# WP7 Task 4.2 Update

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On behalf of the collaboration
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## A reminder

Task 7.4. A 4-channel electronic board prototype for cluster counting and Hybrid readout for high pressure gas TPC for neutrino physics

- Design electronics and realise a 4-channel prototype for cluster counting in ultra-light drift chambers
- Identification and characterisation of adequate gasses
- Construction of a small-scale TPC prototype (#10 l) with a hybrid charge and optical readout

(https://aidainnova.web.cern.ch/wp7)

## Collaborators

- INFN and Politecnico di Bari, IT
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- Imperial College London, UK
  - Morgan Wascko
- Royal Holloway, University of London, UK
  - Asher Kaboth, Jocelyn Monroe
- University of **Santiago**, ES
  - Diego Gonzalez Diaz
- CSIC & Univ. de Valencia, ES
  - Justo Martín-Albo
- University of Warwick, UK
  - Xianguo Lu

Calendar year		2021				2022				2023				2024				2025			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	<b>Q4</b>	Q1	Q2	Q3	Q4	
AIDA time line	Year 1				Year 2				Year 3				Year 4								
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	23	Q4	-			
atmospheric pressure tests																					
high pressure tests																					
Commission and calibrate the existing spectrophotometer and build and comission a high pressure one																					
Magboltz simulations of spectrometer measurements																					
Commission a MPGD gas amplification stage with optical readout, including coarse charge readout on one of the amplification planes																					
Test gas mixtures for their primary scintillation and electroluminescence yield																					
Research to find promising mixture for t0 determination via scintillation tagging						Г															
Optimise the optical TPC for stable MPGD operation using the gas mixtures researched before																					
Measurements to search for a hydrogen rich gas mixture, suitable for operation in an (optical) TPC																					
Readout tests with a fast camera (when available) $\rightarrow$																					

Main development: RHUL TPC moved to FNAL, measurement ready to be published; Warwick TPC (WarTPC) platform and Bari Lab being set up.

### ALICE MWPC testing at RHUL



2022: Vessel, TPC, and MWPC moved to FNAL for beam test (TOAD@DUNE)



### 2023 April

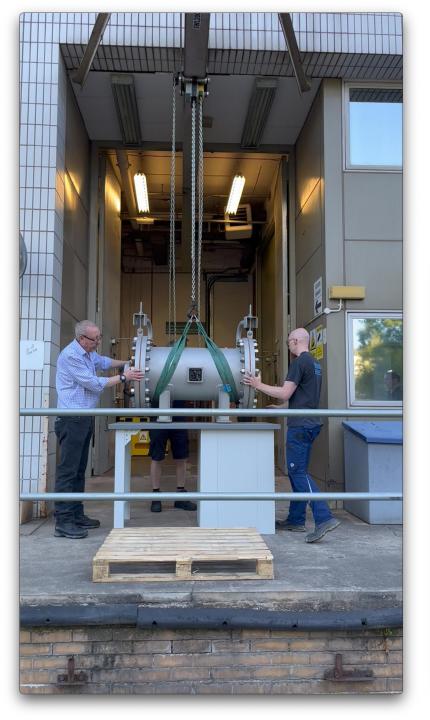
### First operation of an ALICE OROC operated in high pressure Ar-CO<sub>2</sub> and Ar-CH<sub>4</sub>

"The largest gain achieved at 4.8bar was  $(64 \pm 2) \cdot 10^3$  at stable conditions with an anode wire voltage of 2990 kV in Ar-CH4 (95.9-4.1). In Ar-CO2 (90-10) a gain of (4.2  $\pm$  0.1)  $\cdot$  10^3 was observed at an anode voltage of 2975 V at 4 barA gas pressure."

(to appear very soon)

## WarTPC Overview and Status

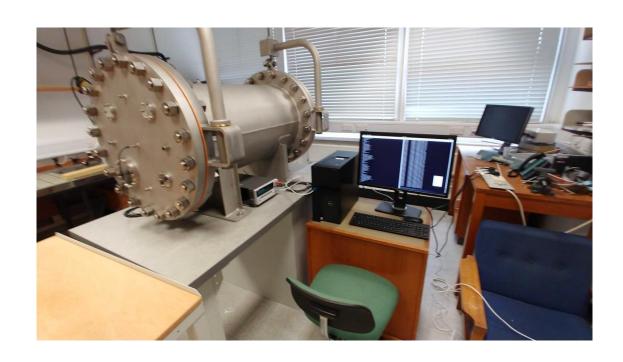
- 10 bar HPgTPC designed for gas studies and optical readout development for generic gas TPC R&D
- Optical readout will be done using a TimePix3 camera.
- Will initially operate at 1 bar, before upgrading to 10 bar operation.
- Currently, the gas system has been set up, and the vessel is leak tight.
- Electronics for TPC are currently being built. Field Cage, Cathode, and Anode Holder have been finished



2022 August: Pressure vessel (200 L, 10 bar) being set up in Warwick



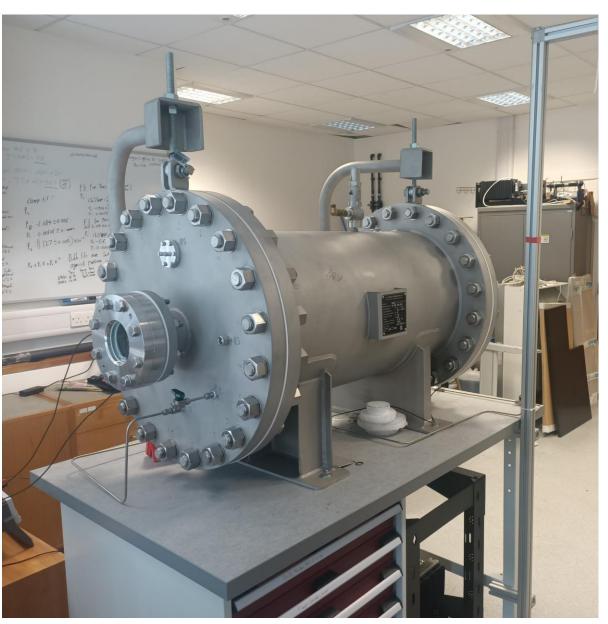
## 2022 November: Vessel testing at pressure and TPC field cage being built



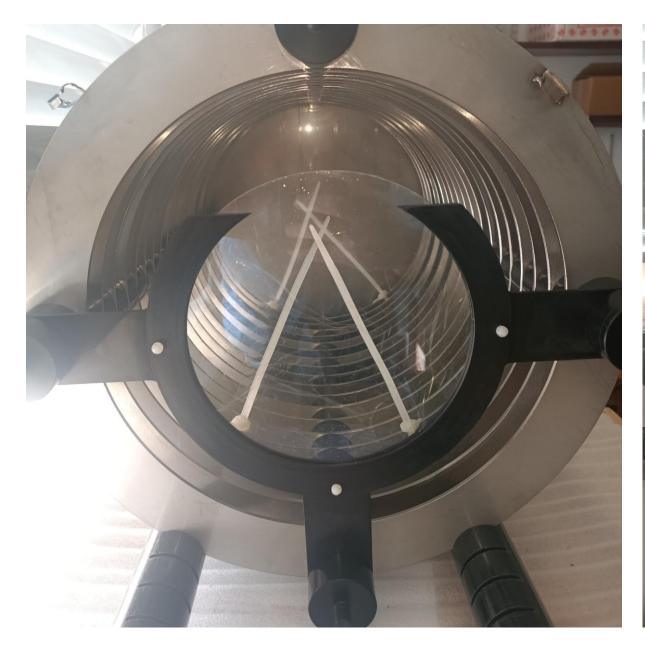


A-side B-side





### 2023 April: field cage and anode and cathode holders built









### Bari Lab being setup (2022)

Refurbishing to operate a high-pressure TPC prototype:

- high pressure gas line installed
- O2 and CO2 sensors for safety installed
- new ventilation system installed and tested
- instrumenting the lab (e.g. new power supply able to go up 100 kV, new movable table, mass flow meters...)

Design and construction of a highpressure TPC prototype in Bari by using local CAD group and local mechanical workshop

 Goal: to test prototype with different gas mixtures and by using MPGDs and TimePix as readout (2024)

### 2023 April status

#### Lab

- setting up of the lab almost done (still need to buy some DAQ components)
- searching a good candidate external company to build the cylinder of the HPTCP
- the flange should be built in home by our mechanical workshop

#### Contract

- Evaluating candidates for a research contract dedicated to AIDAInnova activities

## **BACKUP**