

SPIN PWG Input to Disk Space Committee

Request II

Files: 2011 jet trees

Size: Approx. 7.5 TB

Production Information

The files are **data** produced from the 2011 run

Species: p+p

Energy: 500 GeV

Polarization: Transverse

Trigger: pp500_production_2011

Production: P11id

Library: SL11d

File Description

The files contain “skim” trees and “jet” trees using the anti- k_T jet-finding algorithm with the following R parameters: 0.7, 0.6, and 0.5. Each contains branches for jets made using EMC towers exclusively, EMC towers with TPC tracks of more than 12 hits, and EMC towers with TPC tracks of more than 5 hits. The following triggers have been filtered for the trees: VPDMB, JP0, JP1, JP2*L2JetHigh, AJP, BHT0*VPDMB, BHT1, BHT2, and BBCMB. Tracks are required to pass the following quality cuts:

- “Flag” = 0
- $N_{\text{hits}} > 12$ or 5 depending on the branch
- $N_{\text{hits}}/N_{\text{poss}} > 0.51$
- p_T -dependent DCA cut
- $0.2 < p_{T,\text{track}} < 200 \text{ GeV}/c$
- $|\eta| < 2.5$
- Radius of last point $> 125 \text{ cm}$

EMC towers are required to pass the following quality cuts:

- Status = 1
- Masking known hot towers from the jet finder
- ADC-pedestal > 4 and ADC-pedestal $> 3 \times \text{RMS}$
- $E_T > 0.2 \text{ GeV}$

For reconstruction, jets are required to have a minimum p_T of 5 GeV with a maximum of 200 GeV.

Skim trees contain global, event-level information, including the following:

- Run-ID, fill-ID, event ID, etc.
- Bunch-crossing and spin-bit info
- Trigger rates
- Event timestamp

- Trigger-ID
- Prescale
- Trigger thresholds
- Trigger simulator response
- Lists of towers and patches above trigger threshold
- Event vertex information (position, rank, etc.)

Jet trees contain detailed information about the jet events. Jets are associated with a particular vertex for the event. Within each jet structure, specific information is accessible, such as the following:

- Kinematic information (p , p_T , η , ϕ , etc.)
- Kinematics from the lab frame
- Neutral and charged energy fractions
- Number of tracks/towers
- Summed tower/track energy
- Jet patch information
- Structures for associated tracks and towers

For associated tracks, one can obtain the following information:

- Flag
- Charge
- N_{hits} , $N_{\text{hits fit}}$, $N_{\text{hits dE/dx}}$
- dE/dx
- DCA
- First and last point
- $n_\sigma(\pi)$, $n_\sigma(K/p)$, $n_\sigma(e^\pm)$
- Mass
- Kinematic information (p , p_T , η , ϕ , etc.)

For associated towers, one can obtain information such as the following:

- Energy, ADC, pedestal, RMS
- Status
- EMC sector, subsector, etabin, and phibin

For more detail, one may refer to the code in the CVS repository:

<http://www.star.bnl.gov/cgi-bin/protected/cvsweb.cgi/StRoot/StSpinPool/StJetEvent/>
<http://www.star.bnl.gov/cgi-bin/protected/cvsweb.cgi/StRoot/StSpinPool/StJetSkimEvent/>
<http://www.star.bnl.gov/cgi-bin/protected/cvsweb.cgi/StRoot/StSpinPool/StJets/>
<http://www.star.bnl.gov/cgi-bin/protected/cvsweb.cgi/StRoot/StJetFinder/>
<http://www.star.bnl.gov/cgi-bin/protected/cvsweb.cgi/StRoot/StJetMaker/>

Physics Analysis related to the request

The present request is critical to the analysis of transverse single-spin asymmetries in jet and jet+pion production at 500 GeV. The analysis investigates spin-dependent azimuthal asymmetries in the production of jets as well as in the distribution of charged-pions within jets. The inclusive jet azimuthal asymmetry is sensitive to twist-3 PDFs related to the k_T -integrated Sivers function. Asymmetries in pions

within jets are sensitive to physical quantities such as quark transversity (through the Collins effect) and gluon linear polarization (through the Collins-like effect). The analysis utilizes jets from the present files with $6 < p_T < 55$ GeV/c and pions within jets with $0.1 < z < 0.8$. Additionally, the analysis investigates asymmetry dependence upon j_T , the pion p_T relative to the jet axis. The analysis has observed the Collins effect at a significance of 6σ in jets with high p_T . At low p_T , the analysis will place the first-ever constraints on gluon linear polarization. The forthcoming paper was previewed by the PWGC on 12/16/14 and is expected to proceed efficiently to GPC within the next few months. The target journal is PRD with a possible companion letter to PRL.

For more information, one may consult the paper proposal page:

<https://drupal.star.bnl.gov/STAR/pwg/spinAnalysisStatus.html/2011-pions-jets-aut-500-gev>.