Tutorial 1

What/Why CASA
Importing data in CASA
Finding out what the data file has
Exploring the data
Data selection syntax

What/Why CASA

- Common Astronomical Software Applications (CASA)
- Developed by

National Radio Astronomical Observatory (NRAO, US) (lead)

European Southern Observatory (ESO)

National Astronomical Observatory of Japan (NAOJ)

CSIRO-Australia Telescope National Facility (CSIRO-ATNF)

Netherlands Institute for Radio Astronomy (ASTRON)

CASA... for the future

- Official package for
  - Jansky Very Large Array (J-VLA)
  - Atacama Large Millimeter/submillimeter Array (ALMA)
- Actively being developed to meet the needs of the new-generation radio telescopes
  - Big increase in the raw sensitivity of the instruments, need improved algorithms for calibration and imaging in order to benefit from it.
  - Will meet the needs of Upgraded GMRT
  - Actively under development: Stability, changes, bugs, surprises, smaller user base, ...

CASA: Some Truths

Actively under development:

- Stability issues
- changes
- bugs
- surprises
- smaller user base, ...

But there is help available:

- (Steadily improving) Documentation
- Make an account an NRAO and use the HelpDesk
- Improved stability and a growing user community

Importing data in to CASA

- Importing GMRT data into CASA
  Flexible Image Transport System (FITS)
  UVFITS (understood by AIPS, MIRIAD)

- ***importuvfits***
  input – UVFITS data file
  output – Measurement Set (MS)
  understood by CASA

What does my data file have?

- ***Listobs***
  - Which sources, how many scans
  - Observing frequency, time and duration
  - Frequency and time resolution
  - Array coordinates

Examining/exploring the data

plotuv -useful for plotting u-v coverage

plotxy – line plots, fairly general, useful for scripting

plotms – interactive general purpose and versatile, cannot be scripted yet (4.1.0)

viewer (casaviewer) – gray scale/waterfall plots

Examining/exploring the data

U-v coverage

Azimuth vs Elevation

Time series (time vs amp, phase)

Bandshape (freq. vs amp, phase)

Hunt for bad antennas, scans, frequency channels, baselines (per polarisation)

We'll learn to 'flag' them tomorrow

Data selection syntax

Range: X~Y

Time: YYYY/MM/DD/HH:MM:SS

Time range: Time1~Time2

Antenna: 1~3 = 1,2,3

11,12,15

Baseline: ANT1 (OPERATOR) ANT2

& - only cross-correlations

&& - both auto and cross corr.

&&& - only auto corr.

Data selection syntax

Specification	Meaning
`ANT`	Select only cross-correlation baselines between all the antennas in `ANT` and *all* other available antennas
`ANT&`	Select only cross-correlation baselines between antennas in `ANT` only
`ANT1 & ANT2`	Select only cross-correlation baselines between antennas in `ANT1` and `ANT2`
`ANT&&`	Select cross- *and* auto-correlation baselines between all the antennas in `ANT` only
`ANT&&*`	Select cross- *and* auto-correlation baselines between all the antennas in `ANT` and *all* other available antennas
`ANT1 && ANT2`	Select cross- *and* auto-correlation baselines between antennas in `ANT1` and `ANT2`
`ANT&&&`	Select *only* auto-correlation baselines for antennas in `ANT`
`!ANT`	Excludes all baselines involving antennas in `ANT`. `ANT` can be any of the above expressions
`ANT1 ; !ANT2`	`ANT1` and `ANT2` can be any of the above expressions. This selects only cross-correlation baselines between all the antennas in `ANT1` and *all* other available antennas **except** those involving antennas in `ANT2`.

http://www.aoc.nrao.edu/~sbhatnag/misc/msselection/msselection.html msselection.pdf