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Prospects for Next-Generation Storage Ring Light Sources[1]

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Storage ring light sources are among the most productive large-scale scientific user facilities in existence, owing to a combination of broad tunability, mature technology, high capacity, remarkable reliability, and high performance. The most commonly-used performance measure is the photon beam brightness, which is proportional to the flux per unit volume in six-dimensional phase space. The brightness is generally maximized by minimizing the transverse phase space area, or emittance, of the electron beam that generates the photons. Since the 1990's, most storage ring light sources have used a variant of the Chasman-Green, or double-bend-achromat (DBA), lattice, which produces transverse emittances of several nanometers. Presently, several light sources are under construction based on more challenging multi-bend-achromat (MBA) concepts, which promise an order of magnitude reduction in the emittance. Somewhat larger reductions are contemplated for upgrades of the largest facilities. This talk briefly surveys the relevant concepts in light source design, then explains both the mechanism and challenge of achieving next-generation emittances. Other factors, such as improved radiation-emitting devices, are also described.

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