

**Appendix D**  
**Raw Data and Summary of Plywood Formaldehyde Emission (Timber Wood Species)**

<b>Item/ Size/ Composition</b>		HWPW/ 2.5 mm, (2440 x 1220)mm/ (0.6+1.5+0.6)mm								
<b>Glue Type/ Process</b>		UF (FF= 0.32 %, GS= 28±2 g/ft <sup>2</sup> )/ HP(115 °C, 8 kg/cm <sup>2</sup> )								
<b>Method/ Standard/ Specimens</b>		DC-AA (24 hr, 20 °C)/ JAS 233/ (150 x 50)mm, 10pcs								
<b>Panel</b>	<b>Absorbance DC-AA (412 nm)</b>									
	<b>BNG</b>	<b>BTI</b>	<b>KPR</b>	<b>KRG</b>	<b>LRN</b>	<b>MGS</b>	<b>RSY</b>	<b>SDM</b>	<b>WSY</b>	<b>YSY</b>
P1	0.1296	0.0773	0.0383	0.0548	0.1246	0.0780	0.0471	0.0624	0.0893	0.1059
P2	0.1284	0.0766	0.0351	0.0557	0.1257	0.0798	0.0454	0.0663	0.0904	0.1037
P3	0.1276	0.0785	0.0377	0.0574	0.1226	0.0768	0.0512	0.0637	0.0855	0.1055
P4	0.1282	0.0764	0.0351	0.0562	0.1216	0.0818	0.0443	0.0658	0.0902	0.1050
P5	0.1239	0.0750	0.0402	0.0559	0.1236	0.0828	0.0472	0.0698	0.0897	0.1067
	<b>Formaldehyde emission DC-AA (mg/L)</b>									
P1	0.9908	0.5810	0.2750	0.4045	0.9516	0.5860	0.3439	0.4640	0.6750	0.8050
P2	0.9813	0.5750	0.2500	0.4111	0.9603	0.6000	0.3310	0.4943	0.6830	0.7880
P3	0.9752	0.5900	0.2700	0.4250	0.9360	0.5770	0.3760	0.4740	0.6450	0.8020
P4	0.9795	0.5740	0.2500	0.4154	0.9280	0.6160	0.3220	0.4904	0.6820	0.7980
P5	0.9460	0.5630	0.2900	0.4128	0.9433	0.6240	0.3448	0.5220	0.6780	0.8110
<b>Mean</b>	<b>0.97</b>	<b>0.58</b>	<b>0.27</b>	<b>0.41</b>	<b>0.94</b>	<b>0.60</b>	<b>0.34</b>	<b>0.49</b>	<b>0.67</b>	<b>0.80</b>
SD	0.017	0.010	0.017	0.007	0.013	0.020	0.020	0.022	0.016	0.009
Co-v	0.02	0.02	0.06	0.02	0.01	0.03	0.06	0.05	0.02	0.01
RSD	1.7%	1.7%	6.4%	1.8%	1.3%	3.3%	6.0%	4.5%	2.3%	1.1%

<b>Item/ Size/ Composition</b>		HWPW/ 2.5 mm, (2440 x 1220)mm/ (0.6+1.5+0.6)mm								
<b>Glue Type/ Process</b>		UF (FF= 0.32 %, GS= 28±2 g/ft <sup>2</sup> )/ HP(115 °C, 8 kg/cm <sup>2</sup> )								
<b>Method/ Standard/ Specimens</b>		SC-CA (2½ hr, 25 °C)/ ASTM 6007-02/ (127 x 70)mm, 6pcs								
<b>Panel</b>	<b>Absorbance SC-CA (580 nm)</b>									
	<b>BNG</b>	<b>BTI</b>	<b>KPR</b>	<b>KRG</b>	<b>LRN</b>	<b>MGS</b>	<b>RSY</b>	<b>SDM</b>	<b>WSY</b>	<b>YSY</b>
P1	0.2924	0.1434	0.0770	0.1107	0.2594	0.2028	0.0997	0.1230	0.2359	0.2297
P2	0.2819	0.1462	0.0794	0.1059	0.2669	0.2144	0.1072	0.1307	0.2347	0.2355
P3	0.2784	0.1504	0.0689	0.1118	0.2538	0.2080	0.1058	0.1486	0.2498	0.2250
P4	0.2669	0.1454	0.0807	0.1033	0.2688	0.2084	0.1087	0.1453	0.2147	0.2312
P5	0.2865	0.1405	0.0787	0.1146	0.2655	0.2094	0.1035	0.1277	0.2231	0.2293
	<b>Formaldehyde emission SC-CA (µg/mL)</b>									
P1	0.23	0.12	0.07	0.09	0.21	0.15	0.08	0.10	0.19	0.20
P2	0.22	0.12	0.07	0.08	0.21	0.16	0.08	0.10	0.19	0.20
P3	0.22	0.12	0.06	0.09	0.20	0.15	0.08	0.12	0.20	0.19
P4	0.21	0.12	0.07	0.08	0.22	0.15	0.09	0.11	0.17	0.20
P5	0.22	0.11	0.07	0.09	0.21	0.15	0.08	0.10	0.18	0.20
<b>Mean</b>	<b>0.22</b>	<b>0.12</b>	<b>0.07</b>	<b>0.09</b>	<b>0.21</b>	<b>0.15</b>	<b>0.08</b>	<b>0.11</b>	<b>0.18</b>	<b>0.20</b>
SD	0.007	0.003	0.004	0.004	0.005	0.003	0.003	0.009	0.011	0.003
Co-v	0.03	0.03	0.06	0.04	0.02	0.02	0.03	0.08	0.06	0.02
RSD	3.4%	2.5%	5.9%	4.2%	2.4%	2.0%	3.3%	8.3%	5.7%	1.6%

<b>Item/ Size/ Composition</b>		HWPW/ 2.5 mm, (2440 x 1220)mm/ (0.6+1.5+0.6)mm								
<b>Glue Type/ Process</b>		UF (FF= 0.32 %, GS= 28±2 g/ft <sup>2</sup> )/ HP(115 °C, 8 kg/cm <sup>2</sup> )								
<b>Method/ Standard/ Specimens</b>		SPME-A (24 hr, 20 °C)/ JAS 233/ (150 x 50)mm, 10pcs								
<b>Panel</b>	<b>Peak Area SPME-A (RT=7.5 min)</b>									
	<b>BNG</b>	<b>BTI</b>	<b>KPR</b>	<b>KRG</b>	<b>LRN</b>	<b>MGS</b>	<b>RSY</b>	<b>SDM</b>	<b>WSY</b>	<b>YSY</b>
P1	4528760	2099388	907228	1367019	3548523	2282948	1121812	1507804	2608867	3362518
P2	4551679	2121227	909572	1298818	3635201	2264012	1137399	1619922	2640467	3365773
P3	4788492	2163389	924260	1295988	3710531	2324829	1138871	1699903	2678410	3392249
P4	4100409	2168161	932351	1372945	3885063	2421591	1154382	1725784	2678556	3526737
	<b>Formaldehyde emission SPME-A (mg/L)</b>									
P1	1.47	0.69	0.30	0.45	1.16	0.75	0.37	0.49	0.85	1.10
P2	1.48	0.69	0.30	0.43	1.18	0.74	0.37	0.53	0.86	1.10
P3	1.56	0.71	0.31	0.43	1.21	0.76	0.37	0.56	0.87	1.10
P4	1.33	0.71	0.31	0.45	1.26	0.79	0.38	0.56	0.87	1.15
<b>Mean</b>	<b>1.46</b>	<b>0.70</b>	<b>0.30</b>	<b>0.44</b>	<b>1.20</b>	<b>0.76</b>	<b>0.37</b>	<b>0.54</b>	<b>0.86</b>	<b>1.11</b>
SD	0.095	0.011	0.004	0.014	0.046	0.023	0.004	0.032	0.011	0.025
Co-v	0.06	0.02	0.01	0.03	0.04	0.03	0.01	0.06	0.01	0.02
RSD	6.5%	1.5%	1.3%	3.1%	3.8%	3.0%	1.2%	5.9%	1.3%	2.3%

**Appendix D**  
**Raw Data and Summary of Formaldehyde Emission (Timber Wood Species)**

Item/ Size/ Composition		HWPW/ 2.5 mm, (2440 x 1220)mm/ (0.6+1.5+0.6)mm								
Glue Type/ Process		UF (FF= 0.32 %, GS= 28±2 g/ft <sup>2</sup> )/ HP(115 °C, 8 kg/cm <sup>2</sup> )								
Method/ Standard/ Specimens		SPME-W/ Nil/ (15x10)mm, 2pcs								
Panel	Peak Area SPME-W (RT=7.5 min)									
	BNG	BTI	KPR	KRG	LRN	MGS	RSY	SDM	WSY	YSY
P1	5077748	2558603	1041994	1458093	4861031	2697917	1281378	1744442	2857544	3700560
P2	5250245	2559032	1046578	1477756	4402064	2815275	1362124	1758116	2948639	3602823
P3	4880908	2596705	1063515	1504287	4354165	2831380	122515	1917509	3090716	3638221
P4	5079520	2428174	1069678	1453868	4516161	2855920	1316545	1847837	3197853	3618091
Panel	Formaldehyde emission SPME-W (mg/L)									
	BNG	BTI	KPR	KRG	LRN	MGS	RSY	SDM	WSY	YSY
P1	1.65	0.83	0.34	0.48	1.58	0.88	0.42	0.57	0.93	1.20
P2	1.71	0.83	0.34	0.48	1.43	0.92	0.45	0.58	0.96	1.17
P3	1.59	0.85	0.35	0.49	1.42	0.92	0.40	0.63	1.01	1.18
P4	1.65	0.79	0.35	0.48	1.47	0.93	0.43	0.60	1.04	1.18
<b>Mean</b>	<b>1.65</b>	<b>0.83</b>	<b>0.35</b>	<b>0.48</b>	<b>1.48</b>	<b>0.91</b>	<b>0.43</b>	<b>0.59</b>	<b>0.99</b>	<b>1.18</b>
SD	0.049	0.024	0.004	0.007	0.073	0.023	0.019	0.026	0.049	0.014
Co-v	0.03	0.03	0.01	0.02	0.05	0.02	0.04	0.04	0.05	0.01
RSD	3.0%	2.9%	1.2%	1.5%	5.0%	2.5%	4.4%	4.4%	5.0%	1.2%

Item/ Size/ Composition		HWPW/ 2.5 mm, (2440 x 1220)mm/ (0.6+1.5+0.6)mm								
Glue Type/ Process		UF (FF= 0.32 %, GS= 28±2 g/ft <sup>2</sup> )/ HP(115 °C, 8 kg/cm <sup>2</sup> )								
Method/ Standard/ Specimens		LLE-FID/ EPA 556/ (150 x 50)mm, 10pcs								
Panel	Peak Area LLE-FID (RT=12 min)									
	BNG	BTI	KPR	KRG	LRN	MGS	RSY	SDM	WSY	YSY
P1	307949	98786	18470	58786	222790	121255	45139	76038	132750	162952
P2	322191	104769	19087	59769	240153	124167	45897	77392	134838	162932
P3	334495	99432	17432	55824	194753	129432	41768	75863	122932	178643
P4	342617	114863	16529	53735	204723	114863	40457	73863	121516	180008
Panel	Formaldehyde emission LLE-FID (mg/L)									
	BNG	BTI	KPR	KRG	LRN	MGS	RSY	SDM	WSY	YSY
P1	1.73	0.55	0.10	0.33	1.25	0.68	0.25	0.43	0.74	0.92
P2	1.81	0.59	0.10	0.33	1.35	0.70	0.26	0.43	0.76	0.91
P3	1.88	0.56	0.09	0.31	1.09	0.73	0.23	0.42	0.69	1.00
P4	1.93	0.64	0.09	0.30	1.15	0.64	0.22	0.41	0.68	1.01
<b>Mean</b>	<b>1.84</b>	<b>0.59</b>	<b>0.10</b>	<b>0.32</b>	<b>1.21</b>	<b>0.69</b>	<b>0.24</b>	<b>0.42</b>	<b>0.72</b>	<b>0.96</b>
SD	0.085	0.042	0.006	0.016	0.113	0.034	0.015	0.008	0.038	0.053
Co-v	0.05	0.07	0.07	0.05	0.09	0.05	0.06	0.02	0.05	0.06
RSD	4.6%	7.2%	6.6%	4.9%	9.3%	5.0%	6.1%	1.9%	5.3%	5.6%

**Summary:**

Plywood	Formaldehyde Emission (ppm)					Relative Standard Deviation, RSD (%)				
	DC-AA	SC-CA	SPME-A	SPME-W	LLE-FID	DC-AA	SC-CA	SPME-A	SPME-W	LLE-FID
BNG	0.97	0.22	1.46	1.65	1.84	1.7%	3.4%	6.5%	3.0%	4.6%
BTI	0.58	0.12	0.70	0.83	0.59	1.7%	2.5%	1.5%	2.9%	7.2%
KPR	0.27	0.07	0.30	0.35	0.10	6.4%	5.9%	1.3%	1.2%	6.6%
KRG	0.41	0.09	0.44	0.48	0.32	1.8%	4.2%	3.1%	1.5%	4.9%
LRN	0.94	0.21	1.20	1.48	1.21	1.3%	2.4%	3.8%	5.0%	9.3%
MGS	0.60	0.15	0.76	0.91	0.69	3.3%	2.0%	3.0%	2.5%	5.0%
RSY	0.34	0.08	0.37	0.43	0.24	6.0%	3.3%	1.2%	4.4%	6.1%
SDM	0.49	0.11	0.54	0.59	0.42	4.5%	8.3%	5.9%	4.4%	1.9%
WSY	0.67	0.18	0.86	0.99	0.72	2.3%	5.7%	1.3%	5.0%	5.3%
YSY	0.80	0.20	1.11	1.18	0.96	1.1%	1.6%	2.3%	1.2%	5.6%