Introduction to CASA, Calibration & Basic Imaging

Nineteenth Synthesis Imaging Workshop

13 June – June 21, 2023

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/SIS2023/ALMA_Manual_Tutorial/

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

How to set up your Directory

In your SDP81 directory create two sub-directories labeled /Calibration and /Imaging and move the files you downloaded (or copied) as follows:

In **/Calibration** you should have:
- **SDP81_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:
- **SDP.81_Band4_continuum.ms** (fully calibrated continuum measurement set ready for imaging)
- **SDP.81_Band4.ms** (fully calibrated measurement set containing both continuum and line emission ready for imaging)
- **SDP.81_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 – 6.4.1.12

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 :

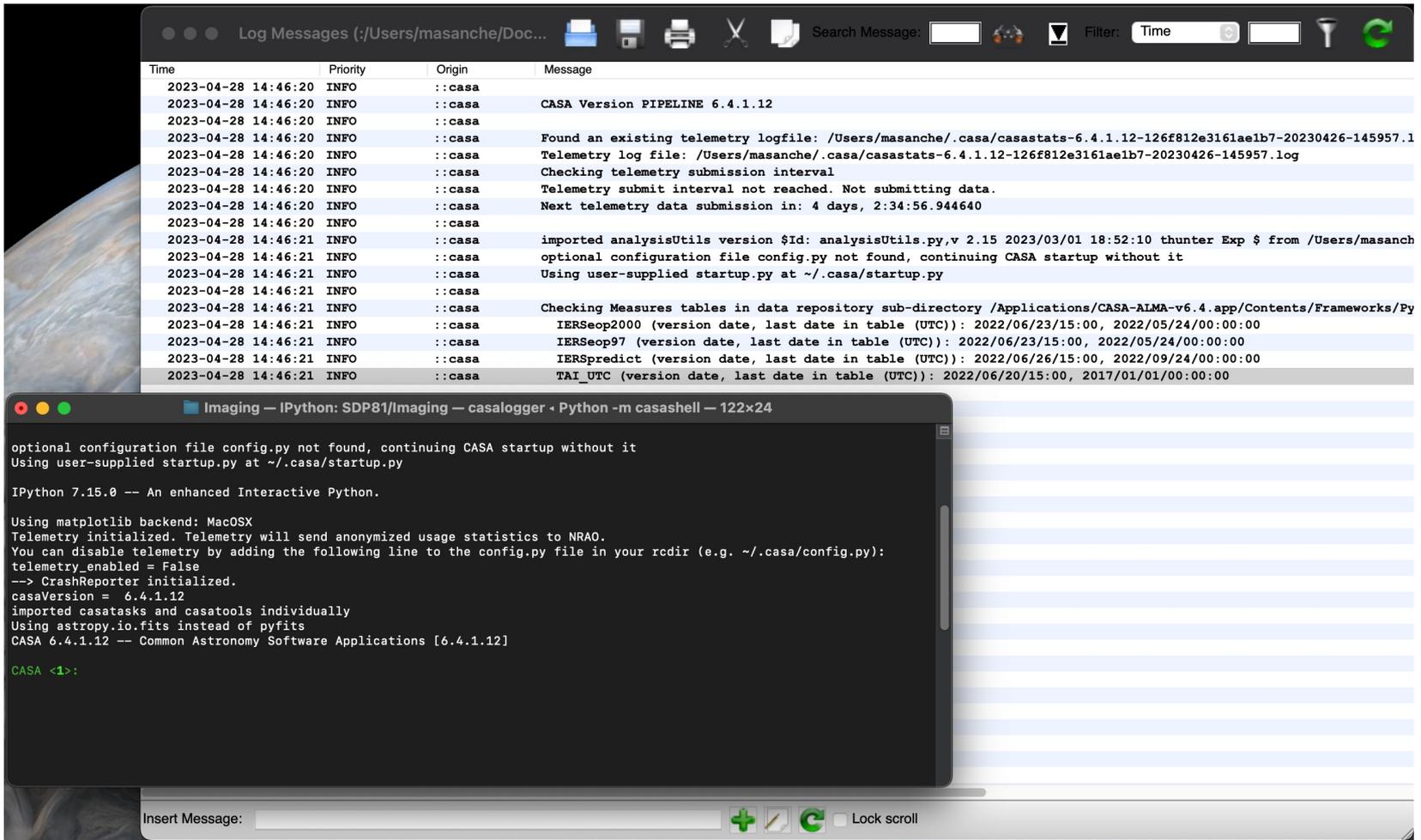https://casaguides.nrao.edu/index.php/Analysis_Utilities

Tutorial Startup

Everyone:

```
> cd /SDP81
> cd Calibration
```

CASA Startup

$ **casa (or casa -r version, e.g. casa -r 6.4.1 if you have multiple casa versions installed)**

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 untar **SDP81_B4_uncalibrated.ms.split.tgz**.