

Marek Taševský

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SCIENTIFIC DEGREE: Research Professor of the Czech Academy of Sciences from 2021

EDUCATION **Charles University**, Prague, Czech Republic
Ph.D., Subnuclear Physics, February 2000

- Dissertation Topic: “Virtual photon structure from low Q^2 dijet production at HERA”
- Advisor: Alice Valkárová

M.S., Subnuclear Physics, June 1993

RESEARCHER ID ORCID: 0000-0002-1535-9732
ResearcherID H-4630-2014
INSPIRE ID: INSPIRE-00224260

LANGUAGE SKILLS **Czech** - Native language
English - Proficient
French - Advanced
Russian - Intermediate

RESEARCH INTERESTS **Experimental and Phenomenological Particle Physics**

- **Soft QCD phenomena (hadronization, particle production and correlations)**
Measured several types of quark and gluon fragmentation functions using OPAL data. Interested in interplay between soft and hard scales and in proper choice of the hard scale. Relation between biased and unbiased jets for such measurements. Observed unexpected similarities in correlations between small and large collision systems is a vibrant topic.
- **Diffraction processes**
Interested in interplay between soft and hard scales. Extracting soft survival probabilities from real data.
 - Searches for QCD Instantons
- **Exclusive processes useful for New Physics searches**
Interested in providing realistic feasibility studies making use of Forward Proton detectors and fast simulation of ATLAS/CMS detector, and considering all relevant backgrounds. Focusing on procedures for taming huge combinatorial backgrounds utilizing exclusivity criteria including Time-of-Flight detectors.
 - Dark Matter searches and Axion-like particle searches using $\gamma\gamma$ collisions at LHC
 - $t\bar{t}$ production in photon-induced or Pomeron-induced processes
 - Exclusive Higgs boson production
 - Participating in developing Monte Carlo models (**SuperChic**)
- **ATLAS Forward Proton (AFP) detector: combined performance studies, Time-of-Flight (ToF) performance, global alignment**

- Responsible for global alignment using Beam Position Monitors around LHC beam pipe.
- Dependence of combinatorial background suppression on time and spatial resolutions of ToF detector.
- **Jet physics**
Radius-dependence, Infra-red safety, multi-jet events, experimental reconstruction techniques.
- **Photon structure**
Evolution with virtuality and hard scale. Proper choice of hard scale. Virtual photon structure: role of longitudinally polarized photons.
- **Hadron structure**
Emphasis on gluon Wigner function. Proposing measurements of Wigner function in exclusive and semi-exclusive interactions, overviewing detection techniques.

EMPLOYMENT
HISTORY

- 2019 – present: **Leading researcher** at Institute of Physics of CAS, Prague.
- 2005 – 2019: **Senior researcher** at Institute of Physics of CAS, Prague.
- 2003 – 2005: **Postdoctoral Fellow** in Department of Physics of Antwerp University, Belgium.
- 2000 – 2003: **Scientific Fellow** at CERN.
- 1998 – 2000: **Junior researcher** at Institute of Physics of CAS, Prague.

Teaching
Experience

- 2023 – present: **Lecture course for MSc students** *Experimental methods in particle physics* at Palacky University, Olomouc.
- 2017, 2021: **Course for PhD students** *Diffraction in particle physics* at Palacky University, Olomouc.

INITIATIVES

- 2015, 2016, 2018, 2022: Main organizer of 2-day workshops for students of all levels (theory and experiment). First day primarily devoted to student presentations and getting feedback from other students and senior researchers including an invited respected theorist from abroad. Second day devoted to lectures given by the theorist.

Supervision

PHD THESES

- 2021 – present [co-supervisor]: Maura G. B. T. (Laboratory of Instrumentation and Experimental Particles Physics, Lisbon, Portugal), *ATLAS searches for rare dark matter signatures*, including technical supervision of her qualification task in ATLAS.
- 2009 – 2015 (defended): Vlastimil K. (Charles University, Prague), *Study of diffractive processes at the ATLAS Experiment*, forming the base of the ATLAS paper “Dijet production in $\sqrt{s} = 7$ TeV pp collisions with large rapidity gaps at the ATLAS experiment” (publication **(10)** below).
- 2006 – 2011 (defended) [consultant]: Vojtěch J. (Czech Technical University, Prague), *Central Exclusive Higgs Boson Production in the ATLAS Experiment at the LHC*.

MASTER THESES

- 2016 – 2019: Ota Z. (Czech Technical University, Prague), *Study of the top quark in the ATLAS experiment.*
- 2007 – 2009: Vlastimil K. (Charles University, Prague), *Study of diffractive processes at the ATLAS Experiment.*
- 2006 – 2008 [consultant]: Pavel R. (Czech Technical University, Prague), *Detailed simulation of the AFP detector.*

BACHELOR THESES

- 2016 – 2017: Ondřej S. (Czech Technical University, Prague), *Jet processes at LHC.*
- 2016 – 2017: Dagmar B. (Czech Technical University, Prague), *Study of diffractive processes at LHC.*
- 2015 – 2016: Ota Z. (Czech Technical University, Prague), *Jet physics at LHC.*

ONE-YEAR
INTERNSHIPS IN THE
ATLAS
EXPERIMENT

- 2022 – 2023: Weronika S. (DESY), *Global alignment of AFP with exclusive leptons in Run 3.*
- 2021 – 2022: Pragati P. (Krakow IFJ PN), *Beam optics studies for AFP in Run 2 and Run 4.*
- 2020 – 2021: Yohany R. G. (Bogota UAN), *Global alignment of AFP with exclusive leptons in Run 2.*

RESEARCH
ACTIVITIES

- 2023 – 2024: analysis advisor and editor of ATLAS paper about performance of the forward proton time-of-flight detector in Run 2. Published in arXiv, submitted to JINST.
- 2023: co-authoring a review on multi-dimensional hadron structure via gluon Wigner function.
- 2022: asked to co-write a chapter about forward physics at high-luminosity LHC in the book *The future of the Large Hadron Collider.*
- 2019 – present: Responsible for AFP Global alignment using Beam Position Monitors.
- 2019: Asked by PDG to lead the effort to write a new chapter about Soft QCD and Diffraction in the *Review of Particle Physics.*
- 2017 – present: Active in providing the physics case for keeping AFP in the High-Luminosity Upgrade period at LHC (HL-LHC phase). In 2021 and 2022 leading a working group “AFP Physics case for HL-LHC” and summarizing the outcome in a written document (46 pages). Co-authored papers which propose various measurements using AFP, e.g. search for Dark Matter and Axion-like particles, top-anti-top production or Wigner function, proposing novel approaches in taming combinatorial backgrounds, and participated in development of tools, e.g. `SuperChic 4` and ToF method.
- 2015 – 2020: Deputy Physics Coordinator of AFP.
- 2012 – present: Founding member of AFP (ATLAS Forward Proton, successor of RP220), till 2017 member of AFP management board. Co-author of the physics motivation.
- 2006 – 2012: During the period of my Deputy Project Leadership of the RP220 project (Roman Pots at 220 m) I helped to form and co-lead a working group in Prague focused on forward physics at LHC (about 8 people): feasibility studies for the physics case of the project RP220 in ATLAS, acceptance and resolution studies, fast and detailed simulation, alignment and R&D for Silicon detectors and Roman Pots. Fully funded from a general grant covering all Czech activities in ATLAS.
- 2005 – 2009: Member of FP420, as a main analyser, I was one of responsables for the physics case and asked to present status at several reviews. From a close cooperation with a renowned theory group Khoze-Martin-Ryskin (KMR) several phenomenology papers originated which formed a core of the physics case for the FP420 project (Forward Protons at 420 m from the interaction point of ATLAS/CMS detector) and for the seminal work on prospects for forward physics at LHC.

- 2003 – 2005: During my postdoctoral stay in Antwerp University in Belgium I joined the CMS experiment where I was responsible for implementing fast simulation of Roman Pots (forward proton detectors), belonging to the TOTEM experiment, in the CMS reconstruction software. With this tool and together with detailed simulation of the response of the CMS detector to signal as well as background events with properly overlaid pile-up interactions, I was able to estimate feasibility of the detection of Higgs bosons produced exclusively in three main decay modes ($b\bar{b}$, WW and $\tau\tau$).
- 2000 – 2003: I moved to CERN where I obtained a scientific fellowship for 2 years. My work on measurements of several types of fragmentation functions together with their scaling violations using all LEP 1 and LEP 2 data was published as an OPAL paper and was regularly cited in the Review of Particle Physics by Particle Data Group. Beside the observed scaling violations, the extensive OPAL paper includes studies of differences between biased and unbiased jets and a proper choice of the hard scale.
- 1995 – 2000: I joined the H1 Collaboration at DESY in Hamburg where my technical task was to provide a software package which would link detector objects belonging to one particle, i.e. tracks in various tracking detectors and clusters or towers in calorimeters and muon spectrometers. The package was included as a switchable module in the official H1 reconstruction program. The topic of my PhD thesis was structure of real and virtual photons via jets in the final state. A fruitful collaboration with theorists as well as model builders was established and utilized in the thesis text and phenomenology papers.

FUNDED RESEARCH
PROJECTS

- 2000 – 2001: PI of the grant of the Grant Agency of CAS (IAB1010005), *The jet production in interactions of the virtual photon.*

LEADERSHIP AND
COORDINATION

- 2021: Research Professor of the Czech Academy of Sciences
- 2021 – present: Head of the Department of Experimental Particle Physics at home institute.
- 2009 – 2020: Deputy Head of the Department of Experimental Particle Physics at home institute.
- 2020: Chair of Programme Committee and Scientific Secretary of the ICHEP2020 Conference.
- 2020 – present: Chair of the Forward Detector Institutional Board in the ATLAS experiment.
- 2020 – 2022: Co-convener of the working group Soft QCD and Diffraction in the ATLAS experiment.
- 2015 – 2020: AFP Deputy Physics Coordinator in the ATLAS experiment.
- 2019 – 2022: Representative of Czech Republic in Restricted meetings of the Committee for Future Accelerators (RECFA).
- 2014 – 2022: Representative of Czech Republic in Plenary meetings of the Committee for Future Accelerators (ECFA).
- 2017: Chair of the Local Organizing Committee of the Elastic and Diffractive scattering Conference (EDS 2017) in Prague.
- 2017: Deputy Chair and Chair of the Speakers Committee in the ATLAS experiment.
- 2014 – present: Institute Representative in the Forward Detector group in the ATLAS experiment.
- 2012 – 2017: Member of the AFP Management Board in the ATLAS experiment.
- 2006 – 2012: Co-leader of the Czech working group focusing on forward physics at LHC.
- 2006 – 2012: Deputy Project Leader of the RP220 project (predecessor of AFP).

- 2006 – 2009: Physics Co-coordinator of the FP420 Collaboration.

MEMBERSHIP IN
COMMITTEES

- 2022 – present: Member of the Editorial Board of the journal Physics (MDPI).
- 2021 – present: Member of the Editorial Board of the journal Symmetry (MDPI).
- 2019: Member of the Local Organizing Committee of the Multiple-partonic interactions Conference (MPI 2019) in Prague.
- 2015: Member of the Program Committee of the International Symposium on Multi-particle Dynamics Conference (ISMD 2015).
- 2014 – 2017: Member of the Speakers Committee in the ATLAS experiment.
- 2013 – 2017: Member of the Panel 203 of the Czech Science Foundation.
- 2013: Member of the Program Committee of the EDS 2013 Conference.
- 2011: Member of the Program Committee of the EDS 2011 Conference.
- Member of numerous Examination and Defence Committees at Czech universities.
- Reviewer in journals Physics Review D, Journal of High Energy Physics and Universe.

ORGANIZATION OF
NATIONAL EVENTS

- 2014 – 2022: Main organizer of assemblies of the Czech High-Energy Physics community.
- 2008 – 2019: Main organizer of regular division seminars at home institute.

OUTREACH
ACTIVITIES

- 2014: author of the article *Future circular collider at CERN* in the Czech Journal for Physics, nr.4

PUBLICATIONS WITH
ESSENTIAL INPUT

See a separate document.

INVITED ORAL
PRESENTATIONS AT
INTERNATIONAL
CONFERENCES

Full list at www.fzu.cz/en/people/mgr-marek-tasevsky-phd-dsc/talks.

- Meeting of the LHC Top Physics Working Group (2020): *(Semi)Exclusive production of Top pair at LHC*.
- XXVII International Workshop on Deep Inelastic Scattering and Related Subjects (DIS 2019): *Measurements of single diffraction using the ALFA forward spectrometer at ATLAS (for ATLAS Collab.)*.
- XXVIII International Symposium on Lepton Photon Interactions at High Energies (Lepton Photon 2017): *Soft QCD measurements at LHC (for ALICE, ATLAS, CMS, LHCb, LHCf and TOTEM Collaborations)*.
- 8th International Workshop on Multiple Partonic Interactions at the LHC (MPI 2016): *ATLAS results on diffraction and exclusive production (for ATLAS Collab.)*.
- International Workshop on Diffraction in High-Energy Physics (Diffraction 2016): *Status of the AFP project in the ATLAS experiment (for ATLAS Collab.)*.

ORAL
PRESENTATIONS AT
INTERNATIONAL
EVENTS

Full list at www.fzu.cz/en/people/mgr-marek-tasevsky-phd-dsc/talks.

- Workshop on Photon-induced processes 2022: *Photon induced di-jets and general QCD analysis with AFP*
- Plenary ECFA Meeting 2019: *Mid-term report: Czech Republic*.
- European Physical Society Conference on High Energy Physics 2019 (EPS-HEP 2019): *Searches for Dark Mater at LHC in forward proton mode*.
- ATLAS Overview (Collaboration) Week 2019: *Forward proton physics and performance*.
- XXVII International Workshop on Deep Inelastic Scattering and Related Subjects (DIS 2019): *Searches for Dark Matter at the LHC in forward proton mode*.

ORAL
PRESENTATIONS AT
NATIONAL EVENTS

Full list at www.fzu.cz/en/people/mgr-marek-tasevsky-phd-dsc/talks.

- Assembly of the CZ HEP Community 2022: *ECFA & RECFA Activities*.
- Assembly of the CZ HEP Community 2021: *ECFA & RECFA Activities*.
- Exceptional Assembly of the CZ and SK HEP Communities (discussion on Update of European Strategy of Particle Physics) 2019: *Linear Collider meeting in Lausanne April 2019*.
- Exceptional Assembly of the CZ and SK HEP Communities (discussion on Update of European Strategy of Particle Physics) 2018: *Future Linear and Circular Colliders*.
- CZ-SK ATLAS Physics workshop 2018: *Status of AFP*.

LECTURES IN
INTERNATIONAL
SCHOOLS

- WE-Heraeus-Summerschool on Diffractive and Electromagnetic Processes at High Energies 2011: *Proton tagging at high luminosities at the LHC*.
- LAFEX International School on High-Energy Physics - Present and Future (LISHEP 2011): *AFP and HPS - Forward Proton Projects (for AFP and HPS Collab.)*.

SEMINARS

Full list at www.fzu.cz/en/people/mgr-marek-tasevsky-phd-dsc/talks.

- Seminar of the Institute of theoretical physics of Charles University 2021: *Exclusivity at high-energy collisions*
- Seminar of the Joint Laboratory of Optics and Department of applied physics, Palacky University, Olomouc 2017: *Soft QCD measurements at LHC and Highlights from the Lepton Photon 2017 conference*.
- Seminar of the Division of Physics of elementary particles, Institute of Physics of CAS 2017: *Soft QCD measurements at LHC and Highlights from the Lepton Photon 2017 conference*.
- Seminar of the Division of Physics of elementary particles, Institute of Physics of CAS 2014: *FCC - Future Circular Collider*.
- Seminar of the Division of Physics of elementary particles, Institute of Physics of CAS 2010: *Status of the AFP Project*.