

CALCULATION OF STRAY LIGHT IN GONIOPHOTOMETER ROOM

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The Working group for goniophotometry at Physikalisch-Technische Bundesanstalt (PTB) in Braunschweig, Germany, is equipped with a new robotic goniophotometer for the luminous flux measurements. To characterize the instrument, to reduce the measurement uncertainty and to determine respective uncertainty components, the influence of the stray light on the measurement results needed to be determined. Of course the room as well as the goniophotometer were made in a way to minimize the influence of the stray light to the measurement results. In spite of that, for the most precise measurements with a relative measurement uncertainty under $5 \cdot 10^{-3}$, the stray light has to be evaluated and considered in the final result. In case of the old PTB three-axis (gimbal mounted) goniophotometer, the stray light was determined once by the measurements with the shutters of different sizes. With extrapolation of the measurement results to the zero size of the shutter the stray light was calculated and later considered in the luminous flux measurement results independent of the actual spatial light intensity distribution. With the new robotic goniophotometer this procedure is not possible due to the different reasons like the versatility of the possible traces which can be configured for special lamp types. Because of that, we try to find out a different and more accurate way for determination of the stray light.

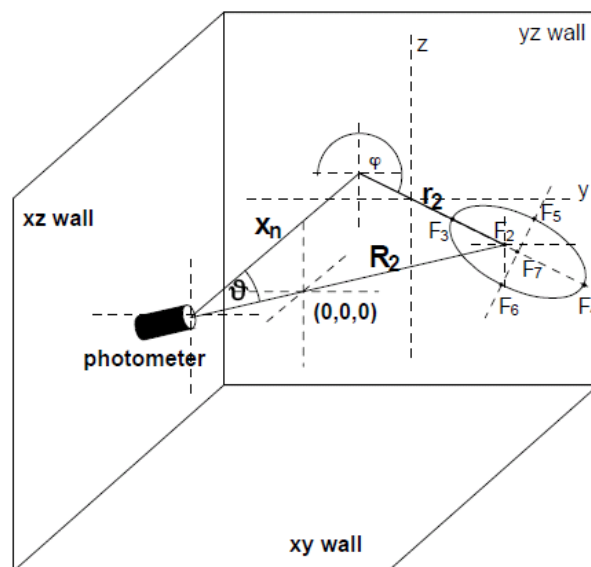


Figure 1 – the geometry used for calculation of stray light in goniophotometer room

As one of the promising possibilities the measurement of stray light with a “back-looking” photometer on each measuring robot arm was considered. Additionally to the main photometer another photometer, directed to the wall of the room, should be used. The measurement with this additional photometer would run on-line with the measurement of the luminous flux of the light source with the main photometer. In this way it also considers the influence of luminous intensity distribution of different light sources on

amount of stray light. Before its application, the proposed procedure was first tested with the help of calculations using mathematical models. In the paper, the mathematical models for the calculation of stray light in goniophotometer room is presented together with the calculation results. The results indicate that stray light measurements could help to decrease the total relative measurement uncertainty down to $2 \cdot 10^{-3}$.

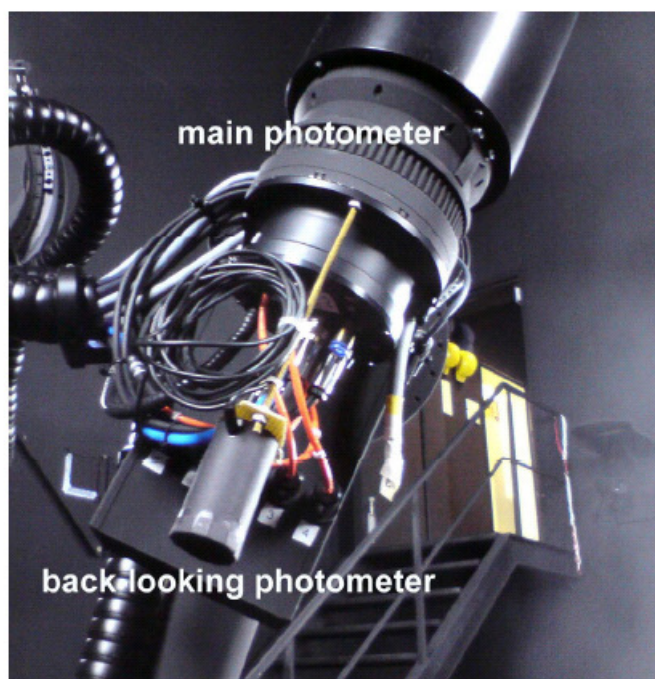


Figure 2 – Back-looking photometer with shutter experimentally mounted on the robotic arm behind the main photometer

Keywords: goniophotometer, stray light calculation, mathematical model