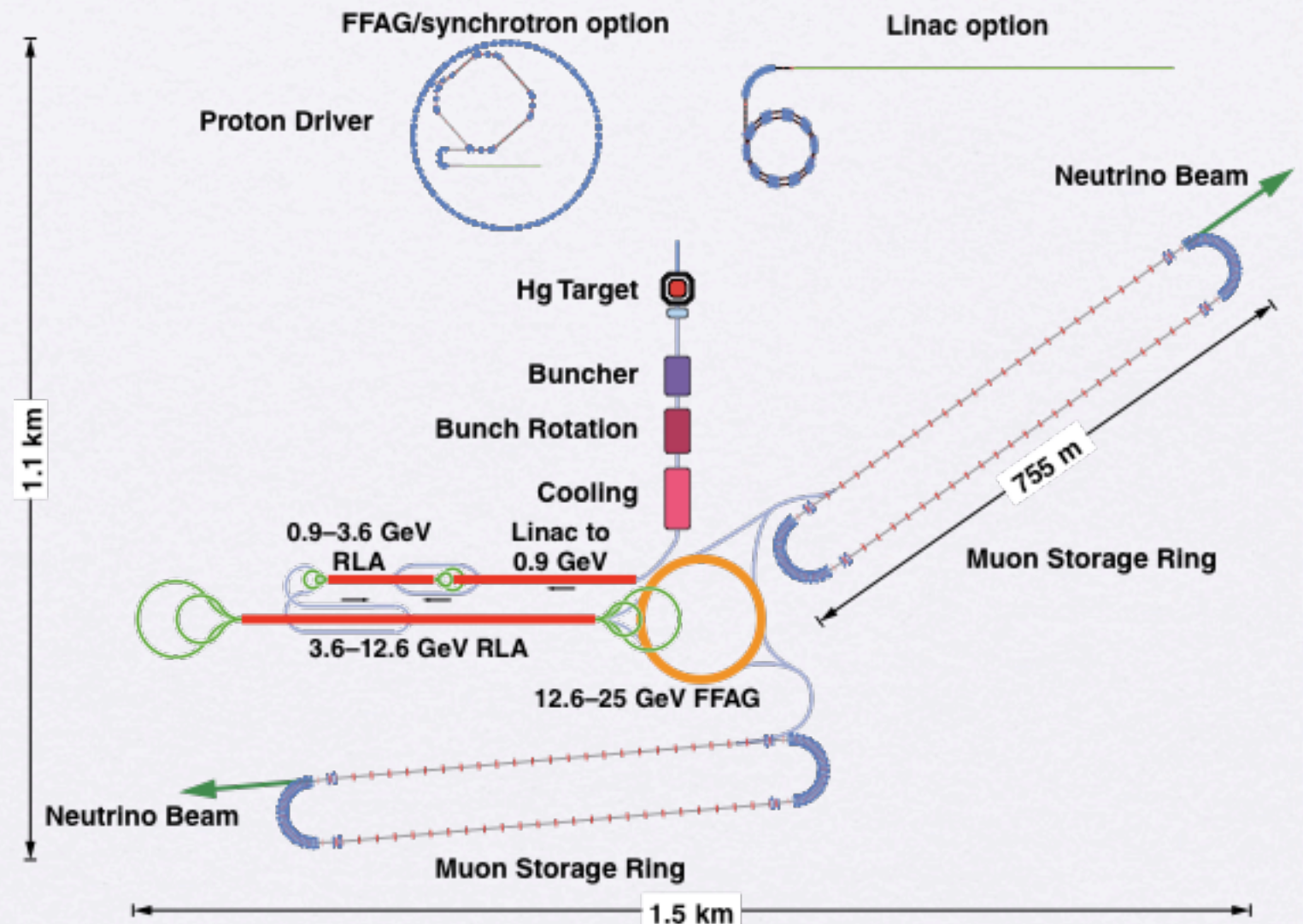# UKNF WP1 Conceptual Design

- UKNF Team leading players in International Scoping Study

- Continuing to play major roles in International Design Study

UKNF designs represent

- only choice for proton driver meeting ISS specifications.

- ISS benchmark for muon acceleration

- main ISS choice (racetrack) and alternatives (triangle, bowtie) for muon storage rings

Proton Driver

- Two recent designs provide 4 MW at 50 Hz and 10 GeV, with bunch structures suitable for NF

  - synchrotron booster feeds either an FFAG main ring or second synchrotron.

  Current UKNF Work

  layout of injection scheme, acceleration modelling, development of an FFAG code including space charge, study of ns bunch compression.

- From these, a model has been developed for a 30 GeV 4 MW driver suitable for a future muon collider.

30 GeV Ring

3 GeV RCS Booster

10 GeV non-scaling FFAG

H°,H⁻

0.2 GeV H⁻ linac

H⁻ collimation
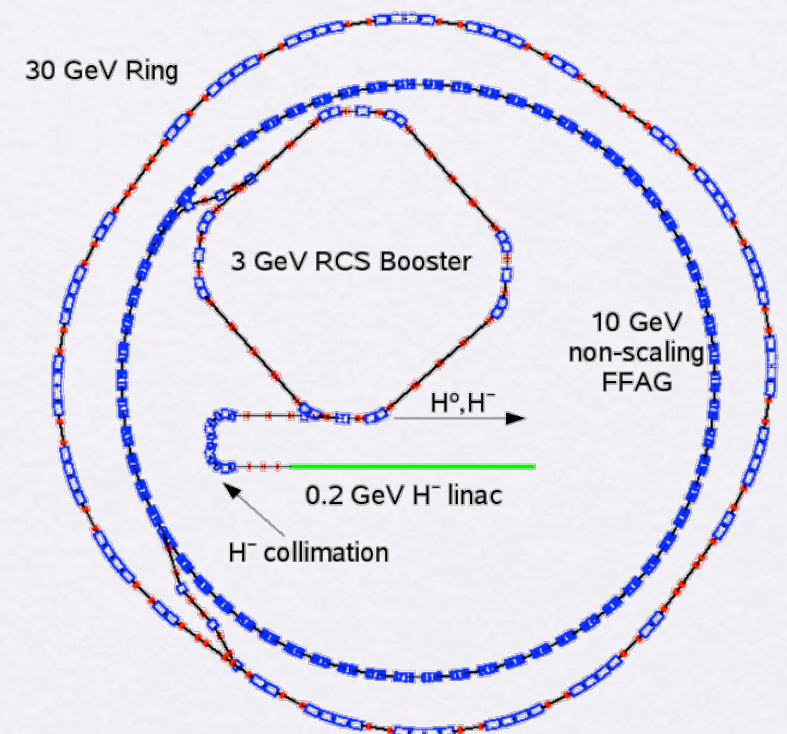
Muon Front-End

Capture Channel

- Continued optimization with new releases of improved Muon1 code. UKNF channel is now viable alternative to ISS benchmark for performance.

- Oxford D.Phil. Thesis (Stephen Brooks) to be submitted summer 2008.

Muon Cooling

- Further development of dogbone cooling channel

  - Longer design, allows RF cavities to be separated from magnetic fields.

  - Recirculators at ends provide cheaper design.

80m linear cooling channel
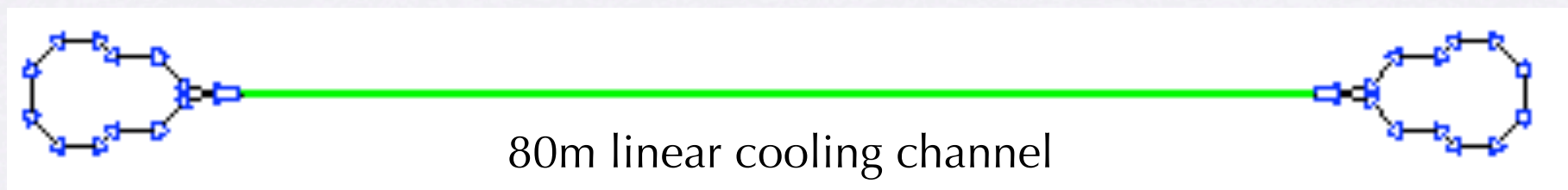
Muon Acceleration

- UK led design of ISS acceleration scheme.

- In process of assessing dogbone RLAs in detail (injection, switchyards etc) - may lead to different energy ranges.

- Continued understanding of FFAG beam dynamics, combined with code development.

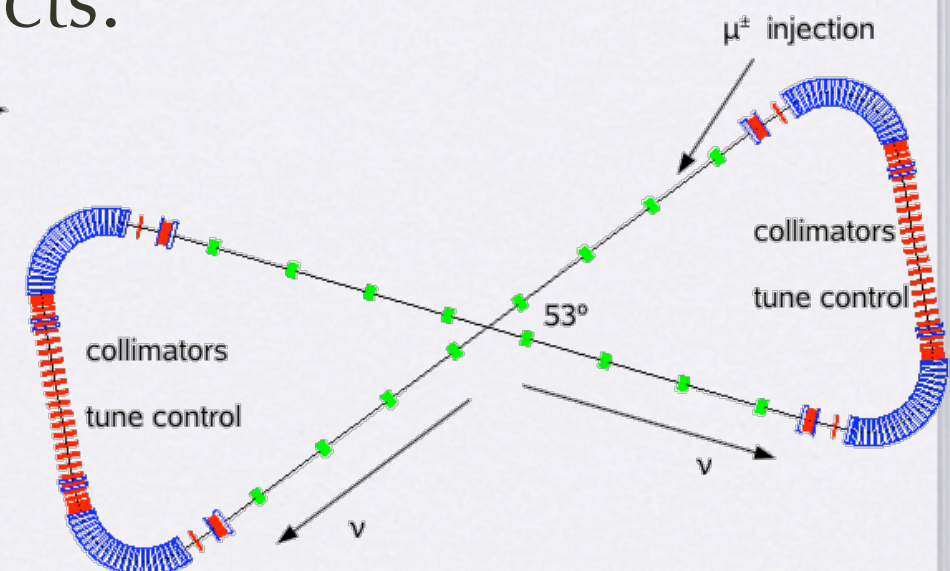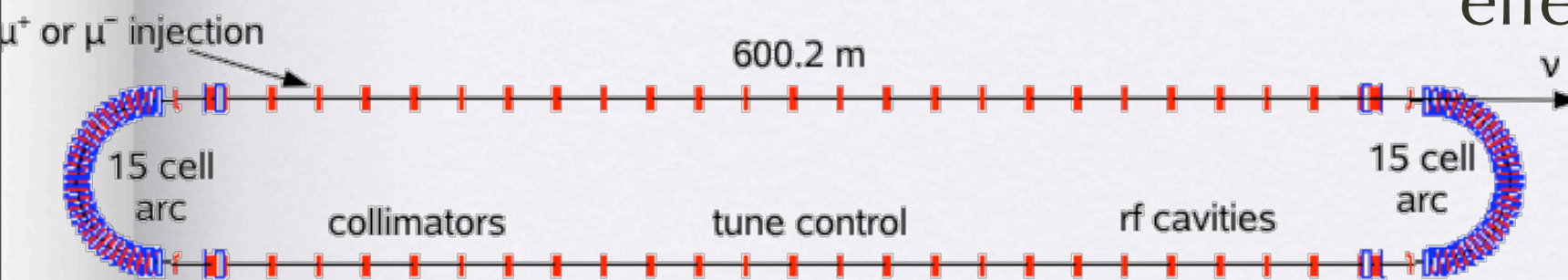- Theoretical involvement in EMMA non-scaling FFAG
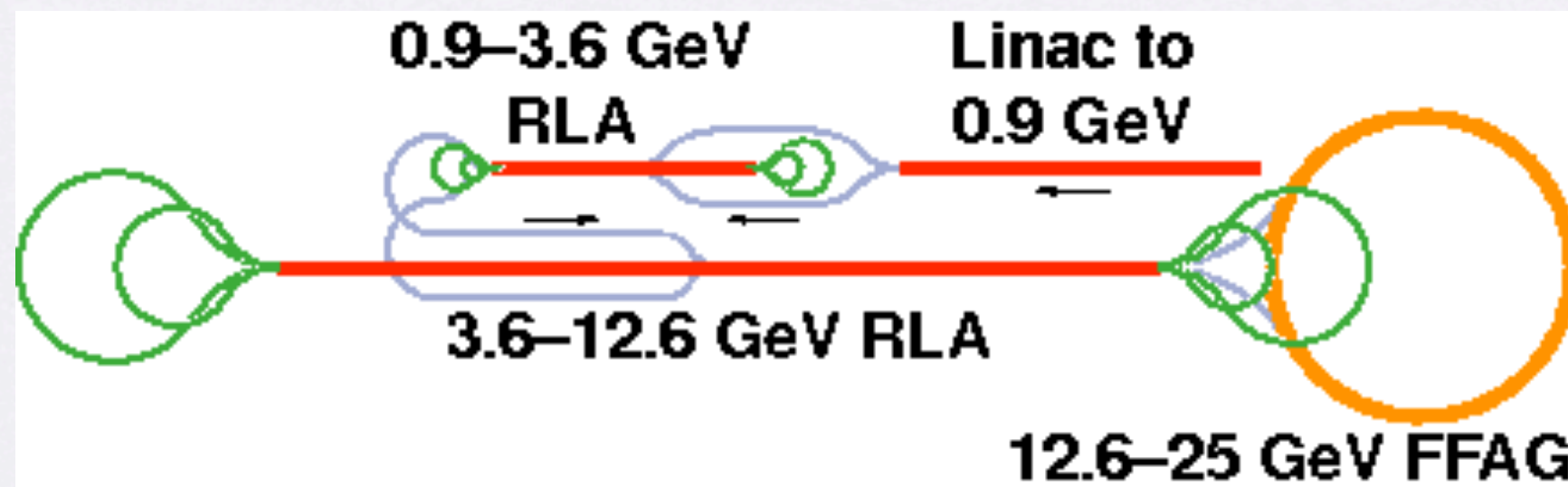
Storage/Muon Decay

- UK preference for triangle design

  - Better efficiency; finding detector sites is not difficult; one ring for μ^+, one for μ^-, both in same tunnel

- UK design for (ISS-preferred) racetrack being developed
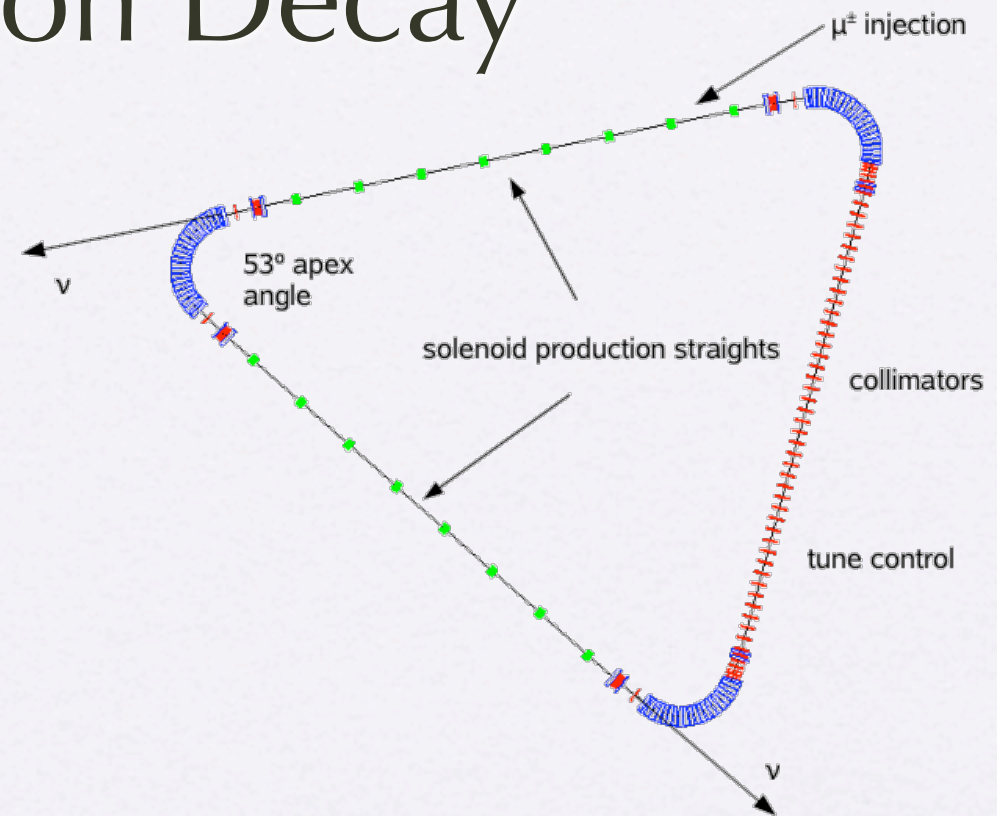
- Modelling code Zgoubi being altered to allow study of storage rings, including bowtie and polarization effects.

μ± injection
53° apex angle
ν
solenoid production straights
collimators
tune control

μ+ or μ− injection
600.2 m
ν
15 cell arc
collimators
tune control
rf cavities
15 cell arc

μ± injection
collimators
tune control
53°
collimators
tune control
ν
ν

IDS Work Programme

Proton Driver

- design of a system to meet ISS parameters

- lattice, transfer lines, full simulation; cost estimation

- possible comparison with other options

Front-End

- Re-design in line with results from MUCOOL:

- lattice, tracking, optimisation, determine transmission into accelerator acceptance.

IDS Work Programme

Acceleration

- NC acceleration from cooling to SC linac

  - matching, simulation, transmission, emittance growth

- SC pre-acceleration linac

  - tracking idealised lattice, study for full trans. & long. acceptance.

- Dogbone RLAs

  - mid-linac injection

  - full lattice design, chromatic correction, switchyard, arc crossings.

  - tracking to generate output distribution; check transmission, emittance growth

IDS Work Programme

Acceleration

- Linear NS-FFAGs

    - main ring lattice

    - kickers for injection and extraction (JSBerg)

    - transfer lines

    - tracking to demonstrate transmission, emittance growth etc

IDS Work Programme

Storage Rings

- lattice designs for 25 GeV, incl. injection and extraction

- transfer lines from FFAGs

- tracking, incl. losses and flux distribution in production straights.

- enginering design, cost estimate.