

COLOCATIONS AND MONUMENTATION IN THE DORIS NETWORK

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Antenna types in the DORIS permanent network

Alcatel



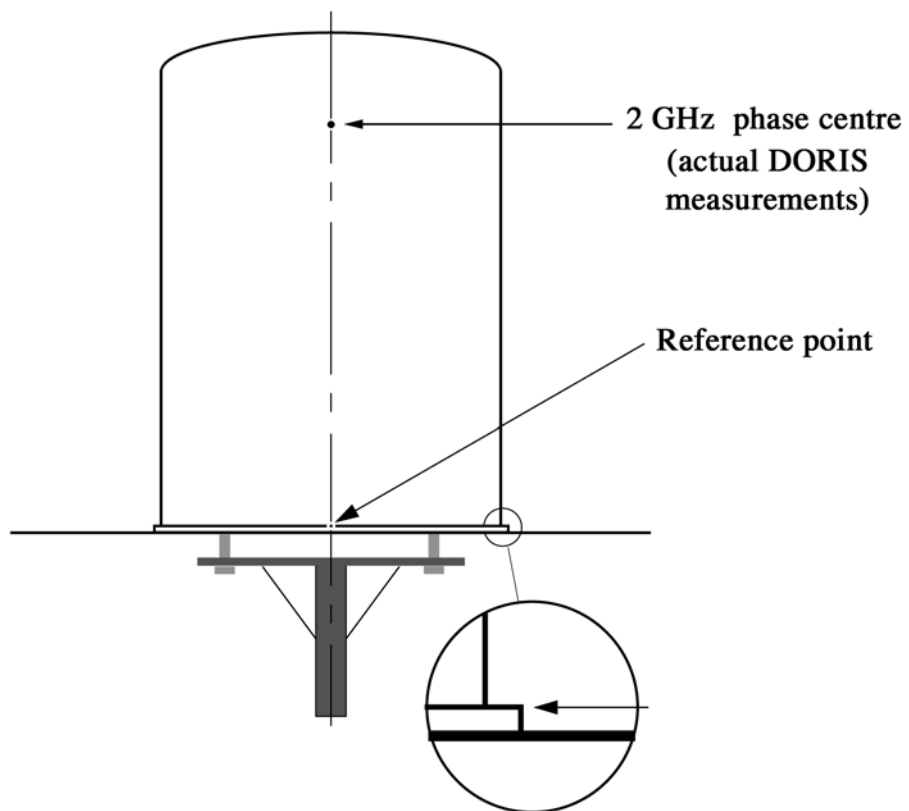
- 10 stations
- Deployed 1986 --> 1992
- Point identification: xxxA

Starec



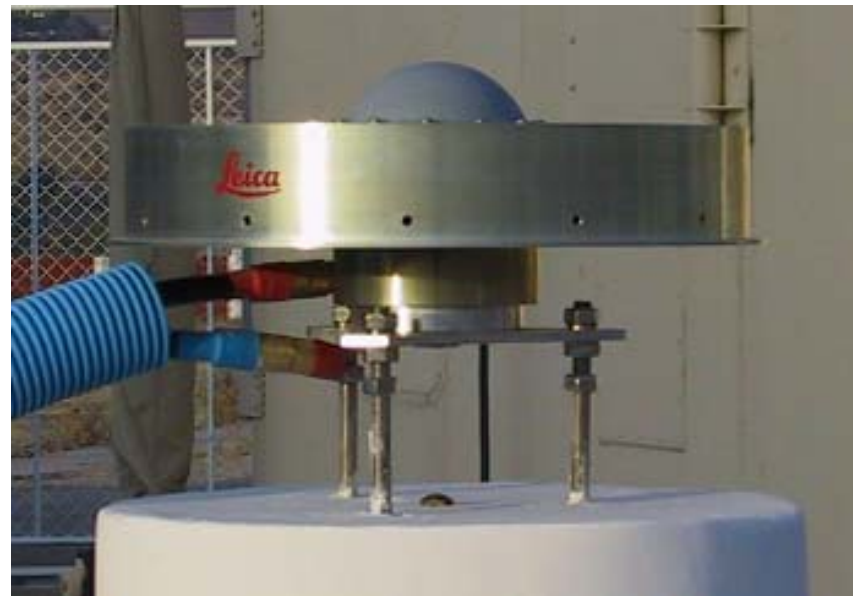
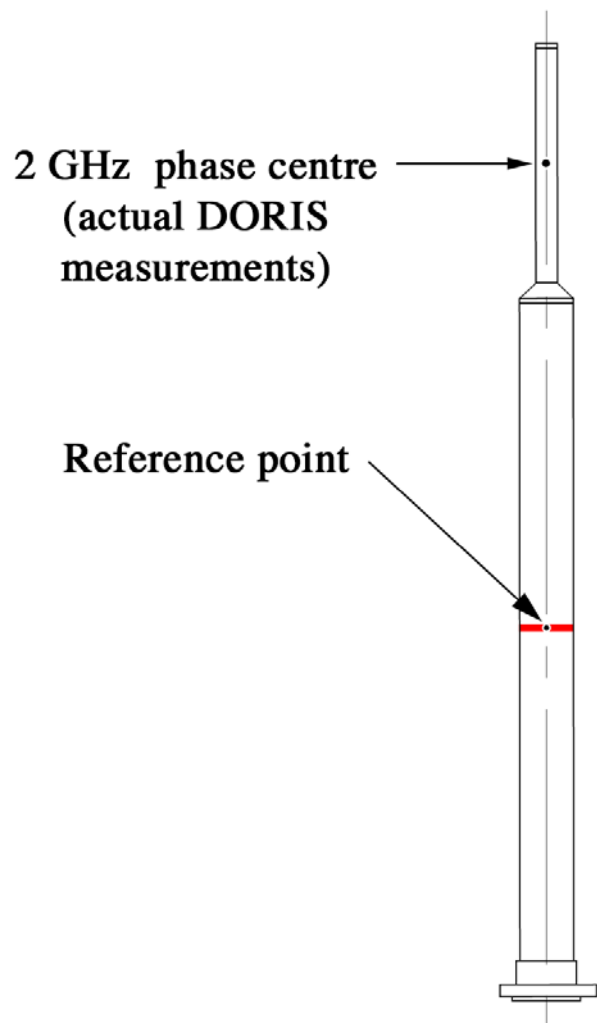
- 46 stations (+ 2 IDS experiments)
- Deployed as of 1992
- Point identification: xxxB

Survey of a DORIS/Alcatel antenna



**GPS survey using the
forced centering interface**

Survey of a DORIS/Starec antenna



**GPS survey using the
forced centering interface**

Colocations with other IERS techniques: how active and reliable are they?

- **Many instruments colocated with DORIS are not currently operating:**
 - **Discontinued long-term occupation by:**
 - » VLBI (Richmond, Santiago)
 - » SLR (e.g. Dionysos, Easter Island, Goldstone, etc.)
 - **Short duration (2 days only once, to a few days per year) mobile VLBI occupations (Toulouse, Ponta Delgada, Metsähovi)**
 - **Unreliable tie:**
 - **Insufficient accuracy, measured only once, sometimes many years ago**
 - **Very long baseline, different geological movements (e.g. Kourou)**
 - **Ties to be measured: Sakhalinsk, Cachoeira**
- > Not all DORIS presumed colocations have the same usefulness for the current realisation of the ITRS**

DORIS stations in proximity to other IERS techniques



○ No colocation (17 stations + 1 IDS exp.)

◆ 2 other techniques (12 stations)

● 1 other technique (21 stations)

■ 3 other techniques (6 stations + 1 IDS exp.)

DORIS colocations with active other techniques



- No active colocation (22 stations + 1 IDS exp.)
- ◆ 2 other techniques (11 stations)
- 1 other technique (21 stations)
- 3 other techniques (2 stations + 1 IDS exp.)

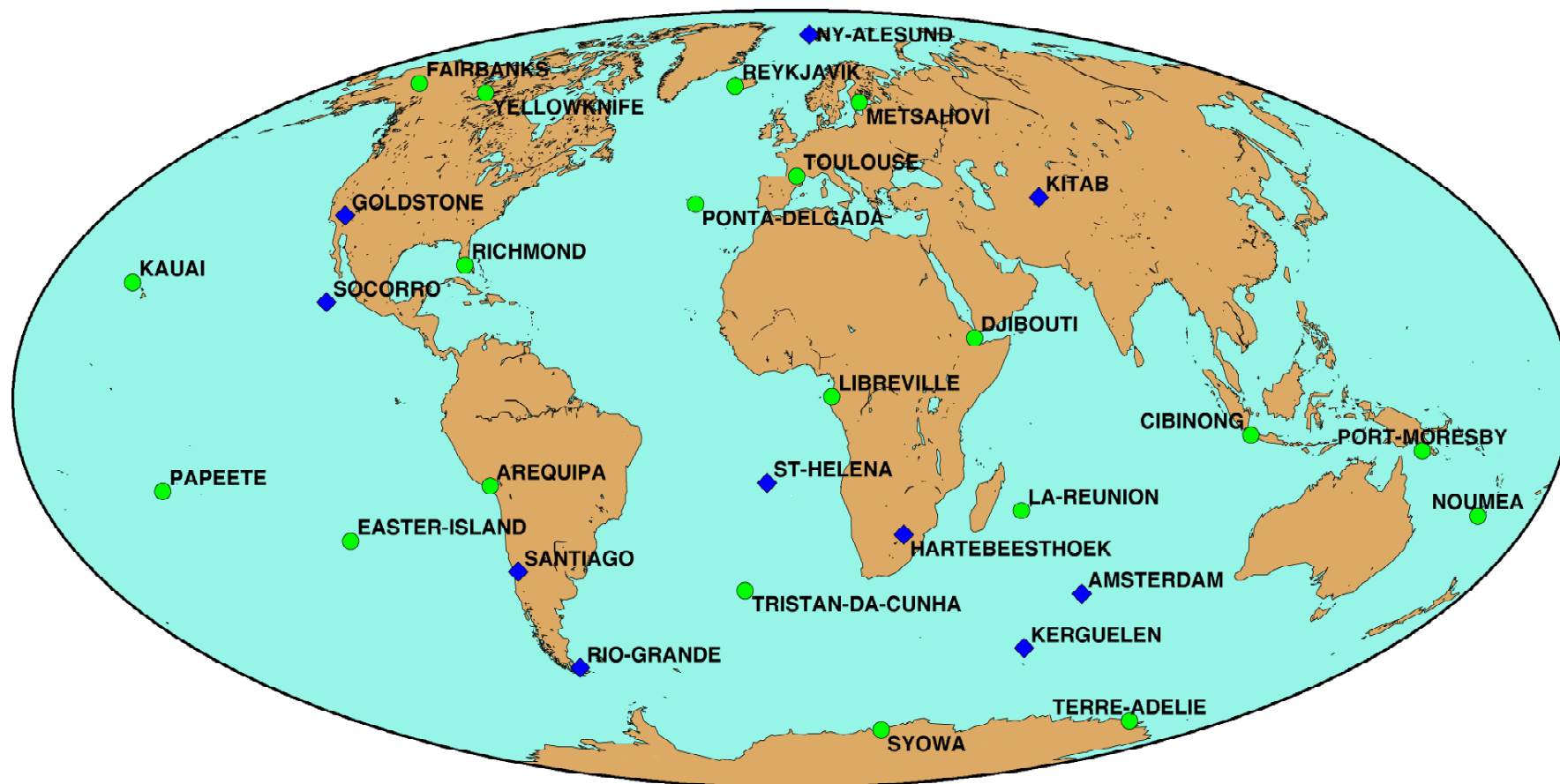
Number of colocations: theoretical vs active

DORIS +...	Theoretical	Active & surveyed
GPS	38	34
SLR	12 + 1 IDS exp.	7 + 1 IDS exp.
VLBI	13 + 1 IDS exp.	8 + 1 IDS exp.

DORIS « internal » colocations (1)

- **31 DORIS stations, out of the 56 making up the current permanent network, have multiple antenna positions (following antenna change or relocation):**
 - Two different antenna positions at 20 sites
 - Three different antenna positions at 10 sites
- **All ties between different antenna positions on the same site have been measured accurately, except:**
 - AMSA-AMSB (approximate connection planned, AMSA no longer exists)
 - HBKA-HBLA (antenna moved by host agency, no direct survey)
 - HELA-HELB (antenna change by host agency, no survey)
 - KERA-KERB (dubious KERA antenna height)
 - GOLLA-GOMA (no direct connection)

DORIS « internal » colocations (2)



● 2 DORIS antenna positions

◆ 3 DORIS antenna positions

The overall antenna stability depends on the stability of:

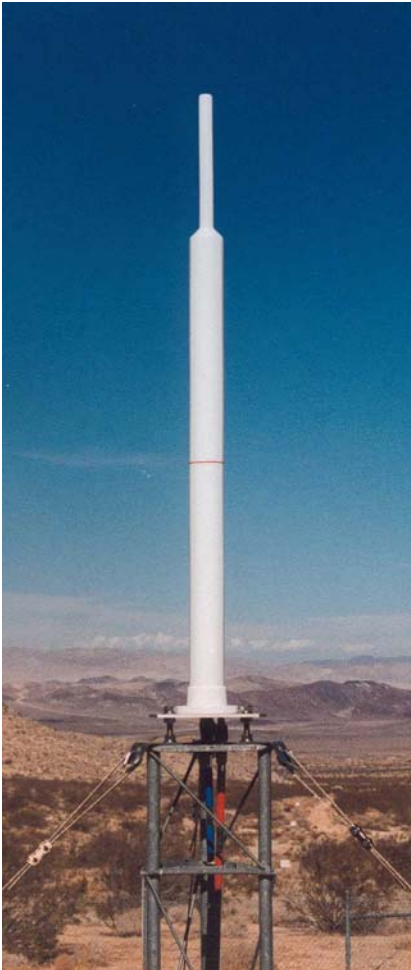
- **The mounting structure:**
 - Metal tower (guyed or not)
 - Steel pole
 - Metal interface
- **The monument on which this structure is installed:**
 - Concrete pillar or block (founded or not on the underlying bedrock)
 - Building
- **The geological structure on which the monument is located**

Antenna support: 1st generation (—>1992)



- **Stability requirement: a few cm**
(expected DORIS positioning accuracy = 10 cm)
- **Guyed metal tower: guy-wires not always placed so as to guarantee a long term antenna stability**
- **Alcatel antennas:**
 - Phase center position known to within ± 5 mm
 - Difficult to survey and center
 - No accurate verticality adjustment
 - Catches the wind
- **Measured eccentricities after more than 10 years: 1 to 5 cm**

Antenna support: 2nd generation (1993 —> 1999)



- **Stability requirement: 1 cm over 10 years
(Achieved DORIS positioning accuracy = 2 to 3 cm)**
- **Starec antennas available:**
 - Phase center position known to within ± 1 mm
 - Easy to accurately survey and center
 - Resist high winds
- **Improved guying and verticality adjustment:**
 - 3 guy-wires at 120° , whose tension is adjusted to reach a mm level centering
 - The supporting plate can be leveled so as to adjust the antenna verticality to within ± 1 mm
- **Excellent short term rigidity and stability, but long term stability still dependent on the guy-wires**

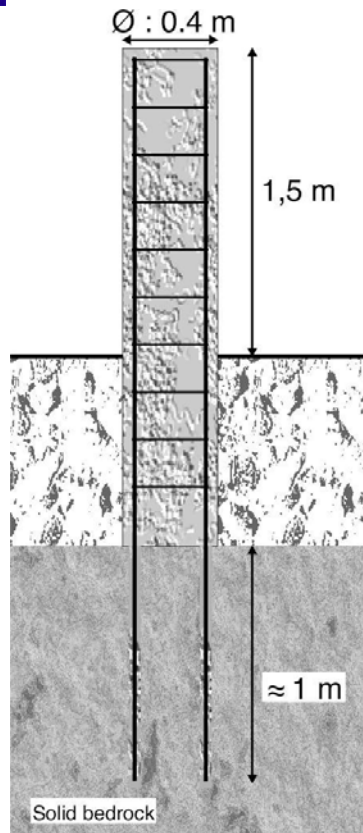
Antenna support: 3rd generation (as of 2000)



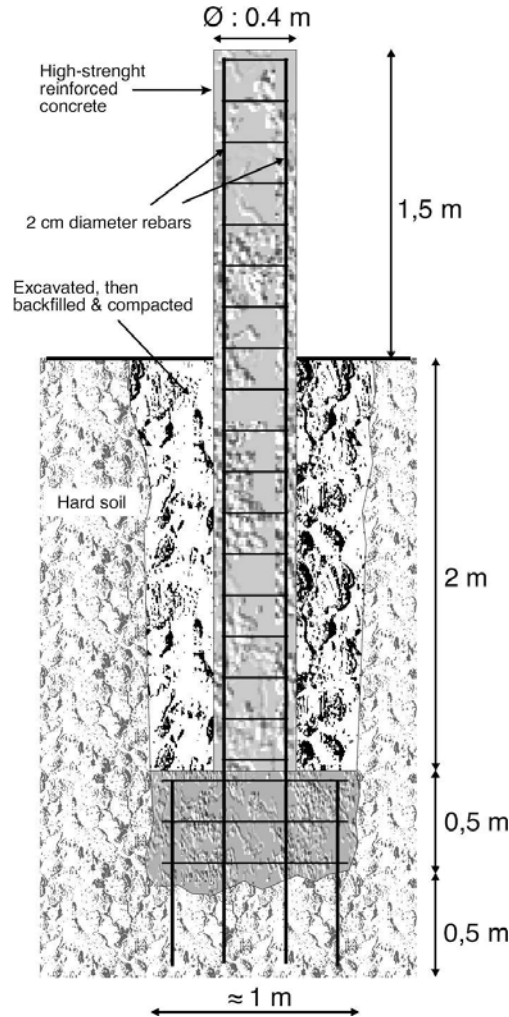
- **Stability requirement: a few mm over 10 years**
(DORIS positioning accuracy approaching 1 cm)
- **Antenna supports:**
 - Forced centering plate on a concrete monument
 - Metal mounting structures not requiring guy-wires
- **Monuments:**
 - Prefer ground installation rather than buildings
 - Concrete structure deeply anchored into the ground
(design depends on ground nature)
 - Buildings: low elevation, antenna on a load-bearing wall



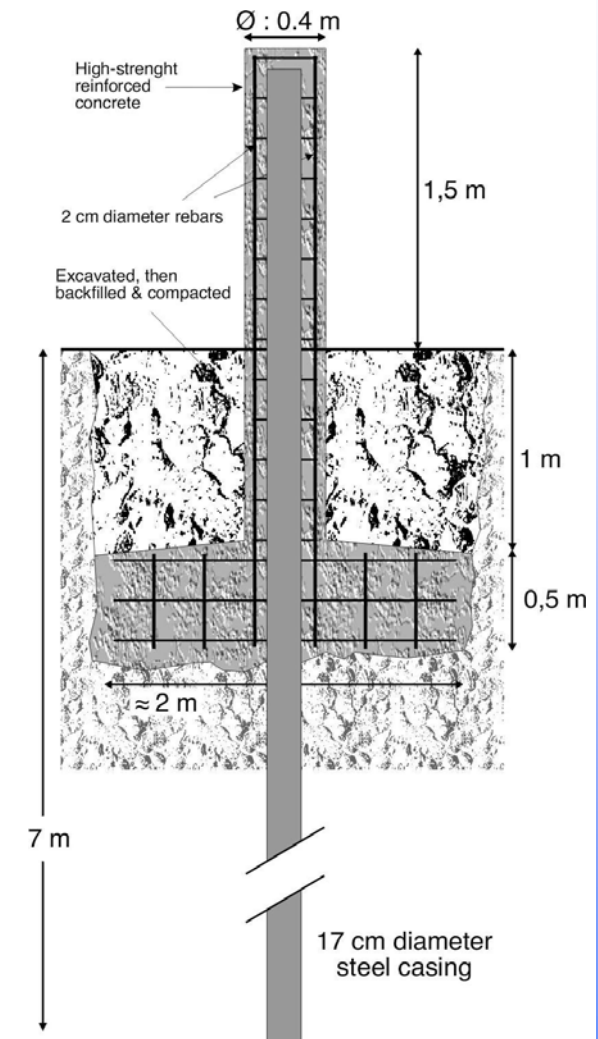
Examples of DORIS pillar designs



Bedrock at or near ground level



No bedrock, but hard soil



Soft soil

Network renovation progress: estimated antennas stability

