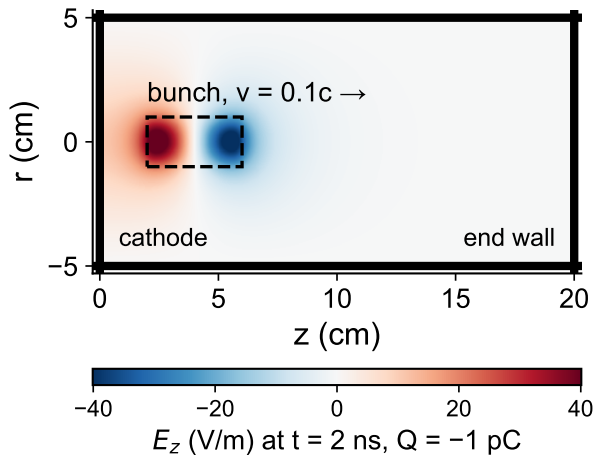
Electromagnetic Space-Charge Fields in a Cylindrical RF Cavity with an Axial Aperture

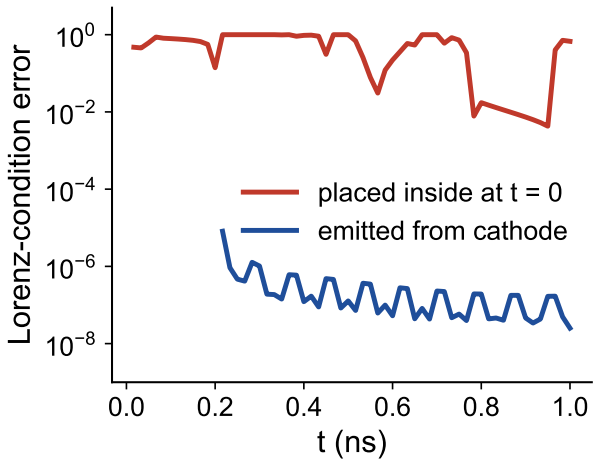
Cathode emission makes eigenmode fields Maxwell-consistent

1 Bunch leaves the cathode



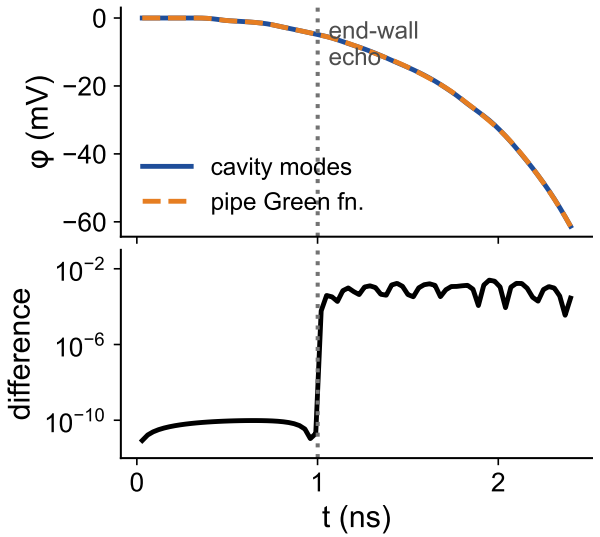
Cavity eigenmodes: every wall condition exact; $\mathbf{E}$ and $\mathbf{B}$ as formulas.

2 Start from the cathode



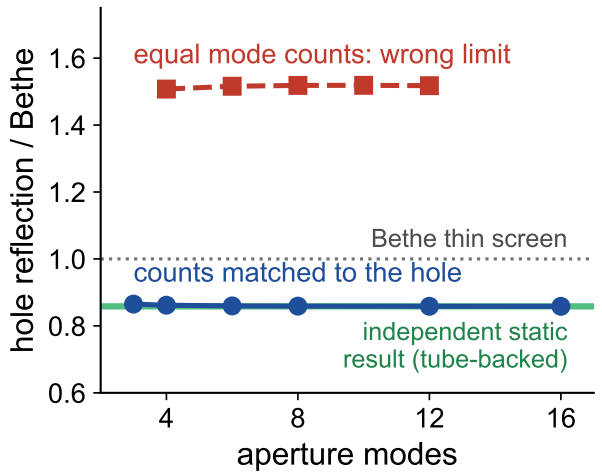
A bunch placed inside breaks the Lorenz condition for good; an emitted one does not.

3 Independent check



Matches the cathode-pipe Green function to $\sim 10^{-10}$ in ϕ until the end-wall echo.

4 The aperture



Matched mode counts give the tube-backed hole, $0.572\,b^3$; equal counts do not.

Prescribed trajectories, no rf field yet. Next: rf-driven bunch and a full-wave comparison.