PICO Update
SEF February 11 2026

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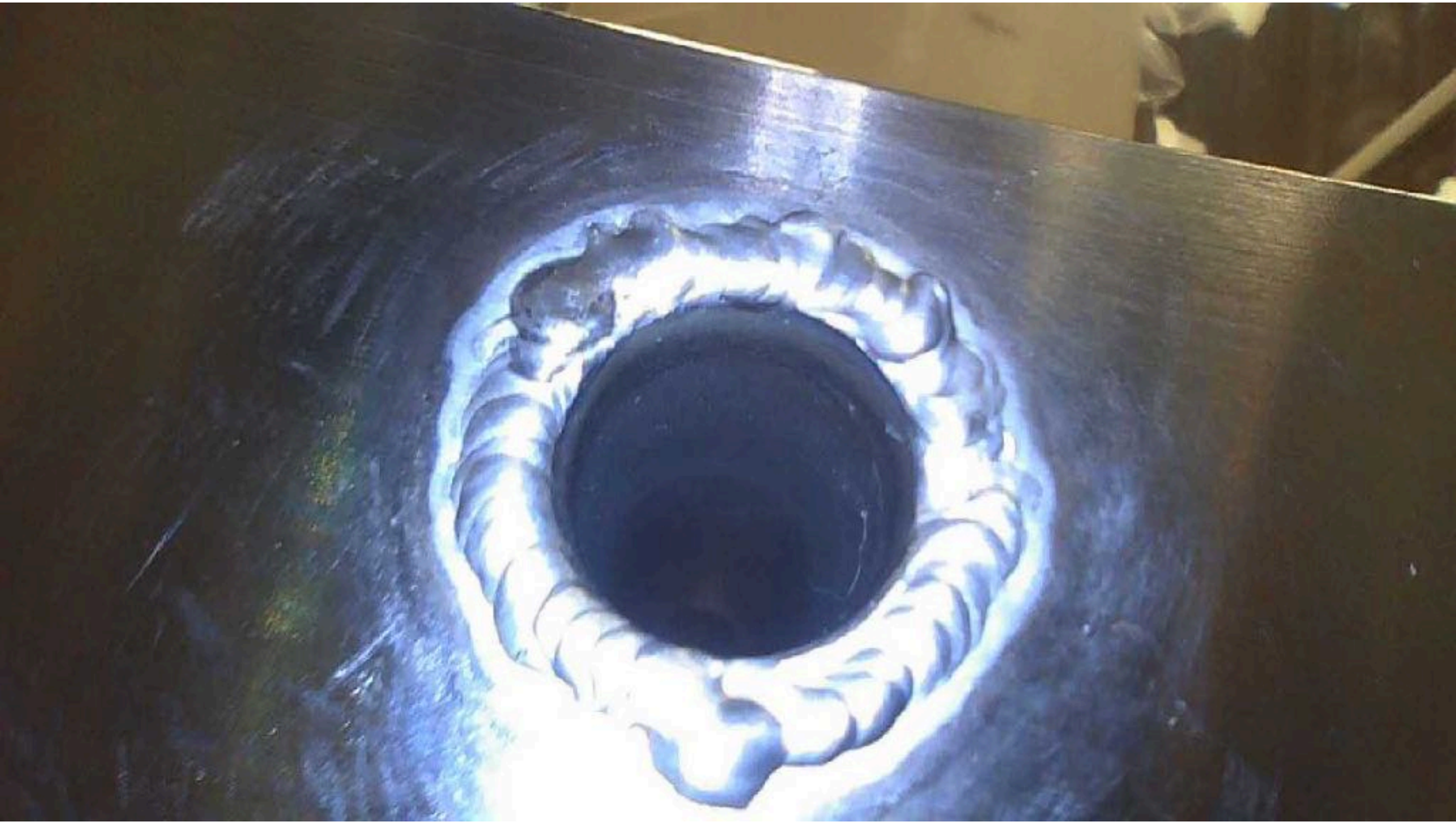
Progress

- PICO-500 is the focus of our activities
  - The large pressure vessel has received regulatory approval and passed a Radon emanation measurement
  - The inner vessel needed a complicated re-cleaning after a contamination was spotted and removed
  - Many more tools and parts have arrived on site and the final pieces are being machined and will be arriving on Site soon
  - The process systems (Freon filling system, pressure control system, pneumatic control system) are nearing completion and are undergoing final testing and early commissioning before shipping to site
- The detector will be filled with liquids later this year.

From the last meeting


FEATHERLITE



- Pressure system, Inner cooling coil, Freon Filling System

PICO-40L

- The problems with expansions have been studied and some issues have been addressed.

- After a lengthy approval process to change the chiller heat exchanger fluid for the main chiller, operation could start again as soon as the end of this month.

- We are hoping to complete a Radon acoustic calibration data sample that was started during the last run and ideally add a temperature/threshold scan with the detector

- The work leading to the “right-side-up” detector concept that is used for PICO-40L and PICO-500 has been written up and will be published in a paper in the coming weeks.

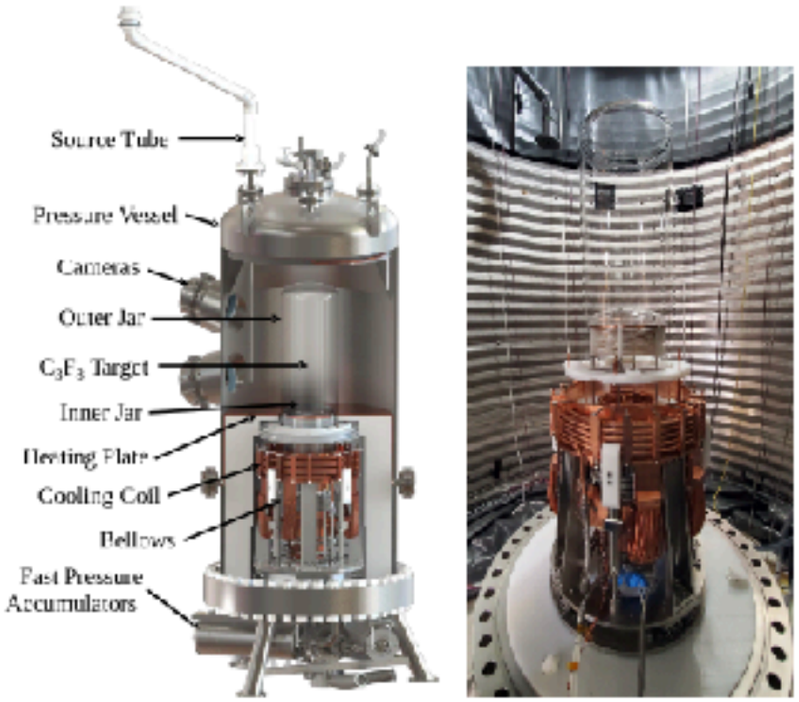


Figure 1. (Left) Schematic side-view of the PICO-40L pressure vessel with the major detector components labelled. The outer synthetic fused silica vessel houses the C_3F_8 target. Two of the four camera ports are visible on the left of the pressure vessel. The heating plate and cooling coil maintain the temperatures of the two thermal zones. The fast accumulators allow for rapid recompression of the chamber after a bubble is formed. The calibration (source) tube can be seen penetrating the pressure vessel on the left. (Right) The PICO-40L inner assembly assembled inside the water tank.

to minimize sensitivity to this class of background event while maximizing sensitivity to nuclear recoils [3]. The range of temperatures and pressures over which the detector has been designed to operate, along with some iso-threshold curves in the region, are shown graphically in Figure 2.

The lower zone is maintained at a temperature of nominally −25 °C, such that the C_3F_8 is not superheated over the entire operational pressure range, so that bubble nucleations rarely occur outside the view of the cameras at the silica vessel flanges, seals, stainless-steel components, or plumbing connections. The inner vessel assembly, external hydraulic controls, thermal control system, photography, and instrumentation are described in detail in the following sections.

The PICO-40L experiment is located at SNOLAB, an underground laboratory located at the Vale Creighton mine in Greater Sudbury, Ontario, Canada. The laboratory is situated in a hanging wall of norite granite rock several hundred meters from the ore body and mining areas. The surface profile of the mine site is flat, and the 2072 m overburden gives approximately 6000 m water-equivalent shielding, resulting in a cosmic-ray muon flux of 0.27 m^{-2}·day^{-1} [12]. The PICO-

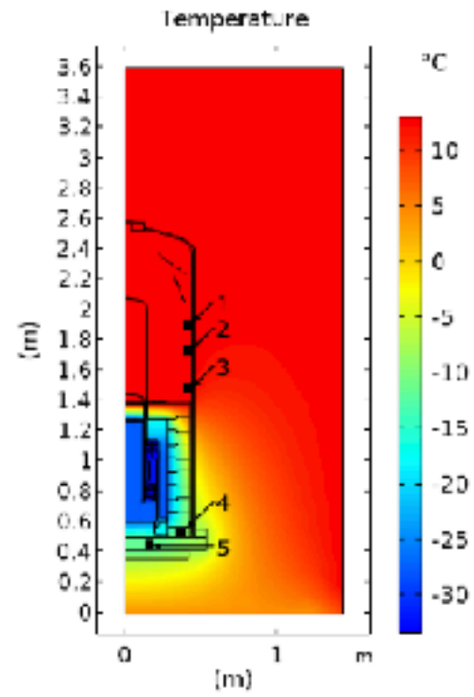


Figure 7. Temperature profile of a 2-dimensional axisymmetric simulation of a simplified model of the PICO-40L detector, after reaching equilibrium. The numbered black squares correspond to locations of RTDs in the detector, and a comparison to commissioning data is shown in Table 1. All simulated temperatures are within a few of the measured temperatures.

2.5 Camera system

PICO-40L has an optical system with four monochrome Basler ace acA1920-155um cameras paired with Kowa LMVZ4411 varifocal lenses observing the inner detector under an angle of $(14 \pm 10)°$ from above and $(-14 \pm 10)°$ from below. Two rows of cameras allow stereo reconstruction with an opening angle of 60°. The cameras are each enclosed in a water-tight enclosure with their custom LED rings and heat exchangers. A thermal control system and thermal sensors are also present on the LED rings. The LED rings each hold 48 red LEDs (model: XPEPHR-L1-0000-00801 from Cree) and are equipped with light-diffusing foils and a light seal to prevent stray light from the LEDs from directly entering the camera aperture. The cameras are mounted on a flexible mount that enables the camera to move along the view port axis. A linear slide allows the camera to be retracted from the measurement position when adjusting the lens settings. The mount also allows the adjustment of the angle to the pressure vessel view port normal with two degrees of freedom. The LEDs receive staggered pulses using six Mightex SLC-AA04-US LED driver boards triggered by the exposure gate from their respective cameras, allowing a view of the detector without reflections from neighbouring camera lights. The camera housings are flushed with air to prevent

Summary

- PICO is on track to deliver PICO-500 with operation planned to start this year.

- PICO-40L will continue to play a role in informing the bubble chamber R&D program before reaching the end of its useful life, likely within the coming two years.