

Co-locations and Monumentation in the DORIS Network

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COLOCATIONS AND MONUMENTATION IN THE DORIS NETWORK

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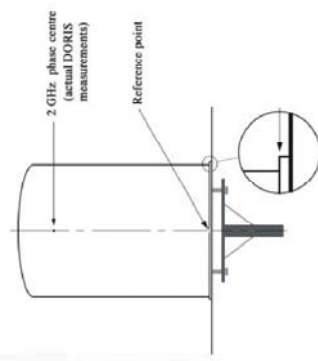


IDS

IGN

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Survey of a DORIS/Alcatel antenna



2 GHz phase centre (actual DORIS measurements)

Reference point



GPS survey using the forced centering interface

IDS

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Antenna types in the DORIS permanent network

Alcatel



- 10 stations
- Deployed 1986 → 1992
- Point identification: xxxxA

Starec



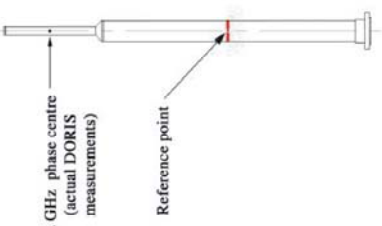
- 46 stations (+ 2 IDS experiments)
- Deployed as of 1992
- Point identification: xxxB

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Survey of a DORIS/Starec antenna



2 GHz phase centre (actual DORIS measurements)

Reference point



GPS survey using the forced centering interface

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- Not all DORIS presumed colocations have the same usefulness for the current realisation of the ITRS

29

- No colocation (17 stations + 1 DS exp.)
- 1 other technique (21 stations)
- 3 other techniques (6 stations + 1 IDS exp.)
- 2 other techniques (12 stations)

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)
 - GOLA-GOMA (no direct connection)

DORIS antennas stability: general points

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

DORIS « internal » colocations (2)



- 2 DORIS antenna positions
- 3 DORIS antenna positions

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 vertically 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

12

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13

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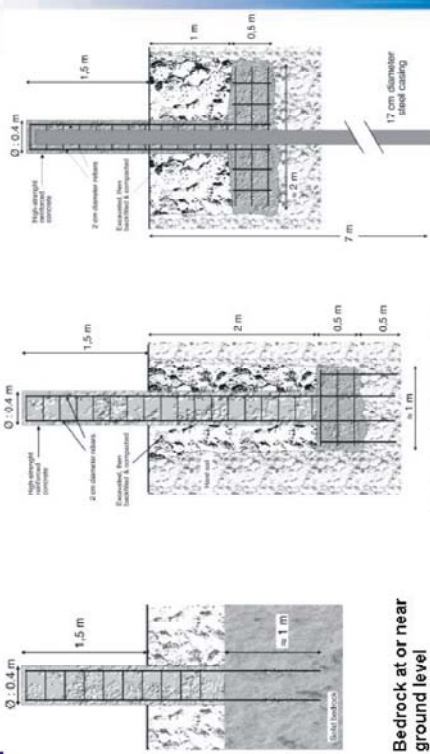
14

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Examples of DORIS pillar designs

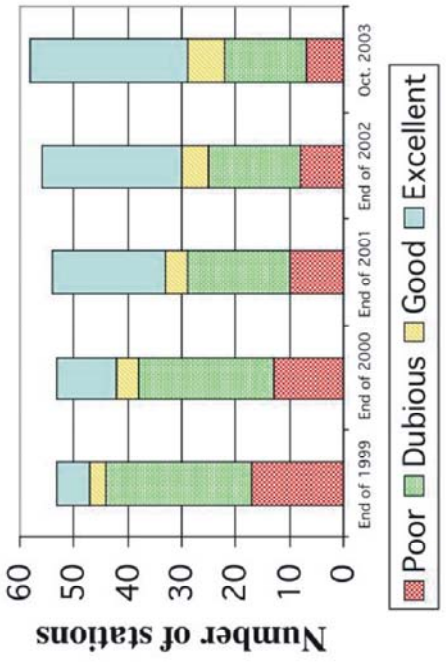


Bedrock at or near ground level

No bedrock, but hard soil

Soft soil

Network renovation progress: estimated antennas stability



Number of stations

End of 1999 End of 2000 End of 2001 End of 2002 Oct. 2003

■ Poor ■ Dubious ■ Good ■ Excellent

15

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16

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16

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17

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