
Update on NASA's TBIRD Program

Presented to CCSDS Optical Comm Working Group

12 October 2021

Terabyte Infrared Delivery (TBIRD)



6U CubeSat in LEO
3U Lasercom payload



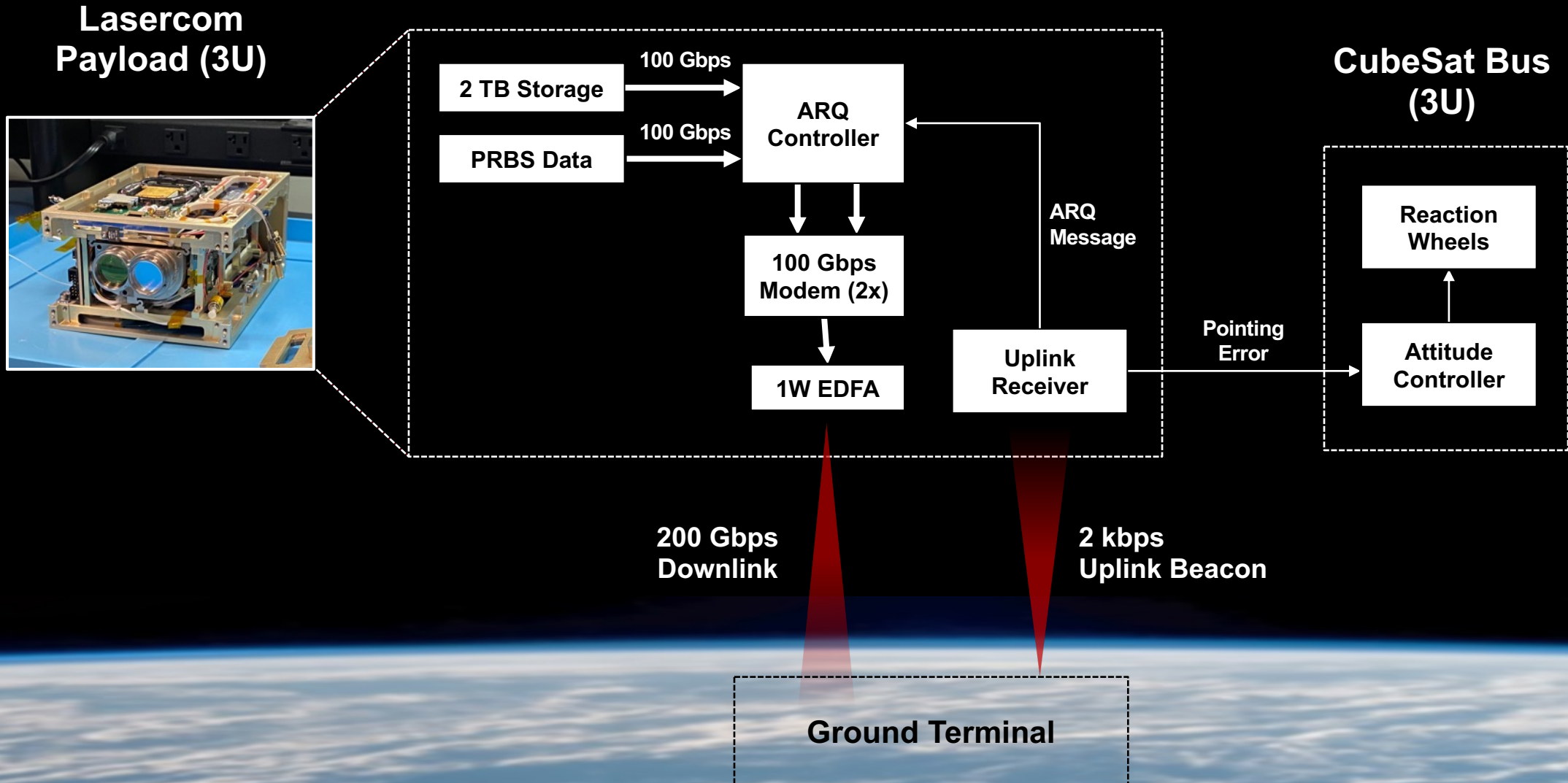
200 Gbps downlink

- Leverage fiber telecom equipment for 200 Gbps burst delivery (TBs per pass)
- Demonstrate robust data transfer through atmospheric channel
- 3U lasercom terminal payload hosted on 6U CubeSat
 - NASA Small Sat Pathfinder Tech Demo

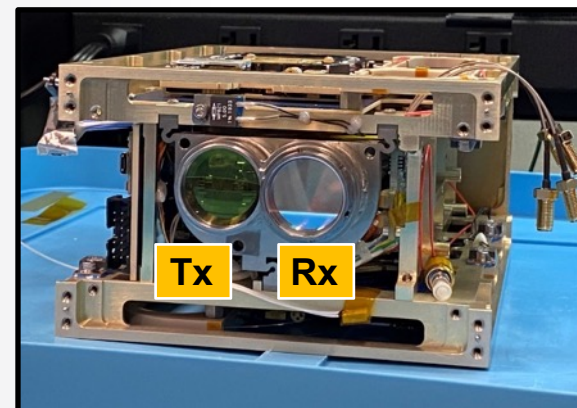
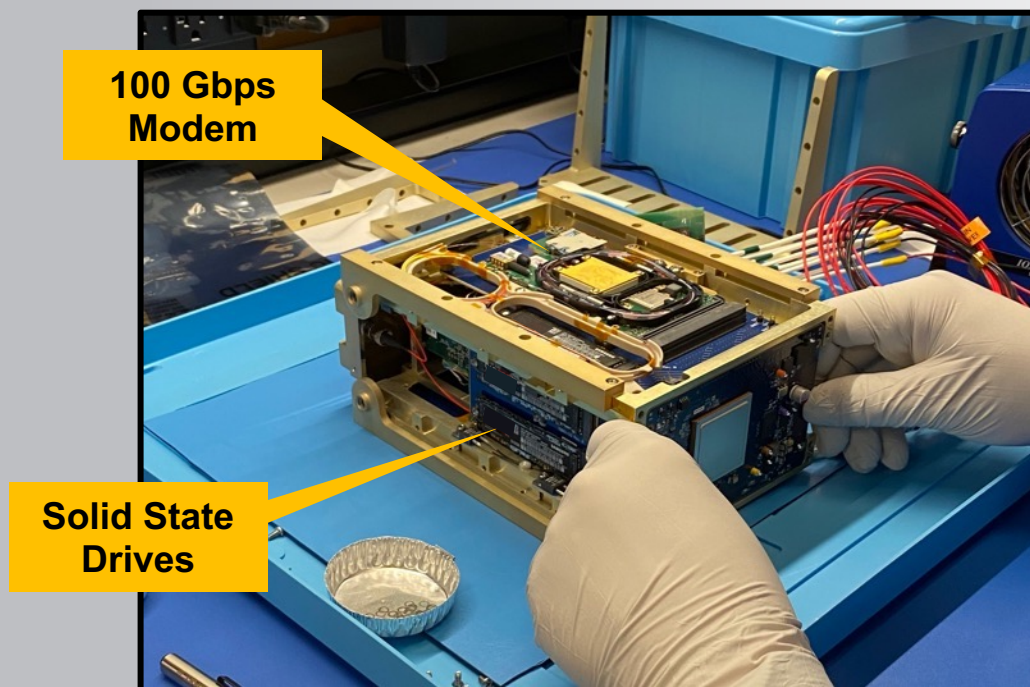


JPL/OCTL
Ground terminal

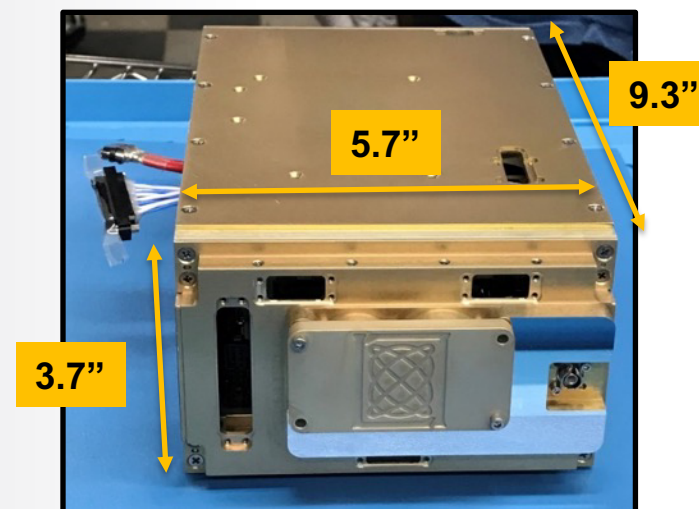
Communication and Body-Pointing Architecture



Payload Assembly



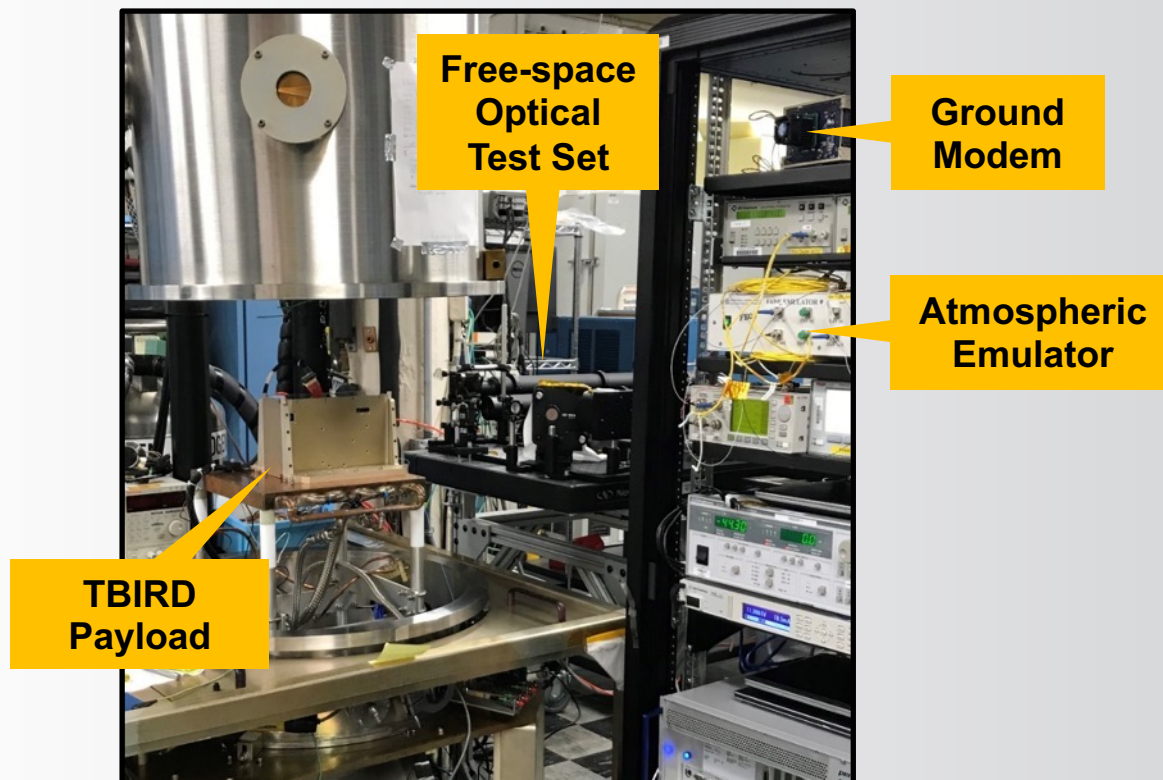
Bi-static Transmit & Receive Optics



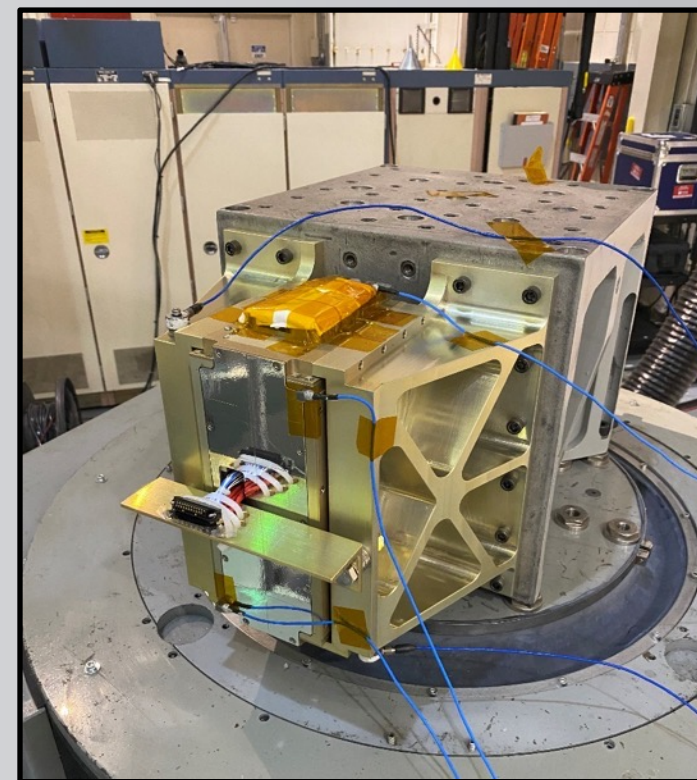
Integrated Payload
9.3"x5.7"x3.7"

Environmental Testing

Thermal Vacuum

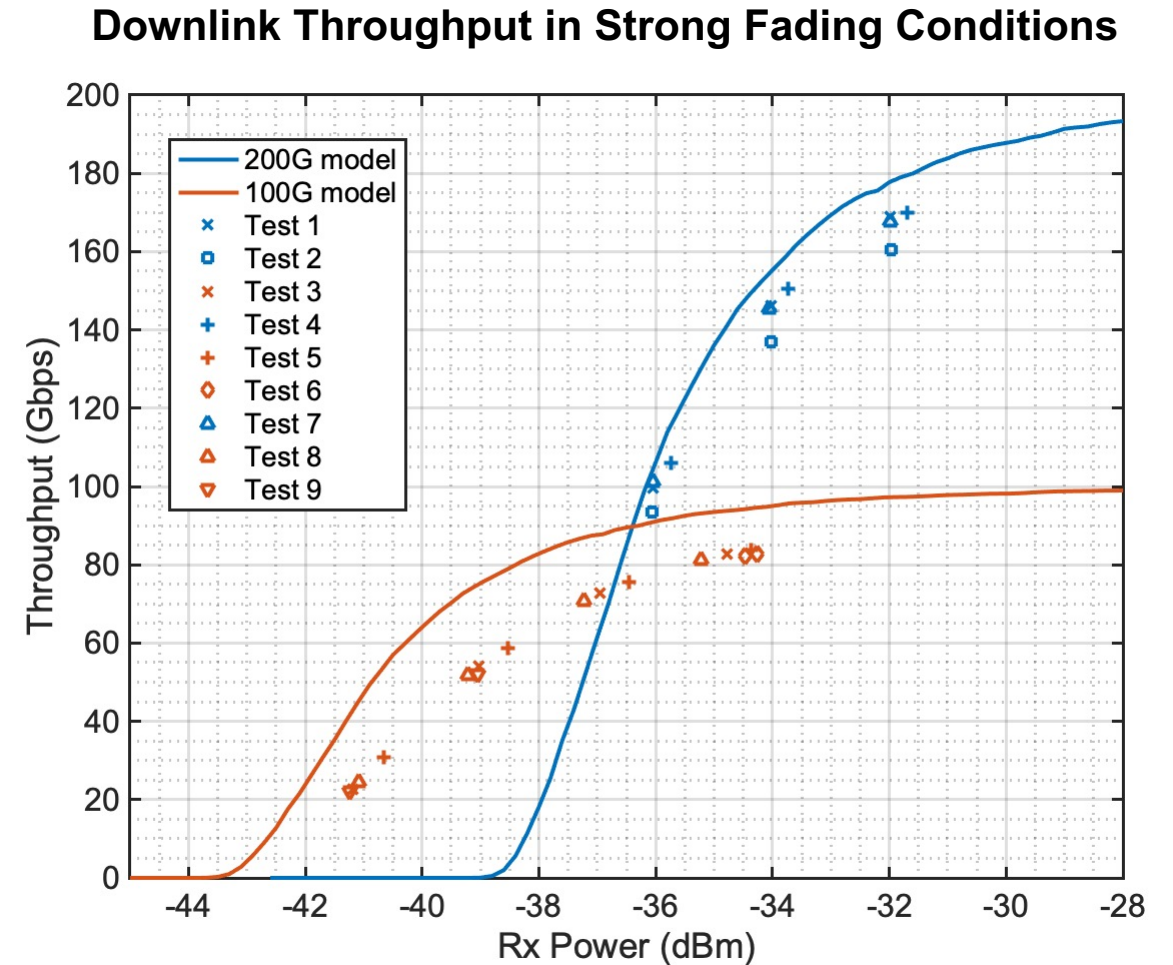


Shock & Vibration



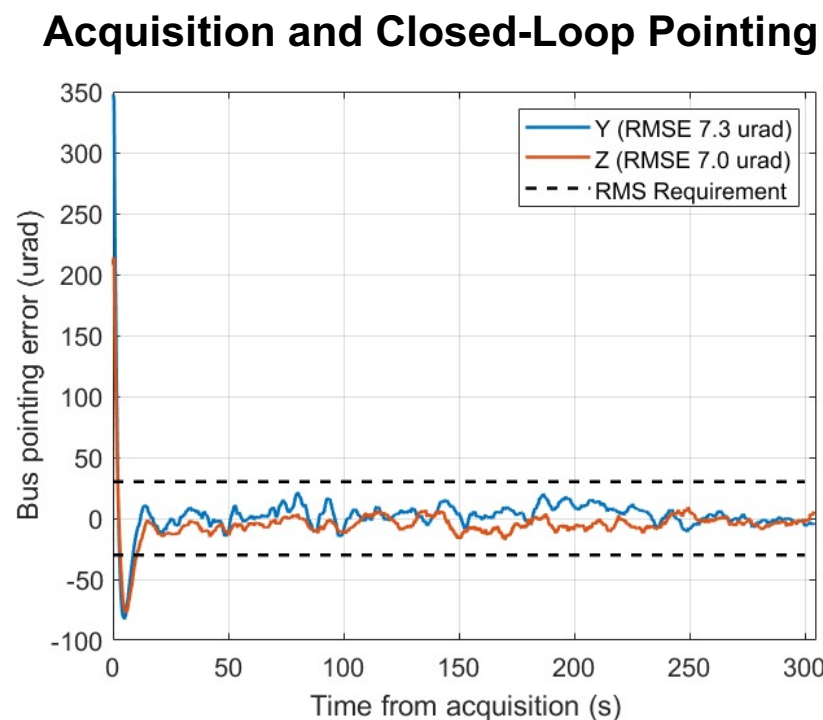
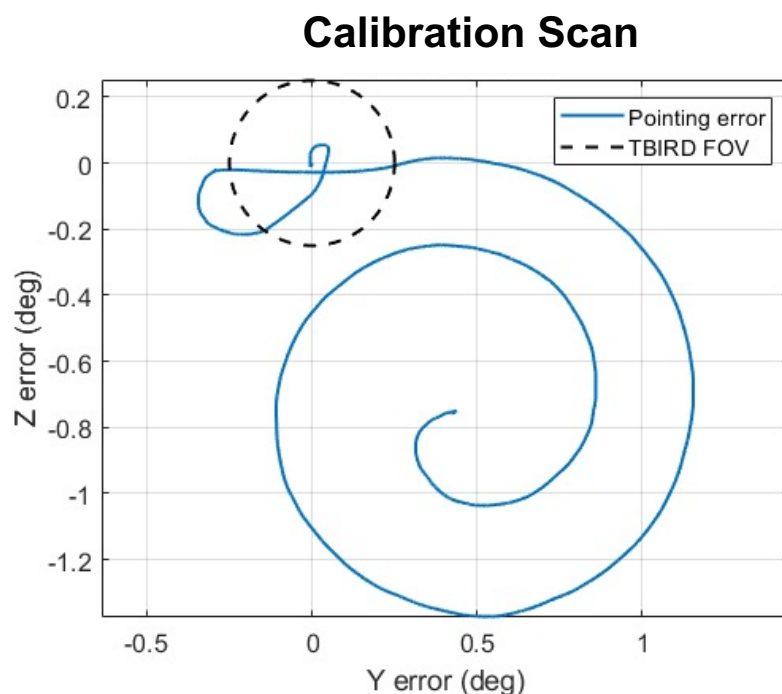
Environmental Testing Results

- **High-Rate Communication**
 - Emulated strong fading on both the downlink and the uplink beacon/ARQ
 - 100 and 200 Gbps modes achieved error-free comm and agreed with model
- **Beacon Tracking**
 - <20 urad tracking error with low received power (-70 dBm)
- **TX/RX Optics Alignment**
 - <40 urad boresight misalignment through TVAC and shake



Pointing, Acquisition, and Tracking (PAT) Testing

- Performed PAT testing using engineering units of bus and payload
- Flat-sat configuration emulated reaction wheel behavior
- Validated acquisition scan and closed-loop pointing architecture



Project Status

- **Payload assembled**
- **Environmental testing in progress**
- **Ground terminal in progress**
- **Launch in Spring 2022**