Quark-Mass Effects in GF HJJ for VBF studies

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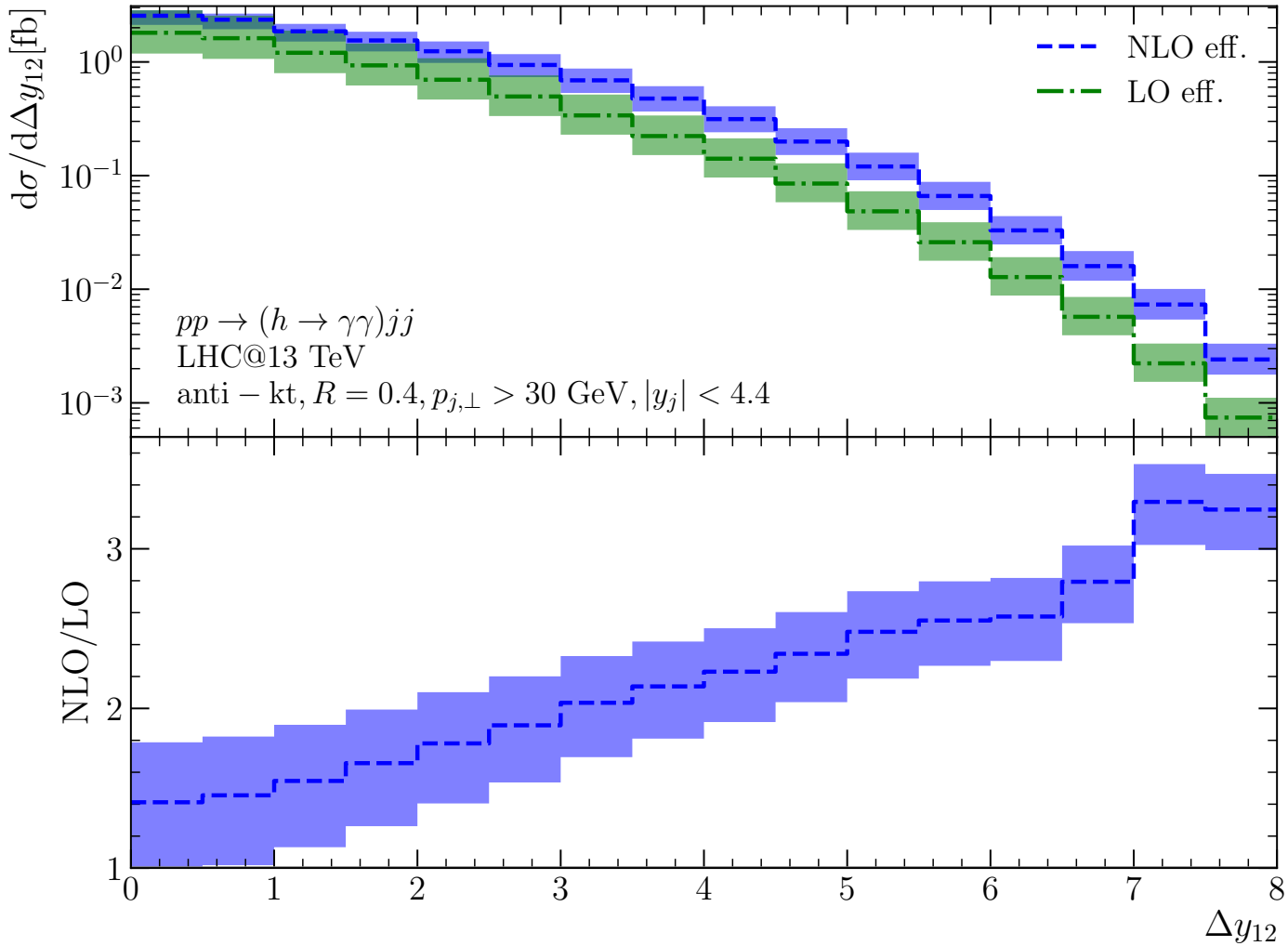
Perturbative Predictions at Large s_{jj}

Coefficients in the perturbative series receive **logarithmic corrections** in **regions of phase space** where **ratios of kinematic scales** are allowed or required to be large. These spoil the convergence of fixed order.

High Energy Jets stabilises the perturbative series by calculating the **leading and some sub-leading logarithmic terms** for dijet processes to all orders in the coupling. **Implications** for the GF component of H+jets in the VBF region: **Further suppression** of GF relative to NLO estimate.

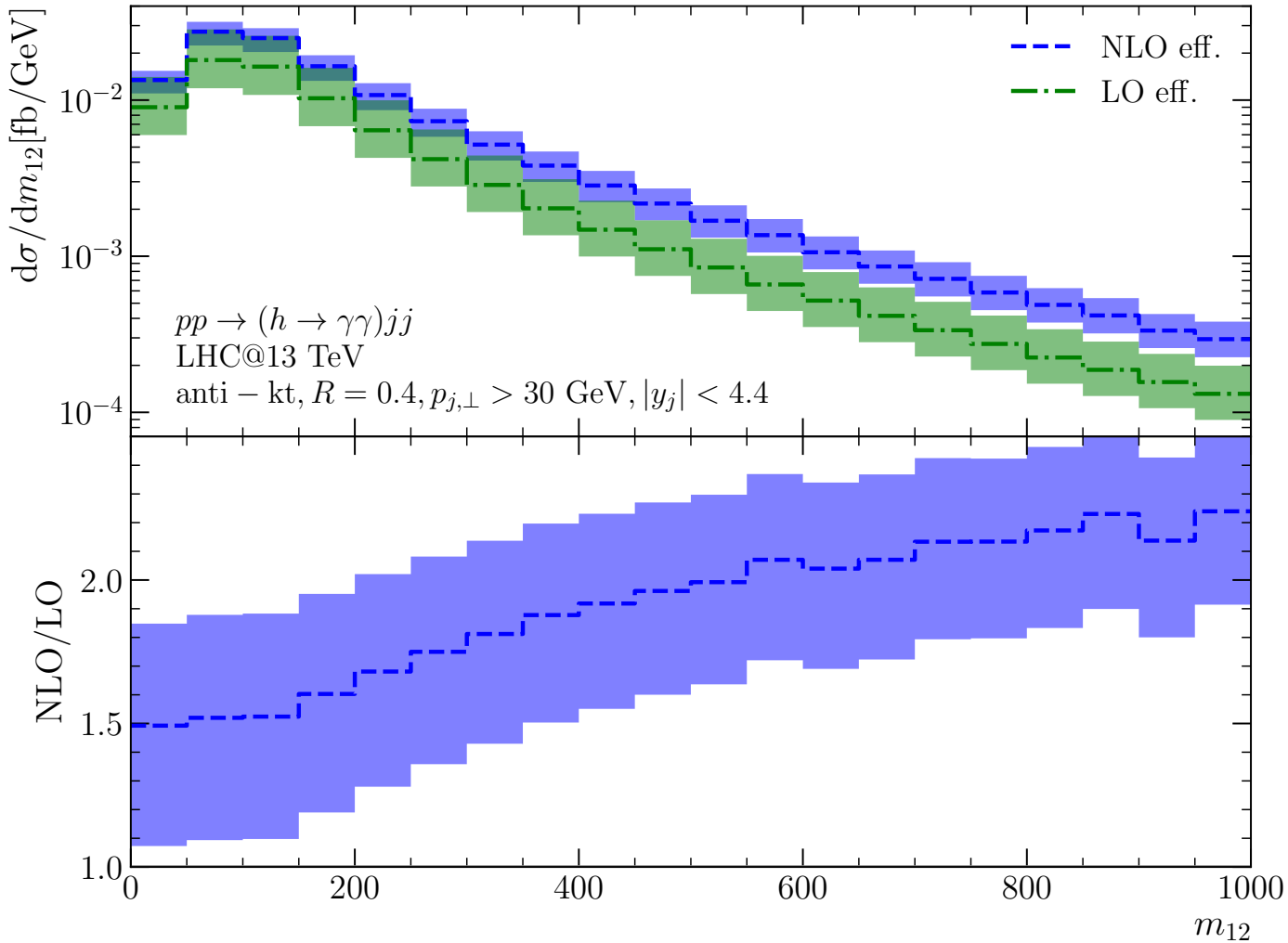
We find that the **finite quark mass** effects **reduce the GF component** further compared to the result obtained previously with the infinite top mass, even if there is **no effect at fixed-order**.

Non-convergence of Fixed Order



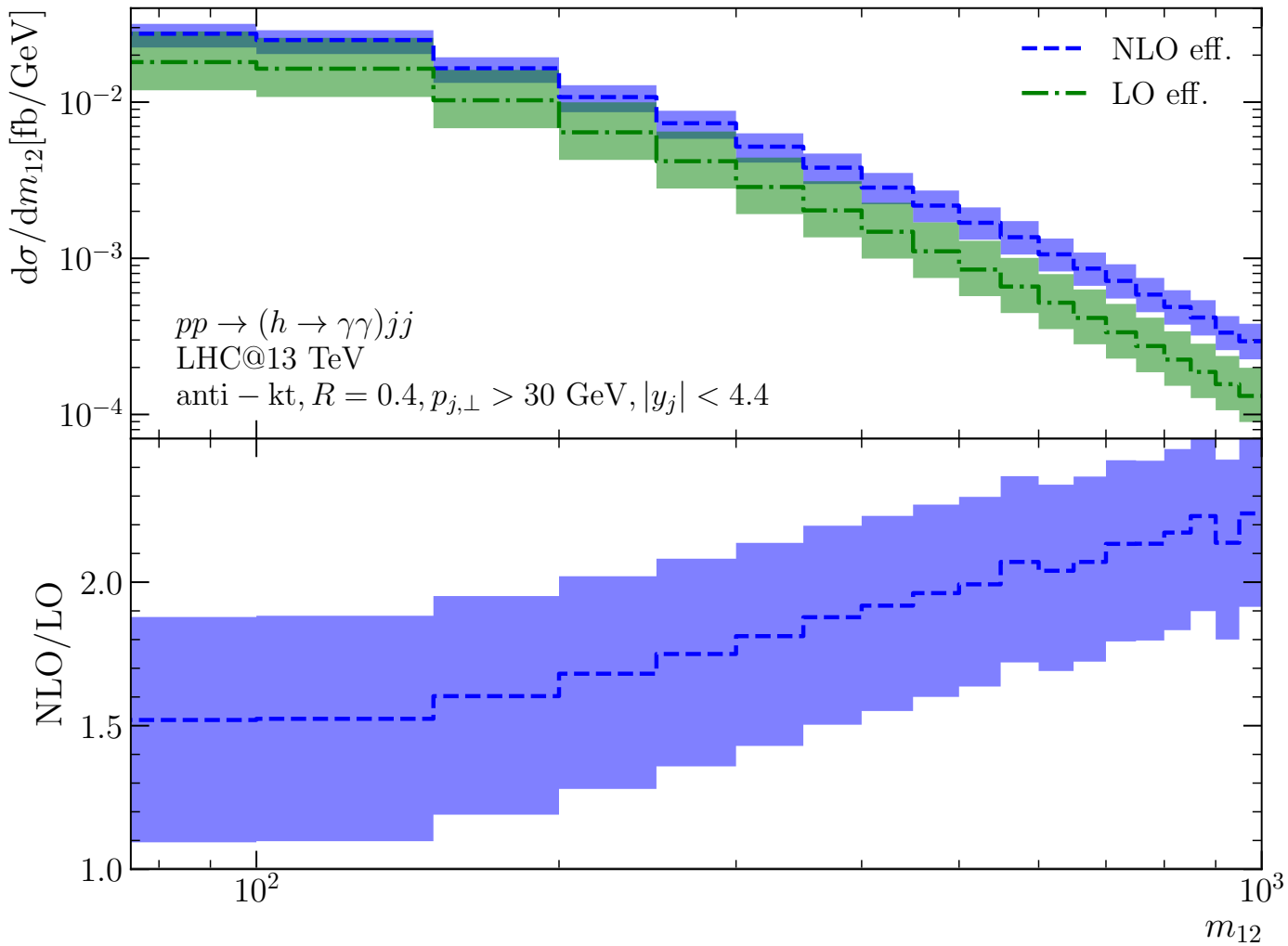
The NLO K-factor increases in a straight line with Δy_{12}.

Non-convergence of Fixed Order



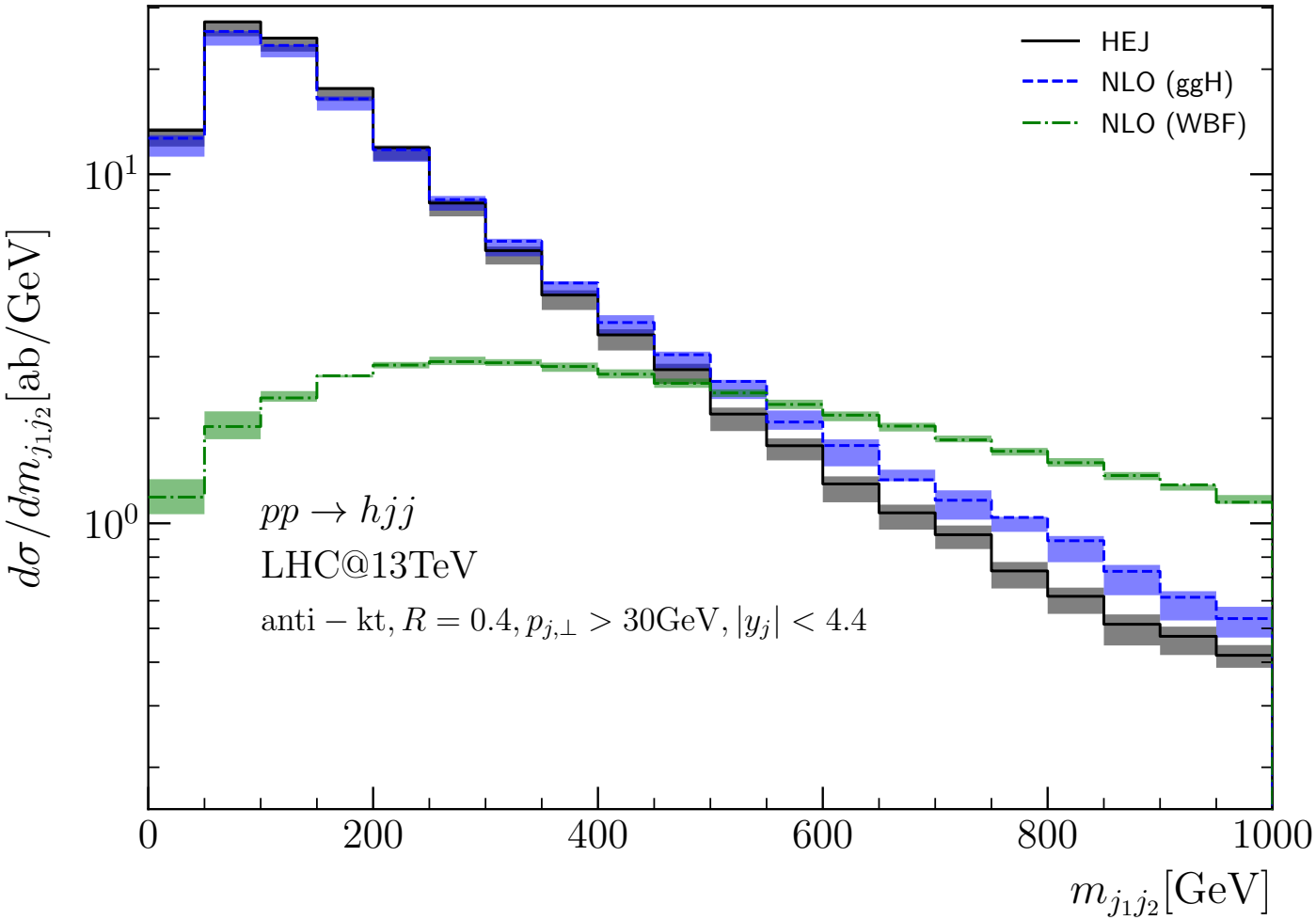
The NLO K-factor increases logarithmically with m_{12}.

Non-convergence of Fixed Order



The NLO K-factor increases in a straight line with $\log(m_{12})$. $K_{VBF} \sim 2.2$

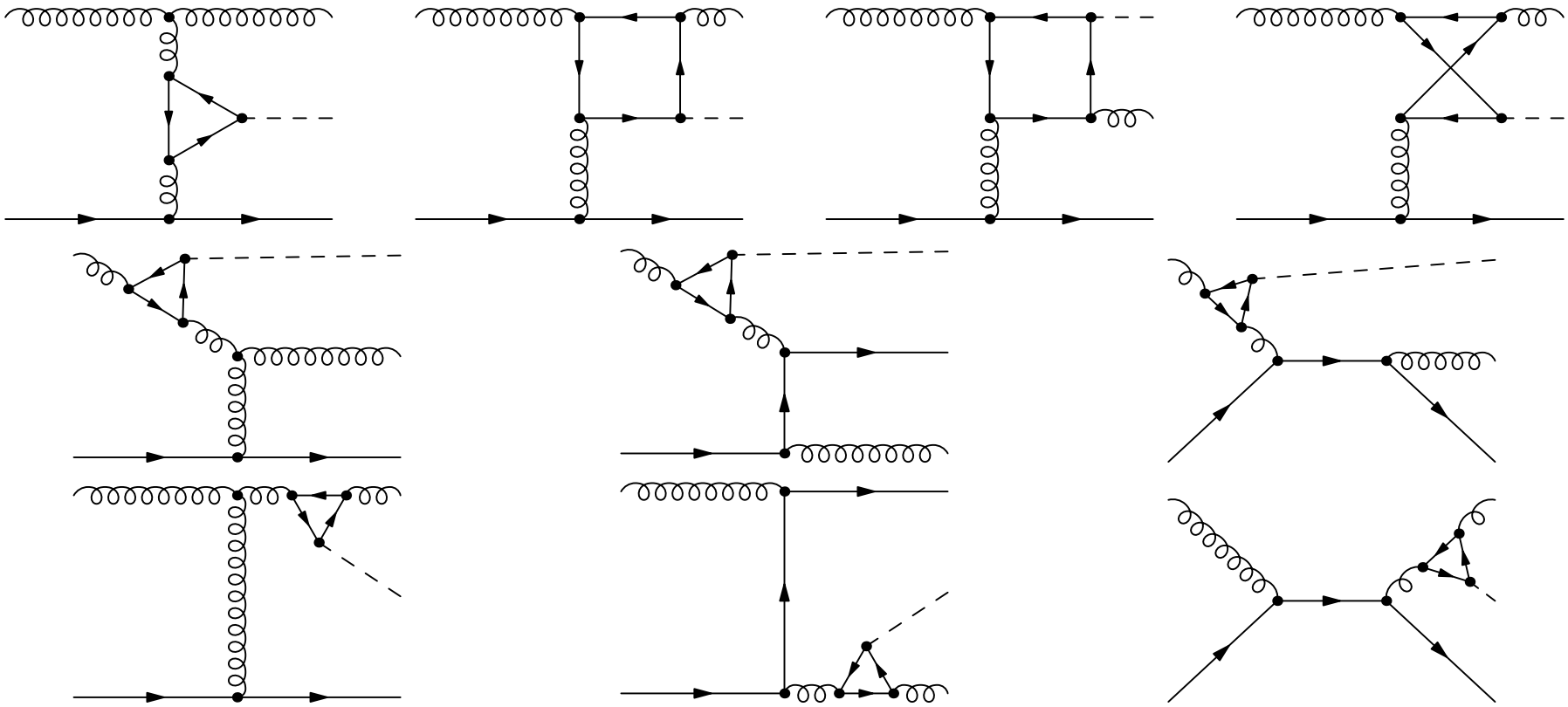
High Energy Jets (HEJ)



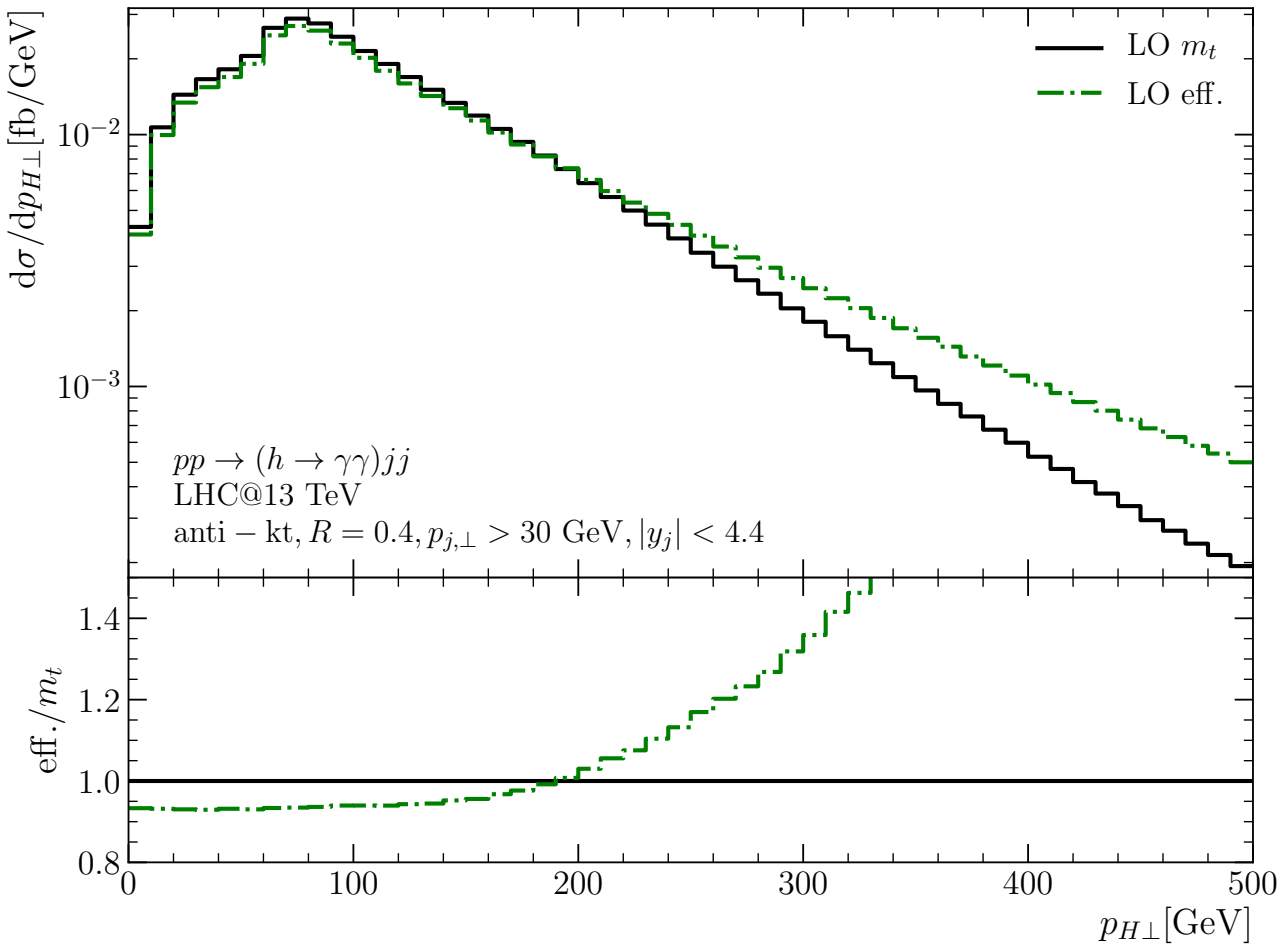
HEJ addresses the shortcomings of fixed order by calculating and summing to all orders logarithmic terms in $\alpha_s \log(s_{jj}/p_t^2) \sim \alpha_s \Delta y_{fb}$.

Leads to **suppression of GF component compared to NLO**. arxiv:1803.07977

Finite Quark Mass Effects



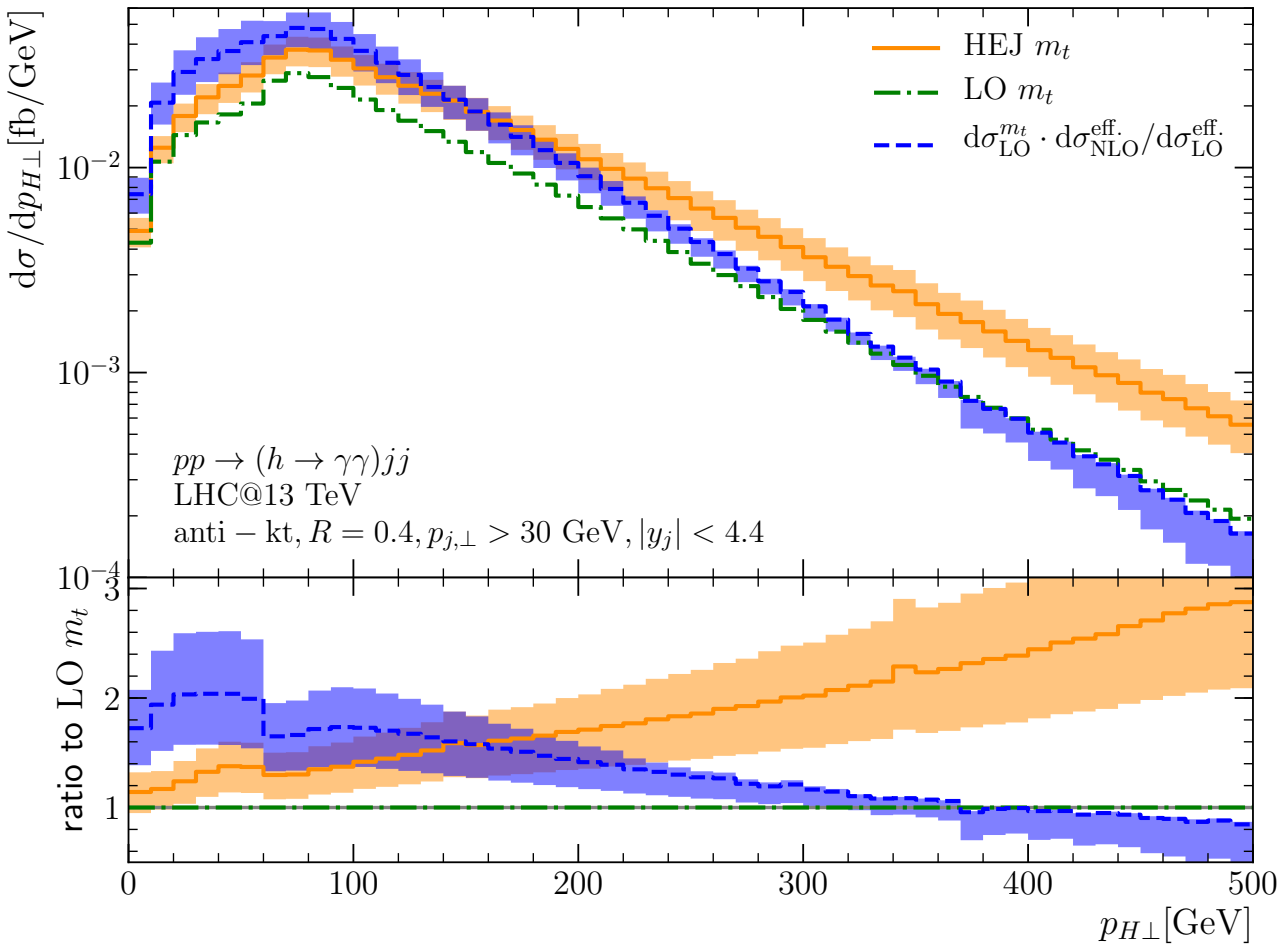
Finite Quark Mass Effects at Fixed Order



The finite quark mass has negligible net effect on the cross section, but **local effects are 10% at the peak.**

arxiv:1812.08072

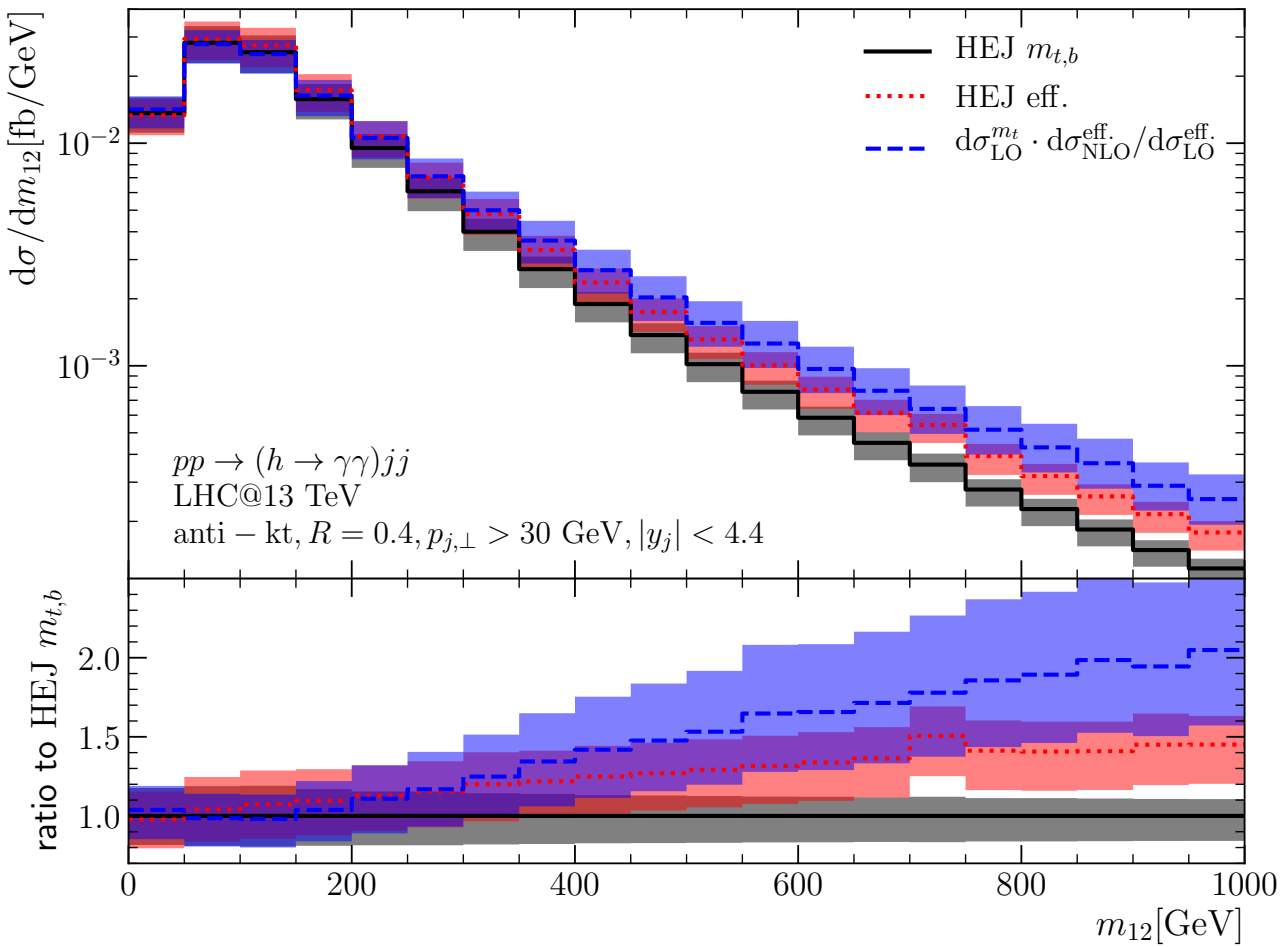
Finite Quark Mass Effects



The spectrum in $p_{H\perp}$ **is hardened with HEJ**, therefore the **quark mass effects are larger**.

arxiv:1812.08072

Finite Quark Mass Effects



The finite quark mass **reduce the cross section from HEJ within VBF cuts by a further $O(10\%)$**, to **$1/2 - 2/3$ of best possible predictions from just fixed order.**

arxiv:1812.08072