Trigger Study for Higgs boson pair productions in the $bb\tau\tau$ final state at the ATLAS Experiment Run3

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Analyses of DiHiggs production, particularly in the main Run-3 channels requiring at least one $H \to bb$ decay, are trigger limited especially in the region relevant for BSM constraints on the Higgs trilinear coupling. Substantial increases in signal efficiency require trigger rates that are unsuitable for the main physics stream, but can be accommodated in the delayed stream inside High Level Trigger (HLT) in ATLAS detector. 150 Hz has been earmarked for a new asymmetric 4-jet trigger targeting the $HH \to bb\tau\tau$ signature.

This study is mainly focusing on ultilizing delayed stream and study Run-2 triggers to reoptimize HLT rate for income Run-3 for $bb\tau\tau$ channel, as this channel is the one with the second largest branching ratio in di-Higgs decays. We hope to understand better the efficiency of the Run-2 di-tau trigger at HLT with respect to the L1 triggers. In particular, the characteristics of the events that do not pass the HLTs will be investigated with truth taus transverse momentum (p_T), 1- and 3- track prongs, eta(η) RNN scores, and tau identification. Through this type of study, we hope to at least recover the efficiency from the tau variables. If we maximize the trigger, the efficiency from tau variables could possibly exceed the performance in Run2.

o 追加情報 (以下の 4 項目に関して、あれば必ず記入)
1) ATLAS 内での状況 (WG 認知の元で進めているか、共同研究者の名前等)
Working within the $HH \to bb\tau\tau$ trigger group coordinated by Jason Veatch and Yanlin Liu.
2) 研究進行状況 (アブストラクトには書けない実状等)
Under study with the signal samples. Planning to propose a new trigger selection in a few months for deployment by early summer.
3) 実データを用いない予定であれば、その旨 (用いる可能性がある場合には、現時点で は用いる、としてください)
Once deployed, trigger validation with commissioning date might be shown. Not sensitive to signal nor physics context.
4) その他コメント (連続講演の予定など)
None

[0]https://arxiv.org/pdf/2007.12539.pdf