Status Report on Recent Michigan Group Tracking Studies

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Goal:

Evaluate the impact of slepton & neutralino mass measurements on tracking performance requirements

Background:

• Follow up on extensive work by Colorado group (U. Nauenberg et al.) on slepton and other supersymmetry channels
• Focus here is quantifying performance requirements on tracking system
• Approach taken similar to that used in Higgstrahlung studies (impact of $M_H$ measurement) (see, e.g., Haijun’s Santa Cruz presentation)
Very brief presentation here, but Haijun will give more detailed report at November 21 LCD Teleconference

Status:

• Getting our feet wet – studying smuon channel

\[ e^+ e^- \rightarrow \tilde{\mu}_R^+ \tilde{\mu}_R^-; \quad \tilde{\mu}_R^\pm \rightarrow \mu^\pm \chi_1^0 \]

• Using Snowmass SPS#2

Smuon / neutralino masses: 157 / 129 GeV

• Learning what is important in mass measurements

• Will show sample of very preliminary findings

• Much work to do
Min/max ideal muon energies vs c.m. energy

Slepton mass = 156.95 GeV
Neutralino mass = 128.7 GeV

\[ \sqrt{s} = 313.9 \text{ GeV}, \ E_{\text{min}} = 25.71, \ E_{\text{max}} = 25.71 \text{ GeV} \]
\[ \sqrt{s} = 350 \text{ GeV}, \ E_{\text{min}} = 15.99, \ E_{\text{max}} = 41.34 \text{ GeV} \]
\[ \sqrt{s} = 500 \text{ GeV}, \ E_{\text{min}} = 9.07, \ E_{\text{max}} = 72.82 \text{ GeV} \]
\[ \sqrt{s} = 800 \text{ GeV}, \ E_{\text{min}} = 5.25, \ E_{\text{max}} = 125.78 \text{ GeV} \]
\[ \sqrt{s} = 1000 \text{ GeV}, \ E_{\text{min}} = 4.14, \ E_{\text{max}} = 159.65 \text{ GeV} \]
How much does tracking resolution matter?

Not much, apparently…
Results (preliminary!) on relative mass error (smuon/neutralino)

Dominant effects from radiation emission and beam spread

Detector choice arbitrary for measurement (!)
Summary

Much work to do, but first stab gives surprising result:

• Track momentum resolution not critical to mass measurement
• Low-momentum end-point more important than high end-point
• Needs to be checked!
• More mass pairs with higher $\Delta M$ need to be looked at
• Low $\Delta M$ pairs require special attention (2-gamma background)

Please attend Nov 21 LCD teleconference to learn details