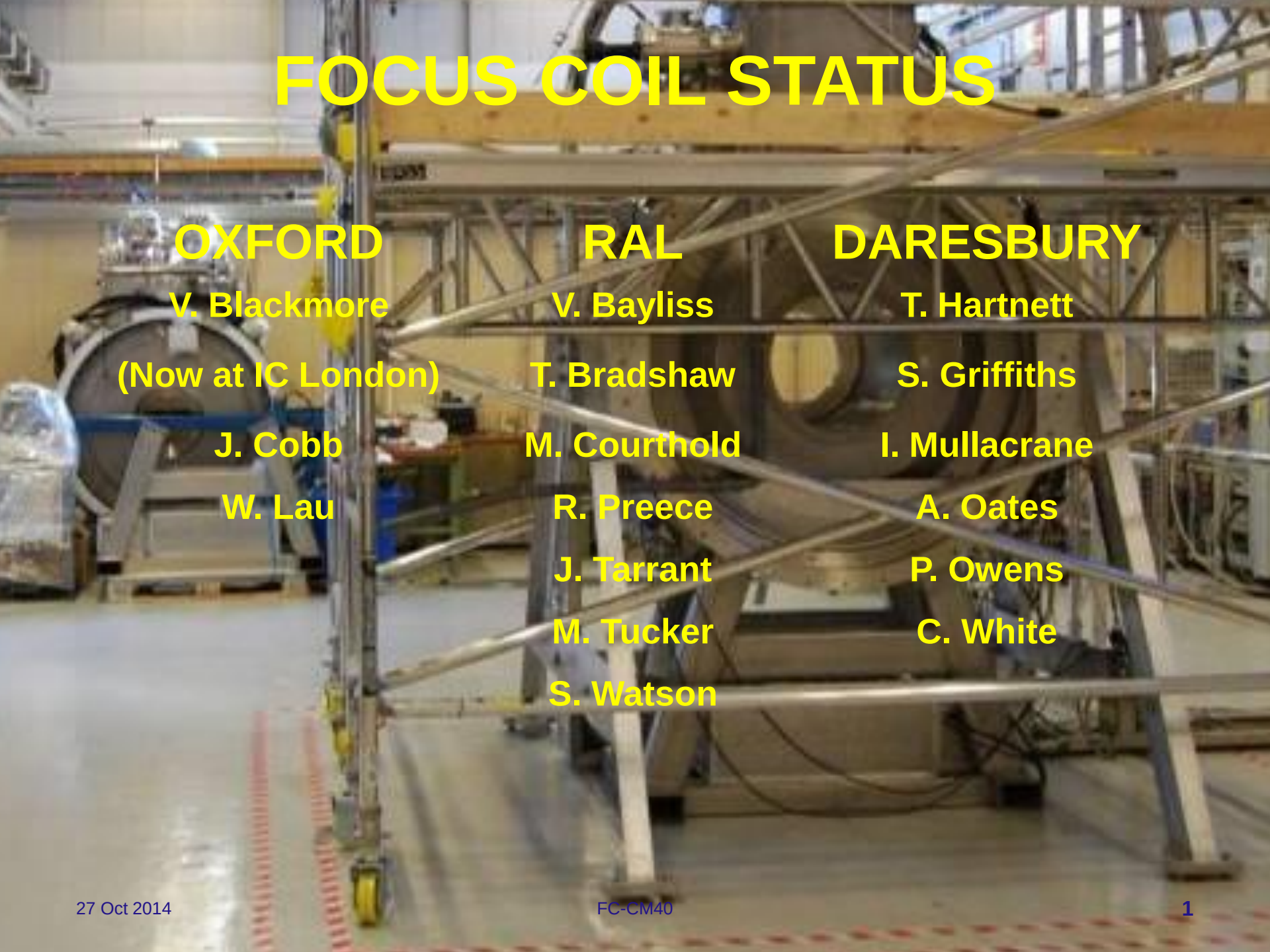
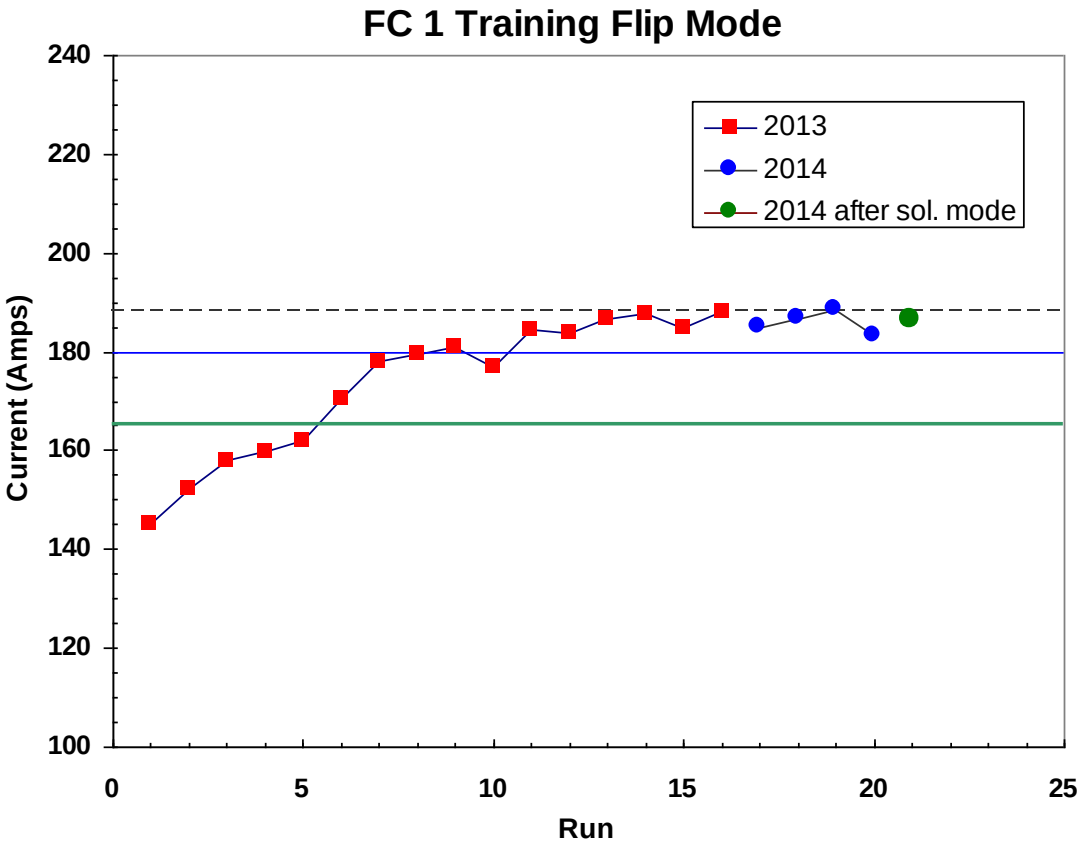
FOCUS COIL STATUS



OXFORD	RAL	DARESBURY
V. Blackmore	V. Bayliss	T. Hartnett
(Now at IC London)	T. Bradshaw	S. Griffiths
J. Cobb	M. Courthold	I. Mullacrane
W. Lau	R. Preece	A. Oates
	J. Tarrant	P. Owens
	M. Tucker	C. White
	S. Watson	

FC 1 @ *CM39*

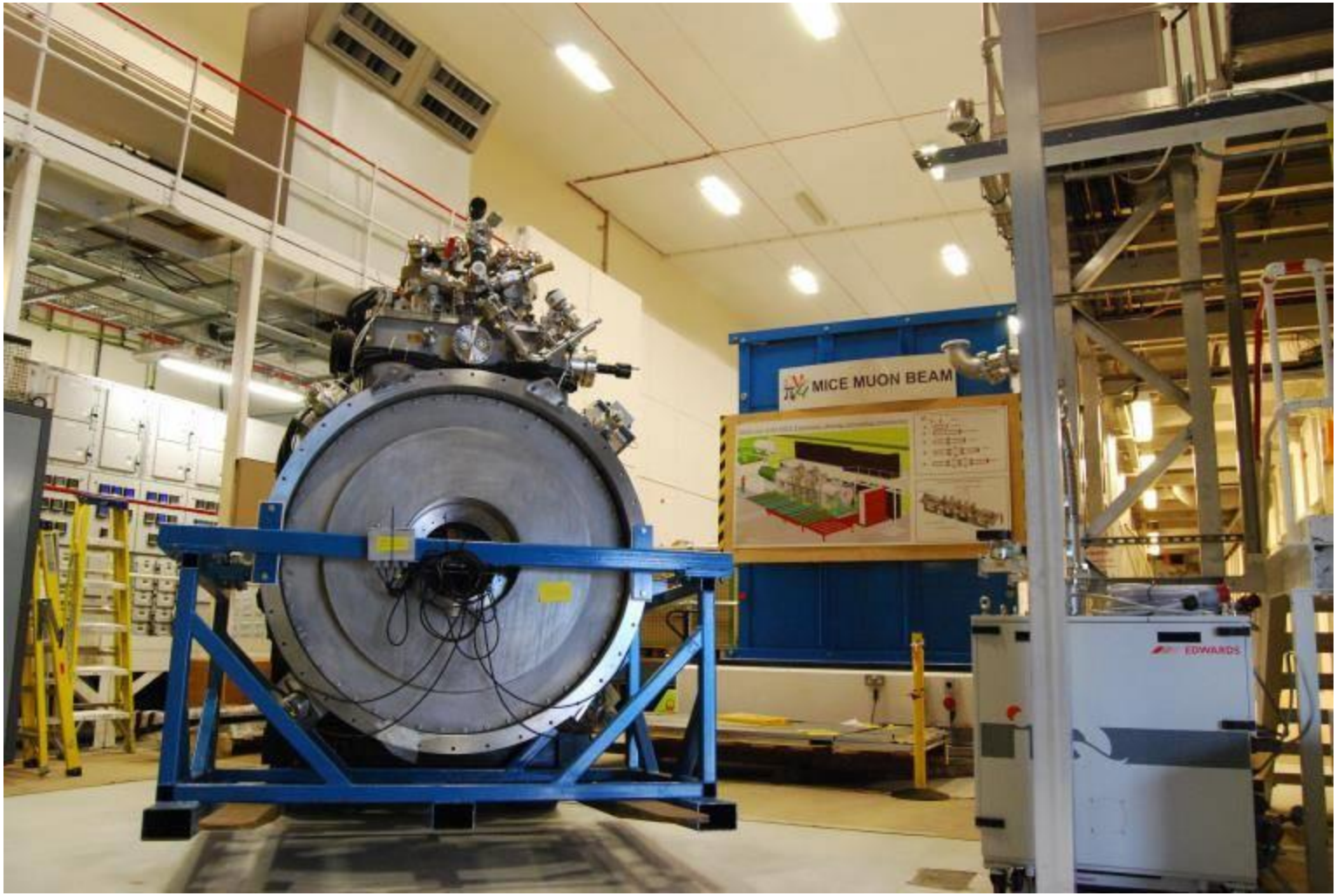


Remembers its training

Stable at 180 Amps for 24 hours

***May* have to de-rate for Step IV to ~ 165 A (a guess)**

FC 1 NOW IN HALL



Moved to Hall 19 June

FC 2

- **FC 2 arrived end October 2013**
  - **Connected**
  - **Pumped down**
  - **Started to cool with cryocoolers**

- **Three faults:**
  - **Faulty temp. sensor**
  - **He leak**
    - **Worse when cold**
  - **Thermal shorts**
    - **Couldn’t cool cold mass…**

- ***Returned to manufacturer in January***

FC 2 PLANS @ CM39

FC 2	*Start*	*Duration*
Cooldown	2 Jul	3 weeks
Solenoid mode training	24 Jul	2 weeks
Flip mode training	7 Aug	10 weeks

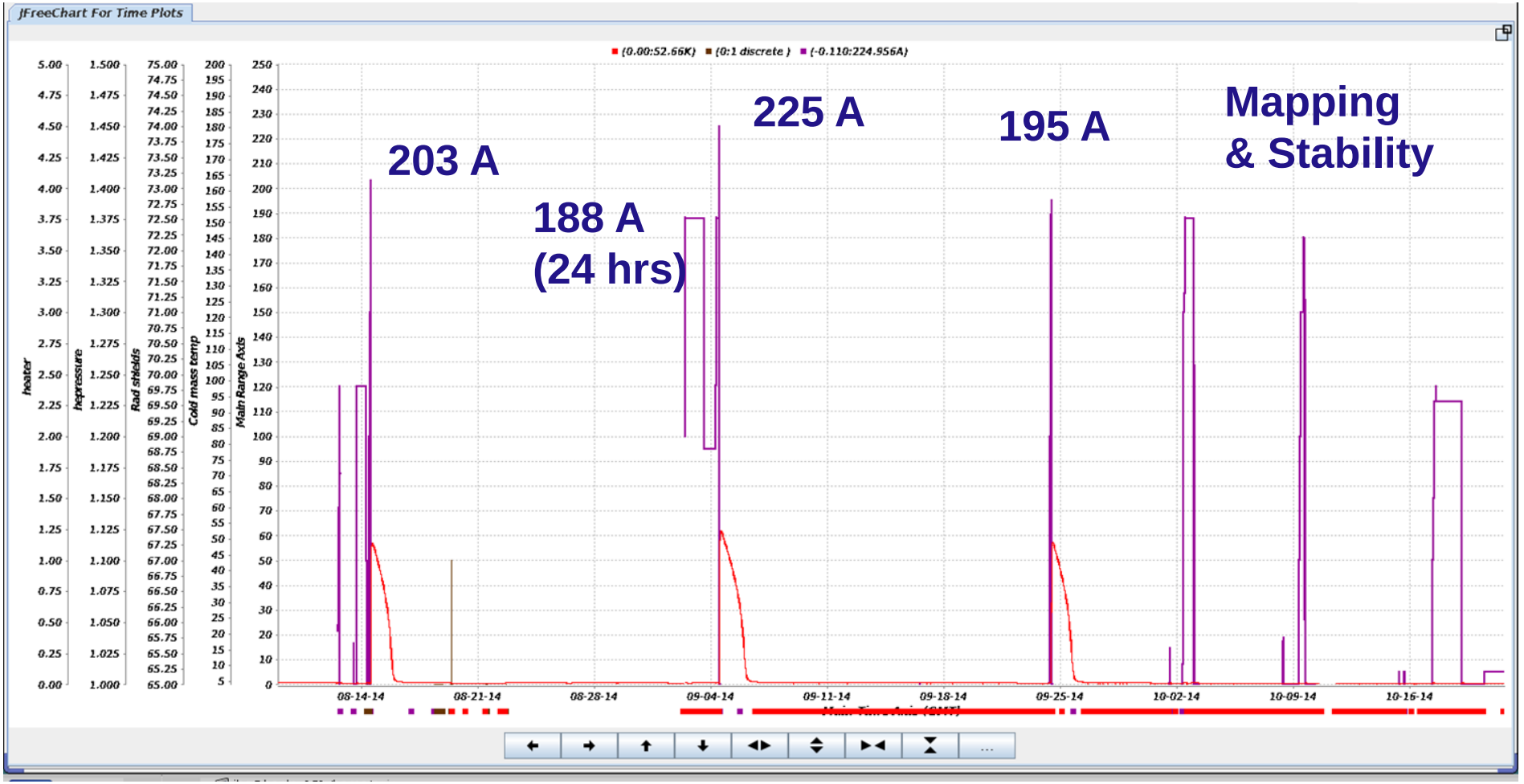
Know by mid-September if FC 2 better than FC 1

It is

Know much* sooner *if He leak is a real problem

It isn't

FC2 HISTORY – CURRENTS



Two *true* quenches; one – 225 A – caused by hard limit in psu

SUMMARY

120 A solenoid mode (114 A = '240 MeV/c') – *first try*

Quench at 203 A in flip mode – *first try*

24h @ 188 A flip mode

225 A and rising in flip mode….
Controller hits hard limit → fast ramp down → (quench) !!!

Quench at 195 A in flip mode

188 A for 12 hours *then psu ramps down*

Mapping…. various currents

114 Amps solenoid mode for 43 hours *then psu ramps down*

The controller has prevented sensible stability tests

AMI CONTROLLER MISBEHAVIOUR

Ramped down after 24 hours at 188 Amps
Ramped down after 12 hours at 188 Amps
Took over during ramp down after ~ 8 hours at 170 A

AMI controller swapped

Ramped down after 43 hours at 114 Amps
Ramped down after 42 hours at 5 Amps
"Quench detect" light on AMI controller with zero current

Unplug Ethernet cable
Ramped down after 68 hours at 5 amps (as of 25/X/14)

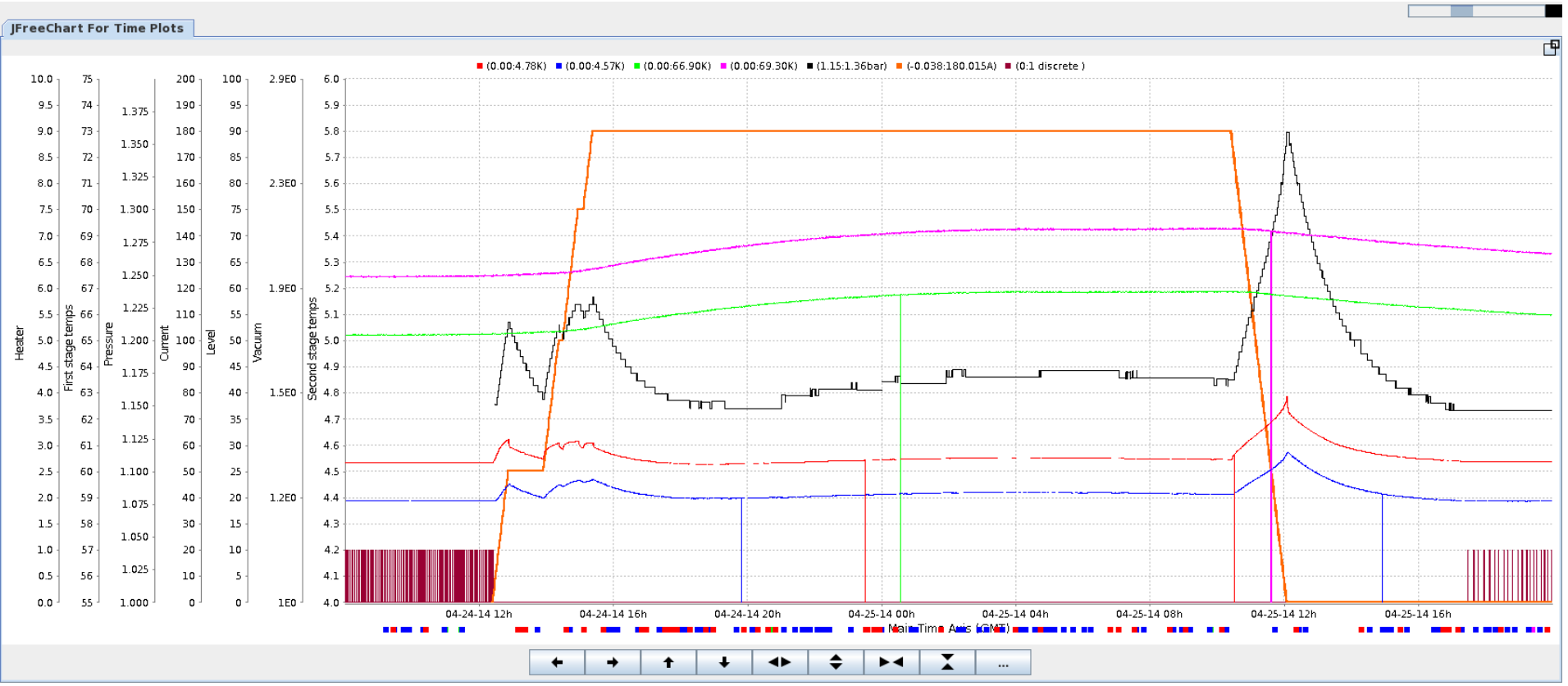
Mean time between spontaneous ramp downs is about 30 hours

Slight indication that it's more likely at higher currents (> 114A) ?

DL people looking at this; need to check mains stability

No use as it is…

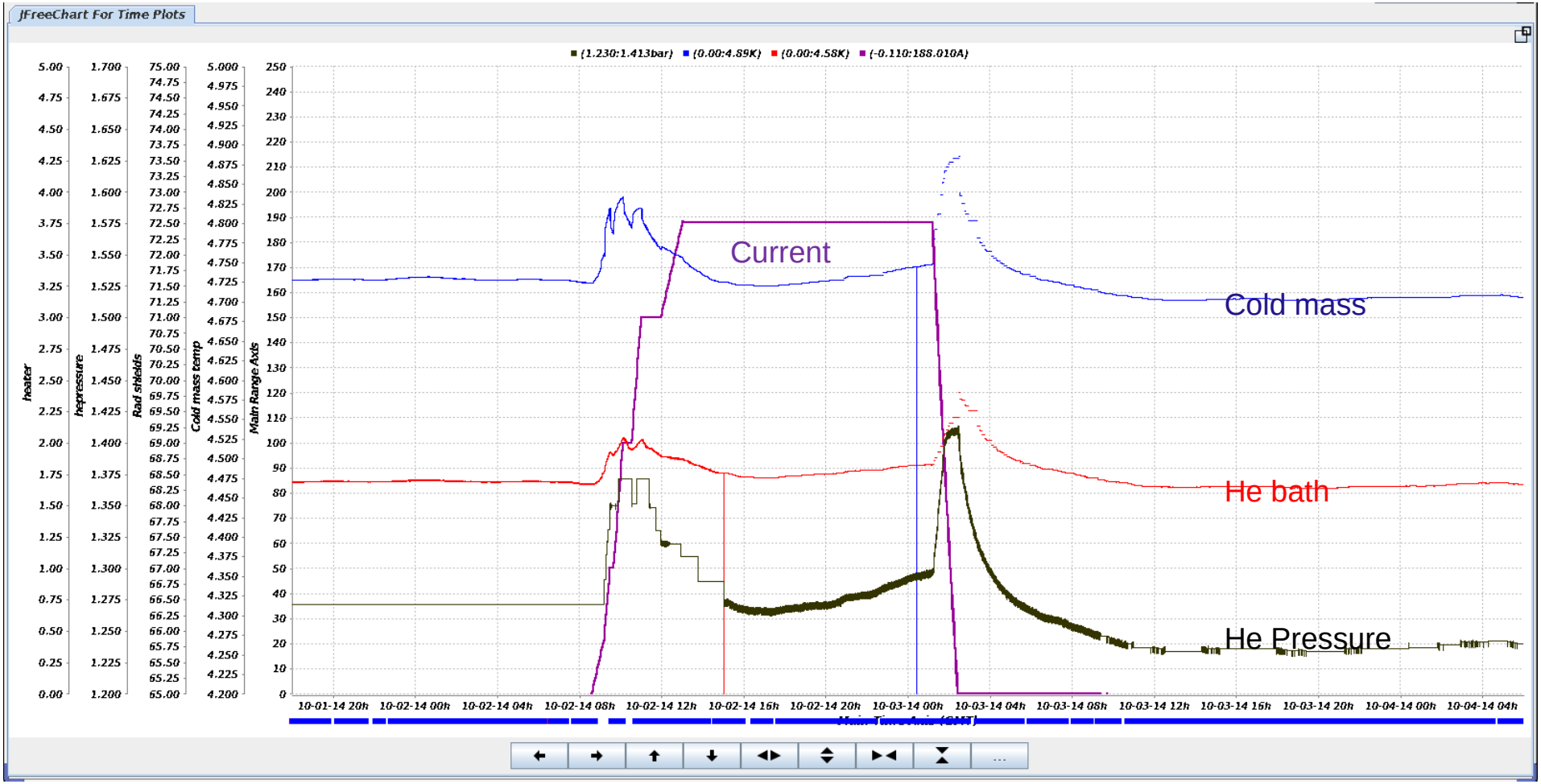
FC 1 THERMAL BEHAVIOUR



Heater operates to stabilise He temperature & pressure

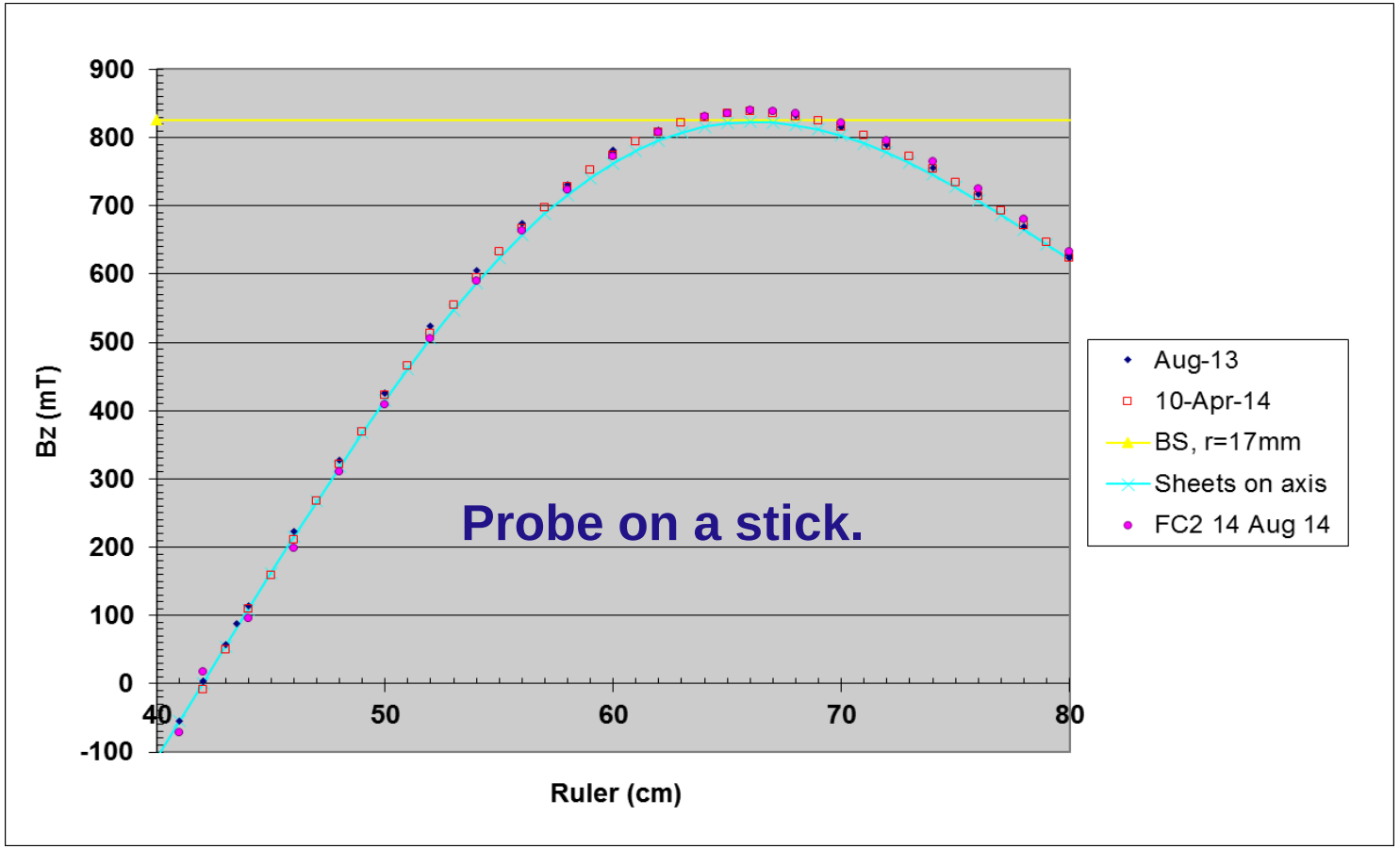
➔ Some excess cooling power – but little and < expected

THERMAL PERFORMANCE FC 2



Heater never operates; less excess cooling power than FC1
But doesn't seem to be show stopper – there is plenty of temperature margin

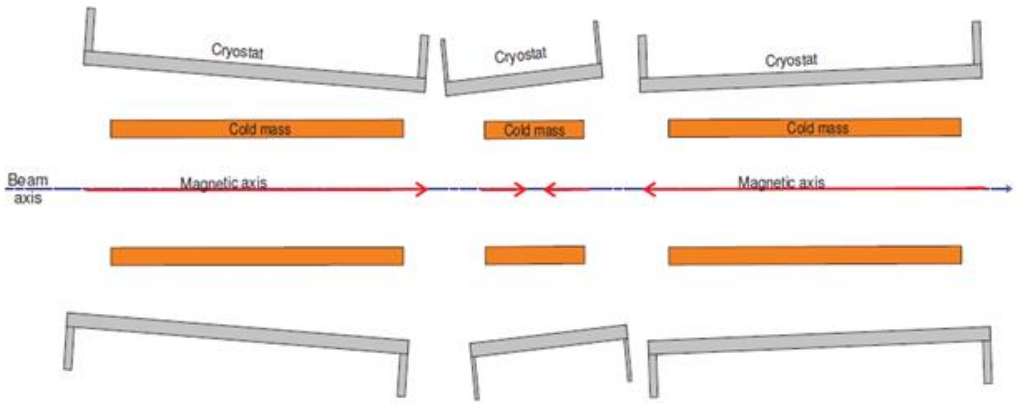
FIELDS & MAPPING



FC1 ~ FC2 and both ~ 1.5 % > calculation (see V.B.'s talk)

We might not understand the (cold) dimensions of coils

FINDING THE MAGNETIC AXIS



Need to know position of *magnetic axis* to 0.25 – 0.5 mm to align axes of modules to beam axis

‘Magnetic axis’ means perpendicular components of B = 0

Mapper measures Bx, By, Bz on circles at 30, 60, 90… mm from axis (compare with 0.25 mm)

From V.B.'s talk

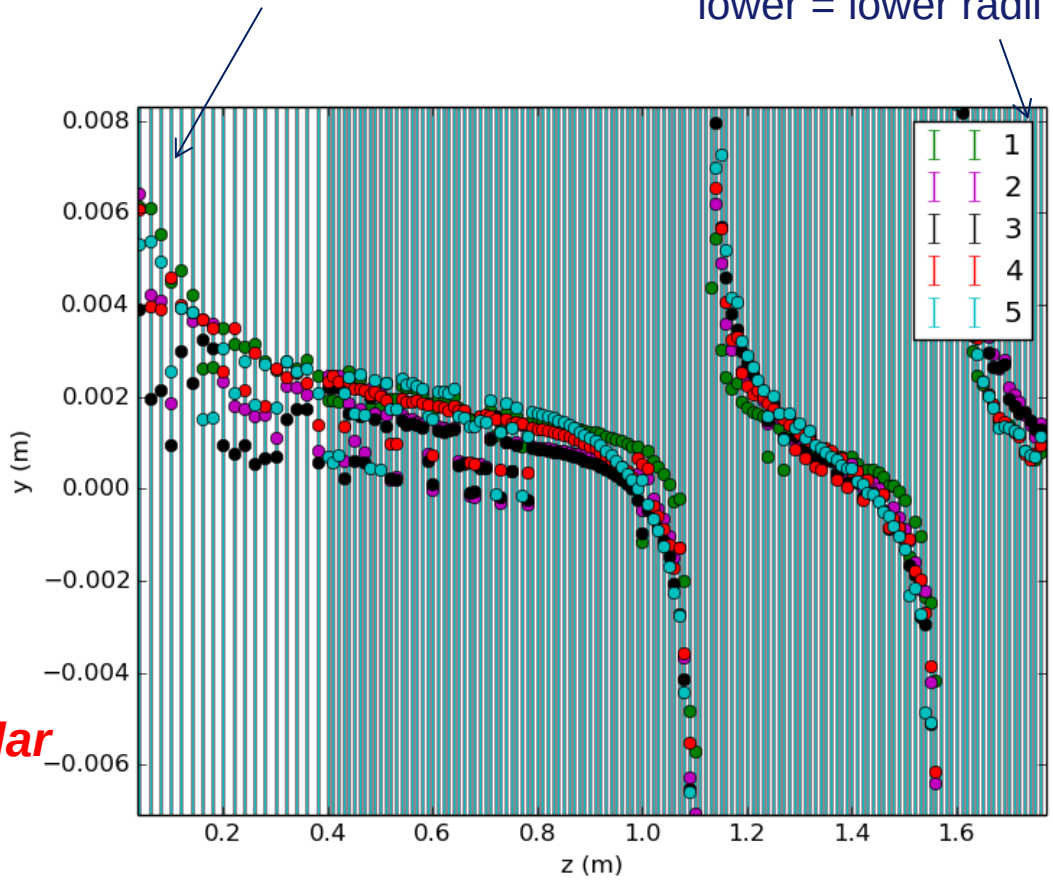
Finding the magnetic axis (y, FC2@150A)

- Uses:
  - **Alignment of cooling channel**
  - Better fits to coil dimensions for realistic MAUS field maps

$$B_y \cong my + c + \alpha B_x + \beta B_z$$

This isn't a "pretty pattern". They're the error bars from Minuit!

Hall probe ID, lower = lower radii



My attempts with FC1 look similar

➔ Much to understand (too much data)

PLANS

Understand & fix PSU / AMI controller behaviour

Finish stability tests on FC2 at 188 A

Explore limits of / training curve of FC2 up to 225 A

Swap FC2 ←→ FC1

Continue to understand mapper data to find axis

Repair FC1 ?

Estimate is ~£500k + 18 months

But not knowing what went wrong means fix not guaranteed

➔ Large risk

THE END