

- Kurzbeschreibung des Experiments
- Beteiligung des Instituts



Die Physik von BELLE

- CKM Matrix is Unitary, Elements can be complex.
- One phase cannot be rotated away. Usually put in corner terms

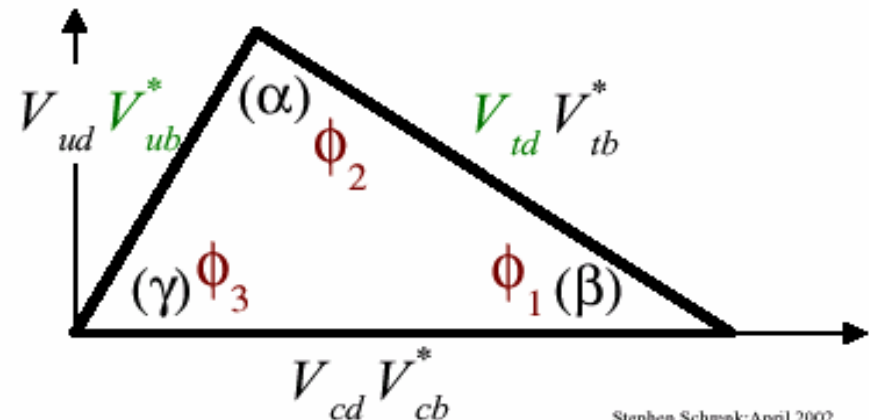
$$V \equiv \begin{pmatrix} V_{ud} & V_{us} & V_{ub} \\ V_{cd} & V_{cs} & V_{cb} \\ V_{td} & V_{ts} & V_{tb} \end{pmatrix} \approx \begin{pmatrix} 1 - \lambda^2/2 & \lambda & A\lambda^3(\rho - i\eta) \\ -\lambda & 1 - \lambda^2/2 & A\lambda^2 \\ A\lambda^3(1 - \rho - i\eta) & -A\lambda^2 & 1 \end{pmatrix}$$

Wolfenstein Parameterization

- Unitarity and columns 1 & 3:

$$V_{ud}V_{ub}^* + V_{cd}V_{cb}^* + V_{td}V_{tb}^* = 0$$

CP Violation is proportional to the area of the triangle.

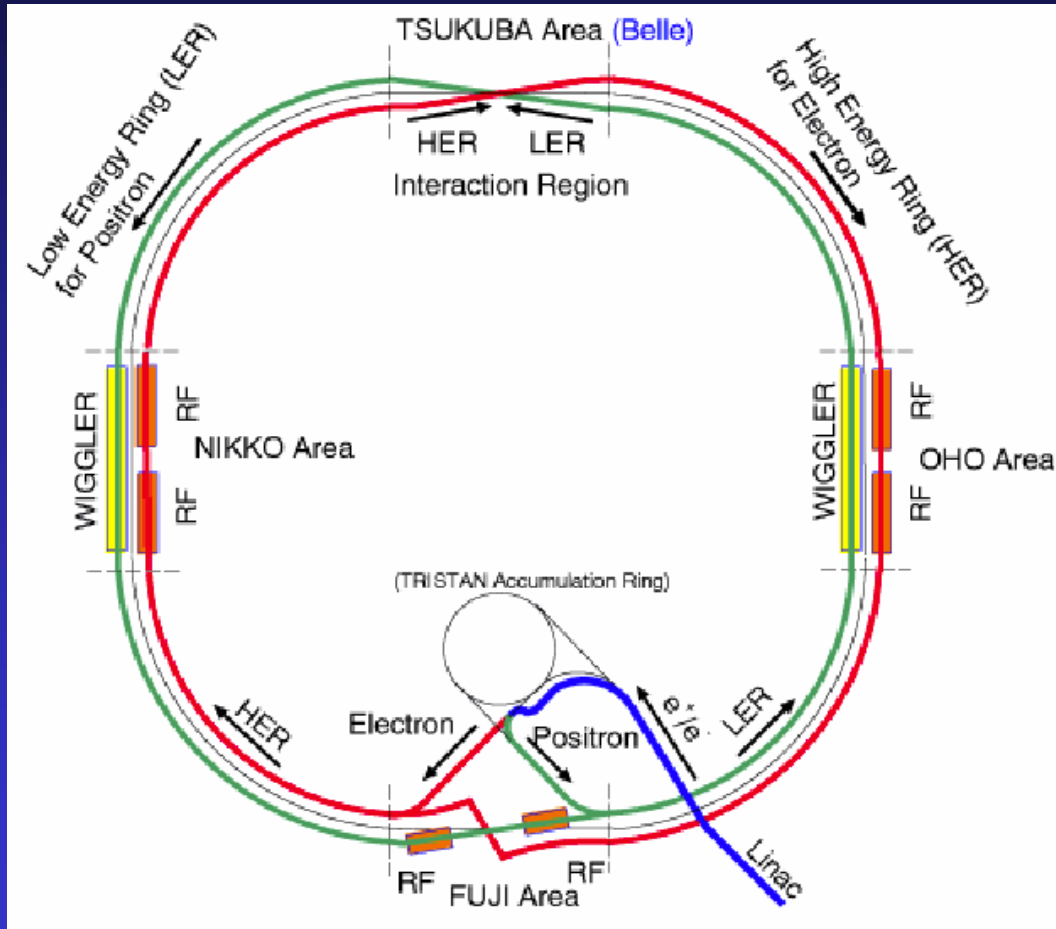
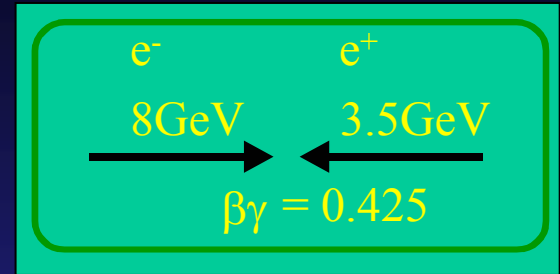


Stephen Schrenk: April 2002

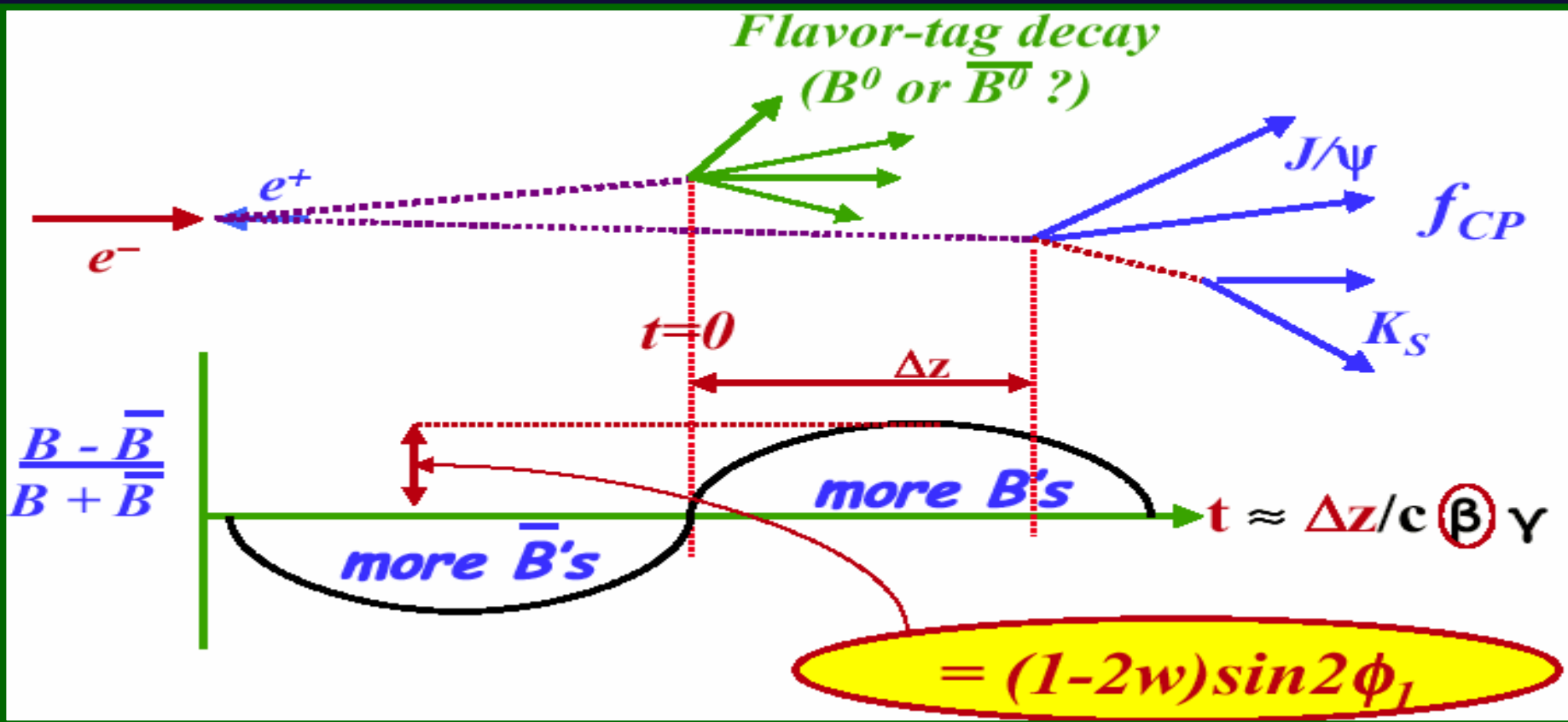


KEKB Collider

$L=5.6 \times 10^{33} \text{cm}^{-2}\text{sec}^{-1}$
 Design= $10^{34} \text{cm}^{-2}\text{sec}$



Φ_1 : über mischungsinduzierte CP-Verletzung



$$A(\Delta t) \equiv \frac{\Gamma(\bar{B}_d^0 \rightarrow f_{CP}) - \Gamma(B_d^0 \rightarrow f_{CP})}{\Gamma(\bar{B}_d^0 \rightarrow f_{CP}) + \Gamma(B_d^0 \rightarrow f_{CP})} = -\xi_f \sin 2\phi_1 \sin \Delta m_d \Delta t,$$

Δt $\equiv t_{CP} - t_{tag}$

f_{CP} : CP eigenstate

$\Gamma(\bar{B}_d^0 (B_d^0) \rightarrow f_{CP})$: decay rate for a $\bar{B}_d^0 (B_d^0)$ to f_{CP} at Δt

ξ_f : CP-eigenvalue of f_{CP}

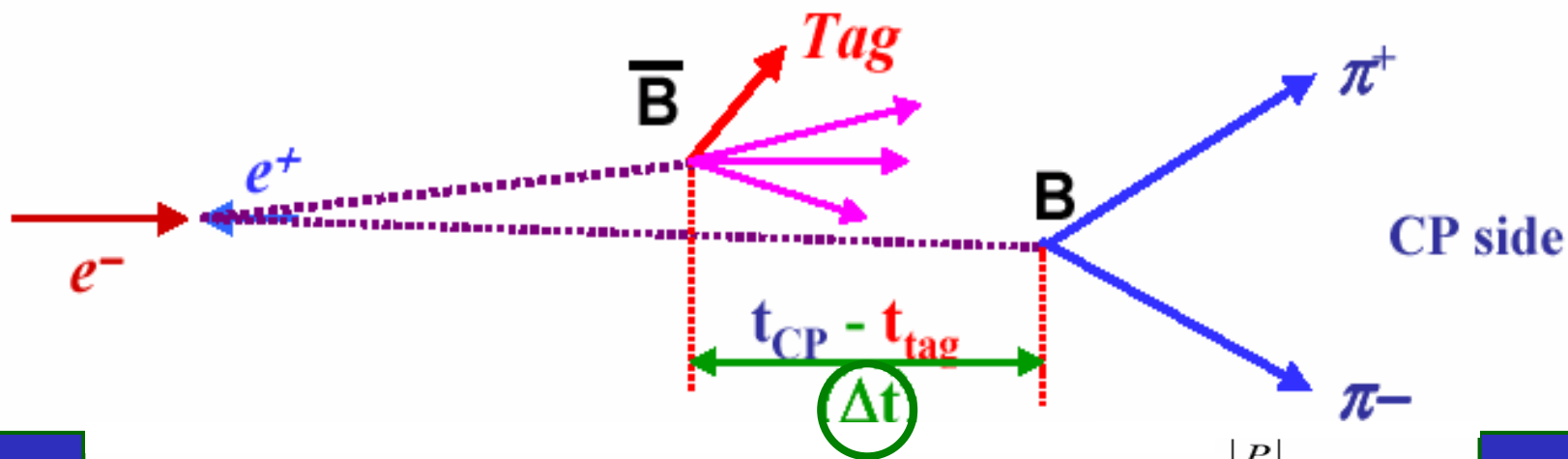
$$\phi_1 \equiv \pi - \arg \left(\frac{-V_{tb}^* V_{td}}{-V_{cb}^* V_{cd}} \right)$$



Φ_2 : über direkte CP-Verletzung

$$Rq (B \rightarrow \pi^+ \pi^-; \Delta t) = \frac{e^{-|\Delta t|/\tau_B}}{4\tau_B} [1 + q \cdot \{ C_{\pi\pi} \cos(\Delta m \Delta t) + S_{\pi\pi} \sin(\Delta m \Delta t) \}]$$

$q = +1$ (B^0 tagging), -1 (\bar{B}^0 tagging)

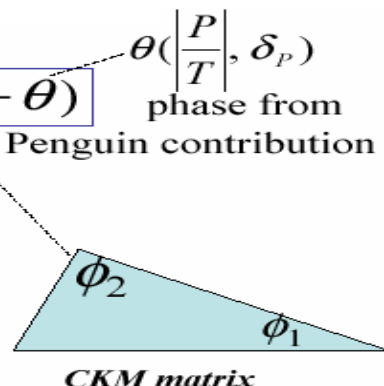


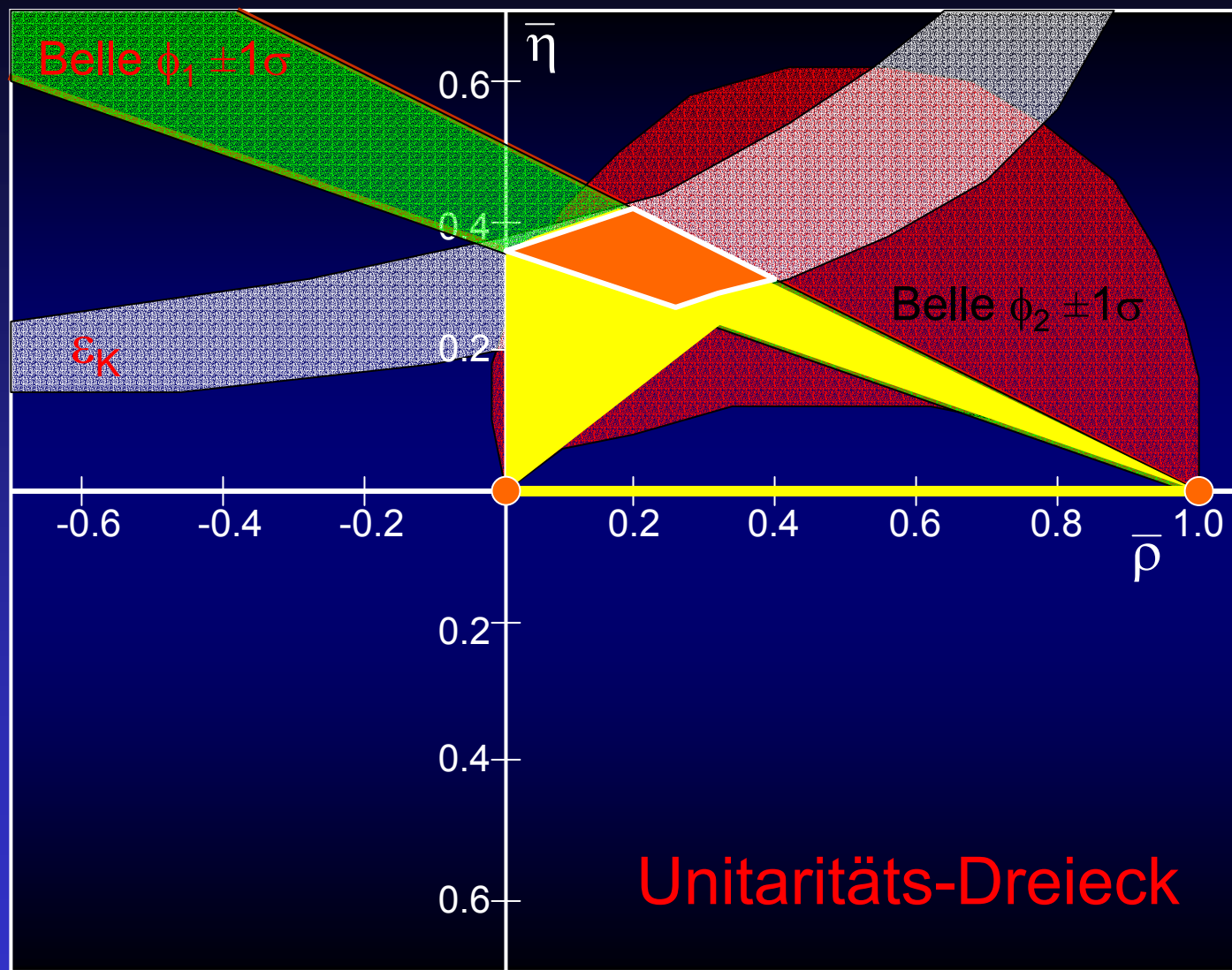
$$S_{\pi\pi} = \frac{2 \text{Im} \lambda}{|\lambda|^2 + 1} = \sqrt{1 - C_{\pi\pi}^2} \sin 2(\phi_2 + \theta)$$

$\theta = \left(\frac{P}{T}, \delta_P \right)$
phase from Penguin contribution

$$C_{\pi\pi} = \frac{|\lambda|^2 - 1}{|\lambda|^2 + 1} = \frac{|\bar{A}_{+-}|^2 - |A_{+-}|^2}{|\bar{A}_{+-}|^2 + |A_{+-}|^2}$$

**DCPV
asymmetry**



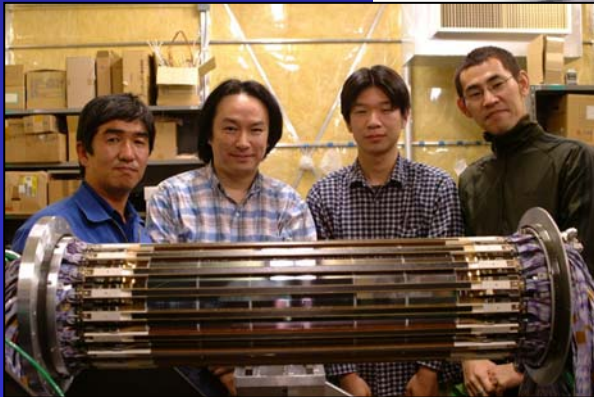
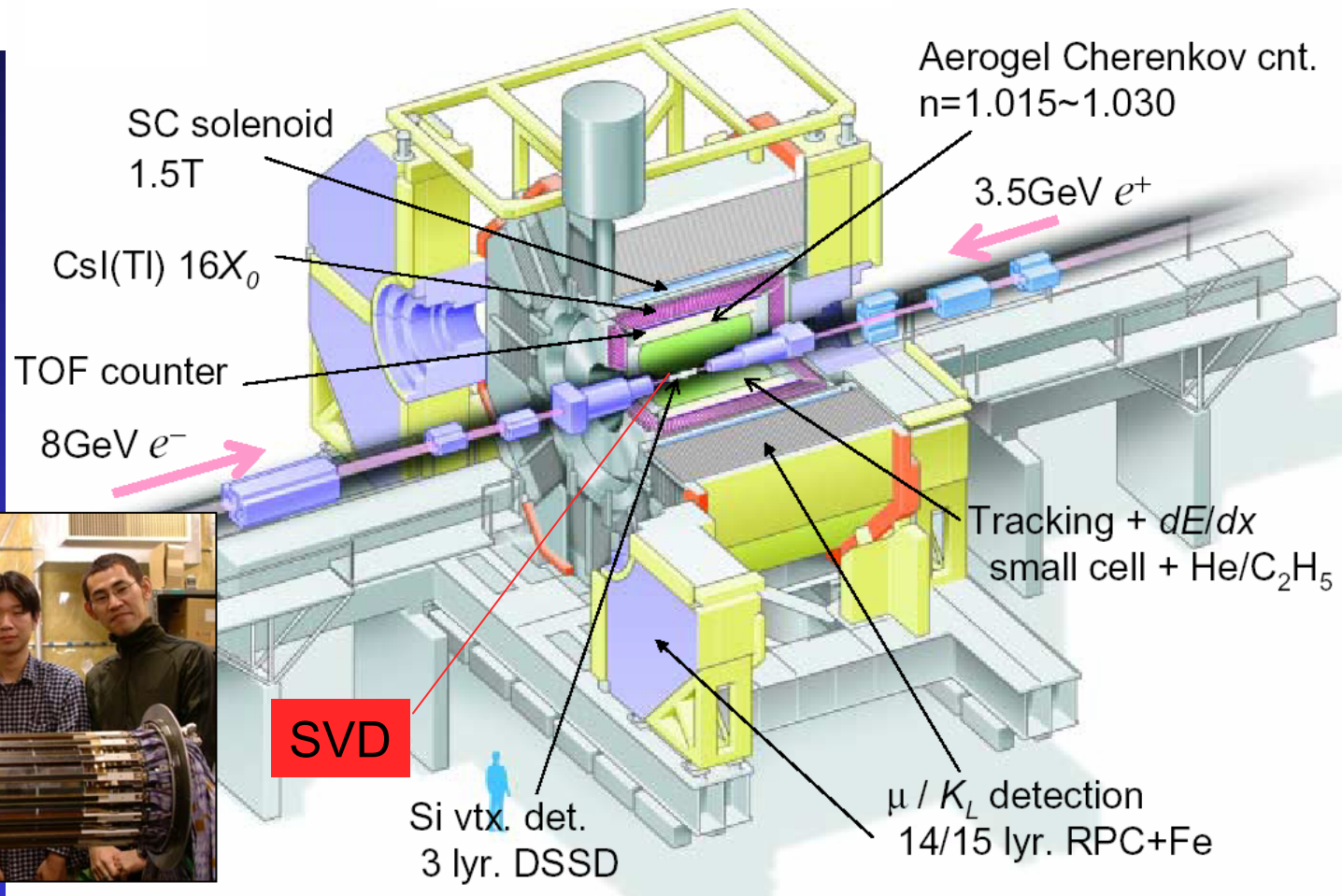


PDG 2002 + (BELLE $\phi_1 + \phi_2$)



Beteiligung des Instituts

- an der Hardware des Silicon Vertex Detectors





FADC system for SVD 2

New FADC system

36 FADC (40 MHz, 10 bit) on a board

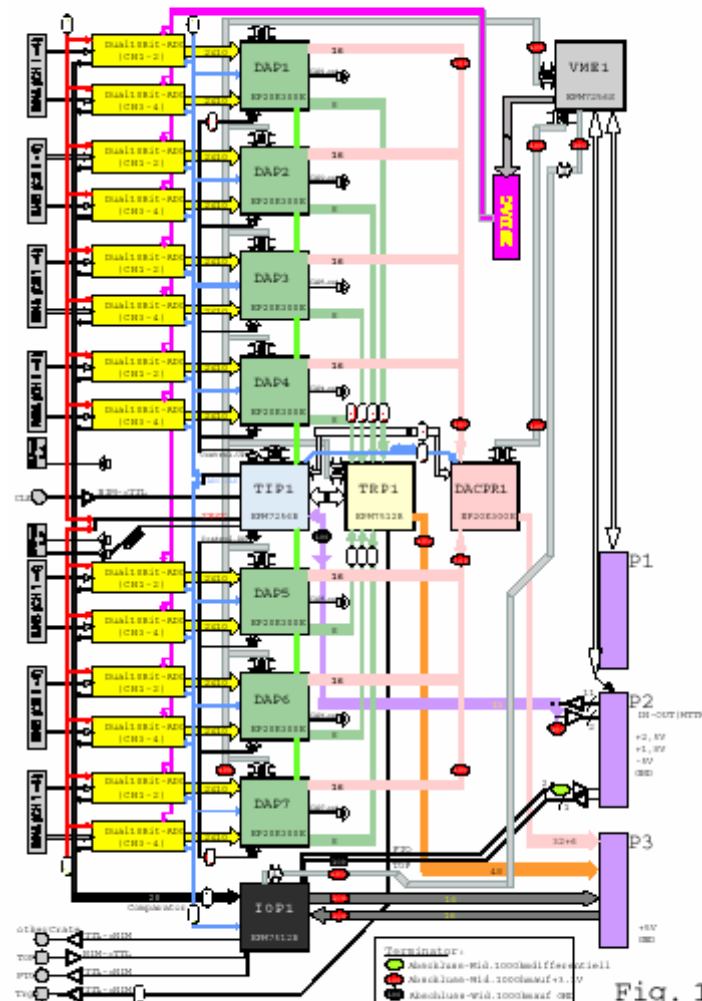
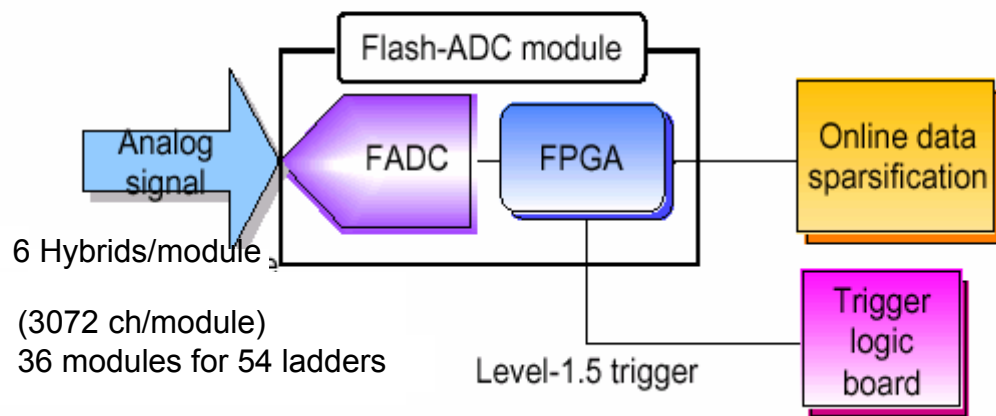
Search L 0 triggers

(VA1TA, TOF, sCDC)

Generate L 1.5 trigger signal

All delivered to KEK August 2002

Backend electronics schematic diagram

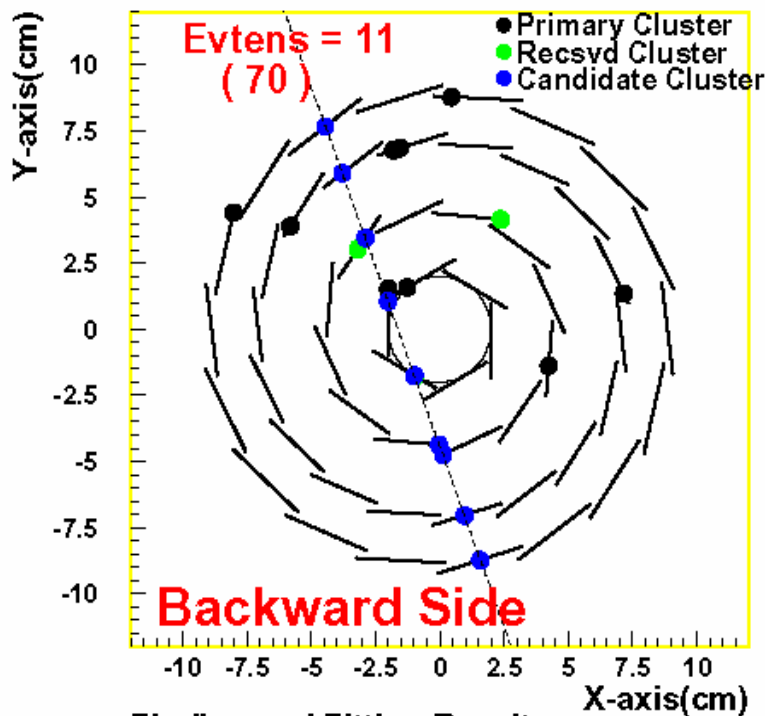


36 FADC für SVD 2.0
wurden im August 2002
nach Japan geschickt



Tests mit kosmischer Strahlung erfolgreich

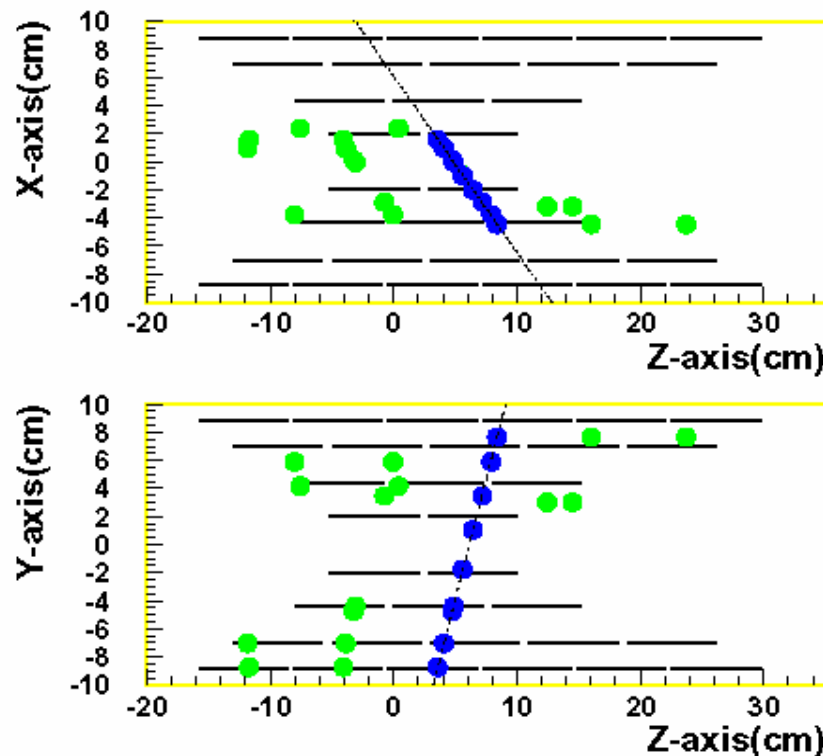
2D Track Finding(used N-Cluster)

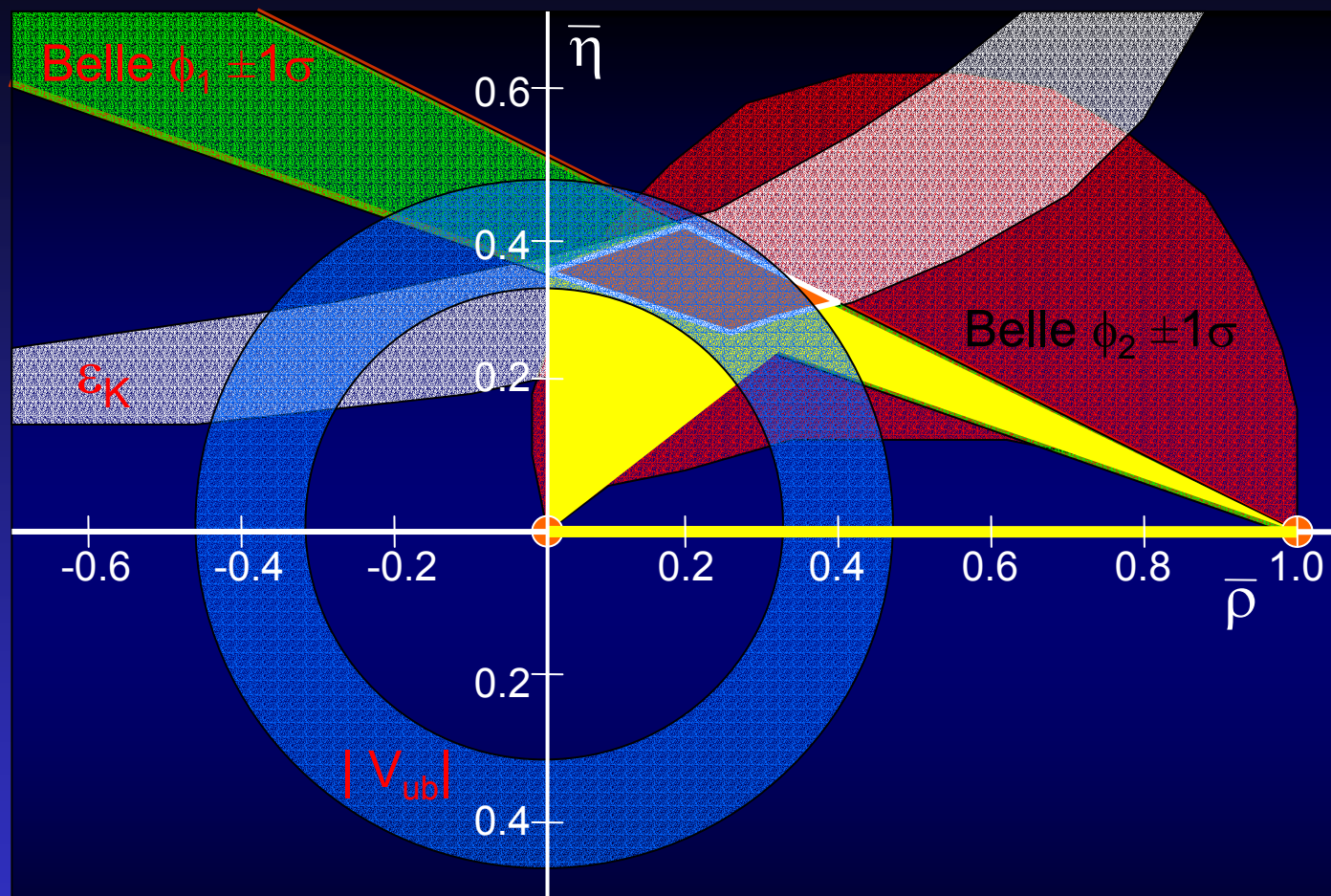


Finding and Fitting Result

Number of Cluster = 9
Directon = (0.332777, -0.905035, -0.264899)
2D LINE Y = -2.71964X + -4.39046

3D Track Finding(PN-Cluster)





Beteiligung des Instituts

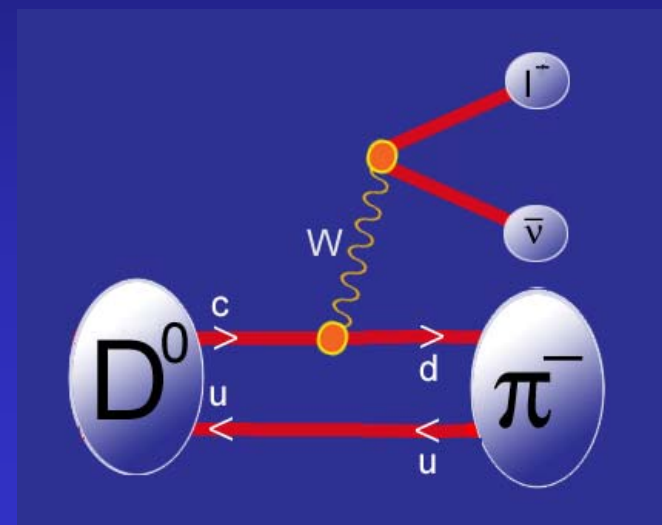
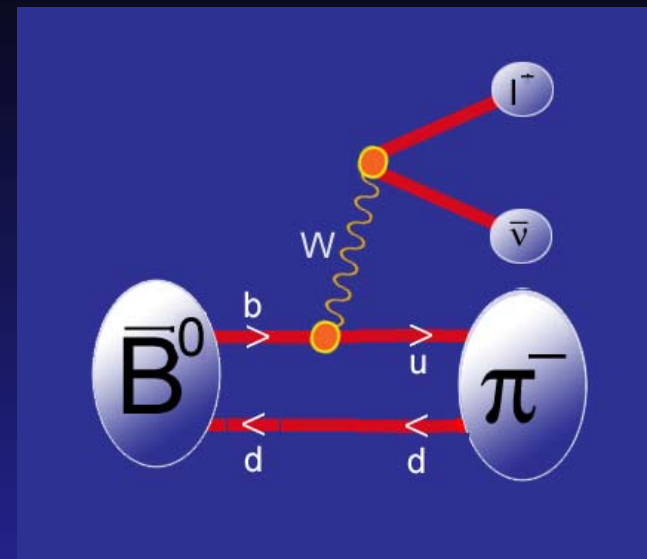
- an der Analyse zur Bestimmung von V_{ub}

PDG 2002 + (BELLE $\phi_1 + \phi_2$)



Messung von V_{ub}

- über den Zerfall $B \rightarrow \pi l \nu$
- benötigt wird Formfaktor $f_B(q^2)$
- der analoge Formfaktor $f_D(q^2)$ kann im Zerfall $D \rightarrow \pi l \nu$ gemessen werden
- das Verhältnis f_B/f_D ist durch numerische Methoden (Lattice) gut bekannt



- um eine möglichst hohe Statistik zu erreichen, werden die benötigten D-Mesonen aus D^*D^* (u.ä.) Ereignissen rekonstruiert

