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Top Quark at the LHC: Exploring Beyond the Standard Model

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Top quark being the heaviest elementary particle, and the only quark which decays in its bare form, has the potential to reveal crucial information on particle dynamics. For example, precise measurement of top quark mass is needed to understand the vacuum structure, including its stability. Having the strongest coupling with Higgs boson, it can reveal information related to the electroweak symmetry breaking in a unique way. BSM effects can affect the couplings of the top quark with the Higgs boson, as well as other quarks and gauge bosons. Some of these lead to rare decays of top quark with small branching fractions, but significantly larger than the corresponding SM predictions. With very large cross section at TeV energies of pp collisions, the LHC at the end of its Run3 is expected to produce close to half-a-million top quark-antiquark pairs. Such statistics is capable of probing some of the BSM scenarios of rare decays. Proper understanding of the role of CP-symmetry in particle dynamics is another important issue. For example, presence of non-zero electric dipole moment of an elementary particle would indicate violation of CP-symmetry beyond what the CKM quark mixing structure prescribes. Top quark is an ideal system to probe this. In addition to the top quark-antiquark pair production, sizeable production of single top events and four-top events are expected at the LHC in its high luminosity version beyond Run3.

In the talk, we shall review the top quark study in the light of LHC within and beyond the SM, summarising the experimental and theoretical results so far. Some emphasise will be given to the Flavour-Changing-Neutral-Current (FCNC) interactions of the top quark, as this is one of our current interests.

Keyword-1

Top quark

Keyword-2

Beyond the Standard Model

Keyword-3

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Primary author: Prof. POULOSE, Poulose (Indian Institute of Technology Guwahati)

Presenter: Prof. POULOSE, Poulose (Indian Institute of Technology Guwahati)

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