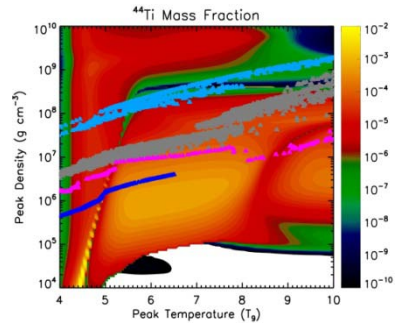
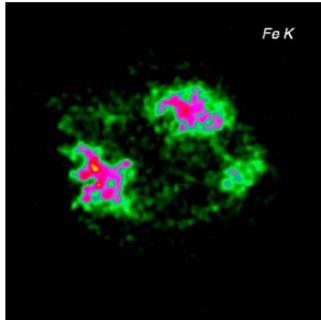




## The Notre Dame AMS Facility – Probing Galactic radioactivity

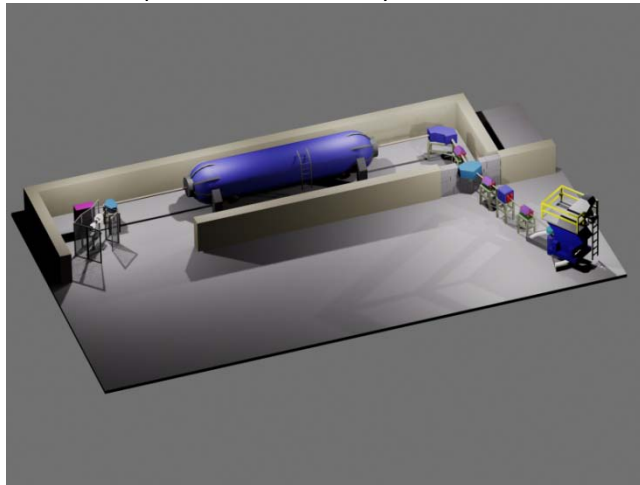
Gamma-rays from radioactive by-products of nucleosynthesis ejecta provide a direct measurement of cosmic nucleosynthesis (i.e. the formation of nuclei in stellar environments) as the detection of the decay gamma-rays with satellite-borne telescopes provide direct isotopic constraints to the physics of nuclear burning regions inside stars.



(Left) Iron  $\gamma$ -rays emissions detected by the Chandra satellite from the remnants of the Cass A Supernova, (Right) Model calculation of  $^{44}\text{Ti}$  produced in a supernovae (G. Magkotsios et. Al)

Material produced in these inner regions is ejected into interstellar space during the final phases of the evolution of the star by stellar winds and ultimately when these stars explode as supernovae. Two isotopes of interest to our group are  $^{44}\text{Ti}$  and  $^{60}\text{Fe}$ . Measurement of the gamma-line from the radioactive decay of these isotopes can then be used to compare to the production rates predicted by our stellar nucleosynthesis models. In addition, their distribution and intensity can provide information on temperature, density and possible convection zones in stars.

In order to correctly interpret this information it is necessary to know to a high degree of precision the nuclear production cross-section for  $^{40}\text{Ca}(\alpha,\gamma)^{44}\text{Ti}$  as well as the half-life of  $^{60}\text{Fe}$  (previously measured to be  $1.5 \times 10^6$  y and currently determined as  $2.6 \times 10^6$  y [1]). Both these projects are ongoing using the Notre Dame Accelerator Mass spectrometry facility at Notre Dame. The high isobaric and isotopic separation sensitivity brought by AMS [2,3] makes it possible to measure these isotopes down to extremely low concentrations.



Layout of the AMS facility at the Nuclear Science Laboratory. From Left to right: The MCSNICS ion source, FN Tandem Accelerator, high energy analyzing magnet, switching magnet, Wien filter and Spectrograph

