RF EXPOSURE EVALUATION REPORT

Product Name:	High-End Smart Video Phone
Trade Mark:	GRANDSTREAM
Model No. / HVIN:	GXV3350
Add. Model No. / HVIN:	N/A
Report Number:	190613022RFC-5
Test Standards:	FCC 47 CFR Part 1 Subpart I RSS-102 Issue 5
FCC ID:	YZZGXV3350
IC:	11964A-GXV3350
Test Result:	PASS
Date of Issue:	August 5, 2019

Prepared for:

Grandstream Networks, Inc.
126 Brookline Ave., 3rd Floor, Boston, MA 02215, USA

Prepared by:

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Date: August 5, 2019

Version

Version No.	Date	Description
V1.0	August 5, 2019	Original

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

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

1.2 EUT INFORMATION

Product Name:	High-End Smart Video Phone		
Model No. / HVIN:	GXV3350		
Add. Model No. / HVIN:	N/A		
Trade Mark:	GRANDSTREAM		
DUT Stage:	Identical Prototype		
EUT Supports Function:	2.4 GHz ISM Band:	IEEE 802.11b/g/n	
		Bluetooth V4.2	
	5 GHz U-NII Bands:	5 150 MHz to 5 250 MHz	IEEE 802.11a/n
		5 250 MHz to 5 350 MHz	IEEE 802.11a/n
		5 470 MHz to 5 725 MHz	IEEE 802.11a/n
		5 725 MHz to 5 850 MHz	IEEE 802.11a/n
Software Version:	1.0.0.4		
Hardware Version:	V1.2A		

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

For BT_LE	
Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2402 MHz to 2480 MHz
Bluetooth Version:	Bluetooth LE
Type of Modulation:	GFSK
Number of Channels:	40
Channel Separation:	2 MHz
Antenna Type:	Dipole Antenna
Antenna Gain:	4 dBi
Maximum Peak Power:	0.77 dBm

For BT_EDR	
Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2402 MHz to 2480 MHz
Bluetooth Version:	Bluetooth BR + EDR
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Type of Modulation:	GFSK, π/4DQPSK, 8DPSK
Number of Channels:	79
Channel Separation:	1 MHz
Antenna Type:	Dipole Antenna
Antenna Gain:	4 dBi
Maximum Peak Power:	7.39 dBm

For 2.4 GHz ISM Band of Wi-Fi	
Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2412 MHz to 2462 MHz
Support Standards:	IEEE 802.11b, IEEE 802.11g, IEEE 802.11n-HT20, IEEE 802.11n-HT40
Type of Modulation:	IEEE 802.11b: DSSS(CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM(64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT20: OFDM(64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT40: OFDM(64-QAM, 16-QAM, QPSK, BPSK)
Data Rate:	IEEE 802.11b: Up to 11 Mbps IEEE 802.11g: Up to 54 Mbps IEEE 802.11n-HT20: Up to MCS7 IEEE 802.11n-HT40: Up to MCS7
Number of Channels:	IEEE 802.11b: 11 IEEE 802.11g: 11 IEEE 802.11n-HT20: 11 IEEE 802.11n-HT40: 7
Channel Separation:	5 MHz
Antenna Type:	Dipole Antenna
Antenna Gain:	4 dBi
Maximum Peak Power:	IEEE 802.11b: 20.85 dBm IEEE 802.11g: 24.13 dBm IEEE 802.11n-HT20: 24.20 dBm IEEE 802.11n-HT40: 23.29 dBm

For 5 GHz U-NII Bands of Wi-Fi	
Frequency Bands:	5150 MHz to 5250 MHz (U-NII-1)
	5250 MHz to 5350 MHz (U-NII-2A)
	5470 MHz to 5725 MHz (U-NII-2C)
	5 725 MHz to 5 850 MHz (U-NII-3)
Frequency Ranges:	5180 MHz to 5240 MHz
	5260 MHz to 5320 MHz
	5500 MHz to 5700 MHz
	5 745 MHz to 5 825 MHz
Support Standards:	IEEE 802.11a/n
TPC Function:	Not Support
DFS Operational mode:	Slave without radar Interference detection function
Type of Modulation:	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK)
	IEEE 802.11n: OFDM(64QAM, 16QAM, QPSK, BPSK)
Channel Spacing:	IEEE 802.11a/n-HT20: 20 MHz
	IEEE 802.11n-HT40: 40 MHz
Data Rate:	IEEE 802.11a: Up to 54 Mbps
	IEEE 802.11n-HT20: Up to MCS7
	IEEE 802.11a/n-HT20: 20 MHz
Number of Channels:	5150 MHz to 5250 MHz: 4 for IEEE 802.11a/n-HT20 2 for IEEE 802.11n-HT40
	5250 MHz to 5350 MHz: 4 for IEEE 802.11a/n-HT20 2 for IEEE 802.11n-HT40
	5470 MHz to 5725 MHz: 11 for IEEE 802.11a/n-HT20

	5 for IEEE 802.11n-HT40				
	5725 MHz to 5850 MHz: 5 for IEEE 802.11a/n-HT20 2 for IEEE 802.11n-HT40				
Antenna Type:	Dipole Antenna				
Antenna Gain:	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				
Maximum EIRP (dBm):	**Chain 0**		**U-NII-1**		
	IEEE 802.11a:		19.84		
	IEEE 802.11n-HT20:		19.78		
	IEEE 802.11n-HT40:		17.74		
Maximum conducted output power (dBm):		**U-NII-1**	**U-NII-2A**	**U-NII-2C**	**U-NII-3**
	IEEE 802.11a:	16.34	15.25	16.30	14.93
	IEEE 802.11n-HT20:	16.28	15.09	15.77	15.33
	IEEE 802.11n-HT40:	14.24	13.57	14.38	14.68

1.4 OTHER INFORMATION

Test channels for BT_LE				
Type of Modulation	**Tx/Rx Frequency**	**Test RF Channel Lists**		
		Lowest(L)	**Middle(M)**	**Highest(H)**
GFSK	2402 MHz to 2480 MHz	Channel 0	Channel 19	Channel 39
		2402 MHz	2440 MHz	2480 MHz

Test channels for BT_EDR				
Mode	**Tx/Rx Frequency**	**Test RF Channel Lists**		
		Lowest(L)	**Middle(M)**	**Highest(H)**
GFSK (DH1, DH3, DH5)	2402 MHz to 2480 MHz	Channel 0	Channel 39	Channel 78
		2402 MHz	2441 MHz	2480 MHz
π/4DQPSK (DH1, DH3, DH5)	2402 MHz to 2480 MHz	Channel 0	Channel 39	Channel 78
		2402 MHz	2441 MHz	2480 MHz
8DPSK (DH1, DH3, DH5)	2402 MHz to 2480 MHz	Channel 0	Channel 39	Channel 78
		2402 MHz	2441 MHz	2480 MHz

Test channels for 2.4 GHz ISM Band of Wi-Fi				
Mode	**Tx/Rx Frequency**	**Test RF Channel Lists**		
		Lowest(L)	**Middle(M)**	**Highest(H)**
IEEE 802.11b	2412 MHz to 2462 MHz	Channel 1	Channel 6	Channel 11
		2412 MHz	2437 MHz	2462 MHz
IEEE 802.11g	2412 MHz to 2462 MHz	Channel 1	Channel 6	Channel 11
		2412 MHz	2437 MHz	2462 MHz
IEEE 802.11n-HT20	2412 MHz to 2462 MHz	Channel 1	Channel 6	Channel 11
		2412 MHz	2437 MHz	2462 MHz
IEEE 802.11n-HT40	2422 MHz to 2452 MHz	Channel 3	Channel 7	Channel 9
		2422 MHz	2437 MHz	2452 MHz

Test channels for 5 GHz U-NII Bands of Wi-Fi				
Mode	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
IEEE 802.11a IEEE 802.11n-HT20	5150 MHz to 5250 MHz	Channel 36	Channel 44	Channel 48
		5180 MHz	5220 MHz	5240 MHz
	5250 MHz to 5350 MHz	Channel 52	Channel 60	Channel 64
		5260 MHz	5300 MHz	5320 MHz
	5470 MHz to 5725 MHz	Channel 100	Channel 116	Channel 140
		5500 MHz	5580 MHz	5700 MHz
	5725 MHz to 5850 MHz	Channel 149	Channel 157	Channel 165
		5745 MHz	5785 MHz	5825 MHz
IEEE 802.11n-HT40	5150 MHz to 5250 MHz	Channel 38	--	Channel 46
		5190 MHz	--	5230 MHz
	5250 MHz to 5350 MHz	Channel 54	--	Channel 62
		5270 MHz	--	5310 MHz
	5470 MHz to 5725 MHz	Channel 102	Channel 110	Channel 134
		5510 MHz	5550 MHz	5670 MHz
	5725 MHz to 5850 MHz	Channel 151	--	Channel 159
		5755 MHz	--	5795 MHz

1.5 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

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^2)	Averaging Times $\|E\|^2$, $\|H\|^2$ 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^2)	Averaging Times $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-100000	/	/	**1**	30

Note: f = frequency in MHz: * = Plane-wave equivalents 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[6] 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/4πR^2= EIRP/4πR^2
S = power density (in appropriate units, e.g., mw/cm2)
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 2412MHz to 2462 MHz for IEEE802.11b/g/n and
operating at 5150 MHz to 5250 MHz for IEEE802.11a/n and
operating at 5250 MHz to 5350 MHz for IEEE802.11a/n and
operating at 5470 MHz to 5725 MHz for IEEE802.11a/n and
operating at 5725 MHz to 5850 MHz for IEEE802.11a/n

3.4.1.1 Antenna Type:

Chain 0: Dipole Antenna

3.4.1.2 Antenna Gain:

Chain 0: 2412MHz to 2462 MHz: 4 dBi

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

3.4.1.3 Results for FCC 47 CFR Part 1 Subpart I

Operating Mode	Freq.	Declared maximum conducted average output power	Max. positive tolerance according manufacturer	Antenna Gain	Calculated maximum EIRP	Declared maximum EIRP	MPE Limit	MPE Value
	(MHz)	(dBm)		(dBi)	(dBm)	(mW)	(mW/cm^2)	
IEEE 802.11b	2412-2462	17	2	4.0	23	199.5262	1	0.0397
IEEE 802.11g	2412-2462	14	2	4.0	20	100.0000	1	0.0199
IEEE 802.11n-HT20	2412-2462	14	2	4.0	20	100.0000	1	0.0199
IEEE 802.11n-HT40	2412-2462	13	2	4.0	19	79.4328	1	0.0158
IEEE 802.11a	5180-5240	15	2	3.5	20.5	112.2018	1	0.0223
	5260-5320	15	2	3.5	20.5	112.2018	1	0.0223
	5500-5700	15	2	3.5	20.5	112.2018	1	0.0223
	5745-5825	15	2	3.5	20.5	112.2018	1	0.0223
IEEE 802.11n-HT20	5180-5240	15	2	3.5	20.5	112.2018	1	0.0223
	5260-5320	15	2	3.5	20.5	112.2018	1	0.0223
	5500-5700	15	2	3.5	20.5	112.2018	1	0.0223
	5745-5825	15	2	3.5	20.5	112.2018	1	0.0223
IEEE 802.11n-HT40	5190-5230	14	2	3.5	19.5	89.1251	1	0.0177
	5270-5310	14	2	3.5	19.5	89.1251	1	0.0177
	5510-5670	14	2	3.5	19.5	89.1251	1	0.0177
	5755-5795	14	2	3.5	19.5	89.1251	1	0.0177

3.4.1.4 Results for RSS-102 Issue 5

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 802.11b	2412-2462	17	2	4.0	23	0.1995	2.6840
IEEE 802.11g	2412-2462	14	2	4.0	20	0.1000	2.6840
IEEE 802.11n-HT20	2412-2462	14	2	4.0	20	0.1000	2.6840
IEEE 802.11n-HT40	2412-2462	13	2	4.0	19	0.0794	2.6840
IEEE 802.11a	5180-5240	15	2	3.5	20.5	0.1122	4.5253
	5260-5320	15	2	3.5	20.5	0.1122	4.5729
	5500-5700	15	2	3.5	20.5	0.1122	4.7145
	5745-5825	15	2	3.5	20.5	0.1122	4.8570
IEEE 802.11n-HT20	5180-5240	15	2	3.5	20.5	0.1122	4.5253
	5260-5320	15	2	3.5	20.5	0.1122	4.5729
	5500-5700	15	2	3.5	20.5	0.1122	4.7145
	5745-5825	15	2	3.5	20.5	0.1122	4.8570
IEEE 802.11n-HT40	5190-5230	14	2	3.5	19.5	0.0891	4.5312
	5270-5310	14	2	3.5	19.5	0.0891	4.5789
	5510-5670	14	2	3.5	19.5	0.0891	4.7204
	5755-5795	14	2	3.5	19.5	0.0891	4.8628

3.4.2 For BT

For BT_LE function, operating at 2402MHz to 2480 MHz for GFSK and

For BT_EDR function, operating at 2402MHz to 2480 MHz for GFSK, π/4 DQPSK, 8DPSK

3.4.2.1 Antenna Type:

Chain 0: Dipole Antenna

3.4.2.2 Antenna Gain:

Chain 0: 2402MHz to 2480 MHz: 4 dBi

3.4.2.3 Results for FCC 47 CFR Part 1 Subpart I

Operating Mode	Freq.	Declared maximum conducted average output power	Max. positive tolerance according manufacturer	Antenna Gain	Calculated maximum EIRP	Declared maximum EIRP	MPE Limit	MPE Value
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(mW)	(mW/cm^2)	
LE	2402-2480	-2	1	4.0	1.9953	1	0.0004	1.9953
EDR	2402-2480	8	2	4.0	25.1189	1	0.0050	25.1189

3.4.2.4 Results for RSS-102 Issue 5

Operating Mode	Freq.	Declared maximum conducted average output power	Max. positive tolerance according manufacturer	Antenna Gain	Calculated maximum EIRP	Declared maximum EIRP	Limit
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(W)	(W)
LE	2402-2480	-2	1	4.0	3	0.0020	2.6764
EDR	2402-2480	8	2	4.0	14	0.0251	2.6764

3.4.3 Simultaneous Multi-band Transmission MPE Analysis

3.4.4.1 List of Mode for Simultaneous Multi-band Transmission

No.	Configurations	Support/Not Support
1	2.4G _WLAN + BT	Not Support
2	5G_WLAN + BT	Not Support

3.4.4.2 Results for transmit simultaneously

Not applicable.

APPENDIX 1 PHOTOS OF TEST SETUP

Not applicable

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal Photos.

*** End of Report ***