NETWORK 2008 REVIEW: EVOLUTION, MAINTENANCE AND COLOCATIONS

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Network evolutions since the last IDS workshop

Since March 2006:

- 3 existing stations were completely renovated (complete equipment upgrade and new antenna support): Dionysos, Toulouse & Papeete
- 2 stations were added to the network:
  - Rikitea (replacing Rapa)
  - Betio (partly replacing Guam)
- 2 antennas were repaired following damage: Djibouti and Marion
- 10 antenna supports were modified (antenna raising) in order to remove the N-type bent connectors

Current status:

- 49 stations (out of 58 in the current network) were either installed, or renovated after 2000.
The next step: a new quality leap for the network

- The network renovation action, decided at the end of 1999, is now almost complete.

- It aimed at improving the long term stability of the antenna reference point.

- In order to also improve the data quality and quantity, new specifications were recently defined by CNES and IGN for the environment of the DORIS stations.

- All new stations, and all existing ones when modified, will have to comply with these more stringent requirements.

- Exemptions can be granted on an individual basis.

- A few stations have already been improved with this aim.

- Results are visible on the received power budget.
The main requirements

• For the beacon (and other indoor equipment):
  – Reliable and stable power supply
  – Clean environment
  – Limited temperature changes

• For the antenna support and connection:
  – Short and long-term stability
  – Direct connection of the cables (no bent connectors)
  – Minimal mechanical constraints on the connectors
  – Increased minimum curvature radius of the cables

• For the antenna environment:
  – Clear sky view above 5° (formerly 10°), measured from the antenna base
  – No metal object (likely to cause multipath) in a 5 m radius around the antenna, except the antenna support itself

• For the host agency:
  – Should be made aware of these requirements, and of the need to keep on meeting them in the long term
Antenna support upgrade

Former support

New support
Antenna support evolution example: Rio Grande (1)

Initial installation (1987):
Alcatel antenna, very loose guying

First upgrade (1995): Starec antenna,
3 m tower, good quality guying,
mm-level centring and verticality
Antenna support evolution example: Rio Grande (2)


2008: new antenna support. Cables strongly fastened to the support, direct connection of the cables.
Antenna environment improvement
Example 1: Monument Peak

2007 (before the change)

Power attenuation*

*courtesy of P.Yaya
Antenna environment improvement
Example 2: Rio Grande

2007 (before the change)

- Lightning pole
- Metal roof
- DORIS antenna
- Boarding

2008 (after the change)

Power attenuation*

*courtesy of P.Yaya
Distribution of the DORIS equipment

- 1 station (Starec antenna)
- 3 stations (2nd generation beacon)
- 54 stations (3rd generation beacon)

No more Alcatel antennas:
Operation rate since 2007-01-01

Average value: 88%
3rd generation beacons: current status & failures

Status of the 74 delivered beacons

- Operating: 72%
- Out of order, on site: 4%
- In repair: 5%
- Spares: 10%
- In transit: 9%

46 beacon failures since delivery

- 2 GHz: 48%
- 400 MHz: 22%
- Other: 13%
- OUS: 17%
The antenna failures

• The Alcatel antennas:
  – used for the initial network deployment, from 1986 to 1992
  – Still in operation at a few stations, until mid-2007
  – Accumulated operating time: 5907 month.antennas = 492 year.antenna
  – No failure at all

• The Starec antennas:
  – Deployed as of 1992
  – Accumulated operating time: almost 500 year.antenna (same sample as above)
  – Several failures on the 400 MHz channel over the last 3 years
  – About 10 antennas have been replaced, 3 more on their way

• A major issue:
  – Replacing an antenna requires to carry out a geodetic control
  – Long data loss (up to a few months)

• A corrective action is necessary:
  – Problem seems to be due to corrosion and mechanical damage to the internal 400 MHz connector
  – Issue taken into account in the evolution of the antenna design, but in the meantime?
Future evolution of the DORIS equipment

The following evolutions are being considered:

• Longer antenna cables (requiring an external amplifier):
  – More freedom for the choice of the antenna setup and support
  – Easier to meet the sky view + stability requirements
• Modified antennas:
  – Improved 400 MHz connector (failure cause)
  – Geometry control
• Modified beacon software: better battery runtime in case of power outages
• Simplified weather data acquisition: pressure sensor only

→ version 3.1, available as of 2010
Co-locations (<10 km) with other active IERS techniques
Summary of currently active co-locations

DORIS + GPS: 38 sites
  + SLR: 9 sites
  + VLBI: 6 sites
  + GPS + SLR: 8 sites
  + GPS + VLBI: 6 sites
  + GPS + SLR + VLBI: 2 sites
DORIS-DORIS co-locations

- 2 DORIS antenna positions
- 3 DORIS antenna positions
- 4 DORIS antenna positions
Tide gauges co-locations (<10 km)
Planned future evolutions

- Remaining renovations:
  - Krasnoyarsk: delayed several years (administrative delays), hopefully next spring
  - Socorro: pending a new agreement with the host agency
  - Kourou

- Continuation of the antenna environment improvement, on the occasion of maintenance trips

- New stations in project:
  - Tamanrasset, Algeria (replacement for Arlit): GPS, planned SLR
  - Riyad, Saudi Arabia: SLR + GPS co-location (agreement ready)
  - Other project: Fairbanks antenna move, or site replacement?
Planned new stations: IGN / IDS proposals
Planned new stations: Pacific Ocean coverage

Note: Fairbanks (which might be replaced by one of these projects) is not shown for better legibility