The Joint Institute for Nuclear Astrophysics

Multi-Channel R- matrix Analysis using Azure Code.

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I. R-Matrix Considerations

- Formulation of Lane and Thomas.
- All Angular momentum channels
- All decay reactions
- All interferences

II. Azure Code

- Speed of Minimization
- Cross Section or S-factor
- Yields & Angular Distributions
- Simultaneous Analysis

III. Errors and Sensitivity

- Error Analysis based on X^2 and parameter scanning
- Monte Carlo error analysis available
- Testing sensitivity of extrapolated data to improve data.

Structure of the code Azure

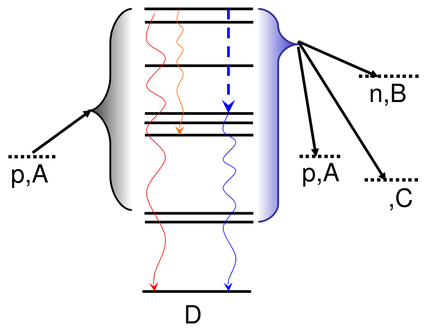
User Setup
- Nuclear Environment
- Mode Selection
- Azure Configurations
- Data Preparation

Azure.for

MAIN → Initial parameters → FCN → Fitted parameters / X^2 → MINUIT: Least Squares Fitting Routine → OUTPUT

Versatility of Azure:

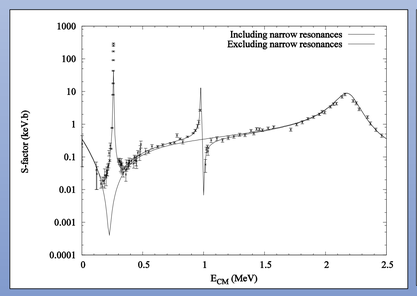
- All ang. Mom. channels
- All decay channels



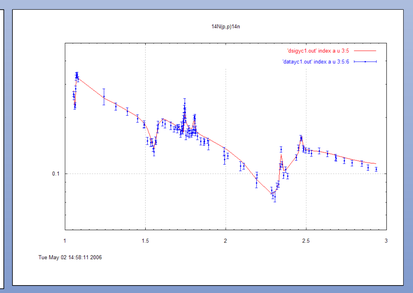
$^{14}N(p,\gamma)^{15}O$ $^{14}N(p,p)^{14}N$

- Astrophysically important_
- Abundant published data analysis.

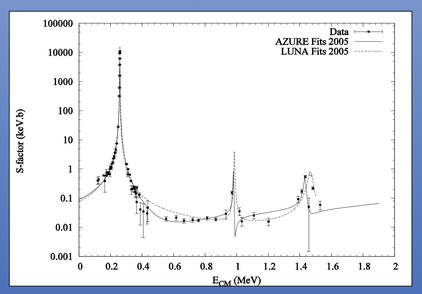
γ [g.s.] - transition



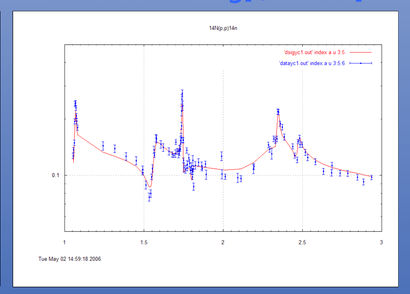
Elastic scattering[θ = 90°]



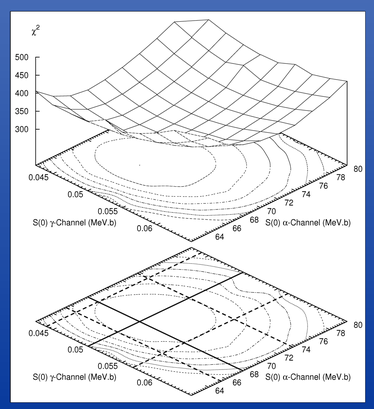
γ [6.18 MeV] - transition

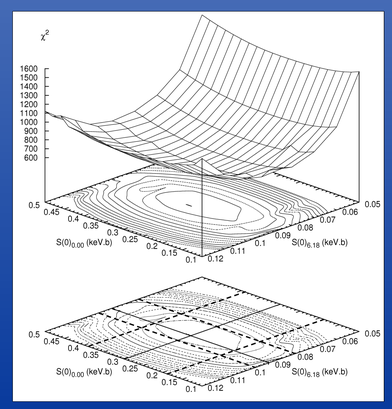


Elastic scattering[θ = 153°]



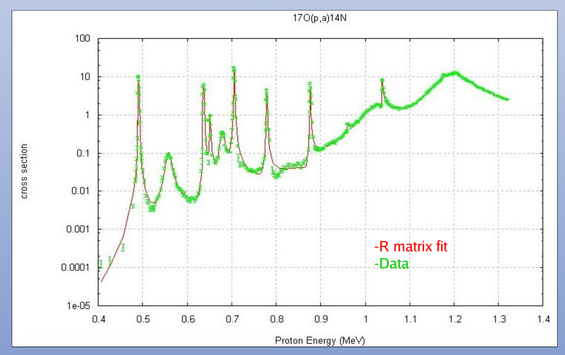
Error Analysis:



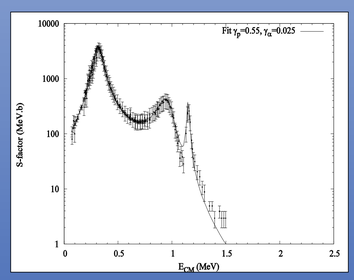


Other Examples

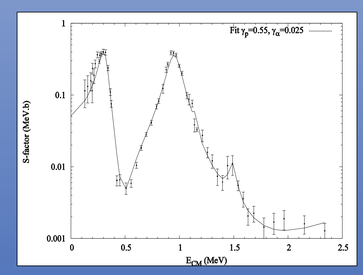
$^{17}F(p,\ )^{14}N$



$^{15}N(p,\ )^{12}C$

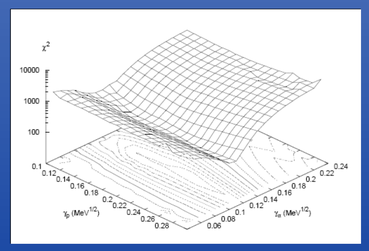


$^{15}N(p,\gamma)^{16}O$

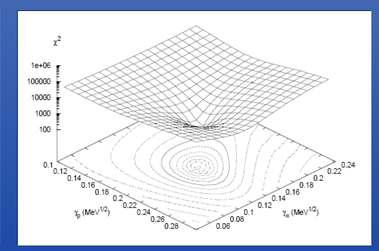


Error Analysis:

γ - ray channel only



Combined γ and channels



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