BEC INCORPORATED

CERTIFICATION APPLICATION TEST REPORT

TEST STANDARDS:
FCC Part 15 Subpart C, IC RSS-Gen, IC RSS-247
DTS Intentional Radiator

EUT:
Legrand Models WNAL23 Adorne Wireless Smart Switch with Netatmo and WNAL63 Adorne Wireless Smart Dimmer with Netatmo

FCC ID: 2AU5D-ASWDM
ISED ID: 25764- ASWDM

REPORT#: BEC-2150-01 REV1

TEST DATES: 06/08/2021 – 06/15/2021

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

PREPARED BY: _____
Paul Banker**,** Test Engineer

REVIEWED and APPROVED BY: _____
Steve Fanella**,** Quality Manager

ACCREDITED
Testing Cert #2957.01

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Notice to Customer

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Revision History

Revision #	Description of Changes	Date of Changes	Date Released
0	Test Report Initial Release	N/A	06/18/2021
1	In Section 1.5 Test Result Summary Table we changed the 15.207 Test Result from PASS to N/A. Antenna gain value of + 1.1 dBi that customer supplied to BEC before testing started was incorrect. The correct Antenna gain is + 3.3 dBi. The following sections were updated with the antenna gain value or data related to the calculations using the antenna gain: Section 1.1 Project General Information Section 4.7.2.1 EIRP Level WNAL23 Zigbee Radio Test Results Section 4.7.2.2 EIRP Level WNAL63 Zigbee Radio Test Results	07/09/2021	07/09/2021

1.0 Administrative Information

1.1 Project General Information

Project Number	BEC-2150			
Manufacturer	Legrand			
EUT Description	Legrand Model WNAL23 Adorne Wireless Smart Switch with Netatmo			
EUT Description	Legrand Model WNAL63 Adorne Wireless Smart Dimmer with Netatmo			
EUT Test Models	WNAL23	WNAL23	WNAL63	WNAL63
EUT Test Types	SMA connector at antenna port and radio test software	Standard antenna and radio test software	SMA connector at antenna port and radio test software	Standard antenna and radio test software
EUT Serial Numbers	None	None	None	None
EUT Samples	2150-01	2150-02	2150-03	2150-04
FCC ID	2AU5D-ASWDM			
ISED ID	25764- ASWDM			
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	+ 3.3 dBi			
FCC Classification	Digital Transmission System (DTS)			
Samples Received	06/07/2021			
Condition Received	Suitable for test			
Sample Type	Production units			
Firmware Versions	WNAL23: BNLT_v42.bin and WNAL63: BNLD_v22.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 Collin Richards
Customer Reference Number	PO # SP117452-802

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 that 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 Models WNAL23 and WNAL63 were 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 500 kHz – 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**

* EUT is battery powered, there is no AC mains connection.

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 ° ± 5 °
Humidity: 50% ± 20%
Barometric Pressure: 1000mb ± 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 WNAL23 is a wireless switch from the adorne collection, manufactured by Legrand. The WNAL23 switch uses a CR2032 battery to power a Zigbee radio that operates at 2.4 GHz controlled by the Netatmo Smart Lighting System. The WNAL23 wireless switch with Netatmo serves as an endpoint receiver to a nearby gateway device in an IOT network for smart lighting/electric device control.

The WNAL63 is a wireless dimmer from the adorne collection, manufactured by Legrand. The WNAL63 dimmer uses a CR2032 battery to power a Zigbee radio that operates at 2.4 GHz controlled by the Netatmo Smart Lighting System. The WNAL63 wireless dimmer with Netatmo serves as an endpoint receiver to a nearby gateway device in an IOT network for smart lighting/electric device control.

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 WNALX3 Adorne Wireless Smart Switch and Smart Dimmer 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 WNAL23 and WNAL63 models with Zigbee radio samples contained control software that can utilize the O-QPSK modulation used in normal operation. 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.

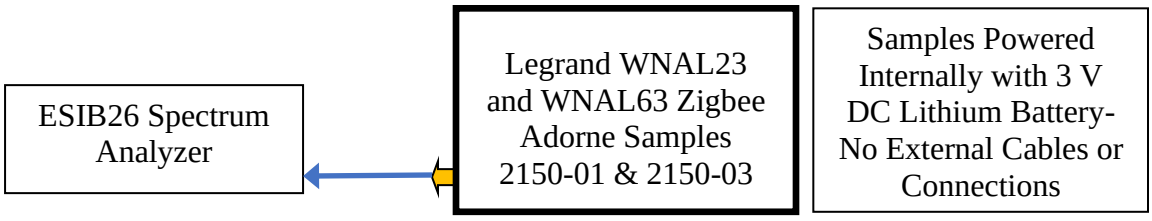
2.5 Test Configuration Rationale

Samples of the Legrand Models WNAL23 and WNAL63, 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



BEC-926, 1 Meter SMA Cable Connecting the SMA Connection from the Zigbee Radio Output to the Input of the Rohde and Schwarz ESIB26 Measurement Analyzer

SMA Adapter Connected from the Zigbee Radio for connection to the SMA Cable

2.6.2 Zigbee Configuration – Radiated Measurement

Legrand WNAL23 and WNAL63 Zigbee Adorne Samples 2150-02 & 2150-04	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 Wireless Smart Switch - Antenna Conducted Sample	Legrand	WNAL23	No Serial Number	2150-01
Adorne Wireless Smart Switch - Antenna Conducted Sample		WNAL23	No Serial Number	2150-02
Adorne Wireless Smart Dimmer - Radiated Emissions Sample		WNAL63	No Serial Number	2150-03
Adorne Wireless Smart Dimmer - Radiated Emissions Sample		WNAL63	No Serial Number	2150-04

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 WNALX3 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

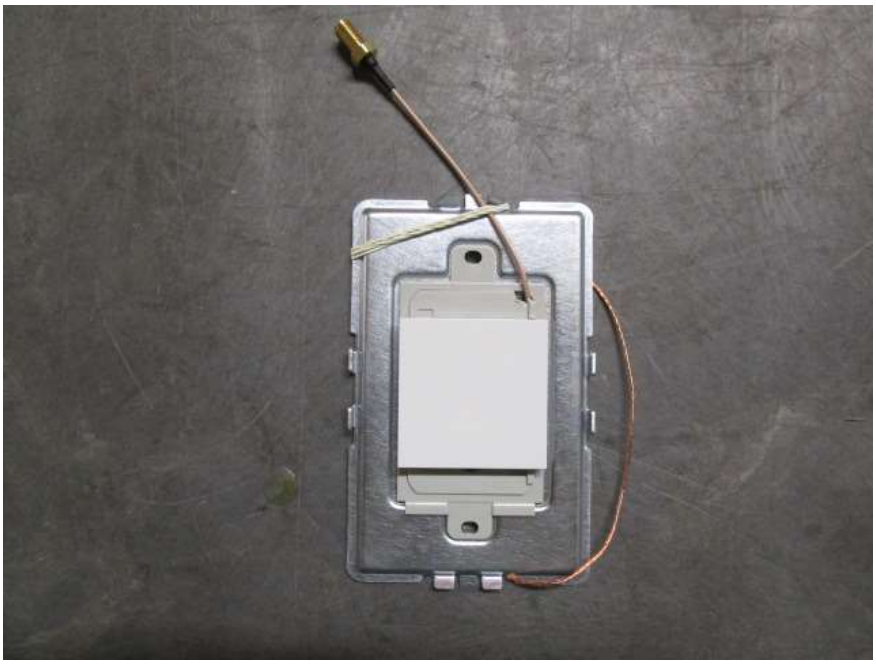
A ground connection to the metal plate was used during radiated emissions testing. However, the circuit board of the EUT is isolated from the metal plate.

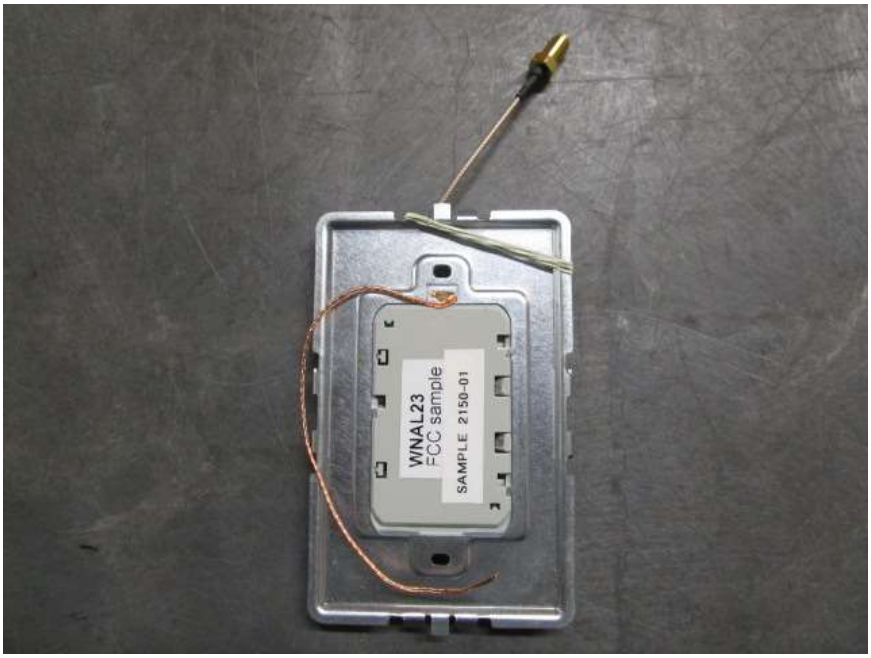
2.10 EUT Modifications

With the exception for the attachment of an SMA connector directly to the antenna output on the main board of the Legrand Model WNALX3, no modifications were made to the test samples.

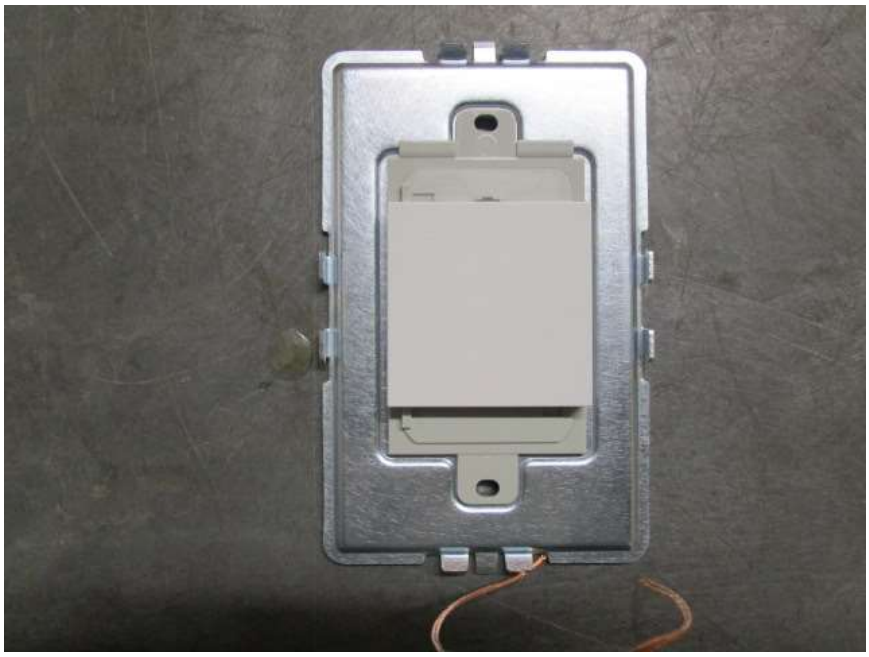
2.11 EUT Pictures Legrand WNALX3 Series Zigbee Radio Samples

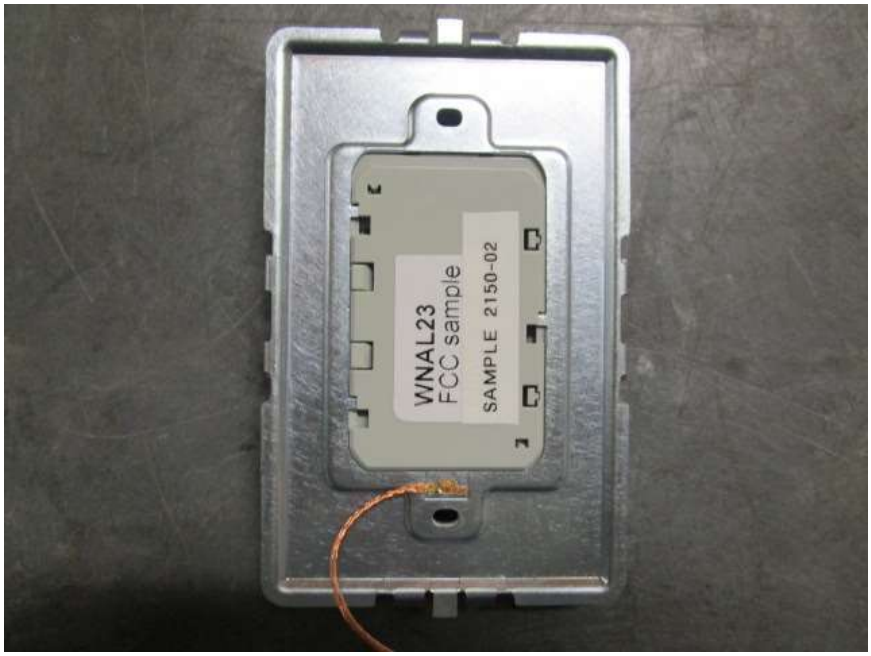
LEGRAND WNAL23 SAMPLE 2150-01 FRONT AND BACK SIDE



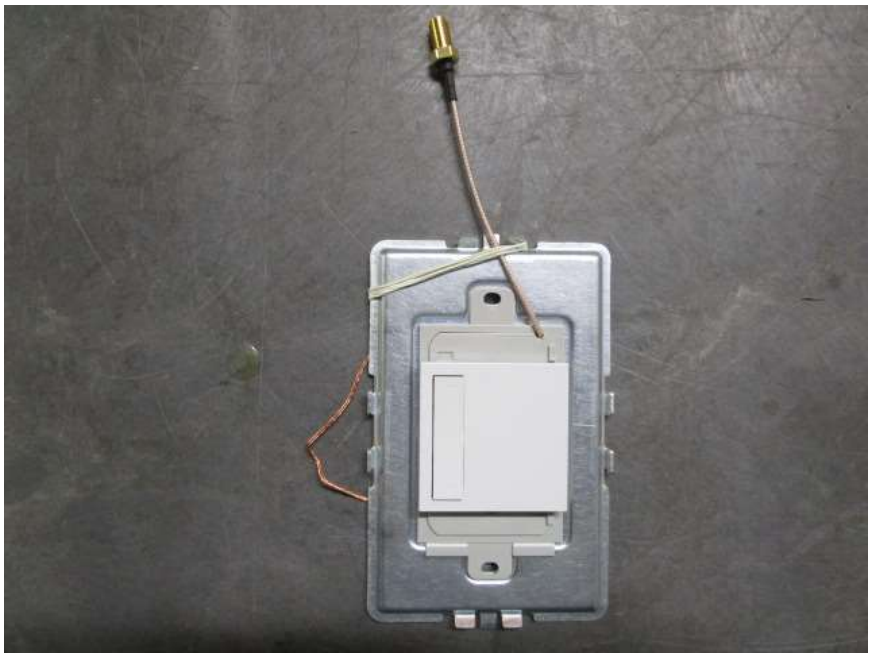


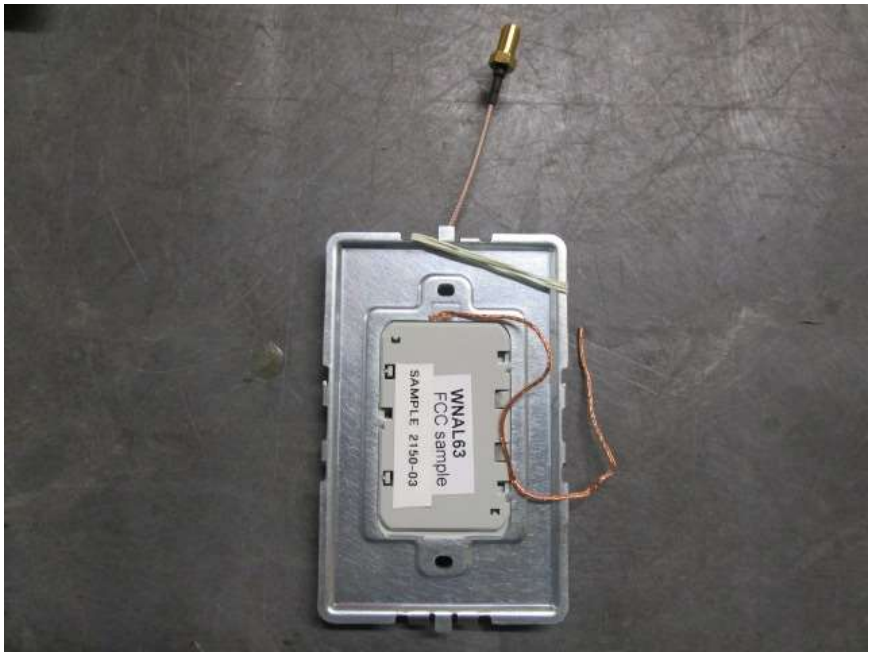
LEGRAND WNAL23 SAMPLE 2150-02 FRONT AND BACK SIDE



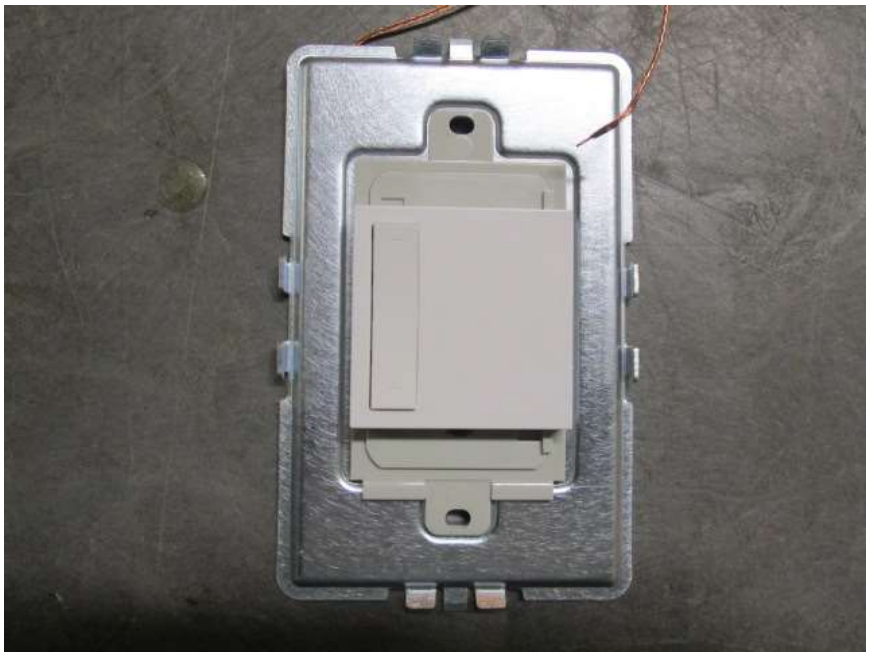


LEGRAND WNAL63 SAMPLE 2150-03 FRONT AND BACK SIDE





LEGRAND WNAL63 SAMPLE 2150-04 FRONT AND BACK SIDE



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 C63.10-2020, 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 WNALX3 Series 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 WNALX3 Series. 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 WNALX3 Series with Zigbee radio is a battery powered unit 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 WNALX3 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 WNALX3 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 EUT**s** were evaluated for maximum emissions. The position of the EUTs placed flat on the horizontal surface of the 80-cm table was determined to be the axis that produced the highest emissions for the Legrand WNAL23 and WNAL63 models.

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 (dBµV/m) = Meter Reading (dBµV) + 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 of the Legrand Model WNALX3 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.

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 WNAL23 Zigbee Radio (06/14/2021)

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 transmission signal was modulated at maximum output.

Legrand Model WNAL23 Zigbee Radio, Low Channel 11, 2405 MHz, Modulated

Frequency	Peak Level	QP Level	Antenna Polarity	Turntable Angle	Antenna Height	C/F	47 CFR 15.205 15.209		Result
							QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	
80.006	17.91	15.59	V	229	100	-13.03	40.00	-24.41	Pass
100.591	19.79	16.71	V	256	111	-9.92	43.52	-26.81	Pass
133.618*	18.04	13.91	H	083	252	-6.52	43.52	-29.61	Pass
170.86*	14.98	12.54	V	075	185	-7.78	43.52	-30.98	Pass
197.878	16.83	13.28	V	293	149	-6.89	43.52	-30.24	Pass
199.588	18.05	13.60	H	092	196	-6.81	43.52	-29.92	Pass
448.196	21.70	18.33	H	050	244	-2.68	46.02	-27.69	Pass
541.855	22.69	19.75	H	350	244	-1.49	46.02	-26.27	Pass
698.528	27.47	22.41	H	150	225	1.01	46.02	-23.61	Pass
762.706	25.81	23.02	V	095	251	1.71	46.02	-23.00	Pass
830.590	28.54	24.68	V	259	148	3.11	46.02	-21.34	Pass
935.494	28.75	25.80	V	254	225	4.30	46.02	-20.22	Pass
976.292*	30.05	25.97	H	171	208	4.83	53.98	-28.01	Pass

*Restricted Band Signal

Legrand Model WNAL23 Zigbee Radio, Middle Channel 18, 2440 MHz, Modulated

Frequency	Peak Level	QP Level	Antenna Polarity	Turntable Angle	Antenna Height	C/F	47 CFR 15.205 15.209		Result
							QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	
80.008	16.36	12.58	V	021	130	-13.03	40.00	-27.42	Pass
100.616	19.38	16.67	V	004	136	-9.91	43.52	-26.85	Pass
132.286*	16.33	13.97	H	064	214	-6.47	43.52	-29.55	Pass
160.191	16.17	13.45	V	299	177	-7.23	43.52	-30.07	Pass
194.737	17.39	12.76	H	305	256	-7.54	43.52	-30.76	Pass
401.741*	19.53	16.99	V	359	217	-3.78	46.02	-29.03	Pass
484.058	21.88	19.18	H	065	178	-2.07	46.02	-26.84	Pass
545.643	21.64	19.78	H	095	140	-1.59	46.02	-26.24	Pass
637.865	23.72	21.73	V	228	205	0.03	46.02	-24.29	Pass
717.682	26.93	22.89	V	349	233	1.41	46.02	-23.13	Pass
765.365	25.41	23.13	H	325	226	1.81	46.02	-22.89	Pass
886.968	28.61	25.54	V	081	242	3.82	46.02	-20.48	Pass
983.861*	30.61	26.20	H	359	166	4.89	53.98	-27.78	Pass

*Restricted Band Signal

Legrand Model WNAL23 Zigbee Radio, High Channel 26, 2480 MHz, Modulated

Frequency	Peak Level	QP Level	Antenna Polarity	Turntable Angle	Antenna Height	C/F	47 CFR 15.205 15.209		Result
							QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	
80.006	18.37	16.25	V	150	110	-13.03	40.00	-23.75	Pass
100.684	18.63	17.10	V	158	130	-9.90	43.52	-26.42	Pass
139.746	17.01	13.81	H	138	119	-6.70	43.52	-29.71	Pass
193.715	14.97	12.75	H	134	108	-7.73	43.52	-30.77	Pass
196.178	16.13	13.13	V	279	140	-7.24	43.52	-30.39	Pass
373.838	19.47	16.53	H	271	197	-4.21	46.02	-29.49	Pass
403.139*	20.83	17.31	V	056	149	-3.70	46.02	-28.71	Pass
570.111	23.62	20.67	H	108	206	-1.04	46.02	-25.35	Pass
609.666*	25.10	20.79	V	357	147	-0.68	46.02	-25.23	Pass
788.255	26.48	24.30	V	171	250	2.44	46.02	-21.72	Pass
831.870	28.56	24.92	H	348	207	3.11	46.02	-21.10	Pass
915.383	28.65	25.60	V	346	168	4.11	46.02	-20.42	Pass
984.23*	30.74	26.50	H	245	136	4.90	53.98	-27.48	Pass

*Restricted Band Signal

Legrand Model WNAL23 Zigbee Radio, Rx Mode

Frequency	Peak Level	QP Level	Antenna Polarity	Turntable Angle	Antenna Height	C/F	47 CFR 15.205 15.209		Result
							QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	
79.988	17.25	14.38	V	332	110	-13.03	40.00	-25.62	Pass
100.346	20.58	16.91	V	359	109	-9.97	43.52	-26.61	Pass
115.486*	18.29	14.18	H	291	103	-6.95	43.52	-29.34	Pass
120.263*	20.43	14.49	V	301	145	-6.57	43.52	-29.03	Pass
198.888	16.34	13.73	H	097	234	-6.77	43.52	-29.79	Pass
286.344	16.37	15.13	H	071	141	-5.35	46.02	-30.89	Pass
486.501	22.70	19.57	H	320	146	-1.99	46.02	-26.45	Pass
544.764	23.69	19.96	V	042	111	-1.59	46.02	-26.06	Pass
634.378	24.34	21.97	V	200	220	-0.03	46.02	-24.05	Pass
684.833	26.17	22.67	V	287	161	0.69	46.02	-23.35	Pass
814.318	27.39	24.55	H	312	244	2.87	46.02	-21.47	Pass
838.290	28.96	25.06	V	296	149	3.24	46.02	-20.96	Pass
942.848	28.17	25.86	H	270	214	4.35	46.02	-20.16	Pass

*Restricted Band Signal

Test Results: The Legrand Model WNAL23, 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 20.22 dB.

4.4.4 Emissions in Frequency Bands 1 - 18 GHz WNAL23 Zigbee Radio Test Results (06/09/2021 and 06/10/2021)

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 transmission signal was modulated at maximum output.

Legrand Model WNAL23 Zigbee Radio, Low Channel 11, 2405 MHz, Modulated

Frequency	Peak Level	Avg Level	Ant Pol	Azimuth	Ant Hght	C/F	FCC 15.205/209, RSS-GEN/RSS-247				Result
							Peak		Average		
							Limit	Margin	Limit	Margin	
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
4.8090*	47.33	41.12	V	088	149	1.60	73.98	-26.65	53.98	-12.86	PASS
4.8109*	37.72	28.45	H	012	119	1.61	73.98	-36.26	53.98	-25.53	PASS
7.2053	44.12	34.43	V	330	153	4.17	73.98	-29.86	53.98	-19.55	PASS
7.2097	44.56	34.46	H	101	221	4.19	73.98	-29.42	53.98	-19.52	PASS
9.6165	47.71	37.96	V	345	161	7.24	73.98	-26.27	53.98	-16.02	PASS
9.6214	48.03	37.94	H	152	230	7.22	73.98	-25.95	53.98	-16.04	PASS
12.0194*	50.52	40.11	H	145	136	8.32	73.98	-23.46	53.98	-13.87	PASS
12.0226*	49.72	40.02	V	122	243	8.32	73.98	-24.26	53.98	-13.96	PASS
14.4212	55.96	47.05	H	300	228	12.83	73.98	-18.02	53.98	-6.93	PASS
14.4247	55.92	47.17	V	211	239	12.83	73.98	-18.06	53.98	-6.81	PASS

*Restricted Band Signal

Legrand Model WNAL23 Zigbee Radio, Middle Channel 18, 2440 MHz, Modulated

Frequency	Peak Level	Avg Level	Ant Pol	Azimuth	Ant Hght	C/F	FCC 15.205/209, RSS-GEN/RSS-247				Result
							Peak		Average		
							Limit	Margin	Limit	Margin	
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
4.8792*	47.98	38.05	V	245	104	1.81	73.98	-26.00	53.98	-15.93	PASS
4.8795*	40.48	30.50	H	072	110	1.81	73.98	-33.50	53.98	-23.48	PASS
7.3202*	43.73	34.68	V	154	120	4.57	73.98	-30.25	53.98	-19.30	PASS
7.3276*	44.44	34.64	H	302	167	4.60	73.98	-29.54	53.98	-19.34	PASS
9.7623	47.68	37.37	V	033	208	6.81	73.98	-26.30	53.98	-16.61	PASS
9.7680	48.34	37.59	H	045	246	6.81	73.98	-25.64	53.98	-16.39	PASS
12.2030*	48.87	40.05	V	351	224	8.33	73.98	-25.11	53.98	-13.93	PASS
12.2070*	48.96	39.41	H	000	200	8.34	73.98	-25.02	53.98	-14.57	PASS
14.6379	57.10	47.64	H	331	153	12.76	73.98	-16.88	53.98	-6.34	PASS
14.6446	56.29	47.20	V	086	151	12.75	73.98	-17.69	53.98	-6.78	PASS

*Restricted Band Signal

Legrand Model WNAL23 Zigbee Radio, High Channel 26, 2480 MHz, Modulated

Frequency	Peak Level	Avg Level	Ant Pol	Azimuth	Ant Hght	C/F	FCC 15.205/209, RSS-GEN/RSS-247				Result
							Peak		Average		
							Limit	Margin	Limit	Margin	
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
4.9493*	40.14	29.00	H	302	223	1.84	73.98	-33.84	53.98	-24.98	PASS
4.9589*	46.16	36.17	V	244	126	1.85	73.98	-27.82	53.98	-17.81	PASS
7.4320*	43.61	34.66	V	359	154	4.71	73.98	-30.37	53.98	-19.32	PASS
7.4324*	45.00	34.84	H	217	242	4.71	73.98	-28.98	53.98	-19.14	PASS
9.9135	46.90	37.42	H	128	105	6.62	73.98	-27.08	53.98	-16.56	PASS
9.9180	47.63	37.77	V	008	212	6.61	73.98	-26.35	53.98	-16.21	PASS
12.4074*	50.22	39.86	H	068	165	8.47	73.98	-23.76	53.98	-14.12	PASS
12.4132*	50.08	39.56	V	254	222	8.48	73.98	-23.90	53.98	-14.42	PASS
14.8692	57.02	46.44	V	060	168	11.75	73.98	-16.96	53.98	-7.54	PASS
14.8727	55.74	46.19	H	346	121	11.73	73.98	-18.24	53.98	-7.79	PASS

*Restricted Band Signal

Legrand Model WNAL23 Zigbee Radio, Rx Mode

Frequency	Peak Level	Avg Level	Ant Pol	Azimuth	Ant Hght	C/F	FCC 15.205/209, RSS-GEN/RSS-247				Result
							Peak		Average		
							Limit	Margin	Limit	Margin	
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
4.7987*	37.82	28.39	H	281	103	1.56	73.98	-36.16	53.98	-25.59	PASS
4.8048*	37.69	28.74	V	164	172	1.59	73.98	-36.29	53.98	-25.24	PASS
7.2121	42.83	33.96	V	087	171	4.20	73.98	-31.15	53.98	-20.02	PASS
7.2217	45.69	34.04	H	325	156	4.24	73.98	-28.29	53.98	-19.94	PASS
9.6210	47.53	37.38	H	203	181	7.22	73.98	-26.45	53.98	-16.60	PASS
9.6213	47.10	37.80	V	218	225	7.22	73.98	-26.88	53.98	-16.18	PASS
12.0209*	49.69	39.96	H	329	150	8.32	73.98	-24.29	53.98	-14.02	PASS
12.0221*	49.32	39.94	V	097	196	8.32	73.98	-24.66	53.98	-14.04	PASS
14.4209	56.16	47.31	H	248	249	12.83	73.98	-17.82	53.98	-6.67	PASS
14.4394	56.95	46.87	V	343	188	12.84	73.98	-17.03	53.98	-7.11	PASS

*Restricted Band Signal

Test Results: The Legrand Model WNAL23 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 6.34 dB.

4.4.5 Emissions in Frequency Bands 18 – 25 GHz WNAL23 Zigbee Radio (06/10/2021)

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 transmission signal was modulated at maximum output.

The result of the emissions scans showed no measurable signals between 18 and 25 GHz while the WNAL23 Transmitted low, middle, high channels and in Receive Mode.

Test Results: The Legrand Model WNAL23 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.

4.4.6 Emissions in Frequency Bands 30 MHz – 1000 MHz WNAL63 Zigbee Radio (06/15/2021)

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 transmission signal was modulated at maximum output.

Legrand Model WNAL63 Zigbee Radio, Low Channel 11, 2405 MHz, Modulated

Frequency	Peak Level	QP Level	Antenna Polarity	Turntable Angle	Antenna Height	C/F	47 CFR 15.205 15.209		Result
							QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	
80.012	16.43	14.58	V	181	146	-13.03	40.00	-25.42	Pass
100.756	19.58	16.61	V	238	101	-9.88	43.52	-26.91	Pass
120.666*	17.95	14.33	H	359	148	-6.56	43.52	-29.19	Pass
198.675	17.07	13.56	V	104	187	-6.79	43.52	-29.96	Pass
312.054	18.82	15.37	H	125	110	-4.98	46.02	-30.65	Pass
557.517	22.38	19.90	V	084	185	-1.48	46.02	-26.12	Pass
575.643	23.74	20.95	H	262	139	-0.87	46.02	-25.07	Pass
657.477	25.72	21.83	V	237	100	0.49	46.02	-24.19	Pass
689.625	27.08	22.40	H	159	148	0.70	46.02	-23.62	Pass
890.869	28.53	25.48	V	179	237	3.89	46.02	-20.54	Pass
915.182	28.38	25.36	V	212	105	4.13	46.02	-20.66	Pass
927.925	27.46	25.78	H	337	250	4.27	46.02	-20.24	Pass
973.831*	27.97	26.16	H	021	225	4.77	53.98	-27.82	Pass

*Restricted Band Signal

Legrand Model WNAL63 Zigbee Radio, Mid Channel 18, 2440 MHz, Modulated

Frequency	Peak Level	QP Level	Antenna Polarity	Turntable Angle	Antenna Height	C/F	47 CFR 15.205 15.209		Result
							QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	
80.005	19.03	16.26	V	194	101	-13.03	40.00	-23.74	Pass
100.852	19.08	17.17	V	360	103	-9.86	43.52	-26.35	Pass
146.966	17.34	13.60	H	214	250	-6.94	43.52	-29.92	Pass
198.179	15.40	13.51	H	262	148	-6.85	43.52	-30.01	Pass
392.332	19.18	17.02	H	287	235	-3.90	46.02	-29.00	Pass
465.947	21.99	18.81	V	315	226	-2.44	46.02	-27.21	Pass
580.697	23.87	20.97	V	325	244	-0.76	46.02	-25.05	Pass
678.272	24.21	22.39	V	194	136	0.58	46.02	-23.63	Pass
704.311	25.51	22.54	H	359	245	1.16	46.02	-23.48	Pass
831.493	27.27	24.83	V	033	159	3.11	46.02	-21.19	Pass
845.842	27.74	24.77	H	037	195	3.29	46.02	-21.25	Pass
984.092*	31.13	26.27	H	345	147	4.90	53.98	-27.71	Pass
989.895*	28.83	26.16	V	301	149	4.81	53.98	-27.82	Pass

*Restricted Band Signal

Legrand Model WNAL63 Zigbee Radio, High Channel 26, 2480 MHz, Modulated

Frequency	Peak Level	QP Level	Antenna Polarity	Turntable Angle	Antenna Height	C/F	47 CFR 15.205 15.209		Result
							QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	
80.003	19.25	16.66	V	249	103	-13.03	40.00	-23.34	Pass
100.540	20.64	17.60	V	110	108	-9.93	43.52	-25.92	Pass
121.120*	17.02	14.23	H	195	245	-6.55	43.52	-29.29	Pass
312.634	18.45	15.48	H	222	198	-4.98	46.02	-30.54	Pass
319.334	18.43	15.70	V	267	189	-4.89	46.02	-30.32	Pass
346.156	18.21	15.85	H	341	215	-4.71	46.02	-30.17	Pass
462.548	21.50	19.02	H	321	195	-2.49	46.02	-27.00	Pass
572.084	23.30	20.83	V	012	104	-0.94	46.02	-25.19	Pass
656.734	24.97	22.11	V	000	100	0.52	46.02	-23.91	Pass
779.727	27.46	24.11	V	089	158	2.14	46.02	-21.91	Pass
815.621	28.16	24.61	H	328	119	2.85	46.02	-21.41	Pass
897.684	27.64	25.57	V	048	233	3.93	46.02	-20.45	Pass
937.335	28.14	25.98	H	140	255	4.26	46.02	-20.04	Pass

*Restricted Band Signal

Legrand Model WNAL63 Zigbee Radio, Rx Mode

Frequency	Peak Level	QP Level	Antenna Polarity	Turntable Angle	Antenna Height	C/F	47 CFR 15.205 15.209		Result
							QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	
80.010	18.50	16.34	V	236	110	-13.03	40.00	-23.66	Pass
100.482	19.98	17.87	V	097	110	-9.94	43.52	-25.65	Pass
113.840	17.05	13.87	H	005	234	-7.14	43.52	-29.65	Pass
200.479	16.10	13.60	H	275	235	-6.99	43.52	-29.92	Pass
350.473	18.59	16.13	V	000	176	-4.62	46.02	-29.89	Pass
463.513	22.14	19.03	H	310	110	-2.49	46.02	-26.99	Pass
587.962	24.37	21.11	H	182	151	-0.60	46.02	-24.91	Pass
592.615	23.95	21.17	V	203	196	-0.60	46.02	-24.85	Pass
677.336	25.79	22.64	H	115	149	0.58	46.02	-23.38	Pass
686.310	25.76	22.75	V	018	105	0.70	46.02	-23.27	Pass
807.282	27.83	24.47	V	184	105	2.80	46.02	-21.55	Pass
893.353	28.44	25.69	V	095	140	3.90	46.02	-20.33	Pass
932.519	28.70	26.08	H	008	104	4.28	46.02	-19.94	Pass
987.719	27.86	26.67	V	014	155	4.90	53.98	-27.31	Pass

*Restricted Band Signal

Test Results: The Legrand Model WNAL63, 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 19.94 dB.

4.4.7 Emissions in Frequency Bands 1 - 18 GHz WNAL63 Zigbee Radio Test Results (06/10/2021)

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 transmission signal was modulated at maximum output.

Legrand Model WNAL63 Zigbee Radio, Low Channel 11, 2405 MHz, Modulated

Frequency	Corrected		Antenna Polarity	Azimuth	Antenna Height	Correction Factor	FCC 15.205/209 RSS-GEN/247				Result
	Peak Level	Avg Level					Peak Limit	Peak Margin	Avg Limit	Avg Margin	
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
4.8039*	39.33	28.44	H	324	102	1.58	73.98	-34.65	53.98	-25.54	PASS
4.8091*	45.96	38.79	V	139	151	1.60	73.98	-28.02	53.98	-15.19	PASS
5.2098	39.93	30.16	V	049	104	2.75	73.98	-34.05	53.98	-23.82	PASS
5.2287	39.51	30.23	H	126	214	2.77	73.98	-34.47	53.98	-23.75	PASS
6.7809	43.80	34.01	V	190	115	3.62	73.98	-30.18	53.98	-19.97	PASS
7.2470	43.89	34.33	V	166	119	4.35	73.98	-30.09	53.98	-19.65	PASS
7.3216*	43.93	34.62	H	341	158	4.58	73.98	-30.05	53.98	-19.36	PASS
8.6416	47.10	37.42	H	297	125	6.39	73.98	-26.88	53.98	-16.56	PASS
9.6151	48.83	37.98	V	111	171	7.25	73.98	-25.15	53.98	-16.00	PASS
9.6818	47.77	37.84	H	041	249	7.00	73.98	-26.21	53.98	-16.14	PASS
12.0312*	49.64	40.23	H	224	238	8.31	73.98	-24.34	53.98	-13.75	PASS
12.0352*	49.76	39.85	V	261	191	8.31	73.98	-24.22	53.98	-14.13	PASS

*Restricted Band Signal

Legrand Model WNAL63 Zigbee Radio, Mid Channel 18, 2440 MHz, Modulated

Frequency	Corrected		Antenna Polarity	Azimuth	Antenna Height	Correction Factor	FCC 15.205/209 RSS-GEN/247				Result
	Peak Level	Avg Level					Peak Limit	Peak Margin	Avg Limit	Avg Margin	
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
4.8812*	43.32	34.00	V	142	131	1.81	73.98	-30.66	53.98	-19.98	PASS
4.8812*	43.98	34.50	H	274	240	1.81	73.98	-30.00	53.98	-19.48	PASS
7.3064*	44.09	34.80	V	000	101	4.53	73.98	-29.89	53.98	-19.18	PASS
7.3149*	43.23	34.76	V	155	217	4.56	73.98	-30.75	53.98	-19.22	PASS
7.3371*	44.96	34.65	H	284	210	4.63	73.98	-29.02	53.98	-19.33	PASS
8.1038*	46.71	36.87	H	130	207	5.43	73.98	-27.27	53.98	-17.11	PASS
9.7522	46.75	37.10	V	147	121	6.82	73.98	-27.23	53.98	-16.88	PASS
9.7580	55.98	48.81	V	219	214	6.82	73.98	-18.00	53.98	-5.17	PASS
9.7626	48.50	38.34	H	129	246	6.81	73.98	-25.48	53.98	-15.64	PASS
12.1993*	49.15	40.20	V	330	237	8.33	73.98	-24.83	53.98	-13.78	PASS
12.2140*	50.89	40.19	H	001	146	8.34	73.98	-23.09	53.98	-13.79	PASS
14.6589	56.25	47.30	H	007	228	12.71	73.98	-17.73	53.98	-6.68	PASS

*Restricted Band Signal

Legrand Model WNAL63 Zigbee Radio, High Channel 26, 2480 MHz, Modulated

Frequency	Corrected		Antenna Polarity	Azimuth	Antenna Height	Correction Factor	FCC 15.205/209 RSS-GEN/247				Result
	Peak Level	Avg Level					Peak Limit	Peak Margin	Avg Limit	Avg Margin	
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
4.9588*	42.11	31.21	V	123	102	1.85	73.98	-31.87	53.98	-22.77	PASS
4.9675*	39.80	29.45	H	218	124	1.87	73.98	-34.18	53.98	-24.53	PASS
5.6837	40.52	30.61	H	116	143	3.12	73.98	-33.46	53.98	-23.37	PASS
7.4557*	43.96	35.15	H	191	146	4.69	73.98	-30.02	53.98	-18.83	PASS
7.4622*	45.62	34.83	V	180	246	4.68	73.98	-28.36	53.98	-19.15	PASS
9.9184	51.15	42.51	H	322	242	6.61	73.98	-22.83	53.98	-11.47	PASS
9.9219	60.21	50.61	V	220	260	6.61	73.98	-13.77	53.98	-3.37	PASS
12.3994*	49.90	40.25	V	334	147	8.45	73.98	-24.08	53.98	-13.73	PASS
12.4093*	49.66	40.21	H	359	103	8.48	73.98	-24.32	53.98	-13.77	PASS
14.8839	55.45	46.75	V	310	222	11.68	73.98	-18.53	53.98	-7.23	PASS
14.9047	55.70	46.69	H	159	135	11.58	73.98	-18.28	53.98	-7.29	PASS

*Restricted Band Signal

Legrand Model WNAL63 Zigbee Radio, Rx Mode

Frequency	Corrected		Antenna Polarity	Azimuth	Antenna Height	Correction Factor	FCC 15.205/209 RSS-GEN/247				Result
	Peak Level	Avg Level					Peak Limit	Peak Margin	Avg Limit	Avg Margin	
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
1.5477*	30.50	20.49	V	043	203	-10.51	73.98	-43.48	53.98	-33.49	PASS
2.1248	33.84	23.47	V	343	197	-6.72	73.98	-40.14	53.98	-30.51	PASS
2.8695*	33.63	24.65	V	024	220	-3.93	73.98	-40.35	53.98	-29.33	PASS
5.3008	39.23	29.96	H	299	161	3.00	73.98	-34.75	53.98	-24.02	PASS
7.6288*	44.30	35.02	H	082	183	4.62	73.98	-29.68	53.98	-18.96	PASS
8.0799*	46.05	37.03	V	133	120	5.41	73.98	-27.93	53.98	-16.95	PASS
9.9021	46.74	37.32	H	294	102	6.63	73.98	-27.24	53.98	-16.66	PASS
10.7388*	48.46	37.93	V	335	101	6.60	73.98	-25.52	53.98	-16.05	PASS
12.3350*	49.35	40.08	H	124	206	8.41	73.98	-24.63	53.98	-13.90	PASS
12.9181	53.37	43.21	V	169	207	9.35	73.98	-20.61	53.98	-10.77	PASS
13.7466	55.16	45.72	H	304	102	11.70	73.98	-18.82	53.98	-8.26	PASS
14.1864	56.48	47.78	H	137	104	12.86	73.98	-17.50	53.98	-6.20	PASS

*Restricted Band Signal

Test Results: The Legrand Model WNAL63 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 3.37 dB.

4.4.8 Emissions in Frequency Bands 18 – 25 GHz WNAL63 Zigbee Radio (06/14/2021)

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 transmission signal was modulated at maximum output.

The result of the emissions scans showed no measurable signals between 18 and 25 GHz while the WNAL63 Transmitted low, middle, high channels and in Receive Mode.

Test Results: The Legrand Model WNAL63 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.

4.5 DTS Bandwidth (FCC Section 15.247(a)(2) RSS-247 5.2(a))

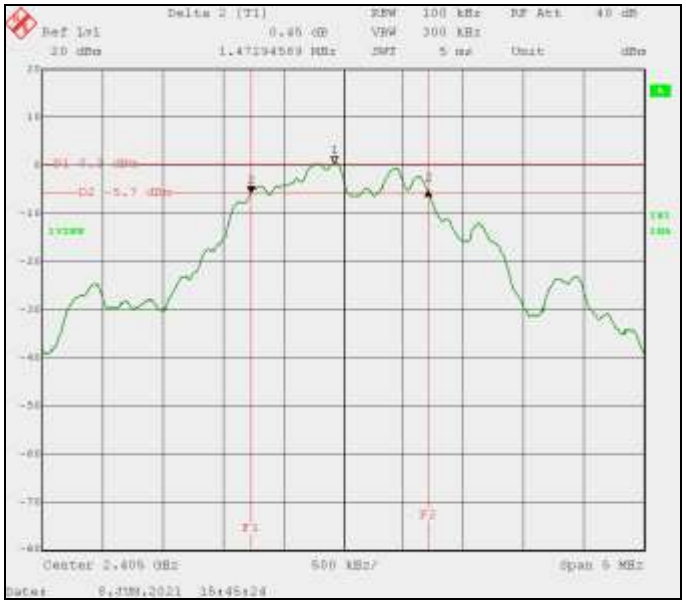
4.5.1 DTS Bandwidth – Test Procedure

The procedure of KDB 550874 D01 Section 8.2, references ANSI C63.10, Section 11.8, Option 1 for the measurement of the DTS Bandwidth. The Spectrum Analyzer settings are listed below. O-QPSK modulation was used.

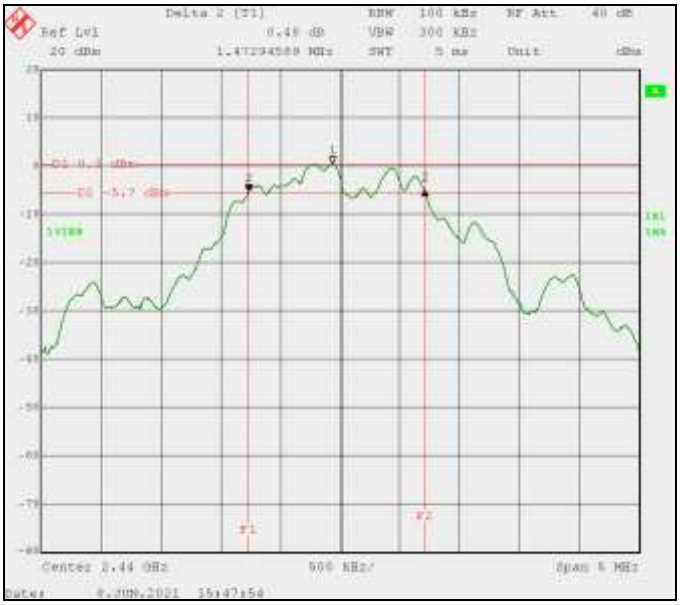
SA Settings			ANSI C63.10 Requirement
Span	5	MHz	2 to 5 times OBW
RBW	100	kHz	1 - 5 % of OBW (min 100 kHz)
VBW	300	kHz	≈3 times RBW
Sweep Time	5	ms	Auto

4.5.1.1 DTS Bandwidth Test Results WNAL23 Zigbee Radio (06/08/2021)

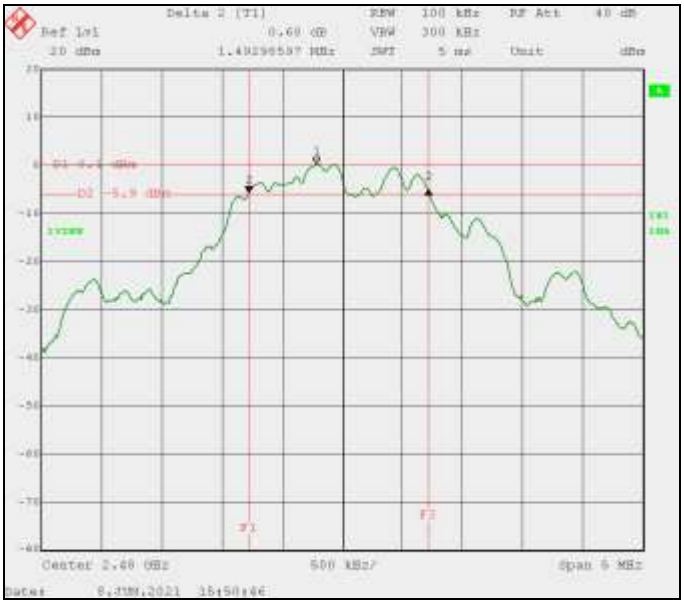
Legrand WNAL23 Zigbee Radio Low channel 11, 2405 MHz, O-QPSK Modulation



Legrand WNAL23 Zigbee Radio Middle channel 18, 2440 MHz, O-QPSK Modulation



Legrand WNAL23 Zigbee Radio High channel 26, 2480 MHz, O-QPSK Modulation

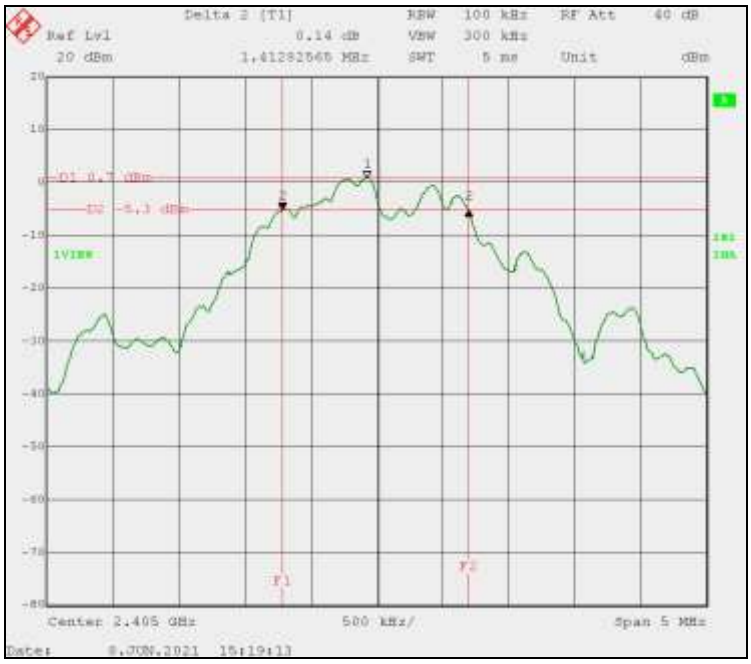


Channel	Frequency	Measured 6 dB BW	47 CFR 15.247(a)(2) & RSS-247 5.2 Minimum Limit	Margin	Result
	MHz	kHz	kHz	kHz	
11	2405.0	1472.95	500.00	972.95	Pass
18	2440.0	1472.95	500.00	972.95	Pass
26	2480.0	1492.99	500.00	992.99	Pass

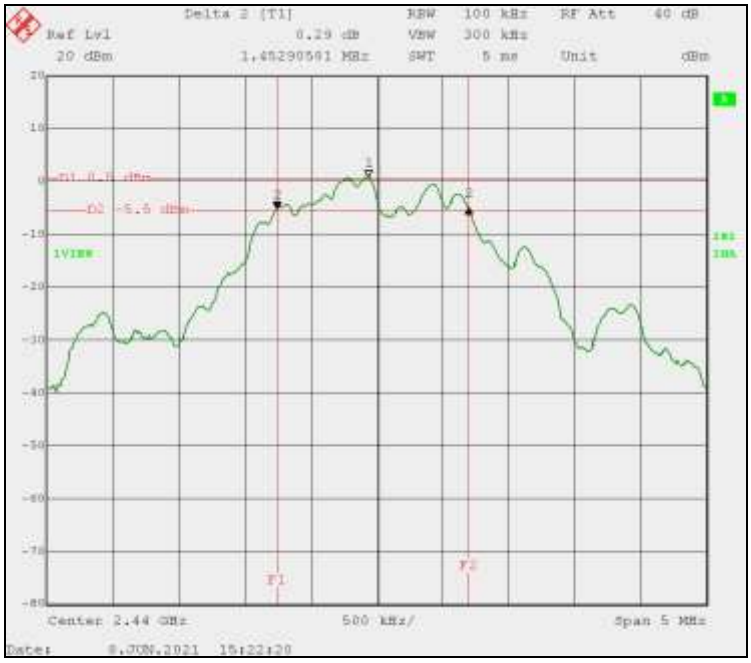
Test Results: The 6 dB Occupied Bandwidth measurements for the Legrand Model WNAL23 with Zigbee Radio were measured and are compliant to the minimum bandwidth requirements. The results are also used to select bandwidths and frequency spans for other radio measurements.

4.5.1.2 DTS Bandwidth Test Results WNAL63 Zigbee Radio (06/08/2021)

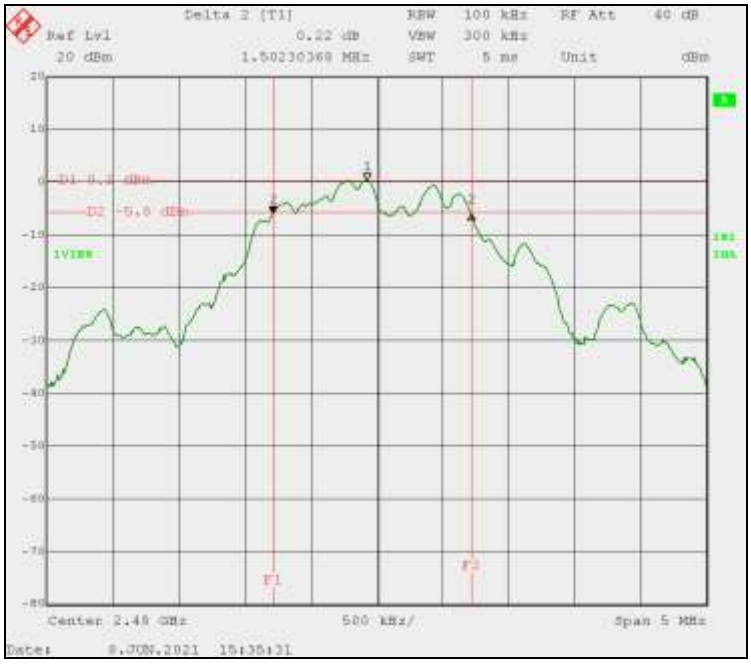
Legrand WNAL63 Zigbee Radio Low channel 11, 2405 MHz, O-QPSK Modulation



Legrand WNAL63 Zigbee Radio Middle channel 18, 2440 MHz, O-QPSK Modulation



Legrand WNAL63 Zigbee Radio High channel 26, 2480 MHz, O-QPSK Modulation



Channel	Frequency	Measured 6 dB BW	47 CFR 15.247(a)(2) & RSS-247 5.2 Minimum Limit	Margin	Result
	MHz	kHz	kHz	kHz	
11	2405.0	1412.83	500.00	912.83	Pass
18	2440.0	1452.91	500.00	952.91	Pass
26	2480.0	1502.30	500.00	1002.30	Pass

Test Results: The 6 dB Occupied Bandwidth measurements for the Legrand Model WNAL63 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

RSS-GEN requires the measurement of the 99% bandwidth of the transmitter. The Zigbee radio utilizes only O-QPSK modulation.

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. The SA settings are listed in the table below.

Spectrum Analyzer Settings for 99% Occupied Bandwidth measurements:

SA Settings			ANSI C63.10 requirement
Span	8	MHz	(1.5 to 5 times OBW)
RBW	100	kHz	(1 to 5% of OBW)
VBW	300	kHz	≥(3 X RBW)
Sweep Time	5	ms	Auto

4.6.1.1 99% BW, WNAL23 Zigbee Radio Test Results (06/08/2021)

Legrand WNAL23 Zigbee Radio Low channel 11, 2405 MHz, O-QPSK Modulation

Legrand WNAL23 Zigbee Radio Mid channel 18, 2440 MHz, O-QPSK Modulation

Legrand WNAL23 Zigbee Radio High channel 26, 2480 MHz, O-QPSK Modulation

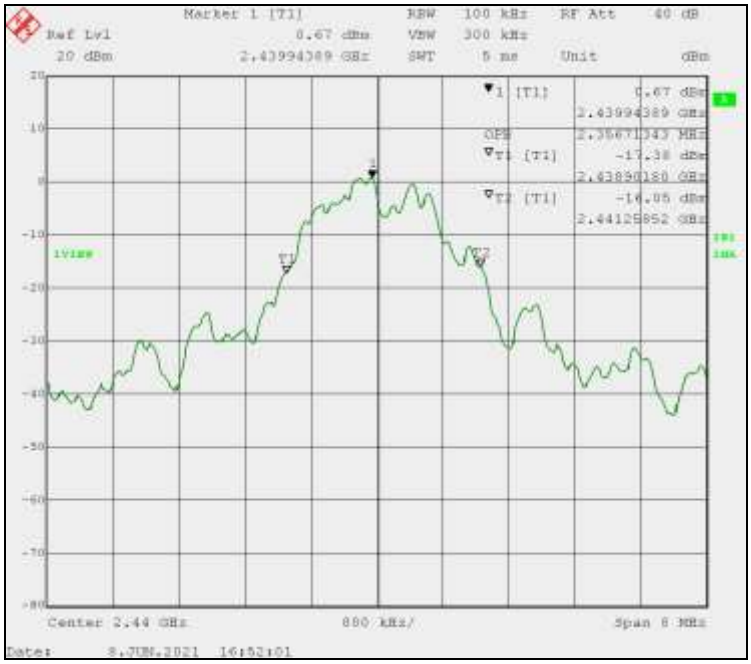
Channel	Frequency (MHz)	99% Occupied BW (MHz)
11	2405.0	2.373
18	2440.0	2.405
26	2480.0	2.453

Test Results: The 99% Occupied Bandwidth measurements for the Legrand Model WNAL23 with Zigbee Radio are displayed above and included in the ISED Un-licensed Radio application.

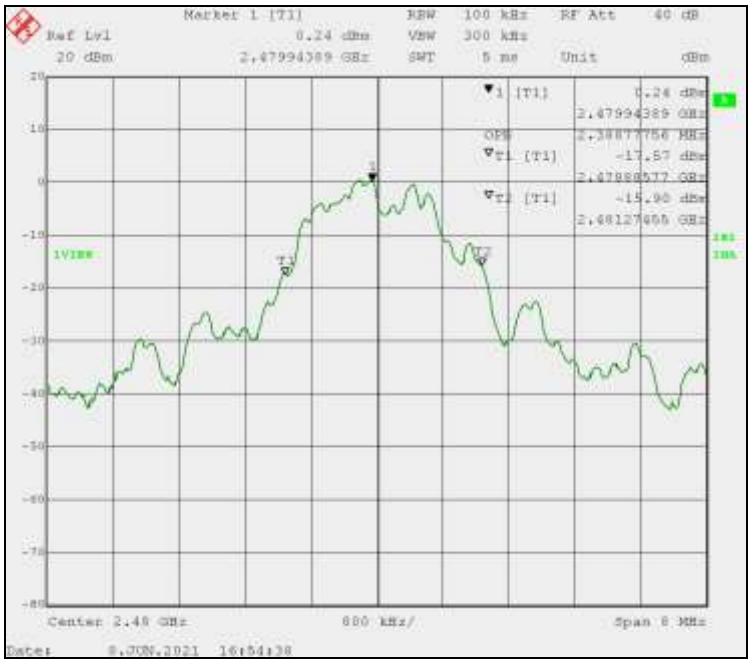
4.6.1.2 99% BW, WNAL63 Zigbee Radio Test Results (06/08/2021)

Legrand WNAL63 Zigbee Radio Low channel 11, 2405 MHz, O-QPSK Modulation

Legrand WNAL63 Zigbee Radio Mid channel 18, 2440 MHz, O-QPSK Modulation



Legrand WNAL63 Zigbee Radio High channel 26, 2480 MHz, O-QPSK Modulation



Channel	Frequency (MHz)	99% Occupied BW (MHz)
11	2405.0	2.325
18	2440.0	2.357
26	2480.0	2.389

Test Results: The 99% Occupied Bandwidth measurements for the Legrand Model WNAL63 with Zigbee Radio are displayed above and included in the ISED Un-licensed Radio application.

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

4.7.1 Maximum Conducted (Peak) 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. Spectrum analyzer parameters are listed for the Zigbee radio maximum conducted (peak) output power. The un-modulated carrier was also measured for comparison.

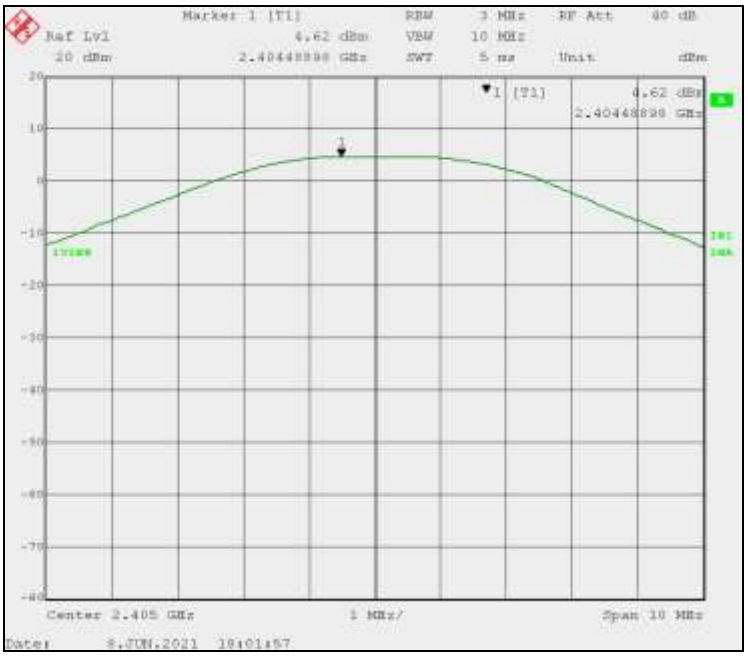
4.7.1.1 Maximum Conducted (Peak) Output Power WNAL23 Zigbee Radio O-QPSK Modulation Test Results (06/08/2021)

Spectrum Analyzer Settings for Zigbee Radio Measurements

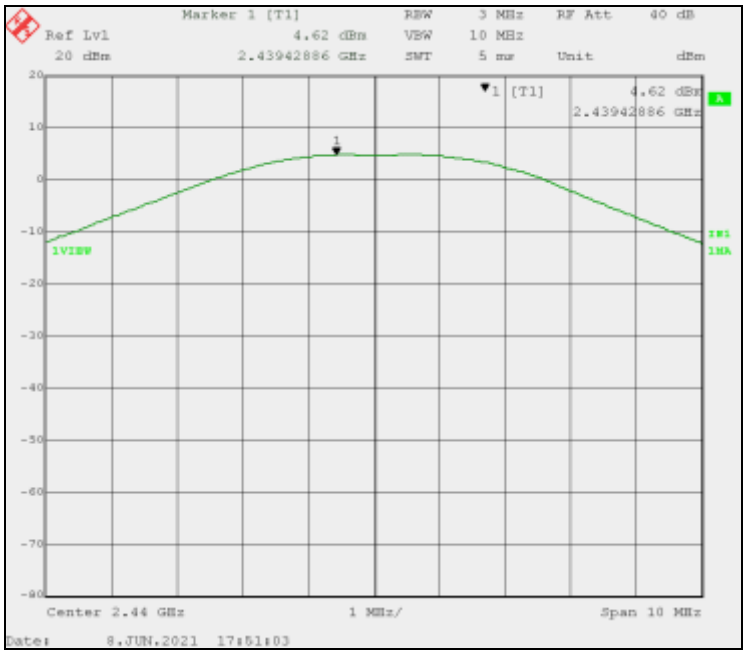
Zigbee Radio, O-QPSK modulation			
Spec Analyzer Settings			ANSI C63.10 requirement
Span	10	MHz	≥ 3 X RBW
RBW	3	MHz	RBW ≥ DTS BW
VBW	10	MHz	≥ 3 X RBW
Sweep	5	ms	Auto

The spectrum analyzer utilized Peak Detection for measurement.

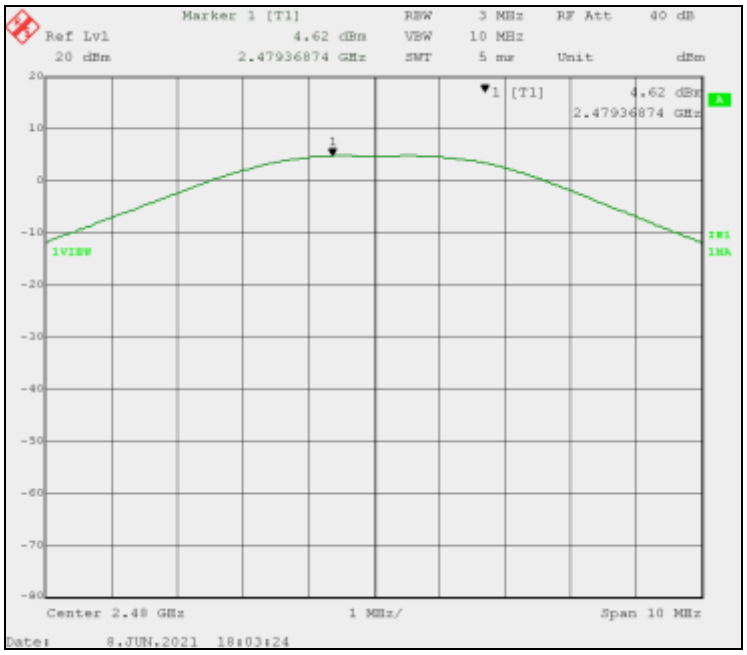
Legrand Model WNAL23 Zigbee Radio
Low Channel 11, 2405 MHz, O-QPSK Modulation



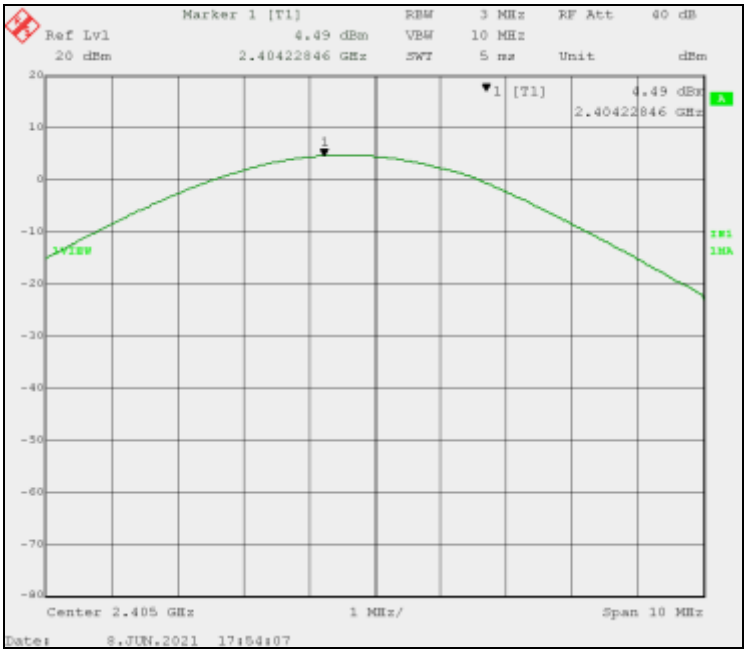
Legrand Model WNAL23 Zigbee Radio
Middle Channel 18, 2440 MHz, O-QPSK Modulation



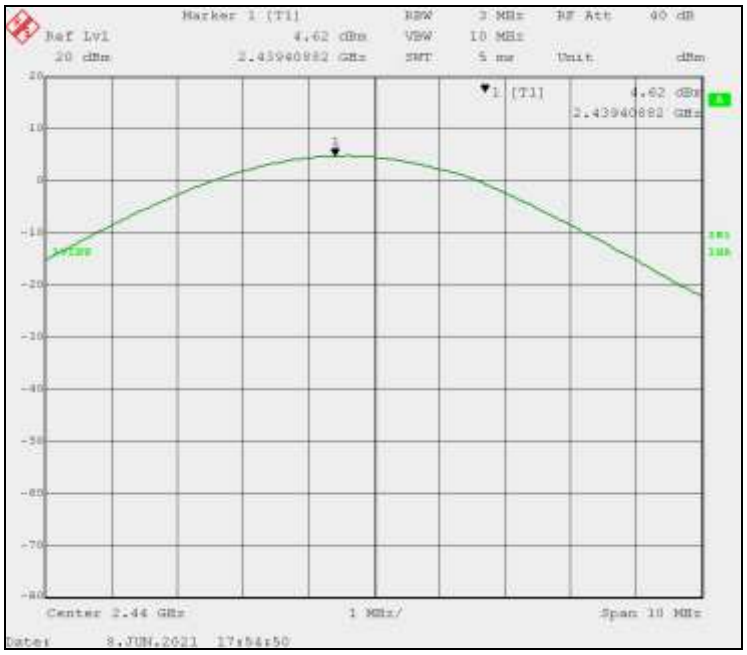
Legrand Model WNAL23 Zigbee Radio
High Channel 26, 2480 MHz, O-QPSK Modulation



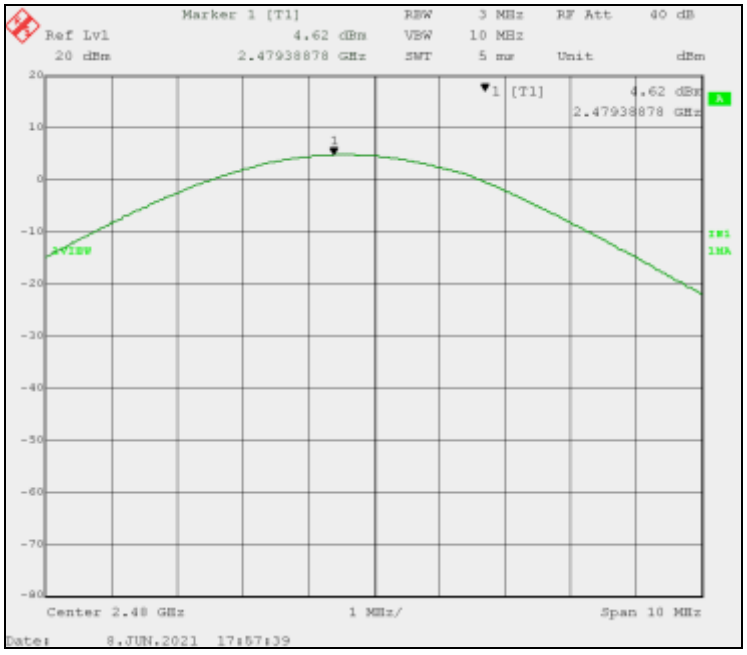
Legrand Model WNAL23 Zigbee Radio
Low Channel 11, 2405 MHz, No modulation



Legrand Model WNAL23 Zigbee Radio
Middle Channel 18, 2440 MHz, No modulation



Legrand Model WNAL23 Zigbee Radio
High Channel 26, 2480 MHz, No modulation



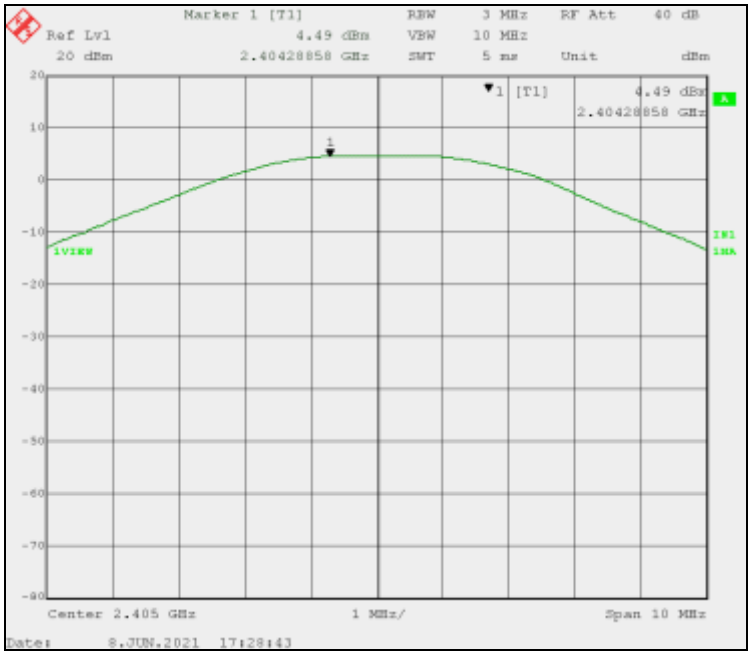
Channel	Modulation	Frequency (GHz)	Measured Level	Cable # 962 Loss	Total		Limit		Margin		Result
					dBm	Watts	dBm	Watts	dBm	Watts	
11	O-QPSK	2405.0	4.62	0.47	5.09	0.0032	30.00	1.000	-24.91	-0.997	Pass
18		2440.0	4.62	0.47	5.09	0.0032	30.00	1.000	-24.91	-0.997	Pass
26		2480.0	4.62	0.47	5.09	0.0032	30.00	1.000	-24.91	-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	4.49	0.47	4.96	0.0031	30.00	1.000	-25.04	-0.997	Pass
18		2440.0	4.62	0.47	5.09	0.0032	30.00	1.000	-24.91	-0.997	Pass
26		2480.0	4.62	0.47	5.09	0.0032	30.00	1.000	-24.91	-0.997	Pass

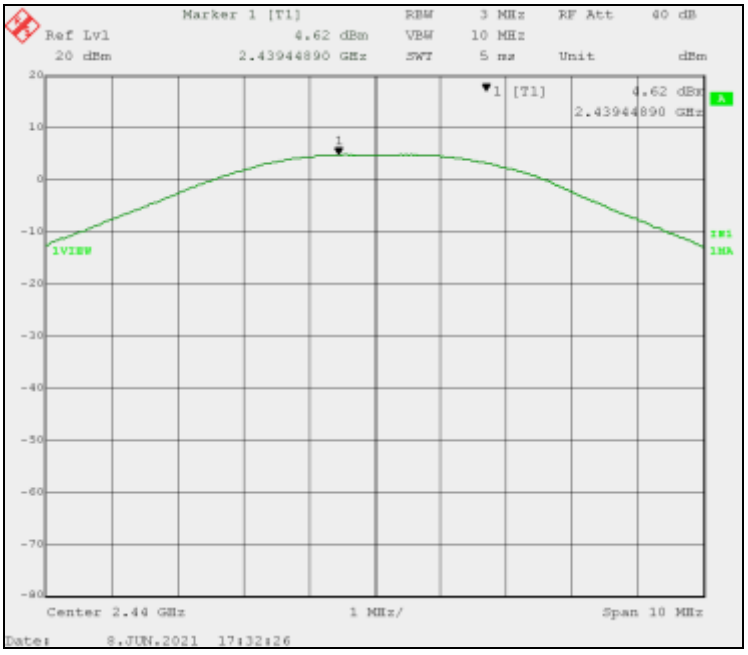
Test Results: The Maximum Conducted (Peak) Power Output measurements for the Legrand Model WNAL23 with Zigbee Radio, modulated with O-QPSK and un-modulated, are compliant to the requirements of 47 CFR Part 15.247(b)(3) and ISED, RSS-247 Section 5.4(d).

4.7.1.2 Maximum Conducted (Peak) Output Power WNAL63 Zigbee Radio O-QPSK Modulation Test Results (06/08/2021)

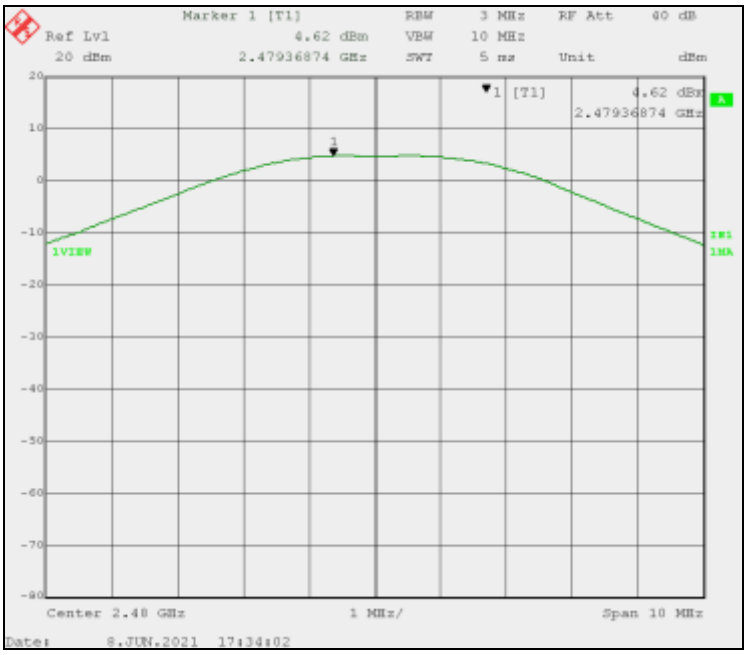
Legrand Model WNAL63 Zigbee Radio
Low Channel 11, 2405 MHz, O-QPSK Modulation



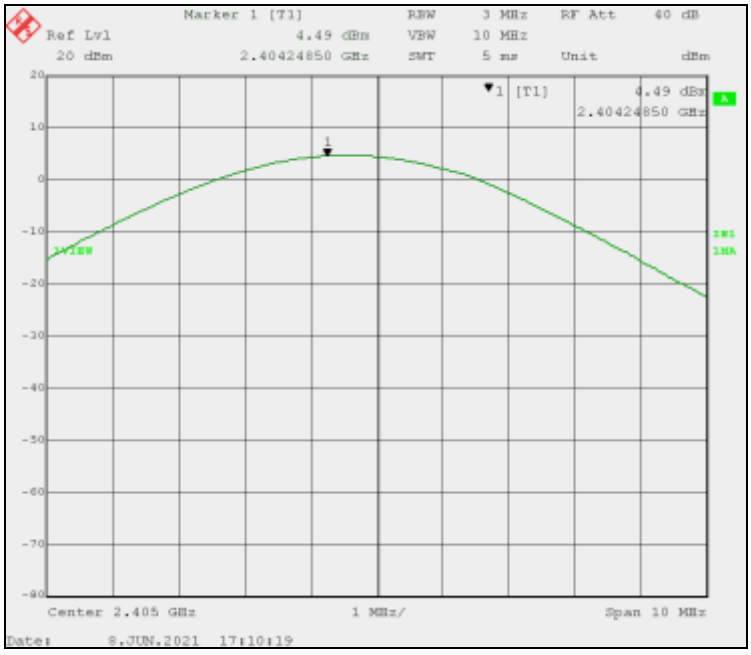
Legrand Model WNAL63 Zigbee Radio
Middle Channel 18, 2440 MHz, O-QPSK Modulation



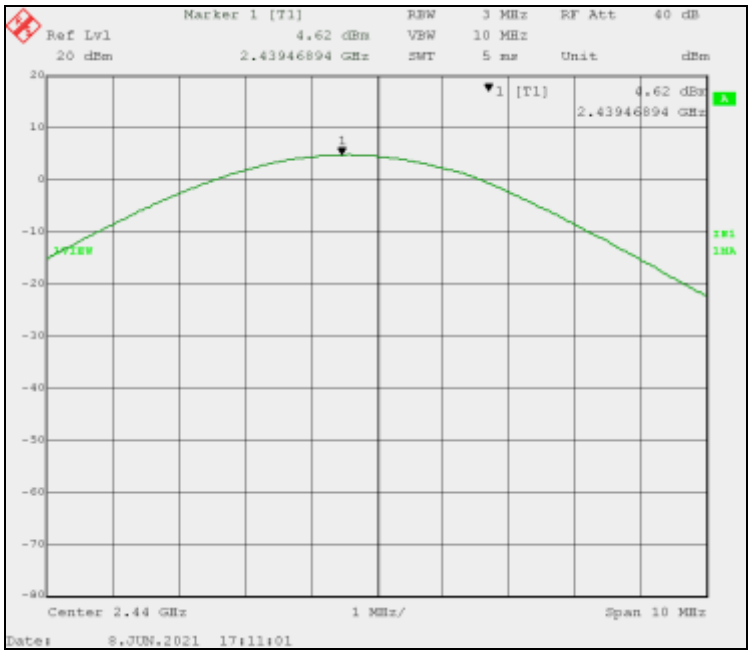
Legrand Model WNAL63 Zigbee Radio
High Channel 26, 2480 MHz, O-QPSK Modulation



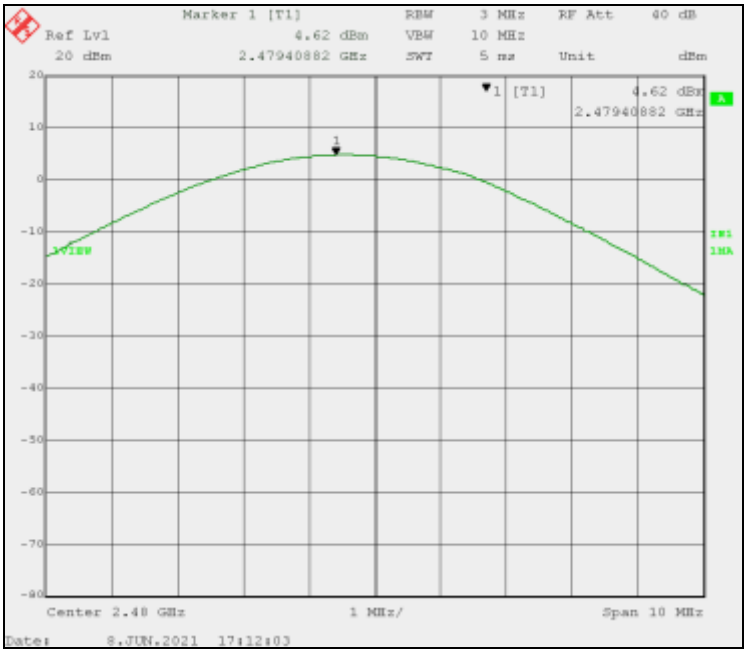
Legrand Model WNAL63 Zigbee Radio
Low Channel 11, 2405 MHz, No modulation



Legrand Model WNAL63 Zigbee Radio
Middle Channel 18, 2440 MHz, No modulation



Legrand Model WNAL63 Zigbee Radio
High Channel 26, 2480 MHz, No modulation



Channel	Modulation	Frequency (GHz)	Measured Level	Cable # 962 Loss	Total		Limit		Margin		Result
					dBm	Watts	dBm	Watts	dBm	Watts	
11	O-QPSK	2405.0	4.49	0.47	4.96	0.0031	30.00	1.000	-25.04	-0.997	Pass
18		2440.0	4.62	0.47	5.09	0.0032	30.00	1.000	-24.91	-0.997	Pass
26		2480.0	4.62	0.47	5.09	0.0032	30.00	1.000	-24.91	-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	4.49	0.47	4.96	0.0031	30.00	1.000	-25.04	-0.997	Pass
18		2440.0	4.62	0.47	5.09	0.0032	30.00	1.000	-24.91	-0.997	Pass
26		2480.0	4.62	0.47	5.09	0.0032	30.00	1.000	-24.91	-0.997	Pass

Test Results: The Maximum Conducted (Peak) Power Output measurements for the Legrand Model WNAL63 with Zigbee Radio, modulated with O-QPSK and un-modulated, are compliant to the requirements of 47 CFR Part 15.247(b)(3) and ISED, RSS-247 Section 5.4(d).

4.7.2 EIRP Level WNALX3 Zigbee Radio Test Results (06/08/2021)

The Innovation, Science and Economic Development Canada (ISED), RSS-247 requires the calculation of the Effective Isotropic Radiated Power (EIRP) for the Legrand Model WNALX3 with Zigbee Radio. Below is the tabular data, using measured power levels from the previous section.

4.7.2.1 EIRP Level WNAL23 Zigbee Radio Test Results

Channel	Modulation	Frequency (GHz)	Transmitter Output Total		Antenna Gain		EIRP				Result
							Total		Limit	Margin	
			dBm	Watts	Isotropic	Numeric	dBm	Watts	Watts	Watts	
11	O-QPSK	2405.0	5.09	0.0032	3.30	2.138	8.39	0.0069	4.00	-3.9931	Pass
18		2440.0	5.09	0.0032	3.30	2.138	8.39	0.0069	4.00	-3.9931	Pass
26		2480.0	5.09	0.0032	3.30	2.138	8.39	0.0069	4.00	-3.9931	Pass

Channel	Modulation	Frequency (GHz)	Transmitter Output Total		Antenna Gain		EIRP				Result
							Total		Limit	Margin	
			dBm	Watts	Isotropic	Numeric	dBm	Watts	Watts	Watts	
11	None	2405.0	4.96	0.0031	3.30	2.138	8.26	0.0067	4.00	-3.9933	Pass
18		2440.0	5.09	0.0032	3.30	2.138	8.39	0.0069	4.00	-3.9931	Pass
26		2480.0	5.09	0.0032	3.30	2.138	8.39	0.0069	4.00	-3.9931	Pass

4.7.2.2 EIRP Level WNAL63 Zigbee Radio Test Results

Channel	Modulation	Frequency (GHz)	Transmitter Output Total		Antenna Gain		EIRP				Result
							Total		Limit	Margin	
			dBm	Watts	Isotropic	Numeric	dBm	Watts	Watts	Watts	
11	O-QPSK	2405.0	4.96	0.0031	3.30	2.138	8.26	0.0067	4.00	-3.9933	Pass
18		2440.0	5.09	0.0032	3.30	2.138	8.39	0.0069	4.00	-3.9931	Pass
26		2480.0	5.09	0.0032	3.30	2.138	8.39	0.0069	4.00	-3.9931	Pass

Channel	Modulation	Frequency (GHz)	Transmitter Output Total		Antenna Gain		EIRP				Result
							Total		Limit	Margin	
			dBm	Watts	Isotropic	Numeric	dBm	Watts	Watts	Watts	
11	None	2405.0	4.96	0.0031	3.30	2.138	8.26	0.0067	4.00	-3.9933	Pass
18		2440.0	5.09	0.0032	3.30	2.138	8.39	0.0069	4.00	-3.9931	Pass
26		2480.0	5.09	0.0032	3.30	2.138	8.39	0.0069	4.00	-3.9931	Pass

Test Results: The Effective Isotropic Radiated Power measurements for the Legrand Model WNALX3 with Zigbee Radio, modulated with O-QPSK and un-modulated, are compliant to the requirements of ISED, RSS-247 Section 5.4(d).

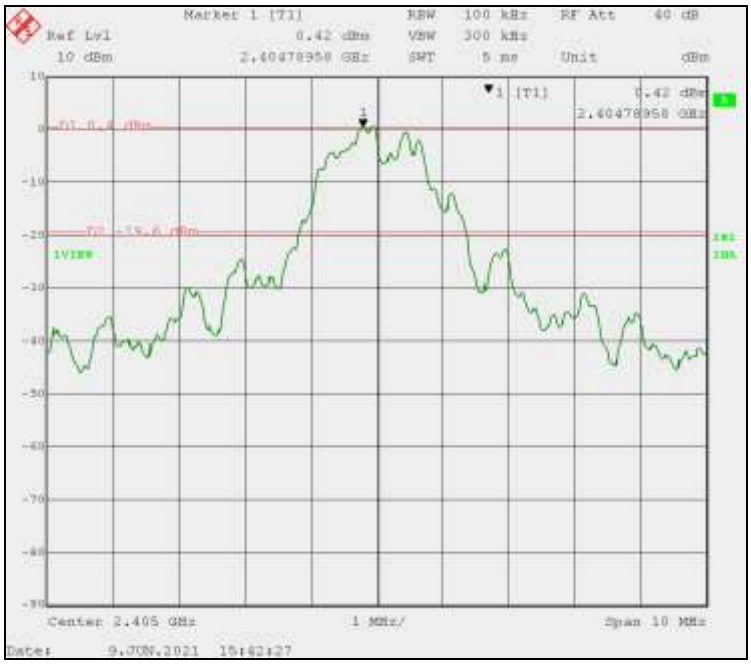
4.8 Emissions in Non-restricted Frequency Bands 500 kHz – 25 GHz (FCC Section 15.247(d), RSS-247 Sec.5)

4.8.1 Emissions in Non-restricted Frequency Bands 500 kHz – 25 GHz Test Procedure

The results in this section, for the WNAL23 and WNAL63 depict the highest emissions, while transmitting with modulation on Channels 11 and 18 respectively. The channels not presented and Receive modes were measured and showed similar but lower emissions. Spectrum Analyzer screens for low, middle, high channels and Receive Mode were recorded and are available upon request. Spectrum Analyzer RBW was 100 kHz, VBW was 300 kHz and Span varied.

4.8.2 Emissions in Non-restricted Frequency Bands 500 kHz – 25 GHz 30 dB Reference Measurement.

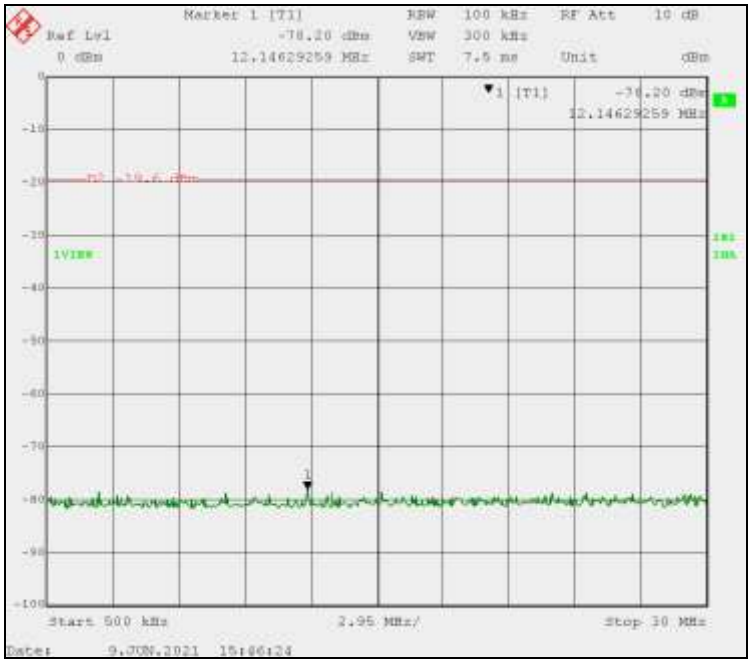
4.8.2.1 WNAL23 Zigbee Radio Reference Measurement, Channel 11 (06/09/2021)



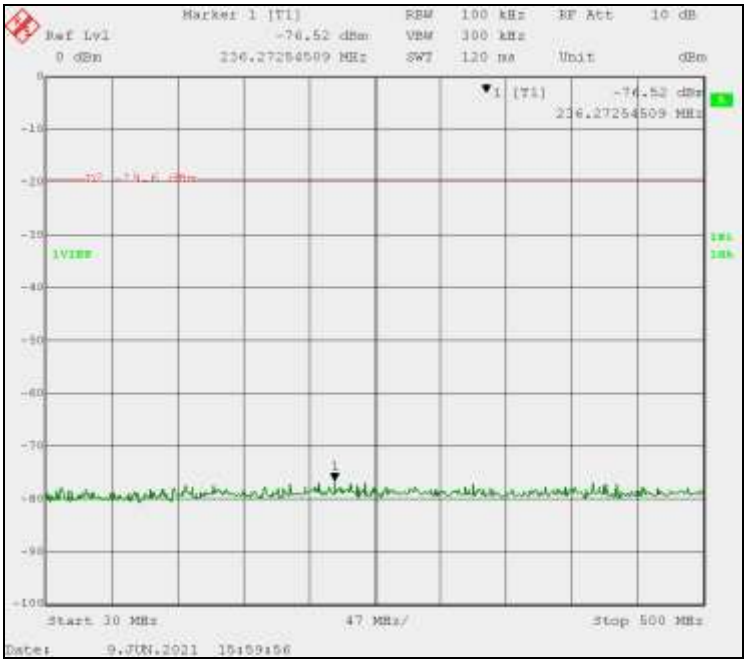
The peak level of 0.4 dBm is the maximum peak output of the Legrand Model WNAL23 with Zigbee Radio transmitting with modulation on Channel 11 at full power. The conducted spurious emissions from the antenna port must be 20 dB down from this peak. The resultant limit is therefore -19.6 dBm. This limit is displayed on the plots below.

4.8.2.2 Emissions in Non-restricted Frequency Bands WNAL23 Zigbee Radio Test Results (06/09/2021)

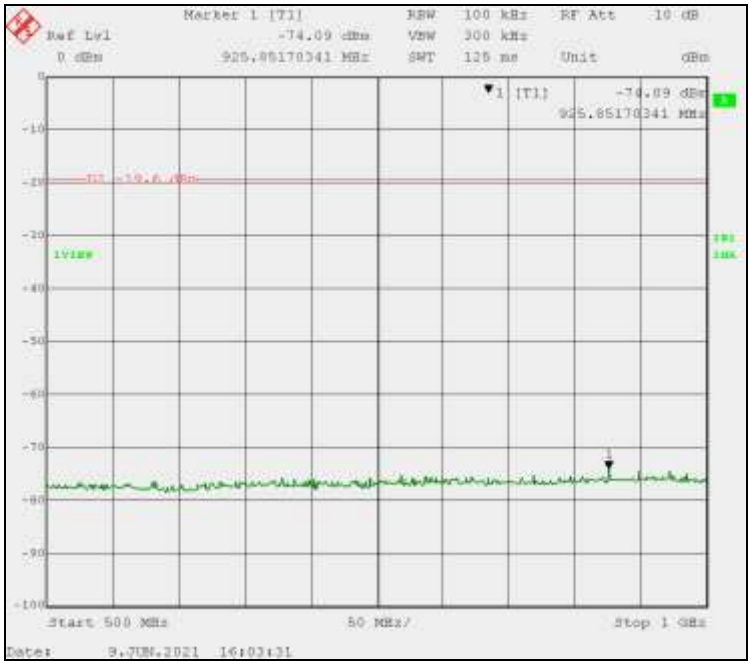
WNAL23 Zigbee Radio Transmitting Ch.11: 500 kHz – 30 MHz (Without High Pass Filter)



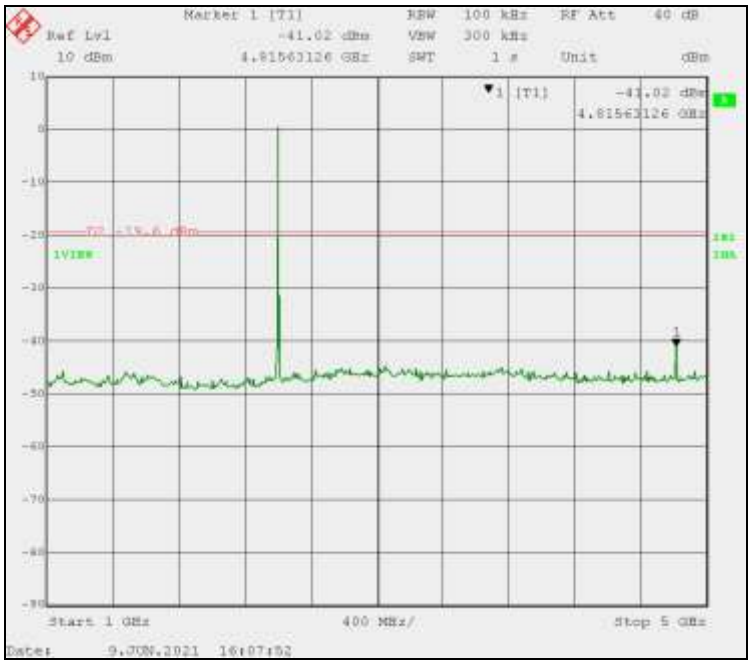
WNAL23 Zigbee Radio Transmitting Ch.11: 30 MHz – 500 MHz (Without High Pass Filter)



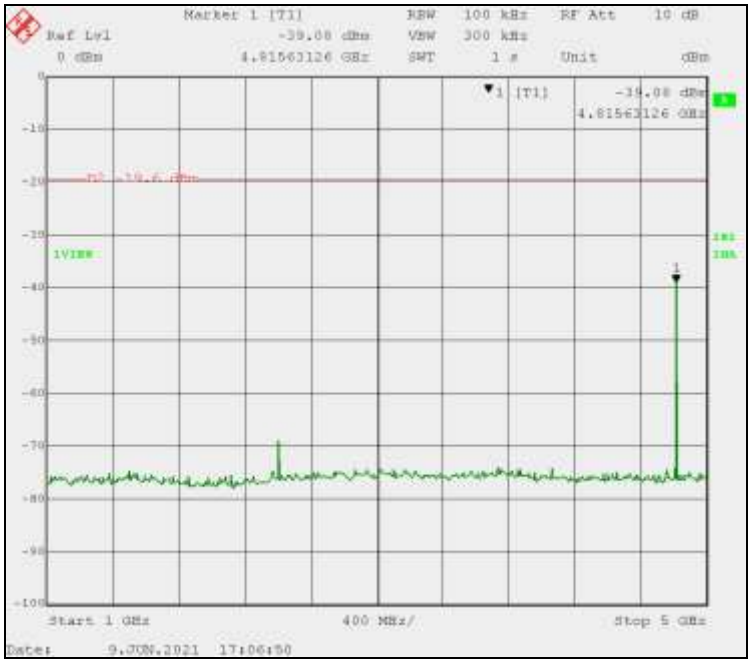
WNAL23 Zigbee Radio Transmitting Ch.11 (Without High Pass Filter): 500 MHz – 1 GHz



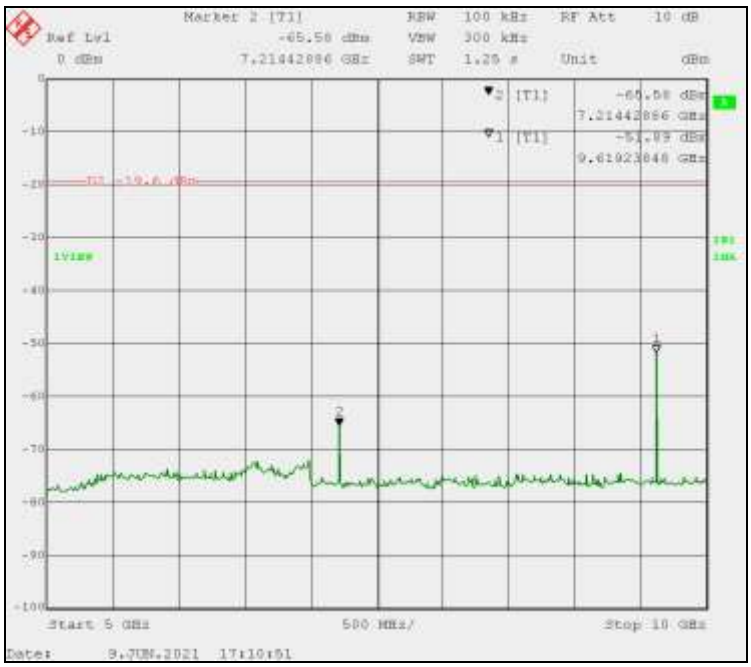
WNAL23 Zigbee Radio Transmitting Ch.11 (Without High Pass Filter Installed): 1 GHz – 5 GHz



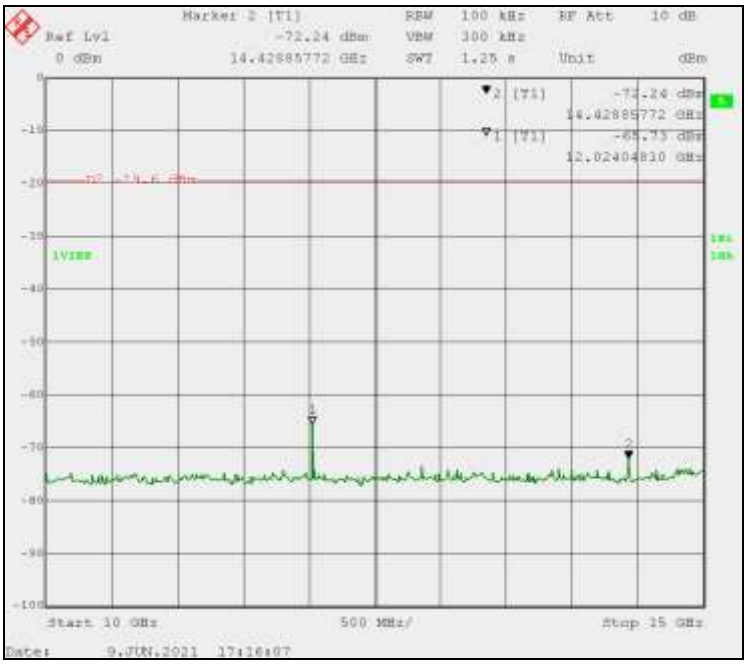
WNAL23 Zigbee Radio Transmitting Ch.11 (With High Pass Filter Installed): 1 GHz – 5 GHz



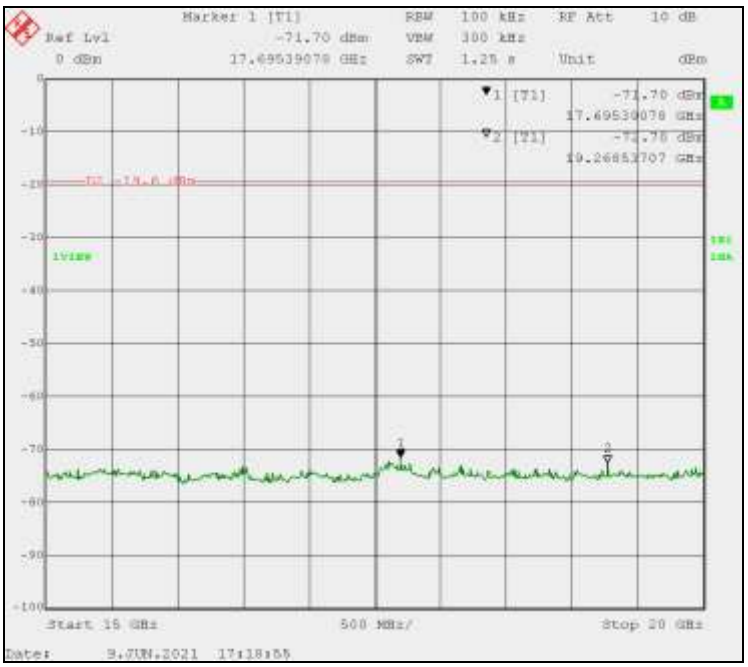
WNAL23 Zigbee Radio Transmitting Ch.11 (With High Pass Filter Installed): 5 GHz – 10 GHz



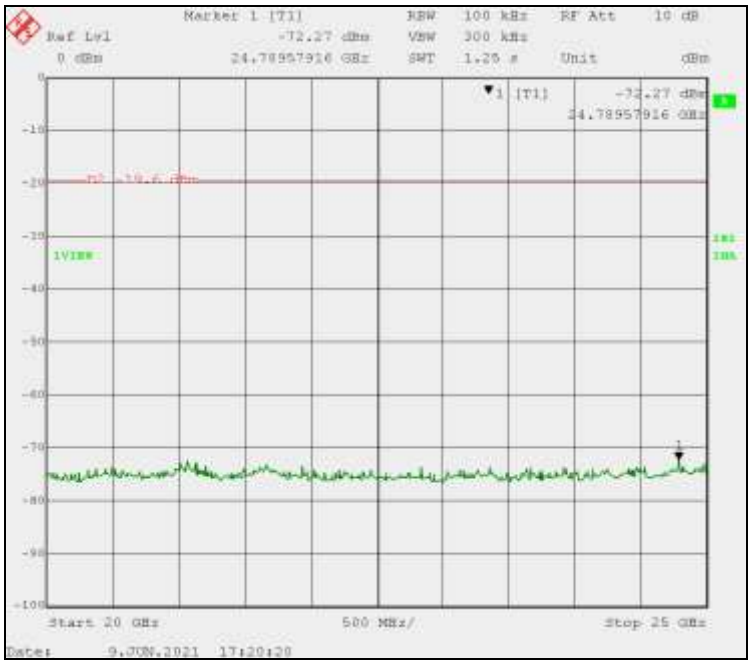
WNAL23 Zigbee Radio Transmitting Ch.11 (With High Pass Filter Installed): 10 GHz – 15 GHz



WNAL23 Zigbee Radio Transmitting Ch.11 (With High Pass Filter Installed): 15 GHz – 20 GHz



WNAL23 Zigbee Radio Transmitting (With High Pass Filter Installed): 20 GHz – 25 GHz

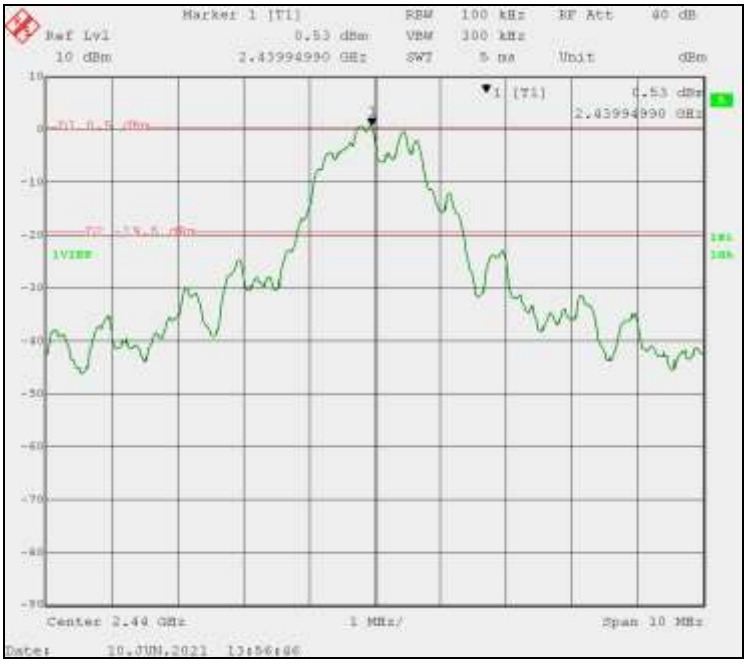


Highest peak emissions from the Spectrum Analyzer Screens:

Frequency	Peak	20 dB below Max Peak Reference	Margin	Result
MHz	dBm	dBc	dB	
4815.631	-39.08	-19.60	-19.48	PASS
7214.429	-65.58	-19.60	-45.98	PASS
9619.239	-51.89	-19.60	-32.29	PASS
12024.048	-65.73	-19.60	-46.13	PASS
14428.858	-72.24	-19.60	-52.64	PASS
17695.391	-71.70	-19.60	-52.10	PASS

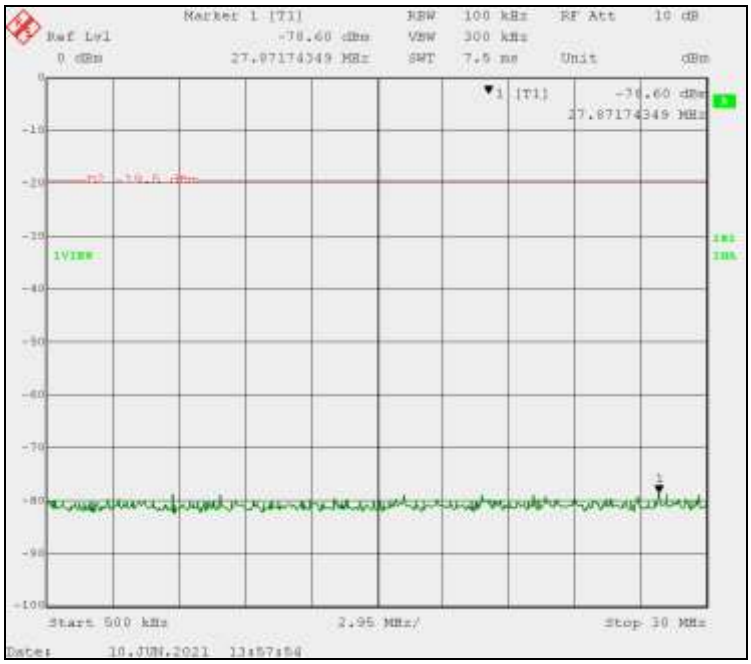
Test Results: Emissions in Non-Restricted Frequency Bands, measured from the Legrand Model WNAL23 Zigbee Radio, transmitting with modulation on Channel 11, comply with the requirements of 47 CFR Part 15.247 (d) with 19.48 dB of margin.

4.8.2.3 WNAL63 Zigbee Radio Reference Measurement, Channel 18 (06/10/2021)

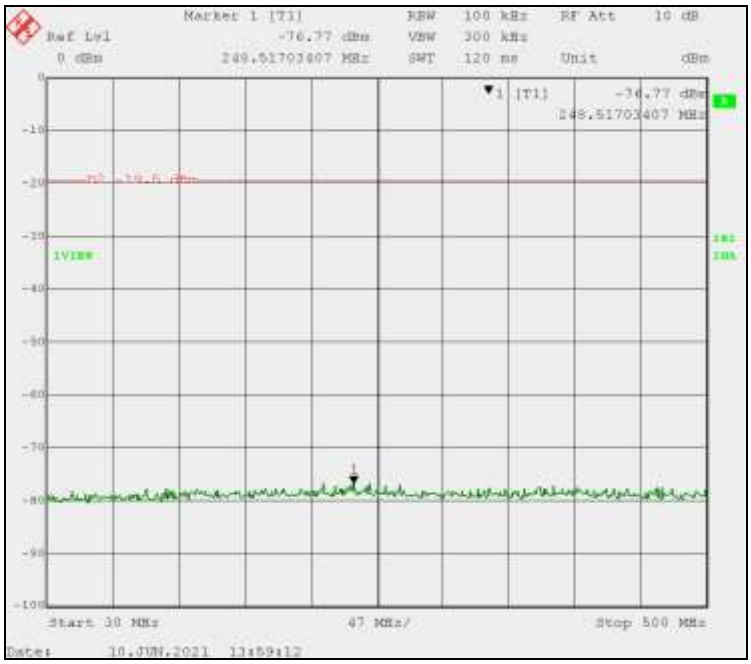


The peak level of 0.5 dBm is the maximum peak output of the Legrand Model WNAL63 Zigbee Radio transmitting with modulation on Channel 18 at full power. The conducted spurious emissions from the antenna port must be 20 dB down from this peak. The resultant limit is therefore -19.5 dBm. This limit is displayed on the plots below.

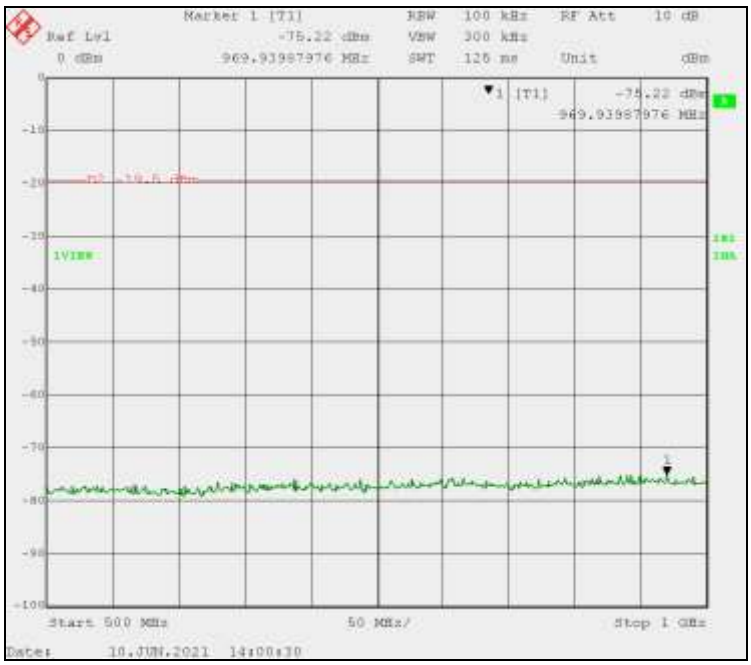
WNAL63 Zigbee Radio Transmitting Ch.18: 500 kHz – 30 MHz (Without High Pass Filter)



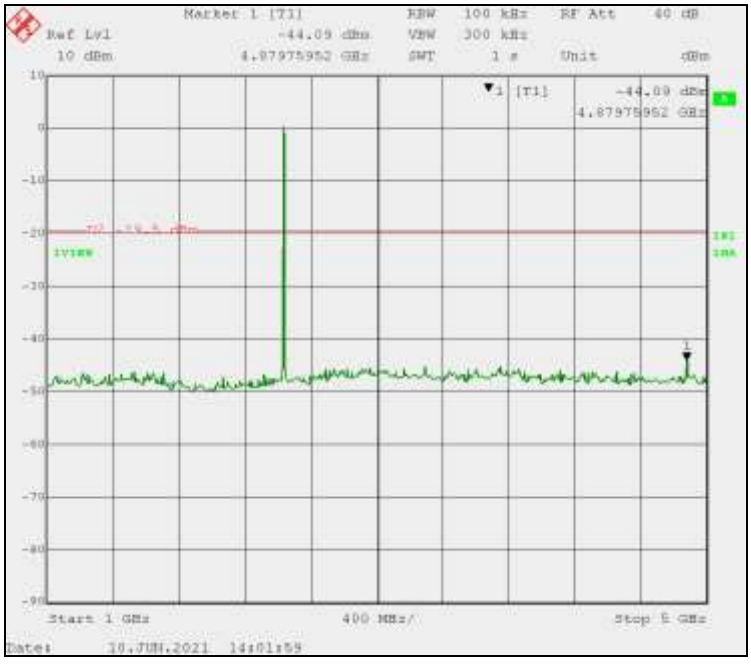
WNAL63 Zigbee Radio Transmitting Ch.18: 30 MHz – 500 MHz (Without High Pass Filter)



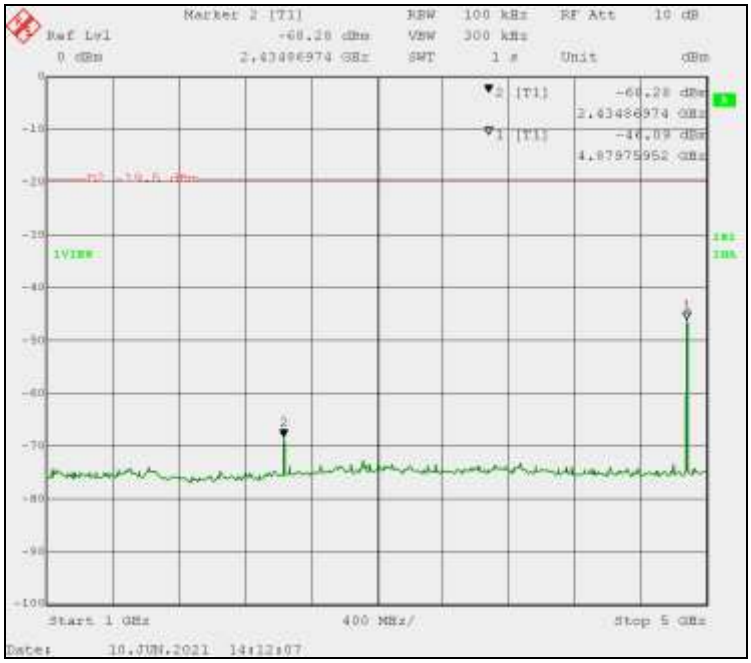
WNAL63 Zigbee Radio Transmitting Ch.18 (Without High Pass Filter): 500 MHz – 1 GHz



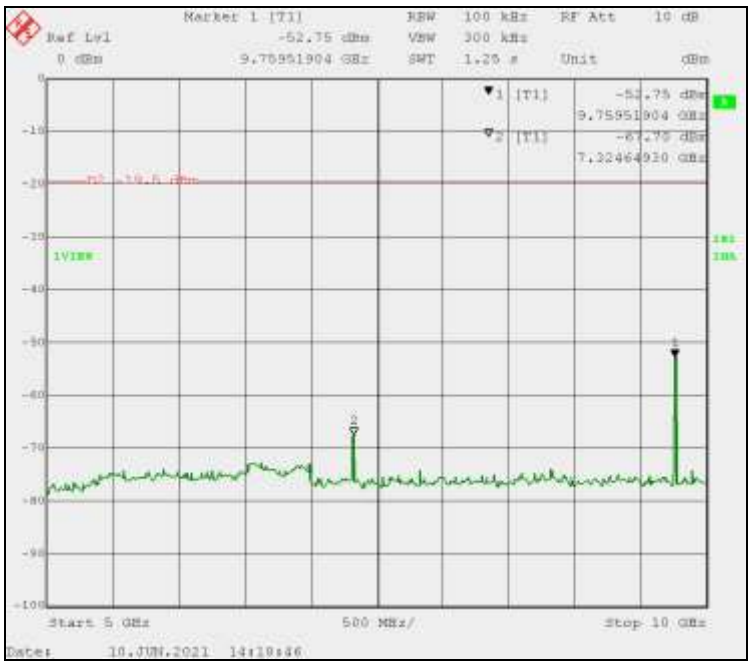
WNAL63 Zigbee Radio Transmitting Ch.18 (Without High Pass Filter Installed): 1 GHz – 5 GHz



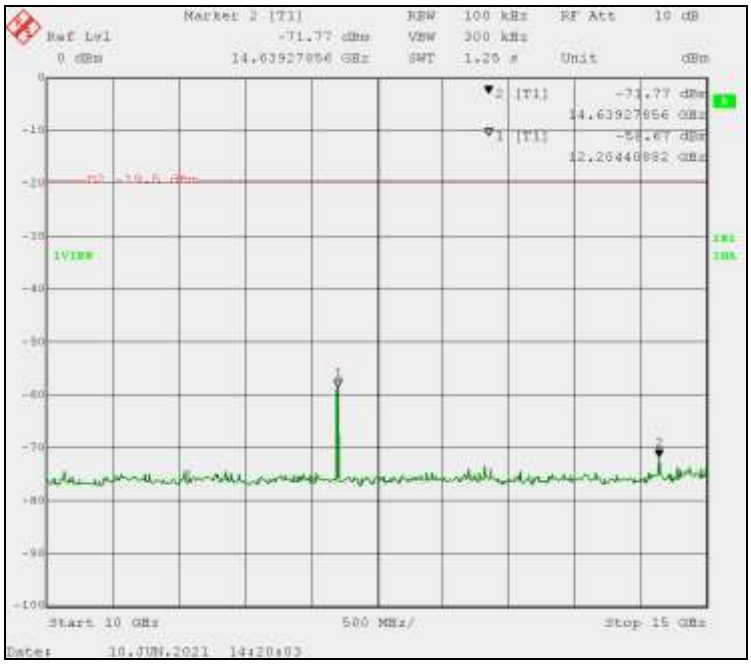
WNAL63 Zigbee Radio Transmitting Ch.18 (With High Pass Filter Installed): 1 GHz – 5 GHz



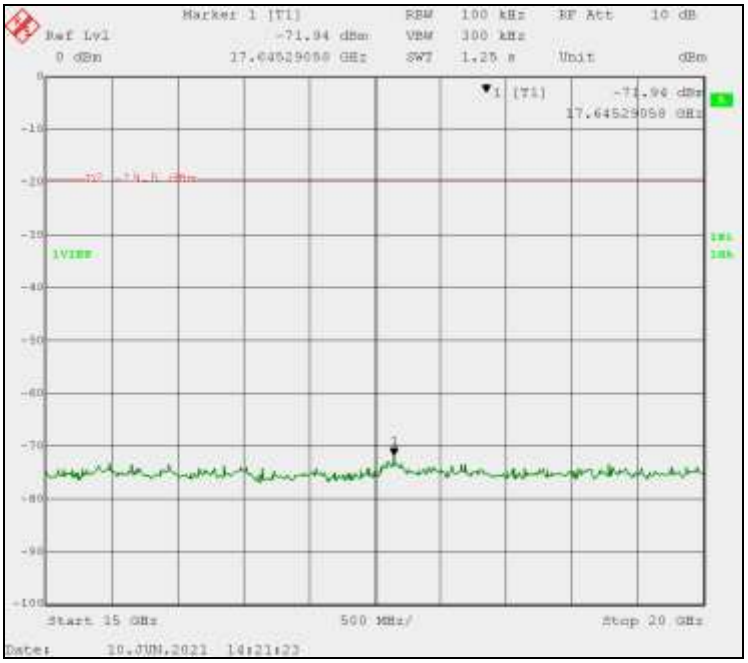
WNAL63 Zigbee Radio Transmitting Ch.18 (With High Pass Filter Installed): 5 GHz – 10 GHz



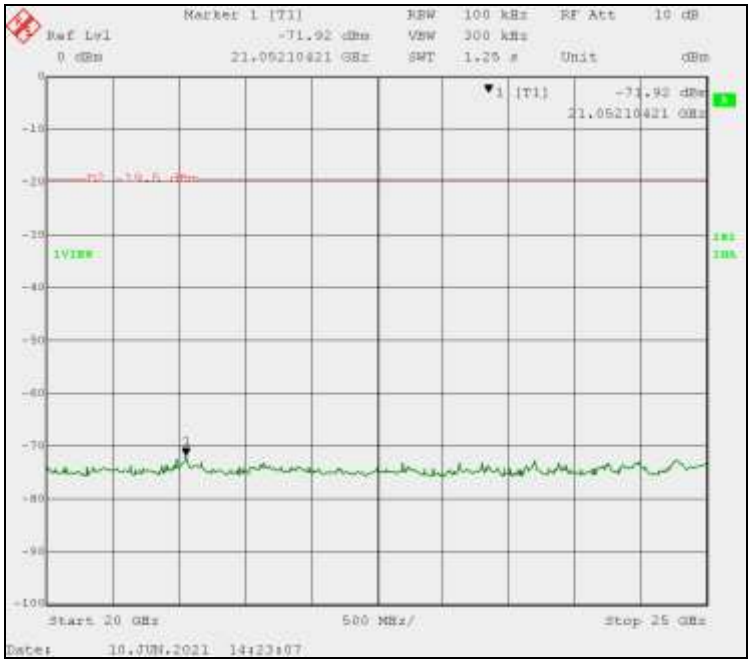
WNAL63 Zigbee Radio Transmitting Ch.18 (With High Pass Filter Installed): 10 GHz – 15 GHz



WNAL63 Zigbee Radio Transmitting Ch.18 (With High Pass Filter Installed): 15 GHz – 20 GHz



WNAL63 Zigbee Radio Transmitting Ch.18 (With High Pass Filter Installed): 20 GHz – 25 GHz



Highest peak emissions from the Spectrum Analyzer Screens:

Frequency	Peak	20 dB below Max Peak Reference	Margin	Result
MHz	dBm	dBc	dB	
4879.759	-44.09	-19.50	-24.59	PASS
7324.649	-67.00	-19.50	-47.50	PASS
9759.519	-52.75	-19.50	-33.25	PASS
12204.409	-58.67	-19.50	-39.17	PASS
14639.279	-71.77	-19.50	-52.27	PASS
21052.104	-71.92	-19.50	-52.42	PASS

Test Results: Emissions in Non-Restricted Frequency Bands, measured from the Legrand Model WNAL63 Zigbee Radio, transmitting with modulation on Channel 18, comply with the requirements of 47 CFR Part 15.247 (d) with 24.59 dB of margin.

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

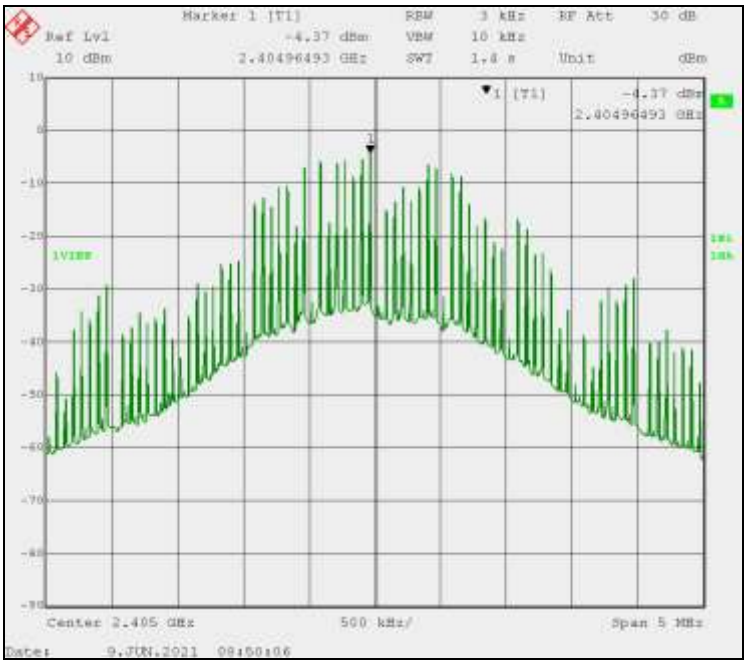
4.9.1 Power Spectral Density Test Procedure

A conducted, peak, power measurement of the output frequency was measured for the Legrand WNAL23 and WNAL63 for each of the low, middle and high operating frequencies with modulation. The Zigbee radio was modulated with O-QPSK. 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. The Spectrum Analyzer settings:

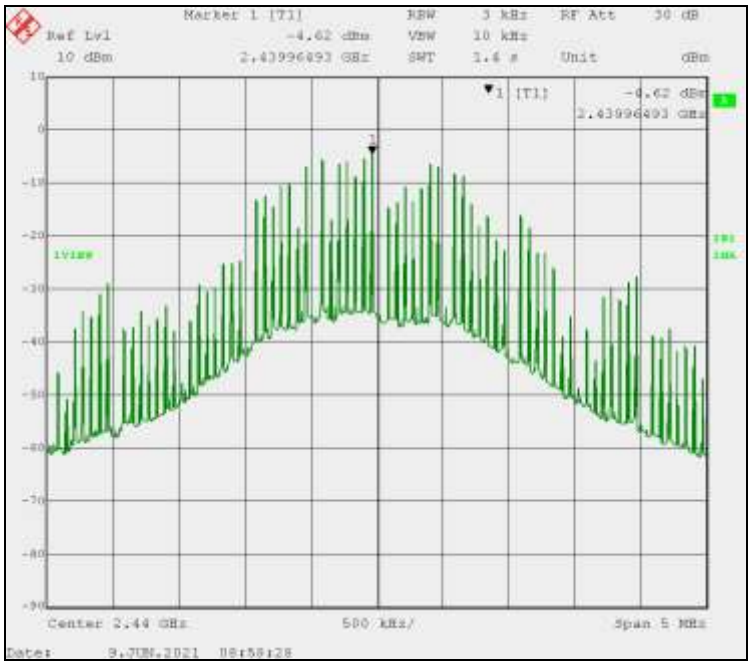
Zigbee Radio, O-QPSK modulation			
Spec Analyzer Settings			ANSI C63.10 requirement
Span	5	MHz	≥ 1.5 X DTS BW
RBW	3	kHz	3 kHz ≥ RBW ≥ 100 kHz
VBW	10	kHz	≥ 3 X RBW
Sweep	1.4	s	Auto

4.9.1.1 Power Spectral Density WNAL23 Zigbee Radio Test Results (06/09/2021)

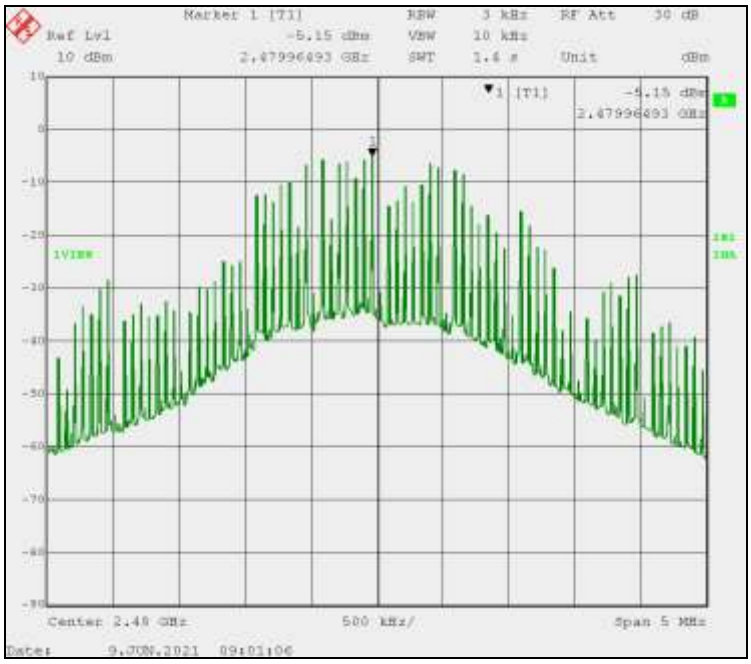
WNAL23 Zigbee Radio Low Channel 11, 2405 MHz PSD



WNAL23 Zigbee Radio Middle Channel 18, 2440 MHz PSD



WNAL23 Zigbee Radio High Channel 26, 2480 MHz PSD

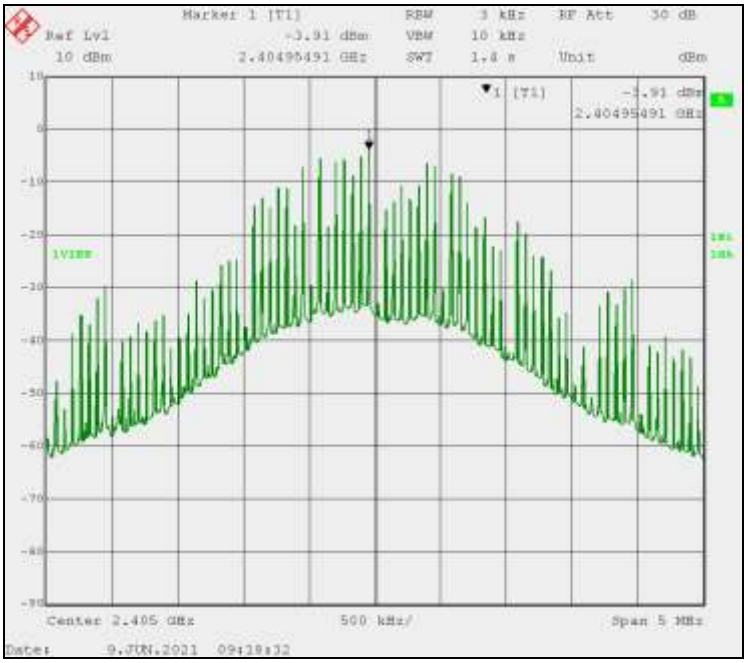


Channel	Modulation	Frequency (MHz)	Measured Level (dBm)	Cable # 814 Loss (dB)	Total dBm	Limit dBm	Margin dBm
11	O-QPSK	2405.0	-4.37	0.47	-3.90	8.00	-11.90
18		2440.0	-4.62	0.47	-4.15	8.00	-12.15
26		2480.0	-5.15	0.47	-4.68	8.00	-12.68

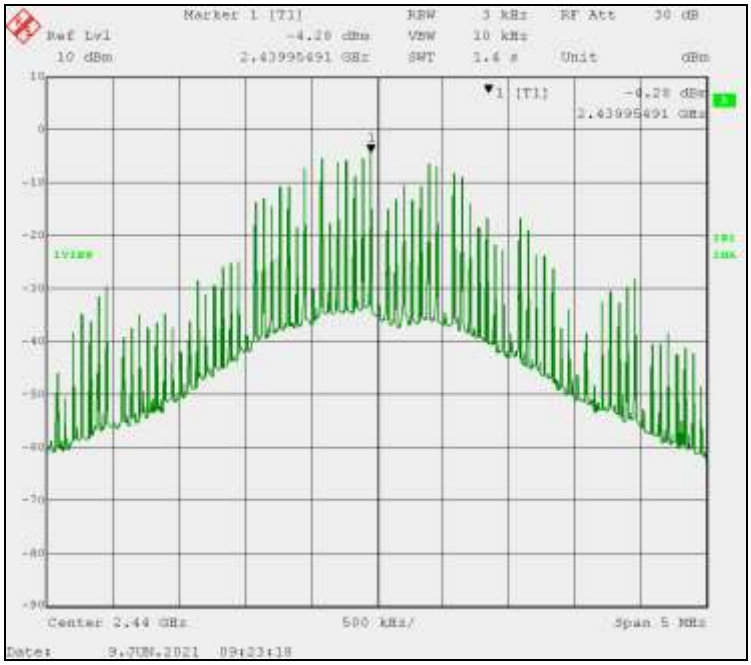
Test Results: The Power Spectral Density measurements of the Legrand Model WNAL23 with Zigbee Radio are compliant with the limits specified in FCC Section 15.247(e) with margin of 11.90 dB.

4.9.1.2 Power Spectral Density WNAL63 Zigbee Radio Test Results (06/09/2021)

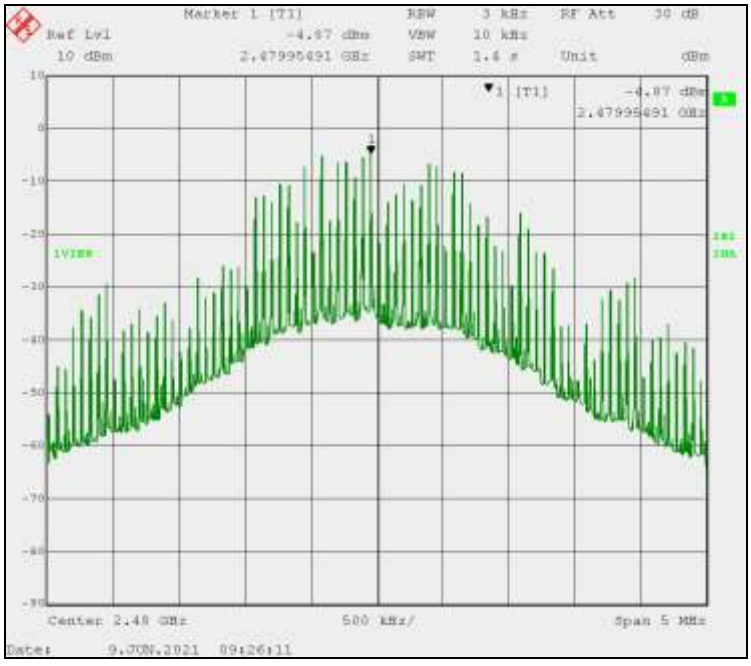
WNAL63 Zigbee Radio Low Channel 11, 2405 MHz PSD



WNAL63 Zigbee Radio Middle Channel 18, 2440 MHz PSD



WNAL63 Zigbee Radio High Channel 26, 2480 MHz PSD



Channel	Modulation	Frequency (MHz)	Measured Level (dBm)	Cable # 814 Loss (dB)	Total dBm	Limit dBm	Margin dBm
11	O-QPSK	2405.0	-3.91	0.47	-3.44	8.00	-11.44
18		2440.0	-4.28	0.47	-3.81	8.00	-11.81
26		2480.0	-4.87	0.47	-4.40	8.00	-12.40

Test Results: The Power Spectral Density measurements of the Legrand Model WNAL63 with Zigbee Radio are compliant with the limits specified in FCC Section 15.247(e) with margin of 11.44 dB.

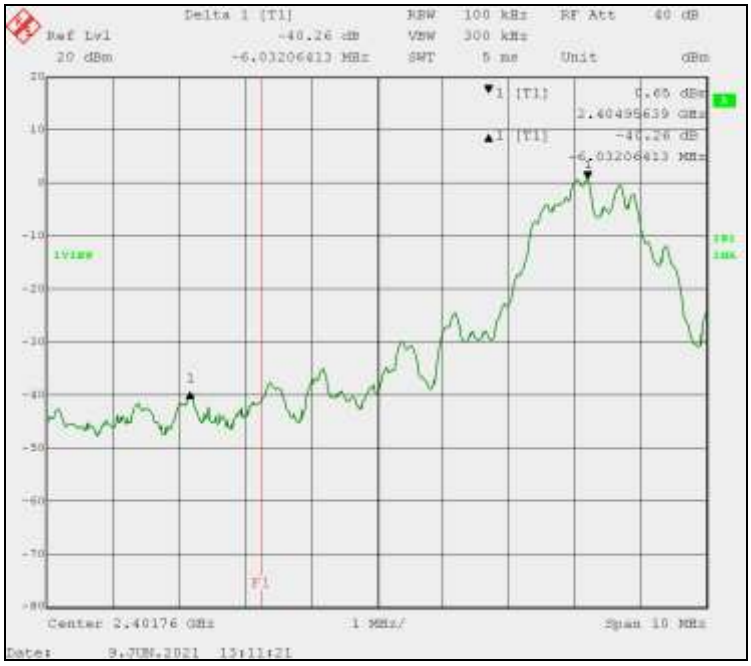
4.10 Band Edge Measurement (FCC Part 15.247(d), RSS-247 5.5)

4.10.1 Band Edge Measurement Test Procedure

The measurements of the authorized band edge for the WNALX3 Zigbee radios were made using the antenna conducted test procedure described in Section 6.10.4 of ANSI C63.10. The restricted band edge measurement was made using Section 6.10.5. The EUT transmitted with modulation on the low and high channels.

4.10.1.1 Lower Authorized Band Edge Test Result – WNAL23 (06/09/2021)

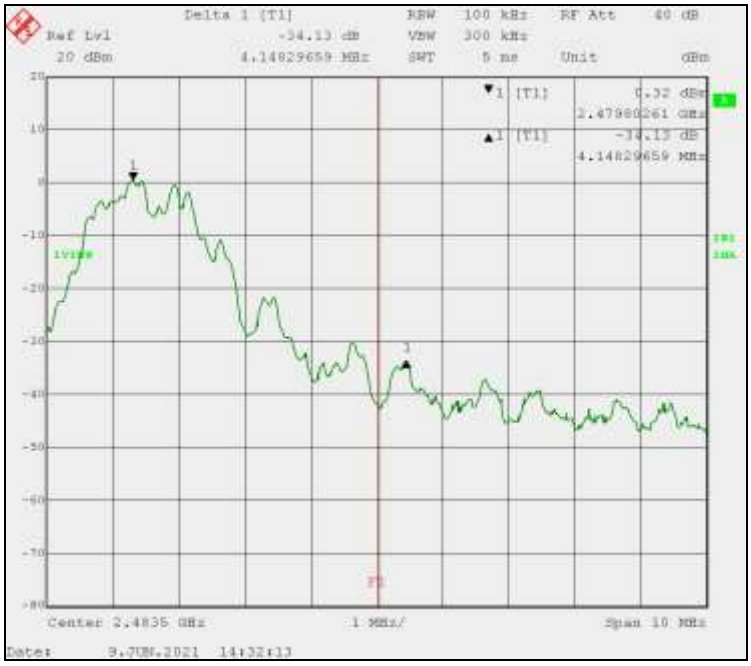
Zigbee Radio transmitting at 2.405 GHz, O-QPSK



The authorized band begins at 2.400 GHz. The lowest operating frequency of the EUT is 2.405 GHz. The screen above shows the low channel modulated emission profile. Normal Marker ▼1 is at the highest emission inside the authorized band. Delta Marker ▲1, marks the highest emission level outside of the authorized band. The red, vertical line F1 is the Authorized Band boundary at 2.40 GHz. The value of Delta Marker ▲ is the difference between the two markers. The limit is 20 dB, the value is 40.26 dB.

4.10.1.2 Upper Restricted Band Edge Test Result – WNAL23 (06/09/2021)

Zigbee Radio transmitting at 2.48 GHz, O-QPSK



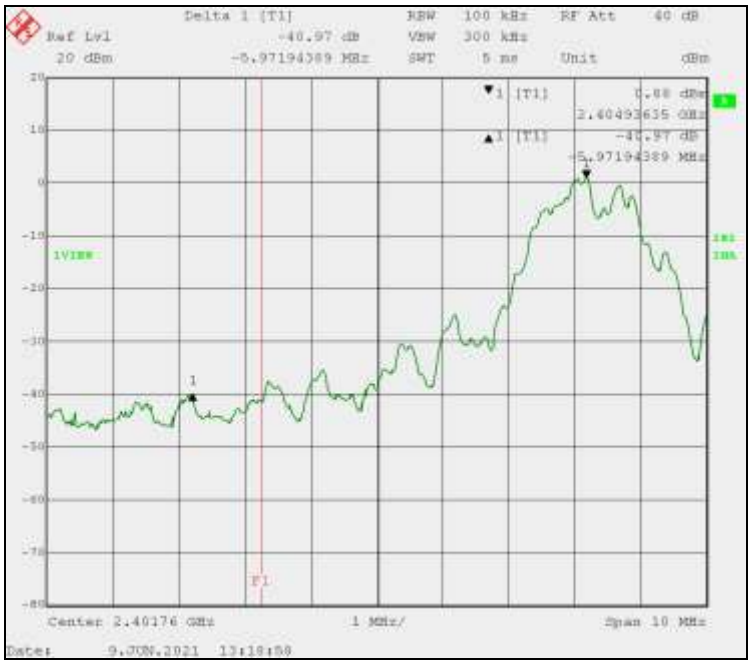
The restricted band begins at 2.4835 GHz. The highest operating frequency of the EUT is 2.480 GHz. The screen above shows channel 28, modulated transmission emission profile. Normal Marker ▼1 is at the highest emission within the authorized band. Delta Marker ▲1, marks the highest emission in the restricted band. The red, vertical line F1 is the Restricted Band boundary at 2.4835 GHz. The value of Delta Marker ▲ is the difference between the two markers. The limit is 20 dB, the value is 34.13 dB.

Band Edge / Freq (GHz)	Modulation	Fundamental Frequency Carrier		Band-edge Peak Level	Delta	Limit	Margin
		MHz	dBm	dBm	dBm	dBc	dBm
Lower / 2.400	O-QPSK	2405.0	0.65	-39.61	40.26	20.00	-20.26
Upper / 2.4835		2480.0	0.32	-33.81	34.13	20.00	-14.13

Test Results: Band-edge measurement of the Legrand Model WNAL23 Zigbee Radio, transmitting with O-QPSK modulation, is compliant to the FCC and ISED limits with margin of 14.13 dB.

4.10.1.3 Lower Authorized Band Edge Test Result – WNAL63 (06/09/2021)

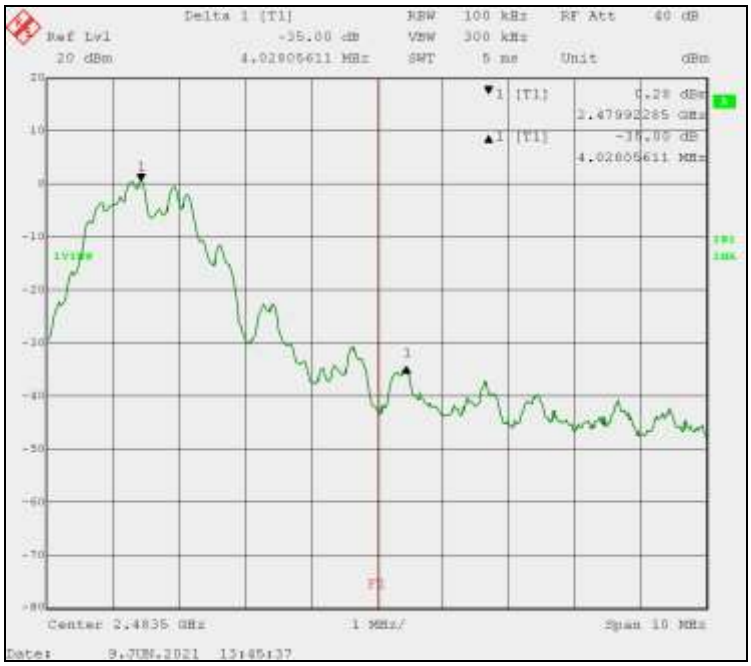
Zigbee Radio transmitting at 2.405 GHz, O-QPSK



The authorized band begins at 2.400 GHz. The lowest operating frequency of the EUT is 2.405 GHz. The screen above shows the low channel modulated emission profile. Normal Marker ▼1 is at the highest emission inside the authorized band. Delta Marker ▲1, marks the highest emission level outside of the authorized band. The red, vertical line F1 is the Authorized Band boundary at 2.40 GHz. The value of Delta Marker ▲ is the difference between the two markers. The limit is 20 dB, the value is 40.97 dB.

4.10.1.4 Upper Restricted Band Edge Test Result – WNAL63 (06/09/2021)

Zigbee Radio transmitting at 2.48 GHz, O-QPSK



The restricted band begins at 2.4835 GHz. The highest operating frequency of the EUT is 2.480 GHz. The screen above shows channel 28, modulated transmission emission profile. Normal Marker ▼1 is at the highest emission within the authorized band. Delta Marker ▲1, marks the highest emission in the restricted band. The red, vertical line F1 is the Restricted Band boundary at 2.4835 GHz. The value of Delta Marker ▲ is the difference between the two markers. The limit is 20 dB, the delta value is 35.00 dB.

Band Edge / Freq (GHz)	Modulation	Fundamental Frequency Carrier		Band-edge Peak Level	Delta	Limit	Margin
		MHz	dBm	dBm	dBm	dBc	dBm
Lower / 2.400	O-QPSK	2405.0	0.88	-40.09	40.97	20.00	-20.97
Upper / 2.4835		2480.0	0.28	-34.72	35.00	20.00	-15.00

Test Results: Band-edge measurement of the Legrand Model WNAL63 Zigbee Radio, transmitting with O-QPSK modulation, is compliant to the FCC and ISED limits with margin of 15.00 dB.

Appendix A – Legrand WNALX3 with Zigbee Radio Test Setup Pictures

SEE APPENDIX A titled “Appendix A Legrand WNALX3 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	06/26/18	3 Years	06/26/21
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	01/08/19	3 Years	01/08/22
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	08/03/20	1 Year	08/03/21
Intentional Radiator Testing High Frequency RF Test Cable	Suhner	S04272B	N/A	962	08/03/20	1 Year	08/03/21
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