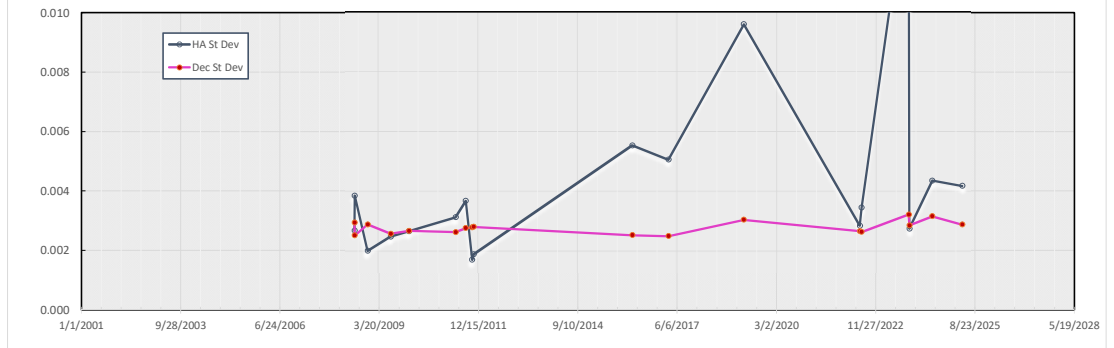
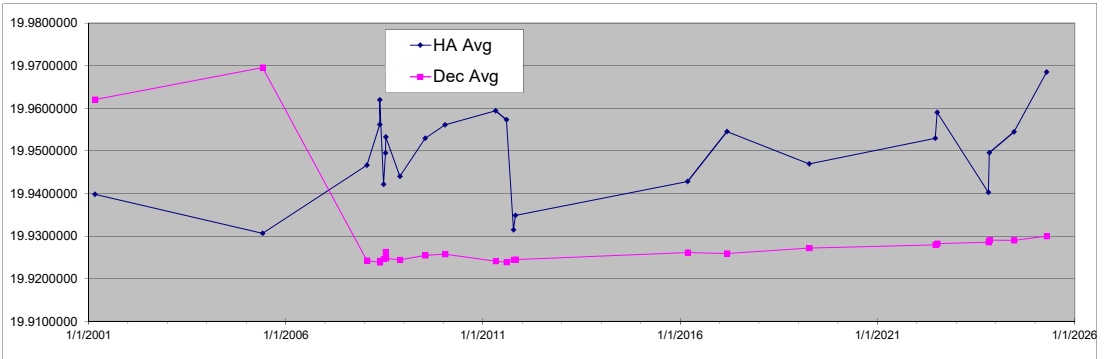


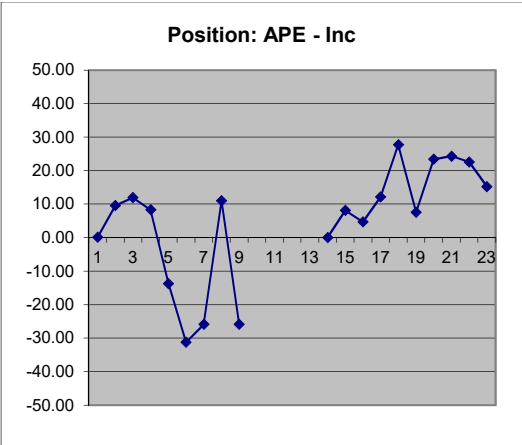
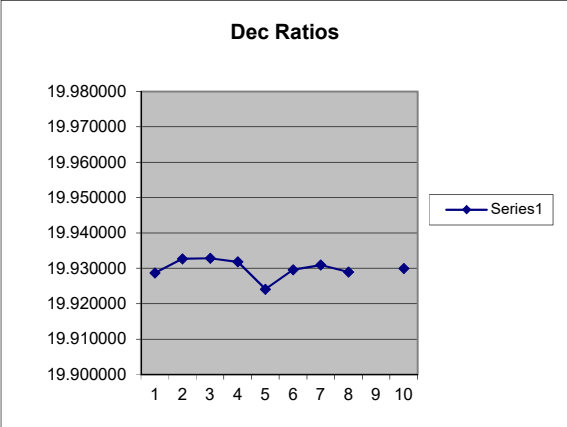
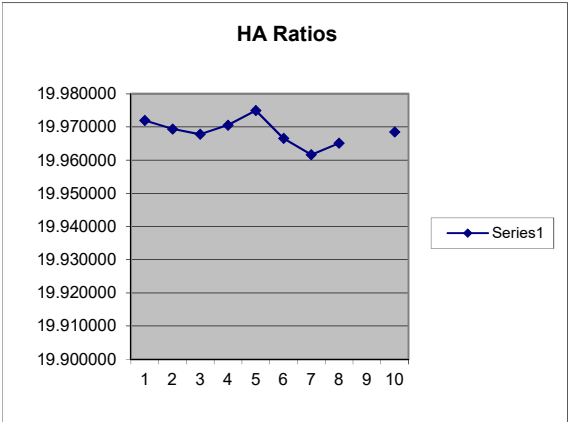
Date	HA Avg	Dec Avg	HA St Dev	Dec St Dev	Comment
3/1/2001	19.9397840	19.9620390			IRTF hire J.Harwood to do a pointing run. Ration were also determined. See history/0103_tcs1
6/1/2005	19.9306430	19.9695380			original tcs3 encoder ratio were determine by hand. Used during development
1/22/2008	19.9466470	19.9242480			used encoder_util. High (but constant) HA error - forgot to initialize pmac at Zenith at start. Error -mean are < 10 except for #3, #8 (-21, -28 as).
5/20/2008	19.9561650	19.9238220			used encoder_util. 1 day before pointing run. HA gear clear; Dec gears not cleaned (daycrew to do tomorrow)
5/21/2008	19.9619690	19.9242340			used encoder_util. Dec bullgear was cleaned. Modified TCS3 to used these values.
6/24/2008	19.9421450	19.9246220			measured the encoders, as the 23June engineer showed lots of errors in the HA ratios (150" at 3.0 hrs). Previous encoder measurement (of 19.961) is wrong?
7/14/2008	19.9495090	19.9262780	0.002661	0.002936	Measured encoder ration 1 day before tcs3 pointing run.
7/15/2008	19.9532450	19.9248080	0.003843	0.002498	for tcs3 engineering
11/24/2008	19.9440080	19.9244310	0.001979	0.002871	Nov 25 tcs3 pointing run
7/14/2009	19.9529260	19.9254430	0.002461	0.002560	July 14 tcs3 pointing run
1/14/2010	19.9560920	19.9257970	0.002646	0.002653	July 14 tcs3 pointing run
4/28/2011	19.9593925	19.9241089	0.003113	0.002614	March 28, 2011 pointing run
8/8/2011	19.9573124	19.9238708	0.003662	0.002747	Aug 09, 2011 pointing run.
10/12/2011	19.9315081	19.9244321	0.001684	0.002768	Oct 12, 2011 - after complains of bad tracking
10/28/2011	19.9348587	19.9244643	0.001867	0.002789	Oct 28, 2011 - for oct 29 pointing run.
3/11/2016	19.9428137	19.9261658	0.005534	0.002507	March 28, 2016 pointing run
3/10/2017	19.9545344	19.9259447	0.005051	0.002475	March 13, 2017 pointing run
4/9/2019	19.9469514	19.9272320	0.009611	0.003027	April 4, 2019 pointing run
6/20/2022	19.9529791	19.9279676	0.002825	0.002642	Jun 20 2022 - after HA encoder P/S fix. Updated TCS with these values for July 8 pointing run.
7/7/2022	19.9590543	19.9282787	0.003440	0.002615	July 7 2022 - a day before pointing run.
10/26/2023	19.9402609	19.9285342	0.014681	0.003203	October 26 2023 - a day before pointing run.
11/2/2023	19.9495686	19.9290731	0.002730	0.002838	November 02 2023 - redo of 10/26/2023 due to a bad data point.
6/18/2024	19.9544584	19.9289880	0.004347	0.003146	June 2024 - Done by Alex Seigel. Value not used.
4/16/2025	19.9685046	19.9299740	0.004168	0.002863	For Apr 21 pointing run. Updated TCS with these values.



4/16/2025

HA APES radians	Counts	radians to l Dist APE(h Dist_as			Dist Cnt	Ratio	Using Ration
0.000149447	612	0.001					0.18
-0.26141208	-1076895	-0.999	-0.999	-53950.94	-1077507	19.971979	9.56
-0.522988513	-2154324	-1.998	-0.999	-53954.01	-1077429	19.969395	11.97
-1.04620846	-4309290	-3.996	-1.999	-107921.86	-2154966	19.967836	8.36
0.000004107	290	0.000	3.996	215796.83	4309580	19.970543	-13.68
0.261499086	1077685	0.999	0.999	53937.21	1077395	19.974985	-31.18
0.523096815	2155047	1.998	0.999	53958.40	1077362	19.966528	-25.84
1.046417914	4309765	3.997	1.999	107942.73	2154718	19.961679	11.06
-0.000009203	478	0.000	-3.997	-215841.09	-4309287	19.965091	-25.84
Average						19.968504610	
St Dev						0.004168228	

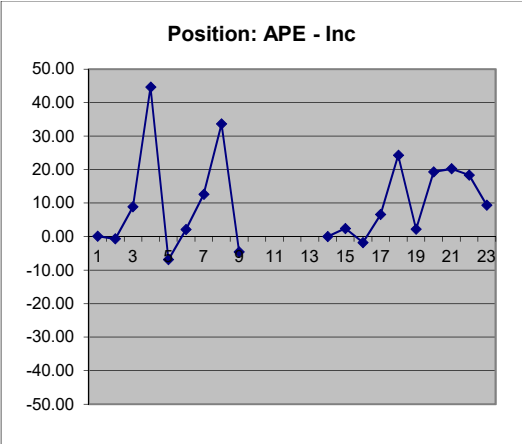
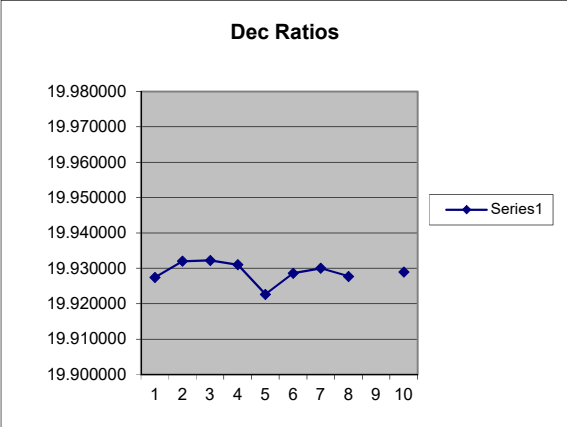
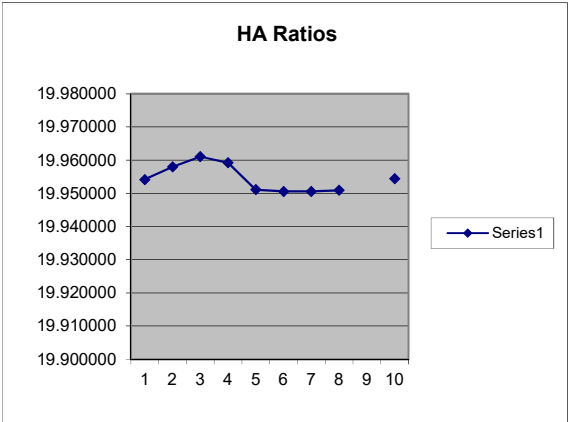
Dec APES radians	counts	radians to l Dist APE(D Dist (AS)			Dist Cnt	Ratio	Using Ration
0.34906008	1434772	20.000					8.15
0.087298133	358776	5.002	-14.998	-53992.28	-1075996	19.928702	4.70
-0.174442994	-717352	-9.995	-14.997	-53987.98	-1076128	19.932732	12.17
-0.697917774	-2869590	-39.988	-29.993	-107974.42	-2152238	19.932850	27.76
0.349055275	1434764	19.999	59.987	215953.69	4304354	19.931838	7.56
0.61091278	2510905	35.003	15.003	54011.99	1076141	19.924114	23.44
0.872691276	3587020	50.002	14.999	53995.69	1076115	19.929646	24.33
1.047196927	4304422	60.000	9.998	35994.37	717402	19.930948	22.57
0.349125209	1434898	20.003	-39.997	-143987.63	-2869524	19.928962	15.26
Average						19.929974020	
St Dev						0.002863305	



4/16/2025

HA APES radians	Counts	radians to l Dist APE(h Dist_as			Dist Cnt	Ratio	Using Ration
0.000160627	658	0.001					0.16
-0.261651119	-1076918	-0.999	-1.000	-54002.55	-1077576	19.954169	-0.63
-0.523356388	-2154262	-1.999	-1.000	-53980.59	-1077344	19.957990	8.93
-1.04675202	-4309220	-3.998	-1.999	-107958.10	-2154958	19.961059	44.64
0.000057877	375	0.000	3.999	215920.04	4309595	19.959217	-6.85
0.261854184	1077723	1.000	1.000	53999.36	1077348	19.951124	2.17
0.523658476	2155075	2.000	1.000	54001.01	1077352	19.950589	12.64
1.047265995	4309774	4.000	2.000	108001.80	2154699	19.950584	33.61
0.000101	506	0.000	-4.000	-215993.28	-4309268	19.950935	-4.52
Average						19.954458375	
St Dev						0.004347279	

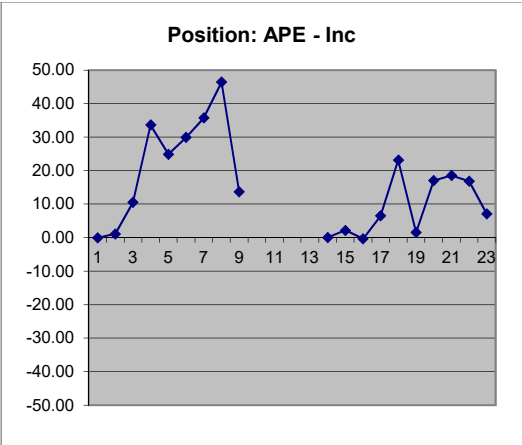
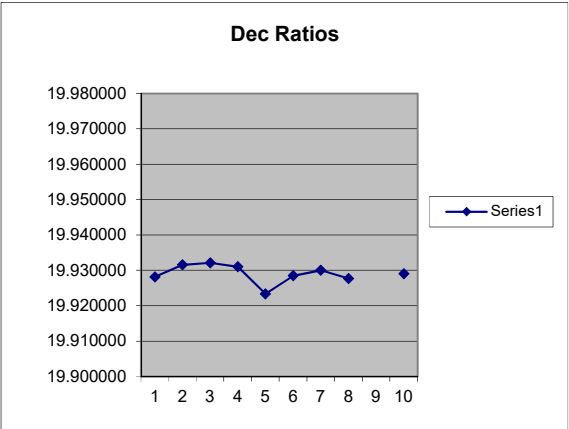
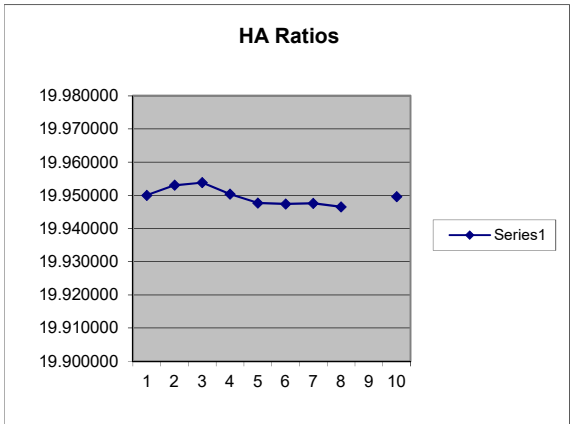
Dec APES radians	counts	radians to l Dist APE(D Dist (AS)			Dist Cnt	Ratio	Using Ration
0.349050471	1434775	19.999					2.45
0.087279982	358812	5.001	-14.998	-53994.04	-1075963	19.927440	-1.74
-0.17447022	-717317	-9.996	-14.997	-53989.85	-1076129	19.932060	6.58
-0.697961549	-2869559	-39.990	-29.994	-107977.84	-2152242	19.932257	24.29
0.349044065	1434753	19.999	59.989	215960.41	4304312	19.931023	2.24
0.610917585	2510882	35.003	15.004	54015.29	1076129	19.922673	19.35
0.872708359	3586994	50.003	15.000	53998.22	1076112	19.928656	20.25
1.04722095	4304392	60.001	9.999	35995.81	717398	19.930044	18.34
0.349120404	1434924	20.003	-39.998	-143993.57	-2869468	19.927750	9.40
Average						19.928988015	
St Dev						0.003146197	



11/2/2023

HA APES radians	Counts	radians to l Dist APE(h Dist_as			Dist Cnt	Ratio	Using Ration
0.000138799	573	0.001					-0.09
-0.261731508	-1077020	-1.000	-1.000	-54014.63	-1077593	19.950022	1.13
-0.523511843	-2154406	-2.000	-1.000	-53996.07	-1077386	19.953045	10.54
-1.047081031	-4309298	-4.000	-2.000	-107993.90	-2154892	19.953831	33.62
0.000179792	243	0.001	4.000	216013.05	4309541	19.950373	24.90
0.262029869	1077628	1.001	1.000	54010.46	1077385	19.947712	29.93
0.523881543	2155004	2.001	1.000	54010.78	1077376	19.947424	35.74
1.047577437	4309744	4.001	2.000	108020.03	2154740	19.947596	46.42
0.000166483	412	0.001	-4.001	-216044.02	-4309332	19.946546	13.69
Average						19.949568617	
St Dev						0.002730232	

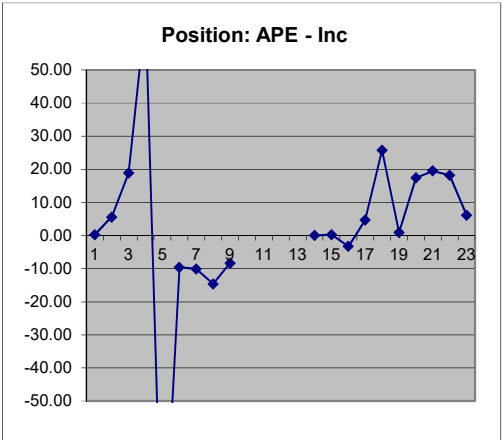
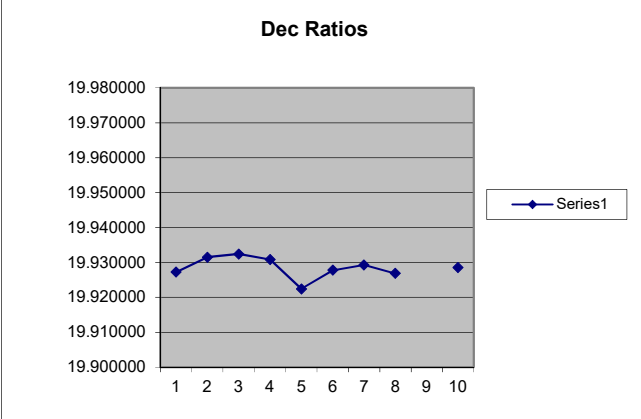
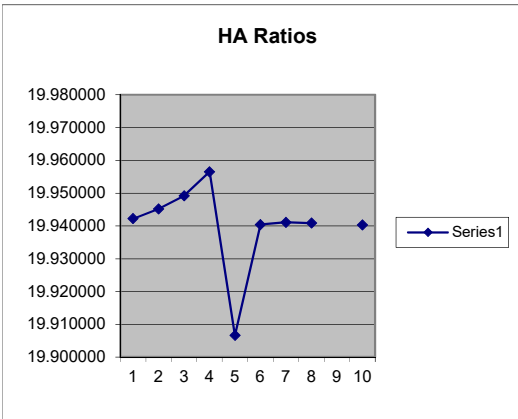
Dec APES radians	counts	radians to l Dist APE(D Dist (AS)			Dist Cnt	Ratio	Using Ration
0.349050471	1434787	19.999					2.16
0.087281584	358793	5.001	-14.998	-53993.71	-1075994	19.928137	-0.38
-0.174475024	-717338	-9.997	-14.998	-53991.18	-1076131	19.931609	6.49
-0.697967955	-2869574	-39.991	-29.994	-107978.17	-2152236	19.932140	23.11
0.349044065	1434773	19.999	59.989	215961.73	4304347	19.931064	1.54
0.610911179	2510913	35.003	15.004	54013.97	1076140	19.923364	17.01
0.872703555	3587023	50.002	15.000	53998.55	1076110	19.928497	18.58
1.047215612	4304419	60.001	9.999	35995.70	717396	19.930050	16.81
0.349102254	1434902	20.002	-39.999	-143996.22	-2869517	19.927725	7.07
Average						19.929073129	
St Dev						0.002837733	



10/26/2023

HA APES radians	Counts	radians to hours	Dist APE(hr)	Dist_as	Dist Cnt	Ratio	Using Ration
0.000132411	540	0.001					0.23
-0.261831596	-1077017	-1.000	-1.001	-54033.96	-1077557	19.942220	5.54
-0.523713615	-2154398	-2.000	-1.000	-54017.04	-1077381	19.945205	18.93
-1.047414833	-4309332	-4.001	-2.000	-108021.13	-2154934	19.949190	67.30
-0.01549401	-61606	-0.059	3.942	212848.95	4247726	19.956528	-106.34
0.261967048	1077656	1.001	1.060	57230.45	1139262	19.906570	-9.65
0.523909759	2155029	2.001	1.001	54029.56	1077373	19.940435	-10.12
1.047773353	4309757	4.002	2.001	108054.62	2154728	19.941100	-14.66
0.000054151	390	0.000	-4.002	-216107.60	-4309367	19.940840	-8.39
Average						19.940260869	
St Dev						0.014681116	

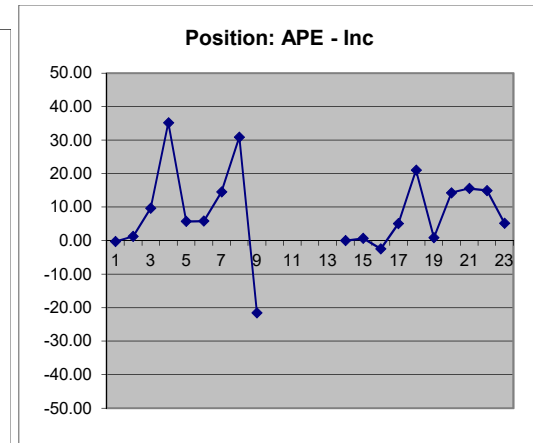
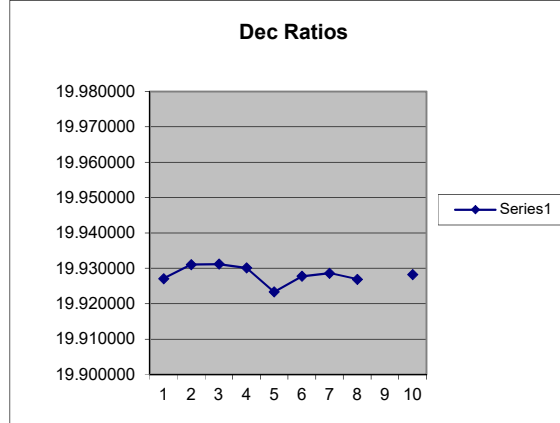
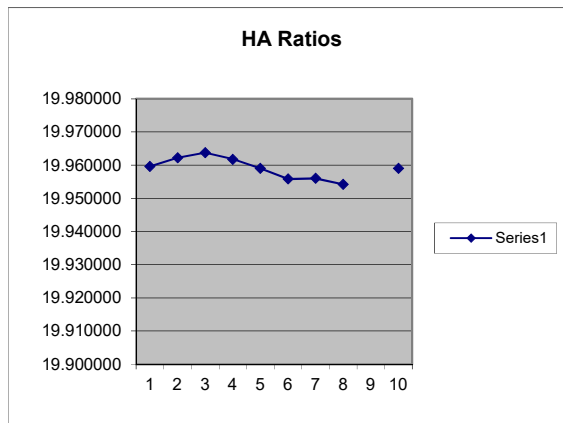
Dec APES radians	counts	radians to Degrees	Dist APE(Deg)	Dist (AS)	Dist Cnt	Ratio	Using Ration
0.349050471	1434786	19.999					0.26
0.087270373	358795	5.000	-14.999	-53996.02	-1075991	19.927228	-3.28
-0.174486769	-717330	-9.997	-14.998	-53991.29	-1076125	19.931457	4.64
-0.697971158	-2869562	-39.991	-29.993	-107976.41	-2152232	19.932429	25.74
0.349048335	1434764	19.999	59.990	215963.27	4304326	19.930824	0.93
0.610927194	2510902	35.004	15.005	54016.39	1076138	19.922434	17.46
0.872729179	3587012	50.004	15.000	54000.54	1076110	19.927765	19.54
1.047249244	4304413	60.003	9.999	35997.35	717401	19.929274	18.21
0.349108126	1434906	20.002	-40.001	-144001.94	-2869507	19.926863	6.13
Average						19.928534187	
St Dev						0.003202785	



7/7/2022

HA APES radians	Counts	radians to f Dist APE(h Dist_as			Dist Cnt	Ratio	Using Ration
0.000488573	2016	0.002					-0.23
-0.261513232	-1076636	-0.999	-1.001	-54041.75	-1078652	19.959605	1.26
-0.523100313	-2153720	-1.998	-0.999	-53956.21	-1077084	19.962188	9.73
-1.046245194	-4307938	-3.996	-1.998	-107906.38	-2154218	19.963769	35.22
0.000083432	228	0.000	3.997	215820.77	4308166	19.961776	5.79
0.261704585	1077282	1.000	0.999	53963.24	1077054	19.959033	5.84
0.52336194	2154312	1.999	0.999	53970.70	1077030	19.955827	14.57
1.046678248	4308401	3.998	1.999	107941.74	2154089	19.956034	30.91
-0.000000152	430	0.000	-3.998	-215892.92	-4307971	19.954203	-21.58
Average						19.959054337	
St Dev						0.003440178	

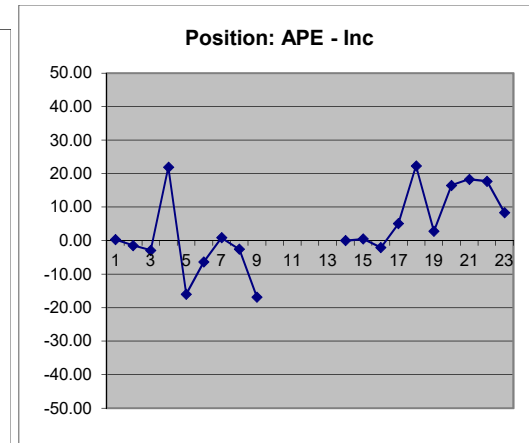
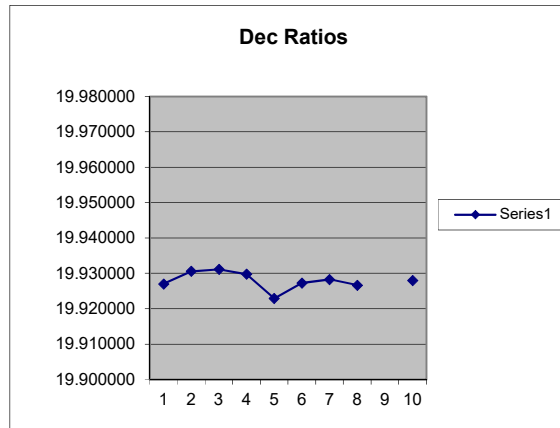
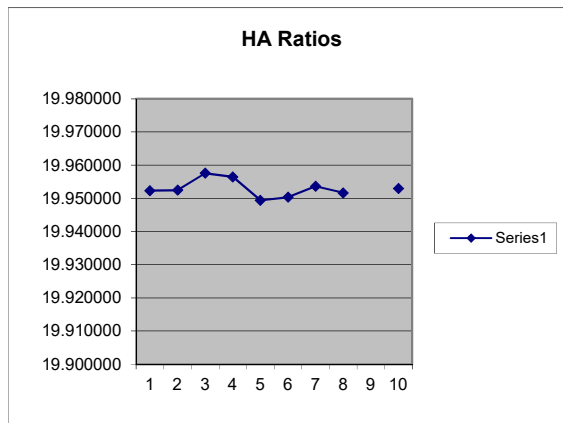
Dec APES radians	counts	radians to f Dist APE(D Dist (AS)			Dist Cnt	Ratio	Using Ration
0.349041395	1434722	19.999					0.68
0.087263433	358746	5.000	-14.999	-53995.58	-1075976	19.927112	-2.48
-0.174486769	-717330	-9.997	-14.997	-53989.85	-1076076	19.931078	5.10
-0.697969023	-2869422	-39.991	-29.993	-107975.97	-2152092	19.931213	21.00
0.349037125	1434700	19.998	59.989	215960.52	4304122	19.930134	0.90
0.610894629	2510799	35.002	15.003	54011.99	1076099	19.923337	14.30
0.872690208	3586884	50.001	15.000	53999.21	1076085	19.927790	15.62
1.04720974	4304260	60.001	9.999	35997.24	717376	19.928640	14.97
0.349085171	1434812	20.001	-40.000	-143998.53	-2869448	19.926926	5.19
Average						19.928278702	
St Dev						0.002615151	



6/20/2022

HA APES radians	Counts	radians to f Dist APE(h Dist_as			Dist Cnt	Ratio	Using Ration
0.000130813	532	0.000					0.32
-0.261612787	-1076664	-0.999	-1.000	-53988.49	-1077196	19.952326	-1.45
-0.523321251	-2153722	-1.999	-1.000	-53981.25	-1077058	19.952448	-2.89
-1.04663117	-4307950	-3.998	-1.999	-107940.42	-2154228	19.957566	21.93
-0.000013462	263	0.000	3.998	215880.40	4308213	19.956481	-15.96
0.261732801	1077313	1.000	1.000	53989.04	1077050	19.949419	-6.32
0.523465222	2154355	1.999	1.000	53986.19	1077042	19.950325	0.86
1.046841156	4308428	3.999	1.999	107954.04	2154073	19.953613	-2.57
0.000015819	402	0.000	-3.999	-215923.23	-4308026	19.951656	-16.88
Average						19.952979132	
St Dev						0.002825309	

Dec APES radians	counts	radians to f Dist APE(D Dist (AS)			Dist Cnt	Ratio	Using Ration
0.349040328	1434699	19.999					0.49
0.087258629	358712	5.000	-14.999	-53996.35	-1075987	19.927032	-2.05
-0.174497446	-717363	-9.998	-14.998	-53991.07	-1076075	19.930612	5.12
-0.697980767	-2869452	-39.991	-29.993	-107976.19	-2152089	19.931145	22.33
0.349049937	1434692	19.999	59.990	215965.59	4304144	19.929768	2.82
0.610913314	2510793	35.003	15.004	54013.20	1076101	19.922927	16.49
0.872714231	3586873	50.003	15.000	54000.32	1076080	19.927291	18.32
1.047237499	4304252	60.002	9.999	35998.01	717379	19.928297	17.72
0.349102254	1434797	20.002	-40.000	-144000.73	-2869455	19.926670	8.35
Average						19.927967636	
St Dev						0.002642176	



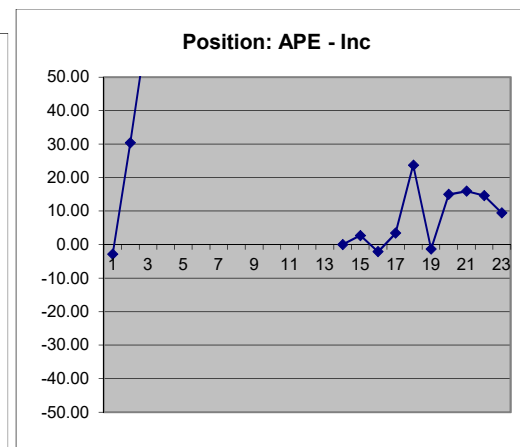
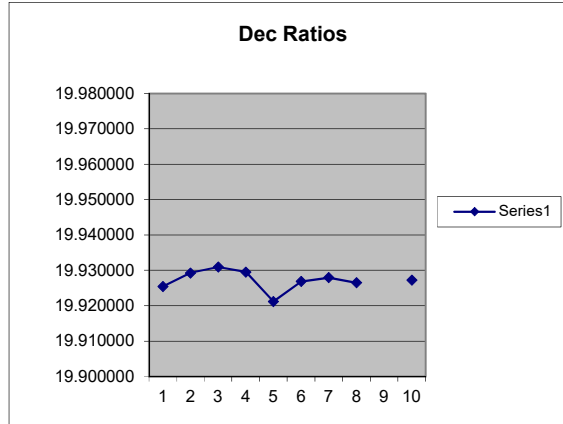
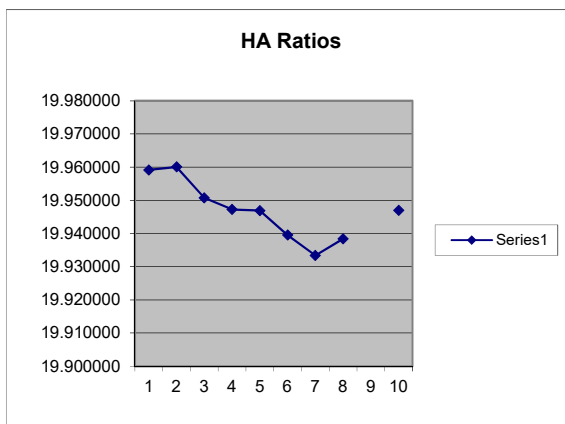
4/9/2019

HA APES radians	Counts	radians to l Dist APE(h Dist_as			Dist Cnt	Ratio	Using Ration
0.001398943	5812	0.005					-2.82
-0.26168945	-1077290	-1.000	-1.005	-54265.88	-1083102	19.959173	30.43
-0.523427195	-2154880	-1.999	-1.000	-53987.29	-1077590	19.960070	65.93
-1.047156629	-4310100	-4.000	-2.000	-108026.95	-2155220	19.950762	86.57
0.000463019	248	0.002	4.002	216087.06	4310348	19.947275	83.07
0.26237219	1077834	1.002	1.000	54022.64	1077586	19.946932	83.12
0.524368671	2155381	2.003	1.001	54040.65	1077547	19.939563	103.14
1.048500585	4310382	4.005	2.002	108109.97	2155001	19.933416	176.50
0.000475796	281	0.002	-4.003	-216170.63	-4310101	19.938421	84.05

Average 19.946951430
St Dev 0.009611363

Dec APES radians	counts	radians to l Dist APE(D Dist (AS)			Dist Cnt	Ratio	Using Ration
0.349037125	1434588	19.998					2.74
0.087271975	358754	5.000	-14.998	-53992.94	-1075834	19.925458	-2.07
-0.174481964	-717240	-9.997	-14.997	-53990.63	-1075994	19.929275	3.47
-0.697946601	-2869234	-39.989	-29.992	-107972.33	-2151994	19.930976	23.76
0.349014703	1434576	19.997	59.986	215951.27	4303810	19.929542	-1.28
0.610879682	2510591	35.001	15.004	54013.53	1076015	19.921213	15.03
0.872662449	3586574	50.000	14.999	53996.57	1075983	19.926876	16.00
1.047174506	4303896	59.999	9.999	35995.70	717322	19.927994	14.62
0.349110261	1434754	20.003	-39.996	-143986.09	-2869142	19.926523	9.50

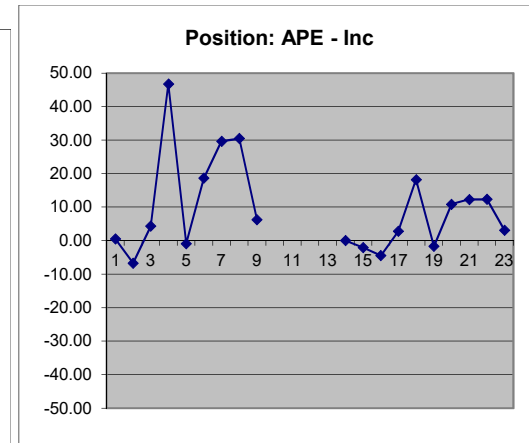
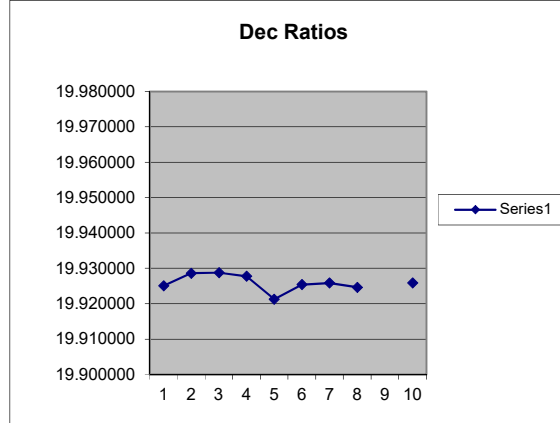
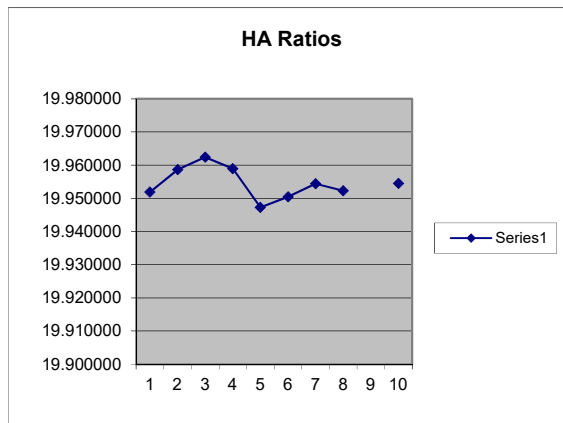
Average 19.927232038
St Dev 0.003026588



3/10/2017

HA APES radians	Counts	radians to f Dist APE(h Dist_as			Dist Cnt	Ratio	Using Ration
0.000016884	60	0.000					0.48
-0.261666025	-1076862	-0.999	-1.000	-53975.97	-1076922	19.951877	-6.71
-0.523264819	-2153802	-1.999	-0.999	-53958.62	-1076940	19.958626	4.35
-1.046353268	-4307638	-3.997	-1.998	-107894.74	-2153836	19.962382	46.78
0.00000251	28	0.000	3.997	215826.37	4307666	19.958942	-0.89
0.26174824	1076962	1.000	1.000	53988.93	1076934	19.947311	18.66
0.523448186	2153878	1.999	1.000	53979.49	1076916	19.950467	29.66
1.046730953	4307650	3.998	1.999	107934.82	2153772	19.954376	30.52
0.000033388	12	0.000	-3.998	-215896.87	-4307638	19.952295	6.29
Average						19.954534446	
St Dev						0.005050978	

Dec APES radians	counts	radians to f Dist APE(D Dist (AS)			Dist Cnt	Ratio	Using Ration
0.349041929	1434611	19.999					-2.07
0.087268772	358766	5.000	-14.998	-53994.59	-1075845	19.925052	-4.49
-0.17449798	-717247	-9.998	-14.998	-53993.27	-1076013	19.928651	2.84
-0.698031483	-2869287	-39.994	-29.996	-107986.54	-2152040	19.928781	18.21
0.34903926	1434592	19.998	59.993	215973.84	4303879	19.927779	-1.67
0.610907976	2510628	35.002	15.004	54014.30	1076036	19.921317	10.87
0.872716901	3586640	50.003	15.001	54001.97	1076012	19.925422	12.29
1.047246575	4303959	60.003	10.000	35999.33	717319	19.925899	12.37
0.349111863	1434796	20.003	-40.000	-144000.62	-2869163	19.924657	3.07
Average						19.925944736	
St Dev						0.002474867	



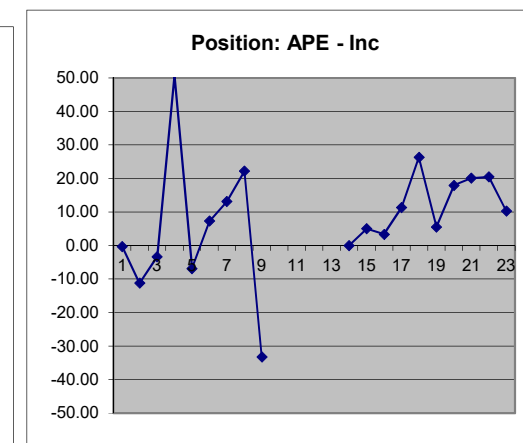
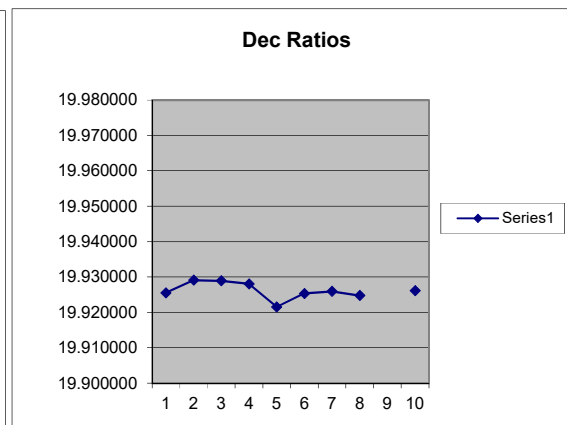
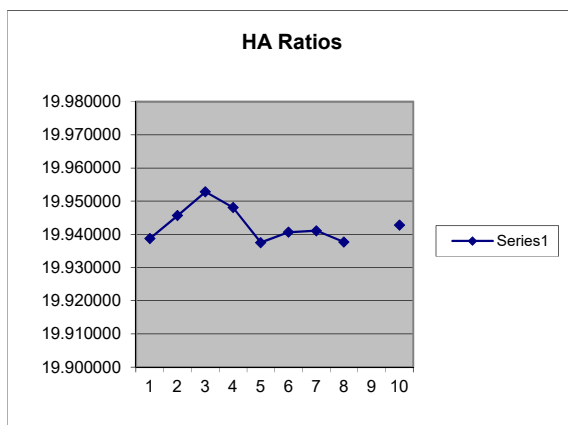
3/11/2016

HA APES radians	Counts	radians to l Dist APE(h Dist_as			Dist Cnt	Ratio	Using Ration
-0.000013994	-52	0.000					-0.28
-0.261755465	-1076508	-1.000	-1.000	-53988.05	-1076456	19.938781	-11.20
-0.52341282	-2152992	-1.999	-0.999	-53970.70	-1076484	19.945710	-3.36
-1.046542795	-4305967	-3.997	-1.998	-107903.30	-2152975	19.952818	50.77
-0.000046469	-54	0.000	3.997	215855.36	4305913	19.948140	-6.88
0.261722686	1076450	1.000	1.000	53993.76	1076504	19.937562	7.34
0.523454574	2152969	1.999	1.000	53986.08	1076519	19.940678	13.12
1.046885343	4305920	3.999	1.999	107965.35	2152951	19.941130	22.24
-0.000177967	-69	-0.001	-3.999	-215972.31	-4305989	19.937690	-33.25

Average 19.942813722
St Dev 0.005533547

Dec APES radians	counts	radians to l Dist APE(D Dist (AS)			Dist Cnt	Ratio	Using Ration
0.349051538	1434525	19.999					5.02
0.087314148	358800	5.003	-14.996	-53987.21	-1075725	19.925552	3.36
-0.174422174	-717112	-9.994	-14.996	-53986.99	-1075912	19.929097	11.30
-0.697895886	-2868923	-39.986	-29.993	-107974.20	-2151811	19.928936	26.31
0.349033388	1434440	19.998	59.985	215944.66	4303363	19.928082	5.55
0.61087381	2510374	35.000	15.002	54008.46	1075934	19.921581	17.97
0.872657644	3586280	50.000	14.999	53996.79	1075906	19.925369	20.13
1.047173438	4303544	59.999	9.999	35996.47	717264	19.925956	20.51
0.349112397	1434670	20.003	-39.996	-143985.43	-2868874	19.924753	10.30

Average 19.926165751
St Dev 0.002507416



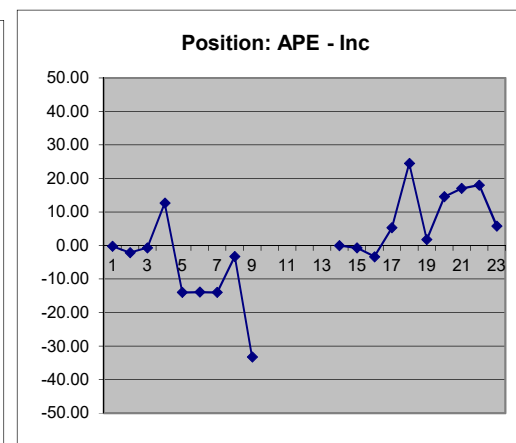
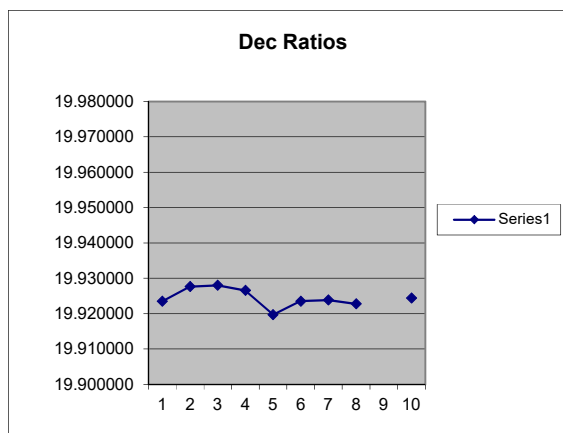
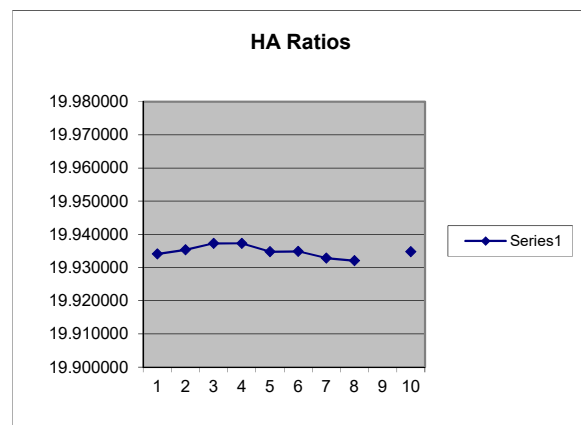
10/28/2011

HA APES radians	Counts	radians to I Dist APE(h Dist_as			Dist Cnt	Ratio	Using Ration
-0.00000867	-31	0.000					-0.23
-0.262135052	-1077820	-1.001	-1.001	-54067.45	-1077789	19.934157	-2.14
-0.524253981	-2155646	-2.003	-1.001	-54065.91	-1077826	19.935408	-0.64
-1.048431147	-4311254	-4.005	-2.002	-108119.30	-2155608	19.937310	12.65
-0.000067764	0	0.000	4.004	216240.47	4311254	19.937313	-13.98
0.262061812	1077838	1.001	1.001	54068.11	1077838	19.934821	-13.87
0.524183935	2155649	2.002	1.001	54066.57	1077811	19.934888	-13.95
1.048467045	4311214	4.005	2.003	108141.15	2155565	19.932883	-3.24
-0.000172111	-44	-0.001	-4.006	-216297.35	-4311258	19.932089	-33.29

Average 19.934858666
St Dev 0.001867181

Dec APES radians	counts	radians to I Dist APE(D Dist (AS)			Dist Cnt	Ratio	Using Ration
0.349048869	1434506	19.999					-0.72
0.087281584	358769	5.001	-14.998	-53993.38	-1075737	19.923499	-3.34
-0.174463814	-717103	-9.996	-14.997	-53988.86	-1075872	19.927665	5.34
-0.697948737	-2868860	-39.990	-29.993	-107976.52	-2151757	19.928009	24.55
0.349046734	1434447	19.999	59.988	215958.32	4303307	19.926563	1.80
0.610902103	2510343	35.002	15.003	54011.55	1075896	19.919741	14.61
0.872703555	3586224	50.002	15.000	54000.43	1075881	19.923565	17.04
1.047233229	4303471	60.002	10.000	35999.33	717247	19.923899	18.06
0.349109194	1434623	20.002	-40.000	-143998.42	-2868848	19.922774	5.85

Average 19.924464334
St Dev 0.002788908



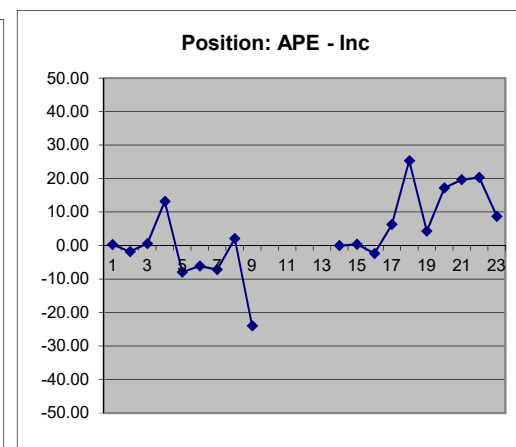
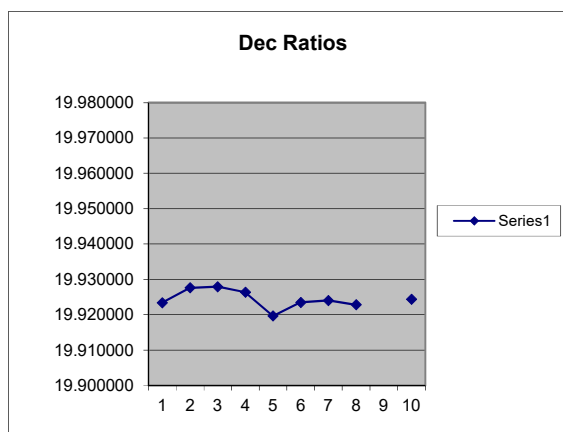
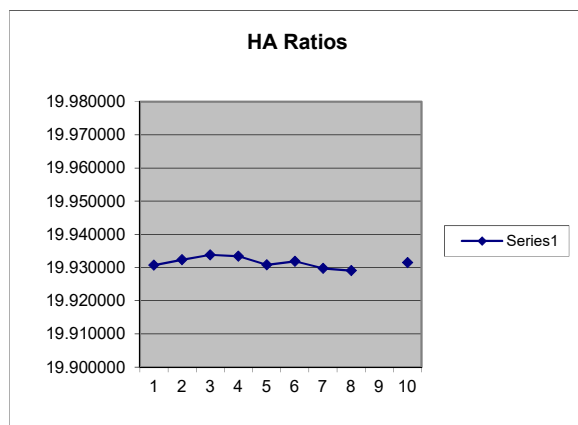
10/12/2011

HA APES radians	Counts	radians to I Dist APE(h Dist_as		Dist Cnt	Ratio	Using Ration	
-0.000316386	-1306	-0.001				0.27	
-0.262178175	-1077823	-1.001	-1.000	-54012.87	-1076517	19.930749	-1.79
-0.524339162	-2155659	-2.003	-1.001	-54074.59	-1077836	19.932395	0.62
-1.048609494	-4311274	-4.005	-2.003	-108138.52	-2155615	19.933831	13.22
-0.000035289	13	0.000	4.005	216283.96	4311287	19.933457	-7.93
0.262147525	1077855	1.001	1.001	54079.09	1077842	19.930847	-6.14
0.524310109	2155670	2.003	1.001	54074.91	1077815	19.931885	-7.16
1.048677867	4311249	4.006	2.003	108158.61	2155579	19.929795	2.14
-0.000126326	-42	0.000	-4.006	-216331.39	-4311291	19.929105	-23.95

Average 19.931508145
St Dev 0.001683996

Dec APES radians	counts	radians to I Dist APE(DDist (AS)			Dist Cnt	Ratio	Using Ration
0.349049937	1434486	19.999					0.39
0.087279449	358740	5.001	-14.998	-53994.04	-1075746	19.923422	-2.35
-0.174472355	-717156	-9.997	-14.997	-53990.19	-1075896	19.927622	6.29
-0.697968489	-2868953	-39.991	-29.994	-107978.83	-2151797	19.927953	25.37
0.349061148	1434454	20.000	59.990	215965.37	4303407	19.926376	4.31
0.610921856	2510368	35.003	15.004	54012.65	1075914	19.919668	17.22
0.872725442	3586255	50.003	15.000	54000.87	1075887	19.923514	19.71
1.047256718	4303515	60.003	10.000	35999.66	717260	19.924077	20.35
0.349125743	1434631	20.003	-40.000	-143999.85	-2868884	19.922826	8.75

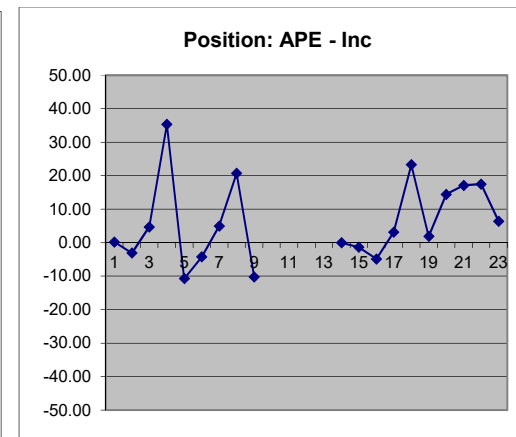
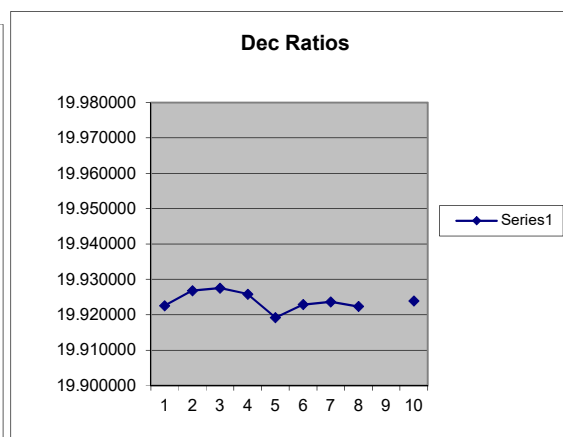
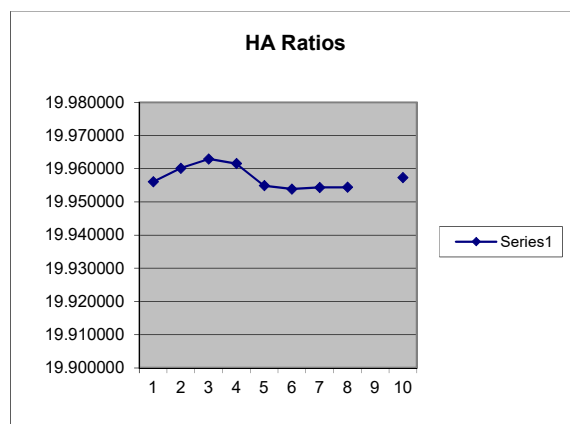
Average 19.924432112
St Dev 0.002767602



8/9/2011

HA APES radians	Counts	radians to I Dist APE(h Dist_as			Dist Cnt	Ratio	Using Ration
-0.000011864	-53	0.000					0.21
-0.261848632	-1077836	-1.000	-1.000	-54007.71	-1077783	19.956095	-3.09
-0.523648665	-2155689	-2.000	-1.000	-54000.13	-1077853	19.960192	4.70
-1.047162485	-4311340	-4.000	-2.000	-107982.48	-2155651	19.962971	35.32
-0.000037951	58	0.000	4.000	215984.94	4311398	19.961568	-10.73
0.261828097	1077897	1.000	1.000	54013.75	1077839	19.954901	-4.21
0.523699469	2155705	2.000	1.000	54014.85	1077808	19.953921	4.97
1.047425709	4311305	4.001	2.000	108026.29	2155600	19.954402	20.73
-0.000072023	-92	0.000	-4.001	-216061.92	-4311397	19.954451	-10.25
Average						19.957312403	
St Dev						0.003662012	

Dec APES radians	counts	radians to I Dist APE(D Dist (AS)			Dist Cnt	Ratio	Using Ration
0.349056343	1434507	19.999					-1.37
0.087258629	358694	5.000	-15.000	-53999.65	-1075813	19.922590	-4.84
-0.174508657	-717223	-9.999	-14.998	-53993.38	-1075917	19.926832	3.18
-0.698017603	-2869032	-39.993	-29.995	-107981.47	-2151809	19.927576	23.26
0.349068621	1434492	20.000	59.994	215977.04	4303524	19.925841	1.91
0.610940006	2510427	35.004	15.004	54014.85	1075935	19.919244	14.45
0.872754804	3586326	50.005	15.001	54003.18	1075899	19.922883	17.13
1.047290884	4303591	60.005	10.000	36000.65	717265	19.923668	17.50
0.349118269	1434607	20.003	-40.002	-144008.44	-2868984	19.922332	6.38
Average						19.923870823	
St Dev						0.002746659	



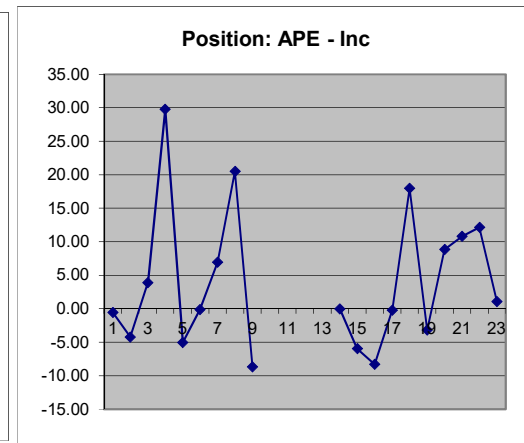
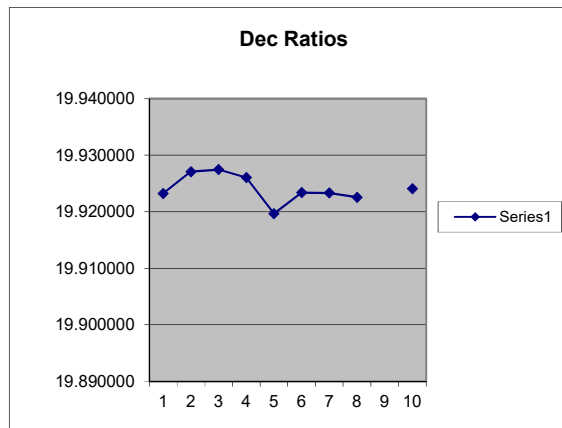
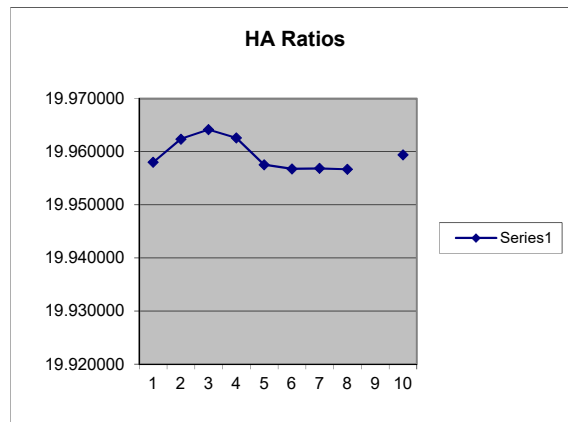
4/28/2011

HA APES radians	Counts	radians to l Dist APE(h Dist_as			Dist Cnt	Ratio	Using Ration
-0.000014526	-49	0.000					-0.54
-0.261738961	-1077474	-1.000	-1.000	-53984.54	-1077425	19.958029	-4.23
-0.523417612	-2154946	-1.999	-1.000	-53975.10	-1077472	19.962391	3.88
-1.046716351	-4309842	-3.998	-1.999	-107938.11	-2154896	19.964181	29.78
-0.000025174	-3	0.000	3.998	215895.55	4309839	19.962611	-5.04
0.261718959	1077478	1.000	1.000	53988.60	1077481	19.957564	-0.10
0.523466287	2154930	1.999	1.000	53989.26	1077452	19.956783	6.96
1.046947099	4309788	3.999	2.000	107975.67	2154858	19.956885	20.53
-0.000061908	-82	0.000	-3.999	-215961.11	-4309870	19.956695	-8.66

Average 19.959392458
St Dev 0.003113488

Dec APES radians	counts	radians to l Dist APE(D Dist (AS)			Dist Cnt	Ratio	Using Ration
0.3490462	1434574	19.999					-5.97
0.087258629	358767	5.000	-14.999	-53997.56	-1075807	19.923251	-8.29
-0.174521469	-717217	-9.999	-14.999	-53996.02	-1075984	19.927098	-0.19
-0.698069385	-2869174	-39.996	-29.997	-107989.51	-2151957	19.927463	17.99
0.349051005	1434538	19.999	59.996	215984.08	4303712	19.926061	-3.17
0.610929863	2510527	35.004	15.005	54016.39	1075989	19.919676	8.85
0.872752134	3586484	50.005	15.001	54004.72	1075957	19.923388	10.80
1.047302095	4303795	60.006	10.001	36003.51	717311	19.923361	12.15
0.349117735	1434728	20.003	-40.003	-144010.86	-2869067	19.922574	1.06

Average 19.924108937
St Dev 0.002613793



1/14/2010

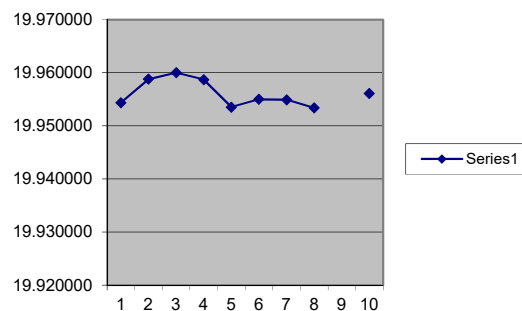
HA APES radians	Counts	radians to f Dist APE(h Dist_as			Dist Cnt	Ratio	Using Ration
0.000004639	26	0.000					-0.35
-0.26177676	-1077436	-1.000	-1.000	-53996.29	-1077462	19.954371	-5.00
-0.523497469	-2154887	-2.000	-1.000	-53983.77	-1077451	19.958795	2.30
-1.046912799	-4309813	-3.999	-1.999	-107962.16	-2154926	19.960012	23.50
-0.000037419	-55	0.000	3.999	215933.55	4309758	19.958724	-4.96
0.261756226	1077412	1.000	1.000	53998.82	1077467	19.953530	1.97
0.523529107	2154873	2.000	1.000	53994.53	1077461	19.955002	4.92
1.047069547	4309765	4.000	2.000	107987.97	2154892	19.954927	11.23
-0.000093319	-23	0.000	-4.000	-215992.85	-4309788	19.953383	-18.10

Average 19.956092893
St Dev 0.002645757

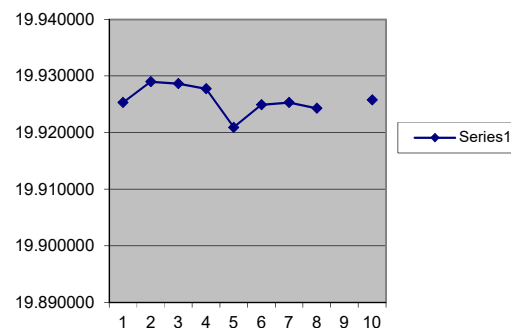
Dec APES radians	counts	radians to f Dist APE(D Dist (AS)			Dist Cnt	Ratio	Using Ration
0.349037125	1434554	19.998					-0.74
0.087285321	358781	5.001	-14.997	-53990.19	-1075773	19.925344	-1.96
-0.174457941	-717155	-9.996	-14.997	-53988.42	-1075936	19.929013	6.75
-0.697953007	-2869025	-39.990	-29.994	-107978.61	-2151870	19.928670	22.31
0.34903232	1434502	19.998	59.988	215956.23	4303527	19.927775	0.88
0.610886622	2510459	35.001	15.003	54011.33	1075957	19.920951	14.02
0.87268487	3586402	50.001	15.000	53999.76	1075943	19.924957	16.30
1.047215078	4303703	60.001	10.000	35999.44	717301	19.925338	17.12
0.349107592	1434699	20.002	-39.999	-143995.01	-2869004	19.924330	6.52

Average 19.925797164
St Dev 0.002652847

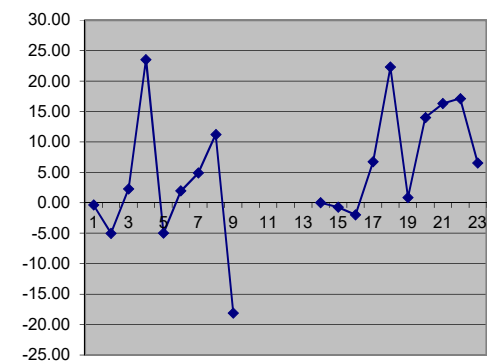
HA Ratios



Dec Ratios



Position: APE - Inc



7/14/2009

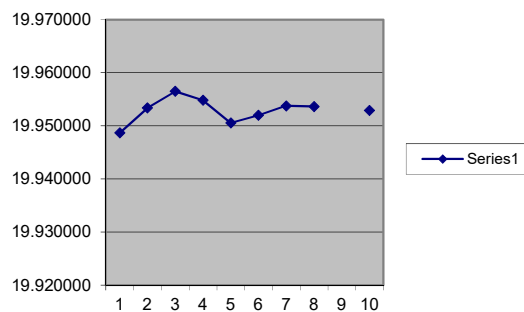
HA APES radians	Counts	radians to l Dist APE(h Dist_as			Dist Cnt	Ratio	Using Ration
-0.000044872	-58	0.000					-6.35
-0.261763451	-1076954	-1.000	-1.000	-53983.33	-1076896	19.948676	-17.85
-0.52344636	-2153958	-1.999	-1.000	-53975.97	-1077004	19.953396	-16.57
-1.046730725	-4307966	-3.998	-1.999	-107935.15	-2154008	19.956502	2.77
-0.000097045	-43	0.000	3.998	215883.69	4307923	19.954833	-17.86
0.261625793	1076972	0.999	1.000	53984.21	1077015	19.950556	-11.45
0.523327335	2153978	1.999	1.000	53979.82	1077006	19.952012	-8.98
1.046672391	4307941	3.998	1.999	107947.67	2153963	19.953771	-13.55
-0.000020915	26	0.000	-3.998	-215895.99	-4307915	19.953659	-5.62

Average 19.952925619
St Dev 0.002461435

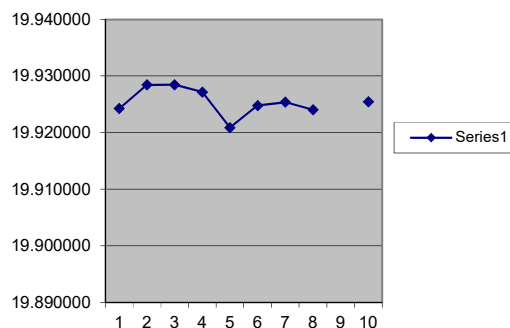
Dec APES radians	counts	radians to l Dist APE(D Dist (AS)			Dist Cnt	Ratio	Using Ration
0.349047268	1434500	19.999					2.79
0.087276245	358706	5.001	-14.998	-53994.15	-1075794	19.924270	-0.39
-0.174465949	-717196	-9.996	-14.997	-53988.20	-1075902	19.928465	7.79
-0.697941263	-2868965	-39.989	-29.993	-107974.53	-2151769	19.928486	24.28
0.349054741	1434477	19.999	59.988	215958.43	4303442	19.927178	5.48
0.610904773	2510413	35.002	15.003	54010.45	1075936	19.920887	17.83
0.872696615	3586321	50.002	15.000	53998.44	1075908	19.924797	19.59
1.047219883	4303596	60.001	9.999	35998.01	717275	19.925408	19.65
0.349110795	1434625	20.003	-39.999	-143995.34	-2868971	19.924055	9.62

Average 19.925443156
St Dev 0.002560105

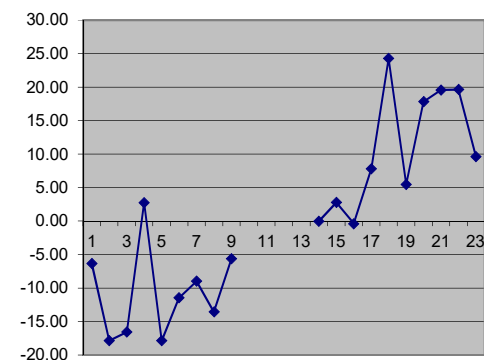
HA Ratios



Dec Ratios



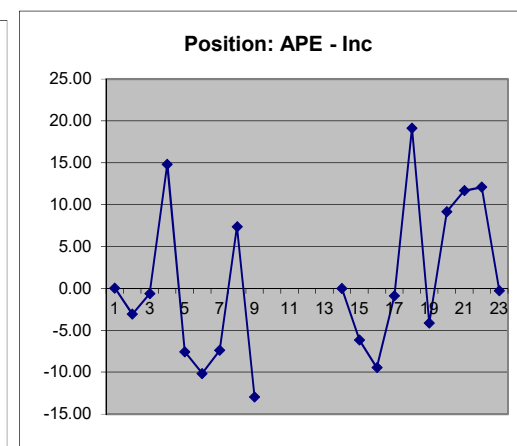
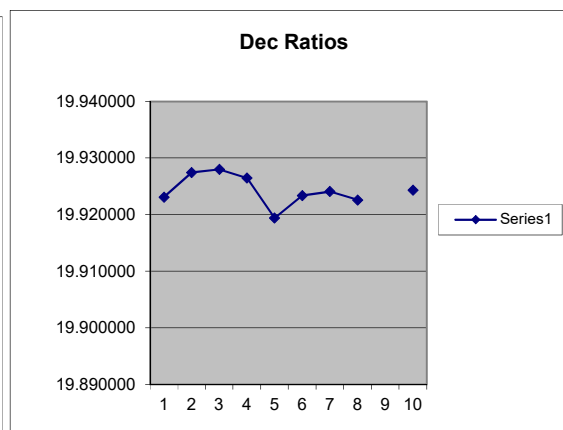
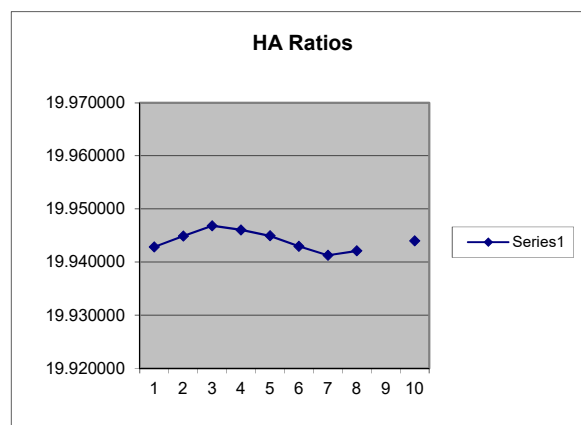
Position: APE - Inc



11/25/2008

HA APES radians	Counts	radians to I Dist APE(h Dist_as			Dist Cnt	Ratio	Using Ration
-0.000124729	-514	0.000					0.04
-0.261909855	-1077370	-1.000	-1.000	-53997.06	-1076856	19.942864	-3.05
-0.523806249	-2154794	-2.001	-1.000	-54020.01	-1077424	19.944906	-0.62
-1.047517583	-4309518	-4.001	-2.000	-108023.22	-2154724	19.946860	14.82
-0.000011864	102	0.000	4.001	216063.56	4309620	19.946075	-7.56
0.261867493	1077459	1.000	1.000	54016.49	1077357	19.944963	-10.15
0.523771134	2154810	2.001	1.000	54021.55	1077351	19.942987	-7.38
1.047624287	4309514	4.002	2.001	108052.43	2154704	19.941283	7.39
-0.000083203	-84	0.000	-4.002	-216105.18	-4309598	19.942132	-12.95
Average						19.944008729	
St Dev						0.001979274	

Dec APES radians	counts	radians to I Dist APE(D Dist (AS)			Dist Cnt	Ratio	Using Ration
0.349044598	1434586	19.999					-6.15
0.087237809	358708	4.998	-15.000	-54001.53	-1075878	19.923103	-9.44
-0.174533747	-717261	-10.000	-14.998	-53994.26	-1075969	19.927470	-0.89
-0.698049633	-2869146	-39.995	-29.995	-107982.90	-2151885	19.928016	19.15
0.349047268	1434557	19.999	59.994	215979.24	4303703	19.926466	-4.14
0.610930931	2510551	35.004	15.005	54017.38	1075994	19.919403	9.18
0.872758007	3586528	50.005	15.002	54005.71	1075977	19.923393	11.69
1.047305298	4303854	60.006	10.001	36002.96	717326	19.924082	12.11
0.34909478	1434675	20.002	-40.005	-144016.26	-2869179	19.922605	-0.26
Average						19.924317310	
St Dev						0.002871239	



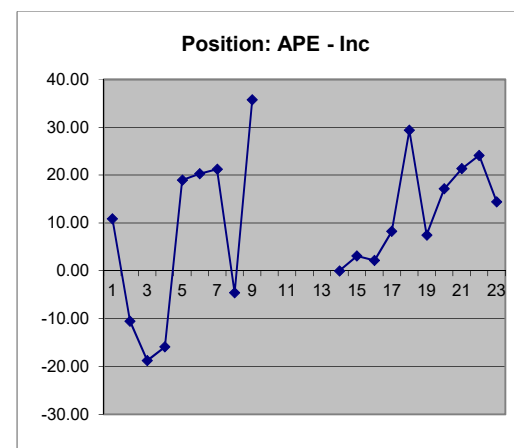
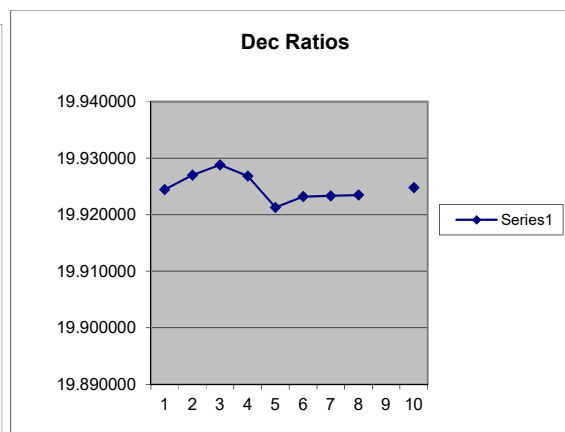
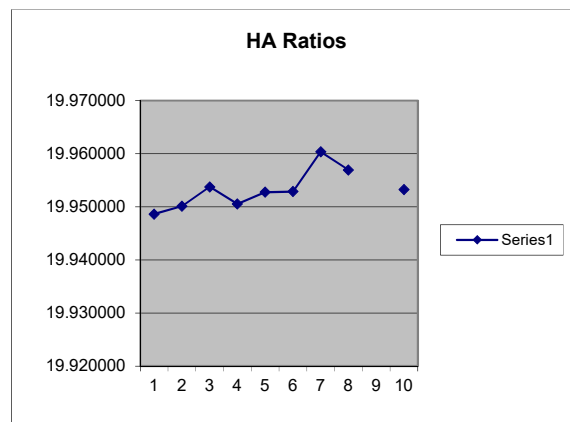
7/15/2008

HA APES radians	Counts	radians to l Dist APE(h Dist_as			Dist Cnt	Ratio	Using Ration
0.176559974	726442	0.674					10.90
-0.272420635	-1120979	-1.041	-1.715	-92608.90	-1847421	19.948634	-10.51
-0.526677907	-2167249	-2.012	-0.971	-52444.33	-1046270	19.950108	-18.75
-1.060311741	-4363557	-4.050	-2.038	-110069.88	-2196308	19.953760	-15.91
0.176598838	726441	0.675	4.725	255131.12	5089998	19.950518	18.97
0.436486029	1796020	1.667	0.993	53605.58	1069579	19.952755	20.28
0.702597276	2891222	2.684	1.016	54889.38	1095202	19.952893	21.25
1.054175224	4338710	4.027	1.343	72518.16	1447488	19.960353	-4.58
-0.001066509	-5103	-0.004	-4.031	-217659.23	-4343813	19.956944	35.76

Average 19.953245
St Dev 0.003842783

Dec APES radians	counts	radians to l Dist APE(hr)			Dist Cnt	Ratio	Using Ration
0.345051444	1418026	19.770					3.10
0.084583535	347577	4.846	-14.924		-1070449	19.924463	2.17
-0.184189387	-757144	-10.553	-15.400		-1104721	19.927002	8.28
-0.695988461	-2860950	-39.877	-29.324		-2103806	19.928796	29.41
0.340628011	1399759	19.517	59.394		4260709	19.926849	7.50
0.607053621	2494519	34.782	15.265		1094760	19.921307	17.16
0.863937299	3550172	49.500	14.718		1055653	19.923221	21.38
1.047797502	4305743	60.034	10.534		755571	19.923352	24.15
0.341526471	1403314	19.568	-40.466		-2902429	19.923475	14.40

Average 19.924808
St Dev 0.002498015



7/14/2008

HA APES radians	Counts	radians to l Dist APE(h Dist_as		Dist Cnt	Ratio	Using Ration
-0.000003636103	-16	0.000				0.05
-0.261691759162	-1076555	-1.000	-1.000	-53977.05	-1076539	19.944384
-0.523326068000	-2153070	-1.999	-0.999	-53965.95	-1076515	19.948041
-1.046452877000	-4305799	-3.997	-1.998	-107902.65	-2152729	19.950659
-0.000055996000	-14	0.000	3.997	215834.85	4305785	19.949443
0.261584131000	1076526	0.999	0.999	53967.15	1076540	19.948061
0.523182805000	2153040	1.998	0.999	53958.60	1076514	19.950740
1.046261618000	4305770	3.996	1.998	107892.75	2152730	19.952499
0.000009454000	-15	0.000	-3.996	-215805.00	-4305785	19.952202

Average 19.949504
St Dev 0.002660721

Dec APES radians	counts	radians to l Dist APE(hr)		Dist Cnt	Ratio	Using Ration
0.349064881	1434539	20.000				7.51
0.086833524	356800	4.975	-15.025	-1077739	19.925253	4.70
-0.175322687	-720907	-10.045	-15.020	-1077707	19.930373	15.80
-0.699568204	-2875908	-40.082	-30.037	-2155001	19.929097	31.05
0.349053245	1434539	19.999	60.082	4310447	19.928676	5.11
0.611336962	2512277	35.027	15.028	1077738	19.921257	18.76
0.873556683	3589983	50.051	15.024	1077706	19.925527	20.82
1.048362074	4308410	60.067	10.016	718427	19.925200	22.78
0.349090091	1434538	20.001	-40.065	-2873872	19.924900	12.76

Average 19.926285
St Dev 0.002936173

