From: Carl Wheldon <c.wheldon@bham.ac.uk>

Sent: 26 May 2021 14:37

To: Ben Phoenix (Physics and Astronomy); Lilley, Steven (STFC,RAL,ISIS)

Cc: Birmingham Energy Institute

Subject: Re: NNUF access MC40 proton XS measurements

Hi Steve, Ben,

This sounds good. Steve, I remember we discussed this quite a few

years ago when you were at Culham.

I think the main thing we're missing is a suitable X-ray detector. We have

a really small solid angle one for up to 20-30 keV,

and otherwise potentially one SiLi detector but that is used for teaching from

September on. Our thin-window HPGe detectors would pick these energies

up from Ta and W but with fairly lousy efficiency.

I can do 14:15 tomorrow over Zoom if that works?

Cheers,

Carl

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Carl Wheldon

Director of the Birmingham Cyclotron Facility

Radiation Protection Supervisor (Physics)

NEA Data Bank Liaison (Birmingham)

School of Physics and Astronomy

From: Ben Phoenix <B.Phoenix@bham.ac.uk>

Sent: 26 May 2021 12:11

To: Lilley, Steven (STFC,RAL,ISIS)

Cc: Birmingham Energy Institute; Carl Wheldon

Subject: RE: NNUF access MC40 proton XS measurements

Hi,

This sounds interesting and very much like something we could do on the cyclotron. While it’s nominally

a 40 MeV cyclotron the most we can do in reality is ~38, 36 semi comfortably. We have pretty good

energy resolution though and this sounds like it’s still in the region of interest for you. I have cc’d in our

academic lead Carl Wheldon who has done a lot of work with cross section measurements in the past. I

think it’s probably worth us setting up a quick chat with us all where we can discuss which detectors we

have available etc.

Are you the same Steve Lilley who worked at Atkins, who I worked with on my masters project ~15 years

ago?

Thanks,

Ben

From: Steven Lilley - STFC UKRI <steven.lilley@stfc.ac.uk>

Sent: 26 May 2021 11:02

To: energy@contacts.bham.ac.uk

Subject: NNUF access MC40 proton XS measurements

Good morning,

Following the NNUF call for access time

I am interested in the possibility of doing proton cross section measurements in the region 10-40 MeV

on W and Ta.

The energy region is of interest as it is traditionally the energy region where evaluated libraries stop and

models begin although that has changed somewhat in recent years thought TENDL etc. The materials

chosen are of interest for spallation facilities, compact neutron sources such as HBS being developed in

Germany and fusion facilities.

A look in Exfor and TENDL suggests several measurable cross sections (in the mbarn region ) but with

discrepancies between experimental and evaluated data as well as often experimental data stopping at

20 MeV in some cases just below the peak.

I guess this is suitable for the MC40 rather than new facility.

Particularly interesting cases

181Ta(p,4n) 178W – 4 experimental data sets covering different energy ranges, 1 set disagrees with

others, 0.1-1b - requires x ray photon detector 178W is mostly 50 ish keV x-rays

181Ta(p,n)181W – 4 experimental data sets non above 20MeV, discrepant from TENDL evaluation, low

energy gammas and low intensity

182W(p,2n)181Re – 1 data set – disagrees with evaluation.

186W(p,n)Re186 – 2 experimental data sets, no agreement between experiments or evaluations

Many more reactions are also possible but with small amounts or no data to compare against.

Please let me know if you think this might be viable and if it is worth putting a full proposal in.

Kind regards

Steve Lilley