August 5st, 2020

Muon Colliders

LoIs contribution to SnowMass21

- Theory Frontier
- Energy Frontier
- Accelerator Frontier
- Instrumentation Frontier
- Computational Frontier
- Community Engagement Frontier

Nadia Pastrone INFN TORINO

As a new forming collaboration…

- We can agree to submit LoIs of common interest signed by people who are already been working or are willin to contribute during the next year of SnowMass21 process
- I propose to add a sentence like:

  " This work will be pursued within the new forming International Muon Collider collaboration"

- It would be nice to have a common template and to share the text during next 2 weeks ➔ twiki

  before next meeting **August 26 h 14-18**

  https://indico.cern.ch/event/944012/

Lists of proposed common LoIs

- Muon Collider facility overview (Daniel Schulte/Nadia Pastrone)
- Muon Collider proton source (Mark Palmer + MAP coll)
- Muon Collider positron source/LEMMA (Marica Biagini)

- Muon Collider physics (Andrea Wulzer ++) ➔ **to be discussed**
- Muon Collider Machine Detector Interface/background (Donatella Lucchesi ++) ➔ **to be discussed**
- Muon Collider Experiment/Detectors (Nadia Pastrone ++) ➔ **to be discussed**

- vFFAs in Muon Collider (Shinji Machida)

POSSIBLE RELATED LoIs:

- NuStorm (Ken Long)

Additional dedicated LoIs

Machine parameters

Center of mass energy $\sqrt{s}$ (TeV)	.126	3	14
Circumference (km)	0.3	4.5	14
Interaction points	1	2	2
Average luminosity (10^{34} cm^{-2} s^{-1})	0.008	1.8	40
Integrated luminosity/detector (ab^{-1}/year)	0.001	0.18	4
Time between collisions (μs)	1	15	47
Cycle repetition rate (Hz)	1	5	5
Energy spread (rms, %)	0.004	0.1	0.1
Bunch length (rms, mm)	63	5	1
IP beam size (μm)	75	3.0	0.6
Dipole design field (T)	10	10	15
Proton driver beam power (MW)	4	4	1
Beam power in collider (MW)	0.08	5.3	20.2

extras

Letters of Interest - LOI

deadline: August 31, 2020

Snowmass conveners see the proposals and encourage the community to begin studying them.

*Help conveners to prepare the **Snowmass Planning Meeting**;*

Virtual Snowmass Community Planning Meeting October 5 (Oct. 5-9), 2020

*Letters should give **brief descriptions of the proposal and cite the relevant papers to study***

Instructions for submitting letters are available at ***https://snowmass21.org/loi***

Authors of the letters are also encouraged to submit later a full write-up for their work as a contributed paper

- ➔ Very brief (two pages)
- ➔ Uploaded by Authors through Snowmass 2021 Wiki
- ➔ Index of submitted LOI available on the Snowmass 2021 Wiki
- ➔ Could represent existing work (cite) or new ideas
- ➔ Help conveners plan work of the Frontier (liaisons with other Frontiers: avoid duplication/build synergy
- ➔ **If further developed in the Snowmass 2021 exercise could lead to a Contributed Paper**

https://snowmass21.org/submissions/ **deadline: July 31, 2021**

Machine - MDI

- **LoI requested by AF4 (multi-TeV Collider) – Accelerator Frontier**

  to MAP, LEMMA and the new International Muon Collider Collaborations

  focusing on potential machine routes, R&D requirements, and possible timelines to deliver colliders that could operate in the 1-100 TeV center-of-mass energy range

  link to AF1 and AF7 for enabling machine technologies

- Different dedicated meeting across Energy and Accelerator Frontier to discusss machine parameters and possible physics reaches ➔ see at links: https://indico.fnal.gov/category/1113/

Energy Frontier

- **We have to discuss which LoI we can prepare mainly related to:**
  - **EF01-04**: Higgs, Top, EW
  - **EF08-10**: BSM – new resonances - LLP

- Energy Frontier meetings ➔ see at links:
  https://indico.fnal.gov/category/1145/

Instrumentation & computation Frontier

Understand the impact of detector designs on physics

- **We have to prepare requirement we would like to reach at an experiment at Muon Collider,mainly on:**
  - **Trackers – sensors with timing and electronics**
  - **Calorimeter – high granularity and timing required**
  - **Software tools**
  - **AI/ML applications**

Instrumentation ➔ see at links: https://indico.fnal.gov/event/43730/

Computational ➔ to come soon at links: https://indico.fnal.gov/event/43829/