First Bites of the KINGFISH*

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*Key Insights on Nearby Galaxies: A Far-Infrared Survey with Herschel
The Spitzer Infrared Nearby Galaxies Survey (SINGS) Hubble Tuning-Fork

Ellipticals

Unbarred Spirals

Intermediate Spirals

Strong Bulge

Barred Spirals

Weak Bulge

Irregulars

Strong Bulge

Some text and images related to galaxies and their classifications are present on the page.
KINGFISH Summary

• Multi-wavelength observations of 61 galaxies
  – from SINGS + M101, IC 342, NGC 3077, NGC 2146)
• Complete, deep PACS/SPIRE imaging
  – 70, 110, 160, 250, 350, 500 µm
• PACS line imaging (centres, strips, HII regions)
• SINGS/Spitzer ancillary data  (radio to X-ray)
• Core science goals
  – spatially resolved SED maps → star formation, dust physics
  – deep extended submillimetre maps → cold dust in galaxies
  – cooling lines → physics of atomic/molecular environments
NGC 6946
PACS spectroscopic pointings
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KINGFISH SDP Targets

NGC 1097

NGC 4559
Three Views of NGC 4559

SDSS
  gri

GALEX
  0.15/0.23 μm

Spitzer
  3.6/8/24 μm

Scd  dist = 11.6 Mpc
M_B = -20.5  L_{IR}/L_{opt} = 0.2
The PACS View of NGC 4559

Red — PACS 160
Green — PACS 100
Blue — PACS 70

Spitzer 3.6, 8.0, 24 μm
The PACS View of NGC 4559

Red – PACS 160
Green – PACS 100
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Spitzer 3.6, 8.0, 24 μm
The SPIRE View of NGC 4559
250, 350, 500 µm
The Integrated SED of NGC 4559

with Dale et al. (2007) SED model fit to MIPS

$\nu F_\nu$ (10^{-13} W m^{-2})

Wavelength ($\mu$m)

PACS 100
PACS 160
PACS 70
SPIRE 250
SPIRE 350
SPIRE 500
Individual H II Complexes at 160 µm
SEDs of Individual H II Regions
overlayed with normalized D07 Model for NGC 4559

Optical

PACS

$\lambda$ (\mu m)
PACS and PACS/MIPS color–color relations

![Graph showing PACS Colors of NGC 4569 Regions and HII regions with various markers and error bars.](image-url)
• young SF regions have suppressed far-IR emission relative to entire galaxies
• consistent with substantial IR emission contribution from diffuse dust (and low dust attenuation in HII regions)
NGC 4559: MAPPING EXCITATION IN DISKS WITH PACS

First Spectra obtained in Chop-Nod Strip

SPECTRA SHOW EMISSION IN ALMOST ALL PIXELS

IMAGE: GALEX FUV/B/IRAC 8 μm
Strong variations in [CII], [OI], [NII]

[NII] 121 μm, 3 positions

CHOP-NOD OBSERVATIONS PROVIDE GLIMPSE OF THE HUGE POTENTIAL OF THE KINGFISH PROJECT
Lessons Learned from SDP (so far)

• PACS, SPIRE imaging (scan mapping) meets proposed performance objectives
  – dust emission seen over wide range of spatial scales, with systematic variations in SEDs, temperatures
  – removal of low-frequency noise challenging, critical for interpretation of low surface brightness emission

• PACS line imaging achieves S/N targets for interstellar cooling lines
  – again, ratios show large local variations
  – efficacy of wavelength-switching for this application remains to be tested (coming soon!)
The KINGFISH Team

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*with special thanks to...