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Design of a new S-band 250 MeV electron linac with RF SLED compression for the CLS

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RI Research Instruments (RI) in partnership with The Canadian Light Source (CLS) have designed a new 250 MeV electron linac to inject into the 0.25-2.9 GeV booster synchrotron. The RF frequency is 3000.24 MHz, the sixth harmonic of the 500.04 MHz booster and storage ring RF cavity frequency, and the main accelerating sections consists of three 5 m constant gradient accelerating structures. The 3 GHz bunching sections and the first accelerating structure are fed by a 40 MW klystron, while structures two and three are fed by a single 40 MW klystron with a SLED RF compression scheme. The electron source consists of a 90 keV thermionic cathode with a 500 MHz modulated grid and a 500 MHz sub-harmonic pre-buncher to synchronise with the booster ring cavity frequency. A single-bunch mode can be delivered, as well as a multi-bunch with up to 140 ns bunch trains of up to 5.6 nC of charge per shot, both at a 1 Hz repetition rate to match the booster ramp cycle. The project is scheduled to bring the linac into operation for top-up injection into the CLS storage ring by mid-2024. This paper will present the design with a special focus on the implementation of a SLED to deliver a recovery mode of operation using only a single klystron.

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Footnotes

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Yes

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