



BEC INCORPORATED

CERTIFICATION APPLICATION TEST REPORT

TEST STANDARDS:

**FCC Part 15 Subpart C, IC RSS-Gen, IC RSS-247
DTS Intentional Radiator**

EUT:

**Legrand Model WNACB4 and Model WZ3ACB4
adorne 4-Button Scene Controller**

FCC ID: 2AU5D-WACB4

ISED ID: 25764-WACB4

REPORT#: BEC-2194-01

TEST DATES: 03/17/2022 – 03/31/2022

CUSTOMER:

**Pass & Seymour/Legrand
50 Boyd Avenue
Syracuse, NY 13209**

PREPARED BY:

Paul Banker, Test Engineer

REVIEWED and APPROVED BY:

Steve Fanella, Quality Manager

The results described in this report relate only to the item(s) tested. This document shall not be reproduced except in full without prior written permission of BEC Incorporated





TABLE OF CONTENTS

Notice to Customer	4
Revision History	4
1.0 Administrative Information	5
1.1 Project General Information	5
1.2 Preface	6
1.3 Laboratory and Customer Information	6
1.4 Measurement Uncertainty	7
1.5 Test Result Summary Table	8
1.6 Condition of Received Sample	9
1.7 Climatic Environment	9
1.8 Test Equipment	9
2.0 Equipment Under Test	10
2.1 EUT Description	10
2.2 Product Category	10
2.3 Product Classification	10
2.4 Test Configuration	11
2.5 Test Configuration Rationale	11
2.6 Test Configuration Diagrams – Zigbee Radio	11
2.6.1 Zigbee Configuration – Conducted Measurement	11
2.6.2 Zigbee Configuration – Radiated Measurement	12
2.7 EUT Information, Interconnection Cabling and Support Equipment	12
2.8 Test Signals and Test Modulation	13
2.8.1 Zigbee Radio - Test Signals and Modulation	13
2.9 Grounding	13
2.10 EUT Modifications	13
3.0 Applicable Requirements, Methods, and Procedures	14
3.1 Applicable Requirements	14
3.1.1 FCC Requirements	14
3.1.2 Industry Canada Requirements	14
3.1.3 Basic Test Methods and Test Procedures	14
3.2 Deviations or Exclusions from the Requirements	14
4.0 Test Results	15
4.1 Antenna Requirement (47 CFR 15.203)(RSS-GEN ANNEX A (10)(g))	15
4.2 External RF power amps/antenna modifications (47 CFR 15.204)(RSS-GEN 8.3)	15
4.3 Conducted Emissions AC Power Port (47 CFR 15.207)(RSS-GEN 7.2)	15
4.4 Emissions in Non-Restricted and Restricted Frequency Bands, 30 MHz - 25 GHz (47 CFR 15.205, 15.209)(RSS-GEN 8.9, 8.10)	15
4.4.1 Radiated Spurious Emissions Test Facility	16
4.4.2 Emissions in Non-Restricted and Restricted Frequency Bands Test Procedure	17
4.4.3 Emissions in Frequency Bands 30 MHz – 1000 MHz WNACB4 and WZ3ACB4 Zigbee Radio (03/23/2022)	18
4.4.4 Emissions in Frequency Bands 1 - 18 GHz WNACB4 and WZ3ACB4 Zigbee Radio Test Results (03/17/2022)	20
4.4.5 Emissions in Frequency Bands 18 – 25 GHz WNACB4 and WZ3ACB4 Zigbee Radio (03/30/2022)	22



4.5	DTS Bandwidth (FCC Section 15.247(a)(2) RSS-247 5.2(a)).....	23
4.5.1	DTS Bandwidth – Test Procedure	23
4.5.1.1	DTS Bandwidth Test Results Model WNACB4 and Model WZ3ACB4 Zigbee Radio (03/21/2022).....	23
4.6	99% Occupied Bandwidth (RSS-247 5.2(a))	25
4.6.1	99% Occupied Bandwidth Test Procedure	25
4.6.1.1	99% OBW, WNACB4 and WZ3ACB4 Zigbee Radio Test Results (03/21/2022). ..	26
4.7	Maximum Conducted (Average) Output Power and EIRP (FCC Part 15.247(b)(3), RSS-247 Section 5.4(d)).....	28
4.7.1	Maximum Conducted (Average) Output Power Test Procedure.....	28
4.7.1.1	Maximum Conducted (Average) Output Power WNACB4 and WZ3ACB4 Zigbee Radio O-QPSK Modulation Test Results (03/21/2022)	29
4.7.2	EIRP Level WNACB4 and WZ3ACB4 Zigbee Radio Test Results (03/21/2022)	33
4.7.2.1	EIRP Level WNACB4 and WZ3ACB4 Zigbee Radio Test Results	33
4.8	Emissions in Non-restricted Frequency Bands 5 MHz – 25 GHz (FCC Section 15.247(d), RSS-247 Sec.5)	34
4.8.1	Emissions in Non-restricted Frequency Bands 5 MHz – 25 GHz Test Procedure	34
4.8.2	Emissions in Non-restricted Frequency Bands 5 MHz – 25 GHz 30 dBc Reference Measurement.....	34
4.8.2.1	WNACB4 and WZ3ACB4 Zigbee Radio Reference Measurement, Channel 11 (03/21/2022).....	34
4.8.2.1.1	Emissions in Non-restricted Frequency Bands	35
4.8.2.2	WNACB4 and WZ3ACB4 Zigbee Radio Reference Measurement, Channel 18 (03/22/2022).....	40
4.8.2.2.1	Emissions in Non-restricted Frequency Bands	41
4.8.2.3	WNACB4 and WZ3ACB4 Zigbee Radio Reference Measurement, Channel 26 (03/22/2022).....	46
4.8.2.3.1	Emissions in Non-restricted Frequency Bands	47
4.8.2.4	WNACB4 and WZ3ACB4 Zigbee Radio Reference Measurement, Rx Mode (03/22/2022).....	52
4.8.2.4.1	Emissions in Non-restricted Frequency Bands	52
4.9	Power Spectral Density (FCC Section 15.247(e), RSS-247 Section 5.2(b))	57
4.9.1	Power Spectral Density Test Procedure	57
4.9.1.1	Power Spectral Density WNACB4 and WZ3ACB4 Zigbee Radio Test Results (03/21/2022).....	57
4.10	Band Edge Measurement (FCC Part 15.247(d), RSS-247 5.5)	59
4.10.1	Band Edge Measurement Test Procedure.....	59
4.10.1.1	Lower Authorized Band Edge Test Result – WNACB4 and Model WZ3ACB4 (03/31/2022).....	59
4.10.1.2	Upper Restricted Band Edge Test Result – WNACB4 and Model WZ3ACB4 (03/31/2022).....	62
	Appendix A – Legrand WNACB4 and WZ3ACB4 with Zigbee Radio Test Setup Pictures...	65
	Appendix B – Test Equipment.....	66



Notice to Customer

This report and any recommendations it contain represent the result of BEC's testing and assessment on behalf of your company. Testing has been conducted according to accepted engineering standards and practices. This report reflects testing and assessment of product samples provided by your company and may not reflect the characteristics of other samples, especially those produced at different times. This report and its findings and recommendations, if implemented, should not be construed as an assurance or implied warranty for the continuing electromagnetic compatibility (EMC) of the product. **BEC shall not be liable for incidental or consequential damages, even if advised of the possibility thereof.**

BEC will not disseminate this report to other parties without your express permission. You may reproduce this report in its entirety including this notice and the entireties of any supplemental test reports on the same product (e.g. reports on additional testing following modification). However 'you may not reproduce portions of the report (except for the entirety of the summary section) or quote from it for any purpose without specific prior written permission from BEC'.

Revision History

Revision #	Description of Changes	Date of Changes	Date Released
0	Test Report Initial Release	N/A	05/23/2022
1	Edited the Report to identify the models tested as Model WNACB4 and Model WZ3ACB4. Added EUT test software setting descriptions in each of the test sections. Table Headings in Section 4.4.4, 1 to 18 GHz test range were edited to add that the Peak and Average measurements were Corrected values.	06/22/2022	06/22/2022
2	Corrected 1-18 GHz Middle and High Channel Data to show correct Peak Margins on Page 20 and Page 21	06/30/2022	06/30/2022



1.0 Administrative Information

1.1 Project General Information

Project Number	BEC-2194	
Manufacturer	Legrand	
EUT Description	adorne 4-Button Scene Controller	
EUT Test Models	WNACB4 and WZ3ACB4	
EUT Test Types	SMA connector at antenna port and radio test software	Standard antenna and radio test software
EUT Serial Numbers	None	None
EUT Samples	2194-01	2194-02
FCC ID	2AU5D-WACB4	
ISED ID	25764- WACB4	
Zigbee Radio Chip Manufacturer	Atmel	
Zigbee Radio Chip Model	SAMR21E	
Radio Type	Zigbee	
Frequency of Operation	2405 – 2480 MHz	
Modulation Type	O-QPSK	
Antenna Gain	+ 4.28 dBi	
FCC Classification	Digital Transmission System (DTS)	
Samples Received	03/10/2022	
Condition Received	Suitable for test	
Sample Type	Production units	
Firmware Version	TestRadio_WNRL63.bin	
Applicable FCC Rules	FCC Rules Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System	
Applicable ISED Rules	RSS-Gen: General Requirements for Compliance of Radio Apparatus & RSS-247: Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices	



1.2 Preface

This report documents product testing conducted to verify compliance of the specified EUT with applicable standards and requirements as identified herein. EUT, test instrument configurations, test procedures, and recorded data are generally described in this report. The reader is referred to the applicable test standards for detailed procedures. The following table summarizes the test results obtained during this evaluation.

1.3 Laboratory and Customer Information

Test Laboratory Location	BEC Incorporated 970 East High Street Pottstown, PA 19464
Test Personnel	Paul Banker / Steve Fanella / JR Fanella
BEC Laboratory Number FCC Registration	US1118
BEC Laboratory Number ISED Registration	7342A-1
Test Performed For	Pass & Seymour/Legrand 50 Boyd Avenue Syracuse, NY 13209
Customer Technical Contacts	Joshua Haines and Jeff Richards
Customer Reference Number	PO # SP218277-802



1.4 Measurement Uncertainty

Measurement	Measurement Distance	Range	Measurement Limit	Expanded Uncertainty
Radiated Disturbance Open Area Test Site	3 Meter	30 MHz – 1 GHz	Class A or B	3.93
Conducted Disturbance AC Mains	N/A	150 kHz – 30 MHz	Class A or B	2.69
Radio Frequency	N/A	1 MHz – 26.5 GHz	N/A	± 0.086 ppm
RF power, conducted	N/A	1 MHz – 26.5 GHz	N/A	± 1.48 dB
Conducted spurious emission of transmitter, valid up to 6 GHz	N/A	150 kHz – 26.5 GHz	N/A	± 2.73 dB
Occupied Bandwidth	N/A	1 MHz – 26.5 GHz	N/A	± 2 %
Temperature	N/A	15 – 35° C	N/A	± 0.5 °C
Humidity	N/A	20 – 95 %	N/A	± 2.5 %

No adjustments to measured data presented in this report are required because all values of uncertainty are less than the CISPR 16-4-2:2018 recommendations. These uncertainties have a coverage factor of $k = 2$, which yields approximately a 95% level of confidence for the near-normal distribution typical of most measurement results.



1.5 Test Result Summary Table

The Legrand Model WNACB4 and WZ3ACB4 was tested and found to be compliant to the sections of the FCC Part 15 Subpart C and RSS-Gen RSS-247 standards listed below:

Report Section	FCC Part 15, Subpart C	RSS-Gen	RSS-247	Test Description	Result
4.1	15.203(b)	Annex A 10(g)		Antenna Requirement	PASS
4.2	15.204	8.3		External RF power amplifiers and antenna modifications	PASS
4.3	15.207	7.2		Conducted Limits (AC Power) 150 kHz – 30 MHz	N/A
4.4	15.205(a) 15.209	8.9, 8.10	3.3	Emissions in Non-Restricted and Restricted Frequency Band 30 MHz – 25 GHz	PASS
4.5	15.247(a)(2)		5.2 (a)	6 dB Occupied Bandwidth	PASS
4.6		6.7		99% Occupied Bandwidth	PASS
4.7	15.247(b)(3)		5.4 (d)	Maximum Conducted (Peak) Power Output and EIRP	PASS
4.8	15.247(d)		5.5	Emissions in Restricted Frequency Bands 30 MHz – 25 GHz	PASS
4.9	15.247(e)		5.2 (b)	DTS maximum power spectral density level in the fundamental emission	PASS
4.10	15.247(d)		5.5	DTS band-edge emission measurements	PASS

Rationale for EUT operation: The EUT was tested using a Zigbee radio which contained test software that utilized O-QPSK modulation used in normal operation.



1.6 Condition of Received Sample

An evaluation of the EUT was conducted in order to verify test subject identity and condition and to ensure suitability for testing. No evidence of physical damage was noted. The test item condition was deemed acceptable for the performance of the requested test services.

1.7 Climatic Environment

Unless noted elsewhere in this report, the following were the ambient conditions in the laboratory during testing:

Temperature: $22^{\circ} \pm 5^{\circ}$

Humidity: $50\% \pm 20\%$

Barometric Pressure: $1000\text{mb} \pm 20\%$

1.8 Test Equipment

All test equipment is checked to manufacturer's specifications and, when applicable, have current N.I.S.T. traceable, ISO 9002 conforming certificates of calibration. Test equipment used for the tests described herein is listed in Appendix A.



2.0 Equipment Under Test

Unless otherwise noted in the individual test results sections, testing was performed on the EUT as follows.

2.1 EUT Description

The adorne 4-Button Scene Controller is comprised of two identical devices that are identified as the Model WNACB4 which is the adorne 4-Button Netatmo Scene Controller and the Model WZ3ACB4 which is the adorne 4-Button Hospitality Scene Controller.

The adorne 4-Button Scene Controller is a wireless switch from the Adorne collection, manufactured by Legrand. The switch uses a CR2032 battery to power a Zigbee radio that operates at 2.4 GHz controlled by the Netatmo Smart Lighting System. The scene controller allows for an end user configurable, preset lighting scene that adds four customized scenes to a connected installation.

The Model WNACB4 adorne 4-Button Netatmo Scene Controller and the Model WZ3ACB4 adorne 4-Button Hospitality Scene Controller are identical in construction and functionality. There are no differences except cosmetics and the differences in model numbers are for marketing purposes.

2.2 Product Category

FCC Part 15, Subpart C (Section 15.247), IC RSS-Gen, IC RSS-247

2.3 Product Classification

47 CFR Part 15, Subpart C, Section 15.247 “DTS Operation within the band of 900 – 928 MHz, 2400 – 2483.5 MHz, and 5725 – 5850 MHz.”



2.4 Test Configuration

Samples of the Legrand Model WNACB4 and WZ3ACB4 adorne 4-Button Scene Controller with Zigbee, were tested at the Low Channel 11 at 2405 MHz, Middle Channel 18 at 2440 MHz and High Channel 26 at 2480 MHz. The Legrand models with Zigbee radio samples contained control software that can utilize the O-QPSK modulation used in normal operation. The control software sets the EUT with the maximum output power when in Transmit Mode (With and Without Modulation). The control software also allowed the tester to select an un-modulated transmit signal for the radio of the unit under test or to place the radio in a receive mode. The highest amplitude was determined to be when the radio transmitted with modulation.

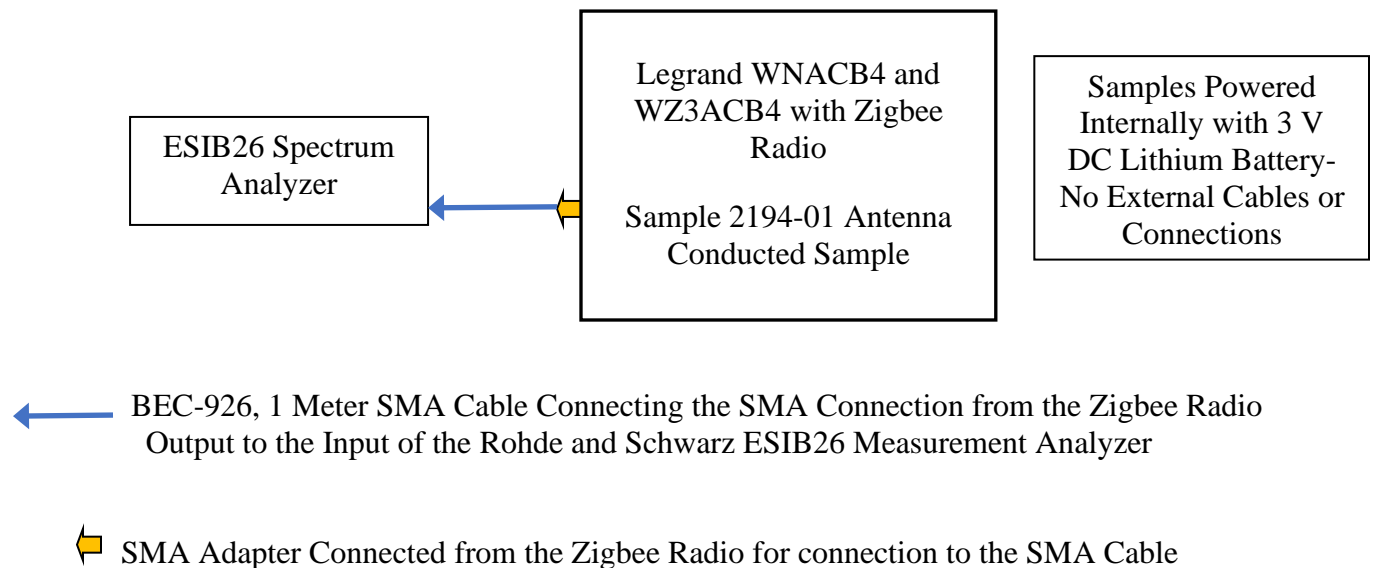
2.5 Test Configuration Rationale

Samples of the Legrand Models WNACB4 and WZ3ACB4 with Zigbee radio, were powered under battery power and were supplied with software which controlled the operation of the Zigbee radio in a manner consistent with normal use.

2.6 Test Configuration Diagrams – Zigbee Radio

Block diagrams of the EUT configuration showing interconnection cables are illustrated below. The drawing shows the physical hardware layout used for the tests along with I/O cables and AC power distribution. Diagrams show the Conducted Measurement configuration connection and Radiated Measurement configuration connection when testing the Zigbee Radio.

2.6.1 Zigbee Configuration – Conducted Measurement





2.6.2 Zigbee Configuration – Radiated Measurement

Legrand WNACB4 and
WZ3ACB4 Radiated
Emissions Test Sample
2194-02

Samples Powered
Internally with 3 V DC
Lithium Battery-No
External Cables or
Connections

2.7 EUT Information, Interconnection Cabling and Support Equipment

EUT Hardware

Description	Manufacturer	Model	Serial Number	Sample Number
adorne 4-Button Scene Controller - Antenna Conducted Test Sample	Legrand	WNACB4 and WZ3ACB4	None	2194-01
adorne 4-Button Scene Controller - Radiated Test Sample				2194-02

Interconnection Cable List (Conducted Measurement Test Setup)

Manufacturer	Model	Type	Shielding	Length	Description
Suhner	S04272B	High Frequency RF Cable 1 to 40 GHz	Double Braid	1 Meter	Measurement Cable from the Antenna SMA Connector to the R&S ESIB26 Receiver. Asset # BEC-962

Support Equipment

Description	Manufacturer	Model #	Serial #
3 V DC Lithium Battery	Panasonic	CR2032	No Serial Number



2.8 Test Signals and Test Modulation

By design this product does not have an external modulation input connector, therefore, normal internally generated modulation was used. When evaluating the type of signal that would generate the highest output amplitude there was no difference between the un-modulated carrier and the modulated carrier. The testing was performed using modulated signals.

2.8.1 Zigbee Radio - Test Signals and Modulation

The EUT transmits to a discrete frequency on a specific channel. The Legrand WNACB4 and WZ3ACB4 with Zigbee radio has 16 Channels available. The 16 Channels and frequencies that can be transmitted by the EUT are as follows:

Zigbee Channel	Frequency (MHz)		Zigbee Channel	Frequency (MHz)
11	2405		19	2445
12	2410		20	2450
13	2415		21	2455
14	2420		22	2460
15	2425		23	2465
16	2430		24	2470
17	2435		25	2475
18	2440		26	2480

For the required testing, the EUT was configured to transmit at low Channel 11 (2405 MHz), middle Channel 18 (2440 MHz) and high Channel 26 (2480 MHz). The Zigbee radio utilizes one modulation, O-QPSK.

2.9 Grounding

There was no ground connection to the EUT during test. This presents the worst-case scenario of an ungrounded device; either by failing to attach ground at installation or breakage of ground wire.

2.10 EUT Modifications

With the exception for the attachment of an SMA connector directly to the antenna output on the main board of the Legrand Model WNACB4 and Model WZ3ACB4, no modifications were made to the test samples.



3.0 Applicable Requirements, Methods, and Procedures

3.1 Applicable Requirements

The results of the measurement of the radio disturbance characteristics of the EUT described herein may be applied and where appropriate, provide a presumption of compliance to one or more of the following requirements or to other requirements at the discretion of the customer, regulatory agencies, or other entities.

3.1.1 FCC Requirements

Code of Federal Regulations: Title 47 – Telecommunication

Chapter I - Federal Communications Commission

Sub-chapter A – General

Part 15 – Radio Frequency Devices

Subpart C - Intentional Radiators

3.1.2 Industry Canada Requirements

RSS-Gen Issue 5: General Requirements for Compliance of Radio Apparatus

RSS-247 Issue 2: Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices.

3.1.3 Basic Test Methods and Test Procedures

558074 D01 DTS Meas Guidance v05r02, Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating under Section 15.247 of the FCC Rules.

ANSI C63.10-2013, American National Standard for Compliance Testing of Unlicensed Wireless Devices.

3.2 Deviations or Exclusions from the Requirements

No deviations or exclusions were made.



4.0 Test Results

4.1 Antenna Requirement (47 CFR 15.203)(RSS-GEN ANNEX A (10)(g))

The antenna used by the Legrand Model WNACB4 and Model WZ3ACB4 is a quarter-wave, inverted F wire antenna. The antenna is a trace on the PCB inside the enclosure. There are no detachable parts of the antenna. The antenna is not replaceable, nor changeable, and therefore complies with the requirements of this section.

4.2 External RF power amps/antenna modifications (47 CFR 15.204)(RSS-GEN 8.3)

There are no RF power amplifier kits available to be used with the Legrand Model WNACB4 and Model WZ3ACB4. There are no detachable parts of the antenna. The antenna is not replaceable, nor changeable, and therefore complies with the requirements of this section.

4.3 Conducted Emissions AC Power Port (47 CFR 15.207)(RSS-GEN 7.2)

The Legrand Model WNACB4 and Model WZ3ACB4 with Zigbee radio is a battery powered device and therefore does not require the Conducted Emissions AC Power Port testing.

4.4 Emissions in Non-Restricted and Restricted Frequency Bands, 30 MHz - 25 GHz (47 CFR 15.205, 15.209)(RSS-GEN 8.9, 8.10)

The emissions from the Legrand Model WNACB4 and Model WZ3ACB4 with Zigbee Radio, which fall in the restricted bands of operation, detailed in this section, comply with the limits of 15.209. The Legrand Model WNACB4 and Model WZ3ACB4 was tested at three frequencies: Low (2405 MHz), Middle (2440 MHz) and High (2480 MHz). The modulation was O-QPSK.

Measurement of the signals was performed with the EUT on a turntable and a variable height antenna mast at 3 meters distance. The signals residing in restricted bands of operation are designated in the tables below.



4.4.1 Radiated Spurious Emissions Test Facility

OATS

The Open Area Test Site (OATS) is an all-weather facility with a wooden enclosure that contains a ground level 4-foot diameter turntable capable of rotating equipment 360 degrees. The enclosure is free of reflective metallic objects and extraneous electromagnetic signals. This non-metallic enclosure and the 3 and 10 meter test range existing outside the enclosure rest upon a protective insulating material, which in turn covers a flat, metal, continuous ground plane.

Instrumentation for remote control of the antenna mast, turntable, and other equipment are controlled by personnel indoors. The EUT and support peripherals required for EUT operation were placed on a table 80 cm high for tabletop equipment or directly on the turntable surface for floor standing equipment.

The test site complies with the attenuation measurements specified in ANSI C63.4.

SR#1

The Semi-Anechoic Shielded Room (SR#1) is a ferrite and absorber lined chamber which houses a 5-foot diameter turntable capable of rotating equipment 360 degrees and antenna mast for Horizontal and Vertical polarity measurements. The enclosure is free of reflective metallic objects and extraneous electromagnetic signals. This 3-meter shielded enclosure has a raised computer floor with metal tile bottoms providing a continuous ground plane.

Instrumentation for remote control of the antenna mast, turntable, and other equipment are controlled by personnel outside the chamber. The EUT and support peripherals required for EUT operation were placed on a table 80 cm high for tabletop equipment or directly on the turntable surface for floor standing equipment.



4.4.2 Emissions in Non-Restricted and Restricted Frequency Bands Test Procedure

Radiated Emissions 30 MHz – 40 GHz

The EMI receiver was set to quasi-peak mode for frequencies from 30MHz to 1GHz and the appropriate CISPR bandwidths were employed. The receiver was set to average mode for frequencies above 1GHz with the appropriate CISPR bandwidths were employed.

Three orthogonal positions of the EUTs were evaluated for maximum emissions. The position of the EUTs placed in an upright position horizontal with buttons facing the measurement antenna on the horizontal surface of the 80-cm table was determined to be the axis that produced the highest emissions for the Legrand Model WNACB4 and Model WZ3ACB4.

Significant emissions found during the preliminary scans were maximized by rotating the turntable and varying the antenna height. Both horizontal and vertical antenna polarities were also investigated for suspect emissions. The signals are maximized and measured using the in house generated RADE or off the shelf TILE software. The support equipment and test item(s) were powered off in turn to determine the source of the emissions where appropriate.

Field strengths were calculated as follows:

Field Strength (dB μ V/m) = Meter Reading (dB μ V) + Antenna Factor (dB/m) + Cable Loss (dB) – Amplifier Gain (dB)

The EUTs were tested in the 30 to 1000 MHz, 1 to 18 GHz and then 18 to 25 GHz frequency ranges. Both the Legrand Model WNACB4 and Model WZ3ACB4 with Zigbee radio samples were tested with the radio transmitting at low, middle and high frequencies and while in receive mode (non-transmission). The Zigbee radio was tested with modulated transmission signals at maximum output.

The following tables are the highest emissions recorded and summarized. The use of the 15.209 limit table for restricted band emissions is not required but ensures compliance to 15.205 and 15.209. The signals in the tables that fall into the restricted bands, described in 15.205, are marked with an asterisk.

Photographs of the radiated emissions test setups are in Appendix A of this radio grant submission.



4.4.3 Emissions in Frequency Bands 30 MHz – 1000 MHz WNACB4 and WZ3ACB4 with Zigbee Radio (03/23/2022)

Radiated emissions scans, 30 – 1000 MHz, were made for the EUT configured for the low, middle and high transmission frequencies and in Rx mode. The Transmit Frequencies were measured with O-QPSK Modulation at maximum output.

Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio, Low Channel 11, 2405 MHz, Modulated

Frequency	Corrected		Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC Part15.205/209 RSS-GEN/247		Result
	Peak Level	QP Level					QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	
30.153	21.32	20.22	H	313	125	-0.33	40.00	-19.78	Pass
916.918	25.70	25.26	V	138	240	4.14	46.02	-20.76	Pass
930.553	25.62	25.02	V	179	245	4.26	46.02	-21.00	Pass
939.799	26.40	24.94	H	161	192	4.36	46.02	-21.08	Pass
960.427*	25.74	25.73	V	070	224	4.64	53.98	-28.25	Pass
961.077*	27.02	25.76	H	343	214	4.70	53.98	-28.22	Pass

*Restricted Band Signal

Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio, Middle Channel 18, 2440 MHz, Modulated

Frequency	Corrected		Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC Part15.205/209 RSS-GEN/247		Result
	Peak Level	QP Level					QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	
894.712	27.64	24.65	V	346	147	3.80	46.02	-21.37	Pass
940.385	29.49	24.97	H	132	141	4.36	46.02	-21.05	Pass
956.788	26.96	25.54	H	102	249	4.55	46.02	-20.48	Pass
958.089	28.34	25.68	V	029	146	4.66	46.02	-20.34	Pass
958.497	29.78	25.70	H	143	144	4.67	46.02	-20.32	Pass
959.933	26.27	25.62	V	281	224	4.60	46.02	-20.40	Pass

*Restricted Band Signal



Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio, High Channel 26, 2480 MHz, Modulated

Frequency	Corrected		Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC Part15.205/209 RSS-GEN/247		Result
	Peak Level	QP Level					QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	
948.523	26.29	25.17	H	212	119	4.39	46.02	-20.85	Pass
950.762	27.18	25.27	H	188	219	4.44	46.02	-20.75	Pass
956.847	26.74	25.37	V	303	130	4.55	46.02	-20.65	Pass
958.968	28.26	25.73	H	097	175	4.68	46.02	-20.29	Pass
960.455*	29.16	25.57	V	356	191	4.64	53.98	-28.41	Pass
966.972*	26.96	25.60	V	308	207	4.72	53.98	-28.38	Pass

*Restricted Band Signal

Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio, Rx Mode

Frequency	Corrected		Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC Part15.205/209 RSS-GEN/247		Result
	Peak Level	QP Level					QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	
901.003	27.17	24.83	H	201	251	3.91	46.02	-21.19	Pass
909.425	26.08	25.05	V	135	100	4.06	46.02	-20.97	Pass
919.853	25.77	25.08	V	097	104	4.13	46.02	-20.94	Pass
926.325	27.34	25.01	V	000	171	4.27	46.02	-21.01	Pass
949.534	27.80	25.05	H	199	255	4.46	46.02	-20.97	Pass
960.71*	28.34	25.48	H	164	108	4.67	53.98	-28.50	Pass

*Restricted Band Signal

Test Results: The Legrand Model WNACB4 and Model WZ3ACB4 with Zigbee Radio complies with the requirements of 47 CFR Part 15.205, 15.209 and RSS-Gen Section 8.10 for non-restricted and restricted bands of operation, between 30 MHz – 1 GHz, with a margin of 19.78 dB.



4.4.4 Emissions in Frequency Bands 1 - 18 GHz WNACB4 and WZ3ACB4 with Zigbee Radio Test Results (03/17/2022)

Radiated emissions scans, 1 – 18 GHz, were made for the EUT configured for the low, middle and high transmission frequencies and in Rx mode. The Transmit Frequencies were measured with O-QPSK Modulation at maximum output. Peak and Average levels shown in the table are corrected values.

Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio, Low Channel 11, 2405 MHz, Modulated

Frequency	Peak Corrected	Average Corrected	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factors	FCC 15.205/209, RSS-GEN/247 Limits				Result
							Peak Limit	Peak Margin	Average Limit	Average Margin	
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
1.0357*	31.07	21.18	V	303	103	-13.23	73.98	-42.91	53.98	-32.80	PASS
1.0359*	30.68	21.20	H	359	175	-13.23	73.98	-43.30	53.98	-32.78	PASS
1.9218	33.24	23.23	V	290	102	-7.28	73.98	-40.74	53.98	-30.75	PASS
2.4047	47.88	44.32	H	021	155	-5.36	73.98	-26.10	53.98	-9.66	PASS
2.4182	35.12	25.88	V	083	112	-5.37	73.98	-38.86	53.98	-28.10	PASS
4.8100*	49.78	39.28	H	040	210	1.68	73.98	-34.70	53.98	-14.70	PASS
4.8100*	48.88	40.08	V	023	188	1.68	73.98	-33.90	53.98	-13.90	PASS
9.6200	53.99	43.99	V	062	200	6.29	73.98	-29.99	53.98	-9.99	PASS
14.0945	56.33	46.44	H	038	107	12.34	73.98	-17.65	53.98	-7.54	PASS
14.4676	54.99	46.14	V	276	120	12.23	73.98	-18.99	53.98	-7.84	PASS
14.6880	55.84	46.42	H	007	188	12.18	73.98	-18.14	53.98	-7.56	PASS
14.8994	53.33	45.43	V	359	199	11.08	73.98	-20.65	53.98	-8.55	PASS
*Restricted Band Signal											

Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio, Middle Channel 18, 2440 MHz, Modulated

Frequency	Peak Corrected	Average Corrected	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factors	FCC 15.205/209, RSS-GEN/247 Limits				Result
							Peak Limit	Peak Margin	Average Limit	Average Margin	
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
1.0375*	30.44	20.83	V	096	131	-13.21	73.98	-43.54	53.98	-33.16	PASS
1.0390*	31.86	21.20	H	149	141	-13.19	73.98	-42.12	53.98	-32.78	PASS
1.1158*	30.21	21.17	H	159	124	-12.51	73.98	-43.77	53.98	-32.81	PASS
1.1166*	30.07	21.04	V	039	164	-12.51	73.98	-43.91	53.98	-32.94	PASS
2.4467	34.89	24.99	V	331	165	-5.42	73.98	-39.09	53.98	-28.99	PASS
4.8800*	49.08	40.68	H	020	195	1.88	73.98	-24.90	53.98	-13.30	PASS
4.8800*	51.48	44.28	V	045	213	1.88	73.98	-22.50	53.98	-9.70	PASS
14.6989	55.32	46.13	V	018	100	12.15	73.98	-18.66	53.98	-7.85	PASS
14.8223	54.73	45.84	H	204	208	11.64	73.98	-19.25	53.98	-8.14	PASS
14.9517	54.72	45.16	V	299	104	10.88	73.98	-19.26	53.98	-8.82	PASS



Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio, High Channel 26, 2480 MHz, Modulated

Frequency	Peak Corrected	Average Corrected	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factors	FCC 15.205/209, RSS-GEN/247 Limits				Result
							Peak Limit	Peak Margin	Average Limit	Average Margin	
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
1.0379*	30.60	20.76	H	214	158	-13.20	73.98	-43.38	53.98	-33.22	PASS
1.0561*	29.99	20.63	V	040	110	-13.04	73.98	-43.99	53.98	-33.35	PASS
2.4796	47.70	44.33	H	015	213	-5.39	73.98	-26.28	53.98	-9.65	PASS
2.4805	46.03	38.46	V	075	105	-5.39	73.98	-27.95	53.98	-15.52	PASS
2.4956*	41.45	33.98	V	152	100	-5.40	73.98	-32.53	53.98	-20.00	PASS
4.9600*	51.63	43.83	H	032	212	1.83	73.98	-22.35	53.98	-10.15	PASS
4.9600*	49.13	39.93	V	023	185	1.83	73.98	-24.85	53.98	-14.05	PASS
14.2436	55.14	46.12	V	190	154	12.50	73.98	-18.84	53.98	-7.86	PASS
14.3504	55.99	46.28	H	308	208	12.26	73.98	-17.99	53.98	-7.70	PASS
14.3633	54.69	46.43	V	154	119	12.26	73.98	-19.29	53.98	-7.55	PASS
14.9432	56.19	44.90	H	187	193	10.91	73.98	-17.79	53.98	-9.08	PASS

Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio, Rx Mode

Frequency	Peak Corrected	Average Corrected	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factors	FCC 15.205/209, RSS-GEN/247 Limits				Result
							Peak Limit	Peak Margin	Average Limit	Average Margin	
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
1.0388*	28.51	19.58	V	012	109	-13.19	73.98	-45.47	53.98	-34.40	PASS
14.0309	55.48	45.76	V	249	101	11.98	73.98	-18.50	53.98	-8.22	PASS
14.7790	55.44	45.94	V	093	101	11.87	73.98	-18.54	53.98	-8.04	PASS
16.2684	52.55	42.76	H	250	163	8.89	73.98	-21.43	53.98	-11.22	PASS
16.7993	55.27	45.42	H	116	171	11.80	73.98	-18.71	53.98	-8.56	PASS
16.9270	55.47	46.54	H	346	207	12.34	73.98	-18.51	53.98	-7.44	PASS
*Restricted Band Signal											

Test Results: The Legrand Model WNACB4 and Model WZ3ACB4 with Zigbee Radio complies with the requirements of 47 CFR Part 15.205, 15.209 and RSS-Gen Section 8.10 for non-restricted and restricted bands of operation between 1 – 18 GHz with an Average Margin of 7.44 dB.



4.4.5 Emissions in Frequency Bands 18 – 25 GHz WNACB4 and WZ3ACB4 with Zigbee Radio (03/30/2022)

Radiated emissions scans, 18 -25 GHz, were made for the EUT configured for the low, middle and high transmission frequencies and in Rx mode. The Transmit Frequencies were measured with O-QPSK Modulation at maximum output.

The result of the emissions scans showed no measurable signals between 18 and 25 GHz while the WNACB4 and WZ3ACB4 Transmitted low, middle, high channels and in Receive Mode.

Test Results: The Legrand Model WNACB4 and Model WZ3ACB4 with Zigbee Radio complies with the requirements of 47 CFR Part 15.205 and RSS-Gen Section 8.10 for non-restricted and restricted bands of operation between 18 and 25 GHz.



DTS Bandwidth Measurement Summary Table

Channel-Tx Modulated	Frequency	Measured DTS 6 dB BW	47 CFR 15.247(a)(2) & RSS- 247 5.2 Minimum Limit	Margin	Result
	MHz	kHz	kHz	kHz	
11	2405.0	1452.91	500.00	952.91	Pass
18	2440.0	1462.93	500.00	962.93	Pass
26	2480.0	1523.05	500.00	1023.05	Pass

Test Results: The 6 dB, DTS Bandwidth measurements for the Legrand Model WNACB4 and Model WZ3ACB4, with Zigbee Radio, were measured and are compliant to the minimum bandwidth requirements. The results are also used to select bandwidths and frequency spans for other radio measurements.

4.6 99% Occupied Bandwidth (RSS-247 5.2(a))

4.6.1 99% Occupied Bandwidth Test Procedure

KDB 558074, Section 2.1 describes the use of maximum conducted (average) output power using 99% occupied bandwidth of the transmitter. RSS-247 also requires the 99% OBW measurement. ANSI C63.10, Section 6.9.3 permits the use of the automated, bandwidth measurement utility of the spectrum analyzer was used to measure the 99% bandwidth at each of the low, middle and high operating frequencies. 99% Bandwidth measurements were made for the EUT configured for the low, middle and high transmission frequencies. The Transmit Frequencies were measured with O-QPSK Modulation at maximum output.

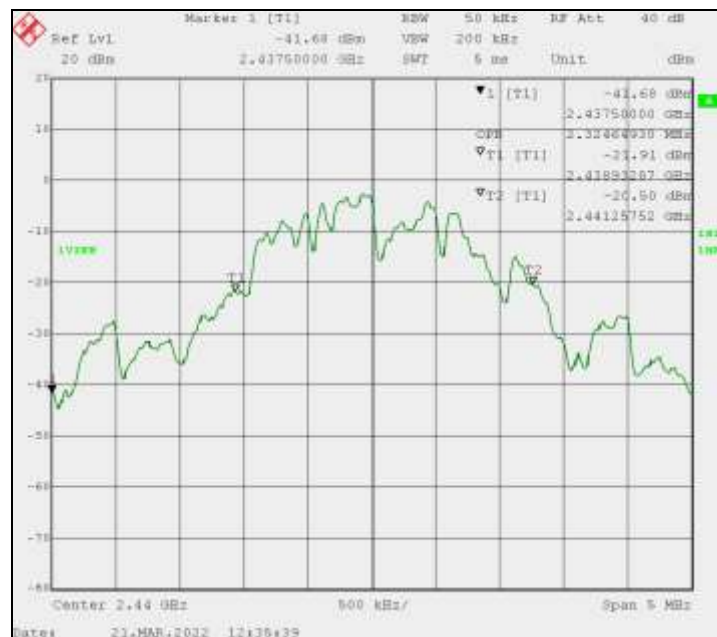
The SA settings are listed in the table below were used during 99% Occupied Bandwidth measurement.

SA Settings			ANSI C63.10 requirement
Span	5	MHz	(1.5 to 5 times OBW)
RBW	50	kHz	(1 to 5% of OBW)
VBW	200	kHz	$\geq(3 \times \text{RBW})$
Sweep Time	5	ms	Auto

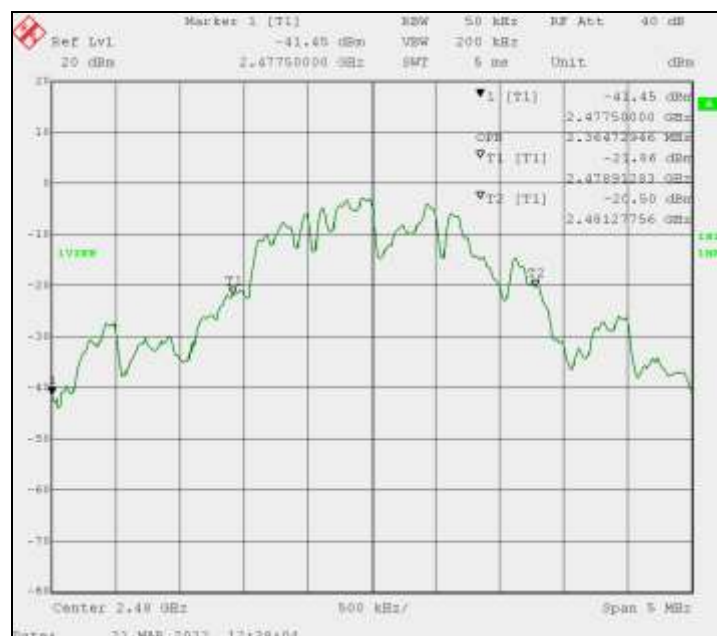


4.6.1.1 99% OBW, WNACB4 and WZ3ACB4 with Zigbee Radio Test Results (03/21/2022)

Legrand WNACB4 and WZ3ACB4 Zigbee Radio Low channel 11, 2405 MHz, O-QPSK Modulation



Legrand WNACB4 and WZ3ACB4 Zigbee Radio Mid channel 18, 2440 MHz, O-QPSK Modulation





Legrand WNACB4 and WZ3ACB4 Zigbee Radio High channel 26, 2480 MHz, O-QPSK Modulation



99% Occupied Bandwidth Measurement Summary Table

Channel	Frequency (MHz)	99% Occupied BW (MHz)
11	2405.0	2.325
18	2440.0	2.365
26	2480.0	2.305

Test Results: The 99% Occupied Bandwidth measurements for the Legrand Model WNACB4 and Model WZ3ACB4 with Zigbee Radio are displayed above. The bandwidths will be used when measuring maximum conducted (average) output power and be included in the ISSED Un-licensed Radio application.



4.7 Maximum Conducted (Average) Output Power and EIRP (FCC Part 15.247(b)(3), RSS-247 Section 5.4(d))

4.7.1 Maximum Conducted (Average) Output Power Test Procedure

A conducted power measurement of the output frequency of the Zigbee radio was measured according to the guidance of KDB 550874 D01, Section 8.3.1.2. The modulated, transmitter output signal is wide-band and noise-like. Further guidance from the KDB document identified ANSI C63.10, Section 11.9.2.2.2., (Method AVGSA-1), as the measurement procedure. The 99% Occupied Bandwidth is used to determine Spectrum Analyzer settings. The SA parameters are listed for the Zigbee radio maximum conducted (average) output power. Maximum Conducted Output Power measurements were made for the EUT configured for the low, middle and high transmission frequencies. The Transmit Frequencies were measured with O-QPSK Modulation at maximum output. The un-modulated carrier at maximum output was also measured for comparison.

Spectrum Analyzer Settings for Zigbee Radio Measurements for Maximum Output Power and EIRP.

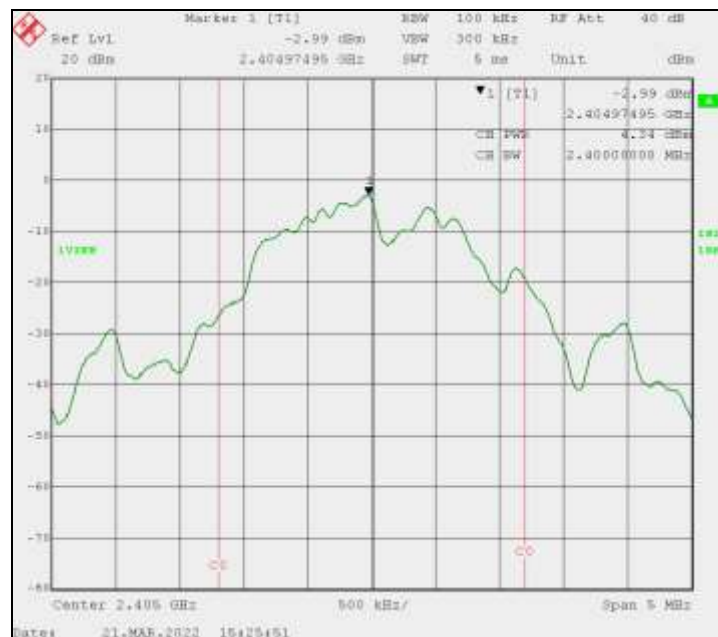
Spectrum Analyzer Settings			ANSI C63.10, 11.9.2.2 requirement
Span	5	MHz	$\geq 1.5 \times \text{OBW}$
RBW	100	MHz	1% - 5% of the OBW (not to exceed 1 MHz)
VBW	300	MHz	$\geq 3 \times \text{RBW}$
Sweep	5	ms	Auto

The spectrum analyzer utilized RMS Detection, averaged 100 traces, for measurement.

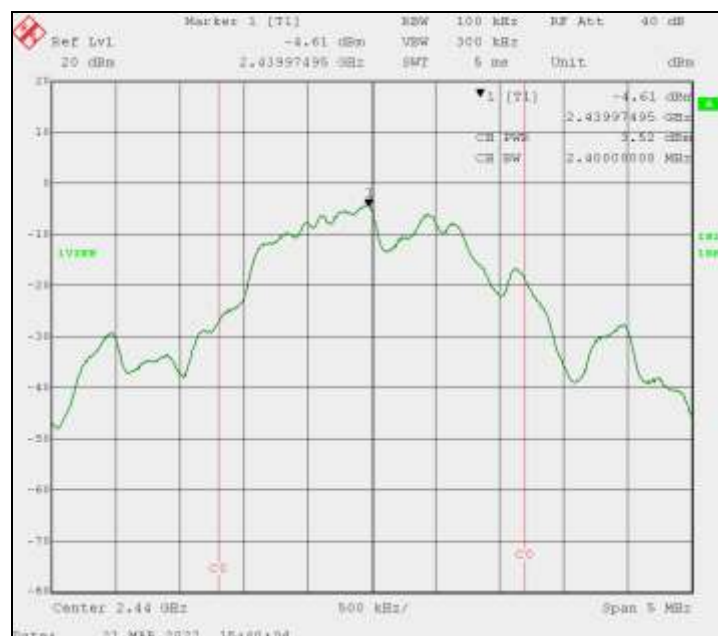


4.7.1.1 Maximum Conducted (Average) Output Power WNACB4 and WZ3ACB4 with Zigbee Radio O-QPSK Modulation Test Results (03/21/2022)

Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio Low Channel 11, 2405 MHz, O-QPSK Modulation

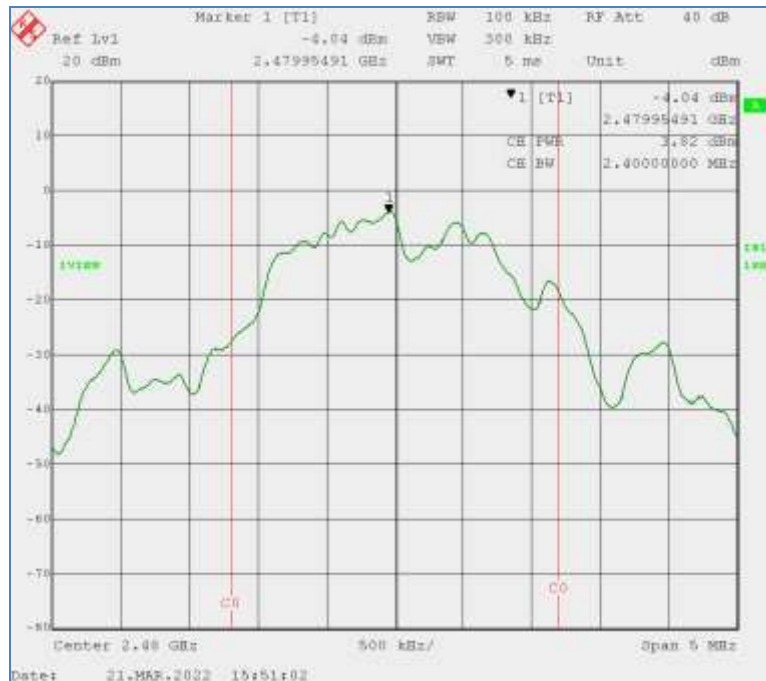


Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio Middle Channel 18, 2440 MHz, O-QPSK Modulation

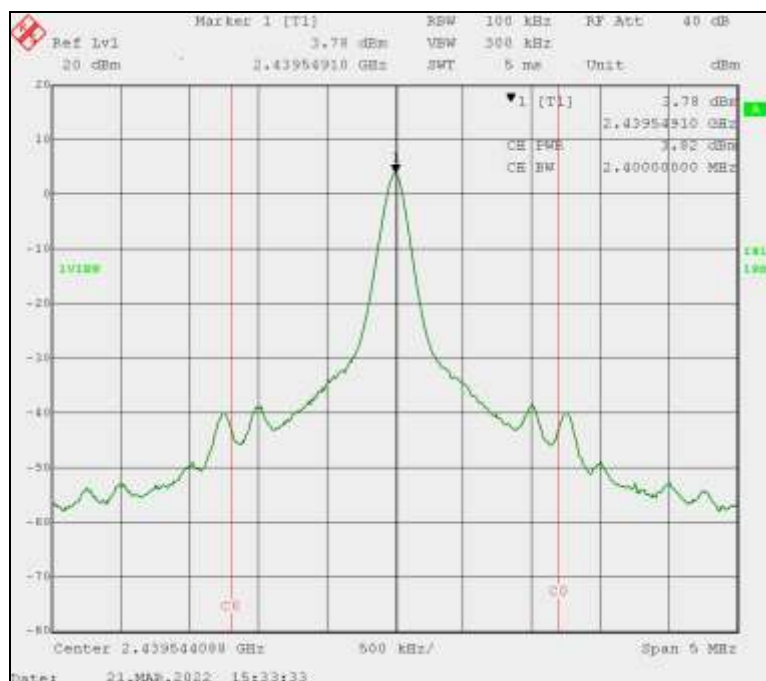




Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio High Channel 26, 2480 MHz,
O-QPSK Modulation

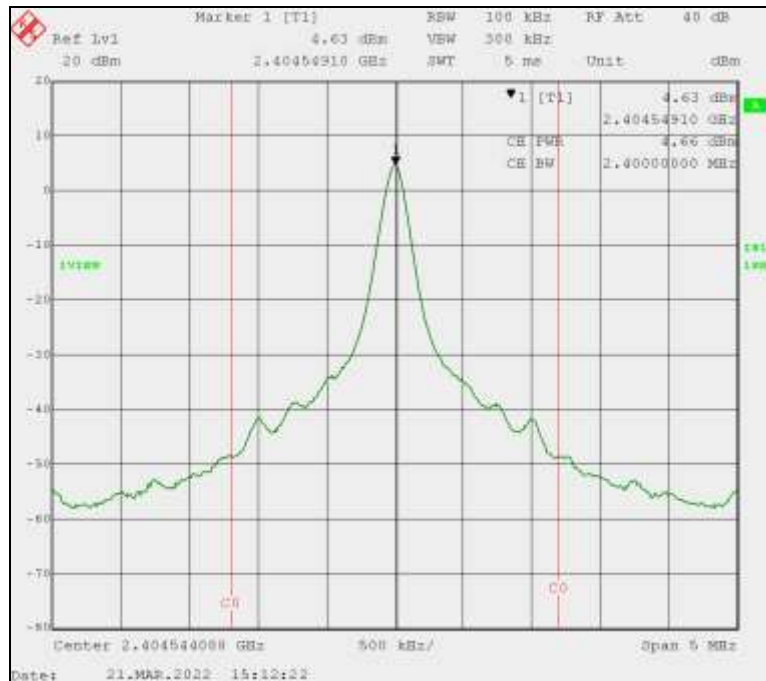


Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio Low Channel 11, 2405 MHz,
No modulation

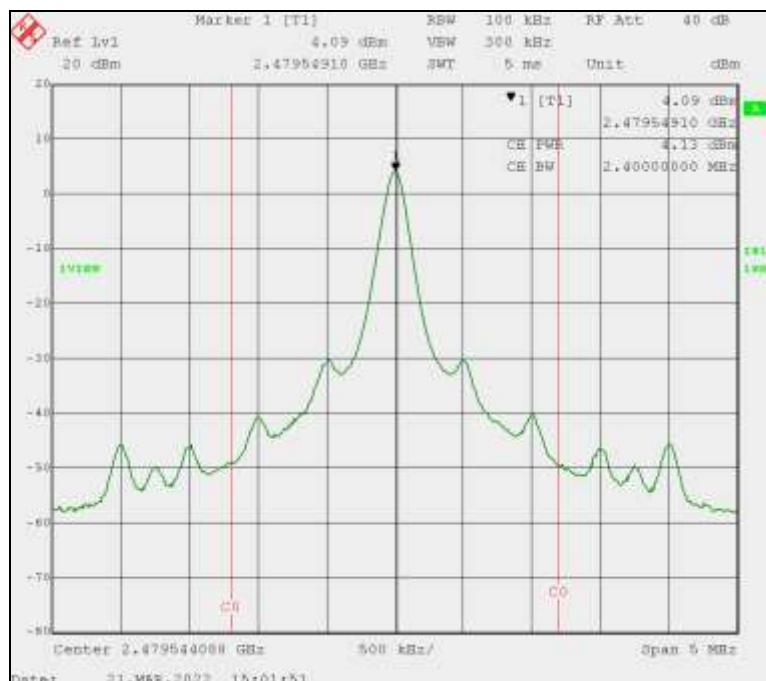




Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio Middle Channel 18, 2440 MHz,
No modulation



Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio High Channel 26, 2480 MHz,
No modulation





Maximum Conducted Output Power Measurement Summary Tables

Channel	Modulation	Frequency (GHz)	Measured Level	Cable # 962 Loss	Total		Limit		Margin		Result
					dBm	Watts	dBm	Watts	dBm	Watts	
11	O-QPSK	2405.0	4.34	0.47	4.81	0.0030	30.00	1.000	-25.19	-0.997	Pass
18		2440.0	3.52	0.47	3.99	0.0025	30.00	1.000	-26.01	-0.997	Pass
26		2480.0	3.82	0.47	4.29	0.0027	30.00	1.000	-25.71	-0.997	Pass

Channel	Modulation	Frequency (GHz)	Measured Level	Cable # 962 Loss	Total		Limit		Margin		Result
					dBm	Watts	dBm	Watts	dBm	Watts	
11	None	2405.0	3.82	0.47	4.29	0.0027	30.00	1.000	-25.71	-0.997	Pass
18		2440.0	4.66	0.47	5.13	0.0033	30.00	1.000	-24.87	-0.997	Pass
26		2480.0	4.13	0.47	4.60	0.0029	30.00	1.000	-25.40	-0.997	Pass

Test Results: The Maximum Conducted (Average) Power Output measurements for the Legrand Model WNACB4 and Model WZ3ACB4 with Zigbee Radio, modulated with O-QPSK and un-modulated, are compliant to the requirements of 47 CFR Part 15.247(b)(3) and ISSED, RSS-247 Section 5.4(d).



4.7.2 EIRP Level WNACB4 and WZ3ACB4 with Zigbee Radio Test Results (03/21/2022)

The Innovation, Science and Economic Development Canada (ISED), RSS-247 requires the calculation of the Effective Isotropic Radiated Power (EIRP) for the Legrand Model WNACB4 and Model WZ3ACB4 with Zigbee Radio. Below is the tabular data, using measured power levels from the previous section in which measurements were made for the EUT configured for the low, middle and high transmission frequencies. The Transmit Frequencies were measured with O-QPSK Modulation at maximum output. The un-modulated carrier at maximum output was also measured for comparison.

4.7.2.1 EIRP Level WNACB4 and WZ3ACB4 Zigbee Radio Test Results

Channel	Modulation	Frequency (GHz)	Transmitter Output Total		Antenna Gain		RSS-247, Section 5.4 (d) EIRP						Result
			dBm	Watts	Isotropic	Numeric	Total		Limit		Margin		
							dBm	Watts	dBm	Watts	dBm	Watts	
11	O-QPSK	2405.0	4.81	0.0030	4.28	2.679	9.09	0.0081	36.00	4.00	-26.91	-3.9919	Pass
18		2440.0	3.99	0.0025	4.28	2.679	8.27	0.0067	36.00	4.00	-27.73	-3.9933	Pass
26		2480.0	4.29	0.0027	4.28	2.679	8.57	0.0072	36.00	4.00	-27.43	-3.9928	Pass

Channel	Modulation	Frequency (GHz)	Transmitter Output Total		Antenna Gain		RSS-247, Section 5.4 (d) EIRP						Result
			dBm	Watts	Isotropic	Numeric	Total		Limit		Margin		
							dBm	Watts	dBm	Watts	dBm	Watts	
11	None	2405.0	4.29	0.0027	4.28	2.679	8.57	0.0072	36.00	4.00	-27.43	-3.9928	Pass
18		2440.0	5.13	0.0033	4.28	2.679	9.41	0.0087	36.00	4.00	-26.59	-3.9913	Pass
26		2480.0	4.60	0.0029	4.28	2.679	8.88	0.0077	36.00	4.00	-27.12	-3.9923	Pass

Test Results: The Effective Isotropic Radiated Power measurements for the Legrand Model WNACB4 and Model WZ3ACB4 with Zigbee Radio, modulated with O-QPSK and un-modulated, are compliant to the requirements of ISED, RSS-247 Section 5.4(d).



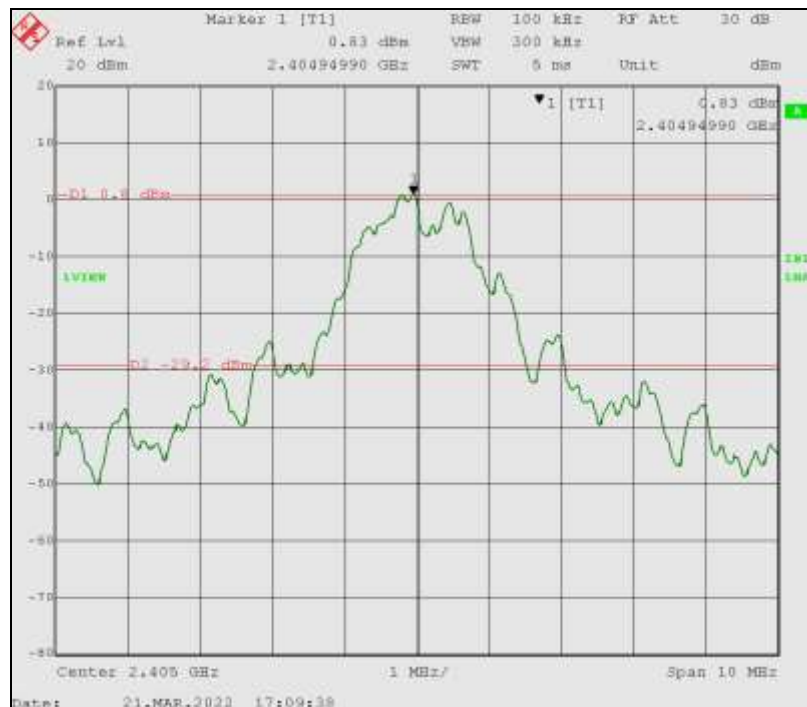
4.8 Emissions in Non-restricted Frequency Bands 5 MHz – 25 GHz (FCC Section 15.247(d), RSS-247 Sec.5)

4.8.1 Emissions in Non-restricted Frequency Bands 5 MHz – 25 GHz Test Procedure

The results in this section, for the WNACB4 and WZ3ACB4 depict the highest emissions, while transmitting with modulation on Channels 11, 18, 26 and Rx modes. Spectrum Analyzer RBW was 100 kHz, VBW was 300 kHz and the SA Span varied. Emissions measurements were made for the EUT configured for the low, middle and high transmission frequencies. The Transmit Frequencies were measured with O-QPSK Modulation at maximum output. The un-modulated carrier at maximum output was also measured for comparison.

4.8.2 Emissions in Non-restricted Frequency Bands 5 MHz – 25 GHz 30 dBc Reference Measurement.

4.8.2.1 WNACB4 and WZ3ACB4 with Zigbee Radio Reference Measurement, Channel 11 (03/21/2022)

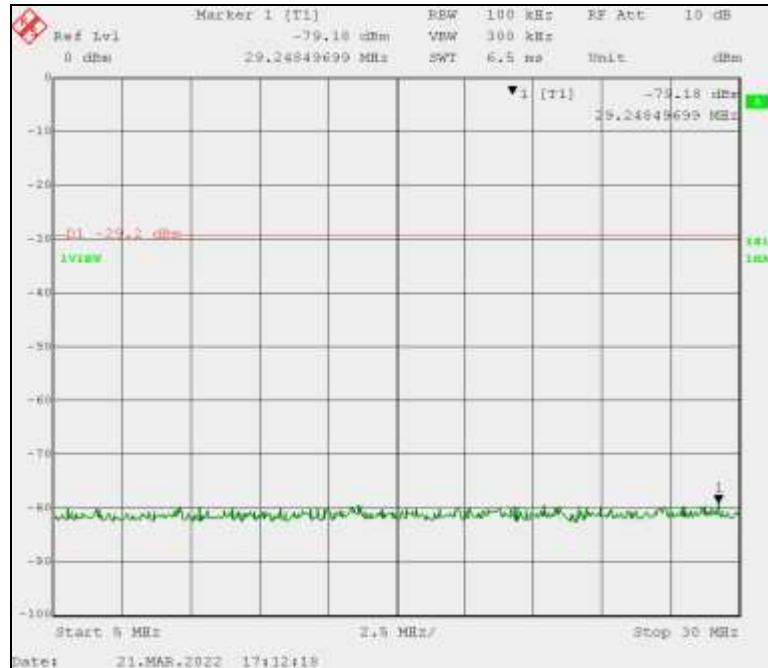


The peak level of 0.8 dBm is the maximum peak output of the Legrand Model WNACB4 and Model WZ3ACB4 with Zigbee Radio transmitting with modulation on Channel 11 at full power. The conducted spurious emissions from the antenna port must be 30 dB down from this peak. The resultant limit is therefore -29.2 dBm. This limit is displayed on the plots below.

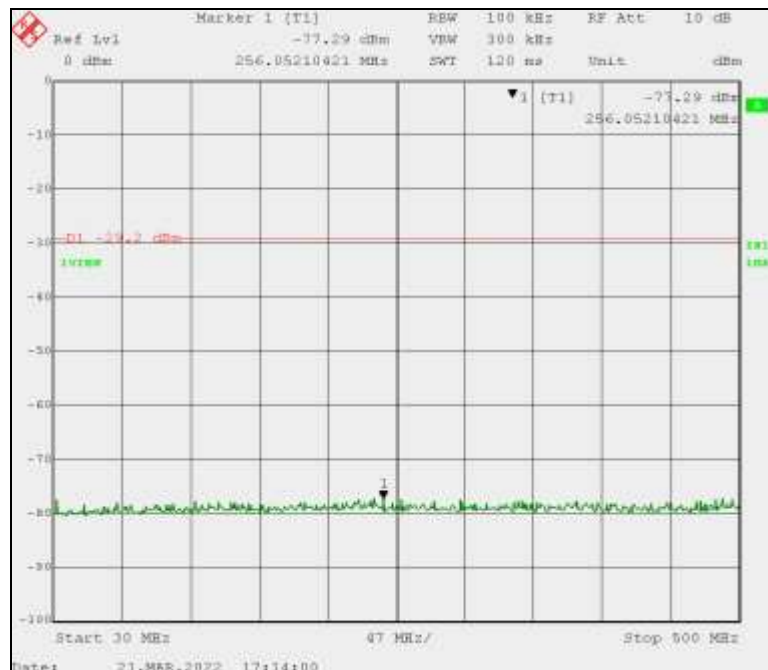


4.8.2.1.1 Emissions in Non-restricted Frequency Bands WNACB4 and WZ3ACB4 with Zigbee Radio Test Results Channel 11 (03/21/2022)

Legrand WNACB4 and WZ3ACB4 Ch 11 2405 MHz Zigbee Radio Transmitting: 5 – 30 MHz

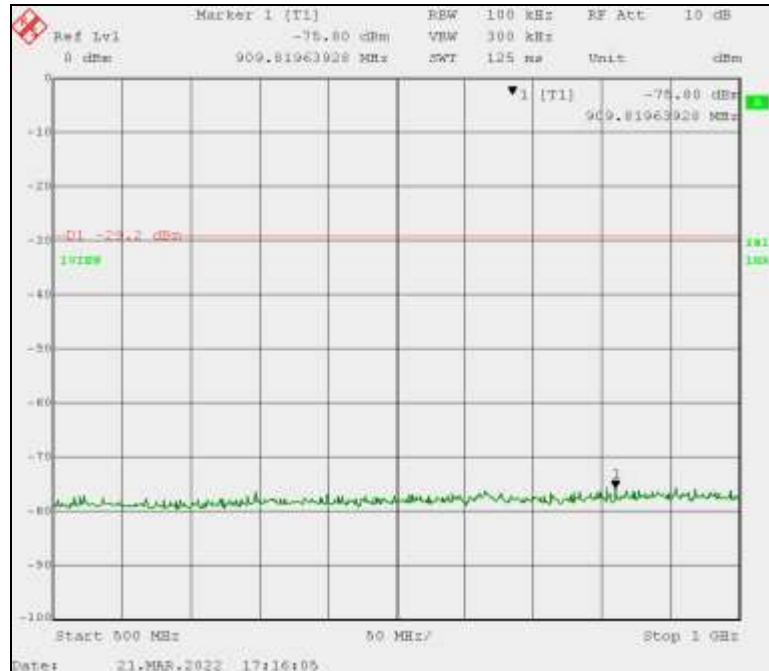


Legrand WNACB4 and WZ3ACB4 Ch 11 2405 MHz Zigbee Radio Transmitting: 30 – 500 MHz

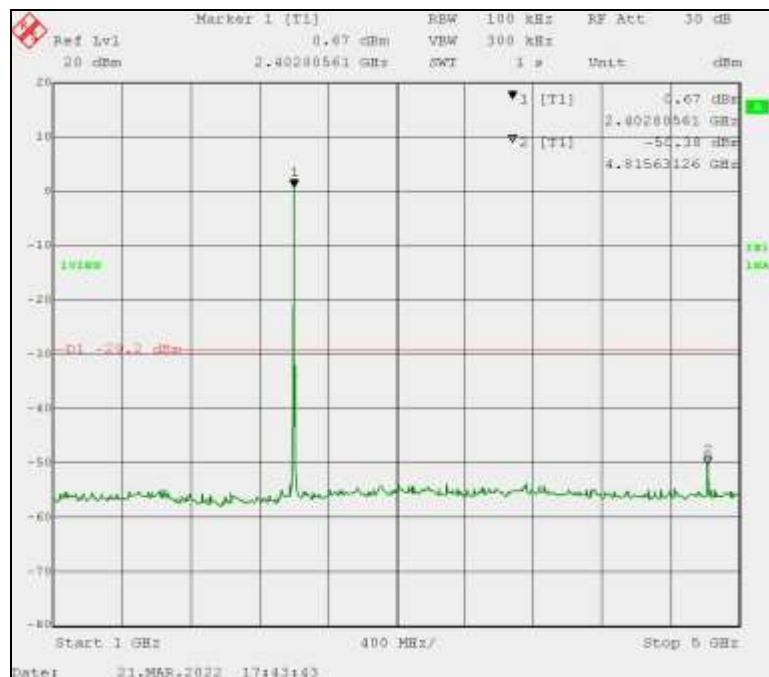




Legrand WNACB4 and WZ3ACB4 Ch 11 2405 MHz Zigbee Radio Transmitting: 500 MHz – 1 GHz

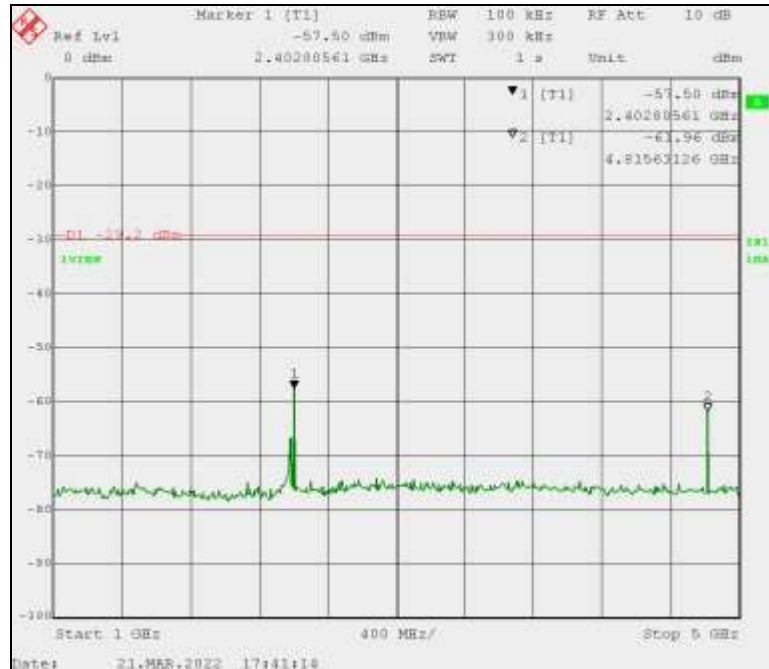


Legrand WNACB4 and WZ3ACB4 Ch 11 2405 MHz Zigbee Radio Transmitting: 1 GHz – 5 GHz (No Notch Filter Installed During Measurement)

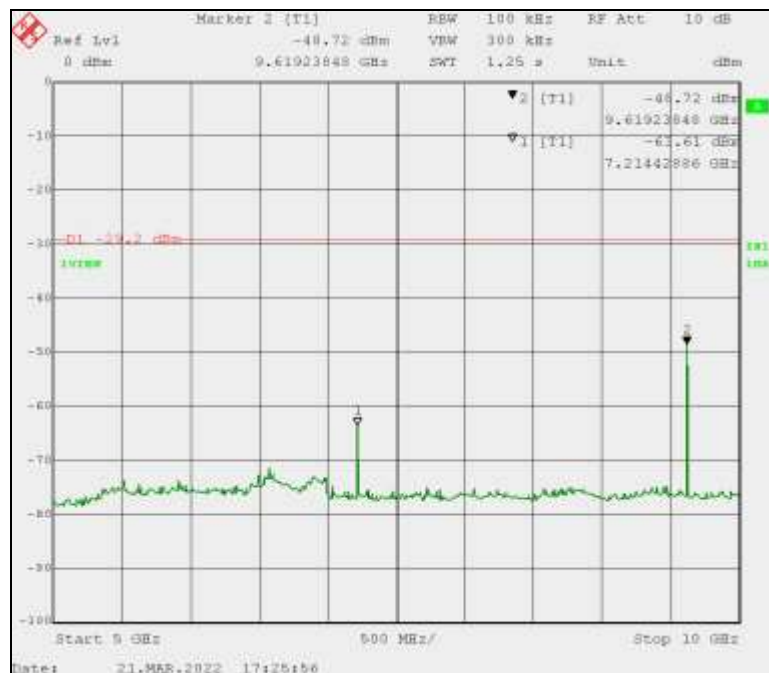




Legrand WNACB4 and WZ3ACB4 Ch 11 2405 MHz Zigbee Radio Transmitting: 1 GHz – 5 GHz (With the Notch Filter Installed During Measurement)

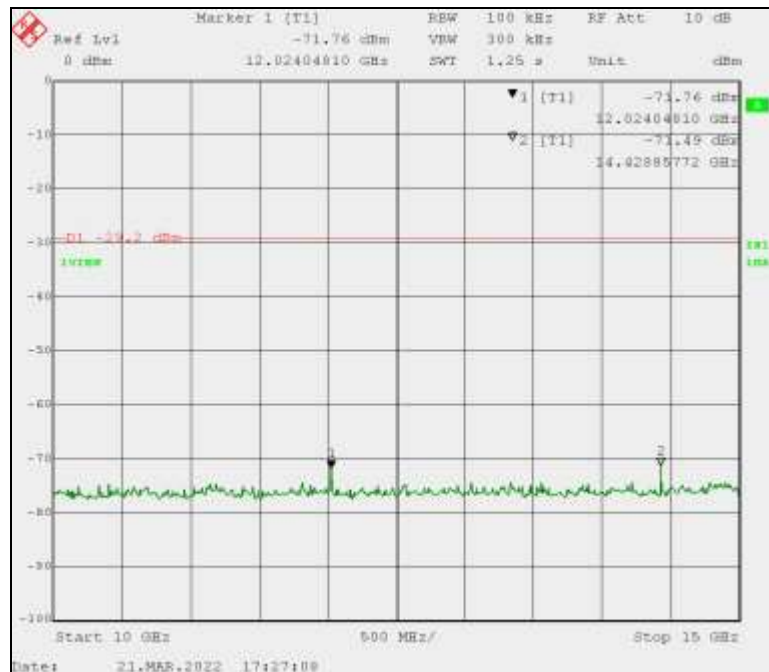


Legrand WNACB4 and WZ3ACB4 Ch 11 2405 MHz Zigbee Radio Transmitting: 5 GHz – 10 GHz

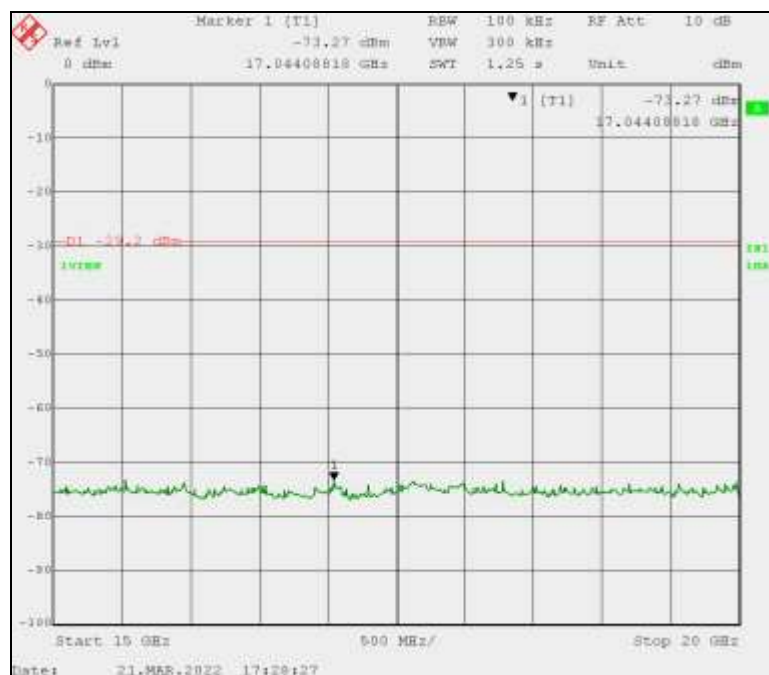




Legrand WNACB4 and WZ3ACB4 Ch 11 2405 MHz Zigbee Radio Transmitting: 10 GHz – 15 GHz

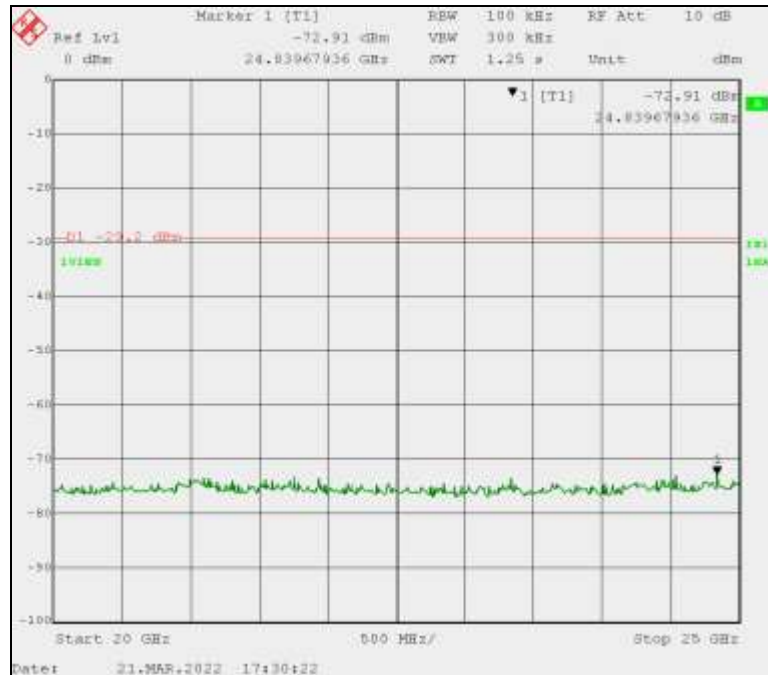


Legrand WNACB4 and WZ3ACB4 Ch 11 2405 MHz Zigbee Radio Transmitting: 15 GHz – 20 GHz





Legrand WNACB4 and WZ3ACB4 Ch 11 2405 MHz Zigbee Radio Transmitting: 20 GHz – 25 GHz



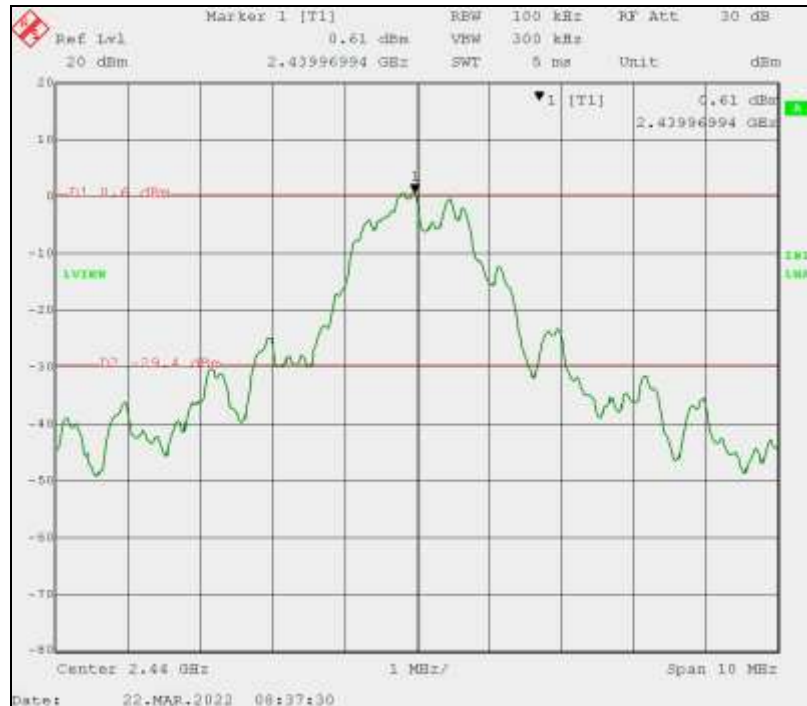
Non-Restricted Band Emissions Measurement Summary Table Showing Highest Measurements

Frequency	Peak	30 dB below Max Peak Reference	Margin	Result
GHz	dBm	dBc	dB	
4.816	-61.96	-29.20	-32.76	PASS
7.214	-63.61	-29.20	-34.41	PASS
9.619	-48.72	-29.20	-19.52	PASS
12.024	-71.76	-29.20	-42.56	PASS
14.429	-71.49	-29.20	-42.29	PASS
17.044	-73.27	-29.20	-44.07	PASS

Test Results: Emissions in Non-Restricted Frequency Bands, measured from the Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio, transmitting with modulation on Channel 11, comply with the requirements of 47 CFR Part 15.247 (d) with 19.52 dB of margin.



4.8.2.2 WNACB4 and WZ3ACB4 with Zigbee Radio Reference Measurement, Channel 18 (03/22/2022)

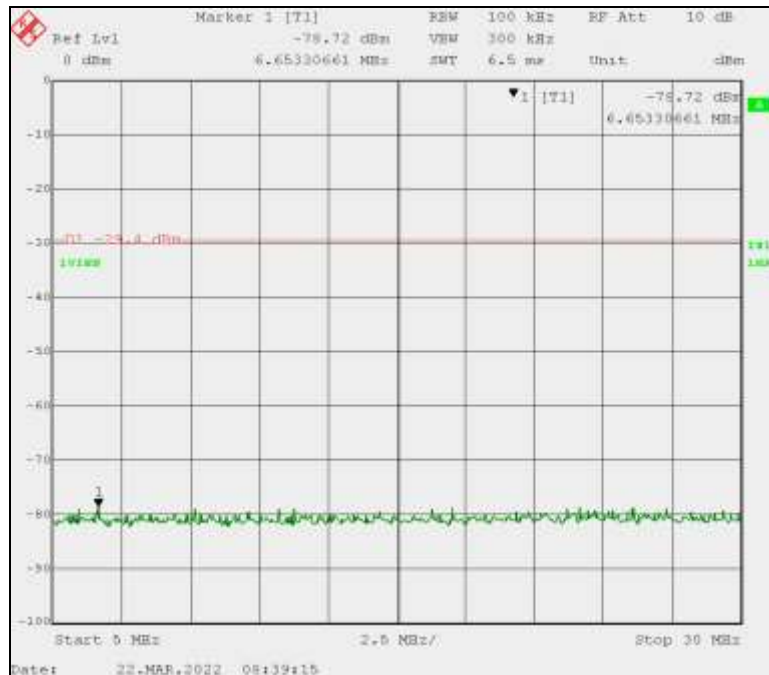


The peak level of 0.6 dBm is the maximum peak output of the Legrand Model WNACB4 and Model WZ3ACB4 with Zigbee Radio transmitting with modulation on Channel 18 at full power. The conducted spurious emissions from the antenna port must be 30 dB down from this peak. The resultant limit is therefore -29.4 dBm. This limit is displayed on the plots below.

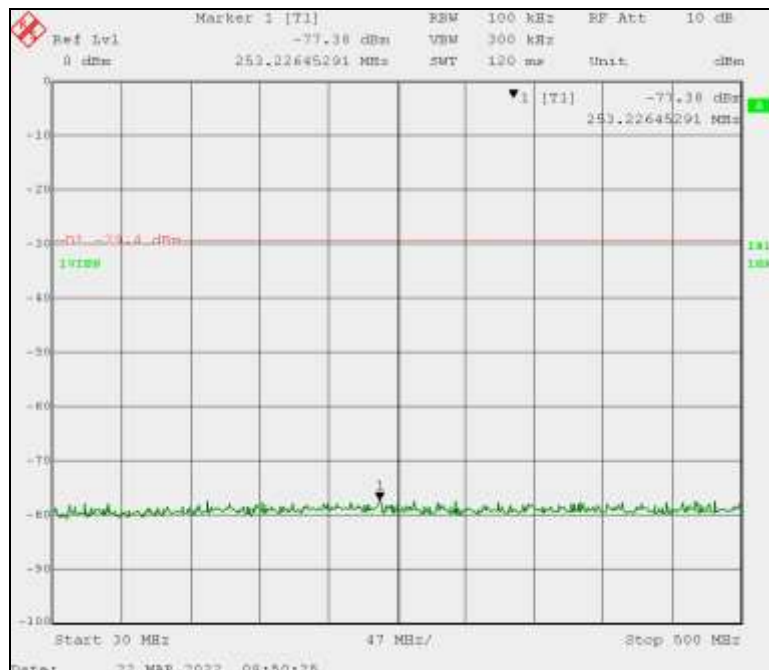


4.8.2.2.1 Emissions in Non-restricted Frequency Bands WNACB4 and WZ3ACB4 with Zigbee Radio Test Results Channel 18 (03/22/2022)

Legrand WNACB4 and WZ3ACB4 Ch 18 2440 MHz Zigbee Radio Transmitting: 5 – 30 MHz

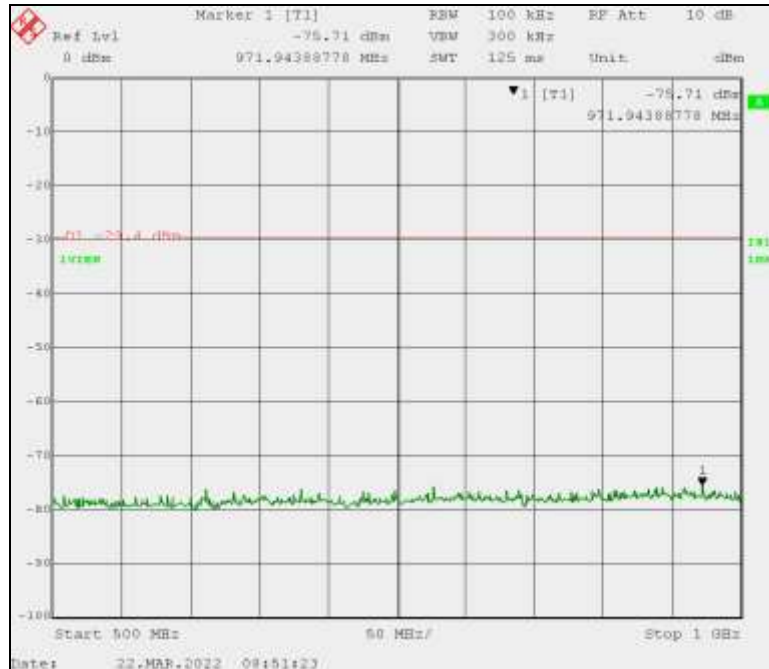


Legrand WNACB4 and WZ3ACB4 Ch 18 2440 MHz Zigbee Radio Transmitting: 30 – 500 MHz

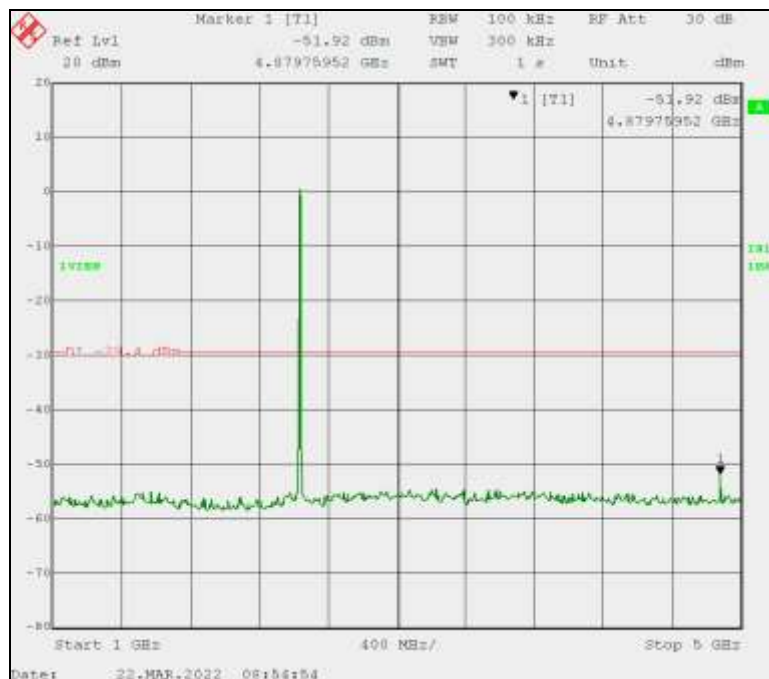




Legrand WNACB4 and WZ3ACB4 Ch 18 2440 MHz Zigbee Radio Transmitting: 500 MHz – 1 GHz

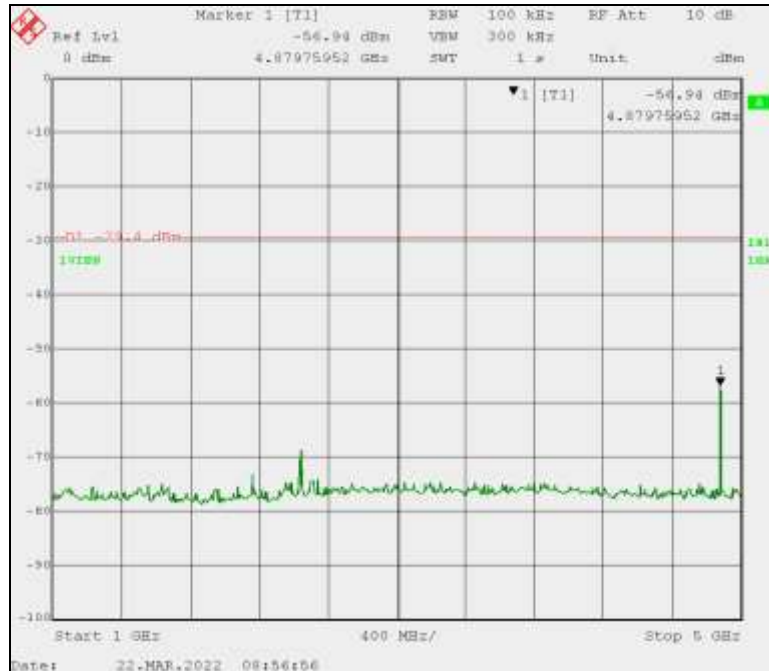


Legrand WNACB4 and WZ3ACB4 Ch 18 2440 MHz Zigbee Radio Transmitting: 1 GHz – 5 GHz (No Notch Filter Installed During Measurement)

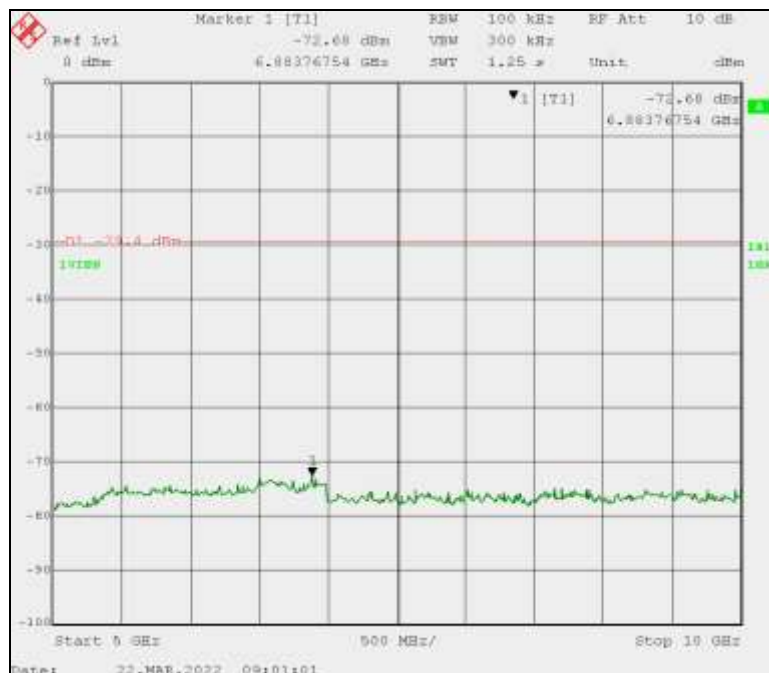




Legrand WNACB4 and WZ3ACB4 Ch 18 2440 MHz Zigbee Radio Transmitting: 1 GHz – 5 GHz (With the Notch Filter Installed During Measurement)

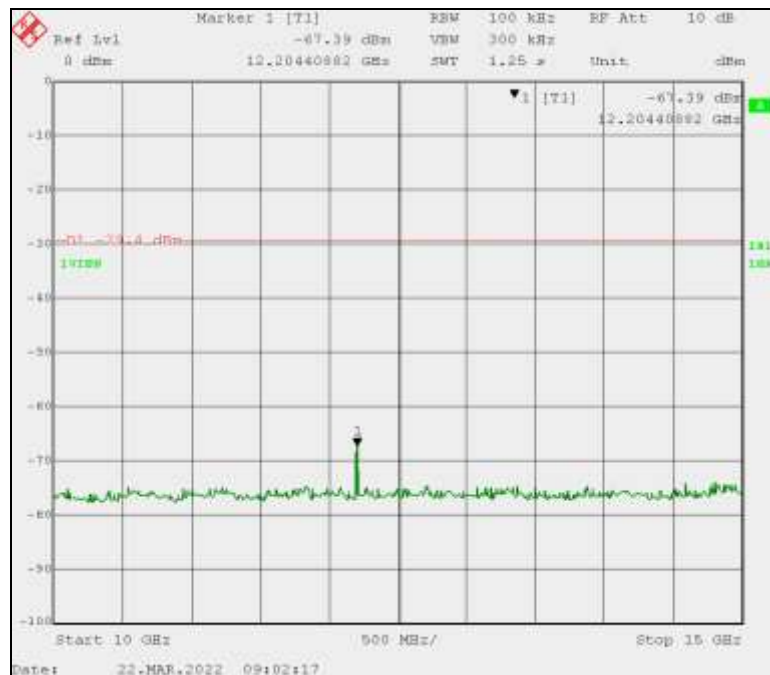


Legrand WNACB4 and WZ3ACB4 Ch 18 2440 MHz Zigbee Radio Transmitting: 5 GHz – 10 GHz

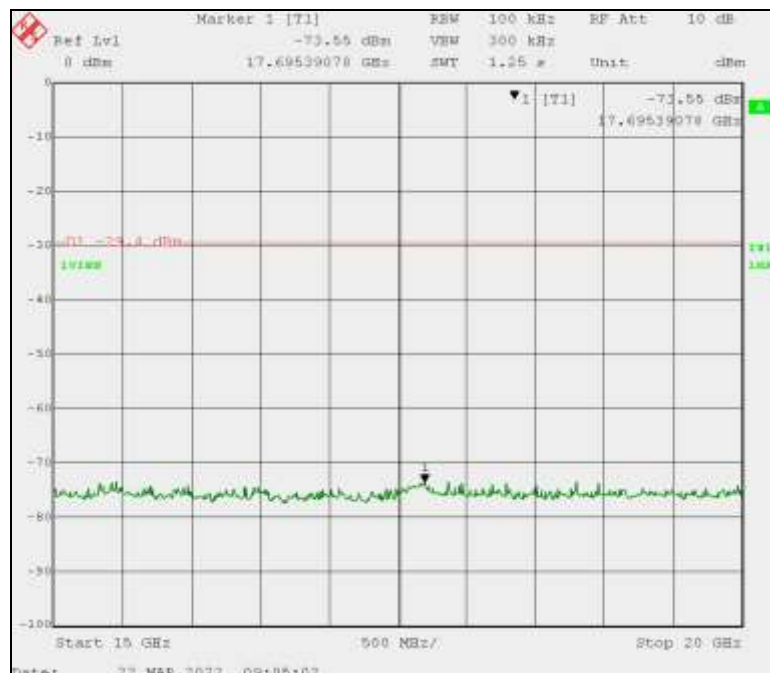




Legrand WNACB4 and WZ3ACB4 Ch 18 2440 MHz Zigbee Radio Transmitting: 10 GHz – 15 GHz

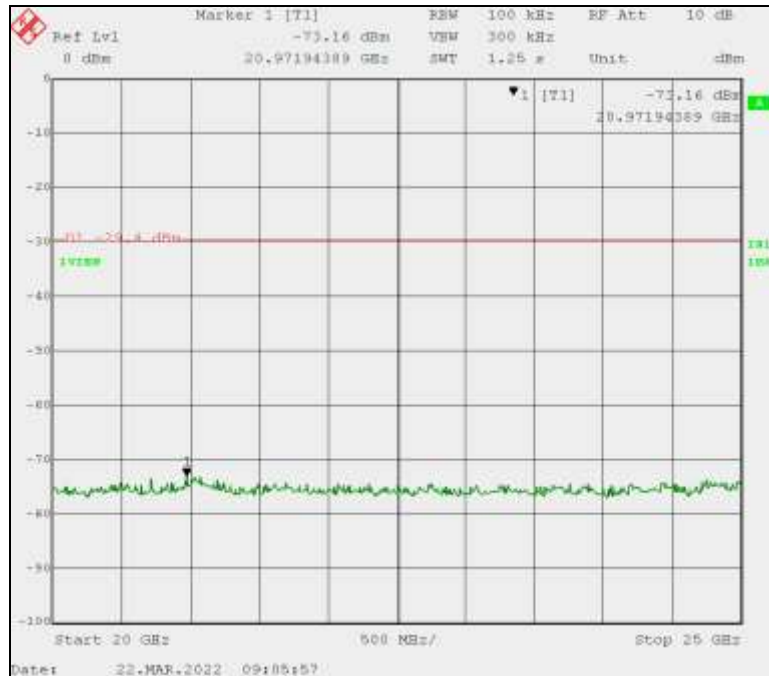


Legrand WNACB4 and WZ3ACB4 Ch 18 2440 MHz Zigbee Radio Transmitting: 15 GHz – 20 GHz





Legrand WNACB4 and WZ3ACB4 Ch 18 2440 MHz Zigbee Radio Transmitting: 20 GHz – 25 GHz



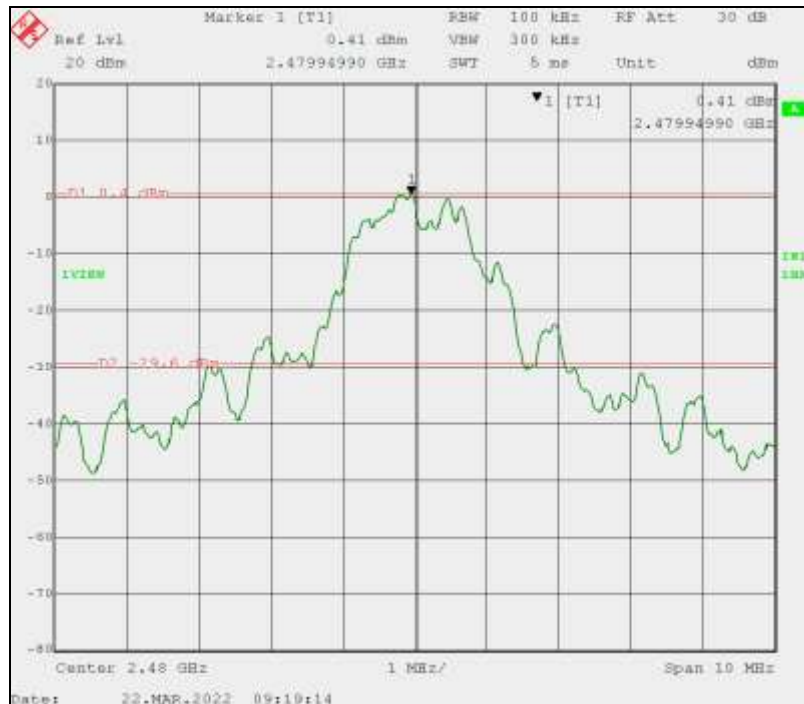
Non-Restricted Band Emissions Measurement Summary Table Showing Highest Measurements

Frequency	Peak	30 dB below Max Peak Reference	Margin	Result
GHz	dBm	dBc	dB	
0.972	-75.71	-29.40	-46.31	PASS
4.880	-56.94	-29.40	-27.54	PASS
6.884	-72.68	-29.40	-43.28	PASS
12.204	-67.39	-29.40	-37.99	PASS
17.695	-73.55	-29.40	-44.15	PASS
20.972	-73.16	-29.40	-43.76	PASS

Test Results: Emissions in Non-Restricted Frequency Bands, measured from the Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio, transmitting with modulation on Channel 18, comply with the requirements of 47 CFR Part 15.247 (d) with 27.54 dB of margin.



4.8.2.3 WNACB4 and WZ3ACB4 with Zigbee Radio Reference Measurement, Channel 26 (03/22/2022)

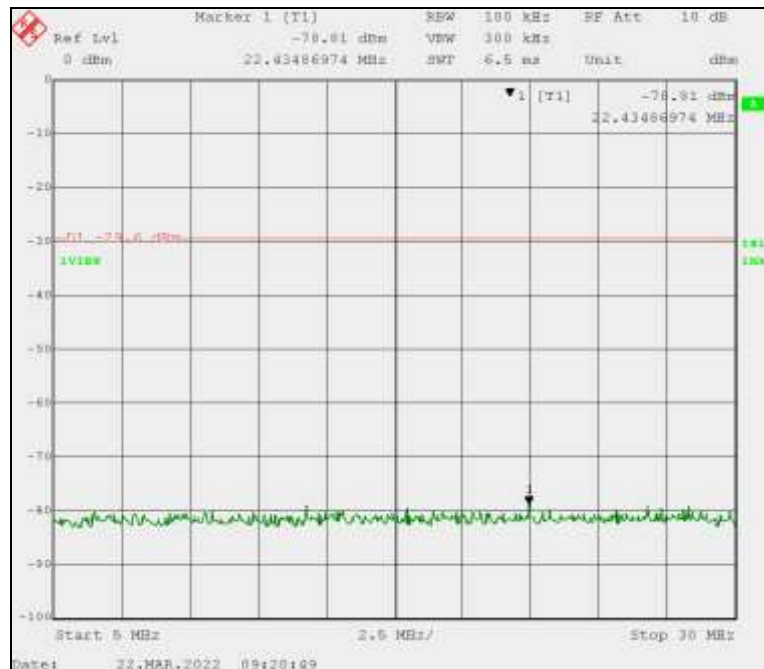


The peak level of 0.4 dBm is the maximum peak output of the Legrand Model WNACB4 and Model WZ3ACB4 with Zigbee Radio transmitting with modulation on Channel 26 at full power. The conducted spurious emissions from the antenna port must be 30 dB down from this peak. The resultant limit is therefore -29.6 dBm. This limit is displayed on the plots below.

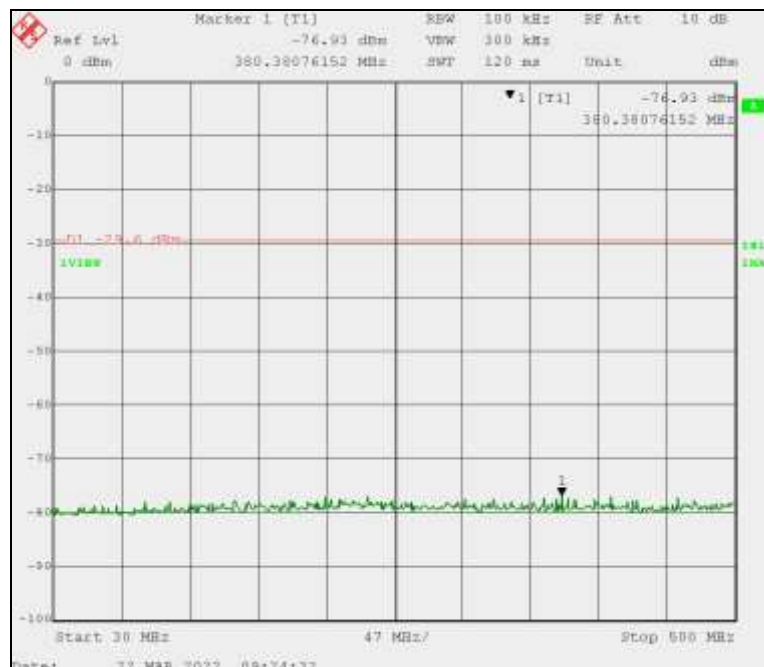


4.8.2.3.1 Emissions in Non-restricted Frequency Bands WNACB4 and WZ3ACB4 with Zigbee Radio Test Results Channel 26 (03/22/2022)

Legrand WNACB4 and WZ3ACB4 Ch 26 2480 MHz Zigbee Radio Transmitting: 5 – 30 MHz

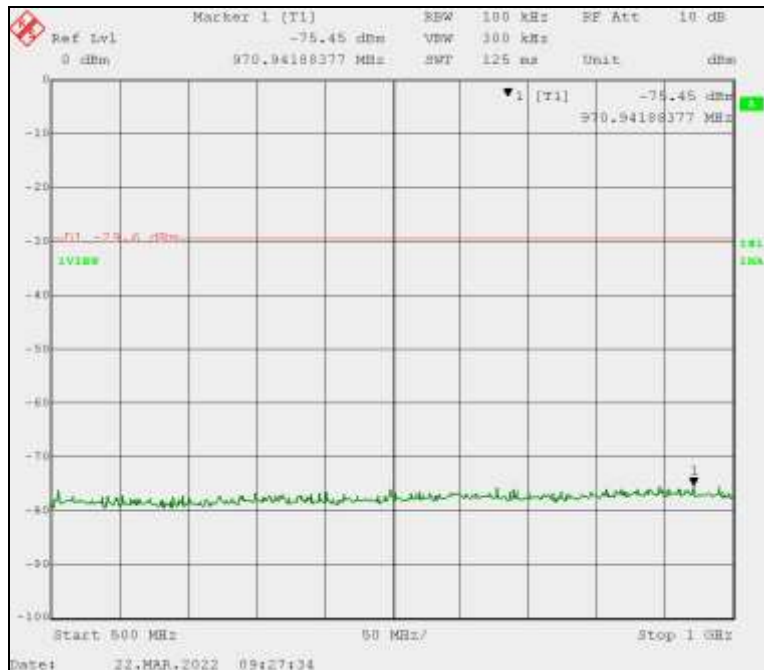


Legrand WNACB4 and WZ3ACB4 Ch 26 2480 MHz Zigbee Radio Transmitting: 30 – 500 MHz

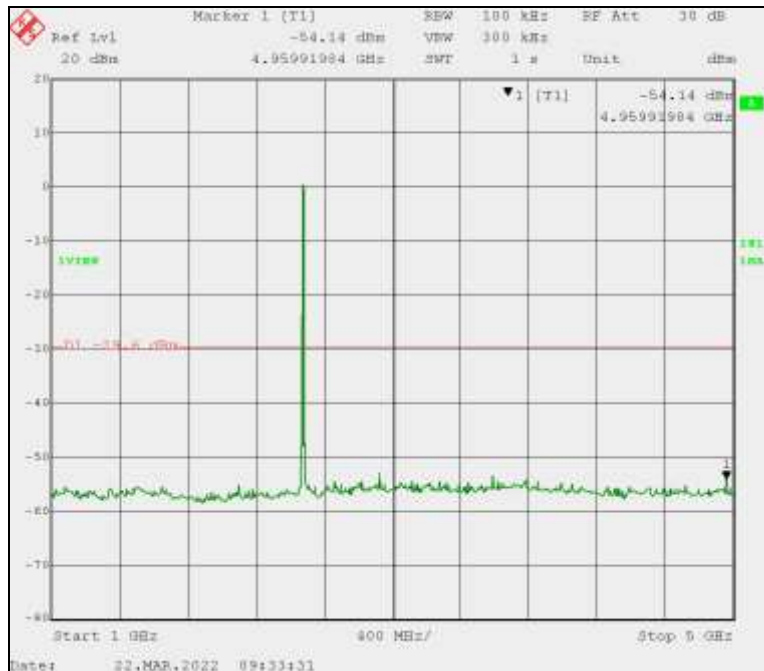




Legrand WNACB4 and WZ3ACB4 Ch 26 2480 MHz Zigbee Radio Transmitting: 500 MHz – 1 GHz

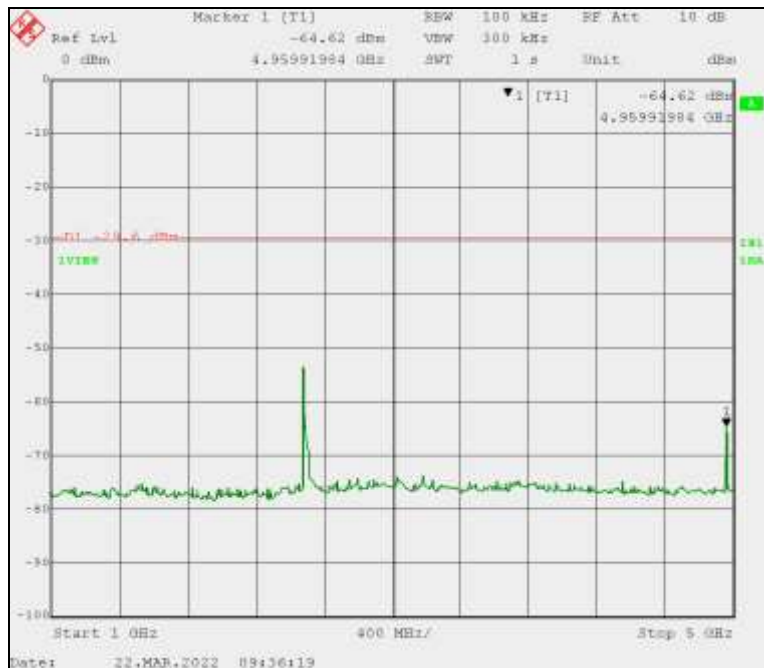


Legrand WNACB4 and WZ3ACB4 Ch 26 2480 MHz Zigbee Radio Transmitting: 1 GHz – 5 GHz (No Notch Filter Installed During Measurement)

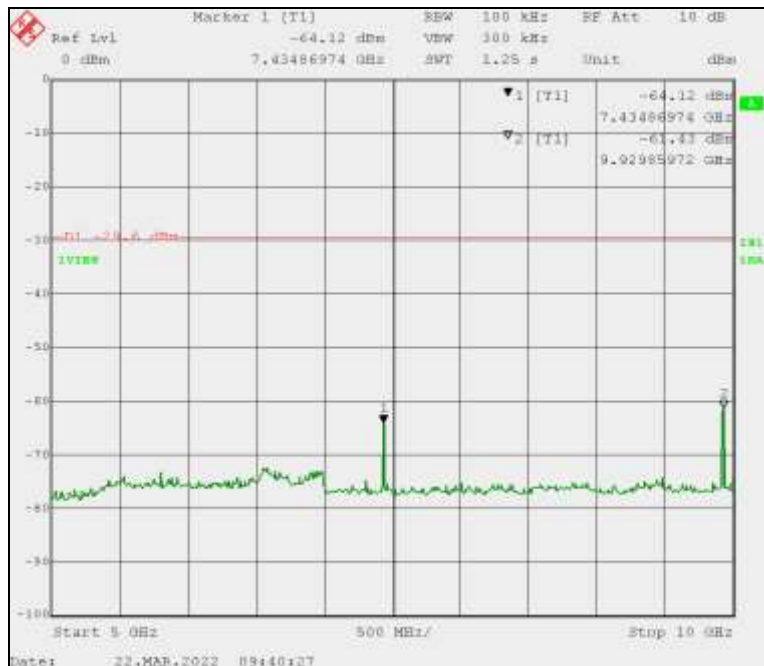




Legrand WNACB4 and WZ3ACB4 Ch 26 2480 MHz Zigbee Radio Transmitting: 1 GHz – 5 GHz (With the Notch Filter Installed During Measurement)

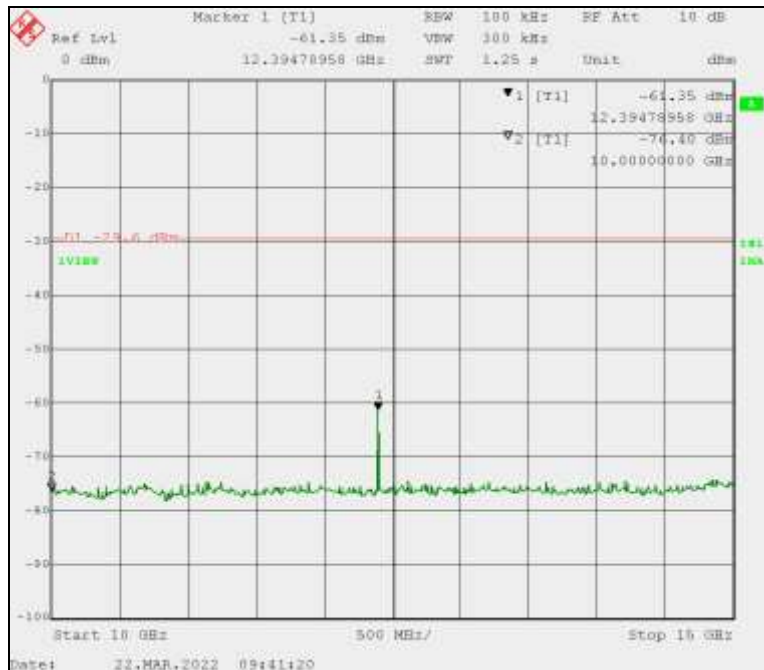


Legrand WNACB4 and WZ3ACB4 Ch 26 2480 MHz Zigbee Radio Transmitting: 5 GHz – 10 GHz

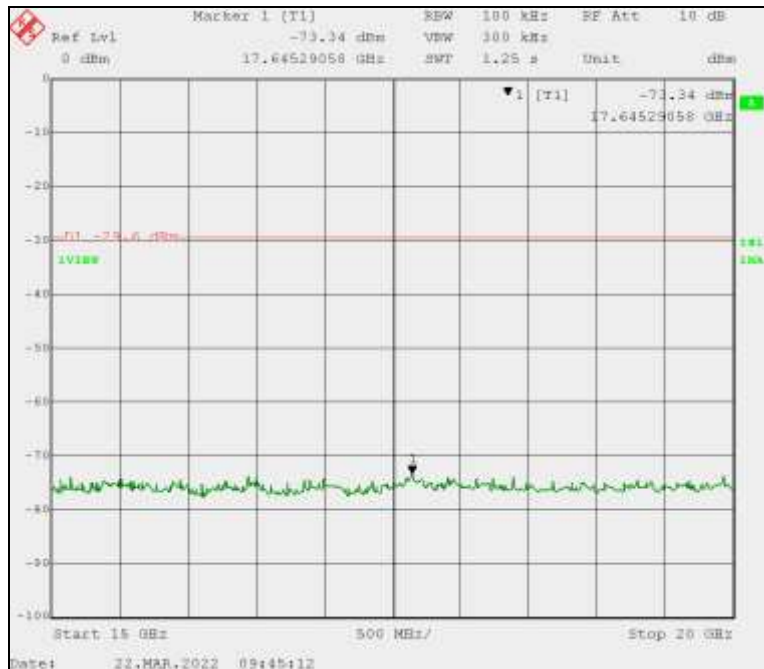




Legrand WNACB4 and WZ3ACB4 Ch 26 2480 MHz Zigbee Radio Transmitting: 10 GHz - 15 GHz

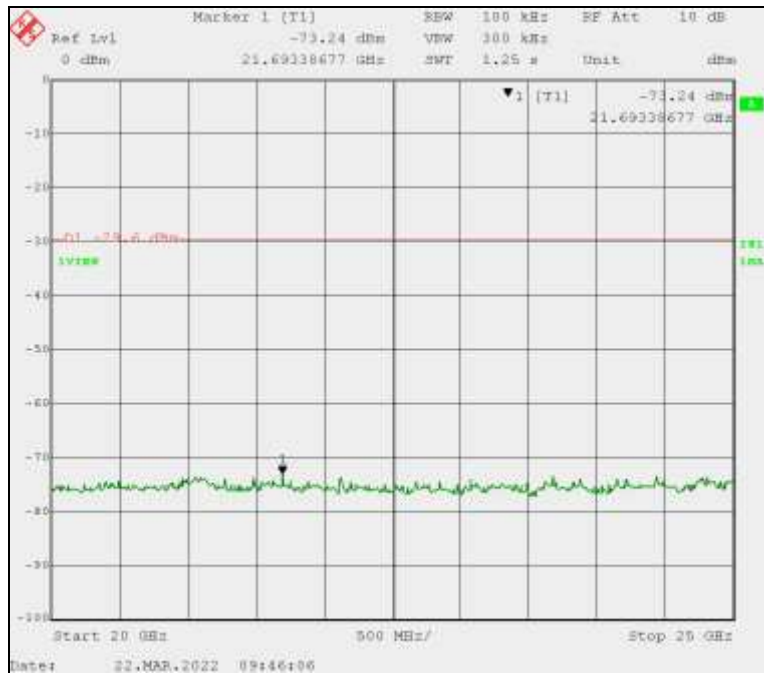


Legrand WNACB4 and WZ3ACB4 Ch 26 2480 MHz Zigbee Radio Transmitting: 15 GHz - 20 GHz





Legrand WNACB4 and WZ3ACB4 Ch 26 2480 MHz Zigbee Radio Transmitting: 20 GHz - 25 GHz



Non-Restricted Band Emissions Measurement Summary Table Showing Highest Measurements

Frequency	Peak	30 dB below Max Peak Reference	Margin	Result
GHz	dBm	dBc	dB	
4.960	-64.62	-29.60	-35.02	PASS
7.435	-64.12	-29.60	-34.52	PASS
9.930	-61.43	-29.60	-31.83	PASS
12.395	-61.35	-29.60	-31.75	PASS
17.645	-73.34	-29.60	-43.74	PASS
21.693	-73.24	-29.60	-43.64	PASS

Test Results: Emissions in Non-Restricted Frequency Bands, measured from the Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio, transmitting with modulation on Channel 26, comply with the requirements of 47 CFR Part 15.247 (d) with 31.75 dB of margin.

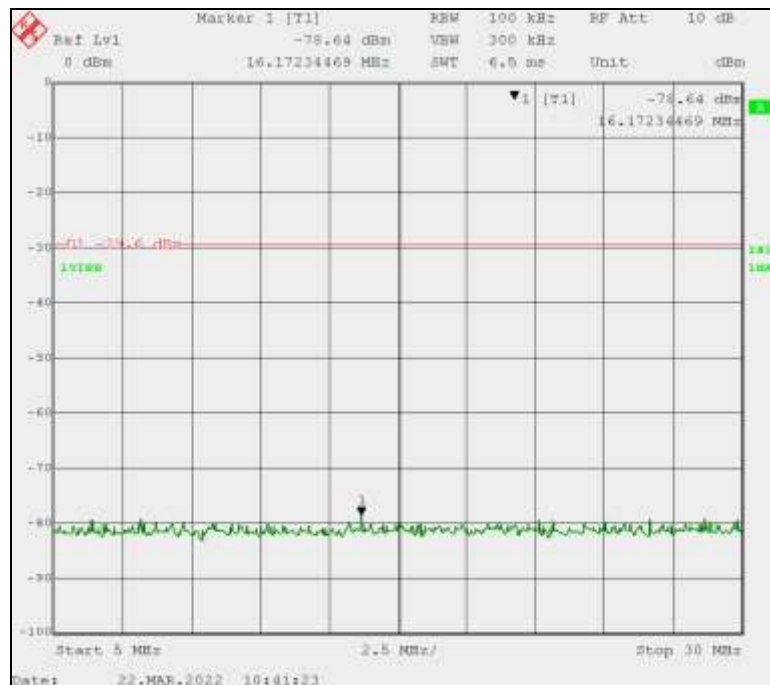


4.8.2.4 WNACB4 and WZ3ACB4 with Zigbee Radio Reference Measurement, Rx Mode (03/22/2022)

The transmitter is not active when measuring the emissions in non-restricted bands while in Rx mode. The lowest reference level from the three Tx mode measurements will be used as the Rx limit. That value is 0.4 dBm. Therefore the -30 dBc level is -29.6 dBm.

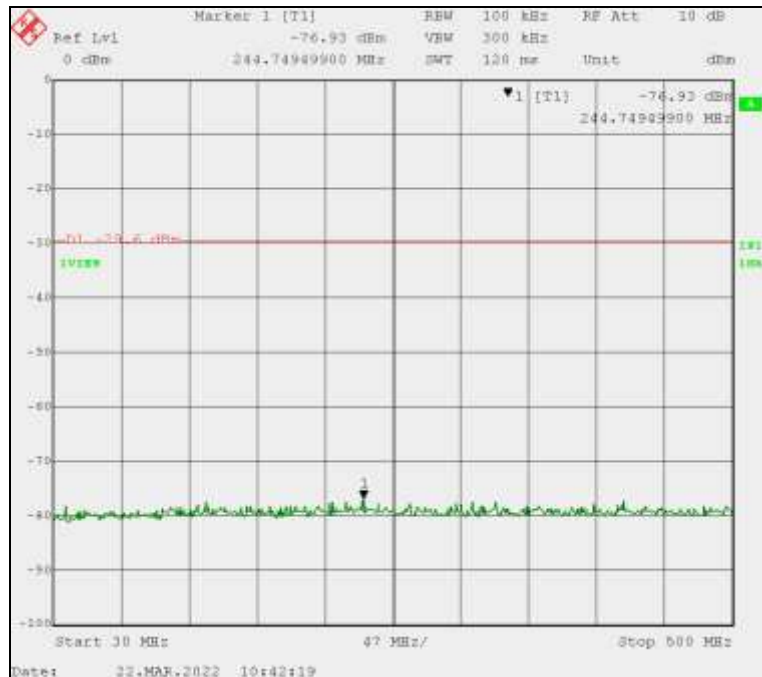
4.8.2.4.1 Emissions in Non-restricted Frequency Bands WNACB4 and WZ3ACB4 with Zigbee Radio Test Results Rx Mode (03/22/2022)

Legrand WNACB4 and WZ3ACB4 Rx Mode Zigbee Radio: 5 – 30 MHz

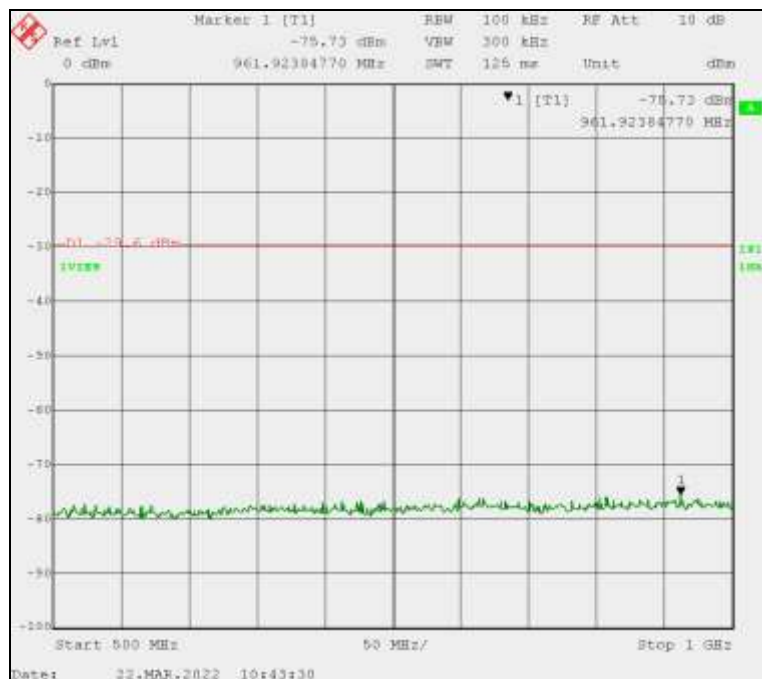




Legrand WNACB4 and WZ3ACB4 Rx Mode Zigbee Radio: 30 – 500 MHz

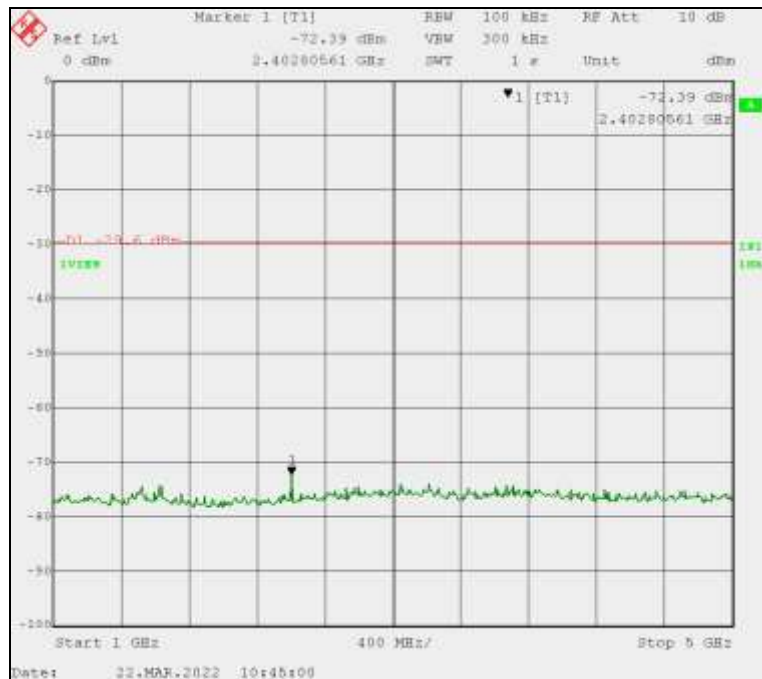


Legrand WNACB4 and WZ3ACB4 Rx Mode Zigbee Radio: 500 MHz - 1 GHz

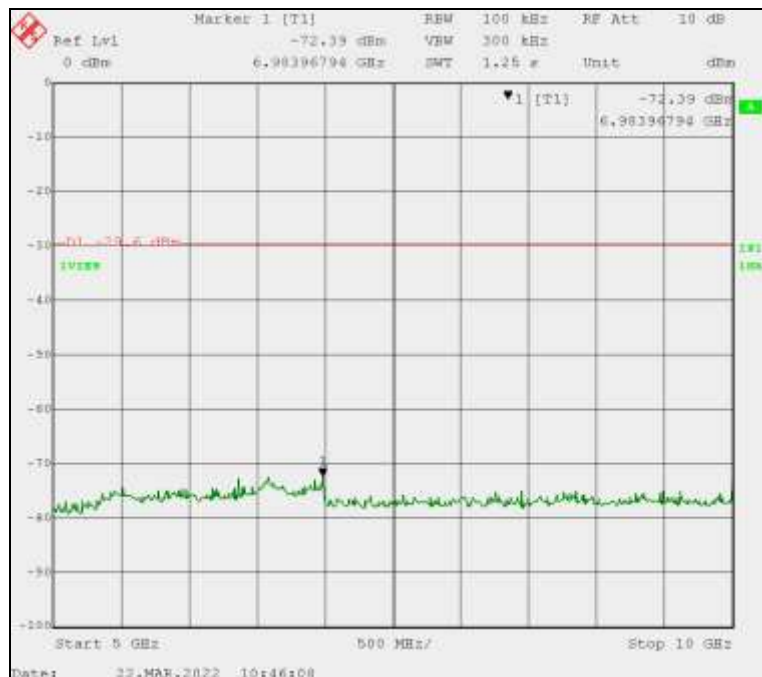




Legrand WNACB4 and WZ3ACB4 Rx Mode Zigbee Radio: 1 GHz – 5 GHz

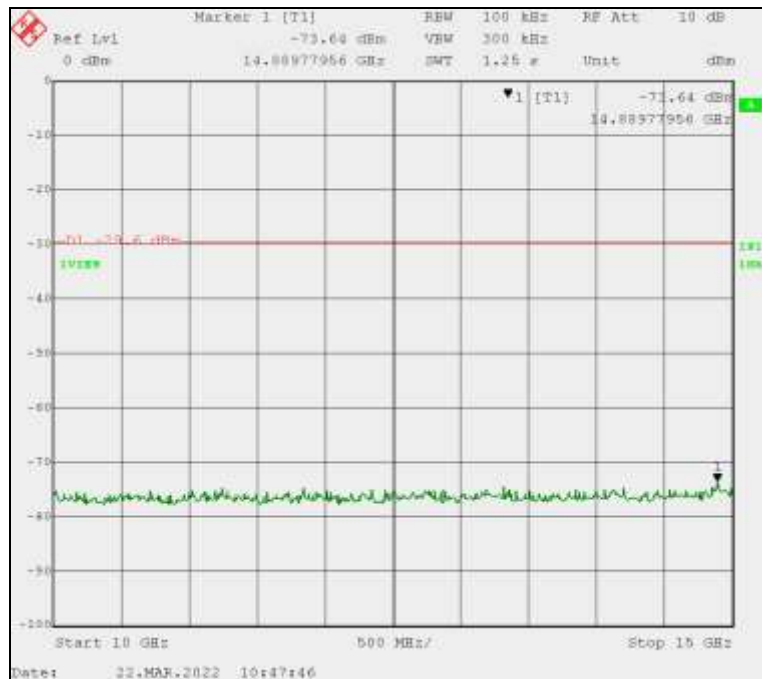


Legrand WNACB4 and WZ3ACB4 Rx Mode Zigbee Radio: 5 GHz – 10 GHz

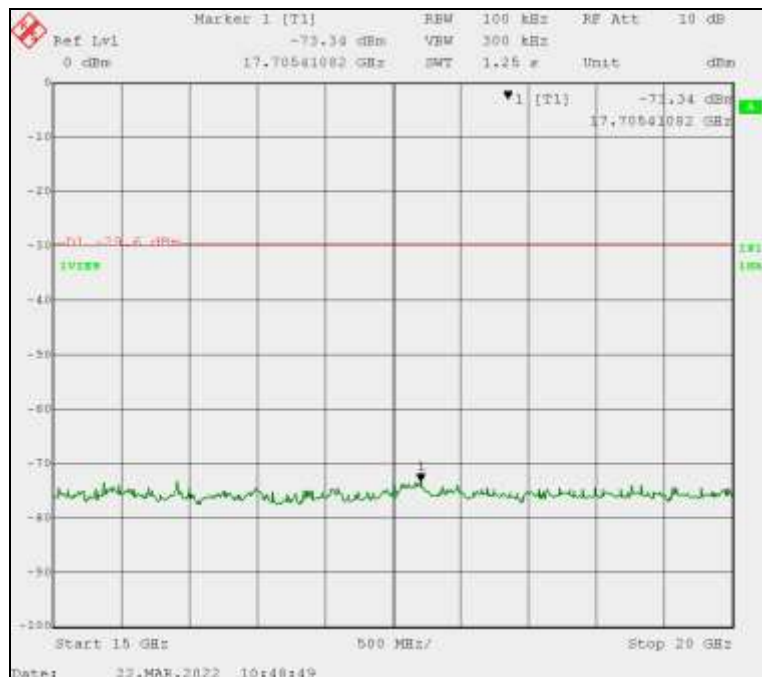




Legrand WNACB4 and WZ3ACB4 Rx Mode Zigbee Radio: 10 GHz – 15 GHz

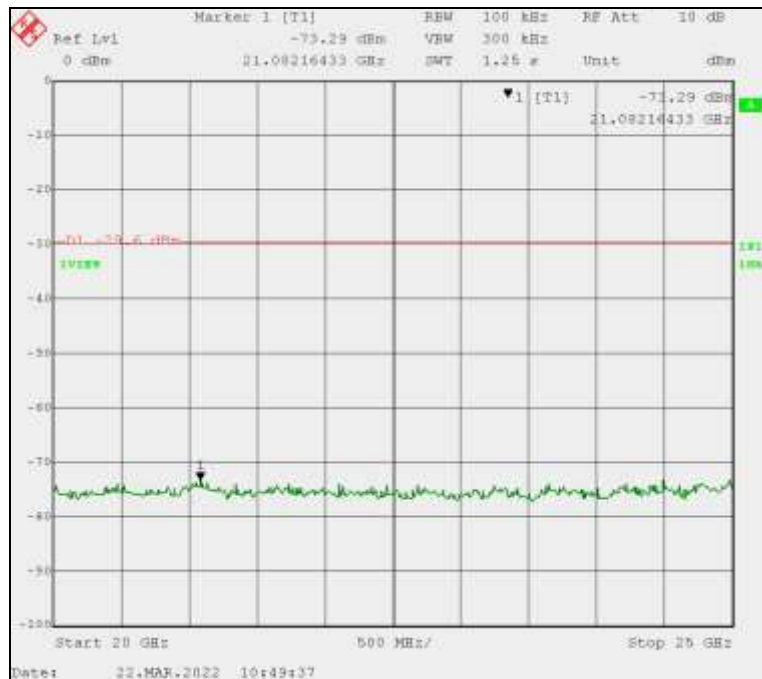


Legrand WNACB4 and WZ3ACB4 Rx Mode Zigbee Radio: 15 GHz – 20 GHz





Legrand WNACB4 and WZ3ACB4 Rx Mode Zigbee Radio: 20 GHz – 25 GHz



Non-Restricted Band Emissions Measurement Summary Table Showing Highest Measurements

Frequency	Peak	30 dB below Max Peak Reference	Margin	Result
GHz	dBm	dBc	dB	
0.2447	-76.93	-29.60	-47.33	PASS
2.403	-72.39	-29.60	-42.79	PASS
6.9839	-72.39	-29.60	-42.79	PASS
14.890	-73.64	-29.60	-44.04	PASS
17.705	-73.34	-29.60	-43.74	PASS
21.082	-73.29	-29.60	-43.69	PASS

Test Results: Emissions in Non-Restricted Frequency Bands, measured from the Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio, in Rx mode, comply with the requirements of 47 CFR Part 15.247 (d) with 42.79 dB of margin.



4.9 Power Spectral Density (FCC Section 15.247(e), RSS-247 Section 5.2(b))

4.9.1 Power Spectral Density Test Procedure

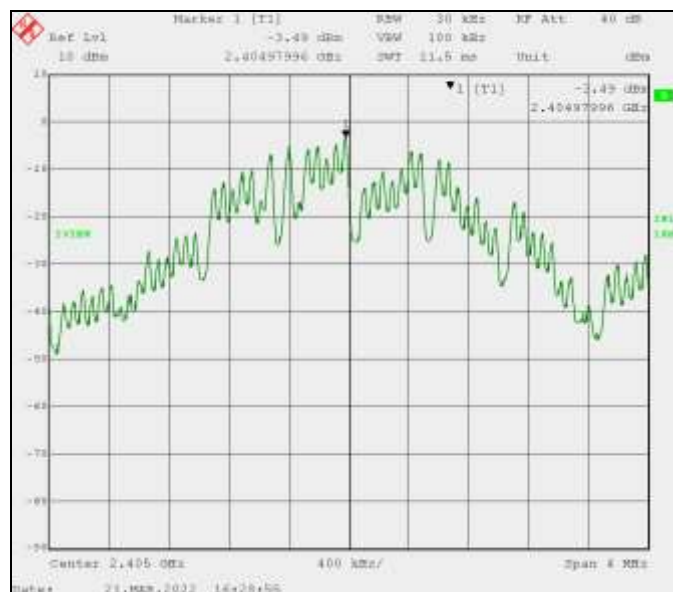
A conducted, peak, power measurement of the output frequency was measured for the Legrand WNACB4 and WZ3ACB4 for each of the low, middle and high operating frequencies with modulation. The Transmit Frequencies were measured with O-QPSK Modulation at maximum output. Peak conducted output power, as directed by ANSI C63.10, Section 11.9.1.1. Therefore, method PKPSD of Section 11.10.2, with 3 kHz bandwidth, was used to measure Power Spectral Density.

Spectrum Analyzer Settings for Zigbee Radio Measurements for Power Spectral Density

Zigbee Radio, O-QPSK modulation			
Spec Analyzer Settings			ANSI C63.10 requirement
Span	4	MHz	$\geq 1.5 \times \text{DTS BW}$
RBW	30	kHz	$3 \text{ kHz} \geq \text{RBW} \geq 100 \text{ kHz}$
VBW	100	kHz	$\geq 3 \times \text{RBW}$
Sweep	11.5	s	Auto

4.9.1.1 Power Spectral Density WNACB4 and WZ3ACB4 with Zigbee Radio Test Results (03/21/2022)

Legrand WNACB4 and WZ3ACB4 Zigbee Radio Channel 11 2405 MHz PSD

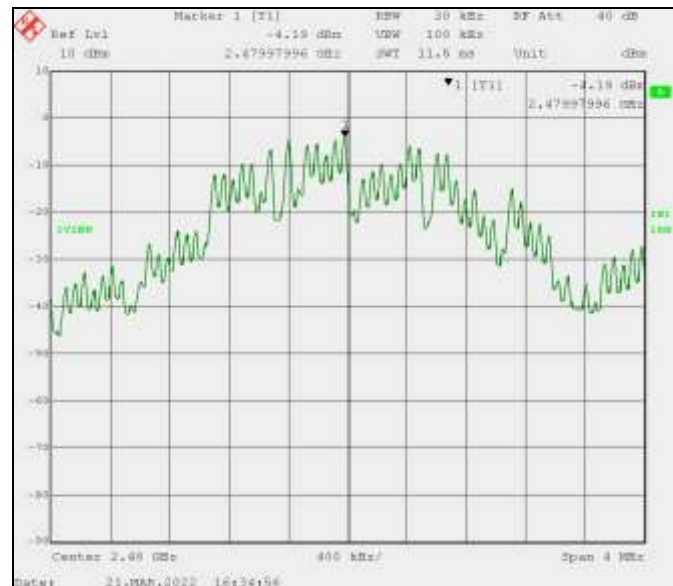




Legrand WNACB4 and WZ3ACB4 Zigbee Radio Channel 18 2440 MHz PSD



Legrand WNACB4 and WZ3ACB4 Zigbee Radio Channel 26 2480 MHz PSD



Channel	Modulation	Frequency (MHz)	Measured Level (dBm)	Cable # 962 Loss (dB)	Total dBm	Limit dBm	Margin dBm
11	O-QPSK	2405.0	-3.49	0.47	-3.02	8.00	-11.02
18		2440.0	-3.71	0.47	-3.24	8.00	-11.24
26		2480.0	-4.19	0.47	-3.72	8.00	-11.72

Test Results: The Power Spectral Density measurements of the Legrand Model WNACB4 and Model WZ3ACB4 with Zigbee Radio are compliant with the limits specified in FCC Section 15.247(e) with margin of 11.02 dB.



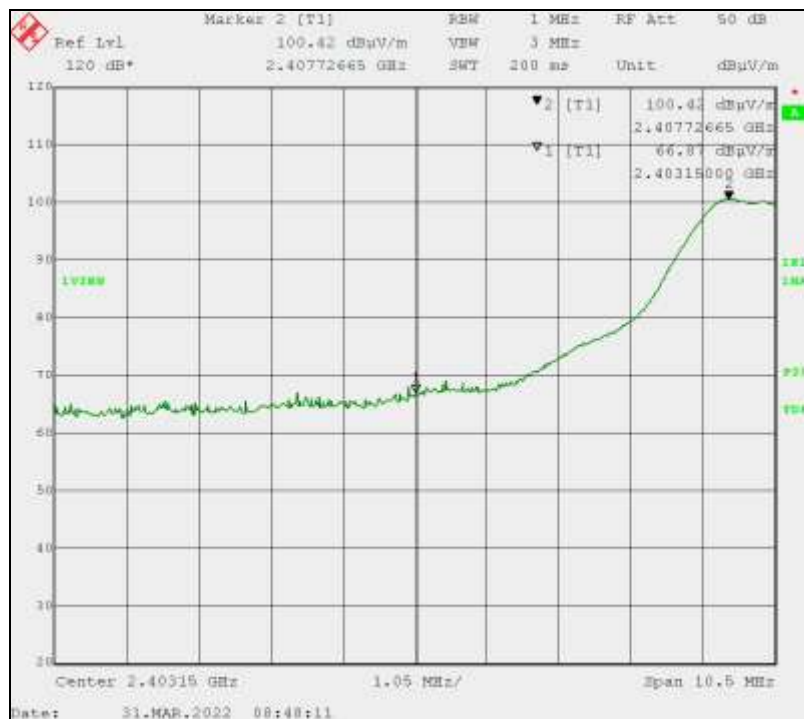
4.10 Band Edge Measurement (FCC Part 15.247(d), RSS-247 5.5)

4.10.1 Band Edge Measurement Test Procedure

The measurements of the authorized band edge for the WNACB4 and Model WZ3ACB4 Zigbee radios were made using the radiated emissions in Section 11.13.1 of ANSI C63.10. The Emission Bandwidth (EBW) of the EUT, does not fall within 2 MHz of any band edge. Therefore, measurements were made using standard methods. The EUT transmitted with modulation on the low and high channels. The Transmit Frequencies were measured with O-QPSK Modulation at maximum output.

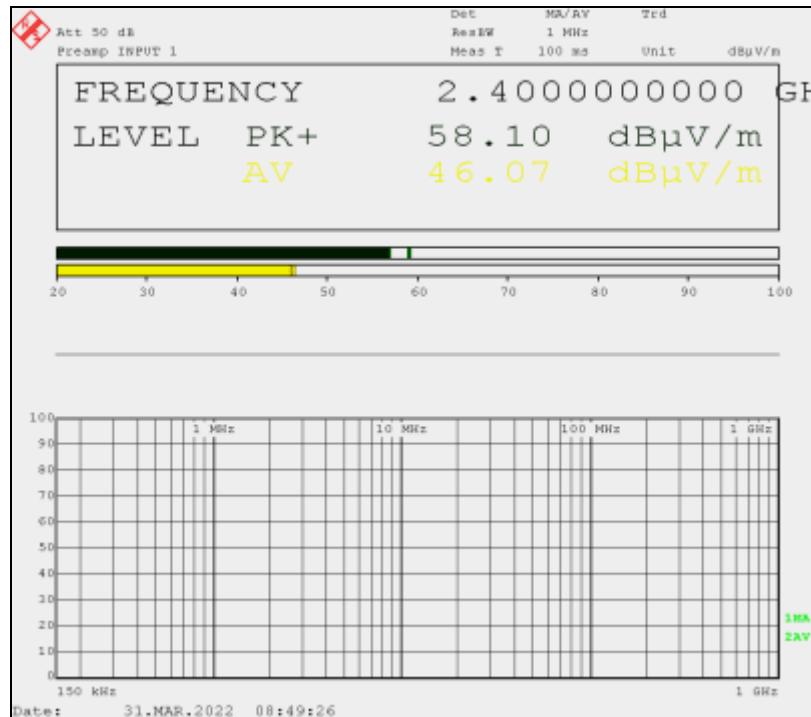
4.10.1.1 Lower Authorized Band Edge Test Result – WNACB4 and Model WZ3ACB4 with Zigbee Radio (03/31/2022)

Legrand WNACB4 and Model WZ3ACB4 Zigbee Radio Zigbee Radio transmitting Ch 11 2405 MHz O-QPSK Horizontal Polarity

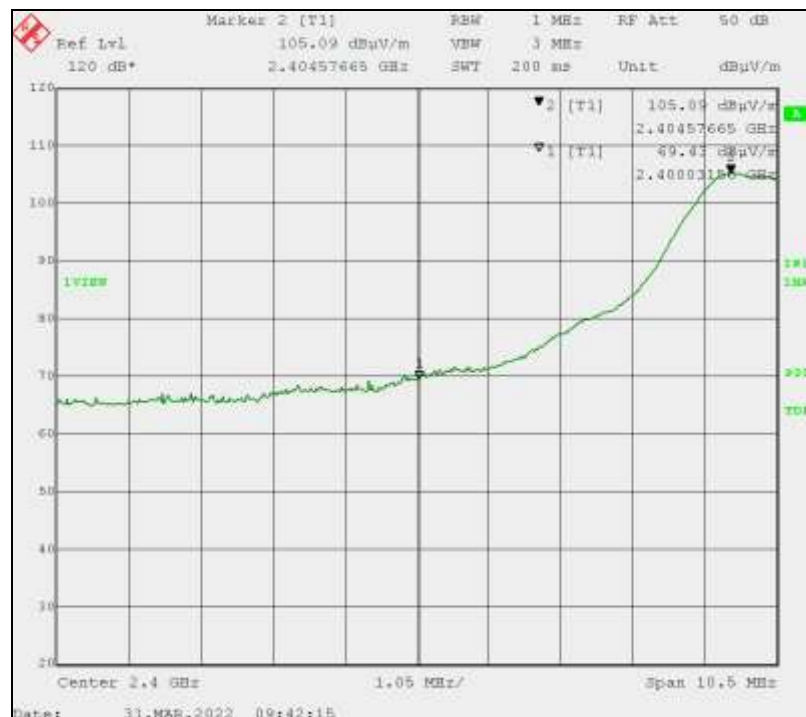




EMI Receiver Horizontal Polarization Measurement at Low Band-edge

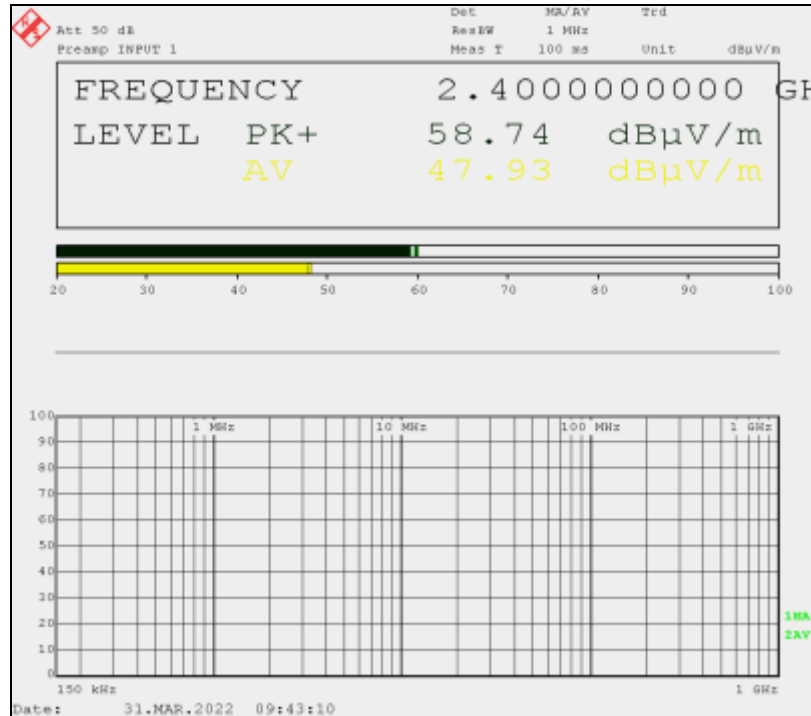


Legrand WNACB4 and Model WZ3ACB4 Zigbee Radio Zigbee Radio transmitting Ch 11 2405 MHz O-QPSK Vertical Polarity





EMI Receiver Vertical Polarization Measurement at Low Band-edge



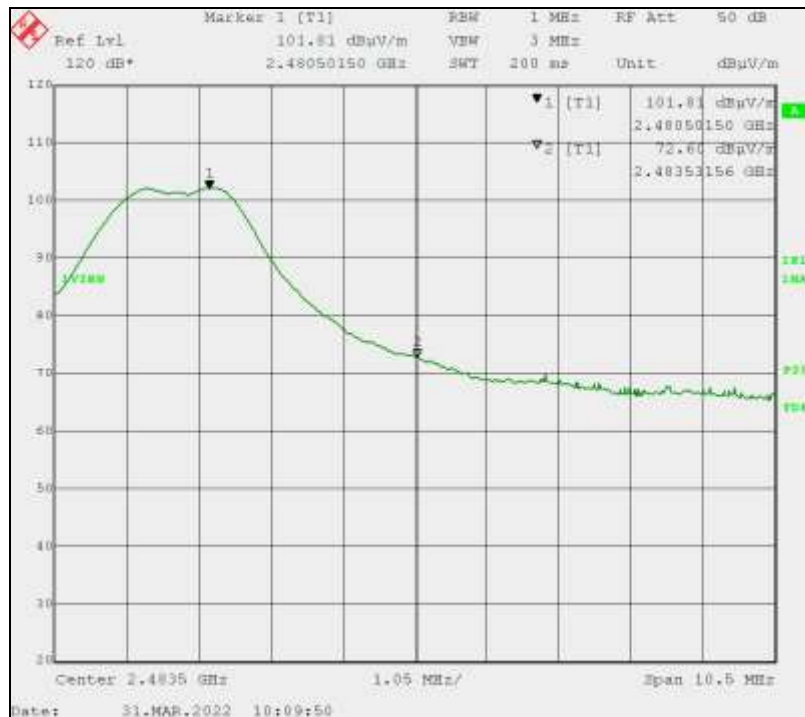
Low Band-Edge Measurement Summary Table

Frequency	Peak Level Corrected	Average Level Corrected	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC 15.205/209 & RSS-GEN/RSS-247				Result
							Peak Limit	Peak Margin	Average Limit	Average Margin	
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
2.4000	56.62	44.59	H	122	262	-1.48	73.98	-17.36	53.98	-9.39	PASS
2.4000	57.26	46.45	V	110	148	-1.48	73.98	-16.72	53.98	-7.53	PASS



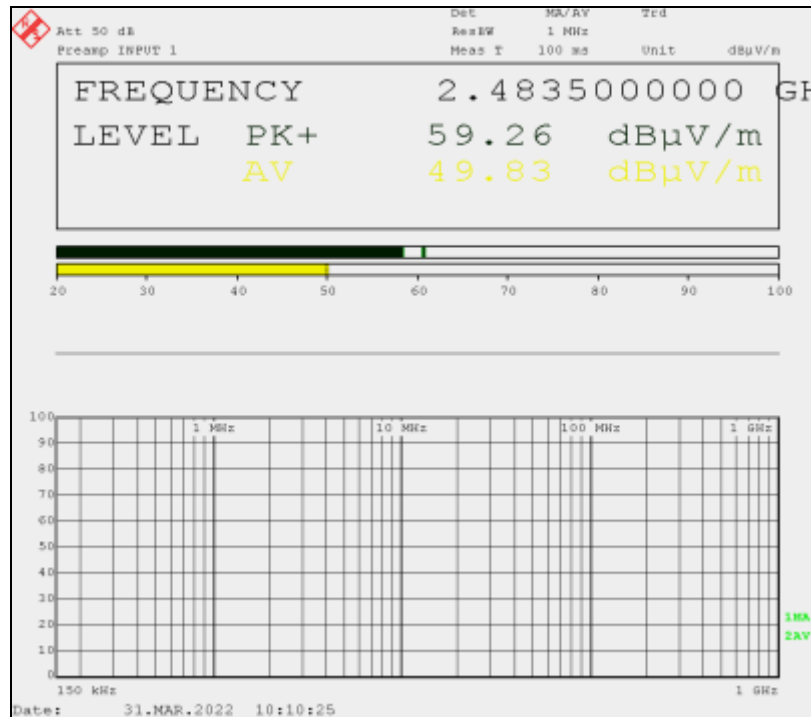
4.10.1.2 Upper Restricted Band Edge Test Result – WNACB4 and Model WZ3ACB4 with Zigbee Radio (03/31/2022)

Legrand WNACB4 and Model WZ3ACB4 Zigbee Radio Zigbee Radio transmitting Ch 26 2480 MHz O-QPSK Horizontal Polarity

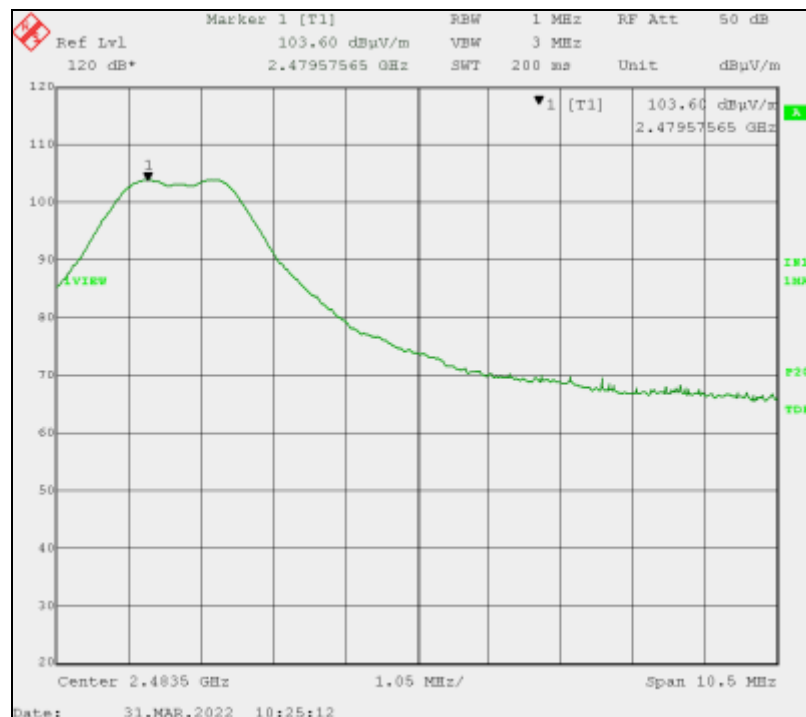




EMI Receiver Horizontal Polarization Measurement at High Band-edge

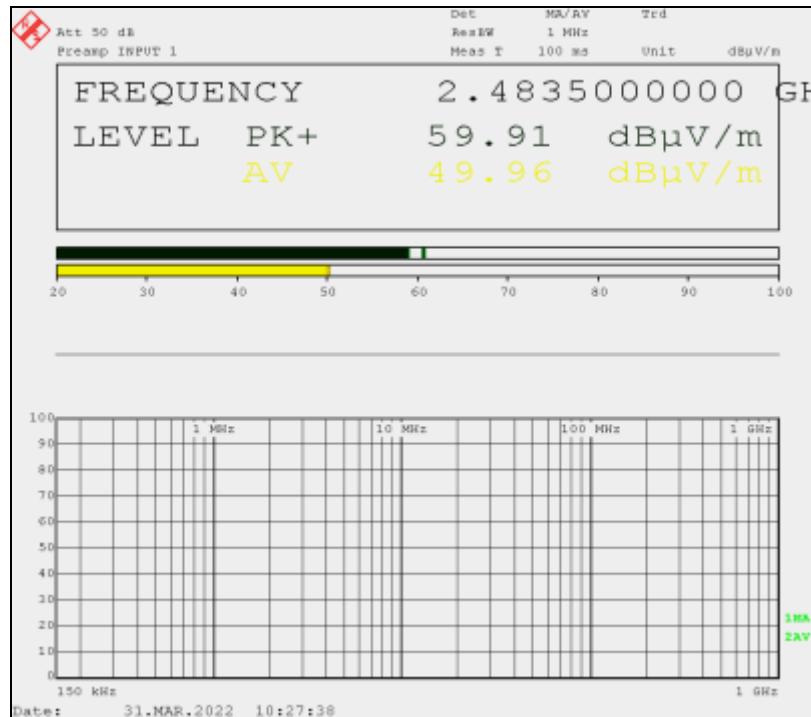


Legrand WNACB4 and Model WZ3ACB4 Zigbee Radio Zigbee Radio transmitting Ch 26 2480 MHz O-QPSK Vertical Polarity





EMI Receiver Vertical Polarization Measurement at High Band-edge



High Band-Edge Measurement Summary Table

Frequency	Peak Level Corrected	Average Level Corrected	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC 15.205/209 & RSS-GEN/RSS-247				
							Peak Limit	Peak Margin	Average Limit	Average Margin	Result
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
2.4835	57.79	48.36	H	048	253	-1.47	73.98	-16.19	53.98	-5.62	PASS
2.4835	58.44	48.49	V	103	265	-1.47	73.98	-15.54	53.98	-5.49	PASS

Test Results: Band-edge measurements of the Legrand Model WNACB4 and Model WZ3ACB4 Zigbee Radio, transmitting with O-QPSK modulation, is compliant to the FCC and ISSED limits with margin of 1.43 dB.



Appendix A – Legrand WNACB4 and WZ3ACB4 with Zigbee Radio Test Setup Pictures

SEE APPENDIX A titled “Appendix A Legrand WNACB4 and WZ3ACB4 with Zigbee Radio Test Setup Pictures”



Appendix B – Test Equipment

Equipment	Manufacturer	Model #	Serial #	BEC #	Calibration Date	Calibration Cycle	Calibration Due Date
EMI Receiver (20 Hz – 26.5 GHz)	Rohde & Schwarz	ESIB 26	836119/006	1010	07/02/19	3 Years	07/02/22
Antenna (30 MHz - 6 GHz)	Sunol Sciences	JB6	A022108	712	06/21/21	3 Years	06/21/24
Amplifier (.09 – 1300 MHz)	Hewlett Packard	8447F	3313A06658	807	01/13/21	2 Years	01/13/23
EMC Analyzer (9 kHz - 1.8 GHz)	Hewlett Packard	8593EM	3710A00214	1026	03/23/20	3 Years	03/23/23
Amplifier System (0.5 – 50 GHz)	Hewlett Packard	83015A 83017A	3123A00360 & 3332A00219	1027	10/13/20	2 Years	10/13/22
Double Ridged Horn Antenna (1 - 18 GHz)	Eaton	3115	2113	836	01/14/22	3 Years	01/14/25
Shielded Room #1	ETS Lindgren	12-2/2-0	4078	859	05/17/18	3 Years	08/17/22
OATS Site (30 MHz – 1 GHz)	BEC	N/A	N/A	705	09/30/21	1 Year	09/30/22
Intentional Radiator Testing High Frequency RF Test Cable	Suhner	S04272B	N/A	962	07/16/20	3 Years	07/16/23
Temp/Humidity Meter	Control Company	4096	151872672	780	04/08/19	2 Years	10/13/22
Software (Tile Instrument Control System)	Quantum Change/EMC Systems	Version 3	N/A	N/A	No Cal. Required	No Cal. Required	No Cal. Required
Radiated Emissions Test Software	BEC	RADE	2.2	N/A	No Cal. Required	No Cal. Required	No Cal. Required