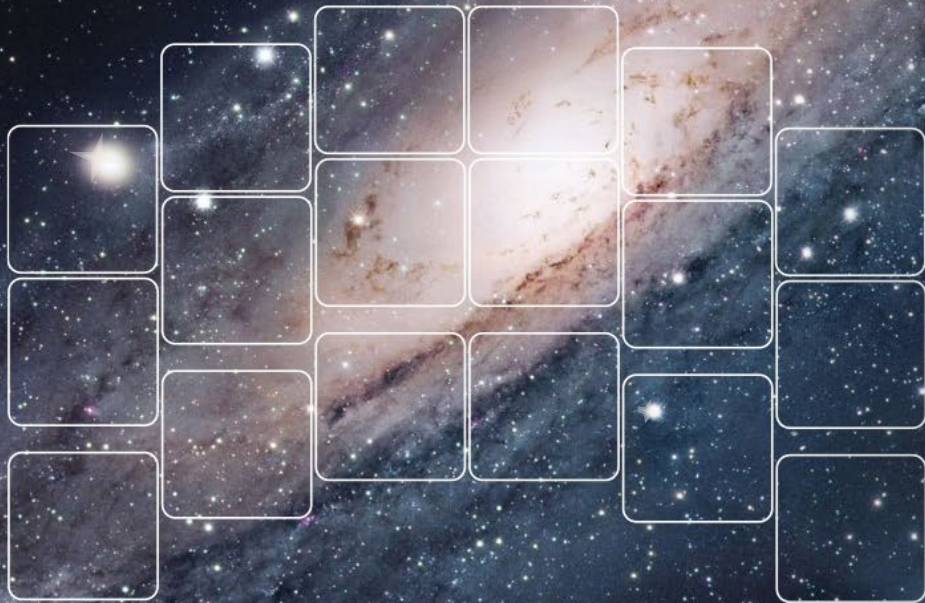




NANCY GRACE ROMAN



SPACE TELESCOPE

Roman Space Telescope Integration and Testing

August 5, 2024

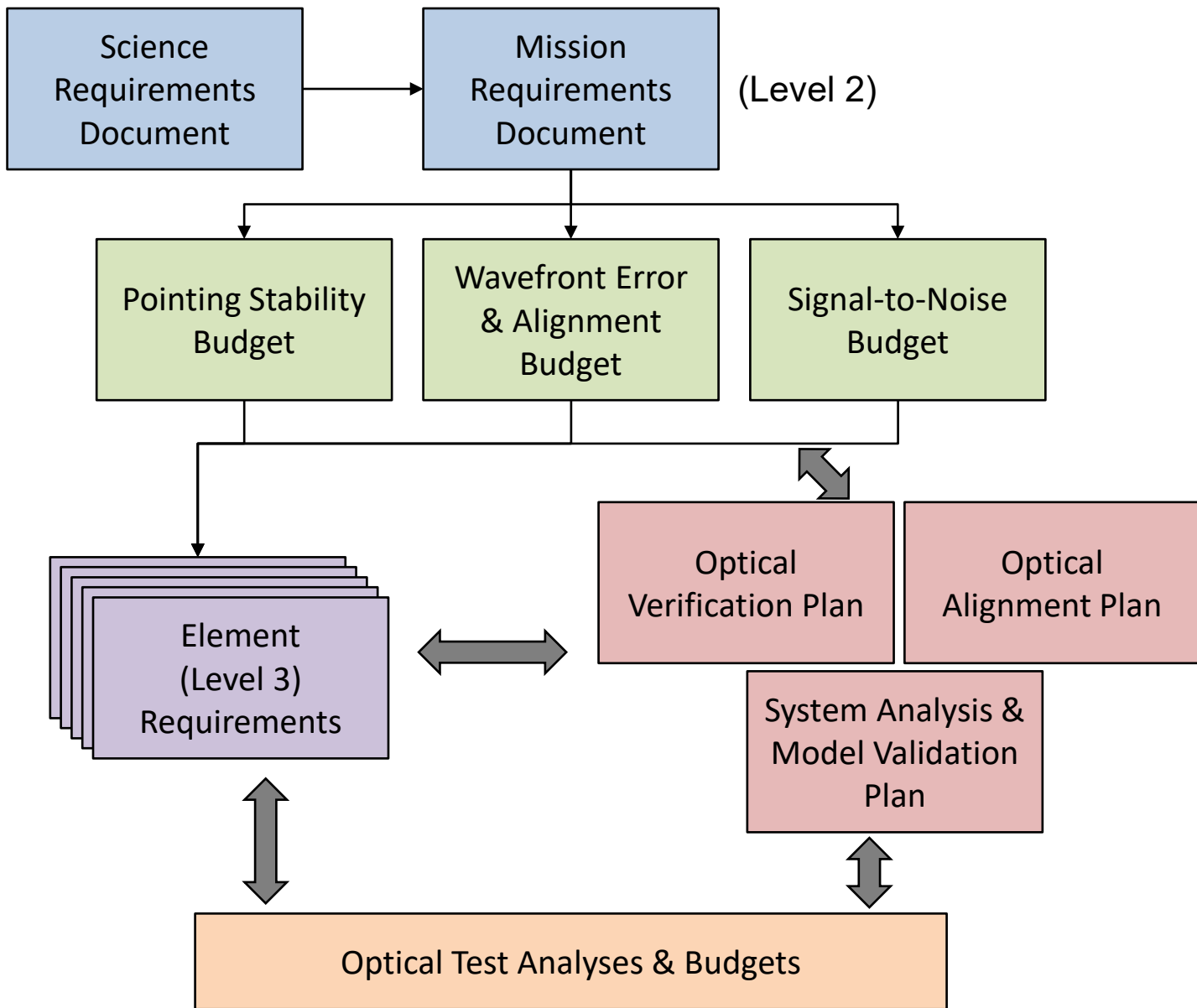
Kaitlyn Summery

Optical Engineer

NASA Goddard Space Flight Center

Roman Space Telescope Reviewed – Not Subject to Export Control

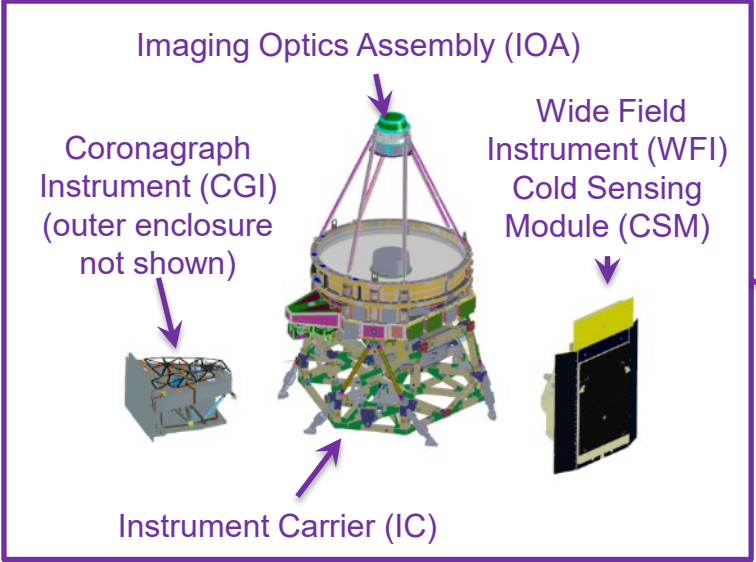
Optical Requirement Allocation & Verification



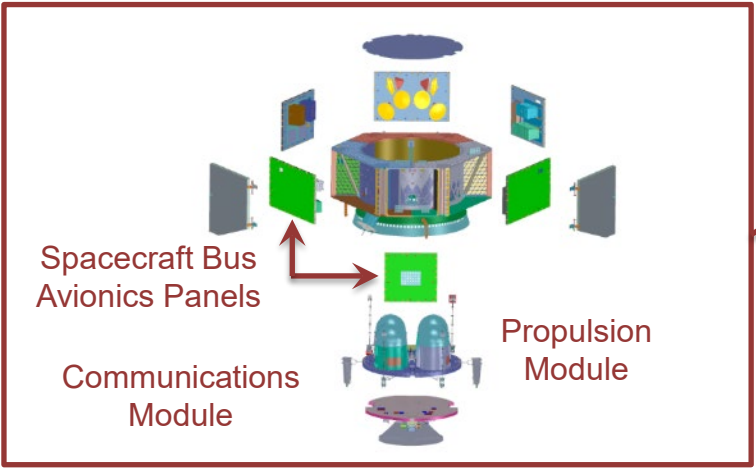
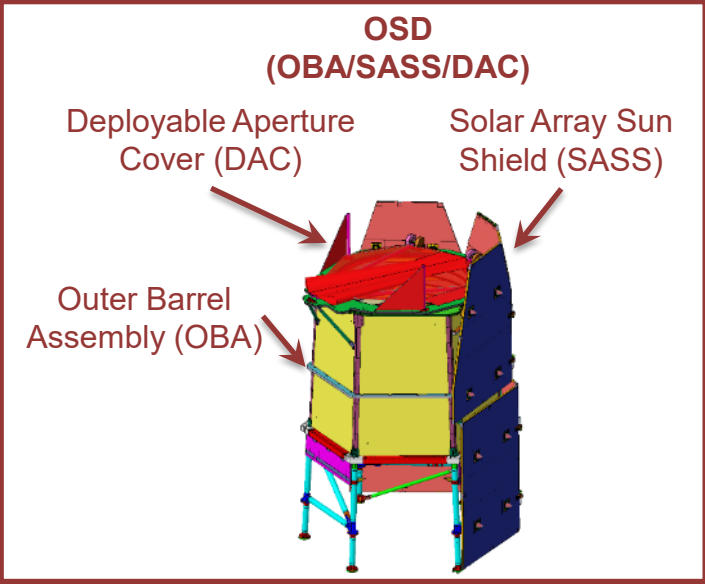
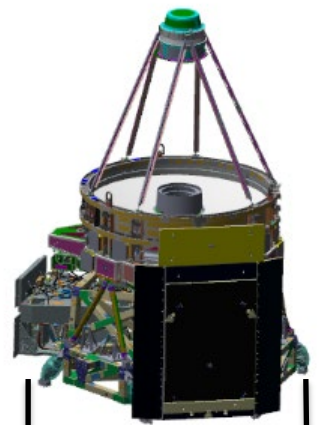
- **Budgets allocate optical performance requirements to each element**
- **Requirements and budget allocations are verified by test and analysis**
 - Documented in Optical Verification Plan, Optical Alignment Plan, and System Analysis and Model Validation Plan
 - Analyses include integrated modeling, stray light, optical Monte Carlo, and wavefront sensing & control
- **Optical test analyses and budgets support optical verification**



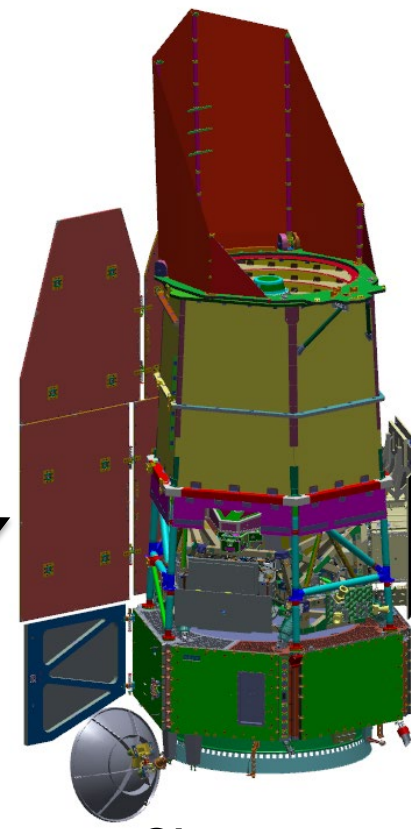
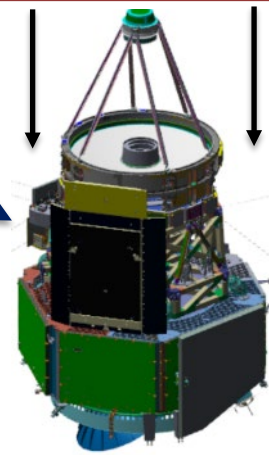
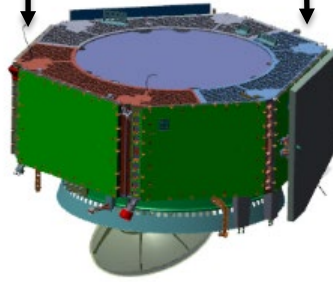
Observatory = **Spacecraft** + **Integrated Payload Assembly**



Integrated Payload Assembly (IPA)



Spacecraft Bus



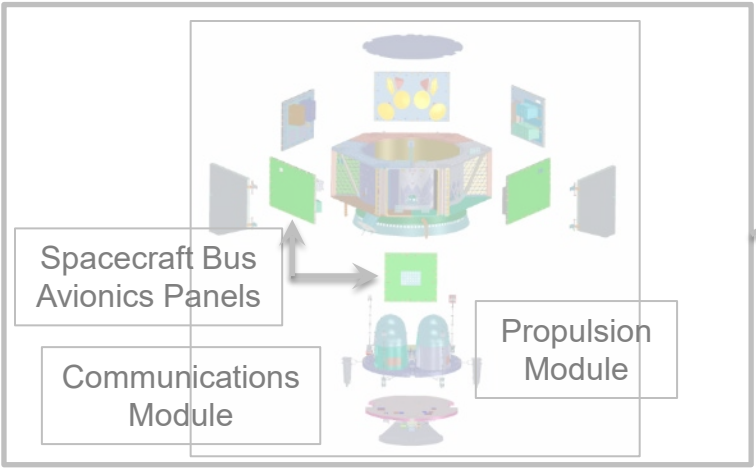
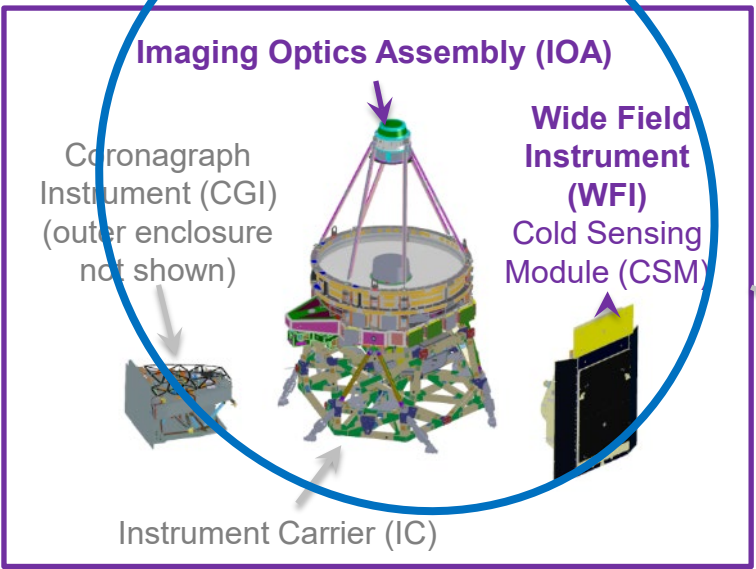
Observatory



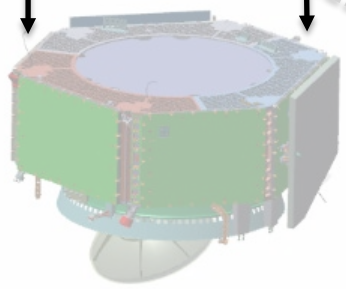
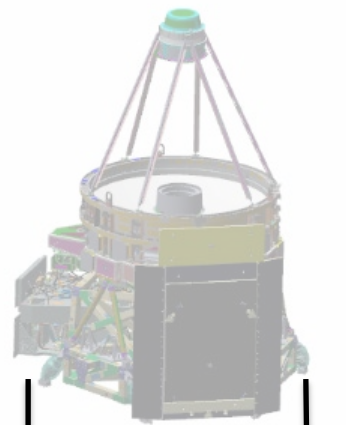
Observatory Description



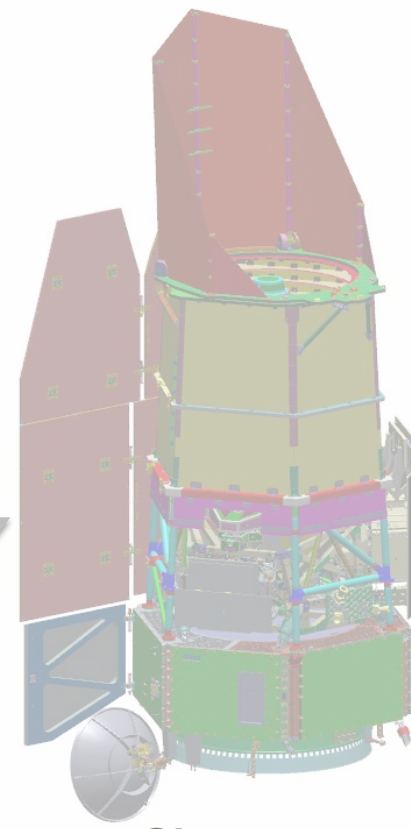
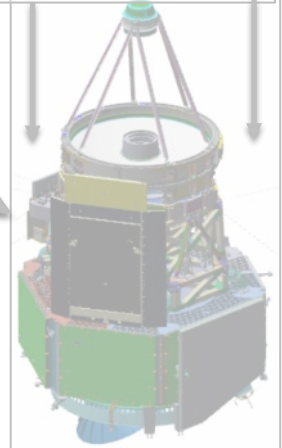
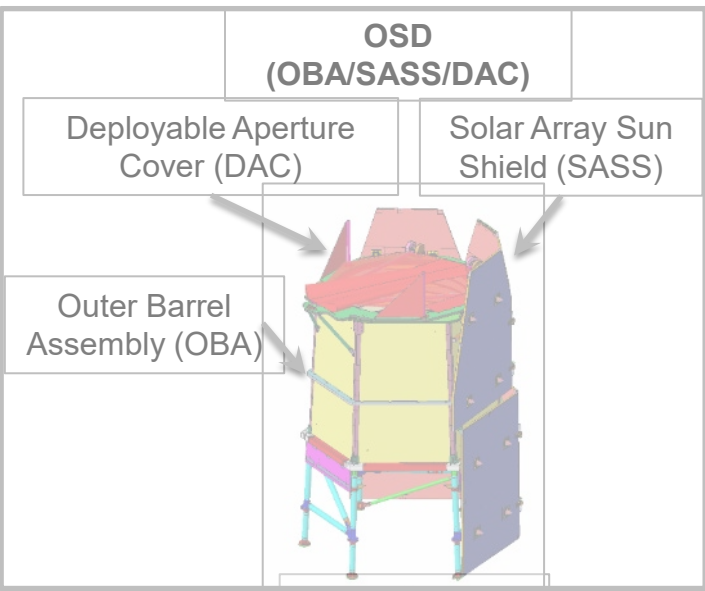
Observatory = **Spacecraft** + **Integrated Payload Assembly**



Integrated Payload Assembly (IPA)



Spacecraft Bus

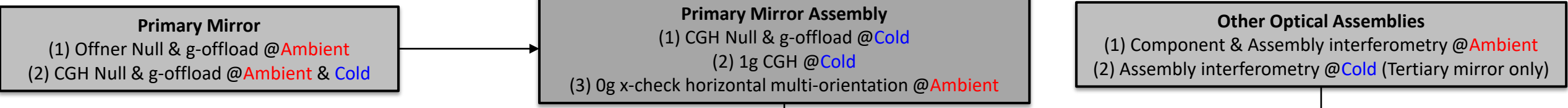


Observatory

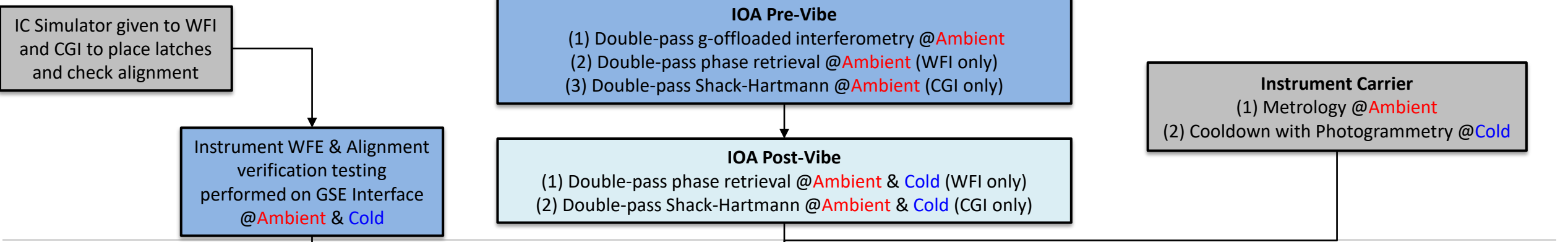


Optical Alignment & WFE Verification Summary

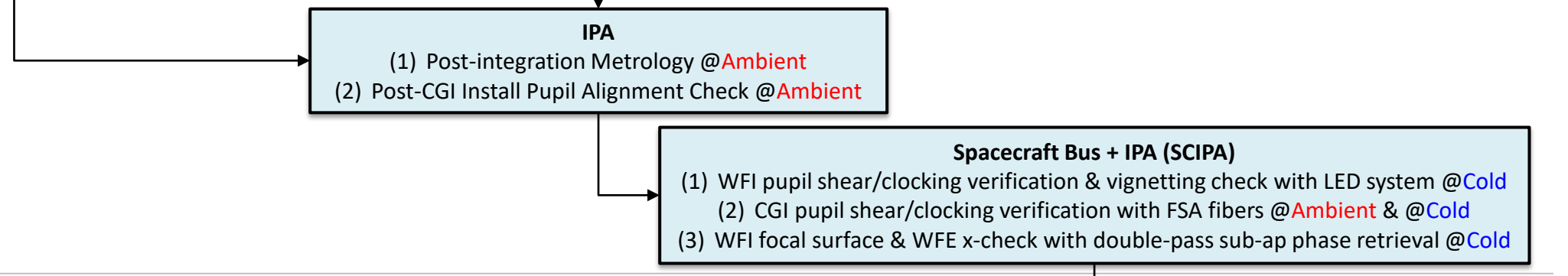
Component Level



Element Level



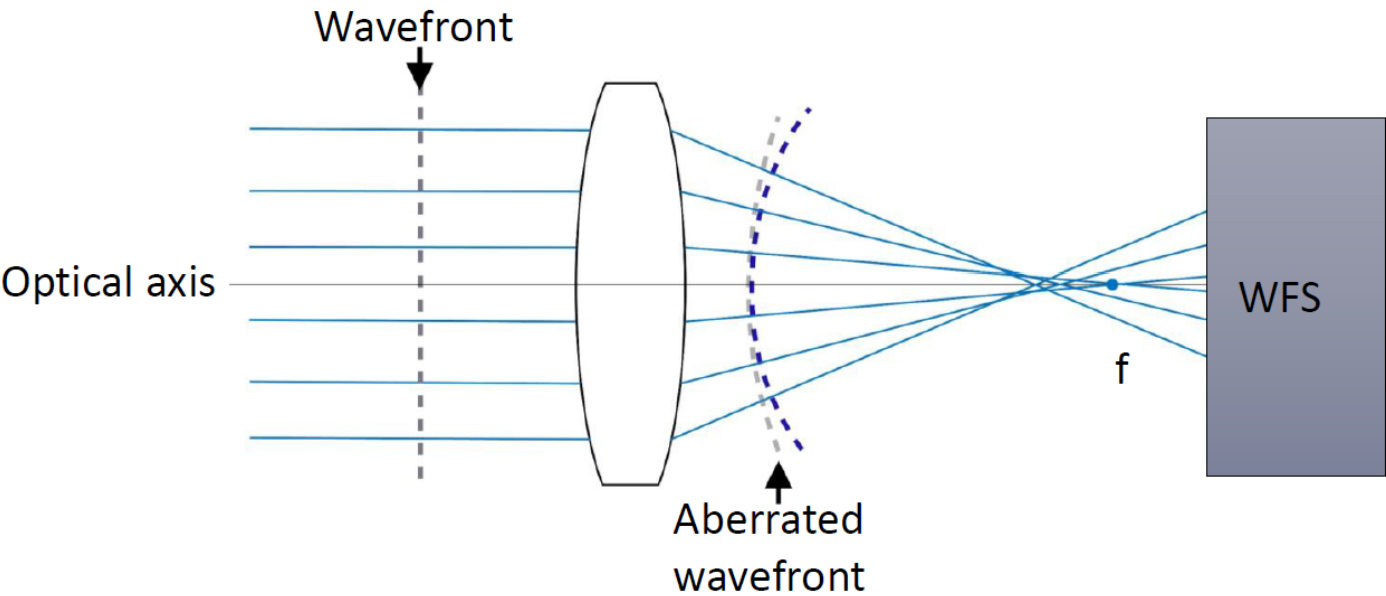
Assembly Level



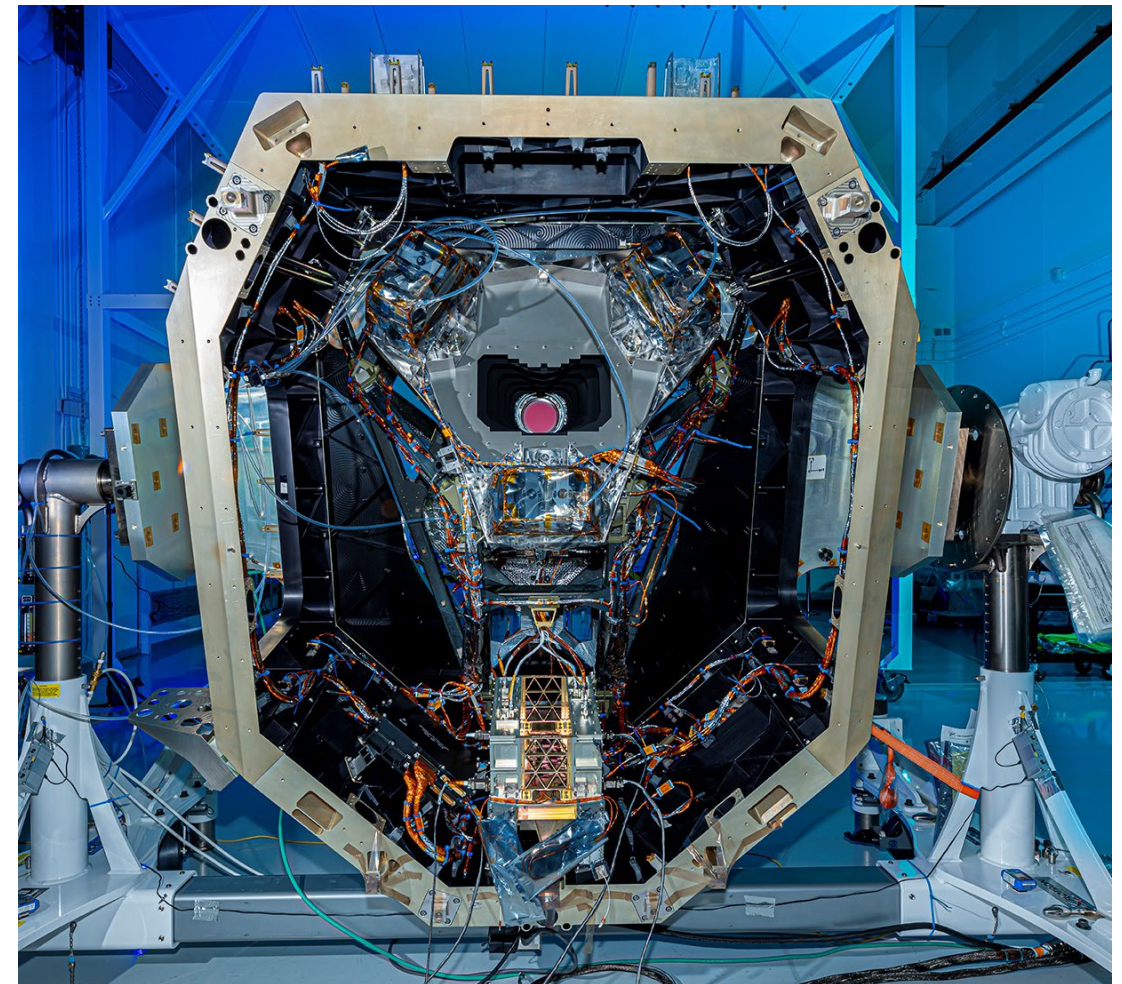
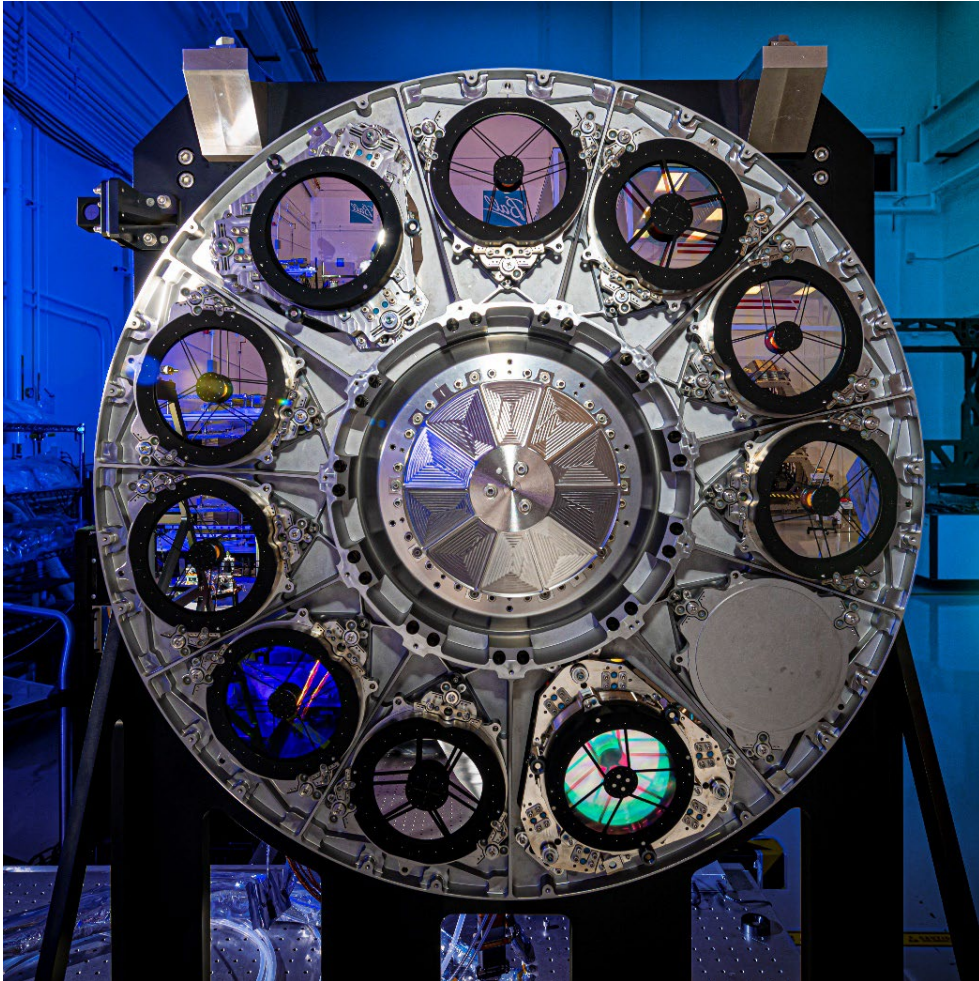
Mission Level



Intro to wavefront sensing



Wide-Field Instrument



Left: Fully populated Element Wheel Assembly (EWA)

Credit: Ball Aerospace

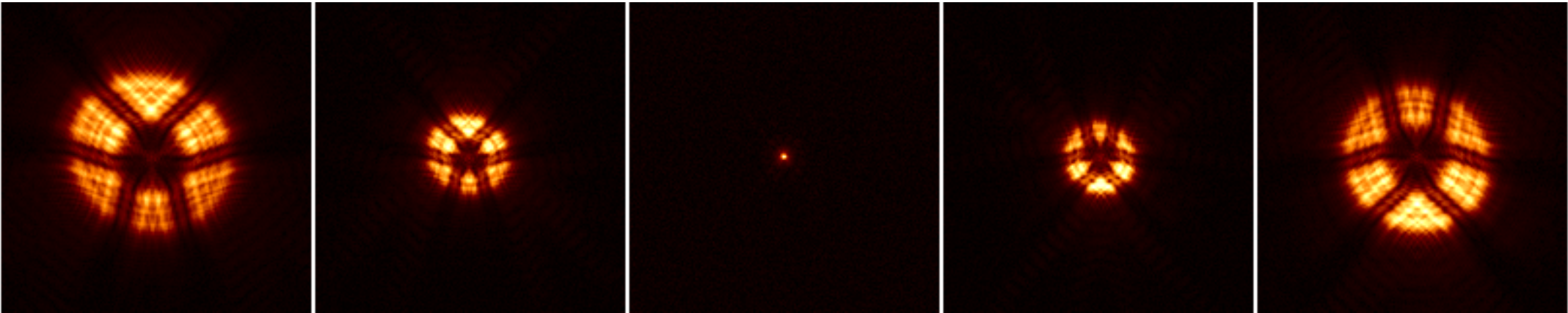
Right: Cold Module with EWA and simplified Relative Calibration System Installed

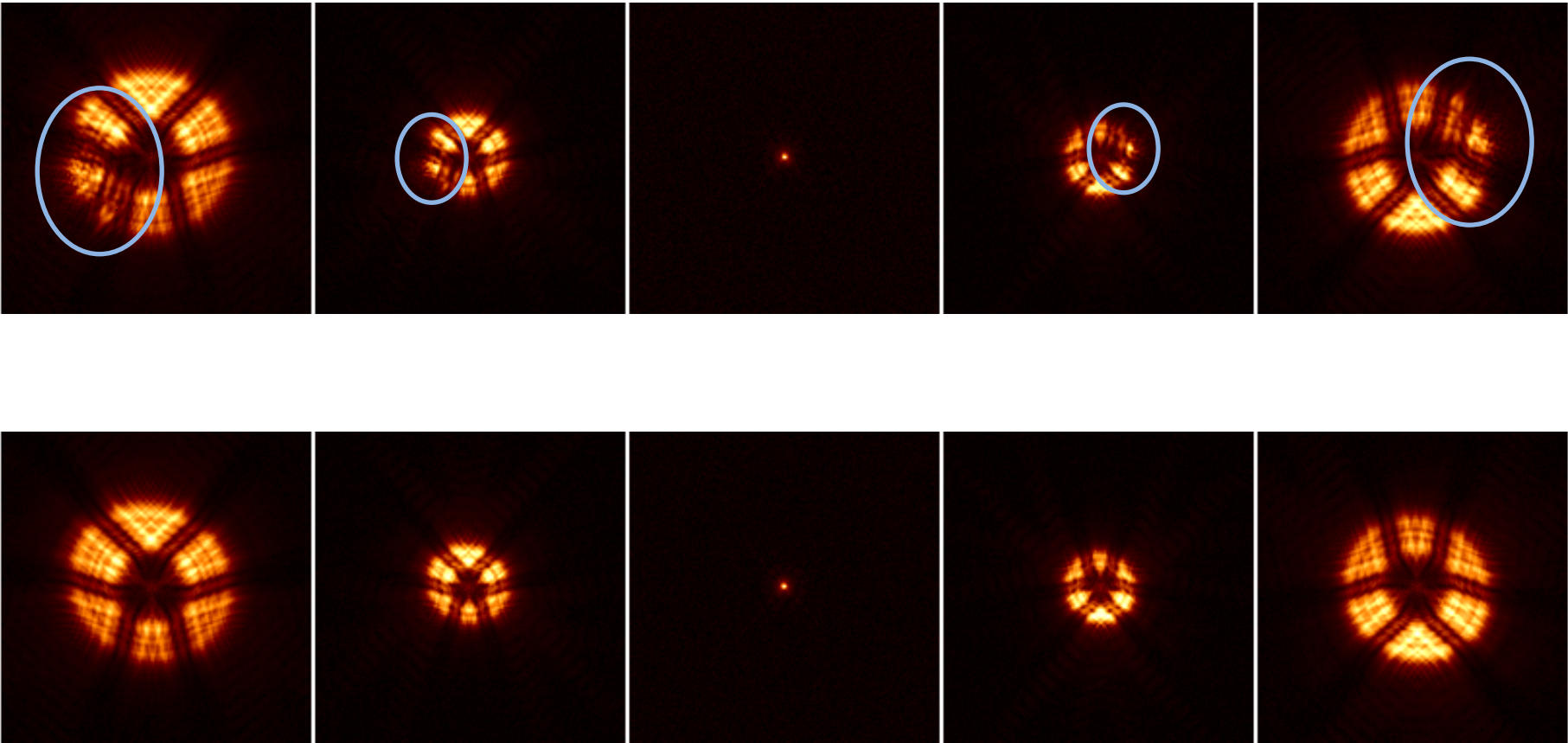
Credit: Ball Aerospace

Amplitude reconstruction and through-focus data

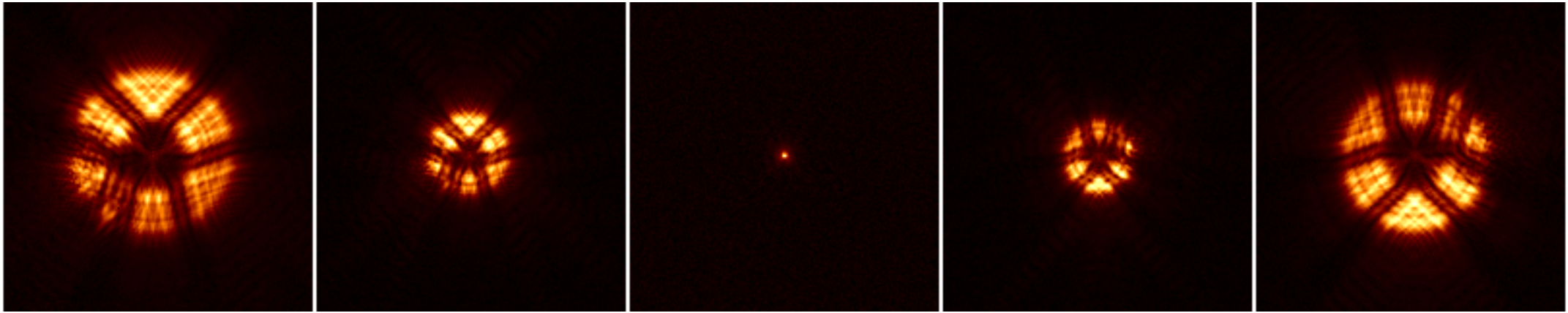
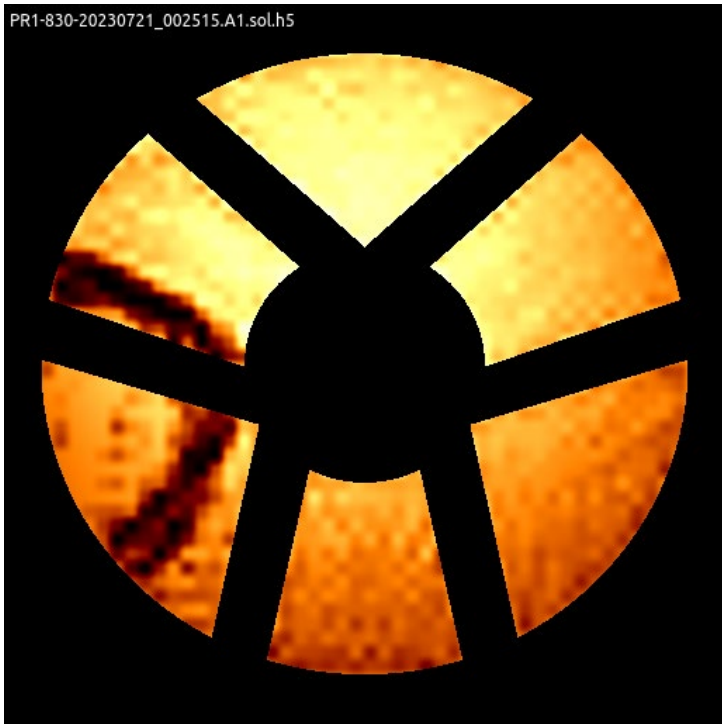


(no anomaly, for comparison)





Amplitude reconstruction and through-focus data



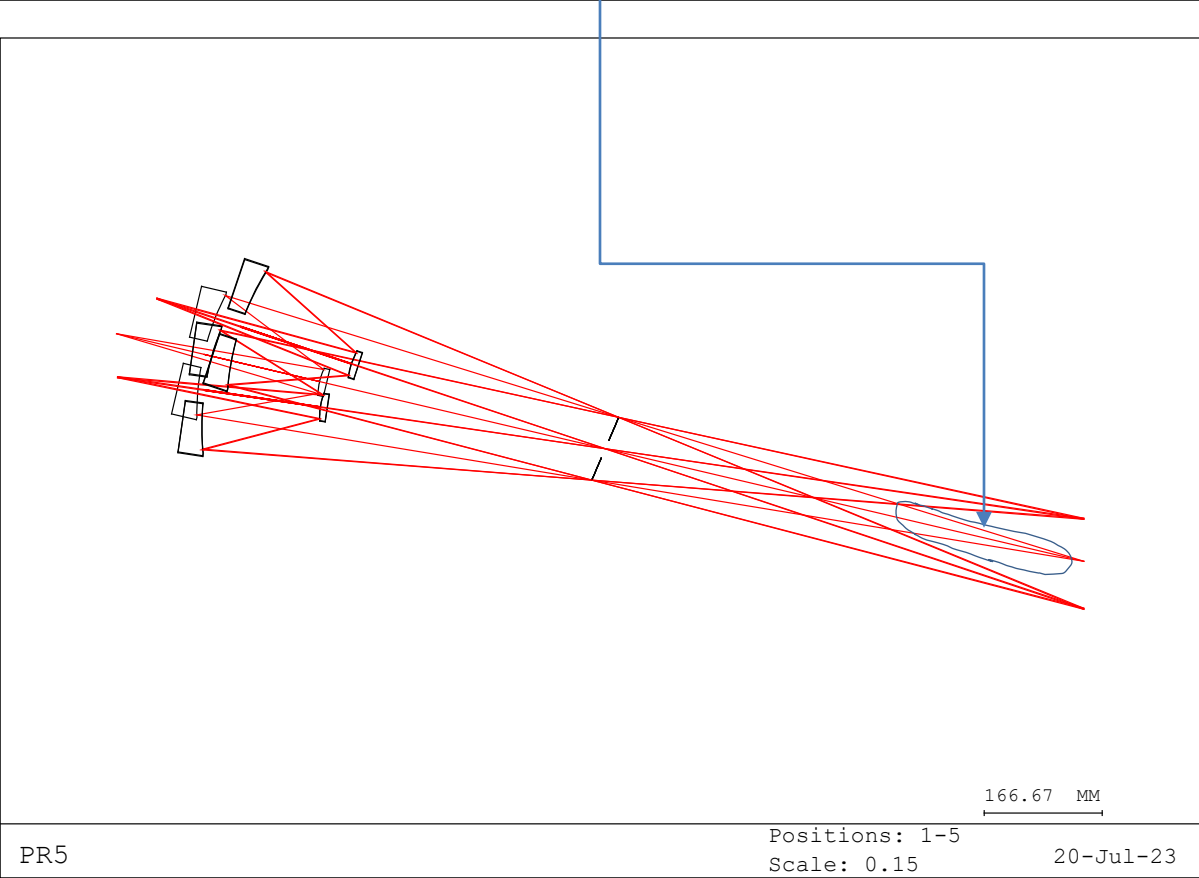
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Code V Ray Trace



An obstruction in this area could block rays that hit PR1 without blocking rays going to the other cameras



Imaging Optics Assembly

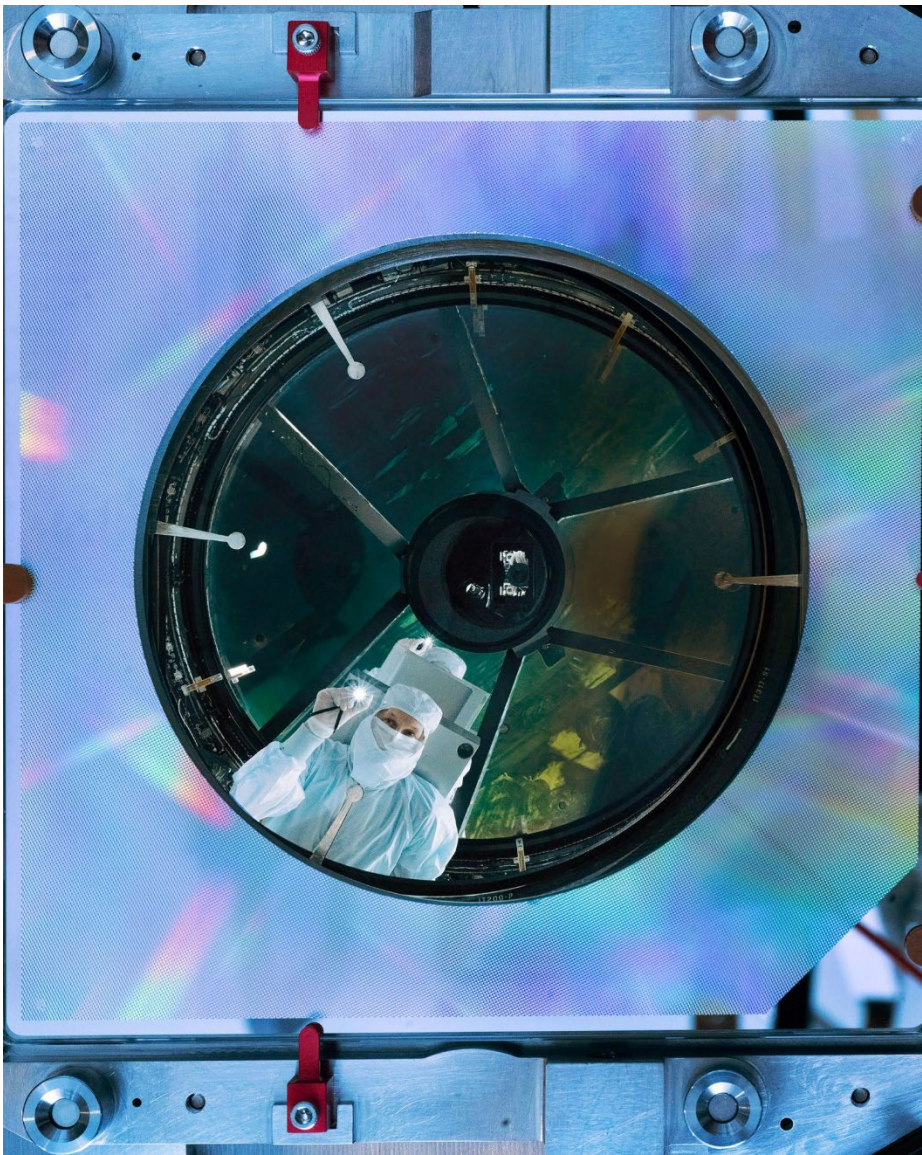
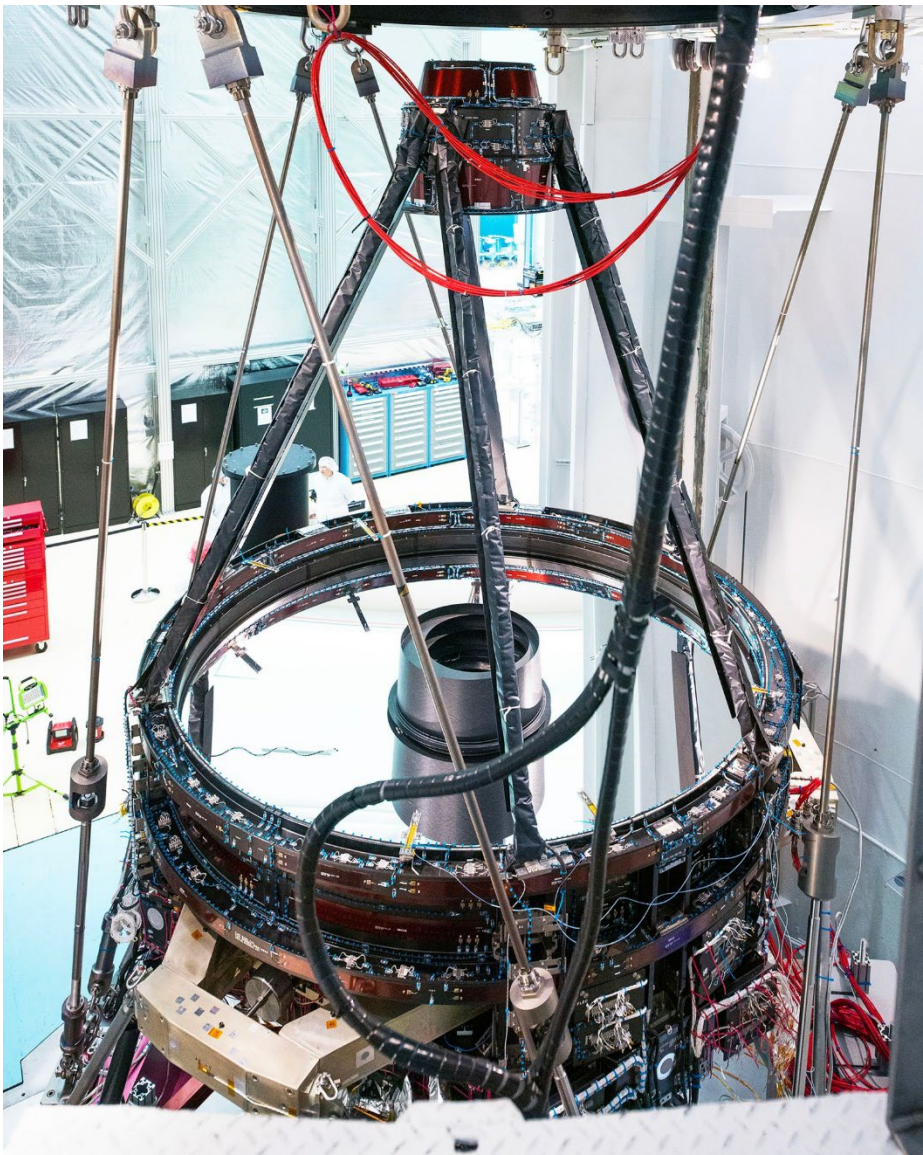
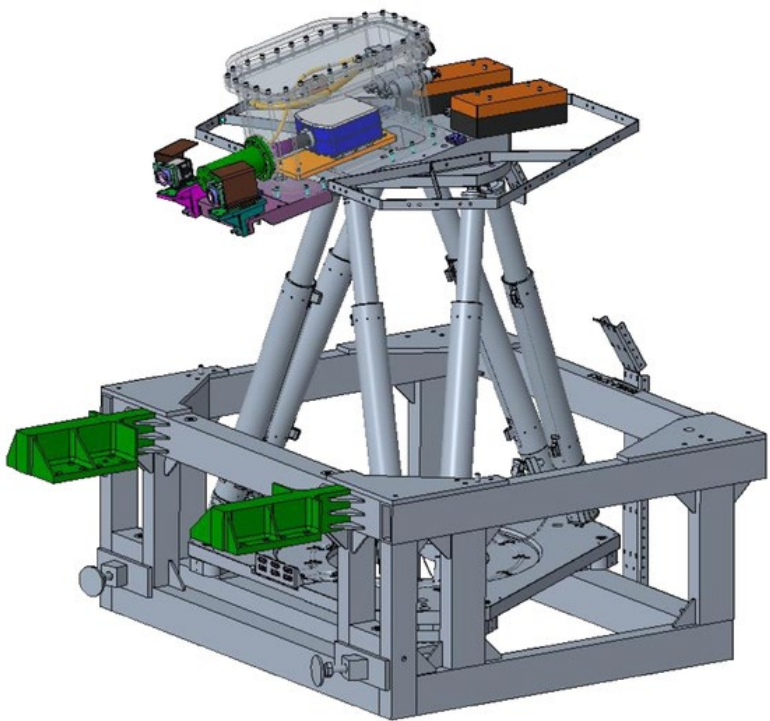
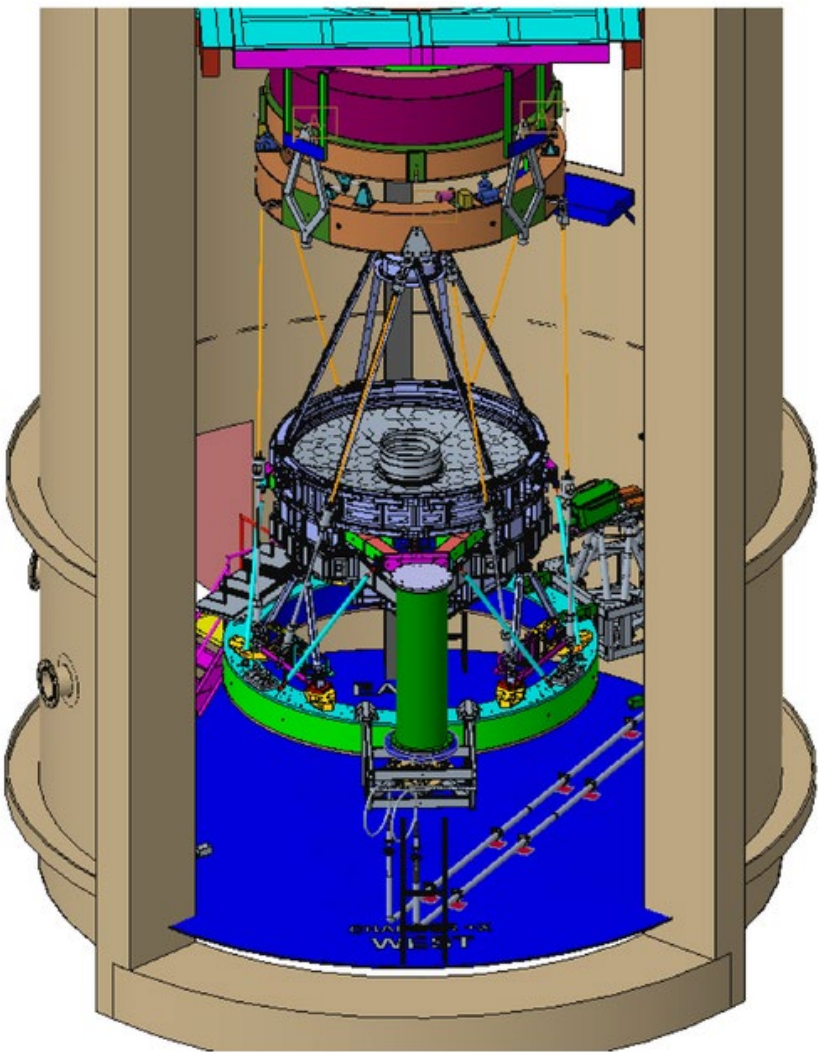
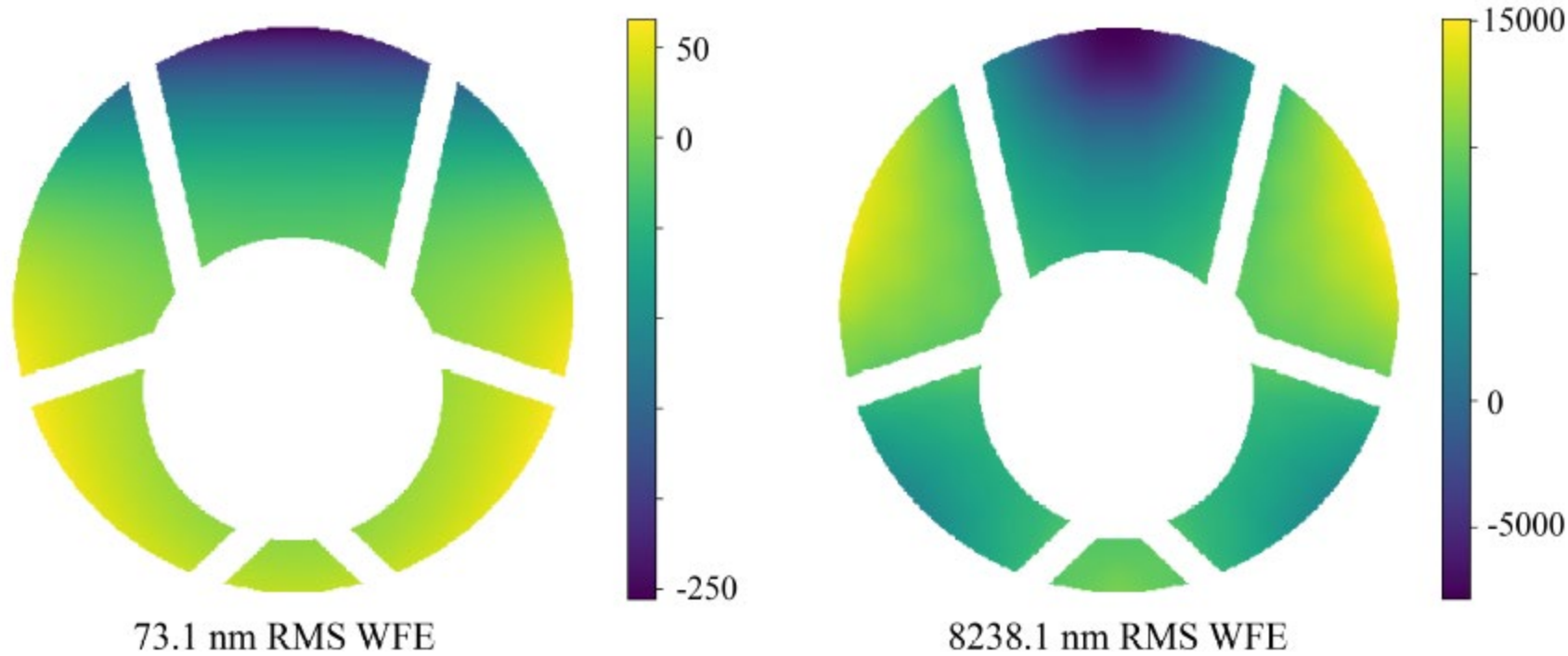


Image Credits: L3Harris Technologies Inc.



Gravity sag



- ★ Matthew R. Bolcar, Josh Abel, Lisa Bartusek, Tom Casey, Bente Eegholm, Guangjun Gao, Tyler Groff, John Hagopian, Joseph Howard, Alden Jurling, Gary Kuan, Dave Kubalak, Kuo-Chia (Alice) Liu, Cathy Marx, Kim Mehalick, Mark Melton, Scott Rohrbach, Derek Sabatke, Tony Whitman, "The Roman Space Telescope optical system: status, test, and verification," Proc. SPIE 12676, UV/Optical/IR Space Telescopes and Instruments: Innovative Technologies and Concepts XI, 126760O (4 October 2023); <https://doi.org/10.1117/12.2677569>
- ★ Tony L. Whitman, Peter Miller, Joshua Abel, Bente Eegholm, Matthew Bolcar, J. Scott Smith, Brian Martens, Pete McCarthy, Joel Proebstle, Erin Schiele, "Roman optical telescope integration status and preparation for test," Proc. SPIE 12676, UV/Optical/IR Space Telescopes and Instruments: Innovative Technologies and Concepts XI, 126760P (4 October 2023); <https://doi.org/10.1117/12.2679201>
- ★ M. Bergkoetter, A. Jurling, K. Summey, D. Leviton, J. Tersigni (2023), "PR1 Anomaly at Titan Ambient" (PR-RST-WFI-3509-026). Project internal document in TDMS.