

Tutorial 3

Calibration

Structure of a MS

Amplitude Calibration

Phase Calibration

A look at the calibrated data

General Advice

Read the help corresponding to a given task carefully, at least once.

Read the text which appears in the 'logger' when you run the text.

A CASA trick

tget <taskname> - will fill in the
<keyword>=<value> pairs from the last
execution of this task

Flagging

3C223.1_240MHz.MS

- Spw='0:0~22'
- Spw='0:44~63'
- Antenna='1'; timerange='22:37:48~25:10:08'
- Antenna='3'; timerange='23:40:33~25:14:53'

Objective of Calibration

- $V_{ij}(\text{obs}) = G_i G_j^* V_{ij}(\text{true})$
 - V_{ij} – visibilities (cross-correlations)
 - G_i, G_j – Antenna gains (complex nos)
- Operationally done via χ^2 minimisation

$$V_{ij}(\text{predicted}) = \mathbf{G}_i \mathbf{G}_j^* V_{ij}(\text{model})$$

$$\chi^2 = \sum_{ij} (V_{ij}(\text{obs}) - V_{ij}(\text{predicted}))^2$$

- Degrees of freedom \mathbf{G}_i , \mathbf{G}_j and $V_{ij}(\text{model})$
- Constraints - $V_{ij}(\text{obs})$
- Approach
 - Minimise degrees of freedom
 - N complex \mathbf{G}_i s (cannot be reduced)
 - Simplest possible $V_{ij}(\text{model})$ –
Point sources

Structure of a MS

- THREE data columns
 - Observed data $V_{ij}(\text{obs})$
 - Corrected data $\mathbf{G}_i^{-1} \mathbf{G}_j^{-1*} V_{ij}(\text{obs})$
 - Model data $V_{ij}(\text{model})$

Establishing a Flux Scale

Approach – observe a source of known strength,

Primary Flux calibrators - 3C48, 3C286, 3C147

setjy

(Flux of 3C286)

***3C286 [I=20.692, Q=0, U=0, V=0] Jy, (Perley-
Butler 2010)***

Calibration

G_i 's are a function of both frequency and time

Key Assumption - Calibration can be separated into frequency and time dependent parts.

Bandpass calibration – Calibration of the frequency dependent part of G_i 's

Approach – use a strong source with no spectral lines in the band of interest.

bandpass - 3C286

Calibration ...

Gain calibration – Calibration of time dependent part of G_i 's.

Approach – Use a strong source known to be non-variable over the time scale of observations

***gaincal* – 3C286**