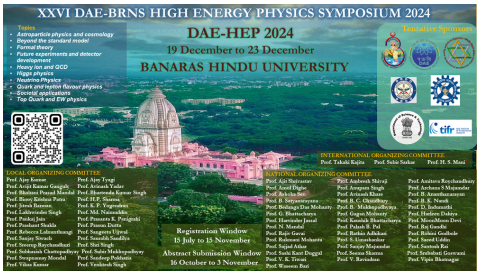

Contribution ID: **297** Type: **Oral**

Model independent effective dimension six operators and scattering unitarity

The effects of physics beyond the Standard Model may be parametrized by a set of higher-dimensional operators leading to an effective theory. The introduction of these operators makes the theory nonrenormalizable, and one may reasonably expect a violation of unitarity in $2 \longrightarrow 2$ scattering processes, depending on the values of the Wilson coefficients of the higher dimensional operators. Bounds on these coefficients may be obtained from demanding that there be no such unitarity violation below the scale of the effective theory. We show, at the lowest level, how the new operators affect the scattering amplitudes with longitudinal gauge bosons, scalars, and tt in the final state, and find that one may expect a violation of unitarity even at the LHC energies with small values of some of the new Wilson coefficients. For most of the others, such a violation needs large coefficients, indicating nonperturbative physics for the ultraviolet-complete theory, although a proper treatment necessitates the inclusion of even higher-dimensional operators. However, deviations from the Standard Model expectations may be observed with even smaller values for these coefficients. We find that $W W \longrightarrow W W$, $W W \longrightarrow ZZ$, and $ZZ \longrightarrow hh$ scatterings are the best possible channels to probe unitarity violations.

Field of contribution

Phenomenology

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Track Classification: Beyond the standard model