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X-ray measurements in a prototype superconducting radiofrequency electron gun for LCLS-II-HE project

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Argonne National Laboratory is collaborating with MSU, HZDR, and SLAC on the design, fabrication, and testing of a prototype superconducting radiofrequency (SRF) gun for the LCLS-II-HE upgrade at SLAC. The gun cavity is a quarter-wave resonator with a frequency of 185.7 MHz. Despite careful calibration of the cavity field probe, there are still uncertainties in the RF measurements taken to determine quality factor and field level in the cavity. One way to independently check the RF measurements is to calculate the field level from the x-ray energy spectrum generated by field emission during testing. X-ray measurements were done with a sodium iodide detector. This paper presents results of x-ray energy spectrum measurements and compares it to the RF measurements of cavity field level at 18 MV/m and 21 MV/m. Numerical simulations are also presented to understand the acceleration and dynamics of field-emitted electrons.

Footnotes

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Primary author: VILLAFANIA, Kaela (Argonne National Laboratory)

Co-authors: KELLY, Michael (Argonne National Laboratory); PIOT, Philippe (Northern Illinois University); KIM, Sang-Hoon (Facility for Rare Isotope Beams, Michigan State University); XU, Ting (Facility for Rare Isotope Beams); PETERSEN, Troy (Argonne National Laboratory)

Presenter: VILLAFANIA, Kaela (Argonne National Laboratory)

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