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TABLE OF CRITICAL RADII FOR TAMPED SPHERES

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Table of Critical Radii for Tamped Spheres

The critical radius r (cm) for a tamped sphere of equal mean free paths can be obtained from the tables and figures of this report. The core and tamper properties are described by the parameters f and σ^-, where σ^- is the inverse mean free path of the core as well as the tamper and

$1 + f_1$ = the average number of neutrons emerging per collision in the core, and

$1 + f_2$ = ditto for the tamper.

For purposes of computation and interpolation $\sigma^- kr$ rather than r was tabulated. The quantity $\sigma^- kr$ is given by

$$\sigma^- kr = \frac{\pi}{2} + \arctan\frac{\nu}{k} + k\,\Delta X(f_1, f_2),$$

where

$$\frac{\arctan k}{k} = \frac{1}{1+f_1}, \quad \frac{\operatorname{arctanh}\nu}{\nu} = \frac{1}{1+f_2}$$

and $\Delta X(f_1, f_2)$ is the so-called end-point correction:

$$\Delta x = \frac{1}{\pi}\int_0^1 \left[g(f_2, \mu) - g(f_1, \mu)\right] \frac{d\mu}{1 - k^2\mu^2}$$

with

$$g(f, \mu) = \arctan\left[\frac{2}{\pi(1+f)\mu} - \frac{2}{\pi}\operatorname{arctanh}\mu\right].$$

For small k the following expansion and table is useful:

$$k = \sqrt{3f_1}\left(1 + .4\,f_1 - .0686\,f_1^2 + \ldots\right)$$

Table of $\Delta X(f_1, f_2)$

f_2 \ f_1	0	.1	.2
-1.0	.28954	.26311	.24085
- .9	.26236	.23971	.22051
- .8	.23002	.21216	.19673
- .7	.19298	.18089	.16991
- .6	.15537	.14910	.14262
- .5	.12058	.11949	.11708
- .4	.08971	.09298	.09403
- .3	.06269	.06957	.07354
- .2	.03906	.04895	.05536
- .1	.01831	.03069	.03917
0	.00000	.01449	.02471

Figure 1 gives σ_{kr} (denoted σ_{kr_0}) for $f_2 = -1.0$ as a function of f_1. Figure 2 gives $\sigma_{kr}/\sigma_{kr_0} = r/r_0$ as a function of f_1 for various f_2, and Figure 3 the same for various ν.

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TABLE OF σ^- for [redacted]

	f_2	-.000	-.005	-.010	-.015	-.020	-.025
f_1	k	.00000	.12223	.17282	.21066	.24298	.27111
0	.00000	1.5708	3.1416	3.1416	3.1416	3.1416	3.1416
.01	.17390	1.5711	2.1839	2.3528	2.4527	2.5215	2.5725
.02	.24690	1.5716	2.0515	2.1819	2.2791	2.3499	2.4047
.03	.30558	1.5723	1.9563	2.0896	2.1801	2.2488	2.3025
.04	.35191	1.5731	1.9076	2.0294	2.1157	2.1786	2.2309
.05	.39498	1.5739	1.8744	1.9864	2.0652	2.1267	2.1771
.06	.43454	1.5748	1.8495	1.9536	2.0278	2.0865	2.1348
.07	.47094	1.5758	1.8301	1.9277	1.9979	2.0536	2.1000
.08	.50536	1.5769	1.8146	1.9066	1.9735	2.0266	2.0712
.09	.53804	1.5779	1.8017	1.8891	1.9527	2.0058	2.0468
.10	.56926	1.5790	1.7910	1.8742	1.9351	1.9842	2.0257
.11	.59827	1.5802	1.7819	1.8614	1.9199	1.9672	2.0073
.12	.62822	1.5814	1.7740	1.8504	1.9066	1.9523	1.9912
.13	.65627	1.5826	1.7672	1.8407	1.8949	1.9391	1.9768
.14	.68352	1.5838	1.7613	1.8321	1.8846	1.9274	1.9639
.15	.71007	1.5850	1.7560	1.8245	1.8752	1.9168	1.9524
.16	.73599	1.5863	1.7514	1.8177	1.8669	1.9073	1.9419
.17	.76134	1.5876	1.7473	1.8115	1.8594	1.8986	1.9324
.18	.78619	1.5888	1.7436	1.8060	1.8526	1.8908	1.9237
.19	.81058	1.5901	1.7404	1.8010	1.8463	1.8836	1.9157
.20	.83454	1.5914	1.7374	1.7964	1.8406	1.8771	1.9084
.21	.85812	1.5927	1.7348	1.7923	1.8354	1.8710	1.9017
.22	.88134	1.5940	1.7324	1.7885	1.8307	1.8654	1.8955
.23	.90425	1.5954	1.7303	1.7851	1.8263	1.8603	1.8897
.24	.92682	1.5967	1.7284	1.7819	1.8222	1.8556	1.8844
.25	.94913	1.5980	1.7267	1.7790	1.8185	1.8511	1.8794
.26	.97118	1.5993	1.7252	1.7764	1.8150	1.8470	1.8747
.27	.99299	1.6006	1.7238	1.7739	1.8118	1.8432	1.8704
.28	1.0146	1.6020	1.7225	1.7717	1.8088	1.8396	1.8663
.29	1.0359	1.6033	1.7214	1.7696	1.8061	1.8363	1.8625
.30	1.0571	1.6046	1.7204	1.7677	1.8035	1.8332	1.8590
.31	1.0781	1.6060	1.7195	1.7659	1.8011	1.8303	1.8557
.32	1.0988	1.6073	1.7187	1.7643	1.7989	1.8276	1.8526
.33	1.1195	1.6086	1.7180	1.7628	1.7968	1.8250	1.8496
.34	1.1399	1.6099	1.7174	1.7615	1.7949	1.8226	1.8468
.35	1.1603	1.6112	1.7169	1.7602	1.7931	1.8204	1.8442
.36	1.1804	1.6125	1.7164	1.7590	1.7914	1.8183	1.8418
.37	1.2005	1.6138	1.7160	1.7580	1.7898	1.8163	1.8394
.38	1.2204	1.6151	1.7157	1.7570	1.7883	1.8145	1.8373
.39	1.2401	1.6164	1.7154	1.7561	1.7870	1.8127	1.8352
.40	1.2598	1.6177	1.7151	1.7552	1.7857	1.8111	1.8332

[redacted]

TABLE OF σ^{-} for

	f_2	-.000	-.005	-.010	-.015	-.020	-.025
f_1	k \ v	.00000	.12223	.17262	.21066	.24290	.27111
.40		1.2596	1.6177	1.7151	1.7552	1.7857	1.8111	1.8332
.41		1.2794	1.6190	1.7150	1.7543	1.7848	1.8006	1.8314
.42		1.2998	1.6205	1.7148	1.7538	1.7834	1.8081	1.8297
.43		1.3182	1.6216	1.7147	1.7531	1.7824	1.8067	1.8280
.44		1.3374	1.6228	1.7147	1.7526	1.7814	1.8054	1.8265
.45		1.3566	1.6241	1.7147	1.7520	1.7805	1.8042	1.8250
.46		1.3756	1.6253	1.7147	1.7516	1.7796	1.8031	1.8236
.47		1.3946	1.6266	1.7147	1.7511	1.7788	1.8020	1.8223
.48		1.4136	1.6278	1.7148	1.7506	1.7781	1.8010	1.8210
.49		1.4324	1.6291	1.7149	1.7504	1.7774	1.8000	1.8198
.50		1.4511	1.6305	1.7150	1.7501	1.7768	1.7992	1.8187
.51		1.4698	1.6315	1.7152	1.7498	1.7762	1.7985	1.8176
.52		1.4884	1.6327	1.7154	1.7496	1.7757	1.7978	1.8166
.53		1.5069	1.6339	1.7156	1.7494	1.7752	1.7968	1.8157
.54		1.5254	1.6351	1.7158	1.7492	1.7748	1.7961	1.8148
.55		1.5438	1.6365	1.7161	1.7491	1.7743	1.7954	1.8140
.56		1.5622	1.6375	1.7164	1.7490	1.7740	1.7948	1.8132
.57		1.5806	1.6387	1.7166	1.7489	1.7736	1.7943	1.8124
.58		1.5987	1.6399	1.7169	1.7489	1.7735	1.7937	1.8117
.59		1.6169	1.6410	1.7172	1.7488	1.7730	1.7932	1.8110
.60		1.6350	1.6422	1.7176	1.7488	1.7727	1.7928	1.8104
.61		1.6531	1.6433	1.7179	1.7488	1.7725	1.7925	1.8097
.62		1.6711	1.6445	1.7182	1.7489	1.7723	1.7919	1.8092
.63		1.6891	1.6456	1.7187	1.7490	1.7721	1.7916	1.8087
.64		1.7070	1.6468	1.7190	1.7490	1.7720	1.7912	1.8082
.65		1.7249	1.6479	1.7194	1.7491	1.7718	1.7909	1.8077
.66		1.7428	1.6490	1.7198	1.7492	1.7717	1.7908	1.8072
.67		1.7606	1.6501	1.7202	1.7493	1.7716	1.7904	1.8068
.68		1.7784	1.6512	1.7206	1.7495	1.7717	1.7901	1.8064
.69		1.7961	1.6523	1.7210	1.7496	1.7715	1.7899	1.8060
.70		1.8138	1.6534	1.7215	1.7498	1.7715	1.7897	1.8057
.71		1.8314	1.6546	1.7219	1.7500	1.7715	1.7896	1.8054
.72		1.8490	1.6556	1.7223	1.7501	1.7714	1.7895	1.8051
.73		1.8666	1.6566	1.7228	1.7504	1.7715	1.7893	1.8048
.74		1.8842	1.6577	1.7232	1.7506	1.7715	1.7891	1.8045
.75		1.9017	1.6587	1.7235	1.7508	1.7715	1.7890	1.8043
.76		1.9192	1.6598	1.7242	1.7510	1.7716	1.7889	1.8041
.77		1.9367	1.6608	1.7246	1.7512	1.7716	1.7888	1.8039
.78		1.9541	1.6618	1.7251	1.7515	1.7717	1.7887	1.8037
.79		1.9715	1.6629	1.7256	1.7517	1.7718	1.7887	1.8036
.80		1.9888	1.6639	1.7261	1.7520	1.7719	1.7886	1.8035

TABLE OF σ_{kr}

	f_2	-.000	-.005	-.010	-.015	-.020	-.025
f_1	k / ν	.00000	.12225	.17252	.21096	.24298	.27111
.80	1.9888	1.6639	1.7261	1.7520	1.7719	1.7886	1.8035
.81	2.0082	1.6649	1.7265	1.7523	1.7720	1.8095	1.8032
.82	2.0255	1.6659	1.7270	1.7525	1.7721	1.8081	1.8031
.83	2.0408	1.6669	1.7275	1.7528	1.7722	1.8067	1.8030
.84	2.0560	1.6679	1.7280	1.7531	1.7724	1.8054	1.8029
.85	2.0765	1.6689	1.7285	1.7534	1.7725	1.8042	1.8028
.86	2.0925	1.6699	1.7290	1.7537	1.7727	1.8031	1.8027
.87	2.1097	1.6709	1.7295	1.7540	1.7729	1.8020	1.8026
.88	2.1268	1.6718	1.7300	1.7543	1.7730	1.8010	1.8026
.89	2.1439	1.6728	1.7305	1.7547	1.7732	1.8000	1.8026
.90	2.1611	1.6737	1.7310	1.7550	1.7734	1.7992	1.8025
.91	2.1782	1.6747	1.7315	1.7553	1.7736	1.7983	1.8025
.92	2.1952	1.6756	1.7320	1.7556	1.7738	1.7975	1.8025
.93	2.2123	1.6766	1.7326	1.7560	1.7740	1.7968	1.8025
.94	2.2293	1.6775	1.7331	1.7563	1.7742	1.7961	1.8025
.95	2.2463	1.6784	1.7336	1.7566	1.7744	1.7954	1.8025
.96	2.2633	1.6793	1.7341	1.7570	1.7746	1.7948	1.8026
.97	2.2803	1.6802	1.7346	1.7574	1.7749	1.7943	1.8026
.98	2.2973	1.6812	1.7351	1.7577	1.7751	1.7937	1.8026
.99	2.3142	1.6821	1.7356	1.7580	1.7753	1.7932	1.8027
1.00	2.3311	1.6830	1.7361	1.7584	1.7756	1.7928	1.8027
1.01	2.3481	1.6838	1.7366	1.7588	1.7758	1.7923	1.8028
1.02	2.3648	1.6847	1.7372	1.7591	1.7760	1.7919	1.8028
1.03	2.3818	1.6856	1.7377	1.7595	1.7763	1.7916	1.8029
1.04	2.3986	1.6865	1.7382	1.7598	1.7765	1.7912	1.8030
1.06	2.4155	1.6873	1.7387	1.7602	1.7768	1.7909	1.8031
1.06	2.4325	1.6882	1.7392	1.7606	1.7771	1.7906	1.8032
1.07	2.4491	1.6890	1.7397	1.7610	1.7773	1.7904	1.8033
1.08	2.4659	1.6899	1.7402	1.7613	1.7776	1.7901	1.8034
1.09	2.4827	1.6907	1.7407	1.7617	1.7778	1.7899	1.8035
1.10	2.4994	1.6916	1.7412	1.7621	1.7781	1.7897	1.8036
1.11	2.5162	1.6924	1.7417	1.7625	1.7784	1.7895	1.8037
1.12	2.5329	1.6933	1.7422	1.7628	1.7787	1.7895	1.8038
1.13	2.5497	1.6941	1.7428	1.7632	1.7789	1.7892	1.8040
1.14	2.5663	1.6949	1.7433	1.7636	1.7792	1.7891	1.8041
1.15	2.5830	1.6957	1.7438	1.7640	1.7795	1.7890	1.8042
1.16	2.5998	1.6965	1.7443	1.7643	1.7798	1.7889	1.8044
1.17	2.6164	1.6973	1.7448	1.7647	1.7801	1.7888	1.8045
1.18	2.6330	1.6981	1.7453	1.7651	1.7804	1.7887	1.8047
1.19	2.6497	1.6989	1.7458	1.7655	1.7807	1.7887	1.8048
1.20	2.6664	1.6997	1.7463	1.7658	1.7810	1.7886	1.8050

TABLE OF σ kr

	f_2	-.05	-.060	-.075	-.100	-.125	-.150
f_1	k \ y	.29638	.37949	.45995	.52543	.58108	.62960
0	.00000	3.1416	3.1416	3.1416	3.1416	3.1416	3.1416
.01	.17390	2.6122	2.7137	2.7827	2.8254	2.8631	2.8787
.02	.24690	2.4491	3.5678	2.6530	2.7075	2.7462	2.7754
.03	.30358	2.3472	2.4709	2.5636	2.6245	2.6684	2.7020
.04	.35191	2.2748	2.3991	2.4952	2.5598	2.6070	2.6436
.05	.39498	2.2196	2.3426	2.4402	2.5069	2.5562	2.5949
.06	.43434	2.1758	2.2965	2.3943	2.4622	2.5130	2.5531
.07	.47094	2.1398	2.2579	2.3552	2.4237	2.4755	2.5166
.08	.50536	2.1097	2.2250	2.3214	2.3900	2.4424	2.4842
.09	.53804	2.0840	2.1966	2.2917	2.3603	2.4129	2.4552
.10	.56926	2.0617	2.1715	2.2654	2.3337	2.3865	2.4289
.11	.59927	2.0422	2.1494	2.2419	2.3098	2.3624	2.4050
.12	.62822	2.0250	2.1296	2.2207	2.2879	2.3406	2.3832
.13	.65627	2.0097	2.1119	2.2014	2.2680	2.3206	2.3630
.14	.68352	1.9960	2.0958	2.1839	2.2497	2.3022	2.3444
.15	.71007	1.9836	2.0811	2.1678	2.2330	2.2852	2.3272
.16	.73599	1.9723	2.0676	2.1531	2.2174	2.2694	2.3110
.17	.76134	1.9621	2.0555	2.1394	2.2030	2.2548	2.2960
.18	.78619	1.9527	2.0442	2.1268	2.1897	2.2412	2.2820
.19	.81058	1.9441	2.0338	2.1150	2.1771	2.2284	2.2687
.20	.83454	1.9362	2.0241	2.1040	2.1654	2.2165	2.2563
.21	.85812	1.9288	2.0151	2.0938	2.1544	2.2051	2.2446
.22	.88134	1.9220	2.0067	2.0842	2.1441	2.1943	2.2335
.23	.90423	1.9158	1.9989	2.0753	2.1344	2.1841	2.2230
.24	.92682	1.9099	1.9916	2.0668	2.1253	2.1744	2.2131
.25	.94915	1.9044	1.9847	2.0589	2.1166	2.1651	2.2037
.26	.97118	1.8993	1.9783	2.0514	2.1084	2.1563	2.1948
.27	.99299	1.8946	1.9722	2.0443	2.1007	2.1479	2.1862
.28	1.0146	1.8901	1.9665	2.0376	2.0933	2.1398	2.1781
.29	1.0359	1.8859	1.9611	2.0312	2.0865	2.1321	2.1705
.30	1.0571	1.8820	1.9560	2.0252	2.0796	2.1246	2.1629
.31	1.0781	1.8782	1.9512	2.0194	2.0733	2.1178	2.1558
.32	1.0988	1.8748	1.9466	2.0140	2.0673	2.1113	2.1491
.33	1.1195	1.8715	1.9423	2.0089	2.0615	2.1051	2.1426
.34	1.1399	1.8684	1.9382	2.0040	2.0560	2.0991	2.1364
.35	1.1605	1.8654	1.9343	1.9992	2.0508	2.0934	2.1304
.36	1.1804	1.8627	1.9306	1.9946	2.0458	2.0880	2.1247
.37	1.2005	1.8601	1.9271	1.9905	2.0409	2.0828	2.1192
.38	1.2204	1.8576	1.9238	1.9864	2.0363	2.0779	2.1139
.39	1.2401	1.8553	1.9206	1.9825	2.0319	2.0732	2.1088
.40	1.2598	1.8531	1.9175	1.9787	2.0276	2.0686	2.1039

TABLE OF σ 1r

	f_2	-.050	-.060	-.075	-.100	-.125	-.150
f_1	k \ ν	.29658	.37949	.46985	.62543	.68108	.62950
.40	1.8598	1.8631	1.9175	1.9787	2.0276	2.0606	2.1059
.41	1.2794	1.8510	1.9146	1.9751	2.0236	2.0642	2.0992
.42	1.2988	1.8490	1.9118	1.9717	2.0197	2.0609	2.0946
.43	1.3182	1.8471	1.9092	1.9684	2.0159	2.0558	2.0902
.44	1.3374	1.8453	1.9067	1.9652	2.0123	2.0518	2.0860
.45	1.3566	1.8436	1.9043	1.9622	2.0088	2.0480	2.0819
.46	1.3756	1.8420	1.9020	1.9593	2.0054	2.0443	2.0780
.47	1.3946	1.8404	1.8997	1.9565	2.0022	2.0408	2.0742
.48	1.4135	1.8390	1.8976	1.9538	1.9991	2.0375	2.0706
.49	1.4324	1.8376	1.8956	1.9512	1.9961	2.0340	2.0669
.50	1.4511	1.8362	1.8936	1.9487	1.9932	2.0306	2.0634
.51	1.4698	1.8350	1.8918	1.9463	1.9904	2.0277	2.0601
.52	1.4884	1.8339	1.8900	1.9440	1.9877	2.0247	2.0568
.53	1.5069	1.8327	1.8883	1.9418	1.9851	2.0218	2.0537
.54	1.5254	1.8316	1.8866	1.9396	1.9826	2.0190	2.0507
.55	1.5438	1.8306	1.8850	1.9375	1.9801	2.0162	2.0477
.56	1.5622	1.8296	1.8835	1.9355	1.9778	2.0136	2.0448
.57	1.5806	1.8286	1.8821	1.9336	1.9755	2.0110	2.0420
.58	1.5987	1.8278	1.8807	1.9318	1.9733	2.0086	2.0394
.59	1.6169	1.8269	1.8793	1.9299	1.9711	2.0062	2.0367
.60	1.6350	1.8261	1.8780	1.9282	1.9690	2.0038	2.0342
.61	1.6531	1.8254	1.8768	1.9265	1.9670	2.0016	2.0317
.62	1.6711	1.8246	1.8756	1.9249	1.9651	1.9994	2.0293
.63	1.6891	1.8240	1.8745	1.9234	1.9632	1.9972	2.0270
.64	1.7070	1.8233	1.8734	1.9219	1.9614	1.9952	2.0247
.65	1.7249	1.8227	1.8723	1.9204	1.9596	1.9932	2.0225
.66	1.7428	1.8221	1.8713	1.9190	1.9580	1.9912	2.0204
.67	1.7606	1.8216	1.8703	1.9176	1.9563	1.9893	2.0183
.68	1.7784	1.8212	1.8694	1.9163	1.9547	1.9875	2.0163
.69	1.7961	1.8206	1.8684	1.9150	1.9531	1.9857	2.0143
.70	1.8138	1.8201	1.8676	1.9138	1.9516	1.9840	2.0124
.71	1.8314	1.8196	1.8667	1.9126	1.9501	1.9823	2.0106
.72	1.8490	1.8193	1.8659	1.9114	1.9487	1.9806	2.0087
.73	1.8666	1.8188	1.8652	1.9103	1.9473	1.9790	2.0069
.74	1.8842	1.8184	1.8644	1.9092	1.9459	1.9775	2.0051
.75	1.9017	1.8181	1.8637	1.9081	1.9446	1.9759	2.0034
.76	1.9192	1.8178	1.8630	1.9071	1.9433	1.9744	2.0018
.77	1.9367	1.8174	1.8623	1.9061	1.9421	1.9730	2.0002
.78	1.9541	1.8171	1.8617	1.9051	1.9409	1.9716	1.9986
.79	1.9715	1.8168	1.8611	1.9042	1.9397	1.9702	1.9971
.80	1.9888	1.8166	1.8605	1.9033	1.9386	1.9688	1.9956

TABLE OF σ^{-} kr

	f_2	-.050	-.050	-.075	-.100	-.125	-.150
f_1	k / ν	.20658	.37949	.48995	.62543	.80106	.82650
.00	1.9868	1.0168	1.0005	1.9858	1.9806	1.9808	1.9956
.81	2.0062	1.0163	1.0099	1.9834	1.9574	1.9876	1.9941
.82	2.0235	1.0161	1.0095	1.9816	1.9564	1.9865	1.9927
.83	2.0408	1.0159	1.0088	1.9808	1.9553	1.9850	1.9913
.84	2.0580	1.0157	1.0083	1.9800	1.9545	1.9838	1.9900
.85	2.0753	1.0155	1.0078	1.9792	1.9535	1.9827	1.9886
.86	2.0925	1.0154	1.0073	1.9804	1.9523	1.9815	1.9873
.87	2.1097	1.0152	1.0069	1.9977	1.9514	1.9804	1.9861
.88	2.1268	1.0151	1.0064	1.9970	1.9506	1.9795	1.9848
.89	2.1439	1.0149	1.0060	1.9968	1.9296	1.9682	1.9836
.90	2.1611	1.0148	1.0056	1.9956	1.9287	1.9672	1.9824
.91	2.1782	1.0147	1.0052	1.9950	1.9278	1.9662	1.9813
.92	2.1952	1.0146	1.0049	1.9944	1.9270	1.9652	1.9801
.93	2.2123	1.0145	1.0045	1.9938	1.9262	1.9642	1.9790
.94	2.2295	1.0145	1.0042	1.9932	1.9254	1.9633	1.9780
.95	2.2465	1.0144	1.0039	1.9926	1.9247	1.9624	1.9769
.96	2.2635	1.0143	1.0035	1.9920	1.9239	1.9615	1.9759
.97	2.2805	1.0143	1.0032	1.9915	1.9232	1.9606	1.9749
.98	2.2975	1.0143	1.0030	1.9910	1.9225	1.9597	1.9739
.99	2.3142	1.0142	1.0027	1.9905	1.9218	1.9589	1.9729
1.00	2.3311	1.0142	1.0024	1.9900	1.9211	1.9581	1.9720
1.01	2.3481	1.0142	1.0022	1.9896	1.9205	1.9572	1.9710
1.02	2.3648	1.0142	1.0019	1.9890	1.9198	1.9565	1.9701
1.03	2.3818	1.0142	1.0017	1.9886	1.9192	1.9557	1.9692
1.04	2.3986	1.0142	1.0014	1.9881	1.9186	1.9550	1.9684
1.05	2.4155	1.0142	1.0012	1.9877	1.9180	1.9542	1.9675
1.06	2.4323	1.0142	1.0010	1.9873	1.9174	1.9535	1.9667
1.07	2.4491	1.0143	1.0008	1.9869	1.9168	1.9528	1.9658
1.08	2.4659	1.0143	1.0006	1.9865	1.9163	1.9521	1.9650
1.09	2.4827	1.0144	1.0005	1.9861	1.9157	1.9514	1.9643
1.10	2.4994	1.0144	1.0003	1.9858	1.9152	1.9508	1.9635
1.11	2.5162	1.0144	1.0002	1.9854	1.9147	1.9501	1.9627
1.12	2.5329	1.0145	1.0000	1.9851	1.9142	1.9495	1.9620
1.13	2.5497	1.0146	1.0099	1.9847	1.9137	1.9489	1.9613
1.14	2.5663	1.0146	1.0097	1.9844	1.9132	1.9483	1.9606
1.15	2.5830	1.0147	1.0096	1.9841	1.9128	1.9477	1.9599
1.16	2.5996	1.0148	1.0095	1.9838	1.9124	1.9471	1.9592
1.17	2.6164	1.0149	1.0094	1.9835	1.9119	1.9465	1.9585
1.18	2.6330	1.0150	1.0093	1.9832	1.9114	1.9460	1.9579
1.19	2.6497	1.0150	1.0092	1.9829	1.9110	1.9454	1.9572
1.20	2.6664	1.0151	1.0091	1.9826	1.9106	1.9449	1.9566

TABLE OF σ kr

	f_2	-.20	-.25	-.30	-.35	-.40	-.50
f_1	y / k	.71041	.77852	.82863	.87206	.90735	.95750
0	.00000	3.1416	3.1416	3.1416	3.1416	3.1416	3.1416
.01	.17590	2.9065	2.9300	2.9458	2.9585	2.9679	2.9829
.02	.24690	2.8173	2.8463	2.8679	2.8852	2.8983	2.9190
.03	.30358	2.7506	2.7847	2.8102	2.8306	2.8465	2.8711
.04	.35191	2.6970	2.7347	2.7632	2.7860	2.8037	2.8317
.05	.39498	2.6518	2.6923	2.7231	2.7478	2.7672	2.7978
.06	.43434	2.6126	2.6554	2.6880	2.7142	2.7351	2.7679
.07	.47094	2.5780	2.6226	2.6567	2.6847	2.7065	2.7410
.08	.50536	2.5472	2.5931	2.6285	2.6570	2.6802	2.7165
.09	.53804	2.5195	2.5664	2.6028	2.6322	2.6565	2.6940
.10	.56926	2.4939	2.5420	2.5795	2.6093	2.6342	2.6732
.11	.59927	2.4707	2.5194	2.5575	2.5882	2.6137	2.6539
.12	.62822	2.4492	2.4986	2.5372	2.5684	2.5946	2.6358
.13	.65627	2.4294	2.4792	2.5184	2.5501	2.5768	2.6188
.14	.68352	2.4109	2.4611	2.5007	2.5328	2.5600	2.6027
.15	.71007	2.3938	2.4442	2.4841	2.5166	2.5441	2.5876
.16	.73599	2.3776	2.4283	2.4685	2.5013	2.5292	2.5732
.17	.76134	2.3625	2.4135	2.4538	2.4869	2.5150	2.5596
.18	.78619	2.3483	2.3992	2.4398	2.4732	2.5015	2.5466
.19	.81058	2.3340	2.3858	2.4266	2.4602	2.4887	2.5343
.20	.83454	2.3222	2.3731	2.4140	2.4479	2.4765	2.5224
.21	.85812	2.3102	2.3611	2.4020	2.4360	2.4648	2.5111
.22	.88134	2.2989	2.3497	2.3907	2.4247	2.4537	2.5003
.23	.90423	2.2881	2.3388	2.3798	2.4141	2.4430	2.4899
.24	.92682	2.2778	2.3284	2.3695	2.4037	2.4328	2.4799
.25	.94913	2.2681	2.3185	2.3595	2.3938	2.4229	2.4703
.26	.97118	2.2587	2.3090	2.3500	2.3843	2.4135	2.4611
.27	.99299	2.2498	2.3000	2.3409	2.3752	2.4045	2.4522
.28	1.0146	2.2413	2.2912	2.3321	2.3664	2.3957	2.4436
.29	1.0359	2.2332	2.2829	2.3237	2.3580	2.3873	2.4353
.30	1.0571	2.2254	2.2749	2.3156	2.3498	2.3792	2.4273
.31	1.0781	2.2179	2.2672	2.3078	2.3420	2.3714	2.4196
.32	1.0988	2.2107	2.2599	2.3003	2.3345	2.3639	2.4121
.33	1.1195	2.2038	2.2527	2.2931	2.3272	2.3566	2.4048
.34	1.1399	2.1972	2.2459	2.2861	2.3202	2.3496	2.3978
.35	1.1603	2.1908	2.2395	2.2794	2.3134	2.3427	2.3910
.36	1.1804	2.1847	2.2330	2.2729	2.3068	2.3361	2.3845
.37	1.2006	2.1788	2.2268	2.2666	2.3004	2.3297	2.3780
.38	1.2204	2.1731	2.2209	2.2605	2.2943	2.3235	2.3718
.39	1.2401	2.1677	2.2152	2.2546	2.2883	2.3175	2.3658
.40	1.2598	2.1624	2.2096	2.2490	2.2825	2.3116	2.3600

	f_2	-.20	-.25	-.30	-.35	-.40	-.50
f_1	k \ y	.71041	.77552	.82863	.87206	.90733	.96760
.40	1.2598	1.6177	1.7151	1.7552	1.7857	1.8111	1.8532
.41	1.2794	2.1572	2.2042	2.2434	2.2769	2.3060	2.3545
.42	1.2988	2.1523	2.1991	2.2381	2.2715	2.3006	2.3488
.43	1.3182	2.1475	2.1940	2.2329	2.2662	2.2952	2.3434
.44	1.3374	2.1429	2.1892	2.2279	2.2611	2.2900	2.3381
.45	1.3566	2.1384	2.1845	2.2230	2.2561	2.2849	2.3330
.46	1.3756	2.1341	2.1799	2.2183	2.2515	2.2800	2.3280
.47	1.3946	2.1300	2.1755	2.2137	2.2466	2.2752	2.3232
.48	1.4135	2.1259	2.1712	2.2092	2.2420	2.2706	2.3185
.49	1.4324	2.1219	2.1670	2.2049	2.2375	2.2660	2.3138
.50	1.4511	2.1181	2.1629	2.2006	2.2332	2.2616	2.3093
.51	1.4698	2.1144	2.1590	2.1965	2.2290	2.2573	2.3049
.52	1.4884	2.1109	2.1551	2.1925	2.2248	2.2531	2.3007
.53	1.5069	2.1074	2.1514	2.1887	2.2209	2.2490	2.2965
.54	1.5254	2.1040	2.1478	2.1849	2.2170	2.2451	2.2924
.55	1.5438	2.1007	2.1443	2.1812	2.2131	2.2412	2.2884
.56	1.5622	2.0975	2.1408	2.1776	2.2094	2.2374	2.2845
.57	1.5806	2.0944	2.1375	2.1741	2.2058	2.2336	2.2807
.58	1.5987	2.0913	2.1342	2.1707	2.2023	2.2300	2.2770
.59	1.6169	2.0884	2.1311	2.1673	2.1988	2.2265	2.2733
.60	1.6350	2.0855	2.1280	2.1641	2.1954	2.2230	2.2696
.61	1.6531	2.0828	2.1250	2.1609	2.1921	2.2196	2.2662
.62	1.6711	2.0801	2.1221	2.1578	2.1889	2.2163	2.2628
.63	1.6891	2.0774	2.1192	2.1548	2.1858	2.2131	2.2595
.64	1.7070	2.0748	2.1164	2.1519	2.1827	2.2100	2.2562
.65	1.7249	2.0723	2.1137	2.1490	2.1797	2.2069	2.2530
.66	1.7428	2.0699	2.1110	2.1462	2.1768	2.2038	2.2499
.67	1.7606	2.0675	2.1084	2.1434	2.1739	2.2009	2.2468
.68	1.7784	2.0652	2.1059	2.1407	2.1711	2.1980	2.2438
.69	1.7961	2.0629	2.1034	2.1381	2.1684	2.1952	2.2408
.70	1.8138	2.0607	2.1010	2.1355	2.1656	2.1924	2.2379
.71	1.8314	2.0585	2.0986	2.1330	2.1630	2.1896	2.2351
.72	1.8490	2.0564	2.0963	2.1305	2.1603	2.1870	2.2323
.73	1.8666	2.0544	2.0941	2.1281	2.1579	2.1844	2.2296
.74	1.8842	2.0524	2.0919	2.1258	2.1556	2.1818	2.2268
.75	1.9017	2.0504	2.0897	2.1235	2.1530	2.1793	2.2242
.76	1.9192	2.0485	2.0876	2.1212	2.1507	2.1768	2.2216
.77	1.9367	2.0466	2.0855	2.1190	2.1483	2.1744	2.2191
.78	1.9541	2.0448	2.0835	2.1168	2.1460	2.1720	2.2166
.79	1.9715	2.0430	2.0815	2.1147	2.1438	2.1697	2.2141
.80	1.9888	2.0412	2.0796	2.1126	2.1416	2.1674	2.2117

	f_2	-.200	-.25	-.30	-.35	-.40	-.50
f_1	k \ y	.71041	.77552	.82863	.87206	.90755	.96750
.80	1.9888	2.0412	2.0796	2.1126	2.1416	2.1674	2.2117
.81	2.0062	2.0395	2.0777	2.1108	2.1396	2.1652	2.2094
.82	2.0235	2.0379	2.0756	2.1086	2.1374	2.1630	2.2070
.83	2.0406	2.0362	2.0740	2.1066	2.1353	2.1606	2.2047
.84	2.0580	2.0347	2.0723	2.1047	2.1333	2.1587	2.2025
.85	2.0753	2.0331	2.0705	2.1028	2.1313	2.1566	2.2005
.86	2.0925	2.0316	2.0688	2.1010	2.1295	2.1546	2.1981
.87	2.1097	2.0300	2.0671	2.0992	2.1274	2.1526	2.1960
.88	2.1268	2.0286	2.0655	2.0974	2.1255	2.1506	2.1939
.89	2.1439	2.0272	2.0639	2.0957	2.1237	2.1487	2.1918
.90	2.1611	2.0257	2.0623	2.0939	2.1218	2.1468	2.1898
.91	2.1782	2.0244	2.0607	2.0922	2.1201	2.1449	2.1878
.92	2.1952	2.0230	2.0592	2.0906	2.1183	2.1431	2.1859
.93	2.2123	2.0217	2.0577	2.0890	2.1166	2.1413	2.1840
.94	2.2293	2.0204	2.0563	2.0874	2.1149	2.1395	2.1820
.95	2.2463	2.0191	2.0549	2.0858	2.1132	2.1378	2.1802
.96	2.2633	2.0179	2.0534	2.0843	2.1116	2.1360	2.1783
.97	2.2803	2.0167	2.0521	2.0828	2.1100	2.1344	2.1765
.98	2.2973	2.0155	2.0507	2.0813	2.1084	2.1327	2.1747
.99	2.3142	2.0143	2.0494	2.0799	2.1069	2.1311	2.1730
1.00	2.3311	2.0132	2.0481	2.0785	2.1054	2.1295	2.1713
1.01	2.3481	2.0120	2.0468	2.0770	2.1038	2.1279	2.1696
1.02	2.3648	2.0109	2.0456	2.0757	2.1024	2.1263	2.1679
1.03	2.3818	2.0098	2.0443	2.0743	2.1009	2.1248	2.1662
1.04	2.3986	2.0088	2.0431	2.0730	2.0995	2.1233	2.1646
1.05	2.4156	2.0077	2.0419	2.0717	2.0981	2.1218	2.1630
1.06	2.4325	2.0067	2.0407	2.0704	2.0967	2.1205	2.1614
1.07	2.4491	2.0057	2.0396	2.0691	2.0953	2.1189	2.1598
1.08	2.4659	2.0047	2.0384	2.0678	2.0940	2.1175	2.1583
1.09	2.4827	2.0037	2.0373	2.0666	2.0927	2.1161	2.1566
1.10	2.4994	2.0028	2.0362	2.0654	2.0914	2 .1147	2.1553
1.11	2.5162	2.0018	2.0352	2.0642	2.0901	2.1133	2.1538
1.12	2.5329	2.0009	2.0341	2.0631	2.0888	2.1120	2.0524
1.13	2.5497	2.0000	2.0331	2.0619	2.0876	2.1107	2.1509
1.14	2.5663	1.9992	2.0321	2.0606	2.0864	2.1094	2.1495
1.15	2.5830	1.9983	2.0311	2.0597	2.0852	2.1081	2.1482
1.16	2.5998	1.9974	2.0301	2.0586	2.0840	2.1069	2.1468
1.17	2.6164	1.9966	2.0291	2.0575	2.0828	2.1056	2.1454
1.18	2.6330	1.9958	2.0281	2.0564	2.0817	2.1044	2.1441
1.19	2.6497	1.9950	2.0272	2.0554	2.0805	2.1032	2.1427
1.20	2.6664	1.9942	2.0263	2.0544	2.0794	2.1020	2.1414

TABLE OF $g - kr$

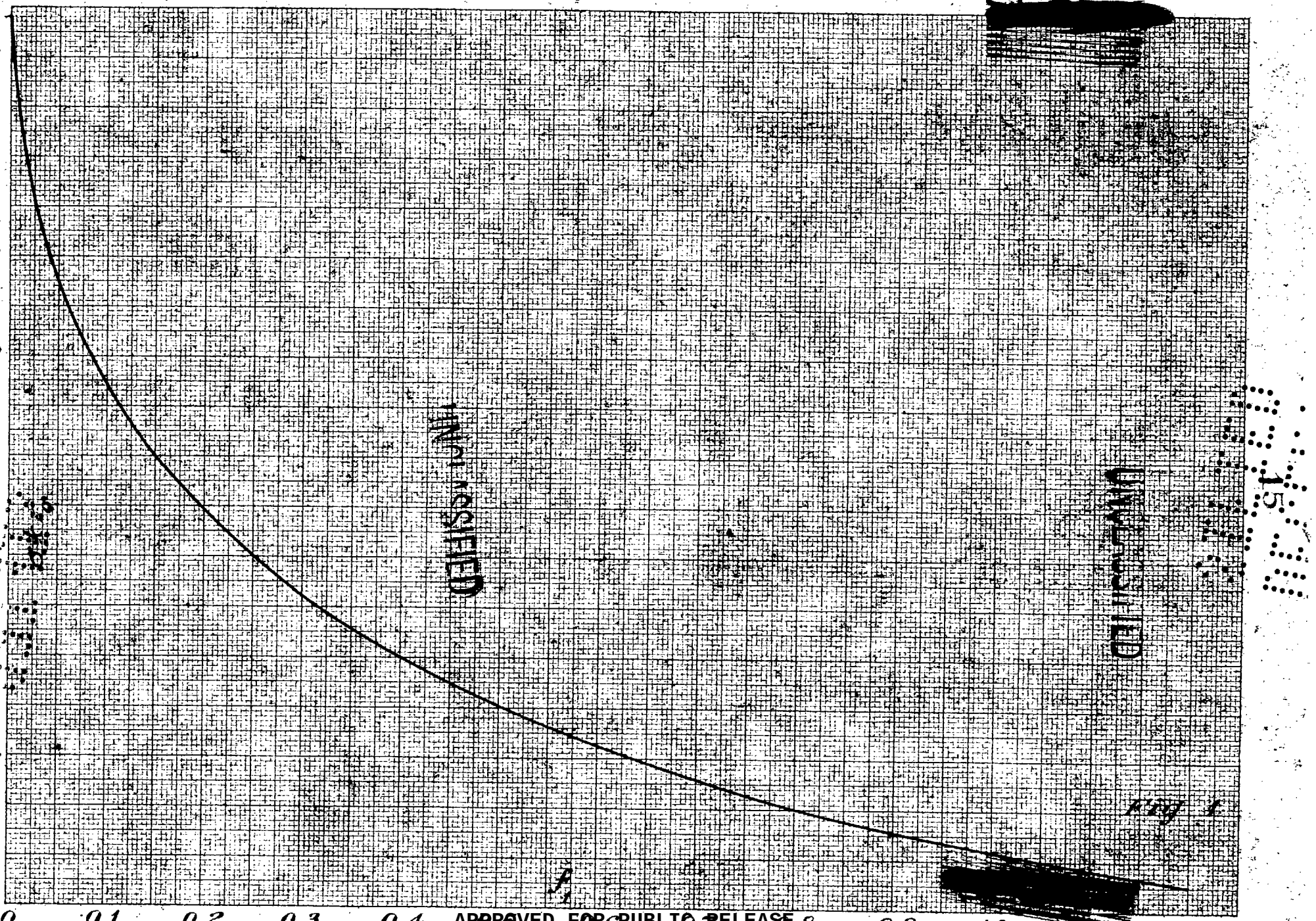
	f_2	-.60	-.70	-.80	-.90	-1.00
f_1	k \ ν	.98562	.99741	.99991	1.00000	1.00000
0	.00000	3.1416	3.1416	3.1416	3.1416	3.1416
.01	.17390	2.9939	3.0023	3.0091	3.0146	3.0193
.02	.24690	2.9342	2.9460	2.9554	2.9631	2.9696
.03	.30358	2.8894	2.9036	2.9149	2.9243	2.9322
.04	.35191	2.8525	2.8686	2.8815	2.8922	2.9012
.05	.39498	2.8206	2.8385	2.8526	2.8644	2.8743
.06	.43434	2.7924	2.8115	2.8269	2.8397	2.8504
.07	.47094	2.7670	2.7873	2.8037	2.8174	2.8289
.08	.50536	2.7438	2.7652	2.7826	2.7970	2.8091
.09	.53804	2.7225	2.7448	2.7630	2.7781	2.7908
.10	.56926	2.7027	2.7260	2.7448	2.7606	2.7739
.11	.59927	2.6843	2.7083	2.7278	2.7441	2.7580
.12	.62822	2.6670	2.6917	2.7119	2.7287	2.7430
.13	.65627	2.6508	2.6762	2.6968	2.7142	2.7289
.14	.68352	2.6354	2.6614	2.6826	2.7004	2.7155
.15	.71007	2.6209	2.6474	2.6691	2.6872	2.7028
.16	.73599	2.6071	2.6341	2.6562	2.6748	2.6906
.17	.76134	2.5940	2.6214	2.6440	2.6629	2.6791
.18	.78619	2.5815	2.6094	2.6323	2.6516	2.6680
.19	.81058	2.5696	2.5978	2.6210	2.6406	2.6574
.20	.83454	2.5581	2.5867	2.6103	2.6302	2.6472
.21	.85812	2.5470	2.5760	2.6000	2.6201	2.6374
.22	.88134	2.5366	2.5658	2.5900	2.6104	2.6280
.23	.90423	2.5265	2.5560	2.5805	2.6012	2.6189
.24	.92682	2.5168	2.5466	2.5713	2.5922	2.6102
.25	.94913	2.5074	2.5374	2.5624	2.5835	2.6017
.26	.97118	2.4985	2.5286	2.5538	2.5752	2.5935
.27	.99299	2.4897	2.5202	2.5455	2.5670	2.5856
.28	1.0146	2.4813	2.5119	2.5374	2.5592	2.5779
.29	1.0359	2.4732	2.5040	2.5297	2.5516	2.5704
.30	1.0571	2.4653	2.4963	2.5222	2.5442	2.5632
.31	1.0781	2.4577	2.4888	2.5148	2.5370	2.5563
.32	1.0988	2.4504	2.4816	2.5078	2.5301	2.5494
.33	1.1196	2.4432	2.4746	2.5009	2.5233	2.5428
.34	1.1399	2.4363	2.4678	2.4942	2.5168	2.5364
.35	1.1603	2.4296	2.4612	2.4877	2.5104	2.5301
.36	1.1804	2.4231	2.4548	2.4814	2.5042	2.5240
.37	1.2005	2.4167	2.4485	2.4755	2.4982	2.5180
.38	1.2204	2.4106	2.4424	2.4693	2.4923	2.5122
.39	1.2401	2.4046	2.4365	2.4634	2.4865	2.5066
.40	1.2598	2.3988	2.4308	2.4578	2.4810	2.5011

TABLE OF σ_{kr}

	f_2	-.60	-.70	-.80	-.90	-1.00
f_1	k \ y	.98662	.99741	.99991	1.00000	1.00000
.40		1.2698	1.6177	1.7151	1.7552	1.7857	1.8111
.41		1.2794	2.3951	2.4252	2.4522	2.4755	2.4967
.42		1.2988	2.3876	2.4197	2.4468	2.4702	2.4905
.43		1.3182	2.3822	2.4145	2.4416	2.4650	2.4854
.44		1.3374	2.3770	2.4092	2.4364	2.4599	2.4803
.45		1.3566	2.3718	2.4041	2.4314	2.4549	2.4754
.46		1.3756	2.3669	2.3991	2.4265	2.4501	2.4707
.47		1.3946	2.3620	2.3943	2.4217	2.4453	2.4660
.48		1.4135	2.3573	2.3896	2.4170	2.4406	2.4613
.49		1.4324	2.3526	2.3849	2.4124	2.4361	2.4569
.50		1.4511	2.3481	2.3804	2.4079	2.4317	2.4525
.51		1.4698	2.3437	2.3760	2.4035	2.4274	2.4482
.52		1.4884	2.3394	2.3717	2.3993	2.4231	2.4440
.53		1.5069	2.3352	2.3675	2.3951	2.4190	2.4399
.54		1.5254	2.3310	2.3634	2.3910	2.4149	2.4358
.55		1.5438	2.3270	2.3593	2.3869	2.4108	2.4318
.56		1.5622	2.3230	2.3554	2.3830	2.4069	2.4280
.57		1.5805	2.3192	2.3515	2.3791	2.4031	2.4241
.58		1.5987	2.3154	2.3477	2.3753	2.3993	2.4204
.59		1.6169	2.3117	2.3440	2.3716	2.3956	2.4167
.60		1.6350	2.3081	2.3403	2.3680	2.3920	2.4131
.61		1.6531	2.3045	2.3368	2.3644	2.3884	2.4096
.62		1.6711	2.3011	2.3333	2.3609	2.3849	2.4061
.63		1.6891	2.2977	2.3298	2.3575	2.3815	2.4027
.64		1.7070	2.2945	2.3264	2.3541	2.3782	2.3994
.65		1.7249	2.2910	2.3232	2.3508	2.3748	2.3961
.66		1.7428	2.2878	2.3199	2.3475	2.3716	2.3928
.67		1.7606	2.2847	2.3167	2.3443	2.3684	2.3897
.68		1.7784	2.2816	2.3136	2.3412	2.3653	2.3865
.69		1.7961	2.2786	2.3106	2.3381	2.3622	2.3836
.70		1.8138	2.2756	2.3076	2.3351	2.3591	2.3804
.71		1.8314	2.2727	2.3046	2.3321	2.3562	2.3775
.72		1.8490	2.2698	2.3017	2.3292	2.3532	2.3746
.73		1.8666	2.2670	2.2988	2.3263	2.3504	2.3717
.74		1.8842	2.2642	2.2960	2.3235	2.3475	2.3688
.75		1.9017	2.2615	2.2933	2.3207	2.3447	2.3660
.76		1.9192	2.2589	2.2906	2.3180	2.3420	2.3633
.77		1.9367	2.2562	2.2879	2.3152	2.3393	2.3606
.78		1.9541	2.2537	2.2852	2.3126	2.3366	2.3579
.79		1.9715	2.2511	2.2827	2.3100	2.3340	2.3553
.80		1.9888	2.2487	2.2801	2.3074	2.3314	2.3527

TABLE OF $\sigma \cdot k^2$

	f_2	-.60	-.70	-.80	-.90	-1.00
f_1	k \ ν	.98562	.99741	.99991	1.00000	1.00000
.80	1.9888	2.2487	2.2801	2.3074	2.3314	2.3527
.81	2.0062	2.2462	2.2776	2.3049	2.3289	2.3502
.82	2.0235	2.2438	2.2752	2.3024	2.3264	2.3476
.83	2.0408	2.2414	2.2728	2.3000	2.3239	2.3452
.84	2.0580	2.2391	2.2704	2.2976	2.3215	2.3428
.85	2.0753	2.2368	2.2681	2.2952	2.3191	2.3404
.86	2.0925	2.2346	2.2658	2.2930	2.3167	2.3380
.87	2.1097	2.2324	2.2635	2.2906	2.3144	2.3357
.88	2.1268	2.2302	2.2613	2.2883	2.3121	2.3334
.89	2.1439	2.2280	2.2591	2.2861	2.3099	2.3311
.90	2.1611	2.2259	2.2569	2.2839	2.3077	2.3289
.91	2.1782	2.2238	2.2548	2.2817	2.3055	2.3267
.92	2.1952	2.2218	2.2527	2.2796	2.3033	2.3244
.93	2.2123	2.2198	2.2506	2.2775	2.3012	2.3223
.94	2.2293	2.2178	2.2486	2.2754	2.2991	2.3201
.95	2.2463	2.2159	2.2466	2.2733	2.2970	2.3180
.96	2.2633	2.2139	2.2446	2.2713	2.2950	2.3161
.97	2.2803	2.2120	2.2426	2.2693	2.2930	2.3141
.98	2.2973	2.2102	2.2407	2.2674	2.2910	2.3121
.99	2.3142	2.2083	2.2388	2.2654	2.2890	2.3101
1.00	2.3311	2.2065	2.2369	2.2635	2.2871	2.3081
1.01	2.3481	2.2047	2.2351	2.2616	2.2851	2.3062
1.02	2.3648	2.2030	2.2333	2.2598	2.2833	2.3043
1.03	2.3818	2.2012	2.2314	2.2579	2.2814	2.3024
1.04	2.3986	2.1995	2.2297	2.2561	2.2796	2.3005
1.05	2.4156	2.1978	2.2279	2.2542	2.2777	2.2987
1.06	2.4323	2.1962	2.2262	2.2526	2.2759	2.2969
1.07	2.4491	2.1945	2.2245	2.2517	2.2742	2.2951
1.08	2.4659	2.1929	2.2228	2.2491	2.2724	2.2933
1.09	2.4827	2.1913	2.2212	2.2474	2.2707	2.2916
1.10	2.4994	2.1897	2.2195	2.2457	2.2690	2.2898
1.11	2.5162	2.1882	2.2179	2.2440	2.2673	2.2881
1.12	2.5329	2.1866	2.2163	2.2424	2.2656	2.2864
1.13	2.5497	2.1851	2.2147	2.2408	2.2640	2.2848
1.14	2.5663	2.1836	2.2132	2.2392	2.2623	2.2831
1.15	2.5830	2.1822	2.2117	2.2376	2.2607	2.2815
1.16	2.5998	2.1807	2.2101	2.2360	2.2591	2.2799
1.17	2.6164	2.1792	2.2086	2.2345	2.2576	2.2783
1.18	2.6330	2.1778	2.2072	2.2330	2.2560	2.2767
1.19	2.6497	2.1764	2.2057	2.2315	2.2545	2.2751
1.20	2.6664	2.1751	2.2043	2.2300	2.2530	2.2736



No. 359-14L. Millimeters, 5 mm lines accented, cm lines heavy.
MADE IN U. S. A.
KEUFFEL & ESSER CO.

Ratio of Tamped Sphere to Bare Sphere

$\frac{r}{r_0}$

1.0
0.9
0.8
0.7
0.6
0.5

0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2

f_1

-0.90
-0.80
-0.70
-0.60
-0.50
-0.40
-0.35
-0.30
-0.25
-0.20
-0.15
-0.125
-0.10
-0.075
-0.05
-0.025
-0.015
-0.01
-0.005
0.0

Values of A_2

16

Fig 2

No. 359-14L. Millimeters, 5 mm lines accented, cm lines heavy.
MADE IN U.S.A.
KEUFFEL & ESSER CO.

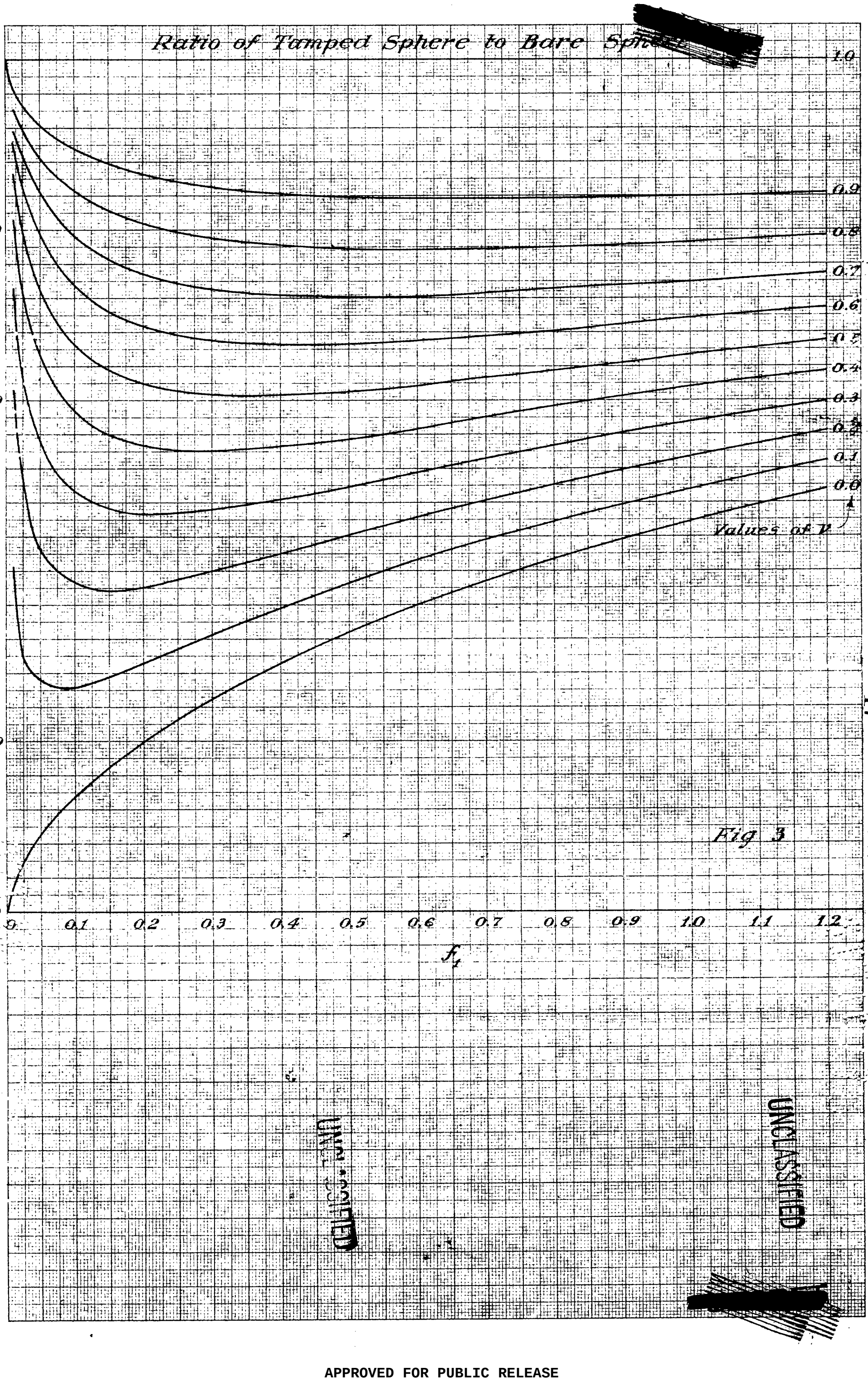


Fig 3

12

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