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Applications of horizontal field damping wigglers in the diffraction limited storage ring

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In this study, we present a lattice design for the diffraction limited storage ring (DLSR), that achieves an ultra-low natural emittance of $25.6 \text{ pm} \cdot \text{rad}$ (N-IBS). To address the significant intrabeam scattering (IBS) effect resulting from the ultra-low emittance and long damping times, Horizontal Field Damping Wigglers (HFDWs) were adopted. These components decrease damping times and beam horizontal emittance while generating vertical emittance, thereby achieving a “round beam” in the 864mDLSR. The optimal peak field, period length, and overall length of the HFDWs for the 864mDLSR have been determined using theoretical analysis and accelerator toolbox simulations. In addition, the linear optical corrections were performed on both the front and rear units of the HFDWs using six quadrupoles. A comparison of spectral brightness and flux was conducted on the 864mDLSRs with and without HFDWs.

Footnotes

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