The Joint Institute for Nuclear Astrophysics

$^{18}F(a,p)^{21}Ne$ reaction: a neutron source for r-process in supernovae

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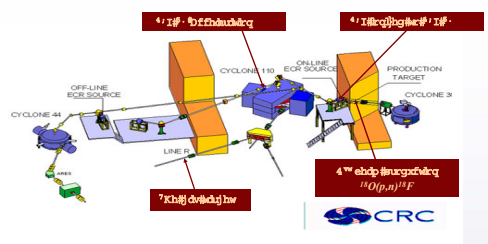
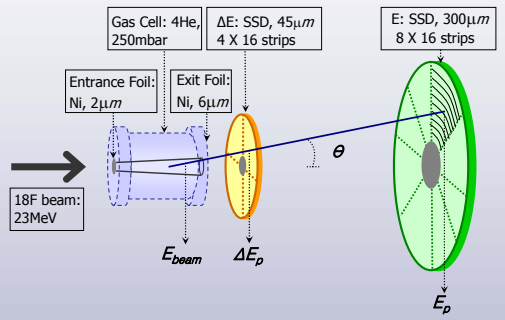
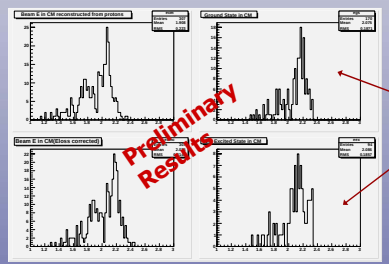
Radioactive beam of 18F at CRC in Belgium



Experimental Setup of 18F(a,p)21Ne at CRC

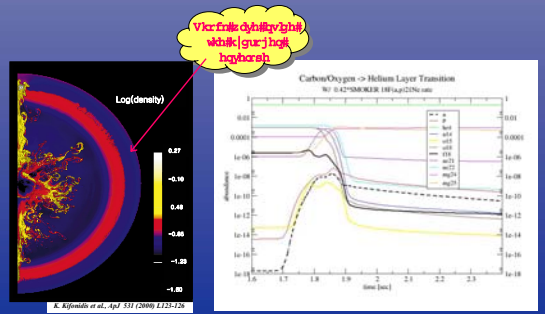


Excitation functions over Center of Mass Energy

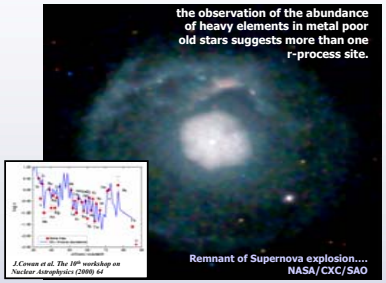


Ratio of Proton group between the ground state transition and the first excited state is complementary study for the reverse reaction, which can have only the ^{21}Ne ground state target.

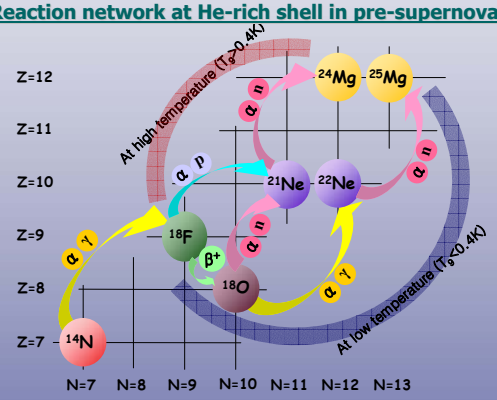
The helium-driven r-process in supernovae II



A possible alternative site to the r-process?



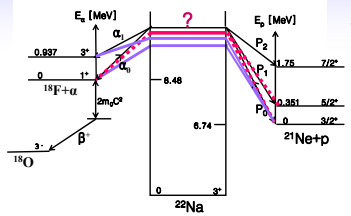
Reaction network at He-rich shell in pre-supernovae



Inverse kinematics:

$^{18}F(a,p)^{21}Ne$, By measuring the ratio of p_1/p_0 with radioactive ^{18}F beam in He gas target

Experiment Design

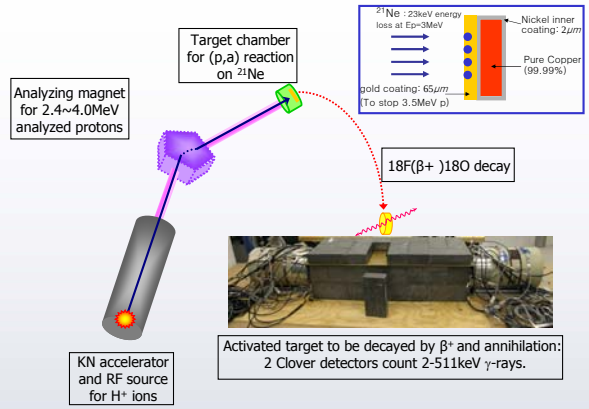


Cross section $\frac{\sigma_{12}}{\sigma_{34}} = \frac{(2j_3+1)(2j_4+1)}{(2j_1+1)(2j_2+1)} \frac{m_3 m_4 E_{34}}{m_1 m_2 E_{12}}$ for $1+2 \rightarrow 3+4$

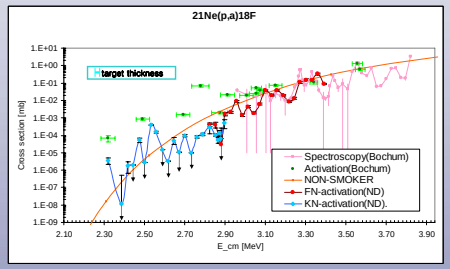
Time-Inverse kinematics:

$^{21}Ne(p,a)^{18}F(\beta^+)^{18}O$, By measuring β+ decay in activation method

Experiment set-up for $^{21}Ne(p,a)^{18}F$ at University of Notre Dame



Cross section comparison with previous measurements



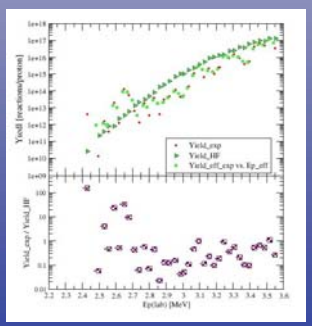
Yield comparison with Hauser-Feshbach cross section

$$Yield_{\_exp}(E) = \int_{E-\Delta}^{E} \frac{\sigma(E)}{\varepsilon(E)}\, dE$$

$$Yield_{\_HF}(E) = \frac{1}{\varepsilon(E)} \int_{E-\Delta}^{E} \sigma_{HF}(E)\, dE$$

Δ : target thickness[MeV]

ε : stopping cross section[eV·cm² /atoms]



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