VLBA Phoenix Navigation Re-Demonstration

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In Many Ways, a Re-Run of 2004 Spacecraft Navigation Pilot Project

Had Already Demonstrated VLBA’s Capabilities
… for high-precision angular position measurements;
using only standard VLBA phase-referencing techniques;
observing only modulated or unmodulated downlink carrier.

But Did Include Some Interesting New Features
Concentrated, targeted observations of single spacecraft.
Dual-spacecraft relative astrometry.
Near-real-time experiment.
Concentrated, Targeted Observations of Single Spacecraft

Tracked Phoenix During Recent Mars Approach

X-band transmitter on interplanetary spacecraft
  … *not* Mars lander’s 400-MHz link.
Increasingly frequent runs as landing date approached.
Accurate pre-determination of reference quasar positions.
  … including one source common to all observations.
Essential preliminary tests re-established 2004 capability.
  Updated leap-second table in NRAO’s version of SPICE code.
  Re-started EOP fetching in JPL’s analysis code.
  One measurement simultaneous with JPL Delta-DOR run.
Dual-Spacecraft Relative Astrometry

Use Position of Orbiters as Proxies for Mars

- Feasible for important special case of approach to planets.
- Depends on accurate model of orbiters’ motion.
- Frees measurement from dependence on quasar references.

- Difficult, in general, to find suitable sources close enough to spacecraft.
- Spacecraft downlink signals generally stronger than closest references.

- Makes possible narrowband e-VLBI data transmission to AOC.

Near-Real-Time Experiment

- Additional feature of project.
- Separate talk by Walter Brisken, tomorrow morning.
Thank you