Curriculum Vitae

Stephen Andrew Wotton
Principal Research Associate
Cavendish Laboratory, University of Cambridge

Personal Details

Date of birth	November 13th 1963
Place of birth	Bristol, UK
Nationality	British
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Academic qualifications

Institution	From	To	Qualifications obtained
Queen Elizabeth's Hospital, Bristol, UK	1975	1980	10 ``O-Levels"
Queen Elizabeth's Hospital, Bristol, UK	1980	1982	3 ``A-Levels",1 ``S-Level"
University of Birmingham, UK	1982	1985	BSc, Physics
University of Cambridge, UK	1985	1989	PhD, High Energy Physics

Research Career Summary

My principal current research interests are in the development of high-performance readout systems for high energy physics experiments. These systems are characterised by having high channel-count and channel-density, extreme operating environments (including under the influence of ionising radiation), high sensitivity and high data bandwidth. Currently I am exploring the development of instrumentation for high precision time of arrival measurements of single-photons produced in Ring-Imaging Cherenkov detectors.

University of Cambridge, UK, 1995-

I currently hold the position of Principal Research Associate in the HEP group of the Department of Physics. The post is funded through a grant from the UK Science and Technologies Facilities Council.

From 1995 to 2001 I worked on the CERN NA48 experiment which published a ground-breaking measurement of ε'/ε in the neutral Kaon system (a non-zero value of this ratio establishes the existence of direct CP-violation in Kaon decays). My primary research activities for NA48 were in the field of data-acquisition and trigger development for the muon veto subsystem.

From 1997 to 2018 I worked on the CERN LHCb experiment, specialising in aspects of the Ring Imaging Cherenkov (RICH) detector used for particle identification in the LHCb experiment. The LHCb experiment was conceived to measure the "unitarity triangle" representing the parameters of the CKM matrix. The RICH detectors, designed to distinguish between the types of particles produced in high energy proton-proton interactions, require the use of extremely sensitive (single-photon sensitivity) extremely high rate (40 MHz) detectors. I lead the project within the LHCb collaboration to design and implement the high-speed readout interface for the RICH detectors. This phase of the LHCb experiment has now completed after 10 successful years of operation.

From 2008 to 2018 I have been engaged in a program of evaluation, design and testing of readout systems for the next major phase of the LHCb RICH program. These activities started with the design, construction and operation of prototype RICH readout systems for evaluation in the CERN test beam environment. Following this prototyping phase I led the design and development of digital on-detector readout modules for the RICH. These modules exploit commercially available programmable logic devices and custom radiation-hard ASICs in order to implement a high bandwidth but physically compact system to transport data from the photon sensors to the LHCb event filter farm. I also coordinate the overall electronics activities of the LHCb RICH collaborating institutes.

I am currently also exploring new ideas and technologies for use in future RICH detectors including the potential use of precision photon timing to maintain or improve the performance of RICH systems under conditions of extreme occupancy. These activities include the evaluation of photon sensitive devices and the development of the required compact readout systems. I am currently exploring the possibility of an international collaborative project to design a fully operational prototype position- and time-sensitive photon sensor array. I am leading this read-out electronics activity within the UK collaboarting institutes and also within the wider international LHCb RICH collaboration.

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From 2015 to 2019 I supervised a PhD project that exploits hardware developed for the ATLAS and LHCb experiment to build a demonstration muon scattering tomography apparatus capable of locating and distinguishing materials inside closed containers. The apparatus has potential applications in the field of nuclear security. The project was in collaboration with and partly supported by AWE. I am currently supervising a CERN doctoral student researching novel meta-materials for use as Cherenkov radiators for particle physics and machine learning techniques for particle identifiaction in future experiments.

Research Associate, University of Heidelberg, Germany, 1991-1995

During this period I held a post equivalent to Research Associate. I initially worked on the testing and commissioning of new transputer-based flash analoque-to-digital (FADC) read-out controllers for the OPAL jet chamber. At around this time, transputer architectures promised to revolutiionise the design of massively parallelised, distributed and networked systems. However, they were subsequently superseded by the rapidly evolving RISC CPU architectures and transputers never becam economically viable. I developed the transputer algorithms that were used to read out the network of jet chamber FADCs and this compact and elegant solution continued in reliable service over many years until the end of OPAL data-taking. Following the commissioning of the transputer FADC system I played a central role in the upgrade of the jet chamber's multi-processor, data processing and acquisition system. Increases in the performance of the LEP collider necessitated a corresponding performance increase in the real-time VME-based system and I took a leading role in the real-time software development for the new HP PA-RISC CPUs that replaced the existing Motorola MVME 68040 CPUs. I had continued responsibility for the OPAL run control and other OPAL data acquisition subsystems.

CERN Fellow, CERN, Geneva, Switzerland, 1989-1991

OPAL is a CERN experiment at the Large Electron Positron (LEP) collider designed to measure parameters of the Standard Model through decays of the Z0. As a CERN fellow, during the first years of OPAL data taking I was a core contributor to the data acquisition systems of the OPAL detector. I was also responsible for the experiment's run control and other central data-acquisition systems and was an early pioneer of using object-oriented programming techniques for these applications.

Research student, University of Cambridge, UK, 1985-1989

As a member of the UA2 collaboration, a CERN experiment at the SppS (proton-antiproton) collider that co-discovered the W and Z particles and measured their properties, I developed a new, fast simulation of the UA2 scintillating fibre detector for an upgrade of the UA2 apparatus and I performed an analysis of prompt photon production.

Publications

I have an extensive publication list including hundreds of papers published with the OPAL, NA48 and LHCb collaborations. Here are a few selected highlights:

Keizer F, Gorbatch A, Parker MA, Steer C, Wotton SA. *A compact, high resolution tracker for cosmic ray muon scattering tomography using semiconductor sensors* Journal of Instrumentation 13(10) 23 Oct 2018

Baszczyk MK, Benettoni M, Calabrese R, Cardinale R, Carniti P, Cassina L, Cavallero G, Cojocariu L, Ramusino AC, D'Ambrosio C, et al. *Test of the photon detection system for the LHCb RICH Upgrade in a charged particle beam* Journal of Instrumentation 12(1) 16 Jan 2017

Aaij R, Adeva B, Adinolfi M, Affolder A, Ajaltouni Z, Akar S, Albrecht J, Alessio F, Alexander M, Ali S, et al., *LHCb detector performance*, International Journal of Modern Physics A 30(7) 10 Mar 2015

Adinolfi M, Rinella GA, Albrecht E, Bellunato T, Benson S, Blake T, Blanks C, Brisbane S, Brook NH, Calvi M, et al., *Performance of the LHCb RICH detector at the LHC*, Eur. Phys. J. C 73:2431

Adinolfi M, Albrecht E, D'Ambrosio C, Gys T, Morant J, Piedigrossi D, Patel M, Wyllie K, Ameri M, Fontanelli F et al., *Performance of the LHCb RICH photo-detectors and readout in a system test using charged particles from a 25 ns-structured beam*, Nucl Instr Meth A 603(3):287-293 21 May 2009

Fanti V, Lai A, Marras D, Musa L, Nappi A, Batley R, Bevan A, Dosanjh RS, Galik R, Gershon T et al., The beam and detector for the NA48 neutral kaon CP violation experiment at CERN, Nucl Instr Meth, A 574(3):433-471 11 May 2007

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Albrecht E, Baker J, Barber G, Bibby J, Calvi M, Charles M, Duane A, Easo S, Eisenhardt S, Eklund L et al., Performance of a cluster of multi-anode photomultipliers equipped with lenses for use in a prototype RICH detector, Nucl Instr Meth A 488(1-2):110-130 01 Aug 2002

Albrecht E, Barber G, Bibby JH, Brook NH, Duane A, French M, Gibson V, Giles R, Halley AW, Harnew N et al., *Performance of a prototype RICH detector using hybrid photo-diodes*, Nucl Instr Meth A 456(3):190-205 01 Jan 2001

Albrecht E, Barber G, Bibby JH, Brook NH, Doucas G, Duane A, Easo S, Eklund L, French M, Gibson V et al., *A prototype RICH detector using multi-anode photo multiplier tubes and hybrid photo-diodes*, Nucl Instr Meth A 456(3):233-247 01 Jan 2001

Albrecht E, Barber G, Bibby JH, Brook NH, Duane A, French M, Gibson V, Giles R, Halley AW, Harnew N et al., *First observation of Cherenkov ring images using hybrid photon detectors*, Nucl Instr Meth A 411(2-3):249-264 11 Jul 1998

Baines J.T.M., Beck F, Burckhart H.J., Charlton D.G., Cranfield R, Crone G, Elcombe P.A., Farthouat P, Fukunaga C, Geddes N.I. et al., *The data acquisition system of the OPAL detector at LEP*, Nucl Instr Meth a 325(1-2):271-293 01 feb 1993

Ansorge R.E., Anrouet C, Bareyre P, Bonamy P, Booth CN, Bouchard M, Bourdinaud M, Cordier M, Crittenden J, Dewolf R.S. et al., *The UA2 scintillating fiber detector*, Nucl Instr Meth A 273(2-3):826-832 15 Dec 1988

Ansorge R.E., Aurouet C, Bareyre P, Bonamy P, Booth C.N., Bouchard M, Bourdinaud M, Cordier M, Crittenden J, Dupont J et al., *Performance of a scintillating fiber detector for the UA2 upgrade*, Nucl Instr Meth a 265(1-2):33-49 01 Mar 1988

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