SIDIS Trigger Rate Update

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SIDIS Hadron Background Rate Update

- SIDIS windows rate update
- SIDIS target rate update

Single e^- Trigger Rates

Rate (kHz)	FAEC		FAEC+LGC		FAEC+LGC+SPD+up+down	
	V1.2	V1.0	V1.2	v1.0	V1.2	V1.0
e^-	70 68	68	64 63	63	59+1.1+1.8 58	58
π^0	558.6 (63)	1022 (116)	23.3 (16.5)	42.9 (31)	17.1 (15.3)	32.2 (29.6)
π^-	426	637.8	2.89	3.9	2.7	3.7
π^+	513.5	694	2.3	4.2	2.1	3.8
p	161.3	202	0	0	0	0
All hadrons no e	2057.9 1847	3009	37.7 36	64	28.9+3.1+4.5 28	49.5+2.4+0.04
FAEC total(e+background)					94.5kHz	114.1 kHz

Only primary particle in parenthesis

https://solid.jlab.org/DocDB/0001/000115/001/hardonrateupdata_06082018.pdf

80cm<R<140cm 90cm<R<130cm

Rate (kHz)	LAEC		LAEC+SPD+up+down	
	V1.2	V1.0	V1.2	V1.0
e-	4.5 2.4	4.5	4.1+3.6+2.6 2.3	4.1+3.6+2.6
π^0	7.8	14.7	0.4	0.7
π^-	3.0	6.5	2.6	6.0
π^+	3.3	8.6	2.9	7.9
All hadrons no e-	20.7 10.23	36.9	8.5+8.4+5.1 4.8	17.1+7.6+0.2
LAEC total (e+background)			32.3	35

Single e: 94.5+32.3=126.8kHz

Hadron Trigger Rates

h_FA (kHz)	EC		EC+SPD+up+down	
	V1.2	V1.0	V1.2	V1.0
e	133 134	140	95.4+3.5+3.7 96	100+4+4
π^0	2417	4607	265	548
π^-	2829	4925	2493	3971
π^+	3502	5855	3103	5151
p	1928.9	3510	1802.16	3164
All hadrons no e-	10715 11083	17392	7982+2578+3859 8247.8	12805+4500 +6000
LAEC total (e+background)			14521	23413

Hadron Trigger coincident Rates

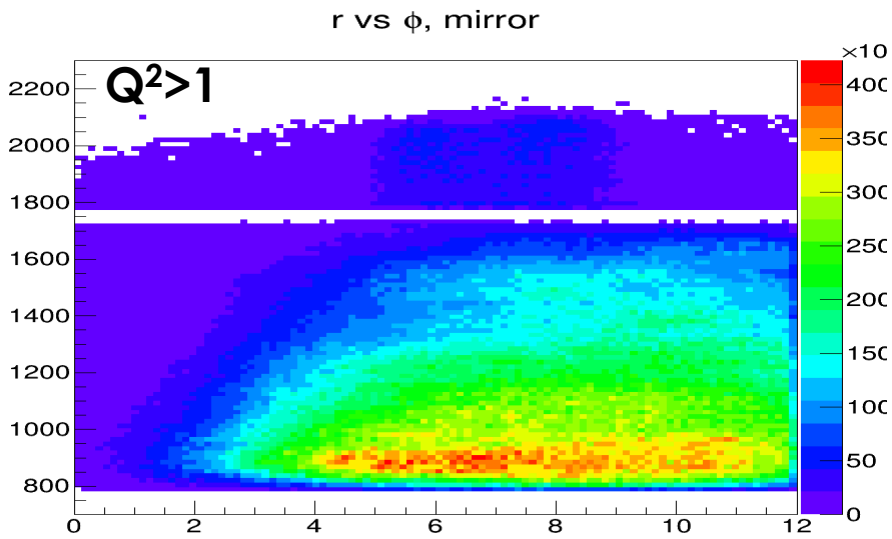
Coin trigger rate(kHz) >=32.5cm		e_FA	h_FA	e_LA	e_FA & h_FA	e_LA & h_FA	e_LA & h_FA)+ (e_LA+h_FA)
e+ π^+	V1.0	36	127	4.5	9.1	1.2	10.3
	V1.2	50.2	77	5.5	7.7	1.1	8.8
e+π^-	V1.0	27	99	3.3	6.3	0.76	7.06
	V1.2	43.7	67	4.3	6.5	0.81	7.3
e+π^0	V1.0	27	42	2.6	0.6	0.05	0.65
	V1.2	45	58	4.8	2.5	0.32	2.82
e+p	V1.0	22	94	2.5	6.2	0.76	6.96
	V1.2	16	31	2.2	4.3	0.74	5.04

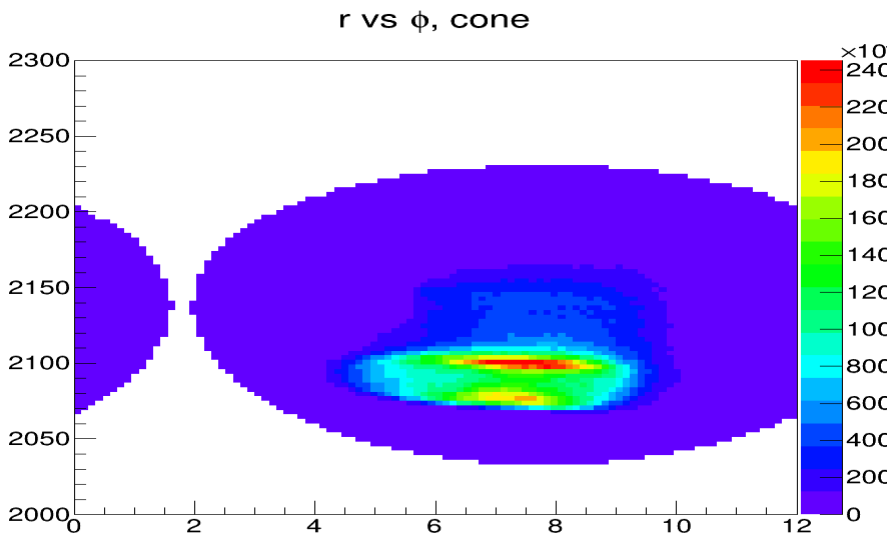
SIDIS trigger rates Update

- **Single e:** 94.5+32.3=126.8kHz
- **Random coin**:
  (94.5+32.3−8.33−6.99−2.99-2.28)*14521*$1e^{3}$*$30e^{-9}$
  =46.2kHz

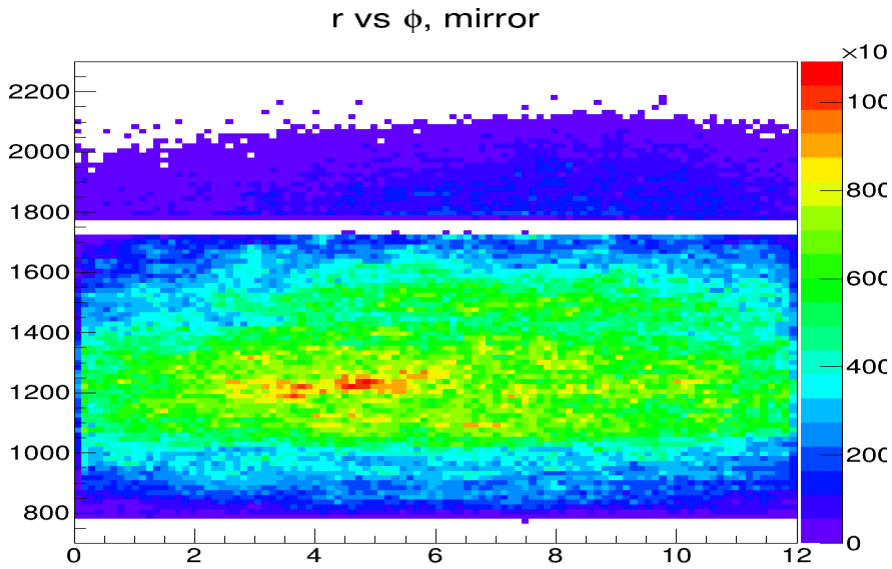
SIDIS LGC plots

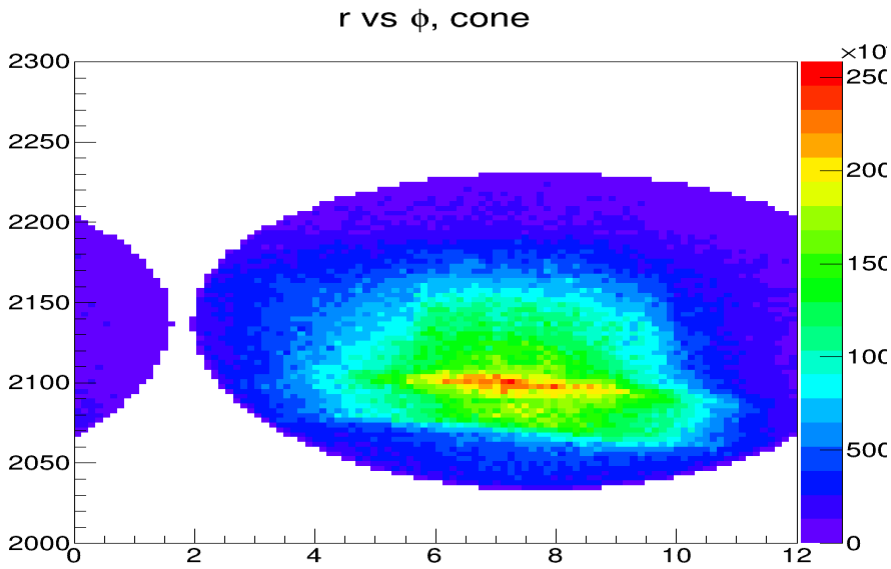
eDIS without blinders with cones



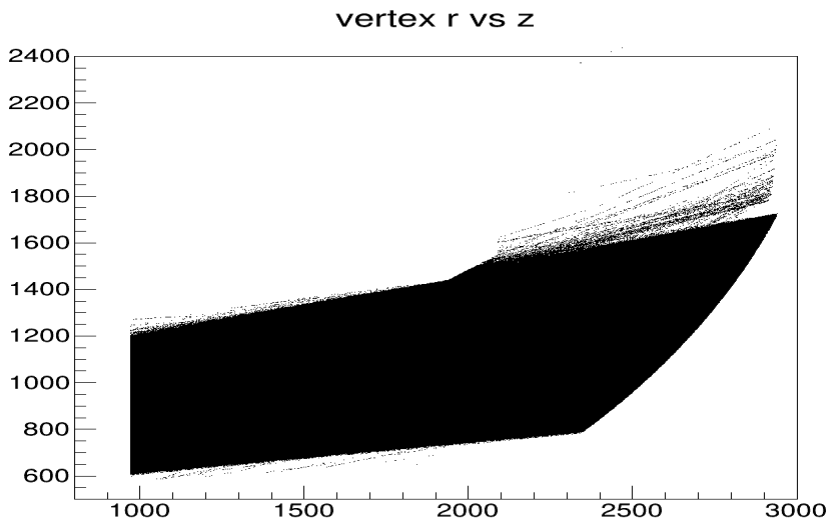


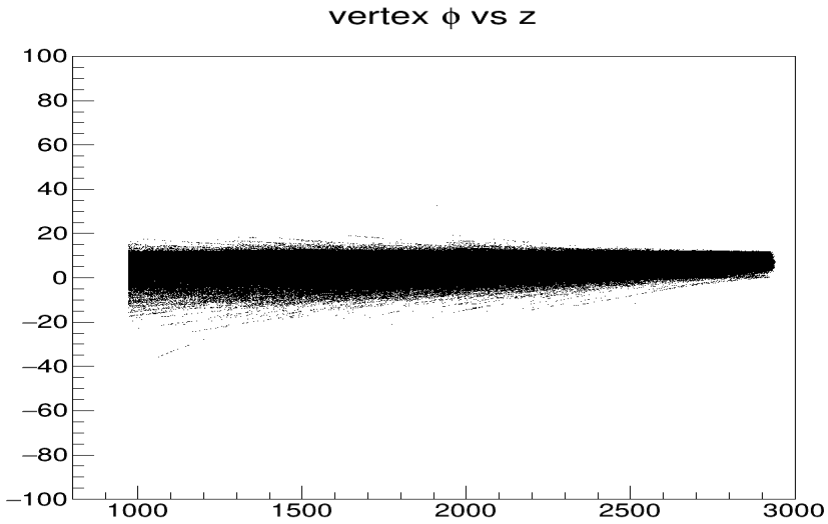
π^0 without blinders with cones



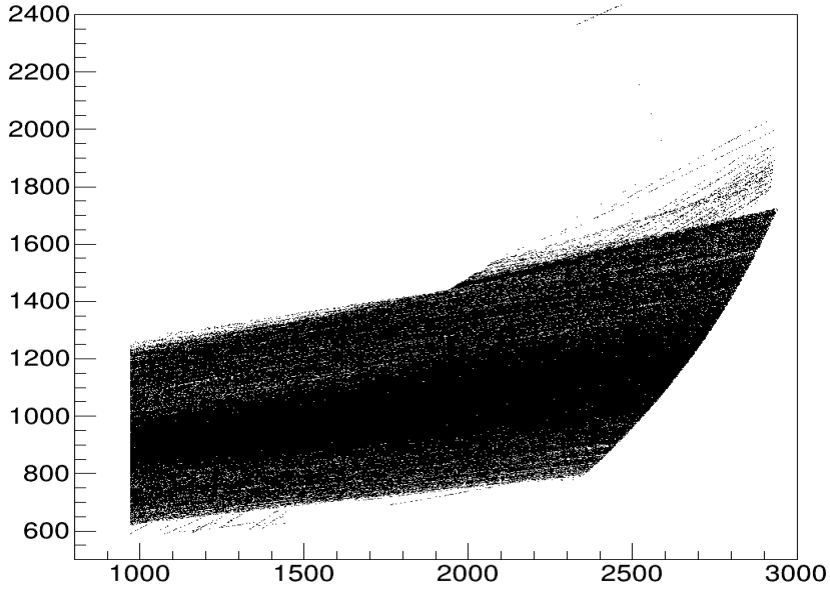


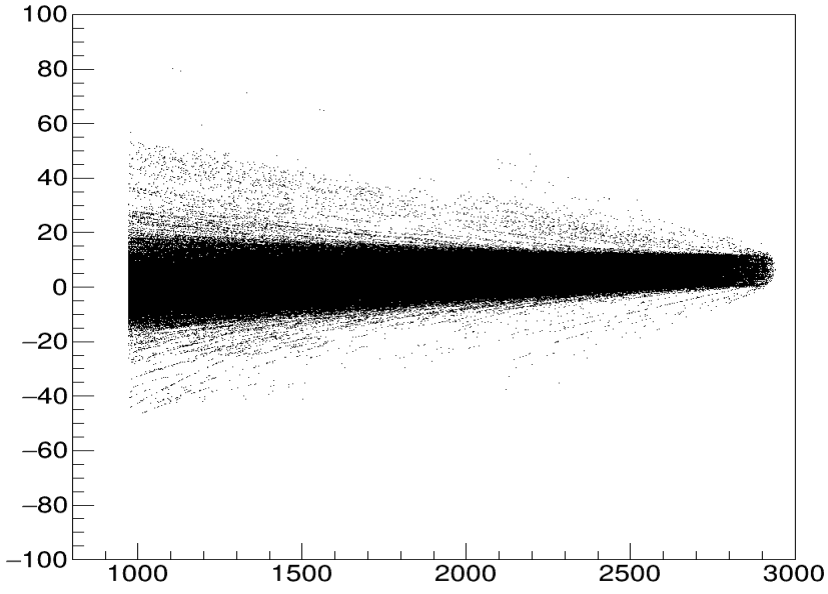
eDIS without blinders with cones



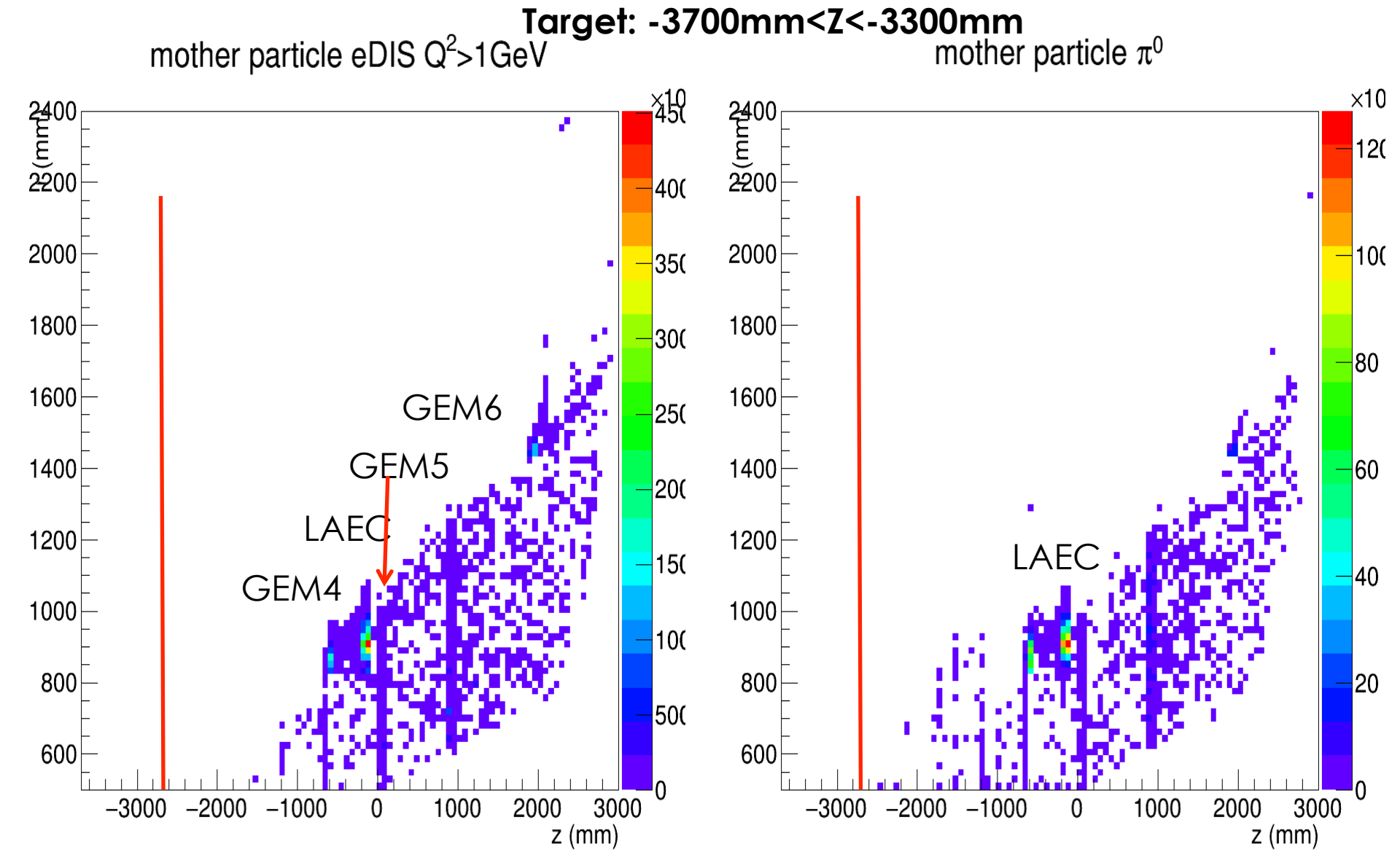


π^0 without blinders with cones





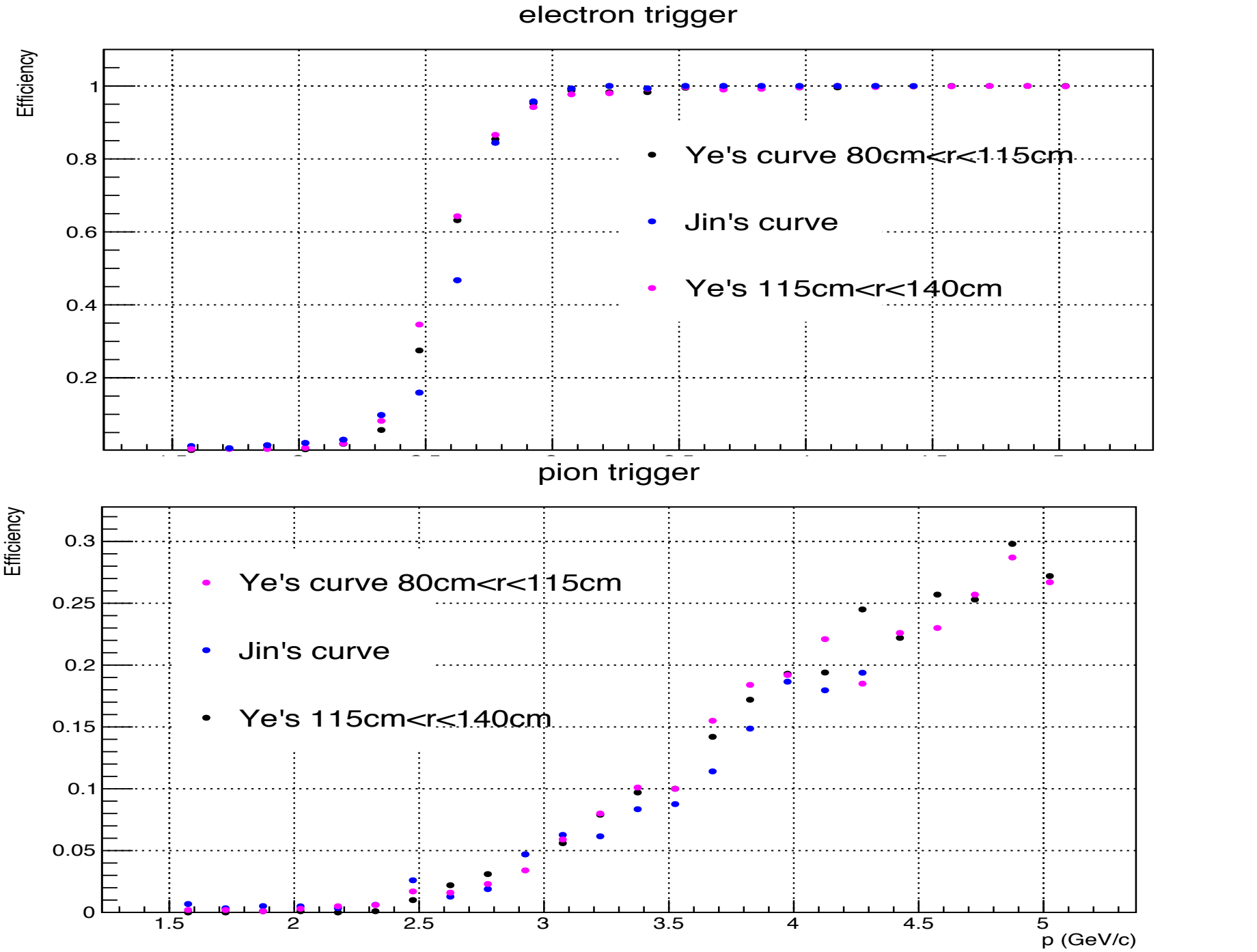
Optical photon mother information



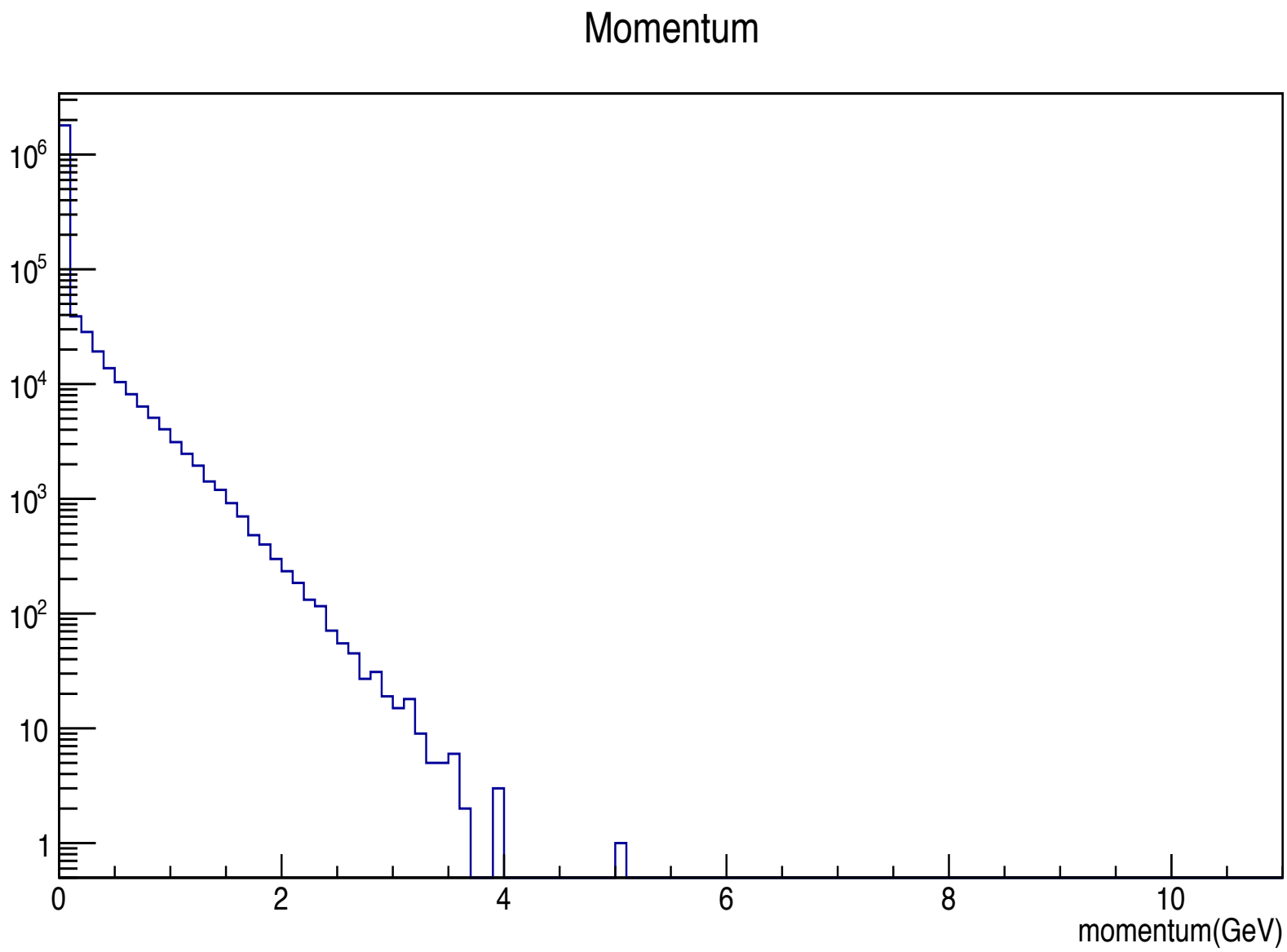
LGC front tank window density influence (0.0025cm)

π^0 Rate (kHz)	FAEC	FAEC+LGC	FAEC+LGC+SPD
SL_PVF Density(1.45g/cm^3)	559.4 (63.9)	23.46 (17.13)	17.25 (15.76)
vacuum	551 (62.43)	23.39 (17.01)	17.29 (16.08)
SL_PVF 5*density	553.1 (63.59)	22.9 (16.85)	17.25 (15.77)
SL_PVF 10*density	558.4 (63.15)	22.9 (17.29)	17.29 (16.20)

Backup


electron trigger
Efficiency
1
0.8
0.6
0.4
0.2
Ye's curve 80cm<r<115cm
Jin's curve
Ye's 115cm<r<140cm
pion trigger
Efficiency
0.3
0.25
0.2
0.15
0.1
0.05
0
Ye's curve 80cm<r<115cm
Jin's curve
Ye's 115cm<r<140cm
1.5
2
2.5
3
3.5
4
4.5
5
p (GeV/c)

Hadron momentum



Problem check

Compare tow methods for the following setups:

Target	Density g/cm3	Radiation Length g/cm2	Length cm	X_0
PVDIS LH	**0.071**	**63.22**	**40**	**4.5e-2**
PVDIS LD	**0.169**	**125.97**	**40**	**5.4e-2**
SIDIS 3He	**1.345e-3**	**67.42**	**40**	**0.8e-3**
SIDIS Up/ DownWindow	**2.76**	**19.42**	**0.012**	**1.7e-3**
JPsi	**0.071**	**63.22**	**15**	**1.7e-2**

HallD hadron generator (SoLID-Bggen)

- **SoLID_Bggen-v1.0**

  SOLID-Bggen event generator (HallD) -----modified by Rakitha

  - E>3 GeV: PYTHIA is used
  - 0.15<E<3 GeV: a mixture of 10 dominating exclusive processes ($\gamma + p$) is used. For the single pion production differential cross sections, the SAID code is used.

- **SoLID_Bggen-v1.1----**modified by Jixie Zhang
  - Run on the current ifarm environment.
  - Beam current, target X_0, ρ, and L for different target.

- **SoLID_Bggen-v1.2----modified by Jixie Zhang**
  - Add window thickness to include more bremsstrahlung photons

Hadron Trigger coincident Rates

Coin trigger rate(kHz) >=32.5cm		e_FA	h_FA	e_LA	e_FA & h_FA	e_LA & h_FA	e_LA & h_FA)+ (e_LA+h_FA)
e+ k^+	V1.0	10	19	1	0.6	0.06	0.66
	V1.2	11.4	18.11	0.66	2.09	0.16	2.25
e+k^-	V1.0	1.3	6.8	0	0.11	0.002	0.112
	V1.2	2.0	3.6	0.07	0.45	0.01	0.46
e+k^0	V1.0	5.4	23	0.5	1.6	0.12	1.72
	V1.2	5.7	9.33	0.33	1.14	0.07	1.21
No hadron	V1.0	47	18	12805	17	5.9	23
	V1.2	12	18.1	0.7	2.13	0.15	2.28

Hadron Trigger coincident Rates

Coin trigger rate(kHz) >=32.5cm		e_FA	h_FA	e_LA	e_FA & h_FA	e_LA & h_FA	e_LA & h_FA)+ (e_LA+h_FA)
e+ π^+	V1.0	36	127	4.5	9.1	1.2	10.3
	V1.2	49	78	5.4	7.7	1.2	8.9
e+π^-	V1.0	27	99	3.3	6.3	0.76	7.06
	V1.2	43.7	67	4.5	6.5	0.84	7.34
e+π^0	V1.0	27	42	2.6	0.6	0.05	0.65
	V1.2	46	58	4.9	2.6	0.29	2.89
e+p	V1.0	22	94	2.5	6.2	0.76	6.96
	V1.2	11	18.1	1.1	2.07	0.28	2.35