Study on Tracks Information

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Today's presentation

Topics

- Preliminary study on the new variables using tracking information

Motivation

In our signal there is no colour connection between the VBF jets, this is the motivation for the Central Jet Veto.

CJV Definition

Veto an event if there is a jet:

- Between both selected jets
- Minimum jet $p_T > 30$ GeV passing PU ID

CJV Disadvantages

- Assumes colours connection will manifest as reconstructed jets
- Minimum p_T
- Only looks for objects between the 2 selected jets.

So I suggest as a complementary variable(s) look at the tracking information.

Definition

For our signal if we assume we selected the correct primary vertex:

Reasoning

- Tracks coming out of this vertex should be just our jets and the underlying event.
- Therefore most tracks above a minimum p_T threshold should be in our jets.
- This should not be true for our background since colour connection implies presence of particles and/or jets on the event coming from the primary vertex.
- We can define/study variables to look at the this difference between signal and background.

CAVEAT: The assumption of correct primary vertex be an incorrect if both signal jets are outside the tracking region

Definition

Select events where the 2 leading jets:

- $p_T < 50$ and $|\eta| < 4.7$
- Pass PU ID

Look at:

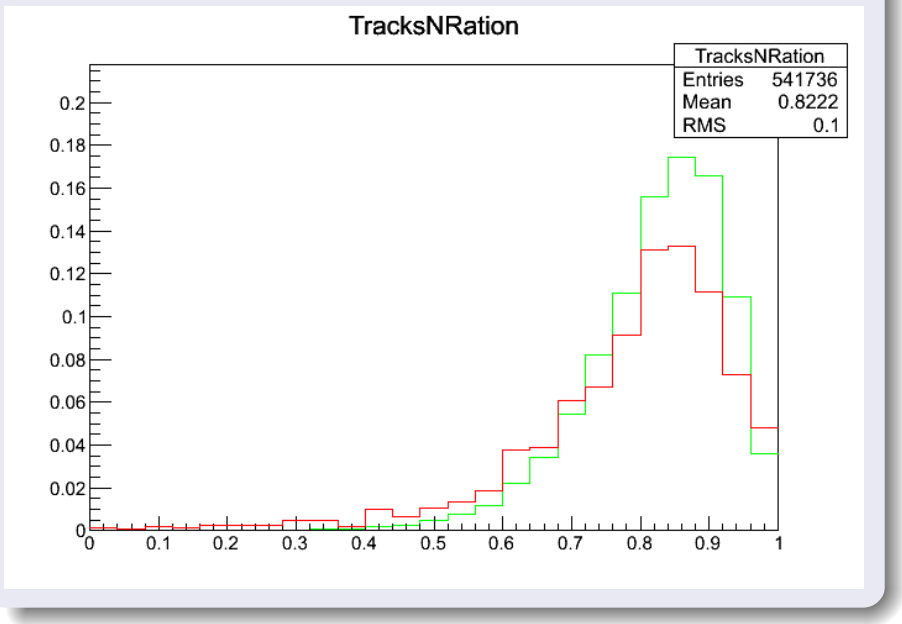
- Ratio of number track outside jets
- Ratio of track energy outside jets

We can also compare this to current CJV cut

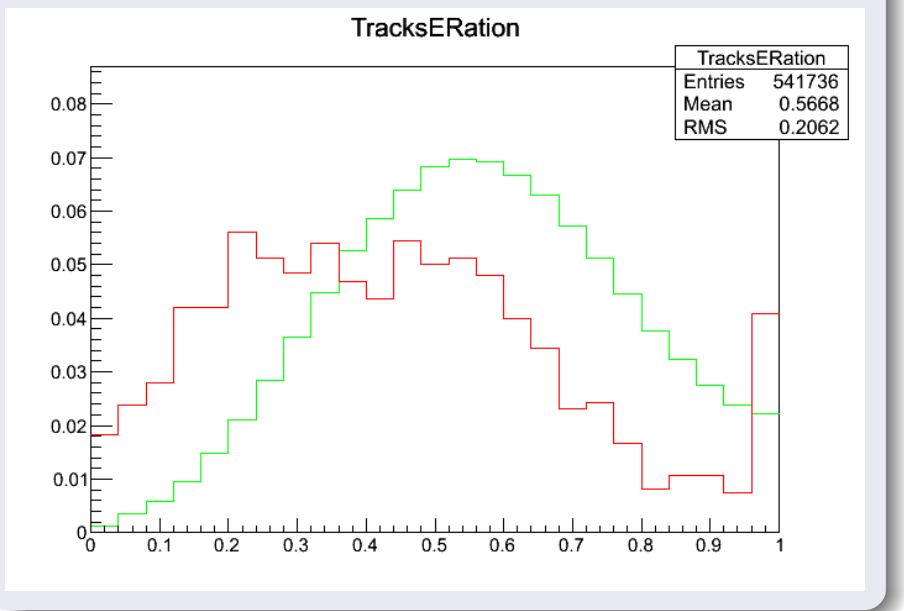
Tracks $p_T > 0$ - All events

All Plots from now on, signal (red) and VBF QCD (green). All plots scaled to 1. Y-axis covers $[0, 1[$ (to be fixed later).

Outside Number Ratio

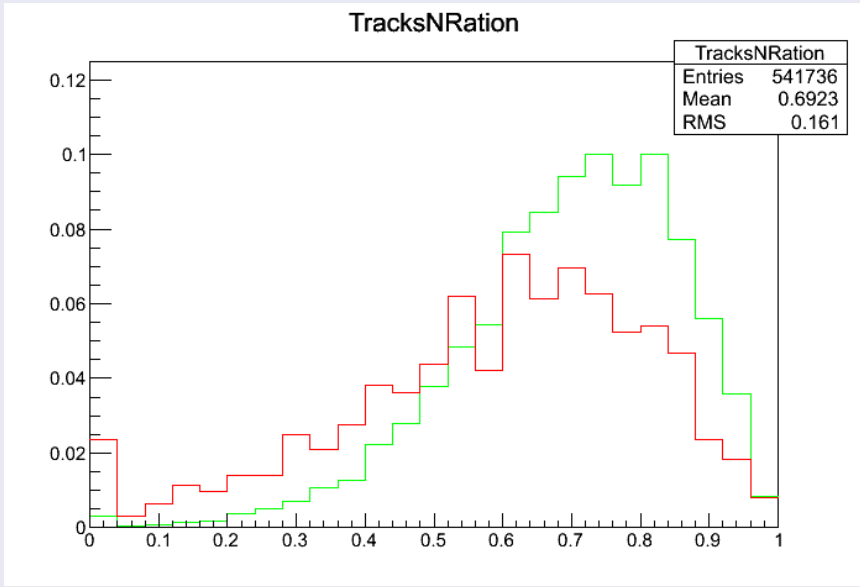


Outside Energy Ratio

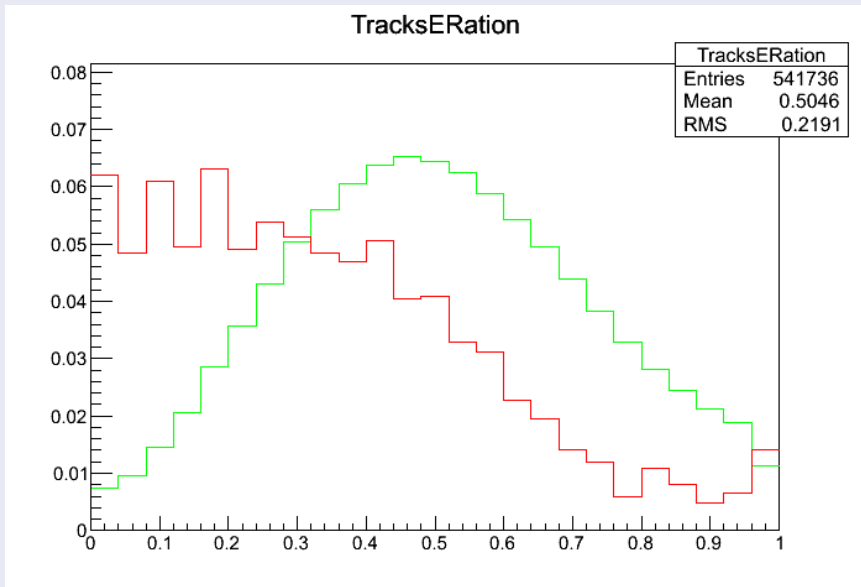


Tracks $p_T > 1$ - All events

Outside Number Ratio



Outside Energy Ratio



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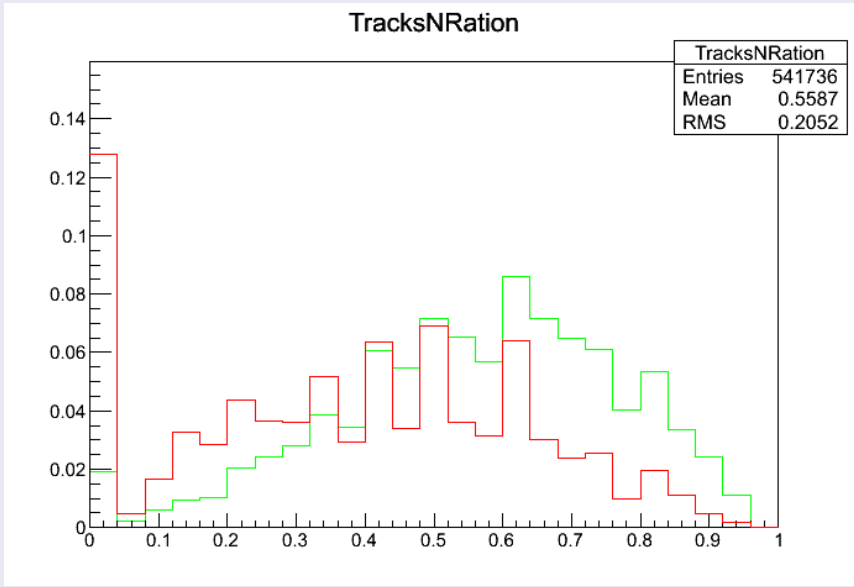
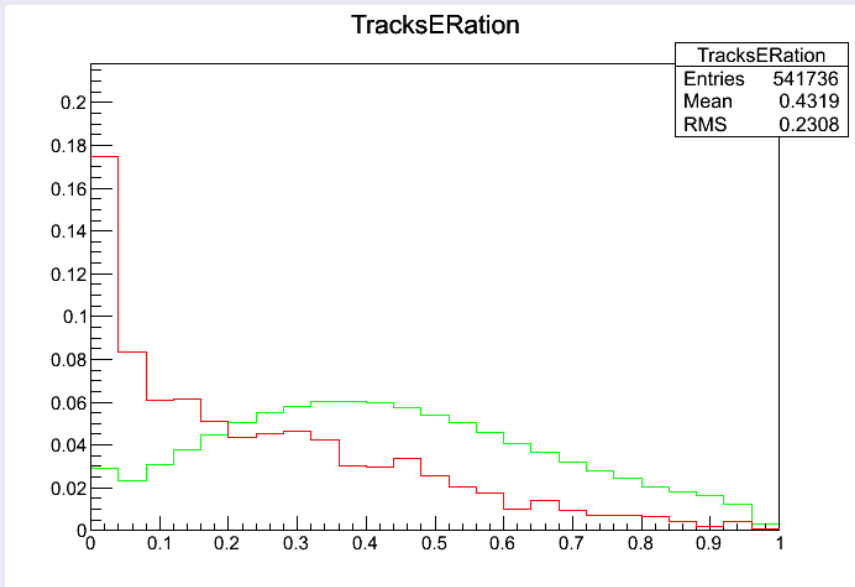
Tracks $p_T > 2$ - All events

Outside Number Ratio

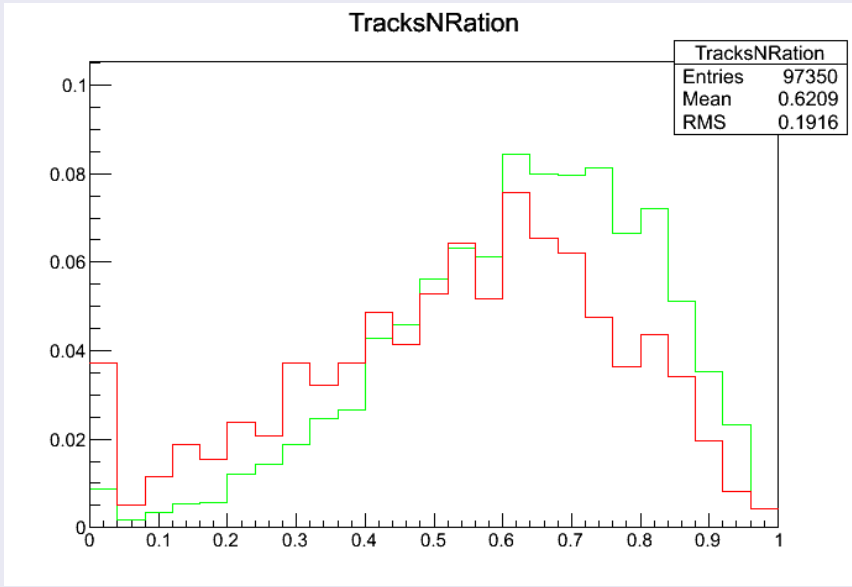


Outside Energy Ratio

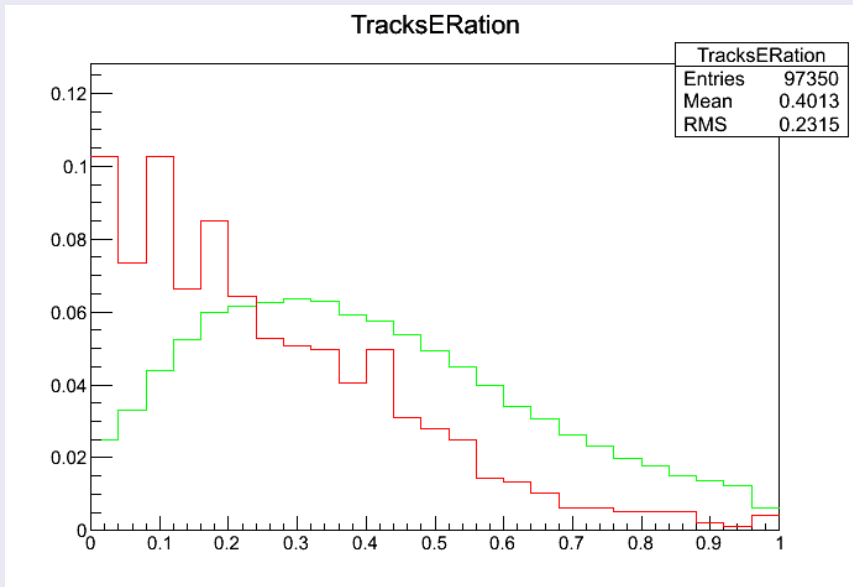


Tracks $p_T > 1$ - All events CJV Pass

Outside Number Ratio

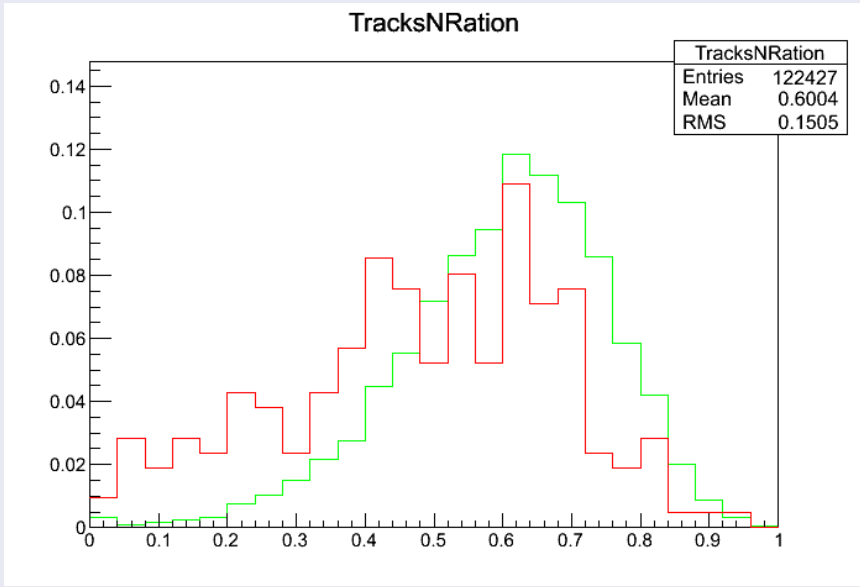


Outside Energy Ratio

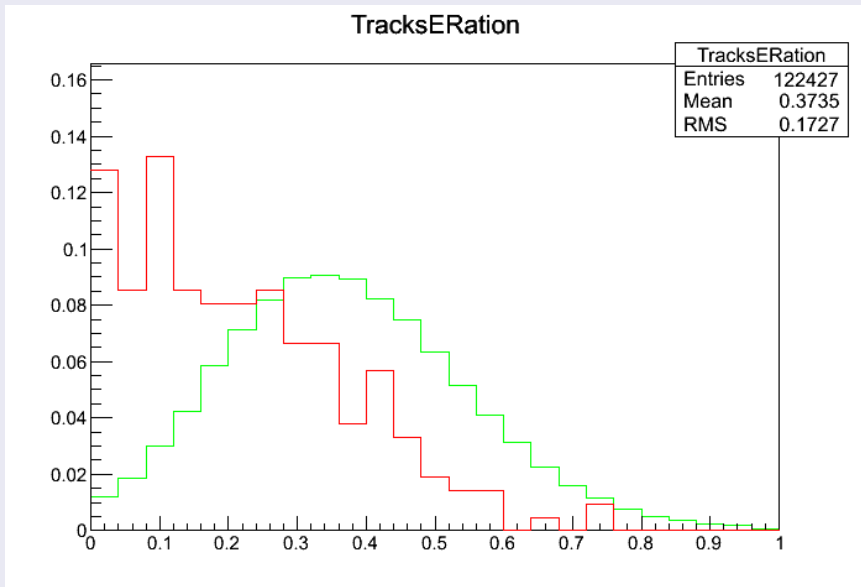


Tracks $p_T > 1$ - BB

Outside Number Ratio



Outside Energy Ratio



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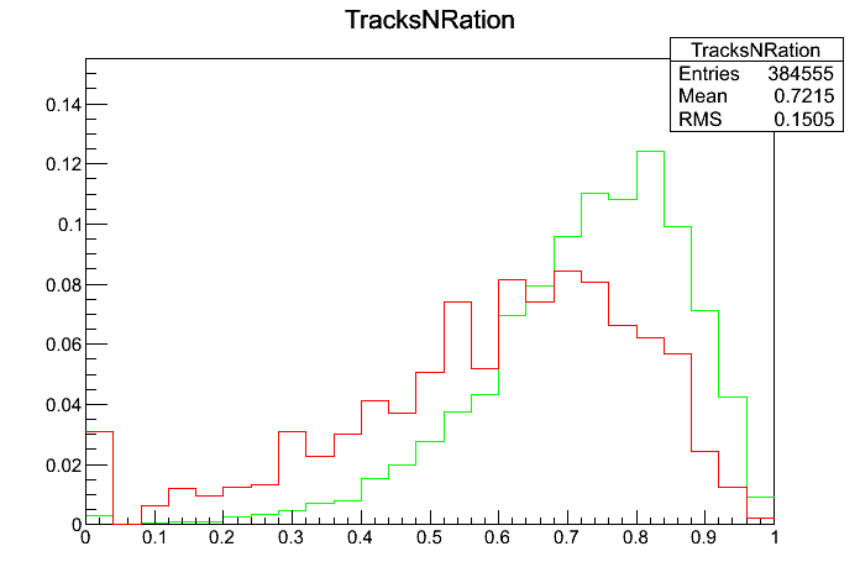
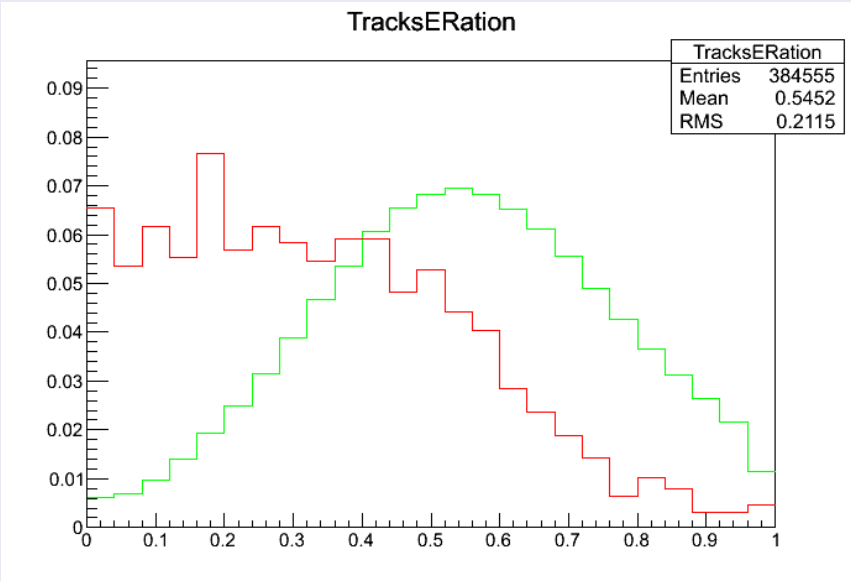
Tracks $p_T > 1$ - BE

Outside Number Ratio

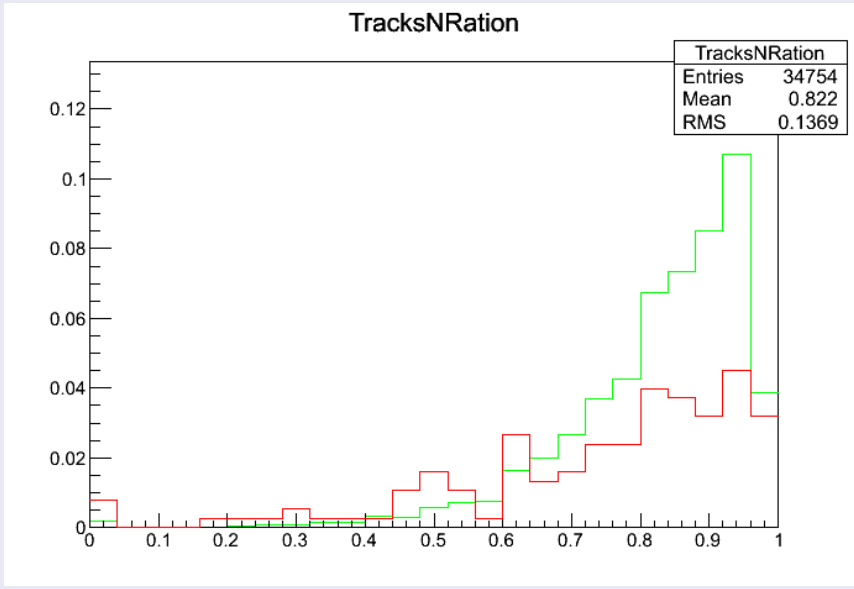


Outside Energy Ratio

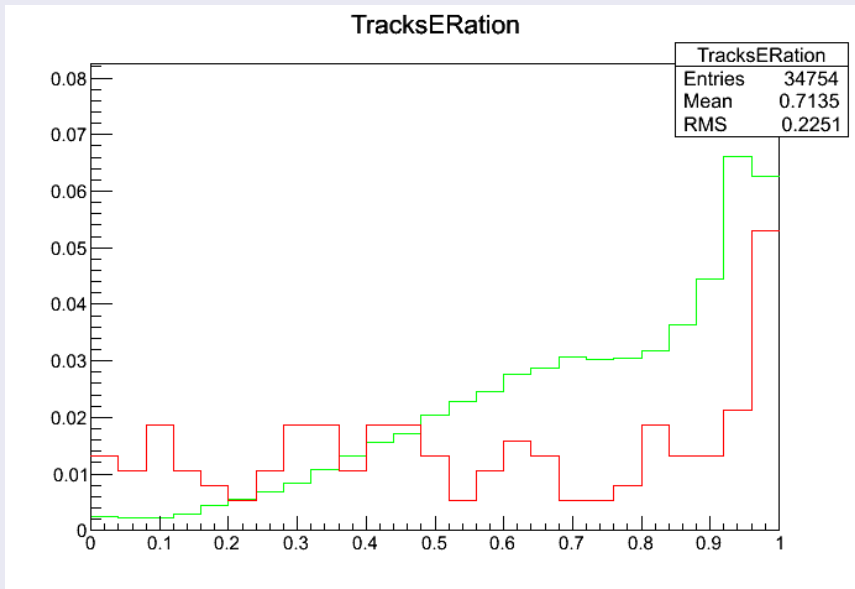


Tracks $p_T > 1$ - EE

Outside Number Ratio



Outside Energy Ratio



Summary and next steps

Summary:

- Energy ration is a descriminat variable that add information to CJV

Next Steps:

- Study including this variables in our mva.
- MVA optimization
- L1-HLT studies

Backup Slides