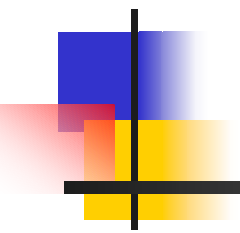


Introduction to the E391a

E391a Collaboration

High Energy Accelerator Research Organization, **KEK, Japan**

***J**oint **I**nstitute for **N**uclear **R**esearch (Dubna),* **Russia**

Department of Physics, **Kyoto University, Japan**

***N**ational **D**efense **A**cademy of **J**apan,* **Japan**

Department of Physics, **National Taiwan University, Taiwan**

Department of Physics, **Osaka University, Japan**

Department of Physics, **Pusan National University, Korea**

***R**esearch **C**enter for **N**uclear **P**hysics, Osaka University,* **Japan**

Faculty of Science and Engineering, **Saga University, Japan**

Department of Physics, **University of Chicago, USA**

Department of Physics, **Yamagata University, Japan**

$K_L \to \pi^0 \nu\bar{\nu}$ physics

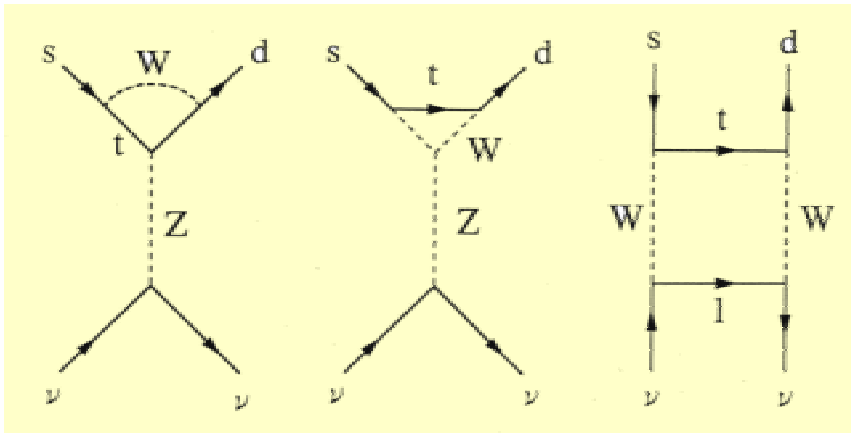
- Flavor Changing Neutral Current
- Direct CP violation ($\Delta s = 1$)

  Im(Vtd) measurement
- Very small theoretical ambiguity

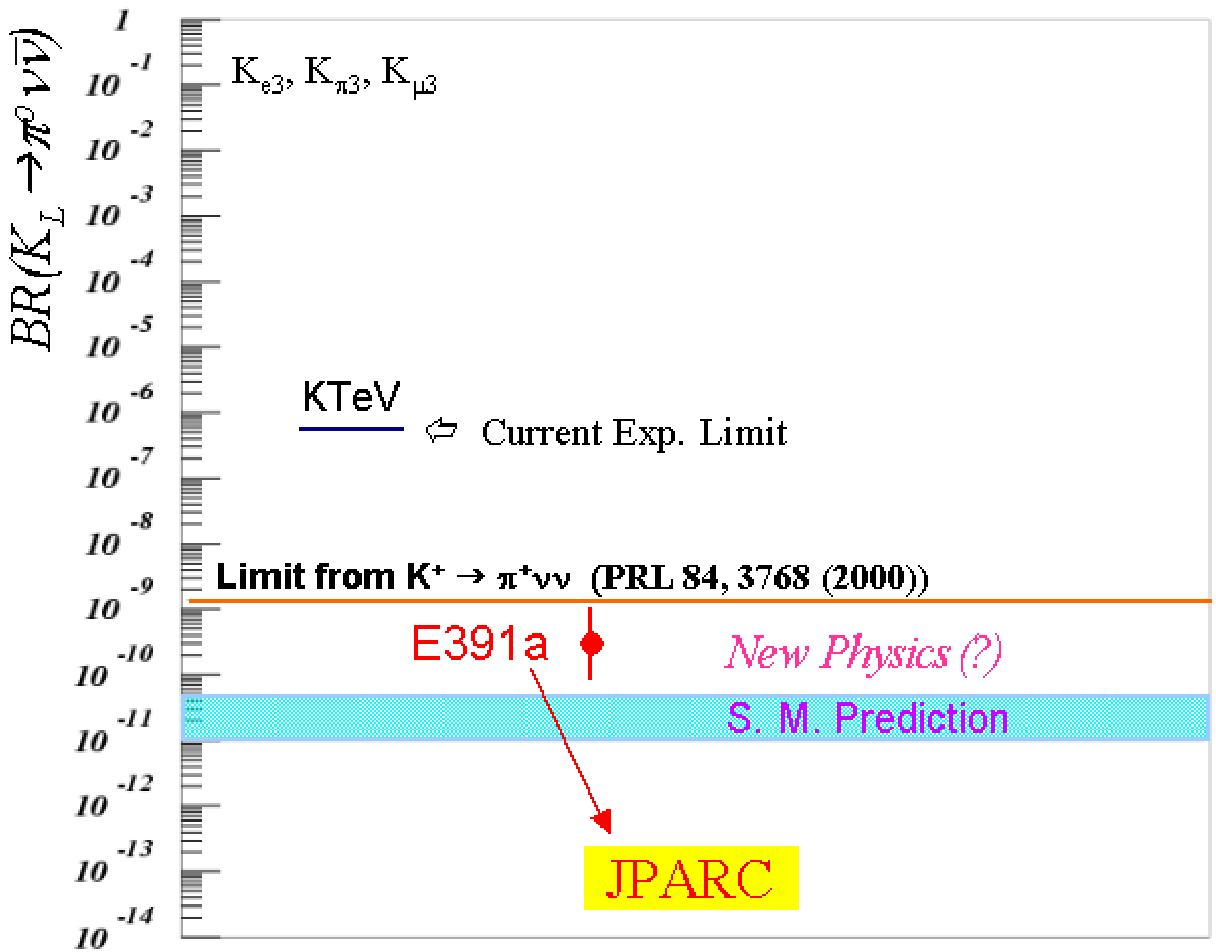
  Only top loop in SM

  clean and pure
- Last frontier in K-decay

  challenging



Experimental situation
- Current and future -



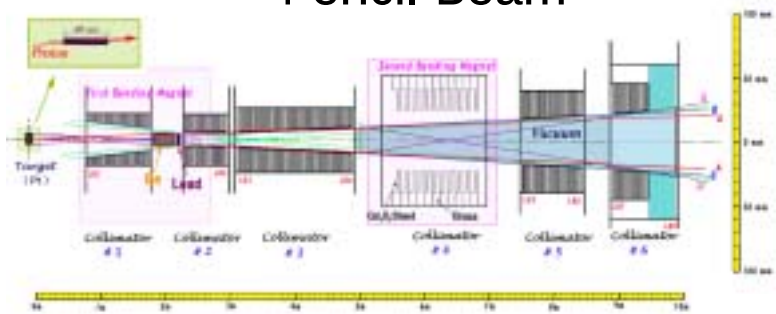
Mile stones

- Dec.1996: conditionally approved
- Mar.1999: constructed the beam line
- July 2001: approved
- Oct. 2002: engineering run
- Nov.2003: middle section (last vacuum chamber) arrived
- 18 Feb. 2004: Started data taking

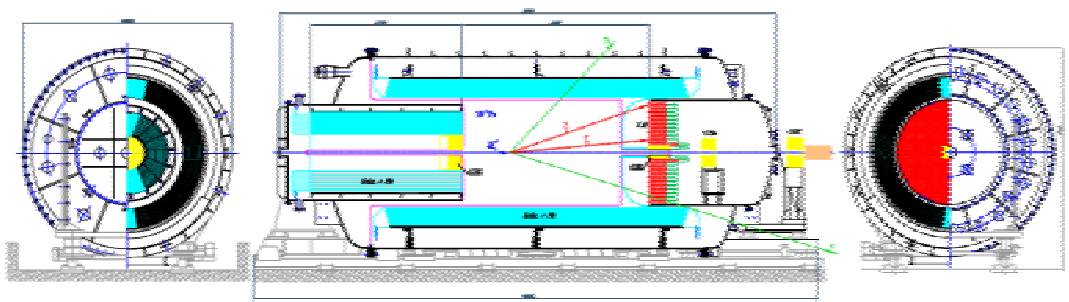
Detection Method

- Pencil beam
- Detector with complete veto system
  - 4π coverage with thick calorimeter
  - Wide acceptance
  - Double decay chamber
  - Operation in high vacuum
- High P_T selection
- Step by step approach
  - KEK-PS E391a
  - JPARC

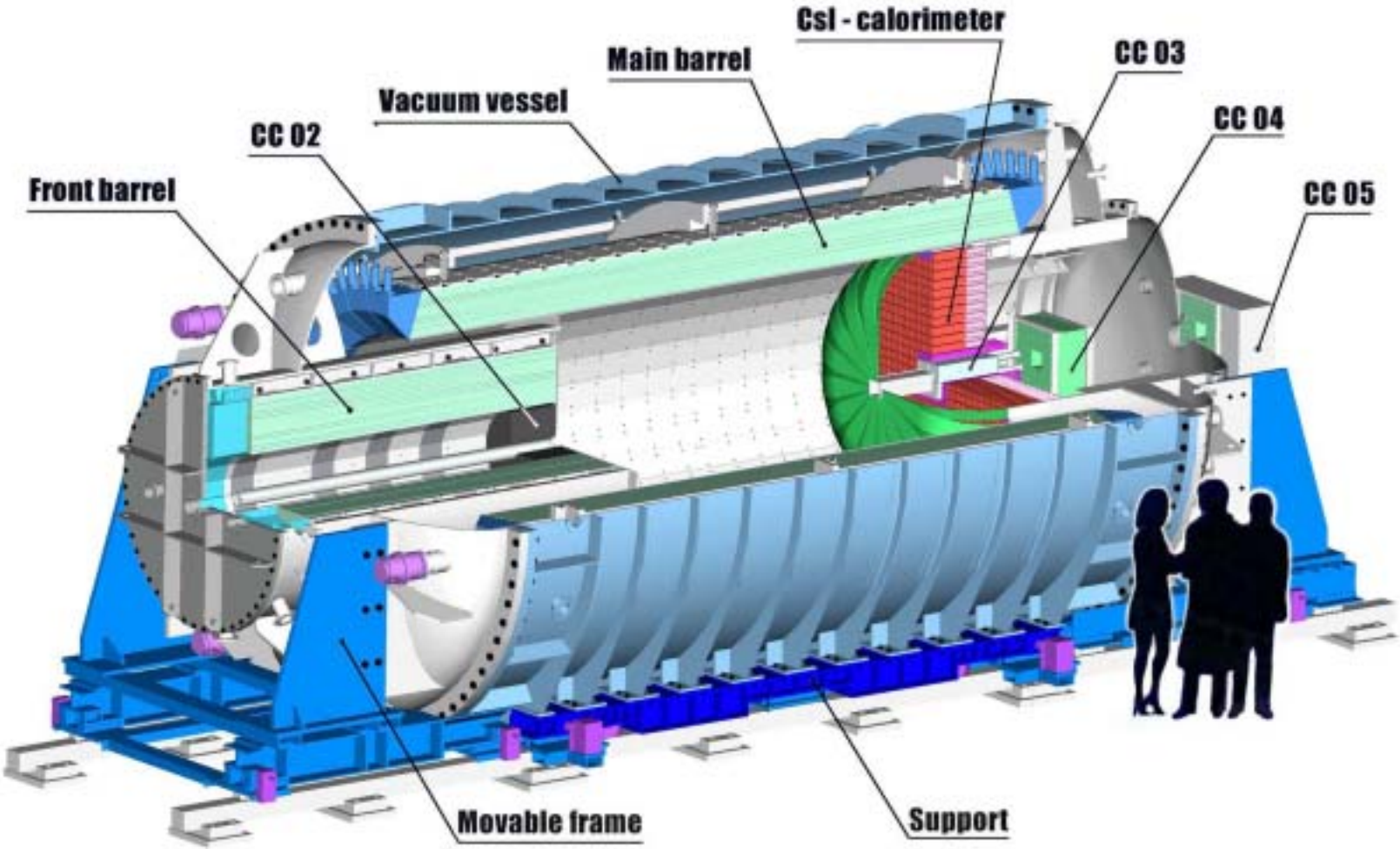
Pencil Beam



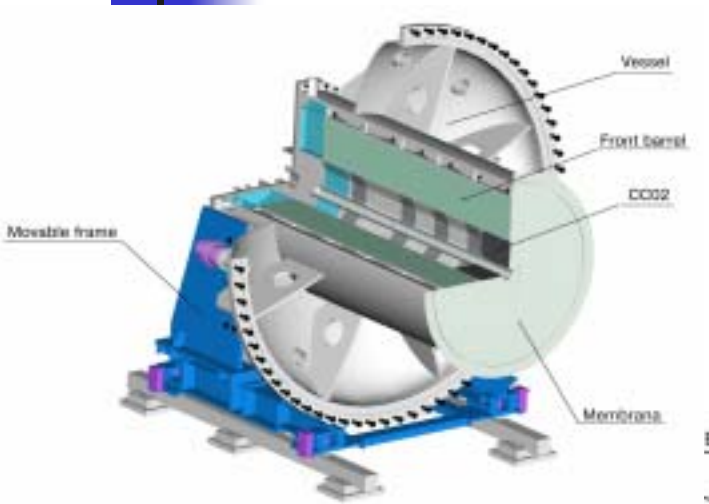
Detector system

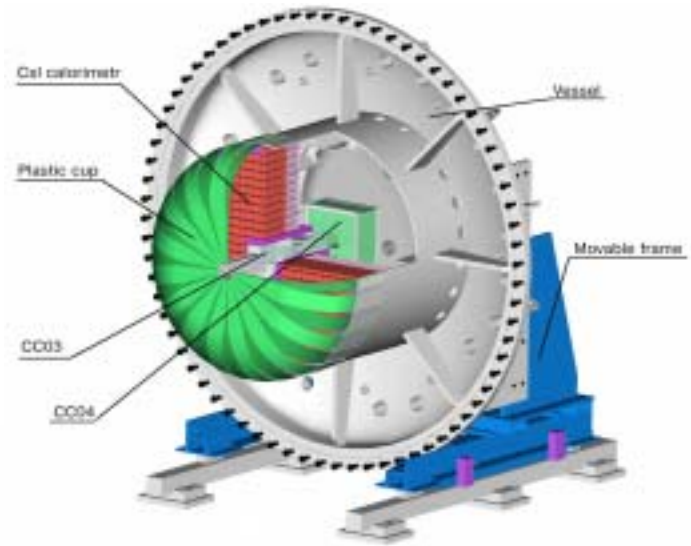


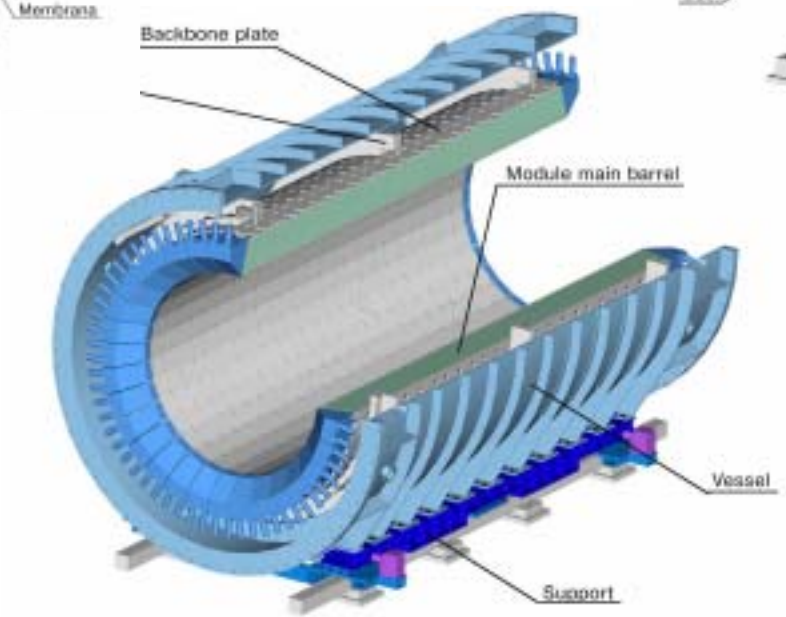
Detector system



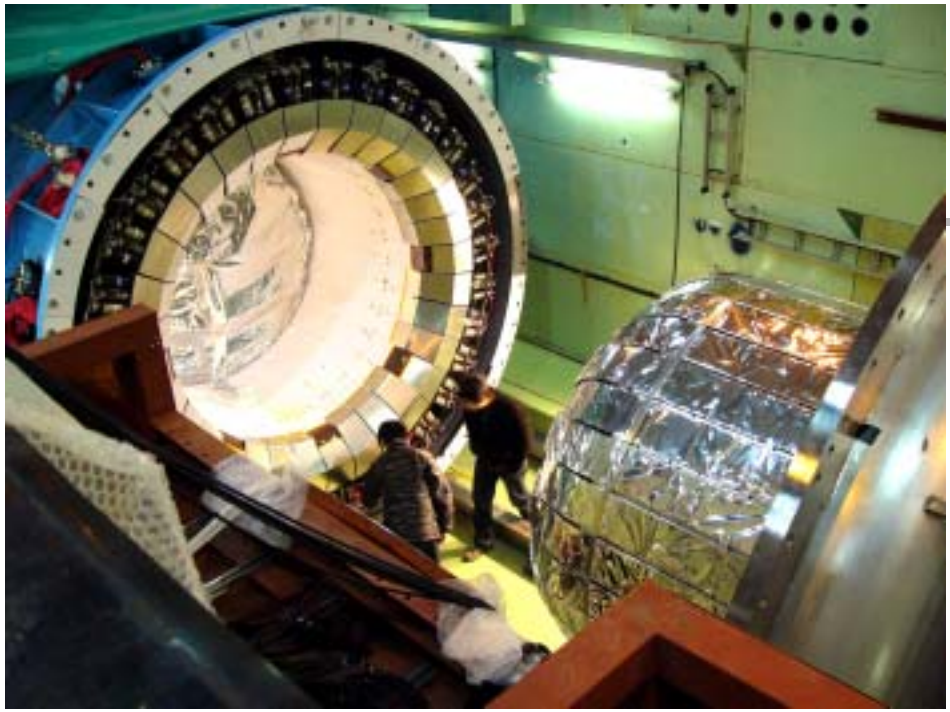
Detector system (Cont.)

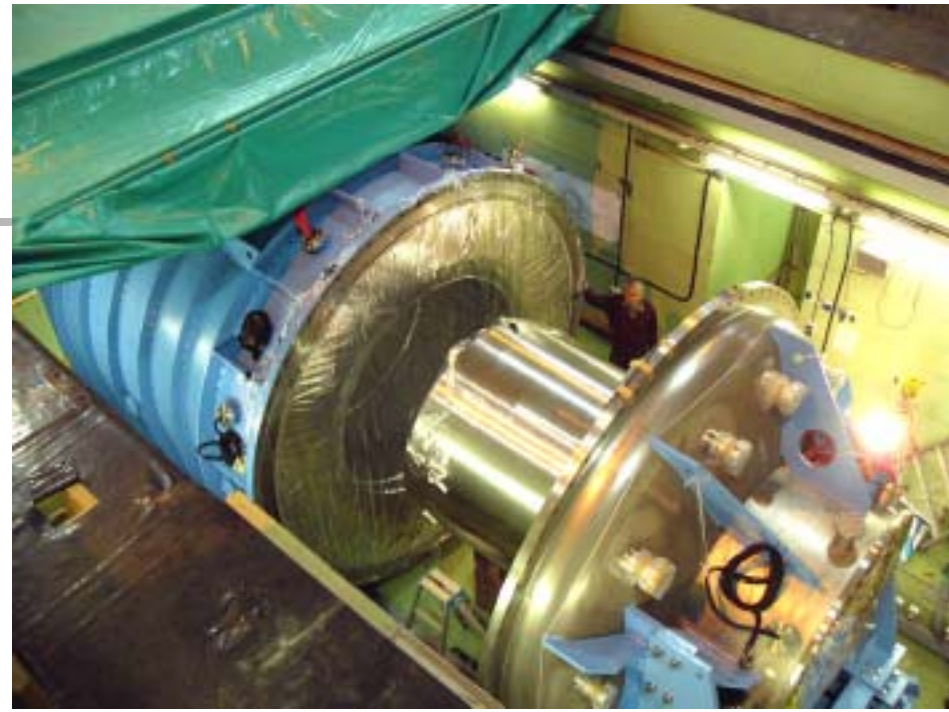






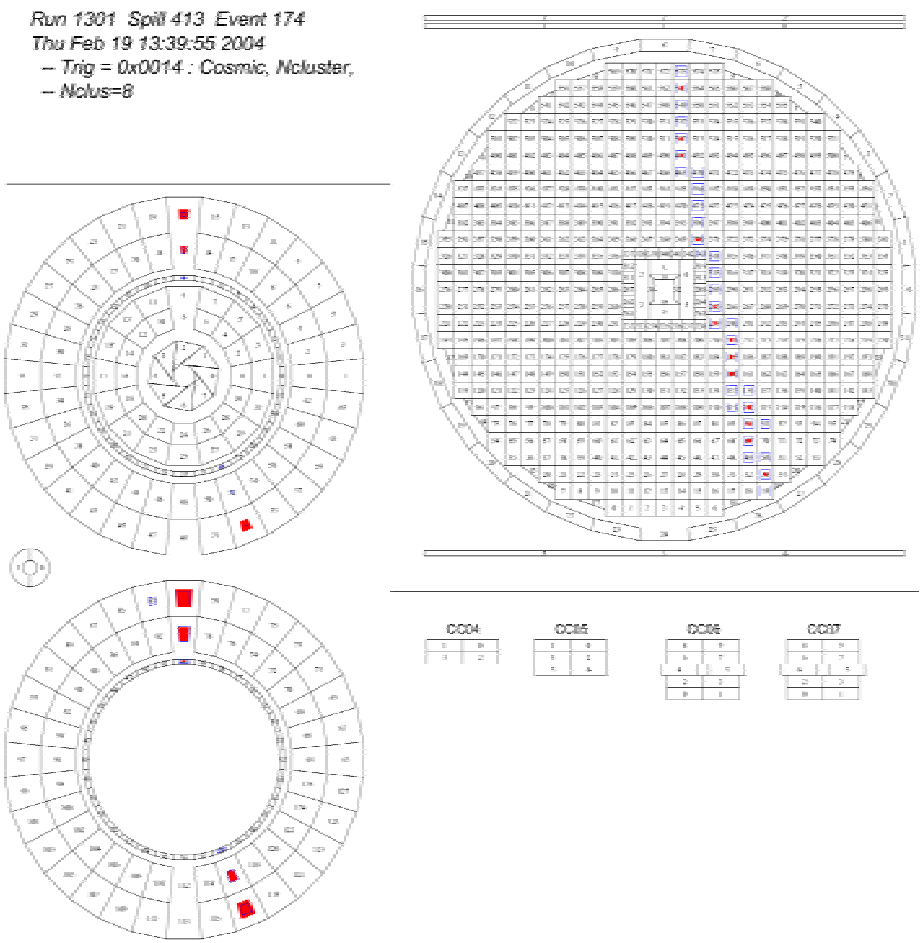
Detector Integration

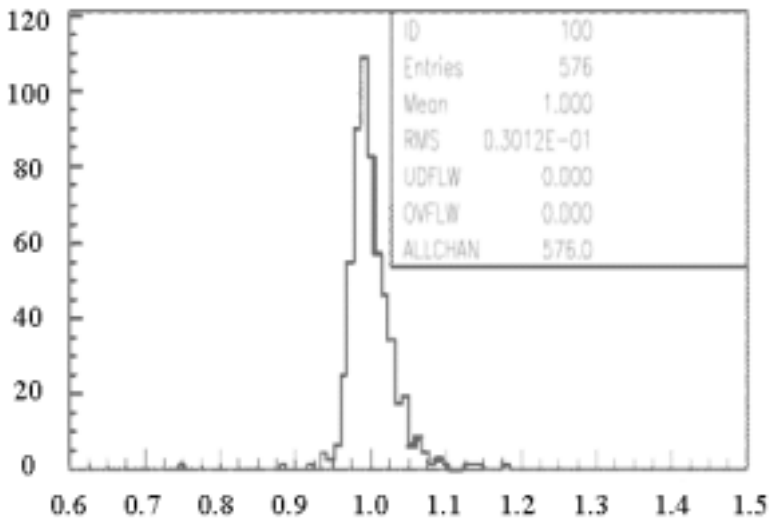




Jan 22, 2004

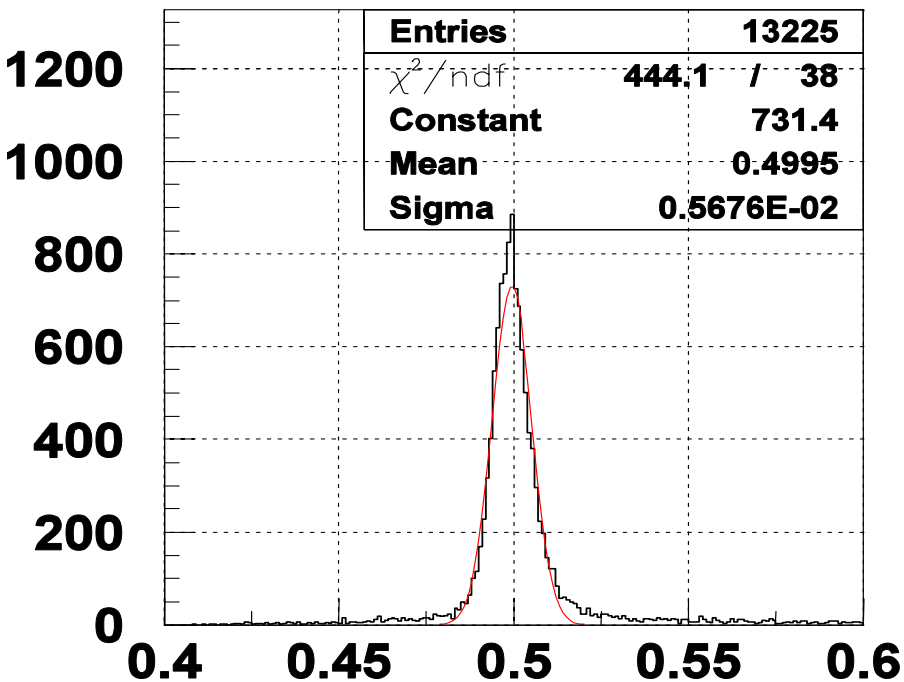
Calibration using cosmic rays





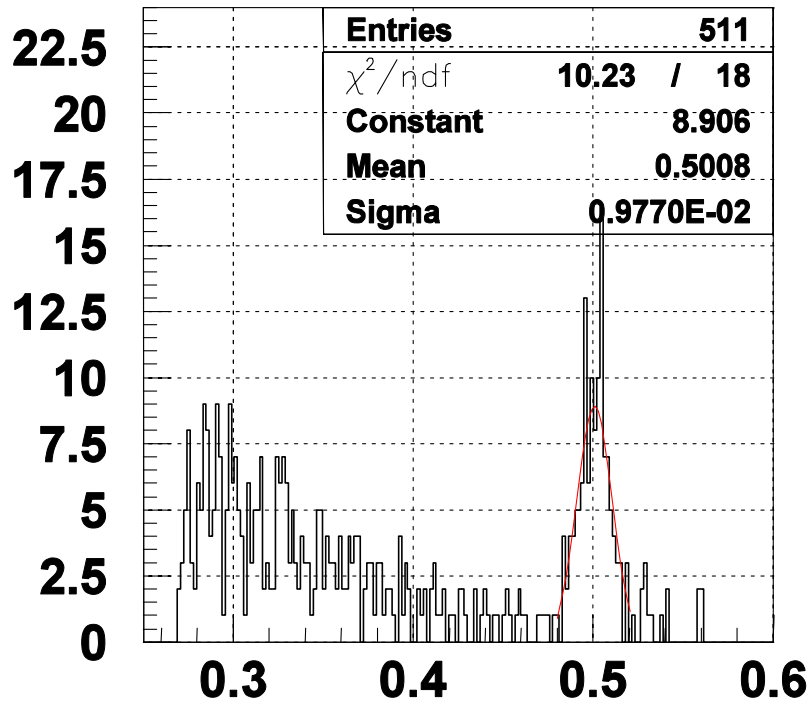
Clearly reconstructed K_L decay modes

- $K_L \rightarrow \pi^0\pi^0\pi^0$



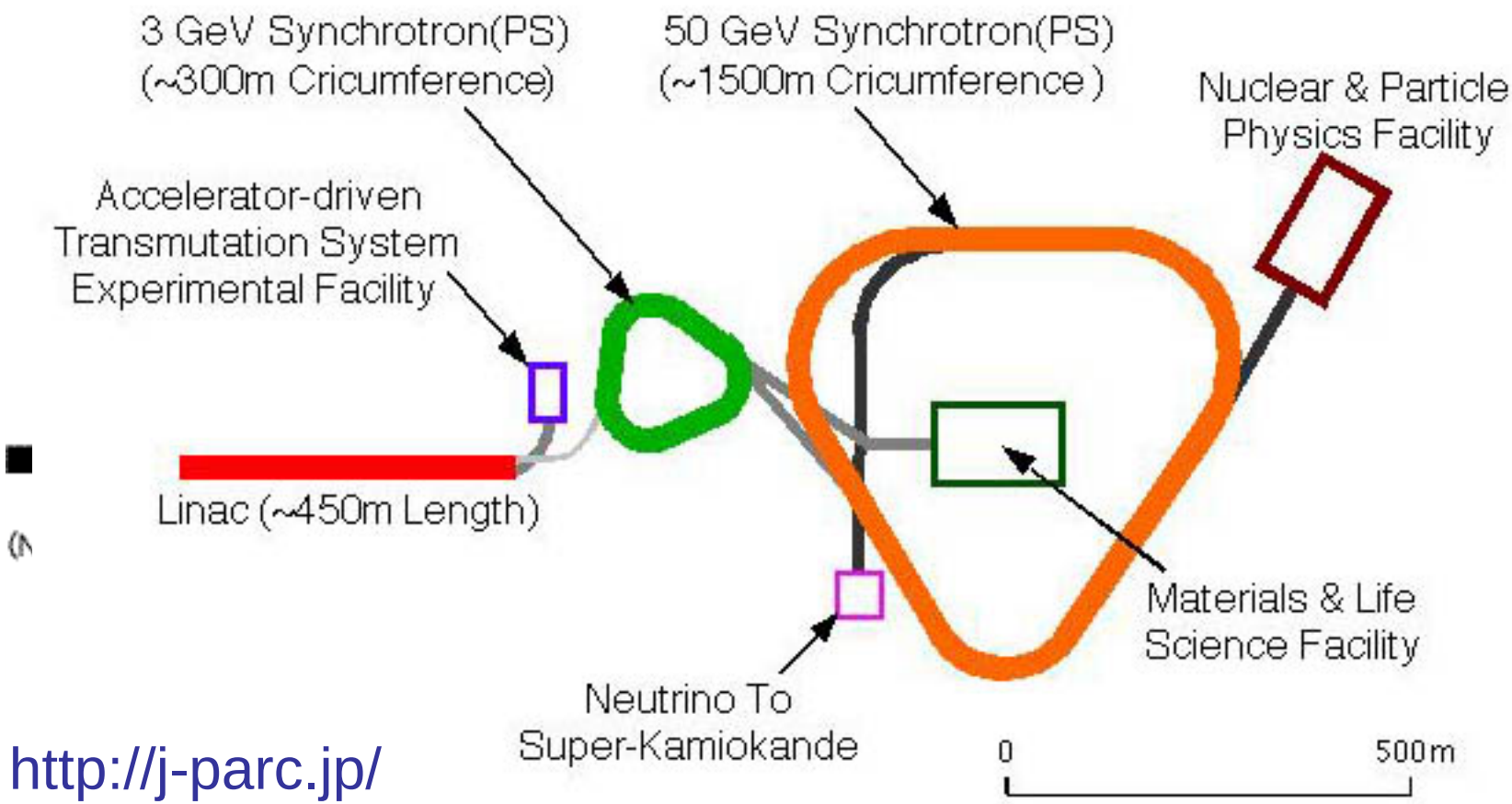
6-γ invariant mass (GeV/c^2)

$K_L \rightarrow \pi^0\pi^0$



4-γ invariant mass (GeV/c^2)

JPARC



http://j-parc.jp/

A-line plan at JPARC