

Physics and Applications of High Brightness Beams



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Status of high gradient C-band RF photoinjector project at LANL

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This talk will report on the status Cathodes And Radio-frequency Interactions in Extremes (CARIE) high gradient C-band RF photoinjector project at Los Alamos. Modern applications such as X-ray sources require electron beams with ultra-low emittance and very high brightness that may be achieved by accelerating the electron beam produced in an RF photoinjector with electric field higher than 100 MV/m. At LANL we are putting together the high gradient photoinjector test stand capable of producing electric fields at the cathodes as high as 250 MV/m. The photoinjector will be powered by a 50 MW, 5.712 GHz Canon klystron. Adding capability to operate the photoinjector at cryogenic temperatures is considered. The construction of CARIE began in October of 2022. A concrete vault was renovated, capable to provide radiation protection for electron beams with beam power up to 20 kW. The klystron will be delivered in summer of 2023. All waveguide and vacuum components have been ordered. The all-copper photoinjector was designed and is currently in fabrication. The second version of the photoinjector will operate with replaceable high quantum-efficiency cathodes and produce an ultra-bright 250 pC electron beam accelerated to the energy of 8 MeV. The status of the facility, the designs of the photoinjector and the beamline, and plans for photocathode testing will be presented.

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