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Beam physics in support of active experiments in space KATERYNA YAKYMENKO, GIAN LUCA DELZANNO, BRUCE CARLSTEN, Los Alamos National Laboratory, VADIM ROYTERSHTEYN, Space Science Institute — Recent advances in accelerator technologies as well as space diagnostic instruments open possibilities for new electron beam experiments in space. Two examples of such experiments include the CONNection EXplorer (CONNEX) experiment and the Beam Plasma Interaction Experiment (BeamPIE). The CONNEX experiment aims to study magnetic field-line connectivity between magnetosphere and ionosphere. BeamPIE will fly an advanced electron beam on an ionospheric rocket in order to generate whistler and X-mode plasma waves. Our theoretical and modeling work supports the design of both experiments and other applications such as using electron beams to remediate artificial and natural radiation belts. In the presentation we will focus on the beam dynamics for these applications. We perform particle simulations of the transverse beam dynamics coupled with a simple model of longitudinal beam dynamics. We discuss how the beam dynamics affects the beam-generated wave-source region in the BeamPIE experiment and how it can be maximized by optimizing the beam parameters. We also show that the transverse beam dynamics plays an important role in for beam stability in the CONNEX experiment.

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