Status Report of Beam Diagnosis System (Beam Profile Detector)

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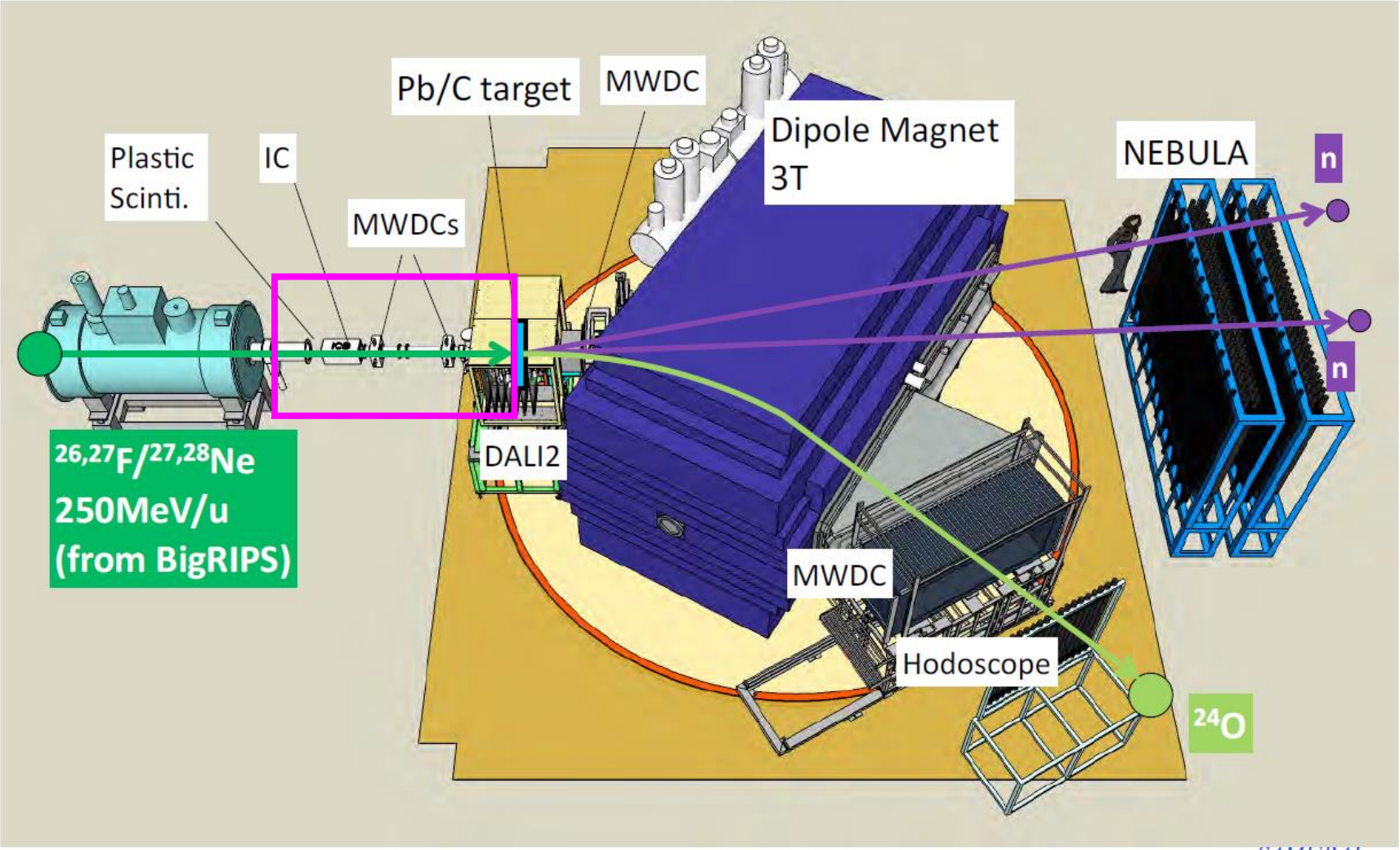
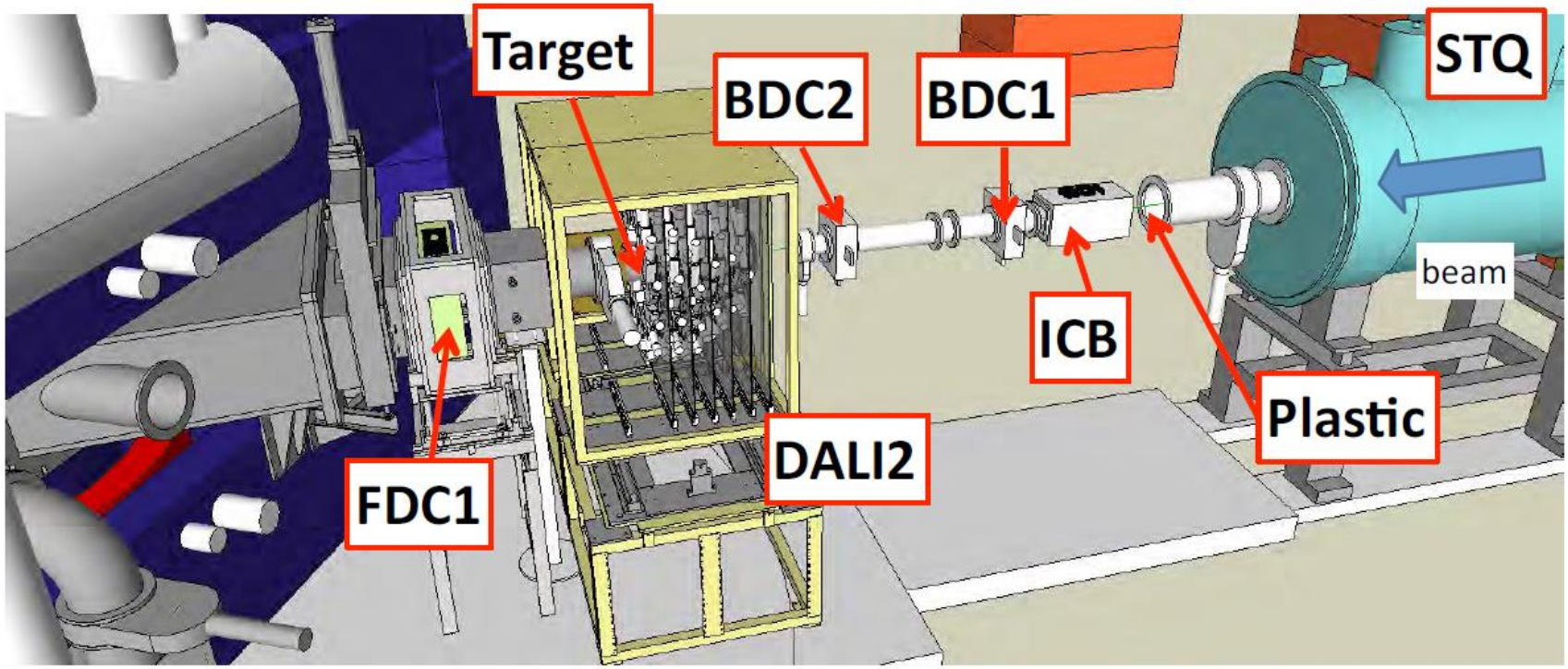
SMURAI Detector



Beam Profile Detector in SMURAI

- Detectors for incoming beams: beam position (BDC), PID(Plastic and ICB), γ(DALI2) and tracking detector(FDC1) for electro-magnetic spectroscopy at SAMURAI.



SMURAI BDC (Beam Drift Chamber)

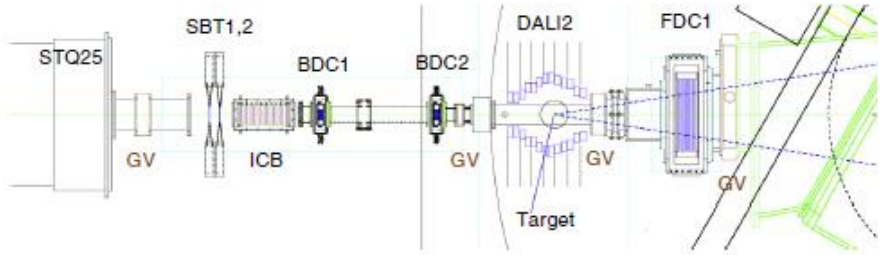


Fig. 6. Expanded view of the upstream part of the experimental setup.

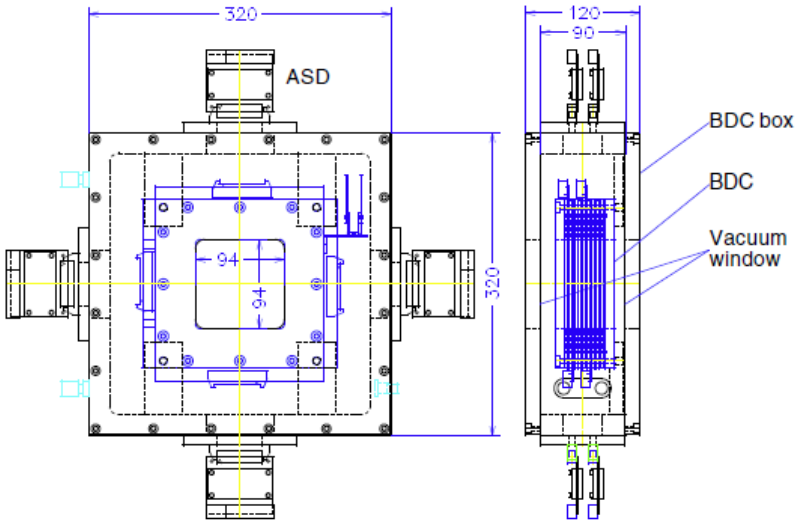


Fig. 9. Schematic view of the BDC and the BDC box.

NIMB 317 (2013) 294-304

- Walenta type Drift chamber
- 2.5 mm drift length
- i-C_4H_{10} at 50-100 torr
- Anode, potential wire diameter of 20 μm(Au-W), 80 μm(Au-Al)
- Cathode (gas window) 8 μm^t Al-Kapton
- Effective area : 8 cm x 8 cm

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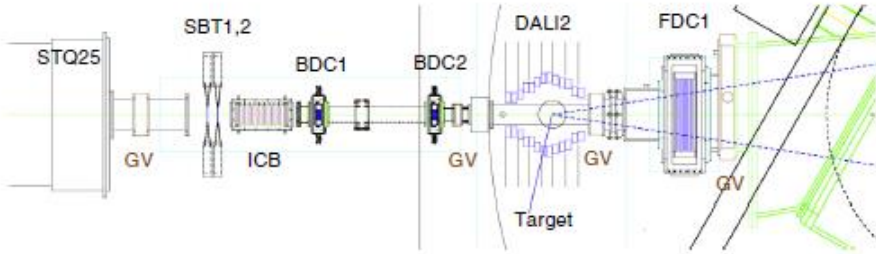

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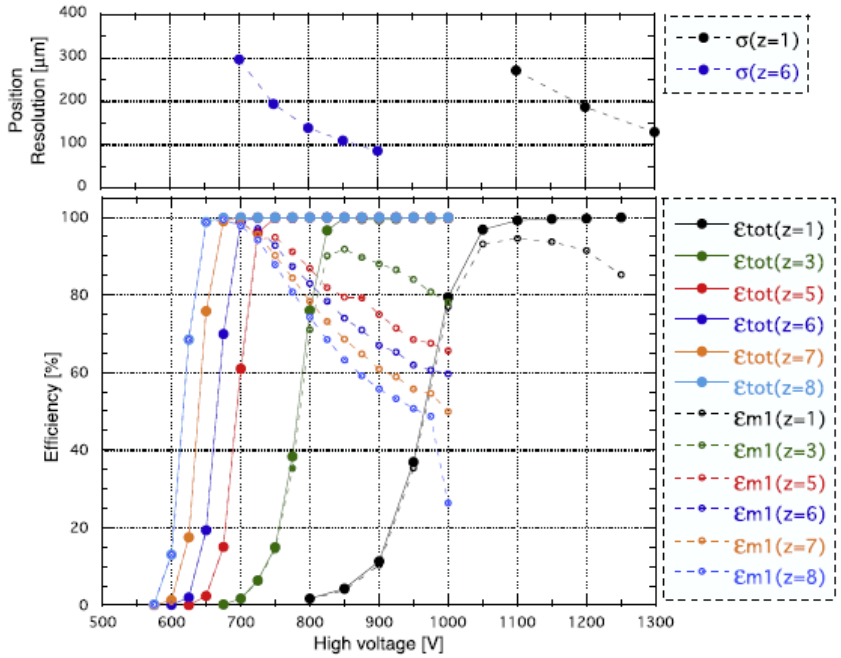

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Requirements

- Position resolution : ~ 100 μm
- Efficiency : 100 % at > 600 V

SMURAI BDC (Beam Drift Chamber)

- Beam Rate Estimation : LiSe++ (Seonghak Lee)

Fragment	Decay Type	Primary beam (400 kW)		Production Reaction	RI beam eneryg	RI beam Intensity	RI Beam purity
		Type	에너지 (MeV/u)		(MeV/u)	(pps)	(%)
132Sn	Beta- decay	238U	200	in-flight fission	133.2	8.21E+06	1.4661
130Sn	Beta- decay	238U	200	in-flight fission	133.1	3.74E+08	13.6
124Sn	stable	124Sn	230	transmission	230	8.77E+13	100
112Sn	stable	112Sn	263	transmission	263	8.49E+13	100

  - Expected Beam : ^{132}Sn : 8 x 10^{+6} pps with 133.2 MeV/u

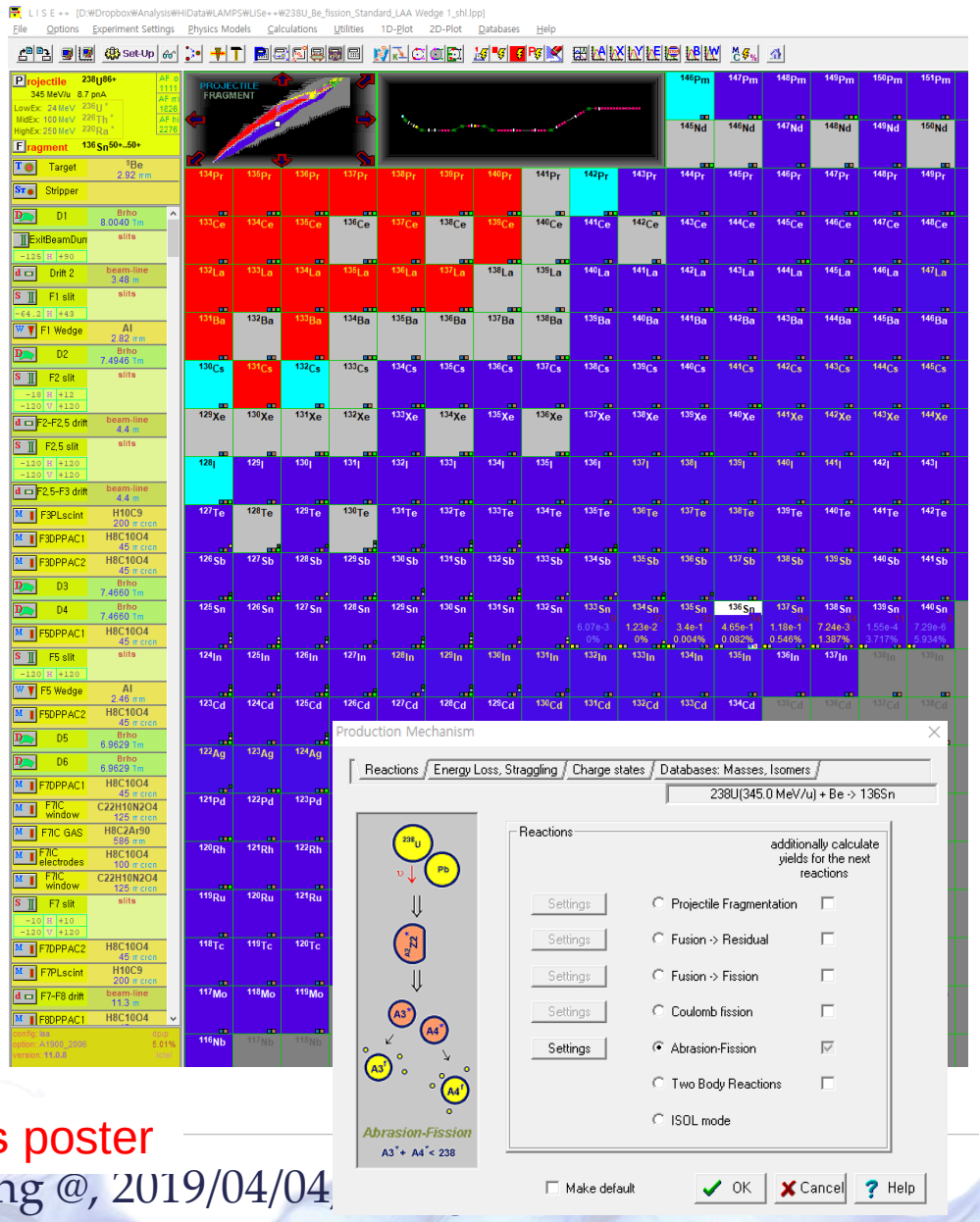
- To determine specific conditions of Drift Chamber, we will use GarField program (Dr. Hwang with Seonghak Lee)

Get Yield of ^{136}Sn by LiSe++

- In order to verify if our understanding would be correct or not, we reproduced yield of ^{136}Sn by LiSe++
- BigRIPS results : Y. Shimizu et al., JPSJ 87 (2018) 014203

	Sn setting
Primary beam	$^{238}U^{86+}$
	345 MeV/nucleon
$B\rho$[a)]	8.004 Tm
Central particle[b)]	$^{136}Sn^{50+}$
Production target	Be 2.92 mm
Degrader at F1	Al 2.82 mm
Degrader at F5	Al 2.46 mm
Exit beam dump	+90.0/−125.0 mm
F1 slit	+43.0/−64.2 mm
F2 slit	+12.0/−18.0 mm
F7 slit	+10.0/−10.0 mm
Average beam intensity[c)]	8.70 pnA
Total dose	1.95×10^{16} particles
Average live time	98.2%
Average trigger rate	55.1 particles/s
Irradiation time	99.6 h

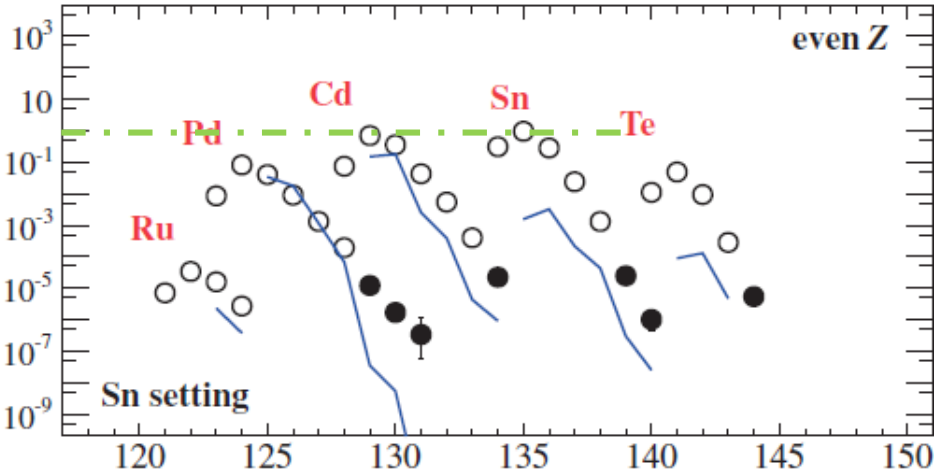
a) Values from the magnetic fields of the first dipole ma
b) The $B\rho$ setting after F1 is tuned for the listed ions.
c) 1 pnA (particle nA) = 6.24×10^9 particles/s.

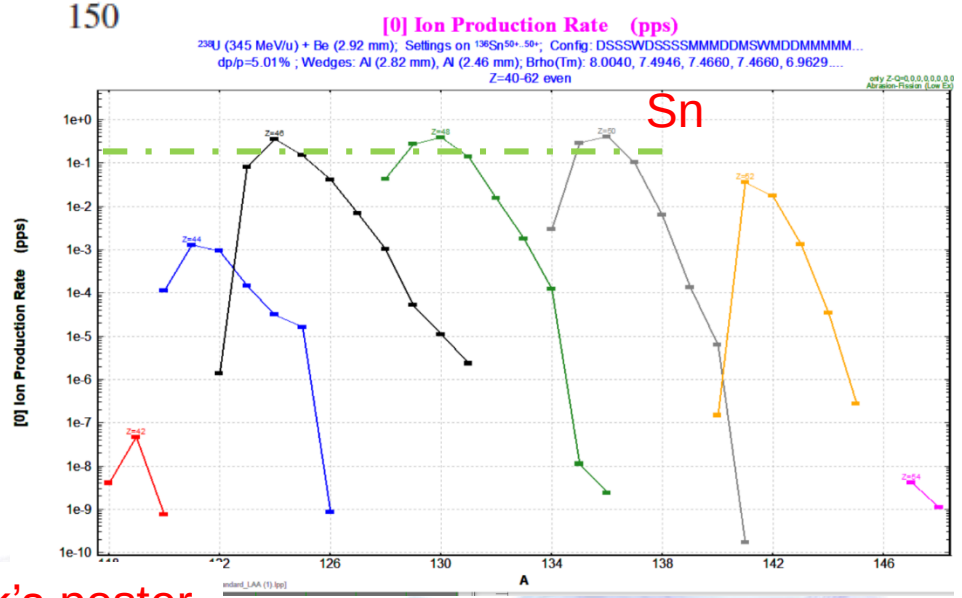


Detail study was presented in Seonghak's poster

Get Yield of ^{136}Sn by LiSe++

- Results





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Summary & Plan

- Final yield : 4.65 x 10^{-1} pps ~~ similar order of magnitude to the results produced by BigRIPS.

- GarField Study will start soon (maybe from next week) with Dr. Hwang's help and we will decide the detail design of Drift Chamber proto-type.

- To do list
  - Yield extraction : Seonghak & Dong Ho
  - Prototype DC construction : Seonghak & Sanghoon & Dong Ho

- Expected schedule
  - 4 – 5 : GarField simulation & Buying equipment
  - 5 – 10 : Chamber assembly
  - 10 –12 : Beam test (unknown beam : any idea to test?)

Thank You Very Much
for your attention !

Back Up

Get Yield of ^{132}Sn by LiSe++

- BigRIPS