LH2 System

Progress and Future Plans

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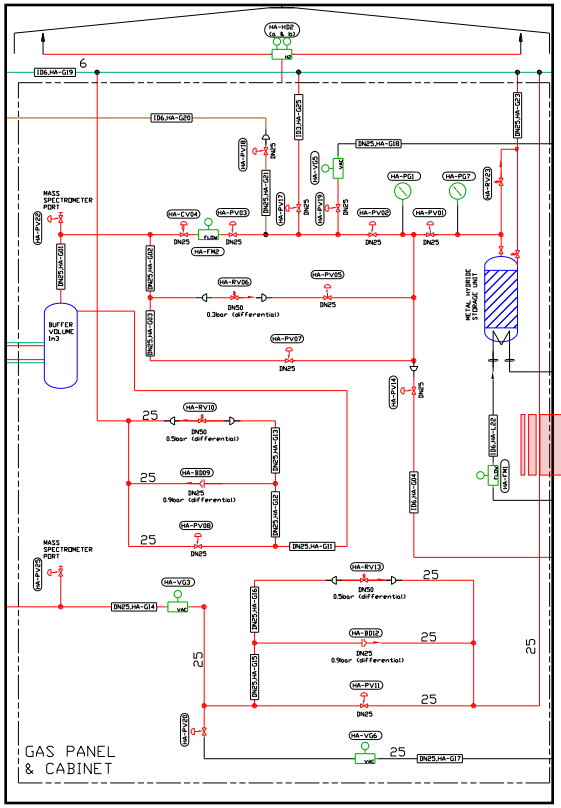
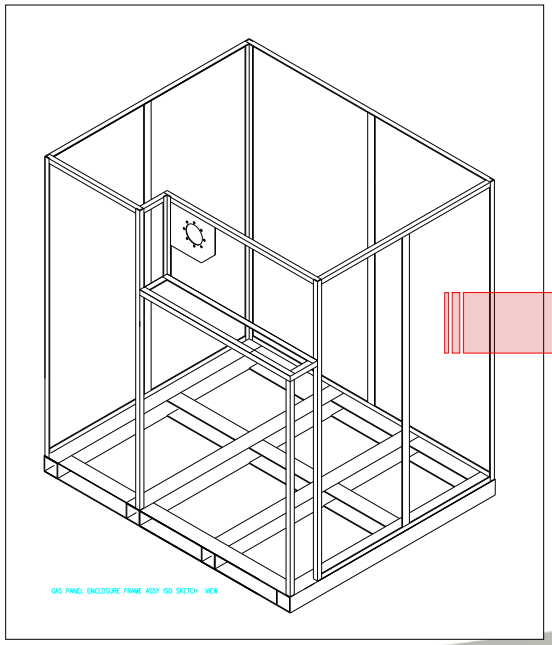
Outline

1. R&D System Manufacture
2. Control System
3. Hall Infrastructure
4. Safety Update
5. AFC Integration Issues
6. Plans for 2010/11

R&D System Manufacture (1)

- Buffer Volume, Transfer Line and Test Cryostat all complete
- Gas Panel assembly 95% complete
- Design of enclosure is being detailed





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R&D System Manufacture (2)

- Gas Panel manufacturing
  - Weld inspection and pipe cleaning complete
  - Flow meters (final item of instrumentation) procured and installed in the gas panel
  - Relief valves assembled into dedicated mounting frames
  - Pressure transmitters integrated

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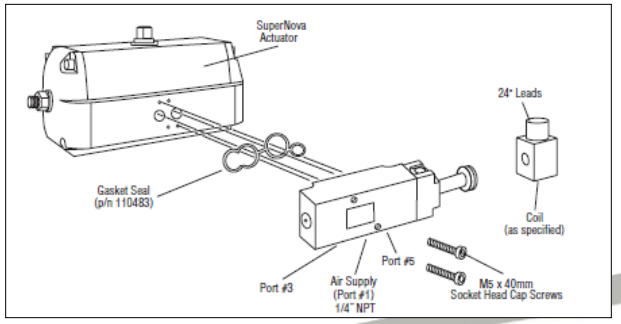
R&D System Manufacture (3)



- Final assembly of pipework now complete
- Pneumatic lines fitted and valve operation tested
- Only remaining mechanical work is to fit solenoids for control of pneumatic actuators (to be mounted on temporary plate until enclosure is constructed)
- When these are in place, GP will be ready for electrical wiring (by DL)

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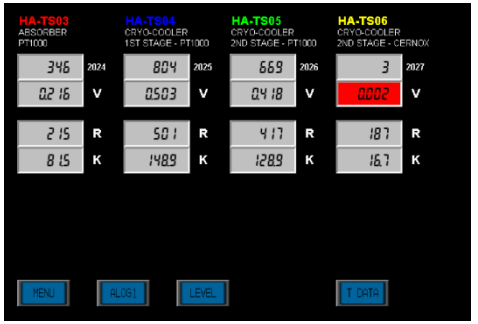
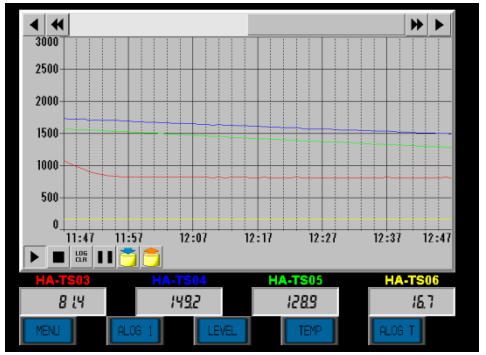
Acceptance Testing

- Cryostat currently assembled with Buffer Tank and Gas Panel
- Temporary transfer lines fitted between Buffer and Cryostat (due to limited space at AS Scientific)
- This allows:
  - Leak testing
  - Pressure testing (and possibly certification)
  - Full system cool-down
  - Some testing of control sequences for helium
- Next step is then to install in the MICE Hall and repeat these steps with the transfer line and other infrastructure

Control System

- Control Panel assembled with (almost) all components needed for He testing
- PLC programmed
  - Temperature logging
  - Valve control tested
  - Example control sequence tested
- Sequences for gas panel operation currently being written (only He sequences needed for acceptance tests)
- Design work underway for ventilation system and vacuum system control





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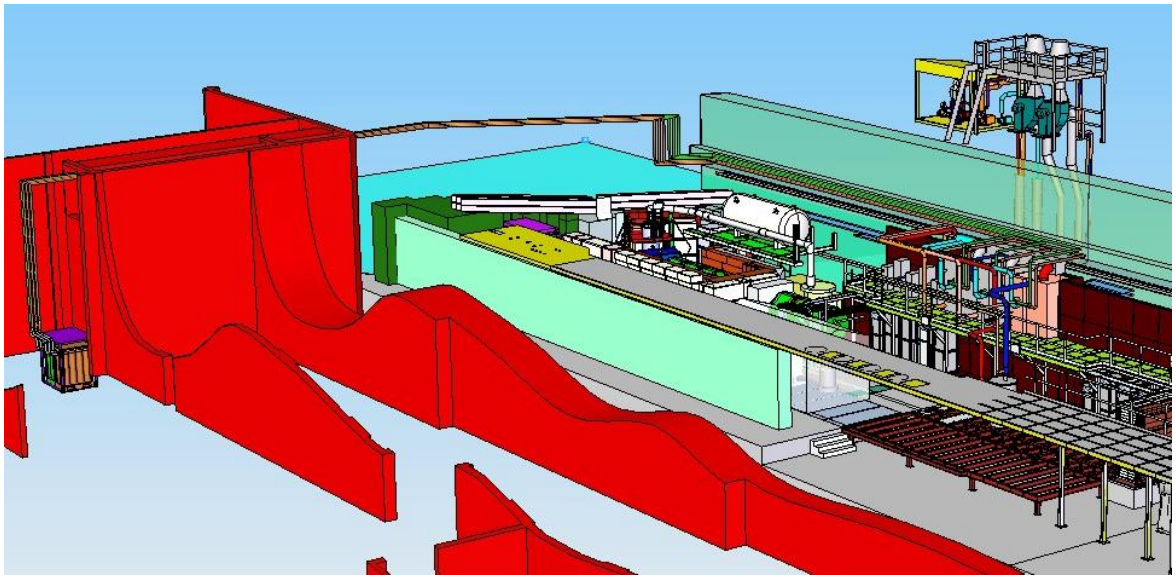
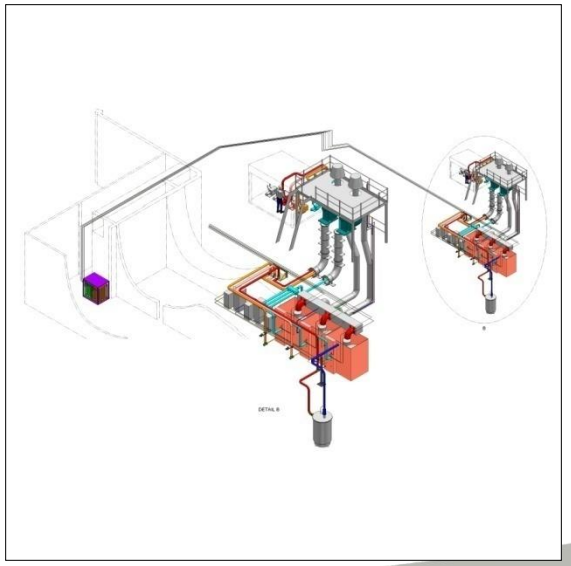
Hall Infrastructure

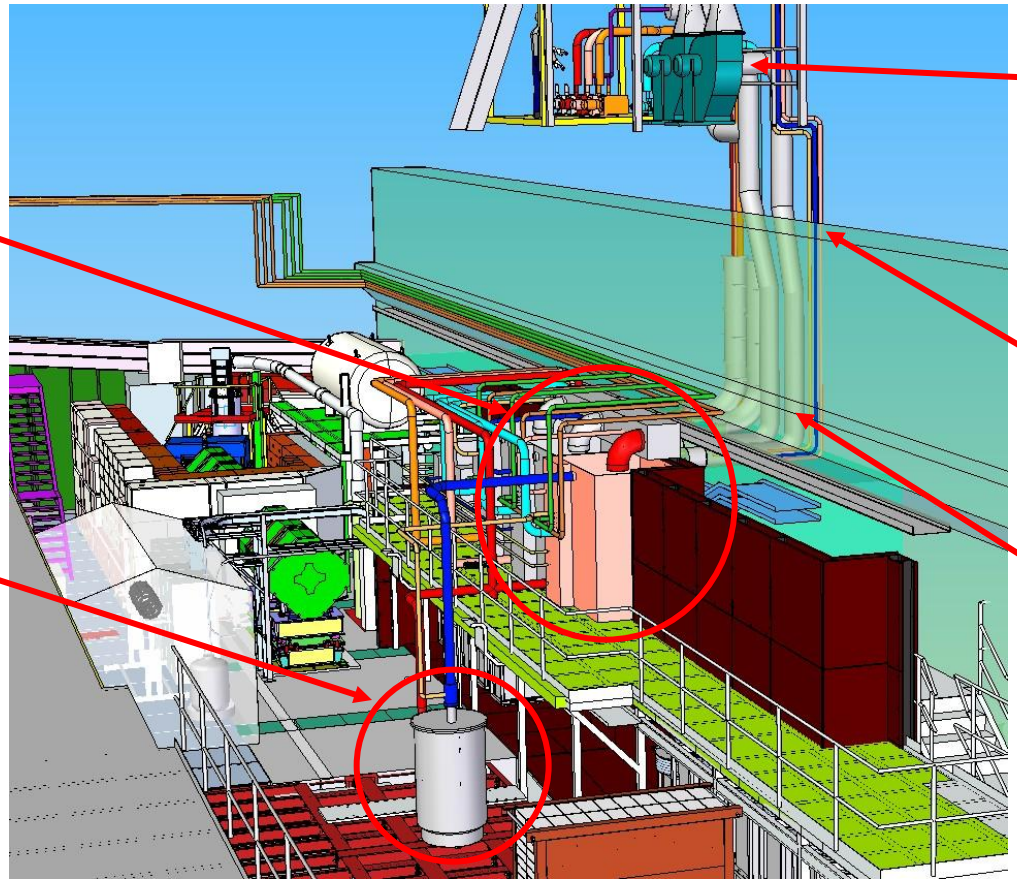
To install the R&D system in the MICE Hall requires:

- Bottle store
- Vacuum system with roughing pumps sited externally
- Ventilation system to exhaust any leaks in Gas Panel, Buffer Volume or Hydride Bed.





Hall Infrastructure



Gas Panel Enclosures

Test Cryostat

Fans

Relief lines

Ventilation ducts

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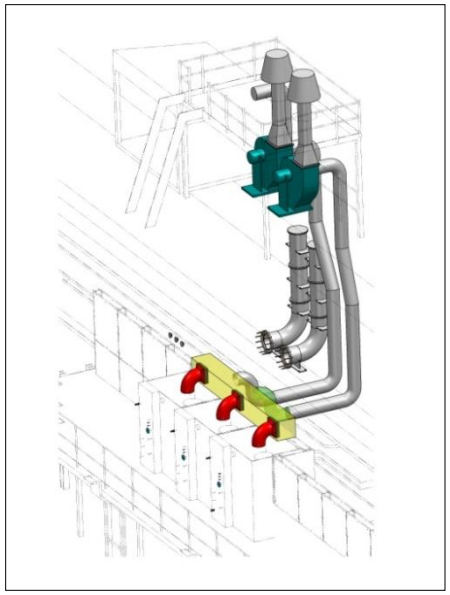
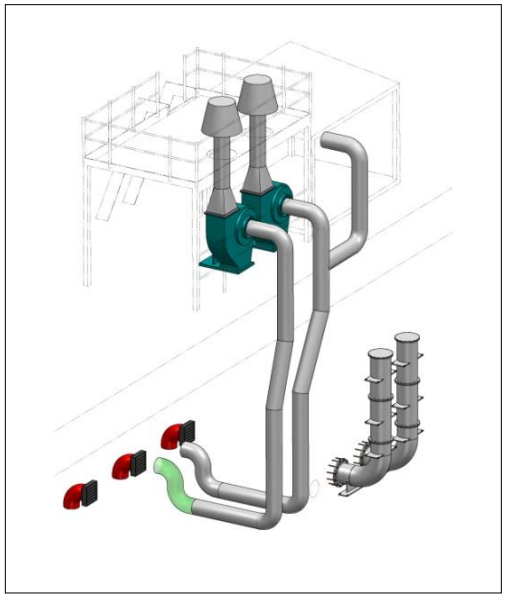
Ventilation System





Basis of safety

- Eliminate sources of ignition

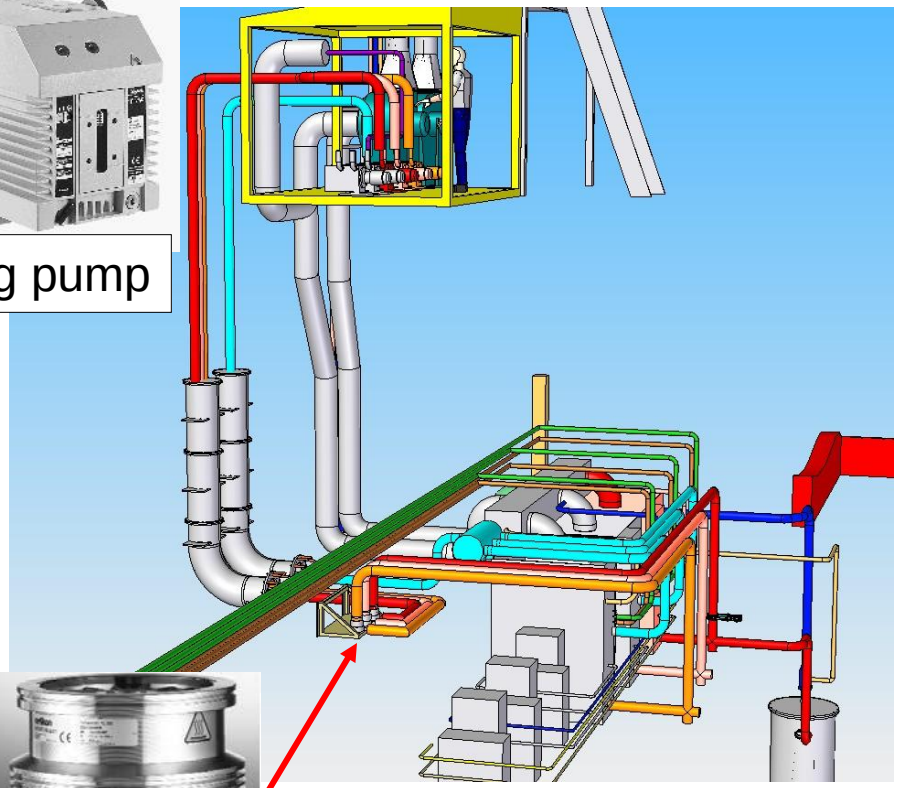
⇨ ATEX rated fans

- Fans are specified such that one fan only is capable of providing sufficient flow to exhaust all three systems
- An explosive atmosphere from a small release in the gas panel would only persist for a matter of minutes
- Fans have been purchased and are ready to install

Vacuum System

- Dedicated pump enclosure to be sited on MICE Hall roof
  - Will house backing pumps required for all 3 hydrogen systems
  - Will also have capacity to house backing pumps required for other cooling channel modules
  - Designated Hydrogen Zone 2 (same as Gas Panel Enclosures) for DSEAR purposes
- Turbo pumps for AFC modules' safety vacuum shown on South Wall (must be behind magnetic shield wall)

Backing pump



Turbo pumps

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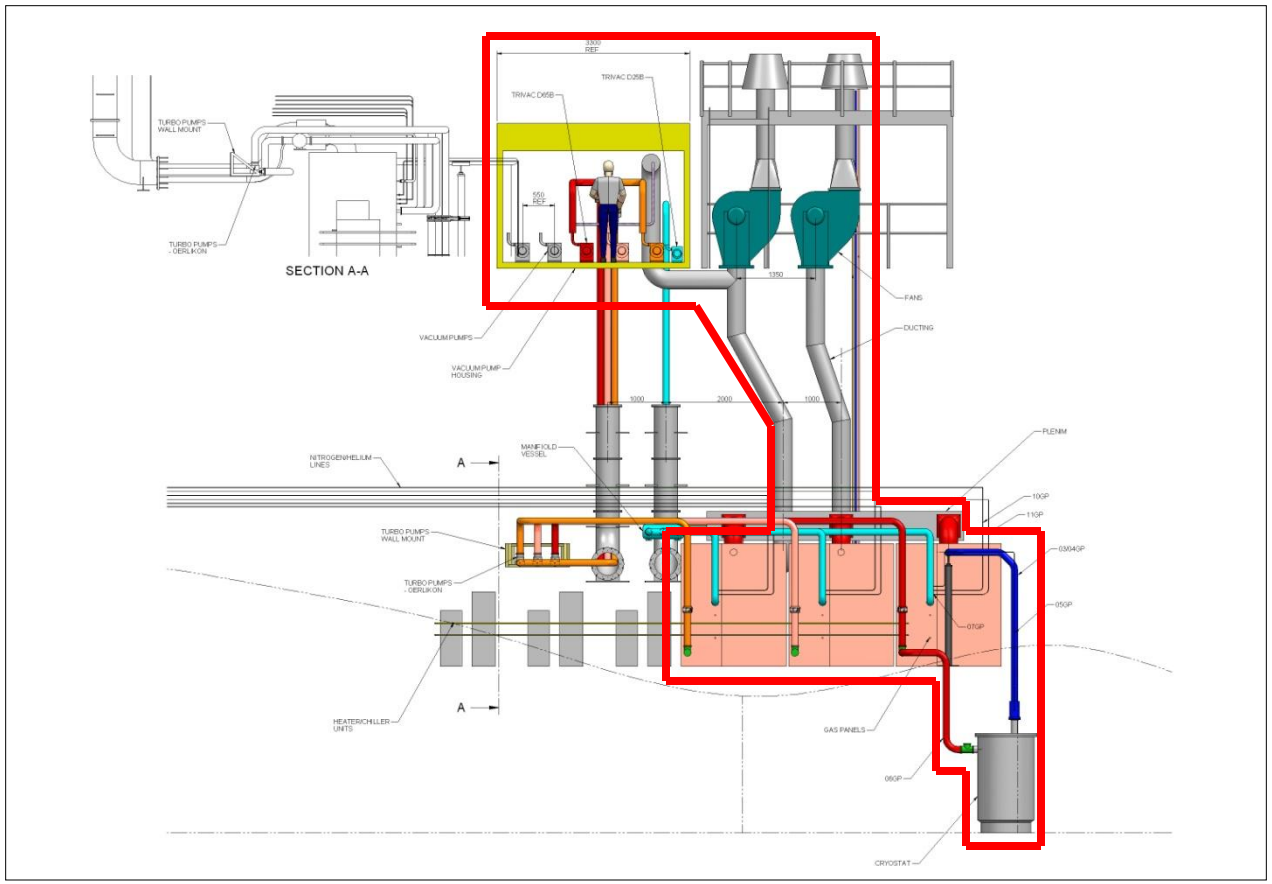
Safety – DSEAR Zoning



- Test Cryostat (or AFC absorber vacuum space)
- Gas Panel Enclosure
- Pump Enclosure
- Connecting ductwork

...are Zone 2.

("A place in which an explosive atmosphere....is not likely to occur in normal operation, but, if it does occur, will persist for a short period only.")

The MICE Hall *<u>is not</u>*

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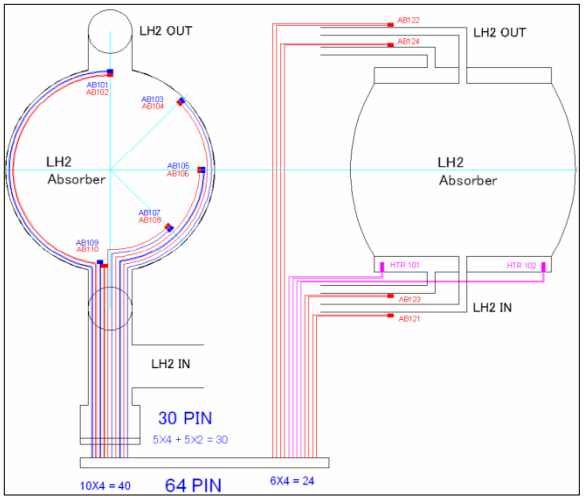
Safety – UPS Requirements

- Recent discussions held amongst the Hydrogen System team on the UPS requirements for the system
- Document currently being drafted for submission to Technical Board
- Key conclusions
  - In the event of a mains failure:
    - System will fail to its pre-defined 'safe-state'
    - Instrumentation and valve position information will continue to be available from the control system
    - The hydrogen detection system will continue to function

Integration with the AFC

- Working with Oxford, KEK and Tesla to ensure that the R&D system is compatible with the AFC module
  - Instrumentation (i.e. level sensors, pressure sensors and thermometry) which must be compatible with UK regulations (i.e. DSEAR – we can 'self-certify')
  - Process line connections
- Aim to test absorber in R&D test cryostat to check interfaces and instrumentation



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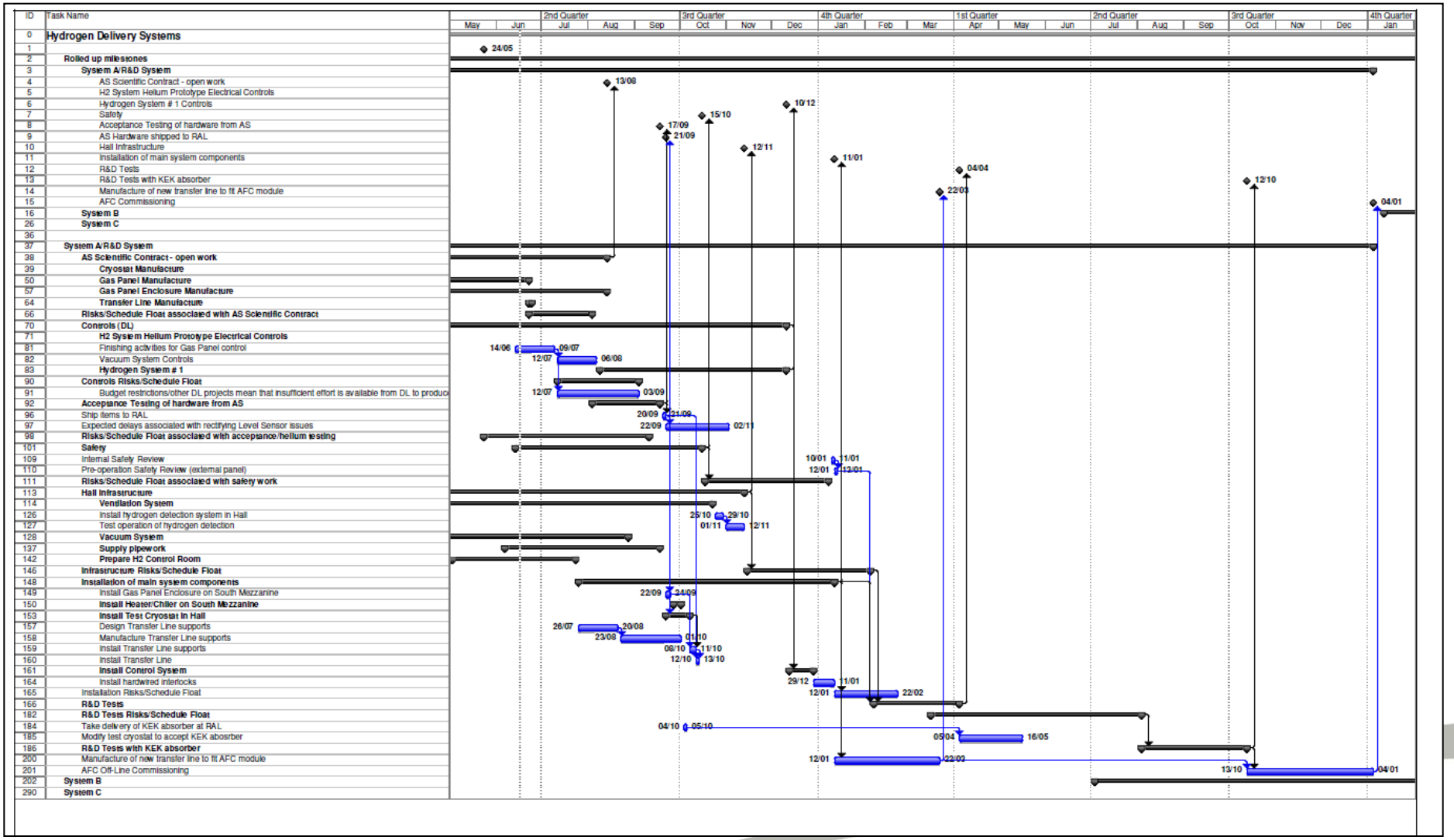
Schedule



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Summary and Future Plans

- R&D System manufacture in final stages with acceptance testing imminent.
- Control system work is more than keeping pace with the mechanical hardware and in good shape for initial testing.
- Safety principles of system well established, but implementation and documentation of these are still ongoing. Results from helium testing will be an important input to a pre-operation safety review.
- Design work underway for hall infrastructure requirements, but lots to do.
- Need to continue to work closely with KEK, Oxford and Tesla to ensure compatibility with AFC.
- Aim to take advantage of the long ISIS shutdown and delays to the Spectrometer Solenoids to install as much infrastructure as possible in the rest of this financial year.
- Several tasks:
  - Install R&D system components on south mezzanine
  - Build pumping enclosure and install vacuum system
  - Position fans, install ductwork and construct access platforms
  - Route vent lines outside hall
  - Install hydrogen detection system
  - Route cabling and install control racks in H2 Control Room