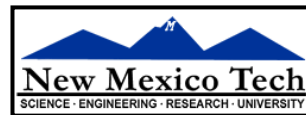


Introduction to CASA, Calibration & Basic Imaging



Seventeenth Synthesis Imaging Workshop
29 June – July 17 2020



Introduction to CASA, Calibration & Basic Imaging



ALMA Data Reduction Tutorial
Synthesis Imaging Summer School

Atacama Large Millimeter/submillimeter Array
Expanded Very Large Array
Robert C. Byrd Green Bank Telescope
Very Long Baseline Array



Tutorial download link – for people using their own computers

The data for this tutorial can be downloaded from this link:

https://bulk.cv.nrao.edu/almadata/public/ALMA_tutorial/Download_files/SDP81/

The presentation (**ALMA-Basic-Tutorial_SISS-2020.pdf**) is available at the link

Download all the files to a directory named **SDP81**

Untar the files using the following command (change file name as needed):

```
tar xvzf SDP81_B4_uncalibrated.ms.split.tgz
```



Tutorial data repository – for people using NRAO resources

Follow instructions to login to the NRAO cluster node on your computer, following instructions sent to you.

The data for this tutorial are in the SDP81 directory

```
> cd /lustre/aoc/siw/nrao/data/ALMA/SDP81
```

This presentation is ALMA-Basic-Tutorial_SISS-2020.pdf

```
> evince ALMA-Basic-Tutorial_SISS-2020.pdf
```

Copy all files from the SDP81 directory to your data directory

```
> cp -r * /lustre/aoc/observers/nm-****/data/.
```

```
➤ mkdir SDP81
```

Untar the files using the following command (change file name as needed):

```
tar xvzf SDP81_B4_uncalibrated.ms.split.tgz
```



How to set up your Directory

In your SDP8I directory create two sub-directories labeled /Calibration and /Imaging and move the files you downloaded (or copied) as follows:

In /Calibration you should have:

- SDP8I_B4_uncalibrated.ms.split (the data file containing uncalibrated data with minor initial processing applied)
- data_prep.py (script detailing the initial processing that has already been applied)
- calibration.py (the script we will work through together to calibrate the data)

In /Imaging you should have:

- SD.P8I_Band4_continuum.ms (fully calibrated continuum measurement set ready for imaging)
- SDP.8I_Band4.ms (fully calibrated measurement set containing both continuum and line emission ready for imaging)
- SDP.8I_Band4_COline.ms.contsub (fully calibrated line-only measurement set)
- imaging.py (the script we will work through together to image the data)
- combination.py (a script detailing the steps taken to create the measurement sets ready for imaging: this is just for reference **we won't be using it!**)



CASA version – 5.6.1-8

The **CASA** version used for this tutorial can be downloaded from this link:

https://casa.nrao.edu/casa_obtaining.shtml

Also download the **Analysis Utilities** package and edit **CASA** initialization file following instructions here:

https://casaguides.nrao.edu/index.php/Analysis_Utilities

For participants using **NRAO** resources:

Default casa version on **NM** cluster is casa 5.6.1-8.e17

Copy `analysis_scripts.tar` from

`/lustre/aoc/siw/nrao/data/ALMA/` to your home directory, untar and edit casa initialization file as described in link above



Tutorial Startup

NM-lustre users: Login using login on your computer

```
> cd /lustre/aoc/observers/nm-****/data
```

Everyone:

```
> cd /SDP81
```

```
> cd Calibration
```

CASA Startup

\$ `casa` (or `casa -r version`, e.g. `casa -r 5.6.1-8.e17` if you have multiple casa versions installed)

```
nmpost029 - Konsole
File Edit View Bookmarks Settings Help
Current version is 5.6.1-8.e17
nmpost029$ casa -r 5.6.1-8.e17
=====
The start-up time of CASA may vary
depending on whether the shared libraries
are cached or not.
=====
IPython 5.1.0 -- An enhanced Interactive Python.
PIPELINE CASA 5.6.1-8 -- Common Astronomy Software Applications
Found an existing telemetry logfile: /lustre/aoc/observers/nm-4372/.casa/casastats-561-
8-2c02c472503d645e-20200521-153416-PIPELINE.log
Telemetry initialized. Telemetry will send anonymized usage statistics to NRAO.
You can disable telemetry by adding the following line to your ~/.casarc file:
EnableTelemetry: False
casaVersion = 5.6.1-8
imported casatasks and tools using taskinit *
--> CrashReporter initialized.
Enter doc('start') for help getting started with CASA...
Using matplotlib backend: TkAgg
CASA <1>: []
```

Log Messages (nmpost029:/lustre/aoc/observers/nm-4372/data/ALMA_tutorial/SDP81/Imaging/casa-20200522-180307.log) <@...>

Time	Priority	Origin	Message
2020-05-22 18:03:11	INFO	::casa	
2020-05-22 18:03:11	INFO	::casa	Checking telemetry submission interval
2020-05-22 18:03:11	INFO	::casa	Telemetry submit interval not reached. Not submitting data.
2020-05-22 18:03:11	INFO	::casa	Next telemetry data submission in: 5 days, 21:31:04.965163
2020-05-22 18:03:11	INFO	::casa	CASA Version PIPELINE 5.6.1-8



An Overview of your Directory

To begin, if you haven't already done so ... start casa:

```
casa
```

Note that you can run system commands from within casa via:

```
os.system("ls")
```

```
!ls
```

The dataset we will be working with is large, so there is likely not enough memory to save the data at various steps throughout the reduction process. Should your dataset get corrupted, you can grab a new copy from the main repository to start fresh either at the start of calibration.py or at the start of the imaging.py:

```
os.system("rm -rf SDP81_B4_uncalibrated.ms.split")
```

```
os.system("tar xvf /lustre/aoc/siw/nrao/ALMA/SDP81/  
SDP81_B4_uncalibrated.ms.split.tgz")
```

