



Boosted W 's inside of jets

*Collinear W emission as background to new physics searches
and SM measurements at very high energies*

David W. Miller

work ongoing with James Ferrando, Clement Helsens,
Joey Huston, Michael Spannowsky, Miles Wu

Enrico Fermi Institute



THE UNIVERSITY OF
CHICAGO

30 October, 2014



The issue: W-strahlung

The question(s): Can we see this and it is a “problem” for boosted particle searches?

● Issue(s) for Searches:

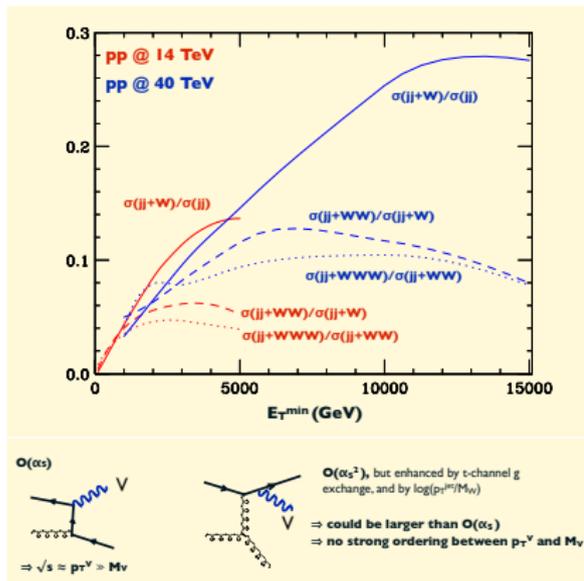
- High- p_T SM processes with boosted W 's represent a major background for boosted top and W signals
- W 's produced in close proximity to a jet can look almost identical to a boosted top
- Careful discussion of this in **Rehermann and Tweedie, arXiv:1007.2221**

● Issue(s) for Measurements:

- Potentially large theoretical uncertainties on production
- Interesting to go after these W and Z s, and verify their production properties

● Relevance to this group/discussion:

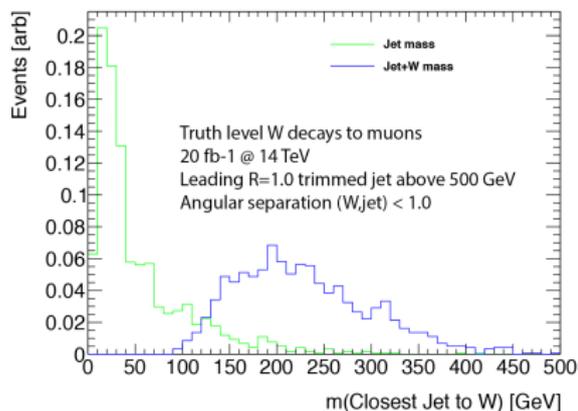
- Does this process(es) pose a problem at an FCC for boosted top (single/pair) searches or WW scattering measurements?
- Can improvements and measurements at the LHC improve predictions and modeling for future colliders?



Michelangelo Mangano

Further Discussion and Issues

- **W emission as a background**
 - How severe is the background to top tagging?
 - **Right:** What is the impact on jet mass?
 - Can we use leptonic decays as *proxy* for the hadronic decays that will constitute a background for top tagging?
 - Can we discriminate between the W-strahlung background and true tops using angular information?
- **Potential ideas for the report**
 - What can we expect for various top taggers in terms of background yields?
 - How does this depend on calorimeter granularity (e.g. for jet substructure)?



Truth-level “mass” formed by using the μ from W decay as a proxy for the W and adding to the nearby jet’s mass

$$P(W - \text{strahlung}) \approx \frac{1}{4} \frac{\alpha^2}{\pi} \log^2 \frac{p_T}{m_W}$$

Additional Material

Outline

2 *Backup slides and additional information*