

# Comparing invariant and transverse masses:

$$M^2 = m_a^2 + m_b^2 + 2(e_a e_b \cosh(\Delta\eta) - a_x b_x - a_y b_y)$$
$$M_T^2 = m_a^2 + m_b^2 + 2(e_a e_b - a_x b_x - a_y b_y)$$

Since  $\cosh(\Delta\eta) \geq 1$  have  $M_T \leq M$

with equality when  $\Delta\eta = 0$ .

(Not same as throwing away z information!)

But have bound, and bound can be saturated.

Note that at this point we are assuming we know  $m_b$ .