

Abstract Submitted
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An Integrated Approach to the Design of Diffraction Limited Light Sources JI LI, University of Oxford — Many laboratories around the world are aiming to build a next generation diffraction-limited light source. Diamond Light Source is planning an upgrade of its accelerator with a factor- 20 reduction in emittance. One of the key aspects in the design of the upgrade is the optimisation of the photon beam properties, including the flux, brightness, and spot size, as well as the divergence and/or coherence of the new sources. To find the best trade-offs between electron beam dynamics and photon dynamics, we developed a wrapper code package which integrated the accelerator physics tracking code (ELEGANT) with radiation codes (SRW, SHADOW). We also implemented the Non-Dominated Sorting Genetic Algorithm II (NSGA II) in this approach so as to optimise a beamline using both wavefront and ray-tracing models. We evaluated the characteristics of the expected X-rays using the Diamond I13 coherence beamline as an example, and found extremely promising results arising from the optimisation. The beam size reduced significantly from $(\sigma_x, \sigma_y) = (17.9, 10.3) \mu\text{m}$ to $(\sigma_x, \sigma_y) = (3.3, 1.9) \mu\text{m}$, as a result the peak intensity increased by 40 times. We believe this code package would be a valuable tool for the design of future advanced synchrotron facilities.

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