

ISIS - brief overview

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with

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Controls Group

Workshop on Accelerator Operations

SLAC, Menlo Park, CA

6th - 10th August 2012



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ISIS

ISIS

- **ISIS not an acronym – Margaret Thatcher 1985**
- **First spallation neutron source to run 2 targets**
- **Pulsed Neutron & Muon Source**
- **World leading research centre for physical & life sciences – Physics, chemistry, Biology, Engineering, materials science**
- **1984 (Dec) – First Beam to Target Station 1 (18 ports)**
- **2008 (Aug) – First Neutrons from TS2 (18 ports)**
- **52m Diameter Rapid Cycling Synchrotron (RCS)**
- **200 μ A → 300 μ A with 2nd Harmonic RF**
- **£145M 2nd Target Station**



ISIS

Main Components

- Pre-Injector
- Linac
- Synchrotron – 10 section 800 MeV Protons
- Extracted Proton Beamline 1 & EPB2
- 2 Target Stations (TS-1 & TS-2)
- Intermediate Target – 7 Muon beamlines (4 RIKEN)

H⁺ Ions → -35keV → RFQ/665keV → Linac/70MeV →
Foil/Protons → Synchrotron/800MeV → EPB's →
TS1 (160kW, 40Hz)/TS2 (40kW, 10Hz) Neutrons



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FUNDING

HM Government



Dept. Of Business Innovation & Skills



Research Councils UK



Science & Technology Facilities Council



RUTHERFORD APPLETON LABS



ISIS

£30M Resource

<£50M including collaborations



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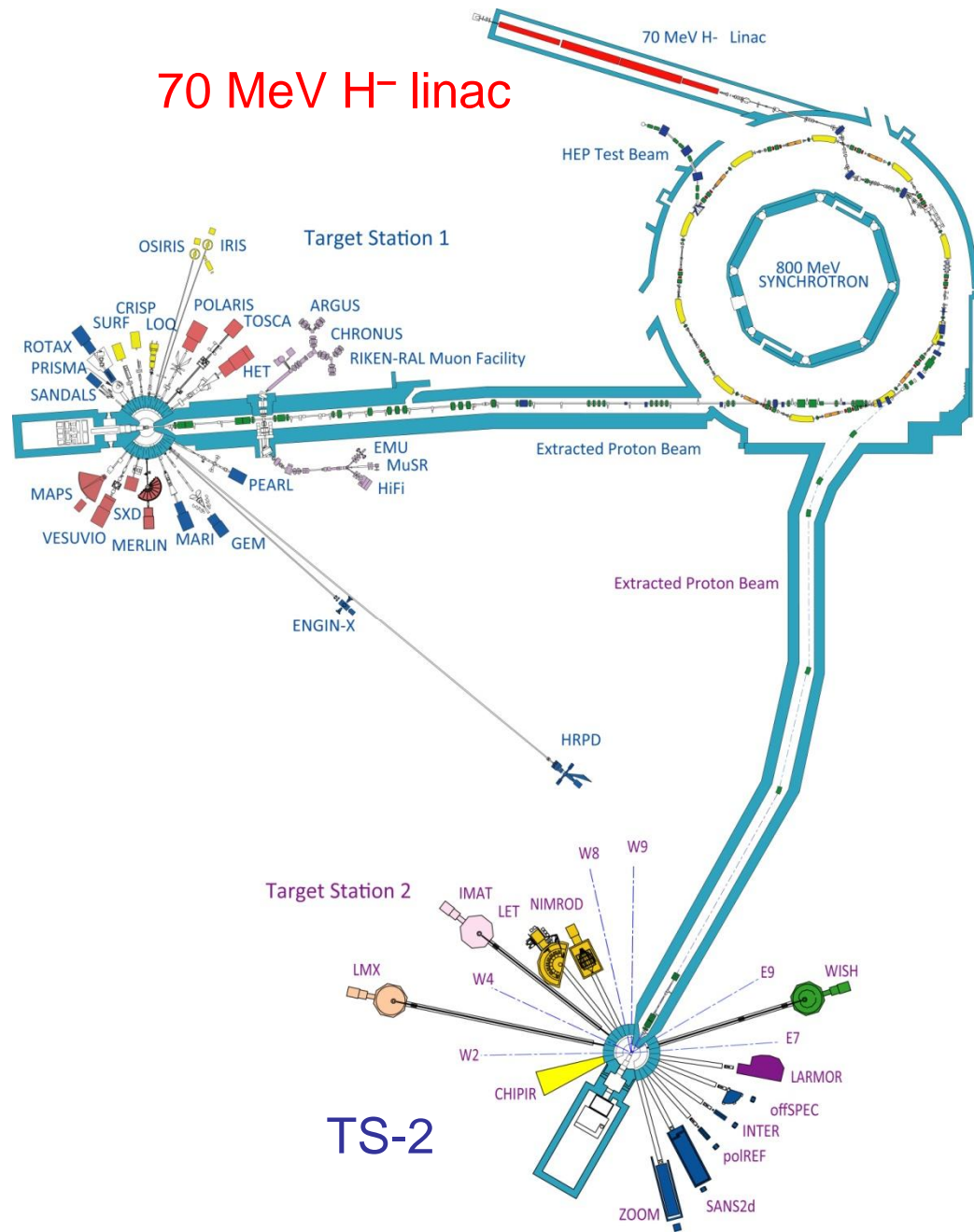
Rutherford Appleton Laboratory, looking north-east

ISIS

70 MeV H⁻ linac

800 MeV
proton
synchrotron

TS-1





MACHINE OPERATIONS

- **Funded for 160 days operation per year**
- **24/7 during scheduled cycles**
- **Shutdowns (maintenance) - 1 to 6 weeks**
- **2 Machine Physics periods per cycle**
- **1 day for beam line permits**
- **24 hour mid cycle maintenance period**
- **350 staff, 120 Accelerator technicians and engineers, instrument support, health physics**
- **Shift Staff perform 1st line diagnostics**
- **On Call Expertise**



SHIFT DETAILS

- **5 Teams of 4**
- **24/7 Operation**
- **5 week shift cycles - MAN**
- **8 hour weekday shifts**
- **12 hour weekends**
- **Standby week – partially paid**
- **Rely on goodwill**



GENERAL INFORMATION

- Supports International community of 3000 scientists
- Free for Academic Researchers if results published in public domain
- ~ 1000 visitors per year
- ~ 900 Experiments per year
- ~ 500 Publications per year
- 9000 publications since 1984
- CELLA – hydrogen energy storage
<http://www.cellaenergy.com/>
- MICE – Muon Ionising Cooling Experiment –
Neutrino Factory



AVAILABILITIES

Defined as:

Beam pulses delivered/Beam pulses scheduled

- **FY 2007/08** **80.1%**
- **FY 2008/09** **81.3%**
- **FY 2009/10** **77.5%**
- **FY 2010/11** **76.1%**
- **FY 2011/12** **82.7%**



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OPERATIONAL ISSUES

- **Power loss – Substations**
- **Water Plant – Low flows, blockages**
- **Vacuum Plant – O-rings, gate valves**
- **Obsolete equipment – Psu's, magnets, choke**
- **Single point failures – Tank 4, Vacuum personnel**
- **High ambient temperatures (relatively speaking) - insufficient water coolant capacity, use of fans**
- **On Call personnel – insufficient people to cover**
- **Recruitment & Retention – retention payments made & now recruitment payments to get right people**



POSSIBLE ISIS UPGRADES

1. Phase 3 Target Station 2 instruments
2. Replacement/partial replacement of Linac (same energy)
3. 180MeV Linac & Ring Injection System (\leq 0.5MW)
4. 3 GeV RCS for beam power of \sim 1 MW
5. Further upgrade to accumulate and accelerate beam from a 0.4 – 0.8 GeV linac for 2 – 5 MW beams.



Thank you for listening

Questions?



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