# Hubert Niewiadomski

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Date of birth: 3 March 1979

## EDUCATION

Ph.D. in Experimental Particle Physics (2004 – 2008)

Manchester University, School of Physics and Astronomy / CERN, TOTEM,
*Reconstruction of Protons in the TOTEM Roman Pot Detectors at the LHC.*

M.Sc. in Computer Science (1998 – 2003)

Warsaw University of Technology, Faculty of Electronics and Information Technology, graduation with highest honours, top 10 student.
*Serial Decomposition of Feed-Forward Neural Networks.*

Opera Vocal Studies, baritone (2005 – 2009)

Conservatoire Supérieure de Musique de Genève, class of Gilles Cachemaille.

## PROFESSIONAL AND SCIENTIFIC EXPERIENCE

Deputy Analysis coordinator, CERN, THE TOTEM Experiment (2011 – now)

- **Partial coordination of Data Analysis Group**: Responsibility for software and data readiness for the analysis; responsibility for Monte Carlo studies of RP detectors; coordination of several analysis projects.
- **Computing:** Responsibility for performance of the reconstruction and analysis algorithms.

FELLOW, CERN, THE TOTEM EXPERIMENT (2010 – now)

- **Data Analysis**: Analysis of large data sets (tens of TBs) registered with the TOTEM detectors at the Large Hadron Collider at CERN (LHC); design and practical development of data reconstruction and analysis algorithms (pattern recognition, feature extraction, classification, noise cancellation and regularisation techniques, background subtraction, unfolding, non-linear regression); statistical and multivariate analysis techniques.
- **Data processing:** Coordination of Roman Pot detector data processing; parallel data processing.
- **R&D studies:** Novel approach to Large Hadron Collider (LHC) optics imperfection studies.
- **Others:** Supervision of several master's and PHD students.

POST DOC, Pennsylvania State University and CERN / TOTEM (2007 – 2010)

- **R&D studies:** Study of new LHC Roman Pot locations in the LHC IR3 region in order to extend the diffractive physics programme of TOTEM towards lower DPE masses.
- **Monte Carlo:** Development of pattern recognition and proton reconstruction algorithms for the Roman Pot detectors; supervision of TOTEM Offline Database and TOTEM Visualisation projects; Monte Carlo studies of the early TOTEM physics programme.
- **Beam optics analysis:** Development of the LHC aperture analyser for the acceptance studies of TOTEM Roman Pot detectors.
- **Other activities:** Supervision of several students and a master thesis. Participation in the TOTEM software, physics and alignment groups.

DOCTORAL STUDENT, CERN / TOTEM (2004 – 2007)

- **Monte Carlo:** Development of a full simulation and reconstruction software of the Roman Pot detectors in the CMSSW/Geant4 framework together with the fast proton transport model. Physics simulations for selected running scenarios. Analysis of MC data.
- **Beam optics analysis:** Studies of TOTEM reconstruction capabilities for various LHC running scenarios. Development of a novel method of the LHC proton transport modelling based on multidimensional polynomial expansion.
- **Data transmission:** Algorithms for fibber transmission jitter correction (correlation based approach); tests of an ASIC prototype (VFAT) and implementation of hardware-software interface.
- **Detector performance studies:** Beam tests of prototype 'edgeless' silicon detectors and active edge 3D silicon devices; Implementation of required reconstruction and analysis software; Data acquisition monitoring software.
- **Other activities:** Supervision of several students.

SUMMER INTERNSHIP at CERN / TOTEM (2003)

Development of software for beam tests of prototype 'edgeless' silicon detectors; detectors' performance studies and analysis of sensors' active edge behaviour.

YOUNG RESEARCHER, Warsaw University of Technology (2000 – 2003)

Students' research in the group of Prof. T. Łuba and Dr. P. Sapiecha in the Division of Telecommunications Fundamentals; several papers on logic synthesis, machine learning and artificial neural networks; participation in the grant of the Polish National Research Committee.

ENGINEER, POSNET, Warsaw (2000 – 2002)

Hardware-software co-design engineer. Designer of an operating system for an FPGA based hardware with an embedded processor.

## SKILLS

- Excellent practical and theoretical knowledge of data analysis and statistics.
- Excellent practical knowledge of mathematics, physics and numerical methods.
- Experience in data modelling and decomposition of complex systems.
- Expertise in Artificial Intelligence methods: Neural Networks, Genetic Algorithms, Machine Learning.
- Processing of large data sets, practical experience in memory and time optimisation.
- Distributed and parallel computing.
- Experience in management and development of large software packages, practical knowledge of software engineering.
- Excellent knowledge of C++/C and object oriented programming, data structures and algorithms. Knowledge of Python, Java, C, Pascal and Hardware Description Languages (Verilog, VHDL).
- Experience in analysis libraries (expert in ROOT) and mathematical software (Mathematica).
- Good practical knowledge of Monte Carlo methods.
- Knowledge of RDBS systems (ORACLE) and SQL.
- Some experience in computer graphics (OpenGL).
- MS Office software (MS Office), Latex, image editing software (Adobe Photoshop, Adobe Illustrator, Corel Draw, Corel Photo-Paint), audio editing and recording (Sound Forge).

## HONOURS AND AWARDS

- Warsaw University of Technology Rector's award for exceptional graduation (2003)
- Warsaw University of Technology Vice Rector's award for cultural activity (2003)
- Scholarship of the Ministry of Education for scientific and academic results (2001 – 2003)
- Second prize in The Competition of Research of Young Scientists and Researchers, Military Academy of Technology, Warsaw, Poland (2000)
- Laureate of the National Contest in Physics for secondary school students (1998)
- Scientific Scholarship of the Prime Minister of Poland (1997 – 1998)
- Scholarship of Polish Children's Fund in physics (1994 – 1998)

## PUBLICATIONS WITH SIGNIFICANT CONTRIBUTIONS

- The TOTEM Collaboration: **First measurement of the total proton-proton cross-section at the LHC energy of sqrt(s) = 7 TeV**, Europhys. Lett., 96 (2011) 21002.
- The TOTEM Collaboration: **Proton-proton elastic scattering at the LHC energy of sqrt(s) = 7 TeV**, Europhys. Lett. 95 (2011) 41001.
- H. Niewiadomski et al.: **Near-edge Performance of the TOTEM 'Edgeless' Silicon Detectors with Current Terminating Structure (CTS)**, being reviewed by the TOTEM Collaboration.
- H. Niewiadomski et al.: **Performance of a 3D Active Edge Planar Silicon Detector**, being reviewed by the TOTEM Collaboration.
- K. Eggert, P. Aspell, R. Assmann, V. Avati, M. Deile, H. Niewiadomski, V. Previtali, E. Radermacher, T. Weiler: **Detection of Diffractive Protons in IR3 at the LHC**, in progress.
- G. Ruggiero, V. Avati, G. Antchev, M. Deile, K. Eggert, V. Eremin, J. Kaspar, H. Niewiadomski, J. Petäjäjärvi, E. Radicioni, F. Ravotti, E. Radermacher, W. Snoeys, W. Spearman, J. Wu, **Characteristics of edgeless silicon detectors for the Roman Pots of the TOTEM experiment at the LHC**, Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 29 January 2009.
- G. Ruggiero, V. Avati, G. Antchev, M. Deile, K. Eggert, V. Eremin, J. Kaspar, H. Niewiadomski, F. Ravotti, E. Radermacher, W. Snoeys, W. Spearman: **Planar Edgeless Silicon Detectors for the TOTEM Experiment**, NIMA, PSD2008 in Glasgow.
- The TOTEM Collaboration: **The TOTEM Experiment at the LHC**, 2008 JINST 3 S08007, doi: 10.1088/1748-0221/3/08/S08007.
- E. Noschis for the TOTEM Collaboration: **Final Size Planar Edgeless Silicon Detectors for the TOTEM Experiment**, Nucl. Instrum. Methods Phys. Res., A 563 (2006) 41.
- G. Ruggiero, on the behalf of the TOTEM Collaboration: **Edgeless Silicon Detectors for the TOTEM Experiment**, IEEE Trans. Nucl. Sci. 52 (2005) 5.
- M. Deile, for the TOTEM Collaboration: **Tests of a Roman Pot Prototype for the TOTEM Experiment**, Proceedings of PAC05, Knoxville, Tennessee, USA, May 2005.
- Eggert K., Oriunno M., Bozzo M., et al.: **TOTEM Technical Design Report**, Geneva, CERN, Switzerland, 7 January 2004.
- Selvaraj H., Niewiadomski H., Buciak P., Pleban M., Sapiecha P., Łuba T., Muthukumar V.: **Implementation of Large Neural Networks using Decomposition**, Proceedings of the International Conference on Mathematics and Engineering Techniques in Medicine and Biological Sciences, pp. 249-255, Las Vegas, Nevada, USA, June 24-27 2002.
- Buciak P., Łuba T., Niewiadomski H., Pleban M., Sapiecha P., Selvaraj H.: **Decomposition and Argument Reduction of Neural Networks**, IEEE Sixth International Conference on Neural Networks and Soft Computing (ICNNSC'02), Zakopane, Poland, June 11-15, 2002.
- Selvaraj H., Niewiadomski H., Buciak P., Pleban M., Sapiecha P., Łuba T.: **Implementation of Large Neural Networks using Decomposition**, The 2002 International Conference on Mathematics and

Engineering Techniques in Medicine and Biological Sciences (METMBS'02), Las Vegas, USA, June 24-27, 2002.

- Niewiadomski H., Buciak P., Pleban M., Selvaraj H., Sapiecha P., Łuba T: **Decomposition of Large Neural Networks**, Proceedings of the IASTED International Conference, Applied Informatics, International Symposium on Artificial Intelligence and Applications, pp. 165-170, Innsbruck, Austria, February 18-21, 2002.
- Łuba T., Niewiadomski H., Pleban M., Selvaraj H., Sapiecha P.: **Functional decomposition and its applications in design of digital circuits and machine learning**. Proc. of the IASTED Int. Symposia. Applied Informatics. pp. 54-59, Innsbruck, Austria, Feb. 2001.
- Selvaraj H., Niewiadomski H., Pleban M., Sapiecha P.: **Decomposition of Digital Circuits and Neural Networks**, World Multiconference on Systemics, Cybernetics and Informatics, pp. 302-307, Orlando, USA 2001.

## MUSIC

- Solo baritone parts in operas and oratorios, solo performances with reputable orchestras, a vast repertoire of songs and melodies, numerous concerts in Poland, Switzerland, France, Austria and Germany.
- Solo vocal concerts in renewed auditoriums including the Grand Hall of Warsaw University of Technology (2011), Geneva Cathedral (2011), Victoria Hall (Geneva, 2008), Bâtiment des Forces Motrices (Geneva, 2005) and Polish Radio Concert Studio (Warsaw, 2001).
- Auxiliary organist of Saint Theresa Church in Geneva.

## OTHER HOBBIES

Energy, philosophy, politics, theology.

## LANGUAGES

Polish (mother tongue), English (fluent), French (advanced), German (intermediate), Russian (beginner), Italian (beginner), Latin (beginner).