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Experimental design for coherent synchrotron radiation with shielding

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The impediment of collective beam effects, including coherent synchrotron radiation (CSR) is a critical challenge in the generation of high-brightness beams, requiring new theoretical and experimental insight. This work will outline plans for a sequence of upcoming experiments at the Argonne Wakefield Accelerator (AWA) that leverages both the large parameter space for the bunch charge and size, various bunch profiles (round and flat beams) as well as the capability of generating shaped bunches through laser shaping and the emittance exchange. In particular, we will discuss an upcoming CSR shielding study using a dipole chamber with a variable gap size along with plans for future experiments that benchmark the effect of CSR on the beam phase space in a laser-shaped short electron bunch. This work is part of a comprehensive analysis including the development of novel self-consistent CSR simulation methods and theoretical analysis. The results of the experimental components, in addition to providing benchmarks for the theoretical developments, will explore the parameter bounds of 1/2/3D CSR effects on beam dynamics, evaluate CSR effects on complex beams and eventually be used to propose mitigation strategies.

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Working group

WG5 : Beam sources, monitoring and control

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