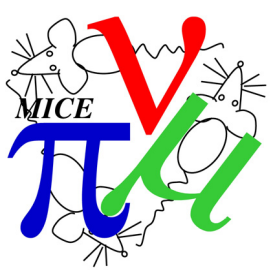


MICE Technical Update

and

RAL Plans

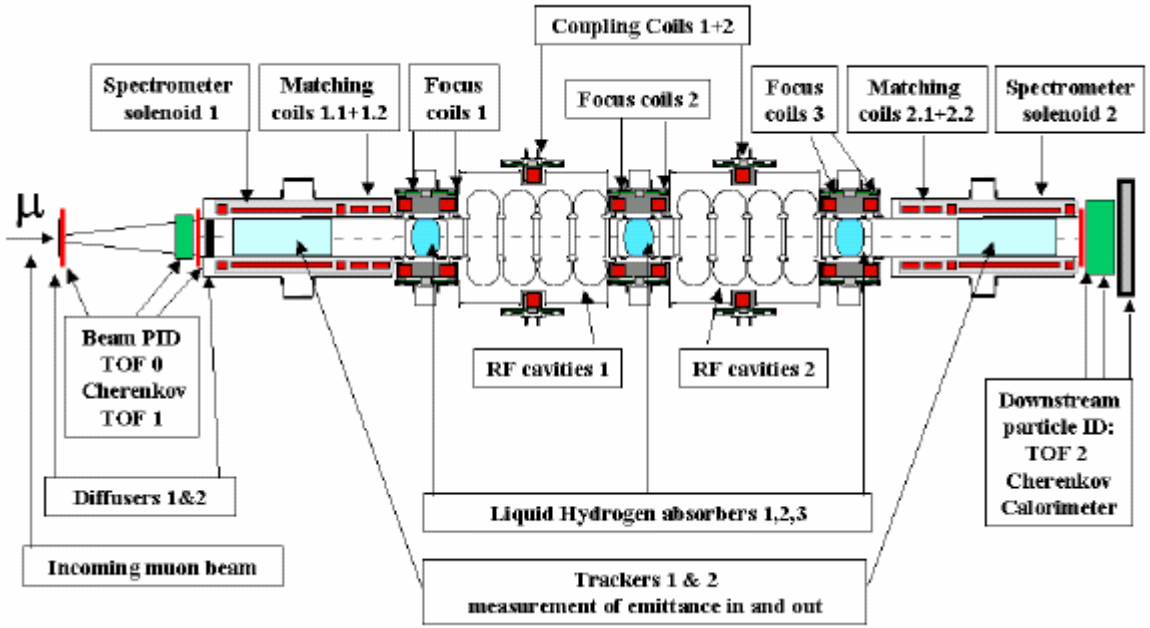
MUTAC, BNL,

29 April 2004

Paul Drumm

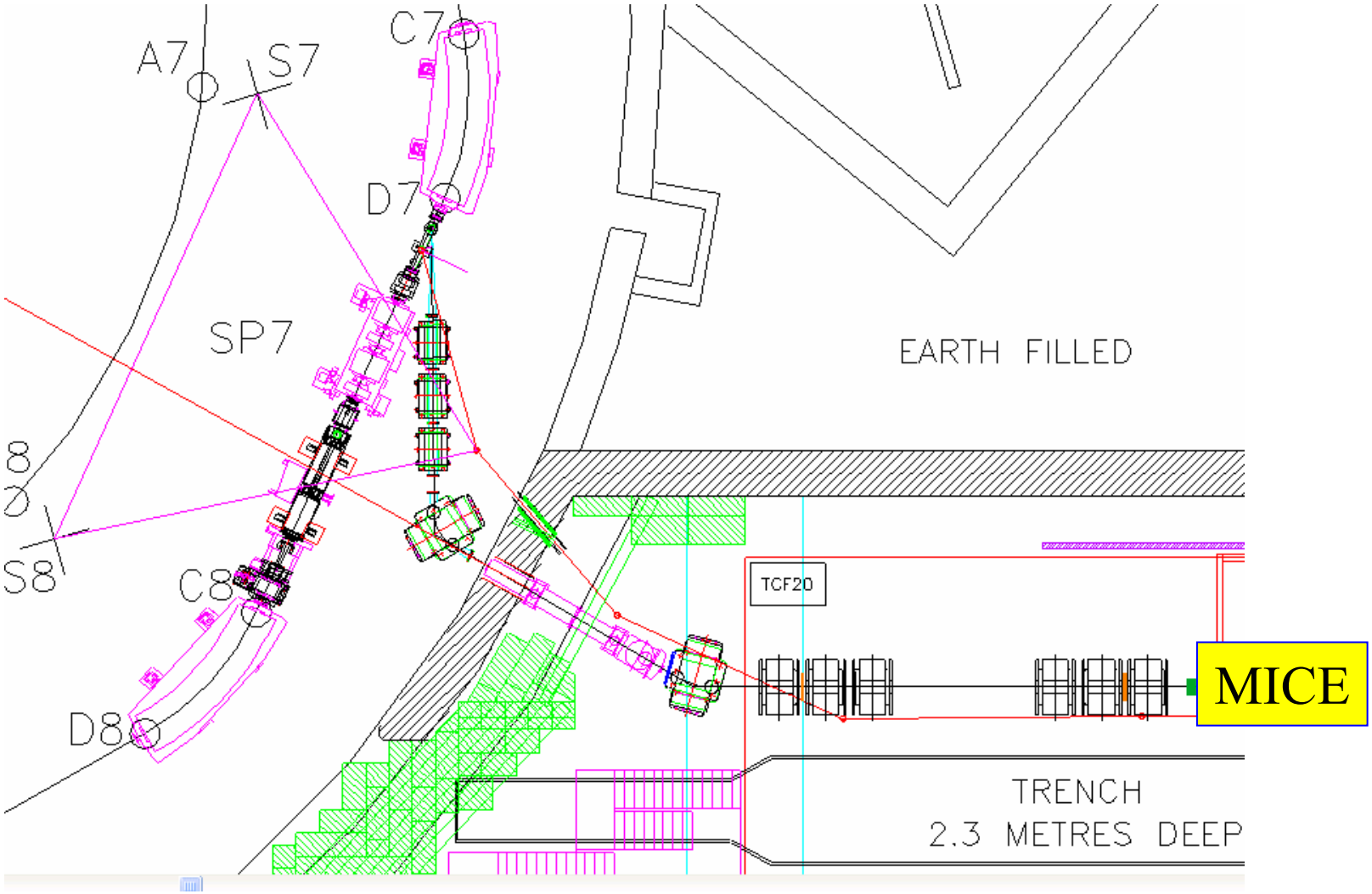
29 April 2004

Beam line



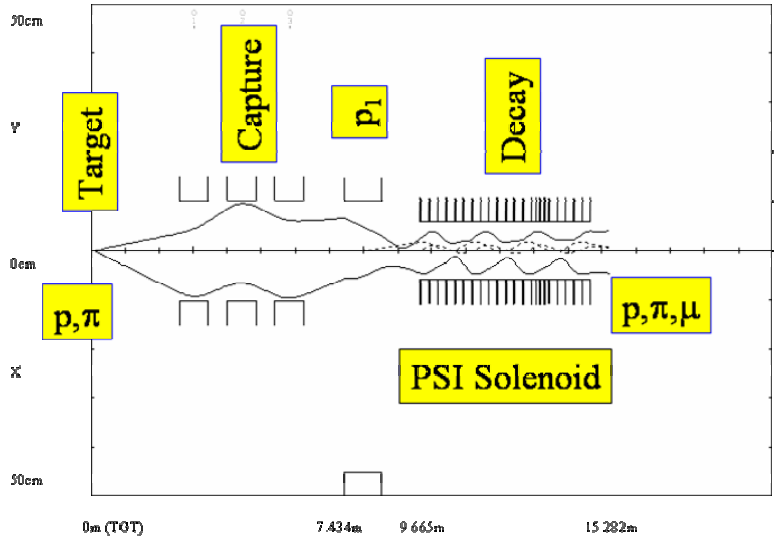
- drifting beam not matched to MICE
  - Large aperture quads found
  - Matching Design with
  - PSI SC Solenoid important ingredient

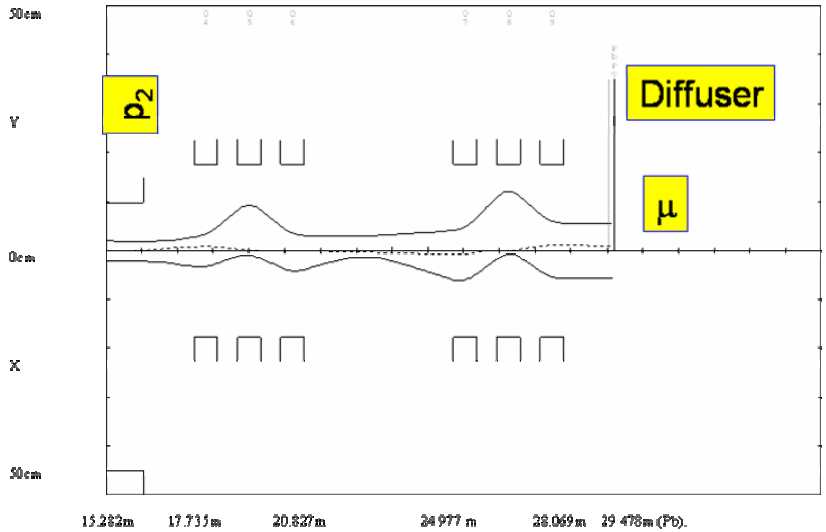
Beam Line Progress



Paul Drumm
29 Apr 2004

Capture-decay-matching

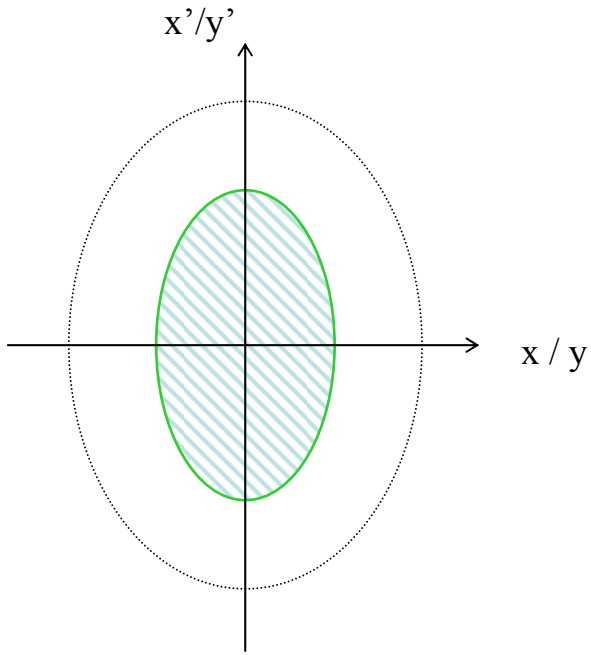




Paul Drumm
29 Apr 2004

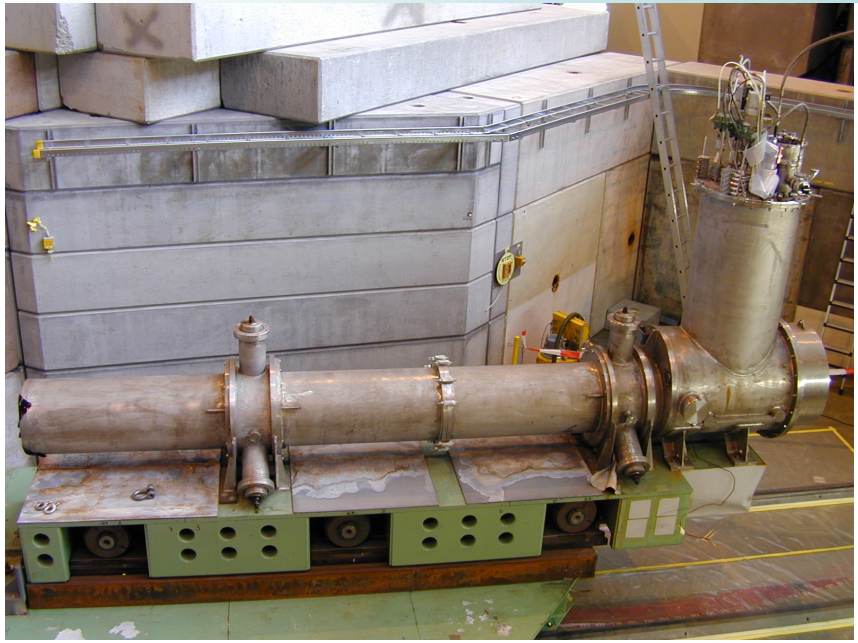
Beam Matching

- Matched beam at entrance to tracker
  - "6 π mm.r"
  - "Upright" beam
  - Variable emittance
    - Change size of muon beam
    - Change thickness of diffuser
    - Select particles in software



Paul Drumm
29 Apr 2004

PSI Solenoid

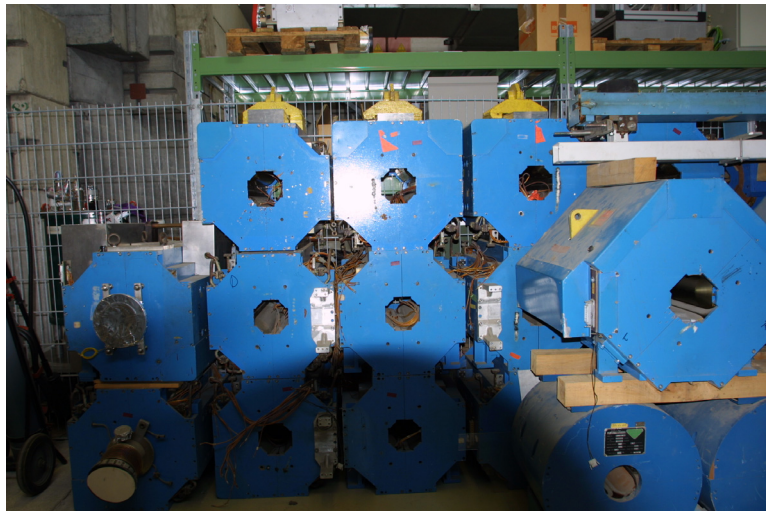


Solenoid
Power Supply
Cryo Control System

Active
– remake hot parts

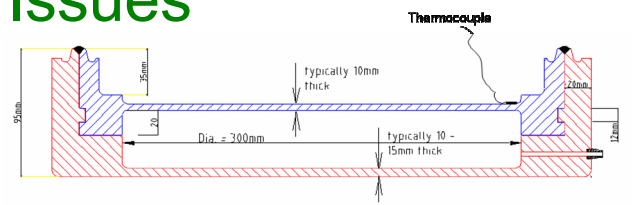
Sign MoU in October

Beam Elements



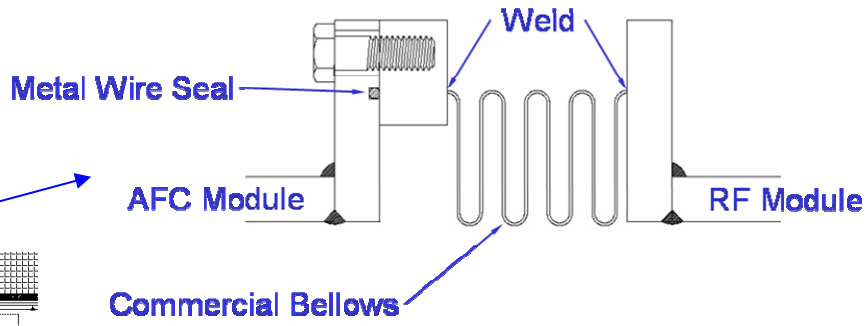
Particular Achievements

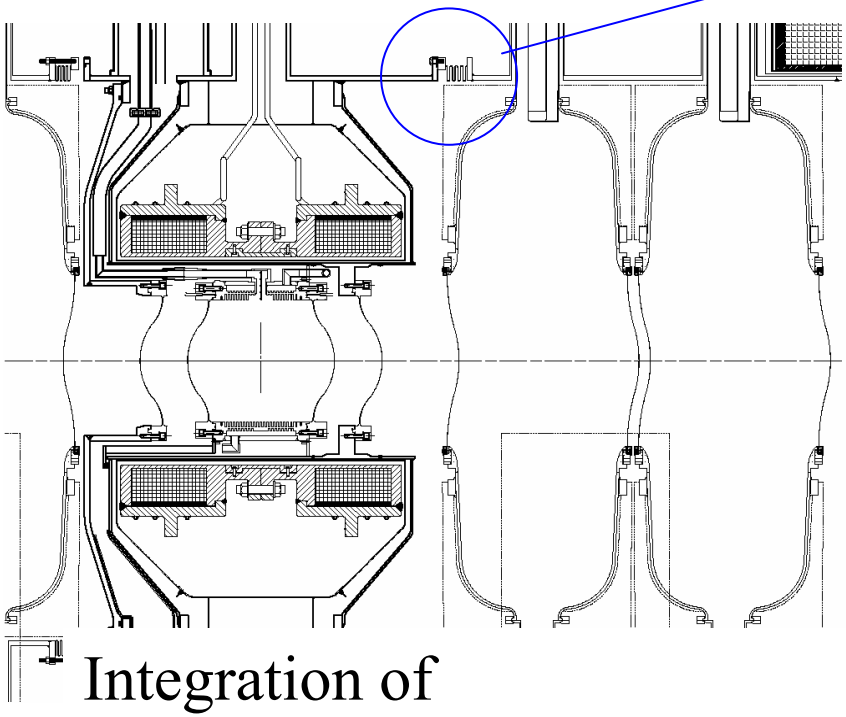
- Absorber & Focus Coil
  - Design Convergence
  - Safety Review
    - Significant Milestone – doing things right!
    - Considerable Effort
    - Collaboratively successful US/UK/JP
    - Useful comments from Panel
    - Result - Highly Successful with RAL
    - Must not lose sight of Safety Issues
  - Hydride bed
  - Window Tests
  - R&D…



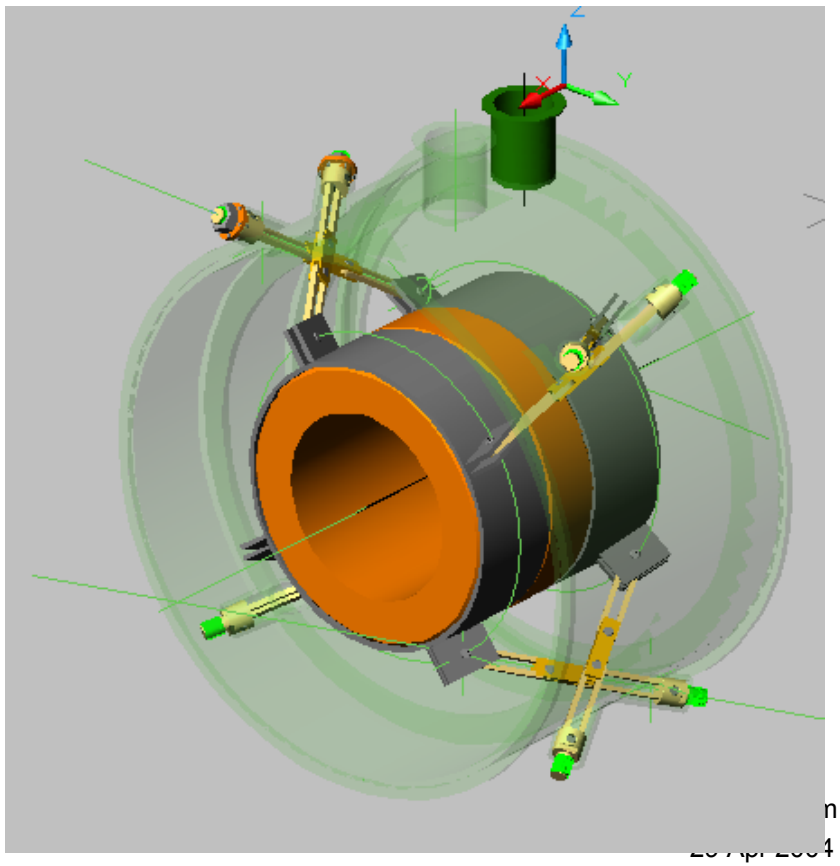
Particular Achievements

- Interfaces





Integration of
absorber & cavity module
-Impact on operational issues
& Alignment



RF Baseline Design

- RF Power Design driven by cost issues (no funds for a new system)
  - Optimal – one amplifier per cavity

- 2 Amplifiers from LBNL = 4 MW total
- 1 or 2 Amplifiers from CERN = 2, 4 or 8 MW total
  - 4 MW amplifier needs a bigger drive
- Spare TH116 Tubes from ISIS

- Split or more amplifiers?
  - Circulator – cavity ↔ cavity ↔ amplifier isolation
  - Hybrid device - possibly cheaper – some coupling?
  - Assume that we do R&D (trials) when we have the equipment
    - Need both cavities and one amplifier circuit
    - Test out a hybrid circuit driving two cavities

Paul Drumm
29 Apr 2004

LBNL Power Amps

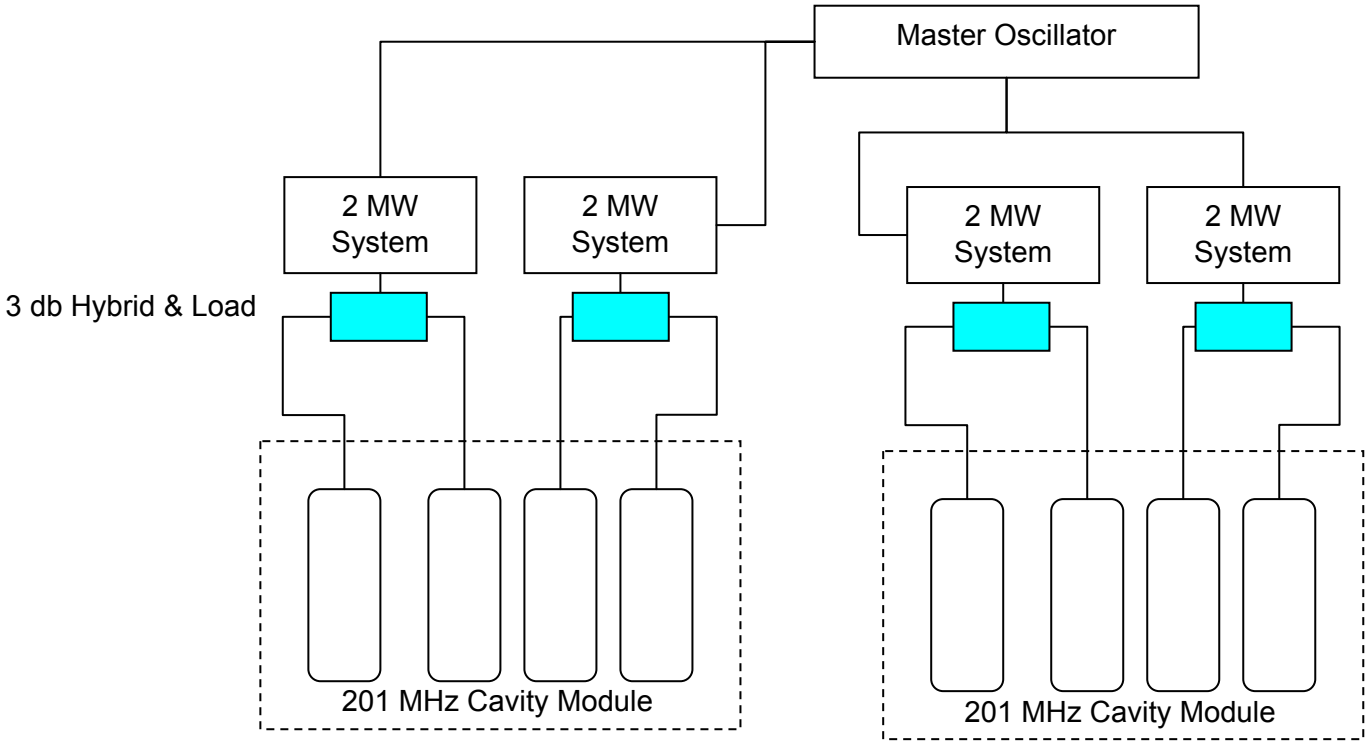
Paul Drumm
29 Apr 2004

CERN Plans

- New Discussion
  - Proposed 4 MW system built from “2MW” amplifier and driver
  - Two outputs @ 2MW ?
  - Potential Second System
  - Cost not carried by CERN
  - Preference is for 4 similar systems:
    - Cost & Risk balance of
      - 2 × 2 MW vs 1 × 4 MW
- Review RF design
  - CERN RF proposal
  - Low level options
  - Control & Monitoring

} Workshop in May

Emerging Baseline



… potential supply problem with tubes @ 4MW
… stock of ISIS TH116 tubes 2MW max…

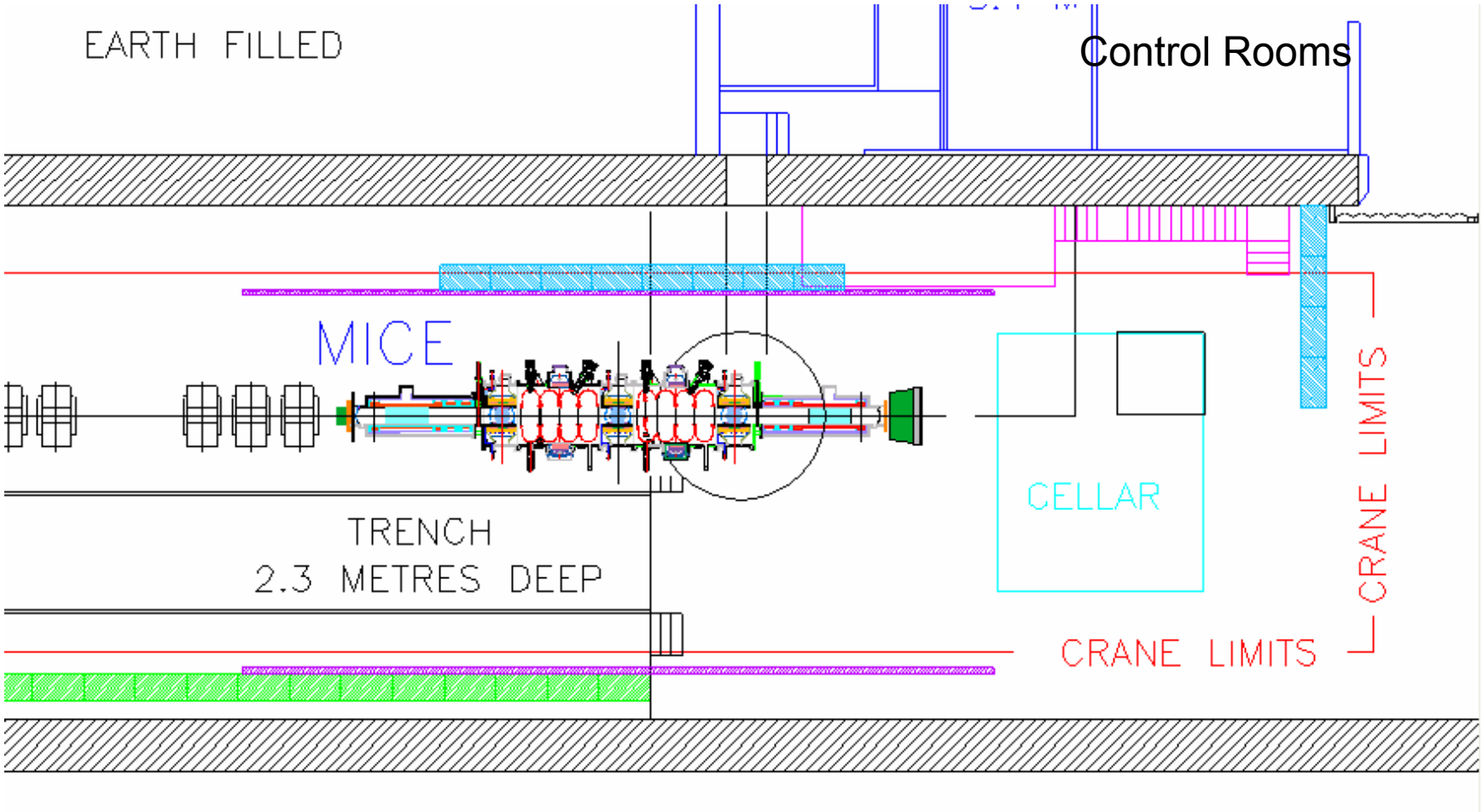
Paul Drumm
29 Apr 2004

UK Plans 2004

- Limited funds:
  - Berkeley RF system to Daresbury Lab. (DL)
  - Strip down and make a technical assessment of the equipment
    - Cost to refurbish
    - Confirm equipment is serviceable

- Set up a test-stand at DL
  - Hall and facilities available
  - Need to be in full funding mode

X-Ray Shielding – Conditioning/Running



Un-quantified issue…

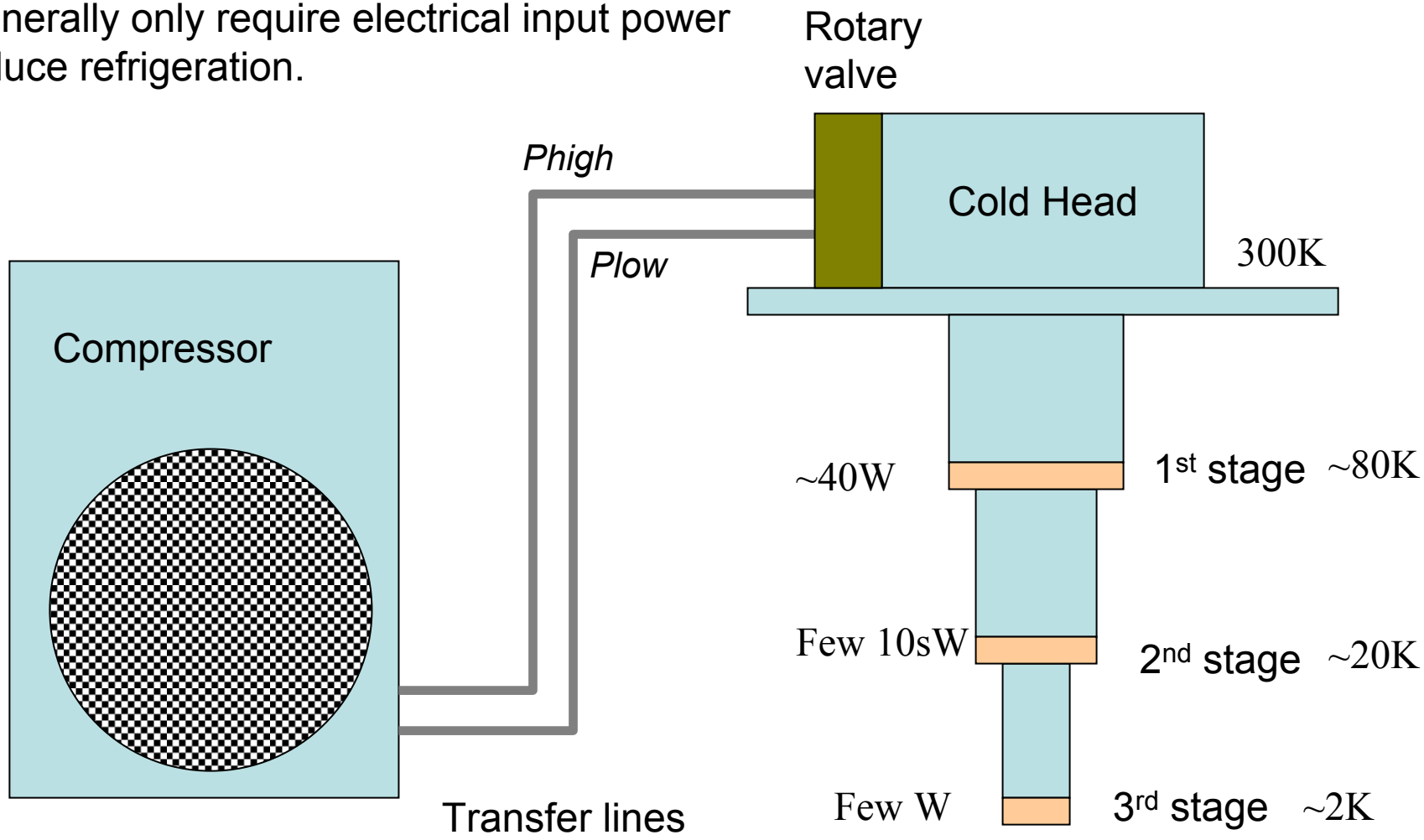
- Links in with Lab G cavity activities
- Measurement plans

Particular Achievements

- Infrastructure
  - Inventory of heat load
    - cooling pipes
    - better understanding of absorber heat load
  - Cryocoolers…
    - Applicability to magnets ✓
    - Applicability to absorbers ?
    - Applicability to VLPCs ✓
  - Hydrogen System
    - Metal Hydride bed vs
    - Gas storage tanks

Cryocoolers

Cryocoolers are closed cycle cooling systems that generally only require electrical input power to produce refrigeration.



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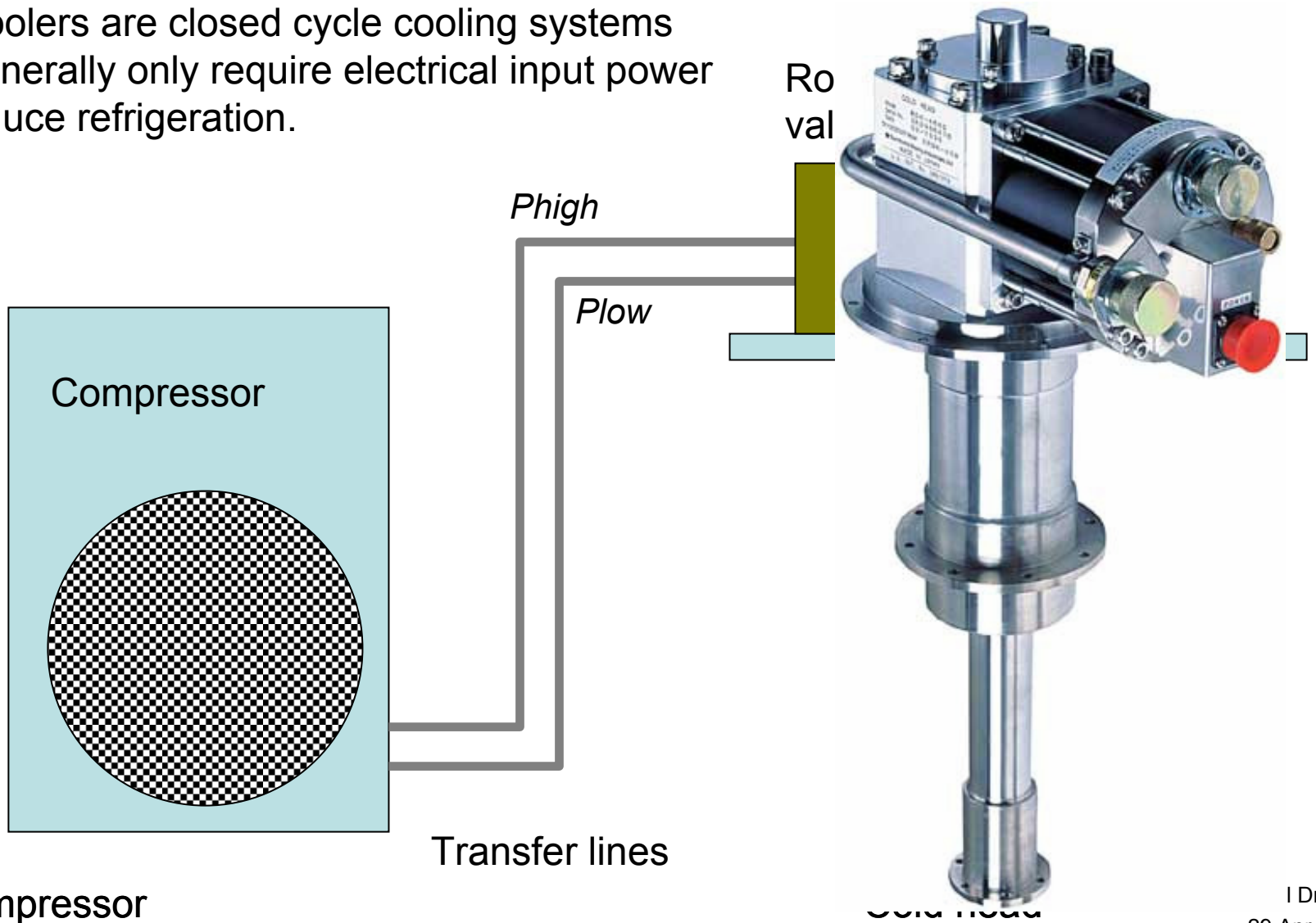
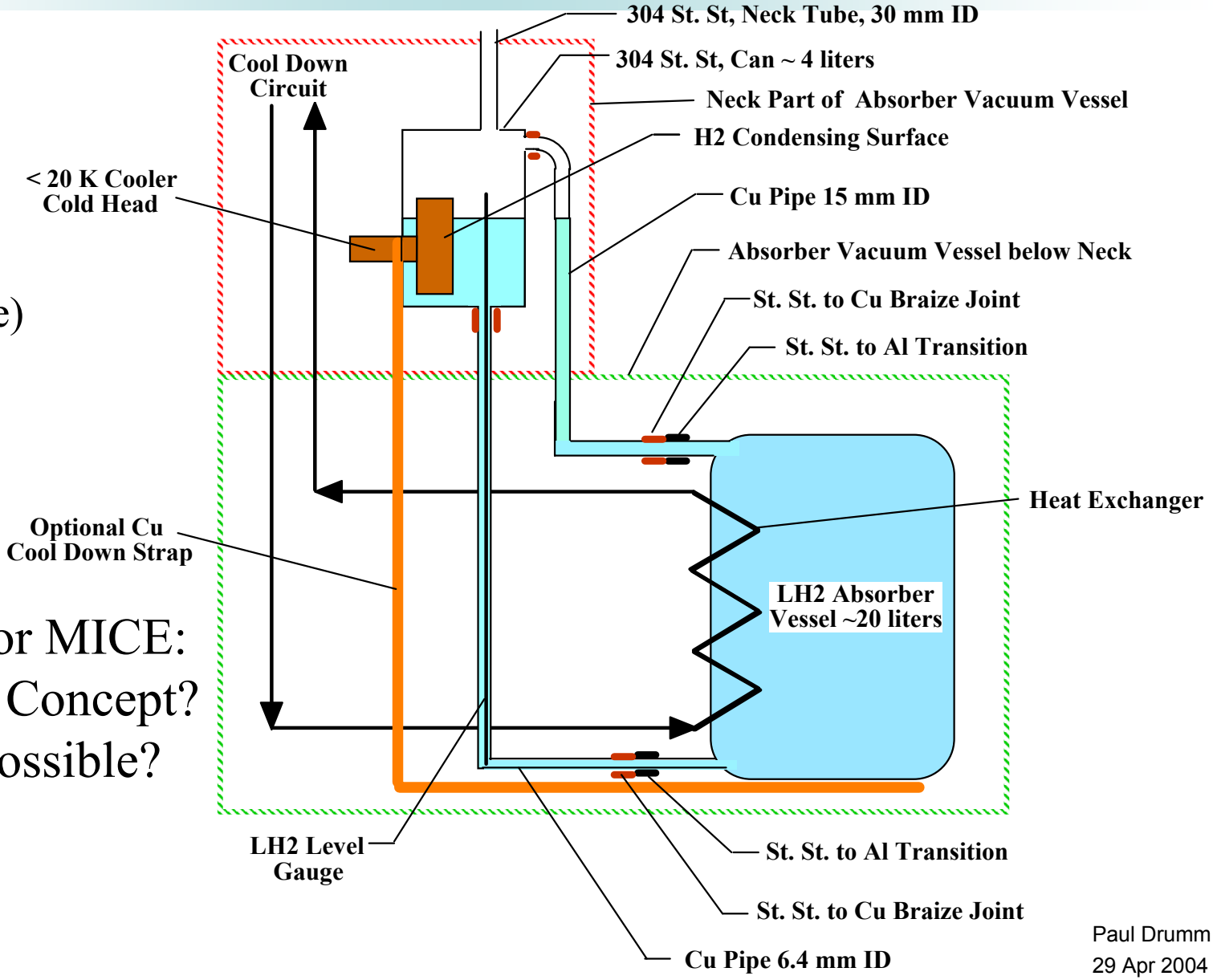


Cryocoolers

- Issues are
  - Central plant: Infrastructure cost £2M (loaded)
    - Absolute cost!
    - Devastates cash flow!
    - Bulk of cooling is in the transfer lines
  - Cryocoolers: Part of equipment: £0.75M (loaded)
    - Compact, distributed, scaleable
    - Lower power consumption – less plant
    - Still need a TCF20 for muon decay Solenoid
    - Cooldown is long (unless)
      - supplement cooling power with LN2/LHe
  - Meeting of magnet designers
    - No dissent; encouraged;
    - Need to look carefully at Absorber cooling
  - VLPC cryostat benefits
    - Cryocoolers appropriate for 8K
- Accepted view within MICE

Absorber Cooling

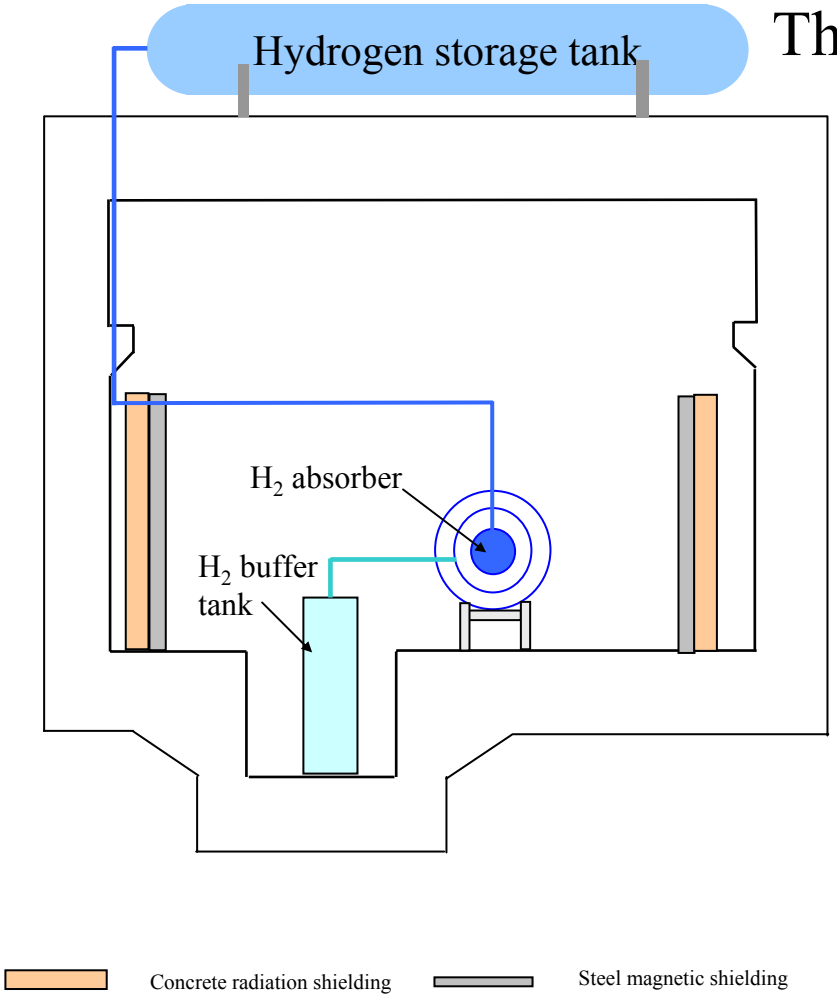
(example)



Questions for MICE:
Compatible Concept?
He option possible?

Hydrogen Tanks

Three tanks required



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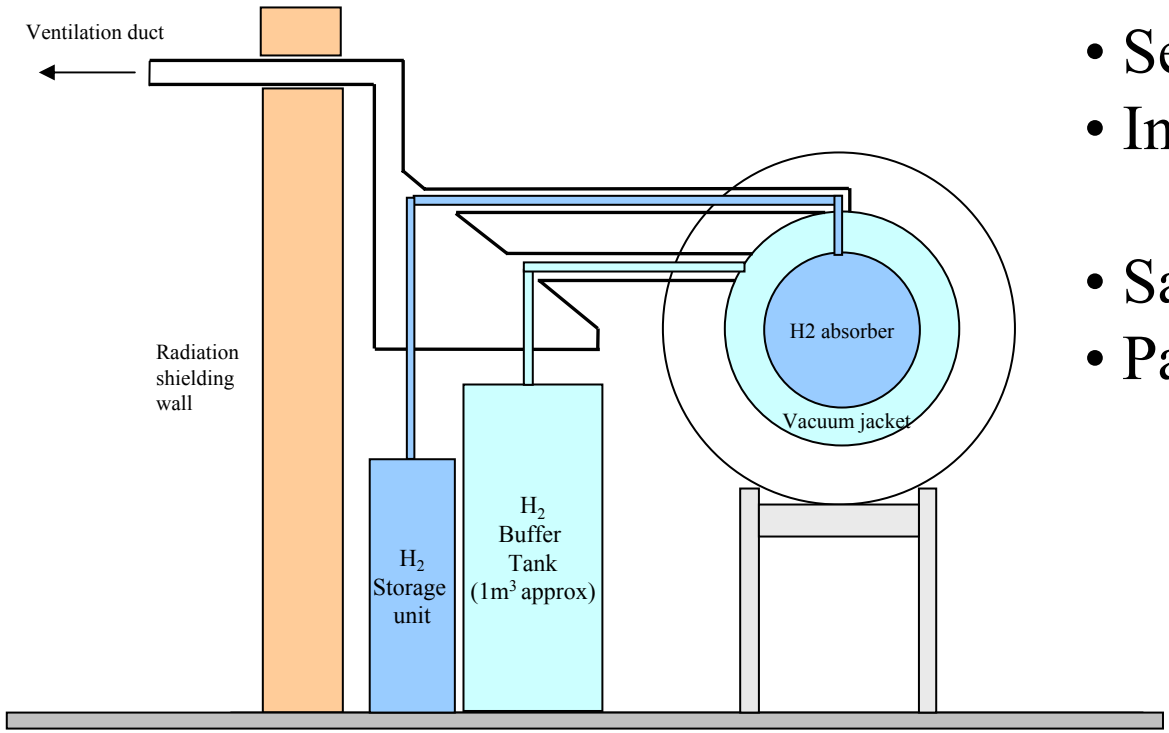
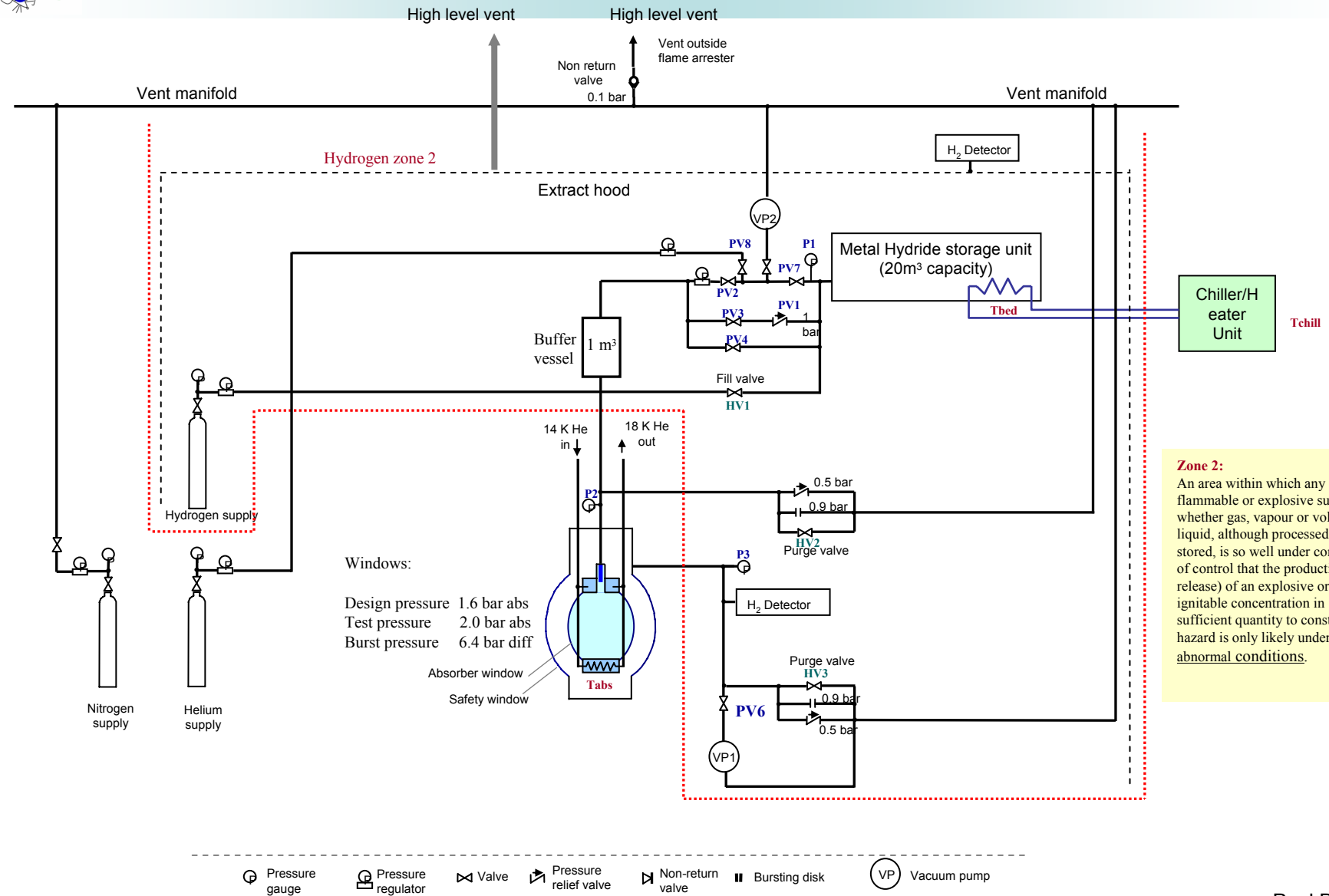
Metal Hydride bed



- Innovative!
- Separate systems
- Incremental

- Safe Storage
- Passive

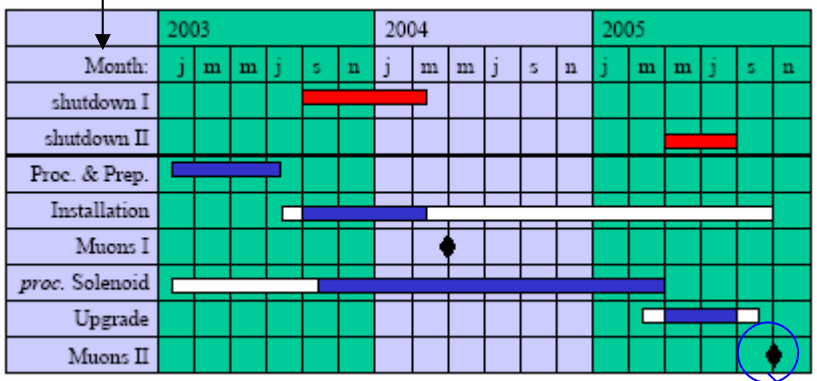
…evolving



Zone 2:
An area within which any flammable or explosive substance whether gas, vapour or volatile liquid, although processed or stored, is so well under conditions of control that the production (or release) of an explosive or ignitable concentration in sufficient quantity to constitute a hazard is only likely under abnormal conditions.

Milestones & Schedule

LBNL Collaboration Meeting late 2002: Aspirations



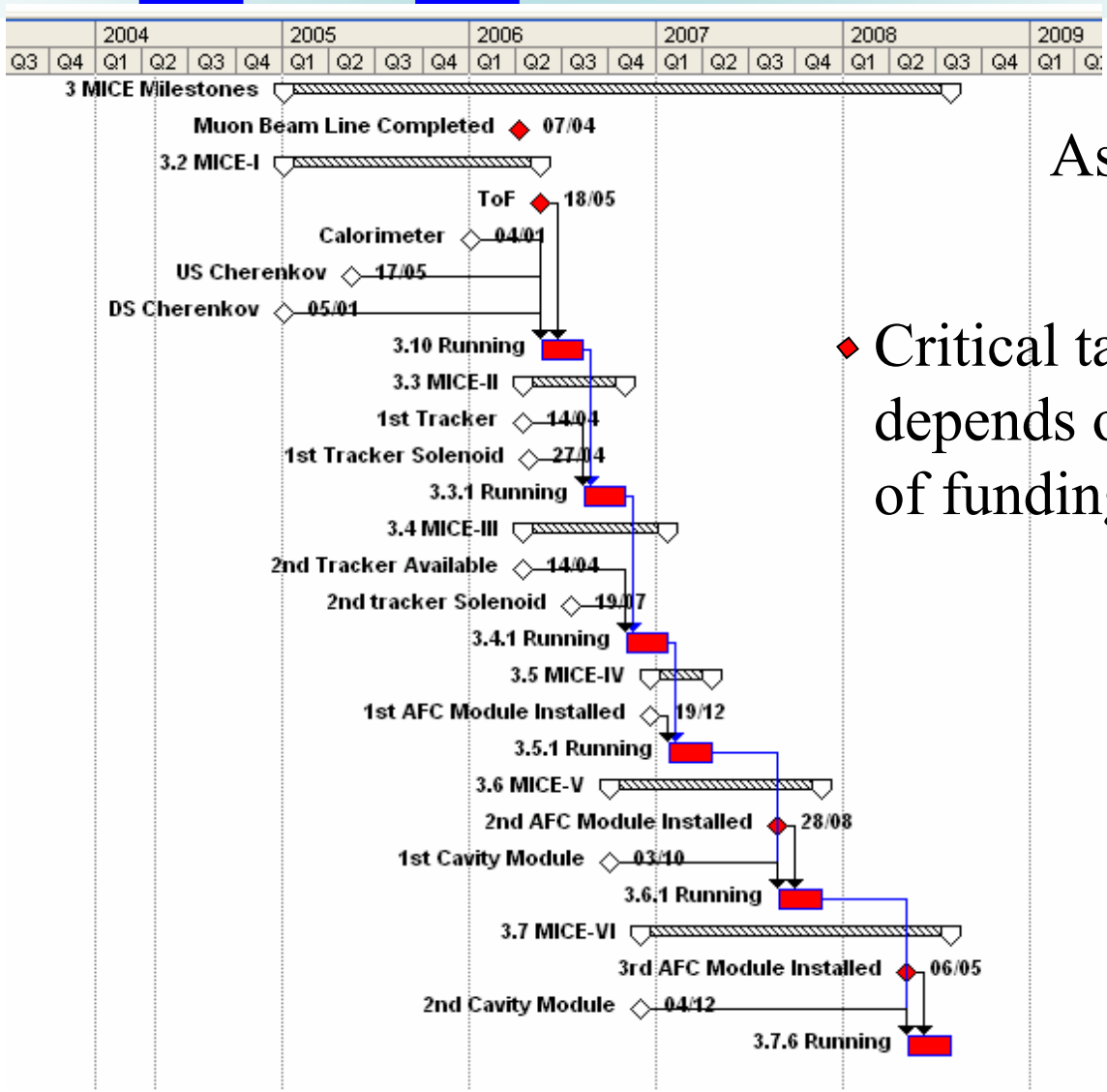
6 months

..year & a half later

Progress has been limited!

- Funding not yet available
  - Reality; slower start
- ISIS shutdowns have changed…
  - 2003/4 shutdown delayed 6 months
  - Next shutdown moves into 2006
  - Not the bandwidth in 2004 shutdown
- Doubt value of an intermediate beam line
  - PSI solenoid discussions
  - Resolved concerns

MICE Schedule (WBS)



As of April 2004

- Critical tasks… but depends on timescale of funding

http://www.isis.rl.ac.uk/accelerator/mice/wbs/98/mice_wbs.html

Technical Board

- Chair:
  - Drumm
- Cooling channel:
  - Zisman
- Detectors:
  - Bross
  - Palladino
- Simulation/Software:
  - Torun
- Integration:
  - Ivanyushenkov (secretary)
  - Black
- Safety:
  - Baynham
- Ex officio:
  - Spokesman &
  - Deputy

Every two weeks by phone

Agenda & Minutes:

http://www.eng-external.rl.ac.uk/MICE-GEN/

"The Technical Board oversees all aspects of the experiment and infrastructure design, time schedules, construction, cost, installation and computing matters. It serves as an advisory body for the Executive Board."

It will identify issues;

It should not try to solve problems during the phone meetings but delegate to the experts and later discuss their conclusions;

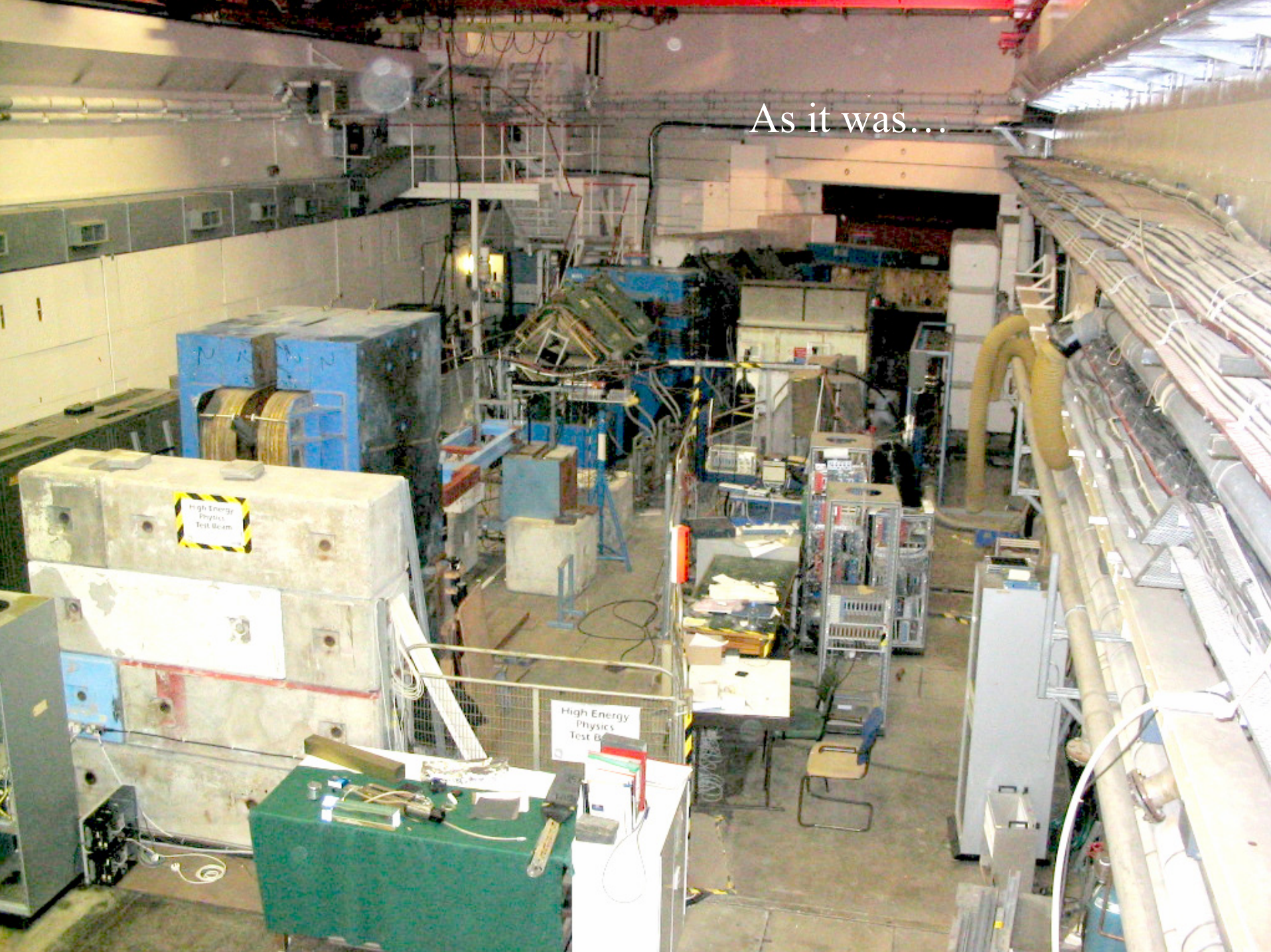
Technical Review & unfinished issues…

- Completed Technical Review:
  - http://www.isis.rl.ac.uk/accelerator/mice/tr/mice_tech_ref.html
- Review Magnet design:
  - Currents & beta-fn, coils, stay clear, forces;
- Detectors
  - Magnetic Shielding & tracker solenoid forces
  - Rates in beam line
- Forces, Supports, Alignment & Survey
- Alignment: effect on experiment
  - Discussions between physics and engineering
  - Control, instrumentation and monitoring
- Data Acquisition

TB manages the **change process**;

Immediate Plans at RAL

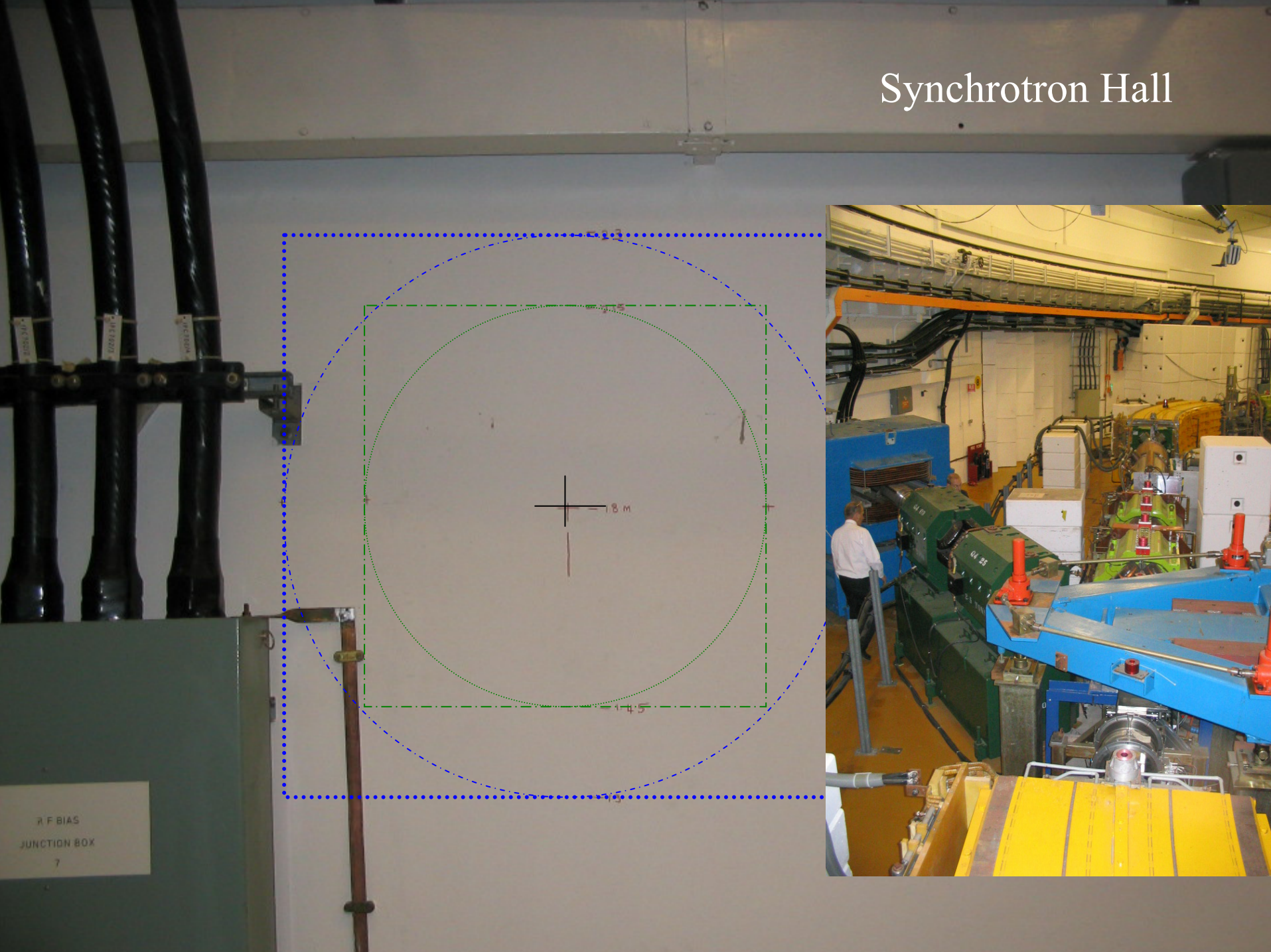
- RAL Plans constrained by
  - Funding availability
  - ISIS Schedule
- Already cleared hall in anticipation of 2004 shutdown
- Work to drill hole mid May is in progress
  - Cleared away shielding – expose wall
  - Remove old beam line from synchrotron
  - Start drilling Friday 14th May


As it was…
High Energy Physics Test Beam
High Energy Physics


As it became…


MICE Hall – last week
preparation work started
for drilling mid May:
4 ft thick wall
65 cm diameter aperture

Synchrotron Hall



and finally

- Impressive amount of work being done;
- Huge enthusiasm for MICE - not yet matched by funding;
- Funding issues need to be resolved soon:
  - MICE needs a positive Indication from US funding agencies will be a significant step forward; important to liberate UK & encourage Eu funding
- and thanks to all those I stole slides from…