

## Nature inspired healthy light in the built environment

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**Duration:** 2014 - 2018

# Intelligent Lighting Institute

## Nature Inspired Healthy Light in the Built Environment

### Research description

Light exposure is not only essential for vision, but also for health of human beings through stimulation of the image forming (IF) and non-image-forming (NIF) effects. However, to date, the (day)lighting recommendations are based mainly on the IF light effects. Although this approach is sufficient to provide visual comfort and performance in spaces, it does not necessarily ensure an adequate level of NIF effects for health benefits.

Six light factors influencing stimulation of NIF effects have been reviewed and categorized based on their characteristics into two groups: luminous and temporal. Attention has been paid mainly to the luminous light factors (spectrum, quantity, and directionality) and particularly to light directionality as an important factor which has been found to play a significant role in the magnitude of NIF effects in humans. This research aims to **develop** a model to incorporate light directionality with regards to its NIF effects in (day)lighting design of a healthy office environment.

### Methodology

In this research six different objectives have been defined and grouped in three main phases of: "preparation", "development", and "recommendation". During the preparation phase the state of the art insights in the IF and particularly NIF effects of light on people have been reviewed. In the development phase, the focus has been on developing new measurement and simulation methods for investigation of NIF light effects. In the last phase the developed model will be used to define design guidelines to include light directionality with regards to its NIF effects in daylighting design.

### Highlights in 2017

A novel measurement method and instrument has been designed to perform multidirectional spectral measurement in an office setting to facilitate a better understanding and investigation of the NIF potential of spaces (Figure 1). The influence of weather type on light directionality and its NIF effects has also been studied (Figure 2). Moreover, a simulation method has been developed to include light directionality with regard to its NIF effects in analysis of luminous environments (Figure 3). The method has been used to assess the influence of different design parameters (window size, view position, view direction, and furniture design) on the NIF impact of light in a reference office. Doing so, the most influential design parameters and the most healthy location(s) in the office were identified.

### Future plan

Final step is to use outcome of the measurement and simulation methods to recommend **design guidelines** on the consideration of IF and NIF effects of light (focusing on light directionality) within the design process.

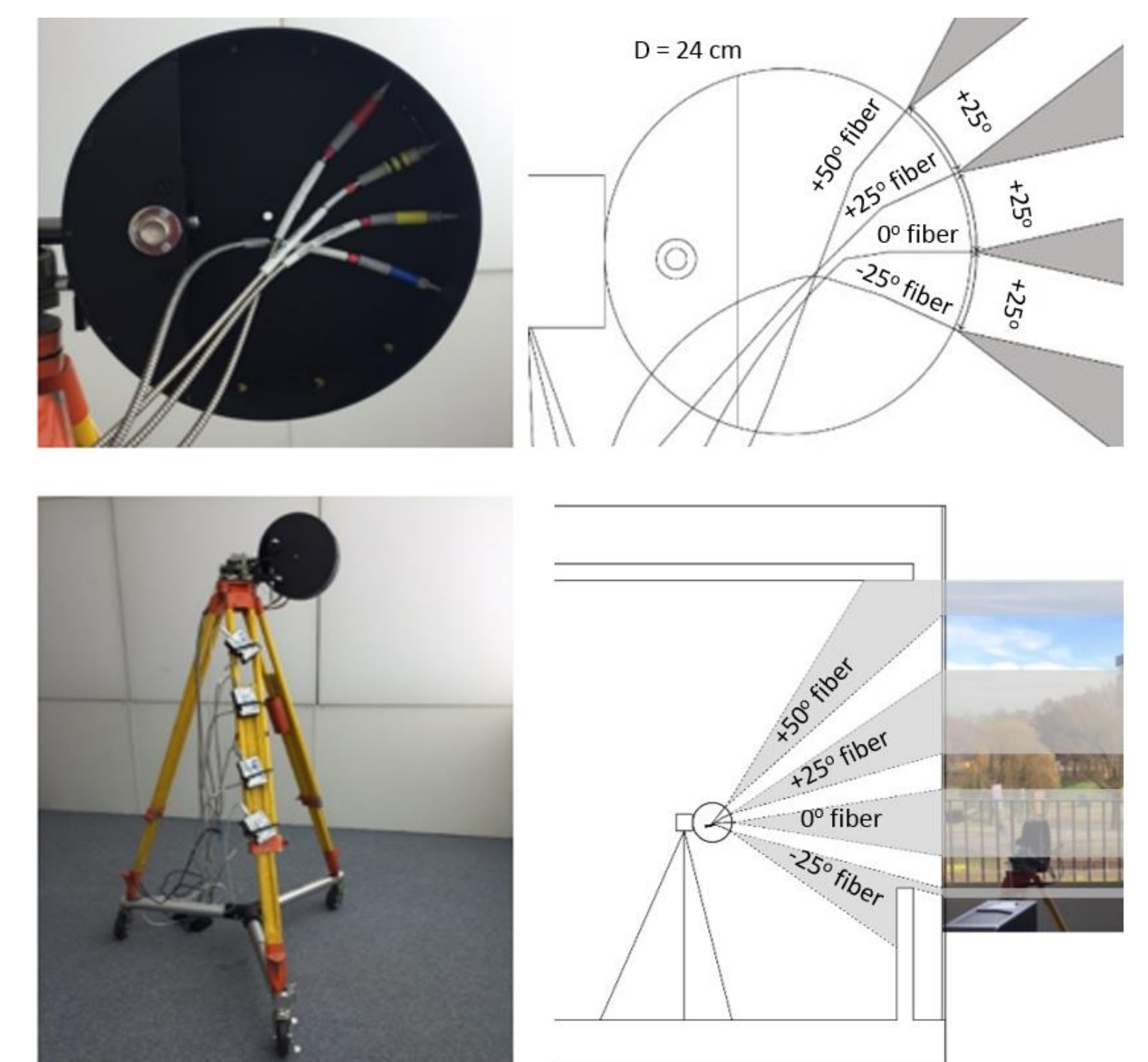


Figure 1: Multidirectional Spectroradiometer (MuS) instrument, its schematic drawing and placement in a day-lit office.

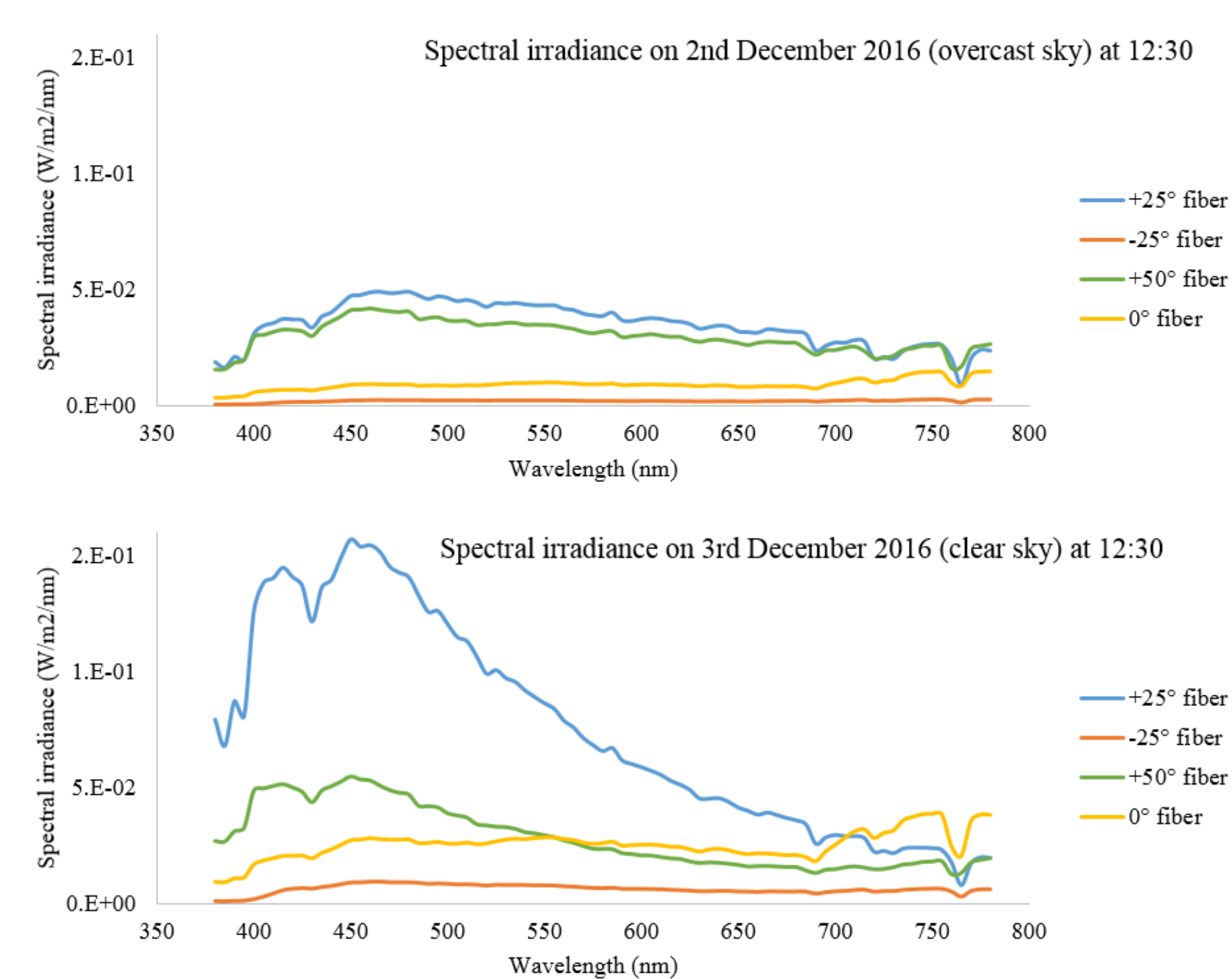


Figure 2: Multidirectional spectral irradiances measured simultaneously at 12:30 in two days, one with a clear sky and the other one with an overcast sky.

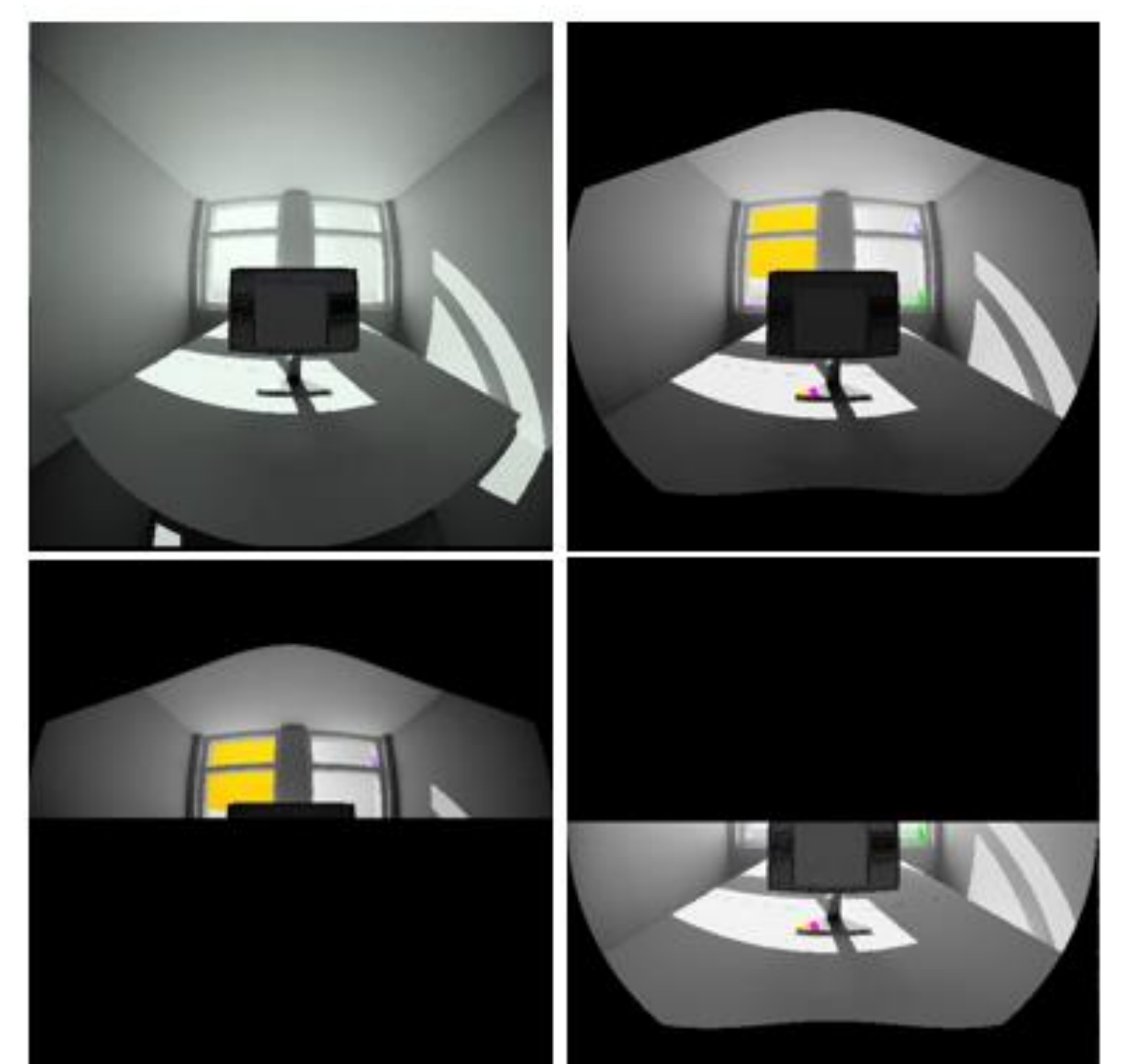


Figure 3: New simulation method to include light directionality with regards to its NIF effects in analysis of luminous environments.