Maximum Permissible Exposure Report

1. Product Information

FCC ID:	2AG6GH8951-LQA
Product name	Cellular Wi-Fi Router
Model number	H8951-LQA, H7921-LQA,H8922-LQA,H8922S-LQA,H7960-LQA, H8958-LQA
Power supply	DC 12V/1.5A adapter from AC 120V/60Hz
Antenna Gain	3.0dBi (max.) For WCDMA Band II; 3.0dBi (max.) For WCDMA Band IV; 3.0dBi (max.) For WCDMA Band V; 3.0dBi (max.) For LTE FDD Band 2; 3.0dBi (max.) For LTE FDD Band 4; 3.0dBi (max.) For LTE FDD Band 12; 3.0dBi (max.) For WLAN
Hardware version	V30
Software version	V703_SE
UMTS Operation Frequency Band	UMTS FDD Band II/IV/V
LTE Operation Frequency Band	LTE FDD band 2, FDD band 4, FDD band 12
WCDMA Release Version	R99
HSDPA Release Version	Release 10
HSUPA Release Version	Release 6
DC-HSUPA Release Version	Not Supported
LTE Release Version	R8
LTE/UMTS Power Class	Level 3
WLAN FCC Modulation Type	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)
WLAN FCC Operation frequency	IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz IEEE 802.11n HT40:2422-2452MHz
Antenna Type	Reverse SMA Antenna
Exposure category	General population/uncontrolled environment
EUT Type	Production Unit
Device Type	Mobile Device

2. Evaluation Method

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.
In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.
In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is ≤ 1.0. The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

3. Limit

3. 1 Refer evaluation method

ANSI C95.1–1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.
FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.
FCC CFR 47 part1 1.1310: Radiofrequency radiation exposure limits.
FCC CFR 47 part2 2.1091: Radiofrequency radiation exposure evaluation: mobile devices.

3. 2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	6
3.0 – 30	1842/f	4.89/f	($900/f^2$)*	6
30 – 300	61.4	0.163	1.0	6
300 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 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

4. MPE Calculation Method

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01

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

Where: S=power density
P=power input to antenna
G=power gain of the antenna in the direction of interest relative to an isotropic radiator
R=distance to the center of radiation of the antenna

5. Antenna Information

H8951-LQA can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna Identification in Internal photos	Antenna type and antenna number	Operate frequency band	Maximum antenna gain
Antenna 0	2.4G WLAN	External Antenna	2.4GHz – 2.5 GHz	3.00 dBi
Antenna 1	UMTS/LTE Antenna	External Antenna	600 MHz – 2.5 GHz	3.00 dBi
Antenna 2	UMTS/LTE Diversity Antenna (Only RX)	External Antenna	600 MHz – 2.5 GHz	3.00 dBi

6. Conducted Power

2.4GWLAN

Test Mode	Channel	Frequency (MHz)	Measured Peak Output Power (dBm)	Measured Average Output Power (dBm)
IEEE 802.11b	1	2412	18.45	15.45
	6	2437	18.66	15.62
	11	2462	18.11	15.54
IEEE 802.11g	1	2412	17.54	14.54
	6	2437	17.65	14.12
	11	2462	17.15	14.32
IEEE 802.11n HT20	1	2412	17.21	12.54
	6	2437	17.11	12.65
	11	2462	17.20	12.21
IEEE 802.11n HT40	3	2422	15.54	10.22
	6	2437	15.65	10.25
	9	2452	15.80	10.50

UMTS

Item	band	WCDMA Band II result (dBm)			WCDMA Band V result (dBm)			WCDMA Band IV result (dBm)		
		Channel/Frequency(MHz)			Channel/Frequency(MHz)			Channel/Frequency(MHz)		
	sub-test	9262/ 1852.4	9400/ 1880	9538/ 1907.6	4132/ 826.4	4183/ 836.6	4233/ 846.6	1312/ 1712.4	1413/ 1732.6	1513/ 1752.6
RMC	12.2kbps	23.65	23.65	23.71	23.66	23.75	23.75	23.56	23.78	23.69
HSDPA	Sub –Test 1	23.45	23.46	23.58	23.54	23.33	23.49	23.37	23.42	23.55
	Sub –Test 2	22.56	22.10	22.23	22.45	22.19	22.51	22.13	22.04	22.07
	Sub –Test 3	21.33	21.40	21.04	21.22	21.02	21.42	21.19	21.36	21.10
	Sub –Test 4	21.04	21.01	21.12	21.72	21.08	21.06	21.39	21.20	21.10
HSUPA	Sub –Test 1	22.65	22.02	22.51	22.12	22.94	22.54	22.78	22.86	22.69
	Sub –Test 2	21.21	21.03	21.16	21.28	21.32	21.24	21.29	21.08	21.31
	Sub –Test 3	21.30	21.22	21.33	21.34	21.25	21.32	21.63	21.15	21.24
	Sub –Test 4	21.15	21.12	21.23	21.22	21.12	21.14	21.53	21.05	21.11
	Sub –Test 5	20.47	21.02	20.46	20.03	20.48	21.03	20.21	20.44	20.30

LTE Band2

BW (MHz)	Frequency (MHz)	RB Configuration		Average Power [dBm]	
		Size	Offset	QPSK	16QAM
1.4	1850.7	1	0	25.20	24.26
		1	3	25.22	24.30
		1	5	25.25	24.31
		3	0	25.13	24.22
		3	2	25.21	24.23
		3	3	25.16	24.23
		6	0	24.44	23.25
	1880.0	1	0	25.05	24.33
		1	3	25.13	24.33
		1	5	25.19	24.37
		3	0	25.07	23.97
		3	2	25.06	24.05
		3	3	25.02	24.01
		6	0	24.37	23.11
	1909.3	1	0	25.16	24.20
		1	3	25.18	24.26
		1	5	25.21	24.26
		3	0	25.05	24.00
		3	2	25.13	24.10
		3	3	25.07	24.08
		6	0	24.43	23.31
3	1851.5	1	0	25.29	24.44
		1	7	25.40	24.55

		1	14	25.35	24.49
		8	0	24.47	23.40
		8	4	24.47	23.43
		8	7	24.52	23.45
		15	0	24.46	23.30
	1880.0	1	0	25.12	24.21
		1	7	25.22	24.29
		1	14	25.17	24.24
		8	0	24.33	23.22
		8	4	24.31	23.25
		8	7	24.38	23.24
		15	0	24.25	23.09
	1908.5	1	0	25.23	24.39
		1	7	25.31	24.45
		1	14	25.28	24.33
		8	0	24.34	23.21
		8	4	24.35	23.19
		8	7	24.37	23.22
		15	0	24.24	23.13
5	1852.5	1	0	25.33	24.52
		1	12	25.44	24.66
		1	24	25.40	24.62
		12	0	24.36	23.36
		12	6	24.40	23.40
		12	13	24.45	23.44
		25	0	24.37	23.29
	1880.0	1	0	25.15	24.32
		1	12	25.25	24.36
		1	24	25.24	24.32
		12	0	24.14	23.10
		12	6	24.18	23.13
		12	13	24.13	23.09
		25	0	24.06	22.98
	1907.5	1	0	25.24	24.11
		1	12	25.34	24.14
		1	24	25.31	24.04
		12	0	24.15	23.06
		12	6	24.20	23.11
		12	13	24.13	23.06
		25	0	24.12	23.04
10	1855.0	1	0	25.41	24.56
		1	24	25.47	24.64
		1	49	25.55	24.74
		25	0	24.30	23.20
		25	12	24.41	23.31
		25	25	24.54	23.47
		50	0	24.38	23.33
	1880.0	1	0	25.26	24.40
		1	24	25.26	24.32
		1	49	25.39	24.45
		25	0	24.11	23.00
		25	12	24.13	23.01
		25	25	24.10	22.97
		50	0	24.06	22.98
	1905.0	1	0	25.45	24.68
		1	24	25.33	24.56
		1	49	25.36	24.45
		25	0	24.21	23.18
		25	12	24.22	23.18
		25	25	24.25	23.20
		50	0	24.22	23.19
15	1857.5	1	0	25.46	24.60

		1	37	25.50	24.71
		1	74	25.55	24.75
		37	0	24.46	23.36
		37	18	24.55	23.45
		37	38	24.66	23.57
		75	0	24.57	23.47
	1880.0	1	0	25.37	24.51
		1	37	25.27	24.34
		1	74	25.49	24.57
		37	0	24.32	23.18
		37	18	24.37	23.20
		37	38	24.39	23.20
		75	0	24.31	23.19
	1902.5	1	0	25.62	24.72
		1	37	25.40	24.56
		1	74	25.45	24.47
		37	0	24.50	23.42
		37	18	24.43	23.34
		37	38	24.43	23.36
		75	0	24.44	23.34
20	1860.0	1	0	25.62	24.70
		1	49	25.64	24.74
		1	99	25.62	24.71
		50	0	24.27	23.18
		50	25	24.47	23.37
		50	50	24.61	23.54
		100	0	24.50	23.41
	1880.0	1	0	25.59	24.67
		1	49	25.41	24.39
		1	99	25.75	24.73
		50	0	24.13	23.05
		50	25	24.15	23.03
		50	50	24.14	23.00
		100	0	24.15	23.04
	1900.0	1	0	25.76	24.87
		1	49	25.54	24.72
		1	99	25.56	24.62
		50	0	24.40	23.36
		50	25	24.35	23.30
		50	50	24.42	23.39
		100	0	24.44	23.36

LTE Band4

BW (MHz)	Frequency (MHz)	RB Configuration		Average Power [dBm]	
		Size	Offset	QPSK	16QAM
1.4	1710.7	1	0	21.63	20.87
		1	3	21.62	20.89
		1	5	21.62	20.80
		3	0	21.89	21.20
		3	2	21.87	21.10
		3	3	21.85	21.08
		6	0	20.78	20.11
	1732.5	1	0	21.53	20.83
		1	3	21.72	20.95
		1	5	21.71	20.98
		3	0	21.85	20.48
		3	2	21.91	20.85
		3	3	21.55	20.95
		6	0	20.79	19.91
	1754.3	1	0	22.07	21.68
		1	3	22.13	21.79
		1	5	22.12	21.76

		3	0	22.26	21.39
		3	2	22.31	21.42
		3	3	22.30	21.45
		6	0	21.26	20.37
3	1711.5	1	0	21.73	20.91
		1	7	21.72	20.91
		1	14	21.45	20.61
		8	0	20.88	19.93
		8	4	20.81	19.86
		8	7	20.77	19.82
		15	0	20.82	19.91
	1732.5	1	0	21.55	20.23
		1	7	21.87	20.21
		1	14	21.94	20.11
		8	0	20.12	18.93
		8	4	20.09	19.15
		8	7	20.04	19.08
		15	0	19.96	19.19
	1753.5	1	0	22.16	21.33
		1	7	22.27	21.46
		1	14	22.13	21.34
		8	0	21.37	20.52
		8	4	21.34	20.52
		8	7	21.35	20.49
		15	0	21.37	20.38
5	1712.0	1	0	21.71	20.95
		1	12	21.57	20.81
		1	24	21.23	20.48
		12	0	20.68	19.61
		12	6	20.64	19.57
		12	13	20.58	19.52
		25	0	20.65	19.71
	1732.5	1	0	21.40	19.78
		1	12	21.79	20.05
		1	24	21.98	20.20
		12	0	19.77	18.72
		12	6	19.88	18.85
		12	13	20.02	18.98
		25	0	19.91	19.01
	1752.5	1	0	21.75	21.60
		1	12	22.10	21.65
		1	24	22.07	21.52
		12	0	21.31	20.37
		12	6	21.32	20.38
		12	13	21.20	20.26
		25	0	21.24	20.35
10	1715.0	1	0	21.87	21.04
		1	24	21.37	20.54
		1	49	21.07	20.24
		25	0	20.47	19.53
		25	12	20.38	19.45
		25	25	20.23	19.31
		50	0	20.35	19.43
	1732.5	1	0	21.31	20.31
		1	24	21.82	20.72
		1	49	22.43	20.71
		25	0	19.97	18.84
		25	12	19.86	19.10
		25	25	20.14	19.34
		50	0	19.93	19.16
	1750.0	1	0	21.99	21.78
		1	24	21.85	21.36

		1	49	21.71	21.31
		25	0	21.26	20.42
		25	12	21.38	20.44
		25	25	21.22	20.33
		50	0	21.30	20.32
15	1717.5	1	0	21.89	21.03
		1	37	21.17	20.35
		1	74	21.06	20.24
		37	0	20.37	19.38
		37	18	20.22	19.22
		37	38	19.99	19.00
		75	0	20.17	19.21
	1732.5	1	0	21.20	20.29
		1	37	21.87	20.76
		1	74	22.61	21.50
		37	0	19.89	18.69
		37	18	20.48	19.28
		37	38	20.49	19.59
		75	0	20.16	19.18
	1747.5	1	0	21.87	21.27
		1	37	21.60	20.90
		1	74	21.46	20.74
		37	0	21.18	20.41
		37	18	20.98	20.40
		37	38	21.18	20.50
		75	0	21.52	20.52
20	1720.0	1	0	22.10	21.51
		1	49	21.15	20.65
		1	99	21.62	21.20
		50	0	20.24	19.27
		50	25	20.10	19.13
		50	50	19.80	18.82
		100	0	20.02	19.01
	1732.5	1	0	21.37	20.89
		1	49	21.97	21.52
		1	99	22.88	22.16
		50	0	19.97	18.89
		50	25	20.28	19.09
		50	50	20.76	20.01
		100	0	20.29	19.18
	1745.0	1	0	21.56	20.65
		1	49	21.67	20.83
		1	99	21.51	20.67
		50	0	20.54	19.61
		50	25	20.62	19.71
		50	50	20.66	19.98
		100	0	21.16	20.22

LTE Band12

BW (MHz)	Frequency (MHz)	RB Configuration		Average Power [dBm]	
		Size	Offset	QPSK	16QAM
1.4	699.7	1	0	24.43	23.63
		1	3	24.46	23.69
		1	5	24.45	23.62
		3	0	24.63	23.93
		3	2	24.63	23.88
		3	3	24.59	23.86
		6	0	23.56	22.87
	707.5	1	0	24.33	23.71
		1	3	24.47	23.79
		1	5	24.41	23.76
		3	0	24.62	23.89
		3	2	24.65	23.94
		3	3	24.62	23.91
		6	0	23.62	22.77
	715.3	1	0	24.56	24.20
		1	3	24.59	24.23
		1	5	24.60	24.18
		3	0	24.75	23.88
		3	2	24.81	23.89
		3	3	24.79	23.83
		6	0	23.82	22.93
3	700.5	1	0	24.44	23.62
		1	7	24.75	23.84
		1	14	24.52	23.57
		8	0	23.72	22.73
		8	4	23.65	22.71
		8	7	23.64	22.67
		15	0	23.72	22.80
	707.5	1	0	24.41	23.63
		1	7	24.71	23.76
		1	14	24.49	23.64
		8	0	23.67	22.71
		8	4	23.69	22.73
		8	7	23.72	22.74
		15	0	23.70	22.80
	715.3	1	0	24.60	23.82
		1	7	24.74	23.97
		1	14	24.57	23.76
		8	0	23.86	23.02
		8	4	23.83	23.01
		8	7	23.84	22.99
		15	0	23.86	22.86
5	701.5	1	0	24.42	23.68
		1	12	24.51	23.77
		1	24	24.43	23.67
		12	0	23.63	22.54
		12	6	23.60	22.51
		12	13	23.58	22.50
		25	0	23.61	22.70
	707.5	1	0	24.40	23.67
		1	12	24.57	23.81
		1	24	24.47	23.71
		12	0	23.58	22.51
		12	6	23.64	22.56
		12	13	23.69	22.62
		25	0	23.67	22.72
	714.5	1	0	24.52	23.91
		1	12	24.77	24.12
		1	24	24.58	23.91

		12	0	23.78	22.84
		12	6	23.81	22.84
		12	13	23.68	22.72
		25	0	23.74	22.83
10	704	1	0	24.56	23.68
		1	24	24.42	23.64
		1	49	24.53	23.69
		25	0	23.48	22.58
		25	12	23.48	22.57
		25	25	23.56	22.61
		50	0	23.52	22.61
	707.5	1	0	24.44	23.64
		1	24	24.51	23.68
		1	49	24.71	23.82
		25	0	23.53	22.59
		25	12	23.59	22.63
		25	25	23.68	22.73
		50	0	23.65	22.74
	713.5	1	0	24.57	23.83
		1	24	24.65	23.92
		1	49	24.73	23.98
		25	0	23.58	22.52
		25	12	23.68	22.46
		25	25	23.53	22.86
		50	0	23.59	22.58

7. Measurement Results

7.1 Standalone MPE

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, r =20cm, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

2.4GHz WLAN

Antenna 0

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW					
IEEE 802.11b	16.00	39.8107	3.0000	1.9953	100%	0.0158	1.0000
IEEE 802.11g	15.00	31.6228	3.0000	1.9953	100%	0.0126	1.0000
IEEE 802.11n HT20	13.00	19.9526	3.0000	1.9953	100%	0.0079	1.0000
IEEE 802.11n HT40	11.00	12.5893	3.0000	1.9953	100%	0.0050	1.0000

WWAN Main Antenna (UMTS/LTE)

Antenna 1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW					
UMTS Band V	24.00	251.1886	3.0000	1.9953	100%	0.0998	0.5493
UMTS Band IV	24.00	251.1886	3.0000	1.9953	100%	0.0998	1.0000
UMTS Band II	24.00	251.1886	3.0000	1.9953	100%	0.0998	1.0000
LTE Band 2 – QPSK	26.00	398.1072	3.0000	1.9953	100%	0.1581	1.0000
LTE Band 2 – 16QAM	25.00	316.2278	3.0000	1.9953	100%	0.1256	1.0000
LTE Band 4 – QPSK	23.00	199.5262	3.0000	1.9953	100%	0.0792	1.0000
LTE Band 4 – 16QAM	22.00	158.4893	3.0000	1.9953	100%	0.0629	1.0000
LTE Band 12 – QPSK	25.00	316.2278	3.0000	1.9953	100%	0.1256	0.4660
LTE Band 12 – 16QAM	24.00	251.1886	3.0000	1.9953	100%	0.0998	0.4660

Remark:
1. Output power (Average) including turn-up tolerance;
2. Output power was adjust to duty cycle at 100% if measured duty cycle less than 98%;
3. MPE evaluate distance is 20cm from user manual provide by manufacturer;

7.2 Simultaneous Transmission MPE

H8951-LQA supports 1 antennas for 2.4GHz WLAN and 1 antennas for UMTS/LTE, 1 Diversity Antenna (Only RX) for UMTS/LTE, and the 2 transmitter antennas can transmit simultaneous.
According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;
∑ of MPE ratios ≤ 1.0

7.2.2 Summary simultaneous transmission results

Maximum Simultaneous transmission MPE Ratios for 2.4GHz WLAN and WWAN Main Antenna (UMTS/LTE transmitter antenna)

Maximum MPE ratio $_{2.4GWLAN}$	Maximum MPE ratio $_{WWAN}$	∑MPE ratios	Limit	Results
0.0158	0.2695	0.3	1.0	PASS

8. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

----------THE END OF REPORT----------