

Trigger Development for Emerging Jet Analysis

Many Beyond the Standard Model (BSM) ideas envisage a connection between the Dark Matter (DM) and Baryonic matter densities (i.e. from Standard Model (SM)) where the DM has an asymmetry in the ratio of matter over antimatter similar to baryons. The dark sector is connected to the visible sector by a heavy mediator. It is highly relevant to explore the signature of this connection as part of the full big spectrum of all the possible new physics scenarios that could be discovered at the LHC. In this presentation, we explore a strategy that utilizes calorimeter jets that are composed dominantly of displaced tracks and have many different vertices within the jet cone. A TeV scale field produces decays to two dark quarks and possibly other SM fields. These dark quarks shower and hadronize producing dark mesons, forming into two jet-like structures just like SM QCD (Quantum Chromodynamics) in the same direction as one of the initial dark quarks. The dark mesons decay into SM quarks with a lifetime of the order of centimeters which in turn emerge as a jet of SM particles. Due to the exponential decay law, each hadron will decay in a different place in the detector and the jets will emerge into the visible sector. These jets are called “emerging jets”. We select events by a trigger that requires a great deal of energy in the form of jets. This trigger should take advantage of the unique features of the emergent jets. We present preliminary work towards developing a new trigger dedicated to Emerging Jets for this analysis with Run-2 Data of CMS at the Large Hadron Collider at CERN.

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