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Hybrid RF photoinjector beam characterization with FET detectors

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RadiaBeam has recently built and commissioned a novel C-band photo injector for high brightness Inverse Compton Source. This photoinjector is capable of producing ultra-short femtoseconds electron 250 pC bunches producing up to 300 A of beam current while maintaining the transverse emittance at a submicron level. In this paper, we describe the beam characterization of this photoinjector using novel field effect transistors (FET) sub-THz detectors. FET detectors based on nanoscale semiconductor wires are passive devices and capable of detecting a very short and weak signal in THz and sub-THz ranges and suit well for beam characterization. By detecting the signal from the coherent transition radiation produced by the electron bunch passing through a thin aluminum foil we were able to characterize the longitudinal beam parameters. This work describes the system layout, experiment procedure, and test results of bunch length measurements.

Footnotes

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