

# RPC R&D 2023. Lines of work and Highlights

## RPC-PET

- **First paper** about BRPC-PET <https://www.doi.org/10.1016/j.nima.2023.168236>
- No new developments due to lack of human resources and the physical relocation of the system at ICNAS.
- **Actively seek for funding**: the Caixa Research Health Call and Interreg project (with European funds) together with ten other Portuguese/Spanish Institutes/Companies.

## Timing RPCs (tRPCs) and PS-tRPCs

- **HADES: First paper** about FD-TOF-RPC (world's first heated RPC) <https://www.doi.org/10.1016/j.nima.2023.168182>
- **R<sup>3</sup>B: First paper** about R<sup>3</sup>B TOF (SHiP timing detector prototype) <https://www.doi.org/10.1016/j.nima.2023.168445>
- **PS-tRPCs: promising results** on a **large area readout** capable of extracting both timing and spatial information (**< 100 ps** and **> 1 mm** respectively, together with > 98 % Eff) scalable in area without the need to incorporate new electronics channels. To be presented in Pisa meeting.

## Autonomous RPCs

- All the data acquisition campaigns planned for the **MUTOM** detector were successfully carried out, demonstrating again the **possibility to use RPCs outdoor**. <https://www.doi.org/10.1016/j.nima.2023.169031>
- Great progress in **Sealed RPCs. Large area multi-gap prototype** <https://www.doi.org/10.1140/epjp/s13360-023-04647-1>, or small portable systems for **SND@LHC** (publication under review), **demonstrating the possibility to work stably for period of more than one year**.

## News

The group is now part of the DRD1 Collaboration at CERN as part of WP7 Timing detectors.

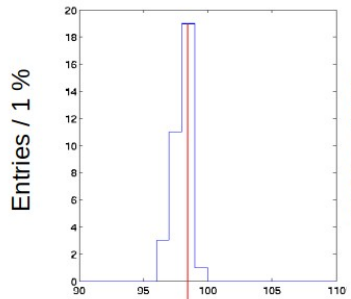
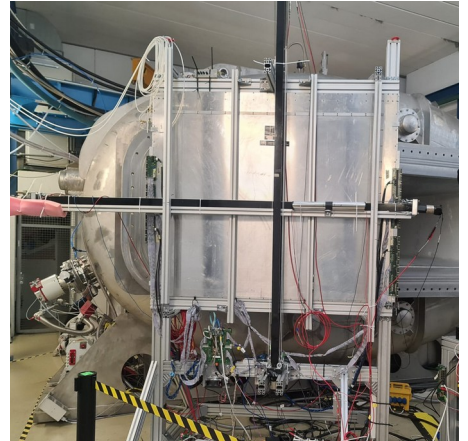
# RPC R&D. Future 2024 (main lines) of work

- **RPC-BrainPET**: We expect to characterize the RPC-BrainPET and start the first human trials
- Consolidate and advance the **PS-tRPC readout** validating the result in large area RPCs and continue the development within DRD1.
- Understand the **SHiP** new situation.
- Continue with the evaluation of **Sealed RPCs** technology incorporating timing ( $< 100$  ps) capability (apply for a specific expP) and continue operating the existing devices.
- Use **sealed RPCs in muon tomography**.
- Complete characterization of **RPCs operated in a pressure range from 1000mBar to 400 mBar** for **SWGO. Installation** onsite of prototypes.

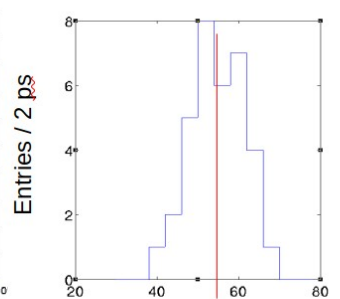
# RPC R&D

## Large area precise TOF-MRPC

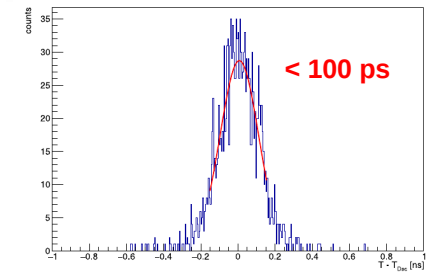
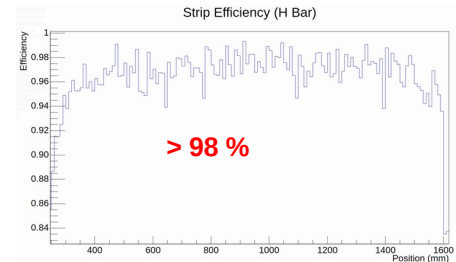
- < 50 ps, > 98%, > 2 m<sup>2</sup>
- Timing detector of ShiP experiment, operative in R<sup>3</sup>B



<98 %>



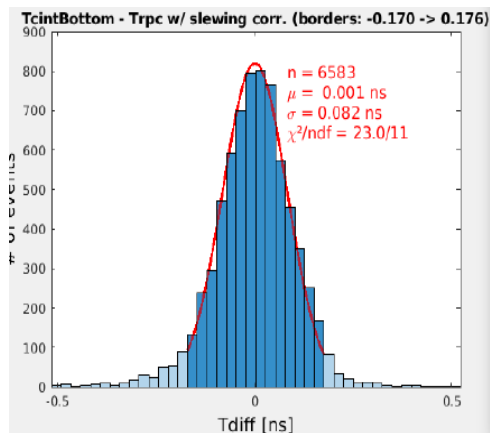
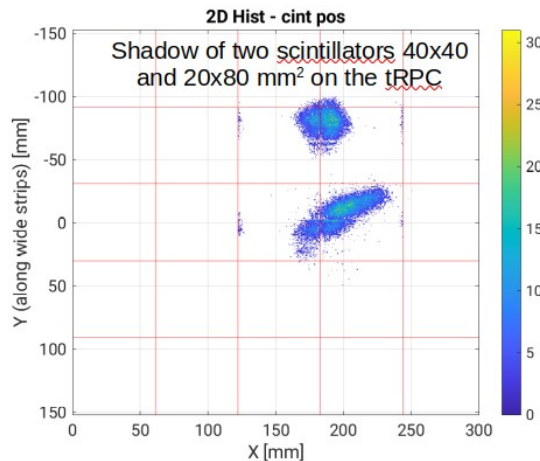
<54 ps>



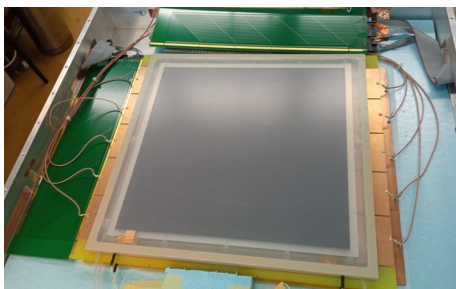
[doi.org/10.1088/1748-0221/15/10/C10017](https://doi.org/10.1088/1748-0221/15/10/C10017)  
[doi.org/10.1016/j.nima.2023.168445](https://doi.org/10.1016/j.nima.2023.168445)

#### Large area PS-TOF-MRPC

- $< 100$  ps,  $> 98\%$ ,  $< 1$  mm<sup>2</sup>,  $> 1$  m<sup>2</sup>
- Low FEE density
- Future PID systems and muon Tomography

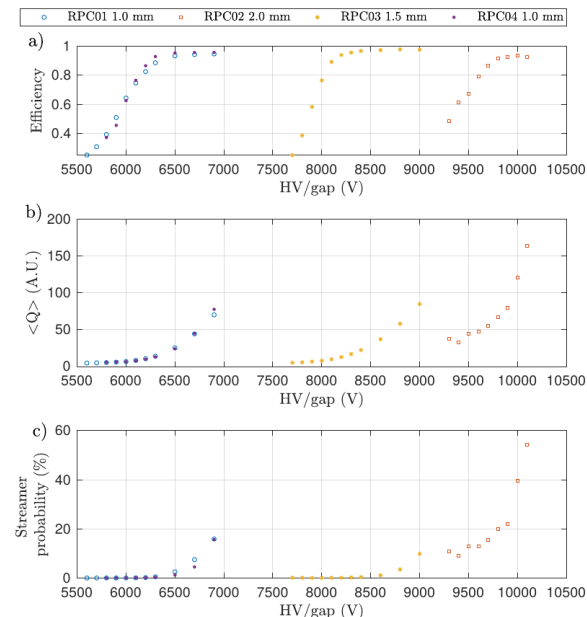


**< 1 mm<sup>2</sup>**



30x30 cm<sup>2</sup> to be extended to 1m<sup>2</sup>

**82 ps**



**Stable operation for more than 6 months**

A. Blanco et al 2023 EPJP 138, 1021  
[doi.org/10.1140/epjp/s13360-023-04647-1](https://doi.org/10.1140/epjp/s13360-023-04647-1)  
[arxiv.org/html/2402.18663v1](https://arxiv.org/html/2402.18663v1)

