INTERNAL CELLULAR ANTENNA

For purposes of this exhibit the internal antenna gain is defined as the gain of the stamped metal antenna in the module plastic case exterior, minus all path losses.

INTERNAL ANTENNA GAIN

The internal antenna gain derived below is strictly an evaluation by Sierra Wireless' certified OTA test lab of the Honeywell host assembly containing the SL3010T module and a stamped metal antenna in the host's plastic case exterior.

The Sierra SL3010T cellular module maximum RMS power comes from the maximum of the lab report data across the two lab reports included with the two FCC listings for the cellular module. This is described further in the updated exhibit, "SL5011 PC2 EXHIBIT 2-4A-D INT ANTENNA.pdf", which determines the values to be 23.98dBm for the Cellular band and 24.13dBm for the PCS band.

Cellular Band

For stamped-metal antenna 2 (Unit #2 below), the maximum Peak EIRP is 24.88 dBm in the cellular band. So the estimated gain is 24.88dBm - 23.98dBm = +0.90 dBi for the CDMA 800 (CELL) band .

PCS Band

For stamped-metal antenna 2 (Unit #2 below), the maximum Peak EIRP is 25.90 dBm in the PCS band. So the estimated gain is 25.90dBm - 24.13dBm = +1.77 dBi for the CDMA 1900 (PCS) band .

Radiated Performance Test Reults

Radiated Performance Test Results (TRP/TIS)

Comments:
1. Unit#1, No ferrite on power cable
2. ESN:60E050E2

Band/ Channel	Freq (MHz)	Cond. Power (dBm)	TRP (dBm)	Peak EIRP (dBm)	Band/ Channel	Freq (MHz)	Cond. Sensitivity (dBm)	TIS (dBm)	Peak EIS (dBm)
CDMA 800 (CELL)			Target:20dBm		CDMA 800 (CELL)			Target:-101dBm	
1013	824.70		20.52	23.76	1013	869.70		-97.51	-100.59
384	836.52		20.65	23.56	384	881.52		-96.57	-101.91
777	848.31		20.36	22.78	777	893.31		-96.26	-100.72
Average		**0.00**	**20.51**	**23.39**	**Average**		**0.00**	**-96.81**	**-101.12**
CDMA 1900 (PCS)			Target:20dBm		CDMA 1900 (PCS)			Target:-101dBm	
25	1851.25		17.46	21.52	25	1931.25		-103.49	-107.80
600	1880.00		19.31	23.54	600	1960.00		-104.41	-109.36
1175	1908.75		19.00	23.39	1175	1988.75		-102.88	-108.65
Average		**0.00**	**18.66**	**22.91**	**Average**		**0.00**	**-103.64**	**-108.65**

Comments:
1. Unit#2, No ferrite on power cable
2. ESN:60E1A8DE

Band/ Channel	Freq (MHz)	Cond. Power (dBm)	TRP (dBm)	Peak EIRP (dBm)	Band/ Channel	Freq (MHz)	Cond. Sensitivity (dBm)	TIS (dBm)	Peak EIS (dBm)
CDMA 800 (CELL)			Target:20dBm		CDMA 800 (CELL)			Target:-101dBm	
1013	824.70		21.19	24.88	1013	869.70		-96.44	-99.97
384	836.52		20.72	23.65	384	881.52		-96.83	-101.99
777	848.31		20.15	23.04	777	893.31		-95.25	-99.58
Average		**0.00**	**20.71**	**23.93**	**Average**		**0.00**	**-96.22**	**-100.65**
CDMA 1900 (PCS)			Target:20dBm		CDMA 1900 (PCS)			Target:-101dBm	
25	1851.25		20.64	25.19	25	1931.25		-103.89	-108.19
600	1880.00		21.41	25.90	600	1960.00		-103.73	-108.20
1175	1908.75		21.41	25.89	1175	1988.75		-102.15	-105.59
Average		**0.00**	**21.17**	**25.67**	**Average**		**0.00**	**-103.32**	**-107.49**

Table 1. Sierra Wireless Radiated Performance Test Results

LOW BAND EMISSIONS

The information in this table is from (1) the radiated emissions lab report included with Sierra's N7N-SL5011 original FCC listing, and (2) the radiated emissions lab report included with Sierra's N7N-SL5011 FCC listing for the class 2 permissive change.

Files:
(1) SL5011 Test Report FOR FCC and IC Certifications IC: 2417C-SL5011 FCC ID: N7NSL5011 (Original Filing)
(2) SL3010T Test Report FOR FCC Certifications FCC ID: N7NSL5011 (PC2)
Sierra Wireless Report Dates: February 18, 2011 (Orig. Filing), August 22, 2013 (PC2)
CDMA-2000 Max Duty Cycle = 100%

MEASUREMENTS FROM REPORT FOR: N7N-SL5011 850 MHz and 1900 MHz Band RF Power Output §2.0153, §22.917						
BAND:	MODE:	TEST:	CHANNEL:	FREQ (MHz):	PEAK (dbm):	RMS while XMIT (dbm): (note 1)
850	CDMA 2000	Lab Meas. for Orig. Filing	1013	824.7	28.48	23.98
850	CDMA 2000	Lab Meas. for Orig. Filing	384	836.52	28.43	23.89
850	CDMA 2000	Lab Meas. for Orig. Filing	777	848.31	28.32	23.82
850	CDMA 2000	Lab Meas. for PC2	1013	824.7	27.88	23.38
850	CDMA 2000	Lab Meas. for PC2	384	836.52	28.18	23.64
850	CDMA 2000	Lab Meas. for PC2	777	848.31	28.04	23.54
Maximum Conducted Power in 850MHz Band					28.48	23.98

note 1 - This column is the average taken during transmitter-on time only; duty-factor is not included.

HIGH BAND EMISSIONS

The information in this table is from the radiated emissions lab report included with Sierra's N7N-SL5011 FCC listing.

Files:
(1) SL5011 Test Report FOR FCC and IC Certifications IC: 2417C-SL5011 FCC ID: N7NSL5011 (Original Filing)
(2) SL3010T Test Report FOR FCC Certifications FCC ID: N7NSL5011 (PC2)
Sierra Wireless Report Dates: February 18, 2011 (Orig. Filing), August 22, 2013 (PC2)
CDMA-2000 Max Duty Cycle = 100%

MEASUREMENTS FROM REPORT FOR: N7N-SL5011 850 MHz and 1900 MHz Band RF Power Output §2.0153, §24.238						
BAND:	MODE:	TEST:	CHANNEL:	FREQ (MHz):	PEAK (dbm):	RMS while XMIT (dbm): (note 1)
1900	CDMA 2000	Lab Meas. for Orig. Filing	25	1851.25	28.63	24.13
1900	CDMA 2000	Lab Meas. for Orig. Filing	600	1880	28.54	24.04
1900	CDMA 2000	Lab Meas. for Orig. Filing	1175	1908.75	28.59	24.09
1900	CDMA 2000	Lab Meas. for PC2	25	1851.25	28.35	23.85
1900	CDMA 2000	Lab Meas. for PC2	600	1880	28.44	23.94
1900	CDMA 2000	Lab Meas. for PC2	1175	1908.75	28.28	23.78
Maximum Conducted Power in 850MHz Band					28.63	24.13

note 1 - This column is the average taken during transmitter-on time only; duty-factor is not included

ANTENNA GAIN CALCULATIONS

PATH LOSS

The printed antenna on the plastic case has spring contact which connects to an exposed trace point on the PCB (see included internal photos exhibit). For 'worst case' calculations, the path loss of this connection is considered to be 0dB.

GAIN CALCULATIONS: WORST CASE ANTENNA GAIN

The calculated worst case 'antenna gain + path loss', for the low and high bands, is in column 16 of the table below.

BAND	MEASURED ANT GAIN				DATA FROM GEMALTO LAB REPORT							DETERMINATION OF COMPLIANCE TO EXEMPTION LIMIT					
col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	col 10	col 11	col 12	col 13	col 14	col 15	col 16	col 17	col 18
	Freq. (Mhz)	Charac-teristic Internal Antenna Gain	Path Loss	Net Antenna Gain +Loss	Technology	Max 'Avg. during xmit' Pwr (dBm) (note 1)	Inherent Duty Factor (dBi)	Max Time-Averaged Pwr (note 2)	Freq. (MHz)	Sierra Test Report Filename	Sierra Test Report Page	FCC: 1.1310(e) Exposure Limit (all intentional radiators) (avg with duty factor) (note 2) (note 4)	FCC: 2.1091(c)(1) RF Exposure Eval (Mobile devices only) (avg with duty factor) (note 2)	**<1.5G:** FCC: Effective Radiated Pwr Limit from 22.913(a)(2) (ERP)(Cellular Devices Only) (avg while xmit), for <1.5G (note 1) ——— **>1.5G:** FCC: EMC Limit from 24.232(c) (EIRP) (Cellular Devices Only) (avg while xmit), for >1.5G (note 1)	**Calculated Worst Case Allowed Internal Antenna Net Gain + Loss (dBi)** (note 3)	Current Antenna's Net Gain + Loss (dBi)	Is Current Antenna's Net Gain + Loss Compliant to FCC Exemption Limit?
LOW BAND GAIN (AMPS)	(824 - 896)	0.90dBi	0dB	0.90dBi	CDMA-2000	23.98	0	23.98	836.52	TR1.pdf, TR2.pdf	5, 5	2.76W_EIRP =34.41dBm	=2.46W_EIRP =33.91dBm	7W_ERP = 11.48W_EIRP = 40.60dBm	9.9	0.90	Y
HIGH BAND GAIN (PCS)	(1850 – 1990)	1.77dBi	0dB	1.77dBi	CDMA-2000	24.13	0	24.13	1880.0	TR1.pdf, TR2.pdf	5, 5	5.03W_EIRP =37.01dBm	4.92W_EIRP =36.92dBm	1.22W_ERP =2W_EIRP =33.01dBm	8.9	1.77	Y

note 1 - This is the average taken during transmitter-on time only; duty-factor is not included.
note 2 - This is time-averaged maximum power. It includes duty-factor.
note 3 - This is the worst case (minimum) of these three calculations: (1) col 13- col 9, (2) col 14-col 9, and (3) col 15-col 7. This lists the worst case antenna gain to meet the given FCC exemption/power limits for the transmit technology in col 6.
note 4 - =[f(in MHz)/1500] mW/cm^2, averaged over 30 min
=[824.20/1500] mW/cm^2
= 0.5495 mW/cm2 @20cm limit
=2.76W_EIRP