X11b The lensing nature of Herschel Bright Sources

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The Herschel surveys have detected more than half a million sub-millimeter galaxies (SMGs), allowing for the selection of both gravitational lenses and rare hyper-luminous galaxies. Gravitational lensing reveals previously-hidden populations of sub-mm sources. In turn, the unlensed sources are the most intensely star-forming systems in the Universe. Direct observations with SMA, NOEMA, and ALMA have identified their nature in the dust continuum, revealing the morphology of dust-obscured star-formation at high redshift. We will present the latest ALMA results revealing the dynamical behaviour inside these star-bursting galaxies in the early Universe, together with the results from redshift searches with NOEMA, IRAM 30m, ACA and ALMA.

Aside from individual lens studies, observations of large samples of Herschel-selected lensed SMGs can provide a unique probe of the intervening Universe and its cosmology. However, increasing the sample of the gravitational lenses still remains a challenge as our current selection methods are only based on relatively-crude flux cuts. Here, we show that optical and near-infrared imaging are an essential tool for identifying the gravitational lenses within the Herschel samples by finding the foreground lensing galaxies. We improve our method to near 100% accuracy, contrary previous work (only $\sim$40%). Based on near-IR VIKING data, we will present the first measure of the lensing probability as a function of selection flux. We will then outline our ongoing work with ALMA in combination with multi-wavelength imaging to target confirmed lensed sources, and conversely, to target unlensed sources - the most intensely starforming systems in the known Universe.