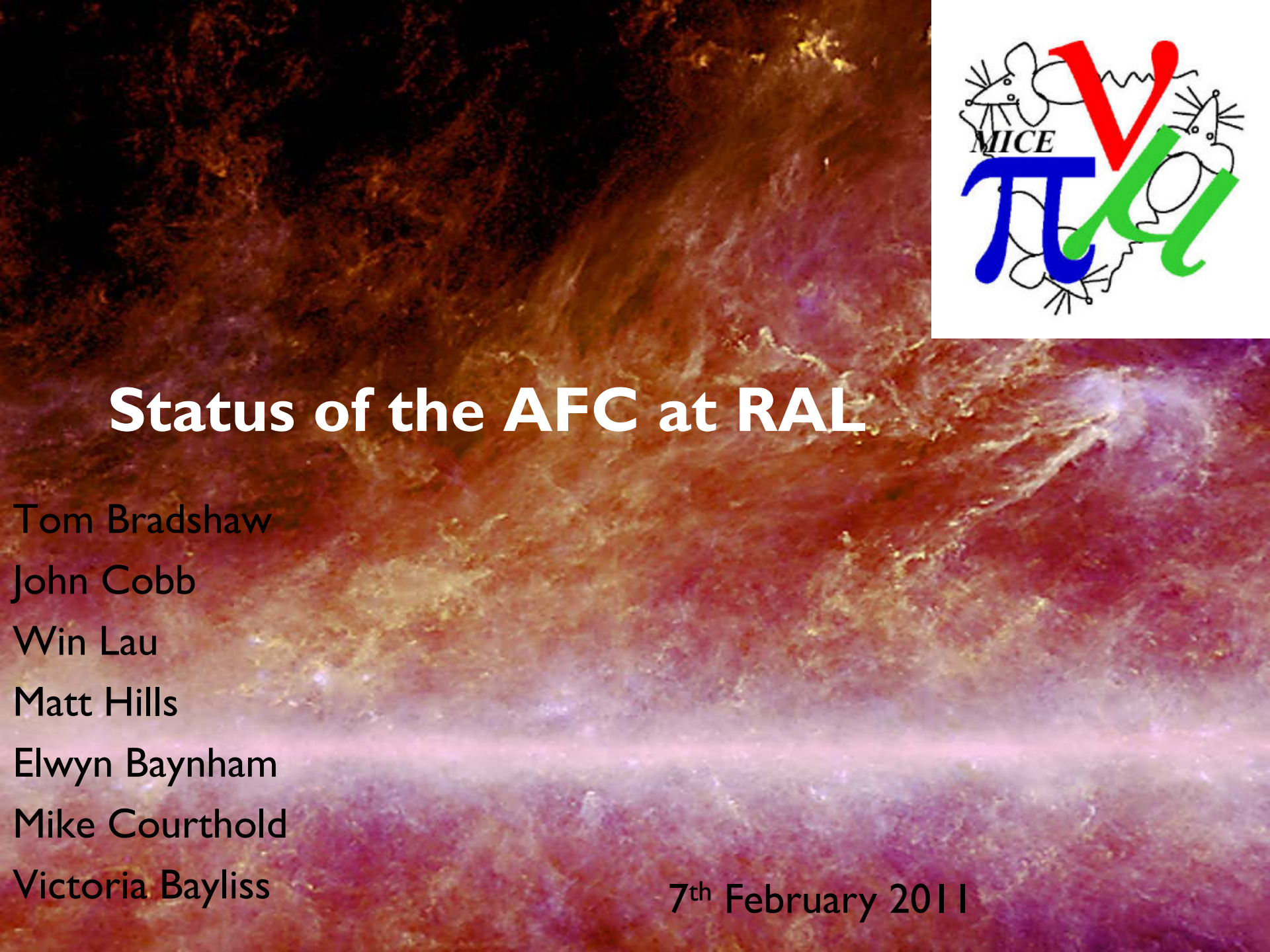


Status of the AFC at RAL

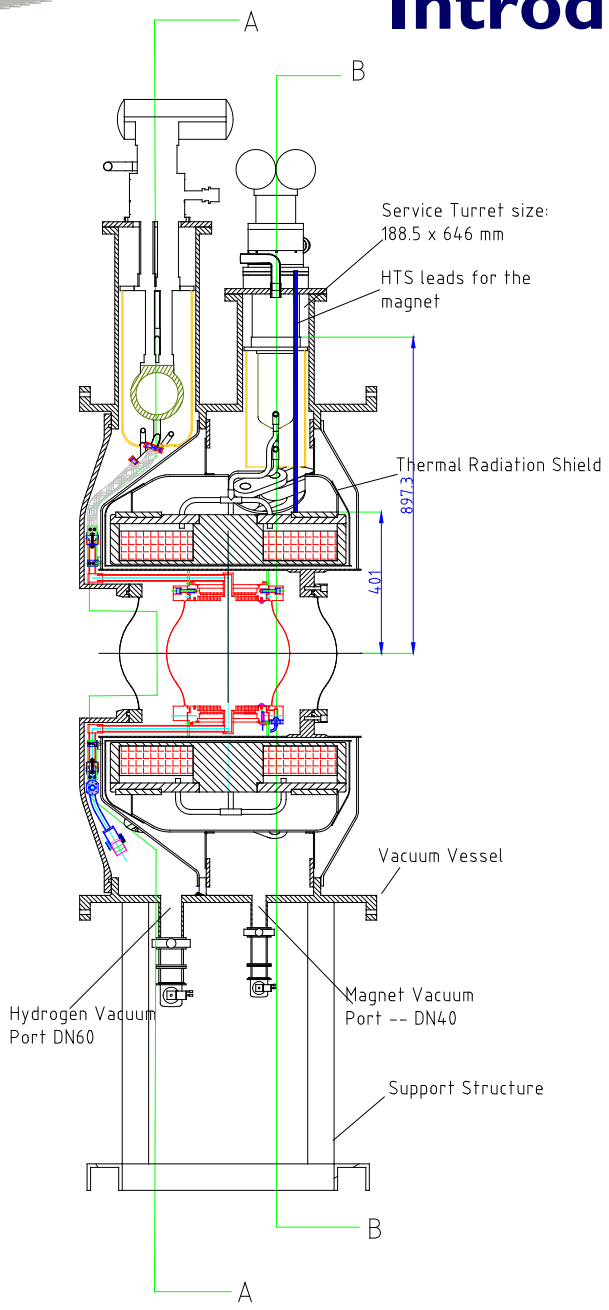
Tom Bradshaw
John Cobb
Win Lau
Matt Hills
Elwyn Baynham
Mike Courthold
Victoria Bayliss

7th February 2011

Introduction

Talk will cover

- Recent progress at TESLA
- Staffing Changes
- Test Plan for AFC at RAL



Recent Progress

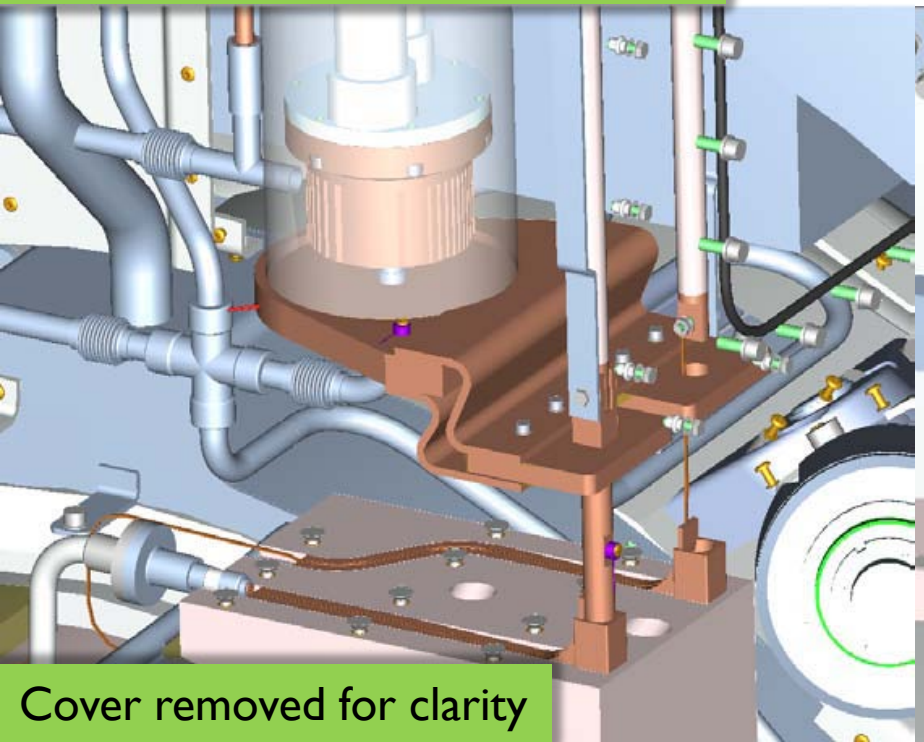
Recent Issues – we have been slow getting the winding started

- Reported last meeting that there was some concern over the loss of bobbin temper after application of insulation. This was completed but there was a delay with remake of G10 insulation (not enough cover in the corners).
- Some high voltage tests have been done on current insulation system. Tests on the 0.3mm G10 showed that it can withstand 3kV for 2 minutes. Tests were done with actual samples and one of the bobbins.
- Tests completed on splice – results obtained in the nano-ohm region. These are being repeated but first indications are excellent.
- Improved thermal contact at top of HTS leads to improve the temperature margin.
- Personnel changes at Tesla mean that we are reviewing items prior to winding to check that issues have not been forgotten.

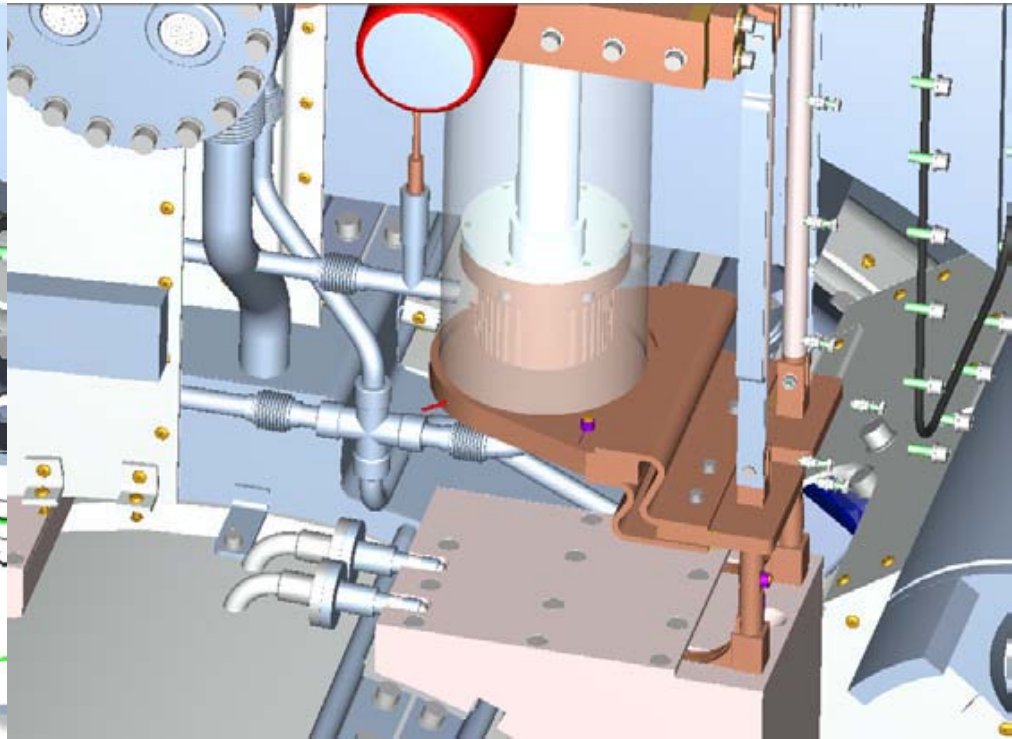
Recent Progress

- Conductor tails - These now exit the coil in a copper half tube which provides good thermal sinking and mechanical support.
- Analysis suggests that this is a good solution and is required.

These are slightly old drawings – the copper channels extend directly into the coil



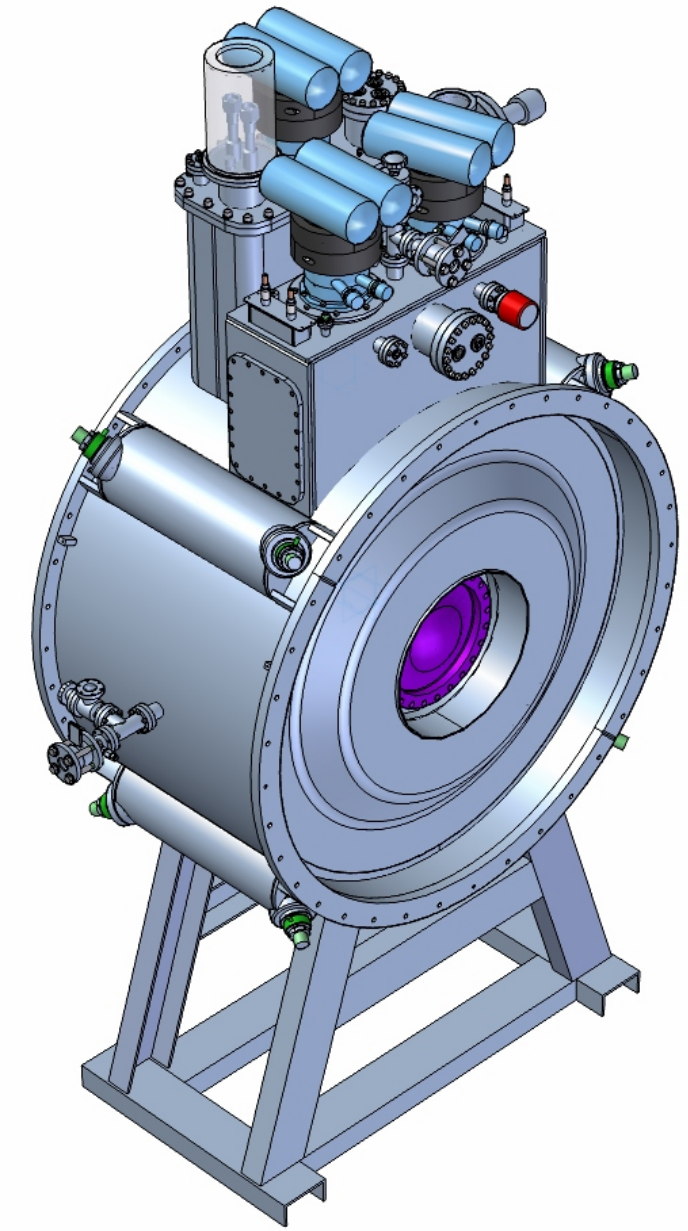
Cover removed for clarity

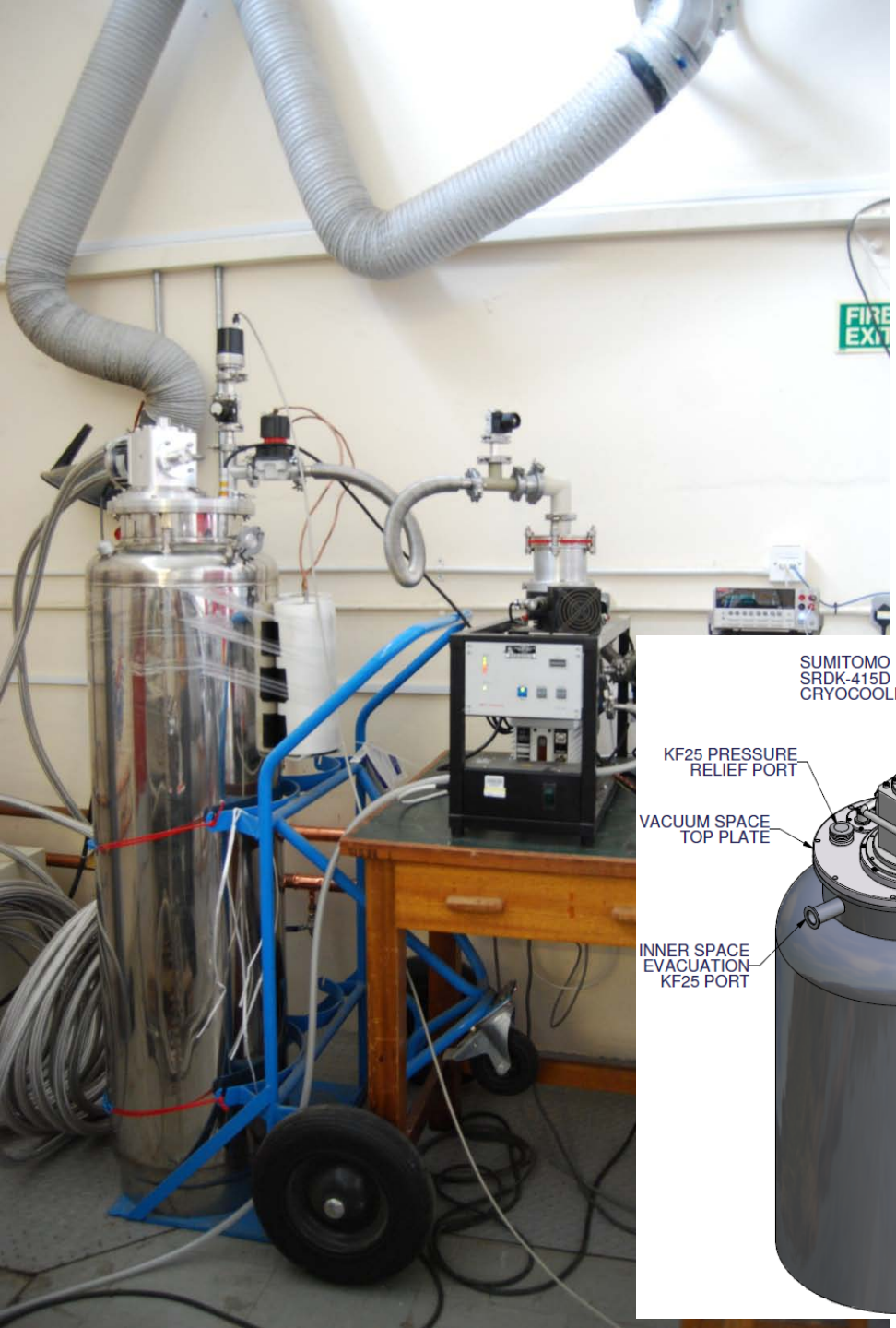


Recent Progress

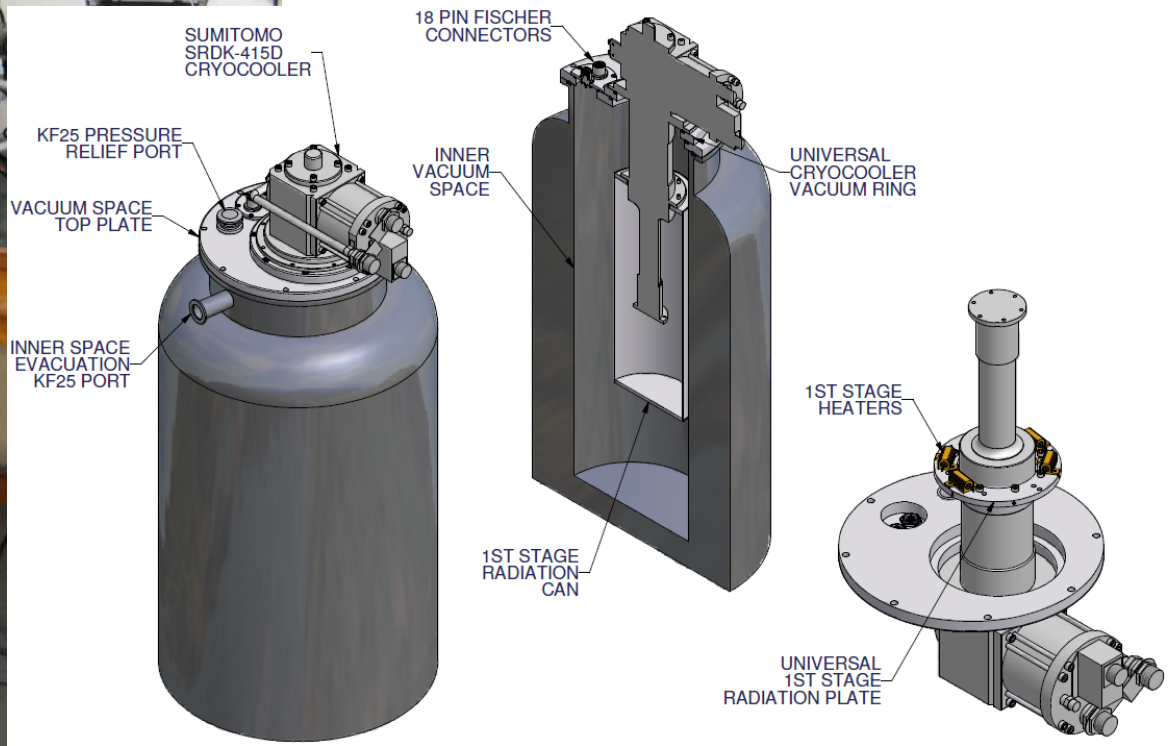
- Assembly sequence "story board" is still being refined – getting the cold mass centre line accurately in the module is proving a challenge.
- Still need Mississippi to scrap a safety window to act as a test piece.

- Quench protection heater sizing is ongoing ...





- We have a test cryostat for checking that the crycoolers meet specification before installation.
- This is at Tesla – we are waiting for a window of opportunity to start tests.



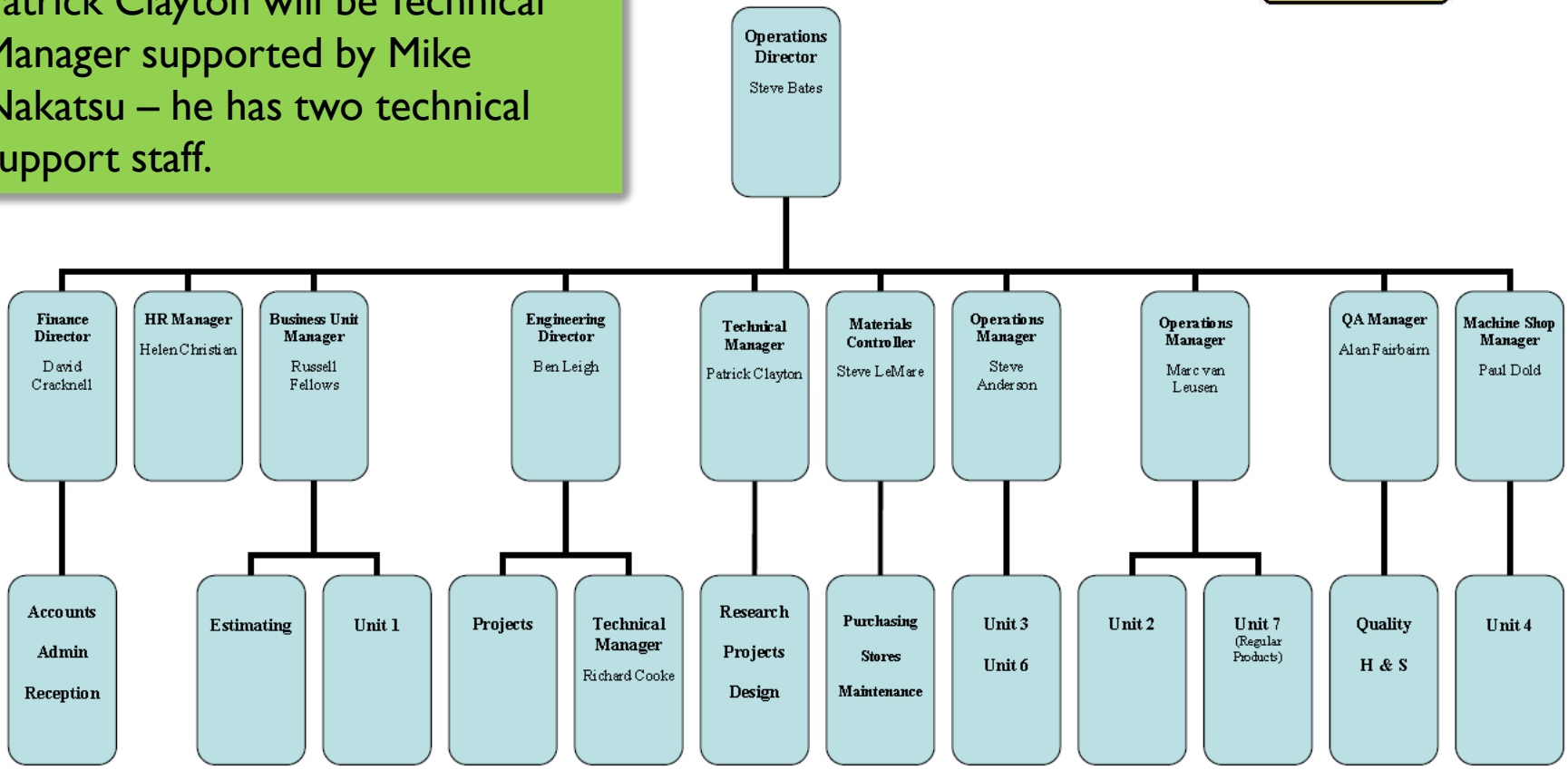
Science & Technology Facilities Council
Technology

Organisation

The recent leaving of Tom Frame – the lead engineer and a frank discussion with TESLA senior management on the lack of progress has precipitated a change of personnel and a reorganisation at TESLA.

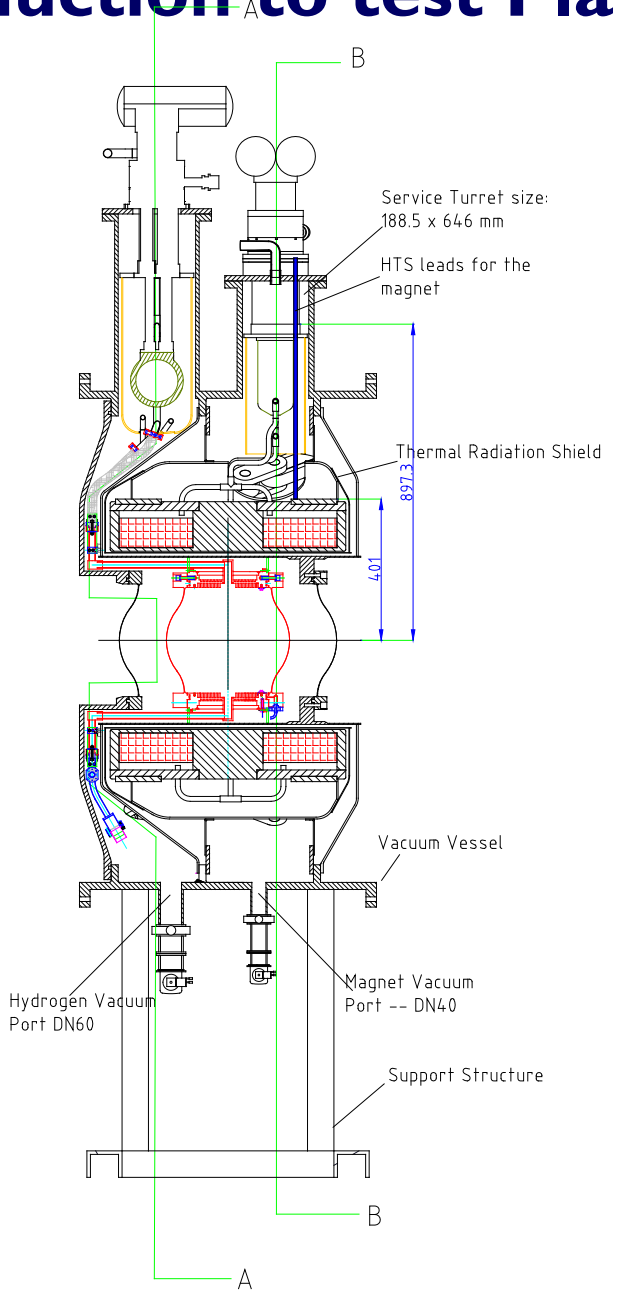
Patrick Clayton will be Technical Manager supported by Mike Nakatsu – he has two technical support staff.

tesla



Introduction to test Plan

- Test plan for the AFC when at RAL
- Special conditions of testing without the lattice means that a support structure will be required for operation of the magnet in the MICE Hall (Item is top heavy and same/similar support will be required for transport.
- Assume that the tests will first be done with hydrogen and the absorber. It may be that the absorber will have to be taken out at the end of the tests to fit a solid one.



Test Plan

- Tesla on-site commissioning and acceptance test at RAL – probably in the MICE Hall
  - Installation
  - Connection of services
  - Cool down
  - Ramp up current

These are the tests which are contractual and represent the final milestone for the delivery of the AFC. It is also an opportunity for us to learn how the system will operate.

Test Plan

- Field Mapping at full field
  - Set-up
  - Mapping
- Absorber integration
  - Fit absorber - check for interferences
  - Integrate with Transfer line
  - Leak check and pump
  - Instrumentation check
- Safety windows
  - Installation
  - Leak check
- Cover plate installation
  - Install
  - Pump down and leak check

This will be done by CERN with OU involvement

We have some tight fitting pipework

Different pump port as normally this would be the MICE vacuum

Test Plan

- Preliminary cool-down
  - Base temperature test
  - Helium condensation
  - Cooling power at 20K
  - Warm-up H2 system
- Hydrogen System test
  - Cool down
  - Part fill with hydrogen
  - Warm-up H2 system
  - Purge
  - Cool & Fill with hydrogen
  - Hold for two days
  - Ramp up field and hold
  - Warm-up H2 system
  - purge

This is a test without hydrogen to test operation and instrumentation. Also the test will thermally cycle the system to check joints.

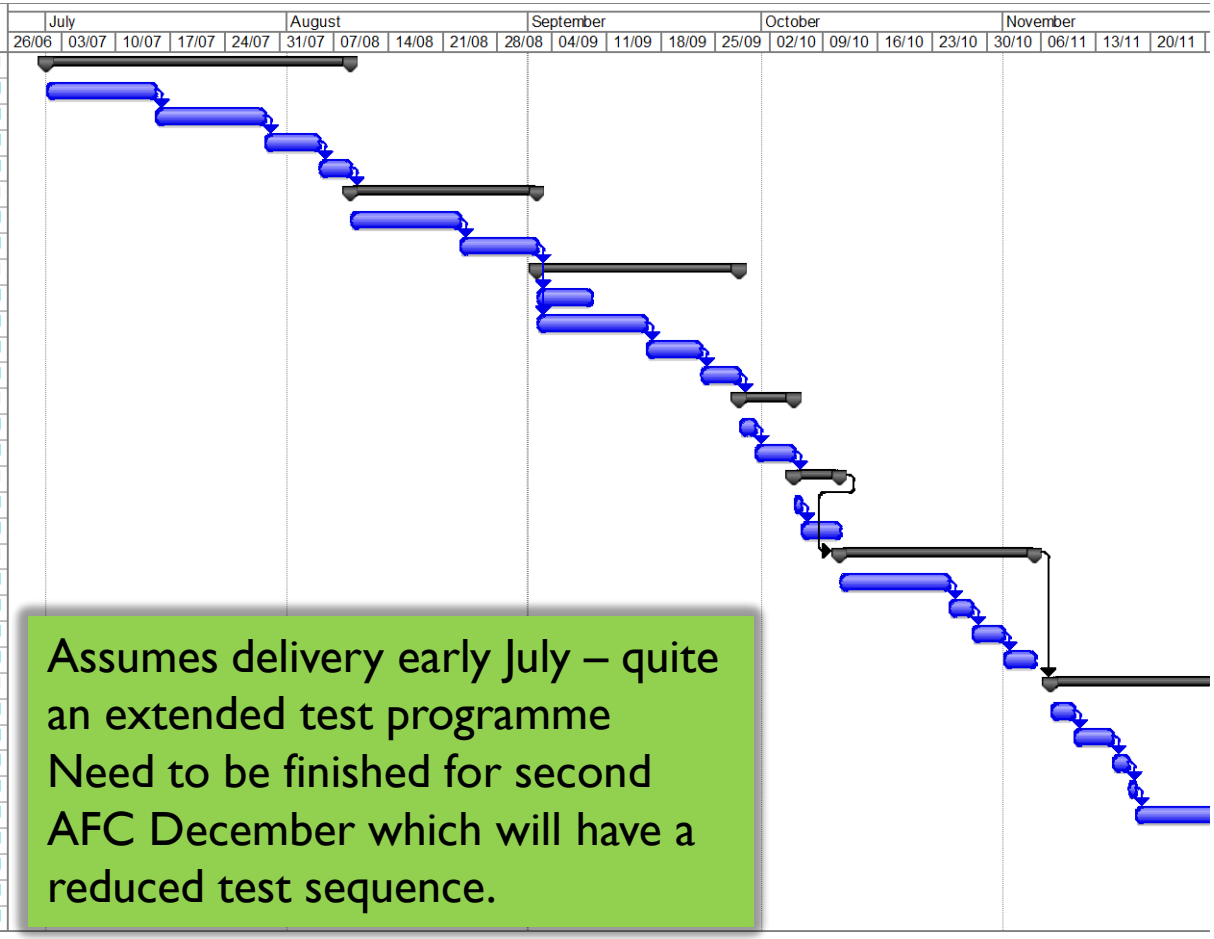
This first part of the test checks the hydrogen fill with a minimum amount of hydrogen to reduce risk.

Second part includes full operational check together with magnetic field in the AFC

Science & Technology Facilities Council
Technology

Schedule

ID	Task Name	Duration	Start	Finish
2	**Tesla on-site commission**	**27 days**	**Fri 01/07/11**	**Mon 08/08/11**
3	Installation	10 days	Fri 01/07/11	Thu 14/07/11
4	Connection of services	10 days	Fri 15/07/11	Thu 28/07/11
5	Cool down	5 days	Fri 29/07/11	Thu 04/08/11
6	Ramp up current	2 days	Fri 05/08/11	Mon 08/08/11
7	**Field Mapping at full field**	**18 days**	**Tue 09/08/11**	**Thu 01/09/11**
8	Set-up	10 days	Tue 09/08/11	Mon 22/08/11
9	Mapping	8 days	Tue 23/08/11	Thu 01/09/11
10	**Absorber integration**	**18 days**	**Fri 02/09/11**	**Tue 27/09/11**
11	Fit absorber	5 days	Fri 02/09/11	Thu 08/09/11
12	Integrate with Transfer li	10 days	Fri 02/09/11	Thu 15/09/11
13	Leak check and pump	5 days	Fri 16/09/11	Thu 22/09/11
14	Instrumentation check	3 days	Fri 23/09/11	Tue 27/09/11
15	**Safety windows**	**5 days**	**Wed 28/09/11**	**Tue 04/10/11**
16	Installation	2 days	Wed 28/09/11	Thu 29/09/11
17	Leak check	3 days	Fri 30/09/11	Tue 04/10/11
18	**Cover plate installation**	**4 days**	**Wed 05/10/11**	**Mon 10/10/11**
19	Install	1 day	Wed 05/10/11	Wed 05/10/11
20	Pump down and leak che	3 days	Thu 06/10/11	Mon 10/10/11
21	**Preliminary cool-down**	**19 days**	**Tue 11/10/11**	**Fri 04/11/11**
22	Base temperature test	10 days	Tue 11/10/11	Mon 24/10/11
23	Helium condensation	3 days	Tue 25/10/11	Thu 27/10/11
24	Cooling power at 20K	2 days	Fri 28/10/11	Mon 31/10/11
25	Warm-up H2 system	4 days	Tue 01/11/11	Fri 04/11/11
26	**Hydrogen System test**	**23 days**	**Mon 07/11/11**	**Wed 07/12/11**
27	Cool down	3 days	Mon 07/11/11	Wed 09/11/11
28	Part fill with hydrogen	3 days	Thu 10/11/11	Mon 14/11/11
29	Warm-up H2 system	2 days	Tue 15/11/11	Wed 16/11/11
30	Purge	1 day	Thu 17/11/11	Thu 17/11/11
31	Cool & Fill with hydrogen	8 days	Fri 18/11/11	Tue 29/11/11
32	Hold for two days	2 days	Wed 30/11/11	Thu 01/12/11
33	Ramp up field and hold	1 day	Fri 02/12/11	Fri 02/12/11
34	Warm-up H2 system	2 days	Mon 05/12/11	Tue 06/12/11
35	purge	1 day	Wed 07/12/11	Wed 07/12/11



Assumes delivery early July – quite an extended test programme
Need to be finished for second AFC December which will have a reduced test sequence.

END