Practical: Make a VLA interferometric image : Submissions Checklist

Part 1 - Data inspection

1. Here, submit following :

For question 10: (6 points 2 for each sub question)

a. What are the sources that have been observed? Find out which one of them are the calibrators?

b. How many antennas have been used in the observation? What were their dimensions?

c. What was the total observation duration? How many sky fields have been observed? How many different sources were present and why the two numbers don't coincide in your opinion?

For question 12 (3 points , 2 for sub-question 1 , 1 for sub-question 2) :

a. Plotants generated plot
b. Name of the centre antenna

For question 14 (12 points 2 for each plot) :
1) Amp vs. time, 2) Phase vs. time, 3) Frequency vs. time, 4) Amplitude vs. UVdist, 5)Amplitude vs. UVdist setting the item 'field' in the header 'data' to a value of 3,
6) Amplitude vs. UVwave.

For question 15 (2 points) : Submit, Amp. vs. time plot plotted above with color coded visibilities plot as shown in lecture.

For question 16 (1 points) : Give resolution for EVLA.

For question 17 (2 points): Reason for difference in images 4 and 5 from question 14?

For question 18 (2 points): What do you think is plot number 6 plotting?

For question 19 (2 points): plot signal measured by the first antenna of each baseline

30 points for this section

Part 2 - Flagging

For question 1-5 (1 point): The command used in CASA

For question 6 (2 points): At the end of the flagging operation, plot the amplitude detected from each antenna.

For question 7 (1 point) : Compare the plot from above question to the amplitude vs. time plot obtained before flagging. What difference do you see?

5 points

Part 3 - Imaging

Question 3 (3 points): What do you observe, the image after flagging?

4 points

Practical 2: Make a VLA interferometric image

Part 4 - calibration

a. **Antenna Position**

Question 1 (4 points): State why and how do you think errors in antenna position can introduce an error in imaging? If the change in each position $(\Delta x_i = 0.1\ m\ ,\ \Delta y_i = 0.1\ m)$, give new sky brightness image for the or the Westerbork Telescope simulation . Compare this image with earlier.

Question 3 (3 points): One line summary for what each of the options given in command in question 2.

Question 4 (3 points, 1.5 each): find out a) what different fields stand for? b) minimal and maximal values for offsets?

10 points

b. **Flux Density calibration**

Question 2 (2 points): Refer to the listobs output in the last part 1, and here figure out the model that is used by comparing with the setjy outputs in the last step

Question 3 (2 points): Report the amplitude calibrator that was used.

Question 5 (3 points, 1 each sub-question):

a. flux density for channel 0 for every Stoke's parameter?

b. Which spectral window is used? maximum and minimum flux density scale ?

c. Find the phase offset of image w.r.t amplitude calibrator.

7 points

c. Phase Calibration

Question 1 (2 points) : List what conditions for a good phase calibrator source.

Question 2 (3 points, 0.5 for each option): One line summary for what each of the options given in command in question 2.

Question 3 (1 point): What is the flagging SNR.

Question 4 (8 points): Plot the gain phases in R polarization for at least 4 antennae .

Question 5 (2 points) : Report antennae for which in phase gains you see sudden jumps.

Question 8 (8 points) : Plot the gain phases in L polarization for at least 4 antennae .

24 points

d. Delay Calibration

Question 2 (2 points): Plot for the time delays for each antenna.

2 points

e.Bandpass Calibration

Question 1 (2 points): Find out if a synthesized beam size is given what will be the positional uncertainty for spectral feature?

Question 3 (8 points, 2 for each plot): Plot the gain phases in R polarization for all antennae . Now using plotcal we can plot four plots:

a. Ampl - R polarization, L polarization
b. Phase - R polarization , L polarization

10 points

f. Gain Calibration

Report the phase calibrator being used by you.

Question 4 (8 points, 2 for each plot): Plot the phase and amplitude gain solutions for each of the L and R polarizations.

8 points

g. Scaling the amplitude gains

Question 3 (2 points): What flux density scale do you obtain for secondary calibrator? Signal to noise ratio (SNR) printed for given calibrator field?

Question 4 (2 points): Use VLA calibrator manual and report if flux density you obtained for the secondary calibrators look fine.

Question 5 (4 points, 2 each): Plot the rescaled amplitudes for R and L polarizations.

8 points

Applying Calibrations

Question 3 (8 points): ***Now,*** that the visibilities are well calibrated. Make standard plots again with plotcal:

a. field 0 - corrected phase and amplitudes.
b. field 1 - corrected phase and amplitudes.

Question 4 (3 points): Plot amplitude vs. phase, centered around zero phase for field/ amplitude calibrator.

11 points

Part -5 - IMAGING Post-Calibration

Question 3 (5 points): To see this image do :

viewer('O/P_image_name.image')

What do you observe now compare it with pre calibration image list changes?

5 points

Total number of points for both the practicals combined are 124.

Each point in these two practicals corresponds to 0.12% towards the grade.