

Spokesman's update

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PAPERS

Papers in progress

| Title | Contact | Comment |
|---|---------------|--|
| Step IV physics | | |
| First measurement of emittance in Step IV | V. Blackmore | Preliminary results made public. Results being finalised so publication can be prepared. |
| Measurement of scattering distributions in MICE | R. Bayes | Preliminary results made public. Results being finalised so publication can be prepared. |
| Ionization cooling demonstration | | |
| Design and expected performance of the MICE demonstration of ionization cooling | J.B. Lagrange | Anticipate revised draft this week. Will be circulated once more before submission. |

| Title | Contact | Comment |
|---|-------------|---|
| Technical | | |
| The design construction of the MICE Electron Muon Ranger | F. Drielsma | doi:10.1088/1748-0221/11/10/T10007 |
| The Reconstruction Software for the MICE Scintillating Fibre Trackers | A. Dobbs | arXiv:1603.07143 Accepted by JINST |
| The MICE Analysis and User Software framework | D. Rajaram | In preparation |

- **Emittance paper:**

- **Working through bias and resolution issues**

- **Scattering paper:**

- **Passed first internal referees' meeting**
- **Many minor issues to be resolved**

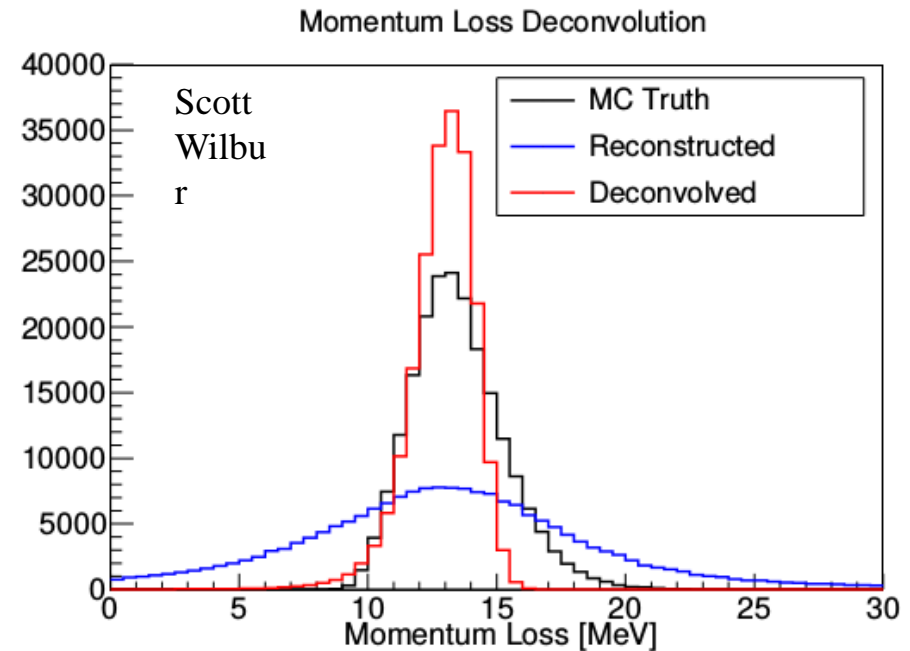
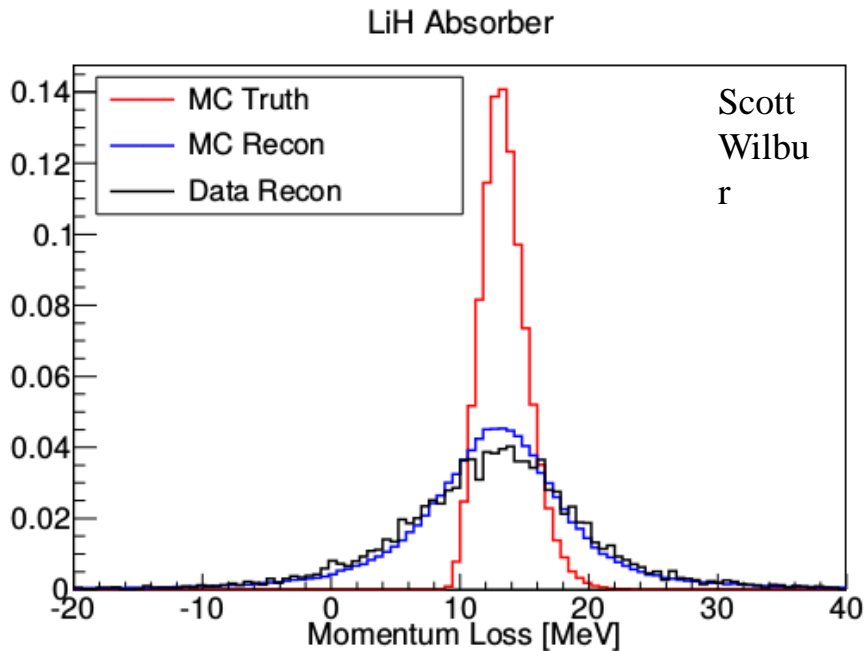
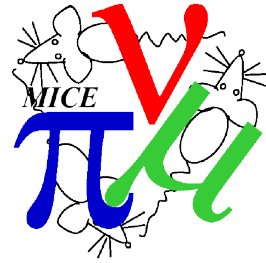
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DATA TAKING

Field-on data summary

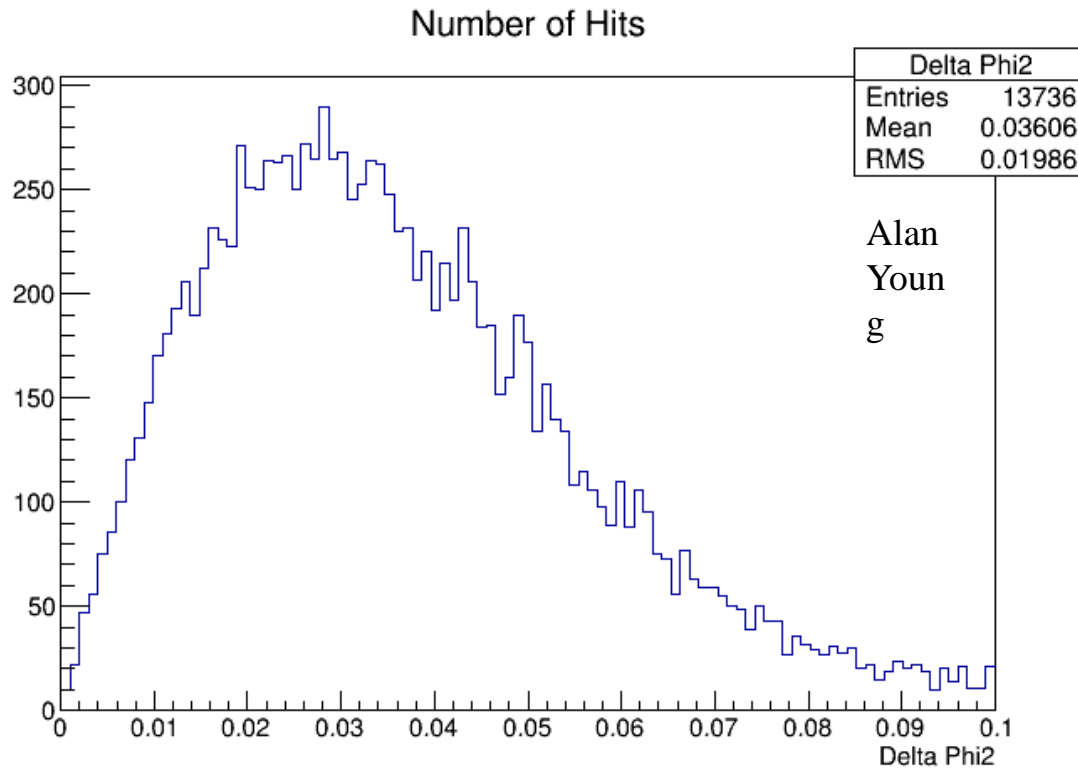
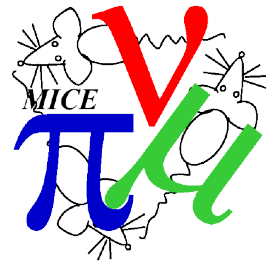
- **2016/03 data – scattering and energy loss**
 - **Energy loss:**
 - **Progressed to first studies on deconvolution**
 - **Scattering**
 - **Extrapolated tracks to the absorber**
 - **Seek to understand details of the resultant distribution before progressing to deconvolution**
- **2016/04 data – evolution of emittance**
 - **Cooling channel optics work with a pragmatic, cautious approach to the magnets**
 - **MICE Muon Beam matching performed online to develop well-matched beams**
 - **Various approaches to analysis ongoing**

2016/03 data – energy loss



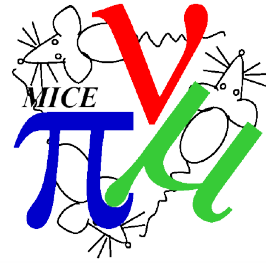
- Good agreement between data and MC
- Clear signal for energy loss
- Working through deconvolution for the width of the distribution

2016/03 data – scattering

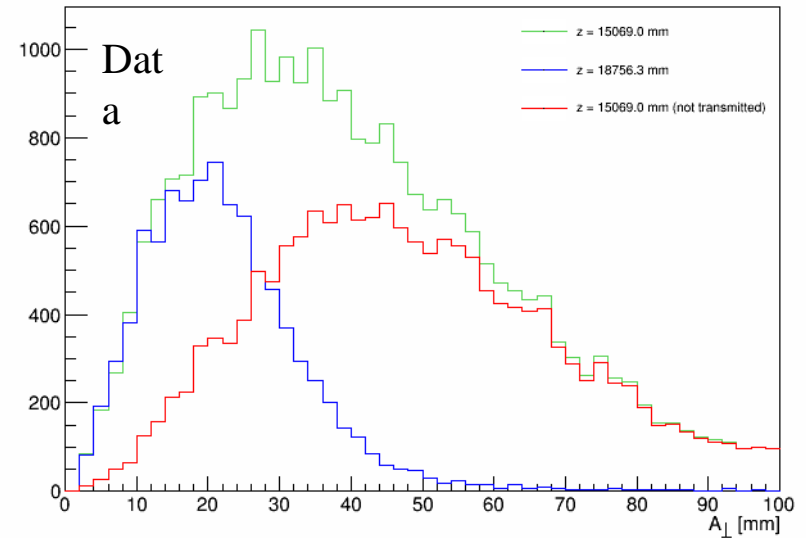


- Scattering angle found by projecting from TKU and TKD to absorber
- Then examine the difference in angle of projected tracks

2016/04 data



- Revised optics solutions in the context of magnet commissioning
- Exploring measurement resolution and bias
 - Detector efficiency
 - Detector resolution
- Exploring model bias
 - Magnet alignment
 - Absorber material
 - Other material budget
 - Beam mismatch



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OPERATIONS

ISIS Schedule

| ISIS Cycle | Date From | Date To | # Days | ### | 1 Jul 16 | 1 Aug 16 | 1 Sep 16 | 1 Oct 16 | 1 Nov 16 | 1 Dec 16 | 1 Jan 17 | 1 Feb 17 | 1 Mar 17 | 1 Apr 17 | 1 May 17 | 1 Jun 17 | 1 Jul 17 | 1 Aug 17 |
|------------|-----------|-----------|--------|-----|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 2015/04 | 16 Feb 16 | 25 Mar 16 | 46 | | | | | | | | | | | | | | | |
| 2016/01 | 12 Apr 16 | 20 May 16 | 38 | | | | | | | | | | | | | | | |
| 2016/02 | 28 Jun 16 | 29 Jul 16 | 31 | | ■ | | | | | | | | | | | | | |
| 2016/03 | 13 Sep 16 | 28 Oct 16 | 45 | | | | ■ | | | | | | | | | | | |
| 2016/04 | 15 Nov 16 | 16 Dec 16 | 31 | | | | | | ■ | | | | | | | | | |
| 2016/05 | 14 Feb 17 | 31 Mar 17 | 45 | | | | | | | | | ■ | | | | | | |
| 2017/01 | 2 May 17 | 2 Jun 17 | 31 | | | | | | | | | | | ■ | | | | |
| 2017/02 | 11 Jul 17 | 4 Aug 17 | 24 | | | | | | | | | | | | | | | ■ |

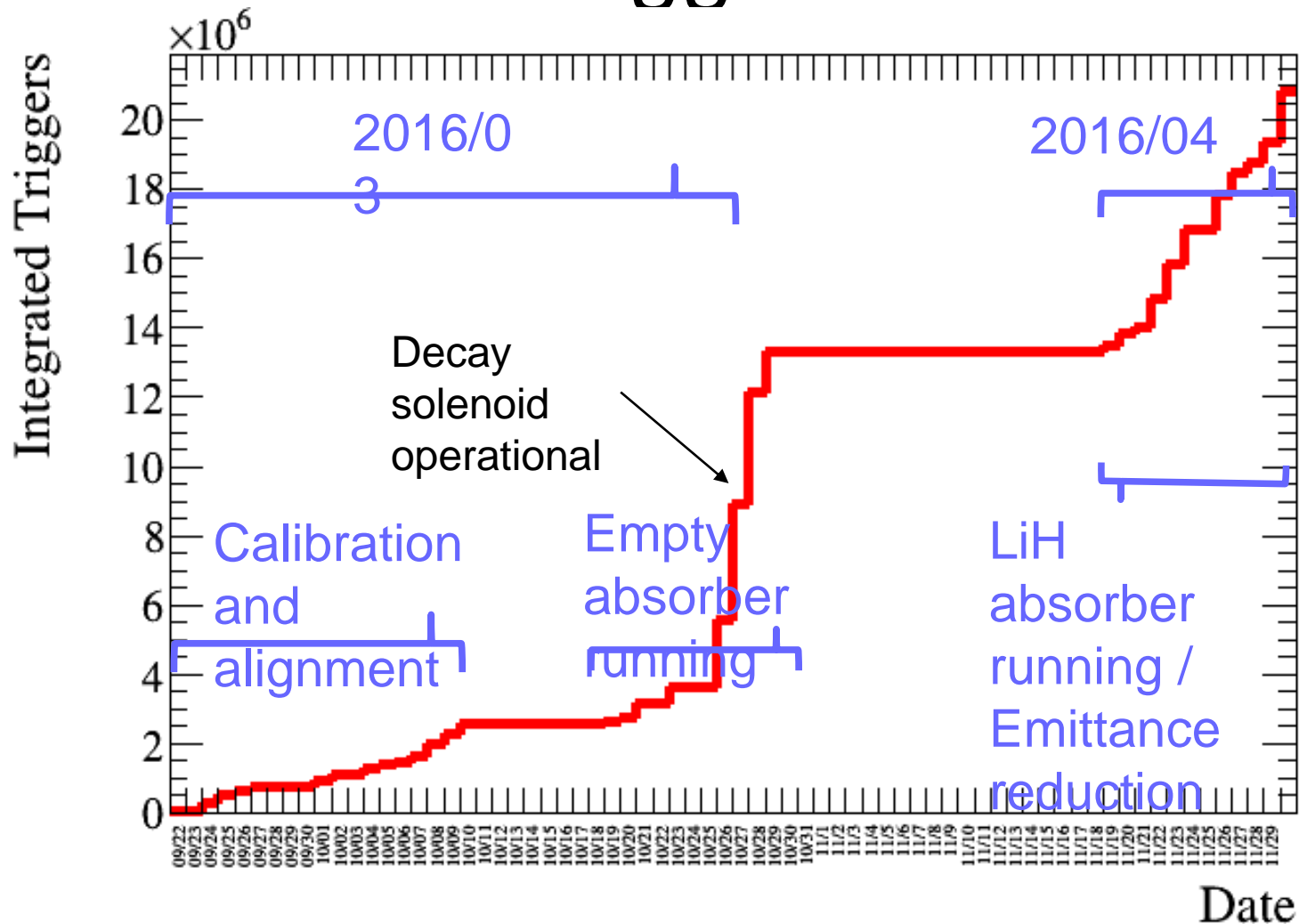
Cycle 2016/03 (13 Sep/28 Oct 2016):

- ▶ channel commissioning and characterisation
- ▶ Materials programme : empty absorber physics
- ▶ 95% take up of data-taking shifts

Cycle 2016/04 (15 Nov/16 Dec 2016):

- ▶ Materials programme : LiH absorber physics
- ▶ Emittance reduction with LiH
- ▶ 100% take up of data-taking shifts

Data-taking – Integrated TOF1 triggers



- ▶ 20 million TOF1 triggers recorded since Sep 2016

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LIQUID HYDROGEN SYSTEM

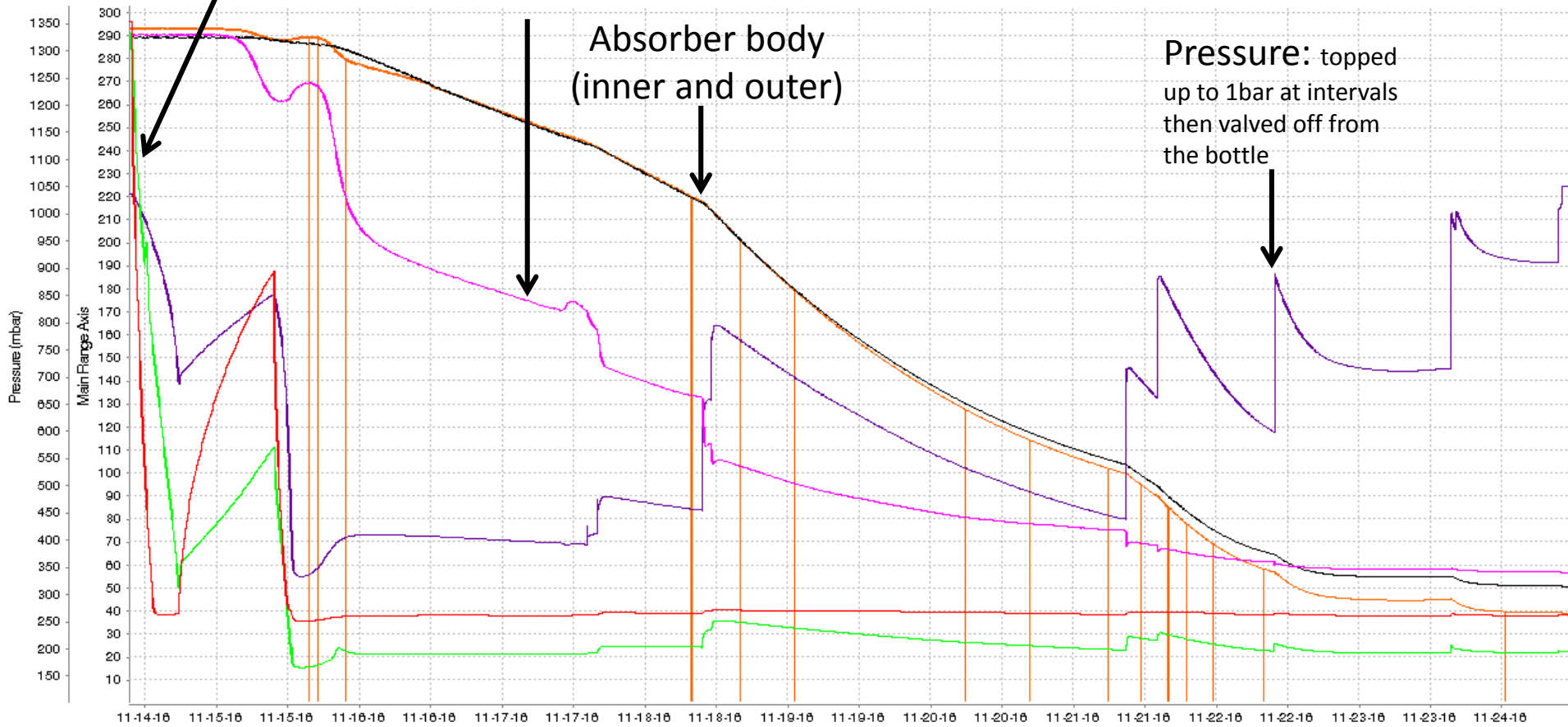
Cryocooler temperatures:

Red – Frist state
Green – Second stage

Absorber inlet

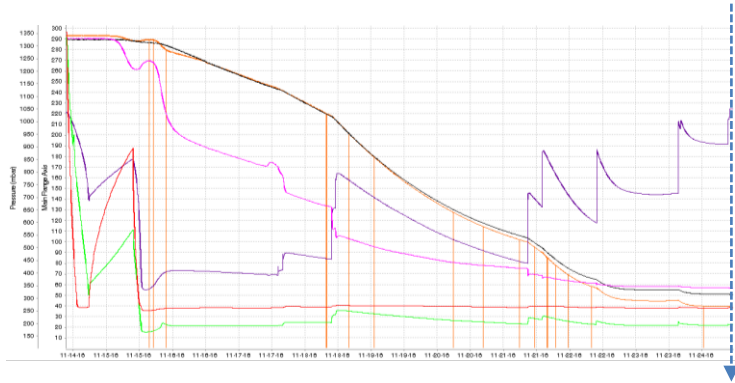
Absorber body
(inner and outer)

Pressure: topped
up to 1bar at intervals
then valved off from
the bottle



Cooldown starts

Pause cooling overnight



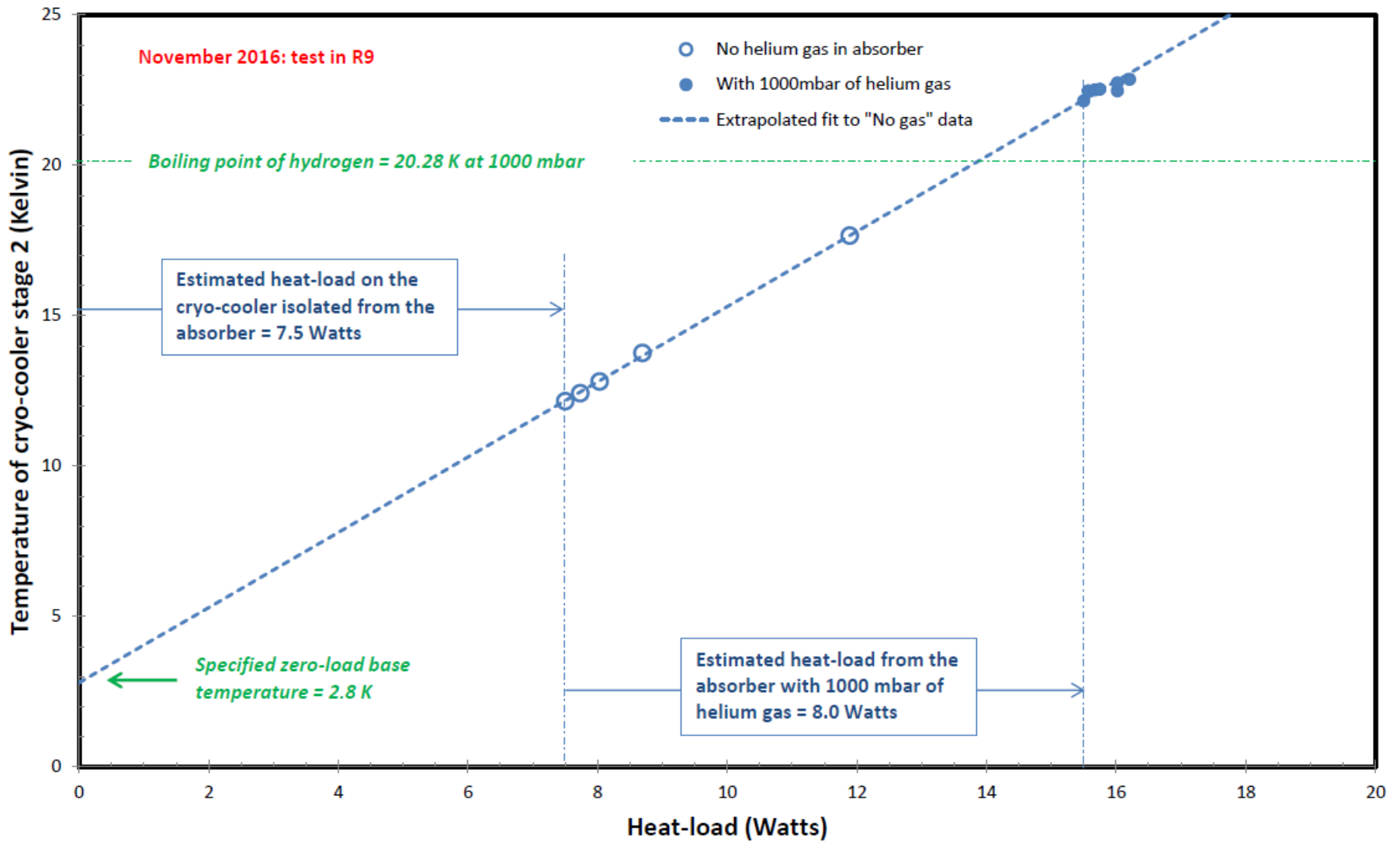
| Sensor | Location | Final reading at equilibrium |
|----------------|----------------------------------|------------------------------|
| MICE-HA-TS-04 | Cryocooler 1 st stage | 39K |
| MICE-HA-TS-06 | Cryocooler 2 nd stage | 21.8K |
| MICE-HA-TS-07A | Absorber gas inlet pipe | 56K |
| MICE-HA-TS-09 | Absorber body (outside) | 50K |
| MICE-HA-TS-03A | (Absorber body (inside)) | 39K |
| MICE-HA-VG-03 | | 1049mbar |

Additional tests

Carried out two additional tests:

- powered a heater on the cryocooler 2nd stage to find relationship between heat load and cryocooler temperature
- Removed gas from system - effectively removing the heat load from the absorber from the cryocooler

Could then extrapolate the heat loads on the cryocooler from the turret and the absorber.



To cool the system to liquefy hydrogen, we need to reduce both the heat load through the turret and the heat load from the absorber.

Reducing heat loads

Absorber:

- Additional MLI across windows
- Remove the pipework connecting the pre-cool circuit (conducting heat from turret and absorbed radiative load in cryostat)

Turret:

- Temp profile in the turret indicates a thermal touch between the 1st and 2nd cryocooler stages
- the turret cooling system will be removed and inspected

Timetable:

- Underway; anticipate remedial work will take one week
- Re-initiate cool down before Christmas

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... AND FINALLY

Scientific programme

Step IV:

Material properties of LH₂ and LiH that determine the ionization-cooling performance

Observation of ϵ_{\perp}^n reduction

MICE demonstration of ionization cooling:

Observation of ϵ_{\perp} reduction with re-acceleration

Observation of ϵ_{\perp} reduction and ϵ_{\parallel} evolution

Observation of ϵ_{\perp} reduction and ϵ_{\parallel} and angular momentum evolution[†]

[†] Requires systematic study of “flip” optics.

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Cancelled!