

Paul Busch
Professor of Mathematical Physics
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Phone: (01904) 323082



Paul Busch studied physics, mathematics and philosophy at the University of Cologne, where he obtained his first degree in Physics in 1979 and his PhD in 1982 with a thesis on the simultaneous measurability of complementary quantum observables. During his postdoctoral years at Cologne and Göttingen, he undertook investigations into a range of foundational problems of quantum theory and statistical physics. Following his habilitation, he was appointed University Docent in Theoretical in Cologne in 1988, and was awarded the title of Professor there in 1994. He held appointments as visiting professor and research scholar at a number of institutions including Florida Atlantic University (1986), the University of Heidelberg (in Philosophy, 1994), Harvard University (with Roy Glauber, Lyman Laboratory of Physics, 1994/5), and the Perimeter Institute of Theoretical Physics (2005-2007). He is Adjunct Professor at the Department of Physics and Astronomy, University of Turku. Paul held a chair in Mathematical Physics at the University of Hull and was Head of Department there from 2002 before joining the University of York in 2005.

Paul Busch's current research interests lie in the interface between physics, mathematics and philosophy, centred around questions concerning the relationship between quantum and classical physics, relativistic quantum measurement and quantum information theory. He is coauthor of three monographs, "The Quantum Theory of Measurement" (Springer, 1991/1996), "Operational Quantum Physics" (Springer, 1995/1997), and "Quantum Measurement" (Springer, 2016). Paul Busch is Associate Editor of the "Foundations of Physics" journal and co-editor of the Springer monograph series "Fundamental Theories of Physics". He was elected Member of L'Académie Internationale de Philosophie des Sciences in 2008, Fellow of the Institute of Physics in 2014, and Member of the Foundational Questions Institute (FQXi) in 2015. From 2016-2018 he serves as President of the International Quantum Structures Association. In the 2017/18 academic year he holds a Royal Society Leverhulme Trust Senior Research Fellowship.

Papers since 2001

Measurement uncertainty relations: characterising optimal error bounds for qubits: Topical Review. / Busch, Paul; Bullock, Thomas Joseph.

In: Journal of Physics A: Mathematical and Theoretical, Vol. 51, No. 28, 13.07.2018.

Sharp uncertainty relations for number and angle. / Busch, Paul; Kiukas, Jukka; Werner, Reinhard F.

In: Journal of Mathematical Physics, Vol. 59, No. 4, 042102, 04.2018.

Symmetry, Reference Frames, and Relational Quantities in Quantum Mechanics. / Loveridge, Leon; Miyadera, Takayuki; Busch, Paul.

In: Foundations of Physics, 05.02.2018.

Optimal joint measurements of complementary observables by a single trapped ion. / Busch, Paul; Xiong, T.P.; Yan, L.L. et al.

In: New Journal of Physics, Vol. 19, 06.2017.

Relativity of quantum states and observables. / Busch, Paul; Loveridge, Leon Deryck; Miyadera, Takayuki.

In: EPL (Europhysics Letters), Vol. 117, 40004, 04.04.2017.

Quantum Measurement. / Busch, Paul; Lahti, Pekka; Pellonpää, Juha-Pekka et al.

Springer, 2016. 542 p. (Theoretical and Mathematical Physics).

Measurement uncertainty: the problem of characterising optimal error bounds. / Busch, Paul; Bullock, Thomas Joseph. 2016.

Approximating relational observables by absolute quantities: a quantum accuracy-size trade-off. / Busch, Paul; Loveridge, Leon Deryck; Miyadera, Takayuki.

In: Journal of Physics A: Mathematical and Theoretical, Vol. 49, No. 18, 185301, 22.03.2016.

Philosophical Problems of Modern Physics – Peter Mittelstaedt 1929–2014. / Busch, Paul.
In: Foundations of Physics, Vol. 45, No. 5, 01.05.2015, p. 483-495.

Direct Tests of Measurement Uncertainty Relations: What It Takes. / Busch, Paul; Stevens, Neil.
In: Physical Review Letters, Vol. 114, 070402, 19.02.2015.

Nachruf auf Peter Mittelstaedt. / Busch, Paul.
In: Physik-Journal, Vol. 2015, No. 2, 02.2015, p. 45-47.

Quantum root-mean-square error and measurement uncertainty relations. / Busch, Paul; Lahti, Pekka; Werner, Reinhard F.
In: Reviews of Modern Physics, Vol. 86, No. 4, 18.12.2014, p. 1261-1281.

Focusing in Arthurs-Kelly-type Joint Measurements with Correlated Probes. / Bullock, Thomas Joseph; Busch, Paul.
In: Physical Review Letters, Vol. 113, 120401, 15.09.2014.

Uncertainty in the context of multi-slit interferometry. / Biniok, Johannes Christopher Garbi; Busch, Paul; Kiukas, Jukka.
In: Physical Review A, Vol. 90, 022115, 22.08.2014.

Measurement Uncertainty Relations. / Busch, Paul; Lahti, Pekka; Werner, Reinhard F.
In: Journal of Mathematical Physics, Vol. 55, No. 4, 042111, 04.2014.

Comment on "Experimental Test of Error-Disturbance Uncertainty Relations by Weak Measurement". / Busch, Paul; Lahti, Pekka; Werner, Reinhard F.
2014.

Steering, incompatibility, and Bell-inequality violations in a class of probabilistic theories. / Busch, Paul; Stevens, Neil.
In: Physical Review A, Vol. 89, No. 2, 022123, 24.02.2014.

Measurement Uncertainty: Reply to Critics. / Busch, Paul; Lahti, Pekka; Werner, Reinhard F.
2014.

Heisenberg uncertainty for qubit measurements. / Busch, Paul; Lahti, Pekka; Werner, Reinhard F.
In: Physical Review A, Vol. 89, No. 1, 012129, 31.01.2014.

Error and unsharpness in approximate joint measurements of position and momentum. / Busch, Paul; Pearson, David B.
2014.

Quantum rms error and Heisenberg's error-disturbance relation. / Busch, Paul.
In: EPJ Web of Conferences, Vol. 78, 01002, 2014.

Von Neumann entropy and majorization. / Busch, Paul; Li, Yuan.
In: Journal of mathematical analysis and applications, Vol. 408, No. 1, 01.12.2013, p. 384-393.

Proof of Heisenberg's error-disturbance relation. / Busch, Paul; Lahti, Pekka; Werner, Reinhard F.
In: Physical Review Letters, Vol. 111, No. 16, 160405, 17.10.2013, p. n/a.

Operational link between mutually unbiased bases and symmetric informationally complete positive operator-valued measures. / Beneduci, Roberto; Bullock, Thomas Joseph; Busch, Paul et al.
In: Physical Review A, Vol. 88, No. 3, 032312, 13.09.2013, p. 1-15.

Quantum measurements constrained by symmetries. / Busch, P.; D. Loveridge, L.

Symmetries and groups in contemporary physics: Proceedings of the XXIX International Colloquium on Group-Theoretical Methods in Physics. ed. / Chengming Bai; Jean-Pierre Gazeau; Mo-Lin Ge. Vol. 11 Singapore: World Scientific Publishing, 2013. p. 587-592 (Nankai Series in Pure, Applied Mathematics and Theoretical Physics; Vol. 11).

Comparing the degrees of incompatibility inherent in probabilistic physical theories. / Busch, Paul; Heinosaari, Teiko; Schultz, Jussi et al.

In: Europhysics Letters, Vol. 103, No. 1, 10002, 07.2013, p. 1-17.

Multislit interferometry and commuting functions of position and momentum. / C. G. Biniok, J.; Busch, P.

In: Physical Review A, Vol. 87, No. 6, 062116, 21.06.2013.

'Measurement of Quantum Mechanical Operators' Revisited. / Busch, P.; Loveridge, L.

In: EUROPEAN PHYSICAL JOURNAL D, Vol. 62, No. 2, 04.2011, p. 297-307.

Position Measurements Obeying Momentum Conservation. / Busch, P; Loveridge, Leon.

In: Physical Review Letters, Vol. 106, No. 11, 110406, 18.03.2011, p. 1-4.

Between Physics and Philosophy: Festschrift for Peter Mittelstaedt on His 80th Birthday. / Busch, Paul.

In: Foundations of Physics, Vol. 40, No. 9-10, 10.2010, p. 1161-1162.

On the notion of coexistence in quantum mechanics. / Busch, P.; Kiukas, J.; Lahti, P.

In: MATHEMATICA SLOVACA, Vol. 60, No. 5, 10.2010, p. 665-680.

Peter Mittelstaedt -- List of Publications until 2010. / Busch, Paul.

In: Foundations of Physics, Vol. 40, No. 9-10, 10.2010, p. 1189 - 1199.

Quantum-Matter-Spacetime: Peter Mittelstaedt's Contributions to Physics and Its Foundations. / Busch, P.; Pfarr, J.; Ristig, M.L. et al.

In: Foundations of Physics, Vol. 40, No. 9-10, 10.2010, p. 1163-1170.

Unsharp Quantum Reality. / Busch, P.; Jaeger, G.

In: Foundations of Physics, Vol. 40, No. 9-10, 10.2010, p. 1341-1367.

Quantum mechanics as a framework for dealing with uncertainty. / Busch, Paul.

In: Physica Scripta, Vol. T140, 014003, 09.2010.

Coexistence of qubit effects. / Busch, Paul; Schmidt, Heinz-Jürgen.

In: Quantum Information Processing, Vol. 9, No. 2, 04.2010, p. 143-169.

Translation of "Die Messung quantenmechanischer Operatoren" by E. Wigner (Z. Phys. 133, 101-108, 1952). / Busch, P.
8 p. 2010, Translation.

On the sharpness and bias of quantum effects. / Busch, Paul.

In: Foundations of Physics, Vol. 39, No. 7, 07.2009, p. 712-730.

Pekka Johannes Lahti - 60th Birthday. / Busch, Paul; Dieks, Dennis; 't Hooft, Gerardus.

In: Foundations of Physics, Vol. 39, No. 6, 06.2009, p. 519-520.

"No Information Without Disturbance": Quantum Limitations of Measurement. / Busch, Paul.

QUANTUM REALITY, RELATIVISTIC CAUSALITY, AND CLOSING THE EPISTEMIC CIRCLE. ed. / WC Myrvold; J Christian. DORDRECHT: Springer, 2009. p. 229-256 (The Western Ontario Series in Philosophy of Science).

Book Review: "Physical Theory and its Interpretation - Essays in Honor of Jeffrey Bub". / Busch, P.
In: Studies In History and Philosophy of Science Part B: Studies In History and Philosophy of Modern Physics, Vol. 40, 2009, p. 92-93.

Effect. / Busch, P; Greenberger, Daniel (Editor); Hentschel, Klaus (Editor) et al.
Compendium of Quantum Physics. Berlin, Heidelberg: Springer, 2009. p. 179 - 180.

Heisenberg Uncertainty Relation (Indeterminacy Relations). / Busch, P; Falkenburg, Brigitte; Greenberger, Daniel (Editor) et al.
Compendium of Quantum Physics. Berlin, Heidelberg: Springer, 2009. p. 281 - 283.

Lüders Rule. / Busch, P; Lahti, Pekka; Greenberger, Daniel (Editor) et al.
Compendium of Quantum Physics. Berlin, Heidelberg: Springer, 2009. p. 356 - 358.

Measurement Theory. / Busch, P; Lahti, Pekka; Greenberger, Daniel (Editor) et al.
Compendium of Quantum Physics. Berlin, Heidelberg: Springer, 2009. p. 374 - 379.

Observable. / Busch, P; Lahti, Pekka; Greenberger, Daniel (Editor) et al.
Compendium of Quantum Physics. Berlin, Heidelberg: Springer, 2009. p. 425 - 428.

Which-Way or Welcher-Weg-Experiments. / Busch, P; Jaeger, Gregg; Greenberger, Daniel (Editor) et al.
Compendium of Quantum Physics. Berlin, Heidelberg: Springer, 2009. p. 845 - 851.

Approximate joint measurements of qubit observables. / Busch, P; Heinosaari, Teiko.
In: Quantum Information and Computation, Vol. 8, No. 8&9, 09.2008, p. 0797-0818.

Measuring position and momentum together. / Busch, Paul; Kiukas, Jukka; Lahti, Pekka.
In: Physics Letters A, Vol. 372, No. 24, 09.06.2008, p. 4379-4380.

The structure of classical extensions of quantum probability theory. / Busch, Paul; Stulpe, Werner.
In: Journal of Mathematical Physics, Vol. 49, No. 3, 032104, 07.03.2008, p. 1-22.

The Time Energy Uncertainty Relation. / Busch, P; Muga, J.G. (Editor); Mayato, R. Sala (Editor) et al.
Lecture Notes in Physics. Vol. 734 2nd. ed. Berlin, Heidelberg: Springer, 2008. p. 73-105.

Heisenberg's uncertainty principle. / Busch, Paul; Heinonen, Teiko; Lahti, Pekka.
In: Physics Reports, Vol. 452, No. 6, 11.2007, p. 155-176.

Universal joint-measurement uncertainty relation for error bars. / Busch, Paul; Pearson, D.B.
In: Journal of Mathematical Physics, Vol. 48, No. 8, 082103, 08.2007, p. -.

Complementarity and uncertainty in Mach-Zehnder interferometry and beyond. / Busch, Paul; Shilladay, Christopher.
In: Physics Reports, Vol. 435, No. 1, 11.2006, p. 1-31.

Less (precision) is more (information): quantum information in terms of quantum statistical models. / Busch, P; Khrennikov, A. (Editor).
Proceedings of International Conference "Quantum Theory: Reconsideration of Foundations - 2. Vaxjo, Sweden: University of Vaxjo Press, 2004. p. 113-128.

Noise and Disturbance in Quantum Mechanics. / Busch, P; Heinonen, Teiko; Lahti, Pekka.
In: Phys. Lett. A, Vol. 320, 2004, p. 261-270.

Polarization Correlations of 1S0 Proton Pairs as Tests of Bell and Wigner Inequalities. / Busch, P; Polachic, C.; Rangacharyulu, C. et al.
In: Phys. Lett. A, Vol. 323, 2004, p. 176-181.

Lüders Theorem for Coherent-State POVMs. / Busch, P; Weigert, Stefan.
In: J. Phys. A: Math. Theor., Vol. 44, No. 12, 12.2003, p. 5474-5486.

Obituary: Slawomir Bugajski 1941-2003. / Beltrametti, Enrico; Busch, Paul; Lahti, Pekka.
In: International Journal of Theoretical Physics, Vol. 42, No. 5, 05.2003, p. 1133-1137.

Quantum States and Generalized Observables: A Simple Proof of Gleason's Theorem. / Busch, Paul.
In: Physical Review Letters, Vol. 91, No. 12/120403, 2003, p. 1-4.

The role of entanglement in quantum measurement and information processing. / Busch, P.
In: International Journal of Theoretical Physics, Vol. 42, 2003, p. 937-941.

Uncertainty Reconciles Complementarity with Joint Measurability. / Busch, P; Shilladay, Chris.
In: Phys. Rev. A, Vol. 68, 034102/1-4, 2003.

Commutativity up to a factor of bounded operators in complex Hilbert space. / Brooke, J.A.; Busch, Paul; Pearson, D.B.
In: Proceedings of the Royal Society of London. Series A, Mathematical and Physical Sciences, Vol. 458, No. 2017, 01.2002, p. 109-118.

Classical versus Quantum Ontology - Book Review Essay: D. Home, Conceptual Foundations of Quantum Mechanics. / Busch, P.
In: Studies In History and Philosophy of Science Part B: Studies In History and Philosophy of Modern Physics, Vol. 33B, 2002, p. 517-539.

EPR-Bell Tests with Unsharp Observables and Relativistic Quantum Measurement. / Busch, P.
Non-locality and Modality : NATO Science Series II. Mathematics, Physics and Chemistry. ed. / Jeremy Butterfield; Tomasz Placek. Vol. 64 Dordrecht, 2002. p. 175-193.

The Time Energy Uncertainty Relation. / Busch, P.
Time in Quantum Mechanics: Lecture Notes in Physics. ed. / J G Muga; et al - E T Bergstrom. Vol. 72 Berlin: Springer, 2002. p. 69-98 (Lecture Notes in Physics).

Are number and phase complementary observables? / Busch, Paul; Pellonpää, J-P.; Ylinen, K. et al.
In: Journal of Physics A: Mathematical and General, Vol. 34, No. 30, 08.2001, p. 5923-5935.

Just How Final Are Today's Quantum Structures? / Busch, P.
In: APPLIED SOFT COMPUTING, Vol. 5, 2001, p. 137-138.

Teleportation and Measurement. / Busch, P; Cassinelli, Gianni; Lahti, Pekka et al.
In: Phys. Lett. A, Vol. 284, 2001, p. 141-145.

Activities

2018-2019 Invitation Fellowship for Research in Japan

Busch, P. (Awardee)

7 Apr 2018 → 11 May 2018

College of Mathematics and Information Science, Shaanxi Normal University, Xi'an, China

Busch, P. (Visitor) & Li, Y. (Collaborator)

30 Mar 2018 → 7 Apr 2018

Theoretical Physics Colloquium, University of Cologne

Busch, P. (Invited speaker)

2 Feb 2018

3rd International Conference on Quantum Foundations

Busch, P. (Keynote/plenary speaker)

4 Dec 2017 → 9 Dec 2017

Roberto Beneduci

Busch, P. (Host)

24 Nov 2017 → 1 Dec 2017

Erkka Haapasalo

Busch, P. (Host)

7 Nov 2017 → 20 Nov 2017

Tom Bullock

Busch, P. (Host)

16 Oct 2017 → 17 Oct 2017

Research seminar

Busch, P. (Invited speaker)

4 Oct 2017

FQXi Workshop: Quantum Incompatibility

Busch, P. (Organiser) & Gühne, O. (Organiser)

28 Aug 2017 → 1 Sept 2017

Department of Physics and Turku Centre for Quantum Physics, University of Turku

Busch, P. (Researcher)

29 Jul 2017 → 18 Aug 2017

Workshop on Quantum Structures 2017 (IQSA)

Busch, P. (Member of programme committee)

4 Jul 2017 → 7 Jul 2017

Leon Deryck Loveridge

Busch, P. (Host)

26 Jun 2017 → 30 Jun 2017

Michael Hall

Busch, P. (Host)

7 Apr 2017 → 9 Apr 2017

G Nimtz

Busch, P. (Host)

7 Feb 2017

D Brody

Busch, P. (Host)

16 Jan 2017 → 17 Jan 2017

"Unsharp objectification" revisited – and what does it mean anyway to test quantum uncertainty?

Busch, P. (Invited speaker)
28 Sept 2016

University of Calabria, Italy

Busch, P. (Collaborator)
5 Sept 2016 → 17 Sept 2016

President

Busch, P. (Other)
15 Jul 2016 → 15 Jul 2018

The Two Faces of Heisenberg's Uncertainty Principle

Busch, P. (Invited speaker)
11 Jul 2016 → 15 Jul 2016

President of International Quantum Structures Association

Busch, P. (Recipient)
Jul 2016 → Jul 2018

Optimal joint measurements of incompatible quantities: the problem of quantifying measurement uncertainty

Busch, P. (Invited speaker)
29 Jun 2016 → 30 Jun 2016

Quantum Mechanics Meets Symplectic Topology

Busch, P. (Organiser)
15 May 2016 → 19 May 2016

György Geher

Busch, P. (Host)
11 Apr 2016 → 16 Apr 2016

Heisenberg Uncertainty for Joint Measurements: Recent Developments

Busch, P. (Invited speaker)
9 Dec 2015

Qubit uncertainty relations - new wine in old skins?

Busch, P. (Invited speaker)
8 Dec 2015

Discussion Meeting on Quantum Mechanics

Busch, P. (Keynote/plenary speaker)
7 Dec 2015

International Conference on Quantum Foundations 2015

Busch, P. (Keynote/plenary speaker)
30 Nov 2015 → 4 Dec 2015

Mathematics (Journal)

Busch, P. (Guest editor)
1 Aug 2015 → 30 Jun 2016

Quantum Physics and Logic QPL 2015

Busch, P. (Keynote/plenary speaker)

13 Jul 2015 → 17 Jul 2015

Physics Colloquium

Busch, P. (Invited speaker)

9 Jul 2015

Invited Talk: "Quantifying Quantum Measurement Uncertainty – Why did it take so long?"

Busch, P. (Invited speaker)

8 Jun 2015 → 11 Jun 2015

LMS Spitalfields Day, Mathematics of Quantum Uncertainty: New Advances and Prospects

Busch, P. (Organiser)

29 May 2015

LMS Spitalfields Day, Mathematics of Quantum Uncertainty: New Advances and Prospects

Busch, P. (Keynote/plenary speaker)

29 May 2015

Madalin Guta

Busch, P. (Host)

29 May 2015 → 31 May 2015

Teiko Heinosaari

Busch, P. (Host)

29 May 2015 → 31 May 2015

Pekka Lahti

Busch, P. (Host)

28 May 2015 → 3 Jun 2015

Reinhard F Werner

Busch, P. (Host)

28 May 2015 → 31 May 2015

Roberto Beneduci

Busch, P. (Host)

25 May 2015 → 31 May 2015

Juba Messamah

Busch, P. (Host)

22 May 2015 → 21 Jun 2015

Juba Messamah

Busch, P. (Host)

26 Apr 2015 → 24 May 2015

Department of Physics and Astronomy, Turku Centre of Quantum Physics, University of Turku

Busch, P. (Visitor)

18 Mar 2015 → 29 Mar 2015

Madalin Guta

Busch, P. (Host)

5 Mar 2015

Tommaso Gentile

Busch, P. (Host)
11 Feb 2015 → 10 Jun 2015

Paola Verrucchi

Busch, P. (Host)
26 Jan 2015

White Rose Quantum Information Meeting

Busch, P. (Invited speaker)
7 Jan 2015

Pekka Lahti

Busch, P. (Host)
16 Nov 2014 → 22 Nov 2014

Jukka Kiukas

Busch, P. (Host)
16 Oct 2014 → 17 Oct 2014

Leon Deryck Loveridge

Busch, P. (Host)
10 Oct 2014 → 13 Oct 2014

Leonid Polterovich

Busch, P. (Host)
5 Oct 2014 → 10 Oct 2014

Department of Physics and Astronomy, Turku Centre of Quantum Physics, University of Turku

Busch, P. (Collaborator)
24 Aug 2014 → 4 Sept 2014

White Rose Quantum Information Workshop: SICs, MUBs, and All That (3)

Busch, P. (Organiser)
16 Jun 2014 → 17 Jun 2014

White Rose Quantum Information Meeting

Busch, P. (Participant)
10 Jun 2014

Earl Campbell

Busch, P. (Host)
7 Apr 2014

Giandomenico Palumbo

Busch, P. (Host)
7 Apr 2014

Jason Doukas

Busch, P. (Host)
7 Apr 2014

Mark Fox

Busch, P. (Host)
7 Apr 2014

Oleg Kim

Busch, P. (Host)
7 Apr 2014

Sanfo Agyo

Busch, P. (Host)
7 Apr 2014

Stefano Pirandola

Busch, P. (Host)
7 Apr 2014

White Rose Quantum Information Meeting

Busch, P. (Organiser)
7 Apr 2014

Tommaso Gentile

Busch, P. (Host)
1 Apr 2014 → 20 Sept 2014

Conceptual and Mathematical Foundations of Quantum Mechanics

Busch, P. (Participant)
28 Mar 2014

Leibniz Universität Hannover

Busch, P. (Collaborator)
27 Mar 2014 → 31 Mar 2014

Jukka Kiukas

Busch, P. (Host)
10 Mar 2014

554 W&E Heraeus Seminar: Quantum Contextuality, Nonlocality, and the Foundations of Quantum Mechanics

Busch, P. (Keynote/plenary speaker)
17 Feb 2014 → 19 Feb 2014

White Rose Quantum Information Meeting

Busch, P. (Participant)
14 Jan 2014

Leon Loveridge

Busch, P. (Host)
13 Jan 2014 → 17 Jan 2014

Seminar: Heisenberg-type error-disturbance trade-off for qubits, at Atominstitut, TU Wien

Busch, P. (Invited speaker)
11 Jan 2014

Roberto Beneduci

Busch, P. (Host)
16 Dec 2013 → 20 Dec 2013

Maurice de Gosson

Busch, P. (Host)
26 Nov 2013 → 27 Nov 2013

Scientific Symposium: Wigner 111 - Colourful & Deep

Busch, P. (Keynote/plenary speaker)
11 Nov 2013

Pekka Lahti

Busch, P. (Host)
19 Oct 2013 → 28 Oct 2013

Guido Bacciagaluppi

Busch, P. (Host)
17 Oct 2013 → 18 Oct 2013

Workshop on "Incompatible Quantum Measurements"

Busch, P. (Keynote/plenary speaker)
9 Sept 2013 → 12 Sept 2013

Univ Turku, Turku Ctr Quantum Phys, Dept Phys & Astron

Busch, P. (Collaborator)
24 Aug 2013 → 1 Sept 2013

Jukka Kiukas

Busch, P. (Host)
6 Jun 2013 → 7 Jun 2013

Marcus Appleby

Busch, P. (Host)
6 May 2013 → 7 May 2013

White Rose Quantum Information Workshop: SICs, MUBs, and All That (2)

Busch, P. (Organiser)
6 May 2013 → 7 May 2013

David Ellerman

Busch, P. (Host)
30 Apr 2013

COST Action MP1006 Conference: Quantum Theory Without Observers III

Busch, P. (Participant)
21 Apr 2013 → 26 Apr 2013

Department of Mathematics, Tel Aviv University

Busch, P. (Visitor)
7 Apr 2013 → 11 Apr 2013

White Rose Quantum Information Workshop: MUBs, SICs, and All That

Busch, P. (Organiser)
4 Feb 2013

Teiko Heinosaari
Busch, P. (Host)
3 Feb 2013 → 8 Feb 2013

Roberto Beneduci
Busch, P. (Host)
27 Jan 2013 → 5 Feb 2013

Roger Colbeck
Busch, P. (Host)
29 Oct 2012 → 31 Oct 2012

Academic Opponent in PhD Defense
Busch, P. (Examiner (external))
8 Sept 2012

Univ Turku, Turku Ctr Quantum Phys, Dept Phys & Astron
Busch, P. (Researcher)
8 Sept 2012 → 16 Sept 2012

Yuan Li
Busch, P. (Host)
1 Sept 2012 → 31 Aug 2013

29th International Conference on Group Theoretical Methods in Physics
Busch, P. (Invited speaker)
20 Aug 2012 → 26 Aug 2012

White Rose Quantum Information Theory Meeting
Busch, P. (Organiser)
19 Mar 2012

Seminar Talk: Unsharp Quantum Reality, Bristol University, Physics and Philosophy
Busch, P. (Invited speaker)
7 Dec 2011

Tirthankar Bhattacharyya
Busch, P. (Host)
11 Oct 2011 → 13 Oct 2011

Roberto Beneduci
Busch, P. (Host)
1 Oct 2011 → 31 Jul 2012

University of Turku
Busch, P. (Collaborator)
26 Sept 2011 → 5 Oct 2011

Takayuki Miyadera
Busch, P. (Host)
9 Sept 2011 → 6 Oct 2011

Dipankar Home
Busch, P. (Host)
15 Aug 2011 → 17 Aug 2011

Teiko Heinosaari

Busch, P. (Host)
25 Jul 2011 → 31 Jul 2011

CHPSTM Workshop "Quantum States: ontic or epistemic?"

Busch, P. (Invited speaker)
25 Jun 2011 → 26 Jun 2011

Pekka Lahti

Busch, P. (Host)
6 Jun 2011 → 12 Jun 2011

University of Sydney and Macquarie University

Busch, P. (Visitor)
5 May 2011 → 17 May 2011

University of Turku

Busch, P. (Collaborator)
3 Apr 2011 → 10 Apr 2011

Physics Seminar, University of Leeds

Busch, P. (Invited speaker)
2 Feb 2011

Jiannis Pachos

Busch, P. (Host)
10 Dec 2010

Quantum Physics And The Nature Of Reality A conference in honour of John Polkinghorne's 80th birthday

Busch, P. (Participant)
26 Sept 2010 → 29 Sept 2010

Foundations of Physics (Journal)

Busch, P. (Guest editor)
1 Sept 2010 → 31 Oct 2010

University of Turku

Busch, P. (Collaborator)
29 Jul 2010 → 14 Aug 2010

16th U.K. and European Meeting on the Foundations of Physics

Busch, P. (Speaker)
5 Jul 2010 → 7 Jul 2010

University of Turku

Busch, P. (Collaborator)
16 May 2010 → 12 Jun 2010

Viacheslav Belavkin

Busch, P. (Host)
6 May 2010 → 13 May 2010

Philosophy Seminar at London School of Economics

Busch, P. (Invited speaker)
15 Mar 2010

Between Physics and Philosophy: Symposium in Honor of Professor Peter Mittelstaedt on the Occasion of his 80th Birthday

Busch, P. (Organiser)
4 Dec 2009 → 5 Dec 2009

Between Physics and Philosophy: Symposium in Honor of Professor Peter Mittelstaedt on the Occasion of his 80th Birthday

Busch, P. (Keynote/plenary speaker)
4 Dec 2009 → 5 Dec 2009

Springer (Publisher)

Busch, P. (Editorial board member)
1 Dec 2009 → ...

Michael Atiyah

Busch, P. (Host)
25 Nov 2009

Fay Dowker

Busch, P. (Host)
19 Nov 2009

David Toms

Busch, P. (Host)
25 Jun 2009

Foundations of Physics (Journal)

Busch, P. (Guest editor)
1 Jun 2009 → 31 Jul 2009

16th Central European Workshop on Quantum Optics

Busch, P. (Keynote/plenary speaker)
23 May 2009 → 27 May 2009

University of Turku

Busch, P. (Collaborator)
22 May 2009 → 28 May 2009

Heinz-Juergen Schmidt

Busch, P. (Host)
3 May 2009 → 16 May 2009

Less is More – The Power of Quantum Uncertainty

Busch, P. (Speaker)
2 Mar 2009

Ian Moss

Busch, P. (Host)
22 Jan 2009

Shirwan Abdullah

Busch, P. (Host)
8 Dec 2008

EQUALS 2, Expository Quantum Lecture Series 2, Foundations of Quantum Science and Technology 2008

Busch, P. (Keynote/plenary speaker)
24 Nov 2008 → 28 Nov 2008

PK Madhu

Busch, P. (Host)
13 Nov 2008

Operational Reconstructions of Hilbert Space Quantum Mechanics - A Guided Tour

Busch, P. (Invited speaker)
31 Oct 2008

Tony Fest: Quantum (Groups+Foundations+Information), A Symposium to Celebrate the Achievements of Professor Tony Sudbery on the Occasion of his 65th Birthday

Busch, P. (Organiser)
29 Sept 2008 → 30 Sept 2008

Karol Kozlowski

Busch, P. (Host)
18 Jul 2008

Quantum Structures 2008

Busch, P. (Speaker)
6 Jul 2008 → 12 Jul 2008

Toby Wiseman

Busch, P. (Host)
30 Jun 2008

North British Mathematical Physics Seminar

Busch, P. (Invited speaker)
26 Jun 2008

Andrew Booker

Busch, P. (Host)
18 Jun 2008

Marcus Appleby

Busch, P. (Host)
2 Jun 2008 → 3 Jun 2008

Pekka Lahti

Busch, P. (Host)
7 Feb 2008

Luigi Amico

Busch, P. (Host)
4 Feb 2008

Vlatko Vedral

Busch, P. (Host)

28 Jan 2008

Invited Research Seminar: 80 Years of Quantum Indeterminacy - new aspects

Busch, P. (Invited speaker)

15 Jan 2008

Ian Jack

Busch, P. (Host)

14 Jan 2008

Foundations of Physics (Journal)

Busch, P. (Editor)

1 Jan 2007 → ...

International Quantum Structures Association (External organisation)

Busch, P. (Member)

1991 → 2020

Projects

Categories of Incompatibilities as Quantum Constraints on Observers

Busch, P. (Principal investigator), Guehne, O. (Researcher) & Heinosaari, T. (Researcher)

18/09/17 → 21/09/17

LMS Scheme 4 - Researchers in Pairs - with T Heinosaari, Turku

Busch, P. (Principal investigator) & Heinosaari, T. (Principal investigator)

29/07/17 → 18/08/17

LMS Spitalfields Day - "Mathematics of Quantum Uncertainty"

Busch, P. (Principal investigator)

29/05/15 → 29/05/15

OQP: Operational Quantum Physics

Busch, P. (Principal investigator) & Lahti, P. (Principal investigator)

1/08/05 → 31/08/16

Quantum Measurement Uncertainty in Quantum Metrology and Estimation

Busch, P. (Principal investigator)

THE ROYAL SOCIETY

1/10/17 → 30/09/18

Quantum mechanics as a framework for dealing with uncertainty

Busch, P. (Principal investigator)

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21/05/09 → 27/05/09