

№	Название статьи	Авторы	Год	Название журнала	Краткая аннотация	Ссылка
2020						
Кафедра теоретической и ядерной физики						
1.	Determination of the primary energy using an ultrathin calorimeter	Elena Dmitrieva, Anastasiya Fedosimova, Igor Lebedev, Abzal Temiraliev, Medeu Abishev, Tolegen Kozhamkulov, Andrey Mayorov and Claudio Spitaleri	2020	J. Phys. G: Nucl. Part. Phys. 47 035202, Q2 https://doi.org/10.1088/1361-6471/ab67e7	An approach for measuring energy of cosmic-ray particles with energies $E > 10^{12}$ eV using an ultrathin calorimeter is presented. The method is based on the analysis of the correlation dependence of the cascade size on the rate of development of the cascade process. In order to determine the primary energy, measurements are made based on the number of secondary particles in the cascade, N_e , at two observation levels Z_1 and Z_2 , separated by an absorber layer. Based on the obtained measurements, a correlation analysis of the dependence of $\log N_e(Z_1)$ on the difference $dN = \log N_e(Z_1) - \log N_e(Z_2)$ is carried out. The correlation curves ($\log N_e$ from dN) in the negative part of the dN axis are almost parallel to each other and practically do not depend on the depth of the cascade development. It makes it possible to determine the primary energy using an ultrathin calorimeter. The best option for applying the method is a calorimeter, which has a unit with a heavy target, leading to the rapid development of the cascade, and a homogeneous measuring and absorption block.	https://www.kaznu.kz/ru/25337/page/
2.	Volkov–Akulov–Starobinsky supergravity revisited	Aldabergenov, Y.	2020	European Physical Journal C 80(4),329, Q2 https://doi.org/10.1140/epjc/s10052-020-7888-8	We find new realizations of Volkov–Akulov–Starobinsky supergravity, i.e. Starobinsky inflationary models in supergravity coupled to a nilpotent superfield describing Volkov–Akulov goldstino. Our constructions are based on the no-scale Kähler potential $K = -3 \log(T + T^\dagger)$ for the inflaton field, and can describe de Sitter vacuum after inflation where supersymmetry is broken by the goldstino auxiliary component. In fact, we show that a more general class of models with $K = -\alpha \log(T + T^\dagger)$ for $3 \leq \alpha \leq 6.37$ can accommodate Starobinsky-like inflation with the universal prediction $n_s \approx 1 - 2Ne$ and $r \approx 4\alpha(\alpha - 2)2Ne^2$, while for $6.37 \lesssim \alpha \lesssim 7.23$ viable hilltop inflation is possible (with n_s and r close to the above expressions). We derive the full component action and the masses of inflaton, gravitino, and inflatino that are generally around the inflationary Hubble scale. Finally, we show that one of our models can be dualized into higher-derivative supergravity with constrained chiral curvature superfield.	https://www.kaznu.kz/ru/25337/page/

3.	Aspects of gauged R symmetry in SU (1,1) /U (1) supergravity	Aldabergenov, Y.	2020	Physical Review D 101(1),015016, Q1 https://doi.org/10.1103/PhysRevD.101.015016	We propose a novel realization of spontaneous supersymmetry breaking in de Sitter vacuum by F- and D-terms in N=1 four-dimensional supergravity coupled to a chiral superfield with SU(1,1)/U(1) target space. Our construction features gauged U(1)R symmetry rotating the chiral scalar field by a phase. Both supersymmetry and R-symmetry can be spontaneously broken, and for two particular parameter choices we obtain no-scale supergravity with positive tunable cosmological constant.	https://www.kaznu.kz/ru/25337/page/
4.	Minimal Starobinsky supergravity coupled to a dilaton-axion superfield	Yermek Aldabergenov, Shuntaro Aoki, Sergei V. Ketov	2020	Physical Review D 101 (2020) 7, 075012, Q1 https://doi.org/10.1103/PhysRevD.101.075012	The minimal Starobinsky supergravity with inflaton (scalaron) and goldstino in a massive vector supermultiplet is coupled to the dilaton-axion chiral superfield with the no-scale Kähler potential and a superpotential. The Kachru-Kallosh-Linde-Trivedi-type superpotential with a constant term is used to stabilize dilaton and axion during inflation, but it is shown to lead to an instability. The instability is cured by adding the alternative Fayet-Iliopoulos (FI) term that does not lead to the gauged R symmetry. Other stabilization mechanisms, based on the Wess-Zumino-type superpotential, are also studied in the presence of the FI term. A possible connection to the D3-brane models is briefly discussed too.	https://www.kaznu.kz/ru/25337/page/
5.	Primordial black holes from modified supergravity	Yermek Aldabergenov, Andrea Addazi, Sergei V. Ketov	2020	European Physical Journal C, 80, Q1 https://doi.org/10.1140/epjc/s10052-020-08506-6	The modified supergravity approach is applied to describe a formation of Primordial Black Holes (PBHs) after Starobinsky inflation. Our approach naturally leads to the two-(scalar)-field attractor-type double inflation, whose first stage is driven by scalaron and whose second stage is driven by another scalar field which belongs to a supergravity multiplet. The scalar potential and the kinetic terms are derived, the vacua are studied, and the inflationary dynamics of those two scalars is investigated. We numerically compute the power spectra and we find the ultra-slow-roll regime leading to an enhancement (peak) in the scalar power spectrum. This leads to an efficient formation of PBHs. We estimate the masses of PBHs and we find their density fraction (as part of Dark Matter). We show that our modified supergravity models are in agreement with inflationary observables, while they predict the PBH masses in a range between 10^{16} g and 10^{20} g. In this sense, modified supergravity provides a natural top-down approach for explaining and unifying the origin of inflation and the PBHs Dark Matter.	https://www.kaznu.kz/ru/25337/page/

6.	New measurements and reanalysis of ^{14}N elastic scattering on ^{10}B target	Nassurlla M., Burtebayev N., Sadykov T.Kh., Boztosun I., Amangeldi N., Alimov D., Kerimkulov Zh., Burtebayeva J., Nassurlla, M., Kurakhmedov A., Sakuta S.B., Karakoc M., Ibraheem A.A., Kemper K.W., Hamada Sh.	2020	Chinese Physics C, V.44(10), P.104103, Q2 https://doi.org/10.1088/1674-1137/abab89	The angular distributions of elastic scattering of ^{14}N ions on ^{10}B targets have been measured at incident beam energies of 21.0 and 24.5 MeV. Angular distributions at higher energies 38-94.0 MeV (previously measured) were also included in the analysis. All data were analyzed within the framework of the optical model and the distorted waves Born approximation method. The observed rise in cross sections at large angles was interpreted as a possible contribution of the α -cluster exchange mechanism. Spectroscopic amplitudes SA_2 and SA_4 for the configuration $^{14}\text{N} \rightarrow ^{10}\text{B} + \alpha$ were extracted. Their average values are 0.58 ± 0.10 and 0.81 ± 0.12 for SA_2 and SA_4 , respectively, suggesting that the exchange mechanism is a major component of the elastic scattering for this system. The energy dependence of the depths for the real and imaginary potentials was found.	https://www.kaznu.kz/ru/25337/page/
7.	Neutrino oscillation in the q-metric	Boshkayev K., Luongo O., Muccino M.	2020	European Physical Journal C, 2020, 80(10), 964, Q1 https://doi.org/10.1140/epjc/s10052-020-08533-3	We investigate neutrino oscillation in the field of an axially symmetric space-time, employing the so-called q-metric, in the context of general relativity. Following the standard approach, we compute the phase shift invoking the weak and strong field limits and small deformation. To do so, we consider neutron stars, white dwarfs and supernovae as strong gravitational regimes whereas the solar system as weak field regime. We argue that the inclusion of the quadrupole parameter leads to the modification of the well-known results coming from the spherical solution due to the Schwarzschild space-time. Hence, we show that in the solar system regime, considering the Earth and Sun, there is a weak probability to detect deviations from the flat case, differently from the case of neutron stars and white dwarfs in which this probability is larger. Thus, we heuristically discuss some implications on constraining the free parameters of the phase shift by means of astrophysical neutrinos. A few consequences in cosmology and possible applications for future space experiments are also discussed throughout the text.	https://www.kaznu.kz/ru/25337/page/
8.	Accretion disc luminosity for black holes surrounded by dark matter	Boshkayev K., Idrissov A., Luongo O., Malafarina D.	2020	Monthly Notices of the Royal Astronomical Society, 2020, 496(2), c. 1115-1123, Q1	We consider the observational properties of a static black hole space-time immersed in a dark matter envelope. We investigate how the modifications to geometry induced by the presence of dark matter affect the luminosity of the black hole's accretion disc. We show that the same disc luminosity as produced by a black hole in vacuum may be produced by a smaller black hole surrounded by dark matter under certain conditions. In particular, we demonstrate that the luminosity of the disc is	https://www.kaznu.kz/ru/25337/page/

				https://doi.org/10.1093/mnras/staa1564	markedly altered by the presence of dark matter, suggesting that the mass estimation of distant supermassive black holes may be changed if they are immersed in dark matter. We argue that a similar effect holds in more realistic scenarios, and we discuss the refractive index related to dark matter lensing. Finally, we show how the results presented here may help to explain the observed luminosity of supermassive black holes in the early Universe.	
9.	Swelling of Doubly Magic Ca 48 Core in Ca Isotopes beyond N=28	Tanaka M., Burtebayev N., Nassurlla Maulen, Kenzhina I., T. K. Zholdybayev, et al.	2020	Physical Review Letters Volume 124, Issue 10, 13 id 1950028, Q1 https://doi.org/10.1103/PhysRevLett.124.102501	Interaction cross sections for Ca42-51 on a carbon target at 280 MeV/nucleon have been measured for the first time. The neutron number dependence of derived root-mean-square matter radii shows a significant increase beyond the neutron magic number N=28. Furthermore, this enhancement of matter radii is much larger than that of the previously measured charge radii, indicating a novel growth in neutron skin thickness. A simple examination based on the Fermi-type distribution, and mean field calculations point out that this anomalous enhancement of the nuclear size beyond N=28 results from an enlargement of the core by a sudden increase in the surface diffuseness of the neutron density distribution, which implies the swelling of the bare Ca48 core in Ca isotopes beyond N=28.	https://www.kaznu.kz/ru/25337/page/
10.	Recent developments of TiO2-based photocatalysis in the hydrogen evolution and photodegradation: A review	Bakbolat, B., Daulbayev, C., Sultanov, F., Bekbaev, A., Chuprakov, I, et al.	2020	Nanomaterials, 2020, 10(9), стр. 1–16, 1790, Q2 https://doi.org/10.3390/nano10091790	The growth of industrialization, which is forced to use non-renewable energy sources, leads to an increase in environmental pollution. Therefore, it is necessary not only to reduce the use of fossil fuels to meet energy needs but also to replace it with cleaner fuels. Production of hydrogen by splitting water is considered one of the most promising ways to use solar energy. TiO ₂ is an amphoteric oxide that occurs naturally in several modifications. This review summarizes recent advances of doped TiO ₂ -based photocatalysts used in hydrogen production and the degradation of organic pollutants in water. An intense scientific and practical interest in these processes is aroused by the fact that they aim to solve global problems of energy conservation and ecology.	https://www.kaznu.kz/ru/25337/page/
11.	Determination of the enhancement factor and the electron screening potential in the D(3He,p)4He reaction using TiD targets.	V. M. Bystritsky, D. K. Chumakov, G. N. Dudkin, M. Filipowicz, A. R. Krylov, B. A. Nechaev, A. Nurkin, V. N. Padalko, F. M. Pen'kov, A. V. Philippov, Yu. Zh.	2020	The European Physical Journal A, volume 56. Article number: 60 (2020), Q2	The study of fusion reactions D(d,p)3HD(d,p)3H, D(d,n)3HeD(d,n)3He, T(d,n)3He eT(d,n)3He, 3He(d,p)4He3He(d,p)4He, and D(3He,p)4HeD(3He,p)4He at astrophysical energies is of interest for both basic and applied physics. These studied provide information on electron screening of nuclear reactions that provide important information on the role of electrons in	https://www.kaznu.kz/ru/25337/page/

		Tuleushev, V. A. Varlachev & E. A. Zhakanbaev		https://doi.org/10.1140/epja/s10050-020-00038-7	reactions induced by deuterons, tritons, and nuclei of helium isotopes that proceed in reactors. The $D(3\text{He},p)4\text{He}$ reaction was investigated at the pulsed plasma Hall accelerator (Tomsk) in the $3\text{He}+3\text{He}^+$ ion energy range $E_{\text{He}}=16\div 34\text{EHe}=16\div 34\text{ keV}$ (laboratory reference frame) with a step of 2 keV. The goal of this work was to determine experimentally the enhancement factor of the $D(3\text{He},p)4\text{He}$ reaction and the electron screening potential U_{e} using a TiD targets with Miller indices [111] and [100]. A strong impact of the target crystal structure on reaction enhancement factor was discovered. We believe that solid-state effects make the largest contribution to the behavior of the enhancement factor $D(3\text{He}, p)4\text{He}$ of the reaction as a function of energy. One of these effects is the particle channeling in crystal structures. An unexpected increase of the enhancement factors for the $D(3\text{He}, p)4\text{He}$ reaction in the energy range $16\div 22\text{keV}$ probably indicates the emergence of some new mechanism that increases the yield of the reaction with lowering energy.	
12.	Reanalysis of the $N(13, \gamma)O(14)$ reaction and its role in the stellar CNO cycle	Dubovichenko, S.B., Kezerashvili, R.Y., Burkova, N.A., Dzhazairov-Kakhramanov, A.V., Beisenov, B.	2020	Physical Review C, 2020, 102(4), 045805, Q2 https://doi.org/10.1103/PhysRevC.102.045805	Within the framework of the modified potential cluster model with forbidden states, the $N(13, \gamma)O(14)$ reaction rate and the astrophysical S factor are considered. It is shown that the first $p(13\text{N})$ resonance determines the S factor and contributions of the M1 and E2 transitions are negligible at energies $E < 1\text{MeV}$, but are significant at high energies. The S factor strongly depends on the $S(13)$ resonance parameters. The influence of the width of the $S(13)$ resonance on the S factor is demonstrated. The reaction rate is calculated and an analytical approximation for the reaction rate is proposed. A comparison of our calculation with existing data is addressed. Results of our calculations for the $N(13, \gamma)O(14)$ reaction rate provide the contribution to the steadily improving reaction-rate database libraries. Our calculations of the $N(13, \gamma)O(14)$ reaction rate along with results for the rates of the $N(14, \gamma)O(15)$ and $C(12, \gamma)N(13)$ processes provide the temperature range $0.13 < T_9 < 0.97$ for the conversion of the carbon-nitrogen-oxygen (CNO) cycle to the hot CNO cycle. Our results demonstrate that, at the early stages of a nova explosion at temperatures of about $0.1T_9$ and at late stages of evolution of supermassive stars at temperatures of about $1.0T_9$,	https://www.kaznu.kz/ru/25337/page/

					the ignition of the hot CNO cycle could occur at much lower densities of a stellar medium.	
13.	Influence of resonances on the $^{11}\text{B}(n,\gamma)^{12}\text{B}$ capture reaction rate. Capture to the ground state of ^{12}B	Dubovichenko, S.B., Burkova, N.A., Dzhazairov-Kakhramanov, A.V., Tkachenko, A.S.	2020	Astroparticle Physics, Volume 123, 102481, Q2 https://doi.org/10.1016/j.astropartphys.2020.102481	Within the framework of the modified potential cluster model with a classification of orbital states according to Young diagrams, the possibility of describing experimental data for total cross sections of the neutron radiative capture on ^{11}B to the ground state of ^{12}B at energies of 10 meV ($1\text{ meV} = 10^{-3}\text{ eV}$) to 7 MeV was considered. It was shown that, taking into account only the E1 transition from the S state of the $n^{11}\text{B}$ scattering to the ground state of ^{12}B , it is quite possible to explain the magnitude of the known experimental cross sections at energies of 25.3 meV to 70 keV. Furthermore, on the basis of the total cross sections of 10 meV to 7 MeV, but excluding resonances above 5 MeV, the reaction rate is calculated in the temperature range of 0.01 to 10.0 T_9 . It is shown that the inclusion of low-lying resonance states makes a significant contribution to the reaction rate, starting already with temperatures of 0.2–0.3 T_9 .	https://www.kaznu.kz/ru/25337/page/
14.	Reaction rate of $p^{14}\text{N} \rightarrow ^{15}\text{O}\gamma$ capture to all bound states in potential cluster model	Dubovichenko, S., Burkova, N., Dzhazairov-Kakhramanov, A., Beysenov, B.	2020	International Journal of Modern Physics E, 2020, 29(1), 1930007, Q2 https://doi.org/10.1142/S0218301319300078	Review of calculation results for astrophysical S-factor of the $^{14}\text{N}(p,\gamma)^{15}\text{O}$ capture reaction in the $p^{14}\text{N}$ channel of ^{15}O was presented. It was carried out in the frame of the modified potential cluster model (MPCM) taking into account resonances in the ^{15}O spectrum up to 3.2MeV at energy of incident protons varying of 30keV to 5MeV. It is possible to describe experimental data for the astrophysical S-factors of the radiative proton capture on ^{14}N to five excited states of ^{15}O at excitation energies of 5.18MeV to 6.86MeV, only under assumption, that all five resonances are D scattering waves. Quality new physical interpretation of the capture mechanism is discussed in this channel to the ground state of ^{15}O . We assumed that the ground state of ^{15}O is determined by the $p^{14}\text{N}^*$ channel with excited $^{14}\text{N}^*$ cluster, which immediately allowed us to correctly describe order of values of the experimental S-factor for capture to this state. Taking into account these results, the total S-factor of the proton capture on ^{14}N and the reaction rates to the ground and five excited states of ^{15}O were determined at temperatures of 0.01 T_9 to 10 T_9 . The parametrization of the total reaction rate with a simple form is performed, which allows as to obtain χ^2 equal to 0.06 with 5% errors of the calculated rate.	https://www.kaznu.kz/ru/25337/page/

15.	Proca tubes with the flux of the longitudinal chromoelectric field and the energy flux/momentum density	Vladimir Dzhunushaliev, Vladimir Folomeev	2020	Eur. Phys. J. C, (2020) 80:1043, Q1 https://doi.org/10.1140/epjc/s10052-020-08633-0	We consider non-Abelian SU(3) Proca theory with a Higgs scalar field included. Cylindrically symmetric solutions describing classical tubes either with the flux of a longitudinal electric field or with the energy flux (and hence with nonzero momentum density) are obtained. It is shown that, in quantum Proca theory, there can exist tubes both with the flux of the longitudinal electric field and with the energy flux/momentum density simultaneously. An imaginary particle – Proca proton – in which ‘quarks’ are connected by tubes with nonzero momentum density is considered. It is shown that this results in the appearance of the angular momentum related to the presence of the non-Abelian electric and magnetic fields in the tube, and this angular momentum is a part of the Proca proton spin.	https://www.kaznu.kz/ru/25337/page/
16.	Spinor field solutions in F(B2) modified Weyl gravity	Vladimir Dzhunushaliev, Vladimir Folomeev	2020	International Journal of Modern Physics D Vol. 29, No. 13 (2020) 2050094 (17 pages), Q2 https://doi.org/10.1142/S0218271820500947	We consider modified Weyl gravity where a Dirac spinor field is nonminimally coupled to gravity. It is assumed that such modified gravity is some approximation for the description of quantum gravitational effects related to the gravitating spinor field. It is shown that such a theory contains solutions for a class of metrics which are conformally equivalent to the Hopf metric on the Hopf fibration. For this case, we obtain a full discrete spectrum of the solutions and show that they can be related to the Hopf invariant on the Hopf fibration. The expression for the spin operator in the Hopf coordinates is obtained. It is demonstrated that this class of conformally equivalent metrics contains the following: (a) a metric describing a toroidal wormhole without exotic matter; (b) a cosmological solution with a bounce and inflation and (c) a transition with a change in metric signature. A physical discussion of the results is given.	https://www.kaznu.kz/ru/25337/page/
17.	Thermodynamics and statistical physics of quasiparticles within the quark gluon plasma model	Vladimir Dzhunushaliev, Vladimir Folomeev, Tlekkabul Ramazanov and Tolegen Kozhamkulov	2020	Modern Physics Letters A, Vol. 35, No. 23 (2020) 2050194 (19 pages), Q2 https://doi.org/10.1142/S0217732320501941	We consider thermodynamic properties of a quark-gluon plasma related to quasiparticles having the internal structure. For this purpose, we employ a possible analogy between quantum chromodynamics and non-Abelian Proca-Dirac-Higgs theory. The influence of characteristic sizes of the quasiparticles on such thermodynamic properties of the quark-gluon plasma like the internal energy and pressure is studied. Sizes of the quasiparticles are taken into account in the spirit of the van der Waals equation but we take into consideration that the quasiparticles have different sizes, and the average value of these sizes depends on temperature. It is shown that this results	https://www.kaznu.kz/ru/25337/page/

					in a change in the internal energy and pressure of the quark-gluon plasma. Also, we show that, when the temperature increases, the average value of characteristic sizes of the quasiparticles increases as well. This leads to the occurrence of a phase transition at the temperature at which the volume occupied by the quasiparticles is compared with the volume occupied by the plasma.	
18.	Non-Abelian Proca theories with extra fields: particlelike and flux tube solutions	Vladimir Dzhunushaliev, Vladimir Folomeev, Tlekkabul Ramazanov, Arislan Makhmudov and Tolegen Kozhamkulov	2020	Phys. Scr. 95 (2020) 074013 (7pp), Q2 https://doi.org/10.1088/1402-4896/ab9791	We consider non-Abelian Proca theories with extra fundamental fields included. In the case of SU(2) Proca theory with nonlinear scalar and spinor fields, we obtain spherically symmetric regular solutions describing particlelike configurations with finite energy. For such systems, we find the energy spectrum and show the presence of a mass gap. In the case of SU(3) Proca theory with a nonlinear scalar field, we obtain cylindrically symmetric solutions describing tubes either with the flux of a longitudinal electric field or with the energy flux or with both of them. It is shown that the tubes with the energy flux may contribute considerably to the Proca proton spin. Consistent with all of this, we have argued that non-Abelian Proca theories containing extra fields may approximately describe some phenomena in QCD.	https://www.kaznu.kz/ru/25337/page/
19.	Measurements of the low-energy neutron and gamma ray accompaniment of extensive air showers in the knee region of primary cosmic ray spectrum	A. Shepetov, A. Chubenko, B. Iskhakov, O. Kryakunova, O. Kalikulov, S. Mamina, K. Mukashev, V. Piscal, V. Ryabov, N. Saduyev, T. Sadykov, N. Salikhov, E. Tautaev, L. Vil'danova, V. Zhukov	2020	European Physical Journal Plus, 135, Q2 https://doi.org/10.1140/epjp/s13360-019-00092-1	Purposeful investigation of radiation fluxes strongly delayed in relation to the main particle front of extensive air shower (EAS) was undertaken at the Tien Shan Mountain Cosmic Ray Station. It was found that the passage of the EAS can be accompanied by the delayed thermal neutrons and by the soft (30–50) keV gamma rays, mostly concentrated within a region of about (5–10) m around the shower axis, where the integral radiation fluence can vary in the limits of $(10^{-4} - 1) \text{ cm}^{-2}$ for neutrons, and of $(0.1 - 1000) \text{ cm}^{-2}$ for gamma rays. The dependence of signal multiplicity on the shower size N_e has a power shape both for the neutron and gamma ray components, with a sharp increase of its power index around the value of $N_e \approx 10^6$, which corresponds to the position of the $3 \times 10^{15} \text{ eV}$ knee in the primary cosmic ray spectrum. The total duration of detectable radiation signal after the EAS passage can be of some tens of milliseconds in the case of neutron component, and up to a few whole seconds for gamma rays. The delayed accompaniment of low-energy radiation particles can be an effective probe to study the interaction of the hadronic component of EAS.	https://www.kaznu.kz/ru/25337/page/

20.	Dirac star with SU(2) Yang-Mills and Proca fields	V. Dzhunushaliev, V. Folomeev	2020	PHYSICAL REVIEW D 101, 024023 (2020), Q1 https://doi.org/10.1103/PhysRevD.101.024023	We study spherically symmetric strongly gravitating configurations supported by nonlinear spinor fields and non-Abelian SU(2) Yang-Mills/Proca magnetic fields. Regular asymptotically flat solutions describing objects with positive Arnowitt-Deser-Misner masses are obtained numerically. When the mass of the spinor fields is much smaller than the Planck mass, we find approximate solutions that can describe systems with total masses comparable to the Chandrasekhar mass and with effective radii of the order of kilometers. For the values of the system free parameters used here, we show that the SU(2) magnetic field always gives a small contribution to the total energy density and mass of the configurations under investigation. From the astrophysical point of view, one can regard such objects as magnetized Dirac stars.	https://www.kaznu.kz/ru/25337/page/
21.	Thick branes in higher-dimensional f(R) gravity	V. Dzhunushaliev, V. Folomeev, G. Nurtayeva and S. D. Odintsov	2020	International Journal of Geometric Methods in Modern Physics, Vol. 17, No. 3 (2020) 2050036 (17 pages), Q2 https://doi.org/10.1142/S021988782050036X	We study the thick brane model within f(R) gravity in D-dimensional spacetimes with $D \geq 6$. The system under consideration consists of two branes orthogonal to each other: the four-dimensional Lorentzian brane and (D - 5)-dimensional Euclidean one. It is numerically shown that, for a given D, regular vacuum asymptotically anti-de Sitter solutions exist only in the range $1 < n < D/2$. Depending on the values of n and boundary conditions imposed on the Lorentzian brane, the solutions can pass or not pass through a fixed point located on the Lorentzian brane, and also be Z2-symmetric or nonsymmetric. In the large-D limit, we find the approximate analytic solutions. It is also shown that a test scalar field is trapped on the Lorentzian brane at any D.	https://www.kaznu.kz/ru/25337/page/
22.	Evaluation of tritium release into primary coolant for research and testing reactors	Kenzhina, I., Ishitsuka, E., Okumura, K., Takemoto, N., Chikhray, Y, et al.	2020	Journal of Nuclear Science and Technology, 2020, стр. 1–12, Q2 https://doi.org/10.1080/00223131.2020.1791760	The sources and mechanisms for the tritium release into the primary coolant in the JMTR and the JRR-3M containing beryllium reflectors are evaluated. It is found that the recoil release from chain reaction of ^9Be is dominant and its calculation results agree well with trends derived from the measured variation of tritium concentration in the primary coolant. It also indicates that the simple calculation method used in this study for the tritium recoil release from the beryllium reflectors can be utilized for an estimation of the tritium release into the primary coolant for a water-cooled research and testing reactors containing beryllium reflectors. © 2020, © 2020 Atomic Energy Society of Japan. All rights reserved.	https://www.kaznu.kz/ru/25337/page/

23.	Possible neutron and proton halo structure in the isobaric analog states of A=12 nuclei	Demyanova, A.S., Starastin, V.I., Danilov, A.N., Burtebaev, N., Janseitov, D, et al.	2020	Physical Review C, 2020, 102(5), 054612, Q2 https://doi.org/10.1103/PhysRevC.102.054612	The differential cross sections of the B11(He3,d)C12 reaction leading to formation of the 0+ ground state and the 15.11-MeV 1+, 16.57-MeV 2-, and 17.23-MeV 1- excited states of C12 are measured at Elab=25 MeV. The analysis of the data is carried out within the coupled-reaction-channels method for the direct proton transfer to the bound and unbound states. The rms radii of the last proton in all states studied are determined. A comparison of the rms radii of the B12, C12, and N12 nuclei in the isobaric analog states (IASs) with isospin T=1 determined by different methods allows us to arrive at a conclusion that these nuclei in the 1- excited states at Ex=2.62, 17.23, and 1.80 MeV, respectively, possess one-nucleon (neutron or proton) halo structure. The enlarged radii and a large probability of the last neutron to be outside of the range of the interaction potential are also found for the 2- states of B12, C12, and N12 at Ex=1.67, 16.57, and 1.19 MeV, respectively. These IASs also can be regarded as candidates for states with one-nucleon (neutron or proton) halo.	https://www.kaznu.kz/ru/25337/page/
Кафедра теплофизики и технической физики						
24.	Refractive Index at Low Temperature of Tetrachloromethane and Tetrafluoroethane Cryovacuum Condensates	Aldiyarov, A.U., Sokolov, D.Y., Nurmukan, A.Y., Ramos, M.A.	2020	ACS Omega Q1	We present low-temperature measurements of the refractive index of cryofilms of tetrachloromethane and 1,1,1,2-tetrafluoroethane at different condensation and measurement temperatures between 16 and 130 K. Using cryovacuum condensation, we have been able to obtain thin films in an amorphous state for both substances despite them being very bad glass formers. Then, we have studied the evolution of the refractive index with an increasing temperature, including by transitions to ordered or partially disordered crystalline states. Copyright © 2020 American Chemical Society.	https://www.scopus.com/record/display.uri?eid=2-s2.0-85085873778&origin=resultslist&sort=plf-f
25.	The study of thermophysical properties of rubber and plastic household waste to determine the temperature conditions of cryoprocessing	Aldiyarov, A., Sokolov, D., Nurmukan, A., Korshikov, E.	2020	Applied Surface Science	The effect of cryogenic treatment on the thermal characteristics emerged from the operation of automobile tires and plastic bottles of commercial beverages. Automobile tires manufactured according to the state standard “GOST 4754-97” (ISO 1043-1:2001 “Plastics – Symbols and abbreviated terms – Part 1: Basic polymers and their special characteristics”; ISO 11469:2000 “Plastics – Generic identification and marking of plastics products”; ISO 472:1999 “Plastics – Vocabulary”) and bottles made of polyethylene terephthalate for food liquids according to the state standard “GOST R 52789-2007”	https://www.scopus.com/record/display.uri?eid=2-s2.0-85079104677&origin=resultslist&sort=plf-f

					(ECE/TRANS/WP.29/GRB/2019/5 “Proposal for amendments to UN Regulation No. 30”) were used as the test samples. Temperature range of investigation was 95–300 K. The thermal conductivity measurements were carried out by a relative stationary heat flow method and the temperature change inside the samples with different forms on heating after cooling to nitrogen temperature. The results obtained are in good agreement with the literature data.	
26.	Investigation of vapor cryodeposited glasses and glass transition of tetrachloromethane films	Aldiyarov, A., Nurmukan, A., Sokolov, D., Korshikov, E.	2020	Applied Surface Science	The vibrational spectra of CCl ₄ in the gas phase and in the condensed state were measured with a goal to compare them. The thickness of the condensed samples was $d = 2.5 \mu\text{m}$. It was shown that an increase in the temperature of the condensed sample leads to a change in the position of the absorption band. Based on the obtained dependence of the position of the absorption band on the temperature of the sample during its heating, an assumption is made that in the temperature range $T = 16 \text{ K} - T = 35 \text{ K}$ the cryocondensate film is in an amorphous high density state. Experiments were conducted to determine the glass transition temperature ($T_g = 79 \text{ K}$) in the sample by observing the half-width of the characteristic absorption band at a fixed frequency in the vibrational spectra versus temperature.	https://www.scopus.com/record/display.uri?eid=2-s2.0-85077181158&origin=resultslist&sort=plf-f
27.	Application of Organic Fuel Additives to Enhance Coal Combustion Efficiency	Messerle, V.E., Paskalov, G., Umbetkaliyev, K.A., Ustimenko, A.B.	2020	Thermal Engineering	The results from numerical and experimental investigations into the influence of organic fuel additives (OFAs) on the efficiency of combusting high-ash Ekibastuz coal are presented. Technology and a special combustion chamber equipped with a plasma-assisted startup system are proposed. The thermodynamic and kinetic parameters of cocombustion of coal with OFA are numerically analyzed, as a result of which the optimum process temperatures, air-to-coal mass consumption ratios, and combustion chamber geometrical parameters have been selected. Thermodynamic analyses of the coal combustion process have shown that 7 kg of air is required to burn 1 kg of coal. A tendency toward increasing the concentrations of CO ₂ and H ₂ O and, accordingly, toward decreasing the concentrations of NO, CO, and O ₂ in the coal combustion products in using OFA has been revealed. The kinetic analysis results have shown that the coal combustion process with a consumption rate of 10 kg/h is fully completed in a combustion chamber 0.2 m in diameter and 0.9 m in height. A series of experiments on cocombustion of Ekibastuz	https://www.scopus.com/record/display.uri?eid=2-s2.0-85080972161&origin=resultslist&sort=plf-f

					coal with OFA was carried out. The investigation results made it possible to evaluate the effectiveness of Omstar-DX1 and Open Flame OFAs, which are prepared as mixtures of light ethers. Comparative experiments of coal combustion with and without OFAs in different concentrations (0–5 cm ³ per kg of coal) have shown that the OFAs increase the flame temperature in the combustion chamber's initial part and decrease this temperature at the chamber's outlet. This means that the air–coal mixture takes less time to ignite and, accordingly, it burns out more rapidly. The introduction of OFAs results in a noticeably more efficient combustion of low-grade coal, in smaller emissions of CO and NO, and in an increased concentration of CO ₂ , which points to the more complete combustion of fuel.	
Кафедра физики твердого тела и нелинейной физики						
28.	Optimized single-axis schedule solar tracker in different weather conditions	Kuttybay, N., Saymbetov, A., Mekhilef, S., Meiirkhanov, A., Svanbayev, Y. Nurgaliyev, M.	2020	Energies Q1 in Control and Optimization	Improving the efficiency of solar panels is the main task of solar energy generation. One of the methods is a solar tracking system. One of the most important parameters of tracking systems is a precise orientation to the Sun. In this paper, the performance of single-axis solar trackers based on schedule and light dependent resistor (LDR) photosensors, as well as a stationary photovoltaic installation in various weather conditions, were compared. A comparative analysis of the operation of a manufactured schedule solar tracker and an LDR solar tracker in different weather conditions was performed; in addition, a simple method for determining the rotation angle of a solar tracker based on the encoder was proposed. Finally, the performance of the manufactured solar trackers was calculated, taking into account various weather conditions for one year. The proposed single-axis solar tracker based on schedule showed better results in cloudy and rainy weather conditions. The obtained results can be used for designing solar trackers in areas with a variable climate.	https://www.scopus.com/record/display.uri?eid=2-s2.0-85092933132&origin=resultlist&sort=plf-f
29.	Prediction of energy consumption for LoRa based wireless sensors network	Nurgaliyev, M., Saymbetov, A., Yashchyshyn, Y., Kuttybay, N., Tukymbekov, D.	2020	Wireless Networks Q2 in Information Systems	This paper shows a method for predicting the lifetime of a wireless sensor network based on the LoRa Ra-01 wireless modules. To develop a prediction model of the energy consumption, wireless sensor modules were assembled and it was obtained experimental data using LabView development environment. There were performed experiments to get	https://www.scopus.com/record/display.uri?eid=2-s2.0-85079789228&origin=result

					battery discharge curve. Experimental data of power consumption depending on the packet length were obtained in transmission mode. Using experimental data, we obtained dependencies of system lifetime on sleep mode duration and packet length. The paper also considered a probabilistic approach to predict the system lifetime depending on the probability of data transmission during the day. The lifetime prediction model is based on Markov's chains. The results obtained in this work can be used to predict lifetime of sensor networks more accurately.	tslist&sort=plf-f
30.	Studies of the distinct regions due to CO selective dissociation in the Aquila molecular cloud	Komesh, T., Baan, W., Esimbek, J., ...Rosli, Z., Ibraimov, M.	2020	Astronomy and Astrophysics Q1 in Physics and Astronomy	Aims. We investigate the role of selective dissociation in the process of star formation by comparing the physical parameters of protostellar-prestellar cores and the selected regions with the CO isotope distributions in photo-dissociation regions. We seek to understand whether there is a better connection between the evolutionary age of star forming regions and the effect of selective dissociation Methods. We used wide-field observations of the 12CO, 13CO, and C18O (J = 1-0) emission lines to study the ongoing star formation activity in the Aquila molecular region, and we used the 70 and 250 μm data to describe the heating of the surrounding material and as an indicator of the evolutionary age of the core. Results. The protostellar-prestellar cores are found at locations with the highest C18O column densities and their increasing evolutionary age coincides with an increasing 70μm/250μm emission ratio at their location. The evolutionary age of the cores may also follow from the 13CO versus C18O abundance ratio, which decreases with increasing C18O column densities. The original mass has been estimated for nine representative star formation regions and the original mass of the region correlates well with the integrated 70 μm flux density. Similarly, the X13 CO/XC 18 O ratio, which provides the dissociation rate for these regions correlates with the 70 μm/250 μm flux density ratio and reflects the evolutionary age of the star formation activity.	https://www.scopus.com/record/display.uri?eid=2-s2.0-85097343840&origin=resultslist&sort=plf-f

31.	High sensitive NH ₃ sensor based on electrochemically etched porous silicon	Khaniyev, B.A., Sagidolda, Y., Dikhanbayev, K.K., Tileu, A.O., Ibraimov, M.K.	2020	Cogent Engineering Q2 in Engineering	In the current study, porous silicon (por-Si) samples were fabricated by electrochemical etching at different times (20 min, 40 min, 60 min). Scanning electron microscope (SEM) images of horizontal cross-sections of the samples showed the formation of pores. The etched samples' porosity was determined by the gravimetric method and amounted to 59.5%, 72.7%, 83.3%, respectively. Optical characteristics such as Raman spectra and photoluminescence (PL) spectra were obtained. The current-voltage and capacitance-voltage characteristics were also measured to calculate the sensitivity of the samples. The study results show that sample, which is etched for 40 minutes has a maximum response value to ammonia (NH ₃) gas than others, and the sensitivity is 33.25. The results demonstrated that it is possible to develop a high sensitive sensor device based on por-Si for determining NH ₃ gas in concentrations below 0.1 ppm at room temperature.	https://www.scopus.com/record/display.uri?eid=2-s2.0-85090012509&origin=resultslist&sort=plf-f
32.	Studies of the distinct regions due to CO selective dissociation in the Aquila molecular cloud	Komeshe, T., Baan, W., Esimbek, J., ...Rosli, Z., Ibraimov, M.	2020	Astronomy and Astrophysics Q1 in Physics and Astronomy	Aims. We investigate the role of selective dissociation in the process of star formation by comparing the physical parameters of protostellar-prestellar cores and the selected regions with the CO isotope distributions in photo-dissociation regions. We seek to understand whether there is a better connection between the evolutionary age of star forming regions and the effect of selective dissociation Methods. We used wide-field observations of the 12CO, 13CO, and C18O (J = 1-0) emission lines to study the ongoing star formation activity in the Aquila molecular region, and we used the 70 and 250 μm data to describe the heating of the surrounding material and as an indicator of the evolutionary age of the core. Results. The protostellar-prestellar cores are found at locations with the highest C18O column densities and their increasing evolutionary age coincides with an increasing 70μm/250μm emission ratio at their location. The evolutionary age of the cores may also follow from the 13CO versus C18O abundance ratio, which decreases with increasing C18O column densities. The original mass has been estimated for nine representative star formation regions and the original mass of the region correlates well with the integrated 70 μm flux density. Similarly, the X13 CO/XC 18	https://www.scopus.com/record/display.uri?eid=2-s2.0-85097343840&origin=resultslist&sort=plf-f

					O ratio, which provides the dissociation rate for these regions correlates with the 70 μm /250 μm flux density ratio and reflects the evolutionary age of the star formation activity.	
33.	Ammonia observations towards the Aquila Rift cloud complex	Tursun, K., Esimbek, J., Henkel, C., Komesh, T., Sailanbek, S.	2020	Astronomy and Astrophysics Q1 in Physics and Astronomy	We surveyed the Aquila Rift complex including the Serpens South and W 40 regions in the NH ₃ (1,1) and (2,2) transitions making use of the Nanshan 26-m telescope. Our observations cover an area of $\sim 1.5^\circ \times 2.2^\circ$ (11.4 pc \times 16.7 pc). The kinetic temperatures of the dense gas in the Aquila Rift complex obtained from NH ₃ (2,2)/(1,1) ratios range from 8.9 to 35.0 K with an average of 15.3 ± 6.1 K (errors are standard deviations of the mean). Low gas temperatures are associated with Serpens South ranging from 8.9 to 16.8 K with an average of 12.3 ± 1.7 K, while dense gas in the W 40 region shows higher temperatures ranging from 17.7 to 35.0 K with an average of 25.1 ± 4.9 K. A comparison of kinetic temperatures derived from para-NH ₃ (2,2)/(1,1) against HiGal dust temperatures indicates that the gas and dust temperatures are in agreement in the low-mass-star formation region of Serpens South. In the high-mass-star formation region W 40, the measured gas kinetic temperatures are higher than those of the dust. The turbulent component of the velocity dispersion of NH ₃ (1,1) is found to be positively correlated with the gas kinetic temperature, which indicates that the dense gas may be heated by dissipation of turbulent energy. For the fractional total-NH ₃ (para+ortho) abundance obtained by a comparison with Herschel infrared continuum data representing dust emission, we find values from 0.1×10^{-8} to 2.1×10^{-7} with an average of $6.9 (\pm 4.5) \times 10^{-8}$. Serpens South also shows a fractional total-NH ₃ (para+ortho) abundance ranging from 0.2×10^{-8} to 2.1×10^{-7} with an average of $8.6 (\pm 3.8) \times 10^{-8}$. In W 40, values are lower, between 0.1 and 4.3×10^{-8} with an average of $1.6 (\pm 1.4) \times 10^{-8}$. Weak velocity gradients demonstrate that the rotational energy is a negligible fraction of the gravitational energy. In W 40, gas and dust temperatures are not strongly dependent on the projected distance to the recently formed massive stars. Overall, the morphology of the mapped region is ring-like, with strong emission at lower and weak emission at higher Galactic	https://www.scopus.com/record/display.uri?id=2-s2.0-85096789313&origin=resultslist&sort=plf-f

					longitudes. However, the presence of a physical connection between the two parts remains questionable.	
34.	G15.684-0.29: One of the Largest Galactic Infrared Bubbles Showing Strong Evidence of Triggered Star Formation	Zhou, J., Zhou, D., Esimbek, J., ...Komesh, T., Tang, X.	2020	Astrophysical Journal Q1 in Physics and Astronomy	The bubble G15.684-0.29 has a radius of 15.7 pc. Its large size indicates that it may have enough time to trigger star formation. We identify 39 dense cold clumps around the bubble from the Hi-GAL survey. All of them satisfy the criteria for forming massive stars, and most of them lie in the bubble shell. We identify 19 molecular clumps around the bubble from the 12CO(3-2) survey, all of which are gravitationally bound. We found 9 Class I YSOs, 28 Class II YSOs, and 12 transition disks (TDs) around the bubble. For those young stellar objects (YSOs) located within the bubble boundary, 6 of 7 Class I YSOs lie in the shell, 15 of 22 Class II YSOs lie inside the bubble, and 3 of 5 TDs lie inside the bubble. The dynamical age of G15.684-0.29 in a turbulent medium is ~ 4 Myr, which is much greater than the shell fragmentation time, ~ 0.82 - 1.74 Myr. We suggest that triggered star formation may be ongoing in the shell of the bubble, and the collect and collapse model may work here. However, we cannot rule out the possibility that the radiation-driven implosion model may work on the formation of some YSOs. As we expected, the larger bubble has a much longer dynamical age, but we failed to find a clear age gradient for YSOs around the bubble. © 2020. The American Astronomical Society. All rights reserved.	https://www.scopus.com/record/display.uri?eid=2-s2.0-85088531809&origin=resultslist&sort=plf-f
35.	Bias voltage-dependent photoinduced current and photoluminescence in organometal perovskite layers on silicon substrates	Sekerbayev, K.S., Shabdan, Y., Mikhailova, S.L., Mikhailova, S.L.Taurbayev, T.I., Timoshenko, V.Y.	2020	Physica B: Condensed Matter Q2 in Electrical and Electronic Engineering	Thin organometal perovskite layers on crystalline silicon substrates under excitation with nanosecond laser pulses were prepared and investigated to reveal an effect of the bias voltage and parameters of the perovskite/silicon structure on photoinduced current and photoluminescence. Numerical simulations of the diffusion, separation and recombination of photoinduced charge carriers in perovskite/silicon structures were carried out to describe both the photoluminescence transient and time-dependent photocurrent at different bias voltage. While the nonradiative surface recombination does not significantly influence the photoluminescence transients for times shorter than 100 ns, the photoinduced current decreases strongly with increasing the surface recombination	https://www.scopus.com/record/display.uri?eid=2-s2.0-85078729645&origin=resultslist&sort=plf-f

					velocity. The simulation results were compared with experimental ones obtained for organometal perovskite deposited on substrates of optically polished crystalline silicon wafers of p-type conductivity and those covered with silicon nanowires. The obtained results are discussed in view of possible applications of the investigated structures in photovoltaics and light emitting optoelectronics.	
36.	Influence of dust particles on ionization equilibrium in partially ionized plasmas	Davletov, A.E., Kurbanov, F., Mukhametkarimov, Y.S.	2020	Physical Review E Q1 in Statistics and Probability	A chemical model is proposed for a dusty plasma consisting of electrons, ions, neutrals, and positively charged dust particles all being at thermodynamic equilibrium. An expression is derived for the Helmholtz free energy, which comprises the ideal part, taking into account the charge of dust particles, and the excess part, evaluated in the framework of the self-consistent chemical model [Phys. Rev. E 83, 016405 (2011)PLEEE81539-375510.1103/PhysRevE.83.016405]. The ionization potential depression for a dust-free partially ionized hydrogen is analytically evaluated for weakly and strongly ionized states to consistently account for the presence of charged and neutral components. An ad hoc interpolation of the ionization potential depression, valid across the whole ionization region, is put forward and subsequent solution of the generalized Saha equation is found to be in a perfect agreement with exact calculations. Minimization of the Helmholtz free energy of dusty plasmas provides the number densities of free electrons, free ions, neutrals, and the dust electric charge as well. Based on consideration of weakly and strongly ionized states, a straightforward comparison is made of the ionization equilibrium in a partially ionized plasma with and without dust particles to demonstrate that at thermal equilibrium positively charged dusts are responsible for an increase in the number density of free electrons and a decrease in the number density of free ions. It is analytically proved that nonideality effects result in a growth of the number densities of free electrons and ions by obtaining the so-called electron and proton ionization potential depressions. Electric charge of dust particles is systematically studied as a full plasma component rather than considering a detailed balance	https://www.scopus.com/record/display.uri?eid=2-s2.0-85087171769&origin=resultslist&sort=plf-f

					of the electron and ion fluxes on the surface of a solitary dust grain.	
37.	Structure of accretion flows in the nova-like cataclysmic variable RW Tri	Subebekova, G., Zharikov, S., Tovmassian, G., Kucáková, H., Khokhlov, S.	2020	Monthly Notices of the Royal Astronomical Society Q1 in Space and Planetary Science	We obtained photometric observations of the nova-like (NL) cataclysmic variable RW Tri and gathered all available AAVSO and other data from the literature. We determined the system parameters and found their uncertainties using the code developed by us to model the light curves of binary systems. New time-resolved optical spectroscopic observations of RW Tri were also obtained to study the properties of emission features produced by the system. The usual interpretation of the single-peaked emission lines in NL systems is related to the bi-conical wind from the accretion disc's inner part. However, we found that the Ha emission profile is comprised of two components with different widths. We argue that the narrow component originates from the irradiated surface of the secondary, while the broader component's source is an extended, low-velocity region in the outskirts of the accretion disc, located opposite to the collision point of the accretion stream and the disc. It appears to be a common feature for long-period NL systems-a point we discuss.	https://www.scopus.com/record/display.uri?eid=2-s2.0-85093970755&origin=resultslist&sort=plf-f
38.	Properties of Galactic B[e] Supergiants. V. 3 Pup- Constraining the Orbital Parameters and Modeling the Circumstellar Environments	Miroshnichenko, A.S., Danford, S., Zharikov, S.V., Kuratova, A.K., Khokhlov, S.A.	2020	Astrophysical Journal Q1 in Physics and Astronomy	We report the results of long-term spectroscopic monitoring of the A-type supergiant with the B[e] phenomenon 3 Pup = HD 62623. We confirm earlier findings that it is a binary system. The orbital parameters were derived using cross-correlation of the spectra in a range of 4460-4632 Å, which contains over 30 absorption lines. The orbit was found to be circular with a period of 137.4 ± 0.1 days, radial velocity semiamplitude $K_1 = 5.0 \pm 0.8$ km s ⁻¹ , systemic radial velocity $\gamma = +26.4 \pm 2.0$ km s ⁻¹ , and mass function $f(m) = (1.81 - 0.76 + 0.97) \times 10^{-3} M_{\odot}$. The object may have evolved from a pair with initial masses of $\sim 6.0 M_{\odot}$ and $\sim 3.6 M_{\odot}$ with an initial orbital period of ~ 5 days. Based on the fundamental parameters of the A-supergiant (luminosity $\log L/L_{\odot} = 4.1 \pm 0.1$ and effective temperature $T_{\text{eff}} = 8500 \pm 500$ K) and evolutionary tracks of mass-transferring binaries, we found current masses of the gainer $M_2 = 8.8 \pm 0.5 M_{\odot}$ and donor $M_1 = 0.75 \pm 0.25 M_{\odot}$. We also modeled the object's IR-excess and derived a dust	https://www.scopus.com/record/display.uri?eid=2-s2.0-85088317915&origin=resultslist&sort=plf-f

					mass of $\sim 5 \cdot 10^{-5} M_{\odot}$ in the optically thin dusty disk. The orbital parameters and properties of the H α line profile suggest that the circumstellar gaseous disk is predominantly circumbinary. The relatively low mass of the gainer led us to a suggestion that 3 Pup should be excluded from the B[e] supergiant group and moved to the FS CMa group. Overall these results further support our original suggestion that FS CMa objects are binary systems, where an earlier mass transfer caused formation of the circumstellar envelope.	
39.	Measurements of the low-energy neutron and gamma ray accompaniment of extensive air showers in the knee region of primary cosmic ray spectrum	Shepetov, A., Chubenko, A., Iskhakov, B., Mukashev, K., Vil'danova, L., Zhukov, V.	2020	European Physical Journal Plus Q1 in General Physics and Astronomy	Purposeful investigation of radiation fluxes strongly delayed in relation to the main particle front of extensive air shower (EAS) was undertaken at the Tien Shan Mountain Cosmic Ray Station. It was found that the passage of the EAS can be accompanied by the delayed thermal neutrons and by the soft (30–50) keV gamma rays, mostly concentrated within a region of about (5–10) m around the shower axis, where the integral radiation fluence can vary in the limits of $(10^{-4} - 1) \text{ cm}^{-2}$ for neutrons, and of $(0.1 - 1000) \text{ cm}^{-2}$ for gamma rays. The dependence of signal multiplicity on the shower size N_e has a power shape both for the neutron and gamma ray components, with a sharp increase of its power index around the value of $N_e \approx 10^6$, which corresponds to the position of the 3×10^{15} eV knee in the primary cosmic ray spectrum. The total duration of detectable radiation signal after the EAS passage can be of some tens of milliseconds in the case of neutron component, and up to a few whole seconds for gamma rays. The delayed accompaniment of low-energy radiation particles can be an effective probe to study the interaction of the hadronic component of EAS.	https://www.scopus.com/record/display.uri?eid=2-s2.0-85078204709&origin=resultslist&sort=plf-f
40.	Improvement of the pseudocapacitive performance of cobalt oxide-based electrodes for electrochemical capacitors	Mirzaeian, M., Akhanova, N., Gabdullin, M., Nurbolat, S., Abdullin, K.	2020	Energies Q1 in Control and Optimization	Cobalt oxide nanopowders are synthesized by the pyrolysis of aerosol particles of water solution of cobalt acetate. Cobalt nanopowder is obtained by subsequent reduction of obtained cobalt oxide by annealing under a hydrogen atmosphere. The average crystallite size of the synthesized porous particles ranged from 7 to 30 nm, depending on the synthesis temperature. The electrochemical characteristics of electrodes based on synthesized cobalt oxide and reduced cobalt oxide are investigated in an electrochemical cell using a 3.5 M KOH	https://www.scopus.com/record/display.uri?eid=2-s2.0-85092889468&origin=resultslist&sort=plf-f

					<p>solution as the electrolyte. The results of electrochemical measurements show that the electrode based on reduced cobalt oxide (Re-Co₃O₄) exhibits significantly higher capacity, and lower Faradaic charge-transfer and ion diffusion resistances when compared to the electrodes based on the initial cobalt oxide Co₃O₄. This observed effect is mainly due to a wide range of reversible redox transitions such as Co(II) ↔ Co(III) and Co(III) ↔ Co(IV) associated with different cobalt oxide/hydroxide species formed on the surface of metal particles during the cell operation; the small thickness of the oxide/hydroxide layer providing a high reaction rate, and also the presence of a metal skeleton leading to a low series resistance of the electrode.</p>	
41.	Measurements of the low-energy neutron and gamma ray accompaniment of extensive air showers in the knee region of primary cosmic ray spectrum	Shepetov, A., Chubenko, A., Iskhakov, B., Mukashev, K., Vil'danova, L., Zhukov, V.	2020	European Physical Journal Plus Q1 in General Physics and Astronomy	<p>Purposeful investigation of radiation fluxes strongly delayed in relation to the main particle front of extensive air shower (EAS) was undertaken at the Tien Shan Mountain Cosmic Ray Station. It was found that the passage of the EAS can be accompanied by the delayed thermal neutrons and by the soft (30–50) keV gamma rays, mostly concentrated within a region of about (5–10) m around the shower axis, where the integral radiation fluence can vary in the limits of (10⁻⁴ - 1) cm⁻² for neutrons, and of (0.1 - 1000) cm⁻² for gamma rays. The dependence of signal multiplicity on the shower size N_e has a power shape both for the neutron and gamma ray components, with a sharp increase of its power index around the value of N_e ≈ 10⁶, which corresponds to the position of the 3 × 10¹⁵ eV knee in the primary cosmic ray spectrum. The total duration of detectable radiation signal after the EAS passage can be of some tens of milliseconds in the case of neutron component, and up to a few whole seconds for gamma rays. The delayed accompaniment of low-energy radiation particles can be an effective probe to study the interaction of the hadronic component of EAS.</p>	https://www.scopus.com/record/display.uri?eid=2-s2.0-85078204709&origin=resultlist&sort=plf-f
42.	Improvement of the pseudocapacitive performance of cobalt	Mirzaeian, M., Akhanova, N., Gabdullin, M., Nurbolat, S., Abdullin, K.	2020	Energies Q1 in Control and Optimization	<p>Cobalt oxide nanopowders are synthesized by the pyrolysis of aerosol particles of water solution of cobalt acetate. Cobalt nanopowder is obtained by subsequent reduction of obtained cobalt oxide by annealing under a hydrogen atmosphere. The average crystallite size of the synthesized porous particles</p>	https://www.scopus.com/record/display.uri?eid=2-s2.0-85092889468

	oxide-based electrodes for electrochemical capacitors				ranged from 7 to 30 nm, depending on the synthesis temperature. The electrochemical characteristics of electrodes based on synthesized cobalt oxide and reduced cobalt oxide are investigated in an electrochemical cell using a 3.5 M KOH solution as the electrolyte. The results of electrochemical measurements show that the electrode based on reduced cobalt oxide (Re-Co ₃ O ₄) exhibits significantly higher capacity, and lower Faradaic charge-transfer and ion diffusion resistances when compared to the electrodes based on the initial cobalt oxide Co ₃ O ₄ . This observed effect is mainly due to a wide range of reversible redox transitions such as Co(II) ↔ Co(III) and Co(III) ↔ Co(IV) associated with different cobalt oxide/hydroxide species formed on the surface of metal particles during the cell operation; the small thickness of the oxide/hydroxide layer providing a high reaction rate, and also the presence of a metal skeleton leading to a low series resistance of the electrode.	&origin=resultlist&sort=plf-f
43.	Designing of WO ₃ @Co ₃ O ₄ Heterostructures to Enhance Photoelectrochemical Performances	Markhabayeva, A.A., Moniruddin, M., Dupre, R., Abdullin, K.A., Nuraje, N.	2020	Journal of Physical Chemistry A Q2 in Physical and Theoretical Chemistry	Heterostructured photocatalysts are superior to single photocatalysts because they offer better charge separation and broaden light harnessing abilities. Although WO ₃ is considered an oxygen-evolving photocatalyst with decent stability and proper band gap, its lower photocatalytic efficiency is ascribed to high charge recombination. In this research, a WO ₃ @Co ₃ O ₄ heterostructure reduced the recombination of photocatalytic charges and extended light absorption abilities, resulting in improved photocatalytic activity. The presence of Co ₃ O ₄ nanoparticles improved light absorption and charge transfer of tungsten oxide films for photoelectrochemical reactions. For photoelectrochemical water oxidation, WO ₃ @Co ₃ O ₄ nanostructures generated a photocurrent 20 times higher than that of pure WO ₃ . Both electrodeposition and sol gel techniques were utilized to synthesize the WO ₃ @Co ₃ O ₄ photoelectrode. Scanning electron microscopy and X-ray diffraction were used to characterize the formation of the above photocatalyst. A photocurrent study was done to investigate the charge separation mechanism to explain the enhanced photocatalytic activity.	https://www.scopus.com/record/display.uri?eid=2-s2.0-85078306915 &origin=resultlist&sort=plf-f

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44.	Melting, freezing, and dynamics of two-dimensional dipole systems in screening bulk media	Aldakul, Y.K., Moldabekov, Z.A., Ramazanov, T.S	2020	Physical Review E	This paper reports on the molecular dynamics simulations of classical two-dimensional (2D) electric dipole systems. The properties of 2D systems with bare (nonscreened) and screened dipole-dipole interactions have been investigated. Based on the polygon construction method, we present simulation results on the phase transition, and we locate the melting and freezing points of 2D dipole systems in terms of a polygon disorder parameter, with the polygon disorder parameter being the sum of nontriangular polygon order parameters. It was found that the phase transition of the system occurs when the polygon disorder parameter has a value 0.165. This result was cross-checked by using both local and overall orientational order parameters. We also identified that the value of the average local orientational order parameter at the phase transition point is 0.67. These results are valid for the ordinary (bare) dipole-dipole interaction as well as the screened dipole-dipole interaction, and they are expected to be general for other 2D systems with repulsive pair interaction. We observed that both melting and freezing points shift to lower values of temperature due to screening. In the liquid state, the radial distribution function and polygon construction method show the loss of order in a structure as screening becomes more severe. Furthermore, the impact of screening on the system's collective excitation spectra and diffusive characteristics at liquid and solid states has been studied. Results show the decrease in the values of both longitudinal and transverse sound speeds and the emergence of anomalous superdiffusive motion in the liquid state due to screening.	https://www.scopus.com/record/display.uri?eid=2-s2.0-85093910914&doi=10.1103/PhysRevE.102.033205&origin=inward&txGid=6ef4b69b6cad9982be1414d99a8e1476
45.	Synthesis of carbon nanowalls on the surface of nanoporous alumina membranes by RI-PECVD method	Yerlanuly, Y., Christy, D., Van Nong, N., Kondo, H., Alpysbayeva, B., Nemkayeva, R., Kadyr, M., Ramazanov, T., Gabdullin, M., Batryshev, D., Hori, M	2020	Applied Surface Science	This work is devoted to the synthesis of carbon nanowalls on the surface of a nanoporous aluminum oxide membrane by radical-injection plasma enhanced chemical vapor deposition method. Nanoporous alumina oxide membranes with different morphology and thickness, which were obtained by the method of two-stage electrochemical anodization, were used as a substrate. For comparative analysis, carbon nanowalls were also obtained on the surface of a silicon substrate and	https://www.scopus.com/record/display.uri?eid=2-s2.0-85084035777&doi=10.1016/j.apsusc.2020.146533

					aluminum foil. The synthesized nanostructures were investigated by using scanning electron microscopy and Raman spectroscopy. The dependence of the morphology and height of carbon nanowalls on the pore size and the thickness of the alumina membrane, respectively, was revealed.	&origin=inward&txGid=eec9e7cce02414ca5bc4462f274928
46.	Thermodynamics and statistical physics of quasiparticles within the quark-gluon plasma model	Dzhunushaliev, V., Folomeev, V., Ramazanov, T., Kozhamkulov, T.	2020	Modern Physics Letters A	We consider thermodynamic properties of a quark-gluon plasma related to quasiparticles having the internal structure. For this purpose, we employ a possible analogy between quantum chromodynamics and non-Abelian Proca-Dirac-Higgs theory. The influence of characteristic sizes of the quasiparticles on such thermodynamic properties of the quark-gluon plasma like the internal energy and pressure is studied. Sizes of the quasiparticles are taken into account in the spirit of the van der Waals equation but we take into consideration that the quasiparticles have different sizes, and the average value of these sizes depends on temperature. It is shown that this results in a change in the internal energy and pressure of the quark-gluon plasma. Also, we show that, when the temperature increases, the average value of characteristic sizes of the quasiparticles increases as well. This leads to the occurrence of a phase transition at the temperature at which the volume occupied by the quasiparticles is compared with the volume occupied by the plasma.	https://www.scopus.com/record/display.uri?eid=2-s2.0-85088967278&doi=10.1142/2fS0217732320501941&origin=inward&txGid=b65691da3f80506c585e7b60849641e6
47.	Non-Abelian Proca theories with extra fields: Particlelike and flux tube solutions	Dzhunushaliev, V., Dzhunushaliev, V., Folomeev, V., Folomeev, V., Kozhamkulov, T., Makhmudov, A., Ramazanov, T.	2020	Physica Scripta	We consider non-Abelian Proca theories with extra fundamental fields included. In the case of SU(2) Proca theory with nonlinear scalar and spinor fields, we obtain spherically symmetric regular solutions describing particlelike configurations with finite energy. For such systems, we find the energy spectrum and show the presence of a mass gap. In the case of SU(3) Proca theory with a nonlinear scalar field, we obtain cylindrically symmetric solutions describing tubes either with the flux of a longitudinal electric field or with the energy flux or with both of them. It is shown that the tubes with the energy flux may contribute considerably to the Proca proton spin. Consistent with all of this, we have argued that non-Abelian Proca theories containing extra fields may approximately describe some phenomena in QCD.	https://www.scopus.com/record/display.uri?eid=2-s2.0-85087526359&doi=10.1088/2f1402-4896%2fab9791&origin=inward&txGid=eeb4f222b65544d4442cec9f6b3d68f9

48.	Superhydrophobic carbonous surfaces production by PECVD methods	Orazbayev, S., Zhumadilov, R., Zhunisbekov, A., Gabdullin, M., Yerlanuly, Y., Utegenov, A., Ramazanov, T.	2020	Applied Surface Science	The paper presents the results of a complex study of superhydrophobic surfaces obtained by PECVD methods in RF discharge plasma with gas mixtures (Ar/CH ₄ and Ar/C ₂ H ₂) and by plasma jet (Ar/CH ₄). In both experiments hydrophobic surfaces were obtained by deposition of carbon nanoparticles on glass and silicon substrates by plasma of Ar (93%) + CH ₄ (7%) and Ar (93%) + C ₂ H ₂ (7%) gas mixtures. To compare surfaces with high hydrophobicity produced by the above two methods their contact angles were studied. The dependence of changes in the contact angle on the storage time of the samples under normal conditions show that samples obtained in Ar/CH ₄ plasma and plasma jet at atmospheric pressure are much better preserved.	https://www.scopus.com/record/display.uri?id=2-s2.0-85081659297&doi=10.1016%2fj.apsusc.2020.146050&origin=inward&txGid=9a9be7dc8fdc9f5558ffe57a4f70ff1d
49.	Ion energy-loss characteristics and friction in a free-electron gas at warm dense matter and nonideal dense plasma conditions	Moldabekov, Z.A., Dornheim, T., Bonitz, M., Ramazanov, T.S.	2020	Physical Review E	We investigate the energy-loss characteristics of an ion in warm dense matter (WDM) and dense plasmas concentrating on the influence of electronic correlations. The basis for our analysis is a recently developed ab initio quantum Monte Carlo- (QMC) based machine learning representation of the static local field correction (LFC) [Dornheim, J. Chem. Phys. 151, 194104 (2019)JCPA60021-960610.1063/1.5123013], which provides an accurate description of the dynamical density response function of the electron gas at the considered parameters. We focus on the polarization-induced stopping power due to free electrons, the friction function, and the stragglng rate. In addition, we compute the friction coefficient which constitutes a key quantity for the adequate Langevin dynamics simulation of ions. Considering typical experimental WDM parameters with partially degenerate electrons, we find that the friction coefficient is of the order of $\gamma/\omega_{pi}=0.01$, where ω_{pi} is the ionic plasma frequency. This analysis is performed by comparing QMC-based data to results from the random-phase approximation (RPA), the Mermin dielectric function, and the Singwi-Tosi-Land-Sjölander (STLS) approximation. It is revealed that the widely used relaxation time approximation (Mermin dielectric function) has severe limitations regarding the description of the energy loss of ions in a correlated partially degenerate electrons gas. Moreover, by comparing QMC-based data with the results obtained using STLS, we find that the ion energy-	https://www.scopus.com/record/display.uri?id=2-s2.0-85086302088&doi=10.1103%2fPhysRevE.101.053203&origin=inward&txGid=c84ac343d88ba5846046d3372c8c2236

					loss properties are not sensitive to the inaccuracy of the static local field correction (LFC) at large wave numbers, $k/k_F > 2$ (with k_F being the Fermi wave number), but that a correct description of the static LFC at $k/k_F 1.5$ is important.	
50.	Collision between a charged particle and a polarizable neutral particle in plasmas	Bastykova, N.K., Moldabekov, Z.A., Kodanova, S.K., Ramazanov, T.S	2020	Physics of Plasmas	The collision of a polarizable neutral particle with a charged particle in plasmas is studied. The neutral particle interaction with a charged particle is considered to be due to an induced dipole moment. Taking into account screening and a finite size of colliding particles, we present accurate and simple interpolation formulas for the total scattering cross section in the case of contact of the neutral particle with the dust particle surface. The results are obtained for both weak and strong coupling between colliding particles.	https://www.scopus.com/record/display.uri?eid=2-s2.0-85084182851&doi=10.1063%2F5.0004163&origin=inward&txGid=6e773986798836d7f3b36d4b73cc978c
51.	Obtaining of carbon nanowalls in the plasma of radio-frequency discharge	Batryshev, D., Yerlanuly, Y., Alpysbaeva, B., Nemkaeva, R., Ramazanov, T., Gabdullin, M.	2020	Applied Surface Science	In this work a synthesis of carbon nanowalls (CNWs) in the plasma of argon and methane gases of capacitively coupled radio-frequency (CCRF) discharge is considered. The carbon nanowalls were synthesized by plasma enhanced chemical vapor deposition method at relatively lower values of discharge power and gas flow rate for low-cost CNWs production. The growth process of carbon nanowalls was studied at different synthesis parameters. The morphology and structure quality of obtained samples were investigated by Raman spectroscopy, scanning electron and atomic force microscopies. It was found, that at a lower value of RF power the formation of CNWs goes better with increasing methane flow rate and further increasing RF power leads to agglomeration of nanowalls and formation of nanoclusters, which then transfer into multilayered graphene. Thus, on the basis of obtained results, a process map with different zones of deposited carbon nanostructures is developed.	https://www.scopus.com/record/display.uri?eid=2-s2.0-85074139354&doi=10.1016%2Fj.apsusc.2019.144119&origin=inward&txGid=c273363f30691414485c257544b28b9d
52.	Dynamic characteristics of three-dimensional strongly coupled plasmas	Arkhipov, Y.V., Ashikbayeva, A., Askaruly, A., Davletov, A.E., Dubovtsev, D.Y.,	2020	Physical Review E	The dynamic structure factor and other dynamic characteristics of strongly coupled one-component plasmas have been studied [Yu. V. Arkhipov, Phys. Rev. Lett. 119, 045001 (2017)PRLTAO0031-	https://www.scopus.com/record/display.uri?eid=2-s2.0-

		Santybayev, K.S., Syzganbayeva, S.A., Conde, L., Tkachenko, I.M.			900710.1103/PhysRevLett.119.045001] using the self-consistent version of the method of moments. Within any version of the latter, the system dielectric function satisfies all involved sum rules and other exact relations automatically, and the advantage of this version is that, in addition, the dynamic characteristics (the dynamic structure factor, the dispersion, and decay parameters of the collective modes) are all expressed in terms of the static ones (the static structure factor) without any adjustment to the simulation data. The approach outlined in the aforementioned Letter is justified in detail and applied mainly to the classical Coulomb systems achieving satisfactory agreement with new numerical simulation data. It is shown how the realm of applicability of the method can be extended to partly degenerate and multicomponent systems, even to simple liquids. Some additional theoretical results are presented in the Supplemental Material.	85097581584&doi=10.1103%2FPhysRevE.102.053215&origin=inward&txGid=0ca04a04c5d4607ffc0fd275d8229857
53.	Performance optimization of back-contact perovskite solar cells with quasi-interdigitated electrodes	Shalenov, E.O., Dzhumagulova, K.N., Ng, A., Jumabekov, A.N.	2020	Solar Energy	A numerical simulation method is used to investigate intricacies of a complex relation between the back-contact electrode (BCE) geometric parameters, the perovskite photo-absorber layer electronic properties, and device performance in back-contact perovskite solar cells (BC-PSCs) with quasi-interdigitated electrodes (QIDEs). To unlock the full potential of BC-PSC with QIDEs, the device performance was investigated by systematically varying the geometric parameters of BCE and the perovskite photo-absorber layer electronic parameters in order to determine the conditions for a best device performance. BC-PSC with QIDEs have a potential to produce power conversion efficiencies (PCEs) higher than PSCs with the conventional sandwich architecture if optimized parameters for electrode geometry and perovskite electronic properties are used. The findings of the present work give an insight into the work principle of these devices and provide a theoretical guidance for design and fabrication of high-performance BC-PSC with QIDEs.	https://www.scopus.com/record/display.uri?eid=2-s2.0-85085204203&origin=resultslist&sort=plf-f&src=s&nlo=&nlr=&nls=&sid=0d429ca8af0dab7edbfa74eb7579cc4f&sot=aut&sdt=cl&cluster=scoprefnameauid%2c%22Ramazanov%2c+T.S.%236701328029%22%2cf%2c%22Gabdullin%2c

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54.	The pulse vacuum-arc plasma generator for nanoengineering application	Zhukeshov, A.M., Gabdullina, A.T., Amrenova, A.U., Fermakhan, K.	2020	Applied Physics A: Materials Science and Processing	In paper described the results of work on the application of vacuum-arc machine in nanoengineering area. Researches were carried out to optimize the operation of this machine for the synthesis of nanomaterials in low-pressure arc-discharge plasma, plasma diagnosis and production of nanopowders. An electrode system based on the grounded cathode with impulse ignition has been developed. The anode current was measured and the mass output of the product was calculated. Experimental data on energy density were obtained, confirming the presence of plasma focusing on the electrode system axis due to its own magnetic field, the focus value of which reaches about 18 kJ/m ² . Powder samples were also obtained in the form of clusters containing the copper particles (up to 98%) and spherical powder with size from 116 nm to	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85089953433&doi=10.1007%2fs00339-020-03922-7&partnerID=40&md5=a7b210da300f039526c330d39971e935

					1.2 μm . Homogeneity and dispersion of powder depended on the time of the processes accompanying the deposition.	
55.	Plasma-grain interaction in ultracold complex plasmas	Sundar S., Moldabekov Z.A.	2020	Physics of Plasmas	The present particle-in-cell simulation for grain-plasma interaction at cryogenic temperatures springs from recent experimental realization of ultracold dusty plasmas with atoms and ions at superfluid helium temperatures. In this work, we discuss the results of particle-in-cell simulations (taking into account ion-atom collisions) for dust particle charge, ion drag force, and interaction between grains in ultracold dusty plasmas. The single grain as well as two grain system is investigated, considering both streaming ions and equilibrium ions. The dependence of plasma mediated inter-grain interactions on the streaming velocity of ions and inter-particle separation is delineated in detail. Additionally, ion density distribution around grains is discussed. The interactions at cryogenic temperatures are distinct from those at room temperature by their differences in magnitude and interaction mechanism details. Most remarkable features are (i) the inter-grain attraction in equilibrium plasmas due to plasma absorption on the surface of grains, (ii) the ion drag force directed against ion streaming velocity in the case of a single dust particle, and (iii) non-linear response of the plasma polarization around grains with an increase in the streaming velocity of ions.	https://www.scopus.com/record/display.uri?eid=2-s2.0-85081123431&origin=resultslist&sort=plf-f&src=s&nlo=&nlr=&nls=&sid=05847e425fb443898eac83b172907f35&sot=aut&sdt=cl&cluster=scoprefnameau id%2c%22Razanov%2c+T.S.%236701328029%22%2cf%2c%22Kodanova%2c+S.K.%236504252200%22%2cf%2c%22Bastykova%2c+N.K.%2354390754300%22%2cf%2c%22Dornheim%2c+T.%2357191924827%22%2cf%2c%22Dzhumagulova%2c+K.N.%236505818372%22%2cf%2

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56.	Ultracold ions wake in dusty plasmas	Sundar S., Moldabekov Z.A.	2020	New Journal of Physics	Motivated by the recent experimental realization of ultracold dusty plasma (2019 Sci. Rep. 9 3261), we present the results of particle-in-cell simulation with Monte-Carlo-collisions for wake behind a dust particle due to focusing of ions at superfluid helium temperature (2 K). Dynamical screening (wakefield) defines structural and dynamical properties of charged dust particles in plasmas such as phase transition, crystal formation, vibration modes (waves) etc. Here, we delineate in detail the dependence of wake strength on the streaming velocity of ions and on the ion-neutral charge exchange collision frequency (neutrals density) in the ultracold dusty plasma. Lowering the temperature to ultracold level leads to a wake pattern behind a dust particle that completely differs from the wake at normal conditions. For wide range of parameters, most remarkable features of the wakefield are (i) the formation of wake pattern with two	https://www.scopus.com/record/display.uri?eid=2-s2.0-85083342534&origin=resultslist&sort=plf-f&src=s&nlo=&nlr=&nls=&sid=05847e425fb443898eac83b172907f35&sot=aut&sdt=cl&cluster=scoprefnameau

				<p>maxima split in transverse to ion flow direction in the downstream area, (ii) pronounced inverse V shape of the wakefield closely resembling the wake in quark-gluon plasma and dense quantum plasma (warm dense matter), and (iii) the inter-dust attraction region in transverse direction. The latter shows that molecule-like interaction between dust particles is realized in ultracold dusty plasmas. These observations show a fundamental difference of ultracold dusty plasma physics from well studied complex plasmas at normal conditions.</p>	<p>id%2c%22Ramazanov%2c+T.S.%236701328029%22%2cf%2c%22Kodanova%2c+S.K.%236504252200%22%2cf%2c%22Bastykova%2c+N.K.%2354390754300%22%2cf%2c%22Dornheim%2c+T.%2357191924827%22%2cf%2c%22Dzhumagulova%2c+K.N.%23650581837%22%2cf%2c%22bscoprefname%2c%22Zhukeshov%2c+A.M.%236506178953%22%2cf%2c%22bscoprefname%2c%22Ramazanov%2c+T.S.%236701328029%22%2cf%2c%22bscoprefname%2c%22Zhukeshov%2c+A.M.%236506178953%22%2cf%2c%22&sl=18&s=AU-</p>
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57.	Oblique magnetic field influence on the wakefield in complex plasmas	Sundar S., Moldabekov Z.A.	2020	Plasma Physics and Controlled Fusion	The results of an investigation of the wakefield around a stationary charged grain in an external magnetic field with non-zero transverse component with respect to the ion flow direction is presented. In contrast to the previously reported significant suppression of the wake oscillations due to the magnetic field applied along the flow, the wake potential exhibits long range recurrent oscillations in the presence a of transverse flow to the magnetic field. Extensive analysis for a wide range of parameters elucidate a strong dependence of the wake on the orientation of the magnetic field in the sonic and supersonic regimes by manifesting sensitivity to even a meager deviation of magnetic field from the longitudinal direction. The impact of the orientation and strength of magnetic field on the wake behavior is assessed. The deviation of the magnetic field induction vector from the longitudinal to ion flux direction leads to the wakefield with two positive peaks split in the transverse to ion flow direction in the downstream region; similar to that of the ultracold ions wake without magnetic field [(2020) New J. Phys. 22 033028].	https://www.scopus.com/record/display.uri?eid=2-s2.0-85092056762&origin=resultslist&sort=plf-f&src=s&nlo=&nlr=&nls=&sid=05847e425fb443898eac83b172907f35&sot=aut&sdt=cl&cluster=scoprefnameauid%2c%22Razmazanov%2c+T.S.%236701328029%22%2cf%2c%22Kodanova%2c+S.K.%236504252200%22%2cf%2c%22Bastykova%2c+N.K.%2354390754300%22%2cf%2c%22Dornheim%2c+T.%2357191924827%22%2cf%2c%22Dzhumagulov

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