

Interim Report



Purpose

- Part of the European Accelerator R&D Roadmap
- MuCol deliverable
- Help to increase support from Council and other funding agencies
- Manage expectation for next reports
- Prepare key elements of the R&D

Interim Report Key Messages



- Strong interest in the collaboration
 - E.g. US P5 ask
- Substantial increase in resources
 - Thanks to EU Design Study
 - More resources in institutes (e.g. CERN MTP)
- Good progress in studies
 - Many examples
- Still not at required level
 - Manage expectations for 2025/2026
- Synergies
 - Strong synergies exist, in particular for HTS magnet development, strong impact on society
- What will we need in the future?
 - RF test stand, demonstrator etc.
 - Technology developments

Interim Report Structure



Executive Summary (Daniel, Nadia Pastrone, Steinar Stapnes)

Implementation Considerations

- Staging
- Maturity
- Timeline considerations
- Reuse of existing infrastructure, Europe and US, site considerations

Physics Potential (Andrea Wulzer)

- Also synergy physics case

Physics, Detector and Accelerator Interface

- Physics and detector needs (Patrick Meade, Simone Pagan Griso, Federico Meloni)
- MDI (Anton Lechner)

Detector (Donatella Lucchesi)

- Concepts (Lorenzo Sestini)
- Technologies (Nazar Bartosik)
- Performance (Massimo Casarsa)

Accelerator design (Christian)

- Overview
- Proton complex (Natalia Milas)
- Muon production and cooling (Chris Rogers)
- Acceleration (Antoine Chance, Heiko Damerau)
- Collider ring (Christian Carli)
- Collective effects (Elias Metral)

Accelerator technologies (Luca)

- Magnets (Luca Bottura)
- Power converter (Fulvio Boattini)
- RF (Dario Giove, Alexej Grudiev)
- Target (Marco Calviani, Anton Lechner)
- Shielding and Absorbers (Anton Lechner, Rui, Jose)
- Muon cooling module (Lucio Rossi, Roberto Losito)
- Cryogenics (Rob, Patricia)
- Vacuum (Jose)
- Instrumentation (Thibaut?)
- Radiation and protection (Claudia)
- Civil engineering (Yuri, John)
- Movers (Antii, Carlotta)
- Other technologies, Electric supply, HVAC, ... (Roberto)
- General safety considerations (Claudia to coordinate)

Synergies (Chris)

- Technologies (Luca Bottura, ...)
- Facilities (Chris Rogers)

R&D programme development (Roberto)

- Demonstrator (Roberto Losito, Chris Rogers)
- RF test stand (Dario Giove, Alexej Grudiev)
- Magnet test facility (Lucio Rossi, Luca Bottura)
- Other test infrastructure required (HiRadMat, ...) (Roberto Losito)

Collaboration Development (Steinar Stapnes, Nadia Pastrone, Daniel Schulte, also Mark Palmer, Sergo Jindariani, Diktys Stratakis)

- Members, contributions, MuCol, US plans

Interim Report Section Layout



Could be similar layout for each section

However might want to group the whole report into this as parts (the first two together) and have sections under them

System Overview

- Short description of the system

Key challenges

- Reminder of key challenges of the system?

Work progress since Roadmap

- Status of the current concept

Work planned for Evaluation Report

- Based on existing resources, until end of 2025

Important missing Effort

- What would be important to add?

Credible Timeline



Become more specific about staging concept

Start considering realistic timelines

- 15 years to start 3 TeV construction
 - Using HTS for muon production and cooling, Nb_3Sn for collider ring (11 T, 16 cm aperture)
- 30 years to start 10 TeV construction
 - Use HTS/hybrid throughout
- About 7 years of construction for each stage
- Can operate up to 13 years at 3 TeV, overlap of construction and operation except for last two years
 - Maybe 2 years of long shutdown, luminosity ramp-up in first 2-3 years
 - Maybe 9-10 years of full luminosity, can relax luminosity target (before assumed 5 years)

Plan is consistent with human resource limitations during construction and initial operation of first stage

- Stretches budget (cost of both stages are expected to be similar)
- Allows significant technology advances between stages
- Total operation time similar to full CLIC programme (and cost maybe below)

Credible Timeline



In future will develop timeline for the

- magnet development and test station
- demonstrator
- RF technology / test station / cooling cell module
- other technologies

Focus on green field for now

- Still at the beginning
- Fair collaboration with the US and other regions

At the end will consider reusing the SPS and LHC tunnels for the muon beam accelerating stages

What to do about LHC tunnel?

- 3 TeV accelerator, but delays project
- 10 TeV accelerator, but have to consider neutrinos more

Plan for Interim Report



Kick-off meeting: today, October 17

Initial draft November 3

- Should contain bullet points of messages
- Important input for executive summary

Complete draft November 17

- Fully formulated text

Content editing completed December 1

- Iteration of main editors with section editors to harmonise level, content etc.

Language edited December 15

IAC review January 2024

Submission to EU and LDG/CERN Council February 2024

Page goal: maximum of 4 pages per section