From Relative to Absolute Antenna Phase Center Corrections

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Current Situation

- GPS antenna offsets and phase center variations (PCVs) are critical part of measurement chain
- Relative calibrations (wrt AOAD/M_T) currently in use;
  - Inadequate for long baselines
  - Long term problems with vertical reference system
  - No calibration below 10 degrees elevation
- Absolute calibrations determined from robot measurements & anechoic chamber
- Satellite calibrations currently not in use
- Given satellite phase center offset, PCVs need to be determined from observations?
- Satellite calibrations must be coordinated with absolute antenna calibrations – constrained scale needed?
- Azimuthal effects not included (ANTEX proposed)
Oral Presentations

• New Anechoic Chamber Results and Comparison with Field and Robot Techniques  Görres, Campbell, Siemes, Becker

• Estimation and Validation of the IGS Absolute Antenna Phase Center Variations  Ge, Gendt

• Impact of Absolute Antenna Phase Center Corrections on Global GPS Solutions  Schmid, Thaller, Steigenberger, Rothacher, Krügel

• The Effect of SCIGN Domes on the Vertical Phase Centre Position in Routine Data Analysis  Schmidt, Dragert, Lu, Schofield

• Local Monitoring of a Fundamental Site with GPS  Rothacher, Lechner, Schlüter
Poster Presentations

• Size Reduction of GPS Antenna’s Ground Planes with High Level of Multipath Protection, Tatarnikov

• The Impact of the PCV Parameters in the Coordinates Estimates, Barzaghi, Borghi

• The Effect of SCIGN Domes on the Vertical Phase Centre Position in Routine Data Analysis, Schmidt, Dragert, Lu, Schofield

• Absolute Field Calibration of Carrier Phase Multipath with a Precise Robot, Dilßner, Seeber, Feldmann, Wübbena, Schmitz, Bachmann
• Agreement between anechoic chamber and robot absolute calibrations is excellent.
• Satellite phase center offset comparisons are fair, while satellite PCV agreement is excellent.
• Satellite calibrations are not consistent within a block.
• Absolute calibrations show time series jumps but less elevation cutoff dependence and improved tropospheric comparisons.
• Radomes can introduce variable amounts of elevation dependent phase changes which distorts height.
• Local networks and antenna/receiver arrays may be necessary for reference frame maintenance at 1 mm-level over decades.
Issues

- Correlation between satellite antenna phase center offsets and terrestrial scale
- Time dependence of the terrestrial scale as the mix of satellite types changes
- Timing of the switch from relative to absolute antenna phase center models:
  - Quantification of magnitudes of effects and decision on when effects are well enough known to warrant re-processing.
  - Expectation is that re-processing will need to be repeated a number of times over the next decade.
Recommendations of Position Paper

- **Antenna / Radome combinations**
  - Avoid whenever possible
  - Forbid domes that do not have reproducible calibrations
  - Allow only domes mountable with reproducible physical relation to the antenna
  - Enter calibrated combinations into igs_01.pcv
- **Introduce antenna subgroups into rcvr_ant.tab & igs_01.pcv**
- **Ideally IGS00 sites should install local antenna arrays for long term stability.**
- **ANTEX format needs to be officially adopted.**
Timescale for decision on absolute phase center models.

• Absolute receiver & satellite antenna calibrations should be officially adopted:
  – By June 2004: Reconcile satellite antenna phase center patterns and offsets between the groups generating these results.
  – Sep-Dec 2004: IGS AC submission of final products with both relative and absolute phase center models used.
  – March 2005: Adoption of new phase center models

• Issues:
  – Values for old PRNs and blocks (particularly Block I) needed.
  – Possible time dependence of values as fuel expended on satellites.
  – Elevation angle cut off tests with relative and absolute models and orbits free.