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Impact of squark generation mixing on the search for squarks and gluinos at LHC

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We study gluino decays, and squark production and decays, in the Minimal Supersymmetric Standard Model (MSSM) with squark generation mixing. We show that the mixing effects can be very large in a significant range of quark-flavour-violating parameters despite the very strong constraints on quark-flavour-violation (QFV) from experimental data on B mesons.

We find that under favourable conditions the branching ratio of the QFV decay $\text{gluino} \rightarrow c \bar{t} (\bar{c} t) + \text{neutralino}_1$ can be as large as about 50%.

We also find that the squark generation mixing can result in a multiple-edge (3- or 4-edge) structure in the charm-top quark invariant mass distribution.

Further we show that the two lightest up-type squarks $su_{\{1,2\}}$ can have very large branching ratios for the decays $su_i \rightarrow \text{charm-quark neutralino}_1$ and $su_i \rightarrow \text{top-quark neutralino}_1$ simultaneously due to the mixing effect, resulting in QFV signals ' $p p \rightarrow c \bar{t} (t \bar{c}) + \text{missing-}E_T + X$ ' at a significant rate at LHC. These remarkable signatures provide an additional powerful test of supersymmetric QFV at LHC. They could have an important impact on the search for gluinos and squarks and the determination of the MSSM parameters at LHC.

Primary author: Prof. HIDAHA, Keisho (Tokyo Gakugei University)

Presenter: Prof. HIDAHA, Keisho (Tokyo Gakugei University)

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