Herschel Space Observatory

Key Programme Open Time Proposal.

DEBRIS: Disc Emission via a Bias−free Reconnaissance in the Infrared/Sub−millimetre

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Science Category: Galactic: Circumstellar/Debris disks

Observing Modes: Pacs Photometer, Spire Photometer

Hours Requested: 353.9

Abstract:
Debris discs are belts of dust particles created from collisions of planetesimals (comets and asteroids) in extrasolar planetary systems. The prototype disc around Vega was discovered ~25 years ago by IRAS, and ~20 discs have been imaged to date, primarily by HST, SCUBA and Spitzer. Despite the relatively low numbers, debris discs are seen to be extraordinarily diverse in character, including systems with vast populations of comets or with perturbations by planets at tens of AU from the host star. Due to this low number, however, our knowledge of debris discs is incomplete; there has been no unbiased survey specifically designed to image a large number of discs. Spitzer greatly improved our understanding of the disc−rich A stars but the number of detections is still low for solar−analogue FGK stars and especially the numerous M stars. For Herschel, we therefore propose the DEBRIS (‘‘Disc Emission via a Bias−free Reconnaissance in the Infrared/Submillimetre") Key Project which will probe 450 nearby A−M stellar systems for debris and measure Solar System dust levels in debris discs for the first time. The large sample is statistically robust and without bias, providing a rich legacy for debris disc and exo−planet science. This deep, flux−limited survey will obtain PACS 100/160 images of all 450 systems (472 fields due to wide binaries), and it will be possible to resolve discs toward each one with the PACS’ high resolution. DEBRIS includes SPIRE imaging in systems where debris is detected with PACS (a rate of 50% is expected). The key science questions are: (a) which kinds of stars have debris and why?

(b) what are the sizes, temperatures and masses of the debris discs? (c) what is the relation of resolved disc structures to the exo-planets? and (d) is our Kuiper Belt common or unusual? The Herschel DEBRIS Key Project will answer these questions using Herschel's high sensitivity, spectral coverage and resolution. Our team includes world experts in debris discs and exo-planet science from 8 countries.