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High Energy Physics - Experiment

New submissions

Submissions received from Tue 4 Aug 20 to Thu 6 Aug 20, announced Fri, 7 Aug 20

- [New submissions](#)
- [Cross-lists](#)
- [Replacements](#)

[total of 27 entries: **1-27**]
[showing up to 2000 entries per page: [fewer](#) | [more](#)]

New submissions for Fri, 7 Aug 20

[1] [arXiv:2008.02508](#) [[pdf](#), [other](#)]

Title: Measurement of the associated production of a Higgs boson decaying into $b\bar{b}$ -quarks with a vector boson at high transverse momentum in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector

Authors: [ATLAS Collaboration](#)

Comments: 49 pages in total, author list starting page 33, 7 figures, 8 tables, to be submitted to Phys. Lett. B. All figures including auxiliary figures are available at [this https URL](#) The results presented in this paper including the correlation matrix have been inserted in HEPdata with the following record: [this https URL](#)

Subjects: High Energy Physics - Experiment (hep-ex)

The associated production of a Higgs boson with a W or Z boson decaying into leptons and where the Higgs boson decays to a $b\bar{b}$ pair is measured in the high vector-boson transverse momentum regime, above 250 GeV, with the ATLAS detector. The analysed data, corresponding to an integrated luminosity of 139 fb^{-1} , were collected in proton-proton collisions at the Large Hadron Collider between 2015 and 2018 at a centre-of-mass energy of $\sqrt{s} = 13$ TeV. The measured signal strength, defined as the ratio of the measured signal yield to that predicted by the Standard Model, is $0.72^{+0.39}_{-0.36}$ corresponding to an observed (expected) significance of 2.1 (2.7) standard deviations. Cross-sections of associated production of a Higgs boson decaying into $b\bar{b}$ quark pairs with a W or Z gauge boson, decaying into leptons, are measured in two exclusive transverse momentum regions, 250-400 GeV and above 400 GeV, and interpreted as constraints on anomalous couplings in the framework of a Standard Model effective field theory.

[2] [arXiv:2008.02601](#) [[pdf](#), [other](#)]

Title: Study of charged-particle multiplicity fluctuations in pp collisions with Monte Carlo event generators at LHC

Authors: [E. Shokr](#), [A. H. El-Farrash](#), [A. De Roeck](#), [M.A. Mohammed](#)

Comments: 15 pages, 5 figures

Subjects: High Energy Physics - Experiment (hep-ex)

Proton-Proton (\sqrt{s}) collisions at the Large Hadron Collider (LHC) are simulated in order to study events with a high local density of charged particles produced in narrow pseudorapidity windows of $|\Delta\eta| = 0.1, 0.2, \text{ and } 0.5$. The \sqrt{s} collisions are generated at center of mass energies of $\sqrt{s} = 2.36, 7, 8, \text{ and } 13$ TeV, i.e. the energies at which the LHC has operated so far, using PYTHIA and HERWIG event generators. We have also studied the average of the maximum charged-particle density versus the event multiplicity for all events, using the different pseudorapidity windows. This study prepares for the multi-particle production background expected in a future search for anomalous high-density multiplicity fluctuations using the LHC data.

[3] [arXiv:2008.02707](#) [[pdf](#), [other](#)]

Title: First flavor tagging calibration using 2019 Belle II data

Authors: [Belle II Collaboration](#): [F. Abudinén](#), [I. Adachi](#), [R. Adak](#), [K. Adameczyk](#), [P. Ahlburg](#), [J. K. Ahn](#), [H. Aihara](#), [N. Akopov](#), [A. Aloisio](#), [F. Ameli](#), [L. Andricek](#), [N. Anh Ky](#), [D. M. Asner](#), [H. Atmacan](#), [V. Aulchenko](#), [T. Aushev](#), [V. Aushev](#), [T. Aziz](#), [V. Babu](#), [S. Bacher](#), [S. Baehr](#), [S. Bahinipati](#), [A. M. Bakich](#), [P. Bambade](#), [S. Banerjee](#), [S. Bansal](#), [M. Barrett](#), [G. Batignani](#), [J. Baudot](#), [A. Beaulieu](#), [J. Becker](#), [P. K. Behera](#), [M. Bender](#), [J. V. Bennett](#), [E. Bernieri](#), [F. U. Bernlochner](#), [M. Bertemes](#), [M. Bessner](#), [S. Bettarini](#), [V. Bhardwaj](#), [B. Bhuyan](#), [F. Bianchi](#), [T. Bilka](#), [S. Bilokin](#), [D. Biswas](#), [A. Bobrov](#), [A. Bondar](#), [G. Bonvicini](#), [A. Bozek](#), [M. Bračko](#), [P. Branchini](#), [N. Braun](#), [R. A. Briere](#), [T. E. Browder](#), [D. N. Brown](#), [A. Budano](#), [L. Burmistrov](#), [S. Bussino](#), [M. Campajola](#), [L. Cao](#), [G. Caria](#), [G. Casarosa](#), [C. Cecchi](#), [D. Červenkov](#), et al. (478 additional authors not shown)

Comments: 28 pages, 10 figures

Subjects: High Energy Physics - Experiment (hep-ex)

We report on the first calibration of the standard Belle II B^0 -flavor tagger using the full data set collected at the $\Upsilon(4S)$ resonance in 2019 with the Belle II detector at the SuperKEKB collider, corresponding to 8.7 fb^{-1} of integrated luminosity. The calibration is performed by reconstructing various hadronic charmed B -meson decays with flavor-specific final states. We use simulation to optimize our event selection criteria and to train the flavor tagging algorithm. We determine the tagging efficiency and the fraction of wrongly identified tag-side B -candidates from a measurement of the time-integrated B^0 - \overline{B}^0 mixing probability. The total effective efficiency is measured to be $\epsilon_{\text{eff}} = 33.8 \pm 3.6 (\text{stat}) \pm 1.6 (\text{sys}) \%$, which is in good agreement with the predictions from simulation and comparable with the best one obtained by the Belle experiment. The results show a good understanding of the detector performance and offer a basis for future calibrations.

Cross-lists for Fri, 7 Aug 20

[4] [arXiv:2008.00271](#) (cross-list from hep-ph) [[pdf](#), [ps](#), [other](#)]

Title: Transverse Energy-Energy Correlations of jets in the electron-proton Deep Inelastic Scattering at HERA

Authors: [Ahmed Ali](#), [Gang Li](#), [Wei Wang](#), [Zhi-Peng Xing](#)

Comments: 18 pages, 11 figures

Subjects: High Energy Physics - Phenomenology (hep-ph); High Energy Physics - Experiment (hep-ex)

We study the event shape variables, transverse energy energy correlation TEEC $\langle \cos \phi \rangle$ and its asymmetry ATEEC $\langle \cos \phi \rangle$ in deep inelastic scattering (DIS) at the electron-proton collider HERA, where ϕ is the angle between two jets defined using a transverse-momentum (k_T) jet algorithm. At HERA, jets are defined in the Breit frame, and the leading nontrivial transverse energy energy correlations arise from the 3-jet configurations. With the help of the NLOJET++, these functions are calculated in the leading order (LO) and the next-to-leading order (NLO) approximations in QCD at the electron-proton center-of-mass energy $\sqrt{s} = 31.4$ GeV. We restrict the angular region to $-0.8 \leq \cos \phi \leq 0.8$, as the forward- and backward-angular regions require resummed logarithmic corrections, which we have neglected in this work. Following experimental jet-analysis at HERA, we restrict the DIS-variables x , $y = Q^2/(xs)$, where $Q^2 = -q^2$ is the negative of the momentum transfer squared q^2 , to $0 \leq x \leq 1$, $0.2 \leq y \leq 0.6$, and the pseudo-rapidity variable in the laboratory frame η_{lab} to the range $-1 \leq \eta_{\text{lab}} \leq 2.5$. The TEEC and ATEEC functions are worked out for two ranges in Q^2 , defined by $5.5 \leq Q^2 \leq 80 \text{ GeV}^2$, called the low- Q^2 -range, and $150 \leq Q^2 \leq 1000 \text{ GeV}^2$, called the high- Q^2 -range. We show the sensitivity of these functions on the parton distribution functions (PDFs), the factorization (μ_F) and renormalization (μ_R) scales, and on $\alpha_s(M_Z)$. Of these

the correlations are stable against varying the scale μ_F and the PDFs, but they do depend on μ_R . These studies are useful in the analysis of the HERA data, including the determination of $\alpha_s(M_Z)$ from the shape variables.

- [5] [arXiv:2008.01095](#) (cross-list from hep-ph) [[pdf](#), [other](#)]

Title: Deciphering the recently discovered tetraquark candidates around 6.9 GeV

Authors: [Jacob Sonnenschein](#), [Dorin Weissman](#)

Comments: 22 pages, 4 figures

Subjects: High Energy Physics - Phenomenology (hep-ph); High Energy Physics - Experiment (hep-ex); High Energy Physics - Theory (hep-th)

Recently a novel hadronic state of mass 6.9 GeV, that decays mainly to a pair of charmonia, was observed in LHCb. The data also reveals a broader structure centered around 6490 MeV and suggests another unconfirmed resonance centered at around 7240 MeV, very near to the threshold of two doubly charmed Ξ_{cc} baryons. We argue in this note that these exotic hadrons are genuine tetraquarks and not molecules of charmonia. It is conjectured that they are V-baryonium tetraquarks, namely, have an inner structure of a baryonic vertex with a cc diquark attached to it, which is connected by a string to an anti-baryonic vertex with a $\bar{c}\bar{c}$ anti-diquark. We examine these states as the analogs of the states $\Psi(4360)$ and $Y(4630)$ which are charmonium-like tetraquarks. A simple method to test these claims is by searching for a significant decay of the state at 7.2 GeV into $\Xi_{cc}\bar{\Xi}_{cc}$. Such a decay would be the analog of the decay of the state $Y(4630)$ into $\Lambda_c\bar{\Lambda}_c$. We further argue that there should be trajectories of both orbital and radial excited states of the $X(6900)$. We predict their masses. It is possible that a few of these states have already been seen by LHCb.

- [6] [arXiv:2008.01853](#) (cross-list from quant-ph) [[pdf](#), [other](#)]

Title: A quantum-enhanced search for dark matter axions

Authors: [K. M. Backes](#), [D. A. Palken](#), [S. Al Kenany](#), [B. M. Brubaker](#), [S. B. Cahn](#), [A. Droster](#), [Gene C. Hilton](#), [Sumita Ghosh](#), [H. Jackson](#), [S. K. Lamoreaux](#), [A. F. Leder](#), [K. W. Lehnert](#), [S. M. Lewis](#), [M. Malnou](#), [R. H. Maruyama](#), [N. M. Rapisdis](#), [M. Simanovskaia](#), [Sukhman Singh](#), [D. H. Speller](#), [I. Urdinarian](#), [Leila R. Vale](#), [E. C. van Assendelft](#), [K. van Bibber](#), [H. Wang](#)

Comments: 7 pages, 4 figures

Subjects: Quantum Physics (quant-ph); High Energy Physics - Experiment (hep-ex)

In dark matter axion searches, quantum uncertainty manifests as a fundamental noise source, limiting the measurement of the quadrature observables used for detection. We use vacuum squeezing to circumvent the quantum limit in a search for a new particle. By preparing a microwave-frequency electromagnetic field in a squeezed state and near-noiselessly reading out only the squeezed quadrature, we double the search rate for axions over a mass range favored by recent theoretical projections. We observe no signature of dark matter axions in the combined $16.96\text{--}17.12$ and $17.14\text{--}17.28$ $\mu\text{eV}/c^2$ mass window for axion-photon couplings above $g_{\gamma} = 1.38 \times g_{\gamma}^{\text{KSVZ}}$, reporting exclusion at the 90% level.

- [7] [arXiv:2008.01898](#) (cross-list from physics.atom-ph) [[pdf](#), [other](#)]

Title: Evading Detector Backaction on a Quantum Cyclotron

Authors: [Xing Fan](#), [Gerald Gabrielse](#)

Comments: 5 pages, 2 figures

Subjects: Atomic Physics (physics.atom-ph); High Energy Physics - Experiment (hep-ex); Quantum Physics (quant-ph)

The state of a one-particle quantum cyclotron can be detected by coupling it to a simple harmonic oscillator. The resulting quantum nondemolition (QND) detection comes at the price of a detector backaction that broadens the resonance lineshapes. The first quantum calculation of the coupled system shows that detection backaction can be evaded by resolving the quantum state of the detection oscillator.

- [8] [arXiv:2008.02049](#) (cross-list from hep-ph) [[pdf](#), [ps](#), [other](#)]

Title: Semileptonic and nonleptonic decays of the axial-vector tetraquark $T_{bb;\overline{u}\overline{d}}^{-}$

Authors: [S. S. Agaev](#), [K. Azizi](#), [B. Barsbay](#), [H. Sundu](#)

Comments: 10 Pages, 2 Figures and 3 Tables

Subjects: High Energy Physics - Phenomenology (hep-ph); High Energy Physics - Experiment (hep-ex); High Energy Physics - Lattice (hep-lat)

The semileptonic and nonleptonic decays of the double-beauty axial-vector tetraquark $T_{bb}^{\overline{u}} \overline{d}$ to a state $T_{bc}^{\overline{u}} \overline{d}$ (hereafter $T_{bb}^{\overline{u}}$ and $\widetilde{T}_{bc}^{\overline{u}}$, respectively) are investigated in the context of the QCD sum rule method. The final-state tetraquark $\widetilde{T}_{bc}^{\overline{u}}$ is treated as an axial-vector particle built of a heavy axial-vector diquark $b^T \gamma_{\mu} C c$ and light scalar antidiquark $\overline{u} C \gamma_5 \overline{d}$. Its spectroscopic parameters are calculated using the two-points sum rules by taking into account contributions of quark, gluon and mixed condensates up to dimension 10. We study the dominant semileptonic $T_{bb}^{\overline{u}} \rightarrow \widetilde{T}_{bc}^{\overline{u}} \overline{\nu}_l$ and nonleptonic decays $T_{bb}^{\overline{u}} \rightarrow \widetilde{T}_{bc}^{\overline{u}} M$, where M is one of the pseudoscalar mesons π , K , D and D_s . The partial widths of these processes are computed in terms of weak form factors $G_i(q^2)$, $i=1,2,3,4$, extracted by employing the QCD three-point sum rule approach. Predictions obtained for partial widths of considered decays are used to improve accuracy of theoretical predictions for full width and lifetime of the tetraquark $T_{bb}^{\overline{u}}$, which are important for experimental exploration of this exotic meson.

[9] [arXiv:2008.02127](#) (cross-list from astro-ph.HE) [[pdf](#), [other](#)]

Title: Constraining the contribution of Gamma-Ray Bursts to the high-energy diffuse neutrino flux with 10 years of ANTARES data

Authors: [ANTARES Collaboration](#): [A. Albert](#), [M. André](#), [M. Anghinolfi](#), [G. Anton](#), [M. Ardid](#), [J.-J. Aubert](#), [J. Aublin](#), [B. Baret](#), [S. Basa](#), [B. Belhorma](#), [V. Bertin](#), [S. Biagi](#), [M. Bissinger](#), [J. Boumaaza](#), [M. Bouta](#), [M.C. Bouwhuis](#), [H. Brânzaș](#), [R. Bruijn](#), [J. Brunner](#), [J. Busto](#), [A. Capone](#), [L. Caramete](#), [J. Carr](#), [S. Celli](#), [M. Chabab](#), [T. N. Chau](#), [R. Cherkaoui El Moursli](#), [T. Chiarusi](#), [M. Circella](#), [A. Coleiro](#), [M. Colomer-Molla](#), [R. Coniglione](#), [P. Coyle](#), [A. Creusot](#), [A. F. Díaz](#), [G. de Wasseige](#), [A. Deschamps](#), [C. Distefano](#), [I. Di Palma](#), [A. Domi](#), [C. Donzaud](#), [D. Dornic](#), [D. Drouhin](#), [T. Eber](#), [N. El Khayati](#), [A. Enzenhöfer](#), [A. Ettahiri](#), [P. Fermani](#), [G. Ferrara](#), [F. Filippini](#), [L. Fusco](#), [P. Gay](#), [H. Glotin](#), [R. Gozzini](#), [K. Graf](#), [C. Guidi](#), [S. Hallmann](#), [H. van Haren](#), [A.J. Heijboer](#), [Y. Hello](#), [J.J. Hernández-Rey](#), et al. (74 additional authors not shown)

Comments: Submitted to MNRAS. 19 pages, 12 figures

Subjects: High Energy Astrophysical Phenomena (astro-ph.HE); Instrumentation and Methods for Astrophysics (astro-ph.IM); High Energy Physics - Experiment (hep-ex)

Addressing the origin of the astrophysical neutrino flux observed by IceCube is of paramount importance. Gamma-Ray Bursts (GRBs) are among the few astrophysical sources capable of achieving the required energy to contribute to such neutrino flux through $p\gamma$ interactions. In this work, ANTARES data have been used to search for upgoing muon neutrinos in spatial and temporal coincidence with 784 GRBs from 2007 to 2017. The expected neutrino fluxes have been calculated for each GRB, in the framework of the internal shock model. The impact in the neutrino flux calculation of the lack of knowledge on the majority of source redshifts and on other intrinsic parameters of the emission mechanism (e.g. minimum variability timescale, bulk Lorentz factor of the source ejecta) has been quantified. The minimum variability timescale is found to be the parameter which mostly affects the GRB-neutrino flux uncertainty. For the selected sources, ANTARES data have been analysed, maximising the discovery probability of the stacking sample through an extended maximum-likelihood strategy. Since no neutrino event passed the quality cuts set by the optimisation procedure, 90% confidence level upper limits (with their uncertainty) on the total expected diffuse neutrino flux have been derived, according to the model. The GRB contribution to the observed diffuse astrophysical neutrino flux around 100 TeV is constrained to be less than 10%.

[10] [arXiv:2008.02209](#) (cross-list from hep-ph) [[pdf](#), [other](#)]

Title: Constraining hidden photons via atomic force microscope measurements and the Plimpton-Lawton experiment

Authors: [D. Kroff](#), [P.C. Malta](#)

Comments: 11 pages, 8 figures; comments are welcome

Subjects: High Energy Physics - Phenomenology (hep-ph); High Energy Physics - Experiment (hep-ex)

Modifications to electrodynamics from physics beyond the Standard Model can be tested to a high accuracy. Here we use two setups to place bounds on hidden photons, an Abelian boson kinetically mixed with the photon. The first setup involves atomic force microscope measurements, originally designed to study the Casimir effect at sub- μm distances. The second setup consists of two concentric metal shells with the outer one exposed to a high voltage. By

measuring the potential difference between the shells it is possible to test Coulomb's law. The limits obtained here cover regions already excluded, in particular by astrophysical observations, but provide a more direct, laboratory-based confirmation of these bounds.

[11] [arXiv:2008.02279](#) (cross-list from hep-ph) [[pdf](#), [other](#)]
 Title: The Cosmological Tension of Ultralight Axion Dark Matter and its Solutions
 Authors: [Jeff A. Dror](#), [Jacob M. Leedom](#)
 Comments: 11 pages, 3 figures
 Subjects: High Energy Physics - Phenomenology (hep-ph); Cosmology and Nongalactic Astrophysics (astro-ph.CO); High Energy Physics - Experiment (hep-ex)

A number of proposed and ongoing experiments search for axion dark matter with a mass nearing the limit set by small scale structure ($\mathcal{O}(10^{-21} \text{ eV})$). We consider the late universe cosmology of these models, showing that requiring the axion to have a matter-power spectrum that matches that of cold dark matter constrains the magnitude of the axion couplings to the visible sector. Comparing these limits to current and future experimental efforts, we find that many searches require axions with an abnormally large coupling to Standard Model fields, independently of how the axion was populated in the early universe. We survey mechanisms that can alleviate the bounds, namely, the introduction of large charges, various forms of kinetic mixing, a clockwork structure, and imposing a discrete symmetry. We provide an explicit model for each case and explore their phenomenology and viability to produce detectable ultralight axion dark matter.

[12] [arXiv:2008.02377](#) (cross-list from hep-ph) [[pdf](#), [other](#)]
 Title: Dark matter assisted lepton anomalous magnetic moments and neutrino masses
 Authors: [Sudip Jana](#), [Vishnu P.K.](#), [Werner Rodejohann](#), [Shaikh Saad](#)
 Comments: 30 pages, 8 figures
 Subjects: High Energy Physics - Phenomenology (hep-ph); High Energy Physics - Experiment (hep-ex)

We propose a framework that addresses the origin of neutrino mass, explains the observed discrepancies in the electron and the muon anomalous magnetic moments (AMMs) data and incorporates the dark matter (DM) relic abundance. Both the neutrino mass and the lepton AMMs are generated at one-loop level mediated by a common set of beyond the Standard Model (SM) states. In this class of models, the SM is extended with vector-like charged fermion and scalar multiplets, all odd under an imposed \mathcal{Z}_2 symmetry, which stabilizes the fermionic or scalar DM candidate residing in one of them. Two scalar multiplets appear in the AMM loops, thus allowing for different signs of their contributions, in agreement with the observed discrepancies which are of opposite sign for electron and muon. The vector-like fermions give rise to large new physics contributions to the lepton AMMs via chirally enhanced terms that are proportional to their mass. To demonstrate the viability of this framework, we perform a detailed study of a particular model for which a fit to the neutrino masses and mixing together with lepton AMMs are provided. Furthermore, DM phenomenology and collider signatures are explored.

[13] [arXiv:2008.02573](#) (cross-list from hep-ph) [[pdf](#), [other](#)]
 Title: Constraining $t \rightarrow u$ flavor changing neutral Higgs coupling at the LHC
 Authors: [Wei-Shu Hou](#), [Ting-Hsiang Hsu](#), [Tanmoy Modak](#)
 Comments: 6 pages, 6 figures
 Subjects: High Energy Physics - Phenomenology (hep-ph); High Energy Physics - Experiment (hep-ex)

We study the constraints on $t \rightarrow u$ flavor changing neutral Higgs (FCNH) coupling, and how it may be explored further at the Large Hadron Collider (LHC). In the general two Higgs doublet model, such transitions can be induced by a nonzero ρ_{tu} Yukawa coupling. We show that such couplings can be constrained by existing searches at the LHC for m_H , m_A and, m_{H^\pm} in the sub-TeV range, where H , A and H^\pm are the exotic CP-even, CP-odd and charged scalars. We find that a dedicated $g_{tH/tA} \rightarrow t \bar{t} u$ search can probe the available parameter space of ρ_{tu} down to a few percent level for $200 \lesssim m_H, m_A \lesssim 600$ GeV, with discovery possible at high luminosity. Effects of how other extra top Yukawa couplings, such as ρ_{tc} and ρ_{tt} , dilute the sensitivity of the ρ_{tu} probe are discussed.

[14] [arXiv:2008.02643](#) (cross-list from hep-ph) [[pdf](#), [other](#)]
 Title: Correlating $h \rightarrow \tau \mu^+ \mu^-$ to the Anomalous Magnetic Moment of the Muon via Leptoquarks

Authors: [Andreas Crivellin](#), [Dario Mueller](#), [Francesco Saturnino](#)

Comments: 7 pages, 3 figures

Subjects: High Energy Physics - Phenomenology (hep-ph); High Energy Physics - Experiment (hep-ex); Nuclear Experiment (nucl-ex); Nuclear Theory (nucl-th)

Recently, both ATLAS and CMS measured the decay $h \rightarrow \mu^+ \mu^-$, finding a signal strength with respect to the Standard Model (SM) expectation of 1.2 ± 0.6 and $1.19^{+0.41+0.17}_{-0.39-0.16}$, respectively. This measurement is particularly interesting in the context of the existing hints for lepton flavor universality violation (LFUV), since their new physics explanations could be tested in this decay mode. Especially the anomalous magnetic moment of the muon (a_μ), where a 3.7% deviation from the SM theory prediction was observed, is promising since like $h \rightarrow \mu^+ \mu^-$ it is a chirality changing transition. Leptoquarks are prime candidates to explain the hints for LFUV, in particular regarding a_μ , as they can generate an m_t/m_μ enhanced contribution. In this letter we calculate and examine the correlations between $h \rightarrow \mu^+ \mu^-$ and a_μ by studying three distinct scenarios. We find that in two of them effects of several percent are predicted, which could be tested by future precision measurements. The third scenario even displays an enhancement of $\text{Br}[h \rightarrow \mu^+ \mu^-]$ by more than 50% if one aims at an explanation of a_μ at the 2% level. Hence, the new ATLAS and CMS measurements already provide important constraints on the parameter space of the model.

[15] [arXiv:2008.02684](#) (cross-list from hep-ph) [[pdf](#), [ps](#), [other](#)]

Title: Relativistic Friedrichs-Lee model and quark-pair creation model

Authors: [Zhi-Yong Zhou](#), [Zhiguang Xiao](#)

Comments: 14 pages, 3 figures

Subjects: High Energy Physics - Phenomenology (hep-ph); High Energy Physics - Experiment (hep-ex); Nuclear Theory (nucl-th)

In this paper, we present how the Friedrichs-Lee model could be extended to the relativistic scenario and be combined with the relativistic quark pair creation model in a consistent way. This scheme could be applied to study the "unquenched" effect of the meson spectra. As an example, if the lowest $J^{PC}=0^{++}$ $(\bar{u}u + \bar{d}d)/\sqrt{2}$ bound state in the potential model is coupled to the $\pi\pi$ continuum, two resonance poles could be found from the scattering amplitude for the continuum states. One of them could correspond to the $f_0(500)$ and the other probably $f_0(1370)$. This scheme might shed more light on why extra states could appear in the hadron spectrum other than the prediction of the quark potential model.

Replacements for Fri, 7 Aug 20

[16] [arXiv:1906.11854](#) (replaced) [[pdf](#), [other](#)]

Title: Statistical Methods Applied to the Search of Sterile Neutrinos

Authors: [Matteo Agostini](#), [Birgit Neumair](#)

Comments: Replaced with the published version. 23 pages, 10 figures

Subjects: High Energy Physics - Experiment (hep-ex); High Energy Physics - Phenomenology (hep-ph); Nuclear Experiment (nucl-ex); Data Analysis, Statistics and Probability (physics.data-an)

[17] [arXiv:1909.09226](#) (replaced) [[pdf](#), [other](#)]

Title: Search for direct production of electroweakinos in final states with one lepton, missing transverse momentum and a Higgs boson decaying into two b -jets in pp collisions at $\sqrt{s}=13$ TeV with the ATLAS detector

Authors: [ATLAS Collaboration](#)

Comments: 41 pages, author list starting at 25, 6 tables, 6 figures, published in EPJ C. All figures including auxiliary figures are available at [this http URL](#)

Journal-ref: Eur. Phys. J. C 80 (2020) 691

Subjects: High Energy Physics - Experiment (hep-ex)

[18] [arXiv:2002.12571](#) (replaced) [[pdf](#), [other](#)]

Title: Enhancing Scalar Productions with Leptoquarks at the LHC

Authors: [Arvind Bhaskar](#), [Debottam Das](#), [Bibhabasu De](#), [Subhadip Mitra](#)

Comments: 12 pages, 10 figures, 1 table (It matches with the journal version)

Journal-ref: Phys. Rev. D 102, 035002 (2020)

Subjects: High Energy Physics - Phenomenology (hep-ph); High Energy Physics - Experiment (hep-ex)

- [19] [arXiv:2005.02267](#) (replaced) [[pdf](#), [other](#)]
 Title: Testing triplet fermions at the electron-positron and electron-proton colliders using fat jet signatures
 Authors: [Arindam Das](#), [Sanjoy Mandal](#), [Tanmoy Modak](#)
 Comments: 22 Figures, 41 Pages and matched published version in Physical Review D
 Journal-ref: Physical Review D 102, 033001 (2020)
 Subjects: High Energy Physics - Phenomenology (hep-ph); High Energy Physics - Experiment (hep-ex)
- [20] [arXiv:2006.05588](#) (replaced) [[pdf](#), [ps](#), [other](#)]
 Title: Inclusive charged and neutral particle multiplicity distributions in χ_{cJ} and J/ψ decays
 Authors: [BESIII collaboration](#): [M. Ablikim](#), [M. N. Achasov](#), [P. Adlarson](#), [S. Ahmed](#), [M. Albrecht](#), [M. Alekseev](#), [A. Amoroso](#), [Q. An](#), [Anita](#), [Y. Bai](#), [O. Bakina](#), [R. Baldini Ferroli](#), [I. Balossino](#), [Y. Ban](#), [K. Begzsuren](#), [J. V. Bennett](#), [N. Berger](#), [M. Bertani](#), [D. Bettoni](#), [F. Bianchi](#), [J. Biernat](#), [J. Bloms](#), [I. Boyko](#), [R. A. Briere](#), [H. Cai](#), [X. Cai](#), [A. Calcaterra](#), [G. F. Cao](#), [N. Cao](#), [S. A. Cetin](#), [J. Chai](#), [J. F. Chang](#), [W. L. Chang](#), [G. Chelkov](#), [D. Y. Chen](#), [G. Chen](#), [H. S. Chen](#), [J. Chen](#), [M. L. Chen](#), [S. J. Chen](#), [X. R. Chen](#), [Y. B. Chen](#), [W. S. Cheng](#), [G. Cibinetto](#), [F. Cossio](#), [X. F. Cui](#), [H. L. Dai](#), [J. P. Dai](#), [X. C. Dai](#), [A. Dbeyssi](#), [D. Dedovich](#), [Z. Y. Deng](#), [A. Denig](#), [I. Denysenko](#), [M. Destefanis](#), [F. De Mori](#), [Y. Ding](#), [C. Dong](#), [J. Dong](#), [L. Y. Dong](#), [M. Y. Dong](#), [Z. L. Dou](#), [S. X. Du](#), [J. Z. Fan](#), [J. Fang](#), [S. S. Fang](#), [Y. Fang](#), [R. Farinelli](#), et al. (414 additional authors not shown)
 Comments: Accepted by Physical Review D
 Subjects: High Energy Physics - Experiment (hep-ex)
- [21] [arXiv:2006.16773](#) (replaced) [[pdf](#), [other](#)]
 Title: Strategies to reduce the environmental impact in the MRPC array of the EEE experiment
 Authors: [M. P. Panetta](#), [M. Abbrescia](#), [C. Avanzini](#), [L. Baldini](#), [R. Baldini Ferroli](#), [G. Batignani](#), [M. Battaglieri](#), [S. Boi](#), [E. Bossini](#), [F. Carnesecchi](#), [C. Cicalò](#), [L. Cifarelli](#), [F. Coccetti](#), [E. Coccia](#), [A. Corvaglia](#), [D. De Gruttola](#), [S. De Pasquale](#), [F. Fabbri](#), [D. Falchieri](#), [L. Galante](#), [M. Garbini](#), [G. Gemme](#), [I. Gnesi](#), [S. Grazzi](#), [D. Hatzifotiadou](#), [P. La Rocca](#), [Z. Liu](#), [L. Lombardo](#), [G. Mandaglio](#), [G. Maron](#), [M. N. Mazziotta](#), [A. Mulliri](#), [R. Nania](#), [F. Noferini](#), [F. Nozzoli](#), [F. Palmonari](#), [M. Panareo](#), [R. Paoletti](#), [M. Parvis](#), [C. Pellegrino](#), [L. Perasso](#), [O. Pinazza](#), [C. Pinto](#), [S. Pisano](#), [F. Riggi](#), [G. Righini](#), [C. Ripoli](#), [M. Rizzi](#), [G. Sartorelli](#), [E. Scapparone](#), [M. Schioppa](#), [A. Scribano](#), [M. Selvi](#), [G. Serri](#), [S. Squarcia](#), [M. Taiuti](#), [G. Terreni](#), [A. Trifirò](#), [M. Trimarchi](#), [C. Vistoli](#), [L. Votano](#), [M. C. S. Williams](#), [A. Zichichi](#), et al. (1 additional author not shown)
 Comments: 11 pages, 9 figures
 Subjects: Instrumentation and Detectors (physics.ins-det); Instrumentation and Methods for Astrophysics (astro-ph.IM); High Energy Physics - Experiment (hep-ex)
- [22] [arXiv:1801.00759](#) (replaced) [[pdf](#), [other](#)]
 Title: On the clustering properties of produced particles in high-energy $\sqrt{s_{pp}}$ collisions
 Authors: [Cheuk-Yin Wong](#), [Hanpu Jiang](#), [Nanxi Yao](#), [Liwen Wen](#), [Gang Wang](#), [Huan Zhong Huang](#)
 Comments: 22 pages, 21 figures
 Subjects: High Energy Physics - Phenomenology (hep-ph); High Energy Physics - Experiment (hep-ex); Nuclear Experiment (nucl-ex); Nuclear Theory (nucl-th)
- [23] [arXiv:1910.02172](#) (replaced) [[pdf](#), [other](#)]
 Title: Development of a multiwire proportional chamber with good tolerance to burst hits
 Authors: [N. Teshima](#), [M. Aoki](#), [Y. Higashino](#), [H. Ikeuchi](#), [K. Komukai](#), [D. Nagao](#), [Y. Nakatsugawa](#), [H. Natori](#), [Y. Seiya](#), [N. M. Truong](#), [K. Yamamoto](#)
 Comments: 8 pages, 16 figures
 Subjects: Instrumentation and Detectors (physics.ins-det); High Energy Physics - Experiment (hep-ex)
- [24] [arXiv:1912.01524](#) (replaced) [[pdf](#), [other](#)]
 Title: A new analysis of the MiniBooNE low-energy excess
 Authors: [C. Giunti](#), [A. Ioannisian](#), [G. Ranucci](#)
 Comments: 7 pages. Major revision taking into account the explanation in [arXiv:2006.16883](#) of the MiniBooNE single-gamma background
 Subjects: High Energy Physics - Phenomenology (hep-ph); High Energy Physics - Experiment (hep-ex)
- [25] [arXiv:2005.05252](#) (replaced) [[pdf](#), [other](#)]
 Title: Neutrino-hydrogen interactions with a high-pressure TPC
 Authors: [Philip Hamacher-Baumann](#), [Xianguo Lu](#), [Justo Martín-Albo](#)
 Comments: 15 pages, 19 figures
 Subjects: Instrumentation and Detectors (physics.ins-det); High Energy Physics - Experiment (hep-ex)
- [26] [arXiv:2007.15830](#) (replaced) [[pdf](#), [other](#)]
 Title: Unsupervised Outlier Detection in Heavy-Ion Collisions

Authors: [Punnathat Thaprasop](#), [Kai Zhou](#), [Jan Steinheimer](#), [Christoph Herold](#)

Comments: 24 pages, 12 figures, new version with added references in section 1 and slightly improved layout of some figures

Subjects: High Energy Physics - Experiment (hep-ex); High Energy Physics - Phenomenology (hep-ph)

[27] [arXiv:2008.00338](#) (replaced) [[pdf](#), [other](#)]

Title: New perspectives on segmented crystal calorimeters for future colliders

Authors: [Marco T. Lucchini](#), [Wonyong Chung](#), [Sarah C. Eno](#), [Yihui Lai](#), [Lorenzo Lucchini](#), [Minh-Thi Nguyen](#), [Christopher G. Tully](#)

Subjects: Instrumentation and Detectors (physics.ins-det); High Energy Physics - Experiment (hep-ex)

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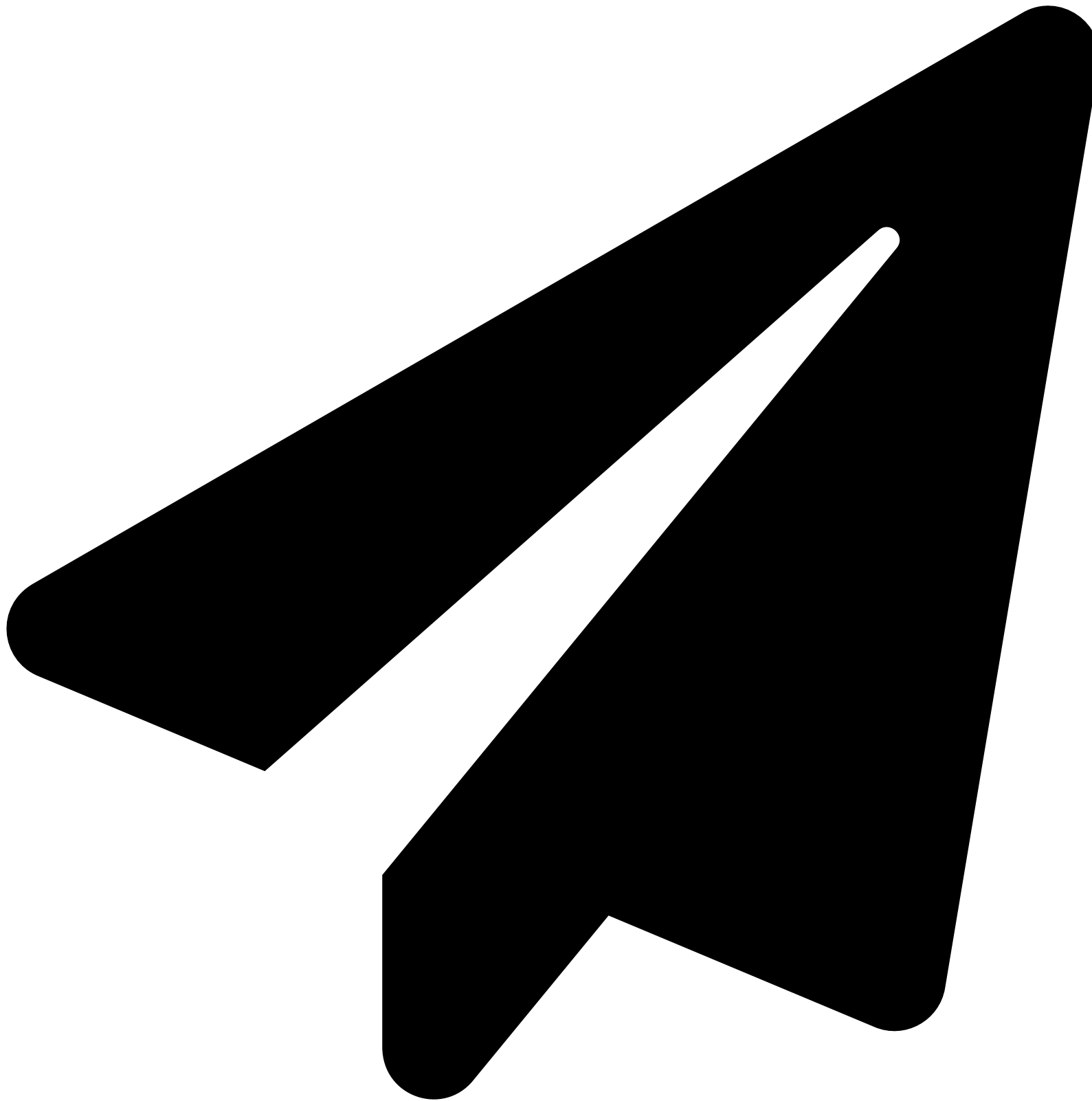
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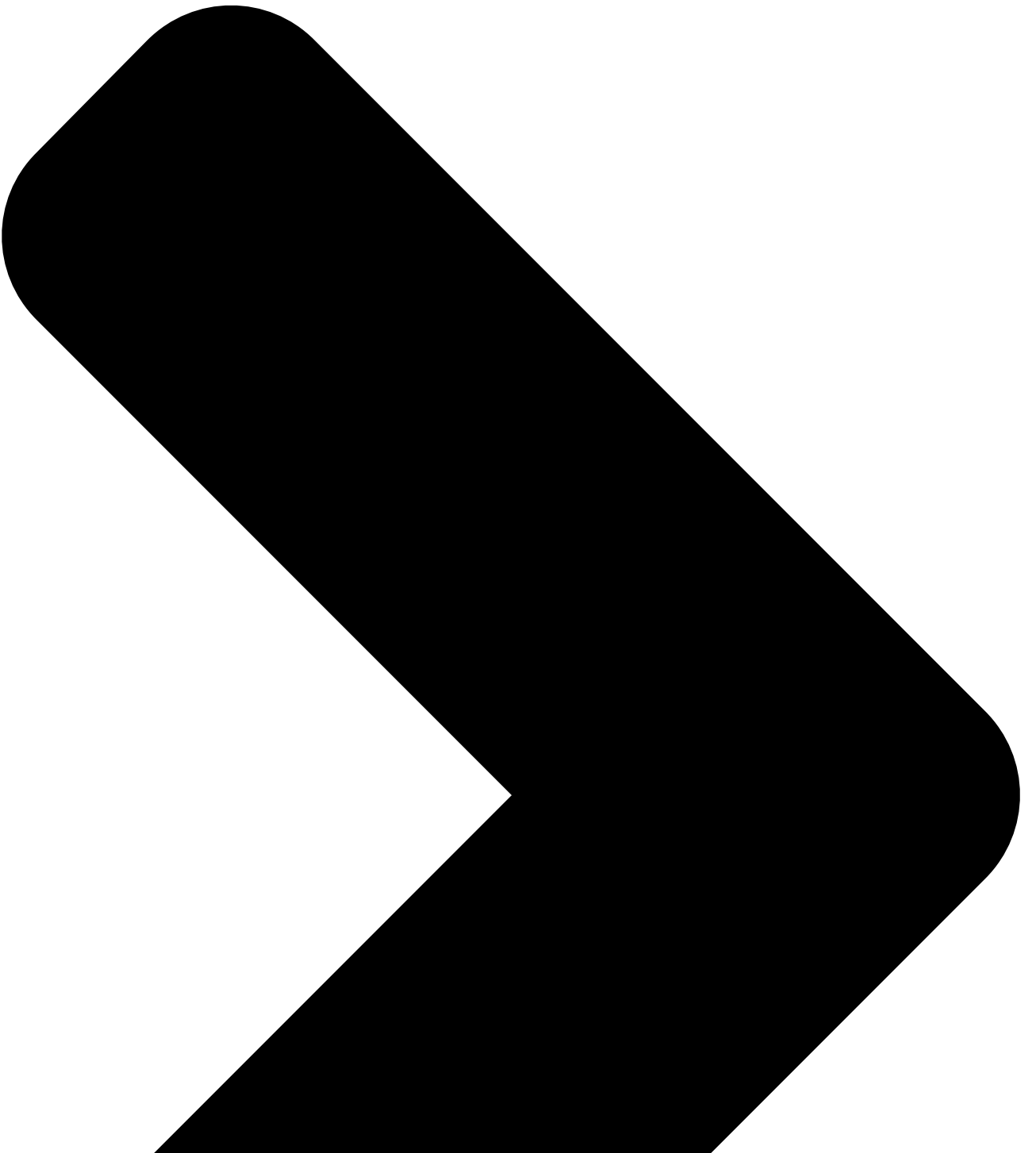
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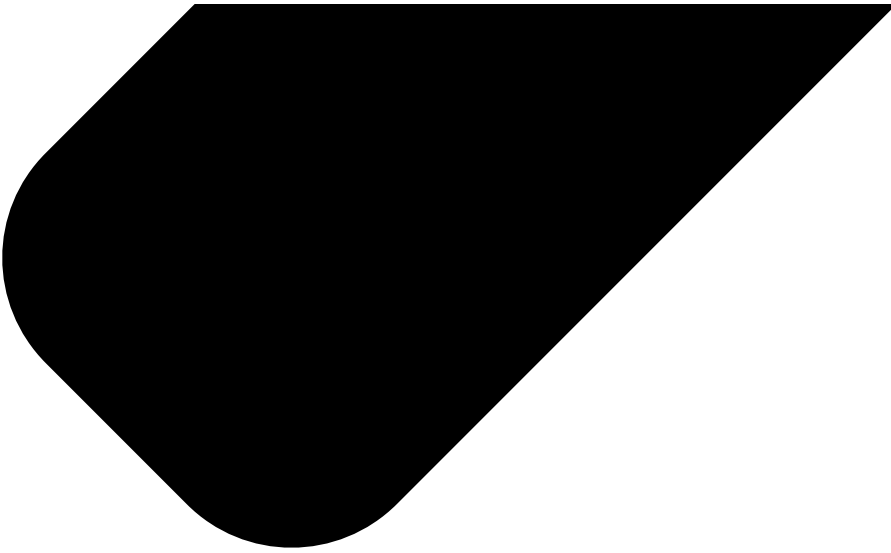
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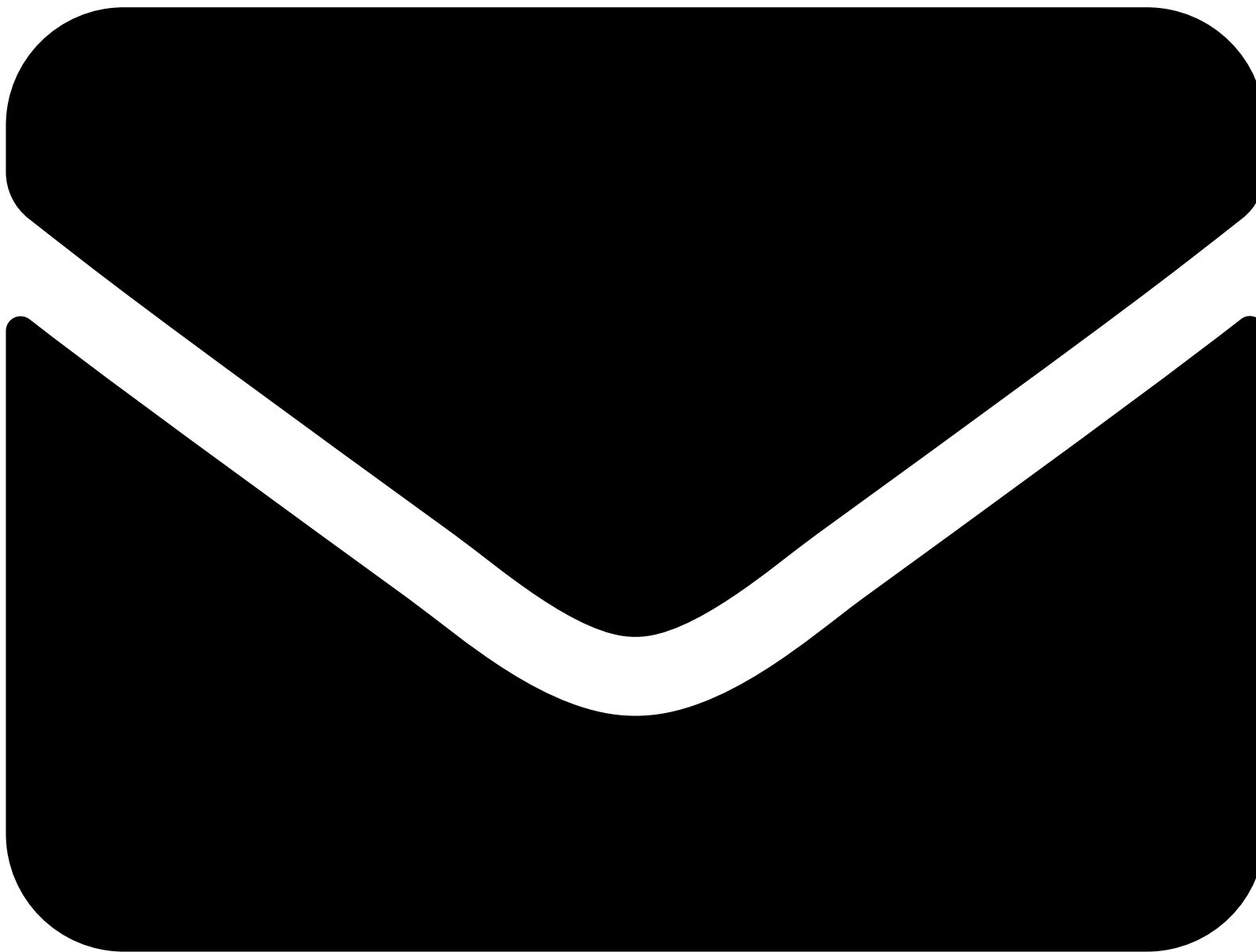
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