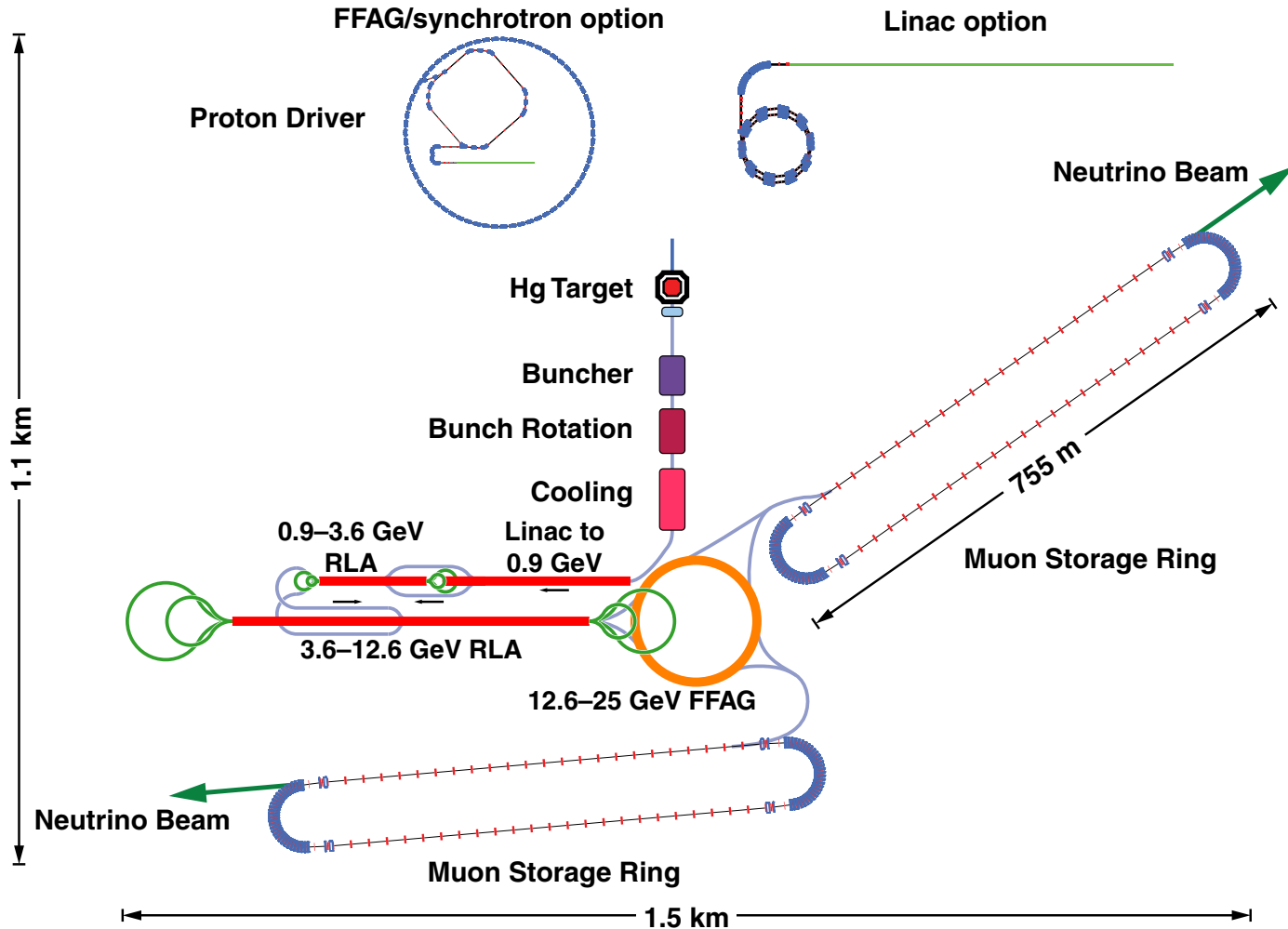# Review of the Accelerator Baseline

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IDS-NF Plenary Meeting
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# Subparts of Accelerator System

- ❍ Proton Driver

- ❍ Target

- ❍ Front End

- ❍ Lower energy acceleration: Linac/RLAs

- ❍ Final acceleration: FFAG

- ❍ Decay ring

# Complete Accelerator Facility

# Proton Driver Specifications

| | |
|---|---:|
| Beam power | 4 MW |
| Kinetic energy | 5–15 GeV |
| Bunch length | 1–3 ns |
| Geometric RMS emittance | $< 5\ \mu$m |
| Repetition rate | 50 Hz |
| Bunches | 3 |
| Total time for bunches | 320 $\mu$s |

# Proton Driver

○ No particular baseline

○ Individual sites describe how their facilities can meet the specs

○ Performance is what matters

❑ But excess radiation in target area unwelcome

# Target

○ Liquid Hg jet

○ 20 m/s velocity

○ Geometry (optimized for 8 GeV)

  ❑ 8 mm radius jet

  ❑ Jet to solenoid axis: 96 mrad

  ❑ Proton beam to solenoid axis: 96 mrad

  ❑ Jet/beam crossing angle: 27 mrad

# Front End

○ Start with Study IIa front end

  ❑ 20 T field at target, tapering down

  ❑ "Neuffer" buncher and phase rotation

  ❑ Ionization cooling

○ Buncher and phase rotation improved

  ❑ Higher (1.5 T) asymptotic field in capture

○ Cooling uses 201.25 MHz warm RF

  ❑ Higher frequencies in buncher/phase rotation

# Low Energy Acceleration

○ Normalized acceptances

  ❏ 30 mm transverse

  ❏ 150 mm longitudinal

○ Stages

  ❏ Linac to 0.9 GeV

  ❏ 4.5 pass RLAs to 3.6 GeV and 12.6 GeV

○ 201.25 MHz superconducting RF

# Acceleration to 25 GeV FFAG

- ⊙ FDF triplet ring, 5 m long drifts
- ⊙ 667 m circumference
- ⊙ Combined function superconduting magnets
- ⊙ About 11.5 turns
- ⊙ 1.2 GV of 201.25 MHz superconducting RF

# Decay Ring

- Two racetrack rings to different baselines
  - 3000–5000 km and 7000–8000 km
  - Each capable of both signs simultaneously
- $0.1/\gamma$ RMS divergence
- $10^{21}$ "useful" decays per $10^7$ s
- 100 ns between bunch trains (detector)

# Decay Ring Diagnostics

- Current measurement to 0.1%

- Polarimeter using decay electrons for energy/polarization measurement

- In-beam divergence measurement
  - Precise method not defined