

LEP

SYMPOSIUM

2001

BEYOND THE

Electroweak Scale

5-6 Nov 2001

ICEPP

U. of Tokyo

LEP **Energy Frontier** e^+e^- Collider

1989 - 2000

LEP-I $\sqrt{s} \approx m_Z$

Electroweak Energy Scale
の上で統一ゲージ理論の
精密検証

$N_\nu = 3$, m_t , ...

LEP-II

Above W^+W^- threshold

W^+W^-

HIGGS

SUSY

$114 \lesssim m_H \lesssim 196 \text{ GeV}$
95% CL

\Rightarrow **LHC, JLC**

e^+e^- Collider &

Hadron Collider (Fixed Target)

Ex 1. Charm GSW, GIM

{ BNL Fixed target J
SPEAR e^+e^- Collider $\psi, \psi', \dots, D, \dots$
DORIS e^+e^- Collider $P_c/\chi, \dots$

Ex 2. 3rd Generation KM

{ SPEAR τ
Femilab fixed target τ, τ'
DORIS-II, CESR τ spectroscopy, B
Tevatron t

Ex 3 LEP + Tevatron

LEP-I m_t indirect determination

Tevatron t discovery
 m_t measurement

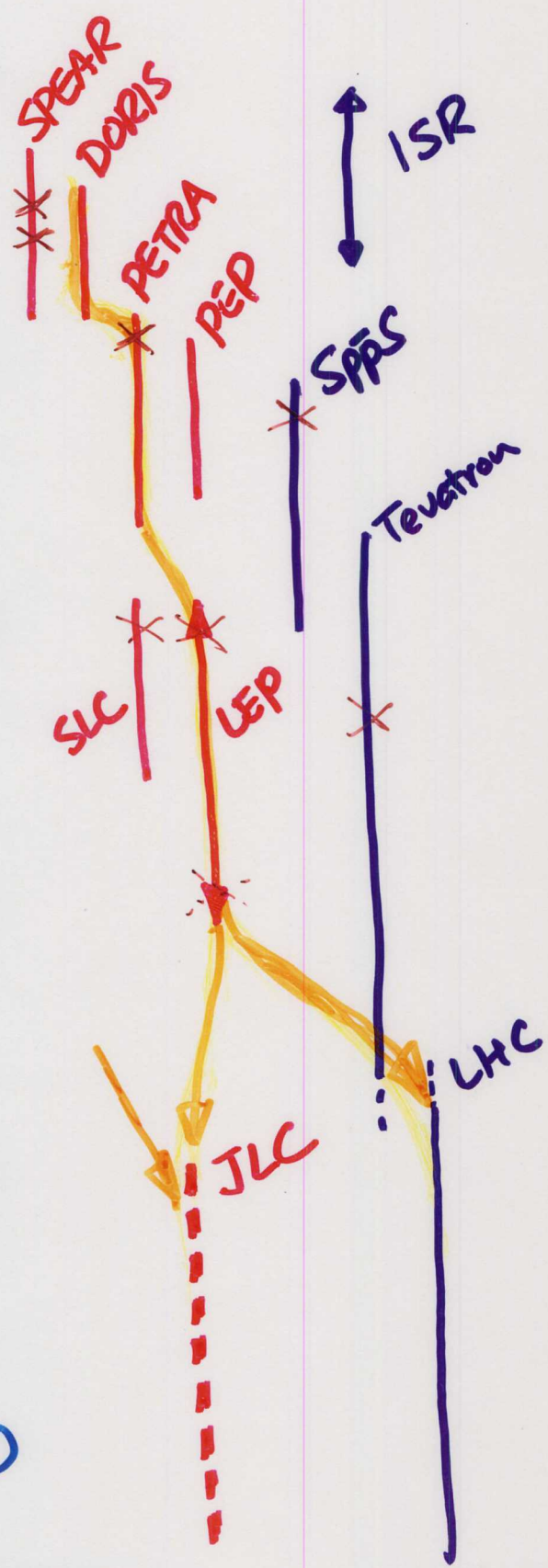
LEP, SLC, ... \leftarrow input

\downarrow
 m_H prediction

$m_H < 196 \text{ GeV}$
(95% CL)

ENERGY FRONTIER COLLIDERS

- 1960
 -
 - 1970
 -
 - 1980
 -
 - 1990
 -
 - 2000
 -
 - 2010
 -
 - 2020



$(\sigma\bar{\sigma})_K$
 Quark
 NC
 J/ψ
 τ
 g
 WZ
 $N_c=3$
 t
 ν oscill.
 $H???$
 $(\sigma\bar{\sigma})_6$
 SUSY h ?
 SUSY h ?

21世紀の素粒子物理学は

更に Exciting.

- Gauge Sector $SU(3)_c \times SU(2)_L \times U(1)$

前世紀に検証

- Light Higgs $114 \leq m_H \leq 196 \text{ GeV}$ (95% CL)

無い筈だ。

- SUSY ($\lesssim \text{TeV scale}$)

恐らく存在

情況証拠 (実験的)

NEW PARADIGM

- Light Higgs

- Unification of d_1, d_2, d_3 @ $0(10^{16}) \text{ GeV}$

- Dark Matter ~ Neutralino

0.3 GeV/cm^3 in our galaxy

- Flavor Physics

Lepton Sector

$\left\{ \begin{array}{l} \nu \text{ atmosph. solar, reactor, long base lin} \\ e^- \quad \mu^+ \rightarrow e^+ \gamma, \quad \mu^- N \rightarrow e^- N, \quad \tau \rightarrow \mu \gamma, \dots \end{array} \right.$

Quark Sector

CKM, θ , $\epsilon'/\epsilon, \dots$

Proton decay

$(CKM)_q \leftrightarrow (MNS)_\nu$

Yukawa coupling is Mess (SUSY 導 λ^2)
更に悪化)

Light Higgs / SUSY ($\lesssim \text{TeV}$)

が存在しなければ 更に Exciting

⇒ 理論に重大な欠落

Energy Frontier の実験で

新たな証拠を捉える。

$O(\text{TeV})$ には必ず“新物理”が存在する。