

Riunione Referee – 25 luglio 2024

R&D Muon Collider

*Stato collaborazione internazionale IMCC
attività INFN in corso e future - sinergie*

Nadia Pastrone



Gruppi INFN in RD_MUCOL @ CSN1

121 persone/30.2 FTE

RD_MUCOL @ CSN1 – ESPP_A_MUCOL @ GE – UE-MUCOL – UE-I_FAST

BA BO FE GE MI MIB LNF LNL LNS NA PD PI PV RM1 RM3 TO TS

Physics, Detector R&D, MDI, Crystals/Targets, Accelerator Activities



HORIZON-INFRA-2022-DEV-01-01

Attività INFN – FTE progetti in sinergia

Progetti con % SINERGICHE:

UE-MUCOL: GE, LNS, NA, PD, RM1, TO, TS + MI Univ e PD Univ

PRIN_20229TBY8B: LNF(30%) e PD(10%) + BA Univ

UE_iFAST: RM1(10%) e TO(5%)

aMUSE-RISE: TO(1%) e TS(5%) + PD Univ

PNRR-IRIS: MI (80%)



SEDE		FTE *100	MuCol	AIDA/PRIN I.FAST/IRIS	ATTIVITA'			COMMENTO	PRIN	DRD
					FISICA/SIMULAZIONI	R&D DETECTOR	ACCELERATORI			
BA		360			x	x		Fisica HCAL HPTPC	calo	x
BO	DTZ	125			x		x	Fisica teo e Fast ramping Magnets		
FE	DTZ	60				x	x	Cristalli		x
GE		160	130				x	Magneti		
LNF		270		30		x		CRILIN	calo	x
LNL	DTZ	10					x	RF +(bersagni sottili)		
LNS	DTZ		135				x	RF		
MI		235	65	80			x	Magneti e RF		
MIB	DTZ	20				x		Test facility-dimostratore		
NA	DTZ	10	10				x	RF		
PI	DTZ	40			x			Fisica Detector		
PD		415	20	10	x	x	x	Fisica Detector Calcolo MDI Dimostratore		x
PV		185			x	x		Fisica e picosec+ generatori teo	gas - no FTE	x
RM1		260	20	10	x		x	MDI fisica e bersagli/materiali		x
RM3	DTZ	10			x			fisica		
TO		295	20	5	x	x	x	fisica R&D detector MDI e accel	gas - no FTE	x
TS	DTZ	5	20	5	x			fisica e ricostruzione		x

TOT FTE	30,2	RD_MUCOL	24,6	MuCol	4,5	AIDA/PRIN/IRIS/I_FAST/aMUSE	1,1
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Design Study activities: EU project

Total EU budget: 3 Meu start March 1 2023 – 4 years
18(+14) beneficiaries (associated) END 28 FEB 2027

HORIZON-INFRA-2022-DEV-01-01:
Research infrastructure concept development



INFN 510 keu UniMI 300 keu UniPD 100 keu + associate partners: UniBO, UniPV INCLUSO OVERHEAD

MuCol study will produce a coherent description of a novel particle accelerator complex that will collide muons of opposite charge at the energy frontier. The study will target a centre-of-mass energy (ECM) of 10 TeV with 3 TeV envisaged as a first stage.

The main outcome of MuCol will be a **report** documenting the facility design that should demonstrate that:

- the **physics case** of the muon collider is sound and **detector systems** can yield sufficient resolution and rejection of backgrounds;
- there are **no principle technology showstoppers** that will prevent the achievement of a satisfactory performance from the accelerator or from the detectors side;
- the muon collider provides a **highly sustainable energy frontier facility** as compared to other equivalent colliders;
- **exploiting synergies with other scientific and industrial R&D projects**, a valuable platform to provide Europe a leading edge not only in terms of discovery potential, but also for the development of associated technologies.

The final report will include a thorough assessment of benefits and risks of the accelerator and detector complex, including an evaluation of the scientific, industrial and societal return beyond high-energy physics, the cost scale and sustainability of the complex and the impact arising from an implementation on the CERN site.

INFN – BUDGET
Total: 408 keu

AdR: 362 keu
Altro: 46 keu

GE: 10 keu missioni
MI: 8 keu missioni
MI: 16 keu consumo
MI: 8 keu licenze
TO: 4 keu progetto

Presentazione Dario Giove su “Status RF e Magneti: richieste RD_Mucoll 2025”

Situazione spese al 2024 ad oggi

Fondi Csn1: contributo 13 kEuro ad acquisto VNA
Missioni

Fondi ESPP-A Mucoll contributo 31 kEuro ad acquisto VNA
nastro HTS 146 kEuro

Milestones 2025 per richieste RD_Mucoll a CSN1

Marzo 2025	Primi risultati test di campo elettrico DC pulsato in campo magnetico
Giugno 2025	Misure RF su cavità a 704 MHz prototipo
Marzo 2025	Sottomissione primo report per design prototipo di cooling cell completa

Milestones 2024



Milestones Proposte

Data	Descrizione
31-12-2024	Final submission of the Interim Report
30-10-2024	First proof of concept of an experiment for a facility at 10 TeV of center of mass energy
31-12-2024	First experimental results of the DC test on samples for the cooling channel NC-RF
31-12-2024	Baseline design to fully integrate a cooling cell
30-10-2024	Studies of the detector shielding design at 3 and 10 TeV

Milestones Concordate

Data	Descrizione
31-07-2024	idem
31-10-2024	idem
15-12-2024	LGAD (DC-RSD e eXFlu): laboratory and test beam resolution measurement to optimize performance
31-12-2024	idem
31-12-2024	Design of a test system for a NC-RF cell and power coupler at 3 GHz in a superconductive magnetic field
31-12-2024	idem
31-12-2024	Completamento disegno matrice 5x5 cristalli - 5layers e progettazione elettronica di lettura. Simulazione completa della matrice

Milestones 2025



Milestones Proposte

Milestones Concordate

Data	Descrizione	Data	Descrizione
30-04-2025	Final submission ESPPU Input Documents		
15-12-2025	CRILIN: realizzazione prototipo con 1 RM e 16.8 X0 e validazione su test beam		
15-12-2025	Report sulla validazione delle tecnologie LGAD-RSD per il tracciatore		

ANCORA DA DEFINIRE - INTENDIAMO FORNIRVI LA LISTA ASAP

PRIN_20229TBY8B co-finanziamento CRILIN



Situazione Contabile Esperimenti

Filtra le richieste

Anno:

2024 ▼

Esperimento:

Prin_20229tby8b ▼

Struttura:

Laboratori Nazionali di Frascati ▼

Gruppo Collegato:

LNF ▼

Filtra

Capitolo ▲	Descrizione ◆	Stanziato ◆	Variato ◆	Subjudice e Cong. ◆	Preimpegno ◆	Impegni ◆	Disponib. ◆	Proposta in corso ◆	Disp. Teorica ◆
U1030102008	Strumenti tecnico-speci 📄	0,00	102.067,34	0,00	0,00	7.293,77	94.773,57	0,00	94.773,57
U2020105001	Attrezzature scientific 📄	0,00	10.000,00	0,00	0,00	0,00	10.000,00	0,00	10.000,00
Totale:		0,00	112.067,34	0,00	0,00	7.293,77	104.773,57	0,00	104.773,57

Esporta

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