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Ray tracing of the National Synchrotron Light Source U4IR beamline

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The U4IR beamline at the National Synchrotron Light Source (NSLS) provides a bright source of IR radiation over four decades of energy (1 μm to 1 cm). Because of large extraction optics (90 x 90 mrad), the source has a long arc-length (172 mm), is highly divergent and introduces aberrations in an optical system. In the past, the brightness advantage of this source was evaluated analytically. We now apply ray tracing to this extended source in order to obtain a more detailed understanding of the problem of correctly dealing with the collection optics and throughput of an IR system. The results of ray tracing using conventional and multi-faceted optics are presented.