

Marketplace

The Solar Heating and Cooling Programme is not only making strides in R&D but also supporting the growth of the solar thermal sector. This section of the newsletter highlights the link between our R&D work and its practical impact on the world.

New Shading Standard Turns To BSDF Data Generation For Complex Fenestration Systems

Shading or daylighting devices are mentioned in several standards and must be considered in standardized methods and regulations. Their importance is growing in the context of increasing risks of building overheating while maintaining high visual comfort for occupants. However, it is often not specified how these devices can or should be represented.

Bidirectional Scattering Distribution Functions (BSDFs) offer an efficient possibility for this. The revised version of ISO/CIE 10916 introduces a three-phase calculation method in its new Annex B and explicitly requires BSDF data for the calculation. This adaptation of ISO/CIE 10916 was developed and coordinated in the context of former IEA SHC Task 61 on integrated lighting solutions.

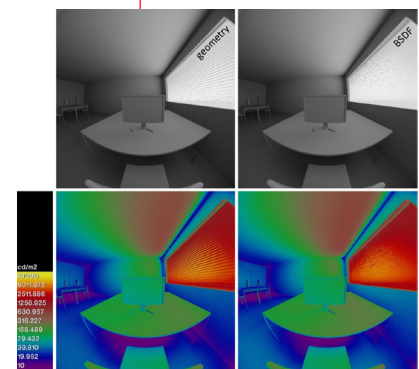
For transparent glazing in windows, standardized methods are well established to characterize the angle-dependent, solar-optical properties (transmittance, absorptance, reflectance). However, no standardized methods currently exist for “optically complex” or light scattering, shading, and daylighting systems. This, in turn, makes objective evaluation of energy performance, solar distribution, daylighting, comfort, and other building performance qualities almost impossible.

Simplified methods for characterizing complex fenestration systems (CFS) have been developed using normal-normal, normal-hemispherical, and diffuse-hemispherical transmittance and reflectance measurements. These methods have found their way into European and international standards (EN 14500/14501, ISO 52022) but can contribute to significant errors when assessing daylighting, indoor environmental quality (visual comfort), and solar gains-related building energy performance.

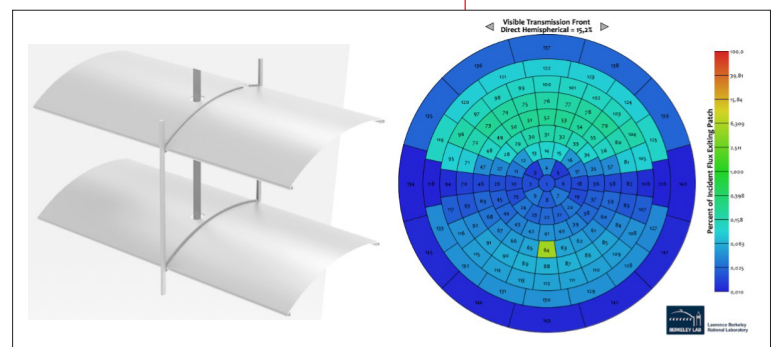
Standards and guidelines exist in various application areas that relate to daylighting and solar heat gains. In some cases, BSDFs are already incorporated, or methods and metrics are used that can be supported by BSDFs. The explicit introduction of BSDFs in ISO 10916 is certainly a milestone here.

The newly launched ISO/CIE AWI 25176 project in ISO/TC 274/JWG 1 aims to specify procedures for the BSDF characterization of CFS and the generation of tabular BSDF data sets as input to ISO 10916 and in simulation tools. The content is based on the results of the completed IEA SHC Task 61: [Integrated Solutions for Daylighting and Electric Lighting](#) and is being developed as part of the ongoing IEA SHC Task 70: [Low Carbon, High Comfort Integrated Lighting](#).

Article contributed by David Geisler-Moroder, leader of SHC Task 70, Subtask C: Subtask C: Digitalized Lighting Solutions (Technology & Design Tools / Process) and Dr. Jan de Boer, Task Manager of SHC Task 70. To learn more about this ongoing Task, visit the [Task webpage](#).



▲ Figure 1. Daylight simulation of an office space with a CFS (venetian blinds) modeled as geometry (left) and modeled with its BSDF (right).



▲ Figure 2. Left: Example CFS, exterior venetian blinds © HELLA Sonnen- und Wetterschutztechnik GmbH). Right: false color representation of BSDF in Klems discretization (right).