IMCC Annual Meeting

CERN – March 14, 2024

International Collaboration Board Meeting

Nadia Pastrone INFN TORINO

PARTICIPANTS	
192 + 32-late	Annual Meeting
67 (partially overlapping)	MDI Workshop

Essentials

International MUON Collider Collaboration

- ✓ the **international community** is working more and more together mainly based, as a starting point, on previous results/studies but steadily growing and focusing on priorities since 2018

  ➔ **over 6 years!**

- ✓ the **international collaboration** established soon after the ESPPU recommendation, in July 2020 evolved in the IMCC with a **Memorandum of Cooperation** expected to be signed by joining Institutes

  ➔ **resources allocated by CERN MTP since 2021 are complemented by other institutes/FA**

- ✓ Accelerator R&D Roadmap in EU and Snowmass21 in US processes, carried on almost in parallel, **strengthen the community,** leading to define resources needs and priorities on different activities

- ✓ The **P5 Report** released December 2023 is encouraging and quite positive

- ✓ The **Interim Report** still requires a focused review to outline the progress and the priorities to support a 10 TeV Muon Collider project with a reasonable timeline

Essentials

International MUON Collider Collaboration

➔ IMCC has the responsibility to steadily evolve into the most inclusive environment

to deliver a multi-TeV muon collider design study,

exploiting at best the international resources and synergies, to establish by the next strategies

whether the investment into a full CDR and a demonstrator

is scientifically justified to be chosen as the future feasible and viable option

- ✓ a **baseline scheme to design the 10 TeV facility** and requires several further studies, setting the right priorities and R&D plans, engaging all the present and future participating institutes

Agenda - Goal

17:00 → 17:20	ICB chair report	Nadia Pastrone
17:20 → 17:40	IMCC/MuCol Project Leader: key points to CB	Daniel Schulte
17:40 → 17:55	Steering Board chair: key points to CB	Steinar Stapnes
18:00 → 18:20	Actions and step forward after P5 report	Mark Palmer
18:20 → 18:30	Proposals to strengthen the collaboration	Nadia Pastrone
18:30 → 18:50	Discussion and next steps	
18:50 → 19:00	AOB	

*Crucial/Strategic time to enlarge and strengthen the **collaboration**!*

There is a lively interested community contributing at different level

Very OPEN ICB:

- ✓ SL and deputies – SB full committee – IMCC and MuCol Coordination Committee
- ✓ Institutes – MoC signed/considering
- ✓ Institutes – EU MuCol beneficiaries/associated
- ✓ US laboratories ….. Other Countries?

Accelerator R&D Roadmap

No insurmountable obstacle found for the muon collider

- but important need for R&D

Aim at **10+ TeV** and potential initial stage at **3 TeV**

NEW OPTION: initial 10 TeV stage at reduced luminosity

Scenario	FTEy	M MCHF
Full scenario	445.9	11.9
Reduced scenario	193	2.45

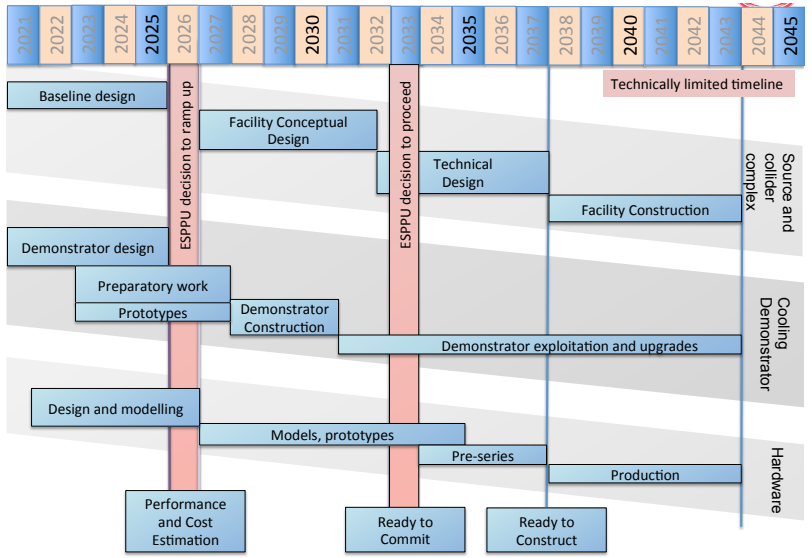
http://arxiv.org/abs/2201.07895

Full scenario deliverables by next ESPPU/other processes

- **Project Evaluation Report**
- **R&D Plan –** a path towards the collider

Allows to make **informed decisions**

Interim report by Spring 2024



Label	Begin	End	Description	Aspirational [FTEy]	Aspirational [kCHF]	Minimal [FTEy]	Minimal [kCHF]
MC.SITE	2021	2025	Site and layout	15.5	300	13.5	300
MC.NF	2022	2026	Neutrino flux mitigation system	22.5	250	0	0
MC.MDI	2021	2025	Machine-detector interface	15	0	15	0
MC.ACC.CR	2022	2025	Collider ring	10	0	10	0
MC.ACC.HE	2022	2025	High-energy complex	11	0	7.5	0
MC.ACC.MC	2021	2025	Muon cooling systems	47	0	22	0
MC.ACC.P	2022	2026	Proton complex	26	0	3.5	0
MC.ACC.COLL	2022	2025	Collective effects across complex	18.2	0	18.2	0
MC.ACC.ALT	2022	2025	High-energy alternatives	11.7	0	0	0
MC.HFM.HE	2022	2025	High-field magnets	6.5	0	6.5	0
MC.HFM.SOL	2022	2026	High-field solenoids	76	2700	29	0
MC.FR	2021	2026	Fast-ramping magnet system	27.5	1020	22.5	520
MC.RF.HE	2021	2026	High Energy complex RF	10.6	0	7.6	0
MC.RF.MC	2022	2026	Muon cooling RF	13.6	0	7	0
MC.RF.TS	2024	2026	RF test stand + test cavities	10	3300	0	0
MC.MOD	2022	2026	Muon cooling test module	17.7	400	4.9	100
MC.DEM	2022	2026	Cooling demonstrator design	34.1	1250	3.8	250
MC.TAR	2022	2026	Target system	60	1405	9	25
MC.INT	2022	2026	Coordination and integration	13	1250	13	1250
			Sum	445.9	11875	193	2445

Table 5.5: The resource requirements for the two scenarios. The personnel estimate is given in full-time equivalent years and the material in kCHF. It should be noted that the personnel contains a significant number of PhD students. Material budgets do not include budget for travel, personal IT equipment and similar costs. Colours are included for comparison with the resource profile Fig. 5.7.

Do not yet have the resources of the reduced scenario

- Priorities with available expertise and resources
- Are approaching O(40 FTE)
- Efforts to increase resources

Grey Book @ CERN – Future Collider

International MUON Collider Collaboration

Research Programme

LHC
SPS
PS
AD
ISOLDE Facility
Irradiation Facility
Neutrino Platform
GRADE
CTF3
R&D
Non-accelerator experiments
Approved Studies for Future Projects

Research Activities

Experiments and Projects under Study
External Experiments
Recognized Experiments
Completed Experiments

Related Links

EP Department
Users' Office
Scientific Committees
Conditions for experiments
Accelerators and Beams
Accelerator Schedules

IMCC

International Muon Collider Collaboration

Synonym:
Research Programme: FCOLLIDER
Approved:
Beam:
Status: Preparation

Overview | Teams | Participations

Spokesperson: SCHULTE, Daniel
Deputy spokeperson(s): ROGERS, Christopher; WULZER, Andrea; LUCCHESI, Donatella
Contact person: PASTRONE, Nadia
Experiment secretariat e-mail: muon.collider.secretariat@cern.ch

Number of Institutes: 2
Number of Countries: 2
Number of Participants: 0
Number of Authors: 0

Status History

Status	Start Date	End Date
Preparation	08-06-2023	

Institute Name	Institute Parent Name	Town	Country	Team Leader & Deputy Team Leader(s)
Peking University		Beijing	China	(TL) LI, QIANG
Riga Technical University		Riga	Latvia	(TL) RATKUS, ANDRIS (DTL) DREIMANIS, KARLIS

IMCC included as: "**Experiments and Projects under Study**"
https://greybook.cern.ch/experiment/detail?id=IMCC

Final notes

International MUON Collider Collaboration

- We always had some and still have a crucial deadline ahead
  ➔ **European Strategy of Particle Physics Update (ESPPU)**

- The Interim Report effort revealed strengths and weakness
  ➔ **mandatory to focus and shape our message to the outside world**

- Shared priorities and plans are mandatory for success
  ➔ **this Annual Meeting showed a lively and reactive community**

- Resources are needed and missing
  ➔ **we can make a further effort to get the crucial support**

It's time to change gear and show our passion!

Last point

International MUON Collider Collaboration

- **The term of the ICB chair is two years**, so my mandate expires at the end of this year

  ➔ **plan to call an ICB meeting to review the status of the collaboration**

  ➔ **we will prepare a selection committee to review the mandate if needed and to launch the call for nominations to vote before the end of the term**

International MUON Collider Collaboration

extras

International Collaboration Board: first principles

- This Collaboration Board aims to be inclusive and fair
  - ➔ all institutes contributing to the Study as a Community

- The institutes are responsible/commit resources (person-power – material – computing ..)
  - ➔ all institutes contributing to the Design Study are considered part of the Community
  - ➔ the Memorandum of Cooperation was prepared aiming to be signed by everybody

- All contributions by institutes (individuals) are referred to defined activities
  - ➔ the results – mainly **publications** and **R&Ds –**
    - ➔ represent the recognition of the work
    - ➔ allow the request of new resources

It is CRUCIAL to distribute information about organization and next steps
MANDATORY: shared authorship rules for the community and anybody who is contributing

Grey Book @ CERN – get ready to join!
June 2023

International MUON Collider Collaboration

- ✓ To join and Institute has to be signed the MoC (Memorandum of Cooperation)
- ✓ There are already recognized institutes at CERN – but we can add others
- ✓ All the rules are at: Team Leaders' corner | Users Office (cern.ch)
- ✓ We can start to list the institutes and for each of them (Team)
  a Team leader and a deputy should be identified and they should get ready to join following the rules
- ✓ We will send a dedicated email to each eligible institute and try to facilitate the enrollment aiming to populate the grey book asap
- ✓ By end of July a specific Muon Collider User Unit will be available to collect all institutes and partecipants to IMCC projects as CERN users.