l'Observatoire de Paris | LESIA

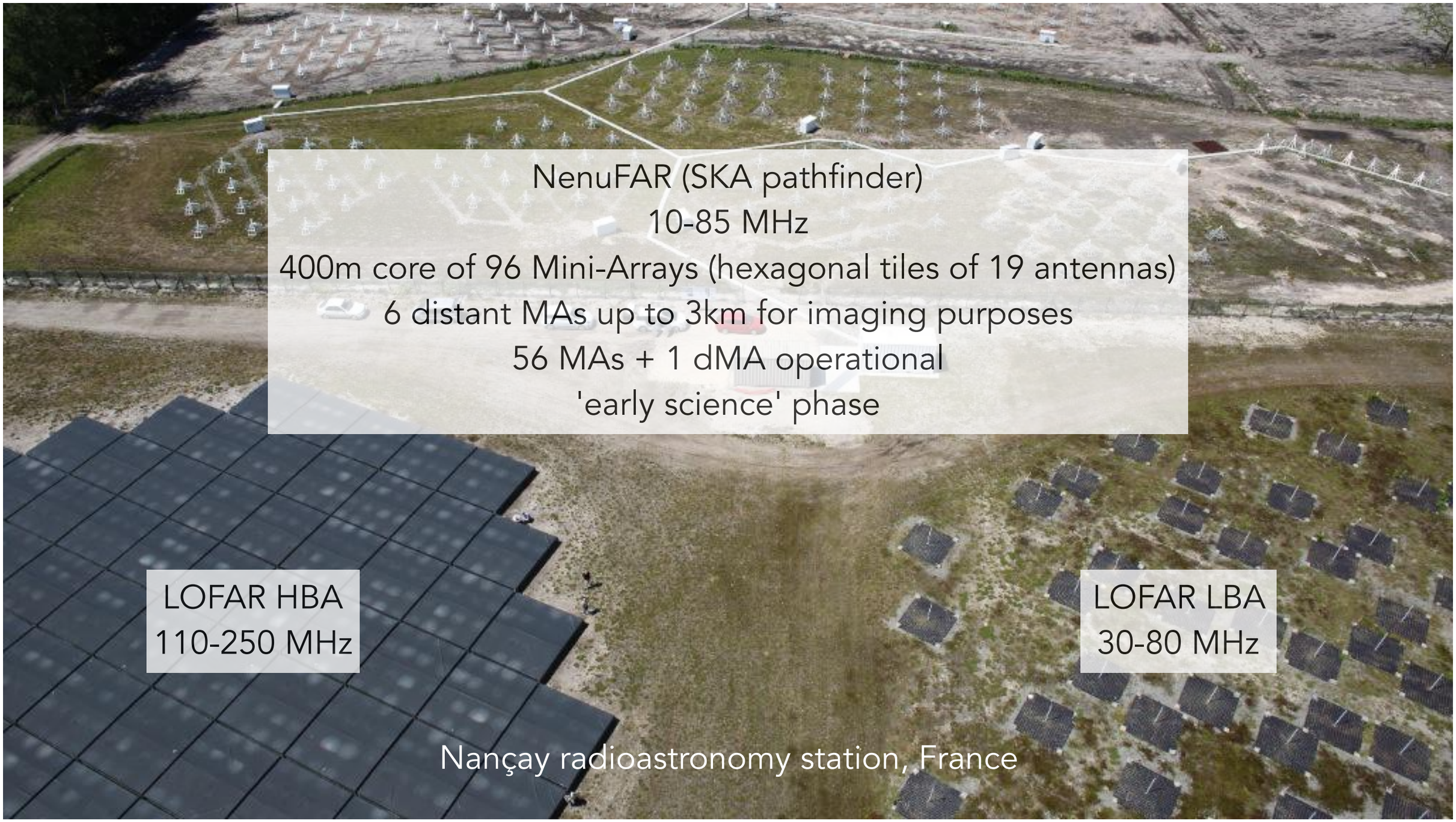
Laboratoire d'Études Spatiales et d'Instrumentation en Astrophysique

NenuFAR Provenance Use Case

Alan Loh, Baptiste Cecconi & the NenuFAR team

07-08 September 2020, Provenance Workshop

NenuFAR low-frequency telescope



NenuFAR: a multi-purpose instrument

Statistical Data (195.3125 kHz, 1s)

Spectral STatistics (SST) ; Beamlet Statistics (BST) ; Cross-correlation STatistics (XST)

Standalone Beamformer

UnDySPuTeD Backend

768 independent beamlets (dir / freq)

Pulsar Mode (coherent dedispersion and folding)

Dynspec Mode

Res.: 3kHz, 1ms

150 MHz bandwidth

Standalone Imager

NICKEL Correlator

Distant Mini-Arrays

23arcmin (@15 MHz)

4arcmin (@85 MHz)

FoV: 46°-8°

Res.: 3kHz, 1s

384 subbands, 64 channels

75MHz bandwidth

Available since July 2020

Transient Buffer (TBB)

Response to external trigger

Last 5 sec of waveform data from each MA (2 polars)

Res.: 5ns

LOFAR Super Station

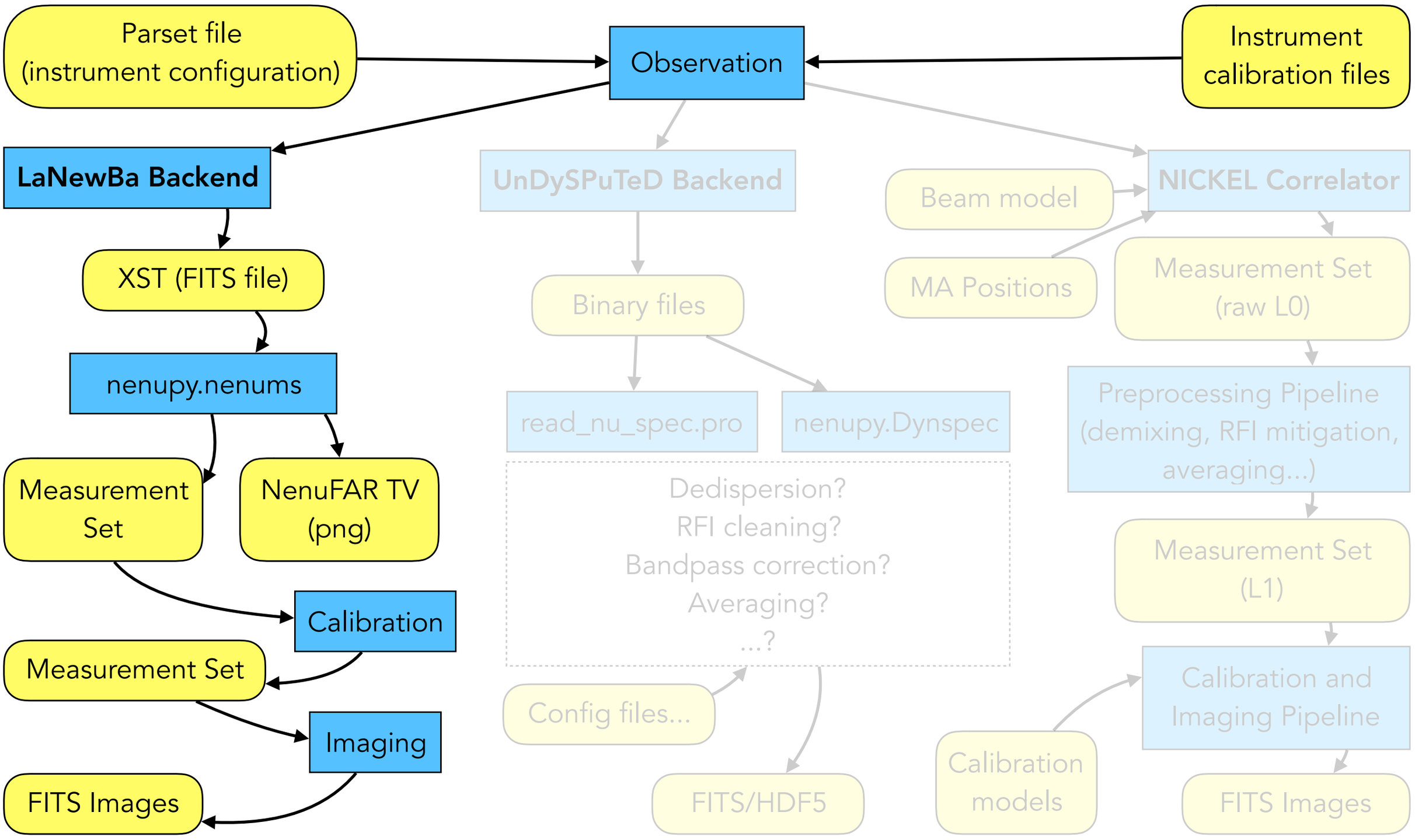
NenuFAR replaces FR606 LBA station (through LBL inputs)

Visibilities produced by the LOFAR correlator

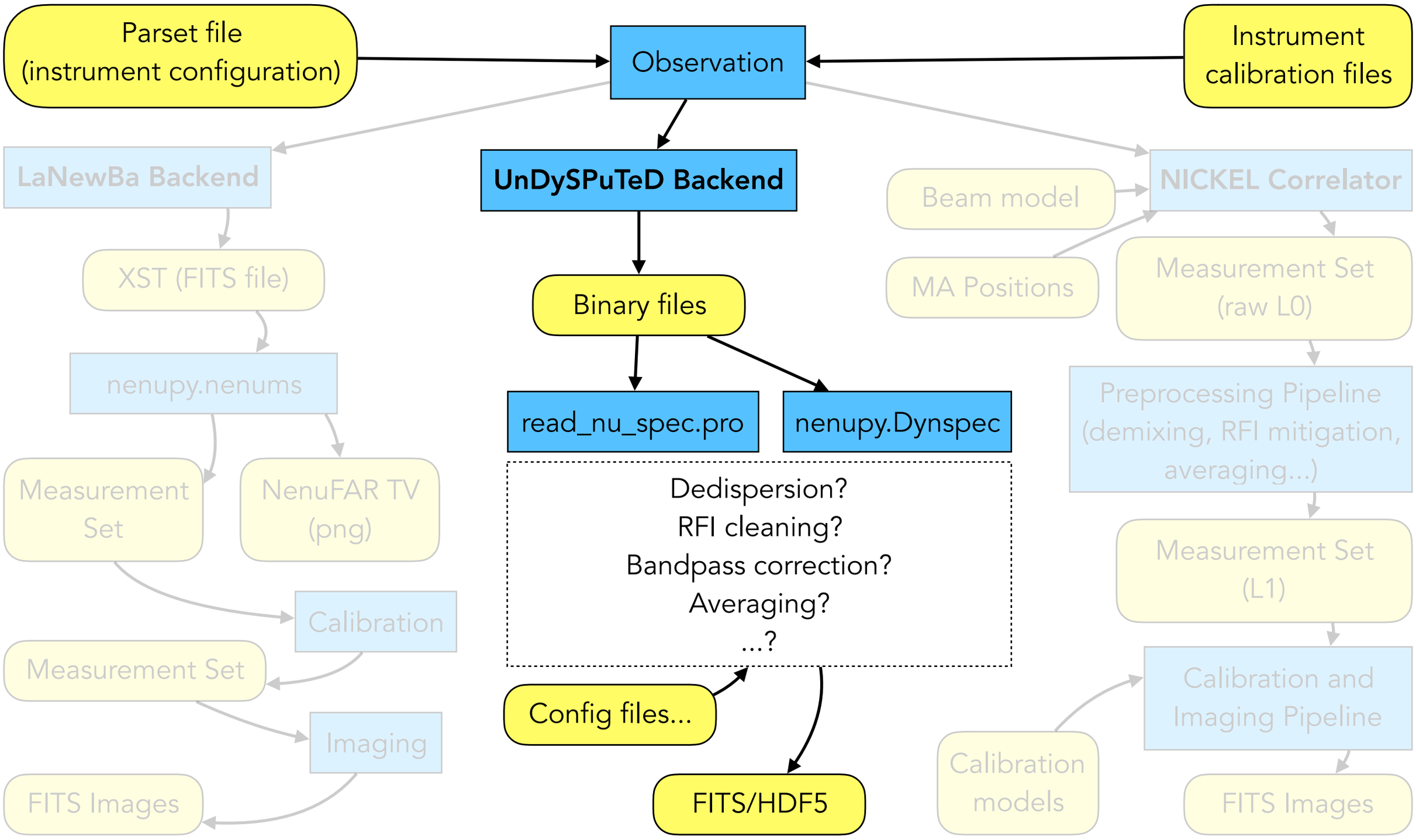
Increase long-baseline sensitivity

To be available

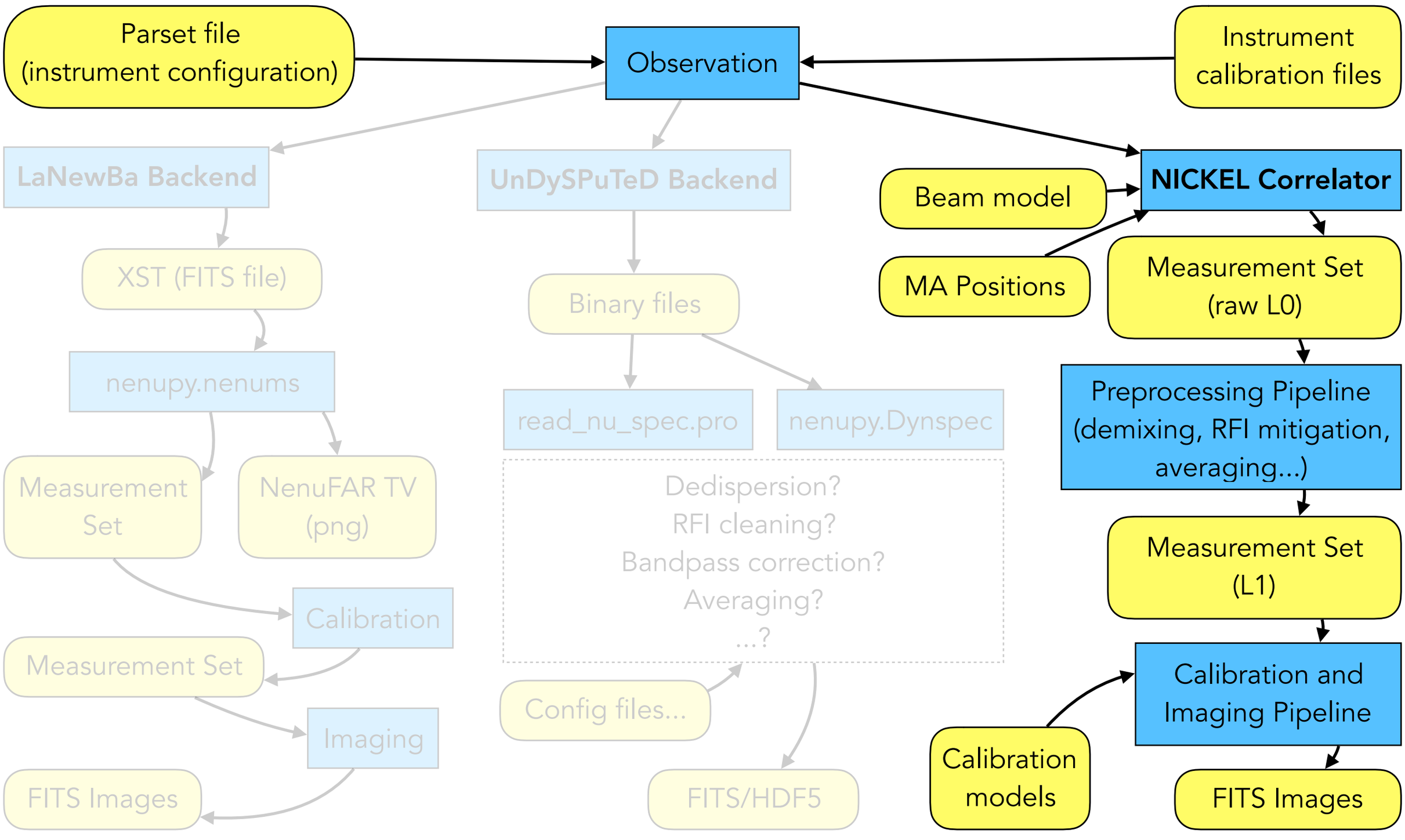
Simplified NenuFAR Data Processing



Simplified NenuFAR Data Processing



Simplified NenuFAR Data Processing



Need for provenance information

- Several operating modes:
  - Beamformer (FITS end-products):
    - Pulsar data (processed through the pulsar pipeline)
    - Dynspec data (2 data reduction softwares: IDL & Python)
  - Imager
    - Measurement Sets (has a HISTORY table, but only stores operations done on the MS, not well structured and detailed: copies of command lines)
      - Data processing towards images involves many steps, that can be fine-tuned
  - TBB
  - LOFAR Super Station: data will be processed by LOFAR
- Huge data volume: data will be delivered '(basic-)science ready'
- Many configuration/calibration files involved
- Many softwares (mainly IDL and/or Python) maintained by different developers
- 17 Key Science Programs: as many observation configurations and data processing strategies!