

# Optimizing Electron Beam Orbit and Injection Stability for Compact Synchrotron Light Sources

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We are working on creating a small synchrotron light source for desktop applications using laser-driven electron acceleration. Our system includes a ring-shaped dipole with a block-shaped permanent magnet to reduce cost and weight. In our initial analysis, we found that minimizing electron beam divergence angles improves orbit stability. We also discovered that modulating the peak magnetic field can enhance stability without the need for additional quadrupoles. CST simulations showed us that the magnetic field within the ring-shaped dipole varies along the orbit due to its unique geometry. One of our main challenges is ensuring stable electron beam injection into the dipole, and to address this, we are using sequential magnetic elements designed to guide and stabilize the injected beam's orbit. This paper outlines our design and optimization efforts to achieve stable beam orbits during injection.

## Paper submission Plan

No

## Best Presentation

Yes

## Contribution track

ICABU WG3. Beamline and Instrumentation

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