PVDIS trigger rate

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Singles rate update on EC

singles	Rate (MHz) Jin's curve, wiser generator, extrapolation below 1 GeV	Rate (MHz) Rakitha's curve, Hall D generator, cut off at 1 GeV
Electron	0.282	0.241
Pim (Hall D)	5.05	4.4
Pip (Hall D)	1.0	0.43
Pi0(Hall D)	0.031	0.015
Total	**6.36=(212 KHz/sector)**	**5.09=(170 KHz/sector)**

The real calculation will use Rakitha's curve and Hall D generator the other numbers are just for reference

Singles rate update using Hall D generator

Singles rate on lgc

Threshold: PMT=2, PE on each pmt=2

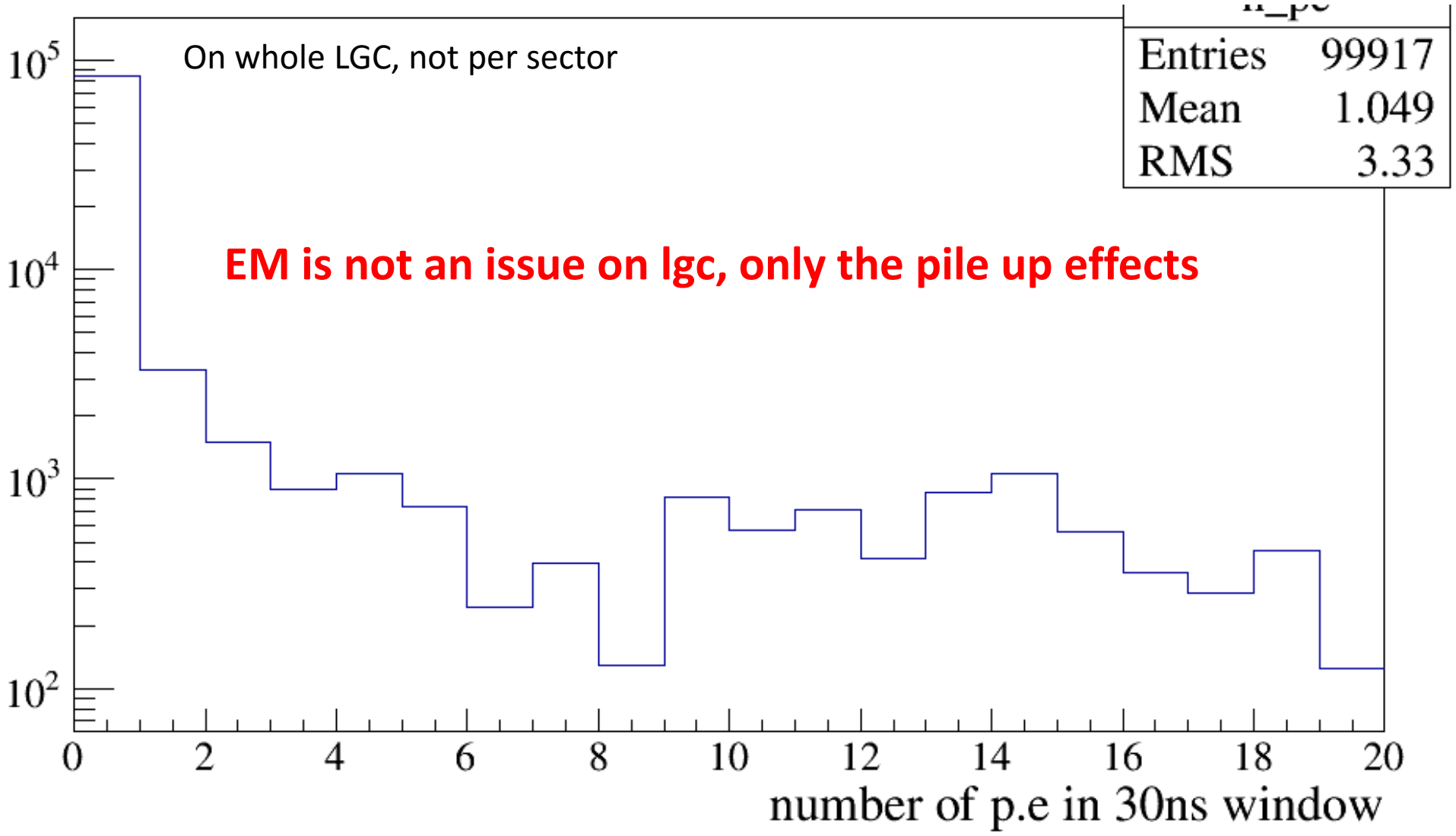
singles	Rate (MHz)
Electron	0.4465
Pim (Hall D)	0.823
Pip (Hall D)	0.436
Pi0(Hall D)	21.76
EM background only (beam on target with hadron process blocked)	0.6 (18 out of 1066 windows can produce a lgc trigger)
Total	**24.1 MHZ (803KHz/sector)**

Beam on target with all processes open: 42MHz

Different by 17.9 MHz

From difference of pi0 rate between G4 and Hall D generator

Number of p.e produced by EM on lgc within 30ns



Rate with EC&lgc both fired for singles event

Numbers with Rakitha's curve and Hall D generator:

PID	Only EC fired	Rate with EC and lgc both fired for the same e or pion event	Efficiency of LGC
Electron	0.24 MHz	0.23 MHz	95.7%
Pim	4.43 MHz	0.64 KHz	0.01%
Pip	0.43 MHz	0 (limit: 0.04kHz)	0.01%
Pi0	0.015 MHz	8.5 KHz	57%

Both EC and LGC have backgrounds taken into account

Coincidence Rate estimation ---Rakitha's curve and Hall D generator

PID	Only EC fired	Rate with EC and lgc both fired for the same e or pion event	Efficiency of LGC
Electron	0.24 MHz	0.23 MHz	95.7%
Pim	4.43 MHz	0.64 KHz	0.01%
Pip	0.43 MHz	0 (limit: 0.04kHz)	0.01%
Pi0	0.015 MHz	8.5 KHz	55%

electron with EC&LGC = 230 KHz = 7.7 KHz/sector

pion with EC&LGC = (0.64 + 0.04 + 8.5) KHz = 9 KHz = 0.3 KHz/sector

Random coincidence per sector = 170 KHz * 803 KHz * 30ns = 4.1 KHz/sector

Total: (7.7+0.3+4.1) KHz = 12.1 KHz/sector

Concern of particle correlations

- High singles rate: pim on EC, pi0 on LGC
- How large is the correlation between pim and pi0 ???
  - Hall D generator can have all possible pions in one event
  - Looking at EC&LGC coincidence will give us hints on the correlations between pions

0.3% of “all-pion” events will fire EC and LGC at the same time

Seems that correlation of pions on EC and LGC is small

Will do more study on it …

Summary of PVDIS trigger rate

- Rakitha's EC curve and Hall D generator
  - Total: (7.7+0.3+4.1) KHz = 12.1 KHz/sector

Backups

Singles rate update on EC

singles	Rate (MHz) Jin's curve, wiser generator	Rate (MHz) Jin's curve, Hall D generator, extrapolation below 1 GeV	Rate (MHz) Rakitha's curve, Hall D generator, cut off at 1 GeV
Electron	0.282	0.282	0.241
Pim (Hall D)	5.05	3.1	4.4
Pip (Hall D)	1.0	0.455	0.43
Pi0(Hall D)	0.031	0.021	0.015
Total	**6.36=(212 KHz/sector)**	**3.8 (=127kHz/sector)**	**5.09=(170 KHz/sector)**

The real calculation will use Rakitha's curve and Hall D generator the other numbers are just for reference

Rate with EC&lgc both fired for singles event

Numbers with Jin's curve and Hall D generator:

PID	Only EC fired	Rate with EC and lgc both fired for the same e or pion event	Efficiency of LGC
Electron	0.282 MHz	0.27 MHz	95.7%
Pim	3.065 MHz	3.8 KHz	0.12%
Pip	0.455 MHz	0 (limit: 0.55kHz)	0.12%
Pi0	0.021 MHz	8 KHz	38%

Numbers with Rakitha's curve and Hall D generator:

Both EC and LGC have backgrounds taken into account

PID	Only EC fired	Rate with EC and lgc both fired for the same e or pion event	Efficiency of LGC
Electron	0.24 MHz	0.23 MHz	95.7%
Pim	4.43 MHz	0.64 KHz	0.01%
Pip	0.43 MHz	0 (limit: 0.04kHz)	0.01%
Pi0	0.015 MHz	8.5 KHz	57%

Coincidence Rate estimation
---Jin's EC curve and Hall D generator

PID	Only EC fired	Rate with EC and lgc both fired for the same e or pion event	Efficiency of LGC
Electron	0.282 MHz	0.27 MHz	95.7%
Pim	3.065 MHz	3.8 KHz	0.12%
Pip	0.455 MHz	0 (limit: 0.55kHz)	0.12%
Pi0	0.021 MHz	8 KHz	38%

electron with EC&LGC = 270 KHz = 9 KHz/sector

pion with EC&LGC = (3.8 + 0.55 + 8) KHz = 12 KHz = 0.4 KHz/sector

Random coincidence per sector = 127 KHz * 803 KHz * 30ns = 3.1 KHz/sector

Total: (9+0.4+3.1) KHz = 12.5 KHz/sector