Compliance
Test
Services

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

Test Report

Certification

FCC ID	2AJAC-CORE3
IC ID	7848A-CORE5
Equipment Under Test	C4-CORE3
Test Report Serial Number	TR7107_01
Date of Test(s)	March 11, 2022 through March 28, 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

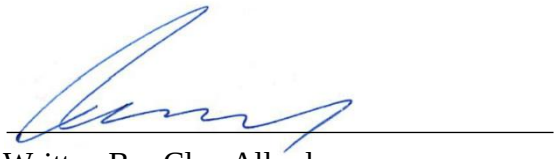
This report has been prepared by Compliance Test Services (CTS) to document compliance of the device described below with the requirement of Federal Communication Commissions (FCC) Part 15, Subpart C. This report may be reproduced in full. Partial reproduction of this report may only be made with the 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-CORE3
FCC ID	2AJAC-CORE3
IC ID	7848A-CORE3

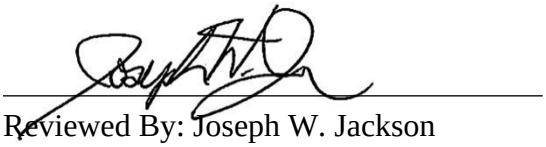
On this 5th day of April 2022, I individually and for Compliance Test Services certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge and are made in good faith.

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	Control 4
Model Number	C4-CORE3
Hardware Version	Rev 4.0
Serial Number / MAC Address	000FFF0C33F3
Rating/power supply	Input: AC 100V-240 VAC,50Hz/60Hz, 0.3A, or PoE +
RCB revision	Rev 4.0
Schematic revision	Rev 4.0
Firmware/Software revision	3.3.0.620746
Antenna	Dipole (2dBi)
Dimensions (mm)	29 x 191 x 127

2.2 Description of EUT

The C4-CORE3 is an entertainment and automation controller in a aluminum, and steel enclosure. This product is used as a main or secondary controller in a smart home automation system and runs software that has the capability of controlling many electronic and audio-video devices in a home.

The C4-CORE3 consists of two PCAs, the main motherboard, and a front panel. The main processor is an NXP I.MX8 based I.MX8MQ SOC. The processor is driven by 27.000MHz and 25.000MHz oscillators which are used to produce all system internal clock signals. The core of the processor runs at 1.5Ghz. The processor interfaces to 2 memory types. The DDR4 SDRAM operates at 1600Mhz. The processor also uses an eMMC Flash memory chip with an SDIO/MMC interface. The processor generates up to 4k60p HDMI video output to display an onscreen interface. This video output has a maximum pixel frequency of 594Mhz. The CORE3 has two wireless radios that use external dipole antennas and operate in the 900MHz and 2.4GHz spectrums. An SPI interface on the processor is used for communication the 802.15.4 2.4Ghz radio ZigBee transceiver. A UART is used to communicate to the 900MHz Zwave radio. The RF level to the radio chips is programmed into the firmware from the values that were used during regulatory testing. These levels cannot be changed by the user. During manufacturing testing (tune-up) the level of the RF is measured to verify that the level is within the level tolerance of ± 0.5 dB. A CPU integrated Cortex M4 core is used to control, IR input/outputs as well as the Contacts and Relays. The external RS232 serial ports that share outputs with two of the IR outputs are controlled by integrated CPU UARTs. The additional two external DB9 serial ports use an SPI to UART converter IC.

The C4-CORE3 has an Ethernet/PoE input port, Ethernet switch poutput, HDMI port, SPDIF audio Input/output, USB (3.0) port, and 6 IR ports, and can be powered via its AC mains (100-240, 50/60Hz) input or via the PoE input.

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: Control4 MN: C4-CORE3 MAC: 000FFF0C33F3	Controller	See Section 2.4
BN: Dell MN: XPS SN: n/a	Laptop	Network/Cat 5e Cable (Note 2)

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
Ethernet In/Out/PoE	2	No	No	Ethernet/Network Cat 5e cable
HDMI	1	Yes	No	1 meter
USB	1	Yes	No	USBA extension cable to USB flash drive ,1 meter
Serial IR	4	No	No	Two conductor cables with 3.5mm mono connector/2 meters
SPDIF	1	Yes	No	RCA 75 Ohm cable, 1 meter

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-CORE3 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 3.3.0.620746 was used to operate the transmitter using a constant transmit mode.

2.8 Block Diagram of Test Configuration

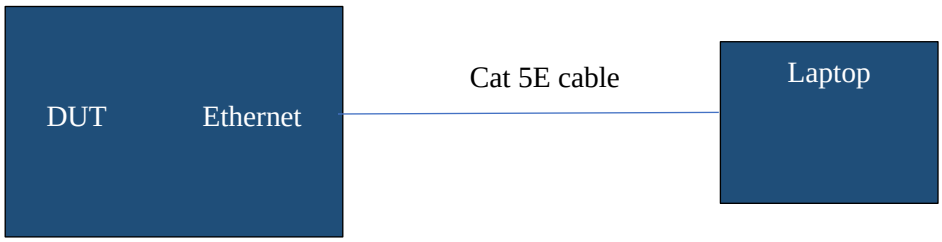


Diagram 1: Test Configuration Block Diagram

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 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	CTS-2861	12/09/2021	12/09/2022
EMI Receiver	Keysight	N9038A	CTS-2778	6/21/2021	6/21/2022
Signal Generator	R&S	SMB100A	CTS-2864	N/A	N/A
Vector Signal Generator	R&S	SMBV100A	CTS-2873	N/A	N/A
Switch Extension	R&S	OSP-B157WX	CTS-2867	12/20/2021	12/20/2022
Switch Extension	R&S	OSP-150W	CTS-2870	01/03/2022	01/03/2023

Table 1: List of equipment used for Direct Connect at the Antenna Port

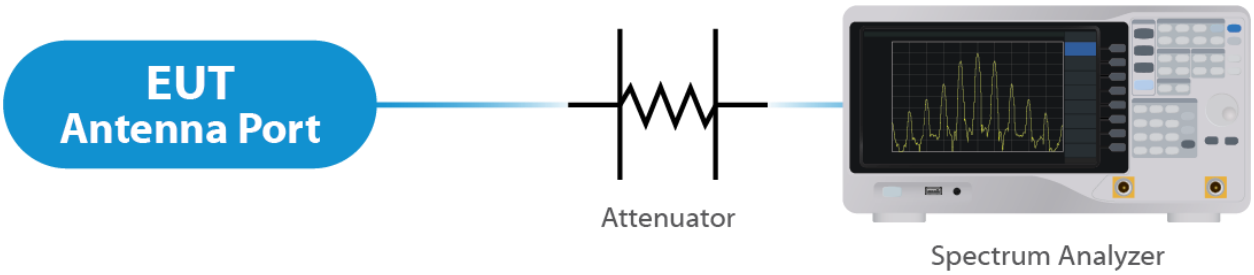


Figure 1: Direct Connect at the Antenna Port Test

4.2 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	5/18/2020	5/18/2022
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 2: List of equipment used for Conducted Emissions Testing at Mains Port

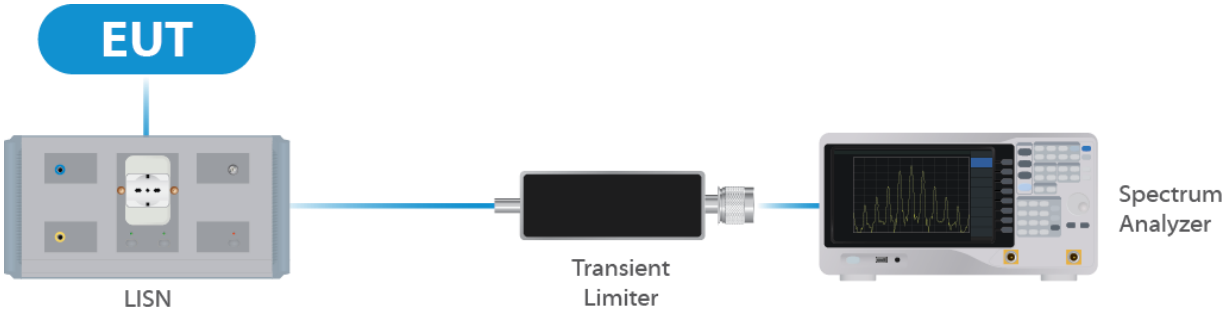


Figure 2: Conducted Emissions Test

4.3 Radiated Emissions

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
EMI Receiver	Keysight	N9038A	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 3: List of equipment used for Radiated Emissions

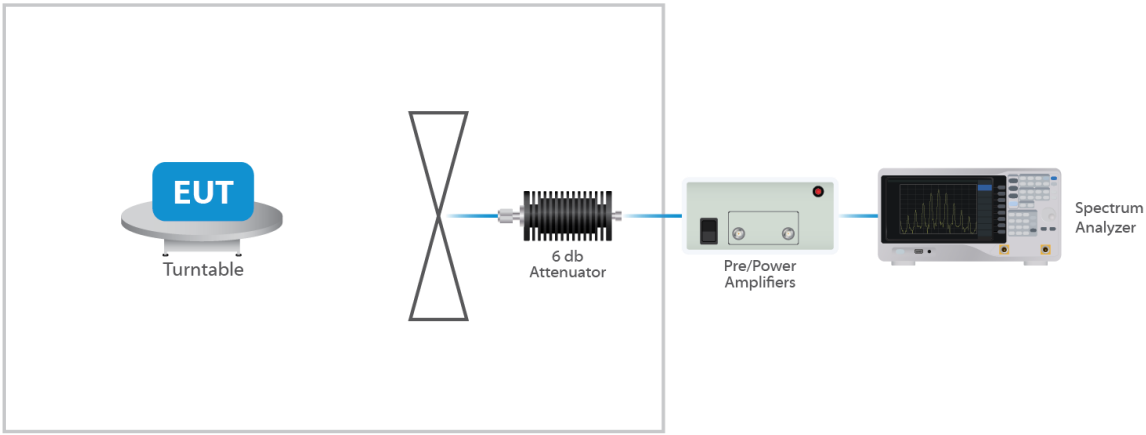


Figure 3: Radiated Emissions Test

4.4 Equipment Calibration

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

4.5 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 (Hot Lead)

Frequency (MHZ)	Detector	Receiver Measured Level (dBµV)	Correction Factor (dB/m)	Corrected Receiver Level (dBµV)	Limit Class B Limit (dBµV)	Margin (dB)
0.165	QP	37.1	9.5	46.6	65.2	-18.6
0.198	QP	35.1	9.5	44.6	63.7	-19.1
0.906	QP	27.0	9.8	36.7	56.0	-19.3
0.165	AVG	28.9	9.5	38.5	56.2	-17.7
0.198	AVG	25.4	9.5	34.9	53.7	-18.8
0.906	AVG	18.0	9.8	27.8	46.0	-18.2

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

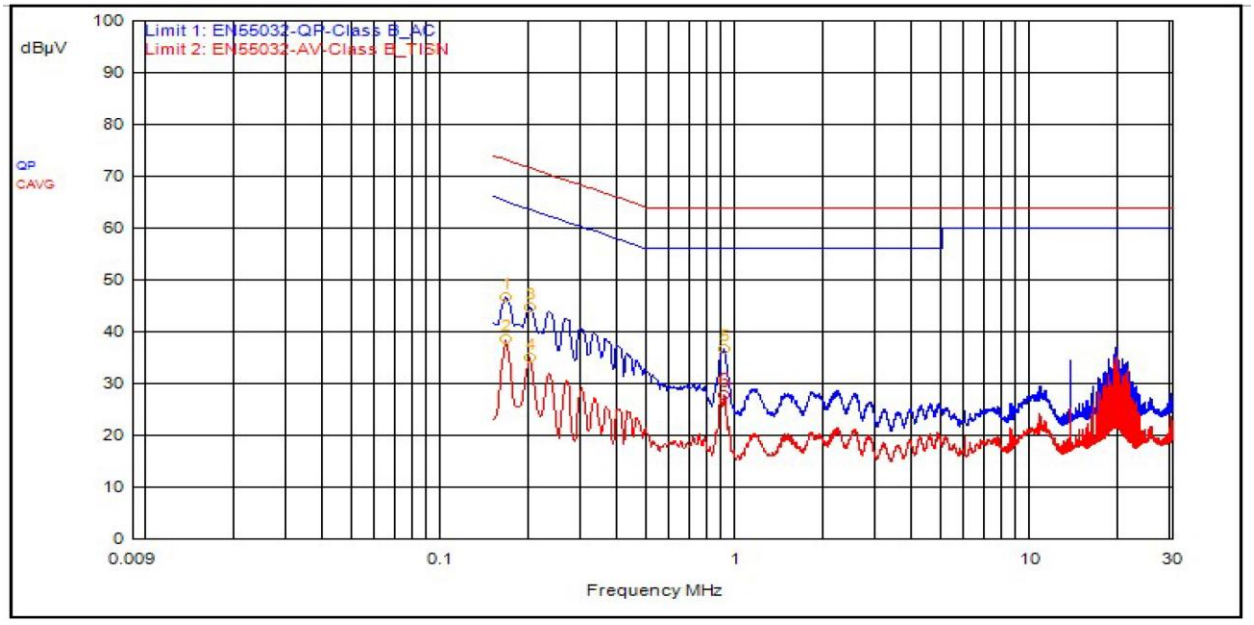
Sample Field Strength Calculation

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 -17.7 dB.



Graph 1: Conducted Emissions Plot – Hot Lead

5.2 Conducted Emissions at Mains Ports Data (Neutral Lead)

Frequency (MHZ)	Detector	Receiver Measured Level (dBµV)	Correction Factor (dB/m)	Corrected Receiver Level (dBµV)	Limit Class B Limit (dBµV)	Margin (dB)
0.165	QP	42.0	9.5	51.5	65.2	-13.7
0.906	QP	31.3	9.8	41.1	56.0	-14.9
0.195	QP	36.3	9.5	45.9	63.8	-17.9
0.165	AVG	34.9	9.5	44.4	55.2	-10.8
0.198	AVG	28.4	9.5	37.9	53.8	-15.9

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

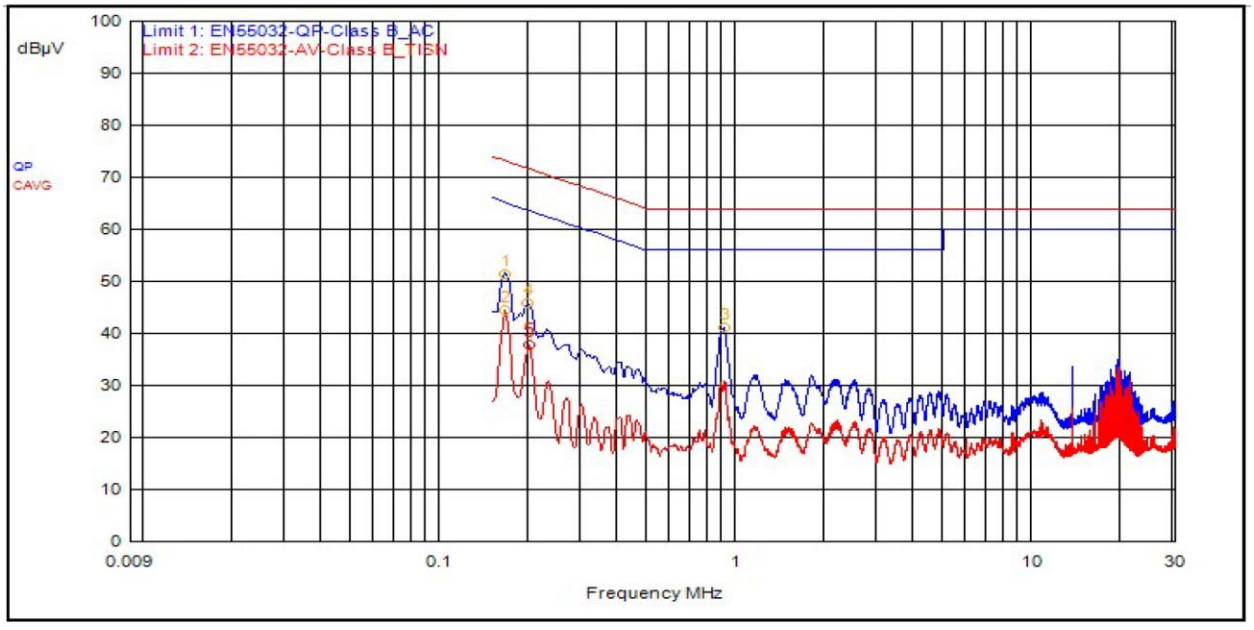
Sample Field Strength Calculation

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 -10.8 dB.



Graph 2: Conducted Emissions Plot – Neutral

5.3 Radiated Emissions: 908 MHz

Freq.	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Cor. (dB)	Det.
30.485 MHz	24.159	30[1]	-5.841	166	1.163	Vert	-11.794	QP
46.296 MHz	29.543	30[1]	-0.457	203	1.038	Vert	-11.046	QP
51.437 MHz	28.356	30[1]	-1.644	140	2.326	Vert	-11.553	QP
61.137 MHz	25.678	30[1]	-4.322	166	1.934	Vert	-14.044	QP
69.188 MHz	24.175	30[1]	-5.825	274	3.681	Vert	-16.317	QP
80.925 MHz	25.049	30[1]	-4.951	151	1.67	Vert	-17.222	QP
1.8166 GHz	53.576	74	-20.424	169	2.534	Vert	-7.659	Peak
1.8166 GHz	52.07	54	-1.93	169	2.534	Vert	-7.659	Avg
1.8169 GHz	52.635	74	-21.365	137	1.817	Hztl	-7.657	Peak
1.8169 GHz	51.147	54	-2.853	137	1.817	Hztl	-7.657	Avg

[1]: Tested at 10m

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 -0.457 dB.

5.4 Radiated Emissions: 916 MHz

Freq.	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Cor. (dB)	Det.
30.459 MHz	27.722	30[1]	-2.278	114	1.926	Vert	-11.801	QP
40.478 MHz	26.052	30[1]	-3.948	84	2.289	Vert	-11.115	QP
47.801 MHz	28.289	30[1]	-1.711	208	3.675	Vert	-11.15	QP
53.778 MHz	25.502	30[1]	-4.498	313	3.655	Vert	-11.968	QP
63.839 MHz	21.833	30[1]	-8.167	90	1.578	Vert	-14.87	QP
1.8319 GHz	51.513	74	-22.487	298	1.816	Vert	-7.545	Peak
1.8319 GHz	49.882	54	-4.118	298	1.816	Vert	-7.545	Avg
1.832 GHz	51.045	74	-22.955	121	2.714	Hztl	-7.544	Peak
1.832 GHz	49.489	54	-4.511	121	2.714	Hztl	-7.544	Avg

[1]: Tested at 10m

Sample Field Strength Calculation

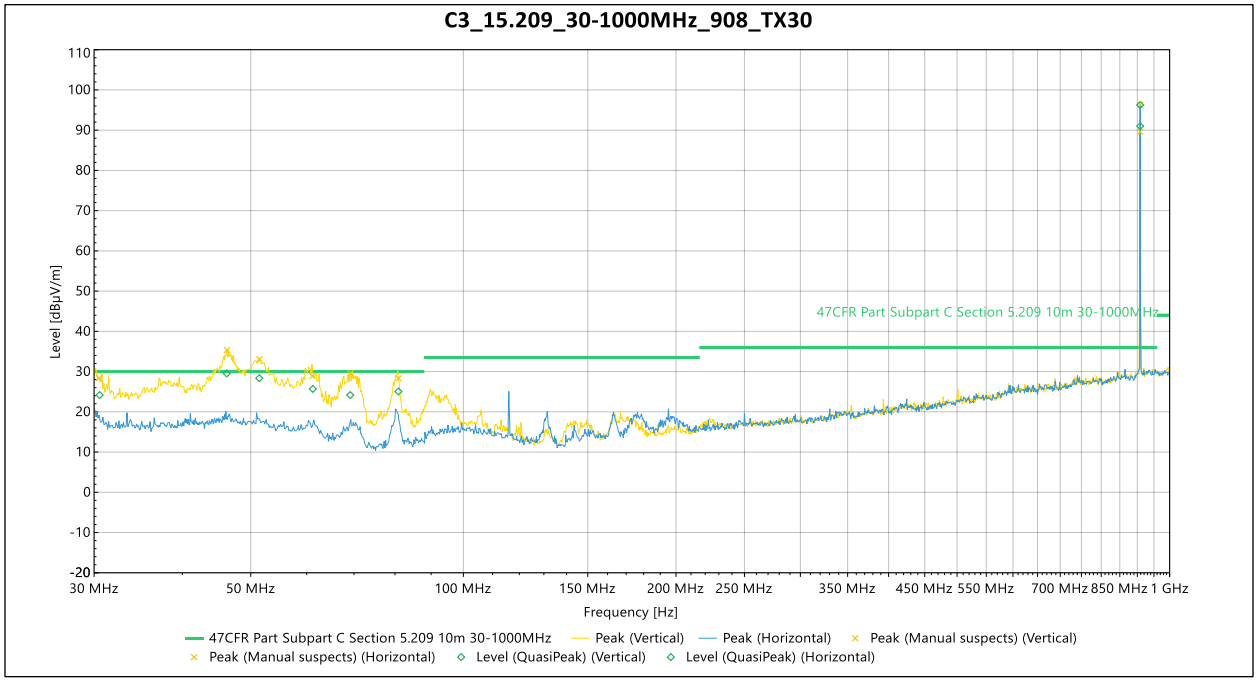
Level = Receiver Reading + Correction Factor

Correction Factor = Antenna Factor + Cable Factor - Amplifier

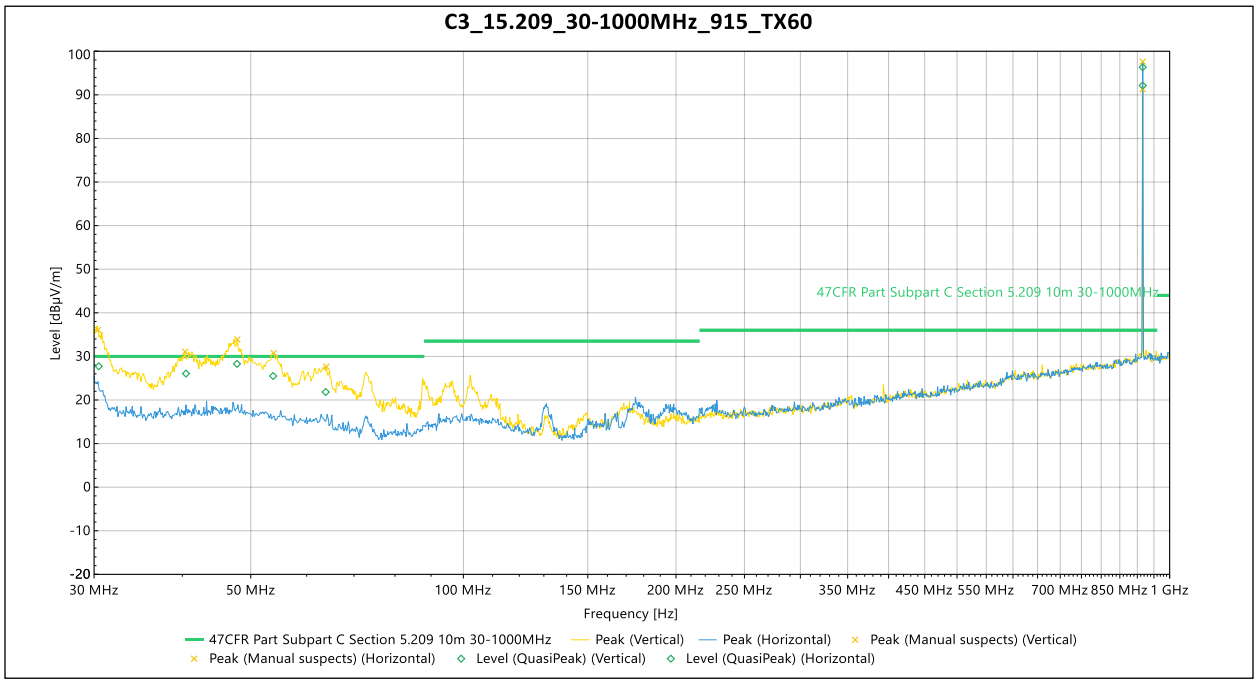
Margin = Level - Limit

Result

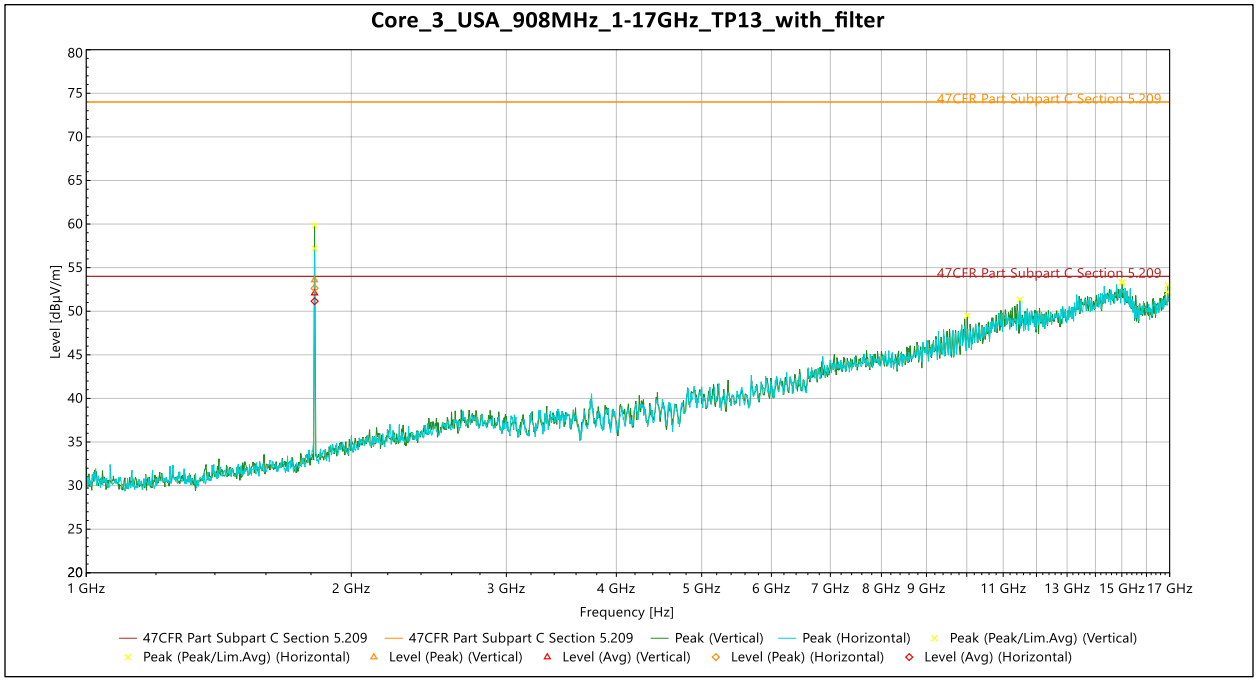
The EUT complied with the specification limit by a margin of -1.711 dB.



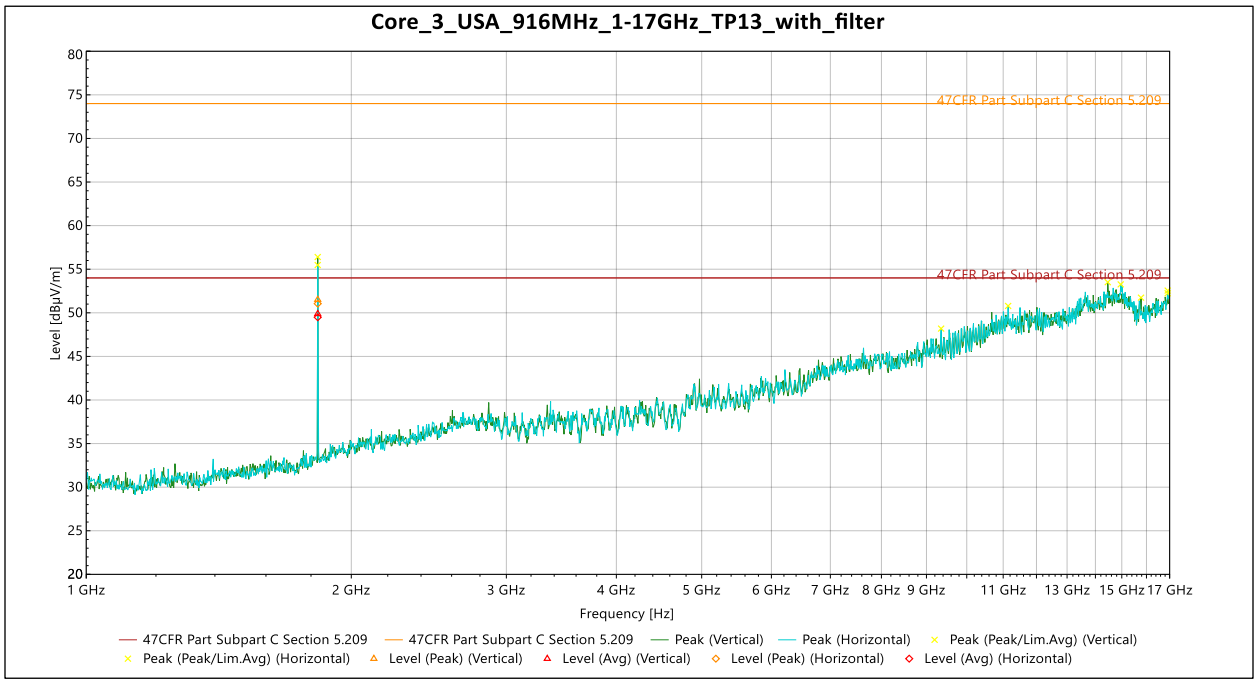
30-1000MHz Fundamental @ 908 MHz



30-1000MHz Fundamental @ 916 MHz

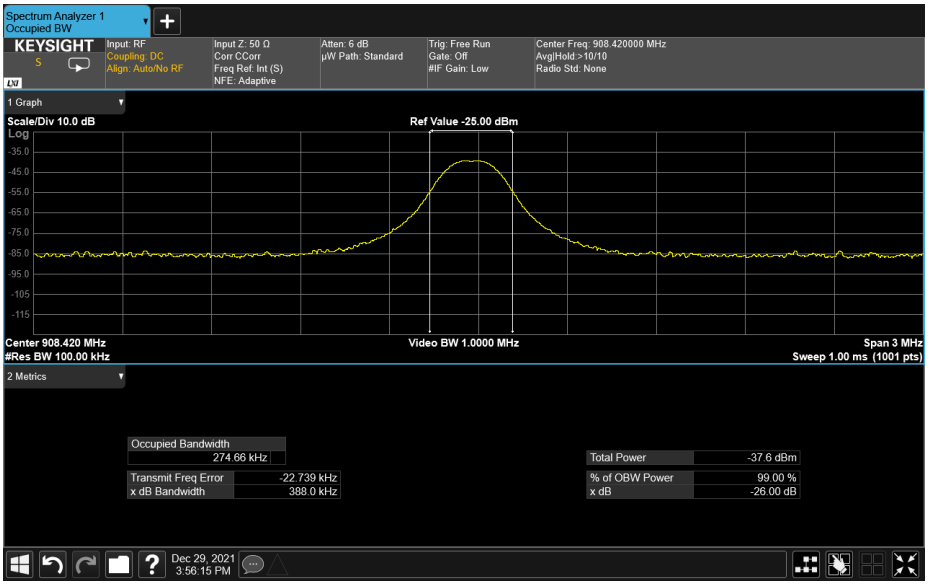


1-17 GHz Fundamental @ 908 MHz

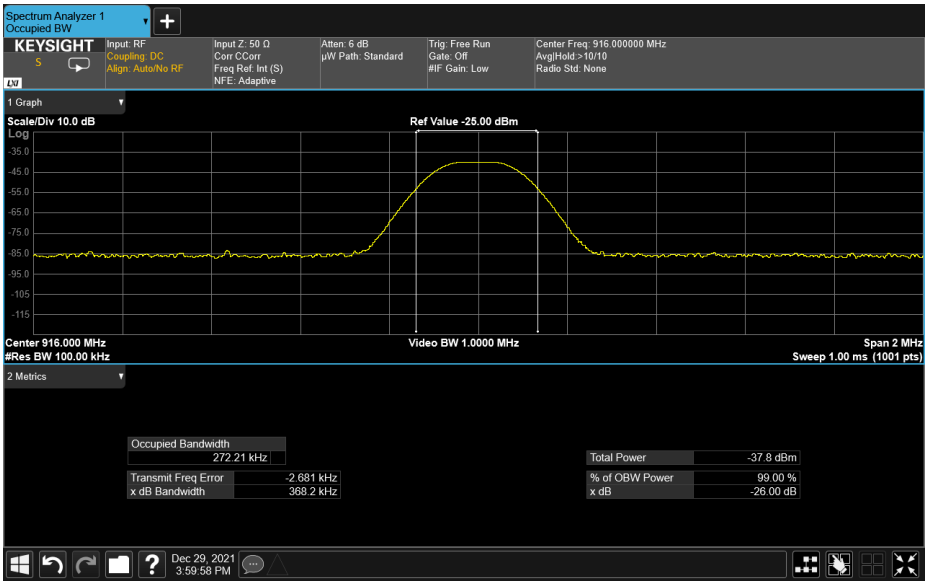


1-17 GHz Fundamental @ 916 MHz

5.5 Bandwidth



908 MHz OBW



916 MHz OBW

5.6 Fundamental Field Strength

Freq.	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	Cor. (dB)	Det.
908.39 MHz	89.891	114	-24.109	231	1.782	Vert	32.185	Peak
908.39 MHz	88.789	94	-5.211	231	1.782	Vert	32.185	Avg.
908.44 MHz	95.93	114	-18.07	310	1.095	Hztl	32.185	Peak
908.44 MHz	93.058	94	-0.942	310	1.095	Hztl	32.185	Avg.
916.03 MHz	92.59	114	-21.41	236	1.547	Vert	32.221	Peak
916.03 MHz	89.691	94	-4.309	236	1.547	Vert	32.221	Avg.
916.05 MHz	97.052	114	-16.948	309	1.124	Hztl	32.221	Peak
916.05 MHz	92.851	94	-1.149	309	1.124	Hztl	32.221	Avg.

-- End of Test Report --