

Andrey Pozdnyakov

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Professional career

- Postdoctoral researcher at RWTH Aachen University (Germany),
 Based in Aachen and working at CMS experiment at the LHC. *2018 – current*
- Postdoctoral researcher at National Central University (Taiwan),
 Based at CERN, working at CMS experiment at the LHC. *2015 – 2018*

Education

- **PhD, December 2015:** *2008 – 2015*
 Northwestern University (Evanston, USA)
 Title of the dissertation: *Search for the Higgs Boson Decays to a Photon and Two Leptons with low Dilepton Invariant Mass* [1]. Advisor: Mayda Velasco
- **MS, June 2008:** *2006 – 2008*
 Moscow Institute of Physics and Technology (Russia), jointly with
 Institute for Theoretical and Experimental Physics (ITEP)
 Title of the MS dissertation: *Impact of the Parton Distribution Functions at small x on the spectra of hadronic jets*. Advisor: Vladimir Gavrilov
- **BS, June 2006:** *2002 – 2006*
 Moscow Institute of Physics and Technology (Russia)
 Title of the BS thesis: *Detecting a Higgs boson with high mass at LHC, Monte Carlo simulations*.
 Advisor: Vladimir Gavrilov

Summer schools

- *Summer 2012*: Hadron Collider Physics Summer School (Fermilab)
- *Summer 2007*: CERN Summer Student Program (Geneva)

Talks given at the Conferences

- **07 Jul. 2022**: International Conference on High Energy Physics (ICHEP), Bologna, Italy. Talk in parallel session: *Constraints on the Higgs-charm coupling by CMS*.
- **28 May 2020**: Large Hadron Collider Physics (LHCP) Conference, Zoom, WWW. Talk in parallel session: *Higgs measurements in 2nd generation decay channels with ATLAS and CMS*
- **11 Jul. 2016**: International Conference on New Frontiers in Physics (ICNFP), Orthodox Academy of Crete, Kolymbari, Greece. Talk in a workshop: *Searches for HH production by the CMS collaboration*.
- **18 Jan. 2016**: A workshop: HH searches with CMS. Lyon, France. Presentation on *Photons* (CMS internal).
- **18 Sep. 2014**: Physics in Collision symposium (PIC), Bloomington, USA
 Plenary talk: *Fermionic Decays of SM Higgs*, Ref. [8].

- **06 Jul. 2014:** Large Hadron Collider Physics (LHCP) Conference, New-York, USA. Presented a poster: *Search for a Higgs boson decaying into $\gamma^*\gamma \rightarrow \mu\mu\gamma$ with dilepton mass below 20 GeV in pp collisions at $\sqrt{s} = 8$ TeV.* Refs. [1, 2].
- **22 Apr. 2013:** Workshop on CMS Beam Conditions, Radiation Monitoring and Luminosity Systems, DESY. Gave a talk online: *BPTX 2012/2013 Scope-Based Algorithms and Running Stability.*
- **07 Feb. 2011:** Minimum Bias and Underlying Event LHC Working Group, CERN. Presented a talk: *CMS update on Minimum Bias results.*

Talks given at the internal meetings

- I made more than a 100 presentations in CMS meetings including pre-approval talks for multiple analyses and approval talks for two analyses. I also gave multiple presentations at the German Physical Society (DPG) annual meetings between 2018 and 2022.

Workshops attended

- *April 2018:* CMS double Higgs production workshop (LLR, France)
- *February 2018:* International School of Trigger and Data Acquisition (Vienna, Austria)
- *December 2016:* CMS double Higgs production workshop (Louvain-la-Neuve, Belgium)
- *January 2016:* CMS double Higgs production workshop (Lyon, France)

Contribution to the CMS experiment

I am a member of the CMS experiment since 2006. Since then I worked in a few different projects and many analysis at CMS. Below is a list of my most significant contributions:

- 2020 – present: For a few years now I am managing the production of the simulated samples at CMS as a Monte Carlo Request Manager (L3 position at CMS).
- 2018 – present: I am one of the main contributors to the CMS search for $H \rightarrow c\bar{c}$ decay in VH channel [3], which gives us the best limit on the coupling of the Higgs boson to charm quark to date. I am also involved in the $H \rightarrow c\bar{c}$ analysis in gluon-fusion channel [4].
- 2011 – 2018: I was responsible for the operation of the Beam Pickup Timing system (BPTX) at CMS (L3 position), which provides beam trigger signals to the Level-1 trigger system and the subsystems of the Beam Instrumentation and Luminosity group (BRIL). It also provided the real-time measurement of the beam timing at the interaction point, $\Delta t(b_1 - b_2)$ [17], which is crucial for the longitudinal alignment of the collision point at CMS. I commissioned the BPTX subsystem in Run-1 and Run-2 of the LHC and supported it throughout CMS operation. In those years I also served as detector on-call expert for the BRIL system.
- 2016 – 2018: I was one of the main contributor to the di-Higgs search analysis in the decay mode to two b-quarks and two photons at 13 TeV [5, 12]. The goal of this analysis is to measure (set a limit on) Higgs boson trilinear coupling. The $HH \rightarrow bb\gamma\gamma$ decay is the most sensitive channel to this coupling.
- 2016 – 2017: I was involved in the beam tests for the future High Granularity Calorimeter (HGCAL) of CMS [7]. In 2016 we tested single silicon sensors, measured their time resolution, signal to noise ratio and their dependence on the irradiation dose. In 2017 we had multiple full *Hexagon* modules composed of many sensors and we were able to measure energy resolution of protons and electrons of the test beam. I was involved in preparing the DAQ front-end software, based on already available euDAQ framework.

- 2014 – 2015: I was a contact person for MC production in the Higgs group (for $H \rightarrow \gamma^* \gamma \rightarrow \ell \ell \gamma$ subgroup). I was also the main contributor to $H \rightarrow \gamma^* \gamma \rightarrow \ell \ell \gamma$ analysis at $\sqrt{s} = 8$ TeV dataset [2, 15, 16]. I am currently also helping with the same analyses on the 13 TeV data [6, 13, 14].
- 2012 – 2013: I worked on $H \rightarrow ZZ \rightarrow 4l$ decay and explored the multi-class MVA tools in TMVA for the purpose of spin/parity hypothesis separation of the Higgs boson [18].
- 2010 – 2012: I was involved in $H \rightarrow ZZ \rightarrow 2\ell 2\nu$ analysis [9, 19], where I contributed to data-driven methods for $t\bar{t}$ background estimation, a clean-up of the *detector noise events*, performance study of various definitions of the *missing energy* variable and optimization of the analysis selection.
- 2010 – 2011: I performed the measurement of charged tracks multiplicity (a.k.a. $dN/d\eta$) [10], requested by the LHC Minimum Bias and Underlying Event LHC Working Group for the purpose of comparison between CMS, ATLAS and Alice experiments; this result is also used for MC generators tuning (included in Rivet tool).
- 2010 – 2011: I measured the event rate and cross section of events with one or more central tracks, for the purpose of comparing it with other experiments and possible use for luminosity measurements [11].
- 2008 – 2010: I helped to perform calibration of the CMS Hadronic Calorimeter (HCAL) with isolated tracks [20]. I wrote a piece of code that collected information of the tracks and HCAL hits needed as inputs to a minimization algorithm. I was also an expert for the HCAL conditions monitoring and maintaining its database.
- 2009 – 2012: I have done numerous central shifts for DQM, Trigger and BRM systems, including the *on-call expert* shifts for the BRIL group.

Teaching Experience

- 2019 – 2022: Teaching Assistant for a class on Data Analysis in Particle Physics at RWTH.
- 2016: Facilitator at the CMS Data Analysis school in Taipei, Taiwan.
- 2009 – 2014: Teaching Assistant at Northwestern University, mostly instructing the laboratory classes and discussion sessions.
- 2004 – 2005: Math teacher at the weekend class for high school kids.

Other Skills

Languages: native Russian, fluent English, B1 in German and French
 Software: C/C++, Python, Java, Shell/Bash
 ROOT, Pythia6, Pythia8, MadGraph, Powheg, MCFM
 CMSSW, xDAQ, euDAQ
 Arduino, Android-SDK
 Hardware: VME and NIM electronics;
 AFM/SEM and nano-lithography technology
 Sports: Sometimes I run. My best time for 10km: 53m; for semi-marathon (21km): 2h00m
 Since 2019 I play football too

List of Publications (with significant personal contribution)

- [1] Andrey Pozdnyakov, “Search for the Higgs Boson Decays to a Photon and Two Leptons with Low Dilepton Invariant Mass”, Northwestern University, Dec. 2015, CMS-TS-2016-001, CERN-THESIS-2015-256, [arXiv:1601.00790]
- [2] “Search for a Higgs boson decaying into $\gamma^*\gamma$ to $\ell\ell\gamma$ with low dilepton mass in pp collisions at $\sqrt{s} = 8$ TeV”, CMS Collaboration, Phys. Lett. B **753**, CERN-PH-EP-2015-137, doi:10.1016/j.physletb.2015.12.039, Dec. 2015, [arXiv:1507.03031]
- [3] ”Search for Higgs boson decay to a charm quark-antiquark pair in proton-proton collisions at $\sqrt{s} = 13$ TeV”, CMS Collaboration, CMS-HIG-21-008, CERN-EP-2022-081, Accepted for publication in Phys. Rev. Lett., [arXiv:2205.05550]
- [4] ”Inclusive search for a boosted Higgs boson decaying to a charm quark pairs in proton-proton collisions at $\sqrt{s} = 13$ TeV”, CMS Collaboration, CMS-PAS-HIG-21-012, [”https://cds.cern.ch/record/2809929”]
- [5] “Search for Higgs boson pair production in the final state containing two photons and two bottom quarks in proton-proton collisions at $\sqrt{s} = 13$ TeV”, CMS Collaboration, 2017, CMS-PAS-HIG-17-008, <http://cds.cern.ch/record/2273383>
- [6] “Search for the standard model Higgs boson in the dilepton plus photon channel in pp collisions at $\sqrt{s} = 13$ TeV”, CMS Collaboration, 2018, CMS-PAS-HIG-17-007, <http://cds.cern.ch/record/2308435>
- [7] N. Akchurin et al, “First beam tests of prototype silicon modules for the CMS High Granularity Endcap Calorimeter”, 2018 JINST 13 P10023, <https://iopscience.iop.org/article/10.1088/1748-0221/13/10/P10023>
- [8] “Fermionic Decays of SM Higgs”, Andrey Pozdnyakov, Conference Report, CMS-CR-2014-363, Sep. 2014, [arxiv:1411.1981]
- [9] “Search for the standard model Higgs boson in the $H \rightarrow ZZ \rightarrow 2\ell 2\nu$ channel in pp collisions at $\sqrt{s} = 7$ TeV”, CMS Collaboration, JHEP **03**, 040 (2012) [arXiv:1202.3478]
- [10] “Pseudorapidity distributions of charged particles in pp collisions at $\sqrt{s} = 7$ TeV with at least one central charged particle”, CMS Collaboration, CMS-PAS-QCD-10-024, Apr. 2011
- [11] “Luminosity Study: Events Selected with a Central Track” Andrey Pozdnyakov, Michael Schmitt, Mayda Velasco, CMS-DP-2011-004 *Public Presentation*, 12 Jun. 2011

CMS internal Notes

- [12] Andrey Pozdnyakov, Rafael Teixeira De Lima, et al, “Search for two Higgs bosons in final states containing two photons and two bottom quarks with the full 2016 dataset”, CMS AN-2016/433
- [13] Victoria Louise Quilatan, Andrey Pozdnyakov, et al, “Search for Higgs boson Dalitz Decay to $\gamma^*\gamma \rightarrow \mu\mu\gamma$ at $\sqrt{s} = 13$ TeV with 2016 data”, CMS AN-2016/493
- [14] Hao-Ren Jheng and Andrey Pozdnyakov, “Search for the Z and Higgs boson decaying into $J/\psi + \gamma$ in pp collisions at $\sqrt{s} = 13$ TeV with 2016 data”, CMS AN-2017/283
- [15] Andrey Pozdnyakov, Chia-Ming Kuo, et al., “Searches for a Higgs boson decaying into a $\gamma^*\gamma$ to a dilepton plus a photon in pp collisions at a center of mass energy of 8 TeV”, CMS AN-2014/211
- [16] Andrey Pozdnyakov and Stoyan Stoynev, “Search for a Higgs boson decaying into $J/\Psi + \gamma$ in pp collisions at $\sqrt{s} = 8$ TeV”, CMS AN-2013/335

- [17] Andrey Pozdnyakov, Jeroen Hegeman, Anne Dabrowski, “BPTX electronics and software at CMS”, *CMS Internal Note*, CMS-IN-2013/010, CERN
- [18] G. Bauer, et al., “Examination of an excess of events in the search for the standard model Higgs boson in the $H \rightarrow ZZ^* \rightarrow 4\ell$ channel”, CMS AN-2012/414
- [19] Joe Bochenek, et al., “Search for the Higgs boson in the $H \rightarrow ZZ^* \rightarrow 2\ell 2\nu$ decay channel in pp collisions with the CMS detector”, CMS AN-2012/138
- [20] A. Anastassov et al., “Single Particle Response in the CMS Calorimeter”, CMS AN-2010/179