MICE Collaboration meeting (CM20)

At RAL 10 – 13 Feb 2008

Engineering and Integration summary

W. Lau, Oxford University

The Engineering & Integration session covered the following topics

- Hydrogen delivery system - Tom
- Decay Solenoid and refrigerator installation - Tom
- RF project plan and status – Andy Moss (*not presented*)
- Remaining Infrastructure and Services – Tim and Andy Nichols
- Cooling Channel interfaces – Steve
- Status of MICE Diffuser - Marco
- Geometry layout of all sub-systems - Wing

Item:	Buffer Tank

Status:

Completed – awaiting certification

Item:	**Cryostat**

Status:

Body & Top Plate complete

Item:	Cryostat

Status:

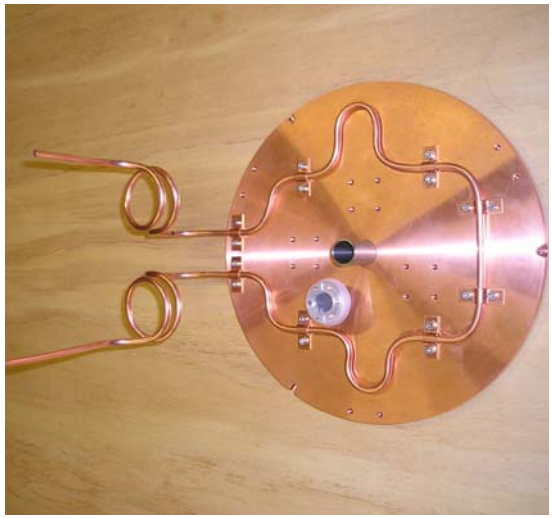
Body & Top Plate complete

Condenser & condensing pot in manufacture

Item:	Others

Status:

Absorber base plate – complete

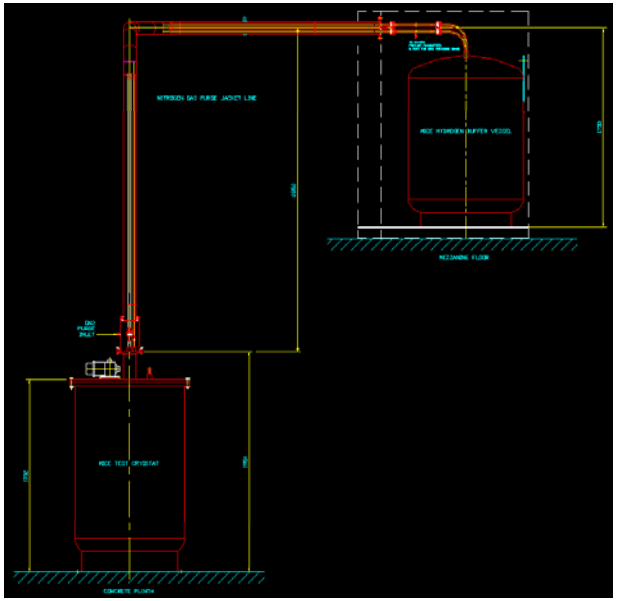


Item:	Others

Status:

Absorber base plate – complete

Gas panel – layouts agreed, fabrication to start.
Expect to complete by June;



Item:	Others

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Delivery of relief valves on critical path;

Item:	Others

Status:

- Absorber base plate – complete
- Gas panel – layouts agreed, fabrication to start.
  Expect to complete by June;
- Delivery of relief valves on critical path;
- Transfer line - designed

Item:	Testing

Issues:

Initial tests with helium to be done in Cryogenics Lab

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- Initial tests with helium to be done in Cryogenics Lab

….. otherwise it interferes with installation of ventilation system which is not installed till September…

Item:	Testing

Issues:

- Initial tests with helium to be done in Cryogenics Lab

Aided Memoir

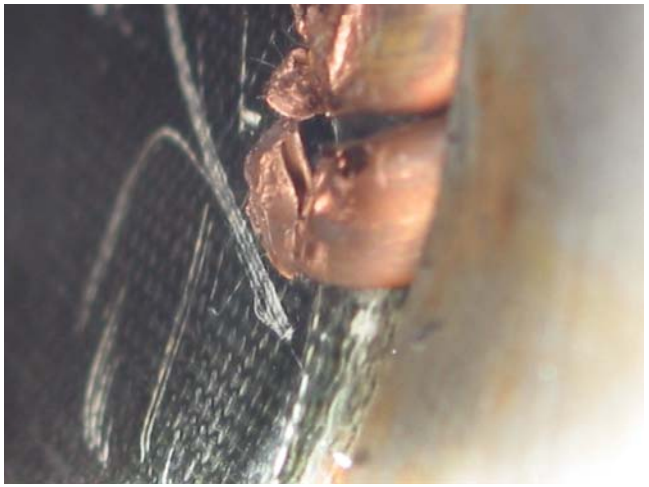
- Consider the need for spare relief valves for the H2 R&D system

Item:	Repairs

Status:

The leak was successfully repaired

Multi layer insulation repaired



Item:	Repairs

Status:

The leak was successfully repaired

Multi layer insulation repaired

Current activities:

- *Completed cold mass alignment*
- *Performed pressure, vacuum and leak checks*
- *Completed control system, pipework and cabling*
- *Connected solenoid to refrigerator and performed a trial run. This was interrupted by Christmas and decision was made to…*
- *Moved solenoid to final location in "Decay Solenoid Ared"*

Item:	Refrigerator

Status:

- Installation completed
- Performance checked into test cap

Item:	Refrigerator

Issues

- Modifications made to cold box to improve performance. Suspect damage turbine causing the problem.
- Both turbines now removed for repair by Linde.
- Expect to take 14 days to turn round

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- Modifications made to cold box to improve performance. Suspect damage turbine causing the problem.
- Both turbines now removed for repair by Linde.
- Expect to take 14 days to turn round

Remaining work

- Prove refrigerator performance
- Move transfer line and attach to solenoid (week of the 17th ?)
- Bake and purge
- Complete gas lines from gas panel and hook up instrumentation and power supply
- Test

Item:	RF Coax

Issues:

- 200MHz RF coax is big equipment and space in the MICE experiment hall is at a premium
- Coax experts suggest that the voltage stand off to 2 Megawatt peak power level requires 12 inch coax components **minimum** !
- Smaller coax can be used if pressurised with insulating gas – nitrogen/ SF6
- MICE Cavity couplers are 4 inch coax therefore **have to be pressurised** !
- Smaller Coax = more power loss along length.

The summing up is extracted directly from Andy's talk.

Best to address the questions to him by email

Item:	Hall Installation

Issues:

- Current suggestion use two outputs from the amplifier in 6 inch coax – 'smaller' components, still large enough
- Still need a hybrid power splitter with a 1MW reject load for each cavity
- Phase shifters needed to offset phase error at coupler, large motor driven line stretchers
- Gas barriers needed inside coax to hold SF6 pressure
- Design of hall installation underway to address the space questions

The summing up is extracted directly from Andy's talk.

Best to address the questions to him by email

Item:	Plan for the amplifier

Plans

- Make design of hall using both types of output configuration over the next few months
- RF meeting at CERN ? Try to set date for May
- Continue rebuild of first large amplifier
- Test amplifier ~ July/August 08
- Test output coax sections of differing sizes with and without gas pressurisation

The summing up is extracted directly from Andy's talk.

Best to address the questions to him by email

Item:	Conclusion on amplifier

Conclusion

- Large amplifier rebuild continuing
- HT power supply components are arriving but this will not be ready until June/July 08
- Amplifier needs testing to prove 2MW possible with single 9 inch output
- Likely modify amplifier to two 6 inch outputs ready for MICE experiment
- SF6 insulating gas will be needed in coax's

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Item:	The “to do” list

PPS – fence, roof and fire escape in the DSA

RF project – False floor

Removing Concrete Ramp

South magnetic shield wall

North magnetic shield wall

Air conditioning

Rolling platforms

Hydrogen system

Mice hall roof

Vacuum

Compressed air

New hall door

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Provisional design review for the fence, roof and fire escape on 15th Feb.

Work to be carried out in the May shutdown

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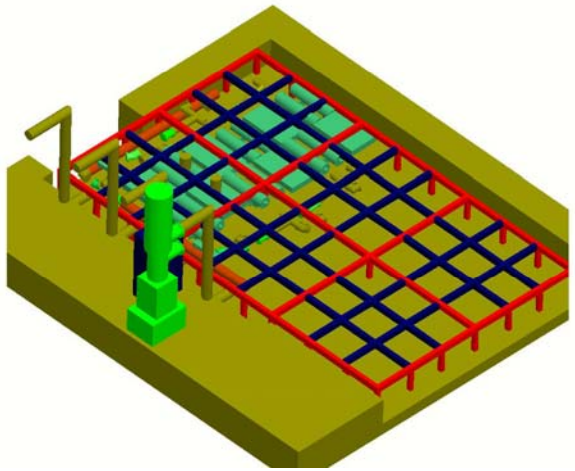
Need to decouple RF project from false floor,

Seems enough space if RF is installed under the false floor – Headroom is tight

Provisional design of false floor starts on 15th of Feb;



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Provisional design of false floor starts on 15th of Feb;

Q: possibility of connecting all amplifiers to a single RFCC module, also consider implication of LN2 temp operation of RF cavities .....

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This is to make more room for the RF components

Work starts on 18th Feb, takes 4 weeks to complete

Area be tented to prevent dust

Need to remove test cap – under review

Q: can test cap tolerate vibration ….

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Design agreed

Steel plate tender received on 6th Feb

Work starts 10th March and includes:

-Alter existing stairway;
- Install magnetic shield wall support structure
- Install shield plate on support structure
- Construct new south wall mezzanine
-Painting and fire proofing

Q: Should steel wall assembly be staged according to MICE stage (until CC arrives, fields will be modest…)

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Provisional design review on 22nd Feb

Could be done in parallel or in series of South wall – depends on contractor's capacity

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New hall door

Layout agreed;

Tender process started – expect delivery before April;

Installation includes:-

- *AC units and ducting*
- *10 fans on roof to remove heat from units*
- *Pipe runs from units to fans on roof;*
- *Electricals*

Commission and testing

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#1 & #7 tracker platform out for manufacture – delivery 1st March;

Design of # 2 – 6 ready by 12th April, delivery 11th July

Item:	The "to do" list
PPS – fence, roof and fire escape in the DSA	
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Removing Concrete Ramp	
South magnetic shield wall	
North magnetic shield wall	
Air conditioning	
Rolling platforms	
Hydrogen system	
Mice hall roof	
Vacuum	
Compressed air	
New hall door	

Needs layout drawing on roof

Checks roof structural rating

Fence between MICE and ISIS roof

Fence or handrails around entire perimeter

Needs permanent stairway to roof

Q: any restriction to roof access due to presence of hydrogen vent?

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New hall door

Make sure they are not forgotten!

Will come back to them!

Item:	The Services

The motivation:

…it is the minor things that holds up the operation…. Example:

Couldn't run Q35 till ISIS is off because a very minor water flange was missing

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Managing the requests:

Off-detector services:

Couldn't run Q35 till ISIS is off because a very minor water flange was missing

Define patch panel and interfaces

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Define patch panel and interfaces

On-detector services is the responsibility of each sub-system:

Power
Readout
Slow Control
Cooling
Vacuum

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Collect everything as an activity within the Phase two WBS

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Item:	The Services

The motivation:

…it is the minor things that holds up the operation…. Example:

Managing the requests:

Off-detector services:

On-detector services is the responsibility of each sub-system:

Collect everything as an activity within the Phase two WBS

Points for discussion:

Nominate a contact for each subsystem (via MICO??)

Ask them to submit details of the requested services

WP1 manager then prepares CAD assembly and written documentation

Couldn't run Q35 till ISIS is off because a very minor water flange was missing

Define patch panel and interfaces

Power
Readout
Slow Control
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Vacuum

Item:	Integration of Spectrometer solenoid Magnet

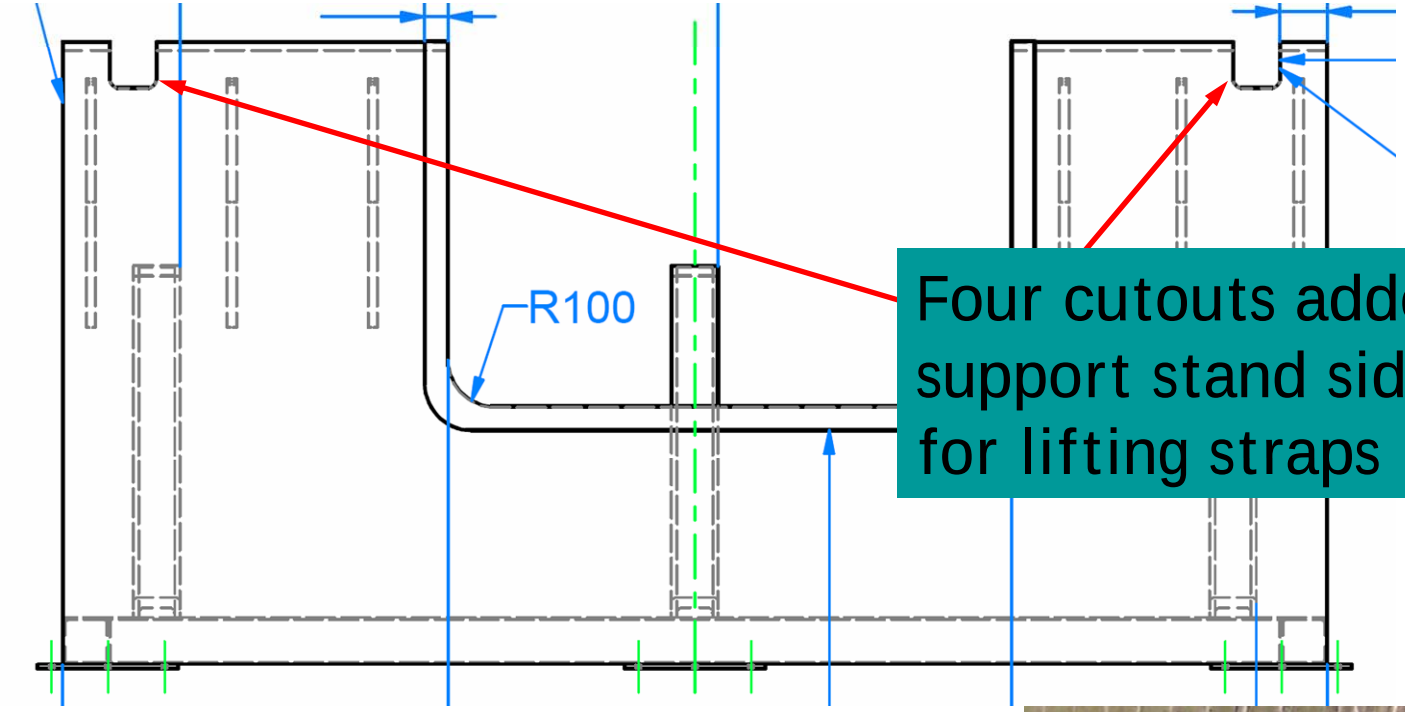
Progress update:

Support structure and interfaces

6 mounting pads added to design

Possible issues with clearance around holes – need to interface with RAL infrastructure team

Lifting rings to vessel added

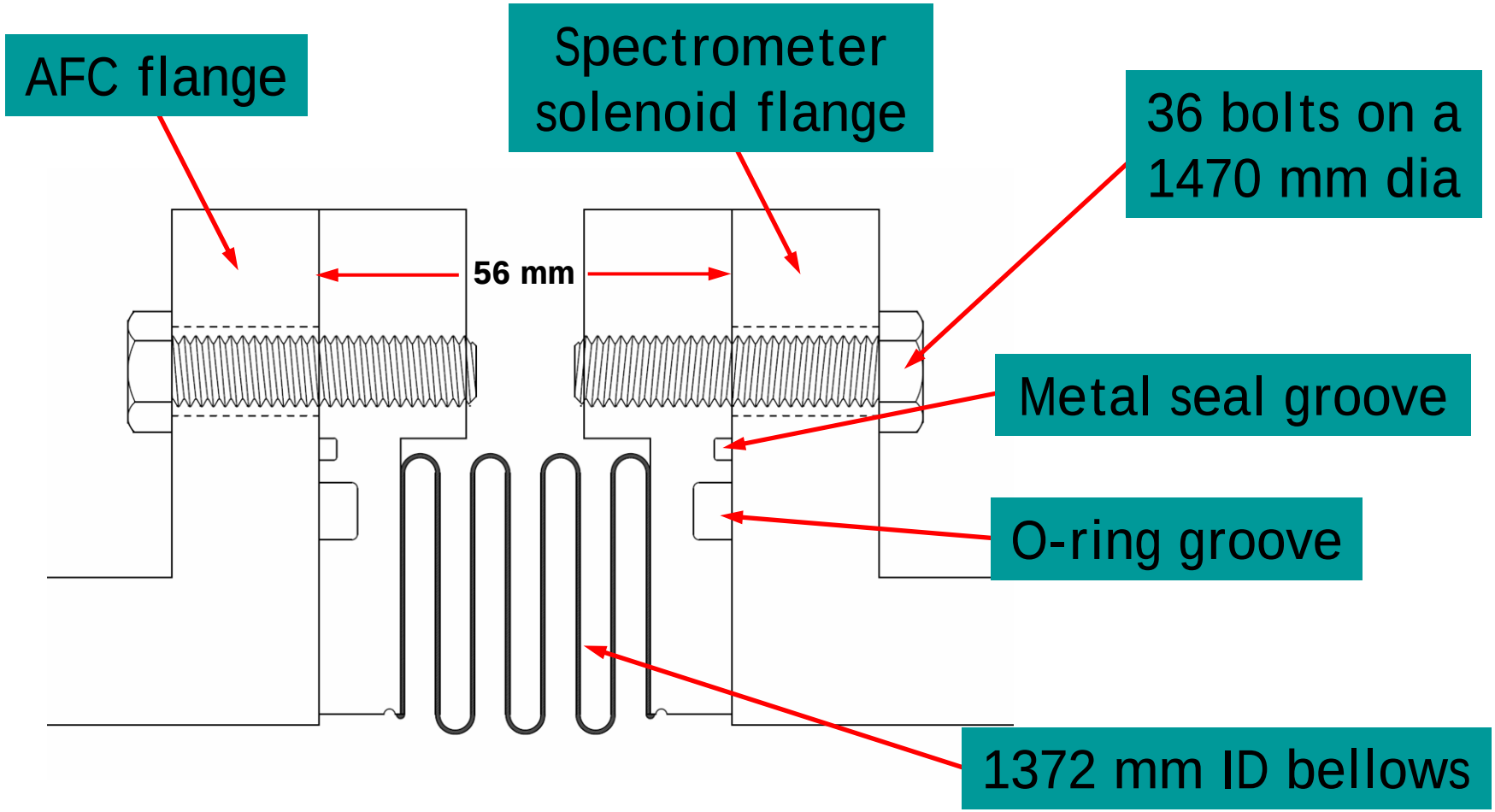


Four cutouts added to the support stand side walls for lifting straps

Item:	Integration of Spectrometer solenoid Magnet

Progress update:

- Support structure and interfaces
- Module joint seal and load transmission


AFC flange
Spectrometer solenoid flange
36 bolts on a 1470 mm dia
56 mm
Metal seal groove
O-ring groove
1372 mm ID bellows

Item:	Integration of Spectrometer solenoid Magnet

Progress update:

- Support structure and interfaces
- Module joint seal and load transmission
- Sub-component interface
  - Tracker to warm bore

Helium window design not done

Mounting holes not included in magnet spec!!

Item:	Integration of Spectrometer solenoid Magnet

Progress update:

- Support structure and interfaces
- Module joint seal and load transmission
- Sub-component interface
  - Tracker to warm bore
  - Radiation shutter

Nothing done – whose responsibility??

Need following up!!

Item:	Integration of Spectrometer solenoid Magnet

Progress update:

- Support structure and interfaces
- Module joint seal and load transmission
- Sub-component interface
  - Tracker to warm bore
  - Radiation shutter
  - Patch panel

Interface bolt holes incorporated

Item:	Integration of Spectrometer solenoid Magnet

Progress update:

- Support structure and interfaces
- Module joint seal and load transmission
- Sub-component interface
  - Tracker to warm bore
  - Radiation shutter
  - Patch panel
  - Diffuser
  - Iron shield
- Power needed, cabling & hose connections
- I & C

Features for mounting diffuser added

Item:	Integration of Spectrometer solenoid Magnet

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- Sub-component interface
  - Tracker to warm bore
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  - Patch panel
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Integration design done

Interface remains unchanged

Parts to be procured soon

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- Sub-component interface
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Power needed, cabling & hose connections

I & C

Power supply for cryocooler:

50 Hz AC; 10.5 kw @ 380/420V, 3 phase

Cooling: min. 3 gpm of water @ 80F max

300 A & 600 A power supply details specified

Liquid cryogens: 600 L LN2, 1000 L LHe (x2)

Instrumentation monitoring req.

Various voltage. He level; heaters, vac

…..

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- Power needed, cabling & hose connections
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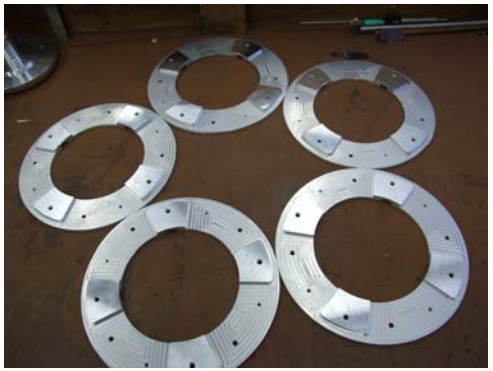
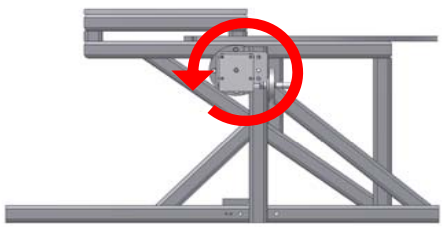
Other related matter:

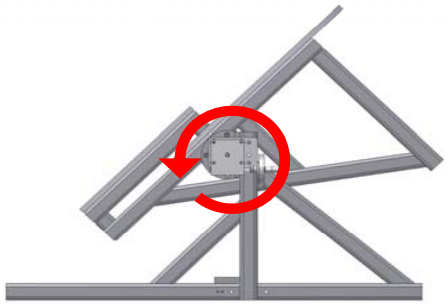
Mike Green pointed out that the two Spectrometer solenoid main coils have different number of turns, but are intended to operate in series.

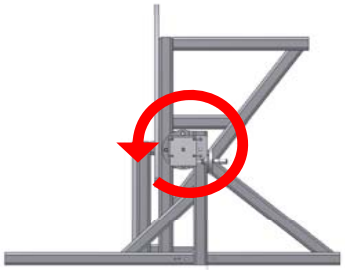
Is this a problem? Can someone check?

Item:	Progress
Progress Mechanics: - 60% of parts done - test stand designed	



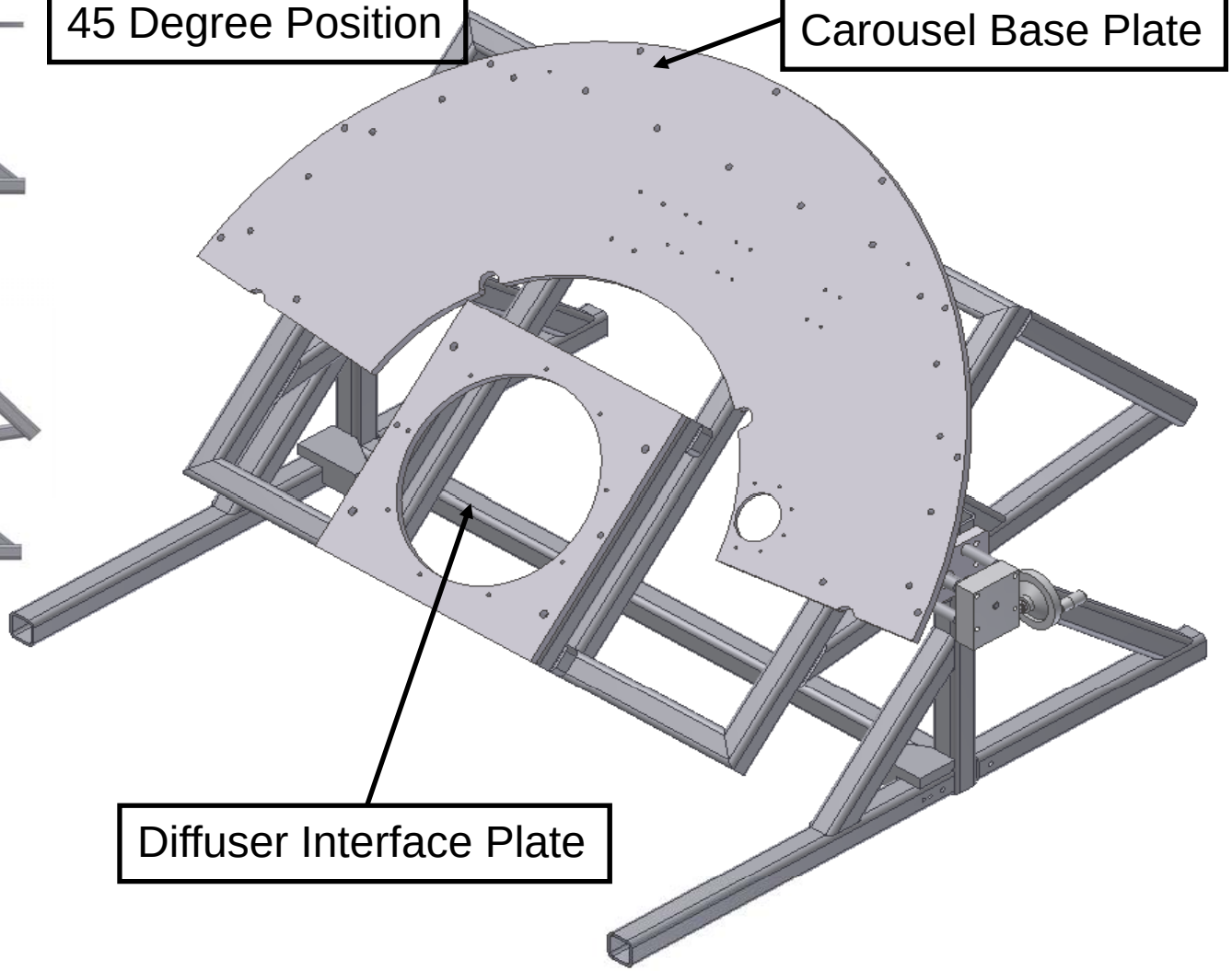






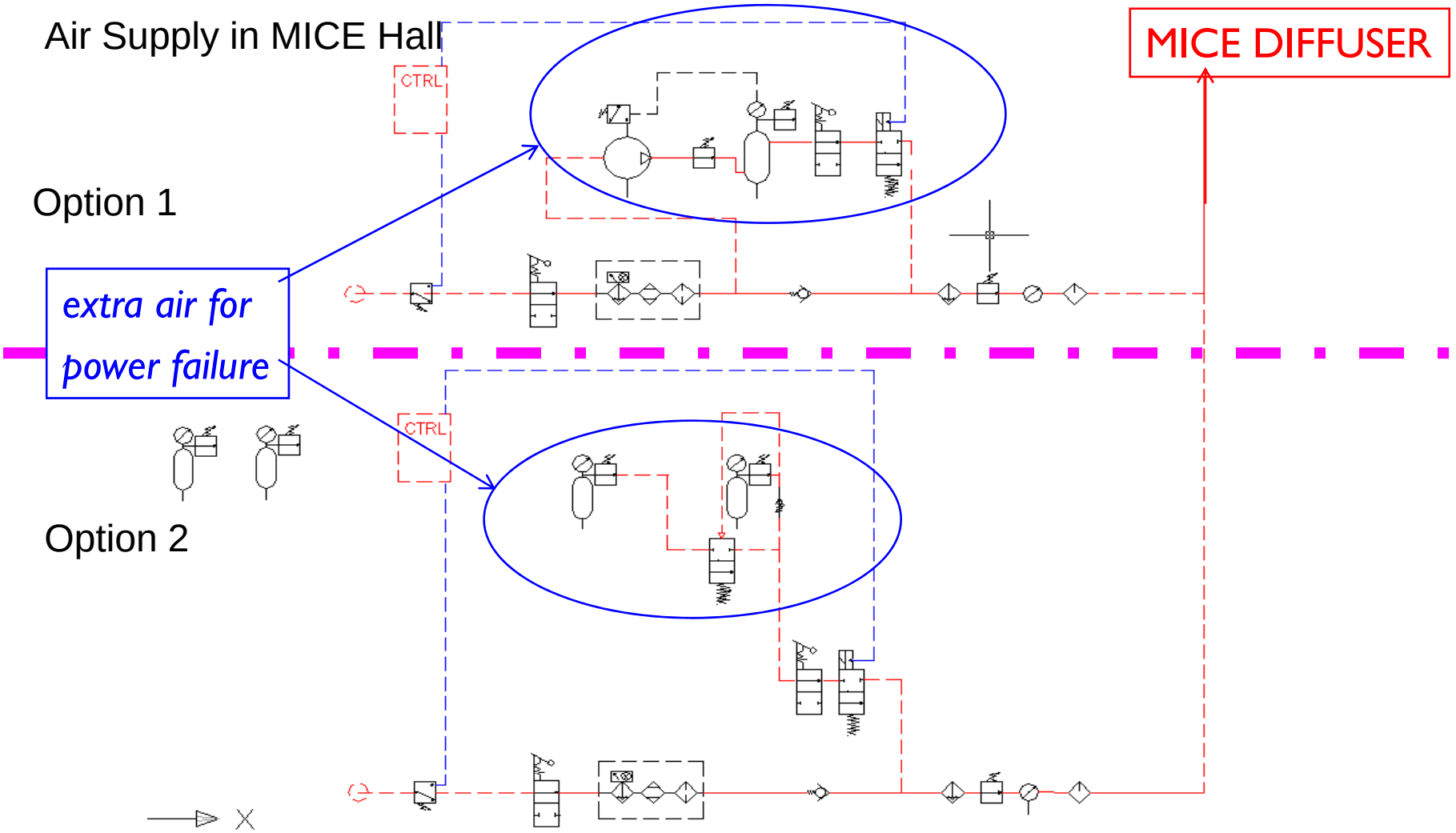
45 Degree Position

Carousel Base Plate



Diffuser Interface Plate

Item:	Progress
Progress Mechanics: - 60% of parts done - test stand designed Air System: - basically designed (external review?)	


Air Supply in MICE Hall
MICE DIFFUSER
Option 1
extra air for power failure
CTRL
CTRL
Option 2

Item:	Progress

Progress

Mechanics:

- 60% of parts done
- test stand designed

Air System:

- basically designed (external review?)
- all valves + interlocks defined
- safety (emergency) systems proposed

(OK with RAL?)

- *Normal Air supply would be provided to MICE Hall (10 bar line)*
- *Additional air required in case of power failure*
- *Air volume required for safety parking of lead disc is 0.7 cubic meter @ ~10 bar*

Item:	Progress

Progress

Mechanics:

- 60% of parts done
- test stand designed

Air System:

- basically designed (external review?)
- all valves + interlocks defined
- safety (emergency) systems proposed (OK with RAL?)

Control:

- state diagram in progress

Control:

1) define the state diagrams for
   - *normal operations*
   - *escape sequence (= power failure)*

2) implement in verilog for FPGA

Electronics:
- *circuit design*
- *realisation*
- *test functions*

Item:	To do list

Mechanics:
- complete cuttings, first mech tests (by end of february)
- build stand
- mount mechanics and test

Air System:
- build valve box + front panel
- connect to diffuser (motors)
- test

Control:
- state diagram → circuit
- build circuit + front panel
- connect to air system and test

Reminder:

Ask Daresbury to review controls and electronics plan at earliest possible stage

Make request to Tim Hayler on instrument rack

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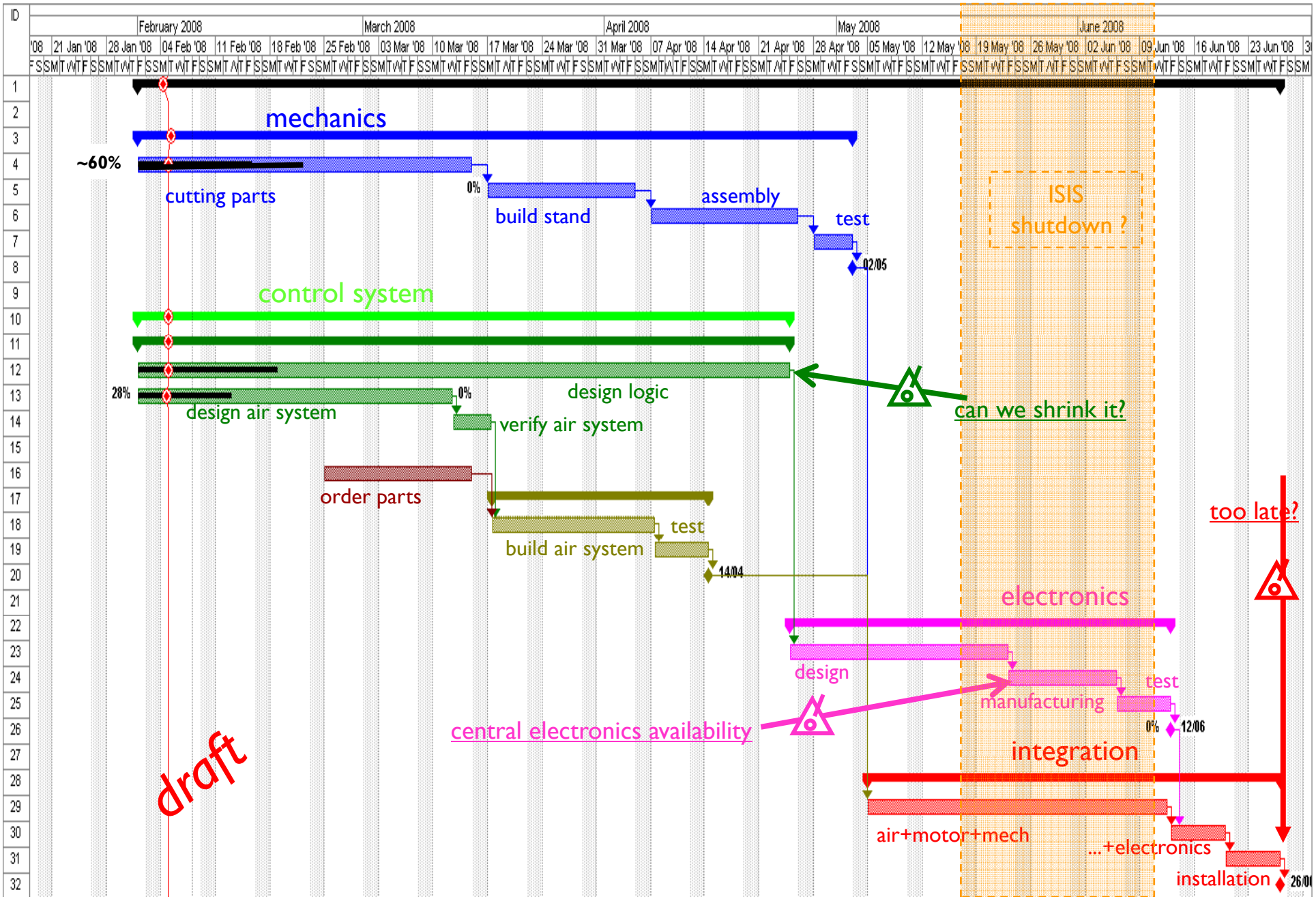
…. Of course the operating manual & associated documentations to follow….

The schedule



Item:	The issue
Overall MICE baseline layout is very valuable, but its usefulness is limited:	

Its very crowded;

It is a huge CAD file

No dimension of datum for placement of beamline elements

Service routes are impossible to visualised

Item:	The issue
Overall MICE baseline layout is very valuable, but its usefulness is limited Its time that we have a 3D CAD assembly of the hall so that …	

External CAD models can be imported

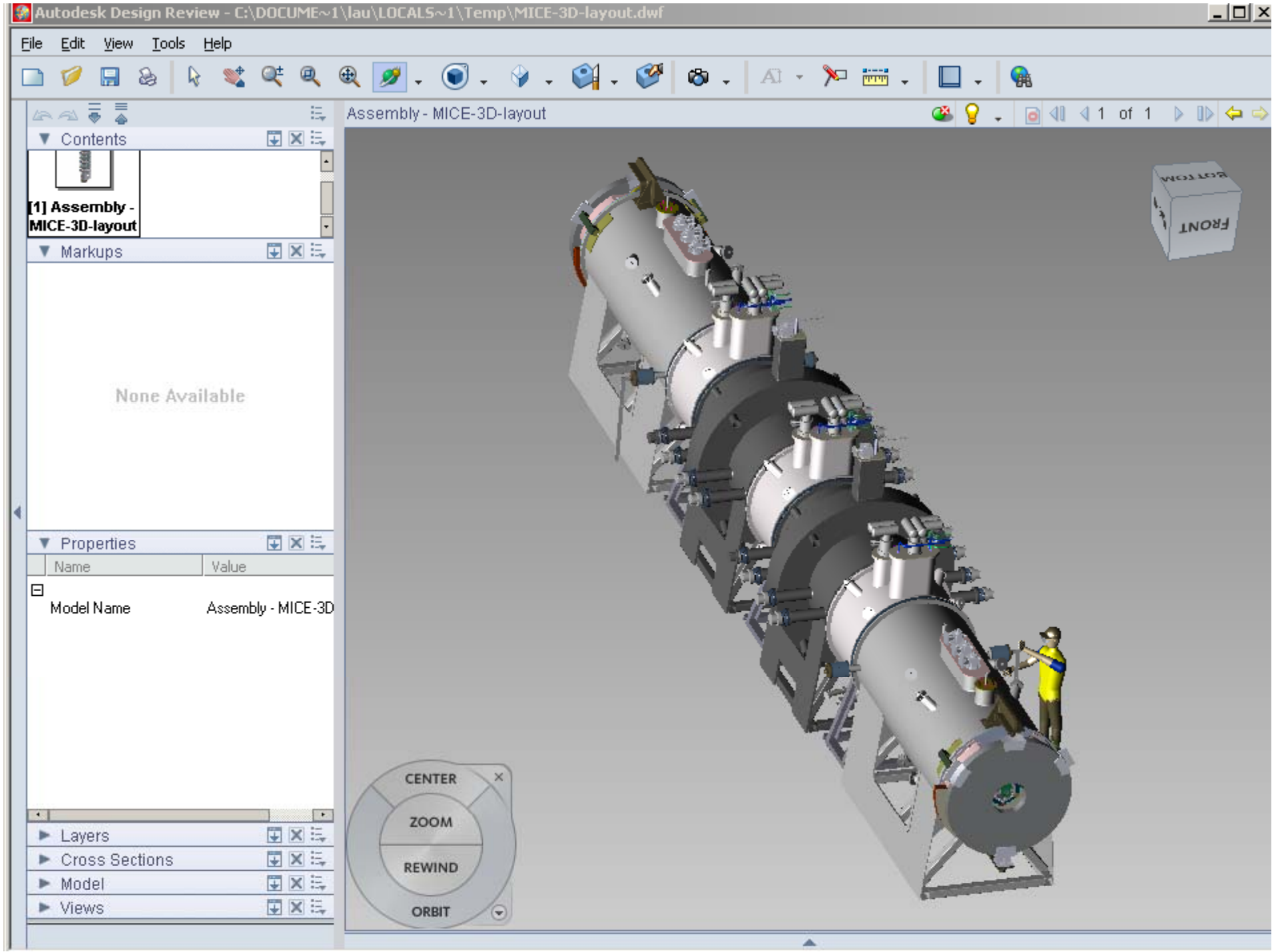
More flexible

Easier to visualise everything

Controlled access by multiple users is easier

……..

Item:	The issue
	Overall MICE baseline layout is very valuable, but its usefulness is limited Its time that we have a 3D CAD assembly of the hall so that … DWF file of 3-D model may be the solution to provide users with all the information that are needed (dimensions, X-sectional views etc) without any impact on the QA control of the drawings


Autodesk Design Review - C:\DOCUME~1\lau\LOCALS~1\Temp\MICE-3D-layout.dwf
File Edit View Tools Help
Contents
[1] Assembly - MICE-3D-layout
Markups
None Available
Properties
Name
Value
Model Name
Assembly - MICE-3D
Layers
Cross Sections
Model
Views
Assembly - MICE-3D-layout
1 of 1
FRONT
CENTER
ZOOM
REWIND
ORBIT

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…. But of course it is a significant engineering overhead……

So …	Conclusion

Engineering integration is a huge task, we are doing our best to make sure that:

- We understand what they are
- We understand their priority
- We spot the discrepancies;
- We have a realistic chance to meet schedule
- We can identify the cost and schedule implication if things slip
- ……

Engineering integration is not a one-man job. We need you to tell us what are the issues and what to integrate

What is more important is we need disciplines to implement them in an orderly manner

Your patience is a pre-requisite to helping us to execute it properly

The punch line …..

What is the difference between a physicist and an engineer?

If an engineer walks into a room and sees a fire in the middle and a bucket of water in the corner, he takes the bucket of water and pours it on the fire and puts it out.

If a physicist walks into a room and sees a fire in the middle and a bucket of water in the corner, he convinces himself there is a solution and asks the engineers to sort it out.