ACES MWL Data analysis preparation status

F. Meynadier, P. Delva, C. Guerlin, C. le Poncin-Lafitte, P. Laurent and P. Wolf

SYRTE (Observatoire de Paris, LNE, UPMC, CNRS)
ACES microwave link setup


Two-way measurement cancels range + tropospheric delay at 1st order

General case
one measurement each 80 ms on ground and in space

Λ configuration (interpolated)
minimizes effects due to range + tropo delay at 2nd order
Global flowchart (part 2)

TEC

Δ conf.

$(\tau^g, \tau^s) \times 4$

Interpolation

- Int. Orbito
- Int. $\Delta \tau f_1$
- Int. $\Delta \tau f_2$
- Int. $\Delta \tau f_3$

Tropo model

- Iono delay calc.

- new $\Delta$ tropo
- new $\Delta$ iono

Desynchronisation

Range + tropo delay

Desynchro $\times 4$

Range + Tropo. delay $\times 4$
Status of modules

- Preprocessing: Large amount of work done to adapt to the hardware.
- Calibration: This relies on output from ongoing calibration campaigns.
- Tropospheric model: Saastamoinen model implemented and tested against realistic simulation.
- Ionospheric delay: implemented and tested (different magnetic field models in simulation and analysis).
- $\Lambda$ configuration: implemented.
- Two-way desynchronisation, range + tropo delay: implemented and tested on simple simulations, complexity gradually increased.

+ «pre-preprocessing», reference systems & timescales transformations...
Simulation status

We can now simulate:
- constant range or constant doppler between stations
- keplerian orbits
- «real» orbits (from SP3 ISS orbitography files)
- tropospheric delay
- ionospheric delay
- multipath
- non-null initial desynchronisation
- gravitational redshift
- single and multiple passes
- for all frequencies

What remains to be done: carrier phase ambiguity, clock noises

*Data transmitted to ADS for ground segment tests*
Testing «realistic» scenarios

Residuals between theoretical (input) data and results of the processing chain with

- keplerian ISS orbit
- atmospheric delays
- gravitational redshift
- 0.1 ms initial desynchro
Residuals of desynchronisation between theoretical (input) data and results of the processing chain, with

- keplerian ISS orbit
- atmospheric delays
- gravitational redshift
- 0.1 ms initial desynchro