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Appendix-A

Table A.1: Current Vs Voltage measurement data for VPI stator of Old Laxapana

V(kV)	I(µA)	V(kV)	I((µA)	V(kV)	I((µA)	V(kV)	I((µA)
0.02	0.6	2.56	3.8	5.09	4.6	7.65	5.4
0.095	2.2	2.62	3.6	5.16	4.6	7.71	5.4
0.12	2.2	2.685	3.8	5.21	4.6	7.76	5.4
0.205	2.4	2.73	3.6	5.285	4.6	7.82	5.4
0.24	2.4	2.815	3.8	5.345	4.6	7.87	5.2
0.315	2.4	2.84	3.8	5.395	4.6	7.97	5.4
0.39	2.6	2.925	3.8	5.455	4.8	8.02	5.4
0.46	2.6	2.99	3.8	5.525	4.8	8.09	5.4
0.5	2.6	3.05	4	5.6	4.8	8.125	5.4
0.57	2.6	3.1	3.8	5.635	4.8	8.2	5.4
0.645	2.6	3.16	3.8	5.71	4.8	8.25	5.6
0.695	2.8	3.21	3.8	5.785	4.8	8.335	5.4
0.765	2.8	3.28	4	5.83	4.8	8.395	5.6
0.815	2.8	3.355	4	5.905	5	8.47	5.6
0.865	2.8	3.415	4	5.94	4.8	8.505	5.6
0.95	3	3.475	4	6.015	4.8	8.58	5.4
1	3	3.54	4.2	6.075	4.8	8.63	5.6
1.06	3	3.61	4	6.14	4.8	8.7	5.6
1.135	3	3.645	4.2	6.225	5	8.76	5.6
1.18	3	3.72	4	6.27	5	8.8	5.6
1.255	3.2	3.78	4.2	6.335	5	8.885	5.6
1.315	3.2	3.845	4.2	6.38	5	8.945	5.6
1.365	3.2	3.905	4.2	6.455	5	9.02	5.8
1.44	3.2	3.99	4.2	6.515	5	9.065	5.6
1.475	3.2	4.025	4.2	6.575	5	9.115	5.6
1.56	3.2	4.1	4.2	6.65	5	9.2	5.8
1.62	3.4	4.16	4.4	6.71	5	9.25	5.8
1.68	3.4	4.22	4.2	6.75	5.2	9.31	5.8
1.73	3.4	4.28	4.4	6.835	5	9.395	5.8
1.805	3.4	4.345	4.4	6.895	5	9.445	5.8
1.875	3.6	4.39	4.4	6.955	5	9.495	5.8
1.94	3.4	4.465	4.4	7.015	5	9.58	6
2	3.6	4.54	4.4	7.065	5.2	9.64	5.8
2.05	3.4	4.6	4.4	7.125	5.2	9.7	5.8
2.11	3.6	4.65	4.4	7.2	5.2	9.75	6
2.185	3.6	4.71	4.6	7.275	5.2	9.8	6
2.23	3.6	4.77	4.6	7.32	5.2	9.86	5.8
2.305	3.6	4.845	4.4	7.395	5.2	9.935	6
2.38	3.6	4.895	4.4	7.455	5.2	10.005	6
2.425	3.6	4.965	4.6	7.515	5.2	10.07	6
2.475	3.6	5.015	4.6	7.565	5.4	10.14	6

Table A.1: Current Vs. Voltage measurement data for VPI stator of Old Laxapana

V(kV)	I(μA)
10.19	6
10.25	6
10.31	6
10.385	6.2
10.445	6.2
10.495	6.2
10.57	6
10.63	6
10.69	6.2
10.75	6.2
10.8	6.2
10.9	6.4
10.935	6.2
10.995	6.2
11.055	6.2
11.12	6.2
11.19	6.4
11.265	6.4
11.315	6.4
11.375	6.4
11.435	6.6
11.51	6.6
11.57	6.4
11.62	6.4
11.68	6.6
11.74	6.6
11.8	6.6
11.865	6.6
11.925	6.6
11.995	6.6
12.045	6.6
12.12	6.6
12.18	6.8
12.255	6.8
12.315	6.6
12.375	6.6
12.45	6.8
12.51	6.6
12.535	6.6
12.605	6.8
12.68	6.8

V(kV)	I(μA)
12.755	6.8
12.79	6.8
12.875	6.8
12.915	7
12.985	6.8
13.06	7
13.11	6.8
13.18	7
13.255	7
13.315	7
13.39	7
13.435	7
13.475	7
13.56	7.2
13.62	7.2
13.68	7.2
13.745	7.2
13.79	7
13.865	7.2
13.925	7
13.975	7.2
14.05	7.2
14.11	7
14.17	7.4
14.245	7.2
14.305	7.4
14.365	7.4
14.425	7.4
14.485	7.4
14.56	7.4
14.62	7.4
14.66	7.4
14.73	7.4
14.815	7.6
14.855	7.4
14.915	7.4
14.99	7.6
15.035	7.6

Table A.2: Current Vs. Voltage measurement for Old Laxapana GVPI stator

V(kV)	I(μA)	V(kV)	I(μA)	V(kV)	I(μA)	V(kV)	I(μA)
0.01	0.1	2.61	2.4	5.21	2.6	7.785	2.9
0.085	1.8	2.67	2.3	5.26	2.7	7.885	3
0.145	1.9	2.73	2.4	5.31	2.6	7.91	2.9
0.195	2	2.795	2.4	5.395	2.7	7.97	3
0.255	2	2.84	2.5	5.455	2.7	8.04	2.9
0.29	2	2.925	2.4	5.525	2.6	8.115	2.9
0.375	2	2.965	2.5	5.59	2.7	8.19	3
0.435	2.2	3.05	2.5	5.635	2.7	8.215	2.9
0.52	2.1	3.11	2.5	5.725	2.7	8.3	3
0.585	2.1	3.195	2.4	5.77	2.7	8.345	3
0.63	2.1	3.22	2.5	5.83	2.8	8.42	2.9
0.72	2.1	3.32	2.5	5.905	2.8	8.47	2.9
0.765	2.1	3.355	2.6	5.955	2.7	8.54	2.9
0.83	2.2	3.415	2.5	6.03	2.8	8.65	3
0.9	2.2	3.475	2.5	6.075	2.7	8.65	3
0.975	2.2	3.56	2.6	6.14	2.7	8.725	2.9
1.01	2.1	3.61	2.5	6.21	2.8	8.775	3
1.11	2.1	3.685	2.5	6.295	2.8	8.86	3
1.145	2.2	3.755	2.5	6.335	2.7	8.92	3
1.205	2.3	3.83	2.5	6.395	2.7	8.995	3.1
1.265	2.2	3.88	2.6	6.465	2.8	9.08	3
1.33	2.3	3.94	2.5	6.53	2.7	9.13	3
1.375	2.2	4	2.5	6.6	2.8	9.175	3
1.475	2.3	4.06	2.7	6.64	2.8	9.265	2.9
1.51	2.3	4.11	2.5	6.7	2.8	9.335	3.1
1.61	2.3	4.21	2.6	6.81	2.8	9.375	3
1.66	2.3	4.27	2.6	6.845	2.8	9.435	3.1
1.705	2.3	4.33	2.4	6.905	2.8	9.47	3
1.78	2.4	4.37	2.6	6.955	2.8	9.555	3.1
1.865	2.3	4.44	2.6	7.015	2.9	9.63	3
1.9	2.3	4.515	2.6	7.115	2.8	9.69	3.1
1.965	2.4	4.565	2.6	7.15	2.8	9.775	3.1
2.025	2.4	4.625	2.6	7.21	2.8	9.825	3
2.095	2.3	4.695	2.7	7.285	2.9	9.875	3.1
2.16	2.4	4.77	2.6	7.345	2.8	9.945	3.1
2.23	2.4	4.83	2.7	7.43	2.8	10.005	3
2.305	2.4	4.905	2.6	7.47	2.9	10.07	3.1
2.355	2.3	4.93	2.5	7.54	2.8	10.155	3.1
2.415	2.3	5	2.5	7.625	2.9	10.19	3.1
2.465	2.3	5.075	2.7	7.65	2.9	10.25	3.1
2.535	2.4	5.15	2.6	7.75	2.8	10.325	3.1

Table A.2: Current Vs. Voltage measurement for Old Laxapana GVPI stator

V(kV)	I(μA)
10.38	3.1
10.45	3.1
10.51	3.1
10.57	3.1
10.66	3.2
10.73	3.2
10.77	3.1
10.84	3.2
10.89	3.1
10.93	3.2
11.02	3.1
11.08	3.2
11.16	3.2
11.21	3.2
11.3	3.2
11.34	3.1
11.4	3.2
11.46	3.2
11.52	3.2
11.58	3.3
11.63	3.2
11.73	3.3
11.74	3.2
11.82	3.3
11.89	3.2
11.95	3.2
12.04	3.3
12.1	3.3
12.13	3.2
12.22	3.2
12.29	3.2
12.33	3.3
12.39	3.2
12.49	3.3
12.52	3.3
12.59	3.3
12.67	3.3
12.73	3.2
12.77	3.3
12.85	3.3

V(kV)	I(μA)
12.975	3.2
13.06	3.3
13.095	3.3
13.22	3.4
13.265	3.4
13.29	3.3
13.365	3.4
13.425	3.3
13.475	3.3
13.56	3.3
13.62	3.4
13.67	3.4
13.745	3.4
13.805	3.4
13.865	3.3
13.94	3.3
13.96	3.3
14.07	3.4
14.095	3.3
14.18	3.4
14.23	3.4
14.305	3.4
14.355	3.4
14.45	3.5
14.475	3.4
14.55	3.5
14.585	3.4
14.685	3.4
14.73	3.5

Table A.3: Current Vs. voltage measurement data for Wimalasurendra stator

V(kV)	I(μA)	V(kV)	I(μA)	V(kV)	I(μA)	V(kV)	I(μA)
0.045	1.1	2.49	6.6	4.965	7.9	7.42	8.9
0.095	4	2.56	6.6	5.025	7.9	7.47	8.9
0.145	4.2	2.635	6.7	5.075	7.9	7.54	9
0.23	4.4	2.685	6.6	5.125	8	7.6	9
0.265	4.5	2.73	6.7	5.21	8	7.69	9.1
0.325	4.7	2.795	6.7	5.27	8	7.725	9.1
0.4	4.7	2.88	6.8	5.345	8.1	7.8	9.1
0.475	4.8	2.94	6.8	5.405	8	7.87	9.1
0.52	4.9	3.015	6.8	5.455	8.1	7.92	9.1
0.595	5	3.085	6.9	5.525	8.1	7.98	9.1
0.655	5	3.135	6.9	5.575	8.2	8.055	9.2
0.72	5.1	3.185	7	5.65	8.2	8.115	9.2
0.765	5.2	3.245	7	5.725	8.3	8.19	9.2
0.84	5.3	3.32	7	5.785	8.3	8.25	9.3
0.9	5.3	3.39	7.1	5.845	8.2	8.31	9.3
0.975	5.4	3.44	7.1	5.905	8.3	8.36	9.3
1.025	5.4	3.515	7.2	5.98	8.3	8.445	9.4
1.095	5.5	3.575	7.3	6.03	8.3	8.495	9.4
1.155	5.6	3.625	7.2	6.1	8.4	8.58	9.4
1.22	5.7	3.685	7.2	6.15	8.4	8.615	9.4
1.28	5.6	3.745	7.2	6.225	8.4	8.675	9.4
1.34	5.8	3.845	7.3	6.285	8.5	8.75	9.5
1.4	5.8	3.89	7.3	6.335	8.4	8.8	9.5
1.485	5.9	3.94	7.4	6.42	8.5	8.885	9.5
1.56	5.9	3.99	7.4	6.48	8.6	8.945	9.6
1.595	6	4.06	7.4	6.54	8.5	9.02	9.6
1.66	6	4.125	7.4	6.615	8.6	9.065	9.6
1.745	6	4.195	7.5	6.65	8.6	9.13	9.6
1.79	6	4.27	7.5	6.725	8.6	9.175	9.7
1.855	6.2	4.33	7.5	6.795	8.7	9.265	9.7
1.94	6.2	4.38	7.6	6.87	8.7	9.325	9.7
2	6.2	4.44	7.6	6.92	8.7	9.375	9.8
2.035	6.2	4.515	7.7	6.98	8.8	9.42	9.8
2.12	6.3	4.585	7.6	7.055	8.8	9.52	9.8
2.185	6.3	4.635	7.7	7.09	8.7	9.59	9.8
2.245	6.4	4.71	7.8	7.175	8.8	9.63	9.8
2.29	6.4	4.77	7.8	7.235	8.9	9.7	9.9
2.365	6.5	4.83	7.8	7.31	8.9	9.75	9.9
2.425	6.5	4.895	7.9	7.345	9	9.825	9.9

Table A.3: Current Vs. voltage measurement data for Wimalasurendra stator

V(kV)	I(μA)
9.885	10
9.96	10
10.005	10
10.08	10
10.14	10
10.205	10
10.265	10.1
10.335	10.1
10.385	10.2
10.46	10.2
10.51	10.2
10.555	10.2
10.64	10.3
10.69	10.3
10.75	10.4
10.825	10.4
10.885	10.4
10.945	10.4
11.02	10.5
11.08	10.5
11.13	10.5
11.205	10.6
11.275	10.6
11.34	10.6
11.41	10.6
11.46	10.7
11.535	10.7
11.58	10.7
11.655	10.8
11.705	10.7
11.755	10.8
11.84	10.8
11.9	10.8
11.95	10.8
12.02	10.9
12.095	10.9
12.145	10.9
12.205	11
12.28	11

V(kV)	I(μA)
12.34	11
12.4	11
12.475	11.1
12.545	11.1
12.57	11.1
12.67	11.2
12.73	11.2
12.79	11.3
12.85	11.3
12.915	11.3
12.975	11.4
13.02	11.3
13.095	11.4
13.155	11.4
13.22	11.4
13.29	11.4
13.35	11.5
13.415	11.5
13.485	11.6
13.525	11.6
13.585	11.6
13.645	11.6
13.705	11.6
13.805	11.7
13.84	11.7
13.915	11.8
13.985	11.8
14.025	11.8
14.095	11.8
14.145	11.9
14.23	11.9
14.305	11.9
14.34	12
14.4	12
14.475	12
14.55	12.1
14.62	12.2
14.67	12.3

Table A.4 :Real part of permittivity measurements along frequency sweep

	Real part of permittivity		
Frequency	OLPS VPI stator (F/m)	OLPS GVPI stator (F/m)	WPS VPI stator (F/m)
0.0010			1.240016
0.0010		1.166985	1.239435
0.0022		1.134582	1.200160
0.0046		1.109073	1.166861
0.0100		1.087937	1.137618
0.0215		1.073242	1.113138
0.0464	1.176998	1.061175	1.093893
0.1000	1.142832	1.051189	1.078045
0.2154	1.114181	1.042573	1.064208
0.4642	1.090800	1.035455	1.051818
1.0000	1.071500	1.028869	1.040908
2.1546	1.056239	1.023147	1.031454
4.6417	1.044404	1.018009	1.023300
10.0000	1.035227	1.013514	1.016354
20.0000	1.028591	1.009868	1.011182
40.0000	1.022793	1.006771	1.006912
70.0000	1.018685	1.004570	1.004078
110.0000	1.015310	1.003001	1.002160
222.2200	1.009698	1.000991	1.000000
446.6800	1.001354	0.999930	
500.0000	1.000000	1.000000	

Table A.5 :Imaginary part of permittivity measurements along frequency sweep

	Imaginary part of permittivity		
Frequency	OLPS VPI stator (F/m)	OLPS GVPI stator (F/m)	WPS VPI stator (F/m)
0.0010			0.186740
0.0010		0.091105	0.185528
0.0022		0.067967	0.120325
0.0046		0.051681	0.086502
0.0100		0.039334	0.066761
0.0215		0.031462	0.054016
0.0464	0.095483	0.025486	0.045612
0.1000	0.074075	0.021116	0.035660
0.2154	0.058517	0.017635	0.029808
0.4642	0.046975	0.015065	0.025410
1.0000	0.037580	0.013010	0.021797
2.1546	0.029872	0.011503	0.018714
4.6417	0.023738	0.010107	0.015888
10.0000	0.019342	0.008838	0.013317
20.0000	0.016893	0.007811	0.011252
40.0000	0.016139	0.006957	0.009486
70.0000	0.016944	0.006397	0.008322
110.0000	0.018889	0.006053	0.007604
222.2200	0.024947	0.006064	0.007282
446.6800	0.035943	0.006923	
500.0000	0.038453	0.007149	

Table A.6 :Dissipation factor measurements along frequency sweep

	Dissipation Factor		
Frequency	OLPS VPI stator	OLPS GVPI stator	WPS VPI stator
0.0010			0.1505946
0.0010		0.078068	0.1496875
0.0022		0.059905	0.1002574
0.0046		0.046599	0.0741323
0.0100		0.036154	0.0586851
0.0215		0.029315	0.0485258
0.0464	0.081125	0.024016	0.0416974
0.1000	0.064817	0.020087	0.0330787
0.2154	0.052520	0.016915	0.0280093
0.4642	0.043065	0.014549	0.0241581
1.0000	0.035073	0.012644	0.0209408
2.1546	0.028281	0.011242	0.0181429
4.6417	0.022729	0.009928	0.0155266
10.0000	0.018684	0.008720	0.0131026
20.0000	0.016423	0.007735	0.0111279
40.0000	0.015780	0.006910	0.0094208
70.0000	0.016633	0.006368	0.0082881
110.0000	0.018604	0.006035	0.0075874
222.2200	0.024707	0.006058	0.0072816
446.6800	0.035895	0.006923	
500.0000	0.038453	0.007149	

Appendix-B

1. Parameter estimation for OLPS GVPI Stator using MATLAB

General model: F (x) = 16.67*(x/b+0.110+ (d*0.110*x^(1-n))/(1-n))

Coefficients (with 95% confidence bounds):

b = 9864 (7633, 1.209e+04)

d = 0.006457 (0.003917, 0.008997)

n = 0.7312 (0.292, 1.17)

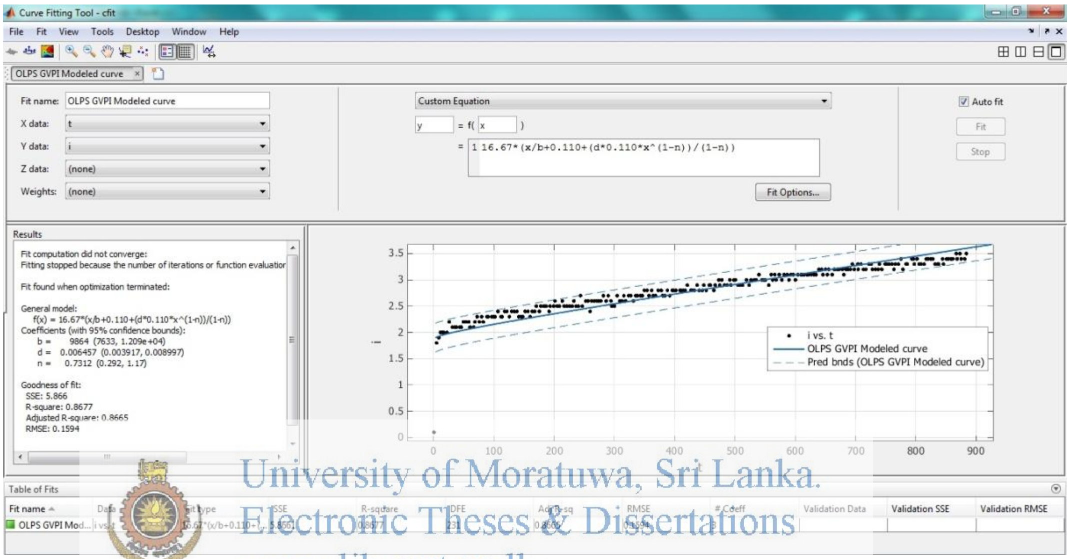

Figure B.1: MATLAB workspace - Curve Fitting tool

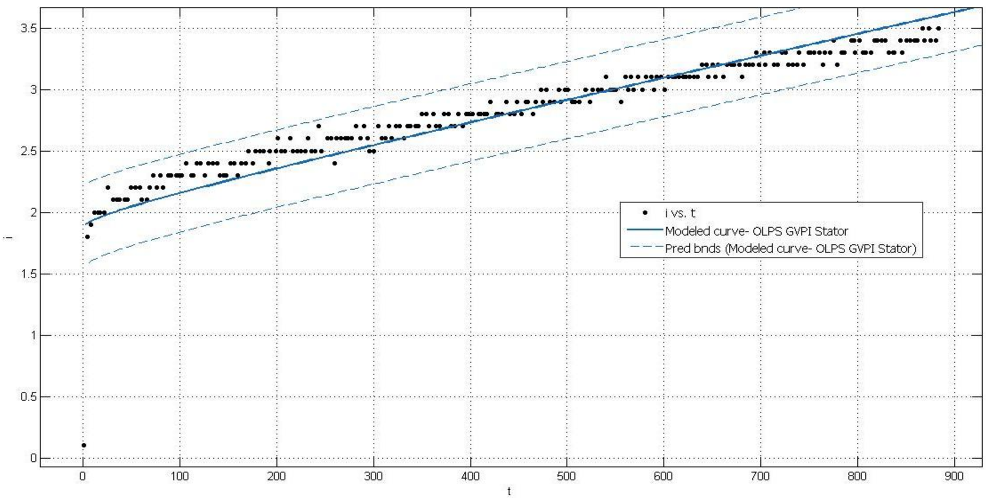

Figure B.2: Modeled curve within 95% prediction boundaries

2. Parameter estimation for OLPS VPI stator using MATLAB

General model: F (x) = 16.67*(x/b+0.0914+(d*0.0914*x^(1-n))/(1-n))

Coefficients (with 95% confidence bounds):

b = 4352 (4221, 4484)

d = 0.07112 (0.07024, 0.07201)

n = 0.7408 (0.7256, 0.7559)

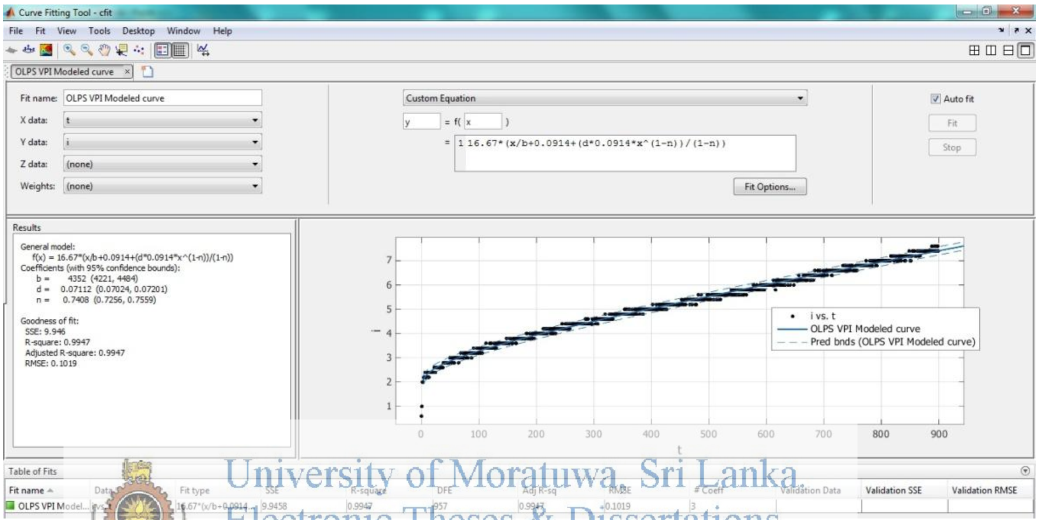

Figure B.3: MATLAB workspace- Curve fitting tool

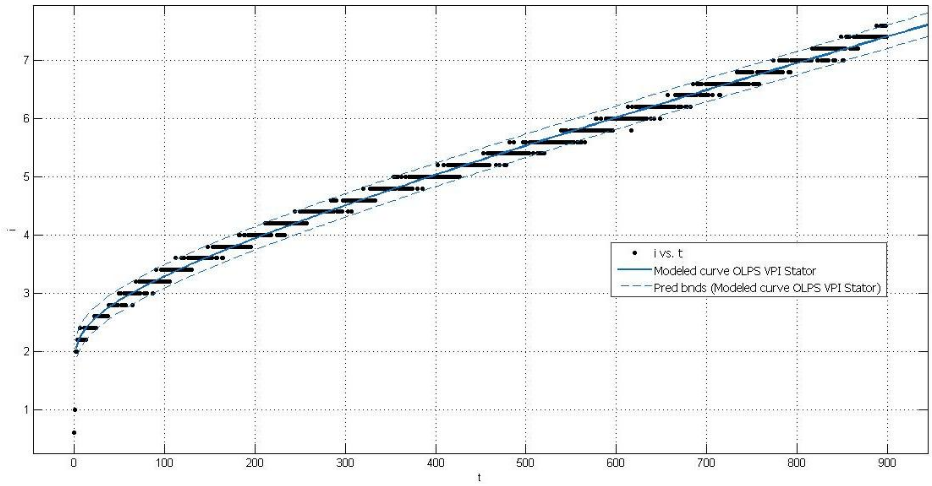

Figure B.4: Modeled curve within 95% prediction bounds

3. Parameter estimation for WPS VPI Stator using MATLAB

General model:

f(x) = 16.67*(x/b+0.158+(d*.158*x^(1-n))/(1-n))

Coefficients (with 95% confidence bounds):

b = 2580 (2524, 2636)

d = 0.07529 (0.07456, 0.07602)

n = 0.7954 (0.7844, 0.8063)

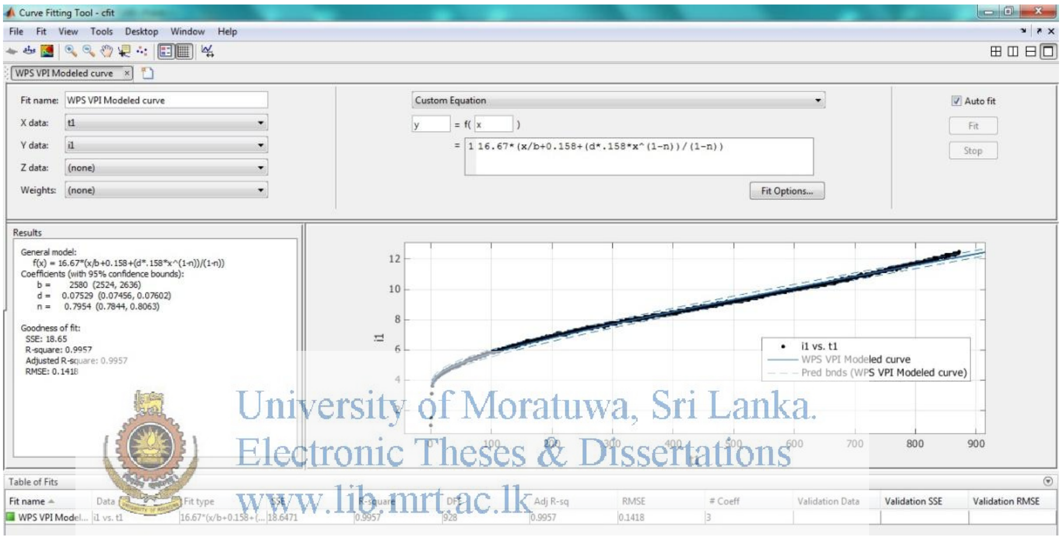

Figure B.5: MATLAB workspace - Curve fitting tool

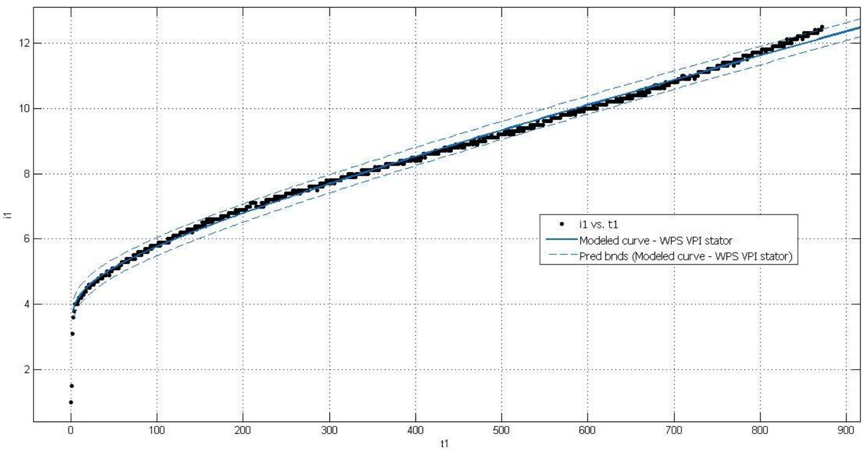

Figure B.6: Modeled curve within 95% prediction boundaries

Appendix-C