

IEEE 118-BUS MODIFIED TEST SYSTEM DATA

In what follows, the data used in this research for modeling and simulating the IEEE 118-bus modified test system is presented. The Tables I (A), I (B), II (A), and II (B) introduces the dynamic data used for modeling and simulating generators and electric machines. Tables III (A), III (B), IV (A), and IV (B) introduce the excitation system data. Tables V (A) and V(B) shows the used data for modeling the governor-turbine systems. Finally, the network data is inserted in Table VI. More information regarding this system is available in [1-2].

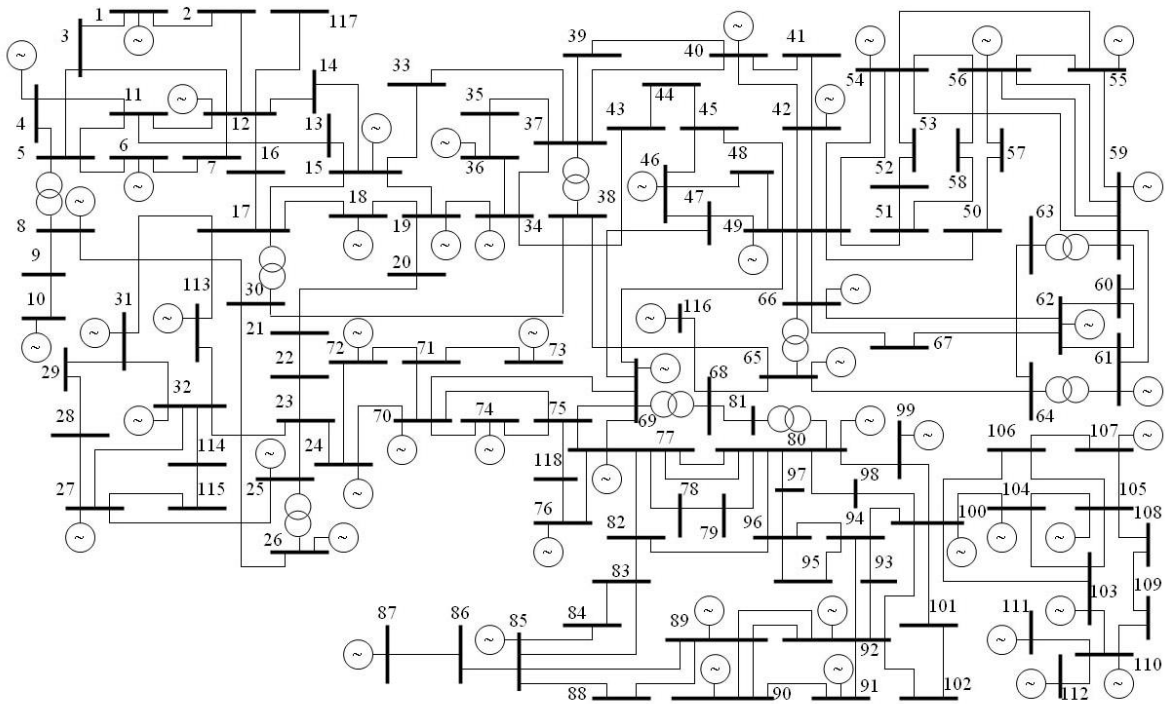


Fig. 1 The topology of IEEE 118-bus test system

TABLE I (A): IEEE 118-BUS MODIFIED TEST SYSTEM GENERATOR DATA

Type Operation	GENROU Sync. Gen.	GENROU Sync. Gen.	GENROU Sync. Gen.	GENROU Sync. Gen.	GENROU Sync. Gen.
Default Unit no. (New Unit no.)	10(119) 69(131) 80(132)	12(120)	25(121) 49(125) 100(135)	26(122)	31(123) 46(124) 87(133)
Rated power (MVA)	590	125	330	410	75
Rated voltage (kV)	22	15.5	20	24	13.8
Rated pf	0.95	0.85	0.9	0.9	0.8
H (s)	2.319	4.768	3.006	3.704	6.187
D	2.000	2	2.000	2.000	2.000
ra (p.u)	0.0046	0.004	0.000	0.0019	0.0031
xd (p.u)	2.110	1.220	1.950	1.7668	1.050
xq (p.u)	2.020	1.160	1.920	1.7469	0.980
$x'd$ (p.u)	0.280	0.174	0.317	0.2738	0.185
$x'q$ (p.u)	0.490	0.250	1.120	1.0104	0.360
$x''d$ (p.u)	0.215	0.134	0.200	0.2284	0.130
$x''q$ (p.u)	0.215	0.134	0.200	0.2284	0.130
x_l or x_p (p.u)	0.155	0.0078	0.199	0.1834	0.070
$T'd0$ (s)	0.5573	8.970	0.9754	0.8418	1.0748
$T'q0$ (s)	0.1371	0.500	0.875	0.8676	0.1102
$T''d0$ (s)	0.0246	0.033	0.0473	0.035	0.0267
$T''q0$ (s)	0.0272	0.070	0.0134	0.035	0.0358
$S(1.0)$	0.079	0.1026	0.082	0.2632	0.100
$S(1.2)$	0.349	0.432	0.290	0.5351	0.3928

TABLE I (B): IEEE 118-BUS MODIFIED TEST SYSTEM GENERATOR DATA

Type Operation	GENROU Sync. Gen.	GENROU Sync. Gen.	GENROU Sync. Gen.	GENROU Sync. Gen.
Default Unit no. (New Unit no.)	54(126) 103(136) 111(137)	59(127) 61(128)	65(129) 66(130)	89(134)
Rated power (MVA)	100	233	512	835
Rated voltage (kV)	13.8	20	24	20
Rated pf	0.8	0.85	0.9	0.9
H (s)	4.985	4.122	2.631	2.6419
D	2.000	2.000	2.000	2.00
ra (p.u)	0.0035	0.0016	0.004	0.0019
xd (p.u)	1.180	1.569	1.700	2.183
xq (p.u)	1.050	1.548	1.650	2.157
$x'd$ (p.u)	0.220	0.324	0.270	0.413
$x'q$ (p.u)	0.380	0.918	0.470	1.285
$x''d$ (p.u)	0.145	0.249	0.200	0.339
$x''q$ (p.u)	0.145	0.249	0.200	0.339
x_l or x_p (p.u)	0.075	0.204	0.160	0.246
$T'd0$ (s)	1.100	1.0614	0.6035	5.690
$T'q0$ (s)	0.1086	0.8895	0.1367	1.500
$T''d0$ (s)	0.0277	0.0336	0.0556	0.041
$T''q0$ (s)	0.0351	0.0381	0.0319	0.144
$S(1.0)$	0.0933	0.0987	0.090	0.134
$S(1.2)$	0.4044	0.303	0.400	0.617

TABLE II (A): IEEE 118-BUS MODIFIED TEST SYSTEM CONDENSERS AND MOTORS DATA

Type Operation	GENROU Condenser	GENROU Condenser	GENROU Motor	GENROU Motor
Default Unit no. (New Unit no.)	1(138), 6(139), 15(140), 19(142) 32(143), 34(144), 36(145), 55(146) 56(147), 62(148), 74(150), 76(151) 77(152), 85(153), 92(154) 104(155), 105(156), 110(157)	18(141) 70(149)	4(158) 24(160) 27(161) 72(164) 73(165)	8(159) 91(167) 107(169)
Rated power (MVA)	25	40	25	35.29
Rated voltage (kV)	13.8	13.8	13.8	13.8
Rated pf	0.0	0.0	0.8	0.85
H (s)	1.200	1.520	5.016	4.4893
D	0.000	0.000	2.000	2.000
ra (p.u)	0.0025	0.000	0.0014	0.000
xd (p.u)	1.769	2.373	1.250	1.400
xq (p.u)	0.855	1.172	1.220	1.372
$x'd$ (p.u)	0.304	0.343	0.232	0.231
$x'q$ (p.u)	0.5795	1.172	0.715	0.060
$x''d$ (p.u)	0.2035	0.231	0.120	0.050
$x''q$ (p.u)	0.2035	0.231	0.120	0.050
x_l or x_p (p.u)	0.1045	0.132	0.114	0.000
$T'd0$ (s)	8.000	11.600	4.750	5.500
$T'q0$ (s)	0.008	0.159	1.500	0.008
$T''d0$ (s)	0.0525	0.058	0.0035	0.008
$T''q0$ (s)	0.0151	0.201	0.210	0.008
$S(1.0)$	0.304	0.295	0.279	0.210
$S(1.2)$	0.666	0.776	0.886	0.805

TABLE II (B): IEEE 118-BUS MODIFIED TEST SYSTEM CONDENSER AND MOTOR DATA

Type Operation	GENROU Motor	GENROU Motor	GENROU Motor	GENROU Motor
Default Unit no. (New Unit no.)	40(162) 113(171)	42(163) 99(168)	90(166) 112(170)	116(172)
Rated power (MVA)	51.2	75	100	384
Rated voltage (kV)	13.8	13.8	13.8	24
Rated pf	0.8	0.8	0.8	0.85
H (s)	5.078	6.186	4.985	2.621
D	2.000	2.000	2.000	2.000
ra (p.u)	0.000	0.000	0.000	0.000
xd (p.u)	1.270	1.050	1.180	1.798
xq (p.u)	1.240	0.980	1.050	1.778
$x'd$ (p.u)	0.209	0.185	0.220	0.324
$x'q$ (p.u)	0.850	0.360	0.380	1.051
$x''d$ (p.u)	0.105	0.130	0.145	0.260
$x''q$ (p.u)	0.105	0.130	0.145	0.260
x_l or x_p (p.u)	0.104	0.070	0.075	0.193
$T'd0$ (s)	6.600	6.100	5.900	5.210
$T'q0$ (s)	0.008	0.300	0.300	1.500
$T''d0$ (s)	0.008	0.038	0.038	0.042
$T''q0$ (s)	0.008	0.099	0.092	0.042
$S(1.0)$	0.2067	0.100	0.0933	0.162
$S(1.2)$	0.724	0.3928	0.4044	0.508

TABLE III (A): IEEE 118-BUS MODIFIED TEST SYSTEM EXCITER DATA FOR GENERATORS

Type	IEEET1	IEEET1	IEEET1	IEEET1	IEEET1
Default Unit no. (New Unit no.)	10(119) 69(131) 80(132)	12(120)	25(121) 49(125) 100(135)	26(122)	31(123) 46(124) 87(133)
Rated power (MVA)	590	125	330	410	75
Rated voltage (kV)	22	15.5	20	24	13.8
Tr (s)	0.000	0.060	0.000	0.000	0.000
Ka (p.u)	200	25	400	400	0.050
Ta (s)	0.3575	0.200	0.050	0.020	20.000
VR_{max} (p.u)	5.730	1.000	3.810	5.270	4.380
VR_{min} (p.u)	-5.730	-1.000	-3.810	-5.270	0.000
Ke (p.u)	1.000	-0.0601	-0.170	1.000	1.000
Te (s)	0.011	0.6758	0.950	0.920	1.980
Kf (p.u)	0.0529	0.108	0.040	0.030	0.000
Tf	1.000	0.350	1.000	1.000	0.100
$E1$	4.2975	2.4975	3.6675	2.4675	2.385
$SE(E1)$	0.000	0.0949	0.0111	0.4351	0.0951
$E2$	5.730	3.330	4.890	3.290	3.180
$SE(E2)$	0.000	0.37026	0.0178	0.6001	0.3712

TABLE III (B): IEEE 118-BUS MODIFIED TEST SYSTEM EXCITER DATA FOR GENERATORS

Type	IEEET1	IEEET1	IEEET1	IEEET1
Default Unit no. (New Unit no.)	54(126) 103(136) 111(137)	59(127) 61(128)	65(129) 66(130)	89(134)
Rated power (MVA)	100	233	512	835
Rated voltage (kV)	13.8	20	24	20
Tr (s)	0.060	0.000	0.000	0.000
Ka (p.u)	25	250	200	400
Ta (s)	0.200	0.060	0.395	0.020
VR_{max} (p.u)	1.000	4.420	3.840	18.300
VR_{min} (p.u)	-1.000	-4.420	-3.840	-18.300
Ke (p.u)	-0.0582	1.000	1.000	1.000
Te (s)	0.6544	0.613	0.008	0.942
Kf (p.u)	0.105	0.053	0.0635	0.030
Tf	0.350	0.330	1.000	1.000
$E1$	2.5785	2.610	2.880	3.765
$SE(E1)$	0.0889	0.000	0.000	0.8147
$E2$	3.438	3.480	3.840	5.020
$SE(E2)$	0.3468	0.000	0.000	2.6756

TABLE IV (A): IEEE 118-BUS MODIFIED TEST SYSTEM EXCITER DATA FOR CONDENSERS AND MOTORS

Type	IEEE T1	IEEE T1	IEEE T1	IEEE T1
Default Unit no. (New Unit no.)	1(138), 6(139) 15(140), 19(142) 32(143), 34(144) 36(145), 55(146) 56(147), 62(148) 74(150), 76(151) 77(152), 85(153) 92(154), 104(155) 105(156), 110(157)	18(141) 70(149)	4(158), 24(160) 27(161), 72(164) 73(165)	8(159) 91(167) 107(169)
Rated power (MVA)	25	40	25	35.29
Rated voltage (kV)	13.8	13.8	13.8	13.8
T_r (s)	0.000	0.000	0.000	0.000
K_a (p.u)	400	400	0.050	57.140
T_a (s)	0.050	0.050	20.000	0.050
V_{Rmax} (p.u)	4.407	6.630	6.812	1.000
V_{Rmin} (p.u)	-4.407	-6.630	1.395	-1.000
K_e (p.u)	-0.170	-0.170	1.000	-0.0445
T_e (s)	0.950	0.950	0.700	0.500
K_f (p.u)	0.040	0.040	0.000	0.080
T_f	1.000	1.000	0.008	1.000
E_1	4.2375	6.375	2.6753	3.375
$SE(E_1)$	0.2174	0.2174	0.4135	0.0711
E_2	5.650	8.500	3.567	4.500
$SE(E_2)$	0.9386	0.9388	0.907	0.2774

TABLE IV (B): IEEE 118-BUS MODIFIED TEST SYSTEM EXCITER DATA FOR CONDENSERS AND MOTORS

Type	IEEET1	IEEET1	IEEET1	IEEET1
Default Unit no. (New Unit no.)	40(162) 113(171)	42(163) 99(168)	90(166) 112(170)	116(172)
Rated power (MVA)	51.2	75	100	384
Rated voltage (kV)	13.8	13.8	13.8	24
Tr (s)	0.000	0.000	0.060	0.000
Ka (p.u)	400	0.050	25	400
Ta (s)	0.050	20.000	0.200	0.020
V_{Rmax} (p.u)	0.613	4.380	1.000	8.130
V_{Rmin} (p.u)	-0.613	0.000	-1.000	-8.130
Ke (p.u)	-0.0769	1.000	-0.0582	1.000
Te (s)	1.370	1.980	0.6544	0.812
Kf (p.u)	0.040	0.000	0.105	0.060
Tf	1.000	0.008	0.350	1.000
$E1$	3.0975	2.385	2.5785	3.6825
$SE(E1)$	0.1117	0.0951	0.0889	0.4589
$E2$	4.130	3.180	3.438	4.910
$SE(E2)$	0.2248	0.3712	0.3468	0.6558

TABLE V (A): IEEE 118-BUS MODIFIED TEST SYSTEM GOVERNOR DATA FOR GENERATORS

Type	BPA_GG	BPA_GG	BPA_GG	BPA_GG	BPA_GG
Default Unit no. (New Unit no.)	10(119) 69(131) 80(132)	12(120)	25(121) 49(125) 100(135)	26(122)	31(123) 46(124) 87(133)
Rated power (MVA)	590	125	330	410	75
Rated voltage (kV)	22	15.5	20	24	13.8
P_{max} (p.u)	0.9372	1.056	1.050	0.8951	1.000
R (p.u)	0.0085	0.040	0.0152	0.0122	0.066
$T1$ (s)	0.080	0.083	0.100	0.180	0.090
$T2$ (s)	0.000	0.000	0.000	0.000	0.000
$T3$ (s)	0.150	0.200	0.400	0.040	0.200
$T4$ (s)	0.050	0.050	0.050	0.250	0.300
$T5$ (s)	10.000	5.000	8.000	8.000	0.000
F	0.280	0.280	0.250	0.267	1.000

TABLE V (B) : IEEE 118-BUS MODIFIED TEST SYSTEM GOVERNOR DATA FOR GENERATORS

Type	BPA_GG	BPA_GG	BPA_GG	BPA_GG
Default Unit no. (New Unit no.)	54(126) 103(136) 111(137)	59(127) 61(128)	65(129) 66(130)	89(134)
Rated power (MVA)	100	233	512	835
Rated voltage (kV)	13.8	20	24	20
P_{max} (p.u)	1.050	0.901	0.898	0.9177
R (p.u)	0.050	0.0214	0.0098	0.006
$T1$ (s)	0.090	0.150	0.150	0.180
$T2$ (s)	0.000	0.000	0.050	0.030
$T3$ (s)	0.200	0.100	0.300	0.200
$T4$ (s)	0.300	0.300	0.260	0.000
$T5$ (s)	0.000	10.000	8.000	8.000
F	1.000	0.237	0.270	0.300

TABLE VI: IEEE 118-BUS MODIFIED TEST SYSTEM BRANCH DATA

fbus	tbus	r	x	b	rateA	rateB	rateC	ratio	angle	status	angmin	angmax
1	2	0.0303	0.0999	0.0254	0	0	0	0	0	1	-360	360;
1	3	0.0129	0.0424	0.01082	0	0	0	0	0	1	-360	360;
4	5	0.00176	0.00798	0.0021	0	0	0	0	0	1	-360	360;
3	5	0.0241	0.108	0.0284	0	0	0	0	0	1	-360	360;
5	6	0.0119	0.054	0.01426	0	0	0	0	0	1	-360	360;
6	7	0.00459	0.0208	0.0055	0	0	0	0	0	1	-360	360;
8	9	0.00244	0.0305	1.162	0	0	0	0	0	1	-360	360;
8	5	0	0.0267	0	0	0	0	0.985	0	1	-360	360;
9	10	0.00258	0.0322	1.23	0	0	0	0	0	1	-360	360;
4	11	0.0209	0.0688	0.01748	0	0	0	0	0	1	-360	360;
5	11	0.0203	0.0682	0.01738	0	0	0	0	0	1	-360	360;
11	12	0.00595	0.0196	0.00502	0	0	0	0	0	1	-360	360;
2	12	0.0187	0.0616	0.01572	0	0	0	0	0	1	-360	360;
3	12	0.0484	0.16	0.0406	0	0	0	0	0	1	-360	360;
7	12	0.00862	0.034	0.00874	0	0	0	0	0	1	-360	360;
11	13	0.02225	0.0731	0.01876	0	0	0	0	0	1	-360	360;
12	14	0.0215	0.0707	0.01816	0	0	0	0	0	1	-360	360;
13	15	0.0744	0.2444	0.06268	0	0	0	0	0	1	-360	360;
14	15	0.0595	0.195	0.0502	0	0	0	0	0	1	-360	360;
12	16	0.0212	0.0834	0.0214	0	0	0	0	0	1	-360	360;
15	17	0.0132	0.0437	0.0444	0	0	0	0	0	1	-360	360;
16	17	0.0454	0.1801	0.0466	0	0	0	0	0	1	-360	360;
17	18	0.0123	0.0505	0.01298	0	0	0	0	0	1	-360	360;
18	19	0.01119	0.0493	0.01142	0	0	0	0	0	1	-360	360;
19	20	0.0252	0.117	0.0298	0	0	0	0	0	1	-360	360;
15	19	0.012	0.0394	0.0101	0	0	0	0	0	1	-360	360;
20	21	0.0183	0.0849	0.0216	0	0	0	0	0	1	-360	360;
21	22	0.0209	0.097	0.0246	0	0	0	0	0	1	-360	360;
22	23	0.0342	0.159	0.0404	0	0	0	0	0	1	-360	360;
23	24	0.0135	0.0492	0.0498	0	0	0	0	0	1	-360	360;
23	25	0.0156	0.08	0.0864	0	0	0	0	0	1	-360	360;
26	25	0	0.0382	0	0	0	0	0.96	0	1	-360	360;
25	27	0.0318	0.163	0.1764	0	0	0	0	0	1	-360	360;
27	28	0.01913	0.0855	0.0216	0	0	0	0	0	1	-360	360;
28	29	0.0237	0.0943	0.0238	0	0	0	0	0	1	-360	360;
30	17	0	0.0388	0	0	0	0	0.96	0	1	-360	360;
8	30	0.00431	0.0504	0.514	0	0	0	0	0	1	-360	360;
26	30	0.00799	0.086	0.908	0	0	0	0	0	1	-360	360;
17	31	0.0474	0.1563	0.0399	0	0	0	0	0	1	-360	360;
29	31	0.0108	0.0331	0.0083	0	0	0	0	0	1	-360	360;
23	32	0.0317	0.1153	0.1173	0	0	0	0	0	1	-360	360;
31	32	0.0298	0.0985	0.0251	0	0	0	0	0	1	-360	360;

27	32	0.0229	0.0755	0.01926	0	0	0	0	0	1	-360	360;
15	33	0.038	0.1244	0.03194	0	0	0	0	0	1	-360	360;
19	34	0.0752	0.247	0.0632	0	0	0	0	0	1	-360	360;
35	36	0.00224	0.0102	0.00268	0	0	0	0	0	1	-360	360;
35	37	0.011	0.0497	0.01318	0	0	0	0	0	1	-360	360;
33	37	0.0415	0.142	0.0366	0	0	0	0	0	1	-360	360;
34	36	0.00871	0.0268	0.00568	0	0	0	0	0	1	-360	360;
34	37	0.00256	0.0094	0.00984	0	0	0	0	0	1	-360	360;
38	37	0	0.0375	0	0	0	0	0.935	0	1	-360	360;
37	39	0.0321	0.106	0.027	0	0	0	0	0	1	-360	360;
37	40	0.0593	0.168	0.042	0	0	0	0	0	1	-360	360;
30	38	0.00464	0.054	0.422	0	0	0	0	0	1	-360	360;
39	40	0.0184	0.0605	0.01552	0	0	0	0	0	1	-360	360;
40	41	0.0145	0.0487	0.01222	0	0	0	0	0	1	-360	360;
40	42	0.0555	0.183	0.0466	0	0	0	0	0	1	-360	360;
41	42	0.041	0.135	0.0344	0	0	0	0	0	1	-360	360;
43	44	0.0608	0.2454	0.06068	0	0	0	0	0	1	-360	360;
34	43	0.0413	0.1681	0.04226	0	0	0	0	0	1	-360	360;
44	45	0.0224	0.0901	0.0224	0	0	0	0	0	1	-360	360;
45	46	0.04	0.1356	0.0332	0	0	0	0	0	1	-360	360;
46	47	0.038	0.127	0.0316	0	0	0	0	0	1	-360	360;
46	48	0.0601	0.189	0.0472	0	0	0	0	0	1	-360	360;
47	49	0.0191	0.0625	0.01604	0	0	0	0	0	1	-360	360;
42	49	0.0715	0.323	0.086	0	0	0	0	0	1	-360	360;
42	49	0.0715	0.323	0.086	0	0	0	0	0	1	-360	360;
45	49	0.0684	0.186	0.0444	0	0	0	0	0	1	-360	360;
48	49	0.0179	0.0505	0.01258	0	0	0	0	0	1	-360	360;
49	50	0.0267	0.0752	0.01874	0	0	0	0	0	1	-360	360;
49	51	0.0486	0.137	0.0342	0	0	0	0	0	1	-360	360;
51	52	0.0203	0.0588	0.01396	0	0	0	0	0	1	-360	360;
52	53	0.0405	0.1635	0.04058	0	0	0	0	0	1	-360	360;
53	54	0.0263	0.122	0.031	0	0	0	0	0	1	-360	360;
49	54	0.073	0.289	0.0738	0	0	0	0	0	1	-360	360;
49	54	0.0869	0.291	0.073	0	0	0	0	0	1	-360	360;
54	55	0.0169	0.0707	0.0202	0	0	0	0	0	1	-360	360;
54	56	0.00275	0.00955	0.00732	0	0	0	0	0	1	-360	360;
55	56	0.00488	0.0151	0.00374	0	0	0	0	0	1	-360	360;
56	57	0.0343	0.0966	0.0242	0	0	0	0	0	1	-360	360;
50	57	0.0474	0.134	0.0332	0	0	0	0	0	1	-360	360;
56	58	0.0343	0.0966	0.0242	0	0	0	0	0	1	-360	360;
51	58	0.0255	0.0719	0.01788	0	0	0	0	0	1	-360	360;
54	59	0.0503	0.2293	0.0598	0	0	0	0	0	1	-360	360;
56	59	0.0825	0.251	0.0569	0	0	0	0	0	1	-360	360;
56	59	0.0803	0.239	0.0536	0	0	0	0	0	1	-360	360;
55	59	0.04739	0.2158	0.05646	0	0	0	0	0	1	-360	360;
59	60	0.0317	0.145	0.0376	0	0	0	0	0	1	-360	360;

59	61	0.0328	0.15	0.0388	0	0	0	0	0	1	-360	360;
60	61	0.00264	0.0135	0.01456	0	0	0	0	0	1	-360	360;
60	62	0.0123	0.0561	0.01468	0	0	0	0	0	1	-360	360;
61	62	0.00824	0.0376	0.0098	0	0	0	0	0	1	-360	360;
63	59	0	0.0386	0	0	0	0	0.96	0	1	-360	360;
63	64	0.00172	0.02	0.216	0	0	0	0	0	1	-360	360;
64	61	0	0.0268	0	0	0	0	0.985	0	1	-360	360;
38	65	0.00901	0.0986	1.046	0	0	0	0	0	1	-360	360;
64	65	0.00269	0.0302	0.38	0	0	0	0	0	1	-360	360;
49	66	0.018	0.0919	0.0248	0	0	0	0	0	1	-360	360;
49	66	0.018	0.0919	0.0248	0	0	0	0	0	1	-360	360;
62	66	0.0482	0.218	0.0578	0	0	0	0	0	1	-360	360;
62	67	0.0258	0.117	0.031	0	0	0	0	0	1	-360	360;
65	66	0	0.037	0	0	0	0	0.935	0	1	-360	360;
66	67	0.0224	0.1015	0.02682	0	0	0	0	0	1	-360	360;
65	68	0.00138	0.016	0.638	0	0	0	0	0	1	-360	360;
47	69	0.0844	0.2778	0.07092	0	0	0	0	0	1	-360	360;
49	69	0.0985	0.324	0.0828	0	0	0	0	0	1	-360	360;
68	69	0	0.037	0	0	0	0	0.935	0	1	-360	360;
69	70	0.03	0.127	0.122	0	0	0	0	0	1	-360	360;
24	70	0.00221	0.4115	0.10198	0	0	0	0	0	1	-360	360;
70	71	0.00882	0.0355	0.00878	0	0	0	0	0	1	-360	360;
24	72	0.0488	0.196	0.0488	0	0	0	0	0	1	-360	360;
71	72	0.0446	0.18	0.04444	0	0	0	0	0	1	-360	360;
71	73	0.00866	0.0454	0.01178	0	0	0	0	0	1	-360	360;
70	74	0.0401	0.1323	0.03368	0	0	0	0	0	1	-360	360;
70	75	0.0428	0.141	0.036	0	0	0	0	0	1	-360	360;
69	75	0.0405	0.122	0.124	0	0	0	0	0	1	-360	360;
74	75	0.0123	0.0406	0.01034	0	0	0	0	0	1	-360	360;
76	77	0.0444	0.148	0.0368	0	0	0	0	0	1	-360	360;
69	77	0.0309	0.101	0.1038	0	0	0	0	0	1	-360	360;
75	77	0.0601	0.1999	0.04978	0	0	0	0	0	1	-360	360;
77	78	0.00376	0.0124	0.01264	0	0	0	0	0	1	-360	360;
78	79	0.00546	0.0244	0.00648	0	0	0	0	0	1	-360	360;
77	80	0.017	0.0485	0.0472	0	0	0	0	0	1	-360	360;
77	80	0.0294	0.105	0.0228	0	0	0	0	0	1	-360	360;
79	80	0.0156	0.0704	0.0187	0	0	0	0	0	1	-360	360;
68	81	0.00175	0.0202	0.808	0	0	0	0	0	1	-360	360;
81	80	0	0.037	0	0	0	0	0.935	0	1	-360	360;
77	82	0.0298	0.0853	0.08174	0	0	0	0	0	1	-360	360;
82	83	0.0112	0.03665	0.03796	0	0	0	0	0	1	-360	360;
83	84	0.0625	0.132	0.0258	0	0	0	0	0	1	-360	360;
83	85	0.043	0.148	0.0348	0	0	0	0	0	1	-360	360;
84	85	0.0302	0.0641	0.01234	0	0	0	0	0	1	-360	360;
85	86	0.035	0.123	0.0276	0	0	0	0	0	1	-360	360;
86	87	0.02828	0.2074	0.0445	0	0	0	0	0	1	-360	360;

85	88	0.02	0.102	0.0276	0	0	0	0	0	1	-360	360;
85	89	0.0239	0.173	0.047	0	0	0	0	0	1	-360	360;
88	89	0.0139	0.0712	0.01934	0	0	0	0	0	1	-360	360;
89	90	0.0518	0.188	0.0528	0	0	0	0	0	1	-360	360;
89	90	0.0238	0.0997	0.106	0	0	0	0	0	1	-360	360;
90	91	0.0254	0.0836	0.0214	0	0	0	0	0	1	-360	360;
89	92	0.0099	0.0505	0.0548	0	0	0	0	0	1	-360	360;
89	92	0.0393	0.1581	0.0414	0	0	0	0	0	1	-360	360;
91	92	0.0387	0.1272	0.03268	0	0	0	0	0	1	-360	360;
92	93	0.0258	0.0848	0.0218	0	0	0	0	0	1	-360	360;
92	94	0.0481	0.158	0.0406	0	0	0	0	0	1	-360	360;
93	94	0.0223	0.0732	0.01876	0	0	0	0	0	1	-360	360;
94	95	0.0132	0.0434	0.0111	0	0	0	0	0	1	-360	360;
80	96	0.0356	0.182	0.0494	0	0	0	0	0	1	-360	360;
82	96	0.0162	0.053	0.0544	0	0	0	0	0	1	-360	360;
94	96	0.0269	0.0869	0.023	0	0	0	0	0	1	-360	360;
80	97	0.0183	0.0934	0.0254	0	0	0	0	0	1	-360	360;
80	98	0.0238	0.108	0.0286	0	0	0	0	0	1	-360	360;
80	99	0.0454	0.206	0.0546	0	0	0	0	0	1	-360	360;
92	100	0.0648	0.295	0.0472	0	0	0	0	0	1	-360	360;
94	100	0.0178	0.058	0.0604	0	0	0	0	0	1	-360	360;
95	96	0.0171	0.0547	0.01474	0	0	0	0	0	1	-360	360;
96	97	0.0173	0.0885	0.024	0	0	0	0	0	1	-360	360;
98	100	0.0397	0.179	0.0476	0	0	0	0	0	1	-360	360;
99	100	0.018	0.0813	0.0216	0	0	0	0	0	1	-360	360;
100	101	0.0277	0.1262	0.0328	0	0	0	0	0	1	-360	360;
92	102	0.0123	0.0559	0.01464	0	0	0	0	0	1	-360	360;
101	102	0.0246	0.112	0.0294	0	0	0	0	0	1	-360	360;
100	103	0.016	0.0525	0.0536	0	0	0	0	0	1	-360	360;
100	104	0.0451	0.204	0.0541	0	0	0	0	0	1	-360	360;
103	104	0.0466	0.1584	0.0407	0	0	0	0	0	1	-360	360;
103	105	0.0535	0.1625	0.0408	0	0	0	0	0	1	-360	360;
100	106	0.0605	0.229	0.062	0	0	0	0	0	1	-360	360;
104	105	0.00994	0.0378	0.00986	0	0	0	0	0	1	-360	360;
105	106	0.014	0.0547	0.01434	0	0	0	0	0	1	-360	360;
105	107	0.053	0.183	0.0472	0	0	0	0	0	1	-360	360;
105	108	0.0261	0.0703	0.01844	0	0	0	0	0	1	-360	360;
106	107	0.053	0.183	0.0472	0	0	0	0	0	1	-360	360;
108	109	0.0105	0.0288	0.0076	0	0	0	0	0	1	-360	360;
103	110	0.03906	0.1813	0.0461	0	0	0	0	0	1	-360	360;
109	110	0.0278	0.0762	0.0202	0	0	0	0	0	1	-360	360;
110	111	0.022	0.0755	0.02	0	0	0	0	0	1	-360	360;
110	112	0.0247	0.064	0.062	0	0	0	0	0	1	-360	360;
17	113	0.00913	0.0301	0.00768	0	0	0	0	0	1	-360	360;
32	113	0.0615	0.203	0.0518	0	0	0	0	0	1	-360	360;
32	114	0.0135	0.0612	0.01628	0	0	0	0	0	1	-360	360;

27	115	0.0164	0.0741	0.01972	0	0	0	0	0	1	-360	360;
114	115	0.0023	0.0104	0.00276	0	0	0	0	0	1	-360	360;
68	116	0.00034	0.00405	0.164	0	0	0	0	0	1	-360	360;
12	117	0.0329	0.14	0.0358	0	0	0	0	0	1	-360	360;
75	118	0.0145	0.0481	0.01198	0	0	0	0	0	1	-360	360;
76	118	0.0164	0.0544	0.01356	0	0	0	0	0	1	-360	360;

References:

- [1] P. Demetriou, M. Asprou, J. Quiros-Tortos, and E. Kyriakides, "Dynamic ieee test systems for transient analysis," IEEE Systems Journal, vol. 11, no. 4, pp. 2108–2117, 2017.
- [2] F. M. Gonz'alez-Longatt and J. L. Rueda, PowerFactory applications for power system analysis. Springer, 2014.