The GP-B satellite is controlled to roll with a period of 77.5 sec about an axis along the direction to the guide star.

- Disturbance torques fixed to the body of the satellite are averaged out.
- Gyroscope readout noise is reduced.

The roll phase is required in the data analysis to separate the drifts of the gyroscope spin axes in the orbital plane and perpendicular to the orbital plane.

The roll phase is determined on the ground to high accuracy with telemetry data from star trackers.

**Objective of Analysis**
- Determine roll phase, referenced to true north, of Quartz Block relative to apparent star positions.

**Star tracker data includes:**
- Centred positions on CCDs
- Star magnitude
- Time of centred detection
- Star identification
- Pair-wise pattern matching to catalog using high occupancy bins of histogram of angular separation, difference in angle to IM Peg, and magnitude difference.
- Typically ID 10-25 stars per roll period per tracker.

**Estimation at 2 sec intervals:**
- Star detection frequency dependent fit over several roll periods
- Typically ID 10-25 stars per roll period per tracker.
- Time of centroid detection

**Sensors are attached to a**
- Close-loop control of the satellite are mounted on the graphite ring around the dewar of the satellite.
- Two Attitude Reference Platforms (ARPs) are mounted on the graphite ring around the dewar of the satellite.
- One control gyroscopes package and one star tracker are mounted on each ARP.

**Disturbances (estimated from data):**
- Roll pointing errors relative to commanded values.
- Mechanical distortions between sensors and quartz block.

**Conclusions**
- The error of the roll phase determined on the ground is 7 arcsec (RMS). The peak-to-peak value of the roll phase error is less than 80 arcsec.
- The error of time conversion between the vehicle time and UTC is less than 2x10^{-6} sec. The time latency between effective sample time of science data and stamped vehicle time is verified to an accuracy of 1x10^{-6} sec in the ground tests.