

## CURRICULUM VITAE

### PERSONAL INFORMATION

Surname, First name: **Polischuk (Shkulkova) Oksana**

Date of birth: 01.06.1985

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### CURRENT POSITION

Senior scientific researcher at Lepton Physics Department, Institute for Nuclear Research of the National Academy of Sciences of Ukraine.

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### PREVIOUS POSITIONS

2019-up to now: Senior scientific researcher, Lepton Physics Department, Institute for Nuclear Research, Kyiv, Ukraine.

2019 Visiting professor (3 months) at Tor Vergata University (Rome, Italy), Astroparticle Physics.

2016-2019 Scientific researcher, Lepton Physics Department, Institute for Nuclear Research, Kyiv, Ukraine.

2015 – 2016 Junior scientific researcher, Lepton Physics Department, Institute for Nuclear Research, Kyiv, Ukraine.

2014 – 2015 Post-Doc at INFN – Roma section (research grant – senior researcher), Italy.

2012 – 2014 Post-Doc at INFN – Roma section (grant for non-Italian citizen), Italy.

2009 – 2012 Leading engineer, Lepton Physics Department, Institute for Nuclear Research, Kyiv, Ukraine.

2007 – 2010 Engineer, Lepton Physics Department, Institute for Nuclear Research, Kyiv, Ukraine.

2005 – 2007 Engineer, Nuclear Physics Department, Kyiv National University, Kyiv, Ukraine.

### FELLOWSHIPS

2020 – 2021 Grant of the National Academy of Sciences of Ukraine for Laboratory for young scientists, Ukraine.

2018 – 2019 Grant of the National Academy of Sciences of Ukraine for Laboratory for young scientists, Ukraine.

2017 – 2018 Grant of the National Academy of Sciences of Ukraine for young scientists “Investigation of the double beta decay of  $^{106,116}\text{Cd}$  and  $^{150}\text{Nd}$ ”, Ukraine.

2009 – 2010 Grant of the National Academy of Sciences of Ukraine for young scientists “Double beta decay and neutrino properties”, Ukraine.

2007 – 2009 The Royal Society Grant of Great Britain “Development of advanced scintillation detectors for cryogenic dark matter search”, Ukraine.

2007 – 2008 Grant of National Academy of Sciences of Ukraine for young scientists “Research of  $2\beta$ -decay of  $^{116}\text{Cd}$  in Solotvina Underground Laboratory of Institute of Nuclear Research of the National Academy of Sciences of Ukraine”, Ukraine.

### AWARDS

2019 Laureate of the National prize “Golden fortune”, Ukraine

2018 Laureate (Top-10) of the L’Oreal Award “For women in science”, Ukraine

2010 Prize of the President of Ukraine for young scientists for the cycle of works "Rare nuclear processes" (together with other 3 persons), Ukraine

### SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS

2016 – 2019 1 Master thesis, Nuclear physics department, Institute for nuclear research, Ukraine.

### ORGANISATION OF SCIENTIFIC MEETINGS

2013 organization of the International Workshop on Radiopure Scintillators (RPSCINT’2013), ~35 participants, Kyiv, Ukraine.

- 2009 – 2012 organization of the conferences and scientific secretary of the Annual Conference of Institute for Nuclear Research, ~150 participants, Kyiv, Ukraine.
- 2010, 2012 participation in organization of the conferences Current Problems in Nuclear Physics and Atomic Energy (NPAE), ~200 participants, Kyiv, Ukraine.

### SCIENTIFIC INTERESTS:

Search for double beta decay (DBD) and dark matter, solar axions; investigation of rare alpha and single beta decays, low background HPGe  $\gamma$  spectrometry. R&D of crystal scintillators for dark matter experiments, including low temperature studies. Development of low background crystal scintillators, including crystals from enriched materials. Pulse-shape discrimination with scintillation detectors. Bolometric technique.

### MAJOR COLLABORATIONS

**DAMA** investigation of rare decays ( $2\beta$ , rare  $\alpha$  and  $\beta$  decays), Laboratori Nazionali del Gran Sasso, Italy

**AMORE** searching for neutrinoless  $2\beta$  decay of  $^{100}\text{Mo}$ , Yang-yang laboratory, South Korea.

**CUPID**

### TRACK RECORD

I have fully participated in the following searches:

1. R&D of low background crystal scintillators (also crystals from enriched materials) for DBD and dark matter experiments, including low temperature studies (with a help of the pulse-shape discrimination technique, time-amplitude analysis, front-edge analysis, etc). In particular, I was involved in the installation and starting of the experimental setup and in the subsequent data taking and data analysis:

1.1 Development and investigation of enriched  $^{106}\text{CdWO}_4$  crystal scintillators to search for double beta decay processes in  $^{106}\text{Cd}$ ;

1.2 Investigation of the properties of inorganic crystal scintillators ( $\text{CaMoO}_4$ ,  $\text{ZnWO}_4$ ,  $\text{MgWO}_4$ ,  $\text{PbWO}_4$ ,  $\text{PbMoO}_4$ ,  $\text{ZnMoO}_4$ ) as detectors to search for double beta decay and dark matter;

1.3 Investigation of  $\text{BaF}_2$  crystal scintillator;

1.4 Investigation  $^{116}\text{CdWO}_4$  crystal scintillator ( $2\nu 2\beta$  decay of  $^{116}\text{Cd}$  was observed with the highest to-date accuracy, while the new (currently the world best) limit on  $0\nu 2\beta$  mode was set).

1.5 Development and study of crystal scintillators and materials with lanthanides ( $\text{CeO}_2$ ,  $\text{Nd}_2\text{O}_3$  and  $\text{Gd}_2\text{O}_3$ ) as detectors to search for double beta decay.

2. Investigation of double beta decay, rare alpha and single beta decays with the help of low background HPGe  $\gamma$  spectrometry. I have strongly contributed in the installation of the experimental setups and to the data analyses of the following experiments (investigation of  $2\beta$  decay of  $^{100}\text{Mo}$  and  $^{96,104}\text{Ru}$  are presented in my PhD thesis):

2.1 Experimental observation of two neutrino double beta decay of  $^{100}\text{Mo}$  to the first excited  $0^+_1$  level of  $^{100}\text{Ru}$  with the highest accuracy on the date of publication;

2.2 New limits on half-life for double beta processes in  $^{96}\text{Ru}$ ,  $^{104}\text{Ru}$  and  $^{190}\text{Pt}$  isotopes;

2.3 Investigation of lanthanides (neodymium, gadolinium, cerium) and barium (all the elements contain promising double beta active isotopes) purified by liquid-liquid extraction technique and test of their radioactive contamination.

3. Investigation of rare and exotic events like solar axions, rare alpha with the help of low background HPGe  $\gamma$  spectrometry. I have been involved in the installation and data taking of the experiments. Moreover, I was in charge of data analysis of the experiments:

3.1 New limit on the mass of  $^7\text{Li}$  solar axions (the best to-date for  $^7\text{Li}$ );

3.2 First observation of alpha decay of  $^{190}\text{Pt}$  to the first excited level of  $^{186}\text{Os}$ .

I'm co-author of more than 90 publications (in particular: Refereed Journals – 45; Proceedings of International Conferences – 47), with a total of 1229 citations.

### LIST OF SELECTED PUBLICATIONS

1. E.Armengaud, et al., **The CUPID-Mo experiment for neutrinoless double-beta decay: performance and prospects**. *Eur. Phys. J. C* 80(2020)44, 15 p.
2. E.Armengaud, et al., **Precise measurement of  $2\nu\beta\beta$  decay of  $^{100}\text{Mo}$  with the CUPID-Mo detection technology**. *Eur. Phys. J. C* 80(2020)674, 10 p.
3. F.A. Danevich et al., **Decay scheme of  $^{50}\text{V}$** , *Phys. Rev. C* 102 (2020) 024319.

4. P. Belli et al., **Search for  $\alpha$  decay of naturally occurring osmium nuclides accompanied by  $\gamma$  quanta**, *Phys. Rev. C* 102 (2020) 024605.
5. A.S. Barabash et al., **Low background scintillators to investigate rare processes**, *J. Instrumentation* 15 (2020) C07037.
6. P. Belli et al., **Developments and improvements of radiopure  $\text{ZnWO}_4$  anisotropic scintillators**, *J. Instrumentation* 15 (2020) C05055.
7. P. Belli, et al., **Search for  $\alpha$  decay of naturally occurring osmium nuclides accompanied by  $\gamma$  quanta**. *Phys. Rev. C* 102(2020)024605, 10 p.
8. P. Belli, **Measurements of  $\text{ZnWO}_4$  anisotropic response to nuclear recoils for the ADAMO project**. *Eur. J. Phys. A* 56(2020)83, 11 p.
9. P. Belli, et al., **Search for double beta decay of  $^{106}\text{Cd}$  with an enriched  $^{106}\text{CdWO}_4$  crystal scintillator in coincidence with  $\text{CdWO}_4$  scintillation counters**. *Universe* 6(2020)182, 15 p.
10. F.A. Danevich, et al., **First search for  $2\varepsilon$  and  $\varepsilon\beta^+$  decay of  $^{174}\text{Hf}$** . *Nucl. Phys. A* 996(2020)121703.
11. F.A. Danevich et al., **First search for  $\alpha$  decays of naturally occurring Hf nuclides with emission of  $\gamma$  quanta**. *Eur. Phys. J. A* 56(2020)5, 10 p.
12. P. Belli, et al., **First search for  $2\varepsilon$  and  $\varepsilon\beta^+$  processes in  $^{168}\text{Yb}$** . *Nucl. Phys. A* 990(2019)64-78.
13. V. Alenkov, et al., **First results from the AMoRE-Pilot neutrinoless double beta decay experiment**. *Eur. Phys. J. C* 79(2019)791.
14. P. Belli, et al., **First direct search for  $2\varepsilon$  and  $\varepsilon\beta^+$  decay of  $^{144}\text{Sm}$  and  $2\beta^-$  decay of  $^{154}\text{Sm}$** . *Eur. Phys. J. A* 55(2019)201, 9 p.
15. P. Belli, et al., **New development of radiopure  $\text{ZnWO}_4$  crystal scintillators**, *Nucl. Instrum. Meth. A* 935(2019)89-94.
16. A.S. Barabash, et al., **Final results of the Aurora experiment to study  $2\beta$  decay of  $^{116}\text{Cd}$  with enriched  $^{116}\text{CdWO}_4$  crystal scintillators**, *Phys. Rev. D* 98 (2018) 092007, 16 p.
17. P. Belli, et al., **First search for  $2\varepsilon$  and  $\varepsilon\beta^+$  decay of  $^{162}\text{Er}$  and new limit on  $2\beta^-$  decay of  $^{170}\text{Er}$  to the first excited level of  $^{170}\text{Yb}$** . *J. Phys. G* 45(2018)095101, 14 p.
18. P. Belli, et al., **New limits on  $2\varepsilon$ ,  $\varepsilon\beta^+$  and  $2\beta^+$  decay of  $^{136}\text{Ce}$  and  $^{138}\text{Ce}$  with deeply purified cerium sample**. *Eur. Phys. J. A* 53(2017)172, 8 p.
19. A.S. Barabash, et al., **Improvement of radiopurity level of enriched  $^{116}\text{CdWO}_4$  and  $\text{ZnWO}_4$  crystal scintillators by recrystallization**. *Nucl. Instrum. Meth. A* 833(2016)77-81.
20. P. Belli, et al., **Search for  $2\beta$  decay of  $^{106}\text{Cd}$  with an enriched  $^{106}\text{CdWO}_4$  crystal scintillator in coincidence with four HPGe detectors**. *Phys. Rev. C* 93(2016)045502, 9 p.
21. P. Belli, et al., **Search for long-lived superheavy eka-tungsten with radiopure  $\text{ZnWO}_4$  crystal scintillator**. *Phys. Scripta* 90(2015)085301, 6 p.
22. P. Belli, et al., **Investigation of rare nuclear decays with  $\text{BaF}_2$  crystal scintillator contaminated by radium**. *Eur. J. Phys. A* 50(2014)134, 9 p.
23. P. Belli, et al., **Search for  $2\beta$  decays of  $^{96}\text{Ru}$  and  $^{104}\text{Ru}$  by ultralow-background HPGe  $\gamma$  spectrometry at LNGS: Final results**. *Phys. Rev. C* 87(2013)034607, 8 p.
24. P. Belli, et al., **First search for double- $\beta$  decay of  $^{184}\text{Os}$  and  $^{192}\text{Os}$** . *Eur. Phys. J. A* 49(2013)24, 6 p.
25. P. Belli, et al., **Search for  $^7\text{Li}$  solar axions using resonant absorption in LiF crystal: Final results**. *Phys. Lett. B* 711(2012)41-45.
26. P. Belli, et al., **Search for double- $\beta$  decay processes in  $^{106}\text{Cd}$  with the help of a  $^{106}\text{CdWO}_4$  crystal scintillator**. *Phys. Rev. C* 85(2012)044610, 12 p.
27. P. Belli, et al., **First observation of  $\alpha$  decay of  $^{190}\text{Pt}$  to the first excited level ( $E_{\text{exc}} = 137.2$  keV) of  $^{186}\text{Os}$** . *Phys. Rev. C* 83(2011)034603, 7 p.
28. P. Belli, et al., **First search for double  $\beta$  decay of platinum by ultra-low background HP Ge  $\gamma$  spectrometry**. *Eur. Phys. J. A* 47(2011)91, 8 p.
29. P. Belli, et al., **New observation of  $2\nu 2\beta$  decay of  $^{100}\text{Mo}$  to the  $0^+_1$  level of  $^{100}\text{Ru}$  in the ARMONIA experiment**. *Nucl. Phys. A* 846(2010)143-156.
30. H. Kraus, et al.,  **$\text{ZnWO}_4$  scintillators for cryogenic dark matter experiments**. *Nucl. Instrum. Meth. A* 600(2009)594-598.

31. F.A.Danevich, et al., **Scintillation properties of pure and Ca-doped ZnWO<sub>4</sub> crystals**. *Phys. Status Solidi A* **205**(2008)335-338.

## MAIN LIST OF MY PRESENTATIONS AT CONFERENCES

- 9th International Conference on New Frontiers in Physics (ICNFP 2020), Crete, Greece, 4.09–2.10.2020. Online.
- Matrix Elements for the Double-beta-decay EXperiments meeting – MEDEX'19 – Prague, Czech Republic – *May 27–31, 2019*.
- Matrix Elements for the Double-beta-decay EXperiments meeting – MEDEX'17 – Prague, Czech Republic – *May 29 – June 2, 2017*.
- Invited talk at LNGS, Italy — *November 24, 2016*.
- Workshop for young scientists "Scintillation processes and materials for the registration of ionizing radiation", Kharkiv, Ukraine — *September 11–14, 2016*.
- XIV International Conference on Topics in Astroparticle and Underground Physics – TAUP'15 – Torino, Italy – *September 7 – 11, 2015*.
- Matrix Elements for the Double-beta-decay EXperiments meeting – MEDEX'15 – Prague, Czech Republic – *June 9 – 12, 2015*.
- International Workshop on Radiopure Scintillators – RPSCINT-2013 – Institute for Nuclear Research (National Academy of Sciences of Ukraine), Kyiv, Ukraine – *September 17 – 20, 2013*.
- Workshop in Low Radioactivity Techniques – LRT2013, INFN – Laboratori Nazionali del Gran Sasso, Assergi (AQ), Italy — *April 10–12, 2013*.
- Workshop on results of the Astroparticle Physics (Project Kosmomikrofizyka-2) of the National Academy of Sciences of Ukraine, Kyiv, Ukraine — *November 21–22, 2012*.
- The 4<sup>th</sup> International Conference “Current Problems in Nuclear Physics and Atomic Energy”, Kyiv, Ukraine — *September 3–7, 2012*.
- School-workshop of young scientists “Scintillation Processes and Materials for Registration of Ionization Radiation”, Kharkiv, Ukraine — *September, 2011, 2012, 2014, 2018*.
- The 3<sup>rd</sup> International Conference “Current Problems in Nuclear Physics and Atomic Energy”, Kyiv, Ukraine — *June 07–12, 2010*.
- International Conference “Engineering of Scintillation Materials and Radiation Technologies”, Kharkiv, Ukraine — *November 16–21, 2008*.
- The 2<sup>nd</sup> International Conference “Current Problems in Nuclear Physics and Atomic Energy”, Kyiv, Ukraine — *June 09–15, 2008*.
- Annual Conference of Institute for Nuclear Research, Kyiv, Ukraine — *January 2008, 2009, 2010, 2011, 2012, 2014, 2016, 2017, 2018*.