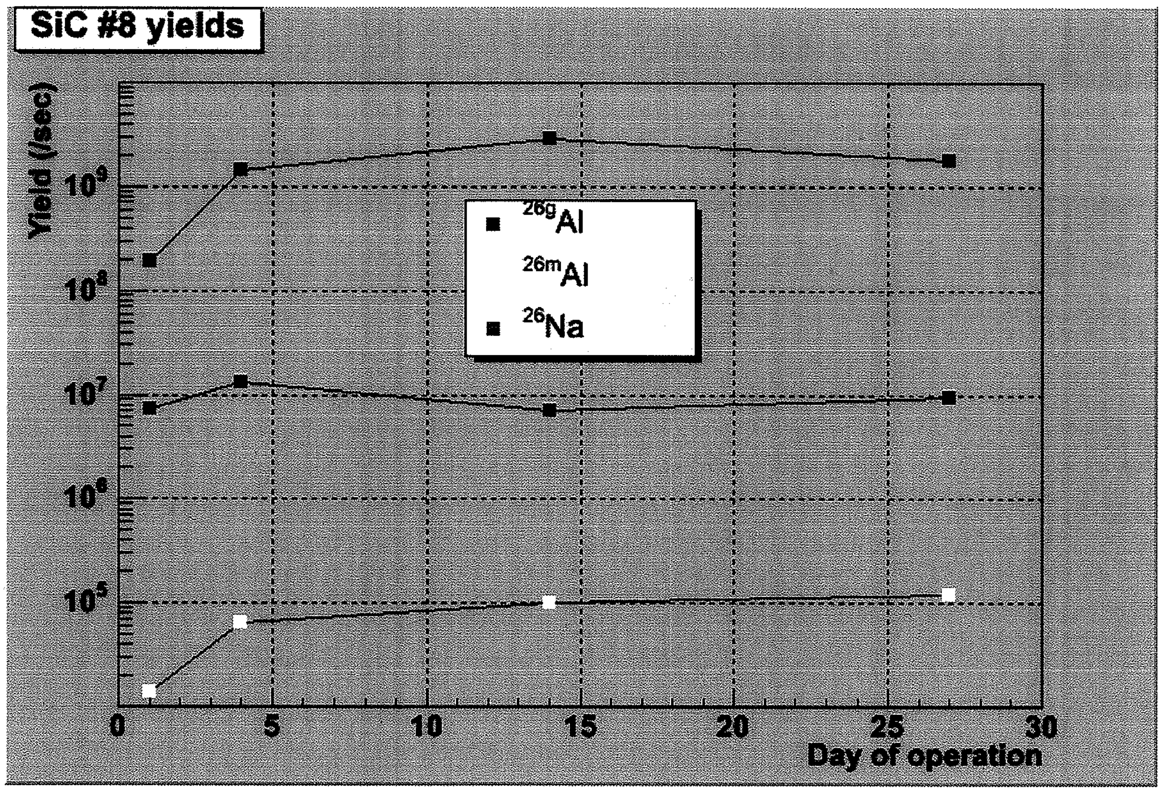
Expected ^{26}Al yields

Performance of SiC #8, May/June 2004:

Peak intensity ~1.2 x 10^8 s^{-1} (at DRAGON)

Average intensity (384 keV/u) ~ 1.0 x 10^8 s^{-1}
(205 keV/u) ~ 0.7 x 10^8 s^{-1}

Yield station measurements during this period:



This was achieved with 35 ± 2 μA proton beam.

Fluctuations in ^{26}Na attributable to proton beam current.

June 2005 run will use HPSiC target, capable of sustaining at least 65 μA (more if beam defocussed on target, potentially 100 μA – however development time has not been allocated for this) – Aluminium production should scale linearly with proton current.

> Can assume factor 1.86 more **production** from HPSiC
> Can assume factor 2 more **ionization** from TRILIS

Therefore, if we scale up from the average intensity during 205 keV/u run last June, we might expect 2.6 x 10^8 s^{-1}at DRAGON target.

Yield = 3.86×10^{-13}

with 40 shifts of running, would expect 4.49×10^{14} ions on target (18 μC @ 6+)

→ 173 reactions
x BGO x CSF
→ 39 coincidences

This is a do-able experiment if we can maintain this beam intensity!!

Even if we get a factor 2 less beam, we can have a publishable result.

Key factors:

1. Beam tune – minimize losses through entire accelerator: spend time with pilot beam to do this.
2. Separator tune needs to be spot on and well understood.
3. Leaky beam rejection is key.

Estimate from 2004 run: in 9.5 μs HI-coinc.gamma TOF window, have 10 randoms.

→ 0.056 rand/ μs/ μC

in 1 μs TOF cut will get 24 randoms for our 4.49×10^{14} beam ions.

Need accuracy in energy measurement and local TOF.

E989 $^{26g}Al(p,\gamma)^{27}Si$ preparations

Gas Target:

8 Torr – small pumping tubes – turbo problem?

Elastic Monitors:

Primary source of normalization!(can also take intermittent FC4 readings)
Size of elastic signal?
Rutherford cross-section- prescale factor

Dipoles:

for 6+ recoils, 205 keV/u: ~44 kV
for 6+ recoils, 384 keV/u: ~82 kV

NaI coincidence counters:

require ^{22}Na coincidence calibration (summer student?)
spectra into ROOT (scaler gated on 511s?)

HPGe counter:

require source calibration (summer student?)
efficiency curve, extrapolate to 1809 keV
spectrum into ROOT

Finals Slits:

Acceptance issues:
Leaky beam cut-off – study with ^{26}Mg tuned to recoils?
GEANT simulation.

MCP:

foils made?

DSSSD:

Energy calibration – TDC offset match
Three-line alpha source – self timing of alphas – deadlayer correction
Pulse height defect – interstrip effects
GEANT simulation
Local TOF – add MCP to GEANT

BGO:

Timing:

Calibration reaction: $^{27}Al(p,\gamma)^{28}Si$

Calibration reaction

$^{27}Al(p,\gamma)^{28}Si$, E_R=195.5 keV, $\omega\gamma$=14 meV
Q = 11.585 MeV
E_{beam} = 201.1 keV/u
E_{rec} = 5.234 MeV
TOF = 1.664 ns/cm

E_x = 11.781 MeV

100% M1+E2 → 2^{nd} Ex. (4618 keV), Eγ = 7159 keV
100% E2 → 1^{st} Ex. (1779 keV), Eγ = 2839 keV
100% E2 → g.s. , Eγ = 1779 keV

θmax ~ 22 mrad (14 mrad for 7 MeV γ-ray)

MCP – DSSSD time diff. = 1.5 ns
Estimated resolution ~ 1.22 ns

Recoil energy spread ~ 3%

Require high beam intensity from OLIS (> 5 e 9 /sec) and 4/5 days running.
This will benefit from OLIS mods (Oven etc).

Normally would look at high energy resonance first with RIB, but if we can do this reaction, could go straight to low E resonance.