Investigation of pulsed spin polarized electron beams at the S-DALINAC

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A source of polarized electrons has been implemented at the superconducting Darmstadt electron linac S-DALINAC. It uses photo-emission from strained-layer superlattice-GaAs (SSL) and bulk-GaAs photocathodes, driven by either 3 GHz modulated diode lasers at 780 nm (high polarization) and 405 nm (unpolarized, high quantum efficiency) or a short-pulse Ti:Sapphire laser system at 780 nm. We present results from measurements with varying laser pulse lengths, yielding electron bunch lengths between 40 ps and 90 ps using a pulse stretcher system and a single-mode optical fiber. The electron bunch length was determined using a chopper rf cavity and a slit system. The dependence of the electron polarization from the rf phase was studied over the electron bunch both for SSL and bulk cathodes. The extracted data at low quantum efficiency require an extension of the model description for photo-emission from semiconductor cathodes.

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