

## **Данные об официальных оппонентах и ведущей организации**

по диссертации Елецких Ивана Владимировича “Поиск нового бозона  $Z^*$  в данных протон-протонных столкновений детектора ATLAS в канале с двумя мюонами в конечном состоянии” на соискание ученой степени кандидата физико-математических наук по специальности 01.04.16 – “Физика атомного ядра и элементарных частиц”.

### **Официальные оппоненты**

#### **1. Петрухин Анатолий Афанасьевич**

доктор физико-математических наук, профессор кафедры экспериментальной ядерной физики и космофизики Национального исследовательского ядерного университета “МИФИ”, руководитель научно-образовательного центра НЕВОД;

aapetrukhin@mephi.ru;

тел. +7 (495) 788-56-99, доб. 9929, факс +7 (499) 324-87-80;

115409, г. Москва, Каширское ш., 31, НИЯУ “МИФИ”.

#### Список избранных публикаций Петрухина А.А. за 2009-2014 гг.:

1. R.P. Kokoulin, A.G. Bogdanov, G. Mannocchi, [A.A. Petrukhin](#), O. Saavedra, V.V. Shutenko, G. Trinchero, I.I. Yashin, *Local muon density spectra at large zenith angles as a probe of high-energy hadronic interaction models*, Nuclear Physics B - Proceedings Supplements, 01/2009; 196:106-109;
2. A.G. Bogdanov, R.P. Kokoulin, Yu.F. Novoseltsev, R.V. Novoseltseva, V.B. Petkov, [A.A. Petrukhin](#), *Investigation of the spectrum of high-energy muons by the method of multiple interactions on the basis of data from the Baksan underground scintillation telescope*, Physics of Atomic Nuclei 01/2009; 72(12):2049-2058;
3. D.A. Timashkov, Yu.V. Balabin, N.S. Barbashina, E.V. Vashenyuk, K.G. Kompaniets, G.Mannocchi, [A. A. Petrukhin](#), O. Saavedra, G. Trinchero, V.V. Shutenko, I.I. Yashin, *Detection of GLE of December 13, 2006, using the muon hodoscope*, Bulletin of the Russian Academy of Sciences Physics 01/2009; 73(3):309-311;
4. S.Yu. Matveev, V.I. Galkin, M.G. Kogan, R.P. Kokoulin, A.A. Petrukhin, V.S. Puchkov, *Role of very-high-energy muons in generation of penetrating cascades in the Pamir experiment*, Bulletin of the Russian Academy of Sciences Physics 06/2009; 73(5):633-636;
5. A.G. Bogdanov, R.P. Kokoulin, Yu.F. Novoseltsev, R.V. Novoseltseva, V.B. Petkov, [A.A. Petrukhin](#), *Energy spectrum of cosmic ray muons in  $\sim 100$  TeV energy region reconstructed from the BUST data*, Astroparticle Physics 11/2009;
6. S.S. Khokhlov, I.A. Vorob'ev, V.G. Gulyi, I.S. Kartsev, V.V. Kindin, K.G. Kompaniets, M.A. Korolev, [A.A. Petrukhin](#), V.V. Shutenko, I.I. Yashin, *New detecting system of the NEVOD Cherenkov water detector*, Bulletin of the Lebedev Physics Institute 01/2010; 37(4):126-128;
7. N.S. Barbashina, A.N. Dmitrieva, K.G. Kompaniets, A.S. Mikhailenko, [A.A. Petrukhin](#), D.A. Timashkov, S.S. Khokhlov, V.V. Shutenko, E.I. Yakovleva, I.I. Yashin, *Study of dynamics of global disturbances of the Earth's magnetosphere using muon detectors*, Bulletin of the Lebedev Physics Institute 01/2010; 37(6):165-166;
8. A.G. Bogdanov, D.M. Gromushkin, R.P. Kokoulin, G. Mannocchi, [A.A. Petrukhin](#), O. Saavedra, G. Trinchero, D.V. Chernov, V.V. Shutenko, I.I. Yashin, *Investigation of the properties of the flux and interaction of ultrahigh-energy cosmic rays by the method of local-muon-density spectra*, Physics of Atomic Nuclei 01/2010; 73(11):1852-1869;

9. A.N. Dmitrieva, R.P. Kokoulin, [A.A. Petrukhin](#), D.A. Timashkov, *Corrections for temperature effect for ground-based muon hodoscopes*, Astroparticle Physics 01/2011; 34:401-411;
10. V.V. Borog, V.G. Kirillov-Ugryumov, [A.A. Petrukhin](#), V.V. Shestakov, *Study of the nuclear and electromagnetic interactions of high-energy muons*, Canadian Journal of Physics 02/2011; 46(10);
11. N.S. Barbashina, R.P. Kokoulin, K.G. Kompaniets, [A.A. Petrukhin](#), D.A. Timashkov, I.I. Yashin, G. Mannocchi, G. Trinchero, O. Saavedra, *WAVELET ANALYSIS OF ATMOSPHERIC MUON DATA*, International Journal of Modern Physics A 01/2012; 20(29);
12. E.A. Zadeba, N.V. Ampilogov, N.S. Barbashina, A.G. Bogdanov, A.A. Borisov, D.V. Chernov, L.I. Dushkin, R.M. Fakhrutdinov, S. S. Khohlov, R.P. Kokoulin, K.G. Kompaniets, A.S. Kozhin, V.V. Ovchinnikov, [A.A. Petrukhin](#), V.A. Selyakov, V.V. Shutenko, I.I. Yashin, *The coordinate-tracking detector based on the drift chambers for ultrahigh-energy cosmic ray investigations*, Journal of Instrumentation 08/2014; 9(08):C08018;

## **1. Панков Александр Альбертович**

доктор физико-математических наук, профессор кафедры физики, руководитель Лаборатории физических исследований Гомельского государственного технического университета им. П.О. Сухого,

pankov@ictp.it;

Тел. (+375-232) 48-33-94, факс (+375-232) 47-91-65;

Беларусь 246746, Гомель, Проспект Октября, 48, ауд. 434, корпус 2.

### Список избранных публикаций Панкова А.А. за 2009-2014 гг.:

1. P. Osland, [A.A. Pankov](#), A.V. Tsyrinov, *Identification of extra neutral gauge bosons at the International Linear Collider*, Eur.Phys.J. C67 (2010) 191-204;
2. A.A. Babich, [A.A. Pankov](#), A.V. Tsyrinov, N.V. Karpenko, *Searches for new neutral gauge Z-prime bosons at the e+ e- International Linear Collider and their identification*, Phys.Atom.Nucl. 73 (2010) 773-784, Yad.Fiz. 73 (2010) 803-815;
3. I.A. Serenkova, [A.A. Pankov](#), *Determination of the spin of the narrow graviton Kaluza-Klein resonances in the process of lepton pair production in the Large Hadron Collider for the ATLAS experiment*, Russ.Phys.J. 53 (2010) 172-181;
4. I.A. Serenkova, [A.A. Pankov](#), A.V. Tsyrinov, V.A. Bednyakov, *Spin identification of graviton resonances in the process p p --> e+ e- + X at the Large Hadron Collider (LHC)*, Phys.Atom.Nucl. 73 (2010) 1266-1282, Yad.Fiz. 73 (2010) 1307-1323;
5. V.V. Andreev, G. Moortgat-Pick, P. Osland, [A.A. Pankov](#), N. Paver, *Discriminating Z' from Anomalous Trilinear Gauge Coupling Signatures in e+e--> W+W- at ILC with Polarized Beams*, Eur.Phys.J. C72 (2012) 2147;
6. A.V. Tsyrinov, J. Kalinowski, P. Osland, [A.A. Pankov](#), *Sneutrino Identification in Lepton Pair Production at ILC with Polarized Beams*, Phys.Lett. B718 (2012) 94-99;
7. V.V. Andreev, [A.A. Pankov](#), *Distinguishing Indirect Signatures of New Physics at the International Linear Collider: Z' Versus Anomalous Gauge Couplings*, Nonlin.Phénom.Complex Syst. 16 (2013) 51-57;

8. I.D. Bobovnikov, [A.A. Pankov](#), *Constraints on Extra Neutral Gauge Bosons from  $W^+W^-$  Production at the ILC*, Nonlin.Phénom.Complex Syst. 16 (2013) 382-387;
9. V.V. Andreev, P. Osland, [A.A. Pankov](#), *Precise determination of Z-Z' mixing at the CERN LHC*, Phys.Rev. D90 (2014) 055025;
10. [A.A. Pankov](#), I.A. Serenkova, A.V. Tsytrinov, *Probe of extra dimensions in lepton pair production at the LHC: An update*, AIP Conf.Proc. 1606 (2014) 128-133;
11. V.V. Andreev, [A.A. Pankov](#), *Z-Z' Mixing in  $W^\pm$  Pair Production at the CERN Large Hadron Collider*, Nonlin.Phénom.Complex Syst. 17 (2014) 1, 10-16;

### **Ведущая организация**

**Московский государственный университет им. М.В. Ломоносова;**

info@rector.msu.ru;

Тел.: +7 (495) 939-10-00, факс: +7 (495) 939-01-26;

119991, Москва, Ленинские горы, д. 1, Московский государственный университет имени М.В.Ломоносова.

### Список избранных публикаций сотрудников МГУ за 2009-2014 гг.:

1. Gladilin L.K., Grishkevich Iu.V., Kramarenko V.A., Rud V.I., Sivoklokov S.Iu., Smirnova L.N., *Measurement of WZ Production in Proton-Proton Collisions at  $\sqrt{s} = 7 \text{ TeV}$  with the ATLAS Detector*, European Physical Journal C, V.72, 2012, p.2173;
2. A.V. Beliaev, E.E. Boos, V.E. Bunichev, M.N. Dubinin, L.V. Dudko, A.A. Ershov, A.M. Gribushin, I.I. Katkov, V.I. Kliukhin, I.P. Lokhtin, A.A. Markina, S.V. Obraztcov, M.A. Perfilov, S.V. Petrushanko, A.A. Popov, V.I. Savrin, A.M. Snigirev, *Search for a light pseudoscalar Higgs boson in the dimuon decay channel in pp collisions at  $\sqrt{s} = 7 \text{ TeV}$* , Physical Review Letters, V.109, 2012, 121801;
3. A.V. Beliaev, E.E. Boos, V.E. Bunichev, M.N. Dubinin, L.V. Dudko, A.A. Ershov, A.M. Gribushin, I.I. Katkov, V.I. Kliukhin, I.P. Lokhtin, A.A. Markina, S.V. Obraztcov, M.A. Perfilov, S.V. Petrushanko, A.A. Popov, V.I. Savrin, A.M. Snigirev, *Performance of CMS muon reconstruction in pp collision events at  $\sqrt{s} = 7 \text{ TeV}$* , Journal of Instrumentation, V.7, 2012, 010002;
4. A.S. Boldyrev, L.K. Gladilin, Iu.V. Grishkevich, V.A. Kramarenko, V.I. Rud, S.Iu. Sivoklokov, L.N. Smirnova, S.M. Turchikhin, *Search for Microscopic Black Holes in a Like-sign Dimuon Final State using large Track Multiplicity with the ATLAS detector*, Physical Review D - Particles, Fields, Gravitation and Cosmology, V.88, 2013, 7, 072001;
5. A.S. Boldyrev, L.K. Gladilin, Iu.V. Grishkevich, V.A. Kramarenko, V.I. Rud, S.Iu. Sivoklokov, L.N. Smirnova, S.M. Turchikhin, *Search for excited electrons and muons in  $\sqrt{s} = 8 \text{ TeV}$  proton-proton collisions with the ATLAS detector*, New journal of physics. 2013, vol. 15, no. 093011, p. 32;
6. E.E. Boos, V.E. Bunichev, L.V. Dudko, D.E. Karmanov, V.A. Kuzmin, M.M. Merkin, Perfilov M.A., *Search for Higgs boson production in trilepton and like-charge electron-muon final states with the D0 detector*, Physical Review D - Particles, Fields, Gravitation and Cosmology, V.88, 2013, 5, 52009;
7. A.V. Beliaev, E.E. Boos, V.E. Bunichev, M.N. Dubinin, L.V. Dudko, A.A. Ershov, A.M. Gribushin, I.I. Katkov, V.I. Kliukhin, I.P. Lokhtin, A.A. Markina, S.V. Obraztcov, M.A. Perfilov, S.V. Petrushanko, A.A. Popov, V.I. Savrin, A.M. Snigirev, *Search for anomalous production of highly boosted Z bosons decaying to dimuons in pp collisions at  $\sqrt{s}=7 \text{ TeV}$* ,

Physics Letters, Section B: Nuclear, Elementary Particle and High-Energy Physics, V.722, 2013, p.28-47;

8. A.V. Beliaev, E.E. Boos, V.E. Bunichev, M.N. Dubinin, L.V. Dudko, A.A. Ershov, A.M. Gribushin, I.I. Katkov, V.I. Kliukhin, I.P. Lokhtin, A.A. Markina, S.V. Obraztcov, M.A. Perfilov, S.V. Petrushanko, A.A. Popov, V.I. Savrin, A.M. Snigirev, *Search for a non-standard-model Higgs boson decaying to a pair of new light bosons in four-muon final states*, Physics Letters, Section B: Nuclear, Elementary Particle and High-Energy Physics, V.726, 2013, p.564-586;
9. LHCb Collaboration, *Measurement of the CKM angle  $\gamma$  using  $B \pm \rightarrow D K^\pm$  with  $D \rightarrow K_S^0 \pi^+ \pi^-$ ,  $K_S^0 K^+ K^-$  decays*, JHEP 1410 (2014) 97;
10. LHCb Collaboration, *First observations of the rare decays  $B^+ \rightarrow K^+ \pi^+ \pi^- \mu^+ \mu^-$  and  $B^+ \rightarrow \phi K^+ \mu^+ \mu^-$* , JHEP 1410 (2014) 64;
11. A.S. Boldyrev, A.S. Romanyuk, S.Yu. Smirnov, V.O. Tikhomirov, *Modeling the drift properties of gas mixtures of a GasPixel detector for upgrading the ATLAS setup*, Phys.Part.Nucl.Lett. 11 (2014) 43-53, Pisma Fiz.Elem.Chast.Atom.Yadra (2014) 2, 312–324;