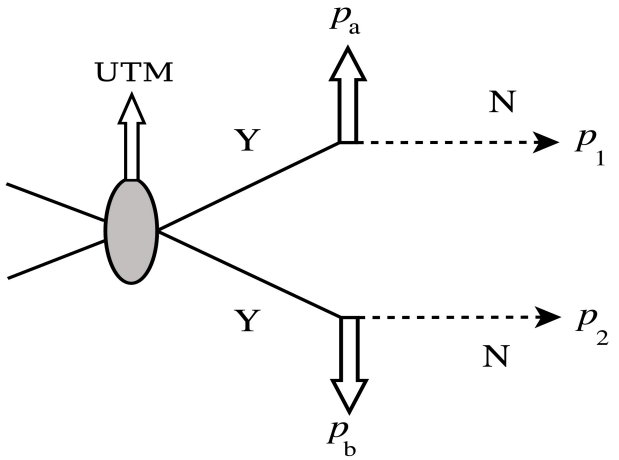
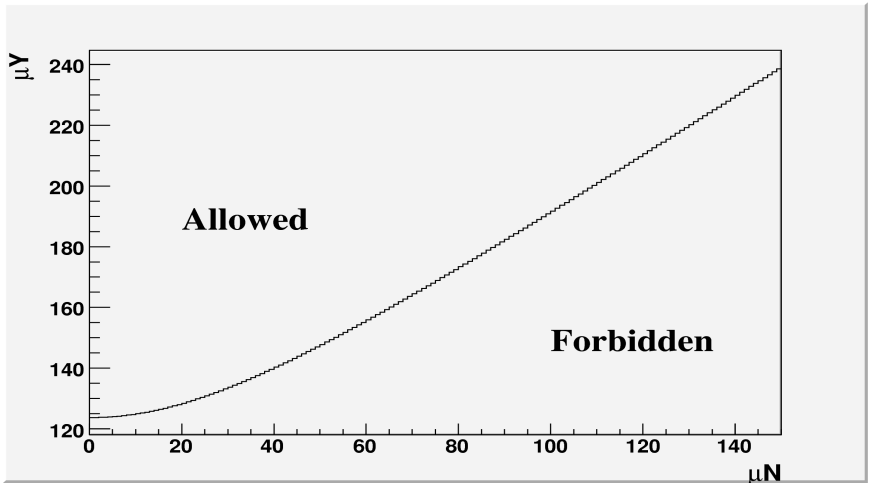
Constraining the mass space

Zhenyu Han / UC Davis

- Assuming an event topology, we can constrain the mass space using measured momenta: visible particles, missing PT.
- "Minimal constraints" equivalent to MT2 (Cheng & Han)



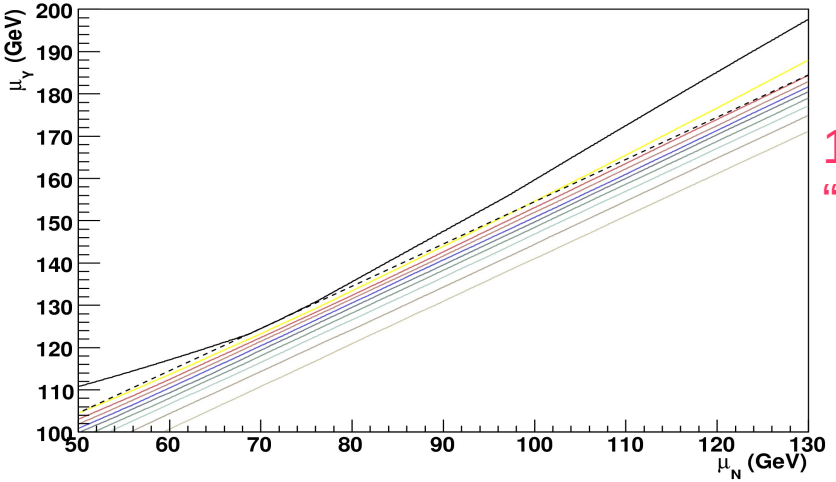


1 evt

$$p_1^2 = p_2^2 = \mu_N^2$$

$$(p_1 + p_a)^2 = (p_2 + p_b)^2 = \mu_Y^2$$

$$p_1^x + p_2^x = p_{miss}^x, p_1^y + p_2^y = p_{miss}^y$$

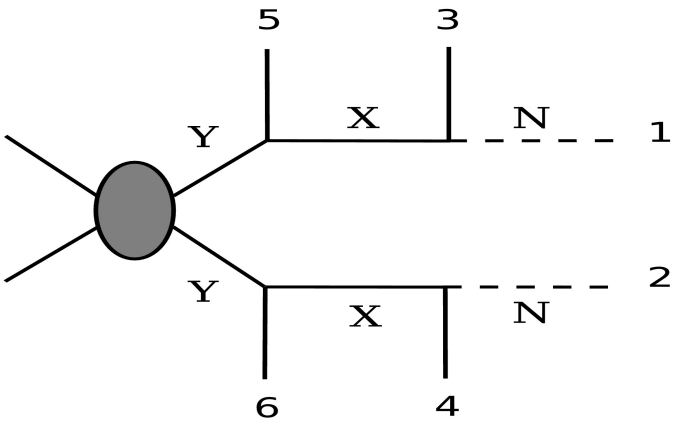


1000 evt
"MT2 Kink"

Unbounded region, "kink"

2 visible particles per decay chain

(Cheng, Gunion, Han, Marandella, McElrath)

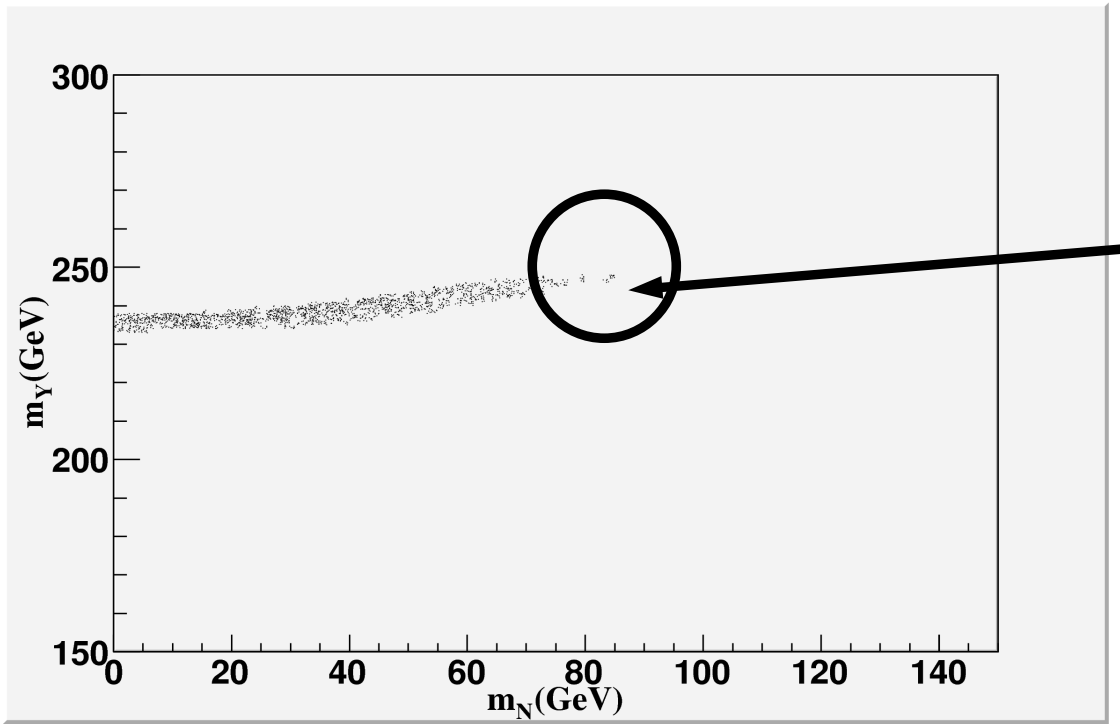


$$p_1^2 = p_2^2 = \mu_N^2$$

$$(p_1 + p_3)^2 = (p_2 + p_4)^2 = \mu_X^2$$

$$(p_1 + p_3 + p_5)^2 = (p_2 + p_4 + p_6)^2 = \mu_Y^2$$

$$p_1^x + p_2^x = p_{miss}^x, \quad p_1^y + p_2^y = p_{miss}^y$$



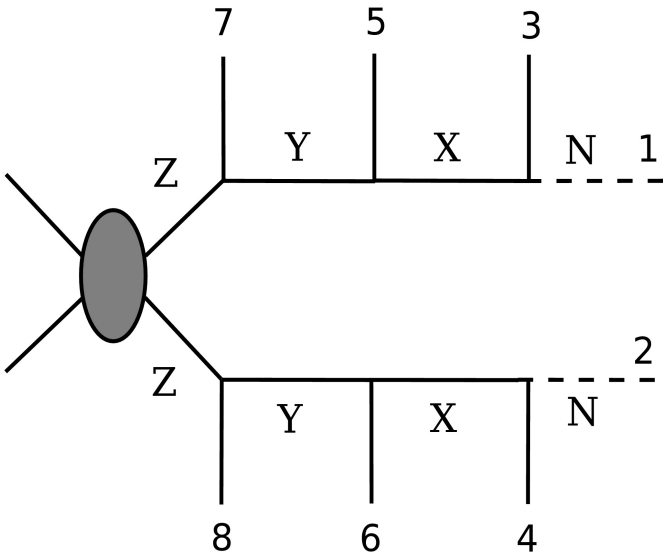
500 events, no smearing

Correct masses

Bounded region
"tip"

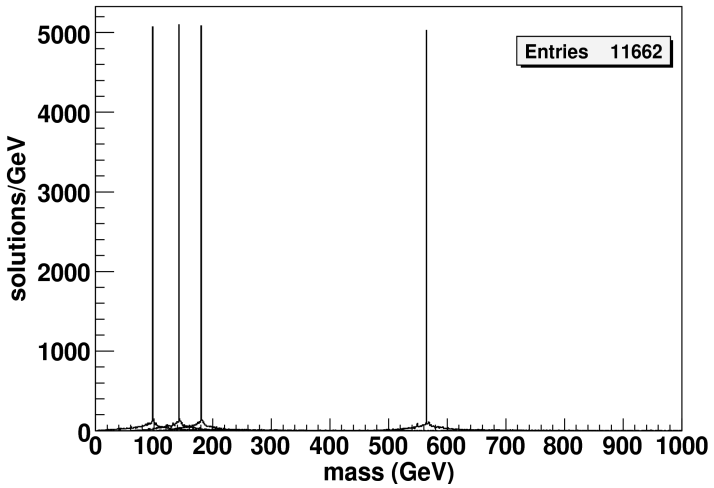
3 visible particles per decay chain

(Cheng,Engelhardt, Gunion, Han, McElrath)

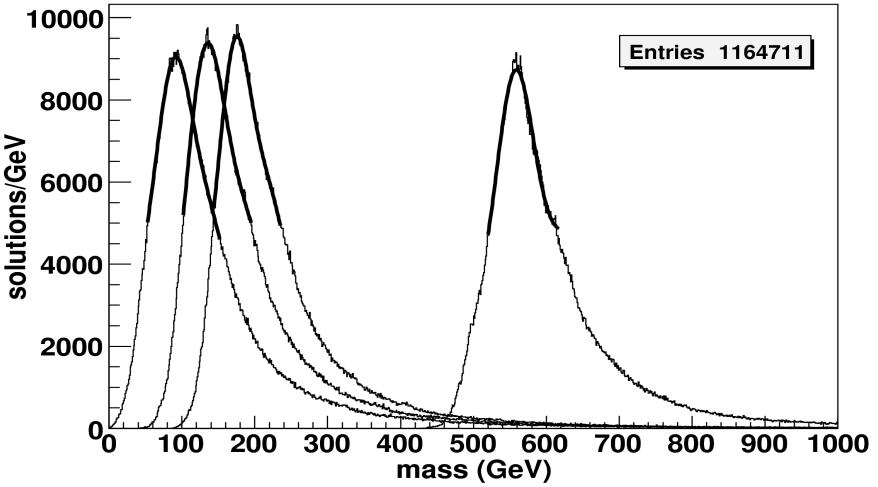


- More constraints, unknowns stay the same: p1, p2

- Combining two events and assuming the masses are the same, we obtain "*discrete solutions*".



SPS1a, ideal case, 100 events



SPS1a, realistic case, 1000 events (~700 signal events)