## **DPF2015**



Contribution ID: 187

Type: not specified

## Flavor Tagging TeV Jets for BSM and QCD

Wednesday 5 August 2015 15:00 (20 minutes)

We present a new scheme for tagging *b*-jets with  $p_T > 500$  GeV, which we call  $\mu_x$  tagging. At the LHC, the primary method to tag *b*-jets (jets which originate from bottom quarks) relies on tracking their charged constituents. However, when jets are highly boosted, their dense, collimated environment makes precise tracking difficult. Thus, as jet  $p_T$  approaches 1 TeV, track-based *b*-tags lose efficiency, and the probability to mis-tag light jets rises dramatically. This is a problem, since many heavy BSM resonances ( $W' \rightarrow tb$ ,  $Z'/G^* \rightarrow t\bar{t}/b\bar{b}$ , etc.) require tagging at least one energetic *b*-jet and rejecting the light-jet background.

Using muons from semi-leptonic *b*-hadron decay, we define a variable *x* which encodes angular correlations between the muon and the boosted subjet of the decay. Requiring  $x \leq x_{max}$  allows us to tag *b*-jets and effectively discriminate the light-jets (including those which undergo gluon splitting). This is especially useful at ATLAS, which has excellent capabilities for standalone muons. We find an efficiency to tag *b*-jets, *c*-jets and light-jets of  $\epsilon_b \approx 14\%$ ,  $\epsilon_c \approx 6.5\%$  and  $\epsilon_{light} \approx 0.65\%$  respectively (where primary gluons splitting to heavy flavors are classified as light-jets). For heavy flavor jets (*b* / *c*), these efficiencies are essentially flat (over  $-2.5 \leq \eta \leq 2.5$  and  $0.5 \text{ TeV} \leq p_T \leq 2.1 \text{ TeV}$ ). For light-jets, the rejection rate improves slightly with  $p_T$ .

This scheme could be immediately useful in discovering a heavy, "leptophobic" Z' in the dijet channel. We simulate such a Z' at several TeV-scale masses and, using only the  $\mu_x$  tag, predict a substantial increase in the sensitivity to discover heavy Z' at the LHC Run II. Additionally, since  $\mu_x$  and track-based tagging are not mutually exclusive, using both should maximize the total *b*-tagging efficiency.

## **Oral or Poster Presentation**

Oral

Primary author: PEDERSEN, Keith (Illinois Institute of Technology)
Co-author: SULLIVAN, Zack (Illinois Institute of Technology)
Presenter: PEDERSEN, Keith (Illinois Institute of Technology)
Session Classification: QCD and Heavy Ions

Track Classification: QCD Theory