Paper I: Dish Array Performance

(Reza's notes from 11 June '19, updated)

Goals

Show effectiveness of the current instrument and observation strategy (transit mode) in terms of calibration and noise level.

This would be a paper mostly based on data analysis.

Combine observations at different latitudes:

- Regular 24 hr observations at lower declinations (how much of this data do we have?)
    - decs of bright sources (CygA, CasA …)
    - other decs (~ 80 deg)
    - ask Jixia for more/different observations in 700-800 MHz band?
- Regular 24 hour observations at NCP

Content/tasks

- Observations and data sets - wiki page listing data files and overview of contents - Trevor
- Determine the set of usable pairs/baselines
- Determine fraction of usable data (frequency band, time, RFI cleaning)
- Instrument status : summary feed performance (noise/gain) - frequency response …
- Calibration strategy : noise source + sky sources
    - Check phases with less bright sources at different ra, same dec
    - Extract calibration parameters - check stability
- Noise level - stability/ comparison to expectations. Auto- & cross-correlation - Anh
- Integrate few nights (5-10 nights) , combine nights and pairs with same baseline and check that the increase in sensitivity with integration time (auto- & cross-correlation) - Santanu
- Observe sources at dec ~ 79, 80 deg declination
- Determine phases - check stability and compare phases with lower declinations
- Observe at higher latitudes (~ 85-86, 90 deg) - integrate, combine fringes from several nights and check that the faint sources are seen
- We have to decide then if we can use a longer integration (~ month) at 90 deg, or should be cover a slightly larger area (radius 5-15 degrees)
- If possible : Tianlai maps around the bright sources

Paper-II : The Tianlai North Celestial Cap Survey

(Reza's notes from 11 June '19, updated)

Goals

A simulation-based forecast paper. Perform a realistic simulation of Tianlai reconstructed maps from Tianlai Polar Cap observations.

Content/tasks

- Introduction : TNCCS as a 21cm Intensity Mapping testbed
- Presentation of the survey with the two? three? redshift ranges and expected results
- At low redshift $0<z<0.1$: detection of HI clumps, and cross correlation with NCC
- Presentation of the NCC photometric catalog
- Simulation of TNCCS with NCC sources : evaluate the cross-correlation signal level
    - Assign redshifts (photo-z) to NCC sources
    - Assign HI mass to galaxies
    - Determine HI contribution from not-optically detected galaxies
    - Maybe Paco can help with this?
- Check if we gain something from covering two 100 MHz bands from 1430 … 1230 MHz , instead of a single 100 MHz band
- The high redshift band : $0.75 < z < 1$: Is it possible to detect the 21cm autocorrelation signal using the high k// modes ?
- Determine the baseline foreground maps (GSM or Haslam or Planck) + radio source catalogue + spectral indices
- Determine calibration strategy and estimate uncertainties
- Compute simulated visibilities, calibration + map making
- We need to carry simulations creating visibility time streams for the polar cap type observations to assess the expected noise level and if there is a possibility to detect the signal.
- Conclusion: show that the TNCCS could pave be a step along the path to show that 21cm Intensity Mapping could be a cosmological probe