



Stronger Together: Strengthening Collaboration and Coordination of Contamination Control and Planetary Protection Implementation Activities on Flight Projects

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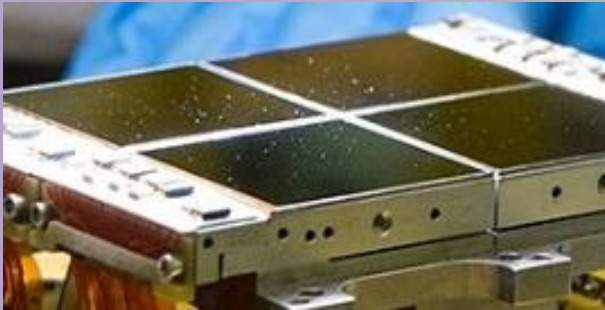
NASA Contamination, Coatings, Materials, and Planetary Protection Workshop
November 9, 2021

Introduction

Contamination Control

Planetary Protection

Particulate Contamination



NASA/Goddard/Chris Gunn

Molecular Contamination



NASA/Langley/Elaine Seasly

Biological Contamination



NASA/KSC/Jason Johns

Core principle:
Enable scientific studies and exploration by
reducing contamination effects

Purpose

- Both disciplines experience similar challenges during the flight hardware assembly, integration, and test phase that present as risks to mission success.

Monitoring Behavior in Clean Areas



NASA/Langley

Responding to Contamination Events



NASA/Langley/Elaine Seasly

- Opportunities exist to collaborate, share knowledge and lessons learned, and encourage support amongst contamination control and planetary protection practitioners.

Goal is to foster greater collaboration, coordination, and sharing between the contamination control and planetary protection disciplines.

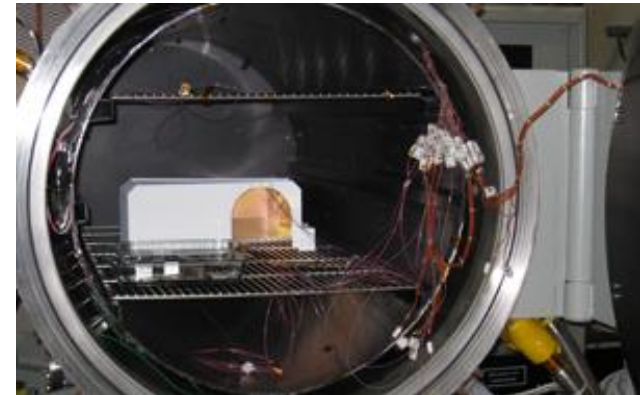


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Hardware Bakeouts

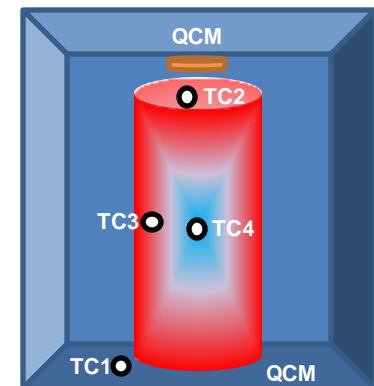
- Bakeouts utilized to reduce contamination of hardware
 - CC: Reduce molecular contamination
 - PP: Reduce biological contamination
- Thermocouple (TC) placement on hardware is critical in data collection
 - CC monitors for hardware temperatures, especially for hardware sensitivities
 - PP can apply biological reduction credits only if there is supporting data. Time at temperature required (continuous).
 - Quartz Crystal Microbalance (QCM) may determine when “done” for CC but PP needs time & temp data



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Example:

- TC1 on oven wall
- TC2 on HW surface
- TC3 between HW surface and center
- TC4 at center of HW



Example Hardware Bakeout

Macro-organisms in Cleanrooms

- Macro-organisms in cleanrooms (insects, small mammals, small reptiles) are a Foreign Object Debris (FOD) risk that create concerns for both CC & PP
 - Compromises clean areas & creates a mobile source for contamination
 - Visual inspections of hardware may not detect areas accessible by macro-organisms
 - Related article: <https://berkshire.com/bug-battle-in-cleanroom/>
- CC & PP benefit from planning and response activities
 - Inspect cleanrooms before hardware introduced
 - For high-risk areas (repeat issues) daily walk-down inspections may be needed
 - Develop an incident notification and response plan



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Collaboration, Coordination, and Sharing

- Opportunities in current collaboration efforts
 - Partnering in research opportunities:
 - CC&PP Sub-Topic S4.05 in NASA's Small Business Innovative Research (SBIR) program
 - PP Research in NASA's Research Opportunities in Space and Earth Science (ROSES) program
 - Modeling & analytical tool development
- Collaboration and support into the future
 - New NASA PP policies and new commercial industry standards
 - Possible future NASA CC&PP Community of Practice?



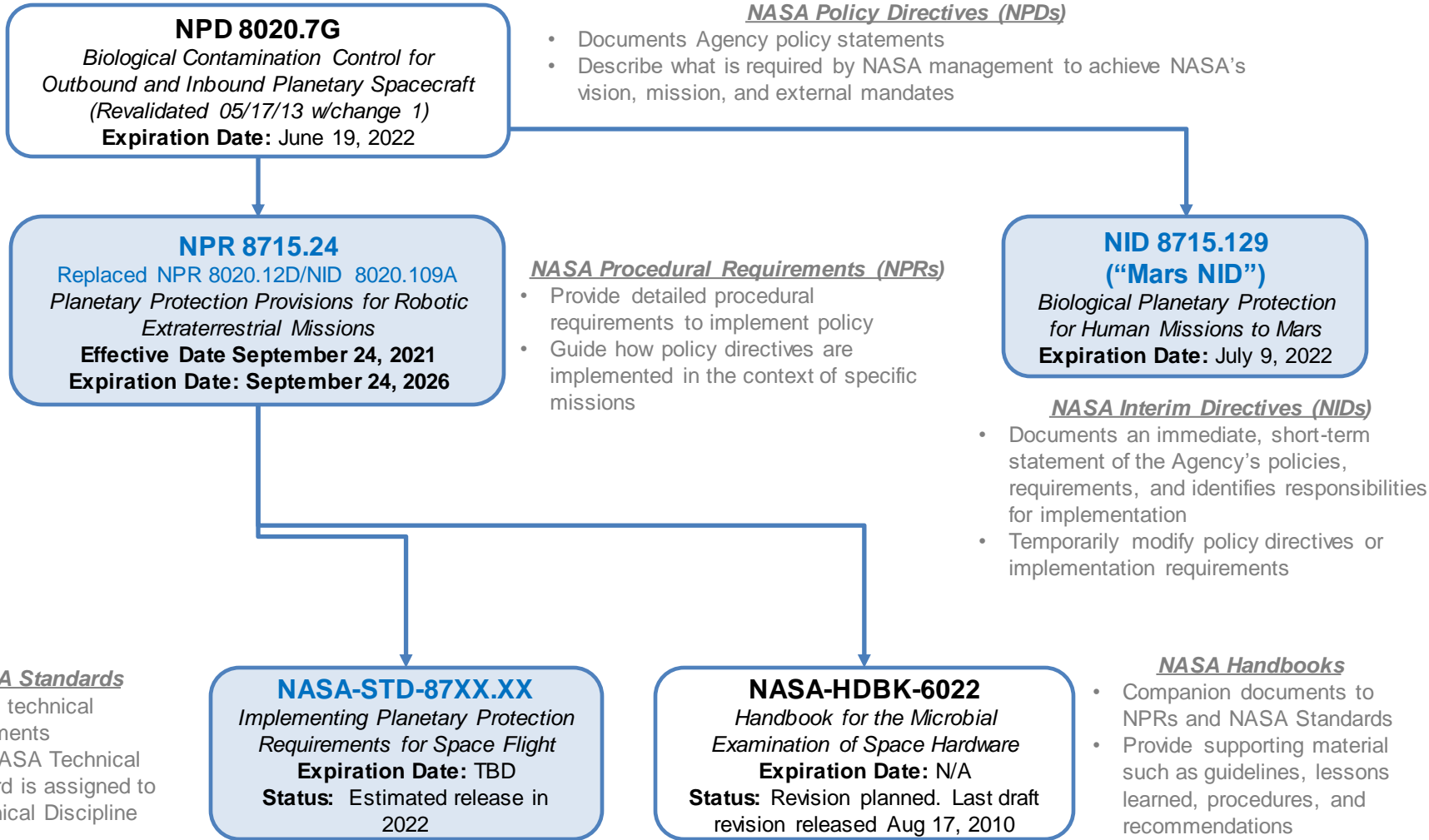
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NASA Engineering Network Communities of Practice





NASA's Planetary Protection Policy Documents



= New Documents

All published documents found in NODIS: <https://nodis3.gsfc.nasa.gov/> or the OPP website: <https://sma.nasa.gov/sma-disciplines/planetary-protection>