

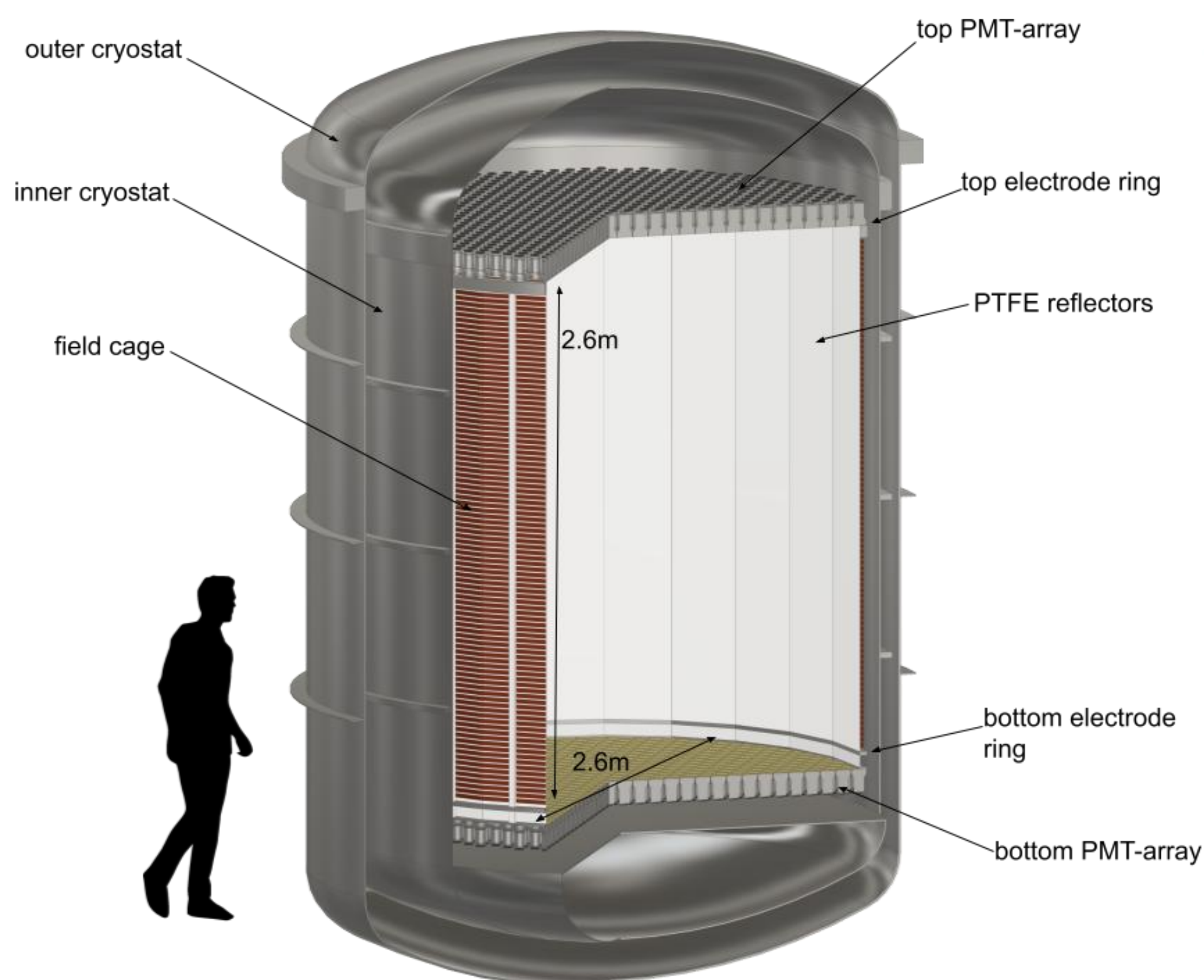
PANCAKE

-a testing platform for future LXe TPCs

UNI
FREIBURG

DARWIN will be the ultimate LXe-based dark matter detector, covering the entire accessible WIMP parameter space. Due to its large dimensions of 2.6m in diameter and in height its technical realization will be challenging. In our lab at Freiburg University we are currently commissioning PANCAKE, a large-diameter R&D platform for testing future detector components and techniques in a cryogenic LXe environment. Its 2.8m wide and flat (0.25m) cryostat will contain around 400 kg of xenon and many auxiliary systems are required for the safe operation of the set-up.

DARWIN-the ultimate dark matter detector:



DARWIN

- 40t active xenon content to achieve maximal sensitivity

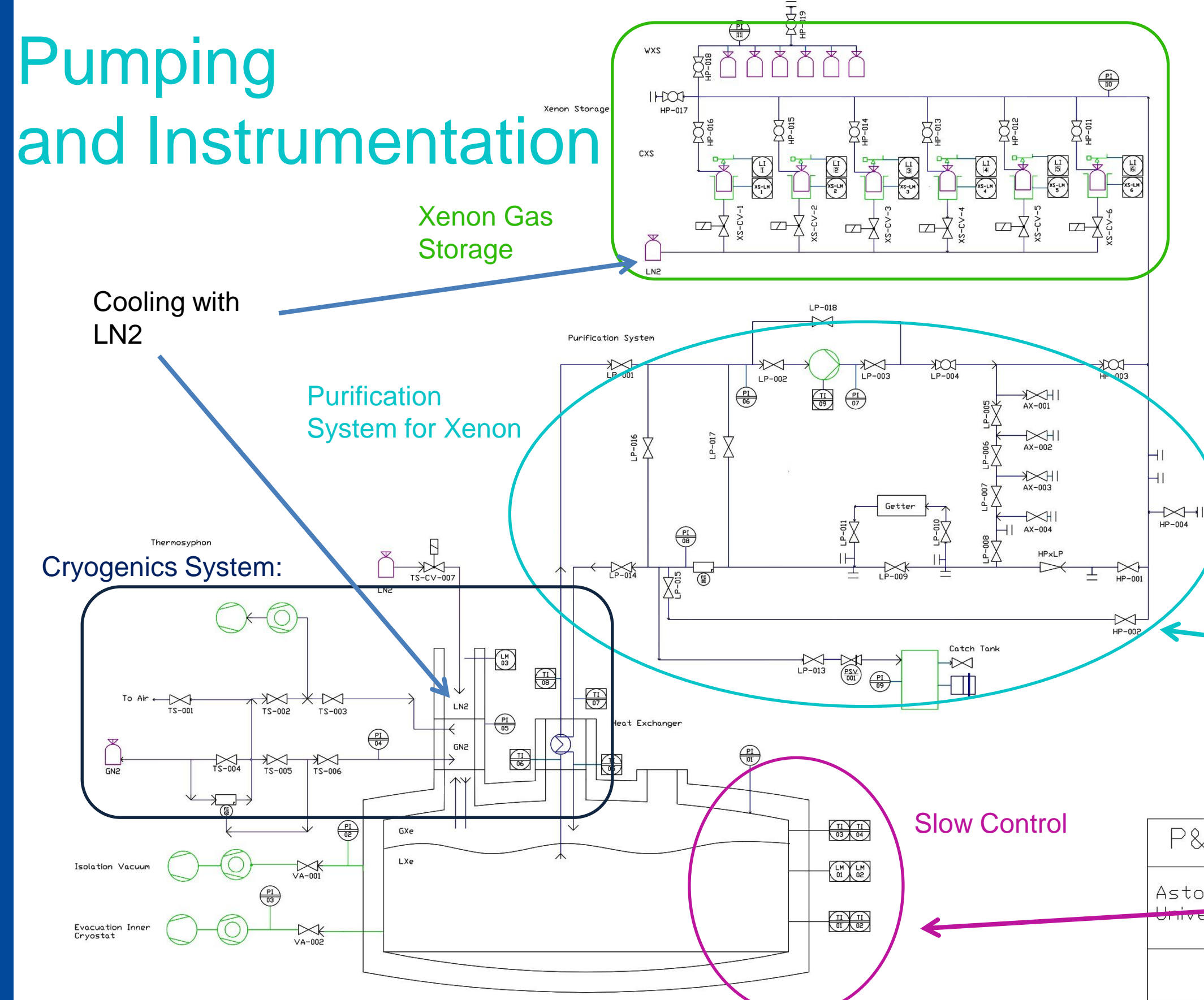
- Challenges:
 - background reduction (mainly ^{222}Rn) \rightarrow R&D on-going
 - TPC: the realization of 2.6m wide electrodes, PMT arrays or field cage is challenging \rightarrow PANCAKE as test facility

PANCAKE-R&D Platform:

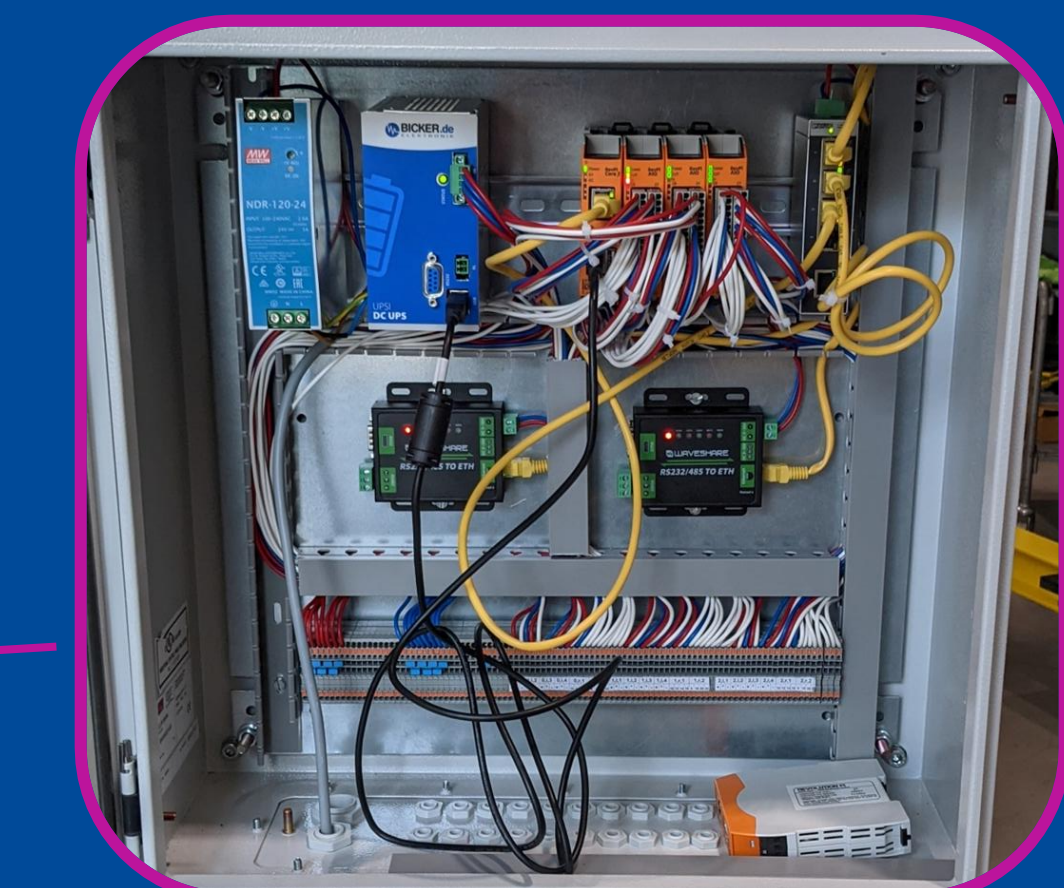
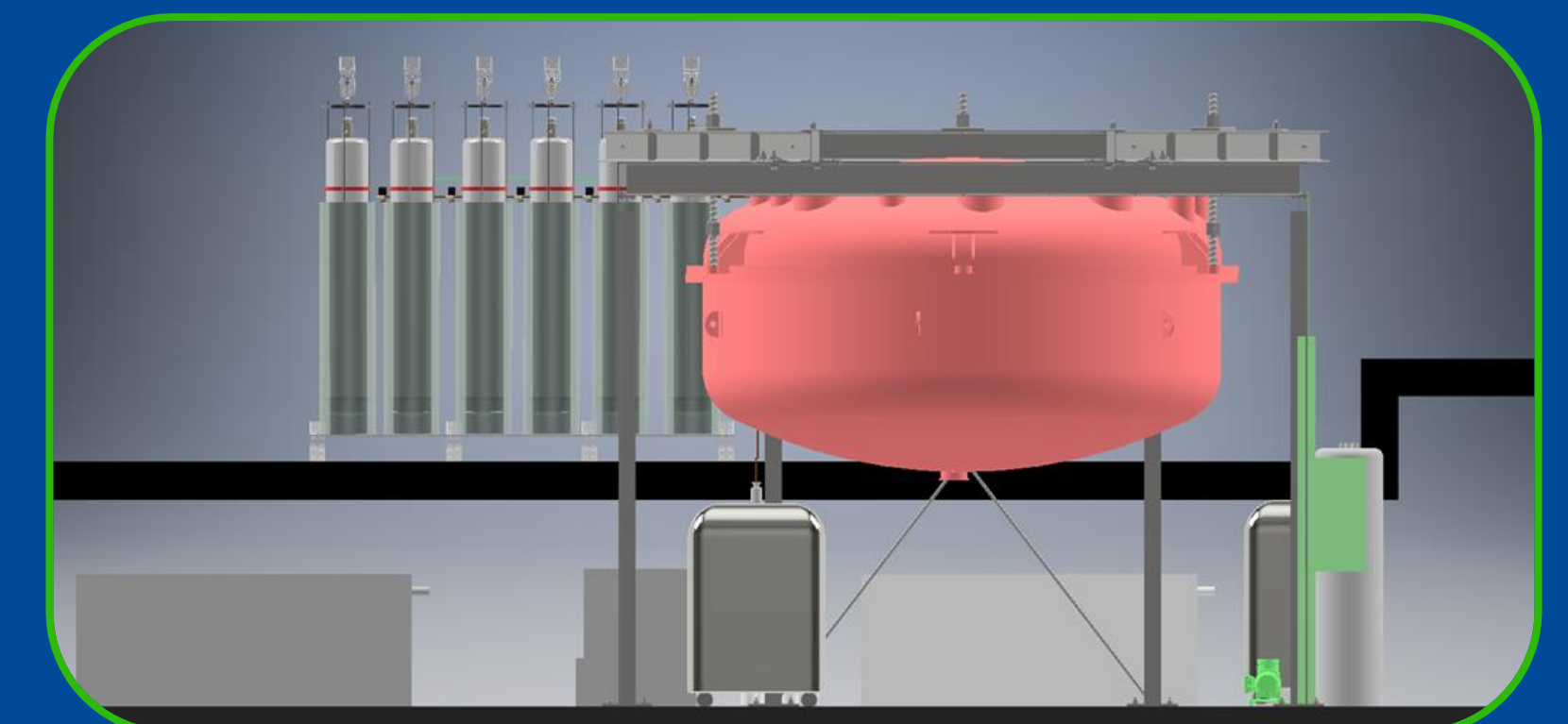
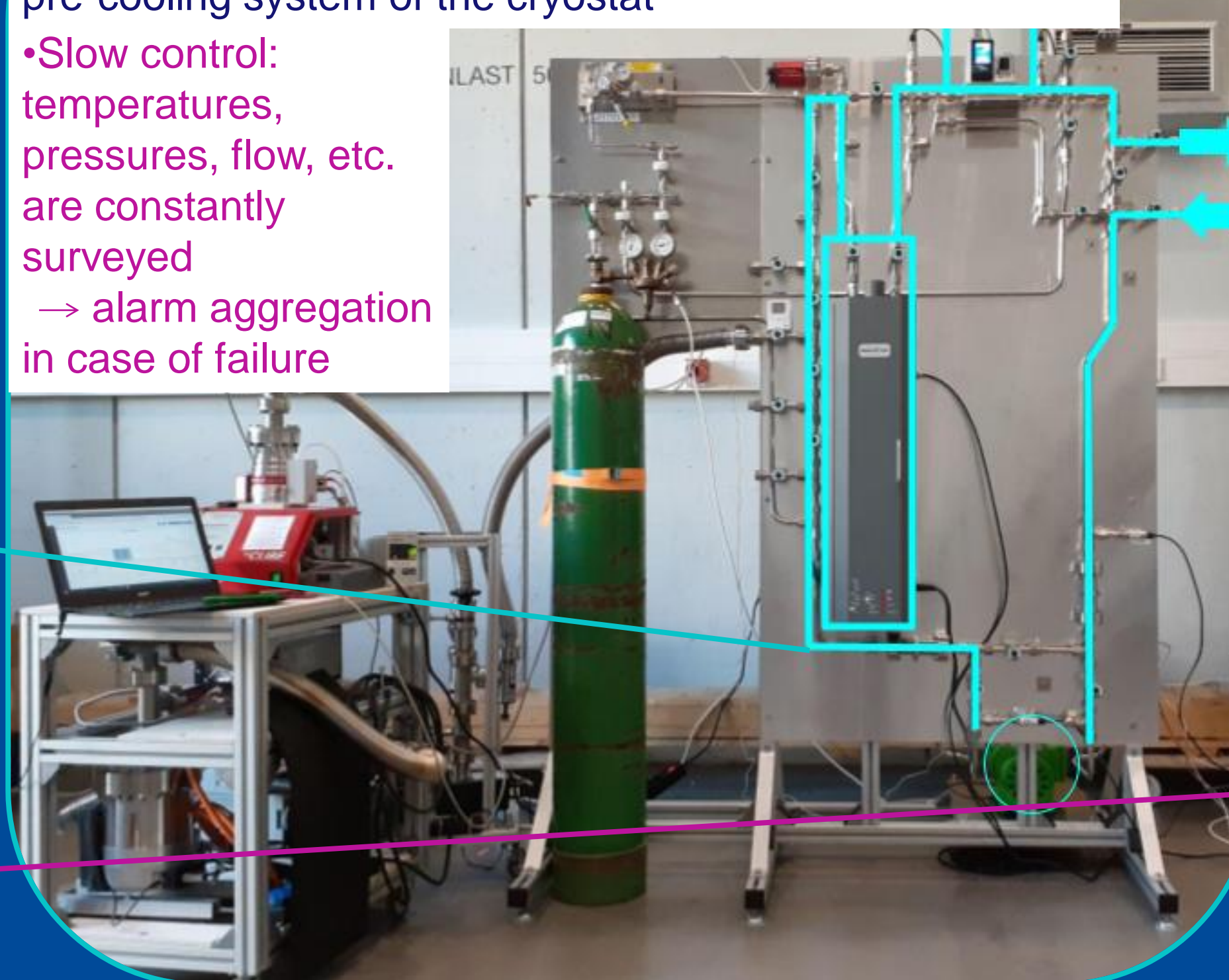


- 2.8m wide and 0.75m deep (IC)
- 400kg xenon
- Operation @ 2bar pressure and 170K temperature

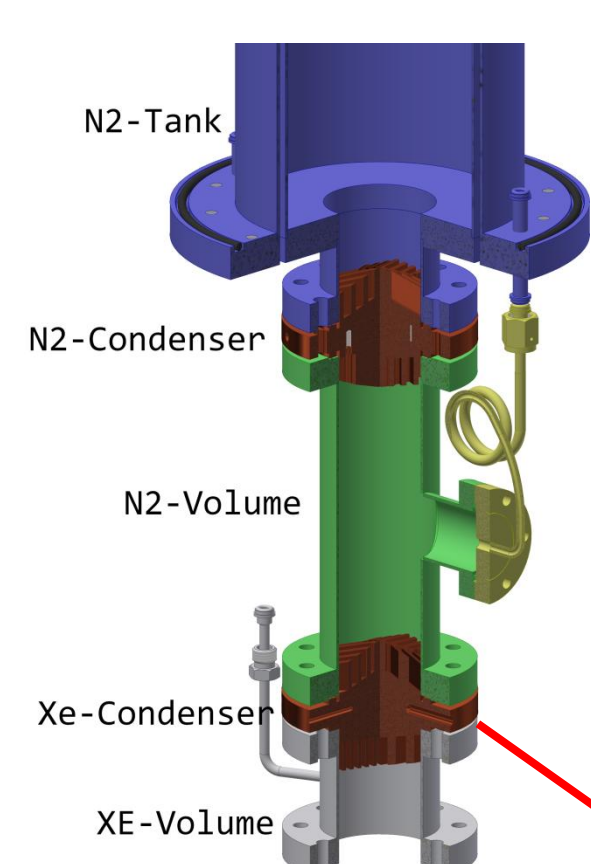
Pumping and Instrumentation



- Gas recuperation and storage system \rightarrow tracking our precious xenon
- Cooling the gas: Heat exchanger, thermosyphon plus pre-cooling system of the cryostat
- Slow control: temperatures, pressures, flow, etc. are constantly surveyed \rightarrow alarm aggregation in case of failure



Cooling and Liquefaction:



- To reach operation temperature of $\sim 170\text{K}$ for xenon liquefaction: reduce heat input
- Multi-layer insulation (MLI) and isolation vacuum between inner and outer cryostat (IC/OC)
- Pre-cool 3t of steel from IC with 6 cooling pads from copper
- Liquefaction at copper condenser in the thermosyphon



Outlook: Currently we are commissioning all our subsystems with the outlook of an argon test cooling and a subsequent xenon run in summer.

