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Numerical study of 5 MeV SRF electron linac for wastewater purification

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Superconducting Radio Frequency (SRF) technology is a proven solution for generating high-power electron beams (EB), suitable for tasks like purifying wastewater from challenging impurities such as PFAS. This study elaborates on effectiveness of EB treatment and outlines design considerations for a 1.3 GHz SRF linac operating at 5 MeV with an average beam current of 10 mA. Nu-merical analyses for the accelerator system, ensuring that the beam reaches 5 MeV with the desired characteristics, lead to a compact beamline structure. This structure includes a 100 kV thermionic gridded electron gun, a 1.3 GHz 3-cell low beta buncher cavity, and three 2-cell 1.3 GHz accelerator cavities, along with necessary focusing solenoids, all fitting within 3 meter. Given the need for high beam current, achieving a high bunch repetition rate is important. We therefore will employ the RF gating to the grid of the electron gun. The results of the numerical studies will be presented at this conference.

Footnotes

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Author: KAVAR, Anjali (Tohoku University)

Co-authors: KASHIWAGI, Shigeru (Research Center for Accelerator and Radioisotope Science); MUTO, Toshiya (Tohoku University); HAYATO, abiko (Tohoku University); HINODE, Fujio (Tohoku University); NAGASAWA, Ikurou (Tohoku University); NANBU, Ken-ichi (Tohoku University); SHIBATA, Kotaro (Tohoku University); TAKAHASHI, Ken (Tohoku University); KUDO, Kodai (Tohoku University); YAMADA, Hiroki (Tohoku University); HAMA, Hiroyuki (Tohoku University)

Presenter: KAVAR, Anjali (Tohoku University)

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