MICE absorbers work package

MPB – 05/04/16

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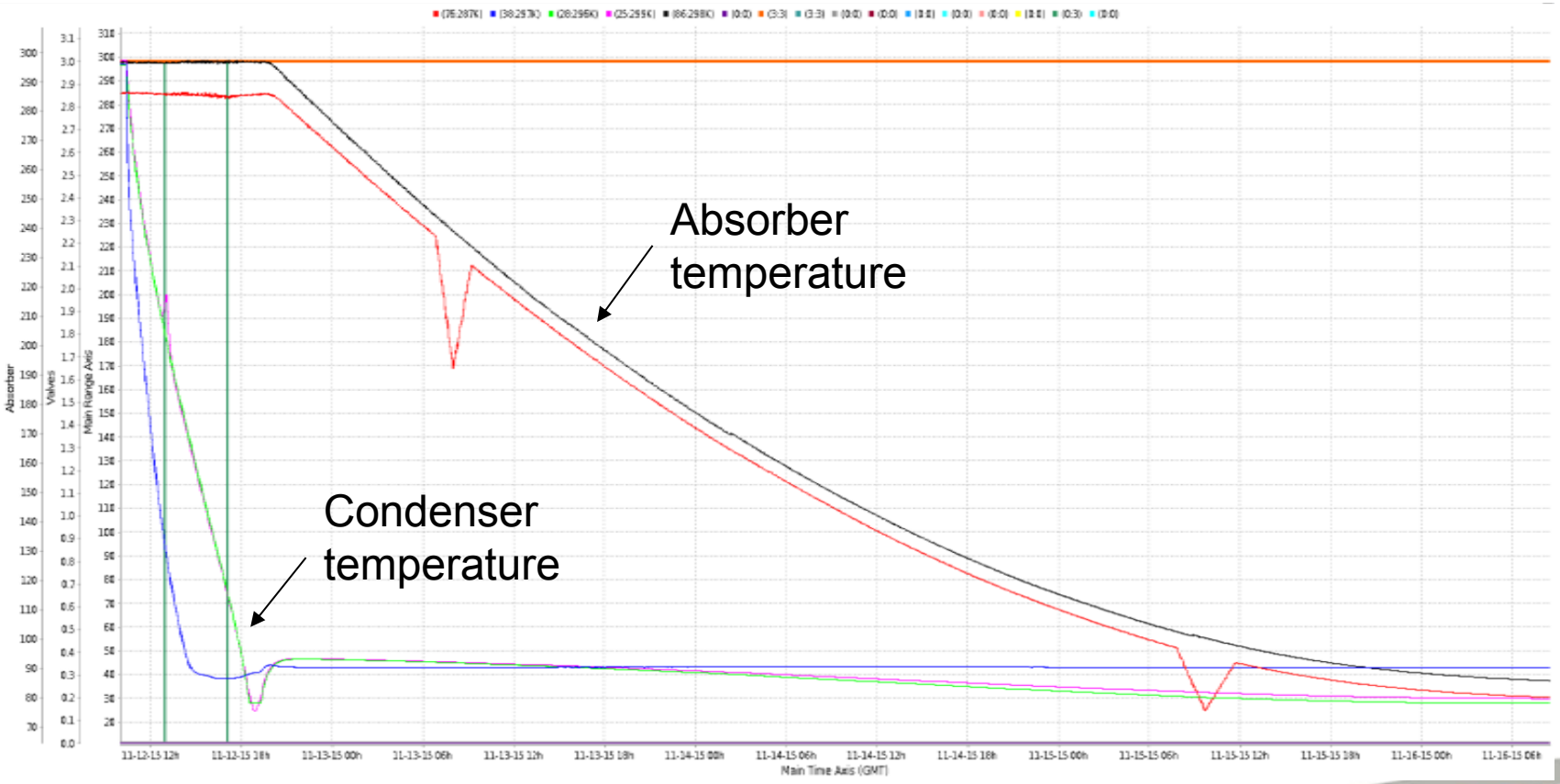
Contents

- Hydrogen absorber-FC#2
  - System cooldown in MICE hall
  - Remedial work on thermal system
  - Repair of leaks
- Absorber
  - xenon absorber
  - Lithium hydride absorber
- Schedule and resourcing

Cooldown in MICE hall



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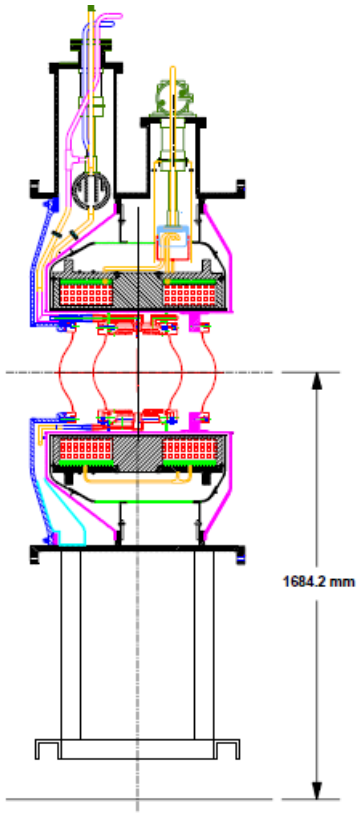
Remedial work on thermal system

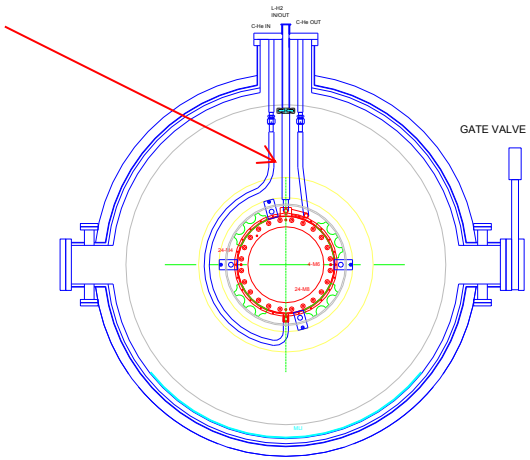
- Thermal model shows significant heat loads through radiation on absorber and conduction through cooling pipes (including LN2 pre-cooling pipes)
- Glass fibre stand-off to prevent touch between top-hat and cooling pipes
- Improved insulation
  - Add insulation between feet of absorber and warm bore of FC
  - Cover dull surfaces with aluminium tape/aluminised mylar to reduce radiative heat load



AFC MODULE
WITH FINAL ABSORBER

Remedial work on thermal system

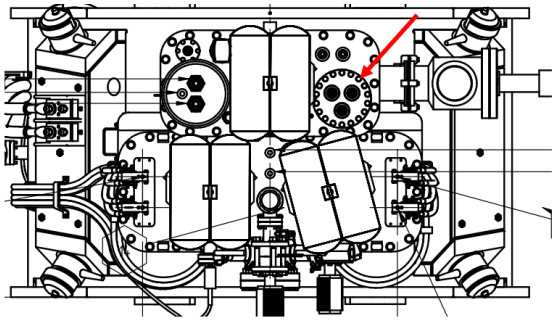
- Including heater on LH2 cooling pipework to drive flow around the circuit
  - Watlow 25W heater identical to existing heaters in the insulation vacuum

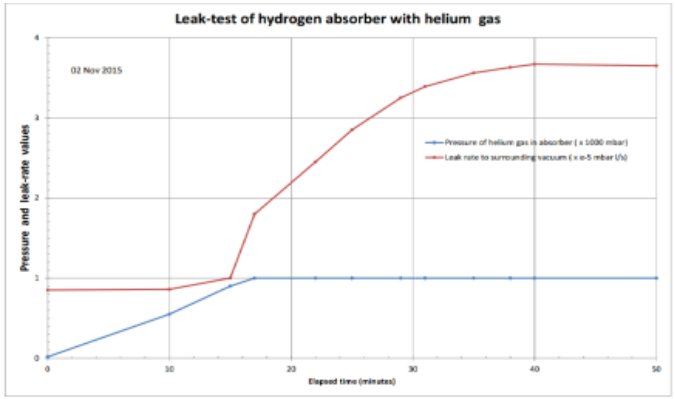


Diagnosis of leaks

- Pressure rise as cryostat warmed up indicated 10-3 mbar.l/s leak

- Two leaks invalidating the H2 safety case:
  - Feedthrough on turret - 1 x 10-3mbar.l/s
  - Absorber circuit – initially 3.6 x 10-5mbar.l/s, then after 2nd cooldown 1.2 x 10-3 mbar.l/s





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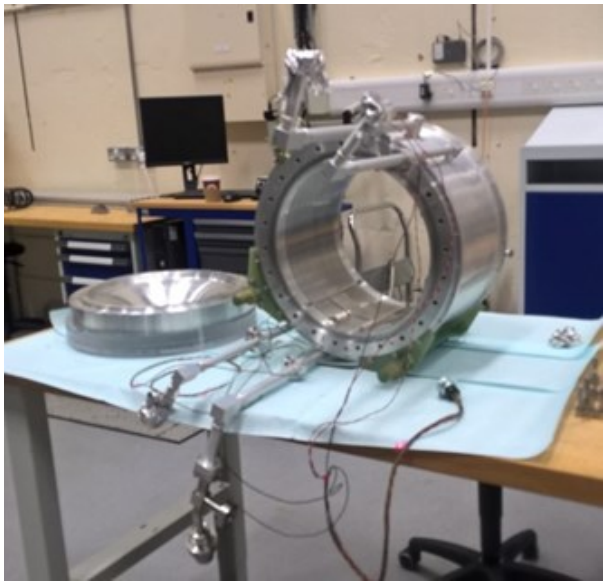
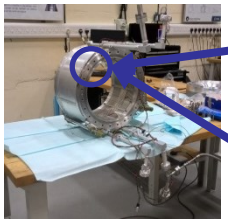
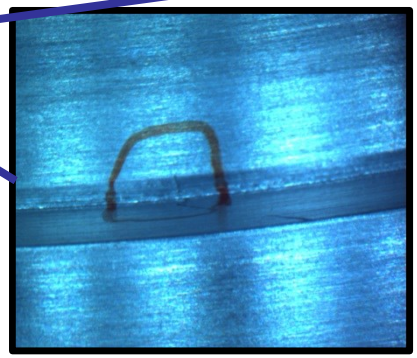
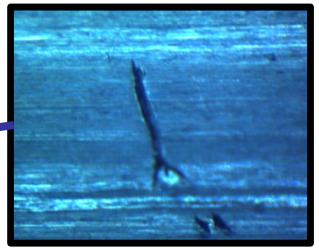
Repair of leaks



- Leak checked the absorber circuit to confirm leak location
- Inspection of joint:
  - Scratch across sealing face on window
  - Aluminium swarf coming off edge into indium
  - Indium uneven thickness around groove
- Investigate surface defects:
  - Faintly show on dye penetrant test
  - X-ray showed not deep or detrimental
- Re-seal following agreed procedure
- Thermal cycle and leak test

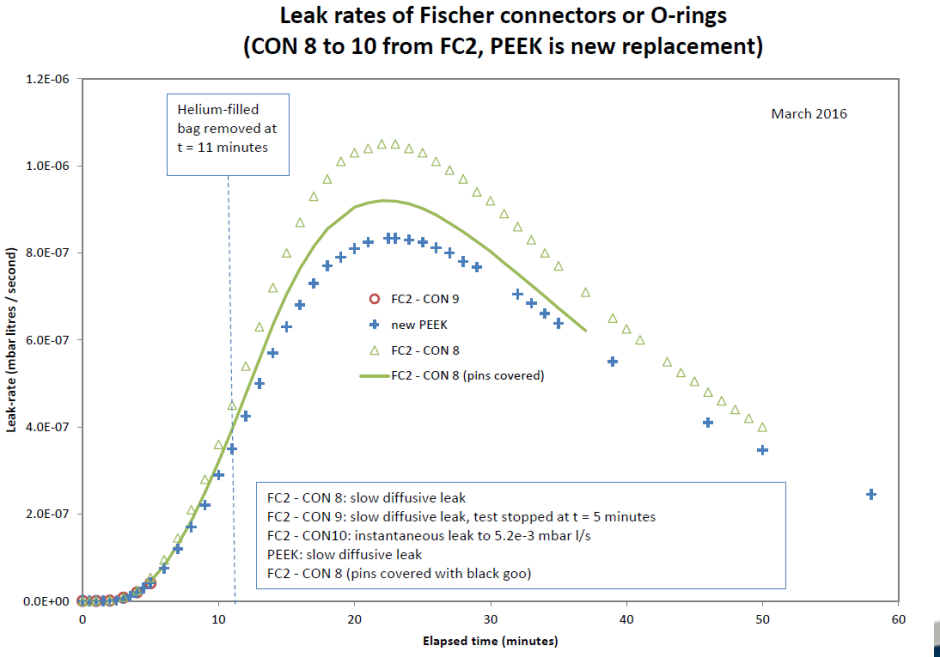






Repair of leaks

- The leaking feedthrough is being replaced.
  - All 3 feedthroughs now being soldered back in place were leak-checked - show 10^{-7}mbar l/s
  - Prevent leaks developing again
    - preventing feedthroughs rotating in the top-plate
    - strain-relieving cables



Absorbers used

- Xenon absorber
  - Prior to FC#2 being removed from the beamline
  - Connected up a bottle to the hydrogen system

- Lithium Hydride absorber
  - FC#1 installed in MICE Hall
  - Used to hold the Lithium Hydride absorber

Schedule

- Absorber ready for testing in R9 - 24th June
  - Replaced leaky feedthrough - 15th April
  - Remedial work on defects in the groove - 15th April
  - Reattached the absorber windows - 18th April
  - Leak test and thermal cycle absorber - 22nd April
  - Installed absorber in the FC#2 and ready for testing - 27th May
- Test the cooldown with Helium in R9. (end - June) - 24th June
- Installed the AFC#2 back in the MICE hall - 8th July
- Safety sign-off - 26th Aug
  - Draft paperwork submission - 16th July (WGM)
  - System commissioned (leak/pressure test etc) - 12th Aug
  - Address snagging items & WG sign-off - 12th Aug (WGM)
  - Director sign-off - 26th Aug
- Hydrogen operation (estimated)
  - Cooldown time - 7 days
  - Liquefaction time - 3 days

WGM = working group meeting