GPS LINK BUDGET Room 3033 (ROBOTICS

	L1		L2	
Satellite Transmitter				
Satellite Transmitter Power (25 Watts)	14	dBW	14	dBW
RF Losses in transmitter path	-1.25	dB	-1.25	dB
Antenna Gain (with respect to isotrope)	13.5	dBi	13.5	dBi
Satellite ERP	26.25	**dBW**	26.25	**dBW**
Propagation				
Atmospheric and Polarization Losses	-0.5	dB	-0.5	dB
Free Space Path Loss	-1.84E+02	dB	-1.82E+02	dB
Received Power on Earth dBW	-1.59E+02	**dBW**	-1.57E+02	**dBW**
Received Power on Earth dBm	-1.29E+02	**dBm**	-1.27E+02	**dBm**
Facility Re-radiation System				
Gain of Receive Antenna	36.5	dBic	36.5	dB
RF Losses in Cable & Connectors (min.)	-7.16	dB	-6.19	dB
(from Receive Antenna to Amplifier)				
Gain of Line Amplifier (adjusted & measure	18.4	dB	17.8	dB
RF Losses in Cable & Connectors (meas.)	-0.95	dB	-0.82	dB
(from Amplifier to Passive Antenna)				
Gain of Passive Radiating Antenna	3.5	dBic	3.5	dBc
Free Space Path Loss (100ft)	-6.61E+01	dB	-6.39E+01	dB
RF Power Level at 100ft Distanc	**-1.44E+02**	**dBm**	**-1.40E+02**	**dBm**
*Sum of gains & losses between W1 & W2				

Free Space Path Loss Calculations
Satellite to Earth

where d = distance	2.52E+07	m	2.52E+07	m
lambda = wavelength = c/f	1.91E-01		2.44E-01	
c = speed of light	3.00E+08	m/sec	3.00E+08	m/sec
f = frequency	1.57E+09	Hz	1.23E+09	Hz
Free Space Path Los	-1.84E+02	dB	-1.82E+02	dB

100ft from Passive Antenna

where d = distance	3.05E+01	m	3.05E+01	m
lambda = wavelength = c/f	1.91E-01		2.44E-01	
c = speed of light	3.00E+08	m/sec	3.00E+08	m/sec
f = frequency	1.57E+09	Hz	1.23E+09	Hz
Free Space Path Los	-6.61E+01	dB	-6.39E+01	dB

GPS LINK BUDGET

Room 3297 (SIL)	L1									L2								
Satellite Transmitter																		
Satellite Transmitter Power (25 Watts)	14	dBW								14	dBW							
RF Losses in transmitter path	-1.25	dB								-1.25	dB							
Antenna Gain (with respect to isotrope)	13.5	dBi								13.5	dBi							
Satellite ERP	26.25	**dBW**								26.25	**dBW**							
Propagation																		
Atmospheric and Polarization Losses	-0.5	dB								-0.5	dB							
Free Space Path Loss	-1.84E+02	dB								-1.82E+02	dB							
Received Power on Earth dBW	-1.59E+02	**dBW**								-1.57E+02	**dBW**							
Received Power on Earth dBm	-1.29E+02	**dBm**								-1.27E+02	**dBm**							
Room#	3175A	Screen Rm	3163	3297A	3297B	3297C	3297D	3175B		3175A	Screen Rm	3163	3297A	3297B	3297C	3297D	3175B	
Facility Re-radiation System	**PORT 1**	**PORT 2**	**PORT 3**	**PORT 4**	**PORT 5**	**PORT 6**	**PORT 7**	**PORT 8**		**PORT 1**	**PORT 2**	**PORT 3**	**PORT 4**	**PORT 5**	**PORT 6**	**PORT 7**	**PORT 8**	
Gain of Receive Antenna	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	dBic	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	dB
RF Losses in Cable & Connectors (min)	-2	-2	-2	-2	-2	-2	-2	-2	dB	-1.73	-1.73	-1.73	-1.73	-1.73	-1.73	-1.73	-1.73	dB
(from Receive Antenna to Amplifier)																		
Gain of Line Amplifier (measured)	32.73	31.68	32.58	32.21	32.35	32.3	32.28	32.36	dB	37.65	37.72	37.52	37.12	37.5	37.52	37.7	37.65	dB
RF Losses in Cable & Connectors	-5.6	-10.79	-15.08	-3.97	-4.22	-4.4	-4.17	-5.6	dB	-5.11	-9.32	-12.95	-3.48	-3.86	-4	-3.8	-5.11	dB
(from Amplifier to Passive Antenna)																		
Gain of Passive Radiating Antenna	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	dBic	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	dBc
Free Space Path Loss (100ft)	-6.61E+01	-6.61E+01	-6.61E+01	-6.61E+01	-6.61E+01	-6.61E+01	-6.61E+01	-6.61E+01	dB	-6.39E+01	-6.39E+01	-6.39E+01	-6.39E+01	-6.39E+01	-6.39E+01	-6.39E+01	-6.39E+01	dB
Additional Attenuators	-20	-16	-12	-21	-21	-21	-22	-20		-20	-16	-12	-21	-21	-21	-22	-20	
RF Power Level at 100ft Distance	**-1.50E+02**	**-1.52E+02**	**-1.51E+02**	**-1.49E+02**	**-1.50E+02**	**-1.50E+02**	**-1.51E+02**	**-1.50E+02**	**dBm**	**-1.40E+02**	**-1.40E+02**	**-1.40E+02**	**-1.40E+02**	**-1.40E+02**	**-1.40E+02**	**-1.40E+02**	**-1.40E+02**	**dBm**

Free Space Path Loss Calculations

Satellite to Earth	**L1**									**L2**	
where d = distance	2.52E+07	m								2.52E+07	m
lambda = wavelength = c/f	1.91E-01									2.44E-01	
c = speed of light	3.00E+08	m/sec								3.00E+08	m/sec
f = frequency	1.57E+09	Hz								1.23E+09	Hz
Free Space Path Loss	-1.84E+02	dB								-1.82E+02	dB

100ft from Passive Antenna

where d = distance	3.05E+01	m								3.05E+01	m
lambda = wavelength = c/f	1.91E-01									2.44E-01	
c = speed of light	3.00E+08	m/sec								3.00E+08	m/sec
f = frequency	1.57E+09	Hz								1.23E+09	Hz
Free Space Path Loss	-6.61E+01	dB								-6.39E+01	dB

Band	**L1**									**L2**								
Amplified Splitter Port	**PORT 1**	**PORT 2**	**PORT 3**	**PORT 4**	**PORT 5**	**PORT 6**	**PORT 7**	**PORT 8**		**PORT 1**	**PORT 2**	**PORT 3**	**PORT 4**	**PORT 5**	**PORT 6**	**PORT 7**	**PORT 8**	
Line Gain Amplifier (measured)	16.68	16.68	16.68	16.68	16.68	16.68	16.68	16.68	dB	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	dB
Antenuator	-1	-1	-1	-1	-1	-1	-1	-1	dB	-1	-1	-1	-1	-1	-1	-1	-1	dB
Amplifiered Splitter Port Gain (measured)	17.05	16	16.9	16.53	16.67	16.62	16.6	16.68	dB	17.95	18.02	17.82	17.42	17.8	17.82	18	17.95	dB
Total	**32.73**	**31.68**	**32.58**	**32.21**	**32.35**	**32.3**	**32.28**	**32.36**	**dB**	**37.65**	**37.72**	**37.52**	**37.12**	**37.5**	**37.52**	**37.7**	**37.65**	**dB**

GPS LINK BUDGET Room 4005 (Scorpion)

	L1		L2	
Satellite Transmitter				
Satellite Transmitter Power (25 Watts)	14	dBW	14	dBW
RF Losses in transmitter path	-1.25	dB	-1.25	dB
Antenna Gain (with respect to isotrope)	13.5	dBi	13.5	dBi
Satellite ERP	26.25	**dBW**	26.25	**dBW**
Propagation				
Atmospheric and Polarization Losses	-0.5	dB	-0.5	dB
Free Space Path Loss	-1.84E+02	dB	-1.82E+02	dB
Received Power on Earth dBW	-1.59E+02	**dBW**	-1.57E+02	**dBW**
Received Power on Earth dBm	-1.29E+02	**dBm**	-1.27E+02	**dBm**
Facility Re-radiation System				
Gain of Receive Antenna	36.5	dBic	36.5	dB
RF Losses in Cable & Connectors (min.)	-5.261	dB	-4.604	dB
(from Receive Antenna to Amplifier)				
Gain of Line Amplifier (adjusted & measured)*	17.4	dB	16.8	dB
RF Losses in Cable & Connectors (meas.)	-1.9	dB	-1.65	dB
(from Amplifier to Passive Antenna)				
Gain of Passive Radiating Antenna	3.5	dBic	3.5	dBc
Free Space Path Loss (100ft)	-6.61E+01	dB	-6.39E+01	dB
RF Power Level at 100ft Distance	**-1.44E+02**	**dBm**	**-1.40E+02**	**dBm**

*Sum of gains & losses between W1 & W2

Free Space Path Loss Calculations
Satellite to Earth

where d = distance	2.52E+07	m	2.52E+07	m
lambda = wavelength = c/f	1.91E-01		2.44E-01	
c = speed of light	3.00E+08	m/sec	3.00E+08	m/sec
f = frequency	1.57E+09	Hz	1.23E+09	Hz
Free Space Path Loss	-1.84E+02	dB	-1.82E+02	dB

100ft from Passive Antenna

where d = distance	3.05E+01	m	3.05E+01	m
lambda = wavelength = c/f	1.91E-01		2.44E-01	
c = speed of light	3.00E+08	m/sec	3.00E+08	m/sec
f = frequency	1.57E+09	Hz	1.23E+09	Hz
Free Space Path Loss	-6.61E+01	dB	-6.39E+01	dB

GPS LINK BUDGET

Room 4006	L1					L2				
Satellite Transmitter										
Satellite Transmitter Power (25 Watts)	14	dBW				14	dBW			
RF Losses in transmitter path	-1.25	dB				-1.25	dB			
Antenna Gain (with respect to isotrope)	13.5	dBi				13.5	dBi			
Satellite ERP	26.25	**dBW**				26.25	**dBW**			
Propagation										
Atmospheric and Polarization Losses	-0.5	dB				-0.5	dB			
Free Space Path Loss	-1.84E+02	dB				-1.82E+02	dB			
Received Power on Earth dBW	-1.59E+02	**dBW**				-1.57E+02	**dBW**			
Received Power on Earth dBm	-1.29E+02	**dBm**				-1.27E+02	**dBm**			
Facility Re-radiation System	**PORT 1**	**PORT 2**	**PORT 3**	**PORT 4**		**PORT 1**	**PORT 2**	**PORT 3**	**PORT 4**	
Gain of Receive Antenna	36.5	36.5	36.5	36.5	dBic	36.5	36.5	36.5	36.5	dB
RF Losses in Cable & Connectors (min.)	-6.91	-6.91	-6.91	-6.91	dB	-6.29	-6.29	-6.29	-6.29	dB
(from Receive Antenna to Amplifier)										
Gain of Line Amplifier (measured)	31.84	31.55	31.85	31.6	dB	30.4	30.3	30.5	30.41	dB
RF Losses in Cable & Connectors	-1.51	-1.62	0	0	dB	-1.44	-1.56	0	0	dB
(from Amplifier to Passive Antenna)										
Gain of Passive Radiating Antenna	3.5	3.5	3.5	3.5	dBic	3.5	3.5	3.5	3.5	dBc
Free Space Path Loss (100ft)	-6.61E+01	-6.61E+01	-6.61E+01	-6.61E+01	dB	-6.39E+01	-6.39E+01	-6.39E+01	-6.39E+01	dB
Additional Attenuators	-12	-12	0	0		-12	-12	0	0	
RF Power Level at 100ft Distance	**-1.43E+02**	**-1.44E+02**	*	*	**dBm**	**-1.40E+02**	**-1.40E+02**	*	*	**dBm**
* (NOT USED) 50 OHM TERMINATION										

Free Space Path Loss Calculations

Satellite to Earth	**L1**					**L2**	
where d = distance	2.52E+07	m				2.52E+07	m
lambda = wavelength = c/f	1.91E-01					2.44E-01	
c = speed of light	3.00E+08	m/sec				3.00E+08	m/sec
f = frequency	1.57E+09	Hz				1.23E+09	Hz
Free Space Path Loss	-1.84E+02	dB				-1.82E+02	dB

100ft from Passive Antenna

where d = distance	3.05E+01	m				3.05E+01	m
lambda = wavelength = c/f	1.91E-01					2.44E-01	
c = speed of light	3.00E+08	m/sec				3.00E+08	m/sec
f = frequency	1.57E+09	Hz				1.23E+09	Hz
Free Space Path Loss	-6.61E+01	dB				-6.39E+01	dB

Band	**L1**					**L2**				
Amplified Splitter Port	**PORT 1**	**PORT 2**	**PORT 3**	**PORT 4**		**PORT 1**	**PORT 2**	**PORT 3**	**PORT 4**	
Line Gain Amplifier (measured)	21.35	21.35	21.35	21.35	dB	20.5	20.5	20.5	20.5	dB
Antenuator	-10	-10	-10	-10	dB	-10	-10	-10	-10	dB
Amplifiered Splitter Port Gain (measured)	20.49	20.2	20.5	20.25	dB	19.9	19.8	20	19.91	dB
Total	**31.84**	**31.55**	**31.85**	**31.6**	**dB**	**30.4**	**30.3**	**30.5**	**30.41**	**dB**

GPS LINK BUDGET Room 4037 (RVA)

	L1					L2				
Satellite Transmitter										
Satellite Transmitter Power (25 Watts)	14	dBW				14	dBW			
RF Losses in transmitter path	-1.25	dB				-1.25	dB			
Antenna Gain (with respect to isotrope)	13.5	dBi				13.5	dBi			
Satellite ERP	26.25	**dBW**				26.25	**dBW**			
Propagation										
Atmospheric and Polarization Losses	-0.5	dB				-0.5	dB			
Free Space Path Loss	-1.84E+02	dB				-1.82E+02	dB			
Received Power on Earth dBW	-1.59E+02	**dBW**				-1.57E+02	**dBW**			
Received Power on Earth dBm	-1.29E+02	**dBm**				-1.27E+02	**dBm**			
Facility Re-radiation System	**PORT 1**	**PORT 2**	**PORT 3**	**PORT 4**		**PORT 1**	**PORT 2**	**PORT 3**	**PORT 4**	
Gain of Receive Antenna	36.5		36.5		dBic	36.5		36.5		dB
RF Losses in Cable & Connectors (min.)	-2.65		-2.65		dB	-2.33		-2.33		dB
(from Receive Antenna to Amplifier)										
Gain of Line Amplifier	18.4		18.4		dB	18.4		18.4		dB
RF Losses in Cable & Connectors	-5.254		-1.21		dB	-4.609		-1.06		dB
(from Amplifier to Passive Antenna)										
Gain of Passive Radiating Antenna	3.5		3.5		dBic	3.5		3.5		dBc
Free Space Path Loss (100ft)	-6.61E+01		-6.61E+01		dB	-6.39E+01		-6.39E+01		dB
Additional Attenuator	-1		-5			-1		-5		
RF Power Level at 100ft Distance	**-1.45E+02**	*****	**-1.45E+02**	*****	**dBm**	**-1.40E+02**	*****	**-1.40E+02**	*****	**dBm**
* (NOT USED) 50 OHM TERMINATION										

Free Space Path Loss Calculations

Satellite to Earth	**L1**					**L2**				
where d = distance	2.52E+07	m				2.52E+07	m			
lambda = wavelength = c/f	1.91E-01					2.44E-01				
c = speed of light	3.00E+08	m/sec				3.00E+08	m/sec			
f = frequency	1.57E+09	Hz				1.23E+09	Hz			
Free Space Path Loss	-1.84E+02	dB				-1.82E+02	dB			

100ft from Passive Antenna

where d = distance	3.05E+01	m				3.05E+01	m			
lambda = wavelength = c/f	1.91E-01					2.44E-01				
c = speed of light	3.00E+08	m/sec				3.00E+08	m/sec			
f = frequency	1.57E+09	Hz				1.23E+09	Hz			
Free Space Path Loss	-6.61E+01	dB				-6.39E+01	dB			

GPS LINK BUDGET Room 4072 (ETL)

	L1					L2				
Satellite Transmitter										
Satellite Transmitter Power (25 Watts)	14	dBW				14	dBW			
RF Losses in transmitter path	-1.25	dB				-1.25	dB			
Antenna Gain (with respect to isotrope)	13.5	dBi				13.5	dBi			
Satellite ERP	26.25	**dBW**				26.25	**dBW**			
Propagation										
Atmospheric and Polarization Losses	-0.5	dB				-0.5	dB			
Free Space Path Loss	-1.84E+02	dB				-1.82E+02	dB			
Received Power on Earth dBW	-1.59E+02	**dBW**				-1.57E+02	**dBW**			
Received Power on Earth dBm	-1.29E+02	**dBm**				-1.27E+02	**dBm**			
Facility Re-radiation System	**PORT 1**	**PORT 2**	**PORT 3**	**PORT 4**		**PORT 1**	**PORT 2**	**PORT 3**	**PORT 4**	
Gain of Receive Antenna (max.)	36.5	36.5	36.5	36.5	dBic	36.5	36.5	36.5	36.5	dB
RF Losses in Cable & Connectors (min.)	-3.44	-3.44	-3.44	-3.44	dB	-2.97	-2.97	-2.97	-2.97	dB
(from Receive Antenna to Amplifier)										
Gain of Line Amplifier	18.4	18.4	18.4	18.4	dB	18.4	18.4	18.4	18.4	dB
RF Losses in Cable & Connectors	-6.68	-6.68	-6.68	-6.68	dB	-5.77	-5.77	-5.77	-5.77	dB
(from Amplifier to Passive Antenna)										
Gain of Passive Radiating Antenna	3.5	3.5	3.5	3.5	dBic	3.5	3.5	3.5	3.5	dBc
Free Space Path Loss (100ft)	-6.61E+01	-6.61E+01	-6.61E+01	-6.61E+01	dB	-6.39E+01	-6.39E+01	-6.39E+01	-6.39E+01	dB
Additional Attenuator	0	0	0	0		0	0	0	0	
RF Power Level at 100ft Distance	**-1.46E+02**	**-1.46E+02**	**-1.46E+02**	**-1.46E+02**	**dBm**	**-1.41E+02**	**-1.41E+02**	**-1.41E+02**	**-1.41E+02**	**dBm**

Free Space Path Loss Calculations

Satellite to Earth	**L1**					**L2**	
where d = distance	2.52E+07	m				2.52E+07	m
lambda = wavelength = c/f	1.91E-01					2.44E-01	
c = speed of light	3.00E+08	m/sec				3.00E+08	m/sec
f = frequency	1.57E+09	Hz				1.23E+09	Hz
Free Space Path Loss	-1.84E+02	dB				-1.82E+02	dB

100ft from Passive Antenna

where d = distance	3.05E+01	m				3.05E+01	m
lambda = wavelength = c/f	1.91E-01					2.44E-01	
c = speed of light	3.00E+08	m/sec				3.00E+08	m/sec
f = frequency	1.57E+09	Hz				1.23E+09	Hz
Free Space Path Loss	-6.61E+01	dB				-6.39E+01	dB

GPS LINK BUDGET Room 9002 (Seek Eagle)

	L1		L2	
Satellite Transmitter				
Satellite Transmitter Power (25 Watts)	14	dBW	14	dBW
RF Losses in transmitter path	-1.25	dB	-1.25	dB
Antenna Gain (with respect to isotrope)	13.5	dBi	13.5	dBi
Satellite ERP	26.25	**dBW**	26.25	**dBW**
Propagation				
Atmospheric and Polarization Losses	-0.5	dB	-0.5	dB
Free Space Path Loss	-1.84E+02	dB	-1.82E+02	dB
Received Power on Earth dBW	-1.59E+02	**dBW**	-1.57E+02	**dBW**
Received Power on Earth dBm	-1.29E+02	**dBm**	-1.27E+02	**dBm**
Facility Re-radiation System				
Gain of Receive Antenna	36.5	dBic	36.5	dB
RF Losses in Cable & Connectors (min.)	-5.261	dB	-4.604	dB
(from Receive Antenna to Amplifier)				
Gain of Line Amplifier (measured)	17.4	dB	16.8	dB
RF Losses in Cable & Connectors (meas.)	-1.9	dB	-1.65	dB
(from Amplifier to Passive Antenna)				
Gain of Passive Radiating Antenna	3.5	dBic	3.5	dBc
Free Space Path Loss (100ft)	-6.61E+01	dB	-6.39E+01	dB
RF Power Level at 100ft Distance	**-1.44E+02**	**dBm**	**-1.40E+02**	**dBm**

Free Space Path Loss Calculations
Satellite to Earth

where d = distance	2.52E+07	m	2.52E+07	m
lambda = wavelength = c/f	1.91E-01		2.44E-01	
c = speed of light	3.00E+08	m/sec	3.00E+08	m/sec
f = frequency	1.57E+09	Hz	1.23E+09	Hz
Free Space Path Loss	-1.84E+02	dB	-1.82E+02	dB

100ft from Passive Antenna

where d = distance	3.05E+01	m	3.05E+01	m
lambda = wavelength = c/f	1.91E-01		2.44E-01	
c = speed of light	3.00E+08	m/sec	3.00E+08	m/sec
f = frequency	1.57E+09	Hz	1.23E+09	Hz
Free Space Path Loss	-6.61E+01	dB	-6.39E+01	dB