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Measuring the luminosity of a $\gamma\gamma$ collider with $\gamma\gamma \to \ell^+\ell^-\gamma$ events

V. Makarenko, K. Mönig, T. Shishkina

Abstract. The process $\gamma\gamma \to \ell^+\ell^-$ is highly suppressed when the total angular momentum of the two colliding photons is zero so that it cannot be used for luminosity determination. This configuration, however is needed for Higgs production at a photon collider. It will be shown that the process $\gamma\gamma \to \ell^+\ell^-\gamma$ can be used in this case to measure the luminosity of a collider with a precision that is good enough not to limit the error on the partial decay width $\Gamma(\mathrm{H} \to \gamma\gamma)$.

Right-handed Dirac neutrinos in νe^- scattering and azimuthal asymmetry in recoil electron event rates

S. Ciechanowicz, M. Misiaszek, W. Sobków

PACS. 13.15.+g, 13.88.+e

Abstract. In this paper a scenario with the participation of the exotic scalar S, tensor T and pseudoscalar P couplings of the right-handed neutrinos in addition to the standard vector V, axial A couplings of the left-handed neutrinos in the low-energy ($\nu_\mu e^-$) and ($\nu_e e^-$) scattering processes is considered. Neutrinos are assumed to be massive Dirac fermions and to be polarized. Both reactions are studied at the level of the four-fermion point interaction. The main goal is to show that the physical consequence of the presence of the right-handed neutrinos is an appearance of the azimuthal asymmetry in the angular distribution of the recoil electrons caused by the non-vanishing interference terms between the standard and exotic couplings, proportional to the transverse neutrino polarization vector. The upper limits on the expected effect of this asymmetry for the low-energy neutrinos ($E_\nu < 1\,MeV$) are found. We also show that if the neutrino helicity rotation ($\nu_L \to \nu_R$) in the solar magnetic field takes place, the similar effect of the azimuthal asymmetry of the recoil electrons scattered by the solar neutrinos should be observed. This effect would also come from the interference terms between the standard $(V, A)_L$ and exotic $(S, T, P)_R$ couplings. New-type neutrino detectors with good angular resolution could search for the azimuthal asymmetry in event number.

Particle identification with the ALICE TOF detector at very high particle multiplicity

ALICE TOF Group (Bologna-CERN-ITEP-Salerno):
A.N. Akindinov, A. Alici, F. Anselmo, P. Antonioli, Y.W.

Baek, M. Basile, G. Cara Romeo, E. Cerron-Zeballos, L. Cifarelli, F. Cindolo, F. Cosenza, A. De Caro, S. De Pasquale, A. Di Bartolomeo, M. Fusco Girard, V. Golovine, M. Guida, D. Hatzifotiadou, A.B. Kaidalov, S.M. Kiselev, G. Laurenti, E. Lioublev, M.L. Luvisetto, A. Margotti, A.N. Martemiyanov, S. Morozov, R. Nania, P. Otiougova, A. Pesci, F. Pierella, P.A. Polozov, E. Scapparone, G. Scioli, S. Sellitto, A.V. Smirnitski, M.M. Tchoumakov, G P. Vacca, G. Valenti, G. Venturi, D. Vicinanza, K.G. Voloshin, M.C.S. Williams, S. Witoszynskyj, B.V. Zagreev, C. Zampolli, A. Zichichi

Abstract. A procedure developed to achieve particle identification in very high multiplicity conditions using a complex time-of-flight system is illustrated in detail by simulating and studying the performance of the ALICE TOF detector in a realistic scenario of Pb-Pb and p-p interactions at LHC.

Isospin relation and SU(3) breaking effects of strong phases in charmless B decays

Yue-Liang Wu, Yu-Feng Zhou

Abstract. Isospin and flavor SU(3) relations in charmless hadronic B decays $B \to \pi\pi, \pi K$ are investigated in detail with paying attention to the SU(3) symmetry breaking effects in both amplitudes and strong phases. In general, the isospin and the flavor SU(3) structure of the effective Hamiltonian provide several relations among the amplitudes and strong phases. Whereas a global fit to the latest data shows that some relation seems not to be favorable for a consistent explanation to the current data within the standard model (SM). By considering several patterns of SU(3) breaking, the amplitudes and the corresponding strong phases are extracted and compared with the theoretical estimations. It is found that in the case of SU(3) limits and also the case with SU(3) breaking only in amplitudes, the fitting results lead to an unexpected large ratio between two isospin amplitudes $a_{3/2}^c/a_{3/2}^u$, which is about an order of magnitude larger than the SM prediction. The results are found to be insensitive to the weak phase γ. By including SU(3) breaking effects on the strong phases, one is able to obtain a consistent fit to the current data within the SM, which implies that the SU(3) breaking effect on strong phases may play an important role in understanding the observed charmless hadronic B decay modes $B \to \pi\pi$ and πK. It is possible to test those breaking effects in the near future from more precise measurements of direct CP violation in B factories.

TOPICAL VOLUME

International Europhysics Conference on High Energy Physics

Aachen (Germany) – July 17–23, 2003

The High Energy Physics (HEP) conference of the European Physical Society (EPS) is one of the two most important international conferences of this research field. It is organized every second year in alternation with the International Conference on High Energy and Particle Physics (ICHEP) of the International Union for Pure and Applied Physics (IUPAP). In 2003 the conference (International Europhysics Conference on High Energy PHysics, HEP 2003) was held in Aachen, Germany on July 17–23. The two most recent previous conferences of this series were held in Budapest 2001 and in Tampere 1999. The conference consisted of poster sessions, parallel sessions and plenary sessions. The first three days (starting Thursday) were reserved for the parallel sessions on 15 different topics with more than 300 invited contributions. After a break reserved for excursions three days of plenary talks followed where the status and the recent progress of elementary particle physics was reviewed by 18 invited speakers. The conference is traditionally also used as a forum for the presentation of the prizes sponsored by the European Physical society. During the opening ceremony the 2003 High Energy Particle Physics Prize of the EPS was awarded to David Gross (UC Santa Barbara), David Politzer (Caltech) and Frank Wilczek (MIT). In addition the prize for Young Particle Physicists was given to Guillaume Unal (LAL Orsay), the Gribov Medal to Nima Arkani-Hamed (Harvard) and the Outreach Prize to Rolf Landua (CERN) and Nicholas Tracas (Athens).

The conference was organized by the High Energy and Particle Physics Divison of the European Physical Society and it was supported by the Human Potential Programme of the European Commission, the University of Aachen (RWTH Aachen, where "RWTH" stands for Rheinisch Westfälische Technische Hochschule), the Friends of the University (Pro RWTH) and the Department of Physics at the University of Aachen.

The EPS Conference at Aachen received more than 1400 abstracts. After a severe selection a small number was accepted for a direct presentation during the parallel sessions. In many cases the convenors asked for a mini review covering several abstracts. This procedure ended up in about 320 contributions to the parallel sessions. The write-ups of these contributions are published in this Topical Volume. In addition it contains also the 20 reports given by the plenary speakers, which reviewed their field including the achievements of the parallel sessions.

Prospects for the search for a standard model Higgs boson in ATLAS using vector boson fusion

S. Asai, G. Azuelos, C. Buttar, V. Cavasinni, D. Costanzo, K. Cranmer, R. Harper, K. Jakobs, J. Kanzaki, M. Klute, R. Mazini, B. Mellado, W. Quayle, E. Richter-Wąs, T. Takemoto, I. Vivarelli, Sau Lan Wu

Abstract. The potential for the discovery of a Standard Model Higgs boson in the mass range $m_H < 2m_Z$ in the vector boson fusion mode has been studied for the ATLAS experiment at the LHC. The characteristic signatures of additional jets in the forward regions of the detector and of low jet activity in the central region allow for an efficient background rejection. Analyses for the $H \to WW^{**}$ and $H \to \tau\tau$ decay modes have been performed using a realistic simulation of the expected detector performance. The results obtained demonstrate the large discovery potential in the $H \to WW^{**}$ decay channel and the sensitivity to Higgs boson decays into τ-pairs in the low-mass region around 120 GeV/c^2.

Rare $B \to baryon$ decays from CLEO

Jana B. Thayer

Abstract. We have searched for baryon-containing radiative penguin decays in 9.7×10^6 $B\bar{B}$ events collected at the $\Upsilon(4S)$ with the CLEO detector. We find no evidence for such decays, and set a 90% confidence level upper limit of $\mathcal{B}(B \to X_s\gamma, X_s \text{ containing baryons})_{E_\gamma > 2.0 \text{ GeV}} <$

564

3.8 × 10^{-5}. Corrections to CLEO's recent $b \to s\gamma$ measurement due to $B \to X_s(baryon)\gamma$ decays are well within the errors quoted. A search for semileptonic decays of B mesons to $e\bar{p}$ inclusive final states in the same data sample found no evidence for such decays and set an upper limit of $\mathcal{B}(B \to \bar{p}e^-\bar{\nu}_e X) < 5.9 \times 10^{-4}$. These limits suggest that external W emission is not the dominant source of baryon production in B decay.

Order-α_s^2 corrections to semi-inclusive DIS

A. Daleo, C.A. García Canal, R. Sassot

Abstract. We analyze the order-α_s^2 gluon initiated QCD corrections to semi-inclusive deep inelastic scattering. We focus in the most singular pieces of these corrections and discuss the prescription of overlapping singularities in more than one variable and their factorization.

Prompt photon production with associated jets at HERA

D.H. Saxon

Abstract. We present the first observation of prompt photon production in deep inelastic scattering, by ZEUS, and make comparisons to NLO calculations and to Monte Carlos. New results are also presented on the photoproduction of prompt photons, by H1, with comparisons to calculations and to earlier data.

Prospects for little Higgs models at the LHC

Eduardo Ros

Abstract. The ATLAS Collaboration at the LHC is presently investigating the possibility to detect particles predicted by Little Higgs models. In this talk, the possibility to detect the heavy gauge boson Z_H and its subsequent decay into Zh is reviewed.

Contact interactions at Hera, LEP and Tevatron

Corinne Goy

Abstract. Current experimental limits on 4-fermions Contact Interactions at Hera, LEP and Tevatron are reviewed.

Neutrino magnetic moment results at the Kuo-Sheng Nuclear Power Plant

Hau-Bin Li, Henry T. Wong
(on behalf of the TEXONO Collaboration)

Abstract. A search of neutrino magnetic moment was carried out at the Kuo-Sheng Nuclear Power Station at a distance of 28 m from the 2.9 GW reactor core. With a high purity germanium detector of mass 1.06 kg surrounded by scintillating NaI(Tl) and CsI(Tl) crystals as anti-Compton detectors, a detection threshold of 5 keV and a background level of $1 \, \mathrm{kg}^{-1}\mathrm{keV}^{-1}\mathrm{day}^{-1}$ at 12-60 keV were achieved. Based on 4712 and 1250 hours of Reactor ON and OFF data, respectively, the limits on the neutrino magnetic moment of $\mu_{\bar{\nu}_e} < 1.3(1.0) \times 10^{-10} \, \mu_{\mathrm{B}}$ at $90(68)\%$ confidence level were derived. Indirect bounds of the $\bar{\nu}_e$ radiative lifetime of $\mathrm{m}_\nu^3 \, \tau_\nu > 2.8(4.8) \times 10^{18}$ eV^{3}s can be inferred. The present status and future plans are discussed.

Top quark production at the Tevatron at NNLO

Nikolaos Kidonakis, Ramona Vogt

Abstract. We present results for top quark production at the Tevatron including next-to-next-to-leading order (NNLO) soft-gluon corrections. We show the stability of the cross section with respect to kinematics choice and scale when the NNLO corrections are taken into account.

Search for excited fermions

Eusebio Sánchez Álvaro

Abstract. Recent results on searches for excited fermions
at the LEP, HERA and Tevatron colliders are reported.
These results improve the limits on the masses and cou-
plings of excited fermions.

Terrestrial neutrino experiments
and the search for leptonic CP violation

P. Migliozzi, F. Terranova (presented by F. Terranova)

Abstract. Terrestrial neutrino experiments could be the
ideal tool to investigate CP violation in the leptonic sec-
tor if the θ_{13} angle of the PMNS matrix is sufficiently
high. This condition will be tested by several future long-
baseline detectors (Phase I experiments). We discuss the
interplay among these experiments and possible synergies.
It is shown that, without a dedicated $\bar{\nu}$ run, Phase I exper-
iments cannot reach a sensitivity able to ground (or dis-
courage in a definitive manner) the building of the Phase
II projects that are aimed at the determination of the lep-
tonic CP phase. In fact, this capability is almost saturated
by high energy beams like CNGS, especially for high val-
ues of the ratio $\Delta m_{21}^2/|\Delta m_{31}^2|$. Moreover, we discuss the
interplay between on-peak and off-peak experiments and
the constraints to the PMNS matrix in case of early evi-
dence for $\nu_\mu \to \nu_e$ oscillations at the athmospheric scale
(high θ_{13}).

Status of neutrino masses and mixing

Carlo Giunti

Abstract. The experimental evidences in favor of oscil-
lations of solar (and KamLAND) and atmospheric (and
K2K) neutrinos are briefly reviewed and accommodated
in the framework of three-neutrino mixing. The implica-
tions for the values of neutrino masses are discussed and
the bounds on the absolute scale of neutrino masses from
Tritium β-decay and cosmological data are reviewed. Fi-
nally, we discuss the implications of three-neutrino mixing
for neutrinoless double-β decay.

Results from the ICARUS T600 module
A measurement of the μ decay spectrum

Javier Rico for the ICARUS Collaboration

Abstract. We have studied the μ decay energy spec-
trum from a sample of stopping μ events acquired dur-
ing the test run of the ICARUS T600 prototype. This
detector allows the spatial reconstruction of the events
with fine granularity, hence the precise measurement of
the μ range and dE/dx with high sampling rate. This in-
formation is used to compute the correction factors needed
for the calorimetric reconstruction. The Michel ρ param-
eter is then measured by comparison of the experimental
and Monte Carlo simulated μ decay spectra, obtaining
$\rho = 0.72 \pm 0.06$ (stat.) ± 0.08 (syst.).

Open charm production in DIS at HERA

S. Chekanov

Abstract. An overview of recent HERA results on inclu-
sive production of $D^{*\pm}$ mesons in deep inelastic scattering
is given.

Final state correlations at LEP 2
Bose-Einstein correlations and the W mass

Paul de Jong

Abstract. Recent experimental results on Bose-Einstein correlations are presented. Emphasis will be put on the measurement of between-W correlations in WW events at LEP 2.

Dynamical correlation length near the chiral critical point

Kerstin Paech

Abstract. The dynamical evolution of small systems undergoing a chiral symmetry breaking transition in the course of rapid expansion is discussed. The time evolution of the dynamical correlation length for trajectories passing through a second-order critical point is extracted. It is shown that while the maximum value of the correlation length is bound from above by dynamical effects, the time interval during which it is near its maximum grows steadily with the system size and with decreasing expansion rate.

Beauty hadron lifetimes and B-meson CP-violation parameters from lattice QCD

Cecilia Tarantino

Abstract. The present status of the theoretical estimates of beauty hadron lifetime ratios and of width differences and CP-violation parameters in B_d and B_s systems is reviewed. In the last two years accurate lattice calculations and next-to-leading order perturbative computations have improved these theoretical predictions, leading to the following updated results: $\tau(B^+)/\tau(B_d) = 1.06 \pm 0.02$, $\tau(B_s)/\tau(B_d) = 1.00 \pm 0.01$, $\tau(\Lambda_b)/\tau(B_d) = 0.88 \pm 0.05$, $\Delta\Gamma_d/\Gamma_d = (2.42 \pm 0.59)10^{-3}$, $\Delta\Gamma_s/\Gamma_s = (7.4 \pm 2.4)10^{-2}$, $|(q/p)_d| - 1 = (2.96 \pm 0.67)10^{-4}$ and $|(q/p)_s| - 1 = -(1.28 \pm 0.28)10^{-5}$.

Spectator interactions and factorization in $B \to \pi l \nu$ decay

M. Beneke, T. Feldmann

Abstract. We investigate the factorization of different momentum modes that appear in matrix elements for exclusive B meson decays into light energetic particles for the specific case of $B \to \pi$ form factors at large pion recoil. We first integrate out hard modes with virtualities of order m_b^2 (m_b being the heavy quark mass), and then hard-collinear modes with virtualities $m_b \Lambda$ (Λ being the strong interaction scale). The resulting effective theory contains soft and collinear fields with virtualities Λ^2. We prove a previously conjectured factorization formula for $B \to \pi$ form factors in the heavy quark limit to all orders in α_s, paying particular attention to 'endpoint singularities' that might have appeared in hard spectator interactions.

Non-valence Fock states in heavy-to-light form factors at large recoil

Björn O. Lange

Abstract. We studied three-particle Fock state contributions to heavy-to-light form factors in the context of soft-collinear effective theory and found that they enter at leading power. These contributions are non-factorizable due to the appearance of endpoint singularities, however they do not violate spin-symmetry relations at leading power. In this talk I present their numerical estimation in a crude model in which the "soft overlap" contribution is cut off and find that they might lower the standard values for the form factors at maximum recoil significantly. Furthermore I briefly discuss the role of soft-collinear messenger modes in the region of soft overlap.

Perturbative and non-perturbative aspects of heavy-quark fragmentation

Einan Gardi, Matteo Cacciari

Abstract. We describe a new approach to heavy-quark fragmentation which is based on a resummed perturbative calculation and parametrization of power corrections, concentrating on the $z \longrightarrow 1$ limit, where the heavy meson carries a large fraction of the momentum of the initial quark. It is shown that the leading power corrections in this region are controlled by the scale $m(1 - z)$. Renormalon analysis is then used to extend the perturbative treatment of soft and collinear radiation to the non-perturbative regime. Theoretical predictions are confronted with data on B-meson production in e^+e^- annihilation.

Towards CP-violation results from DØ

Paul Balm (for the DØCollaboration)

Abstract. We have made a preliminary study of a dimuon sample corresponding to 114 pb^{-1} of data taken in Run II at the Tevatron. From this sample we have selected 157 ± 20 $B_d \to J/\psi K_S^0$ and 133 ± 17 $B_s \to J/\psi \phi$ decays. In a subset of the data we have measured the $B^{\pm}$ lifetime in the $J/\psi K^{\pm}$ channel to be 1.76 ± 0.24 ps. We have implemented a jet-charge initial-flavor tag as well as a soft-muon tag, and we have measured the respective tagging powers to be $(2.4 \pm 1.7)\%$ and $(3.3 \pm 1.8)\%$. Our conclusion from these studies is that we have made good progress towards understanding all ingredients required to make CP violation measurements in the B_d and B_s systems.

Jet production in two-photon collisions at LEP

Thorsten Wengler

Abstract. Jet and di-jet production are studied in collisions of quasi-real photons collected during the LEP2 program at e^+e^- center-of-mass energies from 189 to 209 GeV. OPAL reports good agreement of NLO perturbative QCD with the measured differential di-jet cross sections, which reach a mean transverse energy of the di-jet system of 25 GeV. L3, on the other hand, finds drastic disagreement of the same calculation with single jet production for transverse jet momenta larger than about 25 GeV.

Exclusive production of hadron pairs in two-photon interactions

B.Echenard on behalf of the L3 Collaboration

Abstract. The knowledge of two-photon processes increased during the last years thanks to the large sample of $e^+e^- \to e^+e^-$ *hadrons* events collected at LEP. Non perturbative QCD phenomena are investigated through the study of exclusive meson and baryon pair production. The cross sections are measured as a function of the $\gamma\gamma$ center-of-mass energy, $W_{\gamma\gamma}$, and the center-of-mass production angle of the hadron, θ^*. Exclusive $\rho^0\rho^0$ and $\rho^+\rho^-$ production for quasi-real photons are investigated through a spin-parity-helicity analysis. Exclusive $\rho^0\rho^0$ production is also studied as a function of the photon virtuality Q^2 and compared to recent QCD predictions.

Multiplicities and particle production at LEP

Edward K.G. Sarkisyan,

Abstract. Recent results on hadron multiplicities in heavy and light quark fragmentation above the Z^0 peak (OPAL), and multiplicity distribution analysis (L3) and inclusive f_1 production (DELPHI) in hadronic Z^0 decays are presented.

Search for top and bottom squarks

Carsten Rott /for the ALEPH, CDF, DELPHI, L3, and
OPAL Collaborations

Abstract. Searches for the lightest scalar top quark $\tilde{t}_1$
and scalar bottom quark $\tilde{b}_1$ performed at LEP2 with a
center-of-mass energy of up to $\sqrt{s} = 209$ GeV and at
Tevatron using data collected at $\sqrt{s} = 1.8$ TeV during
Run I and at $\sqrt{s} = 1.96$ TeV during Run II, are discussed.
Different possible decay modes were considered and no
evidence for any such signal was observed. Exclusion limits
were extracted.

The OPERA experiment: $\nu_\mu \to \nu_\tau$ and $\nu_\mu \to \nu_e$ physics program

J.E. Campagne for the OPERA collaboration

Abstract. An update the physics potential of the
OPERA experiment is given for the $\nu_\mu \to \nu_\tau$ design goal
as well as for the improved limit that can be reached on the
unknown θ_{13} mixing angle by means of $\nu_\mu \to \nu_e$ search.

Development of a TPC for the future linear collider

S. Roth

Abstract. A Time Projection Chamber is the primary
option for the main tracker of the detector at a future
e^+e^- linear collider. The tracking system has to face sig-
nificantly more complicated event topologies and higher
backgrounds compared to previous e^+e^- colliders, which
puts stringent requirements on its overall design. The de-
sign issues and R&D plans for developing such a high per-
formance TPC are presented. Particular emphasis is put
on the R&D for a new type of gas amplification system,
based on micro pattern gas detectors.

The Detector and interaction region for a photon collider at TESLA

Aura Rosca

Abstract. TESLA is designed as an electron-positron lin-
ear collider (LC) based on super-conducting technology. A
second interaction region is forseen to be incorporated in
the design allowing its possible operation as a photon col-
lider. In this paper I describe the basic design of the $\gamma\gamma$
interaction region taking into account the beam-beam and
laser related issues and review some aspects of other ac-
celerator components such as the feedback system and the
beam dump which are critical to the operation of TESLA
as a photon collider.

Charmed-B decays at $BABAR$

Vincent Tisserand, for the $BABAR$ Collaboration

Abstract. We present recent results on charmed-B
decays using data collected by the $BABAR$ experi-
ment at the PEP-II storage ring. This report is sub-
divided in 3 parts. In a first step, we present pre-
liminary results on the measurement of the branch-
ing fractions of seven color-suppressed $\overline{B}^0$-meson de-
cays into $D^{(*)0}\pi^0$, $D^{(*)0}\eta$, $D^{(*)0}\omega$, and $\mathbf{D}\emptyset\eta'$. Then
we discuss the preliminary measurement of the ratio of
Cabibbo-suppressed to Cabibbo-favored branching frac-
tions $\mathcal{B}(B^- \to D^0 K^-)/\mathcal{B}(B^- \to D^0 \pi^-)$, where the $D\emptyset$ is
possibly reconstructed in the CP-even $\pi^-\pi^+$ and K^-K^+
modes. For the $D\emptyset$ decays into CP-eigenstates, a search
for a direct CP asymmetry is performed. For the same
category of decay processes, we show a precise prelimi-
nary measurement of both the branching fraction of B^-
decaying to $D^{*0}K^{*-}$ and of the fraction of longitudinal po-
larization in this decay. Finally, we present a study where
the 22 possible B decays to $\overline{D}^{(*)}D^{(*)}K$ are reconstructed
exclusively. The branching fractions of the B^0 and of the
B^+ to $\overline{D}^{(*)}D^{(*)}K$ are presented and a search for decays
$B \to \overline{D}^{(*)}D_{sJ}^+(\to D^{(*)0}K^+)$, where the D_{sJ}^+ represents the
orbitally excited D_s states, is also discussed.

Estimate of the charming penguin contributions to $B \to \pi\pi$

Blaženka Melić

Abstract. We consider the problem of factorization in B decays and illustrate the calculation of nonfactorizable contributions employing the QCD light-cone sum rule method. We present a more detailed calculation of the "charming penguin" contributions as a potential source of the substantial nonfactorizable $O(1/m_b)$ effects in the $B \to \pi\pi$ decay. Although the predicted corrections are not sizable, by calculating the CP asymmetry we illustrate how such corrections can accumulate to a visible effect. In conclusion, nonfactorizable contributions in nonleptonic B decays into charmonium are briefly discussed.

New strategies to extract weak phases from neutral B decays

Robert Fleischer

Abstract. We discuss new, theoretically clean strategies to determine the angle γ of the unitarity triangle from $B_d \to DK_{\mathrm{S(L)}}$, $B_s \to D\eta^{(')}, D\phi, ...$ decays, and point out that $B_s \to DK_{\mathrm{S(L)}}$ and $B_d \to D\pi^0, D\rho^0, ...$ modes allow very interesting determinations of the B_q^0–$\overline{B_q^0}$ mixing phases ϕ_s and ϕ_d, respectively. Their colour-allowed counterparts $B_s \to D_s^{(*)\pm}K^\mp, ...$ and $B_d \to D^{(*)\pm}\pi^\mp, ...$ also offer new methods to probe γ.

Power corrections to e^+e^- Dijet event shapes

Carola F. Berger, George Sterman

Abstract. We discuss a class of event shapes for e^+e^- dijet events that include the thrust as a special case. Large logarithmic corrections to the corresponding cross sections can be resummed to all logarithmic orders at leading power. However, irrespective of the order up to which the perturbative expansion is calculated, it has to be supplemented by nonperturbative corrections due to its at best asymptotic nature. We find that the leading power corrections are universal for the class of event shapes discussed here. Based on these findings, we provide sample numerical predictions for the distributions of the new event shapes.

Little Higgs phenomenology

Heather E. Logan

Abstract. Recently a new class of models has emerged that addresses the naturalness problem of a light Higgs boson. In these "little Higgs" models, the Standard Model Higgs boson is a pseudo-Nambu-Goldstone boson of an approximate global symmetry. The Higgs boson acquires mass radiatively only through "collective breaking" of the global symmetry, so that more than one interaction is required to give the Higgs a mass. This protects the Higgs mass from receiving quadratically divergent radiative corrections at one-loop. These models contain new vector bosons, fermions and scalars at the TeV scale that cancel the quadratic divergences in the Higgs mass due to the Standard Model gauge, top quark, and Higgs boson loops. In this talk I review the phenomenology of the little Higgs models, focusing on collider signatures and electroweak precision constraints.

Neutrino masses and mixings: What do they mean?
Or: 'Going beyond the Standard Model: but where?'

Francesco Vissani

Abstract. Neutrino masses show that the standard model of the elementary particles and interactions is incomplete and suggest the existence of physics at high mass scales. Furthermore, the difference between quark and lepton mixing raising new questions. We discuss some theoretical attempts to address these questions emphasizing their limitations and the potential.

The effective neutrino charge radius

J. Papavassiliou, J. Bernabéu, D. Binosi J. Vidal

Abstract. It is shown that at one-loop order a neutrino charge radius (NCR) may be defined, which is ultraviolet finite, does not depend on the gauge-fixing parameter, nor on properties of the target other than its electric charge. This is accomplished through the systematic decomposition of physical amplitudes into effective self-energies, vertices, and boxes, which separately respect electroweak gauge invariance. In this way the NCR stems solely from an effective proper photon-neutrino one-loop vertex, which satisfies a naive, QED-like Ward identity. The NCR so defined may be extracted from experiment, at least in principle, by expressing a set of experimental electron-neutrino cross-sections in terms of the finite NCR and two additional gauge- and renormalization-group-invariant quantities, corresponding to the electroweak effective charge and mixing angle.

Compact $U(1)$ gauge theories in $2 + 1$ dimensions and the physics of low dimensional insulating materials

F. S. Nogueira, J. Smiseth, E. Smørgrav, A. Sudbø

Abstract. Compact abelian gauge theories in $d = 2 + 1$ dimensions arise often as an effective field-theoretic description of models of quantum insulators. In this paper we review some recent results about the compact abelian Higgs model in $d = 2 + 1$ in that context.

Power corrections in models with extra dimensions

J.F. Oliver, J. Papavassiliou, A. Santamaria

Abstract. We critically revisit the issue of power-law running in models with extra dimensions. The general conclusion is that, in the absence of any additional physical principle, the power-corrections tend to depend strongly on the details of the underlying theory.

Unstoppable, sbottomless sfermion searches. Searches for scalar partners of fermions (excluding stops and sbottoms)

Isabel Trigger

Abstract. Results are presented from searches by the LEP collaborations for scalar partners of leptons and light quarks in the context of the Minimal Supersymmetric Standard Model (MSSM). Examples shown are searches by OPAL for events with two leptons and significant missing transverse momentum and events with anomalous dE/dx, L3 searches for mass-degenerate squarks and for single electrons, and a DELPHI search for staus of mass less than $M_{Z^0}/2$. No evidence is observed for any signal indicating physics beyond the Standard Model (SM). Limits are shown in the context of a constrained MSSM (CMSSM).

Black holes at future colliders and in cosmic rays

Greg Landsberg

Abstract. One of the most dramatic consequences of low-scale (~ 1 TeV) quantum gravity would be copious production of mini black holes at future accelerators and in ultra-high-energy cosmic ray interactions. Hawking radiation of these black holes is constrained mainly to our (3+1)-dimensional world and results in their rapid evaporation. We review selected topics in the mini-black-hole phenomenology, such as production rates at colliders and in cosmic rays, Hawking radiation as a sensitive probe of the dimensionality of extra space, as well as an exciting possibility of finding new physics in the decays of black holes.

Search for extra dimensions at LHC

Laurent Vacavant,
for the ATLAS and CMS Collaborations

Abstract. Some of the studies performed by the ATLAS and CMS collaborations to establish the future sensitivity of the experiments to extra dimension signals are reviewed. The discrimination of those signals from other new physics signals and the extraction of the underlying parameters of the extra dimension models are discussed.

Physics with large extra dimensions

I. Antoniadis

Abstract. The recent understanding of string theory opens the possibility that the string scale can be as low as a few TeV. The apparent weakness of gravitational interactions can then be accounted by the existence of large internal dimensions, in the submillimeter region. Furthermore, our world must be confined to live on a brane transverse to these large dimensions, with which it interacts only gravitationally. In my lecture, I describe briefly this scenario which gives a new theoretical framework for solving the gauge hierarchy problem and the unification of all interactions. I also discuss its main properties and implications for observations at both future particle colliders, and in non-accelerator gravity experiments. Such effects are for instance the production of Kaluza-Klein resonances, graviton emission in the bulk of extra dimensions, and a radical change of gravitational forces in the submillimeter range.

Random matter density perturbations and LMA

N. Reggiani, M.M. Guzzo, P.C. de Holanda

Abstract. There are reasons to believe that mechanisms exist in the solar interior which lead to random density perturbations in the resonant region of the Large Mixing Angle solution to the solar neutrino problem. We find that, in the presence of these density perturbations, the best fit point in the $(\sin^2 2\theta, \Delta m^2)$ parameter space moves to smaller values, compared with the values obtained for the standard LMA solution. Combining solar data with KamLAND results, we find a new compatibility region, which we call VERY-LOW LMA, where $\sin^2 2\theta \approx 0.6$ and $\Delta m^2 \approx 2 \times 10^{-5}$ eV^2, for random density fluctuations of order $5\% < \xi < 8\%$. We argue that such values of density fluctuations are still allowed by helioseismological observations at small scales of order 10 - 1000 km deep inside the solar core.

Cosmology and neutrino masses – An update

Steen Hannestad

Abstract. Present cosmological observations yield an upper bound on the neutrino mass which is significantly stronger than laboratory bounds. However, the exact value of the cosmological bound is model dependent and therefore less robust. Here, I review the current status of cosmological neutrino mass bounds and also discuss implications for sterile neutrinos and LSND in particular.

Global fits of the CKM matrix

G. Eigen, G.P. Dubois-Felsmann, D.G. Hitlin, F.C. Porter

Abstract. We report upon the present status of global fits to Cabibbo-Kobayashi-Maskawa matrix.

Review on the inclusive rare decays $B \to X_s\gamma$ and $B \to X_d\gamma$ in the Standard Model

Kay Bieri, Christoph Greub

Abstract. We review the NLL QCD calculations for the branching ratio of $B \to X_s\gamma$ in the SM. In particular, we emphasize the problem related to the definition of the

charm quark mass which leads to a rather large uncertainty of the NLL predictions. The various steps needed for a NNLL calculation, in which the m_c issue can be settled, is also sketched. We briefly summarize the results of a calculation of the $\mathcal{O}(\alpha_s^2 n_f)$ corrections to $\mathrm{BR}(B \to X_s \gamma)$, which was recently performed as a first step in the NNLL program. We then also briefly review the status of the photon energy spectrum and show the comparison with experimental data. Finally, we review the status of the CKM suppressed decay mode $B \to X_d \gamma$.

Electroweak penguin B decays at Belle

Patrick Koppenburg

Abstract. We summarise the most recent results of the Belle experiment about flavour changing neutral current (FCNC) radiative and (semi-) leptonic B decays. In particular, we report about the first observation of the decays $B \to K^* \ell^+ \ell^-$, $B \to \phi K \gamma$, the inclusive $B \to X_s \ell^+ \ell^-$. We also report about searches for $B \to \ell^+ \ell^-$ decay and for CP asymmetries in $B \to K^* \gamma$.

$B \to k\nu\bar{\nu}$, $B \to \tau\nu$, $B \to \mu\nu$ searches at BABAR

Concetta Cartaro

Abstract. We present a search for the $B^- \to K^- \nu\bar{\nu}$, $B^- \to \tau^- \bar{\nu}$ and $B^- \to \mu^- \bar{\nu}$ decays in a data sample of 82 fb^{-1} collected at the $\Upsilon(4S)$ resonance with the $BABAR$ detector at the SLAC PEP-II asymmetric B Factory. We find no evidence of signal for such decays and for all of them we set a 90% C.L. upper limit. For the $B^- \to K^- \nu\bar{\nu}$ decay we set a 90% C.L. upper limit of $\mathcal{B}(B^- \to K^- \nu\bar{\nu}) < 7.0 \times 10^{-5}$. For the $B^- \to \tau^- \bar{\nu}$ decay we set a 90% C.L. upper limit of $\mathcal{B}(B^- \to \tau^- \bar{\nu}) < 4.1 \times 10^{-4}$. For the $B^- \to \mu^- \bar{\nu}$ decay we set a 90% C.L. upper limit of $\mathcal{B}(B^- \to \mu^- \bar{\nu}) < 6.6 \times 10^{-6}$. All results are preliminary.

General search for new phenomena in ep scattering at HERA

Martin Wessels

Abstract. A model-independent search for deviations from the Standard Model prediction has been performed in e^+p and e^-p collisions at HERA using H1 data. All experimentally measurable event topologies involving isolated electrons, photons, muons, neutrinos and jets with high transverse momenta have been investigated. A good agreement with the Standard Model prediction is found in most of the event classes. A new algorithm has been developed to look for regions with large deviations from the Standard Model in the invariant mass and sum of transverse momenta distributions and to quantify the significance of the fluctuations observed. The largest deviation is found in topologies with an isolated muon, missing transverse momentum and a jet which confirms previous observations. About 2% of hypothetical Monte Carlo experiments would produce deviations more significant than the one observed in the corresponding distribution of sum of transverse momenta.

New NA48 results on CP violation

Cristina Lazzeroni

Abstract. NA48 has searched for CP violation and rare neutral-kaon decays in data collected in 1998-2002. Results for the decays $K_{L,S} \to \pi^+\pi^- e^+e^-$ and $K_S \to \pi^0 e^+e^-$, and for the measurement of the $K_L \to \pi e \nu$ charge asymmetry, are presented.

Search for CP violation in $B \to \pi h$ decays and $B \to \rho h$ decays with $BABAR$ experiment

C. Yèche

Abstract. We present *BABAR* experiment studies to observe *CP* violation in the two-body decays (πK and $\pi\pi$) and the quasi two-body decays (ρK and $\rho\pi$) of B mesons. The results are obtained from data samples of about 89(123) million $\Upsilon(4S) \to B\bar{B}$ decays collected between 1999 and 2002(2003) with the *BABAR* detector at the PEP-II asymmetric-energy B Factory at SLAC.

Constraining the unitarity triangle with $B \to K^*\gamma$ and $B \to \rho\gamma$

Stefan W. Bosch

Abstract. We discuss the exclusive radiative decays $B \to K^*\gamma$ and $B \to \rho\gamma$ in QCD factorization within the Standard Model. The analysis is based on the heavy-quark limit of QCD. Our results for these decays are complete to next-to-leading order in QCD and to leading order in the heavy-quark limit. Phenomenological implications for branching ratios and isospin breaking effects are discussed. Special emphasis is placed on constraining the CKM unitarity triangle from these observables.

Indications for large rescattering in rare B decays

George W.S. Hou

Abstract. The sign of $A_{\rm CP}(K^-\pi^+) < 0$, the evidence for $\bar{B}^0 \to \pi^0\pi^0$, and the possibly sizable $A_{\pi\pi}$ and $S_{\pi\pi}$ in $\bar{B}^0 \to \pi^+\pi^-$ all suggest that final state rescattering may be needed in $\bar{B} \to PP$ decay, which is echoed by large color suppressed $\bar{B}^0 \to D^0 h^0$ modes. An SU(3) formalism of $\mathbf{8} \otimes \mathbf{8} \to \mathbf{8} \otimes \mathbf{8}$ rescattering in PP final states leads to interesting predictions, in particular allowing for small $\bar{B}^0 \to K^- K^+$.

Integral and derivative dispersion relations, analysis of the forward scattering data

E. Martynov, J.R. Cudell, O.V. Selyugin

Abstract. Integral and derivative dispersion relations (DR) are considered for the forward scattering pp and $\bar{p}p$ amplitudes. A new representation for the derivative DR, valid not only at high energy, is obtained. The data on the total cross sections for $pp(\bar{p}p)$ interaction as well as the data on the parameter ρ are analyzed within the various forms of the DR and high-energy Regge models. It is shown that three models for the Pomeron, Simple pole Pomeron, Tripole Pomeron and Dipole Pomeron (the both with the intercept equal unit) lead to practically equivalent description of the data at $\sqrt{s} > 5$ GeV. It is also shown that the correctly calculated low-energy part of the dispersion integral (from the two-proton threshold up to $\sqrt{s} = 5$ GeV) allows to reproduce well the ρ data at low energies without additional free parameters.

Progress on multiple interactions. Modelling the underlying event in hadron–hadron collisions

P. Skands, T. Sjöstrand

Abstract. We report on the development of a new model for the underlying event in hadron–hadron collisions. The model includes parton showers for all interactions, as well as non-trivial flavour, momentum, and colour correlations between interaction initiators and beam remnant partons.

Status of lattice calculations of B-meson decays and mixing

Hartmut Wittig

Abstract. The present status of lattice calculations of $f_{\rm B}$, $B_{\rm B}$ and SU(3) flavour breaking ratios such as $f_{\rm B_s}/f_{\rm B}$ is reviewed. Particular attention is devoted to systematic uncertainties, such as those arising from the lack of simulation data for dynamical quarks with realistic masses, and the related difficulties associated with chiral extrapolations. Global averages for decay constants and mixing parameters are presented (Table 1), and the procedures to obtain them are discussed in detail.

**String theory.
A short overview**

Lars Brink

Abstract. A short overview of 35 years of string theory
is given.

**Searches for neutral Higgs boson
and interpretations in the MSSM at LEP**

Philip Bechtle

PACS: 12.60.Fr, 12.60.Jv, 13.66.Fg, 14.80.Cp

Abstract. This paper discusses recent publications of the
LEP collaborations DELPHI, L3 and OPAL on searches
for Higgs bosons motivated by MSSM scenarios as well
as their interpretation in the MSSM. With the final pub-
lication of the LEP collaborations available or awaited,
more and more interpretations in different MSSM models,
including both CP conserving and CP violating, become
available. Also specialized analyses close open areas in the
parameter space. In the same time, better theoretical cal-
culations with an increased maximal mass of the h boson
were presented. Both the new scenarios as well as the new
theoretical limit on $m_{\rm h}$ has consequences for the limits
from LEP. The searches, the models in which they are
interpreted and the implications of the LEP results for
future SUSY searches, especially on the $\tan\beta$ limit, are
presented here.

Inclusive semileptonic B decays at $BABAR$

Urs Langenegger

PACS: 13.20.He, 12.39.Hg

Abstract. We report updates on two analyses of inclu-
sive semileptonic B decays based on a dataset of 89 mil-
lion $B\overline{B}$ events recorded with the $BABAR$ detector at the
$\Upsilon(4S)$ resonance. Events are selected by fully reconstruct-
ing the decay of one B meson and identifying a charged

lepton from the decay of the other $\overline{B}$ meson. In the first
analysis, the measurement of the first and second mo-
ment of the hadronic mass distribution in Cabibbo-favored
$\overline{B} \to X_c \ell \bar\nu$ decays allows for the determination of the non-
perturbative parameters $\bar\Lambda$ and λ_1 of Heavy Quark Effec-
tive Theory (HQET) and $|V_{cb}|$. In the second analysis,
the hadronic mass distribution is used to measure the in-
clusive charmless semileptonic branching fraction and to
determine $|V_{ub}|$.

V_{cb}, V_{ub}, HQET at Belle

Christoph Schwanda

Abstract. In this article, we review five new Belle mea-
surements relevant to the CKM matrix elements $|V_{cb}|$ and
$|V_{ub}|$: one measurement of inclusive $B \to X_c l \nu$ decays us-
ing full reconstruction of the other B, three different mea-
surements of inclusive $B \to X_u l \nu$ decays using various
experimental techniques, and finally the first evidence for
the decay $B^+ \to \omega l^+ \nu$.

**KATRIN – Direct measurement of ν-masses
in the sub-eV range**

Guido Drexlin for the KATRIN Collaboration

PACS: 23.40.-s, 14.60.Pq

Abstract. The KArlsruhe TRItium Neutrino (KATRIN)
experiment is a next-generation direct neutrino mass ex-
periment with sensitivity to sub-eV ν-masses. It combines
an ultra-luminous molecular windowless gaseous tritium
source with a high resolution electrostatic retarding spec-
trometer (MAC-E filter) to measure the spectral shape of
β-decay electrons close to the T_2 end point at 18.6 keV
with unprecedented precision. If no neutrino mass signal
is found, the KATRIN sensitivity after 3 years of measure-
ments is $m_\nu < 0.2$ eV (90 % CL.); a ν-mass signal of $m_\nu =
0.35$ (0.30) eV can be measured with 5 (3) σ evidence.

First results of the NEMO3 experiment

L. Simard, Representing the NEMO Collaboration

Abstract. The objective of the NEMO Collaboration is to search for neutrinoless double beta decay and thus to investigate physics beyond the Standard Model. The expected sensitivity for the effective neutrino mass is on the order of 0.1 eV. The NEMO-3 detector has been operating in the Fréjus Underground Laboratory and has been collecting data since February of 2003. The half-life of two-neutrino double beta decay has been measured for ^{100}Mo and ^{82}Se. Constraints on the background for neutrinoless double beta decay have been set.

Experimental constraints on extra dimensions

Salvatore Mele

Abstract. In the last few years the proposed existence of large extra dimensions has changed the landscape of high energy physics, suggesting longly sought answers to fundamental questions like the hierarchy problem. To date, several theoretical models have been proposed and a vigorous experimental effort has started, aimed to hunt for manifestations of extra dimensions in form of deviations from the Newton law in short-range tests of gravity or as new particle interactions at the world's most powerful colliders. An overview is presented of the details of the experimental searches and their findings.

Flavour physics and CP violation

Thomas Mannel

Abstract. In this talk I give a personal selection of recent theoretical topics in flavour physics and CP violation. The main emphasis is on the theoretical methods used to calculate rates and spectra for heavy meson decays and how these results compare to the data.

Updated NLL results for $\bar{B} \to X_{s,d}\gamma$ in and beyond the SM

T. Hurth, E. Lunghi, W. Porod

Abstract. We present general model-independent formulae for the branching ratios and the direct tagged CP asymmetries for the inclusive $\bar{B} \to X_d\gamma$ and $\bar{B} \to X_s\gamma$ modes. We also update the corresponding SM predictions.

Non-diagonal flavour observables in B and collider physics

T. Hurth, W. Porod

Abstract. Until now the focus within the direct search for supersymmetry has mainly been on flavour diagonal observables. Recently lepton flavour violating signals at future electron positron colliders have been studied. There is now an opportunity to analyse the relations between collider observables and low-energy observables in the hadronic sector. In a first work in this direction, we study flavour violation in the squark decays of the second and third generations taking into account results from B physics, in particular from the rare decay $b \to s\gamma$. Correlations between various squark decay modes can be used to get more precise information on various flavour violating parameters.

The renormalized B-meson light-cone distribution amplitude

Bjorn O. Lange

Abstract. I discuss the renormalization-group equation governing the leading order light-cone distribution amplitude of the B-meson $\phi_+^B(\omega,\mu)$ and its exact analytic solution. The solution displays two features concerning the

asymptotic behaviour of $\phi_+^B(\omega, \mu)$ for small and large values of ω. I comment on further applications and argue that the loss of normalizability is not a problem in practice.

A non-perturbative computation of the B-meson decay constant and the b-quark mass in HQET

Jochen Heitger

Abstract. A lattice computation of the B-meson decay constant and the mass of the b-quark to leading order in the heavy quark effective theory is presented. The involved renormalization problems are solved non-perturbatively, and the continuum limit is taken. In the quenched approximation the results reported here already offer an interesting numerical precision, which will be further improved in the near future.

$|V_{cb}|$, $|V_{ub}|$, and HQET at CLEO

Karl M. Ecklund, for the CLEO collaboration

PACS: 12.15.Hh, 13.20.He

Abstract. I report results from the CLEO collaboration on semileptonic B decays, highlighting measurements of the Cabibbo-Kobayashi-Maskawa matrix elements $|V_{cb}|$ and $|V_{ub}|$. I describe the techniques used to obtain the recent improvements in precision for these measurements, including the use of the $b \to s\gamma$ photon spectrum to reduce hadronic uncertainties in semileptonic B decays. I also report new measurements of $|V_{cb}|$ using the inclusive semileptonic branching fraction $\mathcal{B}(B \to Xe\nu)$ and of $|V_{ub}|$ through study of the q^2 dependence of $B \to \pi\ell\nu$ and $B \to \rho\ell\nu$.

Double $c\bar{c}$ and $D^{(*)}\bar{D}^{(*)}$ production at Belle

T.V. Uglov, for the Belle collaboration

PACS: 14.40.Gx, 12.38.Bx, 13.66.Bc, 12.39.Hg, 13.87.Fh

Abstract. We present a new study of double $c\bar{c}$ production in the e^+e^- continuum. We report a study of many double charmonium final states in e^+e^- annihilation. The $e^+e^- \to J/\psi c\bar{c}$ cross-section is measured with reduced model dependence. The cross-section of the coherent $D^{(*)}\bar{D}^{(*)}$ pair production in the e^+e^- continuum is measured for the first time.

Rare charm and B decays at CDF

Julia Thom (on behalf of the CDF Collaboration)

Abstract. We present results on rare charm and B decays using $65pb^{-1}$ of data taken with the CDF detector in Run II. Three results are discussed, a measurement of the relative branching ratios $\Gamma(D^0 \to K^+K^-)/\Gamma(D^0 \to K\pi)$ and $\Gamma(D^0 \to \pi^+\pi^-)/\Gamma(D^0 \to K\pi)$ and the direct CP-violating decay rate asymmetry, and a limit on the branching ratio of the FCNC decay $D^0 \to \mu^+\mu^-$. We also discuss the prospects for the search for $B_s^0 \to \mu^+\mu^-$ decays.

Accelerator R&D

Maury Tigner

Abstract. Accelerator R&D is analyzed into its various categories, important ongoing segments are discussed and the need for a new paradigm in accelerator R&D is put forward in the hope of contributing to a strengthening of accelerator based particle physics around the world.

Search for leptoquark production and lepton flavour violation

A.F. Zarnecki

PACS: 13.85.Rm

Abstract. Direct and indirect leptoquark searches performed at LEP, HERA and the Tevatron are reviewed. No signal of leptoquark production or exchange is observed. Complementary limits are obtained from different processes and different experiments.

Searches for new physics in photonic final states at LEP

Marat Gataullin (on behalf of the LEP Collaborations)

Abstract. A brief review of searches for physics beyond the Standard Model in photonic final states at LEP is given here. These include searches for supersymmetry, large extra dimensions and contact interactions. Recent results from all four LEP experiments are presented, including improved limits on the new scale of gravity for models with large extra dimensions and the most precise direct measurement of the number of light neutrino species. Status and prospects of the LEP combined searches are also discussed.

Latest results of the Mainz Neutrino Mass Experiment

C. Kraus, J. Bonn, B. Bornschein, L. Bornschein, B. Flatt, A. Kovalik, B. Müller, E.W. Otten, T. Thümmler, J.P. Schall, C. Weinheimer

Abstract. The Mainz Neutrino Mass Experiment investigates the endpoint region of the tritium β decay spectrum very precisely to extract the rest mass of the electron antineutrino. The measurements are performed with a MAC-E-Filter, combining <u>M</u>agnetic <u>A</u>diabatic <u>C</u>ollimation and an <u>E</u>lectrostatic high pass Filter. After optimal preparation of the apparatus very stable and high quality data have been taken in 2001, which do not show any residual problem. A combined analysis of data from 1998/1999 and 2001 lead to the final value of $m_\nu^2 = -0.7 \pm 2.2_{stat} \pm 2.1_{sys}$ eV^2/c^4, leading to an upper limit $m_\nu \leq 2.3$eV/c^2 (95% C.L.).

MICE: The international Muon Ionization Cooling Experiment

Emilio Radicioni, on behalf of the MICE collaboration

Abstract. The MICE collaboration has designed an experiment made by a section of an ionization cooling channel equipped with particle detectors used as beam diagnostics stations. The channel uses liquid-hydrogen absorbers to provide energy loss and high-gradient RF cavities to re-accelerate the particles; this setup is designed to reduce the beam transverse emittance by $> 10\%$ for muon momenta in the range 140MeV/c to 240MeV/c. The particle detectors, grouped in two spectrometers before and after the channel, are meant to measure the beam transmittance and emittance reduction with an absolute precision of $\pm 0.1\%$.

B physics at DØ

Michael D. Hildreth, for the DØ Collaboration

Abstract. An overview of progress in B physics studies with the DØ Detector at the Fermilab Tevatron is presented, based on approximately 114 pb^{-1} of Run II data. Results on the performance of the upgrade DØ tracking system are shown. Signals for many exclusive $B^\pm$, B_d^0, and B_s decay modes are shown, along with preliminary results for b-hadron lifetimes and b-quark production cross sections.

Radiative Penguin decays at the *BaBar* experiment $B \to K^* \gamma$, $B \to \rho \gamma$, $B \to \omega \gamma$ and $B \to X_s \gamma$

Eugeni Graugés (*BaBar* collaboration)

Abstract. A review of the results obtained from the analysis of the B meson decays that involve Radiative Penguin processes, recorded at the BaBar experiment at the Stanford Linear Accelerator Center PEP-II B-Factory, is presented. The physics interest of these processes and their SM prediction are discussed briefly. The most relevant selection techniques used in the analysis are described before quoting the latest results made public by the BaBar collaboration as of July 2003.

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**Searches for physics beyond the Standard Model
in $t\bar{t}$ events**

Petra Merkel

Abstract. The top quark is currently only observed at
the Tevatron, where it is mainly produced in $t\bar{t}$ pairs.
Due to the very high mass of the top quark compared
to the other quarks and the gauge bosons, it is expected
to play a special role in electroweak symmetry breaking.
Therefore it might be especially sensitive to new physics.
Measurements of various production and decay quantities
of the top quark could lead to discoveries of physics be-
yond the standard model. Several such measurements were
performed by the CDF collaboration during Run1 of the
Tevatron. These measurements and first results from CDF
in Run2 are presented.

**Prototype for an undulator-based source for po-
larised positrons. International polarised positron
collaboration: Project E-166**

Gudrid Moortgat-Pick

Abstract. The full exploitation of the physics potential
of a future Linear Collider requires the development of po-
larised positron beams. A very promising scheme for the
technical realisation is the use of helical undulators, gen-
erating circular polarised photons of several MeV which
are then converted in a thin target to longitudinally po-
larised positrons. The experiment E-166 tests this scheme.
It uses the low-emittance 50-GeV electron beam at the Fi-
nal Focus Test Beam (FFTB) at SLAC, passing through
a 1 meter-long helical undulator. The flux and polarisa-
tion of the undulator photons as well as the properties of
the positrons will be measured and will be compared with
simulations.

**Theoretical status of CP violation
in Kaon decays [ϵ'/ϵ]**

Vincenzo Cirigliano

Abstract. This talk is devoted to review the status of
theoretical calculations of ϵ'/ϵ. The focus is mainly on
recent developments in non-lattice approaches to hadronic
matrix elements.

**CKM angles from non-leptonic B decays
using SU(3) flavour symmetry**

Joaquim Matias

Abstract. We discuss the determination of the CKM an-
gles γ and α using recent data from non-leptonic B de-
cays together with flavour symmetries. Penguin effects are
controlled by means of the CP-averaged branching ratio
$B_d \to \pi^{\pm} K^{\mp}$. The information from $\mathcal{A}_{CP}(B_d \to J/\Psi K_S)$
(two solutions for ϕ_d), R_b and γ allow us to determine β,
even in presence of New Physics not affecting $\Delta B = 1$
amplitudes. In this context we address the question of to
what extent there is still space for New Physics.

**Improving multiparton Monte Carlo tools
in hadronic collisions**

Fulvio Piccinini

Abstract. Recent work on leading order multiparton cal-
culations for hadronic collisions is reviewed, with special
emphasis on the `ALPGEN` event generator. Some problems
connected with the interface of the partonic events gen-
erated via matrix elements with the showering are ad-
dressed.

Theoretical progress for the associated production of a Higgs boson with heavy quarks at hadron colliders

S. Dawson, C.B. Jackson, L.H. Orr, L. Reina, D. Wackeroth

Abstract. The production of a Higgs boson in association with a pair of $t\bar{t}$ or $b\bar{b}$ quarks plays a very important role at both the Tevatron and the Large Hadron Collider. The theoretical prediction of the corresponding cross sections has been improved by including the complete next-to-leading order QCD corrections. After a brief introduction, we review the results obtained for both the Tevatron and the Large Hadron Collider.

Bulk fields with brane terms

F. del Aguila, M. Pérez-Victoria, J. Santiago

Abstract. In theories with branes, bulk fields get in general divergent corrections localized on these defects. Hence, the corresponding brane terms are renormalized and should be included in the effective theory from the very beginning. We review the phenomenology associated to brane kinetic terms for different spins and backgrounds, and point out that renormalization is required already at the classical level.

Supersymmetric Higgs production at the large hadron collider

Robert Harlander

Abstract. We review the status of theoretical predictions for the production of neutral Higgs bosons at the LHC. Special emphasis is put on the role of bottom quarks in the gluon fusion process and in the associated production of Higgs bosons with $b\bar{b}$ pairs.

Chiral symmetry and hyperfine $q\bar{q}$ splittings

Felipe J. Llanes-Estrada, Stephen R. Cotanch, Adam P. Szczepaniak, Eric S. Swanson

Abstract. We review theoretical calculations for the pseudoscalar-vector meson hyperfine splitting with no open flavor and also report a many body field theoretical effort to assess the impact of chiral symmetry in the choice of effective potentials for relativistic quark models. Our calculations predict the missing η_b meson to have mass near 9400 MeV.

Theoretical aspects of Higgs physics at the LHC

Mauro Moretti

Abstract. The strategies recently developed to study Higgs boson properties at the LHC are reviewed. It is shown how to obtain model-independent determinations of couplings to fermions and gauge bosons by exploiting different production and decay channels. We consider the case of Weak Boson Fusion Higgs production with $H \to b\bar{b}$

New ideas on SUSY searches at future linear colliders

S. Hesselbach, O. Kittel, G. Moortgat-Pick, W. Öller

Abstract. Several results obtained within the SUSY group of the ECFA/DESY linear collider study are presented: (i) a possibility to determine $\tan\beta$ and the trilinear couplings A_f via polarisation in sfermion decays, (ii) the impact of complex MSSM parameters on the third generation sfermion decays, (iii) determination of CP violation in the complex MSSM via T-odd asymmetries in neutralino production and decay, and (iv) an analysis of the chargino and neutralino mass parameters at one-loop level.

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B lifetimes and flavour tagging at CDF Run II

Sinéad M. Farrington

Abstract. Data samples of $\sim$140pb^{-1} gathered with CDF Run II's displaced vertex trigger and J /Ψ trigger have led to measurements of B hadron lifetimes in exclusive and semileptonic modes which are presented here. Also discussed are evaluations of flavour tagging techniques in Run II data.

Charmless B decays from CLEO:
Rare and not-so-rare

Richard D. Ehrlich

Abstract. We present updated results from the CLEO collaboration from two studies of B meson decay to charmless hadronic final states. In the first analysis, we combine data from the CLEO II and CLEO III detectors to provide final measurements of thirteen two-body decay modes. In the second, the combined CLEO II and CLEO II.V data set is used to determine the η' momentum spectrum and branching ratio in the inclusive process $B \to \eta' X_{nc}$; with a more powerful analysis technique than was previously used. For the momentum range $2.0 < P_{\eta'} < 2.7$ GeV/c , we find a branching ratio, $\mathcal{B}(B \to \eta' X_{nc})$, of $[4.6 \pm 1.1 \pm 0.4 \pm 0.5] \times 10^{-4}$. The uncertainties are statistical, systematic, and due to subtraction of charm-decay background, respectively.

Rare decays of tau-lepton

Takayoshi Ohshima

Abstract. We have searched for the Lepton Flavor Violating decays $\tau^- \to \mu^- \gamma$ and $\tau^- \to \mu^- \eta$ using $\sim$85 fb^{-1} of data accumulated by the Belle detector at KEKB, and attained preliminary upper limits for the branching fraction $Br(\tau^- \to \mu^- \gamma) < 3.2 \times 10^{-7}$ and $Br(\tau^- \to \mu^- \eta) < 3.4 \times 10^{-7}$, respectively, at the 90% confidence level. These are the first data that reach to the sensitivity of 10^{-7} level, and provide some constraints on the parameter spaces of $\tan\beta$ vs. SUSY mass and $\tan\beta$ vs. Higgs mass.

Tests of chiral perturbation theory
in K$_S$ rare decays at NA48

R. Fantechi

Abstract. The NA48 collaboration has performed an extensive study of rare kaon decays. In particular tests of Chiral Perturbation Theory have been done, using data from the $\text{Re}(\varepsilon'/\varepsilon)$ runs in 1998 and 1999 for $K_L \to \pi^0 \gamma\gamma$ and from the NA48/1 High Intensity K_S for $K_S \to \gamma\gamma$ and for the first observation of $K_S \to \pi^0 \gamma\gamma$

Search for extra dimensions at hadron colliders

Michiel Sanders (for the CDF and DØ collaborations)

Abstract. To explain the large difference between the Planck scale and the electroweak scale, models in which gravity propagates in more than four dimensions have recently been proposed. In this paper, results from searches for extra dimensions at the Tevatron p$\bar{\text{p}}$ collider are presented. Limits are set on the higher dimensional Planck scale, and expectations for the LHC pp collider are given.

Search for new particles or gauge bosons decaying
into dileptons/dijets at the tevatron

Mario Paolo Giordani

Abstract. The existence of new particles decaying in a jet or lepton pair is probed with the Run II data collected

by the Tevatron p$\bar{\text{p}}$ collider at $\sqrt{s} = 1.96$ TeV. Searches performed on both jet and lepton data collected by the CDF and DØ detectors do not show signs of any new resonance within the considered mass range. The sensitivity achieved by these searches leads to 95% *C.L.* limits on the production cross-section times branching ratio for axigluons, flavour universal colorons, excited quarks, colour octet techni-ρ, E_6 diquarks, new gauge bosons and Randall-Sundrum gravitons. Excluded mass regions for these models are also computed.

Flavour and model-independent Higgs boson searches at LEP

Maarten Boonekamp

Abstract. Now the LEP experiments have finalized their results on the Standard-Model Higgs boson, and are finalizing results on the most common Supersymmetric scenari, a wealth of results are being released that do not rely on explicit model assumptions, but rather on particular final states. In the absence of any convincing excess in the data, results are then extracted in a quasi model-independent way, most often in the form of excluded signal cross-sections, normalized to Standard Model cross-sections. The aim of the experiments is to provide a catalog of results that can be used in a straightforward way for future studies of models of electroweak symmetry breaking.

Search for MSSM/mSUGRA at DØ

Martin Wegner, for the DØ collaboration

Abstract. This report summarizes recent searches for supersymmetric particles using the DØ Detector at Fermilab. Limits on the production of stop squarks are reported. The status of the mSUGRA search for $\chi^0 \chi\pm \to lll$ and of a model-independent search for $e + \mu$ final states are presented. The first evidence for τ identification in the DØ Run II data is shown.

Searches for new physics in events with photon final states at CDF at the TeVatron

Beate Heinemann for the CDF collaboration

Abstract. The first CDF Run II analyses based on about 80 pb^{-1} on searches for events containing photons in the final state are presented. No deviations from the Standard Model predictions are found and limits on some scenarios of physics beyond the Standard Model are presented.

Top quark cross-section measurements at the Tevatron

Wolfgang Wagner for the CDF Collaboration

Abstract. Run II of the Tevatron collider at Fermilab is well under way and data samples larger than those of Run I are at hand. In this contribution I summarize the current status of cross-section measurements for top-quark pair ($t\bar{t}$) production at the CDF and DØ experiments.

Extraction of the x-dependence of the non-perturbative QCD b-quark fragmentation distribution component

E. Ben-Haim

Abstract. Using recent measurements of the b-quark fragmentation distribution obtained in $e^+e^- \to b\bar{b}$ events, registered at the Z pole, the non-perturbative QCD component of the fragmentation distribution has been extracted independently of any hadronic physics modelling. This distribution depends only on the way the perturbative QCD component has been defined. When the perturbative QCD component is taken from a parton shower Monte-Carlo, the non-perturbative QCD component is rather similar with those obtained from the Lund or Bowler models. When the perturbative QCD component

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is the result of an analytic NLL computation, the non-perturbative QCD component has to be extended in a non-physical region and thus cannot be described by any hadronic modelling. In the two examples, used to characterize these two situations, which are studied at present, it happens that the extracted non-perturbative QCD distribution has the same shape, being simply translated to higher-x values in the second approach, illustrating the ability of the analytic perturbative QCD computation to account for softer gluon radiation than with a parton shower generator.

**Particle physics solutions
to the UHECR puzzle − 2003**

M. Kachelrieß

Abstract. The status of solutions to the ultra-high energy cosmic ray (UHECR) puzzle that involve particle physics beyond the standard model is reviewed. Signatures and experimental constraints are discussed for the most promising suggestions like the Z-burst model and topological defects (allowed only as subdominant contributions), supermassive dark matter (no positive evidence in its favor), strongly interacting neutrinos or new primaries (no viable models known), and violation of Lorentz invariance (viable).

**New NNLL QCD results
on the decay $B \to X_s \ell^+ \ell^-$**

A. Ghinculov, T. Hurth, G. Isidori, Y.-P. Yao

Abstract. We present here new NNLL predictions on the inclusive rare decay $B \to X_s \ell^+ \ell^-$ based on our new two-loop QCD analysis of the four-quark operators.

Charmed B decays at Belle

Shiro Suzuki

Abstract. Recent results of B decays to charmed mesons and charmonium states from Belle collaboration are reviewed. The contributions of two-body $B \to D^{**}\pi$ decays with narrow (j_q=3/2) and broad (j_q=1/2) D^{**} have been determined. We report the first observation of the decay $B^+ \to \psi(3770)K^+$ ($\psi(3770) \to D^0\bar{D}^0$ and D^+D^-). Also we report the observation of the $D_{sJ}(2317)$ and $D_{sJ}(2457)$ in B decays.

Rare ϕ decays

The KLOE Collaboration, presented by Camilla Di Donato

Abstract. The Kloe experiment has collected an integrated luminosity $\sim 500pb^{-1}$ up to now, which means $\sim 1.65 \times 10^9$ ϕ decays. The huge amount of events allowed us to measure rare ϕ decays. We measured the radiative decays of the ϕ meson into π^0, η and $\eta'(958)$. These measurements are relevant to assess the mixing in the pseudoscalar nonet as well as to evaluate the gluon content in the $\eta'(958)$. Moreover also the radiative decays into $\pi^0\pi^0\gamma$ and $\eta\pi^0\gamma$ have been measured. These decays are dominated by the final states $f_0(980)$ and $a_0(980)$. The measurement of the branching ratios and of the $\pi^0\pi^0$ or $\eta\pi^0$ invariant mass spectrum helps to understand the controversial nature of the above scalar mesons.

**Preliminary results on the search for the neutrinoless double beta decay of ^{130}Te
with the Cuoricino experiment**

A. Nucciotti,, for the Cuoricino Collaboration

Abstract. The search for neutrinoless double beta decay (DBD-0ν) is a powerful tool to establish the correct neutrino mass hierarchy and whether the neutrino is a Majorana or Dirac particle. The Milano group has run several experiments using thermal detectors to search for the ^{130}Te DBD-0ν. The Cuoricino experiment consists of an array of 62 TeO$_2$ thermal detectors for a total mass of about 40 kg, by far the largest cryogenic experiment in

the world. The detector installation in the Gran Sasso Underground Laboratory has been recently completed. After a test phase the experiment is now taking data and we report here the preliminary results. Cuoricino is the first step toward the CUORE experiment, which will consists of 1000 TeO$_2$ thermal detectors for a total mass of about 760 kg: in this paper we discuss also the physics potential of both stages for what concerns the DBD-0ν search.

Recent b-physics results from OPAL

David Waller

Abstract. The most recent b-physics results from the OPAL experiment at LEP are reviewed. A measurement of semileptonic B meson decays to narrow orbitally-excited charm mesons is presented first, followed by a study of charm production in b-hadron decays. Here, B refers to B$^+$ and B^0 mesons and their charge conjugates, and b-hadron refers to the admixture of hadrons containing a b quark produced in electron-positron annihilations at $\sqrt{s} = $ m$_Z$.

Search for SUSY in gauge mediated and anomaly mediated supersymmetry breaking models

Thomas Nunnemann for the DØ Collaboration

Abstract. In this note, recent results on the search for Gauge Mediated Supersymmetry Breaking (GMSB) and Anomaly Mediated Supersymmetry Breaking (AMSB) at the LEP and Tevatron colliders are summarized. We report on DØ's search for GMSB in di-photon events with large missing transverse energy and discuss the sensitivity of similar searches based on future Tevatron integrated luminosities.

Recent rare charm results from CLEO

Yongsheng Gao (for CLEO Collaboration)

Abstract. We present some recent results in rare charm decays from CLEO Collaboration. The data used were collected by the CLEO II and III detectors at the Cornell Electron Storage Ring (CESR). A brief future outlook for the CESR-c/CLEO-c program is also presented.

B decays into charm at CLEO. Measurement of the branching fraction and helicity amplitudes in $B \to D^\star \rho$ decays

István Dankó (CLEO Collaboration)

Abstract. Recent measurements of the branching fractions and helicity amplitudes of the decays $B^- \to D^{\star 0}\rho^-$ and $\bar{B}^0 \to D^{\star +}\rho^-$ by the CLEO collaboration are presented. The fraction of longitudinal polarization in the $\bar{B}^0 \to D^{\star +}\rho^-$ decay is found to be consistent with the factorization hypothesis, although the helicity amplitudes show evidence for nonzero final-state interaction phases.

String theory

J.L.F. Barbón

Abstract. This is a rendering of a general talk on the state of String Theory given at the EPS-2003 conference. It is intended for a wide audience of experimental and theoretical physicists and emphasizes general ideas rather than technical aspects.

QCD factorisation in radiative B decays

Sébastien Descotes-Genon

Abstract. We study how, in the heavy-quark limit and at one loop, the amplitude of the radiative decays $B \to \gamma \ell \nu_\ell, B \to \gamma\gamma, B \to \gamma \ell^+ \ell^-$ factorise, i.e., they can

be written as a convolution of a (perturbative) hard-scattering amplitude and the (nonperturbative) light-cone distribution amplitude of the B-meson. Using the framework of the Soft-Collinear Effective Theory, large logarithms can be resummed and the amplitudes of the 3 decays are shown to differ from each other only through the dynamics above M_B.

Nonfactorizable effects in B to charmonium decays

Fulvia De Fazio

Abstract. Nonleptonic B to charmonium decays generally deviate from the factorization predictions. We study rescattering effects mediated by intermediate charmed mesons in this class of decay modes and, in particular, we consider $B^- \to K^- h_c$ with h_c the $J^{PC} = 1^{+-}$ $\bar{c}c$ meson, relating this mode to $B^- \to K^- \chi_{c0}$. We find $\mathcal{B}(B^- \to K^- h_c)$ large enough to be measured at the B factories, hence this process could be used to study the poorly known h_c.

Cancellation of infrared divergences at NNLO

Stefan Weinzierl

Abstract. Perturbative calculations at next-to-next-to-leading order for multi-particle final states require a method to cancel infrared singularities. I discuss how to setup the subtraction method at NNLO.

On the coupling $g_{f_0 K^+ K^-}$
and the structure of $f_0(980)$

Fulvia De Fazio

Abstract. We use light-cone QCD sum rules to evaluate the strong coupling $g_{f_0 K^+ K^-}$ which enters in several analyses concerning the scalar $f_0(980)$ meson. The result is $6.2 \leq g_{f_0 K^+ K^-} \leq 7.8$ GeV.

Color superconductor
with a color-sextet condensate

Tomáš Brauner

Abstract. We analyze color superconductivity of one massive flavor quark matter at moderate baryon density with a spin-zero color-sextet condensate. The most general form of the order parameter implies complete breakdown of the $SU(3) \times U(1)$ symmetry. However, both the conventional fourth-order polynomial effective bosonic description and the fermionic NJL-type model in the mean-field approximation favor an enhanced $O(3)$ symmetry of the ground state. We suggest two mechanisms how the complete symmetry breakdown could be achieved.

Electroweak Corrections
to $e^+ e^- \to \nu \bar{\nu} H$ and $e^+ e^- \to t \bar{t} H$

A. Denner, S. Dittmaier, M. Roth, M.M. Weber

Abstract. The most interesting Higgs-production processes at future $e^+ e^-$ colliders belong to the process class $e^+ e^- \to f \bar{f} H$. We study the full $\mathcal{O}(\alpha)$ corrections to this reaction in the Standard Model for neutrinos and top quarks in the final state. Leading higher-order corrections from initial-state radiation and QCD corrections are also taken into account. Although cancellations between the different kinds of corrections occur, the full corrections are of the order of $\pm 10\%$ and thus important ingredients in the theoretical predictions for future $e^+ e^-$ colliders.

Multi-photon corrections to W boson mass determination at hadron colliders

C.M. Carloni Calame, G. Montagna, O. Nicrosini, M. Treccani

Abstract. The impact of higher-order final-state photonic corrections on the precise determination of the W-boson mass at the Tevatron and LHC colliders is evaluated. The W-mass shift from a fit to the transverse mass distribution is found to be about 10 MeV in the $W \to \mu\nu$ channel and a few MeV in the $W \to e\nu$ channel. The calculation, which is implemented in the Monte Carlo event generator HORACE for data analysis, can contribute to reduce the uncertainty associated to the W mass measurement at present and future hadron collider experiments.

Hopf algebra structures in particle physics

Stefan Weinzierl

Abstract. In the recent years, Hopf algebras have been introduced to describe certain combinatorial properties of quantum field theories. I will give a basic introduction to these algebras and review some occurrences in particle physics.

An analysis of the inclusive $\Upsilon(1S) \to \eta'X$ decay and constraints on the η'-meson distribution amplitudes

Ahmed Ali, Alexander Y. Parkhomenko

Abstract. We calculate the η'-meson energy spectrum in the $\Upsilon(1S) \to \eta'ggg \to \eta'X$ decay in the leading-order perturbative QCD in the static-quark limit for the orthoquarkonium. Our principal result is the extraction of parameters of the $\eta'g^*g$ effective vertex function (EVF) involving a virtual and a real gluon from the available data on the hard part of the η'-meson energy spectrum. The perturbative-QCD based framework provides a good description of the available CLEO data, allowing one to constrain the lowest Gegenbauer coefficients $B_2^{(q)}$ and $B_2^{(g)}$ of the quark-antiquark and gluonic distribution amplitudes of the η'-meson. The resulting constraints are combined with the existing ones on these coefficients from an analysis of the $\eta' - \gamma$ transition form factor and the requirement of positivity of the EVF, yielding $B_2^{(q)}(\mu_0^2) =$

-0.008 ± 0.054 and $B_2^{(g)}(\mu_0^2) = 4.6 \pm 2.5$ for $\mu_0^2 = 2$ GeV^2. This reduces significantly the current uncertainty on these coefficients.

Predictions for top quark spin correlations at the Tevatron and the LHC at next-to-leading order in α_s

A. Brandenburg

Abstract. Predictions for angular distributions of top quark decay products that are sensitive to $t\bar{t}$ spin correlations are presented at next-to-leading order in α_s for the Tevatron and the LHC.

The $\eta'g^*g^{(*)}$ vertex including the η'-meson mass

Ahmed Ali

Abstract. The $\eta'g^*g^{(*)}$ effective vertex function (EVF) is calculated in the QCD hard-scattering approach, taking into account the η'-meson mass. We work in the approximation in which only one non-leading Gegenbauer moment in both the quark-antiquark and gluonic light-cone distribution amplitude for the η'-meson is kept. The EVF with one off-shell gluon is shown to have the form $F_{\eta'g^*g}(q_1^2, 0, m_{\eta'}^2) = m_{\eta'}^2 H(q_1^2)/(q_1^2 - m_{\eta'}^2)$, valid for $|q_1^2| > m_{\eta'}^2$. An interpolating formulae for the EVF in the space-like region of the virtuality q_1^2, which satisfies the QCD-anomaly normalization for on-shell gluons and the perturbative-QCD result for the gluon virtuality $|q_1^2| \gtrsim 2$ GeV^2, is also presented.

GUT scale inflation and leptogenesis

Qaisar Shafi, Vedat N. Şenoguz

Abstract. We reconsider supersymmetric hybrid inflation in which inflation is associated with the breaking of a

gauge symmetry G to H, with the symmetry breaking scale $M \sim 10^{16}$ GeV. The models discussed feature a spectral index $n_s \geqslant 0.98$ while $\mathrm{d}n_s/\mathrm{d}\ln k \lesssim 10^{-3}$ and the tensor to scalar ratio $r \lesssim 10^{-4}$. If G corresponds to $SO(10)$ or one of its rank five subgroups, the observed baryon asymmetry is naturally explained via leptogenesis.

Masses and branching fractions at CDF

S. D'Auria

Abstract. We present a collection of new results on b-meson and Λ_b masses and branching fractions measured at CDF. We have improved our measurement of the Λ_b and B_s mass and we have measured the branching fractions of $B_s \to D_s\pi$, $\Lambda_b \to \Lambda_c\pi$ and $B_u \to \Phi K^{\pm}$.

B semileptonic decays @ DELPHI

A. Oyanguren

Abstract. Updated results on B semileptonic decays at the DELPHI experiment are presented. Measurements of b-hadron lifetimes, exclusive $\overline{\mathrm{B}}^0_d \to \mathrm{D}^{*+}\ell^-\overline{\nu}_\ell$ decays and inclusive moments of the hadronic mass distribution are encompassed here. They focus on a precise determination of the CKM matrix element V_{cb}.

Search for (singly and doubly) charged Higgses

Javier Cuevas

Abstract. Recent results on searches for singly and doubly charged Higgs bosons at LEP, Tevatron and Hera colliders are reported. These results do not show any deviation from the Standard Model expetations allowing to set lower limits on the mass of the charged Higgs bosons.

Indirect dark matter search with AMS-02

Mariusz Sapinski

Abstract. The Alpha Magnetic Spectrometer (AMS) is a high energy particle physics experiment in space to be placed on the International Space Station (ISS) in 2006 for a three years mission. The main physics goals in the astroparticle domain are the anti-matter and the dark matter searches. Some results of Monte Carlo feasibility study of the AMS detector sensitivity to indirect dark matter searches are presented.

Concluding talk

D. Treille

Abstract. I give my personal account of the conference in simple terms.

Experimental results in heavy flavor physics

Sheldon Stone

Abstract. The interplay of experiment and theory is explored in the context of current data on b and c decay. Measurements of $|V_{cb}|$ and $|V_{ub}|$ are extracted from existing data. Conservative estimates give $|V_{cb}| = (42.4 \pm 1.2_{exp} \pm 2.3_{thy}) \times 10^{-3}$ and $|V_{ub}| = (3.90 \pm 0.16_{exp} \pm 0.53_{thy}) \times 10^{-3}$. Using these values along with data on B_d, B_s mixing and CP violation in the K_L system, the allowed region of the CKM parameters ρ and η is derived. Tests of factorization in two-body hadronic B decays to one heavy and one light meson are shown and compared with modern theories which are also used to see if there is new physics in two-body B decays to light mesons. The two new narrow D_{sJ} states, discovered by BaBar and CLEO, respectively, are interpreted in light of the observation of these states in B decays by Belle.

Baryonic B decays at Belle

Hsuan-Cheng Huang for the Belle collaboration

Abstract. Recent results of baryonic B decays from Belle are reported. This study is done by a 78 fb^{-1} data sample, consisting of 85.0 ± 0.5 million $B\bar{B}$ pairs, collected by the Belle detector at the KEKB asymmetric energy e^+e^- (3.5 on 8 GeV) collider. The results reported here include the first observation of the two-body decay $B^0 \to p\bar{\Lambda}_c$, the first hyperonic decay $B^0 \to p\bar{\Lambda}\pi^-$, and first observations of $B^+ \to p\bar{p}\pi^+$, $B^0 \to p\bar{p}K^0$, and $B^0 \to p\bar{p}K^{\star+}$.

Evidence for $K \to K^*\ell^+\ell^-$ and measurement of $B \to K\ell^+\ell^-$

Anders Ryd on behalf of the BABAR collaboration

Abstract. We present evidence for the flavor-changing neutral current decay $B \to K^*\ell^+\ell^-$ and a measurement of the $B \to K\ell^+\ell^-$ branching fraction, where $\ell^+\ell^-$ is either an e^+e^- or $\mu^+\mu^-$ pair. The data sample analyzed comprises 88.5×10^6 $\Upsilon(4S) \to B\bar{B}$ decays collected with the BABAR detector at the PEP-II e^+e^- storage ring. Averaging over $K^{(*)}$ isospin and lepton flavor, we obtain $\mathcal{B}(B \to K^*\ell^+\ell^-) = (1.40^{+0.57}_{-0.49} \pm 0.21) \times 10^{-6}$ and $\mathcal{B}(B \to K\ell^+\ell^-) = (0.68^{+0.17}_{-0.15} \pm 0.04) \times 10^{-6}$, where the uncertainties are statistical and systematic. The significance for the $B \to K^*\ell^+\ell^-$ signal is 3.0σ and for $B \to K\ell^+\ell^-$ the signal significance is over 7σ.

Rare hadronic B decays from *BaBar*

David Payne, for the *BaBar* Collaboration
(SLAC-PUB-10238)

Abstract. A selection of rare decay results from *BaBar* are presented, from a data sample of $82fb^{-1}$ of data taken at the $\Upsilon(4S)$ resonance (corresponding to 88×10^6 $B\bar{B}$ pairs).

Search for H/A $\to \mu\mu$ and $\tau\mu$ at the LHC

Silvia Arcelli

Abstract. The expected experimental sensitivity to the heavy neutral Higgs boson decays H/A $\to \mu\mu$ and H/A $\to \tau\mu$ at the LHC is discussed in the framework of the MSSM and of two type-III Two-Higgs-Doublet Models allowing for lepton flavour violation (LFV), respectively. Despite a small branching fraction, the H/A $\to \mu\mu$ decay allows for a precise measurement of the Higgs boson mass and for an evaluation of the ratio of the vacuum expectation values of the two Higgs doublets, $\tan\beta$. The search for the lepton flavour violating decay H/A $\to \tau\mu$ allows stringent constraints to be set on the LFV coupling parameter $\lambda_{\tau\mu}$.

Gaugino searches and constraints on supersymmetry

Paolo Azzurri

Abstract. The negative outcome of gaugino searches at LEP has been one of the most disappointing results for fans of supersymmetric models. In the framework of minimal supersymmetric models with GUT unification assumptions, the combined absence of supersymmetry and Higgs signals in the LEP data, sets stringent constraints on the models parameter space, and lower limits on the mass of the lightest neutralino and of other supersymmetric particles. All limits are given at 95% Confidence Level.

A review of searches for R-parity-violating SUSY

Christian Schwanenberger

Abstract. Searches for pair and single production of supersymmetric particles under the assumption that R-parity is violated via a single dominant coupling are presented. A subset of the most recent results from LEP, Tevatron and HERA is selected. The data are in agreement with the Standard Model expectation. Limits on the production cross sections and the masses of supersymmetric particles are derived.

Single-top production via flavour changing neutral currents

J. Ferrando

Abstract. Recent results on single-top production via flavour changing neutral currents (FCNC) are summarised. Model independent limits can be set directly for the process at both LEP and HERA and indirectly from the decays of the top quark at the TeVatron. No evidence for FCNC are observed at LEP and the TeVatron. Some events compatible with single top production are observed by the H1 collaboration at HERA, but no such events appear at ZEUS. Limits on FCNC from the different experiments are presented, with the strongest coming from the HERA and LEP experiments.

Effects of new physics on CP violation in B decays

George W.S. Hou

Abstract. We discuss two models with 1 extra CP phase in $b \leftrightarrow s$ transition. The CP phase $\arg(V_{t's}V_{t'b})$ with fourth generations, previously ignored, could impact on $b \rightarrow s\ell^+\ell^-$, Δm_{B_s} and $\sin 2\Phi_{B_s}$, but does not affect EM and strong penguins. With SUSY at TeV scale, a right-handed "$\widetilde{sb}_1$" squark can be driven light by flavor mixing. It does not affect $b \rightarrow s\ell^+\ell^-$, but can generate $S_{\phi K_S} < 0$ while giving $S_{\eta' K_S} \sim \sin 2\Phi_{B_d} \cong 0.74$. B_s mixing and $\sin 2\Phi_{B_s}$ would likely be large, and $S_{K_S\pi^0\gamma} \neq 0$ in $B^0 \rightarrow K^{*0}\gamma$ is promising.

Diffractive Higgs production at Tevatron and LHC

Christophe Royon

Abstract. We discuss the different models of central diffractive production of the Higgs boson at the Tevatron and the LHC. We also describe how the models can be tested using diffractive production data being taken at the Tevatron. We finally discuss the advantages of using diffractive events to reconstruct the mass of the Higgs boson especially at the LHC.

Results on CP violation from CLEO

Victor Pavlunin

Abstract. We report on recent searches for CP violation from the CLEO collaboration. Searches for CP asymmetries described in this contribution are performed in the Dalitz plot of $D^0 \rightarrow \pi^-\pi^+\pi^0$ decays [1], in the space of kinematic variables in the decay $\Lambda_c^+ \rightarrow \Lambda e^+\nu$ [2] and in the decay rates for charge conjugate states of $B^0 \rightarrow K^*(892)^+\pi^-$ [3]. The data sample used in these analyses was collected with the CLEO detector at the Cornell Electron Storage Ring (CESR), Ithaca, NY.

Inclusive measurements of diffractive DIS at H1

Paul Thompson

Abstract. Recent measurements of the diffractive cross section in deep-inelastic scattering (DIS) at HERA are presented. The data are used to investigate the factorisation properties of diffractive DIS and to examine its quantum chromodynamic (QCD) structure.

Latest results from RHIC

David J. Hofman

PACS: 25.75.-q, 25.75.Nq

Abstract. Some of the most recent results from the Relativistic Heavy Ion Collider (RHIC) are reported. Exciting new experimental features have been observed in data from all four experiments. These new observations indicate the creation of a new form of 'hot dense matter' at RHIC energies, the properties of which are now beginning to be determined.

COBRA – A new approach to double beta decay

K. Zuber

PACS: 23.40.-s, 21.10.Tg, 29.40.Wk, 27.60.+j

Abstract. The COBRA experiment is going to use a large amount of CdZnTe semiconductor detectors to perform a search for various double beta decay modes. The current status of the experiment is presented as well as first results. A short outlook on future activities is presented.

Recent results from the Sudbury Neutrino Observatory

A.W. Poon, for the SNO Collaboration

PACS: 26.65.+t, 14.60.Pq, 95.85.Ry

Abstract. The Sudbury Neutrino Observatory (SNO) measures both the flux of the electron-type neutrinos and the total flux of all active flavours of neutrinos originating from the Sun. A model-independent test of neutrino flavour transformation was performed by comparing these two measurements. In 2002, this flavour transformation was definitively demonstrated. In this talk, results from these measurements and the current status of the SNO detector are presented.

MACRO results on atmospheric neutrino oscillations

G. Giacomelli, A. Margiotta,
for the MACRO Collaboration

PACS: 13.15.+g, 14.60.Pq, 96.40.De, 96.40.Tv

Abstract. The final results of the MACRO experiment on atmospheric neutrino oscillations are presented. The data concern different event topologies with average neutrino energies of ~ 3 and ~ 50 GeV. Multiple Coulomb Scattering of the high energy muons was used to estimate the neutrino energy of each event. The angular distributions, the L/E_ν distribution, the particle ratios and the absolute fluxes all favour $\nu_\mu \to \nu_\tau$ oscillations with maximal mixing and $\Delta m^2 = 0.0023$ eV^2. A discussion is made on the Monte Carlos used for the atmospheric neutrino flux.

Status of the Super-Kamiokande and the K2K experiment

Yoshinari Hayato
for the SK and the K2K collaborations

PACS: 14.60.pq

Abstract. In this paper, the recent results of atmospheric neutrino oscillation analysis and the current status of the Super-Kamiokande are presented. This time, entire SK-I data, which correspond to the 1489 days live days, were analyzed and the preliminary results of the oscillation analysis are reported. Also, the recent results and current status of the KEK to Kamioka long-baseline neutrino oscillation (K2K) experiment are presented.

Status and prospects of the MINOS experiment

Peter Shanahan

Abstract. The MINOS experiment aims to conduct precision measurements of neutrino oscillation properties. Commissioning will start in early 2005, with two detectors separated by a baseline of 735km, and a beam of primarily ν_μ.

The NuMI off-axis long baseline experiment

Alfons Weber

Abstract. Several different experiments have now established that neutrinos do oscillate or may have presented experimental evidence that can be explained by neutrino oscillations [1,2,3,4]. The purpose of future experiments is now to measure with high precision the parameters of the neutrino mixing or so-called MNS matrix. One of those experiments is planned at the powerful NuMI neutrino beam line. The experiment is especially designed to obtain a high sensitivity for electron neutrino appearance in a muon neutrino beam. This measurement is related to the mixing angle Θ_{13}, which is so far undetermined from previous measurements. This article will report on possible technology choices and the physics reach of the experiment.

Global analysis of $D \to PV$ decays and SU(3) flavor symmetry breaking effects

M. Zhong, Y.L. Wu, W.Y. Wang,

Abstract. We investigate in detail both the Cabibbo-allowed and singly Cabibbo-suppressed $D \to PV$ decays based on the diagrammatic decomposition in the factorization formalism. Two sets of solutions discarded in the literature are picked up and discussed carefully. It is found that one of these solutions can provide satisfactory explanation in a natural manner on the process $D^+ \to \overline{K}^0 K^{*+}$ which is thought to be a puzzle. The relations $E_V + E_P = 0$ and $A_V + A_P = 0$ are badly broken, which indicates that the exchange and annihilation diagrams may receive contributions from more sources other than the $q\bar{q}$ intermediate state interactions. It is shown that, to have a consistent explanation to the experimental data with reasonable values for the parameters a_1 and a_2, the SU(3) symmetry breaking effects have to be considered. The SU(3) flavor symmetry breaking effects due to mass factors and due to formfactors and decay constants are analyzed in detail.

Prospects for observing the Kaluza-Klein excitations of the W boson in the ATLAS detector at the LHC

G. Polesello, M. Prata

Abstract. Kaluza-Klein excitations of the gauge bosons are a notable feature of theories with "small" (~ 1 TeV) extra dimensions. The leptonic decays of the excitations of the W boson provide at the LHC the striking signature of events containing an isolated high P_T lepton accompanied by a high transverse momentum imbalance. We investigate the reach for these signatures through a parametrized simulation of the ATLAS detector. With an integrated luminosity of 100 fb^{-1} a peak in the transverse invariant mass of the lepton-neutrino system will be detected if the compactification scale (M_c) is below 6 TeV. If no signal is observed, with an integrated luminosity of 100 fb^{-1} a limit of $M_c > 11.7$ TeV can be obtained from the study of the lepton-neutrino transverse mass distribution below the peak. If a peak is detected, a measurement of the couplings of the boson to leptons and quarks can be performed for M_c up to ~ 5 TeV.

Experimental results in heavy flavor physics

Sheldon Stone

Abstract. The interplay of experiment and theory is explored in the context of current data on b and c decay. Measurements of $|V_{cb}|$ and $|V_{ub}|$ are extracted from existing data. Conservative estimates give $|V_{cb}| = (42.4 \pm 1.2_{exp} \pm 2.3_{thy}) \times 10^{-3}$ and $|V_{ub}| = (3.90 \pm 0.16_{exp} \pm 0.53_{thy}) \times 10^{-3}$. Using these values along with data on B_d, B_s mixing and CP violation in the K_L system, the allowed region of the CKM parameters ρ and η is derived. Tests of factorization in two-body hadronic B decays to one heavy and one light meson are shown and compared with modern theories which are also used to see if there is new physics in two-body B decays to light mesons. The two new narrow D_{sJ} states, discovered by BaBar and CLEO, respectively, are interpreted in light of the observation of these states in B decays by Belle.