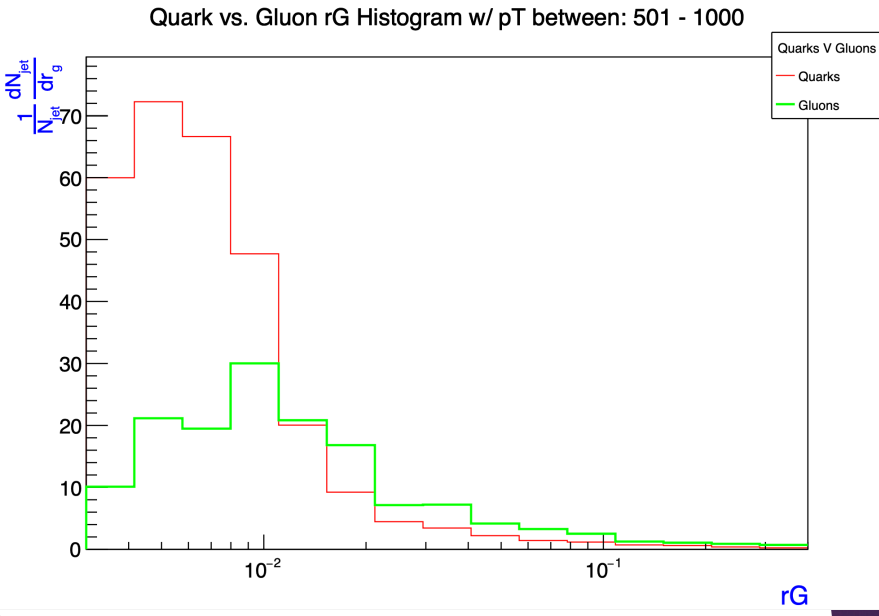
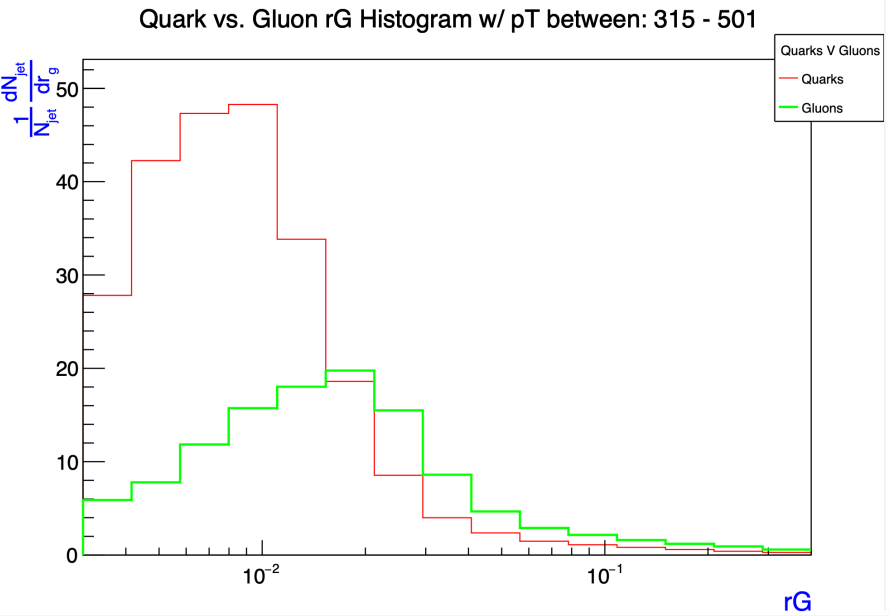
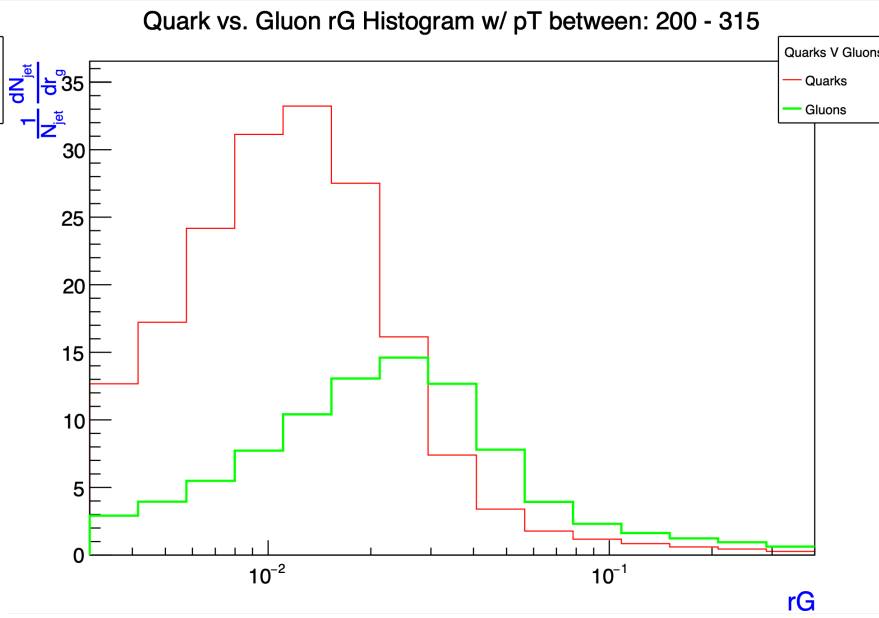
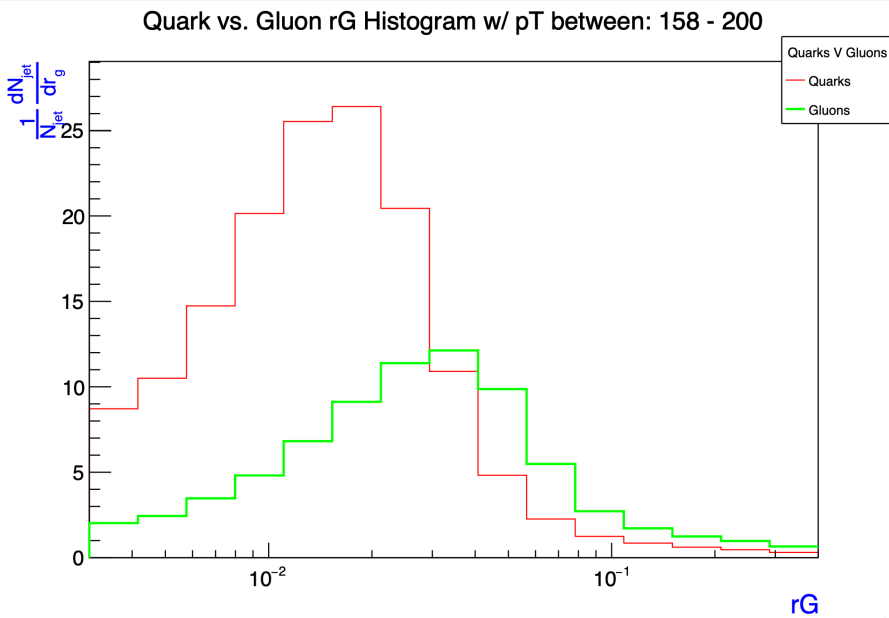


Jet Girths of Parton Collisions

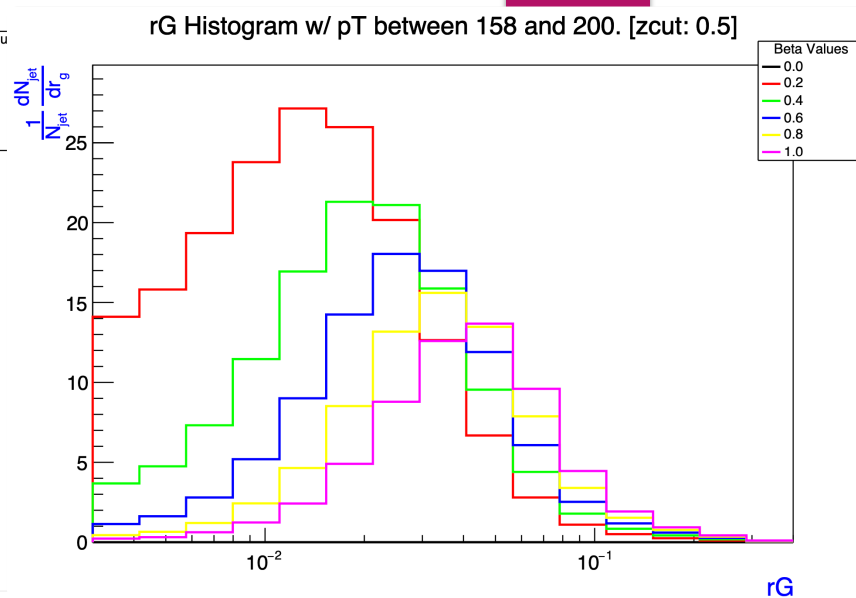
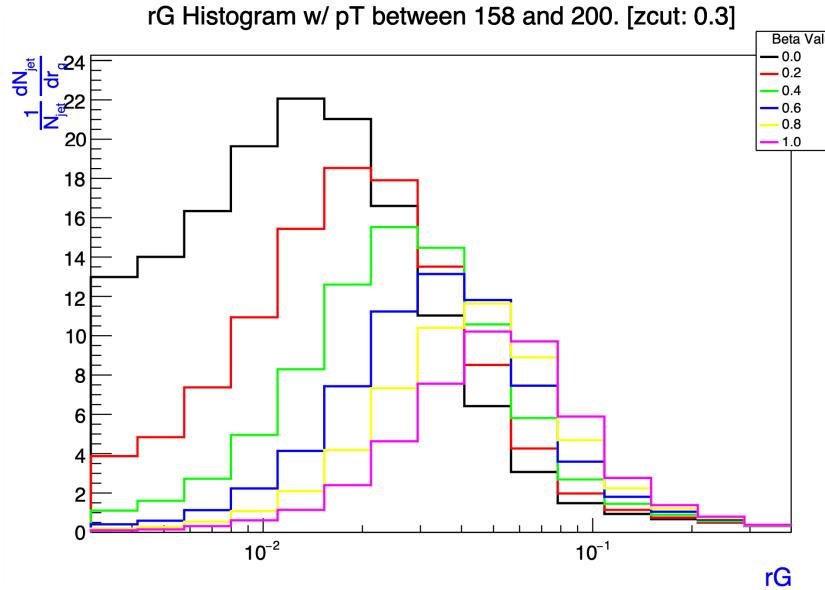
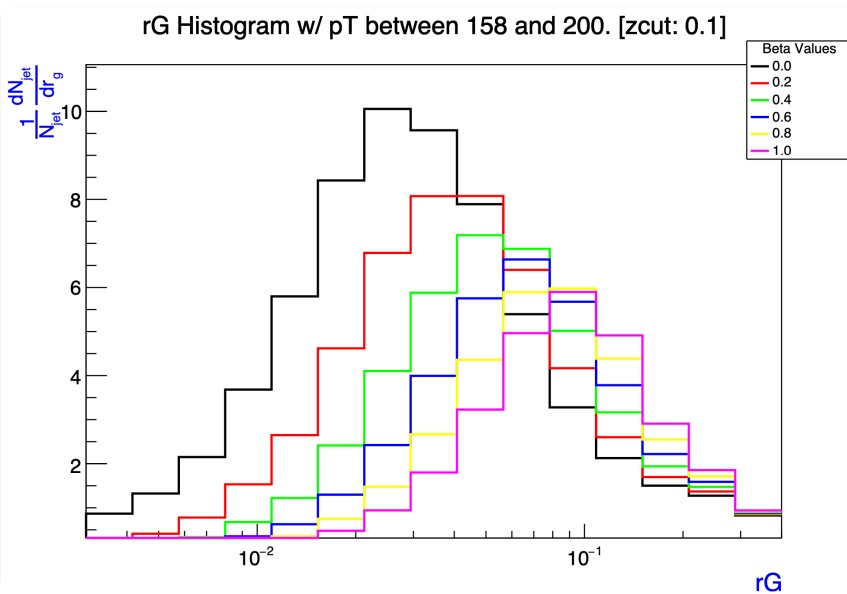
SoftDrop Algorithm: Varying Beta and Z-cut

- ▶ Softdrop algorithm:
$$\frac{\min(pT_1, pT_2)}{pT_1 + pT_2} > Z_{cut} \cdot \left(\frac{\Delta R}{R} \right)^\beta$$
- ▶ (Our R was .4)
- ▶ Increasing Beta means higher angular sensitivity: Softcut is harder to pass for wide-angle separation (essentially we care about angle more).
- ▶ Increasing Z-cut means we care about pT differences more: Softcut is harder to pass for large pT differences (essentially we care about pT more).
- ▶ While a higher Beta while keeping Z-cut fixed results in more jets passing, angular sensitivity still increase due to the fact that this ratio keeps increasing:
$$\left(\frac{\frac{\Delta R_2}{R}}{\frac{\Delta R_1}{R}} \right)^\beta$$



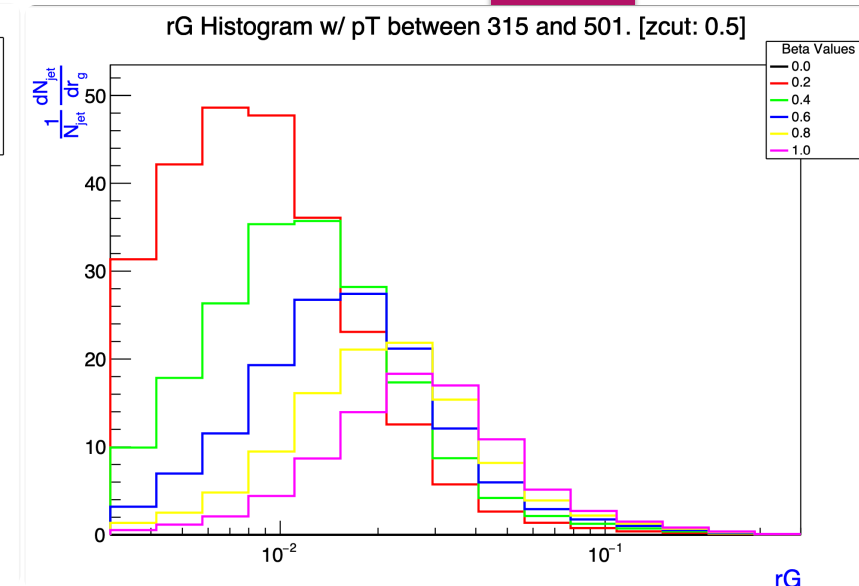
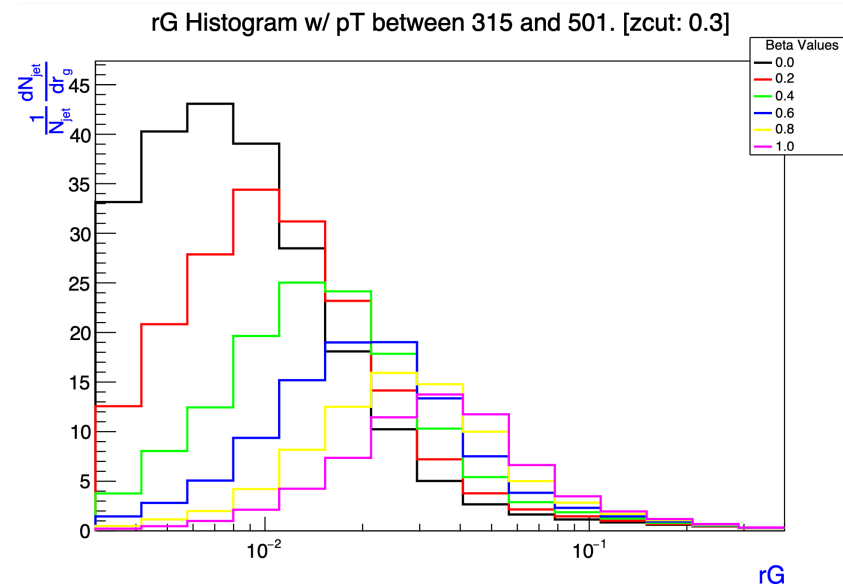
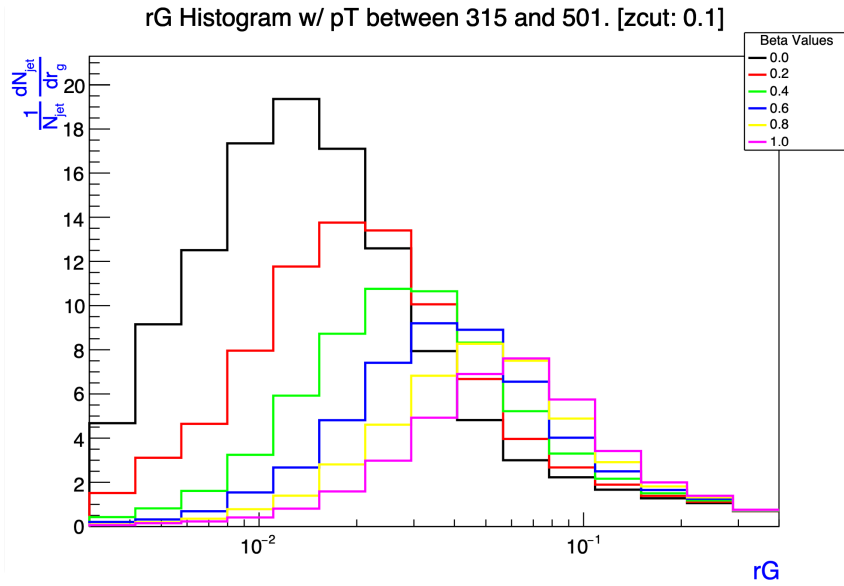
Quark V.
Gluon
by pT
Range

As pT increases, average jet girth decreases due to higher collimation



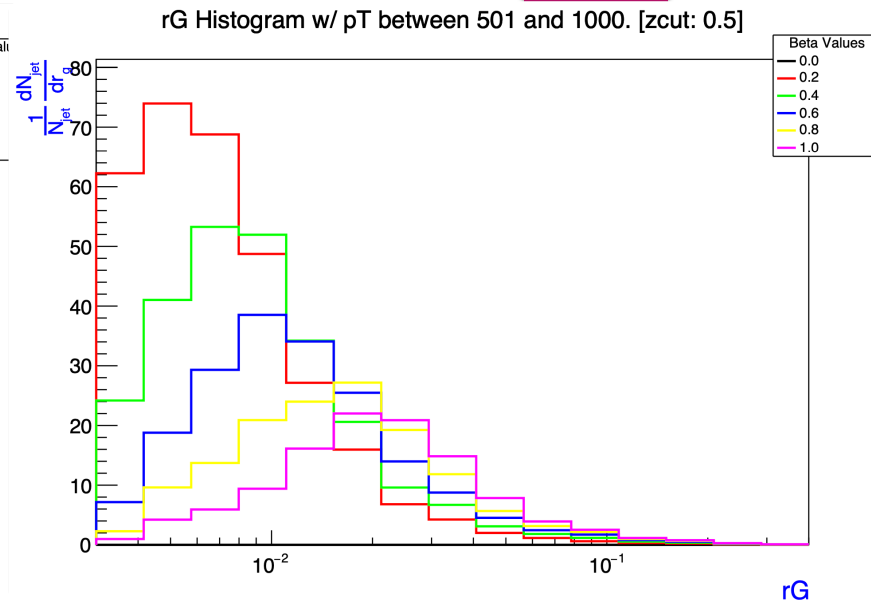
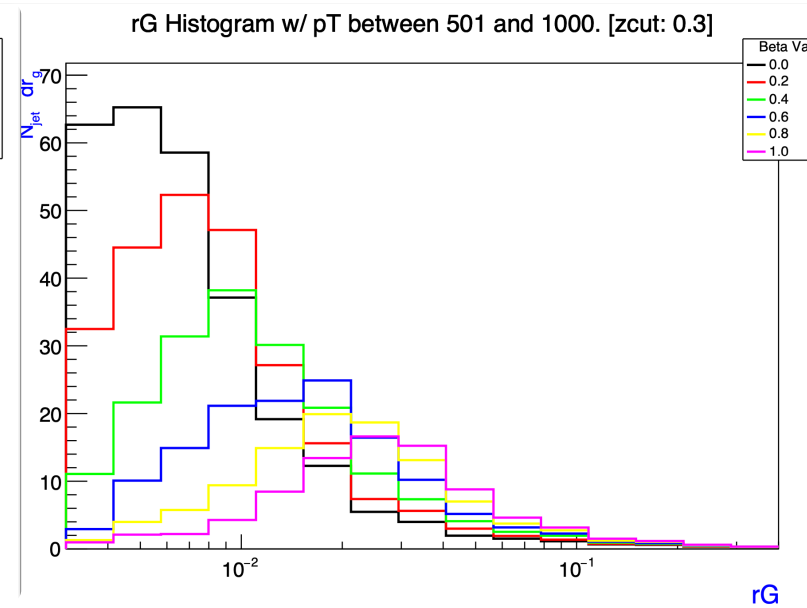
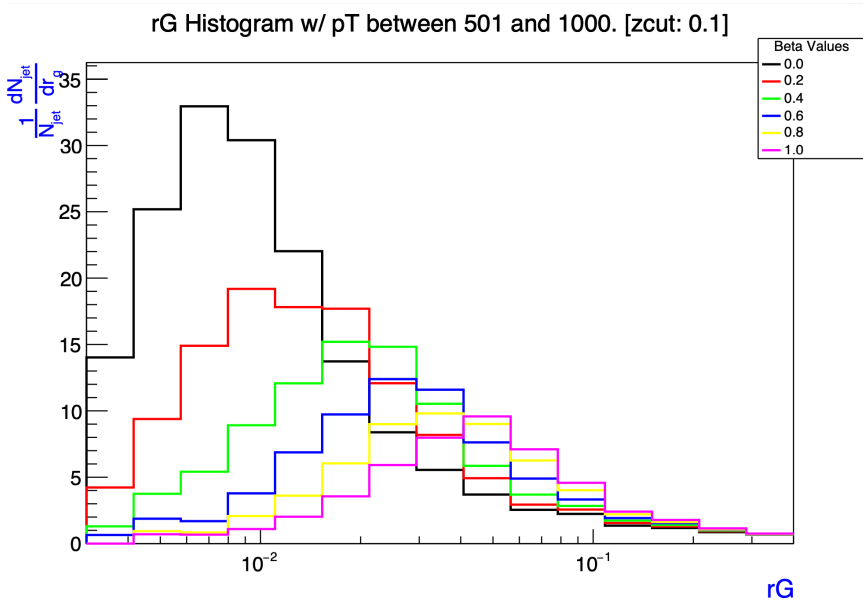
Varying Z-Cut *(pT Range 1)

- ▶ As Z-cut increases, average jet girths decrease and the graph left shift (due to higher strictness)
- ▶ As Beta Increases, average jet girths increase
- ▶ Jets of Zcut .5 and beta 0 never pass as $\frac{1}{2} \nrightarrow \frac{1}{2}$



Varying Z-Cut *(pT Range 2)

- ▶ As Z-cut increases, average jet girths decrease and the graph left shift (due to higher strictness)
- ▶ As Beta Increases, average jet girths increase
- ▶ Jets of Zcut .5 and beta 0 never pass as $\frac{1}{2} !> \frac{1}{2}$



Varying Z-Cut *(pT Range 3)

- ▶ As Z-cut increases, average jet girths decrease and the graph left shift (due to higher strictness)
- ▶ As Beta Increases, average jet girths increase
- ▶ Jets of Zcut .5 and beta 0 never pass as $\frac{1}{2} !> \frac{1}{2}$

A photograph of three shark fins protruding from the ocean surface. The largest fin is on the left, and two smaller ones are on the right. The water is dark blue with some white foam around the fins. The text '~FIN~' is overlaid on the left side of the image.

~FIN~