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Challenges related to the design, commissioning and operation of 3rd generation light sources

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Third generation synchrotron light sources under operation have reached very low emittances (1-5 nm.rad) at energies of a few GeV. Linear and nonlinear beam dynamics optimizations of their storage ring lattices are complex but well mastered. An overview of the procedures used for the optimization will be shown in this talk together with the performance of the latest generation of operating storage ring based light sources. Trends and innovations to meet the increasing user's demands for high brilliance, excellent stability, Top-up injection, and different time structures will also be presented. In addition, efforts are increasing toward the design of ultra-low horizontal emittance lattices either by the construction of new projects (MAXIV in Sweden and Sirius in Brazil) or by proposing possible upgrade of the existing sources based on a rebuild of the arcs with MBA cells (ESRF, SPring8, APS, ⋯).

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