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Appendix I

Test Systems Data

Table A.I.1 Bus Data of IEEE 14-bus test system

Bus	Voltage		Generation		Load	
	Mag (pu)	Ang (deg)	P_a (MW)	Q_r (MVAr)	P_a (MW)	Q_r (MVAr)
1	1.06	0.000*	1440.41	272.85	-	-
2	1.045	-35.519	185.92	1129.2	88.31	51.68
3	1.01	-86.972	0	547.57	383.34	77.32
4	0.706	-71.598	-	-	194.52	-15.87
5	0.684	-60.864	-	-	30.93	6.51
6	1.07	-107.154	0	443.28	45.58	30.52
7	0.803	-94.863	-	-	-	-
8	1.09	-94.863	0	177.73	-	-
9	0.713	-107.008	-	-	120.05	67.55
10	0.733	-109.058	-	-	36.62	23.6
11	0.881	-108.504	-	-	14.24	7.32
12	0.976	-111.201	-	-	24.82	6.51
13	0.926	-111.255	-	-	54.94	23.6
14	0.688	-117.101	-	-	60.63	20.35

Table A.I.2 Branch Data of IEEE 14-bus test system

Lines	From bus	To bus	Resistance	Reactance	Susceptance
1	1	2	0.01938	0.05917	0.0528
2	1	5	0.05403	0.22304	0.0492
3	2	3	0.04699	0.19797	0.0438
4	2	4	0.05811	0.17632	0.034
5	2	5	0.05695	0.17388	0.0346
6	3	4	0.06701	0.17103	0.0128
7	4	5	0.01335	0.04211	0
8	4	7	0	0.20912	0
9	4	9	0	0.55618	0
10	5	6	0	0.25202	0
11	6	11	0.09498	0.1989	0
12	6	12	0.12291	0.25581	0
13	6	13	0.06615	0.13027	0
14	7	8	0	0.17615	0
15	7	9	0	0.11001	0
16	9	10	0.03181	0.0845	0
17	9	14	0.12711	0.27038	0
18	10	11	0.08205	0.19207	0
19	12	13	0.22092	0.19988	0
20	13	14	0.17093	0.34802	0

Table A.I.3 Bus Data of IEEE 30-bus test system

Bus	Voltage		Generation		Load	
	Mag (pu)	**Ang (deg)**	**P_a (MW)**	**Q_r (MVAr)**	**P_a (MW)**	**Q_r (MVAr)**
1	1	0.000*	25.97	-1	-	-
2	1	-0.415	60.97	32	21.7	12.7
3	0.983	-1.522	-	-	2.4	1.2
4	0.98	-1.795	-	-	7.6	1.6
5	0.982	-1.864	-	-	-	-
6	0.973	-2.267	-	-	-	-
7	0.967	-2.652	-	-	22.8	10.9
8	0.961	-2.726	-	-	30	30
9	0.981	-2.997	-	-	-	-
10	0.984	-3.375	-	-	5.8	2
11	0.981	-2.997	-	-	-	-
12	0.985	-1.537	-	-	11.2	7.5
13	1	1.476	37	11.35	-	-
14	0.977	-2.308	-	-	6.2	1.6
15	0.98	-2.312	-	-	8.2	2.5
16	0.977	-2.644	-	-	3.5	1.8
17	0.977	-3.392	-	-	9	5.8
18	0.968	-3.478	-	-	3.2	0.9
19	0.965	-3.958	-	-	9.5	3.4
20	0.969	-3.871	-	-	2.2	0.7
21	0.993	-3.488	-	-	17.5	11.2
22	1	-3.393	21.59	39.57	-	-
23	1	-1.589	19.2	7.95	3.2	1.6
24	0.989	-2.631	-	-	8.7	6.7
25	0.99	-1.69	-	-	-	-
26	0.972	-2.139	-	-	3.5	2.3
27	1	-0.828	26.91	10.54	-	-
28	0.975	-2.266	-	-	-	-
29	0.98	-2.128	-	-	2.4	0.9
30	0.968	-3.042	-	-	10.6	1.9

Table A.I.4 Branch Data of IEEE 30-bus test system

Lines	From bus	To bus	Resistance	Reactance	Susceptance
1	1	2	0.02	0.06	0.03
2	1	3	0.05	0.19	0.02
3	2	4	0.06	0.17	0.02

4	3	4	0.01	0.04	0
5	2	5	0.05	0.2	0.02
6	2	6	0.06	0.18	0.02
7	4	6	0.01	0.04	0
8	5	7	0.05	0.12	0.01
9	6	7	0.03	0.08	0.01
10	6	8	0.01	0.04	0
11	6	9	0	0.21	0
12	6	10	0	0.56	0
13	9	11	0	0.21	0
14	9	10	0	0.11	0
15	4	12	0	0.26	0
16	12	13	0	0.14	0
17	12	14	0.12	0.26	0
18	12	15	0.07	0.13	0
19	12	16	0.09	0.2	0
20	14	15	0.22	0.2	0
21	16	17	0.08	0.19	0
22	15	18	0.11	0.22	0
23	18	19	0.06	0.13	0
24	19	20	0.03	0.07	0
25	10	20	0.09	0.21	0
26	10	17	0.03	0.08	0
27	10	21	0.03	0.07	0
28	10	22	0.07	0.15	0
29	21	22	0.01	0.02	0
30	15	23	0.1	0.2	0
31	22	24	0.12	0.18	0
32	23	24	0.13	0.27	0
33	24	25	0.19	0.33	0
34	25	26	0.25	0.38	0
35	25	27	0.11	0.21	0
36	28	27	0	0.4	0
37	27	29	0.22	0.42	0
38	27	30	0.32	0.6	0
39	29	30	0.24	0.45	0
40	8	28	0.06	0.2	0.02
41	6	28	0.02	0.06	0.01

Table A.I.5 Bus Data of IEEE 118-bus test system

Bus	Voltage		Generation		Load	
	Mag(pu)	Ang(deg)	P_a (MW)	Q_r(MVAr)	P_a (MW)	Q_r (MVAr)
1	0.955	10.973	0	-3.1	51	27
2	0.971	11.513	-	-	20	9
3	0.968	11.856	-	-	39	10
4	0.998	15.574	0	-15.01	39	12
5	1.002	16.019	-	-	-	-
6	0.99	13.292	0	15.93	52	22
7	0.989	12.847	-	-	19	2
8	1.015	21.041	0	63.14	28	0
9	1.043	28.295	-	-	-	-
10	1.05	35.876	450	-51.04	-	-
11	0.985	13.006	-	-	70	23
12	0.99	12.489	85	91.29	47	10
13	0.968	11.63	-	-	34	16
14	0.984	11.771	-	-	14	1
15	0.97	11.474	0	7.16	90	30
16	0.984	12.187	-	-	25	10
17	0.995	13.995	-	-	11	3
18	0.973	11.781	0	28.43	60	34
19	0.962	11.315	0	-14.27	45	25
20	0.957	12.191	-	-	18	3
21	0.958	13.778	-	-	14	8
22	0.969	16.332	-	-	10	5
23	0.999	21.249	-	-	7	3
24	0.992	21.114	0	-14.91	13	0
25	1.05	28.18	220	50.04	-	-
26	1.015	29.96	314	10.12	-	-
27	0.968	15.604	0	3.98	71	13
28	0.962	13.879	-	-	17	7
29	0.963	12.885	-	-	24	4
30	0.985	19.034	-	-	-	-
31	0.967	13.002	7	32.59	43	27
32	0.963	15.061	0	-16.28	59	23
33	0.971	10.854	-	-	23	9
34	0.984	11.511	0	-20.83	59	26
35	0.98	11.055	-	-	33	9
36	0.98	11.056	0	7.73	31	17
37	0.991	11.967	-	-	-	-

38	0.961	17.108	-	-	-	-
39	0.97	8.577	-	-	27	11
40	0.97	7.496	0	28.45	66	23
41	0.967	7.052	-	-	37	10
42	0.985	8.653	0	41.03	96	23
43	0.977	11.46	-	-	18	7
44	0.984	13.943	-	-	16	8
45	0.986	15.773	-	-	53	22
46	1.005	18.576	19	-5.03	28	10
47	1.017	20.799	-	-	34	0
48	1.021	20.019	-	-	20	11
49	1.025	21.022	204	115.85	87	30
50	1.001	18.983	-	-	17	4
51	0.967	16.364	-	-	17	8
52	0.957	15.411	-	-	18	5
53	0.946	14.436	-	-	23	11
54	0.955	15.348	48	3.9	113	32
55	0.952	15.058	0	4.66	63	22
56	0.954	15.245	0	-2.29	84	18
57	0.971	16.449	-	-	12	3
58	0.959	15.592	-	-	12	3
59	0.985	19.448	155	76.83	277	113
60	0.993	23.23	-	-	78	3
61	0.995	24.121	160	-40.39	-	-
62	0.998	23.505	0	1.26	77	14
63	0.969	22.827	-	-	-	-
64	0.984	24.593	-	-	-	-
65	1.005	27.719	391	81.51	-	-
66	1.05	27.559	392	-1.96	39	18
67	1.02	24.919	-	-	28	7
68	1.003	27.598	-	-	-	-
69	1.035	30.000*	513.86	-82.42	-	-
70	0.984	22.618	0	9.67	66	20
71	0.987	22.207	-	-	-	-
72	0.98	21.109	0	-11.13	12	0
73	0.991	21.995	0	9.65	6	0
74	0.958	21.669	0	-5.63	68	27
75	0.967	22.93	-	-	47	11
76	0.943	21.799	0	5.27	68	36
77	1.006	26.751	0	12.17	61	28

78	1.003	26.447	-	-	71	26
79	1.009	26.745	-	-	39	32
80	1.04	28.99	477	105.47	130	26
81	0.997	28.145	-	-	-	-
82	0.989	27.272	-	-	54	27
83	0.984	28.464	-	-	20	10
84	0.98	31	-	-	11	7
85	0.985	32.556	0	-5.61	24	15
86	0.987	31.186	-	-	21	10
87	1.015	31.445	4	11.02	-	-
88	0.987	35.69	-	-	48	10
89	1.005	39.748	607	-5.9	-	-
90	0.985	33.338	0	59.31	163	42
91	0.98	33.351	0	-13.09	10	0
92	0.99	33.881	0	-13.96	65	10
93	0.985	30.849	-	-	12	7
94	0.99	28.682	-	-	30	16
95	0.98	27.71	-	-	42	31
96	0.992	27.543	-	-	38	15
97	1.011	27.916	-	-	15	9
98	1.024	27.433	-	-	34	8
99	1.01	27.067	0	-17.54	42	0
100	1.017	28.059	252	95.55	37	18
101	0.991	29.647	-	-	22	15
102	0.989	32.365	-	-	5	3
103	1.01	24.318	40	75.42	23	16
104	0.971	21.748	0	2.39	38	25
105	0.965	20.644	0	-18.33	31	26
106	0.961	20.383	-	-	43	16
107	0.952	17.583	0	6.56	50	12
108	0.966	19.443	-	-	2	1
109	0.967	18.991	-	-	8	3
110	0.973	18.144	0	0.28	39	30
111	0.98	19.789	36	-1.84	-	-
112	0.975	15.045	0	41.51	68	13
113	0.993	13.993	0	6.75	6	0
114	0.96	14.726	-	-	8	3
115	0.96	14.718	-	-	22	7
116	1.005	27.163	0	51.32	184	0
117	0.974	10.948	-	-	20	8
118	0.949	21.942	-	-	33	15

Table A.I.6 Branch Data of IEEE 118-bus test system

Lines	From bus	To bus	Resistance	Reactance	Susceptance
1	1	2	0.0303	0.0999	0.0254
2	1	3	0.0129	0.0424	0.01082
3	4	5	0.00176	0.00798	0.0021
4	3	5	0.0241	0.108	0.0284
5	5	6	0.0119	0.054	0.01426
6	6	7	0.00459	0.0208	0.0055
7	8	9	0.00244	0.0305	1.162
8	8	5	0	0.0267	0
9	9	10	0.00258	0.0322	1.23
10	4	11	0.0209	0.0688	0.01748
11	5	11	0.0203	0.0682	0.01738
12	11	12	0.00595	0.0196	0.00502
13	2	12	0.0187	0.0616	0.01572
14	3	12	0.0484	0.16	0.0406
15	7	12	0.00862	0.034	0.00874
16	11	13	0.02225	0.0731	0.01876
17	12	14	0.0215	0.0707	0.01816
18	13	15	0.0744	0.2444	0.06268
19	14	15	0.0595	0.195	0.0502
20	12	16	0.0212	0.0834	0.0214
21	15	17	0.0132	0.0437	0.0444
22	16	17	0.0454	0.1801	0.0466
23	17	18	0.0123	0.0505	0.01298
24	18	19	0.01119	0.0493	0.01142
25	19	20	0.0252	0.117	0.0298
26	15	19	0.012	0.0394	0.0101
27	20	21	0.0183	0.0849	0.0216
28	21	22	0.0209	0.097	0.0246
29	22	23	0.0342	0.159	0.0404
30	23	24	0.0135	0.0492	0.0498
31	23	25	0.0156	0.08	0.0864
32	26	25	0	0.0382	0
33	25	27	0.0318	0.163	0.1764
34	27	28	0.01913	0.0855	0.0216
35	28	29	0.0237	0.0943	0.0238
36	30	17	0	0.0388	0
37	8	30	0.00431	0.0504	0.514
38	26	30	0.00799	0.086	0.908

39	17	31	0.0474	0.1563	0.0399
40	29	31	0.0108	0.0331	0.0083
41	23	32	0.0317	0.1153	0.1173
42	31	32	0.0298	0.0985	0.0251
43	27	32	0.0229	0.0755	0.01926
44	15	33	0.038	0.1244	0.03194
45	19	34	0.0752	0.247	0.0632
46	35	36	0.00224	0.0102	0.00268
47	35	37	0.011	0.0497	0.01318
48	33	37	0.0415	0.142	0.0366
49	34	36	0.00871	0.0268	0.00568
50	34	37	0.00256	0.0094	0.00984
51	38	37	0	0.0375	0
52	37	39	0.0321	0.106	0.027
53	37	40	0.0593	0.168	0.042
54	30	38	0.00464	0.054	0.422
55	39	40	0.0184	0.0605	0.01552
56	40	41	0.0145	0.0487	0.01222
57	40	42	0.0555	0.183	0.0466
58	41	42	0.041	0.135	0.0344
59	43	44	0.0608	0.2454	0.06068
60	34	43	0.0413	0.1681	0.04226
61	44	45	0.0224	0.0901	0.0224
62	45	46	0.04	0.1356	0.0332
63	46	47	0.038	0.127	0.0316
64	46	48	0.0601	0.189	0.0472
65	47	49	0.0191	0.0625	0.01604
66	42	49	0.0715	0.323	0.086
67	42	49	0.0715	0.323	0.086
68	45	49	0.0684	0.186	0.0444
69	48	49	0.0179	0.0505	0.01258
70	49	50	0.0267	0.0752	0.01874
71	49	51	0.0486	0.137	0.0342
72	51	52	0.0203	0.0588	0.01396
73	52	53	0.0405	0.1635	0.04058
74	53	54	0.0263	0.122	0.031
75	49	54	0.073	0.289	0.0738
76	49	54	0.0869	0.291	0.073
77	54	55	0.0169	0.0707	0.0202
78	54	56	0.00275	0.00955	0.00732

79	55	56	0.00488	0.0151	0.00374
80	56	57	0.0343	0.0966	0.0242
81	50	57	0.0474	0.134	0.0332
82	56	58	0.0343	0.0966	0.0242
83	51	58	0.0255	0.0719	0.01788
84	54	59	0.0503	0.2293	0.0598
85	56	59	0.0825	0.251	0.0569
86	56	59	0.0803	0.239	0.0536
87	55	59	0.04739	0.2158	0.05646
88	59	60	0.0317	0.145	0.0376
89	59	61	0.0328	0.15	0.0388
90	60	61	0.00264	0.0135	0.01456
91	60	62	0.0123	0.0561	0.01468
92	61	62	0.00824	0.0376	0.0098
93	63	59	0	0.0386	0
94	63	64	0.00172	0.02	0.216
95	64	61	0	0.0268	0
96	38	65	0.00901	0.0986	1.046
97	64	65	0.00269	0.0302	0.38
98	49	66	0.018	0.0919	0.0248
99	49	66	0.018	0.0919	0.0248
100	62	66	0.0482	0.218	0.0578
101	62	67	0.0258	0.117	0.031
102	65	66	0	0.037	0
103	66	67	0.0224	0.1015	0.02682
104	65	68	0.00138	0.016	0.638
105	47	69	0.0844	0.2778	0.07092
106	49	69	0.0985	0.324	0.0828
107	68	69	0	0.037	0
108	69	70	0.03	0.127	0.122
109	24	70	0.00221	0.4115	0.10198
110	70	71	0.00882	0.0355	0.00878
111	24	72	0.0488	0.196	0.0488
112	71	72	0.0446	0.18	0.04444
113	71	73	0.00866	0.0454	0.01178
114	70	74	0.0401	0.1323	0.03368
115	70	75	0.0428	0.141	0.036
116	69	75	0.0405	0.122	0.124
117	74	75	0.0123	0.0406	0.01034
118	76	77	0.0444	0.148	0.0368

119	69	77	0.0309	0.101	0.1038
120	75	77	0.0601	0.1999	0.04978
121	77	78	0.00376	0.0124	0.01264
122	78	79	0.00546	0.0244	0.00648
123	77	80	0.017	0.0485	0.0472
124	77	80	0.0294	0.105	0.0228
125	79	80	0.0156	0.0704	0.0187
126	68	81	0.00175	0.0202	0.808
127	81	80	0	0.037	0
128	77	82	0.0298	0.0853	0.08174
129	82	83	0.0112	0.03665	0.03796
130	83	84	0.0625	0.132	0.0258
131	83	85	0.043	0.148	0.0348
132	84	85	0.0302	0.0641	0.01234
133	85	86	0.035	0.123	0.0276
134	86	87	0.02828	0.2074	0.0445
135	85	88	0.02	0.102	0.0276
136	85	89	0.0239	0.173	0.047
137	88	89	0.0139	0.0712	0.01934
138	89	90	0.0518	0.188	0.0528
139	89	90	0.0238	0.0997	0.106
140	90	91	0.0254	0.0836	0.0214
141	89	92	0.0099	0.0505	0.0548
142	89	92	0.0393	0.1581	0.0414
143	91	92	0.0387	0.1272	0.03268
144	92	93	0.0258	0.0848	0.0218
145	92	94	0.0481	0.158	0.0406
146	93	94	0.0223	0.0732	0.01876
147	94	95	0.0132	0.0434	0.0111
148	80	96	0.0356	0.182	0.0494
149	82	96	0.0162	0.053	0.0544
150	94	96	0.0269	0.0869	0.023
151	80	97	0.0183	0.0934	0.0254
152	80	98	0.0238	0.108	0.0286
153	80	99	0.0454	0.206	0.0546
154	92	100	0.0648	0.295	0.0472
155	94	100	0.0178	0.058	0.0604
156	95	96	0.0171	0.0547	0.01474
157	96	97	0.0173	0.0885	0.024
158	98	100	0.0397	0.179	0.0476

159	99	100	0.018	0.0813	0.0216
160	100	101	0.0277	0.1262	0.0328
161	92	102	0.0123	0.0559	0.01464
162	101	102	0.0246	0.112	0.0294
163	100	103	0.016	0.0525	0.0536
164	100	104	0.0451	0.204	0.0541
165	103	104	0.0466	0.1584	0.0407
166	103	105	0.0535	0.1625	0.0408
167	100	106	0.0605	0.229	0.062
168	104	105	0.00994	0.0378	0.00986
169	105	106	0.014	0.0547	0.01434
170	105	107	0.053	0.183	0.0472
171	105	108	0.0261	0.0703	0.01844
172	106	107	0.053	0.183	0.0472
173	108	109	0.0105	0.0288	0.0076
174	103	110	0.03906	0.1813	0.0461
175	109	110	0.0278	0.0762	0.0202
176	110	111	0.022	0.0755	0.02
177	110	112	0.0247	0.064	0.062
178	17	113	0.00913	0.0301	0.00768
179	32	113	0.0615	0.203	0.0518
180	32	114	0.0135	0.0612	0.01628
181	27	115	0.0164	0.0741	0.01972
182	114	115	0.0023	0.0104	0.00276
183	68	116	0.00034	0.00405	0.164
184	12	117	0.0329	0.14	0.0358
185	75	118	0.0145	0.0481	0.01198
186	76	118	0.0164	0.0544	0.01356

Appendix II

Transmission Line Length of the Test Systems

Table A.II.1 Line Length of IEEE 14-bus test system

From	To	Length (km)	From	To	Length (km)
1	**2**	29.8	**6**	**12**	16.1
1	**5**	94.4	**6**	**13**	8.4
2	**3**	82.8	**9**	**10**	46.5
2	**4**	89.2	**9**	**14**	16.8
2	**5**	87.6	**10**	**11**	11.4
3	**4**	96.6	**12**	**13**	20.5
4	**5**	20.8	**13**	**14**	22.1
6	**11**	12.4			

Table A.II.2 Line Length of IEEE 30-bus test system

From	To	Length (km)	From	To	Length (km)
1	**2**	29.3	**19**	**20**	4.4
1	**3**	78.7	**10**	**20**	12.7
2	**4**	87.6	**10**	**17**	47
3	**4**	19.8	**10**	**21**	4.6
2	**5**	83.1	**10**	**22**	9.4
2	**6**	89.2	**21**	**22**	1.5
4	**6**	19.3	**15**	**23**	12.9
5	**7**	66	**22**	**24**	13.1
6	**7**	41.2	**23**	**24**	17.1
6	**8**	19.5	**24**	**25**	22.6
12	**14**	16.1	**25**	**26**	28.4
12	**15**	8.4	**25**	**27**	13.7
12	**16**	12.4	**27**	**29**	27.4
14	**15**	20.5	**27**	**30**	39.8
16	**17**	11.5	**29**	**30**	29.9
15	**18**	13.8	**8**	**28**	99
18	**19**	8.2	**6**	**28**	27.6

Table A.II.3 Line Length of IEEE 118-bus test system

From	To	Length (km)	From	To	Length (km)
1	**2**	48	38	65	311.8
1	**3**	20.4	64	65	94.3
4	**5**	3.2	49	66	34.8
3	**5**	43.7	49	66	34.8
5	**6**	21.7	62	66	87.9
6	**7**	8.4	62	67	47.1
8	**9**	90.5	65	66	0.1
9	**10**	95.6	66	67	40.9
4	**11**	33.1	65	68	49.2
5	**11**	32.4	47	69	133.7
11	**12**	9.4	49	69	156
2	**12**	29.6	69	70	53
3	**12**	76.8	24	70	176.5
7	**12**	14.7	70	71	15.2
11	**13**	35.2	24	72	84.2
12	**14**	34	71	72	77.1
13	**15**	117.8	71	73	17
14	**15**	94.1	70	74	63.6
12	**16**	36.2	70	75	67.8
15	**17**	21	69	75	62
16	**17**	77.9	74	75	19.5
17	**18**	21.4	76	77	70.7
18	**19**	20.8	69	77	48.8
19	**20**	46.5	75	77	95.6
15	**19**	19	77	78	6
20	**21**	33.8	78	79	9.9
21	**22**	38.6	77	80	25.5
22	**23**	63.2	77	80	48.2
23	**24**	22.3	79	80	28.4
23	**25**	30.3	68	81	62.2
25	**27**	61.7	77	82	44.7
27	**28**	34.7	82	83	17.7

28	**29**	40.7	**83**	**84**	8.2
8	**30**	154.3	**83**	**85**	69.4
26	**30**	274.2	**84**	**85**	4
17	**31**	75.2	**85**	**86**	57
29	**31**	16.6	**86**	**87**	201.5
23	**32**	52.3	**85**	**88**	38.7
31	**32**	47.3	**85**	**89**	169.1
27	**32**	36.3	**88**	**89**	27
15	**33**	60.1	**89**	**90**	85.5
19	**34**	119	**89**	**90**	41.8
35	**36**	4.1	**90**	**91**	40.2
35	**37**	20	**89**	**92**	19.2
33	**37**	66.8	**89**	**92**	67.8
34	**36**	13.4	**91**	**92**	61.3
34	**37**	4.2	**92**	**93**	40.9
37	**39**	50.9	**92**	**94**	76.1
37	**40**	88.7	**93**	**94**	35.3
30	**38**	165.7	**94**	**95**	20.9
39	**40**	29.1	**80**	**96**	69
40	**41**	23	**82**	**96**	25.6
40	**42**	88	**94**	**96**	42.3
41	**42**	65	**80**	**97**	35.4
43	**44**	105.1	**80**	**98**	43.5
34	**43**	71.7	**80**	**99**	82.9
44	**45**	38.7	**92**	**100**	118.5
45	**46**	64.1	**94**	**100**	28.1
46	**47**	60.6	**95**	**96**	26.8
46	**48**	93.5	**96**	**97**	33.5
47	**49**	30.2	**98**	**100**	72.3
42	**49**	130.3	**99**	**100**	32.8
42	**49**	130.3	**100**	**101**	50.7
45	**49**	100.8	**92**	**102**	22.5
48	**49**	26.7	**101**	**102**	45
49	**50**	39.8	**100**	**103**	25.3

49	**51**	72.5	**100**	**104**	82.2
51	**52**	30.6	**103**	**104**	74.8
52	**53**	70	**103**	**105**	82.1
53	**54**	48.5	**100**	**106**	101.6
49	**54**	125.1	**104**	**105**	16.7
49	**54**	138.6	**105**	**106**	23.9
54	**55**	29.7	**105**	**107**	85.6
54	**56**	4.5	**105**	**108**	38.3
55	**56**	7.5	**106**	**107**	85.6
56	**57**	51.2	**108**	**109**	15.5
50	**57**	70.8	**103**	**110**	72.1
56	**58**	51.2	**109**	**110**	41.1
51	**58**	38.1	**110**	**111**	35.5
54	**59**	92	**110**	**112**	35.8
56	**59**	126.7	**17**	**113**	14.5
56	**59**	122.3	**32**	**113**	97.5
55	**59**	86.7	**32**	**114**	24.6
59	**60**	58.1	**27**	**115**	29.9
59	**61**	60.1	**114**	**115**	4.2
60	**61**	5.1	**68**	**116**	12.3
60	**62**	22.5	**12**	**117**	58.3
61	**62**	15.1	**75**	**118**	23
63	**64**	61.4	**76**	**118**	26.1
64	**61**	0.1			