

Test Report

Product	Codec for Telepresence Unit		
Name and address of the applicant	Cisco Systems Norway AS Philip Pedersens vei 1 1366 Lysaker, NORWAY		
Name and address of the manufacturer	Cisco Systems, Inc. 170 West Tasman Drive San Jose, CA 95134, USA		
Model	TTC6-15		
Rating	Mains (100-240V AC, 50-60Hz, 2.0-1.2A)		
Trademark	CISCO		
Additional information	Bluetooth LE, Bluetooth Classic, WiFi 6E		
Tested according to	Parts of FCC Part 15.407 Unlicensed National Information Infrastructure Devices (U-NII) Parts of ISED Canada RSS-248, Issue 2 Licence-Exempt Local Area Network (LE-LAN) Devices		
Order number	PRJ0014735		
Tested in period	2023-01-26 and 2023-01-27		
Issue date	2023-11-24		
Name and address of the testing laboratory	<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="text-align: center;">  <p>Nemko Scandinavia AS Instituttveien 6 2007 Kjeller, Norway www.nemko.com</p> </div> <div style="text-align: center;"> <p>CAB Number: FCC: NO0001 ISED: NO0470 ISED No: 2040D-1</p> </div> <div style="text-align: center;">   <p>NORWEGIAN ACCREDITATION TEST 033</p> </div> </div> <p style="text-align: center; color: red; font-weight: bold; font-size: small;">An accredited technical test executed under the Norwegian accreditation scheme</p>		
	 Prepared by [Frode Sveinsen]	 Approved by [Jan G Eriksen]	
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Revision history

Revision	Date	Comment	Sign
A	2023-10-10	First Edition	FS
B	2023-11-24	Corrected reference to SGS report	FS

GENERAL REMARKS

This report applies only to the sample(s) tested. It is the manufacturer's responsibility to ensure the additional production units of this product are manufactured with identical electrical and mechanical components. The manufacturer is solely responsible for any modifications that could result in non-compliance with the relevant regulations.

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Opinions expressed within this report regarding general assessments and qualifications for PASS or FAIL to the standards limits and requirements, are not part of the current accreditation. Neither are opinions expressed regarding model variants covered by the testing of this report.

CALIBRATION

All instruments used in the tests given in this test report are calibrated and traceable to national or international standards. Between calibrations all test set-ups are controlled and verified on a regular basis by periodic checks to ensure, with 95% confidence, that the instruments remain within the calibrated levels.

MEASUREMENT UNCERTAINTY

Measurement uncertainties are calculated or considered for all instruments and instrument set-ups used during these tests. Uncertainty figures are found in a separate clause in this report.

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2 INFORMATION

2.1 Test Item

Name	Cisco
Model	TTC6-15
FCC ID	LDK0615C2718
ISED ID	2461N-0615C2718
Serial number	FOC2641N3SK
Hardware identity and/or version	DV1
Software identity and/or version	RoomOS 10.20.X
Frequency Ranges	U-NII 5: 5955 – 6415 MHz
Operating Modes	802.11ax (20/40/80 MHz BW)
Type of Modulation	Digital (OFDM - Orthogonal frequency-division multiplexing)
Antenna Connector	RP-SMA
Number of Antennas	2
Antenna Diversity Supported	Yes
Smart Antennas Supported	MIMO
TPC Supported	Not implemented. Not required when EIRP is below 500 mW
Power Supply	Powered from Mains (120V 60Hz)
Antennas	BT/BLE/WIFI: SMARTEQ Model 710689 EUT has 3 identical antennas, one for BT/BLE and two for WiFi. All antennas have RP-SMA connectors

Description of Test Item

The tested EUT is a Collaboration Endpoint with WiFi 6E and Bluetooth.

This report covers only additional spurious emissions tests for use in the 6GHz frequency bands. All other RF tests are covered by Test Report No.: TERF2211002262ER Issued by SGS Taiwan Ltd. for the Murata RF Module Model No. LBEE5XV2EA (FCC ID: VPYLBEE5XV2EA, IC: 772C-LBEE5XV2EA).

The EUT uses only U-NII Band 5, U-NII Band 6, 7 and 8 are disabled in this device.

WiFi modulation 802.11a in U-NII Band 5 is not part of the WiFi 6E standard and is disabled in this EUT.

2.2 Normal test conditions

Temperature:	20 - 24 °C
Relative humidity:	20 - 50 %
Normal test voltage:	120 V 60 Hz

The values are the limit registered during the test period.

2.3 Test Engineer

Frode Sveinsen

2.4 Antenna Requirement

Is the antenna detachable?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
If detachable, is the antenna connector non-standard?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Type of antenna connector: RP-SMA		

2.5 Worst-Case Configuration

Radiated Emissions and Power Line Conducted Emissions were performed with the EUT set to transmit at the channel with the highest output power as worst-case scenario.

2.6 EUT Operating Modes

Description of operating modes	Continuous TX, 6 GHz 802.11ax 20/40/80 MHz Mode
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2.7 Power Levels

Default Power Levels were used for all tests.

2.8 Comments

The measurements were done with the EUT powered by 120 V AC. It was checked that power variations between 85% and 115% did not have any influence on the measurements.

MIMO measurements were performed with the EUT transmitting in MIMO mode on both antennas (P0 and P1). When measuring radiated the direction was locked and the maximum position was found.

Measurements in SISO mode was performed on P0 when measuring at the antenna connector, and on both antennas when measuring radiated.

3 TEST REPORT SUMMARY

3.1 General

The tests were performed to demonstrate compliance with FCC CFR 47 Part 15, paragraph 15.407 and ISED RSS-248 Issue 2.

Tests were performed in accordance with ANSI C63.4-2014 and ANSI C63.10-2013.

Test were performed in accordance with the following standards and measurement descriptions:

Standard	Description
FCC Part 15E	Unlicensed National Information Infrastructure Devices
ISED RSS-248, Issue 2	Radio Local Area Network (RLAN) Devices Operating in the 5925-7125 MHz Band
FCC KDB 987594 D02	6 GHz EMC Measurement
FCC KDB 789033 D02	General N-UNII Test Procedures New Rules
FCC KDB 662911 D01	Multiple Transmitter Output
FCC KDB 412172 D01	Determining EP and EIRP
ANSI C63.4-2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10-2020	Procedures for Compliance testing of Unlicensed Wireless Devices
ISED RSS-GEN, Issue 5	General Requirements for Compliance of Radio Apparatus

Radiated tests were performed in a semi-anechoic chamber at measuring distance of 3m.

<input checked="" type="checkbox"/> New Submission	<input checked="" type="checkbox"/> Production Unit
<input type="checkbox"/> Class II Permissive Change	<input type="checkbox"/> Pre-production Unit
6XD Equipment Code	<input type="checkbox"/> Family Listing

3.2 Test Summary

Name of test	FCC Part 15 reference	RSS-248 Issue 2 RSS-GEN Issue 5 reference	Result
Supply Voltage Variations	15.31(e)	6.11 (RSS-GEN)	Complies
Antenna Requirement	15.203	6.8 (RSS-GEN)	Complies
Power Line Conducted Emission	15.107(a) 15.207(a)	7.2 / 8.8 (RSS-GEN)	Complies
Maximum Conducted Output Power	15.407(a)	4.5	N/T ¹
Power Spectral Density (PSD)	15.407(a)	4.5	N/T ¹
Emission Bandwidth (EBW)	15.407(a)	4.4	N/T ¹
Unwanted Emissions	15.407(b)	4.6	Complies
Contention Based Protocol	15.407(d)(6)	4.7	N/T ¹
Radiated Emissions	15.205 15.209	4.6 7.3 (RSS-GEN) 8.9 (RSS-GEN)	Complies

¹ Covered by Test Report No. TERF2211002262ER Issued by SGS Taiwan Ltd.Central RF Lab.

4 TEST RESULTS

4.1 Radiated Emissions, 30 – 1000 MHz

FCC 15.205, 15.209, 15.407

ISED RSS-GEN, Issue 5, Clause 8.9

Measurement procedure: ANSI C63.10-2013 Clause 12.7

Test Results: Complies

Measurement Data:

Detector: QuasiPeak (Pre-scan with Peak Detector)

Measuring distance 3m

Tested in test mode with the EUT transmitting continuously on channel 45.

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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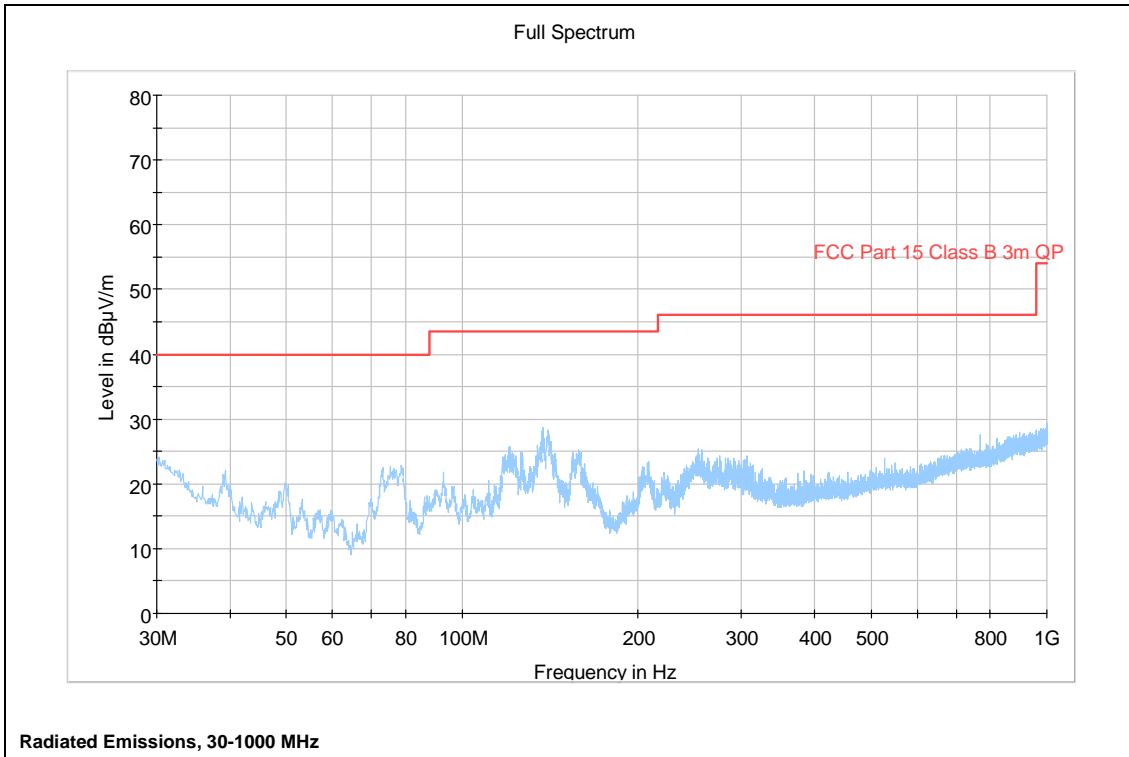
This is a class A device; all emissions are below the Class A limit.

None of the emissions above are in a restricted band.

See attached plots.

Requirements/Limit

FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
Frequency	Radiated emission limit @3 meters	
30 – 88 MHz	100 μ V/m	40.0 dB μ V/m
88 – 216 MHz	150 μ V/m	43.5 dB μ V/m
216 – 960 MHz	200 μ V/m	46.0 dB μ V/m
960 – 1000 MHz	500 μ V/m	54.0 dB μ V/m
	Limits above are with Quasi Peak Detector	



4.2 Radiated Emissions, 1 – 40 GHz

FCC 15.205, 15.209, 15.407

ISED RSS-248, Issue 2, Clause 4.6

ISED RSS-GEN, Issue 5, Clause 8.9

Measurement procedure: ANSI C63.10-2013 Clause 12.7

Test Results: Complies

Measurement Data:

Carrier freq. (MHz)	Measured Frequency (GHz)	Modulation	Measured Emission (dBµV/m)		Limit (dBµV/m)		Margin (dB)	
			Peak	Average	Pk*	Av	Pk	Av
Any	5925	Any	64.0	N/A	68.2	N/A	4.2	N/A
Any	7125	Any	< 60	N/A	68.2	N/A	>8	N/A
Any	Any	Any	<58	<46	68.2	54	>10	>8

Peak Limit is -27 dBm for all out-of-band emissions, this is converted to 68.2 dBµV/m @3m by using the formula from KDB 412172.

Measuring distance 3m up to 18 GHz.

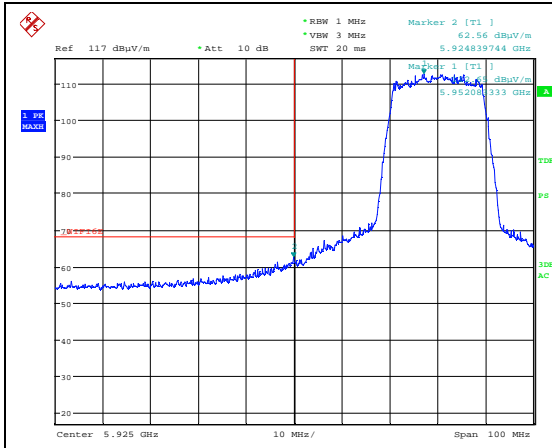
A High-Pass Filter (6.5 GHz) was used for out-of band measurements from 7 to 12 GHz, except Band Edge.

Antenna factor, amplifier gain and cable loss are included in Spectrum Analyzer "Transducer factor".

See attached plots.

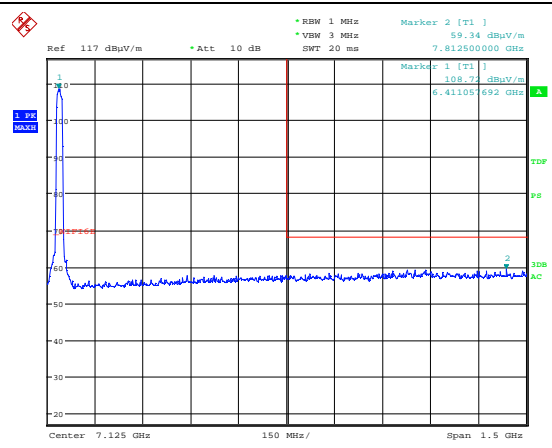
Requirements/Limit

FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency	Average Detector (dBµV/m)	Peak Detector (dBµV/m)
1 – 40 GHz	54.0	74.0



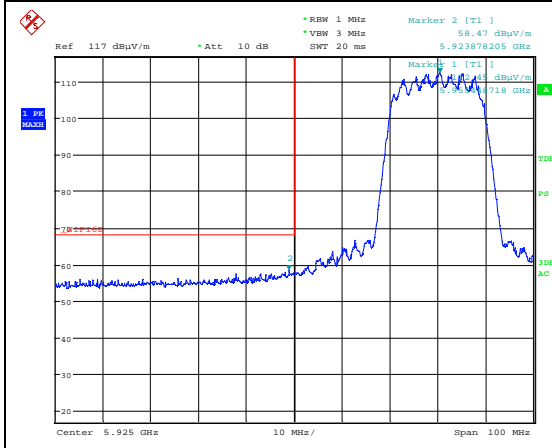
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Band Edge, 5925 MHz, Ch01, 802.11ax HT20 SISO, Pk, Max



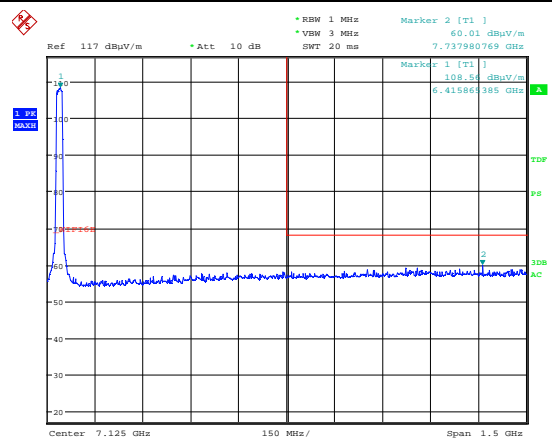
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Band Edge, 7125 MHz, Ch93, 802.11ax HT20 SISO, Pk, Max



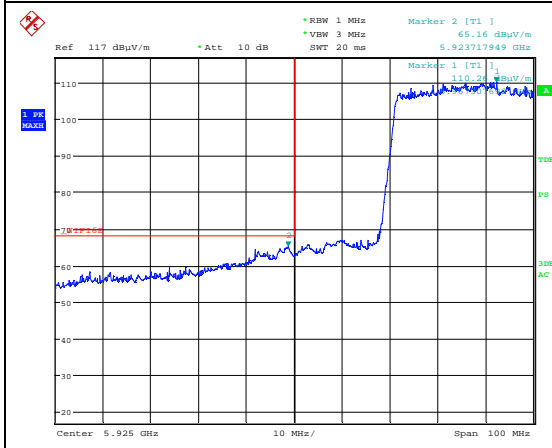
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Band Edge, 5925 MHz, Ch01, 802.11ax HT20 MIMO, Pk, Max



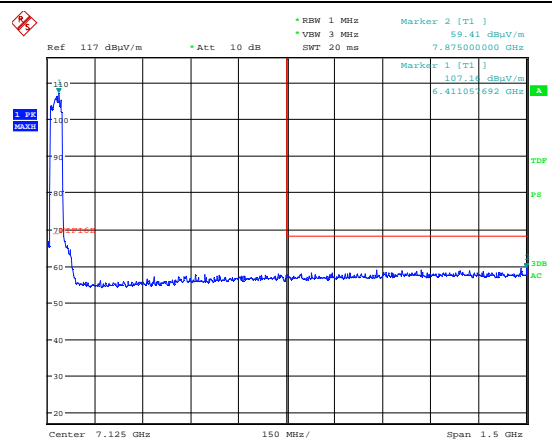
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Band Edge, 7125 MHz, Ch93, 802.11ax HT20 MIMO, Pk, Max



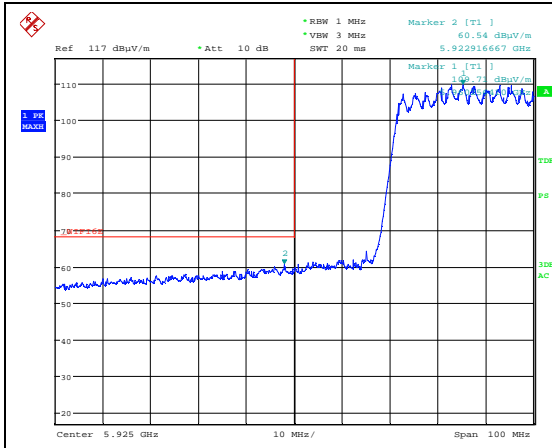
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Band Edge, 5925 MHz, Ch03, 802.11ax HT40 SISO, Pk, Max



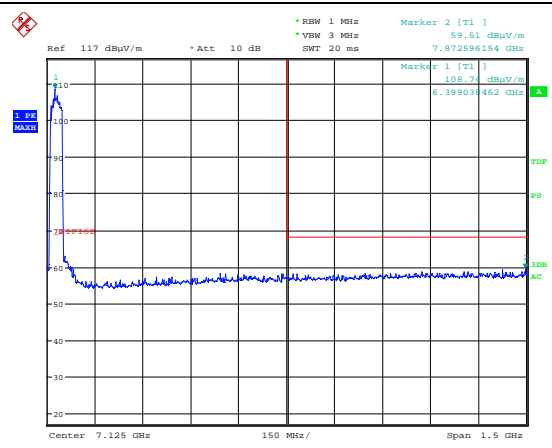
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Band Edge, 7125 MHz, Ch91, 802.11ax HT40 SISO, Pk, Max



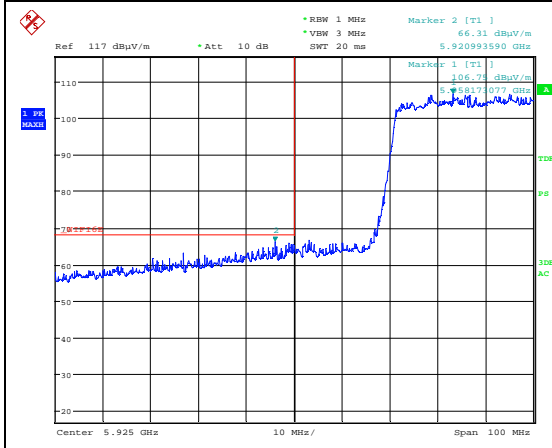
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Band Edge, 5925 MHz, Ch03, 802.11ax HT40 MIMO, Pk, Max



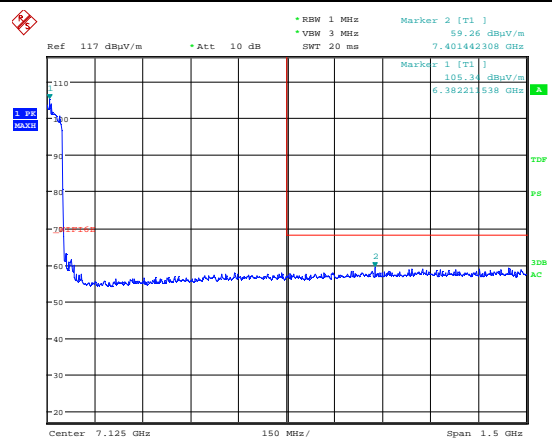
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Band Edge, 7125 MHz, Ch91, 802.11ax HT40 MIMO, Pk, Max



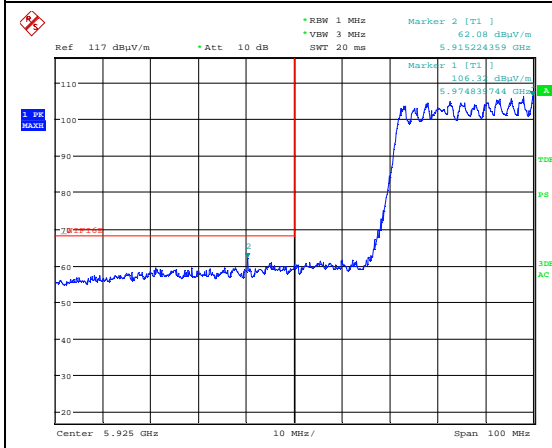
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Band Edge, 5925 MHz, Ch07, 802.11ax HT80 SISO, Pk, Max



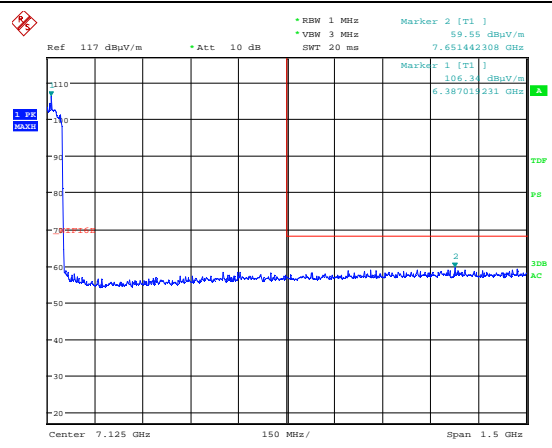
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Band Edge, 7125 MHz, Ch87, 802.11ax HT80 SISO, Pk, Max



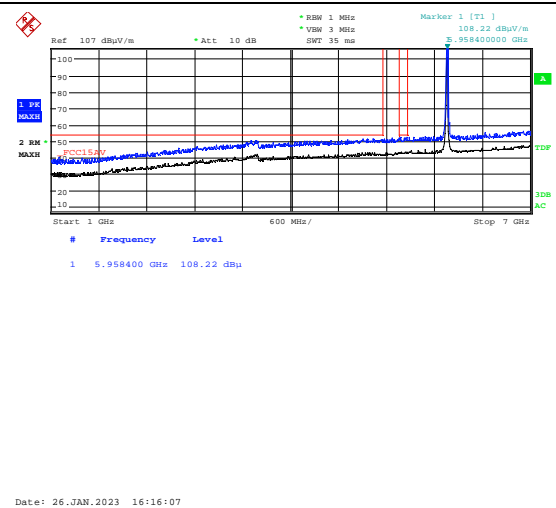
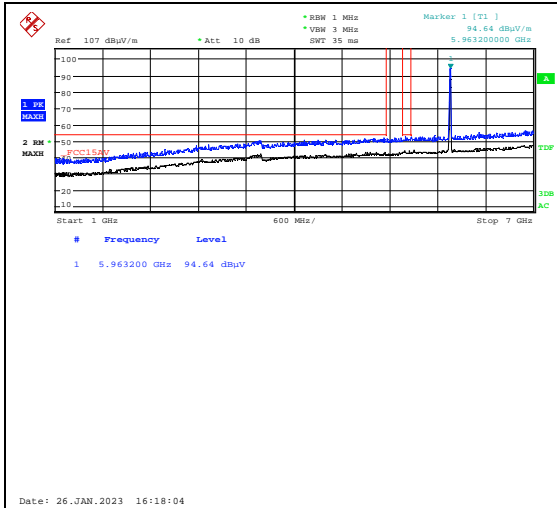
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Band Edge, 5925 MHz, Ch07, 802.11ax HT80 MIMO, Pk, Max



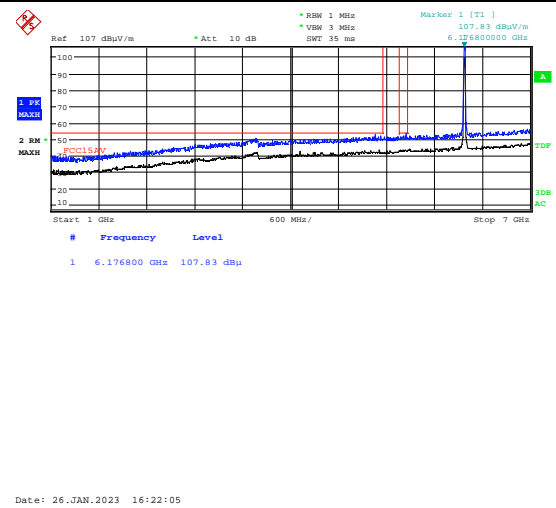
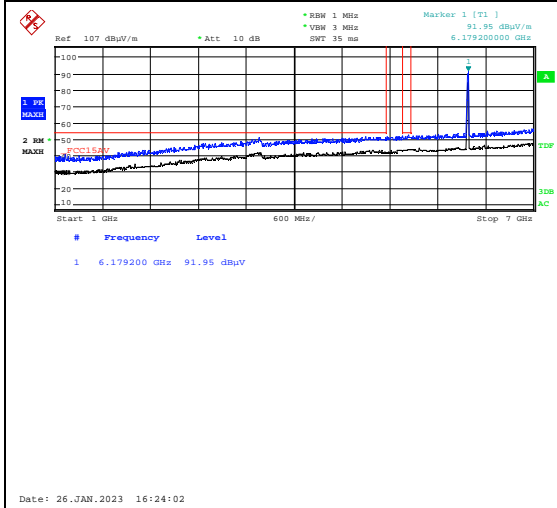
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Band Edge, 7125 MHz, Ch87, 802.11ax HT80 MIMO, Pk, Max



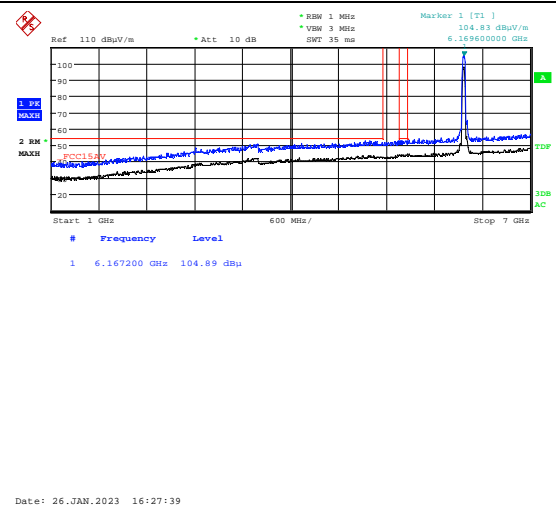
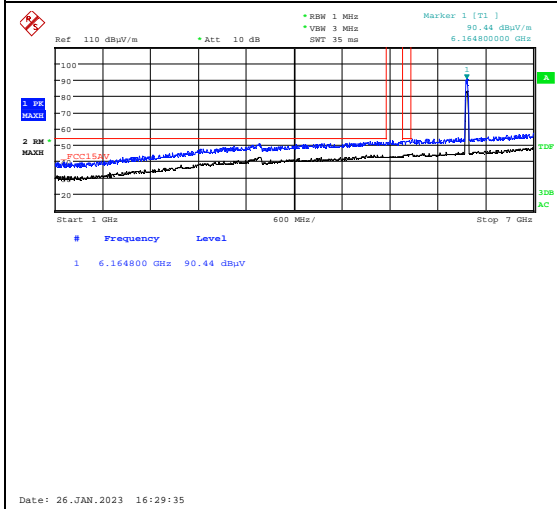
Radiated Emissions 1-7 GHz, Ch01, 802.11ax HT20 Ant0, HP

VP



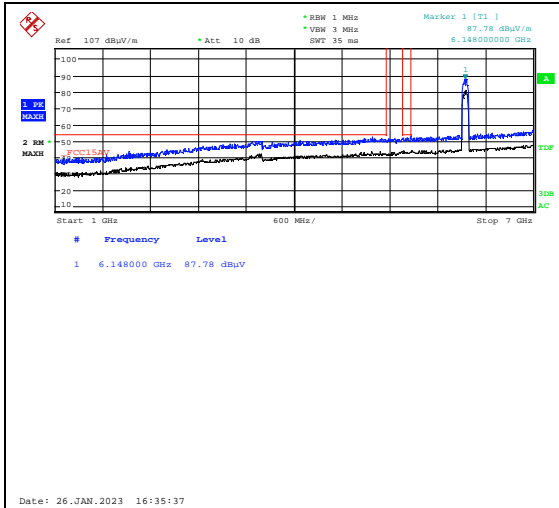
Radiated Emissions 1-7 GHz, Ch45, 802.11ax HT20 Ant0, HP

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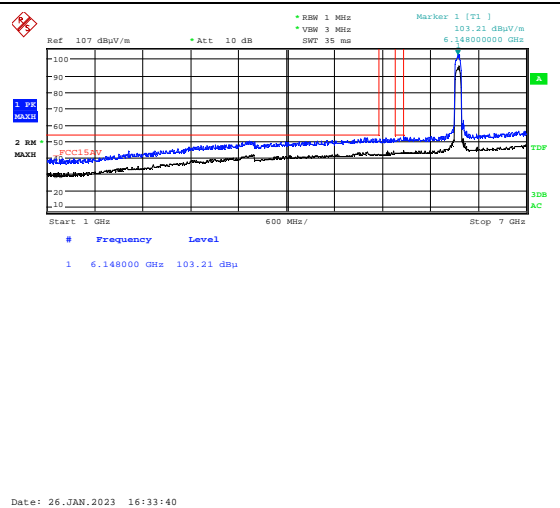


Radiated Emissions 1-7 GHz, Ch43, 802.11ax HT40 Ant0, HP

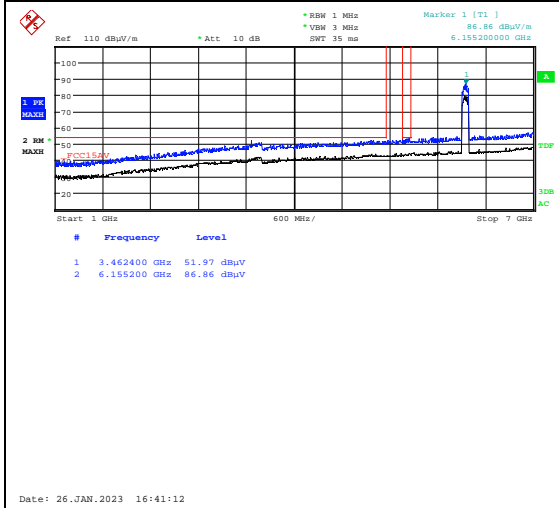
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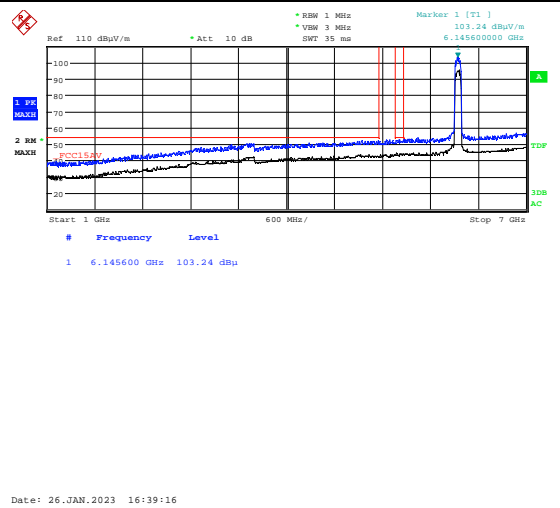
Radiated Emissions 1-7 GHz, Ch39, 802.11ax HT80 Ant0, HP



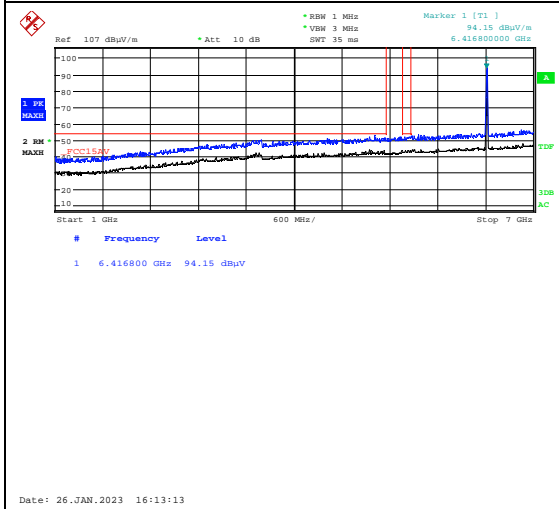
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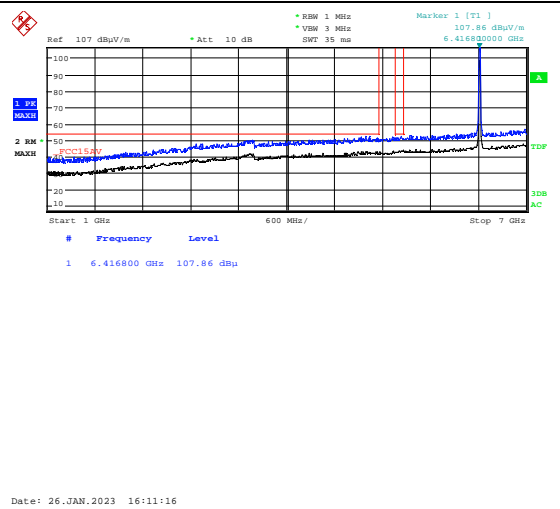
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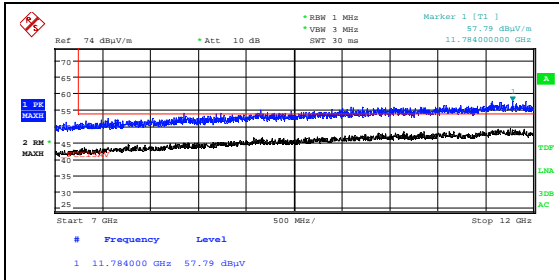
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Radiated Emissions 1-7 GHz, Ch93, 802.11ax HT20 Ant0, HP

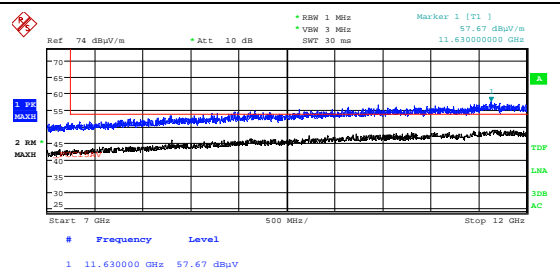


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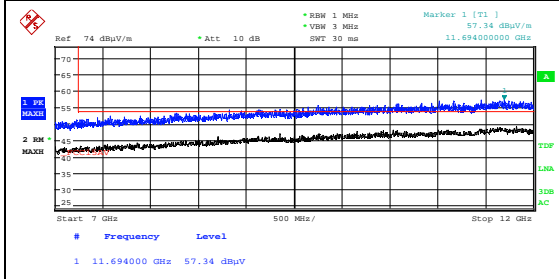
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Radiated Emissions 7-12 GHz, Ch01, 802.11ax HT20 Ant0, HP



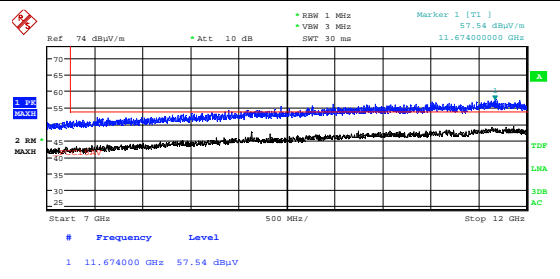
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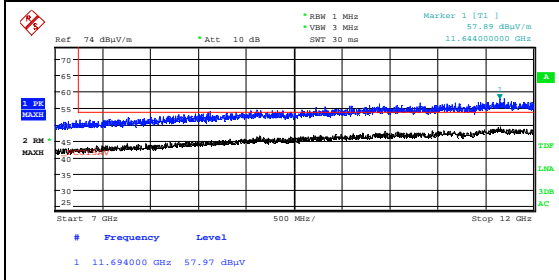
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Radiated Emissions 7-12 GHz, Ch01, 802.11ax HT20 Ant1, HP



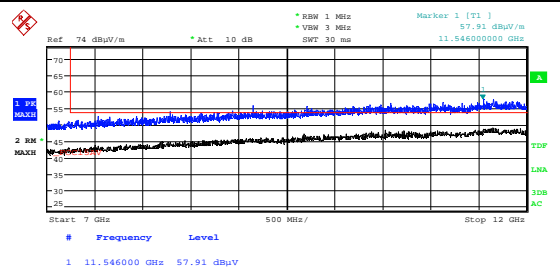
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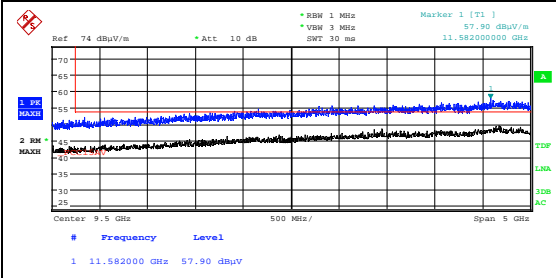
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Radiated Emissions 7-12 GHz, Ch01, 802.11ax HT20 MIMO, HP



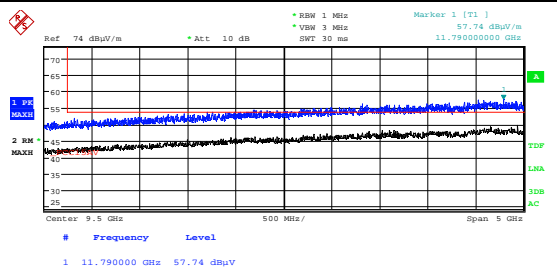
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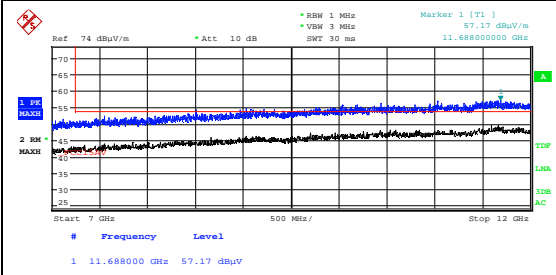
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Radiated Emissions 7-12 GHz, Ch45, 802.11ax HT20 Ant0, HP



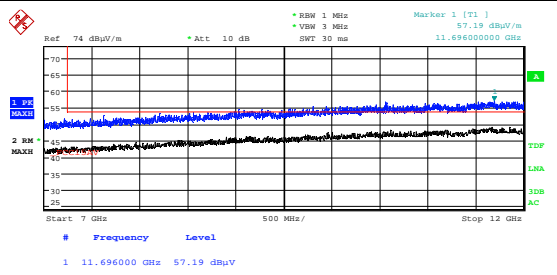
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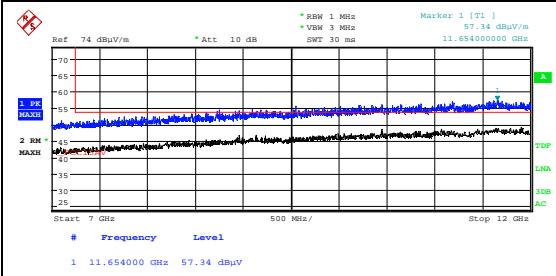
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Radiated Emissions 7-12 GHz, Ch45, 802.11ax HT20 Ant1, HP



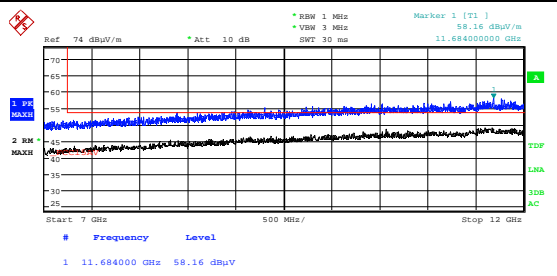
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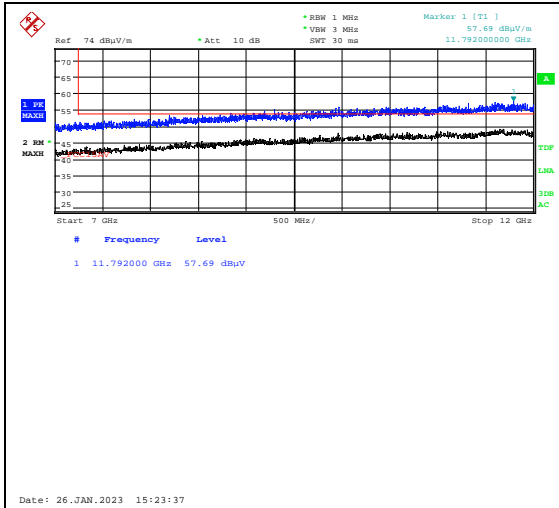
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Radiated Emissions 7-12 GHz, Ch45, 802.11ax HT20 MIMO, HP

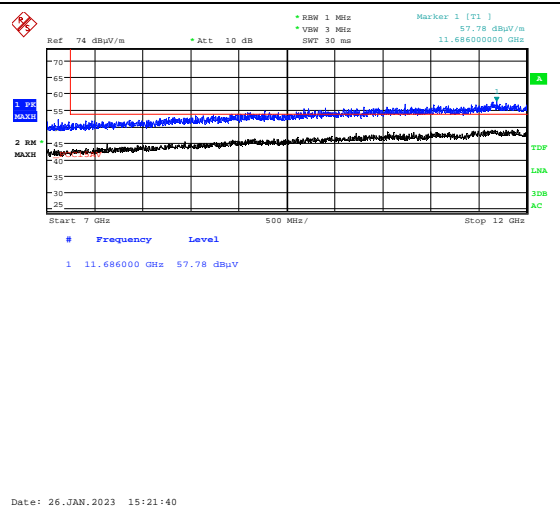


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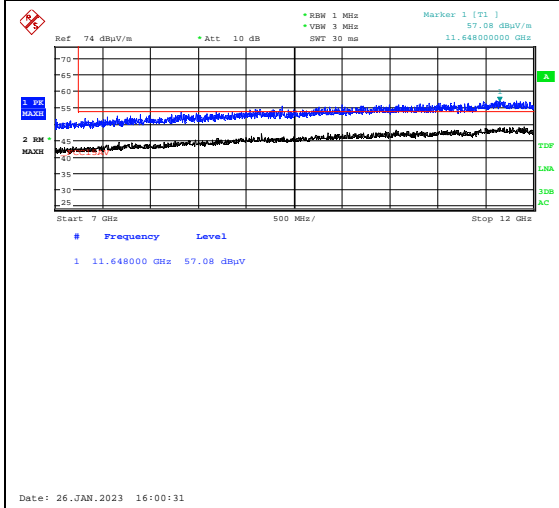
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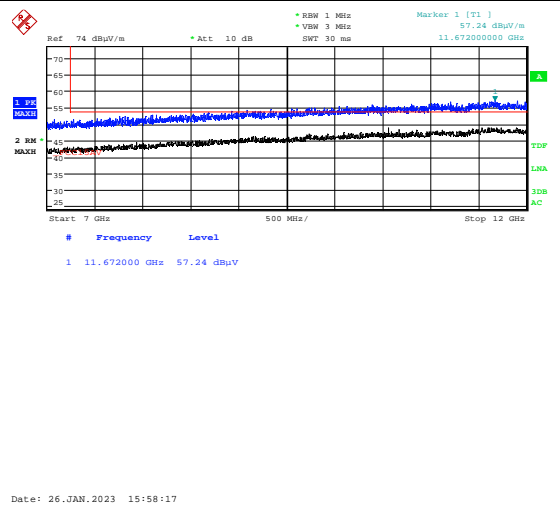
Radiated Emissions 7-12 GHz, Ch93, 802.11ax HT20 Ant0, HP



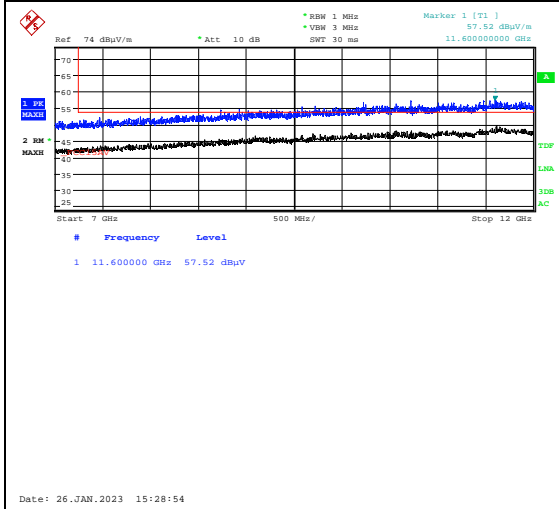
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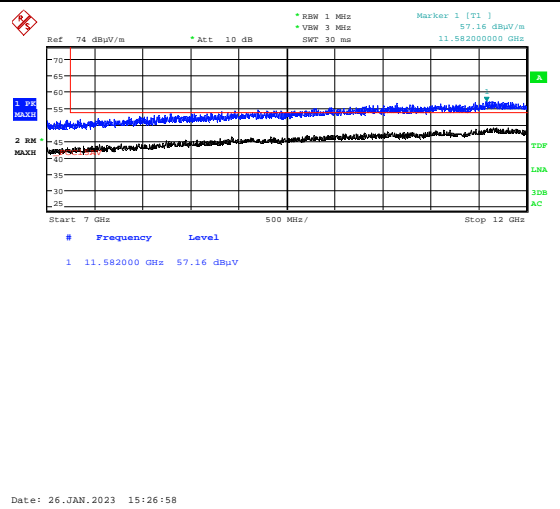
Radiated Emissions 7-12 GHz, Ch93, 802.11ax HT20 Ant1, HP



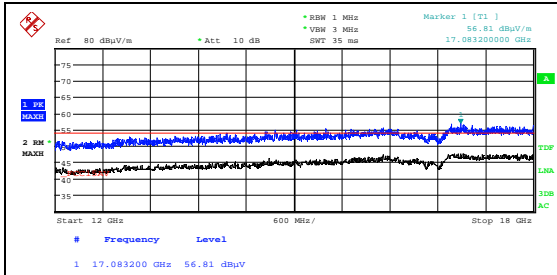
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Radiated Emissions 7-12 GHz, Ch93, 802.11ax HT20 MIMO, HP

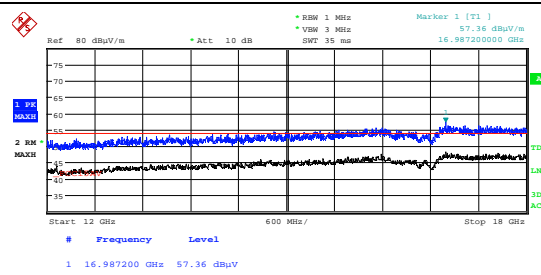


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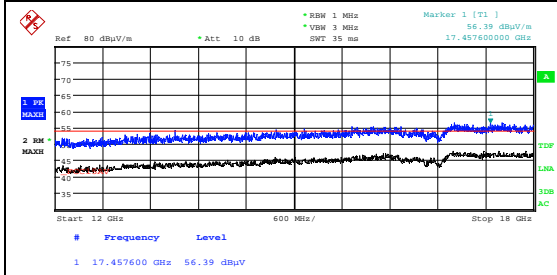
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Radiated Emissions 12-18 GHz, Ch01, 802.11ax HT20 Ant0, HP



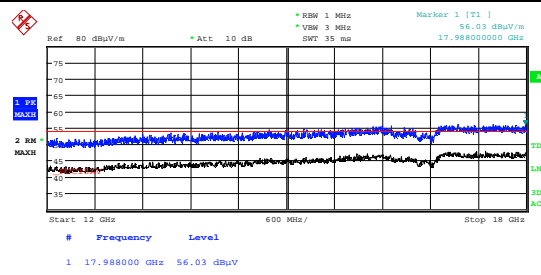
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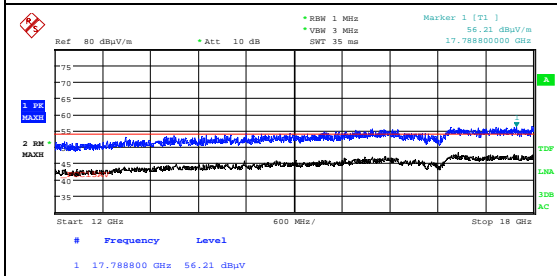
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Radiated Emissions 12-18 GHz, Ch01, 802.11ax HT20 Ant1, HP



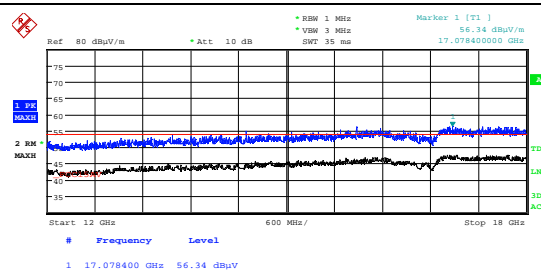
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VP



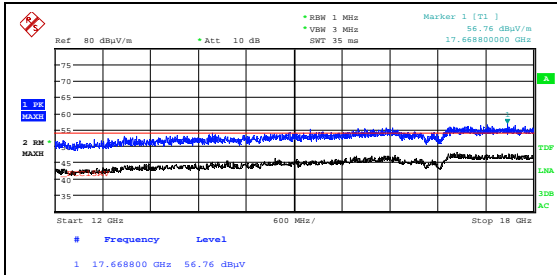
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Radiated Emissions 12-18 GHz, Ch01, 802.11ax HT20 MIMO, HP



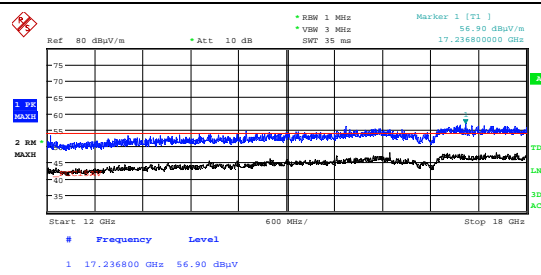
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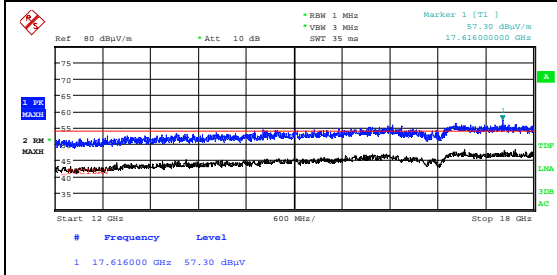
Date: 27.JAN.2023 13:33:05

Radiated Emissions 12-18 GHz, Ch45, 802.11ax HT20 Ant0, HP



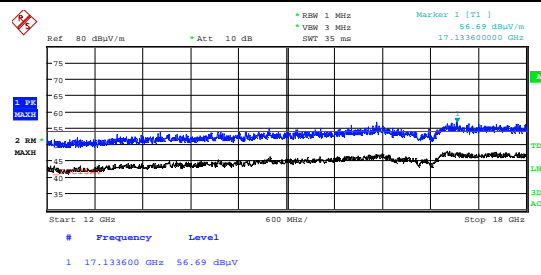
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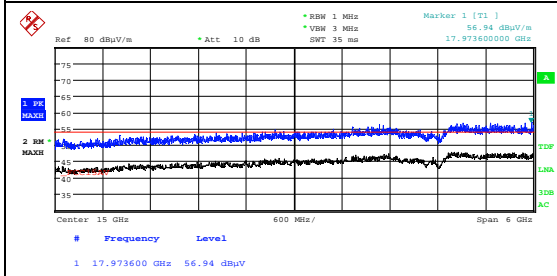
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Radiated Emissions 12-18 GHz, Ch45, 802.11ax HT20 Ant1, HP



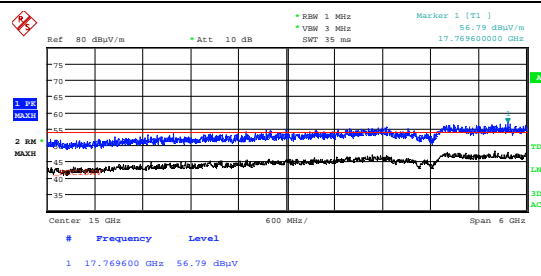
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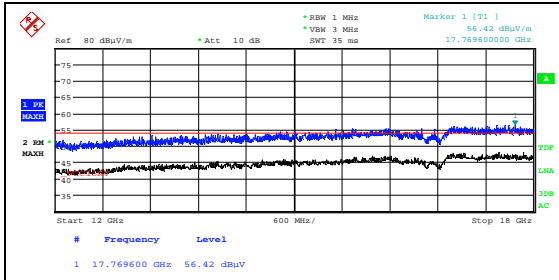
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Radiated Emissions 12-18 GHz, Ch45, 802.11ax HT20 MIMO, HP



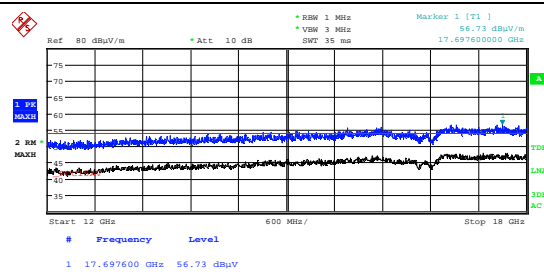
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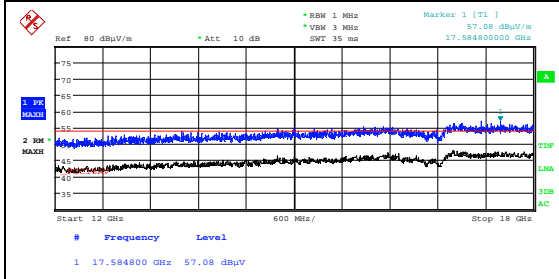
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Radiated Emissions 12-18 GHz, Ch43, 802.11ax HT40 MIMO, HP



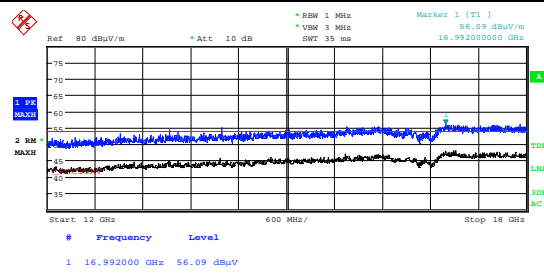
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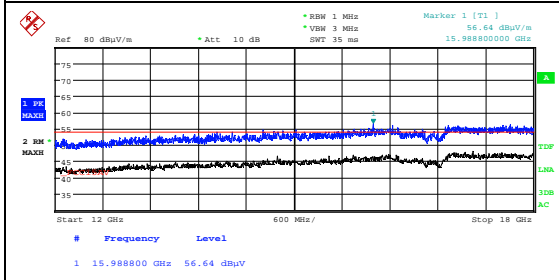
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Radiated Emissions 12-18 GHz, Ch39, 802.11ax HT80 MIMO, HP



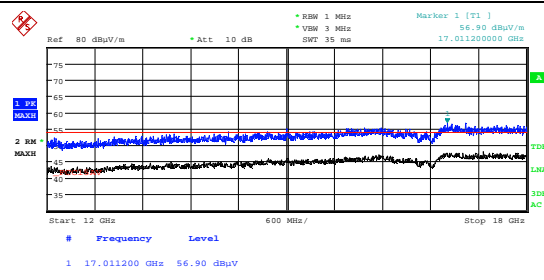
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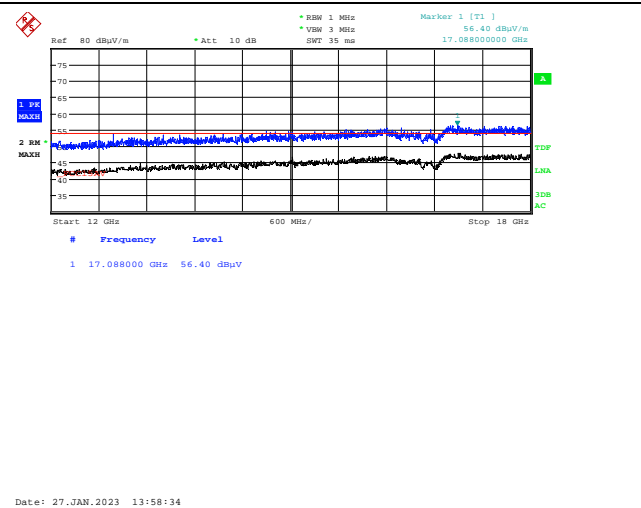
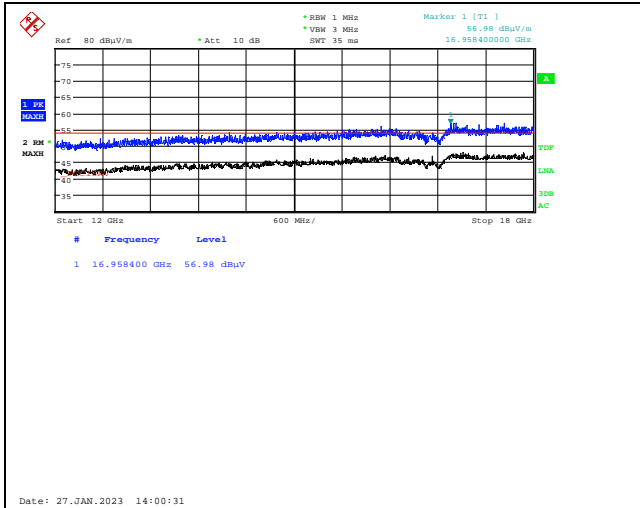
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Radiated Emissions 12-18 GHz, Ch93, 802.11ax HT20 Ant0, HP



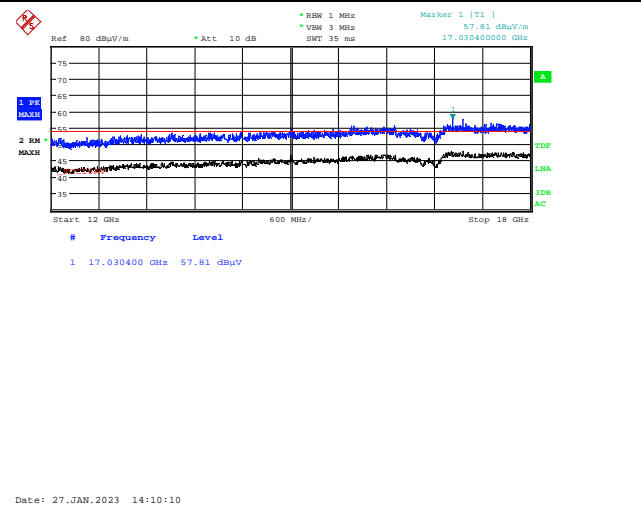
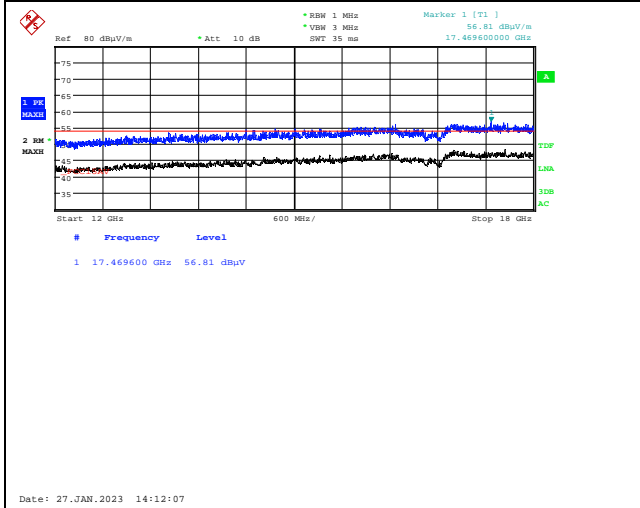
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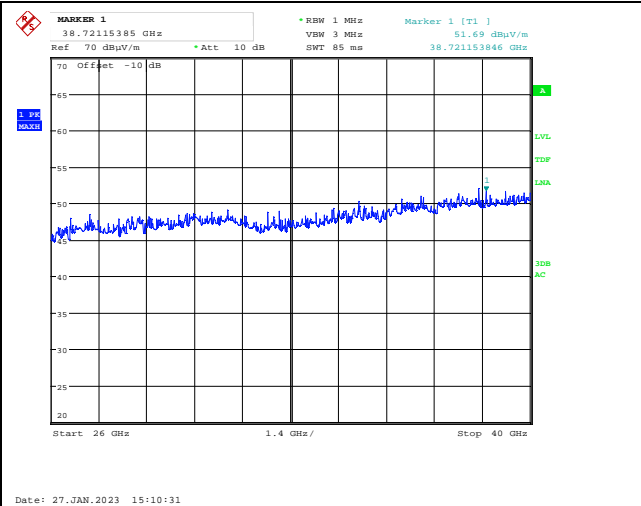
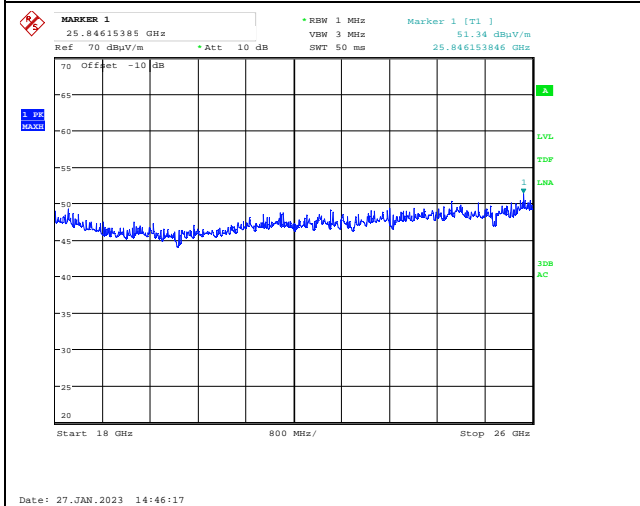
Radiated Emissions 12-18 GHz, Ch93, 802.11ax HT20 Ant1, HP

VP



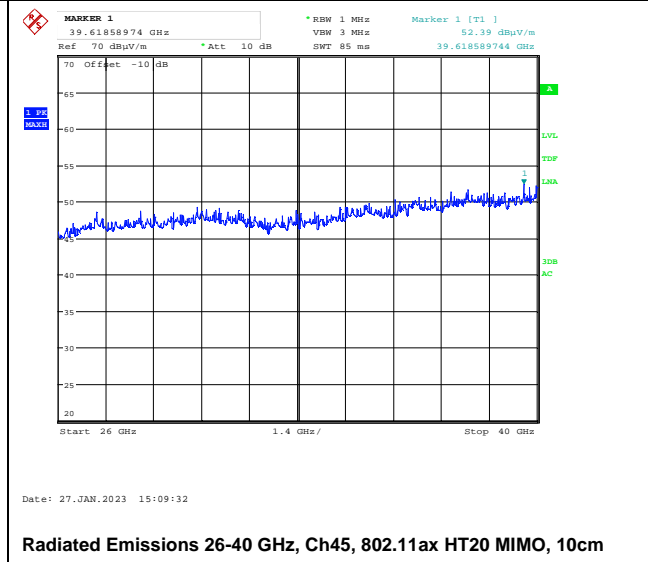
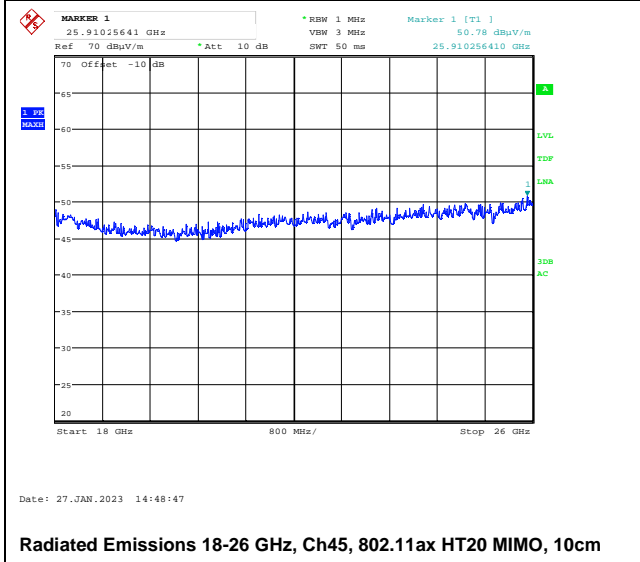
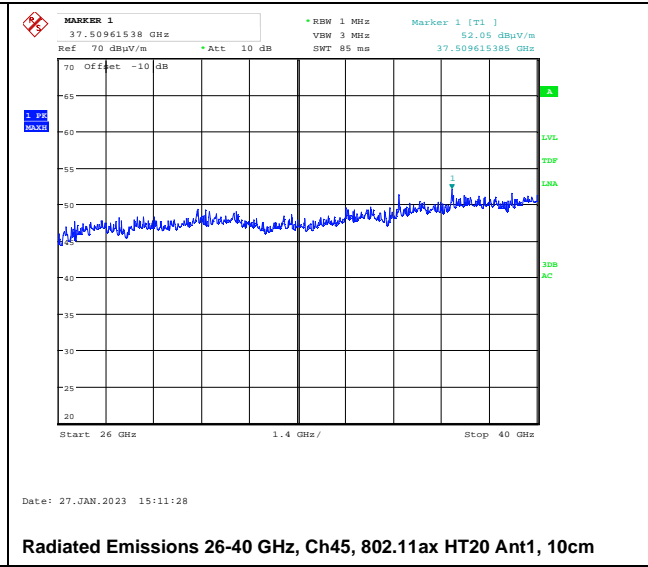
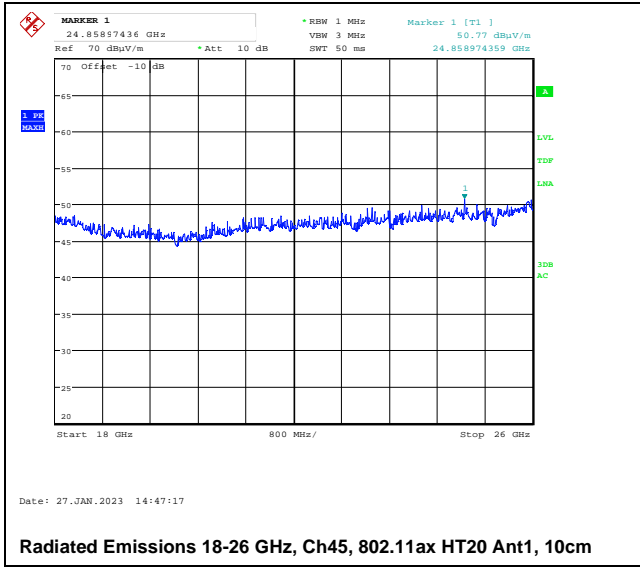
Radiated Emissions 12-18 GHz, Ch93, 802.11ax HT20 MIMO, HP

VP



Radiated Emissions 18-26 GHz, Ch45, 802.11ax HT20 Ant0, 10cm

Radiated Emissions 26-40 GHz, Ch45, 802.11ax HT20 Ant0, 10cm



5 Measurement Uncertainty

Measurement Uncertainty Values		
Test Item		Uncertainty
Output Power		±0.5 dB
Power Spectral Density		±0.5 dB
Out of Band Emissions, Conducted	< 3.6 GHz	±0.6 dB
	> 3.6 GHz	±0.9 dB
Spurious Emissions, Radiated	< 1 GHz	±2.5 dB
	> 1 GHz	±2.2 dB
Emission Bandwidth		±4 %
Power Line Conducted Emissions		+2.9 / -4.1 dB
Spectrum Mask Measurements	Frequency	±5 %
	Amplitude	±1.0 dB
Frequency Error		±0.6 ppm
Temperature Uncertainty		±1 °C

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2

6 LIST OF TEST EQUIPMENT

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2022-01 2023-01	2023-01 2024-01
2	6810-17B	Attenuator	Suhner	LR 1669	2022-05	2023-05
3	L01G18G1	LowPass Filter (1 GHz)	Microwave Circuits	LR 1768	COU	
4	WHKX6.5/18G-8SS	HighPass Filter (6.5 GHz)	Wainwright Inst.	LR 1619	COU	
5	VULB 9163	BiLog Antenna	Schwarzbech	LR 1616	2021-05	2024-05
6	310	Preamplifier	Sonoma Inst.	LR 1686	2022-08	2023-08
7	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2022-08	2023-08
8	3115	Horn Antenna	EMCO	LR 1226	2022-11	2027-11
9	3117-PA	Horn Antenna +PreAmp	EMCO	LR 1717	2022-08	2023-08
10	Model 638	Antenna Horn	Narda	LR 1480	N/A	
11	Model V637	Horn Antenna	Narda	LR 099	N/A	
12	JS4-20004000	Preamplifier	Miteq	LR 1591	2022-08	2023-08
14	Model 87 V	Multimeter	Fluke	LR 1600	2022-03	2024-03
15	6812B	AC Power Source	Agilent	LR 1515	2022-11	2024-11
16	ST18/SMA/N/36	RF Cable	Suhner	LR 1627	COU	
17	SF102/1000MM	RF Cable	Suhner	SN 50113/2	COU	
18	SF102/2000MM	RF Cable	Suhner	SN 500100/2	COU	

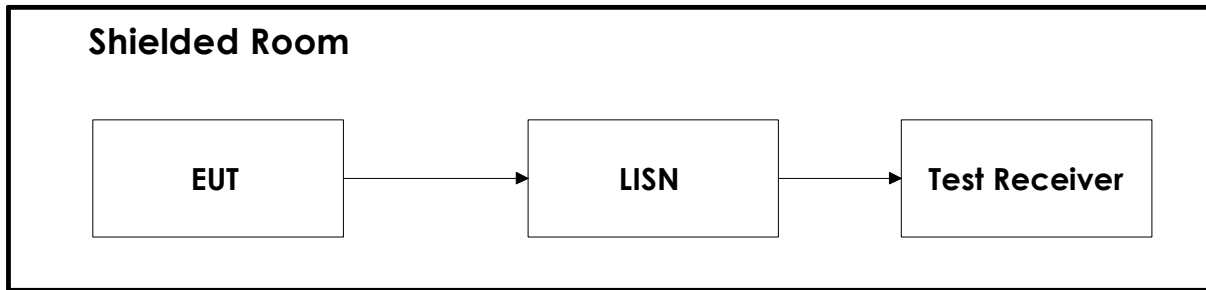
Note: COU – calibrate on use; N/A – Not Applicable

The software listed below has been used for one or more tests.

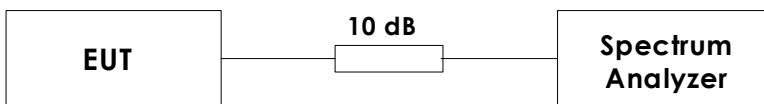
No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.50.40	EMC test software
2	Nemko AS	RSPlot	1.0.8.0	Screen capture from R&S Spectrum Analyzers

7 BLOCK DIAGRAM

7.1 Power Line Conducted Emission

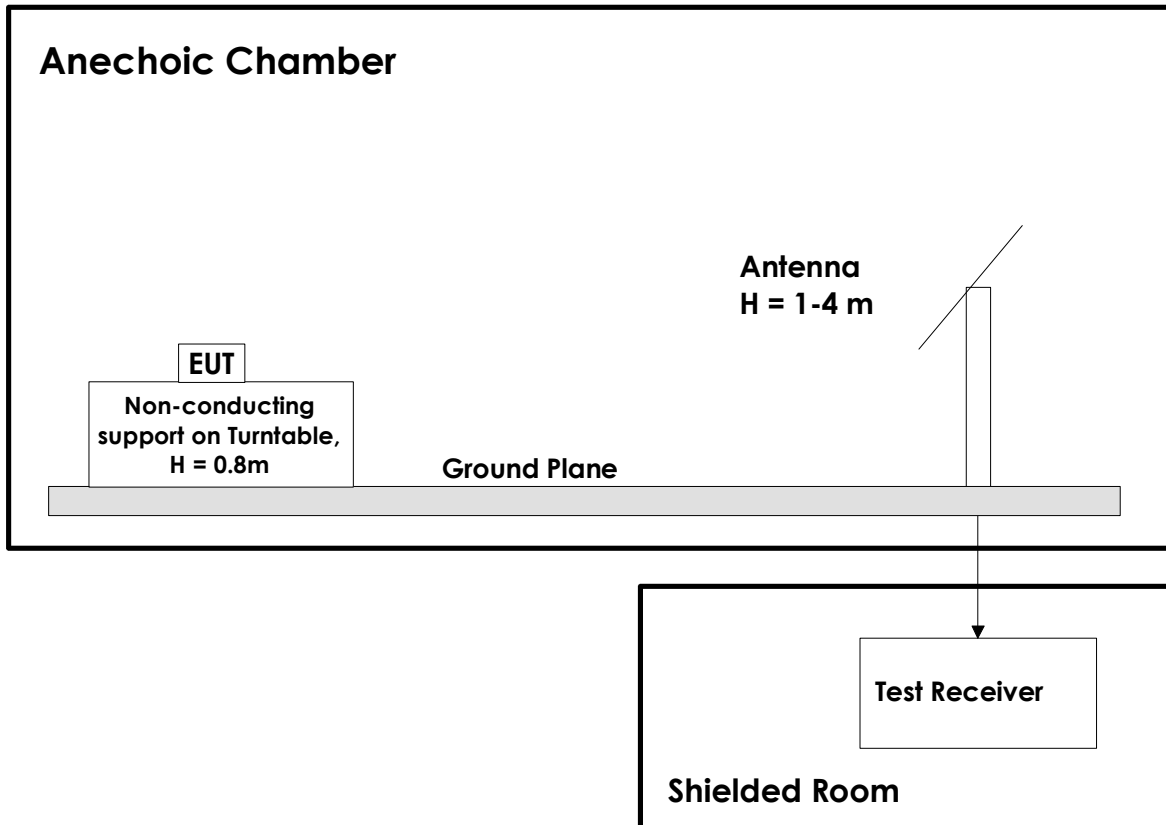


7.2 Conducted Tests



This test set-up is used for all Conducted tests. For the Frequency Stability test the EUT was placed in a climatic chamber.

7.3 Test Site Radiated Emission



This test setup is used for all radiated emissions tests. Measuring distance is 3m for all frequencies.

Emissions above 1 GHz are measured with a Spectrum Analyzer and Horn Antenna.

All measurements at 1GHz and above were performed with turntable height 1.5m and with the ground plane covered by absorbers.

A pre-amplifier is used for all measurements, and High-Pass filter is used for all harmonics.