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How Large can the SUSY Contributions to $b \rightarrow s\ell^+\ell^-$ Processes be?

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We examine how large the effects in $b \rightarrow s\ell^+\ell^-$ transitions in the MSSM with a general flavour structure can be. After carefully analyzing all potentially important supersymmetric contributions, we find that the largest effects arise in case of a light wino, a light smuon and muon sneutrino, a relatively light left stop, maximal mixing among left-handed down-squarks of the 2nd and 3rd generation, with one light (order 600 GeV) and one decoupled mass eigenstate. While the bound from $B \rightarrow X_s\gamma$ can always be avoided by a suitable choice of flavour violating A terms or large μ -term, $B_s - \bar{B}_s$ mixing depends mainly (for fixed squark and Wino masses) on the gluino and the Bino mass. However, also in the latter observable, a cancellation, because of the crossed gluino diagrams, is possible. We find that the effect in $R(K)$ and $R(K^*)$ can be at most of the order of 5% and correlate this to SUSY searches at the LHC. Concerning the LFU observables where still tensions with the SM predictions exist, like P'_5 and the total branching ratios of $B_s \rightarrow \phi\mu\mu$ and $B \rightarrow K\mu\mu$, only even smaller are possible, due to an unavoidable cancellation between the Wino box diagram and the respective off-shell photon penguin.

Primary authors: CRIVELLIN, Andreas (University of Zurich (CH)); DEDES, Athanasios (University of Ioannina); ROSIEK, Janusz Andrzej (University of Warsaw (PL)); Mr MANTZAROPOULOS, Kostas (University of Ioannina)

Presenter: Mr MANTZAROPOULOS, Kostas (University of Ioannina)

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