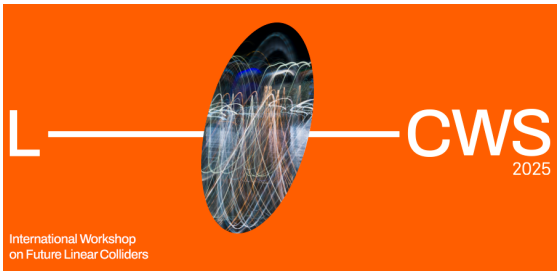

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Beam dynamics based design of a heavy loaded X-band linac for neutron production

Wednesday 22 October 2025 12:10 (20 minutes)

Electron linear accelerators are compact and energy-efficient drivers for moderate neutron production, making them attractive for research, medical, and industrial applications. We present a preliminary beam-dynamics design of an X-band accelerator capable of delivering an electron beam with a mean final energy of 509 MeV. The design prioritizes stable, high-intensity operation, achieving an 87% beam-loading ratio. The system demonstrates 100% transmission tolerance for initial beam-offset jitters up to 5% and for linac element rms misalignments up to 100 μm. The resulting source is expected to emit neutrons at a strength of $1.56 \cdot 10^{14}$ n/s, with an estimated energy cost of $8.57 \cdot 10^{-10}$ J per neutron. These results highlight the potential of X-band electron linacs as efficient drivers for neutron generation in a wide range of applications.

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