Stop-Higgsino Associated Production at a 100 TeV Collider
Ahmed Ismail (Argonne/UIC), Ashutosh V. Kotwal (Fermilab/Duke)

Introduction
• Natural supersymmetry motivates light stops and Higgsinos
• Usually, search through stop pair production, with decay to top + invisible Higgsino
• When stop is parametrically heavier than Higgsino, stop-Higgsino associated production can compete

Search Strategy
• Large top Yukawa compensates for electroweak cross section

Analysis
• Signal is top + jet + Higgsinos; extra jet from initial state gluon splitting to bottom pair
• Irreducible background from top + jet + invisible Z
• Initially select events with two jets and MET > 2 TeV
• Apply boosted decision tree using kinematics of first two jets and missing energy as inputs, where hardest jet is generally from top
• MadGraph + Pythia simulation with flat top tagging efficiency applied
• Reducible background from light flavor jets faking tops not included, but potentially subdominant with improved detector performance (see poster by Nhan Tran)

Results (cont.)
• Also have bound on Higgsino independent of stop mass
• Results from tW production with the off-shell W going to Higgsinos
• Exclusion could eventually reach Higgsino thermal dark matter mass of 1 TeV with increased luminosity

Results
• Events with high jet $p_T$ and MET usually offer most discrimination between signal and background
• Can probe stops up to several TeV with 3 ab$^{-1}$ of integrated luminosity
• Significance improves markedly at lower Higgsino mass

Conclusions
• Associated stop-Higgsino production offers a novel way to test natural supersymmetry at 100 TeV
• Required top tagging rate and integrated luminosity set goals for future collider and detector development