ALEPH: risultati di fisica e ricordi

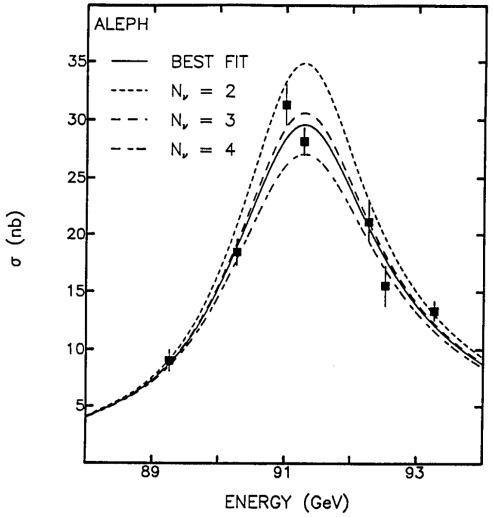
Roberto TENCHINI

BARI – 7 Novembre 2023

Sicuramente ho scordato molti nomi e altro … ricordatemeli e aggiornerò le slides !
I nomi che appaiono sono solo dei gruppi italiani (tranne qualche eccezione)

La corsa tra LEP e SLC per N_ν

Aleph:	N = 3.27 +/– 0.30
Delphi:	N = 2.40 +/– 0.64
Opal:	N = 3.12 +/– 0.42
L3:	N = 3.42 +/– 0.48

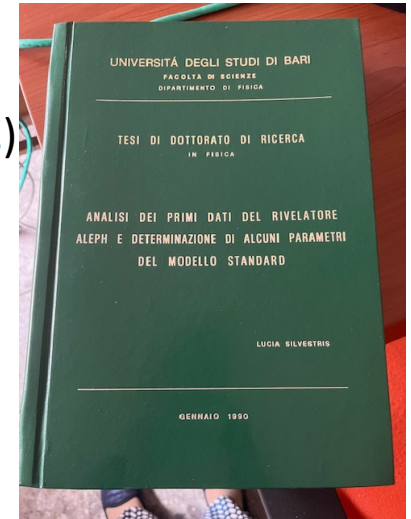


Mark II **91.17±0.18** **N_ν = 2.7±0.7**

Fabrizio Palla e Monica Pepe-Altarelli et al. : selezione calorimetrica (Jack S.)

Ed Blucher et al. : selezione con tracce (**Alain B.**)

Tesi dottorato **Lucia Silvestris**



ELSEVIER

Physics Letters B

Volume 231, Issue 4, 16 November 1989, Pages 519-529

Determination of the number of light neutrino species

ALEPH Collaboration, D. DeCamp, B. Deschizeaux, J.-P. Lees, M.-N. Minard, J.M. Crespo, M. Delfino, E. Fernandez [1], M. Martinez, R. Miquel, M.L. Mir, S. Orteu, A. Pacheco, J.A. Perlas, E. Tubau, M.G. Catanesi, M. de Palma, A. Farilla, G. Iaselli, G. Maggi...G. Zobernig

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https://doi.org/10.1016/0370-2693(89)90704-1

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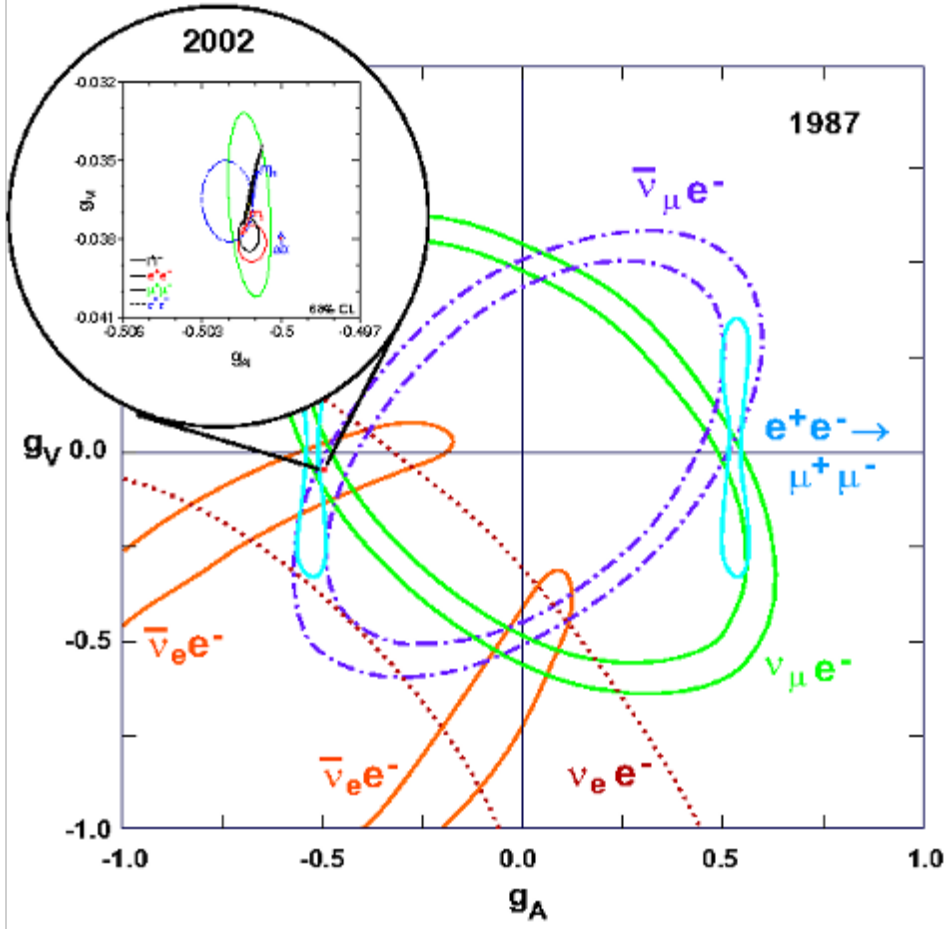
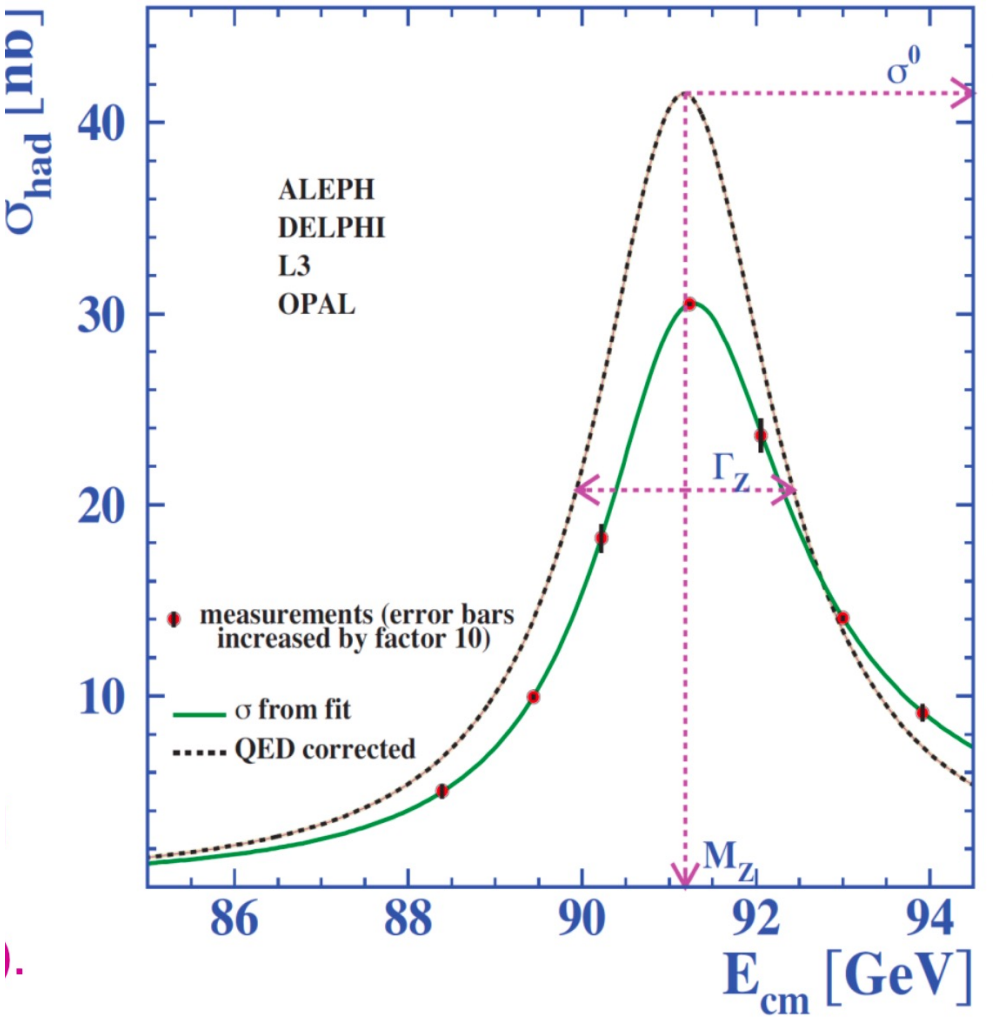
Abstract

The cross-section for $e^+e^- \rightarrow$ hadrons in the vicinity of the Z boson peak has been measured with the ALEPH detector at the CERN Large Electron Positron collider, LEP. Measurements of the Z mass, M_Z = (91.174±0.070) GeV, the Z width Γ_Z=(2.68±0.15) GeV, and of the peak hadronic cross-section, σ_{had}^{peak}=(29.3±1.2) nb, are presented. With the constraints of the standard electroweak model, the number of light neutrino species is found to be N_ν=3.27±0.30. this results rules out of the possibility of a fourth type of light neutrino at 98% CL.

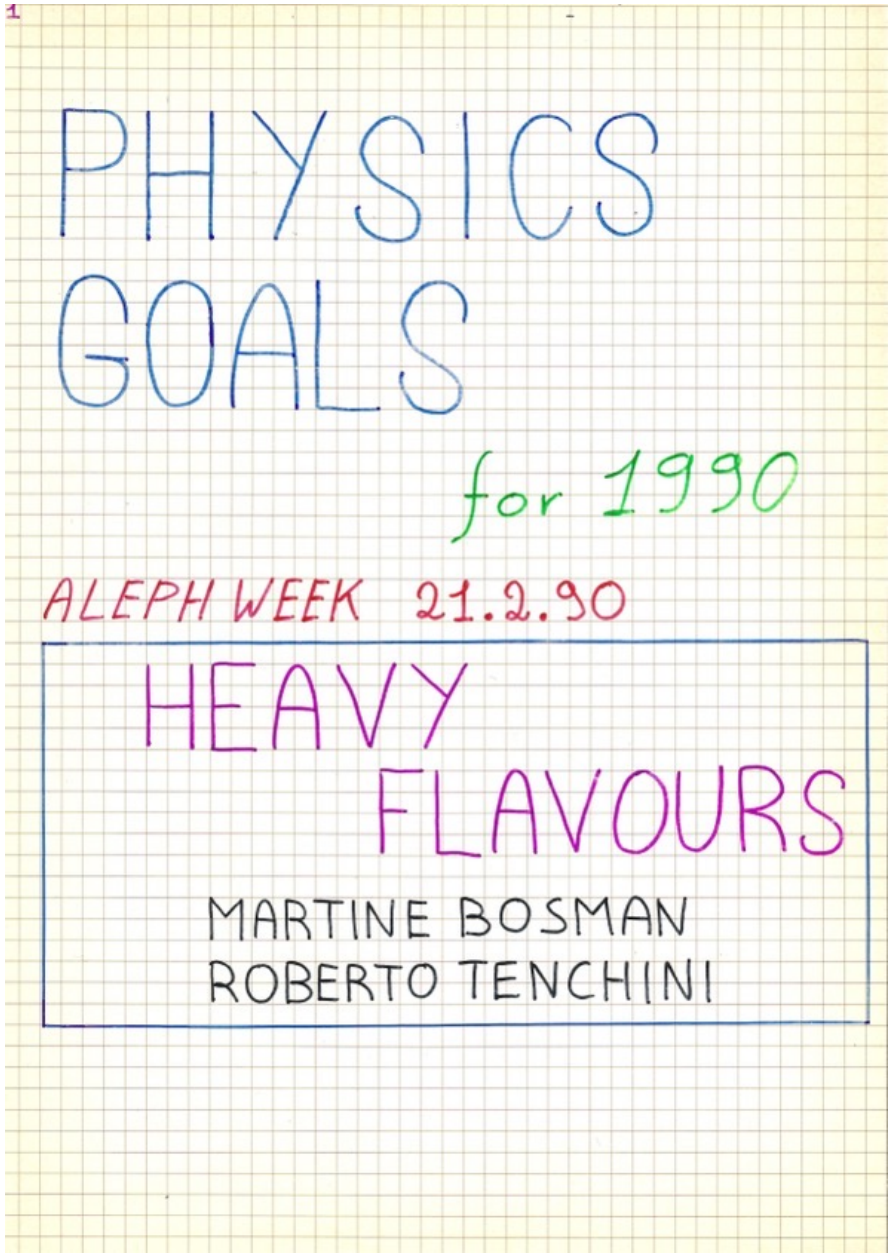
Z lineshape parameters

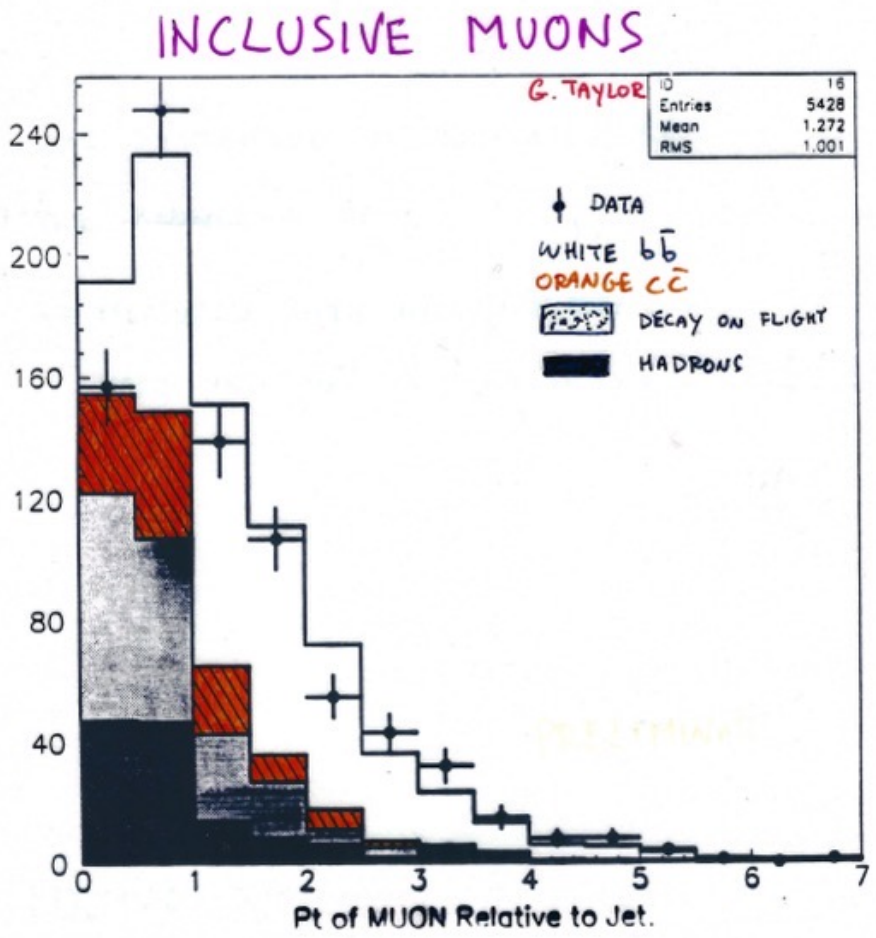
Tra di noi coinvolti **Monica Pepe-Altarelli**, **Mauro De Palma** (fit) , poi per i μ **Fabio Bossi e Andrea Venturi**, per i τ **Gigi Rolandi, Agnese Ciocci, Piersimone Marrocchesi, Gerri Ganis, Anna Gregorio**





Heavy Quarks prima di VDET





Contributo pisano all'analisi di Aleph nel 1994

1) Asimmetria Forward Backward di Z in BBbar. ABBANEO, LIGABUE

Consistenza Gruppo Pisano : 3 persone su un totale di 5
Note interne prodotte nel 93/94 : 2 brevi, una lunga (80 pagine)
Articoli su riviste internazionali : due
Contributed paper a conferenze internazionali : uno (Moriond 94).

2) BBbar mixing. ABBANEO, LIGABUE

Vedi asimmetria

3) Vita media inclusiva del B. DELL'ORSO, MONETA, VANNINI

Consistenza Gruppo Pisano : 3 persone su un totale di 3
Note interne prodotte nel 93/94 : una
Articoli su riviste internazionali : un articolo pubblicato.
uno in preparazione.

4) Vite medie separate B+/B- CALDERINI, WALSH

Consistenza Gruppo Pisano : 2 persone su un totale di 3
Note interne prodotte nel 93/94 : una
Articoli su riviste internazionali : un articolo pubblicato.
Contributed paper a conferenze internazionali : uno (Glasgow).

5) Produzione di J/psi. PALLA, SPAGNOLO

Consistenza Gruppo Pisano : 2 persone su un totale di 6
Note interne prodotte nel 93/94 : una
Articoli su riviste internazionali : un articolo pubblicato.
Contributed paper a conferenze internazionali : uno (Moriond).

6) Produzione di Bs e Ds, vita media del Bs RIZZO, WALSH, PALLA

Consistenza Gruppo Pisano : 4 persone su un totale di 4
Note interne prodotte nel 93/94 : una
Contributed paper a conferenze internazionali : uno (Glasgow).

7) Vita media del tau. FIDECARO, FERRANTE, LUSIANI, MESSINEO, SCIABÀ

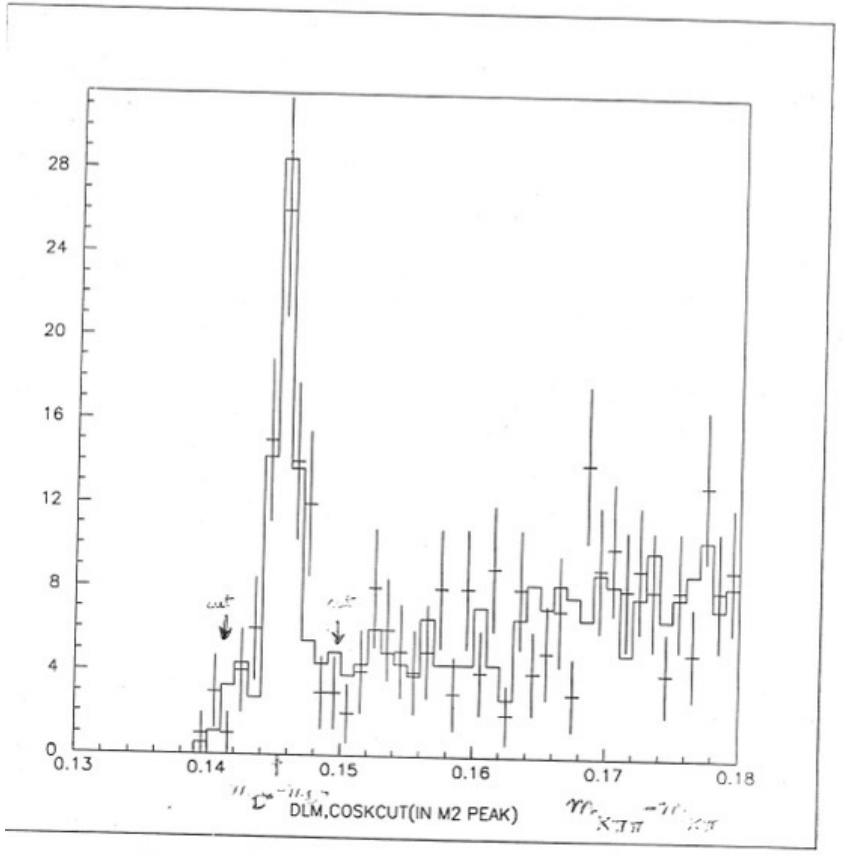
Consistenza Gruppo Pisano : 5 persone su un totale di 8
Note interne prodotte nel 93/94 : una
Articoli su riviste internazionali : un articolo pubblicato.
Contributed paper a conferenze internazionali : uno (Glasgow).

8) Produzione di D** in decadimenti del B. CARPINELLI, WALSH

Consistenza Gruppo Pisano : 2 persone su un totale di 3
Note interne prodotte nel 93/94 : una
Contributed paper a conferenze internazionali : uno (Glasgow).
Articoli su riviste internazionali : uno in preparazione.

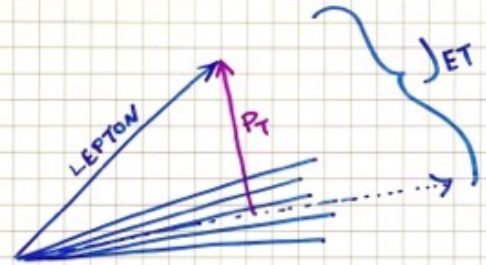
Fisica del b (Pisa) e charm (Bari) inizio anni 90

FROM THE D* GROUP : B. ATWOOD, G. BONVICINI, P. COLAS
D. CREANZA, C. KLOPFENSTEIN, M. MACCI, S. NATALI, A. PUTZER,
M. QUATTROMINI, P. SCIACOVELLI, G. SELVAGGI



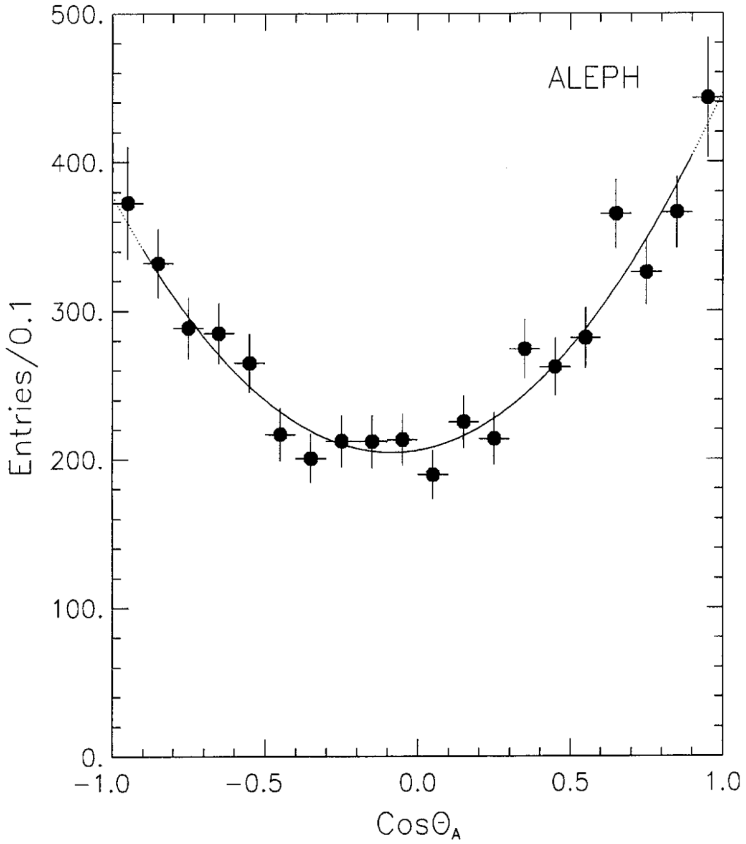
4

- P_T definition



- $\begin{cases} P^{LEPTON} > 3\ GeV/c \\ P_T^{LEPTON} > 1.\ (\text{INCLUDENDO IL LEPTONE}) \\ \quad\ 1.3\ (\text{ESCLUDENDO IL LEPTONE}) \end{cases}$ GeV/c

- ALGORITMO PER I JET : SI AGGIUNGONO PARTICELLE FINO A QUANDO $M_{INV} < M_{CUT} \sim M_b$



EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

CERN-PPE/91-71
22 April 1991

Measurement of the Forward-Backward Asymmetry in $Z \to b\bar{b}$ and $Z \to c\bar{c}$

The ALEPH Collaboration

Abstract

From a sample of 150 000 hadronic Z decays collected with the ALEPH detector at LEP, events containing prompt leptons are used to measure the forward-backward asymmetries for the channels $Z \to b\bar{b}$ and $Z \to c\bar{c}$, giving the results $A_{FB}^b = 0.126 \pm 0.028 \pm 0.012$ and $A_{FB}^c = 0.064 \pm 0.039 \pm 0.030$. These asymmetries correspond to the value of effective electroweak mixing angle at the Z mass $\sin^2\theta_W(m_Z^2) = 0.2262 \pm 0.0053$.

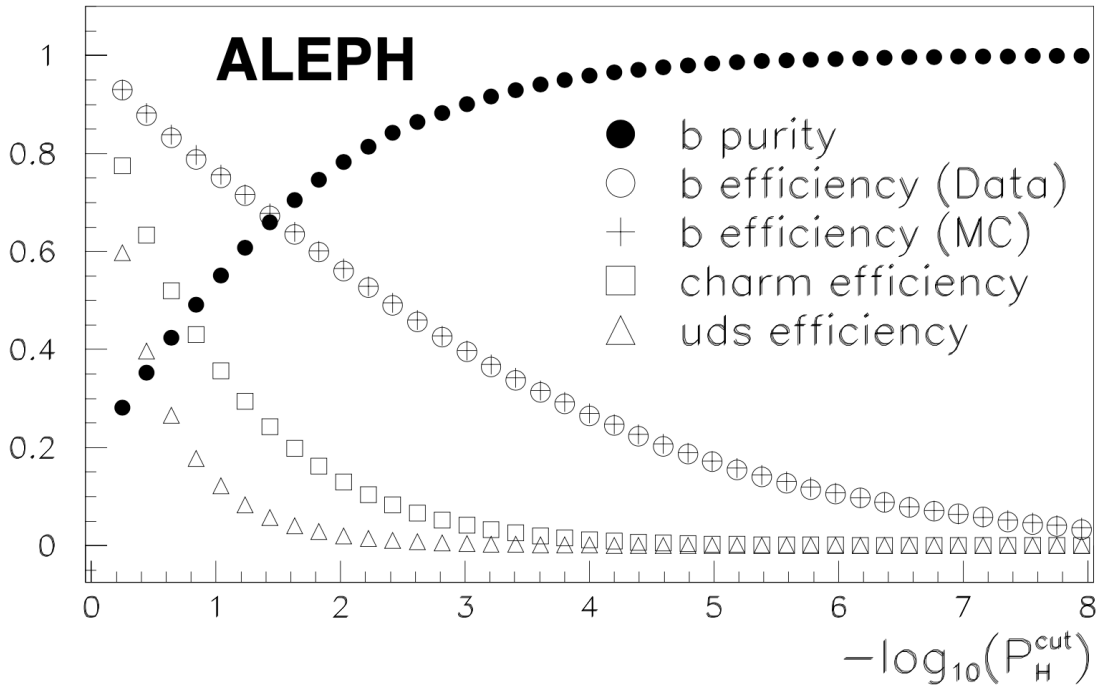
(Submitted to Physics Letters B)

Duccio Abbaneo, Franco Ligabue, Fabrizio Palla, R.T.

*See the following pages for the list of authors.

- Importante l'uso dell'Energy Flow (adesso Particle Flow) per la direzione del jet

Misura precisa di R_b e lunga saga



Dave Brown

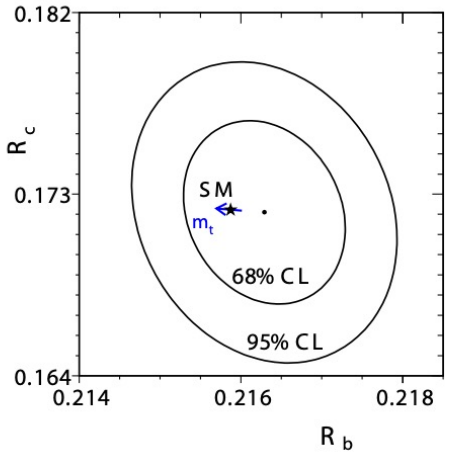
EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

CERN-PPE/97-018
11 February 1997

Fabrizio Palla, Jack Steinberger

A Measurement of R_b using Mutually Exclusive Tags

The ALEPH collaboration

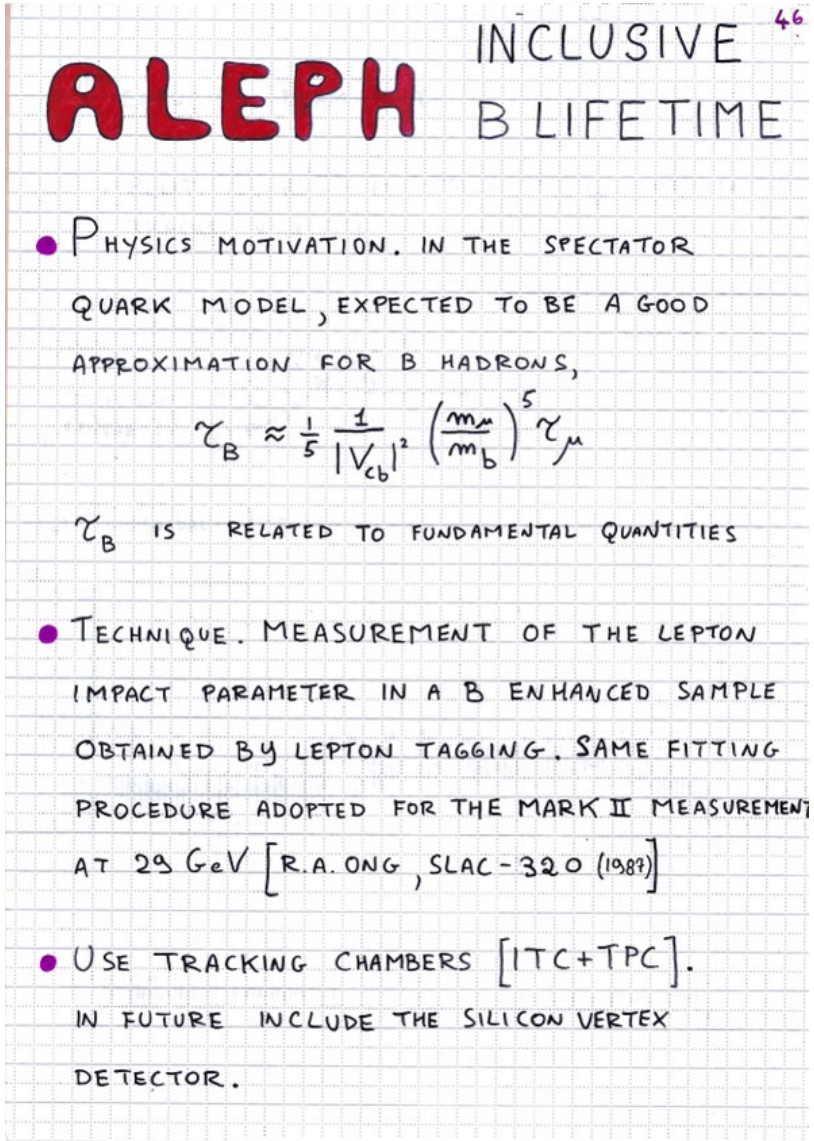


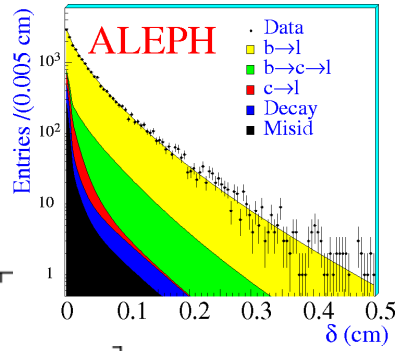
Abstract

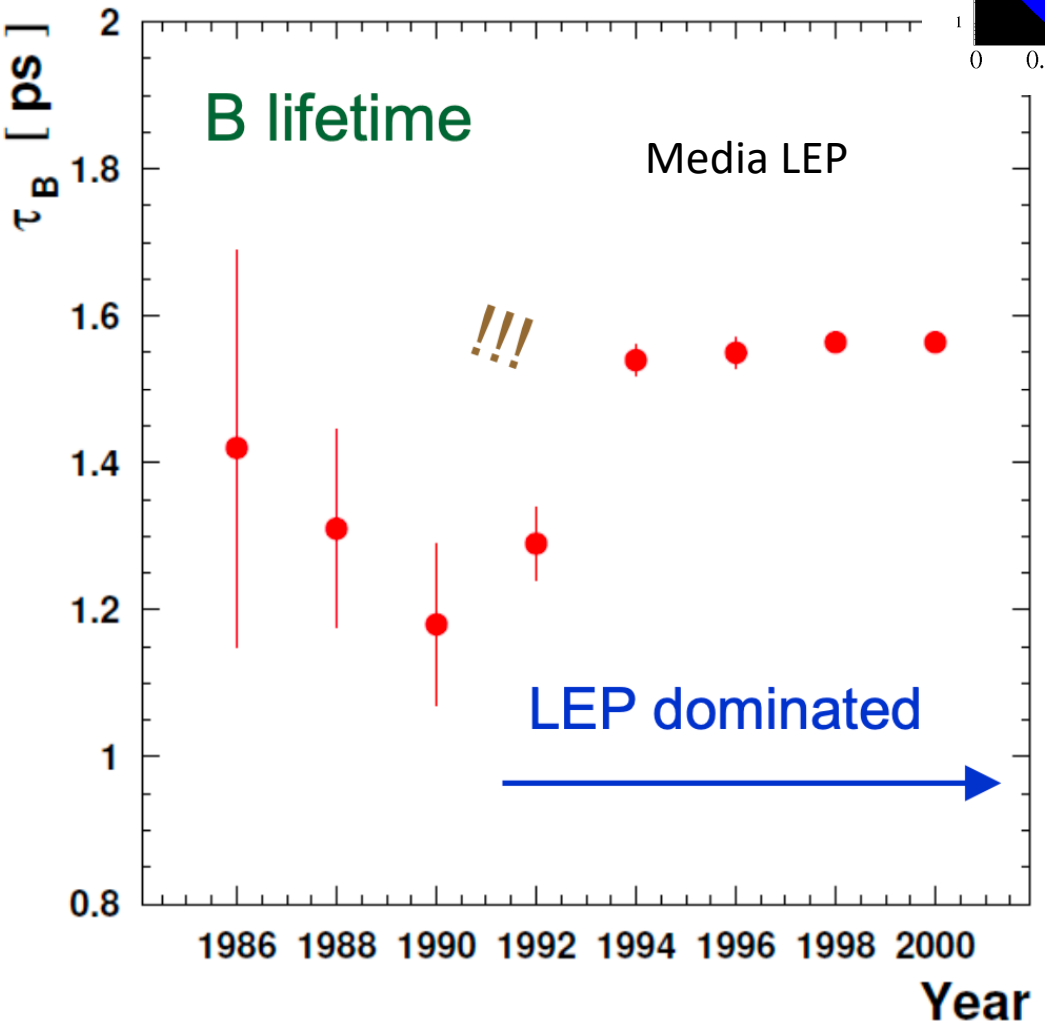
five mutually exclusive hemisphere tags has been performed
EP1 statistics. Three tags are designed to select the decay of
e remaining two select Z^0 decays to c and light quarks, and
ging efficiencies. The result, $R_b = 0.2159 \pm 0.0009(\text{stat}) \pm$
t with the electroweak theory prediction of 0.2158 ± 0.0003.

be submitted to Physics Letters B)

La vita media del b (quella giusta) con VDET



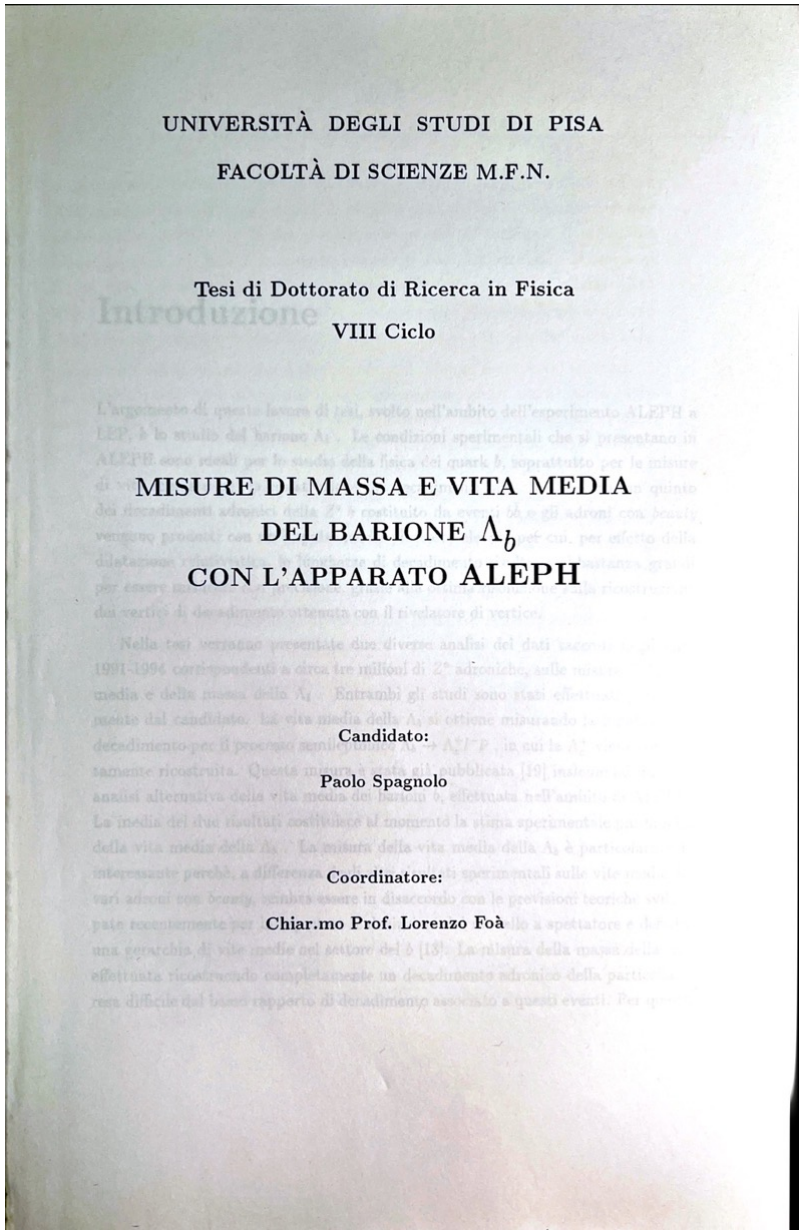




Roberto Dell'Orso, Lorenzo Moneta, Cristina Vannini

Roger Forty

Scoperta della Λ_b



UNIVERSITÀ DEGLI STUDI DI PISA

FACOLTÀ DI SCIENZE M.F.N.

Tesi di Dottorato di Ricerca in Fisica

VIII Ciclo

MISURE DI MASSA E VITA MEDIA
DEL BARIONE Λ_b
CON L'APPARATO ALEPH

Candidato:

Paolo Spagnolo

Coordinatore:

Chiar.mo Prof. Lorenzo Foà

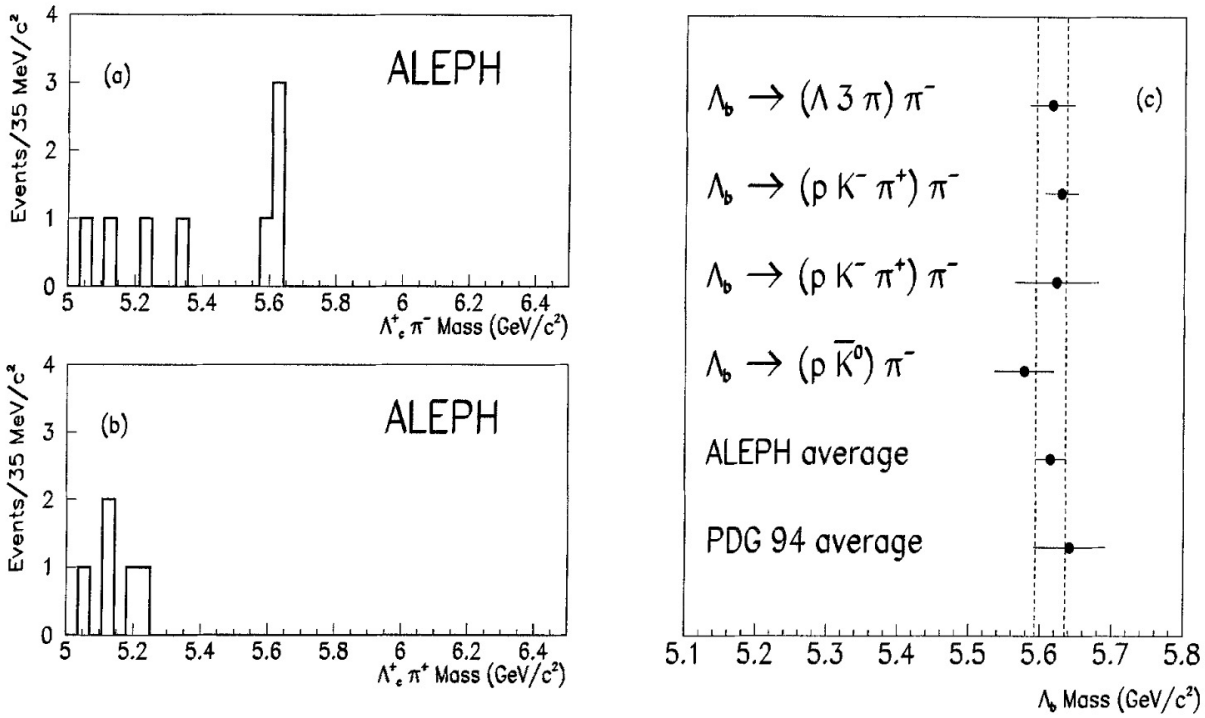


Fig. 1. (a) $\Lambda_c\pi$ invariant mass distribution for the right-sign combinations and (b) wrong-sign combinations. (c) Λ_b invariant masses for the four selected candidates. Also shown are the average value and the PDG 94 world average. The dotted lines indicate the $\pm 1\sigma$ values around the ALEPH average measurement.

Gian Musolino, Paolo Spagnolo

Scoperta(*) del Bs

(*) contesa con Delphi

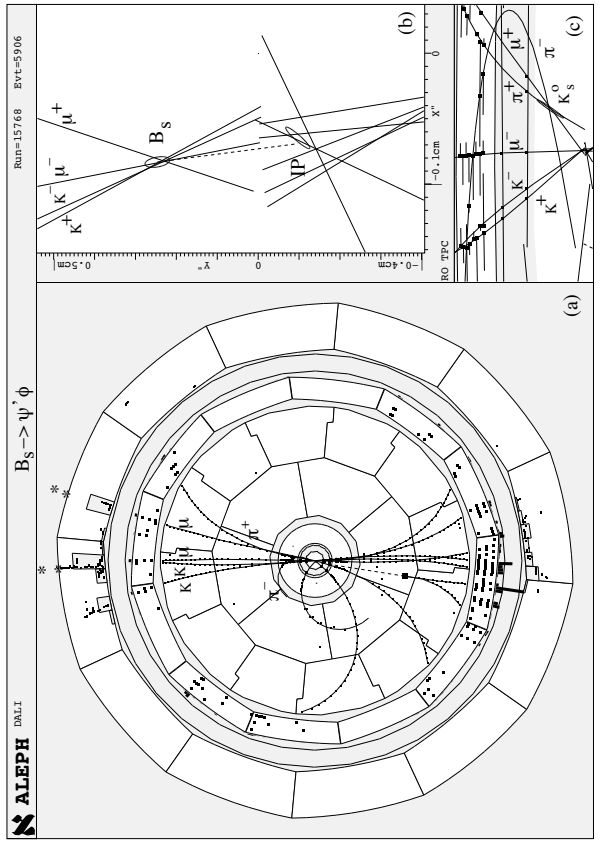


Figure 1: (a) A fisheye $r\phi$ view of the $B_S \to \psi'\phi$ event. The tracks forming the B_S meson are appropriately labeled. (b) A closeup view of the event near the interaction point. The error ellipses on the interaction point (IP) and the B_S vertex are 3σ. (c) A fisheye view of the event near the inner tracking chambers in the $r-\phi$ dimensions. The track coordinates recorded in the VDET and the ITC are shown. All tracks forming the B_S traverse a single silicon wafer in the inner and outer layer of the VDET minimizing mass measurement errors from possible internal misalignment in the VDET. The K^0_S decay daughters are labeled as π^+ and π^-. The vertex error ellipse is 3σ. The π^- track has momentum of 0.27 GeV and curls inside the ITC in the magnetic field of 1.5 T and has no coordinates in the TPC.

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

CERN-PPE/93-97
16 June 1993

First Measurement of the B_S Meson Mass

The ALEPH Collaboration

Abstract

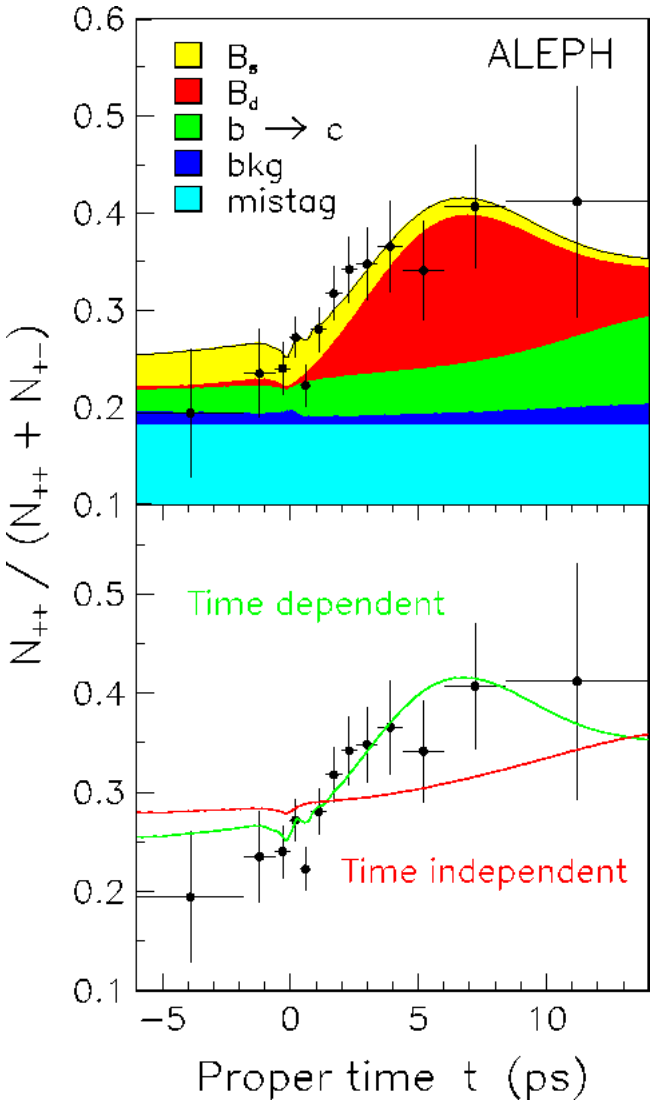
In a sample of about 1.1 million hadronic Z decays recorded with the ALEPH detector during the 1990-1992 running of LEP, two unambiguous B_S meson candidates were observed. From these events the mass of the B_S meson has been measured to be $5.3686 \pm 0.0056(stat.) \pm 0.0015(syst.)$ GeV.

(Submitted to Physics Letters B)

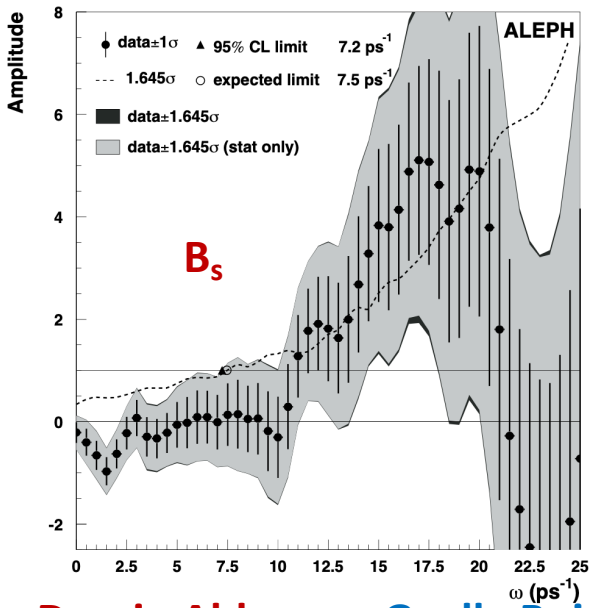
*See the following pages for the list of authors.

Vivek Sharma

Oscillazioni e prime misure della evoluzione temporale

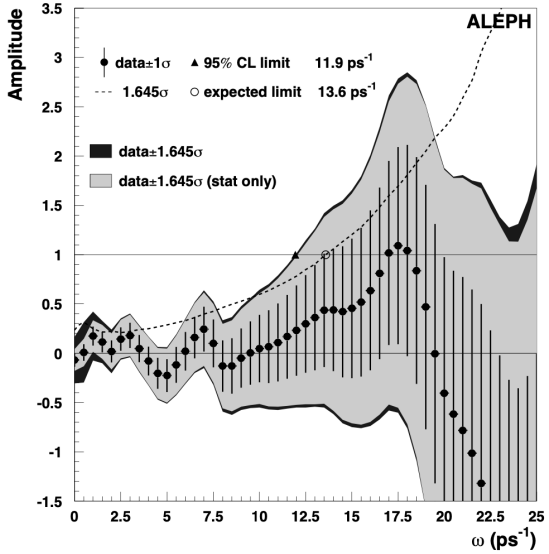


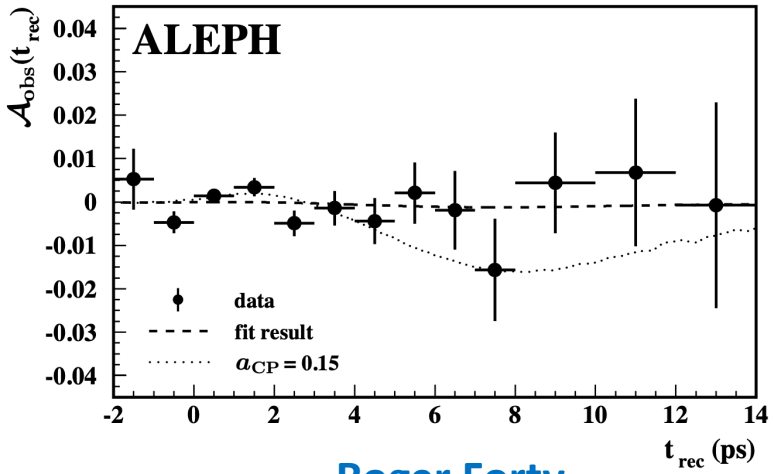
Roger Forty



Fabrizio Palla, Andrea Sciabà

Duccio Abbaneo, Gaelle Boix





Roger Forty

Per la parte time-indipendent (χ)
Duccio Abbaneo e Concezio Bozzi

Fisica del tau: polarizzazione, branching ratios, etc

Gigi Rolandi, Agnese Ciocci, Piersimone Marrocchesi, Gerri Ganis, Anna Gregorio

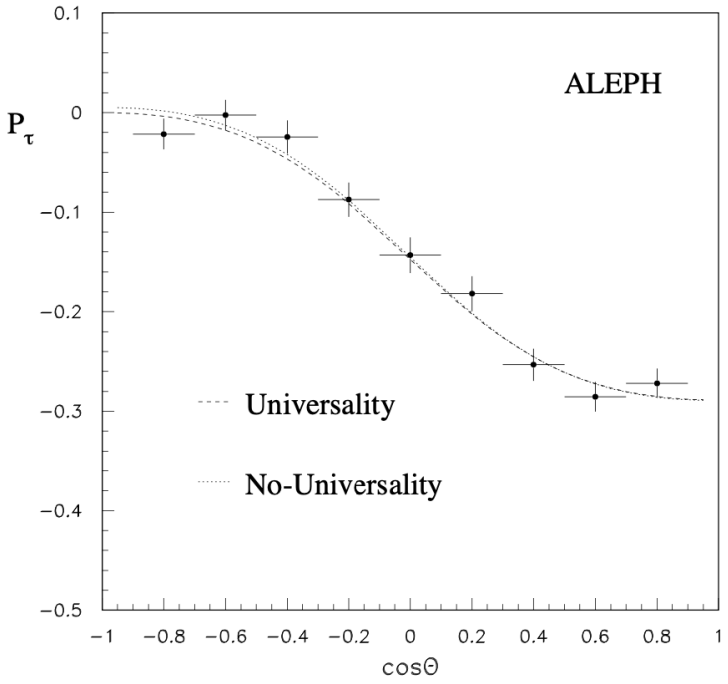
Branching Ratios and Spectral Functions of τ Decays: Final ALEPH Measurements and Physics Implications

The ALEPH Collaboration[1]

Abstract

The full LEP-1 data set collected with the ALEPH detector at the Z pole during 1991-1995 is analysed in order to measure the τ decay branching fractions. The analysis follows the global method used in the published study based on 1991-1993 data, but several improvements are introduced, especially concerning the treatment of photons and π^0's. Extensive systematic studies are performed, in order to match the large statistics of the data sample corresponding to over 300 000 measured and identified τ decays. Branching fractions are obtained for the two leptonic channels and eleven hadronic channels defined by their respective numbers of charged particles and π^0's. Using previously published ALEPH results on final states with charged and neutral kaons, corrections are applied to the hadronic channels to derive branching ratios for exclusive final states without kaons. Thus the analyses of the full LEP-1 ALEPH data are combined to yield a complete description of τ decays, encompassing 22 non-strange and 11 strange hadronic modes. Some physics implications of the results are given, in particular related to universality in the leptonic charged weak current, isospin invariance in a_1 decays, and the separation of vector and axial-vector components of the total hadronic rate. Finally, spectral functions are determined for the dominant hadronic modes and updates are given for several analyses. These include: tests of isospin invariance between the weak charged and electromagnetic hadronic currents, fits of the ρ resonance lineshape, and a QCD analysis of the nonstrange hadronic decays using spectral moments, yielding the value $\alpha_s(m_\tau^2) = 0.340 \pm 0.005_{\rm exp} \pm 0.014_{\rm th}$. The evolution to the Z mass scale yields $\alpha_s(M_Z^2) = 0.1209 \pm 0.0018$. This value agrees well with the direct determination from the Z width and provides the most accurate test to date of asymptotic freedom in the QCD gauge theory.

(Submitted to Physics Reports)



Michel Davier, Jean Claude Brient, Andre Rougé

OPEAN ORGANIZATION FOR NUCLEAR RESEARCH (CERN)

CERN-EP/2001-027
March 2, 2001

Measurement of the Tau Polarisation at LEP

The ALEPH collaboration*

Abstract

The polarisation of τ's produced in Z decay is measured using 160 pb^{-1} of data accumulated at LEP by the ALEPH detector between 1990 and 1995. The variation of the polarisation with polar angle yields the two parameters $\mathcal{A}_e = 0.1504 \pm 0.0068$ and $\mathcal{A}_\tau = 0.1451 \pm 0.0059$ which are consistent with the hypothesis of e-τ universality. Assuming universality, the value $\mathcal{A}_{e\text{-}\tau} = 0.1474 \pm 0.0045$ is obtained from which the effective weak mixing angle $\sin^2\theta_{\rm W}^{\rm eff} = 0.23147 \pm 0.00057$ is derived.

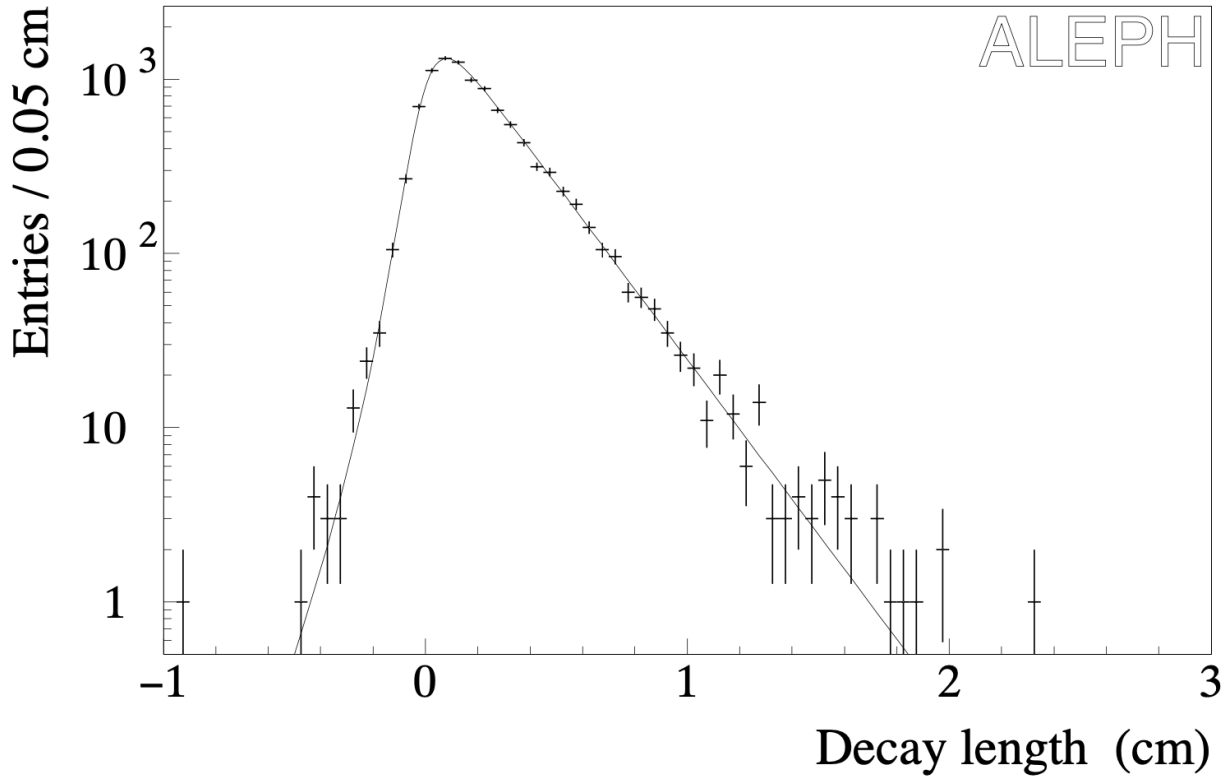
To be submitted to The European Physical Journal C

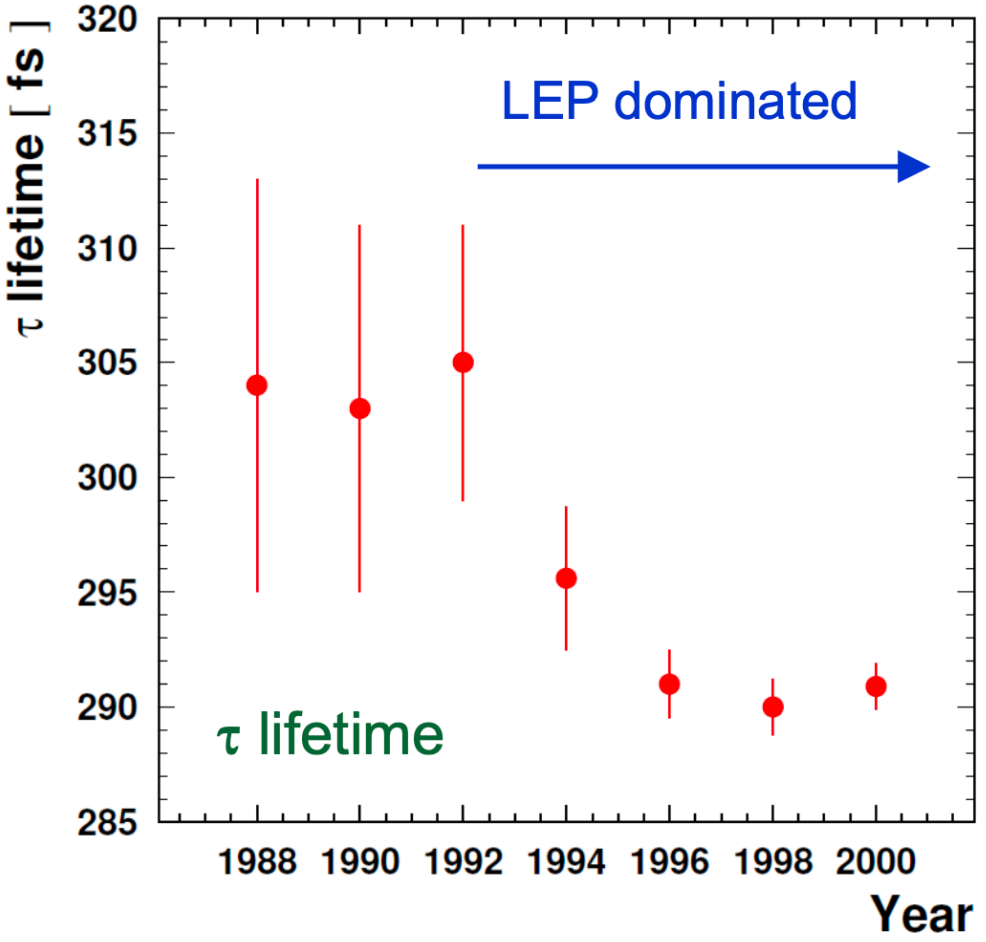
*See next pages for the list of authors.

Vita media del tau

Francesco Fidecaro, Isidoro Ferrante, Alberto Lusiani, Alberto Messineo, Andrea Sciabà

Steve Wasserbaech





Molte tecniche utilizzate : impact parameter sum(MIPS) method, the impact parameter difference (IPD) method, and the decay length (DL) method , 3-D method

Limite massa neutrino tau

Fabio Cerutti, Luca Passalacqua

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

CERN PPE/95-03
13 January 1995

An upper limit for the τ neutrino mass from $\tau \to 5\pi(\pi^0)\nu_\tau$ decays.

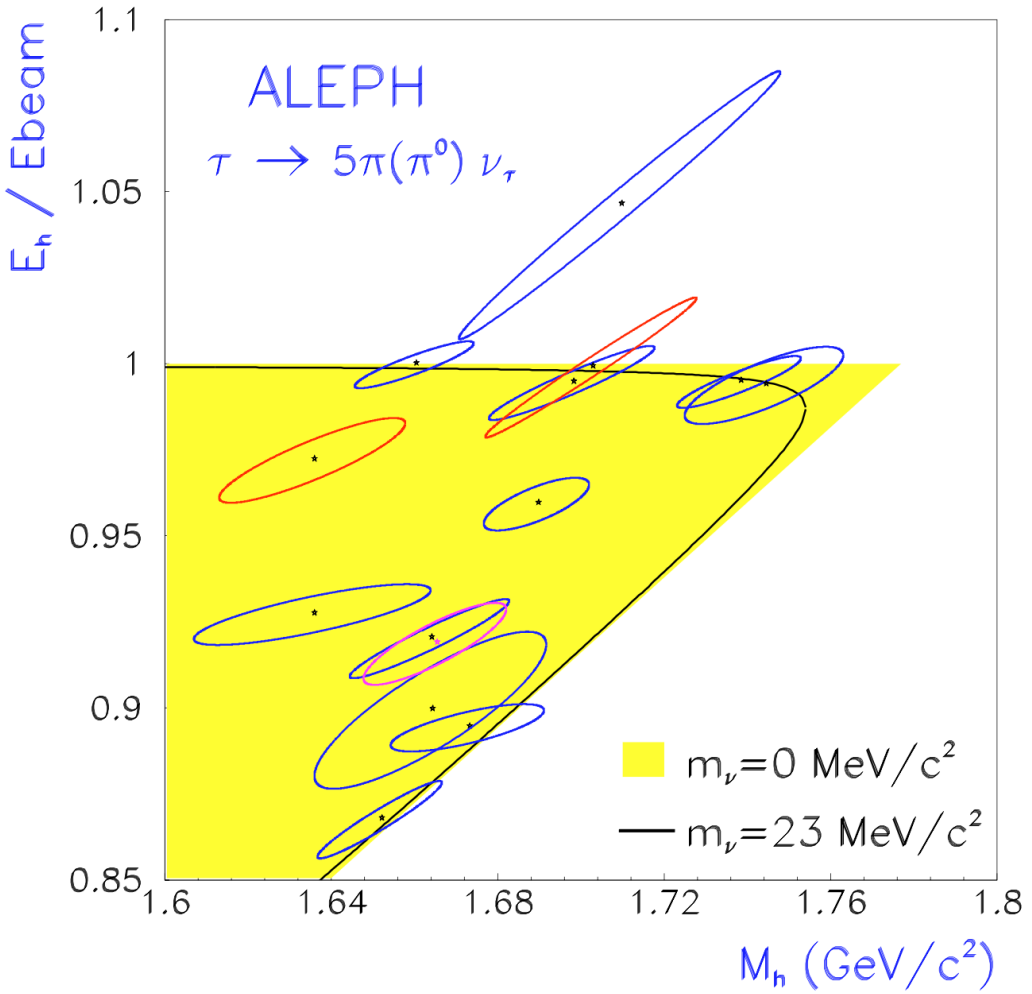
The ALEPH Collaboration*

Abstract

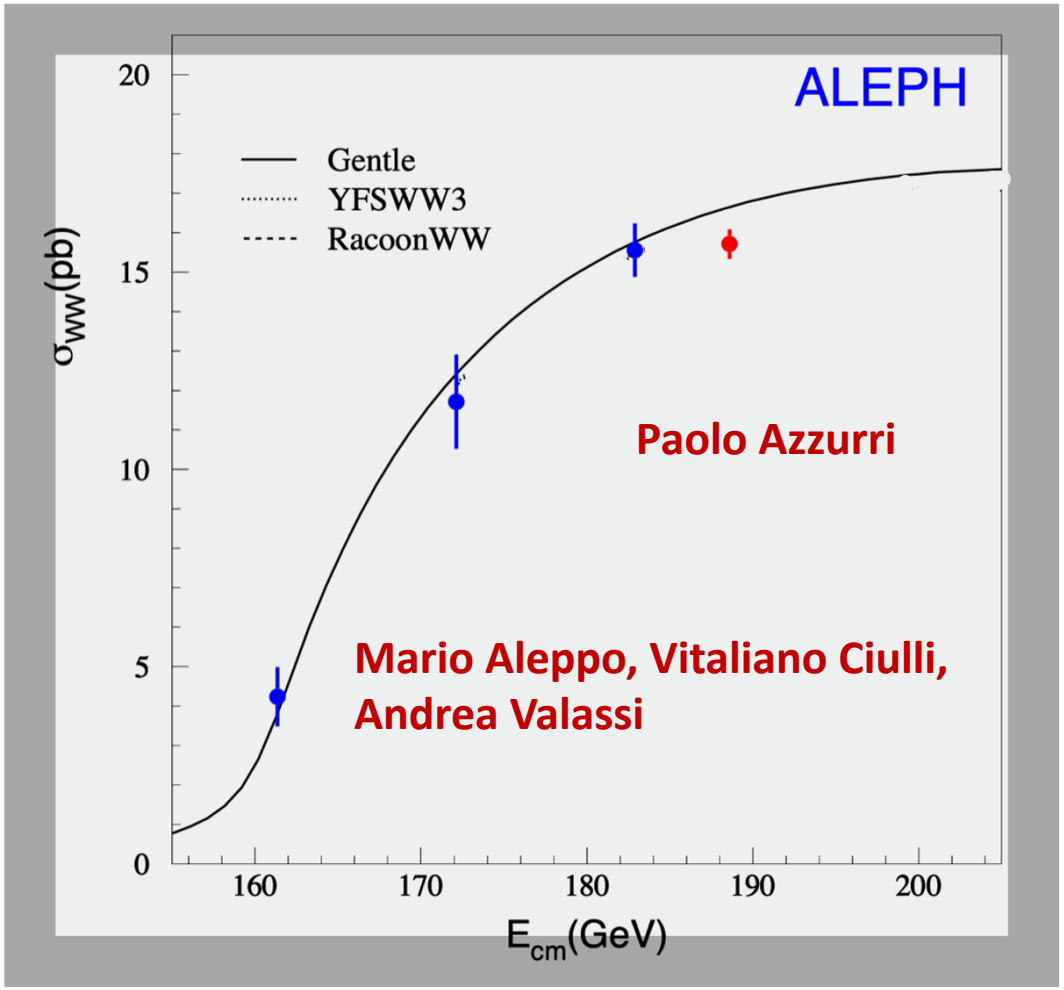
From a sample of 152.000 τ decays collected by the ALEPH detector at LEP an upper limit of 24 MeV at 95% CL on the τ neutrino mass has been determined. The limit is obtained using a two dimensional likelihood fit of the visible energy and the invariant mass distribution of 25 $\tau \to 5\pi(\pi^0)\nu_\tau$ events.

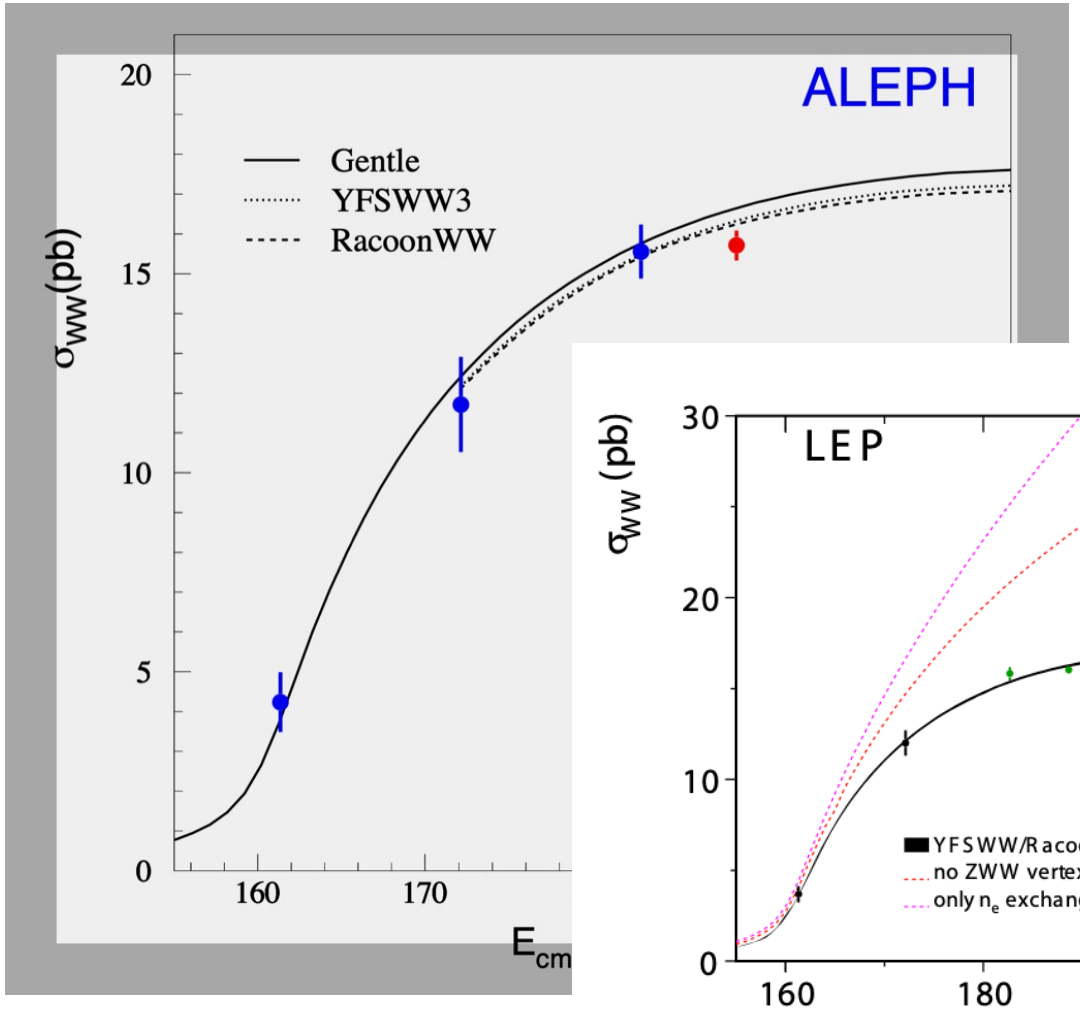
(To be submitted to Physics Letters B)

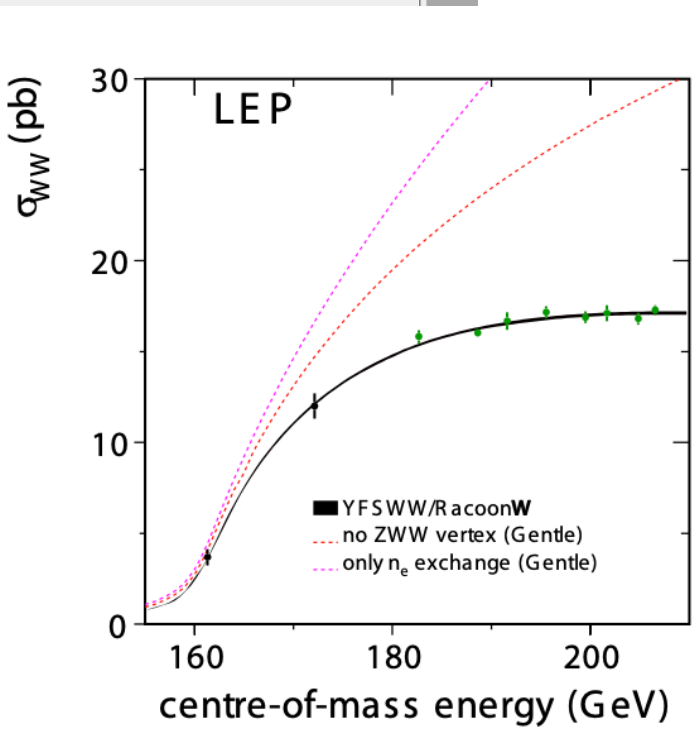
*See the following pages for the list of authors.



LEP2 : sorpresa dalla sezione d'urto WW (e confessione teorica … manca o(α))

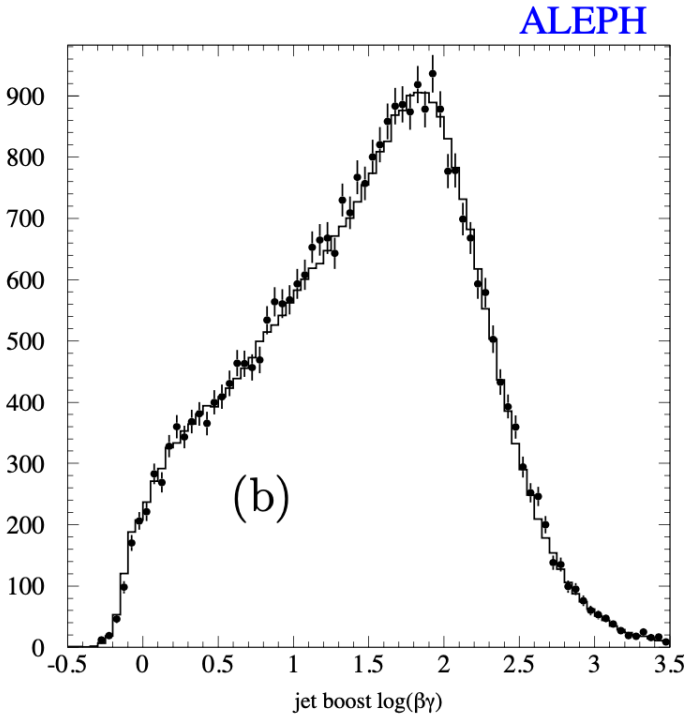


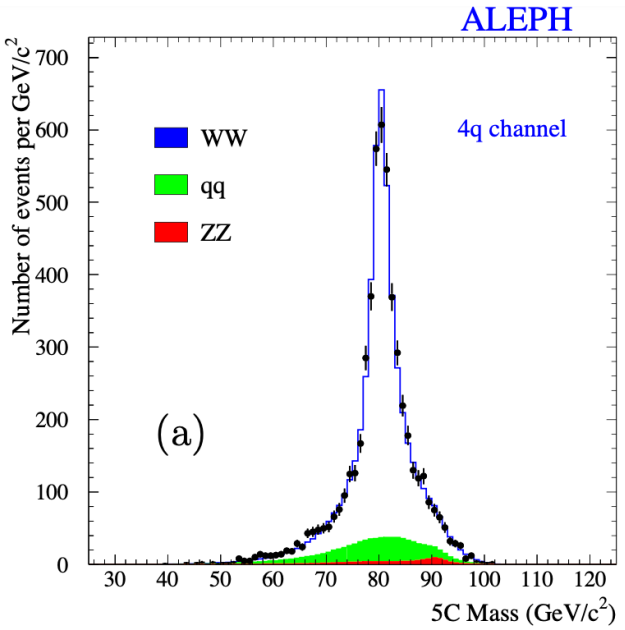


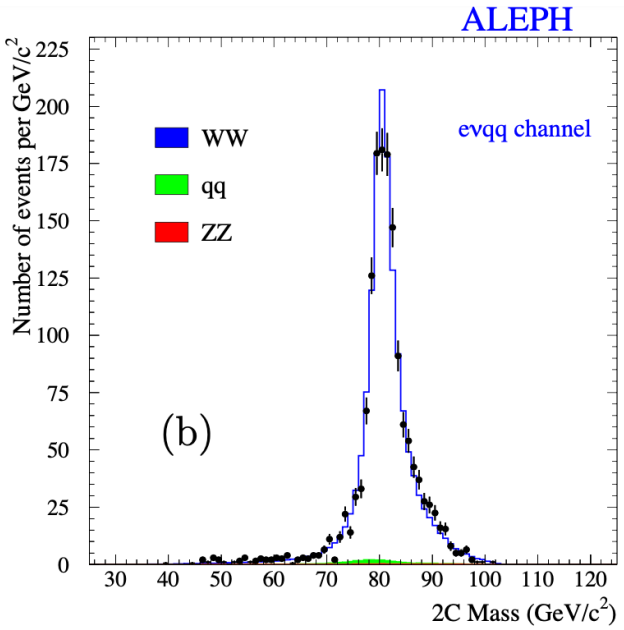


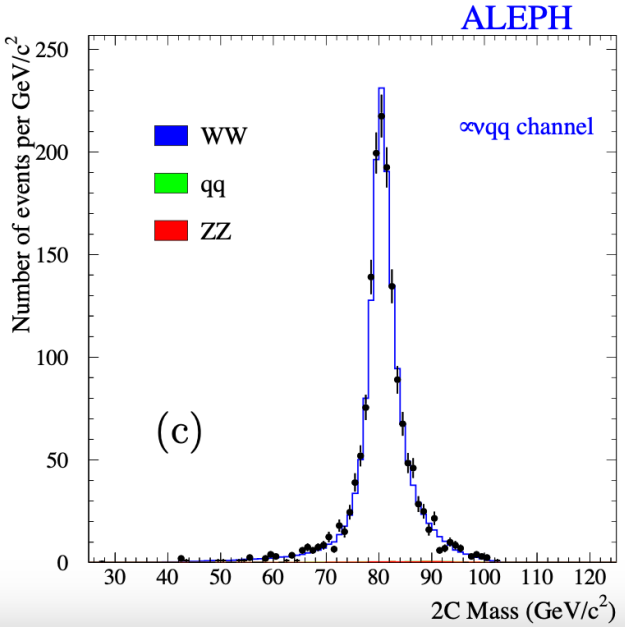
Massa W

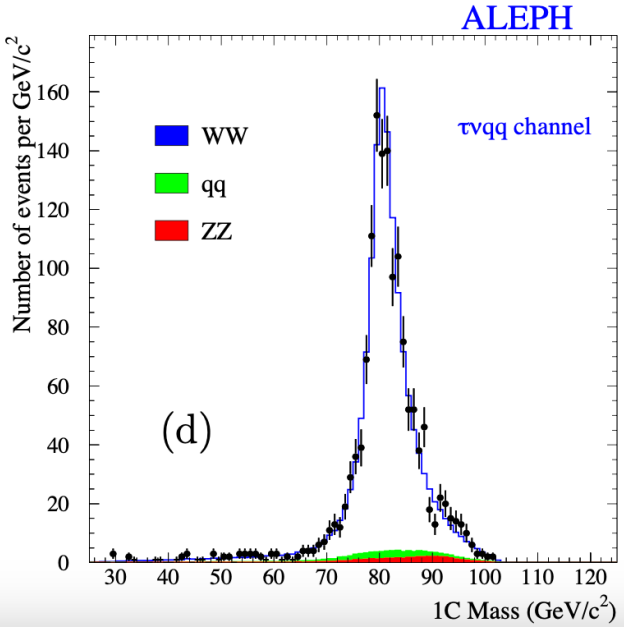
Paolo Azzurri, Franco Ligabue, R.T., Andrea Venturi









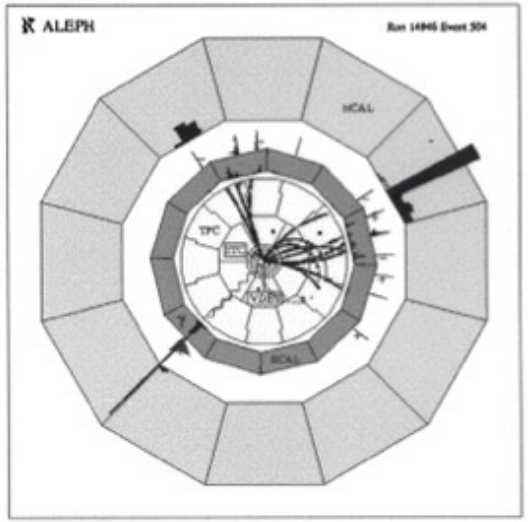


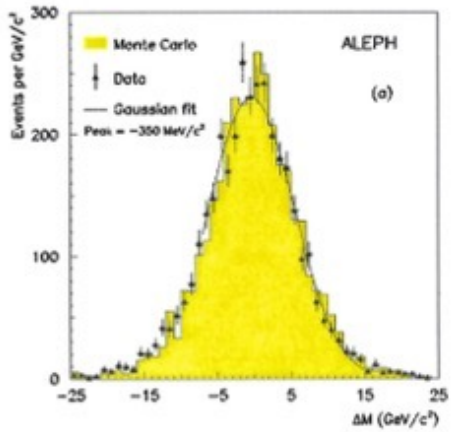
Energy flow, ora conosciuta come Particle Flow

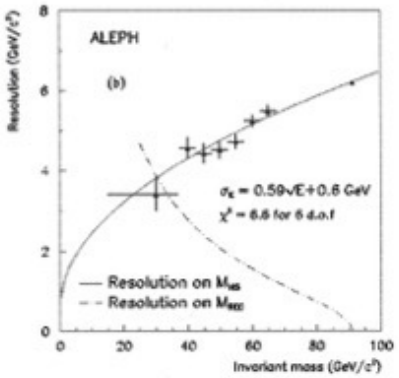
Gerri Ganis, Patrick Janot

Energy Flow Performance studied with data

Tool: radiative events







Lavoro su ricostruzione e banche di relazione: Giuseppe Bagliesi, R.T.
Ricordo anche Alain Bonissent

SUSY: esempio Ricerca di chargini

Anna Colaleo, Nicola De Filippis, Marcello Maggi
Mario Antonelli, Fabiola Gianotti, Giacomo Sguazzoni

EUROPEAN LABORATORY FOR PARTICLE PHYSICS (CERN)

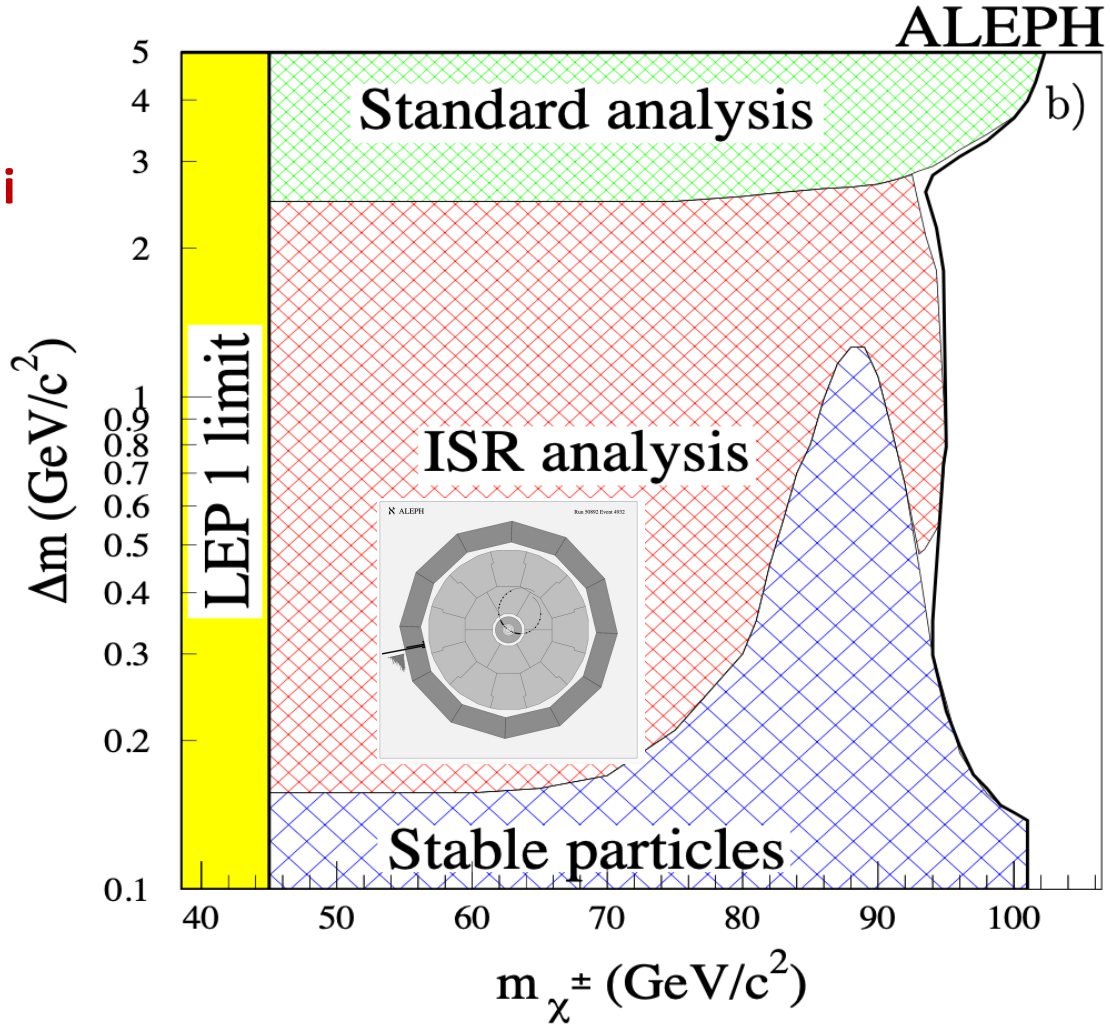
CERN-PPE/97-128
September 22, 1997

Searches for Charginos and Neutralinos

in e^+e^- Collisions

at $\sqrt{s} = 161$ and 172 GeV

The ALEPH Collaboration



QCD: due esempi

Guenther Dissertori

A Measurement of the *b*-quark Mass from Hadronic Z Decays

The ALEPH Collaboration

Abstract

Hadronic Z decay data taken with the ALEPH detector at LEP1 are used to measure the three-jet rate as well as moments of various event-shape variables. The ratios of the observables obtained from b-tagged events and from an inclusive sample are determined. The mass of the b quark is extracted from a fit to the measured ratios using a next-to-leading order prediction including mass effects. Taking the first moment of the y_3 distribution, which is the observable with the smallest hadronization corrections and systematic uncertainties, the result is

$$m_b(M_Z) = [3.27 \pm 0.22(\text{stat}) \pm 0.22(\text{exp}) \pm 0.38(\text{had}) \pm 0.16(\text{theo})]\ \text{GeV}/c^2 \quad .$$

The measured ratio is alternatively employed to test the flavour independence of the strong coupling constant for b and light quarks.

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Physics Letters B

Volume 561, Issues 3–4, 29 May 2003, Pages 213-224

A measurement of the gluon splitting rate into $c\bar{c}$ pairs in hadronic Z decays

ALEPH Collaboration, A. Heister, S. Schael, R. Barate, R. Brunelière, I. De Bonis, D. Decamp, C. Goy, S. Jezequel, J.-P. Lees, F. Martin, E. Merle, M.-N. Minard, B. Pietrzyk, B. Trocmé, S. Bravo, M.P. Casado, M. Chmeissani, J.M. Crespo, E. Fernandez...G. Dissertori

Show more

Andrea Giammanco

https://doi.org/10.1016/S0370-2693(03)00495-7

Abstract

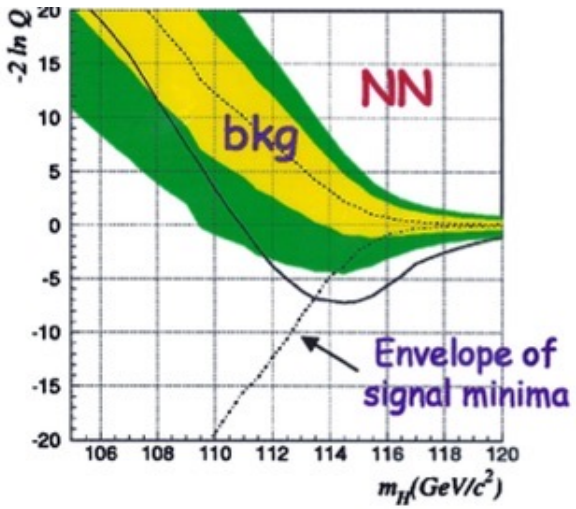
The rate of gluon splitting into $c\bar{c}$ pairs in hadronic Z decays is measured using the data sample collected by ALEPH from 1991 to 1995. The selection is based on the identification of leptons (electrons and muons) originating from semileptonic charm decays, and on the topological properties of signal events. The result derived from the selected sample is $g_{c\bar{c}} = (3.26 \pm 0.23(\text{stat}) \pm 0.42(\text{syst}))\%$.

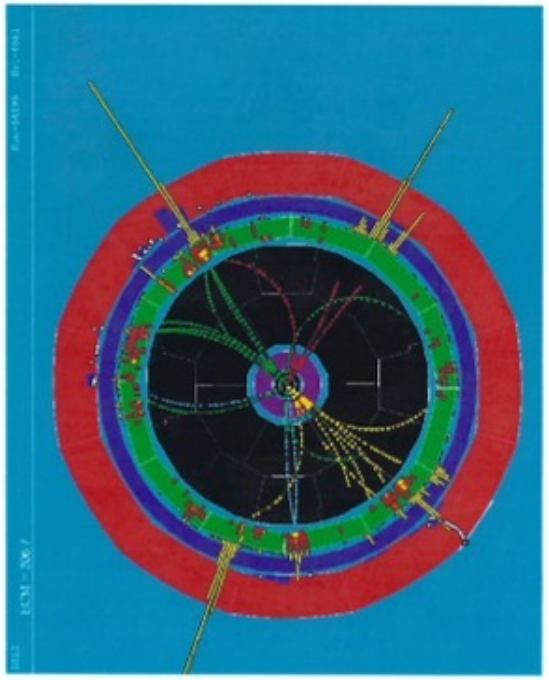
Higgs a 115 GeV ?

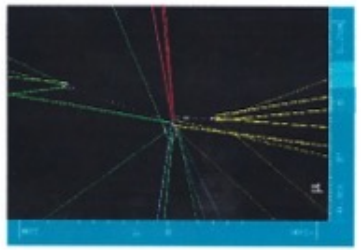
CERN-EP/2000-138
November 13, 2000

Observation of an Excess in the Search
for the Standard Model Higgs Boson at ALEPH

The ALEPH Collaboration *)







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Physics Letters B 526 (2002) 191–205

PHYSICS LETTERS B

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Final results of the searches for neutral Higgs bosons in e^+e^- collisions at $\sqrt{s}$ up to 209 GeV

ALEPH Collaboration

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PII: S0370-2693(01)01487-3

Uso dei dati di ALEPH archiviati

Grazie a Marcello Maggi

Statement on the use of Aleph data for long-term analyses.

The Aleph Collaboration

The data collected by the Aleph experiment in the years 1990-2000 have been archived to allow their use for physics analyses after the closure of the Collaboration. The archiving includes the last set of simulated events and the most updated version of the analysis software.

Limitations.

The available information is not sufficient to repeat all analyses, particularly when systematic effects play an important role as, for instance, for precision measurements in the electroweak sector. Examples of physics analyses that cannot be repeated on archived data are

- The measurement of the Z lineshape
- The measurement of the W mass
- The measurement of the tau polarization
- The measurement of leptons and quarks forward-backward asymmetry
- Most heavy flavour measurements, such as the measurement of R_b, of the CKM matrix elements, of B_d and B_s oscillations
- The searches for the Higgs boson
- Many searches in the Susy sector

Authorized Users.

The use of archived Aleph data is authorized to former members of the Aleph Collaboration and their collaborators. The use of a subset of data for teaching and pedagogical purposes, under the guidance of former members of the Collaboration, is allowed.

Authorship.

The publication of results based on archived Aleph data is not allowed until 1 year after the official termination of the Collaboration, foreseen for the end of 2004. The authors of the analysis take full responsibility for the publication. Any figure, plot or table using Aleph data should contain the label “ALEPH Archived Data”. A reference to the present document “Statement on the use of Aleph data for long-term analyses” must be present in the publication.

Approved by the Aleph Steering Committee
CERN
4 December 2003

Preprint typeset in JHEP style - PAPER VERSION
ZU-TH 28/07, IPPP/07/91, ETHZ-IPP RP-2007-04, Edinburgh 2007-48

Guenther Dissertori

First determination of the strong coupling constant using NNLO predictions for hadronic event shapes in e^+e^- annihilations

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EUROPEAN ORGANISATION FOR NUCLEAR RESEARCH (CERN)

Paolo Spagnolo (late publication firmata da tutti)

Search for neutral Higgs bosons decaying into four taus at LEP2

The ALEPH Collaboration*)

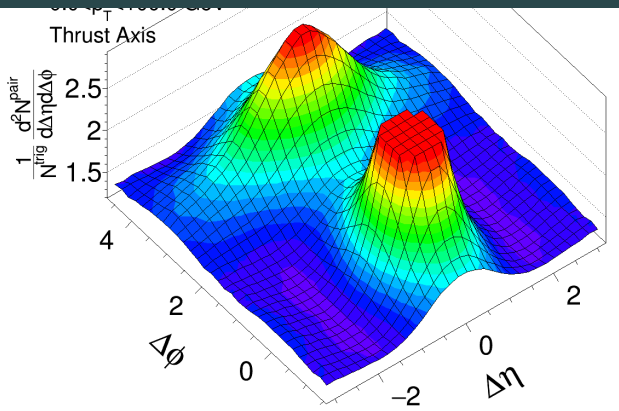
Abstract

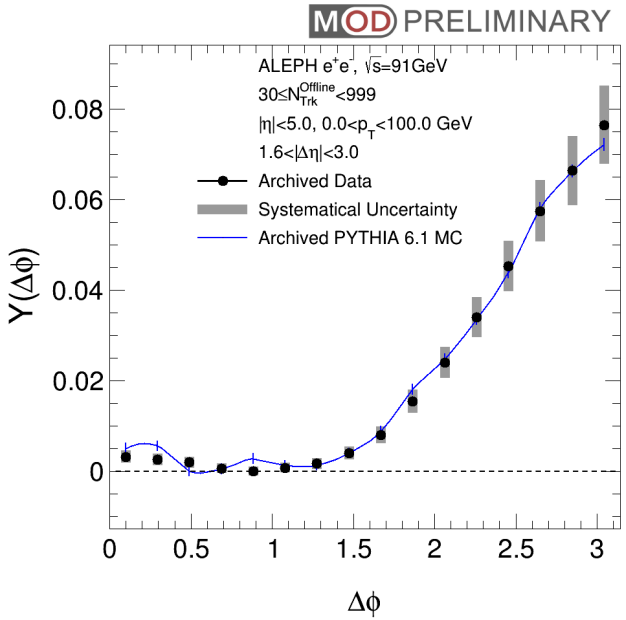
A search for the production and non-standard decay of a Higgs boson, h, into four taus through intermediate pseudoscalars, a, is conducted on 683 pb^{-1} of data collected by the ALEPH experiment at centre-of-mass energies from 183 to 209 GeV. No excess of events above background is observed, and exclusion limits are placed on the combined production cross section times branching ratio, $\xi^2 = \frac{\sigma(e^+e^-\to Zh)}{\sigma_{SM}(e^+e^-\to Zh)} \times B(h\to aa) \times B(a\to\tau^+\tau^-)^2$. For $m_h < 107$ GeV/c^2 and $4 < m_a < 10$ GeV/c^2, $\xi^2 > 1$ is excluded at the 95% confidence level.

Submitted to the Journal of High Energy Physics (JHEP)

* See next pages for the list of authors

Two-Particle Correlation in e^+e^- Collisions at 91.2 GeV with ALEPH Archived Data





- The first two-particle correlation analysis in e^+e^- performed in bins of event multiplicity up to N = 35 - 55
  - No significant ridge signal is observed in beam axis analysis
- Thrust axis and jet region veto are employed to enhance the signal from soft radiations
  - No significant difference between ALEPH LEP1 data and PYTHIA6 observed
- No evidence of the final state effect in the probed event multiplicity ranges:
  - An important reference of the ridge signal observed in pp, pA, dA and AA collisions
- LEP2 Data analysis (up to $\sqrt{s}$~208 GeV) ongoing… stay tuned!