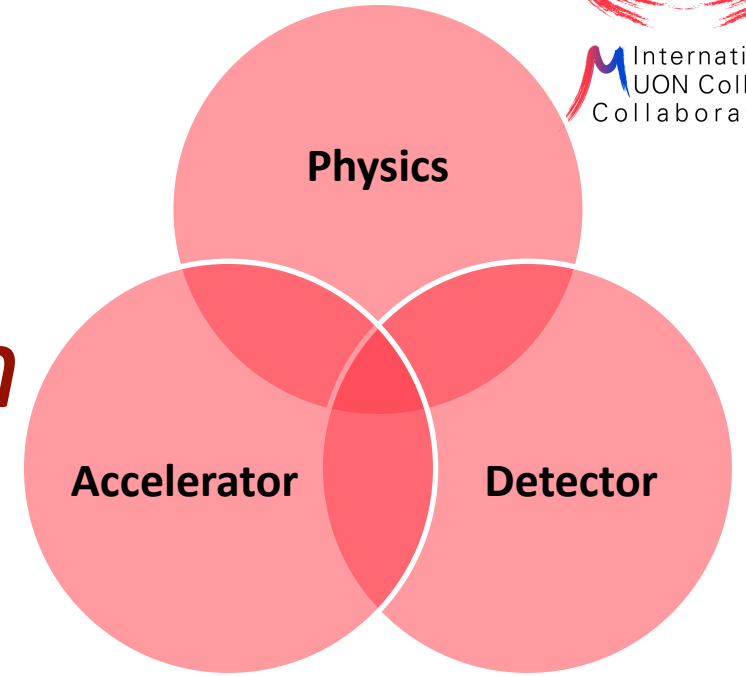


# IMCC Annual Meeting

DESY – May 16, 2025



## *Discussion on Funding ↔ Collaboration growth*



- ➔ *national/regional funds - how do we better coordinate?*
- ➔ *how to contact new institutes/countries? synergies with other projects?*
- ➔ *how to be more inclusive, encourage community growth and access new resources?*

*Nadia Pastrone*



# Essentials

2026 UPDATE  
OPEN SYMPOSIUM  
**European Strategy  
for Particle Physics**



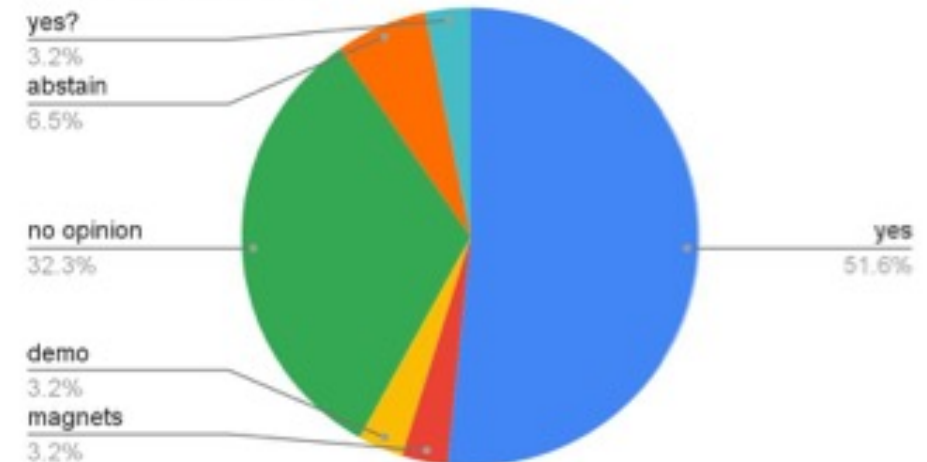
23-27 JUNE 2025



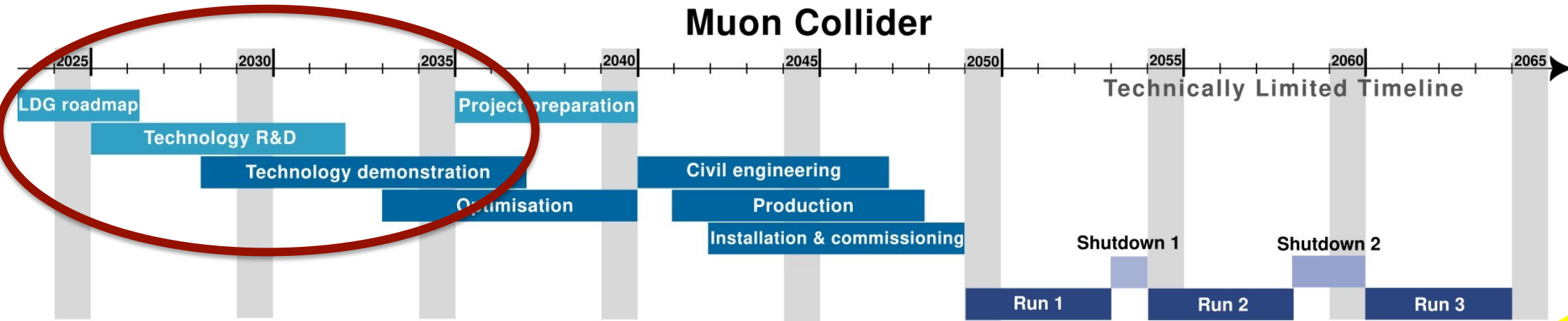
- ✓ the **international community** working together more and more is steadily growing and focusing on priorities which needs to be coherently shared by all countries contributing now to the on-going ESPPU  
→ **over 6 years!**      **How can we improve?**
- ✓ the **international collaboration** established after the last ESPPU recommendation, 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 extra-funds by institutes/FA**  
→ **resources**      **How can we improve?**
- ✓ Accelerator R&D Roadmap in EU and Snowmass21 in US processes, **strengthen the community**, leading to define resources needs and priorities on different activities  
→ **NEW EU ESPPU input documents**

**How can we prepare to support our project along the EU ESPPU on-going process?**

Support MuC R&D?



# Timeline & R&D Resources need



Year	I	II	III	IV	V	VI	VII	VIII	IX	X
<b>Accelerator Design and Technologies</b>										
Material (MCHF)	1.6	3.2	4.8	6.4	9.6	10.8	12.0	12.0	12.0	12.0
FTE	47.1	60.6	75.0	85.0	100.0	120.0	150.0	174.6	177.2	185.1
<b>Demonstrator</b>										
Material (MCHF)	0.6	2.2	3.9	5.4	7.8	15.1	25.9	32.4	31.8	12.6
FTE	9.5	11.0	12.5	29.2	29.7	30.5	25.5	27.7	26.7	25.5
<b>Detector</b>										
Material (MCHF)	0.5	1.1	1.6	2.1	2.1	2.1	2.1	2.6	3.1	3.1
FTE	23.4	46.5	70.0	93.0	93.0	93.0	93.0	116.4	139.5	139.5
<b>Magnets</b>										
Material (MCHF)	3.0	4.9	10.1	10.0	11.0	13.4	11.7	7.2	6.6	4.7
FTE	23.3	28.4	36.4	40.9	44.3	47.1	46.2	37.7	36.1	29.4
<b>TOTALS</b>										
Material (MCHF)	5.7	11.4	20.3	23.9	30.6	41.4	51.7	54.2	53.5	32.4
FTE	103.3	146.5	194.0	248.1	267.0	290.6	314.8	356.3	379.4	379.6

From LDG Review - February 2025

**Conduct an Independent Review of Scope, Schedule, and Costs:** An urgent, independent evaluation is needed to assess the overall scope, timeline, and budget of the Muon Collider R&D program for the **period 2026-2036**. This review will be crucial to ensure that funding requests for this R&D phase are well-justified and aligned with project objectives.

**Totals:**  
**Duration 10 years**

**Accelerator: 300 MCHF material, 1800 FTEy**  
**Detector: 20 MCHF material, 900 FTEy**

## POINTS TO BE NOTED:

- Our present estimate require careful revision/planning  
➔ how to we face/collect the estimated needed resources?

# Example Prospective Resources

## Already successful

- MuCol, IFAST, MUSIC, ...
- Fermilab site study
- Grants for US detector work
- DoE grant for RF test stand at SLAC
- ...



## LDG might

- Integrate final cooling solenoid in the HFM programme
- Strengthen the HFM programme contribution to magnet protection studies
- Explore RF panel contributions

## Other grant requests

- E.g. one for MUSIC calorimetry

## Other sources to try

- Increased contributions from partners
- More grants
- ...

## EU co-funding request via IFAST2

- Power converter (PSI, CERN and Infineon)
- FFAG (UKRI and ESS)
- Mover system (CERN and ?)

## Collaboration on target solenoid with fusion magnet technology

F4P

EUROFusion

ENI

Gauss Fusion



## Physics case for intermediate facilities

- Could leverage extra funding

**Will try to collect this centrally**

# *National/Regional funds - how to coordinate?*



## **NATIONAL FUNDS:**

- ✓ Funding Agency → **not for granted everywhere - how can we improve?**
- ✓ Government → **better to exploit synergies - also projects across countries**
- ✓ Private

## **REGIONAL/INTERNATIONAL FUNDS:**

- ✓ European calls → **to be coordinated/prepared on time**
- ✓ Across region-funds (i.e. RISE)
  - **NETWORKS FUNDS: for graduate students / postdocs / anybody**
- ✓ ????



# The international collaboration

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

*We have a lively interested community contributing at different level with the ESPPU ahead*

**22 COUNTRIES**

~ 85 institutes joined so far IMCC

Memorandum of Cooperation  
will be signed by a few more institutes

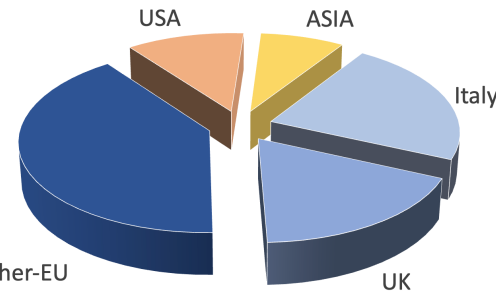
~ 75% of the total interested to join

**REVISION on-going**

Submitted ESPPU input as large project

Proposed an R&D plan that can make a muon collider reality by 2050

- 406 pages supplementary “backup” document, ~450 authors and supporters



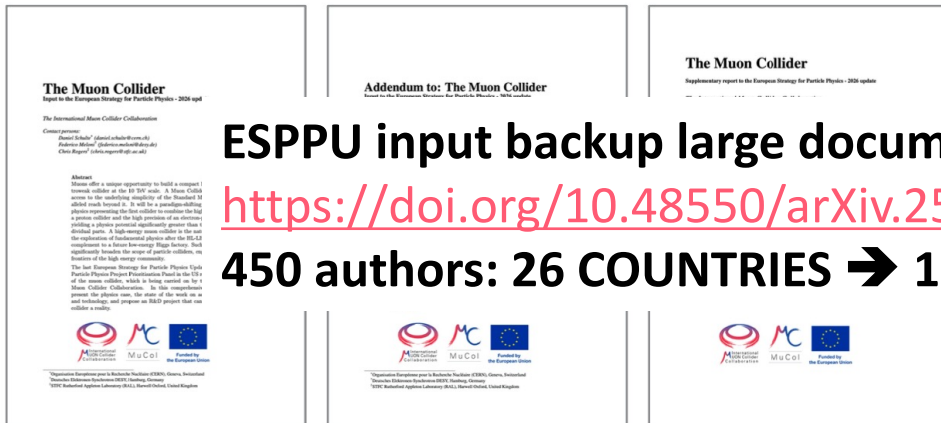
## TO BE IMPLEMENTED:

- Direct contact Country/Institute  
➔ to support and strengthen the collaboration
- Institute's interest to be further explored
- Encourage joint effort to apply for funding

**ESPPU input backup large document**

<https://doi.org/10.48550/arXiv.2504.21417>

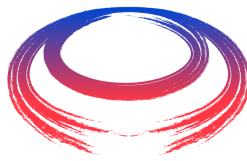
**450 authors: 26 COUNTRIES ➔ 131 institutes**



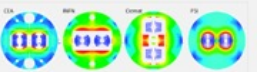




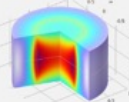

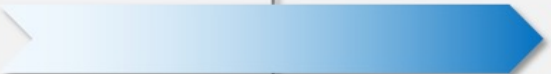
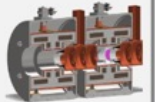






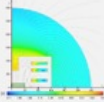
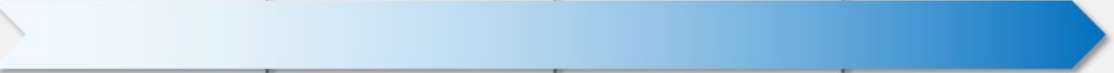
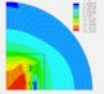


***Thanks to all for inputs  
and further ideas and commitment!***

***and.... extras***

# Magnet R&D impact - Luca Bottura talk

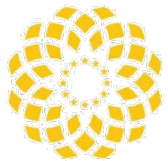


International  
UON Collider  
Collaboration

	HEP and NP 	High-field science 	NMR 	MRI	Fusion 	Motors/generators 
TM1 20@20 		High field, low consumption			High-field, large bore and large stored energy	
TM2 SOLID 		High field, low consumption		High-field large bore, cryo-free technology		
TM3 UHF-DEMO 	FCC-ee, CLIC (e+ source)	Ultra-high-field	Ultra-high-field			High-field, compact windings
TM4 RCS-String		High pulsed power and energy recovery			High pulsed power and energy recovery	
TM5 MBHY	FCC-hh, SppC					
TM6 MBHTS 	FCC-hh, SppC					3D, compact pole winding
TM7 MBHTSY 	FCC-hh, SppC					3D, compact pole winding
TM8 MQHTSY	FCC-hh, SppC					3D, compact pole winding



# PRACTICAL IMPACT EXAMPLES



- **Fusion for Energy** (ITER EU Domestic Agency)
  - Framework agreement and first addendum in final negotiation
  - Contribution to the design of the HTS target solenoid, relevant to the central solenoid of DTT
- **EUROFusion** (next step European fusion reactor)
  - Framework agreement signed in 2023, first addendum signed in 2024
  - Contribution to the design of the HTS target solenoid, relevant to the magnets of a Volumetric Neutron Source proposed as next step in the European fusion strategy
- **Gauss Fusion** (one of the leading EU fusion start-ups)
  - Consultancy agreement signed in 2023
  - CERN contribution to the design of the LTS/HTS GIGA stellarator magnets, based on advances in the HTS target solenoid
- **ENI** (oil and gas energy giant)
  - Framework agreement and first addendum signed in 2024
  - Collaboration on the conceptual design and project proposal for the CERN construction of a large bore HTS solenoid (20@20 model coil) relevant to the muon collider and fusion
- IFAST-2 proposal to **INFRA-2025-TECH-01-02** (CERN, INFINEON, PSI)
  - Proposal of fast pulsed power cell + magnet system sent to IFAST-2 coordination for ranking at TIARA
  - Industrial interest in rapidly pulsed and large energy/power supplies