Indirect Measurements of the $^{18}F(\alpha,p)^{21}Ne$ Reaction with the TUDA Scattering Chamber

Jessica Tomlinson

University of York

jrt501@york.ac.uk

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Astrophysics with modern small-scale accelerators

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Astrophysical Motivation

Impact on ^{19}F abundances in AGB models

- Region of interest is the He burning shell in thermally pulsing AGB stars.
- AGB models do not synthesise enough ^{19}F to match F/O abundances observed.

How can the $^{18}F(\alpha,p)^{21}Ne$ reaction help?

- $^{18}F(\alpha,p)^{21}Ne$ reaction competes with $^{18}F(\beta^{+}\nu)^{18}O$ as well as producing protons.
- This increases the product $N_{18O}N_{p}$
- Enhances production of ^{19}F via the chain $^{18}O(p,\alpha)^{15}N(\alpha,\gamma)^{19}F$

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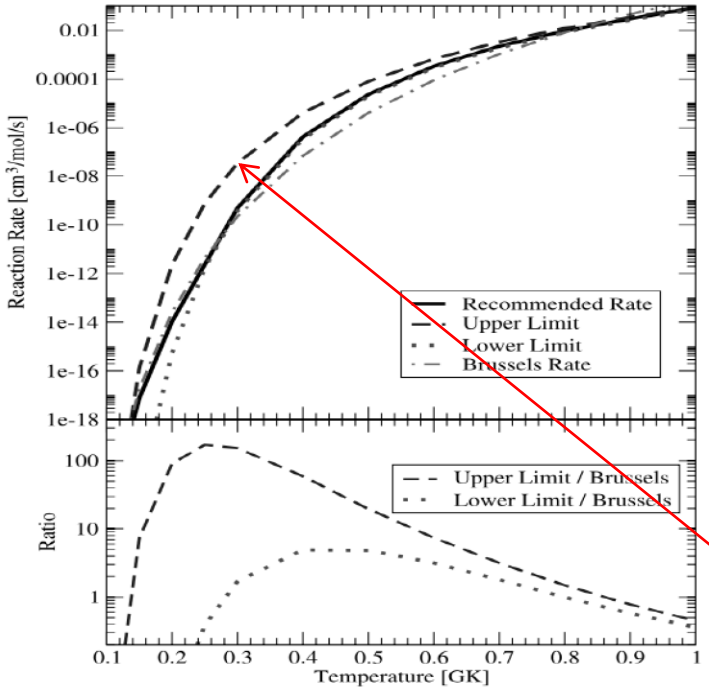
Previous Measurements



Amanda I. Karakas *et. al.* 2008

- Time-reversed measurement measured by H. Y. Lee *et. al.* using proton beam and ^{21}Ne implanted Cu/Au targets.
- Models suggest rate lies closer to upper limit.
- Systematic error in this data from oxygen contamination on backing material via:

  $^{17}O(p,\gamma)^{18}F$

  $^{18}O(p,n)^{18}F$
- This gives a high upper limit at energies of interest.

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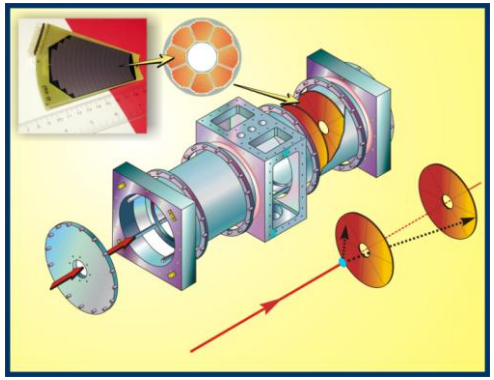
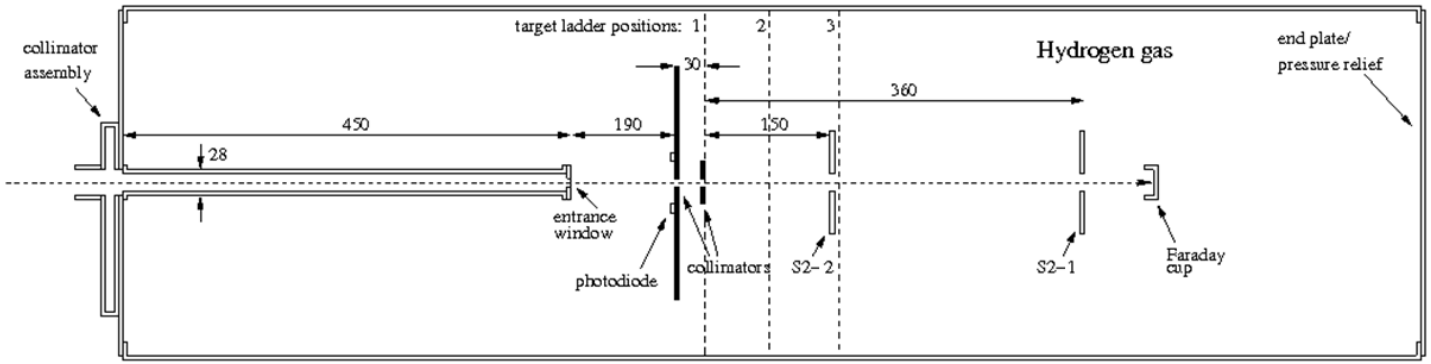
Inverse reaction measurement with H_2 target



http://tuda.triumf.ca/

- ^{21}Ne beam on hydrogen gas target to measure $^{21}Ne(p,\alpha)^{19}F$.
- Safety procedures implemented.
- Beam energies ranging from 50.6 to 68.2 MeV corresponding to energies of 0.6 to 1.4 MeV in the $^{18}F+\alpha$ system.



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University of York, UK
J. Brown, A.M. Laird, M.A. Bentley, S.P. Fox, B.R. Fulton

University of Edinburgh, UK
A.J. Murphy, T. Davinson

TRIUMF, Canada
C. Ruiz , H. Al Falou , L. Buchmann , J. Fallis , O. Kirseborn

Colorado School of Mines, US
U. Hager

University of Basel, Switzerland
F. Herwig, M. Pignatari

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Thank you!

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