GRAVITY PROBE B

PROCEDURE FOR

PAYLOAD VERIFICATION

TRAPPED FLUX MEASUREMENT PROCEDURE

Run #_____

Prepared by: B. Muhlfelder

Approvals: *If the procedure involves operations which may affect SQUID Readout health (e.g., connecting to SQUID connectors or applying voltage to gyro electrodes), B. Muhlfelder must be included in the approval block.*

Program Responsibility	Signature	Date
B. Muhlfelder *SQUID Hardware Test Leade*r		
R. Brumley *Gyro Manager*		
M. Taber *Payload Test Director*		
M. Anderson GP-B System Engineering		
D. Ross GP-B Quality Assurance		
S. Buchman GP-B Hardware Manager		

NOTES:
Level of QA required during performance of this procedure:
__X__ Stanford QA Representative
__X__ Notification of Government QA Representative

All redlines must be approved by QA. Redline authority: J. Lockhart, B. Muhlfelder

Revision Record:

Rev	Rev Date	ECO #	Summary Description

Acronyms and Abbreviations:

Acronym / Abbreviation	Meaning

A Scope

This document is the Test procedure to verify the trapped flux level in the GP-B flight gyroscopes. 1, 2, 3, or 4 gyroscopes may be tested using this procedure. Rev C SQUID readout electronics (non-flight) are to be used to carry out this test.

B Requirements Verification

B.1 Low frequency SQUID data required for verification per requirement (section 1.5 of T003).

C Configuration Requirements

The trapped flux measurement requires that the gyroscope be levitated and spinning. The Probe must be pumped upon to minimize the amount of exchange gas. The test will be performed under the environmental conditions existing in the payload test area of HEPL.

D Hardware Required

D.1 Flight hardware required

Description	No. Req'd
Probe C with 4 flight SQUIDs attached to 4 gyroscope readout cables	1
65113-1C34292 Probe C/ SM Dewar Assembly	

D.2 Commercial test equipment

Equipment	Model	Serial Number	Calibr. Exp. Date
Laboratory Power Supplies	Tektronix PS281		
Digital Multimeters	Keithley Model 196		
Oscilloscope	Tektronix TAS 220		
Strip Chart Recorder			
Standard Test Cables	Various		

D.3 Mechanical/Electrical Special test equipment

Description	Part No.	Rev. no.	Serial No.	Certification Date
Rev C SQUID Electronics(fwd/aft)				
And related Cables				

D.4 Tools

Description	No. Req'd
Various hand tools	A/R

D.5 Expendables

Description	Quantity
None	

E Software Required

E.1 Flight Software

Flight Software Name	Version No.
None	

E.2 CSTOL Scripts

CSTOL Script Name	Version No.
None	

E.3 SPC Scripts

SPC Script Name	Version No.
None	

E.4 Test Support Software

Test Software Name	Version No.
None	

F Procedures Required

P0476 is the EOS/ESD risk mitigation plan. P0481 is the gyro levitation procedure and this procedure will appear on the Payload test travel sheet. P0498 is the SQUID electronics acceptance procedure and as such will not appear on the Payload test travel sheet. It is for reference only. This procedure must be completed prior to starting the trapped flux measurement procedure. Verify P0498 has been completed _____. P0516 is the spin up procedure. This procedure appears on the Payload test travel sheet. P0559 is the probe pump out procedure. This procedure appears on the Payload test travel sheet.

G Equipment Pretest Requirements

Equipment	Serial No.	Test Required	Proc. No.	Test Performed Date	By
Rev C Electronics	Head: Cont:	P0498	P0498		
Rev C Electronics	Head: Cont:	P0498	P0498		
Rev C Electronics	Head: Cont:	P0498	P0498		
Rev C Electronics	Head: Cont:	P0498	P0498		

H Personnel Requirements

Test Leader: B. Muhlfelder
Test Engineers: J. Lockhart, G. Gutt, M. Luo, R. Brumley
QA: D. Ross, R. Lesse

I Safety Requirements

The hardware used is this test is ESD/EOS sensitive. In addition to the items listed below, the test leader must read the EOS/ESD Risk Mitigation Procedure P0476 _____ (Barry Muhlfelder).

I.1 Electrical mating and demating of flight hardware connectors

I.1.1 Connection and disconnection shall be performed only when the equipment involved is in a powered-down state.

I.1.2 Connector savers are to be used unless otherwise specified.

I.1.3 Connectors shall be inspected for contamination and for bent, damaged, or recessed pins prior to mating.

I.1.4 Grounded wrist straps are to be worn prior to removal of connector caps or covers and during mating/demating operations.

I.1.5 ESD-protective caps or covers are to be immediately installed after demating of connectors.

Examine all mating connectors before attempting to mate them. Remove any foreign particle. Look for any damaged pins or sockets. Do not force the coupling action if excessive resistance is encountered. Ensure that key ways are aligned.

J General Instructions

J.1 Redlines must be approved by QA.

J.2 Any nonconformance or test anomaly should be reported by a Discrepancy Report. Refer to the Quality Plan, P0108, for guidance. Do not alter or break test configuration if a test failure occurs; notify quality assurance.

K DELETED

L Operations

L.1 *Notify via email the ONR government representative 24 hours prior to starting test_____ (bm)*

Notify via email QA 24 hours prior to starting test_____(bm).

L.2 Set up: SQUID #1 reads out gyro #1, SQUID #2 reads out gyro #2, SQUID #3 reads out gyro #3 and SQUID #4 reads out gyro #4. Indicate here which

gyroscope trapped flux signals are to be measured in the running of this procedure.
GYRO #1_____
GYRO #2_____
GYRO #3_____
GYRO #4_____

L3: Rev. C Electronics Setup and Test

Verify that the required SQUIDs are flux locked (in which case skip these setup steps) or flux lock the required SQUIDs using the following operations.

Make the following settings on the power supplies: Current Coarse adjustment to 70 - 80 % of full scale; Volts/Amps switch to Volts; Amps Hi/Lo to Hi. Turn on the supply and set the displayed voltage to 28.0 V +/- 0.2 V using the Coarse and Fine voltage controls.

Set/verify Control Unit settings:	SQUID 1	SQUID 2	SQUID 3	SQUID 4
Int/Ext switch (real panel) to "Int"_____	_____			
Power switch set to "Off"	_____			
Meter switch set to "DM"	_____			
Bias switch set to "0000"	_____			
Range switch set to "1"	_____			
DC Mod switch set to "8000"	_____			
Gain switch set to "1"	_____			
Reset Level switch set to "13V"	_____			

Turn on the power to the required SQUIDs. Reset system, bias, and offset controls.

Adjust the Control Unit "Bias" control to 4000 by making steps of 1000 and pressing the "Adjust" button after each change.

Adjust the Control Unit "DC Mod" control in steps of 0100 or 0010 (pressing the adjust button each time, as will always be done when making adjustments) until the largest possible reading is obtained on the control unit meter. Adjust 1000 step as required.

Likewise, change the "Bias" control by steps of "0100" or "0010" until the control unit meter reading is maximized. Adjust 1000 as required. Record the resulting bias value below:

Bias setting for Maximum Demod reading:

SQUID 1 _____
SQUID 2 _____
SQUID 3 _____
SQUID 4 _____

Record the demod value observed (adjust triggering as need for stable display).

Waveform peak-peak amplitude:

SQUID #	AMPLITUDE
1	_____
2	_____
3	_____
4	_____

Flux lock the SQUIDs.

Record below the flux locked flux to voltage transfer function for R1, G1.

SQUID #	Volts/flux quanta
1	
2	
3	
4	

Attach the output of the SQUIDs to the strip chart recorder. Record on the chart paper the P doc number, the run number of the P doc, the time, the date, the gyro #, and the chart speed and full scale.

Pump on probe per P559. Probe pressure is _____. QBS temperature is _____.

Verify each gyroscope is levitated (or indicate NLR for No Levitation Required) or levitate each gyroscope as required per P481.

Record on the chart recorder paper any change in the range or gain of the SQUID electronics or chart recorder scale or speed.

Gyroscope #	Levitation Time/date
1	
2	
3	
4	

If the gyroscope is not spinning, record using a strip chart recorder the pendulation data for 30 minutes or as needed as determined by the gyroscope manager.

Verify each gyroscope rotor is spinning (or indicate NSR for No Spin Required) or spin each gyroscope per P516.

Gyroscope #	Time/date of initiation of spinup	Time/date of completion of spinup
1		
2		
3		
4		

Record data on strip chart recorder for 4 hours or as needed as determined by the gyroscope manager. Indicate below the difference between the minimum and maximum SQUID voltage.

Gyroscope #	Vp-p(data)	Success Criteria
1		
2		
3		
4		

M Documentation

Data from this Procedure shall be stored in FIST operations procedure notebook.

N Completion of Procedure

This test procedure was completed satisfactorily.

Test Engineer_____ Date_____

This is to certify that the information obtained under this test procedure is as represented and the documentation is completed and correct.

Product Assurance_____ Date_____