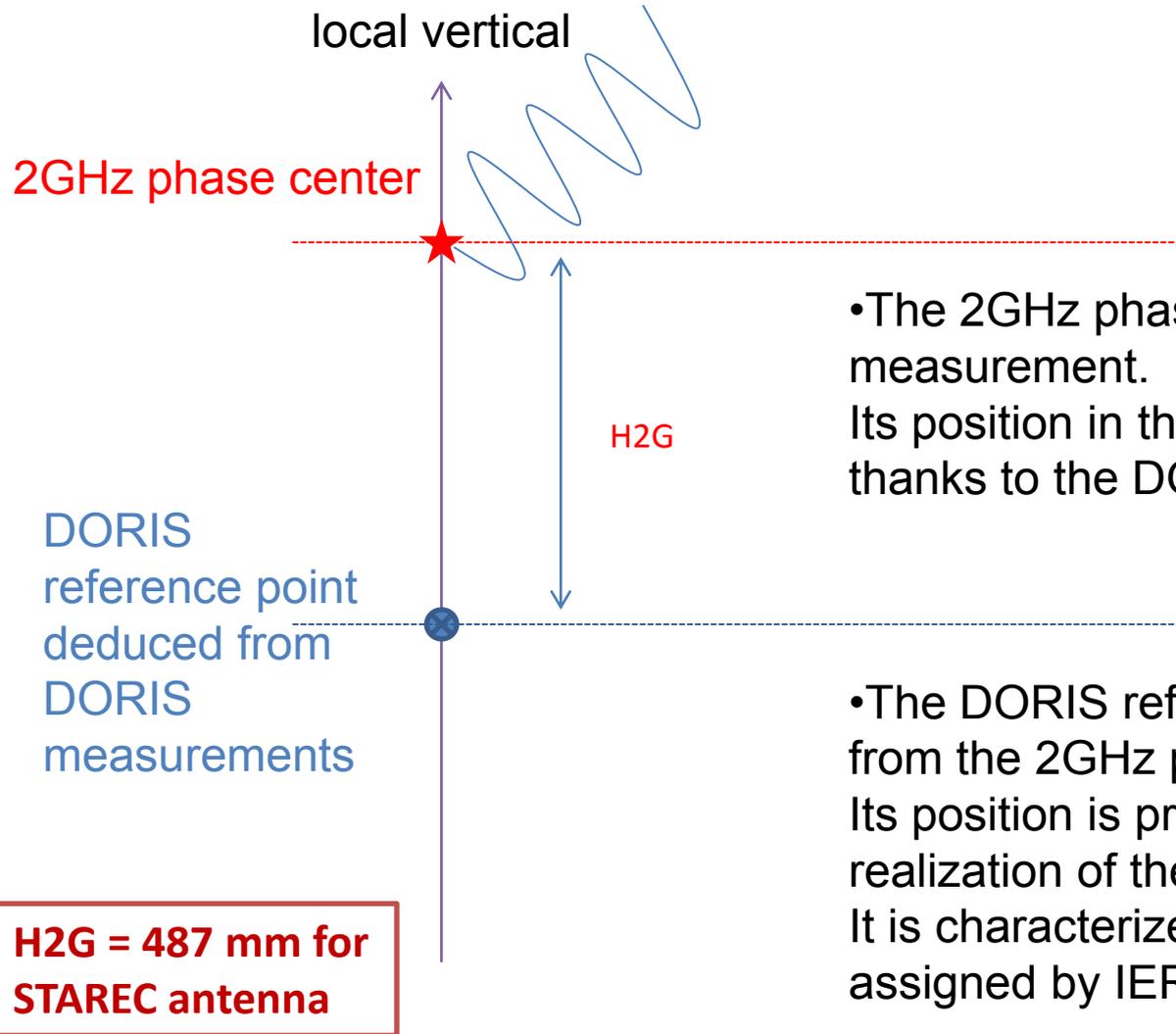


# New radio frequency characterization of the STAREC antennas

## Application in DORIS data processing

## Points determined from the DORIS measurements

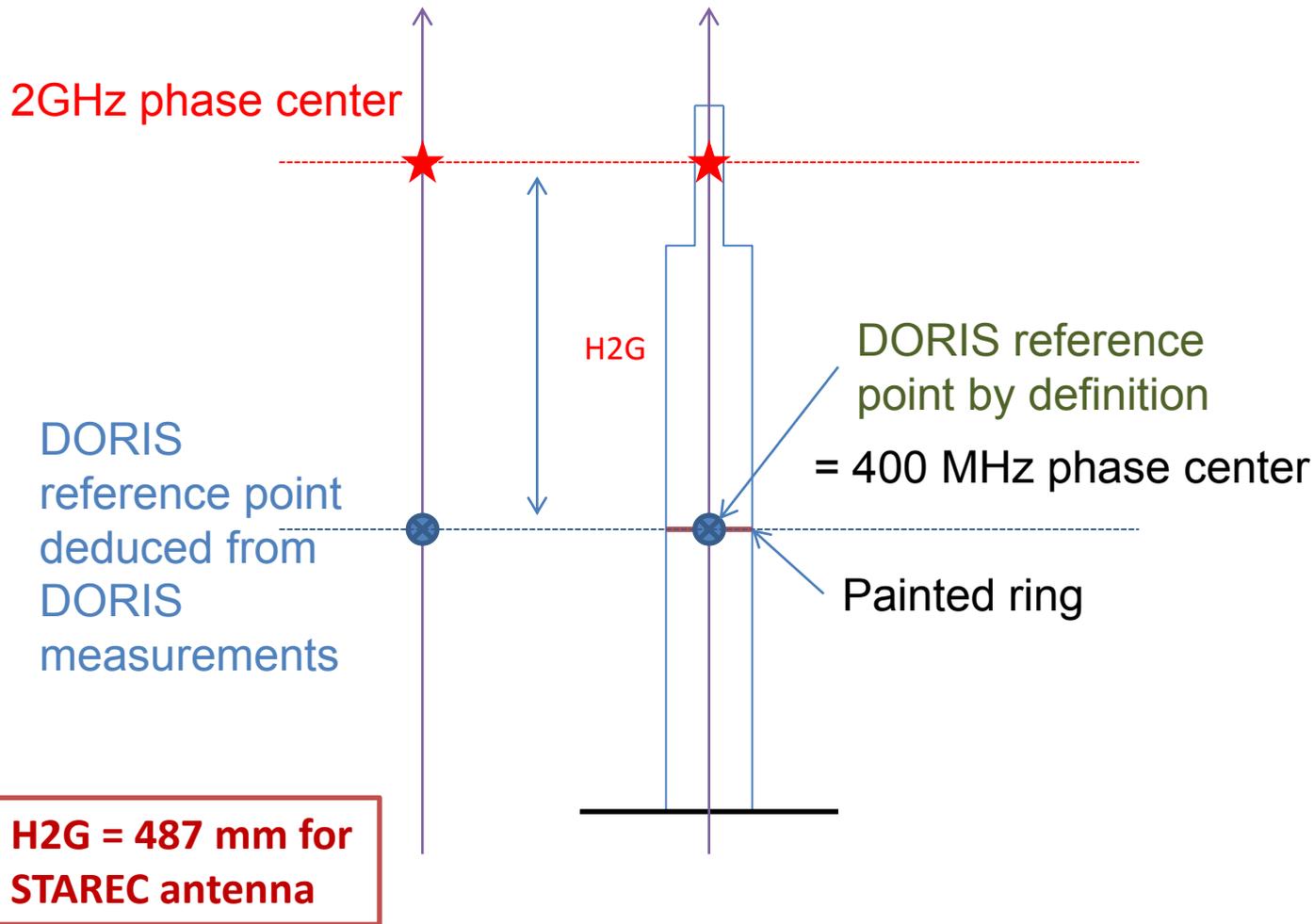


- The 2GHz phase center is the point of measurement.  
Its position in the ITRS is determined thanks to the DORIS measurements.

- The DORIS reference point is deduced from the 2GHz phase center.  
Its position is provided to IERS for the realization of the ITRFs.  
It is characterized by a DOMES number assigned by IERS.

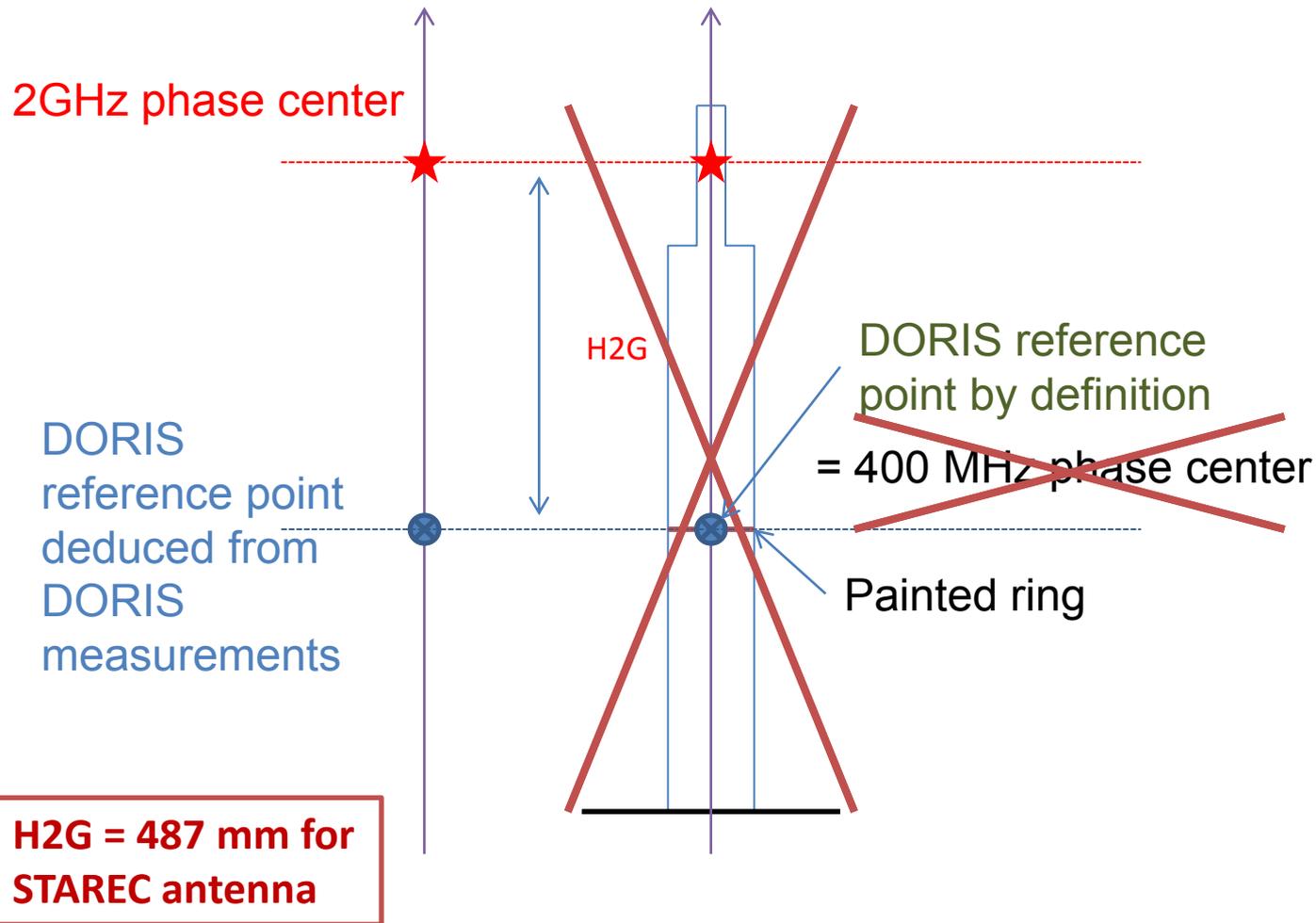
**By construction. for a STAREC antenna. the DORIS reference point is located 487 mm under the 2GHz phase center. on the local vertical axis.**

# Corresponding points on the STAREC antenna as supposed until recently



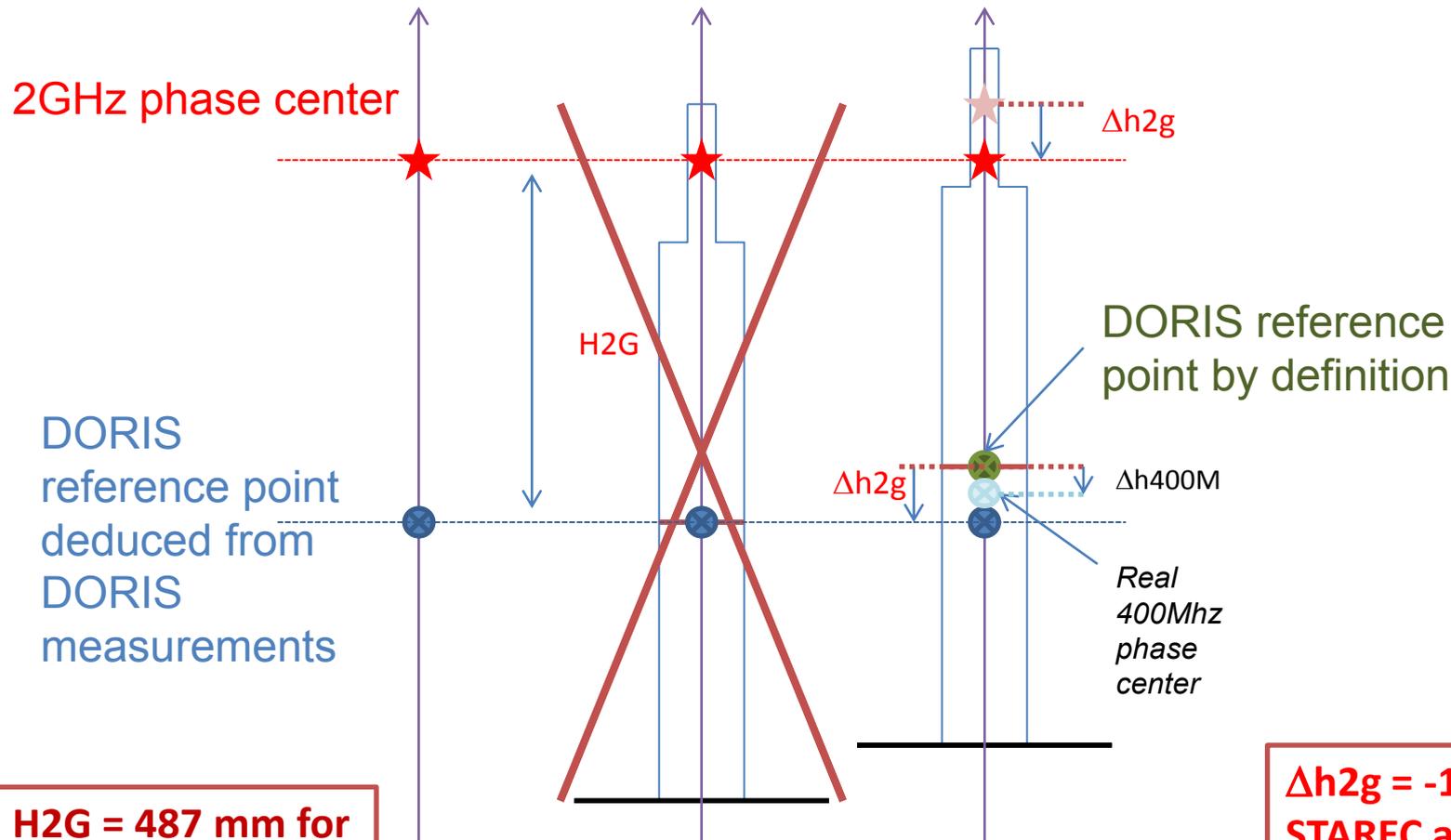
**By definition. for a STAREC antenna. the DORIS reference point corresponds to the 400 MHz phase center. It is at the center of the red ring painted on the antenna.**

**But...**



**Recent radio frequency characterization performed by CNES concludes this geometry description of the STAREC antenna is wrong**

# Corresponding points on the STAREC antenna as determined from recent characterization by CNES

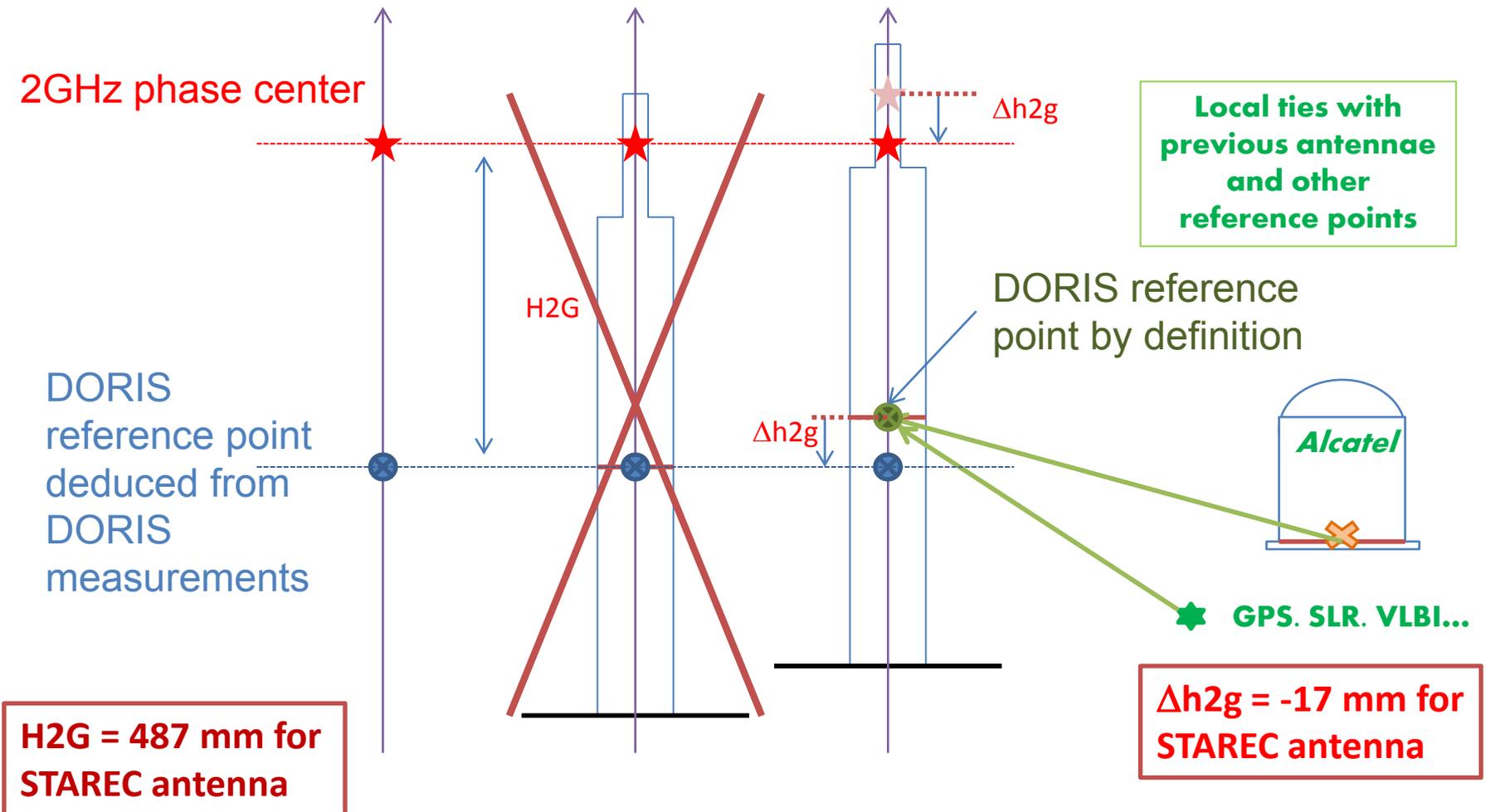


**H2G = 487 mm for STAREC antenna**

**$\Delta h_{2g} = -17$  mm for STAREC antenna**

$\Delta h_{400M} = -7$ mm

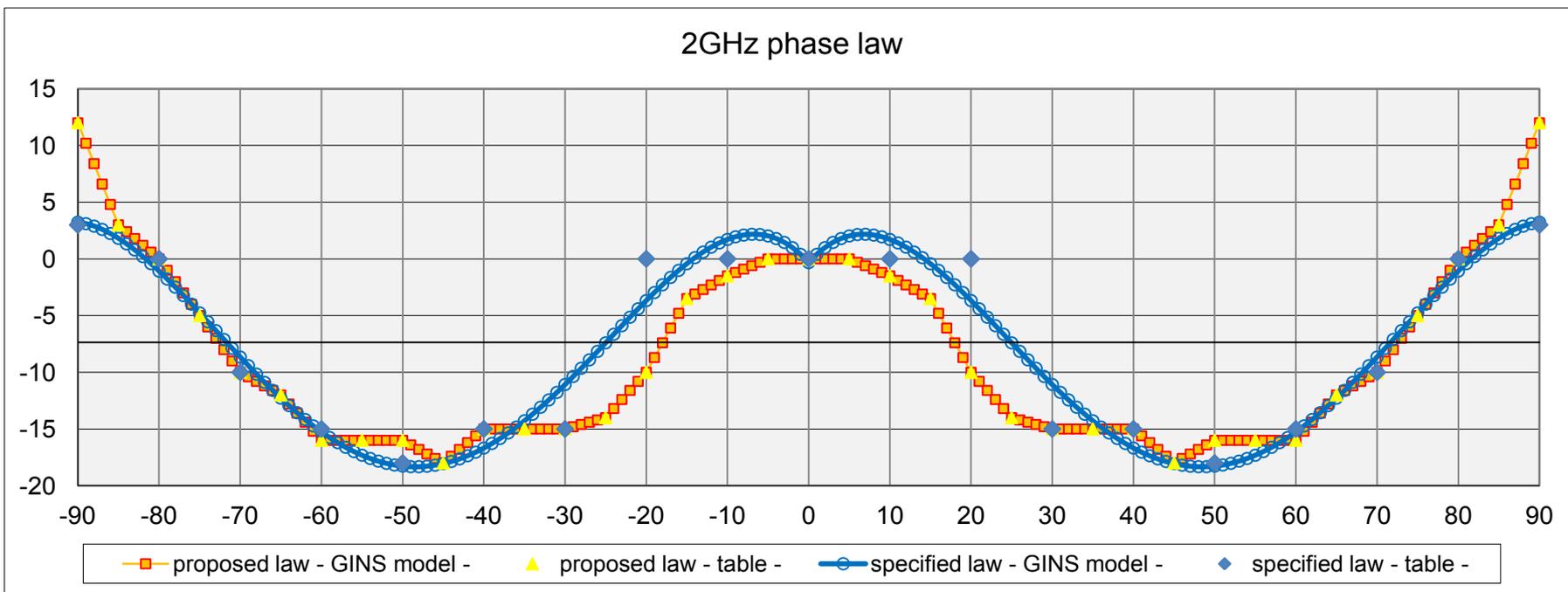
The 2GHz phase center is 17 mm under the supposed position and the 400Mhz phase center is 7 mm under the painted ring. Then. the DORIS reference point of the IDS ACs solutions is 17 mm under the defined DORIS reference point.



The local ties and IDS ACs solutions do not use the same DORIS reference point. An additional vector ( $\Delta h_{2g}$ ) must be taken into account for the ITRF realization so that both measurements are compatible (and have the right weights).

## New phase law 2GHz

Site (°) (wrt zenith)	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Phase correction (°)	0	0	-1.5	-3.5	-10	-14	-15	-15	-15	-18	-16	-16	-16	-12	-10	-5	0	3	12



Tests on one week: 08/07/2012 – 14/07/2012 (#1696)

→ DORIS ref. point – 2GHz phase center = 487 or 470mm

→ Without phase law, with specified law, with new law

POD processing on Jason2. Cryosat-2. Hy-2a. Spot-4. Spot-5 (3.5-day arcs)

→ Impact of the correction in terms of:

- Orbit fit residuals

Network coordinate weekly solution from the cumulative  
NEQ Jason2+Cryosat-2+Hy-2a+Spot-4+Spot-5

→ Impact of the correction in terms of:

- Station height residuals
- TRF scale factor (vs ITRF2008)

## Mean values of DORIS orbit fit residuals (unit: mm/s)

*\* indicates variations wrt to the values of the first line*

- POD processing (station coord. fixed; orbit and tropo. delay solved)

Station coordinates:

- DORIS reference point = DPOD2008
- 2GHz PC = Ref Pt + H2G (+487mm on vertical)

	Cryosat-2	Hy-2a	Jason-2	Spot-4	Spot-5
Without phase law	0.3541	0.3388	0.3282	0.3848	0.3602
With old 2GHz phase law*	-0.0009	+0.0003	+0.0003	+0.0008	-0.0010
With new 2GHz phase law*	-0.0012	-0.0006	-0.0003	-0.0013	-0.0017

- 2GHz PC = Ref Pt + H2G -  $\Delta h_{2g}$  (+470 mm on vertical)

	Cryosat-2	Hy-2a	Jason-2	Spot-4	Spot-5
Without phase law	0.3556	0.3411	0.3288	0.3860	0.3626
With old 2GHz phase law*	-0.0014	-0.0014	-0.0000	-0.0008	-0.0018
With new 2GHz phase law*	-0.0022	-0.0009	-0.0005	-0.0021	-0.0022

## Mean values of height residuals before 7-parameter transformation, and scale factor (unit: mm)

- Network coordinate weekly combined solution (station coord., orbit parameters, dynamical parameters and tropo. delay solved)
  - Comparison to DPOD2008
  - A priori: DORIS reference point = DPOD2008
  - 2GHz PC = Ref Pt + H2G (+487mm on vertical)

	Height residuals	Scale factor
Without phase law	+11.1	-12.4
With old 2GHz phase law	+1.6	-3.1
With new 2GHz phase law	+4.2	-5.6

- 2GHz PC = Ref Pt + H2G -  $\Delta h_{2g}$  (+470 mm on vertical)

	Height residuals	Scale factor
Without phase law	+26.0	-27.4
With old 2GHz phase law	+16.5	-17.8
With new 2GHz phase law	+19.3	-20.6

## **Summary:**

**Tests with one week of Jason-2, Cryosat-2, Hy-2a, Spot-4, Spot-5 data.**

**Coordinates of the DORIS point kept unchanged (DPOD2008 coordinates)**

**-with vecteur DORIS point – 2GHz phase center = 487 OR 470mm**

**-with 2GHz specified phase law OR new phase law OR without law**

## **Results:**

**-better results with DORIS point – CDP = 487 mm → DPOD2008 (ITRF2008) coordinates are not the coordinates of the defined DORIS point (red ring) but a point 17 mm below (more weight is given to the DORIS data than to the ties)**

**-orbit residuals decrease with law phase than without, and more with the new law than the specified law**

**-height residuals and scale criteria slightly better with the specified law**

## **Other results:**

**-phase correction is applied with a negative sign. Same tests with positive correction applied show degradation of all criteria.**

## **Not investigated:**

**-impact on laser residuals for Jason-2, Cryosat-2, Hy-2**

**-orbit comparison and impact on radial component**

## What to do?

- **New « ITRF-like » computation using an additional « 17mm » vector to join the « construction » DORIS point (derived from DORIS data) and the « definition » DORIS point (red ring) to be applied to the tie vectors OR the DORIS solutions (→ Zuheir?)**
  
- **When the sitelogs give the DORIS coordinates derived only from ties to GPS (or other techniques, or maybe even Alcatel antenna), compare them to coordinates derived from DORIS data (→ Jérôme? ACs?)**