

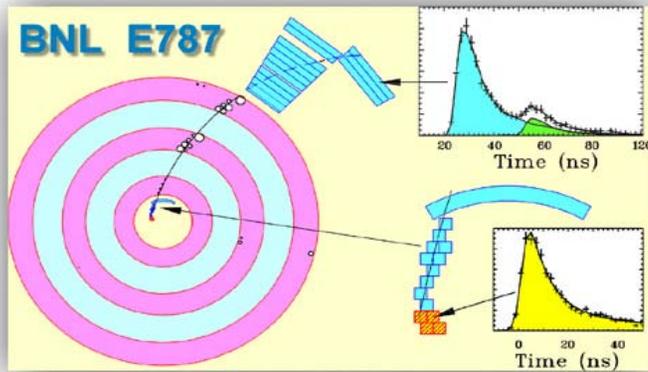
Rare K Decays: Results from E949

Steve Kettell

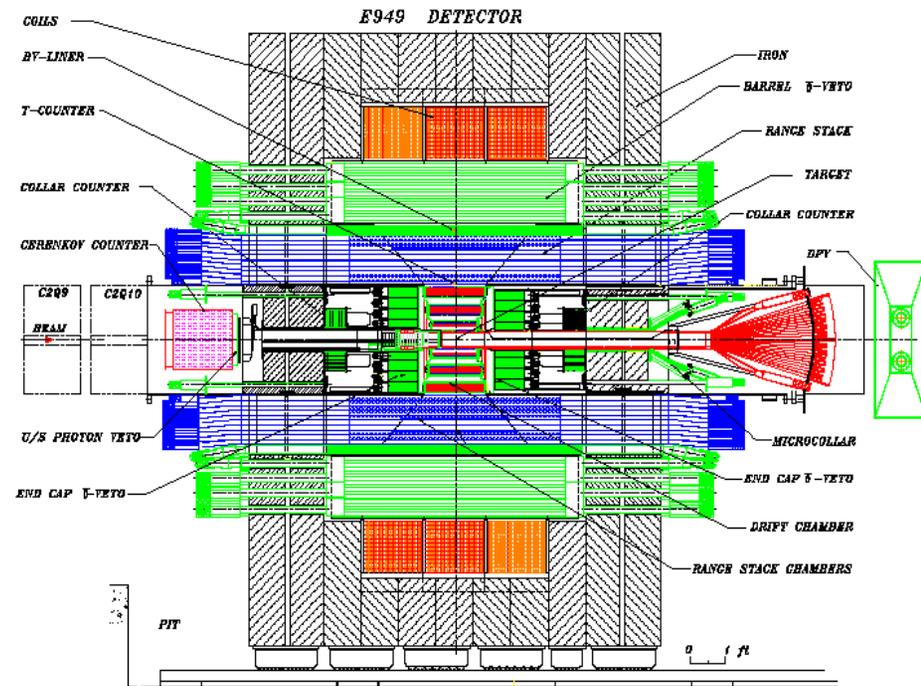
BNL



E949 – Measurement of $B(K^+ \rightarrow \pi^+ \nu \bar{\nu})$



\$75M Expenditure including \$10M Upgrade of E787



Contributing Countries and Institutions:

US --- BNL, FNAL, University of New Mexico, Stony Brook

Japan --- Fukui, KEK, Kyoto, National Defense Academy, Osaka, RCNP

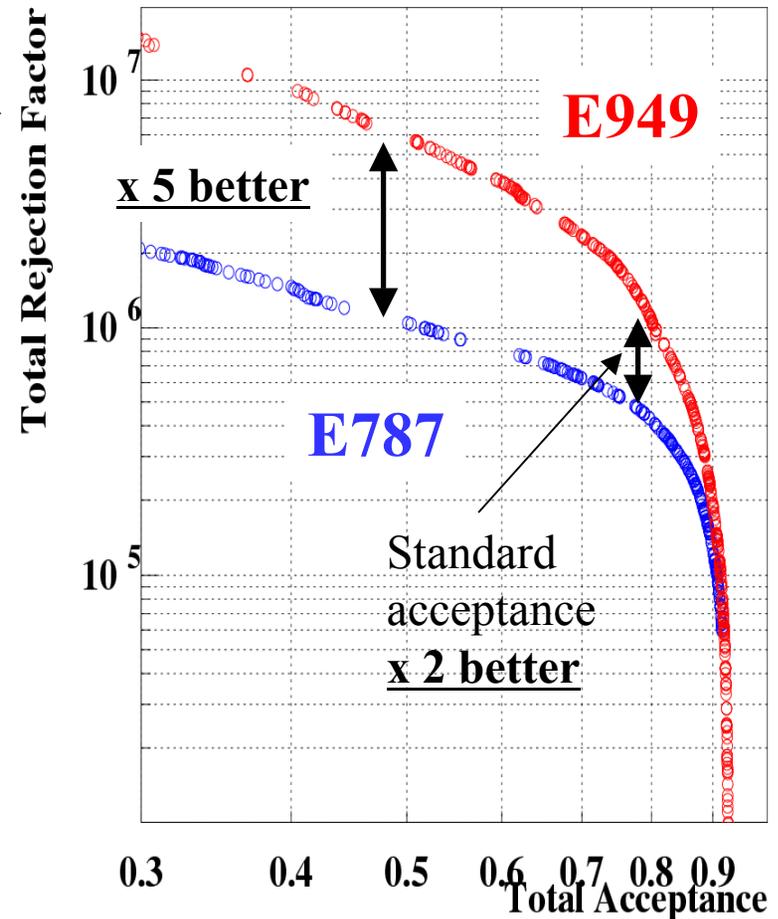
Canada --- Alberta, University of British Columbia, TRIUMF

Russia --- IHEP, INR

E949 Upgrades

- 'Higher' flux, 'increased' duty factor
- *Improved photon veto system*
Lower phase space now accessible
- Trigger/DAQ – reduce deadtime, enable operation at higher rate
- RS gain monitor – improved π^+ energy resolution
- Electronics – improved range and momentum resolution
- Beam systems – improved detectors and electronics

π^0 Rejection vs. Acceptance



E949 Results

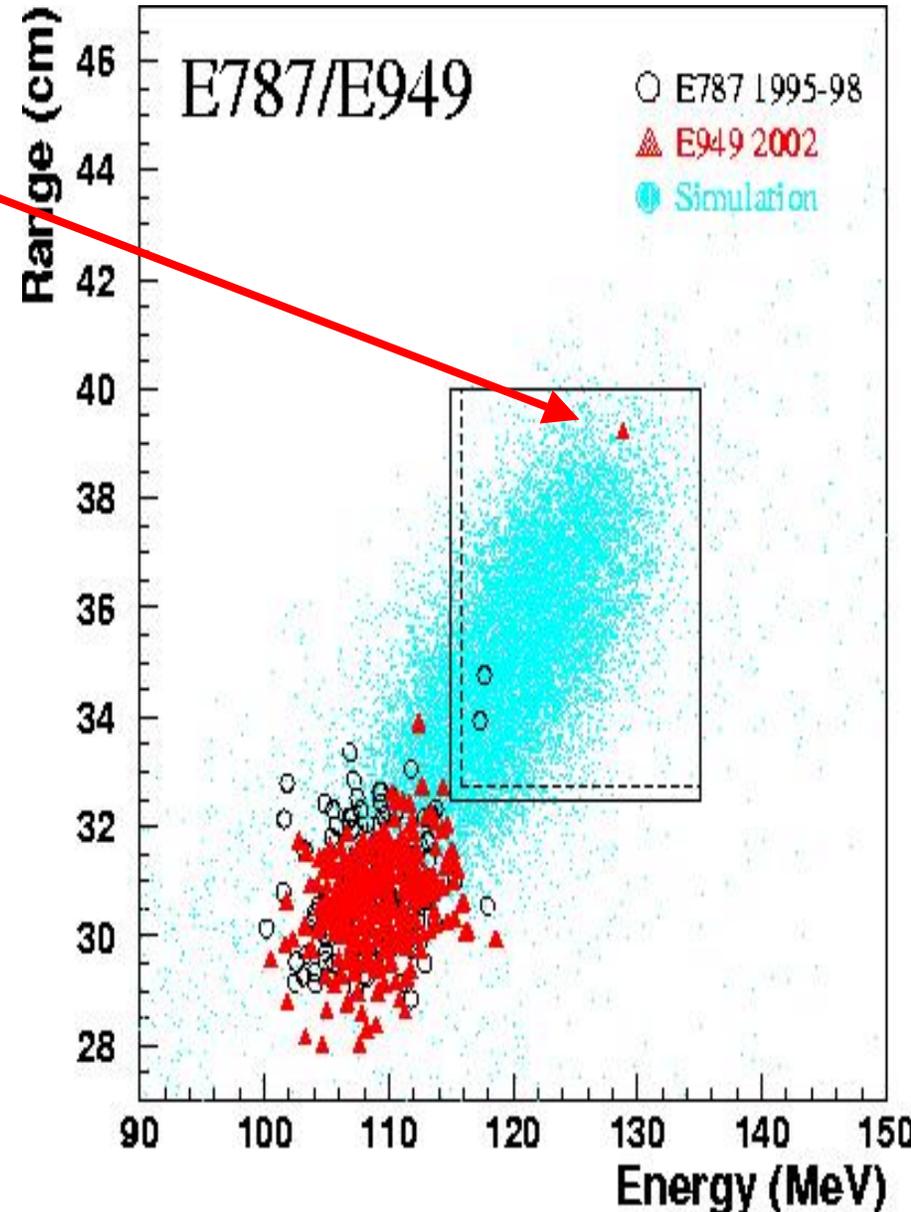
- E949 has observed a 3rd $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ event:

$$B(K^+ \rightarrow \pi^+ \nu \bar{\nu}) = 1.47^{+1.30}_{-0.89} \times 10^{-10}$$

$$(\text{SM: } 0.8 \times 10^{-10})$$

- $0.006 < |V_{td}| < 0.027$
- $-0.77 \times 10^{-3} < \text{Re}\lambda_t < 1.06 \times 10^{-3}$
- $0.23 \times 10^{-3} < |\lambda_t| < 1.06 \times 10^{-3}$
- $|\text{Im}\lambda_t| < 0.89 \times 10^{-3}$

- Submitted to PRL



Progress in $K^+ \rightarrow \pi^+ \nu \bar{\nu}$



Summary

- E949 observed a 3rd $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ event – consistent with the SM prediction but twice the expectation.
- Lower Phase space region accessible - results next year with similar sensitivity (double E949 sensitivity).
- Detector and collaboration ready to complete experiment but ...?
- Proposal to complete E949 submitted to NSF.
- Together, E949 and KOPIO provide a unique opportunity for discovery of new physics.

Possible manifestation of new physics

