

FCC RF EXPOSURE REPORT

FCC ID: Q78-ZXHNF680V9

Project No. : 2001H021
Equipment : GPON ONT
Brand Name : ZTE
Test Model : ZXHN F680
Series Model : ZXHN F689
Applicant : ZTE Corporation
Address : ZTE Plaza, Hi-Tech Park, Nanshan District, Shenzhen, Guangdong,
P.R.China
Manufacturer : ZTE Corporation
Address : ZTE Plaza, Hi-Tech Park, Nanshan District, Shenzhen, Guangdong,
P.R.China
Date of Receipt : Jan. 17, 2020
Date of Test : Apr. 23, 2020 ~ Apr. 27, 2020
Issued Date : Jun. 11, 2020
Report Version : R01
Test Sample : Engineering Sample No.: SH2020030642, SH2020030642-1
Standard(s) : FCC Guidelines for Human Exposure IEEE C95.1 & FCC Part 2.1091
FCC Title 47 Part 2.1091, OET Bulletin 65 Supplement C

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

Krain. Wu

Prepared by : Krain Wu

Ryan. Wang

Approved by : Ryan Wang



Certificate # 5123.03

Add: No. 29, Jintang Road, Tangzhen Industry Park, Pudong New Area, Shanghai 201210, China

TEL: +86-021-61765666

Web: www.newbtl.com

REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue	Jun. 05, 2020
R01	Modified the comments of the certification authority.	Jun. 11, 2020

1. MPE CALCULATION METHOD

Calculation Method of RF Safety Distance:

$$S = \frac{PG}{4\pi r^2} = \frac{EIRP}{4\pi r^2}$$

where:

S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

Table for Filed Antenna

For 2.4GHz:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain(dBi)
1	N/A	N/A	PCB	N/A	3
2	N/A	N/A	PCB	N/A	3
3	N/A	N/A	PCB	N/A	3
4	N/A	N/A	PCB	N/A	3

Note:

For Beamforming:

- (1) Antenna Gain=3 dBi. This EUT supports MIMO 4X4, any transmit signals are correlated with each other, so Directional gain = $G_{ANT} + 10\log(N)$ dBi, that is Directional gain=3+10log(4)dBi=9.02; So, the output power limit is 30-9.02+6=26.98, the power spectral density limit is 8-9.02+6=4.98.

For Non-Beamforming:

- (2) This EUT supports CDD, and all antennas have the same gain, Directional gain= $G_{ANT} + \text{Array Gain}$, where Array Gain is as follows:

For power spectral density measurements, $N_{ANT} = 4$, $N_{SS} = 1$. So Directional gain = $G_{ANT} + \text{Array Gain} = 10\log(N_{ANT}/N_{SS})$ dB = 3+10log(4/1)dBi=9.02. Then, the power density limit is 8-(9.02-6)=4.98.

For power measurements, Array Gain = 0 dB ($N_{ANT} \leq 4$), so the Directional gain=3.

For 5GHz:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	PCB	N/A	3
2	N/A	N/A	PCB	N/A	3
3	N/A	N/A	PCB	N/A	3
4	N/A	N/A	PCB	N/A	3

Note:

For Beamforming:

- (1) Antenna Gain=3 dBi. This EUT supports MIMO 4X4, any transmit signals are correlated with each other, so Directional gain = $G_{ANT} + 10\log(N)$ dBi, that is Directional gain = $3 + 10\log(4)$ dBi = 9.02; So, the UNII-2A, UNII-2C output power limit is $24 - 9.02 + 6 = 20.98$, the UNII-1, UNII-3 output power limit is $30 - 9.02 + 6 = 26.98$. The UNII-1 power spectral density limit is $17 - 9.02 + 6 = 13.98$, the UNII-2A, UNII-2C power spectral density limit is $11 - 9.02 + 6 = 7.98$, the UNII-3 power spectral density limit is $30 - 9.02 + 6 = 26.98$.

For Non-Beamforming:

- (2) This EUT supports CDD, and all antennas have the same gain, Directional gain = $G_{ANT} + \text{Array Gain}$, where Array Gain is as follows:
 For power spectral density measurements, $N_{ANT} = 3$, $N_{SS} = 1$. So Directional gain = $G_{ANT} + \text{Array Gain} = G_{ANT} + 10\log(N_{ANT}/N_{SS})$ dB = $3 + 10\log(4/1)$ dBi = 9.02. Then, the UNII-1 power spectral density limit is $17 - 9.02 + 6 = 13.98$, the UNII-2A, UNII-2C power spectral density limit is $11 - 9.02 + 6 = 7.98$, the UNII-3 power spectral density limit is $30 - 9.02 + 6 = 26.98$.
 For power measurements, Array Gain = 0 dB ($N_{ANT} \leq 4$), so the Directional gain = 3.

2. TEST RESULTS

For 2.4GHz Non-Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Tune up Power (dBm)	Max. Tune up Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
3	1.9953	26.00	398.1072	0.15811	1	Complies

For 2.4GHz Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Tune up Power (dBm)	Max. Tune up Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
9.02	7.9799	17.00	50.1187	0.07961	1	Complies

For 5GHz UNII-1 Non-Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Tune up Power (dBm)	Max. Tune up Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
3	7.9799	27.00	501.1872	0.19904	1	Complies

For 5GHz UNII-2A Non-Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Tune up Power (dBm)	Max. Tune up Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
3	7.9799	21.00	125.8925	0.05000	1	Complies

For 5GHz UNII-2C Non-Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Tune up Power (dBm)	Max. Tune up Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
3	7.9799	21.00	125.8925	0.05000	1	Complies

For 5GHz UNII-3 Non-Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Tune up Power (dBm)	Max. Tune up Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
3	7.9799	27.00	501.1872	0.19904	1	Complies

For 5GHz UNII-1 with Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Tune up Power (dBm)	Max. Tune up Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
9.02	7.9799	27	501.1872	0.79607	1	Complies

For 5GHz UNII-2A with Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Tune up Power (dBm)	Max. Tune up Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
9.02	7.9799	21	125.8925	0.19996	1	Complies

For 5GHz UNII-2C with Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Tune up Power (dBm)	Max. Tune up Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
9.02	7.9799	21	125.8925	0.19996	1	Complies

For 5GHz UNII-3 with Beamforming:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Tune up Power (dBm)	Max. Tune up Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
9.02	7.9799	27	501.1872	0.79607	1	Complies

Note: The calculated distance is 20 cm.
Output power including tune up tolerance.

For the max simultaneous transmission MPE:

2.4G+5G

Power Density (S) (mW/cm ²) 2.4GHz	Power Density (S) (mW/cm ²) 5GHz	Total	Limit of Power Density (S) (mW/cm ²)	Test Result
0.15811	0.79607	0.95418	1	Complies

End of Test Report