



# A Test Lab Techno Corp.

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## MPE Report

Test Report No.	: 1511FS11
Applicant	: Sierra Wireless Inc.
Manufacturer	: Sierra Wireless Inc.
Product Type	: Module
Trade Name	: AirPrime
Model Number	: HL7618
Date of Received	Nov. 16, 2015
Test Period	: Nov. 16, 2015
Date of Issued	Dec. 09, 2015
Test Specification	: ANSI / IEEE Std.C95.1-1992 47 CFR § 2.1091 47 CFR §1.1310
Location of Test Lab.	: Chang-an Lab.

1. The test operations have to be performed with cautious behavior, the test results are as attached.
2. The test results are under chamber environment of A Test Lab Techno Corp. A Test Lab Techno Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples.
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## 1. Description of Equipment under Test (EUT)

Applicant	Sierra Wireless Inc. 13811 Wireless Way, Richmond, BC, Canada V6V 3A4					
Manufacturer	Sierra Wireless Inc. 13811 Wireless Way, Richmond, BC, Canada V6V 3A4					
Product Type	Module					
Trade Name	AirPrime					
Model Number	HL7618					
FCC ID	N7NHL7618					
IMEI Number	355463070000006					
Frequency Range	Band	UL Frequency (MHz)	DL Frequency (MHz)	Modulation		
	LTE Band 4	1710 ~ 1755	2110 ~ 2155	QPSK, 16QAM		
	LTE Band 13	777 ~ 787	746 ~ 756	QPSK, 16QAM		
Channel Bandwidth	LTE Band 4 : 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 13: 5MHz, 10MHz					
Transmit Power (conducted power)	Band	QPSK		16QAM		
		(dBm)	(W)	(dBm)	(W)	
	LTE Band 4 (Channel Bandwidth 1.4MHz)		22.69	0.186	22.38	0.173
	LTE Band 4 (Channel Bandwidth 3MHz)		22.93	0.196	22.38	0.173
	LTE Band 4 (Channel Bandwidth 5MHz)		22.91	0.195	22.39	0.173
	LTE Band 4 (Channel Bandwidth 10MHz)		22.92	0.196	22.35	0.172
	LTE Band 4 (Channel Bandwidth 15MHz)		23.01	0.200	22.23	0.167
	LTE Band 4 (Channel Bandwidth 20MHz)		22.74	0.188	22.05	0.160
	LTE Band 13 (Channel Bandwidth 5MHz)		22.36	0.172	21.85	0.153
LTE Band 13 (Channel Bandwidth 10MHz)		22.02	0.159	21.78	0.151	
Antenna Specification	LTE Band 4: 6.99 dBi LTE Band 13 : 11.87 dBi					
Temperature Range	-30 ~ +55°C					
RF Evaluation	5.20 W/m <sup>2</sup>					

The above equipment was tested by A Test Lab Techno Corp. For compliance with the requirements set forth in 47 CFR § 2.1091 & 47 CFR § 1.1310. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties



## 2. Human Exposure Assessment

Due to the design and installation of this product, it is not possible to conduct SAR evaluation. This is because client either manufactures or supplies the antenna(s) that will be used in the installation of this product. Therefore, this product will be evaluated as a mobile device per 47 CFR §1.1310 titled "Radiofrequency radiation exposure limits", generally referred to as MPE limits.

In 47 CFR § 2.1091, paragraph (b) defines a mobile device 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 cm is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons." This product is intended to be installed into a vehicle such that the unit is physically secured at one location. In the installation guide supplied with the product,

Client has made the following statement: "IMPORTANT: To meet the FCC's RF Exposure Guidelines, the antenna should be installed so there is at least 20 cm of separation between the body of the user and nearby persons and the antenna". Based on the installation of the transceiver and the antenna, the transmitters radiating structure is more than 20 cm from the user. Thus, this product is a "mobile device" as defined in section § 2.1091 paragraph (b).

Exposure evaluation

$$S = \frac{PG}{4\pi R^2}$$

$$G_{max} = \frac{4\pi R^2}{P_{av}} S_{limit}$$

Where

S: power density

P: power input to the 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.



### 3. RF Output Power

Band	Channel Bandwidth	Modulation	Channel	Frequency (MHz)	RB Configuration		Average Power			
					Size	Offset	(dBm)	(W)		
LTE Band 4	1.4 MHz	QPSK	19957	1710.7	1	0	22.39	0.173		
					1	2	22.36	0.172		
					1	5	22.34	0.171		
					3	0	22.34	0.171		
					3	1	22.31	0.170		
					3	3	22.29	0.169		
			6	0	21.37	0.137				
			20175	1732.5	1	0	22.42	0.175		
					1	2	22.40	0.174		
					1	5	22.40	0.174		
					3	0	22.40	0.174		
					3	1	22.36	0.172		
					3	3	22.33	0.171		
			6	0	21.36	0.137				
			20393	1754.3	1	0	<b>22.69</b>	<b>0.186</b>		
					1	2	22.65	0.184		
					1	5	22.65	0.184		
					3	0	22.62	0.183		
					3	1	22.61	0.182		
					3	3	22.58	0.181		
			6	0	21.65	0.146				
			16QAM	19957	1710.7	1	0	21.91	0.155	
						1	2	21.78	0.151	
						1	5	21.66	0.147	
		3				0	21.50	0.141		
		3				1	21.49	0.141		
		3				3	21.45	0.140		
		6				0	21.37	0.137		
		20175				1732.5	1	0	21.64	0.146
							1	2	21.60	0.145
							1	5	21.50	0.141
							3	0	21.39	0.138
							3	1	21.32	0.136
				3	3		21.26	0.134		
		6		0	20.50	0.112				
		20393		1754.3	1	0	<b>22.38</b>	<b>0.173</b>		
					1	2	22.31	0.170		
					1	5	22.00	0.158		
					3	0	21.90	0.155		
					3	1	21.82	0.152		
					3	3	21.79	0.151		
		6		0	20.96	0.125				





Band	Channel Bandwidth	Modulation	Channel	Frequency (MHz)	RB Configuration		Average Power		
					Size	Offset	(dBm)	(W)	
LTE Band 4	5 MHz	QPSK	19975	1712.5	1	0	22.55	0.180	
					1	12	22.54	0.179	
					1	24	22.39	0.173	
					12	0	21.50	0.141	
					12	6	21.46	0.140	
					12	13	21.46	0.140	
			20175	1732.5	25	0	21.40	0.138	
					1	0	22.54	0.179	
					1	12	22.46	0.176	
					1	24	22.33	0.171	
					12	0	21.57	0.144	
					12	6	21.56	0.143	
			20375	1752.5	12	13	21.55	0.143	
					25	0	21.55	0.143	
					1	0	<b>22.91</b>	<b>0.195</b>	
					1	12	22.86	0.193	
					1	24	22.70	0.186	
					12	0	21.87	0.154	
			16QAM	19975	1712.5	12	6	21.85	0.153
						12	13	21.83	0.152
						25	0	21.82	0.152
						1	0	21.80	0.151
						1	12	21.76	0.150
						1	24	21.61	0.145
		20175		1732.5	12	0	20.65	0.116	
					12	6	20.62	0.115	
					12	13	20.57	0.114	
					25	0	20.54	0.113	
					1	0	22.15	0.164	
					1	12	21.88	0.154	
		20375		1752.5	1	24	21.58	0.144	
					12	0	20.76	0.119	
					12	6	20.75	0.119	
					12	13	20.57	0.114	
					25	0	20.54	0.113	
					1	0	<b>22.39</b>	<b>0.173</b>	
		19975		1712.5	1	12	22.34	0.171	
					1	24	22.25	0.168	
					12	0	21.08	0.128	
					12	6	21.00	0.126	
					12	13	20.89	0.123	
					25	0	20.88	0.122	



Band	Channel Bandwidth	Modulation	Channel	Frequency (MHz)	RB Configuration		Average Power	
					Size	Offset	(dBm)	(W)
LTE Band 4	10 MHz	QPSK	20000	1715.0	1	0	22.66	0.185
					1	24	22.46	0.176
					1	49	22.46	0.176
					25	0	22.22	0.167
					25	12	22.03	0.160
					25	25	21.65	0.146
			50	0	21.39	0.138		
			1	0	<b>22.92</b>	<b>0.196</b>		
			1	24	22.50	0.178		
			1	49	22.43	0.175		
			25	0	21.67	0.147		
			25	12	21.62	0.145		
			25	25	21.61	0.145		
			50	0	21.50	0.141		
			1	0	22.84	0.192		
			1	24	22.78	0.190		
			1	49	22.74	0.188		
			25	0	21.94	0.156		
			25	12	21.88	0.154		
			25	25	21.82	0.152		
			50	0	21.78	0.151		
			1	0	21.78	0.151		
			1	24	21.62	0.145		
			1	49	21.33	0.136		
		25	0	20.69	0.117			
		25	12	20.59	0.115			
		25	25	20.57	0.114			
		50	0	20.41	0.110			
		1	0	22.30	0.170			
		1	24	22.17	0.165			
		1	49	22.01	0.159			
		25	0	20.77	0.119			
		25	12	20.66	0.116			
		25	25	20.62	0.115			
		50	0	20.60	0.115			
		1	0	<b>22.35</b>	<b>0.172</b>			
		1	24	22.32	0.171			
		1	49	22.19	0.166			
		25	0	20.99	0.126			
		25	12	20.97	0.125			
		25	25	20.93	0.124			
		50	0	20.89	0.123			





Band	Channel Bandwidth	Modulation	Channel	Frequency (MHz)	RB Configuration		Average Power	
					Size	Offset	(dBm)	(W)
LTE Band 4	15 MHz	QPSK	20025	1717.5	1	0	22.54	0.179
					1	38	22.46	0.176
					1	74	22.03	0.160
					38	0	21.67	0.147
					38	18	21.63	0.146
					38	37	21.49	0.141
			75	0	21.31	0.135		
			1	0	22.77	0.189		
			1	38	22.57	0.181		
			1	74	22.52	0.179		
			38	0	21.75	0.150		
			38	18	21.61	0.145		
			38	37	21.49	0.141		
			75	0	21.44	0.139		
			1	0	<b>23.01</b>	<b>0.200</b>		
			1	38	22.74	0.188		
			1	74	22.61	0.182		
			38	0	22.01	0.159		
			38	18	21.90	0.155		
			38	37	21.87	0.154		
			75	0	21.75	0.150		
			1	0	21.74	0.149		
			1	38	21.72	0.149		
			1	74	21.61	0.145		
		38	0	20.72	0.118			
		38	18	20.52	0.113			
		38	37	20.52	0.113			
		75	0	20.44	0.111			
		1	0	21.98	0.158			
		1	38	21.72	0.149			
		1	74	21.71	0.148			
		38	0	20.76	0.119			
		38	18	20.70	0.117			
		38	37	20.67	0.117			
		75	0	20.51	0.112			
		1	0	<b>22.23</b>	<b>0.167</b>			
		1	38	22.22	0.167			
		1	74	21.99	0.158			
		38	0	20.99	0.126			
		38	18	20.91	0.123			
		38	37	20.91	0.123			
		75	0	20.78	0.120			



Band	Channel Bandwidth	Modulation	Channel	Frequency (MHz)	RB Configuration		Average Power	
					Size	Offset	(dBm)	(W)
LTE Band 4	20 MHz	QPSK	20050	1720.0	1	0	22.69	0.186
					1	49	22.16	0.164
					1	99	22.01	0.159
					50	0	21.70	0.148
					50	25	21.50	0.141
					50	50	21.49	0.141
			100	0	21.28	0.134		
			1	0	22.49	0.177		
			1	49	22.32	0.171		
			1	99	22.01	0.159		
			50	0	21.67	0.147		
			50	25	21.57	0.144		
			50	50	21.50	0.141		
			100	0	21.33	0.136		
			1	0	<b>22.74</b>	<b>0.188</b>		
			1	49	22.48	0.177		
			1	99	22.29	0.169		
			50	0	21.89	0.155		
			50	25	21.85	0.153		
			50	50	21.69	0.148		
			100	0	21.67	0.147		
			1	0	22.01	0.159		
			1	49	21.44	0.139		
			1	99	21.17	0.131		
		50	0	20.75	0.119			
		50	25	20.50	0.112			
		50	50	20.44	0.111			
		100	0	20.42	0.110			
		1	0	<b>22.05</b>	<b>0.160</b>			
		1	49	21.68	0.147			
		1	99	21.60	0.145			
		50	0	20.68	0.117			
		50	25	20.54	0.113			
		50	50	20.49	0.112			
		100	0	20.41	0.110			
		1	0	22.05	0.160			
		1	49	21.91	0.155			
		1	99	21.81	0.152			
		50	0	20.90	0.123			
		50	25	20.78	0.120			
		50	50	20.71	0.118			
		100	0	20.60	0.115			



Band	Channel Bandwidth	Modulation	Channel	Frequency (MHz)	RB Configuration		Average Power	
					Size	Offset	(dBm)	(W)
LTE Band 13	5 MHz	QPSK	23205	779.5	1	0	22.20	0.166
					1	12	22.11	0.163
					1	24	22.08	0.161
					12	0	21.30	0.135
					12	6	21.25	0.133
					12	13	21.19	0.132
			25	0	21.18	0.131		
			1	0	22.19	0.166		
			1	12	22.16	0.164		
			1	24	22.11	0.163		
			12	0	21.29	0.135		
			12	6	21.28	0.134		
			12	13	21.28	0.134		
			25	0	21.27	0.134		
			1	0	<b>22.28</b>	<b>0.169</b>		
			1	12	22.24	0.167		
			1	24	22.02	0.159		
			12	0	21.26	0.134		
			12	6	21.21	0.132		
			12	13	21.19	0.132		
			25	0	21.16	0.131		
			1	0	<b>21.85</b>	<b>0.153</b>		
			1	12	21.57	0.144		
			1	24	21.21	0.132		
		12	0	20.32	0.108			
		12	6	20.30	0.107			
		12	13	20.23	0.105			
		25	0	20.17	0.104			
		1	0	21.67	0.147			
		1	12	21.64	0.146			
		1	24	21.39	0.138			
		12	0	20.49	0.112			
		12	6	20.41	0.110			
		12	13	20.36	0.109			
		25	0	20.29	0.107			
		1	0	21.44	0.139			
		1	12	21.40	0.138			
		1	24	21.08	0.128			
		12	0	20.37	0.109			
		12	6	20.31	0.107			
		12	13	20.30	0.107			
		25	0	20.27	0.106			



Band	Channel Bandwidth	Modulation	Channel	Frequency (MHz)	RB Configuration		Average Power	
					Size	Offset	(dBm)	(W)
LTE Band 13	10 MHz	QPSK	23230	782.0	1	0	<b>22.02</b>	<b>0.159</b>
					1	24	21.77	0.150
					1	49	21.53	0.142
					25	0	21.29	0.135
					25	12	21.28	0.134
					25	25	21.27	0.134
					50	0	21.11	0.129
		16QAM	23230	782.0	1	0	<b>21.78</b>	<b>0.151</b>
					1	24	21.15	0.130
					1	49	20.77	0.119
					25	0	20.46	0.111
					25	12	20.37	0.109
					25	25	20.32	0.108
					50	0	20.20	0.105



#### 4. Max. Gain Evaluation

Band	Channel Bandwidth	Modulation	Frequency (MHz)	Limit (mw)/cm <sup>2</sup>	Distance (cm) [R]	Duty Cycle	Calculations to meet EIRP limits				Calculations to meet MPE limits		
							Max. power (dBm)	EIRP limits (W)	Antenna gain to meet EIRP limits		max tune-up power (upper limit) (dBm) [P]	Antenna Gain limits (dBi)	Numeric Gain [G]
									Numeric	[dBi]			
LTE Band 4	1.4 M	QPSK	1710.7	1.00	20	1	22.39	1.00	5.76	7.60	23.1	24.61	13.91
			1732.5	1.00	20	1	22.42	1.00	5.72	7.57	23.1	24.61	13.91
			1754.3	1.00	20	1	22.69	1.00	5.38	7.31	23.1	24.61	13.91
	3 M	QPSK	1711.5	1.00	20	1	22.60	1.00	5.49	7.40	23.1	24.61	13.91
			1732.5	1.00	20	1	22.60	1.00	5.49	7.40	23.1	24.61	13.91
			1753.5	1.00	20	1	22.93	1.00	5.09	7.07	23.1	24.61	13.91
	5 M	QPSK	1712.5	1.00	20	1	22.55	1.00	5.55	7.44	23.1	24.61	13.91
			1732.5	1.00	20	1	22.54	1.00	5.57	7.46	23.1	24.61	13.91
			1752.5	1.00	20	1	22.91	1.00	5.11	7.08	23.1	24.61	13.91
	10 M	QPSK	1715.0	1.00	20	1	22.66	1.00	5.42	7.34	23.1	24.61	13.91
			1732.5	1.00	20	1	22.92	1.00	5.10	7.08	23.1	24.61	13.91
			1750.0	1.00	20	1	22.84	1.00	5.19	7.15	23.1	24.61	13.91
	15 M	QPSK	1717.5	1.00	20	1	22.54	1.00	5.57	7.46	23.1	24.61	13.91
			1732.5	1.00	20	1	22.77	1.00	5.28	7.23	23.1	24.61	13.91
			1747.5	1.00	20	1	23.01	1.00	5.00	6.99	23.1	24.61	13.91
	20 M	QPSK	1720.0	1.00	20	1	22.69	1.00	5.38	7.31	23.1	24.61	13.91
			1732.5	1.00	20	1	22.49	1.00	5.63	7.51	23.1	24.61	13.91
			1745.0	1.00	20	1	22.74	1.00	5.32	7.26	23.1	24.61	13.91

Min G1:6.99 dBi

Min G2: 13.91 dBi

Min G(G1,G2) : 6.99 dBi

G1 : Antenna gain(dBi) to comply with EIRP limits

G2 : Antenna gain(dBi) to comply with MPE limits

Note: In order to comply with MPE and ERP limits therefore the max antenna gain should not exceed 6.99 dBi in LTE Band 4.



Band	Channel Bandwidth	Modulation	Frequency (MHz)	Limit (mw)/cm <sup>2</sup>	Distance (cm) [R]	Duty Cycle	Calculations to meet ERP limits				Calculations to meet MPE limits		
							Max. power (dBm)	ERP limits (W)	Antenna gain to meet ERP limits		max tune-up power (upper limit) (dBm) [P]	Antenna Gain limits (dBi)	Numeric Gain [G]
									Numeric	[dBi]			
LTE Band 13	5 M	QPSK	779.5	0.520	20	1	22.20	30.00	296.56	24.72	22.3	15.39	11.87
			782.0	0.521	20	1	22.19	30.00	297.24	24.73	22.3	15.42	11.88
			784.5	0.523	20	1	22.28	30.00	291.15	24.64	22.3	15.48	11.90

Min G1: 24.64 dBi

Min G2: 11.87 dBi

Min G(G1,G2) :11.87 dBi

G1 : Antenna gain(dBi) to comply with ERP limits

G2 : Antenna gain(dBi) to comply with MPE limits

Note: In order to comply with MPE and ERP limits therefore the max antenna gain should not exceed 11.87 dBi in LTE Band 13.

Summary gain	
Band	Antenna Gain evaluation(dBi)
LTE Band 4	6.99
LTE Band 13	11.87



## 5. Test Result

Band	Channel Bandwidth	Modulation	Frequency (MHz)	Limit (mw/cm <sup>2</sup> )	Distance (cm) [R]	Max Tune-up Power (upper limit) (dBm) [P]	ANT Gain [G] (dBi)	Numeric Gain [G]	Duty Cycle	[P] x [G] with Duty cycle (mW) [TP]	Power Density (mw/cm <sup>2</sup> ) [S]
LTE Band 4	15 M	QPSK	1717.5	1.000	20	23.10	6.99	5	1	1020.869	0.203
			1732.5	1.000	20	23.10	6.99	5	1	1020.869	0.203
			1747.5	1.000	20	23.10	6.99	5	1	1020.869	0.203
LTE Band 13	5 M	QPSK	779.50	0.520	20	22.30	11.87	15.38	1	2611.899	0.520
			782.00	0.521	20	22.30	11.87	15.38	1	2611.899	0.520
			784.50	0.523	20	22.30	11.87	15.38	1	2611.899	0.520

Note: The Numeric Gain calculated by  $10^{(\text{ant. Gain(dBi)} / 10)}$ .