ISAC Science Forum, 2004-03-31

PRESENT: Jean-Michel Poutissou (JMP), Marik Dombsky (MD), Pierre Bricault (PB), Pat Walden, Phil Levy, Paul Schmor, Jens Lassen, Andrew Hurst, Barry Davids, Rick Bartman, Chris Ruiz (CR), Dave Hutcheon, Jens Dilling, Greg Hackman (GH), Lothar Buchmann (LB), John Behr, Kei Minasomino, Martin Smith, Peter Jackson, Miguel Olivo, Keerthi Jayamanna, Dick Yuan, Paul Delheij, Joe Vaz, Matt Pearson

Notes transcribed by GH

Report on Prior Beam times, Beta-NMR

No BNMR representatives were present to report on how their beam time went. Although there were reports of beam fluctuations, there was also suggestion that the experimenters were nonetheless happy. The discussion was inconclusive. JMP will pressure BNMR to report at the next forum on what actions were taken to correct their beam fluctuation and asymmetry problems and what effect they had.

Report on upcoming beam time, E909: Greg Hackman

E909 is one of a series of approved ISAC experiments for precision measurements of lifetimes and branching ratios, in particular ^{34}Ar. GH reported that $t_{1/2}$ of ^{26}Na had been measured by the highly reliable and well understood GPS setup to be 1.07128(13) s, and that this would be used as a “standard clock” for verifying the accuracy of lifetime measurement from γ yields measured with the 8π. There were significant anomalies in previous runs including problems with readout, pileup and Compton suppression. The goal of this beamtime is to quantify the effects of pileup.

In the ensuing discussion it was pointed out that one really needs to test the apparatus with a positron emitter to fully simulate the ^{34}Ar case, which also has a positron-emitting ^{34}Cl daughter. GH, and the rest of the collaboration, acknowledges this, and also points out that it is sensible to fully understand the simple case of a negatron emitter before proceeding to more complicated cases.

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

Lothar Buchmann presented an elegant summary of the need for an accurate direct measurement of the ^{12}C(^{4}He,γ)^{16}O reaction, using DRAGON and the ISAC accelerators with stable beams. LB also discussed problems with the DRAGON acceptance in a first attempt at this experiment, and described upgrades to the differential pumping, beam optics, and beamline that were incorporated to correct these issues. Analysis of the first measurement was discussed and showed reasonable agreement with previous measurements when cross sections were

deduced following correction for these acceptance limitations. The present run aims to measure accurately the absolute cross sections for the 1^- and 2^+ . The limitation on these experiments is now the stable beam current that -ISAC can deliver.

Prospects for Experiments with ^{26}Al: Chris Ruiz and Marik Dombsky

CR presented a detailed discussion on the role of a 188 keV resonance in ^{26g}Al in stellar nucleosynthesis and why it would be interesting to study with DRAGON. He discussed problems with beam contaminants and showed that DRAGON should be able to resolve them. CR went on to conclude that 10^9 particles per second would be needed for an astrophysically useful measurement. MD then described how ^{26}Al was first suspected as part of the mass 26 beam due to an excess of Faraday cup current relative to ^{26}Na yield from SiC targets and was positively identified in a collected sample that was gamma-counted in the 8π. MD found that approximately (and consistently) 8% to 12% of the calculated Al yield cups was measured as current on Faraday cups, subtracting ^{26}Na contributions measured by decay at the yield station. MD concludes that 10^9/s ^{26}Al can be delivered with existing sources to the accelerator system; depending on losses there, the experiment may be feasible. MD pointed out that in the short term the high-power target, and in the long term alternative target materials and TRILIS, could provide more yield.

ECR source performance – Pierre Bricault

PB reported on his experiments on the on-line ECR source in the target station, including detailed explanations of his setup and the methodology he employed. The ECR source is stable for pressures lower than 3×10^{-6} Torr. However, the ionization efficiency for neon is very sensitive to operating pressure or, equivalently, introduction of background gases; in particular, at ~10^{14} particles per second of injected gas, the neon ionization efficiency drops by two orders of magnitude. The emittance of the neon beam increases with the pressure mainly due to the formation of a low energy tail causes by collision on gas atoms during the acceleration. Although the entire beam intensity is measured at IMS:FC0, due to its large emittance it will not be transport further that IMS:Slit11. The net result will be an even lower intensity at the experimental station.

Beam Development Strategy meeting – Jean-Michel Poutissou

JMP reported on two meetings of the Beam Development Strategy committee. The first meeting reviewed the status of ongoing source developments, namely the high-power target (currently operating with a 70 μA electron beam as a heat load), the negative ion source, the compact FEBIAD ion source, the laser ion source, the actinide target, and the laser ion source.

In the second meeting, medium term developments to 2005 were discussed. JMP made it clear that the highest priority is developing new beams for nuclear astrophysics, and since the current ECR source is unlikely to provide the Ne ionization efficiency or emittance required for the nuclear astrophysics programs, it is time to adjust priorities. The May ECR runs will be used to help learn what needs to be done for a future ECR source to be developed in the long term.
The three priorities and milestones for beam development reported by JMP are:

- First gallium beams for experiments from TRILIS in December 2004 (tests on West target station in September)
- Actinide target test: this requires input from the Actinide Target Task Force currently defining the requirements for the test.
- Neon Beams for Nuclear Astrophysics from a compact FEBIAD ion source: Upon receipt of a Design Note outlining that such a source will have the necessary ionization efficiency and reliability for this program, the FEBIAD source would become the highest priority for new ion source development.

The negative ion source development could continue at a lower priority so would any development of an improved ECR .

There was some discussion about whether or not an actinide target test was feasible at the end of 2004. It most likely is not but the task force has to complete its evaluation first.

AGENDA ITEMS PROPOSED FOR NEXT MEETING, 2004-04-14:

- Report on previous and upcoming experiments (ongoing)
- ^{11}C tests
- Follow up on Beta-NMR beam instability problems