



TEST REPORT

Reference No..... : WTN22F11236598W003
FCC ID : 2A9TP-ZIGBEE
Applicant..... : CES2020 LLC
Address..... : 150 Bishop Landing, Irvine, CA 92620,USA
Manufacturer : The same as above
Address..... : The same as above
Product Name..... : Zigbee gateway
Model No..... : Zigbee
Test specification..... : FCC CFR47 Part 1 Subpart I (Section 1.1307): 2020
Date of Receipt sample : 2022-11-25
Date of Test : 2022-12-05
Date of Issue..... : 2023-02-13
Test Report Form No. : WEW-MPE-01A
Test Result..... : Pass

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

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1 Revision History

Test Report No.	Date of Issue	Description	Status
WTN22F11236598W003	2023-02-13	Original	Valid

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3 General Information

3.1 General Description of E.U.T

Product Name : Zigbee gateway
Model No. : Zigbee
Model Description : ---
Rated Voltage..... : DC 5V, 0.1A
Battery Capacity : ---
Power Adapter : ---

3.2 Technical Characteristics of WiFi Module

Support Standards : 802.11b, 802.11g, 802.11n
Frequency Range : 2412-2462MHz for 802.11b/g/n(HT20)
2422-2452MHz for 802.11n(HT40)
RF Output Power : 18.41dBm (Conducted)
Modulation : 802.11b: DSSS(DBPSK/DQPSK/CCK)
802.11g/n: OFDM (BPSK/QPSK/16QAM/64QAM)
Data Rate : 1-11Mbps, 6-54Mbps, up to 300Mbps
Quantity of Channels : 11 for 802.11b/g/n(HT20); 7 for 802.11n(HT40)
Channel Separation..... : 5MHz
Type of Antenna : PCB Printed Antenna
Antenna Gain : 2.5dBi

3.3 Technical Characteristics of Zigbee Module

Support Standards : IEEE 802.15.4
Frequency Range : 2405-2475MHz
RF Output Power : 5.84dBm (Conducted)
Modulation : OQPSK
Quantity of Channels : 15
Channel Separation..... : 5MHz
Type of Antenna : PCB Printed Antenna
Antenna Gain : 2.2dBi

3.4 Disclaimer

The antenna gain information is provided by the customer. The laboratory is not responsible for the accuracy of the antenna gain information.



4 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

4.1 Standard Applicable

According to §1.1307(b)(3) and 447498 D04 Interim General RF Exposure Guidance v01, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

Option A: FCC Rule Part 1.1307 (b)(3)(i)(A): The available maximum time-averaged power is no more than 1mW, regardless of separation distance.

Option B: FCC Rule Part 1.1307 (b)(3)(i)(B): The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

Option C: FCC Rule Part 1.1307 (b)(3)(i)(C): The minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters.

Single RF Sources Subject to Routine Environmental Evaluation	
RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$
1.34-30	$3,450 R^2/f^2$
30-300	$3.83 R^2$
300-1,500	$0.0128 R^2 f$
1,500-100,000	$19.2 R^2$



For Multiple RF sources: FCC Rule Part 1.1307(b)(3)(ii):

(A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required).

(B) In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

4.2 Calculation Result

Radio Access Technology	Min. Frequency (MHz)	Max. Output Power (dBm)	Max. Tune-up Output Power (dBm)	Antenna Gain (dBi)	Duty Cycle (%)	Tune-Up EIRP (dBm)
WiFi	2412	18.41	19.00	2.5	100	21.50
Zigbee	2405	5.84	6.00	2.2	100	8.20

Frequency (MHz)	Option	Min. Distance (cm)	Tune-up ERP		Exposure Limit (mW)	Ratio	Result
			(dBm)	(mW)			
2412	C	20.00	19.35	86.10	768	0.11	Pass
2405	C	20.00	6.05	4.03	768	0.01	Pass

Note:

1. ERP=EIRP-2.15dB; EIRP= Output Power + Antenna gain
2. Option A, B and C refers as clause 1.2.
3. For option B, Pth(mW) convert to Exposure Limit(mW); For option C, ERP(W) convert to Exposure Limit(mW).
4. Ratio= Tune-Up ERP(mW)/ Exposure Limit (mW)

Mode for Simultaneous Multi-band Transmission:

Radio Access Technology	Ratio 1	Ratio 2	Simultaneous Ratio	Limit	Result
WiFi+Zigbee	0.11	0.01	0.12	1.00	Pass

Result: Pass

=====End of Report=====