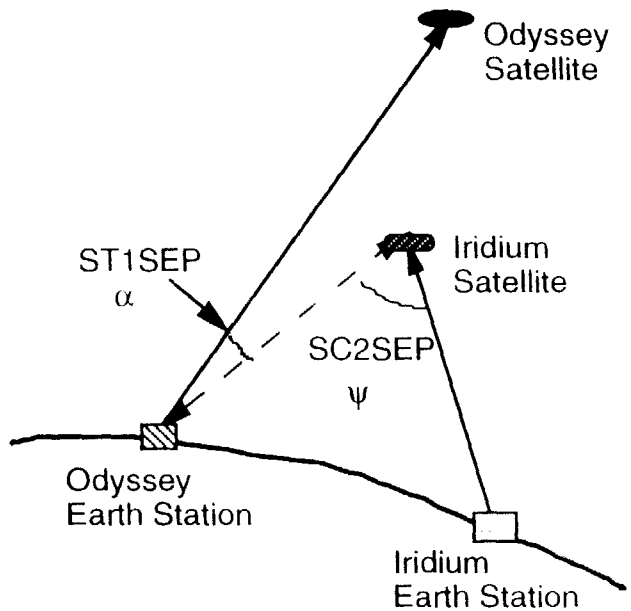
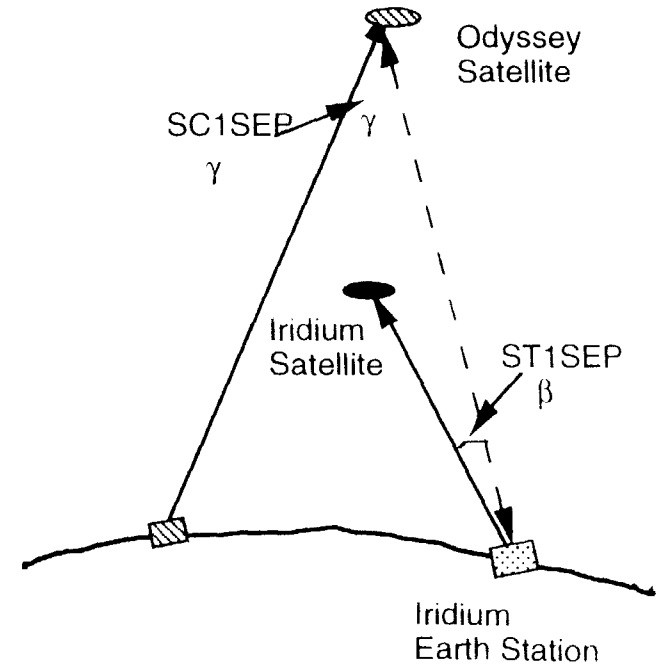
Odyssey/Iridium Conjunctions



Case 1



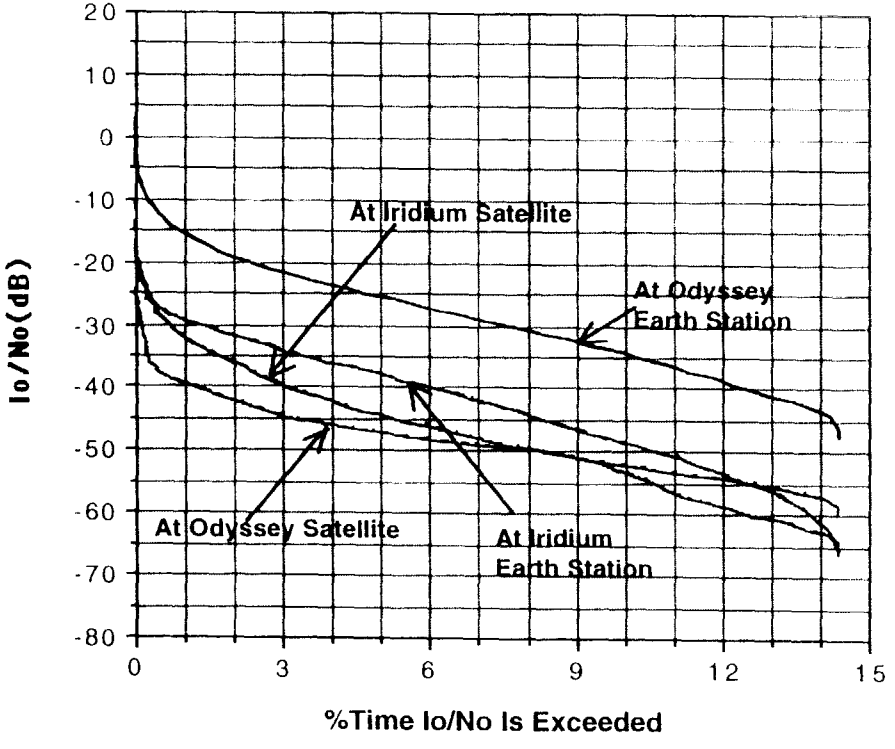
Case 2

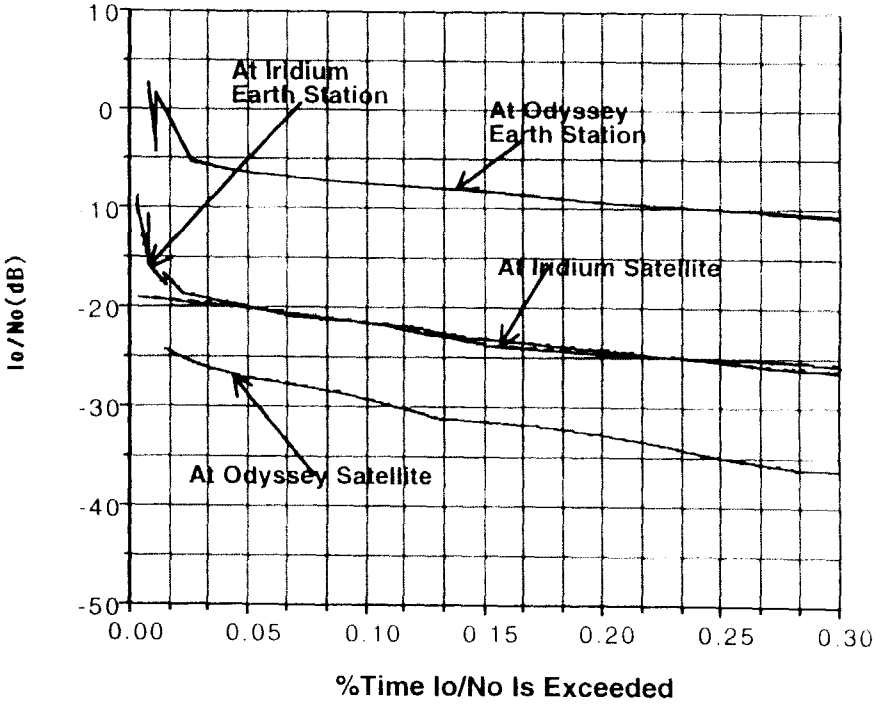
Summary

- **A simulation of 12 Odyssey satellite and 66 Iridium satellite as over 3-days period, with time interval of 10 seconds. In this simulation, the satellite separation angles viewed by the earth stations and the earth station separation angles viewed by the satellites were computed. Along with separation angles, the level of interference was computed as shown in Figures below:**

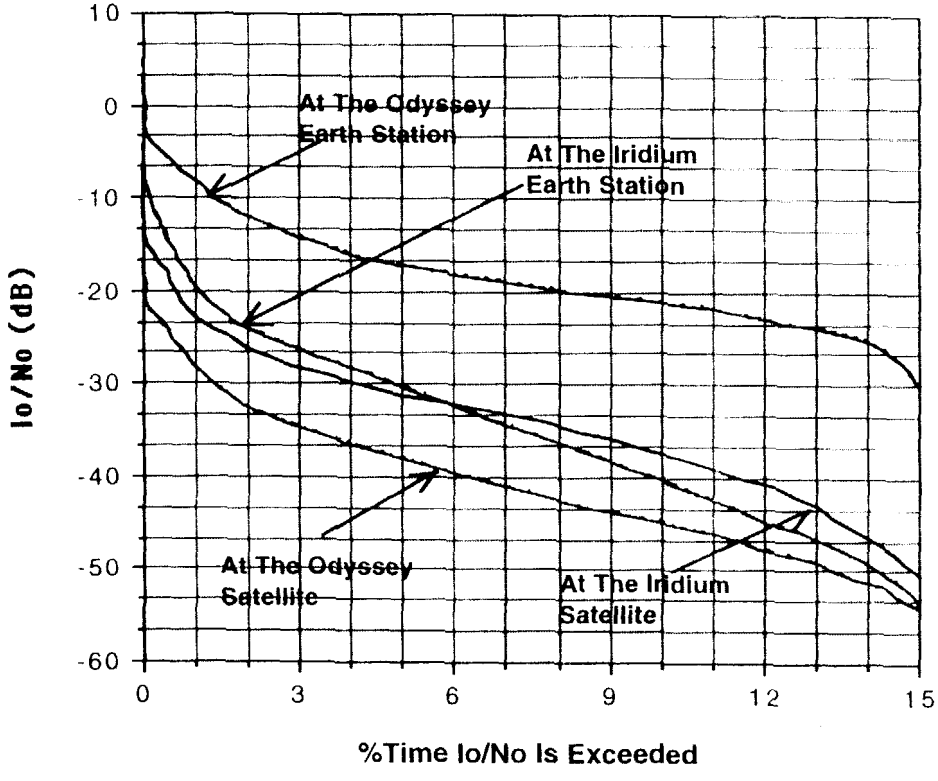
Parameters	Case 1	Case 2
Angle Off Line of Sight From E/S (or Off Axis Angle α or β)	$\leq 0.15^\circ$ (α)	$\leq 0.5^\circ$ (β)
Angle Off Line of Sight To Earth Station From Satellite	$\leq 8.6^\circ$ (ψ)	$\leq 1.5^\circ$ (γ)
Minimum Elevation Angle	$\geq 10^\circ$ (Odyssey)	$\geq 5.0^\circ$ (Iridium)
Occurances (Per 3 days)		
* San Luis Obispo / Las Vegas	2	8
* Portland, Maine / Montpelier	11	16

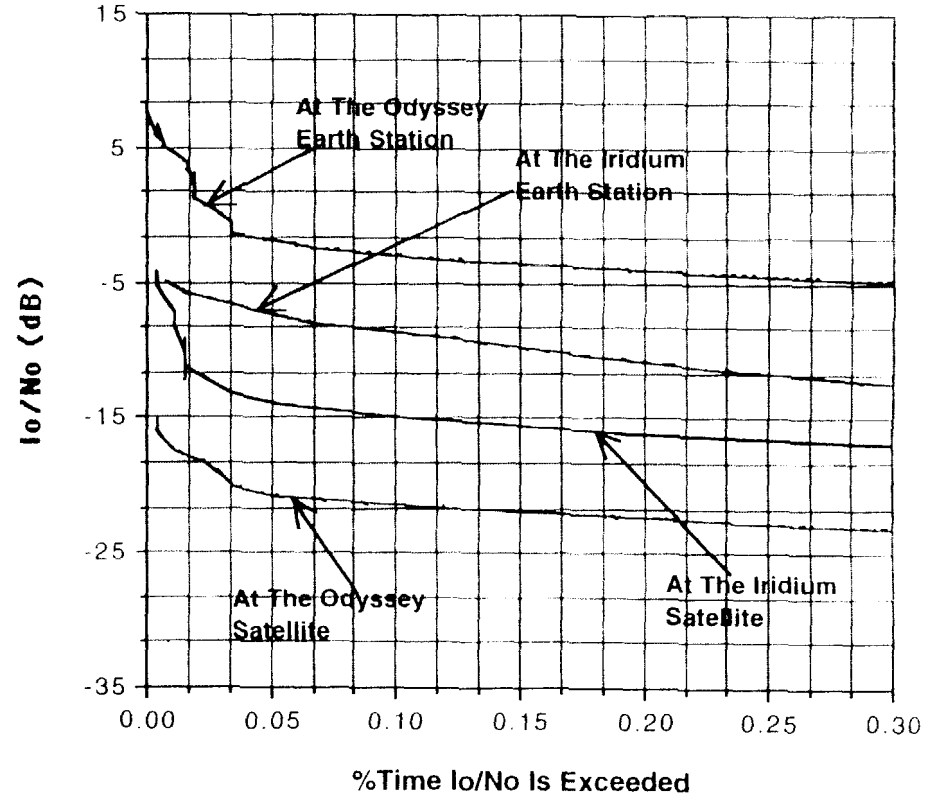
Potential Odyssey/Iridium Interference Based On Odyssey E/S San Luis Obispo & Iridium E/S Las Vegas





Potential Odyssey/Iridium Interference Based On Odyssey E/S Portland & Iridium E/S Montpelier





Conclusion

- Based on our analysis, the levels of interference at either the Odyssey satellite/earth station receiver or the Iridium satellite/ earth station receiver are well below the Iridium interference criteria.
- We conclude that the Odyssey system and the Iridium system can share the 29.1 - 29.4 GHz and 19.3 - 19.6 GHz bands on a co directional basis for their feeder link operations.

ODYSSEY/IRIDIUM CONJUNCTIONS

Satellite 1 - ODYSSEY
Satellite 2 - IRIDIUM
Station 1 - ODYSSEY San Luis Obispo (35.2N, 120.4W)
Station 2 - IRIDIUM Las Vegas (36.1N, 115.1W)

Number of Conjunctions (per 3 days)

Case 1 3

Case 2 8

α β γ φ E·L DISTANCE E·L DISTANCE

TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
5.8935	1	66	2.46	18.12	1.96	18.12	140.10	21.88	7167.40	141.72	23.84	848.48	146.98	24.06	7065.71	166.83	26.86	789.84	0.575673E-03
7.0463	1	12	1.64	5.59	0.94	7.82	59.11	17.53	7379.33	59.45	15.92	1048.71	61.01	22.39	7143.18	55.88	25.43	816.44	0.382661E-02
12.8012	1	29	0.92	13.60	1.83	16.14	282.27	47.26	6197.76	282.16	48.18	542.91	282.22	41.70	6370.12	273.84	29.90	738.56	0.191293E-02
19.6849	1	60	1.11	9.50	1.61	10.52	306.00	20.92	7212.72	305.69	19.86	939.76	306.31	17.52	7380.03	297.35	13.55	1125.03	0.330814E-01
29.7205	1	64	4.94	8.68	1.99	13.72	148.32	17.81	7365.15	144.94	14.09	1106.88	154.91	19.26	7293.50	163.38	16.07	1044.33	0.674119E-03
29.8241	1	63	1.08	16.24	1.98	17.32	142.50	21.31	7194.28	143.29	22.10	886.28	149.38	23.28	7101.49	167.09	24.71	830.71	0.284359E-01
31.0071	1	9	0.85	6.85	0.95	8.48	59.29	18.06	7352.95	59.41	17.22	1010.61	61.18	22.94	7117.38	55.38	27.34	781.17	0.300857E-01
36.7481	1	26	1.53	12.01	1.72	15.09	280.46	44.39	6283.87	280.73	45.91	559.61	280.84	38.87	6466.58	273.49	28.52	760.94	0.555269E-01
43.6456	1	57	0.28	8.82	1.59	10.48	307.12	18.58	7326.97	307.14	18.86	965.38	307.58	15.31	7492.50	298.83	12.92	1146.87	0.386045E-01
53.7850	1	60	0.62	15.52	2.01	17.00	145.45	20.91	7213.18	145.95	21.32	904.09	152.35	22.63	7131.93	169.20	23.57	858.24	0.473175E-01
54.9273	1	6	3.20	4.80	1.00	8.43	63.12	21.62	7179.40	63.53	18.44	976.59	65.16	26.74	6945.44	60.77	29.57	743.79	0.104571E-01
60.7059	1	34	1.73	10.64	1.60	13.82	278.96	41.35	6381.58	279.36	43.06	582.99	279.71	35.89	6574.31	273.21	26.80	790.85	0.721852E-01
67.5560	1	65	2.44	8.22	1.59	10.83	308.11	16.78	7417.35	308.97	19.07	959.80	308.67	13.62	7580.81	300.23	13.23	1135.98	0.152289E-01

TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
5.5296	2	57	2.48	9.92	1.26	13.65	66.97	29.65	6820.85	67.66	27.25	782.90	69.10	35.17	6601.16	64.30	44.39	571.74	0.276470E-01
11.1536	2	17	1.05	10.47	1.67	11.54	306.61	24.09	7064.43	306.27	23.09	864.28	306.63	20.63	7226.83	296.74	15.99	1046.86	0.386013E-01
12.4868	2	31	4.26	18.79	2.11	16.67	190.87	35.00	6607.78	195.70	33.50	686.56	199.03	32.45	6706.88	218.48	24.54	834.12	0.701350E-02
22.5635	2	34	1.12	6.72	0.85	6.72	54.79	10.01	7775.26	54.48	11.10	1213.63	56.74	14.47	7536.43	50.95	18.23	982.27	0.590925E-02
35.0976	2	14	0.41	9.76	1.65	11.28	307.43	21.96	7163.62	307.40	21.55	898.83	307.59	18.61	7325.42	298.14	14.96	1078.88	0.123289E+00
36.4050	2	28	1.99	17.44	2.10	17.56	195.26	38.07	6494.79	197.61	37.37	639.38	203.60	35.07	6605.04	221.58	26.83	790.33	0.284934E-01
46.5559	2	31	2.04	8.07	0.86	7.29	54.94	10.56	7745.46	54.38	12.52	1160.92	56.88	15.03	7506.90	50.34	20.17	932.03	0.591140E-03
52.3565	2	48	2.88	20.29	2.22	19.86	288.46	59.07	5905.36	287.36	56.26	495.23	286.13	53.38	6033.96	274.55	34.81	669.67	0.372649E-01
59.0585	2	22	0.05	9.21	1.63	10.89	308.24	19.68	7272.85	308.29	19.67	944.34	308.56	16.45	7433.86	299.48	13.63	1122.36	0.237728E+00
60.3645	2	25	3.61	18.28	2.08	16.77	198.60	39.41	6447.44	202.63	37.64	636.34	206.93	36.11	6566.19	225.05	26.33	799.41	0.289966E-02
69.1320	2	14	4.86	17.32	1.84	15.22	140.44	13.73	7575.11	143.59	17.54	1001.56	146.48	15.79	7468.01	164.17	19.89	938.83	0.152896E-02
70.3962	2	28	0.66	5.02	0.82	6.29	57.69	12.33	7649.48	57.81	11.68	1191.73	59.70	16.96	7408.36	55.01	19.27	954.71	0.286096E-01

TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
4.2288	3	56	1.75	15.96	2.11	16.37	171.60	22.82	7122.91	173.44	23.26	860.57	178.78	22.19	7152.65	195.77	20.21	930.94	0.403728E-02
13.2314	3	36	1.72	6.73	1.10	8.89	102.46	16.50	7431.30	102.10	14.82	1083.08	107.20	21.03	7207.48	114.14	23.03	865.48	0.956547E-02
13.3984	3	35	3.49	12.15	0.86	9.85	91.49	16.90	7411.35	91.78	20.38	926.70	95.57	21.80	7170.77	102.25	32.41	701.53	0.126135E-01
26.7030	3	39	3.98	14.23	1.82	13.18	304.38	34.32	6633.47	303.02	30.52	729.09	303.55	30.41	6789.41	291.84	20.85	915.42	0.108550E-01
37.1778	3	44	1.16	7.95	1.18	9.87	105.22	16.88	7412.41	104.96	15.75	1054.06	110.14	21.30	7194.86	118.25	23.98	845.45	0.143003E-01
37.3454	3	43	4.29	14.13	0.94	11.23	94.20	17.59	7376.42	94.72	21.85	891.79	98.48	22.45	7140.34	107.15	34.36	675.39	0.961011E-02
43.2886	3	59	3.67	9.85	1.16	7.34	249.19	33.39	6669.49	250.30	29.84	739.57	252.93	27.90	6895.18	255.37	18.30	980.39	0.101927E-01
50.6586	3	36	4.23	13.59	1.78	12.40	305.30	31.47	6746.00	303.87	27.43	779.61	304.71	27.71	6903.52	293.48	18.84	966.08	0.147466E-01
52.1050	3	50	4.54	19.35	2.15	16.98	175.23	27.04	6932.64	180.32	27.25	782.82	182.87	26.02	6977.21	203.72	22.31	881.36	0.348948E-02
60.9986	3	42	4.18	6.88	1.43	9.85	116.73	15.53	7481.31	115.32	11.58	1195.28	122.15	19.30	7291.52	129.05	17.23	1010.14	0.354766E-02
61.1339	3	41	0.40	9.46	1.26	11.00	108.10	17.31	7390.64	107.98	16.93	1018.89	113.21	21.61	7180.23	122.76	25.20	821.04	0.510484E-01
67.2014	3	67	0.90	7.42	1.09	7.62	248.32	31.21	6756.69	248.45	30.32	732.16	252.09	25.81	6986.75	254.13	18.63	971.57	0.283791E-02

TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
4.9397	4	61	1.28	5.18	0.55	4.62	86.44	10.19	7765.43	86.47	11.47	1199.38	90.06	14.95	7511.36	92.68	19.48	949.38	0.579868E-02
17.7108	4	52	4.30	7.43	1.52	9.90	308.71	11.01	7720.67	310.11	15.09	1074.60	309.69	8.04	7884.86	302.50	10.22	1247.72	0.340367E-02
19.6011	4	10	1.11	15.23	2.18	18.40	163.56	26.50	6956.15	162.47	25.96	806.50	171.28	26.57	6952.90	188.00	24.43	836.37	0.151784E-01
28.8684	4	58	0.36	4.52	0.61	4.81	88.53	10.74	7735.26	88.61	11.10	1213.55	92.27	15.48	7483.59	95.41	18.87	965.30	0.753643E-01
29.0085	4	57	4.64	9.57	0.45	5.42	80.03	10.17	7766.67	80.14	14.81	1083.60	83.30	14.99	7509.12	84.55	24.49	835.00	0.763021E-02
43.5556	4	7	0.59	16.53	2.21	19.31	165.79	29.00	6848.33	165.15	28.84	755.68	173.84	28.84	6854.85	192.29	26.33	799.44	0.333527E-02
52.8296	4	66	0.39	4.25	0.69	5.28	90.94	11.70	7683.55	90.81	11.33	1204.58	94.84	16.43	7435.27	98.32	19.09	959.50	0.599829E-02
52.9697	4	65	3.97	9.20	0.51	5.82	82.33	11.29	7705.48	82.52	15.26	1069.23	85.74	16.14	7449.98	87.88	25.12	822.63	0.997355E-02

65.7586	4	56	4.57	9.45	1.58	8.37	309.10	14.84	7517.21	307.77	10.45	1238.49	309.78	11.79	7678.38	302.00	6.28	1418.54	0.265052E-02
67.4637	4	4	2.15	15.71	2.24	19.90	167.06	31.22	6756.35	164.81	30.29	732.62	175.42	30.92	6768.36	193.04	27.60	776.75	0.172801E-01

TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
9.2151	5	9	3.23	7.85	1.54	10.45	306.88	15.24	7496.48	307.86	18.32	979.78	307.61	12.04	7665.01	299.59	12.57	1159.30	0.874096E-03
33.2713	5	5	4.96	10.85	1.62	9.33	307.54	19.96	7259.15	306.00	15.22	1070.46	307.87	16.68	7422.24	299.07	10.02	1255.80	0.351103E-02
57.2314	5	2	3.69	9.62	1.59	9.08	307.51	17.57	7377.41	306.44	14.03	1108.91	308.04	14.35	7542.35	299.79	9.11	1293.08	0.698173E-02

TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
0.7975	6	34	1.47	10.00	1.67	12.40	306.30	24.36	7051.88	306.73	25.78	809.78	306.31	20.88	7214.98	296.17	17.95	989.97	0.257171E-01
17.1430	6	55	1.06	5.61	1.29	7.58	214.93	11.53	7692.51	214.33	12.41	1164.93	219.80	7.95	7889.70	225.42	7.34	1369.81	0.108768E-01
19.0689	6	2	0.86	16.52	1.41	17.10	52.68	28.53	6868.16	52.24	29.30	748.21	53.54	33.56	6662.97	37.81	44.78	568.53	0.313957E-01
24.7451	6	31	2 0.41	10.13	1.67	11.99	306.31	24.18	7060.31	306.40	24.58	833.31	306.34	20.70	7223.55	296.34	17.07	1014.91	0.831653E-01
2 43.0287	6	10	2 0.46	17.58	1.50	18.64	52.32	31.13	6759.81	52.10	31.55	713.72	52.96	36.24	6561.29	35.42	48.20	542.76	0.944280E-01
48.6698	6	28	4.46	8.75	1.58	11.89	305.58	19.67	7273.35	306.88	23.97	845.69	306.02	16.28	7443.03	296.91	16.68	1026.30	0.499142E-02
66.9468	6	7	1.24	16.24	1.58	19.03	51.92	33.32	6672.36	52.54	32.19	704.52	52.36	38.49	6479.91	35.44	49.32	535.14	0.400528E-01

TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
8.6187	7	12	0.83	6.64	1.47	8.71	207.47	11.97	7668.99	206.92	12.59	1158.64	212.65	8.80	7842.60	219.30	7.94	1342.96	0.108403E-01
17.9333	7	60	4.74	11.36	1.95	16.55	134.48	25.53	6999.02	131.58	21.60	897.59	141.61	28.24	6880.42	154.30	26.68	793.00	0.288605E-02
32.5813	7	9	0.56	7.11	1.45	8.12	208.21	11.54	7692.21	208.61	11.13	1212.50	213.33	8.33	7868.44	220.29	6.64	1401.77	0.151124E-01

TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
7.4989	8	66	4.22	9.22	1.43	8.28	298.18	20.47	7234.50	297.67	16.28	1038.09	298.90	16.62	7425.65	292.01	10.28	1245.26	0.874601E-02
9.4141	8	17	2.45	11.82	1.75	15.24	125.50	22.56	7135.01	124.30	20.38	926.60	131.93	25.92	6981.59	145.10	26.79	791.10	0.465488E-02
31.4292	8	63	1.97	7.71	1.38	8.27	297.47	18.40	7336.22	297.39	16.43	1033.50	298.37	14.57	7531.31	291.74	10.38	1241.31	0.115358E-03
33.3521	8	14	3.15	12.00	1.79	16.01	125.48	24.75	7034.26	123.85	21.97	889.04	132.14	28.16	6883.91	145.78	28.84	755.66	0.814739E-02
2 55.3877	8	60	1 0.06	6.73	1.32	8.09	296.92	15.98	7458.07	296.97	15.95	1047.92	298.00	12.20	7656.71	291.52	9.99	1256.90	0.106164E+00
57.3130	8	22	3.28	13.03	1.85	17.30	125.83	27.24	6923.93	124.05	24.38	837.30	132.78	30.67	6778.53	147.98	31.76	710.75	0.115997E-01

TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
17.5610	9	63	1.12	8.31	1.03	8.57	49.71	12.22	7655.38	49.46	13.31	1133.20	51.31	16.56	7428.59	43.75	20.77	917.13	0.140755E-01
24.9408	9	40	3.18	7.38	1.46	9.97	119.70	13.67	7578.05	118.74	10.63	1231.53	125.10	17.22	7395.25	132.62	15.66	1056.67	0.702052E-03
41.5175	9	60	0.65	7.32	1.08	8.74	50.13	14.69	7524.86	50.19	14.04	1108.63	51.63	19.13	7300.09	44.38	21.84	892.05	0.462191E-01
46.8477	9	17	1.84	7.77	1.31	8.08	293.48	20.28	7243.97	293.23	18.45	976.46	294.45	16.18	7447.80	287.94	11.65	1192.75	0.280376E-01
48.8956	9	37	3.95	7.93	1.51	10.73	119.72	16.31	7441.36	118.65	12.49	1162.03	125.34	19.92	7261.50	133.46	17.96	989.84	0.626647E-02
65.4540	9	57	2.65	6.05	1.12	8.71	50.51	16.97	7407.56	51.15	14.39	1097.03	51.90	21.50	7185.10	45.45	22.43	878.77	0.127574E-02
2 70.7140	9	14	2 0.39	6.71	1.27	8.22	292.40	19.12	7300.38	292.53	19.49	948.98	293.50	15.01	7508.12	287.15	12.38	1166.14	0.175717E-01

TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
22.6643	10	22	0.95	5.28	1.20	7.24	220.15	13.79	7571.91	219.51	14.50	1093.39	224.96	9.89	7782.23	230.17	8.70	1310.22	0.177585E-01
1,2 32.9764	10	17	1 0.27	6.82	1.04	7.96	49.07	11.92	7671.63	49.06	11.64	1193.05	50.66	16.22	7445.87	43.92	18.49	975.21	0.812596E-01
38.7433	10	45	3.55	19.99	2.21	19.06	310.18	49.46	6135.79	307.41	46.43	555.63	306.79	45.49	6250.22	288.68	31.29	717.48	0.163183E-01
2 46.6202	10	19	2 0.40	5.22	1.12	6.68	223.16	14.10	7555.61	222.90	14.41	1096.36	227.85	10.05	7773.22	232.89	8.46	1320.54	0.322901E-01
56.9315	10	14	1.51	6.44	1.08	8.35	49.81	14.56	7531.43	50.08	13.07	1141.57	51.29	18.98	7307.18	44.64	20.51	923.52	0.149309E-01
70.4833	10	16	1.56	4.66	1.09	6.96	225.00	15.27	7494.47	224.08	16.56	1029.82	229.67	11.11	7715.46	234.28	10.03	1255.31	0.977700E-02

TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
5.5443	11	47	1.84	4.77	0.80	4.45	276.13	16.56	7428.73	276.25	14.71	1086.59	278.19	11.93	7671.10	275.23	8.15	1333.89	0.206958E-01
13.2569	11	26	3.92	9.59	1.21	7.57	278.51	29.61	6822.39	278.32	25.70	811.33	279.91	24.58	7042.14	275.32	16.01	1046.07	0.282914E-02
29.4721	11	55	0.76	3.80	0.74	4.16	275.34	14.66	7526.38	275.43	13.90	1113.25	277.50	10.08	7771.69	274.67	7.51	1362.06	0.307630E-01
31.3989	11	6	4.42	22.58	1.34	19.69	92.51	29.97	6807.68	93.17	34.36	675.45	97.18	35.35	6594.39	113.22	55.04	501.38	0.159030E-01
37.2081	11	34	3.78	9.28	1.22	7.60	280.96	28.25	6880.05	280.88	24.47	835.40	282.25	23.35	7098.53	277.37	15.29	1068.25	0.161129E-01
1,2 53.4317	11	52	1 0.10	3.09	0.68	3.79	274.84	12.36	7647.91	274.82	12.46	1163.10	277.09	7.84	7895.79	274.34	6.39	1413.48	0.140298E+00
61.0239	11	32	4.72	7.15	1.34	10.50	292.58	22.57	7134.83	293.44	27.22	783.40	293.45	18.35	7338.27	285.95	17.85	992.80	0.721883E-02

TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
14.0972	12	41	2.23	14.33	2.02	14.23	162.99	15.17	7499.75	165.13	16.01	1046.09	169.37	15.35	7490.74	184.23	15.07	1075.11	0.449743E-02
15.5622	12	55	2.36	6.71	1.08	9.65	58.52	21.57	7181.75	58.89	19.24	955.54	60.22	26.56	6953.26	53.90	30.34	731.73	0.176094E-01
20.9319	12	12	2.02	5.04	0.74	4.20	269.68	19.71	7271.43	269.90	17.70	997.02	272.01	14.82	7517.77	269.95	10.20	1248.43	0.236751E-01

22.9130	12	32	1.83	6.38	0.97	8.97	88.37	21.62	7179.69	88.23	19.79	941.40	92.37	26.78	6943.94	96.88	31.81	710.01	0.439341E-02
28.7052	12	49	4.28	7.79	1.42	12.69	278.20	36.11	6565.91	278.59	40.38	607.79	279.31	30.82	6772.47	273.21	25.19	821.09	0.474439E-02
38.0449	12	38	3.50	14.95	2.00	13.52	165.45	13.85	7568.70	168.94	14.76	1085.26	171.69	13.82	7570.33	187.07	13.43	1129.30	0.204281E-02
39.5155	12	52	2.37	7.49	1.12	10.66	60.35	23.84	7075.62	60.73	21.50	900.01	62.09	28.98	6849.15	55.64	34.07	679.09	0.184945E-01
44.9226	12	9	3.29	5.59	0.73	3.84	270.18	18.92	7310.15	270.75	15.68	1056.18	272.49	14.07	7557.02	270.79	8.74	1308.54	0.187209E-02
46.8703	12	29	3.05	6.06	1.06	9.71	87.66	24.19	7059.65	87.64	21.15	908.24	91.68	29.47	6828.43	96.38	34.02	679.77	0.116968E-01
52.6614	12	46	2.31	8.38	1.41	11.65	281.20	34.28	6635.30	281.53	36.57	648.43	282.15	29.16	6841.65	275.73	23.07	864.75	0.711120E-02
61.9980	12	35	4.80	15.44	1.98	12.64	167.99	12.46	7642.64	172.87	13.08	1141.31	174.07	12.22	7655.39	189.83	11.44	1200.54	0.109930E-02
63.4703	12	49	2.17	8.73	1.18	11.96	62.28	26.15	6971.66	62.79	24.02	844.59	64.09	31.42	6747.85	57.68	38.40	628.10	0.622434E-02

	Number of Conjunctions (Per 3 Days)
Case 1	3
Case 2	8

PORTLAND, MAINE (ODYSSEY)

(IRIDIUM)

MONTPELIER

Number of Conjunctions (for 3 days)

Case 1 11

Case 2 16

ODYSSEY/IRIDIUM CONJUNCTIONS

Satellite 1 - ODYSSEY
Satellite 2 - IRIDIUM
Station 1 ODYSSEY Portland, Maine (43.4N, 70.2W)
Station 2 - IRIDIUM Montpelier (44.2N, 72.3W)

	TIME	SC1	SC2	ST1SEP (α)	ST2SEP (β)	SC1SEP (γ)	SC2SEP (ψ)	ST1S1AZ	ST1S1EL (E.L)	ST1S1RG (DISTANCE)	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
	6.8984	1	23	3.10	9.24	1.01	12.70	121.14	76.98	5646.01	131.04	79.33	428.19	119.24	74.25	5671.58	122.17	65.07	459.56	0.242184E-02
	7.8425	1	29	0.71	4.22	0.69	4.75	60.39	17.74	7368.72	60.38	17.04	1015.74	60.09	16.70	7421.47	64.18	15.18	1071.79	0.573070E-01
	13.6032	1	46	2.69	13.21	0.83	11.48	296.19	55.37	5986.38	297.73	57.92	487.32	294.54	57.91	5929.79	295.61	71.11	442.79	0.177269E-01
	31.7723	1	26	2.67	5.37	0.70	4.79	60.54	20.13	7250.91	60.74	17.47	1003.40	60.33	19.06	7303.22	64.60	15.56	1059.89	0.158180E-01
	37.5545	1	54	1.33	10.93	0.79	10.53	296.71	52.22	6062.94	297.69	53.41	510.16	295.13	54.72	6001.66	295.71	65.65	457.72	0.119010E+00
	55.7293	1	34	4.38	6.83	0.71	4.91	60.84	22.91	7118.65	61.29	18.55	973.69	60.73	21.81	7170.50	65.31	16.52	1030.77	0.735542E-02
2	61.5141	1	51	0.22	8.52	0.74	9.45	297.22	49.01	6148.22	297.38	48.82	538.49	295.68	51.47	6082.35	295.36	59.98	478.34	0.390397E+00
	62.8360	1	63	3.76	0.56	0.53	4.84	148.78	26.98	6935.13	152.23	29.18	750.17	146.44	25.17	7015.44	145.97	24.81	828.71	0.107441E-01

	TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
	4.4534	2	64	3.92	2.82	0.27	1.54	292.77	17.44	7383.91	292.69	13.52	1126.18	291.17	19.40	7286.68	290.57	16.64	1027.29	0.945601E-02
	22.4151	2	45	1.47	11.15	0.95	10.78	94.82	67.11	5762.15	94.68	65.64	457.74	95.79	64.67	5801.03	102.24	54.00	506.94	0.130154E+00
	23.2973	2	51	1.26	3.77	0.68	4.55	57.37	13.18	7604.34	57.21	14.43	1095.95	56.94	12.25	7653.57	60.75	12.89	1147.80	0.336345E-01
	28.3465	2	61	0.72	2.15	0.21	1.67	292.13	13.61	7581.20	292.06	14.33	1099.14	290.54	15.51	7482.14	289.85	17.56	1000.80	0.503388E-01
1,2	47.2571	2	48	0.24	3.93	0.69	4.70	57.75	15.48	7483.75	57.69	15.72	1055.12	57.40	14.53	7533.13	61.43	14.07	1107.54	0.739970E-01
	52.3047	2	58	2.68	4.04	0.18	1.61	292.15	11.22	7709.23	292.07	13.90	1113.43	290.57	13.09	7609.17	289.87	17.07	1014.86	0.144645E-01
	70.2468	2	39	0.93	10.96	0.96	11.16	107.49	69.77	5724.44	106.40	68.92	448.24	107.33	67.14	5761.65	110.01	56.25	495.26	0.893567E-01
	71.1164	2	56	1.75	4.76	0.70	4.61	57.57	16.88	7412.06	57.92	15.16	1072.37	57.28	15.93	7460.88	61.54	13.55	1125.17	0.108007E-01

	TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
	14.5324	3	61	2.54	5.02	0.74	6.26	56.76	23.45	7093.84	56.16	25.94	806.86	56.73	22.46	7139.72	62.07	23.50	855.57	0.747019E-02
1,2	14.7497	3	8	0.24	3.56	0.69	4.26	54.39	11.11	7715.12	54.39	11.35	1203.86	53.92	10.29	7760.03	57.54	10.12	1251.63	0.938894E-01
2	19.8069	3	18	0.32	1.69	0.29	2.27	287.60	17.23	7394.72	287.65	16.91	1019.40	285.88	19.15	7298.69	284.79	20.50	923.81	0.496089E-01
2	21.8487	3	38	0.33	1.22	0.26	1.81	128.41	17.46	7383.07	128.59	17.74	995.91	126.73	15.55	7480.41	126.08	14.50	1093.52	0.550332E-01
	38.4841	3	58	0.87	5.26	0.75	6.34	57.55	26.01	6977.85	57.34	26.86	789.87	57.62	24.98	7024.01	63.35	24.25	839.95	0.368462E-01
	38.7055	3	5	1.14	4.15	0.70	4.34	54.92	13.29	7598.20	55.19	12.18	1173.27	54.52	12.44	7643.63	58.44	10.87	1222.23	0.227154E-01
	43.7653	3	15	1.00	2.77	0.26	2.10	287.52	14.78	7519.92	287.40	15.78	1053.19	285.81	16.68	7422.65	284.57	19.18	957.01	0.430610E-01
1,2	45.8035	3	35	0.09	1.76	0.30	2.14	129.01	20.12	7251.64	129.08	20.17	931.89	127.29	18.17	7347.38	126.43	16.61	1028.19	0.142577E+00
	62.4408	3	66	0.73	5.94	0.77	6.43	58.40	28.67	6862.02	58.46	27.95	770.70	58.57	27.59	6908.35	64.62	25.15	821.97	0.872307E-01
	62.6655	3	2	2.49	5.03	0.70	4.43	55.47	15.55	7480.05	55.96	13.11	1140.32	55.15	14.67	7525.96	59.34	11.71	1190.41	0.582753E-02
	67.6730	3	23	2.70	4.36	0.24	2.11	287.05	12.98	7614.57	287.05	15.68	1056.10	285.35	14.85	7516.63	284.19	19.07	960.00	0.226936E-02
	68.5835	3	29	4.73	8.44	1.02	13.39	305.38	75.08	5663.27	297.37	70.96	443.15	305.45	77.79	5639.33	291.24	86.05	422.50	0.388395E-01
	69.6813	3	43	1.57	3.37	0.32	2.12	128.33	21.92	7165.42	127.65	20.49	924.04	126.62	19.94	7260.27	125.15	16.87	1020.55	0.181554E-01

	TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
	4.7387	4	5	4.11	3.34	0.77	7.92	164.03	40.36	6414.96	169.28	41.41	597.96	160.75	38.72	6471.56	158.16	36.09	654.11	0.912515E-02
	6.0161	4	18	1.54	4.76	0.74	5.79	55.34	20.84	7216.71	55.07	22.37	880.20	55.23	19.92	7261.25	60.28	20.33	928.05	0.431400E-02
	12.8242	4	51	2.84	4.35	0.67	7.16	111.78	46.03	6233.89	113.53	48.61	539.94	110.68	43.67	6306.43	113.30	39.78	613.72	0.205226E-01
	28.6618	4	2	3.75	3.46	0.77	7.78	167.04	38.65	6474.13	171.75	39.51	616.55	163.76	37.12	6528.98	160.73	34.68	671.30	0.159110E-01
1,2	29.9416	4	15	0.21	5.04	0.74	5.87	56.31	23.18	7106.51	56.25	23.38	858.05	56.27	22.21	7151.82	61.59	21.18	907.37	0.116454E+00
	36.7726	4	48	3.91	4.45	0.71	7.97	112.08	49.09	6146.12	114.82	52.59	514.81	110.99	46.68	6214.79	114.37	42.93	584.11	0.853776E-02
	53.8973	4	23	0.56	5.70	0.75	6.10	57.49	25.94	6981.08	57.75	25.43	816.45	57.55	24.91	7027.18	63.41	22.95	867.40	0.211325E-02

	TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
1,2	4.3042	5	8	0.10	5.39	0.63	6.06	102.55	41.88	6364.18	102.41	41.88	593.56	101.83	39.65	6439.31	104.26	34.63	672.00	0.388694E+00
	10.1054	5	25	2.06	5.52	0.40	4.05	283.98	23.47	7093.00	284.02	25.53	814.58	282.09	25.46	7002.34	279.95	30.65	727.09	0.186210E-01
	10.2480	5	24	4.56	3.22	0.49	3.78	273.96	25.44	7003.43	274.48	20.90	913.99	271.75	27.33	6919.77	269.51	24.82	828.49	0.146748E-01
1,2	20.3026	5	27	0.24	5.67	0.67	6.47	143.52	41.91	6363.12	143.84	41.91	593.33	140.95	39.80	6434.07	137.25	34.95	667.91	0.288168E+00
	21.4646	5	40	2.48	4.36	0.72	5.40	53.17	16.50	7431.37	52.49	18.90	964.46	52.91	15.68	7473.55	57.15	17.27	1008.98	0.108056E-01
	28.2293	5	5	1.32	6.78	0.67	6.31	101.95	44.32	6286.03	101.64	43.02	583.37	101.30	42.06	6358.15	103.75	35.56	660.47	0.273944E-01
	34.0455	5	33	2.31	5.57	0.37	3.77	286.26	22.43	7141.18	286.24	24.74	830.03	284.45	24.43	7048.89	282.63	29.76	740.89	0.298413E-02

34.1886	5	32	4.26	3.09	0.47	3.54	276.46	24.66	7038.20	276.63	20.41	925.97	274.34	26.59	6952.35	272.01	24.32	838.57	0.210395E-02
44.2621	5	24	1.60	4.55	0.68	6.79	147.39	41.14	6388.69	149.09	42.11	591.51	144.68	39.11	6458.10	141.45	35.35	663.00	0.251606E-01
45.4256	5	37	2.15	4.43	0.73	5.61	54.24	18.62	7324.93	53.62	20.69	919.25	54.05	17.75	7368.34	58.57	18.87	965.24	0.109329E-01
52.1886	5	2	1.15	7.15	0.71	6.94	101.78	47.29	6196.91	101.31	46.19	557.48	101.21	44.99	6265.41	103.78	38.10	631.31	0.892607E-01
58.0064	5	30	2.26	5.14	0.34	3.38	288.58	21.12	7203.19	288.83	23.37	858.31	286.85	23.12	7109.24	285.75	28.16	767.06	0.270824E-01
58.1495	5	29	4.15	2.83	0.43	3.20	279.04	23.59	7087.37	279.28	19.45	950.08	277.01	25.53	6999.22	275.13	23.28	860.25	0.124862E-01
68.1646	5	32	0.06	5.70	0.68	6.43	149.63	39.84	6432.62	149.70	39.87	612.90	146.88	37.87	6501.79	142.29	35.56	685.86	0.271676E+00
69.3113	5	45	0.72	4.60	0.73	5.56	55.03	20.08	7253.65	54.86	20.78	917.03	54.89	19.17	7297.91	59.75	18.88	964.80	0.481088E-01

TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
1.6999	6	50	0.27	5.47	0.56	5.89	274.71	31.27	6754.16	274.82	31.53	714.05	272.39	33.26	6674.76	268.15	37.51	637.85	0.509472E-01
12.5764	6	53	4.59	5.11	0.72	7.01	67.39	30.44	6788.25	66.16	34.91	668.44	67.46	29.07	6845.27	73.05	30.70	726.31	0.212316E-01
17.8534	6	10	2.78	5.02	0.45	3.36	264.85	10.59	7743.39	264.21	13.30	1133.70	262.77	12.14	7659.68	259.21	15.78	1053.11	0.649692E-02
18.7456	6	14	3.91	8.04	0.95	12.32	297.01	66.23	5775.66	293.64	62.60	468.10	295.36	68.89	5736.36	286.56	76.52	432.20	0.450947E-01
19.8281	6	30	1.64	3.05	0.50	4.54	97.77	30.87	6770.57	98.03	32.49	700.33	97.00	28.86	6854.28	99.86	27.13	784.98	0.234560E-01
25.6161	6	47	0.13	5.09	0.53	5.51	277.46	30.47	6786.69	277.32	30.52	729.04	275.24	32.49	6704.94	271.32	36.43	650.13	0.290289E+00
36.4863	6	50	3.06	5.19	0.72	6.94	71.99	33.77	6655.01	71.66	36.81	645.65	72.09	32.23	6715.26	78.20	31.94	708.12	0.408057E-03
43.7854	6	27	0.89	3.70	0.54	4.92	97.60	33.70	6657.56	97.64	34.58	672.54	96.90	31.65	6738.74	99.72	28.86	755.41	0.199008E-01
49.5720	6	55	0.95	3.67	0.50	4.80	280.49	29.04	6846.49	280.33	28.11	767.97	278.40	31.08	6761.88	275.29	33.64	684.80	0.758554E-01
60.4425	6	47	4.57	5.13	0.72	7.35	74.71	35.82	6576.97	74.09	40.36	608.03	74.82	34.19	6638.63	81.01	34.74	670.55	0.774837E-02
66.6257	6	19	3.78	7.26	0.89	11.33	291.54	60.63	5874.15	289.41	57.01	491.59	289.40	63.21	5826.07	281.16	69.70	446.21	0.510764E-01
67.6917	6	24	1.35	5.43	0.58	4.97	96.78	35.84	6575.95	96.54	34.51	673.51	96.16	33.77	6654.72	98.79	28.83	755.90	0.363285E-01

TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
4.0203	7	10	1.51	4.70	0.68	5.86	69.53	27.24	6923.90	69.39	28.74	757.25	69.42	25.84	6985.16	74.58	25.18	821.34	0.135316E-01
10.8619	7	41	4.62	6.53	0.88	10.46	76.15	55.32	5987.71	74.62	59.87	478.83	77.38	53.42	6032.97	87.06	50.71	526.15	0.294716E-01
16.6666	7	58	3.17	1.27	0.32	2.22	301.91	21.45	7187.70	301.30	18.33	979.57	300.55	23.47	7092.67	300.22	22.24	883.06	0.110653E-01
17.0706	7	4	1.16	7.57	0.61	7.19	276.87	36.52	6550.78	276.91	37.69	635.85	274.49	38.62	6475.16	269.36	45.16	565.47	0.419549E-01
27.9422	7	7	0.84	4.69	0.68	5.83	71.98	28.80	6856.49	71.76	29.62	743.00	71.88	27.33	6919.75	76.84	25.81	809.24	0.820548E-01
33.7275	7	24	3.35	4.22	0.68	7.03	268.99	38.51	6479.15	269.43	35.18	665.12	266.23	40.49	6410.46	260.81	41.52	596.94	0.277274E-01
35.5392	7	56	2.73	3.22	0.31	1.76	97.40	12.77	7626.25	96.70	10.12	1251.71	96.35	11.02	7720.38	96.99	7.86	1346.72	0.524653E-02
40.6275	7	66	1.82	0.17	0.29	2.12	303.54	19.35	7289.87	303.24	17.56	1001.00	302.22	21.34	7192.87	302.41	21.32	904.21	0.249243E-01
41.0268	7	12	0.64	6.46	0.57	6.46	280.16	34.64	6621.49	280.13	35.27	663.93	277.95	36.75	6542.28	273.90	42.41	588.78	0.995434E-01
51.8978	7	4	1.01	4.80	0.67	5.96	74.82	30.80	6773.46	74.71	31.80	710.09	74.73	29.23	6838.65	79.83	27.51	778.24	0.488201E-01
57.6851	7	32	2.25	4.53	0.65	6.61	268.79	35.40	6592.48	268.97	33.16	691.23	266.13	37.34	6520.91	260.79	39.05	621.21	0.195767E-01
59.5308	7	53	1.75	2.51	0.31	1.83	98.22	13.56	7584.30	97.73	11.87	1184.66	97.17	11.79	7678.66	98.05	9.43	1279.85	0.140199E-01
64.5801	7	63	0.40	1.41	0.27	2.08	305.09	17.35	7388.50	304.98	16.96	1017.89	303.80	19.30	7291.37	304.36	20.61	921.05	0.509269E-01
65.0033	7	9	1.47	4.01	0.56	5.75	280.61	33.85	6651.93	280.59	32.37	702.02	278.44	35.96	6571.72	274.96	38.86	623.23	0.277723E-01

TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
2.4560	8	66	3.87	5.39	0.77	8.32	76.40	42.98	6328.54	75.53	46.81	552.83	76.79	41.23	6385.83	83.70	39.96	611.92	0.121962E-01
8.1458	8	15	3.77	1.48	0.37	2.67	301.60	24.53	7044.14	300.87	20.82	915.94	300.24	26.61	6951.35	299.77	25.19	821.19	0.160449E-01
9.3017	8	30	3.06	10.46	0.88	8.58	206.89	33.11	6680.43	203.67	34.61	672.15	203.27	33.01	6684.56	190.77	33.40	687.94	0.729863E-02
19.3519	8	33	4.65	6.73	0.62	4.26	74.48	24.44	7048.22	74.53	19.79	941.40	74.17	22.96	7116.65	77.69	17.08	1014.41	0.302502E-02
19.4958	8	32	2.45	4.28	0.67	5.33	65.45	20.71	7223.14	65.05	23.13	863.46	65.18	19.49	7282.02	69.61	20.47	924.40	0.103858E-01
26.3758	8	63	0.56	7.12	0.80	8.18	75.42	45.39	6253.35	75.52	45.95	559.33	75.98	43.63	6307.85	83.48	39.26	619.09	0.213777E+00
32.0792	8	23	2.82	0.65	0.34	2.52	302.88	22.68	7129.41	302.35	19.90	938.55	301.56	24.73	7035.37	301.45	24.09	843.25	0.206007E-01
33.2390	8	27	2.88	10.48	0.89	8.86	209.54	34.23	6637.06	206.64	35.87	656.68	205.84	34.23	6637.26	193.14	34.92	668.34	0.216159E-01
43.3128	8	30	4.90	7.06	0.61	4.24	76.92	25.78	6987.84	77.00	20.88	914.56	76.60	24.22	7058.24	80.09	17.96	989.83	0.961930E-02
43.4568	8	29	2.37	4.38	0.66	5.39	67.57	22.24	7150.44	67.33	24.60	832.90	67.32	20.95	7211.54	71.96	21.66	896.16	0.245482E-01
50.3339	8	60	1.10	8.45	0.83	8.44	74.53	48.39	6165.52	74.84	47.31	549.10	75.31	46.62	6216.51	83.28	40.43	607.28	0.872822E-01
56.0713	8	20	4.27	2.44	0.33	2.17	303.10	22.15	7154.33	302.19	17.97	989.58	301.77	24.19	7059.94	301.23	21.80	892.91	0.722340E-02
57.1988	8	24	1.62	9.47	0.89	8.99	212.85	35.12	6603.02	211.26	36.10	653.91	209.09	35.25	6598.40	197.47	35.68	658.97	0.251066E-01
67.3700	8	26	1.53	4.20	0.65	5.28	69.51	23.20	7105.38	69.33	24.72	830.47	69.26	21.85	7168.52	73.78	21.67	896.02	0.233731E-01

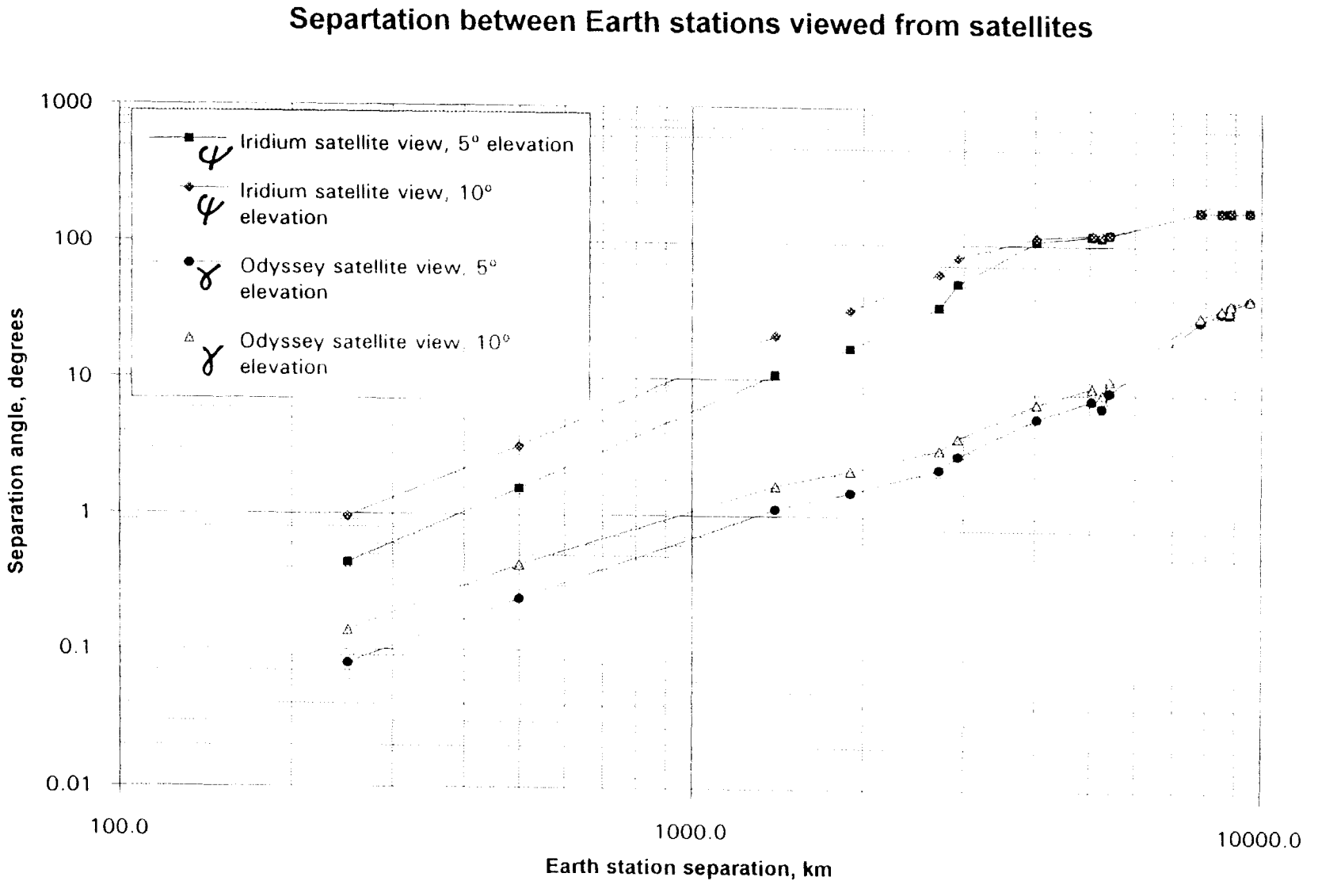
TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
0.9878	9	55	3.75	9.46	0.80	6.57	187.36	26.95	6936.56	183.15	27.15	784.53	184.23	26.16	6971.13	173.88	24.74	829.98	0.618023E-02
10.0488	9	35	0.09	0.94	0.19	1.21	124.81	13.80	7571.53	124.82	13.89	1113.68	123.23	11.92	7671.37	122.79	11.09	1213.71	0.108955E+00
16.3062	9	60	4.46	4.45	0.73	5.81	244.84	25.98	6979.00	246.39	21.75	894.07	241.92	27.20	6925.43	238.24	24.23	840.27	0.894483E-02
16.7724	9	6	2.37	8.62	0.92	11.52	256.52	57.24	5944.30	257.75	54.97	501.75	251.86	59.09	5904.96	235.71	62.72	467.67	0.305325E-01

17.8501	9	20	1.61	5.94	0.76	7.57	72.09	39.23	6453.82	71.81	40.83	603.44	72.44	37.63	6510.33	79.23	35.30	663.65	0.570957E-01
24.9007	9	52	3.41	9.49	0.82	6.99	189.15	28.81	6856.17	185.28	29.21	749.68	185.91	28.08	6887.58	175.32	26.75	791.84	0.673444E-02
33.9842	9	43	0.80	0.39	0.20	1.34	127.30	13.25	7600.28	127.62	13.99	1110.24	125.67	11.40	7699.76	125.33	11.20	1209.63	0.245008E-01
40.2630	9	57	2.62	4.23	0.70	5.66	245.11	23.27	7101.94	245.87	20.75	917.80	242.31	24.48	7046.72	237.93	23.10	864.16	0.136349E-02
40.7316	9	3	3.03	7.76	0.90	10.88	256.24	54.10	6016.33	257.26	51.14	523.50	251.91	55.93	5973.65	238.34	58.47	484.85	0.614244E-01
41.7856	9	17	2.35	8.74	0.81	7.80	70.59	44.31	6286.46	71.24	42.01	592.41	71.26	42.70	6337.52	79.03	36.32	651.36	0.363800E-01
48.8563	9	49	1.05	7.66	0.84	7.50	192.00	30.52	6784.75	190.80	30.72	726.05	188.64	29.87	6811.53	179.99	28.56	760.32	0.291133E-01
57.9404	9	40	1.83	0.59	0.22	1.55	130.05	12.85	7621.57	131.02	14.42	1096.06	128.37	11.02	7720.36	128.40	11.61	1194.28	0.364491E-02
64.2170	9	65	0.77	4.52	0.68	5.54	245.33	20.67	7224.94	245.54	19.92	938.06	242.63	21.86	7168.29	237.77	22.18	884.45	0.148517E-01
64.6811	9	11	3.02	7.16	0.87	10.35	255.89	51.14	6090.76	257.19	48.24	542.50	251.81	52.93	6045.14	240.25	55.25	500.31	0.263532E-01
65.7202	9	14	3.30	9.85	0.84	8.10	69.73	46.94	6207.19	70.82	43.73	577.30	70.61	45.32	6255.29	79.11	37.79	634.75	0.341186E-01

TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
1.7335	10	60	1.76	1.44	0.19	1.31	108.48	11.82	7676.63	109.04	13.50	1126.83	107.22	9.99	7776.24	108.45	10.77	1226.28	0.122995E-01
8.8874	10	33	0.93	11.68	1.00	11.98	56.84	67.69	5753.46	57.73	66.83	454.08	61.09	66.32	5774.30	79.50	58.25	485.83	0.172351E+00
9.6522	10	38	3.59	4.88	0.57	3.50	74.21	16.77	7417.67	73.89	13.20	1137.24	73.67	15.38	7489.01	76.18	11.16	1211.18	0.116311E-01
14.6964	10	50	2.76	4.31	0.20	1.79	306.13	11.94	7670.55	306.73	14.64	1089.12	304.84	13.81	7571.02	306.24	17.90	991.35	0.271617E-02
16.3870	10	9	2.85	8.54	0.77	6.48	178.16	30.17	6799.07	174.91	29.76	740.89	175.02	29.06	6845.51	165.81	26.51	796.27	0.846253E-02
25.6551	10	57	0.88	0.77	0.18	1.13	110.57	11.68	7684.71	110.81	12.52	1160.90	109.27	9.84	7784.95	110.04	9.89	1261.11	0.110168E-01
31.7122	10	14	4.68	4.62	0.77	6.12	236.52	25.77	6988.59	238.54	21.47	900.65	233.47	26.72	6946.39	229.95	23.37	858.19	0.747986E-02
32.8205	10	30	2.20	13.13	1.02	12.21	54.36	70.87	5710.23	57.92	69.04	447.93	59.73	69.56	5727.28	81.36	60.00	478.26	0.266158E-01
49.6166	10	65	0.35	0.61	0.16	1.01	113.19	11.92	7671.32	113.28	12.26	1170.31	111.84	10.07	7772.00	112.29	9.64	1271.06	0.264811E-01
55.6678	10	22	3.70	4.36	0.75	5.76	237.23	22.86	7121.19	238.64	19.40	951.29	234.32	23.82	7076.85	230.58	21.17	907.67	0.198767E-02
56.7781	10	27	1.62	13.17	1.03	12.70	50.11	74.35	5670.61	54.11	73.18	438.28	57.30	73.16	5683.23	83.19	63.76	463.97	0.519771E-02
64.2590	10	3	4.52	11.35	0.85	7.82	185.75	36.23	6561.50	180.14	36.43	650.10	182.15	35.33	6595.33	168.80	32.74	696.92	0.903440E-03

TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
0.4739	11	47	2.57	11.20	0.93	9.98	61.75	55.65	5979.87	63.57	53.31	510.73	63.71	54.21	6013.76	76.37	46.43	555.69	0.680292E-01
6.1715	11	7	3.95	5.91	0.21	2.18	303.46	13.84	7569.40	304.31	17.70	996.89	302.12	15.75	7470.18	303.63	21.48	900.38	0.923710E-03
23.2065	11	40	3.41	10.62	0.84	8.60	226.84	30.85	6771.05	224.23	33.45	687.24	223.43	31.50	6744.82	211.30	34.59	672.42	0.146213E-01
24.3892	11	55	3.34	11.96	0.95	10.24	61.46	58.21	5923.32	63.42	55.05	501.34	63.73	56.76	5954.92	76.96	47.88	545.02	0.129955E-01
25.1449	11	60	0.04	2.81	0.56	3.34	70.60	10.05	7773.13	70.64	10.04	1254.81	69.92	8.81	7841.70	72.72	8.35	1325.30	0.178042E+00
47.1671	11	37	2.36	9.09	0.83	8.02	227.72	28.37	6874.97	226.05	30.23	733.53	224.44	29.04	6846.67	214.31	31.50	714.53	0.150797E-01
48.3484	11	52	1.38	11.17	0.97	11.00	60.91	61.39	5859.48	62.09	60.14	477.70	63.67	59.93	5888.06	78.31	52.24	516.87	0.911415E-01
49.1034	11	57	2.01	3.76	0.58	3.37	70.58	12.41	7645.31	70.72	10.41	1240.35	69.97	11.15	7713.38	72.85	8.68	1310.91	0.809651E-02
54.2111	11	11	4.42	3.19	0.27	1.51	303.47	18.05	7353.32	302.57	13.72	1119.48	302.14	20.02	7256.32	301.57	16.88	1020.38	0.490667E-02
71.0290	11	45	4.66	11.24	0.82	8.07	226.76	26.82	6942.24	223.26	30.32	732.04	223.56	27.44	6914.91	211.43	31.30	717.34	0.132905E-01

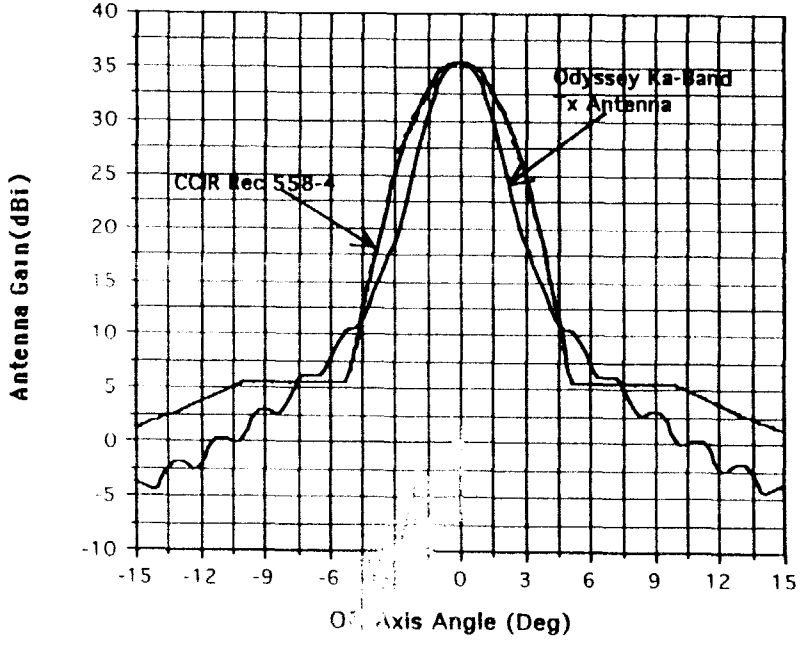
TIME	SC1	SC2	ST1SEP	ST2SEP	SC1SEP	SC2SEP	ST1S1AZ	ST1S1EL	ST1S1RG	ST1S2AZ	ST1S2EL	ST1S2RG	ST2S1AZ	ST2S1EL	ST2S1RG	ST2S2AZ	ST2S2EL	ST2S2RG	OffAxisR(dps)
21.6256	12	29	3.09	5.63	0.27	2.82	300.57	18.51	7330.70	301.09	21.56	898.53	299.17	20.49	7233.66	300.03	26.07	804.37	0.938024E-02
22.7289	12	43	1.00	10.80	1.02	12.71	190.77	70.69	5712.51	193.72	70.49	444.27	182.04	69.71	5725.27	160.16	63.20	465.94	0.999616E-01
45.5826	12	26	4.39	6.74	0.23	2.58	300.87	15.98	7458.21	301.52	20.33	927.98	299.47	17.92	7359.76	300.51	24.60	832.91	0.840740E-02
46.6862	12	40	4.86	8.22	1.03	13.04	200.99	72.01	5696.35	213.80	69.56	446.58	191.21	71.46	5702.92	174.00	66.04	456.51	0.395467E-01
70.5522	12	37	1.69	10.80	1.04	13.19	206.89	73.52	5679.31	211.63	72.55	439.58	196.12	73.22	5682.57	167.60	67.80	451.30	0.113586E+00


Separtation between Earth stations viewed from satellites
Iridium satellite view, 5° elevation
Iridium satellite view, 10° elevation
Odyssey satellite view, 5° elevation
Odyssey satellite view, 10° elevation
Separation angle, degrees
1000
100
10
1
0.1
0.01
100.0
1000.0
10000.0
Earth station separation, km

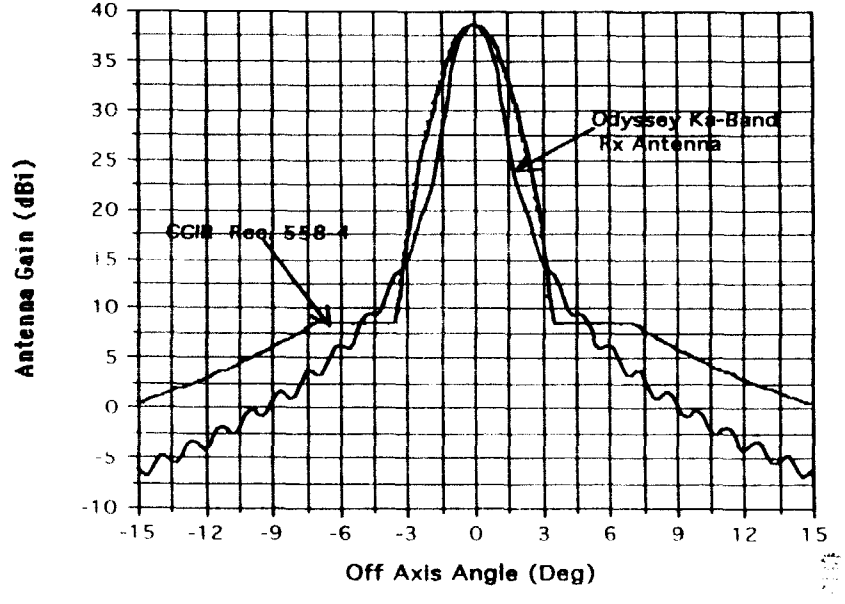
			View from Iridium satellites		View from Odyssey satellites	
Iridium Earth station	Odyssey Earth station	Separation, km	Elevation angle 5°	Elevation angle 10°	Elevation angle 5°	Elevation angle 10°
Monpelier	Portland, Maine	250.2	0.44	0.96	0.08	0.14
Las Vegas	San Luis Obispo	500.0	1.56	3.2	0.24	0.43
Spokane	San Luis Obispo	1400.7	10.93	21.03	1.13	1.68
Atlanta	Portland, Maine	1902.5	17	32.5	1.5	2.17
Kansas City	Portland, Maine	2724.6	34.3	60.69	2.25	3.12
Kansas City	San Luis Obispo	2934.0	51.73	80.73	2.82	3.83
Atlanta	San Luis Obispo	4033.8	106.94	115.1	5.37	6.87
Las Vegas	Portland, Maine	5050.1	118.4	121.2	7.28	9.06
Spokane	Portland, Maine	5257.8	114.95	119.32	6.47	8.14
Monpelier	San Luis Obispo	5424.8	121.5	122.75	8.41	10.34
Atlanta	Buenos Aires	7817.0	180	180	27.99	30.42
Kansas City	Buenos Aires	8531.5	180	180	32.7	34.76
Monpelier	Buenos Aires	8788.2	180	180	32.18	34.29
Las Vegas	Buenos Aires	8846.7	180	180	36.3	37.95
Spokane	Buenos Aires	9550.2	180	180	39.8	40.93
Phoenix	San Luis Obispo	800				

The Odyssey Satellite Antenna Patterns

Transmit Antenna



Receive Antenna



JAN 22 1996

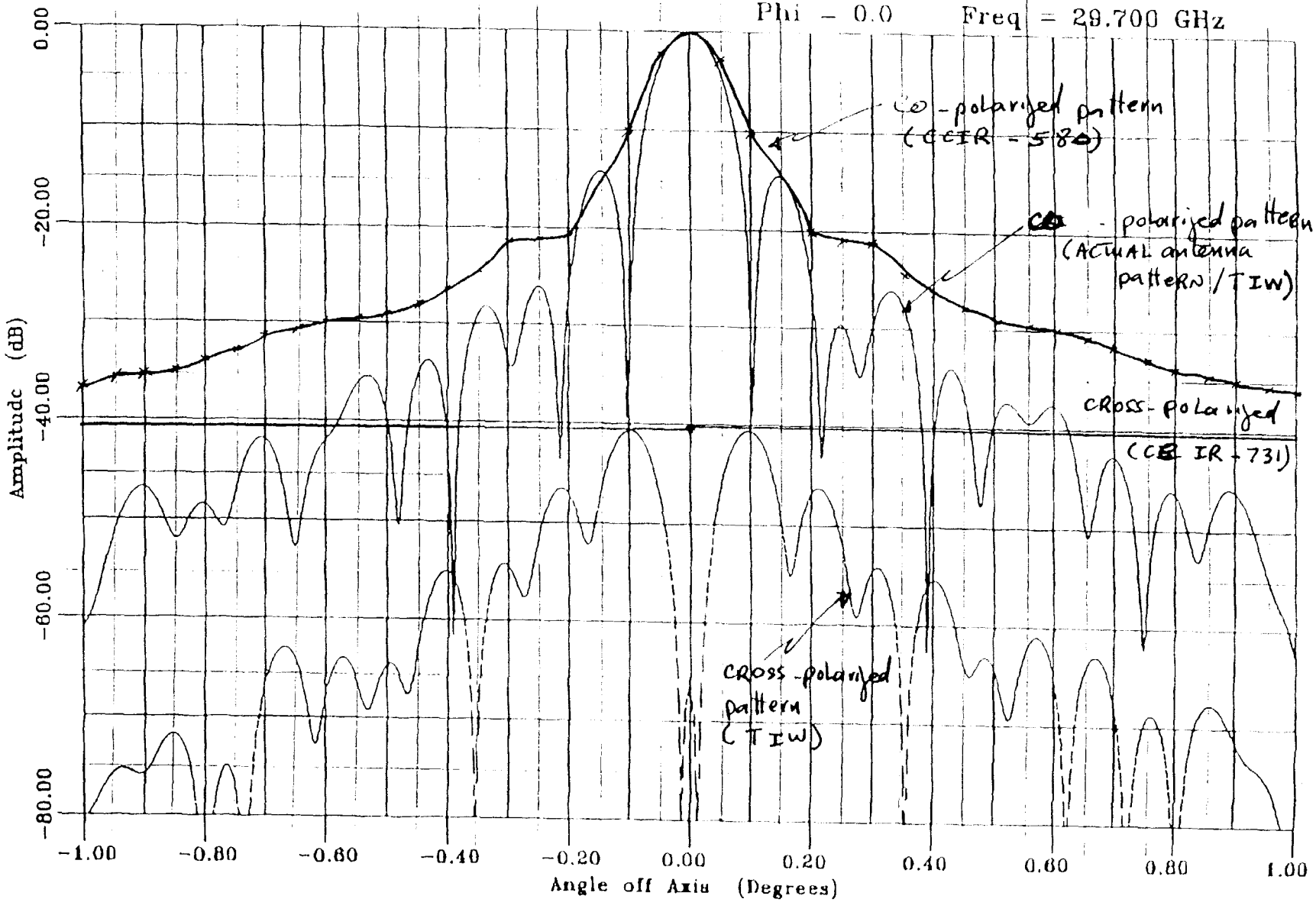
Hau H. Ho
1/14/96

7 Meter High Efficiency 20-30 GHz Antenna

Far Field Pattern

Polarization: Left C.P.

Phi = 0.0 Freq = 29.700 GHz



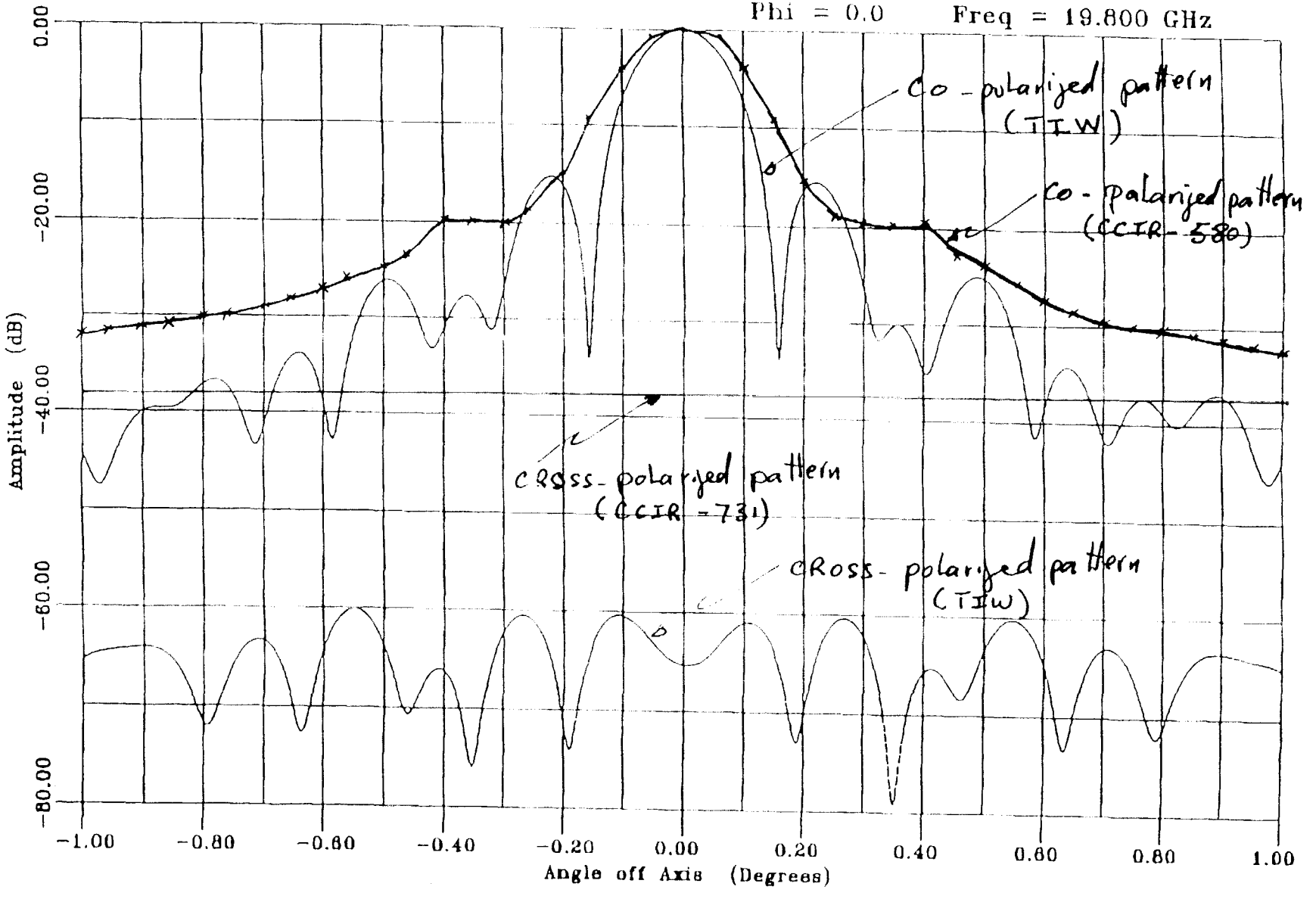
MAY 22 '95 17:04 408 654 5614 PAGE.02

7 Meter High Efficiency 20-30 GHz Antenna

Far Field Pattern

Polarization: Right C.P.

Phi = 0.0 Freq = 19.800 GHz



MAY 22 '95 17:04 408 654 5614 PAGE.03

ODYSSEY TRANSMIT ANTENNA			IRIDIUM SAT. RX ANT.			IRIDIUM SAT	Iridium Satellite Tx System		Odyssey E/S Rx Par			[illegible]	Iridium TRANSMIT ANTENNA			ODYSSEY SAT. RX ANT.			ODYSSEY SAT	ODYSSEY Satellite Tx System		IRIDIUM E/S Rx Par		
TX POWER DEN	ANT. GAIN	XPD	SAT RX GAIN	XPD	NET ISOLATION	RX Io/No (dB)	Sat. TX Ant Gain(dBI)	SAT. TX ANT XPD (dB)	RX E/S ANT GAIN (dB)	RX E/S Ant XPD (dB)	NEXT ISOLATION (dB)	RX Io/No dB	TX POWER DEN dBW	ANT. GAIN dBI	XPD dB	SAT RX GAIN	XPD	NET ISOLATION	RX Io/No (dB)	Sat. TX Ant Gain(dBI)	SAT. TX ANT XPD (dB)	RX E/S ANT GAIN (dB)	RX E/S Ant XPD (dB)	NEXT ISOLATION (dB)
80.23172	11.7	4.5	0.1	0	-0.27	-52.9	1.6	4.662676094	11.7	4.5	-1.159273	-35.2	-86.36698	2.5	1.4	36.1	27.6195122	-3.34	-55.5	5.7	0	2.5	1.4	0.0274836
-80.231674	12.6	4.7	0.1	0	-0.29	-52.0	1.4	4.499473142	12.6	4.7	-1.1644799	-34.5	-86.385641	2.8	1.6	36.1	27.6195122	-3.43	-55.2	10.1	4.40048789	2.8	1.6	0.4887206
-80.231613	13.5	4.9	0.1	0	-0.31	-51.1	1.2	4.335746263	13.5	4.9	1.1653455	-33.8	-86.403968	3.1	1.7	36.1	27.6195122	-3.52	-55.0	14.0	8.29935981	3.1	1.7	1.2142648
-80.231567	14.3	5.0	0.1	0	-0.33	-50.3	1.1	4.171495456	14.3	5.0	1.1608391	-33.0	-86.421583	3.5	1.9	36.1	27.6195122	-3.61	-54.8	17.2	11.4947655	3.5	1.9	1.8680166
80.231505	15.2	5.2	0.1	0	-0.35	-49.4	0.9	4.047963528	15.2	5.2	1.1624969	-32.3	-86.438858	3.8	2.0	36.1	27.6195122	-3.70	-54.5	19.9	14.170893	3.8	2.0	2.3904558
80.231459	15.9	5.3	0.1	0	0.36	-48.7	0.8	3.882795853	15.9	5.3	1.1455805	-31.8	86.455414	4.2	2.2	36.1	27.6195122	-3.78	54.3	21.8	16.0617068	4.2	2.2	2.7436743
-80.231397	16.4	5.3	0.1	0	-0.37	-48.2	0.7	3.75857627	16.4	5.3	1.1331234	-31.3	86.471624	4.5	2.3	36.1	27.6195122	3.87	-54.0	23.1	17.4404459	4.5	2.3	3.0026773
-80.231336	16.7	5.4	0.1	0	0.37	-47.9	0.5	3.592491724	16.7	5.4	1.1004851	-31.1	-86.487109	4.9	2.5	36.1	27.6195122	-3.95	-53.8	23.8	18.0644243	4.9	2.5	3.1506171
-80.231274	16.7	5.4	0.1	0	-0.37	-47.9	0.4	3.467584486	16.7	5.4	-1.0697821	-31.2	-86.502242	5.2	2.6	36.1	27.6195122	-4.02	-53.6	23.8	18.0644243	5.2	2.6	3.2168233
-80.231228	16.4	5.3	0.1	0	-0.37	-48.2	0.2	3.342382544	16.4	5.3	1.030084	-31.6	-86.516644	5.5	2.7	36.1	27.6195122	-4.10	-53.3	23.1	17.3613307	5.5	2.7	-3.1866864
-80.231167	15.8	5.3	0.1	0	-0.36	-48.7	0.1	3.174988183	15.8	5.3	-0.9730731	-32.3	-86.530689	5.8	2.8	36.1	27.6195122	-4.17	-53.1	21.7	15.9783689	5.8	2.8	3.0385737
-80.231105	15.1	5.2	0.1	0	-0.34	49.4	0.1	3.049098586	15.1	5.2	0.9211789	-33.1	86.543996	6.1	3.0	36.1	27.6195122	4.24	52.9	19.7	13.9930393	6.1	3.0	2.7546346
-80.231044	14.3	5.0	0.1	0	0.33	-50.2	-0.1	2.965008461	14.3	5.0	0.8741678	-33.9	-86.556942	6.4	3.1	36.1	27.6195122	-4.29	-52.7	17.0	11.3025047	6.4	3.1	2.2672787
-80.230982	13.4	4.9	0.1	0	-0.31	-51.1	-0.3	2.838627683	13.4	4.9	0.8144255	-34.9	-86.569145	6.6	3.1	36.1	27.6195122	-4.35	-52.5	13.6	7.88204936	6.6	3.1	1.5417528
-80.23092	12.5	4.7	0.1	0	-0.29	-52.0	-0.4	2.711952197	12.5	4.7	-0.7538288	35.9	-86.580791	6.9	3.2	36.1	27.6195122	-4.39	-52.3	9.5	3.833517	6.9	3.2	0.6931137
-77.939205	11.9	4.6	23.0	22.89	-4.75	-39.2	23.5	26.59552877	11.9	4.6	5.1811703	-24.4	-79.24465	5.5	2.7	37.4	28.9228679	-4.05	47.0	6.6	0.90551287	5.5	2.7	0.1825411
77.93826	12.4	4.7	23.0	22.86	-4.81	-38.8	23.5	26.58058051	12.4	4.7	5.2495924	-24.0	-79.240546	5.8	2.8	37.4	28.9228679	-4.11	-46.8	9.2	3.49035367	5.8	2.8	0.5542115
-77.937314	12.9	4.8	22.9	22.82	4.87	38.4	23.5	26.5655995	12.9	4.8	5.3183749	-23.5	-79.236444	6.0	2.9	37.4	28.9228679	-4.17	46.6	11.7	5.95496932	6.0	2.9	1.0500681
-77.936358	13.5	4.9	22.9	22.79	-4.94	-38.0	23.5	26.55058575	13.5	4.9	-5.3875048	-23.1	-79.23218	6.3	3.0	37.4	28.9228679	-4.23	-46.4	14.0	8.29935981	6.3	3.0	-1.5899638
77.935413	14.1	5.0	22.9	22.76	-5.00	-37.5	23.4	26.53553925	14.1	5.0	-5.456978	22.6	-79.227836	6.6	3.1	37.4	28.9228679	-4.29	-46.1	16.2	10.5235251	6.6	3.1	2.1155195
-77.934468	14.7	5.1	22.8	22.73	-5.06	-36.9	23.4	26.52046	14.7	5.1	-5.5300235	-22.0	-79.223412	6.9	3.2	37.4	28.9228679	-4.35	-45.9	18.4	12.7202424	6.9	3.2	2.6137103
-77.933511	15.3	5.2	22.8	22.7	5.12	-36.4	23.4	26.50534601	15.3	5.2	5.5969285	21.5	-79.218827	7.2	3.3	37.4	28.9228679	-4.41	-45.7	20.3	14.6111804	7.2	3.3	3.0173015
-77.932567	16.0	5.3	22.8	22.67	-5.18	-35.8	23.4	26.49020327	16.0	5.3	5.6673915	-20.9	-79.214162	7.5	3.4	37.4	28.9228679	-4.47	-45.4	22.2	16.4746702	7.5	3.4	-3.379534
-77.931622	16.8	5.4	22.7	22.64	-5.25	-35.1	23.4	26.47502579	16.8	5.4	5.7381657	-20.2	-79.209337	7.8	3.5	37.4	28.9228679	-4.53	-45.2	23.9	18.217935	7.8	3.5	3.6919756
-77.930666	17.6	5.5	22.7	22.6	-5.31	-34.4	23.4	26.45981556	17.6	5.5	5.8092469	-19.5	-79.204514	8.2	3.6	37.4	28.9228679	4.59	44.9	25.5	19.8409745	8.2	3.6	3.9598153
77.929722	18.4	5.6	22.7	22.57	-5.37	-33.7	23.3	26.44457259	18.4	5.6	5.877324	-18.8	-79.19953	8.5	3.7	37.4	28.9228679	4.65	44.6	27.0	21.2780874	8.5	3.7	4.1806054
-77.928766	19.4	5.7	22.7	22.57	-5.44	-32.8	23.3	26.44457259	19.4	5.7	5.9502279	-17.9	-79.194386	8.8	3.8	37.4	28.9228679	-4.72	44.3	28.4	22.6661414	8.8	3.8	4.3821174
77.927822	20.3	5.8	22.6	22.54	-5.50	-32.0	23.3	26.42929687	20.3	5.8	6.0188566	-17.0	-79.189245	9.2	3.9	37.4	28.9228679	-4.78	-44.0	29.6	23.8789499	9.2	3.9	4.5509744
77.926866	21.4	5.9	22.6	22.51	-5.56	-31.0	23.3	26.41398841	21.4	5.9	6.0877409	16.0	-79.183944	9.5	4.0	37.4	28.9228679	-4.84	43.7	30.7	24.9822144	9.5	4.0	4.7041863
77.925922	22.6	6.0	22.6	22.48	5.62	-29.9	23.3	26.3986472	22.6	6.0	6.1535082	15.0	-79.178565	9.9	4.1	37.4	28.9228679	4.90	43.4	31.6	25.9310989	9.9	4.1	4.8359535
77.924978	23.8	6.1	22.5	22.44	5.68	28.8	23.3	26.38327325	23.8	6.1	-6.2194944	-13.8	79.173026	10.3	4.2	37.4	28.9228679	4.97	43.1	32.5	26.7806238	10.3	4.2	4.9562617
77.924023	25.3	6.2	22.5	22.44	-5.74	-27.4	23.3	26.38327325	25.3	6.2	6.2870177	12.4	-79.167409	10.7	4.3	37.4	28.9228679	-5.03	-42.7	33.3	27.5618297	10.7	4.3	5.0688893
77.923079	26.8	6.3	22.5	22.41	-5.79	-26.0	23.3	26.36786655	26.8	6.3	6.3468474	11.0	-79.161715	11.1	4.4	37.4	28.9228679	-5.09	-42.4	33.9	28.1714875	11.1	4.4	5.1689014
77.922124	28.5	6.4	22.5	22.38	-5.84	-24.4	23.3	26.3524271	28.5	6.4	6.4064368	9.4	-79.155943	11.5	4.5	37.4	28.9228679	5.15	-42.0	34.4	28.6835765	11.5	4.5	5.2622286
-77.921181	30.1	7.5	22.4	22.35	-6.62	-23.5	23.2	26.33695491	30.1	7.5	7.2579743	-8.6	-79.150012	12.0	4.6	37.4	28.9228679	-5.22	-41.6	34.7	29.0409244	12.0	4.6	5.3465152
-77.920226	31.7	9.1	22.4	22.35	-7.68	-23.0	23.2	26.33695491	31.7	9.1	8.4302407	8.2	79.144005	12.4	4.7	37.4	28.9228679	5.28	41.3	35.0	29.283706	12.4	4.7	5.4213909
77.919282	32.7	10.1	22.4	22.31	-8.38	-22.8	23.2	26.32144998	32.7	10.1	9.2127753	-8.0	-79.13792	12.9	4.8	37.4	28.9228679	-5.34	-40.8	35.1	29.4082224	12.9	4.8	5.4934358
-77.918328	32.7	10.1	22.4	22.28	-8.38	22.8	23.2	26.3059123	32.7	10.1	9.2107347	-8.0	-79.131759	13.4	4.9	37.4	28.9228679	-5.40	-40.4	35.1	29.4082224	13.4	4.9	-5.5558346
77.917385	32.0	9.4	22.4	22.28	-7.86	-23.0	23.2	26.3059123	32.0	9.4	8.6423897	8.2	79.12544	13.9	4.9	37.4	28.9228679	-5.46	40.0	35.0	29.3205522	13.9	4.9	5.6136805
77.91643	30.5	7.9	22.3	22.25	-6.85	-23.5	23.2	26.29034187	30.5	7.9	7.5275803	-8.6	-79.119045	14.4	5.0	37.4	28.9228679	5.52	39.5	34.8	29.1051442	14.4	5.0	5.6643983
-77.915487	28.9	6.4	22.3	22.22	-5.83	-24.2	23.2	26.2747387	28.9	6.4	6.4131221	-9.1	-79.112493	14.9	5.1	37.4	28.9228679	-5.58	-39.0	34.5	28.7848694	14.9	5.1	5.7053017
-77.914533	27.2	6.3	22.3	22.22	5.78	-25.8	23.2	26.2747387	27.2	6.3	6.3553852	-10.8	-79.105945	15.5	5.2	37.5	28.9546431	-5.65	38.5	34.0	28.3231844	15.5	5.2	5.[illegible]98545
-77.91359	25.7	6.2	22.3	22.18	-5.72	-27.3	23.2	26.25910278	25.7	6.2	6.2930647	-12.3	-79.099242	16.0	5.3	37.5	28.9546431	5.70	38.0	33.4	27.741453	16.0	5.3	5.7579297
-77.912636	24.2	6.1	22.3	22.18	-5.66	-28.7	23.2	26.25910278	24.2	6.1	6.2289501	-13.6	-79.092462	16.6	5.4	37.5	28.9546431	-5.78	37.4	32.7	27.0143486	16.6	5.4	5.765727
-77.911694	23.0	6.0	22.3	22.15	-5.60	-29.9	23.1	26.24343412	23.0	6.0	6.1637004	-14.9	-79.085527	17.3	5.5	37.5	28.9546431	-5.82	-36.9	31.9	26.2397348	17.3	5.5	5.7616014
-77.91074	21.8	5.9	22.2	22.12	5.53	31.1	23.1	26.22773271	21.8	5.9	6.0953518	-16.0	-79.078597	17.9	5.5	37.5	28.9546431	-5.87	36.3	31.0	25.3256262	17.9	5.5	[illegible]
77.909798	20.7	5.8	22.2	22.12	5.47	32.1	23.1	26.22773271	20.7	5.8	6.0286013	-17.0	79.071512	18.5	5.6	37.5	28.9546431	-5.92	-35.7	30.0	24.3121579	18.5	5.6	5.6917095
77.908844	19.8	5.7	22.2	22.09	5.41	33.1	23.1	26.21199856	19.8	5.7	5.9607885	-17.9	-79.064352	19.1	5.7	37.5	28.9546431	-5.97	-35.1	28.9	23.1993301	19.1	5.7	5.6217975
77.90789	18.9	5.7	22.2	22.09	5.35	33.9	23.1	26.21199856	18.9	5.7	-5.8945681	18.8	-79.057118	19.8	5.8	37.5	28.9546431	-6.02	34.5	27.7	21.9871426	19.8	5.8	5.5241604
77.906948	18.0	5.6	22.2	22.05	-5.28	-34.7	23.1	26.19623166	18.0	5.6	5.8240242	19.6	-79.049729	20.4	5.8	37.5	28.9546431	6.07	33.9	26.3	20.6074099	20.4	5.8	5.[illegible]768776
77.905995	17.3	5.5	22.2	22.05	-5.22	-35.4	23.1	26.19623166	17.3	5.5	5.7583641	20.3	-79.042266	21.0	5.9	37.5	28.9546431	6.11	33.3	24.9	19.1915351	21.0	5.9	[illegible]
77.905053	16.5	5.4	22.1	22.02	-5.15	-36.2	23.1	26.18043202	16.5	5.4	5.688442	-21.0	-79.03473	21.6	5.9	37.5	28.9546431	6.14	32.8	23.3	17.5979309	21.6	5.9	4.940712
-77.9041	15.8	5.3	22.1	22.02	-5.09	-36.8	23.1	26.18043202	15.8	5.3	5.6233802	21.6	-79.02712	22.1	6.0	37.5	28.9546431	6.17	-32.3	21.7	15.9783689	22.1	6.0	4.6389727
-77.903147	15.2	5.2	22.1	21.99	-5.03	-37.4	23.1	26.16459963	15.2	5.2	5.5540847	-22.2	-79.019356	22.5	6.0	37.5	28.9546431	-6.19	31.9	19.9	14.170893	22.5	6.0	4.24390[illegible]
77.902205	14.6	5.1	22.1	21.99	-4.97	-38.0	23.1	26.16459963	14.6	5.1	5.4896052	22.8	-79.0116	22.8	6.0	37.5	28.9546431	6.21	31.7	18.0	12.3476438	22.8	6.0	3.7886955
-77.901253	14.0	5.0	22.1	21.99	-4.90	-38.5	23.1	26.16459963	14.0	5.0	5.4222227	-23.3	-79.003691	22.9	6.0	37.5	28.9546431	-6.22	-31.5	16.0	10.3262963	22.9	6.0	3.2239914
77.900311	13.5	4.9	22.1	21.95	-4.84	39.0	23.0	26.14873449	13.5	4.9	5.3571382	-23.8	-78.995709	22.9	6.0	37.5	28.9546431	-6.22	-31.5	14.0	8.29935981	22.9	6.0	2.6165726
-77.899359	12.9	4.8	22.1	21.95	-4.78	-39.5	23.0	26.14873449	12.9	4.8	5.2904179	-24.3	-78.987575	22.8	6.0	37.5	28.9546431	-6.21	-31.6	11.8	6.06414071	22.8	6.0	1.9347686
-77.898406	12.5	4.7	22.1	21.95	-4.72	-39.9	23.0	26.14873449	12.5	4.7	5.2271954	-24.7	-78.979449	22.8	6.0	37.5	28.9546431	-6.20	31.9	9.5	3.833517	22.6	6.0	1.2928864
79.717371	12.0	4.6	0.1	0	-0.27	-53.0	4.4	7.549099104	12.0	4.6	1.9141932	-33.8	-86.856415	-0.5	-0.3	36.9	28.4229342	2.50	57.7	7.2	1.50353365	0.5	-0.3	0.0188617
-79.718053	12.9	4.8	0.1	0	-0.29	-52.1	4.6	7.663986254	12.9	4.8	2.0073862	-32.8	-86.852866	-0.3	-0.2	36.9	28.4229342	-2.57	-57.5	11.8	6.06414071	-0.3	-0.2	0.4269941
-79.718749	13.9	4.9	0.1	0	-0.31	-51.2	4.7	7.778578697	13.9	4.9	2.0974658	31.8	86.84853	-0.1	0.1	36.9	28.4229342	2.63	57.4	15.8	9.92885775	-0.1	0.1	1.0053976
-79.719431	14.9	5.1	0.1	0	0.33	-50.3	4.8	7.892876431	14.9	5.1	2.1841464	-30.9	-86.843803	0.1	0.1	36.9	28.4229342	-2.69	57.2	18.9	13.1804017	0.1	0.1	1.5063771
-79.720127	15.8	5.3	0.1	0	0.35	49.3	4.9	7.968911193	15.8	5.3	2.2563671	-29.9	-86.83829	0.3	0.2	36.9	28.4229342	-2.74	-57.1	21.6	15.8947826	0.3	0.2	1.8894987
-79.720808	16.7	5.4	0.1	0	-0.36	-48.5	5.0	8.082717747	16.7	5.4	2.3320297	-29.0	-86.832192	0.5	0.3	36.9	28.4229342	-2.80	57.0	23.7	17.9872964	0.5	0.3	2.15837
-79.721505	17.4	5.5	0.1	0	-0.37	-47.8	5.1	8.198229592	17.4	5.5	-2.4001092	-28.2	-86.825311	0.7	0.4	36.9	28.4229342	-2.85	-56.8	25.3	19.5548188	0.7	0.4	2.3484692
-79.722187	18.0	5.8	0.1	0	-0.38	-47.2	5.2	8.309446729	18.0	5.6	2.4585729	-27.6	-86.818043	0.8	0.5	36.9	28.4229342	-2.90	-56.7	26.3	20.6074099	0.8	0.5	2.4804495
79.722883	18.3	5.6	0.1	0	-0.39	-47.0	5.3	8.422369157	18.3	5.6	-2.5018948	27.3	-86.809997	1.0	0.6	36.9	28.4229342	-2.94	56.6	26.7	21.0127972	1.0	0.6	2.5527558
79.723565	18.2	5.6	0.1	0	-0.39	-47.1	5.5	8.572473959	18.2	5.6	2.5423042	27.3	-86.80137	1.1	0.7	36.9	28.4229342	-2.98	56.5	26.6	20.8786617	1.1	0.7	2.5802673
-79.724247	17.8	5.5	0.1	0	-0.38	-47.4	5.6	8.684708735	17.8	5.5	-2.55923	-27.6	-86.792165	1.3	0.7	36.9	28.4229342	-3.0[illegible]	56.4	26.0	20.2627562	1.3	0.7	2.5607501
79.724944	17.2	5.4	0.1	0	0.37	-48.1	5.7	8.796648802	17.2	5.4	2.5616339	-28.1	-86.782382	1.4	0.8	36.9	28.4229342	[illegible]	56.3	24.7	19.0444829	1.4	0.8	2.4767053
-79.725626	16.4	5.3	0.1	0	-0.36	-48.9	5.8	8.90829416	16.4	5.3	2.5528244	-28.8	-86.771829	1.5	0.9	36.9	28.4229342		56.2	23.0	17.2819672	1.5	0.9	2.314724
-79.726308	15.5	5.2	0.1	0	-0.34	49.8	6.0	9.056698203	15.5	5.2	-2.5448192	-29.6	-86.760899	1.5	0.9	36.9	28.4229342		-56.1	20.7	14.9589391	1.5	0.9	2.0469774
-79.727005	14.5	5.1	0.1	0	-0.32	-50.8	6.1	9.167653909	14.5	5.1	-2.5183844	-30.4	-86.749204	1.6	0.9	36.9	28.4229342		-56.1	17.8	12.0655866	1.6	0.9	1.6337461
-79.727687	13.6	4.9	0.1	0	-0.30	-51.7	6.2	9.315139081	13.6	4.9	2.4975903	-31.2	-86.73694	1.6	1.0	36.9	28.42293[illegible]		56.0	14.4	8.71269587	1.6	1.0	1.080257
-79.728369	12.7	4.7	0.1	0	-0.28	-52.6	6.3	9.425409134	12.7	4.7	-2.462337	32.0	-86.724111	1.7	1.0	36.9	28.422[illegible]		56.0	10.5	4.84959342	1.7	1.0	0.4556797
78.076378	11.6	4.5	22.8	22.67	-4.69	-39.8	23.4	26.49020327	11.6	4.5	5.1335657	-24.6	-79.327805	5.4	2.7	37.4	28.890[illegible]	[illegible].02	-47.1	5.7	0	5.4	2.7	0.0977132
78.075429	12.0	4.6	22.7	22.64	4.75	-39.4	23.4	26.47502579	12.0	4.6	5.1953557	-24.3	-79.323579	5.8	2.8	37.4	28.890[illegible]	4.08	-46.9	7.4	1.74100317	5.6	2.8	0.284325
-78.074481	12.5	4.7	22.7	22.6	4.80	39.1	23.4	26.45981556	12.5	4.7	5.2511049	-23.9	79.319189	5.9	2.9	37.4	28.890[illegible]	-4.14	-46.7	9.5	3.833517	5.9	2.9	0.6219916
78.073521	12.9	4.8	22.7	22.57	-4.85	38.7	23.3	26.44457259	12.9	4.8	-5.310266	-23.6	-79.314718	6.1	3.0	37.4	28.890[illegible]	-4.19	-46.5	11.7	5.95496932	6.1	3.0	1.0585279
78.072573	13.3	4.8	22.7	22.57	-4.90	38.3	23.3	26.44457259	13.3	4.8	5.3644341	-23.2	-79.310167	6.4	3.1	37.4	28.890[illegible]	-4.24	-46.3	13.5	7.77710075	6.4	3.1	1.4810403
78.071625	13.8	4.9	22.6	22.54	-4.95	37.9	23.3	26.42929687	13.8	4.9	5.4208833	-22.8	-79.305453	6.7	3.1	37.4	28.890[illegible]	4.30	46.1	15.3	9.62817067	6.7	3.1	1.9260314
78.070678	14.3	5.0	22.6	22.51	5.00	37.6	23.3	25.41398841	14.3	5.0	5.4743374	22.4	79.300659	6.9	3.2	37.4	28.8905701	-4.36	-45.9	17.0	11.3025047	6.9	3.2	2.3251447
78.06973	14.7	5.1	22.6	22.48	-5.04	37.2	23.3	26.3986472	14.7	5.1	5.5247496	-22.0	-79.295785	7.2	3.3	37.4	28.8905791	4.41	45.6	18.5	12.812771	7.2	3.3	2.6731245
78.06877	15.2	5.2	22.5	22.44	5.08	36.8	23.3	26.38327325	15.2	5.2	5.5720864	-21.7	-79.290749	7.5	3.4	37.4	28.8905791	4.47	45.4	19.9	14.170893	7.5	3.4	2.9764998
78.067823	15.6	5.2	22.5	22.41	5.12	36.4	23.3	26.36786655	15.6	5.2	5.6195678	-21.3	-79.285633	7.7	3.5	37.4	28.8905791	-4.52	-45.2	21.2	15.4731252	7.7	3.5	3.251329
78.066876	16.1	5.3	22.5	22.38	5.16	36.1	23.3	26.3524271	16.1	5.3	5.6606648	20.9	79.280355	8.0	3.6	37.4	28.8905791	-4.58	44.9	22.3	16.5565177	8.0	3.6	3.4771946
78.065926	16.5	5.4	22.4	22.35	5.19	35.7	23.2	26.33695491	16.5	5.4	5.701861	20.5	-79.275081	8.3	3.7	37.4	28.8905791	-4.63	-44.7	23.3	17.5979309	8.3	3.7	3.6834337
78.064968	16.9	5.4	22.4	22.35	5.23	35.4	23.2	26.33695491	16.9	5.4	5.7378447	-20	-79.269645	8.6	3.8	37.4	28.8905791	-4.68	-44.5	24.1	18.4463379	8.6	3.8	3.[illegible]0419