Beam fitting and other stuff…

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NATIONAL
GEOGRAPHIC™

This morning @ 2 A.M. NB: this is not a wild boar

This morning @ 2 A.M. + ε NB: this is still not a wild boar

For frustrated people who haven't seen a real Nançay's wild boar … yet

Sanglier

Marcassin
(young wild boar)

We could finally PURR in our niche

Let’s (try to) do some science

LBA Dipole Sarod's Model

From LOFAR beamshapes and their use in calibration and imaging – Sarod Yatawatta – Sep. 10, 2009

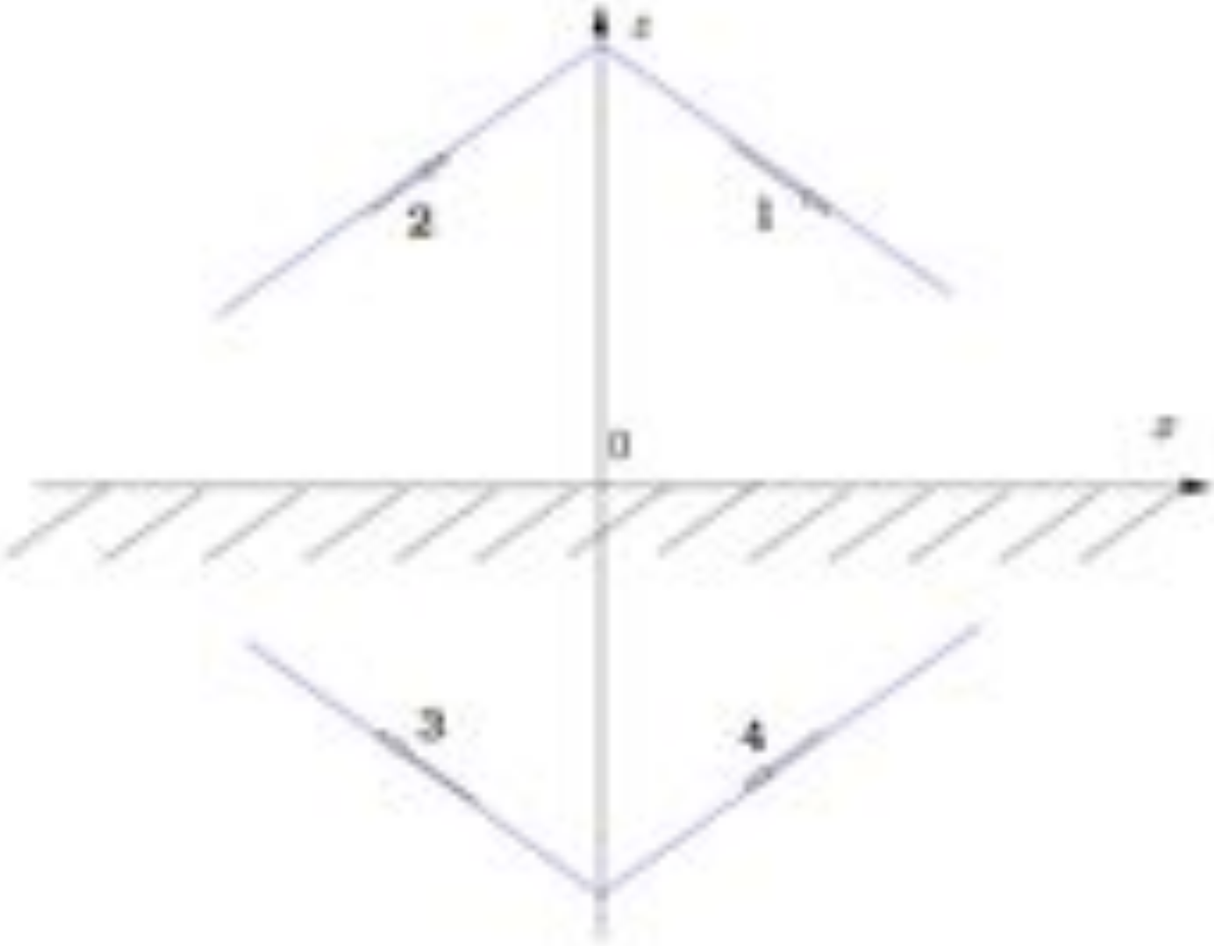


Figure 5: LBA dipole on infinite ground plane

Total (far) **E**-field :

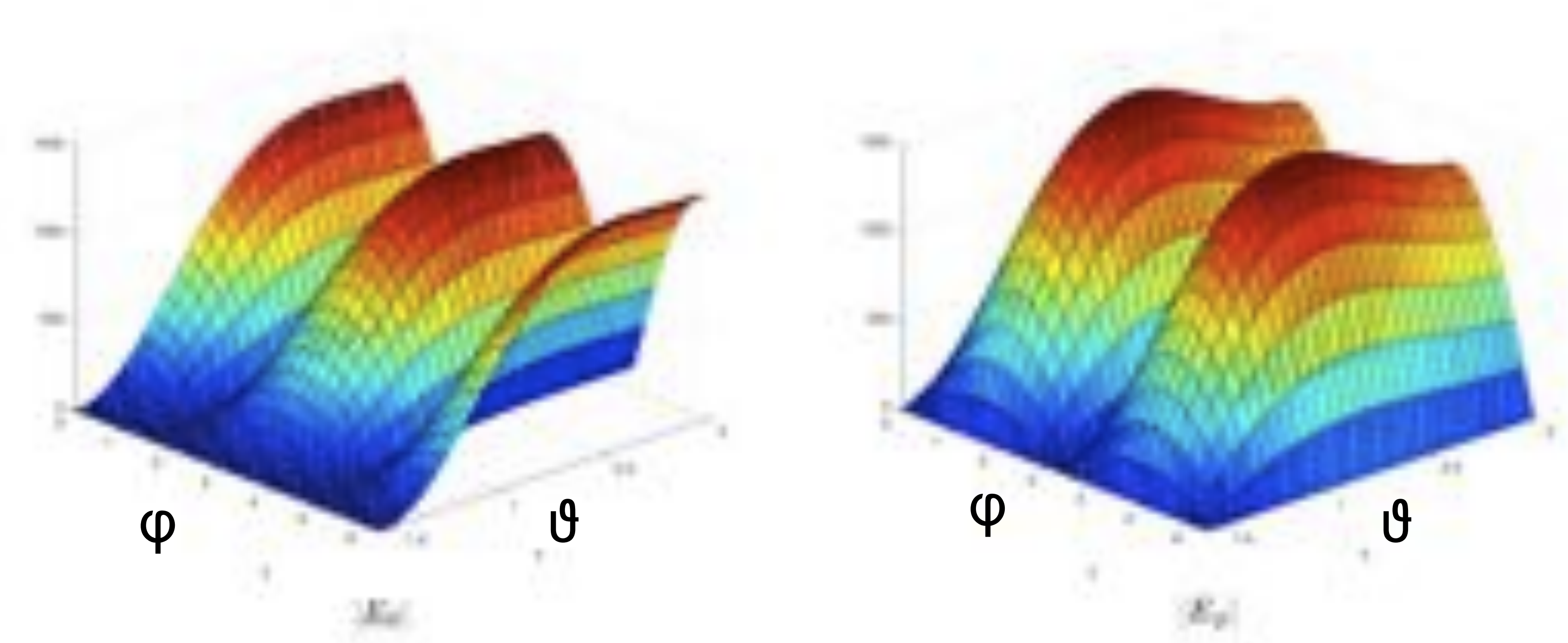
- 4 terms along u_θ
- 4 terms along u_φ

$$E_{\theta 1} = \frac{\mu I_0 \omega k}{4\pi}(-\cos\alpha_1 \sin\theta - \sin\alpha_1 \cos\theta\cos\phi) \int_0^L \exp\left(jk(l\sin\theta\cos\phi + (h - l/\tan\alpha_1)\cos\theta\right)\sin\left(\frac{k}{\sin\alpha_1}(L-l)\right) dl$$
$$= \frac{\mu I_0 \omega k}{4\pi}(-\cos\alpha_1 \sin\theta - \sin\alpha_1 \cos\theta\cos\phi)\, \Gamma_+(\sin\theta\cos\phi - \cos\theta/\tan\alpha_1, h\cos\theta, k, L, \alpha_1)$$

$$E_{\phi 4} = \frac{\mu I_0 \omega k}{4\pi}(-\sin\alpha_1 \sin\phi) \int_0^L \exp\left(jk(l\sin\theta\cos\phi - (h - l/\tan\alpha_1)\cos\theta\right)\sin\left(\frac{k}{\sin\alpha_1}(L-l)\right) dl$$
$$= \frac{\mu I_0 \omega k}{4\pi}(-\sin\alpha_1 \sin\phi)\, \Gamma_+(\sin\theta\cos\phi + \cos\theta/\tan\alpha_1, -h\cos\theta, k, L, \alpha_1)$$

Re-implementation in IDL for fitting

LBA Beam model @ 80 Mhz

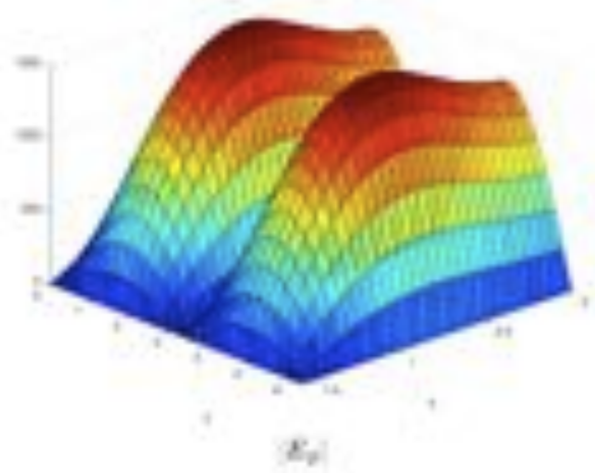


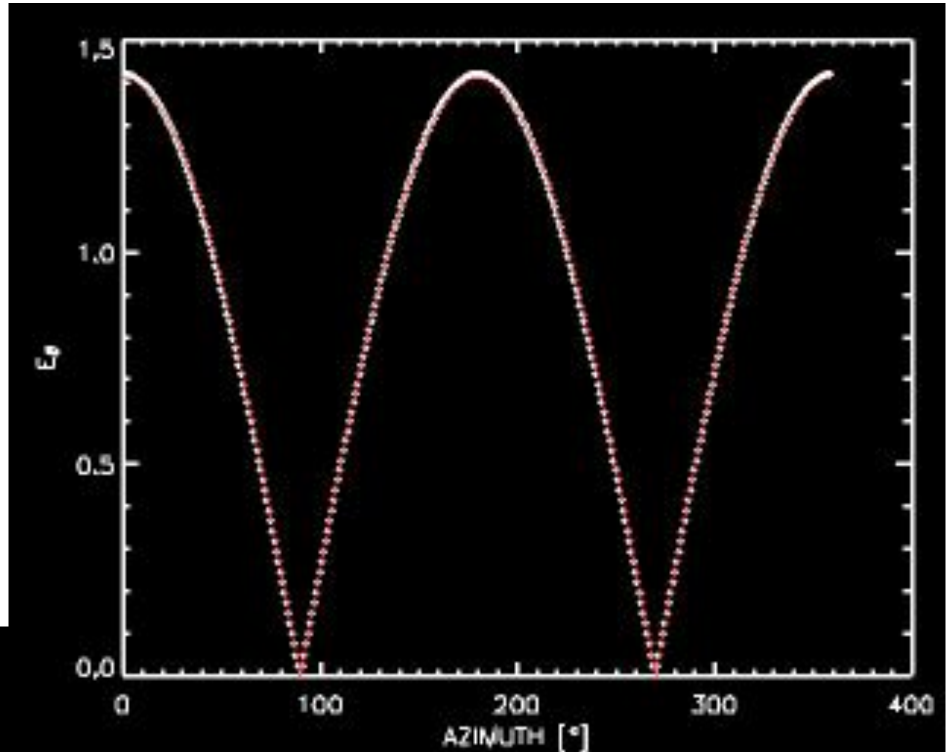
|E_{theta}|

Figure 11: LBA Beam at 80 MHz

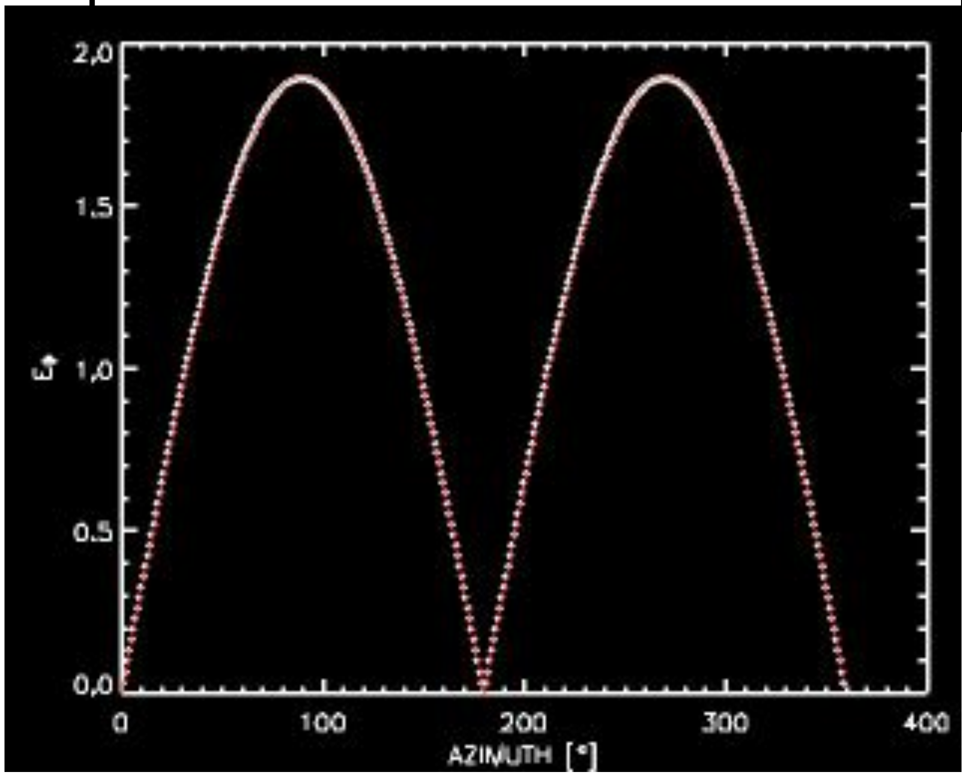
|E_{phi}|

θ=40°

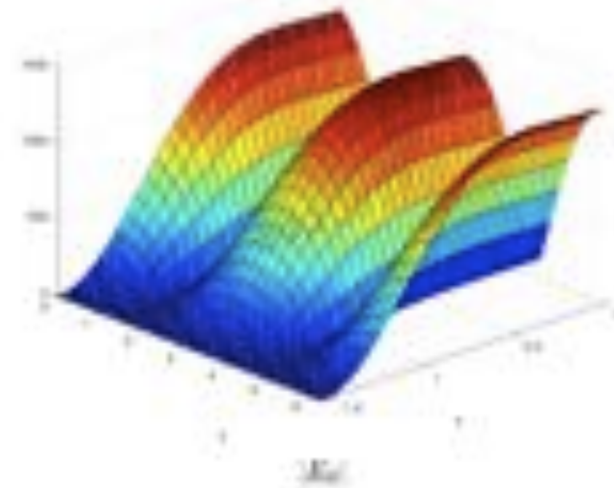




E_{phi}



E_{theta}



Fitting for E_{theta} and E_{phi}

$$\left|E_{\varphi}(\theta,\phi)\right| = P_1(\theta) * \left|\cos(\varphi - \varphi_{01} - \frac{\pi}{2})\right|$$

$$P_1(\theta) = 1{,}53216 - 0{,}01\theta + 0{,}001\theta^2 - 2.10^{-5}\theta^3 + 6{,}9.10^{-8}\theta^4$$

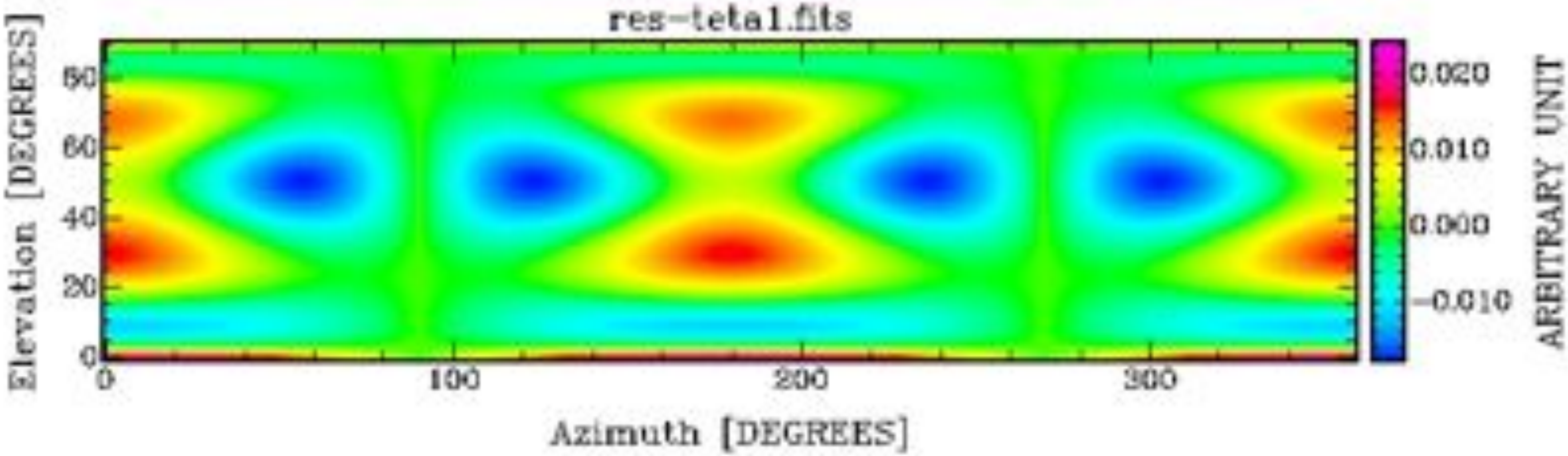
$$\left|E_{\theta}(\theta,\phi)\right| = P_2(\theta) * \left|\cos(\varphi - \varphi_{02})\right|$$

$$P_1(\theta) = 1{,}52228 - 0{,}01\theta + 0{,}001\theta^2 - 2{,}8.10^{-5}\theta^3 + 1{,}8.10^{-7}\theta^4$$

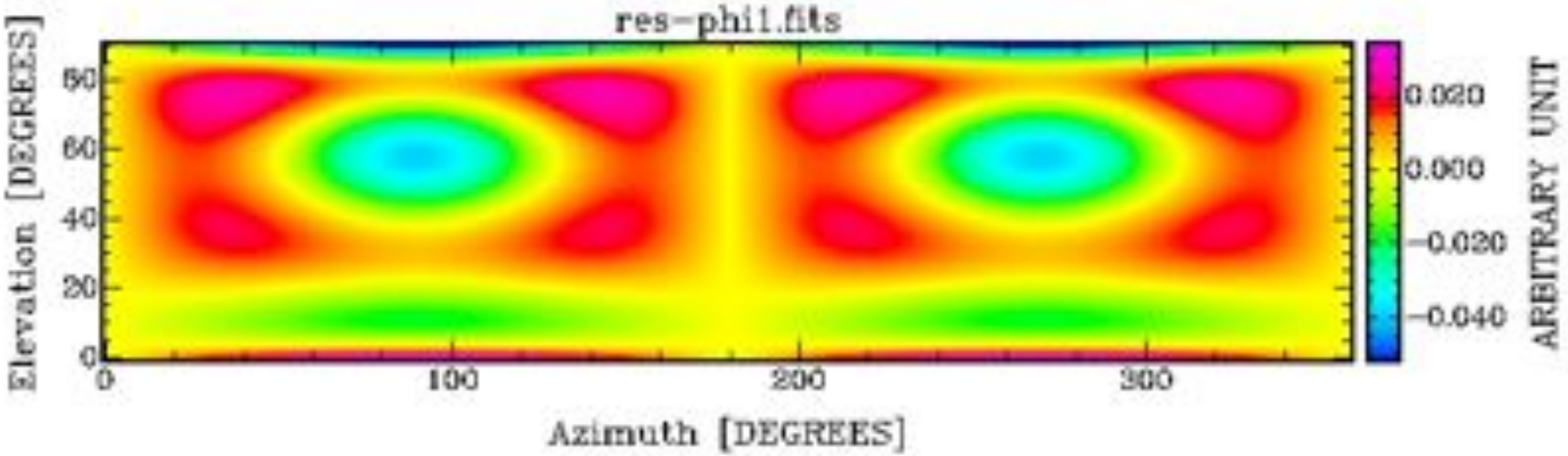
$$\phi_{01}, \phi_{02} \approx 0$$

Residuals

E_{tetha}



E_{phi}



Now, we have simplified expressions of the LBA beam

What we have to do now (and what we are doing):

- Take into account the frequency dependency

- Do a similar work as Shannon & Fred's according to Sarod's paper. (currently working on it)
(vla-beams.py understanding & cannibalization & french criticizing)

- Do the same thing for HBA

- Play with station beams

- Help you getting reimbursed

Beam measurements with the Embrace tile

PI Embrace testing: Steve Torchinsky & al.

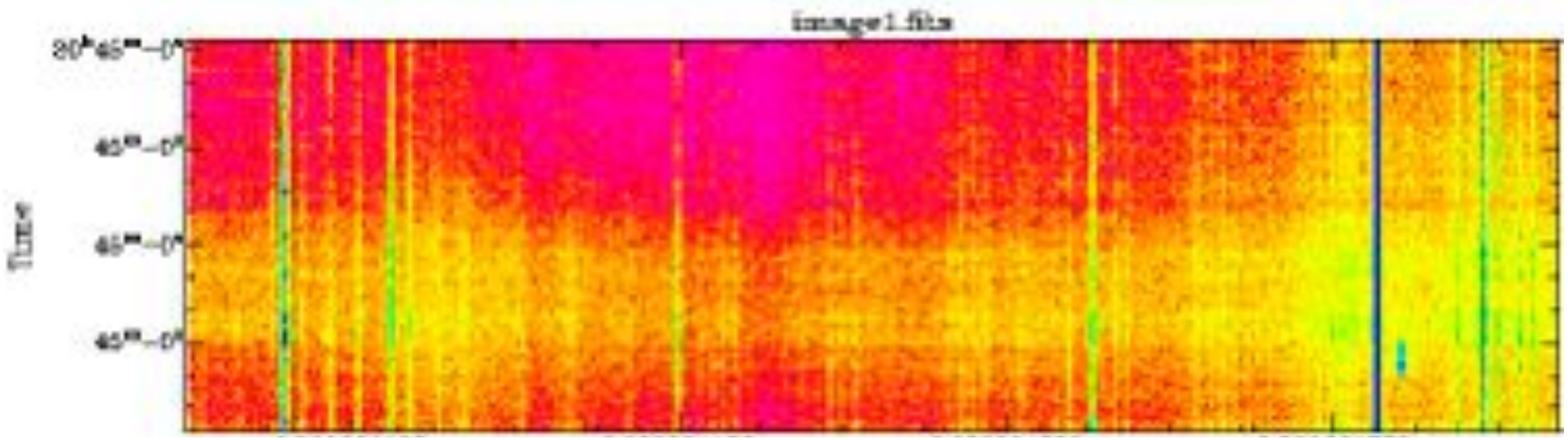
High-Tech wooden blockers for Elevation

High-Tech plastic wheels for Azimuth

First results (few hours ago!)

1 hour observation of the sun

Raw data



F = [1.15 GHz, 1.25 GHz]

Now it’s time for football !!

Oleg 1 – Julien 0

French Football coherent failure