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Probing a MeV-scale Scalar Boson and a TeV-Scale Vector-like Quark in the $U(1)_{T3R}$ BSM Extension from gg Fusion, qq Fusion at the LHC using Machine Learning

Wednesday, July 12, 2023 5:00 PM (20 minutes)

The $U(1)_{T3R}$ extension of the Standard Model is an attractive formulation that addresses the mass hierarchy between the third and the first two generations of fermions, explains thermal dark matter abundance, and the muon $g - 2$ and $R_{K^{(*)}}$ anomalies. The model contains a dark matter candidate scalar boson, the ϕ particle, and a vector-like quark (a scalar and vector mediator), the χ_u particle. We perform a phenomenological study to search for and constrain the parameter space of the χ_u and ϕ particles.

In particular, we present a study looking at the production of ϕ and χ_u particles from proton-proton (pp) collisions at CERN's Large Hadron Collider (LHC) primarily through gluon-gluon and quark-quark fusion. We consider the final states of the χ_u decaying to b-quarks, muons, and neutrinos and the ϕ particle decaying to $\mu^+\mu^-$. We use machine learning algorithms to maximize the signal sensitivity and aim for a $\geq 5\sigma$ discovery reach with an integrated luminosity of 3000 fb^{-1}. Further, we note the proposed methodology can be a key mode for discovery over a large mass range, including low masses, traditionally considered difficult due to experimental constraints.

Is this abstract from experiment?

No

Name of experiment and experimental site

N/A

Is the speaker for that presentation defined?

Yes

Details

Umar Sohail Qureshi, Vanderbilt University, USA.

Internet talk

Maybe

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