020
PCE	THP Monitor	PCE-THB 40	EMC-1206	10/15/2020
ETS Lindgren	TILE SW	Version 7.5.3.5	EMC-1105	N/A
Chroma	AC Power source	61602	EMC-598	N/A

Note: Items with Calibration Due data marked as N/A are characterized before test, where applicable.

8 Test Site Description

8.1 Radiated Emissions Test Site

Radiated measurements are performed in a 3m semi-anechoic chamber, which meets NSA requirements for the frequency range of 30MHz to 1000MHz. For measurements above 1 GHz, absorbers are laid out on the ground plane between the receiving antenna and the EUT to meet Site VSWR requirements in accordance with ANSI C63.4:2014.

8.1.1 Radiated Measurements in 9kHz- 30 MHz

The EUT is positioned on a turntable at a height of 80cm using a non-conducting table. A loop antenna is positioned at 3m from the EUT periphery at 1m height from the ground. The turntable is rotated 360 degrees to determine the highest emissions. This is repeated for three orientations of the measurement antenna- parallel, perpendicular and ground-parallel. All possible orientations of the EUT were investigated for emissions and the flat orientation was identified as the worst-case configuration.

8.1.2 Radiated Measurements in 30 MHz - 1000 MHz

The EUT is positioned on a turntable at a height of 80cm using a non-conducting table. A linearly polarized broadband antenna is positioned at 3m from the EUT periphery. The turntable is rotated 360 degrees and the antenna height varied from 1m to 4m to determine the highest emissions. This is repeated for both Horizontal and Vertical polarizations of the measurement antenna. All possible orientations of the EUT were investigated for emissions and the vertical standing mode was identified as the worst-case configuration.

8.1.3 Radiated Measurements above 1GHz

The EUT is positioned on a Turntable at a height of 1.5m. A linearly polarized antenna is positioned at 3m from the EUT periphery. Guidelines in ANSI C63.10:2013 were followed with respect to maximizing the emissions. The measurement antenna is set at a fixed 1.5m height while the turntable is rotated 360 degrees and the EUT elevation angle is varied from 0 to 150 degrees to determine the highest emissions. This is repeated for both Horizontal and Vertical polarizations of the measurement antenna. Measurements above 18GHz were performed at a 3m distance.

8.2 Antenna port conducted measurements

All antenna port conducted measurements were performed on a bench-top setup consisting of a spectrum analyzer, power meter (as necessary), splitters/combiners (as necessary), attenuators, and pre-characterized RF cables.

The correction factors between the EUT and the spectrum analyzer were added internally in the analyzer settings, where applicable. The plots displayed take into account these correction factors.

8.3 Test Setup Diagrams

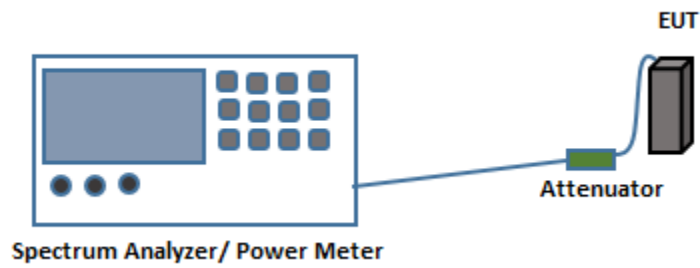


Figure 8-1. Test Setup for Antenna port conducted measurements

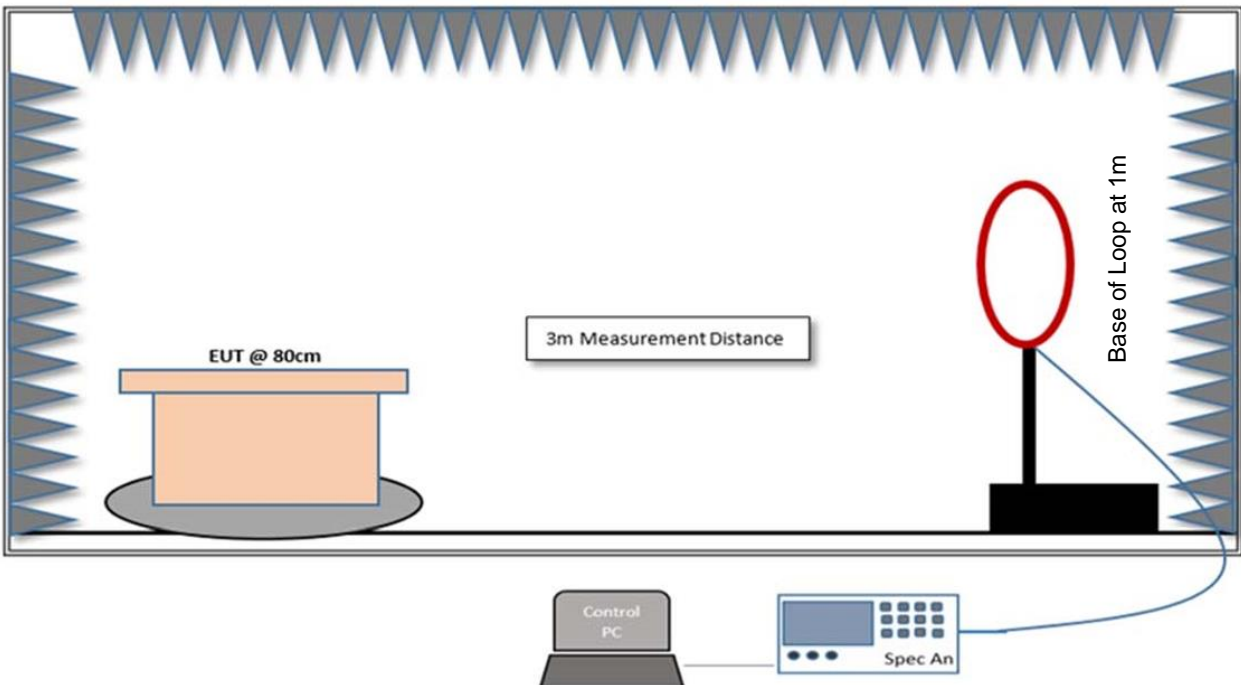


Figure 8-2. Test Setup for Radiated measurements in 9kHz - 30MHz Range

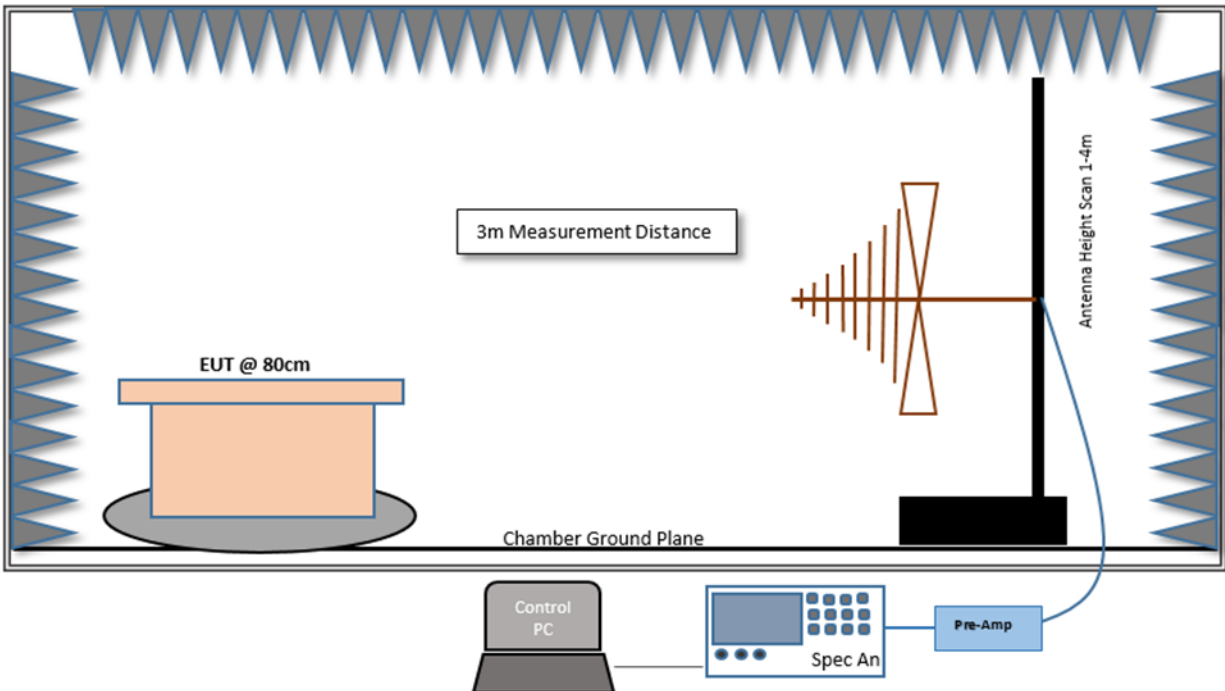


Figure 8-3. Test Setup for Radiated measurements in 30MHz- 1GHz Range

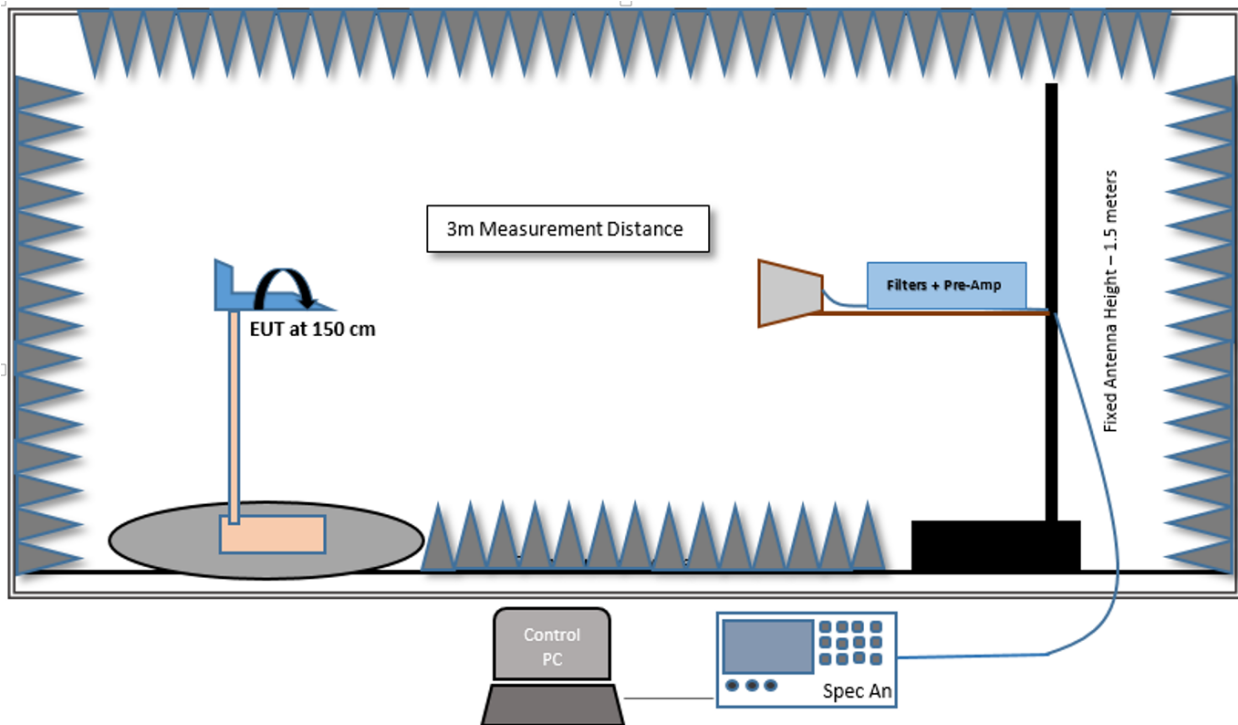


Figure 8-4. Test Setup for Radiated measurements in 1GHz- 18GHz Range

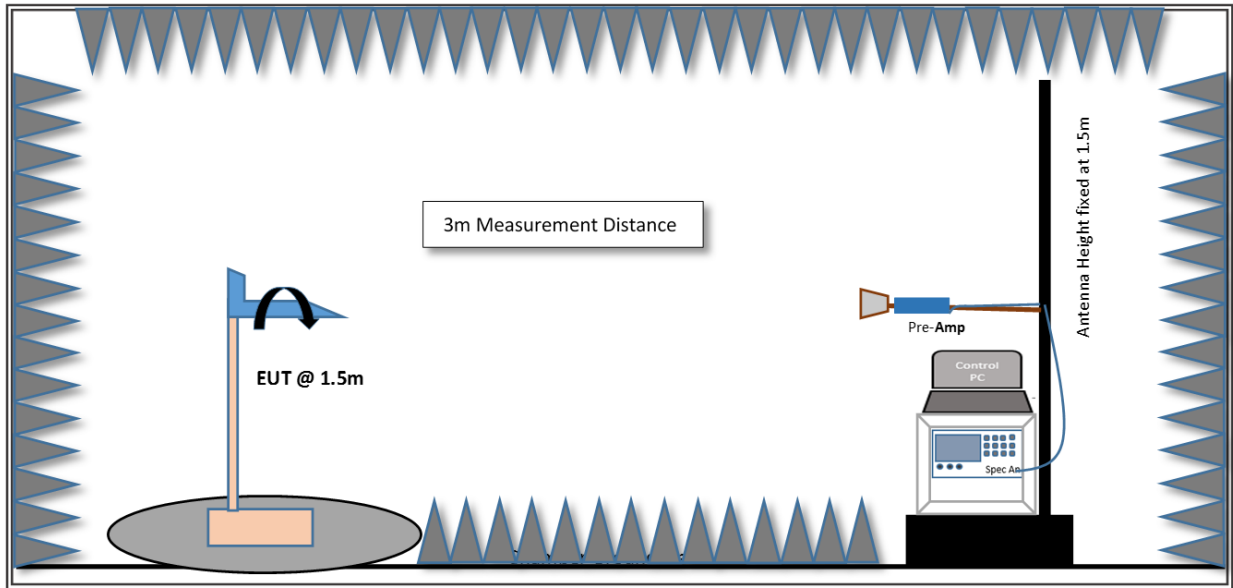


Figure 8-5. Test Setup for Radiated measurements >18GHz

9 Test Results- Conducted

9.1 26-dB Emission Bandwidth

9.1.1 Test Requirement:

FCC CFR 47 Rule Part 15.407 (a)
ISED RSS-247 [6.2.1]

9.1.2 Test Method:

Measurements were performed according to the procedures defined in KDB 789033- General UNII Test Procedures New Rules v02r01 and ANSI C63.10:2013.

Spectrum Analyzer settings:

RBW = approximately 1% of the Emissions Bandwidth

VBW \geq 3xRBW

Trace Mode= Peak Detector (Max Hold)

Sweep time= Auto

The in-built functionality of the Spectrum Analyzer is used to measure the 26-dB emission bandwidth.

9.1.3 Limits:

Reporting and measurement purposes only.

9.1.4 Test Results:

See Section 9.2.5.

9.2 99% Occupied Bandwidth

9.2.1 Test Requirement:

ISED RSS-247 [6.2]

9.2.2 Test Method:

Measurements were performed according to the procedures defined in KDB 789033- General UNII Test Procedures New Rules v02r01 and ANSI C63.10 2013.

Spectrum Analyzer settings:

Set the center frequency to the nominal EUT channel center frequency

Span = 1.5 to 5.0 times the 99% Occupied Bandwidth

RBW = 1% to 5% of the 99% Occupied Bandwidth

VBW \geq 3xRBW

Trace Mode= Peak Detector (Max Hold)

Sweep time= Auto

The built-in functionality of the Spectrum Analyzer is used to measure the 99% Occupied Bandwidth.

9.2.3 Limits:

Reporting and measurement purposes only.

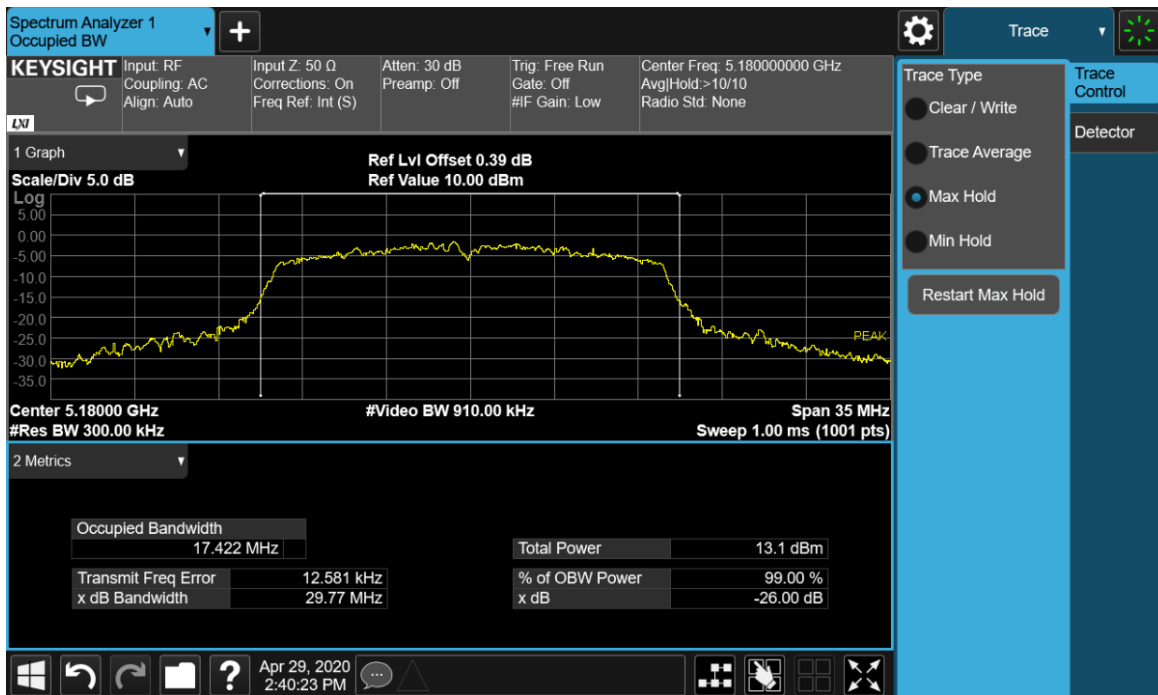
9.2.4 Test Results:

See Section 9.2.5.

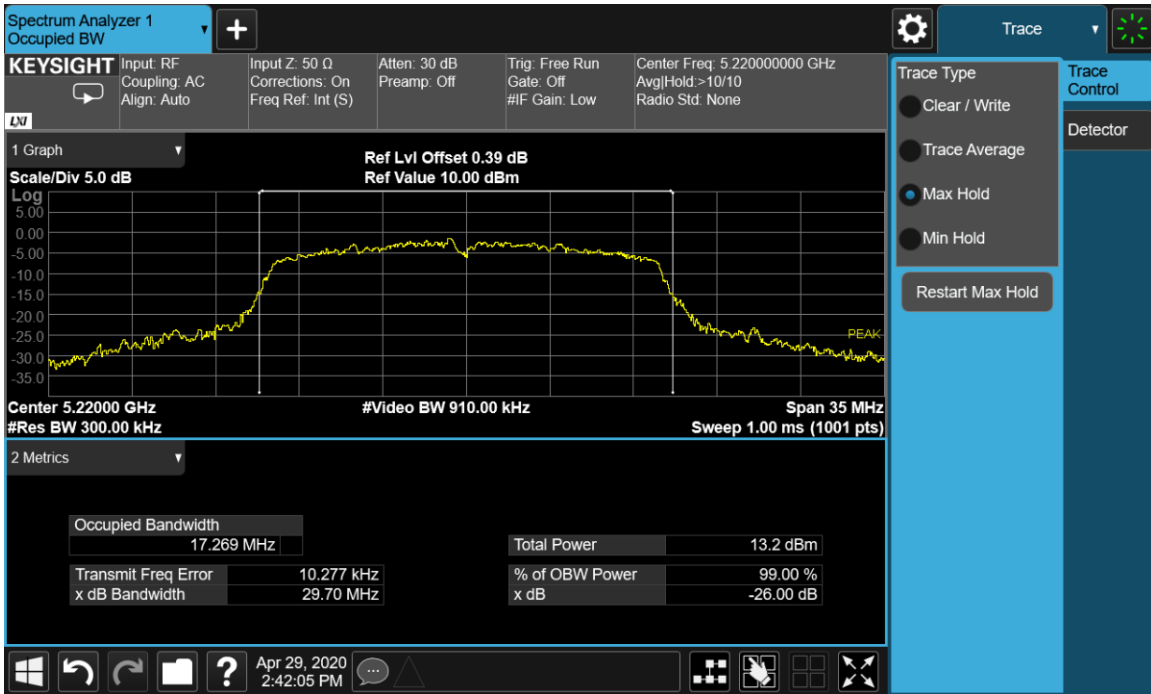
9.2.5 Test Data:

9.2.5.1 Chain A 802.11a 26-dB Emission Bandwidth

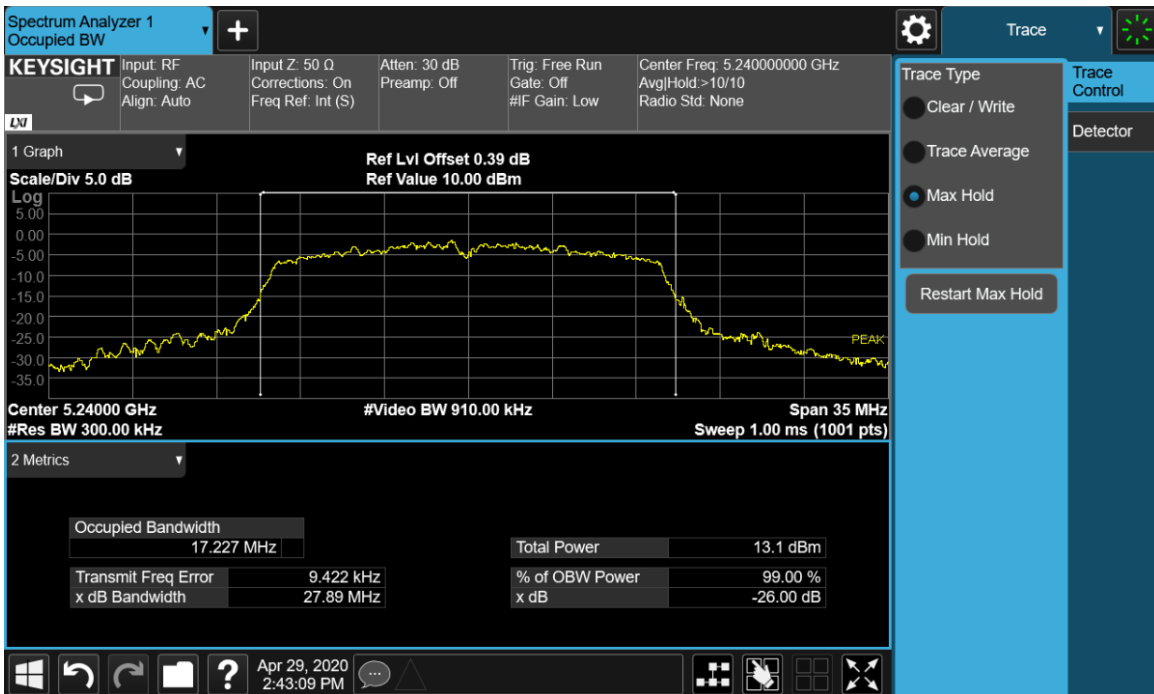
Chain A 802.11a 26-dB Emission Bandwidth				
Band	Channel No.	Frequency (MHz)	26-dB Emission Bandwidth (MHz)	99% Occupied BW (MHz)
UNII-1	36	5180	29.77	17.42
	44	5220	29.70	17.27
	48	5240	27.89	17.23
UNII-2A	52	5260	28.87	17.22
	60	5300	28.88	17.18
	64	5320	29.82	17.15
UNII-2C	100	5500	31.26	17.75
	116	5580	30.06	17.65
	140	5700	29.89	17.36
UNII-3	149	5745	30.98	17.73
	157	5785	30.65	17.34
	165	5825	30	17.45



Plot 9-1. 26-dB Emission Bandwidth and 99% OBW Chain A 802.11a (Ch. 36)



Plot 9-2. 26-dB Emission Bandwidth and 99% OBW Chain A 802.11a (Ch. 44)



Plot 9-3 26-dB Emission Bandwidth and 99% OBW Chain A 802.11a (Ch. 48)