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Title:Spitzer-IRAC identification of Herschel-atlas SPIRE sources

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Abstract:We use Spitzer -IRAC data to identify near-infrared counterparts to submillimeter galaxies detected with Herschel -SPIRE at 250  $\mu\text{m}$  in the Herschel Astrophysical Terahertz Large Area Survey. Using a likelihood ratio analysis we identify 146 reliable IRAC counterparts to 123 SPIRE sources out of the 159 in the survey area. We find that, compared to the field population, the SPIRE counterparts occupy a distinct region of the 3.6 and 4.5  $\mu\text{m}$  color-magnitude space, and we use this property to identify 23 further counterparts to 13 SPIRE sources. The IRAC identification rate of 86% is significantly higher than those that have been demonstrated with wide-field ground-based optical and near-IR imaging of Herschel fields. We estimate a false identification rate of 3.6%, corresponding to 4-5 sources. Among the 73

counterparts that are undetected in Sloan Digital Sky Survey, 57 have both 3.6 and 4.5  $\mu\text{m}$  coverage. Of these, 43 have  $[3.6] - [4.5] \geq 0$ , indicating that they are likely to be at  $z \sim 1.4$ . Thus,  $\sim 40\%$  of identified SPIRE galaxies are likely to be high-redshift ( $z \sim 1.4$ ) sources. We discuss the statistical properties of the IRAC-identified SPIRE galaxy sample including far-IR luminosities, dust temperatures, star formation rates, and stellar masses. The majority of our detected galaxies have  $10^{10} - 10^{11} L_{\odot}$  total IR luminosities and are not intense starbursting galaxies as those found at  $z \sim 2$ , but they have a factor of 2-3 above average specific star formation rates compared to near-IR selected galaxy samples.

Number of references:110

Inspec controlled terms:active galaxies - cosmic dust - infrared sources (astronomical) - red shift - star formation - submillimetre astronomy

Uncontrolled terms:Spitzer-IRAC data - near-infrared counterparts - submillimeter galaxies - Herschel-ATLAS SPIRE sources - likelihood ratio analysis - color-magnitude space - near-infrared imaging - wide-field ground-based optical - SDSS - redshift 1.4 - statistical properties - IRAC-identified SPIRE galaxy sample - far-infrared luminosities - dust temperatures - stellar mass - total infrared luminosities - starbursting galaxies - redshift 2 - average specific star-formation rates - near-IR selected galaxy samples - wavelength 250  $\mu\text{m}$  - wavelength 3.6  $\mu\text{m}$  - wavelength 4.5  $\mu\text{m}$

Inspec classification codes:A9850R Active and peculiar galaxies - A9840L Star-forming regions - A9850E Galactic structure, content and morphology - A9840B Interstellar matter - A9580E Sub-millimetre astronomical observations - A9580G Infrared astronomical observations - A9870L Cosmic IR sources - A9850H Red shift, distances, and spatial distribution of galaxies

Numerical data indexing:wavelength 2.5E-04 m;wavelength 3.6E-06 m;wavelength 4.5E-06 m

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