

KTeV

Study of $K_L \rightarrow \pi e \nu e$

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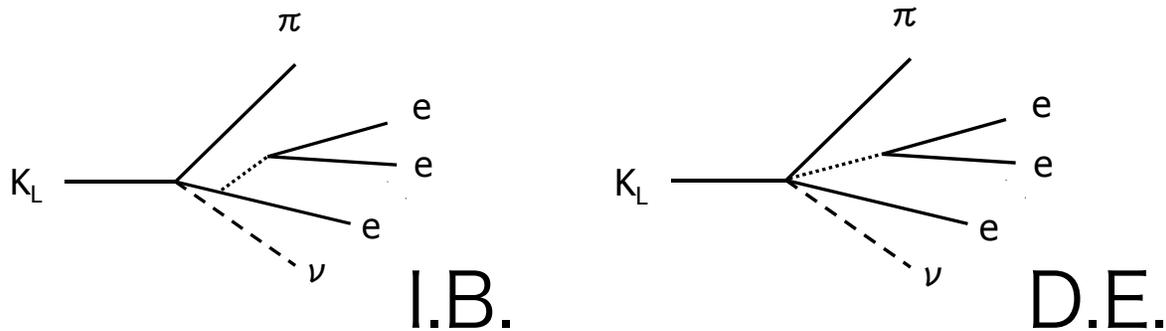
Osaka university

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at Fermilab.

Last meeting

- Interesting of $K_L \rightarrow \pi e \nu ee$



- Not yet Monte Carlo simulation.
- VTXZ e^+e^- were distributed into under stream. -----Are distributed events from πeee events or not.

$K_L \rightarrow \pi e \nu e e$ '97 winter

- 4Track trigger
- $0.95 < E/p < 1.05$ E/p for electron track
- $E/p < 0.8$ for pion track
- One pion and three electrons
- Less than 0.02 Pion-probability for electron(TRD)
- Greater than 0.1 Pion probability for pion
- One of track going into Beam hole track was allowed for an electron
- $- 0.004 \sim 0.048 (\text{GeV}/c)^2 \quad (P_{\parallel \nu}^*)^2$

Strategy of MC

1. Generate M_{γ^*} according to $1/M_{\gamma^*}$
2. Make the flat phase space events using GENBD8 giving $M_{\gamma^*}, M_{\pi}, M_e, M_{\nu}$
3. Calculate the squared amplitude of massive radiative Ke3 as a function of 4-momentum
4. Convert massive gamma into e^+e^- pair according to Kroll-Wada
5. Choose the events according to the squared amplitude

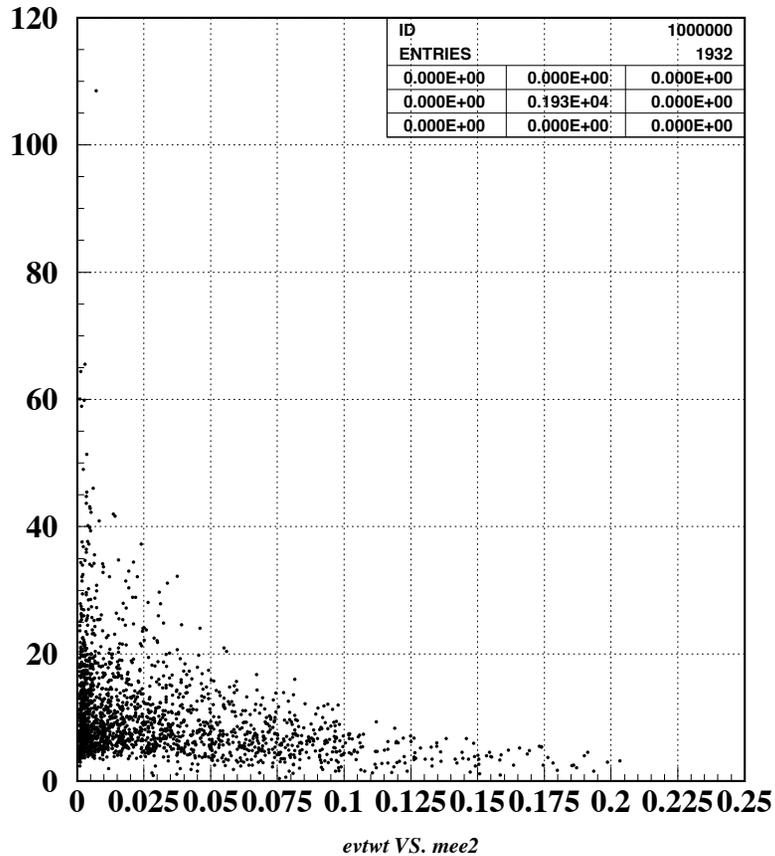
Event weight divergences

- We need to make enough number of events in order to make good event weight(EVTWT) distribution and we need to assign the value of the MAXIMUM-EVTWT larger than every EVTWT. But in my case large number of generation makes events with large EVTWT. Therefore I can not obtain good EVTWT distribution yet.

Amplitude of radiative $K\ell 3$

- B.Holstein's amplitude in term of Chiral perturbation theory
- The amplitude is referred in the PRD paper about Radiative $K\ell 3$ decay by KTeV
- The amplitude has two unphysical parameter obtained by experiment ($L_9=0.0074$, $L_{10}=-0.0060$ by J.Gasser and H.Leutwyler)
I expect that we can refer about these values after all of my analyses.

EVTWT v.s. Mass of e^+e^-

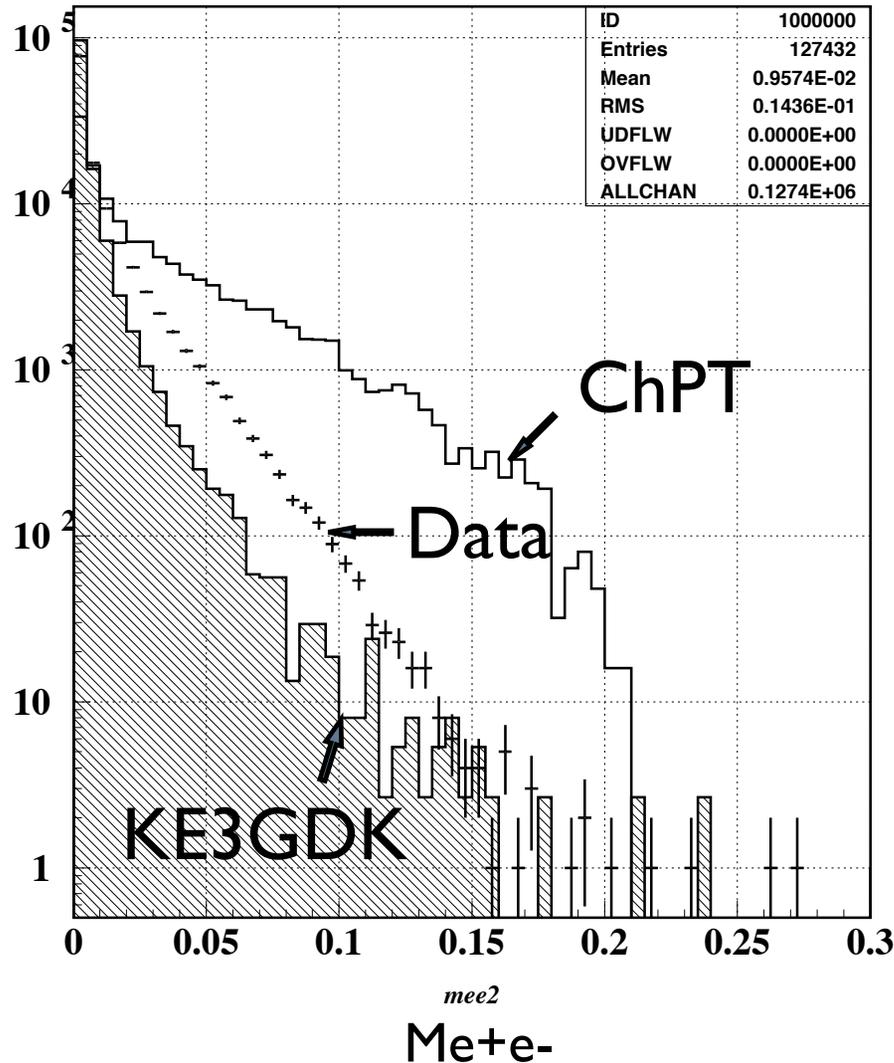


EVTWT vs. M_{ee}

- Number of event should arise with EVTWT but.....
- Some events have both larger EVTWT and enough larger mass than two Me, therefore it not problem of IR divergence of gamma.

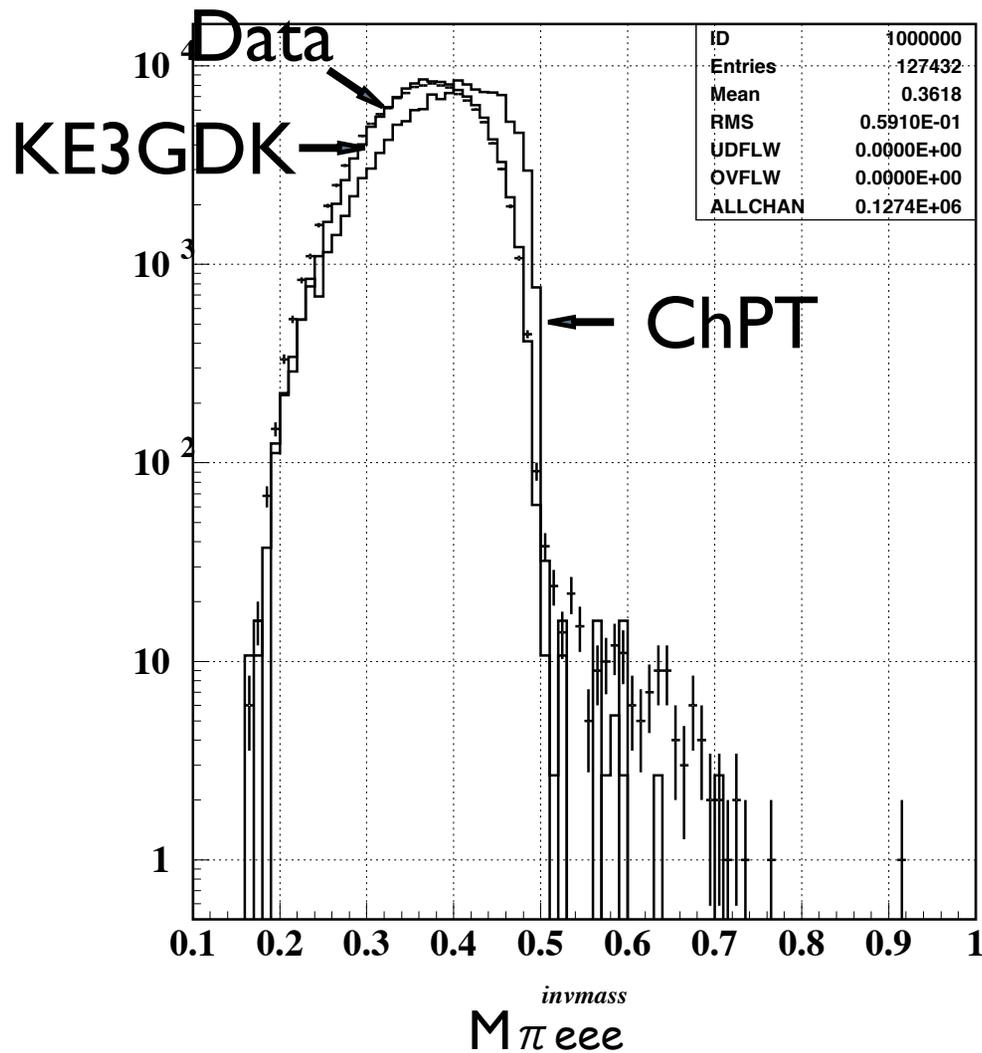
- The distributions of MC shown here very lack accuracy but comparing with MC data using KE3GDK which has only small mass of e^+e^- pair can be reference because My MC still lacks small mass of e^+e^- pair due to the problem of divergence of amplitude.

$M_{e^+e^-}$ of Data and MC



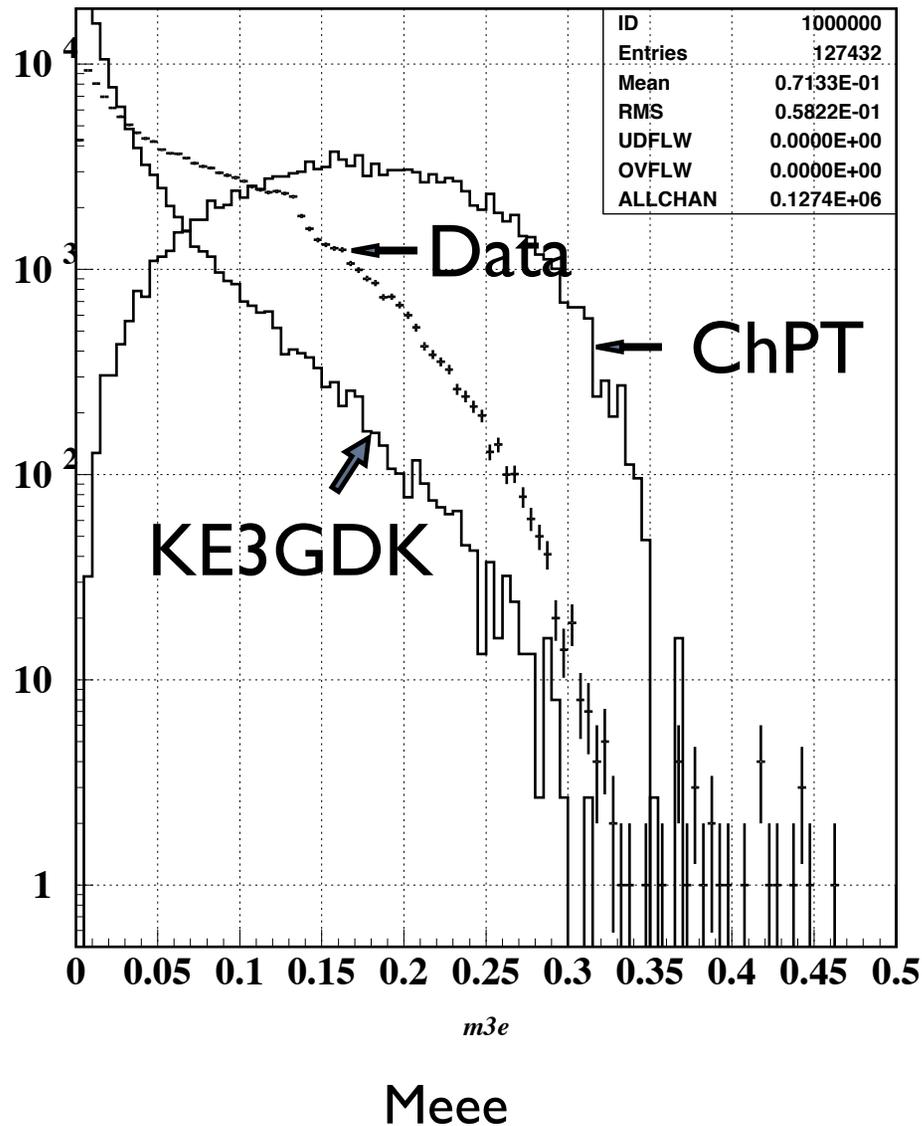
- MC by ChPT has too large mass of e^+e^- pair
- MC by KE3GDK has not large mass of e^+e^-

$M_{\pi eee}$ of Data and MC



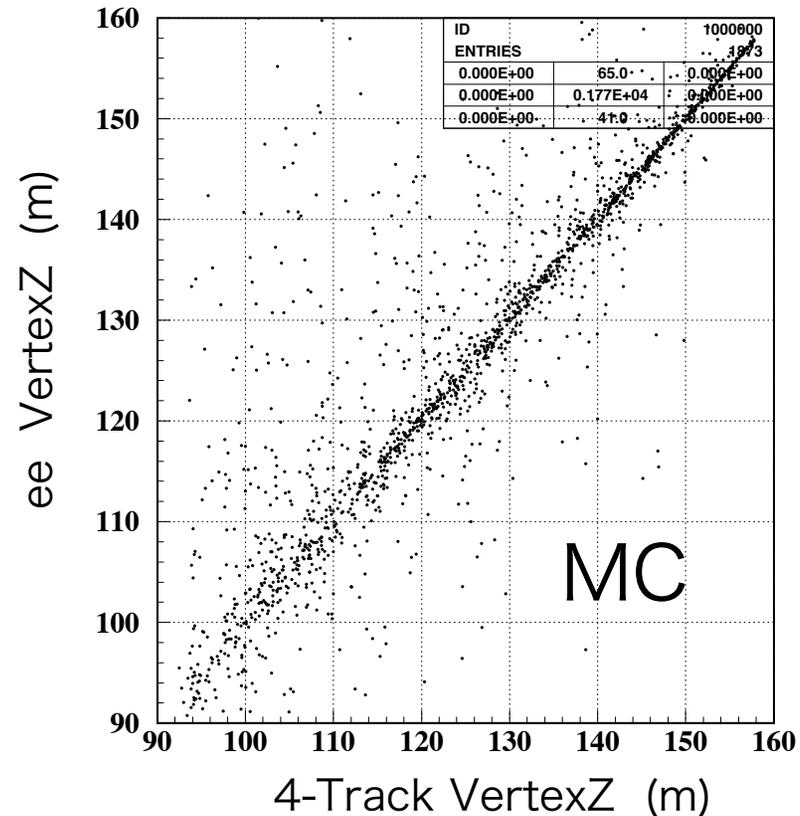
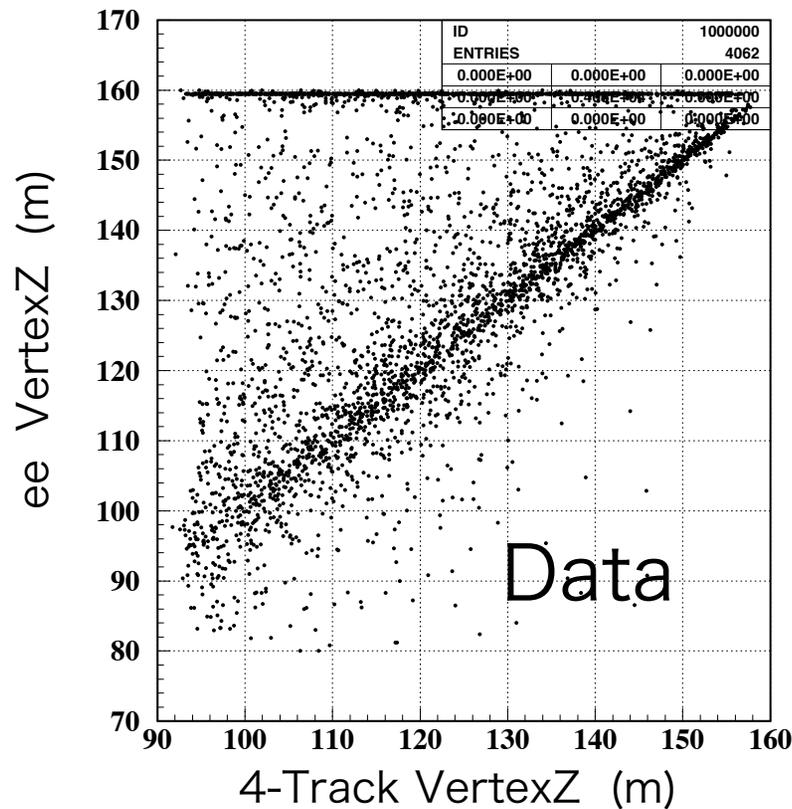
- $M_{\pi eee}$ by MC using KE3GDK is comparable but MC following ChiPT shifts to the heavier side

M_{eee} of Data and MC



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- MC by ChPT has too large mass of 3 electron
- MC by KE3GDK has not large mass of 3 electron

Events distributed into under stream



We can see same phenomenon in Data and MC, therefore in the distributed events $e+e^-$ pair emitted from 4-track vertex too.

Conclusion and next steps

Conclusion

- Events which VTXZee are distributed into down stream are also π eee events.

Next steps

- Fix the MC problem
- Estimate Back ground events
- Understand why VTXZee shift to under stream
- Analysis normalization mode