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Far-Infrared Dielectric Functions: Silicon Nitride (SiNx), Silicon Oxide (SiOx), and High-Purity Silicon (Si)

Giuseppe Cataldo and Edward J. Wollack

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Abstract

This work reports the numerical values of the dielectric functions derived from far-infrared measurements of silicon nitride, silicon oxide, and bulk high-purity silicon. These dielectric parameters have been previously reported in the literature and are presented here in a convenient form for future optical and sensor design applications.

Dielectric Parameters

Tabulated dielectric function data for far-infrared measurements of silicon nitride (SiN_x) [1], silicon oxide (SiO_x) [2], and bulk high-purity silicon (Si) [3] previously reported in the literature are presented. The objective of this report is to capture the numerical values derived from measurements of these engineering materials in a convenient form for future optical and sensor design applications. For the detailed experimental and data analysis methods used in the determination of the optical properties of these materials, one is referred to the primary sources indicated. Considerations related to physically modeling the dielectric response of realizable materials in the far-infrared are discussed in [4].

The notation employed in this compilation is briefly summarized. The real and imaginary components of the complex refractive index, $\hat{n}$, are related to the relative dielectric function by

$$\hat{\varepsilon}_r = \varepsilon_r' + i\,\varepsilon_r'' = \hat{n}^2 = (n^2 - \kappa^2) + i\,2n\kappa\,, \tag{1}$$

where a nonmagnetic relative permeability $\hat{\mu}_r = 1$ is adopted in fully specifying the dielectric medium's electromagnetic constituent relations, and for the time dependence of solutions to Maxwell equations the convention $e^{-i\omega t}$ has been used [5]. Solving for the real and imaginary components of $\hat{n}$ in terms of the relative dielectric permittivity one finds:

$$n = \frac{1}{\sqrt{2}}\sqrt{(\varepsilon_r'^2 + \varepsilon_r''^2)^{\frac{1}{2}} + \varepsilon_r'}\,, \quad \kappa = \frac{1}{\sqrt{2}}\sqrt{(\varepsilon_r'^2 + \varepsilon_r''^2)^{\frac{1}{2}} - \varepsilon_r'}\,. \tag{2}$$

For a low-loss dielectric, $\kappa \ll n$, the loss tangent (*i.e.*, the ratio of the conduction relative to the displacement current densities in the media) can be approximated by $\tan\delta \equiv \varepsilon_r''/\varepsilon_r' \approx 2\kappa/n$. In this report, to convert between frequency and wavelength the value of the speed of light in the vacuum, c_o = 299,792,458 m/sec, has been used [6]. For an overall summary of the measured dielectric function data see Figure 1. The numerical values of the dielectric functions as a function of temperature are tabulated in Tables 1 and 2 at the sample temperatures, T_a, specified.

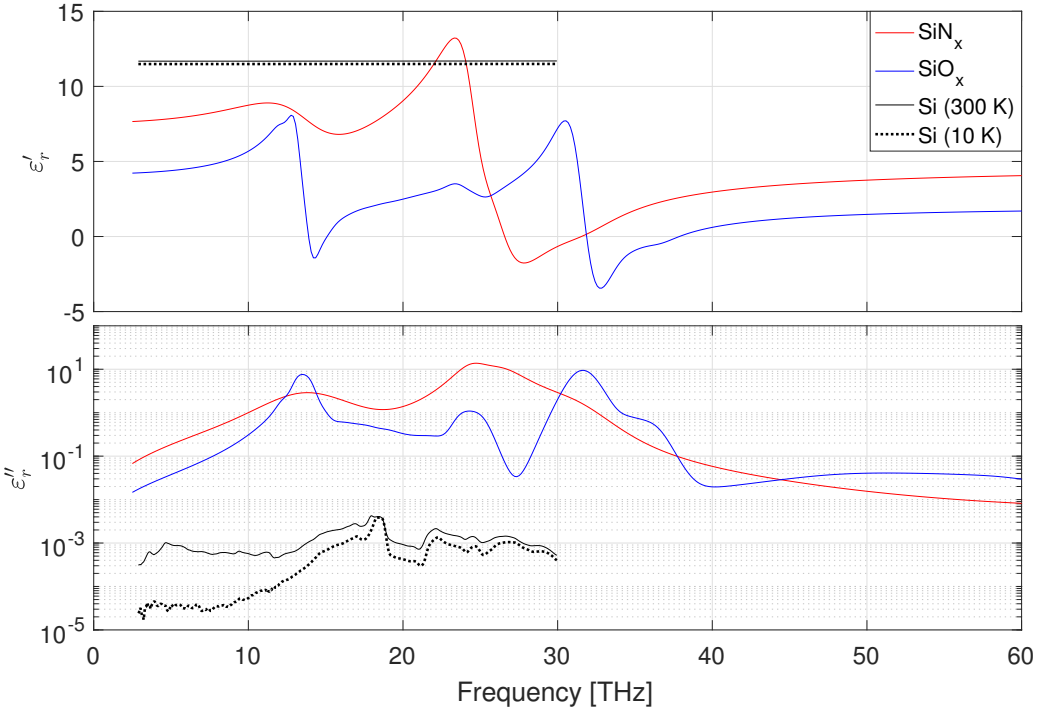

Figure 1. Measured far-infrared dielectric functions of SiN_x [1], SiO_x [2], and high-purity silicon [3]. As defined, the real and imaginary components of the relative dielectric functions are dimensionless.

References

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Table 1. Measured dielectric functions of SiN_x [1] and SiO_x [2] thin films at 300 K. The FTS frequency data vector in inverse centimeters is provided with the recorded precision. The frequency in terahertz and wavelength in microns are computed from this value with the speed of light and reported with the precision (*i.e.,* five significant figures plus one) required to reproduce the dielectric function model fit to the observed data.

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	SiN_x ε'_r [–]	($T_a \simeq 300$ K) ε''_r [–]	SiO_x ε'_r [–]	($T_a \simeq 300$ K) ε''_r [–]
83.40619	2.50045	119.895	7.659	6.75×10^{-2}	4.222	1.47×10^{-2}
88.22736	2.64499	113.344	7.666	7.26×10^{-2}	4.228	1.57×10^{-2}
93.04852	2.78952	107.471	7.674	7.78×10^{-2}	4.234	1.67×10^{-2}
97.86969	2.93406	102.177	7.683	8.33×10^{-2}	4.241	1.77×10^{-2}
102.6909	3.07859	97.3796	7.692	8.89×10^{-2}	4.248	1.88×10^{-2}
107.5120	3.22313	93.0129	7.701	9.47×10^{-2}	4.256	1.99×10^{-2}
112.3332	3.36766	89.0209	7.711	1.01×10^{-1}	4.264	2.11×10^{-2}
117.1544	3.51220	85.3575	7.721	1.07×10^{-1}	4.273	2.22×10^{-2}
121.9755	3.65673	81.9837	7.732	1.13×10^{-1}	4.282	2.35×10^{-2}
126.7967	3.80127	78.8664	7.743	1.20×10^{-1}	4.291	2.47×10^{-2}
131.6179	3.94580	75.9775	7.754	1.27×10^{-1}	4.301	2.61×10^{-2}
136.4390	4.09034	73.2928	7.766	1.34×10^{-1}	4.312	2.74×10^{-2}
141.2602	4.23487	70.7914	7.779	1.41×10^{-1}	4.322	2.89×10^{-2}
146.0814	4.37941	68.4550	7.792	1.49×10^{-1}	4.334	3.03×10^{-2}
150.9025	4.52394	66.2679	7.805	1.57×10^{-1}	4.346	3.19×10^{-2}
155.7237	4.66848	64.2163	7.819	1.65×10^{-1}	4.359	3.35×10^{-2}
160.5449	4.81301	62.2879	7.834	1.73×10^{-1}	4.372	3.52×10^{-2}
165.3660	4.95755	60.4719	7.849	1.82×10^{-1}	4.385	3.70×10^{-2}
170.1872	5.10208	58.7588	7.864	1.91×10^{-1}	4.400	3.88×10^{-2}
175.0084	5.24662	57.1401	7.881	2.01×10^{-1}	4.415	4.08×10^{-2}
179.8295	5.39115	55.6082	7.897	2.10×10^{-1}	4.431	4.29×10^{-2}
184.6507	5.53569	54.1563	7.915	2.21×10^{-1}	4.447	4.50×10^{-2}
189.4719	5.68022	52.7783	7.932	2.31×10^{-1}	4.465	4.73×10^{-2}
194.2930	5.82476	51.4687	7.951	2.42×10^{-1}	4.483	4.97×10^{-2}
199.1142	5.96929	50.2224	7.970	2.53×10^{-1}	4.502	5.23×10^{-2}
203.9354	6.11383	49.0351	7.990	2.65×10^{-1}	4.521	5.50×10^{-2}
208.7565	6.25836	47.9027	8.011	2.78×10^{-1}	4.542	5.78×10^{-2}
213.5777	6.40290	46.8214	8.032	2.91×10^{-1}	4.564	6.09×10^{-2}
218.3989	6.54743	45.7878	8.054	3.04×10^{-1}	4.586	6.41×10^{-2}
223.2200	6.69197	44.7988	8.076	3.18×10^{-1}	4.610	6.76×10^{-2}
228.0412	6.83650	43.8517	8.100	3.33×10^{-1}	4.635	7.12×10^{-2}
232.8624	6.98104	42.9438	8.124	3.49×10^{-1}	4.661	7.52×10^{-2}
237.6835	7.12557	42.0728	8.149	3.65×10^{-1}	4.688	7.94×10^{-2}
242.5047	7.27011	41.2363	8.174	3.82×10^{-1}	4.717	8.39×10^{-2}
247.3259	7.41464	40.4325	8.200	4.00×10^{-1}	4.747	8.88×10^{-2}
252.1470	7.55918	39.6594	8.227	4.19×10^{-1}	4.779	9.40×10^{-2}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	SiN_x ε'_r [$-$]	($T_a \simeq 300$ K) ε''_r [$-$]	SiO_x ε'_r [$-$]	($T_a \simeq 300$ K) ε''_r [$-$]
256.9682	7.70371	38.9153	8.255	4.40×10^{-1}	4.812	9.96×10^{-2}
261.7894	7.84825	38.1986	8.284	4.61×10^{-1}	4.847	1.06×10^{-1}
266.6105	7.99278	37.5079	8.313	4.84×10^{-1}	4.884	1.12×10^{-1}
271.4317	8.13732	36.8417	8.342	5.08×10^{-1}	4.923	1.19×10^{-1}
276.2529	8.28185	36.1987	8.373	5.33×10^{-1}	4.963	1.27×10^{-1}
281.0740	8.42639	35.5778	8.404	5.60×10^{-1}	5.006	1.36×10^{-1}
285.8952	8.57092	34.9779	8.435	5.89×10^{-1}	5.052	1.45×10^{-1}
290.7164	8.71546	34.3978	8.467	6.20×10^{-1}	5.100	1.55×10^{-1}
295.5375	8.85999	33.8366	8.499	6.53×10^{-1}	5.151	1.66×10^{-1}
300.3587	9.00453	33.2935	8.531	6.88×10^{-1}	5.205	1.79×10^{-1}
305.1799	9.14906	32.7676	8.564	7.26×10^{-1}	5.262	1.92×10^{-1}
310.0010	9.29360	32.2580	8.596	7.66×10^{-1}	5.323	2.07×10^{-1}
314.8222	9.43813	31.7640	8.628	8.08×10^{-1}	5.388	2.24×10^{-1}
319.6434	9.58267	31.2849	8.660	8.54×10^{-1}	5.457	2.42×10^{-1}
324.4645	9.72720	30.8200	8.691	9.03×10^{-1}	5.530	2.63×10^{-1}
329.2857	9.87174	30.3688	8.721	9.54×10^{-1}	5.608	2.86×10^{-1}
334.1069	10.0163	29.9305	8.751	1.01×10^{0}	5.691	3.12×10^{-1}
338.9280	10.1608	29.5048	8.778	1.07×10^{0}	5.780	3.41×10^{-1}
343.7492	10.3053	29.0910	8.804	1.13×10^{0}	5.876	3.73×10^{-1}
348.5704	10.4499	28.6886	8.828	1.20×10^{0}	5.978	4.10×10^{-1}
353.3915	10.5944	28.2972	8.849	1.27×10^{0}	6.087	4.52×10^{-1}
358.2127	10.7389	27.9164	8.867	1.34×10^{0}	6.205	5.00×10^{-1}
363.0339	10.8835	27.5456	8.882	1.42×10^{0}	6.330	5.55×10^{-1}
367.8550	11.0280	27.1846	8.892	1.50×10^{0}	6.465	6.19×10^{-1}
372.6762	11.1726	26.8329	8.897	1.58×10^{0}	6.609	6.96×10^{-1}
377.4974	11.3171	26.4903	8.897	1.67×10^{0}	6.763	7.88×10^{-1}
382.3185	11.4616	26.1562	8.891	1.76×10^{0}	6.925	9.04×10^{-1}
387.1397	11.6062	25.8305	8.879	1.85×10^{0}	7.091	1.05×10^{0}
391.9609	11.7507	25.5128	8.859	1.95×10^{0}	7.250	1.24×10^{0}
396.7820	11.8952	25.2028	8.832	2.04×10^{0}	7.382	1.47×10^{0}
401.6032	12.0398	24.9002	8.796	2.14×10^{0}	7.469	1.72×10^{0}
406.4244	12.1843	24.6048	8.752	2.23×10^{0}	7.525	1.97×10^{0}
411.2455	12.3288	24.3164	8.700	2.32×10^{0}	7.599	2.20×10^{0}
416.0667	12.4734	24.0346	8.638	2.41×10^{0}	7.737	2.49×10^{0}
420.8879	12.6179	23.7593	8.567	2.50×10^{0}	7.927	2.93×10^{0}
425.7091	12.7624	23.4902	8.488	2.58×10^{0}	8.077	3.63×10^{0}
430.5302	12.9070	23.2272	8.400	2.65×10^{0}	8.002	4.62×10^{0}
435.3514	13.0515	22.9700	8.305	2.72×10^{0}	7.488	5.76×10^{0}
440.1726	13.1960	22.7184	8.203	2.78×10^{0}	6.474	6.76×10^{0}
444.9937	13.3406	22.4722	8.096	2.82×10^{0}	5.135	7.39×10^{0}
449.8149	13.4851	22.2314	7.985	2.86×10^{0}	3.707	7.60×10^{0}
454.6361	13.6296	21.9956	7.871	2.88×10^{0}	2.311	7.48×10^{0}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	SiN_x ε'_r [−]	($T_a \simeq 300$ K) ε''_r [−]	SiO_x ε'_r [−]	($T_a \simeq 300$ K) ε''_r [−]
459.4572	13.7742	21.7648	7.756	2.89×10^{0}	0.990	7.04×10^{0}
464.2784	13.9187	21.5388	7.643	2.89×10^{0}	-0.173	6.28×10^{0}
469.0996	14.0633	21.3174	7.532	2.87×10^{0}	-1.019	5.23×10^{0}
473.9207	14.2078	21.1006	7.425	2.85×10^{0}	-1.423	4.08×10^{0}
478.7419	14.3523	20.8881	7.324	2.81×10^{0}	-1.421	3.05×10^{0}
483.5631	14.4969	20.6798	7.230	2.76×10^{0}	-1.178	2.28×10^{0}
488.3842	14.6414	20.4757	7.144	2.71×10^{0}	-0.854	1.75×10^{0}
493.2054	14.7859	20.2755	7.067	2.64×10^{0}	-0.543	1.41×10^{0}
498.0266	14.9305	20.0793	7.000	2.58×10^{0}	-0.271	1.17×10^{0}
502.8477	15.0750	19.8867	6.942	2.50×10^{0}	-0.029	9.84×10^{-1}
507.6689	15.2195	19.6979	6.895	2.42×10^{0}	0.199	8.43×10^{-1}
512.4901	15.3641	19.5126	6.858	2.34×10^{0}	0.417	7.41×10^{-1}
517.3112	15.5086	19.3307	6.830	2.26×10^{0}	0.621	6.76×10^{-1}
522.1324	15.6531	19.1522	6.813	2.18×10^{0}	0.802	6.41×10^{-1}
526.9536	15.7977	18.9770	6.804	2.10×10^{0}	0.958	6.24×10^{-1}
531.7747	15.9422	18.8050	6.805	2.02×10^{0}	1.090	6.16×10^{-1}
536.5959	16.0867	18.6360	6.814	1.94×10^{0}	1.203	6.10×10^{-1}
541.4171	16.2313	18.4701	6.831	1.86×10^{0}	1.302	6.04×10^{-1}
546.2382	16.3758	18.3070	6.856	1.79×10^{0}	1.390	5.95×10^{-1}
551.0594	16.5203	18.1469	6.888	1.72×10^{0}	1.471	5.86×10^{-1}
555.8806	16.6649	17.9895	6.926	1.65×10^{0}	1.546	5.76×10^{-1}
560.7017	16.8094	17.8348	6.971	1.59×10^{0}	1.615	5.66×10^{-1}
565.5229	16.9539	17.6828	7.022	1.53×10^{0}	1.679	5.57×10^{-1}
570.3441	17.0985	17.5333	7.078	1.47×10^{0}	1.738	5.48×10^{-1}
575.1652	17.2430	17.3863	7.140	1.42×10^{0}	1.792	5.40×10^{-1}
579.9864	17.3876	17.2418	7.206	1.38×10^{0}	1.841	5.32×10^{-1}
584.8076	17.5321	17.0996	7.277	1.33×10^{0}	1.886	5.22×10^{-1}
589.6287	17.6766	16.9598	7.352	1.30×10^{0}	1.927	5.11×10^{-1}
594.4499	17.8212	16.8223	7.431	1.27×10^{0}	1.966	4.98×10^{-1}
599.2711	17.9657	16.6869	7.514	1.24×10^{0}	2.004	4.84×10^{-1}
604.0922	18.1102	16.5538	7.600	1.22×10^{0}	2.043	4.69×10^{-1}
608.9134	18.2548	16.4227	7.690	1.20×10^{0}	2.082	4.55×10^{-1}
613.7346	18.3993	16.2937	7.783	1.19×10^{0}	2.122	4.43×10^{-1}
618.5557	18.5438	16.1667	7.880	1.18×10^{0}	2.159	4.34×10^{-1}
623.3769	18.6884	16.0417	7.979	1.18×10^{0}	2.194	4.26×10^{-1}
628.1981	18.8329	15.9185	8.082	1.18×10^{0}	2.227	4.18×10^{-1}
633.0192	18.9774	15.7973	8.188	1.19×10^{0}	2.258	4.10×10^{-1}
637.8404	19.1220	15.6779	8.297	1.20×10^{0}	2.287	4.00×10^{-1}
642.6616	19.2665	15.5603	8.410	1.22×10^{0}	2.317	3.88×10^{-1}
647.4827	19.4110	15.4444	8.526	1.24×10^{0}	2.349	3.76×10^{-1}
652.3039	19.5556	15.3303	8.646	1.27×10^{0}	2.381	3.64×10^{-1}
657.1251	19.7001	15.2178	8.770	1.30×10^{0}	2.415	3.52×10^{-1}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	SiN_x ε'_r [–]	($T_a \simeq 300$ K) ε''_r [–]	SiO_x ε'_r [–]	($T_a \simeq 300$ K) ε''_r [–]
661.9462	19.8446	15.1070	8.898	1.34×10^{0}	2.450	3.40×10^{-1}
666.7674	19.9892	14.9977	9.030	1.38×10^{0}	2.487	3.31×10^{-1}
671.5886	20.1337	14.8901	9.167	1.43×10^{0}	2.524	3.22×10^{-1}
676.4097	20.2783	14.7839	9.309	1.49×10^{0}	2.562	3.15×10^{-1}
681.2309	20.4228	14.6793	9.456	1.56×10^{0}	2.600	3.09×10^{-1}
686.0521	20.5673	14.5762	9.608	1.64×10^{0}	2.639	3.05×10^{-1}
690.8732	20.7119	14.4744	9.767	1.72×10^{0}	2.677	3.02×10^{-1}
695.6944	20.8564	14.3741	9.932	1.81×10^{0}	2.715	3.00×10^{-1}
700.5156	21.0009	14.2752	10.104	1.92×10^{0}	2.752	2.98×10^{-1}
705.3367	21.1455	14.1776	10.283	2.04×10^{0}	2.790	2.98×10^{-1}
710.1579	21.2900	14.0814	10.469	2.17×10^{0}	2.827	2.97×10^{-1}
714.9791	21.4345	13.9864	10.662	2.32×10^{0}	2.863	2.97×10^{-1}
719.8002	21.5791	13.8927	10.863	2.49×10^{0}	2.900	2.96×10^{-1}
724.6214	21.7236	13.8003	11.072	2.68×10^{0}	2.938	2.95×10^{-1}
729.4426	21.8681	13.7091	11.288	2.89×10^{0}	2.977	2.93×10^{-1}
734.2637	22.0127	13.6191	11.510	3.13×10^{0}	3.018	2.91×10^{-1}
739.0849	22.1572	13.5302	11.738	3.40×10^{0}	3.064	2.90×10^{-1}
743.9061	22.3017	13.4426	11.969	3.71×10^{0}	3.114	2.91×10^{-1}
748.7272	22.4463	13.3560	12.201	4.05×10^{0}	3.171	2.97×10^{-1}
753.5484	22.5908	13.2705	12.429	4.45×10^{0}	3.233	3.12×10^{-1}
758.3696	22.7353	13.1862	12.648	4.90×10^{0}	3.300	3.39×10^{-1}
763.1907	22.8799	13.1029	12.850	5.40×10^{0}	3.368	3.84×10^{-1}
768.0119	23.0244	13.0206	13.023	5.98×10^{0}	3.432	4.48×10^{-1}
772.8331	23.1690	12.9394	13.153	6.62×10^{0}	3.482	5.34×10^{-1}
777.6542	23.3135	12.8592	13.221	7.34×10^{0}	3.510	6.37×10^{-1}
782.4754	23.4580	12.7800	13.205	8.13×10^{0}	3.508	7.49×10^{-1}
787.2966	23.6026	12.7017	13.078	8.98×10^{0}	3.474	8.58×10^{-1}
792.1177	23.7471	12.6244	12.812	9.87×10^{0}	3.411	9.50×10^{-1}
796.9389	23.8916	12.5480	12.384	1.08×10	3.330	1.02×10^{0}
801.7601	24.0362	12.4726	11.779	1.16×10	3.241	1.06×10^{0}
806.5812	24.1807	12.3980	11.000	1.24×10	3.150	1.09×10^{0}
811.4024	24.3252	12.3243	10.073	1.30×10	3.061	1.09×10^{0}
816.2236	24.4698	12.2515	9.048	1.35×10	2.975	1.08×10^{0}
821.0447	24.6143	12.1796	7.988	1.37×10	2.892	1.05×10^{0}
825.8659	24.7588	12.1085	6.958	1.38×10	2.812	1.01×10^{0}
830.6871	24.9034	12.0382	6.012	1.36×10	2.740	9.47×10^{-1}
835.5082	25.0479	11.9688	5.179	1.34×10	2.681	8.63×10^{-1}
840.3294	25.1924	11.9001	4.467	1.31×10	2.643	7.62×10^{-1}
845.1506	25.3370	11.8322	3.864	1.28×10	2.632	6.49×10^{-1}
849.9717	25.4815	11.7651	3.344	1.25×10	2.651	5.34×10^{-1}
854.7929	25.6260	11.6987	2.879	1.22×10	2.697	4.26×10^{-1}
859.6141	25.7706	11.6331	2.442	1.20×10	2.766	3.32×10^{-1}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	SiN_x ε'_r [–]	($T_a \simeq 300$ K) ε''_r [–]	SiO_x ε'_r [–]	($T_a \simeq 300$ K) ε''_r [–]
864.4352	25.9151	11.5682	2.012	1.17×10	2.849	2.54×10^{-1}
869.2564	26.0597	11.5041	1.576	1.15×10	2.941	1.93×10^{-1}
874.0776	26.2042	11.4406	1.131	1.13×10	3.039	1.46×10^{-1}
878.8987	26.3487	11.3779	0.682	1.10×10	3.138	1.10×10^{-1}
883.7199	26.4933	11.3158	0.240	1.06×10	3.238	8.41×10^{-2}
888.5411	26.6378	11.2544	-0.181	1.03×10	3.339	6.52×10^{-2}
893.3622	26.7823	11.1937	-0.565	9.86×10^{0}	3.439	5.19×10^{-2}
898.1834	26.9269	11.1336	-0.900	9.41×10^{0}	3.540	4.29×10^{-2}
903.0046	27.0714	11.0741	-1.180	8.93×10^{0}	3.643	3.71×10^{-2}
907.8257	27.2159	11.0153	-1.401	8.45×10^{0}	3.747	3.42×10^{-2}
912.6469	27.3605	10.9571	-1.565	7.97×10^{0}	3.854	3.37×10^{-2}
917.4681	27.5050	10.8996	-1.676	7.49×10^{0}	3.964	3.55×10^{-2}
922.2893	27.6495	10.8426	-1.740	7.04×10^{0}	4.078	3.98×10^{-2}
927.1104	27.7941	10.7862	-1.765	6.61×10^{0}	4.197	4.69×10^{-2}
931.9316	27.9386	10.7304	-1.757	6.21×10^{0}	4.321	5.75×10^{-2}
936.7528	28.0831	10.6752	-1.724	5.83×10^{0}	4.453	7.22×10^{-2}
941.5739	28.2277	10.6205	-1.670	5.49×10^{0}	4.592	9.23×10^{-2}
946.3951	28.3722	10.5664	-1.603	5.17×10^{0}	4.740	1.19×10^{-1}
951.2163	28.5167	10.5129	-1.525	4.87×10^{0}	4.898	1.55×10^{-1}
956.0374	28.6613	10.4598	-1.440	4.61×10^{0}	5.068	2.01×10^{-1}
960.8586	28.8058	10.4074	-1.351	4.36×10^{0}	5.249	2.61×10^{-1}
965.6798	28.9504	10.3554	-1.261	4.13×10^{0}	5.445	3.39×10^{-1}
970.5009	29.0949	10.3040	-1.170	3.92×10^{0}	5.654	4.40×10^{-1}
975.3221	29.2394	10.2530	-1.081	3.73×10^{0}	5.879	5.67×10^{-1}
980.1433	29.3840	10.2026	-0.994	3.55×10^{0}	6.117	7.30×10^{-1}
984.9644	29.5285	10.1527	-0.911	3.39×10^{0}	6.368	9.35×10^{-1}
989.7856	29.6730	10.1032	-0.830	3.23×10^{0}	6.628	1.19×10^{0}
994.6068	29.8176	10.0542	-0.753	3.08×10^{0}	6.891	1.51×10^{0}
999.4279	29.9621	10.0057	-0.680	2.94×10^{0}	7.147	1.91×10^{0}
1004.249	30.1066	9.95769	-0.610	2.81×10^{0}	7.380	2.39×10^{0}
1009.070	30.2512	9.91011	-0.543	2.68×10^{0}	7.571	2.96×10^{0}
1013.891	30.3957	9.86299	-0.479	2.56×10^{0}	7.691	3.64×10^{0}
1018.713	30.5402	9.81631	-0.417	2.44×10^{0}	7.706	4.40×10^{0}
1023.534	30.6848	9.77007	-0.357	2.32×10^{0}	7.581	5.25×10^{0}
1028.355	30.8293	9.72427	-0.298	2.20×10^{0}	7.277	6.15×10^{0}
1033.176	30.9738	9.67889	-0.239	2.09×10^{0}	6.766	7.05×10^{0}
1037.997	31.1184	9.63394	-0.179	1.97×10^{0}	6.035	7.90×10^{0}
1042.818	31.2629	9.58940	-0.119	1.86×10^{0}	5.093	8.61×10^{0}
1047.640	31.4074	9.54527	-0.057	1.75×10^{0}	3.978	9.13×10^{0}
1052.461	31.5520	9.50154	0.006	1.65×10^{0}	2.749	9.41×10^{0}
1057.282	31.6965	9.45822	0.072	1.54×10^{0}	1.483	9.41×10^{0}
1062.103	31.8410	9.41528	0.141	1.44×10^{0}	0.262	9.15×10^{0}

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1066.924	31.9856	9.37274	0.212	1.34×10^{0}	-0.840	8.65×10^{0}
1071.745	32.1301	9.33057	0.285	1.25×10^{0}	-1.768	7.96×10^{0}
1076.567	32.2747	9.28879	0.360	1.16×10^{0}	-2.489	7.15×10^{0}
1081.388	32.4192	9.24738	0.438	1.07×10^{0}	-2.996	6.29×10^{0}
1086.209	32.5637	9.20633	0.517	9.90×10^{-1}	-3.304	5.43×10^{0}
1091.030	32.7083	9.16565	0.597	9.13×10^{-1}	-3.439	4.61×10^{0}
1095.851	32.8528	9.12533	0.678	8.42×10^{-1}	-3.437	3.88×10^{0}
1100.672	32.9973	9.08536	0.758	7.76×10^{-1}	-3.332	3.23×10^{0}
1105.494	33.1419	9.04573	0.839	7.15×10^{-1}	-3.157	2.69×10^{0}
1110.315	33.2864	9.00646	0.919	6.58×10^{-1}	-2.937	2.23×10^{0}
1115.136	33.4309	8.96752	0.999	6.07×10^{-1}	-2.695	1.87×10^{0}
1119.957	33.5755	8.92891	1.077	5.59×10^{-1}	-2.446	1.58×10^{0}
1124.778	33.7200	8.89064	1.153	5.16×10^{-1}	-2.203	1.35×10^{0}
1129.599	33.8645	8.85270	1.228	4.76×10^{-1}	-1.975	1.19×10^{0}
1134.421	34.0091	8.81507	1.301	4.40×10^{-1}	-1.768	1.06×10^{0}
1139.242	34.1536	8.77777	1.372	4.07×10^{-1}	-1.584	9.78×10^{-1}
1144.063	34.2981	8.74078	1.442	3.77×10^{-1}	-1.424	9.17×10^{-1}
1148.884	34.4427	8.70410	1.509	3.50×10^{-1}	-1.288	8.72×10^{-1}
1153.705	34.5872	8.66773	1.574	3.26×10^{-1}	-1.172	8.38×10^{-1}
1158.526	34.7317	8.63165	1.637	3.03×10^{-1}	-1.073	8.09×10^{-1}
1163.348	34.8763	8.59588	1.697	2.83×10^{-1}	-0.988	7.85×10^{-1}
1168.169	35.0208	8.56041	1.756	2.64×10^{-1}	-0.914	7.62×10^{-1}
1172.990	35.1654	8.52522	1.813	2.47×10^{-1}	-0.850	7.40×10^{-1}
1177.811	35.3099	8.49033	1.868	2.32×10^{-1}	-0.793	7.19×10^{-1}
1182.632	35.4544	8.45571	1.921	2.18×10^{-1}	-0.744	6.98×10^{-1}
1187.453	35.5990	8.42138	1.973	2.05×10^{-1}	-0.702	6.75×10^{-1}
1192.275	35.7435	8.38733	2.022	1.93×10^{-1}	-0.665	6.50×10^{-1}
1197.096	35.8880	8.35355	2.070	1.82×10^{-1}	-0.634	6.21×10^{-1}
1201.917	36.0326	8.32004	2.116	1.72×10^{-1}	-0.606	5.88×10^{-1}
1206.738	36.1771	8.28680	2.161	1.63×10^{-1}	-0.579	5.49×10^{-1}
1211.559	36.3216	8.25383	2.204	1.55×10^{-1}	-0.551	5.05×10^{-1}
1216.380	36.4662	8.22111	2.246	1.47×10^{-1}	-0.520	4.56×10^{-1}
1221.202	36.6107	8.18866	2.287	1.40×10^{-1}	-0.483	4.04×10^{-1}
1226.023	36.7552	8.15646	2.326	1.33×10^{-1}	-0.441	3.52×10^{-1}
1230.844	36.8998	8.12451	2.364	1.27×10^{-1}	-0.393	3.01×10^{-1}
1235.665	37.0443	8.09281	2.400	1.21×10^{-1}	-0.339	2.53×10^{-1}
1240.486	37.1888	8.06135	2.436	1.16×10^{-1}	-0.282	2.11×10^{-1}
1245.307	37.3334	8.03015	2.471	1.11×10^{-1}	-0.222	1.74×10^{-1}
1250.129	37.4779	7.99918	2.504	1.06×10^{-1}	-0.161	1.43×10^{-1}
1254.950	37.6224	7.96845	2.537	1.02×10^{-1}	-0.101	1.17×10^{-1}
1259.771	37.7670	7.93795	2.568	9.80×10^{-2}	-0.042	9.55×10^{-2}
1264.592	37.9115	7.90769	2.599	9.43×10^{-2}	0.016	7.84×10^{-2}

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1269.413	38.0561	7.87766	2.629	9.07×10^{-2}	0.071	6.48×10^{-2}
1274.234	38.2006	7.84785	2.658	8.74×10^{-2}	0.124	5.41×10^{-2}
1279.056	38.3451	7.81827	2.686	8.42×10^{-2}	0.174	4.56×10^{-2}
1283.877	38.4897	7.78891	2.713	8.13×10^{-2}	0.222	3.91×10^{-2}
1288.698	38.6342	7.75977	2.740	7.85×10^{-2}	0.268	3.40×10^{-2}
1293.519	38.7787	7.73085	2.766	7.58×10^{-2}	0.311	3.01×10^{-2}
1298.340	38.9233	7.70214	2.791	7.33×10^{-2}	0.353	2.71×10^{-2}
1303.161	39.0678	7.67365	2.816	7.10×10^{-2}	0.393	2.48×10^{-2}
1307.983	39.2123	7.64536	2.840	6.87×10^{-2}	0.430	2.31×10^{-2}
1312.804	39.3569	7.61728	2.863	6.66×10^{-2}	0.466	2.19×10^{-2}
1317.625	39.5014	7.58941	2.886	6.46×10^{-2}	0.501	2.10×10^{-2}
1322.446	39.6459	7.56174	2.908	6.26×10^{-2}	0.534	2.04×10^{-2}
1327.267	39.7905	7.53428	2.930	6.08×10^{-2}	0.566	2.00×10^{-2}
1332.088	39.9350	7.50701	2.951	5.91×10^{-2}	0.596	1.97×10^{-2}
1336.910	40.0795	7.47994	2.972	5.74×10^{-2}	0.625	1.96×10^{-2}
1341.731	40.2241	7.45306	2.992	5.58×10^{-2}	0.653	1.96×10^{-2}
1346.552	40.3686	7.42638	3.012	5.43×10^{-2}	0.680	1.96×10^{-2}
1351.373	40.5131	7.39988	3.031	5.28×10^{-2}	0.706	1.97×10^{-2}
1356.194	40.6577	7.37357	3.050	5.14×10^{-2}	0.731	1.99×10^{-2}
1361.015	40.8022	7.34746	3.069	5.01×10^{-2}	0.756	2.01×10^{-2}
1365.837	40.9468	7.32152	3.087	4.88×10^{-2}	0.779	2.03×10^{-2}
1370.658	41.0913	7.29577	3.104	4.76×10^{-2}	0.802	2.05×10^{-2}
1375.479	41.2358	7.27019	3.122	4.64×10^{-2}	0.824	2.08×10^{-2}
1380.300	41.3804	7.24480	3.139	4.53×10^{-2}	0.845	2.11×10^{-2}
1385.121	41.5249	7.21958	3.155	4.42×10^{-2}	0.865	2.13×10^{-2}
1389.942	41.6694	7.19454	3.171	4.31×10^{-2}	0.885	2.16×10^{-2}
1394.764	41.8140	7.16967	3.187	4.21×10^{-2}	0.904	2.20×10^{-2}
1399.585	41.9585	7.14498	3.203	4.11×10^{-2}	0.923	2.23×10^{-2}
1404.406	42.1030	7.12045	3.218	4.02×10^{-2}	0.941	2.26×10^{-2}
1409.227	42.2476	7.09609	3.233	3.93×10^{-2}	0.959	2.29×10^{-2}
1414.048	42.3921	7.07189	3.248	3.84×10^{-2}	0.976	2.33×10^{-2}
1418.869	42.5366	7.04786	3.262	3.76×10^{-2}	0.992	2.36×10^{-2}
1423.691	42.6812	7.02400	3.276	3.67×10^{-2}	1.009	2.40×10^{-2}
1428.512	42.8257	7.00029	3.290	3.59×10^{-2}	1.024	2.43×10^{-2}
1433.333	42.9702	6.97675	3.304	3.52×10^{-2}	1.040	2.47×10^{-2}
1438.154	43.1148	6.95336	3.317	3.44×10^{-2}	1.054	2.51×10^{-2}
1442.975	43.2593	6.93013	3.330	3.37×10^{-2}	1.069	2.54×10^{-2}
1447.796	43.4038	6.90705	3.343	3.30×10^{-2}	1.083	2.58×10^{-2}
1452.618	43.5484	6.88412	3.356	3.24×10^{-2}	1.097	2.62×10^{-2}
1457.439	43.6929	6.86135	3.368	3.17×10^{-2}	1.110	2.66×10^{-2}
1462.260	43.8375	6.83873	3.380	3.11×10^{-2}	1.123	2.70×10^{-2}
1467.081	43.9820	6.81626	3.392	3.05×10^{-2}	1.136	2.74×10^{-2}

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1471.902	44.1265	6.79393	3.404	2.99×10^{-2}	1.148	2.78×10^{-2}
1476.723	44.2711	6.77175	3.416	2.93×10^{-2}	1.160	2.82×10^{-2}
1481.545	44.4156	6.74971	3.427	2.88×10^{-2}	1.172	2.86×10^{-2}
1486.366	44.5601	6.72782	3.438	2.82×10^{-2}	1.184	2.90×10^{-2}
1491.187	44.7047	6.70607	3.449	2.77×10^{-2}	1.195	2.94×10^{-2}
1496.008	44.8492	6.68446	3.460	2.72×10^{-2}	1.206	2.98×10^{-2}
1500.829	44.9937	6.66298	3.471	2.67×10^{-2}	1.216	3.03×10^{-2}
1505.650	45.1383	6.64165	3.481	2.62×10^{-2}	1.227	3.07×10^{-2}
1510.472	45.2828	6.62045	3.491	2.57×10^{-2}	1.237	3.11×10^{-2}
1515.293	45.4273	6.59938	3.501	2.53×10^{-2}	1.247	3.15×10^{-2}
1520.114	45.5719	6.57845	3.511	2.48×10^{-2}	1.257	3.19×10^{-2}
1524.935	45.7164	6.55766	3.521	2.44×10^{-2}	1.266	3.23×10^{-2}
1529.756	45.8609	6.53699	3.531	2.40×10^{-2}	1.276	3.27×10^{-2}
1534.577	46.0055	6.51645	3.540	2.36×10^{-2}	1.285	3.31×10^{-2}
1539.399	46.1500	6.49604	3.550	2.32×10^{-2}	1.294	3.35×10^{-2}
1544.220	46.2945	6.47576	3.559	2.28×10^{-2}	1.302	3.39×10^{-2}
1549.041	46.4391	6.45561	3.568	2.24×10^{-2}	1.311	3.43×10^{-2}
1553.862	46.5836	6.43558	3.577	2.20×10^{-2}	1.319	3.47×10^{-2}
1558.683	46.7281	6.41567	3.585	2.17×10^{-2}	1.327	3.51×10^{-2}
1563.504	46.8727	6.39589	3.594	2.13×10^{-2}	1.335	3.54×10^{-2}
1568.326	47.0172	6.37623	3.603	2.10×10^{-2}	1.343	3.58×10^{-2}
1573.147	47.1618	6.35669	3.611	2.07×10^{-2}	1.351	3.61×10^{-2}
1577.968	47.3063	6.33726	3.619	2.03×10^{-2}	1.358	3.65×10^{-2}
1582.789	47.4508	6.31796	3.627	2.00×10^{-2}	1.365	3.68×10^{-2}
1587.610	47.5954	6.29877	3.635	1.97×10^{-2}	1.373	3.71×10^{-2}
1592.431	47.7399	6.27971	3.643	1.94×10^{-2}	1.380	3.74×10^{-2}
1597.253	47.8844	6.26075	3.651	1.91×10^{-2}	1.386	3.77×10^{-2}
1602.074	48.0290	6.24191	3.659	1.88×10^{-2}	1.393	3.80×10^{-2}
1606.895	48.1735	6.22318	3.666	1.85×10^{-2}	1.400	3.83×10^{-2}
1611.716	48.3180	6.20457	3.674	1.83×10^{-2}	1.406	3.85×10^{-2}
1616.537	48.4626	6.18606	3.681	1.80×10^{-2}	1.412	3.88×10^{-2}
1621.358	48.6071	6.16767	3.689	1.78×10^{-2}	1.419	3.90×10^{-2}
1626.180	48.7516	6.14938	3.696	1.75×10^{-2}	1.425	3.92×10^{-2}
1631.001	48.8962	6.13120	3.703	1.73×10^{-2}	1.431	3.94×10^{-2}
1635.822	49.0407	6.11313	3.710	1.70×10^{-2}	1.437	3.96×10^{-2}
1640.643	49.1852	6.09517	3.717	1.68×10^{-2}	1.442	3.98×10^{-2}
1645.464	49.3298	6.07731	3.723	1.65×10^{-2}	1.448	3.99×10^{-2}
1650.285	49.4743	6.05956	3.730	1.63×10^{-2}	1.454	4.01×10^{-2}
1655.107	49.6188	6.04191	3.737	1.61×10^{-2}	1.459	4.02×10^{-2}
1659.928	49.7634	6.02436	3.743	1.59×10^{-2}	1.464	4.03×10^{-2}
1664.749	49.9079	6.00691	3.750	1.57×10^{-2}	1.470	4.04×10^{-2}
1669.570	50.0525	5.98957	3.756	1.55×10^{-2}	1.475	4.05×10^{-2}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	SiN_x ε'_r [$-$]	($T_a \simeq 300$ K) ε''_r [$-$]	SiO_x ε'_r [$-$]	($T_a \simeq 300$ K) ε''_r [$-$]
1674.391	50.1970	5.97232	3.762	1.53×10^{-2}	1.480	4.06×10^{-2}
1679.212	50.3415	5.95517	3.769	1.51×10^{-2}	1.485	4.07×10^{-2}
1684.034	50.4861	5.93812	3.775	1.49×10^{-2}	1.490	4.07×10^{-2}
1688.855	50.6306	5.92117	3.781	1.47×10^{-2}	1.495	4.08×10^{-2}
1693.676	50.7751	5.90432	3.787	1.45×10^{-2}	1.499	4.08×10^{-2}
1698.497	50.9197	5.88756	3.792	1.43×10^{-2}	1.504	4.08×10^{-2}
1703.318	51.0642	5.87089	3.798	1.41×10^{-2}	1.509	4.09×10^{-2}
1708.139	51.2087	5.85432	3.804	1.40×10^{-2}	1.513	4.09×10^{-2}
1712.961	51.3533	5.83785	3.810	1.38×10^{-2}	1.518	4.09×10^{-2}
1717.782	51.4978	5.82146	3.815	1.36×10^{-2}	1.522	4.08×10^{-2}
1722.603	51.6423	5.80517	3.821	1.35×10^{-2}	1.526	4.08×10^{-2}
1727.424	51.7869	5.78897	3.826	1.33×10^{-2}	1.531	4.08×10^{-2}
1732.245	51.9314	5.77285	3.832	1.32×10^{-2}	1.535	4.08×10^{-2}
1737.066	52.0759	5.75683	3.837	1.30×10^{-2}	1.539	4.07×10^{-2}
1741.888	52.2205	5.74090	3.842	1.29×10^{-2}	1.543	4.07×10^{-2}
1746.709	52.3650	5.72505	3.848	1.27×10^{-2}	1.547	4.06×10^{-2}
1751.530	52.5095	5.70929	3.853	1.26×10^{-2}	1.551	4.06×10^{-2}
1756.351	52.6541	5.69362	3.858	1.25×10^{-2}	1.555	4.05×10^{-2}
1761.172	52.7986	5.67804	3.863	1.23×10^{-2}	1.559	4.05×10^{-2}
1765.993	52.9432	5.66254	3.868	1.22×10^{-2}	1.563	4.04×10^{-2}
1770.815	53.0877	5.64712	3.873	1.21×10^{-2}	1.566	4.03×10^{-2}
1775.636	53.2322	5.63179	3.877	1.19×10^{-2}	1.570	4.02×10^{-2}
1780.457	53.3768	5.61654	3.882	1.18×10^{-2}	1.574	4.02×10^{-2}
1785.278	53.5213	5.60137	3.887	1.17×10^{-2}	1.577	4.01×10^{-2}
1790.099	53.6658	5.58628	3.892	1.16×10^{-2}	1.581	4.00×10^{-2}
1794.920	53.8104	5.57128	3.896	1.14×10^{-2}	1.584	3.99×10^{-2}
1799.742	53.9549	5.55635	3.901	1.13×10^{-2}	1.588	3.98×10^{-2}
1804.563	54.0994	5.54151	3.905	1.12×10^{-2}	1.591	3.97×10^{-2}
1809.384	54.2440	5.52674	3.910	1.11×10^{-2}	1.594	3.96×10^{-2}
1814.205	54.3885	5.51206	3.914	1.10×10^{-2}	1.598	3.94×10^{-2}
1819.026	54.5330	5.49745	3.919	1.09×10^{-2}	1.601	3.93×10^{-2}
1823.847	54.6776	5.48291	3.923	1.08×10^{-2}	1.604	3.92×10^{-2}
1828.669	54.8221	5.46846	3.927	1.07×10^{-2}	1.607	3.91×10^{-2}
1833.490	54.9666	5.45408	3.932	1.06×10^{-2}	1.610	3.89×10^{-2}
1838.311	55.1112	5.43978	3.936	1.05×10^{-2}	1.613	3.88×10^{-2}
1843.132	55.2557	5.42555	3.940	1.04×10^{-2}	1.617	3.87×10^{-2}
1847.953	55.4002	5.41139	3.944	1.03×10^{-2}	1.620	3.85×10^{-2}
1852.774	55.5448	5.39731	3.948	1.02×10^{-2}	1.622	3.84×10^{-2}
1857.596	55.6893	5.38330	3.952	1.01×10^{-2}	1.625	3.82×10^{-2}
1862.417	55.8339	5.36937	3.956	1.01×10^{-2}	1.628	3.81×10^{-2}
1867.238	55.9784	5.35550	3.960	9.97×10^{-3}	1.631	3.79×10^{-2}
1872.059	56.1229	5.34171	3.964	9.89×10^{-3}	1.634	3.77×10^{-2}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	SiN_x ε'_r [$-$]	($T_a \simeq 300$ K) ε''_r [$-$]	SiO_x ε'_r [$-$]	($T_a \simeq 300$ K) ε''_r [$-$]
1876.880	56.2675	5.32799	3.968	9.81×10^{-3}	1.637	3.76×10^{-2}
1881.701	56.4120	5.31434	3.972	9.73×10^{-3}	1.639	3.74×10^{-2}
1886.523	56.5565	5.30076	3.975	9.65×10^{-3}	1.642	3.72×10^{-2}
1891.344	56.7011	5.28725	3.979	9.57×10^{-3}	1.645	3.70×10^{-2}
1896.165	56.8456	5.27380	3.983	9.50×10^{-3}	1.647	3.69×10^{-2}
1900.986	56.9901	5.26043	3.987	9.42×10^{-3}	1.650	3.67×10^{-2}
1905.807	57.1347	5.24712	3.990	9.35×10^{-3}	1.652	3.65×10^{-2}
1910.628	57.2792	5.23388	3.994	9.28×10^{-3}	1.655	3.63×10^{-2}
1915.450	57.4237	5.22071	3.997	9.21×10^{-3}	1.657	3.60×10^{-2}
1920.271	57.5683	5.20760	4.001	9.15×10^{-3}	1.660	3.58×10^{-2}
1925.092	57.7128	5.19456	4.004	9.08×10^{-3}	1.662	3.56×10^{-2}
1929.913	57.8573	5.18158	4.008	9.02×10^{-3}	1.664	3.53×10^{-2}
1934.734	58.0019	5.16867	4.011	8.95×10^{-3}	1.667	3.50×10^{-2}
1939.555	58.1464	5.15582	4.014	8.89×10^{-3}	1.669	3.47×10^{-2}
1944.377	58.2909	5.14304	4.018	8.83×10^{-3}	1.671	3.44×10^{-2}
1949.198	58.4355	5.13032	4.021	8.77×10^{-3}	1.674	3.41×10^{-2}
1954.019	58.5800	5.11766	4.024	8.71×10^{-3}	1.676	3.37×10^{-2}
1958.840	58.7246	5.10506	4.028	8.66×10^{-3}	1.678	3.33×10^{-2}
1963.661	58.8691	5.09253	4.031	8.60×10^{-3}	1.680	3.30×10^{-2}
1968.482	59.0136	5.08006	4.034	8.55×10^{-3}	1.682	3.26×10^{-2}
1973.304	59.1582	5.06764	4.037	8.49×10^{-3}	1.685	3.21×10^{-2}
1978.125	59.3027	5.05529	4.040	8.44×10^{-3}	1.687	3.17×10^{-2}
1982.946	59.4472	5.04300	4.043	8.39×10^{-3}	1.689	3.13×10^{-2}
1987.767	59.5918	5.03077	4.046	8.34×10^{-3}	1.691	3.08×10^{-2}
1992.588	59.7363	5.01860	4.050	8.29×10^{-3}	1.693	3.04×10^{-2}
1997.409	59.8808	5.00648	4.053	8.24×10^{-3}	1.695	2.99×10^{-2}
2002.231	60.0254	4.99443	4.056	8.20×10^{-3}	1.697	2.95×10^{-2}

Table 2. Measured dielectric functions of bulk high-purity silicon [3] at 300 K and 10 K. The FTS frequency data vector in inverse centimeters is provided with the recorded precision. The frequency in terahertz and wavelength in microns are computed from this value with the speed of light and reported with the precision (*i.e.,* five significant figures plus one) required to reproduce the dielectric function model fit to the observed data.

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	Si ε'_r [−]	($T_a \simeq 300$ K) ε''_r [−]	Si ε'_r [−]	($T_a \simeq 10$ K) ε''_r [−]
96.32541	2.88776	103.8148	11.680	3.16×10^{-4}	11.488	2.42×10^{-5}
97.59473	2.92582	102.4645	11.680	3.12×10^{-4}	11.488	2.54×10^{-5}
98.86406	2.96387	101.1490	11.680	3.17×10^{-4}	11.488	2.74×10^{-5}
100.1334	3.00192	99.86680	11.680	3.20×10^{-4}	11.488	3.20×10^{-5}
101.4027	3.03998	98.61670	11.680	3.18×10^{-4}	11.488	2.98×10^{-5}
102.6720	3.07803	97.39752	11.680	3.25×10^{-4}	11.488	2.54×10^{-5}
103.9414	3.11608	96.20810	11.680	3.38×10^{-4}	11.488	2.20×10^{-5}
105.2107	3.15414	95.04739	11.680	3.49×10^{-4}	11.488	2.08×10^{-5}
106.4800	3.19219	93.91436	11.680	3.59×10^{-4}	11.488	2.00×10^{-5}
107.7493	3.23024	92.80801	11.680	3.69×10^{-4}	11.488	1.72×10^{-5}
109.0186	3.26830	91.72743	11.680	3.91×10^{-4}	11.488	2.28×10^{-5}
110.2880	3.30635	90.67173	11.680	4.18×10^{-4}	11.488	3.04×10^{-5}
111.5573	3.34440	89.64005	11.680	4.45×10^{-4}	11.488	3.35×10^{-5}
112.8266	3.38246	88.63157	11.680	4.75×10^{-4}	11.488	3.43×10^{-5}
114.0959	3.42051	87.64555	11.680	5.08×10^{-4}	11.488	3.69×10^{-5}
115.3653	3.45856	86.68121	11.680	5.45×10^{-4}	11.488	4.21×10^{-5}
116.6346	3.49662	85.73787	11.680	5.79×10^{-4}	11.488	3.82×10^{-5}
117.9039	3.53467	84.81484	11.680	6.05×10^{-4}	11.488	3.53×10^{-5}
119.1732	3.57272	83.91147	11.680	6.21×10^{-4}	11.488	3.69×10^{-5}
120.4425	3.61078	83.02714	11.680	6.27×10^{-4}	11.488	3.68×10^{-5}
121.7119	3.64883	82.16126	11.680	6.23×10^{-4}	11.488	3.36×10^{-5}
122.9812	3.68688	81.31325	11.680	6.09×10^{-4}	11.488	3.08×10^{-5}
124.2505	3.72494	80.48257	11.680	5.85×10^{-4}	11.488	3.48×10^{-5}
125.5198	3.76299	79.66868	11.680	5.70×10^{-4}	11.488	3.82×10^{-5}
126.7892	3.80104	78.87110	11.680	5.61×10^{-4}	11.488	4.09×10^{-5}
128.0585	3.83910	78.08932	11.680	5.50×10^{-4}	11.488	4.29×10^{-5}
129.3278	3.87715	77.32290	11.680	5.40×10^{-4}	11.488	4.45×10^{-5}
130.5971	3.91520	76.57136	11.680	5.42×10^{-4}	11.488	4.54×10^{-5}
131.8665	3.95326	75.83430	11.680	5.54×10^{-4}	11.488	4.46×10^{-5}
133.1358	3.99131	75.11129	11.680	5.63×10^{-4}	11.488	4.18×10^{-5}
134.4051	4.02936	74.40194	11.680	5.73×10^{-4}	11.488	3.89×10^{-5}
135.6744	4.06742	73.70586	11.680	5.87×10^{-4}	11.488	3.69×10^{-5}
136.9437	4.10547	73.02269	11.680	6.02×10^{-4}	11.488	3.62×10^{-5}
138.2131	4.14352	72.35206	11.680	6.17×10^{-4}	11.488	3.58×10^{-5}
139.4824	4.18158	71.69364	11.680	6.35×10^{-4}	11.488	3.50×10^{-5}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 300$ K) ε''_r [$-$]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 10$ K) ε''_r [$-$]
140.7517	4.21963	71.04709	11.680	6.55×10^{-4}	11.488	3.67×10^{-5}
142.0210	4.25768	70.41211	11.680	6.78×10^{-4}	11.488	3.86×10^{-5}
143.2904	4.29574	69.78837	11.680	7.06×10^{-4}	11.488	3.96×10^{-5}
144.5597	4.33379	69.17558	11.680	7.35×10^{-4}	11.488	3.98×10^{-5}
145.8290	4.37184	68.57347	11.680	7.62×10^{-4}	11.488	3.97×10^{-5}
147.0983	4.40990	67.98174	11.680	7.90×10^{-4}	11.488	3.91×10^{-5}
148.3677	4.44795	67.40014	11.680	8.24×10^{-4}	11.488	3.75×10^{-5}
149.6370	4.48600	66.82840	11.680	8.69×10^{-4}	11.488	3.72×10^{-5}
150.9063	4.52406	66.26629	11.680	9.14×10^{-4}	11.488	3.73×10^{-5}
152.1756	4.56211	65.71355	11.680	9.58×10^{-4}	11.488	3.61×10^{-5}
153.4449	4.60016	65.16996	11.680	9.92×10^{-4}	11.488	3.60×10^{-5}
154.7143	4.63822	64.63528	11.680	1.01×10^{-3}	11.488	3.66×10^{-5}
155.9836	4.67627	64.10931	11.680	1.02×10^{-3}	11.488	3.43×10^{-5}
157.2529	4.71432	63.59183	11.680	1.01×10^{-3}	11.488	3.11×10^{-5}
158.5222	4.75238	63.08264	11.680	1.00×10^{-3}	11.488	2.82×10^{-5}
159.7916	4.79043	62.58153	11.680	9.84×10^{-4}	11.488	2.75×10^{-5}
161.0609	4.82848	62.08832	11.680	9.74×10^{-4}	11.488	2.68×10^{-5}
162.3302	4.86654	61.60283	11.680	9.66×10^{-4}	11.488	2.70×10^{-5}
163.5995	4.90459	61.12487	11.680	9.51×10^{-4}	11.488	2.96×10^{-5}
164.8688	4.94264	60.65428	11.680	9.37×10^{-4}	11.488	3.26×10^{-5}
166.1382	4.98070	60.19086	11.680	9.26×10^{-4}	11.488	3.69×10^{-5}
167.4075	5.01875	59.73448	11.680	9.12×10^{-4}	11.488	3.80×10^{-5}
168.6768	5.05680	59.28497	11.680	9.00×10^{-4}	11.488	3.68×10^{-5}
169.9461	5.09486	58.84217	11.680	8.92×10^{-4}	11.488	3.56×10^{-5}
171.2155	5.13291	58.40594	11.680	8.86×10^{-4}	11.488	3.54×10^{-5}
172.4848	5.17096	57.97613	11.680	8.80×10^{-4}	11.488	3.48×10^{-5}
173.7541	5.20902	57.55260	11.680	8.76×10^{-4}	11.488	3.37×10^{-5}
175.0234	5.24707	57.13521	11.680	8.75×10^{-4}	11.488	3.52×10^{-5}
176.2928	5.28512	56.72383	11.680	8.74×10^{-4}	11.488	3.71×10^{-5}
177.5621	5.32318	56.31833	11.680	8.73×10^{-4}	11.488	3.76×10^{-5}
178.8314	5.36123	55.91859	11.680	8.72×10^{-4}	11.488	3.71×10^{-5}
180.1007	5.39928	55.52449	11.680	8.74×10^{-4}	11.488	3.75×10^{-5}
181.3700	5.43734	55.13590	11.680	8.74×10^{-4}	11.488	3.83×10^{-5}
182.6394	5.47539	54.75271	11.680	8.75×10^{-4}	11.488	3.80×10^{-5}
183.9087	5.51344	54.37481	11.680	8.73×10^{-4}	11.488	3.80×10^{-5}
185.1780	5.55150	54.00209	11.680	8.70×10^{-4}	11.488	3.81×10^{-5}
186.4473	5.58955	53.63445	11.680	8.67×10^{-4}	11.488	3.78×10^{-5}
187.7167	5.62760	53.27178	11.680	8.63×10^{-4}	11.488	3.69×10^{-5}
188.9860	5.66566	52.91398	11.680	8.57×10^{-4}	11.488	3.49×10^{-5}
190.2553	5.70371	52.56095	11.680	8.47×10^{-4}	11.488	3.28×10^{-5}
191.5246	5.74176	52.21261	11.680	8.37×10^{-4}	11.488	3.19×10^{-5}
192.7940	5.77982	51.86885	11.680	8.27×10^{-4}	11.488	3.18×10^{-5}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 300$ K) ε''_r [$-$]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 10$ K) ε''_r [$-$]
194.0633	5.81787	51.52959	11.680	8.15×10^{-4}	11.488	3.16×10^{-5}
195.3326	5.85592	51.19473	11.680	8.00×10^{-4}	11.488	3.11×10^{-5}
196.6019	5.89398	50.86420	11.680	7.87×10^{-4}	11.488	3.13×10^{-5}
197.8712	5.93203	50.53792	11.680	7.76×10^{-4}	11.488	3.14×10^{-5}
199.1406	5.97008	50.21579	11.680	7.54×10^{-4}	11.488	3.10×10^{-5}
200.4099	6.00814	49.89774	11.680	7.35×10^{-4}	11.488	3.13×10^{-5}
201.6792	6.04619	49.58369	11.680	7.23×10^{-4}	11.488	3.29×10^{-5}
202.9485	6.08424	49.27358	11.680	7.13×10^{-4}	11.488	3.49×10^{-5}
204.2179	6.12230	48.96732	11.680	7.01×10^{-4}	11.488	3.61×10^{-5}
205.4872	6.16035	48.66484	11.680	6.89×10^{-4}	11.488	3.62×10^{-5}
206.7565	6.19840	48.36607	11.680	6.90×10^{-4}	11.488	3.58×10^{-5}
208.0258	6.23646	48.07096	11.680	6.84×10^{-4}	11.488	3.50×10^{-5}
209.2952	6.27451	47.77942	11.680	6.73×10^{-4}	11.488	3.37×10^{-5}
210.5645	6.31256	47.49139	11.680	6.63×10^{-4}	11.488	3.25×10^{-5}
211.8338	6.35062	47.20682	11.680	6.55×10^{-4}	11.488	3.21×10^{-5}
213.1031	6.38867	46.92564	11.680	6.51×10^{-4}	11.488	3.16×10^{-5}
214.3724	6.42672	46.64779	11.680	6.46×10^{-4}	11.488	3.24×10^{-5}
215.6418	6.46478	46.37321	11.680	6.42×10^{-4}	11.488	3.25×10^{-5}
216.9111	6.50283	46.10184	11.680	6.40×10^{-4}	11.488	3.28×10^{-5}
218.1804	6.54088	45.83363	11.680	6.39×10^{-4}	11.488	3.37×10^{-5}
219.4497	6.57894	45.56852	11.680	6.37×10^{-4}	11.488	3.54×10^{-5}
220.7191	6.61699	45.30647	11.680	6.35×10^{-4}	11.488	3.77×10^{-5}
221.9884	6.65504	45.04740	11.680	6.35×10^{-4}	11.488	3.87×10^{-5}
223.2577	6.69310	44.79129	11.680	6.33×10^{-4}	11.488	3.91×10^{-5}
224.5270	6.73115	44.53807	11.680	6.30×10^{-4}	11.488	3.87×10^{-5}
225.7963	6.76920	44.28770	11.680	6.31×10^{-4}	11.488	3.74×10^{-5}
227.0657	6.80726	44.04012	11.680	6.33×10^{-4}	11.488	3.53×10^{-5}
228.3350	6.84531	43.79530	11.680	6.33×10^{-4}	11.488	3.31×10^{-5}
229.6043	6.88336	43.55319	11.680	6.33×10^{-4}	11.488	3.09×10^{-5}
230.8736	6.92142	43.31374	11.680	6.35×10^{-4}	11.488	2.87×10^{-5}
232.1430	6.95947	43.07690	11.680	6.36×10^{-4}	11.488	2.76×10^{-5}
233.4123	6.99752	42.84265	11.680	6.34×10^{-4}	11.488	2.73×10^{-5}
234.6816	7.03558	42.61092	11.680	6.32×10^{-4}	11.488	2.75×10^{-5}
235.9509	7.07363	42.38169	11.680	6.30×10^{-4}	11.488	2.78×10^{-5}
237.2203	7.11168	42.15492	11.680	6.26×10^{-4}	11.488	2.80×10^{-5}
238.4896	7.14974	41.93055	11.680	6.22×10^{-4}	11.488	2.91×10^{-5}
239.7589	7.18779	41.70857	11.680	6.18×10^{-4}	11.488	2.95×10^{-5}
241.0282	7.22584	41.48892	11.680	6.12×10^{-4}	11.488	2.89×10^{-5}
242.2975	7.26390	41.27157	11.680	6.04×10^{-4}	11.488	2.90×10^{-5}
243.5669	7.30195	41.05649	11.680	5.97×10^{-4}	11.488	3.03×10^{-5}
244.8362	7.34000	40.84364	11.680	5.90×10^{-4}	11.488	3.16×10^{-5}
246.1055	7.37806	40.63298	11.680	5.82×10^{-4}	11.488	3.07×10^{-5}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 300$ K) ε''_r [$-$]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 10$ K) ε''_r [$-$]
247.3748	7.41611	40.42448	11.680	5.76×10^{-4}	11.488	3.09×10^{-5}
248.6442	7.45416	40.21812	11.680	5.73×10^{-4}	11.488	3.05×10^{-5}
249.9135	7.49222	40.01385	11.680	5.66×10^{-4}	11.488	2.92×10^{-5}
251.1828	7.53027	39.81164	11.680	5.58×10^{-4}	11.488	2.79×10^{-5}
252.4521	7.56832	39.61147	11.680	5.55×10^{-4}	11.488	2.74×10^{-5}
253.7215	7.60638	39.41330	11.680	5.51×10^{-4}	11.488	2.75×10^{-5}
254.9908	7.64443	39.21711	11.680	5.49×10^{-4}	11.488	2.83×10^{-5}
256.2601	7.68248	39.02285	11.680	5.47×10^{-4}	11.488	2.94×10^{-5}
257.5294	7.72054	38.83052	11.680	5.50×10^{-4}	11.488	3.07×10^{-5}
258.7987	7.75859	38.64006	11.680	5.55×10^{-4}	11.488	3.19×10^{-5}
260.0681	7.79664	38.45147	11.680	5.56×10^{-4}	11.488	3.29×10^{-5}
261.3374	7.83470	38.26471	11.680	5.59×10^{-4}	11.488	3.41×10^{-5}
262.6067	7.87275	38.07976	11.680	5.59×10^{-4}	11.488	3.44×10^{-5}
263.8760	7.91080	37.89658	11.680	5.61×10^{-4}	11.488	3.52×10^{-5}
265.1454	7.94886	37.71516	11.680	5.64×10^{-4}	11.488	3.55×10^{-5}
266.4147	7.98691	37.53547	11.680	5.69×10^{-4}	11.488	3.53×10^{-5}
267.6840	8.02496	37.35748	11.680	5.74×10^{-4}	11.488	3.48×10^{-5}
268.9533	8.06302	37.18117	11.680	5.80×10^{-4}	11.488	3.46×10^{-5}
270.2226	8.10107	37.00652	11.680	5.87×10^{-4}	11.488	3.50×10^{-5}
271.4920	8.13912	36.83350	11.680	5.93×10^{-4}	11.488	3.55×10^{-5}
272.7613	8.17718	36.66209	11.680	5.98×10^{-4}	11.488	3.54×10^{-5}
274.0306	8.21523	36.49227	11.680	6.01×10^{-4}	11.488	3.58×10^{-5}
275.2999	8.25328	36.32402	11.680	6.02×10^{-4}	11.488	3.66×10^{-5}
276.5693	8.29134	36.15731	11.680	6.04×10^{-4}	11.488	3.67×10^{-5}
277.8386	8.32939	35.99212	11.680	6.05×10^{-4}	11.488	3.65×10^{-5}
279.1079	8.36744	35.82844	11.680	6.04×10^{-4}	11.488	3.72×10^{-5}
280.3772	8.40550	35.66623	11.680	6.04×10^{-4}	11.488	3.68×10^{-5}
281.6466	8.44355	35.50549	11.680	6.06×10^{-4}	11.488	3.61×10^{-5}
282.9159	8.48160	35.34620	11.680	6.06×10^{-4}	11.488	3.60×10^{-5}
284.1852	8.51966	35.18832	11.680	6.05×10^{-4}	11.488	3.62×10^{-5}
285.4545	8.55771	35.03185	11.680	6.02×10^{-4}	11.488	3.50×10^{-5}
286.7238	8.59576	34.87677	11.680	6.00×10^{-4}	11.489	3.34×10^{-5}
287.9932	8.63382	34.72305	11.680	5.97×10^{-4}	11.489	3.43×10^{-5}
289.2625	8.67187	34.57068	11.680	5.94×10^{-4}	11.489	3.45×10^{-5}
290.5318	8.70992	34.41964	11.680	5.90×10^{-4}	11.489	3.41×10^{-5}
291.8011	8.74798	34.26992	11.680	5.86×10^{-4}	11.489	3.44×10^{-5}
293.0705	8.78603	34.12149	11.680	5.82×10^{-4}	11.489	3.64×10^{-5}
294.3398	8.82408	33.97434	11.680	5.79×10^{-4}	11.489	3.74×10^{-5}
295.6091	8.86214	33.82846	11.680	5.75×10^{-4}	11.489	3.73×10^{-5}
296.8784	8.90019	33.68382	11.680	5.73×10^{-4}	11.489	3.80×10^{-5}
298.1478	8.93824	33.54042	11.680	5.69×10^{-4}	11.489	3.98×10^{-5}
299.4171	8.97630	33.39823	11.680	5.65×10^{-4}	11.489	4.13×10^{-5}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 300$ K) ε''_r [$-$]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 10$ K) ε''_r [$-$]
300.6864	9.01435	33.25724	11.680	5.63×10^{-4}	11.489	4.14×10^{-5}
301.9557	9.05240	33.11744	11.680	5.64×10^{-4}	11.489	4.18×10^{-5}
303.2250	9.09046	32.97881	11.680	5.67×10^{-4}	11.489	4.31×10^{-5}
304.4944	9.12851	32.84133	11.680	5.71×10^{-4}	11.489	4.42×10^{-5}
305.7637	9.16656	32.70500	11.680	5.79×10^{-4}	11.489	4.42×10^{-5}
307.0330	9.20462	32.56979	11.680	5.91×10^{-4}	11.489	4.40×10^{-5}
308.3023	9.24267	32.43569	11.680	6.05×10^{-4}	11.489	4.47×10^{-5}
309.5717	9.28072	32.30270	11.680	6.19×10^{-4}	11.489	4.66×10^{-5}
310.8410	9.31878	32.17079	11.680	6.34×10^{-4}	11.489	4.80×10^{-5}
312.1103	9.35683	32.03996	11.680	6.43×10^{-4}	11.489	4.96×10^{-5}
313.3796	9.39488	31.91018	11.680	6.48×10^{-4}	11.489	5.14×10^{-5}
314.6489	9.43294	31.78145	11.680	6.47×10^{-4}	11.489	5.27×10^{-5}
315.9183	9.47099	31.65376	11.680	6.41×10^{-4}	11.489	5.29×10^{-5}
317.1876	9.50904	31.52708	11.680	6.32×10^{-4}	11.489	5.26×10^{-5}
318.4569	9.54710	31.40142	11.680	6.23×10^{-4}	11.489	5.28×10^{-5}
319.7262	9.58515	31.27676	11.680	6.15×10^{-4}	11.489	5.13×10^{-5}
320.9956	9.62320	31.15308	11.681	6.08×10^{-4}	11.489	5.00×10^{-5}
322.2649	9.66126	31.03037	11.681	6.04×10^{-4}	11.489	4.94×10^{-5}
323.5342	9.69931	30.90863	11.681	6.00×10^{-4}	11.489	4.94×10^{-5}
324.8035	9.73736	30.78784	11.681	5.94×10^{-4}	11.489	4.92×10^{-5}
326.0729	9.77542	30.66799	11.681	5.90×10^{-4}	11.489	4.86×10^{-5}
327.3422	9.81347	30.54907	11.681	5.88×10^{-4}	11.489	4.93×10^{-5}
328.6115	9.85152	30.43107	11.681	5.85×10^{-4}	11.489	4.97×10^{-5}
329.8808	9.88958	30.31398	11.681	5.81×10^{-4}	11.489	5.08×10^{-5}
331.1501	9.92763	30.19778	11.681	5.78×10^{-4}	11.489	5.20×10^{-5}
332.4195	9.96568	30.08247	11.681	5.75×10^{-4}	11.489	5.30×10^{-5}
333.6888	10.0037	29.96804	11.681	5.70×10^{-4}	11.489	5.45×10^{-5}
334.9581	10.0418	29.85448	11.681	5.64×10^{-4}	11.489	5.59×10^{-5}
336.2274	10.0798	29.74177	11.681	5.58×10^{-4}	11.489	5.83×10^{-5}
337.4968	10.1179	29.62991	11.681	5.52×10^{-4}	11.489	5.99×10^{-5}
338.7661	10.1560	29.51889	11.681	5.45×10^{-4}	11.489	6.13×10^{-5}
340.0354	10.1940	29.40870	11.681	5.39×10^{-4}	11.489	6.26×10^{-5}
341.3047	10.2321	29.29933	11.681	5.35×10^{-4}	11.489	6.28×10^{-5}
342.5741	10.2701	29.19077	11.681	5.31×10^{-4}	11.489	6.28×10^{-5}
343.8434	10.3082	29.08301	11.681	5.26×10^{-4}	11.489	6.35×10^{-5}
345.1127	10.3462	28.97604	11.681	5.22×10^{-4}	11.489	6.47×10^{-5}
346.3820	10.3843	28.86986	11.681	5.21×10^{-4}	11.489	6.58×10^{-5}
347.6513	10.4223	28.76445	11.681	5.19×10^{-4}	11.489	6.71×10^{-5}
348.9207	10.4604	28.65981	11.681	5.18×10^{-4}	11.489	6.95×10^{-5}
350.1900	10.4984	28.55593	11.681	5.20×10^{-4}	11.489	7.20×10^{-5}
351.4593	10.5365	28.45280	11.681	5.21×10^{-4}	11.489	7.25×10^{-5}
352.7286	10.5745	28.35041	11.681	5.25×10^{-4}	11.489	7.27×10^{-5}

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353.9980	10.6126	28.24875	11.681	5.30×10^{-4}	11.489	7.38×10^{-5}
355.2673	10.6506	28.14782	11.681	5.35×10^{-4}	11.489	7.54×10^{-5}
356.5366	10.6887	28.04761	11.681	5.43×10^{-4}	11.489	7.67×10^{-5}
357.8059	10.7268	27.94811	11.681	5.50×10^{-4}	11.489	7.71×10^{-5}
359.0752	10.7648	27.84932	11.681	5.59×10^{-4}	11.489	7.86×10^{-5}
360.3446	10.8029	27.75122	11.681	5.67×10^{-4}	11.489	7.98×10^{-5}
361.6139	10.8409	27.65381	11.681	5.74×10^{-4}	11.489	7.99×10^{-5}
362.8832	10.8790	27.55708	11.681	5.82×10^{-4}	11.489	8.01×10^{-5}
364.1525	10.9170	27.46102	11.681	5.89×10^{-4}	11.489	8.10×10^{-5}
365.4219	10.9551	27.36563	11.681	5.95×10^{-4}	11.489	8.24×10^{-5}
366.6912	10.9931	27.27090	11.681	6.01×10^{-4}	11.489	8.26×10^{-5}
367.9605	11.0312	27.17683	11.681	6.06×10^{-4}	11.489	8.13×10^{-5}
369.2298	11.0692	27.08340	11.681	6.10×10^{-4}	11.489	8.22×10^{-5}
370.4992	11.1073	26.99062	11.681	6.13×10^{-4}	11.489	8.33×10^{-5}
371.7685	11.1453	26.89846	11.681	6.15×10^{-4}	11.489	8.21×10^{-5}
373.0378	11.1834	26.80693	11.681	6.16×10^{-4}	11.489	7.93×10^{-5}
374.3071	11.2214	26.71603	11.681	6.13×10^{-4}	11.489	8.26×10^{-5}
375.5764	11.2595	26.62574	11.681	6.11×10^{-4}	11.489	8.61×10^{-5}
376.8458	11.2976	26.53606	11.681	6.09×10^{-4}	11.489	7.79×10^{-5}
378.1151	11.3356	26.44697	11.681	6.03×10^{-4}	11.489	7.49×10^{-5}
379.3844	11.3737	26.35849	11.681	5.88×10^{-4}	11.489	7.76×10^{-5}
380.6537	11.4117	26.27060	11.681	5.67×10^{-4}	11.489	8.13×10^{-5}
381.9231	11.4498	26.18328	11.681	5.52×10^{-4}	11.489	8.27×10^{-5}
383.1924	11.4878	26.09655	11.681	5.30×10^{-4}	11.489	8.15×10^{-5}
384.4617	11.5259	26.01039	11.681	5.04×10^{-4}	11.489	8.75×10^{-5}
385.7310	11.5639	25.92480	11.681	4.84×10^{-4}	11.489	9.07×10^{-5}
387.0004	11.6020	25.83977	11.681	4.70×10^{-4}	11.489	9.26×10^{-5}
388.2697	11.6400	25.75530	11.681	4.61×10^{-4}	11.489	9.22×10^{-5}
389.5390	11.6781	25.67137	11.681	4.55×10^{-4}	11.489	8.77×10^{-5}
390.8083	11.7161	25.58799	11.681	4.56×10^{-4}	11.489	9.40×10^{-5}
392.0776	11.7542	25.50515	11.681	4.61×10^{-4}	11.490	9.78×10^{-5}
393.3470	11.7922	25.42285	11.681	4.64×10^{-4}	11.490	9.79×10^{-5}
394.6163	11.8303	25.34107	11.682	4.63×10^{-4}	11.490	9.69×10^{-5}
395.8856	11.8684	25.25982	11.682	4.65×10^{-4}	11.490	9.88×10^{-5}
397.1549	11.9064	25.17909	11.682	4.68×10^{-4}	11.490	1.04×10^{-4}
398.4243	11.9445	25.09887	11.682	4.68×10^{-4}	11.490	1.06×10^{-4}
399.6936	11.9825	25.01917	11.682	4.72×10^{-4}	11.490	1.12×10^{-4}
400.9629	12.0206	24.93996	11.682	4.80×10^{-4}	11.490	1.15×10^{-4}
402.2322	12.0586	24.86126	11.682	4.91×10^{-4}	11.490	1.19×10^{-4}
403.5015	12.0967	24.78305	11.682	5.00×10^{-4}	11.490	1.23×10^{-4}
404.7709	12.1347	24.70534	11.682	5.09×10^{-4}	11.490	1.25×10^{-4}
406.0402	12.1728	24.62810	11.682	5.20×10^{-4}	11.490	1.29×10^{-4}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 300$ K) ε''_r [$-$]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 10$ K) ε''_r [$-$]
407.3095	12.2108	24.55135	11.682	5.28×10^{-4}	11.490	1.30×10^{-4}
408.5788	12.2489	24.47508	11.682	5.38×10^{-4}	11.490	1.33×10^{-4}
409.8482	12.2869	24.39928	11.682	5.48×10^{-4}	11.490	1.35×10^{-4}
411.1175	12.3250	24.32395	11.682	5.56×10^{-4}	11.490	1.37×10^{-4}
412.3868	12.3630	24.24908	11.682	5.62×10^{-4}	11.490	1.39×10^{-4}
413.6561	12.4011	24.17467	11.682	5.68×10^{-4}	11.490	1.40×10^{-4}
414.9255	12.4392	24.10071	11.682	5.74×10^{-4}	11.490	1.40×10^{-4}
416.1948	12.4772	24.02721	11.682	5.78×10^{-4}	11.490	1.42×10^{-4}
417.4641	12.5153	23.95416	11.682	5.82×10^{-4}	11.490	1.44×10^{-4}
418.7334	12.5533	23.88154	11.682	5.88×10^{-4}	11.490	1.44×10^{-4}
420.0027	12.5914	23.80937	11.682	5.92×10^{-4}	11.490	1.45×10^{-4}
421.2721	12.6294	23.73763	11.682	5.95×10^{-4}	11.490	1.47×10^{-4}
422.5414	12.6675	23.66632	11.682	6.00×10^{-4}	11.490	1.51×10^{-4}
423.8107	12.7055	23.59544	11.682	6.06×10^{-4}	11.490	1.54×10^{-4}
425.0800	12.7436	23.52498	11.682	6.11×10^{-4}	11.490	1.58×10^{-4}
426.3494	12.7816	23.45494	11.682	6.14×10^{-4}	11.490	1.63×10^{-4}
427.6187	12.8197	23.38532	11.682	6.18×10^{-4}	11.490	1.67×10^{-4}
428.8880	12.8577	23.31611	11.682	6.24×10^{-4}	11.490	1.70×10^{-4}
430.1573	12.8958	23.24731	11.682	6.29×10^{-4}	11.490	1.72×10^{-4}
431.4267	12.9338	23.17891	11.682	6.33×10^{-4}	11.490	1.75×10^{-4}
432.6960	12.9719	23.11092	11.682	6.39×10^{-4}	11.490	1.79×10^{-4}
433.9653	13.0100	23.04332	11.682	6.48×10^{-4}	11.490	1.83×10^{-4}
435.2346	13.0480	22.97611	11.682	6.57×10^{-4}	11.490	1.88×10^{-4}
436.5039	13.0861	22.90930	11.682	6.67×10^{-4}	11.490	1.93×10^{-4}
437.7733	13.1241	22.84288	11.682	6.79×10^{-4}	11.490	1.99×10^{-4}
439.0426	13.1622	22.77683	11.682	6.91×10^{-4}	11.490	2.03×10^{-4}
440.3119	13.2002	22.71117	11.682	7.05×10^{-4}	11.490	2.08×10^{-4}
441.5812	13.2383	22.64589	11.682	7.19×10^{-4}	11.490	2.13×10^{-4}
442.8506	13.2763	22.58098	11.682	7.35×10^{-4}	11.490	2.17×10^{-4}
444.1199	13.3144	22.51644	11.682	7.53×10^{-4}	11.490	2.22×10^{-4}
445.3892	13.3524	22.45227	11.682	7.71×10^{-4}	11.490	2.27×10^{-4}
446.6585	13.3905	22.38847	11.682	7.91×10^{-4}	11.490	2.33×10^{-4}
447.9279	13.4285	22.32502	11.682	8.11×10^{-4}	11.490	2.36×10^{-4}
449.1972	13.4666	22.26194	11.682	8.32×10^{-4}	11.490	2.42×10^{-4}
450.4665	13.5046	22.19921	11.683	8.52×10^{-4}	11.490	2.48×10^{-4}
451.7358	13.5427	22.13683	11.683	8.72×10^{-4}	11.490	2.53×10^{-4}
453.0051	13.5808	22.07480	11.683	8.93×10^{-4}	11.490	2.58×10^{-4}
454.2745	13.6188	22.01312	11.683	9.14×10^{-4}	11.490	2.63×10^{-4}
455.5438	13.6569	21.95179	11.683	9.32×10^{-4}	11.490	2.70×10^{-4}
456.8131	13.6949	21.89079	11.683	9.51×10^{-4}	11.490	2.75×10^{-4}
458.0824	13.7330	21.83013	11.683	9.73×10^{-4}	11.490	2.83×10^{-4}
459.3518	13.7710	21.76981	11.683	9.94×10^{-4}	11.490	2.90×10^{-4}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 300$ K) ε''_r [$-$]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 10$ K) ε''_r [$-$]
460.6211	13.8091	21.70982	11.683	1.01×10^{-3}	11.490	2.97×10^{-4}
461.8904	13.8471	21.65016	11.683	1.03×10^{-3}	11.490	3.06×10^{-4}
463.1597	13.8852	21.59082	11.683	1.05×10^{-3}	11.490	3.16×10^{-4}
464.4290	13.9232	21.53181	11.683	1.07×10^{-3}	11.490	3.22×10^{-4}
465.6984	13.9613	21.47313	11.683	1.09×10^{-3}	11.490	3.30×10^{-4}
466.9677	13.9993	21.41476	11.683	1.11×10^{-3}	11.490	3.42×10^{-4}
468.2370	14.0374	21.35671	11.683	1.12×10^{-3}	11.490	3.53×10^{-4}
469.5063	14.0754	21.29897	11.683	1.14×10^{-3}	11.490	3.64×10^{-4}
470.7757	14.1135	21.24154	11.683	1.16×10^{-3}	11.490	3.76×10^{-4}
472.0450	14.1516	21.18442	11.683	1.18×10^{-3}	11.490	3.91×10^{-4}
473.3143	14.1896	21.12761	11.683	1.20×10^{-3}	11.490	4.03×10^{-4}
474.5836	14.2277	21.07110	11.683	1.22×10^{-3}	11.490	4.14×10^{-4}
475.8530	14.2657	21.01490	11.683	1.25×10^{-3}	11.490	4.28×10^{-4}
477.1223	14.3038	20.95899	11.683	1.28×10^{-3}	11.490	4.43×10^{-4}
478.3916	14.3418	20.90338	11.683	1.31×10^{-3}	11.490	4.56×10^{-4}
479.6609	14.3799	20.84806	11.683	1.35×10^{-3}	11.490	4.71×10^{-4}
480.9302	14.4179	20.79304	11.683	1.38×10^{-3}	11.490	4.89×10^{-4}
482.1996	14.4560	20.73830	11.683	1.42×10^{-3}	11.490	5.07×10^{-4}
483.4689	14.4940	20.68385	11.683	1.46×10^{-3}	11.490	5.24×10^{-4}
484.7382	14.5321	20.62969	11.683	1.50×10^{-3}	11.490	5.42×10^{-4}
486.0075	14.5701	20.57581	11.683	1.53×10^{-3}	11.490	5.61×10^{-4}
487.2769	14.6082	20.52221	11.683	1.56×10^{-3}	11.490	5.79×10^{-4}
488.5462	14.6462	20.46889	11.683	1.59×10^{-3}	11.490	5.91×10^{-4}
489.8155	14.6843	20.41585	11.683	1.60×10^{-3}	11.490	6.04×10^{-4}
491.0848	14.7224	20.36308	11.683	1.62×10^{-3}	11.490	6.14×10^{-4}
492.3542	14.7604	20.31058	11.683	1.64×10^{-3}	11.490	6.23×10^{-4}
493.6235	14.7985	20.25836	11.683	1.66×10^{-3}	11.490	6.31×10^{-4}
494.8928	14.8365	20.20640	11.683	1.68×10^{-3}	11.491	6.37×10^{-4}
496.1621	14.8746	20.15470	11.684	1.70×10^{-3}	11.491	6.45×10^{-4}
497.4314	14.9126	20.10327	11.684	1.72×10^{-3}	11.491	6.51×10^{-4}
498.7008	14.9507	20.05210	11.684	1.74×10^{-3}	11.491	6.60×10^{-4}
499.9701	14.9887	20.00120	11.684	1.76×10^{-3}	11.491	6.68×10^{-4}
501.2356	15.0267	19.95070	11.684	1.78×10^{-3}	11.491	6.77×10^{-4}
502.5050	15.0647	19.90030	11.684	1.80×10^{-3}	11.491	6.87×10^{-4}
503.7743	15.1028	19.85016	11.684	1.82×10^{-3}	11.491	6.99×10^{-4}
505.0436	15.1408	19.80027	11.684	1.83×10^{-3}	11.491	7.11×10^{-4}
506.3129	15.1789	19.75063	11.684	1.85×10^{-3}	11.491	7.23×10^{-4}
507.5823	15.2169	19.70124	11.684	1.86×10^{-3}	11.491	7.35×10^{-4}
508.8516	15.2550	19.65210	11.684	1.88×10^{-3}	11.491	7.47×10^{-4}
510.1209	15.2930	19.60320	11.684	1.89×10^{-3}	11.491	7.58×10^{-4}
511.3902	15.3311	19.55454	11.684	1.90×10^{-3}	11.491	7.71×10^{-4}
512.6596	15.3691	19.50612	11.684	1.91×10^{-3}	11.491	7.84×10^{-4}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 300$ K) ε''_r [$-$]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 10$ K) ε''_r [$-$]
513.9289	15.4072	19.45795	11.684	1.93×10^{-3}	11.491	7.99×10^{-4}
515.1982	15.4453	19.41001	11.684	1.94×10^{-3}	11.491	8.14×10^{-4}
516.4675	15.4833	19.36230	11.684	1.95×10^{-3}	11.491	8.29×10^{-4}
517.7368	15.5214	19.31483	11.684	1.96×10^{-3}	11.491	8.42×10^{-4}
519.0062	15.5594	19.26759	11.684	1.97×10^{-3}	11.491	8.52×10^{-4}
520.2755	15.5975	19.22059	11.684	1.98×10^{-3}	11.491	8.66×10^{-4}
521.5448	15.6355	19.17381	11.684	1.99×10^{-3}	11.491	8.76×10^{-4}
522.8141	15.6736	19.12726	11.684	2.00×10^{-3}	11.491	8.85×10^{-4}
524.0835	15.7116	19.08093	11.684	2.01×10^{-3}	11.491	8.94×10^{-4}
525.3528	15.7497	19.03483	11.684	2.02×10^{-3}	11.491	9.02×10^{-4}
526.6221	15.7877	18.98895	11.684	2.03×10^{-3}	11.491	9.10×10^{-4}
527.8914	15.8258	18.94329	11.684	2.03×10^{-3}	11.491	9.15×10^{-4}
529.1607	15.8638	18.89785	11.684	2.04×10^{-3}	11.491	9.21×10^{-4}
530.4301	15.9019	18.85263	11.684	2.05×10^{-3}	11.491	9.28×10^{-4}
531.6994	15.9399	18.80762	11.684	2.06×10^{-3}	11.491	9.37×10^{-4}
532.9687	15.9780	18.76283	11.684	2.08×10^{-3}	11.491	9.46×10^{-4}
534.2380	16.0161	18.71825	11.684	2.10×10^{-3}	11.491	9.54×10^{-4}
535.5074	16.0541	18.67388	11.684	2.12×10^{-3}	11.491	9.64×10^{-4}
536.7767	16.0922	18.62972	11.684	2.14×10^{-3}	11.491	9.76×10^{-4}
538.0460	16.1302	18.58577	11.684	2.17×10^{-3}	11.491	9.88×10^{-4}
539.3153	16.1683	18.54203	11.684	2.19×10^{-3}	11.491	1.00×10^{-3}
540.5847	16.2063	18.49849	11.684	2.22×10^{-3}	11.491	1.02×10^{-3}
541.8540	16.2444	18.45516	11.685	2.25×10^{-3}	11.491	1.03×10^{-3}
543.1233	16.2824	18.41203	11.685	2.29×10^{-3}	11.491	1.05×10^{-3}
544.3926	16.3205	18.36910	11.685	2.32×10^{-3}	11.491	1.07×10^{-3}
545.6619	16.3585	18.32637	11.685	2.35×10^{-3}	11.491	1.09×10^{-3}
546.9313	16.3966	18.28383	11.685	2.38×10^{-3}	11.491	1.11×10^{-3}
548.2006	16.4346	18.24150	11.685	2.40×10^{-3}	11.491	1.13×10^{-3}
549.4699	16.4727	18.19936	11.685	2.43×10^{-3}	11.491	1.15×10^{-3}
550.7392	16.5107	18.15741	11.685	2.45×10^{-3}	11.491	1.17×10^{-3}
552.0086	16.5488	18.11566	11.685	2.47×10^{-3}	11.491	1.19×10^{-3}
553.2779	16.5869	18.07410	11.685	2.51×10^{-3}	11.491	1.21×10^{-3}
554.5472	16.6249	18.03273	11.685	2.55×10^{-3}	11.491	1.22×10^{-3}
555.8165	16.6630	17.99155	11.685	2.60×10^{-3}	11.491	1.24×10^{-3}
557.0859	16.7010	17.95055	11.685	2.64×10^{-3}	11.491	1.26×10^{-3}
558.3552	16.7391	17.90975	11.685	2.69×10^{-3}	11.491	1.27×10^{-3}
559.6245	16.7771	17.86913	11.685	2.73×10^{-3}	11.491	1.29×10^{-3}
560.8938	16.8152	17.82869	11.685	2.76×10^{-3}	11.491	1.31×10^{-3}
562.1631	16.8532	17.78843	11.685	2.77×10^{-3}	11.491	1.33×10^{-3}
563.4325	16.8913	17.74836	11.685	2.79×10^{-3}	11.491	1.35×10^{-3}
564.7018	16.9293	17.70846	11.685	2.78×10^{-3}	11.491	1.38×10^{-3}
565.9711	16.9674	17.66875	11.685	2.76×10^{-3}	11.491	1.40×10^{-3}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 300$ K) ε''_r [$-$]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 10$ K) ε''_r [$-$]
567.2404	17.0054	17.62921	11.685	2.72×10^{-3}	11.491	1.42×10^{-3}
568.5098	17.0435	17.58985	11.685	2.67×10^{-3}	11.491	1.42×10^{-3}
569.7791	17.0815	17.55066	11.685	2.61×10^{-3}	11.491	1.41×10^{-3}
571.0484	17.1196	17.51165	11.685	2.54×10^{-3}	11.491	1.38×10^{-3}
572.3177	17.1577	17.47281	11.685	2.49×10^{-3}	11.491	1.34×10^{-3}
573.5870	17.1957	17.43415	11.685	2.46×10^{-3}	11.491	1.30×10^{-3}
574.8564	17.2338	17.39565	11.685	2.43×10^{-3}	11.491	1.27×10^{-3}
576.1257	17.2718	17.35732	11.685	2.42×10^{-3}	11.491	1.23×10^{-3}
577.3950	17.3099	17.31917	11.685	2.42×10^{-3}	11.491	1.21×10^{-3}
578.6643	17.3479	17.28118	11.685	2.44×10^{-3}	11.491	1.20×10^{-3}
579.9337	17.3860	17.24335	11.685	2.45×10^{-3}	11.491	1.19×10^{-3}
581.2030	17.4240	17.20569	11.685	2.47×10^{-3}	11.491	1.19×10^{-3}
582.4723	17.4621	17.16820	11.685	2.49×10^{-3}	11.491	1.19×10^{-3}
583.7416	17.5001	17.13087	11.685	2.53×10^{-3}	11.491	1.20×10^{-3}
585.0110	17.5382	17.09370	11.685	2.57×10^{-3}	11.491	1.22×10^{-3}
586.2803	17.5762	17.05669	11.685	2.64×10^{-3}	11.491	1.24×10^{-3}
587.5496	17.6143	17.01984	11.686	2.73×10^{-3}	11.491	1.27×10^{-3}
588.8189	17.6523	16.98315	11.686	2.85×10^{-3}	11.491	1.31×10^{-3}
590.0882	17.6904	16.94662	11.686	2.99×10^{-3}	11.491	1.36×10^{-3}
591.3576	17.7285	16.91024	11.686	3.16×10^{-3}	11.491	1.42×10^{-3}
592.6269	17.7665	16.87402	11.686	3.37×10^{-3}	11.491	1.49×10^{-3}
593.8962	17.8046	16.83796	11.686	3.59×10^{-3}	11.491	1.57×10^{-3}
595.1655	17.8426	16.80205	11.686	3.82×10^{-3}	11.491	1.67×10^{-3}
596.4349	17.8807	16.76629	11.686	4.02×10^{-3}	11.491	1.77×10^{-3}
597.7042	17.9187	16.73068	11.686	4.19×10^{-3}	11.491	1.89×10^{-3}
598.9735	17.9568	16.69523	11.686	4.25×10^{-3}	11.492	2.03×10^{-3}
600.2428	17.9948	16.65992	11.686	4.20×10^{-3}	11.492	2.18×10^{-3}
601.5122	18.0329	16.62477	11.686	4.14×10^{-3}	11.492	2.35×10^{-3}
602.7815	18.0709	16.58976	11.686	4.06×10^{-3}	11.492	2.56×10^{-3}
603.6779	18.0978	16.56512	11.686	4.03×10^{-3}	11.492	2.72×10^{-3}
606.0207	18.1680	16.50109	11.686	3.95×10^{-3}	11.492	3.18×10^{-3}
608.4313	18.2403	16.43571	11.686	4.00×10^{-3}	11.492	3.65×10^{-3}
610.8419	18.3126	16.37085	11.686	4.02×10^{-3}	11.492	3.80×10^{-3}
613.2524	18.3848	16.30650	11.686	4.08×10^{-3}	11.492	3.84×10^{-3}
615.6630	18.4571	16.24265	11.686	4.07×10^{-3}	11.492	3.86×10^{-3}
618.0736	18.5294	16.17930	11.686	4.01×10^{-3}	11.492	3.88×10^{-3}
620.4842	18.6016	16.11645	11.686	3.87×10^{-3}	11.492	3.83×10^{-3}
622.8948	18.6739	16.05408	11.686	3.65×10^{-3}	11.492	3.64×10^{-3}
625.3054	18.7462	15.99219	11.686	3.07×10^{-3}	11.492	3.13×10^{-3}
627.7159	18.8185	15.93077	11.686	2.38×10^{-3}	11.492	2.29×10^{-3}
630.1265	18.8907	15.86983	11.686	1.84×10^{-3}	11.492	1.55×10^{-3}
632.5371	18.9630	15.80935	11.686	1.50×10^{-3}	11.492	1.04×10^{-3}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 300$ K) ε''_r [$-$]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 10$ K) ε''_r [$-$]
634.9477	19.0353	15.74933	11.687	1.32×10^{-3}	11.492	7.36×10^{-4}
637.3583	19.1075	15.68976	11.687	1.23×10^{-3}	11.492	5.88×10^{-4}
639.7689	19.1798	15.63065	11.687	1.18×10^{-3}	11.492	5.31×10^{-4}
642.1794	19.2521	15.57197	11.687	1.14×10^{-3}	11.492	5.14×10^{-4}
644.5900	19.3243	15.51374	11.687	1.10×10^{-3}	11.492	5.02×10^{-4}
647.0006	19.3966	15.45594	11.687	1.07×10^{-3}	11.492	4.87×10^{-4}
649.4112	19.4689	15.39856	11.687	1.04×10^{-3}	11.492	4.72×10^{-4}
651.8218	19.5411	15.34162	11.687	1.02×10^{-3}	11.492	4.59×10^{-4}
654.2324	19.6134	15.28509	11.687	9.98×10^{-4}	11.492	4.50×10^{-4}
656.6429	19.6857	15.22898	11.687	9.85×10^{-4}	11.492	4.45×10^{-4}
659.0535	19.7579	15.17327	11.687	9.73×10^{-4}	11.492	4.42×10^{-4}
661.4641	19.8302	15.11798	11.687	9.60×10^{-4}	11.492	4.38×10^{-4}
663.8747	19.9025	15.06308	11.687	9.45×10^{-4}	11.492	4.32×10^{-4}
666.2853	19.9747	15.00859	11.687	9.29×10^{-4}	11.492	4.24×10^{-4}
668.6959	20.0470	14.95448	11.687	9.12×10^{-4}	11.492	4.18×10^{-4}
671.1065	20.1193	14.90077	11.687	8.95×10^{-4}	11.492	4.12×10^{-4}
673.5170	20.1915	14.84743	11.687	8.78×10^{-4}	11.492	4.05×10^{-4}
675.9276	20.2638	14.79448	11.687	8.62×10^{-4}	11.492	3.96×10^{-4}
678.3382	20.3361	14.74191	11.687	8.52×10^{-4}	11.492	3.89×10^{-4}
680.7488	20.4083	14.68971	11.688	8.48×10^{-4}	11.492	3.83×10^{-4}
683.1594	20.4806	14.63787	11.688	8.45×10^{-4}	11.492	3.80×10^{-4}
685.5700	20.5529	14.58640	11.688	8.42×10^{-4}	11.492	3.79×10^{-4}
687.9805	20.6251	14.53530	11.688	8.34×10^{-4}	11.492	3.81×10^{-4}
690.3911	20.6974	14.48454	11.688	8.21×10^{-4}	11.492	3.83×10^{-4}
692.8017	20.7697	14.43414	11.688	7.99×10^{-4}	11.492	3.81×10^{-4}
695.2123	20.8419	14.38410	11.688	7.70×10^{-4}	11.492	3.71×10^{-4}
697.6229	20.9142	14.33439	11.688	7.39×10^{-4}	11.492	3.53×10^{-4}
700.0335	20.9865	14.28503	11.688	7.21×10^{-4}	11.492	3.29×10^{-4}
702.4440	21.0587	14.23601	11.688	7.23×10^{-4}	11.492	3.08×10^{-4}
704.8546	21.1310	14.18732	11.688	7.49×10^{-4}	11.493	2.98×10^{-4}
707.2652	21.2033	14.13897	11.688	8.04×10^{-4}	11.493	3.01×10^{-4}
709.6758	21.2755	14.09094	11.688	8.94×10^{-4}	11.493	3.20×10^{-4}
712.0864	21.3478	14.04324	11.688	1.02×10^{-3}	11.493	3.56×10^{-4}
714.4970	21.4201	13.99586	11.688	1.18×10^{-3}	11.493	4.22×10^{-4}
716.9075	21.4923	13.94880	11.688	1.35×10^{-3}	11.493	5.25×10^{-4}
719.3181	21.5646	13.90205	11.688	1.50×10^{-3}	11.493	6.60×10^{-4}
721.7287	21.6369	13.85562	11.688	1.63×10^{-3}	11.493	7.93×10^{-4}
724.1393	21.7091	13.80950	11.688	1.74×10^{-3}	11.493	9.01×10^{-4}
726.5499	21.7814	13.76368	11.688	1.84×10^{-3}	11.493	9.82×10^{-4}
728.9605	21.8537	13.71817	11.689	1.93×10^{-3}	11.493	1.05×10^{-3}
731.3710	21.9260	13.67295	11.689	2.00×10^{-3}	11.493	1.12×10^{-3}
733.7816	21.9982	13.62803	11.689	2.08×10^{-3}	11.493	1.19×10^{-3}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 300$ K) ε''_r [$-$]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 10$ K) ε''_r [$-$]
736.1922	22.0705	13.58341	11.689	2.13×10^{-3}	11.493	1.24×10^{-3}
738.6028	22.1428	13.53908	11.689	2.15×10^{-3}	11.493	1.30×10^{-3}
741.0134	22.2150	13.49503	11.689	2.11×10^{-3}	11.493	1.34×10^{-3}
743.4240	22.2873	13.45128	11.689	2.03×10^{-3}	11.493	1.35×10^{-3}
745.8345	22.3596	13.40780	11.689	1.94×10^{-3}	11.493	1.31×10^{-3}
748.2451	22.4318	13.36460	11.689	1.88×10^{-3}	11.493	1.23×10^{-3}
750.6557	22.5041	13.32169	11.689	1.82×10^{-3}	11.493	1.16×10^{-3}
753.0663	22.5764	13.27904	11.689	1.76×10^{-3}	11.493	1.10×10^{-3}
755.4769	22.6486	13.23667	11.689	1.72×10^{-3}	11.493	1.06×10^{-3}
757.8875	22.7209	13.19457	11.689	1.68×10^{-3}	11.493	1.02×10^{-3}
760.2980	22.7932	13.15274	11.689	1.65×10^{-3}	11.493	9.89×10^{-4}
762.7086	22.8654	13.11117	11.689	1.62×10^{-3}	11.493	9.60×10^{-4}
765.1192	22.9377	13.06986	11.689	1.60×10^{-3}	11.493	9.35×10^{-4}
767.5298	23.0100	13.02881	11.689	1.57×10^{-3}	11.493	9.18×10^{-4}
769.9404	23.0822	12.98802	11.689	1.55×10^{-3}	11.493	9.04×10^{-4}
772.3510	23.1545	12.94748	11.689	1.53×10^{-3}	11.493	8.91×10^{-4}
774.7615	23.2268	12.90720	11.690	1.51×10^{-3}	11.493	8.77×10^{-4}
777.1721	23.2990	12.86716	11.690	1.49×10^{-3}	11.493	8.63×10^{-4}
779.5827	23.3713	12.82738	11.690	1.48×10^{-3}	11.493	8.50×10^{-4}
781.9933	23.4436	12.78783	11.690	1.47×10^{-3}	11.493	8.34×10^{-4}
784.4039	23.5158	12.74853	11.690	1.45×10^{-3}	11.493	8.21×10^{-4}
786.8145	23.5881	12.70948	11.690	1.43×10^{-3}	11.493	8.11×10^{-4}
789.2250	23.6604	12.67066	11.690	1.41×10^{-3}	11.493	7.99×10^{-4}
791.6356	23.7326	12.63207	11.690	1.38×10^{-3}	11.493	7.81×10^{-4}
794.0462	23.8049	12.59373	11.690	1.34×10^{-3}	11.493	7.56×10^{-4}
796.4568	23.8772	12.55561	11.690	1.28×10^{-3}	11.493	7.22×10^{-4}
798.8674	23.9494	12.51772	11.690	1.23×10^{-3}	11.493	6.76×10^{-4}
801.2780	24.0217	12.48006	11.690	1.21×10^{-3}	11.493	6.30×10^{-4}
803.6885	24.0940	12.44263	11.690	1.23×10^{-3}	11.493	6.06×10^{-4}
806.0991	24.1662	12.40542	11.690	1.27×10^{-3}	11.493	6.20×10^{-4}
808.5097	24.2385	12.36844	11.690	1.32×10^{-3}	11.493	6.63×10^{-4}
810.9203	24.3108	12.33167	11.690	1.36×10^{-3}	11.494	7.18×10^{-4}
813.3309	24.3830	12.29512	11.690	1.39×10^{-3}	11.494	7.63×10^{-4}
815.7415	24.4553	12.25879	11.690	1.41×10^{-3}	11.494	7.98×10^{-4}
818.1520	24.5276	12.22267	11.690	1.41×10^{-3}	11.494	8.24×10^{-4}
820.5626	24.5998	12.18676	11.691	1.39×10^{-3}	11.494	8.45×10^{-4}
822.9732	24.6721	12.15106	11.691	1.35×10^{-3}	11.494	8.46×10^{-4}
825.3838	24.7444	12.11558	11.691	1.29×10^{-3}	11.494	8.27×10^{-4}
827.7944	24.8167	12.08029	11.691	1.22×10^{-3}	11.494	7.87×10^{-4}
830.2050	24.8889	12.04522	11.691	1.15×10^{-3}	11.494	7.32×10^{-4}
832.6155	24.9612	12.01035	11.691	1.09×10^{-3}	11.494	6.66×10^{-4}
835.0261	25.0335	11.97567	11.691	1.05×10^{-3}	11.494	6.03×10^{-4}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 300$ K) ε''_r [$-$]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 10$ K) ε''_r [$-$]
837.4367	25.1057	11.94120	11.691	1.02×10^{-3}	11.494	5.55×10^{-4}
839.8473	25.1780	11.90693	11.691	1.02×10^{-3}	11.494	5.32×10^{-4}
842.2579	25.2503	11.87285	11.691	1.04×10^{-3}	11.494	5.31×10^{-4}
844.6685	25.3225	11.83896	11.691	1.06×10^{-3}	11.494	5.48×10^{-4}
847.0790	25.3948	11.80527	11.691	1.08×10^{-3}	11.494	5.75×10^{-4}
849.4896	25.4671	11.77177	11.691	1.10×10^{-3}	11.494	6.08×10^{-4}
851.9002	25.5393	11.73846	11.691	1.12×10^{-3}	11.494	6.38×10^{-4}
854.3108	25.6116	11.70534	11.691	1.15×10^{-3}	11.494	6.65×10^{-4}
856.7214	25.6839	11.67241	11.691	1.18×10^{-3}	11.494	6.91×10^{-4}
859.1320	25.7561	11.63966	11.691	1.22×10^{-3}	11.494	7.23×10^{-4}
861.5425	25.8284	11.60709	11.691	1.27×10^{-3}	11.494	7.62×10^{-4}
863.9531	25.9007	11.57470	11.691	1.31×10^{-3}	11.494	8.12×10^{-4}
866.3637	25.9729	11.54250	11.691	1.34×10^{-3}	11.494	8.65×10^{-4}
868.7743	26.0452	11.51047	11.692	1.36×10^{-3}	11.494	9.12×10^{-4}
871.1849	26.1175	11.47862	11.692	1.38×10^{-3}	11.494	9.45×10^{-4}
873.5955	26.1897	11.44695	11.692	1.40×10^{-3}	11.494	9.67×10^{-4}
876.0060	26.2620	11.41545	11.692	1.41×10^{-3}	11.494	9.83×10^{-4}
878.4166	26.3343	11.38412	11.692	1.42×10^{-3}	11.494	9.97×10^{-4}
880.8272	26.4065	11.35296	11.692	1.42×10^{-3}	11.494	1.01×10^{-3}
883.2378	26.4788	11.32198	11.692	1.43×10^{-3}	11.494	1.02×10^{-3}
885.6484	26.5511	11.29116	11.692	1.44×10^{-3}	11.494	1.03×10^{-3}
888.0590	26.6233	11.26051	11.692	1.44×10^{-3}	11.494	1.04×10^{-3}
890.4695	26.6956	11.23003	11.692	1.44×10^{-3}	11.494	1.04×10^{-3}
892.8801	26.7679	11.19971	11.692	1.43×10^{-3}	11.494	1.05×10^{-3}
895.2907	26.8401	11.16956	11.692	1.41×10^{-3}	11.494	1.05×10^{-3}
897.7013	26.9124	11.13956	11.692	1.40×10^{-3}	11.494	1.05×10^{-3}
900.1119	26.9847	11.10973	11.692	1.38×10^{-3}	11.494	1.04×10^{-3}
902.5225	27.0569	11.08006	11.692	1.35×10^{-3}	11.494	1.04×10^{-3}
904.9330	27.1292	11.05054	11.692	1.33×10^{-3}	11.494	1.04×10^{-3}
907.3436	27.2015	11.02118	11.692	1.31×10^{-3}	11.494	1.03×10^{-3}
909.7542	27.2737	10.99198	11.692	1.27×10^{-3}	11.494	1.02×10^{-3}
912.1648	27.3460	10.96293	11.692	1.22×10^{-3}	11.494	9.91×10^{-4}
914.5754	27.4183	10.93404	11.693	1.17×10^{-3}	11.494	9.57×10^{-4}
916.9860	27.4905	10.90529	11.693	1.12×10^{-3}	11.494	9.15×10^{-4}
919.3966	27.5628	10.87670	11.693	1.08×10^{-3}	11.494	8.73×10^{-4}
921.8071	27.6351	10.84826	11.693	1.05×10^{-3}	11.495	8.35×10^{-4}
924.2177	27.7073	10.81996	11.693	1.02×10^{-3}	11.495	8.03×10^{-4}
926.6283	27.7796	10.79181	11.693	9.84×10^{-4}	11.495	7.77×10^{-4}
929.0389	27.8519	10.76381	11.693	9.57×10^{-4}	11.495	7.55×10^{-4}
931.4495	27.9242	10.73596	11.693	9.36×10^{-4}	11.495	7.35×10^{-4}
933.8601	27.9964	10.70824	11.693	9.18×10^{-4}	11.495	7.18×10^{-4}
936.2706	28.0687	10.68067	11.693	9.00×10^{-4}	11.495	7.03×10^{-4}

Frequency ν [cm^{-1}]	Frequency ν [THz]	Wavelength $\lambda_o = c_o/\nu$ [μm]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 300$ K) ε''_r [$-$]	Si ε'_r [$-$]	($T_\mathrm{a} \simeq 10$ K) ε''_r [$-$]
938.6812	28.1410	10.65324	11.693	8.84×10^{-4}	11.495	6.87×10^{-4}
941.0918	28.2132	10.62596	11.693	8.71×10^{-4}	11.495	6.68×10^{-4}
943.5024	28.2855	10.59881	11.693	8.64×10^{-4}	11.495	6.49×10^{-4}
945.9130	28.3578	10.57180	11.693	8.63×10^{-4}	11.495	6.35×10^{-4}
948.3236	28.4300	10.54492	11.693	8.66×10^{-4}	11.495	6.27×10^{-4}
950.7341	28.5023	10.51819	11.693	8.69×10^{-4}	11.495	6.26×10^{-4}
953.1447	28.5746	10.49159	11.693	8.72×10^{-4}	11.495	6.29×10^{-4}
955.5553	28.6468	10.46512	11.693	8.73×10^{-4}	11.495	6.33×10^{-4}
957.9659	28.7191	10.43879	11.693	8.74×10^{-4}	11.495	6.37×10^{-4}
960.3765	28.7914	10.41258	11.693	8.73×10^{-4}	11.495	6.40×10^{-4}
962.7871	28.8636	10.38651	11.694	8.68×10^{-4}	11.495	6.43×10^{-4}
965.1976	28.9359	10.36057	11.694	8.60×10^{-4}	11.495	6.44×10^{-4}
967.6082	29.0082	10.33476	11.694	8.47×10^{-4}	11.495	6.41×10^{-4}
970.0188	29.0804	10.30908	11.694	8.30×10^{-4}	11.495	6.35×10^{-4}
972.4294	29.1527	10.28352	11.694	8.11×10^{-4}	11.495	6.27×10^{-4}
974.8400	29.2250	10.25809	11.694	7.89×10^{-4}	11.495	6.17×10^{-4}
977.2506	29.2972	10.23279	11.694	7.65×10^{-4}	11.495	6.02×10^{-4}
979.6611	29.3695	10.20761	11.694	7.39×10^{-4}	11.495	5.86×10^{-4}
982.0717	29.4418	10.18256	11.694	7.10×10^{-4}	11.495	5.68×10^{-4}
984.4823	29.5140	10.15762	11.694	6.82×10^{-4}	11.495	5.47×10^{-4}
986.8929	29.5863	10.13281	11.694	6.52×10^{-4}	11.495	5.25×10^{-4}
989.3035	29.6586	10.10812	11.694	6.21×10^{-4}	11.495	4.98×10^{-4}
991.7141	29.7308	10.08355	11.694	5.90×10^{-4}	11.495	4.70×10^{-4}
994.1246	29.8031	10.05910	11.694	5.62×10^{-4}	11.495	4.42×10^{-4}
996.5352	29.8754	10.03477	11.694	5.39×10^{-4}	11.495	4.19×10^{-4}
998.9458	29.9476	10.01055	11.694	5.22×10^{-4}	11.495	4.01×10^{-4}