Refractive-Index Dispersion Formulas, Old and New[1] CARRIE E.
BLACK, University of Vermont, WILLIAM KARSTENS, Saint Michael's College,
DAVID Y. SMITH, University of Vermont and Argonne National Laboratory — A
multitude of dispersion formulas, many empirical, have been proposed to approximate the refractive index of transparent materials. The commonly used Cauchy and
Sellmeier formulas are based on classical elastic models. They also follow from more
fundamental linear-response theory: The generalized Cauchy formula follows from
expansion of the Kramers-Kronig relations in a Laurent series. It is exact, but may
involve many terms. In contrast, the Sellmeier formula follows from approximating
the continuous ir and uv absorptions of the material with a spectrum of isolated
lines. A superior representation involves a partial series expansion of the dispersion
relations followed by approximation of the remainder using a discrete spectrum.
The distinction between this and prior formulations is that the isolated-absorption
approximation is made at the last possible step. We have tested this new dispersion
formula on typical optical glasses and found it gives an improved representation of
the index.

David Y. Smith
University of Vermont

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