

MPE Report

Applicant : Synology Inc.
Product Name : Synology 11ax router
Trade Name : Synology
Model Number : WRX560
Applicable Standard : 47 CFR § 2.1091
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Revision History

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1. General Information

1.1 Reference Applicable Standard

Standard	Description	Version
IEEE C95.1	American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300 KHz to 100 GHz, New York.	1992
47 CFR Part §2.1091	Radiofrequency radiation exposure evaluation: mobile devices.	-
47 CFR Part §1.1310	Radiofrequency radiation exposure limits.	-

2. Description of Equipment under Test (EUT)

Applicant	Synology Inc. 9F., No.1, Yuandong Rd., Banqiao Dist., New Taipei City 220632
Manufacturer	EDIMAX TECHNOLOGY Co., LTD. No. 278, Xinhua 1st Rd., Neihu Dist., Taipei City, Taiwan
Product Name	Synology 11ax router
Trade Name	Synology
Model Number	WRX560
FCC ID	YOR-WRX560
Frequency Range	WLAN 2.4 GHz Band : 2412 - 2462 MHz WLAN 5.2 GHz Band : 5180 - 5320 MHz WLAN 5.6 GHz Band : 5500 - 5720 MHz WLAN 5.8 GHz Band : 5745 - 5825 MHz WLAN 5.9 GHz Band : 5845 - 5885 MHz
Supported Modulations	WLAN 2.4 GHz : 802.11b/g/n/ax HT20/HT40/VHT20/VHT40/ HE20/HE40
	WLAN 5 GHz : 802.11a/n/ac/ax HT20/HT40/VHT20/VHT40/VHT80/VHT80+80/HE20/HE40/HE80/HE80+80

Note:

The above information of DUT was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

Antenna Information						
Index	Model	Type	Frequency	Max. Gain (dBi)		
ANT0	MLX22M-121AA0-A	indoor embedded omni directional antenna	2412 - 2462 MHz	3.00		
ANT1			2412 - 2462 MHz	2.90		
ANT2			5180 - 5320 MHz	2.00		
			5500 - 5720 MHz	2.10		
			5745 - 5825 MHz	2.30		
			5845 - 5885 MHz	2.30		
ANT3			5180 - 5320 MHz	2.70		
			5500 - 5720 MHz	2.40		
			5745 - 5825 MHz	2.50		
			5845 - 5885 MHz	2.50		
ANT4			5180 - 5320 MHz	3.50		
			5500 - 5720 MHz	3.40		
			5745 - 5825 MHz	3.40		
			5845 - 5885 MHz	3.40		
ANT5			5180 - 5320 MHz	2.40		
			5500 - 5720 MHz	2.20		
			5745 - 5825 MHz	2.30		
			5845 - 5885 MHz	2.30		
Directional			2412 - 2462 MHz	6.01		
			5180 - 5320 MHz	8.69		
			5500 - 5720 MHz	8.56		
			5745 - 5825 MHz	8.66		
			5845 - 5885 MHz	8.66		

3. RF Exposure Limit

For devices that operate at larger distances from persons, where there are minimal RF coupling interactions between a device and the user or nearby persons, RF exposure compliance using maximum permissible exposure (MPE) limits is applied. The limits for MPE is listed as below:

Limits for General Population / Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824 / f	2.19 / f	(180 / f ²)*	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	F / 1,500	30
1,500-100,000	-	-	1.0	30
Limits for Occupational / Controlled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1,842 / f	4.89 / f	(900 / f ²)*	6
30-300	61.4	0.163	1.0	6
300-1,500	-	-	F / 300	6
1,500-100,000	-	-	5	6

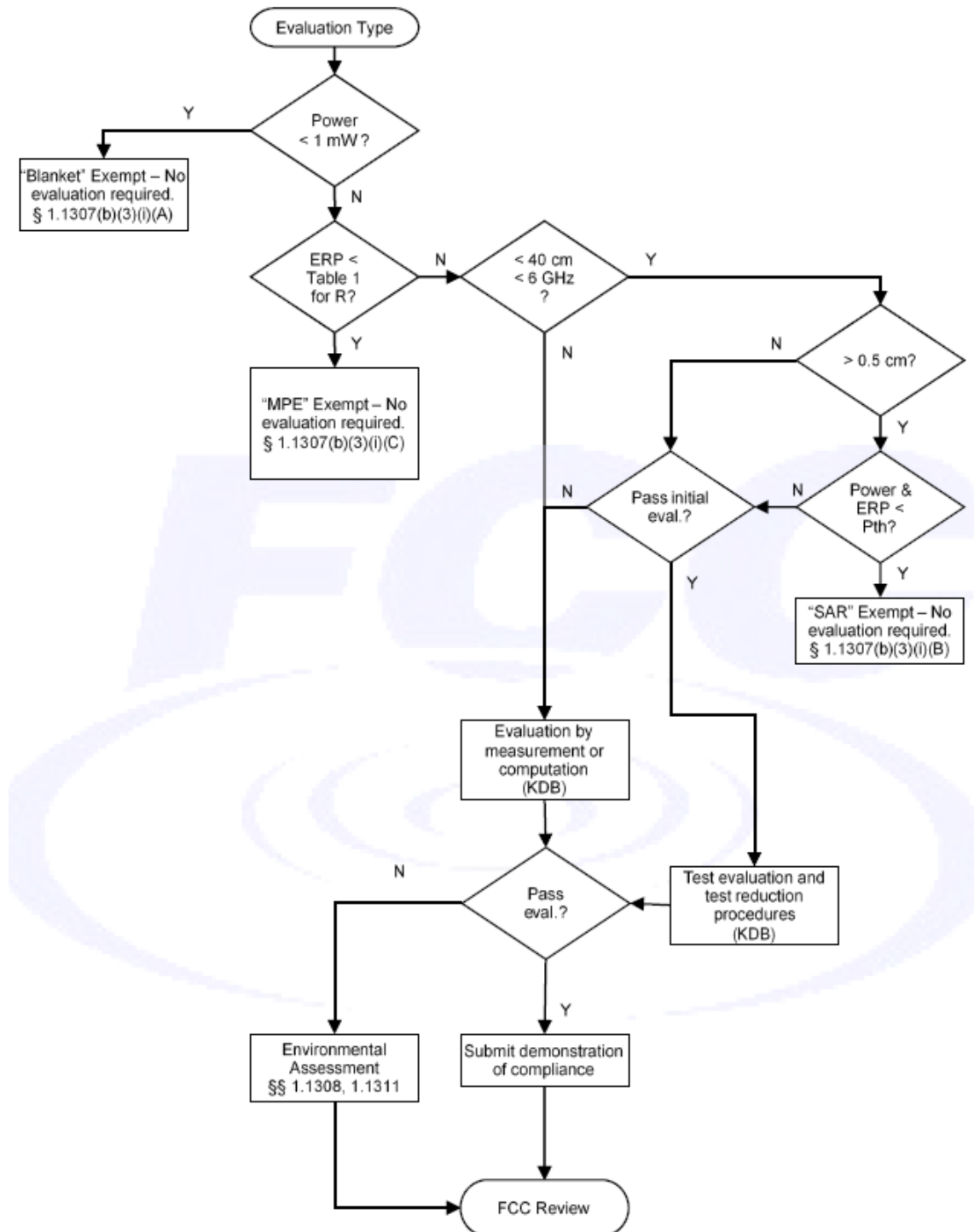
f = frequency in MHz. * = Plane-wave equivalent power density.

4. RF Exposure Assessment

4.1 Exemption Evaluation

Exemption evaluation was performed according to the appendix A and B in KDB447498 D04.

The General Sequence for Determination of Procedure demonstrated in Figure A.1 of KDB447498 D04 was applied.



4.2 Human Exposure Assessment

Due to the design and installation of this product, it is not possible to conduct SAR evaluation. This is because client either manufactures or supplies the antenna(s) that will be used in the installation of this product. Therefore, this product will be evaluated as a mobile device per 47 CFR § 1.1310 titled "Radiofrequency radiation exposure limits", generally referred to as MPE limits.

In 47 CFR § 2.1091, paragraph (b) defines a mobile device as "a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 cm is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons." This product is intended to be installed into a vehicle such that the unit is physically secured at one location. In the installation guide supplied with the product, Client has made the following statement: "IMPORTANT: To meet the FCC's RF Exposure Guidelines, the antenna should be installed so there is at least 20 cm of separation between the body of the user and nearby persons and the antenna". Based on the installation of the transceiver and the antenna, the transmitters radiating structure is more than 20 cm from the user. Thus, this product is a "mobile device" as defined in section § 2.1091 paragraph (b).

Exposure evaluation

$$S_{eip} = \frac{EIRP}{4\pi d^2} = \frac{PG}{4\pi d^2} (W / m^2)$$

Where

S: is the input power (W);

G: is the antenna gain;

d : is the distance between antennas and evaluation point (m).

5. Maximum Tune-up Power

Beam forming OFF :

Operate Band	Frequency (MHz)	MIMO
2.4 GHz	2412 - 2462	29.50
5.2 GHz	5180 - 5240	28.50
5.3 GHz	5260 - 5320	23.50
5.6 GHz	5500 - 5720	24.00
5.8 GHz	5745 - 5825	30.00
5.9 GHz	5845 - 5885	27.50

Beam forming ON :

Operate Band	Frequency (MHz)	MIMO Beamforming
2.4 GHz	2412 - 2462	26.00
5.2 GHz	5180 - 5240	22.00
5.3 GHz	5260 - 5320	17.50
5.6 GHz	5500 - 5720	20.50
5.8 GHz	5745 - 5825	24.50
5.9 GHz	5845 - 5885	23.50

6. Result

Band	Frequency (MHz)	Distance (cm) [R]	Tune-up Power (dBm) [P]	ANT Gain (dBi)	Numeric Gain [G]	Duty Cycle	Power with Duty cycle (mW) [P]x[G]	Power Density (mW/cm ²) [S]	Antenna
2.4 GHz	2412-2462	20.0	29.50	3.00	2.00	1	1782.50	0.35	MIMO
5.2 GHz	5180-5240	20.0	28.50	3.50	2.24	1	1585.80	0.32	MIMO
5.3 GHz	5260-5320	20.0	23.50	3.50	2.24	1	501.47	0.10	MIMO
5.6 GHz	5500-5720	20.0	24.00	3.40	2.19	1	550.10	0.11	MIMO
5.8 GHz	5745-5825	20.0	30.00	3.40	2.19	1	2190.00	0.44	MIMO
5.9 GHz	5845-5885	20.0	27.50	3.40	2.19	1	1231.53	0.25	MIMO
2.4 GHz	2412-2462	20.0	26.00	6.01	3.99	1	1588.45	0.32	MIMO Beamforming
5.2 GHz	5180-5240	20.0	22.00	8.69	7.40	1	1172.82	0.23	MIMO Beamforming
5.3 GHz	5260-5320	20.0	17.50	8.69	7.40	1	416.13	0.08	MIMO Beamforming
5.6 GHz	5500-5720	20.0	20.50	8.56	7.18	1	805.61	0.16	MIMO Beamforming
5.8 GHz	5745-5825	20.0	24.50	8.66	7.35	1	2071.51	0.41	MIMO Beamforming
5.9 GHz	5845-5885	20.0	23.50	8.66	7.35	1	1645.46	0.33	MIMO Beamforming

Note:

1. Mobile or fixed location transmitters, minimum separation distance is 20 cm, even if calculations indicate MPE distance is less.
2. The maximum power and gain were applied to evaluate MPE.
3. The Numeric Gain calculated by $10^{(\text{ant. Gain(dBi)} / 10)}$.
4. The device operating 2.4GHz IEEE 802.11 b/g/n/ax mode is 2TX MIMO.
5. The device operating 5GHz IEEE 802.11 a/n/ac/ax mode is 4TX MIMO.

Simultaneous Transmitting :

WLAN 2.4GHz + WLAN 5GHz

Total MPE = 0.79 mW/cm²

TER = 0.79 < 1

7. Conclusion

The result shows that this device is compliance with the exposure limits in 47 CFR §1.1310.

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