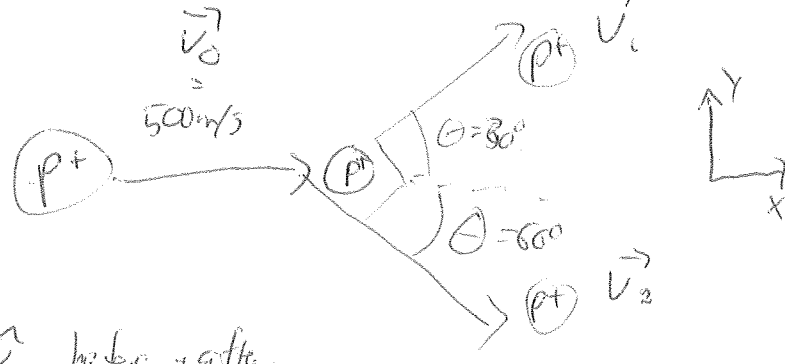


9-25] What are final speeds of colliding protons in the diagram?



Conserve momentum in both \hat{y} and \hat{x} , before + after.

before; \hat{x} : $m_p \cdot (500 \text{ m/s}) = m_p \vec{v}_0 \cdot \hat{x}$

\hat{y} : not moving in \hat{y}

after \hat{x} : $m_p |\vec{v}_2| \cos 60^\circ + m_p |\vec{v}_1| \cos 30^\circ$

after \hat{y} : $m_p |\vec{v}_2| \sin 60^\circ + m_p |\vec{v}_1| \sin 30^\circ$

so: $m_p |\vec{v}_0| = m_p |\vec{v}_2| \cos 60 + m_p |\vec{v}_1| \cos 30^\circ$

and $0 = m_p |\vec{v}_2| \sin 60 + m_p |\vec{v}_1| \sin 30^\circ$

solve 2nd line for $v_1 = - \frac{v_2 \sin 60}{\sin 30^\circ}$ @

Subst: $v_0 = v_2 \sin 60 - v_2 \frac{\sin 60}{\sin 30}$

or $v_2 = \frac{v_0}{\left(\sin 60 - \frac{\sin 60}{\sin 30}\right)} = \frac{500 \text{ m/s}}{(1.15)} = -433 \text{ m/s}$

and $v_1 = - \frac{(433 \text{ m/s}) \sin 60}{\sin 30} = (250 \text{ m/s})$