Spectral evaluation of optical-constant consistency

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Developing optical coatings requires access to accurate optical constants, n and k. Optical constants often lack consistency. A main source of inconsistency arises in not using the Kramers-Kronig analysis in the derivation of n and k; another source is the use of data aggregates of measurements on samples from different labs. Information on optical-constant consistency is valuable for the optical coating developer. This is even more important in the extreme and far ultraviolet, where k is typically non-negligible. Sum rules are tests to evaluate the consistency of optical constants. Common sum rules evaluate consistency over the full spectrum as a whole, but do not give information on the consistency at the range of interest. The use of window functions can overcome this limit. A window function is defined to give extra weight to an intended spectral range. Our previous research on window functions showed that they can tune the sum rule to evaluate the consistency at the desired range. New window functions have been derived that are beneficial compared to preceding functions. They provide a stable evaluation parameter when the window function is made to scan the spectrum. The new functions strongly minimize artifacts that may misguide us in optical-constant evaluation. Examples will be presented including sets of consistent data, such as a Lorentz oscillator, as well as optical constants sets reported in the literature.