

# Tianlai and Paon4

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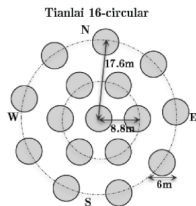
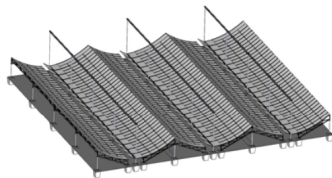
Université Paris-Saclay,  
Orsay, France



21cm group - Orsay - June 25th, 2018

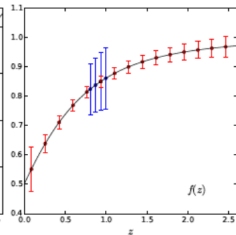
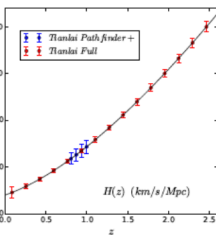
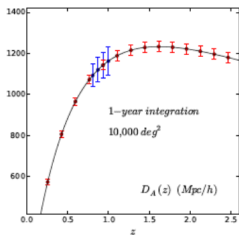
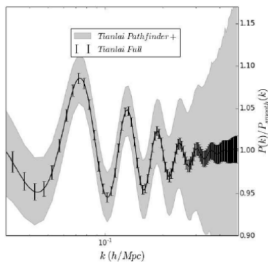
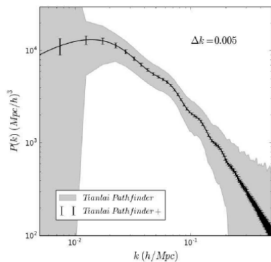
# Tianlai

- A small pathfinder experiment to check the basic principles and designs, find out potential problems
- 3x15x40m cylinders, 96 dual polarization receiver units
- 16 x 6m dishes
- observe 700-800MHz, can be tuned in 600-1420MHz
- If successful: expand to full scale 120mx120m, 2500 units



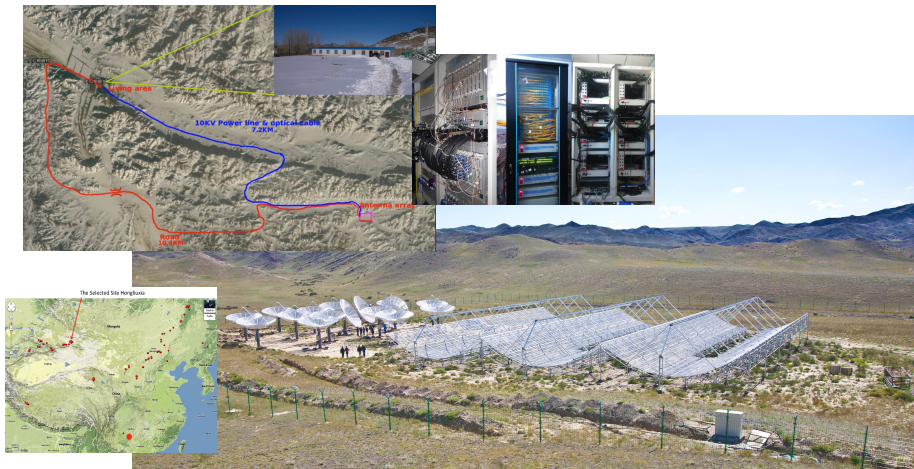
(X. Chen slides @Aspen 02/2018)

# Forecasted sensitivity



Xu et al arXiv :1410.7794

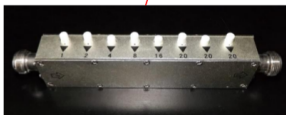
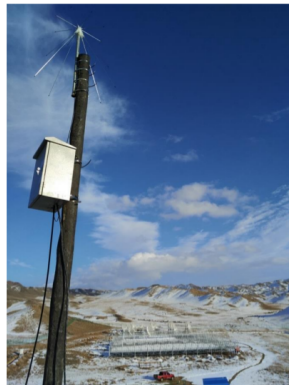
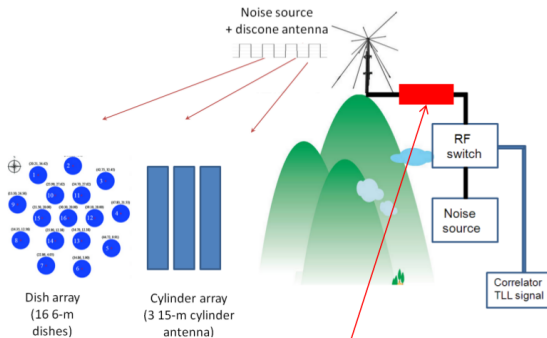
# Tianlai on site



Observations started in fall 2016



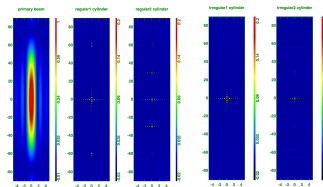
# Calibration source



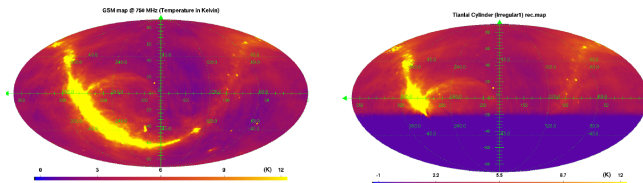
Adjustable Attenuator

# Sky reconstruction (cylinder array)

- synthetic beam & array design (sensor positions)



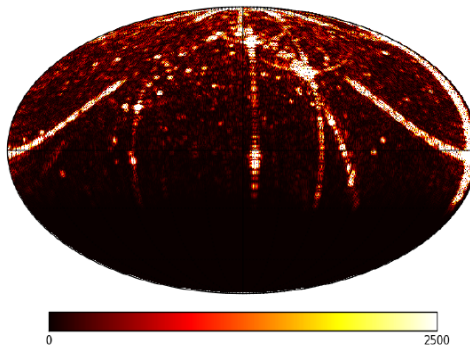
- sky reconstruction using spherical harmonics



Jiao Zhang et al arXiv :1606.03830

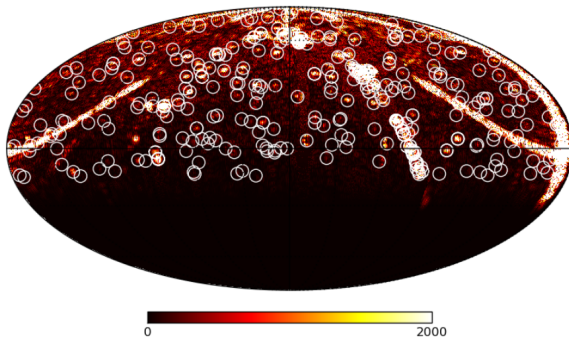
# Preliminary sky maps

(data from sept. 2016)



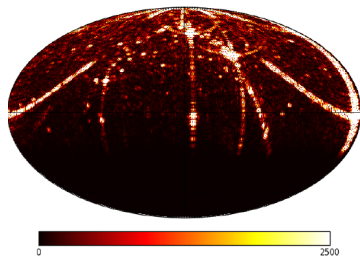
# Preliminary sky maps

(data from sept. 2016)

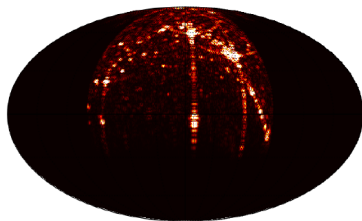


# Preliminary sky maps

(data from sept. 2016)



All Day

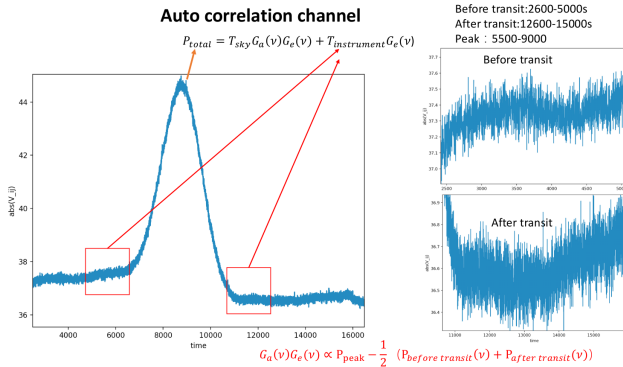


Night Only

Large effect from the Sun during daytime

# Calibration of dish array data

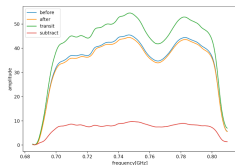
disentangling various components of the frequency response of each channel using transits



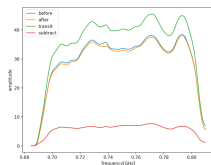
Fengquan Wu

# Calibration of dish array data(2)

disentangling various components of the frequency response of each channel

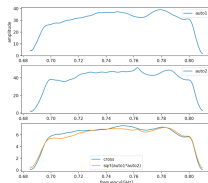


Auto23-23

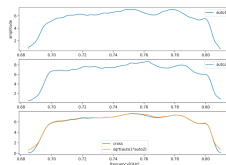


Auto29-29

Cross-correlation channel 2-22



No subtraction on auto channels

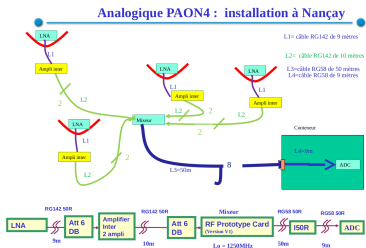


Do subtraction on auto channels

# PAON4

## Characteristics :

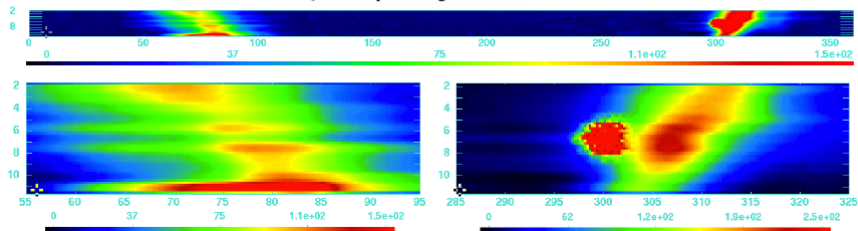
- 4 antennas ( $\sim 3$  deg beams) in Nancay ( $\sim 200$  km south of Paris)
- 2 polar./antenna
- Frequency band 1250 - 1500 MHz ( $\sim 1275 - 1480$  MHz )
- $\pm 20$  degrees from zeith
- transit observations ;  
 $\sim 24$ h scans since 2015
- test bench for electronics, daq and on-line computing analysis





# early maps with PAON4

Quick map making in 1420MHz



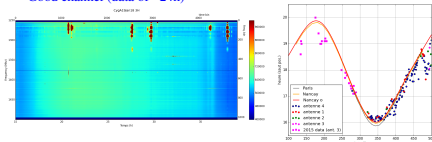
Jiao Zhang PhD

several improvements in hardware since then ...

# Recent activities & prospects on PAON4

- improve daq software, electronic
- a long investigation to understand a perturbation
  - ▶ looks like an increase of noise
  - ▶ on one antenna at a time, ~ every day
  - ▶ but only between sunsets and sunrises
  - ▶ ... due to a small bird (!)
- phase shifts in the electronics/cables
- test IDROGEN board (D. Charlet, LAL)

Good channel (data of ~24h)



Perturbed channel

