Compliance
Test
Services

623 E. 100 S.
Salt Lake City, UT 84102

Test Report

Certification

FCC ID	2AJAC-CORE5
IC ID	7848A-CORE5
Equipment Under Test	C4-CORE5
Test Report Serial Number	TR7030_01
Date of Test(s)	January 6, 2022, and January 20, 2022
Report Issue Date	5 April 2022

Test Specification	Applicant
47 CFR FCC Part 15, Subpart C ICES-003, Issue 7	Snap One LLC 1800 Continental Blvd., Suite 200-300 Charlotte NC 28273 U.S.A.

NVLAP TESTING ilac-MRA

NVLAP LAB CODE 600293-0

Certification of Engineering Report

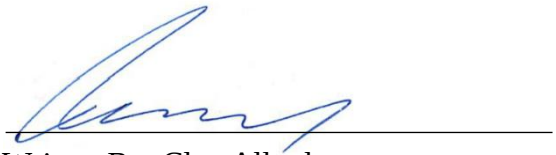
This report has been prepared by Compliance Test Services (CTS) to document compliance of the device described below with the requirement of Federal Communication Commissions (FCC) Part 15, Subpart C. This report may be reproduced in full. Partial reproduction of this report may only be made with the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

Applicant	Snap One LLC
Manufacturer	Snap One LLC
Brand Name	Control 4
Model Number	C4-CORE5
FCC ID	2AJAC-CORE5
IC ID	7848A-CORE5

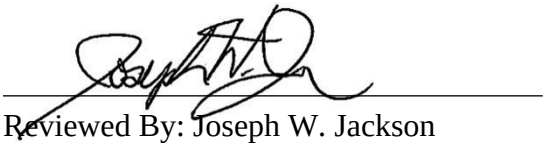
On this 5th day of April 2022, I individually and for Compliance Test Services certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge and are made in good faith.

Although NVLAP has accredited the Compliance Test Services 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.

Compliance Test Services



Written By: Clay Allred



Reviewed By: Joseph W. Jackson

Revision History		
Revision	**Description**	**Date**
01	Original Report Release	5 April 2022

Table of Contents

1 Client Information

1.1 Applicant

Company	Snap One LLC 1800 Continental Blvd., Suite 200-300 Charlotte NC 28273 U.S.A.
Contact Name	Roger Midgley
Title	Principle Compliance Manager

1.2 Manufacturer

Company	Snap One LLC 1800 Continental Blvd., Suite 200-300 Charlotte NC 28273 U.S.A.
Contact Name	Roger Midgley
Title	Principle Compliance Manager

2 Equipment Under Test (EUT)

2.1 Identification of EUT

Brand Name	Snap One LLC
Model Number	C4-CORE5
Hardware Version	Rev 4.0
Serial Number / MAC Address	ST21520017036F13, 000FFF0C3313
Rating/power supply	Input: AC 100V-240 VAC,50Hz/60Hz, Max 18W, Idle 9W, and PoE+
RCB revision	Rev 4.0
Schematic revision	Rev 4.0
Firmware/Software revision	3.3.0.618634
Dimensions (mm)	42 x 442 x 252

2.2 Description of EUT

The C4-CORE5 is a home entertainment controller, used to control home entertainment and home automation which features five independent audio outputs – three digital coaxial, three unbalanced stereo analog, one HDMI Out, wireless Zigbee and Z-wave communications, IR, serial, contacts and relays, and IP control. It also features a USB 3.0 connection for connection to external hard drives and a gigabit LAN port. It is powered via the AC mains and an internal 100-240Vac, 50/60Hz power supply.

The highest internal clocks or internal clock frequency on the EUT is the 2.4 GHz Zigbee wireless clock, and the internal system clock of 1.6 GHz.

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 Compliance Test Services 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: Snap One LLC MN: C4-CORE5 SN: ST21520017036F13	Home Entertainment Controller	EUT

BN: Control4 MN: C4-EA3 SN:	Controller	Network/Cat 5e Cable
BN: Samsung MN: UN43NU6900BXZA SN:09643CPMB13335K	4K TV	HDMI, Blue Jeans Cable
BN: Unifi MN: USW-Lite-8-PoE SN: 245A4C7BAD51	Network switch + PoE Injector	Network/Cat 5e Cable

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	Shielded Cable	Ferrite Core Installed	Cable Description/Length
Contact	1	No	No	Phoenix Contact connector w/12 unshielded conductors/1 meter
Relay	1	No	No	Phoenix Contact connector w/12 unshielded conductors/1 meter
Ethernet	1	No	No	Cat 5e/5 meters
HDMI Out	1	Yes	No	1 meter
USB (3.0)	1	Yes	No	USBA extension cable to USB flash drive/1 meter
Serial	2	No	No	Shielded cable with DB9 connectors/1 meter
IR Sensors	8	No	No	IR transmitters with unshielded cables with mono jacks/2 meters
Digital In	1	Yes	No	Cables with RCA connector/1 meter
Digital Out	3	Yes	No	Cables with RCA connector/1 meter
Analog Audio In (Left and Right)	2	Yes	No	Cables with RCA connector/1 meter
Analog Audio Out (Left and Right)	2	Yes	No	Cables with RCA connector/1 meter
802.15.4 Antenna	1	--	--	RP-SMA connectors direct to antenna
Z-Wave Antenna	1	--	--	RP-SMA connectors direct to antenna

2.5 Operating Environment

Power Supply	120V
AC Mains Frequency	60Hz
Temperature	22 – 24 °C
Humidity	20 – 27 %
Barometric Pressure	1019 mBar

2.6 Operating Modes

The C4-CORE5 was set to constant transmit on low and high channels of the Z-wave radio. The Zigbee radio was also enabled to ensure emissions during simultaneous transmission were compliant. This configuration was determined to produce the worse-case emissions.

2.7 EUT Exercise Software

EUT firmware version 3.3.0.618634 was used to operate the transmitter using a constant transmit mode.

2.8 Block Diagram of Test Configuration

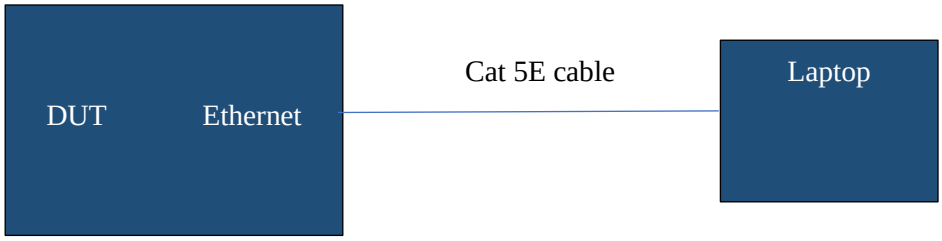


Diagram 1: Test Configuration Block Diagram

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

Title	47 CFR FCC Part 15, Subpart C 15.207, 15.215, and 15.249 Limits and methods of measurement of radio interference characteristics of radio frequency devices.
Purpose of Test	The tests were performed to demonstrate initial compliance

3.2 Methods & Procedures

3.2.1 47 CFR FCC Part 15 Section 15.207

See test standard for details.

3.2.2 47 CFR FCC Part 15 Section 15.215

See test standard for details.

3.2.3 47 CFR FCC Part 15 Section 15.249

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
15.207	RSS-Gen	Conducted Disturbance at Mains Port	0.15 to 30	Compliant
15.215	RSS-Gen	Bandwidth Requirement	902 - 928	Compliant
15.249	RSS-Gen	Fundamental Field Strength	902 - 928	Compliant
15.249	RSS-Gen	Radiated Spurious Emissions	0.009 to 26000	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 Compliance Test Services Draper location at 427 West 12800 South, Draper, UT 84020. Compliance Test Services is accredited by National Voluntary Laboratory Accreditation Program (NVLAP); NVLAP Code 600293-0 which is effective until December 31, 2022.

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	CTS-2500	CTS-6754	12/8/2021
LISN	AFJ	LS16C/10	CTS-2512	CTS-6749	12/6/2021
Cat6 ISN	Teseq	ISN T8-Cat6	CTS-2971	CTS-2971	1/30/2022
ISN	Teseq	ISN T800	CTS-2974	CTS-2974	6/4/2021
LISN	Com-Power	LIN-120C	CTS-2612	CTS-2612	1/6/2022
AC Power Source	Laplace Instruments	AC1000A	CTS-2857	N/A	N/A
Test Software	CTS	Revision 1	CTS-3107	N/A	N/A

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

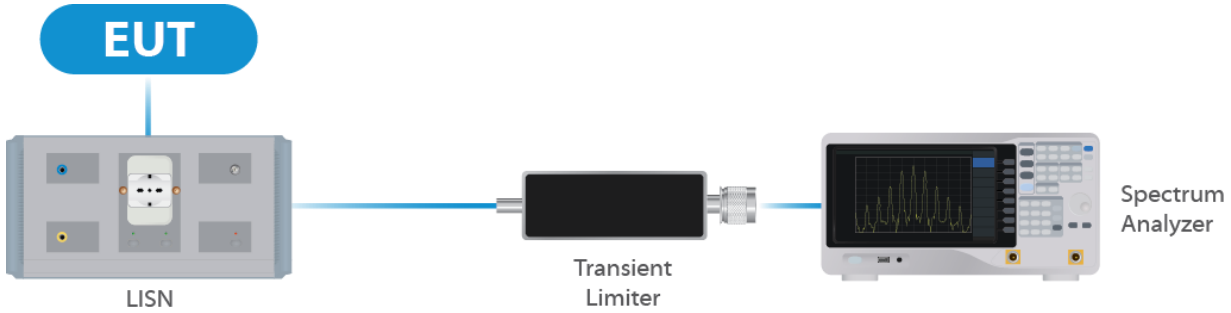


Figure 1: Conducted Emissions Test

4.2 Radiated Emissions

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

Table 2: List of equipment used for Radiated Emissions

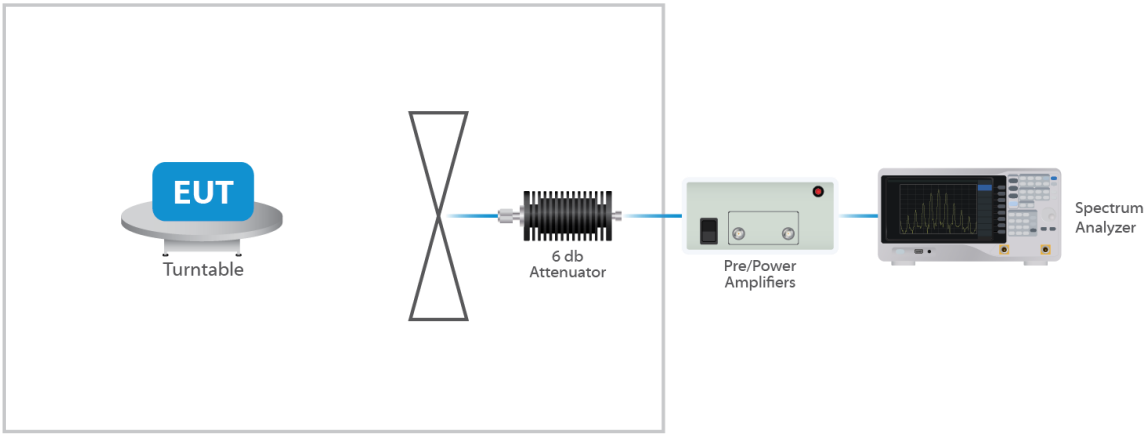


Figure 2: Radiated Emissions Test

4.3 Equipment Calibration

All applicable equipment is calibrated using either an independent calibration laboratory or Compliance Test Services 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.

4.4 Measurement Uncertainty

Test	Uncertainty (± dB)	Confidence (%)
Conducted Emissions	1.44	95
Asymmetric Mode Conducted Emissions	3.61	95
Shielded CDN Conducted Emissions	3.33	95
Radiated Emissions (30 MHz to 1 GHz)	4.38	95
Radiated Emissions (1 GHz to 17 GHz)	4.37	95

5 Test Results

5.1 Conducted Emissions at Mains Ports Data

Frequency (MHZ)	Detector	Receiver Measured Level (dBµV)	Correction Factor (dB/m)	Corrected Receiver Level (dBµV)	Limit Class B Limit (dBµV)	Margin (dB)
13.56	Quasi-Peak (Note 2)	47.2	9.9	57.1	60	-2.9
10.61	Quasi-Peak (Note 2)	30.8	9.9	40.6	60	-19.4
0.150	Quasi-Peak (Note 2)	35.5	9.5	45	66	-21.0
15.23	Quasi-Peak (Note 2)	24.5	9.9	34.2	60	-25.7
0.261	Quasi-Peak (Note 2)	17.6	9.6	27.2	61.4	-34.2

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

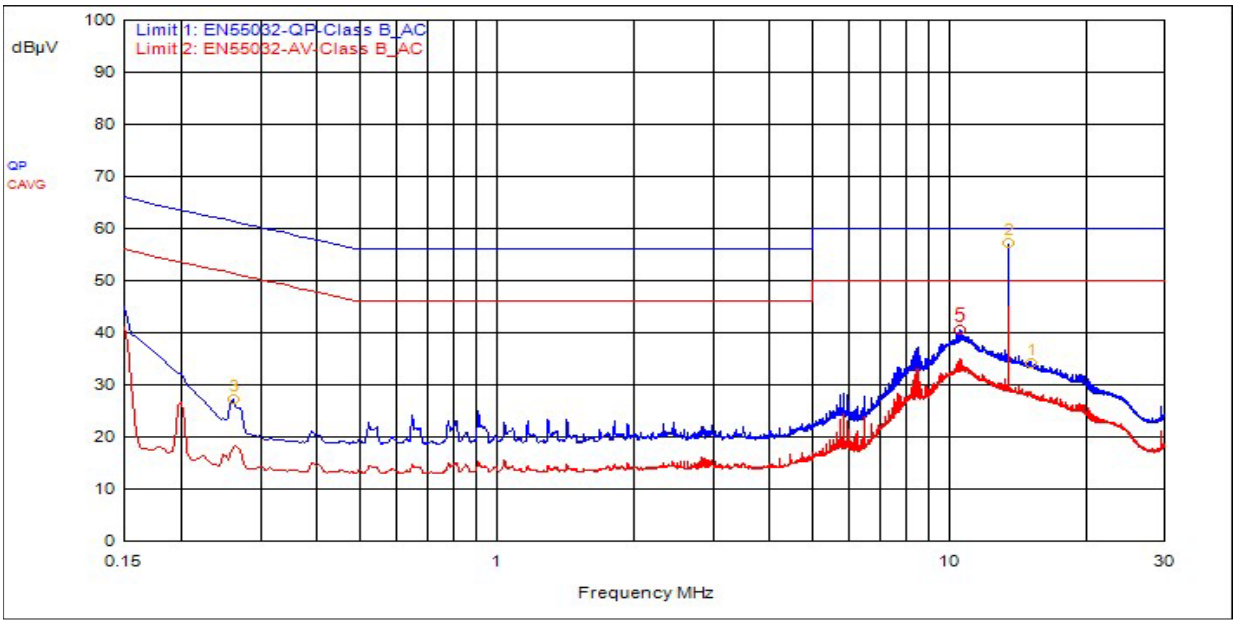
Sample Field Strength Calculation

Correction Factor = LISN Insertion Loss + Cable Insertion Loss + Transient Limiter Insertion Loss

Conducted Emissions Amplitude = Receiver Reading + Correction Factor

Result

The EUT complied with the specification limit by a margin of -2.9 dB.



Graph 1: Conducted Emissions Plot - Neutral

Frequency (MHZ)	Detector	Receiver Measured Level (dBµV)	Correction Factor (dB/m)	Corrected Receiver Level (dBµV)	Limit Class B Limit (dBµV)	Margin (dB)
13.56	Quasi-Peak (Note 2)	47.1	9.9	57	60	-3.0
10.71	Quasi-Peak (Note 2)	30.1	9.9	40	60	-20.0
0.156	Quasi-Peak (Note 2)	30.9	9.5	40.5	65.7	-25.2
29.38	Quasi-Peak (Note 2)	17.4	10.2	27.6	60	-32.4
0.390	Quasi-Peak (Note 2)	14.6	9.6	24.2	58.1	-33.8
0.198	Average (Note 2)	17.1	9.5	26.6	53.7	-27.0

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

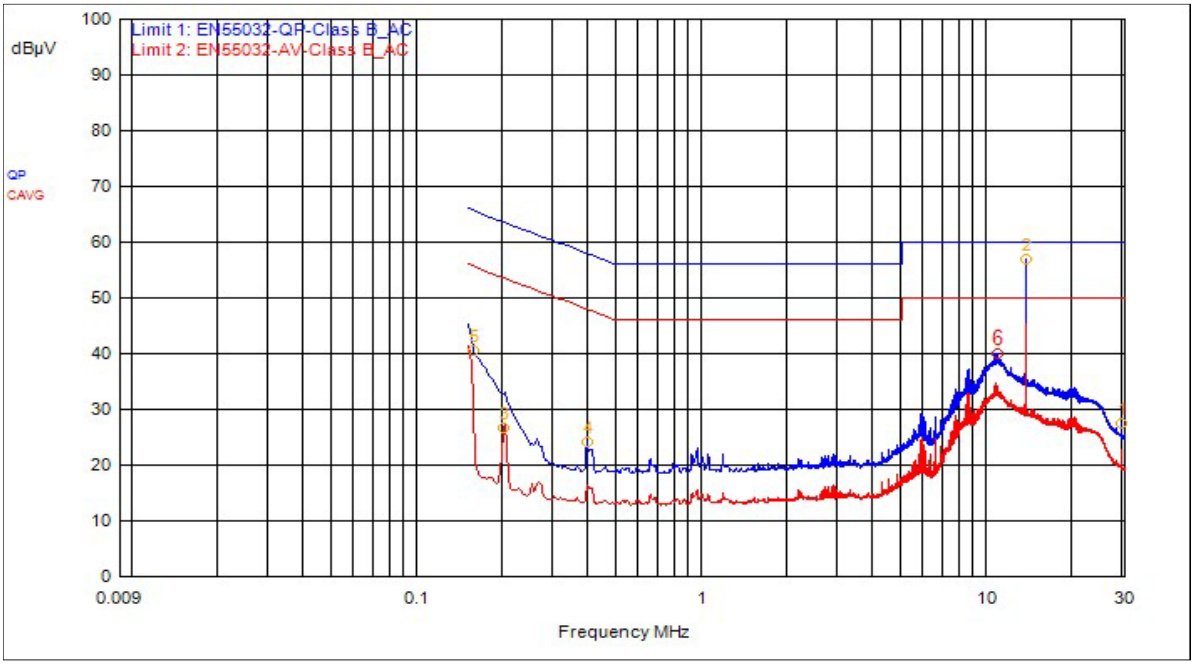
Sample Field Strength Calculation

Correction Factor = LISN Insertion Loss + Cable Insertion Loss + Transient Limiter Insertion Loss

Conducted Emissions Amplitude = Receiver Reading + Correction Factor

Result

The EUT complied with the specification limit by a margin of -3.0 dB.



Graph 2: Conducted Emissions Plot – Line 1

5.2 Radiated Emissions: 908 MHz

Freq. (MHZ)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Cor. (dB)	Det.
11638	55.111	74	-18.889	97	3.233	Hztl	13.942	Pk
15004	58.559	74	-15.441	107	3.097	Hztl	16.089	Pk
16805	59.336	74	-14.664	84	3.444	Hztl	17.628	Pk
11638	42.01	54	-11.99	97	3.233	Hztl	13.942	Avg
15004	45.275	54	-8.725	107	3.097	Hztl	16.089	Avg
16805	45.633	54	-8.367	84	3.444	Hztl	17.628	Avg

Sample Field Strength Calculation

Level = Receiver Reading + Correction Factor
Correction Factor = Antenna Factor + Cable Factor - Amplifier
Margin = Level - Limit

Result

The EUT complied with the specification limit by a margin of -8.367 dB.
Emissions below 1 GHz were investigated but worst case was with 916 MHz transmitting

5.3 Radiated Emissions: 916 MHz

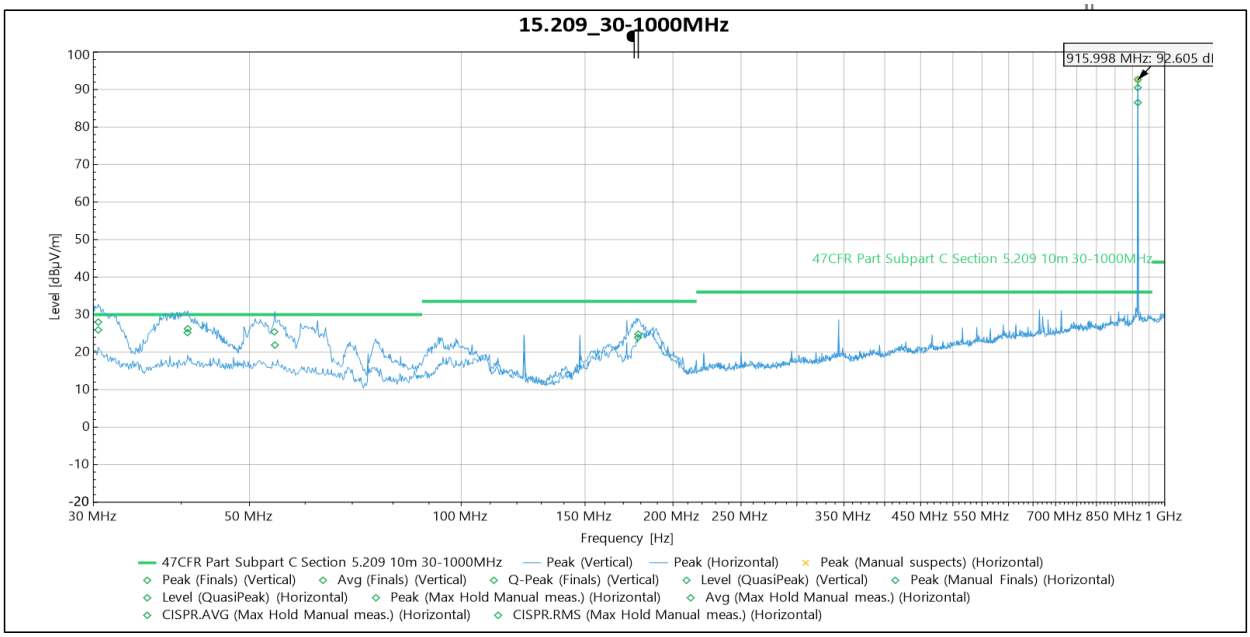
Freq. (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Cor. (dB)	Det.
30.485	25.896	30	-4.104	298	2.352	Vrt	-11.794	QP
40.864	25.187	30	-4.813	102	3.847	Vrt	-11.183	QP
54.347	25.423	30	-4.577	102	3.42	Vrt	-12.11	QP
178.41	24.79	33.5	-8.71	204	1.311	Vrt	-15.747	QP
11068	55.212	74	-18.788	95	3.773	Hztl	14.103	Pk
14451	58.125	74	-15.875	354	1.862	Hztl	15.998	Pk
16904	60.06	74	-13.94	237	3.08	Hztl	18.354	Pk
11068	41.638	54	-12.362	95	3.773	Hztl	14.103	Avg
14451	45.144	54	-8.856	354	1.862	Hztl	15.998	Avg
16904	46.322	54	-7.678	237	3.08	Hztl	18.354	Avg

Sample Field Strength Calculation

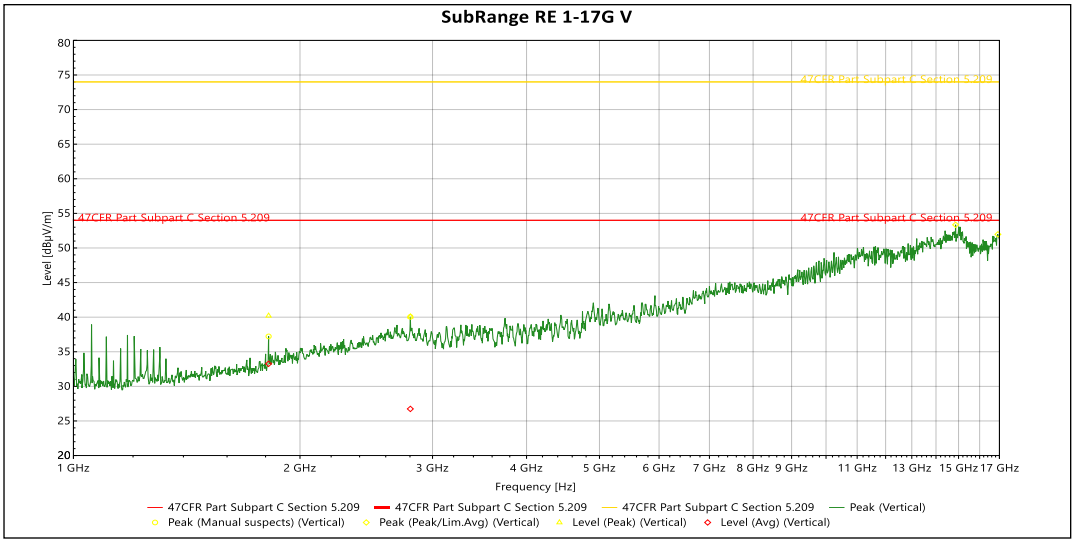
Level = Receiver Reading + Correction Factor
Correction Factor = Antenna Factor + Cable Factor - Amplifier
Margin = Level - Limit

Result

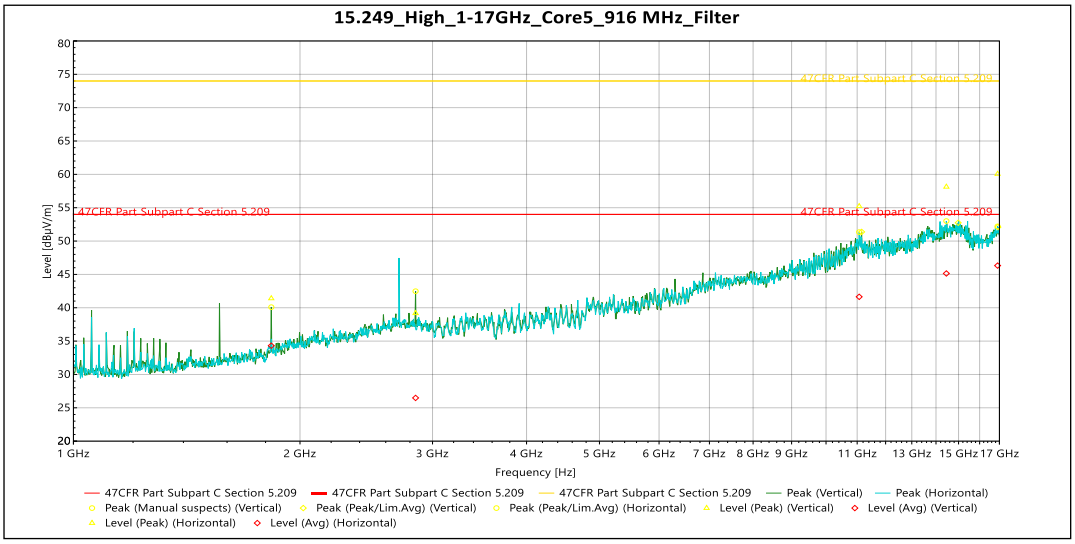
The EUT complied with the specification limit by a margin of -4.104 dB.



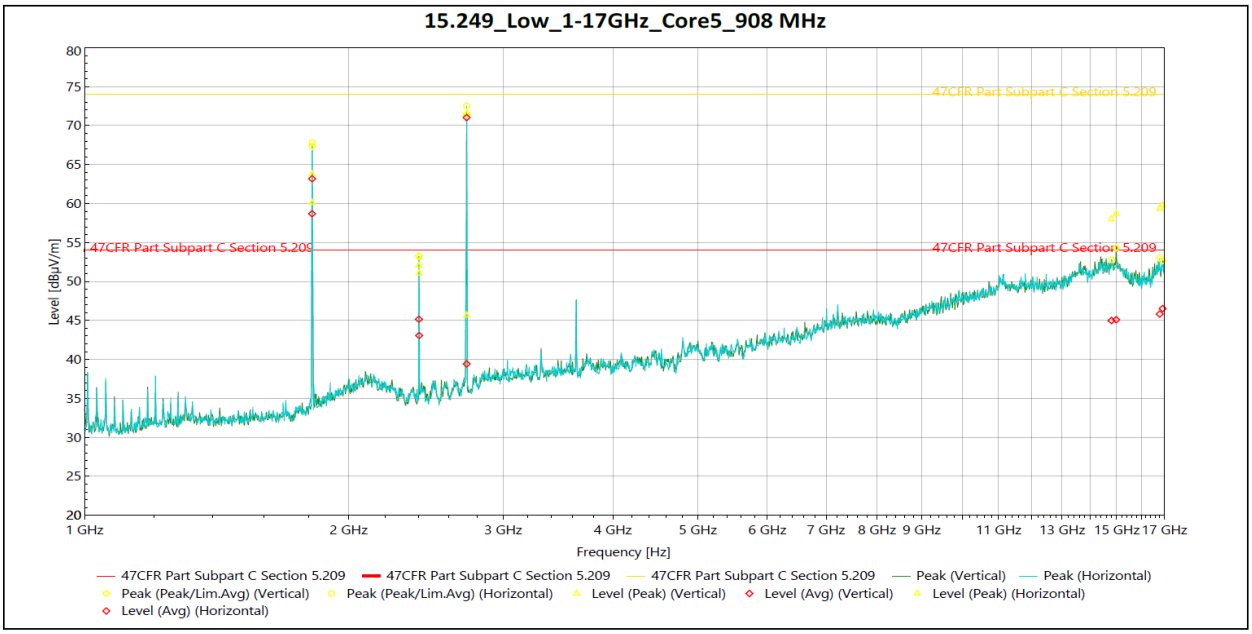
30-1000MHz worst case with 916 MHz transmitting



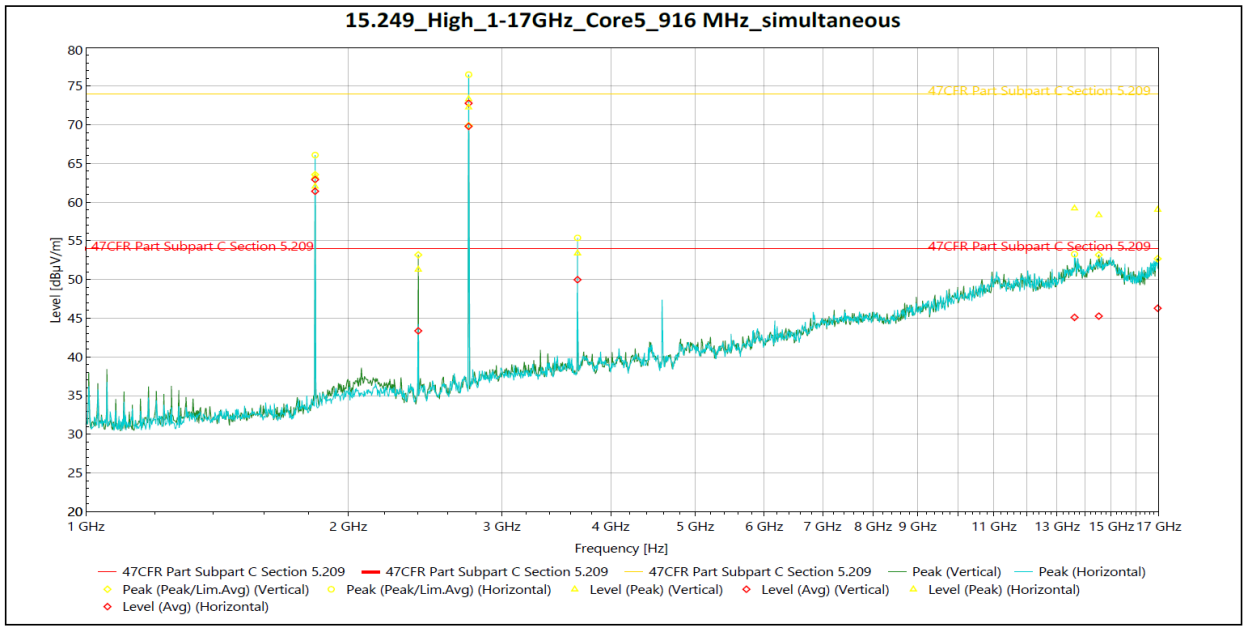
1-17 GHz 908 MHz



1-17 GHz 916 MHz

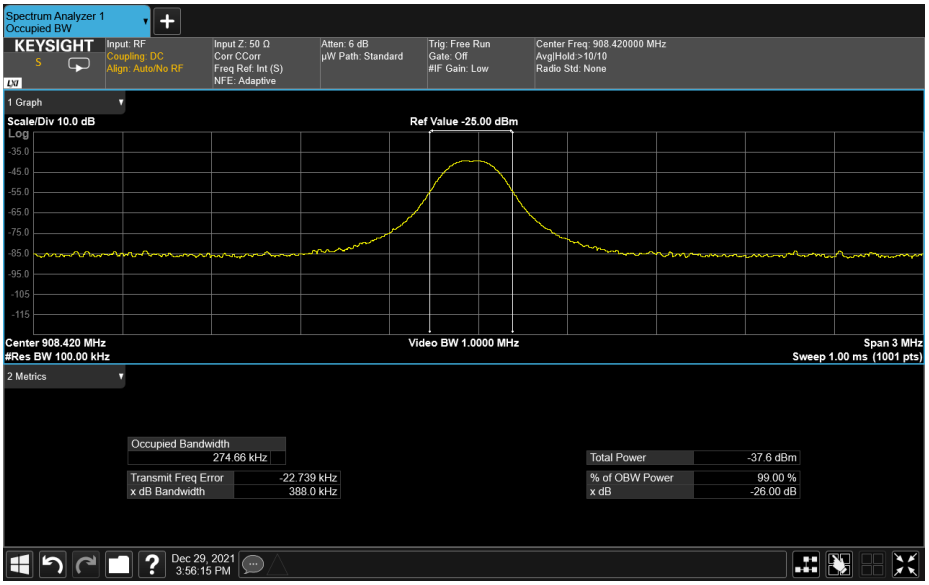


1-17 GHz 908 MHz and 2440 MHz for reference only

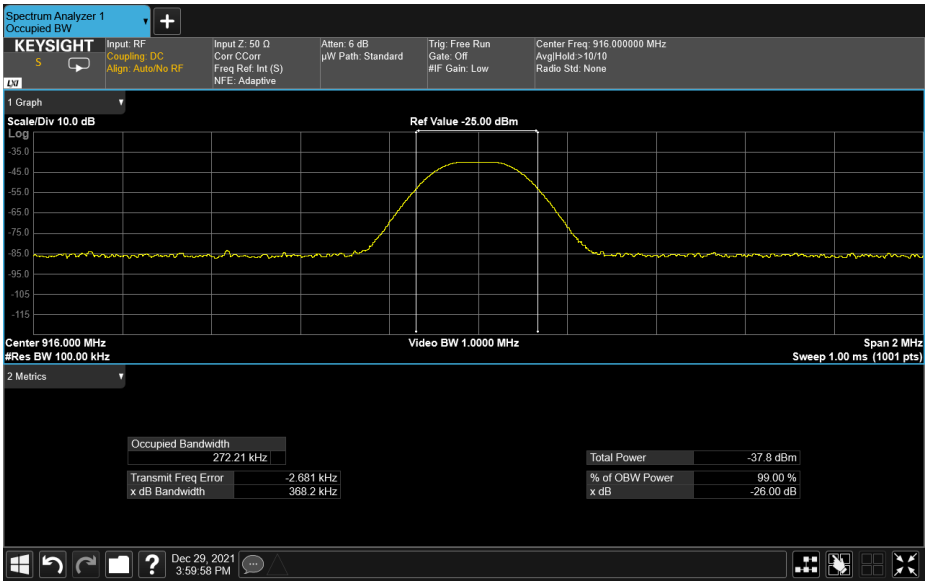


1-17 Hz 916 MHz and 2440 MHz for reference only

5.4 Bandwidth



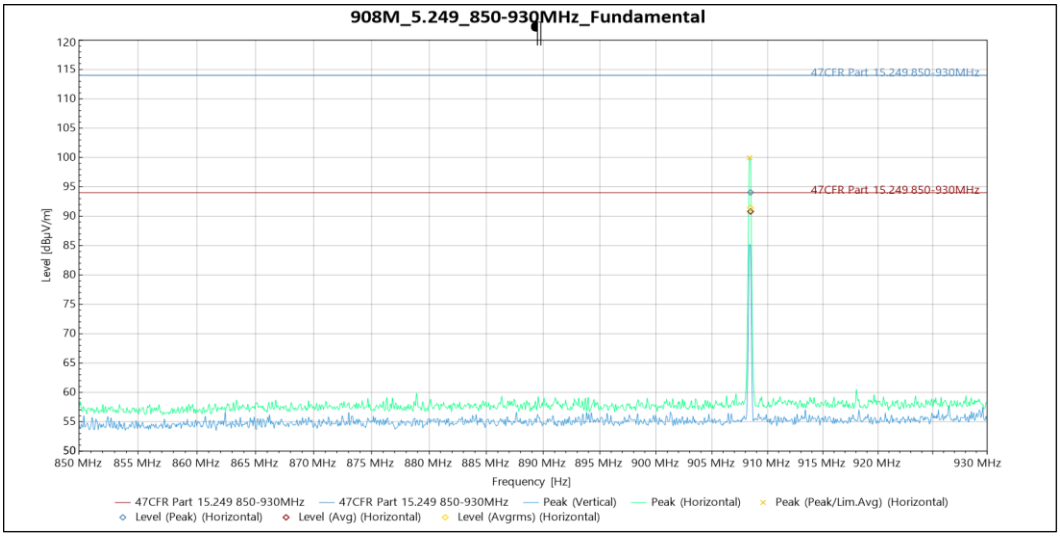
908 MHz OBW

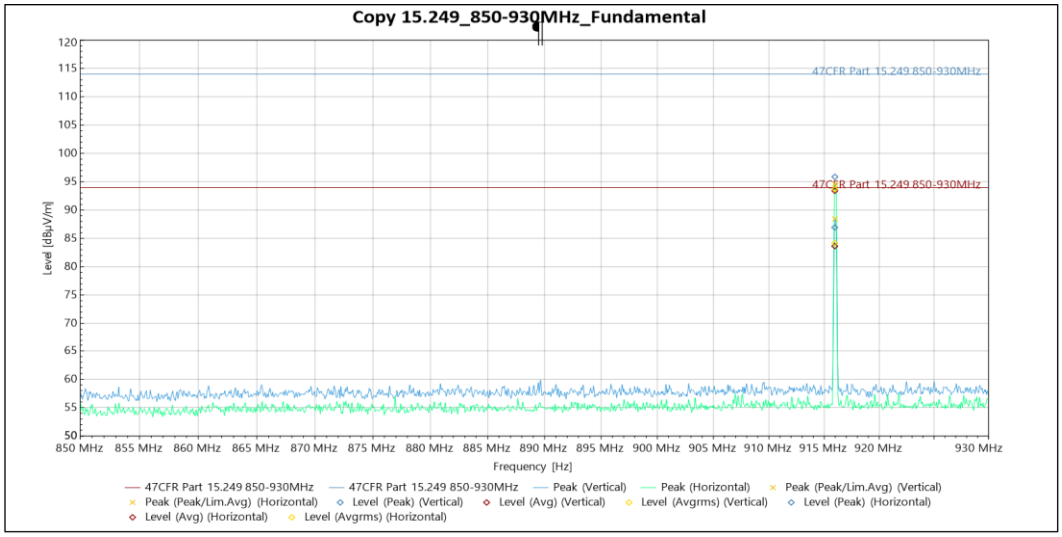


916 MHz OBW

5.5 Fundamental Field Strength

Freq. (MHZ)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Cor. (dB)	Det.
908.46	94.06	114	-19.94	114	1.08	Hor[1]	32.185	Pk
908.46	90.79	94	-3.2	114	1.08	Hor[1]	32.185	Avg
915.96	95.88	114	-18.12	277	1.08	Hor[1]	32.221	Pk
915.96	93.41	94	-0.59	277	1.08	Hor[1]	32.221	Avg
[1]: Worst case polarity								





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