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REPORT ON THE RESEARCH ACTIVITIES OF THE Center FOR THEORETICAL PHYSICS PAS in 2016

In 2016, the Center for Theoretical Physics PAS was engaged in research activity in the following topics:

Topic 1. Mathematical and cosmological aspects of the evolution of gravitational fields

Topic 2. Quantum mechanics of non-linear and complex systems

Topic 3. Physical foundations of information processing

Topic 4. Thermodynamics and dynamics of mesoscopic quantum systems

Topic 5. Applying classical methods and quantum dispersion theory to studying structures of physical objects

Topic 6. Studying space phenomena across a range of time scales

Topic 7. Geometry of maximally nonintegrable vector distributions on manifolds

Topic 8. High-energy astrophysics

Topic 9. Science and society

Topic 10. Optoelectronics and automation in studying the control and regulation of behavior using neuroengineering methods

Topic 11. Using electrodynamics methods to describe gravitational waves

Topic 12. Observational constraints on the properties of dark energy

The Center's research work in 2016 was mainly implemented as part of its statutory activity and under **16** research projects in Poland financed by the National Science Center and the Ministry of Science and Higher Education, as well as under **three** international research projects. The Center

is a member of the QULAPS consortium implementing the ERC Advanced Grant “Quantum Resources: Conceptuals and Applications”, a project led by Prof. R. Horodecki from the University of Gdańsk, which is being implemented at the Center by Prof. M. Kuś. Prof. M. Kuś was likewise the lead researcher for the Intrinsic Randomness in the Quantum World project, financed by the John Templeton Foundation. The [Horyzont 2020](#) EU Framework Programme, in turn, is the EU’s largest research and innovation project.

Since the foundation of Horizon 2020 in 2014, **16 projects** have been awarded Marie Skłodowska-Curie Individual Fellowships, including **two to the Center for Theoretical Physics PAS**. The first is Dr. Remigiusz Augusiak’s “Non-locality in multipartite quantum systems”. The second, “Dance of the galaxies: testing general relativity and alternatives using galaxy velocity fields” led by Dr. Wojciech Hellwing, is at the stage of contract negotiations with the European Commission. The Center’s employees are also working on **four** further research projects, both domestic and international, coordinated by other scientific institutions.

In 2016, the Center’s academic potential continued to develop. Using grants and resources subsidizing its research potential, the Center has employed more scientific staff, lecturers and assistants. In 2016, the Center had an average of **33.2** full-time staff positions, including **28** research positions.

The Center’s employees published **50** research papers in peer-reviewed journals **37** of which are indexed by ISI, including **15** in *Physical Review* (**one** in *PRX*), **two** in *Physical Review Letters*, **three** in the *New Journal of Physics* and **four** in the *Astrophysical Journal*. They also published **eight** popular science articles and delivered **117** talks at domestic and international conferences and science seminars.

Two of the papers written at the Center in 2016 were recognized by *European Physics Letters* as among the **most interesting papers published in 2016**.

Since 2014, the Center for Theoretical Physics PAS has had a dedicated **YouTube channel**, <https://www.youtube.com/channel/UCBmbEBj4eybdApFesQCcc2w>, presenting recordings of seminars and lectures held at the Center. The channel has 700 subscribers, and we have already shared 140 films which have been viewed 85,000 times. This avenue for informing the public of our ongoing activities is a core part of our policy of openness and open access.

Collaboration with research institutes abroad plays an important part in the Center’s activities. In 2016, international journals published 37 papers authored by the Center’s employees in conjunction with scientists working at institutions in other countries. As part of our international collaborations, the Center’s scientists took **73** short research trips abroad. The Center received **11** international guests and hired **four** researchers from abroad. **In 2016, the Center worked with 27 international scientific institutions without signed agreements, pursuing 30 research topics.**

Last year, the Center co-organised nine international scientific conferences.

The Center continues recruiting talented science students for research internships lasting between one and three months. **Many students continue working with the Center for Theoretical Physics PAS and they are frequently employed at research projects conducted at the Center.**

In 2016, a sizable group of **young physicists (11 research assistants)** worked on their PhDs, and a further 11 on their DScs (*habilitations*). Two staff members, Dr. Musumbu Dibwe and Dr. Adam Sawicki, obtained further scientific qualifications.

The Center and the PAS Institute of Physics are participants in the International PhD Studies program. The Center has also signed an agreement according to which our employees are able to study for PhDs at the PAS Nicolaus Copernicus Astronomical Center, which three of them are doing. A further two employees are participating in PhD courses at the PAS Institute of Physics and one at the PAS Astronomical Center.

Last year, our extended family become larger when **one of our employees had a baby.**

Books for the Center's on-site library are generally purchased using funds for individual research projects. Since 2012, the Center has no longer been subscribing to traditional printed journals, with online access to major journal databases provided through the Center's participation in **consortiums** and the Poland-wide **Virtual Science Library** financed by the Ministry of Science and Higher Education since 2010. The Center's employees are able to access **21 international journals** as part of the consortium with the American Physical Society and American Institute of Physics. The Center has a local **intranet** and access to the **Internet**, while our databases are systematically updated and upgraded.

The Center is an active member of the **National Quantum Information Center in Gdańsk**, which also incorporates the Gdańsk University of Technology, the University of Gdańsk, the Adam Mickiewicz University in Poznań, the Jagiellonian University in Kraków, the University of Łódź, the Nicolaus Copernicus University in Toruń and the University of Wrocław.

The Center's employees are members of numerous scientific boards, committees and other research organizations. **Prof. Marek Kuś** is a member of the Scientific Councils at the PAS Institute of Physics, the Institute for Social Studies at the University of Warsaw and the Institute of Theoretical Physics at the University of Warsaw, Chairman of the Scientific Board of the National Quantum Information Center in Gdańsk, editor of the *International Journal of Quantum Information* and member of the editorial committees of *Reports on Mathematical Physics*, *Journal of Physics B* and *Open Systems and Information Dynamics*. **Karol Życzkowski** is a member of the editorial committee of *Open Systems and Information Dynamics*. **Prof. Kazimierz**

Rzǎzewski is a member of the Scientific Board of the National Laboratory of Atomic, Molecular and Optical Physics, Chairman of the Scientific Board of the Center for Atom and Light Quantum Engineering and a Fellow of the American Physical Society and the Institute of Physics in the UK. **Prof. Bożena Czerny** is **editor** of *The Astrophysical Journal* and represents Poland in the **COST Action TD1403 Big Data Era in Sky and Earth Observation** program. **Prof. Lech Mankiewicz** is a member of the Program Board of the Science Festival in Warsaw. The Center's employees participate in 52 scientific boards, editorial committees and expert panels.

Last year, the Center was actively involved in **popularizing physics**. You can find extensive information on our educational activities and those popularizing the Center's research activities on our website <http://www.cft.edu.pl/edu/> .

As part of the **20th Science Festival**, the Center hosted an academic session “Soaring and earthbound physics” on 2 October 2016.

Prof. Lech Mankiewicz is the national coordinator of the program “Universe in your own hands”, editor of the EUHOU-PL portal <http://www.pl.euhou.net>, and coordinator of the Citizen Science Portal “Zooniverse” in Poland. He is also the coordinator of the Polish-language resources of **Khan Academy**. Thanks to funds from the PKO Bank Polski Foundation, the Orange Foundation, private donors and money raised by volunteers, those resources include over 3,000 films on various scientific topics, viewed over six million times, as well as 90% of the mathematics portal, where users have tackled over ten million problems over two and a half years. The most popular materials are films on biology, chemistry and physics as well as interactive materials on programming. The Center's employees actively participate in the development of physics teaching resources.

Our employees make public appearances in the media and give interviews to the press, radio and TV (more on the Center's website <http://www.cft.edu.pl/media.php>). Particularly notable are activities conducted by **Prof. Łukasz A. Turski**; the majority of his appearances with references can be found on web.me.com/lukaszturski. Prof. Turski has published **four** popular science articles on Project-Syndicate.pl. He has also been awarded the **Prof. Maciej W. Grabski Prize** by the **Foundation of Polish Science** for his contributions to improving the public understanding of science.

Research projects conducted at the Center for Theoretical Physics PAS in 2016

Research projects conducted in Poland

Leader	Topic	Project no.	From-to
Prof. Karol Życzkowski	<i>Uncertainty principles and quantum entanglement</i>	2015/18/A/ST2/00274	2016-2021
Dr. Adam Sawicki	<i>Optimality, universality and controllability in quantum calculation theory</i>	2015/18/E/ST1/00200	2016-2021
Prof. Jerzy Kijowski	<i>Stability of the initial problem for Einstein equations: classical and quantum aspects</i>		2017-2020
Dr. Agnieszka Kuźmicz, with assistance from Prof. Bożena Czerny	<i>Stellar populations of gigantic radio sources</i>	016/20/S/ST9/00142	2016-2019
Prof. Kazimierz Rzażewski	<i>Quantum gas dynamics</i>	2015/19/B/ST2/02820	2016-2019
Prof. Bożena Czerny	<i>Main quasar sequence</i>	2015/17/B/ST9/03436	2016-2019
Prof. Iwo Białynicki- Birula	<i>Reproducing geometry from distributed data</i>	UMO- 2012/07/B/ST1/03347	2013-2016
Prof. Agnieszka Janiuk	<i>Astrophysics of processes around dense cosmic objects</i>	UMO- 2012/05/E/ST9/03914	2013-2018
Prof. Kazimierz Rzażewski	<i>Thermal phenomena in cold atomic gases</i>	UMO- 2012/04/A/ST2/00090	2012-2016
Prof. Jerzy Kijowski	<i>Gravitational field energy: geometrical, functional and analytical aspects and physical applications</i>	UMO- 2011/03/B/ST1/02625	2012-2015
Prof. Marek Kuś	<i>Solvability, chaos and control of quantum systems</i>	UMO- 2011/02/A/ST1/00208	2012-2016
Prof. Paweł Nurowski	<i>Monge distribution geometry</i>	UMO- 2013/09/B/ST1/01799	2014-2016
Dr. Michał Ozmaniec	<i>Applications of measure concentration to studying statistical properties of quantum systems</i>	UMO- 2013/09/N/ST1/02772	2014-2016
Tomasz Maciążek, MS	<i>Multi-qubit maximally entangled states and equivalence of states due to SLOCC operations</i>	0165/DIA/2014/43	2014-2018
Dr. Łukasz Rudnicki	<i>Decoherence of non-Gaussian states</i>	UMO- 2014/13/D/ST2/01886	2015-2017
Dr. Krzysztof Pawłowski	<i>Entanglement and decoherence of ultra-cold atoms</i>	UMO- 2014/13/D/ST2/01883	2015-2018

International research projects

Leader	Topic	Project no.	From-to
Dr. Remigiusz Augusiak	<i>Non-locality in Multipartite Quantum Systems</i>	ID# 705109	2016-2018
Prof. Marek Kuś	<i>Quantum Resources: Conceptuals and Applications, (QOLAPS)</i>	ERC-2011-AGD_2011020 9	2012-2016
Prof. Marek Kuś	<i>Intrinsic Randomness in the Quantum World</i>	ID# 4137	2013-2016

Research projects conducted at other institutions with the participation of the Center's employees

Center for Theoretical Physics PAS employee	Topic	Leader (unit)	From-to
Prof. Lech Mankiewicz	<i>Control and regulation of behaviours using neuroengineering methods</i>	Prof. A. Wróbel IBD im. NENCKIEGO	2013-2018

International collaboration

Partnerships with international academic institutes play an essential role in the Center's research program laid out for each given year. Research conducted as part of the Center's statutory activity and under specific projects is frequently conducted in conjunction with scientists from abroad.

In 2016, the Center continued its direct research collaboration agreement, signed in 2011, with several academic institutions in Germany coordinated by the **Institut für Theoretische Physik Universität in Cologne** as part of the research project DFG no. SFB/TR-12. The group includes

universities in **Bochum, Cologne and Duisburg/Eszen**. In 2012, the Center signed a collaborative agreement with the **University of Munich** and the **University of Stockholm** as part of the QOLAPS consortium implementing the **ERC Advanced Grant**. The Center also has research agreements with the **Special Astrophysical Observatory of the Russian Academy of Sciences** and the **5th Institute of Physics at the University of Stuttgart**. The agreement between the Polish Academy of Sciences and the Russian Academy of Science includes the “Transient” project implemented by the Pi of the Sky team, represented by the Center for Theoretical Physics PAS and the **Russian Space Institute of the Russian Academy of Sciences**. On behalf of the Pi of the Sky team, the Center has also signed a Memorandum of Understanding with the LIGO and VIRGO experiments conducting observations of optical afterglows associated with sources of gravitational waves.

Publications by employees of the Center for Theoretical Physics PAS in 2016

No.	Authors	Title	Journal
1	Dardo Goyeneche, Karol Życzkowski, Jakub Adam Bielawski	<i>Multipartite entanglement in heterogeneous systems</i>	PHYSICAL REVIEW A, 2016, v. 94, p. 012346, http://journals.aps.org/pra/pdf/10.1103/PhysRevA.94.012346
2	Adam Sawicki	<i>Universality of beamsplitters</i>	QUANTUM INFORMATION AND COMPUTATION, 2016, v. Vol. 16, p. 0291–0312, http://www.rintonpress.com/xxqic16/qic-16-34/0291-0312.pdf
3	Bożena Jadwiga Czerny, Bei You	<i>Accretion in active galactic nuclei and disk-jet coupling</i>	ASTRONOMISCHE NACHRICHTEN, 2016, v. 337, p. 73-81, http://arxiv.org/abs/1507.05852
4	Artur Czerwiński	<i>Optimal evolution models for quantum tomography</i>	Journal of Physics A-Mathematical and Theoretical, 2016, v. 49, p. 075301, http://iopscience.iop.org/article/10.1088/1751-8113/49/7/075301
5	Petra Sukova, Mikołaj Grzędzielski, Agnieszka Janiuk	<i>Chaotic and stochastic processes in the accretion flows of the black hole X-ray</i>	ASTRONOMY AND ASTROPHYSICS, 2016, v. 586, p. 18, http://arxiv.org/abs/1506.02526

		<i>binaries revealed by recurrence analysis</i>	
6	Ivan Šupić, Remigiusz Augusiak, Alexia Salavrakos, Antonio Acín	<i>Self-testing protocols based on the chained Bell inequalities</i>	NEW JOURNAL OF PHYSICS, 2016, v. 18, p. 035013, http://arxiv.org/abs/1511.09220
7	Jose Málek, Kumbakonam Rajagopal, Petra Sukova	<i>Response of a class of mechanical oscillators described by a novel system of differential-algebraic equations.</i>	Applications of Mathematics, 2016, v. 61, p. 79-102, http://link.springer.com/article/10.1007%2Fs10492-016-0123-0
8	Petra Sukova, Agnieszka Janiak	<i>Non-linear behaviour of XTE J1550-564 during its 1998-1999 outburst, revealed by recurrence analysis</i>	ASTRONOMY AND ASTROPHYSICS, 2016, http://www.aanda.org/articles/aa/pdf/forth/aa28428-16.pdf
9	Rafał Ołdziejewski, Wojciech Górecki, Kazimierz Maria Rzązewski	<i>Two dipolar atoms in a harmonic trap</i>	Europhysics Letters, 2016, v. 114, p. 46003, http://iopscience.iop.org/article/10.1209/0295-5075/114/46003
10	Bei You, Odele Straub, Bożena Jadwiga Czerny, Małgorzata Sobolewska, Agata Antonina Różańska, Michal Bursa, Michal Dovicak	<i>Testing Wind as an Explanation for the Spin Problem in the Continuum-fitting Method</i>	ASTROPHYSICAL JOURNAL, 2016, v. 821, p. 1-15, http://arxiv.org/abs/1506.03959
11	Remigiusz Augusiak,	<i>Asymptotic role of</i>	PHYSICAL REVIEW A, 2016, v. 94, p. 012339-1-012339-11, http://arxiv.org/abs/1506.08837

	Jan Kołodzyński, Alexander Streltsov, Manabendra Nath Bera, Antonio Acin, Maciej Lewenstein	<i>entanglement in quantum metrology</i>	
1 2	Waldemar Kłobus, Michał Oszmaniec, Remigiusz Augusiak, Andrzej Tomasz Grudka	<i>Communication Strength of Correlations Violating Monogamy Relations</i>	FOUNDATIONS OF PHYSICS, 2016, v. 46, p. 620-634, http://arxiv.org/abs/1408.1223
1 3	Sven Gnutzmann, Marek Kuś, Jordan Langham-Lopez	<i>Electron-hole coherent states for the Bogoliubov-de Gennes equation</i>	Journal of Physics A-Mathematical and Theoretical, 2016, v. 49, p. 85302, http://arxiv.org/abs/1509.06936
1 4	Alicja Puścian, SZYMON ŁĘSKI, Grzegorz Henryk Kasprówicz, Maciej Winiarski, Joanna Borowska, Tomasz Nikolaev, Paweł M. Michał Owsiany, Hans-Peter Lipp, EWELINA ANNA KNAPSKA	<i>Eco-HAB as a fully automated and ecologically relevant assessment of social impairments in mouse models of autism</i>	eLife, 2016, v. 19532, p. 10.7554/eLife, http://elifesciences.org/content/5/e19532-download.pdf
1 5	Lukas Fiderer, Marek Kuś, Daniel Braun	<i>Quantum-phase synchronization</i>	PHYSICAL REVIEW A, 2016, v. 94, p. 032336 (1-13), http://arxiv.org/abs/1511.04309v1
1 6	Bożena Jadwiga Czerny, Pu Du, Jian-	<i>A TEST OF THE FORMATION</i>	ASTROPHYSICAL JOURNAL, 2016, v. 832, http://arxiv.org/abs/1610.00420

	Min Wang, Vladimir Karas	<i>MECHANIS M OF THE BROAD LINE REGION IN ACTIVE GALACTIC NUCLEI</i>	
1 7	Tek Ad- hikari, Agata An- tonina Różańska, Bożena Jad- wiga Cz- erny, Krzysztof Hryniewicz, Gary Fer- land	<i>The Intermediat e-line Region in Active Galactic Nuclei</i>	ASTROPHYSICAL JOURNAL, 2016, v. 831, p. 68, http://arxiv.org/abs/1606.00284
1 8	Łukasz Marek Rud- nicki, D.S. Tasca, S.P. Walborn	<i>Uncertainty relations for characterist ic functions</i>	PHYSICAL REVIEW A, 2016, v. 93, p. e022109
1 9	Łukasz Marek Rud- nicki, Irene V., Pablo Sánchez- Moreno, Jesús S.	<i>Monotone measures of statistical complexity</i>	PHYSICS LETTERS A, 2016, v. 380, p. 377–380, http://www.sciencedirect.com/science/article/pii/S0375960115009196/pdf?md5=57c622f6f9866223f964de6fafbbcf63&pid=1-s2.0-S0375960115009196-main.pdf
2 0	Łukasz Marek Rud- nicki	<i>Nonlinear Schrödinger equation from generalized exact uncertainty principle</i>	Journal of Physics A-Mathematical and Theoretical, 2016, v. 49, p. 375301, http://iopscience.iop.org/article/10.1088/1751-8113/49/37/375301/meta;jsessionid=9434E7EF019E94BC55BBC59840E4E3AC.c3.iopscience.cld.iop.org
2 1	Jerzy Juliusz Ki- jowski	<i>Universality of the Einstein theory of gravitation.</i>	INTERNATIONAL JOURNAL OF GEOMETRIC METHODS IN MODERN PHYSICS, 2016, v. 13, http://www.worldscientific.com/doi/pdf/10.1142/S0219887816400089
2 2	Michał Osz- maniec, Remigiusz Augusiak, Christian Gogolin, Jan Kołodziej, Antonio Acin, Ma- ciej Lewen-	<i>Random Bosonic States for Robust Quantum Metrology</i>	Physical Review X, 2016, v. 6, p. 041044-1-34, http://journals.aps.org/prx/abstract/10.1103/PhysRevX.6.041044

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2 3	Krzysztof Pawłowski, Esteve Jerome, Reichel Jakob, Sinatra Alice	<i>Limits of atomic entanglement by cavity feedback: From weak to strong coupling</i>	Europhysics Letters, 2016, v. 113, p. 34005, http://epljournal.edpsciences.org/articles/epl/abs/2016/03/epl17692/epl17692.html
2 4	Jan Aleksander Gutt, Gianni Manno, Giovanni Moreno	<i>Completely exceptional 2nd order PDEs via conformal geometry and BGG resolution</i>	Journal of Geometry and Physics, 2016, http://arxiv.org/pdf/1604.08361
2 5	Iwo Białynicki-Birula, Zofia Białynicka-Birula	<i>Gravitational waves carrying orbital angular momentum</i>	NEW JOURNAL OF PHYSICS, 2016, v. 18, p. 023022 6 pages, http://iopscience.iop.org/article/10.1088/1367-2630/18/2/023022/meta
2 6	Dariusz Pątryk Kajtoch, Krzysztof Pawłowski, Emilia Witkowska	<i>Entanglement storage by classical fixed points in the two-axis countertwisting model</i>	PHYSICAL REVIEW A, 2016, v. 93, p. 022331, http://journals.aps.org/pr/abstract/10.1103/PhysRevA.93.022331
2 7	Michał Józwiowski, Witold Respondek	<i>A contact covariant approach to optimal control with applications to sub-Riemannian geometry</i>	MATHEMATICS OF CONTROL SIGNALS AND SYSTEMS, 2016, v. 28, p. 1-47, http://link.springer.com/article/10.1007/s00498-016-0176-3
2 8	Daniel Zdzisław Pęczak, Mariusz Franciszek Gajda, Tomasz Sowiński	<i>Two-flavour mixture of a few fermions of different mass in a one-dimensional harmonic trap</i>	NEW JOURNAL OF PHYSICS, 2016, v. 18, p. 013030, http://iopscience.iop.org/article/10.1088/1367-2630/18/1/013030
2 9	Tomasz Sowiński, Mariusz Franciszek Gajda, Kazimierz Maria	<i>Diffusion in a system of a few distinguishable fermions in a one-dimensional</i>	Europhysics Letters, 2016, v. 113, p. 56003-1-6, http://iopscience.iop.org/article/10.1209/0295-5075/113/56003

	Rzężewski	<i>double-well potential</i>	
30	Marcin Mińkowski, Magdalena Anna Załuska-Kotur, Łukasz Andrzej Turski, Grzegorz Karczewski	<i>Monte Carlo simulations of morphological transitions in PbTe/CdTe immiscible material systems</i>	Journal of Applied Physics, 2016, v. 120, p. 124305-1-124305-9
31	Martin Trappe, Piotr Grochowski, Mirosław Brewczyk, Kazimierz Maria Rzężewski	<i>Ground-state densities of repulsive two-component Fermi gases</i>	PHYSICAL REVIEW A, 2016, v. 93, p. 023612-10, http://journals.aps.org/pr/abstract/10.1103/PhysRevA.93.023612
32	Iwo Białynicki-Birula, Tomasz Radożycki	<i>Trapping neutral particles endowed with a magnetic moment by an electromagnetic wave carrying orbital angular momentum. Semiclassical theory</i>	PHYSICAL REVIEW A, 2016, v. 93, p. 063402 1-8
33	Dibwe Pierrot Musumbu, Maria Jolanta Przybylska, Andrzej Jerzy Maciejewski	<i>Thermalization in Many-Particle Quantum Walks</i>	OPEN SYSTEMS AND INFORMATION DYNAMICS, 2016, v. 23, p. 19, http://arxiv.org/abs/1602.00305
34	Ravishankar Ramathan, Remigiusz Augusiak, Gláucia Murta	<i>Generalized XOR games with d outcomes and the task of nonlocal computation</i>	PHYSICAL REVIEW A, 2016, v. 93, p. 022333-1-022333-9, http://arxiv.org/abs/1502.02974
3	Zbigniew	<i>Distinguish</i>	PHYSICAL REVIEW A, 2016, v. 93, p. 062112, http://arxiv.org/abs/1507.05123

5	Puchała, Łukasz Paweł, Karol Życzkowski	<i>ability of generic quantum states</i>	
3 6	Agnieszka Janiuk, Michał Stanisław Bejger, Szymon Charzyński, Petra Sukova	<i>On the possible gamma-ray burst–gravitational wave association in GW150914</i>	NEW ASTRONOMY, 2017, v. 51, p. 7 14, http://arxiv.org/pdf/1604.07132v3
3 7	Maciej Lewenstein, Remigiusz Augusiak, Dariusz Hilary Chruściński, Swapan Rana, Jan Stefan Samsonowicz	<i>Sufficient separability criteria and linear maps</i>	PHYSICAL REVIEW A, 2016, v. 93, p. 042335-1- 042335-11, http://arxiv.org/abs/1512.08278
3 8	Tomasz Ignacy Tylec, Marek Kuś, Jacek Krajczok	<i>Non-signalling Theories and Generalized Probability</i>	INTERNATIONAL JOURNAL OF THEORETICAL PHYSICS, 2016, v. 56, p. 3832–3842, http://arxiv.org/abs/1512.02457
3 9	Michał Oszmaniec, Andrzej Tomasz Grudka, Michał Horodecki, Antoni Wójcik	<i>Creating a Superposition of Unknown Quantum States</i>	PHYSICAL REVIEW LETTERS, 2016, v. 116, p. 110403, http://link.aps.org/doi/10.1103/PhysRevLett.116.110403
4 0	B.P. Abbott, Arkadiusz Ćwiek, Mikołaj Stefan Ćwiok, Lech Mankiewicz, Rafał Opiela, Marcin Franciszek Zaremba, Aleksander Filip Żarnecki	<i>LOCALIZATION AND BROADBAND FOLLOW-UP OF THE GRAVITATIONAL-WAVE TRANSIENT GW150914</i>	Astrophysical Journal Letters, 2016, v. 826, p. L13, http://arxiv.org/pdf/1602.08492v3

4 1	Bożena Jadwiga Czerny, Bei You, Agnieszka Kurcz, Justyna Średzińska, Krzysztof Hryniewicz, Marek Nikołajuk, Magdalena Krupa, Jian-Min Wang, C Hu, Piotr Tomasz Życki	<i>The mass of the black hole in RE J1034+396</i>	Astronomy and Astrophysics, 2016, http://arxiv.org/abs/1601.02498
4 2	Małgorzata Siudek, Katarzyna Ewa Małek, M. Scodeglio, B. Garilli, Agnieszka Pollo, C.~P. Haines, A. Fritz, M. Bolzonella, S. de-la-Torre, B.~R. Granett, L. Guzzo, U. Abbas, C. Adami, D. Bottini, A. Cappi, O. Cucciati, G. De-Lucia, I. Davidzon, P. Franzetti, A. Iovino, Janusz Krywult, V. LeBrun, O. LeFevre, D. Maccagni, A. Marchetti, F. Marulli, M. Polletta, L.~A.~M. Tasca, R. Tojeiro, D.	<i>The VIMOS Public Extragalactic Redshift Survey (VIPERS). Star formation history of passive galaxies</i>	Astronomy and Astrophysics, 2016, http://arxiv.org/pdf/1605.05503v2.pdf

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4 3	Qingwen Wu, Bożena Czerny, Mikołaj Grzędziel- ski, Ag- nieszka Ja- niuk, weimin Gu, Aijun Dong, Xiaofeng Cao, Bei You, Zhen Yan, Mouyuan Sun	<i>The Universal “Heartbeat ” Oscillations in Black Hole Systems Across the Mass-scale</i>	ASTROPHYSICAL JOURNAL, 2016, http://dx.doi.org/10.3847/1538-4357/833/1/79
4 4	Jan Alek- sander Gutt	<i>On the extension theorem of Hwang and Mok</i>	Journal für die reine und angewandte Mathematik, 2016, http://www.degruyter.com/dg/journalprintahead.articlelist.resultlinks.fullcontentlink:pdfeventlink/\$002fj\$002fcrll.ahead-of-print\$002fcrelle-2015-0106\$002fcrelle-2015-0106.pdf?t:ac=j\$002fcrll
4 5	Eduardo Paul, Daniel Tasca, Łukasz Marek Rud- nicki, Stephen Walborn	<i>Detecting entangleme- nt of continuous variables with three mutually unbiased bases</i>	PHYSICAL REVIEW A, 2016, v. 94, p. 012303, http://journals.aps.org/pr/abstract/10.1103/PhysRevA.94.012303
4 6	M. Smaczyn- ski, W. Roga, K. Życzkowski	<i>Selfcomple- mentary quantum channels</i>	Open Systems Inform. Dynamics , 2016, v. 23, p. 1650001
4 7	Wojciech Górecki, Kazimierz Rzązewski	<i>Making two dysprosium atoms rotate —Einstein- de Haas effect revisited</i>	Europhysics Letters, 2016, v. 116, p. 26004, http://iopscience.iop.org/article/10.1209/0295-5075/116/26004
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49	Rafał Ołdziejewski, Krzysztof Jachymski	<i>Properties of strongly dipolar Bose gases beyond the Born approximation</i>	PHYSICAL REVIEW A, 2016, v. 94, p. 63638, http://journals.aps.org/pr/abstract/10.1103/PhysRevA.94.063638
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Publications in other journals in 2016

No.	Authors	Title	Journal
1	Jerzy Juliusz Kijowski, Piotr Jan Waluk, Katarzyna Jadwiga Senger	<i>Wigner Function of a Qubit</i>	BANACH CENTER PUBLICATIONS, 2016, v. 110, p. 1-9
2	Jacek Jezierski, Piotr Jan Waluk	<i>Proof of Positive Energy Theorem by spacetime foliations</i>	BANACH CENTER PUBLICATIONS, 2016, v. 110, p. 115-120
3	Łukasz Turski	<i>Edukacja na Rozdrożu [Education at a Crossroads]</i>	PAU, 2016

Conference publications in 2016

No.	Authors	Title	Journal
1	Mikołaj Sowiński, Grzegorz Henryk Kasprowicz, Paweł Kulik, Lech Mankiewicz, Rafał D.,	<i>Modular control system for optogenetic experiments</i>	PROCEEDINGS OF SPIE, 2016, v. 10031, p. 100313F

	Jakub Jarosiński, RAFAŁ CZAJKOWSKI, EWELINA ANNA KNAPSKA, Alicja Puścian, Jakub Kowalski, Konstantin Rusakov, Tomasz Przywózki, Paweł Rasiński, Bartłomiej Marcin Juszczyk		
2	Rafał D., Alicja Puścian, Grzegorz Henryk Kasprowicz, Mikołaj Sowiński, Jakub Jarosiński, Paweł Kulik, RAFAŁ CZAJKOWSKI, EWELINA ANNA KNAPSKA, Jakub Kowalski, Konstantin Rusakov, Tomasz Przywózki, Paweł Rasiński, Bartłomiej Marcin Juszczyk, Lech Mankiewicz	<i>Implementation of control system for optogenetic devices and home-cage environments</i>	PROCEEDINGS OF SPIE, 2016, v. 10031, p. 100312P
3	Jakub Jarosiński, Grzegorz Henryk Kasprowicz, Bartłomiej Marcin Juszczyk, Rafał Krawczyk, Alicja Puścian	<i>Miniature subcutaneous optogenetic device</i>	PROCEEDINGS OF SPIE, 2016, v. 10031, p. 1003139

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4	Ian Anderson, Thomas Leistner, Andree Lischewski, Paweł Krzysztof Nurowski	<i>Conformal Walker metrics and linear Fefferman-Graham equations</i>	arXiv, 2016, http://arxiv.org/pdf/1609.02371v2
5	Paweł Krzysztof Nurowski, Thomas Leistner, Katja Sagerschnig	<i>New relations between G2-geometries in dimensions 5 and 7</i>	arXiv, 2016, http://arxiv.org/pdf/1601.03979v2
6	Paweł Krzysztof Nurowski, Denson C Hill	<i>How the green light was given for gravitational wave search</i>	arXiv, 2016, http://arxiv.org/pdf/1608.08673v1
7	Paweł Krzysztof Nurowski, Ian Anderson	<i>Sp(3,R) Monge geometries in dimension 8</i>	arXiv, 2016, http://arxiv.org/pdf/1606.08675v1
8	M Enríquez, I Wintrowicz, Karol Życzkowski	<i>Maximally Entangled Multipartite States: A Brief Survey</i>	JOURNAL OF PHYSICS: CONFERENCE SERIES, 2016, v. 698, p. 012003
9	Hans-Peter Gittel, Jacek Jezierski, Jerzy Juliusz Kijowski	<i>On the Existence of Rigid Spheres in Four-Dimensional Spacetime Manifolds</i>	Vietnam Journal of Mathematics, 2016, v. 44, p. 231-249, http://dx.doi.org/10.1007/s10013-016-0185-z
10	Didier Barret, Thien-Lam Throng, Agnieszka Janiuk, et. al.	<i>The Athena X-ray Integral Field Unit (X-IFU)</i>	PROCEEDINGS OF SPIE, 2016, v. 9905, p. id. 99052F, 41 pp., http://proceedings.spiedigitallibrary.org/proceeding.aspx?articleid=2546041
11	Paweł Krzysztof Nurowski, Krzysztof Antoni	<i>Conformal transformations and the beginning of the Universe</i>	arXiv, 2016, http://arxiv.org/pdf/1506.03280v1

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12	Paweł Krzysztof Nurowski, Krzysztof Antoni Meissner, Daniel An	<i>Ring Type Structures in the Planck map of the CMB</i>	arXiv, 2016, http://arxiv.org/pdf/1510.06537v2
13	Adam Zadrozny, Marcin Sokołowski, Lech Mankiewicz, Aleksander Filip Żarnecki	<i>Pi of the Sky involvement in LSC-Virgo electromagnetic follow-up project</i>	PROCEEDINGS OF SPIE, 2016, v. 10031, p. 1003141
14	M. Ferocci, Bożena Czerny,	<i>The LOFT mission concept: a status update</i>	Proceedings of the SPIE, 2016, v. 9905, p. 99051
15	Wojciech Szumiński, Tomasz Stachowiak	<i>Analysis of a constrained two-body problem</i>	Dynamical Systems: Theoretical and Experimental Analysis; Springer Proceedings in Mathematics and Statistics, 2016, v. 182, p. 361, arxiv.org/pdf/1606.03009

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1	Wojciech Szumiński, Tomasz Stachowiak	<i>Analysis of a Constrained Two-Body Problem</i>	Dynamical Systems: Theoretical and Experimental Analysis, 2016, http://link.springer.com/book/10.1007/978-3-319-42408-8
2	Małgorzata Siudek, Katarzyna Ewa Małek, B. Garilli, M. Scodergio, A. Fritz, Agnieszka Pollo	<i>VIPERS: Stellar population properties of early-type galaxies</i>	37th Meeting of the Polish Astronomical Society, 2016, p. 246-249, http://www.pta.edu.pl/pliki/proc/vol3/v3p246.pdf
3	Agnieszka Pollo, Katarzyna Ewa Małek, Janusz Krywult, Aleksandra Alicja Solarz, T. Górecki, A. Nadkańska, Małgorzata Siudek	<i>VIPERS: galaxies and large scale structure at $z \sim 1$ in unprecedented detail</i>	37th Meeting of the Polish Astronomical Society, 2016, p. 229-232, http://www.pta.edu.pl/pliki/proc/vol3/v3p229.pdf
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5	Bożena Czerny, Pu Du, Jian-Min Wang, Conor Wildy	<i>Radio quiet quasar main sequence - a hidden parameter behind it</i>	Proceedings of a conference held 27 June - 1 July, 2016 in Garching, 2016, p. id. 50
6	Vladimir Karas, Devaki Kunner- iath, Bożena Cz- erny, Agata Rozanska, Tek P. Adhikari	<i>Accretion of gaseous clumps from the Galactic Center Mini-spiral onto Milky Way's supermassive black hole</i>	21st International Conference on General Relativity and Gravitation, 2016, p. 98
7	Justyna Średzińska, Bożena Czerny, Maciej Bilicki, Krzysztof Hryniewicz, Mag- dalena Krupa, Ag- nieszka Kurcz, Paola Marziani, Agnieszka Pollo, Wojtek Pych, An- drzej Udalski	<i>Tracing dark energy with quasars</i>	37th Meeting of the Polish Astronomical Society, 2016, p. 255-258
8	Tek P. Adhikari, Agata Różańska, Małgorzata Sobolewska, Bożena Czerny	<i>On the warm absorber in AGN outflow</i>	37th Meeting of the Polish Astronomical Society, 2016, p. 239-242
9	Patrycja Bagińska, Agata Różańska, Bożena Czerny, Agnieszka Janiuk	<i>The ionization instability driven outbursts in 4U 1630-472</i>	37th Meeting of the Polish Astronomical Society, 2016, p. 154-157
10	Agnieszka Janiuk, Szymon Charzyński	<i>Simulations of coalescing black holes</i>	Proceedings of the Polish Astronomical Society, 2016, v. 3, p. 127-130 , https://www.pta.edu.pl/proc/v3p127
11	Petra Sukova, Szymon Charzyński, Ag- nieszka Janiuk	<i>Relativistic low angular momentum accretion in 3D</i>	Proceedings of the Polish Astronomical Society, 2016, v. 3, p. 150-153, https://www.pta.edu.pl/proc/v3p150
12	Adam Sawicki, Katarzyna Karnas	<i>Universality of quantum qudit gates</i>	arXiv:1609.05780
13	Adam Sawicki, Katarzyna Karnas	<i>Criteria for universality of quantum gates</i>	arXiv:1610.00547
14	Mikołaj Grzędziel- ski, Agnieszka Ja- niuk, Bożena Cz- erny	<i>Modified viscosity in accretion disks. Application to Galactic black hole binaries, intermediate mass black holes and AGN</i>	arXiv:1609.09322

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