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Gravity Probe B Relativity Mission

PROCEDURE FOR

Cryo Focal Position Measurement of Science Telescope For Cryo Focal Test

GP-B P0252 Rev -

June 18, 1997

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Cryo Focal Position Measurement for Science Telescope For Cryo Focal Test

RE: Suwen Wang
DATE: June 18, 1997
ESTIMATED DURATION: 1 week

Objective:

To determine the focal position of Science Telescope at 4.2 K.

Requirements:

- Procedure to be performed by certified personnel only.
  Certified personnel for the test:
  Suwen Wang
- Procedures as described in Pdoc P0251 complete.

Calibrations:

- The artificial star is calibrated for its collimation using the self contained knife edge device.
- Other measurements are relative and require no calibration.

Precautions:

- Science Telescope is made of fused quartz, a fragile material. Extra precaution is to be taken during all handling to prevent damaging the Telescope.

Conditions for the test:

- Telescope under test:
  Dwg No: 25091-204 Rev - _____.
  Telescope Serial No. _____.
- Test to be performed in artificial star #2 lab.

	Signed	Date
1. Procedures for telescope probe/test dewar integration:		
Lift the probe up by 1/2" with the hoist and move away the probe cart.	____	____
Assemble the copper tube to the outside of the vacuum can.	____	____
Attach heater and thermometer wires.	____	____
Use masking tape to protect the heater and thermometer wire pin connectors.		
Lower the probe down into the dewar carefully to ensure the centration of the probe o.d. with respect to the dewar i.d.	____	____
Tie down ten bolts which holds the probe onto the dewar with 6 in-lb torque.	____	____
Remove the lifting plate from top of the probe by unscrew ten screws.		

Procedures for attaching the probe/dewar assembly to the artificial star: ____ ____

Connect the cables for the readout electronics. ____ ____

Use a flash light to direct light into the telescope and look for signal changes in the detector readout to verify the functionality of the detectors.

Pump the suspension tires to about 50 psi. ____ ____

Manipulate the dewar/probe assembly to beneath the star.

Align the screw holes on top of the probe to those on the star.

Deflate the suspension till the gap of the star and telescope is about 1/4". ____ ____

Place 10 1/4-20 screws from below top of the probe. ____ ____

Further deflate the suspension till the gap is almost zero. ____ ____

Tighten all the screws. ____ ____

Pump the suspension back to 55 psi. Now the dewar and telescope probe assembly should be suspended from the floor. ____ ____

Align the star beam such that the focused beam would fall on to two of the 4 detectors of the quad across the direction of the intended scan. ____ ____

____ ____

____ ____

____ ____

4. Measurement of the focal position

4.1 First, the focal position is measured at room temperature by changing the collimation of the star such that it is equivalent to the detector being +/- 0.15" from the telescope focal point along the optical axis and monitor the slope in the mid portion of the scan curve. Such measurement is achieved by adjusting the fiber tip location of the artificial star light source and running my software FocusScan.

The data were recorded in files named scan_Dir#_date

where:

Dir can be either x or y for the scan direction

is the serial number of the scan of the day

date is the date in the format of m/d/y

The data format of the file is in column vectors. They are ordered in the following manner:

x(arc sec) y(arc sec) chan1(V) chan2(V) chan3(V) chan4(V)

y column is always 0 in this test.

Enter the file names in Table 1.

4.2 The telescope is then cooled to 4.2K.

4.3 The procedure described in 4.1 is repeated at 4.2K.

4.4 The data is analyzed by IgorPro software. The peak position of the slope should be at the position of the fiber where the star is collimated at room temperature. The peak position of the slope at 4.2 K relative to that at room temperature indicates the change of the telescope focal position. A positive change means a focal position shift away from the corrector plate while a negative change indicates a shift towards corrector plate.

Table 1. File Names for Focal Scans

File Path Name: ____.

Temperature	Scan Sequence #	Date	Position from focal point

4.5. Procedure 4 complete.

Signed: ______________________ Date: ______________________

5. Characterization of the windows systems.

5.1 A Zygo interferometer and 6" Homosil flat is used for the transmitted wave front measurement of the windows systems. Any focal error measured should be incorporated into the result of the focal position change.

5.2 The 6" Homosil flat is first placed with side A facing upwards.

5.3 The interferograms are taken at both room temperature and 4.2 K. The measurement at 4.2 K should be made no earlier than 10 hours after the cool down. Record file names in Table 2.

5.4 The 6" Homosil flat is flipped with side B facing upwards and letter marking stay at the same clocking location. Procedure 5.3 is then repeated.

5.5 The summation of the measurements in 5.3 and 5.4 in the telescope clear aperture region provides information for the windows effect for the focal test.

Table 2. File Names for Windows Wavefront Measurment

Path Name: ____

Temperature	Up side	Date	Sub dir name	File Name

5.6 Procedure 5 complete.

Signed: _____ Date: _____