

Project Name:		
ISS Vibration Mitigation		
Business objective served by this project		
Reduce the ambient vibration level at the Instrument Interface to the ISS to an acceptable level		
Project Manager/Leader:	Project Sponsor:	PDS Version/Date:
Michael Sheehan	Gustavo Arriagada	20 October, 2010

Project Description

Issue Statement:

The vibration environment at the Instrument to ISS interface has been determined to be a significant contributor to image degradation, quantified by high residual tip/tilt error as measured by the Altair NGS wavefront sensor. GPI performance degradation due to ISS vibration is also a concern. The primary sources of vibration in and around the ISS are the cryocooler cold heads. This project is focused on the characterization of these vibration sources and engineering means to reduce the vibration level imparted to the ISS and instruments.

Project Objective Statement (POS):

Vibration sources within the ISS and Instrumentation area will be characterized by measuring their amplitude and frequency characteristics. The vibration level at the instrument to ISS interface will be reduced by the application of passive or active means at the vibration source. The goal is to reduce the broadband level in the low frequency range (to 100 Hz) by a factor of 2 and to eliminate any high amplitude, narrow band features. An additional goal is to reduce the residual tip tilt error as measured by the Altair NGS wavefront sensor to 10 mas or less.

- Perform a vibration survey of the ISS to establish baseline the vibration environment
- Conduct a comprehensive vibration test program to identify and characterize all vibration sources in and around the ISS and correlate vibration at these sources to the environment at the Instrument to ISS interface
- Design passive and/or active means to reduce the vibration level at the source and thus reduce the level at the instrument to ISS interface

Project Flexibility:

Flexibility Matrix	Least Flexible	Moderately Flexible	Most Flexible
Scope	X		
Schedule		X	
Resources		X	

Major Deliverables:

- ISS Vibration Characterization Report
- Engineering design documentation for the passive and/or active dampers for the cold heads

Assumptions:

- Cryocooler cold heads are the dominant source of vibration in and around the ISS
- Passive and/or active dampers will be designed to reduce the cold head vibration to acceptable levels

IS and IS NOT:

Describe what the project **is** and what the project **is not**, you can have as many **is** or **is not** as you want.

- **IS:** A process of systematically measuring and characterizing all vibration sources in and around the ISS

- **IS:** Engineering analysis, design, procurement, integration and testing of mechanical and/or electro-mechanical means of reducing the vibration level at these sources to specified levels.
- **IS:**
- **IS NOT:** A means to eliminate all vibration at the Instrument interface
- **IS NOT:** An attempt to change the cryocooler technology currently used in Gemini instrumentation
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Strategy and Resources

Milestones and Stages:

Define and describe a set of milestones for the project, also define stages that can be used later as off ramp points.

- Stage 1
 - Perform a vibration survey of the ISS to baseline the vibration environment
- Stage 2
 - Perform a comprehensive vibration survey to characterize all vibration sources in and around the ISS and the ISS to instrument vibration environment
- Stage 3
 - Engineer passive and/or active damping systems to reduce the vibration levels at the sources and ISS to Instrument interface as well

Estimated Costs:

- Supplies and materials: \$50,000 in 2011 for passive and/or active damping hardware
- Equipment
- Resources: See PI Plan for the resource loading
- Spares: Will be determined during the design phase
- Contracts: \$30,000 for a vibration testing consultant

Core Team Members(see Guidelines for Developing New Projects document):

- Project Manager: Michael Sheehan
- Project Scientist: Tom Hayward
- Systems Engineer: None assigned

Extended Core Team Members:

- Additional Support from Julian Christou (for Altair aspects) and Stephen Goodsell (for GPI aspects)

Dependencies that require coordination:

- Coordination with GPI delivery schedule needs consideration

Risks and Issues:

- Cost: The total cost for the passive and active damping systems will not be known until after the characterization phase is complete
- The instrument configuration when GPI is installed cannot be simulated now. Therefore, some extrapolation of the designs produced in this project will need to be implemented in the future.

Supplemental Resources: