3.3 JET MASS MEASUREMENTS

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It has been proposed[1] that jet mass measurements would be a desirable quantity to measure. For high velocity jets this quantity is not very stable due to the inevitable mixing of the low-energy particles from the fragmentation. In order to have meaningful measurements one must be dealing with jets in which the value of E_{jet}/M_{jet} is relatively low (see graph).

The graph (Fig. 1) is derived from considering the jet in the system of the production of two jets and considering one jet as the sum of the main jet particles + the low energy tail

$$M_{jet}^2 = (E_l + E_{tail})^2 - (p_l + p_{tail})^2.$$

In this system we can consider the mass and the momentum of the tail to be small compared to the main jet.

$$\frac{\Delta M_{jet}}{M_{jet}} \approx \frac{M_{tail}}{M_{jet}} \frac{E_{jet}}{M_{jet}}.$$

For hadron jet production the energy of the jet in this system is observed as p_T. Figure 1. shows some values of this error where the mass of the tail lost has been taken as m_π and m_ρ.

Note that this is the error due to systematic loss. The measurement error on the individual particles must still be taken into account.

Reference

1. L. Clavelli, Phys. Lett. **85B**, 111 (1979); L. Clavelli and H. -P. Nilles, Phys. Rev. D**21**, 1242 (1980)

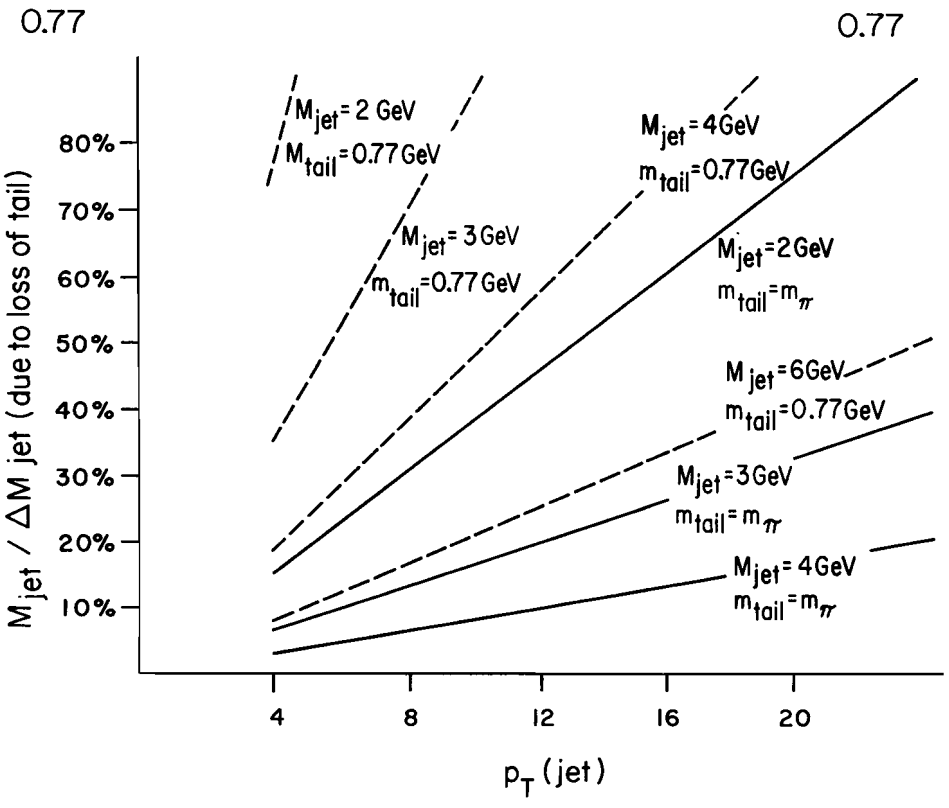
0.77
0.77
M_{jet} / ΔM jet (due to loss of tail)
80%
70%
60%
50%
40%
30%
20%
10%
M_{jet}= 2 GeV
M_{tail}=0.77GeV
M_{jet}= 3GeV
m_{tail}=0.77GeV
M_{jet}=4GeV
m_{tail}=0.77GeV
M_{jet}=2GeV
m_{tail}=m_{π}
M_{jet}=6GeV
m_{tail}=0.77GeV
M_{jet}=3GeV
m_{tail}=m_{π}
M_{jet}=4GeV
m_{tail}=m_{π}
4
8
12
16
20
p_T (jet)

Fig. 1.