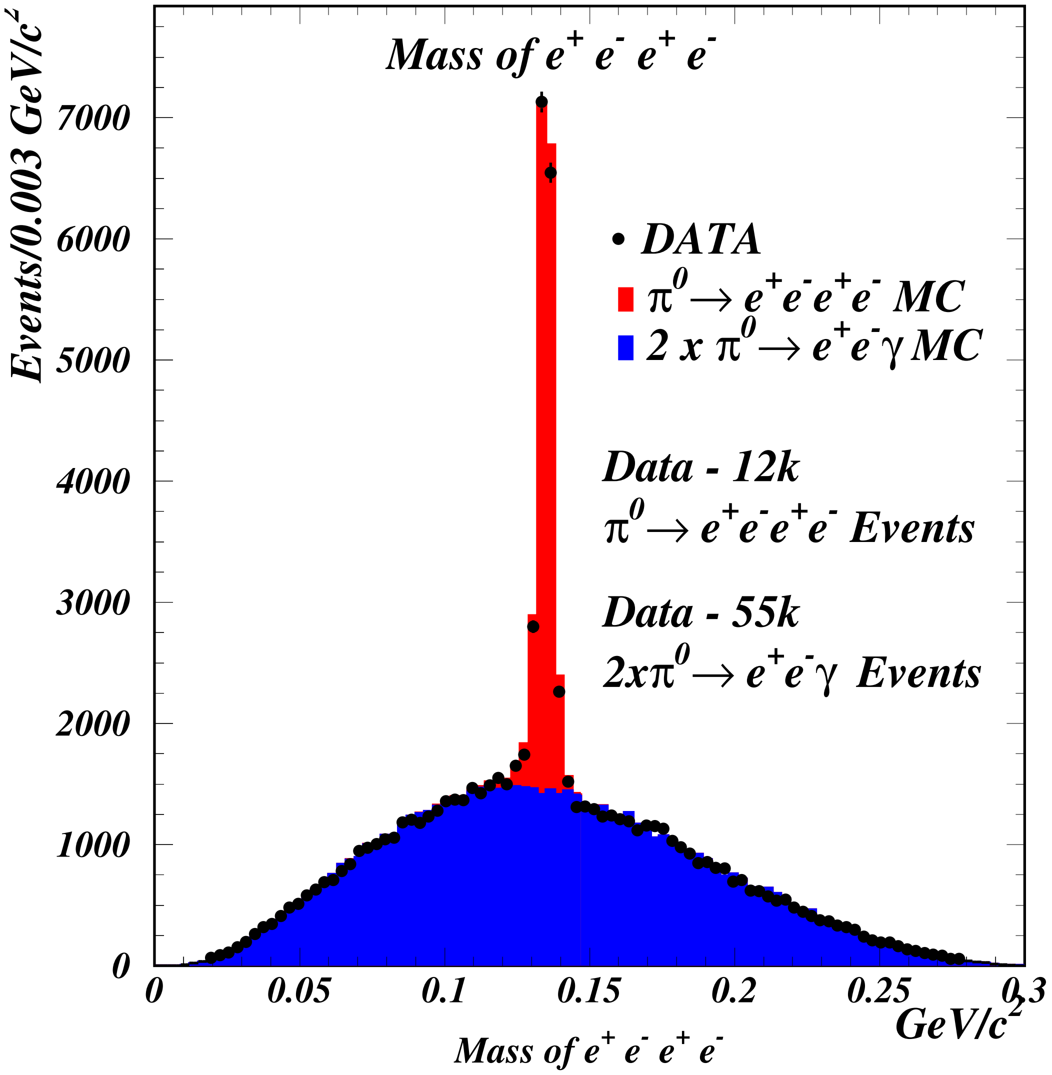
$\pi^0 \to e^+e^-e^+e^-$



KTeV PRELIMINARY Result:

$$\frac{\Gamma(\pi^0 \to e^+e^-e^+e^-)}{\Gamma(\pi^0 \to \gamma\gamma)} = (3.31 \pm 0.04(stat) \quad \pm \quad 0.22(sys)) \times 10^{-5}$$

or $\left(\frac{\Gamma(\pi^0 \to e^+e^-e^+e^-)}{\Gamma(\pi^0 \to e^+e^-\gamma)^2}\right)^{-1} = (4.389 \pm 0.053(stat) \pm 0.171(sys))$

Theory:

3.42×10^{-5} (Pure QED)

Miyazaki, Takasugi, Phys Rev. **D8** 2051 (1973)

Previous Measurement: 146 Events

Ratio of Branching ratios

The naive expectation would be:
Let's call p the probability of a photon to Dalitz decay.

$\pi^0 \rightarrow e^+e{-}e^+e{-}$ is proportional to p^2
$\pi^0 \rightarrow e^+e{-}\gamma$ is proportional to $2p$

So, $\frac{\Gamma(K_L \rightarrow \pi^0\pi^0_D\pi^0_D)}{\Gamma(K_L \rightarrow \pi^0\pi^0\pi^0_{DD})} = \frac{\Gamma(\pi^0 \rightarrow e^+e^-\gamma)^2}{\Gamma(\pi^0 \rightarrow e^+e^-e^+e^-)} = 4$

A measurement different from 4 contains physics.

KTeV measurement:

$$\left(\frac{\Gamma(\pi^0 \rightarrow e^+e^-e^+e^-)}{\Gamma(\pi^0 \rightarrow e^+e^-\gamma)^2}\right)^{-1} = (4.389 \pm 0.053 \quad (stat) \quad \pm 0.171(sys))$$