



**Muon Collider Workshop @ LASA**  
6<sup>th</sup>-7<sup>th</sup> November 2024 | Milan, Italy

# Workshop on Muon Collider Superconducting Magnet Design

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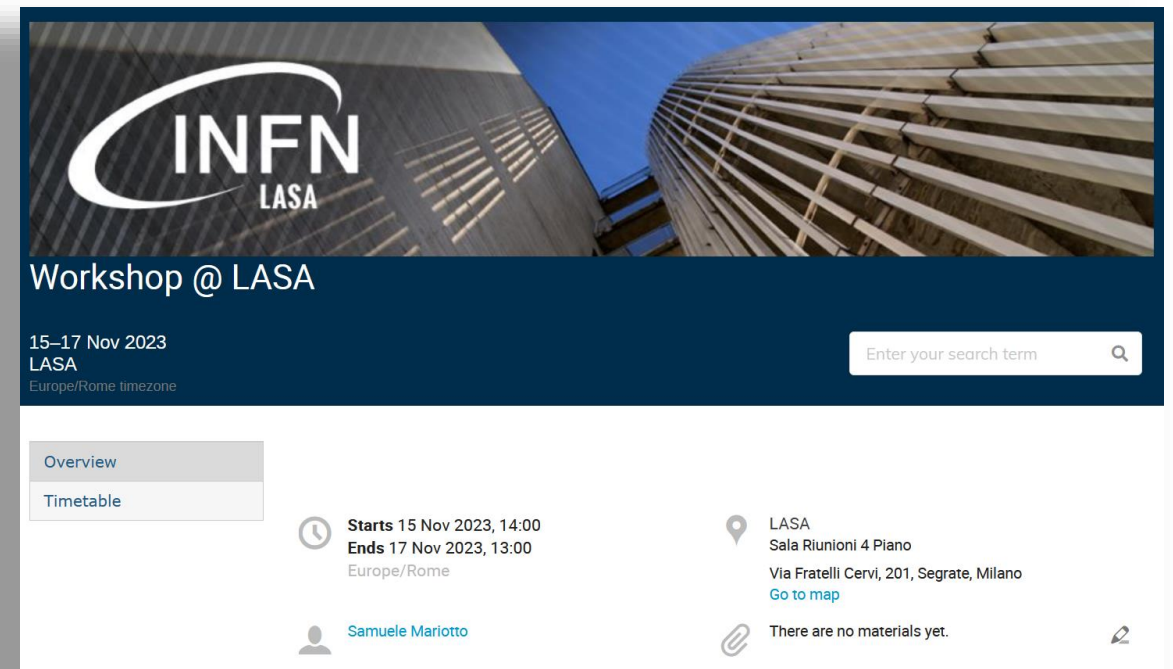


# Workshop Introduction

**First Workshop on 15<sup>th</sup> -17<sup>th</sup> Novembre 2023** dedicated to superconducting magnet organized at **LASA** to discuss detailed topics on magnet design and scaling law for the **Muon Collider conceptual design study**

**Outcome of the discussion useful for magnet detailed design work in 2023-2024 and interaction with other WP**

- **IMCC MDI Workshop (1 presentation)**
- **IMCC Annual Meeting (1 presentation)**
- **ASC 2024**
  - **2 presentations**
  - **3 posters**



The screenshot shows a digital event page for 'Workshop @ LASA'. At the top, there is a banner image of the LASA facility with the INFN logo overlaid. Below the banner, the event title 'Workshop @ LASA' is displayed. The dates '15-17 Nov 2023' and location 'LASA, Europe/Rome timezone' are listed. A search bar is present on the right. On the left, there are tabs for 'Overview' and 'Timetable'. The main content area shows the event start and end times: 'Starts 15 Nov 2023, 14:00' and 'Ends 17 Nov 2023, 13:00' in the Europe/Rome timezone. The organizer is listed as 'Samuele Mariotto'. The location is 'LASA, Sala Riunioni 4 Piano, Via Fratelli Cervi, 201, Segrate, Milano', with a 'Go to map' link. A note at the bottom states 'There are no materials yet.'

# Timetable: 6<sup>th</sup> November

## Morning

### Accelerator Superconducting Dipole

	<b>Magnet design of the 10 T dipole</b>	<i>Tommaso Maiello</i>
	<i>Aula Birattari Piano Rialzato, LASA</i>	09:15 - 09:35
	<b>Magnet stability, charging and discharging</b>	<i>Stefano Sorti</i>
	<i>Aula Birattari Piano Rialzato, LASA</i>	09:35 - 09:55
10:00	<b>Mechanical design of the 10 T dipole</b>	<i>Tommaso Maiello</i>
	<i>Aula Birattari Piano Rialzato, LASA</i>	09:55 - 10:15
	<b>Status of the AC losses and magnetization calculation for the 10 T dipole</b>	
	<i>Aula Birattari Piano Rialzato, LASA</i>	
	<b>Next steps and discussion</b>	
	<i>Aula Birattari Piano Rialzato, LASA</i>	

11:00

### Guided tour of LASA

12:00	<b>Visit to LASA laboratory</b>	
	<i>LASA</i>	12:00 - 13:00
13:00	<b>Lunch</b>	
		13:00 - 14:00

# Timetable: 6<sup>th</sup> November

## Afternoon

### Combined Function Magnet Discussion

14:00	<b>BG/AG Plot</b>	<i>Daniel Novelli</i>
15:00	<i>Aula Birattari Piano Rialzato, LASA</i>	14:00 - 15:30
16:00	<b>Possible Design of a Combined Function Magnet</b>	<i>Daniel Novelli</i>
17:00	<i>Aula Birattari Piano Rialzato, LASA</i>	15:30 - 17:00
18:00	<b>Alternative Solutions</b>	<i>Aula Birattari Piano Rialzato, LASA</i>
		17:00 - 18:00

# Timetable: 7<sup>th</sup> November

## Morning

09:00	<b>Magnet Protection Assumptions</b> <i>Biiloteca 4 Piano, LASA</i>	<i>Tiina-Mari Salmi</i> 09:00 - 10:00
10:00	<b>Cable configurations for Nb3Sn and HTS</b> <i>Biiloteca 4 Piano, LASA</i>	10:00 - 10:45
11:00	<b>Impact of cable choice on Magnet Design</b> <i>Biiloteca 4 Piano, LASA</i>	10:45 - 11:30
12:00	<b>EM and Mechanical Design - Part 1</b> <i>Biiloteca 4 Piano, LASA</i>	<i>Francesco Mariani et al.</i> 11:30 - 12:30

### Magnet Protection and Cable Assumptions

### Dipole Magnet Design

# Timetable: 7<sup>th</sup> November

## Afternoon

### Dipole Magnet Design

14:00	<b>EM and Mechanical Design - Part 2</b> <i>Francesco Mariani et al.</i>	
	<i>Biblioteca 4 Piano, LASA</i>	14:00 - 15:00

15:00	<b>mmWG</b>	
	<i>Biblioteca 4 Piano, LASA</i>	15:00 - 16:00

16:00	<b>AC Losses in HTS tapes and cables</b>	
	<i>Biblioteca 4 Piano, LASA</i>	16:00 - 17:30

### Models for Magnetization

17:00	<b>Synergies with other WP and Research Programs</b>	
	<i>Biblioteca 4 Piano, LASA</i>	17:30 - 18:00

18:00

# Outcome of the Workshop

## 1) Definition of the assumptions for magnet design

- **Cable:** tapes arrangement, geometric parameters,  $J_c$
- **Protection:** metal insulation, not insulated and insulated to be studied in parallel?
  - Need of refined **protection scheme** according to the work on magnet cross-section

## 2) Description of all analyzed magnet performances

- Define **final version of AB plots and BG/A plot**
- **How to present results of analysis at other WP**
  - **MORE IMPORTANT: how to present them outside IMCC collaboration?**  
Comparison of the difference in assumptions and results with other programs
    - HFM
    - USMDP

# Outcome of the Workshop

Design:  
16 T – 140 mm  
T > 10 K

## 3) EM and Mechanical Design

- Define the **material properties** to be used in the simulations
- Which **FQ target** do we use for the **design optimization**?
  - **What about the «variable» constraints? (Budget, Temperature)**
- **Omogenized properties for HTS:** are they appropriate for the mechanical behaviour?
  - Which level of detail do we want to achieve in the analysis? (**Principal Stresses**)
- Steps of mechanical simulations: **assembly, cool down, energization???**
  - Which constraints do we use?

## 4) AC Losses

- **Magnetization Modeling:** Which model do we use?
- **Thermal Design and charging/discharging for the NI coils**





**Enjoy the Workshop!!!**



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