



**BEC INCORPORATED**

**ANTENNA GAIN VALUE CALCULATION REPORT**

**REFERENCE DOCUMENT:  
KDB 789033 D02**

**Legrand Model WNR/WZ3R  
radiant 4-Button Scene Controller**

**FCC ID: 2AU5D-WRCB4**

**REPORT# BEC-2195-05**

**CUSTOMER:  
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## Revision History

Revision #	Description of Changes	Date of Changes	Date Released
0	Test Report Initial Release	N/A	05/23/2022



## 1.0 Administrative Information

### 1.1 General Information Table

<b>Project Number</b>	BEC-2195
<b>Manufacturer</b>	Legrand
<b>Model Number Tested</b>	WNR/WZ3R
<b>EUT Sample Type</b>	FCC Test Code Radiated Sample
<b>EUT Serial Number</b>	None
<b>EUT Sample Number</b>	2195-01
<b>EUT Firmware Version</b>	TestRadio_WNRL63.bin
<b>Frequency of Operation</b>	2405 – 2480 MHz
<b>Antenna Gain Calculated Value</b>	+ 4.28 dBi
<b>Antenna Type</b>	Inverted F
<b>Modulation</b>	O-QPSK
<b>FCC Classification</b>	Digital Transmission System (DTS)
<b>Date Samples Received</b>	02/27/2022
<b>Sample Type and Condition Received</b>	Production Unit Suitable for Test
<b>EUT Description</b>	radiant Wireless 4-Button Scene Controller
<b>FCC ID</b>	2AU5D-WRCB4
<b>FCC KDB Guidance Document</b>	KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Section G 2(d)



## 1.2 Antenna Gain Value Calculation (EIRP Minus Maximum Conducted Output Power)

Antenna Gain Value is calculated as the difference between the Radiated EIRP measurement value of the Highest Peak Corrected Fundamental Tx Frequency Minus the Highest Peak Corrected Maximum Conducted Output Power.

EIRP (dBm): **9.60** dBm  
 Maximum Conducted Output Power (dBm): - **5.32** dBm  
**Calculated Antenna Gain** **4.28** dBi

## 1.3 EIRP (dBm)

“EIRP” is calculated using the following KDB Guidance found in KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Section G 2(d). Highest Peak Corrected Fundamental Tx Frequency converted from dBuV/m to dBm by subtracting 95.2 to get EIRP in (dBm).

d) If radiated measurements are performed, field strength is then converted to EIRP as follows:

(i)  $EIRP = ((E \times d)^2) / 30$

where:

- E is the field strength in V/m;
- d is the measurement distance in m;
- EIRP is the equivalent isotropically radiated power in W.

(ii) Working in dB units, the preceding equation is equivalent to:

$$EIRP[dBm] = E[dB\mu V/m] + 20 \log (d[m]) - 104.77$$

(iii) Or, if d is 3 m:

$$EIRP[dBm] = E[dB\mu V/m] - 95.2$$

The Settings on the Measurement Analyzer for measuring the Fundamental Tx Frequency were:

Zigbee Radio, O-QPSK modulation			
Spec Analyzer Settings			ANSI C63.10 requirement
Span	20	MHz	$\geq 3 \times RBW$
RBW	1	MHz	$RBW \geq DTS \text{ BW}$
VBW	3	MHz	$\geq 3 \times RBW$
Sweep	5	ms	Auto

Highest Peak Corrected Fundamental Tx Frequency=**104.8** dBuV/m

Fundamental Tx Frequency	Peak Level Uncorrected	Axis (EUT)	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	Peak Corrected Total
GHz	dBuV/m	X/Y/Z	H/V	degrees	cm	dB	dBuV/m
2.440	110.3	Y	H	031	275	-5.5	104.8

**104.8 dBuV/m** minus **95.2** = **9.60 dBm (EIRP Final)**



### 1.4 Maximum Conducted Output Power (dBm)

Maximum Conducted Output Power at the same Highest Tx Fundamental Frequency of 2.440 GHz during Bench testing of the EUT radio.

The Settings on the Measurement Analyzer for measuring the Fundamental Tx Frequency were:

Zigbee Radio, O-QPSK modulation			
Spec Analyzer Settings			ANSI C63.10 requirement
Span	10	MHz	$\geq 3 \times \text{RBW}$
RBW	3	MHz	$\text{RBW} \geq \text{DTS BW}$
VBW	10	MHz	$\geq 3 \times \text{RBW}$
Sweep	5	ms	Auto

Maximum Conducted Output Power at the same Highest Tx Fundamental Frequency of 2.440 GHz during Bench testing of the EUT radio= **5.32 dBm** (Maximum Conducted Output Power Final)

Channel	Modulation	Frequency (MHz)	Measured Level	Cable # 962 Loss	Total	
					dBm	Watts
11	O-QPSK	2405.0	4.85	0.47	5.32	0.0034
18		2440.0	4.85	0.47	5.32	0.0034
26		2480.0	4.98	0.47	5.45	0.0035