

<b>Prüfbericht-Nr.:</b> <i>Test report no.:</i>	<b>60445831-003</b>	<b>Auftrags-Nr.:</b> <i>Order no.:</i>	23870469 030	Seite 1 von 19 <i>Page 1 of 19</i>
<b>Kunden-Referenz-Nr.:</b> <i>Client reference no.:</i>	1288983	<b>Auftragsdatum:</b> <i>Order date:</i>	2020.11.29	
<b>Auftraggeber:</b> <i>Client:</i>	IKEA of Sweden AB			
<b>Prüfgegenstand:</b> <i>Test item:</i>	Hub for smart products			
<b>Bezeichnung / Typ-Nr.:</b> <i>Identification / Type no.:</i>	DIRIGERA / E2003 / FCC ID: FHO-E2003			
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	Accredited testing according to FCC Part 15			
<b>Prüfgrundlage:</b> <i>Test specification:</i>	FCC 47 CFR Part 15.209 ANSI C63.10: 2013			
<b>Wareneingangsdatum:</b> <i>Date of sample receipt:</i>	2020.11.30			
<b>Prüfmuster-Nr.:</b> <i>Test sample no.:</i>	See section 2.3			
<b>Prüfzeitraum:</b> <i>Testing period:</i>	2021.02.17 – 2021.02.22			
<b>Ort der Prüfung:</b> <i>Place of testing:</i>	Lund, Sweden			
<b>Prüflaboratorium:</b> <i>Testing laboratory:</i>	TÜV Rheinland Sweden			
<b>Prüfergebnis*:</b> <i>Test result*:</i>	Pass			
<b>überprüft von:</b> <i>reviewed by:</i>		<b>genehmigt von:</b> <i>authorized by:</i>		
<b>Datum: 2021.12.06</b> <i>Date:</i>	Signed by: Niall Forrester	<b>Datum: 2021.12.06</b> <i>Date:</i>	Signed by: Hakan Ahlberg	
<b>Stellung / Position:</b>	Senior Technical Expert	<b>Stellung / Position:</b>	Lab Manager	
<b>Sonstiges / Other:</b>	This report contains only additional Radiated Emissions measurements for simultaneous transmissions configurations			
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* 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
<b>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.</b> <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<sup>60445831-00360445831-003</sup>

REVISION	DATE	REMARKS	AUTHOR
001	2021.08.20	First Release	Niall Forrester
002	2021.09.28	Corrected gain figures, updated module name.	Niall Forrester
003	2021.12.06	Replaced gain with module figure	Niall Forrester

Note: Latest revision report will replace all previous reports

This report based on FCC Part 15.407 Template version 1.0

## Summary of Test Results

FCC 47 CFR Rule Part	Test Description	Applicability	Report Section	RESULT	REMARKS
15.209	Radiated Emissions (Intentional Radiators)	YES	4.1	PASS	

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.

**Note 1:** the device includes pre-certified modules as described in section 2.1 below

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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:	IKEA
Address:	Tulpanvägen 8
	343 34 Älmhult
	Sweden
Contact Person:	Jeton Salihu
Contact e-Mail / Telephone	<a href="mailto:Jeton.salihu@inter.ikea.com">Jeton.salihu@inter.ikea.com</a> +46 701443175

## 2. PRODUCT INFORMATION

### 2.1 General Description

<b>Model name:</b>	DIRIGERA
<b>Manufacturer:</b>	IKEA of Sweden AB, SE-343 81 Älmhult
<b>Model number / Marketing name:</b>	E2003
<b>FCC ID:</b>	FHO-E2003
<b>Description:</b>	Electronic product acting as central hub for IKEA's Home Smart products.
<b>Ancillary Equipment:</b>	See section 2.8

The device incorporates three separate pre-certified modules:

- Murata LBEE5ZZ2AW (FCC ID: VPYLBEE5HY1MW) for WLAN 2.4 GHz 802.11 b/g/n, WLAN 5GHz 802.11 a/n/ac and Bluetooth Low Energy
- Silicon Labs MGM210L "No. 1" (FCC ID: QOQMGM210L) for ZigBee 802.15.4
- Silicon Labs MGM210L "No. 2" (FCC ID: QOQMGM210L) for Thread 802.15.4

Each module uses its own built-in antenna

### 2.2 Device Characteristics

<b>Type of Power Supply</b>	USB Power Supply (via AC/DC Adapter)
<b>Nominal Supply Voltage</b>	120V or 230V AC (Adapter) / 5V DC (USB)
<b>Supply Voltage Range</b>	100-240V AC
<b>Operating Temperature Range</b>	0°C - 40 °C
<b>Operating Air Humidity Range</b>	-
<b>Highest Internal Frequency Source</b>	5825 MHz

### 2.3 Test Samples

EUT #	EUT ID	Description	Used For:
1	A002959287-026	Standard Sample	Radiated Emissions

## 2.4 Wireless Technologies and Bands Supported by the EUT

Technology	Band	Frequency Range (Tx)	Evaluation Performed*
WiFi 802.11 b/g/n (LBEE5ZZ2AW)	2.4 GHz	2412 MHz - 2462 MHz	NO
WiFi 802.11 a/n/ac (LBEE5ZZ2AW)	5 GHz	5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5720 MHz 5745 MHz - 5825 MHz	YES
BlueTooth Low Energy (LBEE5ZZ2AW)	2.4 GHz	2402 MHz – 2480 MHz	NO
ZigBee 802.15.4 (MGM210L No.1)	2.4 GHz	2400 MHz – 2483.5 MHz	YES
Thread 802.15.4 (MGM210L No.2)	2.4 GHz	2400 MHz – 2483.5 MHz	YES

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

## 2.5 Antenna Information

Technology	Band	Number of Antennas	Antenna Type(s)	Gain
WiFi 802.11 a/b/g/n/ac	2.4 GHz	1	Monopole	0.10
BlueTooth Low Energy (LBEE5ZZ2AW)	5 GHz			-0.40
ZigBee 802.15.4 (MGM210L No.1)	2.4 GHz	1	Inverted F PCB Trace	0.50
Thread 802.15.4 (MGM210L No.2)	2.4 GHz	1	Inverted F PCB Trace	0.50

## 2.6 Simultaneous Transmission Capabilities

Active Technologies	Bands	Active Modules
WiFi 802.11 a/n/ac +	5 GHz	(LBEE5ZZ2AW)
ZigBee 802.15.4	2.4 GHz	(MGM210L No.1)
WiFi 802.11 a/n/ac +	5 GHz	(LBEE5ZZ2AW)
Thread 802.15.4	2.4 GHz	(MGM210L No.2)

Except for the two cases listed above, no other simultaneous transmission capabilities are supported by the device. It is not possible for the device to send on any two 2.4GHz technologies simultaneously, and there is no situation where all three modules are active simultaneously. The LBEE5ZZ2AW module cannot transmit for Bluetooth simultaneously with any WLAN configuration.

## 2.7 Wireless Technology Details

Technology	Band	Modulation Type(s)	No. of Channels	Channel Spacing	Adaptivity
WiFi 802.11 b/g/n (LBEE5ZZ2AW)	2.4 GHz	CCK / BPSK / QPSK / 16-QAM / 64-QAM	11	5 MHz	N/A
WiFi 802.11 a/n/ac (LBEE5ZZ2AW)	5 GHz	BPSK / QPSK / 16-QAM / 64-QAM	As per 802.11	5 MHz	N/A
BlueTooth Low Energy (LBEE5ZZ2AW)	2.4 GHz	GFSK	40	2 MHz	N/A
ZigBee 802.15.4 (MGM210L No.1)	2.4 GHz	O-QPSK	16	5 MHz	N/A
Thread 802.15.4 (MGM210L No.2)	2.4 GHz	O-QPSK	16	5 MHz	N/A

## 2.8 U-NII Details

Technology	Band	Usage	TPC Support	DFS Support
WiFi 802.11 a/n/ac (LBEE5ZZ2AW)	5 GHz	Indoor	NO	NO

## 2.9 Ancillary Equipment

ID	Description	Manufacturer / Model	Hardware & Software Versions
A002959287-014	AC/DC Power Supply	IKEA ICPWS5	-
A002959287-015	USB Cable	-	-
A002959287-023	LAN Cable (UTP)	-	-

## 2.10 EUT Diagrams

-

### 3. TEST METHODS

#### 3.1 Test Standards

Testing was performed according to the following standards / references

Standard	Version	Description
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
KDB 789033 D02	V02r01	Guidelines for compliance testing of Unlicensed National information Infrastructure (U-NII) devices. Part 15, Subpart E
KDB 996369 D01	V02	Transmitter module Equipment Authorization Guide



### 3.3 Limits

FCC 47 CFR Rule Part	Test Description	Limit Reference (FCC 47 CFR Reference)
15.209	Radiated Emissions (Intentional Radiators)	15.209 (a) *See Notes 1 & 2

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  $\mu\text{V}/\text{m}$ . Measurements on the test system are made in  $\text{dB}\mu\text{V}/\text{m}$ . 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  $100\mu\text{V}/\text{m}$  at 3m. This gives:

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

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  $30\mu\text{V}/\text{m}$  (=29.54  $\text{dB}\mu\text{V}/\text{m}$ ) at 30m

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

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

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

#### Note 2

Where emission limits are specified in  $\text{dBm}/\text{MHz}$ , a detector bandwidth of 1MHz has been used (unless otherwise stated) to allow for direct conversion from  $\text{dBm}$  to  $\text{dBm}/\text{MHz}$ . Conversion from  $\text{dBm}$  to  $\text{dB}\mu\text{V}/\text{m}$  has been performed according to the equation below and adjustment based on test distances is performed as above.

$$\text{Limit}(\text{dB}\mu\text{V} @3\text{m}) = \text{Limit}(\text{dBm}) + 95.23$$

### 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 3.7

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

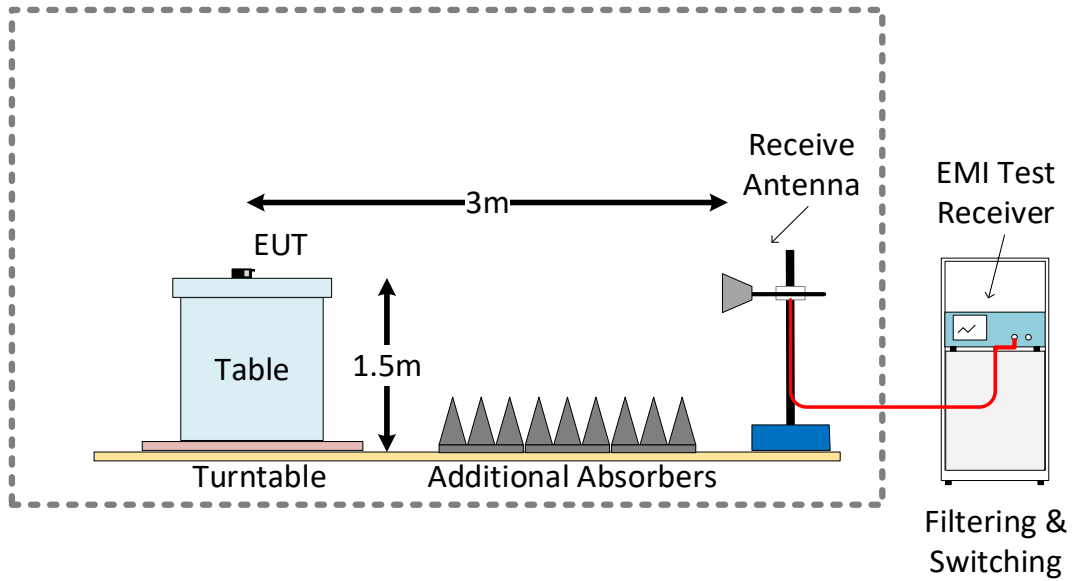
#### 3.4.2 Test Equipment Setup Used by Test Type

FCC 47 CFR Rule Part	Test Description	Test Equipment Used
15.209	Radiated Emissions (Intentional Radiators)	SAC5

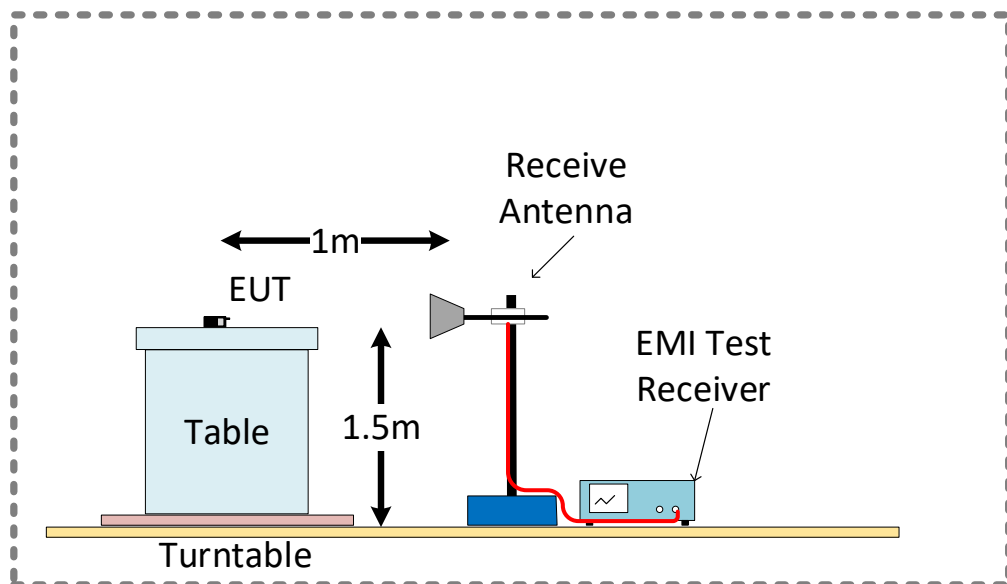
#### 3.4.3 Test Equipment Setup – SAC 5 (Radiated Emissions)

- 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 1GHz – 18GHz



### SAC 5 Test Setup Configuration 18GHz – 40GHz



### 3.5 EUT Configuration During Test

#### Radiated Emissions

For radiated emissions testing, the device was connected to the USB Charger and set to continuous transmit mode on an appropriate channel for both transmitters, with appropriate modulation. A LAN cable was connected between the device and a laptop PC placed outside of the test area.

### 3.6 EUT Operation Modes

Operation mode	Description
Continuous Tx	The device was set to transmit continuously with an appropriate frequency and modulation.

### 3.7 Deviations from the Test Standard

This product is based on pre-certified modules as described in section 2.1, hence a limited test scope has been verified.

This report covers the requirements for Radiated Emissions testing for devices with co-located transmitters operating simultaneously. The simultaneous transmission configurations involve technologies and frequencies covered by 47 CFR Parts 15.247 and 15.407. To ensure compliance with both, the basic emission limits from 47 CFR Part 15.209 have been applied.

Other than the differences highlighted above and the fact that two transmitters were active during the test, the normal test method was applied.

### 3.8 Environmental Conditions

#### 3.8.1 Environmental Conditions – SAC5 (Radiated Emissions)

Date	Time	Temperature (°C)	Relative Humidity (%)
2021.02.17	09:27	18.5	26
2021.02.22	07:52	18.5	33

## 4. TEST RESULTS

### 4.1 Test Results – Radiated Emissions (Intentional Transmitter)

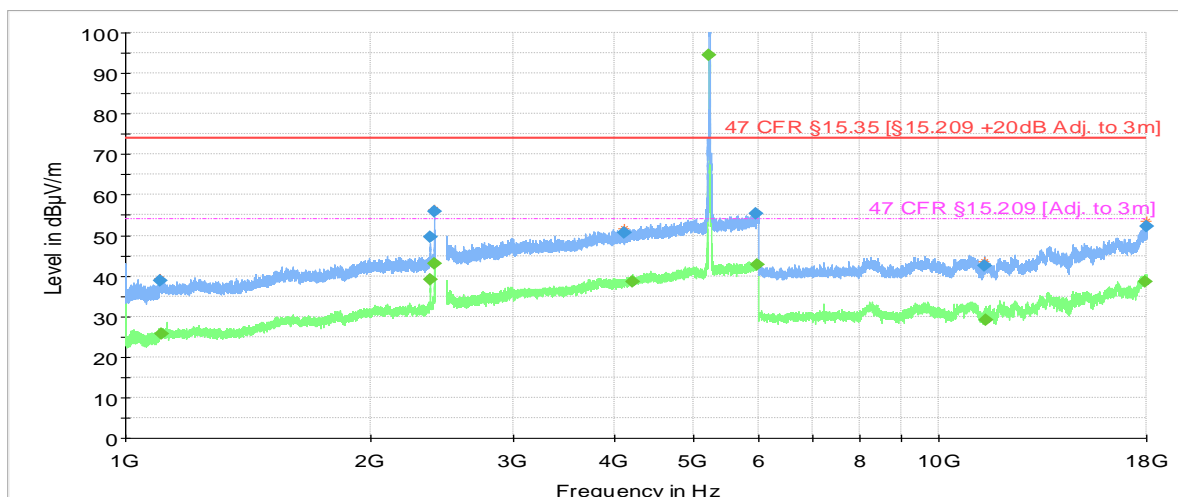
#### 4.1.1 Radiated Emissions (Intentional) – Test Summary

<b>Test Specification</b>	FCC 47 CFR 15.209 (Part 15 Subpart C)		
<b>Test Engineer &amp; Date</b>	Niall Forrester	2021.02.17 – 2021.02.22	
<b>EUT and Ancillary Equipment IDs</b>	A002959287-026	A002959287-014 A002959287-015 A002959287-023	
<b>EUT Operation Mode(s)</b>	Continuous Tx		
<b>EUT Wireless Configuration(s)</b>	See below		
<b>EUT Hardware Configuration(s)</b>	Power from USB Power Supply		
<b>Overall Result</b>	PASS		
Test Parameter	Wireless Configuration	Frequency Range	Result
Radiated Emissions	WLAN 802.11a 6Mbps CH44 (BPSK 5220 MHz) + Thread - Low channel (OQPSK 2405 MHz)	1 GHz – 18 GHz	PASS
Radiated Emissions	WLAN 802.11a 6Mbps CH44 (BPSK 5220 MHz) + Thread - Low channel (OQPSK 2405 MHz)	18 GHz – 40 GHz	PASS
Radiated Emissions	WLAN 802.11a 6Mbps CH44 (BPSK 5220 MHz) + ZigBee High Channel (OPQSK 2480 MHz)	1 GHz – 18 GHz	PASS
Radiated Emissions	WLAN 802.11a 6Mbps CH44 (BPSK 5220 MHz) + ZigBee High Channel (OPQSK 2480 MHz)	18 GHz – 40 GHz	PASS

4.1.2 Radiated Emissions (Intentional) – Test Details

WLAN Channel 44 + Thread Low Channel: 1 GHz – 18 GHz

Test mode condition	802.11a (TX) – Channel 44 - 5220 MHz Thread 2.4 GHz Low channel - 2405 MHz	
Antenna orientation	Horizontal and Vertical	
Sweep frequency	1 GHz – 18 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A002959287-026	
Ancillary Equipment	A002959287-014 / A002959287-015 / A002959287-023	
Test Engineer	Niall Forrester	Date: 2021-02-22
Chamber details	Chamber: SAC 5	



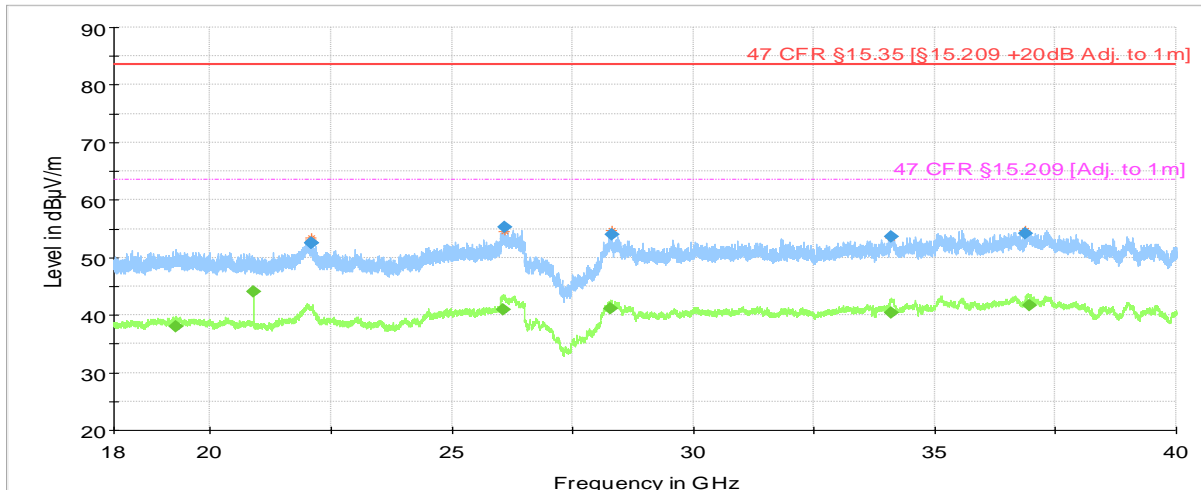
- Preview Result (2)-AVG
- Preview Result (1)-PK+
- ♦ Critical\_Freqs AVG
- 47 CFR §15.35 [§15.209 +20dB Adj. to 3m]
- 47 CFR §15.209 [Adj. to 3m]
- ♦ Final\_Result PK+
- ♦ Final\_Result AVG









Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1101.485000	38.79	---	73.98	35.19	1000.0	1000.000	137.0	V	200.0
1106.098000	---	25.78	53.98	28.20	1000.0	1000.000	125.0	V	10.0
2366.453000	49.50	---	73.98	24.48	1000.0	1000.000	175.0	H	324.0
2366.775000	---	39.06	53.98	14.92	1000.0	1000.000	162.0	H	311.0
2399.840457	55.87	---	73.98	18.11	1000.0	1000.000	125.0	H	312.0
2399.952000	---	42.93	53.98	11.05	1000.0	1000.000	137.0	H	311.0
4101.974000	50.55	---	73.98	23.43	1000.0	1000.000	125.0	V	110.0
4201.965000	---	38.59	53.98	15.39	1000.0	1000.000	158.0	H	221.0
5964.289000	55.34	---	73.98	18.64	1000.0	1000.000	210.0	V	267.0
5979.386000	---	42.86	53.98	11.12	1000.0	1000.000	100.0	V	72.0
11386.059000	42.46	---	73.98	31.52	1000.0	1000.000	100.0	H	265.0
11408.166000	---	29.19	53.98	24.79	1000.0	1000.000	210.0	H	244.0
17901.681000	---	38.60	53.98	15.38	1000.0	1000.000	210.0	V	22.0
17992.461000	52.13	---	73.98	21.85	1000.0	1000.000	110.0	V	72.0

NOTE: The peak visible at 5220MHz is the 5GHz WLAN signal, and hence this has been ignored

WLAN Channel 44 + Thread Low Channel: 18 GHz – 40 GHz

Test mode condition	802.11a (TX) – Channel 44 - 5220 MHz Thread 2.4 GHz Low channel - 2405 MHz	
Antenna orientation	Horizontal and Vertical	
Sweep frequency	18 GHz – 40 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A002959287-026	
Ancillary Equipment	A002959287-014 / A002959287-015 / A002959287-023	
Test Engineer	Niall Forrester	Date: 2021-02-17
Chamber details	Chamber: SAC 5	

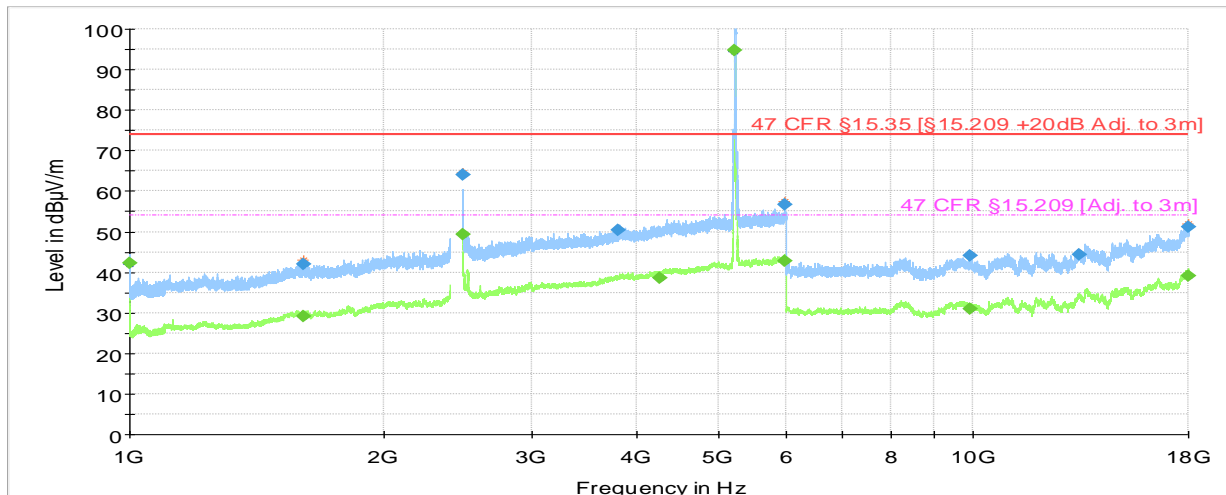


	Preview Result 2-AVG		Preview Result 1-PK+
	Critical_Freqs AVG		Critical_Freqs PK+
	47 CFR §15.35 [§15.209 +20dB Adj. to 1m]		47 CFR §15.209 [Adj. to 1m]
	Final_Result PK+		Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
19298.653000	---	37.92	63.52	25.60	1000.0	1000.000	155.0	H	232.0
20879.932000	---	44.07	63.52	19.45	1000.0	1000.000	155.0	H	232.0
22090.457000	52.61	---	83.52	30.91	1000.0	1000.000	155.0	V	72.0
22092.036000	52.59	---	83.52	30.93	1000.0	1000.000	155.0	V	68.0
26077.752000	---	40.93	63.52	22.59	1000.0	1000.000	155.0	V	308.0
26085.020000	55.33	---	83.52	28.20	1000.0	1000.000	155.0	V	342.0
28281.266000	---	41.14	63.52	22.38	1000.0	1000.000	155.0	V	82.0
28302.539000	54.00	---	83.52	29.53	1000.0	1000.000	155.0	V	38.0
34084.725000	53.55	---	83.52	29.97	1000.0	1000.000	155.0	V	26.0
34111.827000	---	40.34	63.52	23.18	1000.0	1000.000	155.0	H	206.0
36878.985000	54.18	---	83.52	29.35	1000.0	1000.000	155.0	V	216.0
36949.411000	---	41.76	63.52	21.76	1000.0	1000.000	155.0	V	172.0

**WLAN Channel 44 + ZigBee High Channel: 1 GHz – 18 GHz**

<b>Test mode condition</b>	802.11a (TX) – Channel 44 - 5220 MHz ZigBee 2.4 GHz High channel - 2480 MHz	
<b>Antenna orientation</b>	Horizontal and Vertical	
<b>Sweep frequency</b>	1 GHz – 18 GHz	
<b>Standard</b>	47 CFR FCC Part 15 subpart C	
<b>EUT</b>	A002959287-026	
<b>Ancillary Equipment</b>	A002959287-014 / A002959287-015 / A002959287-023	
<b>Test Engineer</b>	Niall Forrester	Date: 2021-02-22
<b>Chamber details</b>	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

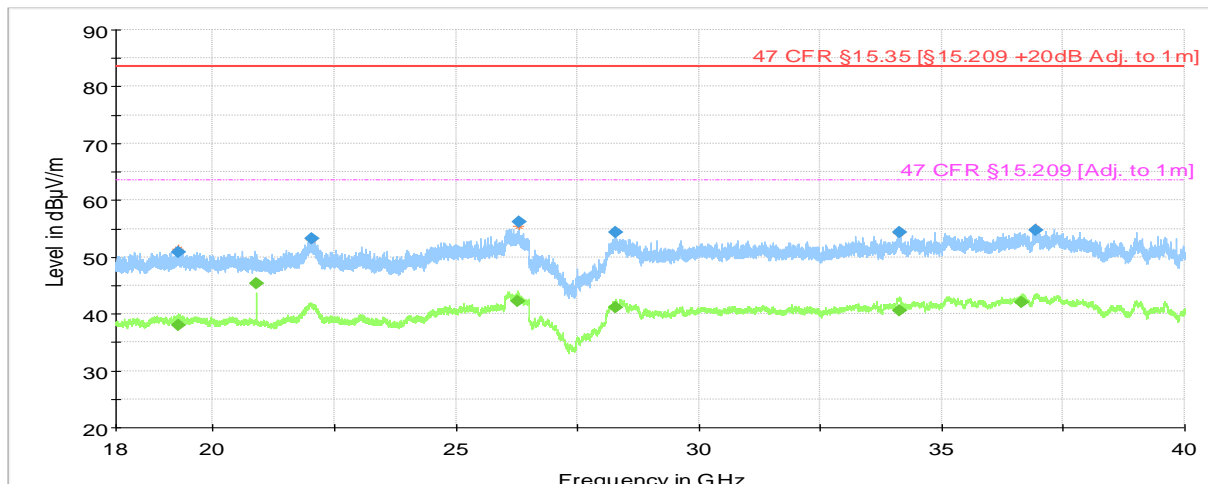
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1000.015593	---	42.19	53.98	11.79	1000.0	1000.000	100.0	H	87.0
1606.434000	42.12	---	73.98	31.86	1000.0	1000.000	187.0	V	221.0
1607.863000	---	29.08	53.98	24.90	1000.0	1000.000	100.0	H	200.0
2483.506248	64.01	---	73.98	9.97	1000.0	1000.000	175.0	H	131.0
2483.585878	---	49.44	53.98	4.54	1000.0	1000.000	127.0	H	144.0
3800.798000	50.46	---	73.98	23.51	1000.0	1000.000	100.0	H	41.0
4243.641000	---	38.70	53.98	15.28	1000.0	1000.000	187.0	H	290.0
5969.524000	56.60	---	73.98	17.38	1000.0	1000.000	149.0	H	87.0
5981.079000	---	42.87	53.98	11.11	1000.0	1000.000	100.0	H	68.0
9906.455000	44.11	---	73.98	29.87	1000.0	1000.000	100.0	H	202.0
9927.575000	---	31.05	53.98	22.93	1000.0	1000.000	101.0	H	116.0
13371.537000	44.46	---	73.98	29.52	1000.0	1000.000	125.0	V	292.0
17974.524000	51.09	---	73.98	22.89	1000.0	1000.000	176.0	H	162.0
17994.251320	---	39.01	53.98	14.97	1000.0	1000.000	147.0	H	292.0

**NOTE: The peak visible at 5220MHz is the 5GHz WLAN signal, and hence this has been ignored**



WLAN Channel 44 + ZigBee High Channel: 18 GHz – 40 GHz

<b>Test mode condition</b>	802.11a (TX) – Channel 44 - 5220 MHz ZigBee 2.4 GHz High channel - 2480 MHz	
<b>Antenna orientation</b>	Horizontal and Vertical	
<b>Sweep frequency</b>	18 GHz – 40 GHz	
<b>Standard</b>	47 CFR FCC Part 15 subpart C	
<b>EUT</b>	A002959287-026	
<b>Ancillary Equipment</b>	A002959287-014 / A002959287-015 / A002959287-023	
<b>Test Engineer</b>	Niall Forrester	Date: 2021-02-17
<b>Chamber details</b>	Chamber: SAC 5	



— Preview Result 2-AVG  
— Preview Result 1-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

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
19292.774000	50.81	---	83.52	32.71	1000.0	1000.000	155.0	H	218.0
19294.232000	---	38.08	63.52	25.44	1000.0	1000.000	155.0	V	322.0
20879.842000	---	45.32	63.52	18.20	1000.0	1000.000	155.0	H	232.0
22029.877000	53.29	---	83.52	30.23	1000.0	1000.000	155.0	V	202.0
26259.776000	---	42.16	63.52	21.36	1000.0	1000.000	155.0	V	12.0
26286.730000	56.16	---	83.52	27.36	1000.0	1000.000	155.0	V	206.0
28276.356000	54.43	---	83.52	29.09	1000.0	1000.000	155.0	V	38.0
28288.909000	---	41.18	63.52	22.34	1000.0	1000.000	155.0	V	248.0
34115.871000	54.32	---	83.52	29.20	1000.0	1000.000	155.0	V	68.0
34135.085000	---	40.50	63.52	23.02	1000.0	1000.000	155.0	V	278.0
36649.357000	---	42.00	63.52	21.52	1000.0	1000.000	155.0	V	232.0
36927.359000	54.67	---	83.52	28.86	1000.0	1000.000	155.0	H	162.0

## 5. TEST EQUIPMENT STATUS

### 5.1 List of Hardware with Calibration Dates

#### 5.1.1 Hardware List – SAC5 System

Type	Manufacturer	Model	Serial Number / ID	Calibration Date	Calibration Due
EMI Test Receiver	Rohde & Schwarz	ESW44	101760 2881044	2020.07.17	2021.07.17
Ultra Broadband Antenna	Rohde & Schwarz	HL562E	100988 2823181	2019.07.23	2021.07.23
Double Ridged Waveguide Horn Antenna	Rohde & Schwarz	HF907	102678 2823164	2019.07.15	2021.07.15
Control Device	Maturo	NCD	NCD/393/2372.01	N/A	N/A
Open Switch & Control Unit	Rohde & Schwarz	OSP150	100081 2884198	2020.08.04	2021.08.04
Open Switch & Control Unit	Rohde & Schwarz	OSP120	100084 2761253	2020.08.04	2021.08.04
Shielded Filter Unit	Rohde & Schwarz	OSP-F Extension 1	101333 2761265	2020.08.04	2021.08.04
Shielded Filter Unit	Rohde & Schwarz	OSP-F Extension 2	101335 2761266	2020.08.04	2021.08.04
Shielded Filter Unit	Rohde & Schwarz	OSP-F Base Unit	101330 2761262	2020.08.04	2021.08.04
Humidity Temperature	Lufft	OPUS 20	1236.0118.0802.033 2771042	2020.07.31	2022.07.31

### 5.2 Software / Firmware Versions

Equipment	Software / Firmware Name	Version
SAC 5	EMC 32	V10.60.10

## 6. MEASUREMENT UNCERTAINTY

### 6.1 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

For photographs, see Appendix 1