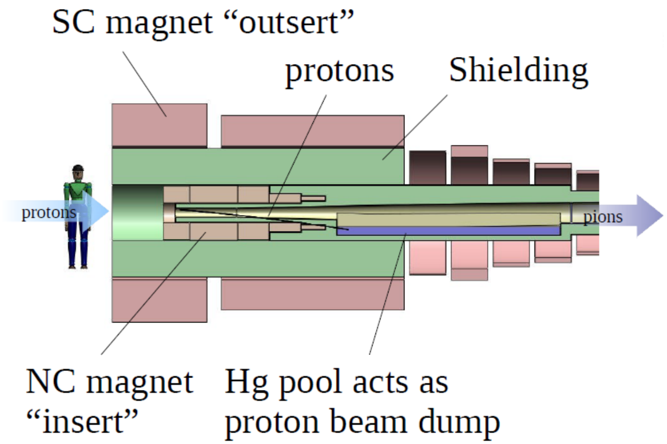
International
MUON Collider
Collaboration

Magnet WG summary

SC Magnets

- After this meeting, clarification on the “magnet parameters” in each area, better understanding of
  - Drivers for physics
  - Drivers for magnets
- Magnets are critical in the target/front end, cooling, acceleration, and collider ring areas

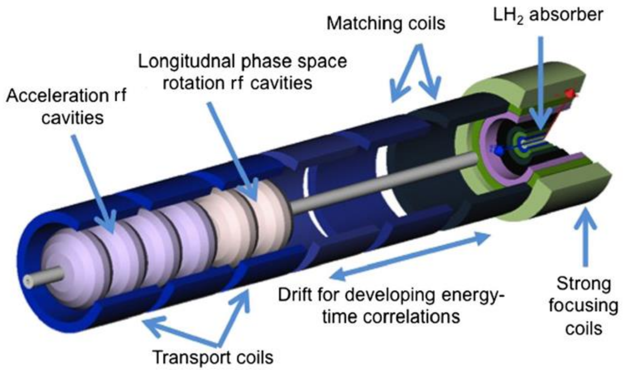
Target end



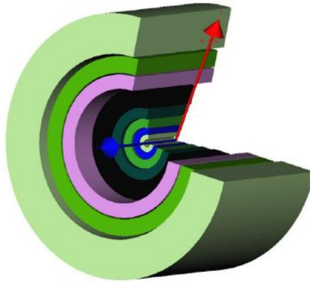
Hybrid design
(superconducting + conventionnal magnets)

- Target field from 15T to 20T, SC coil inner diameter up to 1.2m
- Strong effort needed to optimize the design; balance to be found between radiation loads, operating temperature, magnetic forces, stray field shielding…
- Pending discussions on specific R&D and prototypes

Cooling



Need of high field and very high field solenoids, as short as possible



- >30T, SC coil inner diameter of 50mm for the final cooling
- Huge forces
- Significant radiation loads
- Use of HTS materials: challenges with quench protection, stresses management

- On-going discussions on a demonstrator
- Demonstrator performances ? Keep the aperture constraint, but lower the field?

Acceleration

Need of fast ramped magnets (+/- 1.8T @ 400Hk)

- AC losses management, large stored energy -> protection?
- Power converters (link with existing R&D at CERN)
- Continue the R&D existing at Fermilab (HTS magnet, 0.6T @ 20Hz)
- Discussion on a new demonstrator perrmances

Vertical excursion FFA for muon acceleration (option not discussed in MAP)

- Feasibility of magnets for vFFA as well as vFFA concept itself has to be demonstrated.
- At STFC/RAL, feasibility study on vFFA is going on and normal conducting prototype magnet is being designed.
- Magnets for vFFA muon accelerator may be realised as an extrapolation of the activity.
- R&D on vFFA magnets to build a scale down model of superconducting vFFA magnet.

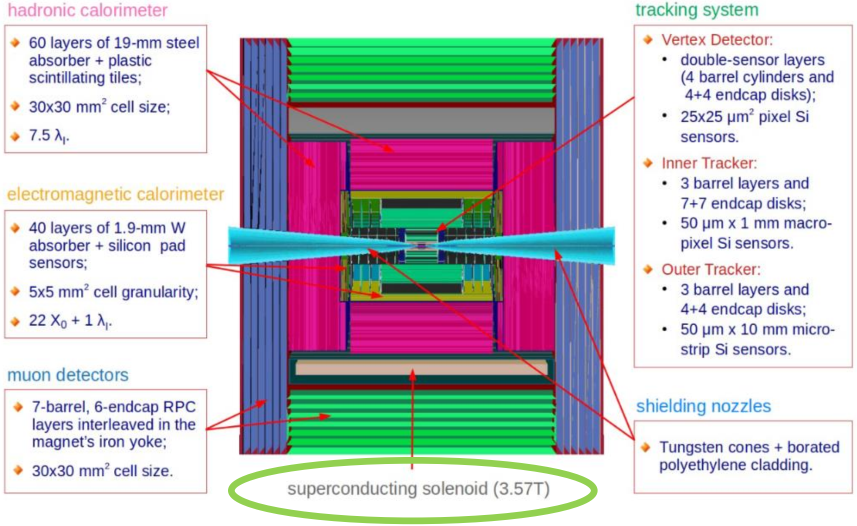
Collider ring

- High field magnets (up to 10T) and high gradient (200T/m) with large apertures (80 mm to 160mm)
  - Combined functions
  - Geometry of combined function magnets (curved magnet such that dipolar field constant?)
  - Field quality requirements to be discussed, understood and defined
  - Open mid-plane magnets?

- Technical issues: mechanical forces, magnet protection (radiation losses management)

- For now, no clear idea of what could be a demonstrator

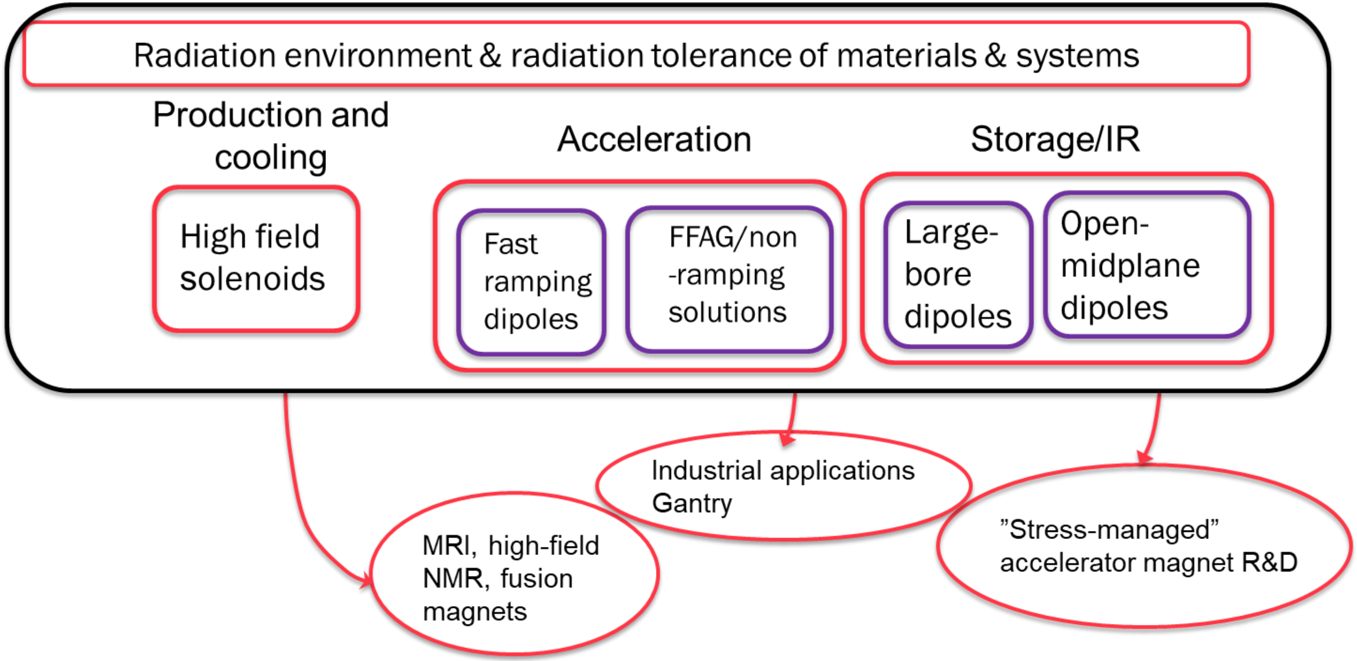
CLIC-like Solenoid Concept



Property	Value
Magnetic field at IP [T]	3.6
Cold mass length [m]	7.89
Free bore diameter [m]	6.85

- Design work to be continued, but no major showstoppers
- Conductor challenge: Currently, no qualified suppliers of aluminium-stabilized NbTi conductors in industry
- Consideration of HTS-based detector magnets for potential future cost savings

Main R&D areas and synergies with other programs



Courtesy Soren Prestemon

Strong synergy with the High Field Magnet program
Possibilities of interaction with national programs

PRELIMINARY R&D LIST AND SHORT TERM PLAN

To be more defined, after this first muon community meeting

- Strong design activity of SC magnets based on realistic performances and specifications
- Push the development of HTS material performances
- R&D needed to address some key technical challenges:
  - Renforced NbTi/Nb3Sn conductors for large high field magnets,
  - Magnet protection again radiation heat loads, specially for HTS magnets, and accelerator magnets
  - Material aging against radiation
  - Material aging and power converter performances for fast cycled magnets…

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Thanks you for your attention