LAMPS Si-CsI Detector

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LAMPS Review

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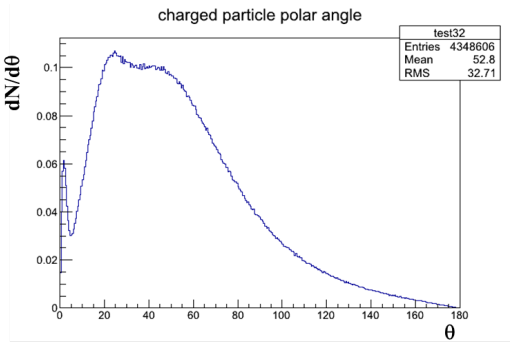
Low Energy LAMPS Experimental Setup

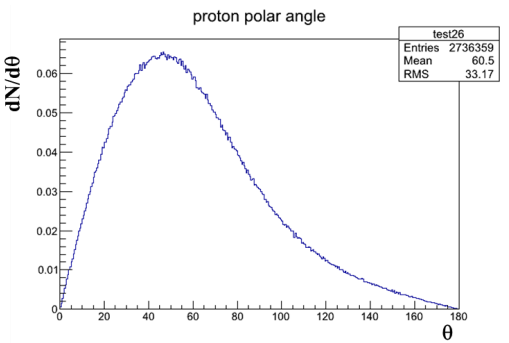
^{132}Sn + ^{124}Sn @ 18.5A MeV

Particle and Heavy Ion Transport code System (PHITS) event simulation

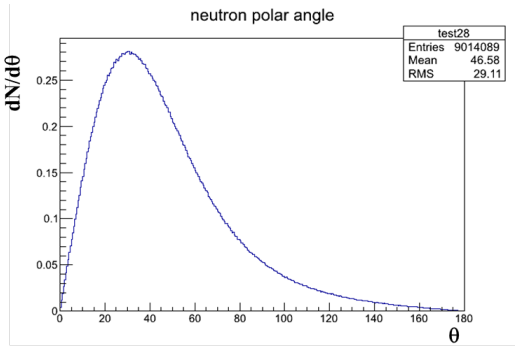
Particle Species	Multiplicity per Event (4π)
charged particle	16
p	10
d	2
t	2
^3He	1
^4He	2
n	33
γ	3



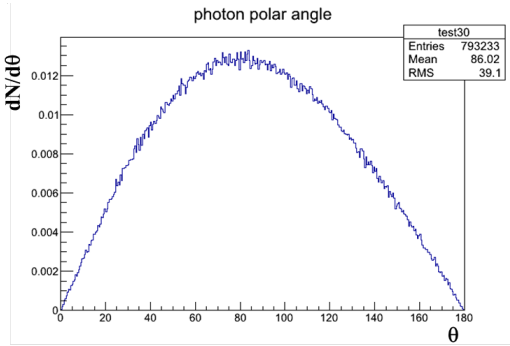
(a) Charged particle polar angle distribution.



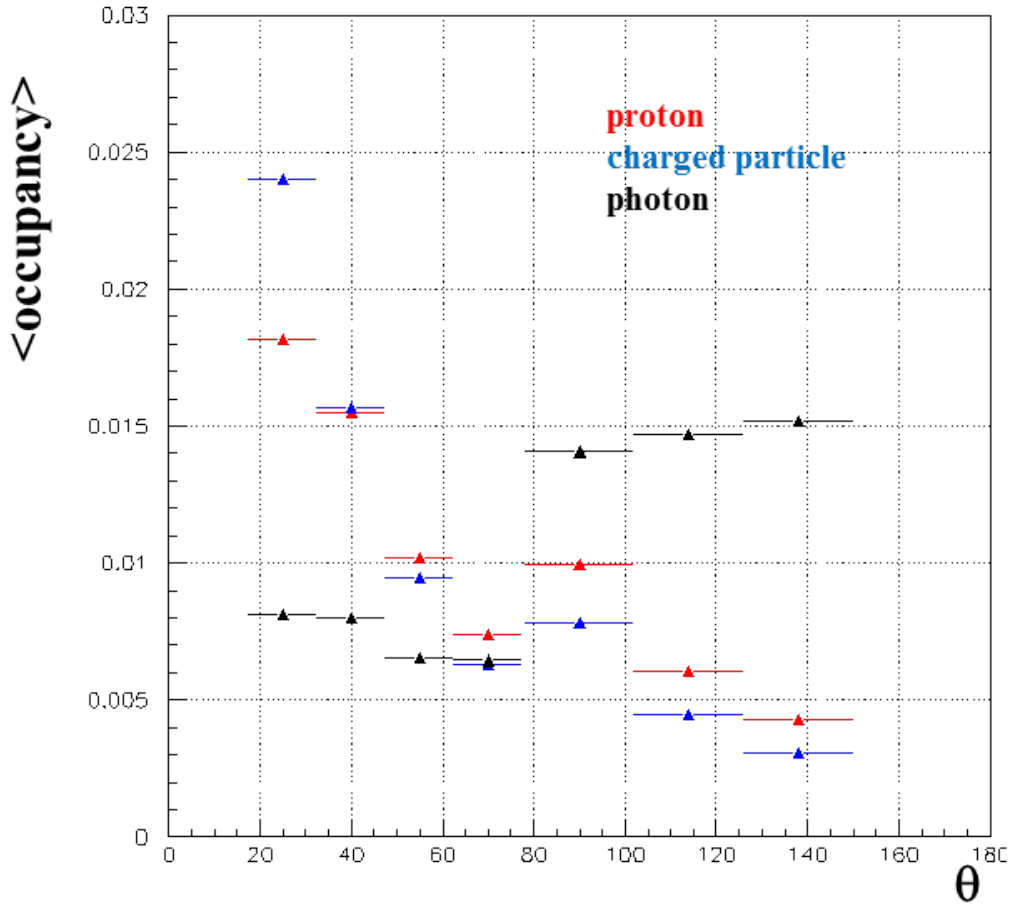
(b) Proton polar angle distribution.



(c) Neutron polar angle distribution.



(d) γ polar angle distribution.

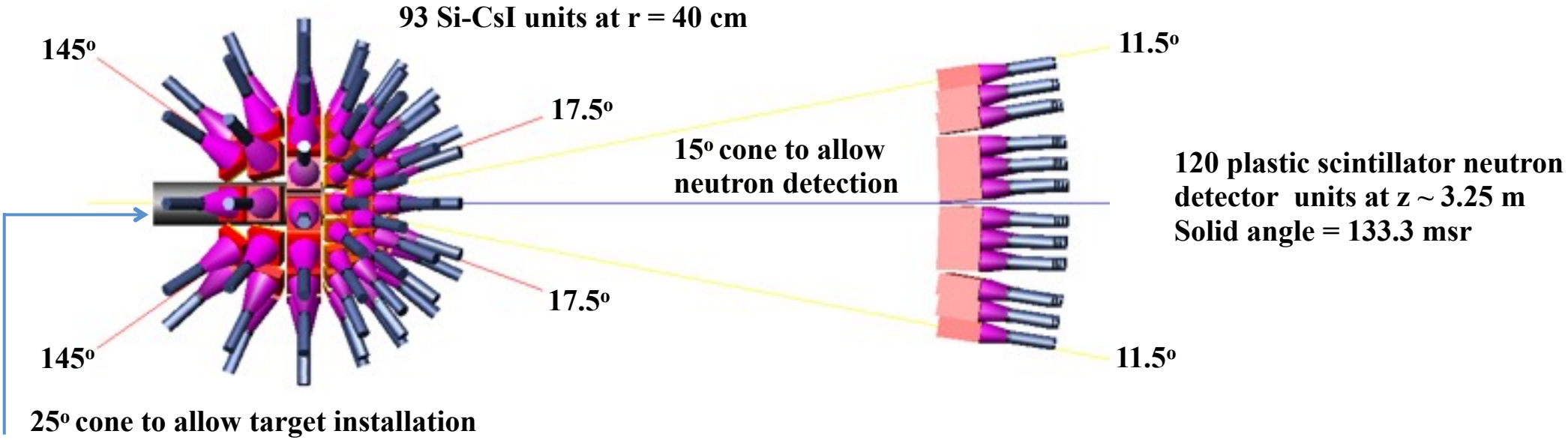


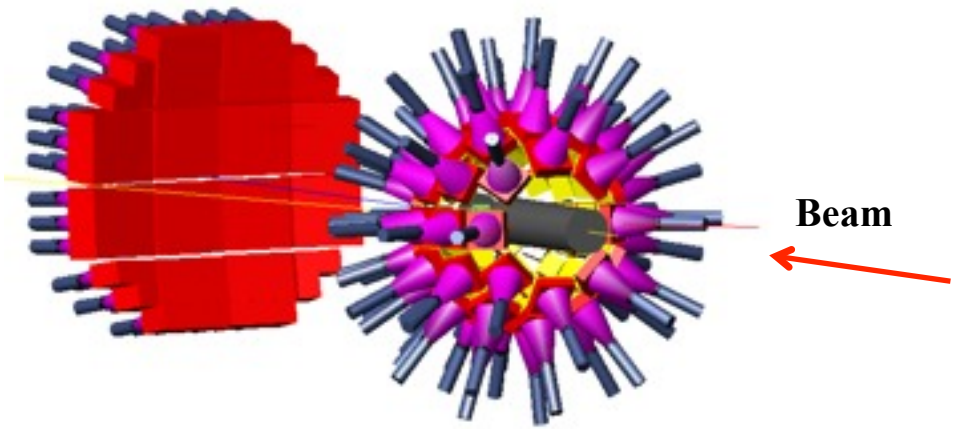
Si-CsI detector unit coverage of polar angle tuned to be <occupancy> < 0.1

Low Energy LAMPS Experimental Setup

$E_{beam} < 18.5A$ MeV

For GDR Experiments (to test PDR measurements as well)





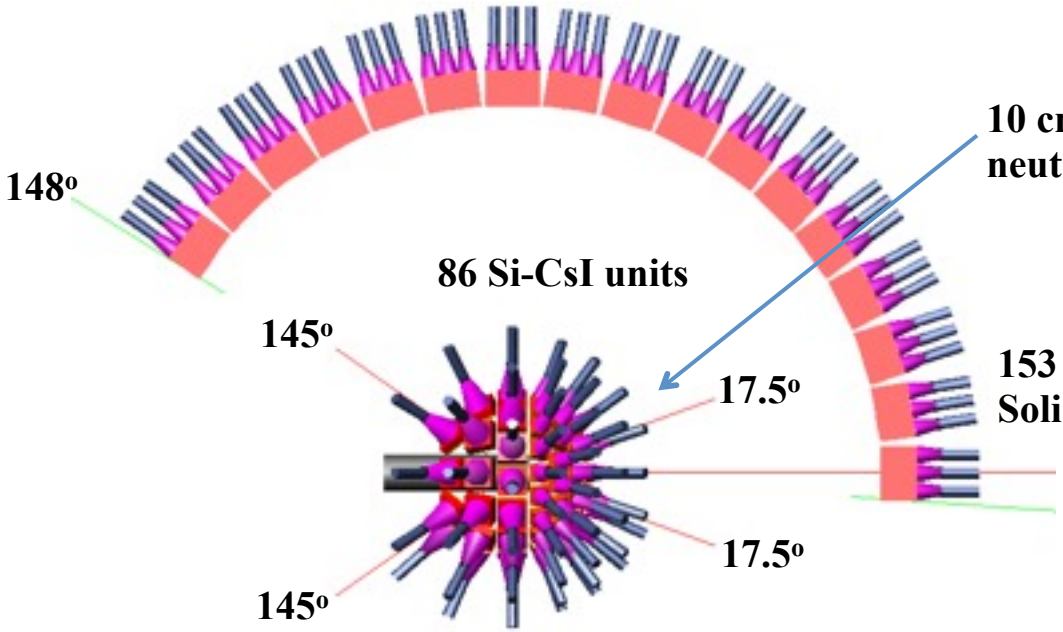
^{50,54}Ca, ^{68,70,72}Ni, ^{106,112,124,130,132}Sn RI beam
+ ^{197}Au/^{208}Pb (stable target)
+ ^{12}C/no target (background control)
❖could be possible from ISOL

Low Energy LAMPS Experimental Setup

$E_{beam} < 18.5A$ MeV

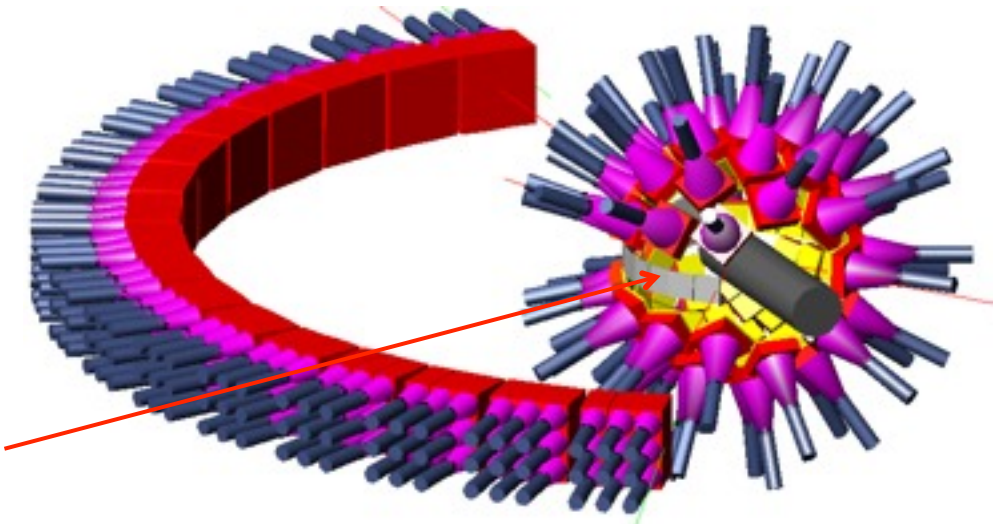
For Heavy-Ion Collision Experiments

^{50,54}Ca, ^{68,70,72}Ni, ^{106,112,124,130,132}Sn RI beam
+ ^{40}Ca, ^{58}Ni, ^{112,118,124}Sn stable target
❖could be possible from ISOL



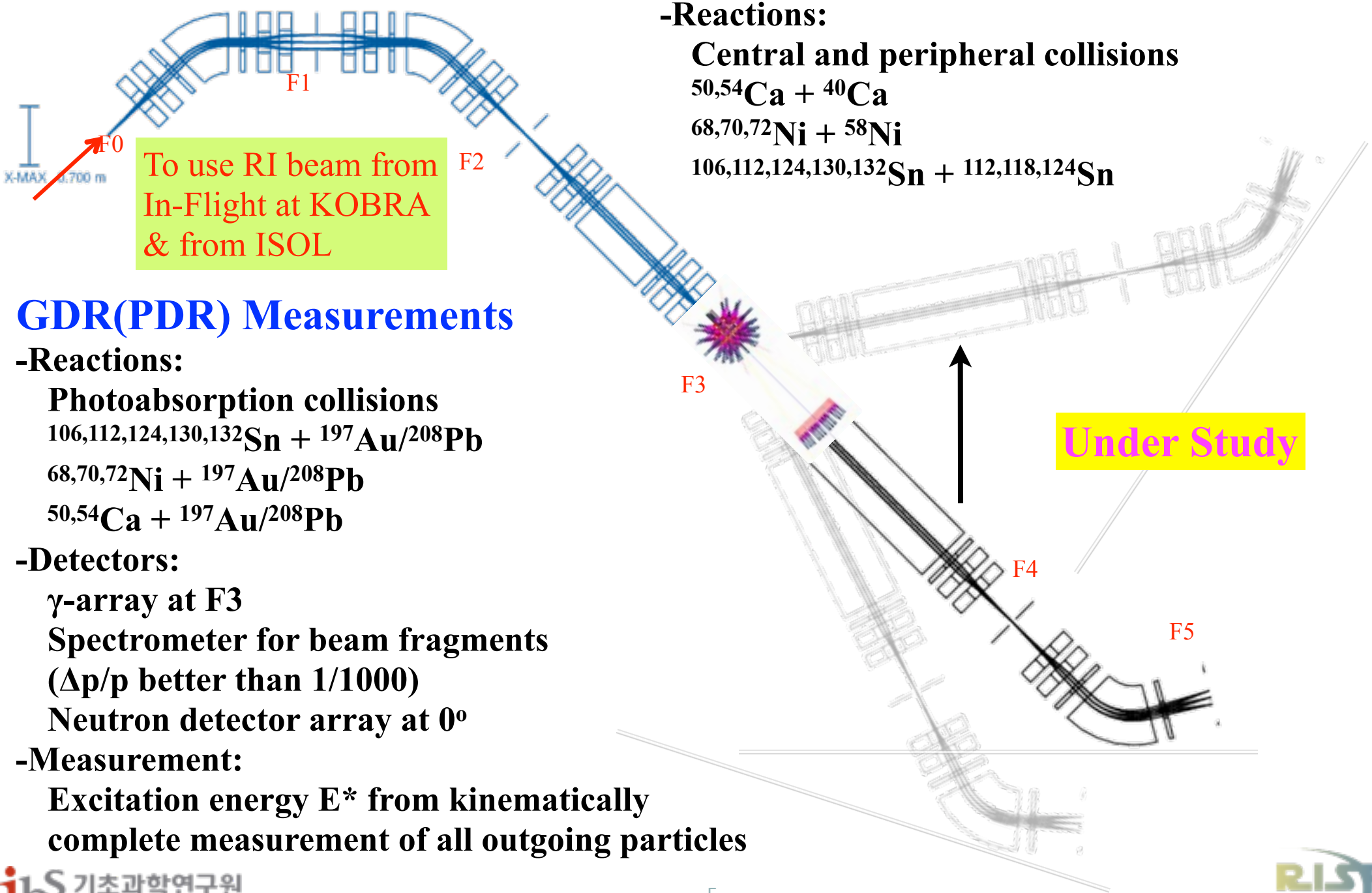
10 cm wide window to allow
neutron detection along equator

153 neutron detector units at r = 2.0 m
Solid angle = 382.5 msr



10 cm wide window to allow
neutron detection along equator

Cooperate with KOBRA



Charged Particle Measurements

-Reactions:

Central and peripheral collisions

^{50,54}Ca + ^{40}Ca

^{68,70,72}Ni + ^{58}Ni

^{106,112,124,130,132}Sn + ^{112,118,124}Sn

GDR(PDR) Measurements

-Reactions:

Photoabsorption collisions

^{106,112,124,130,132}Sn + ^{197}Au/^{208}Pb

^{68,70,72}Ni + ^{197}Au/^{208}Pb

^{50,54}Ca + ^{197}Au/^{208}Pb

-Detectors:

γ-array at F3

Spectrometer for beam fragments
(Δp/p better than 1/1000)

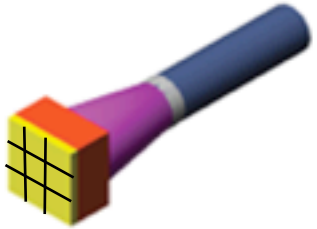
Neutron detector array at 0°

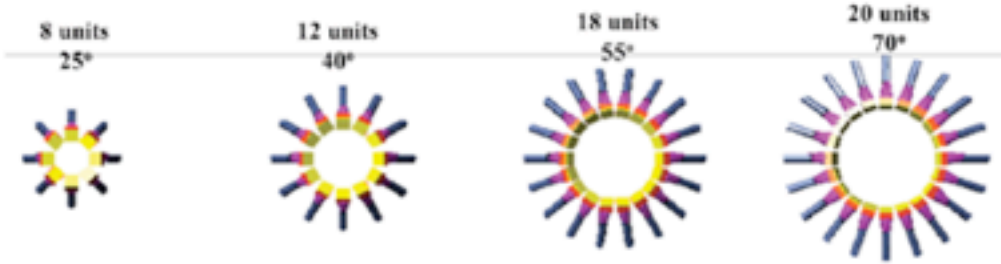
-Measurement:

Excitation energy E* from kinematically complete measurement of all outgoing particles

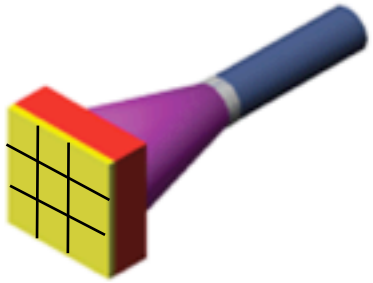
LAMPS Si-CsI Detector R&D

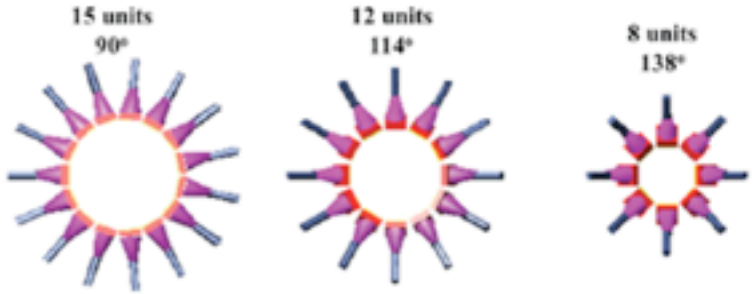
Total 58 detector units
($17.5^o < \theta_{lab} < 77.5^o$)
9 x 9 x 0.01 cm³ Si (3 x 3 Pad)
9 x 9 x 5 cm³ CsI (PMT readout)





Total 35 detector units
($78^o < \theta_{lab} < 150^o$)
15 x 15 x 0.01 cm³ Si (3 x 3 Pad)
15 x 15 x 5 cm³ CsI (PMT readout)

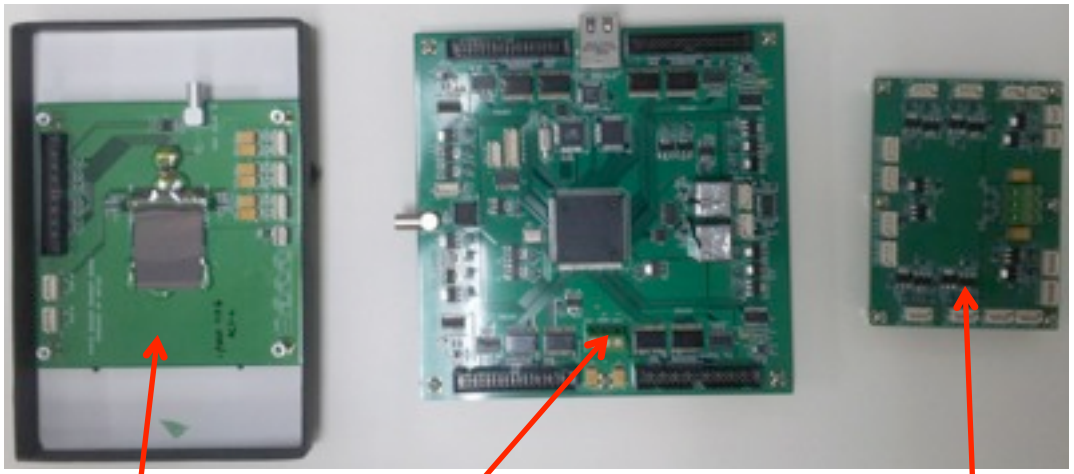




GEANT4 Simulation is going on

Si-CsI detector:
(ΔE-E technique for charged particle measurement as well as γ measurement)

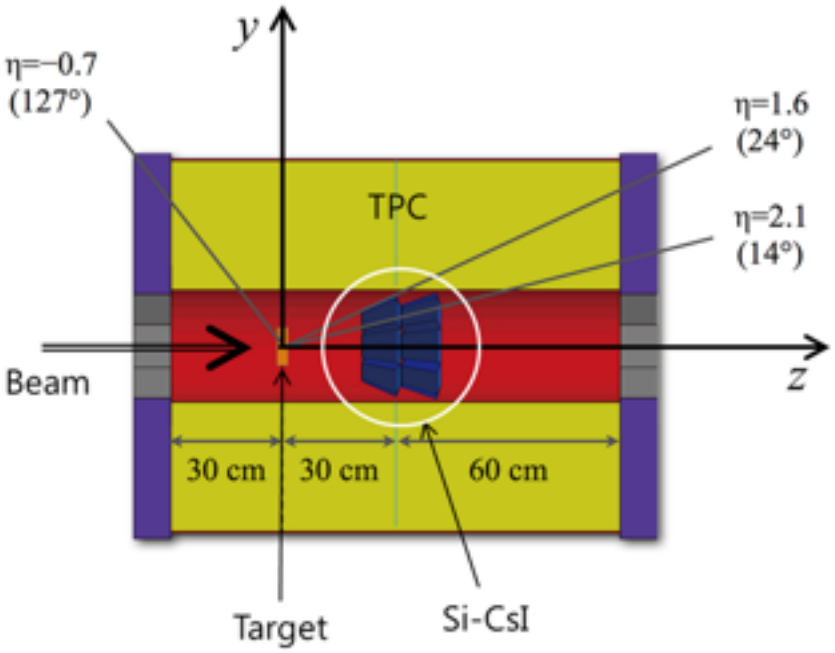
- **Energy resolution from simulation study**
  - **Si: 0.5% of FWHM**
    (Energy resolution < 2% required for charged particle)
  - **CsI: 2.0% of FWHM**
    (Energy resolution < 5% required for max. 30 MeV γ-ray)

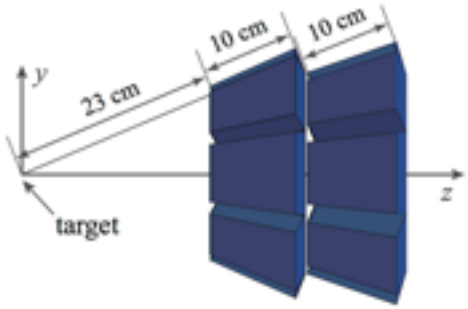


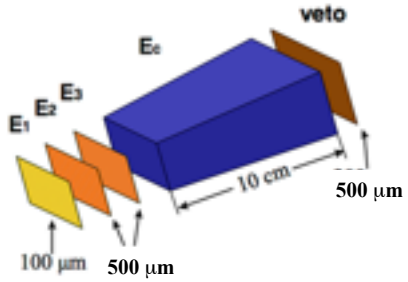
Si detector: R&D with Kyungpook Natl. Univ.
CsI detector: 1st prototype in preparation

Si Detector R&D

High Energy LAMPS Si-CsI Detector





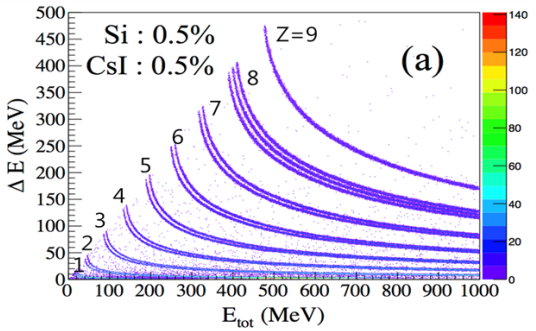


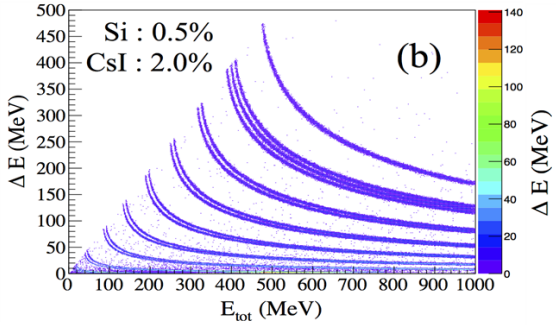
350 msr each		size (mm^2)
inner ring (14^o - 19^o)	front	66.80 × 26.20
	rear	86.92 × 37.84
outer ring (19^o - 24^o)	front	62.09 × 20.08
	rear	89.17 × 28.84

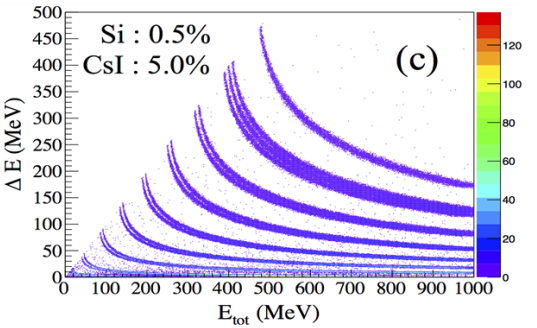
Si-CsI module

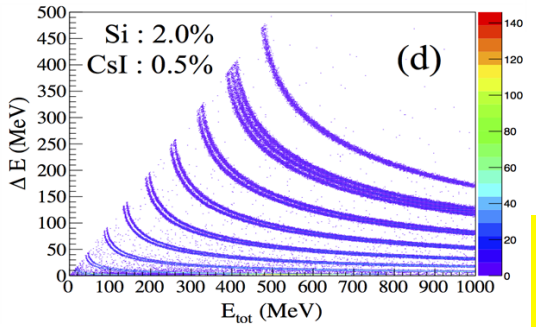
Si: 2 x 8 pad readouts

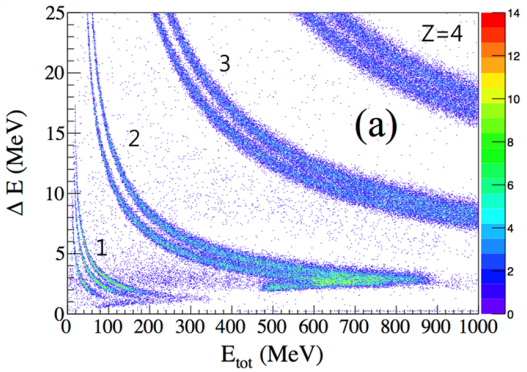
CsI: 4 x 4 APD readouts

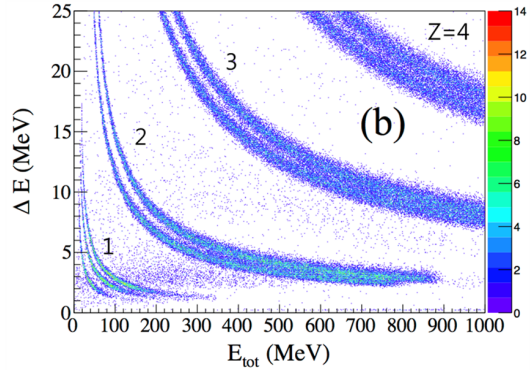








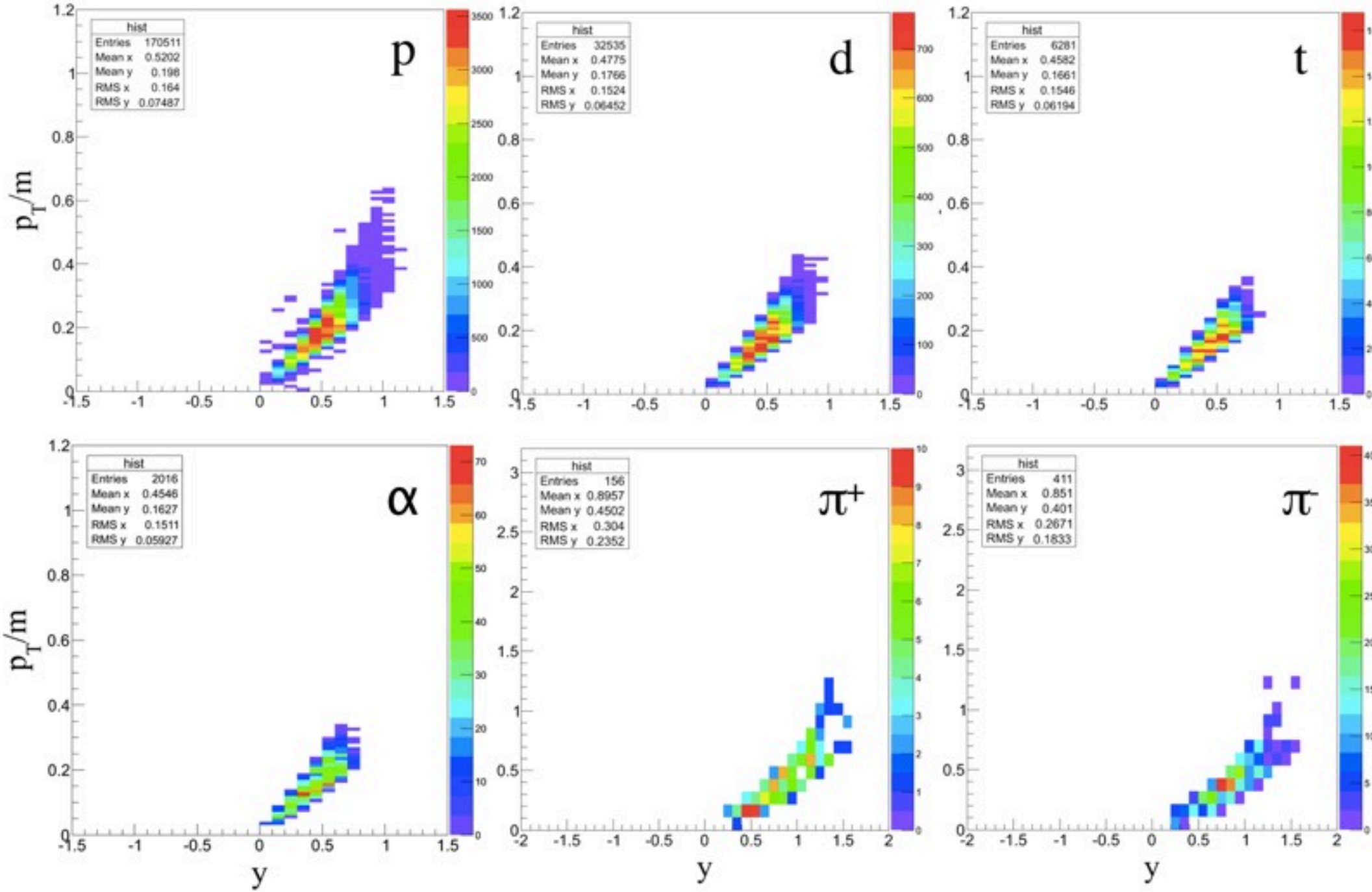




veto Si detector can clean up unexpected correlation

Based on IQMD Au+Au@250*A* MeV & GEANT4 Simulation

High Energy LAMPS Si-CsI Detector Acceptance



Input: IQMD Au+Au @ 250*A* MeV

Thank for your attention!