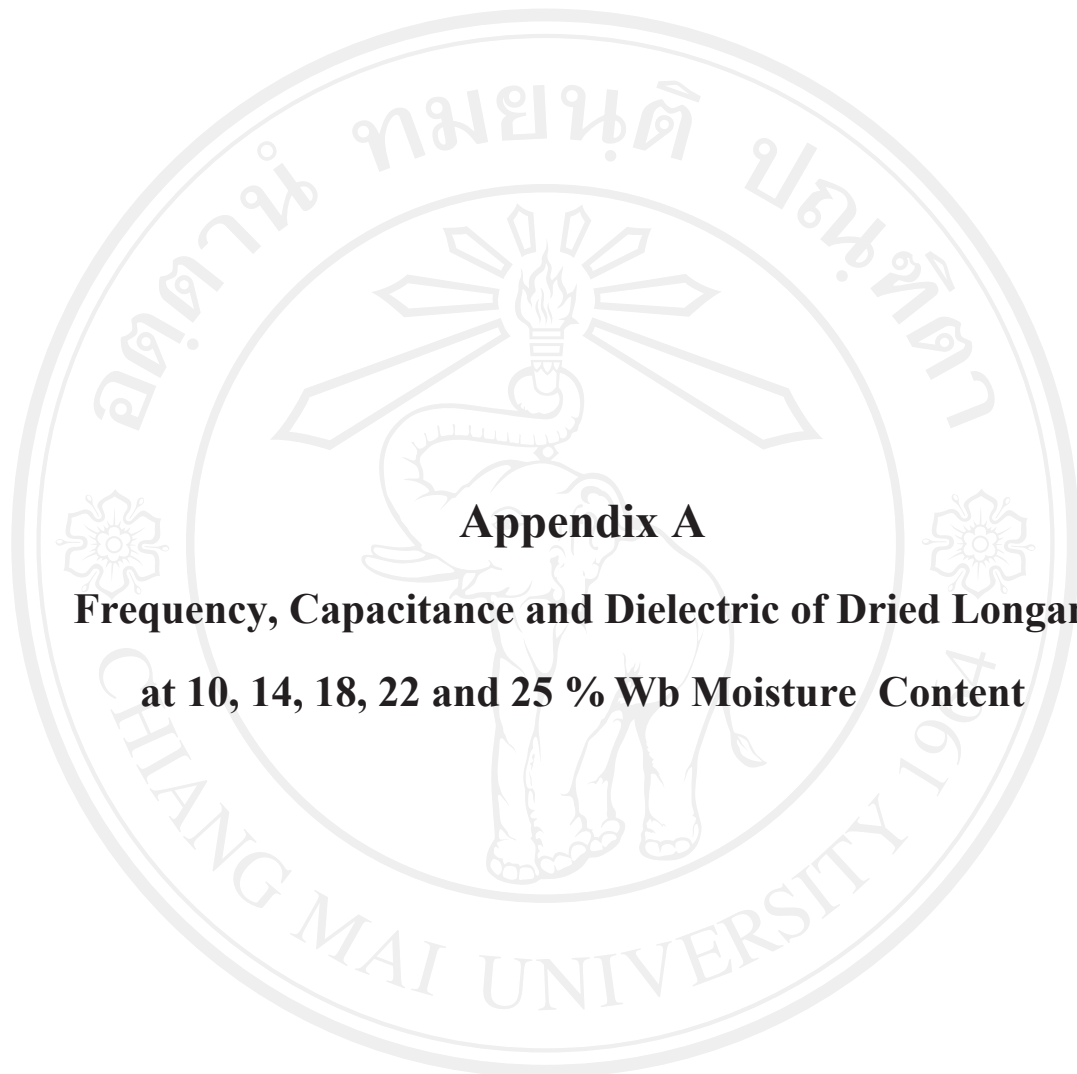


Appendices

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Appendix A

Frequency, Capacitance and Dielectric of Dried Longan

at 10, 14, 18, 22 and 25 % Wb Moisture Content

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Table appendix A 1 Frequency, capacitance and dielectric of dried longan at 10 % Wb moisture content.

Sample	Frequency (MHz)			Capacitance(pF)			Dielectric constant		
	Bulk density (kg/m ³)			Bulk density (kg/m ³)			Bulk density (kg/m ³)		
	1300	1450	1600	1300	1450	1600	1300	1450	1600
1	0.007	0.0076	0.0084	3.916	4.015	4.281	12.608	12.929	13.784
2	0.008	0.0077	0.0089	3.982	4.048	4.447	12.822	13.036	14.319
3	0.008	0.0077	0.0088	4.082	4.048	4.414	13.142	13.036	14.212
4	0.008	0.0077	0.0087	4.115	4.048	4.381	13.249	13.036	14.105
5	0.008	0.0077	0.0086	4.048	4.048	4.347	13.036	13.036	13.998
6	0.007	0.0077	0.0083	3.916	4.048	4.248	12.608	13.036	13.677
7	0.007	0.0078	0.0089	3.883	4.082	4.447	12.502	13.142	14.319
8	0.007	0.0078	0.0078	3.883	4.082	4.082	12.502	13.142	13.142
9	0.007	0.0078	0.0077	3.883	4.082	4.048	12.502	13.142	13.036
10	0.007	0.0078	0.0076	3.883	4.082	4.015	12.502	13.142	12.929
11	0.007	0.0078	0.0089	3.883	4.082	4.447	12.502	13.142	14.319
12	0.007	0.0078	0.0078	3.883	4.082	4.082	12.502	13.142	13.142
13	0.007	0.0078	0.0077	3.883	4.082	4.048	12.502	13.142	13.036
14	0.007	0.0078	0.0076	3.883	4.082	4.015	12.502	13.142	12.929
15	0.007	0.0078	0.0094	3.883	4.082	4.613	12.502	13.142	14.855
16	0.007	0.0078	0.0099	3.883	4.082	4.780	12.502	13.142	15.391
17	0.007	0.0078	0.0088	3.883	4.082	4.414	12.502	13.142	14.212
18	0.007	0.0078	0.0087	3.916	4.082	4.381	12.608	13.142	14.105
19	0.007	0.0078	0.0086	3.916	4.082	4.347	12.608	13.142	13.998
20	0.007	0.0078	0.0083	3.916	4.082	4.248	12.608	13.142	13.677
21	0.007	0.0078	0.0089	3.916	4.082	4.447	12.608	13.142	14.319
22	0.007	0.0078	0.0078	3.916	4.082	4.082	12.608	13.142	13.142
23	0.007	0.0079	0.0088	3.916	4.115	4.414	12.608	13.249	14.212
24	0.007	0.0079	0.0087	3.916	4.115	4.381	12.608	13.249	14.105
25	0.007	0.0079	0.0084	3.916	4.115	4.281	12.608	13.249	13.784
26	0.007	0.0079	0.0089	3.916	4.115	4.447	12.608	13.249	14.319
27	0.007	0.0079	0.0088	3.916	4.115	4.414	12.608	13.249	14.212
28	0.007	0.0081	0.0087	3.916	4.181	4.381	12.608	13.463	14.105
29	0.007	0.0081	0.0086	3.916	4.181	4.347	12.608	13.463	13.998
30	0.007	0.0081	0.0083	3.949	4.181	4.248	12.715	13.463	13.677
31	0.007	0.0081	0.0089	3.949	4.181	4.447	12.715	13.463	14.319
32	0.007	0.0081	0.0078	3.949	4.181	4.082	12.715	13.463	13.142
33	0.007	0.0081	0.0088	3.949	4.181	4.414	12.715	13.463	14.212
34	0.007	0.0082	0.0087	3.949	4.214	4.381	12.715	13.570	14.105
35	0.007	0.0082	0.0087	3.949	4.214	4.381	12.715	13.570	14.105
36	0.007	0.0082	0.0086	3.949	4.214	4.347	12.715	13.570	13.998

Table appendix A 1 Frequency, capacitance and dielectric of dried longan at 10% Wb moisture content (continued).

Sample	Frequency (MHz)			Capacitance(pF)			Dielectric constant		
	Bulk density (kg/m ³)			Bulk density (kg/m ³)			Bulk density (kg/m ³)		
	1300	1450	1600	1300	1450	1600	1300	1450	1600
37	0.008	0.0082	0.0083	3.982	4.214	4.248	12.822	13.570	13.677
38	0.008	0.0082	0.0089	4.015	4.214	4.447	12.929	13.570	14.319
39	0.008	0.0083	0.0078	4.015	4.248	4.082	12.929	13.677	13.142
40	0.008	0.0083	0.0098	4.015	4.248	4.747	12.929	13.677	15.284
41	0.008	0.0083	0.0097	4.015	4.248	4.713	12.929	13.677	15.177
42	0.008	0.0083	0.0094	4.015	4.248	4.613	12.929	13.677	14.855
43	0.008	0.0083	0.0099	4.015	4.248	4.780	12.929	13.677	15.391
44	0.008	0.0083	0.0098	4.015	4.248	4.747	12.929	13.677	15.284
45	0.008	0.0083	0.0097	4.015	4.248	4.713	12.929	13.677	15.177
46	0.008	0.0083	0.0096	4.015	4.248	4.680	12.929	13.677	15.069
47	0.008	0.0083	0.0093	4.015	4.248	4.580	12.929	13.677	14.748
48	0.008	0.0085	0.0089	4.015	4.314	4.447	12.929	13.891	14.319
49	0.008	0.0085	0.0096	4.015	4.314	4.680	12.929	13.891	15.069
50	0.008	0.0085	0.0093	4.015	4.314	4.580	12.929	13.891	14.748
51	0.008	0.0085	0.0089	4.015	4.314	4.447	12.929	13.891	14.319
52	0.008	0.0086	0.0078	4.015	4.347	4.082	12.929	13.998	13.142
53	0.008	0.0086	0.0098	4.015	4.347	4.747	12.929	13.998	15.284
54	0.008	0.0086	0.0097	4.015	4.347	4.713	12.929	13.998	15.177
55	0.008	0.0086	0.0097	4.048	4.347	4.713	13.036	13.998	15.177
56	0.008	0.0087	0.0096	4.048	4.381	4.680	13.036	14.105	15.069
57	0.008	0.0087	0.0093	4.048	4.381	4.580	13.036	14.105	14.748
58	0.008	0.0087	0.0089	4.048	4.381	4.447	13.036	14.105	14.319
59	0.008	0.0087	0.0078	4.048	4.381	4.082	13.036	14.105	13.142
60	0.008	0.0087	0.0098	4.082	4.381	4.747	13.142	14.105	15.284
61	0.008	0.0087	0.0097	4.082	4.381	4.713	13.142	14.105	15.177
62	0.008	0.0087	0.0096	4.082	4.381	4.680	13.142	14.105	15.069
63	0.008	0.0087	0.0093	4.082	4.381	4.580	13.142	14.105	14.748
64	0.008	0.0087	0.0089	4.082	4.381	4.447	13.142	14.105	14.319
65	0.008	0.0087	0.0096	4.082	4.381	4.680	13.142	14.105	15.069
66	0.008	0.0087	0.0083	4.082	4.381	4.248	13.142	14.105	13.677
67	0.008	0.0088	0.0089	4.082	4.414	4.447	13.142	14.212	14.319
68	0.008	0.0088	0.0078	4.082	4.414	4.082	13.142	14.212	13.142
69	0.008	0.0088	0.0098	4.082	4.414	4.747	13.142	14.212	15.284
70	0.008	0.0088	0.0094	4.082	4.414	4.613	13.142	14.212	14.855
71	0.008	0.0088	0.0099	4.082	4.414	4.780	13.142	14.212	15.391
72	0.008	0.0088	0.0098	4.082	4.414	4.747	13.142	14.212	15.284

Table appendix A 1 Frequency, capacitance and dielectric of dried longan at 10% Wb moisture content (continued).

Sample	Frequency (MHz)			Capacitance(pF)			Dielectric constant		
	Bulk density (kg/m ³)			Bulk density (kg/m ³)			Bulk density (kg/m ³)		
	1300	1450	1600	1300	1450	1600	1300	1450	1600
73	0.008	0.0088	0.0097	4.082	4.414	4.713	13.142	14.212	15.177
74	0.008	0.0088	0.0096	4.082	4.414	4.680	13.142	14.212	15.069
75	0.008	0.0088	0.0093	4.082	4.414	4.580	13.142	14.212	14.748
76	0.008	0.0088	0.0089	4.082	4.414	4.447	13.142	14.212	14.319
77	0.008	0.0089	0.0078	4.082	4.447	4.082	13.142	14.319	13.142
78	0.008	0.0089	0.0096	4.082	4.447	4.680	13.142	14.319	15.069
79	0.008	0.0089	0.0093	4.082	4.447	4.580	13.142	14.319	14.748
80	0.008	0.0091	0.0089	4.082	4.514	4.447	13.142	14.533	14.319
81	0.008	0.0092	0.0078	4.082	4.547	4.082	13.142	14.641	13.142
82	0.008	0.0092	0.0088	4.082	4.547	4.414	13.142	14.641	14.212
83	0.008	0.0092	0.0094	4.082	4.547	4.613	13.142	14.641	14.855
84	0.008	0.0092	0.0089	4.082	4.547	4.447	13.142	14.641	14.319
85	0.008	0.0092	0.0088	4.082	4.547	4.414	13.142	14.641	14.212
86	0.008	0.0092	0.0087	4.082	4.547	4.381	13.142	14.641	14.105
87	0.008	0.0092	0.0086	4.082	4.547	4.347	13.142	14.641	13.998
88	0.008	0.0092	0.0093	4.082	4.547	4.580	13.142	14.641	14.748
89	0.008	0.0092	0.0089	4.082	4.547	4.447	13.142	14.641	14.319
90	0.008	0.0093	0.0088	4.082	4.580	4.414	13.142	14.748	14.212
91	0.008	0.0093	0.0086	4.115	4.580	4.347	13.249	14.748	13.998
92	0.008	0.0097	0.0093	4.181	4.713	4.580	13.463	15.177	14.748
93	0.008	0.0097	0.0089	4.214	4.713	4.447	13.570	15.177	14.319
94	0.009	0.0097	0.0088	4.381	4.713	4.414	14.105	15.177	14.212
95	0.009	0.0097	0.0088	4.381	4.713	4.414	14.105	15.177	14.212
96	0.009	0.0097	0.0084	4.381	4.713	4.281	14.105	15.177	13.784
97	0.009	0.0097	0.0089	4.381	4.713	4.447	14.105	15.177	14.319
98	0.009	0.0097	0.0088	4.381	4.713	4.414	14.105	15.177	14.212
99	0.009	0.0097	0.0087	4.414	4.713	4.381	14.212	15.177	14.105
100	0.009	0.0097	0.0086	4.414	4.713	4.347	14.212	15.177	13.998
101	0.009	0.0098	0.0093	4.414	4.747	4.580	14.212	15.284	14.748
102	0.009	0.0098	0.0089	4.447	4.747	4.447	14.319	15.284	14.319
Average	0.007	0.0085	0.0089	4.044	4.326	4.442	13.022	13.932	14.302
Minimum	0.007	0.0076	0.0076	3.882	4.015	4.015	12.501	12.928	12.928
Maximum	0.008	0.0098	0.0099	4.447	4.746	4.780	14.319	15.283	15.391
Stdev	0.000	0.0006	0.0006	0.135	0.208	0.208	0.435	0.6696	0.669

Table appendix A 2 Frequency, capacitance and dielectric of dried longan at 14 % Wb moisture content.

Sample	Frequency (MHz)			Capacitance(pF)			Dielectric constant		
	Bulk density (kg/m ³)			Bulk density (kg/m ³)			Bulk density (kg/m ³)		
	1300	1450	1600	1300	1450	1600	1300	1450	1600
1	0.011	0.011	0.011	5.214	5.214	5.013	16.788	16.788	16.143
2	0.011	0.011	0.011	5.234	5.234	5.013	16.853	16.853	16.143
3	0.011	0.011	0.011	5.234	5.234	5.013	16.853	16.853	16.143
4	0.011	0.011	0.011	5.234	5.234	5.047	16.853	16.853	16.250
5	0.011	0.011	0.011	5.281	5.281	5.047	17.003	17.003	16.250
6	0.011	0.011	0.011	5.281	5.281	5.047	17.003	17.003	16.250
7	0.011	0.011	0.011	5.281	5.281	5.047	17.003	17.003	16.250
8	0.011	0.011	0.011	5.281	5.281	5.047	17.003	17.003	16.250
9	0.011	0.011	0.011	5.281	5.281	5.047	17.003	17.003	16.250
10	0.012	0.012	0.011	5.314	5.314	5.214	17.111	17.111	16.788
11	0.012	0.012	0.011	5.348	5.348	5.214	17.219	17.219	16.788
12	0.012	0.012	0.011	5.481	5.481	5.214	17.649	17.649	16.788
13	0.011	0.011	0.011	5.147	5.147	5.247	16.573	16.573	16.896
14	0.011	0.011	0.011	5.180	5.180	5.247	16.680	16.680	16.896
15	0.011	0.011	0.011	5.180	5.180	5.247	16.680	16.680	16.896
16	0.011	0.011	0.011	5.180	5.180	5.247	16.680	16.680	16.896
17	0.011	0.011	0.011	5.180	5.180	5.247	16.680	16.680	16.896
18	0.011	0.011	0.011	5.180	5.180	5.247	16.680	16.680	16.896
19	0.011	0.011	0.011	5.180	5.180	5.247	16.680	16.680	16.896
20	0.011	0.011	0.011	5.180	5.180	5.247	16.680	16.680	16.896
21	0.011	0.011	0.011	5.180	5.180	5.247	16.680	16.680	16.896
22	0.011	0.011	0.011	5.180	5.180	5.247	16.680	16.680	16.896
23	0.011	0.011	0.011	5.180	5.180	5.247	16.680	16.680	16.896
24	0.011	0.011	0.011	5.180	5.180	5.247	16.680	16.680	16.896
25	0.011	0.011	0.011	5.180	5.180	5.247	16.680	16.680	16.896
26	0.011	0.011	0.011	5.180	5.180	5.247	16.680	16.680	16.896
27	0.011	0.011	0.011	5.180	5.180	5.281	16.680	16.680	17.003
28	0.011	0.011	0.011	5.180	5.180	5.281	16.680	16.680	17.003
29	0.011	0.011	0.011	5.180	5.180	5.281	16.680	16.680	17.003
30	0.011	0.011	0.011	5.180	5.180	5.281	16.680	16.680	17.003
31	0.011	0.011	0.011	5.180	5.180	5.281	16.680	16.680	17.003
32	0.011	0.011	0.011	5.180	5.180	5.281	16.680	16.680	17.003
33	0.011	0.011	0.011	5.214	5.214	5.281	16.788	16.788	17.003
34	0.011	0.011	0.011	5.214	5.214	5.281	16.788	16.788	17.003
35	0.011	0.011	0.011	5.214	5.214	5.281	16.788	16.788	17.003
36	0.011	0.011	0.011	5.214	5.214	5.307	16.788	16.788	17.089

Table appendix A 2 Frequency, capacitance and dielectric of dried longan at 14 % Wb moisture content (continued).

Sample	Frequency (MHz)			Capacitance(pF)			Dielectric constant		
	Bulk density (kg/m ³)			Bulk density (kg/m ³)			Bulk density (kg/m ³)		
	1300	1450	1600	1300	1450	1600	1300	1450	1600
37	0.011	0.011	0.011	5.214	5.214	5.307	16.788	16.788	17.089
38	0.011	0.011	0.011	5.214	5.214	5.307	16.788	16.788	17.089
39	0.011	0.011	0.011	5.214	5.214	5.307	16.788	16.788	17.089
40	0.011	0.011	0.011	5.214	5.214	5.307	16.788	16.788	17.089
41	0.011	0.011	0.011	5.214	5.214	5.307	16.788	16.788	17.089
42	0.011	0.011	0.011	5.214	5.214	5.307	16.788	16.788	17.089
43	0.011	0.011	0.011	5.214	5.214	5.307	16.788	16.788	17.089
44	0.011	0.011	0.011	5.214	5.214	5.307	16.788	16.788	17.089
45	0.011	0.011	0.011	5.214	5.214	5.307	16.788	16.788	17.089
46	0.011	0.011	0.011	5.214	5.214	5.307	16.788	16.788	17.089
47	0.011	0.011	0.011	5.214	5.214	5.307	16.788	16.788	17.089
48	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
49	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
50	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
51	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
52	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
53	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
54	0.011	0.011	0.016	5.214	5.214	5.314	16.788	16.788	17.111
55	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
56	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
57	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
58	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
59	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
60	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
61	0.011	0.011	0.016	5.214	5.214	5.314	16.788	16.788	17.111
62	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
63	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
64	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
65	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
66	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
67	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
68	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
69	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
70	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
71	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111
72	0.011	0.011	0.012	5.214	5.214	5.314	16.788	16.788	17.111

Table appendix A 2 Frequency, capacitance and dielectric of dried longan at 14 % Wb moisture content (continued).

Sample	Frequency (MHz)			Capacitance(pF)			Dielectric constant		
	Bulk density (kg/m ³)			Bulk density (kg/m ³)			Bulk density (kg/m ³)		
	1300	1450	1600	1300	1450	1600	1300	1450	1600
73	0.011	0.011	0.012	5.234	5.234	5.314	16.853	16.853	17.111
74	0.011	0.011	0.012	5.234	5.234	5.314	16.853	16.853	17.111
75	0.011	0.011	0.012	5.234	5.234	5.314	16.853	16.853	17.111
76	0.011	0.011	0.016	5.234	5.234	5.314	16.853	16.853	17.111
77	0.011	0.011	0.012	5.247	5.247	5.314	16.896	16.896	17.111
78	0.011	0.011	0.012	5.247	5.247	5.314	16.896	16.896	17.111
79	0.011	0.011	0.012	5.281	5.281	5.314	17.003	17.003	17.111
80	0.011	0.011	0.012	5.281	5.281	5.314	17.003	17.003	17.111
81	0.033	0.035	0.035	12.626	13.220	13.360	40.653	42.568	43.019
82	0.033	0.035	0.035	12.626	13.220	13.360	40.653	42.568	43.019
83	0.033	0.035	0.035	12.657	13.220	13.360	40.755	42.568	43.019
84	0.033	0.035	0.035	12.657	13.220	13.360	40.755	42.568	43.019
85	0.033	0.035	0.035	12.660	13.220	13.360	40.766	42.568	43.019
86	0.033	0.035	0.035	12.660	13.220	13.360	40.766	42.568	43.019
87	0.033	0.035	0.035	12.660	13.220	13.360	40.766	42.568	43.019
88	0.033	0.035	0.035	12.660	13.255	13.360	40.766	42.681	43.019
89	0.033	0.035	0.035	12.660	13.255	13.360	40.766	42.681	43.019
90	0.033	0.035	0.035	12.660	13.255	13.360	40.766	42.681	43.019
91	0.033	0.035	0.035	12.660	13.255	13.360	40.766	42.681	43.019
92	0.033	0.034	0.035	12.660	13.010	13.360	40.766	41.891	43.019
93	0.033	0.034	0.035	12.660	13.010	13.360	40.766	41.891	43.019
94	0.033	0.034	0.035	12.660	13.010	13.360	40.766	41.891	43.019
95	0.033	0.034	0.035	12.660	13.010	13.360	40.766	41.891	43.019
96	0.033	0.034	0.035	12.660	13.010	13.360	40.766	41.891	43.019
97	0.033	0.034	0.035	12.660	13.010	13.360	40.766	41.891	43.019
98	0.033	0.034	0.035	12.660	13.010	13.360	40.766	41.891	43.019
99	0.033	0.034	0.035	12.660	13.168	13.360	40.766	42.400	43.019
100	0.033	0.035	0.035	12.660	13.189	13.360	40.766	42.466	43.019
101	0.032	0.034	0.034	12.289	13.012	13.208	39.561	41.900	42.534
102	0.030	0.033	0.033	11.893	12.800	12.695	38.297	41.215	40.878
Average	0.036	0.038	0.038	12.660	13.255	13.360	40.765	42.680	43.019
Minimum	0.000	0.000	0.000	0.2409	0.1243	0.1184	0.7756	0.4002	0.381
Maximum	0.011	0.011	0.012	5.234	5.234	5.314	16.853	16.853	17.111
Stdev	0.011	0.011	0.012	5.234	5.234	5.314	16.853	16.853	17.111

Table appendix A 3 Frequency, capacitance and dielectric of dried longan at 18 % Wb moisture content.

Sample	Frequency (MHz)			Capacitance(pF)			Dielectric constant		
	Bulk density (kg/m ³)			Bulk density (kg/m ³)			Bulk density (kg/m ³)		
	1300	1450	1600	1300	1450	1600	1300	1450	1600
1	0.0212	0.0219	0.0228	7.1882	7.4507	7.7288	23.146	23.991	24.886
2	0.0227	0.0229	0.0229	7.6962	7.7896	7.7877	24.781	25.082	25.076
3	0.0205	0.0226	0.0229	6.9684	7.6706	7.7785	22.438	24.699	25.046
4	0.0225	0.0229	0.0231	7.6450	7.7708	7.8406	24.616	25.021	25.246
5	0.0225	0.0226	0.0225	7.6450	7.6706	7.6428	24.616	24.699	24.609
6	0.0225	0.0222	0.0215	7.6450	7.5303	7.3041	24.616	24.247	23.519
7	0.0225	0.0220	0.0215	7.6450	7.4825	7.3041	24.616	24.093	23.519
8	0.0215	0.0212	0.0224	7.3064	7.1821	7.6007	23.526	23.126	24.474
9	0.0213	0.0212	0.0215	7.2427	7.1821	7.3041	23.321	23.126	23.519
10	0.0223	0.0222	0.0215	7.5813	7.5474	7.3041	24.411	24.302	23.519
11	0.0216	0.0216	0.0229	7.3476	7.3153	7.7772	23.659	23.555	25.042
12	0.0213	0.0217	0.0229	7.2427	7.3530	7.7785	23.321	23.676	25.046
13	0.0223	0.0217	0.0231	7.5813	7.3707	7.8406	24.411	23.733	25.246
14	0.0213	0.0217	0.0225	7.2427	7.3513	7.6428	23.321	23.671	24.609
15	0.0225	0.0217	0.0215	7.6216	7.3813	7.3041	24.541	23.767	23.519
16	0.0222	0.0228	0.0215	7.5205	7.7288	7.3041	24.215	24.886	23.519
17	0.0212	0.0218	0.0224	7.1821	7.4018	7.6007	23.126	23.833	24.474
18	0.0218	0.0217	0.0211	7.4018	7.3707	7.1472	23.833	23.733	23.013
19	0.0222	0.0230	0.0231	7.5205	7.7967	7.8246	24.215	25.105	25.195
20	0.0222	0.0220	0.0215	7.5205	7.4594	7.3041	24.215	24.019	23.519
21	0.0228	0.0230	0.0228	7.7407	7.8018	7.7511	24.924	25.121	24.958
22	0.0228	0.0218	0.0228	7.7288	7.4018	7.7511	24.886	23.833	24.958
23	0.0218	0.0227	0.0228	7.4018	7.7186	7.7511	23.833	24.853	24.958
24	0.0230	0.0220	0.0228	7.7967	7.4555	7.7511	25.105	24.006	24.958
25	0.0229	0.0229	0.0228	7.7746	7.7628	7.7511	25.034	24.996	24.958
26	0.0229	0.0220	0.0223	7.7593	7.4594	7.5628	24.984	24.019	24.352
27	0.0220	0.0230	0.0223	7.4683	7.8018	7.5628	24.047	25.121	24.352
28	0.0231	0.0218	0.0223	7.8373	7.4018	7.5628	25.235	23.833	24.352
29	0.0230	0.0227	0.0229	7.8063	7.7186	7.7789	25.136	24.853	25.047
30	0.0220	0.0220	0.0229	7.4683	7.4555	7.7653	24.047	24.006	25.004
31	0.0230	0.0229	0.0229	7.7999	7.7628	7.7663	25.115	24.996	25.007
32	0.0229	0.0213	0.0219	7.7693	7.2243	7.4297	25.016	23.262	23.923
33	0.0230	0.0215	0.0220	7.8033	7.2944	7.4578	25.126	23.487	24.014
34	0.0219	0.0215	0.0229	7.4305	7.2944	7.7763	23.925	23.487	25.039
35	0.0229	0.0215	0.0207	7.7690	7.2944	7.0221	25.016	23.487	22.611
36	0.0229	0.0215	0.0207	7.7724	7.2944	7.0221	25.026	23.487	22.611

Table appendix A 3 Frequency, capacitance and dielectric of dried longan at 18 % Wb moisture content (continued).

Sample	Frequency (MHz)			Capacitance(pF)			Dielectric constant		
	Bulk density (kg/m ³)			Bulk density (kg/m ³)			Bulk density (kg/m ³)		
	1300	1450	1600	1300	1450	1600	1300	1450	1600
37	0.0219	0.0215	0.0207	7.4437	7.2944	7.0221	23.968	23.487	22.611
38	0.0229	0.0215	0.0207	7.7826	7.2944	7.0221	25.059	23.487	22.611
39	0.0219	0.0227	0.0207	7.4437	7.6990	7.0221	23.968	24.790	22.611
40	0.0228	0.0227	0.0207	7.7487	7.6990	7.0221	24.950	24.790	22.611
41	0.0219	0.0215	0.0207	7.4437	7.2944	7.0221	23.968	23.487	22.611
42	0.0214	0.0215	0.0215	7.2744	7.2944	7.2944	23.423	23.487	23.487
43	0.0224	0.0215	0.0215	7.6004	7.2944	7.2944	24.473	23.487	23.487
44	0.0207	0.0215	0.0215	7.0221	7.2944	7.2944	22.611	23.487	23.487
45	0.0207	0.0215	0.0215	7.0221	7.2944	7.2944	22.611	23.487	23.487
46	0.0207	0.0215	0.0215	7.0221	7.2944	7.2944	22.611	23.487	23.487
47	0.0207	0.0215	0.0219	7.0221	7.2944	7.4193	22.611	23.487	23.890
48	0.0207	0.0215	0.0220	7.0221	7.2944	7.4544	22.611	23.487	24.003
49	0.0207	0.0215	0.0220	7.0221	7.2944	7.4544	22.611	23.487	24.003
50	0.0207	0.0215	0.0235	7.0221	7.2944	7.9722	22.611	23.487	25.670
51	0.0210	0.0215	0.0235	7.1168	7.2944	7.9722	22.916	23.487	25.670
52	0.0210	0.0220	0.0235	7.1168	7.4544	7.9722	22.916	24.003	25.670
53	0.0216	0.0220	0.0235	7.3157	7.4544	7.9722	23.556	24.003	25.670
54	0.0216	0.0220	0.0235	7.3157	7.4544	7.9722	23.556	24.003	25.670
55	0.0217	0.0220	0.0235	7.3656	7.4544	7.9722	23.717	24.003	25.670
56	0.0219	0.0220	0.0235	7.4193	7.4544	7.9722	23.890	24.003	25.670
57	0.0219	0.0220	0.0235	7.4193	7.4544	7.9722	23.890	24.003	25.670
58	0.0219	0.0220	0.0235	7.4193	7.4544	7.9722	23.890	24.003	25.670
59	0.0219	0.0220	0.0235	7.4193	7.4544	7.9722	23.890	24.003	25.670
60	0.0219	0.0220	0.0235	7.4193	7.4544	7.9722	23.890	24.003	25.670
61	0.0219	0.0220	0.0235	7.4193	7.4544	7.9722	23.890	24.003	25.670
62	0.0219	0.0235	0.0235	7.4193	7.9722	7.9722	23.890	25.670	25.670
63	0.0219	0.0235	0.0235	7.4193	7.9722	7.9826	23.890	25.670	25.703
64	0.0219	0.0235	0.0235	7.4193	7.9722	7.9826	23.890	25.670	25.703
65	0.0219	0.0235	0.0235	7.4440	7.9722	7.9826	23.969	25.670	25.703
66	0.0219	0.0235	0.0235	7.4440	7.9722	7.9826	23.969	25.670	25.703
67	0.0220	0.0235	0.0235	7.4544	7.9826	7.9826	24.003	25.703	25.703
68	0.0229	0.0235	0.0235	7.7604	7.9826	7.9826	24.988	25.703	25.703
69	0.0229	0.0235	0.0235	7.7604	7.9826	7.9826	24.988	25.703	25.703
70	0.0229	0.0235	0.0222	7.7604	7.9826	7.5190	24.988	25.703	24.211
71	0.0229	0.0235	0.0222	7.7604	7.9826	7.5190	24.988	25.703	24.211
72	0.0225	0.0235	0.0229	7.6329	7.9826	7.7877	24.577	25.703	25.076

Table appendix A 3 Frequency, capacitance and dielectric of dried longan at 18 % Wb moisture content (continued).

Sample	Frequency (MHz)			Capacitance(pF)			Dielectric constant		
	Bulk density (kg/m ³)			Bulk density (kg/m ³)			Bulk density (kg/m ³)		
	1300	1450	1600	1300	1450	1600	1300	1450	1600
73	0.0225	0.0235	0.0229	7.6329	7.9826	7.7785	24.577	25.703	25.046
74	0.0225	0.0235	0.0231	7.6329	7.9826	7.8406	24.577	25.703	25.246
75	0.0225	0.0235	0.0225	7.6432	7.9826	7.6428	24.611	25.703	24.609
76	0.0225	0.0235	0.0215	7.6432	7.9826	7.3041	24.611	25.703	23.519
77	0.0225	0.0235	0.0215	7.6432	7.9826	7.3041	24.611	25.703	23.519
78	0.0224	0.0215	0.0224	7.5873	7.3053	7.6007	24.430	23.522	24.474
79	0.0229	0.0217	0.0215	7.7813	7.3737	7.3041	25.055	23.743	23.519
80	0.0235	0.0221	0.0215	7.9826	7.5051	7.3041	25.703	24.166	23.519
81	0.0225	0.0213	0.0229	7.6432	7.2397	7.7772	24.611	23.311	25.042
82	0.0211	0.0235	0.0215	7.1505	7.9826	7.3041	23.024	25.703	23.519
83	0.0229	0.0235	0.0215	7.7814	7.9826	7.3041	25.056	25.703	23.519
84	0.0214	0.0235	0.0215	7.2759	7.9826	7.3041	23.428	25.703	23.519
85	0.0219	0.0235	0.0215	7.4452	7.9826	7.3041	23.973	25.703	23.519
86	0.0224	0.0235	0.0230	7.5915	7.9826	7.8014	24.444	25.703	25.120
87	0.0219	0.0225	0.0230	7.4249	7.6440	7.7912	23.908	24.613	25.087
88	0.0220	0.0227	0.0219	7.4554	7.7126	7.4488	24.006	24.834	23.985
89	0.0220	0.0215	0.0230	7.4554	7.3053	7.7912	24.006	23.522	25.087
90	0.0219	0.0215	0.0219	7.4251	7.3053	7.4488	23.908	23.522	23.985
91	0.0218	0.0230	0.0229	7.4075	7.7950	7.7878	23.852	25.099	25.076
92	0.0220	0.0229	0.0215	7.4641	7.7813	7.3134	24.034	25.055	23.548
93	0.0215	0.0235	0.0230	7.3059	7.9826	7.8014	23.524	25.703	25.120
94	0.0219	0.0215	0.0230	7.4481	7.3053	7.7912	23.982	23.522	25.087
95	0.0220	0.0217	0.0219	7.4826	7.3737	7.4488	24.093	23.743	23.985
96	0.0218	0.0222	0.0222	7.4149	7.5375	7.5190	23.875	24.270	24.211
97	0.0220	0.0227	0.0222	7.4826	7.7126	7.5190	24.093	24.834	24.211
98	0.0220	0.0225	0.0229	7.4618	7.6371	7.7877	24.026	24.591	25.076
99	0.0220	0.0221	0.0218	7.4618	7.5051	7.4057	24.026	24.166	23.846
100	0.0220	0.0222	0.0219	7.4618	7.5226	7.4304	24.026	24.222	23.925
Average	0.0221	0.0223	0.0223	7.5007	7.5785	7.5836	24.151	24.402	24.418
Minimum	0.0205	0.0211	0.0207	6.9684	7.1667	7.0221	22.437	23.072	22.610
Maximum	0.0235	0.0235	0.0235	7.9826	7.9826	7.9826	25.703	25.703	25.703
Stdev	0.0007	0.0008	0.0009	0.2319	0.2620	0.2923	0.7467	0.843	0.941

Table appendix A 4 Frequency, capacitance and dielectric of dried longan at 22 % Wb moisture content.

Sample	Frequency (MHz)			Capacitance(pF)			Dielectric constant		
	Bulk density (kg/m ³)			Bulk density (kg/m ³)			Bulk density (kg/m ³)		
	1300	1450	1600	1300	1450	1600	1300	1450	1600
1	0.031	0.034	0.033	11.894	13.010	12.695	38.298	41.891	40.878
2	0.031	0.034	0.033	11.929	13.010	12.765	38.409	41.891	41.103
3	0.031	0.034	0.034	11.963	13.010	12.835	38.521	41.891	41.328
4	0.031	0.034	0.034	11.963	13.010	13.010	38.521	41.891	41.891
5	0.031	0.034	0.034	11.963	13.010	13.045	38.521	41.891	42.004
6	0.031	0.034	0.034	11.963	13.010	13.045	38.521	41.891	42.004
7	0.031	0.034	0.034	11.963	13.010	13.045	38.521	41.891	42.004
8	0.031	0.034	0.034	11.963	13.168	13.049	38.521	42.400	42.015
9	0.031	0.035	0.034	11.963	13.189	13.080	38.521	42.466	42.117
10	0.031	0.033	0.034	11.963	12.800	13.080	38.521	41.216	42.117
11	0.031	0.033	0.034	11.963	12.800	13.080	38.521	41.216	42.117
12	0.031	0.033	0.034	11.963	12.800	13.080	38.521	41.216	42.117
13	0.031	0.033	0.034	11.963	12.800	13.080	38.521	41.216	42.117
14	0.031	0.033	0.034	11.963	12.800	13.157	38.521	41.216	42.365
15	0.031	0.033	0.034	11.963	12.800	13.168	38.521	41.216	42.401
16	0.031	0.034	0.034	11.963	12.835	13.171	38.521	41.328	42.410
17	0.031	0.034	0.035	11.963	12.835	13.185	38.521	41.328	42.455
18	0.031	0.034	0.035	11.963	12.835	13.185	38.521	41.328	42.455
19	0.031	0.034	0.035	11.963	12.835	13.185	38.521	41.328	42.455
20	0.031	0.034	0.035	11.963	12.835	13.185	38.521	41.328	42.455
21	0.031	0.034	0.035	11.998	12.835	13.185	38.633	41.328	42.455
22	0.031	0.034	0.035	11.998	12.835	13.185	38.633	41.328	42.455
23	0.031	0.034	0.035	12.033	12.835	13.185	38.745	41.328	42.455
24	0.031	0.034	0.035	12.033	12.835	13.185	38.745	41.328	42.455
25	0.031	0.034	0.035	12.033	12.835	13.185	38.745	41.328	42.455
26	0.031	0.034	0.035	12.033	12.839	13.185	38.745	41.340	42.455
27	0.031	0.034	0.035	12.033	12.860	13.185	38.745	41.407	42.455
28	0.032	0.034	0.035	12.207	12.860	13.185	39.306	41.407	42.455
29	0.032	0.034	0.035	12.207	12.860	13.185	39.306	41.407	42.455
30	0.032	0.034	0.035	12.207	12.860	13.185	39.306	41.407	42.455
31	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455
32	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455
33	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455
34	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455
35	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455
36	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455

Table appendix A 4 Frequency, capacitance and dielectric of dried longan at 22% Wb moisture content (continued).

Sample	Frequency (MHz)			Capacitance(pF)			Dielectric constant		
	Bulk density (kg/m ³)			Bulk density (kg/m ³)			Bulk density (kg/m ³)		
	1300	1450	1600	1300	1450	1600	1300	1450	1600
37	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455
38	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455
39	0.026	0.0280	0.0285	10.165	10.9233	11.0962	32.729	35.1722	35.7290
40	0.026	0.0280	0.0285	10.165	10.9233	11.0962	32.729	35.1722	35.7290
41	0.026	0.0280	0.0285	10.195	10.9233	11.0962	32.828	35.1722	35.7290
42	0.026	0.0280	0.0285	10.195	10.9233	11.0962	32.828	35.1722	35.7290
43	0.026	0.0280	0.0285	10.195	10.9233	11.0962	32.828	35.1722	35.7290
44	0.026	0.0280	0.0285	10.199	10.9233	11.0962	32.840	35.1722	35.7290
45	0.026	0.0280	0.0285	10.199	10.9233	11.0962	32.840	35.1722	35.7290
46	0.026	0.0280	0.0285	10.199	10.9233	11.0962	32.840	35.1722	35.7290
47	0.026	0.0280	0.0285	10.233	10.9233	11.0962	32.951	35.1722	35.7290
48	0.026	0.0280	0.0285	10.233	10.9233	11.0962	32.951	35.1722	35.7290
49	0.026	0.0280	0.0285	10.233	10.9233	11.0962	32.951	35.1722	35.7290
50	0.026	0.0280	0.0285	10.233	10.9233	11.0962	32.951	35.1722	35.7290
51	0.026	0.0280	0.0285	10.233	10.9233	11.0962	32.951	35.1722	35.7290
52	0.026	0.0280	0.0285	10.233	10.9233	11.0962	32.951	35.1722	35.7290
53	0.026	0.0280	0.0285	10.233	10.9233	11.0962	32.951	35.1722	35.7290
54	0.026	0.0280	0.0285	10.233	10.9233	11.0962	32.951	35.1722	35.7290
55	0.026	0.0280	0.0285	10.233	10.9233	11.0962	32.951	35.1722	35.7290
56	0.026	0.0280	0.0286	10.233	10.9233	11.1135	32.951	35.1722	35.7847
57	0.026	0.0280	0.0286	10.233	10.9233	11.1142	32.951	35.1722	35.7869
58	0.026	0.0280	0.0286	10.233	10.9233	11.1308	32.951	35.1722	35.8404
59	0.026	0.0280	0.0286	10.233	10.9233	11.1308	32.951	35.1722	35.8404
60	0.026	0.0280	0.0286	10.233	10.9233	11.1308	32.951	35.1722	35.8404
61	0.026	0.0280	0.0286	10.233	10.9233	11.1308	32.951	35.1722	35.8404
62	0.026	0.0280	0.0286	10.233	10.9233	11.1308	32.951	35.1722	35.8404
63	0.026	0.0280	0.0286	10.233	10.9233	11.1308	32.951	35.1722	35.8404
64	0.026	0.0280	0.0286	10.233	10.9233	11.1308	32.951	35.1722	35.8404
65	0.026	0.0280	0.0286	10.233	10.9233	11.1308	32.951	35.1722	35.8404
66	0.026	0.0280	0.0286	10.233	10.9233	11.1308	32.951	35.1722	35.8404
67	0.026	0.0280	0.0286	10.233	10.9233	11.1308	32.951	35.1722	35.8404
68	0.026	0.0280	0.0286	10.233	10.9233	11.1308	32.951	35.1722	35.8404
69	0.026	0.0280	0.0286	10.233	10.9233	11.1308	32.951	35.1722	35.8404
70	0.026	0.0280	0.0287	10.233	10.9233	11.1655	32.951	35.1722	35.9519
71	0.026	0.0280	0.0287	10.233	10.9233	11.1655	32.951	35.1722	35.9519
72	0.026	0.0280	0.0287	10.233	10.9233	11.1655	32.951	35.1722	35.9519

Table appendix A 4 Frequency, capacitance and dielectric of dried longan at 22% Wb moisture content (continued).

Sample	Frequency (MHz)			Capacitance(pF)			Dielectric constant		
	Bulk density (kg/m ³)			Bulk density (kg/m ³)			Bulk density (kg/m ³)		
	1300	1450	1600	1300	1450	1600	1300	1450	1600
73	0.026	0.0280	0.0287	10.233	10.9233	11.1655	32.951	35.1722	35.9519
74	0.026	0.0280	0.0288	10.233	10.9233	11.2001	32.951	35.1722	36.0633
75	0.026	0.0280	0.0288	10.337	10.9233	11.2001	33.283	35.1722	36.0633
76	0.026	0.0285	0.0288	10.337	11.0793	11.2001	33.283	35.6744	36.0633
77	0.030	0.0326	0.0329	10.337	11.0997	11.2001	33.283	35.7401	36.0633
78	0.026	0.0285	0.0288	10.337	11.0997	11.2001	33.283	35.7401	36.0633
79	0.027	0.0286	0.0288	10.544	11.1308	11.2001	33.949	35.8404	36.0633
80	0.027	0.0286	0.0290	10.544	11.1308	11.2693	33.949	35.8404	36.2863
81	0.027	0.0286	0.0290	10.544	11.1308	11.2693	33.949	35.8404	36.2863
82	0.027	0.0286	0.0290	10.544	11.1308	11.2693	33.949	35.8404	36.2863
83	0.027	0.0286	0.0290	10.575	11.1308	11.2693	34.049	35.8404	36.2863
84	0.027	0.0286	0.0290	10.575	11.1308	11.2693	34.049	35.8404	36.2863
85	0.027	0.0286	0.0290	10.578	11.1308	11.2693	34.060	35.8404	36.2863
86	0.027	0.0286	0.0290	10.578	11.1308	11.2693	34.060	35.8404	36.2863
87	0.027	0.0286	0.0290	10.578	11.1308	11.2693	34.060	35.8404	36.2863
88	0.027	0.0287	0.0290	10.578	11.1655	11.2693	34.060	35.9519	36.2863
89	0.027	0.0287	0.0290	10.578	11.1655	11.2693	34.060	35.9519	36.2863
90	0.027	0.0287	0.0290	10.578	11.1655	11.2693	34.060	35.9519	36.2863
91	0.027	0.0287	0.0290	10.578	11.1655	11.2693	34.060	35.9519	36.2863
92	0.027	0.0280	0.0290	10.578	10.9233	11.2693	34.060	35.1722	36.2863
93	0.027	0.0280	0.0290	10.578	10.9233	11.2693	34.060	35.1722	36.2863
94	0.027	0.0280	0.0290	10.578	10.9233	11.2693	34.060	35.1722	36.2863
95	0.027	0.0280	0.0290	10.578	10.9233	11.2693	34.060	35.1722	36.2863
96	0.027	0.0280	0.0290	10.578	10.9233	11.2693	34.060	35.1722	36.2863
97	0.027	0.0280	0.0290	10.578	10.9233	11.2693	34.060	35.1722	36.2863
98	0.027	0.0280	0.0290	10.578	10.9233	11.2693	34.060	35.1722	36.2863
99	0.027	0.0285	0.0290	10.578	11.0793	11.2693	34.060	35.6744	36.2863
100	0.027	0.0285	0.0290	10.578	11.0997	11.2693	34.060	35.7401	36.2863
Average	0.026	0.0280	0.0286	10.21	10.926	11.1206	32.875	35.1811	35.8076
Minimum	0.024	0.0274	0.0271	9.820	10.716	10.6125	31.622	34.5048	34.1714
Maximum	0.030	0.0326	0.0329	10.578	11.165	11.2693	34.060	35.9519	36.2863
Stdev	0.000	0.0006	0.0005	0.237	0.1228	0.1170	0.7662	0.3953	0.3766

Table appendix A 5 Frequency, capacitance and dielectric of dried longan at 25 % Wb moisture content.

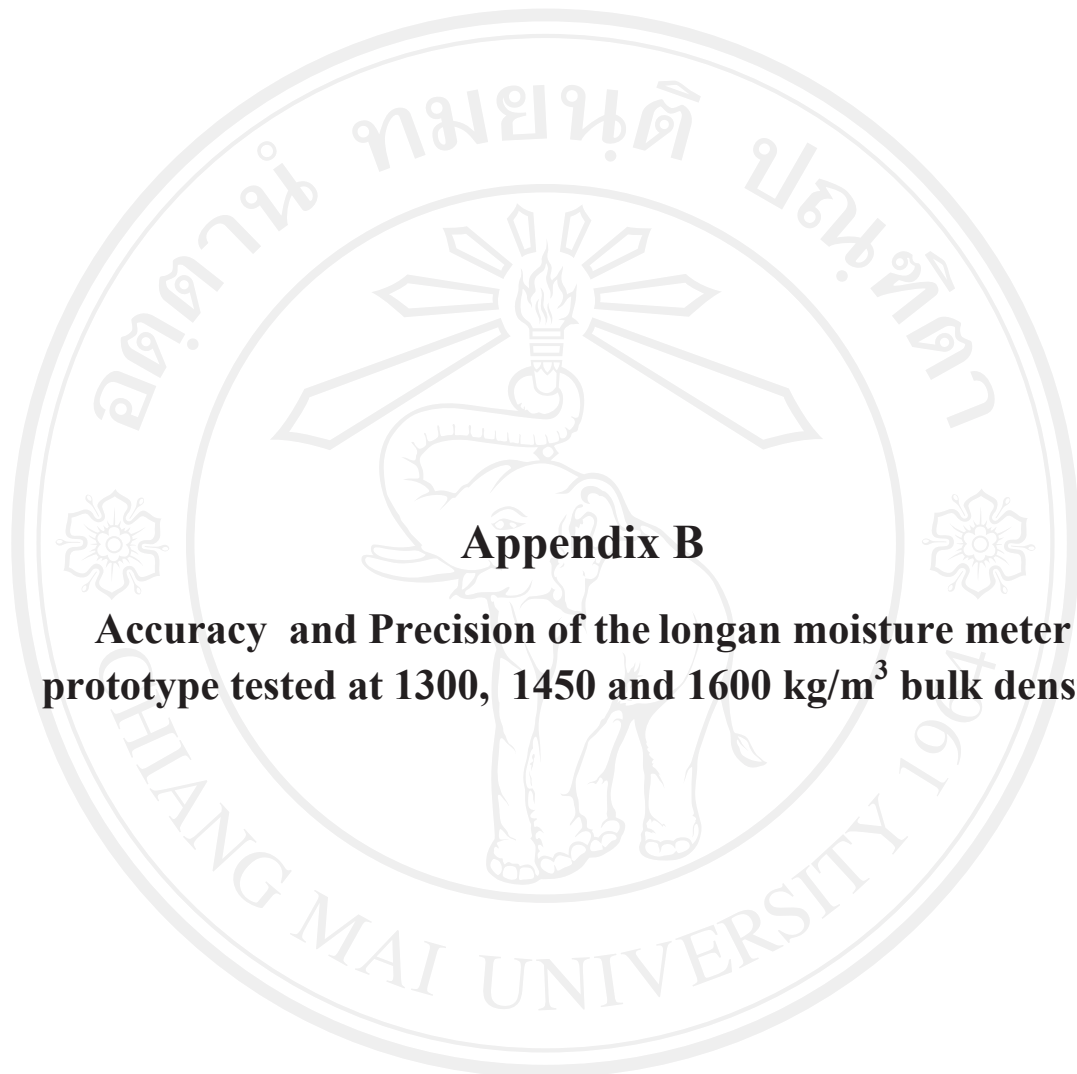
Sample	Frequency (MHz)			Capacitance(pF)			Dielectric constant		
	Bulk density (kg/m ³)			Bulk density (kg/m ³)			Bulk density (kg/m ³)		
	1300	1450	1600	1300	1450	1600	1300	1450	1600
1	0.031	0.034	0.033	11.894	13.010	12.695	38.298	41.891	40.878
2	0.031	0.034	0.033	11.929	13.010	12.765	38.409	41.891	41.103
3	0.031	0.034	0.034	11.963	13.010	12.835	38.521	41.891	41.328
4	0.031	0.034	0.034	11.963	13.010	13.010	38.521	41.891	41.891
5	0.031	0.034	0.034	11.963	13.010	13.045	38.521	41.891	42.004
6	0.031	0.034	0.034	11.963	13.010	13.045	38.521	41.891	42.004
7	0.031	0.034	0.034	11.963	13.010	13.045	38.521	41.891	42.004
8	0.031	0.034	0.034	11.963	13.168	13.049	38.521	42.400	42.015
9	0.031	0.035	0.034	11.963	13.189	13.080	38.521	42.466	42.117
10	0.031	0.033	0.034	11.963	12.800	13.080	38.521	41.216	42.117
11	0.031	0.033	0.034	11.963	12.800	13.080	38.521	41.216	42.117
12	0.031	0.033	0.034	11.963	12.800	13.080	38.521	41.216	42.117
13	0.031	0.033	0.034	11.963	12.800	13.080	38.521	41.216	42.117
14	0.031	0.033	0.034	11.963	12.800	13.157	38.521	41.216	42.365
15	0.031	0.033	0.034	11.963	12.800	13.168	38.521	41.216	42.401
16	0.031	0.034	0.034	11.963	12.835	13.171	38.521	41.328	42.410
17	0.031	0.034	0.035	11.963	12.835	13.185	38.521	41.328	42.455
18	0.031	0.034	0.035	11.963	12.835	13.185	38.521	41.328	42.455
19	0.031	0.034	0.035	11.963	12.835	13.185	38.521	41.328	42.455
20	0.031	0.034	0.035	11.963	12.835	13.185	38.521	41.328	42.455
21	0.031	0.034	0.035	11.998	12.835	13.185	38.633	41.328	42.455
22	0.031	0.034	0.035	11.998	12.835	13.185	38.633	41.328	42.455
23	0.031	0.034	0.035	12.033	12.835	13.185	38.745	41.328	42.455
24	0.031	0.034	0.035	12.033	12.835	13.185	38.745	41.328	42.455
25	0.031	0.034	0.035	12.033	12.835	13.185	38.745	41.328	42.455
26	0.031	0.034	0.035	12.033	12.839	13.185	38.745	41.340	42.455
27	0.031	0.034	0.035	12.033	12.860	13.185	38.745	41.407	42.455
28	0.032	0.034	0.035	12.207	12.860	13.185	39.306	41.407	42.455
29	0.032	0.034	0.035	12.207	12.860	13.185	39.306	41.407	42.455
30	0.032	0.034	0.035	12.207	12.860	13.185	39.306	41.407	42.455
31	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455
32	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455
33	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455
34	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455
35	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455
36	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455

Table appendix A 5 Frequency, capacitance and dielectric of dried longan at 25% Wb moisture content (continued).

Sample	Frequency (MHz)			Capacitance(pF)			Dielectric constant		
	Bulk density (kg/m ³)			Bulk density (kg/m ³)			Bulk density (kg/m ³)		
	1300	1450	1600	1300	1450	1600	1300	1450	1600
37	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455
38	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455
39	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455
40	0.032	0.034	0.035	12.242	13.010	13.185	39.418	41.891	42.455
41	0.032	0.034	0.035	12.273	13.010	13.185	39.518	41.891	42.455
42	0.032	0.034	0.035	12.273	13.010	13.185	39.518	41.891	42.455
43	0.032	0.034	0.035	12.273	13.010	13.185	39.518	41.891	42.455
44	0.032	0.034	0.035	12.277	13.010	13.185	39.530	41.891	42.455
45	0.032	0.034	0.035	12.277	13.010	13.185	39.530	41.891	42.455
46	0.032	0.034	0.035	12.277	13.010	13.185	39.530	41.891	42.455
47	0.032	0.034	0.035	12.312	13.010	13.185	39.642	41.891	42.455
48	0.032	0.034	0.035	12.312	13.010	13.185	39.642	41.891	42.455
49	0.032	0.034	0.035	12.312	13.010	13.185	39.642	41.891	42.455
50	0.032	0.034	0.035	12.312	13.010	13.185	39.642	41.891	42.455
51	0.032	0.034	0.035	12.312	13.010	13.185	39.642	41.891	42.455
52	0.032	0.034	0.035	12.312	13.010	13.185	39.642	41.891	42.455
53	0.032	0.034	0.035	12.312	13.010	13.185	39.642	41.891	42.455
54	0.032	0.034	0.035	12.312	13.010	13.185	39.642	41.891	42.455
55	0.032	0.034	0.035	12.312	13.010	13.185	39.642	41.891	42.455
56	0.032	0.034	0.035	12.312	13.010	13.203	39.642	41.891	42.511
57	0.032	0.034	0.035	12.312	13.010	13.203	39.642	41.891	42.514
58	0.032	0.034	0.035	12.312	13.010	13.220	39.642	41.891	42.568
59	0.032	0.034	0.035	12.312	13.010	13.220	39.642	41.891	42.568
60	0.032	0.034	0.035	12.312	13.010	13.220	39.642	41.891	42.568
61	0.032	0.034	0.035	12.312	13.010	13.220	39.642	41.891	42.568
62	0.032	0.034	0.035	12.312	13.010	13.220	39.642	41.891	42.568
63	0.032	0.034	0.035	12.312	13.010	13.220	39.642	41.891	42.568
64	0.032	0.034	0.035	12.312	13.010	13.220	39.642	41.891	42.568
65	0.032	0.034	0.035	12.312	13.010	13.220	39.642	41.891	42.568
66	0.032	0.034	0.035	12.312	13.010	13.220	39.642	41.891	42.568
67	0.032	0.034	0.035	12.312	13.010	13.220	39.642	41.891	42.568
68	0.032	0.034	0.035	12.312	13.010	13.220	39.642	41.891	42.568
69	0.032	0.034	0.035	12.312	13.010	13.220	39.642	41.891	42.568
70	0.032	0.034	0.035	12.312	13.010	13.255	39.642	41.891	42.681
71	0.032	0.034	0.035	12.312	13.010	13.255	39.642	41.891	42.681
72	0.032	0.034	0.035	12.312	13.010	13.255	39.642	41.891	42.681

Table appendix A 5 Frequency, capacitance and dielectric of dried longan at 25% Wb moisture content (continued).

Sample	Frequency (MHz)			Capacitance(pF)			Dielectric constant		
	Bulk density (kg/m ³)			Bulk density (kg/m ³)			Bulk density (kg/m ³)		
	1300	1450	1600	1300	1450	1600	1300	1450	1600
73	0.032	0.034	0.035	12.312	13.010	13.255	39.642	41.891	42.681
74	0.032	0.034	0.035	12.312	13.010	13.290	39.642	41.891	42.793
75	0.032	0.034	0.035	12.416	13.010	13.290	39.979	41.891	42.793
76	0.032	0.034	0.035	12.416	13.168	13.290	39.979	42.400	42.793
77	0.036	0.039	0.039	12.416	13.189	13.290	39.979	42.466	42.793
78	0.032	0.035	0.035	12.416	13.189	13.290	39.979	42.466	42.793
79	0.033	0.035	0.035	12.626	13.220	13.290	40.653	42.568	42.793
80	0.033	0.035	0.035	12.626	13.220	13.360	40.653	42.568	43.019
81	0.033	0.035	0.035	12.626	13.220	13.360	40.653	42.568	43.019
82	0.033	0.035	0.035	12.626	13.220	13.360	40.653	42.568	43.019
83	0.033	0.035	0.035	12.657	13.220	13.360	40.755	42.568	43.019
84	0.033	0.035	0.035	12.657	13.220	13.360	40.755	42.568	43.019
85	0.033	0.035	0.035	12.660	13.220	13.360	40.766	42.568	43.019
86	0.033	0.035	0.035	12.660	13.220	13.360	40.766	42.568	43.019
87	0.033	0.035	0.035	12.660	13.220	13.360	40.766	42.568	43.019
88	0.033	0.035	0.035	12.660	13.255	13.360	40.766	42.681	43.019
89	0.033	0.035	0.035	12.660	13.255	13.360	40.766	42.681	43.019
90	0.033	0.035	0.035	12.660	13.255	13.360	40.766	42.681	43.019
91	0.033	0.035	0.035	12.660	13.255	13.360	40.766	42.681	43.019
92	0.033	0.034	0.035	12.660	13.010	13.360	40.766	41.891	43.019
93	0.033	0.034	0.035	12.660	13.010	13.360	40.766	41.891	43.019
94	0.033	0.034	0.035	12.660	13.010	13.360	40.766	41.891	43.019
95	0.033	0.034	0.035	12.660	13.010	13.360	40.766	41.891	43.019
96	0.033	0.034	0.035	12.660	13.010	13.360	40.766	41.891	43.019
97	0.033	0.034	0.035	12.660	13.010	13.360	40.766	41.891	43.019
98	0.033	0.034	0.035	12.660	13.010	13.360	40.766	41.891	43.019
99	0.033	0.034	0.035	12.660	13.168	13.360	40.766	42.400	43.019
100	0.033	0.035	0.035	12.660	13.189	13.360	40.766	42.466	43.019
Average	0.032	0.034	0.034	12.287	13.012	13.209	39.566	41.900	42.534
Minimum	0.030	0.033	0.033	11.893	12.800	12.695	38.297	41.215	40.878
Maximum	0.036	0.038	0.038	12.660	13.255	13.360	40.765	42.680	43.019
Stdev	0.000	0.000	0.000	0.240	0.1243	0.118	0.7756	0.4002	0.3813



Appendix B

**Accuracy and Precision of the longan moisture meter
prototype tested at 1300, 1450 and 1600 kg/m³ bulk density**

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Table appendix B 1 Accuracy of the longan moisture meter prototype tested at 1450 kg/m³ bulk density.

Iteration	Moisture content (% wb)				
	10%	14%	18%	22%	25%
1	10.62	14.23	18.94	22.76	25.73
2	10.64	13.80	18.86	22.50	25.66
3	10.64	13.95	18.89	22.60	25.88
4	10.56	14.10	18.89	22.70	25.28
5	10.62	13.75	18.89	22.70	25.56
6	10.59	13.83	18.91	22.58	25.66
7	10.64	13.86	18.86	22.04	25.28
8	10.45	13.86	18.89	22.60	25.76
9	9.62	14.08	18.89	22.76	25.28
10	9.64	14.10	18.84	22.70	25.16
11	9.62	13.62	18.81	22.80	25.26
12	10.62	13.70	18.86	22.01	25.25
13	10.62	14.63	18.86	22.81	25.86
14	10.67	14.63	18.84	22.81	25.56
15	10.67	14.63	18.84	22.80	25.58
16	10.67	14.63	18.91	22.51	25.51
17	10.64	14.63	18.91	22.78	25.08
18	10.64	14.63	18.84	21.81	25.18
19	10.64	14.63	18.81	21.76	25.58
20	10.64	14.63	18.84	21.76	25.49
21	10.64	14.63	18.91	22.71	25.59
22	9.77	14.65	18.81	22.28	25.80
23	10.64	14.65	18.84	21.76	25.28
24	10.64	14.63	18.81	21.76	25.76
25	10.64	14.63	18.18	21.71	25.25
26	9.94	14.63	18.84	22.68	25.28
27	9.54	14.63	18.60	22.26	25.28
28	10.62	13.80	18.76	22.13	25.28
29	10.64	13.83	18.68	21.73	25.21
30	10.64	13.69	18.76	21.73	25.21
31	10.64	14.68	18.81	21.73	25.21
32	10.64	13.80	18.76	21.73	25.49
33	10.48	13.78	18.76	21.73	25.21
34	10.64	14.05	18.76	22.70	25.21
35	10.62	14.79	18.73	22.70	25.21
36	10.64	15.01	18.73	22.30	25.27
37	10.62	15.71	18.55	22.73	25.27

Table appendix B 1 Accuracy of the longan moisture meter prototype tested at 1450 kg/m^3 bulk density (continued).

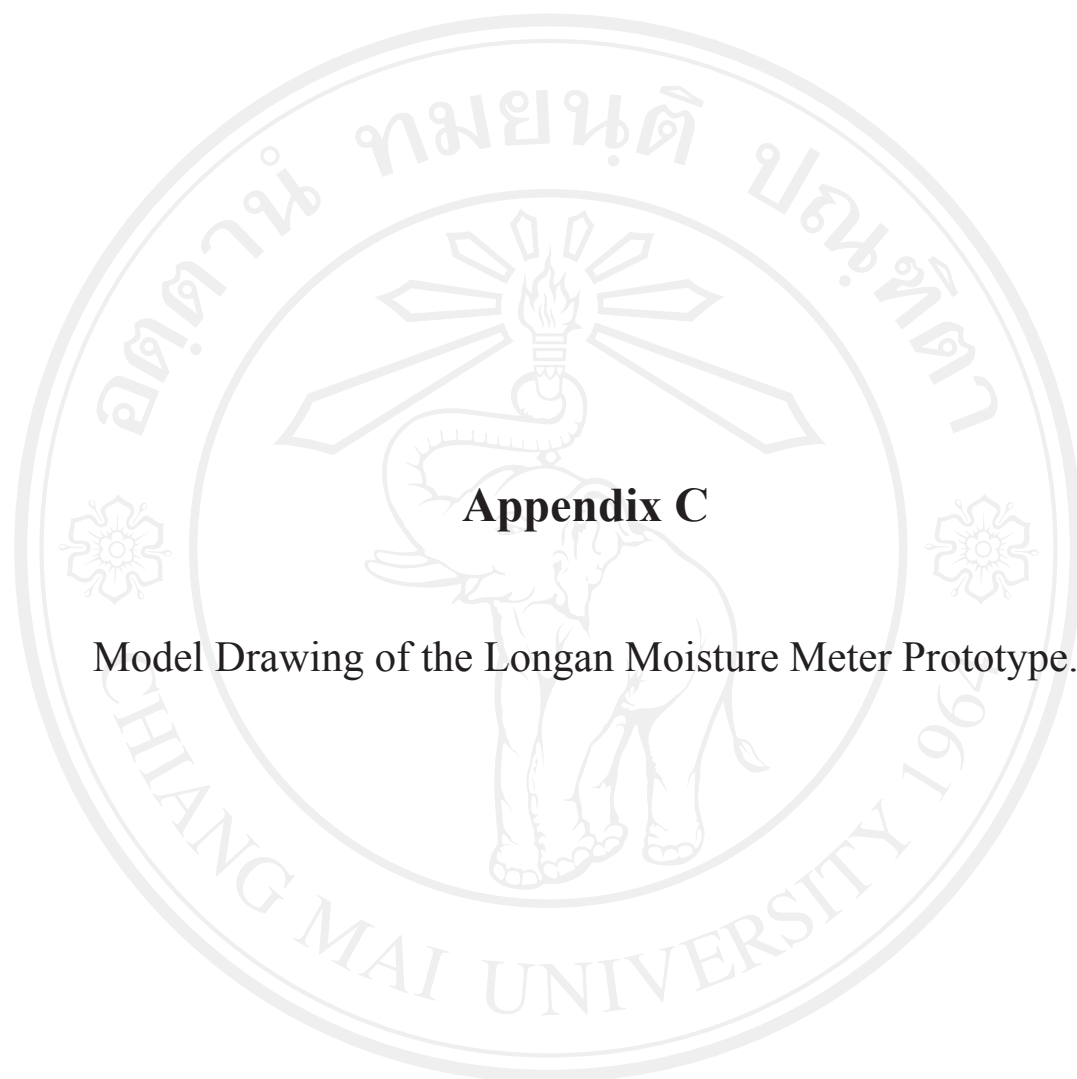
Iteration	Moisture content (% wb)				
	10%	14%	18%	22%	25%
38	10.64	14.81	18.81	22.71	25.70
39	10.67	14.71	18.78	21.71	26.20
40	10.67	15.30	18.73	21.71	25.30
41	10.67	14.53	18.76	22.71	25.25
42	10.56	15.53	18.78	22.65	25.27
43	10.56	15.18	18.76	22.71	25.50
44	10.48	15.01	18.78	22.65	25.60
45	10.62	14.81	18.78	22.65	25.30
46	9.25	14.91	18.76	22.65	25.70
47	10.59	15.36	18.76	22.65	26.45
48	10.51	15.16	18.76	22.65	25.52
49	9.06	15.14	18.76	22.65	25.22
50	9.59	14.84	18.76	22.65	26.52
average	10.43	14.50	18.79	22.38	25.48
stdev	0.43	0.54	0.12	0.42	0.32
min	9.06	13.62	18.18	21.71	25.08
max	10.67	15.71	18.94	22.81	26.52

Table appendix B 2 Precision of the longan moisture meter prototype tested at 1450 kg/m³ bulk density.

Iteration	Moisture content (% wb)				
	10%	14%	18%	22%	25%
1	10.52	14.13	18.06	22.36	25.43
2	10.34	13.87	18.14	22.15	24.96
3	10.34	13.98	18.18	22.36	24.98
4	10.26	14.31	18.19	22.28	25.18
5	10.42	13.85	18.19	22.38	24.86
6	10.69	13.81	18.29	22.48	24.96
7	10.54	13.96	18.31	22.40	25.18
8	10.55	13.85	18.05	21.89	24.96
9	9.76	14.28	18.16	21.96	25.18
10	9.64	14.31	18.08	21.88	25.16
11	9.72	13.72	18.13	21.89	25.16
12	10.52	13.87	18.13	22.88	25.05
13	10.42	14.33	18.17	22.89	24.96
14	10.37	14.53	18.16	21.88	24.86
15	10.11	14.33	18.16	21.87	24.74
16	10.37	14.23	18.06	21.81	24.81
17	10.44	14.43	18.06	22.98	24.99
18	10.54	14.13	18.16	21.81	25.32
19	10.24	14.43	18.26	21.96	24.84
20	10.54	14.33	18.26	21.86	24.89
21	10.44	14.43	18.16	22.01	24.79
22	9.67	14.35	18.26	22.08	24.98
23	10.34	14.25	18.06	21.96	25.31
24	10.34	14.43	18.26	21.86	24.76
25	10.44	14.43	18.16	21.91	25.35
26	9.84	14.23	18.08	21.88	25.41
27	9.74	14.33	18.18	22.06	25.41
28	10.32	13.82	18.18	22.03	25.41
29	10.14	13.85	18.08	21.83	25.31
30	10.14	13.99	18.11	21.93	24.92
31	10.34	14.35	18.11	21.83	24.92
32	10.24	13.85	18.08	21.83	25.42
33	10.38	13.75	18.11	21.93	24.92
34	10.44	14.25	18.08	21.93	25.42
35	10.52	14.39	18.11	21.93	25.41
36	10.54	14.01	18.14	21.98	25.27
37	10.52	13.71	18.04	21.98	25.37

Table appendix B 2 Precision of the longan moisture meter prototype tested at 1450 kg/m³ bulk density (continued).

Iteration	Moisture content (% wb)				
	10%	14%	18%	22%	25%
38	10.14	14.31	18.04	21.99	25.23
39	10.57	14.41	18.24	21.88	25.33
40	10.47	13.73	18.24	22.38	25.22
41	10.57	14.22	18.14	22.08	25.48
42	10.56	14.53	18.14	22.28	25.37
43	10.46	14.18	18.16	21.81	25.10
44	10.38	14.01	18.06	21.85	25.50
45	10.42	14.41	18.06	22.45	25.44
46	9.65	14.31	18.09	22.35	25.53
47	10.49	14.36	18.19	22.85	25.45
48	10.21	14.16	17.98	22.39	25.42
49	9.66	14.14	18.01	22.35	25.32
50	9.79	14.34	17.91	22.48	25.52
average	10.28	14.16	18.13	22.12	25.18
stdev	0.30	0.24	0.08	0.32	0.24
min	9.64	13.71	17.91	21.81	24.74
max	10.69	14.53	18.31	22.98	25.53



Appendix C

Model Drawing of the Longan Moisture Meter Prototype.

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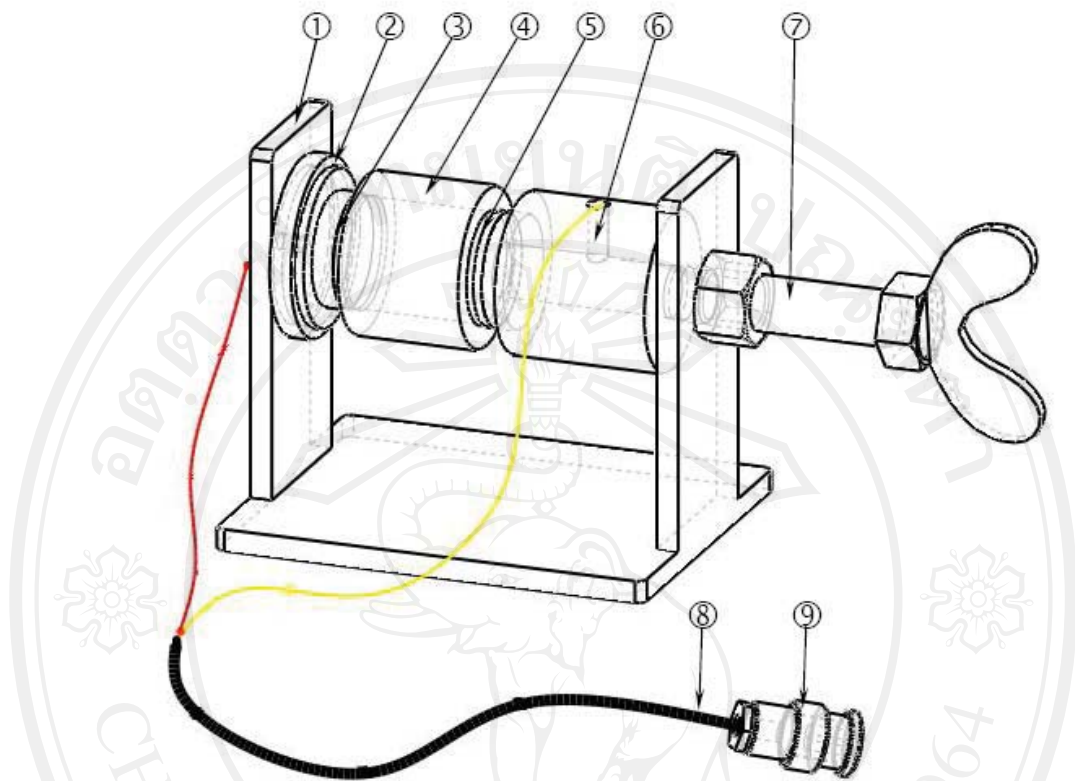


Figure appendix C 1 Model of plastic cylinder.

1. base structure
2. base for supporting aril dried force
3. standless steel plate
4. plastic cylinder
5. standless steel plate
6. plastic pressing
7. pressing screw
8. signal lead
9. connector

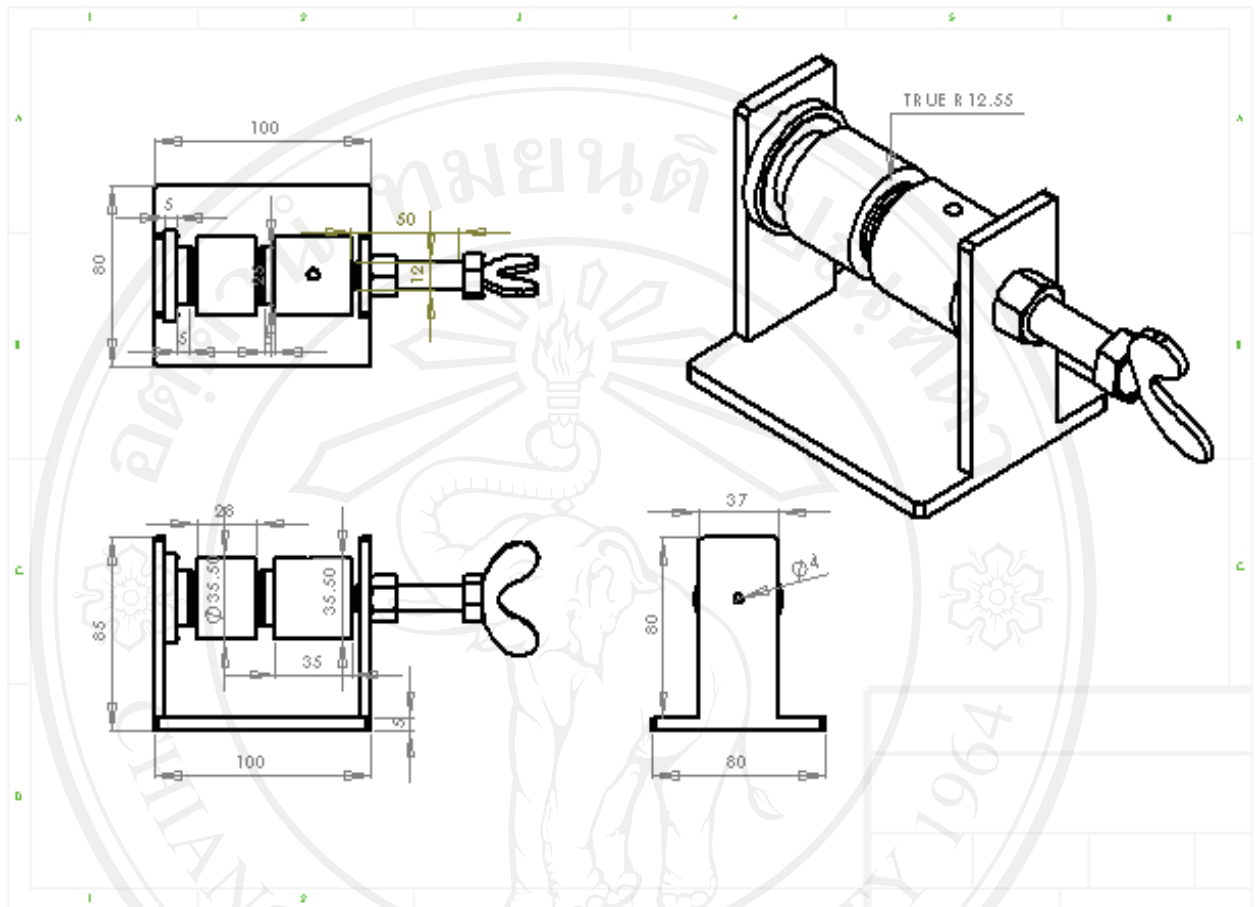
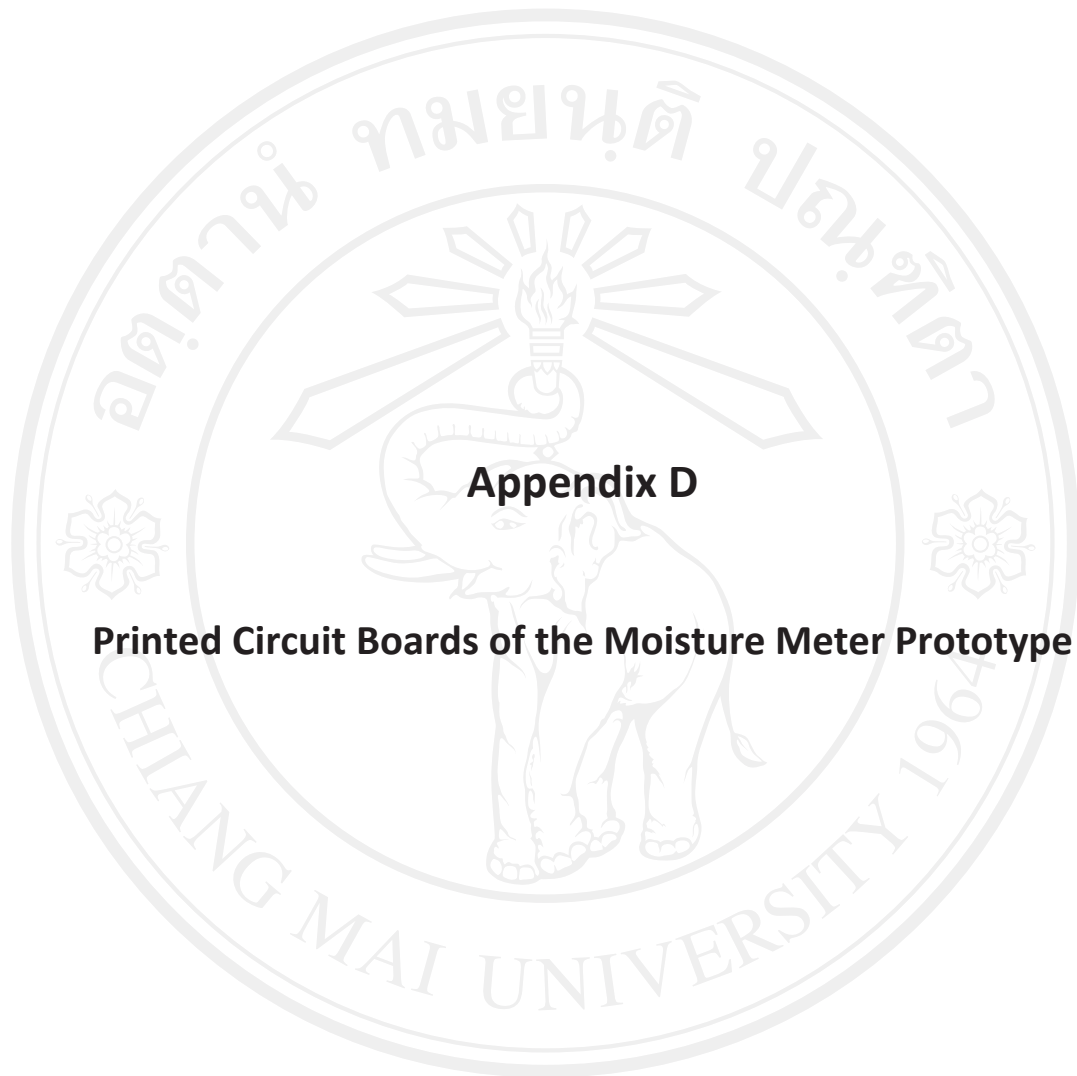


Figure appendix C 2 Sizing of the components.

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Appendix D

Printed Circuit Boards of the Moisture Meter Prototype

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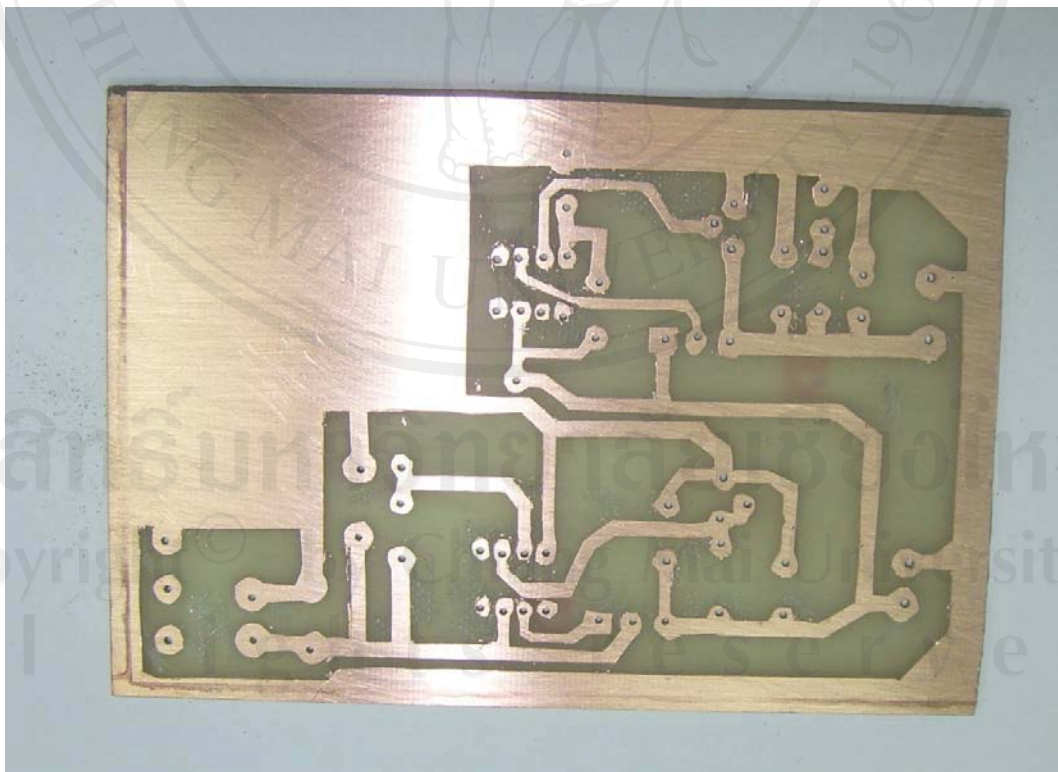
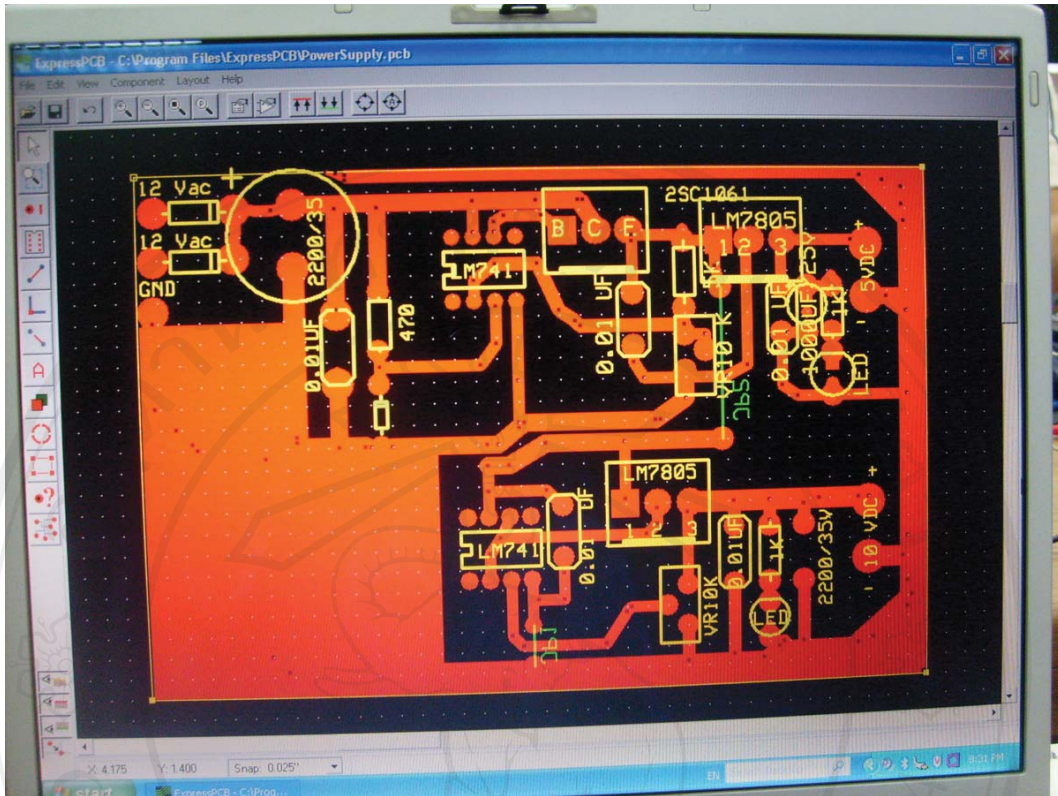
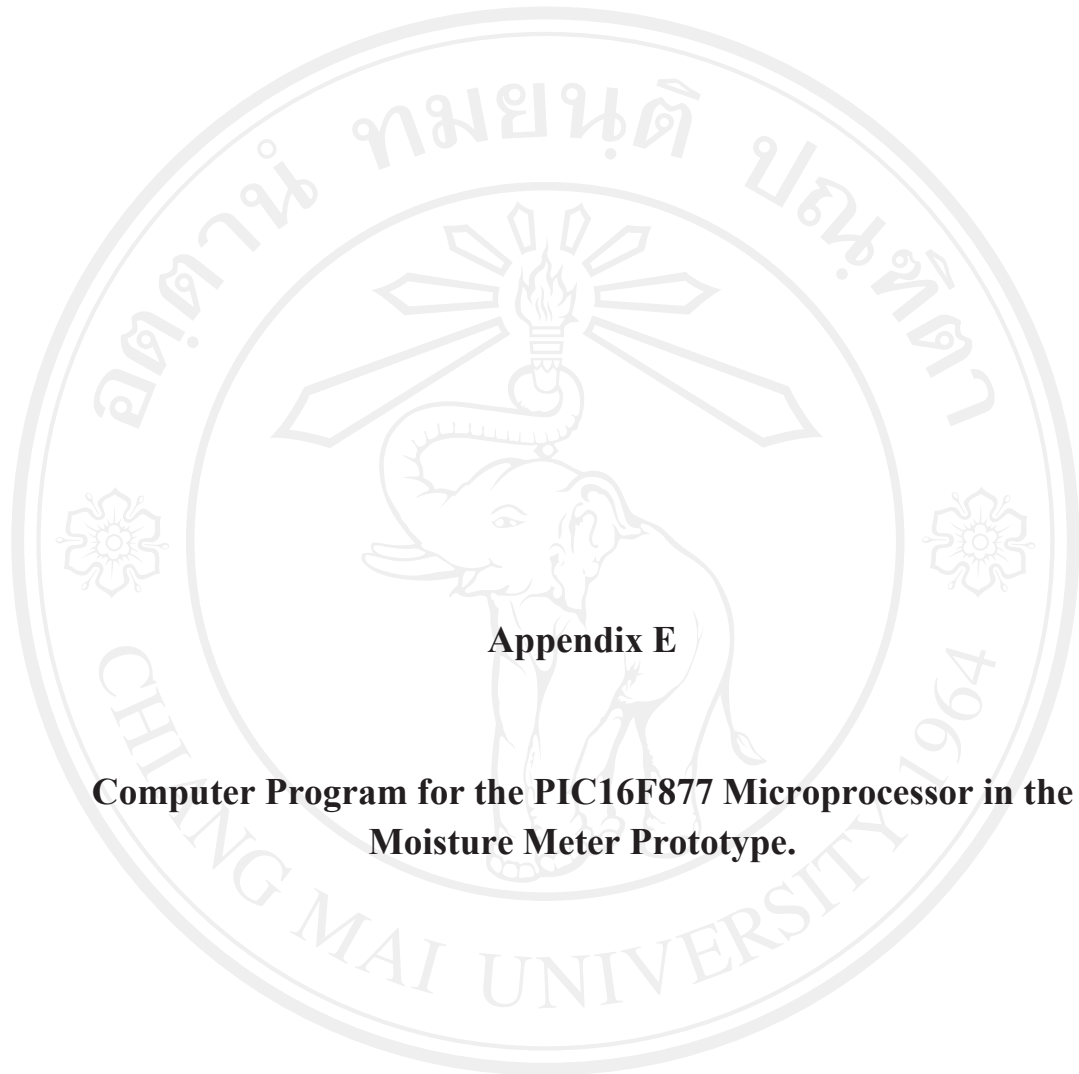


Figure appendix D 2 Printed circuit board 2.



Appendix E

**Computer Program for the PIC16F877 Microprocessor in the
Moisture Meter Prototype.**

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```

#include <18F458.h> // Standard Header file for the PIC16F877 device

#device ADC=10

#define CLOCK_SP 2000000 // Clock Speed(Hz)

// Device Specification

#fuses HS // Oscillator mode HS
#fuses NOLVP, NOWDT // No Low Voltage Program, No Watchdog timer
#fuses NOPROTECT // Code no protection

#use delay (clock=CLOCK_SP) // Use built-in function: delay_ms() & delay_us()
#use rs232(baud=9600,xmit=PIN_C6,rcv=PIN_C7,stream=SD,errors)
##use rs232(baud=9600,xmit=PIN_C6,rcv=PIN_C7,stream=SD,errors)

#define use_portb_lcd // define for use portb lcd

#include "lcd.c" // use module function

#define Vbe 0.0048875855327468230694037145650049

* FUNCTION: Main
* DESCRIPTION: This is the main entry point for the program.
* PARAMETERS: nothing
* RETURNED: nothing

void LCD_Command(int cm) {
lcd_send_byte(0,cm);}

void main(void) {

float a1,y,l1,l2,l3,l4,l5,j[5];

float c,c2,cs,cm,f1,f2,E,t1;

char c1,buff[5];

int k,count;
// CONTROL THE LCD

setup_adc_ports(ALL_ANALOG); //All analog
setup_adc(ADC_CLOCK_INTERNAL);

set_tris_c(0x00);

lcd_init();

delay_ms(1000);

LCD_Command(0x80); // line1

printf(lcd_putc,"*****");

LCD_Command(0xC0); //line 2

```

```

printf(lcd_putc," LONGAN MOISTURE ");

LCD_Command(0x94); // line3

printf(lcd_putc," METER ");

LCD_Command(0xd4); // line4

printf(lcd_putc,"*****");

delay_ms(1500);

LCD_Command(0x01);

output_low(pin_c0); //RESET 16F877

delay_ms(2000);

output_high(pin_c0);

delay_ms(30);

count=180; //Conut Down
while(count>0) {
delay_ms(1);

c1=fgetc(SD);

if(c1=='A'){

for (k=0;k<5;k++)

{ c1=fgetc(SD);

buff[k]=c1;

for (k=0;k<5;k++)

if(buff[k]=='0')j[k]=0;

if(buff[k]=='1')j[k]=1;

if(buff[k]=='2')j[k]=2;

if(buff[k]=='3')j[k]=3;

if(buff[k]=='4')j[k]=4;

if(buff[k]=='5')j[k]=5;

if(buff[k]=='6')j[k]=6;

if(buff[k]=='7')j[k]=7;

if(buff[k]=='8')j[k]=8;

if(buff[k]=='9')j[k]=9;

i1=j[0]*10000;

i2=j[1]*1000;

i3=j[2]*100;

```

```

l4=j[3]*10;
l5=j[4]*1;
a1=l1+l2+l3+l4+l5;
// COMPUTE FREQUENCY
a1=a1/1000; //31122k%1000
f2=(a1*32.1416/1000); //31.122*32.13112=0.9999 MHz
f1=0.83*(a1*32.1416);
t1=f1/1000;
c=(0.33/t1); //Computed Capacitance
c=c*1000;
c2=c;
// COMPUTE THE MOISTURE
//cs=328.52;
//cs=328.7383;
cs=406; //327.294;337,
cm=(cs-c);
// Moisture Content Computation
cm=abs(cm);
y=((-0.104*(cm*cm))+(3.396*(cm))-(1.927));
// COMPUTE THE DIELECTRIC CONSTANT
E=(cm*0.014)/(8.854*0.000491);
LCD_Command(0x80); // line1
printf lcd_putc," F=%0.4f MHz ",t1);
LCD_Command(0xC0); //line 2
printf lcd_putc," MC=%0.2f Percent ",y);
LCD_Command(0x94); // line3
printf lcd_putc," Dielectric=%0.2f ",E);
LCD_Command(0xd4); // line4
printf lcd_putc," c=%0.4f PF ",c2);
//cm=0.00;
//y=0.00;
count=count-1;
} }

```


PUBLICATIONS

International Presentation

Amaroek, S., N. Theera-Umpon, 2009. Relationship between Electrical Capacitance and Moisture Content of Dried Longan Aril. International Conference on Innovations in Agricultural, Food and Renewable Energy Productions for Mankind, Nakhon Ratchasima, Thailand. pp: 47-50.

Journal Publications

Amaroek, S., N. Theera-Umpon, K. Wantanajittikul, and S. Auephanwiriyaikul, 2010. Moisture Content Prediction of Dried Longan Aril from Dielectric Constant Using Multilayer Perceptrons and Support Vector Regression. American Journal of Applied Sciences, 7(10): 1387-1392.

Amaroek, S., N. Theera-Umpon, Economical Moisture Measurement System for Dried Longan Aril Using Electrical Capacitance (Submitted)

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