Prüfbericht-Nr.: *Test report no.:*	**SE24P27W-002**	**Auftrags-Nr.:** *Order no.*:	290100495	Seite 1 von 53 *Page 1 of 53*
Kunden-Referenz-Nr.: *Client reference no.:*	1774198	**Auftragsdatum:** *Order date:*	2023.10.25	
Auftraggeber: *Client:*	IKEA of Sweden AB			
Prüfgegenstand: *Test item:*	Hub for smart products			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	DIRIGERA / E2315 / FCC ID: FHO-E2315			
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:*	2023.12.06
Prüfmuster-Nr.: *Test sample no:*	See section 2.3
Prüfzeitraum: *Testing period:*	2023.12.15 - 2024.04.08
Ort der Prüfung: *Place of testing:*	Lund, Sweden
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland Sweden
Prüfergebnis*: *Test result*:*	Pass

überprüft von: reviewed by:	X Signed by: Maria Nyltun	**genehmigt von:** authorized by:	X Signed by: Hakan Ahlberg
Datum: 2024.05.13 *Date:*		**Datum: 2024.05.13** *Date:*	
Stellung / *Position:*	**Test Engineer**	**Stellung** / *Position:*	Lab Manager

Sonstiges / *Other:*

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	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

V05

Revision History

REVISION	DATE	REMARKS	AUTHOR
001	2024.04.15	First release	Maria Nyltun
002	2024.05.13	Second release	Maria Nyltun
Note: Latest revision report will replace all previous reports			
This report based on FCC Part 15.247 Template version 1.4			

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	PASS	
15.247 (a)(1)	20dB Bandwidth	NO	4.6	N/A	ZigBee is non-hopping
15.247 (a)(1)	Carrier (Hopping Channel) Separation	NO	4.7	N/A	ZigBee is non-hopping
15.247 (a)(1)	Number of Hopping Channels	NO	4.8	N/A	ZigBee is non-hopping
15.247 (a)(1)	Time of Occupancy (Dwell Time)	NO	4.9	N/A	ZigBee is non-hopping
15.247 (a)(2)	6dB Bandwidth & 99% 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	

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.

Table of Contents

1. GENERAL INFORMATION

1.1 Test Site

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

1.2 Client Information

Company Name:	**IKEA of Sweden AB**
Address:	**Tulpanvägen 8**
	343 34 Älmhult
	Sweden
Contact Person:	**Gurudeep Manjulgud Devraj**
Contact e-Mail / Telephone	**gurudeep.manjulgud.devraj@inter.ikea.com**

2. PRODUCT INFORMATION

2.1 General Description

Model name:	DIRIGERA
Manufacturer:	IKEA of Sweden AB, SE-343 81 Älmhult
Model number / Marketing name:	E2315
FCC ID:	FHO-E2315
Description:	Hub for smart products
Ancillary Equipment:	See section 2.7

The device incorporates two separate pre-certified modules:

- Silicon Labs MGM210L22F “No. 1” (FCC ID: QOQMGM210L) for Zigbee 802.15.4
- Silicon Labs MGM210L22F “No. 2” (FCC ID: QOQMGM210L) for Thread 802.15.4

Each module uses its own built-in antenna

2.2 Device Characteristics

Type of Power Supply	USB Power Supply (via AC/DC Adapter)
Nominal Supply Voltage	120V or 230V AC (Adapter) / 5V DC (USB)
Supply Voltage Range	100-240V AC
Operating Temperature Range	0ºC - 40 ºC
Operating Air Humidity Range	-
Highest Internal Frequency Source	2480 MHz

2.3 Test Samples

EUT #	EUT ID	Description	Used For:
1	A003618316-004	Standard Sample	Conducted Emissions Radiated Emissions
2	A003623398-001	Standard Sample	Radiated Emissions
3	A003618316-002	DUT Conducted Radio	Conducted Radio

2.4 Wireless Technologies and Bands Supported by the EUT

Technology	Band	Frequency Range (Tx)	Evaluation Performed*
ZigBee 802.15.4 (MGM210L22F22F No.1)	2.4 GHz	2405 MHz – 2480 MHz	YES
Thread 802.15.4 (MGM210L22F22F No.2)	2.4 GHz	2405 MHz – 2480 MHz	NO

*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 (dBi)
ZigBee 802.15.4 (MGM210L22F No.1)	2.4 GHz	1	Inverted F PCB Trace	0.50
Thread 802.15.4 (MGM210L22F No.2)	2.4 GHz	1	Inverted F PCB Trace	0.50

2.6 Wireless Technology Details

Technology	Band	Modulation Type(s)	No. of Channels	Channel Spacing	Adaptivity
ZigBee 802.15.4 (MGM210L No.1)	2.4 GHz	O-QPSK	16	5 MHz	-
Thread 802.15.4 (MGM210L No.2)	2.4 GHz	O-QPSK	16	5 MHz	-

2.7 Ancillary Equipment

ID	Description	Manufacturer / Model	Hardware & Software Versions
A003625200-005	AC/DC Power supply 5W	-	-
A003618316-005	USB cable	-	-
A003618316-013	Ethernet cable	-	-
A003625200-001	AC/DC Power supply 5W	-	-
A003623398-003	USB cable	-	-
A003623398-007	Ethernet cable	-	-
A003618316-002	AC/DC Power supply 5W	-	-
A003618316-006	USB cable	-	-
A003618316-013	Ethernet cable	-	-

2.8 EUT Diagrams

N/A

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)	Out of Band Emissions	15.247 (d)
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 & 99% Bandwidth	15.247 (a)(2)
15.247 (b)	Peak Conducted Output Power	15.247 (b)(1) [Hopping] 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 µV/m. Measurements on the test system are made in dBµV/m. To convert between these, the following adjustment is used:

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

Example: from 15.209(a) the limit for 30MHz – 88MHz is 100µV/m at 3m. This gives:

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

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 30µV/m (=29.54 dBµV/m) at 30m

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

Example: from 15.209(a) the limit for 1GHz – 18GHz is 500µV/m (=53.98 dBµV/m) at 3m

$Limit@1m = Limit@3m + 20\log\left(\frac{3}{1}\right)$ = 53.98 +9.54 = 63.52 dBµV/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 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

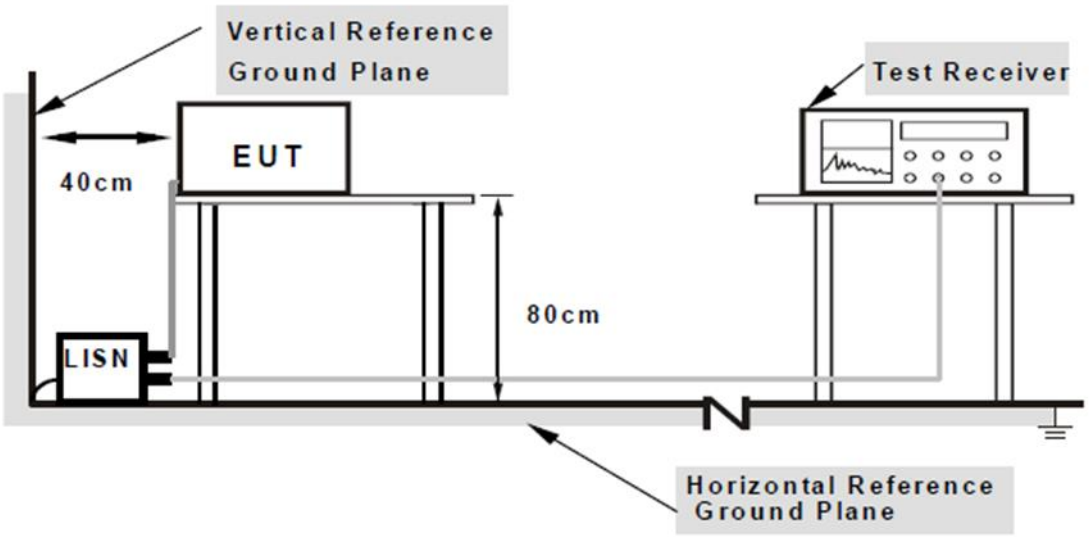
FCC 47 CFR Rule Part	Test Description	Test Equipment Used
15.207	AC Power Line Conducted Emissions (Intentional Radiators)	Conducted Emissions
15.209	Radiated Emissions (Intentional Radiators)	SAC5
15.247 (d)	Out of Band Emissions	CTE
15.247 (d)	Band Edge Compliance (Authorized band)	CTE
15.247 (d)	Band Edge Compliance (Restricted band)	SAC 5
15.247 (a)(1)	20dB Bandwidth	N/A
15.247 (a)(1)	Carrier (Hopping Channel) Separation	N/A
15.247 (a)(1)	Number of Hopping Channels	N/A
15.247 (a)(1)	Time of Occupancy (Dwell Time)	N/A
15.247 (a)(2)	6dB & 99% Bandwidth	CTE
15.247 (b)	Peak Conducted Output Power	CTE
15.247 (e)	Power Spectral Density	CTE

3.4.3 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 50Ω/ 50µH 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.



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

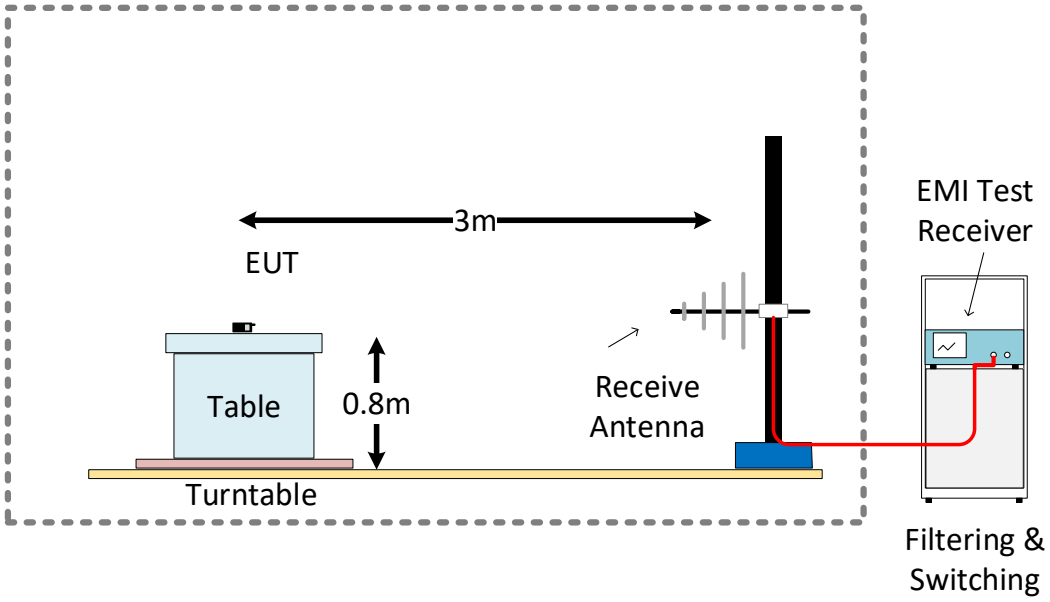
- For frequency range 30MHz-1GHz Log-Periodic Antenna was used. Antenna elevated from 100 cm from floor to 400 cm from floor, and was placed at 3 m from center of turntable in tilted position. The equipment under test (EUT) was placed at the middle of the turntable at 80 cm height from floor. The antenna 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.

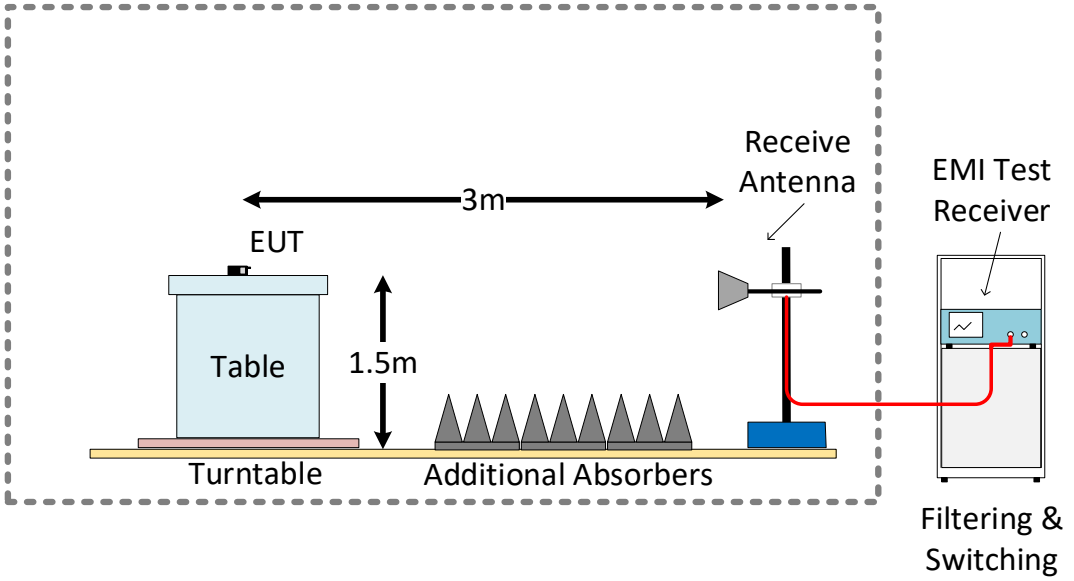
- For frequency range 18GHz-40GHz double horn Antenna was used. Antenna's height was adjusted to150 cm from floor, and 1 m distance to center of turntable. The equipment under test (EUT) was placed at the middle of the turntable on at 150 cm height from floor.

- For all frequency ranges the turntable was rotated 360˚ for obtaining the maximum emission.

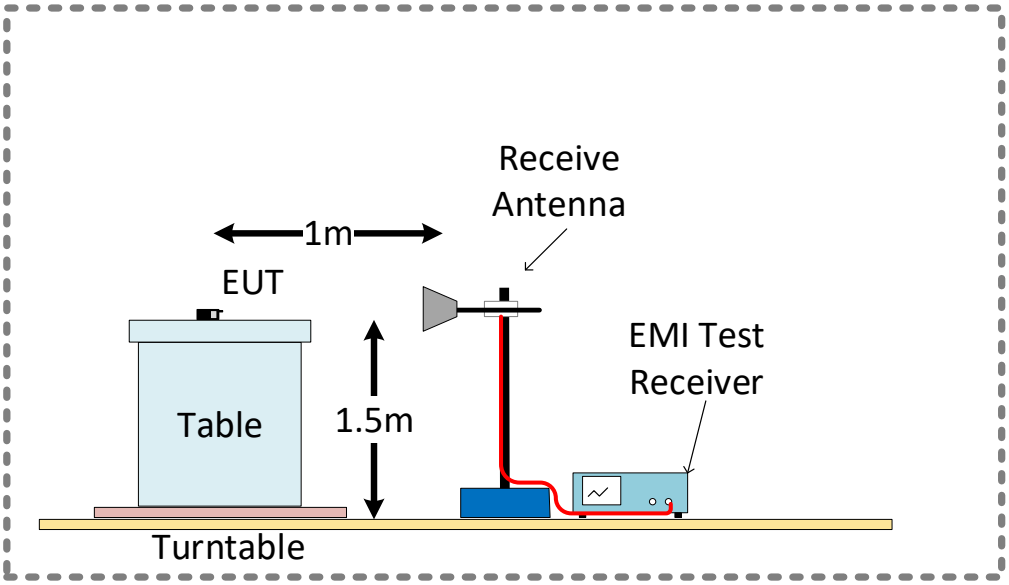
SAC 5 Test Setup Configuration 30MHz – 1GHz



SAC 5 Test Setup Configuration 1GHz – 18GHz



SAC 5 Test Setup Configuration 18GHz – 40GHz



3.5 EUT Configuration During Test

AC Power Line Conducted Emissions

For AC power line conducted emissions testing, the device was connected to the USB Charger and set to continuous transmit mode on the mid channel with appropriate modulation. A LAN cable was connected between the device and a laptop PC placed outside of the test area. Conducted emissions tests were run on the Mains AC connection to the charger. See test setup photographs for more detail.

Radiated Emissions

For radiated emissions testing, the device was connected to the USB Charger and set to continuous transmit mode on an appropriate channel, 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

None.

3.8 Environmental Conditions

3.8.1 Environmental Conditions – Conducted Emissions System

Date	Time	Temperature (°C)	Relative Humidity (%)
2024.01.17	09:16	20.6	22.7

3.8.2 Environmental Conditions – SAC5 (Radiated Emissions)

Date	Time	Temperature (°C)	Relative Humidity (%)
2023.12.15	08:50	19.5	41.5
2023.12.18	08:06	19.8	39.6
2023.12.28	09:20	20.6	33.0
2023.12.29	08:45	21.5	32.4
2024.01.02	15:01	21.9	29.0
2024.01.05	08:52	18.1	28.4
2024.01.11	11:38	20.5	25.0
2024.01.12	10:20	20.3	31.7
2024.01.13	14:23	18.9	31.0
2024.01.15	09:30	19.2	29.3
2024.01.17	09:14	18.6	29.6

3.8.3 Environmental Conditions – Conducted Measurments

Date	Time	Temperature (°C)	Relative Humidity (%)
2024.04.05	10:30	24.7	26.3
2024.04.08	09:28	25.3	27.2

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

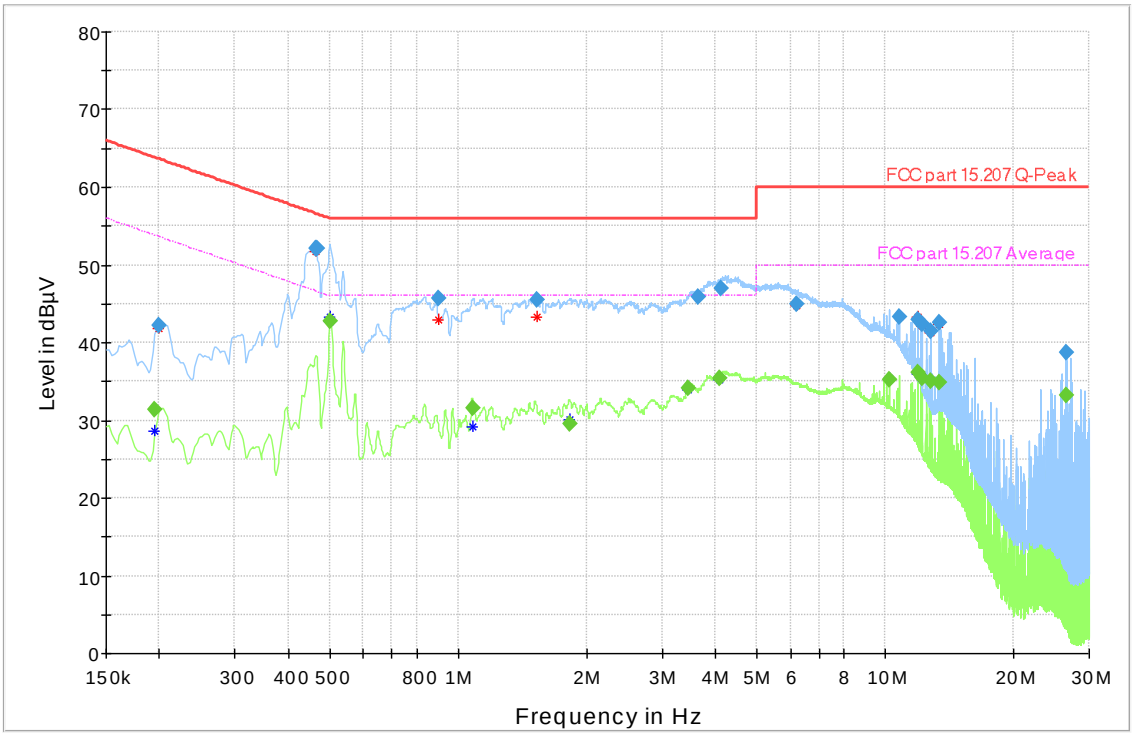
Test Specification	FCC 47 CFR 15.207 (Part 15 Subpart C)	
Test Engineer & Date	Fariborz Abasi	2024.01.17
EUT and Ancillary Equipment IDs	A003618316-004	A003625200-001 A003623398-003 A003623398-007
EUT Operation Mode(s)	Continuous Tx	
EUT Wireless Configuration(s)	Zigbee	
EUT Hardware Configuration(s)	N/A	
Overall Result	PASS	

Test Parameter	Wireless Configuration	Frequency Range	Result*
AC Conducted Power Line Emissions – “N” Line	Zigbee Mid Channel (O-QPSK 2445 MHz)	150 kHz – 30 MHz	PASS
AC Conducted Power Line Emissions – “L1” Line	Zigbee Mid Channel (O-QPSK 2445 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

Test	Conducted Emission	
Test mode condition	ZigBee Mid Channel (2445 MHz)	
Standard	47 CFR Part 15.247 Class B	
EUT	A003618316-004	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2024.01.17



Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.195000	---	31.36	53.82	22.46	1000.0	9.000	L1	ON	9.6
0.199500	42.13	---	63.63	21.50	1000.0	9.000	L1	ON	9.6
0.465000	52.18	---	56.60	4.42	1000.0	9.000	L1	ON	9.6
0.467250	52.15	---	56.56	4.41	1000.0	9.000	L1	ON	9.6
0.503250	---	42.72	46.00	3.28	1000.0	9.000	L1	ON	9.6
0.897000	45.73	---	56.00	10.27	1000.0	9.000	L1	ON	9.6
1.086000	---	31.58	46.00	14.42	1000.0	9.000	L1	ON	9.6
1.529250	45.49	---	56.00	10.51	1000.0	9.000	L1	ON	9.7
1.821750	---	29.60	46.00	16.40	1000.0	9.000	L1	ON	9.7
3.444000	---	34.20	46.00	11.80	1000.0	9.000	L1	ON	9.7
3.648750	45.93	---	56.00	10.07	1000.0	9.000	L1	ON	9.7
4.107750	---	35.34	46.00	10.66	1000.0	9.000	L1	ON	9.7
4.114500	47.02	---	56.00	8.98	1000.0	9.000	N	ON	9.7
6.180000	45.03	---	60.00	14.97	1000.0	9.000	L1	ON	9.7
10.243500	---	35.28	50.00	14.72	1000.0	9.000	L1	ON	9.8
10.792500	43.29	---	60.00	16.71	1000.0	9.000	L1	ON	9.8
11.892750	42.97	---	60.00	17.03	1000.0	9.000	L1	ON	9.8
11.892750	---	36.13	50.00	13.87	1000.0	9.000	L1	ON	9.8
12.198750	42.44	---	60.00	17.56	1000.0	9.000	L1	ON	9.8
12.198750	---	35.50	50.00	14.50	1000.0	9.000	L1	ON	9.8
12.747750	---	35.08	50.00	14.92	1000.0	9.000	L1	ON	9.8
12.747750	41.50	---	60.00	18.50	1000.0	9.000	N	ON	9.8
13.357500	---	34.89	50.00	15.11	1000.0	9.000	L1	ON	9.8
13.418250	42.55	---	60.00	17.45	1000.0	9.000	N	ON	9.8
26.610000	---	33.20	50.00	16.80	1000.0	9.000	L1	ON	9.8
26.610000	38.79	---	60.00	21.21	1000.0	9.000	L1	ON	9.8

4.2 Test Results – Radiated Emissions (Intentional Transmitter)

4.2.1 Radiated Emissions (Intentional) – Test Summary

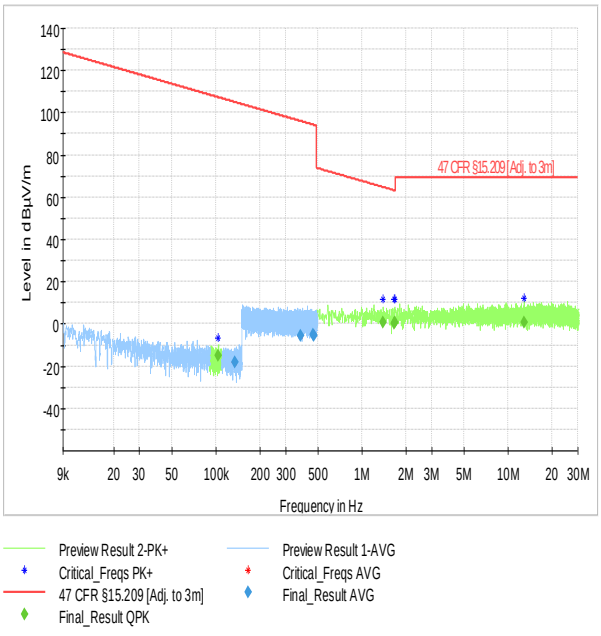
Test Specification	FCC 47 CFR 15.209 (Part 15 Subpart C)	
Test Engineer & Date	Fariborz Abasi	2023.12.15 – 2024.01.15
EUT and Ancillary Equipment IDs	A003623398-001 A003618316-004	A003625200-001 A003623398-003 A003623398-007
EUT Operation Mode(s)	Continuous Tx	
EUT Wireless Configuration(s)	Zigbee	
EUT Hardware Configuration(s)	N/A	
Overall Result	PASS	

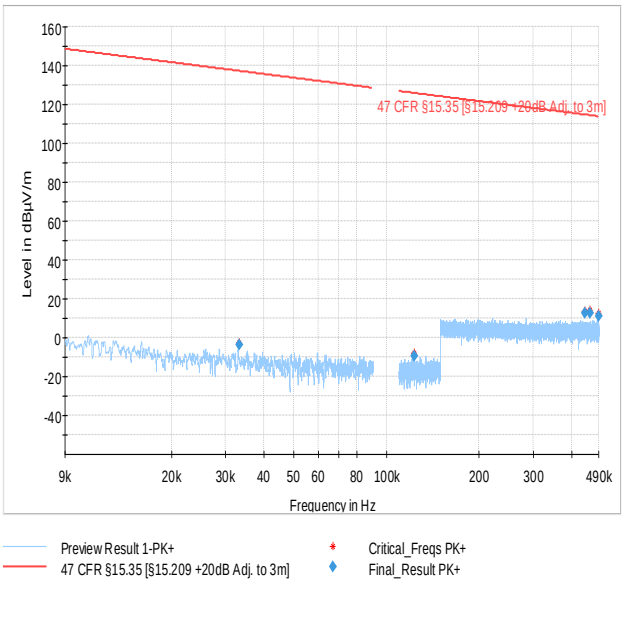
Test Parameter	Wireless Configuration	Frequency Range	Result
Radiated Emissions	Zigbee Low Channel (O-QPSK 2405 MHz)	9 kHz – 30 MHz	PASS
Radiated Emissions	Zigbee Low Channel (O-QPSK 2405 MHz)	30 MHz – 1 GHz	PASS
Radiated Emissions	Zigbee Low Channel (O-QPSK 2405 MHz)	1 GHz – 18 GHz	PASS
Radiated Emissions	Zigbee Low Channel (O-QPSK 2405 MHz)	18 GHz – 40 GHz	PASS
Radiated Emissions	Zigbee Mid Channel (O-QPSK 2445 MHz)	9 kHz – 30 MHz	PASS
Radiated Emissions	ZigbeeMid Channel (O-QPSK 2445 MHz)	30 MHz – 1 GHz	PASS
Radiated Emissions	Zigbee Mid Channel (O-QPSK 2445 MHz)	1 GHz – 18 GHz	PASS
Radiated Emissions	Zigbee Mid Channel (O-QPSK 2445 MHz)	18 GHz – 40 GHz	PASS
Radiated Emissions	Zigbee High Channel (O-QPSK 2480 MHz)	9 kHz – 30 MHz	PASS
Radiated Emissions	Zigbee High Channel (O-QPSK 2480 MHz)	30 MHz – 1 GHz	PASS
Radiated Emissions	Zigbee High Channel (O-QPSK 2480 MHz)	1 GHz – 18 GHz	PASS
Radiated Emissions	Zigbee High Channel (O-QPSK 2480 MHz)	18 GHz – 40 GHz	PASS

4.2.2 Radiated Emissions (Intentional) – Test Details

Low Channel

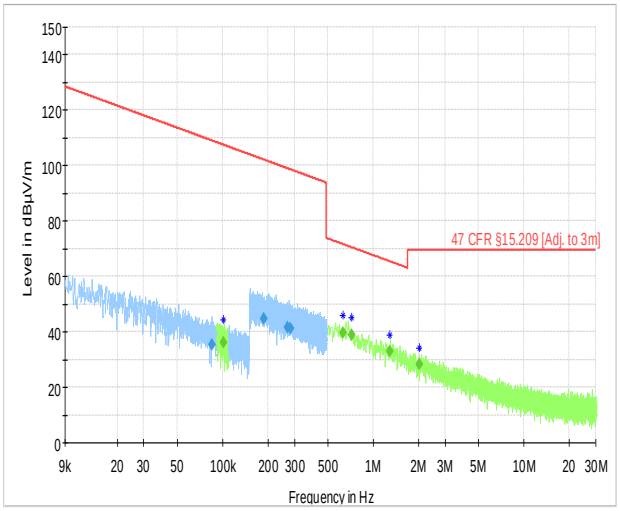
Test mode condition	Zigbee, Low channel (2405 MHz)	
Antenna orientation	Loop Antenna Parallel to Axis	
Sweep frequency	9kHz - 30 MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003623398-001	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2024.01.05
Chamber details	Chamber: SAC 5	

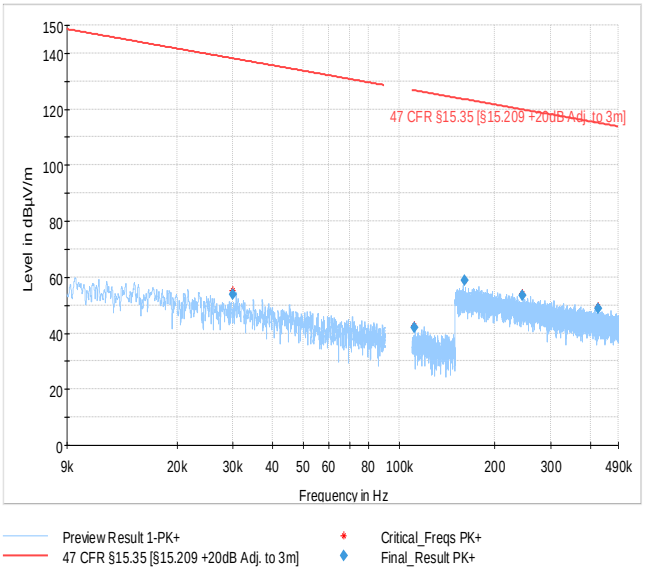




Frequency (MHz)	Average (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.103366	---	-14.73	107.32	122.04	1000.0	0.200	100.0	H	0.0	10.5
0.134300	-18.23	---	105.04	123.27	1000.0	0.200	100.0	H	205.0	10.5
0.380462	-5.61	---	96.00	101.60	1000.0	9.000	100.0	H	206.0	10.2
0.463471	-5.15	---	94.28	99.44	1000.0	9.000	100.0	H	0.0	10.3
0.468026	-5.36	---	94.20	99.56	1000.0	9.000	100.0	H	-41.0	10.3
1.398963	---	0.56	64.69	64.12	1000.0	9.000	100.0	H	135.0	10.8
1.659488	---	0.33	63.21	62.87	1000.0	9.000	100.0	H	49.0	10.8
1.674330	---	0.49	63.13	62.64	1000.0	9.000	100.0	H	25.0	10.8
12.841684	---	0.62	69.54	68.92	1000.0	9.000	100.0	H	256.0	11.4

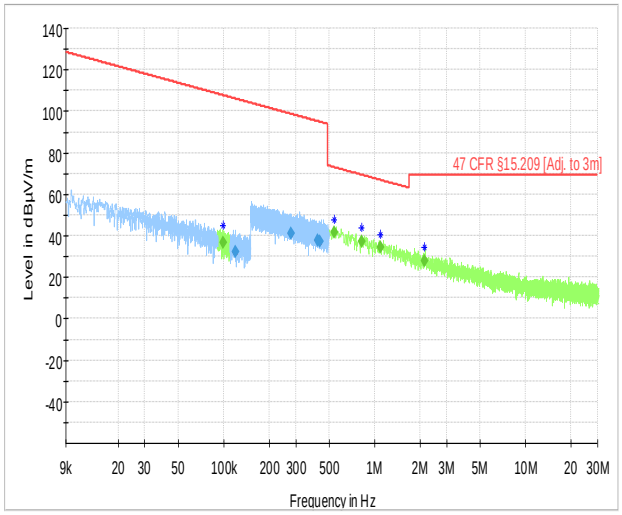
Test mode condition	Zigbee, Low channel (2405 MHz)	
Antenna orientation	Loop Antenna Perpendicular to Axis	
Sweep frequency	9kHz - 30 MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003623398-001	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2024.01.12
Chamber details	Chamber: SAC 5	

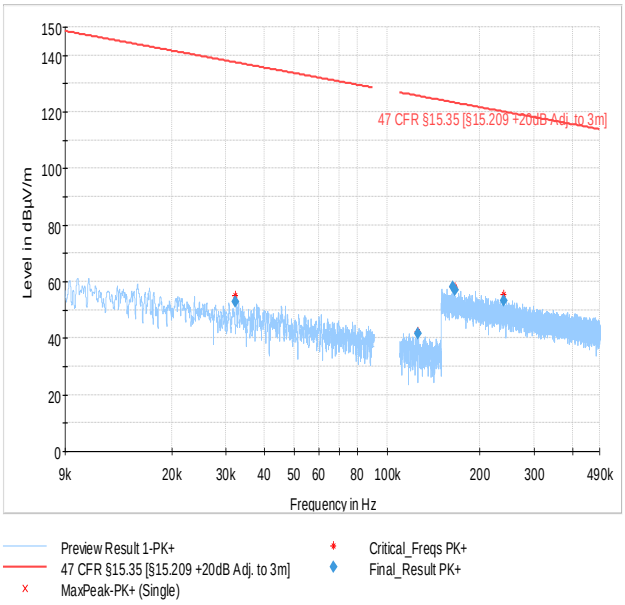




Frequency (MHz)	Average (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
0.084671	35.27	---	109.05	73.78	1000.0	0.200	100.0	H	225.0	10.9
0.101094	---	36.08	107.51	71.43	1000.0	0.200	100.0	H	257.0	10.5
0.188730	44.82	---	102.09	57.27	1000.0	9.000	100.0	H	270.0	10.4
0.269679	41.59	---	98.99	57.40	1000.0	9.000	100.0	H	245.0	10.3
0.283070	41.15	---	98.57	57.42	1000.0	9.000	100.0	H	225.0	10.3
0.628597	---	39.77	71.64	31.87	1000.0	9.000	100.0	H	135.0	10.5
0.718580	---	38.69	70.48	31.79	1000.0	9.000	100.0	H	77.0	10.5
1.285631	---	32.79	65.42	32.63	1000.0	9.000	100.0	H	49.0	10.8
2.019586	---	28.20	69.54	41.35	1000.0	9.000	100.0	H	49.0	10.8

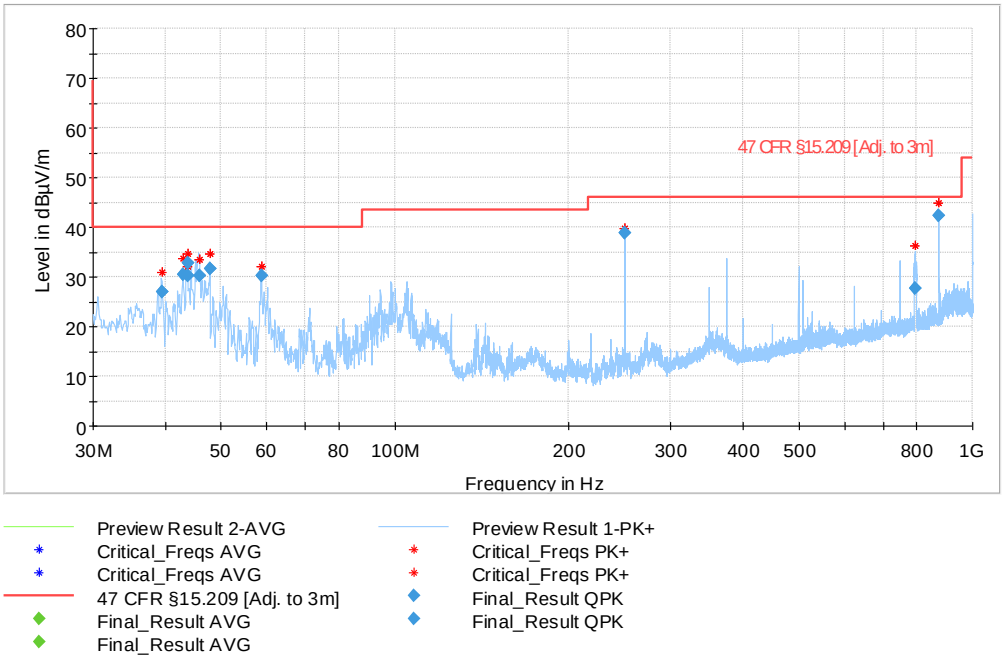
Test mode condition	Zigbee, Low channel (2405 MHz)	
Antenna orientation	Loop Antenna Parallel to floor	
Sweep frequency	9kHz - 30 MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003623398-001	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2024.01.13
Chamber details	Chamber: SAC 5	





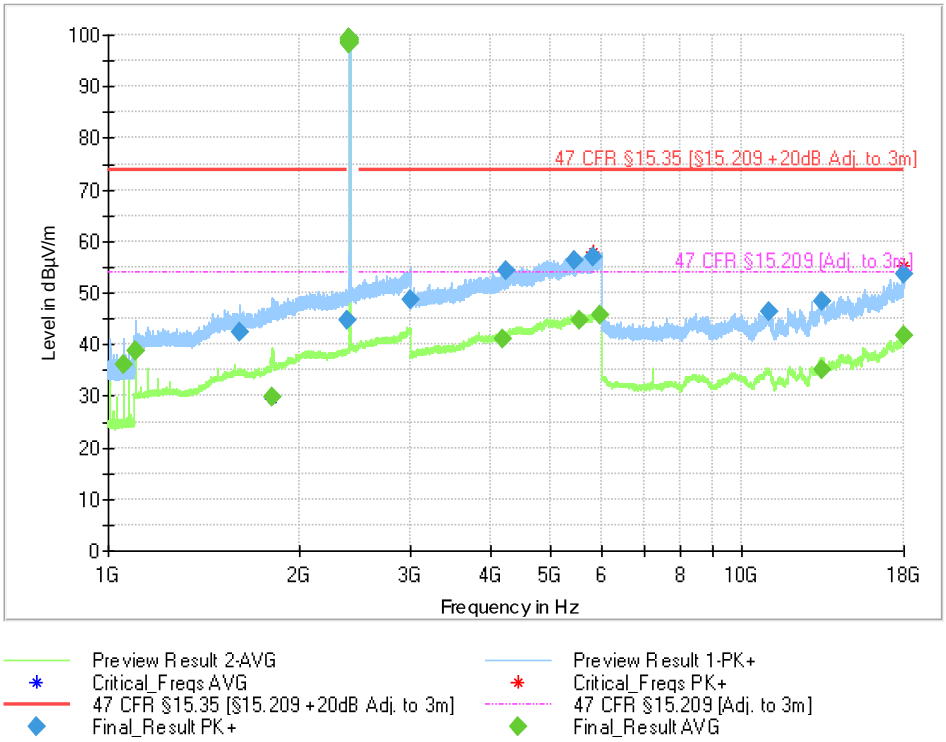
Frequency (MHz)	Average (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.099473	---	36.92	107.65	70.73	1000.0	0.200	100.0	H	0.0	10.5
0.120181	32.07	---	106.01	73.94	1000.0	0.200	100.0	H	229.0	10.5
0.279491	41.24	---	98.68	57.44	1000.0	9.000	100.0	H	49.0	10.3
0.420320	37.70	---	95.13	57.43	1000.0	9.000	100.0	H	-38.0	10.2
0.433322	37.44	---	94.87	57.43	1000.0	9.000	100.0	H	139.0	10.3
0.537659	---	41.57	72.99	31.42	1000.0	9.000	100.0	H	218.0	10.4
0.817908	---	37.30	69.35	32.05	1000.0	9.000	100.0	H	45.0	10.5
1.097801	---	34.69	66.79	32.10	1000.0	9.000	100.0	H	154.0	10.8
2.147127	---	27.68	69.54	41.86	1000.0	9.000	100.0	H	225.0	10.8

Test mode condition	Zigbee, Low channel (2405 MHz)	
Antenna orientation	Horizontal and Vertical	
Sweep frequency	30 MHz – 1 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003623398-001	
Ancillary Equipment	A003618316-001 A003618316-003 A003618316-007	
Test Engineer	Fariborz Abasi	Date: 2023.12.15
Chamber details	Chamber: SAC 5	



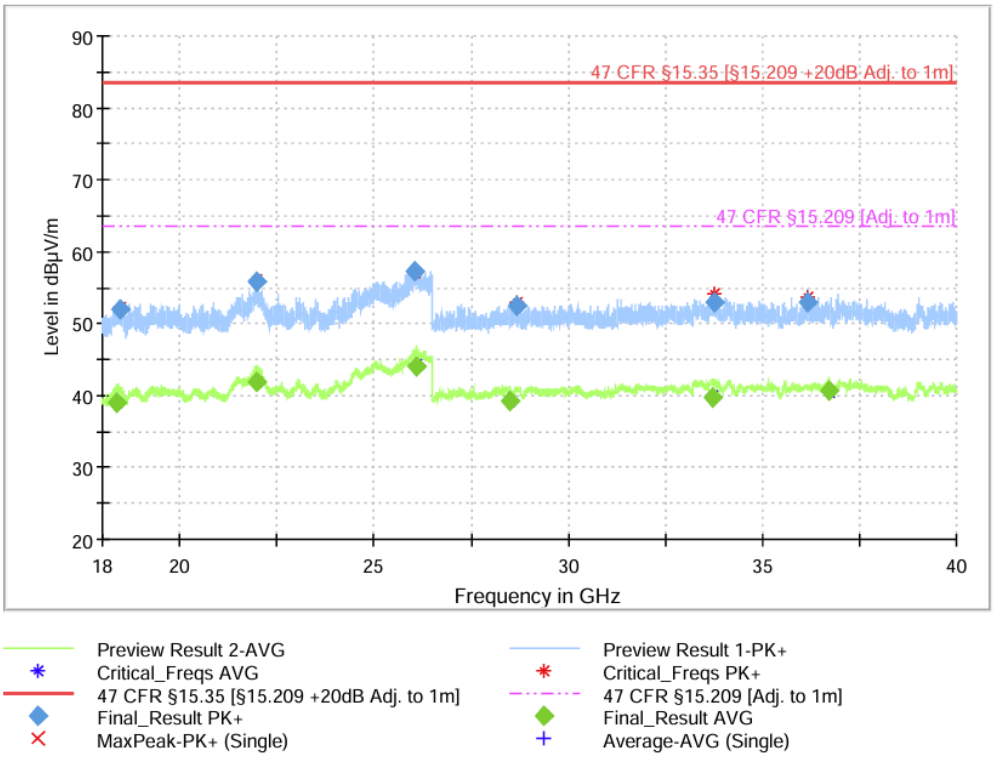
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
39.460840	27.00	40.00	13.00	1000.0	120.000	100.0	V	202.0	-35.0
42.935920	30.57	40.00	9.43	1000.0	120.000	100.0	V	202.0	-37.7
43.786480	30.32	40.00	9.68	1000.0	120.000	129.0	V	112.0	-38.3
43.789480	32.73	40.00	7.27	1000.0	120.000	100.0	V	206.0	-38.3
45.782760	30.27	40.00	9.73	1000.0	120.000	129.0	V	200.0	-39.8
47.803200	31.54	40.00	8.46	1000.0	120.000	100.0	V	158.0	-41.1
58.721840	30.33	40.00	9.67	1000.0	120.000	279.0	V	338.0	-44.7
249.998520	38.83	46.02	7.19	1000.0	120.000	125.0	H	87.0	-40.8
796.455920	27.65	46.02	18.37	1000.0	120.000	179.0	V	248.0	-28.5
874.999440	42.41	46.02	3.61	1000.0	120.000	100.0	H	26.0	-27.5

Test mode condition	Zigbee, Low channel (2405 MHz)	
Antenna orientation	Horizontal and Vertical	
Sweep frequency	1 GHz – 18 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003618316-004	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2023.12.28
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)	Corr. (dB/m)
1615.547000	42.26	---	73.98	31.72	1000.0	1000.000	100.0	H	252.0	-17.5
2378.091000	44.57	---	73.98	29.41	1000.0	1000.000	104.0	V	112.0	-14.3
11013.324000	46.28	---	73.98	27.70	1000.0	1000.000	175.0	H	26.0	8.5
13326.108000	48.36	---	73.98	25.62	1000.0	1000.000	129.0	V	248.0	11.2
2994.269153	48.78	---	73.98	25.20	1000.0	1000.000	179.0	V	11.0	-11.0
1818.030000	---	29.70	53.98	24.28	1000.0	1000.000	100.0	H	162.0	-17.2
17971.478000	53.70	---	73.98	20.28	1000.0	1000.000	175.0	H	116.0	22.0
4237.745000	54.41	---	73.98	19.57	1000.0	1000.000	217.0	H	281.0	-5.2
13340.105000	---	34.97	53.98	19.01	1000.0	1000.000	175.0	V	-18.0	11.2
1056.026000	---	36.06	53.98	17.92	1000.0	1000.000	179.0	V	68.0	-23.3
...	...	...	...	...	...	...	...	...	...	...

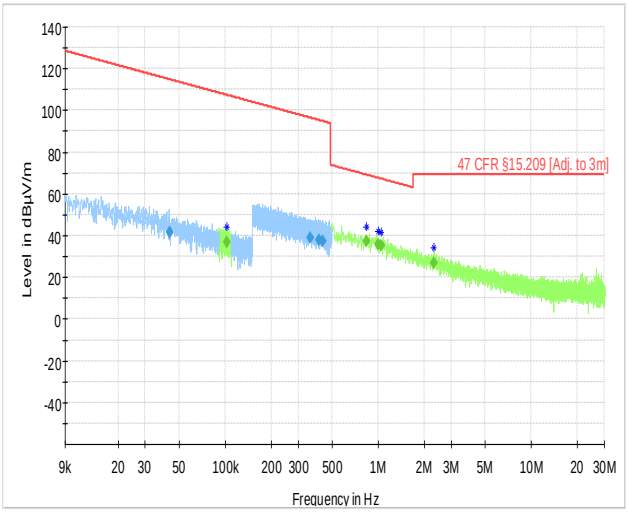
Test mode condition	Zigbee, Low channel (2405 MHz)	
Antenna orientation	Horizontal and Vertical	
Sweep frequency	18 GHz – 40 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003618316-004	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2024.01.02
Chamber details	Chamber: SAC 5	

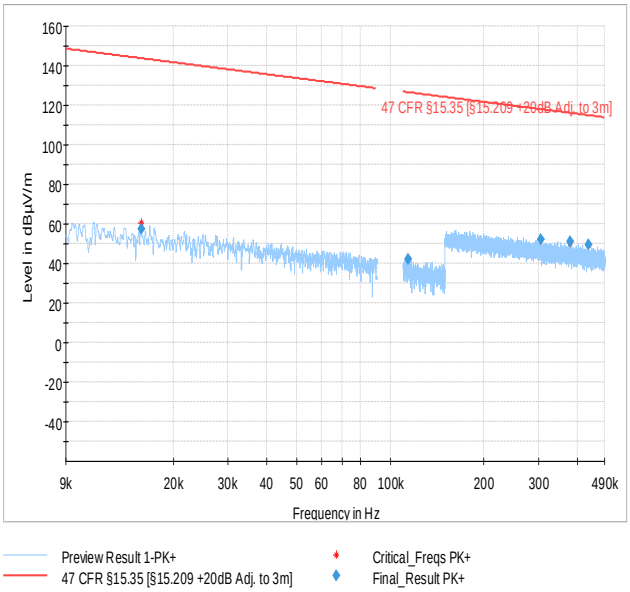


Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
18377.852000	---	39.10	63.52	24.43	1000.0	1000.000	155.0	V
18477.101000	51.98	---	83.52	31.54	1000.0	1000.000	155.0	H
21994.650000	---	41.97	63.52	21.55	1000.0	1000.000	155.0	V
21995.038000	55.79	---	83.52	27.74	1000.0	1000.000	155.0	H
26032.523000	57.22	---	83.52	26.30	1000.0	1000.000	155.0	V
26092.011000	---	44.17	63.52	19.35	1000.0	1000.000	155.0	V
28482.649000	---	39.27	63.52	24.25	1000.0	1000.000	155.0	H
28671.253000	52.56	---	83.52	30.96	1000.0	1000.000	155.0	H
33714.699000	---	39.73	63.52	23.79	1000.0	1000.000	155.0	H
33762.365000	53.04	---	83.52	30.48	1000.0	1000.000	155.0	H
36143.645000	52.92	---	83.52	30.60	1000.0	1000.000	155.0	V
36707.324000	---	40.58	63.52	22.94	1000.0	1000.000	155.0	V

Mid Channel

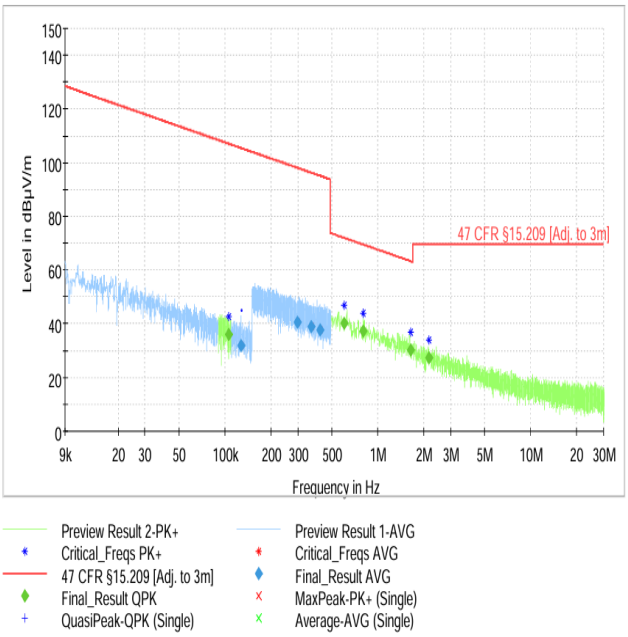
Test mode condition	Zigbee, Mid channel (2445 MHz)	
Antenna orientation	Loop Antenna Parallel to Axis	
Sweep frequency	9kHz - 30 MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003623398-001	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2024.01.05
Chamber details	Chamber: SAC 5	

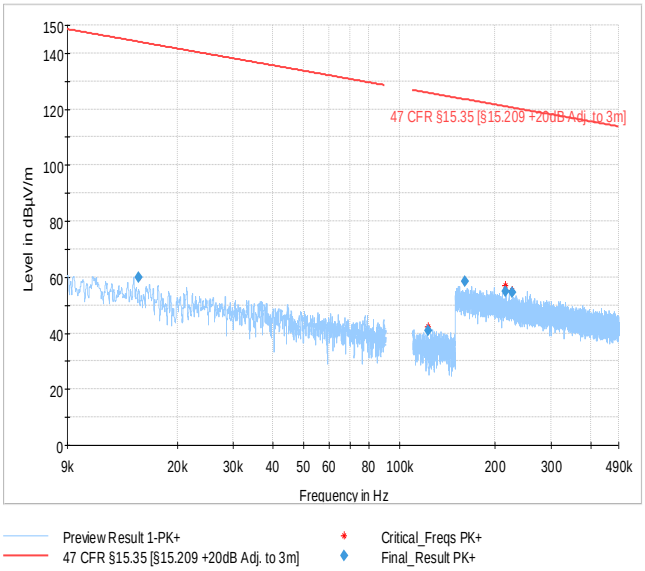




Frequency (MHz)	Average (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.043294	41.34	---	114.88	73.54	1000.0	0.200	100.0	H	225.0	12.2
0.102668	---	36.95	107.38	70.43	1000.0	0.200	100.0	H	-26.0	10.5
0.360671	39.04	---	96.46	57.43	1000.0	9.000	100.0	H	126.0	10.2
0.408733	37.98	---	95.38	57.39	1000.0	9.000	100.0	H	307.0	10.2
0.431803	37.41	---	94.90	57.49	1000.0	9.000	100.0	H	-1.0	10.3
0.836125	---	37.28	69.16	31.88	1000.0	9.000	100.0	H	-1.0	10.5
0.995527	---	35.76	67.64	31.88	1000.0	9.000	100.0	H	38.0	10.8
1.042104	---	35.38	67.25	31.86	1000.0	9.000	100.0	H	167.0	10.8
2.307237	---	26.88	69.54	42.66	1000.0	9.000	100.0	H	13.0	10.8

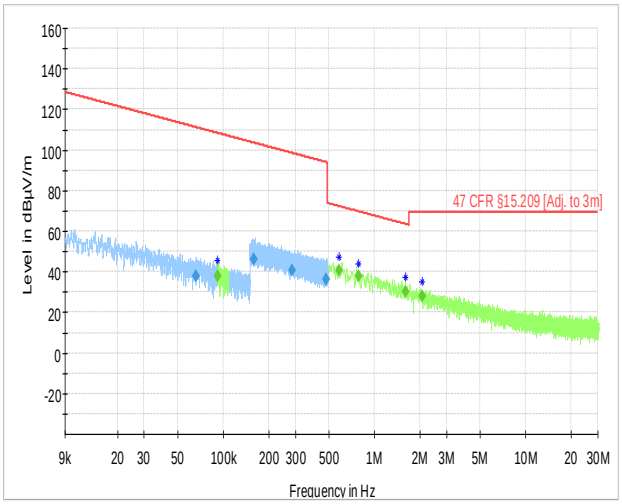
Test mode condition	Zigbee, Mid channel (2445 MHz)	
Antenna orientation	Loop Antenna Perpendicular to Axis	
Sweep frequency	9kHz - 30 MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003623398-001	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2024.01.12
Chamber details	Chamber: SAC 5	

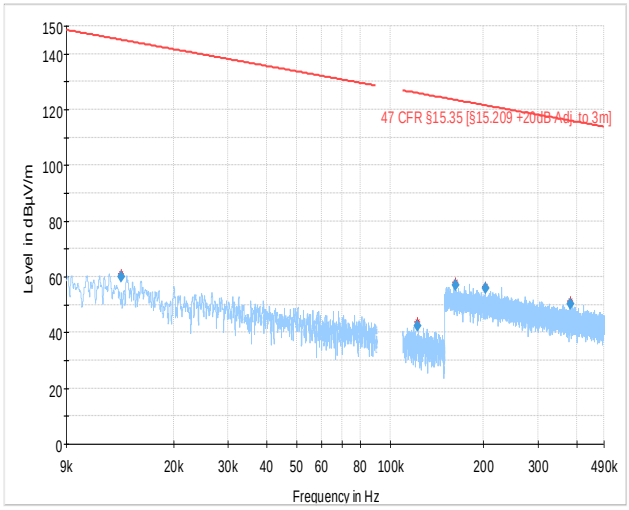




Frequency (MHz)	Average (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
0.105886	---	36.04	107.11	71.07	1000.0	0.200	100.0	H	45.0	10.5
0.128379	31.90	---	105.43	73.54	1000.0	0.200	100.0	H	225.0	10.5
0.296435	40.64	---	98.17	57.53	1000.0	9.000	100.0	H	89.0	10.3
0.365874	38.83	---	96.34	57.50	1000.0	9.000	100.0	H	38.0	10.2
0.419976	37.59	---	95.14	57.55	1000.0	9.000	100.0	H	225.0	10.2
0.605558	---	40.23	71.96	31.74	1000.0	9.000	100.0	H	77.0	10.5
0.806904	---	37.48	69.47	31.98	1000.0	9.000	100.0	H	135.0	10.5
1.635805	---	30.22	63.33	33.11	1000.0	9.000	100.0	H	229.0	10.8
2.164642	---	27.45	69.54	42.09	1000.0	9.000	100.0	H	25.0	10.8

Test mode condition	Zigbee, Mid channel (2445 MHz)	
Antenna orientation	Loop Antenna Parallel to floor	
Sweep frequency	9kHz - 30 MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003623398-001	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2024.01.13
Chamber details	Chamber: SAC 5	



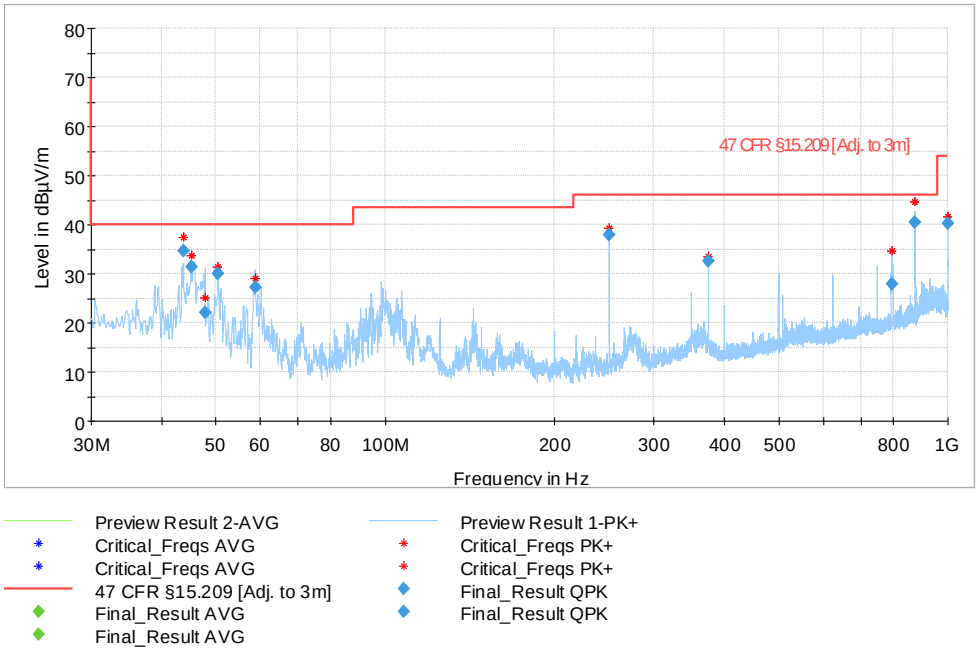


Preview Result 2-PK+
Critical_Freqs PK+
47 CFR §15.209 [Adj. to 3m]
Final_Result QPK
QuasiPeak-QPK (Single)
Preview Result 1-AVG
Critical_Freqs AVG
Final_Result AVG
MaxPeak-PK+ (Single)
Average-AVG (Single)

Preview Result 1-PK+
47 CFR §15.35 [§15.209 +20dB Adj. to 3m]
MaxPeak-PK+ (Single)
Critical_Freqs PK+
Final_Result PK+

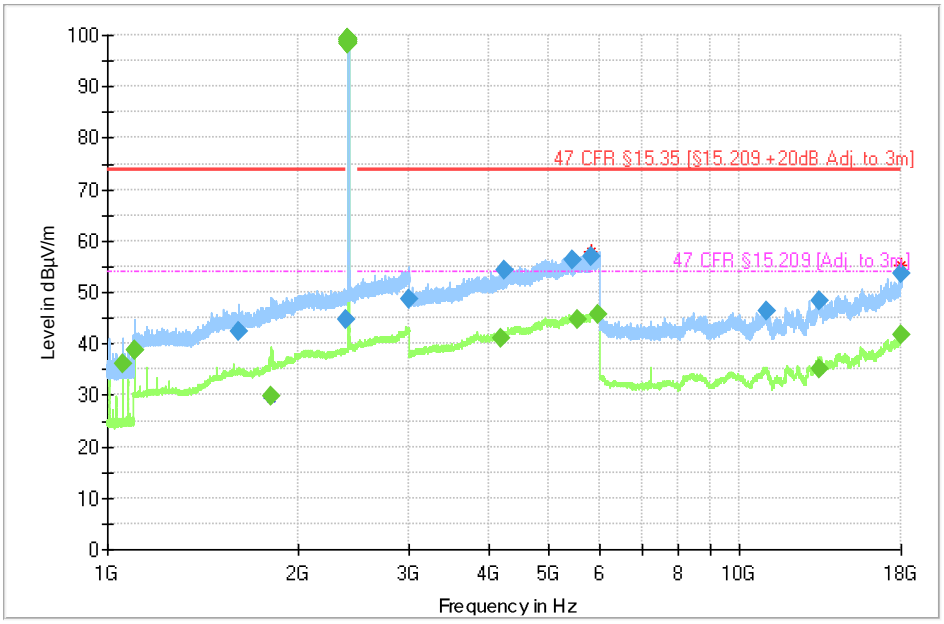
Frequency (MHz)	Average (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.065926	37.74	---	111.22	73.48	1000.0	0.200	100.0	H	-45.0	11.2
0.091422	---	37.75	108.38	70.63	1000.0	0.200	100.0	H	139.0	10.9
0.159507	46.30	---	103.55	57.25	1000.0	9.000	100.0	H	-1.0	10.4
0.286139	40.92	---	98.47	57.55	1000.0	9.000	100.0	H	225.0	10.3
0.479568	36.49	---	93.99	57.50	1000.0	9.000	100.0	H	282.0	10.4
0.582046	---	40.82	72.31	31.48	1000.0	9.000	100.0	H	229.0	10.5
0.784083	---	37.87	69.72	31.84	1000.0	9.000	100.0	H	49.0	10.5
1.601186	---	30.42	63.52	33.09	1000.0	9.000	100.0	H	76.0	10.8
2.062869	---	28.03	69.54	41.51	1000.0	9.000	100.0	H	-45.0	10.8

Test mode condition	Zigbee, Mid channel (2445 MHz)	
Antenna orientation	Horizontal and Vertical	
Sweep frequency	30 MHz – 1 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003623398-001	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2023.12.18
Chamber details	Chamber: SAC 5	



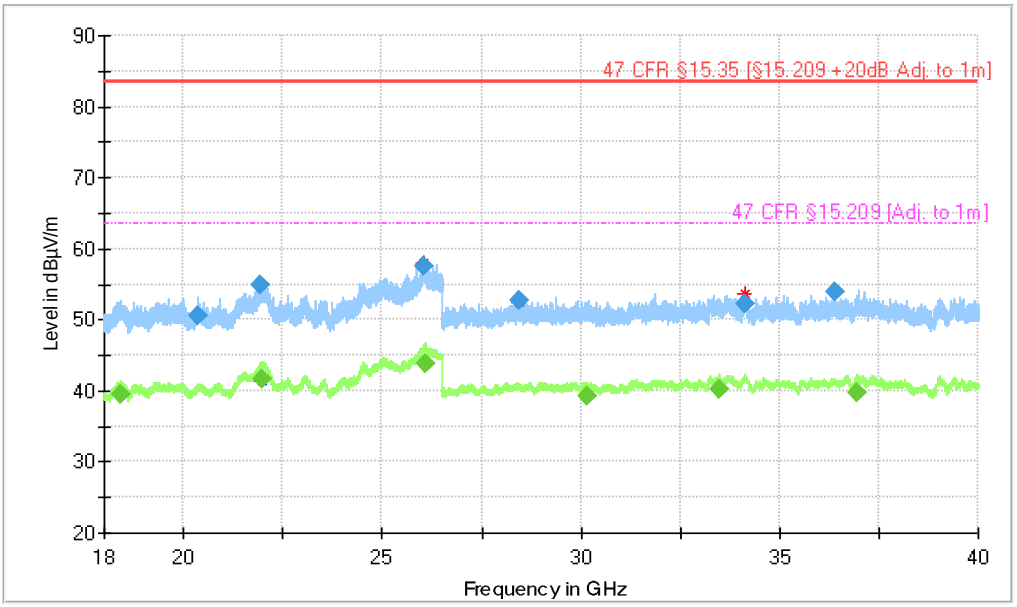
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
43.785160	34.66	40.00	5.34	1000.0	120.000	100.0	V	279.0	-38.3
45.256560	31.43	40.00	8.57	1000.0	120.000	100.0	V	162.0	-39.4
47.797440	22.00	40.00	18.00	1000.0	120.000	100.0	V	87.0	-41.1
50.441400	29.97	40.00	10.03	1000.0	120.000	100.0	V	267.0	-42.8
58.716920	27.25	40.00	12.75	1000.0	120.000	257.0	V	338.0	-44.7
249.993600	37.82	46.02	8.20	1000.0	120.000	129.0	H	72.0	-40.8
374.989280	32.60	46.02	13.42	1000.0	120.000	179.0	V	338.0	-36.8
795.118000	27.92	46.02	18.10	1000.0	120.000	207.0	V	9.0	-28.5
875.001120	40.58	46.02	5.44	1000.0	120.000	100.0	H	26.0	-27.5
999.997900	40.23	53.98	13.75	1000.0	120.000	100.0	V	-3.0	-25.6

Test mode condition	Zigbee, Mid channel (2445 MHz)	
Antenna orientation	Horizontal and Vertical	
Sweep frequency	1 GHz – 18 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003618316-004	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2023.12.28
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)	Corr. (dB/m)
1615.547000	42.26	---	73.98	31.72	1000.0	1000.000	100.0	H	252.0	-17.5
2378.091000	44.57	---	73.98	29.41	1000.0	1000.000	104.0	V	112.0	-14.3
11013.324000	46.28	---	73.98	27.70	1000.0	1000.000	175.0	H	26.0	8.5
13326.108000	48.36	---	73.98	25.62	1000.0	1000.000	129.0	V	248.0	11.2
2994.269153	48.78	---	73.98	25.20	1000.0	1000.000	179.0	V	11.0	-11.0
1818.030000	---	29.70	53.98	24.28	1000.0	1000.000	100.0	H	162.0	-17.2
17971.478000	53.70	---	73.98	20.28	1000.0	1000.000	175.0	H	116.0	22.0
4237.745000	54.41	---	73.98	19.57	1000.0	1000.000	217.0	H	281.0	-5.2
13340.105000	---	34.97	53.98	19.01	1000.0	1000.000	175.0	V	-18.0	11.2
1056.026000	---	36.06	53.98	17.92	1000.0	1000.000	179.0	V	68.0	-23.3
...	...	...	...	...	...	...	...	...	...	...

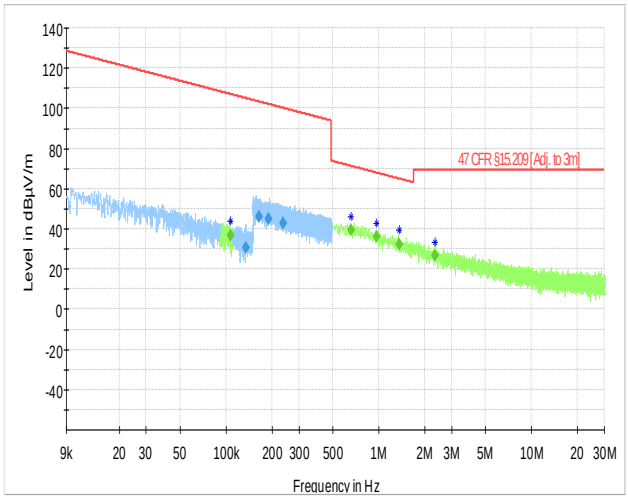
Test mode condition	Zigbee, Mid channel (2445 MHz)	
Antenna orientation	Horizontal and Vertical	
Sweep frequency	18 GHz – 40 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003618316-004	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2024.01.02
Chamber details	Chamber: SAC 5	

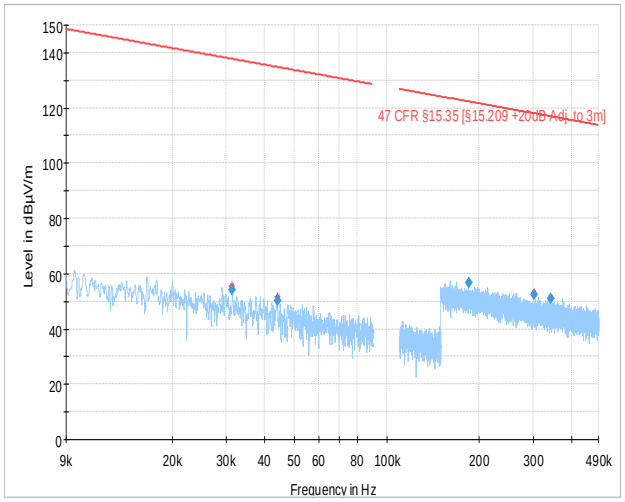


Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18413.963000	---	39.56	63.52	23.96	1000.0	1000.000	155.0	H	262.0	-5.6
20349.342000	50.63	---	83.52	32.90	1000.0	1000.000	155.0	V	52.0	-4.3
21917.976000	54.79	---	83.52	28.73	1000.0	1000.000	155.0	H	248.0	-0.2
21960.787000	---	41.55	63.52	21.97	1000.0	1000.000	155.0	H	225.0	0.1
26059.376000	57.63	---	83.52	25.89	1000.0	1000.000	155.0	H	98.0	0.8
26079.377000	---	43.88	63.52	19.64	1000.0	1000.000	155.0	V	132.0	0.7
28460.081000	52.67	---	83.52	30.85	1000.0	1000.000	155.0	H	338.0	-4.9
30161.813000	---	39.35	63.52	24.17	1000.0	1000.000	155.0	H	308.0	-4.9
33461.341000	---	40.30	63.52	23.23	1000.0	1000.000	155.0	V	86.0	-4.7
34132.885000	52.27	---	83.52	31.26	1000.0	1000.000	155.0	H	352.0	-4.8
36394.275000	53.85	---	83.52	29.67	1000.0	1000.000	155.0	V	102.0	-6.7
36966.493000	---	39.77	63.52	23.76	1000.0	1000.000	155.0	H	52.0	-6.3

High Channel

Test mode condition	Zigbee, High channel (2480 MHz)	
Antenna orientation	Loop Antenna Parallel to Axis	
Sweep frequency	9kHz - 30 MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003623398-001	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2024.01.11
Chamber details	Chamber: SAC 5	



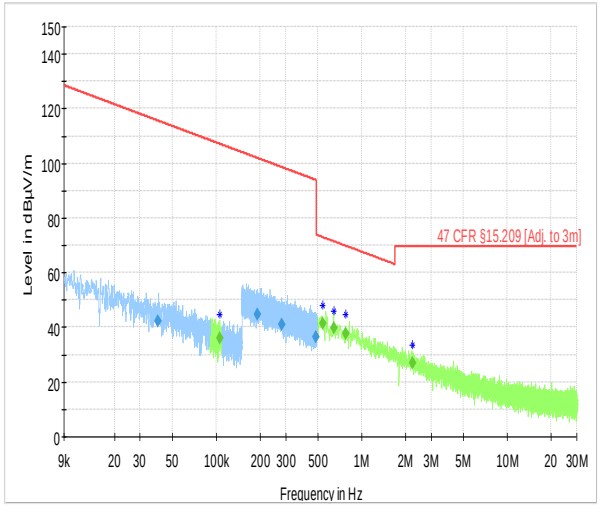


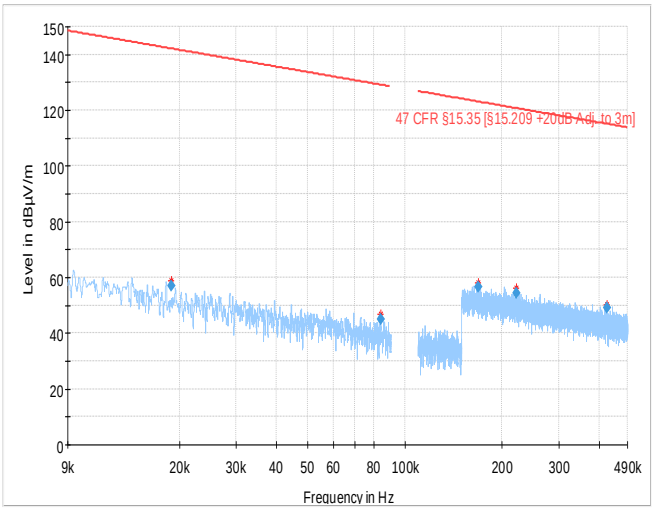
Preview Result 2-PK+
Critical_Freqs PK+
47 CFR §15.209 [Adj. to 3m]
Final_Result QPK
QuasiPeak-QPK (Single)
Preview Result 1-AVG
Critical_Freqs AVG
Final_Result AVG
MaxPeak-PK+ (Single)
Average-AVG (Single)

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

Frequency (MHz)	Average (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.106800	---	36.57	107.03	70.46	1000.0	0.200	100.0	H	101.0	10.5
0.134196	30.83	---	105.05	74.22	1000.0	0.200	100.0	H	178.0	10.5
0.163933	46.07	---	103.31	57.24	1000.0	9.000	100.0	H	225.0	10.4
0.189197	44.93	---	102.07	57.14	1000.0	9.000	100.0	H	76.0	10.4
0.236793	42.77	---	100.12	57.34	1000.0	9.000	100.0	H	101.0	10.4
0.654757	---	39.64	71.28	31.64	1000.0	9.000	100.0	H	244.0	10.5
0.964573	---	35.95	67.92	31.97	1000.0	9.000	100.0	H	-45.0	10.7
1.362567	---	32.34	64.92	32.58	1000.0	9.000	100.0	H	-41.0	10.8
2.334161	---	26.68	69.54	42.86	1000.0	9.000	100.0	H	45.0	10.8

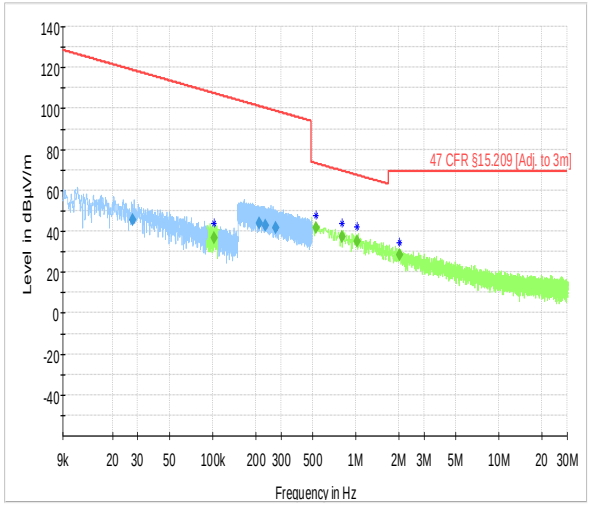
Test mode condition	Zigbee, High channel (2480 MHz)	
Antenna orientation	Loop Antenna Perpendicular to Axis	
Sweep frequency	9kHz - 30 MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003623398-001	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2024.01.12
Chamber details	Chamber: SAC 5	

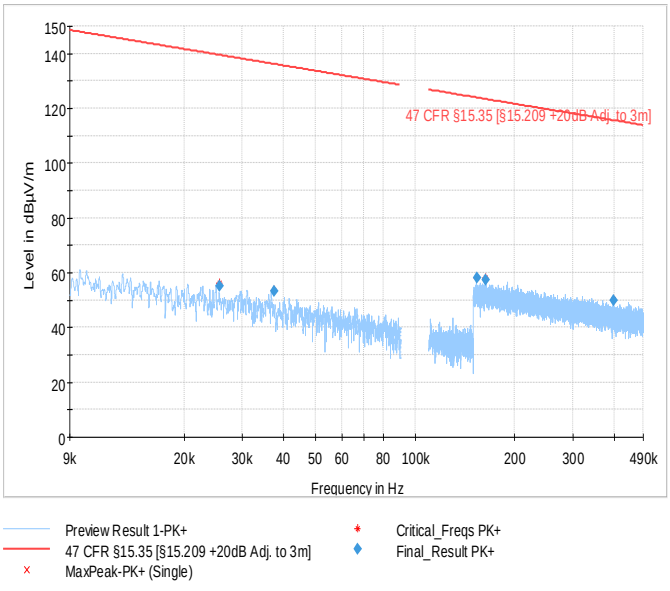




Frequency (MHz)	Average (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
0.039941	42.18	---	115.58	73.40	1000.0	0.200	100.0	H	14.0	12.4
0.106488	---	36.22	107.06	70.84	1000.0	0.200	100.0	H	225.0	10.5
0.191682	44.78	---	101.95	57.17	1000.0	9.000	100.0	H	270.0	10.4
0.281162	41.16	---	98.63	57.47	1000.0	9.000	100.0	H	282.0	10.3
0.483911	36.66	---	93.91	57.25	1000.0	9.000	100.0	H	245.0	10.4
0.539096	---	41.39	72.97	31.58	1000.0	9.000	100.0	H	315.0	10.4
0.641654	---	39.79	71.46	31.67	1000.0	9.000	100.0	H	135.0	10.5
0.777403	---	37.87	69.79	31.92	1000.0	9.000	100.0	H	-41.0	10.5
2.227839	---	27.07	69.54	42.47	1000.0	9.000	100.0	H	135.0	10.8

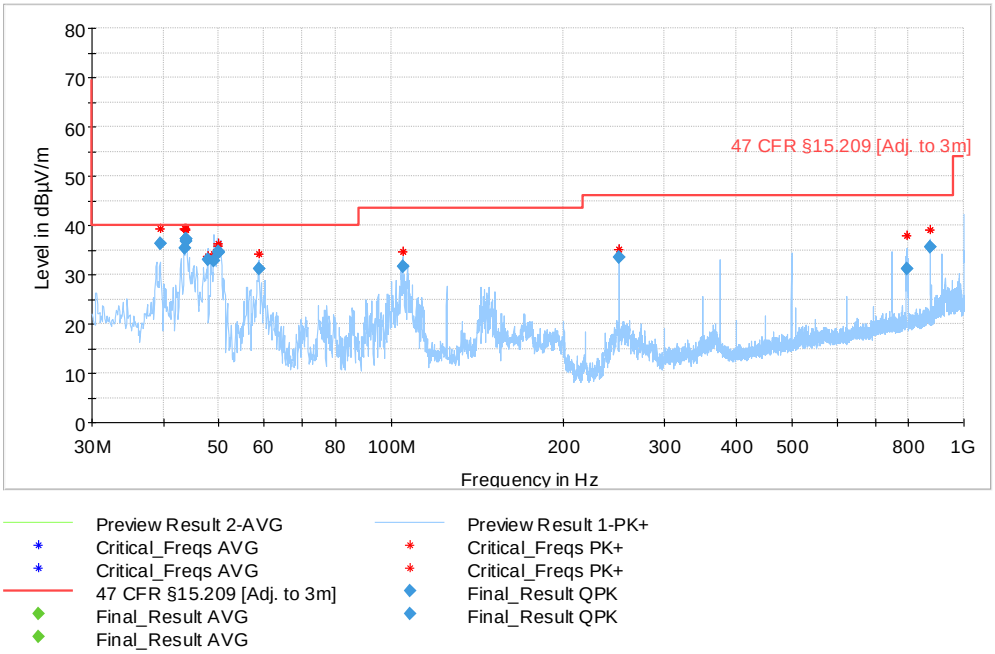
Test mode condition	Zigbee, High channel (2480 MHz)	
Antenna orientation	Loop Antenna Parallel to floor	
Sweep frequency	9kHz - 30 MHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003623398-001	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2024.01.13
Chamber details	Chamber: SAC 5	





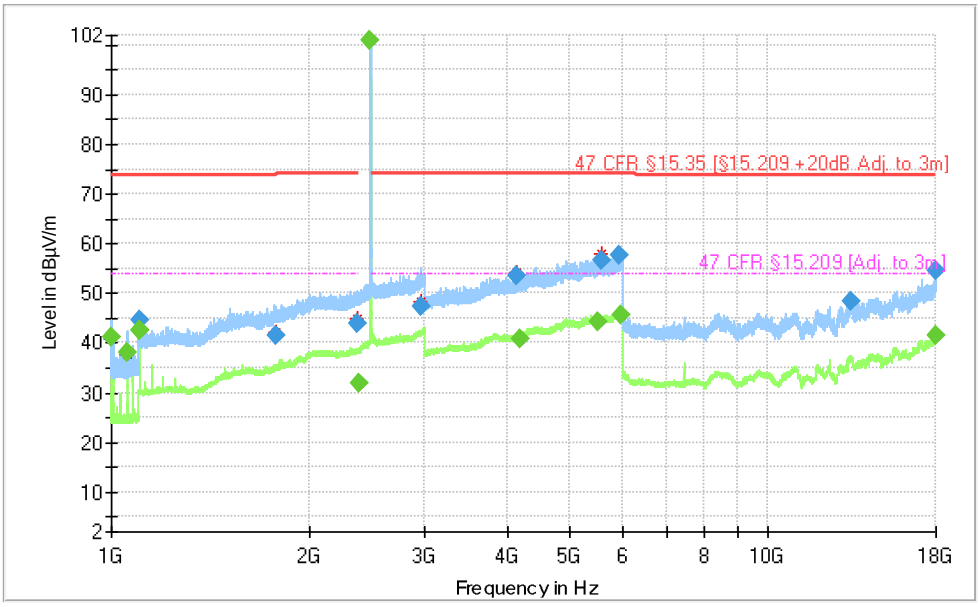
Frequency (MHz)	Average (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.027742	45.71	---	118.74	73.03	1000.0	0.200	100.0	H	45.0	14.0
0.102802	---	36.81	107.36	70.55	1000.0	0.200	100.0	H	65.0	10.5
0.212036	43.83	---	101.08	57.25	1000.0	9.000	100.0	H	135.0	10.4
0.234916	42.93	---	100.19	57.26	1000.0	9.000	100.0	H	0.0	10.4
0.275324	41.41	---	98.81	57.40	1000.0	9.000	100.0	H	-41.0	10.3
0.531156	---	41.44	73.10	31.66	1000.0	9.000	100.0	H	45.0	10.4
0.798767	---	37.51	69.56	32.05	1000.0	9.000	100.0	H	128.0	10.5
1.018607	---	35.27	67.44	32.17	1000.0	9.000	100.0	H	169.0	10.8
2.013839	---	28.13	69.54	41.41	1000.0	9.000	100.0	H	205.0	10.8

Test mode condition	Zigbee, High channel (2480 MHz)	
Antenna orientation	Horizontal and Vertical	
Sweep frequency	30 MHz – 1 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003623398-001	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2024.01.15
Chamber details	Chamber: SAC 5	



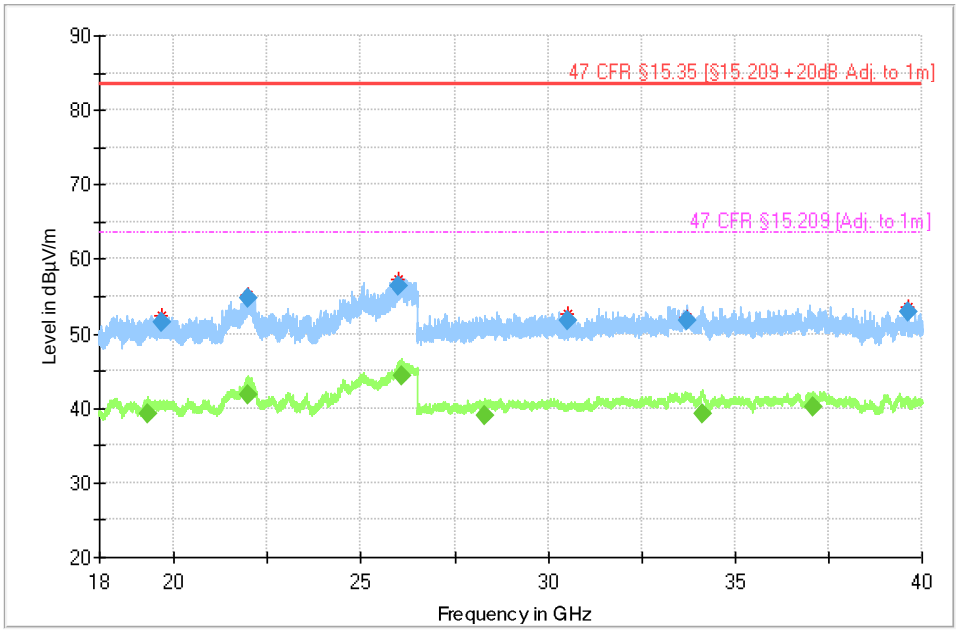
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
39.489200	36.38	40.00	3.62	1000.0	120.000	100.0	V	26.0	-35.0
43.501000	35.40	40.00	4.60	1000.0	120.000	100.0	V	-18.0	-38.1
43.789960	37.12	40.00	2.88	1000.0	120.000	100.0	V	-18.0	-38.3
43.797360	36.83	40.00	3.17	1000.0	120.000	100.0	V	-18.0	-38.3
43.798600	37.24	40.00	2.76	1000.0	120.000	100.0	V	-18.0	-38.3
47.804880	32.92	40.00	7.08	1000.0	120.000	100.0	V	-22.0	-41.1
49.067560	32.81	40.00	7.19	1000.0	120.000	100.0	V	-22.0	-42.0
49.845960	34.60	40.00	5.40	1000.0	120.000	100.0	V	-22.0	-42.4
49.850920	34.45	40.00	5.55	1000.0	120.000	100.0	V	-22.0	-42.4
58.725680	31.06	40.00	8.94	1000.0	120.000	175.0	V	252.0	-44.7
104.750480	31.60	43.52	11.92	1000.0	120.000	125.0	V	335.0	-41.1
249.995880	33.47	46.02	12.56	1000.0	120.000	129.0	H	148.0	-40.8
795.947360	31.14	46.02	14.88	1000.0	120.000	225.0	V	68.0	-28.5
875.002080	35.51	46.02	10.51	1000.0	120.000	125.0	V	87.0	-27.5

Test mode condition	Zigbee, High channel (2480 MHz)	
Antenna orientation	Horizontal and Vertical	
Sweep frequency	1 GHz – 18 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003618316-004	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2023.12.15
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)	Corr. (dB/m)
1000.032256	---	41.01	53.98	12.97	1000.0	1000.000	159.0	V	72.0	-23.2
1056.006000	---	37.93	53.98	16.05	1000.0	1000.000	179.0	V	72.0	-23.3
1103.963691	---	42.54	53.98	11.44	1000.0	1000.000	225.0	V	312.0	-21.6
1104.012237	---	42.50	53.98	11.48	1000.0	1000.000	214.0	V	313.0	-21.6
1104.062581	44.64	---	73.98	29.35	1000.0	1000.000	175.0	H	-18.0	-21.6
1776.993000	41.58	---	73.99	32.42	1000.0	1000.000	175.0	H	292.0	-16.9
2370.595000	43.91	---	74.00	30.09	1000.0	1000.000	125.0	H	22.0	-14.4
2380.162000	---	32.02	54.00	21.98	1000.0	1000.000	129.0	H	100.0	-14.3
2479.446000	104.74	---	---	---	1000.0	1000.000	175.0	V	234.0	-13.3
2480.050000	---	100.81	---	---	1000.0	1000.000	175.0	V	202.0	-13.3
...	...	...	...	...	...	...	...	...	...	...

Test mode condition	Zigbee, High channel (2480 MHz)	
Antenna orientation	Horizontal and Vertical	
Sweep frequency	18 GHz – 40 GHz	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003618316-004	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Fariborz Abasi	Date: 2024.01.02
Chamber details	Chamber: SAC 5	



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19308.470000	---	39.23	63.52	24.29	1000.0	1000.000	155.0	V	218.0	-4.7
19663.093000	51.44	---	83.52	32.08	1000.0	1000.000	155.0	H	22.0	-5.3
21972.732000	54.82	---	83.52	28.70	1000.0	1000.000	155.0	H	292.0	0.0
21992.578000	---	41.83	63.52	21.69	1000.0	1000.000	155.0	H	38.0	0.2
26014.202000	56.46	---	83.52	27.07	1000.0	1000.000	155.0	H	306.0	0.7
26077.299000	---	44.23	63.52	19.29	1000.0	1000.000	155.0	H	248.0	0.7
28315.008000	---	38.93	63.52	24.59	1000.0	1000.000	155.0	H	22.0	-5.0
30503.944000	51.71	---	83.52	31.81	1000.0	1000.000	155.0	H	116.0	-4.9
33691.906000	51.74	---	83.52	31.78	1000.0	1000.000	155.0	V	322.0	-5.1
34117.630000	---	39.35	63.52	24.17	1000.0	1000.000	155.0	H	22.0	-4.8
37105.322000	---	40.26	63.52	23.27	1000.0	1000.000	155.0	V	248.0	-6.8
39618.450000	52.97	---	83.52	30.55	1000.0	1000.000	155.0	V	86.0	-3.1

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)

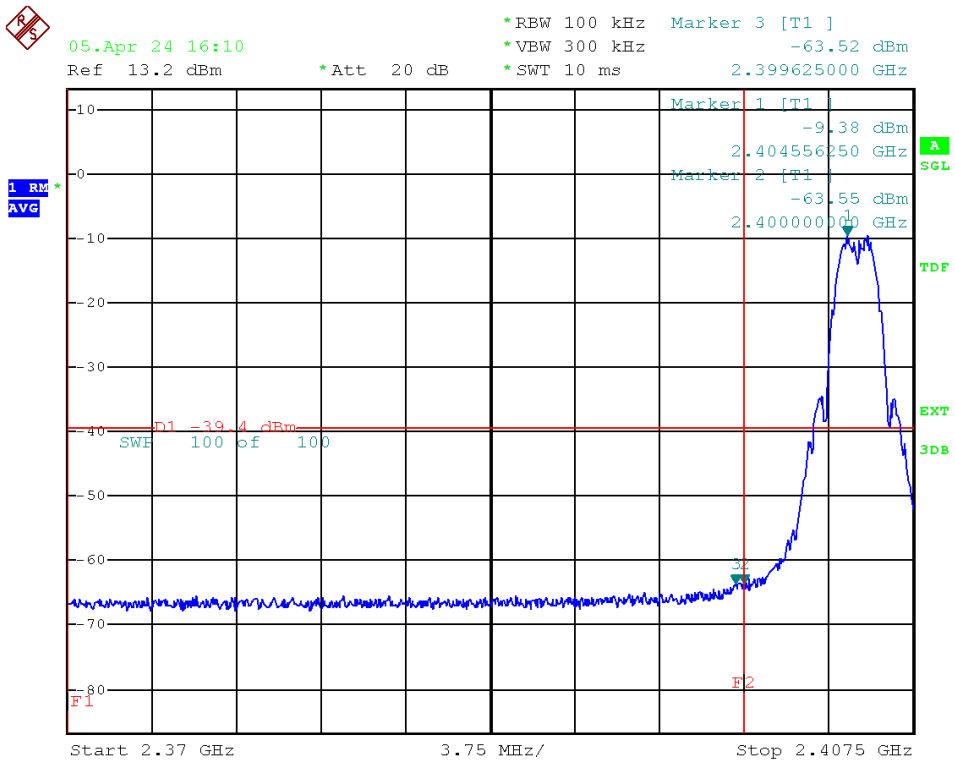
4.4.1 Band Edge Compliance (Authorized Band) – Test Summary

Test Specification	47 CFR 15.247 (d)	
Test Engineer & Date	Maria Nyltun	2024.04.05 – 2024.04.08
EUT and Ancillary Equipment IDs	A003618316-002	A003625200-005 A003618316-005 A003618316-013
EUT Operation Mode(s)	Continuous Tx	
EUT Wireless Configuration(s)	Zigbee	
EUT Hardware Configuration(s)	N/A	
Overall Result	PASS	

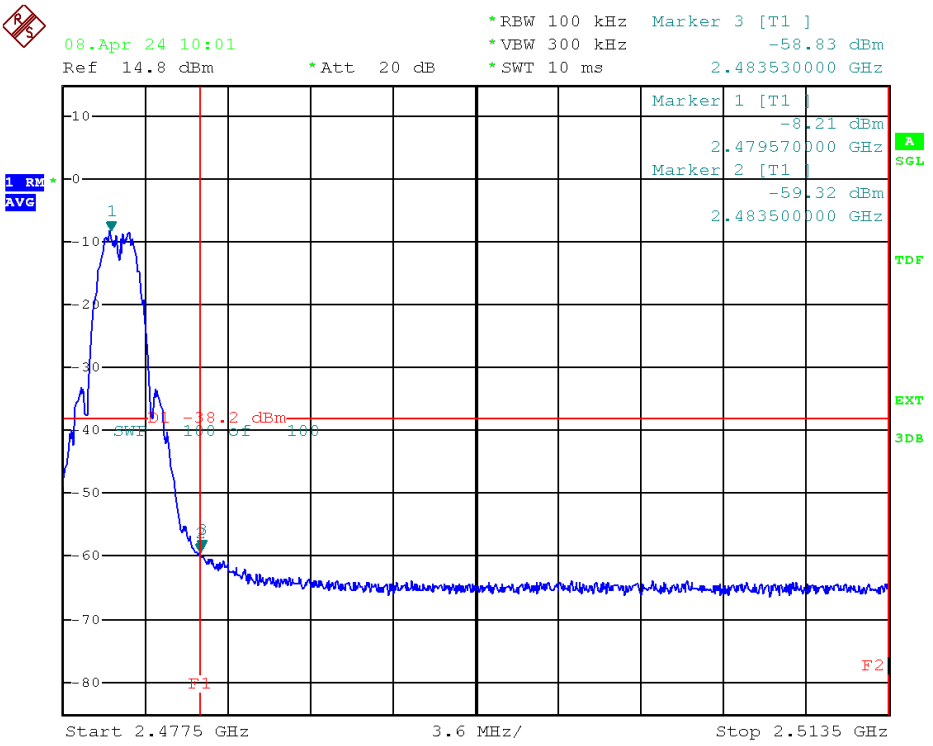
Test Parameter	Wireless Configuration	Measured Level (dBm)	Limit (dBm)	Result
Peak Emissions at Band Edge (Auth. Band – Low Edge)	Zigbee Low Channel (O-QPSK 2405 MHz)	-56.50	-23.3	PASS
Avg. Emissions at Band Edge (Auth. Band – Low Edge)	Zigbee Low Channel (O-QPSK 2405 MHz)	-63.52	-39.4	PASS
Peak Emissions at Band Edge (Auth. Band – High Edge)	Zigbee High Channel (O-QPSK 2480 MHz)	-51.57	-22.11	PASS
Avg. Emissions at Band Edge (Auth. Band – High Edge)	Zigbee High Channel (O-QPSK 2480 MHz)	-58.83	-38.21	PASS

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

Low Channel, Average



High Channel, Average



4.5 Test Results – Band Edge Compliance (Restricted Band)

4.5.1 Band Edge Compliance (Restricted Band) – Test Summary

Test Specification	47 CFR 15.209 & 15.247 (d)	
Test Engineer & Date	Per Isaksson	2023.12.28 – 2023.12.29
EUT and Ancillary Equipment IDs	A003618316-004	A003625200-001 A003623398-003 A003623398-007
EUT Operation Mode(s)	Continuous Tx	
EUT Wireless Configuration(s)	Zigbee	
EUT Hardware Configuration(s)	N/A	
Overall Result	PASS	

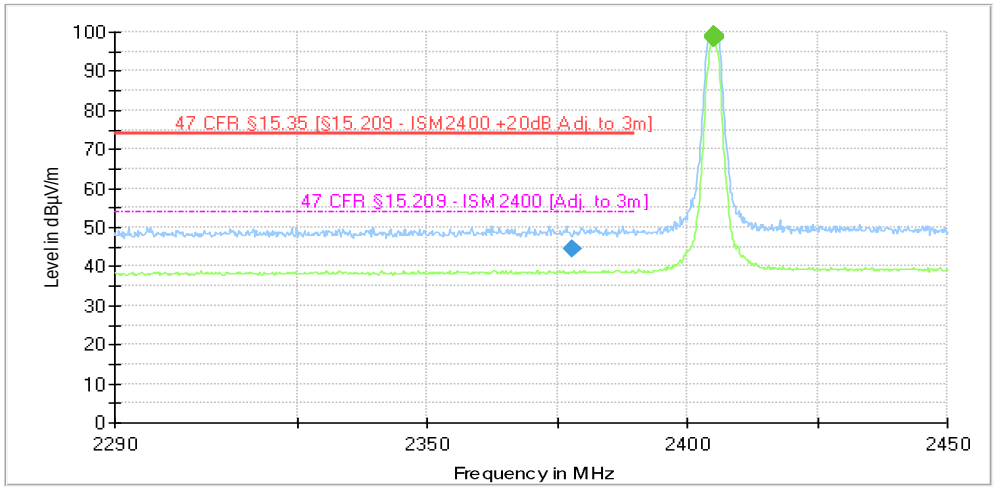
Test Parameter	Wireless Configuration	Result*
Emissions at Band Edge (Rest. Band – Low Edge)	Zigbee Low Channel (O-QPSK 2405 MHz)	PASS
Emissions at Band Edge (Rest. Band – High Edge)	Zigbee High Channel (O-QPSK 2480 MHz	PASS

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

4.5.2 Band Edge Compliance (Restricted Band) – Test Details

Restricted Band – Low Edge

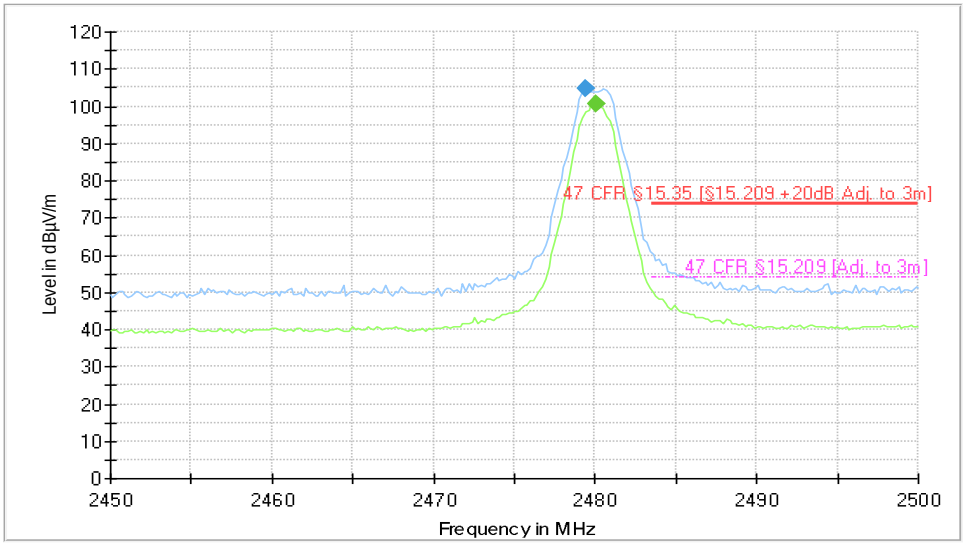
Test mode condition	Zigbee, Low channel (2405 MHz)	
Antenna orientation	Horizontal and Vertical	
Sweep frequency	1 GHz – 18 GHz Lower Band Edge	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003618316-004	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Per Isaksson	Date: 2023.12.28
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)	Corr. (dB/m)
1615.547000	42.26	---	73.98	31.72	1000.0	1000.000	100.0	H	252.0	-17.5
2378.091000	44.57	---	73.98	29.41	1000.0	1000.000	104.0	V	112.0	-14.3
11013.324000	46.28	---	73.98	27.70	1000.0	1000.000	175.0	H	26.0	8.5
13326.108000	48.36	---	73.98	25.62	1000.0	1000.000	129.0	V	248.0	11.2
2994.269153	48.78	---	73.98	25.20	1000.0	1000.000	179.0	V	11.0	-11.0
1818.030000	---	29.70	53.98	24.28	1000.0	1000.000	100.0	H	162.0	-17.2
17971.478000	53.70	---	73.98	20.28	1000.0	1000.000	175.0	H	116.0	22.0
4237.745000	54.41	---	73.98	19.57	1000.0	1000.000	217.0	H	281.0	-5.2
13340.105000	---	34.97	53.98	19.01	1000.0	1000.000	175.0	V	-18.0	11.2
1056.026000	---	36.06	53.98	17.92	1000.0	1000.000	179.0	V	68.0	-23.3
...	...	...	...	...	...	...	...	...	...	...

Restricted Band – High Edge

Test mode condition	Zigbee, High channel (2480 MHz)	
Antenna orientation	Horizontal and Vertical	
Sweep frequency	1 GHz – 18 GHz Upper Band Edge	
Standard	47 CFR FCC Part 15 subpart C	
EUT	A003618316-004	
Ancillary Equipment	A003625200-001 A003623398-003 A003623398-007	
Test Engineer	Per Isaksson	Date: 2023.12.29
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)	Corr. (dB/m)
5976.138000	---	45.55	53.99	8.45	1000.0	1000.000	125.0	V	152.0	-1.5
5516.304000	---	44.19	53.99	9.80	1000.0	1000.000	104.0	V	100.0	-2.3
1103.963691	---	42.54	53.98	11.44	1000.0	1000.000	225.0	V	312.0	-21.6
1104.012237	---	42.50	53.98	11.48	1000.0	1000.000	214.0	V	313.0	-21.6
17992.167840	---	41.54	53.99	12.45	1000.0	1000.000	179.0	H	40.0	22.3
1000.032256	---	41.01	53.98	12.97	1000.0	1000.000	159.0	V	72.0	-23.2
4181.672000	---	40.77	54.00	13.23	1000.0	1000.000	175.0	H	26.0	-5.6
1056.006000	---	37.93	53.98	16.05	1000.0	1000.000	179.0	V	72.0	-23.3
5917.548000	57.71	---	73.99	16.28	1000.0	1000.000	175.0	H	280.0	-1.7
5589.592000	56.68	---	73.99	17.32	1000.0	1000.000	209.0	H	248.0	-2.3
...	...	...	...	...	...	...	...	...	...	...

4.6 Test Results – 20dB Bandwidth

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

4.7 Test Results – Carrier (Hopping Channel) Separation

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

4.8 Test Results – Number of Hopping Channels

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

4.9 Test Results – Time of Occupancy (Dwell Time)

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

4.10 Test Results – 6dB Bandwidth & 99% Bandwidth

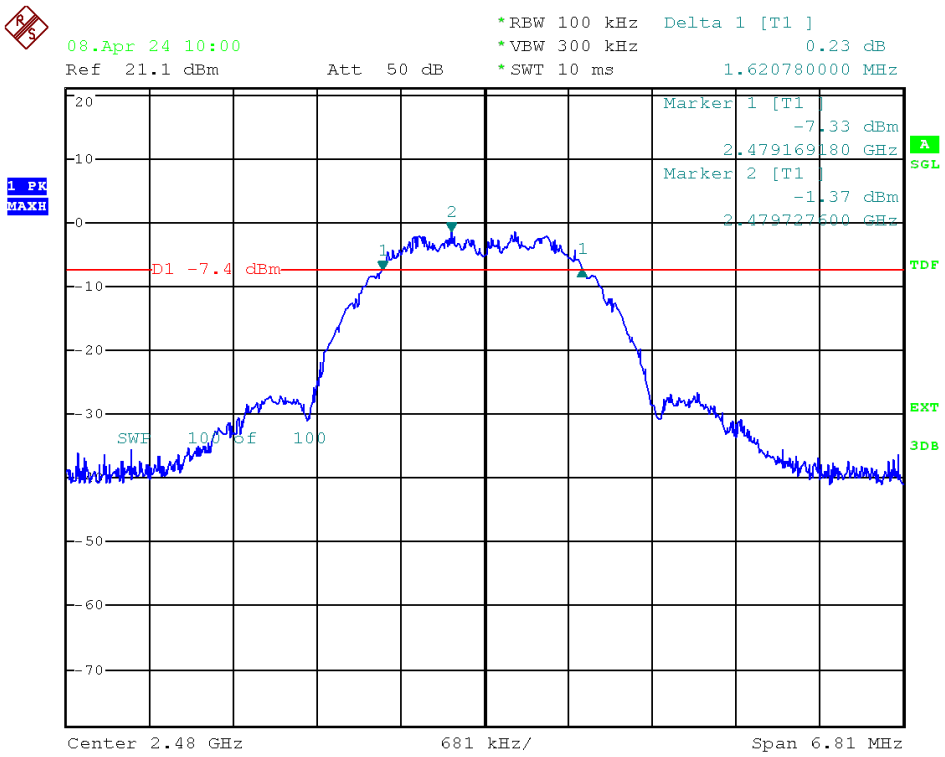
4.10.1 6dB & 99% Bandwidth – Test Summary

Test Specification	15.247 (a)(2)	
Test Engineer & Date	Maria Nyltun	2024.04.05 – 2024.04.08
EUT and Ancillary Equipment IDs	A003618316-002	A003625200-005 A003618316-005 A003618316-013
EUT Operation Mode(s)	Continuous Tx	
EUT Wireless Configuration(s)	Zigbee	
EUT Hardware Configuration(s)	N/A	
Overall Result	PASS	

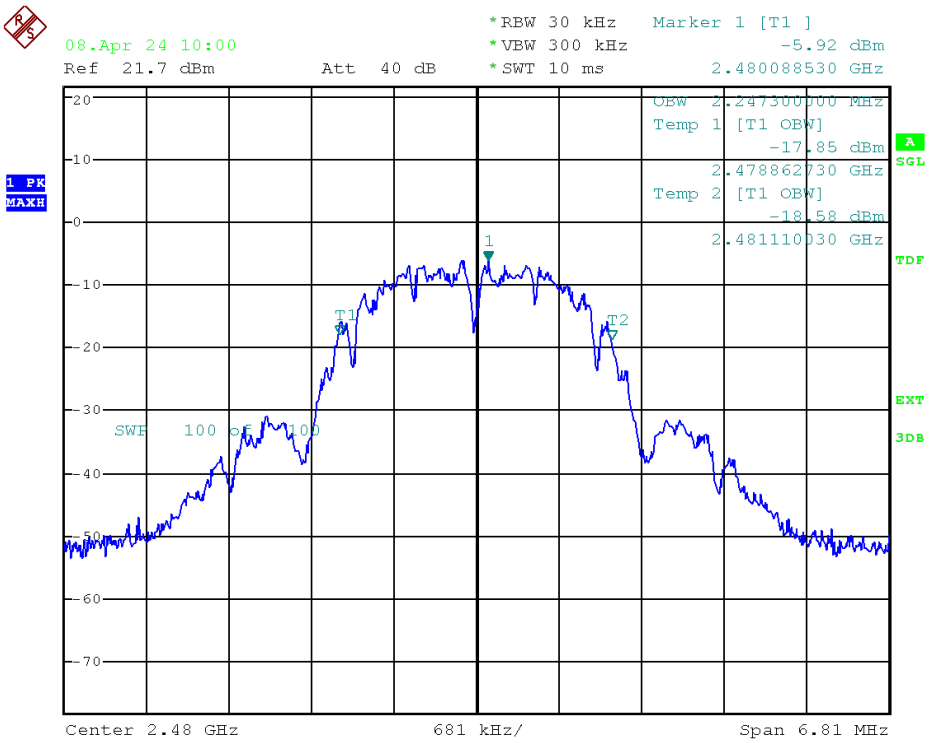
Test Parameter	Wireless Configuration	Measured Level (kHz)	Limit (kHz)	Result
6dB Bandwidth	Zigbee Low Channel (O-QPSK 2405 MHz)	1637.60	>500	PASS
99% Bandwidth	Zigbee Low Channel (O-QPSK 2405 MHz)	2242.35	-	Info Only
6dB Bandwidth	Zigbee Mid Channel (O-QPSK 2445 MHz)	1624.01	>500	PASS
99% Bandwidth	Zigbee Mid Channel (O-QPSK 2445 MHz)	2255.94	-	Info Only
6dB Bandwidth	Zigbee High Channel (O-QPSK 2480 MHz)	1620.78	>500	PASS
99% Bandwidth	Zigbee High Channel (O-QPSK 2480 MHz)	2247.30	-	Info Only

4.10.2 6dB & 99% Bandwidth – Test Details (Worst case plots)

High Channel, 6dB Bandwidth



High Channel, 99% Bandwidth



4.11 Test Results – Peak Conducted Output Power

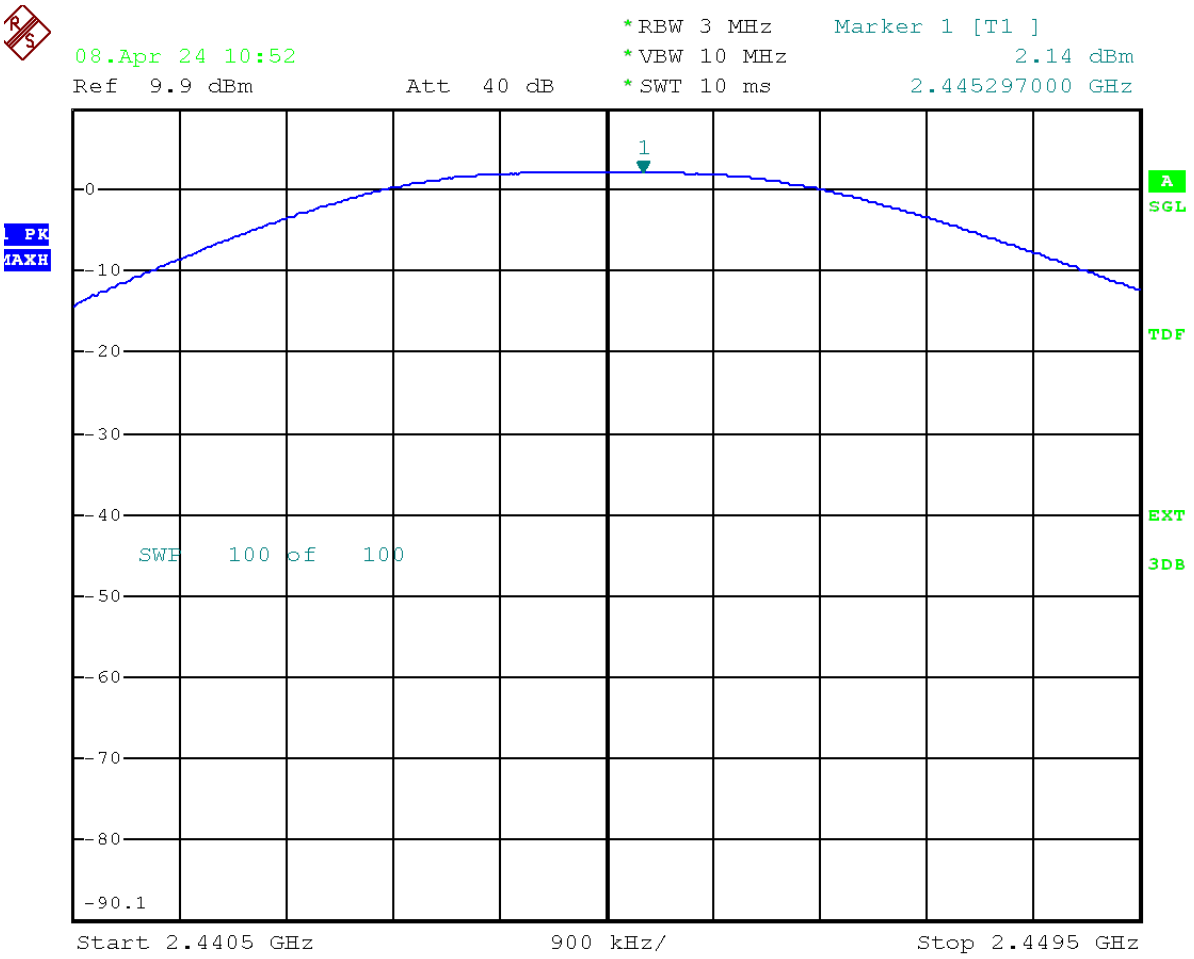
4.11.1 Peak Conducted Output Power – Test Summary

Test Specification	15.247 (b)	
Test Engineer & Date	Maria Nyltun	2024.04.05 – 2024.04.08
EUT and Ancillary Equipment IDs	A003618316-002	A003625200-005 A003618316-005 A003618316-013
EUT Operation Mode(s)	Continuous Tx	
EUT Wireless Configuration(s)	Zigbee	
EUT Hardware Configuration(s)	N/A	
Overall Result	PASS	

Test Parameter	**Wireless Configuration**	**Measured Level (dBm)**			**Limit (dBm)**	**Result**
		Low 0°C	**Nom 25°C**	**High 40°C**		
Peak Conducted Output Power	Zigbee Low Channel (O-QPSK 2405 MHz)	-2.33	0.73	-1.17	> -20 < 30	PASS
Peak Conducted Output Power	Zigbee Mid Channel (O-QPSK 2445 MHz)	-2.02	2.14	-0.72	> -20 < 30	PASS
Peak Conducted Output Power	Zigbee High Channel (O-QPSK 2480 MHz)	0.11	2.08	0.18	> -20 < 30	PASS

4.11.2 Peak Conducted Output Power – Test Details (Worst case plot)

Mid Channel, Normal Temperature



4.12 Test Results – Power Spectral Density

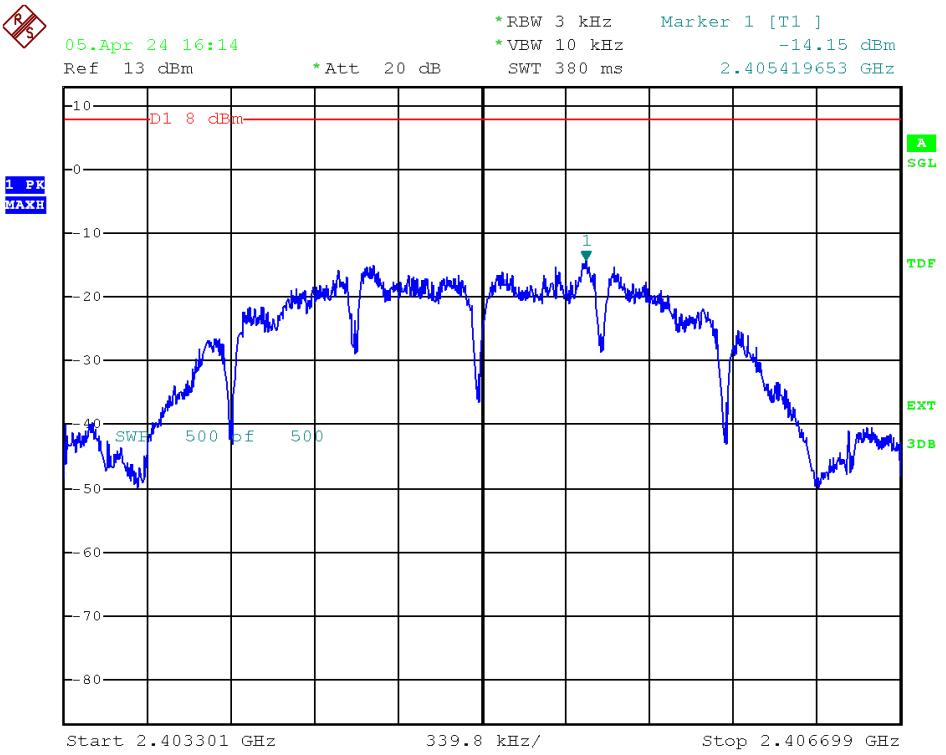
4.12.1 Power Spectral Density – Test Summary

Test Specification	15.247 (e)	
Test Engineer & Date	Maria Nyltun	2024.04.05 – 2024.04.08
EUT and Ancillary Equipment IDs	A003618316-002	A003625200-005 A003618316-005 A003618316-013
EUT Operation Mode(s)	Continuous Tx	
EUT Wireless Configuration(s)	Zigbee	
EUT Hardware Configuration(s)	N/A	
Overall Result	PASS	

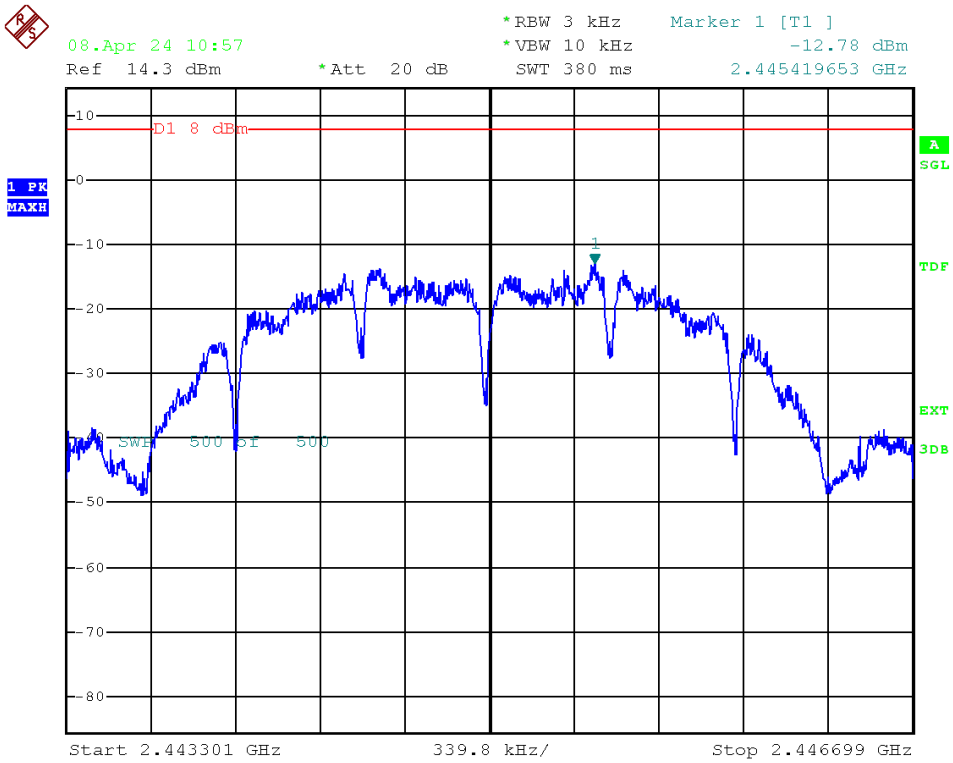
Test Parameter	Wireless Configuration	Measured (dBm/3kHz)	Low Limit (dBm/3kHz)	High Limit (dBm/3kHz)	Result
Power Density	Zigbee Low Channel (O-QPSK 2405 MHz)	-14.15	-30	8	PASS
Power Density	Zigbee Mid Channel (O-QPSK 2445 MHz)	-12.78	-30	8	PASS
Power Density	Zigbee High Channel (O-QPSK 2480 MHz)	-12.85	-30	8	PASS

4.12.2 Power Spectral Density – Test Details

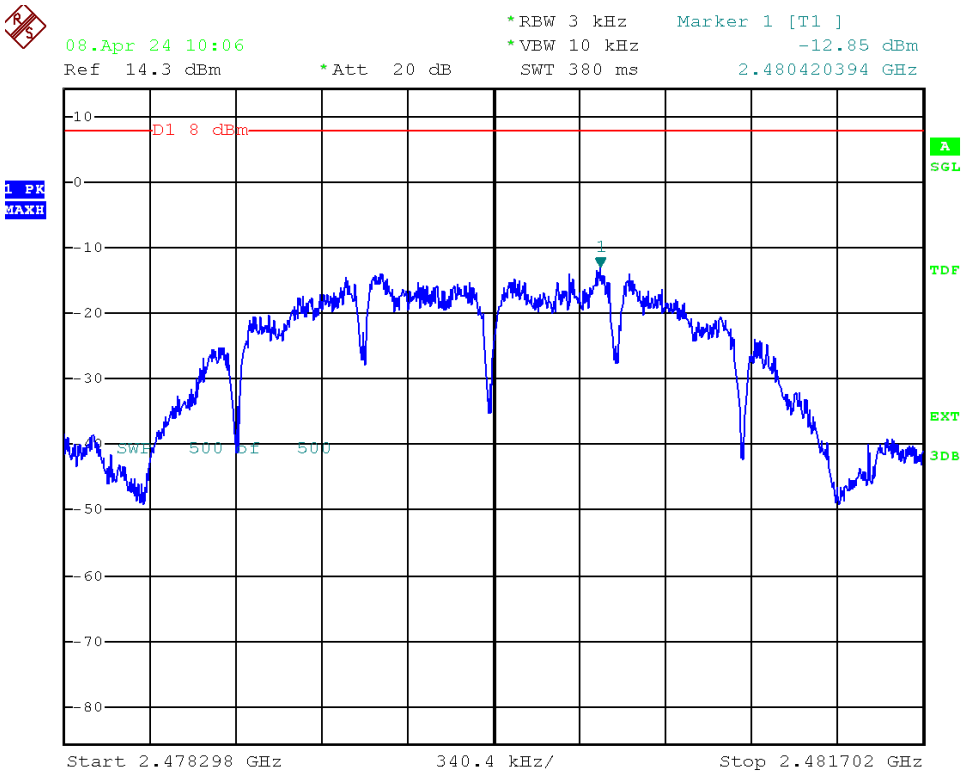
Low Channel



Mid Channel



High Channel



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	HWE 6000	00139	N/A	N/A
Bluetooth Signaling Unit	Rohde & Schwarz	CMW500	163750 2711468	2023-07-17	2024-07-17
Spectrum Analyzer	Rohde & Schwarz	FSP30	100308 2704108	2023-08-16	2024-08-16
Vector Signal Generator	Rohde & Schwarz	SMU200A	101584 2704111	2023-07-13	2024-07-13
Power Supply	Keithley	2700	995343 2704115	2023-07-21	2024-07-21
Multimeter	Fluke	87	61320241 2744110	2023-06-12	2024-06-12
Average Power Sensor	Rohde & Schwarz	NRP-Z31	102145 2704104	2023-07-12	2024-07-12
Temperature Chamber	Vötsch	VT4002	58566032870010 2709706	N/A	N/A
Temp. & Humidity Logger	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	2023.07.03	2024.07.03
Test Receiver 9KHz to 3.5 GHz	Rohde & Schwarz	ESR3	101674 2704016	2023.06.29	2024.06.29
Humidity Temperature Probe	Lufft	OPUS 20	146.0216.0802.030 2703980	2022.07.27	2024.07.27
Multimeter	FLUKE	325	40860701WS 2877011	2023.06.08	2024.06.08

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	2023.08.04	2024.08.04
Ultra Broadband Antenna	Rohde & Schwarz	HL562E	100988 2823181	2023.07.18	2024.07.18
Double Ridged Waveguide Horn Antenna	Rohde & Schwarz	HF907	102678 2823164	2023.07.27	2025.07.27
Horn Antenna – 18 GHz – 26 GHz	ETS Lindgren	UG-596A/U	20898 2814839	2022.07.26	2024.07.26
Horn Antenna – 26 GHz - 40 GHz	ETS Lindgren	UG-600A/U	20623 2814834	2022.07.26	2024.07.26
Frequency Multiplier	Rohde & Schwarz	SMZ-90	101350 2886126	2021.03.08	2024.03.08
Control device	Maturo	NCD	NCD/393/2372.01 2884216	N/A	N/A
Open Switch & Control Unit	Rohde & Schwarz	OSP150	100081 2884198	2023.08.29	2024.08.29
Open Switch & Control Unit	Rohde & Schwarz	OSP120	100084 2761253	2023.08.29	2024.08.29
Shielded Filter Unit	Rohde & Schwarz	OSP-F Extension 1	101333 2761265	2023.08.29	2024.08.29
Shielded Filter Unit	Rohde & Schwarz	OSP-F Extension 2	101335 2761266	2023.08.29	2024.08.29
Shielded Filter Unit	Rohde & Schwarz	OSP-F Base Unit	101330 2761262	2023.08.29	2024.08.29
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	V52.0 V44.0
Conducted Emissions System	EMC 32	V10.60.20
SAC 5	EMC 32	V10.60.10

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