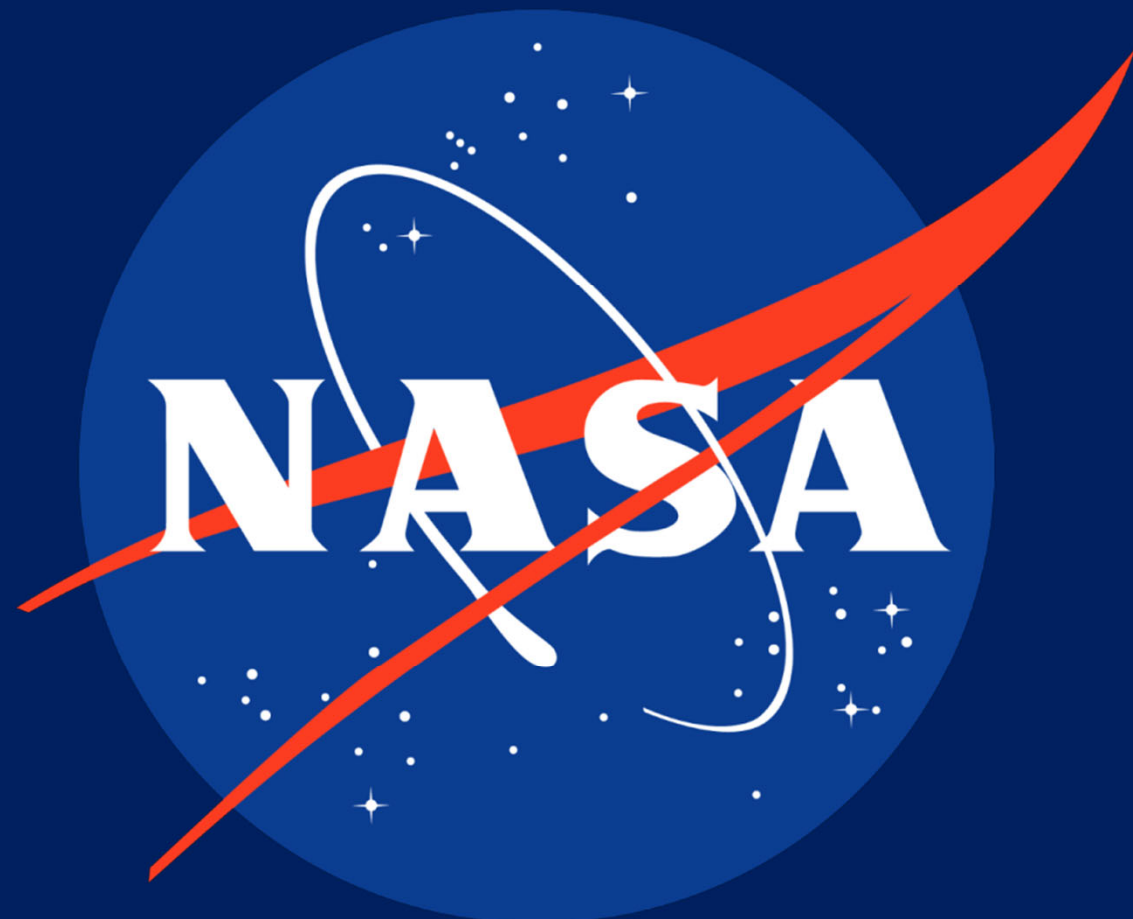# Dragonfly Entry Aerosciences Measurements (DrEAM) NASA Sensor Simulator to DLR Data Acquisition System Test

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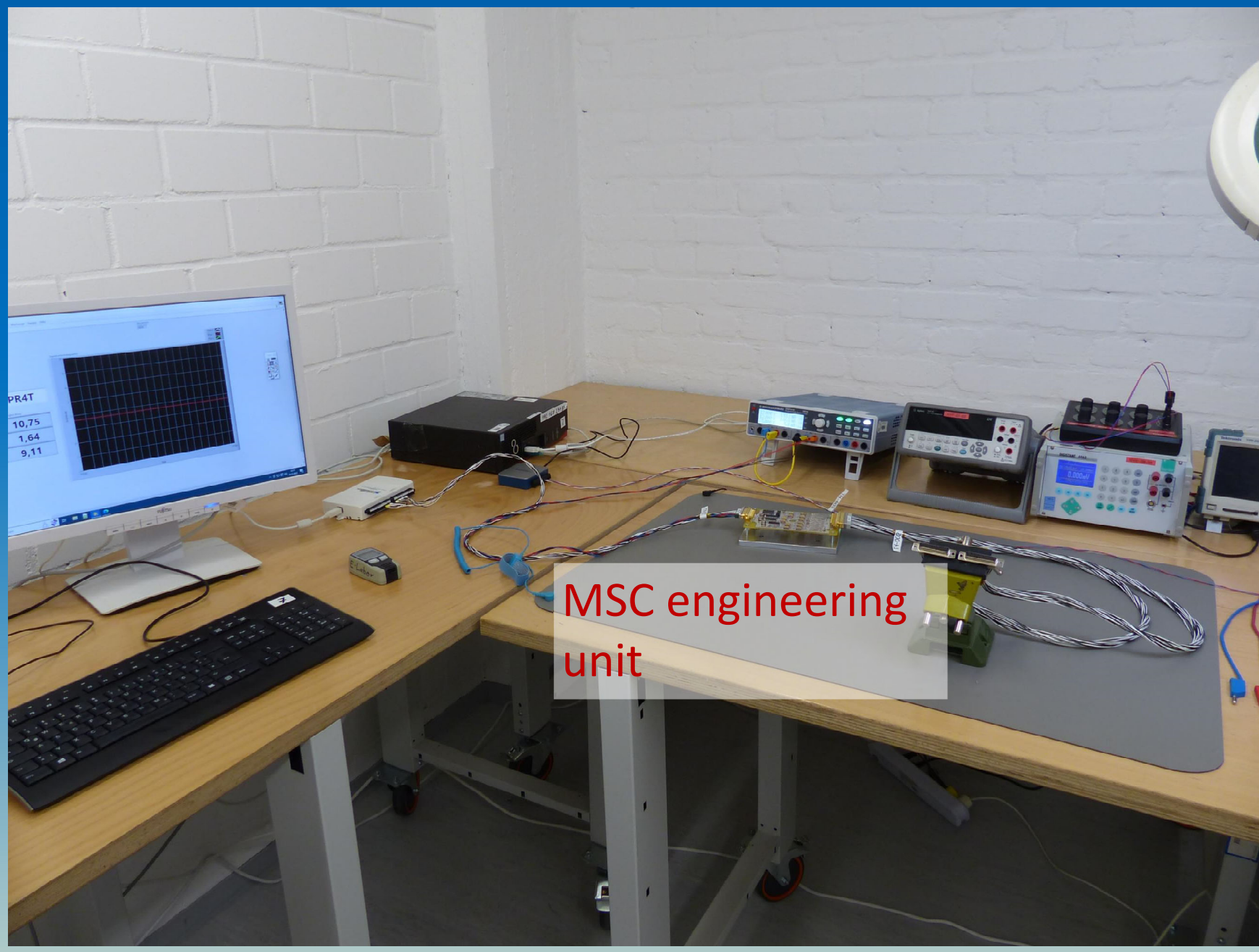
Purpose and Objectives:

Purpose:
Confirm that the DLR Multiplexing Signal Conditioner (MSC) can properly acquire analog signals from the NASA thermocouples and pressure sensors embedded in the Dragonfly aeroshell.

Objectives:
1) Perform checkout test with the NASA sensor simulator to verify channelization and functionality for NASA sensor measurement ranges expected during flight.
2) Verify the DLR MSC engineering unit can acquire simulated output voltages for the following NASA sensors: Type K thermocouples, hypersonic range pressure transducers, RTDs within the pressure transducer assembly
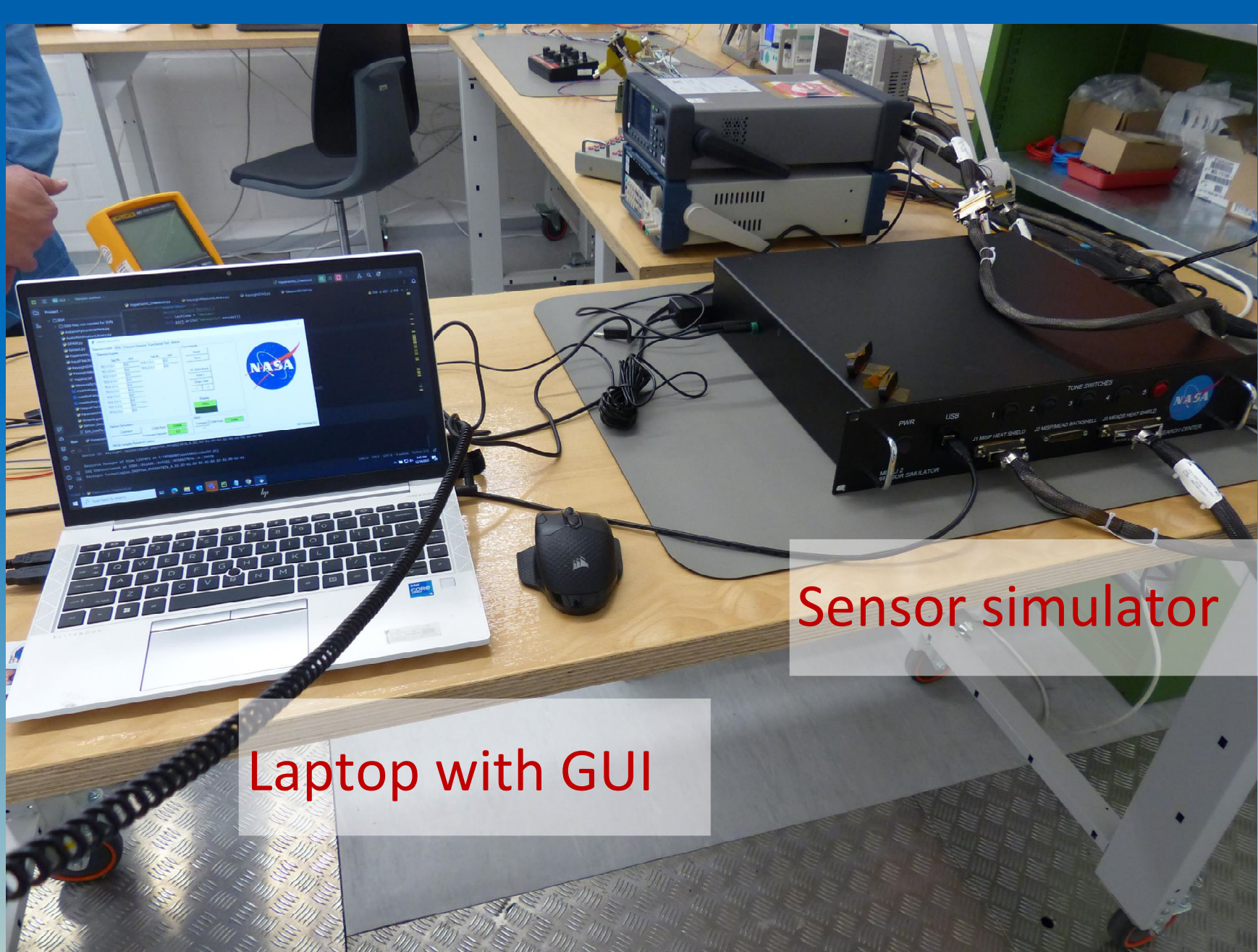
Test Setup

DLR Multiplexing Signal Conditioner

MSC engineering unit

- NASA sensor simulator transmits simulated output voltages via test harness connected to the MSC engineering unit
- MSC engineering unit acquires simulated output voltage and writes the data to a file

- NASA sensor simulator output is independently measured with a Commercial Off-The-Shelf (COTS) data acquisition unit to compare with the data set from the MSC
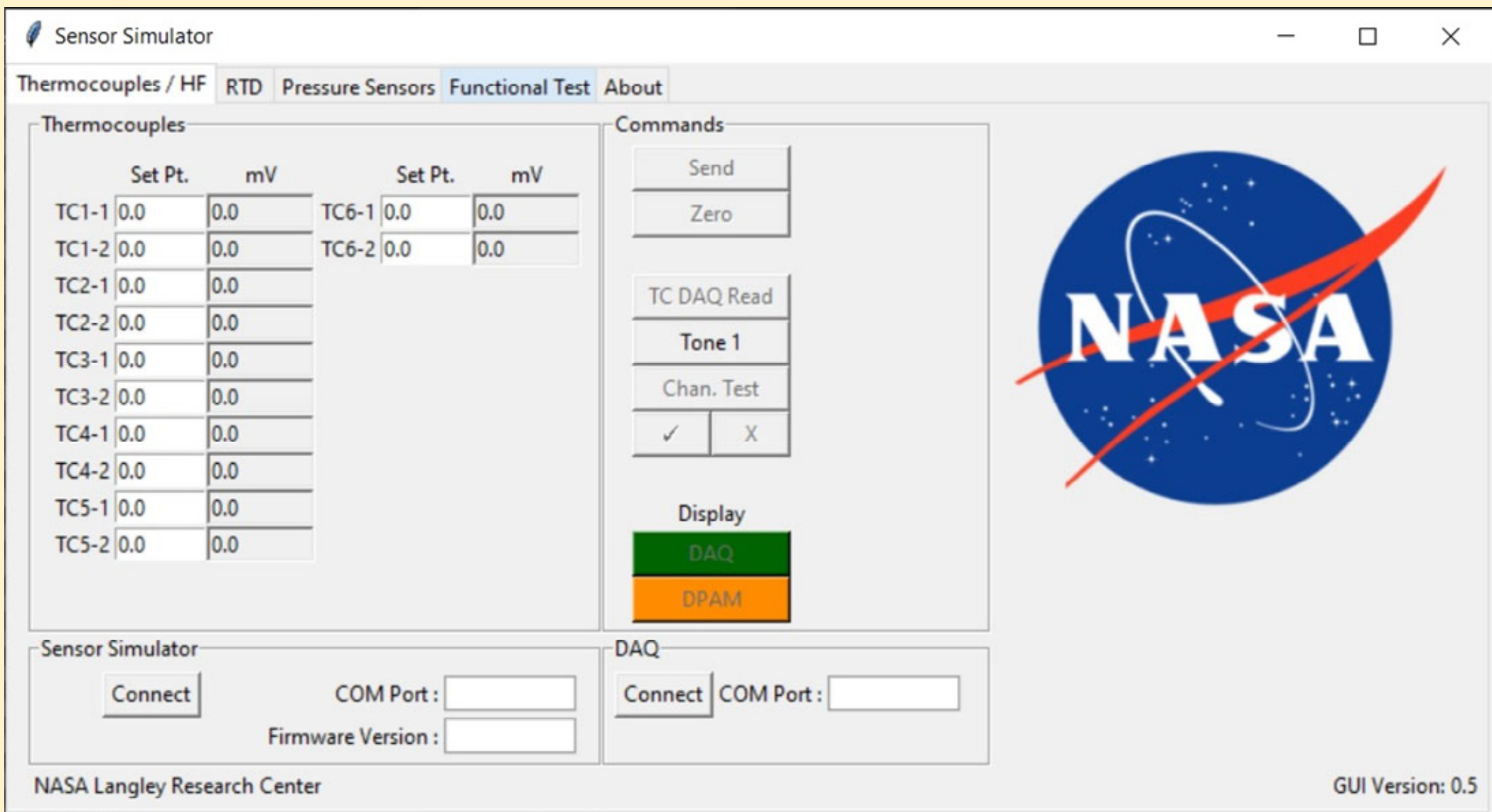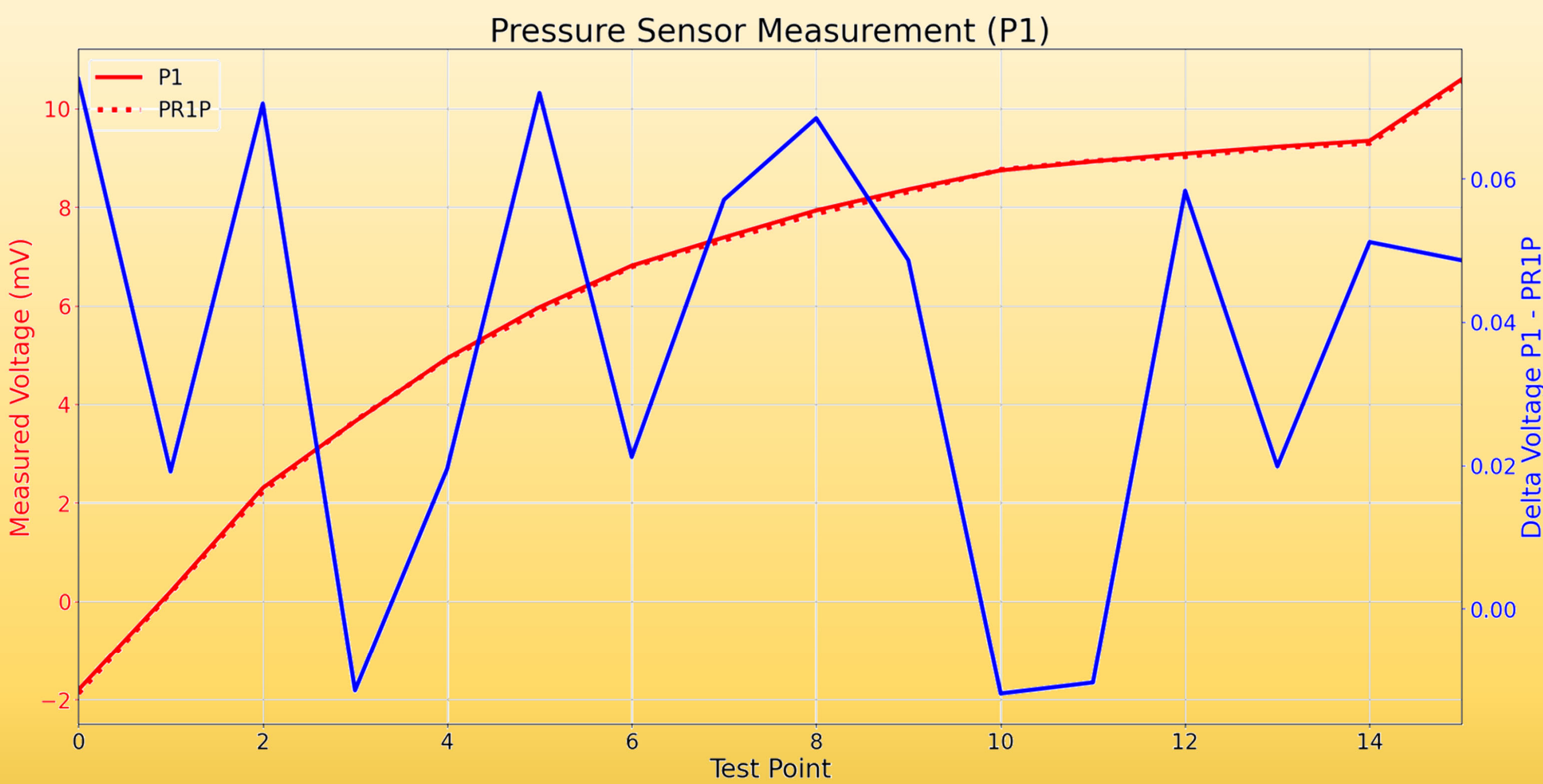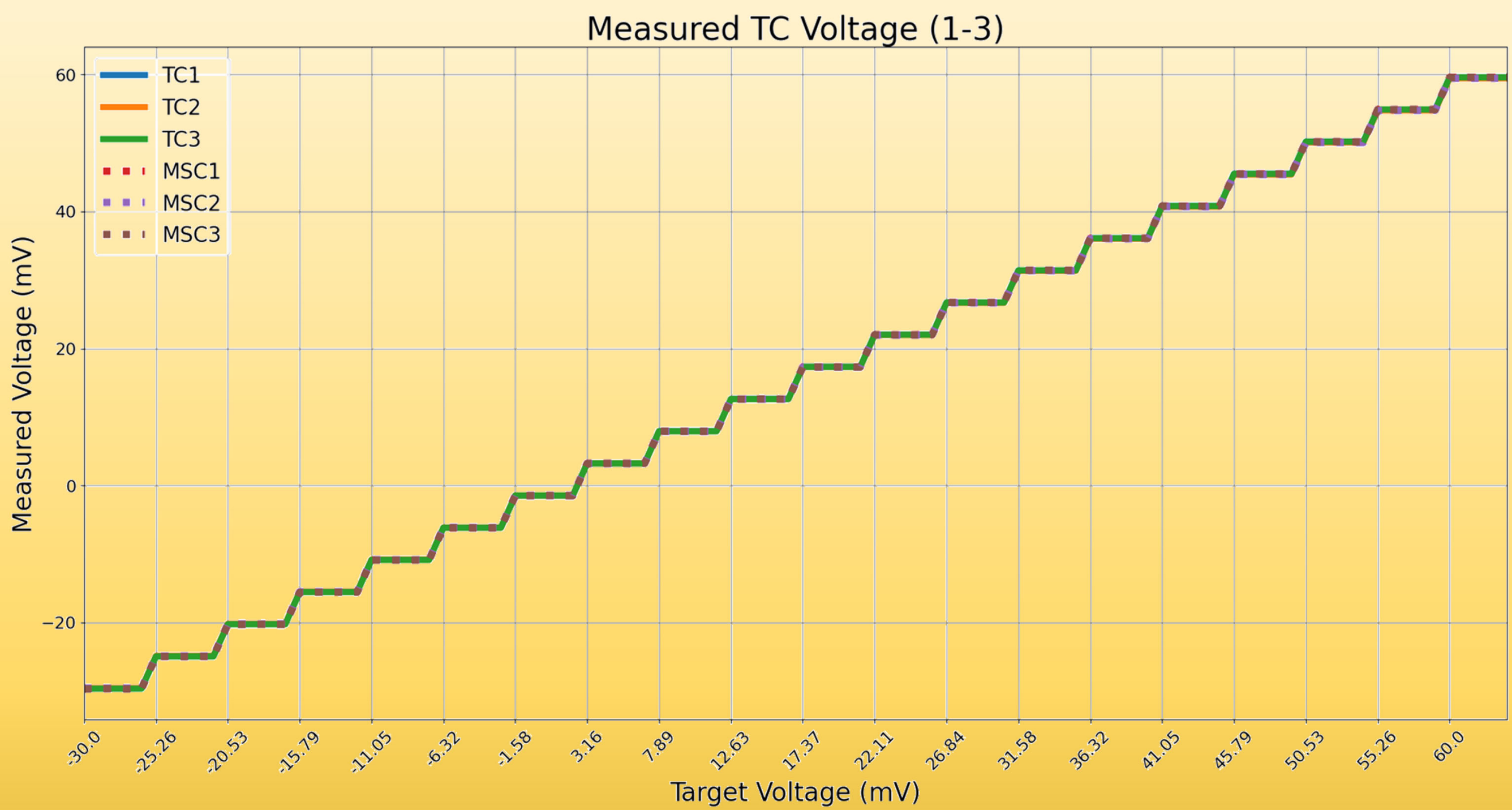
NASA Sensor Simulator

Sensor simulator

Laptop with GUI

Test Matrix:
- Channelization test for all simulated sensor channels: 12 Type K TCs, 5 pressure sensors, and 5 RTDs
- Automated sweep of a single sensor type at set points over the expected measurement range.
  - TC Sweep: User defined min and max voltage, and total data points
  - Pressure Sensor: 16 preset values
  - RTD: 32 preset values

- Sensor simulator was developed at LaRC for the Mars Entry, Descent, and Landing Instrumentation 2 (MEDLI2) project and modified for use on DrEAM
- User interface based on Python and developed at LaRC to automate testing

Results:

Data analysis shows that the deviation between the MSC engineering unit and the NASA sensor simulator output voltage is within +/- 0.1 mV.
Results will feed into the error budget and provide confidence that the current MSC design is capable of successfully capturing DrEAM flight sensor data at Titan during the Dragonfly mission EDL phase.

DrEAM is continuing to test the engineering unit of the MSC and proceeding with flight unit design.

See more DrEAM content here at IPPW 2024!
- Presentation by Ruth Miller: "Dragonfly Entry Aerosciences Measurements (DrEAM) Do-No-Harm Testing"
- Poster by Alyssa Velluci: "Dragonfly Entry Aerosciences Measurements (DrEAM) Suite Data Volume Estimates and Sensor Drift Characterization"