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Lattice design and start-to-end simulations for the ARES linac

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The SINBAD (Short INnovative Bunches and Accelerators at DESY) project is a dedicated, long-term accelerator research and development (R&D) facility currently under construction at the DESY Hamburg campus, aiming to provide an infrastructure for developing several types of novel high-gradient accelerators. We present the design of the magnetic lattice as well as the modeling and simulations of ultra-short electron bunch generation at the ARES (Accelerator Research Experiment at SINBAD) linac, which is the core of the SINBAD facility. In order to meet the requirements of the high-gradient accelerators, the ARES linac was optimized to provide ~100 MeV, low charge (0.5 to 30 picocoulombs) and ultra-short electron bunches (sub-femtosecond to a few femtoseconds) with ultra-small spot sizes (less than a few micrometers) and excellent timing stability (rms bunch arrival-time jitter < 10 femtoseconds).

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