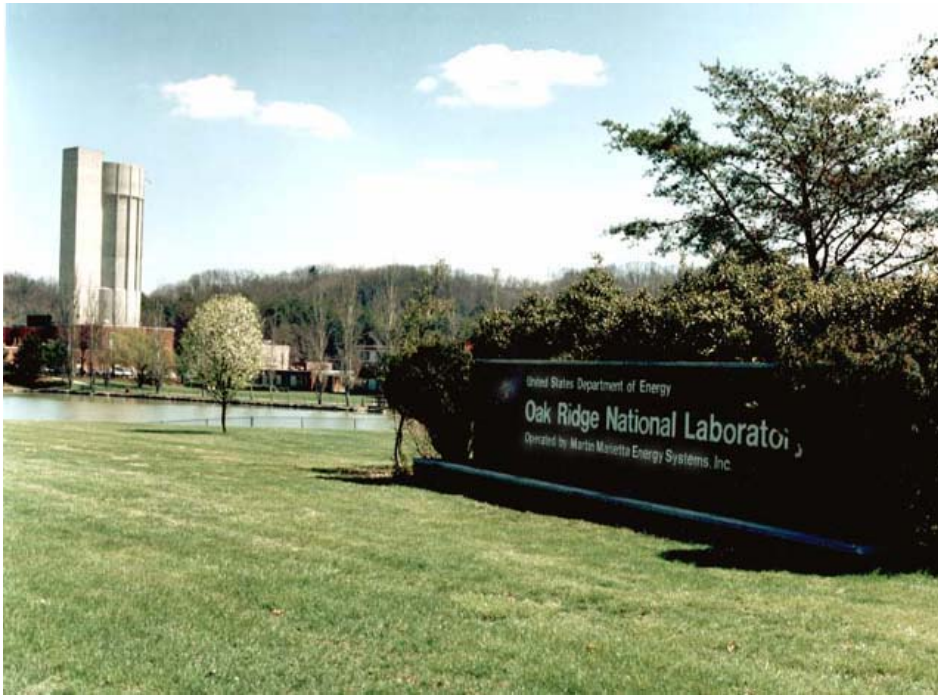


Recent Activities & Initiatives in the ORNL Nuclear Data Program



Caroline D. Nesaraja,
Michael S. Smith
ORNL
Physics Division

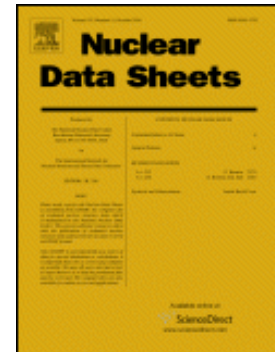


Activities



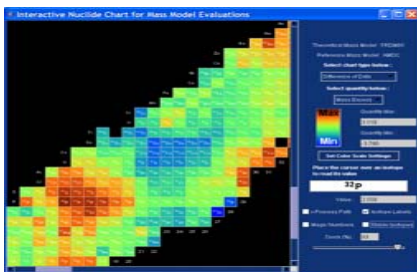
Nuclear Structure Data

- A-chain Evaluations



Nuclear Astrophysics Data

- Evaluation of reactions critical for stellar explosion studies (coupling research and data activities)
- Improve and expand functionality of the Computational Infrastructure for Nuclear Astrophysics for new International Collaboration



Nuclear Structure Data

EVALUATIONS

Heavy mass nuclei

Responsibility: Actinide
Evaluations A=241 – 249

243Cf 10.7 M ε	244Cf 19.4 M α	245Cf 45.0 M ε	246Cf 35.7 H α	247Cf 3.11 H ε	248Cf 333.5 D α	249Cf 351 Y α	250Cf 13.0 α
242Bk 7.0 M ε	243Bk 4.5 H ε	244Bk 4.35 H ε	245Bk 4.94 D ε	246Bk 1.80 D ε	247Bk 1380 Y α	248Bk >8 Y α	249Bk 330 β-
241Cm 32.8 D ε	242Cm 162.8 D α	243Cm 29.1 Y α	244Cm 18.1 Y α	245Cm 5500 Y α	246Cm 4760 Y α	247Cm 1.56E+7 Y α	248Cm 3.48E5 α
240Am 50.8 H ε	241Am 432.6 Y α	242Am 16.02 H β-	243Am 7570 Y α	244Am 10.1 H β-	245Am 2.05 H β-	246Am 39 M β-	247Am 23.0 β-
239Pu 24110 Y α	240Pu 6561 Y α	241Pu 14.220 Y β-	242Pu 3.75E+5 Y α	243Pu 4.956 H β-	244Pu 8.00E+7 Y α	245Pu 10.5 H β-	246Pu 10.8 β-

A=208 evaluated & published (Murray Martin)

A=201 reviewed (Murray Martin)

A=202 reviewed (Murray Martin)

Medium mass nuclei

A=58 submitted to NNDC
(Balraj Singh, Scott Geraedts, & Caroline Nesaraja)

Light mass nuclei

Levels in ^{19}Ne published
(Caroline Nesaraja et al.)

Levels in ^{31}S published
(Z. Ma et al.)

Nuclear Astrophysics Data

^{19}Ne

Motivation: Knowledge of proton induced reactions on ^{18}F is important for novae and X-ray burst

PHYSICAL REVIEW C **75**, 055809 (2007)

Nuclear structure properties of astrophysical importance for ^{19}Ne above the proton threshold energy

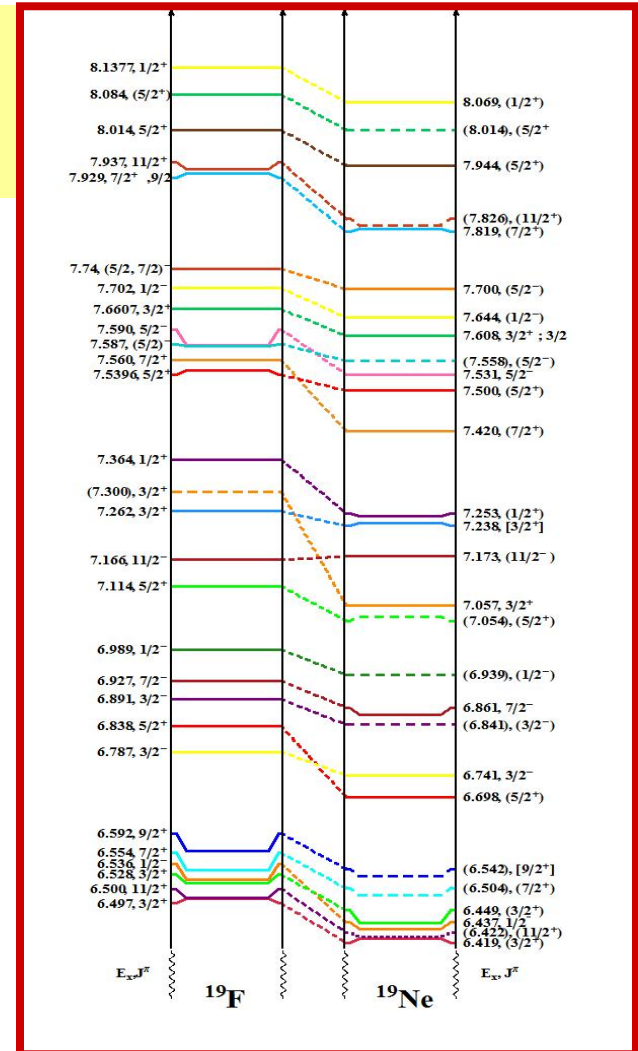
C. D. Nesaraja et al.



Evaluation of **28 levels**

($E_x = 6.4 - 8.1 \text{ MeV}$)

Portion of Ph.D. thesis for N. Shu, CIAE, Beijing, 2004



Nuclear Astrophysics Data

^{31}S

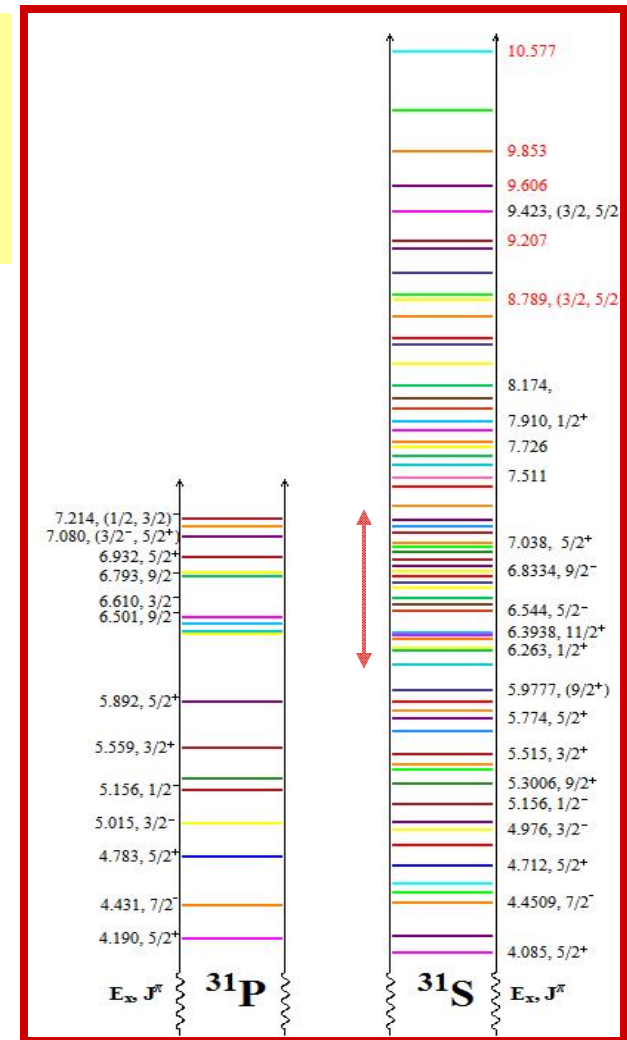
Motivation: $^{30}\text{P}(p,\gamma)^{31}\text{S}$ reaction plays a crucial role in the synthesis of heavier nuclear species in nova outburst on ONe White dwarfs

PHYSICAL REVIEW C **76**, 015803 (2007)
 Astrophysically important ^{31}S states studied
 with the $^{32}\text{S}(p,d)^{31}\text{S}$ reaction
 Z. Ma et al.



Evaluation ^{31}S of **66**
levels (4.1-10.6 MeV)

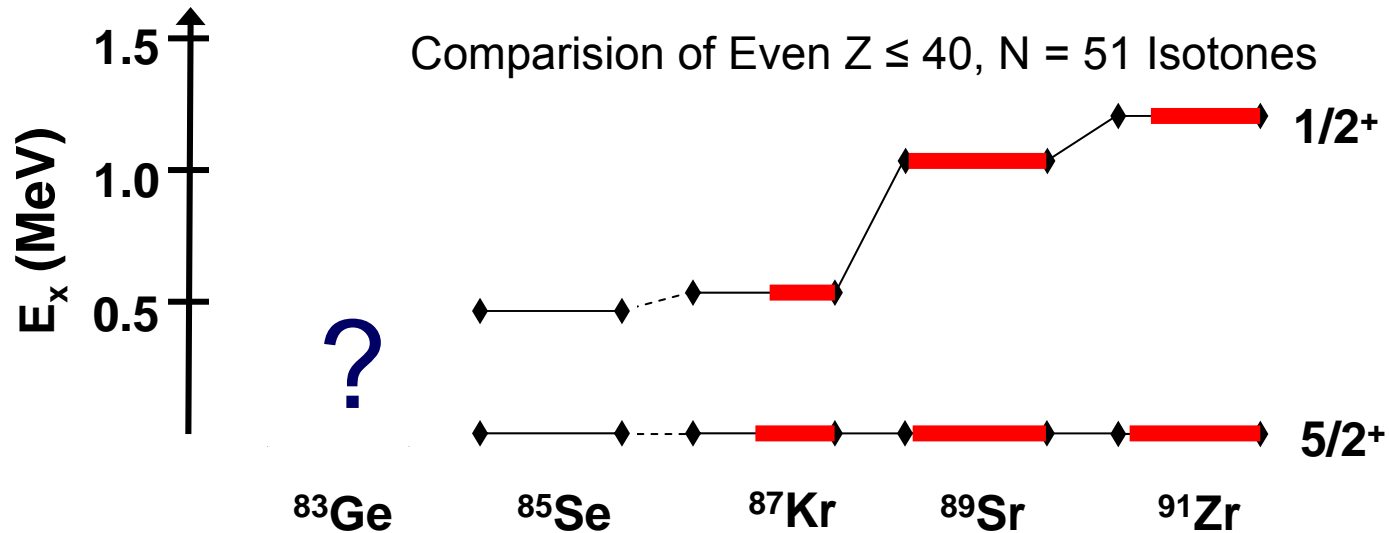
Portion of **Ph.D. thesis** for Z. Ma,
 University of Tennessee Knoxville, 2006



Nuclear Astrophysics Data

^{83}Ge , ^{85}Se

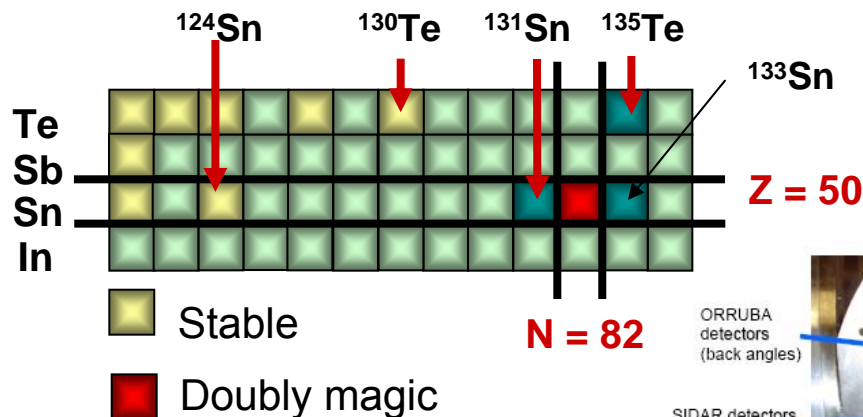
Motivation: To investigate the single particle structure near closed shells which may affect the synthesis of elements in the r -process



Nuclear Astrophysics Data

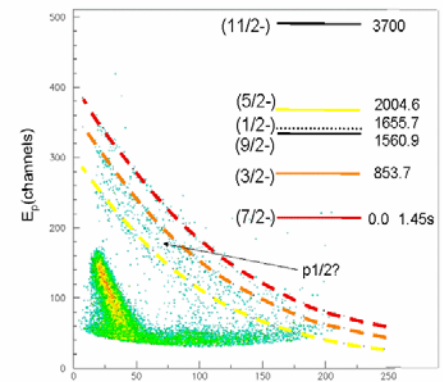
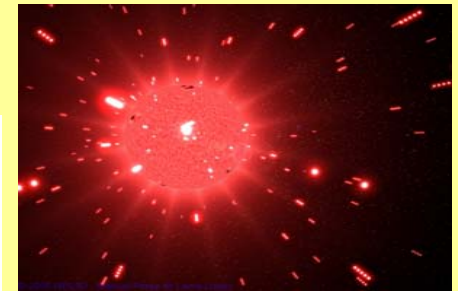
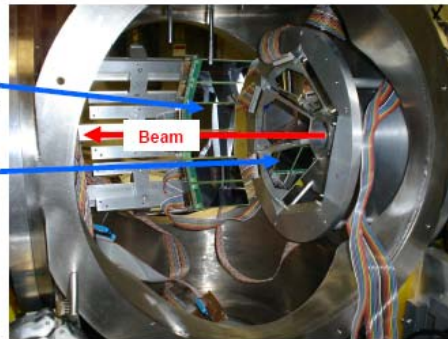
^{131}Sn , ^{133}Sn , ^{135}Te

Motivation: Provide nuclear structure information important for simulating r process nucleosynthesis in supernova explosions



ORRUBA detectors
(back angles)

SIDAR detectors
(back angles)



- (d,p) transfer experiments made with unique radioactive ^{130}Sn , ^{132}Sn and ^{134}Te beams
- analysis and **assessments** in progress to extract energies, spins and spectroscopic factors of single particle levels

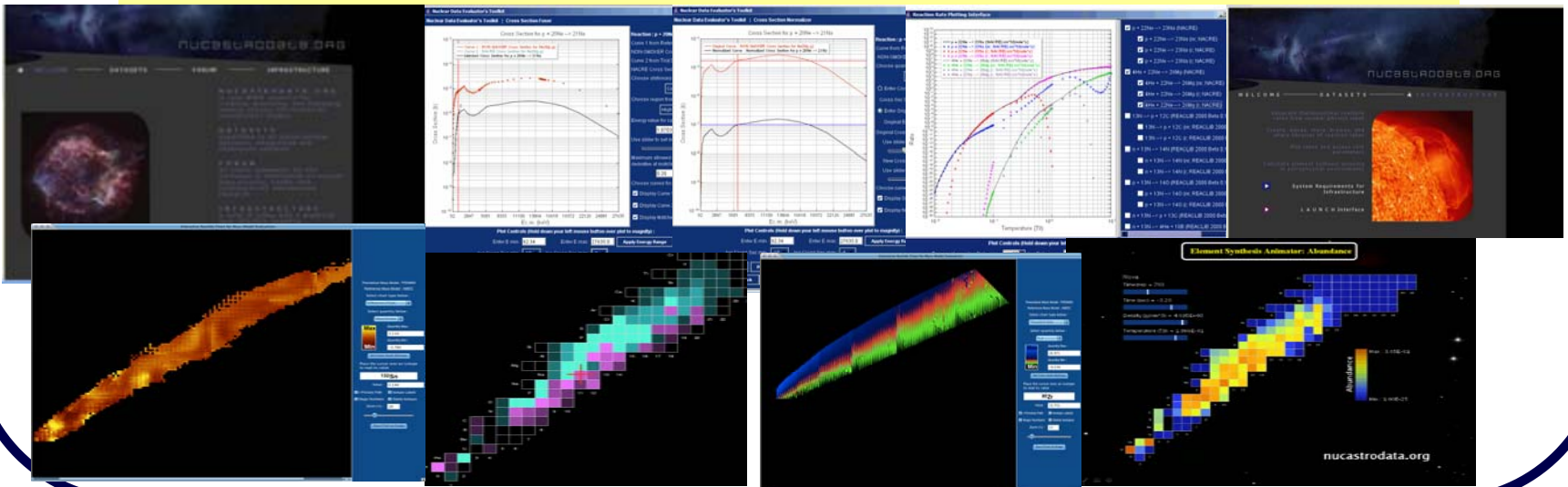
Computational Infrastructure for Nuclear Astrophysics

Overview

Computational Infrastructure for Nuclear Astrophysics is available free online at nucastrodata.org

With a few mouse clicks, one can

- Rapidly incorporate nuclear results into element burning models
- Run models and visualize results
- Share results and comments with online community



Computational Infrastructure for Nuclear Astrophysics

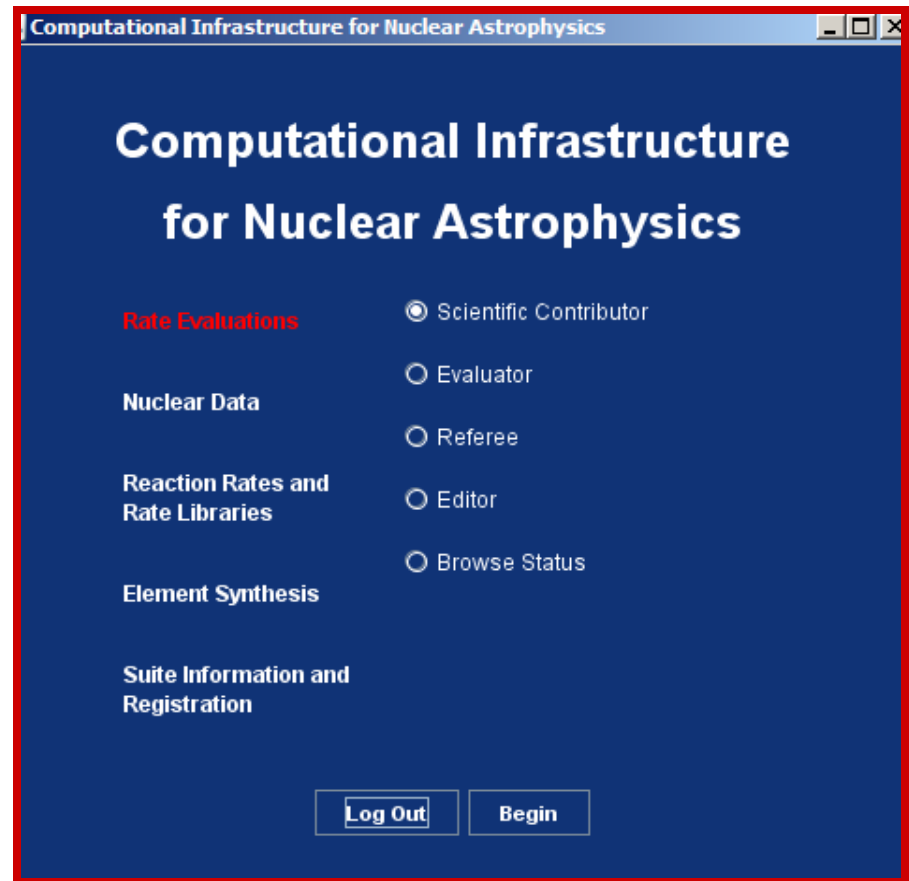
New Features since USNDP-2006 meeting

- Workflow management tools in support of new international collaboration in nuclear astrophysics data

ORNL will provide software backbone for new effort

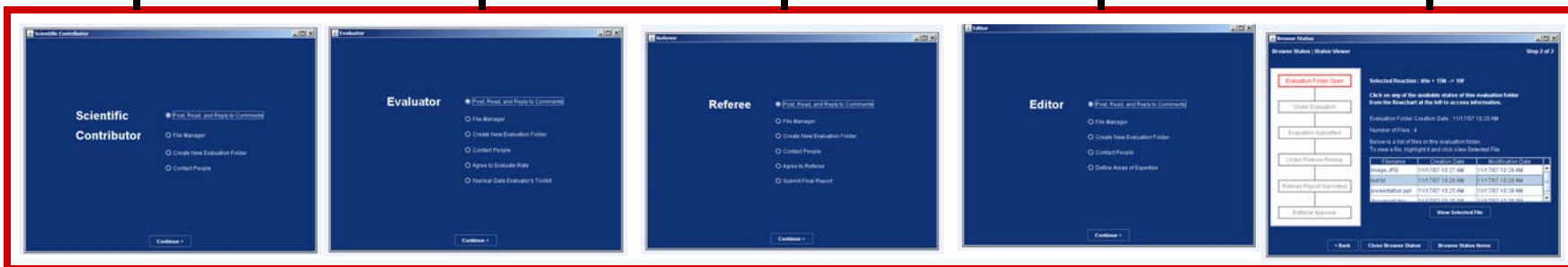
also

- New profiles for element synthesis calculations
- X-ray bursts simulations can be run



Computational Infrastructure for Nuclear Astrophysics

Work Flow Tools



Scientific
Contributor

Evaluator

Referee

Editor

Browse
Status

Motivation:

Creating user friendly tools that **streamline, standardize, and automate** many of the mundane tasks of reaction rate evaluations.

Functions:

- Contribute/Comment to an evaluation
- Assign rate to evaluator
- Evaluate a reaction rate
- Referee an evaluation
- Distribute evaluation when complete
- Archive information

Computational Infrastructure for Nuclear Astrophysics

Future Possibilities

- These **workflow tools** could have utilization throughout the **USNDP**
- Tools are completely and easily **customizable** (e.g. for A-chains, cross sections evaluations ...)
- Could enable anyone to view status of an evaluation
(**transparent process**)
- **Facilitates** evaluation process

Browse Status | Status Viewer Step 2 of 2

Evaluation Folder Open

Under Evaluation

Evaluation Submitted

Under Referee Review

Referee Report Submitted

Editorial Approval

Selected Reaction : 4He + 15N --> 19F

Click on any of the available states of this evaluation folder from the flowchart at the left to access information.

Evaluation Folder Creation Date : 11/17/07 10:20 AM

Number of Files : 4

Below is a list of files in this evaluation folder.
To view a file, highlight it and click *View Selected File*.

Filename	Creation Date	Modification Date
image.JPG	11/17/07 10:27 AM	11/17/07 10:28 AM
text.txt	11/17/07 10:26 AM	11/17/07 10:28 AM
presentation.ppt	11/17/07 10:25 AM	11/17/07 10:28 AM
document.doc	11/17/07 10:25 AM	11/17/07 10:28 AM

View Selected File

< Back Close Browse Status Browse Status Home

- Would like to explore this!