

15th Workshop on Breakdown Science and High Gradient Technology (HG2023)



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Update on high gradient C-band project at LANL

Thursday, 19 October 2023 10:40 (20 minutes)

This talk will report on the status high gradient C-band accelerator structure research at Los Alamos National Laboratory (LANL). Current activities at LANL include construction of the Cathodes And Radio-frequency Interactions in Extremes (CARIE) high gradient C-band RF photoinjector test stand and research on the higher order mode (HOM) absorbers for high gradient cavities. We are putting together the high gradient photoinjector test stand capable of producing electric fields at the cathodes up to 250 MV/m. The photoinjector will be powered by a 50 MW, 5.712 GHz Canon klystron. The klystron was delivered to LANL in July of 2023, installed, and is being tested. A concrete vault was renovated, capable to provide radiation protection for electron beams with beam power up to 20 kW. All required waveguide and vacuum components have been received and the waveguide line to the photoinjector is being constructed. The all-copper photoinjector was designed and is currently in fabrication with the expected delivery in September of 2023. The second version of the photoinjector will be built with replaceable high quantum-efficiency cathodes and produce an ultra-bright 250 pC electron beam accelerated to the energy of 8 MeV. Adding capability to operate the photoinjector at cryogenic temperatures is considered. The status of the facility, the designs of the photoinjector and the beam-line, and plans for photocathode testing will be presented. As a separate synergistic activity, we designed and are currently fabricating a test two-cell accelerating structure with nickel-chrome HOM absorber waveguides. The structure will be tested at LANL's C-band Engineering Research Facility in New Mexico (CERF-NM) with the goal to determine high gradient conditioning and operation limitations of these novel absorbers. The talk will also cover the design of the structure and fabrication and testing plan.

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