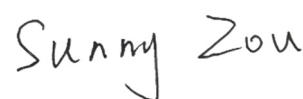
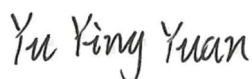


TEST REPORT

Applicant: Xiaomi Communications Co., Ltd.
Address: #019, 9th Floor, Building 6, 33 Xi'erqi Middle Road,
Haidian District, Beijing, China, 100085
Equipment Type: Mobile Phone
Model Name: 24115RA8EG
Brand Name: Redmi
FCC ID: 2AFZZRA8E
Test Standard: 47 CFR Part 15 Subpart E
(refer to section 3.1)
Sample Arrival Date: Aug. 09, 2024
Test Date: Dec. 24, 2024
Date of Issue: Jan. 13, 2025

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Yu Yingyuan**Checked by:** Ye Hongji**Approved by:** Sunny Zou
(Technical Director)

Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Jan. 13, 2025</u>	<u>Initial Issue</u>

TABLE OF CONTENTS

1	GENERAL INFORMATION	4
1.1	Test Laboratory	4
1.2	Test Location	4
2	PRODUCT INFORMATION	5
2.1	Applicant Information	5
2.2	Manufacturer Information	5
2.3	General Description for Equipment under Test (EUT)	5
2.4	Technical Information	6
3	SUMMARY OF TEST RESULTS	8
3.1	Test Standards	8
3.2	Test Verdict	8
4	GENERAL TEST CONFIGURATIONS	9
4.1	Test Environments	9
4.2	Test Equipment List	9
4.3	Test Software List	9
4.4	Measurement Uncertainty	10
5	TEST ITEMS	11
5.1	Proper Power Adjustment, Client Devices Connected to a Standard Power Access Point (APC)	11
5.2	Dual Client Test, Demonstration of Proper Power Adjustment based on Associated AP 13	
ANNEX A	TEST RESULT	15
A.1	Proper Power Adjustment, Client Devices Connected to a Standard Power Access Point (APC)	15

A.2	Dual Client Test, Demonstration of Proper Power Adjustment based on Associated AP 19	
ANNEX B	TEST SETUP PHOTOS	22
ANNEX C	EUT EXTERNAL PHOTOS	22
ANNEX D	EUT INTERNAL PHOTOS	22

1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☒ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Xiaomi Communications Co., Ltd.
Address	#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

2.2 Manufacturer Information

Manufacturer	Xiaomi Communications Co., Ltd.
Address	#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

2.3 General Description for Equipment under Test (EUT)

EUT Name	Mobile Phone
Model Name Under Test	24115RA8EG
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A
EUT ID	S23
IMEI Number	S23: IMEI 1:863541070065403 IMEI 2:863541070065411

2.4 Technical Information

Network and Wireless connectivity	2G Network GSM/GPRS/EDGE 850/900/1800/1900 3G Network WCDMA/HSDPA/HSUPA Band 1/2/4/5/8 4G Network FDD LTE Band 1/2/3/4/5/7/8/12/13/17/20/26/28/32/66 TDD LTE Band 38/40/41/42/48 LTE CA Uplink (UL): CA_3C, CA_7C, CA_38C, CA_40C, CA_1A-3A, CA_1A-7A, CA_1A-8A, CA_1A-20A, CA_3A-7A, CA_3A-20A, CA_7A-20A, CA_7A-28A, CA_2A-4A, CA_4A-5A, CA_4A-7A LTE CA Downlink (DL): CA_20A-32A 5G Network SA: NR n1/n2/n3/n5/n7/n8/n12/n20/n26/n28/n38/n40/n41/n48/n66/n77/n78 NSA(EN-DC): DC_20A_n1A, DC_28A_n1A, DC_3A_n1A, DC_7A_n1A, DC_8A_n1A, DC_40A_n1A, DC_5A_n1A, DC_42A_n1A, DC_1A_n3A, DC_20A_n3A, DC_7A_n3A, DC_8A_n3A, DC_5A_n3A, DC_28A_n3A, DC_1A_n7A, DC_3A_n7A, DC_5A_n7A, DC_20A_n7A, DC_28A_n7A, DC_1A_n8A, DC_7A_n8A, DC_1A_n20A, DC_3A_n20A, DC_7A_n20A, DC_1A_n28A, DC_3A_n28A, DC_7A_n28A, DC_20A_n28A, DC_41A_n28A, DC_1A_n38A, DC_3A_n38A, DC_8A_n38A, DC_20A_n38A, DC_28A_n38A, DC_1A_n40A, DC_3A_n40A, DC_5A_n40A, DC_8A_n40A, DC_28A_n40A, DC_1A_n41A, DC_3A_n41A, DC_8A_n41A, DC_20A_n41A, DC_28A_n41A, DC_1A_n77A, DC_3A_n77A, DC_8A_n77A, DC_28A_n77A, DC_40A_n77A, DC_1A_n78A, DC_3A_n78A, DC_5A_n78A, DC_7A_n78A, DC_8A_n78A, DC_20A_n78A, DC_28A_n78A, DC_38A_n78A, DC_40A_n78A, DC_41A_n78A, DC_26A_n78A, DC_2A_n78A, DC_4A_n78A, DC_66A_n78A, DC_2A_n66A, DC_5A_n66A, DC_7A_n66A, DC_7A_n5A, DC_2A_n77A, DC_4A_n41A, DC_66A_n41, DC_66A_n38A, DC_4A_n38A, DC_4A_n7A, DC_66A_n7A Bluetooth (BR+EDR+BLE) WIFI 802.11a, 802.11b, 802.11g, 802.11n(HT20/40), 802.11ac(VHT20/40/80/160) and 802.11ax(HE20/40/80/160) GPS, GLONASS, Galileo, BDS, QZSS, NFC
-----------------------------------	--

The requirement for the following technical information of the EUT was tested in this report:

Frequency Range	U-NII-5: 5925 MHz to 6425 MHz, U-NII-7: 6525 MHz to 6875 MHz
Product Type	☐ Mobile ☒ Portable ☐ Fix Location
Equipment Classes	6CD
Modulation technology	OFDM, OFDMA
Modulation Type	1024QAM, 256QAM, 64QAM, 16QAM, BPSK, QPSK

Transfer Rate (Mbps) (Single RF path)		802.11ax up to 1201 Mbps
Channel Bandwidth		802.11ax: 20 MHz, 40 MHz, 80 MHz, 160MHz
Antenna Type	Main Antenna	PIFA Antenna
	Aux. Antenna	
Antenna Gain	Main Antenna	U-NII-5: 5925 MHz to 6425 MHz: 0.13 dBi U-NII-7: 6525 MHz to 6875 MHz: -1.10 dBi
	Aux. Antenna	U-NII-5: 5925 MHz to 6425 MHz: -1.90 dBi U-NII-7: 6525 MHz to 6875 MHz: -1.20 dBi
About the Product		The equipment is Mobile Phone, intended for used with information technology equipment.

Note: The above EUT information in section 2.4 was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15 Subpart E	Unlicensed National Information Infrastructure Devices
2	KDB Publication 789033 D02v02r01	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E
3	KDB Publication 987594 D02v03	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure 6 GHz (U-NII) Devices Part 15, Subpart E
4	KDB Publication 662911 D01v02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc)
5	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

3.2 Test Verdict

No.	Description	FCC Part No.	Test Result	Verdict
1	Proper Power Adjustment, Client Devices Connected to a Standard Power Access Point(APC)	15.407 KDB 987594 D02 Section II. L.	ANNEX A.1	Pass
2	Dual Client Test, Demonstration of Proper Power Adjustment based on Associated AP	15.407 KDB 987594 D02 Section II. K.	ANNEX A.2	Pass

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

Relative Humidity	30% to 33%	
Atmospheric Pressure	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+20.4°C to +21.7°C
Working Voltage of the EUT	NV (Normal Voltage)	3.91 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Signaling Unit	ROHDE&SCHWARZ	CMX500	101243	2024.12.16	2025.12.15

4.3 Test Software List

Description	Manufacturer	Software Version	Serial No.
BL410R	BALUN	V2.1.1.488	N/A

4.4 Measurement Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Parameters	Uncertainty
RF output power, conducted	1.28 dB
Temperature	0.8°C
Humidity	4%

5 TEST ITEMS

5.1 Proper Power Adjustment, Client Devices Connected to a Standard Power Access Point (APC)

5.1.1 Test Limit

FCC §15.407 KDB 987594 D02 Section II. L.

A client device that connects to a Standard Power AP must limit its power to a minimum of 6 dB lower than its associated Standard Power access point's authorized transmit power. The term "authorized" means the AFC approved power level for the AP to use on a particular channel.

5.1.2 Test Setup

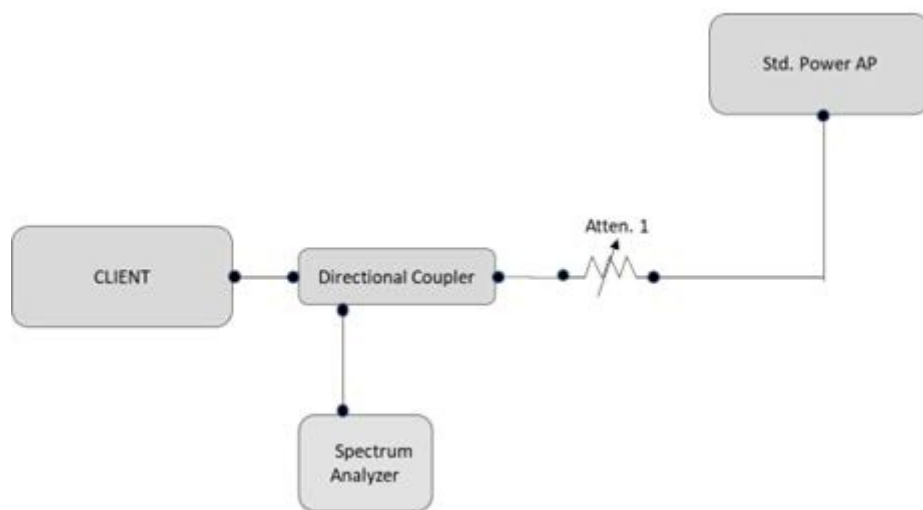


Figure 1. Test setup for conducted testing

5.1.3 Test Procedure

1. Connect equipment as shown in Figure 1 below.
2. In the figure, the Std Power AP can be configured using a developmental board, an Access Point incorporated with test software, or any other hardware configuration that adequately demonstrates proper client power adjustment.
3. Adjust Atten 1 to Std Power AP to facilitate error-free communication with the Client but protect the Client receiver from overload or damage.
4. Configure the Client and AP to associate and send data (stream data). The AP should be configured so its registered power is 36 dBm EIRP.
5. Verify transmission between the Client and the Standard Power AP. Additional attenuators may be required to protect measurement equipment. Measure the Client RF power using any of the methods in C63.10 for NII devices. Use this power and its antenna gain to calculate the Client EIRP.

6. The Client EIRP should be minimally 6 dB lower than the APs.

7. Repeat Steps 2 through 5 at two other selected measurement points—the first at the midpoint and the second at the client's lowest rated power, as declared by the manufacturer.

5.1.4 Test Result

Please refer to ANNEX A.1.

5.2 Dual Client Test, Demonstration of Proper Power Adjustment based on Associated AP

5.2.1 Limit

FCC §15.407 KDB 987594 D02 Section II. K.

A client device may connect to a Standard Power AP with a maximum power level of 30 dBm EIRP or a Low Power indoor AP, but the power level is limited to a maximum of 24 dBm EIRP. If a client has the flexibility to connect to both APs, verification is needed to show that it can distinguish between the two configurations and then control the power levels accordingly.

5.2.2 Test Setup

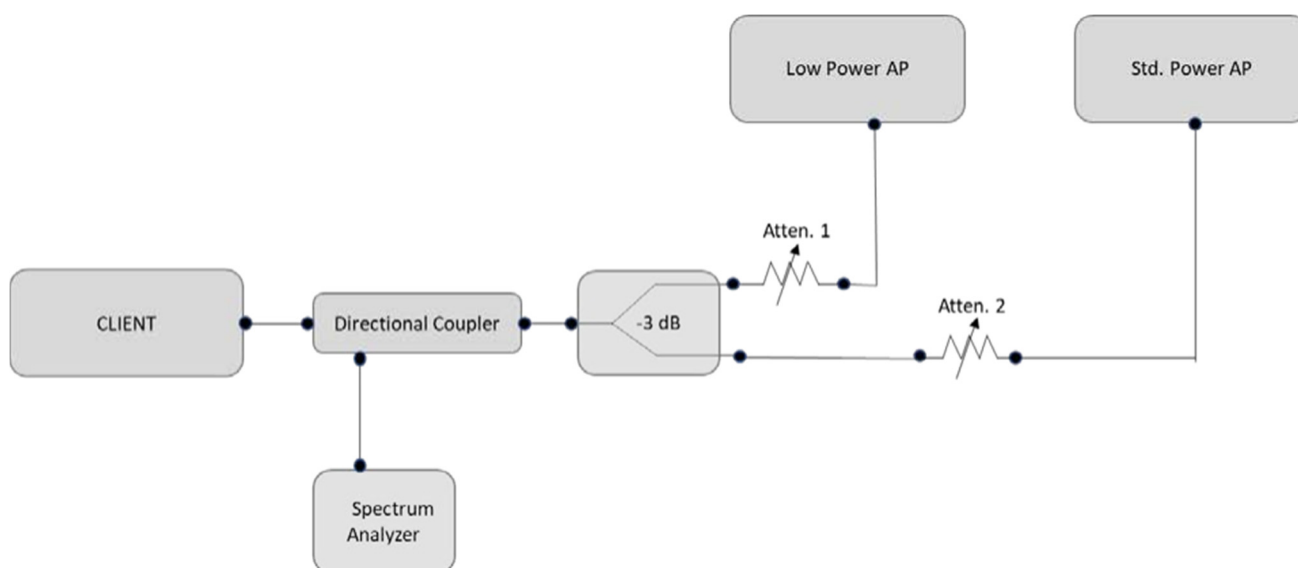


Figure 2. Test setup for conducted testing

5.2.3 Test Procedure

1. Connect equipment as shown in Figure 2 below.
2. Adjust Atten 2 to Standard Power AP to facilitate error-free communication with the Client (Atten 1 should be set to High on the RF path to the Low Power AP).
3. Configure the Client and APs to associate and send data (stream data). The client must be configured to transmit at its highest power level. Initially, because the attenuation on Atten 1 is set high, the Client will only associate with the Std Power AP.
4. Verify transmission between the Client and the Standard Power AP. Additional attenuators may be required to protect measurement equipment. Measure the Client RF power using any of the methods in C63.10 for NII devices.
5. Gradually increase Atten 2 while decreasing Atten 1. This simulates the Client moving from outdoors to indoors. At some level of attenuation, the Client should associate with the Low-Power indoor AP. Verify transmission between the Client and the Low-Power AP.

6. Measure the RF power of the Client device using the same method as in step 4. Verify the power is no more than 24 dBm EIRP.

5.2.4 Test Result

Please refer to ANNEX A.2.

ANNEX A TEST RESULT

A.1 Proper Power Adjustment, Client Devices Connected to a Standard Power Access Point (APC)

Test Data

Companion Standard Power AP: Brand name: ROHDE&SCHWARZ, Model name: CMX500

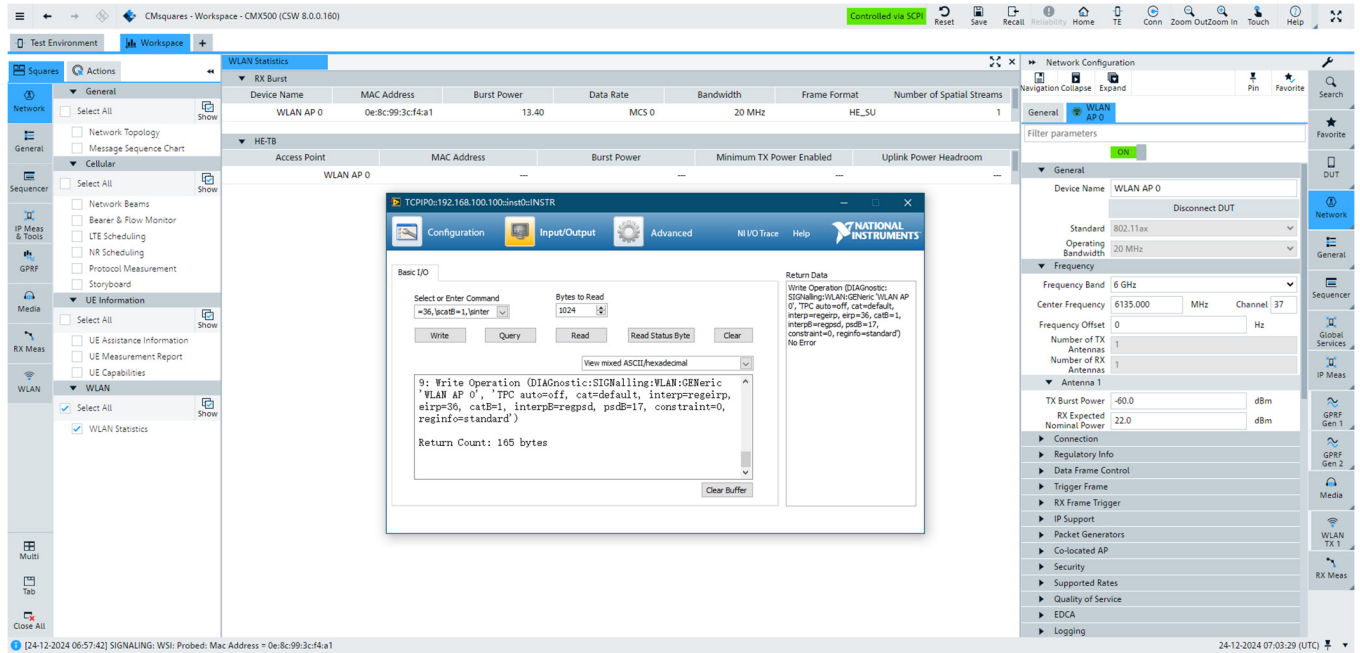
802.11ax 20MHz bandwidth

Test channel: 37	Client Conducted Power (dBm)			Client EIRP (dBm)			AP EIRP (dBm)	AP to client EIRP Delta(dB)	Requirement	Result
	MAIN	AUX	MIMO	MAIN	AUX	MIMO				
Maximum EIRP	13.40	14.03	16.74	13.53	12.13	15.90	36	20.10	At least 6 dB	Pass
Midpoint EIRP	9.21	10.06	12.67	9.34	8.16	11.80	26	14.20		Pass
Lowest EIRP	3.32	4.30	6.85	3.45	2.40	5.97	20	14.03		Pass

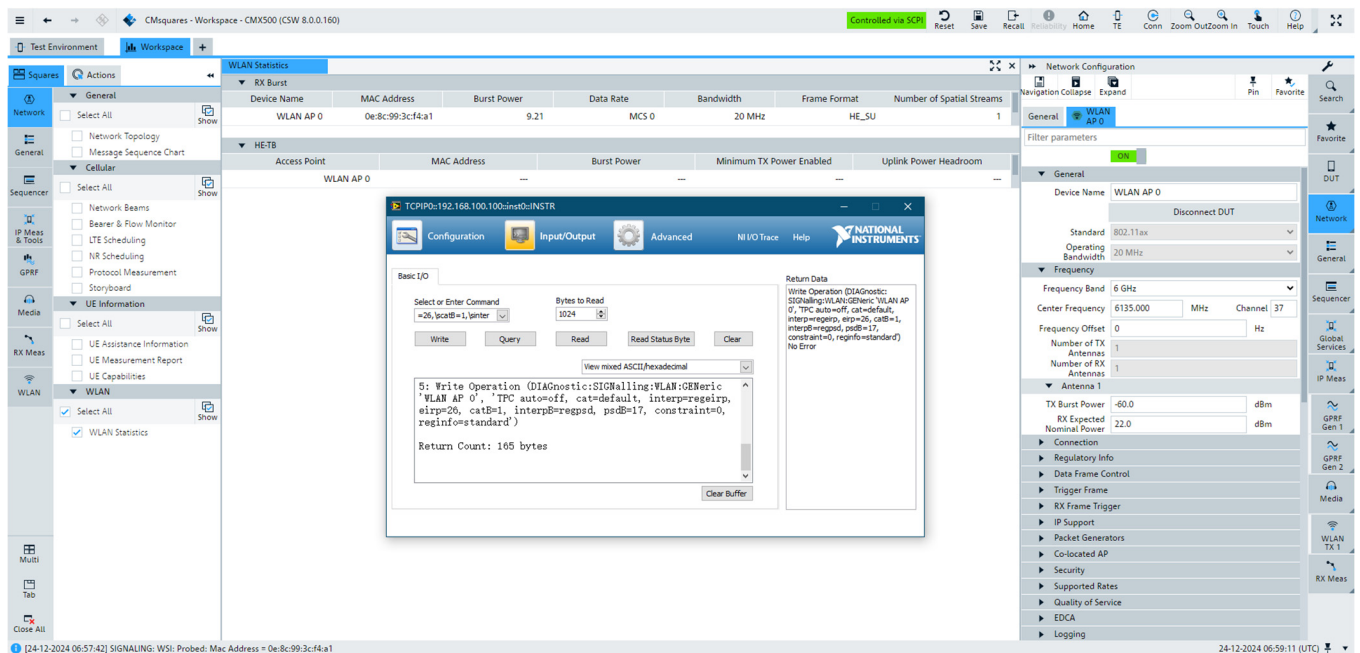
Test Plots

Main Antenna

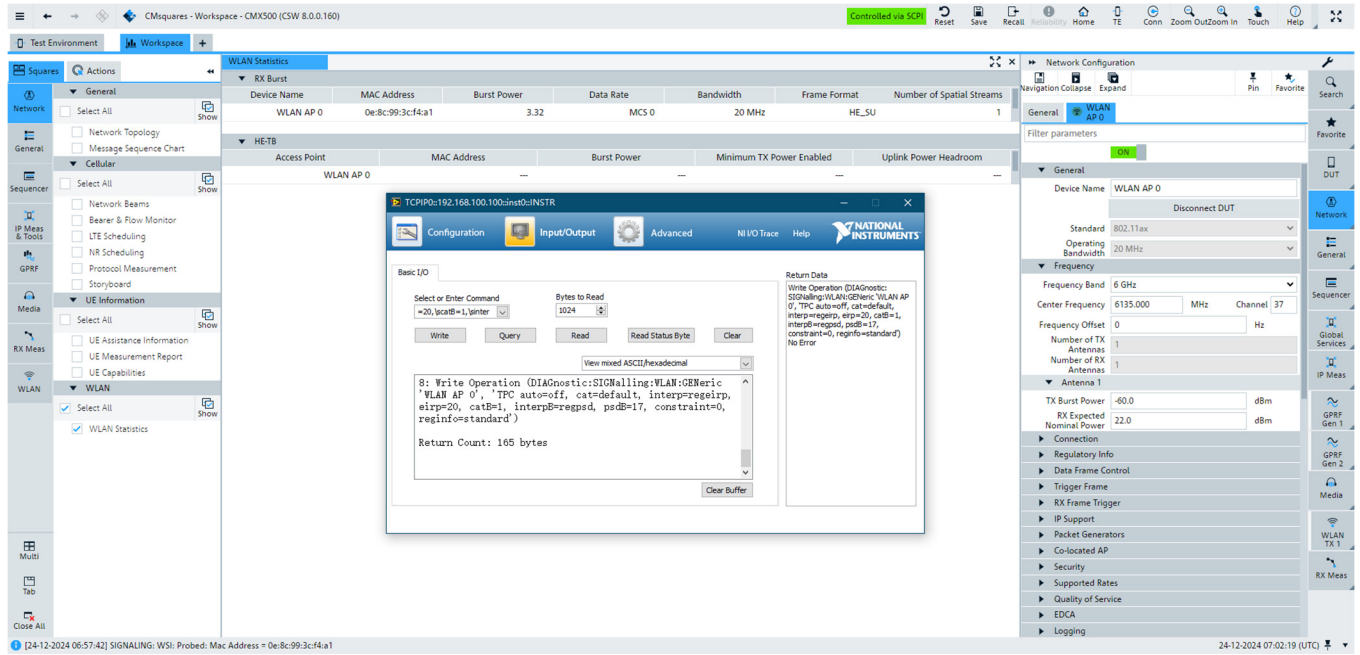
Measured highest power



Measured mid-point power



Measured lowest power



The screenshot displays the CMX500 software interface. The 'WLAN Statistics' window shows the following data:

Device Name	MAC Address	Burst Power	Data Rate	Bandwidth	Frame Format	Number of Spatial Streams
WLAN AP 0	0e:8c:99:3c:f4:a1	3.32	MCS 0	20 MHz	HE_SU	1

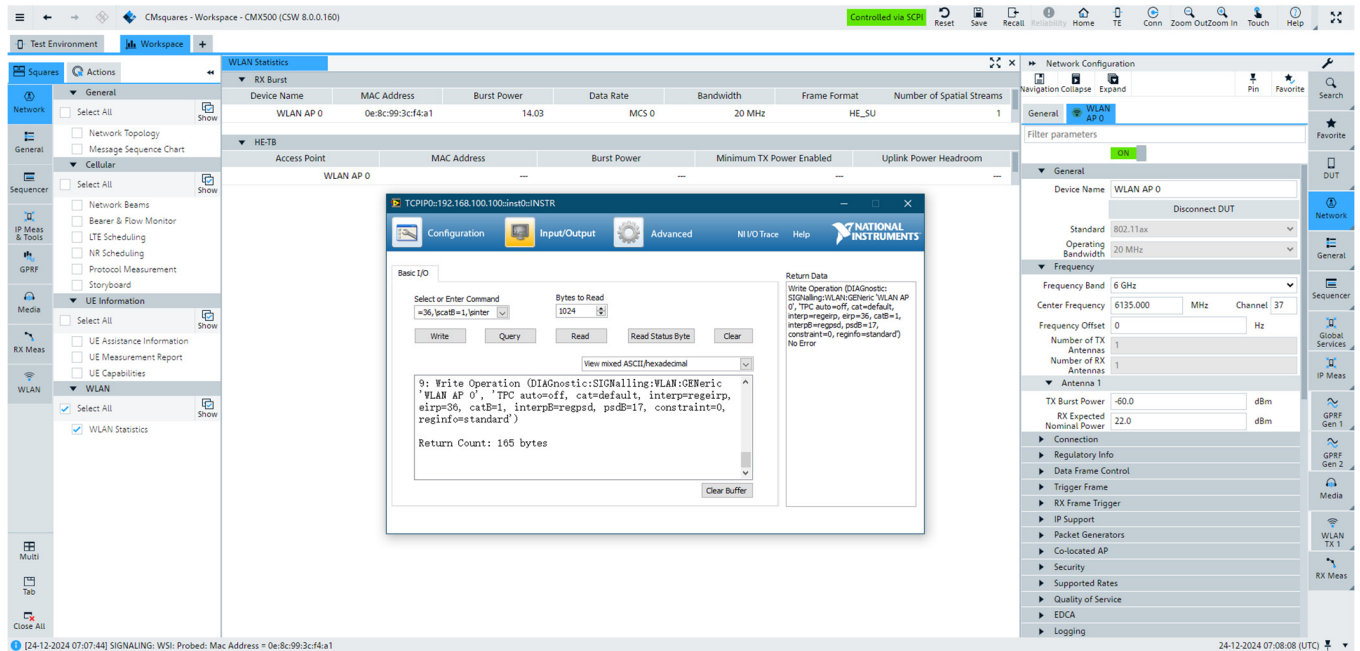
The 'Network Configuration' window shows the following settings:

- Device Name: WLAN AP 0
- Standard: 802.11ax
- Operating Bandwidth: 20 MHz
- Frequency Band: 6 GHz
- Center Frequency: 6135.000 MHz
- Channel: 37
- Frequency Offset: 0 Hz
- Number of TX Antennas: 1
- Number of RX Antennas: 1
- TX Burst Power: -60.0 dBm
- RX Expected Nominal Power: 22.0 dBm

The 'Basic I/O' window shows the command: `8: Write Operation (DIAGNOSTIC:SIGhalling:WLAN:GENERIC 'WLAN AP 0', 'TPC auto=off, cat=default, inter=regseirp, eirp=20, catB=1, interB=regpsd, psdB=17, constraint=0, reginfo=standard')` and the return data: `Return Count: 165 bytes`.

Aux. Antenna

Measured highest power



The screenshot displays the CMX500 software interface. The 'WLAN Statistics' window shows the following data:

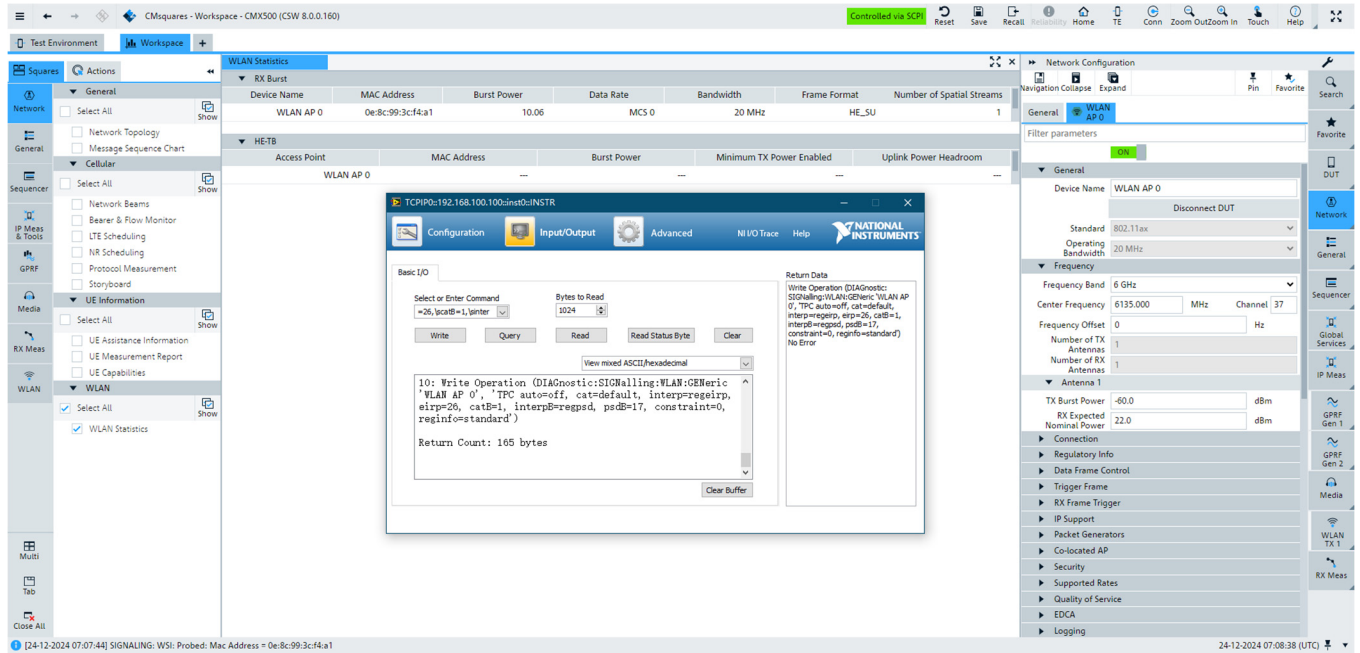
Device Name	MAC Address	Burst Power	Data Rate	Bandwidth	Frame Format	Number of Spatial Streams
WLAN AP 0	0e:8c:99:3c:f4:a1	14.03	MCS 0	20 MHz	HE_SU	1

The 'Network Configuration' window shows the following settings:

- Device Name: WLAN AP 0
- Standard: 802.11ax
- Operating Bandwidth: 20 MHz
- Frequency Band: 6 GHz
- Center Frequency: 6135.000 MHz
- Channel: 37
- Frequency Offset: 0 Hz
- Number of TX Antennas: 1
- Number of RX Antennas: 1
- TX Burst Power: -60.0 dBm
- RX Expected Nominal Power: 22.0 dBm

The 'Basic I/O' window shows the command: `9: Write Operation (DIAGNOSTIC:SIGhalling:WLAN:GENERIC 'WLAN AP 0', 'TPC auto=off, cat=default, inter=regseirp, eirp=36, catB=1, interB=regpsd, psdB=17, constraint=0, reginfo=standard')` and the return data: `Return Count: 165 bytes`.

Measured mid-point power



The screenshot displays the CMX500 software interface. The 'WLAN Statistics' window shows the following data:

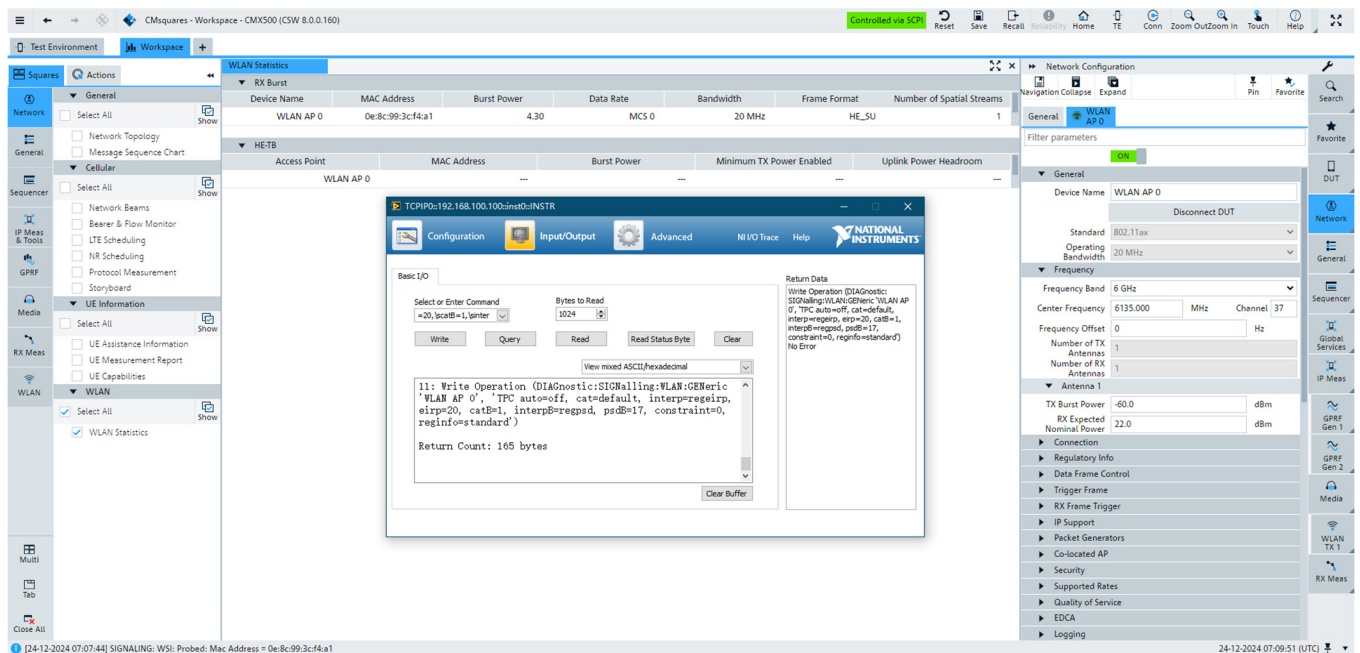
Device Name	MAC Address	Burst Power	Data Rate	Bandwidth	Frame Format	Number of Spatial Streams
WLAN AP 0	0e:8c:99:3c:f4:a1	10.06	MCS 0	20 MHz	HE_SU	1

The 'Network Configuration' window shows the following settings:

- Device Name: WLAN AP 0
- Standard: 802.11ax
- Operating Bandwidth: 20 MHz
- Frequency Band: 6 GHz
- Center Frequency: 6135.000 MHz
- Channel: 37
- Frequency Offset: 0 Hz
- TX Burst Power: -60.0 dBm
- RX Expected Nominal Power: 22.0 dBm

The 'Basic I/O' window shows the command: `10: Write Operation (Diagnostics:SIGWalling:WLAN:Generic 'WLAN AP 0', 'TPC auto=off, cat=default, interp=regseirp, eirp=20, catB=1, interpB=regpsd, psdB=17, constraint=0, reginfo=standard')` and the return data: `Return Count: 165 bytes`.

Measured lowest power



The screenshot displays the CMX500 software interface. The 'WLAN Statistics' window shows the following data:

Device Name	MAC Address	Burst Power	Data Rate	Bandwidth	Frame Format	Number of Spatial Streams
WLAN AP 0	0e:8c:99:3c:f4:a1	4.30	MCS 0	20 MHz	HE_SU	1

The 'Network Configuration' window shows the following settings:

- Device Name: WLAN AP 0
- Standard: 802.11ax
- Operating Bandwidth: 20 MHz
- Frequency Band: 6 GHz
- Center Frequency: 6135.000 MHz
- Channel: 37
- Frequency Offset: 0 Hz
- TX Burst Power: -60.0 dBm
- RX Expected Nominal Power: 22.0 dBm

The 'Basic I/O' window shows the command: `11: Write Operation (Diagnostics:SIGWalling:WLAN:Generic 'WLAN AP 0', 'TPC auto=off, cat=default, interp=regseirp, eirp=20, catB=1, interpB=regpsd, psdB=17, constraint=0, reginfo=standard')` and the return data: `Return Count: 165 bytes`.

A.2 Dual Client Test, Demonstration of Proper Power Adjustment based on Associated AP

Test Data

Companion Standard Power AP and Low Power indoor AP: Brand name: ROHDE&SCHWARZ, Model name: CMX500

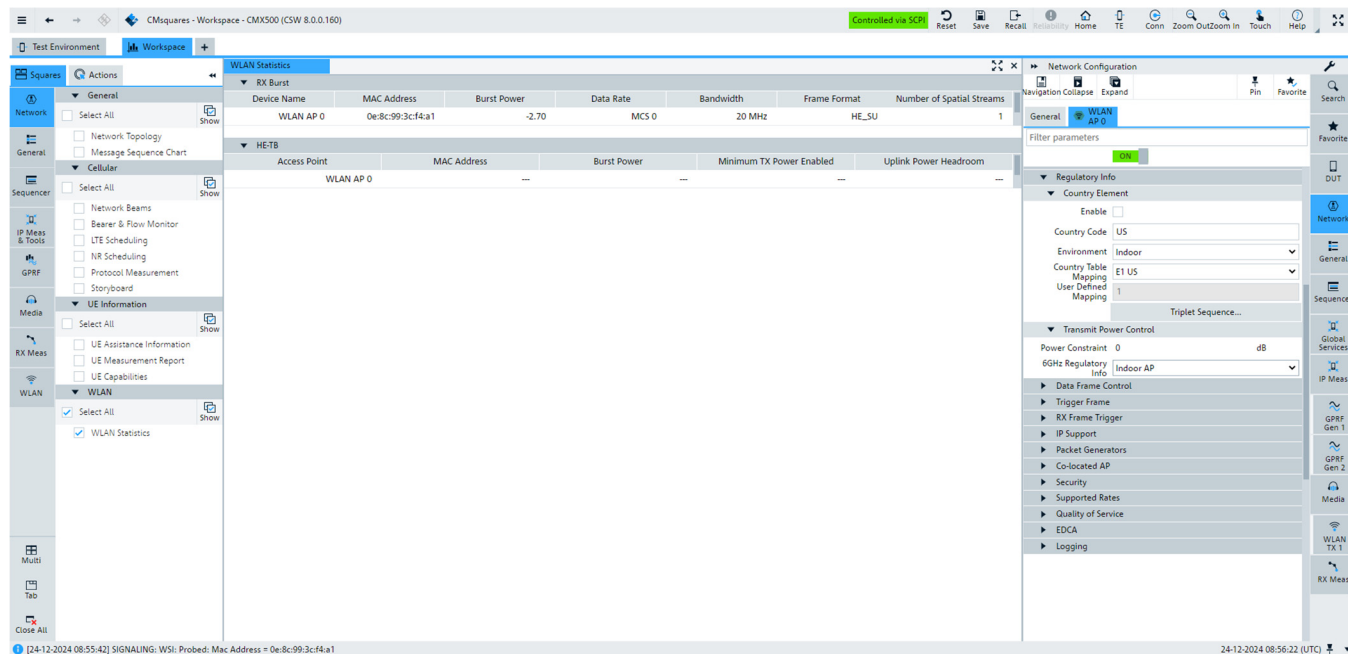
802.11ax 20MHz bandwidth

Test channel: 37	Client Conducted Power (dBm)			Client EIRP (dBm)			Limit EIRP (dBm)	Result
	MAIN	AUX	MIMO	MAIN	AUX	MIMO		
Std. Power AP	13.50	14.17	16.86	13.63	12.27	16.01	30	Pass
Low Power AP	-2.70	-3.17	0.08	-2.57	-5.07	-0.63	24	Pass

Test Plots

Main Antenna

Measured Indoor power



CMX500 - Workspace - CMX500 (CSW 8.0.0.160)

Controlled via SCPI

Test Environment: Workspace

WLAN Statistics

Device Name	MAC Address	Burst Power	Data Rate	Bandwidth	Frame Format	Number of Spatial Streams
WLAN AP 0	0e:8c:99:3c:f4:a1	-2.70	MCS 0	20 MHz	HE_SU	1

HE-TB

Access Point	MAC Address	Burst Power	Minimum TX Power Enabled	Uplink Power Headroom
WLAN AP 0	0e:8c:99:3c:f4:a1	-2.70	Yes	-2.70

Network Configuration

General: WLAN AP 0

Filter parameters: 100%

Regulatory Info

Country Element

Enable: ☐

Country Code: US

Environment: Indoor

Country Table Mapping: E1 US

User Defined Mapping: 1

Triplet Sequence...

Transmit Power Control

Power Constraint: 0 dB

6GHz Regulatory: Indoor AP

Data Frame Control

Trigger Frame

RX Frame Trigger

IP Support

Packet Generators

Co-located AP

Security

Supported Rates

Quality of Service

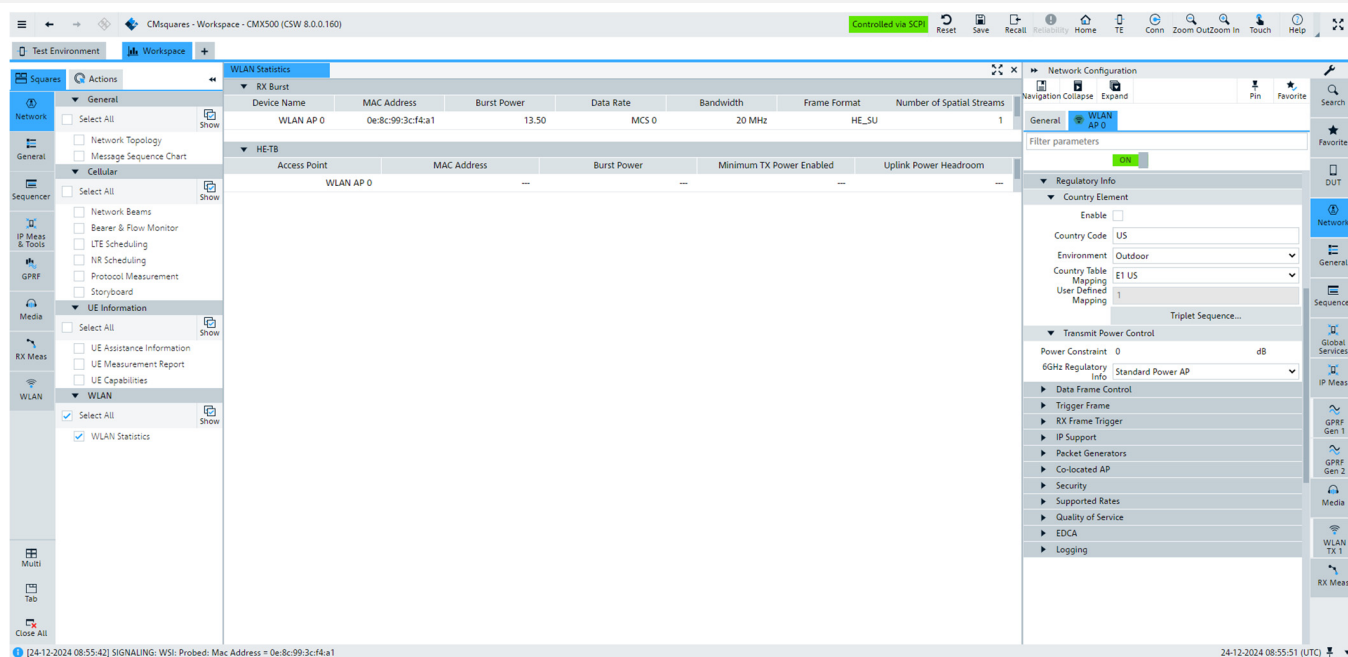
EDCA

Logging

[24-12-2024 08:55:42] SIGNALING: WSI: Probed: Mac Address = 0e:8c:99:3c:f4:a1

24-12-2024 08:56:22 (UTC)

Measured Standard power



CMX500 - Workspace - CMX500 (CSW 8.0.0.160)

Controlled via SCPI

Test Environment: Workspace

WLAN Statistics

Device Name	MAC Address	Burst Power	Data Rate	Bandwidth	Frame Format	Number of Spatial Streams
WLAN AP 0	0e:8c:99:3c:f4:a1	13.50	MCS 0	20 MHz	HE_SU	1

HE-TB

Access Point	MAC Address	Burst Power	Minimum TX Power Enabled	Uplink Power Headroom
WLAN AP 0	0e:8c:99:3c:f4:a1	13.50	Yes	13.50

Network Configuration

General: WLAN AP 0

Filter parameters: 100%

Regulatory Info

Country Element

Enable: ☐

Country Code: US

Environment: Outdoor

Country Table Mapping: E1 US

User Defined Mapping: 1

Triplet Sequence...

Transmit Power Control

Power Constraint: 0 dB

6GHz Regulatory: Standard Power AP

Data Frame Control

Trigger Frame

RX Frame Trigger

IP Support

Packet Generators

Co-located AP

Security

Supported Rates

Quality of Service

EDCA

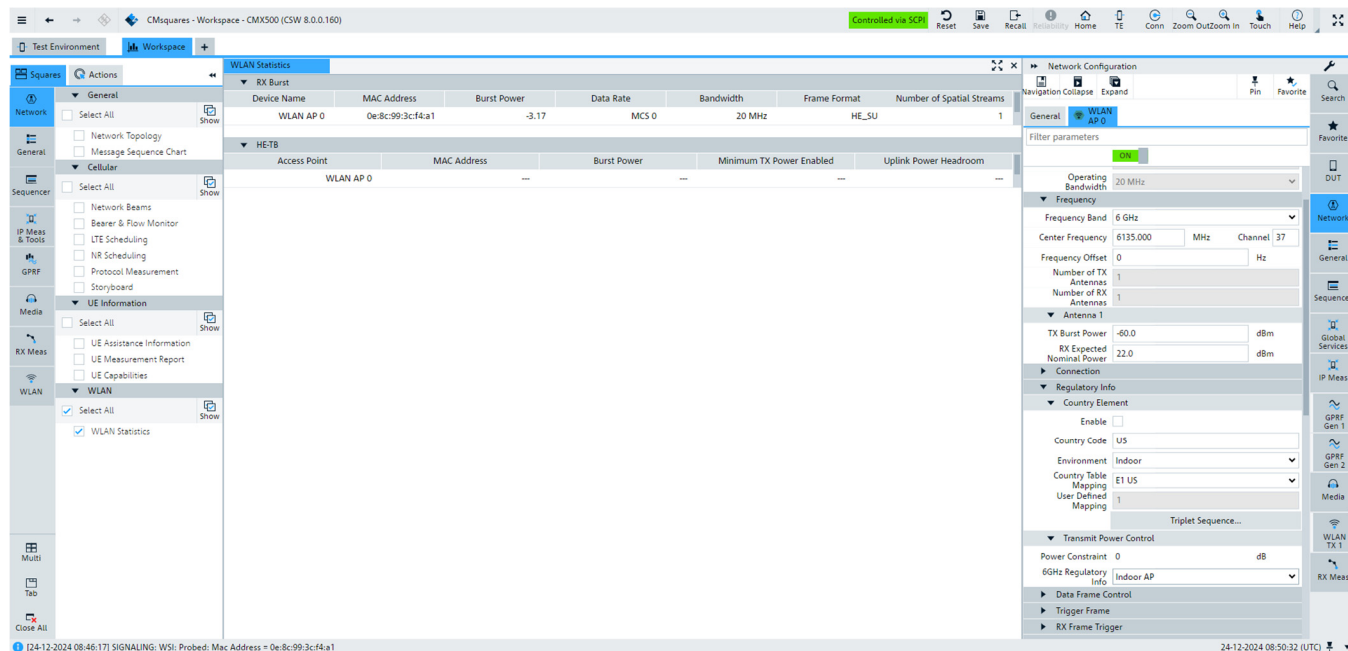
Logging

[24-12-2024 08:55:42] SIGNALING: WSI: Probed: Mac Address = 0e:8c:99:3c:f4:a1

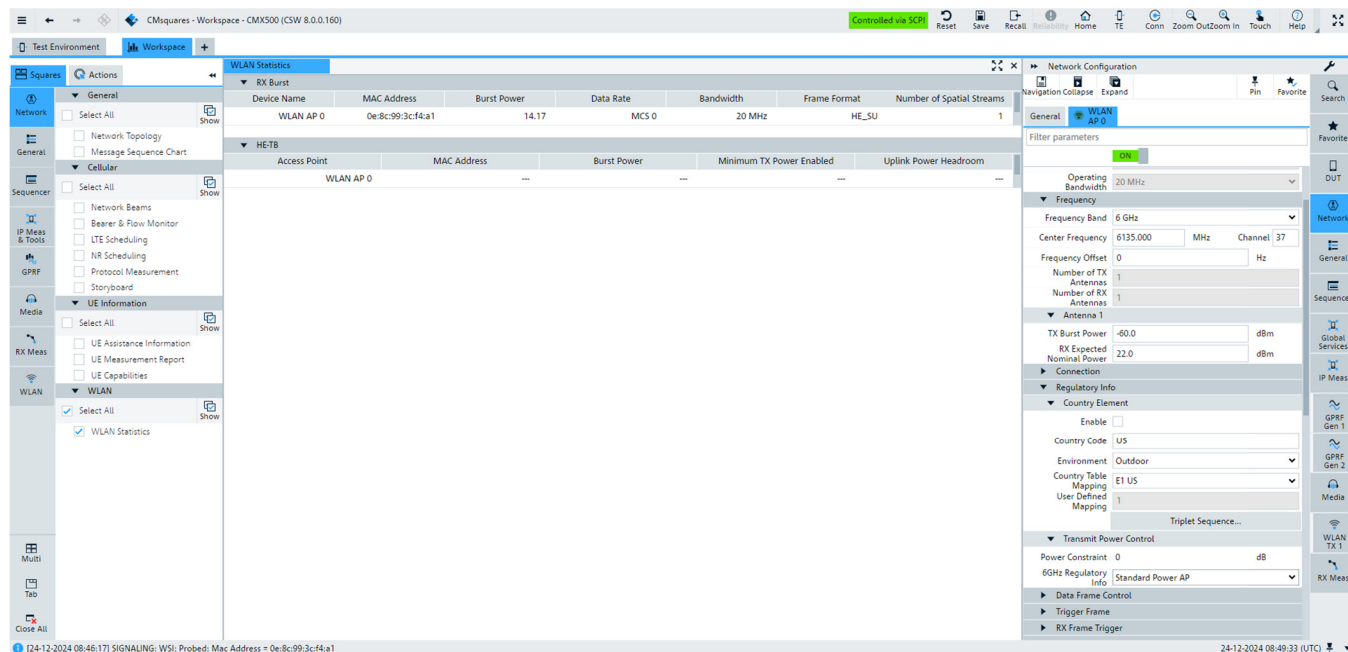
24-12-2024 08:55:51 (UTC)

Aux. Antenna

Measured Indoor power



Measured Standard power



ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2470686-AR-1.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2470686-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2470686-AI.PDF”.

Statement

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