Focal Plane detector for GARIS

RIKEN, Nishina Center Superheavy Element Lab. 森本 幸司 Kouji Morimoto

 GARIS Focal Plane detector Silicon detector box ToF detector

•Gas jet system (for chemistry)

•Future plan

•Summary

RIKEN GARIS(Gas-filled Recoil Ion Separator)



Focal Plane Detector system







Silicon detector Box



Focal plane detector (Position sensitive PSD) Side detector

Silicon detector box

Detection Efficiency for decaying α particles: 85 % (Geometrical)

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Dynamic range: high gain 0 - 20 \text{ MeV} for \alpha decay
low gain 0 - 200 \text{ MeV} for spontaneous fission
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Pre Amp (Kumagai-san Amp): Cf=2pf (Focal Plane PSD), Cf=3pf (Side )
Shaping time: 2.5 \ \mu \text{ sec}
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Energy resolution: Focal Plane : 39 \text{ keV} (FWHM)
Focal plane + side : 66 \text{ keV}
Position resolution: read out up and down
0.6mm (10MeV \alpha)
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For fast decay: $5 \mu \sec -$ Dual ADC (2nd gate)

Noise suppression: cooling 5 ℃ (冷やし過ぎ、冷媒の流し過ぎに注意) フェライトコアが効果的 (for common-mode noise)





Energy calibration of silicon detector



Position resolution



Position differences between ²⁷¹Ds implantation and sequential alpha-decays

Silicon detector Box



Focal Plane Detector system



2つの役目: TOF測定 入射、崩壊イベントの区別



Time of flight detector

(2つの役目: TOFと入射、崩壊イベントの区別)



Raw data (accumulated for 12 hours)



Future plans

さらに寿命の短い崩壊に対応する (5 µ sec 以下の崩壊) measure the pulse shape of pre-amp signal using Flash ADC

Improve Energy resolution of silicon detector 両面をresistive-stripにして、片側をhigh-gain、反対側をlow-gainの Pre-amp gain で読む

Focal Plane にγ線検出器を設置しα-γ測定する Ge検出器、CdTl検出器を検討中

Gas-jet transport system coupled to GARIS

Mylar vacuum window (60 mmΦ): 1 µm thickness at 100 kPa Support grids: honeycomb (89%) or circle (72%) structure Chemically inert Teflon chamber: direct injection of chemical reagents



Summary

Silicon detector box

Dynamic range: high gain 0 - 20 MeV for α decay low gain 0 - 200 MeV for spontaneous fission

Energy resolution: Focal Plane : 39 keV (FWHM) Focal plane + side : 66 keVPosition resolution: read out up and down 0.6mm (10MeV α)

ToF detector

Timing resolution: for ²⁴¹Am α 530 psec (FWHM)

Detection Efficiency: for 241 Am α 99.9 %

Mass resolution A=270 で約10









Collaborators

Kosuke Morita RIKEN Kouji Morimoto **RIKEN Hiromitsu Haba RIKEN RIKEN** Daiya Kaji Takahiro Akiyama **RIKEN**, SaitamaUniv. Nozomi Sato **RIKEN**, Tohoku Univ. Akira Yoneda **RIKEN** Kazuaka Ozeki RIKEN **Toshimi Suda** RIKEN Atsushi Yoshida RIKEN Tetsuya Ohnishi RIKEN Eiji Ideguchi Univ. of Tokyo Akira Ozawa Univ. of Tsukuba, RIKEN Saitama Univ. Takayuki Yamaguchi Hiroyuki Koura JAERI Fuyuki Tokanai Yamagata Univ. Y.-L. Zhao **IHEP Beijing** Xu IMP Lanzhou Η. Hisaaki Kudo Niigata Univ. Shin-ichi Goto Niigata Univ. Keisuke Sueki Univ. of Tsukuba Kenji Katori RIKEN









1. 重イオンリニアック(RILAC)

Gas-jet transport system coupled to a recoil separator



New methodologies in SHE chemistry

Chemical experiments under extremely low background conditions Stable and high gas-jet transport efficiency Chemical reactions with a large variety of chemical reagents