Appendix F

Examination of Alternative Procedures

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Examination of Alternative Procedures

F.1 Alternative Procedure (Baysian Approach) for Determining Population Distribution

To study the effect of incorporating into the analysis the uncertainty associated with the unknown population distribution, one must consider the parameters of any probability distribution as random variables. After selection of the parametric distribution (e.g., lognormal, Weibull, etc.) that best fits the data, one can incorporate the uncertainty of the distribution by randomly drawing parameter values from suitable parameter distributions. The selection usually depends on previous information. In this application, it was assumed that a sensible parameter distribution was the uniform distribution; in other words, a parameter will be drawn randomly from intervals centered in the maximum likelihood parameter estimate, and end points equal to the maximum likelihood estimator plus/minus its standard error.

The construction of the hypothetical distribution (e.g., a hypothetical Weibull distribution) proceeded as follows:

1. Draw one set of model parameters (shape and scale parameters) at random from the corresponding intervals.

2. Perform a goodness-of-fit test to assess if the data (e.g., carbon monoxide) came from the distribution (e.g., Weibull) with the parameters selected.

3. If the p-value of the goodness-of-fit test statistic is larger than 0.40, then one value is randomly selected from this distribution (e.g., Weibull). If the p-value is lower than 0.40, the set of parameters are discarded, and steps 1 and 2 are repeated.

This process is repeated 10,000 times to obtain a hypothetical distribution that will account for the uncertainty associated with the unknown distribution. Once the hypothetical distribution is obtained, the adjustments are calculated following steps 5-7 of the statistical analysis presented in Section 3.2.

This process was applied to three emissions factors to assess the effect of the uncertainty of the distribution on the calculation of the adjustments. Two emissions factors with high p-values on the goodness-of-fit test were selected, which were Wood Combustion Formaldehyde ($p = 0.9245$), and Wood Combustion Carbon Monoxide ($p = 0.904$), and one with low p-values, which was Wood Combustion Nitrogen Oxides ($p=0.137$).

Table F-1 compares the uncertainty ratios calculated by the alternative approach to the values reported in the study, using the Baysian approach, for the 90^{th} percentile and mean target statistics. Tables F-2 through F-4 report all of the calculated uncertainty ratios for formaldehyde, carbon monoxide, and nitrogen oxides, respectively. Tables F-2a through F-4a present the uncertainty ratios reported in the study for these same pollutants, respectively. The uncertainty ratios calculated using the alternative approach show a greater range for most of the pollutants examined. However, some reduction of the uncertainty ratios were observed for percentiles above the mean for nitrogen oxides, especially for the smaller sample size. Further research is needed to account for variability for those pollutants with lower goodness-of-fit test p-values.

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Table F-1 Comparison of Selected Emission Factor Uncertainty Ratios Calculated Using Original (Frequentist) and Modified (Baysian) Approach

Pollutant	*n* -value	Adjustment (Monte Carlo Median Value)			
		Target Statistic: 90th Percentile		Target Statistic: Mean	
		Original Reported Value (Frequentist)	Alternative Approach (Baysian)	Original Reported Value (Frequentist)	Alternative Approach (Baysian)
Formaldehyde	1	11.18	11.59	5.79	6.65
	3	5.23	5.21	2.71	2.99
	5	4.08	4.09	2.12	2.35
	10	3.15	3.20	1.63	1.83
	15	2.88	2.91	1.49	1.67
	20	2.73	2.60	1.41	1.49
	25	2.63	2.53	1.36	1.45
CO	1	2.22	2.41	1.16	1.19
	3	1.97	2.24	1.04	1.11
	5	1.94	2.11	1.02	1.04
	10	1.92	2.04	1.01	1.01
	15	1.92	2.08	1.01	1.03
	20	1.92	2.03	1.01	1.00
	25	1.91	2.06	1.00	1.02
NOx	1	4.92	1.92	2.16	1.14
	3	3.27	1.79	1.44	1.06
	5	2.93	1.72	1.29	1.02
	10	2.61	1.71	1.15	1.01
	15	2.56	1.70	1.12	1.01
	20	2.48	1.69	1.09	1.00
	25	2.45	1.70	1.08	1.01

Table F-2. Alternative (Baysian) Approach: Emissions Factor Uncertainty Ratios by Number of Tests (n) and Target Statistic: Wood Residue Combustion, Formaldehyde

Target Statistic

Median

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.0006	0.0147	0.0465	0.0945	0.1497	0.2148	0.2934	1.0409	6.6505	3.5814	4.9244	7.1432	11.5950	21.7888	99.2299	1556.0021
3	0.0003	0.0066	0.0209	0.0424	0.0672	0.0965	0.1318	0.4675	2.9869	1.6085	2.2117	3.2082	5.2076	9.7858	44.5664	698.8360
5	0.0002	0.0052	0.0164	0.0333	0.0528	0.0758	0.1035	0.3671	2.3456	1.2631	1.7368	2.5193	4.0894	7.6846	34.9972	548.7824
10	0.0002	0.0041	0.0128	0.0260	0.0413	0.0592	0.0809	0.2870	1.8338	0.9875	1.3578	1.9696	3.1971	6.0079	27.3610	429.0418
15	0.0001	0.0037	0.0117	0.0237	0.0376	0.0540	0.0737	0.2615	1.6706	0.8997	1.2370	1.7944	2.9127	5.4734	24.9268	390.8715
20	0.0001	0.0033	0.0104	0.0211	0.0335	0.0481	0.0657	0.2330	1.4885	0.8016	1.1022	1.5988	2.5952	4.8768	22.2099	348.2690
25	0.0001	0.0032	0.0101	0.0206	0.0327	0.0469	0.0640	0.2271	1.4510	0.7814	1.0744	1.5585	2.5299	4.7540	21.6506	339.4979

Mean

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.0030	0.0734	0.2316	0.4704	0.7454	1.0698	1.4608	5.1836	33.1178	17.8345	24.5222	35.5712	57.7398	108.5023	494.1384	7748.4719
3	0.0006	0.0140	0.0443	0.0900	0.1426	0.2047	0.2795	0.9919	6.3375	3.4128	4.6926	6.8070	11.0492	20.7632	94.5592	1482.7611
5	0.0003	0.0084	0.0266	0.0541	0.0857	0.1231	0.1680	0.5963	3.8098	2.0516	2.8210	4.0920	6.6422	12.4818	56.8441	891.3599
10	0.0002	0.0054	0.0170	0.0346	0.0549	0.0787	0.1075	0.3815	2.4376	1.3127	1.8049	2.6182	4.2498	7.9861	36.3702	570.3135
15	0.0002	0.0045	0.0141	0.0286	0.0454	0.0651	0.0889	0.3155	2.0157	1.0855	1.4925	2.1650	3.5143	6.6039	30.0752	471.6026
20	0.0002	0.0039	0.0124	0.0251	0.0398	0.0571	0.0780	0.2768	1.7687	0.9525	1.3096	1.8997	3.0836	5.7946	26.3896	413.8088
25	0.0001	0.0037	0.0116	0.0235	0.0373	0.0535	0.0730	0.2591	1.6554	0.8915	1.2258	1.7781	2.8862	5.4236	24.7000	387.3156

95 Percentile

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.0127	0.3144	0.9923	2.0154	3.1936	4.5834	6.2587	22.2085	141.8894	76.4099	105.0625	152.4008	247.3799	464.8658	2117.0808	33197.4647
3	0.0021	0.0510	0.1610	0.3270	0.5181	0.7435	1.0153	3.6028	23.0184	12.3958	17.0440	24.7236	40.1318	75.4141	343.4489	5385.5445
5	0.0011	0.0269	0.0850	0.1726	0.2735	0.3925	0.5359	1.9017	12.1501	6.5430	8.9966	13.0502	21.1833	39.8067	181.2868	2842.7167
10	0.0006	0.0145	0.0458	0.0930	0.1474	0.2116	0.2889	1.0253	6.5503	3.5275	4.8502	7.0356	11.4203	21.4606	97.7352	1532.5638
15	0.0004	0.0108	0.0340	0.0691	0.1095	0.1572	0.2147	0.7618	4.8671	2.6210	3.6038	5.2276	8.4856	15.9457	72.6195	1138.7303
20	0.0004	0.0091	0.0286	0.0580	0.0919	0.1320	0.1802	0.6394	4.0852	2.2000	3.0249	4.3878	7.1224	13.3842	60.9539	955.8044
25	0.0003	0.0080	0.0251	0.0510	0.0808	0.1160	0.1583	0.5619	3.5897	1.9331	2.6580	3.8557	6.2586	11.7609	53.5611	839.8801

Table F-2a (Also Table D.1-7). Frequentist Approach: Emissions Factor Uncertainty Ratios by Number of Tests (n) and Target Statistic: Wood Residue Combustion, Formaldehyde, Uncontrolled

Target Statistics

Median

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.0010	0.0141	0.0468	0.0923	0.1440	0.2102	0.2874	0.9697	5.7927	3.4813	4.7639	6.9925	11.1801	21.5015	78.4189	1724.1519
3	0.0005	0.0066	0.0219	0.0432	0.0674	0.0983	0.1345	0.4537	2.7101	1.6287	2.2288	3.2715	5.2307	10.0595	36.6885	806.6495
5	0.0004	0.0052	0.0171	0.0337	0.0526	0.0768	0.1050	0.3541	2.1154	1.2713	1.7397	2.5535	4.0827	7.8519	28.6369	629.6239
10	0.0003	0.0040	0.0132	0.0260	0.0405	0.0592	0.0809	0.2730	1.6311	0.9803	1.3414	1.9689	3.1481	6.0543	22.0809	485.4802
15	0.0003	0.0036	0.0120	0.0238	0.0371	0.0541	0.0740	0.2497	1.4915	0.8964	1.2266	1.8004	2.8786	5.5362	20.1912	443.9329
20	0.0002	0.0034	0.0114	0.0225	0.0351	0.0513	0.0702	0.2367	1.4139	0.8497	1.1628	1.7067	2.7289	5.2481	19.1407	420.8347
25	0.0002	0.0033	0.0110	0.0217	0.0339	0.0495	0.0677	0.2284	1.3645	0.8200	1.1221	1.6471	2.6335	5.0647	18.4716	406.1250

Mean

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.0052	0.0745	0.2465	0.4868	0.7593	1.1083	1.5158	5.1133	30.5463	18.3579	25.1210	36.8731	58.9557	113.3829	413.5232	9091.8965
3	0.0009	0.0134	0.0442	0.0873	0.1362	0.1989	0.2720	0.9175	5.4808	3.2939	4.5074	6.6161	10.5783	20.3440	74.1974	1631.3357
5	0.0006	0.0084	0.0279	0.0551	0.0859	0.1254	0.1715	0.5785	3.4559	2.0770	2.8421	4.1717	6.6701	12.8278	46.7847	1028.6278
10	0.0004	0.0053	0.0174	0.0344	0.0537	0.0783	0.1071	0.3614	2.1591	1.2976	1.7756	2.6063	4.1671	8.0141	29.2287	642.6343
15	0.0003	0.0045	0.0148	0.0292	0.0455	0.0664	0.0908	0.3064	1.8303	1.1000	1.5052	2.2094	3.5326	6.7939	24.7782	544.7840
20	0.0003	0.0040	0.0134	0.0264	0.0412	0.0602	0.0823	0.2776	1.6582	0.9966	1.3637	2.0017	3.2004	6.1551	22.4483	493.5585
25	0.0003	0.0038	0.0125	0.0246	0.0384	0.0561	0.0767	0.2589	1.5465	0.9294	1.2718	1.8668	2.9848	5.7404	20.9360	460.3089

95 Percentile

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.0201	0.2899	0.9593	1.8941	2.9545	4.3124	5.8978	19.8958	118.8548	71.4301	97.7452	143.4723	229.3949	441.1696	1609.0062	35376.2962
3	0.0033	0.0471	0.1557	0.3074	0.4796	0.7000	0.9573	3.2295	19.2927	11.5947	15.8662	23.2887	37.2358	71.6114	261.1768	5742.3447
5	0.0019	0.0268	0.0886	0.1749	0.2728	0.3982	0.5447	1.8374	10.9761	6.5965	9.0266	13.2495	21.1843	40.7414	148.5896	3266.9553
10	0.0010	0.0140	0.0463	0.0914	0.1426	0.2081	0.2846	0.9601	5.7354	3.4469	4.7168	6.9233	11.0696	21.2889	77.6435	1707.1033
15	0.0007	0.0108	0.0358	0.0706	0.1101	0.1608	0.2199	0.7417	4.4308	2.6628	3.6439	5.3485	8.5516	16.4464	59.9823	1318.7953
20	0.0006	0.0092	0.0304	0.0601	0.0937	0.1368	0.1871	0.6313	3.7713	2.2665	3.1015	4.5524	7.2787	13.9983	51.0537	1122.4879
25	0.0006	0.0080	0.0263	0.0520	0.0811	0.1184	0.1619	0.5463	3.2634	1.9613	2.6838	3.9394	6.2986	12.1133	44.1789	971.3371

Table F-3. Alternative (Baysian) Approach: Emissions Factor Uncertainty Ratios by Number of Tests (n) and Target Statistic: Wood Residue Combustion, CO

Target Statistic

Median

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.010	0.029	0.106	0.183	0.290	0.431	0.512	0.953	1.190	1.653	1.874	2.100	2.408	2.872	4.427	6.538
3	0.010	0.027	0.099	0.171	0.270	0.402	0.477	0.887	1.108	1.540	1.745	1.955	2.243	2.674	4.123	6.088
5	0.009	0.026	0.093	0.161	0.255	0.378	0.449	0.836	1.044	1.451	1.644	1.842	2.113	2.519	3.884	5.736
10	0.009	0.025	0.090	0.155	0.246	0.365	0.433	0.806	1.007	1.399	1.586	1.777	2.038	2.430	3.746	5.532
15	0.009	0.025	0.092	0.158	0.251	0.373	0.443	0.824	1.029	1.430	1.621	1.816	2.084	2.484	3.830	5.656
20	0.009	0.025	0.090	0.155	0.245	0.364	0.433	0.805	1.004	1.396	1.582	1.773	2.033	2.425	3.738	5.520
25	0.009	0.025	0.091	0.157	0.248	0.369	0.439	0.816	1.018	1.415	1.604	1.798	2.062	2.458	3.790	5.597

Mean

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.032	0.094	0.338	0.583	0.923	1.372	1.630	3.032	3.785	5.261	5.964	6.681	7.664	9.138	14.087	20.803
3	0.011	0.032	0.117	0.201	0.319	0.474	0.563	1.047	1.307	1.816	2.059	2.306	2.646	3.154	4.863	7.182
5	0.010	0.029	0.104	0.180	0.285	0.424	0.503	0.936	1.169	1.625	1.842	2.063	2.367	2.822	4.350	6.424
10	0.009	0.026	0.094	0.163	0.258	0.383	0.455	0.847	1.057	1.470	1.666	1.866	2.141	2.553	3.935	5.812
15	0.009	0.026	0.094	0.163	0.258	0.384	0.456	0.848	1.059	1.472	1.668	1.869	2.144	2.556	3.940	5.819
20	0.009	0.025	0.091	0.156	0.248	0.368	0.437	0.813	1.015	1.411	1.600	1.792	2.056	2.451	3.779	5.580
25	0.009	0.026	0.092	0.160	0.253	0.376	0.446	0.830	1.036	1.440	1.633	1.829	2.098	2.502	3.857	5.695

95 Percentile

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.093	0.269	0.968	1.670	2.646	3.933	4.671	8.690	10.848	15.077	17.090	19.147	21.962	26.187	40.371	59.617
3	0.023	0.066	0.239	0.413	0.654	0.972	1.154	2.147	2.680	3.724	4.222	4.730	5.425	6.469	9.973	14.727
5	0.018	0.051	0.184	0.318	0.505	0.750	0.891	1.657	2.068	2.874	3.258	3.650	4.187	4.992	7.696	11.366
10	0.014	0.040	0.146	0.252	0.399	0.592	0.704	1.309	1.634	2.271	2.574	2.884	3.308	3.944	6.080	8.979
15	0.013	0.037	0.134	0.231	0.365	0.543	0.645	1.200	1.498	2.082	2.360	2.644	3.033	3.616	5.575	8.233
20	0.012	0.033	0.120	0.207	0.328	0.487	0.579	1.076	1.344	1.867	2.117	2.371	2.720	3.243	5.000	7.384
25	0.012	0.033	0.120	0.207	0.328	0.487	0.578	1.076	1.343	1.867	2.116	2.370	2.719	3.242	4.998	7.381

Table F-3a (Also Table D.1-5). Frequentist Approach: Emissions Factor Uncertainty Ratios by Number of Tests (n) and Target Statistic: Wood Residue Combustion, Carbon Monoxide, Uncontrolled

Target Statistic

Median

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.0020	0.0648	0.1855	0.2979	0.3915	0.4806	0.5754	1.0167	1.1640	1.6150	1.7677	1.9581	2.2158	2.6645	3.4704	5.1752
3	0.0018	0.0576	0.1651	0.2652	0.3485	0.4278	0.5122	0.9050	1.0362	1.4376	1.5736	1.7431	1.9725	2.3719	3.0893	4.6068
5	0.0018	0.0566	0.1622	0.2605	0.3423	0.4202	0.5031	0.8889	1.0177	1.4120	1.5455	1.7120	1.9373	2.3296	3.0342	4.5247
10	0.0018	0.0561	0.1608	0.2582	0.3394	0.4166	0.4988	0.8813	1.0090	1.3999	1.5323	1.6974	1.9207	2.3097	3.0083	4.4860
15	0.0018	0.0560	0.1605	0.2577	0.3387	0.4157	0.4977	0.8794	1.0068	1.3969	1.5289	1.6937	1.9165	2.3046	3.0017	4.4762
20	0.0018	0.0561	0.1608	0.2581	0.3393	0.4164	0.4986	0.8810	1.0086	1.3994	1.5317	1.6967	1.9200	2.3088	3.0072	4.4843
25	0.0017	0.0558	0.1599	0.2567	0.3374	0.4141	0.4958	0.8762	1.0031	1.3918	1.5233	1.6874	1.9095	2.2962	2.9907	4.4598

Mean

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.0041	0.1304	0.3735	0.5998	0.7884	0.9676	1.1585	2.0470	2.3436	3.2517	3.5591	3.9425	4.4613	5.3648	6.9875	10.4198
3	0.0021	0.0660	0.1891	0.3036	0.3990	0.4898	0.5864	1.0362	1.1863	1.6459	1.8015	1.9956	2.2582	2.7155	3.5368	5.2742
5	0.0019	0.0612	0.1752	0.2813	0.3697	0.4538	0.5433	0.9601	1.0992	1.5251	1.6692	1.8491	2.0924	2.5161	3.2772	4.8870
10	0.0018	0.0582	0.1668	0.2678	0.3520	0.4320	0.5173	0.9140	1.0464	1.4519	1.5891	1.7603	1.9920	2.3954	3.1199	4.6525
15	0.0018	0.0573	0.1640	0.2634	0.3462	0.4249	0.5087	0.8989	1.0291	1.4279	1.5629	1.7312	1.9591	2.3558	3.0683	4.5755
20	0.0018	0.0572	0.1637	0.2629	0.3456	0.4241	0.5078	0.8973	1.0273	1.4254	1.5601	1.7282	1.9556	2.3517	3.0630	4.5676
25	0.0018	0.0564	0.1617	0.2597	0.3413	0.4189	0.5015	0.8862	1.0145	1.4076	1.5407	1.7067	1.9313	2.3224	3.0248	4.5107

95 Percentile

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.0110	0.3502	1.0033	1.6112	2.1176	2.5990	3.1118	5.4985	6.2951	8.7341	9.5599	10.5898	11.9833	14.4100	18.7686	27.9881
3	0.0039	0.1261	0.3613	0.5802	0.7626	0.9360	1.1207	1.9802	2.2671	3.1455	3.4429	3.8138	4.3157	5.1897	6.7594	10.0797
5	0.0032	0.1014	0.2904	0.4663	0.6129	0.7522	0.9006	1.5914	1.8220	2.5279	2.7669	3.0650	3.4683	4.1706	5.4321	8.1005
10	0.0026	0.0829	0.2375	0.3814	0.5013	0.6153	0.7367	1.3017	1.4903	2.0677	2.2632	2.5070	2.8369	3.4114	4.4432	6.6258
15	0.0024	0.0759	0.2174	0.3490	0.4587	0.5630	0.6741	1.1912	1.3638	1.8922	2.0711	2.2942	2.5961	3.1218	4.0660	6.0634
20	0.0023	0.0731	0.2093	0.3361	0.4417	0.5422	0.6491	1.1470	1.3132	1.8220	1.9943	2.2091	2.4998	3.0060	3.9153	5.8386
25	0.0022	0.0700	0.2006	0.3220	0.4233	0.5195	0.6220	1.0991	1.2583	1.7458	1.9109	2.1167	2.3953	2.8803	3.7516	5.5944

Table F-4. Alternative (Baysian) Approach: Emissions Factor Uncertainty Ratios by Number of Tests (n) and Target Statistic: Wood Residue Combustion, Nox

Target Statistic

Median

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.1706	0.3282	0.4411	0.5312	0.5980	0.6674	0.7253	1.0071	1.1425	1.4175	1.5457	1.6849	1.9248	2.2630	3.1109	6.0479
3	0.1588	0.3054	0.4105	0.4944	0.5566	0.6211	0.6750	0.9373	1.0633	1.3192	1.4386	1.5681	1.7914	2.1062	2.8953	5.6287
5	0.1528	0.2939	0.3951	0.4758	0.5356	0.5977	0.6496	0.9020	1.0233	1.2696	1.3844	1.5091	1.7239	2.0269	2.7862	5.4167
10	0.1513	0.2912	0.3914	0.4713	0.5306	0.5921	0.6435	0.8936	1.0137	1.2577	1.3714	1.4949	1.7077	2.0079	2.7601	5.3660
15	0.1504	0.2894	0.3890	0.4685	0.5274	0.5885	0.6396	0.8882	1.0075	1.2500	1.3631	1.4858	1.6973	1.9957	2.7433	5.3333
20	0.1499	0.2884	0.3877	0.4669	0.5256	0.5865	0.6375	0.8852	1.0042	1.2458	1.3585	1.4809	1.6917	1.9890	2.7342	5.3155
25	0.1502	0.2891	0.3885	0.4679	0.5267	0.5878	0.6388	0.8871	1.0063	1.2485	1.3615	1.4840	1.6953	1.9932	2.7400	5.3269

Mean

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.1914	0.3683	0.4950	0.5962	0.6711	0.7489	0.8139	1.1302	1.2821	1.5907	1.7346	1.8908	2.1600	2.5396	3.4910	6.7869
3	0.1654	0.3182	0.4278	0.5151	0.5799	0.6471	0.7033	0.9766	1.1079	1.3745	1.4989	1.6338	1.8664	2.1945	3.0166	5.8647
5	0.1573	0.3027	0.4068	0.4899	0.5515	0.6154	0.6689	0.9288	1.0536	1.3072	1.4255	1.5538	1.7750	2.0870	2.8688	5.5773
10	0.1540	0.2963	0.3983	0.4796	0.5399	0.6025	0.6548	0.9093	1.0315	1.2798	1.3956	1.5212	1.7378	2.0432	2.8087	5.4605
15	0.1519	0.2923	0.3929	0.4732	0.5327	0.5944	0.6460	0.8971	1.0177	1.2626	1.3769	1.5008	1.7145	2.0158	2.7710	5.3871
20	0.1511	0.2907	0.3908	0.4706	0.5297	0.5912	0.6425	0.8922	1.0121	1.2556	1.3692	1.4925	1.7050	2.0047	2.7557	5.3573
25	0.1510	0.2906	0.3906	0.4704	0.5295	0.5909	0.6422	0.8917	1.0116	1.2551	1.3686	1.4918	1.7042	2.0037	2.7544	5.3549

95 Percentile

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.3780	0.7273	0.9776	1.1773	1.3252	1.4790	1.6073	2.2319	2.5319	3.1413	3.4255	3.7339	4.2655	5.0151	6.8941	13.4028
3	0.2551	0.4908	0.6597	0.7945	0.8943	0.9981	1.0847	1.5062	1.7086	2.1199	2.3117	2.5198	2.8785	3.3844	4.6524	9.0448
5	0.2246	0.4322	0.5810	0.6997	0.7876	0.8789	0.9552	1.3264	1.5047	1.8669	2.0358	2.2190	2.5350	2.9805	4.0971	7.9652
10	0.1993	0.3835	0.5155	0.6208	0.6988	0.7799	0.8476	1.1769	1.3351	1.6565	1.8063	1.9689	2.2493	2.6446	3.6354	7.0675
15	0.1882	0.3621	0.4867	0.5862	0.6598	0.7364	0.8003	1.1113	1.2606	1.5641	1.7056	1.8591	2.1238	2.4971	3.4326	6.6733
20	0.1826	0.3513	0.4721	0.5686	0.6400	0.7143	0.7763	1.0780	1.2228	1.5171	1.6544	1.8033	2.0601	2.4221	3.3296	6.4731
25	0.1781	0.3427	0.4606	0.5547	0.6244	0.6968	0.7573	1.0516	1.1930	1.4801	1.6140	1.7593	2.0098	2.3630	3.2483	6.3150

Table F-4a (Also Table D.1-11). Frequentist Approach: Emissions Factor Uncertainty Ratios by Number of Tests (n) and Target Statistic: Wood Residue Combustion, Nitrogen Oxides, Uncontrolled

Target Statistic

Median

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.0156	0.0638	0.1306	0.2037	0.2765	0.3496	0.4334	1.0031	2.1625	2.3340	2.8737	3.6691	4.9234	7.6758	17.4401	177.5230
3	0.0104	0.0424	0.0868	0.1353	0.1837	0.2322	0.2879	0.6663	1.4365	1.5504	1.9090	2.4373	3.2705	5.0989	11.5850	117.9246
5	0.0093	0.0380	0.0778	0.1214	0.1647	0.2083	0.2582	0.5975	1.2882	1.3903	1.7118	2.1856	2.9328	4.5723	10.3887	105.7472
10	0.0083	0.0338	0.0692	0.1079	0.1464	0.1851	0.2295	0.5311	1.1451	1.2359	1.5217	1.9429	2.6070	4.0645	9.2348	94.0017
15	0.0081	0.0331	0.0678	0.1057	0.1435	0.1815	0.2249	0.5206	1.1224	1.2114	1.4916	1.9044	2.5554	3.9840	9.0520	92.1409
20	0.0079	0.0321	0.0657	0.1025	0.1391	0.1758	0.2180	0.5045	1.0877	1.1739	1.4454	1.8455	2.4763	3.8608	8.7720	89.2901
25	0.0078	0.0317	0.0650	0.1014	0.1377	0.1741	0.2158	0.4994	1.0767	1.1620	1.4308	1.8268	2.4512	3.8216	8.6830	88.3846

Mean

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.0326	0.1329	0.2724	0.4248	0.5766	0.7290	0.9037	2.0916	4.5093	4.8667	5.9922	7.6507	10.2660	16.0053	36.3653	370.1642
3	0.0140	0.0572	0.1172	0.1828	0.2481	0.3137	0.3888	0.9000	1.9403	2.0941	2.5784	3.2921	4.4174	6.8870	15.6478	159.2796
5	0.0112	0.0458	0.0939	0.1465	0.1988	0.2514	0.3116	0.7213	1.5551	1.6783	2.0665	2.6385	3.5404	5.5196	12.5411	127.6562
10	0.0092	0.0375	0.0769	0.1199	0.1628	0.2058	0.2551	0.5905	1.2731	1.3740	1.6917	2.1599	2.8983	4.5186	10.2667	104.5047
15	0.0086	0.0351	0.0720	0.1123	0.1525	0.1927	0.2389	0.5530	1.1922	1.2868	1.5843	2.0229	2.7143	4.2318	9.6150	97.8717
20	0.0083	0.0337	0.0691	0.1078	0.1463	0.1850	0.2293	0.5308	1.1443	1.2350	1.5206	1.9415	2.6052	4.0616	9.2283	93.9353
25	0.0081	0.0329	0.0675	0.1052	0.1428	0.1806	0.2238	0.5180	1.1168	1.2053	1.4841	1.8949	2.5426	3.9641	9.0068	91.6802

95 Percentile

n	Minimum	1 Percentile	5 Percentile	10 Percentile	15 Percentile	20 Percentile	25 Percentile	Median	Mean	75 Percentile	80 Percentile	85 Percentile	90 Percentile	95 Percentile	99 Percentile	Maximum
1	0.1204	0.4913	1.0067	1.5700	2.1310	2.6942	3.3398	7.7300	16.6651	17.9861	22.1459	28.2752	37.9408	59.1519	134.3979	1368.0411
3	0.0369	0.1506	0.3086	0.4812	0.6532	0.8258	1.0237	2.3693	5.1080	5.5129	6.7879	8.6666	11.6292	18.1306	41.1943	419.3185
5	0.0258	0.1052	0.2156	0.3363	0.4564	0.5770	0.7153	1.6555	3.5692	3.8521	4.7430	6.0557	8.1258	12.6686	28.7841	292.9942
10	0.0177	0.0723	0.1482	0.2311	0.3136	0.3965	0.4915	1.1377	2.4528	2.6472	3.2594	4.1615	5.5841	8.7059	19.7805	201.3467
15	0.0150	0.0614	0.1258	0.1962	0.2663	0.3367	0.4173	0.9659	2.0825	2.2475	2.7674	3.5333	4.7411	7.3916	16.7944	170.9507
20	0.0137	0.0561	0.1149	0.1792	0.2432	0.3075	0.3812	0.8824	1.9023	2.0531	2.5279	3.2275	4.3308	6.7520	15.3411	156.1575
25	0.0128	0.0524	0.1074	0.1675	0.2274	0.2875	0.3564	0.8249	1.7784	1.9193	2.3632	3.0173	4.0488	6.3122	14.3419	145.9872

F.2 Method for Computing Targeted Quantiles of Fitted Distributions

During the study, once the parametric distribution was chosen, the various quantiles of the distribution (ranging from 1st to 99th percentiles values) were estimated by simulating a sample size 10,000; ranking each value from smallest to biggest; and choosing the value corresponding to each percentile in the sample. One peer reviewer indicated that although this was a valid and accurate procedure for estimating the targeted quantiles, it was unnecessary. The reviewer indicated that the population quantiles could be calculated directly using an inverse cumulative distribution function (CDF) calculation. Although this is true, for the statistical design of this study, we needed the 10,000 population values to generate the sampling distributions of means for various values of *n* (where *n* is the number of tests comprising an emissions factor). Sampling distributions of means of varying *n* were produced to incorporate into the uncertainty ratios the effect (variability) resulting from varying values of *n*.

Based upon the reviewer's recommendation, we conducted an assessment of the uncertainty induced by the sampling error associated with the estimation of the quantiles of the hypothetical population using a sample of size 10,000 from the corresponding Weibull or log-normal distributions, as compared to using the corresponding inverse CDF calculation. The percentiles were calculated using an equation for the inverse CDF of the Weibull distribution implemented in Splus and an implementation of the CDF for the log-normal distribution available in Microsoft Office EXCEL as suggested by the reviewer. Quantile values corresponding to a sequence of probabilities from 0.05 to 0.95 were calculated using the inverse CDF for each of the 44 emissions factors considered. The inverse CDF quantiles values were compared to the values obtained using the hypothetical population of size 10,000 by subtraction. The log-normal and Weibull percentiles derived from the population values showed a maximum difference from the inverse CDF values of 0.01. Uncertainty ratio values were then calculated for selected emissions factors using the inverse CDF quantiles and compared to the proposed study uncertainty ratios. Results show no significant difference between the two values obtained for the uncertainty. The comparison results (or deltas) are presented in Tables F-5 and F-6; these tables contain the difference between the quantiles based on the sample of size 10,000 (from the study) and the CDF equations for the Weibull and log-normal densities, respectively.

Table F-5. Difference in Quantiles Based Upon Sample of 10,000 and Inverse CDF Calculation for Weibull

Quantiles	Arsenic, Wood Comb.	Cadmium, Wood Comb.	Carbon Monoxide, Wood Comb.	Chromium, Wood Comb.	HCl, UNC, Rrefuse Comb.	HCl, SD/FF, Refuse Comb.	Lead, Wood Comb.	Mercury, Wood Comb.	Nickel, Wood Comb.	Nitrogen Oxides	PM-cond.-organic, Asphalt-Batch	PM-filterable, DSI/FF, Refuse comb.	PM-filterable, WS, Wood Comb.	PM-filterable, MC, Wood comb.	Sulfur dioxide, refuse Comb.
0.05	0.0000	0.0000	-0.0021	0.0000	-0.0306	0.0003	0.0000	0.0000	0.0000	-0.0044	0.0000	0.0000	0.0003	0.0000	-0.0346
0.10	0.0000	0.0000	0.0009	0.0000	0.0199	0.0006	0.0000	0.0000	0.0000	0.0050	0.0000	0.0005	-0.0001	-0.0002	-0.0178
0.15	0.0000	0.0000	0.0011	0.0000	0.0232	0.0005	0.0000	0.0000	0.0000	0.0058	0.0000	-0.0003	0.0001	-0.0007	-0.0158
0.20	0.0000	0.0000	-0.0001	0.0000	0.0475	0.0013	0.0000	0.0000	0.0000	-0.0065	0.0000	-0.0009	-0.0001	-0.0007	-0.0267
0.25	0.0000	0.0000	-0.0001	0.0000	0.0483	0.0010	0.0000	0.0000	0.0000	-0.0126	0.0000	-0.0012	-0.0002	-0.0001	-0.0069
0.30	0.0000	0.0000	0.0021	0.0000	0.0303	0.0009	0.0000	0.0000	0.0000	-0.0127	0.0000	-0.0012	-0.0004	0.0011	-0.0018
0.35	0.0000	0.0000	0.0030	0.0000	0.0106	0.0008	0.0000	0.0000	0.0000	-0.0120	0.0000	-0.0002	-0.0003	0.0017	-0.0152
0.40	0.0000	0.0000	-0.0003	0.0000	0.0097	0.0010	0.0000	0.0000	0.0000	-0.0130	0.0000	-0.0014	-0.0004	0.0025	-0.0263
0.45	0.0000	0.0000	0.0010	0.0000	-0.0214	0.0018	0.0000	0.0000	0.0000	-0.0170	0.0000	-0.0002	-0.0004	0.0028	-0.0207
0.50	0.0000	0.0000	0.0002	0.0000	-0.0554	0.0008	0.0000	0.0000	0.0000	-0.0215	0.0000	-0.0003	-0.0005	0.0020	-0.0136
0.55	0.0000	0.0000	0.0002	0.0000	-0.0610	0.0020	0.0000	0.0000	0.0000	-0.0109	0.0000	0.0006	-0.0004	0.0019	-0.0127
0.60	0.0000	0.0000	0.0001	0.0000	-0.0557	0.0005	0.0000	0.0000	0.0000	-0.0206	0.0000	-0.0002	-0.0004	0.0033	-0.0121
0.65	0.0000	0.0000	-0.0018	0.0000	-0.0668	0.0006	0.0000	0.0000	0.0000	-0.0105	0.0000	0.0008	-0.0002	0.0047	-0.0011
0.70	0.0000	0.0000	-0.0074	0.0000	-0.0885	-0.0001	0.0000	0.0000	0.0000	-0.0080	0.0000	0.0011	-0.0002	0.0051	-0.0137
0.75	0.0000	0.0000	-0.0034	0.0000	-0.0854	-0.0006	0.0000	0.0000	0.0000	-0.0049	0.0000	0.0019	-0.0002	0.0060	0.0008
0.80	0.0000	0.0000	-0.0118	0.0000	-0.0437	0.0014	0.0000	0.0000	0.0000	-0.0033	0.0000	-0.0012	-0.0001	0.0061	-0.0039
0.85	0.0000	0.0000	-0.0194	0.0000	-0.0349	-0.0010	0.0000	0.0000	0.0000	-0.0073	0.0000	-0.0030	-0.0003	0.0052	0.0030
0.90	0.0000	0.0000	-0.0155	0.0000	-0.0113	0.0036	0.0000	0.0000	0.0000	-0.0160	0.0000	-0.0025	-0.0003	0.0039	0.0202
0.95	0.0000	0.0000	-0.0294	0.0000	-0.0144	-0.0163	0.0000	0.0000	0.0000	-0.0328	0.0000	-0.0017	0.0001	0.0195	-0.0521

Table F-6. Difference in Quantiles Based Upon Sample of 10,000 and Inverse CDF Calculation for Log-normal

Quantiles	Acetaldehyde, Wood Comb.	Arsenic, Refuse Comb	Benzene, Asphalt-Drum	Benzene, Wood Comb.	Cadmium, SD ESP, Refuse Comb.	Carbon Monoxide, Refuse Comb.	Formaldehyde, Asphalt-Drum	Formaldehyde, Wood Comb.	Lead, SD/ESP Refuse Comb.	Mercury, SD/FF Refuse Comb.	Nickel SD/FF Refuse Comb.	Nitrogen Oxides, Wood Comb.	PM-cond., Wood Comb.	PM-cond., inorganic Asphalt
0.05	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0026	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0011	0.0000	0.0000
0.10	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0014	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0011	0.0000	0.0000
0.15	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0024	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0011	0.0000	0.0000
0.20	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0007	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0013	0.0000	0.0000
0.25	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0005	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0021	0.0000	0.0000
0.30	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0028	0.0000	0.0000
0.35	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0012	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0013	0.0000	0.0000
0.40	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0008	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0022	0.0000	-0.0001
0.45	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0006	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0028	0.0000	-0.0001
0.50	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0030	0.0001	-0.0001
0.55	0.0000	0.0000	0.0000	0.0000	0.0000	0.0012	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0037	0.0001	-0.0001
0.60	0.0000	0.0000	0.0000	0.0000	0.0000	0.0026	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0044	0.0001	0.0000
0.65	0.0000	0.0000	0.0000	0.0000	0.0000	0.0053	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0047	0.0003	0.0001
0.70	0.0000	0.0000	0.0000	0.0000	0.0000	0.0047	0.0000	0.0001	0.0000	0.0000	0.0000	-0.0082	0.0004	0.0001
0.75	0.0000	0.0000	0.0000	0.0000	0.0000	0.0033	0.0000	0.0001	0.0000	0.0000	0.0000	-0.0094	0.0004	0.0002
0.80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0061	0.0000	0.0001	0.0000	-0.0001	0.0000	-0.0094	0.0002	0.0003
0.85	0.0000	0.0000	0.0000	0.0000	0.0000	0.0173	0.0000	0.0001	0.0000	-0.0001	0.0000	-0.0057	0.0003	0.0004
0.90	0.0000	0.0000	0.0000	0.0000	0.0000	0.0246	0.0000	0.0002	0.0000	-0.0001	0.0000	-0.0001	0.0000	0.0003
0.95	0.0001	0.0000	0.0000	-0.0001	0.0000	0.0212	0.0001	0.0006	-0.0001	-0.0001	0.0000	-0.0052	0.0003	0.0014

Table F-6 continued.

Quantiles	PM-cond., inorganic, WS/FF Asphalt	PM-cond., organic WS/FF Asphalt	PM-filterable Asphalt, Batch Mix	PM-filterable Asphalt, Drum Mix	PM-filterable OSB, Hot Press	PM-filterable, ESP, Refuse Comb.	PM-filterable, SD/ ESP Refuse Comb.	PM-filterable SD/FF Refuse Comb.	PM-filterable, UNC, Refuse Comb.	PM-filterable, ESP, Refuse Comb.	PM-filterable, UNC, Refuse Comb.	PM-filterable, MC, Wood Comb.	PM-filterable, UNC, Wood Comb.	PM-filterable, UNC, Wood Comb.	Sulfur dioxide, Wood Comb.
0.05	0.0000	0.0000	0.0000	0.0000	-0.0005	0.0002	0.0000	0.0002	0.0234	-0.0010	-0.0374	-0.0010	0.0018	-0.0004	0.0000
0.10	0.0000	0.0000	0.0000	0.0000	-0.0007	0.0004	0.0000	0.0001	0.0632	0.0003	0.0224	0.0004	0.0020	-0.0002	0.0000
0.15	0.0000	0.0000	0.0000	0.0000	-0.0001	0.0005	-0.0003	-0.0003	0.0683	-0.0001	0.0045	0.0011	-0.0006	0.0012	0.0000
0.20	0.0000	0.0000	0.0001	0.0000	0.0003	0.0000	0.0000	-0.0003	-0.0043	-0.0009	0.0152	0.0013	-0.0003	0.0012	0.0000
0.25	0.0000	0.0000	0.0001	-0.0001	0.0002	0.0008	-0.0002	-0.0002	0.0224	-0.0028	0.0196	0.0012	0.0016	0.0002	0.0000
0.30	0.0000	0.0000	0.0002	-0.0001	0.0008	0.0011	-0.0004	-0.0002	-0.0863	-0.0018	0.0155	0.0016	0.0016	0.0011	0.0000
0.35	0.0000	0.0000	0.0002	0.0000	0.0004	0.0016	-0.0002	-0.0004	-0.0641	-0.0037	0.0304	0.0007	0.0010	0.0002	0.0000
0.40	0.0001	0.0001	0.0002	-0.0001	0.0002	0.0019	-0.0003	-0.0002	-0.0895	-0.0050	0.0288	0.0008	0.0013	-0.0001	0.0000
0.45	0.0001	0.0001	0.0001	-0.0001	0.0004	0.0015	-0.0004	-0.0003	-0.0734	-0.0028	0.0294	0.0022	0.0002	-0.0021	0.0000
0.50	0.0001	0.0001	0.0000	-0.0001	0.0006	0.0011	-0.0004	0.0001	-0.0550	-0.0033	0.0319	0.0020	-0.0003	-0.0005	0.0000
0.55	0.0001	0.0000	0.0000	0.0000	0.0004	0.0006	-0.0003	-0.0002	-0.0963	-0.0052	0.0330	0.0018	0.0013	-0.0027	0.0001
0.60	0.0001	0.0000	0.0001	-0.0001	-0.0002	-0.0003	0.0001	0.0000	-0.0959	-0.0019	0.0435	0.0020	-0.0001	-0.0021	0.0002
0.65	0.0001	0.0001	-0.0001	0.0000	0.0010	-0.0007	0.0002	0.0000	-0.0274	-0.0012	0.0539	0.0032	0.0016	-0.0056	0.0002
0.70	0.0000	-0.0001	0.0000	0.0000	0.0007	-0.0004	-0.0003	-0.0003	-0.0174	-0.0042	0.0630	0.0014	-0.0022	-0.0034	0.0005
0.75	0.0000	-0.0002	-0.0003	0.0001	0.0005	0.0017	-0.0004	-0.0009	-0.0801	0.0032	0.0518	0.0017	0.0013	-0.0017	0.0003
0.80	0.0000	-0.0004	-0.0004	-0.0001	0.0025	-0.0006	-0.0001	-0.0012	-0.0730	-0.0008	0.0718	0.0012	0.0001	-0.0067	0.0005
0.85	0.0000	-0.0006	-0.0004	-0.0002	-0.0045	-0.0055	-0.0002	-0.0018	0.0050	-0.0176	0.0641	-0.0071	0.0021	-0.0014	0.0005
0.90	0.0001	-0.0008	0.0014	-0.0006	-0.0089	-0.0041	0.0003	-0.0036	0.0161	0.0109	0.0482	-0.0077	0.0084	0.0054	0.0007
0.95	-0.0002	-0.0003	0.0003	-0.0008	-0.0099	-0.0178	0.0011	-0.0076	-0.0414	-0.0212	0.0503	-0.0059	0.0120	0.0060	0.0006