

Remark on auxiliary triggers for diffraction

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„ND” and „NSD” triggers

- First $\langle n \rangle$ measurements at LHC claimed to show excessive increase with energy
- In fact, OK with default PYTHIA 8
- Doubts: ND? NSD? Model dependent!
- Thus simple df: $n_{\text{ch}} > 0$ in $|\eta| < 0.5$ (1.0) bin
- Easy for MC. But is it close to ND or NSD?
- Tests with default PYTHIA 8135, 8145

ND:DD:SD ratios in PYTHIA

8135/8145 at LHC energies

Energy	Inclusive	$N_{\text{ch}} > 0$ in $ \eta < 1.0$	$N_{\text{ch}} > 0$ in $ \eta < 0.5$
0.9 TeV	65.5:12.2:22.3	80.1:7.2:12.7	82.1:6.2:11.7
2.0 TeV	66.2:12.5:21.3	79.8:7.7:12.5	81.6:6.8:11.6
7.0 TeV	67.6:13.2:19.2	79.7:8.8:11.5	81.1:8.0:10.9
0.9 TeV	65.8:12.1:22.2	80.3:7.0:12.7	82.2:6.2:11.6
2.0 TeV	66.1:12.7:21.1	80.0:7.5:12.5	81.3:6.8:11.9
7.0 TeV	67.7:12.8:19.4	79.9:7.3:12.9	81.2:7.7:11.1

Conclusions for „ND” trigger

- With the condition $N_{ch} > 0$ in $|\eta| < 1.0$ (0.5) the ND contribution grows, but DD+SD non-negligible
- Almost no difference between two PYTHIA tunes and three energies
- Thus: a class of events fulfilling such condition useful for MC tests, but not physically defined

Suggestion: NND trigger?

- Triggers discussed – counterpart of well known rapidity gap triggers
- Requiring $N_{ch}=0$ in $|\eta|<1.0$ – effective removal of the ND contribution!
- Not really surprising, but much more effective than at lower energies, even for the gap position fixed

ND:DD:SD ratios in PYTHIA

8135/8145 at LHC energies

Energy	Inclusive	$N_{\text{ch}}=0$ in $ \eta <0.5$	$N_{\text{ch}}=0$ in $ \eta <1.0$
0.9 TeV	65.5:12.2:22.3	17.5:29.6:52.9	3.2:33.7:63.2
2.0 TeV	66.2:12.5:21.3	16.2:31.1:52.8	2.8:35.0:62.1
7.0 TeV	67.6:13.2:19.2	13.9:33.8:52.2	1.9:37.2:60.8
0.9 TeV	65.8:12.1:22.2	24.4:26.9:48.6	6.0:32.9:61.1
2.0 TeV	66.1:12.7:21.1	22.6:27.6:49.6	4.3:36.1:59.6
7.0 TeV	67.7:12.8:19.4	20.7:30.6:48.6	4.6:41.7:53.7

Conclusions

- A simple choice of the event class with no charged particles in the central bin removes practically the ND background!
- This may be useful for the analysis of the ATLAS-TOTEM and CMS-CASTOR data.