

# Curriculum Vitae et Studiorum

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## Personal Information

*Name:* Andrea Parenti

*Date of Birth:* November 7th, 1973

*Place of Birth:* Firenze, Italy

*Citizenship:* Italian

*Current Position:* Scientist at the European XFEL GmbH, Hamburg, Germany.



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## Education

- **July 1992:** High school degree at “Istituto Tecnico Industriale Leonardo da Vinci”, Firenze, Italy, with a final mark of 60/60.
- **July 11th 2000:** *Laurea* degree in Physics (M.Sc.) at “Università degli Studi di Firenze”, Firenze, Italy, with a mark of 110/110.
- **December 18th 2003:** Ph.D. in Physics at “Università degli Studi di Padova”, Padova, Italy.

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## Schools

- **26/08–08/09/2001:** “2001 European School of High Energy Physics”. Organised by CERN at Beatenberg, Switzerland, had the aim to give a theoretical overview of High-Energy Physics to young experimentalists.
- **2–10/06/2002:** “CTEQ Summer School on QCD analysis and phenomenology”. Organised in Madison, Wisconsin, by the CTEQ collaboration (Coordinated Theoretical-Experimental Project on QCD), the school gave a phenomenological review of the QCD.

- **24–28/01/2005:** “Database Workshop for LHC online/offline developers”; an introductory workshop on database organised at CERN especially for LHC software developers.
- **9–14/06/2005:** “Italo-Hellenic School of Physics”, Martignano, Lecce, Italy. Subtitle of the school was “The physics of LHC: theoretical tool & experimental challenges“, since presented the tools for the future physics at LHC.
- **10–14/03/2008:** “Terascale Accelerator School”, DESY Hamburg, Germany. The school covered the physics and engineering concepts of relativistic accelerators and colliders. The programme comprised introductory lectures into the concepts of modern accelerators. The afternoons were reserved for exercises.
- **17–28/08/2009:** “Cern School of Computing”, Göttingen, Germany. The school comprised lectures and exercises. The covered topics were: software security, networking, hardware architecture and virtualisation, data storing and management, data analysis technologies (in particular using root). In the final examination I got a mark of 30/34 (the fourth highest one) and a special mention.

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## Research Activity

### In brief

- **09/1992 – 06/1994:** I had a grant from the “Fondazione Pro Juventute don Carlo Gnocchi” to work on gait analysis.
- **09/1999 – 07/2000:** In July 2000 I got the *Laurea* degree (M.Sc.) in Physics at the Florence University; the thesis title was “Search for resonances in  $ep$  collisions with the ZEUS detector at HERA”. During the preparation of the thesis I was associated to the INFN.
- **11/2000 – 12/2003:** From 2000 to 2003 I was a Ph.D. student at the Physics Department of the Padova University; I was associated to the INFN and member of the ZEUS collaboration. In ZEUS I contributed to the search for excited fermions, but my main works were the search for di-electrons and di-muons and the development of a tracking algorithm for the ZEUS vertex detector, to be used in the trigger.
- **09/2003 – 11/2007:** From fall 2003 to fall 2007 I was a Postdoc at Padova University, associated to the INFN and member of the CMS collaboration. I collaborated in writing the software for the test and commissioning of the

barrel drift muon chambers, and I took shifts for chamber commissioning. I also developed the drift chamber part of the detector control system; my software was first used in 2006 in the Magnet Test/Cosmic Challenge to monitor and configure the 14 involved drift tube chambers and is currently being used as the final slow control system of the 250 chambers.

- **11/2007 – 11/2010:** From November 2007 to November 2010 I have been a fellow at DESY Hamburg. In this period, the multi-lepton analysis initiated during the Ph.D. has been extended to use all the available data and published. I have been the ZEUS responsible person for the simulation of Monte Carlo events on the GRID from December 2007 to October 2008, and the Monte Carlo coordinator of the experiment from November 2008 to June 2010. I was also working in the tracker alignment group of CMS, in particular I was involved in the alignment of the endcaps by using beam halo muons. I have been convener of the electroweak and searches working group at the “XVIII International Workshop on Deep-Inelastic Scattering and Related Subjects” (DIS 2010), held in Florence (Italy) from April 19 to April 23, 2010.
- **11/2010 – March 2012:** From November 2010 to March 2012 I worked in the Experiment Control Group of the Photon Science Department at DESY, mainly on the data acquisition and online control software for the beamlines at PETRA III.
- **03/2012 – Now:** In March 2012 I joined the WP-76 (DAQ & Control Systems) at the European XFEL GmbH, as a Device Integrator Scientist.

More details on my research activities are available below.

#### **September 1992 – June 1994**

I had a grant from “Fondazione Pro Juventute don Carlo Gnocchi” based in Pozzolatico, Firenze, working on gait analysis and respiratory movements analysis; these tests were performed on pathological and sane subjects in order to develop a method of evaluation of the degree of infirmity. I took care of data taking and analysis.

#### **August – September 1998**

I participated to the summer student program at DESY, Hamburg, Germany, working in the exotic physics group of the ZEUS experiment. I first learned the use of the Unix OS and of the Fortran 77 language, used in the experiment; consequently I started using the analysis software of ZEUS.

I first analysed a sample of Photoproduction Monte Carlo events to verify that they were indeed a negligible background in the search for resonances in the

high- $Q^2$  region. Then I analysed the  $e^-p$  data collected in 1998 selecting Neutral Current DIS events, and I compared the distributions of variables with the ones measured in 1994–1997  $e^+p$  interactions. Both the works were presented to the exotic physics group and to the structure function group.

#### **September 1999 – July 2000**

I worked on my *Laurea* degree (M.Sc.) thesis, “*Ricerca di risonanze nelle collisioni ep col rivelatore ZEUS ad HERA*” (Search for resonances in  $ep$  collisions with the ZEUS detector at HERA) under the supervision of Dr. Giuseppe Barbagli and Prof. Piero Spillantini; in that period I was associated to the INFN (Italian National Institute for Nuclear Research).

In my thesis I analysed  $e^-p$  data collected in 1998–1999, in the search for resonances decaying into electron and quark. No excess over the background expected from Neutral Current DIS was observed, therefore upper limits were derived on the production cross sections for such resonances. By assuming the leptoquark phenomenological model for the resonance, an upper limit was extracted for the coupling of such particles to electrons and quarks; in most of the cases those limits were better than the ones published by the LEP and TEVATRON experiments.

#### **November 2000 – December 2003**

In September 2000 I got a position as Ph.D. student at the Physics Department of the Padova University. I started the Ph.D. in November under the supervision of Dr. Luca Stanco. During all the duration of the Ph.D. I was again associated to the INFN.

In my first year of Ph.D. I collaborated to the search for excited fermions in the ZEUS data; this search is important since the existence of such states would clearly indicate fermion compositeness. When I joined the team the 1994–1997 data were already analysed, therefore I evaluated the systematic uncertainties in the analysis. In the following I updated the results with the search for excited electrons and quarks in new (1998–2000) data; the distributions were in agreement with those expected from pure background, thus I evaluated the upper limits on cross section and coupling constants of the excited fermions. The results were presented to the EPS 2001 conference in Budapest, Hungary, and to the LXXXVII SIF (Italian Physical Society) meeting in Milano, Italy; the analysis of 1994–97 data has been published in “Physics Letters B” [10].

In the second year of the Ph.D. I developed a Fortran 77 algorithm for the tracking in the newly installed ZEUS vertex detector (MVD), to be used at the third level of the trigger. The algorithm reconstructed hits in the MVD, then took tracks from the central tracker and propagated them towards the interaction point, assigning the MVD hits to tracks and recalculating track parameters. This algorithm was used for the selection of heavy flavour events; an inclusive filter selected

events with large impact parameter, and a good efficiency for charm and beauty was achieved with a nice rejection power for other types of processes.

In my third year of Ph.D. I analysed the ZEUS data collected between 1996 and 2000 in the search for events having two or more electrons – or muons – in the final state. The process is calculable with high precision in the Standard Model, therefore is good for testing the Standard Model and searching for new physics. The results of the di-muon search was presented to the ICHEP 2004 conference [57] in Beijing, China.

In December 2003 I defended my Ph.D. thesis, “Search for multi-lepton events with the ZEUS detector at HERA and VCMVD: an algorithm for MVD” [43].

#### **October 2001 – Now**

I am responsible of the production site of Monte Carlo events for the ZEUS experiment in Padova.

#### **Fall 2001 – November 2003**

The Padova University and INFN section were responsible for the Barrel–Rear muon detector of the ZEUS experiment (BRMUON). I was in Hamburg several months as BRMUON expert, assuring twenty-four hours seven days a week availability.

#### **September 2003 – November 2007**

In July 2003 I got a post–doc (*Assegno di Ricerca*) at Padova University, to work on the CMS drift tube muon detectors. The position was two years long, and was renewed for two additional years up to August 2007; during all the period I have been associated to the INFN, too. In September and October 2007 I continued my work as an external collaborator of the University.

At the beginning of the post-doc I worked to the software – written in Labview – for the test and configuration of the Minirate<sup>1</sup>.

In September 2004 I modified and added some features to the software in order to use it to monitor and configure the two chambers used in the last beam test, done at CERN from October 5 to 10; I participated to the beam test as software expert and shifter. The data taking was successful; the analysis of data has produced two publications in “Nucl Instrum. Meth.” [61, 66].

Since fall 2004 to fall 2007 I developed the control system (DCS) for the 250 drift tube muon chambers of CMS. The DCS is made up by several parts, and I implemented the C++ server which receives commands from all possible clients (e.g. Labview, Java, CMS run control), interprets and sends them to the chambers; I also interfaced the server to the central ORACLE database using the

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<sup>1</sup>The minirate is the local electronics mounted on the drift tube itself: trigger, read–out and control systems.

ODBC standard. For the Magnet Test/Cosmic Challenge<sup>2</sup> [65] in June–September 2006 I prepared a text user interface and my software was used for monitoring and configuring the 14 drift tube chambers used. My software is currently being used as the final slow control of the 250 drift tubes.

From July 2005 I started working for the drift tube (DT) commissioning [87]. The drift tubes, assembled in Padova and in other European institutes, are now installed at CERN in the CMS Yoke. The DT were tested in the production site but final dressing and electronic certification before installation was done at CERN ISR. Further tests with final cabling were done after installation in the yoke by acquiring and analysing cosmic events. I developed part of the software necessary for the tests at CERN and took shifts for the chamber commissioning.

#### **November 2007 – November 2010**

From fall 2007 to Fall 2010 I have been a DESY Fellow in Hamburg. I resumed the work on di-muon and di-electron search in the data collected by the ZEUS experiment between 1996 and 2007. The results obtained using all the available statistics (1996–2007) have been presented at the EPS-HEP2007 conference in Manchester, UK (for the di-electron channel), and at the ICHEP08 conference in Philadelphia, PA (for the di-muon channel), and finally published [93]. The H1 and ZEUS results have been consequently combined in order to improve the precision of the measurement, and the combination published [94].

I have been the ZEUS responsible person for the production of Monte Carlo simulations on the GRID from December 2007 to October 2008. From October 2008 till June 2010 I have been the Monte Carlo coordinator of the ZEUS experiment.

I have also worked in the tracker alignment group of CMS, in particular I was involved in the alignment of the endcaps by using beam halo muons. I have been responsible for a Perl package used to submit alignment jobs to the CMS computer farm. In 2008, together with a summer student, I have written a graphical user interface to the package, in Perl/Tk.

I have been appointed as a convener of the electroweak and searches working group at the “XVIII International Workshop on Deep-Inelastic Scattering and Related Subjects” (DIS 2010) conference, held on 19-23 April, 2010, in Florence, Italy.

#### **November 2010 – March 2012**

In November 2010 I joined the Experiment Control Group of the Photon Science Department at DESY. I mainly worked on the implementation of control software for the experiments, within the Tango framework (to which DESY is one

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<sup>2</sup>The Magnet Test/Cosmic Challenge is the final phase of the CMS magnet commissioning and the period during which cosmic events were acquired with a complete sector of the CMS detector, with and without the magnetic field.

contributor).

### **March 2012 – Now**

In March 2012 I joined the WP-76 (DAQ & Control Systems) at the European XFEL GmbH, as a Device Integrator Scientist.

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## **Teaching**

- 2005: Laboratory assistant for the course of General Physics I (25 hours).
- 2006: Laboratory assistant for the course of General Physics II (32 hours).
- 2007: Laboratory assistant for the course of General Physics II (48 hours).

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## **Advised Students**

In the year 2001 I co-advised the work of the student Abramo Salvestrin at the Padova University, working on the search of the rare decay  $D^0 \rightarrow \mu^+ \mu^-$  in the data collected by ZEUS in the years 1996–2000. The other advisor was Dr. Riccardo Brugnera from Padova University. We got an upper limit for the branching ratio of the decay, but the result was not competitive to the world best, from WA32 at CERN. Our study was the first search for  $D^0 \rightarrow \mu^+ \mu^-$  in HERA data.

In the summer 2008 I worked with the DESY Summer Student Luis Alberto Sanchez Moreno (from UNAM, Morelia, Mexico). Under the supervision of Dr. Silvia Miglioranza (DESY) and mine, the student developed in perl/Tk a graphical interface to the alignment code of the CMS tracker.

In the summer 2009 I worked with the DESY Summer Student Gregor Bruns (from Universität Leipzig, Germany). Under the supervision of Dr. Justyna Tomaszewska (DESY) and mine, the student worked on the validation of the CMS analysis software, implementing a set of python scripts to automatize the validation procedure.

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## **Public Talks**

- 26/09/2001, Milano (Italy), LXXXVII SIF (Italian Physical Society) Meeting: “*Ricerca di fermioni eccitati nelle collisioni ep ad HERA*” (Search for excited fermions in *ep* collisions at HERA).
- 25/04/2003, St. Petersburg (Russia), XI International Workshop on Deep Inelastic Scattering: “Multi-lepton events at HERA”.
- 19/04/2006, Pavia (Italy), Incontri di Fisica delle Alte Energie: “*Recenti risultati di HERA*” (Recent results from HERA).

- 22/09/2006, Torino (Italy), XCII SIF Meeting: “Commissioning of the Muon Barrel chambers of the CMS experiment”.
- 03/05/2007, Batavia IL, XV IEEE-NPSS Real Time Conference: “The CMS Muon System and its Performance in the CMS Cosmic Challenge”.
- 09/04/2008, London (UK), XVI International Workshop on Deep-Inelastic Scattering: “Multi-lepton and General Searches at HERA”.
- 28/05/2009, San Diego CA, 10th Conference on the Intersections of Particle and Nuclear Physics: “Search for New Physics at HERA”.
- 22/04/2010, Firenze (Italy), XVIII International Workshop on Deep-Inelastic Scattering: “Multilepton production at HERA”
- 23/04/2010, Firenze (Italy), XVIII International Workshop on Deep-Inelastic Scattering: “Electroweak and searches summary talk”
- 29/04/2010, Hamburg (Germany), 69. meeting of the DESY Physics Research Committee: “ZEUS Status Report”

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## Computing skills

- **Operating Systems:** Linux (administrator level), \*nix, Windows e MacOS (user level).
- **Data analysis:** PAW, root.
- **Programming Languages:** C/C++, Fortran 77, Labview.
- **Scripting Languages:** Unix shell (bash, csh), Perl, Python.
- **GUI Toolkits:** Perl/Tk, PyQt.
- **Databases:** Oracle, mySQL (administrator level).
- **Other Languages:** L<sup>A</sup>T<sub>E</sub>X, html, JavaScript.

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## Language skills

- **Italian:** mother tongue.
- **English:** fluent.



- **German:** beginner.

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## **Publications**

Here in the following I will list all my publications.

In particular, during my degree thesis I worked on the search for resonances decaying into leptons plus quarks, published by ZEUS in [1, 34].

During the Ph.D. I collaborated to the search for excited states of fermions [10], but my main work was the study of di-lepton production at HERA, published as DESY-THESIS [43]. The analysis has been recently published [93] and subsequently combined [94] with H1 results.

As a member of CMS I participated in the drift tube commissioning [61, 66, 87] and to the Magnet Test/Cosmic Challenge in 2006 [65]. More recently I worked to the alignment of the tracker [98].

Hamburg, April 4, 2013

(Andrea Parenti)

# List of Publications

- [1] J. Breitweg et al. A search for resonance decays to  $\bar{\nu}$  jet in  $e^+p$  scattering at HERA. *Phys.Rev.*, D63:052002, 2001.
- [2] J. Breitweg et al. Measurement of dijet cross sections for events with a leading neutron in photoproduction at HERA. *Nucl.Phys.*, B596:3–29, 2001.
- [3] J. Breitweg et al. Measurement of open beauty production in photoproduction at HERA. *Eur.Phys.J.*, C18:625–637, 2001.
- [4] J. Breitweg et al. Measurement of dijet production in neutral current deep inelastic scattering at high  $Q^2$  and determination of  $\alpha_s$ . *Phys.Lett.*, B507:70–88, 2001.
- [5] S. Chekanov et al. Study of the effective transverse momentum of partons in the proton using prompt photons in photoproduction at HERA. *Phys.Lett.*, B511:19–32, 2001.
- [6] S. Chekanov et al. Multiplicity moments in deep inelastic scattering at HERA. *Phys.Lett.*, B510:36–54, 2001.
- [7] S. Chekanov et al. Measurement of the neutral current cross section and  $F_2$  structure function for deep inelastic  $e^+p$  scattering at HERA. *Eur.Phys.J.*, C21:443–471, 2001.
- [8] S. Chekanov et al. Three-jet production in diffractive deep inelastic scattering at HERA. *Phys.Lett.*, B516:273–292, 2001.
- [9] S. Chekanov et al. Properties of hadronic final states in diffractive deep inelastic  $ep$  scattering at HERA. *Phys.Rev.*, D65:052001, 2002.
- [10] S. Chekanov et al. Searches for excited fermions in  $ep$  collisions at HERA. *Phys.Lett.*, B549:32–47, 2002.
- [11] S. Chekanov et al. Dijet production in neutral current deep inelastic scattering at HERA. *Eur.Phys.J.*, C23:13–27, 2002.

- [12] S. Chekanov et al. Dijet photoproduction at HERA and the structure of the photon. *Eur.Phys.J.*, C23:615–631, 2002.
- [13] S. Chekanov et al. High mass dijet cross-sections in photoproduction at HERA. *Phys.Lett.*, B531:9–27, 2002.
- [14] S. Chekanov et al. Measurement of the photon proton total cross section at a center-of-mass energy of 209 GeV at HERA. *Nucl.Phys.*, B627:3–28, 2002.
- [15] S. Chekanov et al. Search for lepton-flavor violation in  $e^+p$  collisions at HERA. *Phys.Rev.*, D65:092004, 2002.
- [16] S. Chekanov et al. Exclusive photoproduction of  $J/\psi$  mesons at HERA. *Eur.Phys.J.*, C24:345–360, 2002.
- [17] S. Chekanov et al. Measurement of the  $Q^2$  and energy dependence of diffractive interactions at HERA. *Eur.Phys.J.*, C25:169–187, 2002.
- [18] S. Chekanov et al. Leading neutron production in  $e^+p$  collisions at HERA. *Nucl.Phys.*, B637:3–56, 2002.
- [19] S. Chekanov et al. Measurement of proton dissociative diffractive photoproduction of vector mesons at large momentum transfer at HERA. *Eur.Phys.J.*, C26:389–409, 2003.
- [20] S. Chekanov et al. Measurement of high- $Q^2$  charged current cross sections in  $e^-p$  deep inelastic scattering at HERA. *Phys.Lett.*, B539:197–217, 2002.
- [21] S. Chekanov et al. Measurement of diffractive production of  $D^*(2010)^\pm$  mesons in deep inelastic scattering at HERA. *Phys.Lett.*, B545:244–260, 2002.
- [22] S. Chekanov et al. A ZEUS next-to-leading-order QCD analysis of data on deep inelastic scattering. *Phys.Rev.*, D67:012007, 2003.
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- [24] S. Chekanov et al. Measurement of high- $Q^2$   $e^-p$  neutral current cross sections at HERA and the extraction of  $xF_3$ . *Eur.Phys.J.*, C28:175, 2003.
- [25] S. Chekanov et al. Leading proton production in  $e^+p$  collisions at HERA. *Nucl.Phys.*, B658:3–46, 2003.

- [26] S. Chekanov et al. Study of the azimuthal asymmetry of jets in neutral current deep inelastic scattering at HERA. *Phys.Lett.*, B551:226–240, 2003.
- [27] S. Chekanov et al. Measurements of inelastic  $J/\psi$  and  $\psi'$  photoproduction at HERA. *Eur.Phys.J.*, C27:173–188, 2003.
- [28] S. Chekanov et al. Observation of the strange sea in the proton via inclusive  $\Phi$ -meson production in neutral current deep inelastic scattering at HERA. *Phys.Lett.*, B553:141–158, 2003.
- [29] S. Chekanov et al. Measurement of event shapes in deep inelastic scattering at HERA. *Eur.Phys.J.*, C27:531–545, 2003.
- [30] S. Chekanov et al. Measurement of subjet multiplicities in neutral current deep inelastic scattering at HERA and determination of  $\alpha_s$ . *Phys.Lett.*, B558:41–58, 2003.
- [31] S. Chekanov et al. Scaling violations and determination of  $\alpha_s$  from jet production in  $\gamma p$  interactions at HERA. *Phys.Lett.*, B560:7–23, 2003.
- [32] S. Chekanov et al. Search for single-top production in  $ep$  collisions at HERA. *Phys.Lett.*, B559:153–170, 2003.
- [33] S. Chekanov et al. Dijet angular distributions in photoproduction of charm at HERA. *Phys.Lett.*, B565:87–101, 2003.
- [34] S. Chekanov et al. A search for resonance decays to lepton + jet at HERA and limits on leptoquarks. *Phys.Rev.*, D68:052004, 2003.
- [35] S. Chekanov et al. Measurement of deeply virtual compton scattering at HERA. *Phys.Lett.*, B573:46–62, 2003.
- [36] S. Chekanov et al. Jet production in charged current deep inelastic  $e^+p$  scattering at HERA. *Eur.Phys.J.*, C31:149–164, 2003.
- [37] S. Chekanov et al. Measurement of high- $Q^2$  charged current cross sections in  $e^+p$  deep inelastic scattering at HERA. *Eur.Phys.J.*, C32:1–16, 2003.
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- [39] S. Chekanov et al. Observation of  $K_S^0 K_S^0$  resonances in deep inelastic scattering at HERA. *Phys.Lett.*, B578:33–44, 2004.
- [40] S. Chekanov et al. Measurement of  $D^{*\pm}$  production in deep inelastic  $e^\pm p$  scattering at HERA. *Phys.Rev.*, D69:012004, 2004.

- [41] S. Chekanov et al. Isolated tau leptons in events with large missing transverse momentum at HERA. *Phys.Lett.*, B583:41–58, 2004.
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- [46] S. Chekanov et al. Beauty photoproduction measured using decays into muons in dijet events in  $ep$  collisions at  $\sqrt{s} = 318$  GeV. *Phys.Rev.*, D70:012008, 2004.
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- [49] S. Chekanov et al. Photoproduction of  $D^{*\pm}$  mesons associated with a leading neutron. *Phys.Lett.*, B590:143–160, 2004.
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- [64] A. Parenti. Multi-lepton events at HERA. pages 396–400, 2007. Published in the proceedings of 11th International Workshop on Deep Inelastic Scattering (DIS 2003), St. Petersburg, Russia. ISBN: 5867631486.
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