Science & Technology Facilities Council

Focus Coil Update

Oversight Committee meeting

Roy Preece

24th April 2014

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- FC Team
  - Oxford University – J Cobb, W Lau and V Blackmore
  - RAL – T Bradshaw, M Courthold, V Bayliss, S Watson and M Tucker
  - DL – S Griffiths, T Hartnett, C White, I Mullacrane and P Owens

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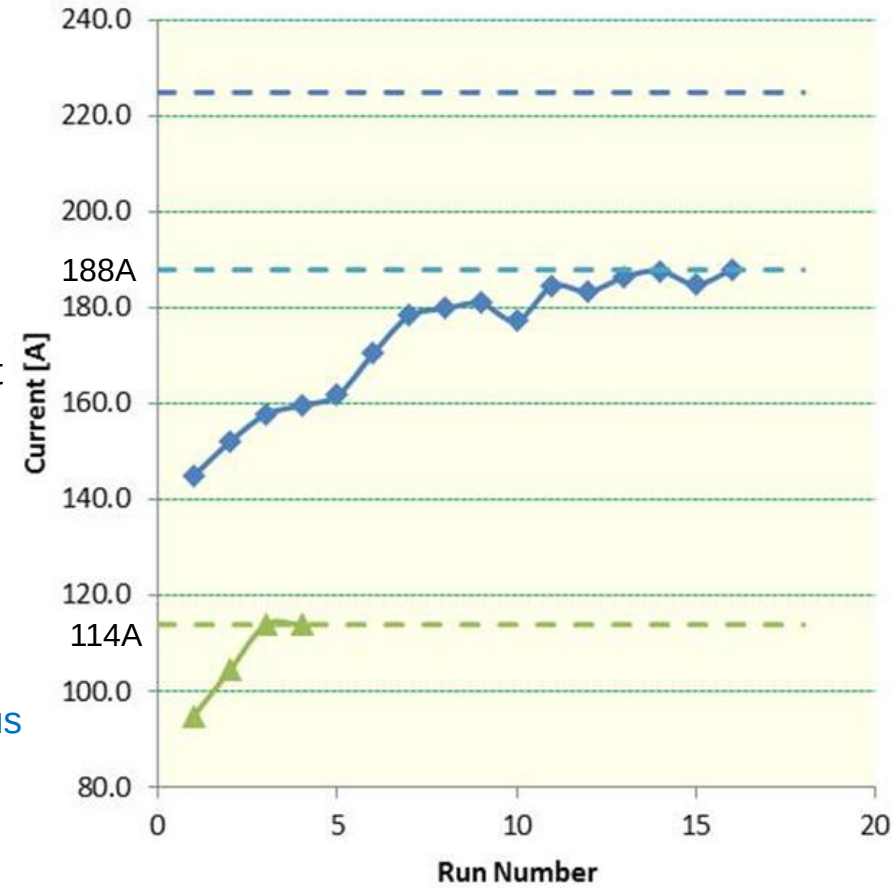
Status at last meeting

- October 2013
  - Full solenoid mode training complete – 114A
    - 240 MeV/C momentum
    - Held for the 2 hours stability test
  - Reached a maximum current of 188A in Flip mode
    - No stability test was carried out
    - Decision for operating at a de-rated current to be made.
  - During this testing period is was known that -
    - The Cold Mass Supports had insufficient tension
    - Cooling at 4K not as anticipated due to insulation being omitted
  - The testing stopped at this point to bring in Focus Coil #2



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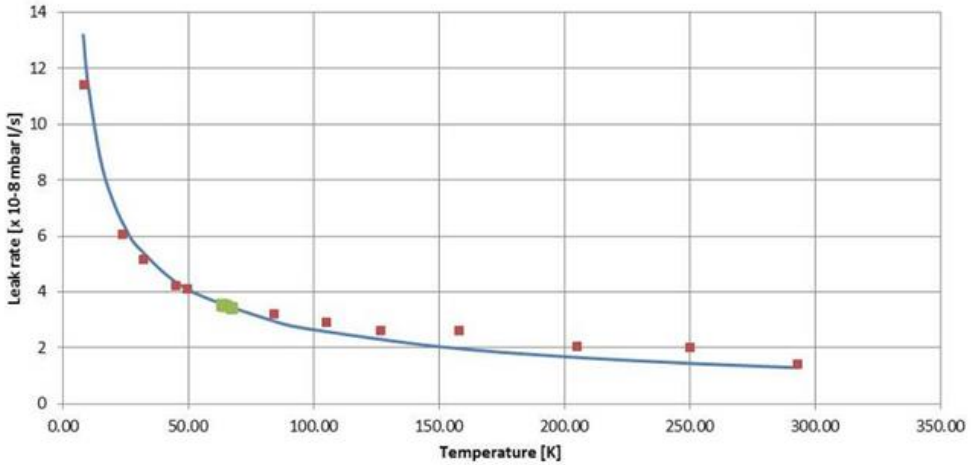
Focus Coil 2 - Findings

- Arrived at the end of October 13 and was pumped on while FC#1 was removed from the test setup.
- Cooling with the cryo-coolers started a few weeks after.
- During the cool down the cold mass bore temp sensor developed a fault.
  - 4 wire sensor, one leg connected to earth
  - Resistances could be used to ascertain a temperature but the lakeshore unit would not read
- Leak in the He system was found
  - Leak rate increased as the temperature dropped
  - The hypothesis is that the leak in on the cold mass, a weld perhaps.
- The temperature of the radiation shield stalled at ~120K
  - Target temp ~60K
  - Condensation on the warm bore was seen in one specific spot
  - Obvious a thermal short – around 90W excess heat load on the 1st stage



Focus Coil 2 - Findings

- Focus Coil #2 shipped back to Tesla for investigation work
- Warm bore removed - some damage to the MLI found but not enough to cause such a large heat leak.
- Warm bore / Cold mass bore not concentric – around 3mm off of centre – Still only a portion of the het load
- Reason found to be the waste material from a pop rivet pressing the MLI to a thermal short.
- No evidence of why the sensor stopped working below a certain temperature.

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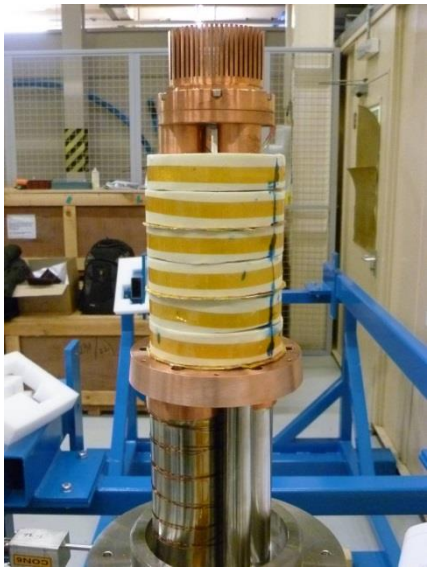
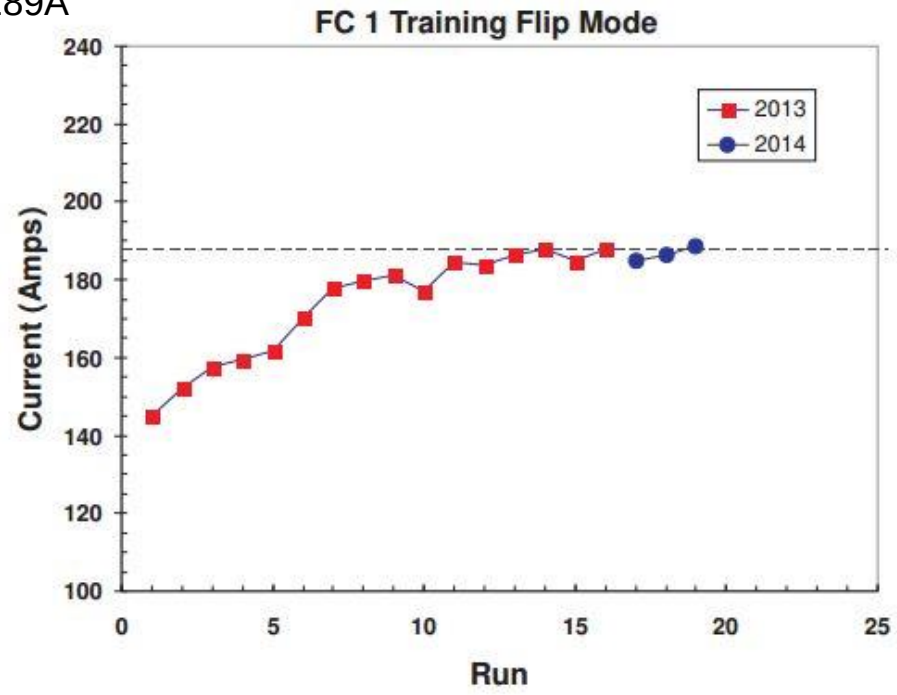
Focus Coil 1 – Back in test position

- Insulation around cooler installed
- Cold Mass support tightened



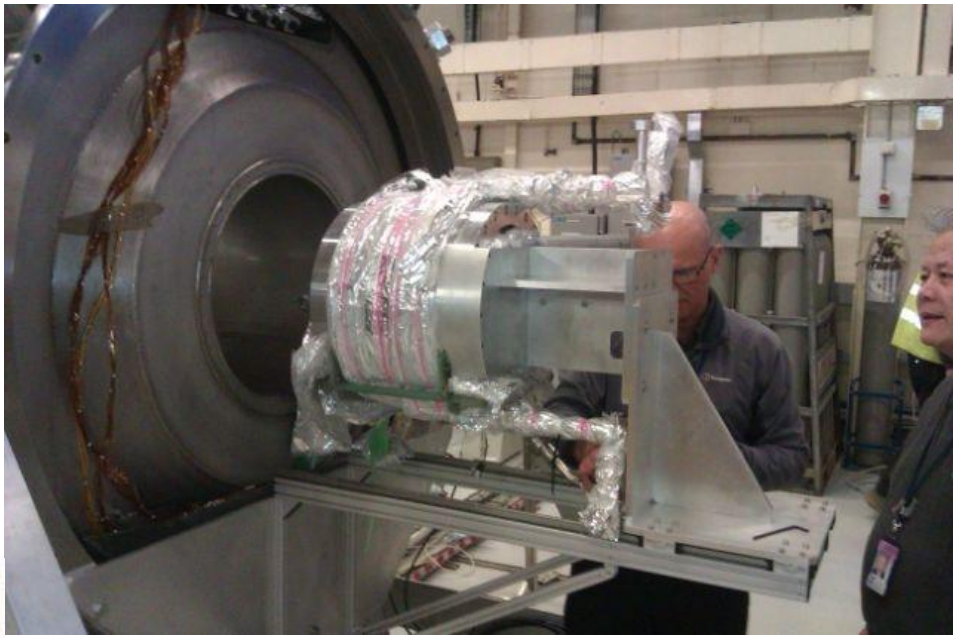
- Magnet cooled and prepared for re-training
- With the insulation added it was noted that the cooldown phase was a little better.
- Turn around time after quench to ready for power was decreased.

- Training re-started and the first run quenched at 185A, just 3A from where the magnet testing had been left. *Remember it's training??*
- Subsequent runs did increase to a maximum of 189A
- Magnet held stable for 4 hours at 185A



Absorber fit check

- Insertion tooling manufactured
- Some adjustment of the Turret / Absorber lines



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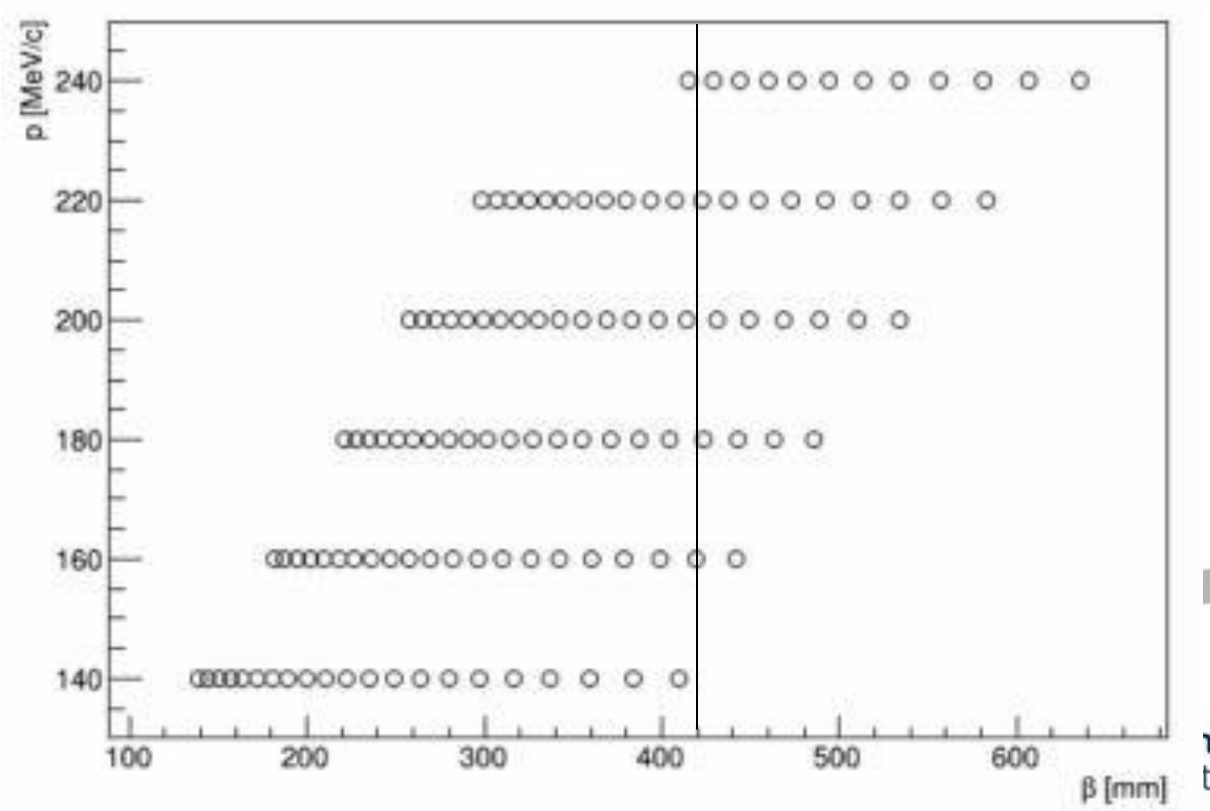
De-rating of the current for Step IV

- Running with Focus Coil #1 (with current operational boundary conditions) operation would required a de-rating for Step IV running.
- 200 MeV/c operational current 188A
- Stable at 185A but this would not give any tuning during lattice operation.
- De-rating factor of 0.85 to allow for the Stick-shift quenching of the coils
- Equates to ~ 160A for operations
- There are a range of momentum and Beta values that can be used for running of the experiment in Step IV



Future Plans

- Receive Focus Coil #2 as soon as possible – current schedule is mid May
- Map Focus Coil #1 in Flip mode, while pumping on Focus Coil #2
- Swap Focus Coil #1 for Focus Coil #2

- *Take Focus Coil #1 to hall and use for fit checks – to be confirmed*

- Cool and power Focus Coil #2 (this magnet has not seen power as yet)

- Dependant on the results from Focus Coil #2 the decision to use Focus Coil #1 at a de-rated operation value or use Focus Coil #2 can be made.

- Decision point for which magnet to use will be - end July 14
- Latest Focus Coil arrival in the hall – November 14