Dr Andrew Cheek

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Positions

Postdoctoral Researcher Oct 2019 - Sep 2021
At the Centre for Cosmology, Particle Physics and Phenomenology (CP3), Université catholique de Louvain, EOS be.h, *Precision predictions and indirect constraints for searches of hidden sectors at the LHC*, promoters are Prof. Fabio Maltoni and Dr Chiara Arina.

Education

Durham University, UK – Physics, PhD Oct 2015 - Sep 2019
Four year position at the Institute for Particle Physics Phenomenology (IPPP), Durham University, with STFC grant.
Supervisor: Prof. David Cerdeño.
PhD Thesis Title: *"Preparing for Dark Matter: Maximising our discrimination power in the event of detection."*, full text.

Durham University, UK – MPhys (Hons) Oct 2011 - Jun 2015
Masters Thesis Supervisor: Prof. Celine Boehm
Masters Thesis Title: *"Investigation of the Parameter Space for Dirac Dark Matter"*

Publications

Preprints:

[1] *"Primordial Black Hole Evaporation and Dark Matter Production: II. Interplay with the Freeze-In/Out Mechanism"*, A. Cheek, L. Heurtier, Y. F. Perez-Gonzalez, J. Turner, arXiv:2107.00016. *Submitted to PRD.*

[2] *"Primordial Black Hole Evaporation and Dark Matter Production: I. Solely Hawking radiation"*, A. Cheek, L. Heurtier, Y. F. Perez-Gonzalez, J. Turner, arXiv:2107.00013. *Submitted to PRD.*

[3] *"Distinguishing $U(1)_{L_\mu - L_\tau}$ from $U(1)_{L_\mu}$ as a solution for $(g-2)_\mu$ with neutrinos"*, D.W.P. Amaral, D.G. Cerdeño, A. Cheek, P. Foldenauer, arXiv:2104.03297. *Submitted to JHEP.*

Journal Publications:

[1] *"Robust Limits from Upcoming Neutrino Telescopes and Implications on Minimal Dark Matter Models"*, S. Basegmez Du Pree, C. Arina, A. Cheek, A. Dekker, M. Chianese, S. Ando, *JCAP* 05 (2021) 054

[2] *"Light and Darkness: consistently coupling dark matter to photons via effective operators"*, C. Arina, A. Cheek, K. Mimasu, L. Pagani, *Eur. Phys. J.***C81** (2021) 3, 223

[3] *"The dark matter component of the Gaia radially anisotropic substructure"*, N. Bozorgnia, A. Fattahi, C. S. Frenk, A. Cheek, D. G. Cerdeño, F. A. Gómez, R. J. J. Grand, F. Marinacci, *JCAP* 07 (2020) 036

[4] *"B anomalies and dark matter: a complex connection"*, D. G. Cerdeño, A. Cheek, P. Martín-Ramiro and J. M. Moreno, *Eur. Phys. J.***C79** (2019) 517.

[5] *"Opening the energy window on direct dark matter detection"*, N. Bozorgnia, D. G. Cerdeno, A. Cheek, B. Penning, *JCAP* 12 (2018) 013.

[6] *"Surrogate Models for Direct Dark Matter Detection"*, D.G. Cerdeño, A. Cheek, E. Reid, H. Schulz, *JCAP* 08 (2018) 011.

Research Visits

InvisiblesPLUS (2019): secondment of 1 month at Kavli IPMU, working with Dr. Tom Melia.

InvisiblesPLUS (2018): secondment of 1 month at Fermilab, working with Dr. Pedro Machado and Dr Jessica Turner. There I initiated a new collaboration.

Volunteer UG researcher (2014): volunteer undergraduate researcher under the supervision of C. Boehm studying astrophysical implications for self interacting DM. Produced a literature review on the topic.

Conference and Workshop talks

ICRC 2021 (July 2021): *Dark Matter Phenomenology from Upcoming Neutrino Telescopes*, parallel talk and discussion forum, see event page and proceedings.

WIN2021 (June 2021): *Dark Matter Phenomenology from Upcoming Neutrino Telescopes*, asynchronous talk and panel member, see event page, talk slides and video

3rd ICTP-SAIFR South American Dark Matter Workshop (Dec 2020): *New insights into dark matter from EFT basics*, see event page and video.

IRN Terascale Meeting (Nov 2020): *New insights into dark matter from EFT basics*, see event page and talk slides.

Dark World to Swampland, IBS-IFT-MultiDark workshop (2020): *New insights into dark matter from EFT basics*, plenary talk, see event page, talk slides and video.

Invisibles workshop 2018: *Using Surrogate Models for Direct Detection* , PhD Forum plenary talk, see event page.

Dark Matter UK Meeting (July 2018): *Challenges to parameter reconstruction in direct detection*, plenary talk, see event page.

Dark Side of the Universe 2018 (2018): *Surrogate Models for Direct Dark Matter Detection,* parallel talk, see event page.

Preparing for Dark Matter Particle Discovery (2018): *Surrogate Models for Direct Dark Matter Detection,* plenary talk, see event page.

MC4BSM (2018): *Surrogate Models for Direct Dark Matter Detection,* plenary talk, see event page.

Unravelling the DM mystery (2018): *RAPIDD tutorial: a quick look at a new tool for direct detection analysis*, tutorial on how to run RAPIDD a software developed with collaborators. See event page

14th MultiDark Consolider Workshop (2017): *Direct Detection, theoretical analysis*, plenary talk, see event page.

YTF 9 (2017): *Distinguishing Dark Matter in Direct Detection*, poster presentation followed by a parallel talk see event page.

Poster Presentations

UK High Energy Physics Forum 2017: *RAPIDD: Reconstruction tool for Direct Detection*, poster presentation.

Invisibles School 2017: *Generalising Direct Detection of Dark Matter*, poster presentation.

Invited Seminars

TTK, RWTH Aachen, Dark Matter Journal Club (Nov 2020): *New insights into dark matter from EFT basics*, seminar given virtually.

Bohr Lunch seminar (Feb 2020): *Particle and Astrophysical implications for direct detection* seminar given at Manchester University Particle Physics group.

CP3 Seminar (Jan 2020): *How stellar substructure in our galaxy changes our view of dark matter* seminar given at Université catholique de Louvain.

McDonald Institute seminar (Sep 2018) : *Making the most of Direct Detection* seminar giving during a visit to Queen's University, Canada. See McDonald Institute website.

IFT Astroparticle Journal club seminar (April 2017): *How far can we push Dark Matter with Direct Detection?*, talk given at IFT during a two week visit.

Teaching

Introduction to Dark Matter Lecture Series (Nov 2020): I have prepared and administered a short introduction to dark matter lecture course for Masters Students at UCLouvain.

Project advisory role (2019-current): I have undertaken various advisory roles with PhD and Masters students advising them through a project or a significant body of work. This includes collaborative projects which lead to publications, but also projects that are solely part of their educational requirements.

Introduction to Coding (Oct 2018): Designed and delivered an introduction to python course for the Durham Foundation program.

Durham Foundations Centre Problems Solving Instructor (2017-2019): Run a module for those undertaking the foundation year in Physics, offered by the Durham Centre for Academic Development (Durham University). Requires me to design the module and class work as well as writing and marking the final examination.

Durham level 1 Foundations of Physics tutor (2016-2019): Tutor for two groups of around 5 students. Requires me to guide them through a general first year physics course, teaching them problem solving skills in Physics. Also requires marking of weekly problem sheets.

Durham level 3 tutor (2015-2016): Workshop demonstrator for Theoretical Physics 3 at Durham University. Topics were relativistic electrodynamics, scattering theory in quantum mechanics and relativistic quantum mechanics.

Physics and Maths tutor (2014-2016): Various private roles as a mathematics and physics tutor for high school and university topics such as quantum mechanics, electromagnetism and nuclear physics.

Positions of responsibility

Referee in the peer review process: I have acted as a referee for PRD and JCAP.

Royal Society Summer Exhibition 2017: Main organiser for modelling the invisible exhibit at the Royal Society, I was involved in every stage of the process, from application to the Royal Society to delivering the exhibit. Helped develop the software for the SuperCDMS replica and built and ran the website. I also undertook a day course in science communication at the Royal Society and gave a Seminar about it in Durham.

Young Theorists Forum 9: Main organiser for local event for PhD students, designed the poster for the event, organised the registration and indico website. Decided on who to invite to be a plenary speaker. Assisted in writing funding applications and chaired sessions. See website YTF.

Dark Matter from aeV to ZeV: Organiser, ran one of the evening 'cultural events' the pub-quiz. Oversaw the audio-visual equipment in the conference room, ensuring all talks were ready before each session. See event.

Young Theorists Forum 10: Main organiser, oversaw the organisation of the event. Managed people on the committee ensuring the smooth running of the event and chaired sessions and ran the poster session, see website YTF.

Diversity and Equality Committee (2016-2017): Reside on a Physics department committee which focuses on improving the work environment in the department to encourage those from any walk of life to flourish. In this role I organised a training event about workplace harassment and micro-aggression.

YETI 2019: On organising committee, helped choose theme for event and invited speakers. See event.

Postgraduate Student Staff Consultative Committee (2016-2019): Reside on a committee to make postgraduate students' concerns and opinions known to members of staff within the Physics department.

Outreach

Particle Physics Masterclass (2018): *The Z Boson at the ATLAS experiment*, talk to introduce students on how to detect particle events in LHC data. See event page.

Royal Society Summer Exhibition (2018): Volunteer at national outreach event at the Royal Society, London, ghosts in the universe.

Green Man Festival Outreach Scientist (2017): Volunteer with the UCL led group, *Quantum secrets of Photosynthesis*. Helped build the stand as well as engage with festival goers about physics.

Other skills

Coding: Experience developing my own software using python and C, using novel computational techniques to perform multidimensional parameter reconstructions, details in *JCAP* 1808 no. 011 (2018). Advanced knowledge of Python, C, bash, Linux, LaTeX, this includes data analysis packages such as pandas and scikit-learn. Experienced with Mathematica, CSS and html. Physics specific tools that I am familiar with include, FeynRules, FeynCalc, MadGraph, MadDM, MicrOMEGAS and AMUSE. Basic knowledge of ROOT, Julia and Fortran.

Languages: Native English speaker, intermediate level Spanish (Castellano), basic French, Chinese Mandarin and British Sign Language.

References

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