

427 West 12800 South Draper, UT 84020

Test Report

Certification

FCC ID	SWX-UDW
IC ID	6545A-UDW
Equipment Under Test	UDW
Test Report Serial Number	TR7075_01
Date of Tests	5-6, 8, 11-14, 25 April 2022
Report Issue Date	27 April 2022

Test Specification	Applicant
47 CFR FCC Part 15, Subpart C	Ubiquiti Inc.
	685 Third Avenue
	New York, NY 10017
	U.S.A.





Certification of Engineering Report

This report has been prepared by Unified Compliance Laboratory (UCL) to document compliance of the device described below with the requirement of Federal Communication Commissions (FCC) Part 15, Subpart C. This report may be reproduced in full. Partial reproduction of this report may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

Applicant	Ubiquiti Inc.
Manufacturer	Ubiquiti Inc.
Brand Name	UniFi
Model Number	UDW
FCC ID	SWX-UDW
IC ID	6545A-UDW

On this 27th day of April 2022, I individually and for Unified Compliance Laboratory certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge and are made in good faith.

Although NVLAP has accredited the Unified Compliance Laboratory testing facilities, this report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the U.S. federal government.

Unified Compliance Laboratory

Written By: Kimberly Rodriguez

Keviewed By: Richard L. Winter



Revision History		
Revision	Description	Date
01	Original Report Release	27 April 2022



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1 Client Information

1.1 Applicant

Company	Ubiquiti Inc. 685 Third Avenue New York, NY 10017 U.S.A.
Contact Name Mark Feil	
Title	Compliance Manager

1.2 Manufacturer

Company	Ubiquiti Inc. 685 Third Avenue New York, NY 10017 U.S.A.	
Contact Name	Mark Feil	
Title	Compliance Manager	



2 Equipment Under Test (EUT)

2.1 Identification of EUT

Brand Name	UniFi
Model Number	UDW
Serial Number	2F3AB46NCM9W
Dimensions (cm)	54.9 x 34.2 x 6.2

2.2 Description of EUT

The Dream Wall is a standalone UniFi OS gateway controller which facilitates high-density PoE switching with integrated (17) gigabit RJ45 ports [(12x PoE and 5x non-PoE)]. The Dream Wall also promotes high-speed WAN and LAN connection with its (2) 10 GbE SFP ports and dual-band WiFi radio. The 2x2 2.4GHz WiFi radio and 5GHz 4x4 radio delivers a 2.7 Gbps aggregate throughput rate. The Dream Wall is equipped with a built-in Bluetooth for set up, and its 1.3" LCM touchscreen concisely displays critical system and status insights needed for device monitoring and configuration.

This report covers the circuitry of the device subject to FCC Part 15, Subpart C. The circuitry of the device subject to FCC Part 15 Subpart B was found to be compliant and is covered under a separate Unified Compliance Laboratory test report.

2.3 EUT and Support Equipment

The EUT and support equipment used during the test are listed below.

Brand Name Model Number Serial Number	Description	Name of Interface Ports / Interface Cables
BN: UniFi MN: UDW (1) SN: 2F3AB46NCM9W	EUT	See Section 2.4
BN: Dell MN: XPS SN: N/A	Laptop Computer	Ethernet Non-Shielded Cat 5e
BN: HP MN: Spectre x360 SN: N/A	Laptop Computer	USB to Serial EUT Connection

Notes: (1) EUT

(2) Interface port connected to EUT (See Section 2.4)

The support equipment listed above was not modified in order to achieve compliance with this standard.



2.4 Interface Ports on EUT

Name of Ports	No. of Ports Fitted to EUT	Cable Description/Length
10 GbE SFP WAN	1	Copper Direct Attach Cable
10 GbE SFP LAN	1	Copper Direct Attach Cable
2.5 GbE RJ45 WAN	1	Un-shielded Cat 5e Cable
PoE, PoE+, PoE++	12 (4, 4, 4)	Un-shielded Cat 5e Cable
Gigabit Ethernet	5	Un-shielded Cat 5e Cable
AC Power	1	3 Conductor Cable NEMA 5- 15P (AC)

2.5 Operating Environment

Power Supply	120V AC
AC Mains Frequency	60 Hz
Temperature	22.0-23.1°C
Humidity	18.9-20.8 %
Barometric Pressure	1016 mBar

2.6 Operating Modes

The UDW was connected to a personal computer laptop and tested using test software in order to enable to constant duty cycle greater or equal to 98% of the WiFi transceiverAll emission modes of 802.11 b/g/n were investigated.

For Conducted emission the device was setup as in normal operation, with the PoE output ports loaded with resistive loads equivalent to 90% (320W) of its max PoE output.

2.7 EUT Exercise Software

EUT firmware version 1.0 was used to operate the transmitter using a constant transmit mode.



2.8 Block Diagram of Test Configuration

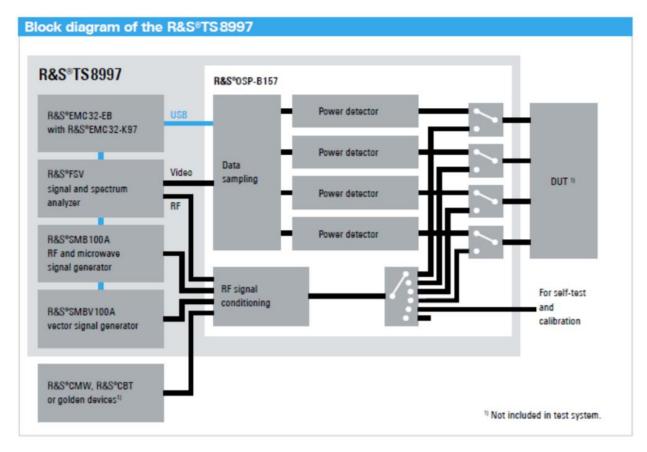


Diagram 1: Test Configuration Block Diagram

2.9 Modification Incorporated/Special Accessories on EUT

There were no modifications made to the EUT during testing to comply with the specification.

2.10 Deviation, Opinions Additional Information or Interpretations from Test Standard

There were no deviations, opinions, additional information or interpretations from the test specification.



3 Test Specification, Method and Procedures

3.1 Test Specification

Limits and methods of measurement of radio interference charact radio frequency devices. Purpose of Test The tests were performed to demonstrate initial compliance	
Title	47 CFR FCC Part 15, Subpart C 15.203, 15.207 and 15.247

3.2 Methods & Procedures

3.2.1 47 CFR FCC Part 15 Section 15.203

See test standard for details.

3.2.2 47 CFR FCC Part 15 Section 15.207

See test standard for details.

3.2.3 47 CFR FCC Part 15 Section 15.247

See test standard for details.

3.3 FCC Part 15, Subpart C

3.3.1 Summary of Tests

FCC Section	ISED Section	Environmental Phenomena	Frequency Range (MHZ)	Result
15.203	N/A	Antenna requirements	Structural Requirement	Compliant
15.207	RSS-Gen	Conducted Disturbance at Mains Port	0.15 to 30	Compliant
15.247(a)	RSS-247 § 5.2	Bandwidth Requirement	2412 to 2462	Compliant
15.247(b)	RSS-247 § 5.4	Peak Output Power	2412 to 2462	Compliant
15.247(d)	RSS-247 § 5.4	Antenna Conducted Spurious Emissions	0.009 to 40000	N/A
15.247(d)	RSS-247 § 5.4	Radiated Spurious Emissions	30 to 40000	Compliant
15.247(e)	RSS-247 § 5.2	Peak Power Spectral Density	2412 to 2462	Compliant

The testing was performed according to the procedures in ANSI C63.10-2013, KDB 558074 and 47 CFR Part 15. Where applicable, KDB 662911 was followed to sum required measurements.



3.4 Results

In the configuration tested, the EUT complied with the requirements of the specification.

3.5 Test Location

Testing was performed at the Unified Compliance Laboratory 3-meter and 10-meter chamber located at 427 West 12800 South, Draper, UT 84020. Unified Compliance Laboratory is accredited by National Voluntary Laboratory Accreditation Program (NVLAP); NVLAP Code 600241-0 which is effective until 30 June 2022. This site has also been registered with Innovations, Science and Economic Development (ISED) department and was accepted under Appendix B, Phase 1 procedures of the APEC Tel MRA for Canadian recognition. ISED No.: 25346, effective until 30 June 2022. Unified Compliance Laboratory has been assigned Conformity Assessment Number US0223 by ISED.



4 Test Equipment

4.1 Conducted Emissions at Mains Ports

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
EMI Receiver	AFJ	FFT3010	UCL-6754	12/8/2021	12/8/2022
LISN	AFJ	LS16C/10	UCL-6749	12/6/2021	12/6/2023
Cat6 ISN	Teseq	ISN T8- Cat6	UCL-2971	1/30/2022	1/30/2023
ISN	Teseq	ISN T800	UCL-2974	6/4/2021	6/4/2022
LISN	Com-Power	LIN-120C	UCL-2612	1/6/2022	1/6/2023
AC Power Source	Laplace Instruments	AC1000A	UCL-2857	N/A	N/A
Test Software	UCL	Revision 1	UCL-3107	N/A	N/A

Table 1: List of equipment used for Conducted Emissions Testing at Mains Port

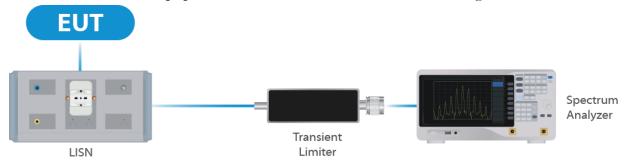


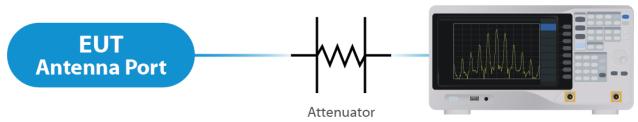
Figure 1: Conducted Emissions Test

4.2 Direct Connect at the Antenna Port Tests

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
Spectrum Analyzer	R&S	FSV40	UCL-2861	1/03/2022	1/03/2023
Signal Generator	R&S	SMB100A	UCL-2864	N/A	N/A
Vector Signal Generator	R&S	SMBV100A	UCL-2873	N/A	N/A
Switch Extension	R&S	OSP- B157WX	UCL-2867	1/03/2022	1/03/2023
Switch Extension	R&S	OSP-150W	UCL-2870	1/03/2022	1/03/2023

Table 2: List of equipment used for Direct Connect at the Antenna Port





Spectrum Analyzer

Figure 2: Direct Connect at the Antenna Port Test

4.3 Radiated Emissions

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
EMI Receiver	Keysight	N9038A	UCL-2778	6/21/2021	6/21/2022
Pre-Amplifier 9 kHz – 1 GHz	Sonoma Instruments	310N	UCL-2889	10/7/2021	10/7/2022
Broadband Antenna	Scwarzbeck	VULB 9163	UCL-3062	8/28/2020	8/27/2022
Broadband Antenna	Scwarzbeck	VULB 9163	UCL-3071	5/19/2020	5/19/2022
Double Ridge Horn Antenna	Scwarzbeck	BBHA 9120D	UCL-3065	7/8/2021	7/8/2022
Log Periodic	Scwarzbeck	STLP 9129	UCL-3068	11/16/2020	11/16/2022
15 - 40 GHz Horn Antenna	Scwarzbeck	BBHA 9170	UCL-2487	5/21/2020	5/21/2022
1 – 18 GHz Amplifier	Com-Power	PAM 118A	UCL-3833	10/7/2021	10/7/2022
Test Software	UCL	Revision 1	UCL-3108	N/A	N/A

Table 3: List of equipment used for Radiated Emissions



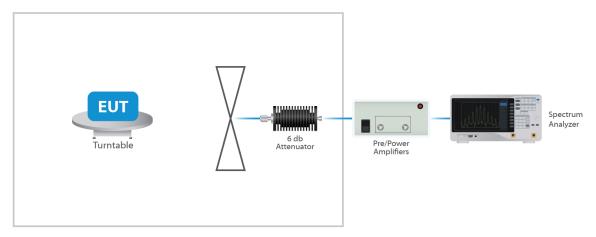


Figure 3: Radiated Emissions Test

4.4 Equipment Calibration

All applicable equipment is calibrated using either an independent calibration laboratory or Unified Compliance Laboratory personnel at intervals defined in ANSI C63.4:2014 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request.

4.5 Measurement Uncertainty

Test	Uncertainty (<u>+</u> dB)	Confidence (%)
Conducted Emissions	1.44	95
Radiated Emissions (9 kHz to 30 MHz)	2.50	95
Radiated Emissions (30 MHz to 1 GHz)	4.38	95
Radiated Emissions (1 GHz to 18 GHz)	4.37	95
Radiated Emissions (18 GHz to 40 GHz)	3.93	95
Direct Connect Tests	K Factor	Value
Emissions Bandwidth	2	2.0%
Output Power	2	1.0 dB
Peak Power Spectral Density	2	1.3 dB
Band Edge	2	0.8 dB
Transmitter Spurious Emissions	2	1.8 dB



5 Test Results

5.1 §15.203 Antenna Requirements

The EUT uses an integral antenna. The maximum gain of the antenna per chain is 5.9 dBi. This is an 802.11 device and utilizes CDD as described in KDB 662911 D01. The antenna is not user replaceable.

For power measurements on IEEE 802.11 devices, Array Gain = 0 dB for NANT \leq 4; For PSD measurements Array Gain = $10 \log(NANT/NSS)$ dB = 3.01dB

Results

The EUT complied with the specification

5.2 Conducted Emissions at Mains Ports Data

Frequency (MHZ)	AC Mains Lead	Detector	Measured Level (dBµV)	Limit (dBµV)	Margin (dB)
2.451	Hot Lead	Quasi-Peak (Note 2)	46.4	56	- 9.60
3.474	Hot Lead	Quasi-Peak (Note 2)	46.3	56	- 9.70
3.882	Hot Lead	Quasi-Peak (Note 2)	45.9	56	- 10.10
3.066	Hot Lead	Quasi-Peak (Note 2)	45.9	56	- 10.10
240,000	Hot Lead	Quasi-Peak (Note 2)	52.0	66.0	- 14.00
2.043	Hot Lead	Quasi-Peak (Note 2)	45.3	56	- 10.70
2.376	Hot Lead	Quasi-Peak (Note 2)	43.4	56	- 12.60
2.247	Hot Lead	Quasi-Peak (Note 2)	42.9	56	- 13.10
3.882	Hot Lead	Average (Note 2)	45.1	46.0	- 0.90
3.4474	Hot Lead	Average (Note 2)	45.5	46.0	- 0.50
3.066	Hot Lead	Average (Note 2)	44.4	46.0	- 1.6
2.451	Hot Lead	Average (Note 2)	44.4	46.0	- 1.6
2.376	Hot Lead	Average (Note 2)	42.2	46.0	- 3.8
2.043	Hot Lead	Average (Note 2)	44.4	46.0	- 1.6
2.451	Neutral Lead	Quasi-Peak (Note 2)	46.3	56	- 9.70
3.474	Neutral Lead	Quasi-Peak (Note 2)	46.2	56	- 9.80
3.066	Neutral Lead	Quasi-Peak (Note 2)	46.1	56	- 9.90
240,000	Neutral Lead	Quasi-Peak (Note 2)	52.1	62.1	- 10.00
3.882	Neutral Lead	Quasi-Peak (Note 2)	45.6	56	- 10.40
3.474	Neutral Lead	Average (Note 2)	45.6	46	- 0.40
3.882	Neutral Lead	Average (Note 2)	45.0	46	- 1.00
3.066	Neutral Lead	Average (Note 2)	44.6	46	- 1.40
2.451	Neutral Lead	Average (Note 2)	44.2	46	- 1.80



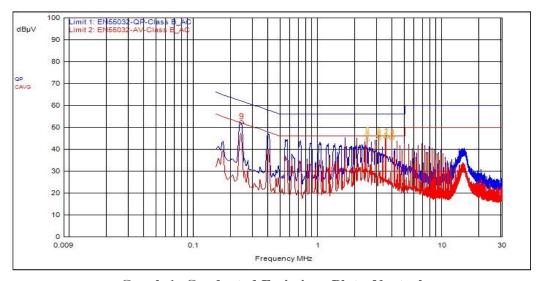
Note 1: The reference detector used for the measurements was Quasi-Peak or Peak and the data was compared to the average limit: therefore, the EUT was deemed to meet both the average and quasi-peak limits.

Note 2: The reference detector used for the measurements was quasi-peak and average and the data was compared to the respective limits.

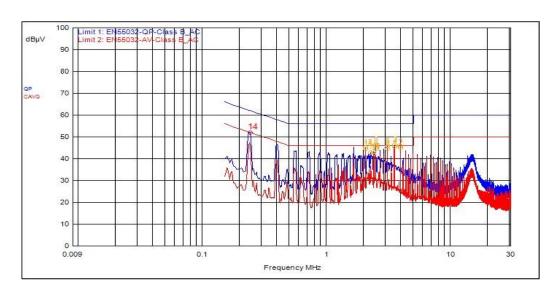
Note 3: The device the transceiver is in is a Class A device and the limits shown are from §15.207 which are the same as the limits for a Class B device under §15.107. These emissions were investigated and were found to be at the same level regardless of whether the transceivers of the device were not powered, powered and idle, or powered and active, therefore, the conducted emissions of the transceivers were deemed compliant with the requirements of the standard.

Result

The EUT complied with the specification limit.



Graph 1: Conducted Emissions Plot - Neutral





Graph 2: Conducted Emissions Plot – Line 1

5.3 §15.247(a)(2) Emissions Bandwidth

All chains were measured under the guidance of KDB 558074 Section 8.2. and KDB 66291 D01. Please see associated annex for details on instrument settings.

Mode	Frequency (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth (MHz)
	2412	15.00	10.15
CCK	2437	16.50	10.20
	2462	15.70	10.20
	2412	16.70	16.40
OFDM	2437	21.60	16.15
	2462	16.60	16.15
	2412	17.70	17.65
HT 20	2437	20.70	17.60
	2462	17.60	17.60
	2422	36.00	34.90
HT 40	2437	35.75	31.20
	2452	36.00	34.30

Result

All chains were tested and the highest bandwidth per chain is reported above.

In the configuration tested, the 6 dB bandwidth was greater than 500 kHz; therefore, the EUT complied with the requirements of the specification (see spectrum analyzer plot within the Annex).



5.4 §15.247(b)(3) Maximum Average Output Power

All chains were measured and summed under the guidance of KDB 558074 Section 8.3.2.3. and KDB 66291 D01. Please see associated annex for details on instrument settings.

The maximum average RF conducted output power measured for this device was 23.17 dBm or 207.49 mW. The limit is 30 dBm or 1 Watt when using antennas with 6 dBi or less gain. The antenna has a gain of 5.9 dBi.

Modulation (BW)	Frequency (MHz)	Data Rate	TP Setting	Conducted Output Power *	Measured EIRP
	2412	Mcs0	16	21.23	27.13
	2417	Mcs0	16.5	21.78	27.68
	2422	Mcs0	17.5	22.98	28.88
	2427	Mcs0	17.5	22.91	28.81
CCV 20	2432	Mcs0	17.5	22.85	28.75
CCK 20	2437	Mcs0	17.5	22.83	28.73
	2447	Mcs0	17.5	23.17	29.07
	2452	Mcs0	17.5	23.02	28.92
	2457	Mcs0	17	22.07	27.97
	2462	Mcs0	17	22.00	27.90
	2412	Mcs0	12.5	18.00	23.90
	2417	Mcs0	14	19.25	25.15
	2422	Mcs0	15	20.10	26.00
	2427	Mcs0	16	20.87	26.77
OFDM 20	2432	Mcs0	17	21.72	27.62
	2437	Mcs0	17	21.72	27.62
	2452	Mcs0	15.5	20.51	5.90
	2457	Mcs0	14	19.18	5.90
	2462	Mcs0	11.5	16.83	26.41
	2412	Mcs0	9.5	14.92	25.08
	2417	Mcs0	13.5	18.85	22.73
	2422	Mcs0	14.5	19.60	20.82
	2427	Mcs0	15.5	20.41	24.75
HT 20	2432	Mcs0	16	20.84	25.50
	2437	Mcs0	17	21.65	26.31
	2447	Mcs0	16.5	21.24	26.74
	2452	Mcs0	15.5	20.47	27.55
	2457	Mcs0	14	19.11	5.90



	2462	Mcs0	11	16.23	27.14
	2422	Mcs0	6.5	12.01	26.37
HT 40	2437	Mcs0	11	16.63	25.01
	2452	Mcs0	8	13.57	22.13

Result

In the configuration tested, the maximum average RF output power was less than 1 watt; therefore, the EUT complied with the requirements of the specification (see spectrum analyzer plot within the Annex).

5.5 §15.247(d) Spurious Emissions

5.5.1 Conducted Spurious Emissions

The frequency range from the lowest frequency generated or used in the device to the tenth harmonic of the highest fundamental frequency was investigated to measure any antenna-conducted emissions. The table show the measurement data from spurious emissions noted across the frequency range when transmitting at the lowest frequency, middle frequency and upper frequency. Shown within the Annex are plots with the EUT tuned to the upper and lower channels. These demonstrate compliance with the provisions of this section at the band edges.

The emissions must be attenuated 30 dB below the highest power spectral density level measured within the authorized band as measured with a 100 kHz RBW.

Result

Conducted spurious emissions were attenuated 30 dB or more below the fundamental; therefore, the EUT complies with the specification.

5.5.2 Radiated Spurious Emissions in the Restricted Bands of §15.205

The frequency range from the lowest frequency generated or used in the device to the tenth harmonic of the highest fundamental emissions was investigated to measure any radiated emissions in the restricted bands. The following tables show measurements of any emissions that fell into the restricted bands of §15.205. The tables show the worst-case emissions measured from the EUT. For frequencies above 18.0 GHz, a measurement distance of 1 meter was used. The noise floor was a minimum of 6 dB below the limits. The emissions in the restricted bans must meet the limits specified in §15.209. Tabular data for each of the spurious emissions is shown below for each of the units. Plots of the band edges are also shown.

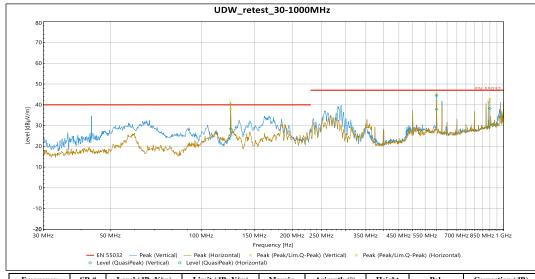
Correction Factor = Antenna Factor + Cable Loss - Pre-Amplifier Gain, and is added to the Receiver reading.

Result

All emissions in the restricted bands of §15.205 met the limits specified in §15.209; therefore, the EUT complies with the specification.

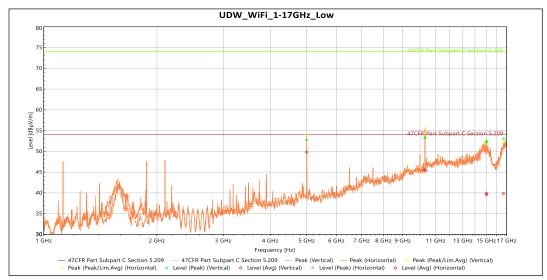
^{*} Gated EIRP shown in the Annex is the conducted measurement





Frequency	SR#	Level (dBµV/m)	Limit (dBµV/m)	Margin	Azimuth (°)	Height	Pol.	Correction (dB)
125 MHz	QP	28.455	40	-11.545	182	1.151	Vertical	-15.927
600 MHz	QP	44.461	47	-2.539	341	3.635	Vertical	-4.383
899.95 MHz	QP	38.246	47	-8.754	219	2.161	Vertical	-0.127
125.05 MHz	QP	25.335	40	-14.665	330	2.853	Horizontal	-15.931
600 MHz	QP	37.868	47	-9.132	77	1.331	Horizontal	-4.383
889.34 MHz	QP	29.449	47	-17.551	358	1.132	Horizontal	-0.575

Table 4: Radiated Emissions within 30MHz - 1GHz

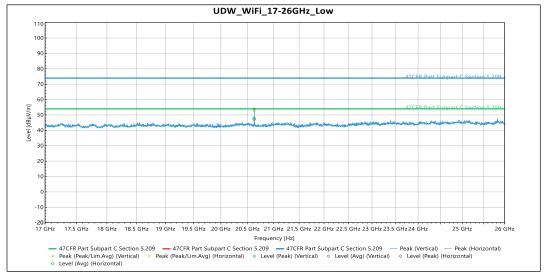


Frequency	SR#	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
10.313 GHz	Peak	53.374	74	-20.626	228	3.806	Vertical	0.873
15.026 GHz	Peak	52.484	74	-21.516	78	3.806	Vertical	7.516
16.668 GHz	Peak	52.972	74	-21.028	235	1.84	Vertical	8.654
10.313 GHz	AVG	45.6	54	-8.4	228	3.806	Vertical	0.873
15.026 GHz	AVG	39.567	54	-14.433	78	3.806	Vertical	7.516



Frequency	SR#	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Correction (dB)
16.668 GHz	AVG	39.859	54	-14.141	235	1.84	Vertical	8.654
4.9999 GHz	Peak	52.772	74	-21.228	258	1.5	Horizontal	-11.369
10.313 GHz	Peak	53.253	74	-20.747	209	1.636	Horizontal	0.873
15.021 GHz	Peak	52.213	74	-21.787	207	1.632	Horizontal	7.412
4.9999 GHz	AVG	49.788	54	-4.212	258	1.5	Horizontal	-11.369
10.313 GHz	AVG	45.33	54	-8.67	209	1.636	Horizontal	0.873
15.021 GHz	AVG	39.886	54	-14.114	207	1.632	Horizontal	7.412

Table 5: Radiated Emissions within 1-17GHz Transmitting at the Lowest Frequency



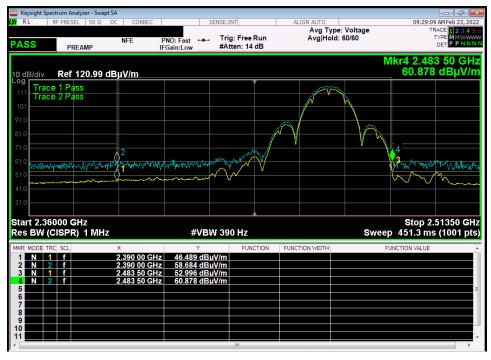
Frequency	SR#	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Pol.	Correction (dB)
20.626 GHz	Peak	53.879	74	-20.121	176	Vertical	-5.625
20.626 GHz	AVG	47.09	54	-6.91	176	Vertical	-5.625
20.626 GHz	Peak	53.866	74	-20.134	213	Horizontal	-5.625
20.626 GHz	AVG	47.991	54	-6.009	213	Horizontal	-5.625

Table 6: Radiated Emissions Transmitting at the Lowest Frequency



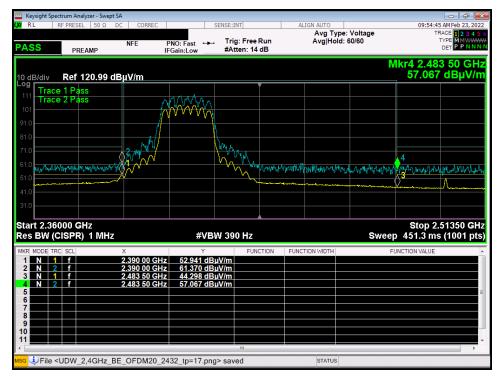


Graph 3: Band Edge Plot CCK20 2412MHz



Graph 4: Band Edge Plot CCK20 2462MHz



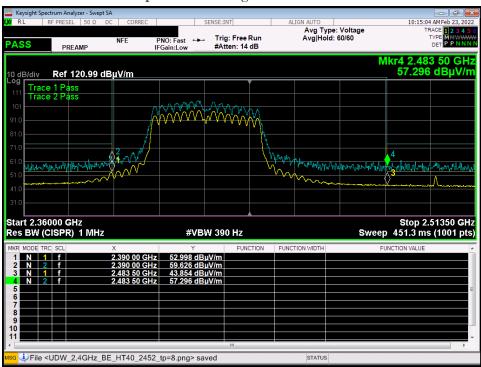


Graph 5: Band Edge HT20 2412MHz





Graph 6: Band Edge HT20 2462MHz



Graph 7: Band Edge HT50 2422MHz



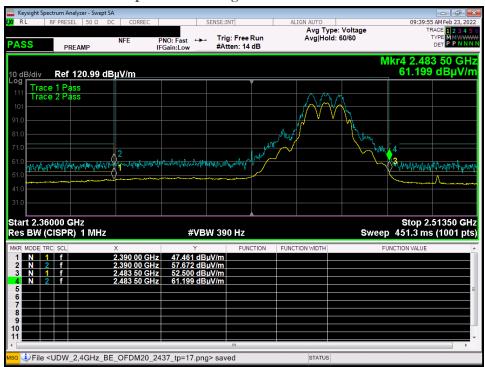


Graph 8: Band Edge HT40 2452MHz





Graph 9: Band Edge OFDM20 2412MHz



Graph 10: Band Edge OFDM20 2462MHz



5.6 §15.247(e) Maximum Average Power Spectral Density

All chains were measured and summed under the guidance of KDB 558074 Section 8.4. and KDB 66291 D01. Please see associated annex for details on instrument settings.

The maximum average power spectral density conducted from the intentional radiator of the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Mode	Frequency (MHz)	Measurement (dBm)	Criteria (dBm)
	2412	-12.48	8.0
CCK	2437	-11.20	8.0
	2462	-11.96	8.0
	2412	-15.30	8.0
OFDM	2437	-11.31	8.0
	2462	-16.41	8.0
	2412	-19.18	8.0
HT 20	2437	-12.20	8.0
	2462	-17.61	8.0
	2422	-24.33	8.0
HT 40	2437	-19.68	8.0
	2452	-22.86	8.0

Result

The maximum average power spectral density was less than the limit of 8 dBm; therefore, the EUT complies with the specification.



-- End of Test Report --