

RF Exposure Evaluation declaration

Product Name : Module

Model No. : HL7648

FCC ID : N7NHL7648

Applicant : Sierra Wireless Inc.

Address : 13811 Wireless Way, Richmond, BC, V6V 3A4 Canada

Date of Receipt : Oct. 04, 2016

Date of Declaration : Oct. 19, 2016

Report No. : 16A0092R-SAUSP01V00

Report Version : V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Module
Model No.	HL7648
Trade Name	AirPrime
IMEI No.	014697000023926
FCC ID	N7NHL7648
Modulation	LTE Band 2 : QPSK/16-QAM
	LTE Band 4 : QPSK/16-QAM
	LTE Band 12 : QPSK/16-QAM
TX Frequency	LTE Band 2: 1850~1910MHz
	LTE Band 4 : 1710MHz~1755MHz
	LTE Band 12 : 699MHz~716MHz
Rx Frequency	LTE Band 2: 1930~1990MHz
	LTE Band 4: 2110~2155MHz
	LTE Band 12 : 729MHz ~746MHz
Bandwidth	LTE Band 2: 1.4MHz/3MHz/5MHz/10MHz/15MHz/20MHz
	LTE Band 4: 1.4MHz/3MHz/5MHz/10MHz/15MHz/20MHz
	LTE Band 12 : 1.4MHz/3MHz/5MHz/10MHz
HW Version	1.0
SW Version	AHL7648.A.2.0.
Antenna Type	Dipole

1.2. Antenna List :

No.	Manufacturer	Part No.	Peak Gain
1	Pulse	SPDA24700/2700	2dBi

2. RF Exposure Evaluation

2.1. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b).

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (Minutes)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	F/1500	30
1500-100,000	--	--	1	30

F= Frequency in MHz

Friis Formula

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

2.2. Test Procedure

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

The temperature and related humidity: 21°C and 60% RH.

2.3. Test Result of RF Exposure Evaluation

Product : Module
Test Item : RF Exposure Evaluation
Test Site : N/A

LTE Band 2 -Peak Gain: 2dBi

Frequency	Conducted Peak Power (dBm)	Maximum ERP/EIRP (W)	Maximum ERP/EIRP Limit (W)	Duty Cycle (%)	Conducted Average Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)	Pass/Fail
1857.5	23.41	0.348	2	100	23.41	219.3	0.0691	1.00	Pass
1880	23.48	0.353	2	100	23.48	222.8	0.0703	1.00	Pass
1902.5	23.86	0.385	2	100	23.86	243.2	0.0767	1.00	Pass

LTE Band 4 -Peak Gain: 2dBi

Frequency	Conducted Peak Power (dBm)	Maximum ERP/EIRP (W)	Maximum ERP/EIRP Limit (W)	Duty Cycle (%)	Conducted Average Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)	Pass/Fail
1717.5	23.50	0.355	1	100	23.50	223.9	0.0706	1.00	Pass
1732.5	23.56	0.360	1	100	23.56	227.0	0.0716	1.00	Pass
1747.5	23.50	0.355	1	100	23.50	223.9	0.0706	1.00	Pass

LTE Band 12 -Peak Gain: 2dBi

Frequency	Conducted Peak Power (dBm)	Maximum ERP/EIRP (W)	Maximum ERP/EIRP Limit (W)	Duty Cycle (%)	Conducted Average Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)	Pass/Fail
699.7	23.61	0.222	3	100	23.61	229.6	0.0724	0.47	Pass
707.5	23.50	0.216	3	100	23.50	223.9	0.0706	0.47	Pass
715.3	23.59	0.221	3	100	23.59	228.6	0.0721	0.48	Pass

Note: The conducted output power is refer to report No.: 16A0092R-HPUSP45V00 from the QuieTek.

2.4. Maximum Antenna Gain Evaluation (Reference Only)

Mode	Frequency	Conducted Peak Power (dBm)	Maximum tune up Power (dBm)	Max Gain to comply with ERP/EIRP		Max Gain to comply with MPE		
				Antenna Gain(dBi)	Maximum ERP/EIRP Limit (W)	Antenna Gain(dBi)	Distance (cm)	Limit (mW/cm ²)
LTE Band 2	1857.5	23.41	25.00	8.01	2	12.01	20	1.00
	1880.0	23.48	25.00	8.01	2	12.01	20	1.00
	1902.5	23.86	25.00	8.01	2	12.01	20	1.00

Note: In order to comply with both ERP/EIRP and Maximum Permissible Exposure limit, the maximum antenna gain shall not be greater than 8.01 dBi in LTE Band 2.

Mode	Frequency	Conducted Peak Power (dBm)	Maximum tune up Power (dBm)	Max Gain to comply with ERP/EIRP		Max Gain to comply with MPE		
				Antenna Gain(dBi)	Maximum ERP/EIRP Limit (W)	Antenna Gain(dBi)	Distance (cm)	Limit (mW/cm ²)
LTE Band 4	1717.5	23.50	25.00	5	1	12.01	20	1.00
	1732.5	23.56	25.00	5	1	12.01	20	1.00
	1747.5	23.50	25.00	5	1	12.01	20	1.00

Note: In order to comply with both ERP/EIRP and Maximum Permissible Exposure limit, the maximum antenna gain shall not be greater than 5 dBi in LTE Band 4.

Mode	Frequency	Conducted Peak Power (dBm)	Maximum tune up Power (dBm)	Max Gain to comply with ERP/EIRP		Max Gain to comply with MPE		
				Antenna Gain(dBi)	Maximum ERP/EIRP Limit (W)	Antenna Gain(dBi)	Distance (cm)	Limit (mW/cm ²)
LTE Band 12	699.7	23.61	25.00	9.77	3	8.70	20	0.47
	707.5	23.50	25.00	9.77	3	8.75	20	0.47
	715.3	23.59	25.00	9.77	3	8.80	20	0.48

Note: In order to comply with both ERP/EIRP and Maximum Permissible Exposure limit, the maximum antenna gain shall not be greater than 8.7 dBi in LTE Band 12.