

Abstract:

**A Highly Competitive Non-Standard Lattice for a 4th Generation Light Source
with Metrology and Timing Capabilities**

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The PTB, Germany's national metrology institute, has relied on synchrotron radiation for metrology purposes for over 40 years and the most prominent customers are lithography systems from ASML/ZEIS. HZB is now working on a concept for a BESSY II successor, based on a 4th generation light source with an emittance of 100 pmrad @ 2.5 GeV. It is essential, that this new facility continues to serve the PTB for metrology purposes. This sets clear boundary conditions for the lattice design, in particular, the need for homogeneous bends as metrological radiation sources. Different Higher-Order-Multi-Bend-Achromat lattices have been developed, based on combined function gradient bends and homogeneous bends in a systematic lattice design approach. All lattices are linearly equivalent with the same emittance and maximum field strength. However, they differ significantly in their non-linear behavior. Based on this analysis, the choice of the BESSY III lattice type is motivated. A special focus is set also on TRIBs (Transverse Resonance Island Buckets) to operate with two orbits as a bunch separation scheme in MBAs, for different repetition rates or for the separation of short and long bunches.