



Introduction to the CSIRO ASKAP Science Data Archive

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Australia's National Science Agency

Credit: ANU & CSIRO





CSIRO ASKAP Science Data Archive

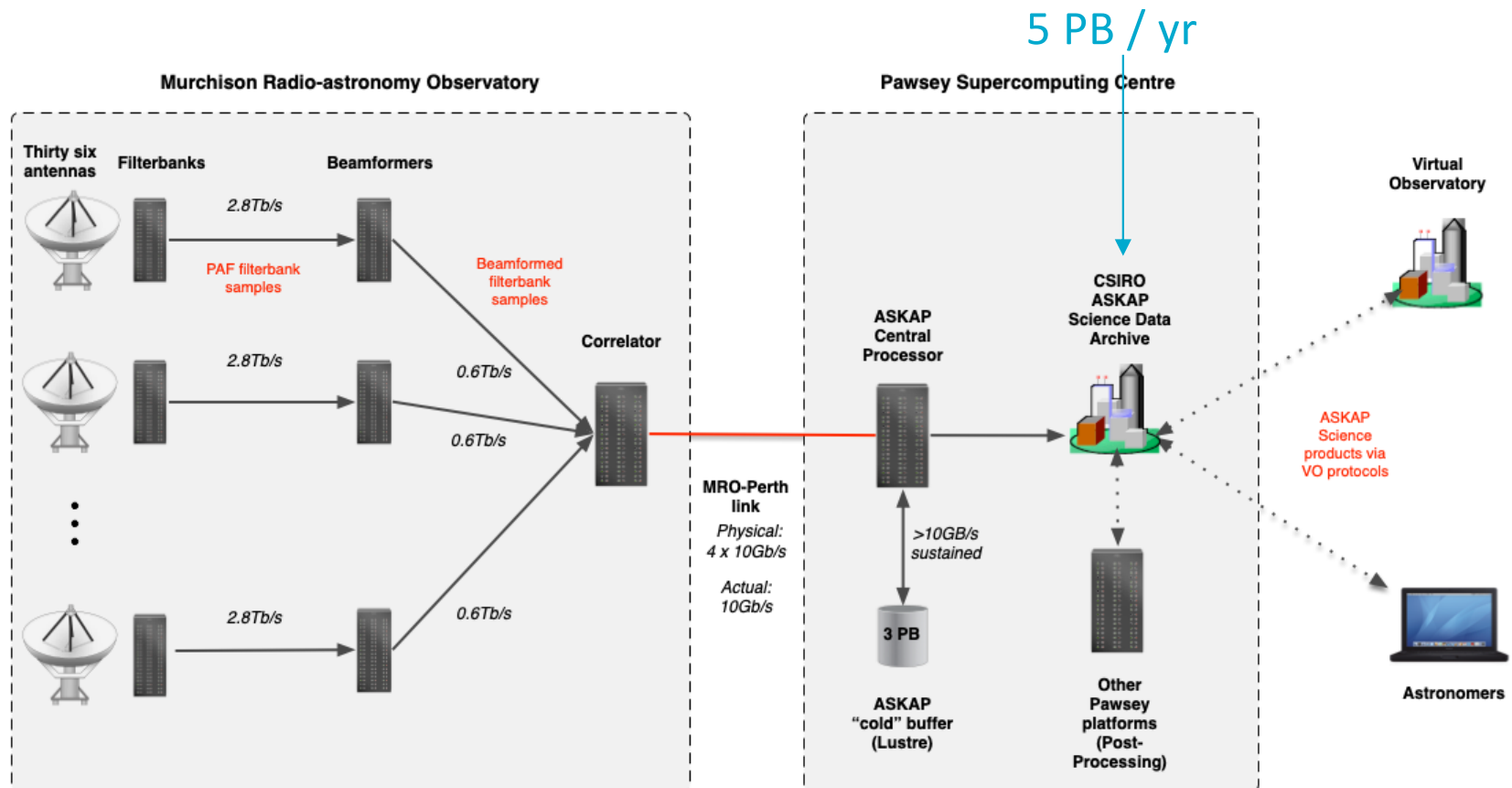
- Archive for Australian Square Kilometre Array Pathfinder (ASKAP)
- Science-ready data products
- Data formats:
 - Images & Image cubes (FITS)
 - Spectra (FITS)
 - Catalogues (VOTable)
 - Visibilities (CASA Measurement Sets)

Credit: CSIRO





ASKAP and all its wonderful data





ASKAP and CASDA Glossary

SST = Survey Science Team. There are 8 survey science teams. See resources on next slide.

SBID = Scheduling Block ID. Observations are performed and processed in scheduling blocks.

Project ID = OPAL and CASDA project codes. ASKAP Project codes are in the form "AS---".

DAP = Data Access Portal. This is CSIRO's enterprise wide portal for data.

VO = Virtual Observatory.

Observational Data = Science data processed by the observatory with ASKAPsoft. Can be released or unreleased.

Unreleased Data = Deposited and available to project team members.

Released Data = Deposited and validated data. Publicly available to all.

Derived Data = Value-added data uploaded by users.



Resources

- CASDA webpage <https://casda.csiro.au>
- ATNF ASKAP webpage
<https://www.atnf.csiro.au/projects/askap/index.html>
- ASKAP newsletter
https://www.atnf.csiro.au/projects/askap/commissioning_update.html
- ASKAP Survey Science confluence space
<https://confluence.csiro.au/display/askapsst/>



CASDA Aims



Data Discovery

Find data useful to you
Minimal radio astronomy
knowledge assumed
Query data products
Query source catalogues



Data Access

Download entire data
products
Extract small parts of very
large cubes (~800GB)



Data Publication

Science team 'value-added'
data
Legacy surveys
DOIs assigned



ASKAP Data on DAP

- ASKAP data is served through CSIRO's Data Access Portal
- These web tools also interact with the VO services
 - Downloads
 - Cutouts
 - Spectra generation
 - Catalogue queries

CASDA Observation Search

Source name / position

Position: ☒ Single ☐ Multiple

Object name: [Resolve](#)

Right ascension:

Declination:

Search radius:

Observation / Project

Project:

Filename:

[Clear form](#)

How to search CASDA data

To display all results just click the button

Enter search parameters

Fill in one or many fields to search CASDA observation results you want.

Searches will be performed against data product types by default, but you can unselect types in the "Data types" section to increase search precision.

Filter search results

You can click on the "configure" button to set up the columns for personal view of the results.

The search results will appear on a new page. Filter the results by clicking "Options", then the "Filter results" button to further refine your search results.

Each filter is applied after clicking at the bottom of the "Filter results" dialog. The number of results that match the filter is calculated and displayed next to the filter label.

CASDA Image Generation Service

Project ID: J221426-453317

Project name: ASKAP Early Science Broadband Survey

Scheduling block IDs: 2338

Image type: cont. extended to

File size: 455.3 Mb

Right ascension range: 326.652342 - 339.768201 decimal degrees

Declination range: -45.502837 - -45.798168 decimal degrees

Frequency range: 1400.49 - 1400.49 MHz

Polarisation: JJ

[View larger image](#)

*Image is a preview of the actual image cube, for reference only.

Instructions:

CASDA provides three methods to generate spatial cutouts or custom spectra from the selected image cube:

1. By providing the 2000 range of values in the RA or Dec fields, and the Frequency values for image cube, to define a single cutout/spectrum.
2. By using the Aladin-Line image. Simply click and drag with your mouse to create the cutout/spectrum area you wish to create.
3. If this image cube was found using a search based on a file containing multiple sources, these same sources can be used to generate multiple cutouts/spectra.

CASDA Skymap Search

Target: [Reset target](#)

[CASDA search help](#)

☒ Continuum Component

☐ Continuum Island

☐ Spectral Line Absorption

☐ Spectral Line Emission

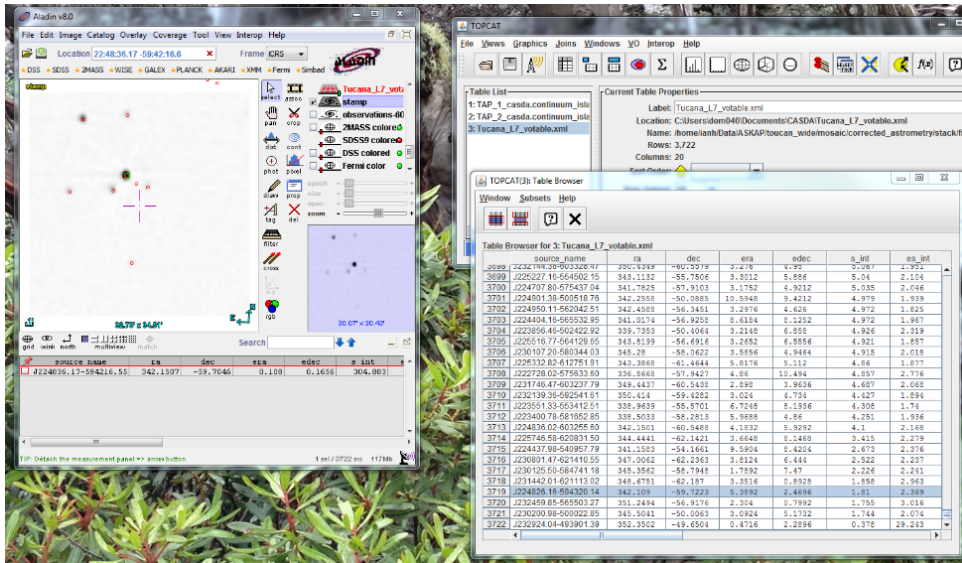
☐ Polarisation Component

☐ None

Name	J221426-453317
RA (J2000)	333.60903
Dec (J2000)	-45.554887
Peak Flux	47.257 mJy
Integrated Flux	52.067 mJy
Major Axis	18.7 arcsec
Minor Axis	15.22 arcsec
Position Angle	112.17 degrees



VO Applications



- Access data directly in
 - TOPCAT
 - Aladin
 - SPLAT-VO
- Example python scripts at:
 - <https://github.com/csiro-rds/casda-samples/>



CASDA Astroquery Module

- Python module
- Discover and download data
- Uses following VO protocols:
 - SIA2, DataLink, SODA
- <https://astroquery.readthedocs.io/en/latest/casda/casda.html>

Download a fits image using astroquery.casda

This example script will download a continuum image of the NGC 7232 galaxy group produced from ASKAP scheduling block 2338, part of the WALLABY test observations. It demonstrates the use and features of the CASDA astroquery library.

```
In [ ]: from astropy import coordinates, units as u, wcs
        from astropy.utils.data import download_files_in_parallel
        from astroquery.casda import Casda
        import getpass
```

First we want to look up the sky location we are interested in. We use the inbuilt SkyCoord lookup to query the CDS name resolver for the sky position.

```
In [ ]: centre = coordinates.SkyCoord.from_name('NGC 7232')
        centre
```

Next we want to create an instance of the CASDA Astroquery object with our credentials. CASDA requires authentication to access any image products. CASDA uses OPAL credentials. Anyone can register for OPAL at <https://opal.atnf.csiro.au/>. The credentials will not be immediately checked, only held until they are needed.

```
In [ ]: username = 'james.dempsey@csiro.au'
        password = getpass.getpass(str("Enter your OPAL password: "))
        casda = Casda(username, password)
```

Now we will search for CASDA data products in our area of interest, around NGC 7232. As this uses CASDA's Simple Image Access Protocol (SIAP2) service, it will return all image, cube and spectral data products, but not measurement sets or catalogues.

Note that we do not need to be authenticated to query metadata, so we just use the class rather than the instance with our credentials, although that would also work.

```
In [ ]: result = Casda.query_region(centre, radius=30*u.arcmin, cache=False)
        result
```

The result is a table with all data products listed. However some of these data products may only be available to the project team as they have not been released yet, so we want to filter those out.



Data in CASDA

ASKAP BETA datasets

- PKS2252-089 HI absorption (Allison et al.)
- Tucana continuum image (Heywood et al.)

LEGACY HI datasets

- HIPASS (Parkes, Koribalski et al.)
- SGPS (ATCA + Parkes, McClure-Griffiths et al.)

AS034 ASKAP Early Science Continuum (EMU)

- NGC 7232 and surrounding area
- 10 EMU cosmology fields
- GAMA G23 (36 dishes)
- Derived data: combined mosaic GAMA G23

AS035 ASKAP Early Science Spectral Line (WALLABY)

- NGC 7232 HI Spectral Line Cubes (2 SBIDs)
- Derived data: - T. Reynolds et al., K. Lee-Waddell et al., For et al., Kleiner et al.

Pilot Surveys ...

- See next slide



Pilot Survey Status (Phase 1, early Sep 2020)

AS101 EMU: all 10
SBIDs deposited and
released

AS102 WALLABY:
Hydra Cluster data
released, other fields
pending processing

AS103 POSSUM: 10
SBIDs deposited,
pending validation
and release

AS104 DINGO:
pending processing

AS107 VAST: all SBIDs
deposited, pending
validation and
release

AS108 GASKAP: 8
SBIDs deposited,
pending validation
and release

AS109 FLASH:
pending processing

AS111 Gravitational
Wave Followup: 7
SBIDs deposited, 5
released



Publishing and Acknowledgements

- CASDA (released) data is available to all astronomers.
- Please follow guidelines at:
<https://www.atnf.csiro.au/research/publications/Acknowledgements.html>
- Publications using data accessed through CASDA should include:
"This paper includes archived data obtained through the CSIRO ASKAP Science Data Archive, CASDA (<http://data.csiro.au>)."
- Individual SSTs have their own data and publication policies.
- Also please include DOIs to the dataset you use in your papers.



Thank you

CSIRO Astronomy and Space Science

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