

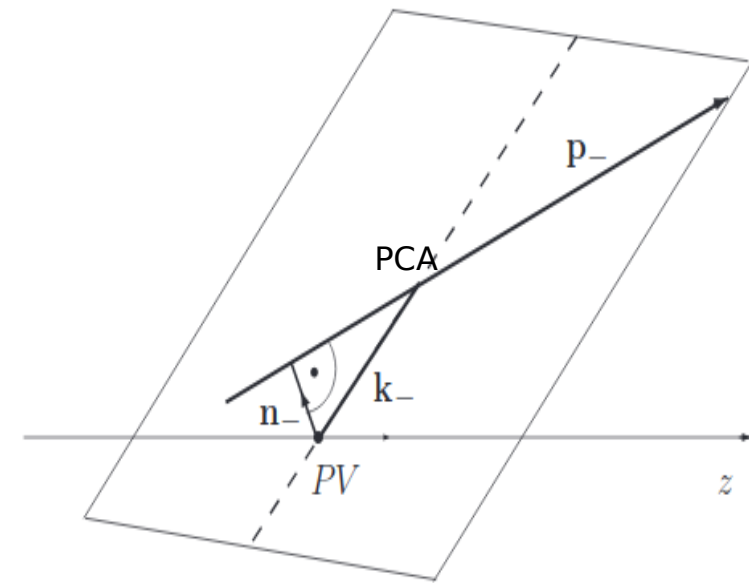
Studies on Refitted Vertex (Contd..)

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Measurement of Impact Parameter Vector

- We consider 1 prong $0\pi^0$ decay of tau. (fig.1 $\tau^- \rightarrow \pi^- \nu_\tau$)
- We linearly extrapolate from the pion production vertex $PCA(x_1, y_1, z_1)$ to the direction of pion momenta p_- .
- The new vector is,
$$x = x_1 + t \cdot p_x$$
$$y = y_1 + t \cdot p_y$$
$$z = z_1 + t \cdot p_z$$
- The length of point PCA is,
$$(d_{PCA})^2 = (x_{PV} - x_1)^2 + (y_{PV} - y_1)^2 + (z_{PV} - z_1)^2$$
- The impact parameter values is when d_{PCA} will be minima.
i.e $\delta(d_{PCA}) = 0$. Which gives the value of “t” parameter,

$$t = (x_{PV} - x_1) \cdot p_x + (y_{PV} - y_1) \cdot p_y + (z_{PV} - z_1) \cdot p_z$$



The Impact parameter vector is,

$$\begin{aligned} n_x &= x_1 + t \cdot p_x \\ n_y &= y_1 + t \cdot p_y \\ n_z &= z_1 + t \cdot p_z \end{aligned}$$

Procedure

IP vector for gen_vertices

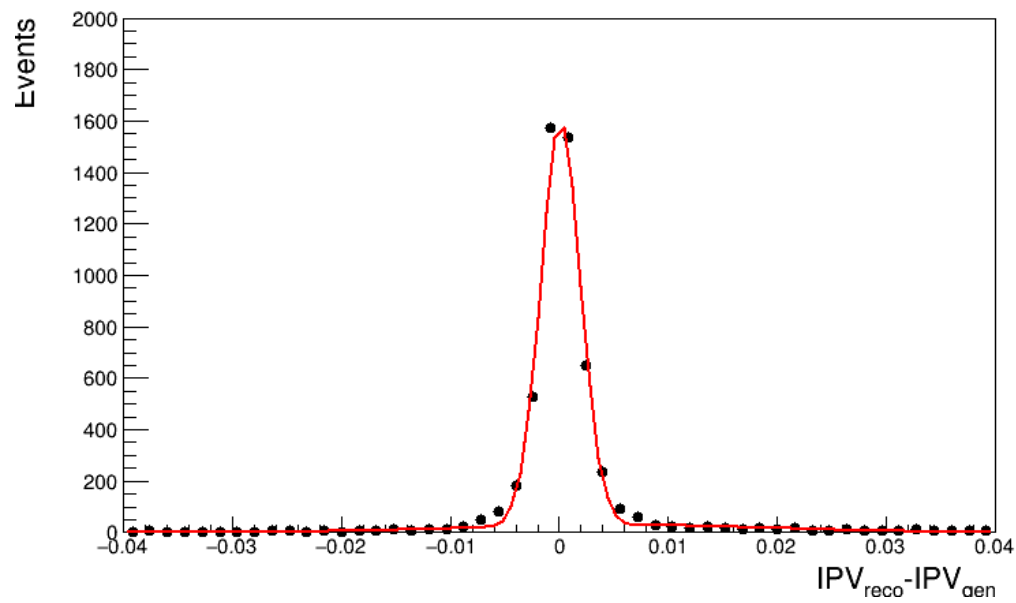
- Selecting pion from one prong decay of genTau, genPion vertices are consider as the PCA points.
And Higgs production vertices are used as PV.
- Extrapolate in the direction of gen pion momenta. Hence the IPV is calculated.

IP vector for reco(& refitted)_vertices

- PCA information and PV(refitted vertices) are stored in the Ntuple.
- Single pion momentum taken from reco Taus decay that matched to genlevel tau that decay to 1prong.
- Extrapolate in the direction of pion momenta. Hence the IPV is calculated.

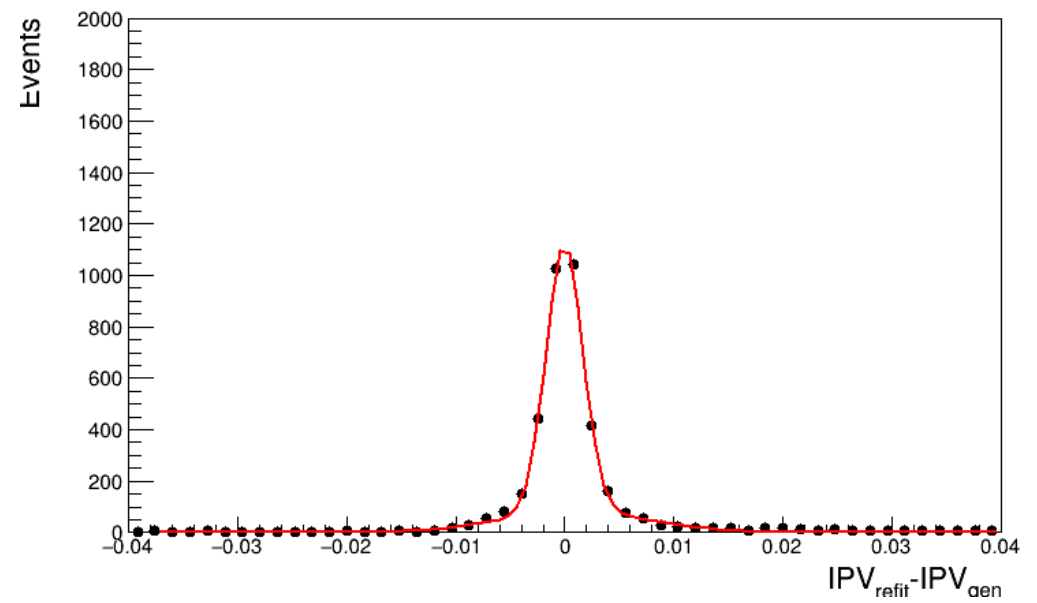
Plots

From Reconstructed PV



$$\sigma_1 = 9.99390e-03$$
$$\sigma_2 = 1.30244e-03$$

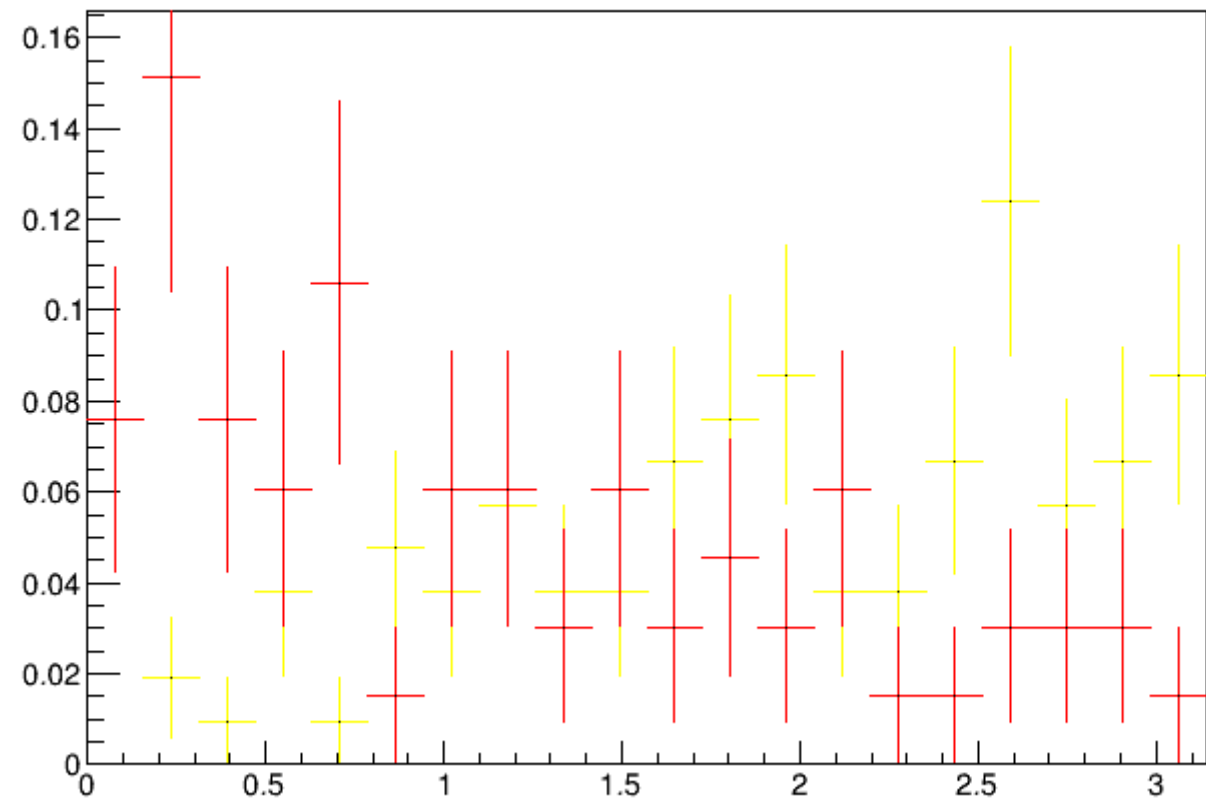
From Refitted PV



$$\sigma_1 = 4.75699e-03$$
$$\sigma_2 = 1.20396e-03$$

CP angle measurement

- We are tried to calculate CP angle from the IPV from reconstructed and from refitted vertex.
- Because the low statistics root file, it is hard to see results.



SUMMARY

- **Studied and compared IPV from reconstructed and refitted vertices.**
- **IPV is improved in refitted case.**