RF EXPOSURE

EVALUATION REPORT

APPLICANT	:	Grandstream Networks,Inc.
PRODUCT NAME	:	IP Multimedia Phone
MODEL NAME	:	GXV3380
BRAND NAME	:	GRANDSTREAM
FCC ID	:	YZZGXV3380
STANDARD(S)	:	47CFR 2.1091 KDB 447498
RECEIPT DATE	:	2019-04-24
TEST DATE	:	2019-06-11
ISSUE DATE	:	2019-06-11

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DIRECTORY

Change history		
Version	**Date**	**Reason of changed**
1.0	2019-06-11	Original

1. Technical Information

Note: Provide by manufacturer.

1.1 Applicant and Manufacturer Information

Applicant:	Grandstream Networks,Inc.
Applicant Address:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA
Manufacturer:	Grandstream Networks,Inc.
Manufacturer Address:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

1.2 Equipment under Test (EUT) Description

EUT Name:	IP Multimedia Phone
Hardware Version:	V1.6
Software Version:	1.0.0.10
Frequency Bands:	WLAN 2.4GHz: 2412 MHz ~2462 MHz WLAN 5.2GHz: 5180 MHz ~ 5240 MHz WLAN 5.3GHz: 5260 MHz ~ 5320 MHz WLAN 5.5GHz: 5500 MHz ~ 5720 MHz WLAN 5.8GHz: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Modulation Mode:	802.11b: DSSS 802.11a/g/n-HT20/HT40/ ac-VHT20/ac-VHT40/VHT80: OFDM Bluetooth BR+EDR: GFSK, π/4-DQPSK, 8-DPSK Bluetooth LE: GFSK
Antenna Type:	PCB Antenna
Antenna Gain:	2.4G: 4dBi , 5G: 5dBi

1.3 Identification of all used EUT

The EUT identity consists of numerical and letter characters, the letter character indicates the test sample, and the following two numerical characters indicate the software version of the test sample.

EUT Identity	Hardware Version	Software Version
1#	V1.6	1.0.0.10

1.4 Applied Reference Documents

Leading reference documents for testing:

No.	Identity	Document Title
1	47 CFR§2.1091	Radio Frequency Radiation Exposure Evaluation: mobile devices
2	KDB 447498 D01v06	General RF Exposure Guidance

2. Device Category and RF Exposure Limit

Per user manual, Based on 47CFR 2.1091, this device belongs to mobile device category with General Population/Uncontrolled exposure.

Mobile Devices:

47CFR 2.1091(b)

For purposes of this section, a mobile device is defined 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 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. In this context, the term “fixed location” means that the device is physically secured at one location and is not able to be easily moved to another location. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 centimeter separation requirement.

GENERAL POPULATION / UNCONTROLLED EXPOSURE

The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	f/1500	30
1500-100,000	-	-	1.0	30

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

3. RF Output Power

<WLAN 2.4GHz>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	CH 1	2412	14.21	14.50	100.00
		CH 6	2437	**14.24**	**14.50**	
		CH 11	2462	13.85	14.50	
	802.11g 6Mbps	CH 1	2412	13.43	14.00	96.86
		CH 6	2437	13.53	14.00	
		CH 11	2462	13.38	14.00	
	802.11n-HT20 MCS0	CH 1	2412	13.66	14.00	96.67
		CH 6	2437	13.61	14.00	
		CH 11	2462	13.52	14.00	

<WLAN 5GHz>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Power	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	CH 36	5180	12.50	13.00	97.21
		CH 44	5220	12.31	13.00	
		CH 48	5240	12.38	13.00	
	802.11n-HT20 MCS0	CH 36	5180	12.05	13.00	97.04
		CH 44	5220	12.03	12.50	
		CH 48	5240	12.05	12.50	
	802.11n-HT40 MCS0	CH 38	5190	13.06	13.50	97.05
		CH 46	5230	13.00	13.50	
	802.11ac-VHT 20 MCS0	CH 36	5180	12.03	12.50	93.91
		CH 44	5220	12.03	12.50	
		CH 48	5240	12.02	12.50	
	802.11ac-VHT 40 MCS0	CH 38	5190	13.05	13.50	93.97
		CH 46	5230	12.75	13.00	
	802.11ac-VHT 80 MCS0	CH 42	5210	**13.50**	**14.00**	88.52

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	CH 52	5260	12.58	13.00	97.21
		CH 60	5300	12.37	13.00	
		CH 64	5320	12.33	13.00	
	802.11n-HT20 MCS0	CH 52	5260	12.17	13.00	97.04
		CH 60	5300	12.01	13.00	
		CH 64	5320	12.16	13.00	
	802.11n-HT40 MCS0	CH 54	5270	13.18	13.50	97.05
		CH 62	5310	12.95	13.50	
	802.11ac-VHT 20 MCS0	CH 52	5260	12.26	13.50	93.91
		CH 60	5300	12.07	12.50	
		CH 64	5320	11.99	12.50	
	802.11ac-VHT 40 MCS0	CH 54	5270	13.18	13.50	93.97
		CH 62	5310	12.87	13.50	
	802.11ac-VHT 80 MCS0	CH 58	5290	**13.52**	**14.00**	88.52

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	CH 100	5500	12.56	13.00	97.21
		CH 120	5600	12.47	13.00	
		CH 144	5720	12.30	13.00	
	802.11n-HT20 MCS0	CH 100	5500	12.47	13.00	97.04
		CH 120	5600	12.05	12.50	
		CH 144	5720	11.78	12.50	
	802.11n-HT40 MCS0	CH 102	5510	13.36	13.50	97.05
		CH 126	5630	13.22	13.50	
		CH 142	5710	12.90	13.50	
	802.11ac-VHT 20 MCS0	CH 100	5500	12.16	12.50	93.91
		CH 120	5600	12.11	12.50	
		CH 144	5720	11.87	12.50	
	802.11ac-VHT 40 MCS0	CH 102	5510	13.24	13.50	93.97
		CH 126	5630	13.11	13.50	
		CH 142	5710	12.85	13.50	
	802.11ac-VHT	CH 106	5530	**13.63**	**14.00**	88.52

	80 MCS0	CH 138	5690	13.45	14.00	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
5.8GHz WLAN	802.11a MCS0	CH 149	5745	15.07	15.50	97.21
		CH 157	5785	14.95	15.50	
		CH 165	5825	14.81	15.50	
	802.11n-HT20 MCS0	CH 149	5745	14.55	15.00	97.04
		CH 157	5785	14.37	15.00	
		CH 165	5825	14.23	15.00	
	802.11n-HT40 MCS0	CH 151	5755	15.63	16.00	97.05
		CH 159	5795	15.28	16.00	
	802.11ac-VHT 20 MCS0	CH 149	5745	14.64	15.00	93.91
		CH 157	5785	14.43	15.00	
		CH 165	5825	14.39	15.00	
	802.11ac-VHT 40 MCS0	CH 151	5755	15.52	16.00	93.97
		CH 159	5795	15.33	16.00	
	802.11ac-VHT 80 MCS0	CH 155	5775	**15.79**	**16.00**	88.52

<Bluetooth>

Mode	Channel	Frequency (MHz)	Average power (dBm)		
			1Mbps	2Mbps	3Mbps
BR / EDR	CH 00	2402	7.72	3.50	2.14
	CH 39	2441	**8.03**	3.32	2.42
	CH 78	2480	7.89	2.64	1.62
Tune-up Limit			8.50	4.00	3.00

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
LE	CH 00	2402	1.64
	CH 19	2440	1.17
	CH 39	2480	0.49
Tune-up Limit			2.00

4. RF Exposure Evaluation

➢ **Standalone transmission evaluation:**

Bands	Frequency (MHz)	Maximum Tune-up Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Power density (mW/cm²)	Limit for MPE (mW/cm²)
WLAN 2.4GHz	2437	14.5	4.0	70.79	0.015	1.0
WLAN 5GHz	5775	16.0	5.0	125.89	0.025	1.0

Note:

1. According to KDB 447498, SAR test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.
2. For 5GHz WLAN, only the worst case will be used for calculating the power density.
3. The Bluetooth belongs low power transmitters, according to KDB 447498 section 4.3.1, the 1-g SAR test exclusion thresholds at test separation Distances≤ 50 mm are determined by: [(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)] ≤ 3.0.
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison

Channel	Frequency (GHz)	Max. tune-up Power (dBm)	Max. Power (mW)	Test distance (mm)	Result	exclusion thresholds for 1-g SAR
CH 39	2.441	8.5	7.08	20	0.55	3.0

   Therefore SAR is not required for Bluetooth mode.

4. MPE calculate method

$$\text{Power Density} = EIRP/4\pi R^2$$

Where: EIRP = P+G

P = Output Power (dBm)

G = Antenna Gain (dBi)

R = Separation Distance (20cm)

➢ Simultaneous transmission evaluation:

Multi-Band simultaneous Transmission Consideration

Simultaneous Transmission Consideration	Position	Applicable Combination
	Body	WLAN 2.4GHz+ Bluetooth
		WLAN 5GHz +Bluetooth

1. This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v06, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is ≤1.6 W/kg. When standalone SAR is not required to be measured, per FCC KDB 447498 D01v06 4.3.2), the following equation must be used to estimate the standalone 1g SAR for simultaneous transmission assessment involving that transmitter.

$$\text{Estimated SAR} = \frac{\sqrt{f(GHz)}}{7.5} \cdot \frac{\text{Max. power of channel, mW}}{\text{Min. Separation Distance, mm}}$$

Mode	Max. tune-up Power (dBm)	Exposure Position	Body
		Test Distance (mm)	20
Bluetooth	8.5	Estimated SAR (W/kg)	0.074

2. The worst condition for WLAN & Bluetooth will be calculated for transmitting simultaneously.

Formula: Result=Power density $_1$/ limit $_1$ + SAR $_2$/ limit $_2$ ≤1

Transmission Bands	Power Density/ SAR	Limit	Simultaneous Transmission Result
WLAN 5GHz	0.025	1	0.071
Bluetooth	0.074	1.6	

Annex A General Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Laboratory Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
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2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
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END OF REPORT