Curriculum Vitae

Claire Louise Poppett

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Nationality : British **Gender :** Female

Education

Postdoctoral - *LBNL 2011-present*

Lead Fiber scientist, DESI - The Dark Energy Spectroscopic Instrument (DESI) will measure the effect of dark energy on the expansion of the universe. It will obtain optical spectra for tens of millions of galaxies and quasars, constructing a 3-dimensional map spanning the nearby universe to 10 billion light years.

Postgraduate - *Durham University 2007-2011*

PhD in Highly Multiplexed Spectroscopy for the Next Generation of Telescopes under Dr Jeremy Allington-Smith.
Conferred in 2011

Undergraduate - *University of Durham (UK) 2002-2006*

MSci in Physics with Astronomy (Honours)

Publications

"Focal ratio degradation performance of fiber positioning technology used in the Dark Energy Spectroscopic Instrument"
Poppett, C. and Edelstein, J.and Besuner, R.and Silber, H.
Proc. SPIE, Volume 9147, 2014

"Focal ratio degration performance of spliced optical fibres and predictions made by the 2-fibre model"
Poppett, C. and Edelstein, J.
Journal of applied optics, submitted, 2014

"Comparing modelling techniques when designing VPH gratings for BigBOSS"
Poppett, C. and Edelstein, J. and Lampton, M. and Jelinsky, P. and Arns, J.,
Proc. SPIE, Vol. 8450, 2012.

"Optical fiber systems for the BigBOSS instrument"
Edelstein, J. and Poppett, C. and Sirk, M. and Besuner, R. and
Lafever, R. and Allington-Smith, J. R. and Murray, G. J., *Proc. SPIE*, Vol. 8450, 2012.

"Optical Fibre Connection Performance Investigation for BigBOSS"
Poppett, C. and Edelstein, J. and Sirk, M. and Vanderburg, A. M. *AAS*, Vol. 219, 2012.

"Diverse field spectroscopy: instrument concepts"
Murray, G. J. and Allington-Smith, J. R. and Blake, S. and Content, R. and
Lemke, U. and Poppett, C.*Proc. SPIE*, Vol. 7735, 2010.

"The dependence of the properties of optical fibres on length"
C. L. Poppett and J. R. Allington-Smith, *MNRAS*, 404:1349–1354, 2010.

"A new method to quantitatively compare focal ratio degradation due to different end termination techniques"
C. L. Poppett and J. R. Allington-Smith, *Proc. SPIE* 7735:29, 2010.

"Strategies for spectroscopy on extremely large telescopes - III. Remapping switched fibre systems"
C. L. Poppett, J. R. Allington-Smith, G. J. Murray, *MNRAS*, 399:443–452, 2009.

"Coupling efficiency and termination of photonic crystal fibres for astronomy"
C. L. Poppett and J. R. Allington-Smith, *Proc. SPIE*, 7018:159, 2008.

"Fibre systems for future astronomy: anomalous wavelength-temperature effects"
C. L. Poppett and J. R. Allington-Smith, *MNRAS*, 379:143–150, 2007.

Research To Date

2011-Present (Lead Fibre Scientist - DESI)
DESI (Dark Energy Spectroscopic Instrument) is a proposed stage 4 dark energy survey, 5000 fibre-fed spectrograph which will be installed on the 4 m Mayall telescope at Kitt Peak Observatory. This is largest fibre fed instrument designed to date and I have been a key member of the design team. In my position as lead fibre scientist I have played an essential role in the design and implementation of novel fibre systems, advanced design of VPH (volume phase holographic) gratings and highly accurate fibre positioning devices. All of these features are critical in meeting the DESI scientific requirements. This work has primarily been achieved by designing and implementing, and analysing laboratory based experiments for a variety of applications in an efficient manor and has resulted in a number of extremely high quality results and publications.
The DESI fibre system begins at the positioners in the focal plane and ends ∼38m later at the spectrograph slit via guides, strain relief boxes, a cable, and telescope pivot points. The main requirements of the system are to conserve étendue and maximise throughput. DESI will probe the geometry of Baryon Acoustic Oscillations (BAO) with 0.3-1% precision from redshifts $3.0 \leq z \geq 0.5$. This will only be possible if the near field PSF of the fibres can be extremely well calibrated. I have performed an extensive study of the near field intensity distribution of fibres used in DESI and this has been instrumental to the calibration plan. Another major aspect of the fibre system is focal ratio degradation (FRD) in the fibres far field - a topic in which I am internationally expert. Previous fibre systems have used mechanical connections in the fibre system to facilitate a more simple integration plan, however the increase in FRD is unacceptable for the throughput requirements of DESI. Instead DESI will use fibres which have been fusion spliced - a new venture for astronomical instrumentation. As part of an extensive campaign which involved identifying and communicating with vendors, as well as educating them to our needs, we have worked together to improve the FRD of their fusion splicing systems.
As an extension of the fibre system I have also been involved in designing and executing an optical test to evaluate the positioning accuracy of various fibre positioning devices. This work was used to refine and improve, and reasses the fibre positioners and has resulted in the development of 2 basic actuator designs. These actuators are able to position fibres to within 5μm. Further tests include increased focal ratio degradation due to bending, twisting, and stress within the positioner.
In addition to managing the fibre system I have been actively involved in many other areas of the project such as volume phase holographic (VPH) grating design. This required extensive use of Zemax and GSolver to evaluate early spectrograph configurations and identified ways to improve the design to allow more efficient gratings that still delivered the required resolution. This had a significant impact on the early design of the camera resulting in a significantly more efficient spectrograph.

2007-2011 (PhD Research)
My PhD research aimed to provide a better understanding of how both Optical and Photonic crystal fibres work in order to build efficient, cost effective instruments for the next generation of telescopes.
This work culminated in experimental work backed up by the development of theoretical models in order to better understand and predict the behaviour of both step-index and photonic crystal fibres.
Using the expertise gained regarding the handling and preparation of fibres, a large, randomised, fibre bundle has been built as a demonstrator for an ELT instrument. This randomisation is particularly important for the implementation of Diverse Field Spectroscopy (DFS) using highly multiplexed Monolithic Fibre Systems (MFS). DFS allows arbitrary distributions of target regions to be addressed in order to optimize observing efficiency when observing complex, clumpy structures such as protoclusters. These structures are expected to be increasingly accessible to extremely large telescopes.

2006 (MSci)
During the 4th year of my undergraduate degree experimental data was obtained which showed that the FRD performance

of fibres at different temperatures is dependent upon the wavelength of light injected. This work has helped in developing the theoretical model which is referred to above.

Other Research Activities

- 2010: Internship at the Australian Astronomical Observatory (AAO).
  Primarily testing the HERMES spectrograph VPH gratings, but also designing an 'On Sky' test for hexabundle fibres, and testing exotic optical fibres such as square and octagonal core fibres.
- 2009: Invited Oral presentation at NAOJ and Kyoto University.
  Spectroscopy with Extremely Large Telescopes
- 2004: Summer Vacation Student, National Physical Laboratory, Teddington.
  I worked in the area of cryogenic radiometers on two projects: The project aims were to develop a new cryogenic radiometer for low optical power levels and to measure the Stefan Boltzmann constant using the Absolute Radiation Detector (a cryogenic radiometer). *Collaborators: J. Ireland, E. Woolliams*

Conferences Attended

- 2010-2014 : "SPIE Astronomical Telescopes + Instrumentation ", Various
- 2012-2015 : "American Astronomical Society", Various

Technical Skills

- Experienced user of Zemax, Python, Matlab, and LaTeX.
- Working knowledge of Fortran 90, and Labview

Teaching Experience

- 2012 : Stand-in lecturer at San Francisco State University (Electricity and Magnetism)
- 2009-2010 : Demonstrator in undergraduate teaching laboratory (Level 2 Electronics and Optics)
- 2008-2009 : Demonstrator in undergraduate teaching laboratory (Level 2 and 3 Optics)
- 2007-2008 : Demonstrator in undergraduate teaching laboratory (Level 2 and 3 Optics)

References

Available on request.