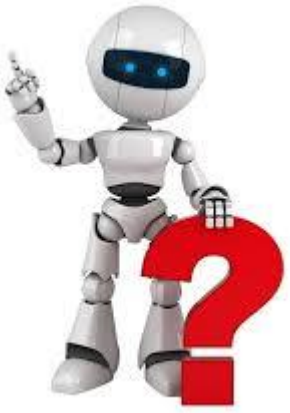


NMR instrument hardware and support

The good, the bad, the ugly?

Tim Claridge

Topics

- Hardware support
  - State of play with Agilent (John Lowe, Bath)
  - Could/would other vendors assist? [magnet servicing?]
- Probes
  - Servicing of He cryoprobes (Juraj Bella, Edinburgh)
  - Update on N_2 cryoprobes
- Robotics and automation
  - Latest robot designs- *user experiences*

Agilent Support
The current state of play…

- John Lowe, University of Bath
  - Two-channel ProPulse 500
  - OneNMR probe (HX broadband)
  - 96 position ”7620” autosampler

Agilent – Current Support

- Pretty good over last 12 months
- Probe repairs
  - probe away for ~3 weeks
  - loan probe delivered in advance
- Applications support
  - always quite efficient; replies to email typically within a few hours
  - **very** helpful (including remote working at weekends…) largely UK-based
  - Spinsights is a great resource for initial “how do I do this…” questions
- Engineer call-outs
  - engineer visit within ~1 week of request

Agilent – Future Support

- Support guaranteed for 7 years (October 2021)
  - Includes magnets, probes, automation, consoles, applications…
  - Quality of support?
- Following this "Agilent typically provides our Asset Maximization service offering for 3 years"
- No further software development
- My personal feelings: short term – great
  mid term – OK
  long term – worried!

He cryoservice summary

Juraj Bella, Edinburgh

- **Southampton** - Varian (Stuart Findlow): Ours worked perfectly until it was serviced at 20,000h and showed no signs of decline (eg lower heater levels required etc).
- **NIMR MRC** – Bruker (Alain Oregioni) : running a test with one of our system, as it will be scrapped next year. We are planning letting it run 18 months. The feed back I've got from Bruker was that it's OK since the platform will be scrapped anyway.
- **Cambridge** - Bruker (Peter Grice): In recent years we have delayed servicing to 11 or 12,000 hours without any real problem.
- **Bristol** – Varian (Matthew Crump): We had not noticed any degradation in performance after 20000 hours although the CCC1 stage was a few K warmer than it had been when the coldhead was last swapped. It is possible we could have squeezed more hours before the system failed
- **Leeds** – Varian (Gary Thompson): We run a Varian v1.5 cold probe (for the moment!). we have had the condenser/filter exchanged without the cold head before now. We also tend to run the cold head until it starts to fail.
- **Edinburgh** – Bruker: currently 13,000 hours, intention 18,000-20,000 hours.

He cryoservice opinions

- **Users:**
  - Stuart Findlow: I believe however that the systems run for 20,000h happily enough so long as the adsorber and gaskets are replaced at the same time as the coldhead.
  - Alain Oregioni: To me, it does not sound as if the cold heads can handle 2 years, but in a clean system, they'll probably do 18 months, especially for later model cryoplatform.
  - Matthew Crump: 20,000 hours has been perfectly fine on a 2nd generation air cooled Varian system in our hands. I would not want to exceed that for the reasons above. Servicing just the condenser and not the cold head would be a possibility but was never offered.
- **Varian / Agilent** (not confirmed) : experienced U.S. field engineer said that coldheads can run happily for up to 5 years, and that they should only really need replacing if the stage 1 & 2 values begin to show an increasing trend.

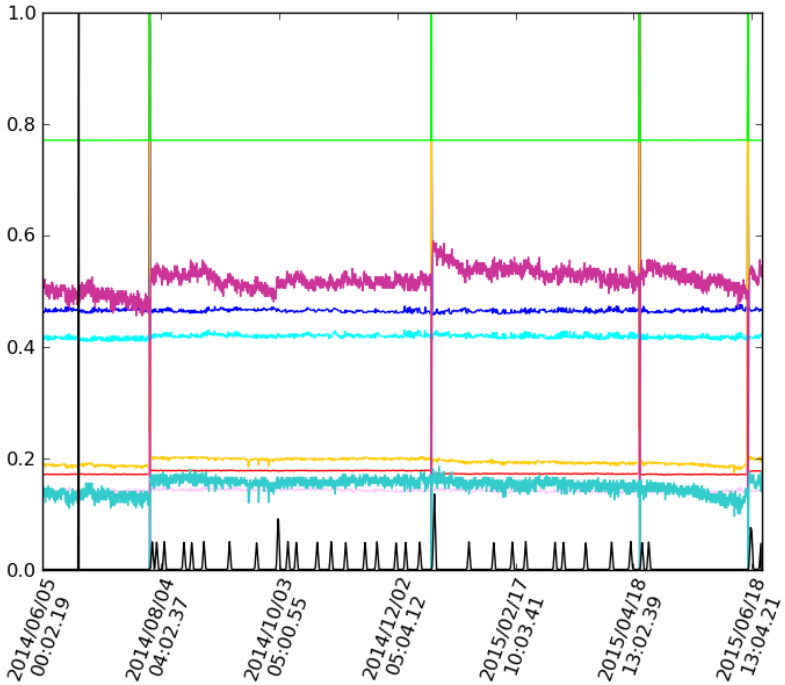
He cryoservice opinions

- **Bruker :** recommends 10,000 hours.

1. Failure within 2 years ?
2. Signs of failure: knocking noise (frozen impurities – compressor / He filter), noise in stage 1 & 2 temperatures, steep decline of any temperature parameter.
3. Compressor lifespan 7 years - £24k. Failure & compressor - £35k. Keep clean!
4. Helium filters! Lifespan?
5. Absorber – lifespan 30,000 hours.
6. Error 221 – severe temperature deviations – bad news.
7. Cryoservice cost £9,675 (£6,900 in 2004) + VAT.
    1. Small / large service – any difference?
8. One can still call Bruker if you go the unplanned route. It should not cost more unless there are further damages. It can take engineer longer to come due to priority of scheduled cryoservices.

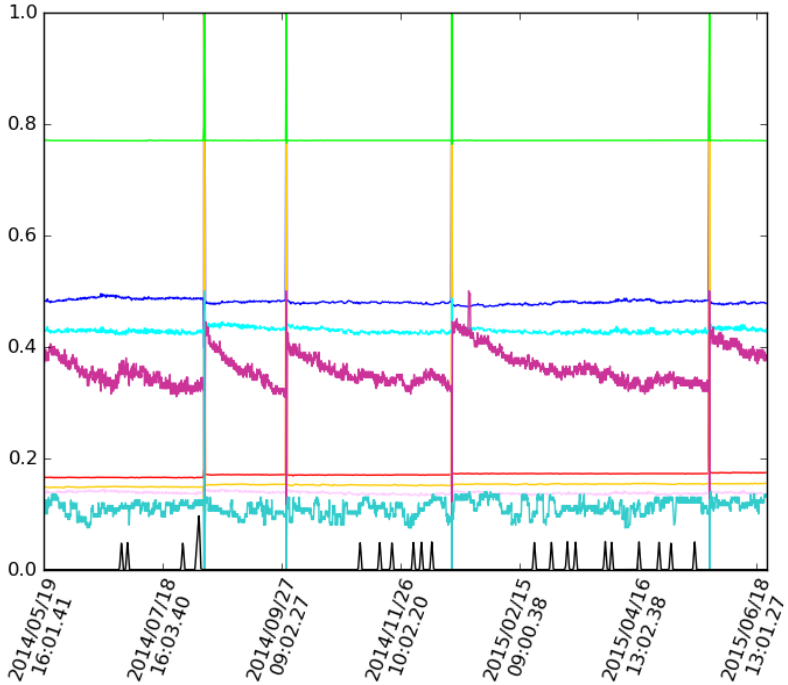
He cryoservice - examples

Bruker 2009 (4th gen. CU); compressor 2010; 45,600h.

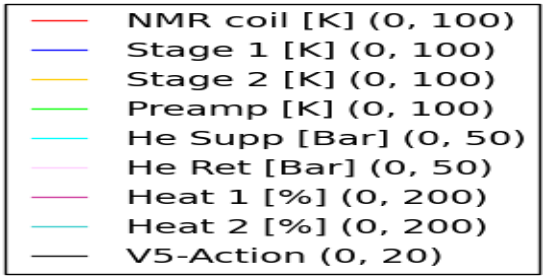


1 year period

Bruker 2006 (3rd gen. CU); compressor 2006; 68,700h.

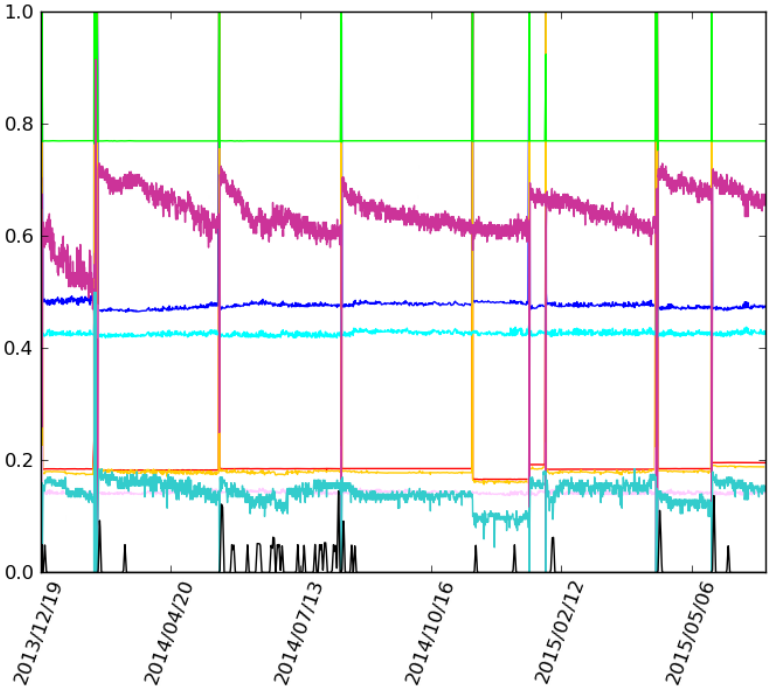


1 year period



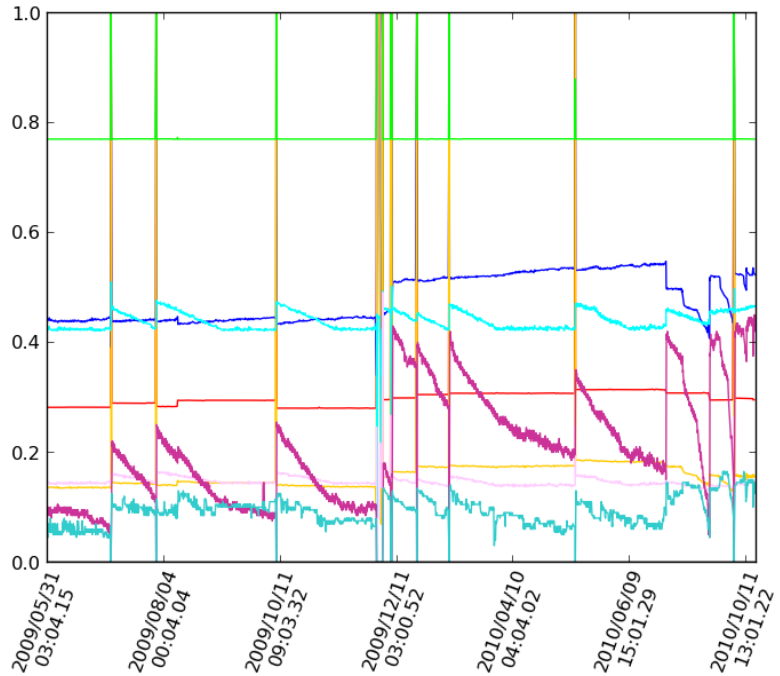
He cryoservice - examples

Bruker 2011 (4th gen. CU); compressor 2007; 25,500h.

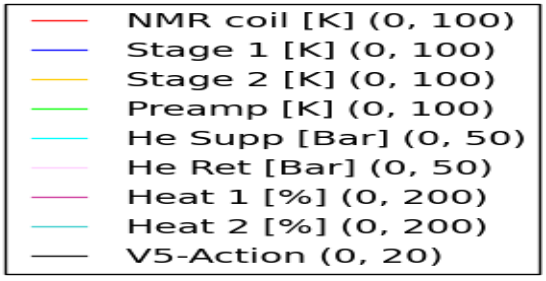


2 years period

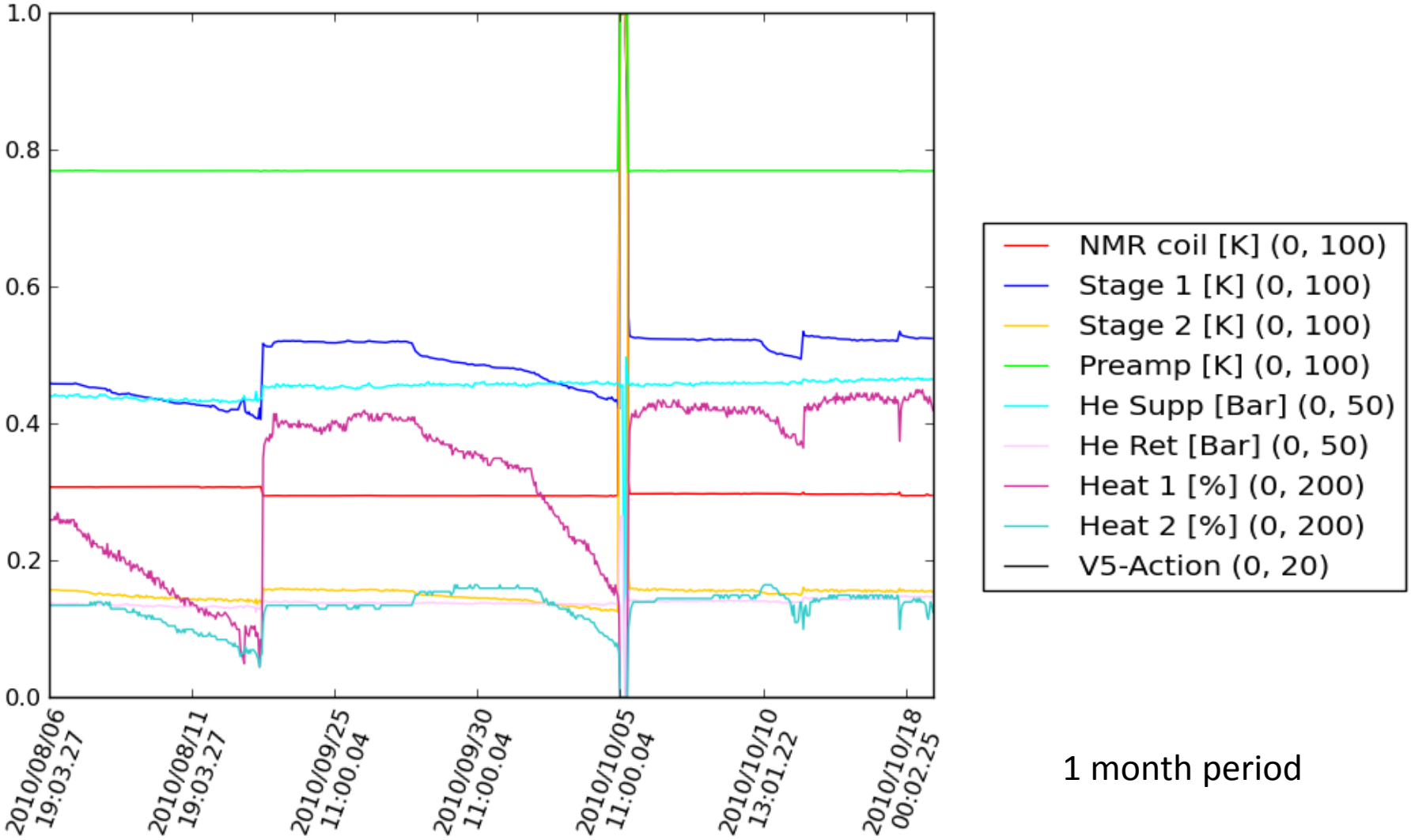
Bruker 2003 (2nd gen. CU); compressor 2003; died 2010



1 year period



He cryoservice - examples



1 month period

N_2 cooled probes

(*2014 follow-up*)

- Bruker Prodigy
  - Transfer line efficiency and dewar hold time… *no progress as far as we know?*
  - Air/N_2 gas supply and dewar icing discussed previously

- Jeol SuperCOOL
  - 2-3x sensitivity gains
  - -40 to +150 ^{o}C
  - *Dewar hold times/refill periods?*