Jonathan W. Dean

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Publications

As First Author

JW Dean, HA Melia, TVB Nguyen, CT Chantler. 2024. *Scandium Kα and Kβ spectra with ab initio satellite intensities and energy eigenvalues*. Physical Review A, **109**: 022809.

JW Dean, CT Chantler, B Ganly. 2022. *Ab initio calculations of Auger electron kinetic energies: Breadth and depth*. Radiation Physics and Chemistry, **200**: 110472

JW Dean, P Pushkarna, HA Melia, TVB Nguyen, CT Chantler. 2022. *Theoretical calculation of characteristic radiation: multi-configuration Dirac–Hartree–Fock calculations in scandium Kα and Kβ*. Journal of Physics B, **55**: 075002.

JW Dean and CT Chantler. 2020. *Vignetted photon fields, recharacterisation of V Kα, and reducing X-ray uncertainties by a factor of two*. X-ray spectrometry, **50**: 134-144.

JW Dean, CT Chantler, LF Smale, HA Melia. 2020. *An absolute energy characterisation of scandium Kβ to 2 parts per million*. Journal of Physics B, **53**: 205004.

JW Dean, CT Chantler, LF Smale, HA Melia. 2019. *High accuracy characterisation for the absolute energy of scandium Kα*. Journal of Physics B, **52**: 165002.

JW Dean, SN Thompson, and CT Chantler. 2024. *Ab initio manganese Kα energy eigenvalues, shake-off probabilities, Auger rates, with tests of convergence*. Molecules, **29**: 4199.

As Co-author

HA Melia,**JW Dean**, TVB Nguyen, CT Chantler. 2023. *Cu K$\alpha_{3,4}$ satellite spectrum with ab initio Auger-rate calculations*. Physical Review A, **107**: 012809.

HA Melia, **JW Dean**, LF Smale, AJ Illig, CT Chantler. 2019. *Count-rate, linearity, and performance of new backgammon detector technology*. X-Ray Spectrometry, **48**: 218-231.

D Sier, **JW Dean**, NTT Tran, CQ Tran, T Kirk, JFW Mosselmans, S Diaz-Moreno, CT Chantler. 2024. *High Accuracy Measurement, Advanced Theory and Analysis of the Evolution of New Satellite Transitions in Manganese using Extended-Range High-Energy-Resolution Fluorescence Detection: Finding satellite transitions over an extended range*. IUCrJ, **4**: 620–633.

In Review

D Sier, NTT Tran, **JW Dean**, T Kirk, CT Chantler. 2024. *Measurement and modelling of satellite transitions in manganese over an extended range*. Journal of Applied Crystallography, **XX**: XXXXXX.

Education

University of Melbourne *Parkville, 3010 VIC, Australia*

PH.D. (PHYSICS) *January 2020 - July 2024*

- Supervisor: Prof. C. T. Chantler

  Research Interests:

  Calculations of X-ray spectral lines from first principles; Experimental X-ray characterisation from crystallography and microcalorimetry; Effects of Auger emission on satellite intensities; Synchrotron Science; Evolution of satellites in X-ray data as a function of incident energy; Quantum Electro-dynamics; Quantum Optics.

  Research Outcomes:
- Seven first-author publications, four co-author publications.
- Calculations of energy eigenvalues, shake-off probabilities, and widths, from first principles of X-ray transitions.
- Characterisations of complex atomic systems with an open $3d$ orbital in scandium [Ar]$3d^1 4s^2$, manganese [Ar]$3d^5 4s^2$, and copper [Ar]$3d^{10} 4s^1$.
- Calculations of Auger electron energies and rates have resulted in two publications and have furthered understanding of discrepancies of satellite intensities in the literature.
- Performing calculations of unobserved transitions in order to improve statistics on synchrotron experiments which were designed for discoveries of these transitions.

University of Melbourne *Parkville, 3010 VIC, Australia*

M.SC. (PHYSICS) *Feb. 2017 - Nov. 2018*

- Supervisor: Prof. C. T. Chantler
- Coursework Mark: 72%
- Thesis Mark: 88%

  Research Outcomes:
- Two experimental publications on scandium Kα and Kβ which resulted in an improvement of the previous absolute energy uncertainty by a factor of 50.
- An analytic publication on the effects of vignetting in curved crystal experiments.
- Ability to use rotating anode X-ray sources.

University of Western Australia *Crawley, 6009 WA, Australia*

B.SC. (PHYSICS AND MATHEMATICS) *Feb. 2014 - Nov. 2016*

- Weighted Average Mark - Physics: 87%
- Weighted Average Mark - Mathematics: 75%

Professional Experience

2024 -	**Postdoctoral Associate**, National Institute of Standards and Technology, Boulder, CO
2023	**Leading Tutor of Science**, Ormond College, University of Melbourne
2023-24	**Science Policy Internship**, The Australian Academy of Science
2022-24	**Research Intern Supervisor**, University of Melbourne
2022-23	**Guest Lecturer**, University of Melbourne
2017-23	**University Tutor**, University of Melbourne
2017-18	**Lab Demonstrator**, University of Melbourne
2016-17	**Research Intern**, University of Western Australia

Awards and Scholarships

2017	**Postgraduate Science Award**, Queen's College, University of Melbourne	*$ 6,600*
2018	**Postgraduate Science Award**, Queen's College, University of Melbourne	*$ 6,600*
2020	**Ph.D. Scholarship**, Australian Research Council	*$ 33,000*
2021	**Ph.D. Scholarship**, Australian Research Council	*$ 33,000*
2022	**Ph.D. Scholarship**, Australian Research Council	*$ 33,000*
2021	**Best Oral Presentation**, International Radiation Physics Society	*$ 10*
2023	**Ph.D. Scholarship**, Australian Research Council	*$ 33,000*
2023	**John Hodgson Scholarship**, University of Melbourne	*$ 4,500*

Presentations

Invited Presentations

July 2024, Paris, France. *Characteristic X-ray radiation of complex atomic systems - open $3d$ orbitals*. Invited seminar at the Sorbonne Université - Campus Pierre et Marie Curie

February 2023, Boulder, Co, USA. *Fluorescence X-ray radiation from the $3d$ transition metals, experiment and theory*. Invited presentation for the National Institute of Standards and Technology.

Conference Presentations

July 2023, Bologna, Italy. *ab initio scandium X-ray spectra*. The International Topical Meeting on Industrial Radiation and Radioisotope Measurement Applications - 11.

July 2023, Bologna, Italy. *The Evolution of Manganese X-ray Spectra from Synchrotron Sources*. The International Topical Meeting on Industrial Radiation and Radioisotope Measurement Applications - 11.

December 2021, Kuala Lumpur, Malaysia (Online). *X-ray spectra from first principles*. International Symposium on Radiation Physics - 15.

February 2021, Kuala Lumpur, Malaysia (Online). *X-ray spectra from first principles*. 3rd International Forum on Advances in Radiation Physics.

July 2019, Lisbon, Portugal. *Characteristic Radiation of Scandium: Applications for medical imaging*. International Conference on Dosimetry and its Applications - 3.

December 2018, Perth, Australia. *Characteristic Radiation of Copper*. Australian Institute of Physics Conference.

Poster Presentations

December 2022, Adelaide, Australia. *First principles modelling of scandium Kα*. Australian Institute of Physics Conference.

December 2018, Perth, Australia. *Characteristic Radiation of Scandium*. Australian Institute of Physics Conference.

Teaching Experience

S2, 2023 **Physics 2 (PHYC10004)**, Guest Lecturer
S2, 2023 **Quantum and Advanced Optics**, Guest Lecturer
S2, 2023 **Physics 2 (PHYC10004)**, Tutor
S2, 2023 **Foundations of Electrical Networks (ELEN20005)**, Tutor
S2, 2023 **Maths for Biomedicine (MAST10016)**, Tutor
S1, 2023 **Physics 1 (PHYC10003)**, Tutor
S1, 2023 **Linear Algebra (MAST10007)**, Tutor
S1, 2023 **Linear Algebra (MAST10007)**, Tutor
S1, 2022 **Foundations of Electrical Networks (ELEN20005)**, Tutor
S2, 2022 **Quantum and Advanced Optics**, Guest Lecturer
S2, 2022 **Physics 1 (PHYC10003)**, Tutor
S2, 2022 **Maths for Biomedicine (MAST10016)**, Tutor
S1, 2022 **Science Discovery Subject (SCIE10005)**, Tutor
S1, 2022 **Calculus 1 (MAST10005)**, Tutor
S2, 2021 **Calculus 2 (MAST10006)**, Tutor
S2, 2021 **Physics 2 (PHYC10004)**, Tutor
S1, 2021 **Linear Algebra (MAST10007)**, Tutor
S1, 2021 **Physics 1 (PHYC10003)**, Tutor
S2, 2020 **Physics 2 (PHYC10004)**, Lab Demonstrator
S2, 2018 **Physics 2 (PHYC10004)**, Tutor
S2, 2018 **Linear Algebra (MAST10007)**, Tutor
S1, 2018 **Physics 1 (PHYC10003)**, Tutor
S1, 2018 **Calculus 1 (MAST10005)**, Tutor
S2, 2017 **Physics 2 (PHYC10004)**, Lab Demonstrator
S2, 2017 **Linear Algebra (MAST10007)**, Tutor
S1, 2017 **Complex Analysis (MAST30021)**, Tutor
S1, 2017 **Physics 1 (PHYC10003)**, Lab Demonstrator
S1, 2017 **Calculus 2 (MAST10006)**, Tutor