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X-ray photon transport simulators comparison: which will win?

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The race toward completing several next-generation X-ray light source facilities around the world has been running hot since a few years. This has created the need to accurately simulate the performances of the beamlines before they are built, so as to make sure the optimal layout has been chosen. To this end, the optical community has at its disposal several simulation tools, most of them incorporated into a single framework, Oasys.

The aim of this work is to highlight the strengths and weaknesses of three among the most commonly used software tools, namely SHADOW, Synchrotron Radiation Workshop (SRW), and WISEr, the first being a ray-tracer, while the last two are concerned with wave optics. For completeness, we included in our analysis also SHADOW's Hybrid extension.

In order to compare the different codes, we propagate a photon beam at different energies through a simple optical system, constituted by a plane mirror and a set of Kirkpatrick-Baez plane-elliptical mirrors.

We compare different diffraction effects, as well as the effects of the mirrors' figure errors.

The results obtained should be useful in choosing a specific simulation tool for a specific task in beamline design, while at the same time clarifying to new users the strengths and limits of each of the codes.

Journal of Synchrotron Radiation Special Issue: will you submit your contribution?

yes

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