



Contribution ID: 343

Type: **not specified**

Flavoured Co-annihilations

Monday, 29 August 2011 12:10 (25 minutes)

In minimal supergravity (mSUGRA) or CMSSM, one of the main co-annihilating partners of the neutralino is the right handed stau, $\tilde{\tau}_R$. In the presence of flavor violation in the right handed sector, the co-annihilating partner would be a flavor mixed state. The flavor effect is two fold: (a) It changes the mass of the $\tilde{\tau}_1$, thus modifying the parameter space of the co-annihilation and (b) flavor violating scatterings could now contribute to the cross-sections in the early universe. In fact, it is shown that for large enough $\delta \sim 0.2$, these processes would constitute the dominant channels in co-annihilation regions. The amount of flavor mixing permissible is constrained by flavor violating $\tau \rightarrow \mu$ or $\tau \rightarrow e$ processes. For Δ_{RR} mass insertions, the constraints from flavor violation are not strong enough in some regions of the parameter space due to partial cancellations in the amplitudes. In mSUGRA, the regions with cancellations within LFV amplitudes do not overlap with the regions of co-annihilations. In NUHM, however, these regions do overlap leading to significant flavored co-annihilations. At the LHC and other colliders, these regions can constitute for interesting signals.

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Session Classification: Parallel Session 3