
ILC physics & software meeting

2026/7/27

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- How is the jet reconstructed?
 - ➡ Determine the jet core → Combine the components
- How is the jet axis determined?
 - ➡ Take the momentum of the particles that make up the jet and sum them

My strategy for jet pairing

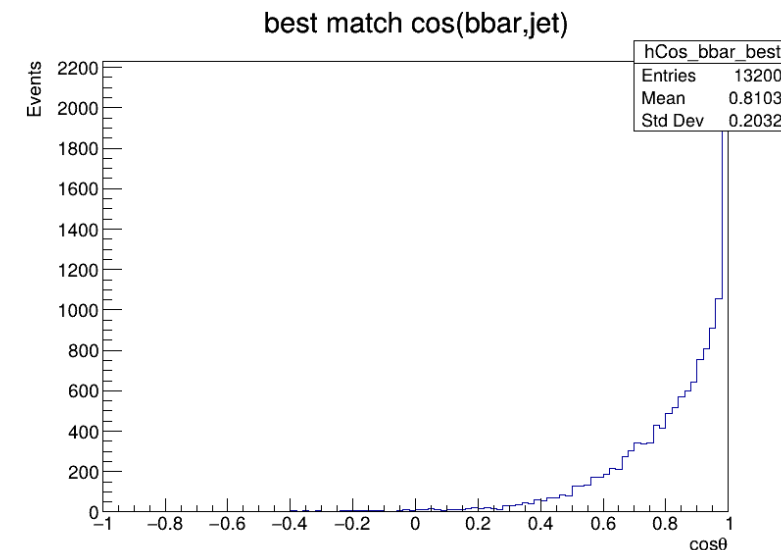
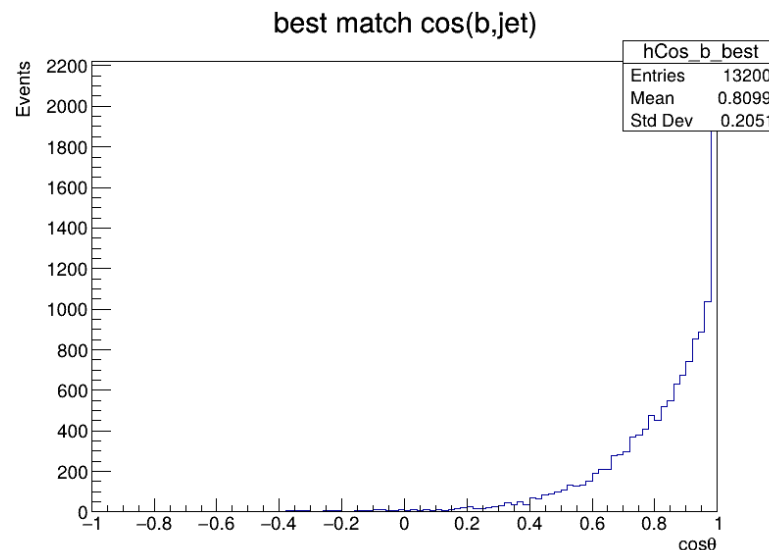
- Get b_{px} , b_{py} , b_{pz} , $bbar_{px}$, $bbar_{py}$, $bbar_{pz}$ (truth quark)
- Get $px1, py1, pz1, px2, py2, pz2$ (reconstructed jet)
- Check at the Jet's vector and the quark's vector, and match those that are pointing in similar directions.
 - Compare $\cos(\text{Jet0}-b) + \cos(\text{jet1}-bbar)$ & $\cos(\text{Jet1}-b) + \cos(\text{jet0}-bbar)$
 - ➡ Select the combination with the highest value

$\cos \theta = 1$ Same

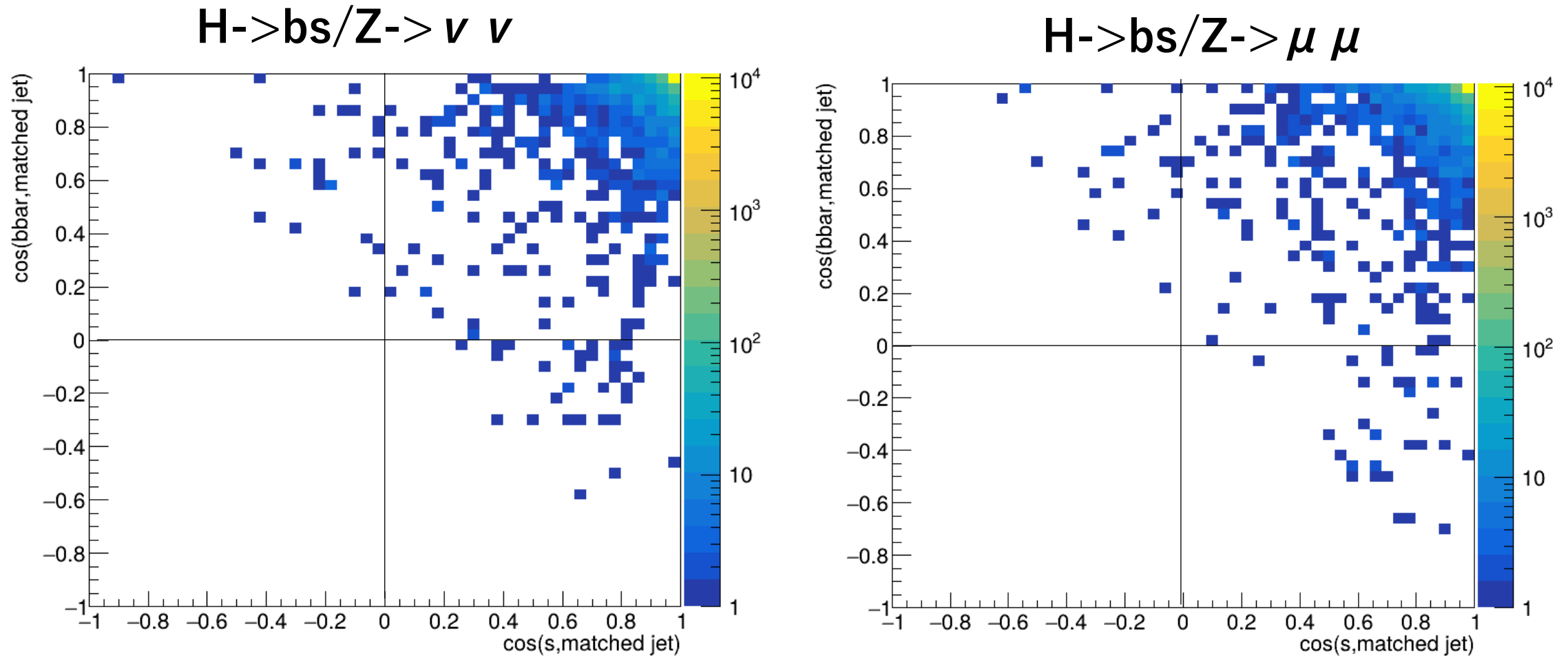
$\cos \theta = -1$ Opposite

It's mostly 1,

but some is near 0.



Isn't it possible that one jet matches "truth q," while the other is completely different? ➡



The directions of both jets coincide with their respective quark directions.

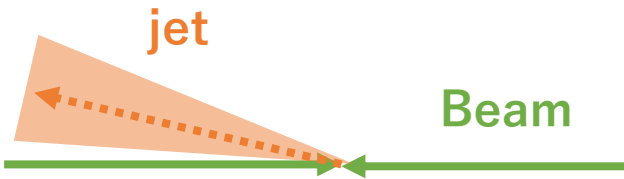
While there are a few cases where only one jet shows a high match rate with the quark (and the other shows a low match rate), no differences attributable to variations in Z decays are apparent.

Jet-truth quark matching ($H \rightarrow b\bar{s}/Z \rightarrow \mu\mu$)

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Motivation

: ensure that the cut conditions are consistent when analyzing the data in conjunction with BG dataset.



- Pile-up refers to beam-induced effects that could be classified as BG.

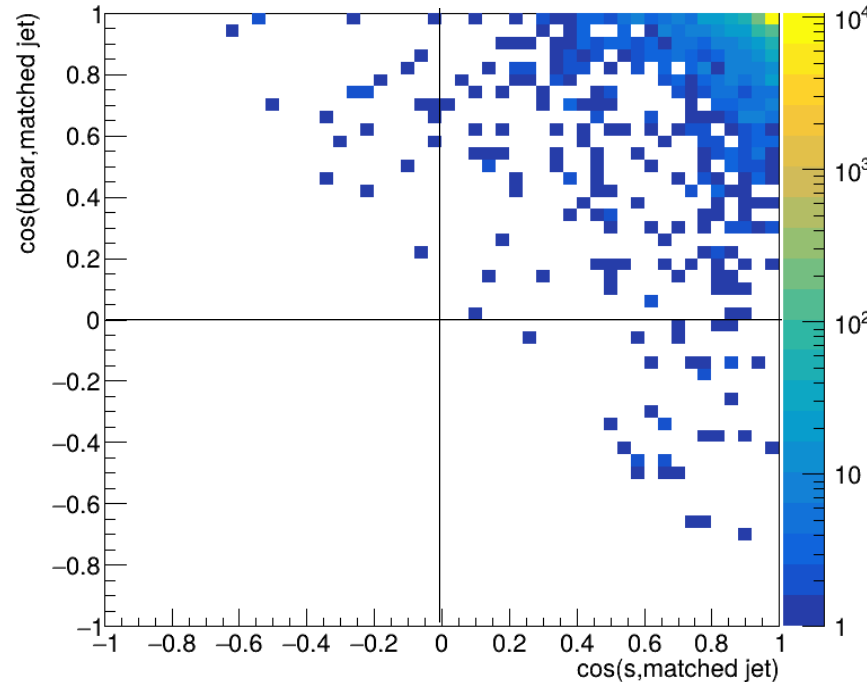
- When performing jet clustering, “Usebeamjet” parameter determines whether the jet axis lies on the beam axis side.

JetClustering’s parameter

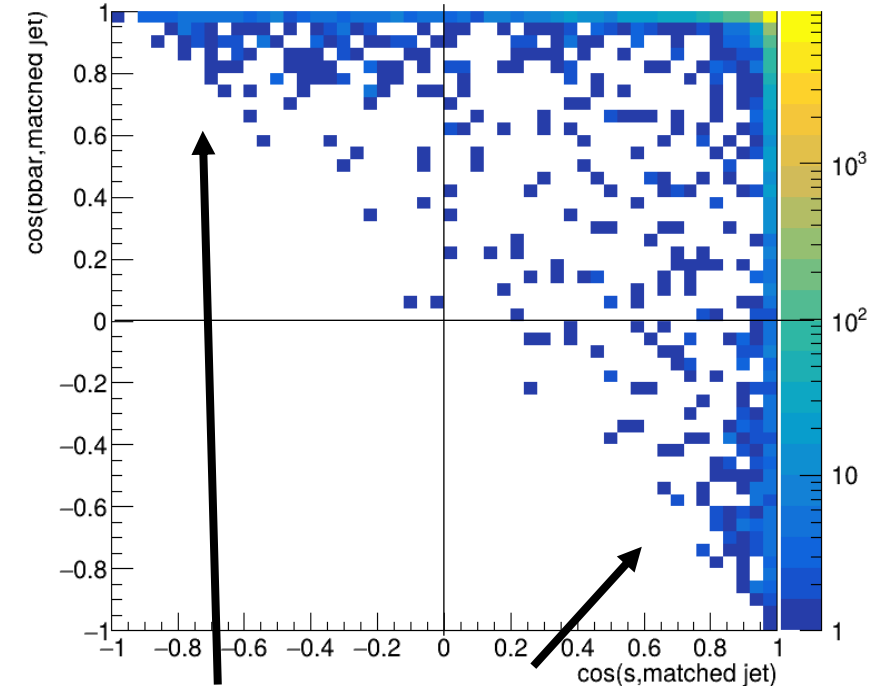
UseBeamJet = 0 ... include pile-up

UseBeamJet = 1 ... Reduce pile-up

UseBeamJet = 0
(in JetClusteringAndFlavortag processor)



UseBeamJet = 1
(in JetClusteringAndFlavortag processor)



There were more events in which only one jet had a high match rate with a quark (the other jet was pointing in almost the opposite direction)

I accidentally used the “Usebeamjet” setting for this event even though I hadn't applied an overlay.

→ It's possible that objects close to the beam axis were deleted, and those with a value of -1 were interpreted as two objects when there was actually only one remaining.

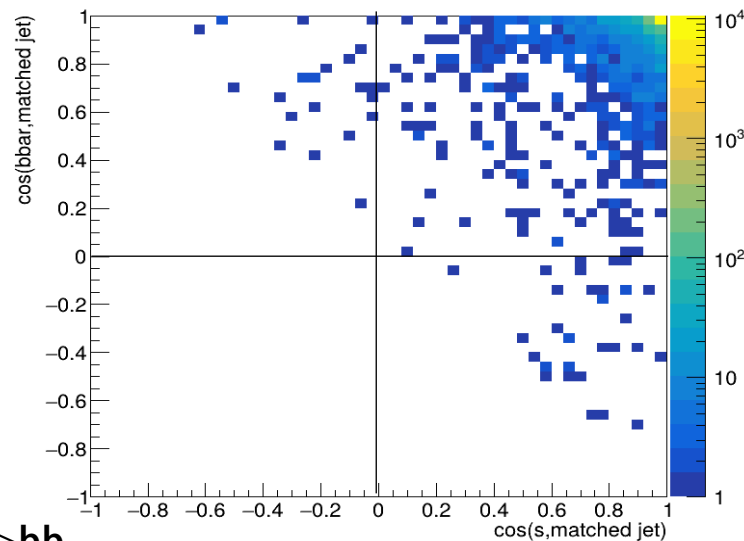
→ I'll consult with Daniel about how to configure the overlay settings.

Jet-truth quark matching ($H \rightarrow b\bar{s}/Z \rightarrow \mu \mu$)

If you want to check the accuracy of the flavor tag,

f.e.) ▪ just the range where the sum of $\cos > 1.6$.

To what extent are events removed?



H->bb

```
=====
Total events : 13200
Score >= 1.4 : 12942
Efficiency 1.4 : 98.0455 %
Score >= 1.6 : 12791
Efficiency 1.6 : 96.9015 %
Score >= 1.8 : 12406
Efficiency 1.8 : 93.9848 %
=====
```

H->bs

```
=====
Total events : 12000
Score >= 1.4 : 11768
Efficiency 1.4 : 98.0667 %
Score >= 1.6 : 11606
Efficiency 1.6 : 96.7167 %
Score >= 1.8 : 11332
Efficiency 1.8 : 94.4333 %
=====
```

H->ss

```
=====
Total events : 15200
Score >= 1.4 : 13625
Efficiency 1.4 : 89.6382 %
Score >= 1.6 : 10699
Efficiency 1.6 : 70.3882 %
Score >= 1.8 : 4280
Efficiency 1.8 : 28.1579 %
=====
```

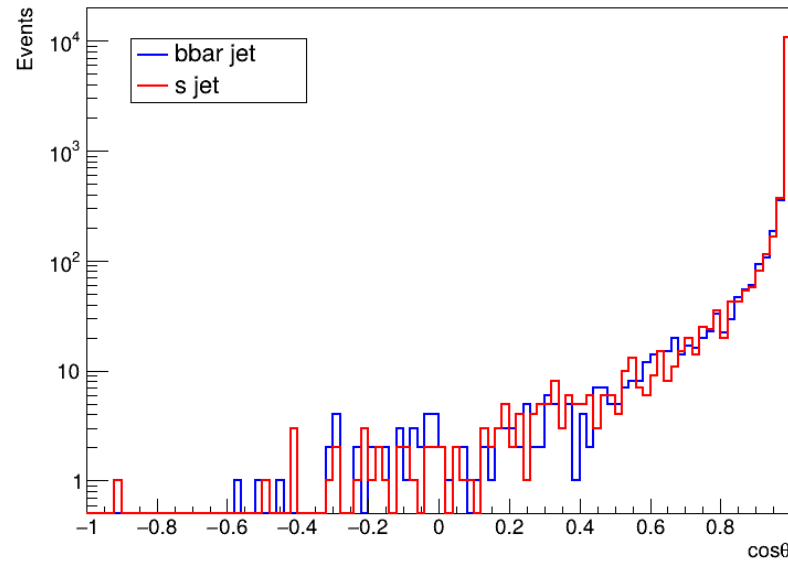
← **H->bs**
: No overlay

**Check the distribution
& the overlay status of the
data used as bb/ss**

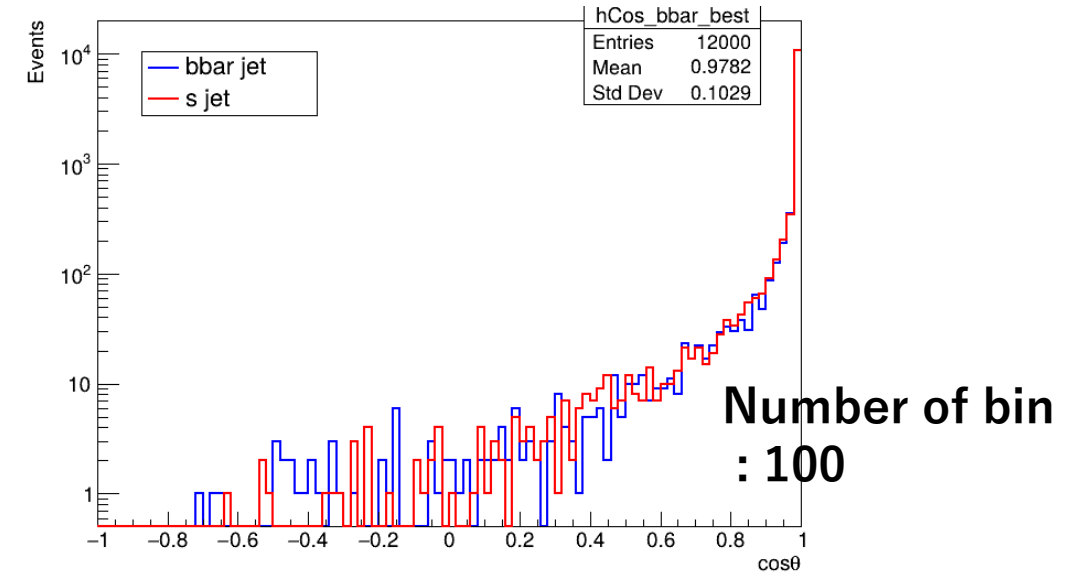
- Check at the correspondence the number of K in each Jets.
- I'll consult with Daniel about how to configure the overlay settings.
- Why is the directional match rate for $s\bar{s}$ lower than that for jet?
 - Check the distribution
 - Check the overlay status of the data used as $b\bar{b}/s\bar{s}$

Backup

$H \rightarrow bs / Z \rightarrow \nu \nu$



$H \rightarrow bs / Z \rightarrow \mu \mu$



When plotted on a log scale, events where $\cos \theta \gtrsim 0$ also become visible (about 1%).

Events where $\cos \theta < 1$ account for about 10–20%.

$\theta \approx 25^\circ$ $\cos \theta = 0.9$
 $\theta \approx 37^\circ$ $\cos \theta = 0.8$

