Introduction to Site Surveys for Co-location

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1. Planning and Strategies

- Site situation
  - Space geodesy observing platforms
    access / operation periods
  - Distance between observing platform
  - Availability of monumentation
- Personnel
- Equipment
  - Tripods, tribrachs
  - Theodolites/tachymeters and reflectors
  - Levelling instruments, levelling rods
  - GPS receivers and antennas
- Weather conditions
2. Site monumentation and local control network

- Control network and footprints
  2 levels of networks: close by and few kilometers distance
  - Stable permanent monumentation
    - Self centering
    - Height reference bolt
    - Thermal insulation
    - Height of pillar suitable for optical observations
    - Network geometry with sufficient lines of sight between pillars
  - Sufficient number of pillars for each technique
  - Suitable for observing between networks
  - Provisional points using tripods
3. Methods

- Local ties / observing platform stability
  Method of choice: conventional terrestrial surveying
  - Determination of ground network coordinates
    * Height (control) of pillars with levelling instruments
    * Establish scale of network using electronic tachymeters
    * Triangulation
  - Determination of technique reference point
    * Develop model for indirect representation
      heavily depends on local situation
    * 3D forward intersects for markers

- Transformation into geocentric system
  - GPS observations of sufficient duration on “identical” points

- Footprints
  - Method of choice: GPS observations
    * Control of footprint points
    * Permanent or campaign type observations
      Permanent requires infrastructure and security of footprint points
4. Equipment

- Survey instruments
  - Tripods, tribrachs
  - Forced centering
  - Theodolites/tachymeters and reflectors
  - Levelling instruments, levelling rods
  - GPS receivers and antennas

- Calibration of survey instruments
  - Electronic distance meters and reflectors
  - Levelling instruments
5. Data Analysis

- Least squares adjustment
  - Raw analysis on site to detect blunders and missing elements
  - Final Adjustment

- Results
  - SINEX file
  - Report

6. General Comments

- Redundancy of measurements
- Repeated surveys for control of stability