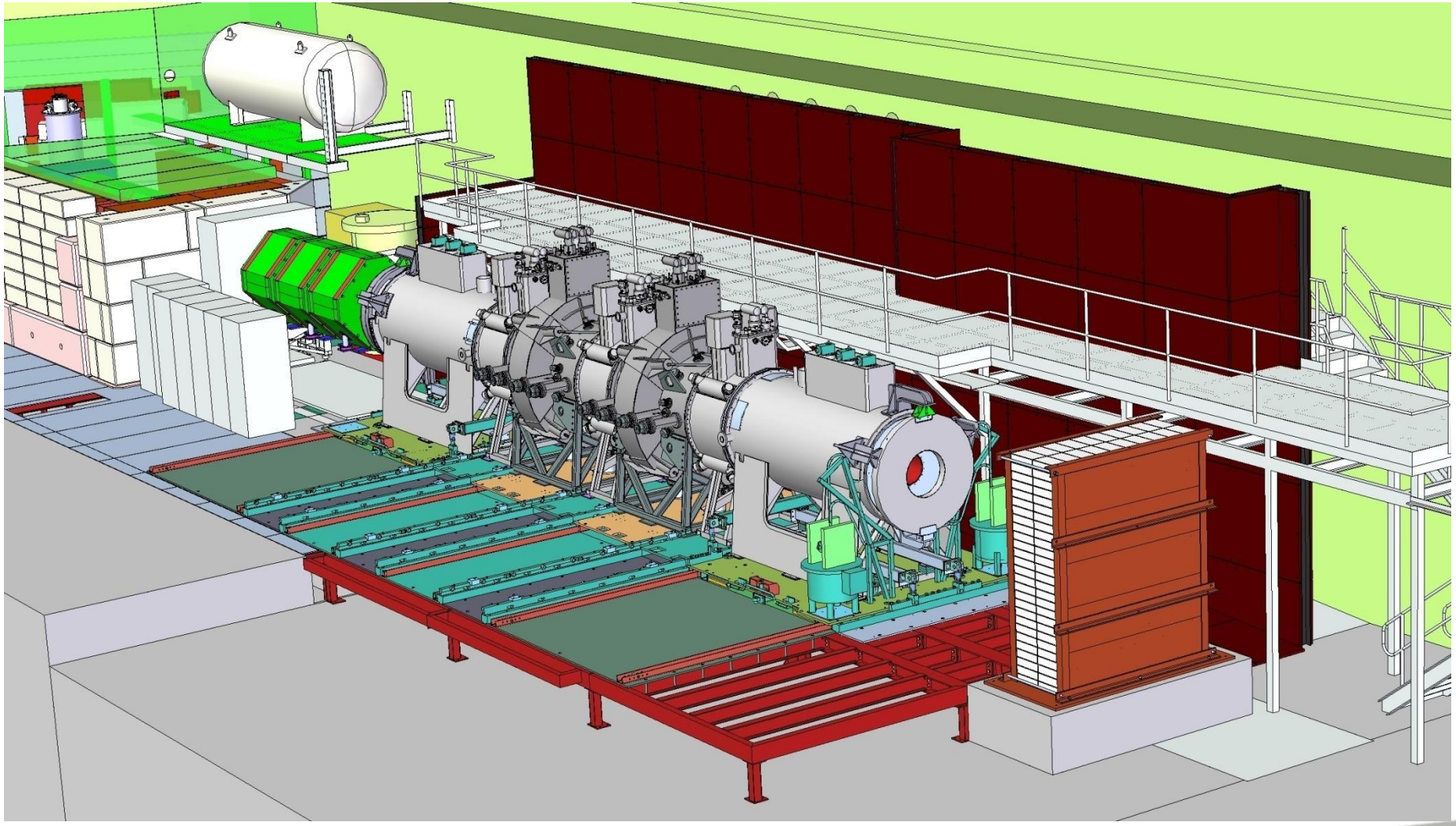
MICE CM27

Engineering integration

Andy Nichols, STFC 9th July, 2010

Just in case we forget what we need to do.....



.....Installation of MICE Step VI in R5.2

Integration

- *Between now and year xxxx, MICE has to successfully build and install several large and complex subsystems, for example:*
  - *Two spectrometers*
  - *Three absorber-focus coils*
  - *Two RF-coupling coil magnets*
  - *And all their services and ancillaries*
- *In a very confined (more confined than we think) space to a reasonable degree of accuracy*
  - *Also have to accommodate several different engineering 'cultures' and standards*
  - *Have demonstrated that a more rigorous engineering approach pays dividends – eg, the MICE target*
  - *Now want to read that across to the other subsystems*
  - *Easier said than done.....*

Integration

- *So we're changing the emphasis slightly, from infrastructure and surroundings to the subsystems and interfaces*
  - *Top level assembly now successfully driven by one (large!) Solid Edge CAD assembly*
  - *We MUST reinforce the RAL/DL engineering team*
  - *Full time integration engineer (Jason) is appointed*
  - *Am now working on support for him*
  - *Monthly MICE Technical Board will be forum for integration issues*
  - *Will build on work already done by Wing & Stephanie*
  - *Integration activity will be centralised at and led by RAL - important*
  - *Discussions just beginning with subsystem owners to encourage information flow*
  - *Jason ready to start mid-late July*

Integration

Lots of detail, but first thoughts from Jason:

Who is point of contact for the system?

What does it do?

How does it do it?

What are its outputs, both required and unwanted (how are the latter dealt with)?

What are the extent of non mechanical interactions (e.g. magnetic, EMC, etc) and is any hardware required to alleviate interaction problems that needs to be accounted for?

What services does it require? Where will they come from? Considerations for routing (space, temperature from, temperature affect on, robustness, crosstalk etc).

What systems, sub-systems & components are being manufactured by who?

What drawing information already exists?

What drawing information is missing (e.g. services)?

What sub-systems or infrastructure are adjacent?

What are its interfaces (parts, infrastructure, etc)? What level of accuracy is defined for the interfaces? Do these interfaces meet at extremes of tolerance? Is there any adjustment in the interfaces?

Is there sufficient space for tooling or inspection equipment to be used on interface connections?

Are there any orientation accuracy requirements (e.g. alignment with beam)?

What are the datum features? What is the accuracy of the datum features?

What standards have been used?

How is quality monitored and controlled?

Safety and requirements for installation & commissioning?

Does it need to be moved again for installation of other subsystems later?

Integration

Even if we don't do anything else, it is vital that we:

- *Define an envelope for each subsystem*
- *Define a stay-clear zone*
- *Define the interfaces*
- *Translate the above into ONE set of top-level reference drawings*
- *The absorber/focus coil interface difficulties would have benefitted from this approach!*
- *Create the drawing depository at last – maybe a mini version of CERN CDD*

Important to remember that this culture must apply across the international project.....