

Doris ground antennas Radio Frequency characterization Status

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OUTLINE

- **Reminder**
- **Analysis of dispersion w.r.t. azimuth angle**
- **On going work with antenna manufacturer**
- **UPCOMING ACTIVITIES**

● Last AWG (April 2013):

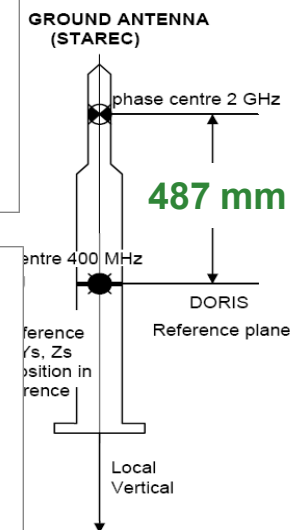
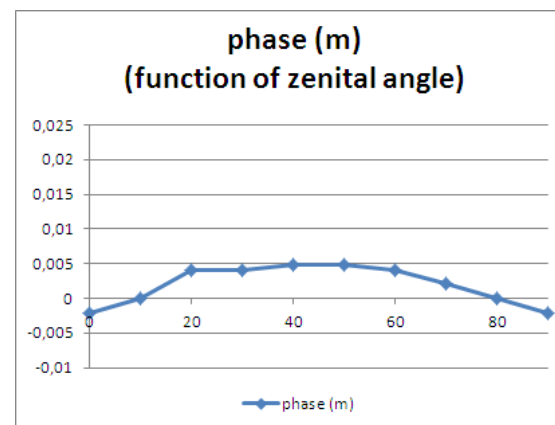
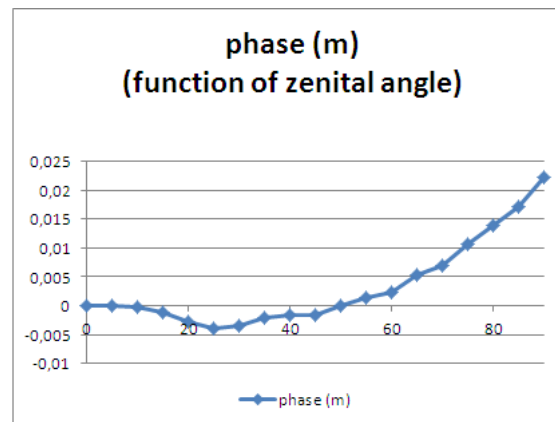
A new characterization for DORIS STAREC ground antennas provided :

◆ **2GHz :**

- » Phase center : 487 mm above the reference plan
- » 2Ghz Phase law :

◆ **400 MHz : no change**

- » Phase center: 0 mm above the reference plan
- » 400Mhz Phase law



Characterizations provided via antex files

Analysis of dispersion w.r.t. azimuth angle (1/4)

- Presentation of DORIS ground antenna characterization at IERS workshop

- ◆ Question raised:

- » Is there a variability of the phase law function of azimuth angle ?

- Analysis performed to evaluate this variability

- ◆ Reminder :

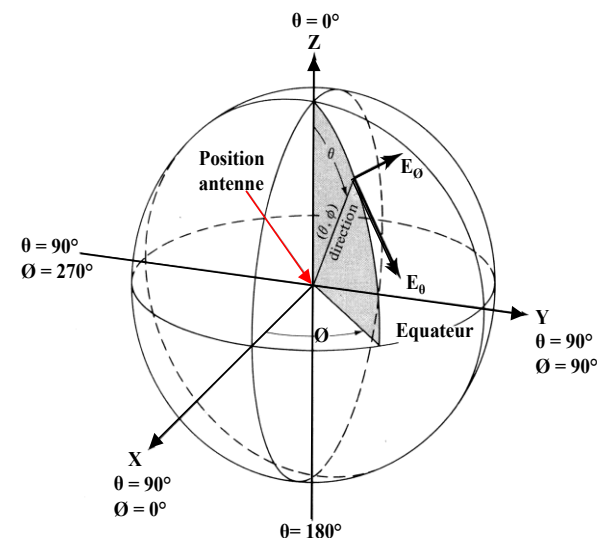
- » Analysis performed by the CNES antenna department give :

Measurements for :

4 plans (4 azimuth angle): $\phi = 0^\circ, 45^\circ, 90^\circ, 135^\circ$
 with θ going from -180 to 180°

- » We can get 8 samples of azimuth measurements:

- $\phi = 0^\circ; 0 < \theta < 90$
- $\phi = 45^\circ; 0 < \theta < 90$
- $\phi = 90^\circ; 0 < \theta < 90$
- $\phi = 135^\circ; 0 < \theta < 90$
- $\phi = 0^\circ; 0 > \theta > -90 \Rightarrow \phi = 180^\circ; 0 < \theta < 90$
- $\phi = 45^\circ; 0 > \theta > -90 \Rightarrow \phi = 225^\circ; 0 < \theta < 90$
- $\phi = 90^\circ; 0 > \theta > -90 \Rightarrow \phi = 270^\circ; 0 < \theta < 90$
- $\phi = 135^\circ; 0 > \theta > -90 \Rightarrow \phi = 315^\circ; 0 < \theta < 90$



Analysis of dispersion w.r.t. azimuth angle (2/4)

◆ For each antenna, we calculate :

» For a given couple (ϕ ; θ) :

» $\varphi - \phi - \varphi_{\text{correction}}(\theta)$

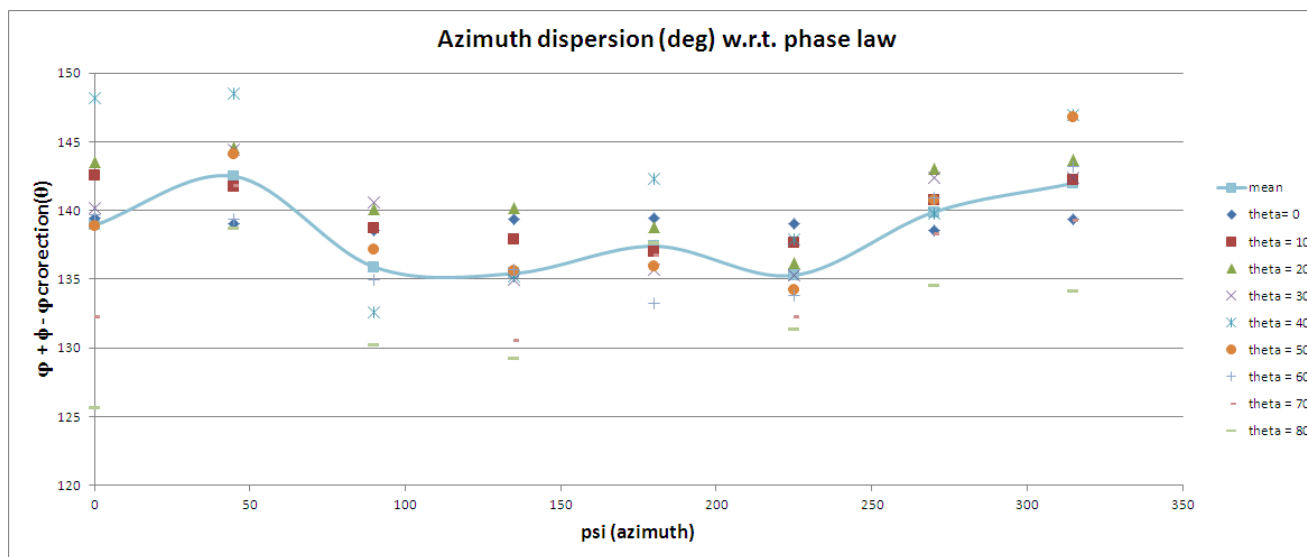
With :

φ : phase measurement performed by the antenna department

ϕ : azimuth angle (a rotation of the antenna implies an offset of phase equal to ϕ)

$\varphi_{\text{correction}}(\theta)$: phase law correction function of zenithal angle θ

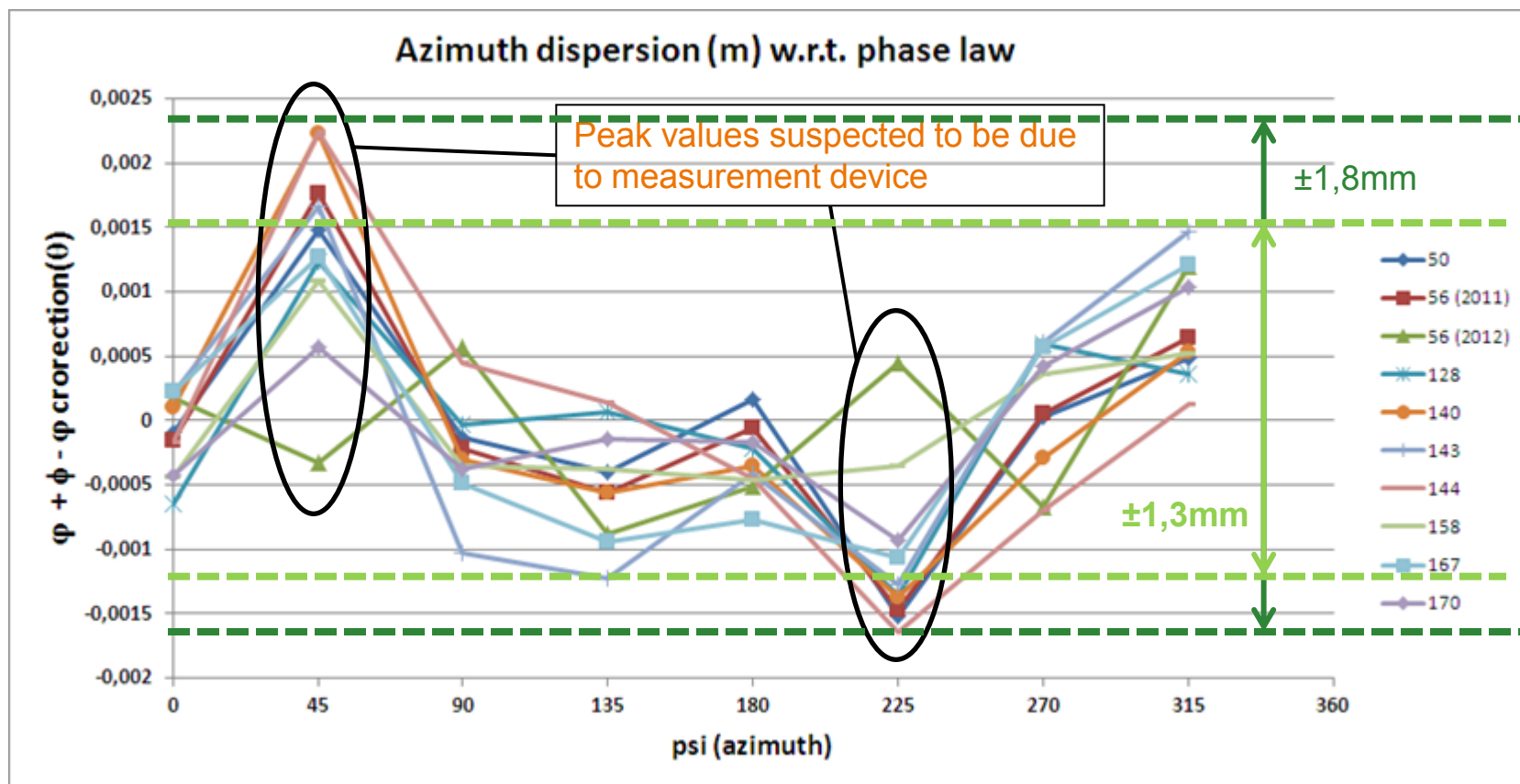
◆ Then we determinate the mean value over θ



Analysis of dispersion w.r.t. azimuth angle (3/4)

This is done for all antennas measured

◆ We get an estimation of the dispersion:



Analysis of dispersion w.r.t. azimuth angle (4/4)

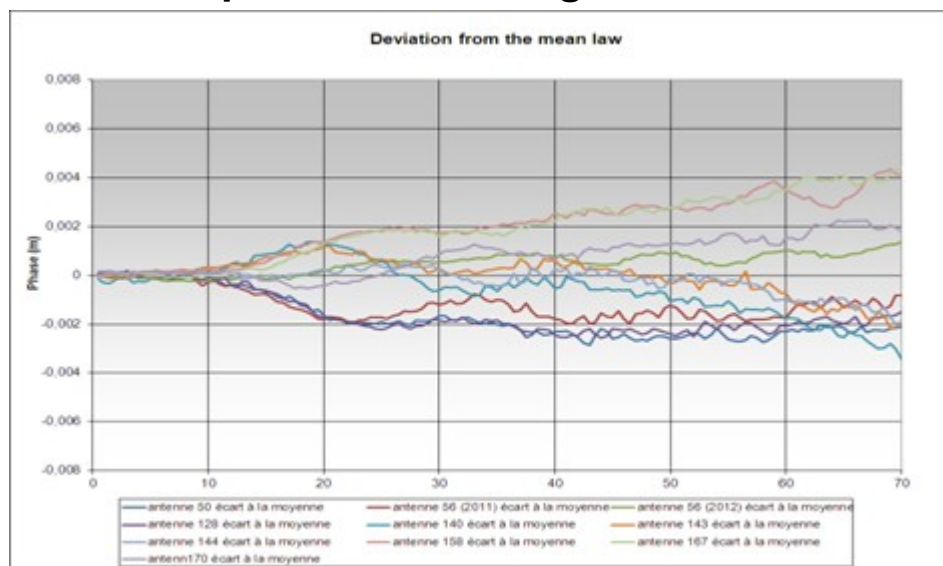
Conclusion:

- We observe an azimuthal dispersion of
 - ◆ $\pm 1,3\text{mm}$ max (assuming peak values due to measurement device)
 - ◆ $\pm 1,8\text{mm}$ including peak values
- When we compare this dispersion to phase law dispersion in elevation ($\pm 3\text{mm}$)
- We assume the DORIS STAREC antenna is non azimuth dependent
 - ◆ Not really a surprise, STAREC antenna is helicoidal, it has a revolution symmetry by conception



On going work with antenna manufacturer

- The phase law provided was estimated by meaning the measurements of 9 antennas
- We observe a dispersion of $\pm 3\text{mm}$ on the phase center height for elevation above 20° ($\theta < 70^\circ$)



- To consolidate our results, some of the antennas were dismantled,
- We observe a dispersion of some mm in antenna hardware (bottom of the 2GHz part w.r.t. mounting plate)
- We are currently working with the antenna manufacturer to improve this point,

Next

- ◆ Azimuth dispersion:
 - » Analyze peak values to determine if it comes from measurement device,

- ◆ Perform a new measurement campaign on the same antennas
 - ⇒ To estimate the measurement system noise
 - ⇒ Will be done by the end of October

- ◆ Consolidate the consistency of series antennas
 - ⇒ On going work with antenna manufacturer

- ◆ Perform the same work on Alcatel antennas
 - ⇒ Alcatel antenna is the previous DORIS ground antenna model (used in the 90's)
 - ⇒ We have now 3 Alcatel antennas

THANK YOU

Backup slides

