

Plans for the PDE measurement of the XA-Megacell

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PhCollector Meeting 11/10/2022



UNIVERSITÀ DEGLI STUDI
DI NAPOLI FEDERICO II



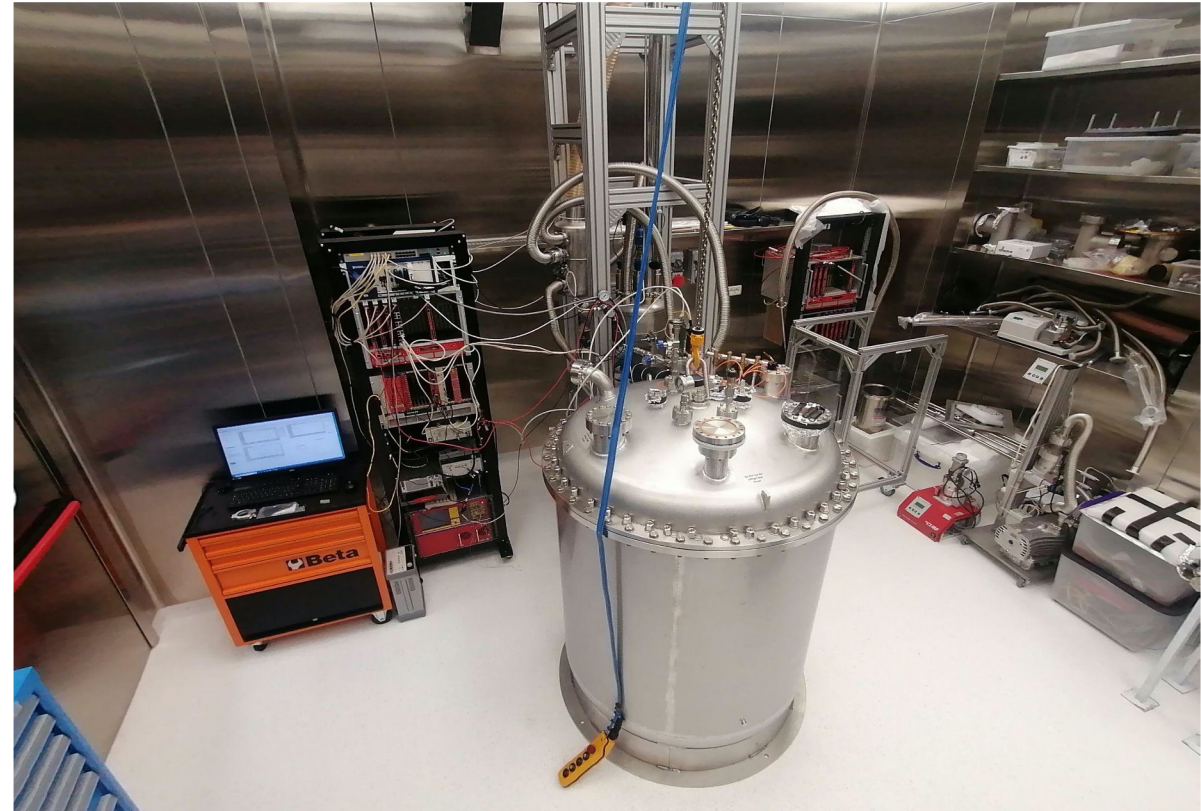
PDE measurement of XA-Megacell

- PDE measurement of XA-Supercell was measured and published in the past @Mi-Bicocca (<https://iopscience.iop.org/article/10.1088/1748-0221/16/09/P09027>)
- An efficiency of 2.9% was found in the best conditions
- Result was confirmed by measurements performed @CIEMAT
- The geometry of XA-Megacell (62 cm x 62 cm) is different from XA-Supercell
- In XA-Megacell SiPM coverage (SiPM number \times area over dichroic number \times area) is about half with respect to XA-Supercell
- It is relevant to establish PDE in XA-Megacell



PDE measurement of XA-Megacell in Napoli

- Custom made cryostat located inside the Naples Cryolab cleanroom (1.15 m diameter – 1.57 m height) coupled with a single wall domed flange)
- It represents the main part of PDU Test Facility **developed for DarkSide** collaboration
- Equipped with PT1000 temperature/level meter sensors, pressure transducer and analog pressure indicator
- The cryostat is designed for automatic LN filling (7 hrs) and draining (15 hrs)

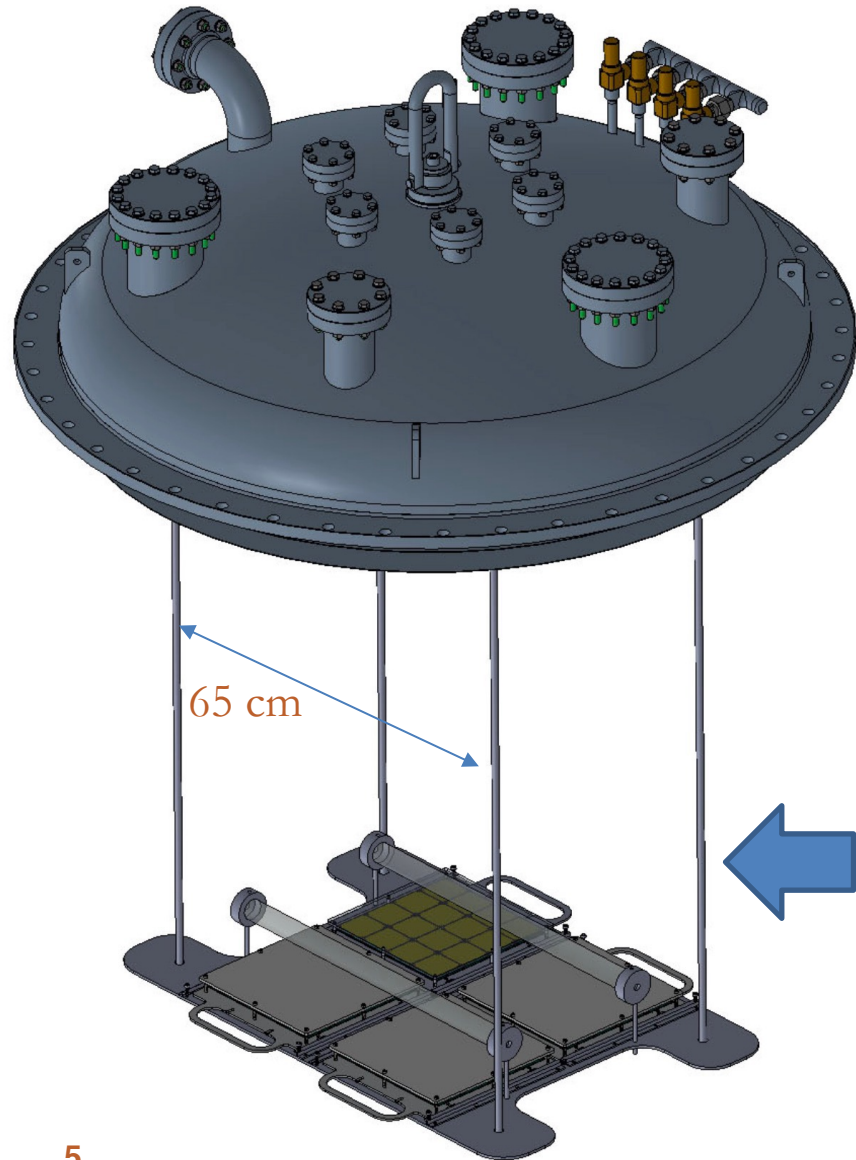


LAr cryostat filling

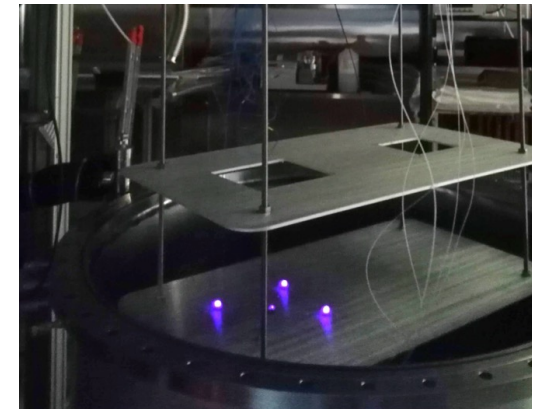
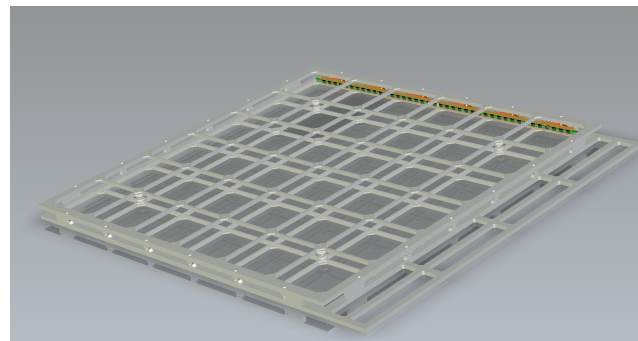
- For this test the cryostat could be filled with 5.0 liquid argon purified by an in-line Trigon filter
- We are studying two options against logistics and main activities scheduled for DarkSide:
 - 1) No Ar recirculation implemented (**baseline option**)
 - 2) GAr recirculation system and purification with hot SAES getter implemented (**under evaluation**)
- LAr purity evaluation by analyzing VUV light triplet component (possible cryogenic PMT used as reference)



Present mechanics and output flanges



- Output flanges: 6 CF40, 3 CF63, 3 CF100
- A manipulator system will be installed with ^{241}Am alpha source
- Illumination system with optical feedthrough and light diffusers
- 405 nm laser available, procurement of UV led source



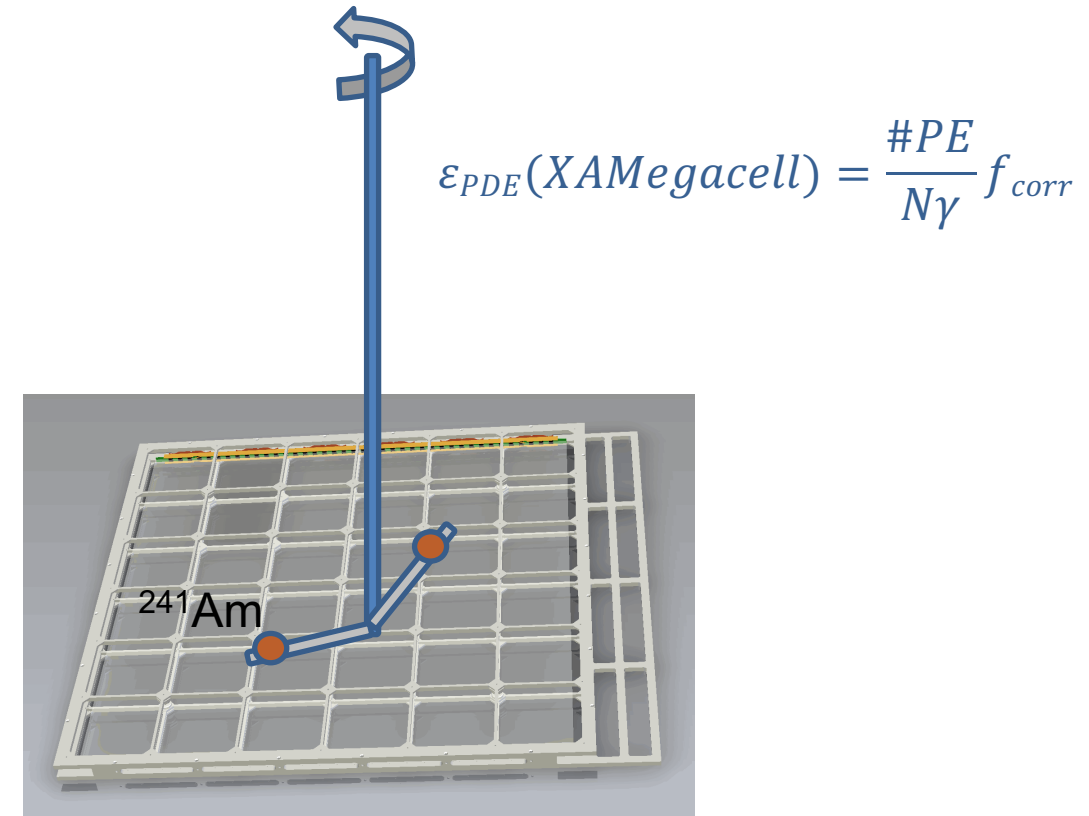
Requirements for PDE measurement of XA-Megacell in Napoli

- **A dedicated XA-Megacell should be fully assembled**
 - dichroics and PTP evaporation from Campinas (we could participate to evaporation campaign)
 - WLS plane preparation
 - Megacell mechanical parts
 - SiPMs on flex circuits
 - Electronics (possible LN test in December 2022 – to be defined)
- For first test we assume both bias and signal readout will be «in copper»
- Megacell electrical connections:
 - SiPM bias voltage
 - Cold amplification stage bias
 - Two differential outputs (x2)



Source and manipulator: to be implemented

- A small activity (~ 250 Bq) ^{241}Am is available
- Source manipulator to be realized with the source holder and a rotation system
- XA-Megacell could have different implementation of WLS plane-flex circuit coupling (check the relative response)
- Evaluation of PDE (estimation of N_γ from simulation and possible contribution from reflected photons)
- Correction factors: SiPM secondary pulses, LAr purity



Conclusions

- The feasibility of PDE measurement of XA-Megacell in Napoli Cryogenic laboratory is under study
- Use of large cryostat available up to March 2023, so as not to interfere with scheduled DarkSide activities
- Preliminary cold electronics test could be performed in December by using LN
- LAr test could be done in February - March 2023 - to be defined

