

RF Exposure Evaluation Declaration

Product Name : Module
Trade Name : AirPrime
Model No. : HL7748
FCC ID. : N7NHL7748

Applicant : Sierra Wireless Inc.

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

Date of Receipt : Aug. 21, 2017
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Report No. : 1780384R-RFUSP02V00
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1. RF Exposure Evaluation

1.1. 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	6
1500-100,000	--	--	1	30

F= Frequency in MHz

Friis Formula

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

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.

1.2. 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: 18°C and 78% RH.

1.3. Test Result of RF Exposure Evaluation

Product	Module
Test Mode	Mode 1: LTE_CAT-M1_Band 2_QPSK_Link
Test Condition	RF Exposure Evaluation

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is 9 dBi or 7.94 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ² .)
	(dBm)	(mW)	(dBm)	(mW)		
1850.7	25	316.23	23.66	232.27	0.50	1.00
1878.3	25	316.23	23.58	228.03	0.50	1.00
1909.3	25	316.23	23.44	220.80	0.50	1.00

Product	Module
Test Mode	Mode 2: LTE_CAT-M1_Band 2_16-QAM_Link
Test Condition	RF Exposure Evaluation

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is 9 dBi or 7.94 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ² .)
	(dBm)	(mW)	(dBm)	(mW)		
1850.7	25	316.23	23.09	203.70	0.50	1.00
1878.3	25	316.23	23.27	212.32	0.50	1.00
1909.3	25	316.23	23.36	216.77	0.50	1.00

Product	Module
Test Mode	Mode 3: LTE_CAT-M1_Band 4_QPSK_Link
Test Condition	RF Exposure Evaluation

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is 6 dBi or 3.98 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ² .)
	(dBm)	(mW)	(dBm)	(mW)		
1710.7	25	316.23	23.39	218.27	0.25	1.00
1730.8	25	316.23	23.78	238.78	0.25	1.00
1754.3	25	316.23	23.68	233.35	0.25	1.00

Product	Module
Test Mode	Mode 4: LTE_CAT-M1_Band 4_16-QAM_Link
Test Condition	RF Exposure Evaluation

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is 6 dBi or 3.98 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ² .)
	(dBm)	(mW)	(dBm)	(mW)		
1710.7	25	316.23	23.32	214.78	0.25	1.00
1730.8	25	316.23	23.56	226.99	0.25	1.00
1754.3	25	316.23	23.45	221.31	0.25	1.00

Product	Module
Test Mode	Mode 5: LTE_CAT-M1_Band 12_QPSK_Link
Test Condition	RF Exposure Evaluation

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is 6 dBi or 3.98 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ² .)
	(dBm)	(mW)	(dBm)	(mW)		
699.7	25	316.23	24.14	259.42	0.25	0.47
705.7	25	316.23	24.16	260.62	0.25	0.47
715.3	25	316.23	23.96	248.89	0.25	0.48

Product	Module
Test Mode	Mode 6: LTE_CAT-M1_Band 12_16-QAM_Link
Test Condition	RF Exposure Evaluation

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is 6 dBi or 3.98 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)
	(dBm)	(mW)	(dBm)	(mW)		
699.7	25	316.23	23.49	223.36	0.25	0.47
705.7	25	316.23	23.58	228.03	0.25	0.47
715.3	25	316.23	23.69	233.88	0.25	0.48