

Astrophysical Dust Destruction

Supervisors: Dr. Charlotte Palmer (c.palmer@qub.ac.uk)

Project Background:

Dust grains are ubiquitous throughout the interstellar medium (ISM). Recent observations have confirmed that there is no line of sight from Earth which is not obstructed to some level by emission from interstellar dust [Planck Collaboration 2016]. This is particularly important in light of the contribution of dust to the microwave emission which needs to be modelled and removed in high sensitivity measurements of the Cosmic Microwave Background [Dunkley et al., 2009]. Such measurements, corrected for microwave emission from dust, are a powerful probe of the dynamics of the early universe [Kamionkowski et al., 1997].

Recent experiments performed by our group at QUB have used high power lasers and specialised 'dusty' targets to model the behaviour of dust in a dynamic plasma. X-ray radiography has been used to obtain ultra-fast snapshots of the dust as it collides with other dust grains and moves through shock waves created by the high-power laser-plasma interaction.

Project Description:

The summer student will work together with researchers at QUB to develop analysis software in Matlab or python for these x-ray snapshots to determine the rate at which the dust is destroyed, a vital test for existing dust models.

Useful references:

Planck Collaboration, *Astronomy and Astrophysics*, 586, A133 (2016)

J Dunkley et al., *American Institute of Physics Conference Proceedings*, 1141, 222 (2009)

M Kamionkowski et al., *Physical Review Letters*, 78, 2058 (1997)

B Draine, [Book] *Physics of the Interstellar medium and intergalactic medium*, Princeton (2011)