IDM2008 - Identification of Dark Matter 2008

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Measurement of Dark Matter Content at the LHC (15'+5')

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Recent cosmological observations have introduced tremendous
constraint on supersymmetry models. The minimal supergravity
(mSUGRA) model explains the observed dark matter content of the
universe and requires stau-neutralino co-annihilation mechanism in
the early universe for a large region of supersymmetry parameter
space. This co-annihilation region is characterized by a small mass
difference (~5-15 GeV) between the lightest stau and the lightest
neutralino. An accurate measurement of the small mass difference at
a collider is crucial to confirm the co-annihilation mechanism.
We show that from measurements at the LHC it is possible to confirm this
mechanism
and using these measurements one can predict the dark matter relic
density with an uncertainty of 6% with 30 fb-1 of data. This is possible by
introducing measurements involving b-quark jets to determine the SUGRA
parameters A0 and tan(beta). We measure all the mSUGRA parameters with
high accuracy
and our methods provide precision mass measurements of the gauginos,
squark, and
lighter stau without the mSUGRA assumption.

This talk is based on the following papers: arXiv:0802.2968 (to appear in Phys
Rev
Lett); Phys.Lett.B649:73-82,2007, Phys.Lett.B639:46-53,2006.

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