ISAC Science Forum, 2004-04-28

PRESENT: Friedhelm Ames, Andrei Andreyev, Gordon Ball, Rick Baartman, John Behr, Ewart Blackmore, Pierre Bricault (PB), Lothar Buchmann (LB), Barry Davids, Jonh D'Auria (JDA), Paul Delheij, Marik Dombsky (MD), James Daoud, Greg Hackman (GH), Andrew Hurst, Dave Hutcheon, Peter Jackson, Keerthi Jayamanna (KJ), Rob Kiefl, Bob Laxdal (REL), Suzie Lapi (SL), Jens Lassen (JL), Phil Levy, Kei Minasomino, Colin Morton, Miguel Olivo, Jean-Michel Poutissou, S.C. Ravuri (RSC), Zaher Salman, Fred Sarazin (FS), Paul Schmor, Alan Shotter, Martin Smith, Mike Trinczek

Notes transcribed by GH

Reports on Prior Beam times

E921: S.C. Ravuri

RSC reported on the discovery of a candidate for a new high-K isomer in the A~180 region. Detailed elucidation of its structure and impact require further analysis. The main limitation on these experiments was contamination with isobars and oxide and fluoride molecular ions. The laser ion source is expected to improve signal-to noise by enhancing delivery of specific nuclei of interest; JL stated that these beams are relatively easy to develop.

E952, $^{12}C(^{4}He,\gamma)^{16}O$ with DRAGON: Lothar Buchmann

LB reported results from the $^{12}C(^{4}He,\gamma)^{16}O$ experiments, the single most important measurement in nuclear astrophysics. Excitation functions for the 1^- and 2^+ resonances were measured; furthermore, for the first time, radiative capture of the 0^+ resonance was unambiguously observed and identified by the coincidence between the recoil and the unique $0^+\rightarrow2^+\rightarrow0^+$ cascade. The important astrophysics measurements are in the non-resonant regimes. At these nanobarn cross sections, measurements are limited by beam intensity. In the discussion, DH reported ~3×10^{-13} beam suppression; REL reported that 1 μA was the space charge limit of the accelerator, and asked whether it was worth investing in better stripping; KJ and others pointed out that the CSB or an OLIS ECR could provide $^{12}C^{2+}$ that could be accelerated without stripping.

Report on Upcoming Experiments

ECR Tests: Pierre Bricault

For the upcoming ECR tests, PB will use Ne & He support gas, and once proton beam was available, he will measure Ne & He yields as a function of proton current. If enough ^{18}Ne is produced, it will immediately be turned over to GPS for

the weekend. After that, proton beam current will be increased and yields measured, and time permitting, other support gases will be tried.

E927, ^{18}Ne(^{3}He,p)^{20}Na: Frederic Sarazin

FS reported on previous measurements made and attempted with a ^{3}He cryogenically cooled gas target. The long-term goal is to measure ^{18}Ne(^{3}He,p)^{20}Na; in the interim, $^{20\text{-}21}$Ne and ^{20}Na beams have been used. Although proton yield was seen online during the ^{20}Na and ^{21}Ne runs most of them originated from carbon buildup on the target foils. This was confirmed by visual inspection of the foils at the end of the experiment. A sophisticated cold trap, designed and fabricated by TRIUMF, will be installed and its effectiveness tested in this beam period. JB pointed out that judicious selection of materials (e.g. for cables) can also reduce carbon contamination.

Report on ^{11}C: John D'Auria

JDA thanked and praised all involved for their efforts to attempt batch mode ^{11}C beam delivery using TR13 for production and ECR for ionization. ^{11}C produced and manually carried as CH_4 gas adsorbed to a zeolite cold trap cell. The beam was to be delivered the to collection box where 511 keV γ rays in a pair of NaI detectors were multiscaled to measure delivered activity. The first attempt was unsuccessful due to a faulty valve on a xenon leak line. In the second run, no activity was seen until 3 hours after injection. This coincided with turning off the He gas to the ECR. The half-life of the activity was measured to be 11±29 minutes. Based on this signal and extrapolating back, it was estimated that of the ^{11}C in the sample at the time the valve from the cold trap was opened, 0.01% was delivered to the collection box. This factor includes ECR source efficiency and release from the cold trap. JDA also showed mass spectra from measurements by KJ of the CH_n^+ yield on the test stand ECR source. JDA would like to do systematic tests with ^{11}C with the ECR on the test stand.

In ensuing discussion it was pointed out that the sample in the cold trap included a lot of stable CH_4, N_2, and other gasses. The ECR ionization potential has been well established to be very sensitive to gas pressure, so PB recommended 99% pure CH_4. JDA suggested CO_2 (as used at BEARS) as an alternative, and SL pointed out that it should easier to extract a "clean" sample since it sublimates at liquid argon temperature.

June-July Schedule – Jean-Michel Poutissou

JMP presented his current plan for ISAC for June and July, noting that the August timeline for the Ta target and precedent July timeline for installation is constrained by experiments involving outside users and equipment. The prototype high-power target with SiC target material will be installed on the east target station in mid-June to provide beam for the ^{26g}Al DRAGON experiment.

The high-power target's main benefit is radiation-enhanced diffusion, which is even more pronounced for short-lived ^{26}Na and ^{26m}Al. On this target, CW proton beam is needed to maintain a high enough target temperature, and so this target cannot be used in a pulsed mode for contaminant reduction. General consensus was that DRAGON would be able to perform the experiment even with a mixed beam. It was pointed out that a regular SiC target would still be on the west target station, and if it was left in, it could be used in pulsed proton mode to provide a clean (albeit less intense) ^{26g}Al for comparison to the high power target.

NEXT MEETING: May 12