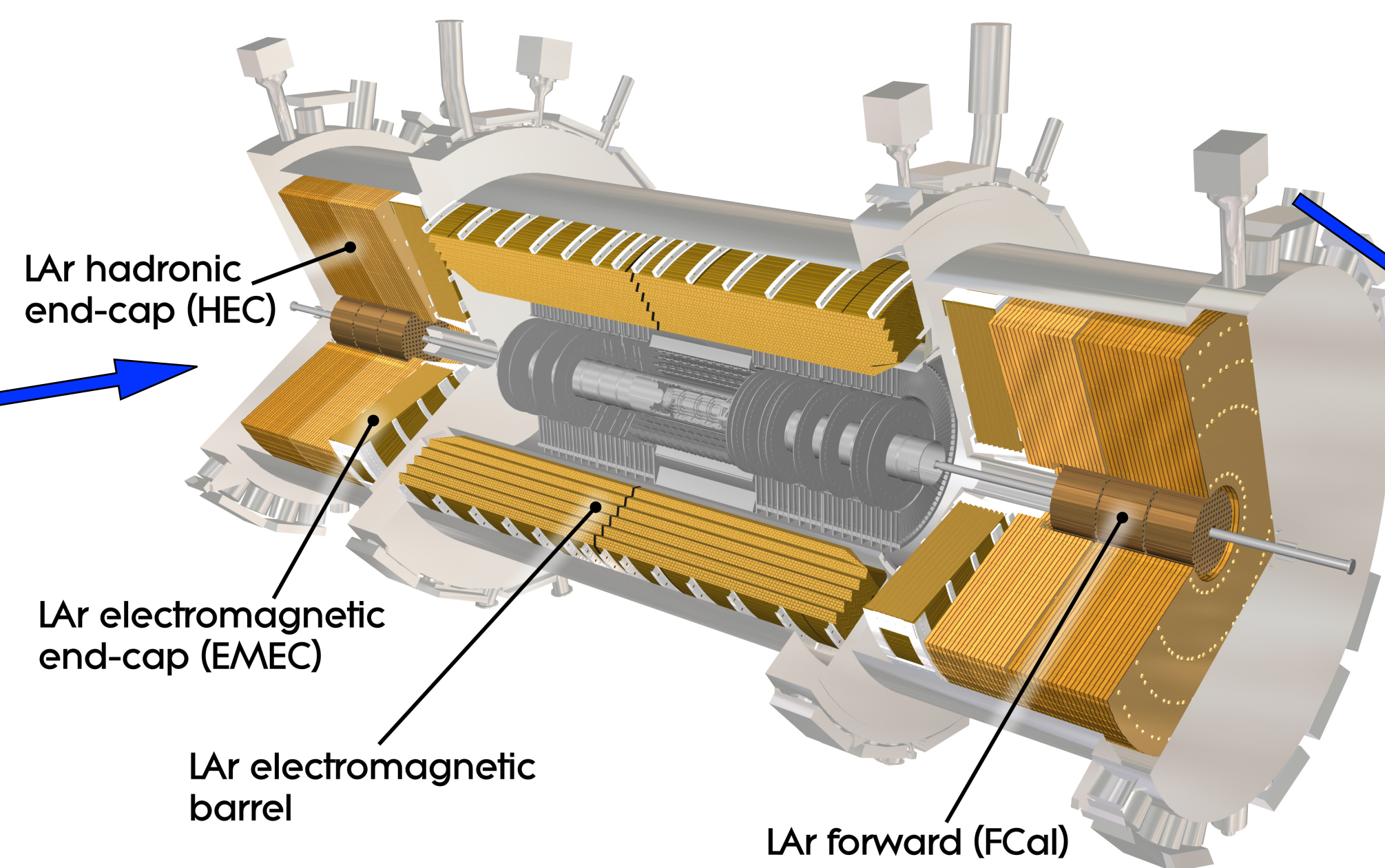
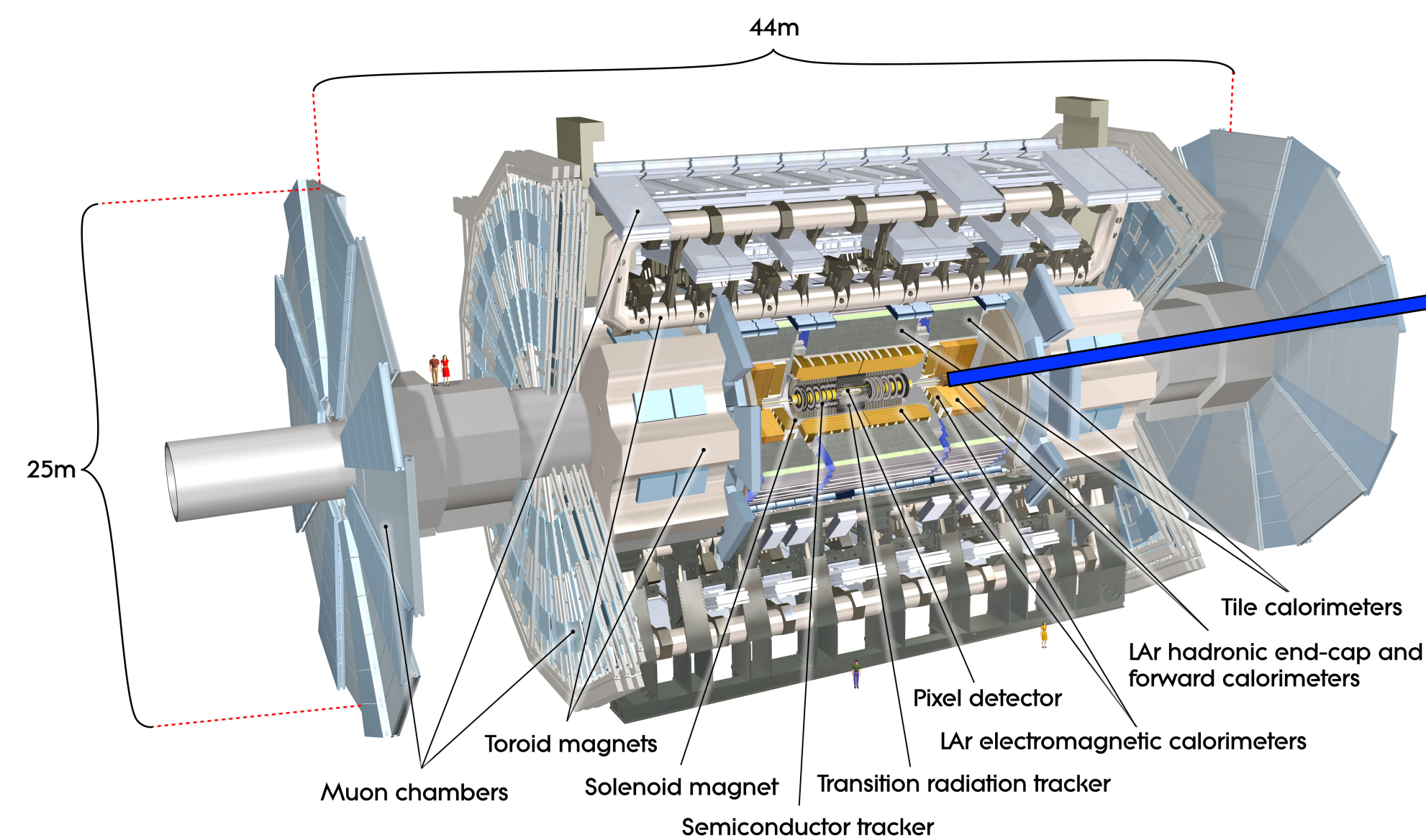


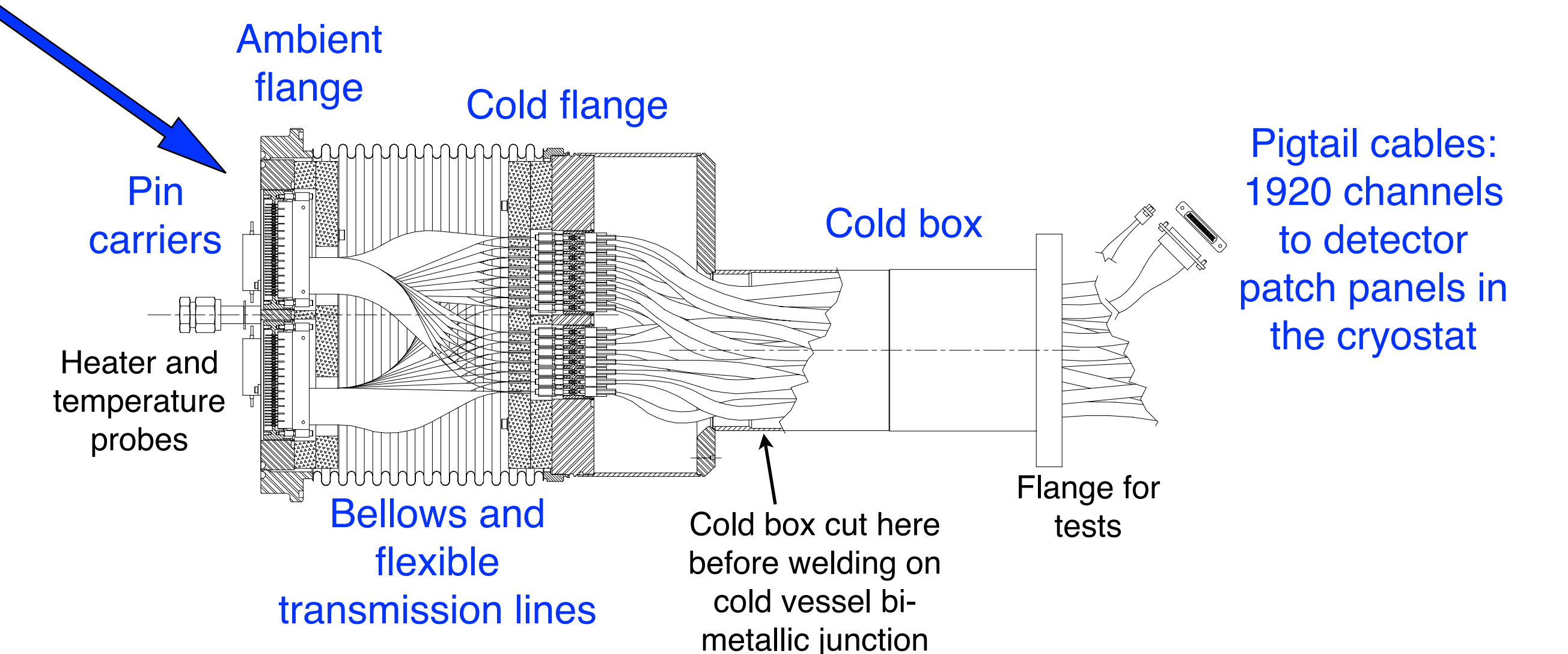
# Signal feedthroughs for the ATLAS liquid argon calorimeters

## TRIUMF-Victoria-BNL Collaboration

The physics reach of the [ATLAS detector](#) at the Large Hadron Collider depends critically on calorimetry to identify and measure the energy of leptons, photons and jets.



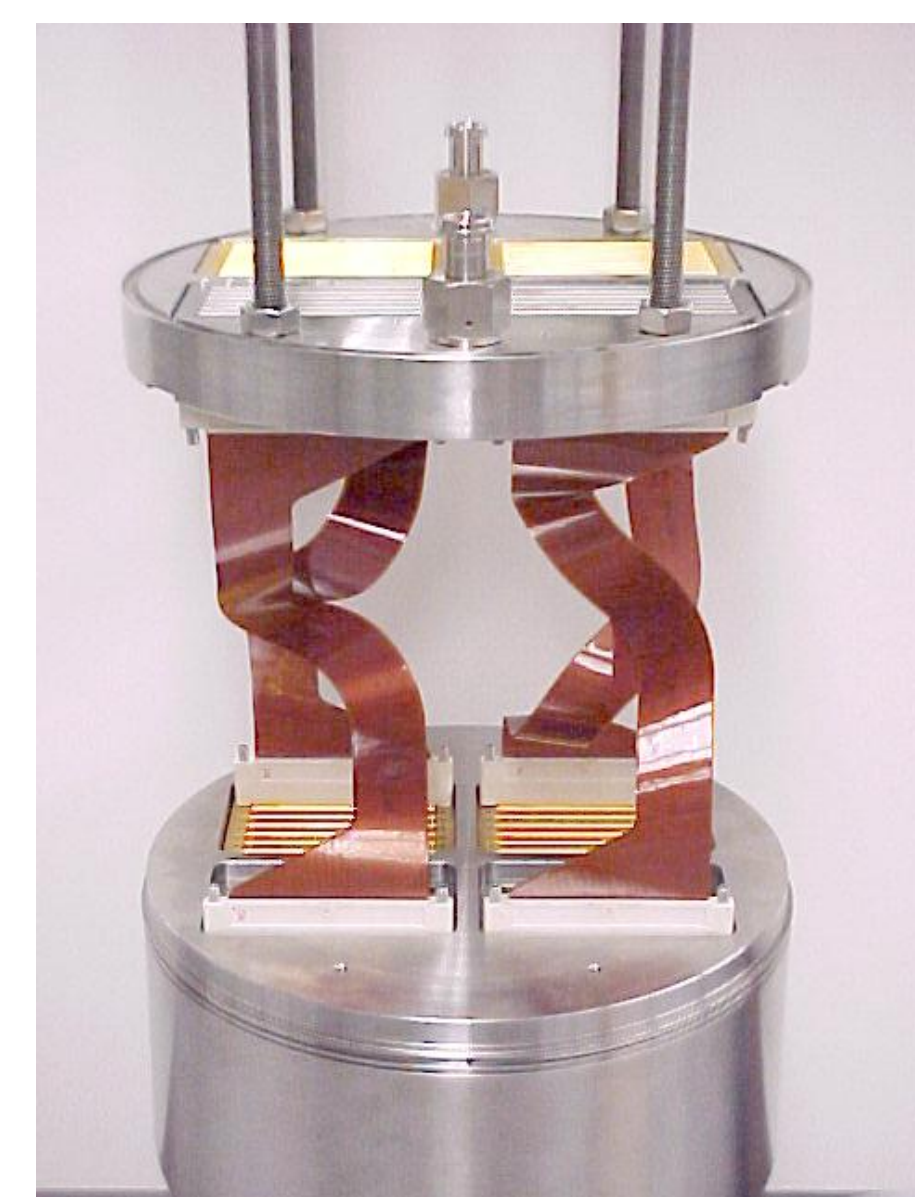
Electrical signals from the high granularity liquid argon calorimeters are extracted from the cryostat using [purpose-built high-density cryogenics feedthroughs](#). The barrel cryostat has 64 feedthrough units built at Brookhaven National Laboratory, while [each endcap cryostat has 25 feedthrough units built at the University of Victoria](#). Each unit carries 1920 signal lines, for a total of over 200,000 calorimeter signal lines.



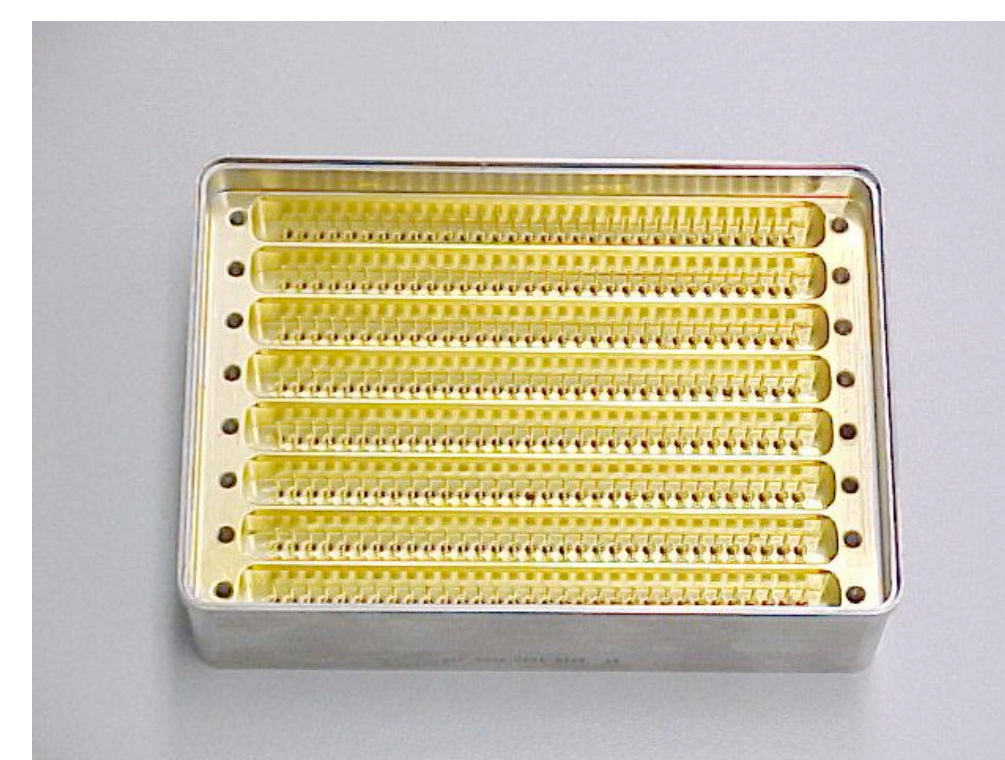
Canada made major contributions to the development, construction, installation and commissioning of the [ATLAS liquid argon calorimeters](#). Liquid argon at a temperature of 87 K is contained in three large cryostats: one barrel and two endcap cryostats. The endcap cryostats contain the electromagnetic and hadronic endcap calorimeters, and the forward calorimeter.



Paul Birney (TRIUMF) and Ken Sexton (BNL) at CERN after the installation of pedestals and warm cables. September 2003.



Flexible transmission lines between the warm and cold flanges during construction.

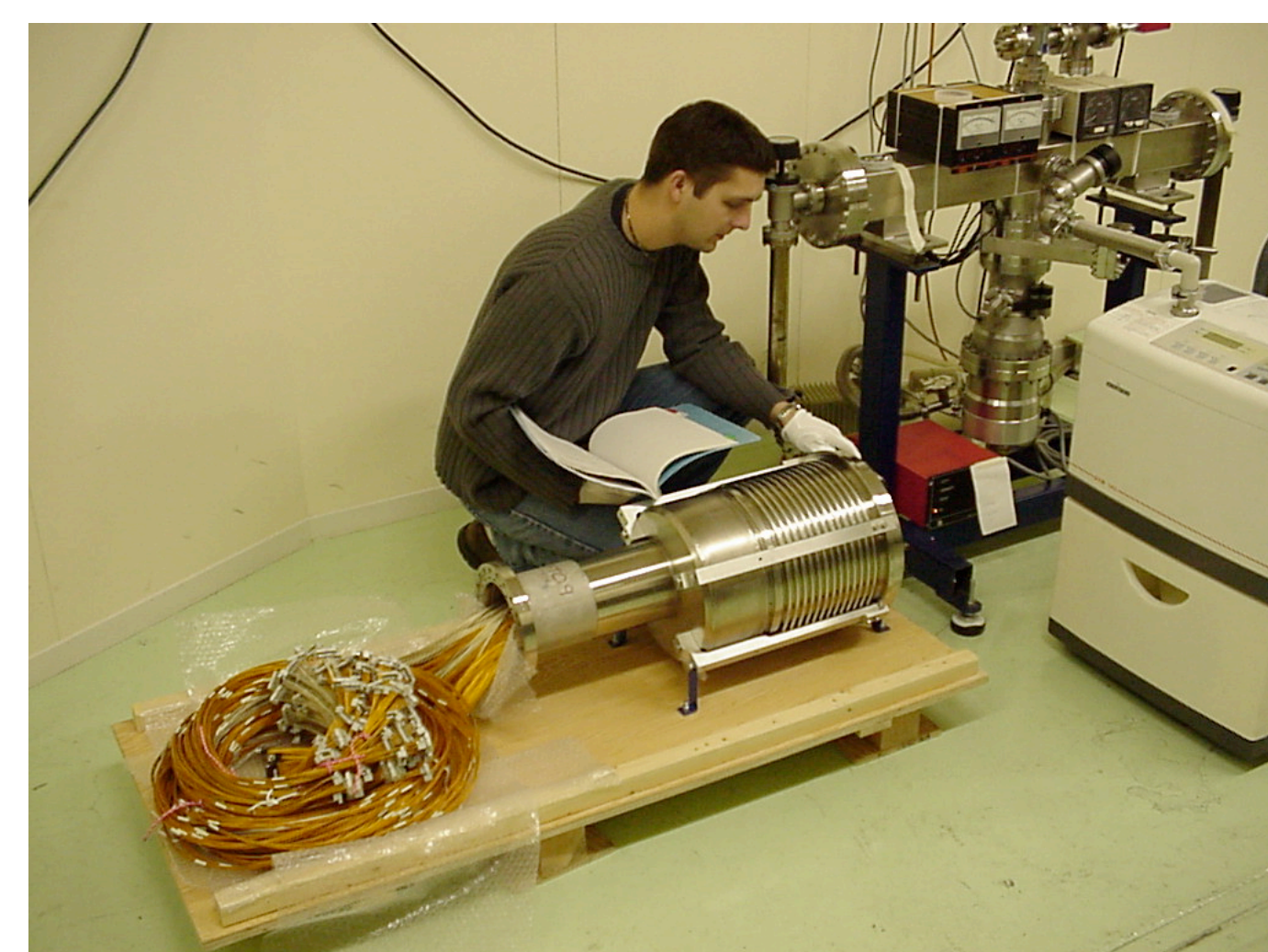


High density pin carriers and flexible kapton transmission lines are key components to the signal feedthroughs. *Reviews of Scientific Instruments 76, 063306 (2005)*

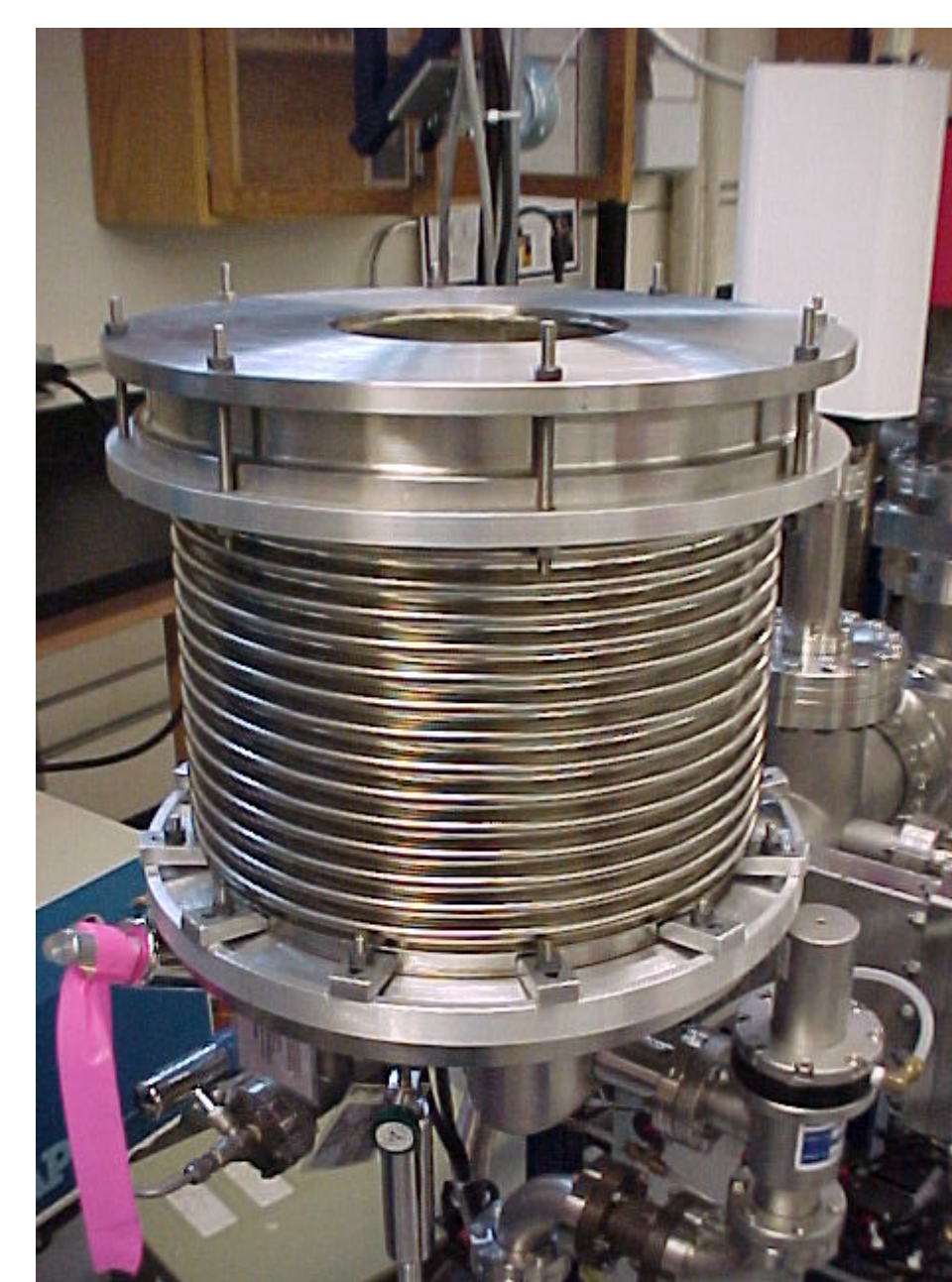
The signal feedthrough design is constrained by stringent mechanical, cryogenic, and electrical requirements, including maintaining excellent electrical signal quality while minimizing heat leakage. Canadian contributions supported by a [\\$4M NSERC Major Installation Grant](#).



UVic and TRIUMF feedthrough team  
Front row left to right: Wendy Wiggins, Margret Fincke-Keeler, Aaron Dowling, Michel Lefebvre (Project Leader), Fiona Holness; Back row left to right: Paul Birney, Mark Lenckowski, Alisa Dowling, Alan Astbury; Not present: Terry Hodges (Chief Engineer), Richard Keeler, Roy Langstaff, Paul Poffenberger, Greg Vowles. Photo: Darren Stone. September 2002.



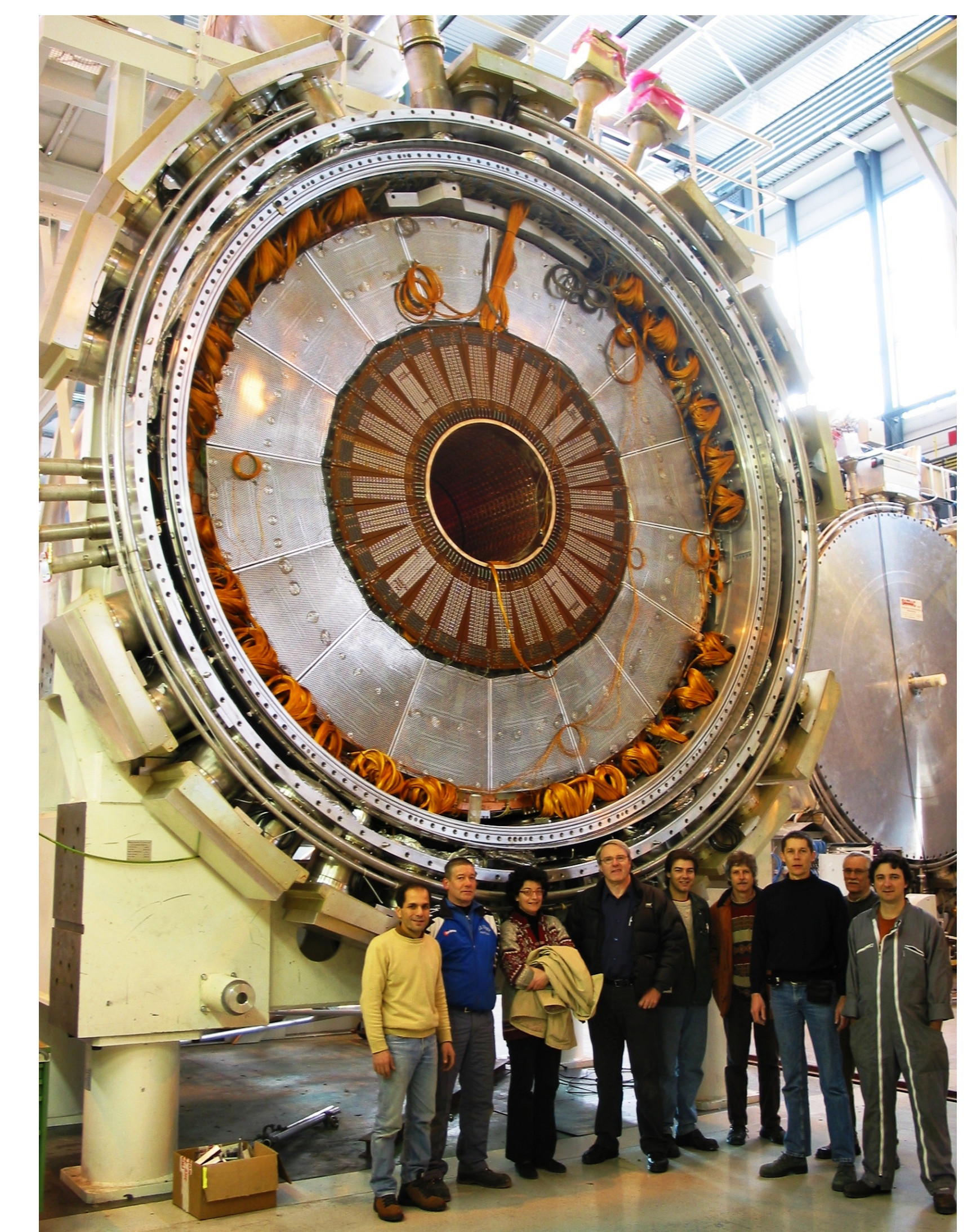
Feedthrough reception tests at CERN, November 2001.



Bellows assembly during leak tests at UVic.



Richard Keeler before finalizing the assembly of the last feedthrough unit produced in Victoria, October 2002.



One of two endcap cryostats prior to closing the cold cover, showing the installed feedthroughs. Roy Langstaff (4th from left). February 2005.