- Prepare for IEEE NSS talk

- Tau decay mode selection

  using ellipsoid shape parameter to check merged photon

- Neutrino energy calculation

  some method

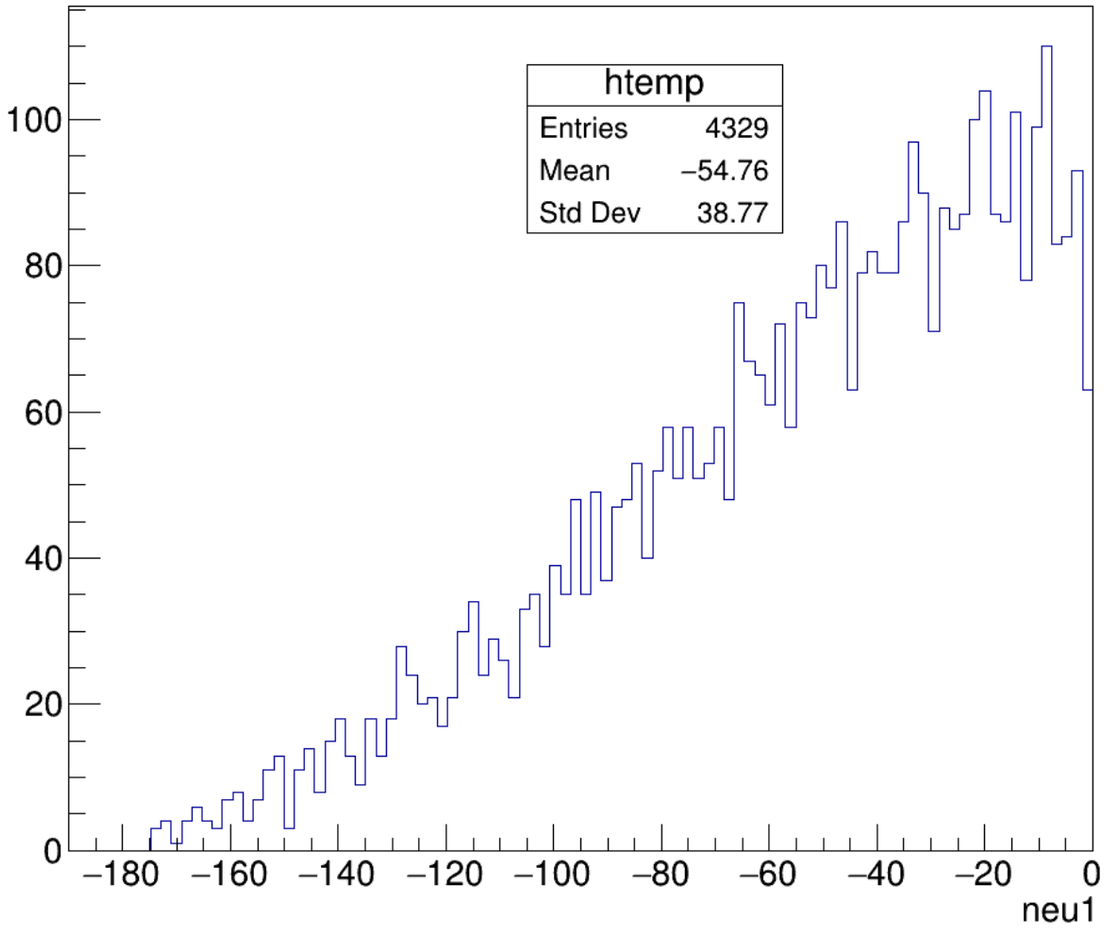
  - w/o beam crossing angle
  - w/ beam crossing angle
  - cone method (?)

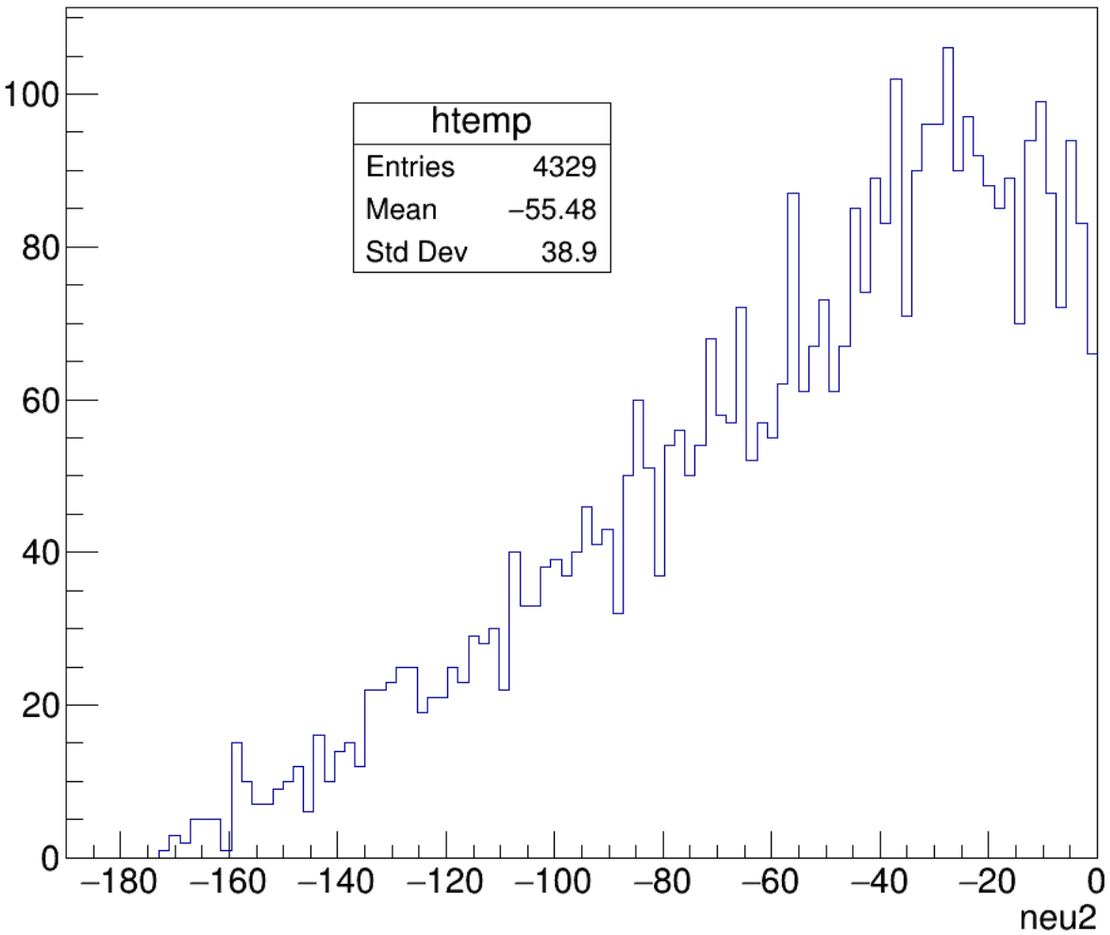
    explain on the next page

w/o beam crossing angle

$$\Sigma P_x = P^{vis}_{\tau^- x} + P^{vis}_{\tau^+ x} + P^{1}_{\nu x} + P^{2}_{\nu x} = 0$$
$$\Sigma P_y = P^{vis}_{\tau^- y} + P^{vis}_{\tau^+ y} + P^{1}_{\nu y} + P^{2}_{\nu y} = 0$$

$$P^{\pm(x,y)} = \frac{P^{vis}_{\tau^{\pm}(x,y)}}{P^{vis}_{\tau^{\pm}}}$$





if only ΣP_x and ΣP_y conservation are considered

both E_ν, $E_{\bar{\nu}}$ are negative energy

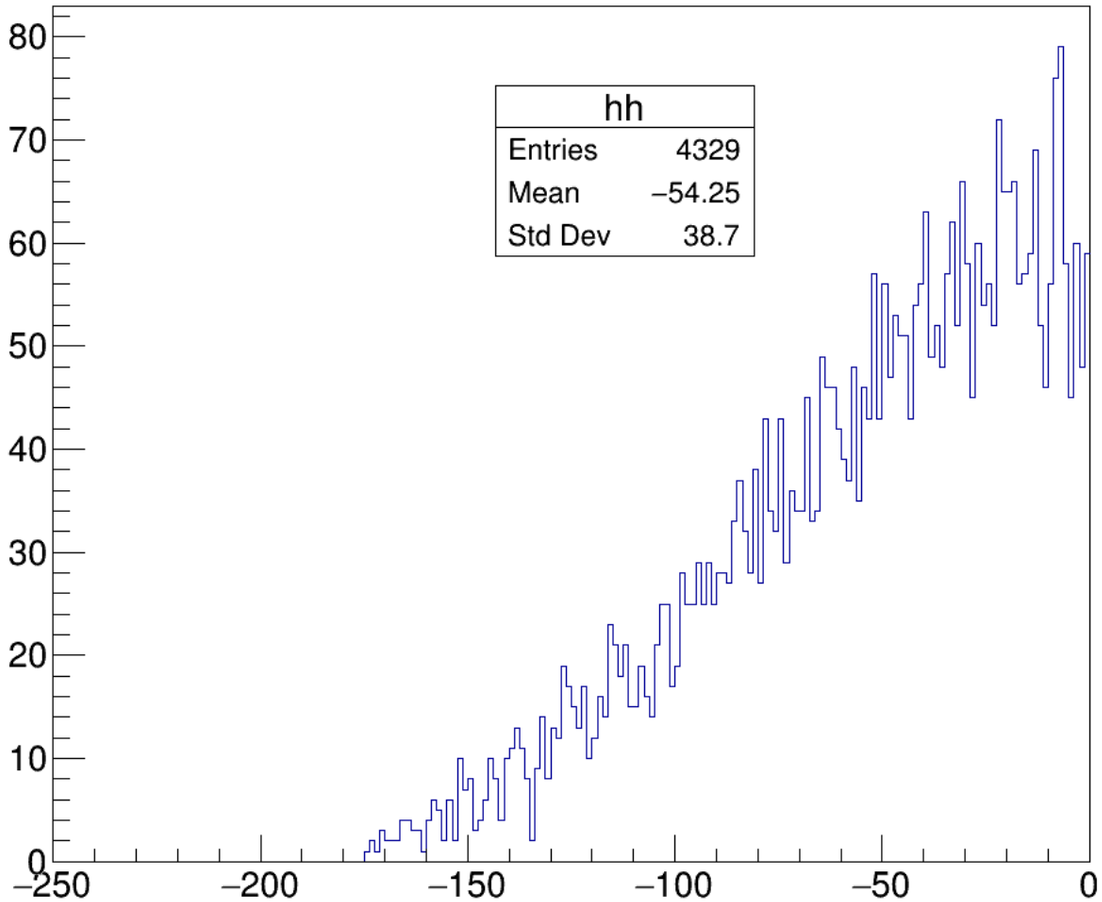
collinear approximation doesn't work well

w/ beam crossing angle

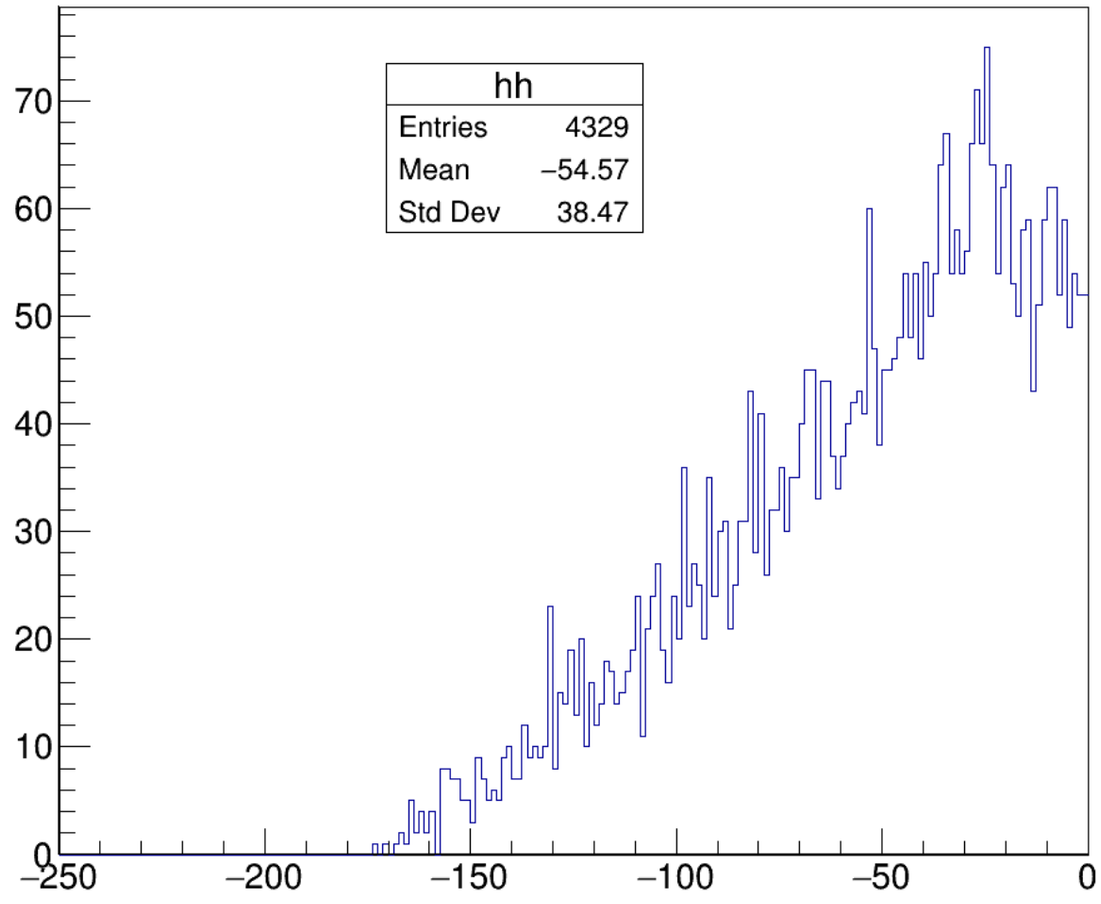
$$\Sigma P_x = P^{vis}_{\tau^- x} + P^{vis}_{\tau^+ x} + P^{1}_{\nu x} + P^{2}_{\nu x} = E_{CM} \sin\alpha \qquad \alpha = 7\ \text{mrad}$$

$$\Sigma P_y = P^{vis}_{\tau^- y} + P^{vis}_{\tau^+ y} + P^{1}_{\nu y} + P^{2}_{\nu y} = 0$$

$$P^{\pm(x,y)} = \frac{P^{vis}_{\tau^{\pm}(x,y)}}{P^{vis}_{\tau^{\pm}}}$$



if only ΣP_x and ΣP_y conservation are considered
and even if crossing angle is considered



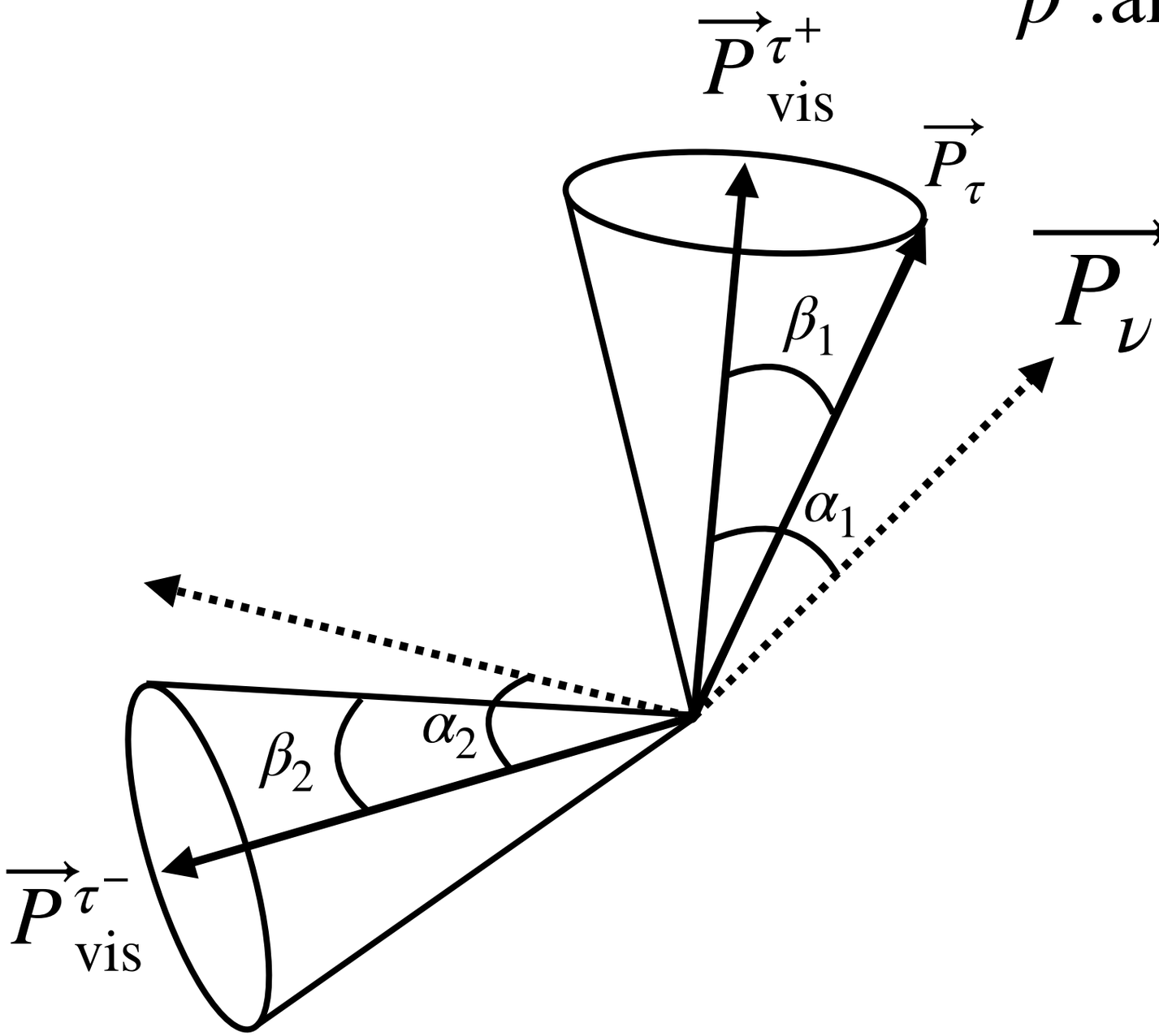
both E_ν, $E_{\bar{\nu}}$ are negative energy

collinear approximation doesn't work well

Find tau visible daughters

α :angle between $\overrightarrow{P}^{\tau^+}_{\text{vis}}$ and $\overrightarrow{P_\nu}$

β :angle between $\overrightarrow{P}^{\tau^+}_{\text{vis}}$ and $\overrightarrow{P_\tau}$

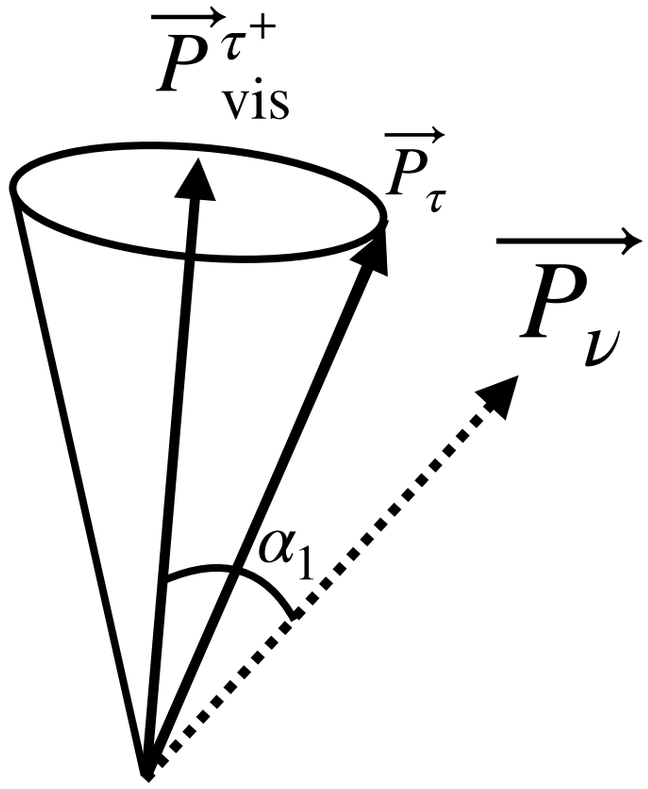


$\overrightarrow{P_\nu}$ assume:

$$E_\nu = \frac{E_{\text{CM}}}{2} - E_{\text{vis}}$$

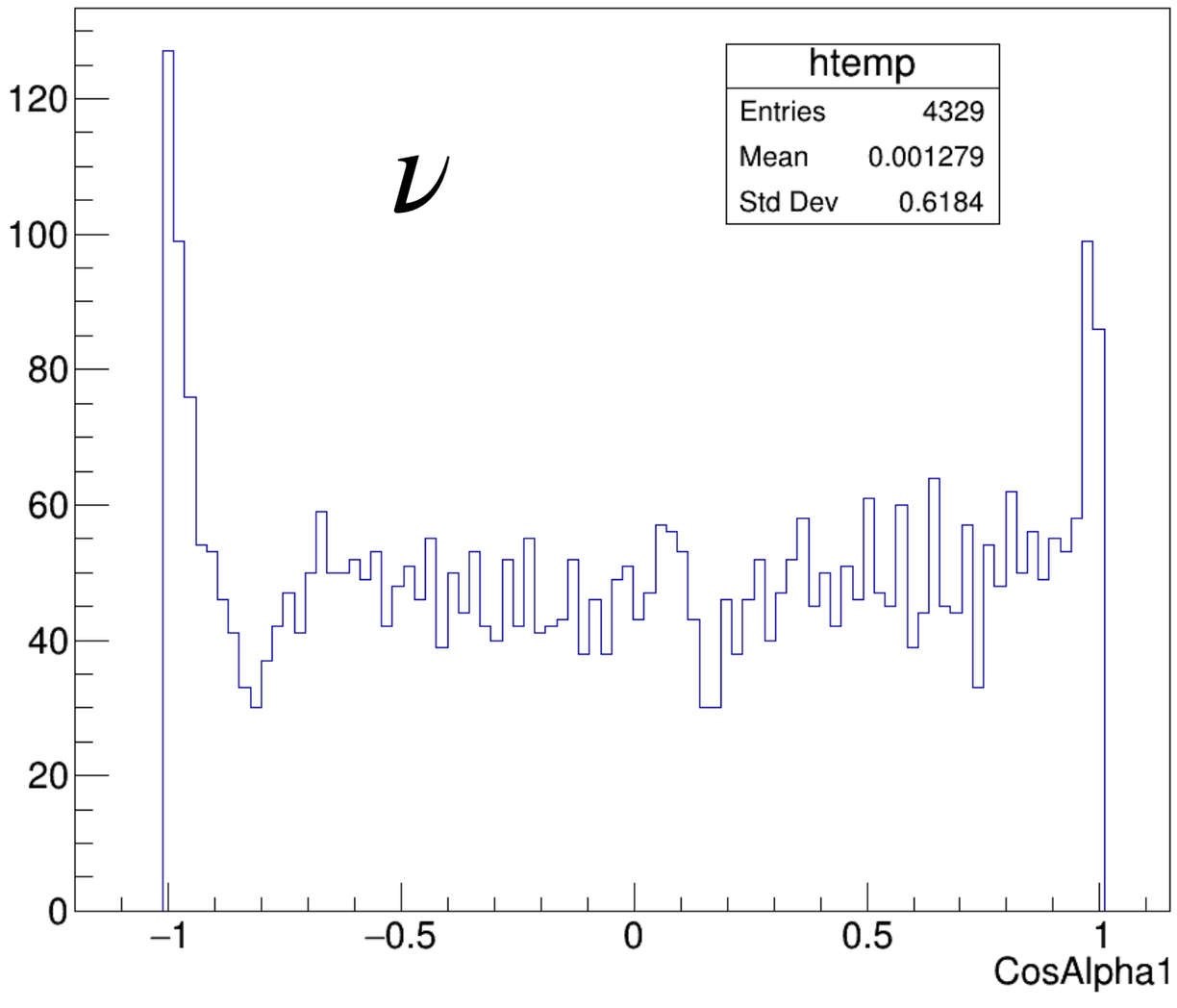
decide β by α

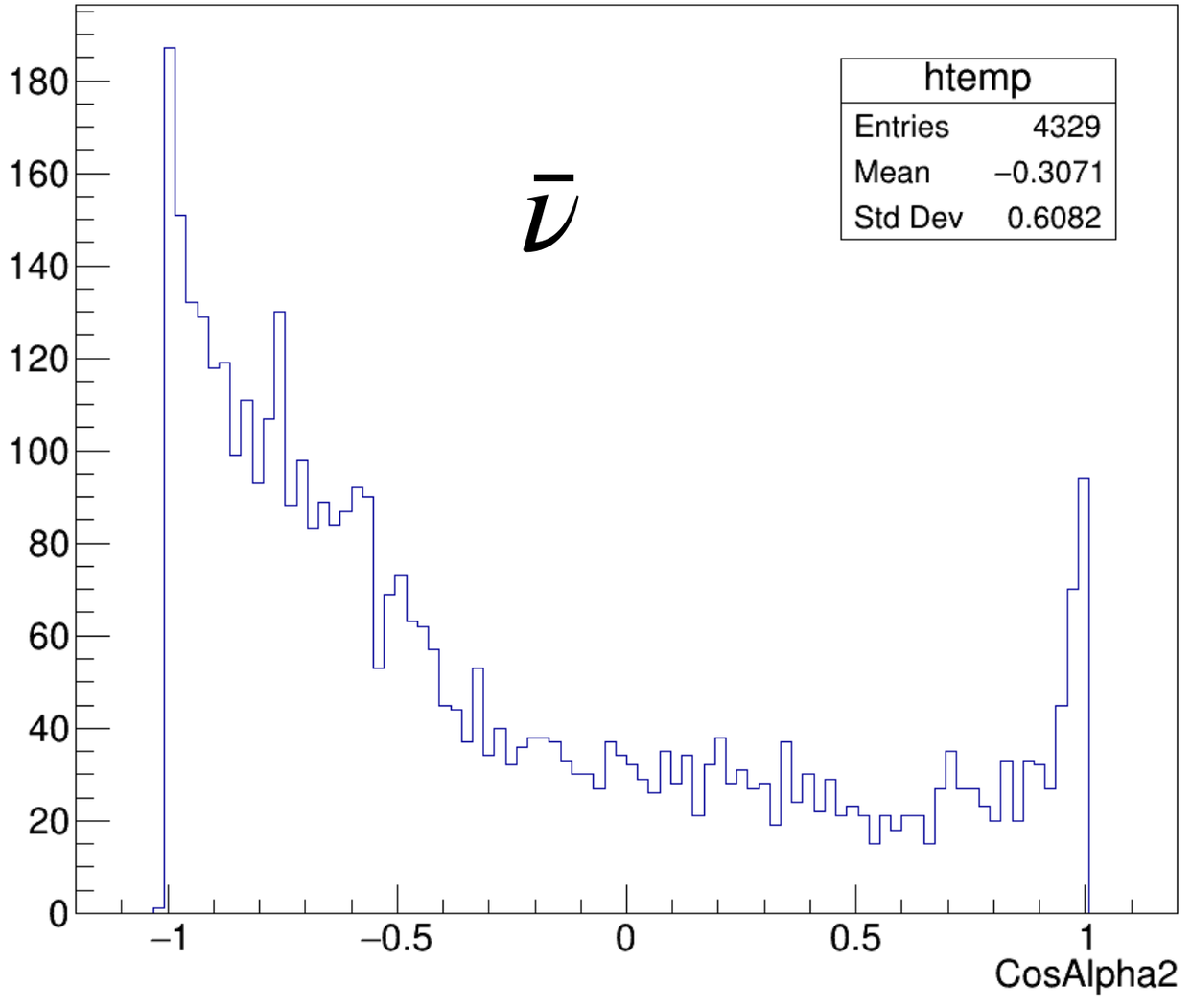
$\cos\alpha$ distribution



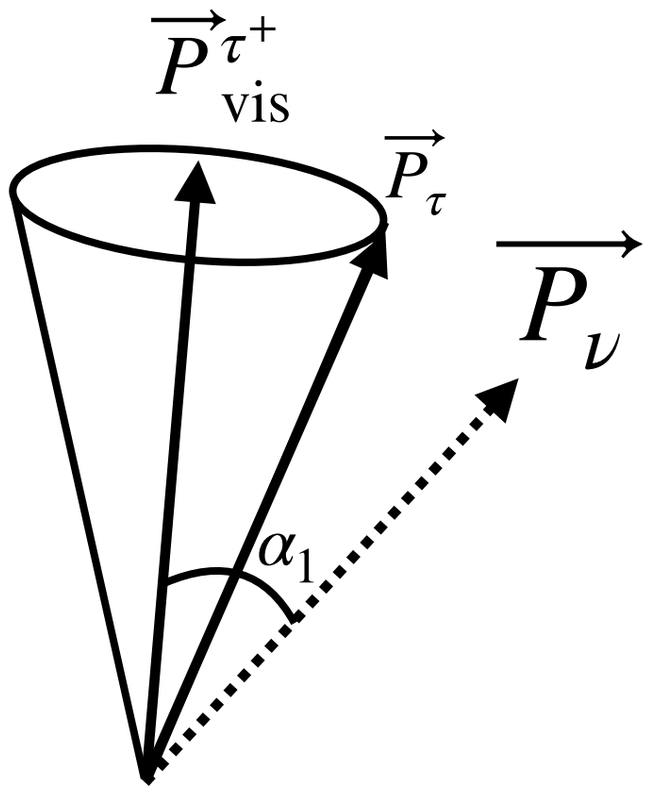
α :angle between $\overrightarrow{P}^{\tau^+}_{\text{vis}}$ and $\overrightarrow{P}_{\nu}$

whole tau-tau sample

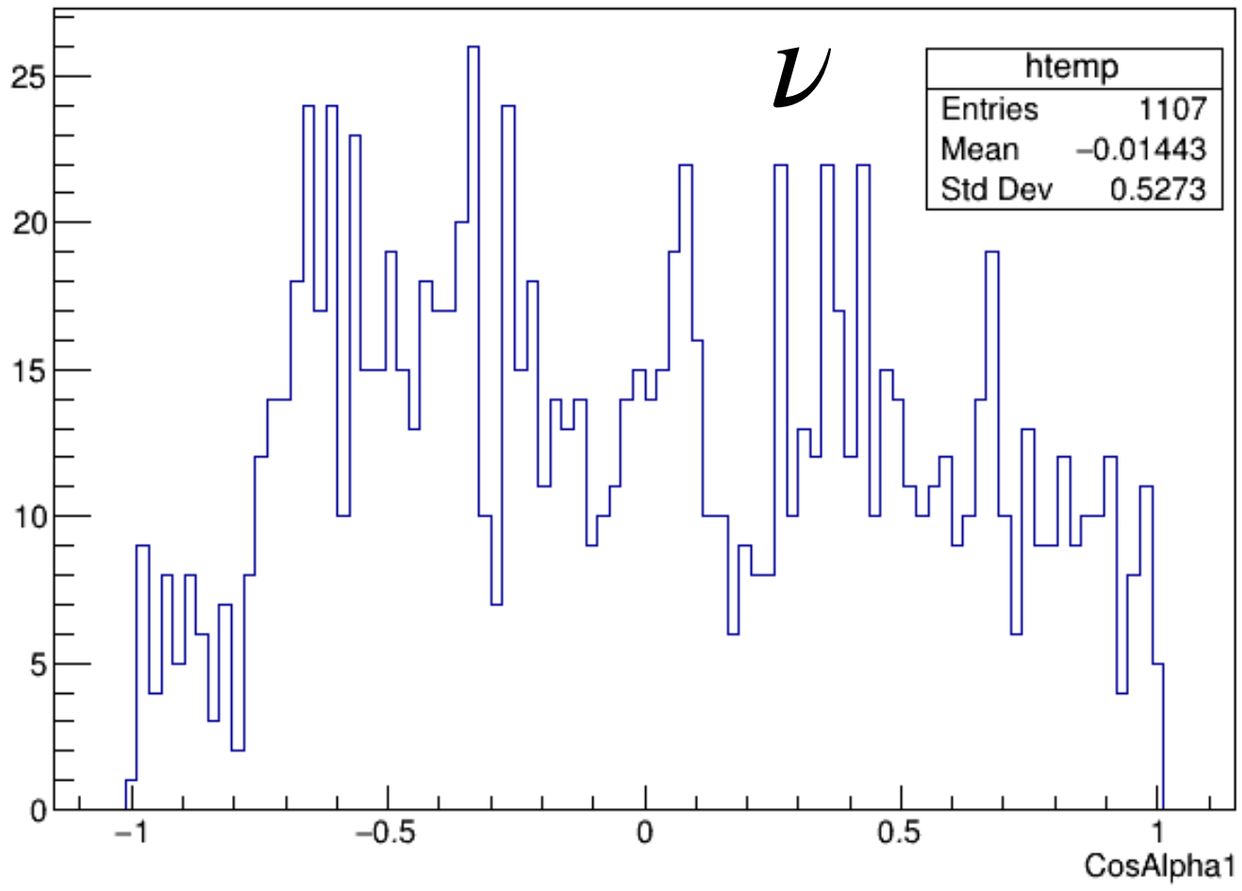


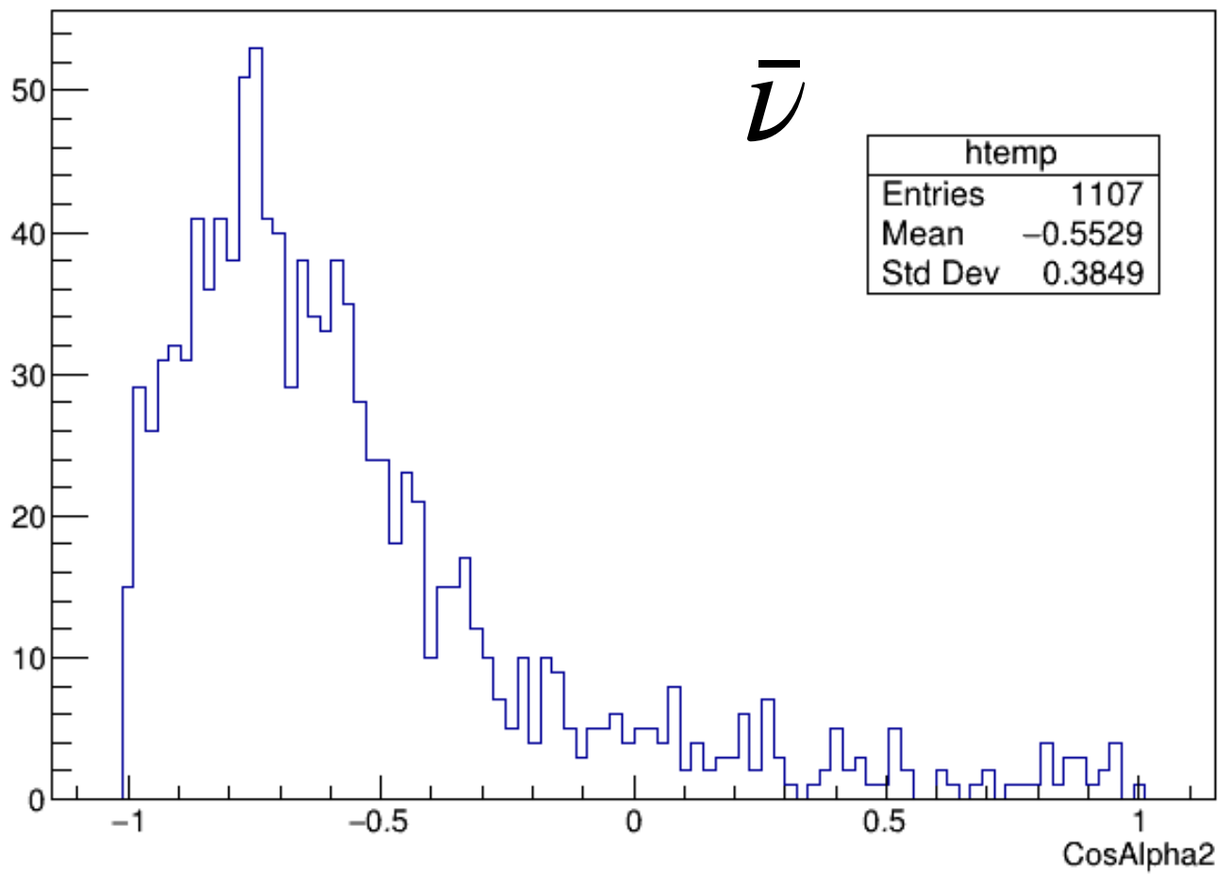


$\cos\alpha$ distribution

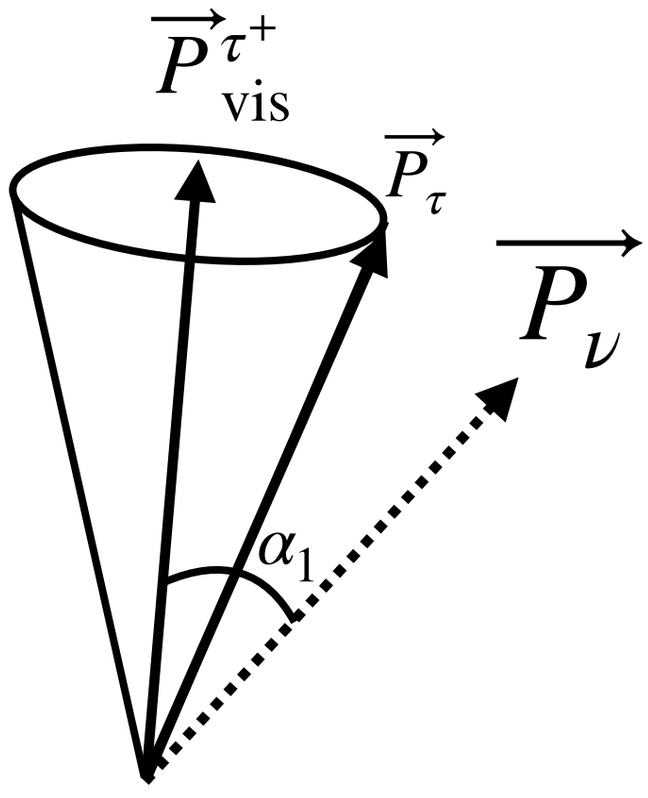


$m_{\tau\tau} > 240$ GeV

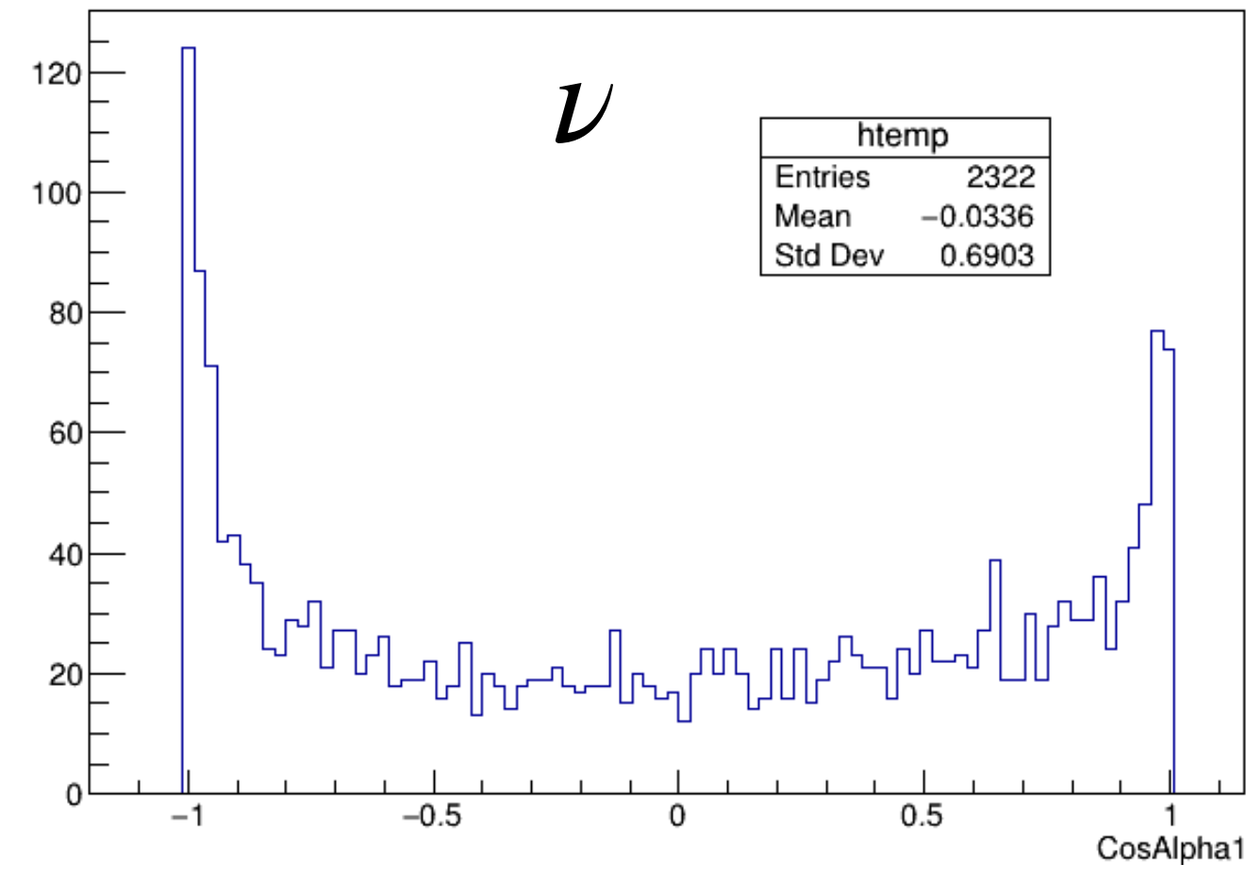


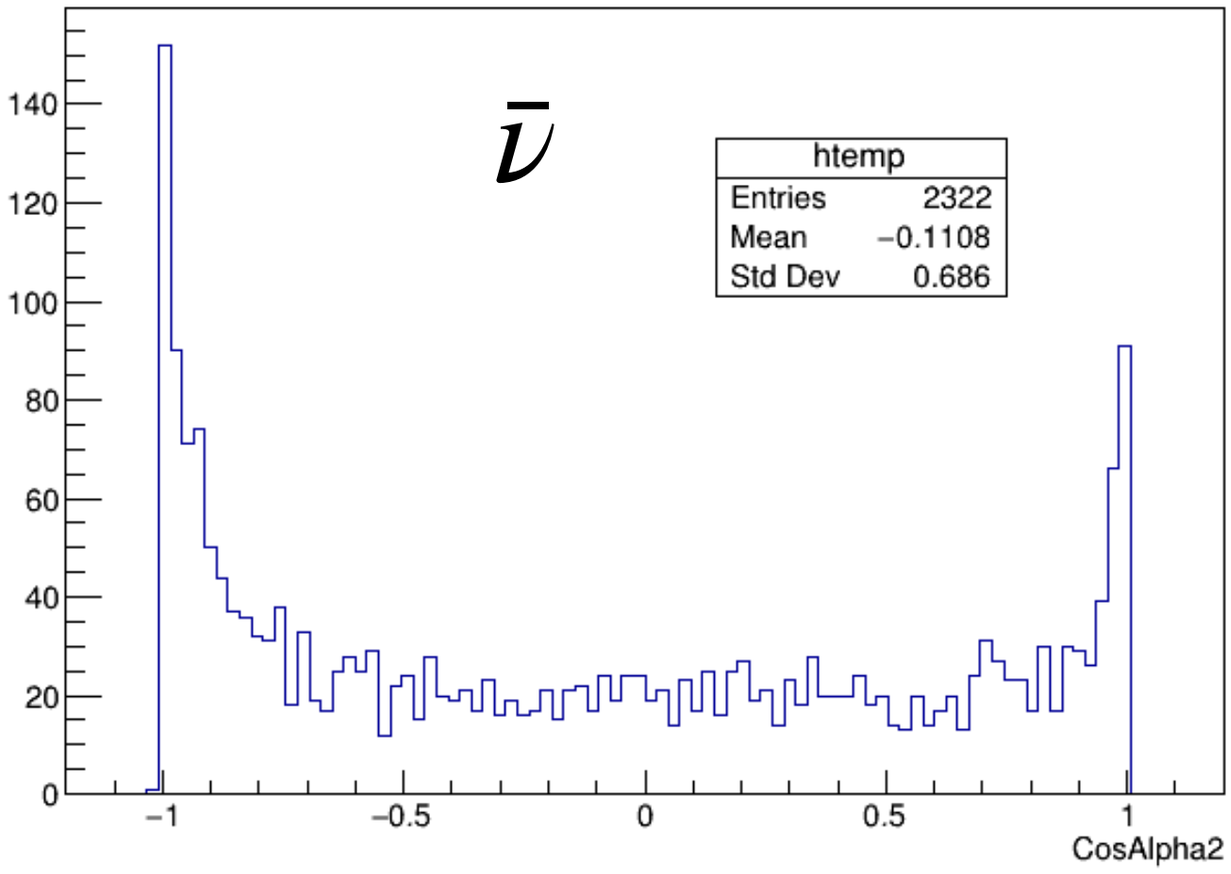


$\cos\alpha$ distribution

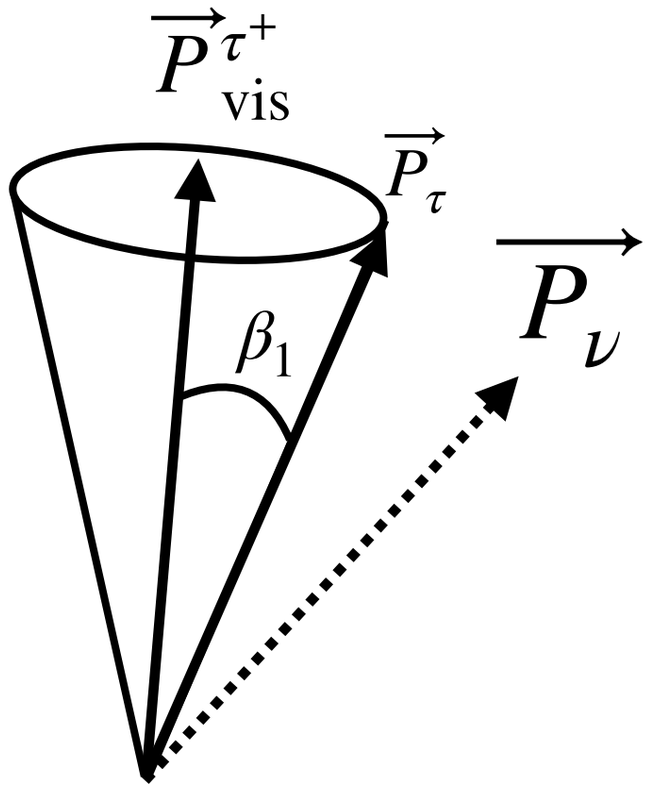


$m_{\tau\tau} < 100$ GeV

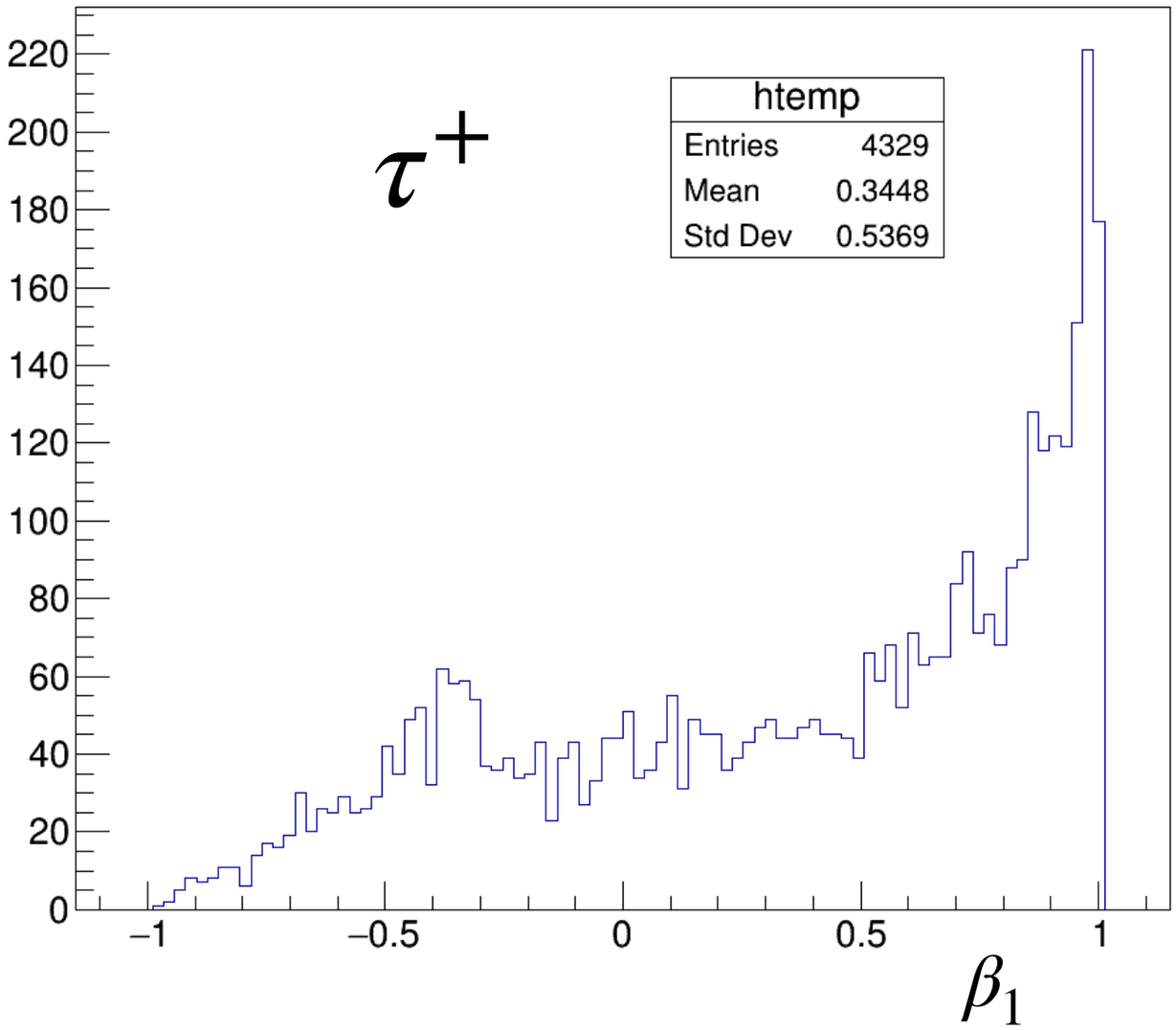


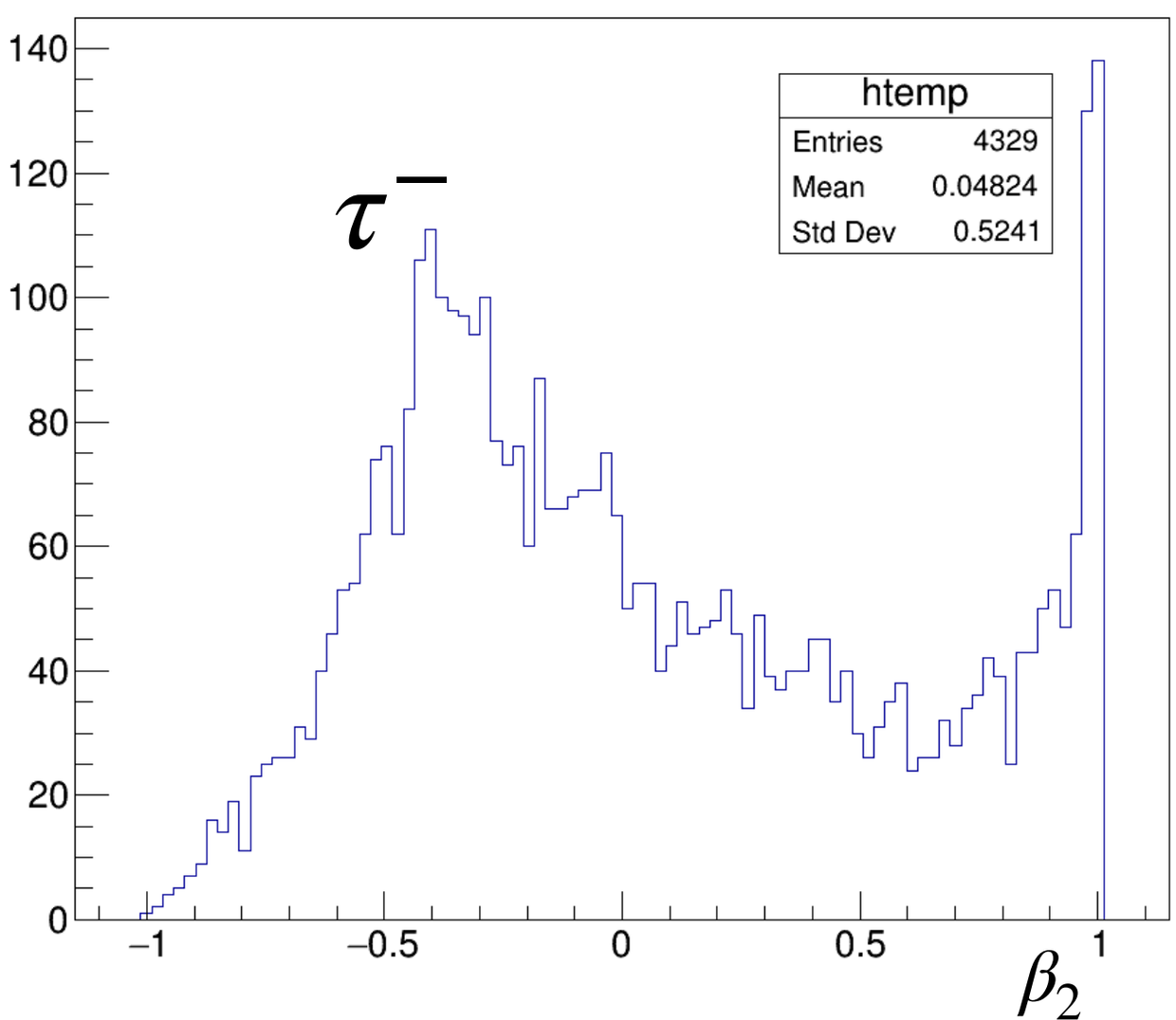


$\cos\beta$ distribution

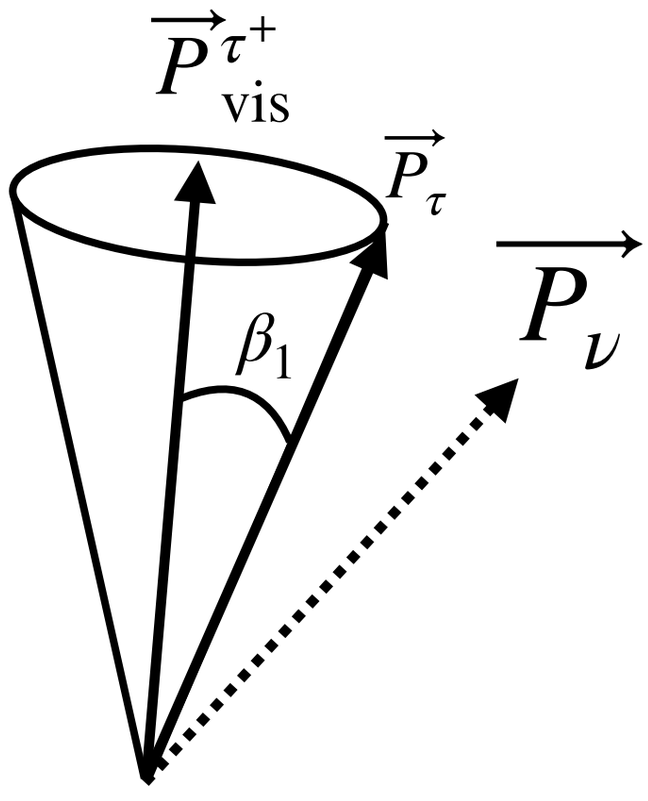


whole tau-tau sample

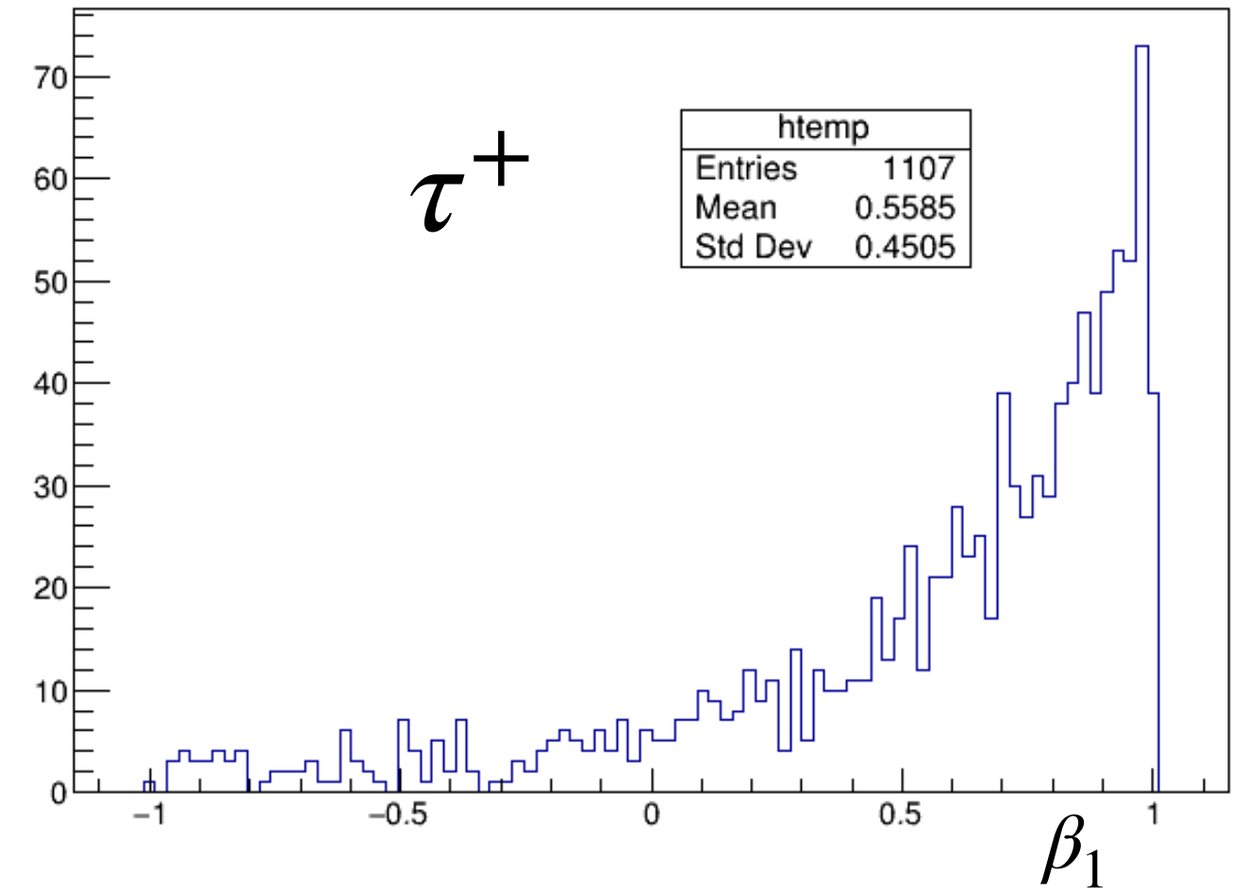


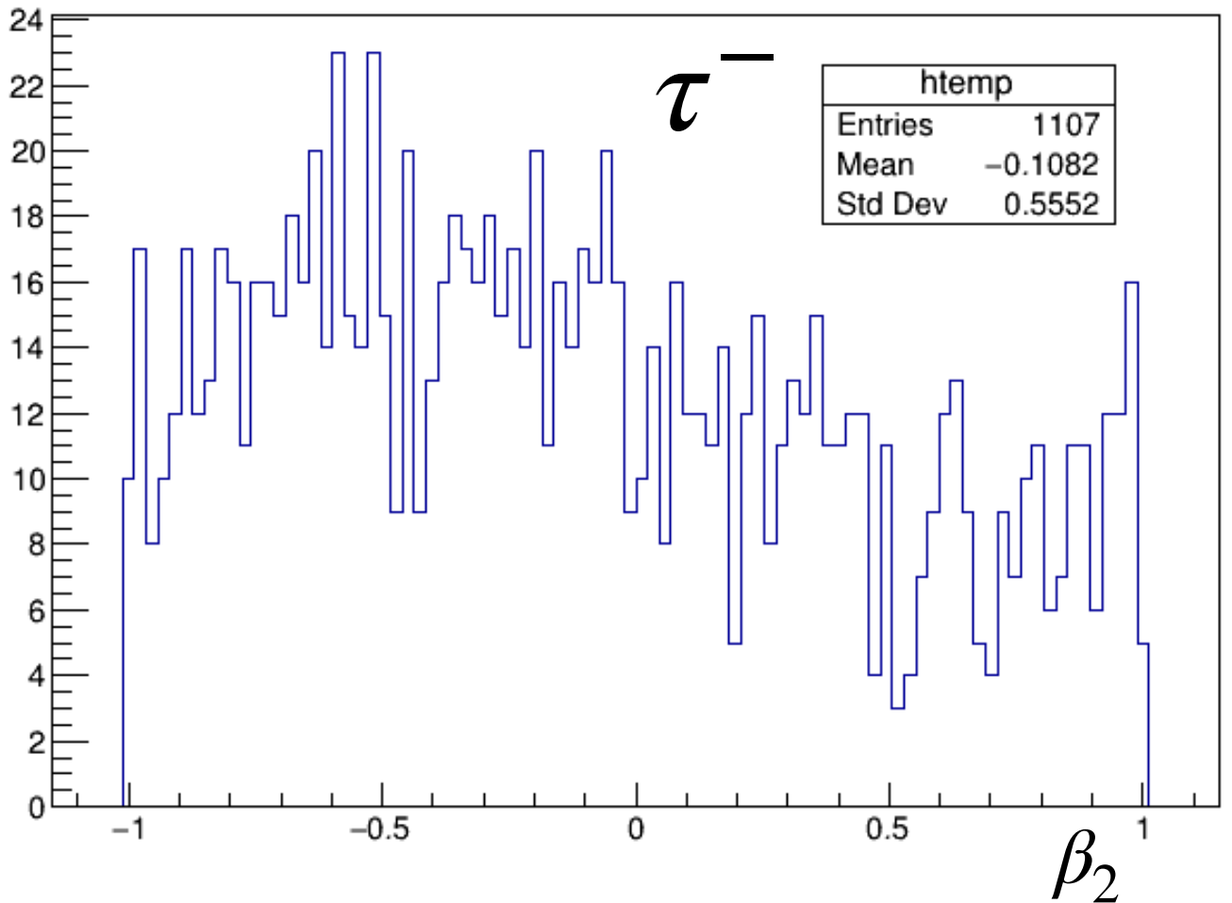


$\cos\beta$ distribution

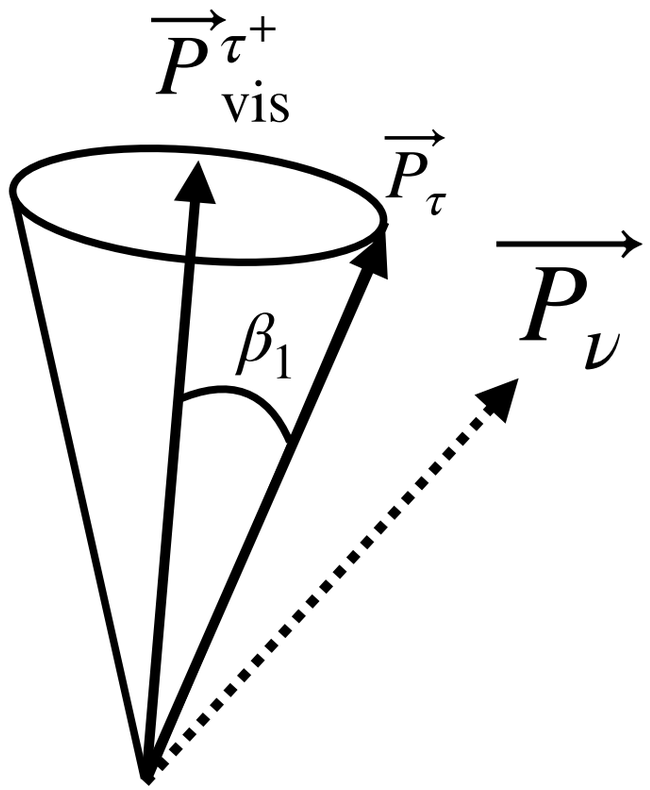


$m_{\tau\tau} > 240$ GeV

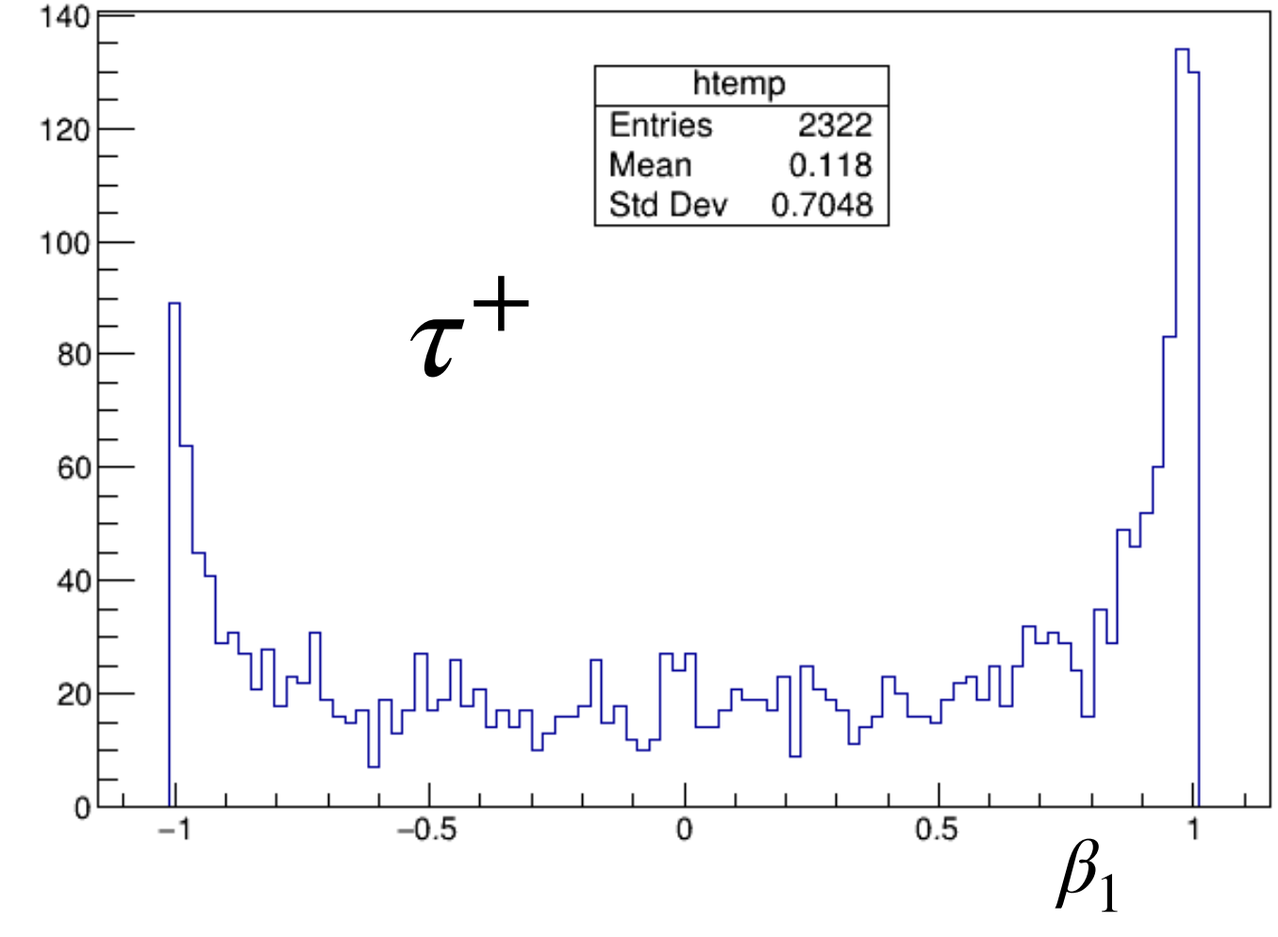


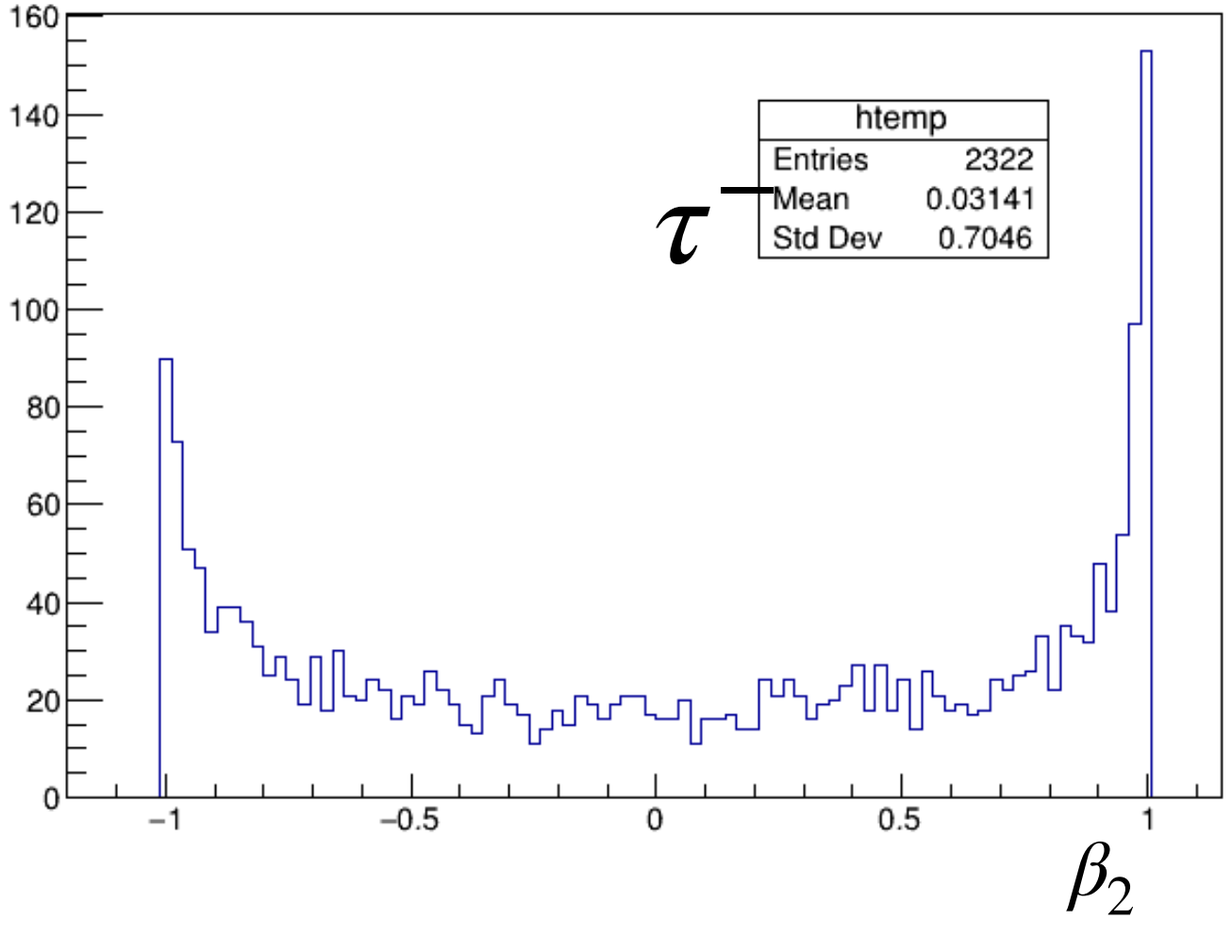


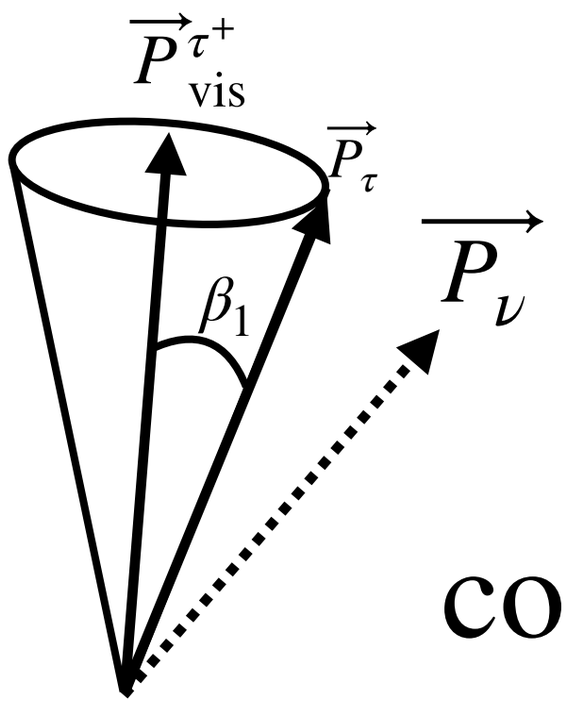
$\cos\beta$ distribution



$m_{\tau\tau} < 100$ GeV



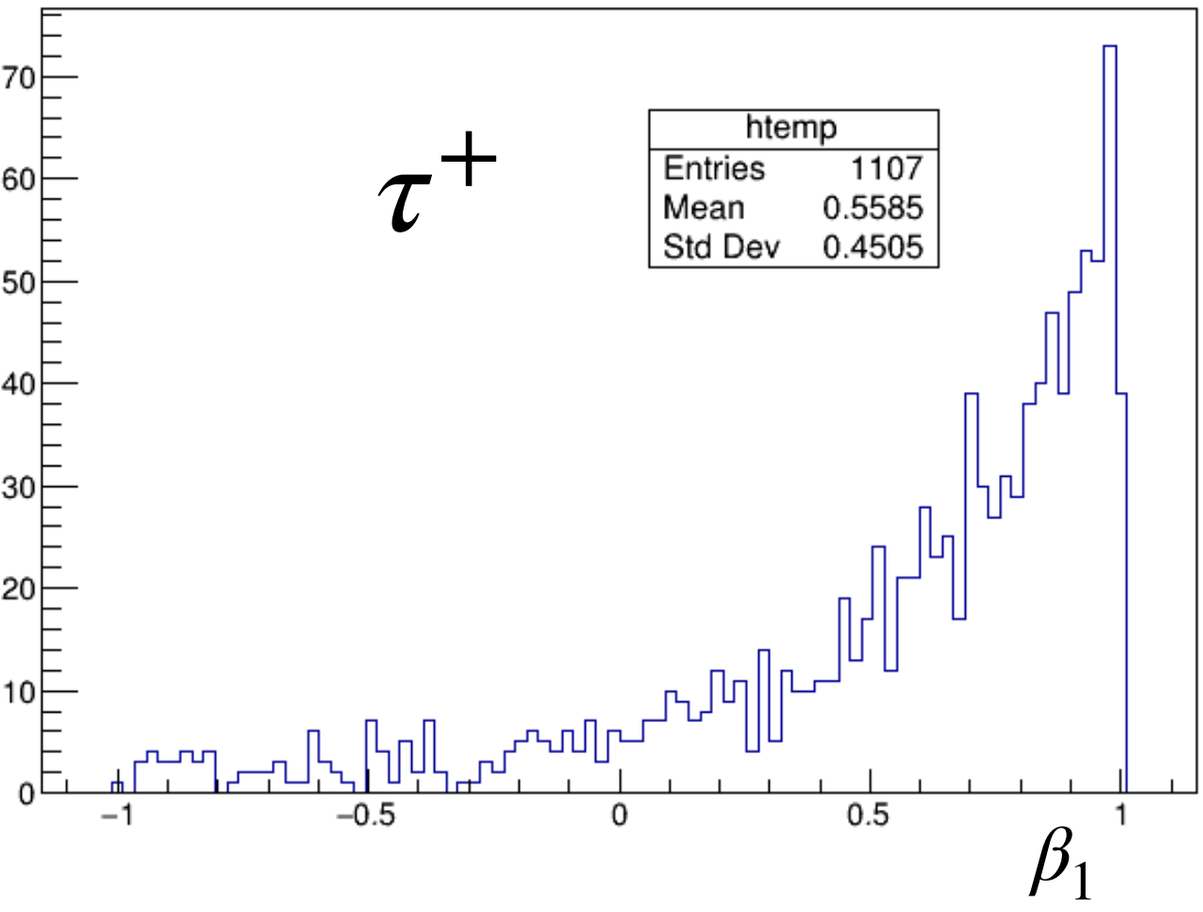


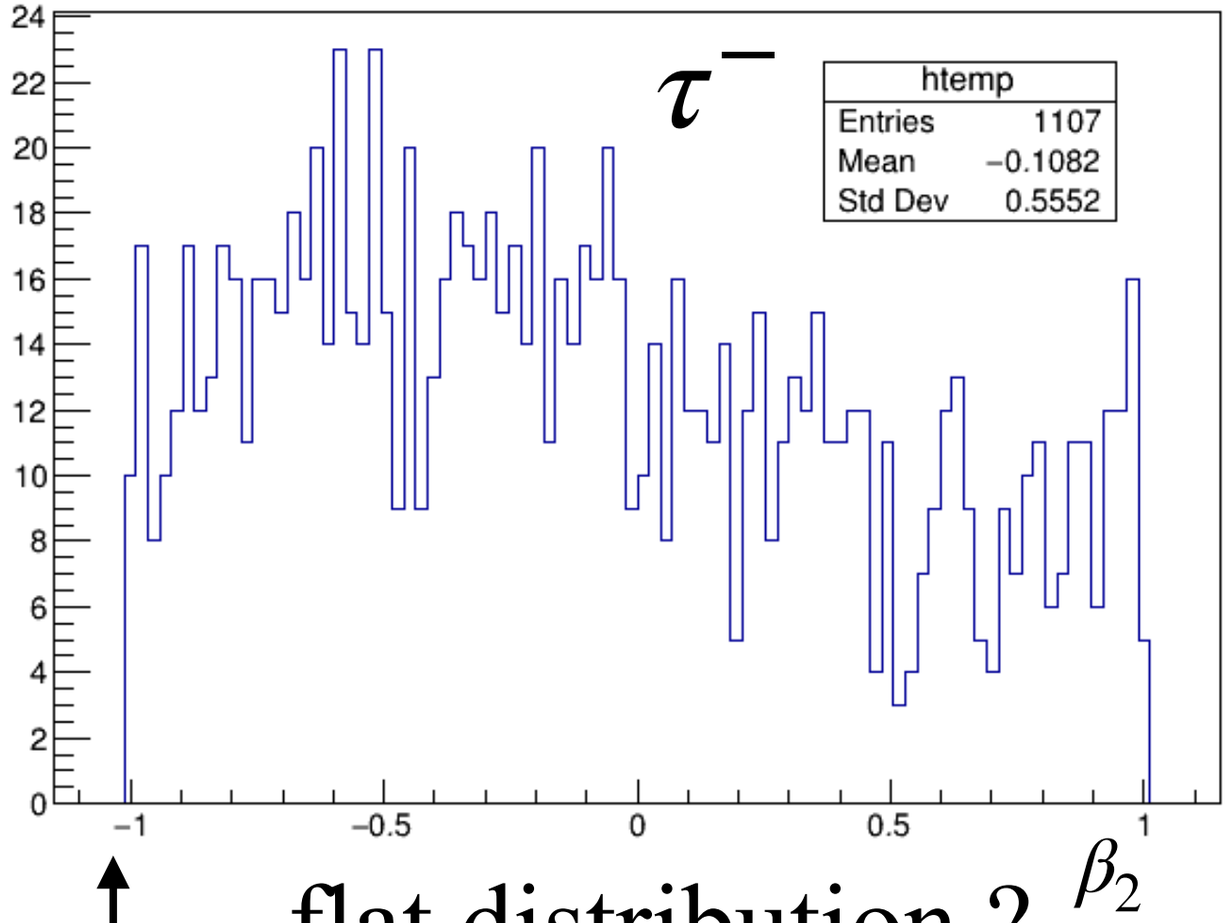


$\cos\beta$ distribution

$m_{\tau\tau} > 240$ GeV

$\cos\beta$ should be close to 1

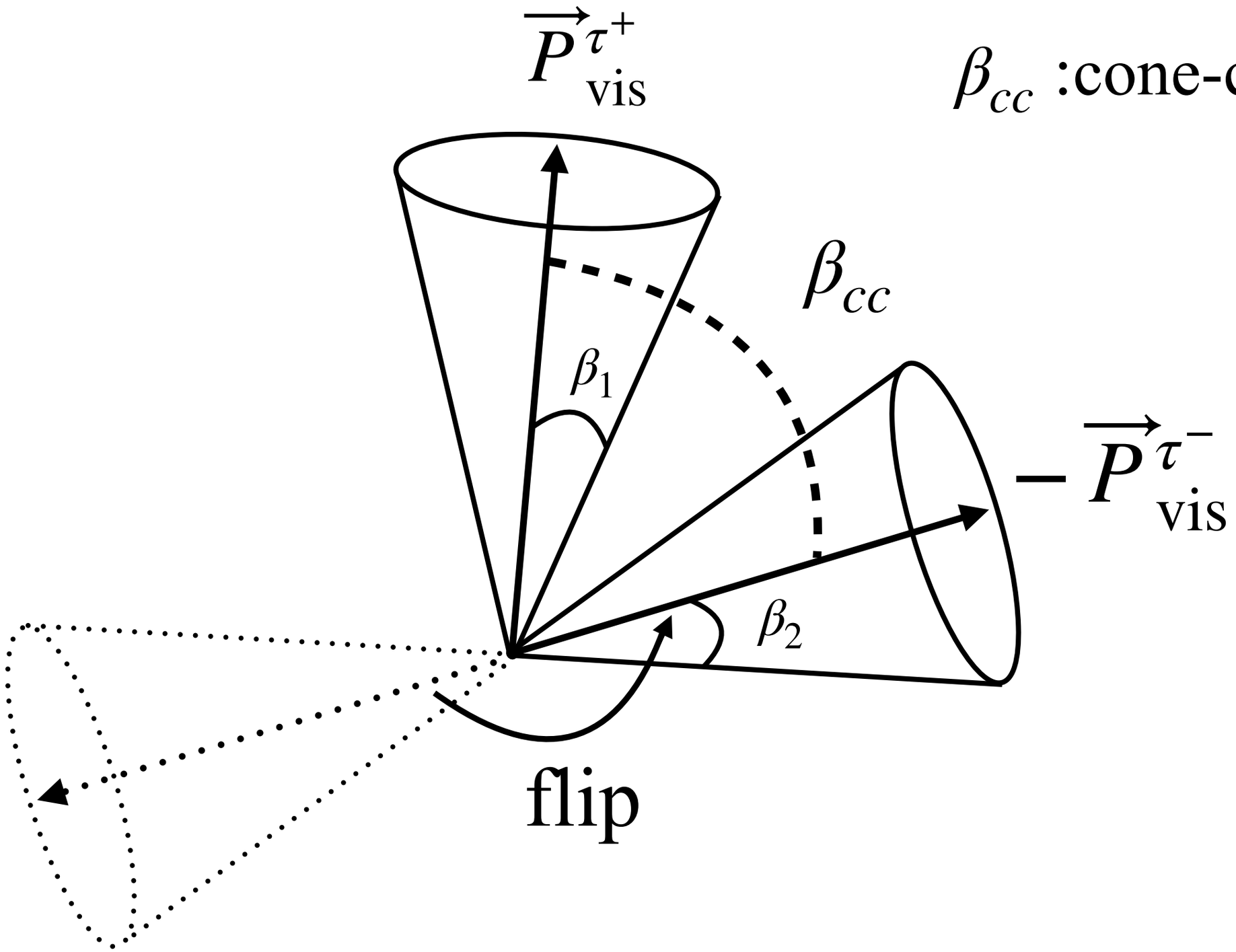




flat distribution ?

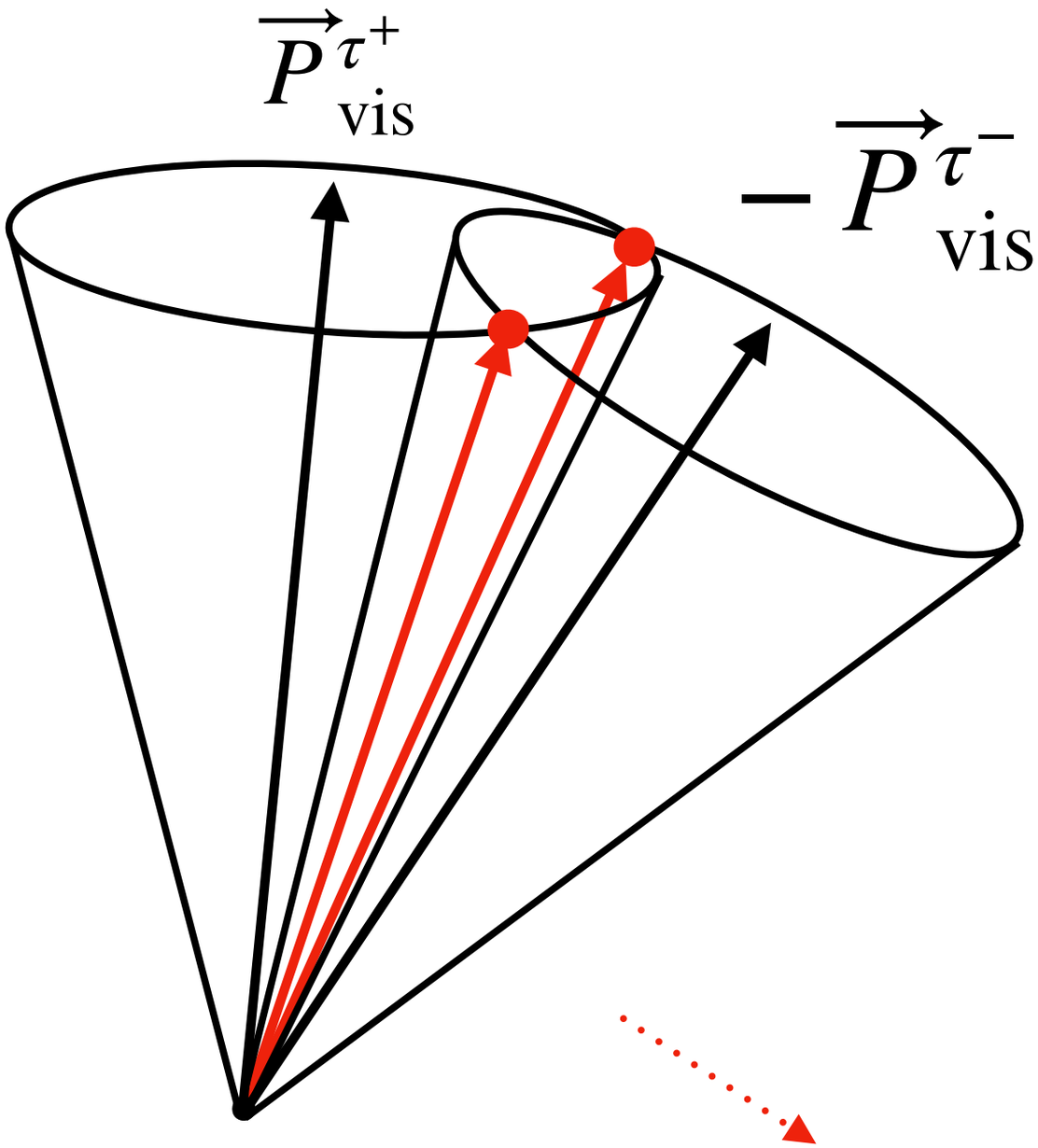
tau is going to backward …

Flip one of tau visible daughter



Find solution

$\longrightarrow \tau$-τ is back-to-back



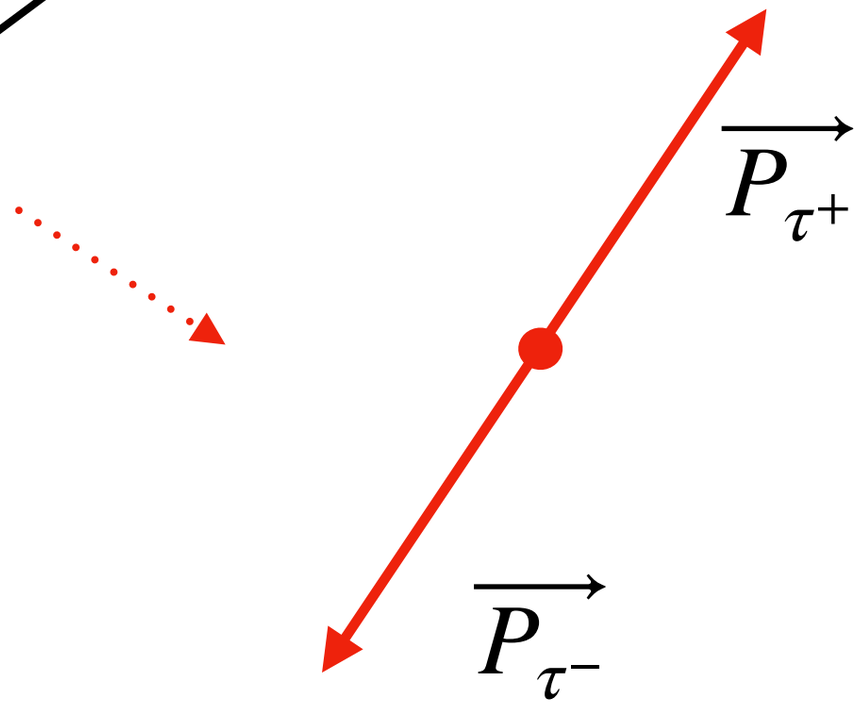
if

$$\beta_1 + \beta_2 > \beta_{cc}$$

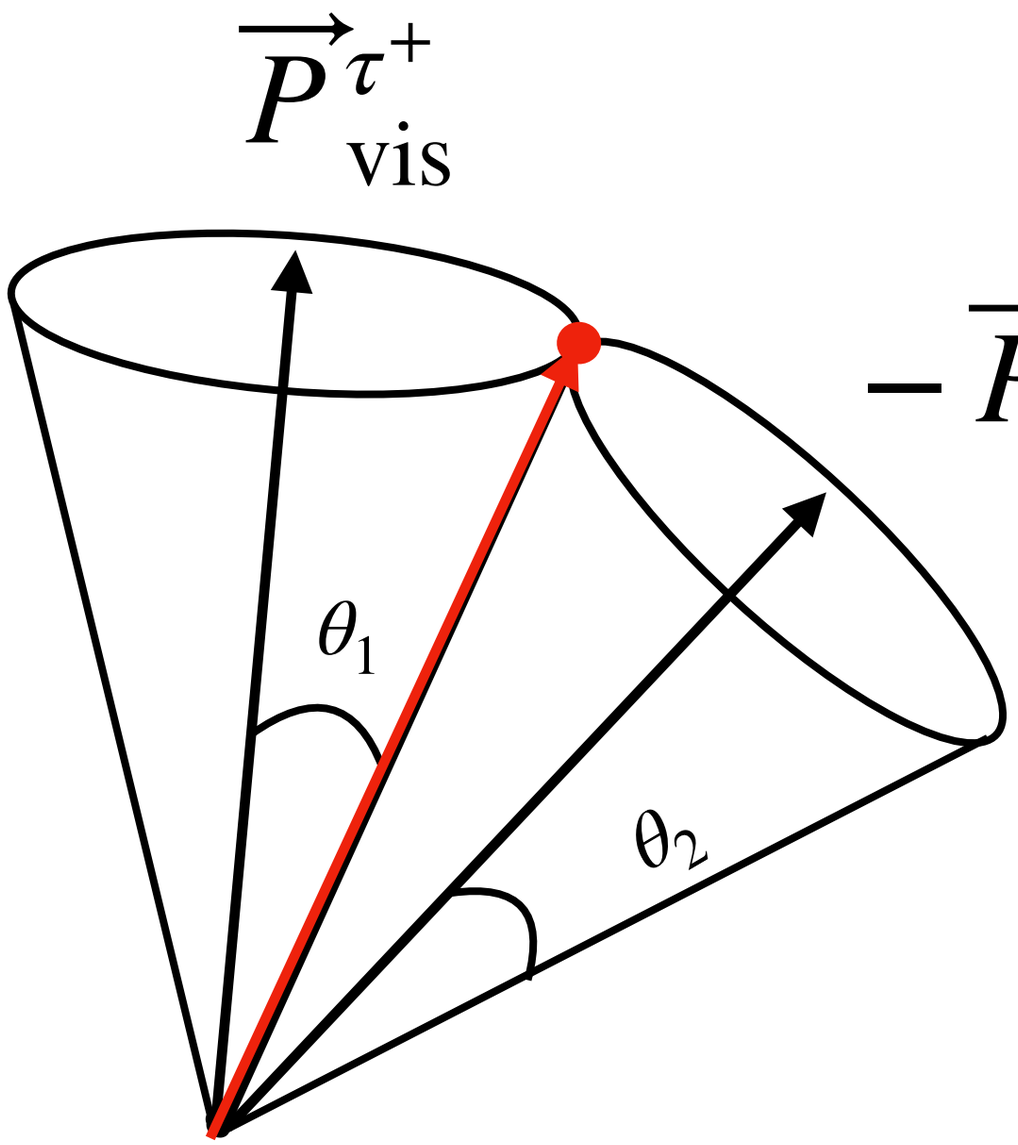
then

2 overlapped points

$\longrightarrow$2 possible solutions



Find solution



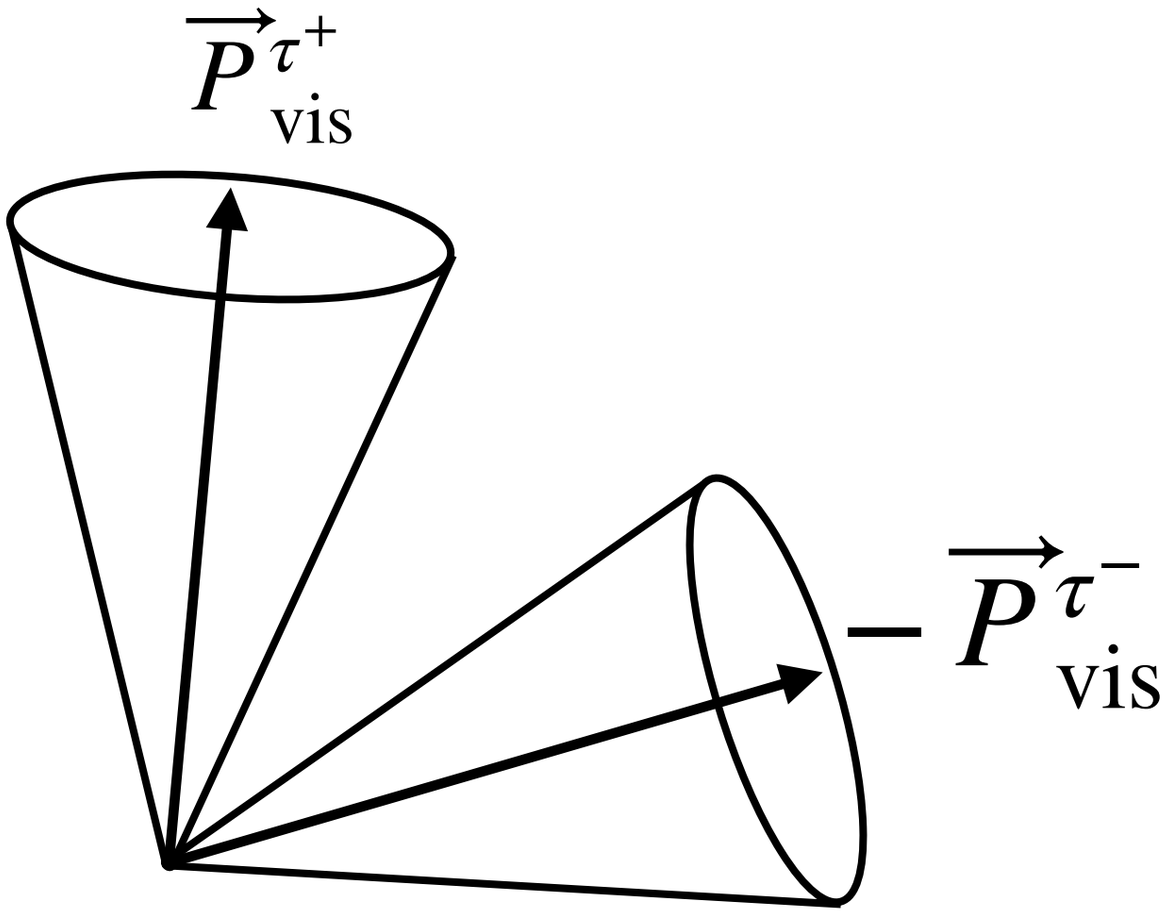
if

$$\beta_1 + \beta_2 = \beta_{cc}$$

then

1 possible solution

Find solution



if

$$\beta_1 + \beta_2 < \beta_{cc}$$

then

NO solutions