

Goals of the Experiment and Collaboration Issues

T. Mori

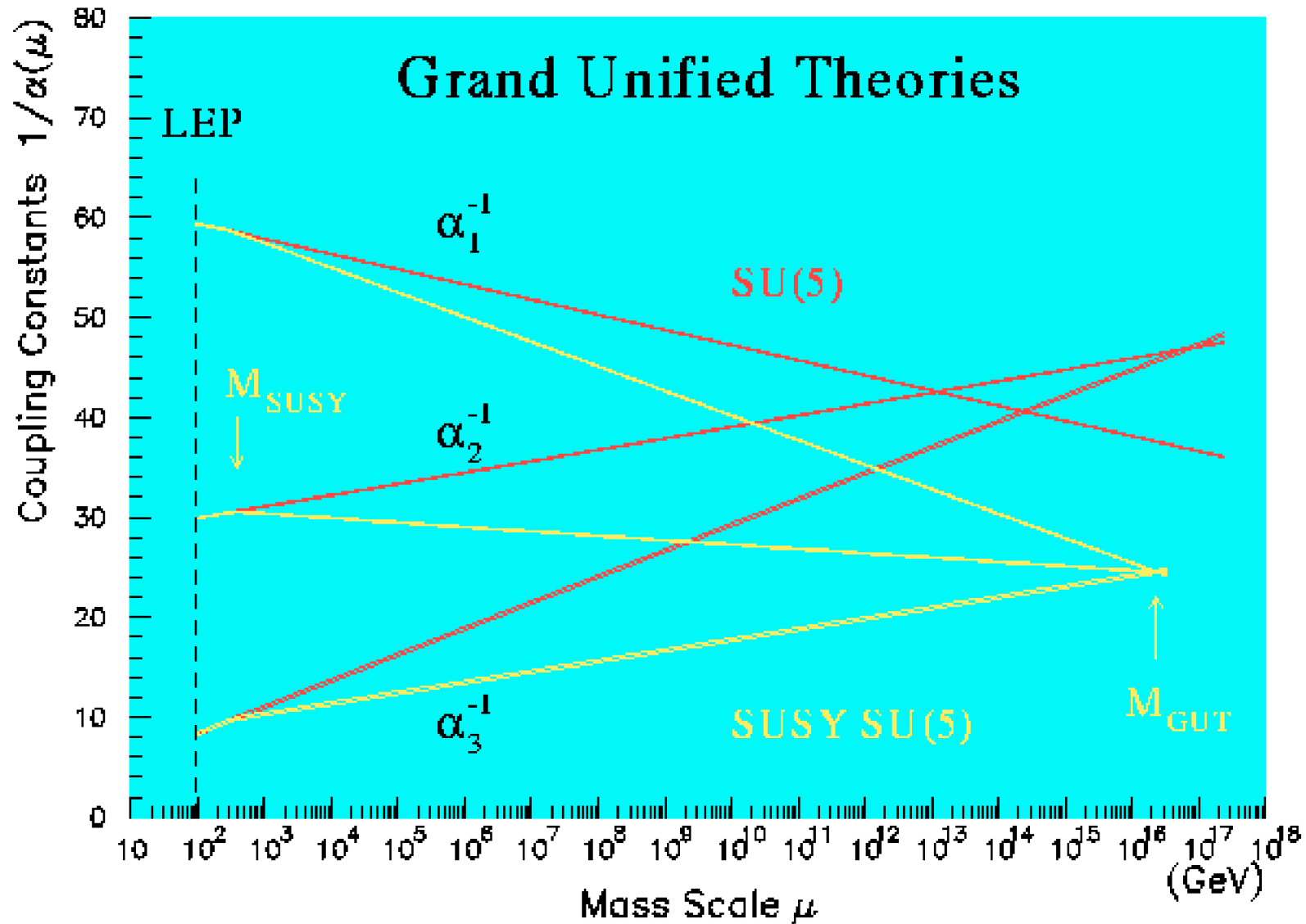
Goals of the Experiment: **Physics**

The aim is to reach a BR well below 1.2×10^{11} and probe into:

- **Supersymmetric Grand Unification**
- **Origin of the Neutrino Oscillations**

They could add up to a higher BR.

Probing Supersymmetric GUT



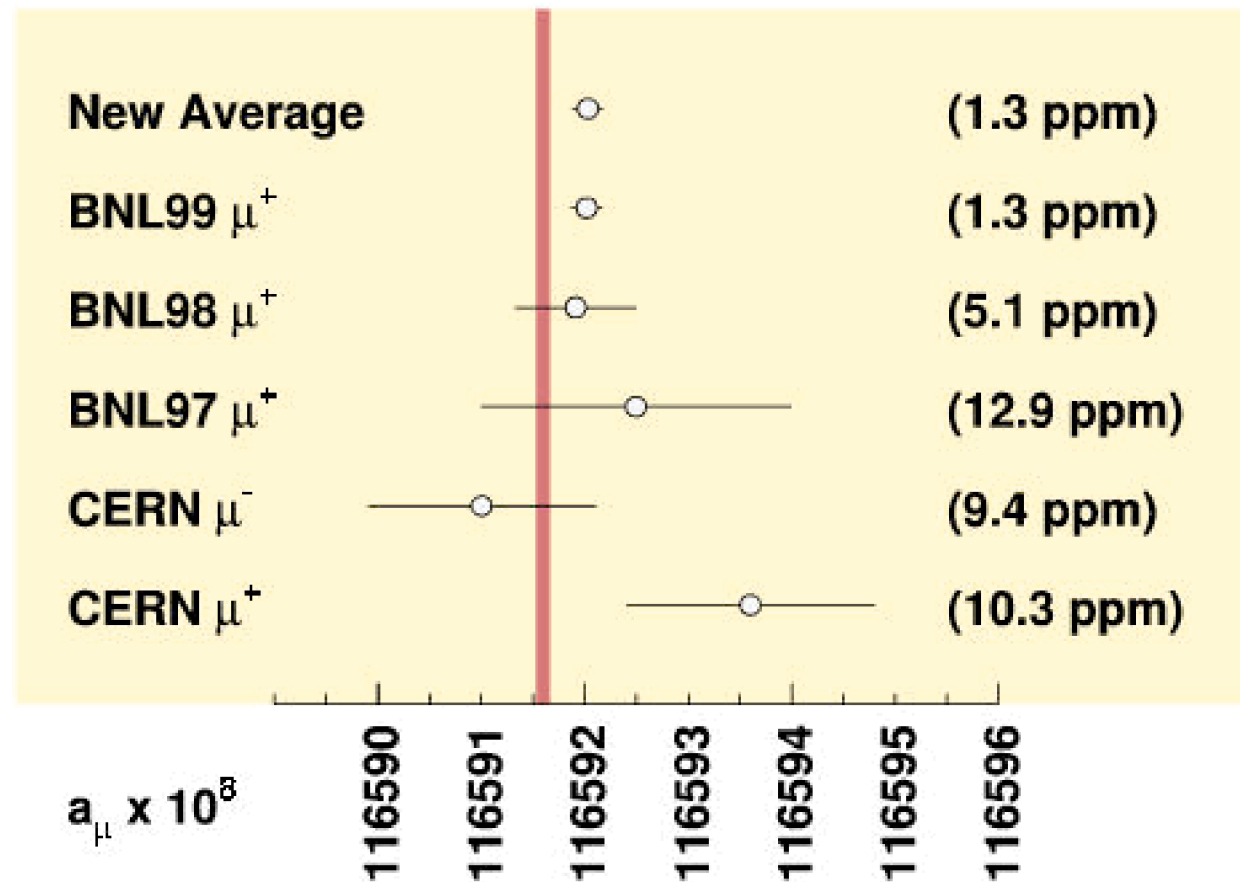
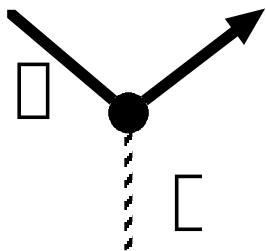
Muon g-2

$$a_{\mu}('99) = 11\,659\,202(14)(6) \times 10^{-10} \text{ (1.3 ppm)}$$

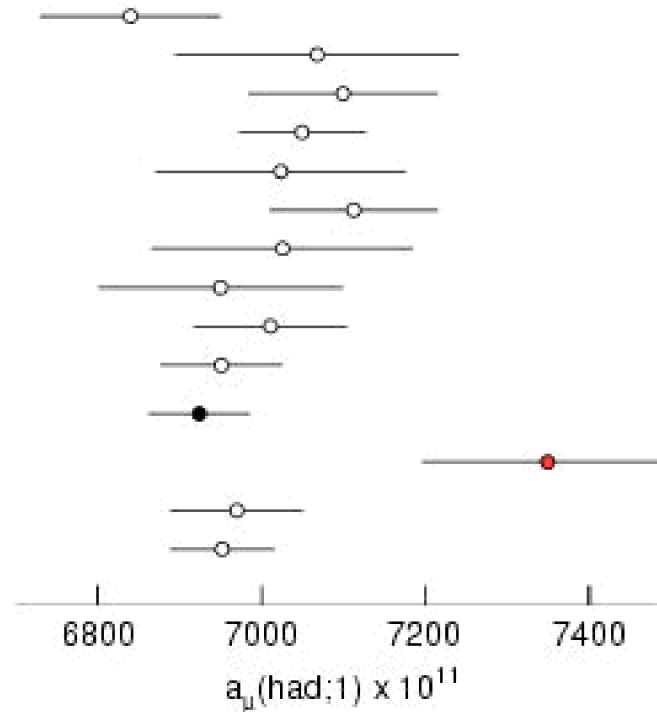
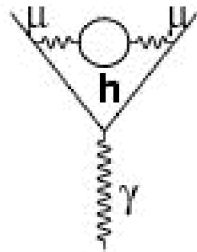
$$a_{\mu}(\text{SM}) = 11\,659\,160(7) \times 10^{-10} \text{ (0.6 ppm)}$$

$$a_{\mu}('99) - a_{\mu}(\text{SM}) = 42(17) \times 10^{-10}$$

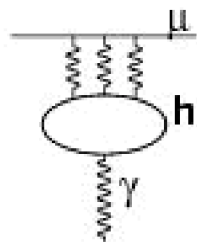
Reduced to
1.6



Hadronic contributions to a_μ



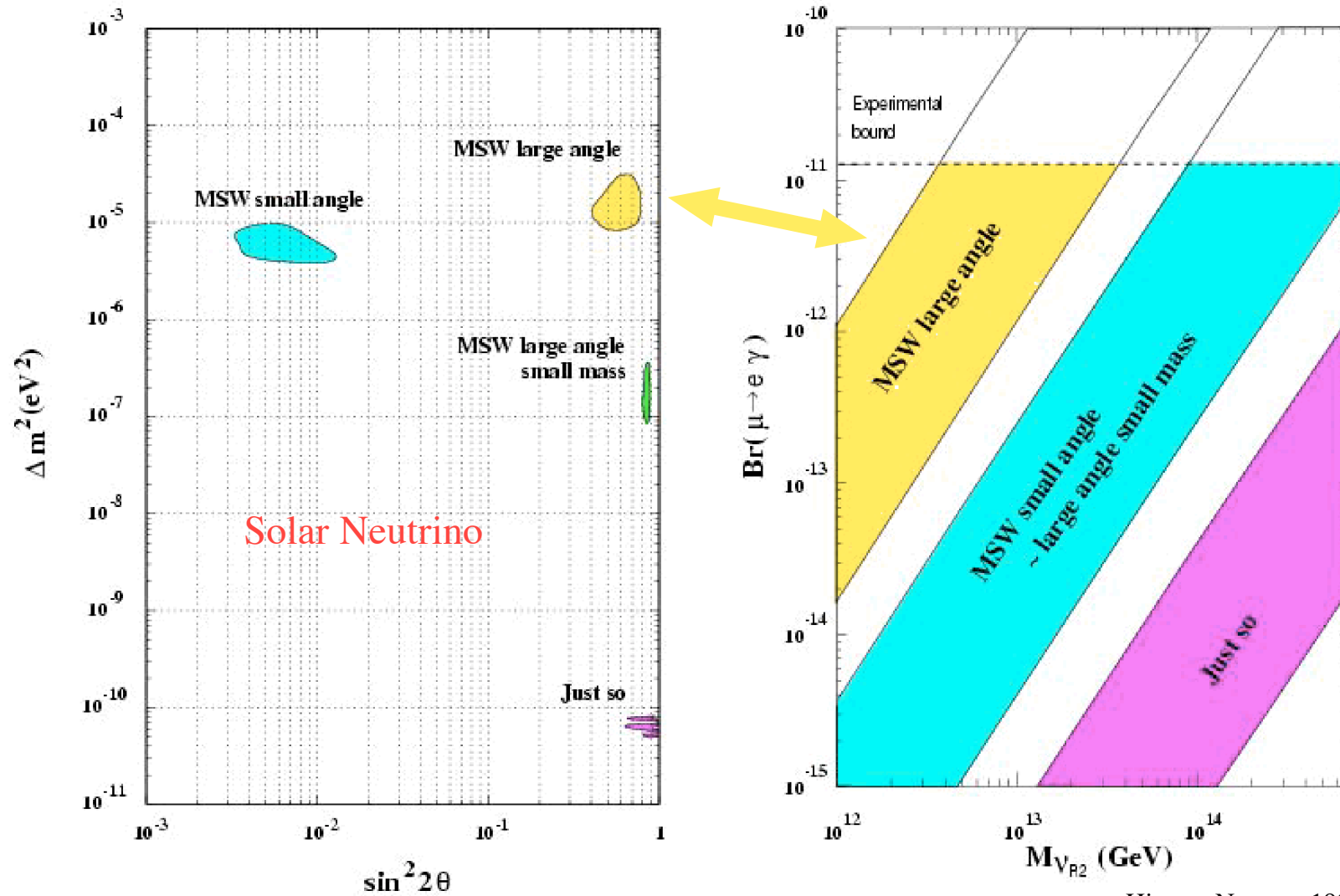
- L.M. Barlow et al., *Nucl.Phys.* B256 (1985) 365.
- T. Kinoshita, B. Hilde, and Y. Okamoto, *Phys.Rev.* D31 (1985) 2108
- J.A. Casas, C. Lopez, and F.J. Yndurain, *Phys.Rev.* D32 (1985) 736
- S. Dubnicka and L. Martinovic, *Phys.Rev.* D42 (1990) 884
- S. Eidelman and F. Jegerlehner, *Z.Phys.* C67 (1995) 583
- K. Adel and F.J. Yndurain, *hep-ph/9509378* (1995) printed in *Rev. Acad. Ciencias (Esp.)*, 92 (1998)
- D.H. Brown and W.A. Worstell, *Phys.Rev.* D54 (1996) 3237
- R. Alemany, M. Davier, and A. Hoechele, *Eur.Phys.J.* C2 (1998) 123
- R. Alemany, M. Davier, and A. Hoechele, *Eur.Phys.J.* C2 (1998) 123
- M. Davier and A. Hoechele, *Phys.Lett.* B419 (1998) 419
- M. Davier and A. Hoechele, *Phys.Lett.* B435 (1998) 427
- $a_\mu(\text{exp}) - a_\mu(\text{QED}) - a_\mu(\text{weak}) - a_\mu(\text{had};2)$
- S. Narison, *Phys.Lett.* B513 (2001) 53
- J.F. De Troconiz, F.J. Yndurain, *hep-ph/0108025* (update of earlier works)



$$\begin{aligned}
 a_\mu(\text{had};1b) &= -79(15) \times 10^{-11} \\
 a_\mu(\text{had};1b) &= -92(32) \times 10^{-11} \\
 \text{Average} &: -85(25) \times 10^{-11}
 \end{aligned}$$

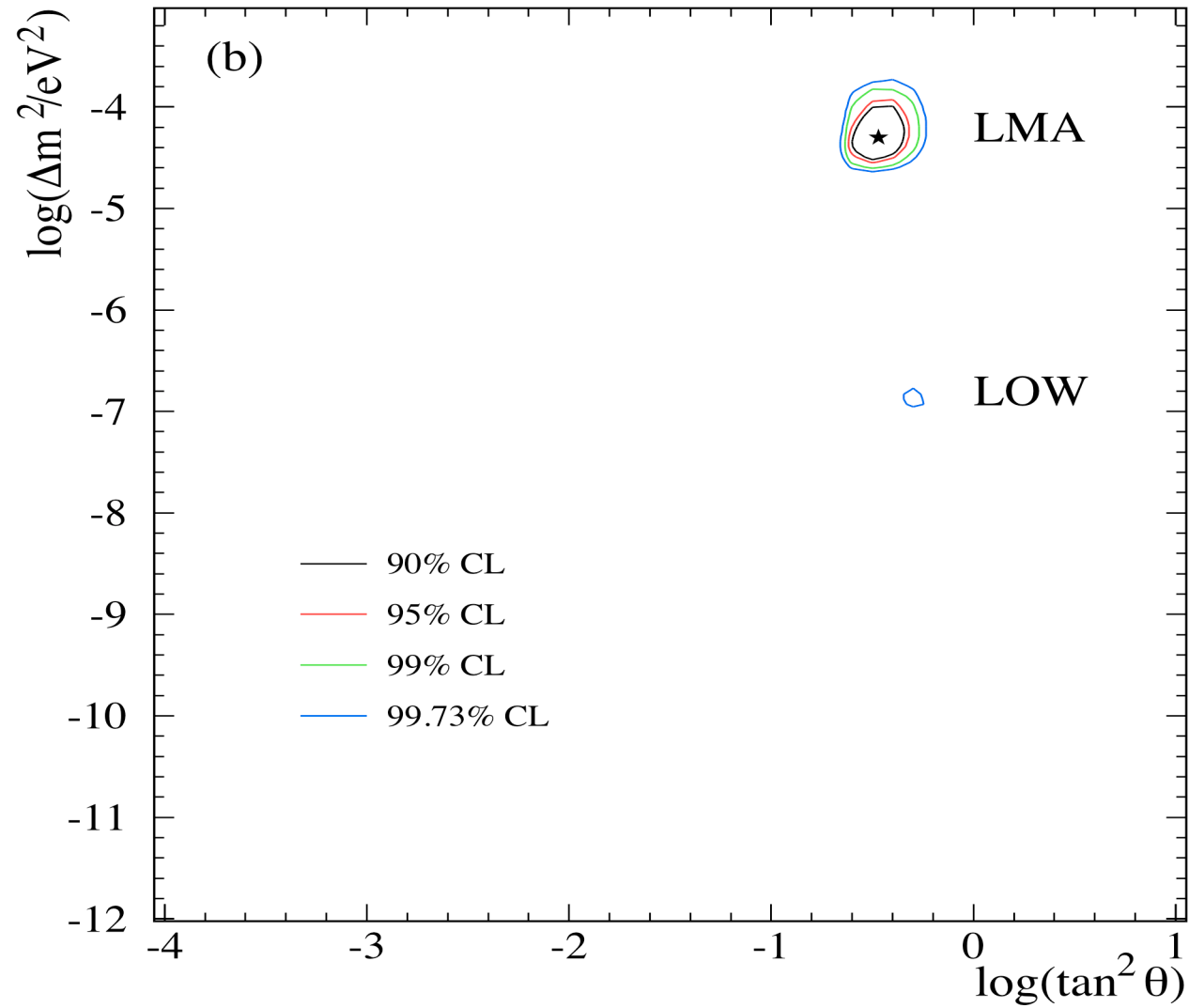
Bijnens, Pallante, and Prades (1996)
Hayakawa and Kinoshita (1998)

Probes Origin of Neutrino Oscillation



Hisano, Nomura 1998

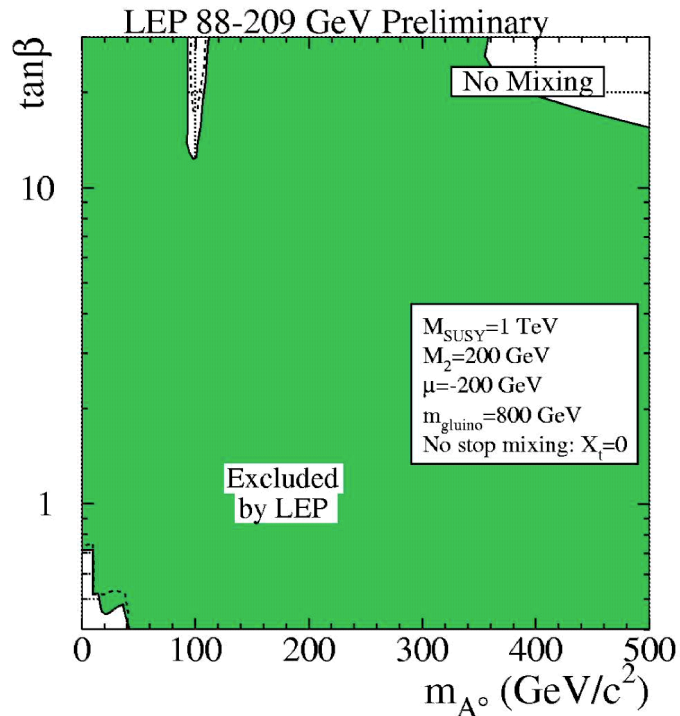
SK + SNO etc. = Large Mixing Solution



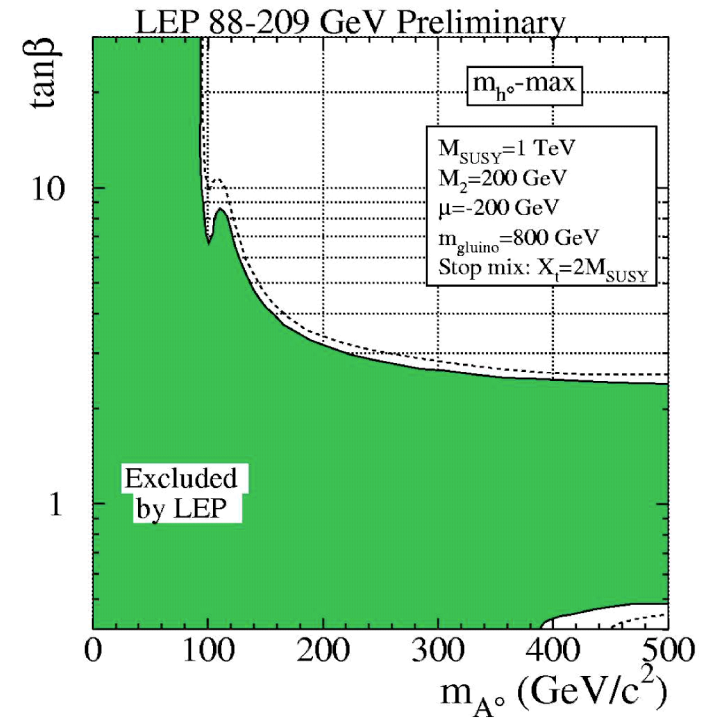
No SUSY Discovered at LEP

→ Small $\tan\beta$ Excluded

No Mixing



M_h Max



Physics:

The motivation for the experiment is
now much higher than ever !

Schedule

Obtain the Result (Discovery or Limit):

Before the LHC Experiments (>2007)

and

Before the MECO Experiment
(still waiting to be funded)

We foresee:

- Start beam tuning with the COBRA toward the end of 2003
- Engineering runs to start in 2004

Depends on budget approval

- Expected Performance and Sensitivity
- More Detailed Schedule



Discussed for each item in the following talks

(then to be summarized by my talk at the end)

The Collaboration

A. Baldini^{4*}, A. de Bari⁵, L. M. Barkov¹, C. Bemporad⁴, P. Cattaneo⁵,
G. Cecchet⁵, F. Cei⁴, T. Doke⁸, J. Egger⁶, M. Grassi⁴, A. A. Grebenuk¹,
T. Haruyama², P.-R. Kettle⁶, B. Khazin¹, J. Kikuchi⁸, Y. Kuno³, A. Maki²,
Y. Makida², T. Mashimo⁷, S. Mihara⁷, T. Mitsuhashi⁷, T. Mori^{7*},
D. Nicolò⁴, H. Nishiguchi⁷, H. Okada⁸, W. Ootani⁷, K. Ozone⁷, R. Pazzi⁴,
S. Ritt⁶, T. Saeki⁷, R. Sawada⁷, F. Sergiampietri⁴, G. Signorelli⁴, V. P.
Smakhtin¹, S. Suzuki⁸, K. Terasawa⁸, A. Yamamoto², M. Yamashita⁸,
S. Yamashita⁷, K. Yoshimura², T. Yoshimura⁸

(Collaboration for the $\mu \rightarrow e\gamma$ Experiment at PSI)

¹BINP, Novosibirsk, Russia

²KEK, Tsukuba, Japan

³Osaka University, Osaka, Japan

⁴University of Pisa and INFN, Pisa, Italy

⁵INFN, Pavia, Italy

⁶PSI, Villigen, Switzerland

⁷University of Tokyo, Tokyo, Japan

⁸Waseda University, Tokyo, Japan

41 members including 1 postdoc and 6 students

23 Japan, 11 Italy, 3 Switzerland, 4 Russia, +Engineers/Technicians

The Collaboration

Spokespersons: T. Mori, A. Baldini

Technical Coordinator: S. Ritt

Responsible Institutes and Contact Persons:

◇ Beam Line:	PSI	(P.-R. Kettle)
◇ COBRA Magnet:	KEK-Tokyo	(W. Ootani)
◇ Drift Chamber:	PSI	(J. Egger)
◇ Timing Counter:	Pisa	(A. Baldini)
◇ Photon Detector:	Tokyo-KEK-Pisa	(S. Mihara)
◇ Trigger:	Pisa	(M. Grassi)
◇ Elec. & DAQ:	PSI	(S. Ritt)

Budget

Total = US\$ 6.5M

Japan:

~ \$2.8M

Photon Detector
COBRA Magnet

approved

Italy:

~ \$2.5M

Photon Detector
Timing Counters
Trigger Electronics

to be requested & approved

PSI:

~ \$1.3M

Photon Detector
Drift Chamber
Beam Line
DAQ Electronics

Status in Japan

Collaborators:

23 people (5 students) from 4 institutes

13 - 14 full manpower equivalent

COBRA Magnet: 2 - 3

Photon Detector: 10 - 11

Beam Line: 0.5 - 1

(Possibly Drift Chamber: 1 student)

Budget:

4-Year Construction Budget: 2000 - 2003 (JFY)

\$2.8M plus some travels to PSI

Operation Money to be requested for 2004 - end

Status in Russia

Novosibirsk:

Technical support for Photon Detector (LXe)

A new e^+e^- collider started keeping them busy

Dubna:

A few people may join us to help with the DC etc.

Background and Sensitivity

	proposal	
δE_γ (%)	1.4 (2.0)	4.0–4.5
δp_e (%)	0.7	0.7–0.9
$\delta t_{e\gamma}$ (nsec)	0.15	0.15
· δt_e (nsec)	0.1	0.1
· δt_γ (nsec)	0.1	0.1
· δz_γ (mm)	16	16–18
$\delta \theta_{e\gamma}$ (mrad)	12 (14)	17–20.5
· $\delta \theta_e$ (mrad)	9	9–12
· δd_e (mm)	2.1	2.1–2.5
· δx_γ (mm)	4 (7)	9–10.5
$\Omega/4\pi$	0.09	0.09
ϵ_e	0.95	0.9
ϵ_γ	0.7	0.6
ϵ_{sel}	0.8	0.7
R_μ /sec	1.0×10^8	$(0.2–0.3) \times 10^8$
T sec	2×10^7	2.6×10^7
S_{1ev}	0.94×10^{-14}	$(3.8–5.6) \times 10^{-14}$
B_{acc}	0.5×10^{-14}	$(2.2–3.5) \times 10^{-14}$
N_{acc}	0.5	0.6
S_{90}	2.9×10^{-14}	$(1.0–1.6) \times 10^{-13}$