

# Adapting Baur's Code to POWHEG

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# Necessary Modifications to Baur's Cross Section Code

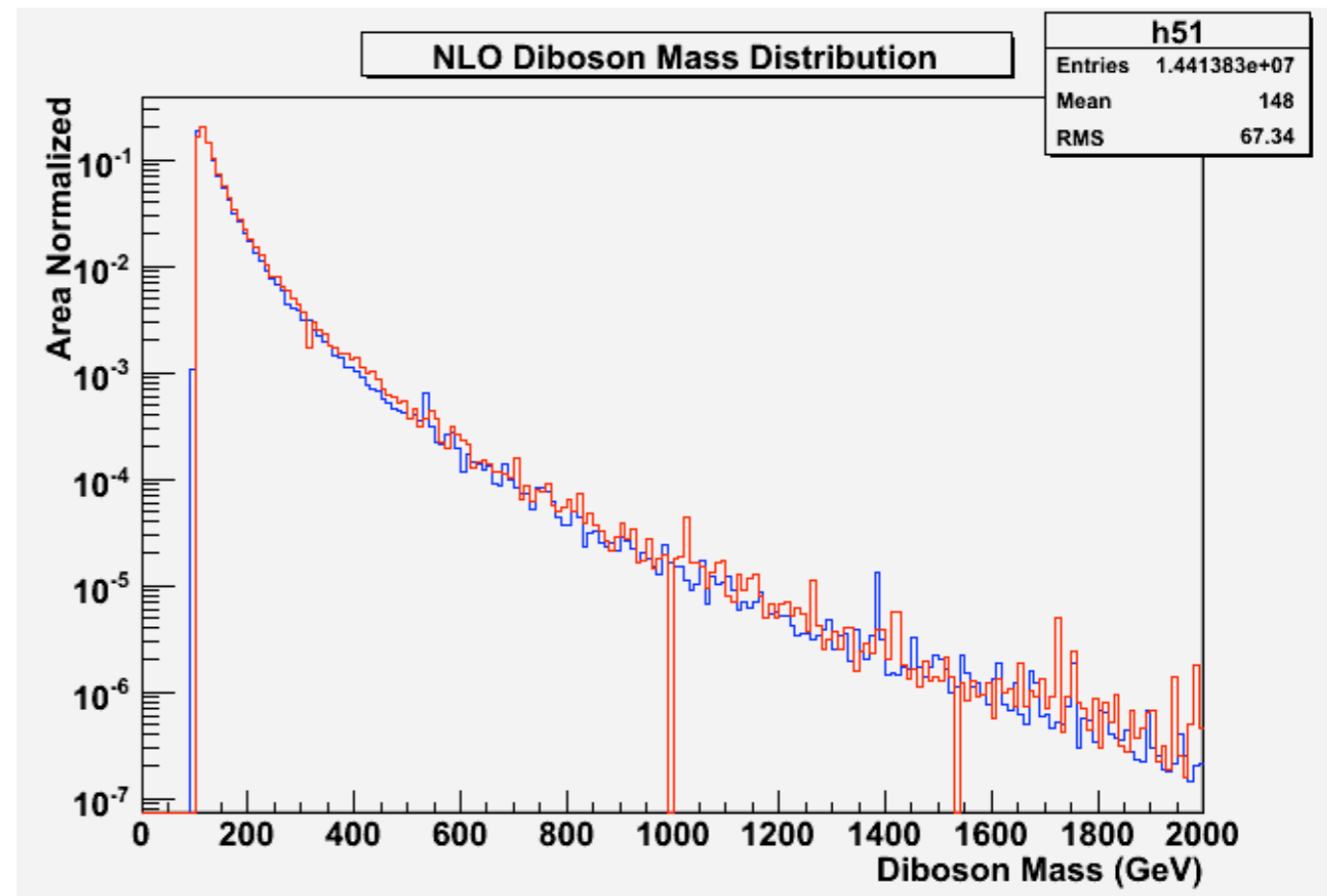
- In subroutines VVQQ and VVQQG
  - Should be the same in WGamma code
- If one is using Catani-Seymour Dipole Subtraction:
  - Change from spin dependent cross section to spin averaged cross section
    - Spin degeneracy weight becomes loops over polarizations and helicities
- Have not yet worked with FKS phase space slicing method

# Singularities in $q+q\bar{q}\rightarrow V+\text{Photon}$ Process

- Dipoles cancel both soft and collinear divergences
  - For now only for color charged particles
    - This means you need kinematics cuts on the photon
- For reference, a list of singularities in these processes
  - Jet/photon becomes soft
    - $p_t$  cut
  - Jet/photon becomes collinear to initial state particle
    - $p_t$  or rapidity cut
  - Photon becomes collinear to jet
    - $\Delta R$  cut between jet and photon
  - Photon becomes collinear to  $V$ 
    - Present in Standard Model  $W$  or  $Z$  with anomalous couplings

# Example Plots from Z Gamma @ NLO

- Following cuts are in place:
  - DR gamma, jet > .7
  - DR lepton, gamma > .7
  - Lepton Pt > 9
  - Photon Pt > 10
  - Photon Rapidity < 1.1
- No Pt or rapidity cut on jet
- Plots area normalized



# NLO Photon $P_T$

h52	
Entries	1.441383e+07
Mean	24.53
RMS	21.39

