Longitudinal Acceptance of Linac

- Consider phase space before acceleration
  - Want to know what region of phase space is "captured" by linac
  - Call one particle the reference particle
  - Look for particles which remain nearby that particle after being accelerated
  - Find region where those particles were *before* being accelerated.
- Consider longitudinal phase space only for now
- Accelerate at constant phase, gradient
- Results optimistic
  - Will move phase toward crest as we accelerate
    - Try to do so that excess particles won't be lost
    - Bunch adiabatically shortens as first, so possible
  - Transverse will decrease longitudinal area
    - Finite angles mean late arrival
    - Right for on-axis particles: gives dimension of ellipsoid

Commentary

- Captured area larger than adiabatic
  - Adiabatic bucket increases in energy spread
  - Rotation counter-clockwise
  - Particles at top right more likely to still be around when bucket area is larger
- Area larger further off-crest
  - 90°, no acceleration, all decay
  - Multiply area by decayed fraction
  - Optimum accelerating phase: around 75° here
- Area increases with gradient
- Funny shape
  - Continues up and to the right
  - Suggestions for description "useful" subregion welcome