

# **A Scaling FFAG for a Foil Proton Source**

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# Parameters

- Protons
- Triangular kinetic energy spectrum to 50 MeV, max at 0 MeV
- 1 m maximum radius
- Maximum field: 0.6–0.7 T
- About 30 lattice cells
- Spot size: 100  $\mu\text{m}$
- Angular spread: about  $20^\circ$
- 10 nC total charge

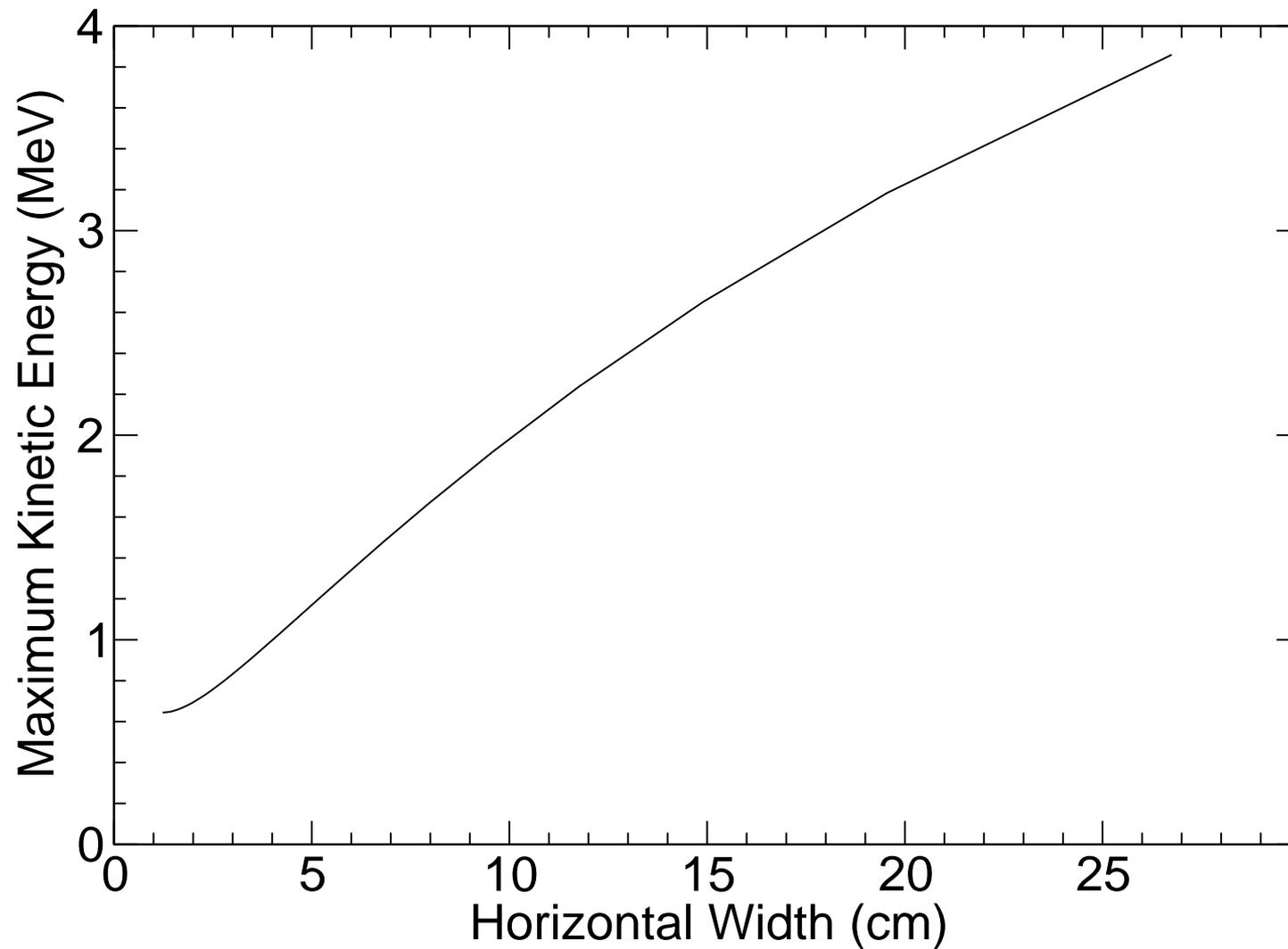
# Type of Machine

- Want large energy acceptance simultaneously
- Fixed field alternating gradient accelerators ideal for this
- Use scaling FFAG
  - ◆ Lots of space charge: non-scaling forces you into resonance at some energies
- For now, don't leave any space in lattice
  - ◆ Use FODO

# Design Tradeoffs

- If all magnets bent forward with 0.6 T, maximum energy of 1 m radius would be 17 MeV
- FFAGs require both forward and backward bending
  - ◆ Horizontal aperture reduced by having more reverse bending
  - ◆ More reverse bending means lower maximum energy
- Optimal efficiency obtained with high horizontal tune, low vertical tune
  - ◆ Dynamic aperture may require more modest tunes
- All numbers are based on optimistic assumptions
- Non-scaling FFAG may allow higher energy for given aperture

# Maximum Energy vs. Aperture



# Matching

- Beam has beta function much smaller than ring
- Must introduce dispersion somehow to match into ring
  - ◆ Smaller dispersion leads to lower energy
- Probably can't put target into ring