

# RF EXPOSURE EVALUATION REPORT

**Product Name:** Mid-Tier 802.11ac Wi-Fi Access Point  
**Trade Mark:** GRANDSTREAM  
**Model No. / HVIN:** GWN7602  
**Report Number:** 191120011RFC-3  
**Test Standards:** FCC 47 CFR Part 1 Subpart I  
RSS-102 Issue 5  
**FCC ID:** YZZGWN7602  
**IC:** 11964A-GWN7602  
**Test Result:** PASS  
**Date of Issue:** February 28, 2020

Prepared for:

**Grandstream Networks, Inc.**  
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UTTR-RF-RSS102-V1.0

**Version**

Version No.	Date	Description
V1.0	February 28, 2020	Original

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## 1. GENERAL INFORMATION

### 1.1 CLIENT INFORMATION

<b>Applicant:</b>	Grandstream Networks, Inc.
<b>Address of Applicant:</b>	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA
<b>Manufacturer:</b>	Grandstream Networks, Inc.
<b>Address of Manufacturer:</b>	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

### 1.2 EUT INFORMATION

<b>Product Name:</b>	Mid-Tier 802.11ac Wi-Fi Access Point		
<b>Model No. / HVIN:</b>	GWN7602		
<b>Trade Mark:</b>	GRANDSTREAM		
<b>DUT Stage:</b>	Identical Prototype		
<b>EUT Supports Function:</b>	2.4 GHz ISM Band:	IEEE 802.11b/g/n	
	5 GHz U-NII Bands:	5 150 MHz to 5 250 MHz	IEEE 802.11a/n/ac
		5 250 MHz to 5 350 MHz	IEEE 802.11a/n/ac
		5 470 MHz to 5 725 MHz	IEEE 802.11a/n/ac
	5 725 MHz to 5 850 MHz	IEEE 802.11a/n/ac	
<b>Software Version:</b>	1.0.0.4		
<b>Hardware Version:</b>	V1		
<b>Sample Received Date:</b>	November 20, 2019		
<b>Sample Tested Date:</b>	November 20, 2019 to February 19, 2020		

### 1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

<b>Frequency Bands:</b>	5150 MHz to 5250 MHz (U-NII-1)
	5250 MHz to 5350 MHz (U-NII-2A)
	5470 MHz to 5725 MHz (U-NII-2C)
	5725 MHz to 5850 MHz (U-NII-3)
<b>Frequency Ranges:</b>	5180 MHz to 5240 MHz
	5260 MHz to 5320 MHz
	5500 MHz to 5700 MHz
	5745 MHz to 5825 MHz
<b>Support Standards:</b>	IEEE 802.11a/n/ac
<b>TPC Function:</b>	Not Support
<b>DFS Operational mode:</b>	Master
<b>Type of Modulation:</b>	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK)
	IEEE 802.11n: OFDM(64QAM, 16QAM, QPSK, BPSK)
	IEEE 802.11ac: OFDM(64QAM, 16QAM, QPSK, BPSK)
<b>Channel Spacing:</b>	IEEE 802.11a/n-HT20/ac-VHT20: 20 MHz
	IEEE 802.11n-HT40/ac-VHT40: 40 MHz
	IEEE 802.11ac-VHT80: 80 MHz
<b>Data Rate:</b>	IEEE 802.11a: Up to 54 Mbps
	IEEE 802.11n-HT20: Up to MCS15
	IEEE 802.11n-HT40: Up to MCS15
	IEEE 802.11ac-VHT20: Up to MCS8
	IEEE 802.11ac-VHT40: Up to MCS9

		IEEE 802.11ac-VHT80: Up to MCS9	
<b>Number of Channels:</b>	5150 MHz to 5250 MHz: 4 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40)/ac-VHT40 1 for IEEE 802.11acVHT80		
	5250 MHz to 5350 MHz: 4 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40)/ac-VHT40 1 for IEEE 802.11acVHT80		
	5470 MHz to 5725 MHz: 11 for IEEE 802.11a/n-HT20/ac-VHT20 5 for IEEE 802.11n-HT40/ac-VHT40 2 for IEEE 802.11ac-VHT80		
	5725 MHz to 5850 MHz: 5 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40/ac-VHT40 1 for IEEE 802.11ac-VHT80		
<b>Antenna Type:</b>	Chain 0	PCB Antenna	
	Chain 1	PCB Antenna	
<b>Antenna Gain:</b>	Chain 0	5150 MHz to 5250 MHz: 3.5 dBi	
		5250 MHz to 5350 MHz: 3.5 dBi	
		5470 MHz to 5725 MHz: 3.5 dBi	
		5725 MHz to 5850 MHz: 3.5 dBi	
	Chain 1	5150 MHz to 5250 MHz: 3.0 dBi	
		5250 MHz to 5350 MHz: 3.0 dBi	
5470 MHz to 5725 MHz: 3.0 dBi			
5725 MHz to 5850 MHz: 3.0 dBi			
<b>Maximum conducted output power (dBm):</b>	<b>MIMO_Chain 0+1</b>	<b>U-NII-2A</b>	<b>U-NII-2C</b>
	IEEE 802.11a:	16.28	18.67
	IEEE 802.11n-HT20:	15.75	18.33
	IEEE 802.11n-HT40:	12.06	14.73
	IEEE 802.11ac-VHT20:	15.64	18.41
	IEEE 802.11ac-VHT40:	11.97	14.87
	IEEE 802.11ac-VHT80:	10.65	13.17

### 1.4 OTHER INFORMATION

Operation Frequency Each of Channel				
	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
IEEE 802.11a, IEEE 802.11n-HT20, IEEE 802.11ac-VHT20	$f = 5000 + 5k, k = 32 + 4n$			$f = 5000 + 5k,$ $k = 145 + 4n$
	$n = 1, \dots, 4$	$n = 5, \dots, 8$	$n = 17, \dots, 27$	$n = 1, \dots, 5$
IEEE 802.11n-HT40, IEEE 802.11ac-VHT40	$f = 5000 + 5k, k = 30 + 8n$			$f = 5000 + 5k,$ $k = 143 + 8n$
	$n = 1, 2$	$n = 1, \dots, 5$	$n = 9, \dots, 13$	$n = 1, 2$
IEEE 802.11ac-VHT80	$f = 5000 + 5k, k = 26 + 16n$			$f = 5000 + 5k,$ $k = 155$
	$n = 1$	$n = 1, 2$	$n = 5, 6$	
Note:				
<b>f</b>	is the operating frequency (MHz);			
<b>k</b>	is the operating channel.			

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## 1.5 GENERAL DESCRIPTION OF APPLIED STANDARDS

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The EUT is a RF product, according to the specifications of the manufacturers. It must comply with the requirements of the following standards:

**FCC 47 CFR Part 1 Subpart I**  
**RSS-102 Issue 5**

All test items have been performed and recorded as per the above standards

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## 1.6 DEVIATION FROM STANDARDS

None.

## 1.7 ABNORMALITIES FROM STANDARD CONDITIONS

None.

## 1.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

## 2. EQUIPMENT LIST

Please refer to the RF test report.

### 3. MPE EVALUATION

#### 3.1 REFERENCE DOCUMENTS FOR EVALUATION

No.	Identity	Document Title
1	FCC 47 CFR Part 1 Subpart I	PROCEDURES IMPLEMENTING THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969
2	RSS-102 Issue 5	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
3	KDB 447498 D01 General RF Exposure Guidance v06	RF EXPOSURE PROCEDURES AND EQUIPMENT AUTHORIZATION POLICIES FOR MOBILE AND PORTABLE DEVICES

#### 3.2 MPE COMPLIANCE REQUIREMENT

##### 3.2.1 Limits

##### 3.2.1.1 FCC 47 CFR Part 1 Subpart I

According to §1.1307(b)(1), 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.

##### 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 <sup>2</sup> )	Averaging Times   E   <sup>2</sup> ,   H   <sup>2</sup> or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	F/300	6
1500-100000	/	/	5	6

##### 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 <sup>2</sup> )	Averaging Times   E   <sup>2</sup> ,   H   <sup>2</sup> or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-100000	/	/	<b>1</b>	30

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

### 3.2.1.2 RSS-102 Issue 5

According to RSS-102 Issue 5, 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.

According to RSS-102 Issue 5, 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.

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz<sup>6</sup> and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $4.49/f^{0.5}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

### 3.2.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

## 3.3 MPE CALCULATION METHOD

### FCC 47 CFR Part 1 Subpart I

$$S = PG/4\pi R^2 = EIRP/4\pi R^2$$

S = power density (in appropriate units, e.g., mw/cm<sup>2</sup>)

P = power input to the antenna (in appropriate units, e.g., mw)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor is normally numeric gain.

R = distance to the center of radiation of the antenna (in appropriate units, e.g., cm)

## 3.4 MPE CALCULATION RESULTS

**Note:** For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

### 3.4.1 For WLAN

For Wi-Fi function, operating at 5250 MHz to 5350 MHz for IEEE802.11a/n/ac and operating at 5470 MHz to 5725 MHz for IEEE802.11a/n/ac.

#### 3.4.1.1 Antenna Type:

Chain 0: PCB Antenna

Chain 1: PCB Antenna

#### 3.4.1.2 Antenna Gain:

Chain 0: 5250 MHz to 5350 MHz: 3.5 dBi

5470 MHz to 5725 MHz: 3.5 dBi

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**Chain 1:** 5250 MHz to 5350 MHz: 3.0 dBi  
 5470 MHz to 5725 MHz: 3.0 dBi

For MIMO mode (2Tx/2Rx), there are two transmission antennas. Both Chain 0 and Chain 1 used at the same time and antenna ports have uniform output powers. The Chain 0 and Chain 1 antenna ports can be used alone. The transmit signals are correlated with each other.

$$\text{The directional gain} = G_{\text{ANT}} + 10 \log(N_{\text{ANT}}) \text{ dBi} = 1.72 + 10 \log(2) = 6.26 \text{ dBi}$$

**3.4.1.3 Results for FCC 47 CFR Part 1 Subpart I**

**For MIMO (2TX/2RX) Mode**

Operating Mode	Freq.	Declared maximum conducted average output power	Max. positive Tolerance according manufacturer	Directional Gain	Calculated maximum EIRP	Declared maximum EIRP	MPE Limit	MPE Value	
	(MHz)	(dBm)		(dBi)	(dBm)	(mW)	(mW/cm <sup>2</sup> )		
MIMO (2TX/2RX)	IEEE 802.11a	5260-5320	16	2	6.26	24.26	266.6859	1	0.0531
		5500-5700	18	2	6.26	26.26	422.6686	1	0.0841
	IEEE 802.11n-HT20	5260-5320	15	2	6.26	23.26	211.8361	1	0.0421
		5500-5700	18	2	6.26	26.26	422.6686	1	0.0841
	IEEE 802.11n-HT40	5270-5310	12	2	6.26	20.26	106.1696	1	0.0211
		5510-5670	14	2	6.26	22.26	168.2674	1	0.0335
	IEEE 802.11ac-VHT20	5260-5320	15	2	6.26	23.26	211.8361	1	0.0421
		5500-5700	18	2	6.26	26.26	422.6686	1	0.0841
	IEEE 802.11ac-VHT40	5270-5310	12	2	6.26	20.26	106.1696	1	0.0211
		5510-5670	14	2	6.26	22.26	168.2674	1	0.0335
	IEEE 802.11ac-VHT80	5290	10	2	6.26	18.26	66.9885	1	0.0133
		5530	13	2	6.26	21.26	133.6596	1	0.0266

**3.4.1.4 Results for RSS-102 Issue 5**

**For MIMO (2TX/2RX) Mode**

Operating Mode	Freq.	Declared maximum conducted average output power	Max. positive Tolerance according manufacturer	Directional Gain	Calculated maximum EIRP	Declared maximum EIRP	Limit
	(MHz)	(dBm)		(dBi)	(dBm)	(W)	(W)
IEEE 802.11a	5260-5320	16	2	6.26	24.26	0.2667	4.57
	5500-5700	18	2	6.26	26.26	0.4227	4.71
IEEE 802.11n-HT20	5260-5320	15	2	6.26	23.26	0.2118	4.57
	5500-5700	18	2	6.26	26.26	0.4227	4.71
IEEE 802.11n-HT40	5270-5310	12	2	6.26	20.26	0.1062	4.58
	5510-5670	14	2	6.26	22.26	0.1683	4.72
IEEE 802.11ac-VHT20	5260-5320	15	2	6.26	23.26	0.2118	4.57
	5500-5700	18	2	6.26	26.26	0.4227	4.71
IEEE 802.11ac-VHT40	5270-5310	12	2	6.26	20.26	0.1062	4.58
	5510-5670	14	2	6.26	22.26	0.1683	4.72
IEEE 802.11ac-VHT80	5290	10	2	6.26	18.26	0.0670	4.59
	5530	13	2	6.26	21.26	0.1337	4.73

MIMO (2TX/2RX)

**APPENDIX 1 PHOTOS OF TEST SETUP**

N/A

**APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS**

Refer to Appendix 2 for EUT external and internal Photos.

\*\*\* End of Report \*\*\*

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