International MUON Collider Collaboration

# Deliverable Plan

D. Schulte

# Support Your Local Panel Member

- Two-round procedure to arrive at deliverable plans
  - first round is to discuss deliverables and overall resources with LDG
  - second round is likely to discuss reduced scenarios with LDG

- LDG charged the panel to provide the scenarios
  - will use your input on scope, cost and priority of work
  - will discuss and arbitrate in the panel
  - will get feedback from LDG
    - have to adjust accordingly

# Timeline

- Need a structured timeline
  - Deliverables and milestones on the way

- Will recover original timeline with slight modification
  - extend exploratory phase until end of 2023
  - reduce definition phase to 2024 and 2025
  - more consistent with P5 in US
  - more consistent with delay due to roadmap process
  - but does not leave 3 year slot for PhD or postdoc
  - some ramping up required before

- Will provide progress report in 2023
  - will need to add this to your plan

# Intermediate Deliverable

Progress report end of 2023

- Intermediate results for
  - collider design
  - assessment of key technology issues
  - site considerations
- Site and scope of test facility identified

Will also have input

- Progress of European programme
  - e.g. from high-field magnet programme
- development of strategy in other regions

More detailed work effort will have started

Will adjust plan

- Redirect resources to most critical issues
- Ask for additional increase if justified
- Start addressing more detailed studies to identify cost and power scale and to prepare demonstration programme

# Tentative Scenario

1) ”Immediate”

- Address most critical challenges and most important design drivers to assess feasibility and prepare key design and parameter choices.
- Remaining at this level will give a better understanding of the muon collider potential in 2026 but leave important gaps in the assessment.

2) ”Urgent”

- Address a range of key challenges to assess the technical maturity of key components. Allows to have a cost scale for the larger part of the muon collider and to gain confidence by the rate of progress. Allows to define the key R&D plan.
- Remaining at this level would leave gaps in the assessment in 2026 that need to be addressed later. Some delay of the CDR phase can occur.

3) ”Important"

- Address the key issues.
- The assessment will allow to be confident that the performance targets can be met after the CDR phase. It will allow to determine the scale of the cost and power consumption. No delay for the CDR phase.

# Objectives, Deliverables and Resources

| Objectives |
|---|
| Basic: Assess whether the neutrino flux can in principle be mitigated sufficiently to allow implementation of the collider in the Geneva area or elsewhere. |
| Develop a concept of the neutrino flux mitigation technology and assess its maturity. |
| **High-level Deliverables** |
| 1) Assessment of the dose and a plan to demonstrate compliance |
| 1) Verification that the proposed mitigation method does not compromise beam operation |
| 2) A basic concept for the mechanical system including the cryogenics. |
| 2) A basic concept of accurate large-stroke, high-resolution mover and alignment system |

| Resources | 1 | 2 | 3 | | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| Staff | 3 | 2.5 | | Student | | 11 | |
| Postdoc | 1.5 | 9 | | Material | | 150 | |

| Interested partners |
|---|
| CERN, resources partly in place, FNAL for benchmarking of code |

Resources are given in total number of FTE-years for the whole duration and in kEuro for material

# Tasks and Resources

| 1 | Task description | Resource estimate staff [FTEy] | postdoc [FTEy] | PhD [FTEy] | material [kEuro] |
|---|---|---|---|---|---|
| | Monte-Carlo simulations to develop robust dose model | 0.5 | 1 | | |
| | Benchmark FLUKA and MARS for dose | | | | |
| | Develop tool to link the collider to the surface map and optimise position | 0.5 | 1 | 1 | |
| | Use tool with realistic source term from beam | 0.5 | 0.5 | | |
| | Assess dose and develop possible methods to demonstrate compliance | 1.5 | | | |
| | Study impact of lattice deformation on beam and assess tolerances and time needed to recover from movements | In HE-Acceleration package | | | |

| 2 | Task description | Resource estimate staff [FTEy] | postdoc [FTEy] | PhD [FTEy] | material [kEuro] |
|---|---|---|---|---|---|
| | Assess impact of movements on mechanical, cryogenics, RF and other systems | 1.0 | 6 | | |
| | Develop concept of large-stroke, high-resolution movers | 0.5 | | 4 | 50 |
| | Develop solution to remotely control positions over a large range | 0.5 | 3 | 3 | 50 |
| | Develop concept of accurate reference system with respect to the surface | 0.5 | | 4 | 50 |

# Work Package Description

| Workpackage Description |
| --- |
| Explain the important issue addressed and how it is addressed. |