New Trigger Studies for Emerging Jets at CMS Experiment
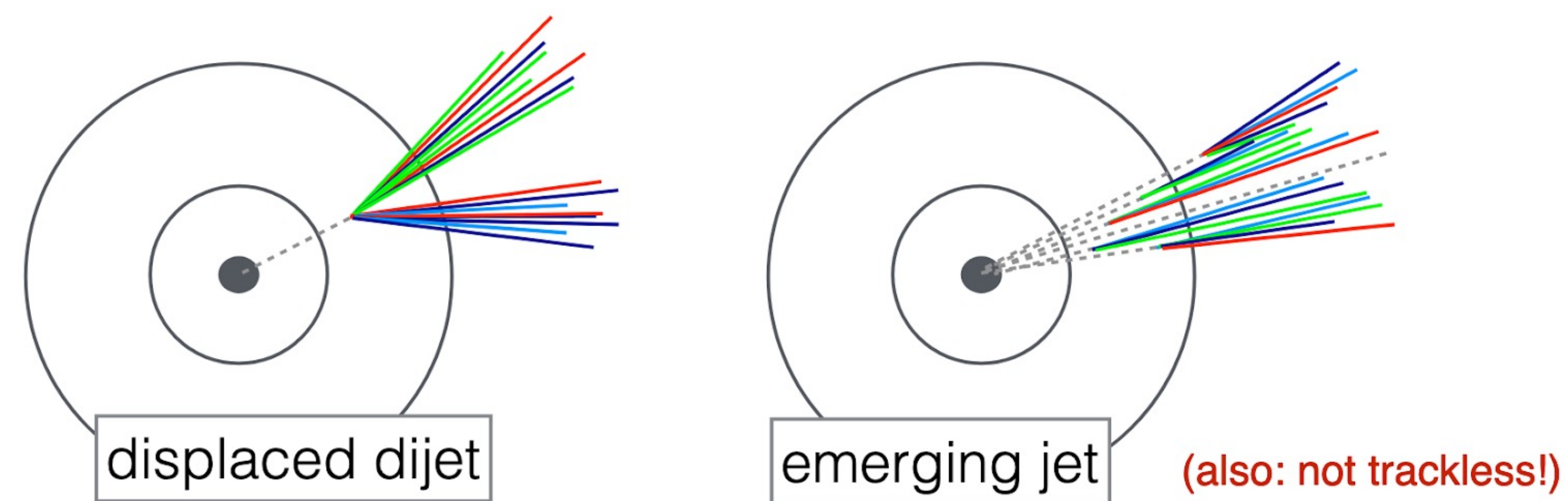
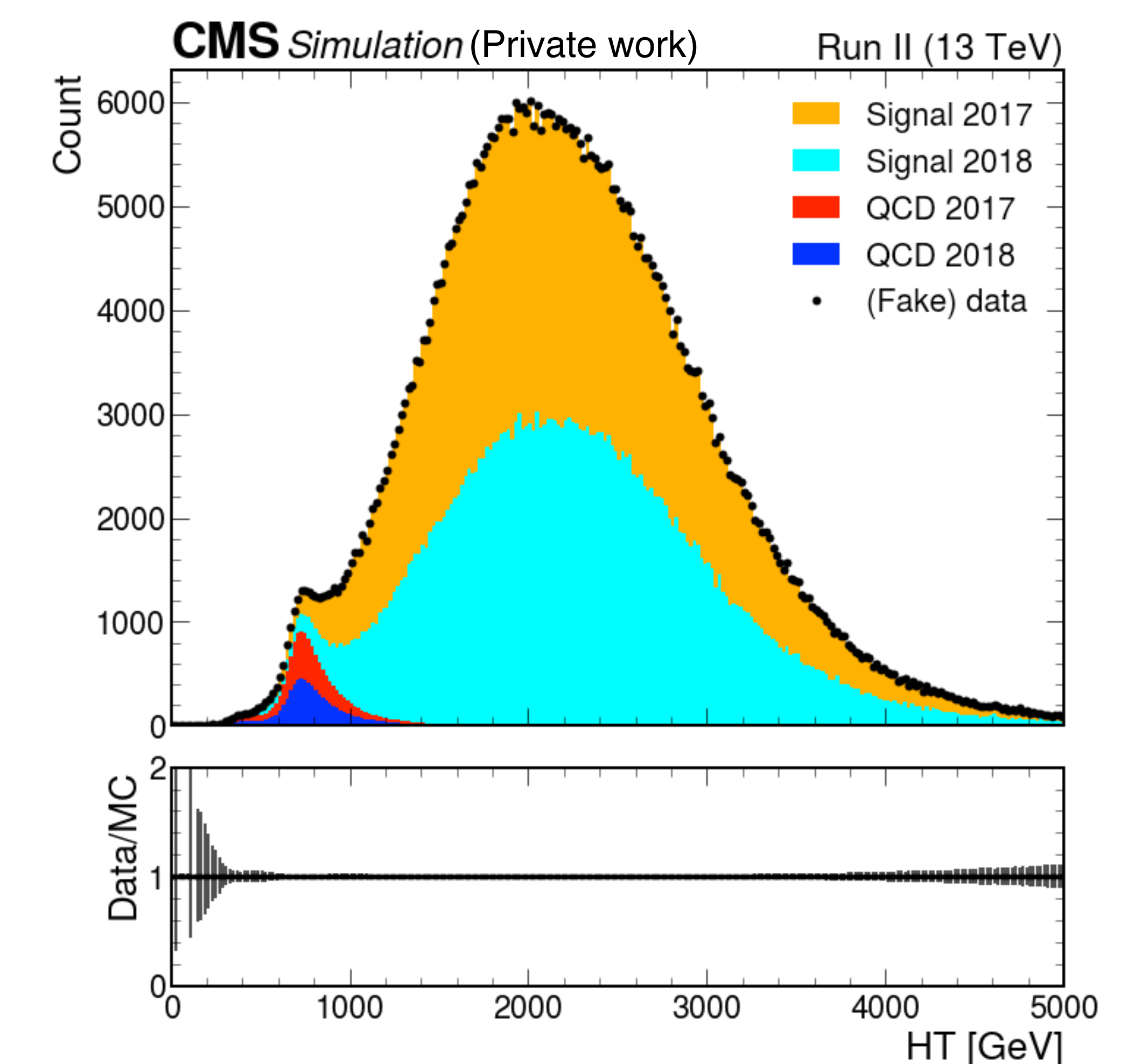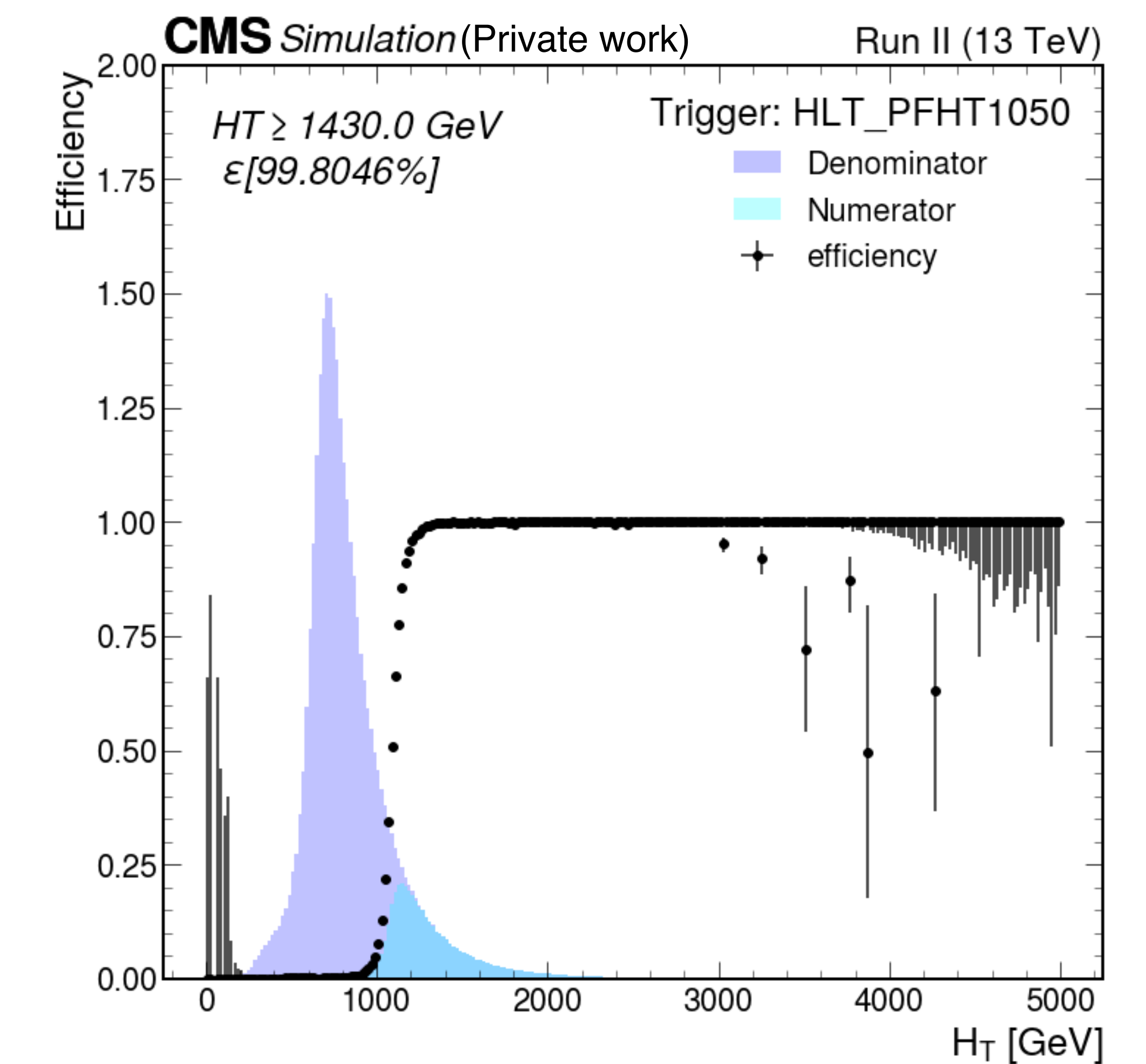Guillermo A. Fidalgo Rodríguez, University of Puerto Rico at Mayagüez

Introduction

- A Trigger is something that "triggers" the data taking process, like a condition that is met in order to take a picture of particles that are coming out of a high energy proton-proton collision.
- I work on a software-based trigger called the "high-level trigger" (HLT).
- We want to search for evidence of dark matter produced at the LHC. We search these by looking at showers of particles, specifically jets that are very different from the Standard Model jets. These jets contain many displaced vertices, and we call them emerging jets (EMJs).
- EMJs are produced as dark analogs to SM jets. The EMJ signature is unique and can predict new physics that other models cannot. A new HLT can potentially improve these searches.

Creating a new HLT

How to create a new Trigger? : We use a java application called ConfDB that runs on the CERN network. This is neat alternative to editing a python file with over 10k lines of code.

Extending the CMS trigger menu so that it includes emerging jets, to complement its existing displaced jet triggers

displaced dijet   emerging jet   (also: not trackless!)
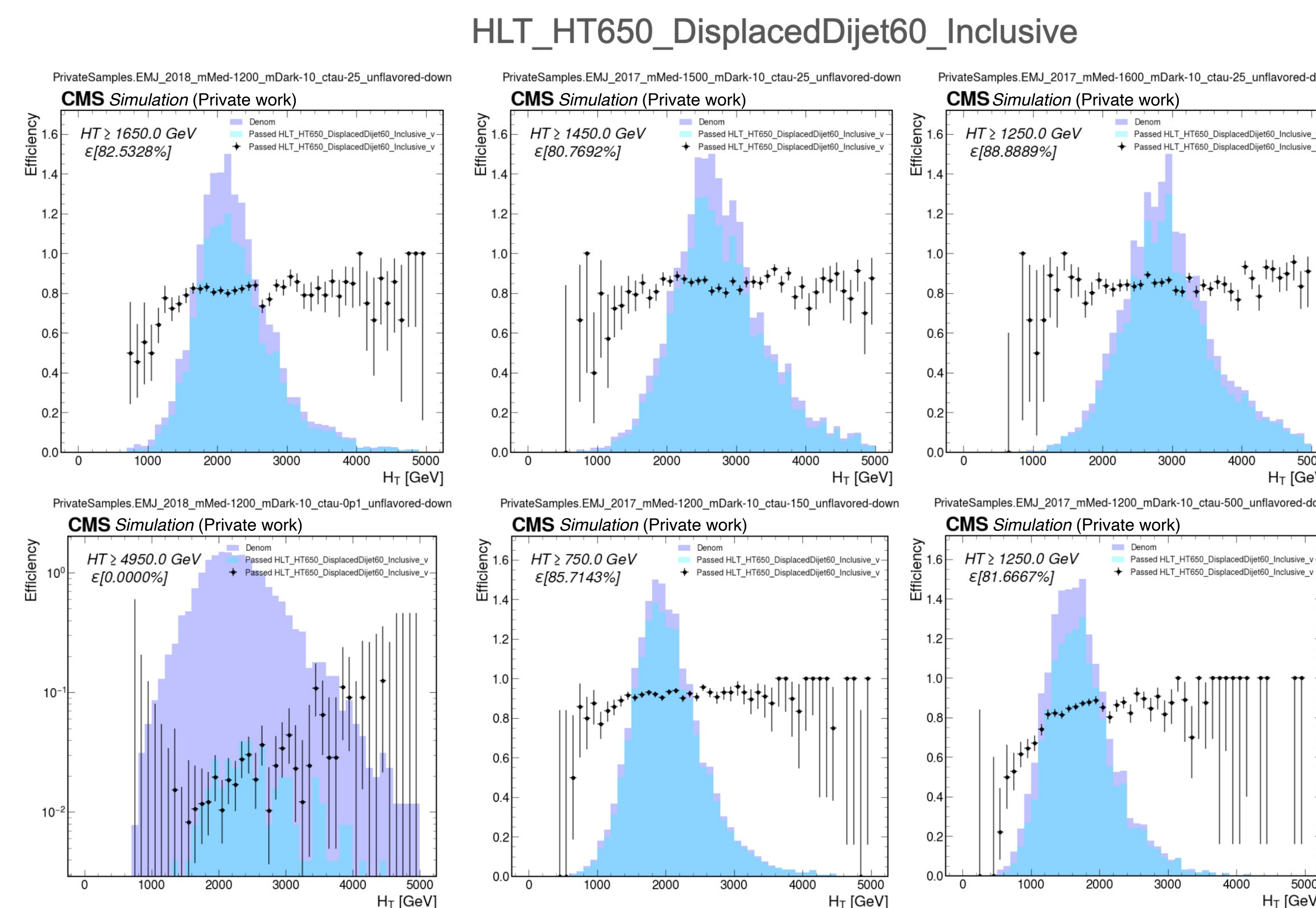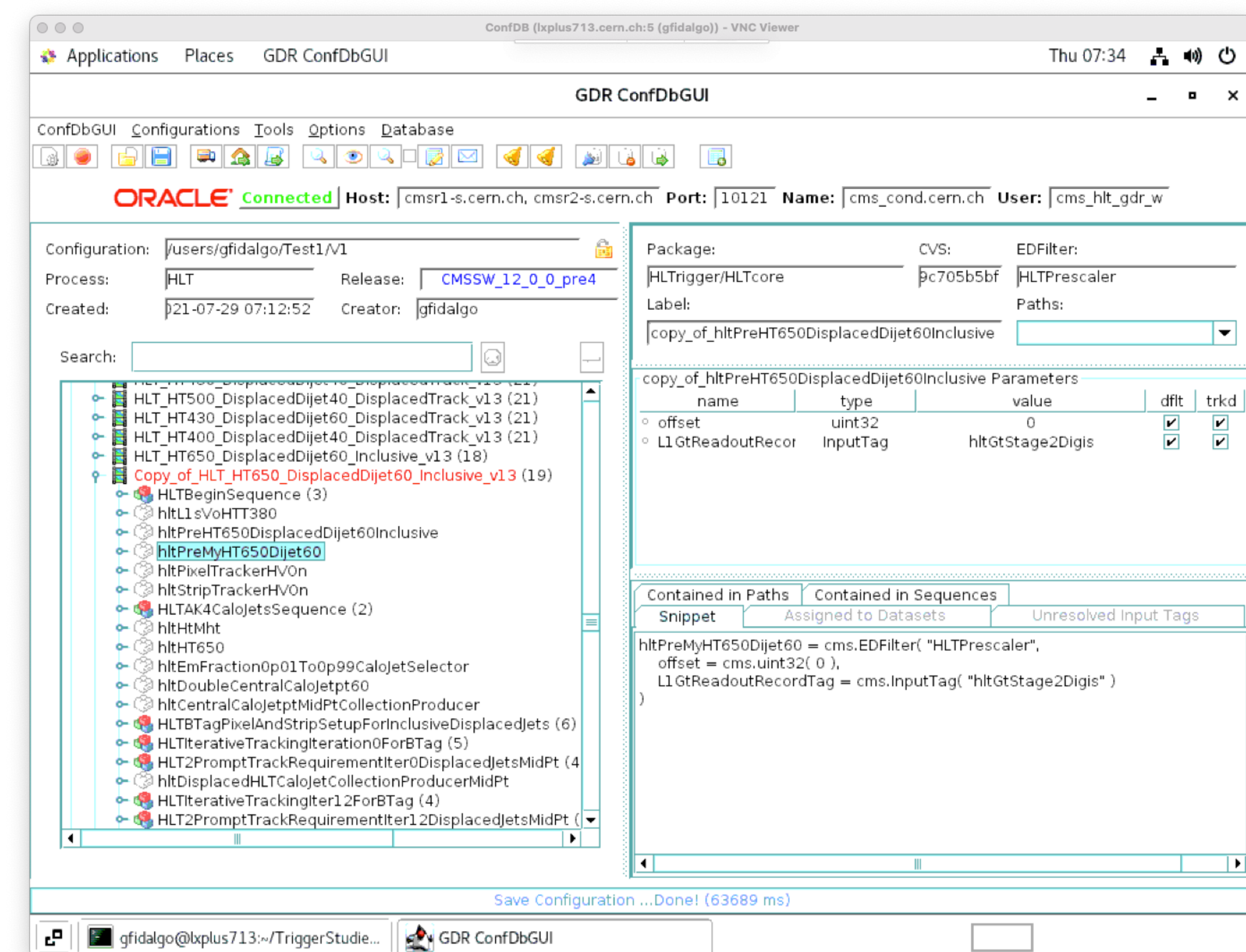
We can measure the efficiencies of many other displaced jet triggers. We think these might be a good starting point to create our new EMJ trigger.

HLT_HT650_DisplacedDijet60_Inclusive

The phase space we are looking at is filled with background. Hence, we need dedicated triggers to help sort through it efficiently.

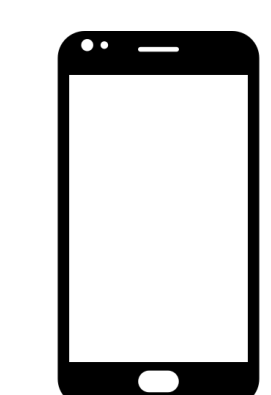This is a work in progress.

Acknowledgments

References

- https://arxiv.org/abs/1502.05409
- https://arxiv.org/abs/1803.08080

Take a picture and find out more about me.