
# ILRS Tracking Support of GP-B

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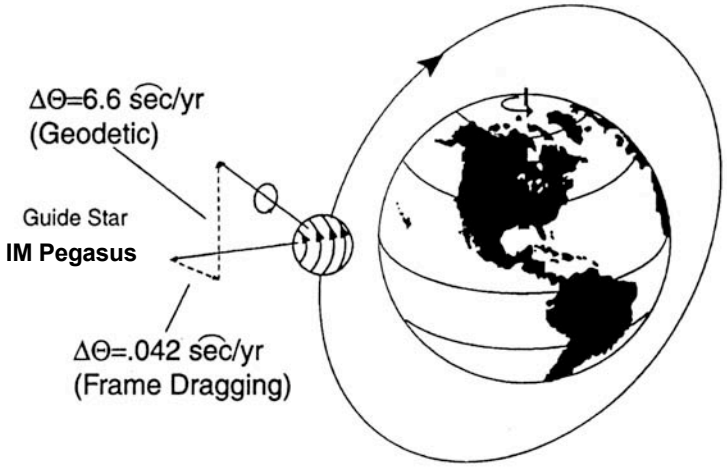
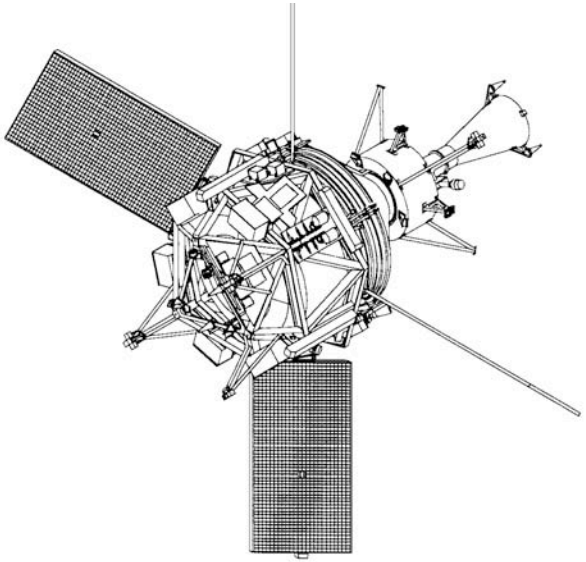
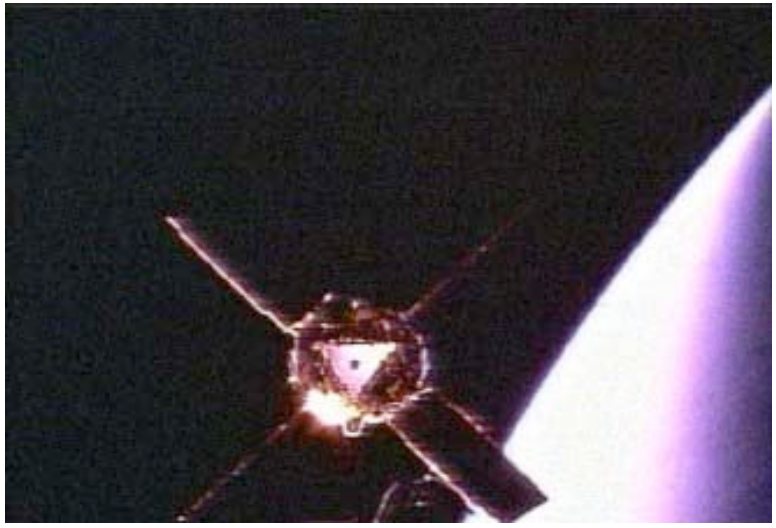
# Gravity Probe-B

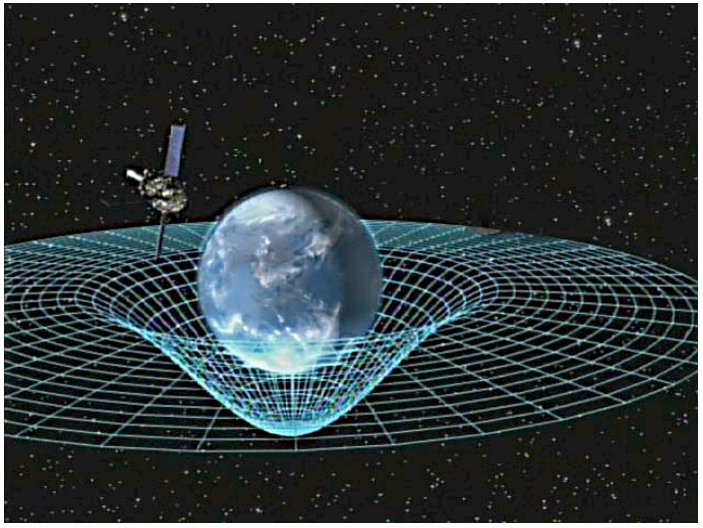
- GP-B relativity experiment successfully launched
  - One month into mission, spacecraft performance remains nominal
  - Drag-free system successfully tested
  - Expect to enter 13-month science phase in one month
- Expected to verify frame dragging on an ultra-precise gyro to better than 1%
- SLR data for orbit verification and backup orbit determination
  - Inertial pointing attitude and limited field of view of the array will limit laser tracks to ~4 minutes or less mostly over the Northern hemisphere



# Successful Launch !





International Laser Ranging Service

# WEEKLY HIGHLIGHTS FOR 4 JUNE 2004:

## GRAVITY PROBE B MISSION UPDATE

After six weeks in orbit, the spacecraft continues to be healthy, with all subsystems performing well.

Over the past two weeks, with the arrival of summer in the Northern Hemisphere, the spacecraft emerged from being partially eclipsed by the Earth each orbit to being in full sunlight continuously.

The spacecraft's orbit is stable and meets our requirements for transition into the science phase of the mission.

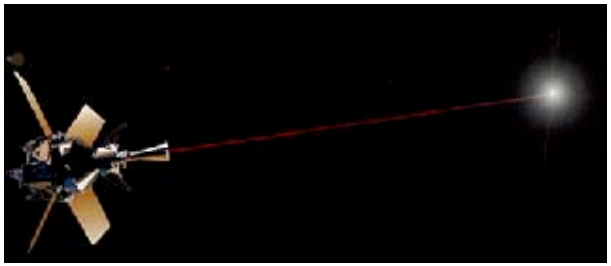
All four gyros remain digitally suspended, and all are spinning very slowly.

Progress in locking the on-board telescope onto the guide star, IM Pegasi, has been slower than anticipated, but this afternoon, as these highlights were being posted, we achieved this important milestone.

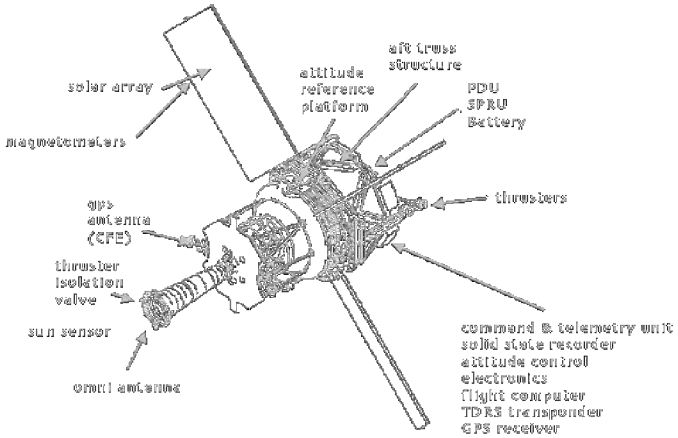
(We'll have more information about locking onto IM Pegasi in next week's Highlights.)

# Gravity Probe B (GP-B)

- Launch on April 20 at 9:57:24 a.m. PDT
- Relativity gyroscope experiment developed by NASA and Stanford University to test two unverified predictions of Einstein's general theory of relativity
- Satellite consists of 4 gyroscopes, quartz telescope, GPS receiver, and retroreflector array
- 16 month mission; tracking will commence 5-6 weeks following launch
- Satellite tracking provided by GPS and SLR
- SLR predictions will be generated by two centers
- Project will generate station pass list distributed through normal prediction channels



*Photos and background information from http://einstein.stanford.edu/*



# GP-B Orbit Configuration

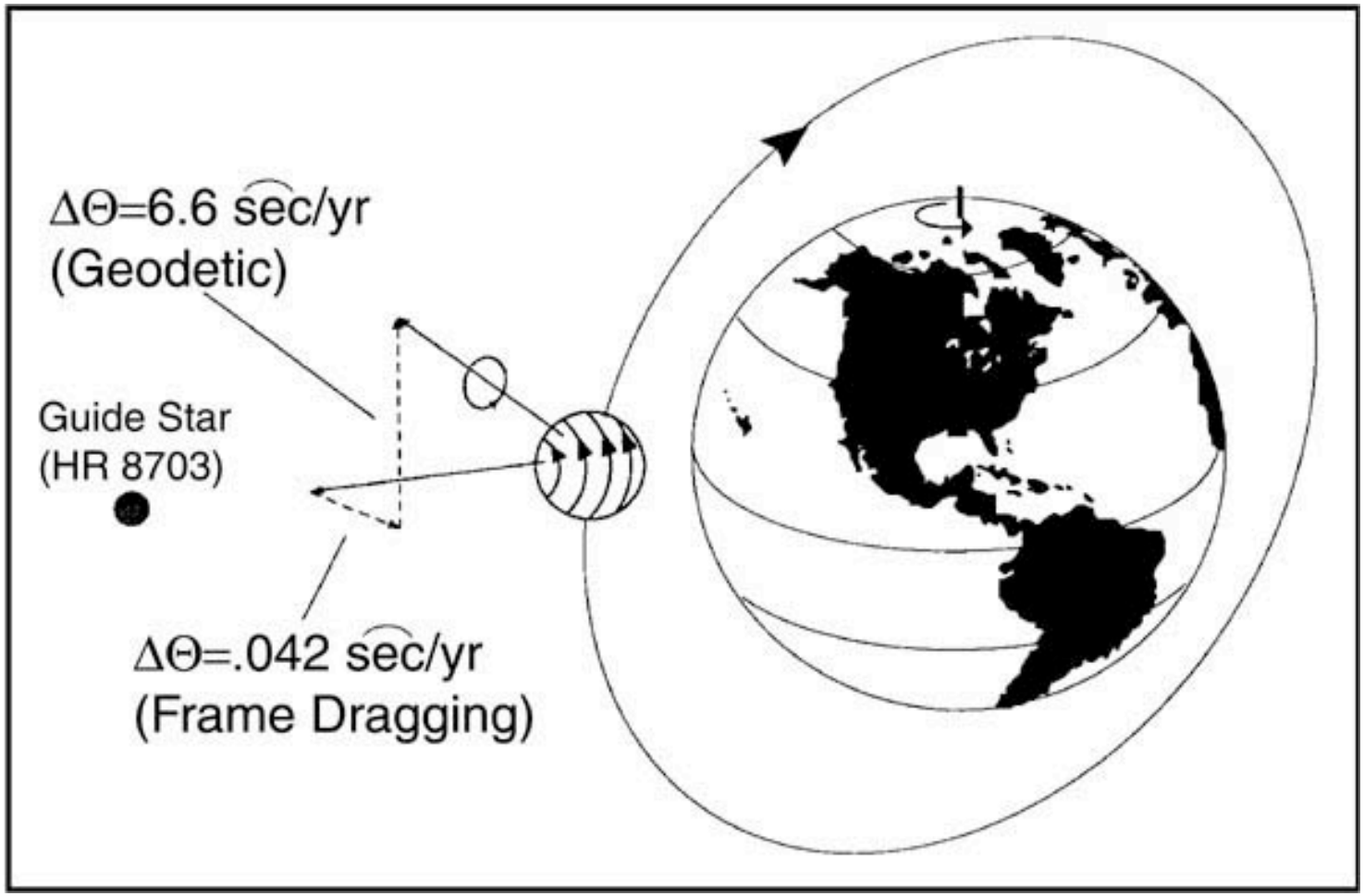



*Photo from http://einstein.stanford.edu/*

# ILRS Support of GP-B

- HTSI will generate daily predictions using SLR data
- CSR will generate predictions using SLR and GPS data
- Stanford U. will provide station viewing tables
  - Because of pointing requirements of the satellite, nearly half of the available passes cannot be tracked
  - Five-degree minimum elevation angle
  - Single file with available passes for all stations
  - Distributed through ILRS predictions exploder and available at CDDIS and EDC ftp sites
  - E-mail format: `Subject: GP-B GLOBAL PASS LIST STANFORD`
  - Filename format: `gpb_globalpasslist_YYMMDD.stanford`

# GP-B Sample Station Viewing Table

```
Satellite         :  GP-B
Generation Date   :  2004-05-20 20:20:34 [UTC]
Generated by      :  GP-B Mission Operations / Stanford University
Minimum Elevation :  5 deg
```

| ID | SAT | Start Date/Time [UTC] | End Date/Time [UTC] | MaxEl [deg] | Durtn [min] |
|---|---|---|---|---|---|
| 1824 | GP-B | 2004-06-01 03:20:20 | 2004-06-01 03:24:36 | 29 | 4.3 |
| 1824 | GP-B | 2004-06-01 04:57:54 | 2004-06-01 05:02:07 | 31 | 4.2 |
| 1824 | GP-B | 2004-06-01 16:01:59 | 2004-06-01 16:05:03 | 26 | 3.1 |
| . | | | | | |
| . | | | | | |
| . | | | | | |

| ID | SAT | Start Date/Time [UTC] | End Date/Time [UTC] | MaxEl [deg] | Durtn [min] |
|---|---|---|---|---|---|
| 7824 | GP-B | 2004-06-01 06:38:05 | 2004-06-01 06:41:57 | 86 | 3.9 |
| 7824 | GP-B | 2004-06-01 19:16:04 | 2004-06-01 19:16:14 | 5 | 0.2 |
| 7824 | GP-B | 2004-06-02 07:03:30 | 2004-06-02 07:06:06 | 39 | 2.6 |
| . | | | | | |
| . | | | | | |
| . | | | | | |
| 7824 | GP-B | 2004-06-29 16:11:02 | 2004-06-29 16:11:35 | 7 | 0.5 |
| 7824 | GP-B | 2004-06-30 03:59:54 | 2004-06-30 04:00:32 | 25 | 0.6 |
| 7824 | GP-B | 2004-06-30 16:35:05 | 2004-06-30 16:36:35 | 13 | 1.5 |

| ID | SAT | Start Date/Time [UTC] | End Date/Time [UTC] | MaxEl [deg] | Durtn [min] |
|---|---|---|---|---|---|
| 7831 | GP-B | 2004-06-01 15:59:08 | 2004-06-01 15:59:28 | 6 | 0.3 |
| 7831 | GP-B | 2004-06-02 03:49:17 | 2004-06-02 03:52:33 | 60 | 3.3 |
| 7831 | GP-B | 2004-06-03 04:14:05 | 2004-06-03 04:17:12 | 57 | 3.1 |
| . | | | | | |
| . | | | | | |
| . | | | | | |
| 8834 | GP-B | 2004-06-30 16:39:04 | 2004-06-30 16:39:24 | 6 | 0.3 |