RF Exposure Evaluation Report

APPLICANT	:	TP-Link Technologies Co., Ltd.
EQUIPMENT	:	AC1900 Smart Home Router with Touch Screen
BRAND NAME	:	TP-Link
MODEL NAME	:	SR20
MARKETING NAME	:	AC1900 Smart Home Router With Touch Screen
FCC ID	:	TE7SR20
STANDARD	:	47 CFR Part 2.1091

We, SPORTON INTERNATIONAL INC., would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091, and pass the limit. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Deputy Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.
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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA612811	Rev. 01	Initial issue of report	Nov. 07, 2016

1. Administration Data

1.1. Testing Laboratory

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978

Applicant	
Company Name	TP-Link Technologies Co., Ltd.
Address	Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park,Shennan Rd, Nanshan, Shenzhen,China

Manufacturer	
Company Name	TP-Link Technologies Co., Ltd.
Address	Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park,Shennan Rd, Nanshan, Shenzhen,China

2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	AC1900 Smart Home Router with Touch Screen
Brand Name	TP-Link
Model Name	SR20
Marketing Name	AC1900 Smart Home Router With Touch Screen
FCC ID	TE7SR20
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Zigbee: 2405 MHz ~ 2475 MHz Z-Wave: 908.4MHz ~ 916MHz
Mode	· 802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 · Zigbee: OQPSK · Z-Wave: 2FSK/2GFSK
EUT Stage	Identical Prototype

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

3. Maximum RF average output power among production units

Mode	Average Power (dBm)
Zigbee	20.5
Z-wave	-6

Band / Frequency (MHz)		IEEE 802.11 Average Power (dBm)					
		Ant 1+2+3					
		11b	11g	HT20	HT40	VHT20	VHT40
2.4GHz Band	2412	**30**	24.5	21.5		21.5	
	2422				20		20
	2437	30	30	30	24	30	24
	2452				20		20
	2462	30	23.5	23		23	

Band / Frequency (MHz)		IEEE 802.11 Average Power (dBm)					
		Ant 1+2+3					
		11a	HT20	HT40	VHT20	VHT40	VHT80
5.2GHz Band	5180	26.5	26.5		26.5		
	5190			19.5		19.5	
	5210						18.5
	5220	26.5	26.5		26.5		
	5230			29.5		29.5	
	5240	26.5	26.5		26.5		
5.8GHz Band	5745	**30**	30		30		
	5755			30		30	
	5775						29
	5785	30	30		30		
	5795			30		30	
	5825	30	30		30		

<Beamforming Mode>

Band / Frequency (MHz)		IEEE 802.11 Average Power (dBm)				
		Ant 1+2+3				
		HT20	HT40	VHT20	VHT40	VHT80
5.2GHz Band	5180	25		25		
	5190		19		19	
	5210					14
	5220	25		25		
	5230		25		25	
	5240	25		25		
5.8GHz Band	5745	**29**		29		
	5755		29		29	
	5775					27.5
	5785	29		29		
	5795		29		29	
	5825	29		29		

Note: MIMO Ant. 1+2+3 average power is a combined result from sum of the power MIMO Ant. 1, MIMO Ant. 2 and MIMO Ant. 3.

4. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f2)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f2)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

The MPE was calculated at 22 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

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

Where:
S = Power Density
P = Output Power at Antenna Terminals
G = Gain of Transmit Antenna (linear gain)
R = Distance from Transmitting Antenna

5. Radio Frequency Radiation Exposure Evaluation

5.1. Standalone Power Density Calculation

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 22cm (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit
Zigbee	2405.0	2.80	20.50	23.300	0.214	213.796	0.035	1.000	0.035
Z-Wave	908.4	4.43	-6.00	-1.570	0.001	0.697	0.0001	0.606	0.0002
2.4GHz WLAN	2412.0	2.82	30.00	32.820	1.914	1914.256	0.315	1.000	0.315
5GHz WLAN	5745.0	3.82	30.00	33.820	2.410	2409.905	0.396	1.000	0.396

Note:
1. In the above table have assessed 2.4GHz/5GHz WLAN, Zigbee and Z-Wave by referring to their maximum antenna gain and maximum power.

<For Beamforming Mode>

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 22cm (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit
5GHz WLAN	5745.0	8.08	29.00	37.080	5.105	5105.050	0.840	1.000	0.840

Note:
1. This device supports Beamforming for WLAN5GHz only; therefore, in the table above which consider maximum directional Gain 8.08dBi for Beamforming mode.
2. In the above table have assessed WLAN5GHz by referring to the maximum antenna gain and maximum power.

5.2. Collocated Power Density Calculation

Zigbee Power Density / Limit	Z-Wave Power Density / Limit	WLAN Power Density / Limit	Σ(Power Density / Limit) of Zigbee+Z-Wave+WLAN
0.035	0.0002	0.840	0.8752

Note:
1. ∑(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for Zigbee+Z-Wave+WLAN.
2. Considering all antennas of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 3 collocated transmitters is compliant

Conclusion:

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.