Theoretical Physics Seminars

Dissecting Multi Photon Resonances at the Large Hadron Collider

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From: TIFR , Mumbai

When: July 25 , 2017 Tuesday 11:30 AM

Place: Room No. 469

We examine the phenomenology of the production, at the 13 TeV Large Hadron Collider (LHC), of the production of a heavy resonance X, which decays via other new on-shell particles n into multi- (i.e.\ three or more) photon final states. In the limit that n is light compared to X, the multi-photon final state may dominantly appear as a two photon final state because the γs from the n decay are highly collinear and are not resolved. We discuss how to discriminate this scenario from $X \rightarrow \gamma \gamma$: rather than discarding non-isolated photons, it is better to relax the isolation criterion and instead form photon jet substructure variables. The spins of X and n leave their imprint upon the distribution of pseudorapidity gap $\Delta \eta$ between the apparent two photon states. Depending on the total integrated luminosity, this can be used in many cases to claim discrimination, although the case where X and n are both scalar particles cannot be discriminated from the direct $X \rightarrow \gamma \gamma$ decay in this manner. In addition, one can bound the mass of n by the mass of each photon jet.

All are welcome