

Prüfbericht-Nr.: Test report no.:	SE23EYYN-003	Auftrags-Nr.: Order no.:	0290100214	Seite 1 von 62 Page 1 of 62
Kunden-Referenz-Nr.: Client reference no.:	2458172	Auftragsdatum: Order date:	2022.09.29	
Auftraggeber: Client:	Nomono AS			
Prüfgegenstand: Test item:	Central hub of recording device			
Bezeichnung / Typ-Nr.: Identification / Type no.:	Space Recorder / FCC ID: 2A9CX-REC1			
Auftrags-Inhalt: Order content:	Accredited Testing			
Prüfgrundlage: Test specification:	FCC 47 CFR Part 15.247 with parts 15.207 & 15.209 ANSI C63.10: 2013			
Wareneingangsdatum: Date of sample receipt:	2022.11.09			
Prüfmuster-Nr.: Test sample no.:	See section 2.3			
Prüfzeitraum: Testing period:	2023.02.21 - 2023.03.08			
Ort der Prüfung: Place of testing:	Lund, Sweden			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland Sweden			
Prüfergebnis*: Test result*:	Pass			
überprüft von: reviewed by:		genehmigt von: authorized by:		
Datum: 2023.05.17 Date:	Signed by: Niall Forrester	Datum: 2023.05.17 Date:	Signed by: Hakan Ahlberg	
Stellung / Position:	Senior Technical Expert	Stellung / Position:	Lab Manager	
Sonstiges / Other:	The device contains multiple radio transmitters. Please see section 2.1 for details and section 3.7 for notes about the configurations tested.			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient N/T = not tested
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts.</i>				

Revision History

REVISION	DATE	REMARKS	AUTHOR
001	2023.04.20	First release	Niall Forrester
002	2023.04.21	Corrected error in wireless frequencies	Niall Forrester
003	2023.05.17	Updated module text	Niall Forrester
Note: Latest revision report will replace all previous reports			
This report based on FCC Part 15.247 Template version 1.3			

Summary of Test Results

FCC 47 CFR Rule Part	Test Description	Applicability	Report Section	RESULT	REMARKS
15.207	AC Power Line Conducted Emissions (Intentional Radiators)	YES	4.1	PASS	
15.209	Radiated Emissions (Intentional Radiators)	YES	4.2	PASS	
15.247 (d)	Antenna Conducted Emissions	NO	4.3	N/A	Radiated testing performed
15.247 (d)	Band Edge Compliance (Authorized Band)	YES	4.4	PASS	
15.247 (d)	Band Edge Compliance (Restricted Band)	YES	4.5	N.P.	Only "Auth Band" part tested
15.247 (a)(1)	20dB Bandwidth	NO	4.6	N/A	WLAN is non-hopping
15.247 (a)(1)	Carrier (Hopping Channel) Separation	NO	4.7	N/A	WLAN is non-hopping
15.247 (a)(1)	Number of Hopping Channels	NO	4.8	N/A	WLAN is non-hopping
15.247 (a)(1)	Time of Occupancy (Dwell Time)	NO	4.9	N/A	WLAN is non-hopping
15.247 (a)(2)	6dB Bandwidth	YES	4.10	PASS	
15.247 (b)	Peak Conducted Output Power	YES	4.11	PASS	
15.247 (e)	Power Spectral Density	YES	4.12	PASS	
-	Maximum Power & e.r.p. Summary	-	4.13	-	For Information Only

Possible test case verdicts:

- | | |
|--|-----------------------|
| - Test case does not apply to the test object: | N/A |
| - Test object complies with the requirement: | PASS or COMPLIANT |
| - Test object does not meet the requirement: | FAIL or NOT COMPLIANT |
| - Test case not performed on the test object: | N.P. |

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1. GENERAL INFORMATION

1.1 Test Site

Test Facility:	TÜV Rheinland Sweden AB
Address:	Mobilvägen 10
	223 62 Lund
	Sweden
Swedac Registration Number:	10325
FCC Test Firm Registration Number:	517458
ISED Test Site Registration Number:	24753

1.2 Client Information

Company Name:	Nomono AS
Address:	Strandveien 43
	7067 Trondheim
	Norway
Contact Person:	Kristine Snyder / Sindre Georgsen
Contact e-Mail / Telephone	compliance@nomono.co +47 40 44 00 40 / +47 93 42 48 42

2. PRODUCT INFORMATION

2.1 General Description

Model name:	Space Recorder
Manufacturer:	Nomono
Model number / Marketing name:	Space Recorder
FCC ID:	2A9CX-REC1
Description:	Central hub of recording device
Ancillary Equipment:	See section 2.8

The device incorporates five separate radio transmitters:

A “Main” module for WLAN 2.4 GHz 802.11 b/g/n, WLAN 5GHz 802.11 a/n/ac and Bluetooth Low Energy.
This module uses its own SMT antenna

4 x “Microphone” modules (labelled “Tx0” “Tx3” below) for communicating with a wireless microphone via Bluetooth Low Energy. Each of these modules is connected to its own PCB antenna

2.2 Device Characteristics

Device Class for 47 CFR Part 15 B	Class B
Type of Power Supply	Internal battery Charging via dedicated charging base or Charging via USB C (No dedicated AC/DC adapter supplied with device)
Nominal Supply Voltage	3.6V DC (Battery) 5.0V DC (From charging base) 5.0V DC (USB)
Supply Voltage Range	2.75V – 4.2V (Battery) 4.9V – 5.1V (From charging base) 5.0V – 12.0V DC (USB)
Operating Temperature Range	0 to 45 °C
Operating Air Humidity Range	-
Highest Internal Frequency Source	5825 MHz

2.3 Test Samples

EUT #	EUT ID	Description	Used For:
1	A003418772-001	Modified with Semi-Rigid Hardware: 830-00002 rev. 4 Firmware: nRF radio: v0.8.0 CPU: v0.6.1	Conducted RF
2	A003420354-001	Standard Sample Hardware: 830-00002 rev. 4 Firmware: nRF radio: v0.8.0 CPU: v0.6.1	Radiated Emissions
3	A003421467-001	Standard Sample Hardware: 830-00002 rev. 4 Firmware: nRF radio: v0.8.0 CPU: v0.6.1	AC Conducted Emissions Radiated Emissions
4	A003421467-002	Standard Sample Hardware: 830-00002 rev. 4 Firmware: nRF radio: v0.8.0 CPU: v0.6.1	Radiated Emissions

2.4 Wireless Technologies and Bands Supported by the EUT

Technology	Band	Frequency Range (Tx)	Evaluation Performed*
WLAN 802.11b/g/n (Main)	2.4 GHz	2412 MHz - 2462 MHz	YES
WLAN 802.11a/n/ac (Main)	5 GHz	5180 MHz – 5825 MHz	NO
Bluetooth Low Energy (Main)	2.4 GHz	2402 MHz - 2480 MHz	NO
Bluetooth Low Energy (Microphone Tx0)	2.4 GHz	2402 MHz - 2480 MHz	NO
Bluetooth Low Energy (Microphone Tx1)	2.4 GHz	2402 MHz - 2480 MHz	NO
Bluetooth Low Energy (Microphone Tx2)	2.4 GHz	2402 MHz - 2480 MHz	NO
Bluetooth Low Energy (Microphone Tx3)	2.4 GHz	2402 MHz - 2480 MHz	NO

*This statement refers only to this report. Other wireless technologies may be covered by other reports.

(Note that other parts of the recording system contain additional wireless transmitters have been tested separately)

2.5 Antenna Information

Technology	Band	Number of Antennas	Antenna Type(s)	Gain (dBi)
WLAN 802.11b/g/n (Main) & Bluetooth Low Energy (Main)	2.4 GHz	1	SMT Chip Antenna	4.20
WLAN 802.11a/n/ac (Main)	5 GHz	1	SMT Chip Antenna	4.50
Bluetooth Low Energy (Microphone Tx0)	2.4 GHz	1	PCB Antenna	2.05
Bluetooth Low Energy (Microphone Tx1)	2.4 GHz	1	PCB Antenna	1.99
Bluetooth Low Energy (Microphone Tx2)	2.4 GHz	1	PCB Antenna	2.58
Bluetooth Low Energy (Microphone Tx3)	2.4 GHz	1	PCB Antenna	1.16

2.6 Simultaneous Transmission Capabilities

Active Technologies	Bands	Active Modules
WLAN 802.11 b/g/n Bluetooth Low Energy Bluetooth Low Energy Bluetooth Low Energy Bluetooth Low Energy (All active simultaneously)	2.4 GHz 2.4 GHz 2.4 GHz 2.4 GHz 2.4 GHz	Main Microphone Tx0 Microphone Tx1 Microphone Tx2 Microphone Tx3 (All active simultaneously)
Bluetooth Low Energy Bluetooth Low Energy Bluetooth Low Energy Bluetooth Low Energy Bluetooth Low Energy (All active simultaneously)	2.4 GHz 2.4 GHz 2.4 GHz 2.4 GHz 2.4 GHz	Main Microphone Tx0 Microphone Tx1 Microphone Tx2 Microphone Tx3 (All active simultaneously)
WLAN 802.11 a/n/ac Bluetooth Low Energy Bluetooth Low Energy Bluetooth Low Energy Bluetooth Low Energy (All active simultaneously)	5 GHz 2.4 GHz 2.4 GHz 2.4 GHz 2.4 GHz	Main Microphone Tx0 Microphone Tx1 Microphone Tx2 Microphone Tx3 (All active simultaneously)

The configurations listed above represent the worst cases. Variations of these configurations where one or more radio transmitters is not active are also possible. The “Microphone” modules operate independent of each other and independent of the “Main” module. The “Main” module is not capable of transmitting WLAN 2.4GHz and WLAN 5GHz simultaneously, neither can it transmit Bluetooth Low Energy and WLAN simultaneously.

2.7 Wireless Technology Details

Technology	Band	Modulation Type(s)	No. of Channels	Channel Spacing	Adaptivity
WLAN 802.11b/g/n (Main)	2.4 GHz	CCK, BPSK, QPSK, 16-QAM, 64-QAM	As per 802.11 Spec	As per 802.11 Spec	N/A
WLAN 802.11a/n/ac (Main)	5 GHz	CCK, BPSK, QPSK, 16-QAM, 64-QAM	As per 802.11 Spec	As per 802.11 Spec	N/A
Bluetooth Low Energy (Main)	2.4 GHz	GFSK	40	2 MHz	N/A
Bluetooth Low Energy (Microphone Tx0)	2.4 GHz	GFSK	40	2 MHz	N/A
Bluetooth Low Energy (Microphone Tx1)	2.4 GHz	GFSK	40	2 MHz	N/A
Bluetooth Low Energy (Microphone Tx2)	2.4 GHz	GFSK	40	2 MHz	N/A
Bluetooth Low Energy (Microphone Tx3)	2.4 GHz	GFSK	40	2 MHz	N/A

2.8 Ancillary Equipment

ID	Description	Manufacturer / Model	Hardware & Software Versions
A003389898-003	USB Charger	Samsung EP-T4510	HW: 13.08.2022 FW: N/A

2.9 EUT Diagrams

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3. TEST METHODS

3.1 Test Standards

Testing was performed according to the following standards / references

Standard	Version	Description
FCC 47 CFR 15.247	-	Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
FCC 47 CFR 15.207	-	Conducted limits
FCC 47 CFR 15.209	-	Radiated emission limits; general requirements

3.2 Additional references

The following standards / references were also considered for the testing

Standard	Version	Description
ANSI C63.10	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

3.3 Limits

FCC 47 CFR Rule Part	Test Description	Limit Reference (FCC 47 CFR Reference)
15.207	AC Power Line Conducted Emissions (Intentional Radiators)	15.207 (a)
15.209	Radiated Emissions (Intentional Radiators)	15.209 (a) *See Note 1
15.247 (d)	Antenna Conducted Emissions	N/A
15.247 (d)	Band Edge Compliance (Authorized Band)	15.247 (d)
15.247 (d)	Band Edge Compliance (Restricted Band)	15.247 (d)
15.247 (a)(1)	20dB Bandwidth	15.247 (a)(1)
15.247 (a)(1)	Carrier (Hopping Channel) Separation	15.247 (a)(1)
15.247 (a)(1)	Number of Hopping Channels	15.247 (a)(1)
15.247 (a)(1)	Time of Occupancy (Dwell Time)	15.247 (a)(1)
15.247 (a)(2)	6dB Bandwidth	15.247 (a)(2)
15.247 (b)	Peak Conducted Output Power	15.247 (b)(3) [Non-Hopping]
15.247 (e)	Power Spectral Density	15.247 (e)

Interpretation of the measurement results has been performed in accordance with ANSI C63.10 section 1.3

Compliance with the requirements has been based on the results of the measurements compared to the specified limits, not taking into account measurement instrumentation uncertainty.

Measurement Uncertainty figures are stated in section 6

Note 1

Radiated Emissions limits in the tables from 47 CFR sections 15.109 & 15.209 are presented in $\mu\text{V/m}$. Measurements on the test system are made in $\text{dB}\mu\text{V/m}$. To convert between these, the following adjustment is used:

$$\text{New Limit} = 20 \log \left(\frac{\text{Original Limit}}{10^6} \right) + 120$$

Example: from 15.209(a) the limit for 30MHz – 88MHz is $100\mu\text{V/m}$ at 3m. This gives:

$$\text{New Limit} = 20 \log \left(\frac{100}{10^6} \right) + 120 = 40\text{dB}\mu\text{V/m at 3m}$$

Additionally, in some cases testing has been performed at distances other than those specified in the tables. When this has occurred, the limits have been adjusted in accordance with the requirements in 47 CFR 15.31, using an extrapolation factor of 40dB/decade at frequencies below 30MHz and 20dB/decade at or above 30MHz

Example: from 15.209(a) the limit for 1.705MHz – 30MHz is $30\mu\text{V/m}$ ($\approx 29.54 \text{ dB}\mu\text{V/m}$) at 30m

$$\text{Limit@3m} = \text{Limit@30m} + 40 \log \left(\frac{30}{3} \right) = 29.54 + 40.00 = 69.54 \text{ dB}\mu\text{V/m at 3m}$$

Example: from 15.209(a) the limit for 1GHz – 18GHz is $500\mu\text{V/m}$ ($\approx 53.98 \text{ dB}\mu\text{V/m}$) at 3m

$$\text{Limit@1m} = \text{Limit@3m} + 20 \log \left(\frac{3}{1} \right) = 53.98 + 9.54 = 63.52 \text{ dB}\mu\text{V/m at 1m}$$

3.4 Description of Test Methods and Equipment Setup

3.4.1 General Description

Testing was performed in accordance with the various requirements of ANSI C63.4 and ANSI C63.10. Any deviations from the test methods are described in section 0

Where different arrangements of equipment were used for different types of measurements, these are tabulated in section 3.4.2 and details of each arrangement are included in subsequent sections

3.4.2 Test Equipment Setup Used by Test Type

FCC 47 CFR Rule Part	Test Description	Test Equipment Used
15.207	AC Power Line Conducted Emissions (Intentional Radiators)	Conducted Emissions
15.209	Radiated Emissions (Intentional Radiators)	SAC5
15.247 (d)	Antenna Conducted Emissions	N/A
15.247 (d)	Band Edge Compliance (Authorized band)	CTE
15.247 (d)	Band Edge Compliance (Restricted band)	SAC 5
15.247 (a)(1)	20dB Bandwidth	CTE
15.247 (a)(1)	Carrier (Hopping Channel) Separation	CTE
15.247 (a)(1)	Number of Hopping Channels	CTE
15.247 (a)(1)	Time of Occupancy (Dwell Time)	CTE
15.247 (a)(2)	6dB Bandwidth	CTE
15.247 (b)	Peak Conducted Output Power	CTE
15.247 (e)	Power Spectral Density	CTE

3.4.3 Test Equipment Setup – CTE System

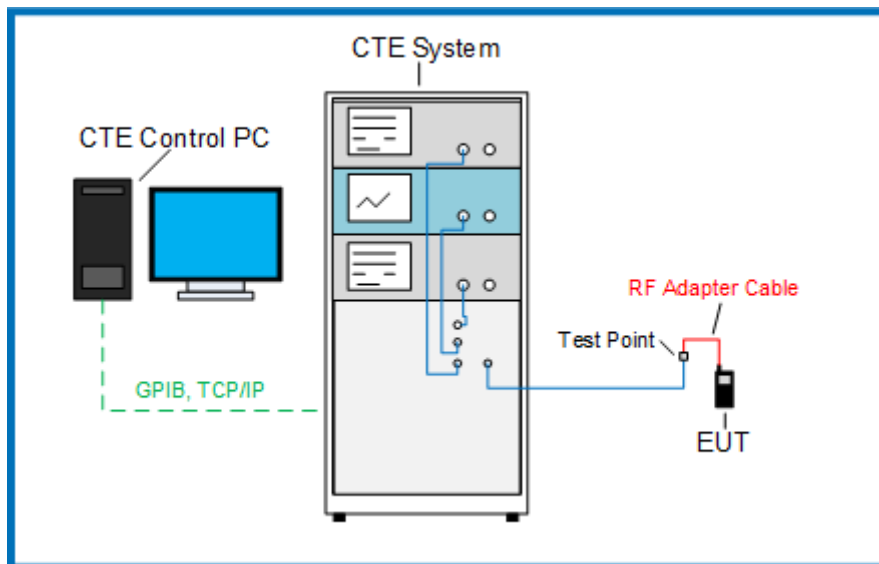
The Comprehensive Test Environment (CTE) system consists of a number of instruments (see section 5.1.1) mounted in a rack together with automated relays and interconnecting hardware. The instruments and other equipment are controlled from a standard PC running software provided by the manufacturer. The RF output of the EUT is connected to the test system via a coaxial cable.

Tests are in the form of pre-defined scripts that can be loaded on the PC. The scripts, as well as the hardware setup, have been verified for conformance with the relevant test specifications.

Losses in the cables and interconnects have been measured using the system's own automated routines and are compensated for automatically. Any additional loss in RF adapter cables supplied together with the EUT can be compensated for using the known characteristics of that adapter.

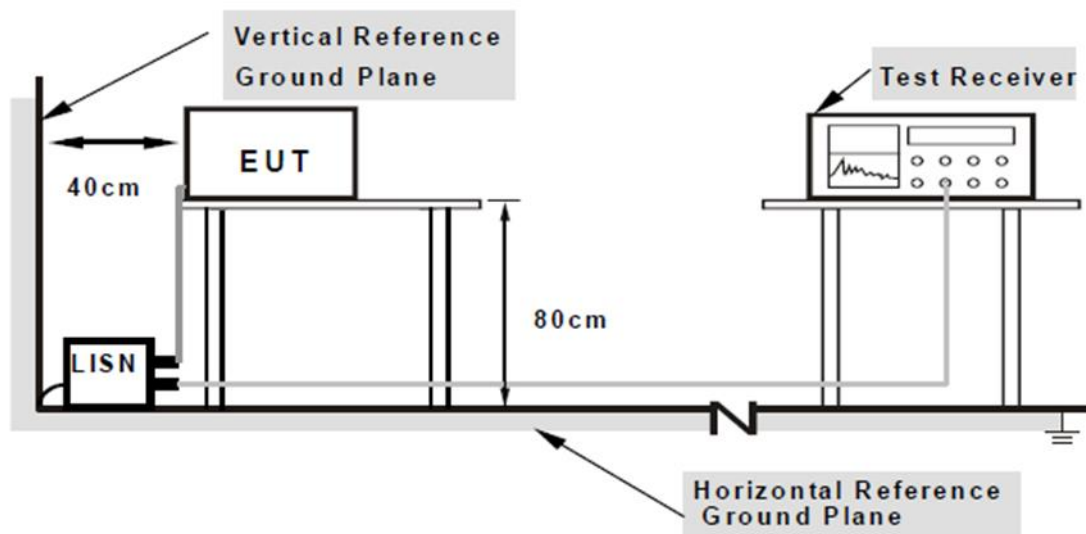
For DFS testing of client devices and some receiver testing, a wireless access point with appropriate certifications is used as the WLAN master device, with the DUT as a client.

CTE Block Diagram



3.4.4 Test Equipment Setup – Conducted Emissions

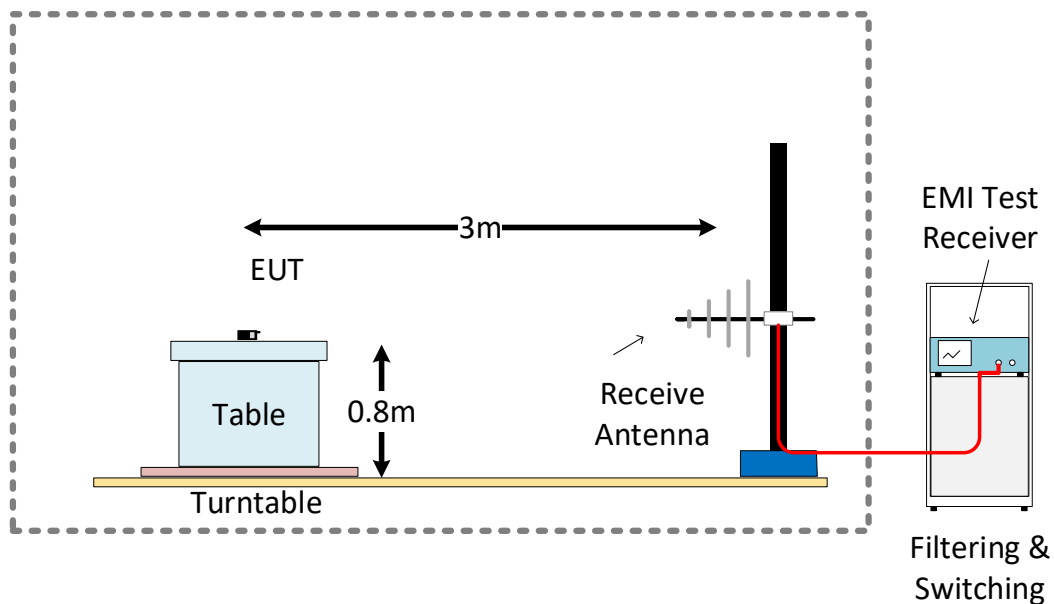
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The LISNs provide $50\Omega/50\mu\text{H}$ of coupling impedance for the measuring instrument.
- The lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched. Emission levels over 10 dB under the prescribed limits could not be reported.



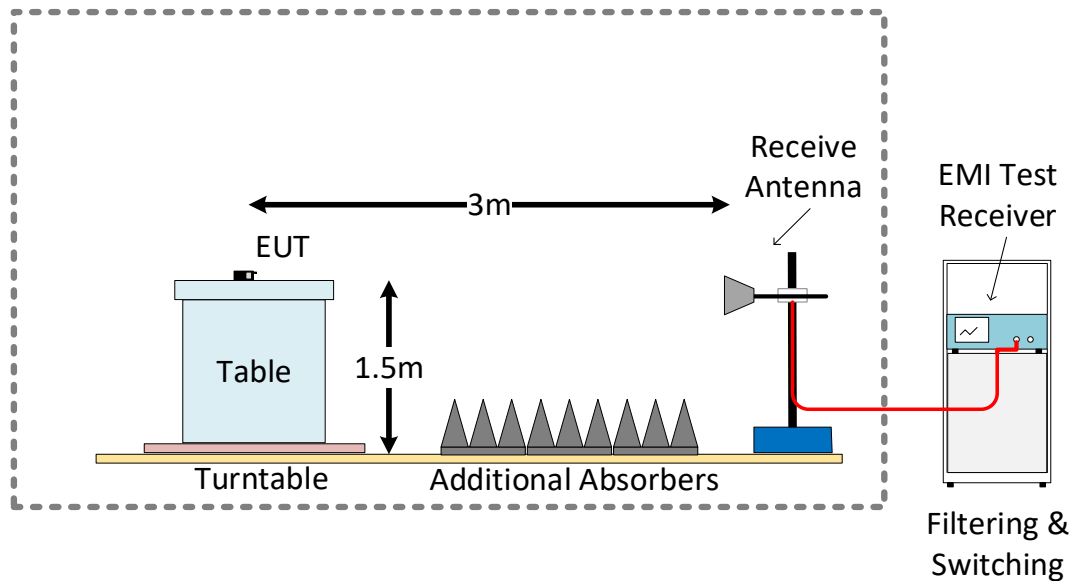
3.4.5 Test Equipment Setup – SAC 5 (Radiated Emissions and Restricted Band Edge)

- For frequency range 30MHz-1GHz Log-Periodic Antenna was used. Antenna elevated from 100 cm from floor to 400 cm from floor, and was placed at 3 m from center of turntable in tilted position. The equipment under test (EUT) was placed at the middle of the turntable at 80 cm height from floor. The antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained.
- For frequency range 1GHz-18GHz horn Antenna was used. Antenna elevated from 100 cm from floor to 200 cm from floor, and was placed at 3 m from center of turntable. The equipment under test (EUT) was placed at the middle of the turntable at 150 cm height from floor. The antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained.
- For frequency range 18GHz-40GHz double horn Antenna was used. Antenna's height was adjusted to 150 cm from floor, and 1 m distance to center of turntable. The equipment under test (EUT) was placed at the middle of the turntable on at 150 cm height from floor.
- For all frequency ranges the turntable was rotated 360° for obtaining the maximum emission.

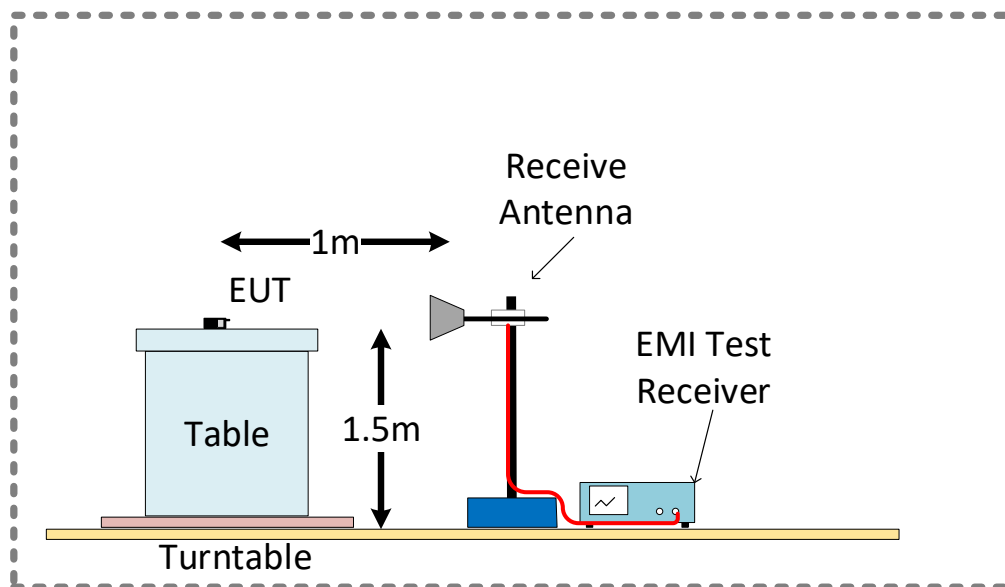
SAC 5 Test Setup Configuration 30MHz – 1GHz



SAC 5 Test Setup Configuration 1GHz – 18GHz

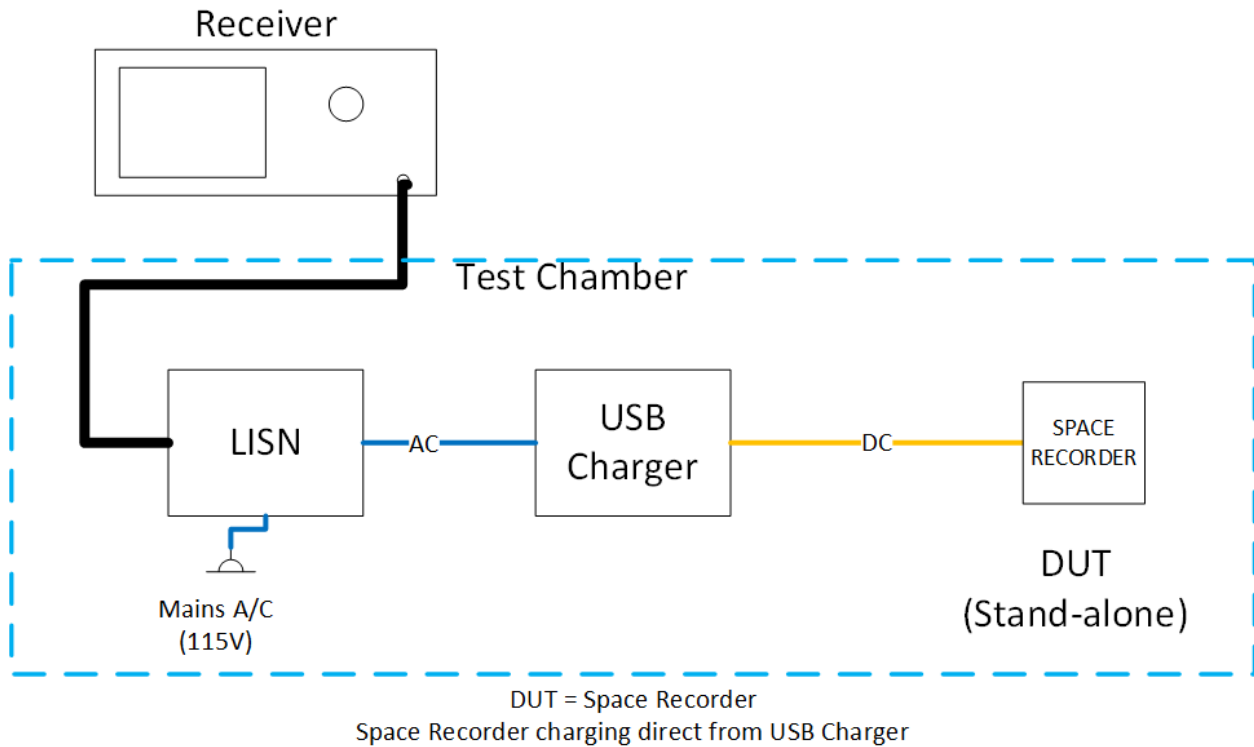


SAC 5 Test Setup Configuration 18GHz – 40GHz



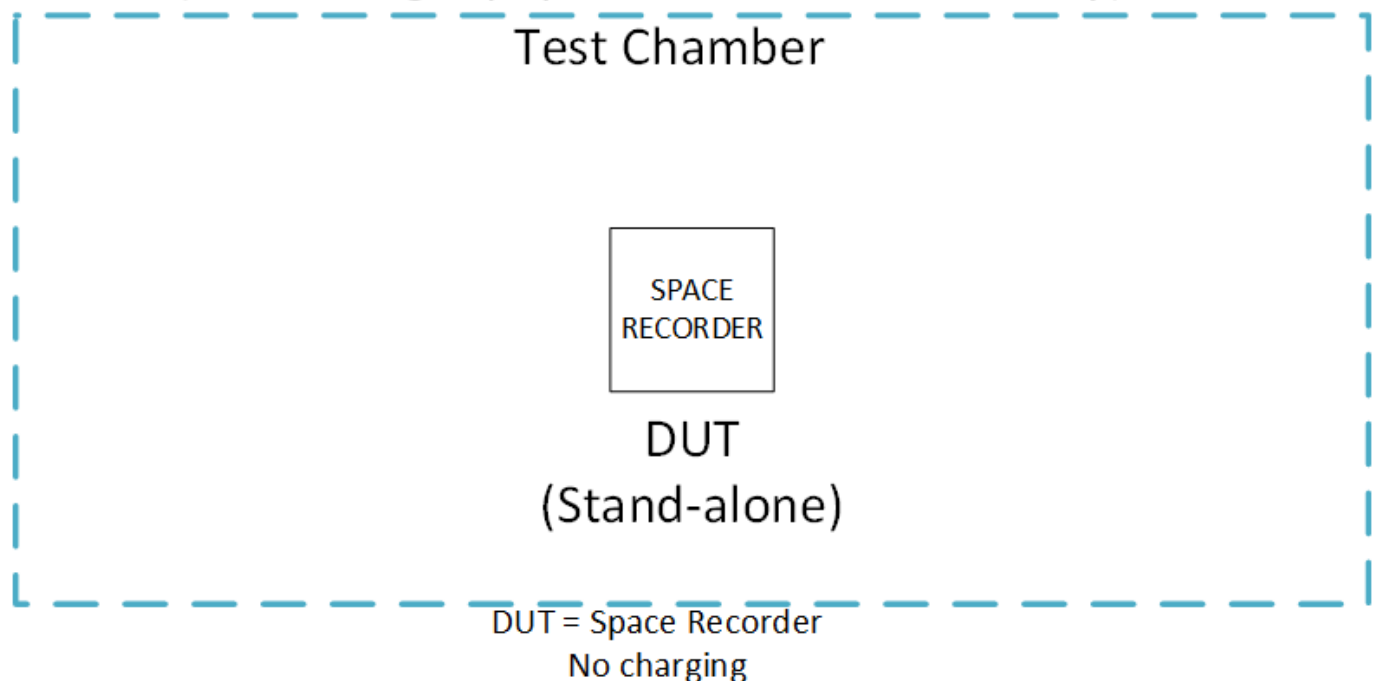
3.5 EUT Configuration During Test

AC Conducted Emissions Testing: Block Diagram (Stand-alone with charging)



Radiated Emissions & Radiated RF Testing: Block Diagram (Stand-alone, no charging)

(Measuring equipment omitted for clarity)



3.6 EUT Operation Modes

Operation mode	Description
Rec – Charge - CTX	Space Recorder only in “stand-alone” configuration. Device charging via USB (not in charging base) Radio transmitter(s) in ‘continuous transmit’ mode – channel frequency and modulation can be set manually. Details about which transmitters, channels etc. listed under “Wireless Configuration”
Rec – No Chg - CTX	Space Recorder only in “stand-alone” configuration. Device not charging (neither base nor USB) – battery power only Radio transmitter(s) in ‘continuous transmit’ mode – channel frequency and modulation can be set manually. Details about which transmitters, channels etc. listed under “Wireless Configuration”
Rec – Cond - CTX	Space Recorder only in “stand-alone” configuration. Antenna replaced by semi-rigid cable for conducted measurements Device not charging – DC power from lab power supply Radio transmitter(s) in ‘continuous transmit’ mode – channel frequency and modulation can be set manually. Details about which transmitters, channels etc. listed under “Wireless Configuration”

3.7 Deviations from the Test Standard

- As defined in FCC 47 CFR Title 47 Part 15.35 (a), a peak detector has been used in place of the quasi-peak detector for measurements between 9kHz and 30MHz in order to reduce test time
- Note about the “Main” module

The “Main” module supports WLAN 2.4GHz, WLAN 2.5 GHz and Bluetooth Low Energy.

Conducted radio tests for WLAN 2.4 GHz have been run for multiple channels, modes and data rates where appropriate. For radiated tests, the configurations with the highest power levels have been selected for radiated testing. The following approach has been applied:

- For spurious emissions 9 kHz – 30 MHz: only a single channel for a single mode and data rate has been tested
- For spurious emissions 30 MHz – 1 GHz: low, mid and high channels for the worst case mode / data rate have been tested
- For spurious emissions 1 GHz – 40 GHz: low, mid and high channels for the worst case mode / data rate have been tested and additionally the worst case channel has been tested for two further mode/data rate combinations covering different modulation types
- Band edge testing is only performed as a conducted radio test in “Authorized Band” section.
- AC Power Line emissions has been tested with one combination of WLAN 2.4GHz channel / mode / data rate.
- Results for additional testing with multiple radio transmitters operating simultaneously is available in a separate report.

3.8 Environmental Conditions

3.8.1 Environmental Conditions – CTE System

Date	Time	Temperature (°C)	Relative Humidity (%)
2023.02.21	09:20	20.6	32
2023.02.22	15:30	19.8	28
2023.02.23	07:18	19.4	29
2023.02.24	10:48	20.2	29
2023.02.28	10:57	20.2	31
2023.03.07	09:50	20.4	27
2023.03.08	08:08	19.8	21

3.8.2 Environmental Conditions – Conducted Emissions System

Date	Time	Temperature (°C)	Relative Humidity (%)
2023.03.02	09:57	22.5	23

3.8.3 Environmental Conditions – SAC5 (Radiated Emissions)

Date	Time	Temperature (°C)	Relative Humidity (%)
2023.02.23	08:00	18.1	32
2023.02.24	11:10	18.5	34
2023.02.27	09:15	18.4	30
2023.02.28	07:35	18.7	32
2023.03.01	07:17	18.7	33
2023.03.02	07:50	18.9	32

4. TEST RESULTS

4.1 Test Results – AC Power Line Conducted Emissions (Intentional Transmitter)

4.1.1 AC Power Line Conducted Emissions (Intentional) – Test Summary

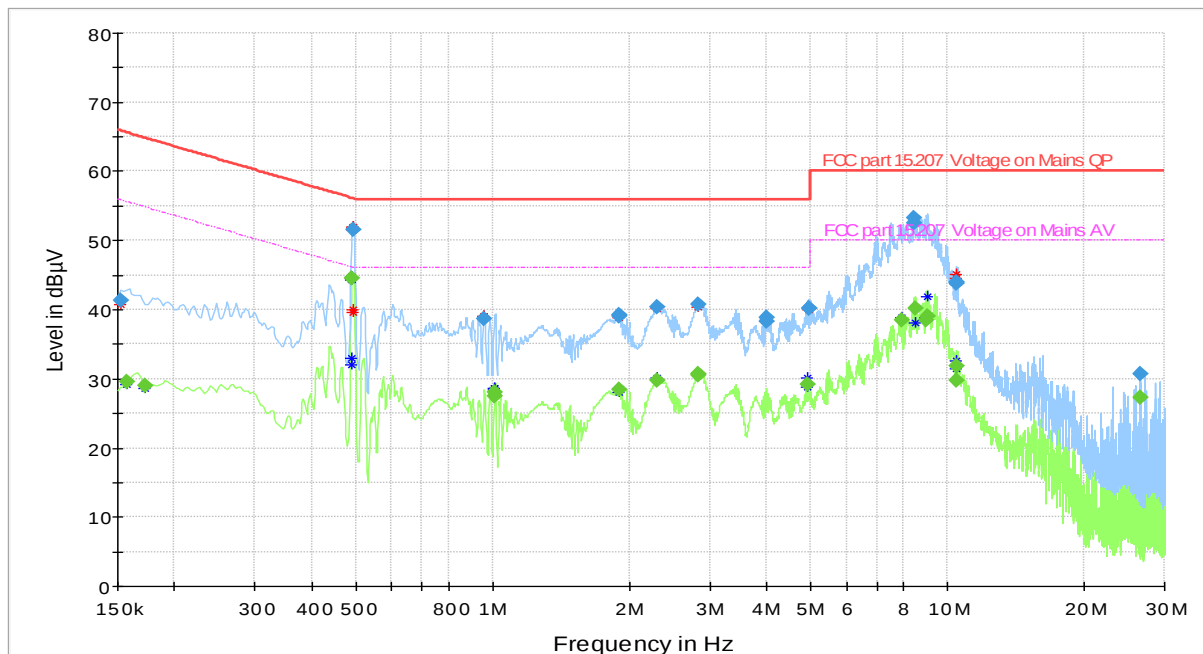
Test Specification	FCC 47 CFR 15.207 (Part 15 Subpart C)		
Test Engineer & Date	Niall Forrester	2023.03.02	
EUT and Ancillary Equipment IDs	A003421467-001	A003389898-003	
EUT Operation Mode(s)	Rec – Charge - CTX		
EUT Wireless Configuration(s)	WLAN 802.11b 2.4 GHz (see details below)		
EUT Hardware Configuration(s)	Stand-alone (Space Recorder)		
Overall Result	PASS		

Test Parameter	Wireless Configuration	Frequency Range	Result*
AC Conducted Power Line Emissions – “N” Line 115V / 60Hz Stand-alone	WLAN 802.11b 20MHz 11Mbps CH 6 (QPSK 2437 MHz)	150 kHz – 30 MHz	PASS
AC Conducted Power Line Emissions – “L1” Line 115V / 60Hz Stand-alone	WLAN 802.11b 20MHz 11Mbps CH 6 (QPSK 2437 MHz)	150 kHz – 30 MHz	PASS

* For detailed measurements, see tables and graphs in sections below

4.1.2 AC Power Line Conducted Emissions (Intentional) – Test Details: Stand-alone

Test mode condition	Conducted Emissions	
Sweep frequency	150 kHz – 30 MHz	
Standard	FCC 47 Part 15.207	
EUT	A003421467-001	
Ancillary Equipment	A003389898-003	
Test Engineer	Niall Forrester	Date: 2023.03.02



Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.152250	41.25	---	65.88	24.62	1000.0	9.000	L1	ON	9.7
0.156750	---	29.66	55.63	25.97	1000.0	9.000	L1	ON	9.7
0.172500	---	28.92	54.84	25.92	1000.0	9.000	L1	ON	9.7
0.492000	---	44.47	46.13	1.67	1000.0	9.000	L1	ON	9.6
0.494250	51.50	---	56.10	4.59	1000.0	9.000	L1	ON	9.6
0.960000	38.62	---	56.00	17.38	1000.0	9.000	L1	ON	9.7
1.009500	---	28.00	46.00	18.00	1000.0	9.000	L1	ON	9.7
1.011750	---	27.53	46.00	18.47	1000.0	9.000	L1	ON	9.7
1.893750	39.18	---	56.00	16.82	1000.0	9.000	L1	ON	9.7
1.893750	---	28.41	46.00	17.59	1000.0	9.000	L1	ON	9.7
1.896000	39.05	---	56.00	16.95	1000.0	9.000	L1	ON	9.7
2.298750	40.43	---	56.00	15.57	1000.0	9.000	L1	ON	9.7
2.301000	---	29.82	46.00	16.18	1000.0	9.000	L1	ON	9.7
2.838750	40.77	---	56.00	15.23	1000.0	9.000	L1	ON	9.8
2.838750	---	30.53	46.00	15.47	1000.0	9.000	L1	ON	9.8
2.841000	---	30.72	46.00	15.28	1000.0	9.000	L1	ON	9.8
3.986250	38.88	---	56.00	17.12	1000.0	9.000	L1	ON	9.8
3.988500	38.32	---	56.00	17.68	1000.0	9.000	L1	ON	9.8
4.920000	---	29.29	46.00	16.71	1000.0	9.000	L1	ON	9.8
4.960500	40.10	---	56.00	15.90	1000.0	9.000	L1	ON	9.8
4.980750	40.12	---	56.00	15.88	1000.0	9.000	L1	ON	9.8
7.917000	---	38.48	50.00	11.52	1000.0	9.000	L1	ON	9.8
8.430000	53.21	---	60.00	6.79	1000.0	9.000	N	ON	9.8
8.441250	52.45	---	60.00	7.55	1000.0	9.000	N	ON	9.8
8.481750	---	40.22	50.00	9.78	1000.0	9.000	N	ON	9.8
8.999250	---	38.53	50.00	11.47	1000.0	9.000	N	ON	9.9
9.024000	---	38.96	50.00	11.04	1000.0	9.000	L1	ON	9.9
10.477500	---	29.85	50.00	20.15	1000.0	9.000	N	ON	9.9
10.479750	---	31.89	50.00	18.11	1000.0	9.000	N	ON	9.9
10.486500	43.72	---	60.00	16.28	1000.0	9.000	L1	ON	9.9
10.488750	43.95	---	60.00	16.05	1000.0	9.000	L1	ON	9.9
26.610000	---	27.25	50.00	22.75	1000.0	9.000	N	ON	10.1
26.610000	30.67	---	60.00	29.33	1000.0	9.000	N	ON	10.1

4.2 Test Results – Radiated Emissions (Intentional Transmitter)

4.2.1 Radiated Emissions (Intentional) – Test Summary

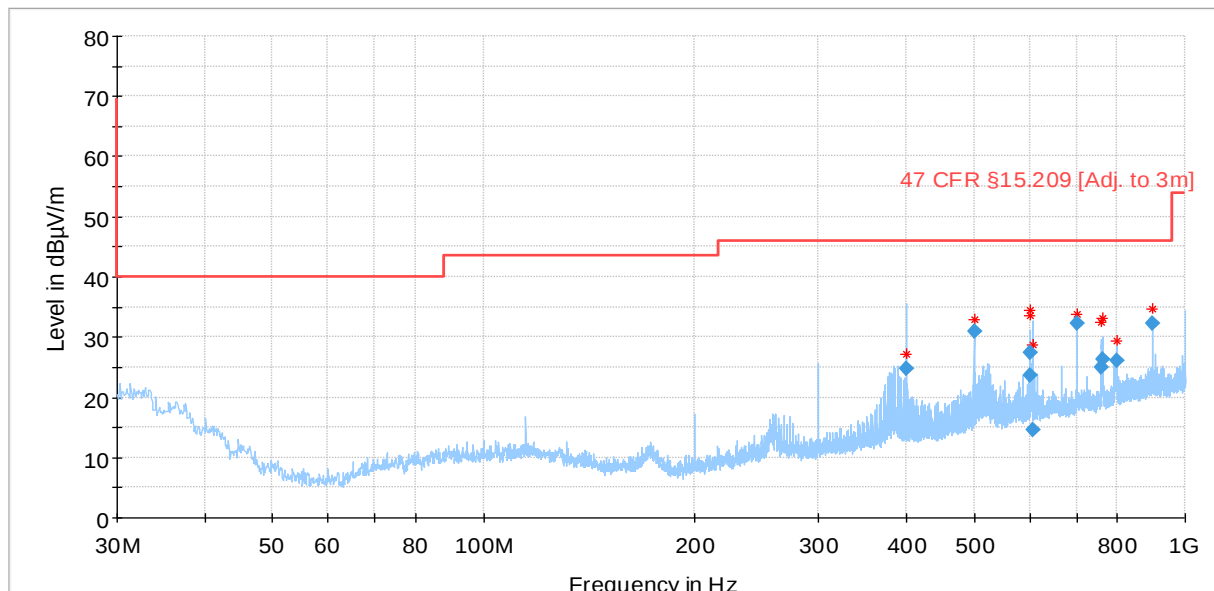
Test Specification		FCC 47 CFR 15.209 (Part 15 Subpart C)	
Test Engineer & Date		Niall Forrester Sam Ebadeh	2023.02.23 – 2023.03.02
EUT and Ancillary Equipment IDs		A003420354-001 A003421467-001 A003421467-002	N/A
EUT Operation Mode(s)		Rec – No Chg - CTX	
EUT Wireless Configuration(s)		WLAN 802.11b 2.4 GHz (see details below)	
EUT Hardware Configuration(s)		Stand-alone (Space Recorder)	
Overall Result		PASS	

Test Parameter	Wireless Configuration	Frequency Range	Result
Radiated Emissions	WLAN 802.11b 20MHz 11Mbps CH 1 (QPSK 2412 MHz)	30 MHz – 1 GHz	PASS
Radiated Emissions	WLAN 802.11b 20MHz 11Mbps CH 1 (QPSK 2412 MHz)	1 GHz – 18 GHz	PASS
Radiated Emissions	WLAN 802.11b 20MHz 11Mbps CH 1 (QPSK 2412 MHz)	18 GHz – 40 GHz	PASS
Radiated Emissions	WLAN 802.11b 20MHz 11Mbps CH 6 (QPSK 2437 MHz)	9 kHz – 30 MHz	PASS
Radiated Emissions	WLAN 802.11b 20MHz 11Mbps CH 6 (QPSK 2437 MHz)	30 MHz – 1 GHz	PASS
Radiated Emissions	WLAN 802.11b 20MHz 11Mbps CH 6 (QPSK 2437 MHz)	1 GHz – 18 GHz	PASS
Radiated Emissions	WLAN 802.11g 20MHz 24Mbps CH 6 (16-QAM 2437 MHz)	1 GHz – 18 GHz	PASS
Radiated Emissions	WLAN 802.11n 20MHz MCS3 CH 6 (16-QAM 2437 MHz)	1 GHz – 18 GHz	PASS
Radiated Emissions	WLAN 802.11b 20MHz 11Mbps CH 6 (QPSK 2437 MHz)	18 GHz – 40 GHz	PASS
Radiated Emissions	WLAN 802.11g 20MHz 24Mbps CH 6 (16-QAM 2437 MHz)	18 GHz – 40 GHz	PASS
Radiated Emissions	WLAN 802.11n 20MHz MCS3 CH 6 (16-QAM 2437 MHz)	18 GHz – 40 GHz	PASS
Radiated Emissions	WLAN 802.11b 20MHz 11Mbps CH 11 (QPSK 2462 MHz)	30 MHz – 1 GHz	PASS
Radiated Emissions	WLAN 802.11b 20MHz 11Mbps CH 11 (QPSK 2462 MHz)	1 GHz – 18 GHz	PASS
Radiated Emissions	WLAN 802.11b 20MHz 11Mbps CH 11 (QPSK 2462 MHz)	18 GHz – 40 GHz	PASS

4.2.2 Radiated Emissions (Intentional) – Test Details

Low Channel – 802.11b 20MHz 11Mbps: 30 MHz – 1 GHz

Test mode condition	WLAN 802.11b 20MHz 11Mbps CH1	
Antenna orientation	Horizontal & vertical	
Sweep frequency	30 MHz – 1 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003421467-001	
Ancillary Equipment	N/A	
Test Engineer	Sam Ebadeh	Date: 2023.02.27
Chamber details	Chamber: SAC 5	

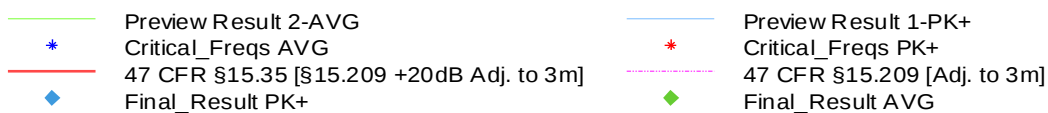
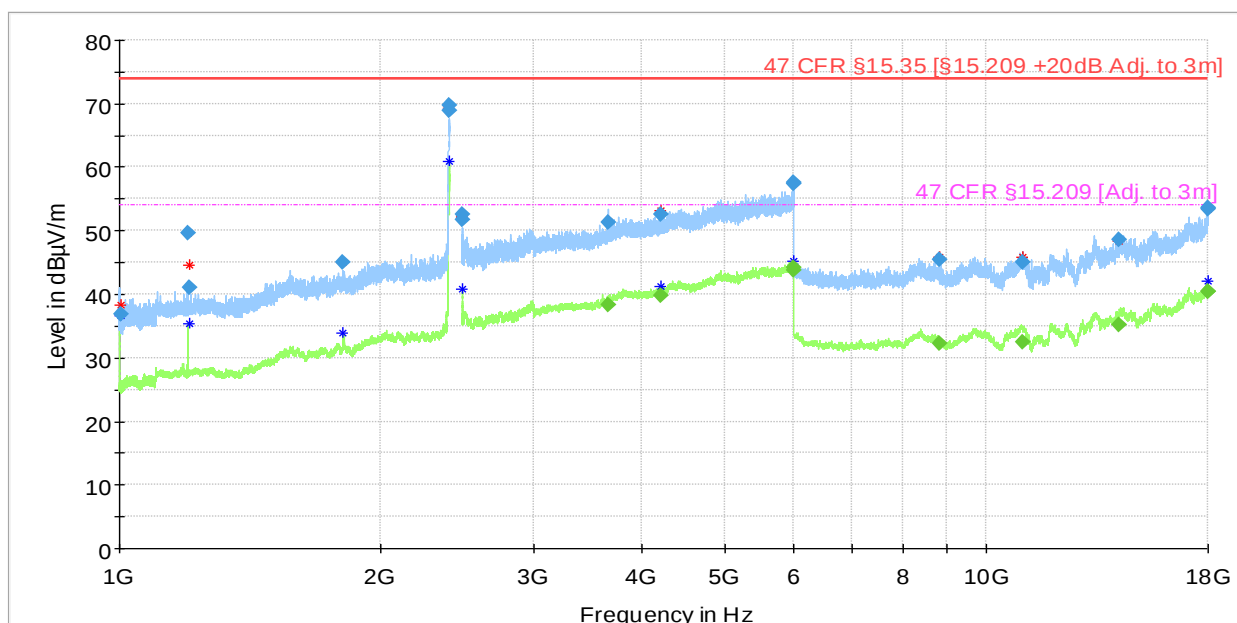


Preview Result 2-AVG	Preview Result 1-PK+
Critical_Freqs AVG	Critical_Freqs PK+
47 CFR §15.209 [Adj. to 3m]	Final_Result QPK
Final_Result AVG	MaxPeak-PK+ (Single)
QuasiPeak-QPK (Single)	Average-AVG (Single)

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
400.008040	24.75	46.02	21.27	1000.0	120.000	104.0	H	112.0
500.000520	30.86	46.02	15.16	1000.0	120.000	125.0	V	89.0
599.965280	23.65	46.02	22.37	1000.0	120.000	100.0	V	289.0
599.968880	27.32	46.02	18.70	1000.0	120.000	100.0	V	292.0
607.847640	14.69	46.02	31.33	1000.0	120.000	104.0	V	292.0
700.003720	32.31	46.02	13.71	1000.0	120.000	208.0	V	292.0
758.986000	24.88	46.02	21.14	1000.0	120.000	175.0	V	252.0
763.067200	26.37	46.02	19.65	1000.0	120.000	175.0	V	280.0
800.013360	26.13	46.02	19.89	1000.0	120.000	129.0	V	-22.0
900.005120	32.26	46.02	13.76	1000.0	120.000	129.0	V	-22.0

Low Channel – 802.11b 20MHz 11Mbps: 1 GHz – 18 GHz

Test mode condition	WLAN 802.11b 20MHz 11Mbps CH1	
Antenna orientation	Horizontal & vertical	
Sweep frequency	1 GHz – 18 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003421467-002	
Ancillary Equipment	N/A	
Test Engineer	Niall Forrester	Date: 2023.02.24
Chamber details	Chamber: SAC 5	

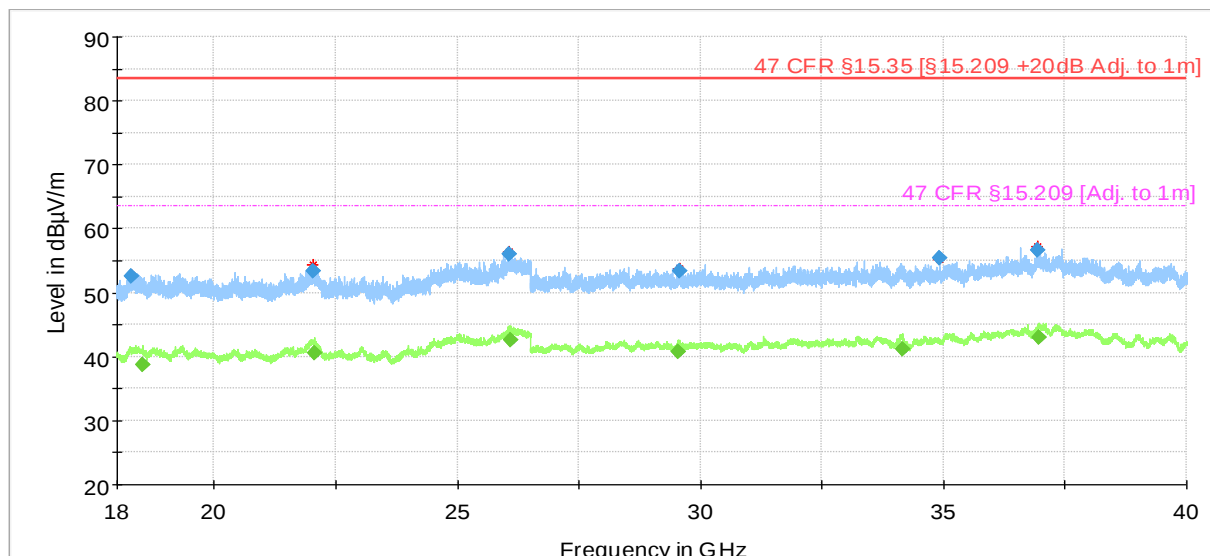


NOTE: peak at 2400MHz is an artefact of the measuring equipment and not due to the DUT
See Band Edge tests for more detailed results at this frequency

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1002.357179	36.87	---	73.98	37.11	1000.0	1000.000	199.0	H	-22.0
1200.125000	49.62	---	73.98	24.36	1000.0	1000.000	125.0	V	-22.0
1203.785000	41.10	---	73.98	32.88	1000.0	1000.000	100.0	V	296.0
1810.109000	45.04	---	73.98	28.94	1000.0	1000.000	100.0	H	296.0
2397.167494	68.93	---	73.98	5.05	1000.0	1000.000	159.0	H	26.0
2397.870520	69.81	---	73.98	4.17	1000.0	1000.000	160.0	H	42.0
2483.595000	52.58	---	73.98	21.40	1000.0	1000.000	206.0	H	202.0
2483.683209	51.79	---	73.98	22.19	1000.0	1000.000	159.0	V	26.0
3662.559000	---	38.34	53.98	15.64	1000.0	1000.000	102.0	H	-2.0
3662.559000	51.32	---	73.98	22.66	1000.0	1000.000	102.0	H	-2.0
4214.757000	---	39.76	53.98	14.22	1000.0	1000.000	125.0	V	68.0
4214.757000	52.52	---	73.98	21.46	1000.0	1000.000	125.0	V	68.0
5979.305000	57.58	---	73.98	16.40	1000.0	1000.000	100.0	V	158.0
5979.305000	---	44.18	53.98	9.80	1000.0	1000.000	100.0	V	158.0
5999.561920	57.41	---	73.98	16.57	1000.0	1000.000	170.0	V	100.0
5999.561920	---	43.73	53.98	10.25	1000.0	1000.000	170.0	V	100.0
8821.946000	45.41	---	73.98	28.57	1000.0	1000.000	120.0	V	162.0
8821.946000	---	32.24	53.98	21.74	1000.0	1000.000	120.0	V	162.0
11000.062000	---	32.50	53.98	21.48	1000.0	1000.000	175.0	V	338.0
11000.062000	45.08	---	73.98	28.90	1000.0	1000.000	175.0	V	338.0
14232.847000	---	35.23	53.98	18.75	1000.0	1000.000	159.0	H	22.0
14232.847000	48.52	---	73.98	25.46	1000.0	1000.000	159.0	H	22.0
17979.793000	---	40.40	53.98	13.58	1000.0	1000.000	210.0	H	158.0
17979.793000	53.33	---	73.98	20.65	1000.0	1000.000	210.0	H	158.0
17980.592000	---	40.32	53.98	13.66	1000.0	1000.000	135.0	H	233.0
17980.592000	53.60	---	73.98	20.38	1000.0	1000.000	135.0	H	233.0

Low Channel – 802.11b 20MHz 11Mbps: 18 GHz – 40 GHz

Test mode condition	WLAN 802.11b 20MHz 11Mbps CH1	
Antenna orientation	Horizontal & vertical	
Sweep frequency	18 GHz – 40 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003420354-001	
Ancillary Equipment	N/A	
Test Engineer	Niall Forrester	Date: 2023.02.23
Chamber details	Chamber: SAC 5	

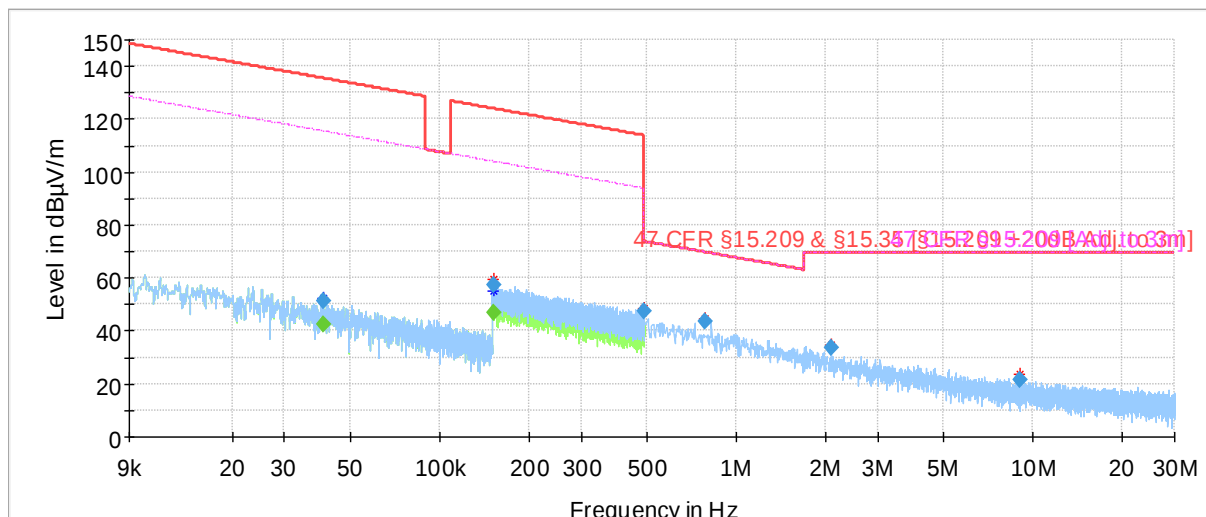


Preview Result 2-AVG	Preview Result 1-PK+
* Critical_Freqs AVG	* Critical_Freqs PK+
* Critical_Freqs AVG	* Critical_Freqs PK+
47 CFR §15.35 [§15.209 +20dB Adj. to 1m]	47 CFR §15.209 [Adj. to 1m]
◆ Final_Result PK+	◆ Final_Result AVG
◆ Final_Result PK+	◆ Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
18285.654000	52.50	---	83.52	31.03	1000.0	1000.000	155.0	V	246.0
18524.094000	---	38.76	63.52	24.76	1000.0	1000.000	155.0	V	308.0
22035.542000	53.46	---	83.52	30.06	1000.0	1000.000	155.0	H	202.0
22049.963000	---	40.53	63.52	22.99	1000.0	1000.000	155.0	H	338.0
26060.067000	56.10	---	83.52	27.42	1000.0	1000.000	155.0	H	292.0
26086.820000	---	42.55	63.52	20.97	1000.0	1000.000	155.0	V	313.0
29550.348000	---	40.82	63.52	22.70	1000.0	1000.000	155.0	H	6.0
29577.952000	53.35	---	83.52	30.17	1000.0	1000.000	155.0	H	172.0
34147.063000	---	41.13	63.52	22.40	1000.0	1000.000	155.0	V	112.0
34912.480000	55.34	---	83.52	28.18	1000.0	1000.000	155.0	V	112.0
36919.813000	56.67	---	83.52	26.85	1000.0	1000.000	155.0	V	102.0
36954.953000	---	42.96	63.52	20.57	1000.0	1000.000	155.0	V	188.0

Mid Channel – 802.11b 20MHz 11Mbps: 9 kHz – 30 MHz

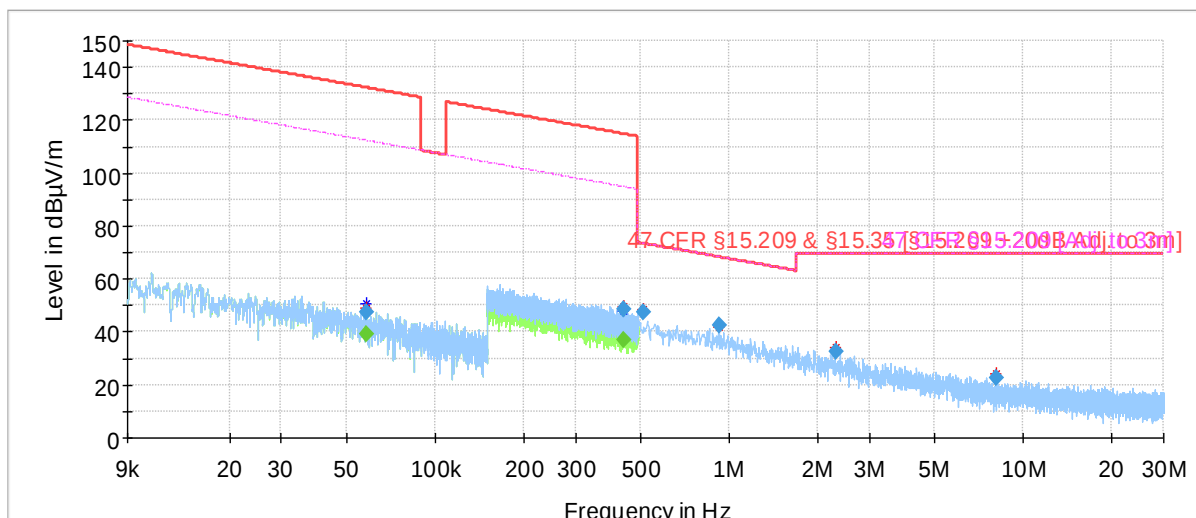
Test mode condition	WLAN 802.11b 20MHz 11Mbps CH6	
Antenna orientation	Loop Antenna parallel to axis	
Sweep frequency	9 kHz – 30 MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003420354-001	
Ancillary Equipment	N/A	
Test Engineer	Niall Forrester	Date: 2023.02.23
Chamber details	Chamber: SAC 5	



- Preview Result 2-AVG
- Preview Result 1-PK+
- * Critical_Freqs AVG
- * Critical_Freqs PK+
- 47 CFR §15.209 & §15.35 [§15.209 +20dB Adj. to 3m]
- 47 CFR §15.209 [Adj. to 3m]
- ◆ Final_Result PK+
- ◆ Final_Result AVG
- × MaxPeak-PK+ (Single)
- + Average-AVG (Single)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.040440	51.33	---	135.47	84.14	1000.0	0.200	100.0	H	-26.0
0.040440	---	42.24	115.47	73.23	1000.0	0.200	100.0	H	-26.0
0.152069	57.49	---	123.96	66.47	1000.0	9.000	100.0	H	135.0
0.152069	---	46.61	103.96	57.35	1000.0	9.000	100.0	H	135.0
0.490394	47.56	---	73.79	26.23	1000.0	9.000	100.0	H	-13.0
0.781460	43.66	---	69.76	26.10	1000.0	9.000	100.0	H	101.0
2.080710	33.39	---	69.50	36.11	1000.0	9.000	100.0	H	205.0
9.064792	21.62	---	69.50	47.88	1000.0	9.000	100.0	H	135.0

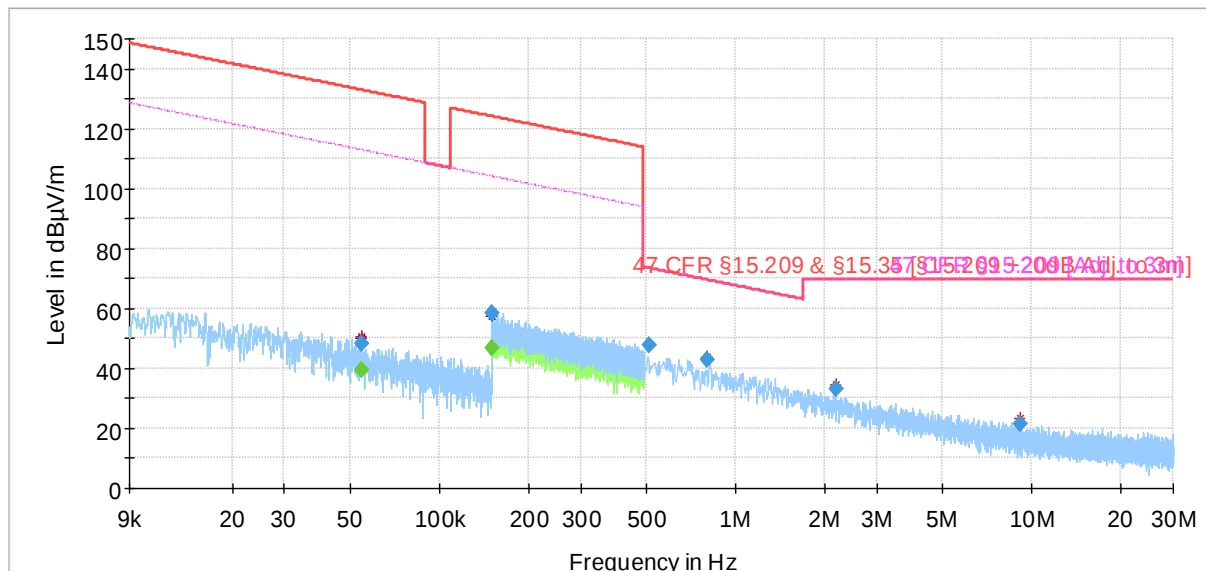
Test mode condition	WLAN 802.11b 20MHz 11Mbps CH6	
Antenna orientation	Loop Antenna perpendicular to axis	
Sweep frequency	9 kHz – 30 MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003420354-001	
Ancillary Equipment	N/A	
Test Engineer	Niall Forrester	Date: 2023.02.23
Chamber details	Chamber: SAC 5	



- Preview Result 2-AVG
- Preview Result 1-PK+
- * Critical_Freqs AVG
- * Critical_Freqs PK+
- 47 CFR §15.209 & §15.35 [§15.209 +20dB Adj. to 3m]
- 47 CFR §15.209 [Adj. to 3m]
- ◆ Final_Result PK+
- ◆ Final_Result AVG
- × MaxPeak-PK+ (Single)
- + Average-AVG (Single)

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.058196	47.69	---	132.31	84.62	1000.0	0.200	100.0	H	135.0
0.058196	---	39.01	112.31	73.30	1000.0	0.200	100.0	H	135.0
0.438109	48.43	---	114.77	66.34	1000.0	9.000	100.0	H	225.0
0.438109	---	37.22	94.77	57.55	1000.0	9.000	100.0	H	225.0
0.512000	47.41	---	73.42	26.01	1000.0	9.000	100.0	H	135.0
0.923986	42.52	---	68.31	25.79	1000.0	9.000	100.0	H	135.0
2.300031	32.59	---	69.50	36.91	1000.0	9.000	100.0	H	315.0
8.072999	22.63	---	69.50	46.87	1000.0	9.000	100.0	H	225.0

Test mode condition	WLAN 802.11b 20MHz 11Mbps CH6	
Antenna orientation	Loop Antenna parallel to floor	
Sweep frequency	9 kHz – 30 MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003420354-001	
Ancillary Equipment	N/A	
Test Engineer	Niall Forrester	Date: 2023.02.23
Chamber details	Chamber: SAC 5	

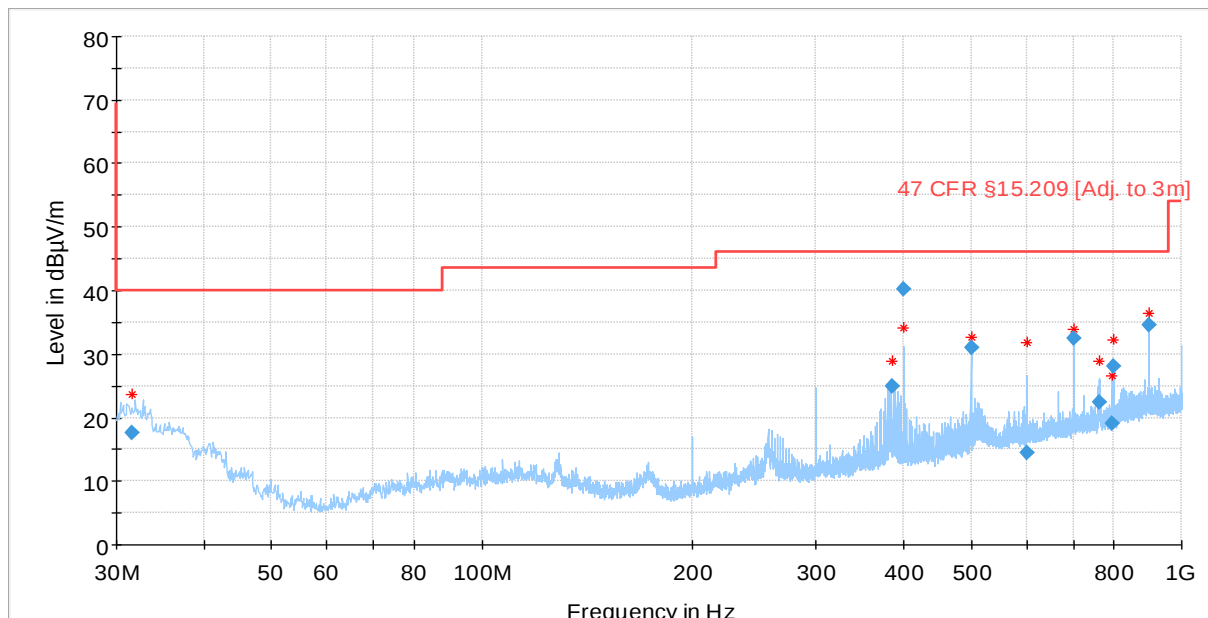


- Preview Result 2-AVG
- Preview Result 1-PK+
- * Critical_Freqs AVG
- * Critical_Freqs PK+
- 47 CFR §15.209 & §15.35 [§15.209 +20dB Adj. to 3m]
- 47 CFR §15.209 [Adj. to 3m]
- ◆ Final_Result PK+
- ◆ Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.054568	48.39	---	132.87	84.48	1000.0	0.200	100.0	H	182.0
0.054568	---	39.51	112.87	73.35	1000.0	0.200	100.0	H	182.0
0.150241	---	46.53	104.07	57.54	1000.0	9.000	100.0	H	45.0
0.150241	58.52	---	124.07	65.55	1000.0	9.000	100.0	H	45.0
0.513681	47.90	---	73.39	25.49	1000.0	9.000	100.0	H	102.0
0.800488	42.91	---	69.55	26.64	1000.0	9.000	100.0	H	45.0
2.196107	33.03	---	69.50	36.47	1000.0	9.000	100.0	H	45.0
9.092481	21.54	---	69.50	47.96	1000.0	9.000	100.0	H	315.0

Mid Channel – 802.11b 20MHz 11Mbps: 30 MHz – 1 GHz

Test mode condition	WLAN 802.11b 20MHz 11Mbps CH6	
Antenna orientation	Horizontal & vertical	
Sweep frequency	30 MHz – 1 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003421467-001	
Ancillary Equipment	N/A	
Test Engineer	Niall Forrester	Date: 2023.03.02
Chamber details	Chamber: SAC 5	



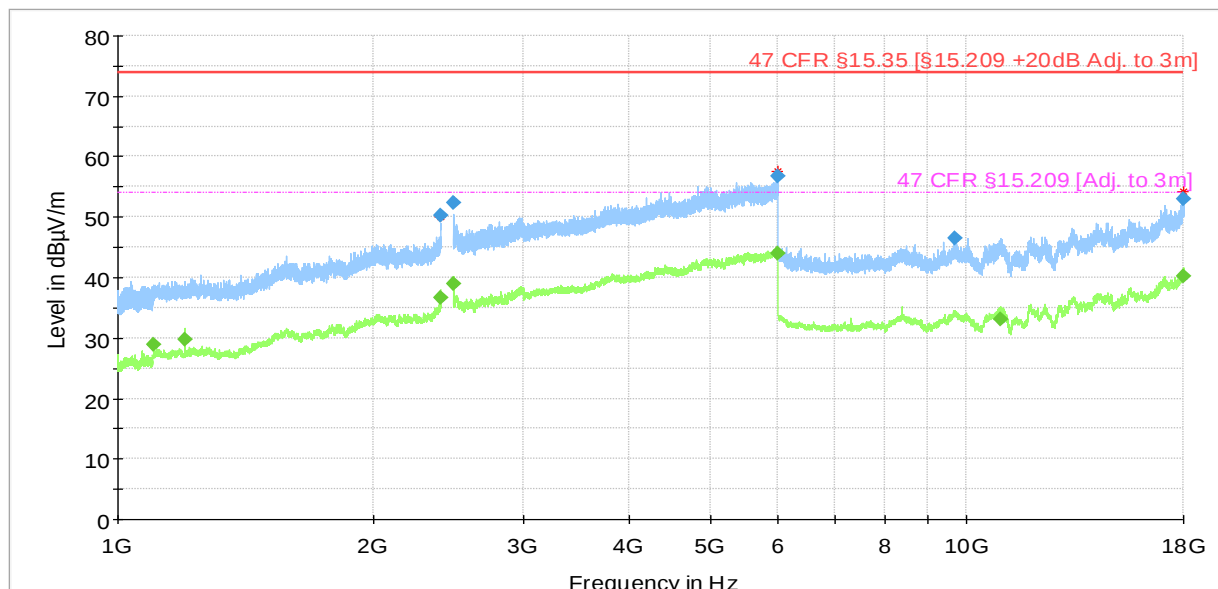
— Preview Result 2-AVG
* Critical_Freqs AVG
— 47 CFR §15.209 [Adj. to 3m]
◆ Final_Result AVG

— Preview Result 1-PK+
* Critical_Freqs PK+
◆ Final_Result QPK

Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
31.534160	17.52	---	40.00	22.48	1000.0	120.000	100.0	V	20.0
384.903560	24.92	---	46.02	21.10	1000.0	120.000	179.0	V	252.0
399.992200	40.12	---	46.02	5.90	1000.0	120.000	175.0	V	292.0
500.002080	31.07	---	46.02	14.95	1000.0	120.000	100.0	V	244.0
599.819720	14.47	---	46.02	31.55	1000.0	120.000	100.0	V	72.0
699.989440	32.40	---	46.02	13.63	1000.0	120.000	179.0	V	158.0
762.947800	22.37	---	46.02	23.65	1000.0	120.000	157.0	V	190.0
796.888600	19.03	---	46.02	26.99	1000.0	120.000	175.0	V	22.0
799.988200	27.99	---	46.02	18.03	1000.0	120.000	125.0	V	131.0
900.012440	34.62	---	46.02	11.40	1000.0	120.000	125.0	V	143.0

Mid Channel – 802.11b 20MHz 11Mbps: 1 GHz – 18 GHz

Test mode condition	WLAN 802.11b 20MHz 11Mbps CH6	
Antenna orientation	Horizontal & vertical	
Sweep frequency	1 GHz – 18 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003421467-001	
Ancillary Equipment	N/A	
Test Engineer	Niall Forrester	Date: 2023.03.01
Chamber details	Chamber: SAC 5	



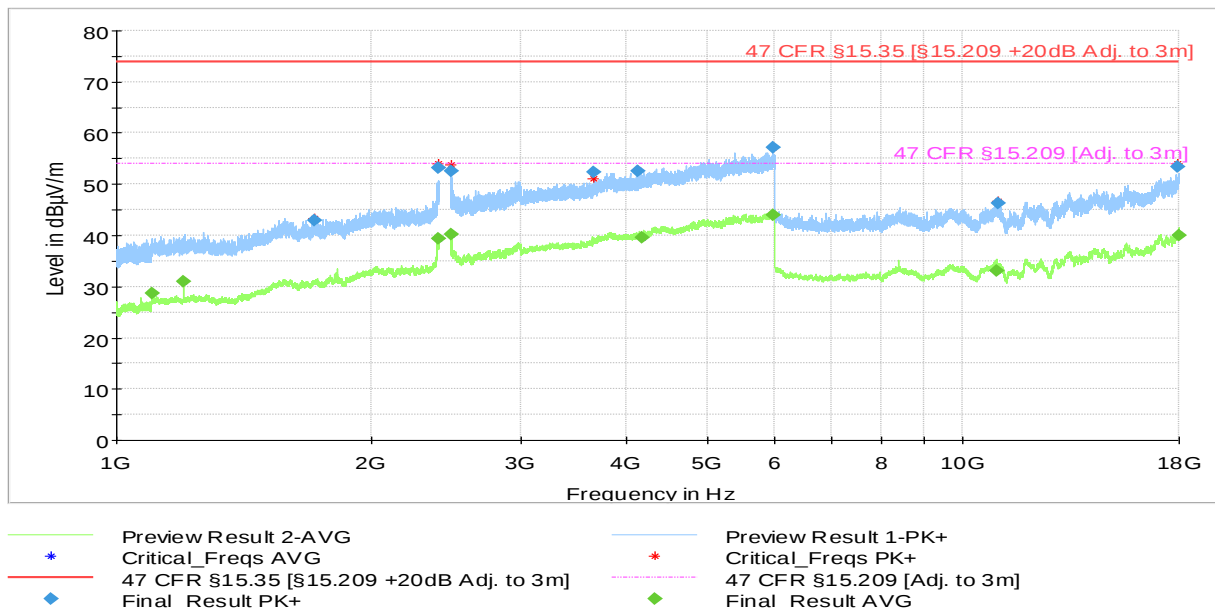
— Preview Result 2-AVG
* Critical_Freqs AVG
— 47 CFR §15.35 [§15.209 +20dB Adj. to 3m]
◆ Final_Result PK+

— Preview Result 1-PK+
* Critical_Freqs PK+
— 47 CFR §15.209 [Adj. to 3m]
◆ Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1100.034371	---	28.95	53.98	25.03	1000.0	1000.000	100.0	V	68.0
1199.675000	---	29.74	53.98	24.24	1000.0	1000.000	125.0	V	158.0
2399.839000	---	36.74	53.98	17.24	1000.0	1000.000	170.0	V	-18.0
2399.937932	50.21	---	73.98	23.77	1000.0	1000.000	125.0	V	222.0
2483.504041	52.42	---	73.98	21.56	1000.0	1000.000	175.0	V	178.0
2483.541500	---	39.02	53.98	14.96	1000.0	1000.000	210.0	V	202.0
5978.423000	---	44.07	53.98	9.91	1000.0	1000.000	149.0	H	-2.0
5979.788000	56.74	---	73.98	17.24	1000.0	1000.000	100.0	V	269.0
9666.679000	46.46	---	73.98	27.52	1000.0	1000.000	100.0	V	338.0
10955.387000	---	33.11	53.98	20.87	1000.0	1000.000	175.0	V	112.0
17981.064000	52.95	---	73.98	21.03	1000.0	1000.000	125.0	H	292.0
17986.027000	---	40.22	53.98	13.75	1000.0	1000.000	125.0	V	279.0

Mid Channel – 802.11g 20MHz 24Mbps: 1 GHz – 18 GHz

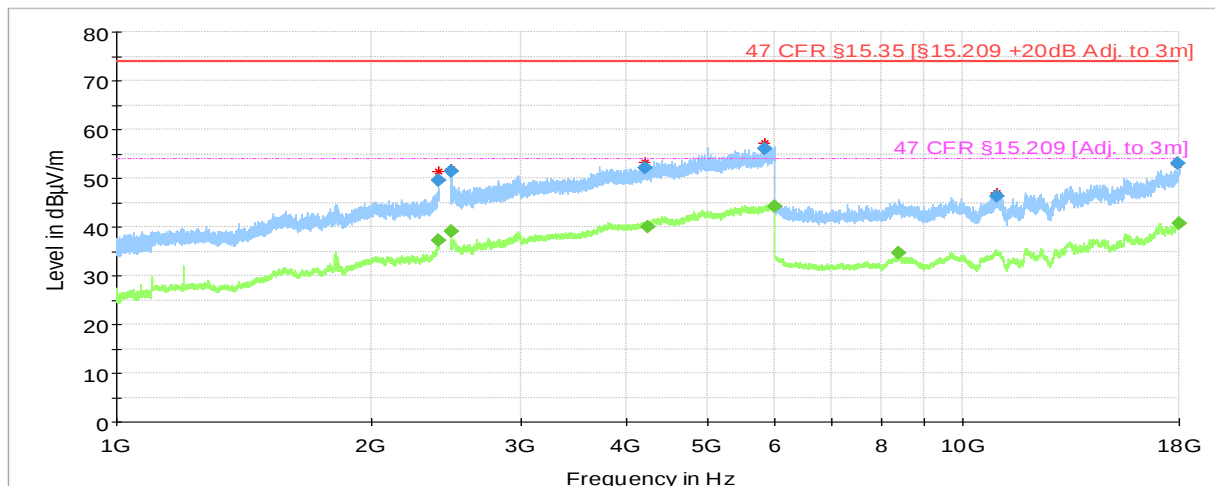
Test mode condition	WLAN 802.11g 20MHz 24Mbps CH6	
Antenna orientation	Horizontal & vertical	
Sweep frequency	1 GHz – 18 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003421467-001	
Ancillary Equipment	N/A	
Test Engineer	Niall Forrester	Date: 2023.03.01
Chamber details	Chamber: SAC 5	



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1099.977956	---	28.68	53.98	25.30	1000.0	1000.000	100.0	V	72.0
1199.949000	---	30.94	53.98	23.04	1000.0	1000.000	187.0	H	222.0
1710.683000	42.86	---	73.98	31.12	1000.0	1000.000	175.0	H	65.0
2399.736474	53.24	---	73.98	20.74	1000.0	1000.000	198.0	H	190.0
2399.933310	---	39.40	53.98	14.58	1000.0	1000.000	125.0	H	191.0
2483.542868	---	40.27	53.98	13.71	1000.0	1000.000	175.0	H	-3.0
2486.405712	52.47	---	73.98	21.50	1000.0	1000.000	175.0	H	20.0
3659.508000	52.27	---	73.98	21.71	1000.0	1000.000	210.0	H	234.0
4125.905000	52.48	---	73.98	21.50	1000.0	1000.000	125.0	V	200.0
4184.231000	---	39.65	53.98	14.33	1000.0	1000.000	100.0	V	338.0
5974.767000	57.11	---	73.98	16.87	1000.0	1000.000	187.0	V	191.0
5977.916000	---	44.06	53.98	9.92	1000.0	1000.000	102.0	V	292.0
10945.594000	---	33.06	53.98	20.92	1000.0	1000.000	175.0	H	296.0
10991.232000	46.26	---	73.98	27.72	1000.0	1000.000	175.0	V	154.0
17962.489000	53.51	---	73.98	20.47	1000.0	1000.000	125.0	H	142.0
17967.360000	---	40.10	53.98	13.88	1000.0	1000.000	210.0	V	68.0

Mid Channel – 802.11n 20MHz MCS3: 1 GHz – 18 GHz

Test mode condition	WLAN 802.11n 20MHz MCS3 CH6	
Antenna orientation	Horizontal & vertical	
Sweep frequency	1 GHz – 18 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003421467-001	
Ancillary Equipment	N/A	
Test Engineer	Niall Forrester	Date: 2023.03.02
Chamber details	Chamber: SAC 5	

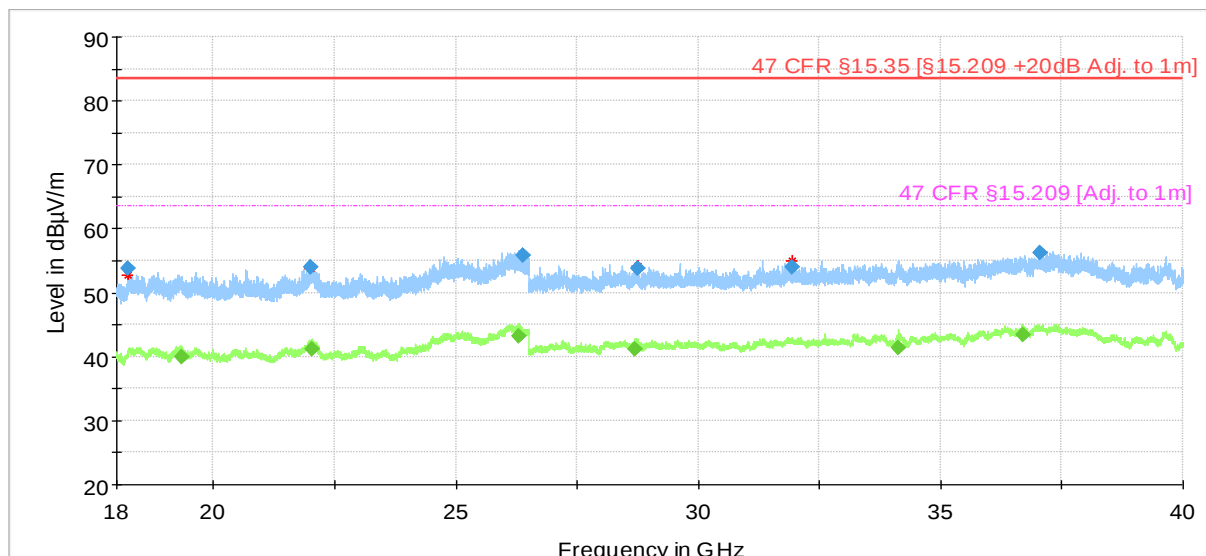


Preview Result 2-AVG	Preview Result 1-PK+
* Critical_Freqs AVG	* Critical_Freqs PK+
* Critical_Freqs AVG	* Critical_Freqs PK+
47 CFR §15.35 [§15.209 +20dB Adj. to 3m]	47 CFR §15.209 [Adj. to 3m]
◆ Final_Result PK+	◆ Final_Result AVG
◆ Final_Result PK+	◆ Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2399.861000	49.57	---	73.98	24.41	1000.0	1000.000	210.0	H	11.0
2399.972500	---	37.17	53.98	16.81	1000.0	1000.000	210.0	V	162.0
2483.558000	---	39.04	53.98	14.94	1000.0	1000.000	125.0	V	-18.0
2483.770500	51.50	---	73.98	22.48	1000.0	1000.000	188.0	V	10.0
4207.231000	52.20	---	73.98	21.78	1000.0	1000.000	146.0	H	72.0
4239.901000	---	39.91	53.98	14.07	1000.0	1000.000	210.0	H	89.0
5822.540000	55.98	---	73.98	18.00	1000.0	1000.000	100.0	H	190.0
5979.220000	---	44.18	53.98	9.80	1000.0	1000.000	100.0	V	200.0
8400.095000	---	34.68	53.98	19.30	1000.0	1000.000	186.0	V	86.0
10974.337000	46.39	---	73.98	27.59	1000.0	1000.000	206.0	V	40.0
17948.956000	52.92	---	73.98	21.06	1000.0	1000.000	197.0	V	220.0
17993.848540	---	40.73	53.98	13.25	1000.0	1000.000	210.0	V	162.0

Mid Channel – 802.11b 20MHz 11Mbps: 18 GHz – 40 GHz

Test mode condition	WLAN 802.11b 20MHz 11Mbps CH6	
Antenna orientation	Horizontal & vertical	
Sweep frequency	18 GHz – 40 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003420354-001	
Ancillary Equipment	N/A	
Test Engineer	Niall Forrester	Date: 2023.02.23
Chamber details	Chamber: SAC 5	

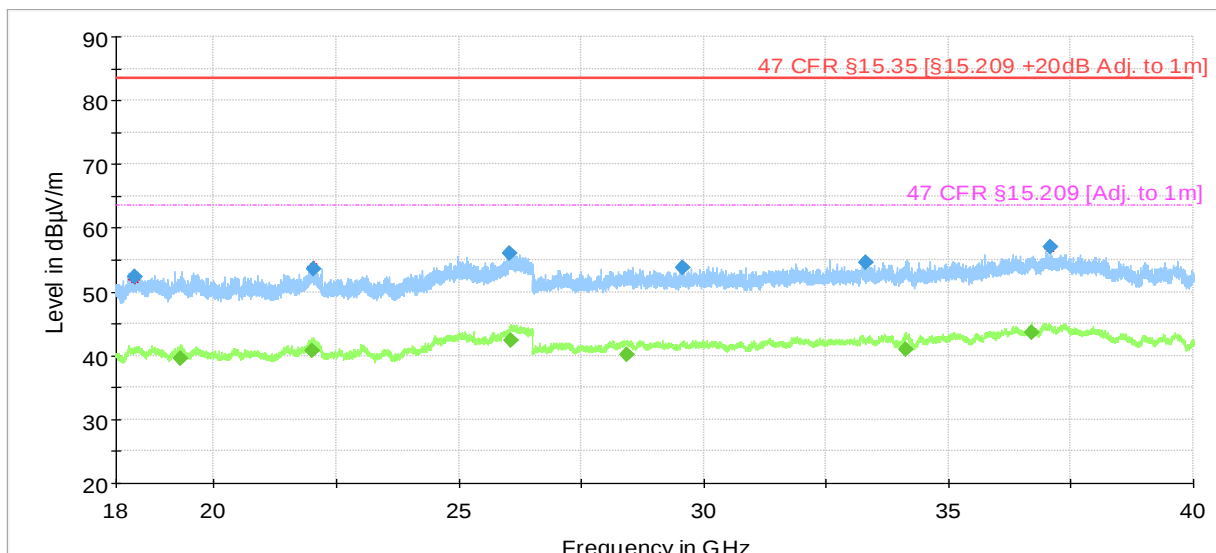


Preview Result 2-AVG	Preview Result 1-PK+
* Critical_Freqs AVG	* Critical_Freqs PK+
* Critical_Freqs AVG	* Critical_Freqs PK+
47 CFR §15.35 [§15.209 +20dB Adj. to 1m]	47 CFR §15.209 [Adj. to 1m]
◆ Final_Result PK+	◆ Final_Result AVG
◆ Final_Result PK+	◆ Final_Result AVG

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
18239.269000	53.79	---	83.52	29.73	1000.0	1000.000	155.0	H	206.0
19331.241000	---	39.84	63.52	23.68	1000.0	1000.000	155.0	H	42.0
21994.798000	54.04	---	83.52	29.48	1000.0	1000.000	155.0	H	98.0
22041.676000	---	41.10	63.52	22.42	1000.0	1000.000	155.0	H	128.0
26286.839000	---	43.13	63.52	20.40	1000.0	1000.000	155.0	V	98.0
26391.545000	55.79	---	83.52	27.73	1000.0	1000.000	155.0	H	232.0
28699.960000	---	41.12	63.52	22.40	1000.0	1000.000	155.0	H	142.0
28744.754000	53.84	---	83.52	29.68	1000.0	1000.000	155.0	V	82.0
31929.136000	54.01	---	83.52	29.51	1000.0	1000.000	155.0	H	102.0
34121.078000	---	41.27	63.52	22.26	1000.0	1000.000	155.0	V	22.0
36704.831000	---	43.49	63.52	20.03	1000.0	1000.000	155.0	V	176.0
37051.062000	56.14	---	83.52	27.38	1000.0	1000.000	155.0	H	98.0

Mid Channel – 802.11g 20MHz 24Mbps: 18 GHz – 40 GHz

Test mode condition	WLAN 802.11g 20MHz 24Mbps CH6	
Antenna orientation	Horizontal & vertical	
Sweep frequency	18 GHz – 40 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003420354-001	
Ancillary Equipment	N/A	
Test Engineer	Niall Forrester	Date: 2023.02.23
Chamber details	Chamber: SAC 5	

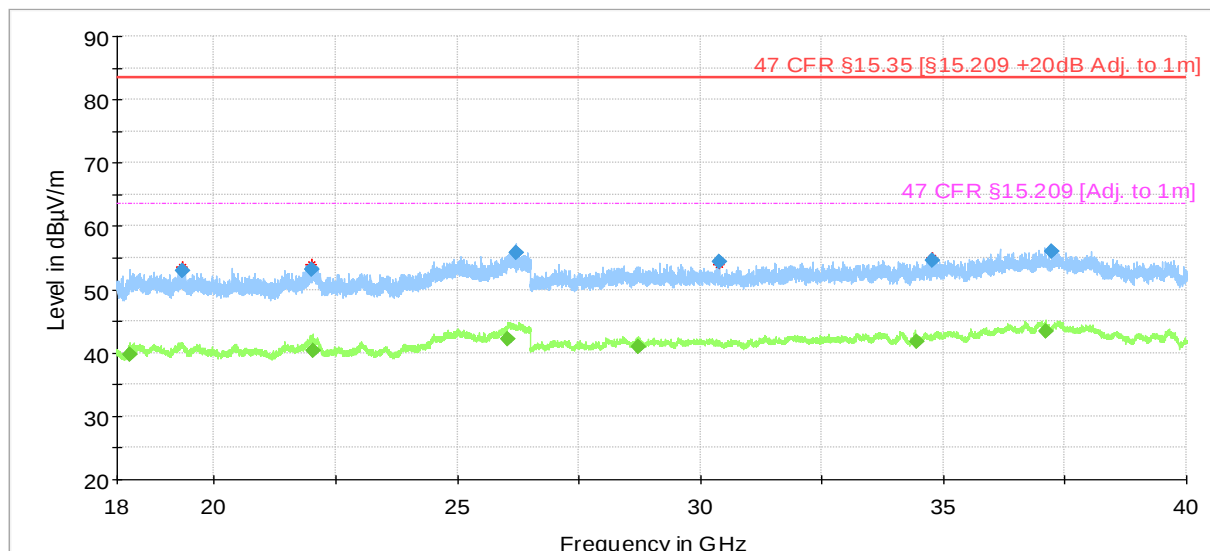


Preview Result 2-AVG	Preview Result 1-PK+
Critical_Freqs AVG	Critical_Freqs PK+
Critical_Freqs AVG	Critical_Freqs PK+
47 CFR §15.35 [§15.209 +20dB Adj. to 1m]	47 CFR §15.209 [Adj. to 1m]
Final_Result PK+	Final_Result AVG
Final_Result PK+	Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
18373.629000	52.32	---	83.52	31.20	1000.0	1000.000	155.0	H	26.0
19323.007000	---	39.63	63.52	23.89	1000.0	1000.000	155.0	H	142.0
22003.717000	---	40.79	63.52	22.73	1000.0	1000.000	155.0	H	222.0
22019.399000	53.59	---	83.52	29.93	1000.0	1000.000	155.0	H	66.0
26033.744000	56.00	---	83.52	27.52	1000.0	1000.000	155.0	H	52.0
26062.826000	---	42.39	63.52	21.13	1000.0	1000.000	155.0	V	248.0
28431.035000	---	40.17	63.52	23.35	1000.0	1000.000	155.0	H	98.0
29573.397000	53.70	---	83.52	29.82	1000.0	1000.000	155.0	V	38.0
33304.765000	54.60	---	83.52	28.93	1000.0	1000.000	155.0	V	38.0
34135.285000	---	40.92	63.52	22.61	1000.0	1000.000	155.0	H	112.0
36684.927000	---	43.57	63.52	19.95	1000.0	1000.000	155.0	V	232.0
37082.046000	57.06	---	83.52	26.46	1000.0	1000.000	155.0	V	296.0

Mid Channel – 802.11n 20MHz MCS3: 18 GHz – 40 GHz

Test mode condition	WLAN 802.11g 20MHz 24Mbps CH6	
Antenna orientation	Horizontal & vertical	
Sweep frequency	18 GHz – 40 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003420354-001	
Ancillary Equipment	N/A	
Test Engineer	Niall Forrester	Date: 2023.02.23
Chamber details	Chamber: SAC 5	

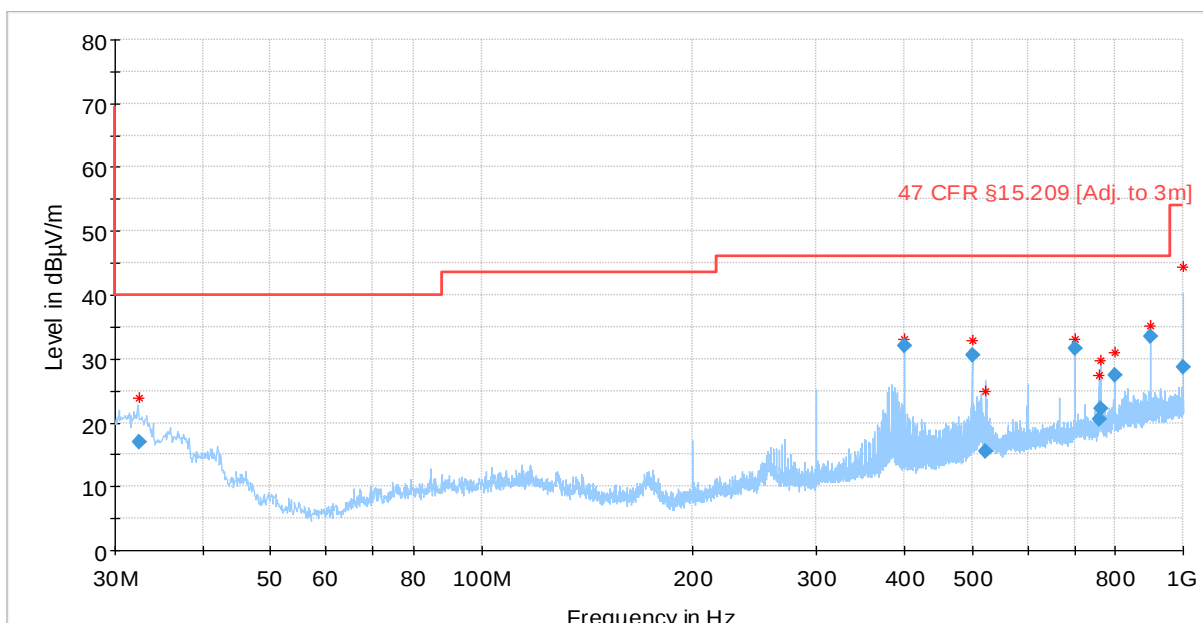


Preview Result 2-AVG	Preview Result 1-PK+
* Critical_Freqs AVG	* Critical_Freqs PK+
* Critical_Freqs AVG	* Critical_Freqs PK+
47 CFR §15.35 [§15.209 +20dB Adj. to 1m]	47 CFR §15.209 [Adj. to 1m]
◆ Final_Result PK+	◆ Final_Result AVG
◆ Final_Result PK+	◆ Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
18262.109000	---	39.81	63.52	23.71	1000.0	1000.000	155.0	H	142.0
19330.763000	52.89	---	83.52	30.63	1000.0	1000.000	155.0	H	172.0
21993.925000	53.14	---	83.52	30.39	1000.0	1000.000	155.0	V	308.0
22024.262000	---	40.42	63.52	23.10	1000.0	1000.000	155.0	V	158.0
26035.912000	---	42.20	63.52	21.32	1000.0	1000.000	155.0	V	8.0
26213.151000	55.78	---	83.52	27.74	1000.0	1000.000	155.0	H	52.0
28725.626000	---	41.01	63.52	22.51	1000.0	1000.000	155.0	H	266.0
30378.136000	54.36	---	83.52	29.16	1000.0	1000.000	155.0	V	156.0
34435.876000	---	41.86	63.52	21.66	1000.0	1000.000	155.0	V	202.0
34770.197000	54.52	---	83.52	29.00	1000.0	1000.000	155.0	V	278.0
37094.624000	---	43.35	63.52	20.17	1000.0	1000.000	155.0	H	322.0
37233.638000	55.92	---	83.52	27.61	1000.0	1000.000	155.0	V	8.0

High Channel – 802.11b 20MHz 11Mbps: 30 MHz – 1 GHz

Test mode condition	WLAN 802.11b 20MHz 11Mbps CH11	
Antenna orientation	Horizontal & vertical	
Sweep frequency	30 MHz – 1 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003421467-001	
Ancillary Equipment	N/A	
Test Engineer	Sam Ebadeh	Date: 2023.02.28
Chamber details	Chamber: SAC 5	

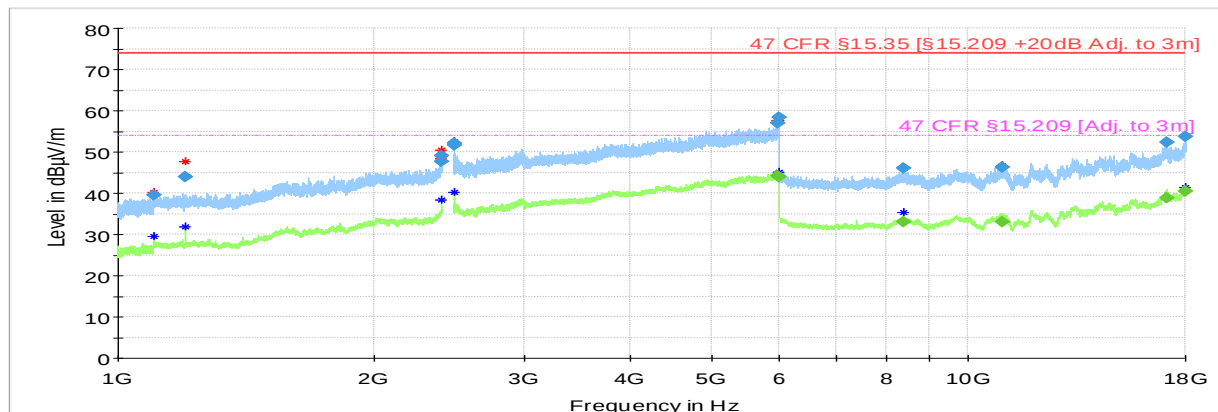


Preview Result 2-AVG	Preview Result 1-PK+
* Critical_Freqs AVG	* Critical_Freqs PK+
47 CFR §15.209 [Adj. to 3m]	◆ Final_Result QPK
◆ Final_Result AVG	

Frequency (MHz)	QuasiPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
32.510520	17.00	---	40.00	23.00	1000.0	120.000	125.0	H	289.0
400.004200	31.97	---	46.02	14.05	1000.0	120.000	175.0	V	221.0
500.000400	30.57	---	46.02	15.45	1000.0	120.000	125.0	V	65.0
521.855480	15.46	---	46.02	30.56	1000.0	120.000	100.0	V	143.0
699.987040	31.58	---	46.02	14.44	1000.0	120.000	179.0	V	296.0
758.865840	20.57	---	46.02	25.45	1000.0	120.000	279.0	V	280.0
763.215840	22.20	---	46.02	23.82	1000.0	120.000	279.0	V	154.0
799.980840	27.36	---	46.02	18.66	1000.0	120.000	129.0	V	335.0
899.981240	33.43	---	46.02	12.59	1000.0	120.000	129.0	V	296.0
999.985840	28.69	---	53.98	25.29	1000.0	120.000	125.0	V	162.0

High Channel – 802.11b 20MHz 11Mbps: 1 GHz – 18 GHz

Test mode condition	WLAN 802.11b 20MHz 11Mbps CH11	
Antenna orientation	Horizontal & vertical	
Sweep frequency	1 GHz – 18 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003421467-001	
Ancillary Equipment	N/A	
Test Engineer	Niall Forrester	Date: 2023.03.01
Chamber details	Chamber: SAC 5	

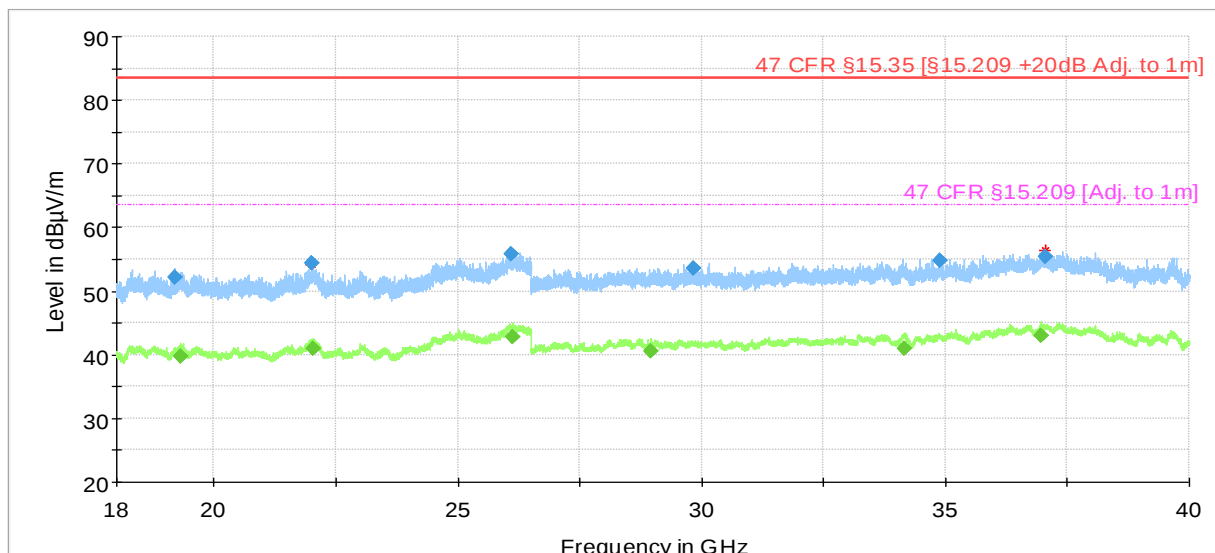


Preview Result 2-AVG	Preview Result 1-PK+
Critical_Freqs AVG	Critical_Freqs PK+
Critical_Freqs AVG	Critical_Freqs PK+
47 CFR §15.35 [§15.209 +20dB Adj. to 3m]	47 CFR §15.209 [Adj. to 3m]
Final_Result PK+	Final_Result AVG
Final_Result PK+	Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1099.757824	39.48	---	73.98	34.50	1000.0	1000.000	100.0	V	55.0
1199.673000	43.88	---	73.98	30.10	1000.0	1000.000	125.0	V	144.0
2398.837500	47.67	---	73.98	26.30	1000.0	1000.000	175.0	H	-22.0
2399.710500	48.96	---	73.98	25.02	1000.0	1000.000	113.0	H	100.0
2483.535054	52.02	---	73.98	21.96	1000.0	1000.000	121.0	V	200.0
2483.631500	51.74	---	73.98	22.24	1000.0	1000.000	127.0	H	334.0
5976.953000	57.08	---	73.98	16.90	1000.0	1000.000	113.0	H	200.0
5976.953000	---	44.09	53.98	9.89	1000.0	1000.000	113.0	H	200.0
5979.585000	---	44.06	53.98	9.92	1000.0	1000.000	100.0	V	202.0
5979.585000	58.26	---	73.98	15.72	1000.0	1000.000	100.0	V	202.0
8401.406000	---	32.99	53.98	20.99	1000.0	1000.000	110.0	V	219.0
8401.406000	45.95	---	73.98	28.03	1000.0	1000.000	110.0	V	219.0
10958.400000	---	33.00	53.98	20.98	1000.0	1000.000	125.0	V	334.0
10958.400000	46.30	---	73.98	27.68	1000.0	1000.000	125.0	V	334.0
17115.312000	52.30	---	73.98	21.68	1000.0	1000.000	100.0	V	68.0
17115.312000	---	38.92	53.98	15.06	1000.0	1000.000	100.0	V	68.0
17995.518000	53.66	---	73.98	20.32	1000.0	1000.000	125.0	V	158.0
17995.518000	---	40.43	53.98	13.55	1000.0	1000.000	125.0	V	158.0

High Channel – 802.11b 20MHz 11Mbps: 18 GHz – 40 GHz

Test mode condition	WLAN 802.11b 20MHz 11Mbps CH11	
Antenna orientation	Horizontal & vertical	
Sweep frequency	18 GHz – 40 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003420354-001	
Ancillary Equipment	N/A	
Test Engineer	Niall Forrester	Date: 2023.02.23
Chamber details	Chamber: SAC 5	



Preview Result 2-AVG	Preview Result 1-PK+
Critical_Freqs AVG	Critical_Freqs PK+
Critical_Freqs AVG	Critical_Freqs PK+
47 CFR §15.35 [§15.209 +20dB Adj. to 1m]	47 CFR §15.209 [Adj. to 1m]
Final_Result PK+	Final_Result AVG
Final_Result PK+	Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
19194.528000	52.11	---	83.52	31.41	1000.0	1000.000	155.0	H	98.0
19323.824000	---	39.65	63.52	23.87	1000.0	1000.000	155.0	H	248.0
22016.679000	54.41	---	83.52	29.11	1000.0	1000.000	155.0	H	262.0
22041.138000	---	40.98	63.52	22.54	1000.0	1000.000	155.0	H	248.0
26106.103000	55.82	---	83.52	27.70	1000.0	1000.000	155.0	V	82.0
26112.204000	---	42.77	63.52	20.75	1000.0	1000.000	155.0	V	248.0
28959.753000	---	40.51	63.52	23.01	1000.0	1000.000	155.0	H	162.0
29828.851000	53.66	---	83.52	29.86	1000.0	1000.000	155.0	V	188.0
34151.106000	---	40.92	63.52	22.60	1000.0	1000.000	155.0	H	172.0
34898.547000	54.83	---	83.52	28.70	1000.0	1000.000	155.0	H	322.0
36967.605000	---	42.92	63.52	20.60	1000.0	1000.000	155.0	H	112.0
37035.892000	55.39	---	83.52	28.14	1000.0	1000.000	155.0	V	218.0

4.3 Test Results – Antenna Conducted Emissions

4.3.1 Antenna Conducted Emissions – Test Summary

Emissions measurements have been performed as radiated test (see section 4.2)

4.4 Test Results – Band Edge Compliance (Authorized Band)

4.4.1 Band Edge Compliance (Authorized Band) – Test Summary

Test Specification	47 CFR 15.247 (d)	
Test Engineer & Date	Niall Forrester	2023.02.21 – 2023.02.28
EUT and Ancillary Equipment IDs	A003418772_001	N/A
EUT Operation Mode(s)	Rec – Cond - CTX	
EUT Wireless Configuration(s)	WLAN 802.11b/g/n 2.4 GHz (see details below)	
EUT Hardware Configuration(s)	Stand-alone (Space Recorder)	
Overall Result	PASS	

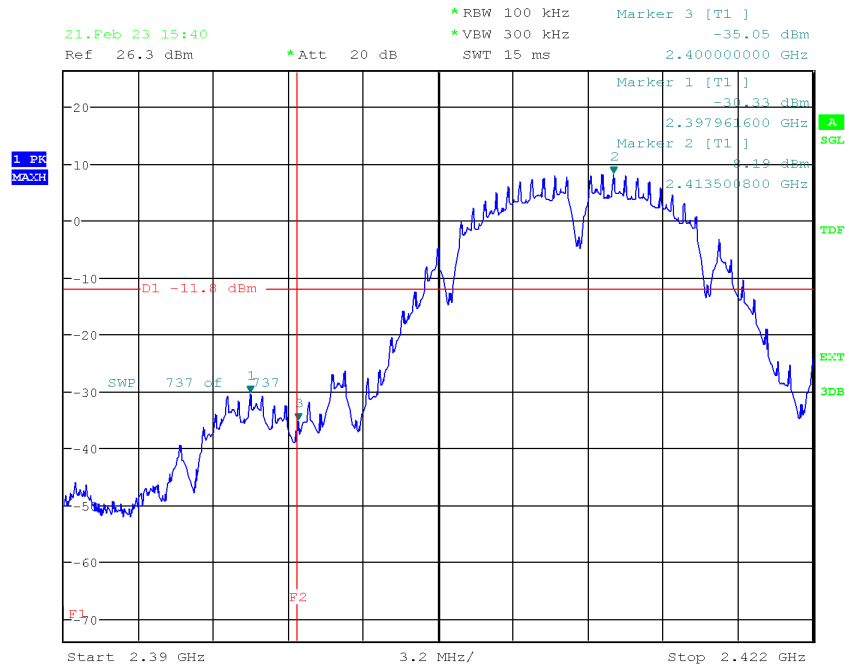
Test Parameter	Wireless Configuration	Max Pwr (dBm/ 100kHz)	Max Emission (dBC)	Limit (dBC)	Result
Peak Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11b 20MHz 1Mbps CH 1 (BPSK 2412 MHz)	8.19	-38.52	-20	PASS
Avg. Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11b 20MHz 1Mbps CH 1 (BPSK 2412 MHz)	-0.89	-38.13	-30	PASS
Peak Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11b 20MHz 5.5Mbps CH 1 (QPSK 2412 MHz)	8.94	-38.95	-20	PASS
Avg. Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11b 20MHz 5.5Mbps CH 1 (QPSK 2412 MHz)	-0.83	-45.42	-30	PASS
Peak Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11b 20MHz 11Mbps CH 1 (QPSK 2412 MHz)	8.63	-38.95	-20	PASS
Avg. Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11b 20MHz 11Mbps CH 1 (QPSK 2412 MHz)	-1.22	-40.37	-30	PASS
Peak Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11b 20MHz 1Mbps CH 11 (BPSK 2462 MHz)	7.83	-53.77	-20	PASS
Avg. Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11b 20MHz 1Mbps CH 11 (BPSK 2462 MHz)	-1.06	-54.34	-30	PASS
Peak Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11b 20MHz 5.5Mbps CH 11 (QPSK 2462 MHz)	9.55	-56.68	-20	PASS
Avg. Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11b 20MHz 5.5Mbps CH 11 (QPSK 2462 MHz)	-1.11	-57.43	-30	PASS
Peak Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11b 20MHz 11Mbps CH 11 (QPSK 2462 MHz)	8.45	-55.96	-20	PASS
Peak Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11b 20MHz 11Mbps CH 11 (QPSK 2462 MHz)	-1.42	-55.17	-30	PASS

Test Parameter	Wireless Configuration	Max Pwr (dBm/ 100kHz)	Max Emission (dBC)	Limit (dBC)	Result
Peak Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11g 20MHz 6Mbps CH 1 (BPSK 2412 MHz)	1.31	-33.50	-20	PASS
Avg. Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11g 20MHz 6Mbps CH 1 (BPSK 2412 MHz)	-6.13	-39.75	-30	PASS
Peak Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11g 20MHz 24Mbps CH 1 (16-QAM 2412 MHz)	1.39	-37.87	-20	PASS
Avg. Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11g 20MHz 24Mbps CH 1 (16-QAM 2412 MHz)	-7.03	-39.96	-30	PASS
Peak Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11g 20MHz 54Mbps CH 1 (64-QAM 2412 MHz)	1.26	-39.13	-20	PASS
Avg. Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11g 20MHz 54Mbps CH 1 (64-QAM 2412 MHz)	-7.22	-41.60	-30	PASS
Peak Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11g 20MHz 6Mbps CH 11 (BPSK 2462 MHz)	1.35	-48.36	-20	PASS
Avg. Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11g 20MHz 6Mbps CH 11 (BPSK 2462 MHz)	-5.91	-52.96	-30	PASS
Peak Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11g 20MHz 24Mbps CH 11 (16-QAM 2462 MHz)	1.49	-50.21	-20	PASS
Avg. Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11g 20MHz 24Mbps CH 11 (16-QAM 2462 MHz)	-6.71	-52.67	-30	PASS
Peak Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11g 20MHz 54Mbps CH 11 (64-QAM 2462 MHz)	1.24	-51.10	-20	PASS
Peak Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11b 20MHz 54Mbps CH 11 (64-QAM 2462 MHz)	-7.03	-53.97	-30	PASS

Test Parameter	Wireless Configuration	Max Pwr (dBm/ 100kHz)	Max Emission (dBC)	Limit (dBC)	Result
Peak Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11n 20MHz MCS0 CH 1 (BPSK 2412 MHz)	1.25	-36.32	-20	PASS
Avg. Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11n 20MHz MCS0 CH 1 (BPSK 2412 MHz)	-7.00	-42.12	-30	PASS
Peak Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11n 20MHz MCS3 CH 1 (16-QAM 2412 MHz)	1.27	-38.52	-20	PASS
Avg. Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11n 20MHz MCS3 CH 1 (16-QAM 2412 MHz)	-7.22	-42.27	-30	PASS
Peak Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11n 20MHz MCS7 CH 1 (64-QAM 2412 MHz)	1.04	-38.77	-20	PASS
Avg. Emissions at Band Edge (Auth. Band – Low Edge)	WLAN 802.11n 20MHz MCS7 CH 1 (64-QAM 2412 MHz)	-8.15	-42.13	-30	PASS
Peak Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11n 20MHz MCS0 CH 11 (BPSK 2462 MHz)	1.67	-50.18	-20	PASS
Avg. Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11n 20MHz MCS0 CH 11 (BPSK 2462 MHz)	-6.71	-53.33	-30	PASS
Peak Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11n 20MHz MCS3 CH 11 (16-QAM 2462 MHz)	1.34	-51.50	-20	PASS
Avg. Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11n 20MHz MCS3 CH 11 (16-QAM 2462 MHz)	-7.49	-53.00	-30	PASS
Peak Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11n 20MHz MCS7 CH 11 (64-QAM 2462 MHz)	1.18	-51.68	-20	PASS
Peak Emissions at Band Edge (Auth. Band – High Edge)	WLAN 802.11n 20MHz MCS7 CH 11 (64-QAM 2462 MHz)	-7.95	-52.99	-30	PASS

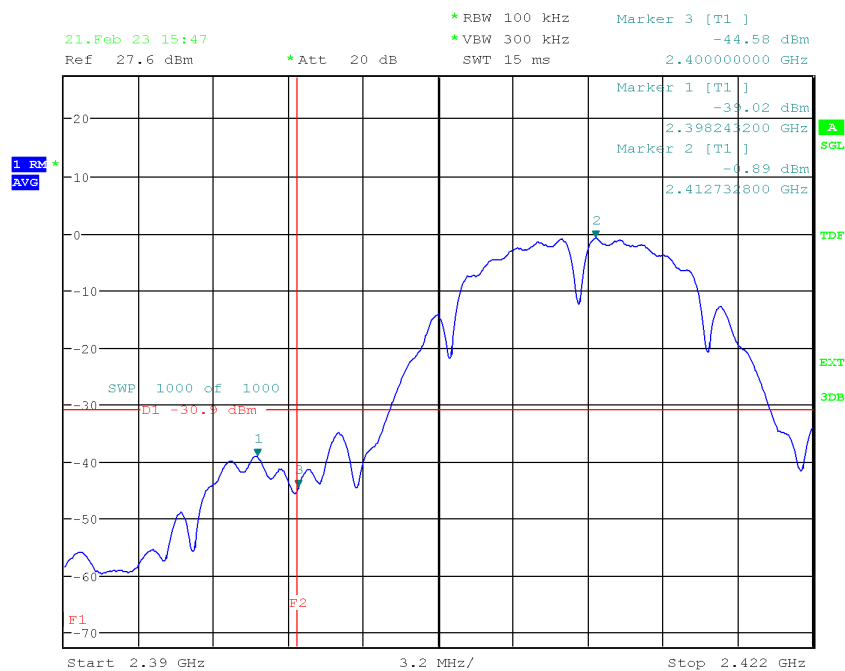
4.4.2 Band Edge Compliance (Authorized Band) – Test Details (Worst Case Plots):

Low Channel – 802.11b 20MHz 1Mbps – Peak



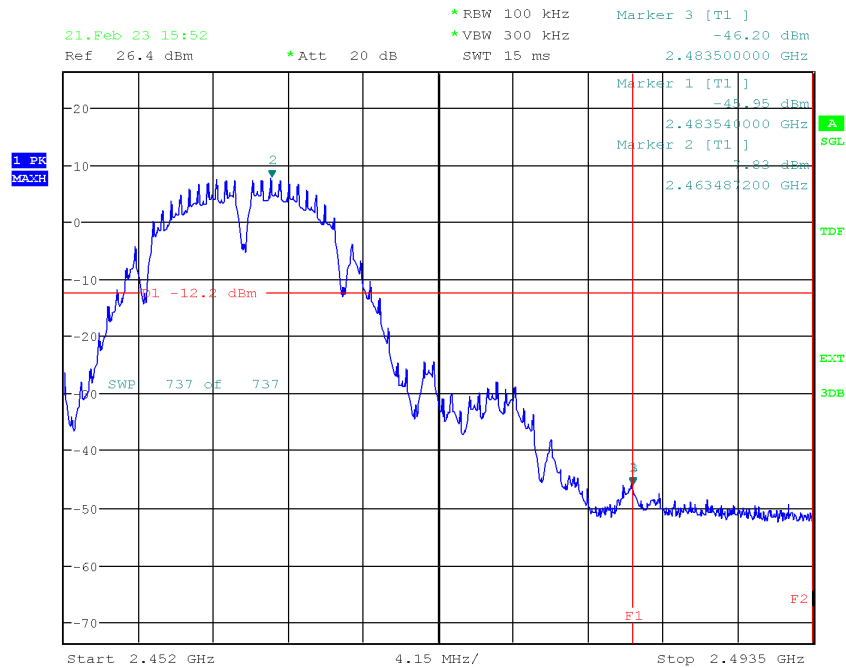
Date: 21.FEB.2023 15:40:07

Low Channel – 802.11b 20MHz 1Mbps – Average



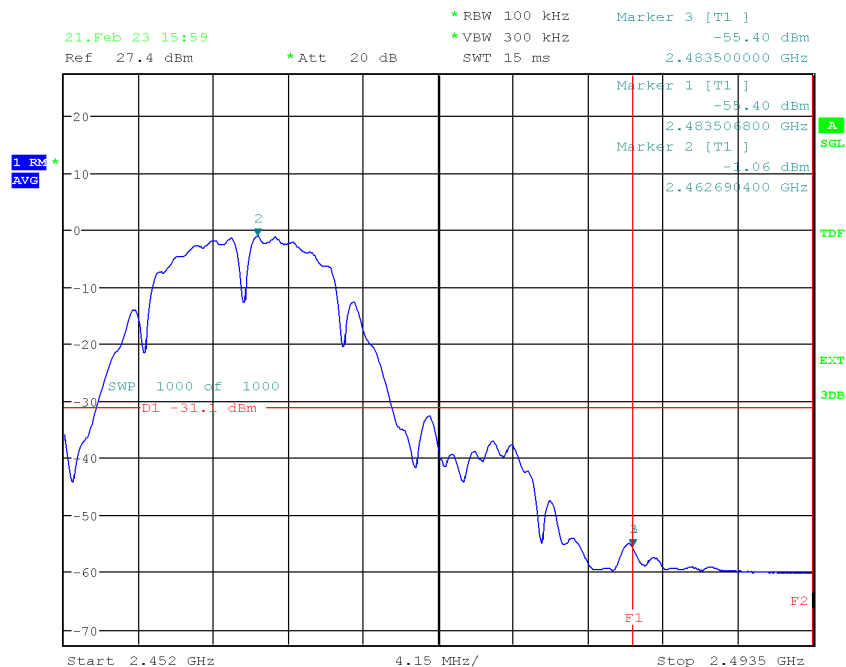
Date: 21.FEB.2023 15:47:15

High Channel – 802.11b 20MHz 1Mbps – Peak



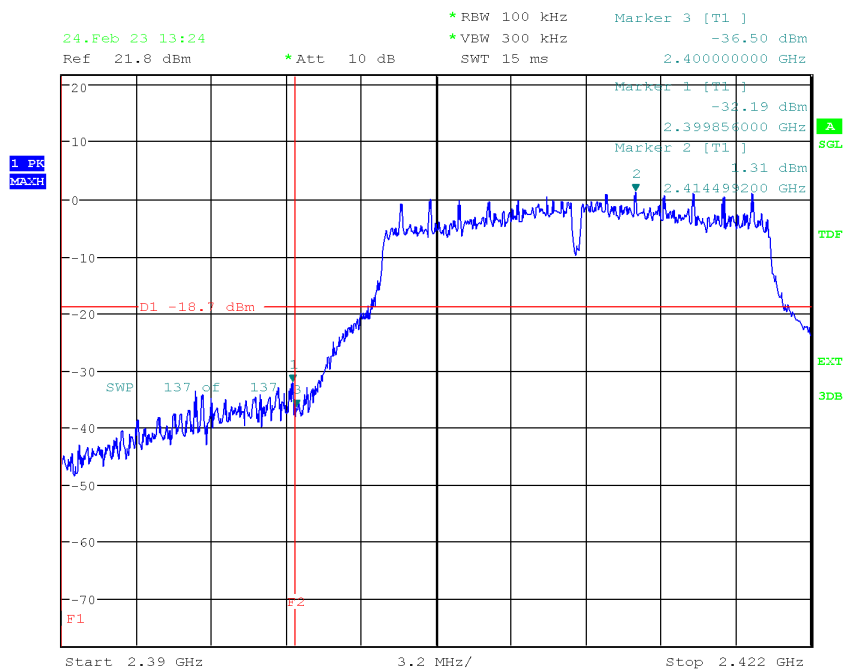
Date: 21.FEB.2023 15:52:41

High Channel – 802.11b 20MHz 1Mbps – Average



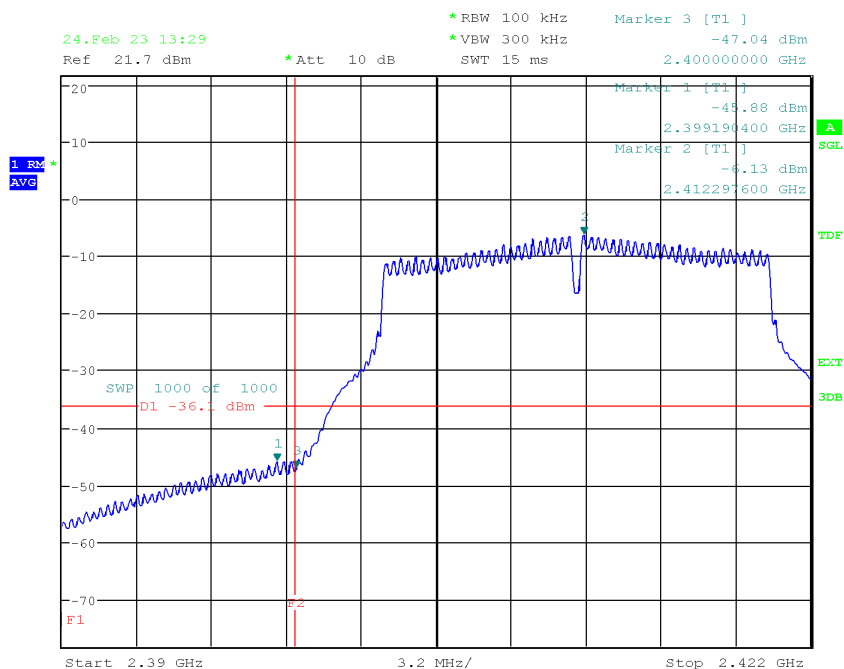
Date: 21.FEB.2023 15:59:39

Low Channel – 802.11g 20MHz 6Mbps – Peak



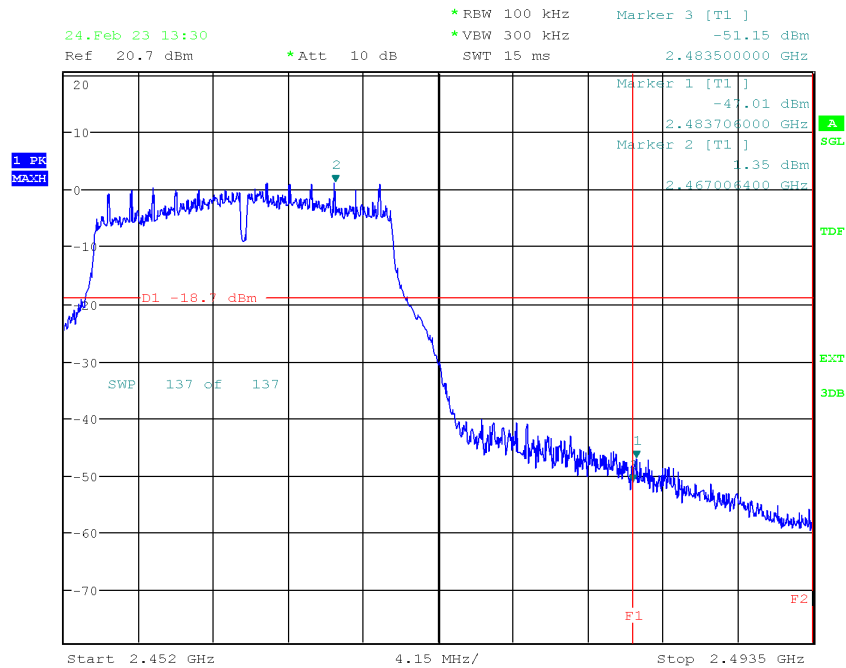
Date: 24.FEB.2023 13:24:27

Low Channel – 802.11g 20MHz 6Mbps – Average



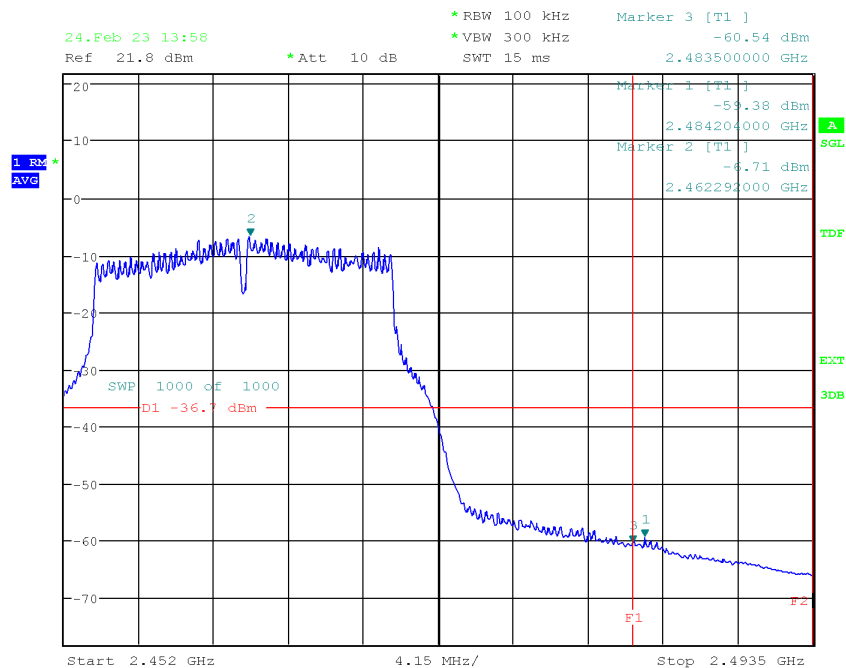
Date: 24.FEB.2023 13:29:26

High Channel – 802.11g 20MHz 6Mbps – Peak



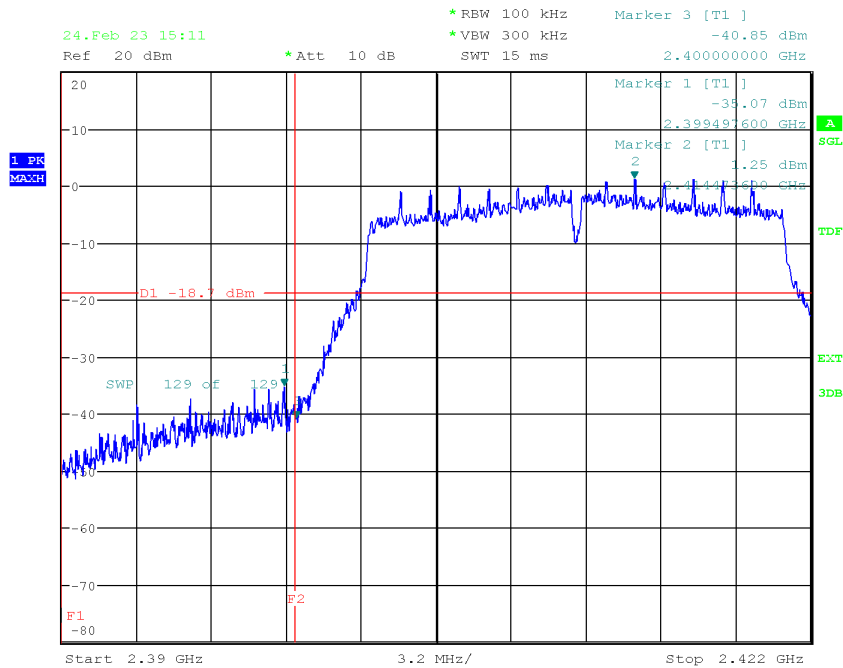
Date: 24.FEB.2023 13:30:51

High Channel – 802.11g 20MHz 24Mbps – Average



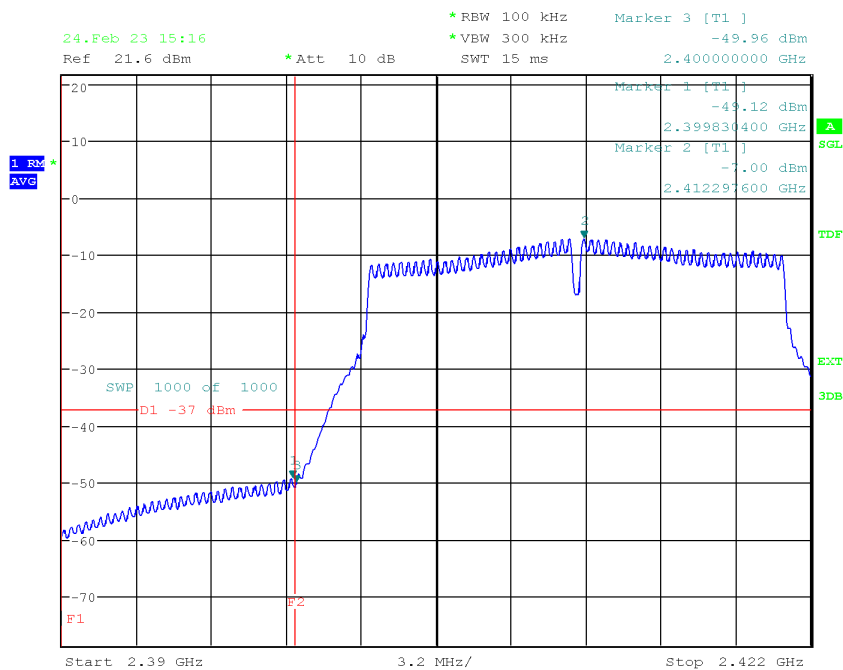
Date: 24.FEB.2023 13:58:41

Low Channel – 802.11n 20MHz MCS0 – Peak



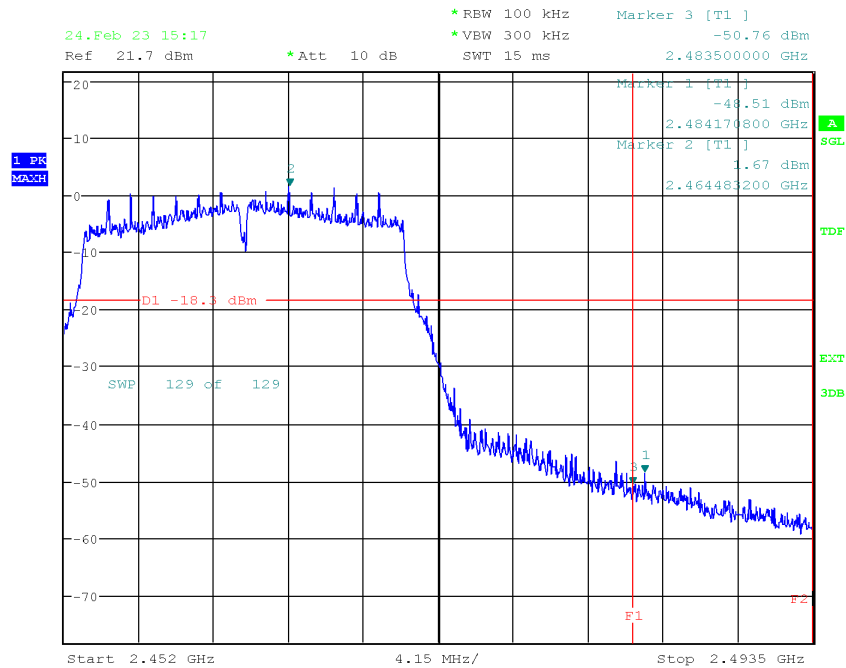
Date: 24.FEB.2023 15:11:13

Low Channel – 802.11n 20MHz MCS0 – Average



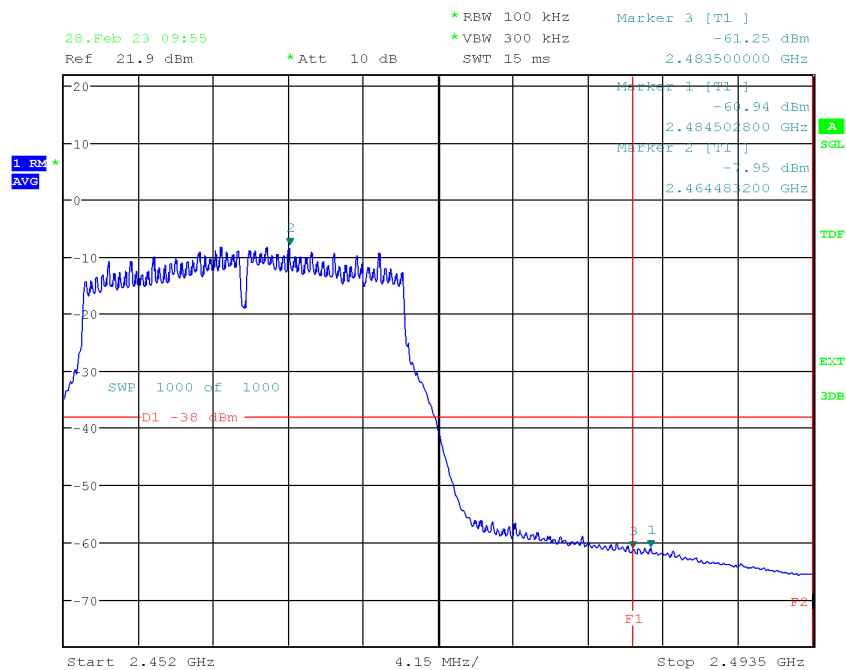
Date: 24.FEB.2023 15:16:11

High Channel – 802.11n 20MHz MCS0 – Peak



Date: 24.FEB.2023 15:17:35

High Channel – 802.11n 20MHz MCS7 – Average



Date: 28.FEB.2023 09:55:25

4.5 Test Results – Band Edge Compliance (Restricted Band)

4.5.1 Band Edge Compliance (Restricted Band) – Test Summary

Test not performed. See also section 4.4

4.6 Test Results – 20dB Bandwidth

4.6.1 20dB Bandwidth – Test Summary

This requirement is not applicable as the radio technology is non-hopping

4.7 Test Results – Carrier (Hopping Channel) Separation

4.7.1 Carrier (Hopping Channel) Separation – Test Summary

This requirement is not applicable as the radio technology is non-hopping

4.8 Test Results – Number of Hopping Channels

4.8.1 Number of Hopping Channels – Test Summary

This requirement is not applicable as the radio technology is non-hopping

4.9 Test Results – Time of Occupancy (Dwell Time)

4.9.1 Time of Occupancy (Dwell Time) – Test Summary

This requirement is not applicable as the radio technology is non-hopping

4.10 Test Results – 6dB Bandwidth

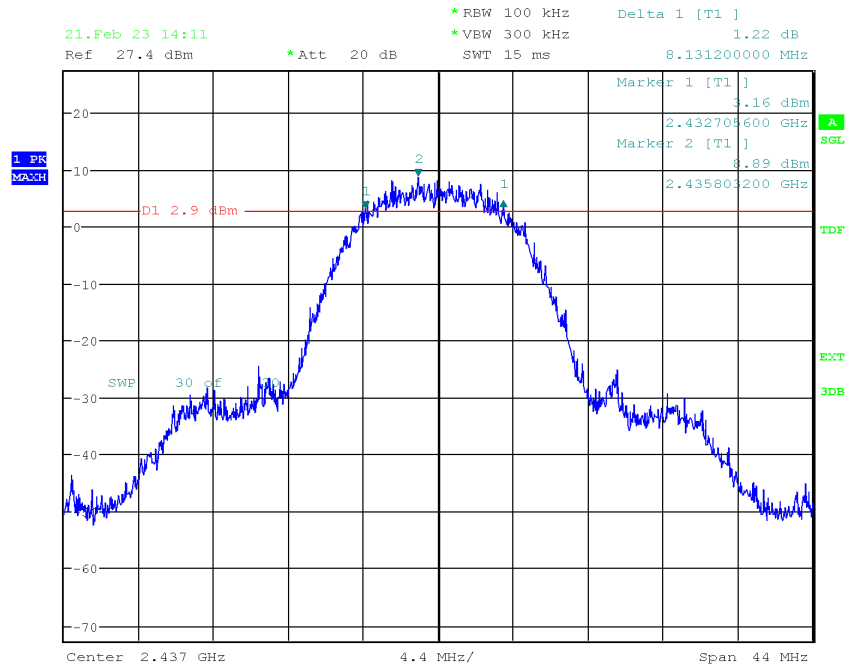
4.10.1 6dB Bandwidth – Test Summary

Test Specification	15.247 (a)(2)	
Test Engineer & Date	Niall Forrester	2023.02.21
EUT and Ancillary Equipment IDs	A003418772_001	N/A
EUT Operation Mode(s)	Rec – Cond - CTX	
EUT Wireless Configuration(s)	WLAN 802.11b/g/n 2.4 GHz (see details below)	
EUT Hardware Configuration(s)	Stand-alone (Space Recorder)	
Overall Result	PASS	

Test Parameter	Wireless Configuration	CH1 (2412 MHz) Measured (kHz)	CH6 (2437 MHz) Measured (kHz)	CH11 (2462 MHz) Measured (kHz)	Limit (kHz)	Result
6dB Bandwidth	WLAN 802.11b 20MHz 1Mbps (BPSK)	9046	9082	9046	>500	PASS
6dB Bandwidth	WLAN 802.11b 20MHz 5.5Mbps (QPSK)	8413	8554	9046	>500	PASS
6dB Bandwidth	WLAN 802.11b 20MHz 11Mbps (QPSK)	8765	8131	8342	>500	PASS
6dB Bandwidth	WLAN 802.11g 20MHz 6Mbps (BPSK)	15648	16320	16000	>500	PASS
6dB Bandwidth	WLAN 802.11g 20MHz 24Mbps (16-QAM)	15968	16320	16320	>500	PASS
6dB Bandwidth	WLAN 802.11g 20MHz 54Mbps (64-QAM)	15904	15744	15872	>500	PASS
6dB Bandwidth	WLAN 802.11n 20MHz MCS0 (BPSK)	16288	17152	16032	>500	PASS
6dB Bandwidth	WLAN 802.11n 20MHz MCS3 (16-QAM)	17280	17632	16864	>500	PASS
6dB Bandwidth	WLAN 802.11n 20MHz MCS7 (64-QAM)	15104	17408	16896	>500	PASS

4.10.2 6dB Bandwidth – Test Details: (Worst Case Plots):

Mid Channel – 802.11b 20MHz 1Mbps



Date: 21.FEB.2023 14:11:20

4.11 Test Results – Peak Conducted Output Power

4.11.1 Peak Conducted Output Power – Test Summary

Test Specification	15.247 (b)	
Test Engineer & Date	Niall Forrester	2023.02.21 – 2023.03.08
EUT and Ancillary Equipment IDs	A003418772_001	N/A
EUT Operation Mode(s)	Rec – Cond - CTX	
EUT Wireless Configuration(s)	WLAN 802.11b/g/n 2.4 GHz (see details below)	
EUT Hardware Configuration(s)	Stand-alone (Space Recorder)	
Overall Result	PASS	

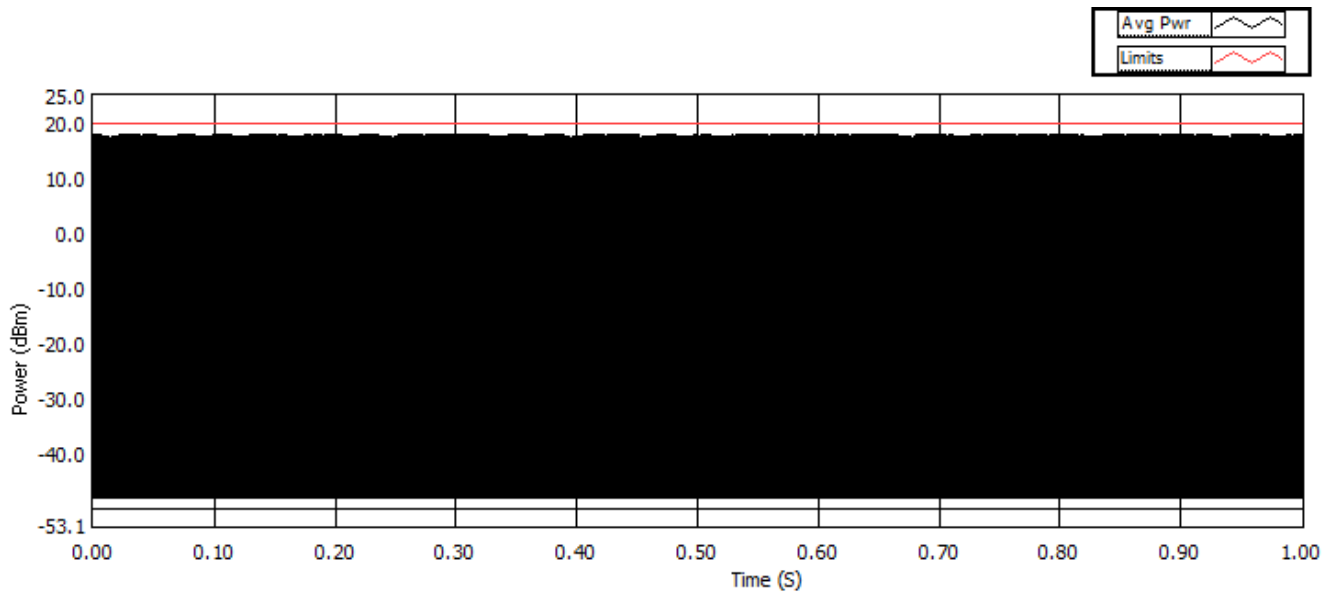
Test Parameter	Wireless Configuration	Measured Level (dBm)			Limit (dBm)	Result
		Low* 2.75V	Nom* 3.6V	High* 4.2V		
Peak Conducted Output Power	WLAN 802.11b 20MHz 1Mbps CH 1 (BPSK 2412 MHz)	-	17.70	-	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11b 20MHz 5.5Mbps CH 1 (QPSK 2412 MHz)	-	17.52	-	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11b 20MHz 11Mbps CH 1 (QPSK 2412 MHz)	17.45	17.64	17.62	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11b 20MHz 1Mbps CH 6 (BPSK 2437 MHz)	-	17.96	-	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11b 20MHz 5.5Mbps CH 6 (QPSK 2437 MHz)	-	17.98	-	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11b 20MHz 11Mbps CH 6 (QPSK 2437 MHz)	17.94	18.11	18.16	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11b 20MHz 1Mbps CH 11 (BPSK 2462 MHz)	-	17.62	-	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11b 20MHz 5.5Mbps CH 11 (QPSK 2462 MHz)	-	17.51	-	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11b 20MHz 11Mbps CH 11 (QPSK 2462 MHz)	17.56	17.63	17.64	> -20 < 30	PASS

Test Parameter	Wireless Configuration	Measured Level (dBm)			Limit (dBm)	Result
		Low* 2.75V	Nom* 3.6V	High* 4.2V		
Peak Conducted Output Power	WLAN 802.11g 20MHz 6Mbps CH 1 (BPSK 2412 MHz)	13.57	13.52	13.55	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11g 20MHz 24Mbps CH 1 (16-QAM 2412 MHz)	13.57	13.58	13.55	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11g 20MHz 54Mbps CH 1 (64-QAM 2412 MHz)	-	13.41	-	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11g 20MHz 6Mbps CH 6 (BPSK 2437 MHz)	17.76	17.99	18.11	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11g 20MHz 24Mbps CH 6 (16-QAM 2437 MHz)	17.63	17.65	17.71	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11g 20MHz 54Mbps CH 6 (64-QAM 2437 MHz)	-	15.01	-	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11g 20MHz 6Mbps CH 11 (BPSK 2462 MHz)	13.73	13.61	13.62	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11g 20MHz 24Mbps CH 11 (16-QAM 2462 MHz)	13.51	13.42	13.68	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11g 20MHz 54Mbps CH 11 (64-QAM 2462 MHz)	-	13.58	-	> -20 < 30	PASS

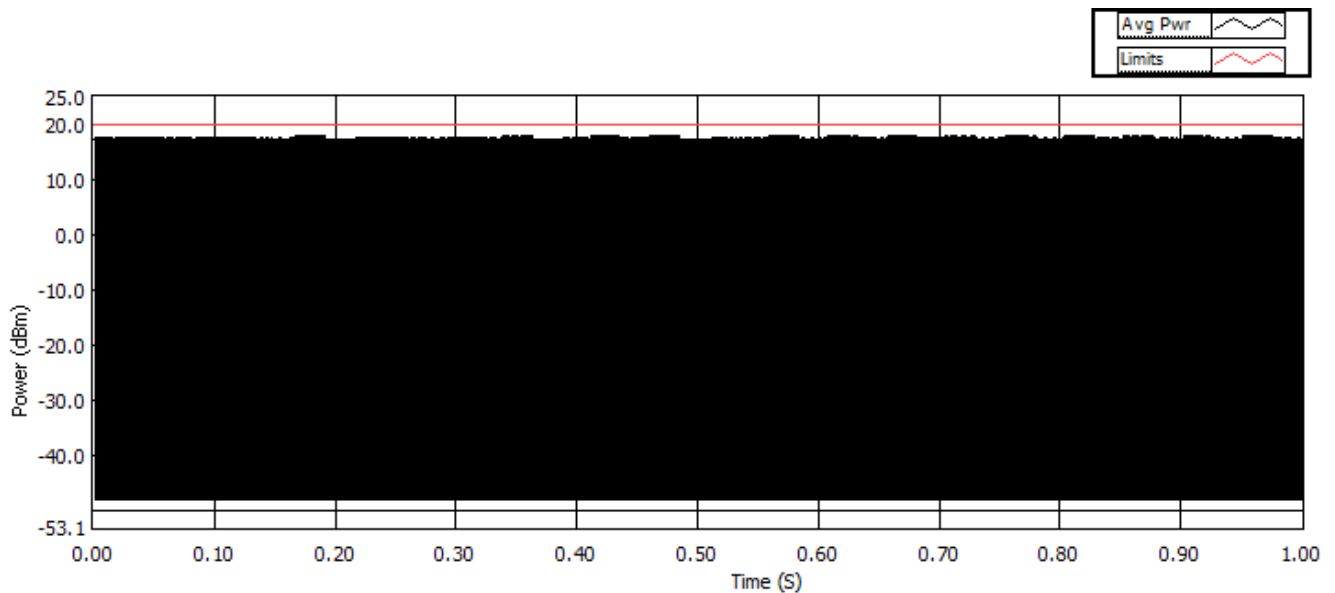
Test Parameter	Wireless Configuration	Measured Level (dBm)			Limit (dBm)	Result
		Low* 2.75V	Nom* 3.6V	High* 4.2V		
Peak Conducted Output Power	WLAN 802.11n 20MHz MCS0 CH 1 (BPSK 2412 MHz)	-	12.98	-	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11n 20MHz MCS3 CH 6 (16-QAM 2437 MHz)	13.15	13.30	13.35	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11n 20MHz MCS7 CH 11 (64-QAM 2462 MHz)	-	13.46	-	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11n 20MHz MCS0 CH 1 (BPSK 2412 MHz)	-	15.52	-	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11n 20MHz MCS3 CH 6 (16-QAM 2437 MHz)	15.69	15.65	15.59	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11n 20MHz MCS7 CH 11 (64-QAM 2462 MHz)	-	13.80	-	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11n 20MHz MCS0 CH 1 (BPSK 2412 MHz)	-	13.37	-	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11n 20MHz MCS3 CH 6 (16-QAM 2437 MHz)	13.36	13.30	13.46	> -20 < 30	PASS
Peak Conducted Output Power	WLAN 802.11n 20MHz MCS7 CH 11 (64-QAM 2462 MHz)	-	13.39	-	> -20 < 30	PASS

4.11.2 Peak Conducted Output Power – Test Details: (Worst case Plots for nominal conditions)

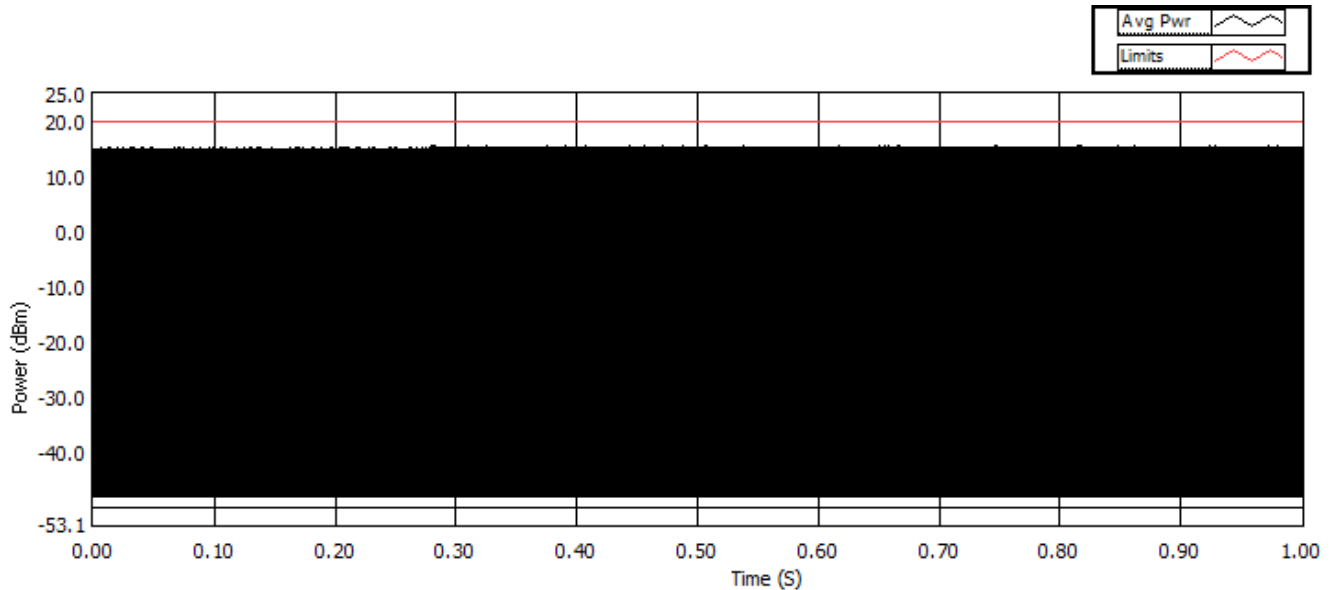
Mid Channel – 802.11b 20MHz 11Mbps



Mid Channel – 802.11g 20MHz 6Mbps



Mid Channel – 802.11n 20MHz MCS3



WLAN_F_TXMAXP_2.4G_20M_TBW_Ch_6_N_MCS3_HtMF_LGI_A1_Other Settings_hWnd_
0_ID_0_MB_Burst_TGTY_BurstTrigger_SR_5.0Ms/s_TH_20.0dBc_MT_1.0s

4.12 Test Results – Power Spectral Density

4.12.1 Power Spectral Density – Test Summary

Test Specification	15.247 (e)	
Test Engineer & Date	Niall Forrester	2023.02.21 – 2023.02.23
EUT and Ancillary Equipment IDs	A003418772_001	N/A
EUT Operation Mode(s)	Rec – Cond - CTX	
EUT Wireless Configuration(s)	WLAN 802.11b/g/n 2.4 GHz (see details below)	
EUT Hardware Configuration(s)	Stand-alone (Space Recorder)	
Overall Result	PASS	

Test Parameter	Wireless Configuration	Measured (dBm/3kHz)	Low Limit (dBm/3kHz)	High Limit (dBm/3kHz)	Result
Power Density	WLAN 802.11b 20MHz 1Mbps CH 1 (BPSK 2412 MHz)	-15.88	-30.00	8.00	PASS
Power Density	WLAN 802.11b 20MHz 5.5Mbps CH 1 (QPSK 2412 MHz)	-15.11	-30.00	8.00	PASS
Power Density	WLAN 802.11b 20MHz 11Mbps CH 1 (QPSK 2412 MHz)	-14.46	-30.00	8.00	PASS
Power Density	WLAN 802.11b 20MHz 1Mbps CH 6 (BPSK 2437 MHz)	-15.47	-30.00	8.00	PASS
Power Density	WLAN 802.11b 20MHz 5.5Mbps CH 6 (QPSK 2437 MHz)	-14.48	-30.00	8.00	PASS
Power Density	WLAN 802.11b 20MHz 11Mbps CH 6 (QPSK 2437 MHz)	-14.11	-30.00	8.00	PASS
Power Density	WLAN 802.11b 20MHz 1Mbps CH 11 (BPSK 2462 MHz)	-15.83	-30.00	8.00	PASS
Power Density	WLAN 802.11b 20MHz 5.5Mbps CH 11 (QPSK 2462 MHz)	-15.38	-30.00	8.00	PASS
Power Density	WLAN 802.11b 20MHz 11Mbps CH 11 (QPSK 2462 MHz)	-14.20	-30.00	8.00	PASS

Test Parameter	Wireless Configuration	Measured (dBm/3kHz)	Low Limit (dBm/3kHz)	High Limit (dBm/3kHz)	Result
Power Density	WLAN 802.11g 20MHz 6Mbps CH 1 (BPSK 2412 MHz)	-18.75	-30.00	8.00	PASS
Power Density	WLAN 802.11g 20MHz 24Mbps CH 1 (16-QAM 2412 MHz)	-18.05	-30.00	8.00	PASS
Power Density	WLAN 802.11g 20MHz 54Mbps CH 1 (64-QAM 2412 MHz)	-16.89	-30.00	8.00	PASS
Power Density	WLAN 802.11g 20MHz 6Mbps CH 6 (BPSK 2437 MHz)	-14.53	-30.00	8.00	PASS
Power Density	WLAN 802.11g 20MHz 24Mbps CH 6 (16-QAM 2437 MHz)	-13.68	-30.00	8.00	PASS
Power Density	WLAN 802.11g 20MHz 54Mbps CH 6 (64-QAM 2437 MHz)	-15.48	-30.00	8.00	PASS
Power Density	WLAN 802.11g 20MHz 6Mbps CH 11 (BPSK 2462 MHz)	-18.58	-30.00	8.00	PASS
Power Density	WLAN 802.11g 20MHz 24Mbps CH 11 (16-QAM 2462 MHz)	-17.61	-30.00	8.00	PASS
Power Density	WLAN 802.11g 20MHz 54Mbps CH 11 (64-QAM 2462 MHz)	-16.43	-30.00	8.00	PASS

Test Parameter	Wireless Configuration	Measured (dBm/3kHz)	Low Limit (dBm/3kHz)	High Limit (dBm/3kHz)	Result
Power Density	WLAN 802.11n 20MHz MCS0 CH 1 (BPSK 2412 MHz)	-21.19	-30.00	8.00	PASS
Power Density	WLAN 802.11n 20MHz MCS3 CH 6 (16-QAM 2437 MHz)	-20.20	-30.00	8.00	PASS
Power Density	WLAN 802.11n 20MHz MCS7 CH 11 (64-QAM 2462 MHz)	-18.38	-30.00	8.00	PASS
Power Density	WLAN 802.11n 20MHz MCS0 CH 1 (BPSK 2412 MHz)	-18.72	-30.00	8.00	PASS
Power Density	WLAN 802.11n 20MHz MCS3 CH 6 (16-QAM 2437 MHz)	-17.74	-30.00	8.00	PASS
Power Density	WLAN 802.11n 20MHz MCS7 CH 11 (64-QAM 2462 MHz)	-18.39	-30.00	8.00	PASS
Power Density	WLAN 802.11n 20MHz MCS0 CH 1 (BPSK 2412 MHz)	-20.86	-30.00	8.00	PASS
Power Density	WLAN 802.11n 20MHz MCS3 CH 6 (16-QAM 2437 MHz)	-20.01	-30.00	8.00	PASS
Power Density	WLAN 802.11n 20MHz MCS7 CH 11 (64-QAM 2462 MHz)	-18.27	-30.00	8.00	PASS

4.13 Test Results – Maximum Power and e.r.p. Summary

The following details are presented for information only

Technology	Band / Configuration	Measured Maximum Conducted Power (dBm)	Measured Maximum Conducted Power (mW)	Antenna Gain (dBi)	Calculated Maximum e.r.p (dBm)	Calculated Maximum e.r.p (mW)
WLAN 802.11b/g/n (Main)	2.4 GHz 802.11b	18.16	65.46	4.20	20.21	104.95
WLAN 802.11b/g/n (Main)	2.4 GHz 802.11g	18.11	64.71	4.20	20.16	103.75
WLAN 802.11b/g/n (Main)	2.4 GHz 802.11n	15.69	37.07	4.20	17.74	59.43

5. TEST EQUIPMENT STATUS

5.1 List of Hardware with Calibration Dates

5.1.1 Hardware List – CTE System

Type	Manufacturer	Model	Serial Number / ID	Calibration Date	Calibration Due
Comprehensive Testing Environment	TÜV Rheinland LGA Products	HWE 6000	00139	N/A	N/A
WLAN Signaling Unit	Rohde & Schwarz	CMW500	163750 2711468	2022.07.18	2023.07.18
Spectrum Analyzer	Rohde & Schwarz	FSU26	100308 2704108	2022.07.13	2023.07.13
Vector Signal Generator	Rohde & Schwarz	SMU200A	101584 2704111	2022.09.08	2023.09.08
Power Supply	Keithley	2303	1198722 2717714	2022.08.22	2023.08.22
Multimeter	Keithley	2700	1035251 2704115	2022.07.06	2023.07.06
Average Power Sensor	Rohde & Schwarz	NRP-Z31	102145 2704104	2022.07.14	2023.07.14
Temperature Chamber	Vötsch	VT4002	58566081940010 2717693	N/A	N/A
Single Input Thermometer	Fluke	Fluke-51-2	41410362WS 2807523	2022.07.02	2023.07.02
Temperature probe	Fluke	80PK-1	WPL26041802 2807528	2022.07.02	2023.07.02
Digital Multimeter	Fluke	87	61320241 2744110	2022.07.05	2023.07.05
Humidity Temperature Probe	Lufft	OPUS 20	146.0216.0802.030 2703980	2022.07.27	2024.07.27

5.1.2 Hardware List – Conducted Emissions System

Type	Manufacturer	Model	Serial Number / ID	Calibration Date	Calibration Due
Two-Line V-network	Rohde & Schwarz	ENV216	101090 2704076	2022.07.14	2023.07.14
Test Receiver 9KHz to 3.5 GHz	Rohde & Schwarz	ESR3	101674 2704016	2022.08.19	2023.08.19
Humidity Temperature Probe	Lufft	OPUS 20	146.0216.0802.030 2703980	2022.07.27	2024.07.27

5.1.3 Hardware List – SAC5 System

Type	Manufacturer	Model	Serial Number / ID	Calibration Date	Calibration Due
EMI Test Receiver	Rohde & Schwarz	ESW44	101760 2881044	2022.07.21	2023.07.21
Ultra Broadband Antenna	Rohde & Schwarz	HL562E	100988 2823181	2021.07.26	2023.07.26
Double Ridged Waveguide Horn Antenna	Rohde & Schwarz	HF907	102678 2823164	2021.07.26	2023.07.26
Horn Antenna	ETS Lindgren	UG-596A/U	20898 2814839	2022.07.26	2024.07.26
Horn Antenna – 40 GHz	ETS Lindgren	UG-600A/U	20623 2814834	2022.07.26	2024.07.26
Control Device	Maturo	NCD	NCD/393/2372.01 2884216	N/A	N/A
Open Switch & Control Unit	Rohde & Schwarz	OSP150	100081 2884198	2022.08.01	2023.08.01
Open Switch & Control Unit	Rohde & Schwarz	OSP120	100084 2761253	2022.08.01	2023.08.01
Shielded Filter Unit	Rohde & Schwarz	OSP-F Extension 1	101333 2761265	2022.08.01	2023.08.01
Shielded Filter Unit	Rohde & Schwarz	OSP-F Extension 2	101335 2761266	2022.08.01	2023.08.01
Shielded Filter Unit	Rohde & Schwarz	OSP-F Base Unit	101330 2761262	2022.08.01	2023.08.01
Humidity Temperature Probe	Lufft	OPUS 20	146.0216.0802.030 2703980	2022.07.27	2024.07.27

5.2 Software / Firmware Versions

Equipment	Software / Firmware Name	Version
Comprehensive Testing Environment (CTE)	CTE – TMF CTE – BT	V51.0 V44.0
Conducted Emissions System	EMC 32	V10.60.20
SAC 5	EMC 32	V10.60.20

6. MEASUREMENT UNCERTAINTY

6.1 Measurement Uncertainty for CTE

Parameter	Uncertainty (Coverage Factor k=2)
Maximum Output Power (15.247b)	±0.51 dB
6dB / 20dB Channel Bandwidth & 99% Occupied bandwidth (15.247a)	<5%
Carrier Frequency Separation (15.247a)	N/A
Number of Hopping Channels (15.247a)	N/A
Time of Occupancy – Dwell Time (15.247a)	N/A
Band Edge Compliance of Conducted Emissions (15.247a)	±1.04 dB
Conducted Spurious Emissions (15.247d)	±2.98 dB
Power Spectral Density (15.247e)	±0.51 dB

6.2 Measurement Uncertainty for Conducted Emissions

Parameter	Uncertainty (Coverage Factor k=2)
Conducted emissions with LISN 150KHz to 30 MHz	2.98 dB

6.3 Measurement Uncertainty for SAC 5 (Radiated Emissions & Band Edge)

Parameter	Uncertainty (Coverage Factor k=2)
Field Strength 10 Hz -9 kHz	3.38 dB
Field Strength 9 kHz -30 MHz	3.38 dB
Field Strength 30 MHz -1000 MHz	3.38 dB
Field Strength 1 GHz -18 GHz	4.88 dB
Field Strength 18 GHz - 40 GHz	5.14 dB

7. PHOTOGRAPHS

See Appendix 1 for photographs