Updated Baseline EMMA Lattice

J. Scott Berg
Brookhaven National Laboratory
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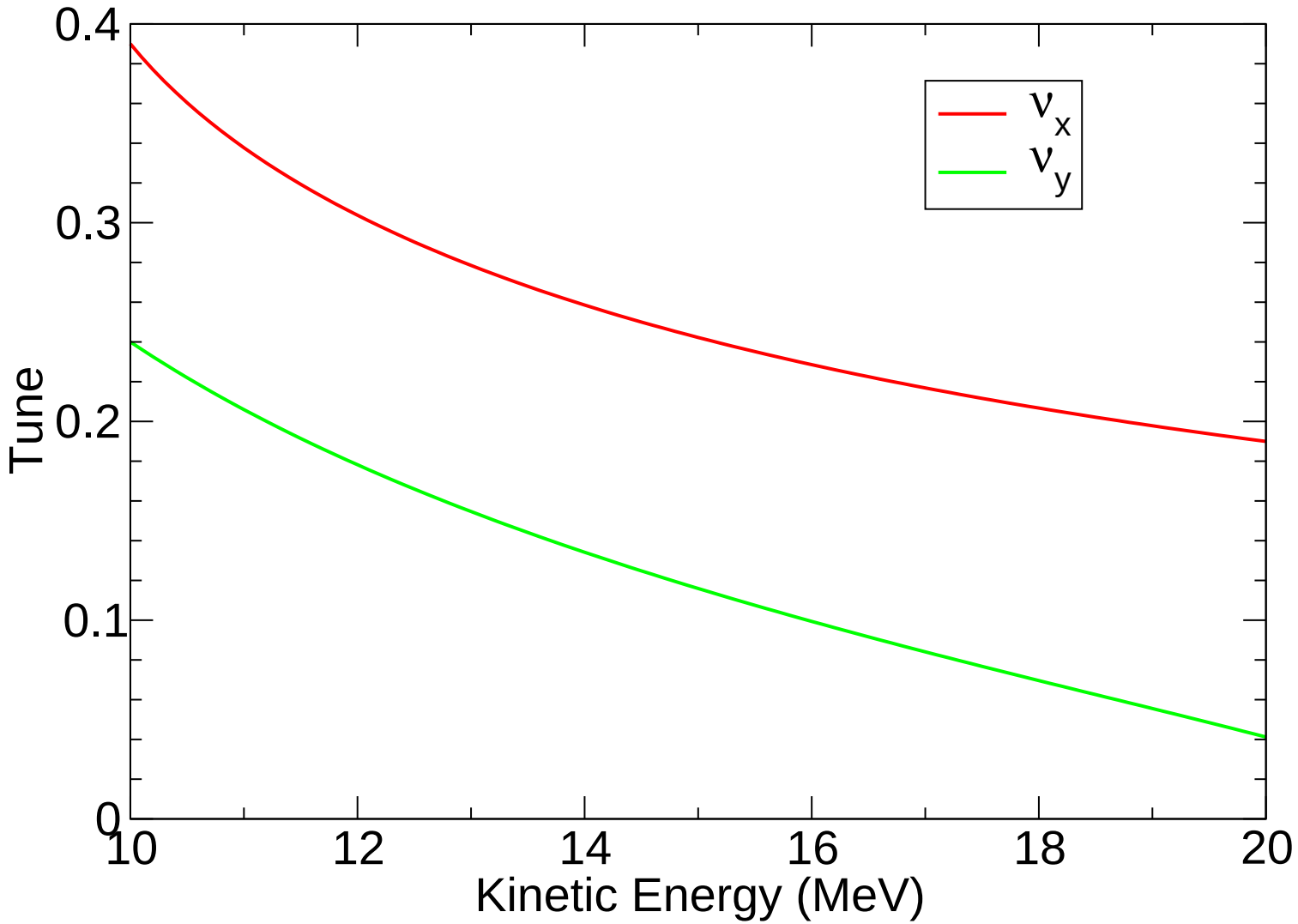
Why an Update?

- Tune at high energy is very low
- Large angles, large edge effects than corresponding muon machines
- Low tune makes lattice properties very sensitive to details
  - E.g., Shinji found very different beta functions at high energy
- In muon machines, vertical size in D at high and low energy about the same
  - Wasn't true here
  - Made magnets larger than needed

Original Lattice
Tunes



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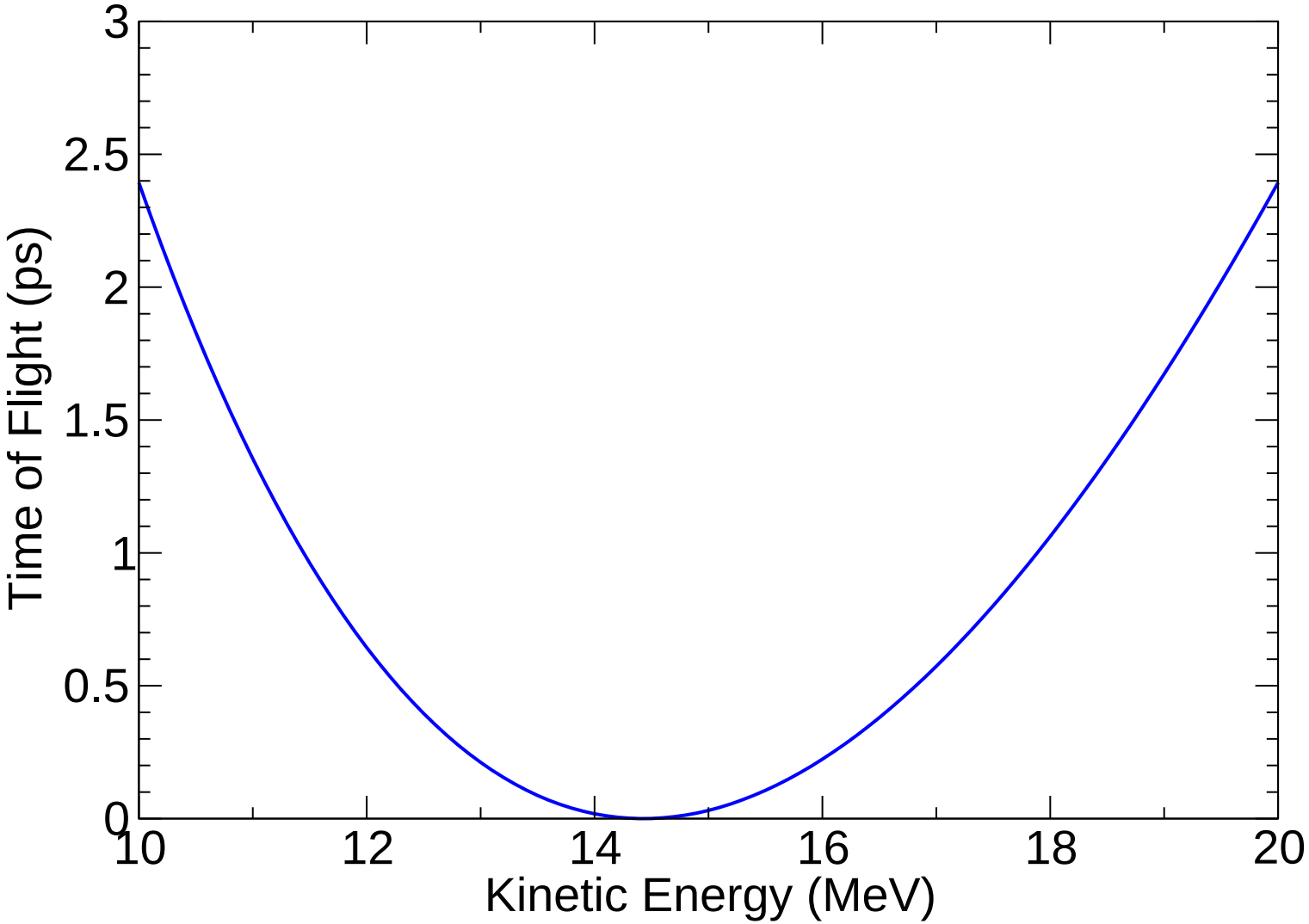
Original Lattice
Time of Flight



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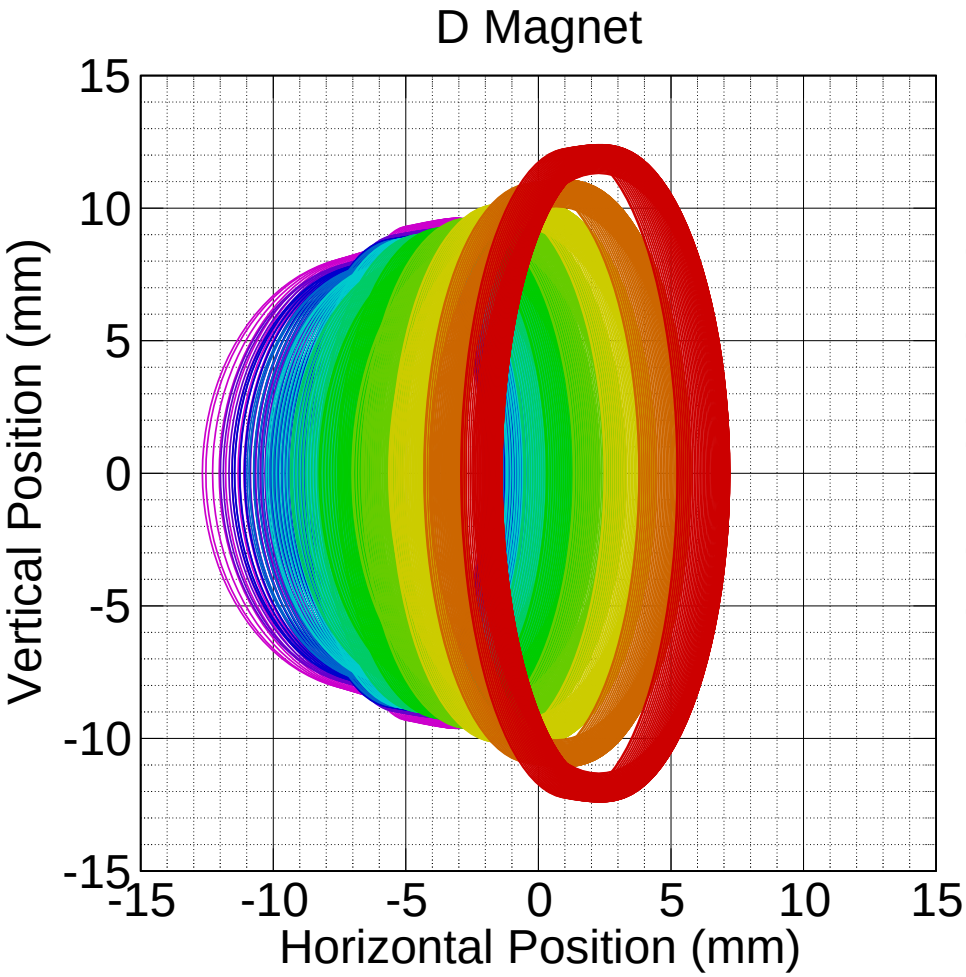
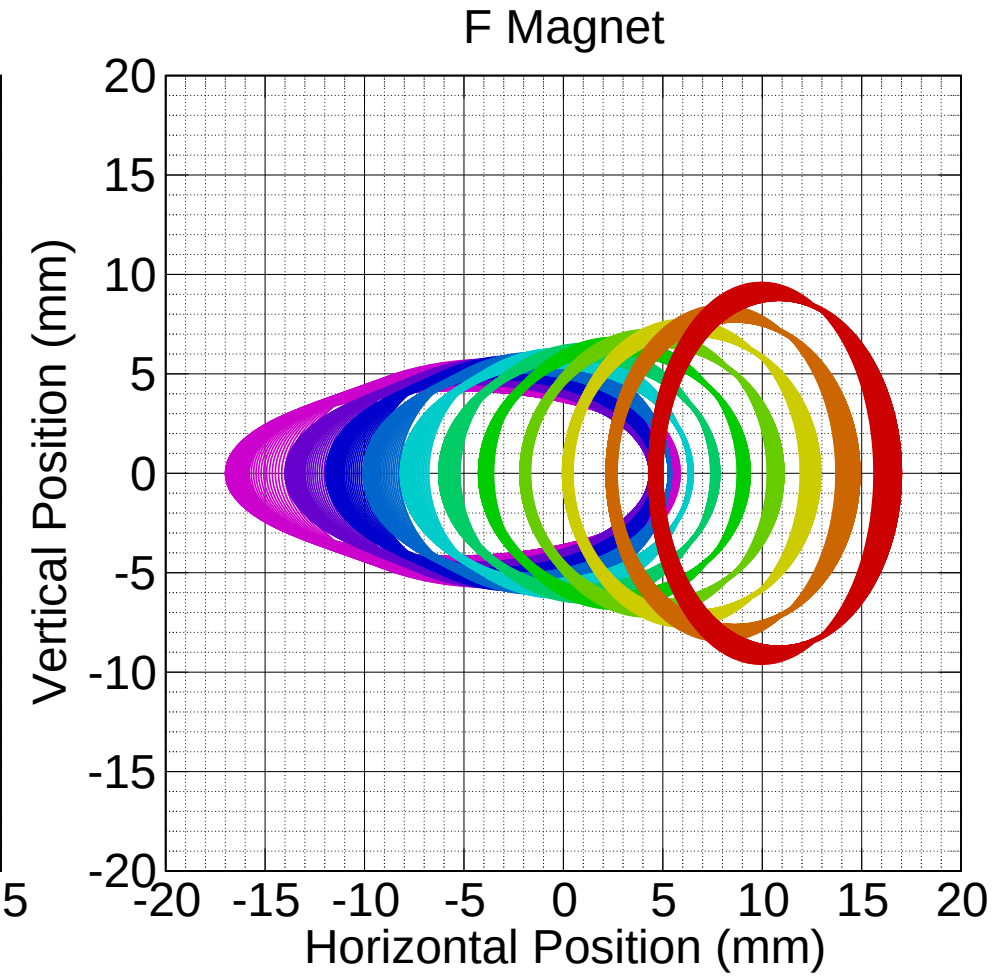
Original Lattice
Beam Ellipses





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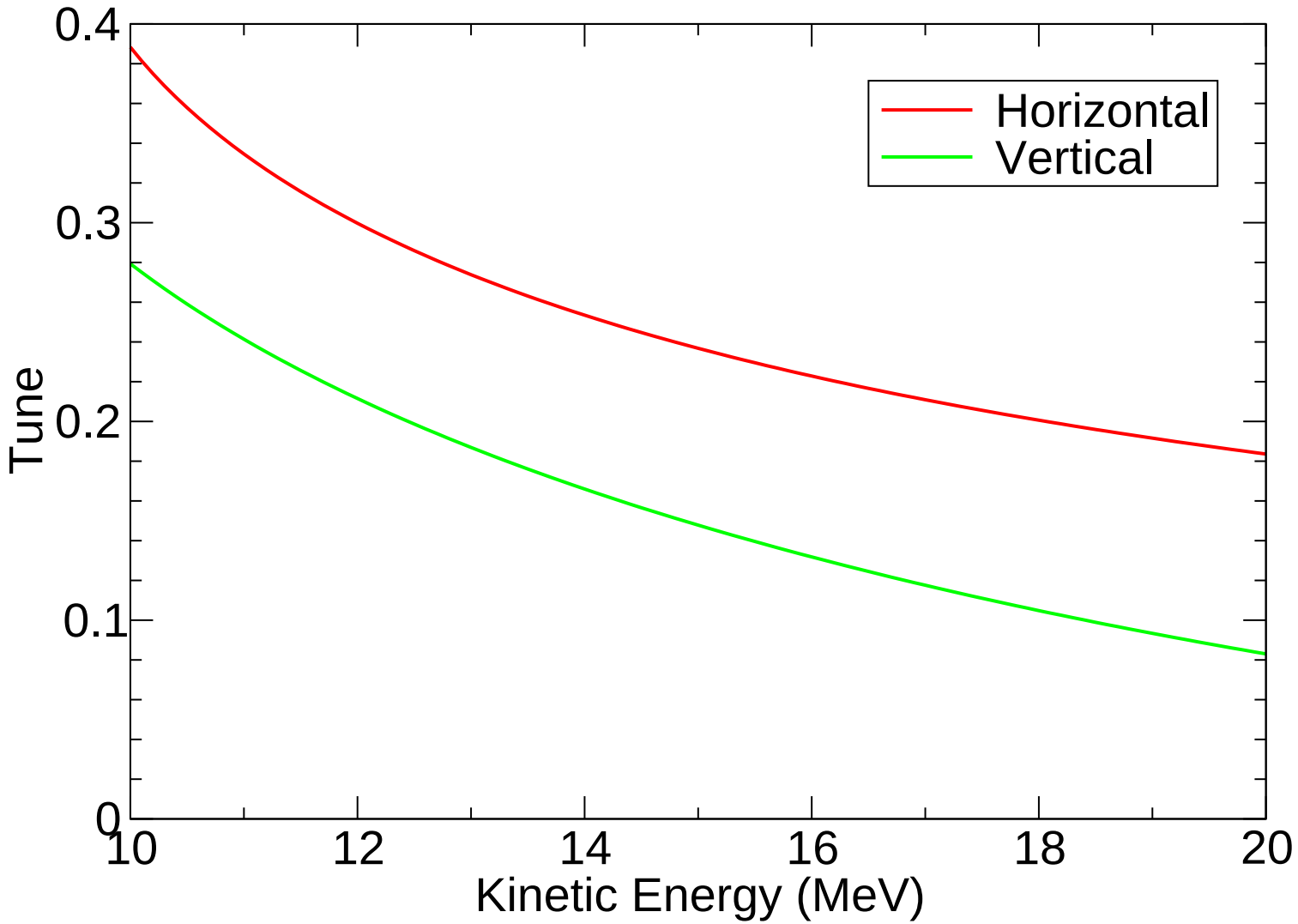
New Lattice

- Optimization criterion: make sum of pipe sizes minimum
  - Previously: fix low energy tunes
  - Pole tips (by my crazy computation) are 0.2 T
  - Still 42 cells
- Results
  - Improved high energy tune substantially
  - Vertical beam pipe size improved
    - ⋆ However, need to leave room anyhow for alternate configurations
    - ⋆ But previous baseline can be considered the high end of the range?
    - ⋆ Small cost in time of flight
- Lattices not all that different

New Lattice
Tunes



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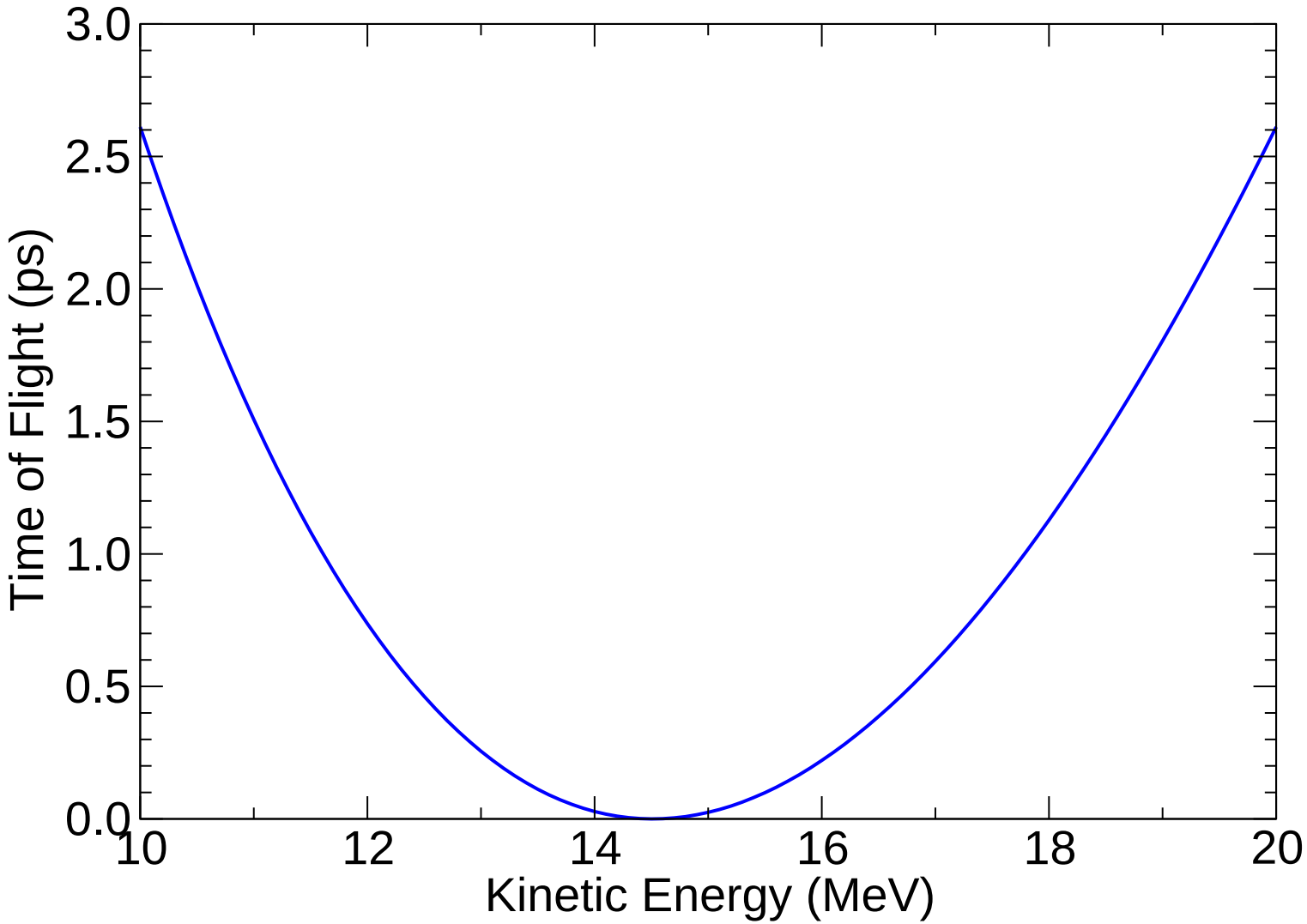
New Lattice
Time of Flight



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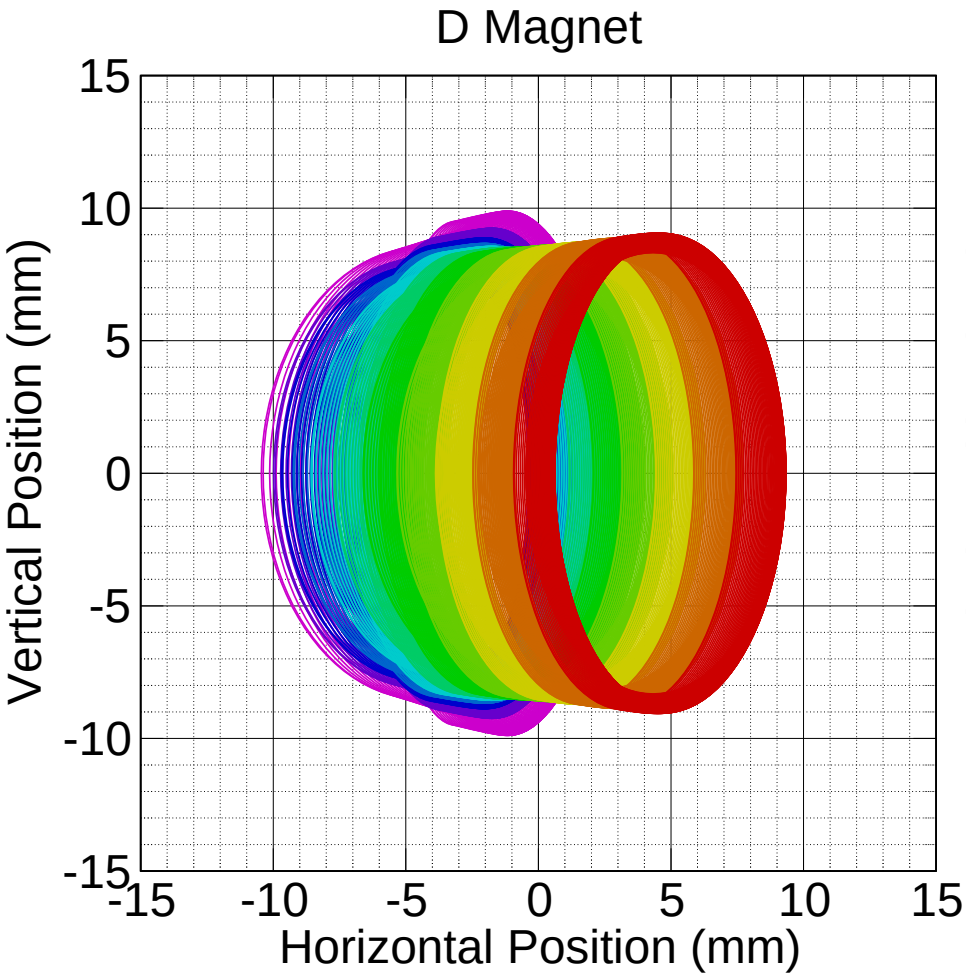
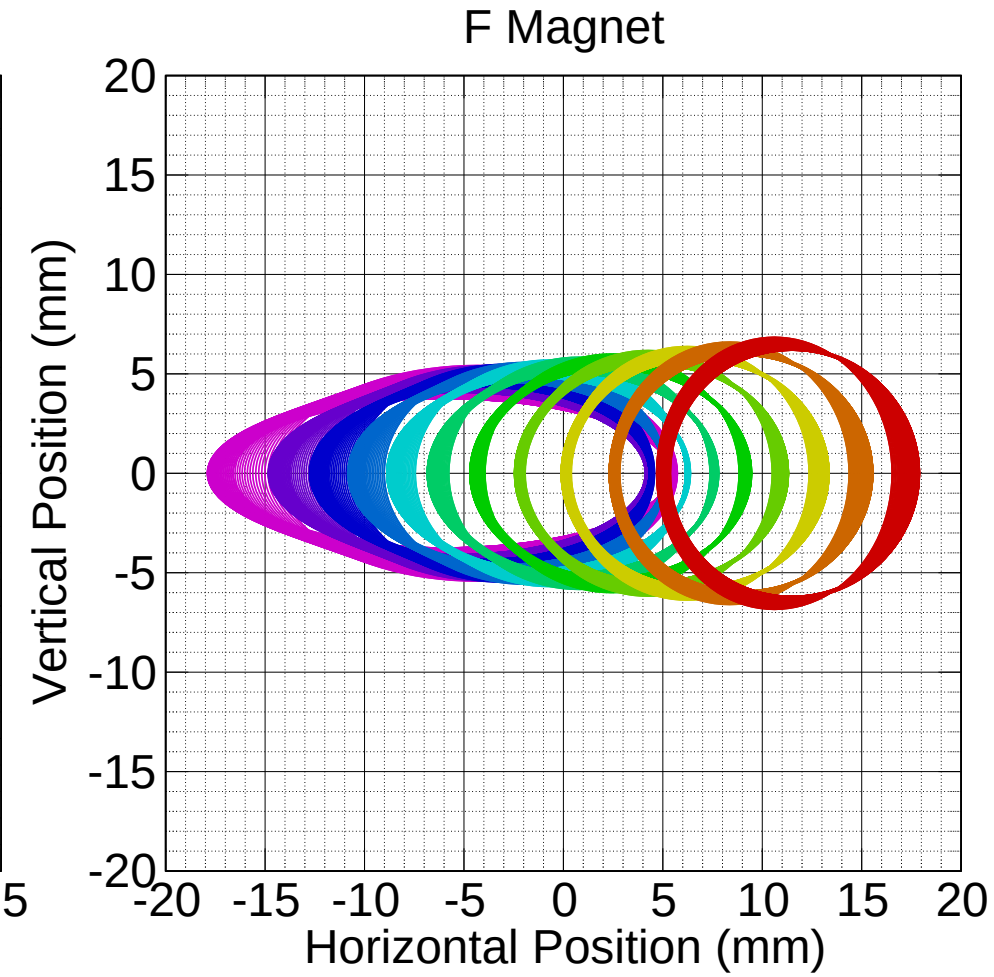
New Lattice
Beam Ellipses





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Lattice Parameters

	Old	New
Long drift (mm)	200	200
Short drift (mm)	40	50
D length (mm)	70.0	71.5
D angle (mrad)	201	200
D dipole (T)	0.133	0.137
D gradient (T/m)	-4.62	-4.59
F length (mm)	60.0	63.1
F angle (mrad)	-51	-50
F dipole (T)	-0.051	-0.045
F gradient (T/m)	7.43	6.68
Voltage/cell @ $a = 1/12$ (kV)	16.3	17.8
$\Delta E/V$ @ $a = 1/12$	614	563

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