W. W. Hansen Experimental Physics Laboratory

STANFORD UNIVERSITY

STANFORD, CALIFORNIA 94305 - 4085

Gravity Probe B Relativity Mission

SCIENCE DOCUMENT FOR

Science Telescope Perpendicularity of Readout Axes at 4K (P0239 Rev.-)

GP-B S0655 Rev -

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Prepared by: Suwen Wang — **Date**
Test Engineer

4/25/02

Approved by: M. Keiser — **Date**
Chief Scientist

4/25/02

Approved by: D. Ross — **Date**
Quality Assurance

4/25/02

Approved by: R. Whelan — **Date**
Systems Engineering

4/25/02

Approved by: B. Muhlfelder — **Date**
Hardware Manager

for Tom Langenstein 4/25/02

T. Langenstein — **Date**
ITAR Assessment Performed
ITAR Control Required ____YES X NO

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Introduction

This report is an addendum to Science Telescope Perpendicularity of Readout Axes at 4 K GP-B P0239 Rev. – Dated January 16, 1998, which corrects the deviation of the readout axes from perpendicularity from 0.38 Degrees +/- 0.64 Degrees to 0.38 Degrees +/- 0.20 Degrees.

Addendum

This addendum is intended to explain in detail how the value of 0.38 Degrees +/- 0.20 was obtained. The numbers presented in Table 1 are from Step 1.6 of P0239 Rev.- Dated 16 January 1998 and are from the Telescope #3 Perpendicular Test plots.

Number	X axis(Degrees)	Y axis (Degrees)	Total (Degrees)
1	3.506	3.499	
2	2.342	3.570	
3	3.544	3.322	
4	2.715	3.543	
5	3.774	3.675	
6	2.734	3.712	
7	3.612	2.629	
8	2.685	2.896	
9	3.259	3.432	
10	2.545	3.497	
11	3.087		
12	2.209		
Average	3.001	3.376	0.38
Standard Deviation	0.532	0.347	0.64
Measurement Error	0.160	0.116	0.20

Table 1. Summary of Data

The average row gives the average of data points for each axis. The total average is the difference of the averages of each axis. The standard deviation row gives the standard deviation of the numbers of each axis. The total standard deviation is the Root Sum Square (RSS) of the two axes since these errors are independent. The average and standard deviation numbers were obtained by creating waves in Igor software and use the statistical analysis command for each of the waves.

The measurement error is the standard deviation divided by the square root of N-1. Here N is the number of data points which is 12 is for the X axis and 10 for the Y axis. The total measurement error is the RSS of measurement error of each axis.

In the original P0239 Rev.- Document the standard deviation (0.64 degrees) was used as the error bar which results in an over estimate of the error bar. A more reasonable error bar should be the measurement error (0.20 degrees).

Summary

The value of 0.38 +/- 0.20 Degrees satisfies the requirement of T003/7.3 Orthogonality which states that the two readout axes of the Science Telescope shall be orthogonal to each other to within 1 Degree.