



Update on Kinematic Fits

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Uni HH - Susy Group Meeting - 12^h May 09

- In typical Susy scenarios: $m_{\chi_1^\pm} - m_{\chi_1^0} \gtrsim m_W$

→ small relative momentum of W and χ^0

- Assume same direction of W and χ^0 and adjust χ^0 momentum to fulfill mass constraint

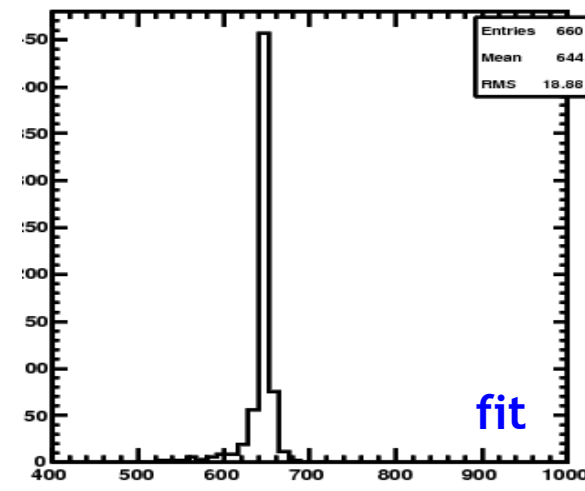
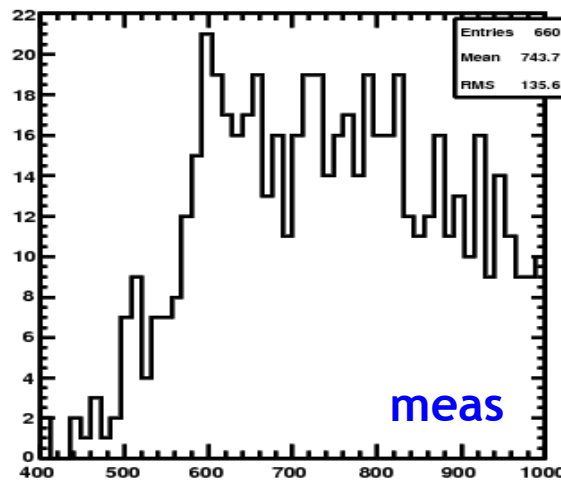
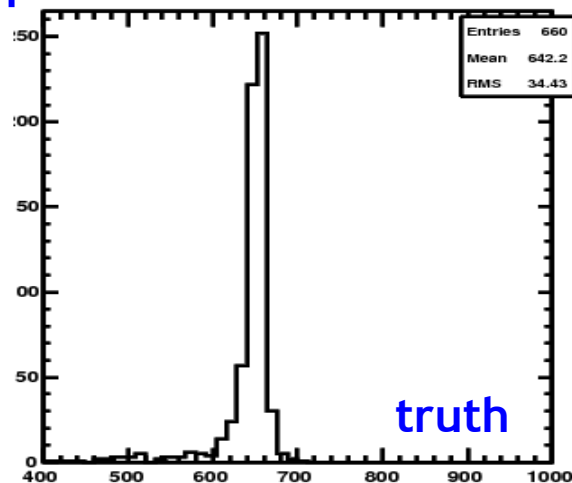
$$0 \stackrel{!}{=} f(x) = m_{\chi_1^\pm}^2 - \left(\left(E_W + \sqrt{m_{\chi_1^0}^2 + (x \cdot p_W)^2} \right)^2 - (1+x)^2 p_W^2 \right)$$

- In general there are 0, 1 or two solutions for x

- 0: take x with smallest $|f(x)|$ (set derivative df/dx to 0)
- 1: ok ... but in practice this never happens
- 2: choose larger solution!

This gives 1, 2 or 4 possible combinations which are all tested

Squark masses:

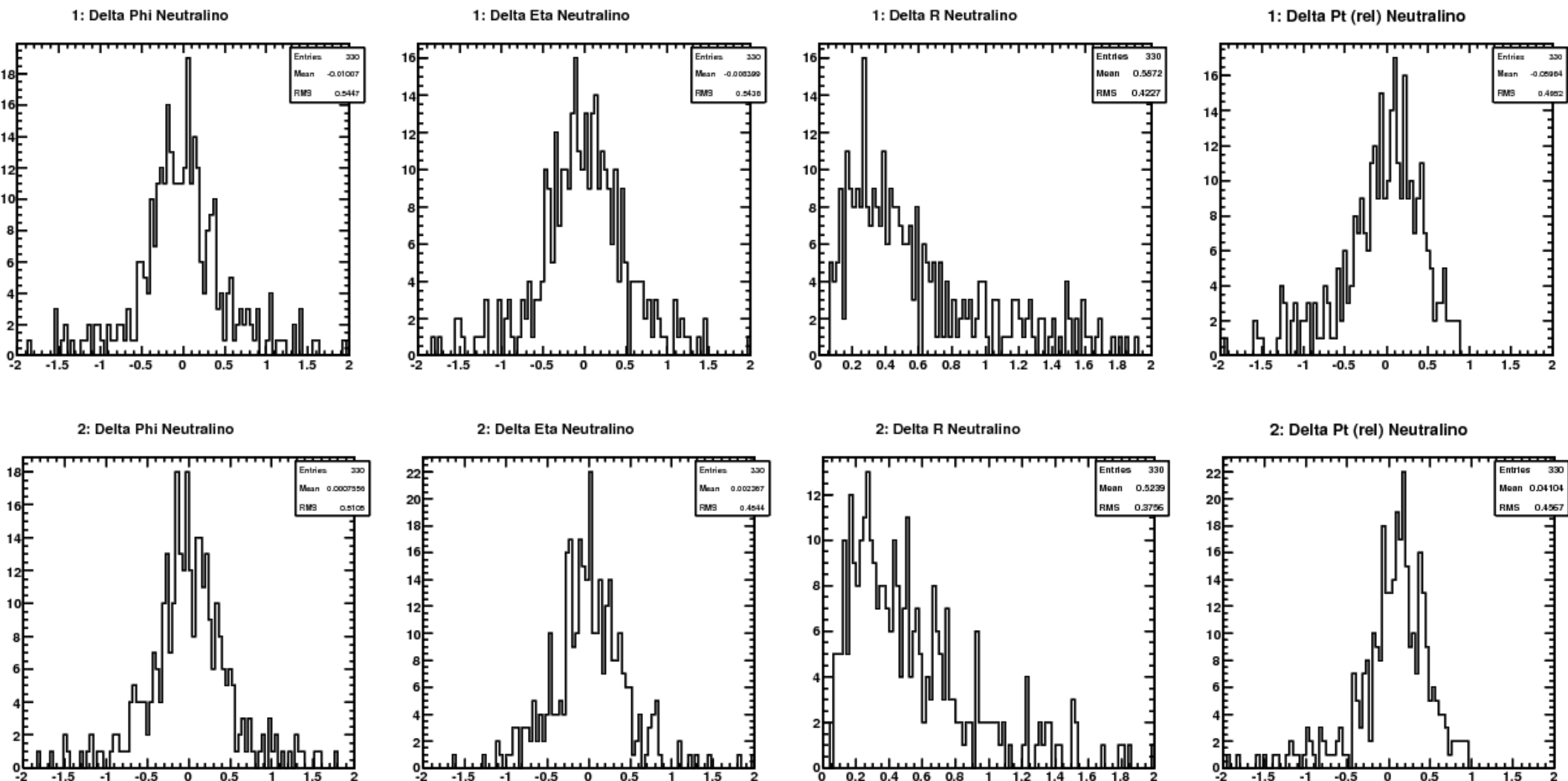


truth

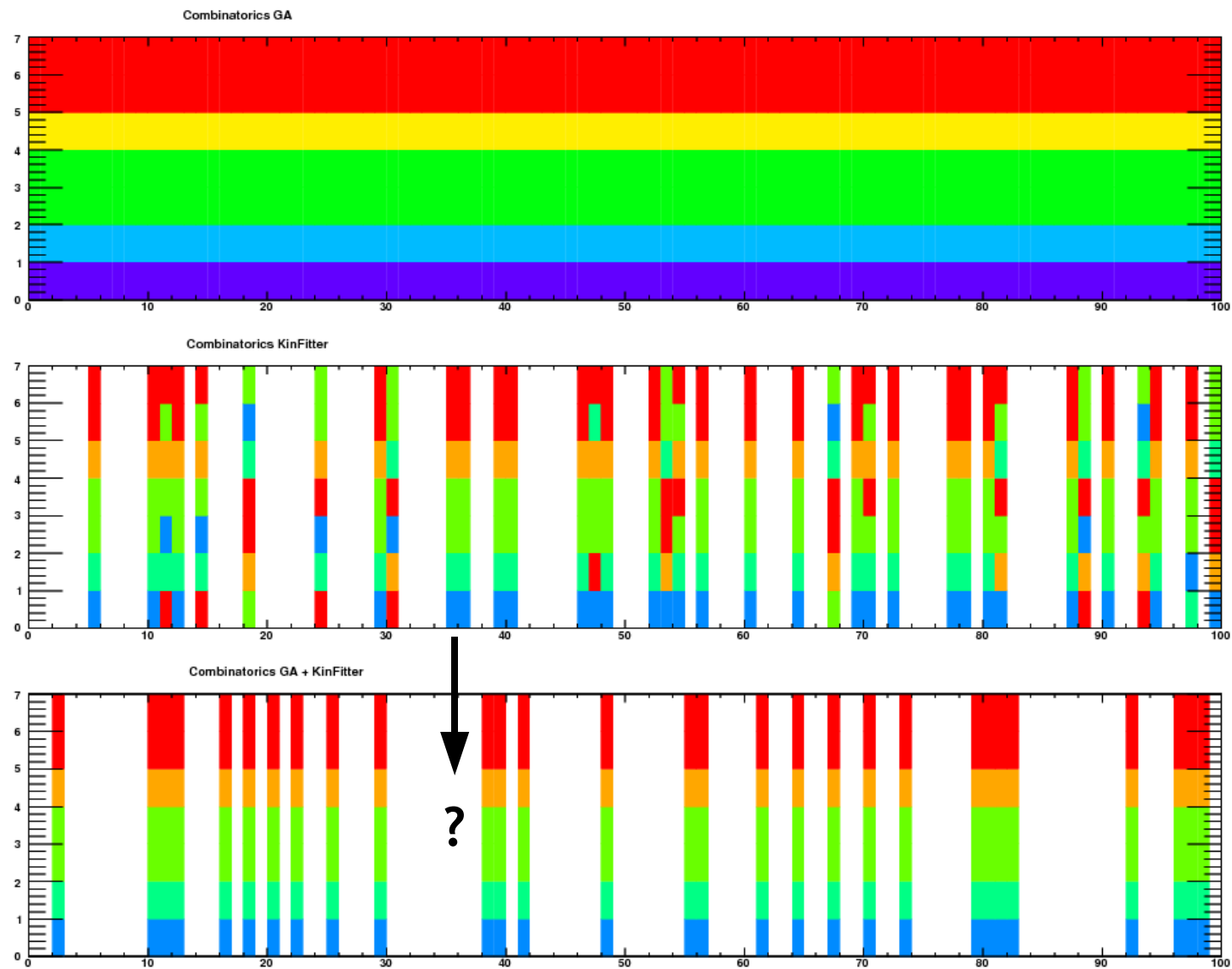
meas

fit

- Resolution of unmeasured parameters looks resonable:



- second W jet
- second W jet
- second squark jet
- first W jet
- first W jet
- first squark jet
- first gluino jet



A view events converge with rough starting values, but not with GA starting values which should be much better



Total number of events: 230000

Number of right cascades (selected): 686

right cascades (present): 330

right cascades (not selected): 2067

similar cascades (selected): 447

similar cascades (present): 274

similar cascades (not selected): 1235

false cascades (selected): 16966

false cascades (not selected): 209046

one branch (selected): 2752

one branch (present): 2325

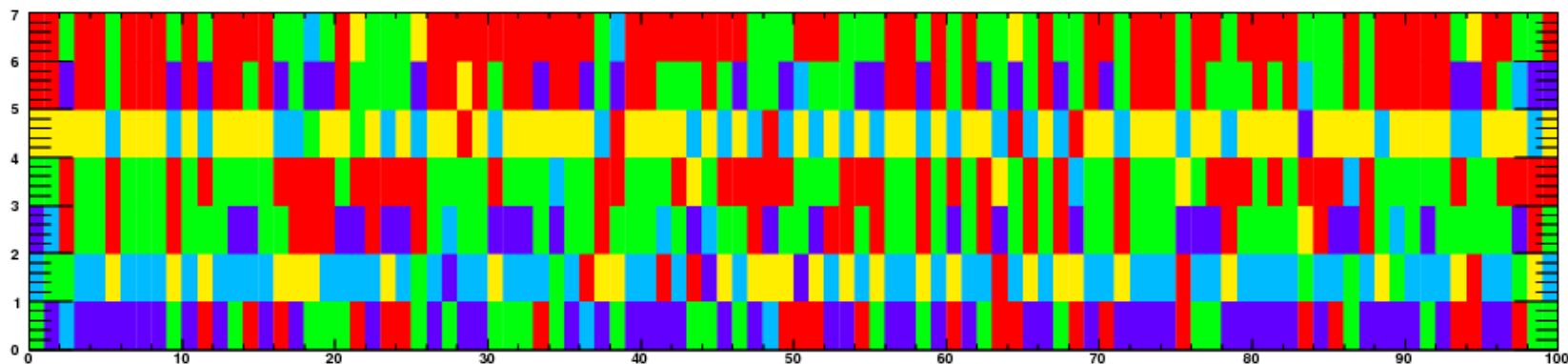
one similar branch (selected): 5443

one similar branch (present): 4029

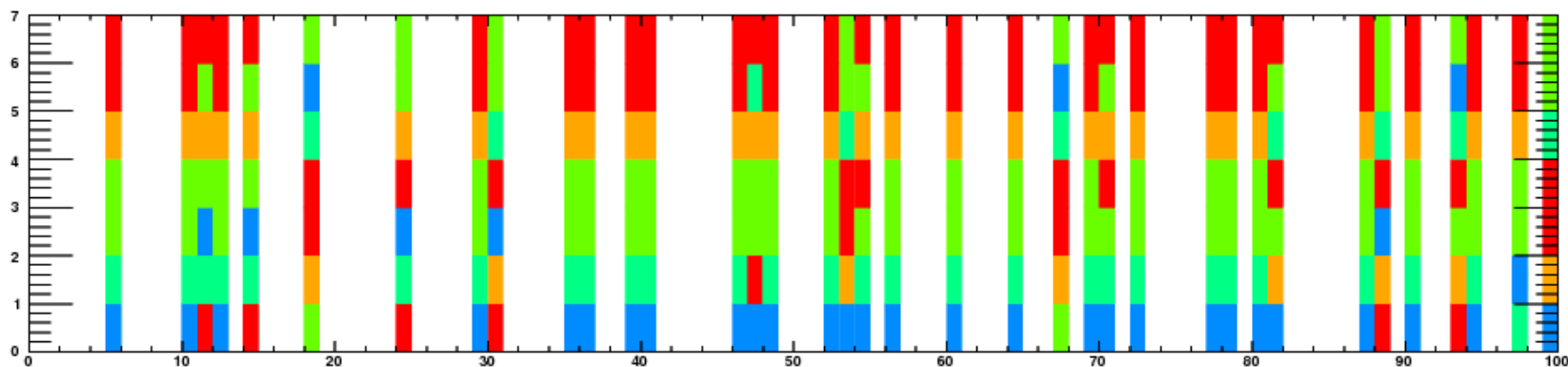
Best is right: 103 from 330

~ 30% complete
right cascade
most wrong
combinations are
exchange of the
two branches

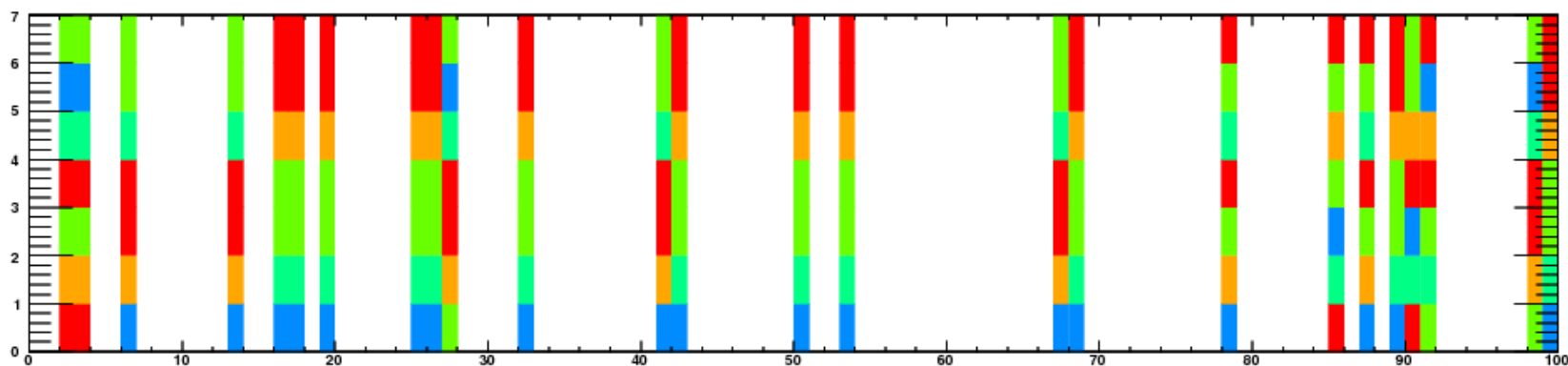
Combinatorics GA



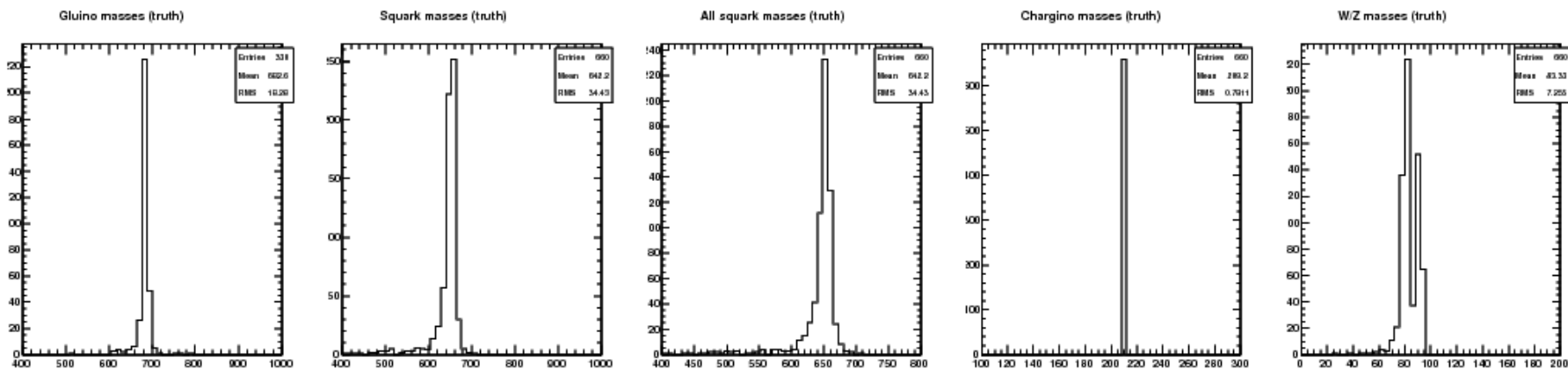
Combinatorics KinFitter



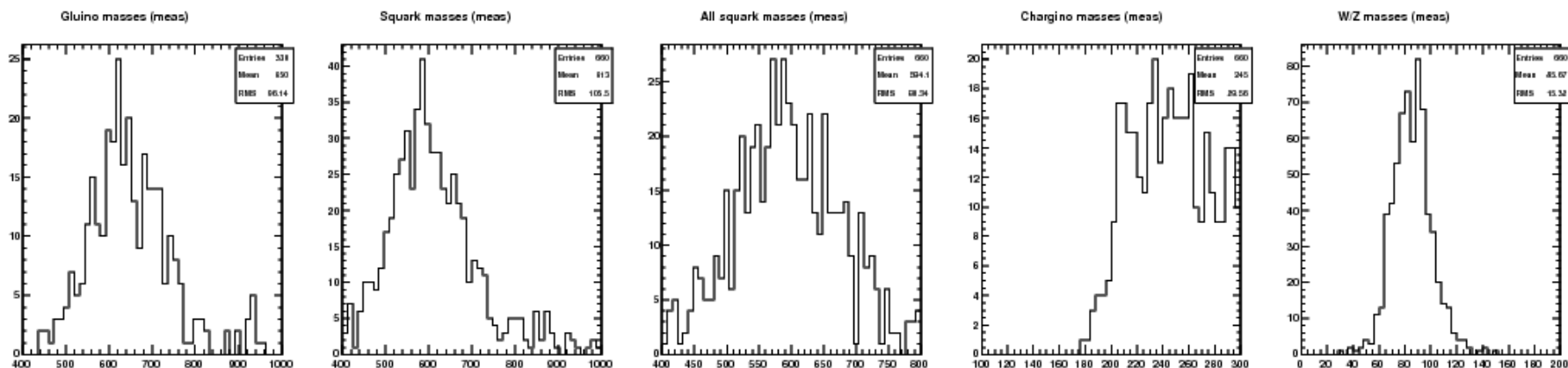
Combinatorics GA + KinFitter



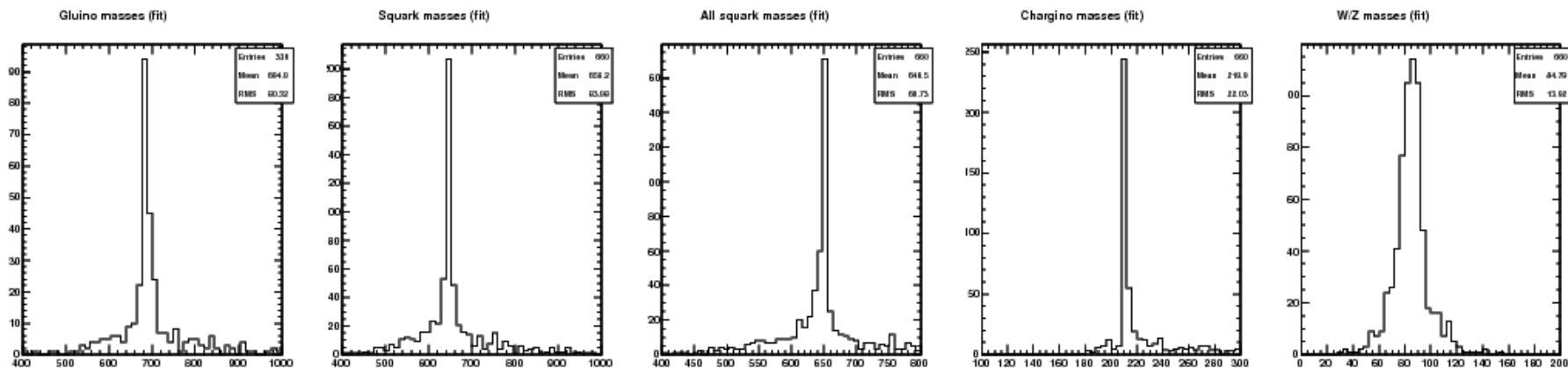
truth



meas



fit



- Improve convergence of KinFitter (step scaling, second order corrections, function of merit ...)
- Scan over mass hypotheses
 - Use NAF
 - First try with: neutralino and gluino mass fixed, varying chargino and squark mass ... and other combinations?
 - In addition mSUGRA scan?
- Test different discriminating variables (e.g. averaged probability, likelihood of best N events, number of converging events ...)
- Include ISR jets in event selection (treat higher statistics vs. larger combinatorial bg)
- Include systematic uncertainties