New tools for optical constant calculation and analysis

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The design of optical elements, such as multilayer mirrors, relies on the availability of accurate optical constants *n* and *k*, which are a function of photon energy. Measuring *n* and *k* of a film material, even more in the far and extreme ultraviolet, involves difficulties, such as the presence of contaminants and roughness. For rather transparent materials, measuring *k* turns difficult due to the small dependence of optical measurements on the specific value of *k*.

To assist us in the process of *n*&*k* calculation, Kramers-Kronig (KK) analysis is an essential tool. *n* and *k* are said to be consistent when they are obtained with the KK relations, i.e., one optical constant is obtained from the other through integration in the full spectrum. KK relations also provide us with sum rules to evaluate the accuracy of the optical constants. Sum rules, which originally consist in the plain integration of the optical constants over the spectrum, can be tuned at the desired spectral range to better evaluate optical-constant consistency in that range.

In the presentation we will focus on our most recent work on optical-constant calculation, which includes the use of adapted sum rules, the improvement of spectral resolution of optical constant through local deconvolution, and the development of a tool to measure small values of *k*.