B-(BD BD) (F.~)

 $P_z(P_3, P_1, P_2, P_3) z (\tilde{E}, \tilde{p}_z)$ 

P=mUz(Vme, Vmot) = (Vmc, Vmot) =

 $=\left(\frac{\mathcal{E}}{\zeta},\vec{\rho}\right)$ 

 $P.P: pp^{\prime\prime} = \left(\frac{E}{c}, \vec{p}\right) \cdot \left(\frac{E}{c}, \vec{p}\right) = \frac{E}{c^2} - \vec{p}^2 = m^2 c^2$ 

kor c = 1 -! 5 = m + p 2

 $P \rightarrow P = (ho, hc, 0, 0), P = (me), 0, 0, 0)$ 

Paper  $P_{\gamma} = \left(\frac{he}{\lambda'}, \frac{he}{\lambda'}, \frac{he}{\lambda'}, \frac{he}{\lambda'}, \frac{he}{\lambda'}, 0\right)$ 

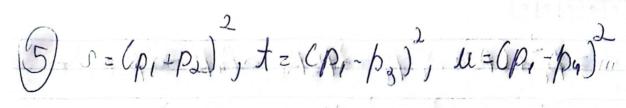
: Wed noitondonos mutalmon ?

Py + P = P + P'

(Pr+D-P) = P2

kajOma

+ P + P + 2P (P, -P) - 2P P' = P' kajoma



 $S = p_1^2 + p_3^2 + 2p_1 p_2$   $t = p_1^2 + p_3^2 - 2p_1 p_3$   $M = p_1^2 + p_4^2 - 2p_1 p_4$ 

For the comernation law: p, +p2 = p3+p4

S+ ++ w = P, + p2 + p2 + p2 + 2p, p2 - 2p, p3 - 2p, put

+ P,I

where: P2 = P3+pq-P1

S+ x+ 1 = p,2+(P3+Pu-P1)+P3+P12+P4+P12+

+2p,(P3+p4-p1)-2p,p3-2P,p4

· (P3+p4-P, ) = P3+p4+P, 2+2P3p4-2P, p4-2P, p3

kajoms

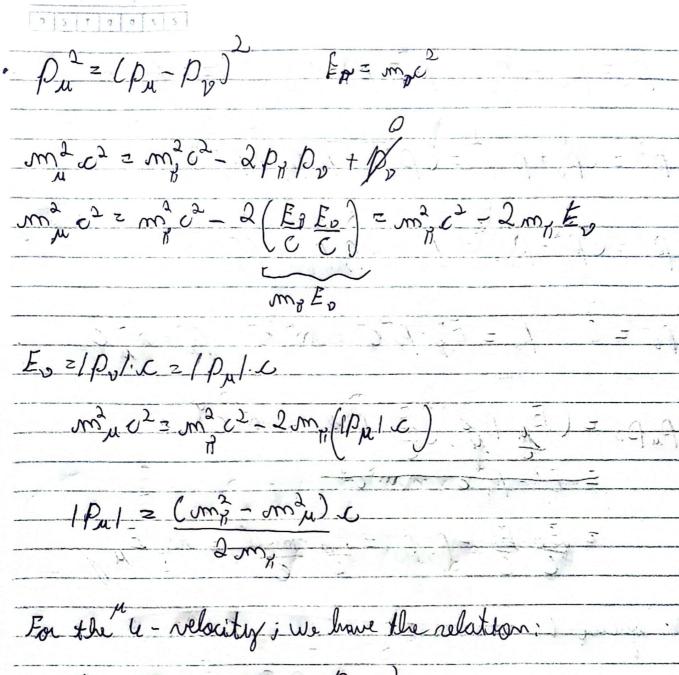
0 5 1 0 6 5 5

5+ + m = p2+p2+p2+p2+p2+p2+p2+2p,p2-2p,p3-
-2PIPu
= P12+P2+P32+P2+ P2+ RP(CP3+P4-P,)
-2p,p3-2p,pu
$S4 + t = P_1^2 + P_2^2 + P_3^2 + P_4^2 + P_4^2 + 2P_1P_3 + 2P_1P_4$ $-2P_1^2 - 2P_1P_3 - 2P_1P_4$
-2p2 - 2pp - 2pp 4
$= \frac{z p_1^2 + p_2^2 + p_3^2 + p_4^2}{z^2 + p_3^2 + p_4^2}$
Pzm²x²: for c21; pzm²
Therefore:
5+ ++m= m2+m2+m2

En = Poc = - Pac = / Pare

0[5]7[9]0[5]5

kajoma



kajoma

Wn = my - my C2 2 my - mg 0 5 7 0 7 5 5

$$(9) p+p=p+p+p$$

- ten to reliter of my

Total Energy consumation: Patet 2 potet 2

$$\left(\frac{E}{c} + mc\right)^2 = (4mc)^2$$

B2 + 2m E + m2c2 - p2 = 16m c2

But, pp p = = p = = m202

2 m 2 + m202 + m202 = 16 m c2

f sm 21 5 3 me

[Ez 7mx2]

kajoma

Per(Ee, Rec) HERA: E=27,6GeV; E=920GeV VS z E, + E2 20 VS = 2 Ecm VS = V4 E Ep = 14.276.9200eV = 318,70g/ l do CM: 1pem/=1pem/=1pem/ Elm = Fcm = Fcm Un repa, no CM as energlas das duas particulas são parals. For Ep = VS = 160 GeV