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Search for the radion using the ATLAS detector

G. Azuelos, D. Cavalli, H. Przysiezniak, L. Vacavant

Abstract. The possibility of observing the radion using the ATLAS detector at the LHC is investigated. Studies on searches for the Standard Model Higgs with the ATLAS detector are re-interpreted to obtain limits on radion decay to $\gamma\gamma$ and $ZZ^{(*)}$. The observability of radion decays into Higgs pairs, which subsequently decay into $\gamma\gamma + b\bar{b}$ or $\tau\tau + b\bar{b}$ is then estimated.

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**Pomeron exchange and t -dependence
of the scattering amplitude**

F. Paccanoni

PACS: 11.55.Jy, 12.40.Nn, 13.85.Dz

Abstract. Constraints on the t -dependence of the hadronic scattering amplitude at asymptotic energies are derived by considering the exchange of the Pomeron, as a Regge pole, between off-shell gluons. Covariant reggeization ensures pure spin α exchange, where α is the Regge trajectory of the Pomeron. The structure of the amplitude, as a function of t , has been derived without a specific choice for the partonic wave functions of the hadrons. New terms appear, with respect to the standard approach, and allow to describe non trivial properties of the diffraction cone in agreement with experimental data, as shown in a specific example.

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**The exclusive rare decays $B \rightarrow K\bar{l}$
and $B_c \rightarrow D(D^*)\bar{l}$ in a relativistic quark model**

Amand Faessler, Th. Gutsche, M.A. Ivanov, J.G. Körner,
V.E. Lyubovitskij

PACS: 12.15.Hh, 12.39.Ki, 13.20.He, 14.40.Nd

Abstract. We study the exclusive rare decay $B \rightarrow K\bar{l}$. We calculate the relevant form factors within a relativistic

constituent quark model, for the first time without employing the impulse approximation. The calculated form factors are used to evaluate differential decay rates and polarization observables. We present results on the q^2 -dependence of a set of observables with and without long-distance contributions. A similar analysis is done for the exclusive rare decays $B_c \rightarrow D(D^*)\bar{l}l$ with special emphasis on the cascade decay $B_c \rightarrow D^*(\rightarrow D\pi)\bar{l}l$. We derive a four-fold angular decay distribution for this process in terms of helicity amplitudes including lepton mass effects. The four-fold angular decay distribution allows to define a number of physical observables which are amenable to measurement. We compare our results with the results of other studies.

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Scientific Note:

Inclusive SUSY searches and measurements at ATLAS

D.R. Tovey

PACS: 12.60.Jv; 14.80.Ly; 04.65.+e

Abstract. Results of a new study of the discovery potential within mSUGRA parameter space of inclusive searches for SUSY at ATLAS are presented. These results indicate that superior performance is provided by the jets + E_T^{miss} channel in which no requirements are placed upon lepton multiplicity. The sensitivity of this and other channels is mapped in $m_0 - m_{1/2}$ parameter space for four different values of $\tan(\beta)$ with similar performance being obtained in all cases. Inclusive measurements of the effective mass scale $M_{\text{susy}}^{\text{eff}}$ and total production cross-section σ_{susy} of supersymmetric particles are also discussed and results presented of a study of the likely measurement precisions.

Keywords. LHC physics; supersymmetry; SUGRA; MSSM; inclusive SUSY measurements; jet signature

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The role of the anomaly cancellation mechanism in the evaluation of the radiatively induced Chern–Simons term in extended QED

O.A. Battistel, G. Dallabona

PACS: 11.30.Qc

Abstract. We consider the possible role played by the anomaly cancellation mechanism in the evaluation of the radiatively induced Chern-Simons (CS) term, arising from the Lorentz and CPT non-invariant fermionic sector, of an extended version of QED. We explicitly evaluate the most general mathematical structure associated to the AVV triangle amplitude, closely related to the one involved in the CS term evaluation, using for this purpose an alternative calculational strategy to handle divergences in QFT's. We show that the requirement of consistency with the choices made in the construction of the Standard Model's renormalizability, in the evaluation of the AVV Green function, leave no room for a nonvanishing radiatively induced CS term, independently of the regularization prescription or equivalent philosophy adopted, in accordance with what was previously conjectured by other authors.

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Possibility of the odderon discovery via observation of charge asymmetry in the diffractive $\pi^+\pi^-$ production at HERA

I.F. Ginzburg, I.P. Ivanov, N.N. Nikolaev

Abstract. The interference between the Pomeron and possible odderon mechanisms of diffractive $\pi^+\pi^-$ photoproduction results in charge asymmetry of the produced pions. The observation of charge asymmetry of pions at moderate $M_{\pi^+\pi^-}$ will be an undoubted signal of odderon existence. To make numerical estimates more definite, we limit ourselves by the region $M_{\pi^+\pi^-} = 1.1 \div 1.5$ GeV, where in the odderon mechanism of dipion production, the production via single $f_2(1270)$ resonance is expected to be dominant. We find a very statistically significant effect of the odderon induced charge asymmetry even with very modest estimates for the f_2 photoproduction cross section (without referring to any particular model of the odderon).

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Schwinger's oscillator realization of an SO(9) tensor operator

Teparksorn Pengpan

PACS: 02.20.Qs, 03.65.Fd, 04.65.+e, 12.60.Jv

Abstract. The weights and representation matrices of the vector and the spinor representation of the Lie algebra SO(9) are introduced in the quantum mechanical

language. Tensor product decompositions of any two of them are explicitly shown by using an algebraic method of quantum mechanics. Similar decompositions are finally achieved for a coupled tensor operator in the picture of Schwinger's bosonic oscillators.

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Moments of the truncated multiplicity distributions

I.M. Dremin, V.A. Nechitailo

PACS: 12.38.Qk

Abstract. In experiment, the multiplicity distributions of inelastic processes are truncated due to finite energy, insufficient statistics or special choice of events. It is shown that the moments of such truncated multiplicity distributions possess some typical features. In particular, the oscillations of cumulant moments at high ranks and their negative values at the second rank can be considered as ones most indicative on specifics of these distributions. They allow to distinguish between distributions of different type.

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Production and decay of excited electrons at the LHC

O. Çakır, C. Leroy, R. Mehdiyev, A. Belyaev

PACS: 12.60.Rc, 13.85.Rm

Abstract. We study single production of excited electrons at the CERN LHC through contact interactions of fermions. Subsequent decays of excited electrons to ordinary electrons and light fermions via gauge and contact interactions are examined. The mass range accessible with the ATLAS detector is obtained.

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Non-factorizable effects in $B - \bar{B}$ mixing

A. Hiorth, J.O. Eeg

PACS: 13.25.Hw; 12.39.Fe; 12.39.Hg

Abstract. We study the B -parameter ("bag factor") for $B - \bar{B}$ mixing within a recently developed heavy-light chiral quark model. Non-factorizable contributions in terms of gluon condensates and chiral corrections are calculated. In addition, we also consider $1/m_Q$ corrections within heavy quark effective field theory. Perturbative QCD effects below $\mu = m_b$ known from other work are also included. Considering two sets of input parameters, we find that the renormalization invariant B -parameter is $\hat{B} = 1.51 \pm 0.09$ for B_d and $\hat{B} = 1.40 \pm 0.16$ for B_s .

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Neutrino mixing in a left-right model

J.A. Martins Simões, J.A. Ponciano

PACS: 12.60.-i, 14.60.St, 14.60.Pq

Abstract. We study the mixing among different generations of massive neutrino fields in a $SU(2)_L \times SU(2)_R \times U(1)_Y$ gauge theory which includes Majorana and Dirac mass terms in the Yukawa sector. Parity can be spontaneously broken at a scale $v_R \simeq 10^3 - 10^4$ GeV. We discuss about possible candidates for the Yukawa coupling matrices and we found that the model can accommodate a consistent pattern for neutral fermion masses as well as neutrino oscillations. The left and right sectors can be connected by a new neutral current.

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A reciprocal Wald theorem for varying gravitational function

Stéphane Fay

PACS: 04.50.+h, 98.80.Cq, 11.27.+d

Abstract. We study when a cosmological constant is a natural issue if it is mimicked by the potential of a massive Hyperextended Scalar Tensor theory with a perfect fluid for Bianchi type I and V models. We then deduce a reciprocal Wald theorem giving the conditions such that the potential tends to a non vanishing constant when the gravitational function varies. We also get the conditions allowing the potential to vanish or diverge.

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Dirac equation in magnetic-solenoid field

S.P. Gavrilov, D.M. Gitman, A.A. Smirnov

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Abstract. We consider the Dirac equation in the magnetic-solenoid field (the field of a solenoid and a collinear uniform magnetic field). For the case of Aharonov-Bohm solenoid, we construct self-adjoint extensions of the Dirac Hamiltonian using von Neumann's theory of deficiency indices. We find self-adjoint extensions of the Dirac Hamiltonian and boundary conditions at the AB solenoid. Besides, for the first time, solutions of the Dirac equation in the magnetic-solenoid field with a finite radius solenoid were found. We study the structure of these solutions and their dependence on the behavior of the magnetic field inside the solenoid. Then we exploit the latter solutions to specify boundary conditions for the magnetic-solenoid field with Aharonov-Bohm solenoid.