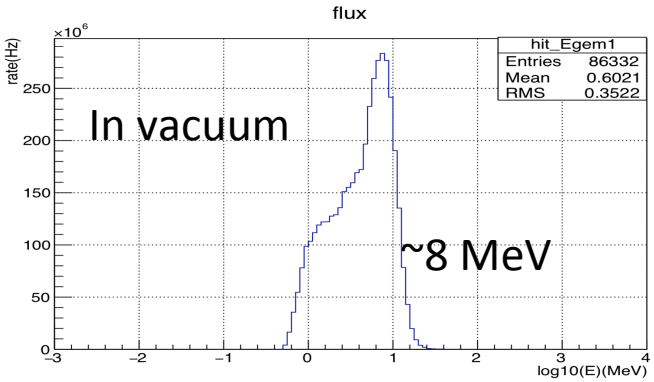
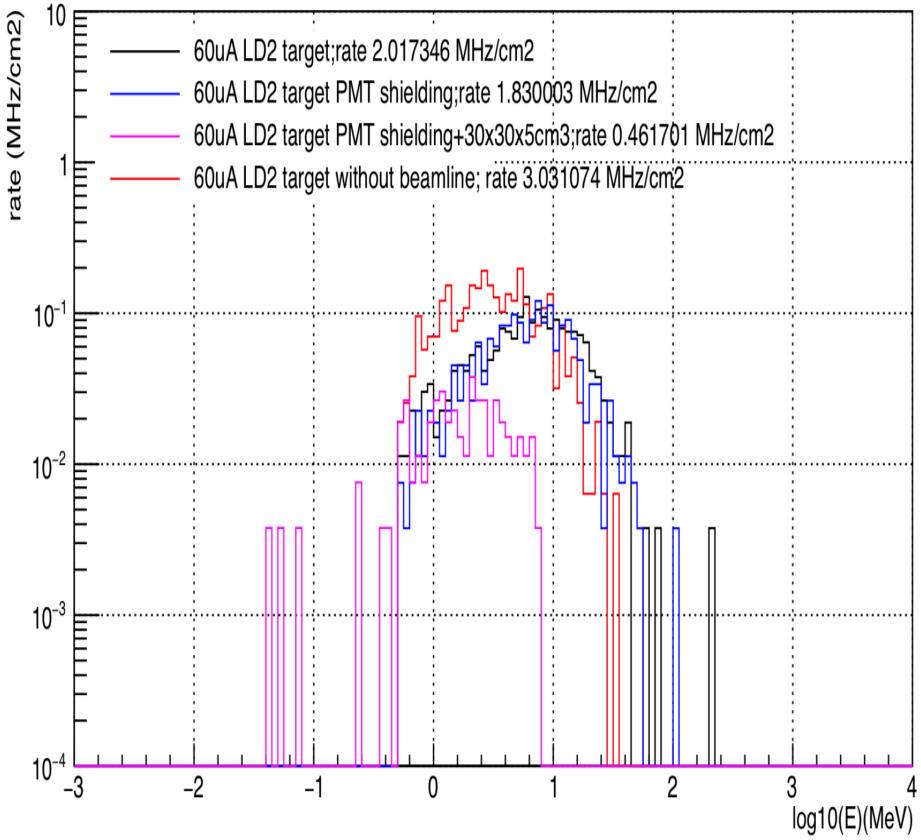
LD2 Target Simulation at 20 Degrees

Background for 20-degrees

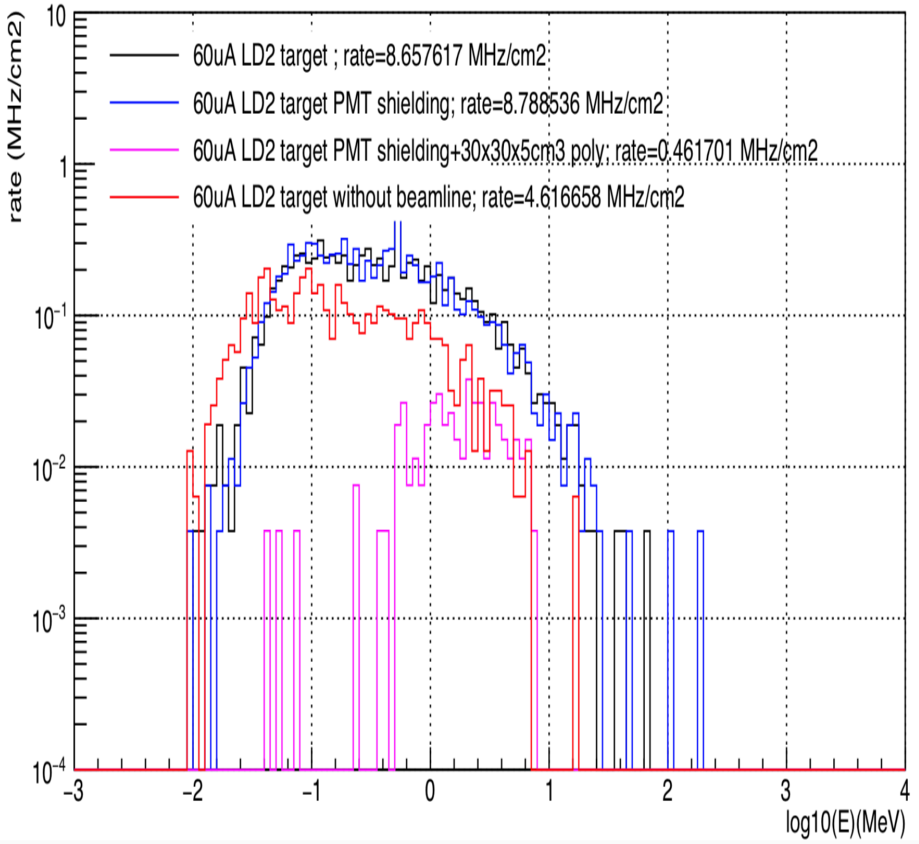
- Moller electrons: dominate GEM00 signal, which can be blocked by 1cm-1in poly
- Beamline generates photons with the MIP energy.



e⁻ on gem1 virtual plane



γ on gem1 virtual plane



10cm-LD2 target I=60uA detectors at 20 degrees 21.7m away from the Target Chamber L_D2= 3.815e^{38}

Poly size in front of GEM00 (cm^3)	GEM00 (MHz/cm2)	GEM10 (MHz/cm2)	SC_A (MHz/cm2)	LASPD (MHz/cm2)	SC_D (MHz/cm2)	PreSh (kHz/cm2)	Shower (kHz/cm2)	SC_B (MHz/cm2)
0	2.28	0.41	1.76	0.91	0.4	32.1	9.68	1
0+PMT SH	2.17	0.34	1.94	0.81	0.37	37.0	9.68	0.84
20x20x1	0.42	0.19	0.42	0.82	0.31	25.87	7.52	0.91
30x30x1	0.39	0.17	0.37	0.74	0.33	14.89	8.43	0.98
30x30x2.54	0.09	0.14	0.33	0.73	0.27	13.95	3.56	0.91
30x30x5.08	0.05	0.155	0.27	0.75	0.35	21.2	4.78	0.98

- Cuts on half MIP
- SCs: 10x5 cm^2 20 ns
- SPD: 10x25 cm^2
- LASPD: 14x40 cm^2 = 560 cm^2

- Poly can reduce the rate of GEM00 and SC_A significantly

L_C=1.88 e^{36} (7-degrees)

10cm-LD2 target I=40uA detectors at 20 degrees 21.7m away from the Target Chamber L_D2= 3.815e^{38}

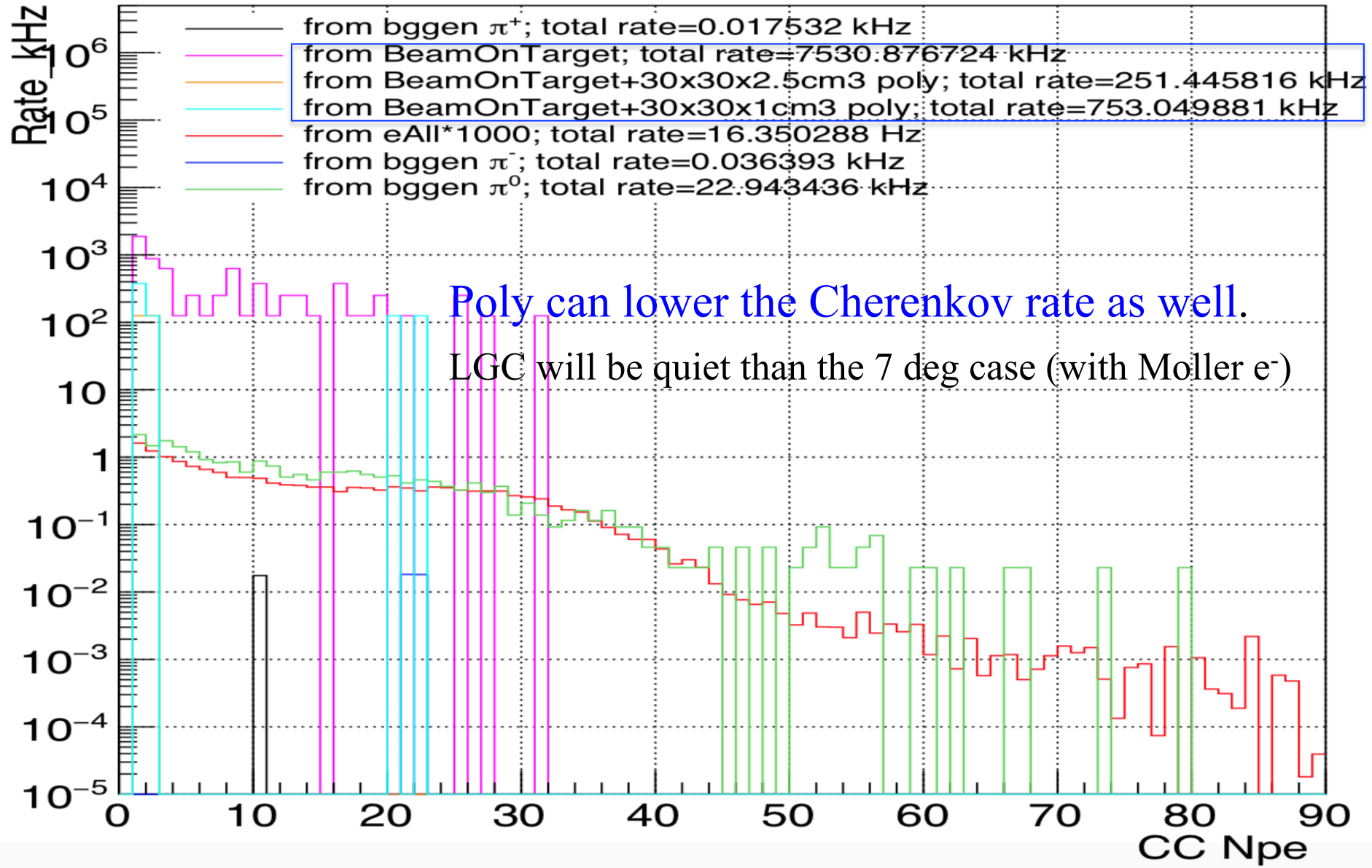
Poly size in front of GEM00 (cm^3)	GEM00 (MHz/cm2)	GEM10 (MHz/cm2)	SC_A (MHz/cm2)	LASPD (MHz/cm2)	SC_D (MHz/cm2)	PreSh (kHz/cm2)	Shower (kHz/cm2)	SC_B (MHz/cm2)
0	1.52	0.27	1.17	0.61	0.4	21.4	6.45	0.67
0+PMT SH	1.45	0.23	1.29	0.54	0.37	24.7	6.45	0.56
20x20x1	0.28	0.13	0.28	0.54	0.31	17.2	5.01	0.61
30x30x1	0.26	0.11	0.25	0.49	0.33	9.9	5.62	0.65
30x30x2.54	0.06	0.1	0.28	0.49	0.27	9.3 (37)	2.37 (6)	0.61
30x30x5.08	0.03	0.1	0.18	0.5	0.35	14.1 (16)	3.19 (3)	0.65

- Cuts on half MIP
- SCs: 10x5 cm^2 20 ns
- SPD: 10x25 cm^2
- LASPD: 14x40 cm^2 = 560 cm^2

- Poly can reduce the rate of GEM00 and SC_A significantly

L_C=1.88 e^{36} (7-degrees)

Cherenkov Npe



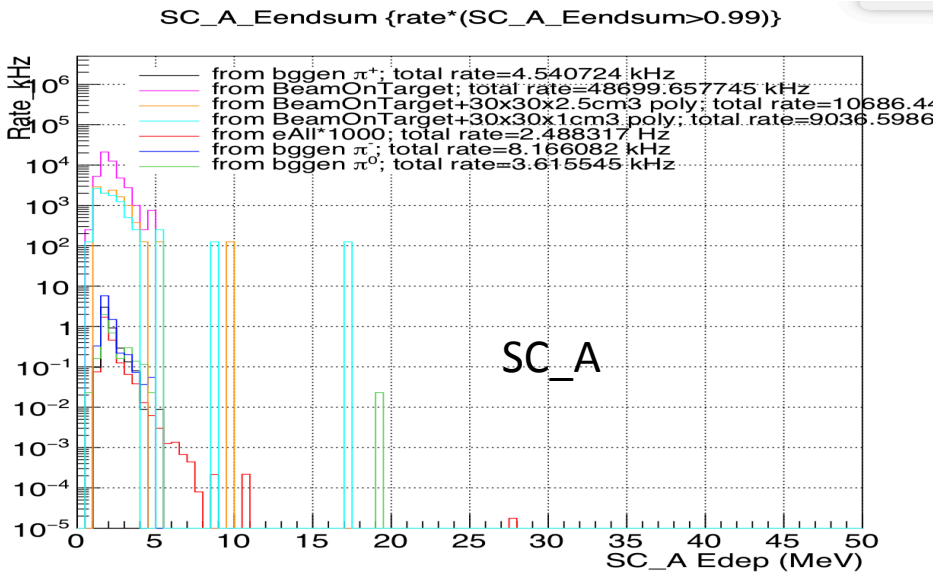
Coincidence Rates @ 20 degrees

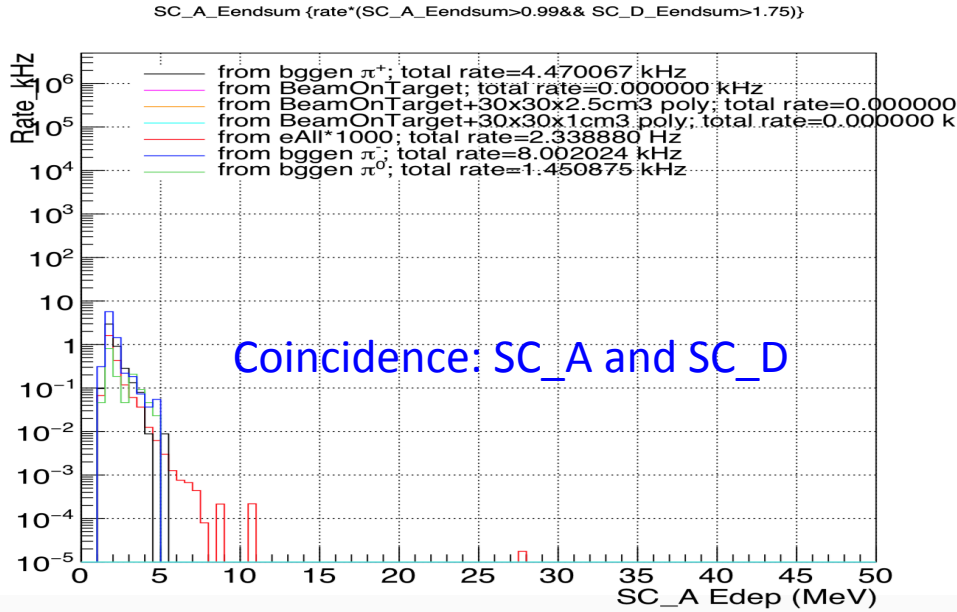
- ShowerSum (0.5 MIP cut) and PreShower (0.5MIP cut) coincidence rate: 369.7 kHz----comparable to the pion rates

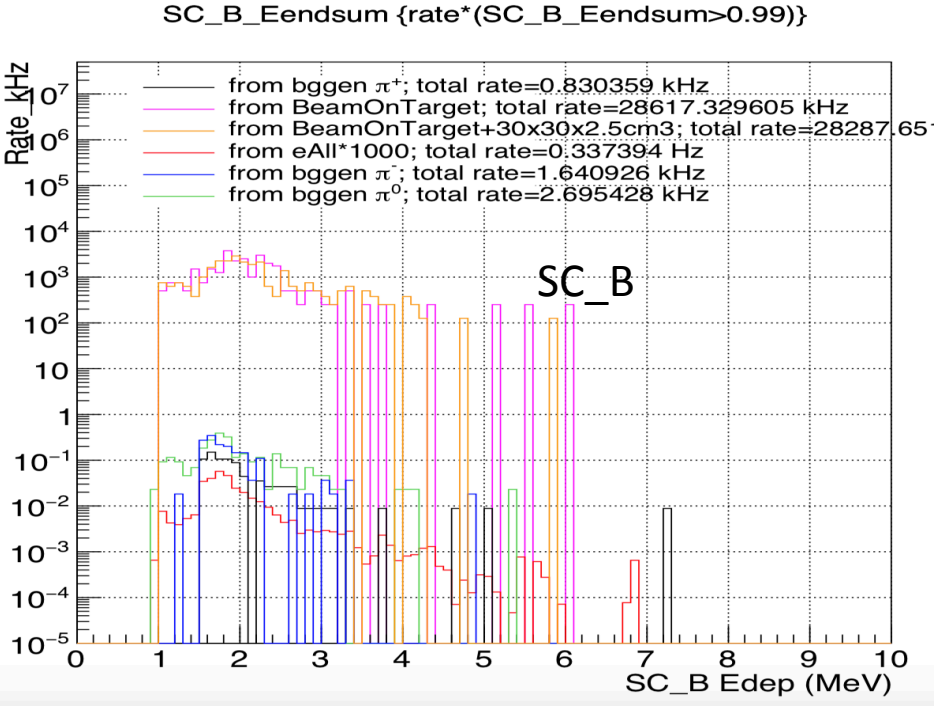
- SC_A (0.5 MIP) and SC_D (0.5 MIP) coincidence rate: 14 kHZ

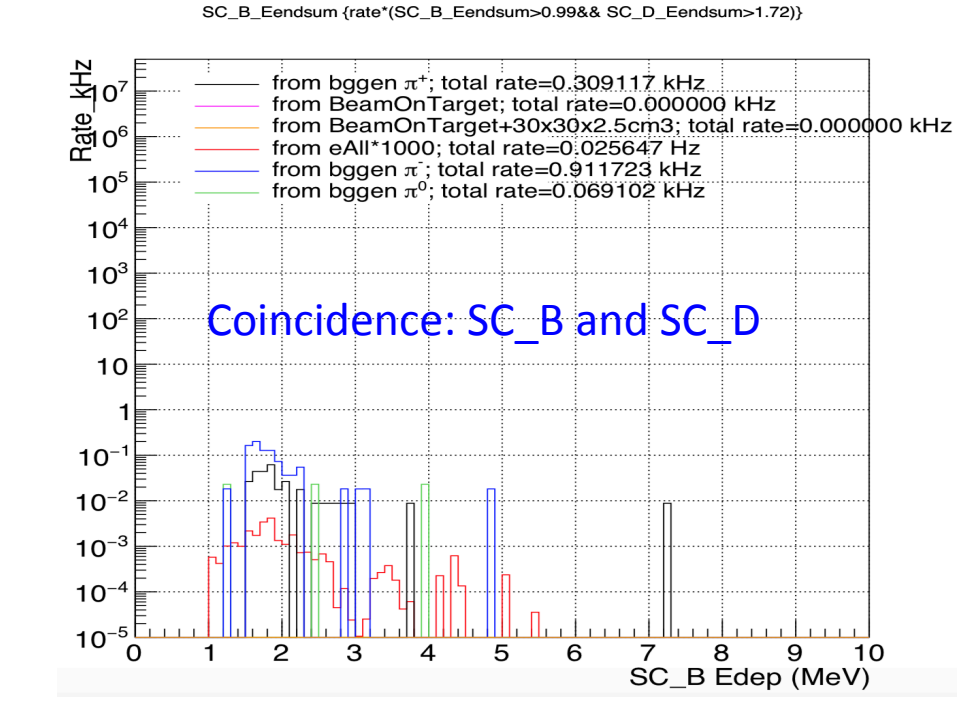
- SC_D (0.5 MIP cut) and SC_B (0.5 MIP cut) coincidence rate: 1.28 kHz

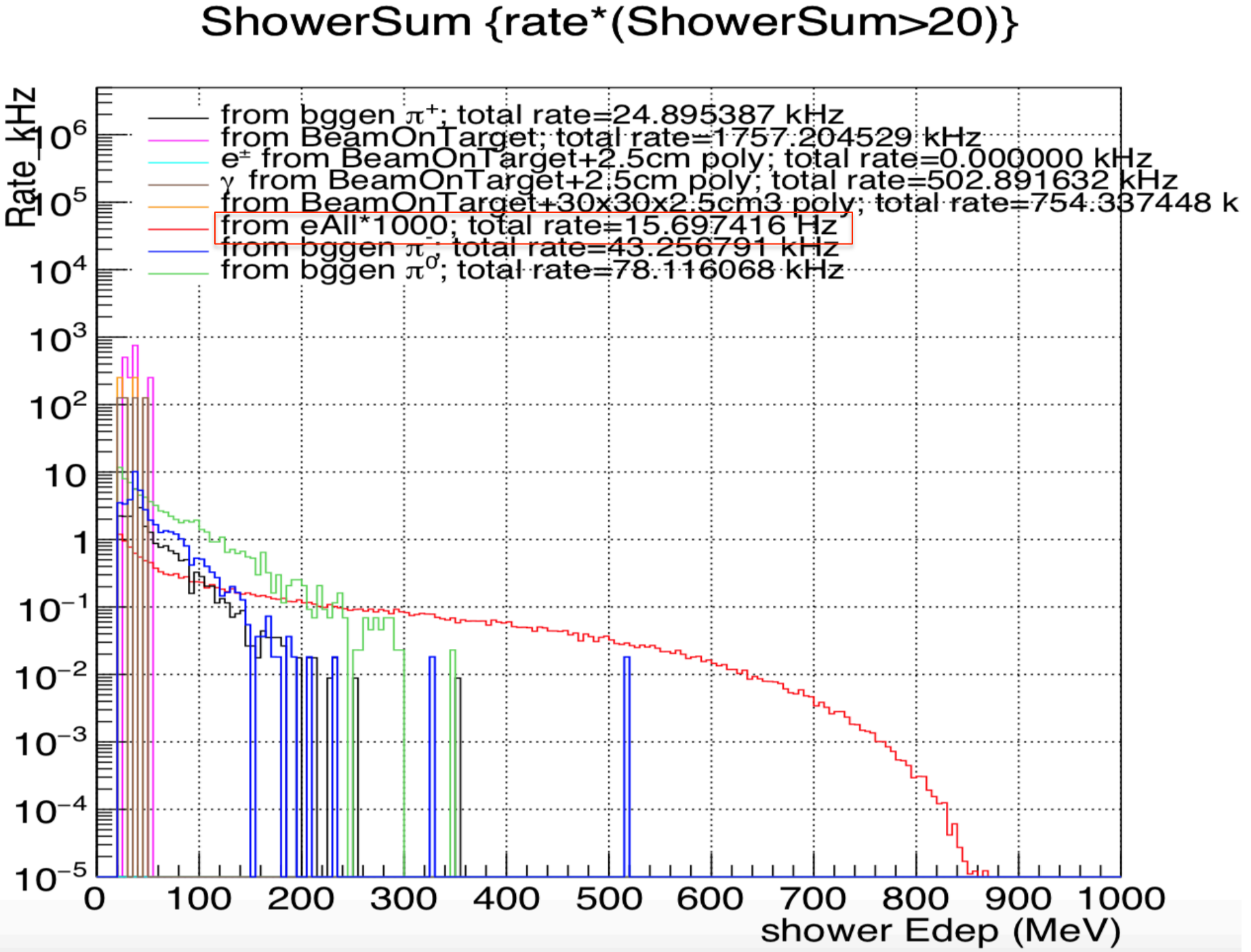
Coincidence Rate



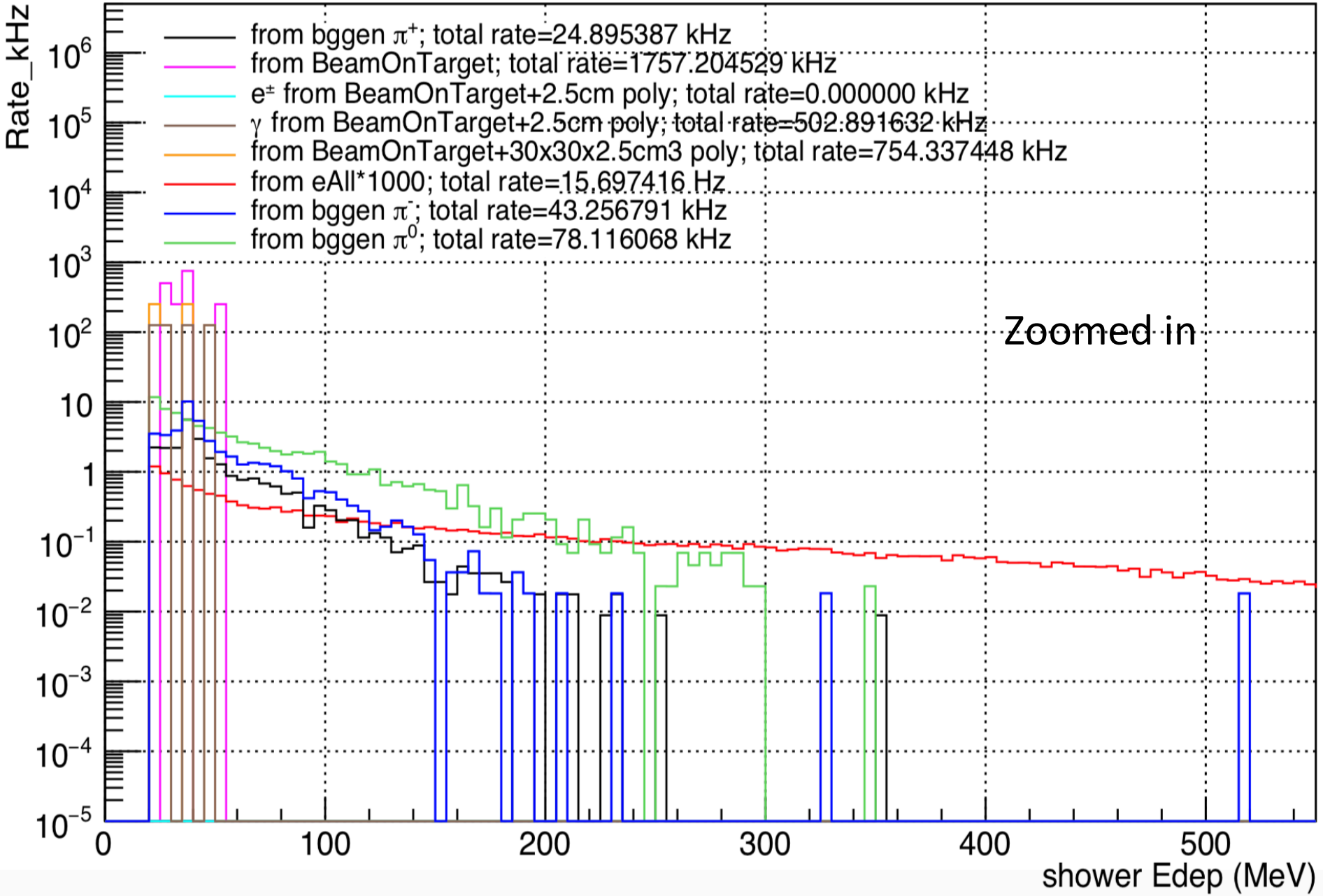







ShowerSum {rate*(ShowerSum>20)}
Rate_kHz
from bggen π+; total rate=24.895387 kHz
from BeamOnTarget; total rate=1757.204529 kHz
e± from BeamOnTarget+2.5cm poly; total rate=0.000000 kHz
γ from BeamOnTarget+2.5cm poly; total rate=502.891632 kHz
from BeamOnTarget+30x30x2.5cm3 poly; total rate=754.337448 k
from eAll*1000; total rate=15.697416 Hz
from bggen π-; total rate=43.256791 kHz
from bggen π0; total rate=78.116068 kHz
shower Edep (MeV)

ShowerSum {rate*(ShowerSum>20)}

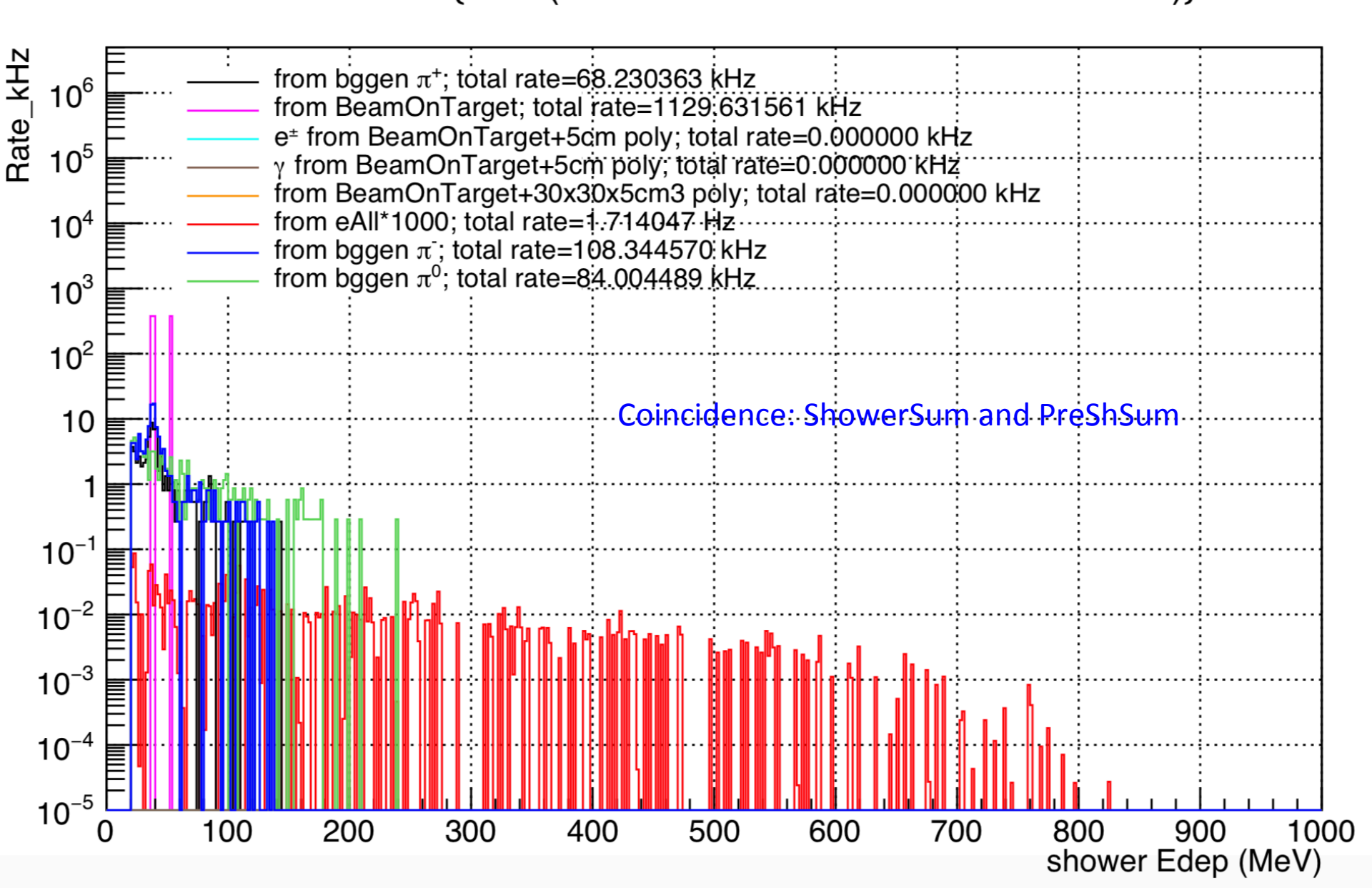


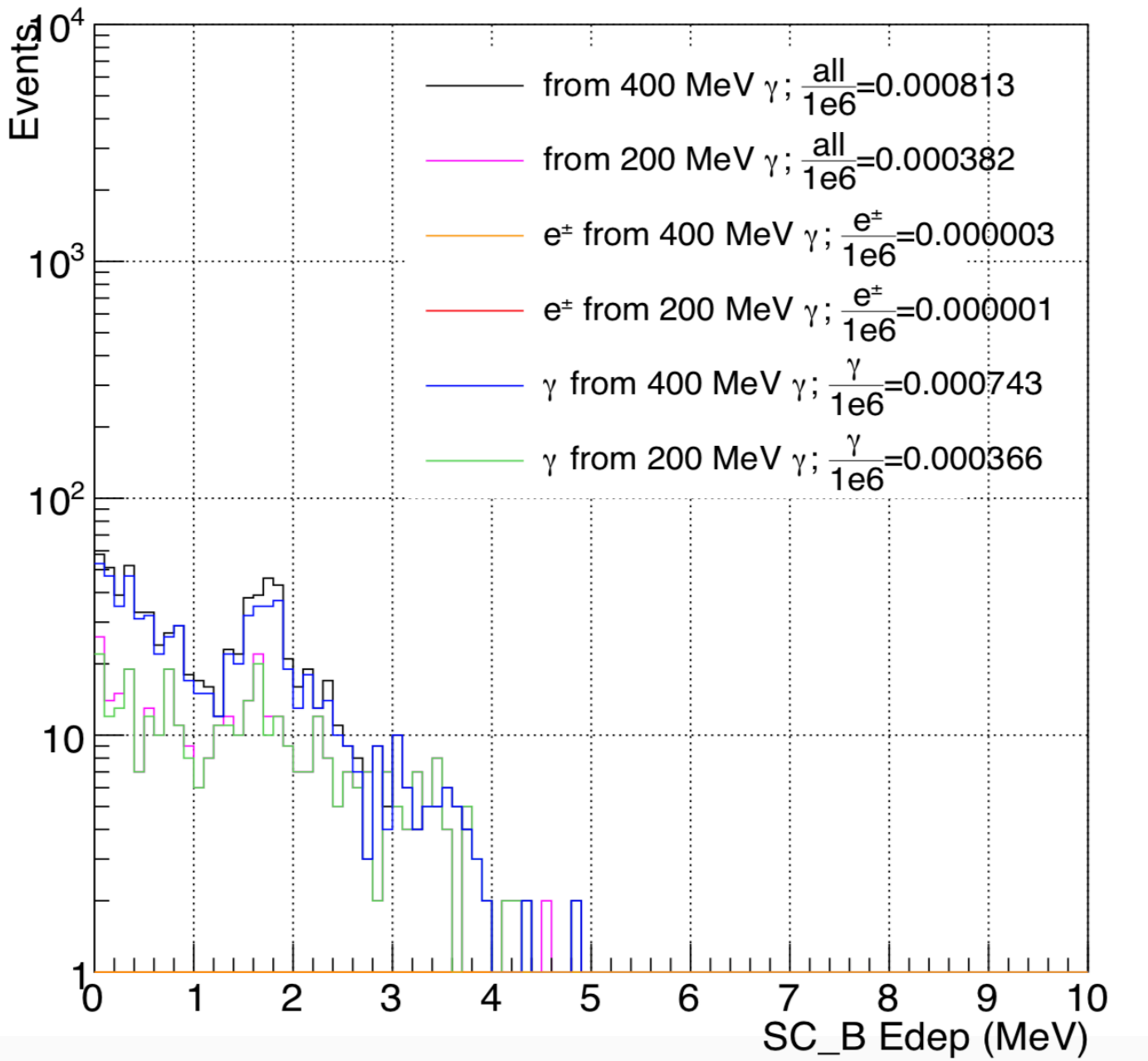
Summary

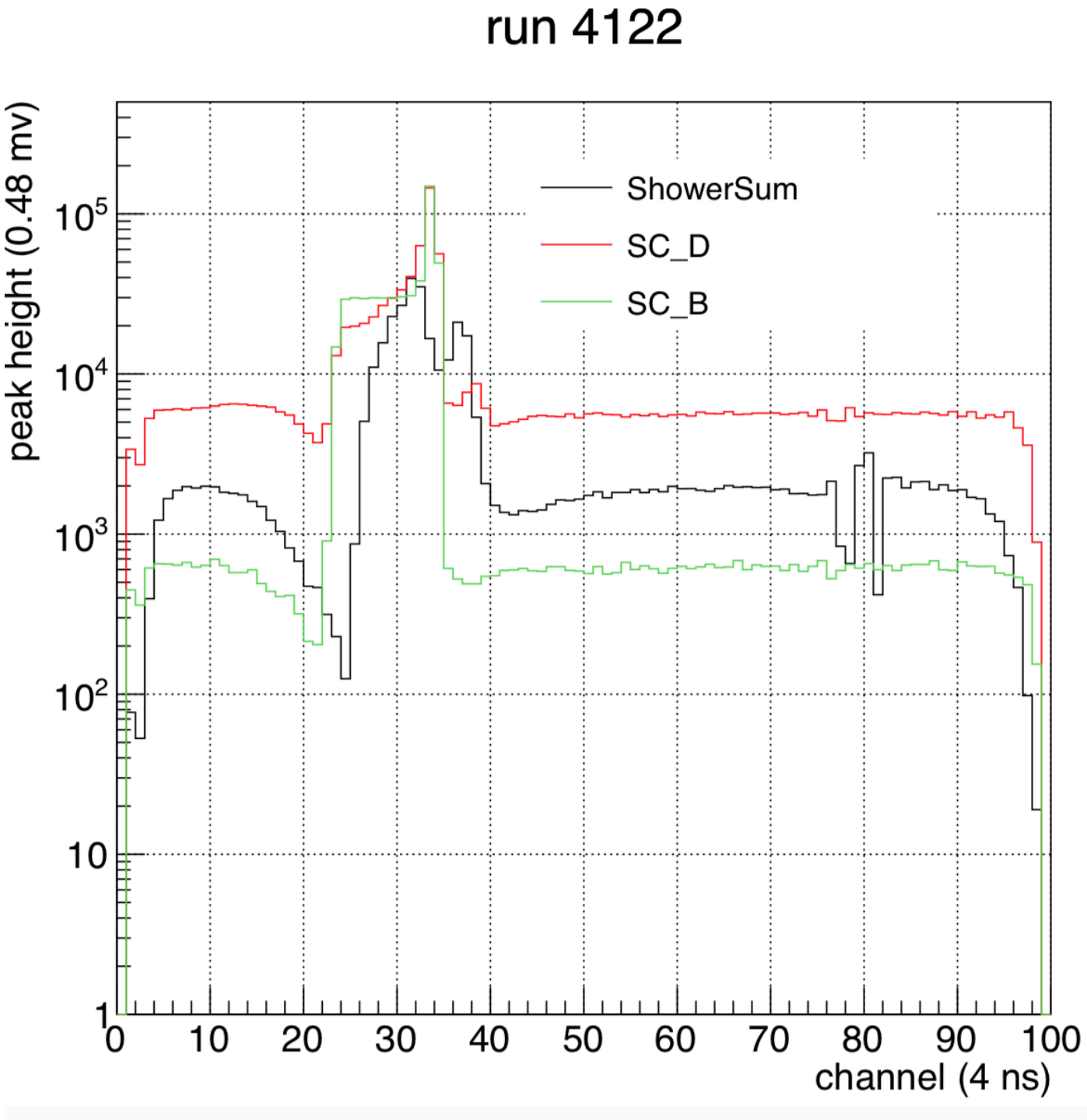
- Add poly in front of GEM00 to protect the gem and lower the rate of the scintillators as well.

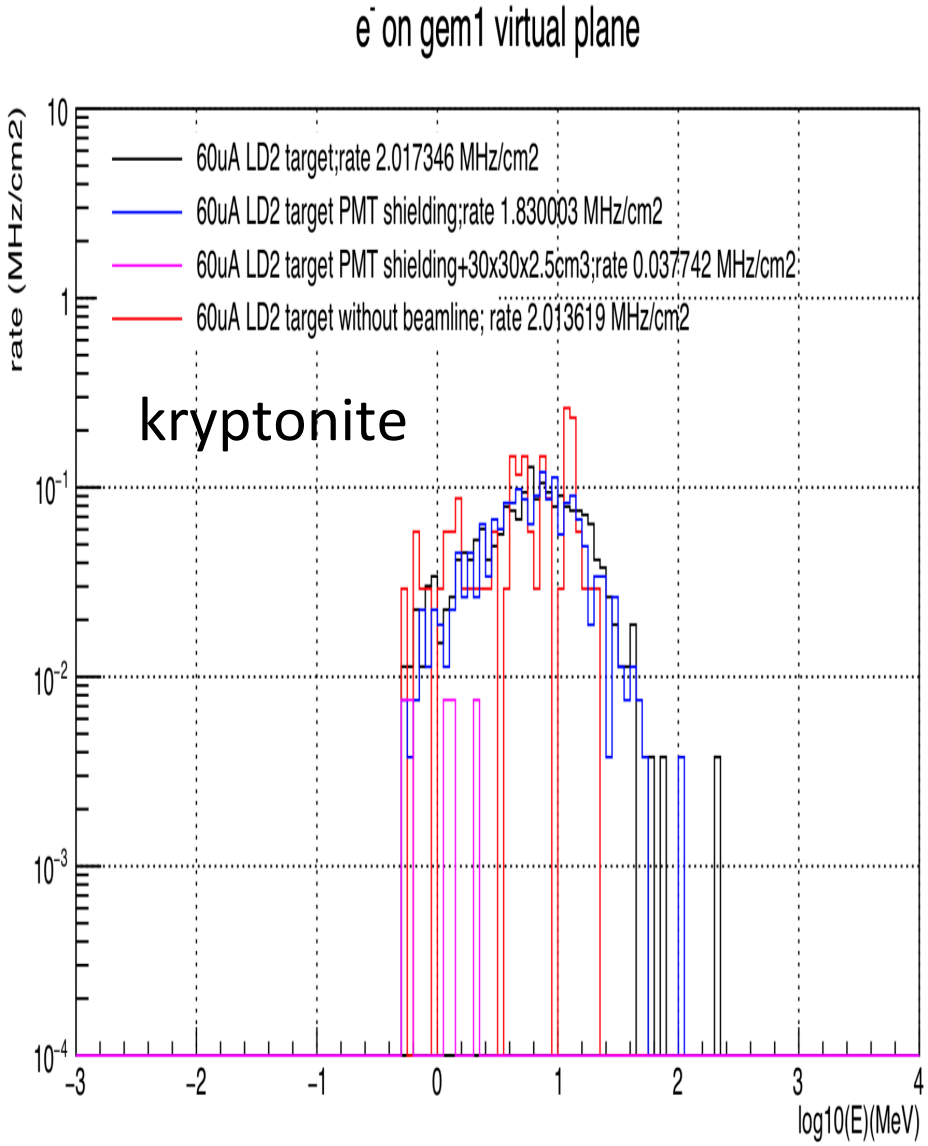
Backup

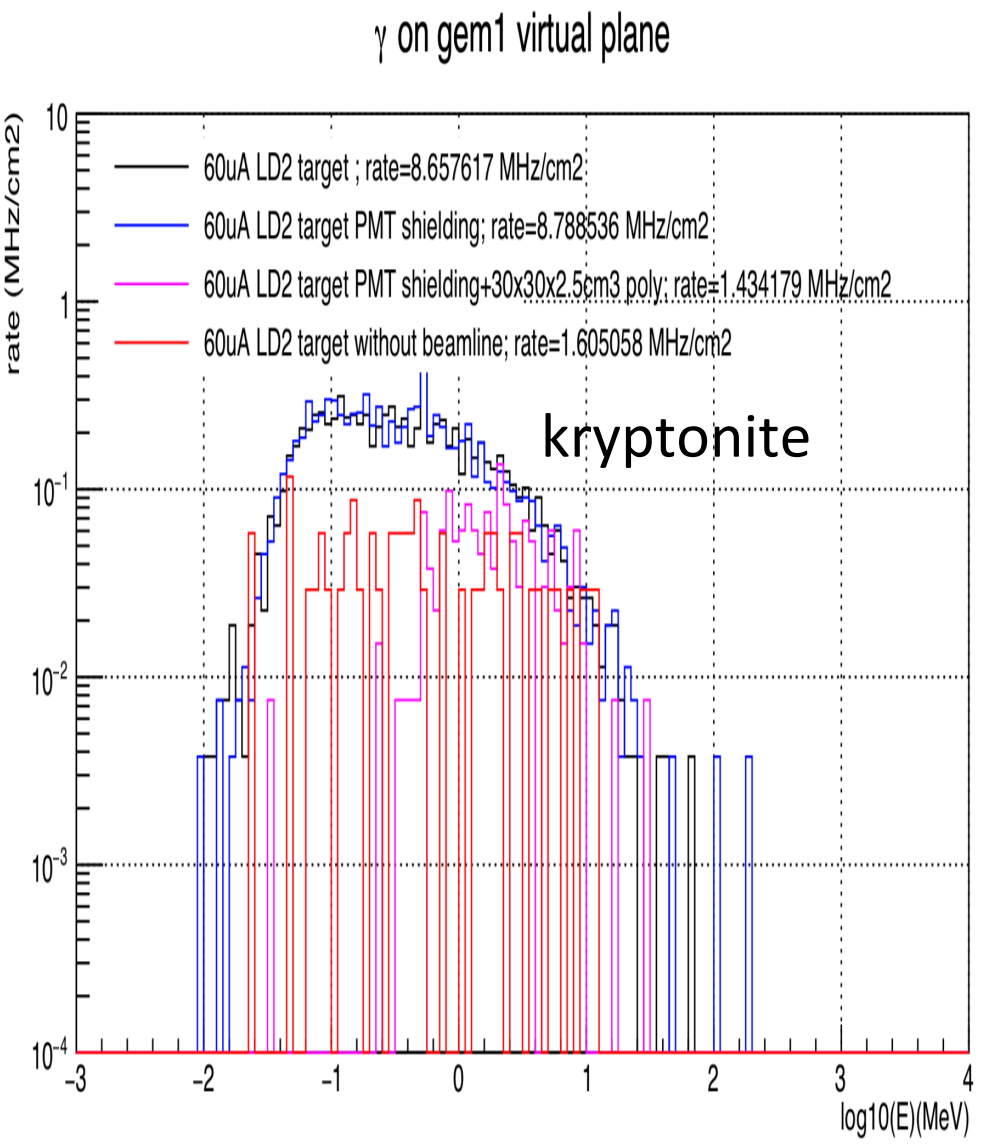
Coincidence Rate




SC_B_Eendsum {rate*(SC_B_Eendsum>0)}
Events
10^4
10^3
10^2
10
1
0
1
2
3
4
5
6
7
8
9
10
SC_B Edep (MeV)
from 400 MeV γ; $\frac{all}{1e6}$=0.000813
from 200 MeV γ; $\frac{all}{1e6}$=0.000382
e± from 400 MeV γ; $\frac{e^{\pm}}{1e6}$=0.000003
e± from 200 MeV γ; $\frac{e^{\pm}}{1e6}$=0.000001
γ from 400 MeV γ; $\frac{\gamma}{1e6}$=0.000743
γ from 200 MeV γ; $\frac{\gamma}{1e6}$=0.000366


run 4122
peak height (0.48 mv)
channel (4 ns)
ShowerSum
SC_D
SC_B
1
10
10^2
10^3
10^4
10^5
0
10
20
30
40
50
60
70
80
90
100


e⁻ on gem1 virtual plane
60uA LD2 target;rate 2.017346 MHz/cm2
60uA LD2 target PMT shielding;rate 1.830003 MHz/cm2
60uA LD2 target PMT shielding+30x30x2.5cm3;rate 0.037742 MHz/cm2
60uA LD2 target without beamline; rate 2.013619 MHz/cm2
kryptonite
rate (MHz/cm2)
log10(E)(MeV)


γ on gem1 virtual plane
60uA LD2 target ; rate=8.657617 MHz/cm2
60uA LD2 target PMT shielding; rate=8.788536 MHz/cm2
60uA LD2 target PMT shielding+30x30x2.5cm3 poly; rate=1.434179 MHz/cm2
60uA LD2 target without beamline; rate=1.605058 MHz/cm2
kryptonite
rate (MHz/cm2)
log10(E)(MeV)

10cm-LD2 target I=60uA detectors at 20 degrees 21.7m away from the Target Chamber

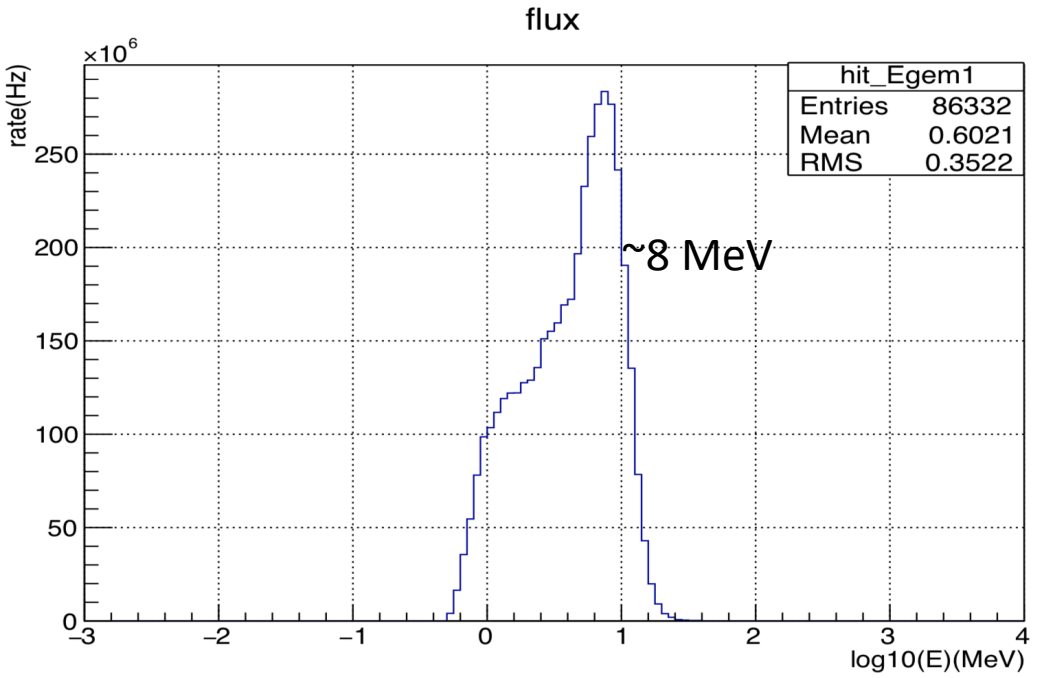
Poly size in front of GEM00 (cm^3)	GEM00 (MHz/cm2)	GEM10 (MHz/cm2)	SC0 (MHz/cm2)	SC1 (MHz/cm2)	SPD (MHz/cm2)	LASPD (MHz/cm2)
0	2.43	0.43	2.3	0.8	1.0	1.0
20x20x2	1.82	0.21	1.4	0.57	0.95	1.0
20x20x5.08	1.04	0.34	0.75	0.65	1.1	1.1
30x30x5.08	0.89	0.23	0.6	0.5	1.0	1.0

CC window front: 20.11

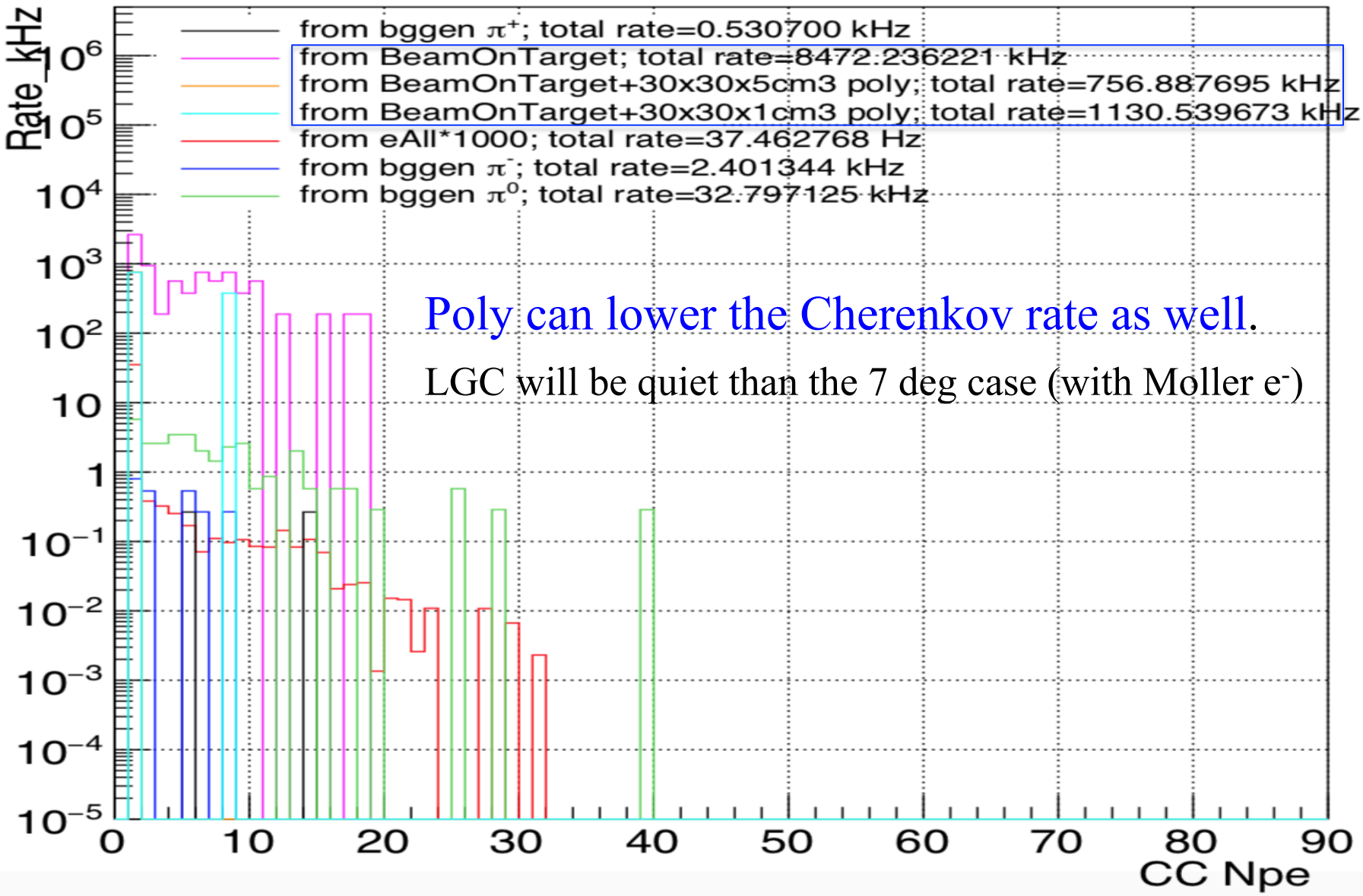
CC window front: 21.97 m----running

$\Delta\Omega 1/\Delta\Omega 2 = 0.84$

- Cuts on half MIP
- SCs: 10x5 cm^2 20 ns
- SPD: 10x25 cm^2
- LASPD: 14x40 cm^2 = 560 cm^2



Cherenkov Npe



Coincidence Rate