W. W. Hansen Experimental Physics Laboratory

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Gravity Probe B Relativity Mission

ESD/EOS RISK MITIGATION PROCEDURE

P0476 REV. -

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Quality Assurance

Date

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Hardware Manager

This procedure gives a set of GP-B specific ESD/EOS risk mitigation rules. These rules were provided to Stanford by ESD/EOS expert Larry Burich of Lockheed Martin. These rules shall be applied to the integration of the flight instrument. Table 1 below gives the integration procedures which are ESD/EOS sensitive and therefore covered by these rules. Each of these procedures shall reference (using redlines of existing procedures, through release of new procedures or through revision of existing procedures) this ESD/EOS procedure for rules governing ESD/EOS risk mitigation. Table 1 contains a signoff box for each covered procedure. This signoff shall indicate that the lead integration team member has read this ESD/EOS Procedure No. 476, will comply with its contents and has modified the applicable governed procedure.

TABLE 1

Procedure Number	Procedure Title	Signoff with Date
P0175	**Integration of Gyros into QB**	
P0206	**Measurement of Gyro Alignment Relative to QWB**	
P0354	**Operations Supplement to Autocollimator**	
P0064	**Assembly and Test of Spinup Plumbing**	
P0177	**SIA to Probe Integration**	
P0439	**Connect DPA Cables, Checkout Telescope**	
P0433	**Integration and Checkout of Instrumentation**	
P0431	**Integration of Gyro Cables with Probe**	
P0435	**Fiber Optic Light Transmission to Gyros**	
P0434	**Post Integration Checkout of Suspension Cables**	
P0415	**SQUID Installation**	
P0436	**Final Probe Checkout, Staking of Fasteners**	

In addition to the text on the next page, note the following:

1. Ion bars are always on upstream of in-process quartz parts.
2. Wrist straps are used only for SQUID integration (P0415) and DPA integration (P0439).
3. All metal hardware and GSE are grounded. Shoes worn by personnel are ***not*** conducting.

GENERAL ESD PREVENTION

Ground:

1. For the purposes of protection of ESD sensitive parts, the utility ground (PG&E) is the common point ground. The utility ground is the reference point for all ground measurements.
2. Do not assume that the electrical outlets are properly wired. Verify that all of the electrical outlets associated with the ESD sensitive hardware are properly wired. When using power strips, verify every outlet.
3. Verification of 120 VAC outlets can be accomplished with a simple plug-in circuit tester.

Conductors in the Work Area:

1. When possible, ground all conductors including people, carts, fixtures, furniture, and the hardware itself.
2. Verify ground-connections with an ohmmeter. Assume all ground wire that are flexed will eventually break. The resistance to ground should be less than 2 ohms.
3. Ground wires connections should be secure enough that they can not be inadvertently disconnect. Small alligator clips and banana type of connectors should not be used (except for wrist straps).

Insulators in the Work Area

Fortunately a charged insulator is usually not as much a problem to static sensitive hardware as a charged conductor.

1. Prevent the tribocharging of insulators by avoiding contact with the insulator when possible.
2. Ionizers provide the only practical means to remove a charge from a insulator.
3. Ionizers require balancing, do not prevent tribocharging, and take number of seconds to remove a charge. An unbalanced ionizer can actually induce a charge on hardware.
4. When an ionizer is required, keep hardware more than one (1) foot away but directly in front of the ionizer.

Electrical Tools

1. All 120 VAC electrical tools are required to have a ground wire.
2. Any part of the power tool (drill, soldering iron, etc.) that will contact a static sensitive part should be measured with an ohmmeter from the tool tip or contact point to ground.

Test Equipment and EOS (Electrical Overstress)

Test equipment can be a cause of electrical overstress created by test equipment design or AC line voltage spikes passing through the test equipment into the hardware.

Personnel Grounding in the Clean Room

ESD flooring and conductive booties reduce the chance of a person charging up. For operations that require a person to touch static sensitive devices directly, it is recommended that the person also wear a wrist strap when possible.

Transporting Static Sensitive Hardware

Static sensitive hardware shall be transported only in protective packaging.

Static sensitive hardware shall only be removed from the protective packaging by a grounded person.