LH_2 Window Fabrication and Test

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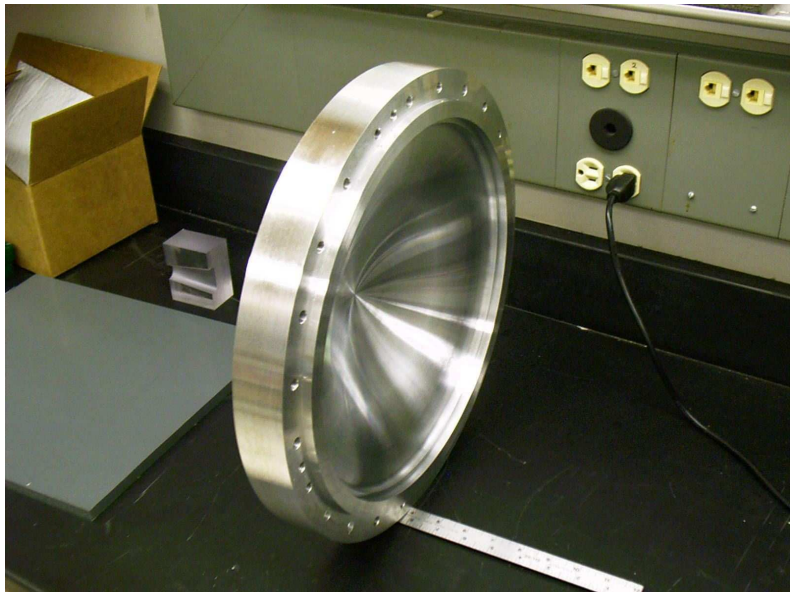
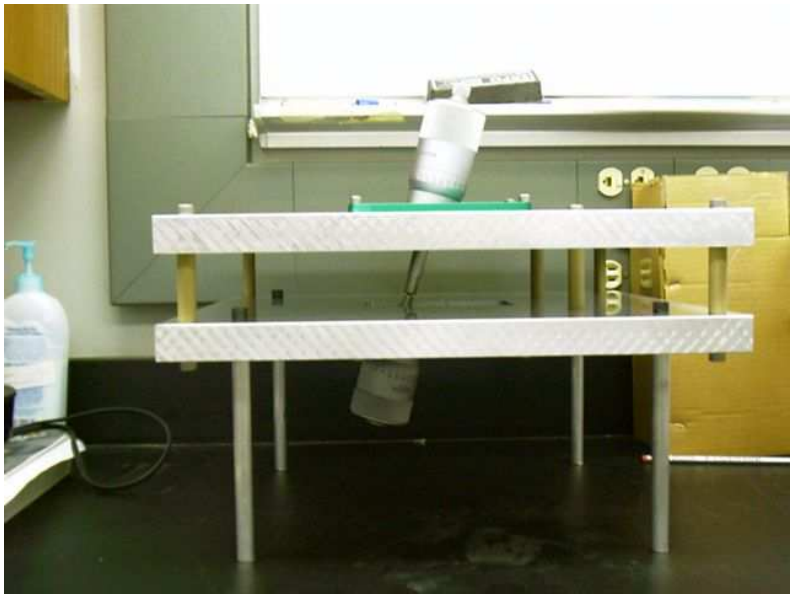
7-10 July 2010 Rutherford Appleton Lab, UK
MICE Collaboration Meeting 27

Thin Aluminum Windows for Liquid Hydrogen Containment

- CNC machining 20 thin aluminum windows to contain LH_2
  The hydrogen causes the ionization cooling of the muons.
  New, stronger double bend window design by Oxford Univ.
  27" swing ROMI CNC lathe (U. Mississippi Physics Machine Shop)
  CNC Fadal 50" x 20" 5020A Vertical Machining Center
  180 micron central thickness. First 11 windows done.
  Burst test 2 windows at 300K, 120, 122 psi. To do: 77K.
  QA: LBNL CMM, UMiss Starrett micrometers (3 microns)
- D. Kaplan ... M. Reep, D. Summers, Progress in absorber R&D 2: Windows, PAC 2001-Chicago, physics/0108028.





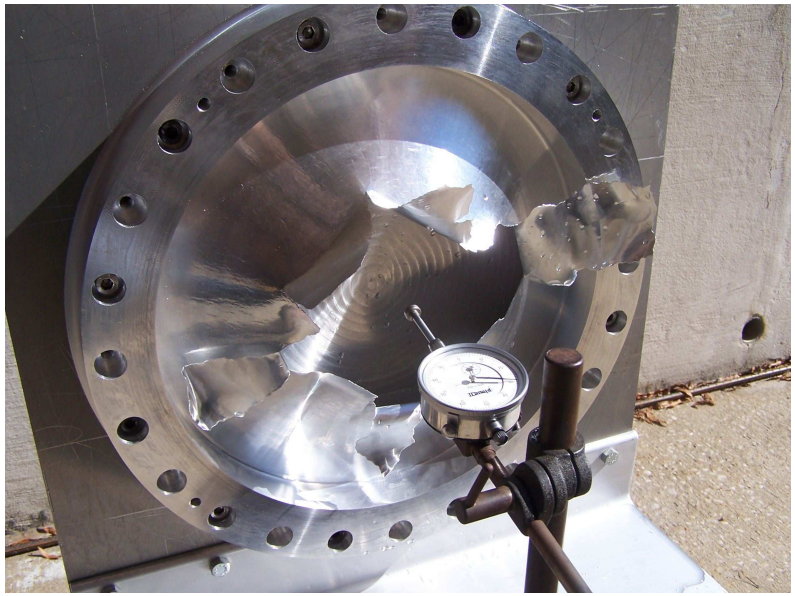
Absorber Window Status

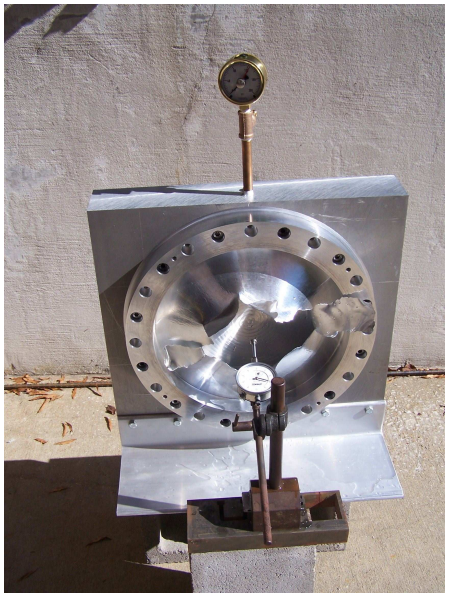
- CNC machining 20 aluminum windows to contain LH_2.
  MICE needs 6 LH_2 windows and 6 safety windows.
  MICE needs 5 spares and 3 windows destructively tested.
  Destructively tests of some windows at T = 77K and 300K.
  Fixtures for destructive LN_2 and H_2O tests completed.
  Will pressurize liquid with a tiny volume of throttled helium.

- Window Production.
  All 20 windows have been roughed out of 6061-T6 aluminum.
  Windows turned on lathe with a machined backing plate.
  Turned on lathe to 2000 microns central thickness.
  UMiss micrometer measures at 0 and 15 degree angles.
  Lathe powered up during measurement. Accuracy not lost.
  Final cuts taken on lathe. Clear plastic hats for shipping.
  LBNL-Berkeley non-contact View Precis 3000 optical CMM

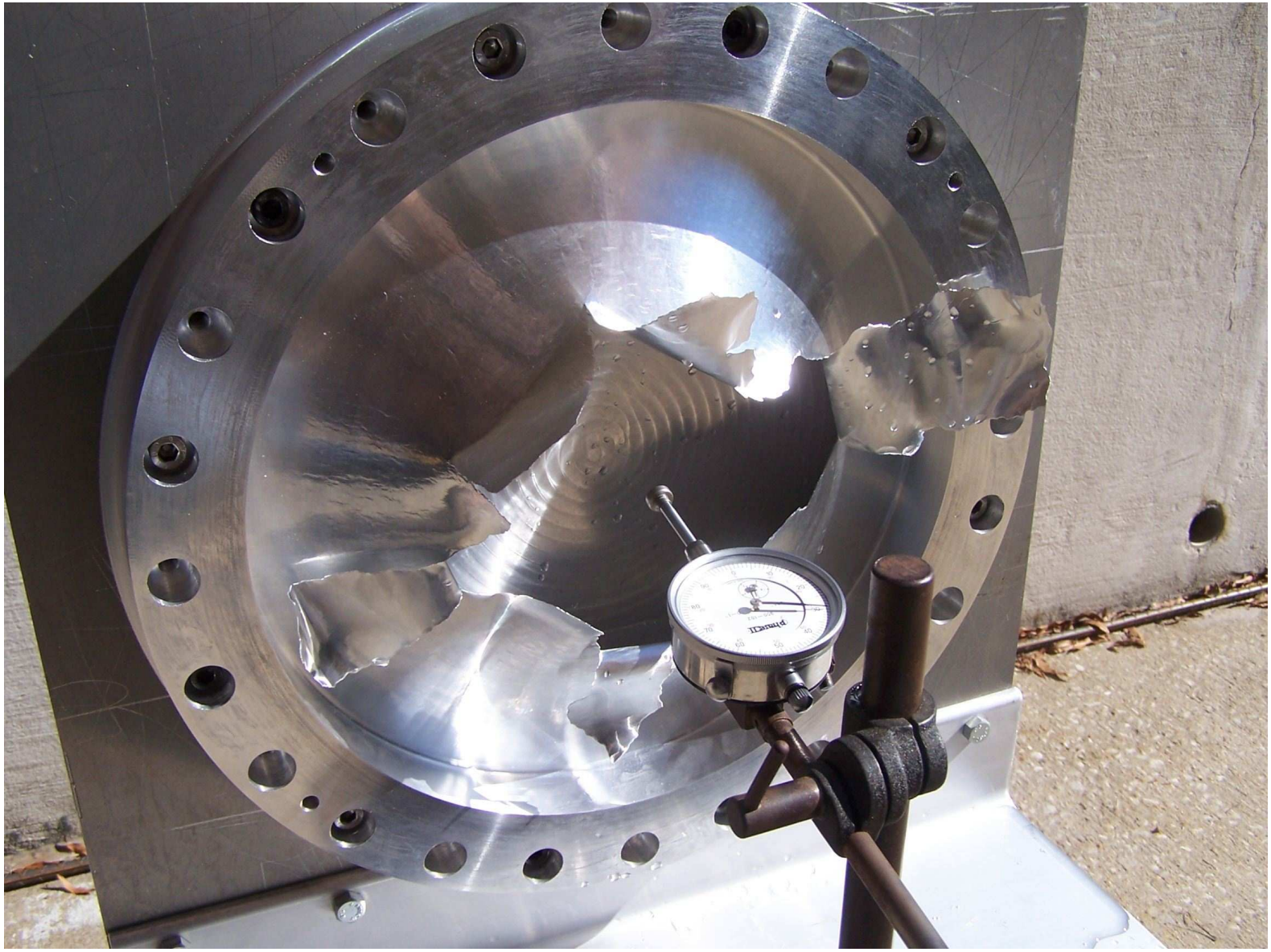
- First 11 windows completed.
  Burst test 2 windows at 300K, 120, 122 psi (8 atmospheres).

Burst test at 300K with water (8 atmospheres)





Burst test at 300K with water



Next Steps

- Get Helicoflex seals for liquid nitrogen burst test.
  Do liquid nitrogen burst test.
  Finish machining 9 safety windows. Burst a window at 300K.
  Clear plastic for shipping hats has arrived. Machine hats.
  Ship windows to LBNL-Berkeley
  Measure with non-contact View Precis 3000 optical CMM.
  Ship windows from LBNL to Rutherford Lab.
  Avoid Value Added Tax and window poking by customs.

- Thinner aluminum $\rightarrow$ Less multiple scattering $\rightarrow$ Cooler muons
  Look into making 2 thinner Lithium-Aluminum alloy windows.
  Space Shuttle LH_2 fuel tanks are Lithium-Aluminum alloy.
  Lithium-Aluminum is almost twice as strong as 6061-T6.
  Possible alloys ($\sim$2% Li): Alcoa 2090-T83, 8090-T6, Kobe...
  Looking for strength and damage tolerance.
  Burst test at 77K and 300K.
  For future designs. Tried & true 6061-T6 aluminum for MICE