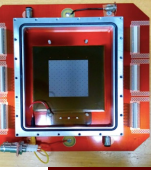


**RHUM**  
**Resistive**  
**High granularity**  
**Micromegas**



CdS Roma Tre - Discussione Preventivi



- **Main goals:**

- Establish resistive Micromegas MPGD as precision, radiation tolerant detectors for high (up to 10 MHz/cm<sup>2</sup> and more) particle rates;
- Low occupancy, high granularity read-out based on small size pads with size  $\mathcal{O}(\text{mm}^2)$ ;
- Prove the scalability to large size detectors;
- Obtain a stable operation at high gains;
- Simplify the construction technique for industrial production.

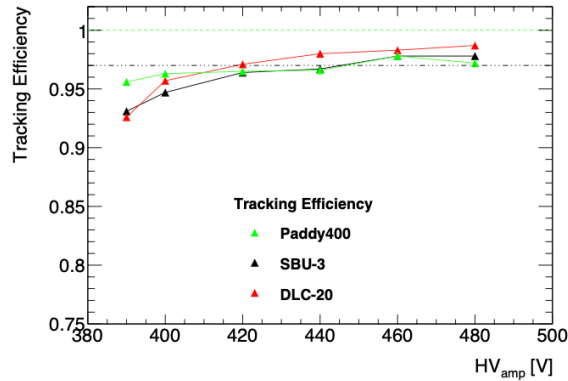
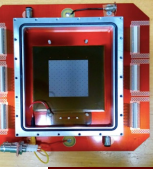
- **Use cases for this technology:**

- Forward Muon tagging detector (e.g. ATLAS High Eta Muon tagger)
- Detectors for high energy and very high intensity new particle accelerators (FCC-ee/hh) or for the Electron-Ion-Collider (EIC)
- Readout layer of a Time Projection Chamber
- + more “exotic” applications [*External Particle Therapy and detection of External Neutral Atoms (ENA) in Space Weather research program*]

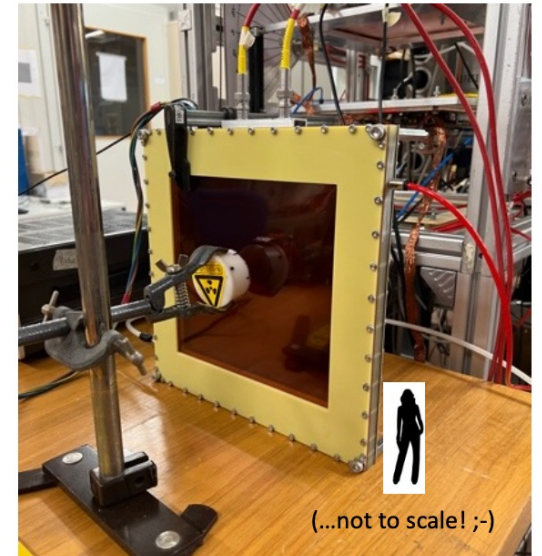
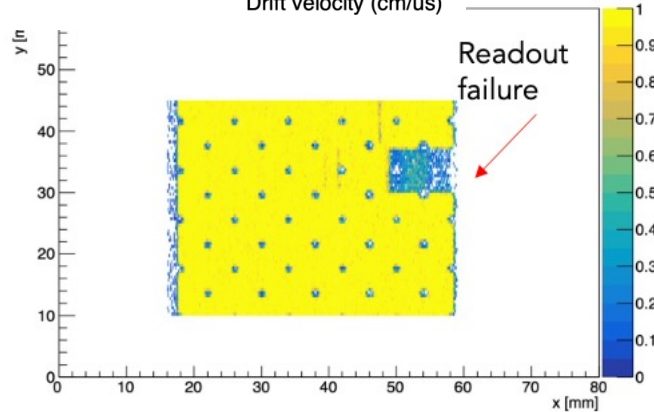
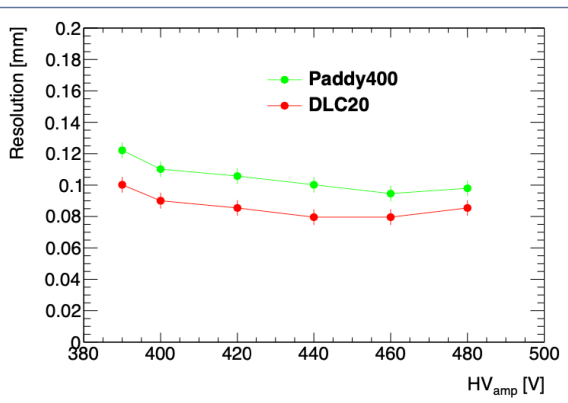
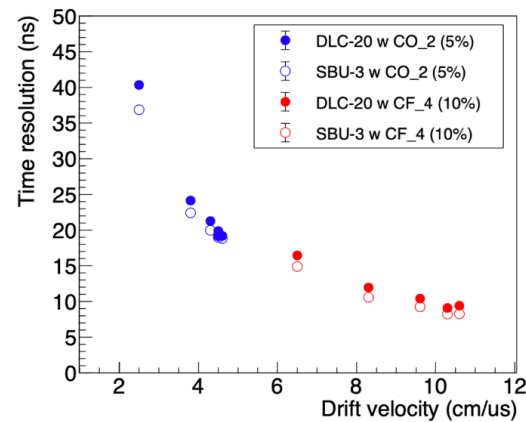
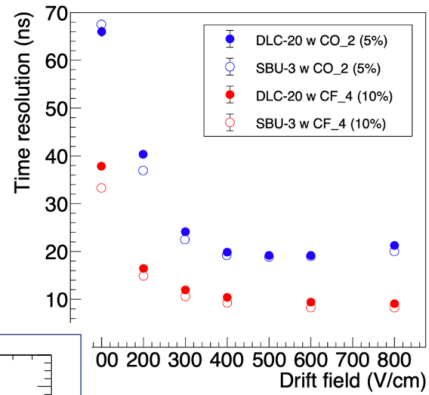
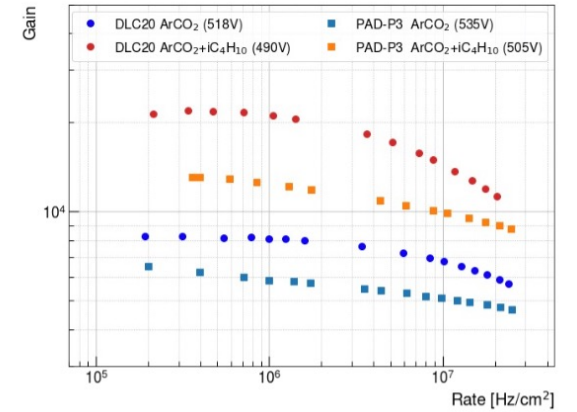
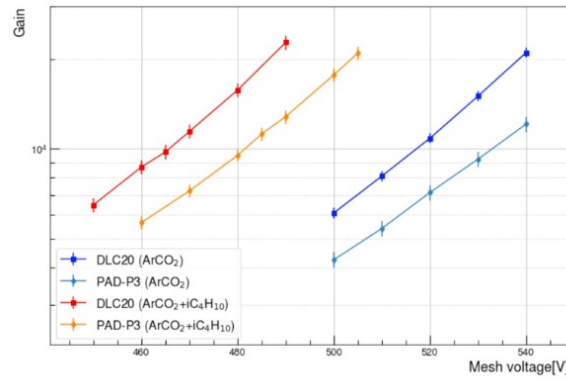
- **“spin-off” collaborations and projects:**

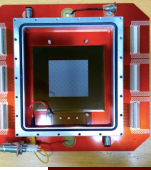
- Ongoing R&D for sampling Hadron Calorimetry for the Muon Collider (RD51 Common Project – contact: P. Verwilligen)
- Currently under consideration:
  - Muon Veto for SHADOWS (proposal for proton dump FIPs physics at CERN)
  - Replacement of Muon detectors for AMBER (successor of Compass)

# A lot of activity and excellent results: examples!



~50 V difference between the two mixtures





## Recap

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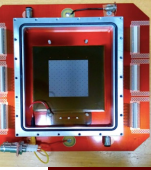
- stable operation up to 20 MHz/cm<sup>2</sup> with gain >10k
- detector efficiency > 97%
- position resolution < 100  $\mu$ m

DLC (SBU) detectors resulted in:

- better energy and spatial resolutions;
- negligible charging up effects;
- Fits in the new stream of resistive mpqd production exploiting DLC and new sputtering facilities → CERN-INFN DLC facility at CERN

New large(r) area prototype built and tested with very promising preliminary results:

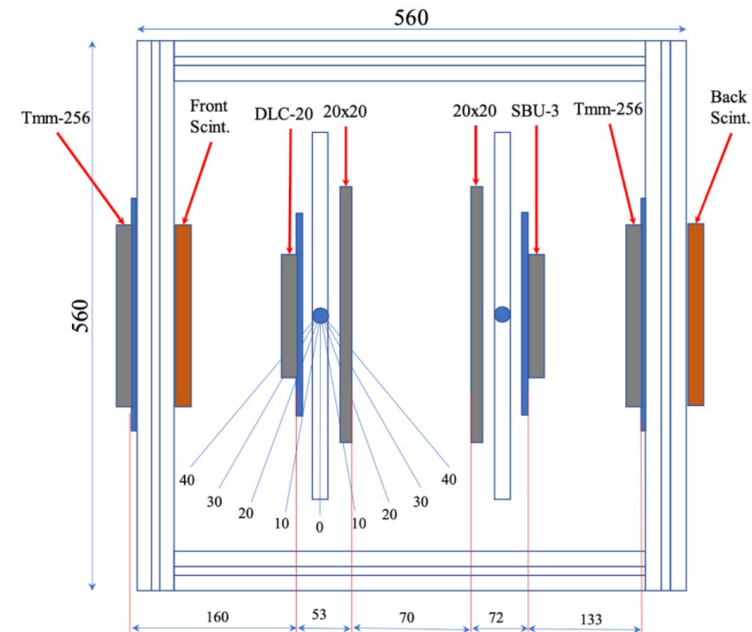
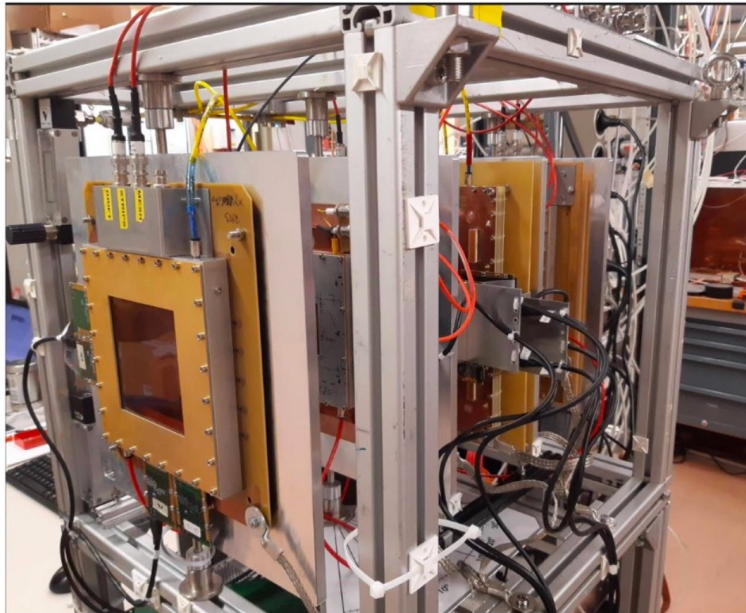
- Rate capability well beyond 1 MHz/cm<sup>2</sup> with large area irradiation
- Energy Resolution < 20% at 5.9 keV



## To do next

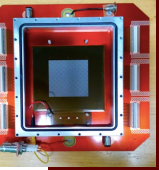
### In two beam periods at CERN (one in these weeks):

- Extend characterization of the large area prototypes (also back to back with common cathode)
- Refine the time resolution measurement
- Characterize the prototypes entirely manufactured by ELTOS



## Estensione del progetto

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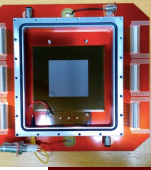


RHUM si dovrebbe concludere quest'anno, ma stiamo chiedendo una estensione.

Motivazioni principali:

- Ritardi nel raggiungimento di alcune milestone (rallentamenti nella produzione di prototipi e difficoltà nel periodo di pandemia)
- Consolidamento degli ottimi risultati raggiunti nell'ambito del progetto
- Preparazione della transizione verso i nuovi DRD (le attività di RHUM sono mature per affrontare nuovi R&D sulle linee indicate dalla ECFA Roadmap)

**Abbiamo discusso la nostra richiesta di estensione con i referee (parere favorevole) e fatto formalmente la richiesta al president di CSN5.**



## Group composition for 2024

The group composition is similar to last year:

- **Roma Tre (1.0 FTE was 1.1 in 2023 and 1.3 in 2022):**

- **Michela Biglietti 0.1**
- **Roberto Di Nardo 0.2**
- **Paolo Iengo 0.2**
- **Mauro Iodice 0.3**
- **Fabrizio Petrucci 0.2**
- **Marco Sessa**

**RL:** FP → Roberto Di Nardo  
(already switched)

- **Napoli (>1FTE)**

- M. Alviggi, M.T. Camerlingo, R. De Asmundis, M. Della Pietra, C. Di Donato, G. Sekhniaidze

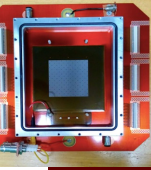
- **Support of the RD51 Collaboration at CERN**

- general support + test beams organization

- **CERN GDD Lab for MPGD tests**

## RHUM – new talks since last year report

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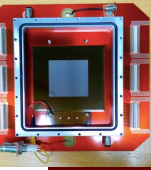


- “Small-pad resistive Micromegas for high-rate environment”, R.Di Nardo ICHEP 2022
- “Towards Large Size Pixelized Micromegas for operation beyond 1 MHz/cm<sup>2</sup>”, F.Petrucci IEEE 2022
- “Towards Large Size Pixelized Micromegas for operation beyond 1 MHz/cm<sup>2</sup>”, M.Iodice MPGD 2022
- “Pixelised Resistive Micromegas for High-Rate Environment”, M. Iodice, Bormio Meeting, 2023

Accepted:

- “High granularity resistive Micromegas for future detectors”, M.T. Camerlingo, TIPP 2023
- “High Granularity Resistive Micromegas for Tracking Detectors in Future Experiments”, EPS 2023





- **Missioni (4 kE +3 s.j.):**

- 2 kE CERN - Validazione con sorgenti e raggi-X dei nuovi prototipi nel laboratorio GDD del CERN
- 3 kE s.j. Test Beams (CERN o PSI) - richiesta s.j. alla possibilità di effettuare il test beam
- 2 kE missioni per collaborazione ditte (trasferimento tecnologico – ELTOS)

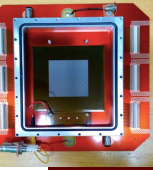
- **Consumo (~13+13 kE):**

- Prototipo  $\sim 50 \times 50$  cm<sup>2</sup> con capacitive sharing dal CERN (in attesa di offerta)
- Prototipo  $\sim 50 \times 50$  cm<sup>2</sup> single DLC foil dalla ELTOS (in attesa di offerta)

*[industrializzazione detector grande area; implementazione della tecnica bulk per la mesh]*

- **Richieste sui servizi**

- Officina meccanica 1 m.u. (realizzazione gas frames, pannello gas, strutture di supporto)



THANKS!



