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UK Nuclear Data Network

PJ Davies

UK NDN

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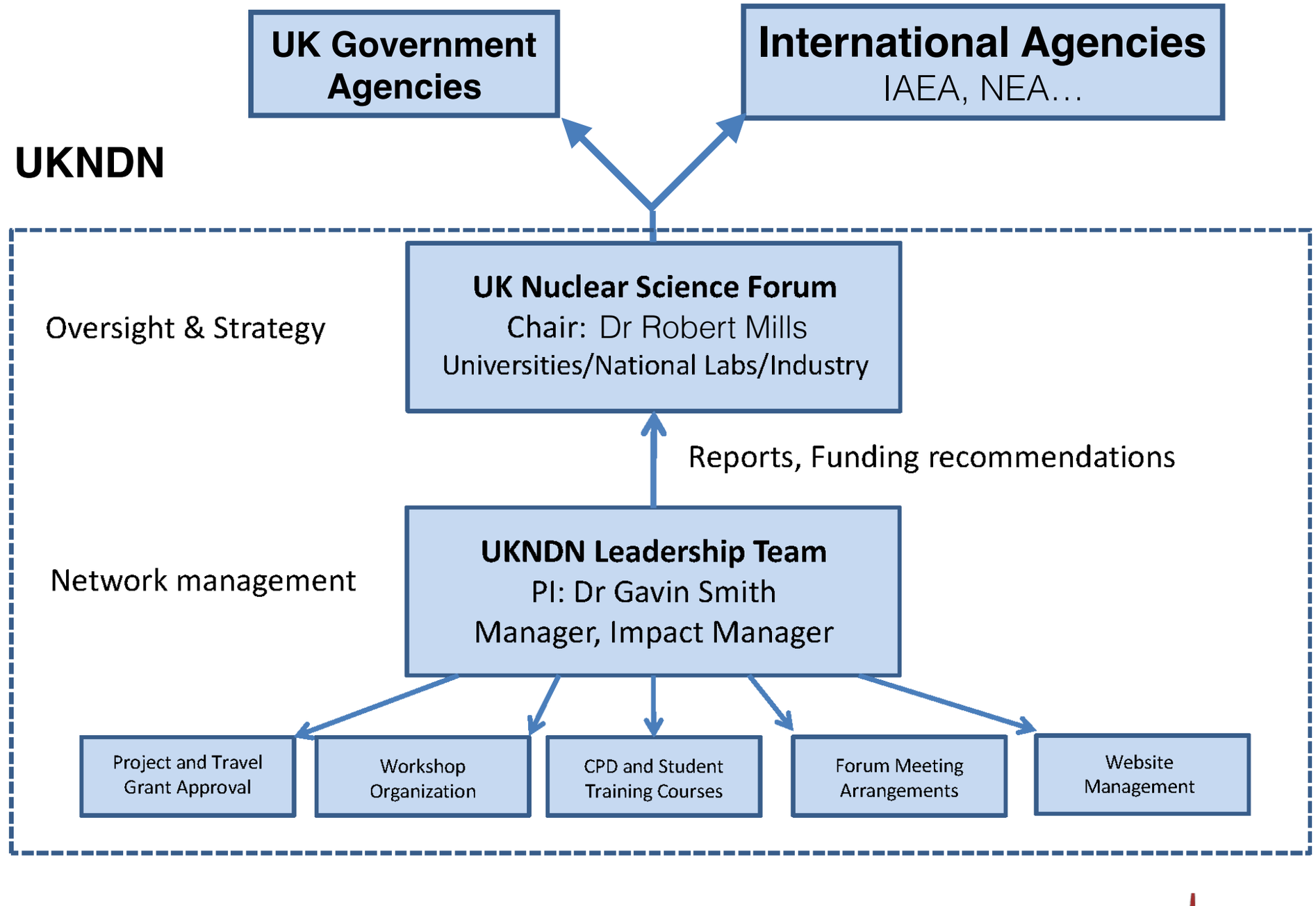


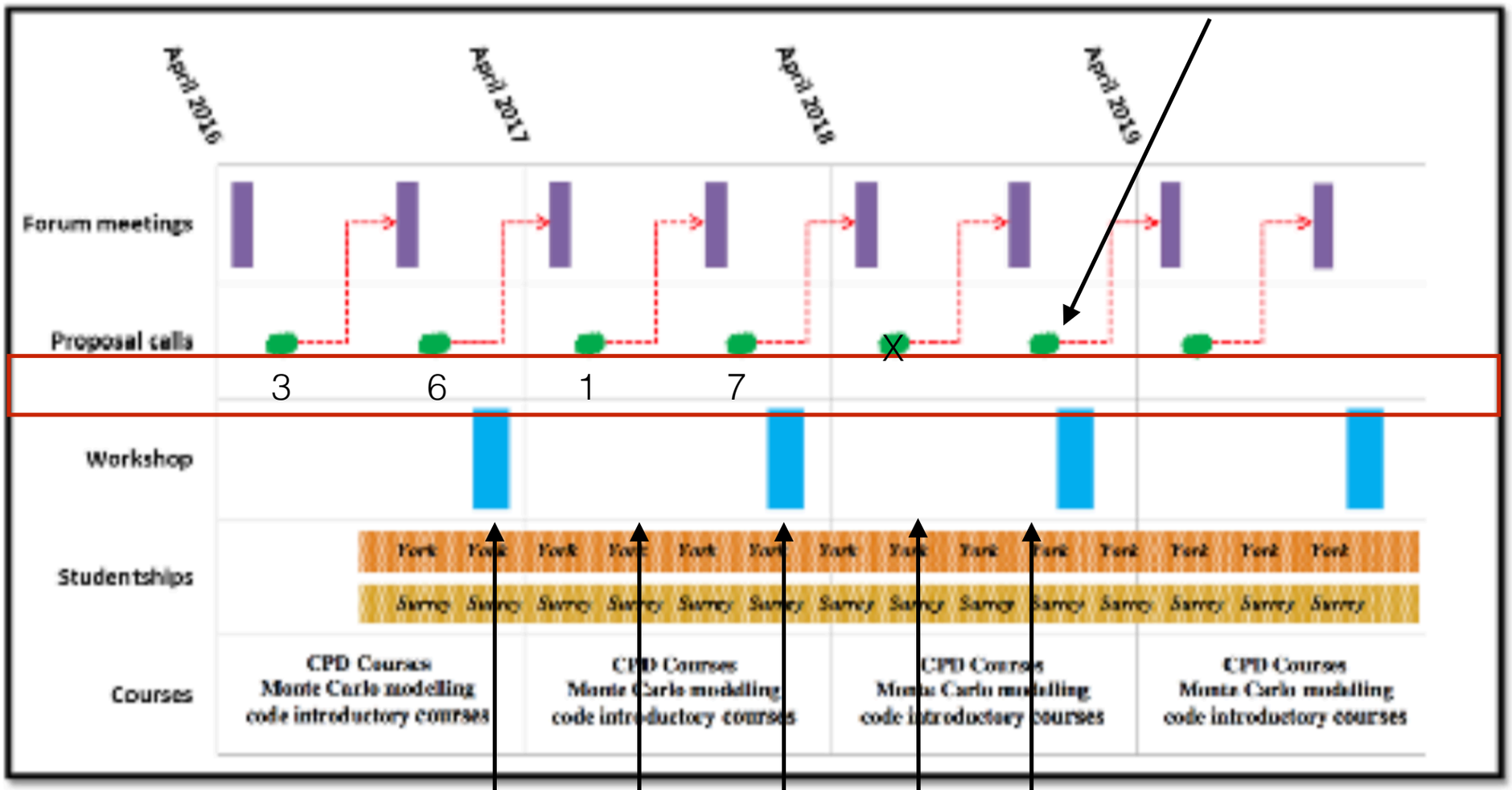
Meet the UK's domestic and international nuclear data commitments

http://www.ukndn.ac.uk

Overview of UKNDN

Scoping studies £10k; Proof-of-concept £50k; Travel £2k; Workshops, Training, CPD

Yr0 Yr1 Yr2 Yr3 Here Yr4



Total Applications

Workshops: Funds still available

PINE2017 **Geant4**

Geant4 NRA School PINE2018

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Project funds

01/06/2017	Small Scale Scoping study - MCPOND (Monte Carlo Processing of Nuclear Data	E. Schwageraus / L. Morgan	U. Cambridge / AWE	7276.50
01/04/2018	Proof of Concept – Nuclear Data Evaluation Techniques and Analysis	Lee Morgan, Eugene Schwageraus	U. Cambridge / AWE	18,777
01/04/2018	Neutron production and shielding characterisation at DCF using neutron spectroscopy	Wady/Joyce	Lancaser/DCF	45,000
01/04/2018	Measuring the $^{13}C(\alpha,n)^{16}O$ cross section using the TexAT active target detector	Smith/Weldon/ Kokolov	SheffieldHalam /Birmingham	9795
01/04/2018	Shipping and T&S for STEFF 239Pu Experiment	Smith/ McFarlane/ Sosin	Manchester	7230
01/04/2018	Measurement of the $^{35}Cl(n,\gamma)$ cross section at n_TOF EAR1	Wright	Manchester	1600

Total fund: £400k
Allocated: £280k

Completed: 5
Ongoing: 11

Institutions: 9
Outside UKNDN: 6

Next funding round: Deadline: 29th March 2019

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Travel Funds

Date	Title	PI	Institute	Amount
01/05/2016	Attending the nTOF collaboration meeting	A. Brown	U. York	350
16/08/2016	Participation in STEFF experiment at nTOF CERN	A. Brown	U. York	1,520
28/08/2016	Attending EXTEND course in Uppsula	D. Jenkins, A. Brown	U. York	650
2/11/16	Funding to attend the Nuclear Data session of the CARM meeting — 3rd November 2016	P Davies	U. York	250
15/03/2017	Present UKNDN activities at India	P. Davies	U. Manchester	650
01/04/2017	Present UKNDN activities at IoP Birmingham	P. Davies	U. Manchester	450
22/05/2017	Discuss research opportunities with NNL	P. Davies, A. Brown	U. Manchester, U. York	100
01/07/2017	96Y beta decay as example for the enhanced contribution of beta-decay heat in fission reactors	M. Scheck, K. Mashtakov	U. Paisley	2,000
20/10/2017	Attending the BRIKEN and R3 commissions tests	G. Lorusso	NPL	2,000
20/10/2017	Attending the BRIKEN and R3 commissions tests	P. Regan	U. Surrey	2,000
31/10/2017	Colloquium at AWE	P. Davies	U. Manchester	200
	Attend LaBr3 workshop in South Africa (ANSTT)	R. Canavan	U. Surrey	2000
01/06/2018	Investigation of gamma-decaying levels beyond the neutron separation threshold	M. Sheck	UWS	2000
01/05/2018	Attend Licorne experiment in IPN Orsay	R. Canavan	U. Surrey	2000
05/05/2018	Attend Licorne experiment in IPN Orsay	P Davies	U. Manchester	600

Total allocated: £21k
Available: £40k

Support 6 early career researchers

Advertise funding via seminars
UWS, Surrey, IoP, CARM, AWE, PINE

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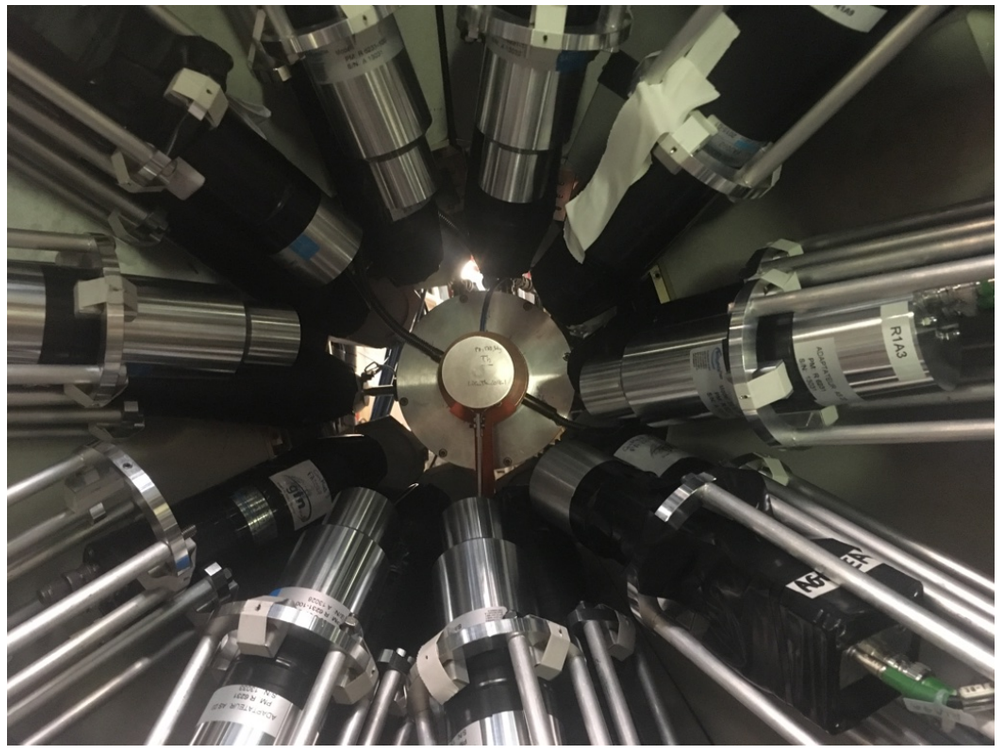
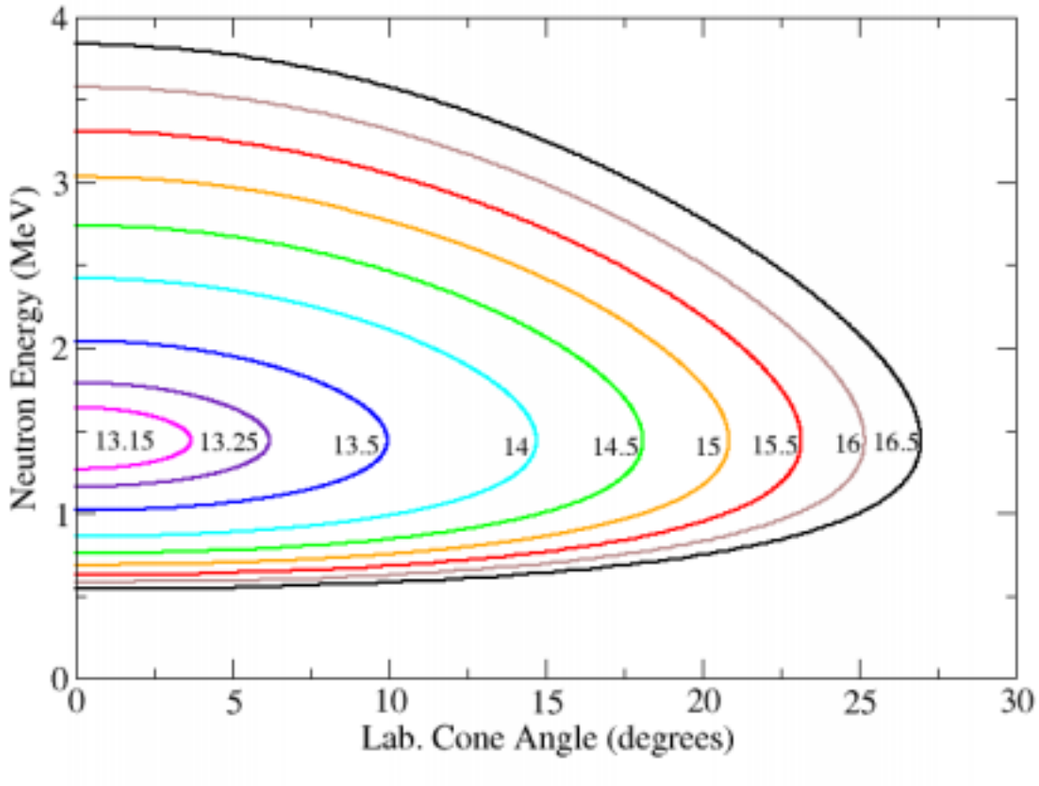
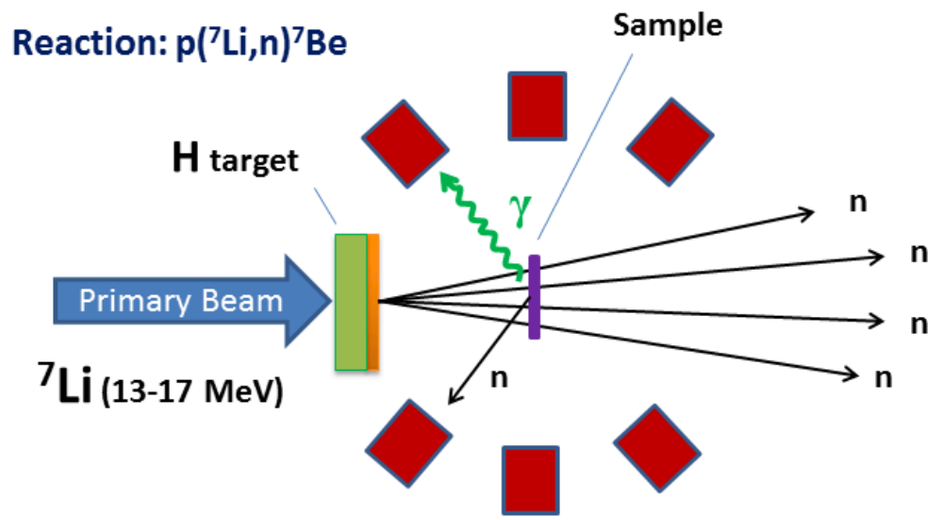
$LaBr_3$ detectors for LICRONE







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NPL National Physical Laboratory

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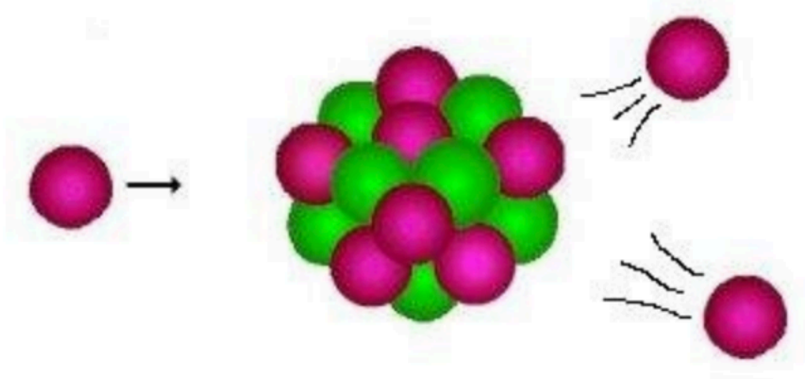
TALYS



- AWE - UK nuclear theory
- TALYS: update to the physics? Is it fit for purpose
- Nuclear theory input into nuclear data calculations — follow on UKNDN grant?
- First step Surrey/York/AWE proof-of-concept grant to outline the needs

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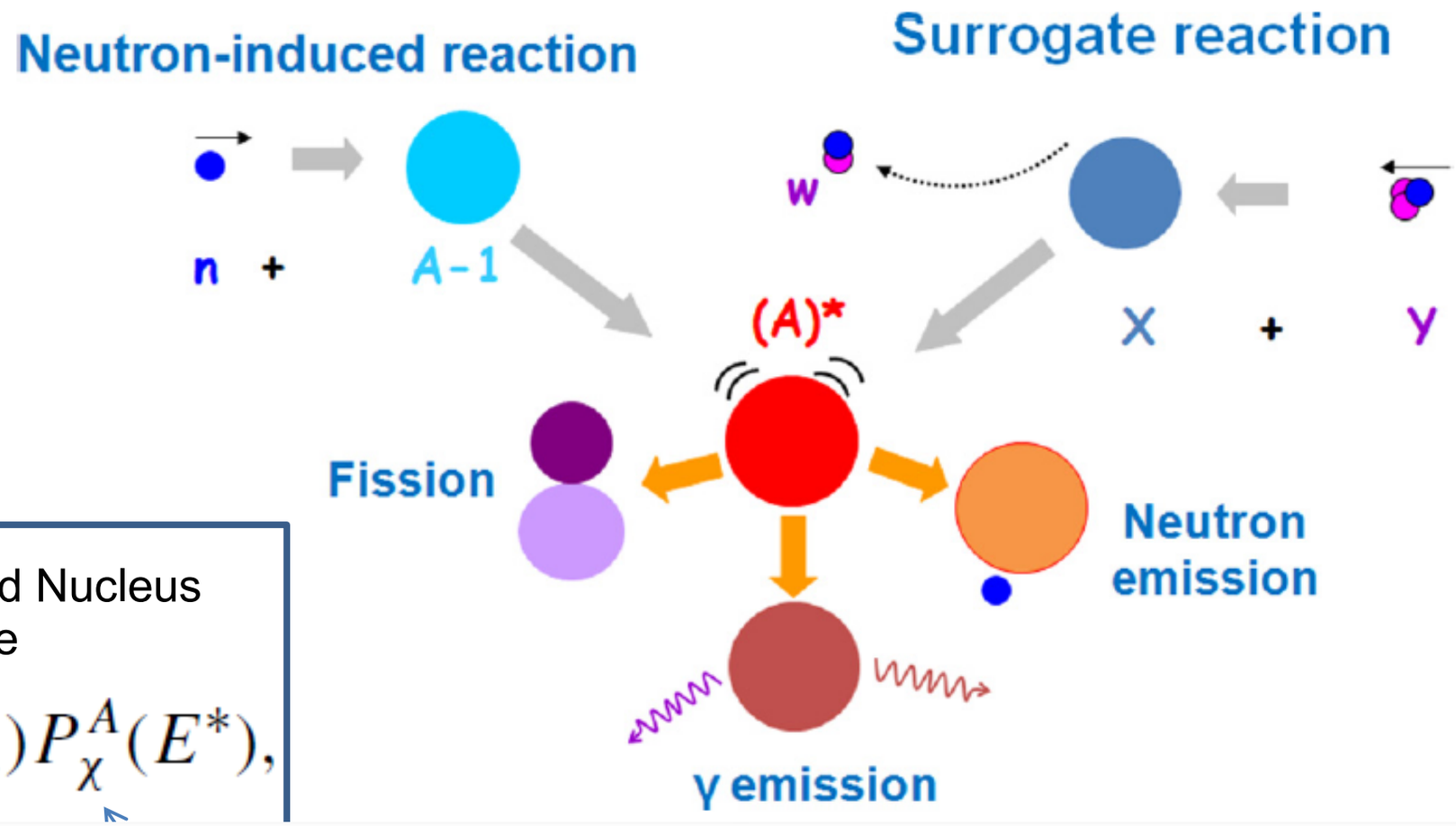
(d,pF) as a Surrogate Reaction for (n,F)



Aim to produce similar Compound Nucleus State to neutron capture

$$\sigma_{\chi}^{A-1}(E_n) = \sigma_{\mathrm{CN}}^{A}(E_n) P_{\chi}^{A}(E^*),$$

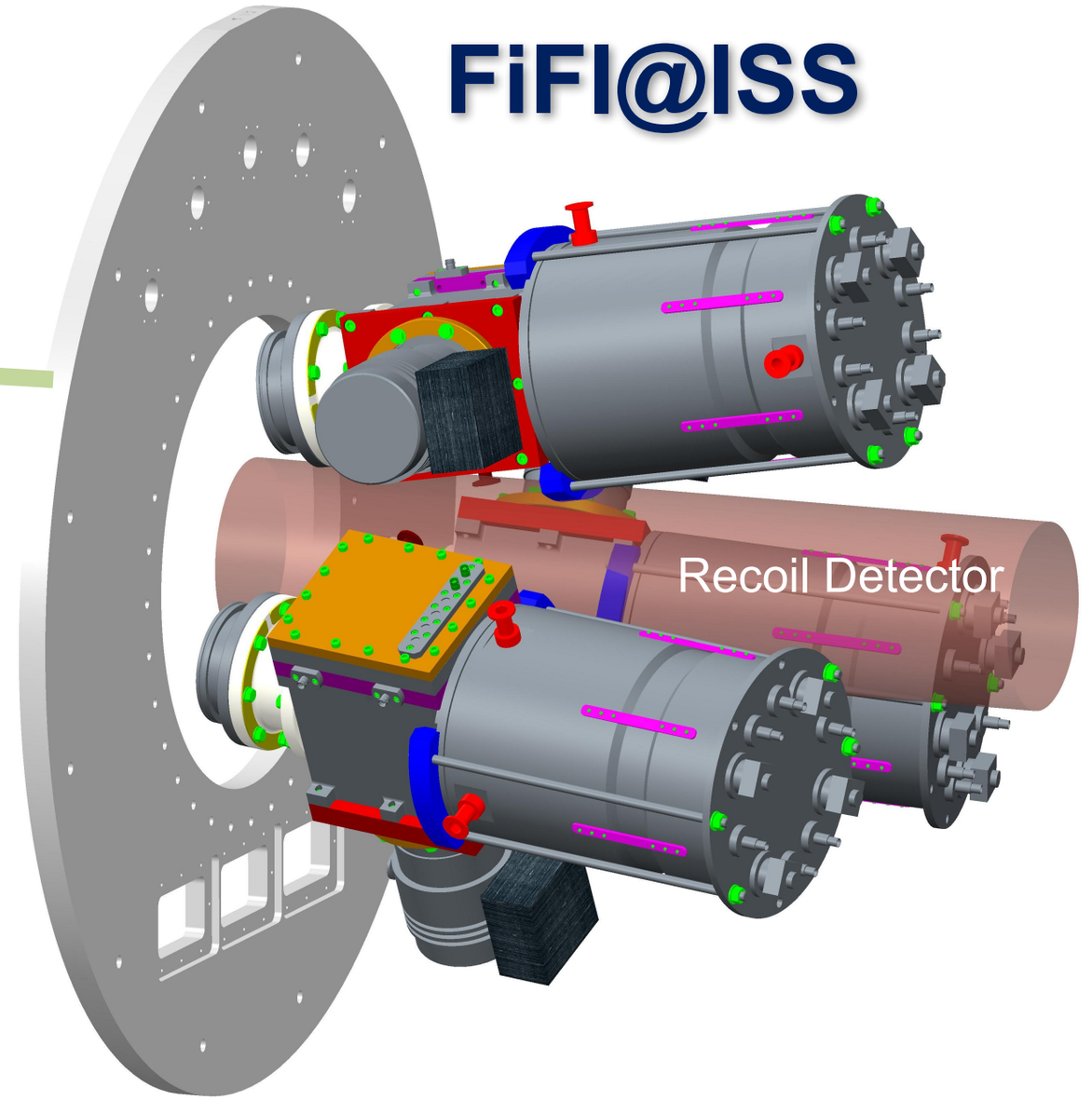
Desired n cross section

Formation by cap

Additional £100k awarded

Brit and Cramer, PHYSICAL REVIEW C **2, 1758(1970)**
Ducasse, *et al*., PHYSICAL REVIEW C **94, 024614 (2016)**

Fission-fragment Detectors



Meeting to discuss research possibilities

Dalton Nuclear Institute

Accelerators, primarily material irradiation damage

- 2.5 MV Pelletron Ion Accelerator
- 5 MV Tandem Pelletron Ion Accelerator

Work up of a research station to measure (p,n) & (a,n) spectra

Workshops and conferences

- Compound nuclear reactions and related topics (CNR2020)
- FISPACT-II workshop
- Geant4 (March/April 2019)
- Funding available for workshops
- Funding available for PhD/PDRA

Future Funding of UKNDN

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Science & Technology Facilities Council

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Home / Funding / Research Grants / Funding opportunities / 21st Century Challenge Networks

21st Century Challenge Networks

21st Century Challenges network Call Opens 21 July 2018, closes 2 October 2018 at 4pm.

- Extended Network+
  - Maximise the impact of earlier Standard Network or Network+ activities
  - Further demonstrate STFC-funded capability to address 21st Challenges and de-risking of concepts to facilitate applications for next-stage funding

Latest News

June 4, 2018
UK researchers contribute to latest Higgs boson breakthrough

May 31, 2018

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Other networks

- UKNDN+ www.ukndn.ac.uk
- Nuclear Security(+) www.nusec.uk
- Proton therapy network protontherapynetwork.com
- Food Network+ www.stfcfoodnetwork.org
- Internet of food things+ (Just announced)
- Good opportunities to find cross discipline partners

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Summary

- Halfway through the UKNDN project
- Half of project funds allocated (£200k)
- Half of travel funds allocated (£21k)
- Additional £100k to investigate surrogate reactions
- Projects cover HPRL and UK requests
- BEIS Accident Tolerant Nuclear Fuels
- Funds still available for workshops. **Suggestions welcome.**
- Fund available for student training. **Let your students know.**

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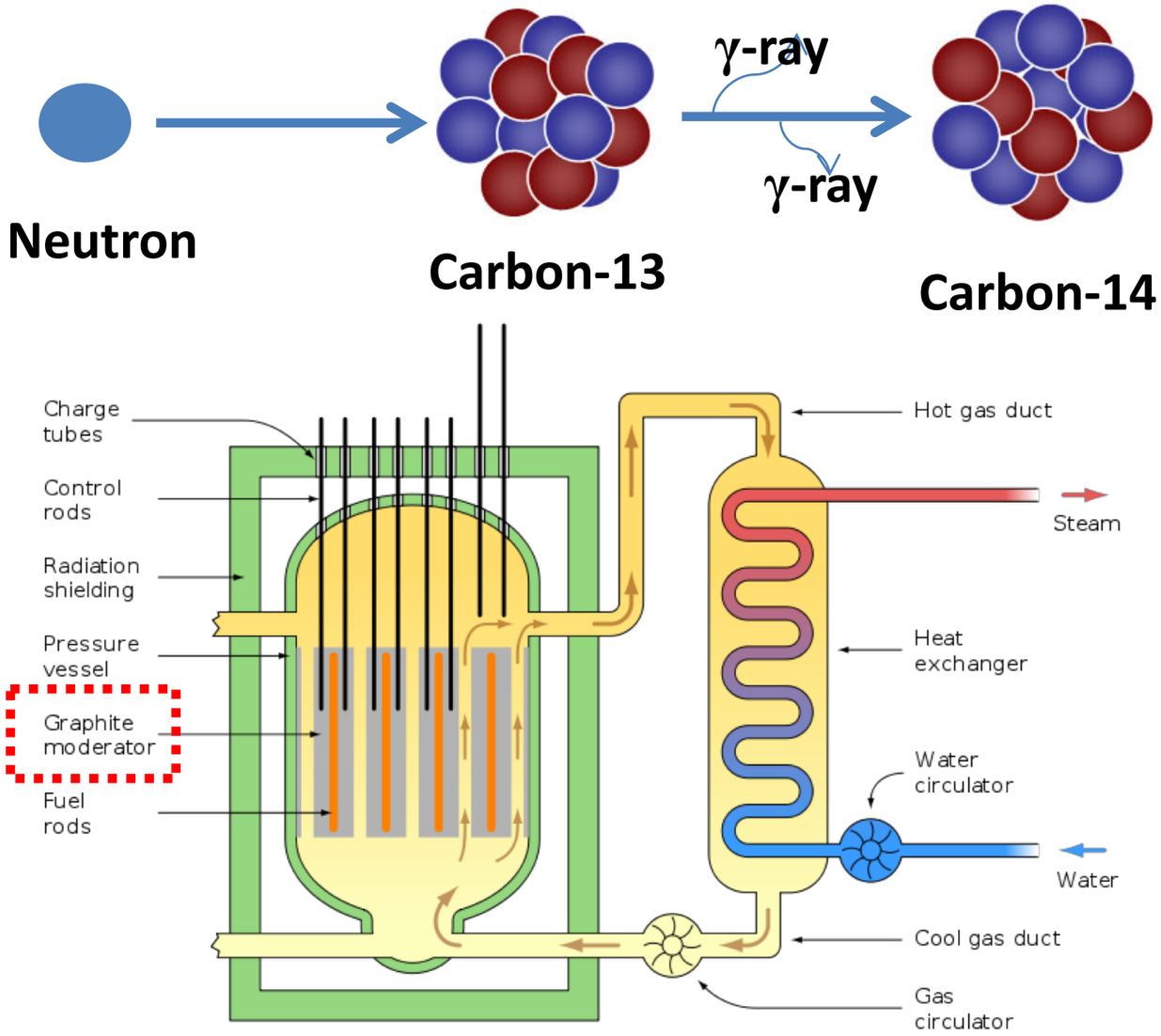
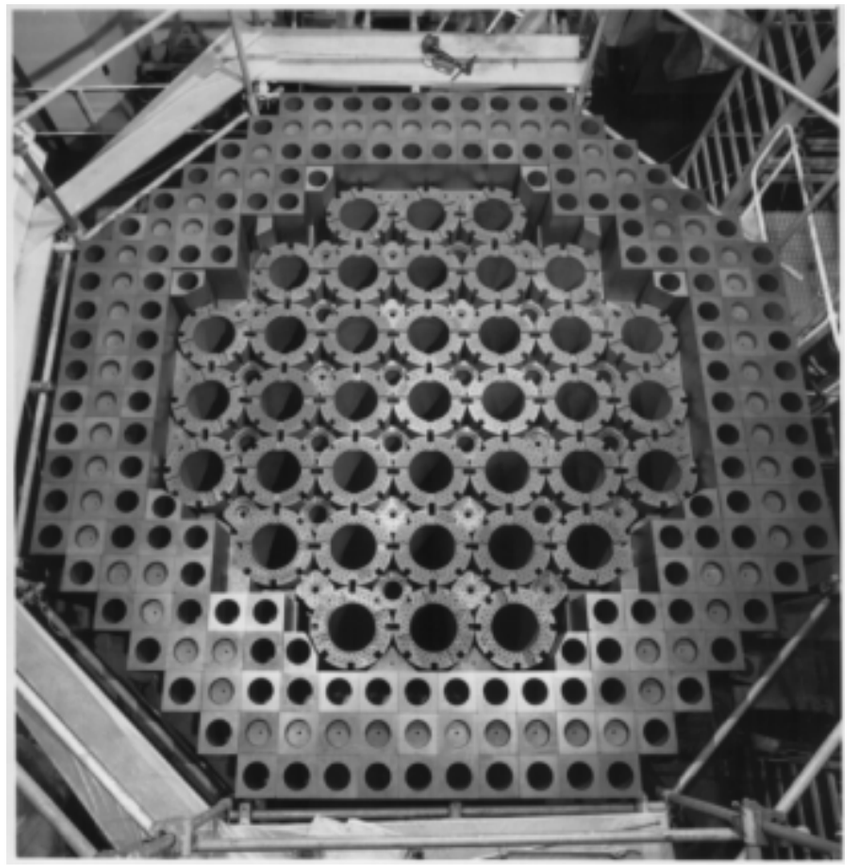
$^{13}C(n,\gamma)$ cross section motivation

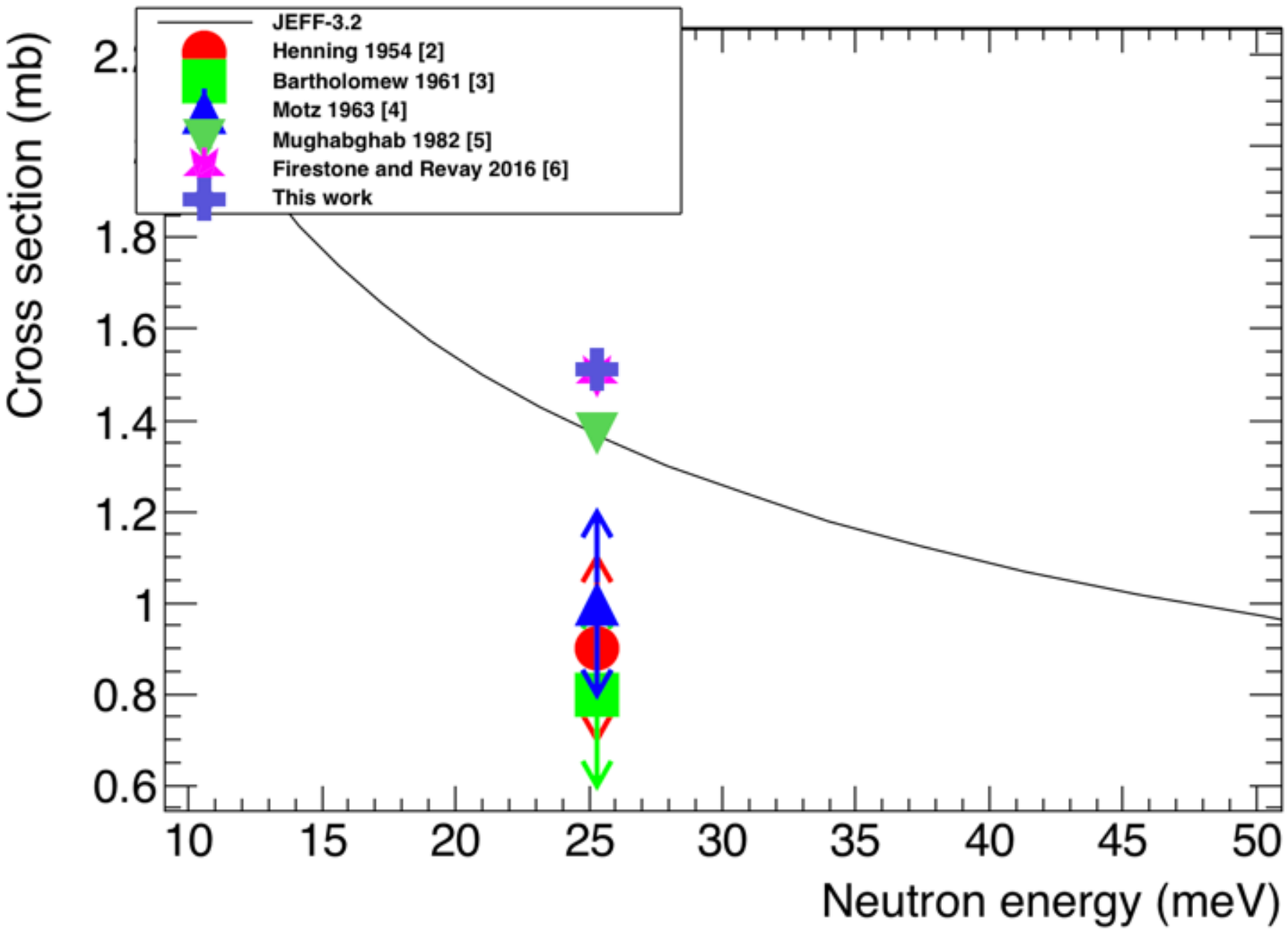




Graphite AGR core before fuel insertion

Irradiated graphite from UK Magnox reactors represents about **30%** of the **UK intermediate waste inventory** (estimated to be **80,000 m³** of graphite weighing approximately **130,000 metric tonnes**) with similar graphite moderated reactors requiring decommissioning in **France, Italy, Japan and Russia**. Not all Magnox reactors were the same!

$^{13}C(n,\gamma)$ cross section – Results



Results from ^{13}C AMS:

σ=1.54±0.03 mb

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$^{35}Cl(n,g)$

A short statement on how the research is relevant to the UK's nuclear data needs (max 500 characters):

Due to the presence of chlorine in various materials used in fission reactors, the $^{35}Cl(n,\gamma)$ reaction is responsible for the production of the radionuclide ^{36}Cl. The level of ^{36}Cl present in nuclear waste is extremely important due to its long half-life and high mobility due to its high solubility in water. In particular, chlorine is present in small amounts in graphite which has been used extensively in nuclear reactors throughout the UK. A more accurate cross section will allow better predictions to be made of the radio-toxicity of the UK's irradiated graphite and thus will aid future nuclear waste programs such as a deep storage repository.

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The need for up-to-date information

Kakrapar Atomic Power Station Unit 1 (KAPS-1)

Pressurised Heavy Water Reactor

Commercial electricity production

KAPS-1, Gujerat, India

Location of Kakrapar Atomic Power Station

Country	India
Coordinates	21°14′19″N 73°21′00″E

10th March 2004, **power transient** at KAPS-1

Power output **73% -> 100% of maximum** power

Incapacitation of a regularity system, tripping the steam generator

Using **data from the 70's** (current version) **new WIMS evaluation** (released in 2005) identified the PCR was positive **— power output increases with increased energy!**

S. Ganesan, AIP Conference Proceedings 769, 1411 (2005);

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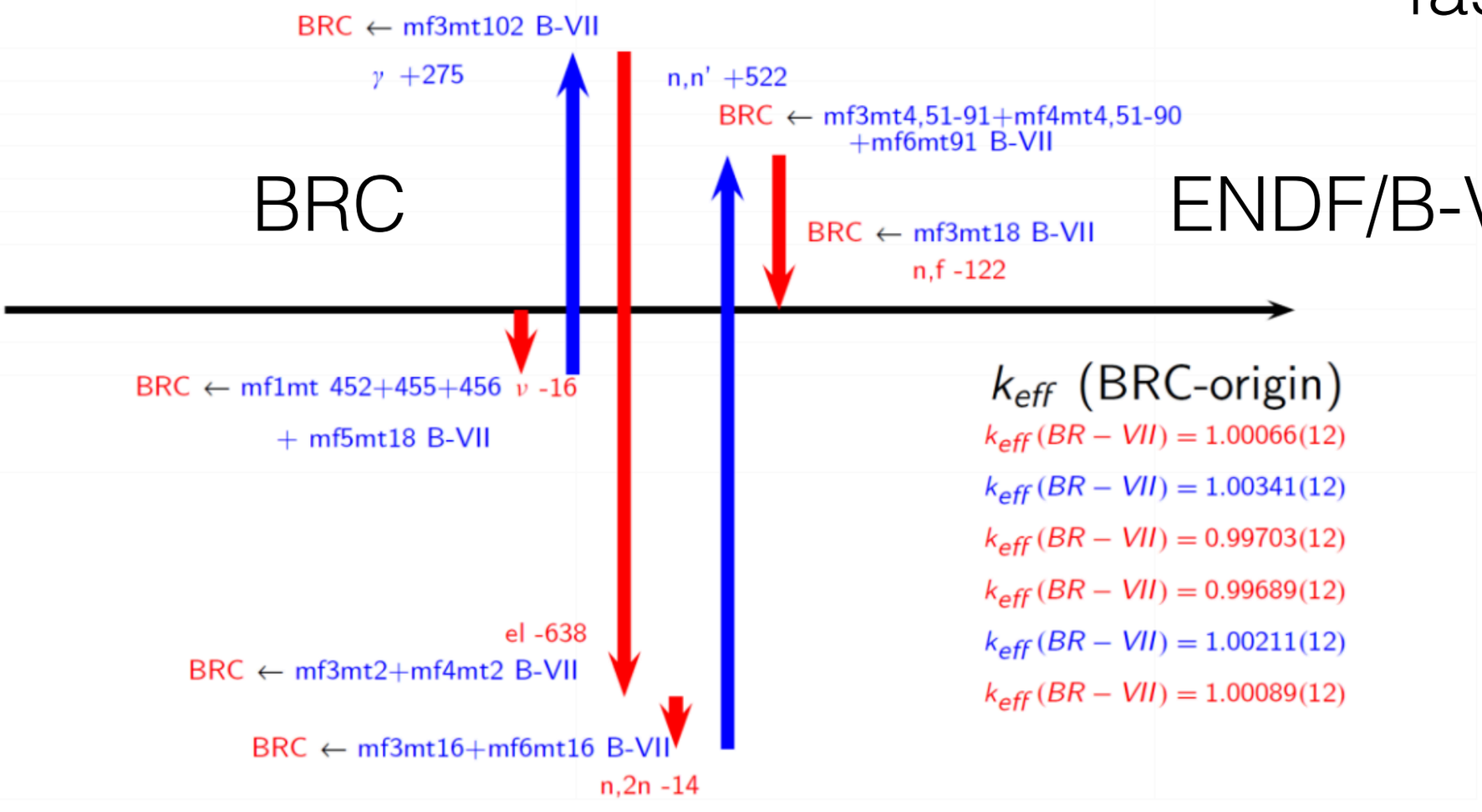
Database adjustments

But as known from B. Morillon study (calculations MCNP5)
JEZEBEL $k_{eff}(BRC) = 1.00082(11)$ $k_{eff}(B\text{-}VII) = 1.00060(12)$

K_{eff} for Pu with fast neutrons



JENDL-4.0, CENDL-3.1, ENDF/B-VII.0, and JEFF-3.1, all contain different inelastic n-scattering cross sections. **Strong compensating factors!**

IAEA Report: INDC(NDS)-0597

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