



PAON project

J.E Campagne

LAL

17/5/2012

Organisation

- **Scientific Concil:** R.Ansari (LAL), Ch. Magneville (CEA/Irfu), J.M.Martin (Obs. Paris/Meudon)
+ 6 other members
- **2 co-PI:** J.E Campagne (LAL) & J.M.M
- **2 Project Ingeeniers:**
 - D. Charlet** (LAL): Electronics & software
 - F. Rigaud** (Obs. Paris/Meudon): Mechanics & Nancy implantation

Why Nançay (reminder)

- **150 ha** of free field dedicated since the 50' to radioastronomy
- **Close to Orsay** ~ 2h drive dist.
- **Existing local infrastructure**
- **Protected bandwidth** [1400-1427]Mhz
- **Since 2008:** BAORadio electronics at the focal plane of the NRT with 2 programs:
 - Focal Array @ Nançay (FAN)
 - HI-Cluster @ Nançay

Budget from recent Scientific Committee @ Obs. Paris & LAL

- **LAL: 23k€**
 - Dishes, mounts, System control, DAQ PCs, cables
- **Obs. Paris/Meudon: 13k€**
 - Feed, dish-feed adaptation & Nançay infra.
- **CEA/Irfu: few k€**
 - LNA

~40k€

PAON phases

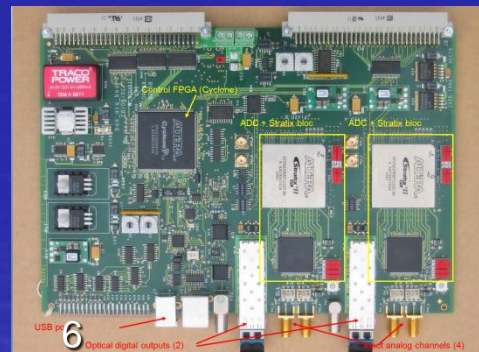
- PAON-2 (2012): validation phase
 - 2 Dishes \varnothing 3m (RF Hamdesign)
 - Elevation only manual
 - Dedicated feed 1250-1500 MHz with LNA homemade
 - Existing BAORadio electronics: 2 polarizations/dish
- PAON-4 (2013): observation phase
 - 4 dishes in remote control



Goals: Beam, Noise, Cross-talk,
Transit observation of fringes

BAOradio existing chain (32 channels)

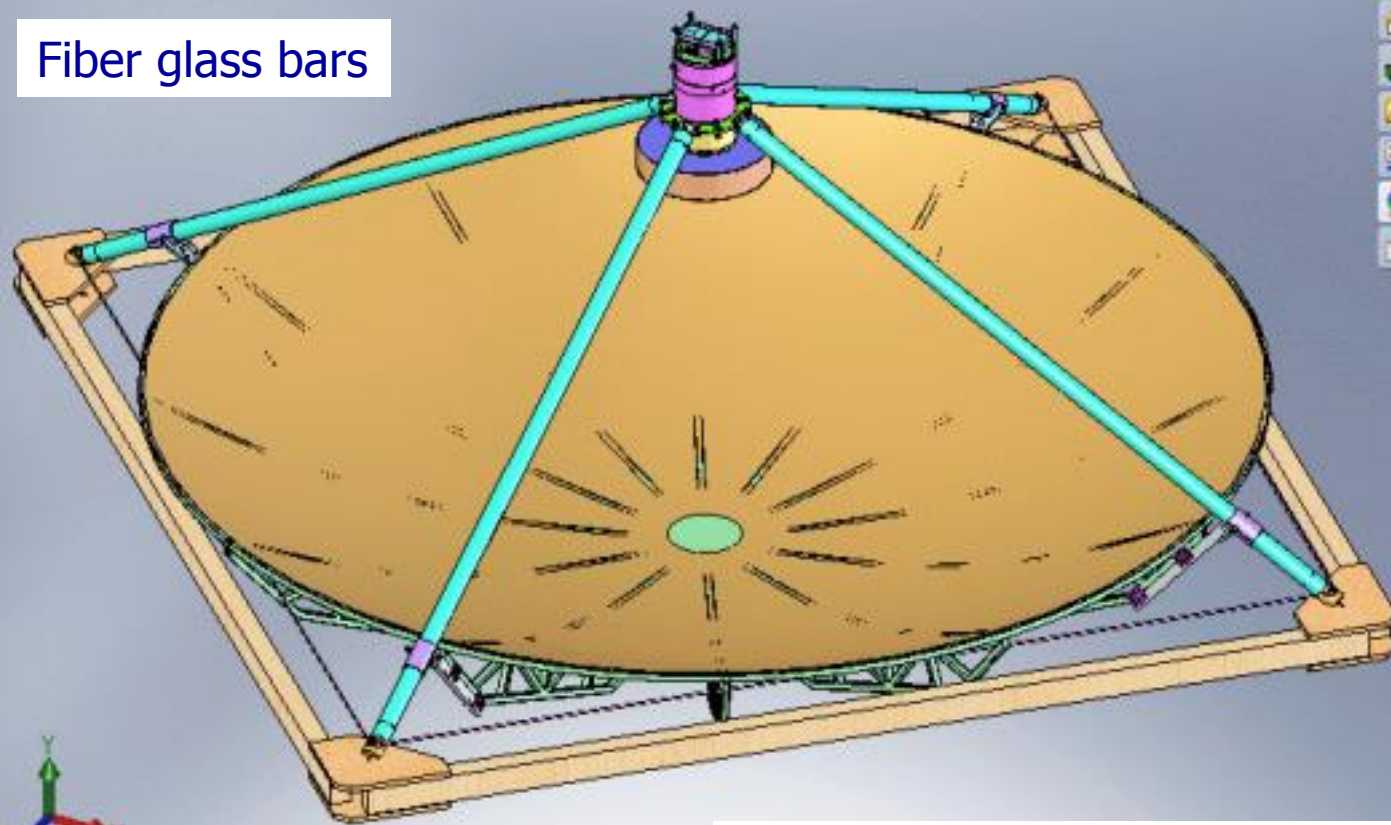
- **AEM** : Analog Electronic Module (Amplification, filtering, frequency shifter)
- **DCLK** : Clock and trigger distribution system
- **DFS** : Digitizer Frequency Separator (ADC-Board)
4 channel, 500 MHz sampling, with on the fly FFT capability, dual high speed optical data transfer
- **PDR** : PCI-Express data reception module



Some recent realizations...



Fiber glass bars



Frame for feed position commissioning

Trimétrique

Meudon

Feed & dish simul.

Dish+Feed only

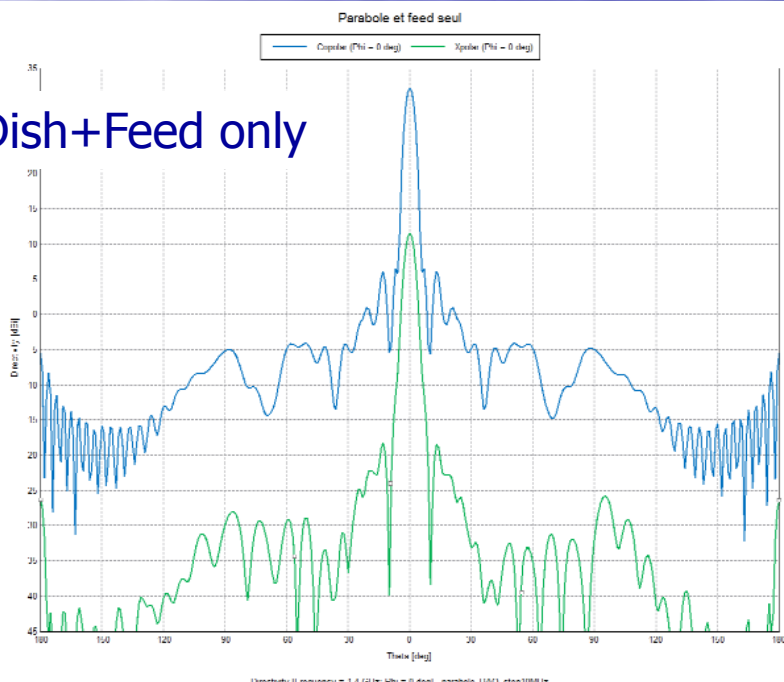


Figure 5 : Lobe en copolar et cross polar dans le plan $\phi = 0^\circ$ (xOz) à 1,4 GHz

8 Glass fiber bars

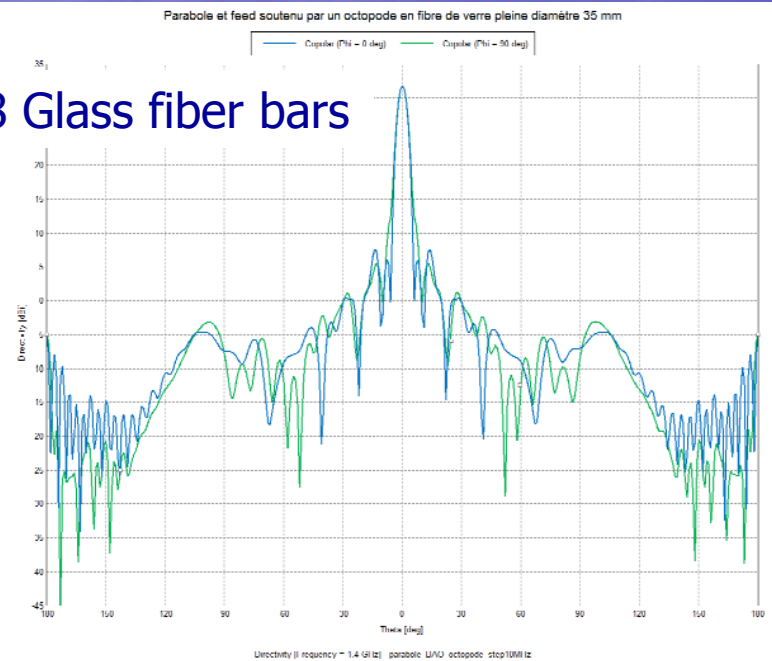
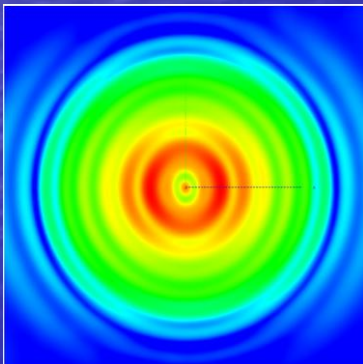
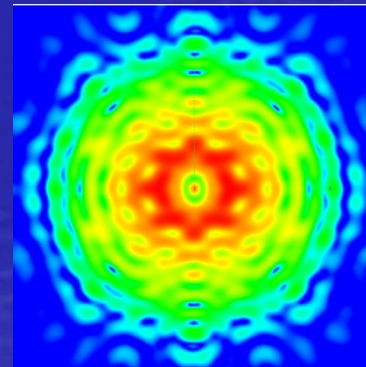


Figure 9 : Lobe en copolar dans les plans principaux (plan xOz - $\phi = 0^\circ$ et plan yOz - $\phi = 90^\circ$) à 1,4 GHz pour la fixation du feed avec un octopode en fibre de verre



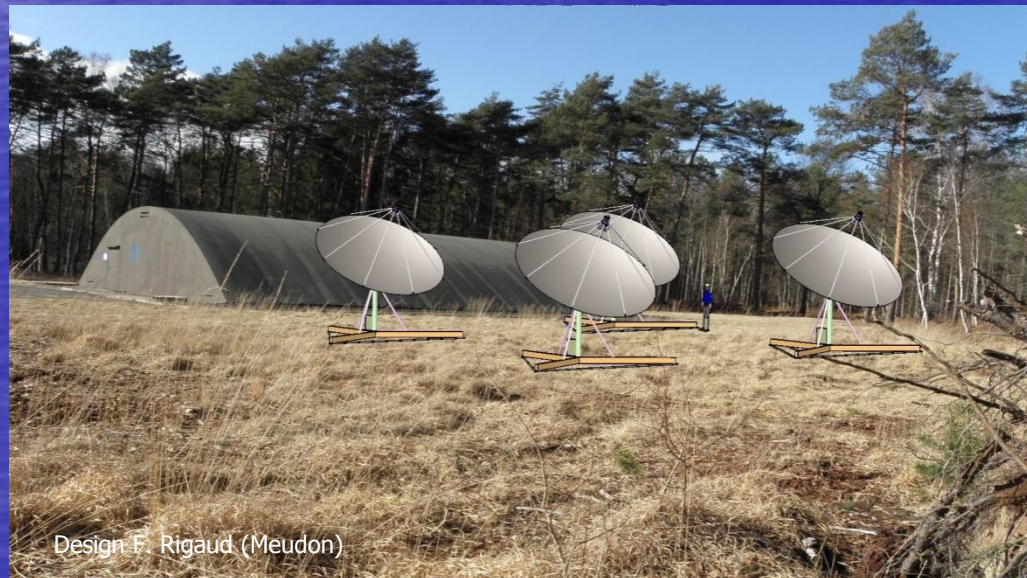
Nançay



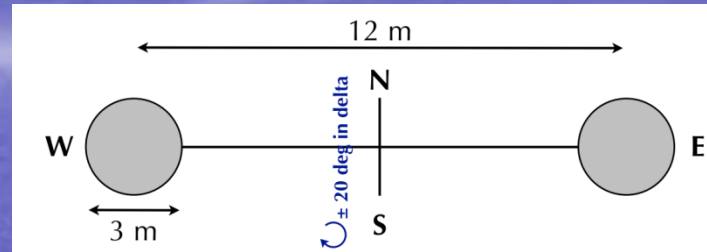
Site considerations

- **Electromagnetic compatibility** is a real matter of concern:
 - The present basic mount is not useable for debugging phase (too noisy) => manual elevation positioning is foreseen (Ok)
 - The DAQ electronics should be shielded too:
 - PAON ask recently to be housed in the EMBRACE special container
- PAON location is under discussion

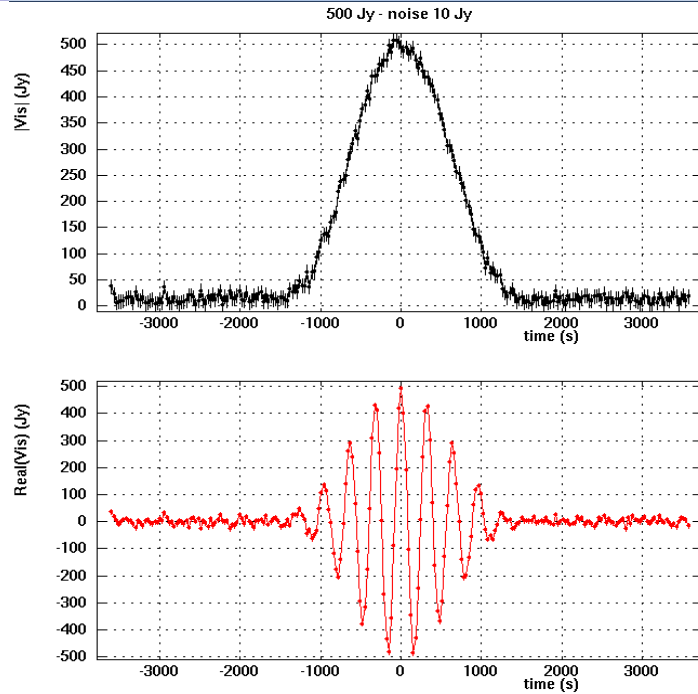
PAON location near EMBRACE



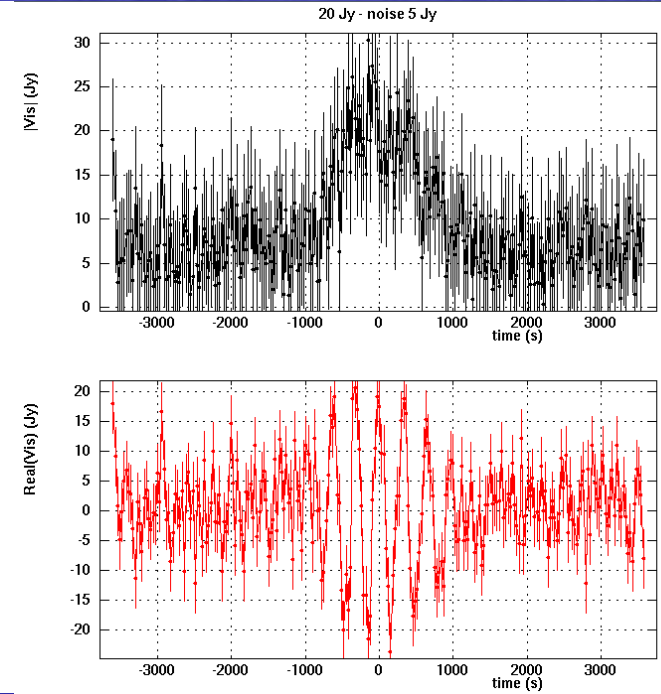
Test of transit observation PAON-2



Transit source 500 Jy, $\sigma \sim 10$ Jy
 Deux Paraboles $D=3$ m à $d=12$
 m, $W_{dish}=2.8$ m, à $\lambda=21$ cm,
 $\Delta\nu=5$ MHz



Transit source 20 Jy, $\sigma \sim 5$ Jy
 Intégration sur 4-5 transits
 Deux Paraboles $D=3$ m à $d=12$ m,
 $W_{dish}=2.8$ m, à $\lambda=21$ cm, $\Delta\nu=5$ MHz



PAON-2 to PAON-4

- What was foreseen : Use 4 dishes 5m \varnothing
 - in project @ RF-HAMdesign since Jan. 2011 4.5m in light material. But they have resigned April 2012 due to market considerations: ie. they have a lot of demands for ≤ 3 m and very few for > 3 m dishes
 - Other manufacturers can provide larger dishes but either with poor mechanical characteristics either with very heavy dishes (> 300 kg) although well machined (eg. ComStar)
 - Investigation for home made dishes in Meudon

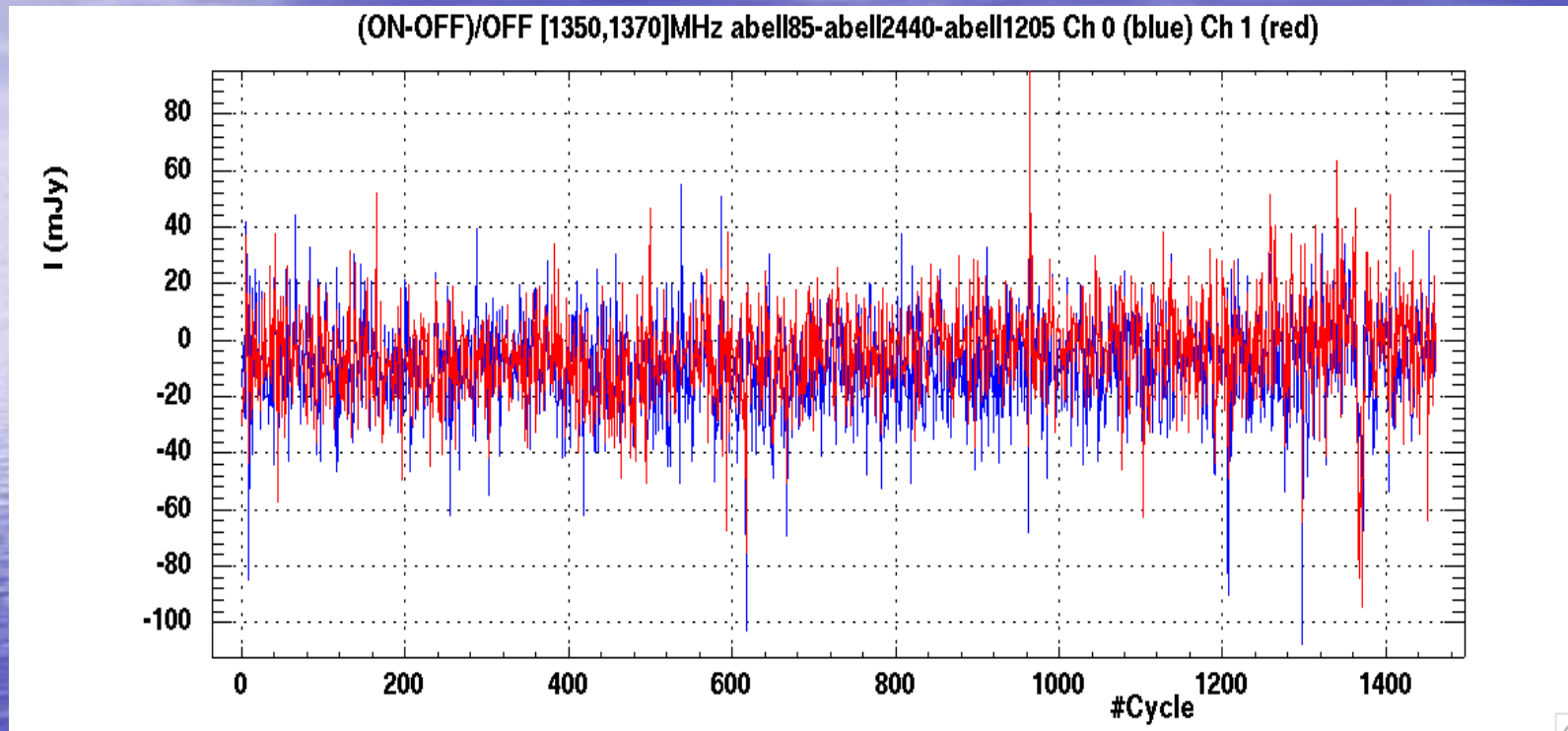


In standby for the moment

PAON-2 to PAON-4

- Alternative: Use 6 dishes 3m \varnothing
 - This is manageable but only $\sim 40\text{m}^2$
(compared to 70m^2 with four 5m-dishes)
- Objective: perform long term observation (several months) to show the stability of the whole BAORadio system:
 - Fringes seen at Pittsburg up to 32-channels during small data taking
 - Long term stability shown with single channel during the HI-cluster program at Nançay

HI-Clusters stability



6 months of data taking (4h On source, eff. 30% DAQ)

Although we have identified many RFIs and 2 spectra modulations.