



A Test Lab Techno Corp.

Changan Lab : N o. 140-1, Changan Street, Bade District, Taoyuan City 33465, Taiwan (R.O.C)
Tel : 886-3-271-0188 / Fax : 886-3-271-0190



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.
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Approved By

: Bill Hu
(Bill Hu)

Tested By

: Sky Chou
(Sky Chou)



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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 ²					

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	22.69	0.186
					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	22.38	0.173
					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	3 MHz	QPSK	19965	1711.5	1	0	22.60	0.182
					1	8	22.52	0.179
					1	14	22.40	0.174
					8	0	21.65	0.146
					8	4	21.62	0.145
					8	7	21.61	0.145
					15	0	21.56	0.143
			20175	1732.5	1	0	22.60	0.182
					1	8	22.54	0.179
					1	14	22.49	0.177
					8	0	21.65	0.146
					8	4	21.63	0.146
					8	7	21.62	0.145
					15	0	21.56	0.143
			20385	1753.5	1	0	22.93	0.196
					1	8	22.89	0.195
					1	14	22.84	0.192
					8	0	21.98	0.158
					8	4	21.92	0.156
					8	7	21.91	0.155
					15	0	21.89	0.155
		16QAM	19965	1711.5	1	0	21.96	0.157
					1	8	21.82	0.152
					1	14	21.55	0.143
					8	0	20.79	0.120
					8	4	20.75	0.119
					8	7	20.66	0.116
					15	0	20.63	0.116
			20175	1732.5	1	0	22.02	0.159
					1	8	21.77	0.150
					1	14	21.68	0.147
					8	0	20.72	0.118
					8	4	20.71	0.118
					8	7	20.65	0.116
					15	0	20.55	0.114
			20385	1753.5	1	0	22.38	0.173
					1	8	22.12	0.163
					1	14	21.85	0.153
					8	0	21.11	0.129
					8	4	21.10	0.129
					8	7	21.03	0.127
					15	0	20.92	0.124

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
					25	0	21.40	0.138
			20175	1732.5	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
					12	13	21.55	0.143
					25	0	21.55	0.143
			20375	1752.5	1	0	22.91	0.195
					1	12	22.86	0.193
					1	24	22.70	0.186
					12	0	21.87	0.154
					12	6	21.85	0.153
					12	13	21.83	0.152
					25	0	21.82	0.152
		16QAM	19975	1712.5	1	0	21.80	0.151
					1	12	21.76	0.150
					1	24	21.61	0.145
					12	0	20.65	0.116
					12	6	20.62	0.115
					12	13	20.57	0.114
					25	0	20.54	0.113
			20175	1732.5	1	0	22.15	0.164
					1	12	21.88	0.154
					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
			20375	1752.5	1	0	22.39	0.173
					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
			20175	1732.5	50	0	21.39	0.138
					1	0	22.92	0.196
					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
			20350	1750.0	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
		16QAM	20000	1715.0	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
			20175	1732.5	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
			20350	1750.0	1	0	22.35	0.172
					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
			20175	1732.5	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
			20325	1747.5	1	0	23.01	0.200
					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
		16QAM	20025	1717.5	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
			20175	1732.5	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
			20325	1747.5	1	0	22.23	0.167
					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
			20175	1732.5	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
			20300	1745.0	1	0	22.74	0.188
					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
		16QAM	20050	1720.0	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
			20175	1732.5	1	0	22.05	0.160
					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
			20300	1745.0	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
			23230	782.0	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
			23255	784.5	1	0	22.28	0.169
					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
		16QAM	23205	779.5	1	0	21.85	0.153
					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
			23230	782.0	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
			23255	784.5	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	22.02	0.159
					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	21.78	0.151
					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 ²	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 ²	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 ²)	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 ²) [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 $10^{(\text{ant. Gain(dBi)} / 10)}$.