

The Spitzer IRS Spectrophotometric Database

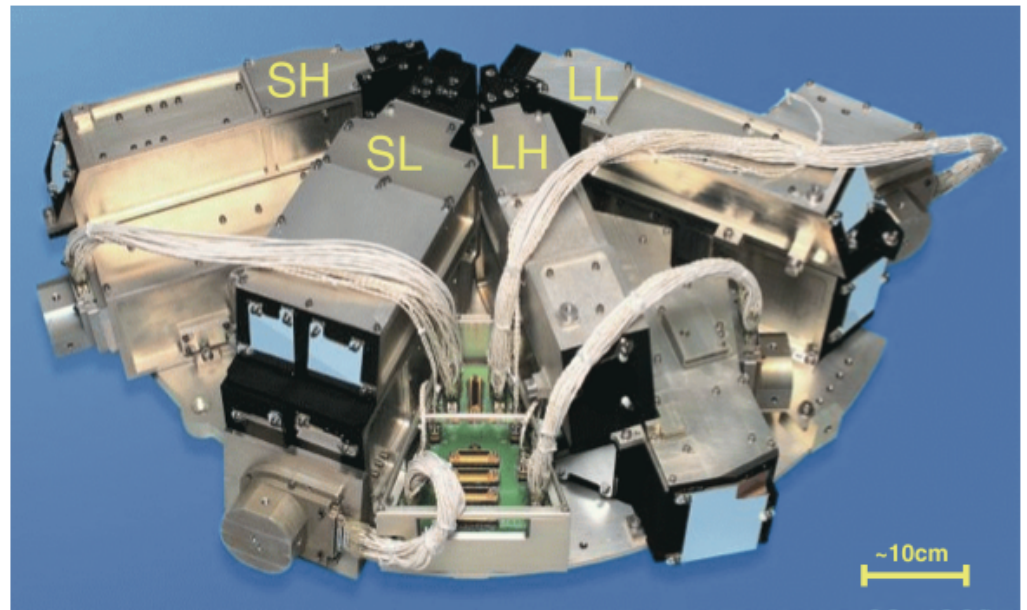
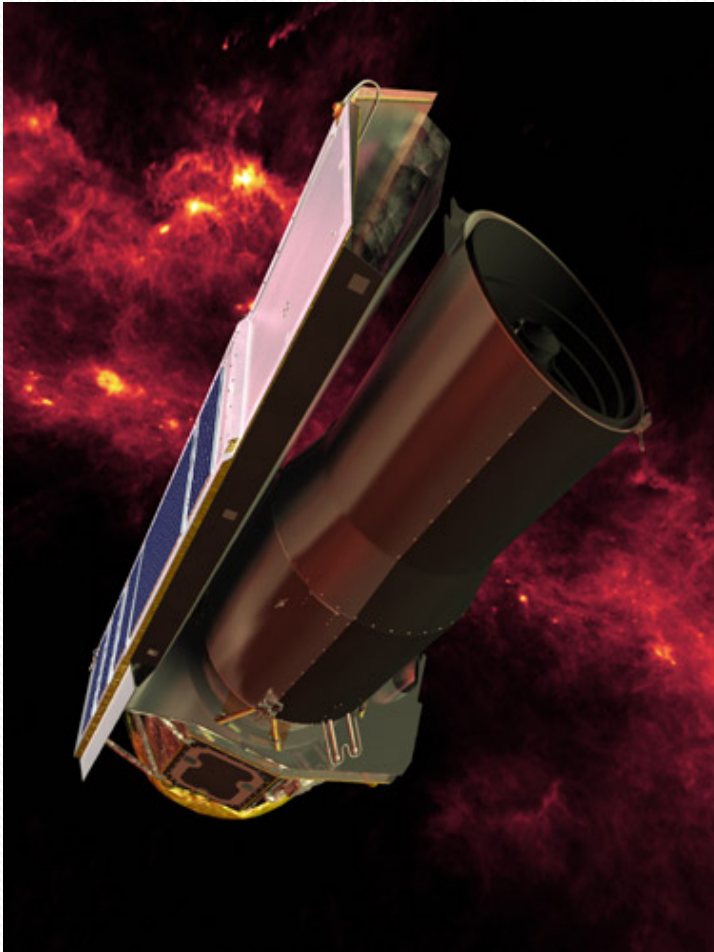
Patrick Ogle, Lee Armus, Bob Narron,
Carl Grillmair, Justin Howell, IRS IST

Integrating Spitzer IRS Archival data into IRSA and NED

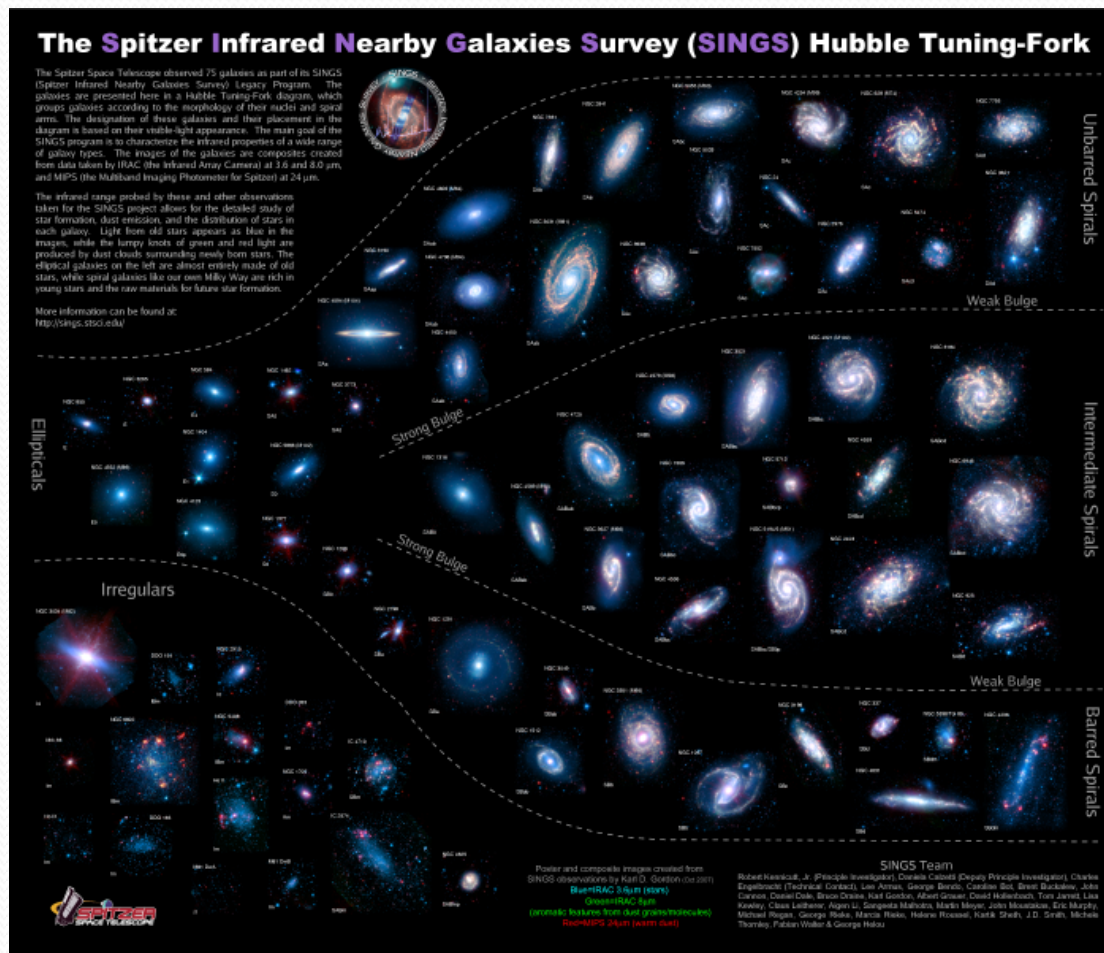
- Tap into the power of IPAC database search tools
- Enable multi-wavelength science
- IRSA: Original and enhanced multiwavelength data (e.g. IRAS, Spitzer, WISE, Planck, GALEX)
- NED: Source ID's, Bandmerging, Basic Data, Photometry/ SEDs, all linked to published references.

- Plan:
 - Deliver IRS Enhanced Spectra and Photometric DB to IRSA
 - Ingest Spitzer IRS Source catalog into NED; link to IRSA spectra

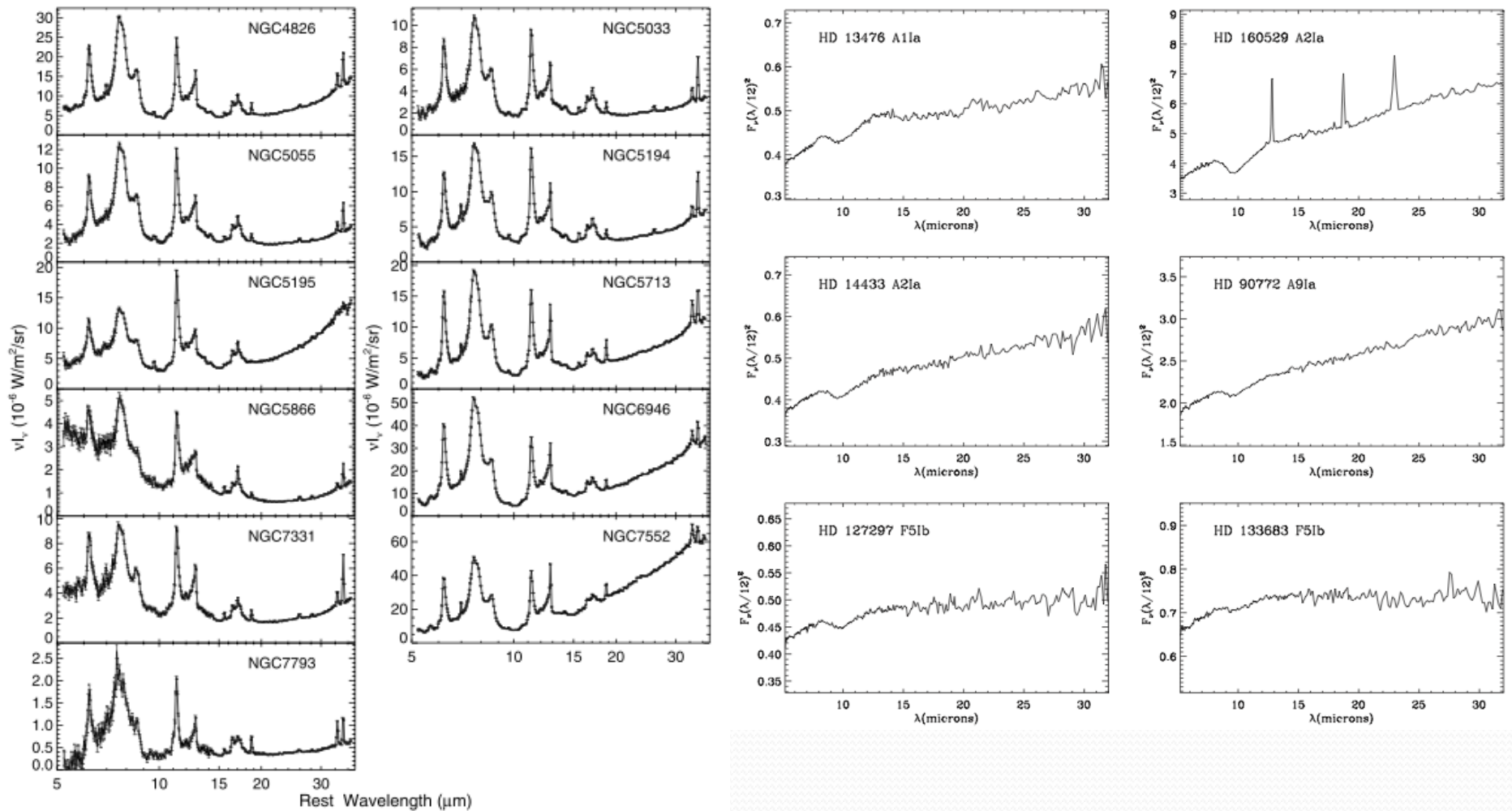
Spitzer IRS



Spitzer IRS (SINGS) Galaxy Targets



Spitzer IRS Spectra



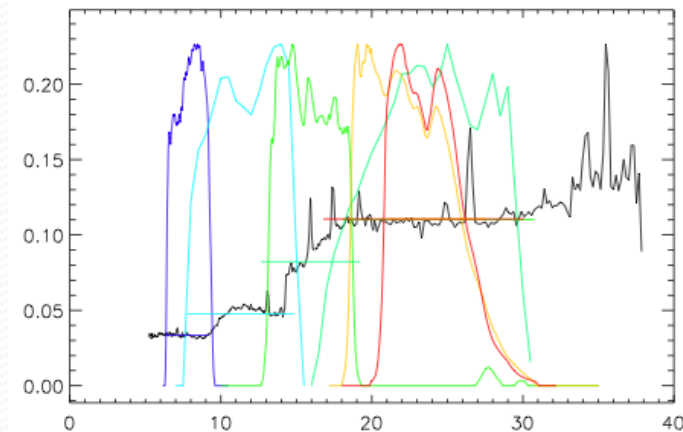
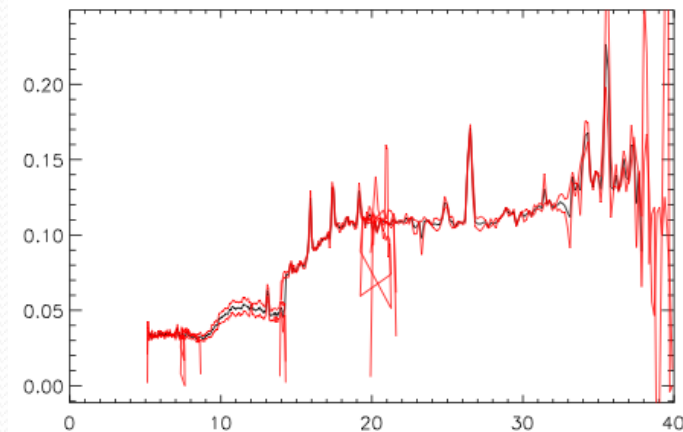
SINGS Galaxies (Smith 07)

Atlas of Stellar Spectra (Ardila 10)

IRS Database Use Cases

- 1) Find spectra for all objects brighter than 1 Jy.
- 2) Search for red galaxies with $MIPS_{24}/IRAC8 > 4$.
- 3) Search for stars with $0.2 < MIPS_{24}/IRAC8 < 1$ dust excess emission.
- 4) Cross-calibrate photometry
 - a. Spitzer instruments (IRAC, IRS, MIPS)
 - b. Other missions (IRAS, WISE).
- 5) Understand Spitzer and WISE source colors.

IRS Enhanced Spectra



17000 IRS observations
(low-resolution, staring mode)

- Background-subtracted spectra
- Nods averaged
- Orders (SL_{1,2}, LL_{1,2}) trimmed and merged
- Photometry in 6 (8) standard bands:
 - Spitzer IRAC8, PU16,22, MIPS24
 - IRAS 12,25
 - WISE bands 3 and 4 (12,22 micron)
- Headers contain position, photometry, and order matching info

Spitzer IRS Database Queries

- ID, cross-ID (NED/Simbad), AORkey
- Position—(RA,Dec) Requested and Extracted
- Order matching (e.g. LL2/SL1 ratio)
- Photometry—IRAC8, MIPS24, PU16,22, IRAS 12,25, [WISE12,22] and uncertainties
- Colors—MIPS24/IRAC8, MIPS24/PU16, PU16/IRAC8, IRAS25/12, [WISE22/12]
- [Cross-dispersion profile width]



IRSA/Gator Data Release

- IRS Enhanced Spectra and Spectrophotometric Data to be released as “Spitzer Legacy” in 2011 Fall.
- Flat-format ASCII table and searchable versions
- Collection of merged spectra

SHA Interface (TBD)

The screenshot displays the NASA/IPAC Infrared Science Archive (IRSA) website. The header includes the IRSA logo and navigation links for Mission, Archive Search, Related Data Archives, Tools & Services, and Help. Below the header, there are links for Spitzer Searches, History/Tags, Catalogs, Read FITS File, and Preferences. A search bar is present with a "Search Again" button and a link to refine the search. The main content area is divided into two panels: "Position Search Results" and "Details".

Position Search Results

Observation Requests (AOR) | Level 2 (PBCD)

Prepare Download | Restrict data in other tabs? | Save | Text View | 1 filter applied

<input type="checkbox"/>	AORKEY	Instrument/Mode	Bandpass	RA (J2000)	Dec (J2000)	File type
<input type="checkbox"/>	3754496	IRS Stare	IRS LL 19.5-38.0um	12h10m34.85s	+39d24m14.3s	Table
<input type="checkbox"/>	3754496	IRS Stare	IRS LL 19.5-38.0um	12h10m30.21s	+39d24m26.4s	Table
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<input type="checkbox"/>	3754496	IRS Stare	IRS SL 5.2-8.7um	12h10m32.50s	+39d24m11.0s	Table
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<input type="checkbox"/>	3754496	IRS Stare	IRS LL 19.5-38.0um	12h10m34.85s	+39d24m14.3s	Table

Details

Details | L1/L2 Data | L1/L2 Coverage

Level 2 (PBCD):IRS SL 7.4-14.5um

Preview: flux_density vs. wavelength

The spectral plot displays flux density on the y-axis (ranging from 0.80 to 2.80) against wavelength in microns on the x-axis (ranging from 7.40 to 14.30). The plot shows a red line representing the flux density, with several distinct peaks. The most prominent peaks are located at approximately 10.5 microns and 14.3 microns. The flux density generally increases with wavelength, with a notable dip around 12.5 microns.


- SHA search on position, flux, color... (or any combination thereof)
- Level 3 (IRS Enhanced) Products tab will give merged spectrum.
- Spectrum, photometric data plotted in Details:Data tab







NED Interface

NASA/IPAC
EXTRAGALACTIC
DATABASE

Featured updates to NED (April 2011)

- [522,157 Objects linked to 1,937 references](#)
- [Redshifts for 104,489 objects](#)
- [Input source list for proximity based cross-matches with NED objects](#)
- [Galactic Extinction added to User-Customized Data Tables](#)
- [Updates to Quick-look Photometry and Derived Luminosities](#)
- [10 additions to Level 5, including "NGC 5128: The Giant Beneath" \(Harris 2010\)](#)



 OBJECTS	 DATA	 LITERATURE	 TOOLS	 INFO
By Name	Images By Object Name or By Region	References by Object Name	Coordinate Transformation & Extinction Calculator	Introduction Latest News/Updates
Near Name	Photometry & SEDs	References by Author Name	Velocity Calculator	Features FAQ
Near Position	Spectra	Text Search	Cosmology Calculators	Overview (pdf)
IAU Format	Redshifts	Knowledgebase 	Extinction-Law Calculators	Source List
By Parameters (All-Sky)	Redshift-Independent Distances	Galaxy Distance Tabulations (NED-D)	Skyplot	Web Links
By Classifications Types, Attributes	Classifications by Object Name	Abstracts	X/Y offset to RA/DEC	Glossary & Lexicon
By Refcode	Positions	Thesis Abstracts	Batch Job Submission Pick Up Results	Team
Object Notes	Diameters		NEW Build Data Table from Input List By Name Near Name/Position (Cross-Matching)	Contact Us or Comment

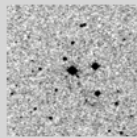
NED Search Results

INDEX for 3C 273

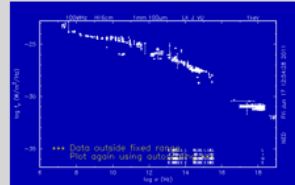
Essential Data (jump to sub-section of this query report):

[Essential Note](#)
[Cross-IDs](#)
[Coordinates](#)
[Basic Data](#)
[Quantities Derived from Redshift](#)
[Redshift-Independent Distances](#)
[Quick-Look Photometry and Luminosities](#) NEW
[Classifications](#)
[Foreground Galactic Extinction](#)
[External Services](#)

Detailed Data (NED queries):



Images



504 Photometric data point(s) and SED

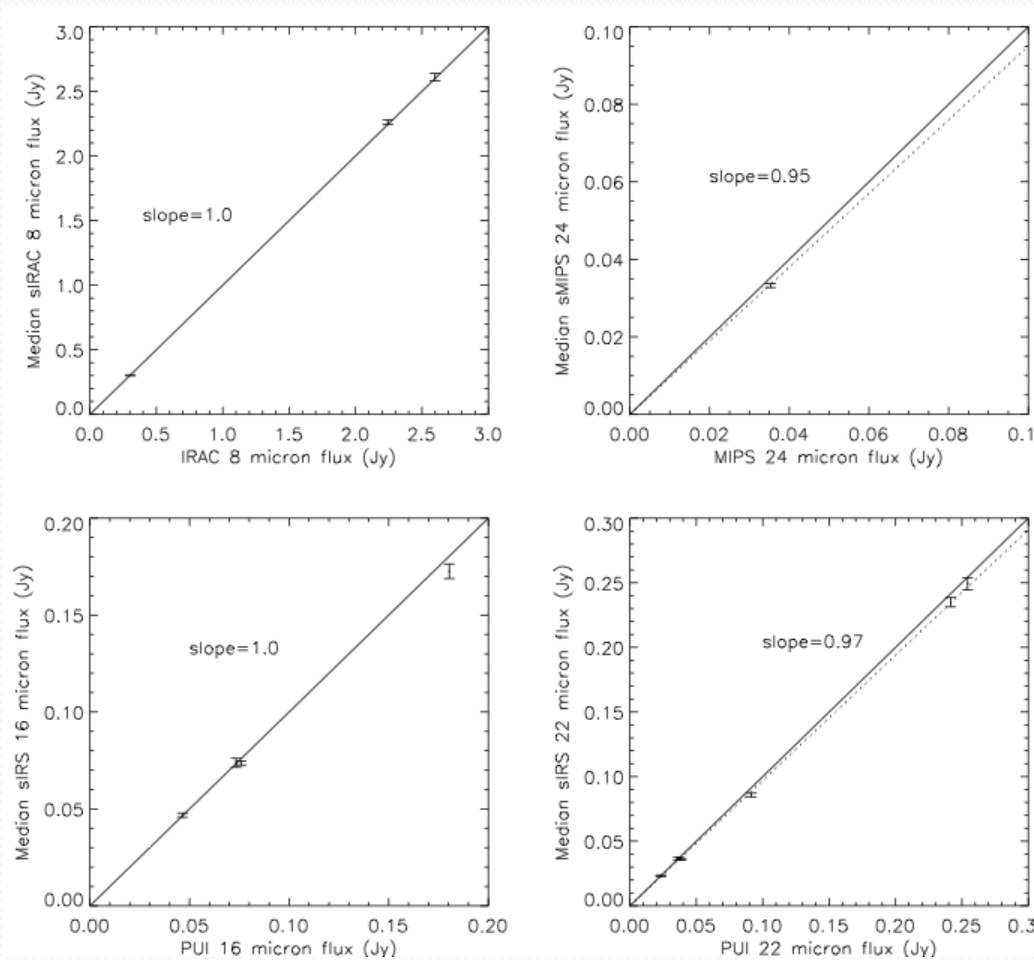
[Spectra](#)
[Redshift-Independent Distances](#)
[2109 Reference\(s\)](#)
[11 Position data point\(s\)](#)
[3 Redshift data point\(s\)](#)
[6 diameter data point\(s\)](#)
[35 Note\(s\)](#)
[PKS data](#)
[HB89 data](#)

EXTERNAL ARCHIVES AND SERVICES for 3C 273 [Help](#) ([Back to INDEX](#))

Data Related Directly to Object Names	Site/Service
Query SIMBAD by primary NED object name -- 3C 273	SIMBAD (CDS, Strasbourg, France)
Fourth Cambridge Survey -- 4C +02.32	VizieR Catalog Query (U.S. mirror, CfA/Harvard)
2MASS Extended Source Images (JHKs) -- 2MASX J12290674+0203083	NASA/IPAC Infrared Science Archive (IRSA)
Query SDSS Sky Server -- SDSS J122906.69+020308.5	SDSS Sky Server
IRAS Point Source Catalog -- IRAS 12265+0219	VizieR Catalog Query (U.S. mirror, CfA/Harvard)
IRAS Faint Source Catalog -- IRAS F12265+0219	VizieR Catalog Query (U.S. mirror, CfA/Harvard)
Catalogue of Principal Galaxies -- PGC 041121	VizieR Catalog Query (U.S. mirror, CfA/Harvard)
Retrieve mean data from LEDA -- PGC 041121	The Lyon/Meudon Extragalactic Database (LEDA)
Parkes Radio Sources Catalogue -- PKS B1226+023	VizieR Catalog Query (U.S. mirror, CfA/Harvard)
Parkes-MIT-NRAO 4.85GHz Surveys -- PMN J1229+0203	VizieR Catalog Query (U.S. mirror, CfA/Harvard)
Original FIRST Source Catalog -- FIRST J122906.7+020308	Faint Images of the Radio Sky at Twenty-Centimeters
FIRST Survey, Version 1999Jul -- FIRST J122906.7+020308	VizieR Catalog Query (U.S. mirror, CfA/Harvard)
<input type="text" value="Retrieve catalog data for NVSS J122906+020305"/>	NRAO/VLA Sky Survey (NVSS)
Texas Survey of radio sources at 365MHz -- TXS 1226+023	VizieR Catalog Query (U.S. mirror, CfA/Harvard)
GB6 catalog of radio sources -- GB6 J1229+0202	VizieR Catalog Query (U.S. mirror, CfA/Harvard)
Query NStED Service -- HIP 060936	NStED Service
Query GALEX (NUV/FUV) Mission Archive (6' search radius) -- 3C 273	GALEX Mission Data Archive at MAST
General Archive Resources -- All queries centered at 12h29m06.7s, +02d03m09s (J2000)	Site/Service
Query Optical and UV Mission Archives (Default search radius)	Multimission Archive at STScI (MAST)
Query High Energy Mission Archives (Default search radius)	HEASARC (NASA/GSFC)
Explore resources with DataScope (15' search radius)	HEASARC (NASA/GSFC)
Query SDSS Sky Server -- 3C 273	SDSS Sky Server
<input type="text" value="Retrieve 2MASS Atlas Images"/> Band(s): <input type="text" value="Ks"/> Size: <input type="text" value="2'"/>	NASA/IPAC Infrared Science Archive (IRSA)
<input type="text" value="Retrieve IRAS ISSA Images"/> Band(s): <input type="text" value="60um"/> Size: <input type="text" value="30'"/>	NASA/IPAC Infrared Science Archive (IRSA)

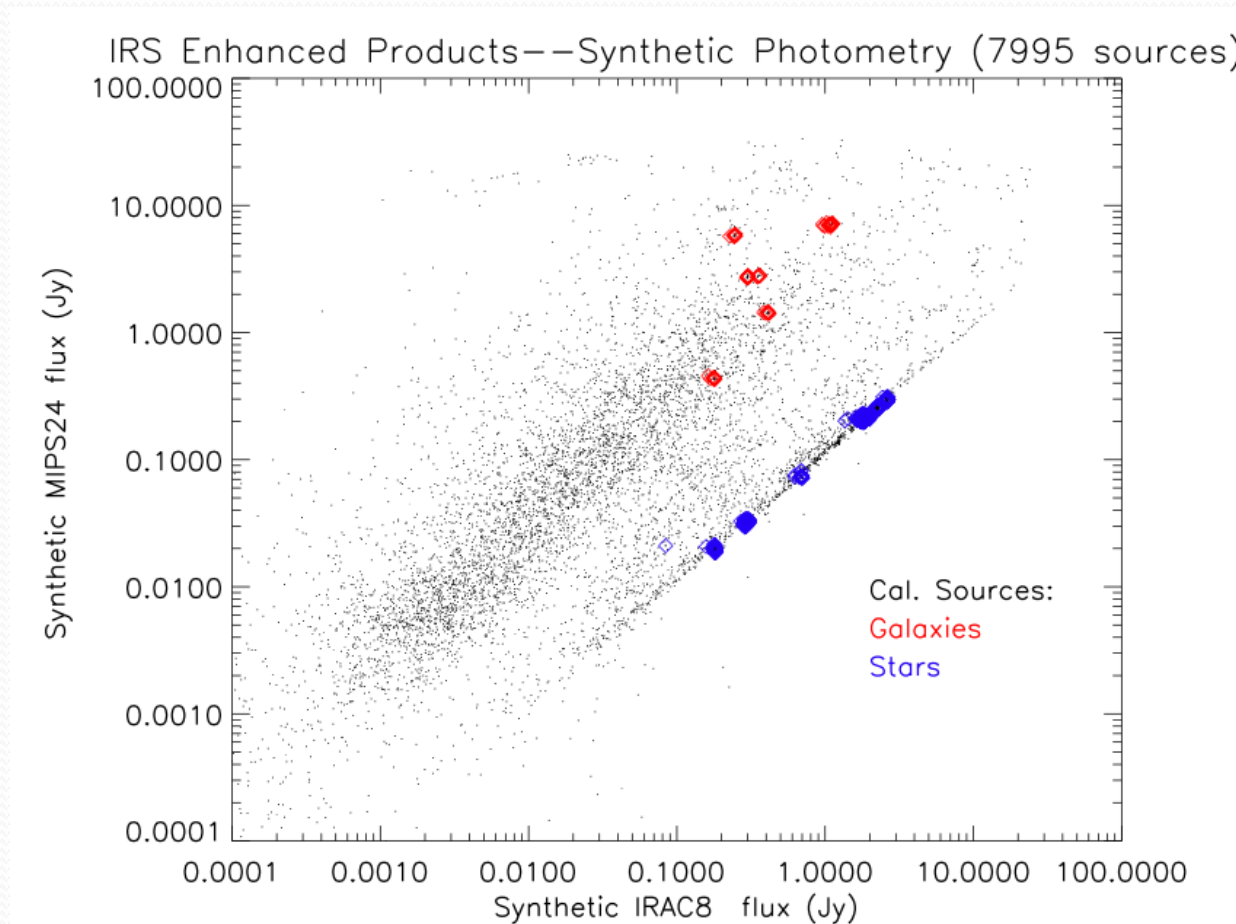
Science Application

I. Spitzer Cross-calibration



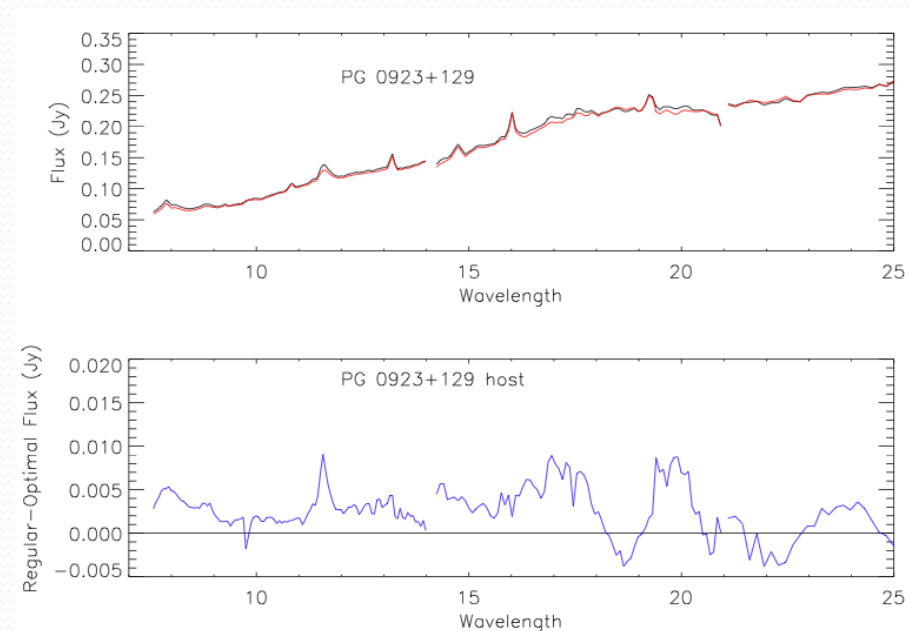
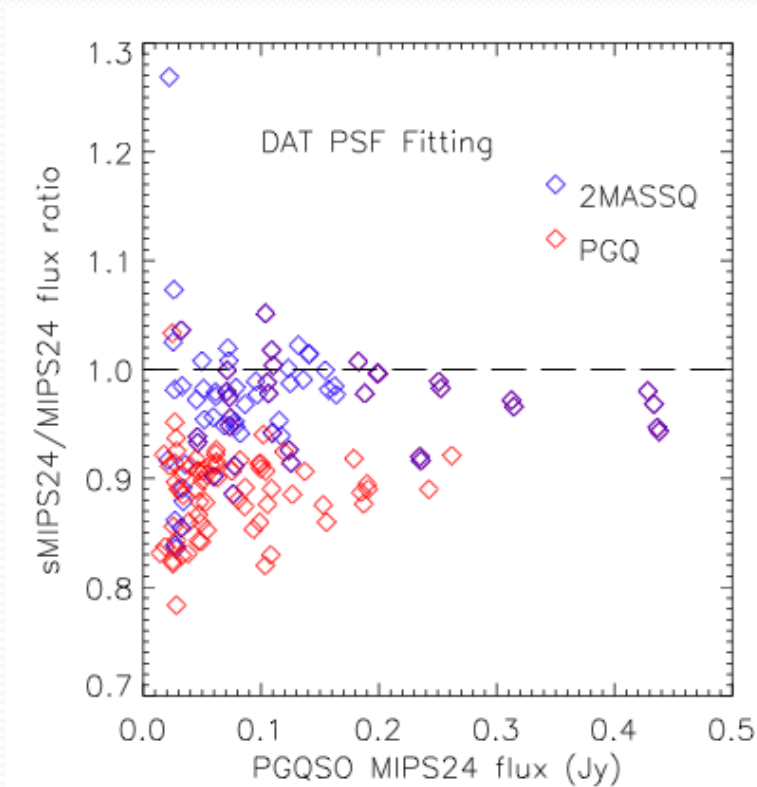
Science Application

II. Star and Galaxy Colors



Science Application

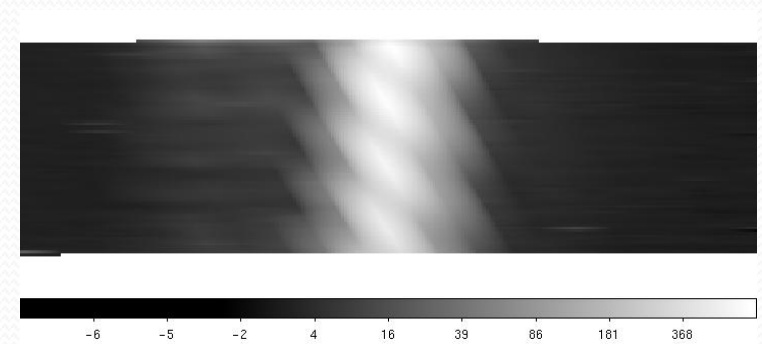
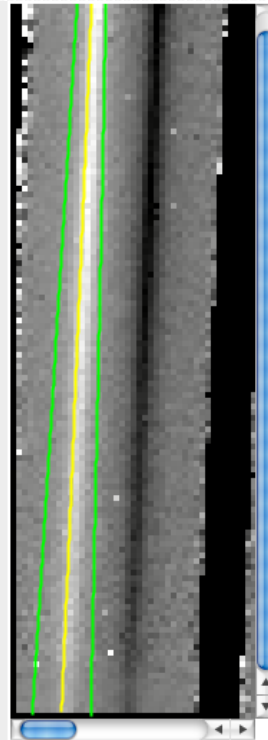
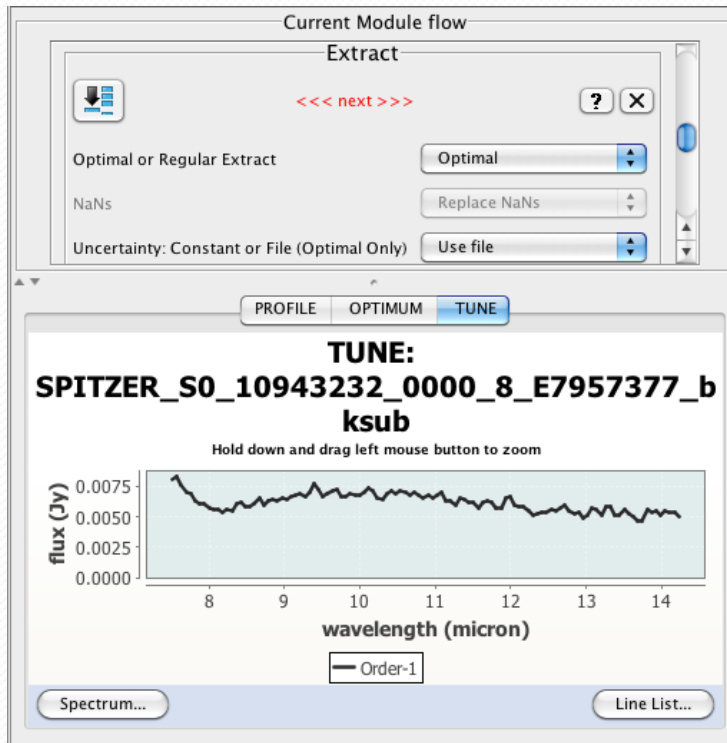
III. Quasar Host Galaxies



Extended quasar host emission revealed by deficit between Spitzer IRS (enhanced) and MIPS 24 photometry.

Difference between regular and optimal extraction emphasizes extended host galaxy emission (PAHs and continuum)

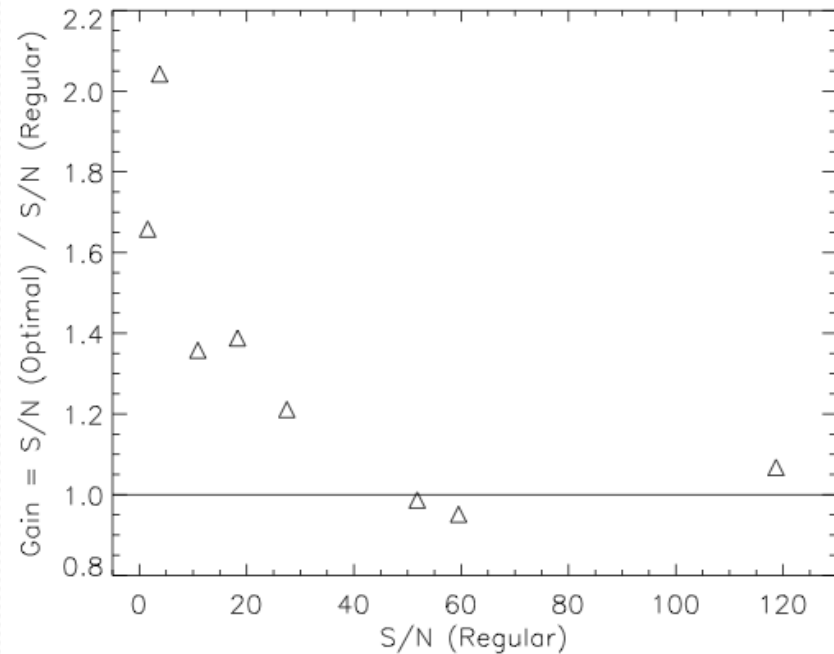
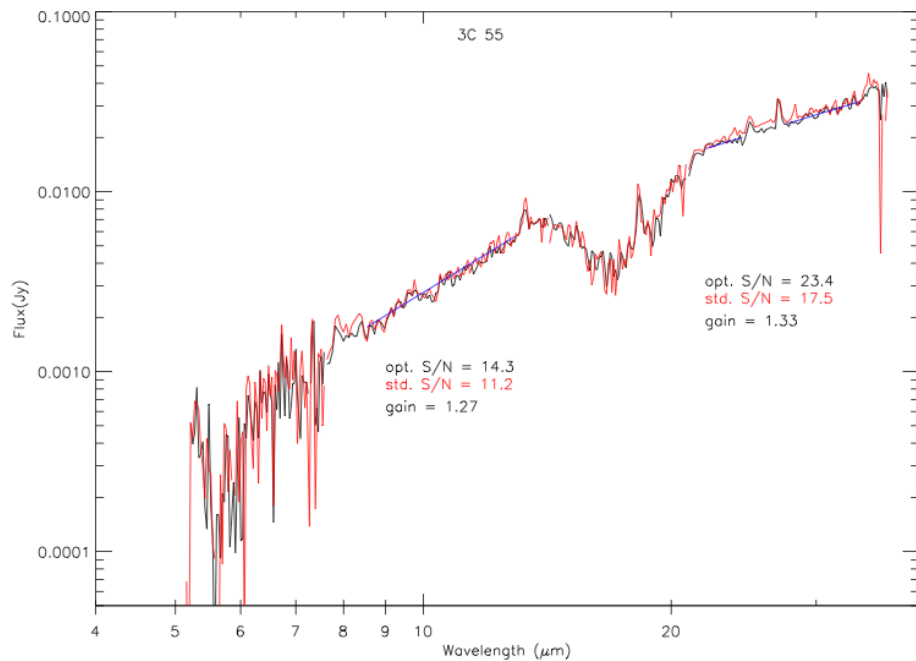
SPICE Optimal Extraction



Stellar PSF template

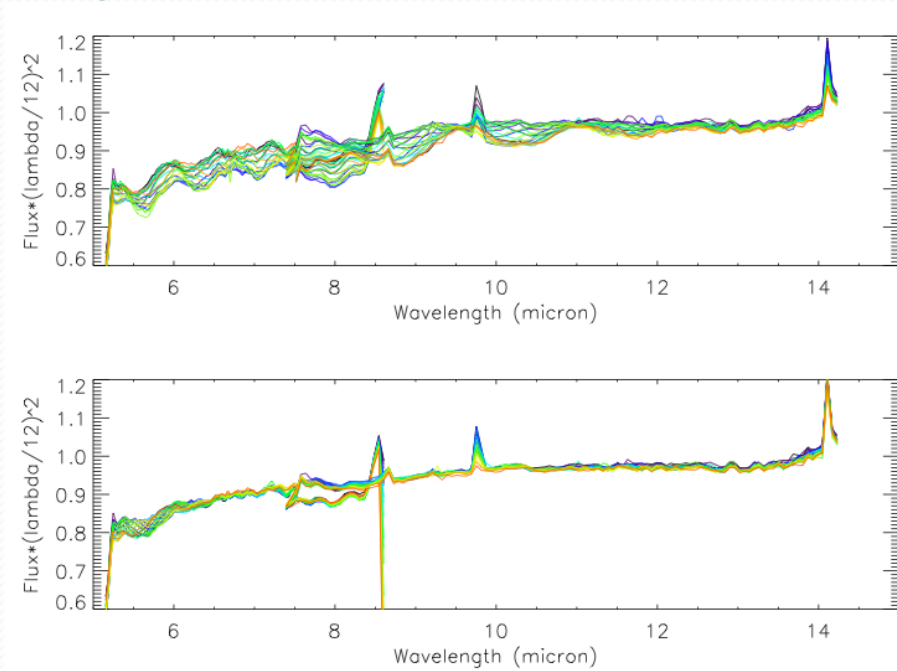
- S/N-weighted spectral extraction, using SPICE GUI
- Uses stellar (point-source) template for instrumental profile (PSF)

SPICE Optimal Performance



- Faint radio galaxy 3C 55 regular vs. optimal
- Signal-to-noise improvement of up to factor 2

SPICE Optimal Extraction Upgrade



Before

After

- Fix wiggles in SPICE optimal extraction
- Finely sampled (0.1 pixel) spectral map of HR 7341
→ better matched templates to science targets
- Optimal extraction revised to pick closest stellar template (modulo 1 pixel)