1. INTRODUCTION

On GMT 2026-08-27, at 239/16:53, the International Space Station (ISS) began an approximately 20-minute, 43-second reboost using the Cygnus NG-24 vehicle. The as-flown timeline identified a reboost Time of Ignition (TIG) of 239/16:53:00 and a duration of 00:20:43. Flight-controller information gave an expected rigid-body ΔV of 1.2 m/s and an altitude increase of approximately 2 km.

The Cygnus docking location and thrust geometry required the ISS to first maneuver to the so-called "-ZVV" reboost attitude before firing the vehicle's thrusters. In this attitude, the Cygnus thrust direction is arranged so that the resulting ISS acceleration is aligned with the orbital-velocity direction required for reboost. As in prior Cygnus reboost analyses, this geometry appears in Space Acceleration Measurement System (SAMS) data as a highly directional acceleration step in the negative Z-axis direction of the Space Station Analysis (SSA) body-fixed coordinate system.

The as-flown timeline shows the maneuver to the Cygnus reboost attitude beginning at GMT 239/15:35:01 and reaching the -ZVV configuration at about 15:55. A quaternion update for the reboost was scheduled at 16:15, followed by attitude-control handover from the US Segment to the Russian Segment (RS) at 16:30. After the reboost, control was handed from RS back to USTO at 17:25, coincident with the maneuver back toward the nominal Torque Equilibrium Attitude (TEA), which continued to about 17:55. The timeline then shows transition to US momentum management at 18:00.

2. QUALIFY

The as-flown timeline brackets the reboost with attitude maneuvers and an interval of Russian Segment attitude control. These surrounding operations are important context because maneuver and attitude-control thruster activity can excite low-frequency structural modes of ISS appendages and modules for substantially longer than the reboost firing itself.

The color spectrogram of Figure 2, computed from SAMS 121f05 (JPM1F1), shows the events leading up to, during, and following the reboost. The maneuver to -ZVV and the subsequent return toward nominal attitude produce transient spectral features and excited structural-mode response. At reboost start, however, the signature is qualitatively different: SAMS sensor heads distributed throughout the Station register a coherent, sustained, directional acceleration step strongly aligned

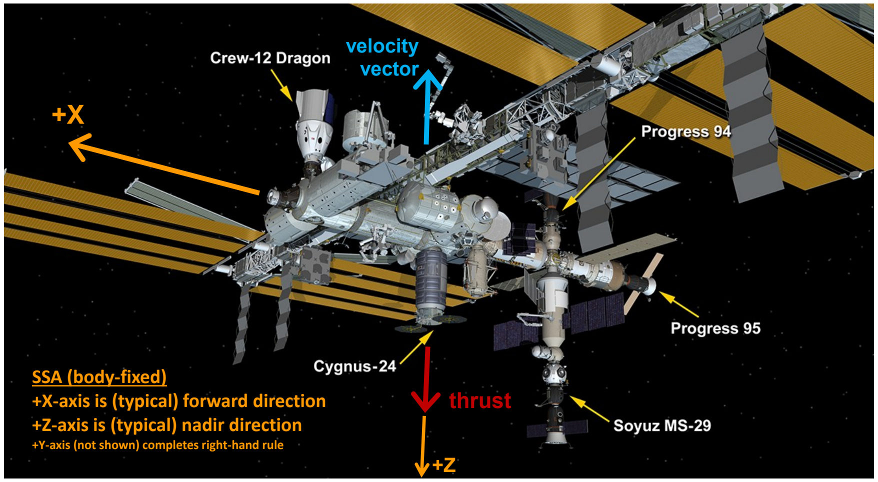

Fig. 1: Cygnus NG-24 location and alignment for the GMT 2026-08-27 reboost.

with the expected vehicle/thrust geometry. For the Cygnus configuration, this rigid-body response is primarily along the SSA Z axis, as demonstrated quantitatively in the following section.

The spectrogram helps establish the patterns and temporal boundaries of the surrounding acceleratory environment, while consensus among spatially separated SAMS sensor heads provides the key qualification. When independent sensors in multiple ISS modules show the same onset, duration, dominant axis, and termination, the response is consistent with whole-vehicle rigid-body acceleration rather than a local vibration source. That is the expected physical result: the reboost accelerates the complete ISS vehicle.

With that qualitative case established, the analysis proceeds to Quantify: interval-average the acceleration, determine the step magnitude and duration, and integrate the acceleration step to obtain the SAMS-derived ΔV.

planned attitude/thrust geometry → expected dominant axis → station-wide SAMS consensus → separate reboost from surrounding maneuver/structural response → quantify acceleration and ΔV

3. QUANTIFY

Analysis of seven distributed SAMS sensor heads shows the tell-tale negative Z-axis step beginning at about the scheduled reboost TIG. Figures 3 through 9 use 5-second interval averages stepped every 1 second. This processing mostly suppresses the superimposed vibratory environment and helps to expose the nearly constant rigid-body acceleration (the step) associated with the reboost. The plotted SAMS axes are inverted to account for the intrinsic polarity "convention" of these transducers.

Across all seven sensors, the mean Z-axis step ranges from -0.097 to -0.100 mg, while the measured duration ranges from 00:20:42 to 00:20:44. Integrating each measured mean acceleration over its measured duration gives signed Z-direction velocity changes from approximately -1.18 to -1.22 m/s. Expressed as reboost magnitude, the seven-sensor consensus is approximately 1.21 m/s, within about 0.01 m/s (less than 1%) of the 1.2 m/s flight-controller value. The close agreement among seven sensor heads distributed throughout the ISS is evidence that the observed feature is the intended station rigid-body reboost response.

A compact quantification of the reboost is given in Table 1. Signed ΔV_z is retained in the table to preserve the measured SSA-axis direction; positive values quoted in the narrative refer to reboost magnitude.

Table 1. SAMS measurements of the Cygnus NG-24 reboost.

Sensor	Mean Z (mg)	Duration	ΔV_z (m/s)	Location
121f02	-0.099	00:20:42	-1.21	COL Endcone
121f03	-0.099	00:20:42	-1.21	LAB1O1 (ER2)
121f05	-0.099	00:20:44	-1.20	JPM1F1 (ER5)
121f08	-0.097	00:20:42	-1.18	COL1A3 (EPM)
es18	-0.100	00:20:43	-1.22	LAB1P2 (ER7)
es19	-0.100	00:20:43	-1.22	JPM1F6 (ER4)
es20	-0.098	00:20:43	-1.20	LAB1S2 (MSG)

Progress vs. Cygnus Reboost Note

A Russian Progress cargo vehicle docked at the aft end of the ISS has its reboost thrusters oriented favorably for reboost and therefore does not require the same pre- and post-reboost attitude maneuvers associated with the Cygnus docking geometry. For Cygnus NG-24, the as-flown timeline explicitly shows the maneuver to -ZVV before the reboost and the maneuver back toward TEA afterward; those additional operations explain much of the surrounding low-frequency structural activity seen in Figure 2.

4. CONCLUSION

Seven distributed SAMS sensor heads measured a remarkably consistent rigid-body signature during the GMT 2026-08-27 Cygnus NG-24 reboost: a negative Z-axis acceleration step of approximately 0.10 mg lasting about 20 minutes 43 seconds. Integrating the measured step yields a SAMS-derived reboost magnitude of approximately 1.21 m/s, with individual sensor estimates spanning only 1.18–1.22 m/s.

The SAMS consensus agrees with the 1.2 m/s flight-controller value to within about 0.01 m/s (less than 1%). Agreement in onset, duration, dominant axis, and integrated velocity change across all seven sensor locations demonstrates that the reboost signature was observed station-wide and supports identification of the event as the intended whole-vehicle rigid-body acceleration.

Compared to typical Progress reboosts, this Cygnus one was **roughly** half the acceleration magnitude and double the duration.

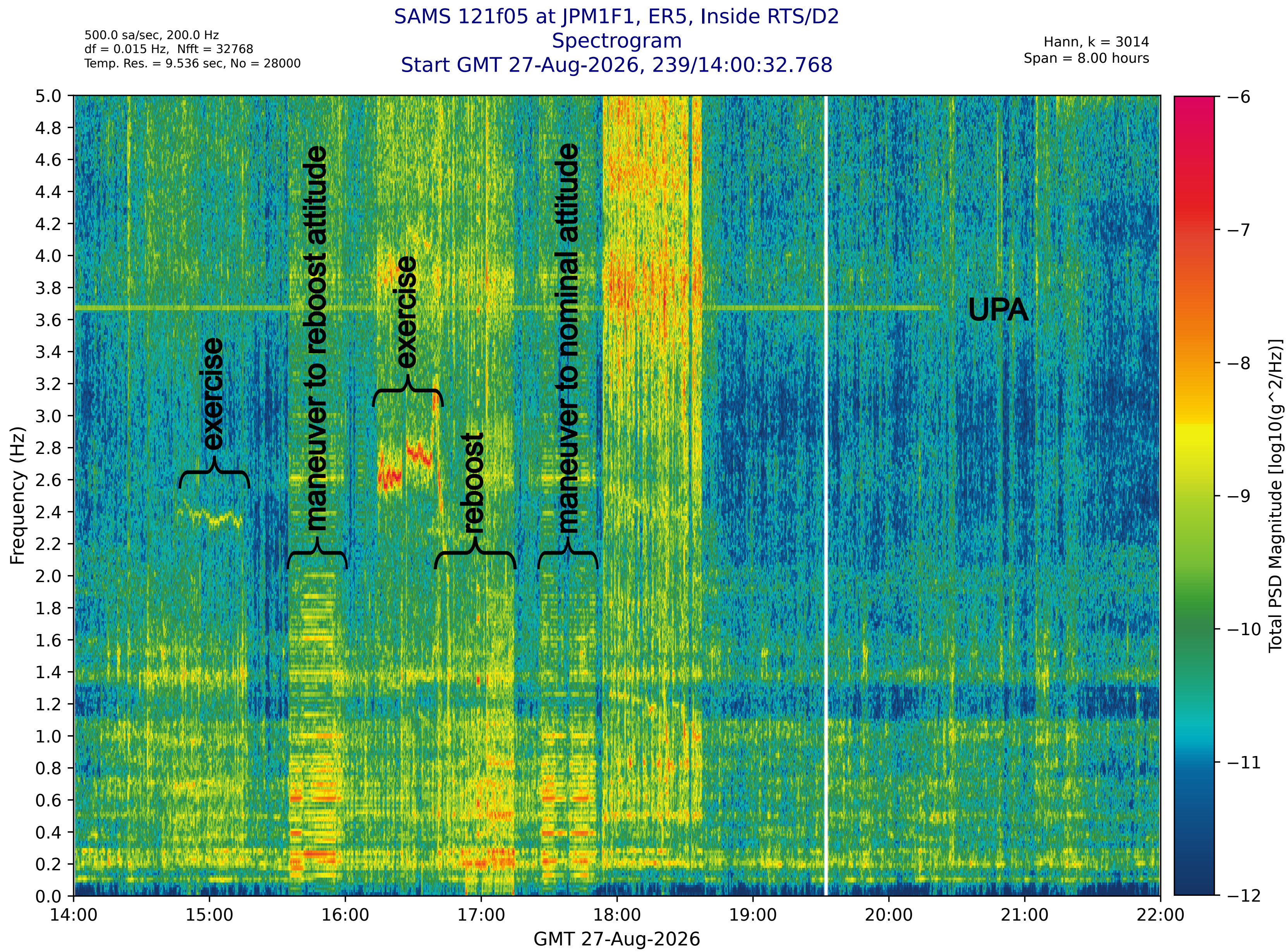

Fig. 2: SAMS spectrogram showing the Cygnus NG-24 reboost and surrounding attitude-control activity on GMT 2026-08-27.

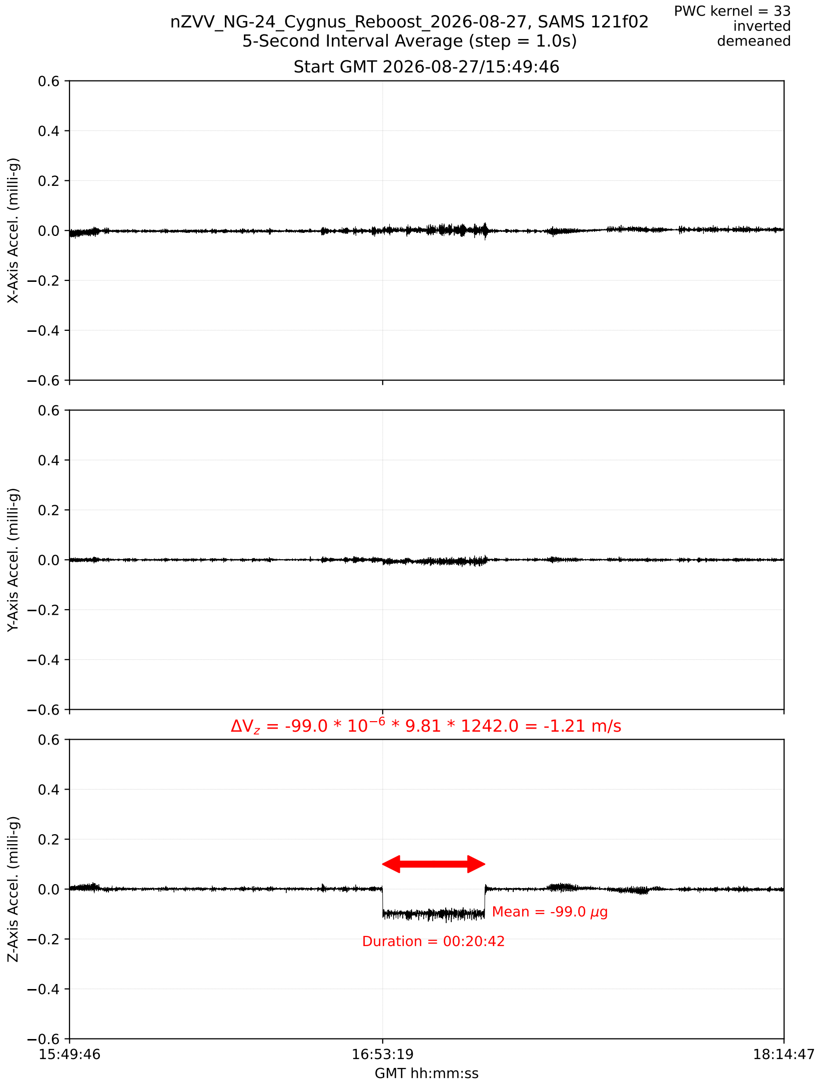

Fig. 3: 5-second interval average for SAMS 121f02 at COL Endcone.

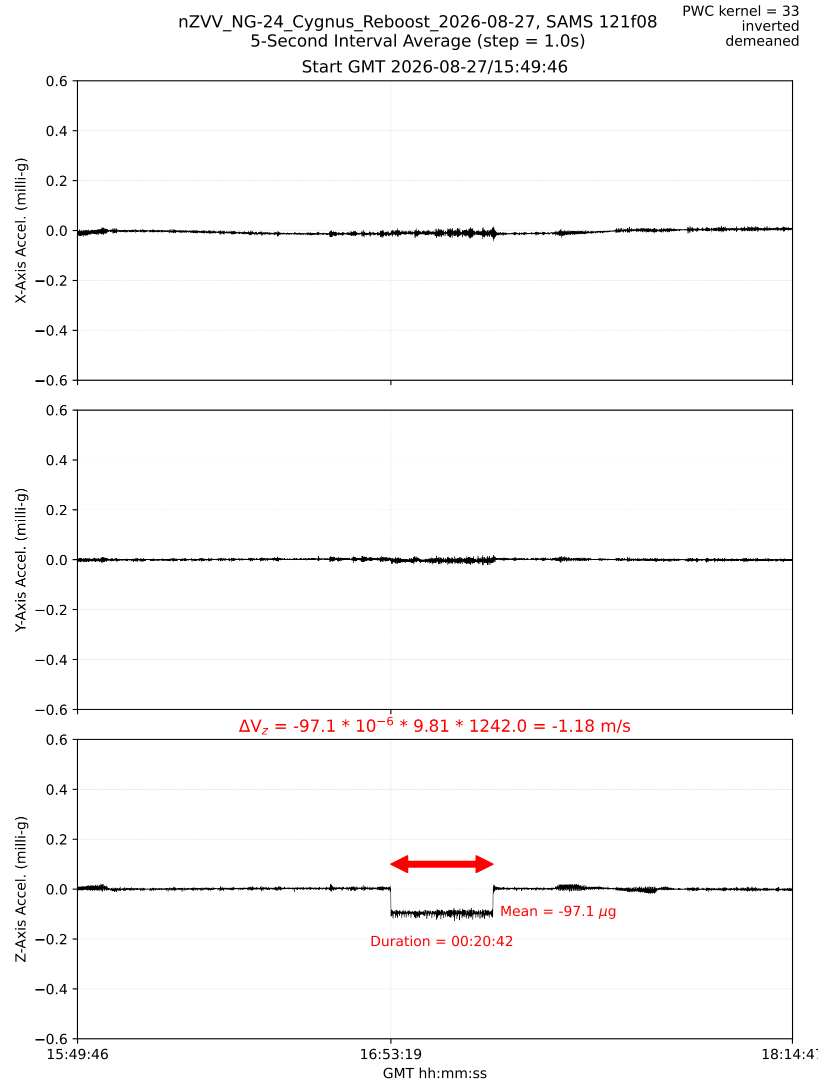

Fig. 4: 5-second interval average for SAMS 121f08 at COL1A3.

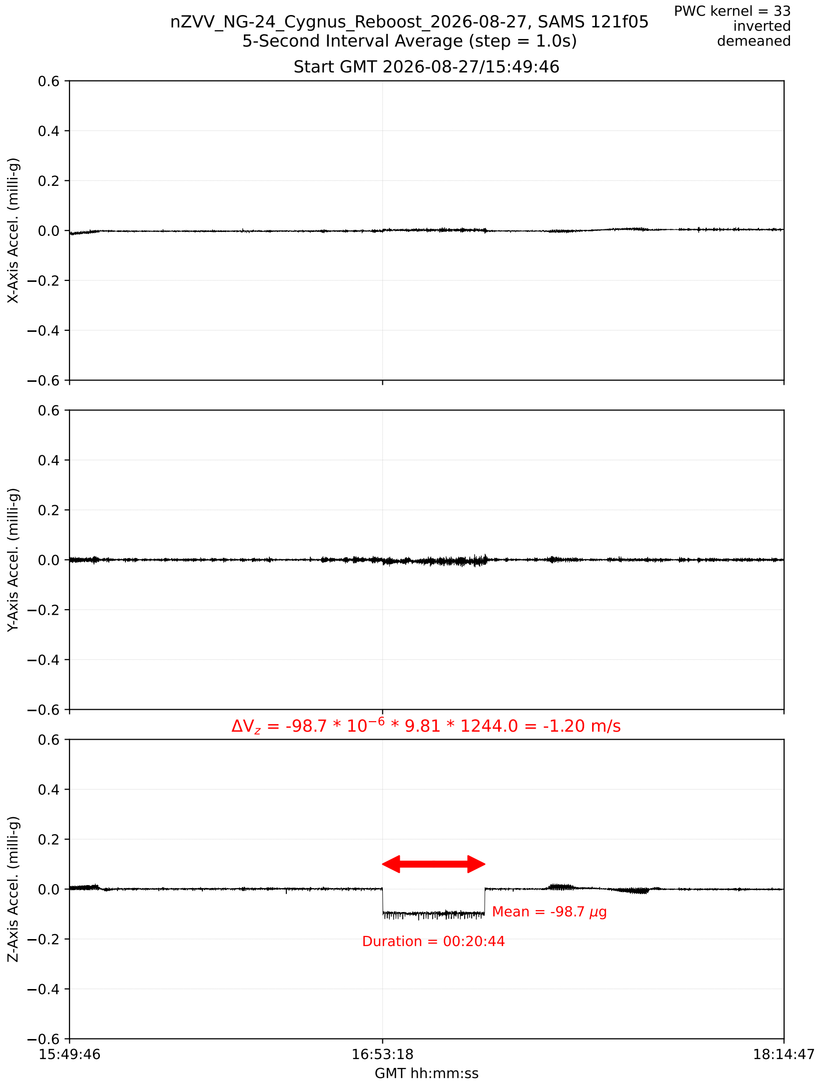

Fig. 5: 5-second interval average for SAMS 121f05 at JPM1F1.

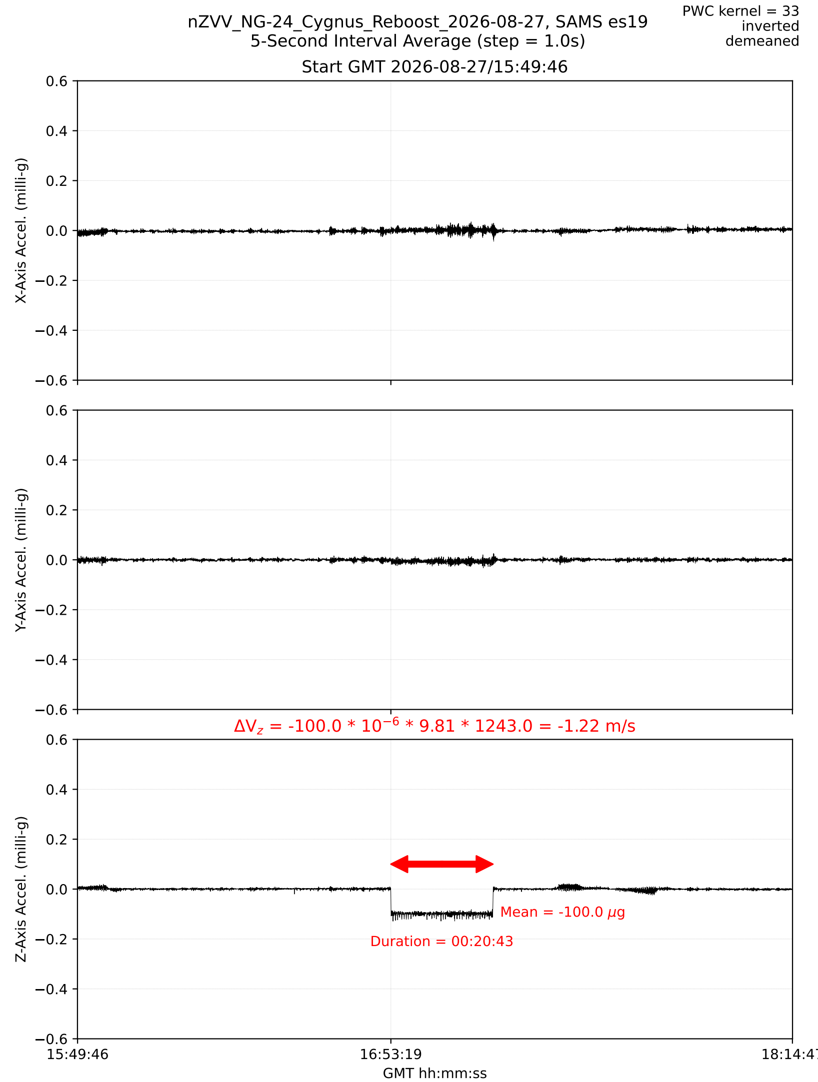

Fig. 6: 5-second interval average for SAMS es19 at JPM1F6.

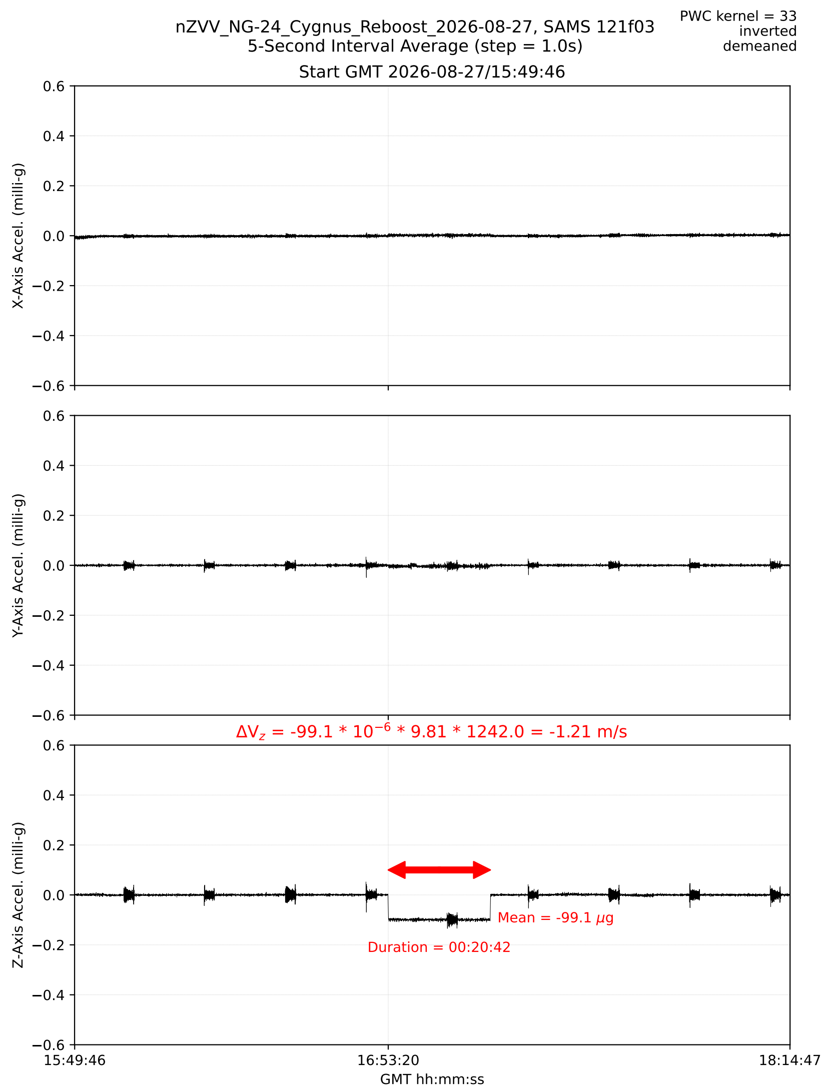

Fig. 7: 5-second interval average for SAMS 121f03 at LAB1O1.

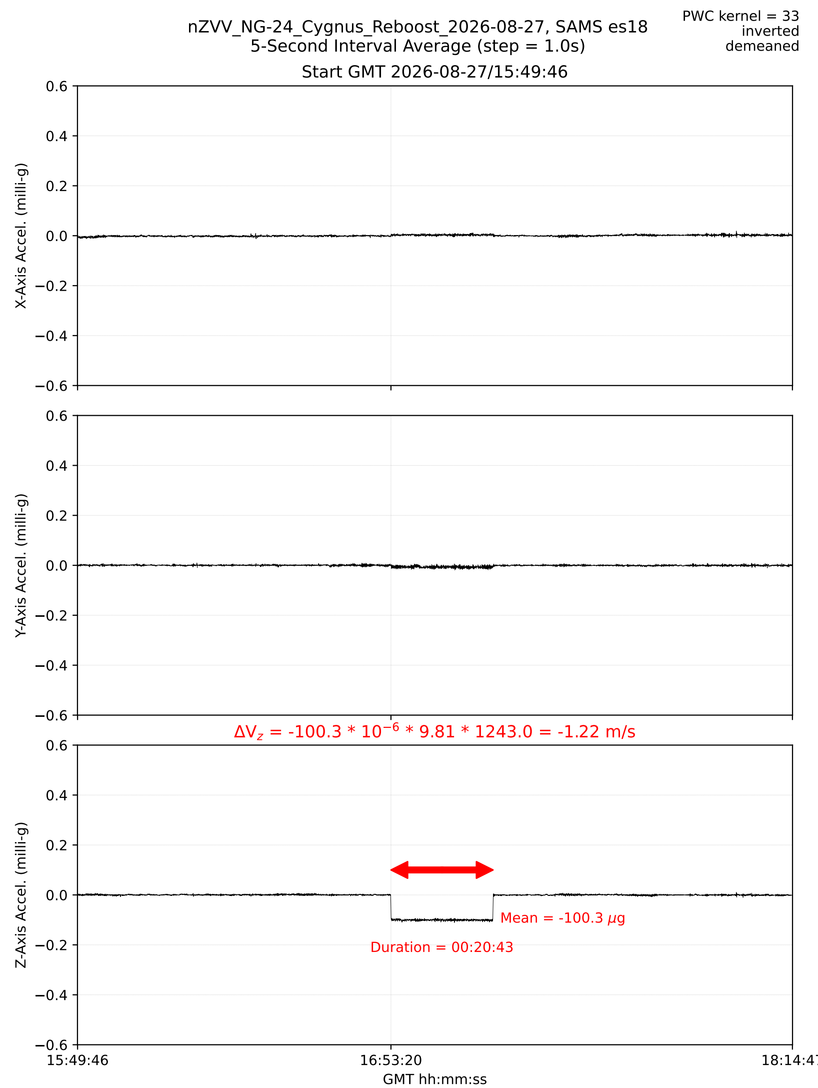

Fig. 8: 5-second interval average for SAMS es18 at LAB1P2.

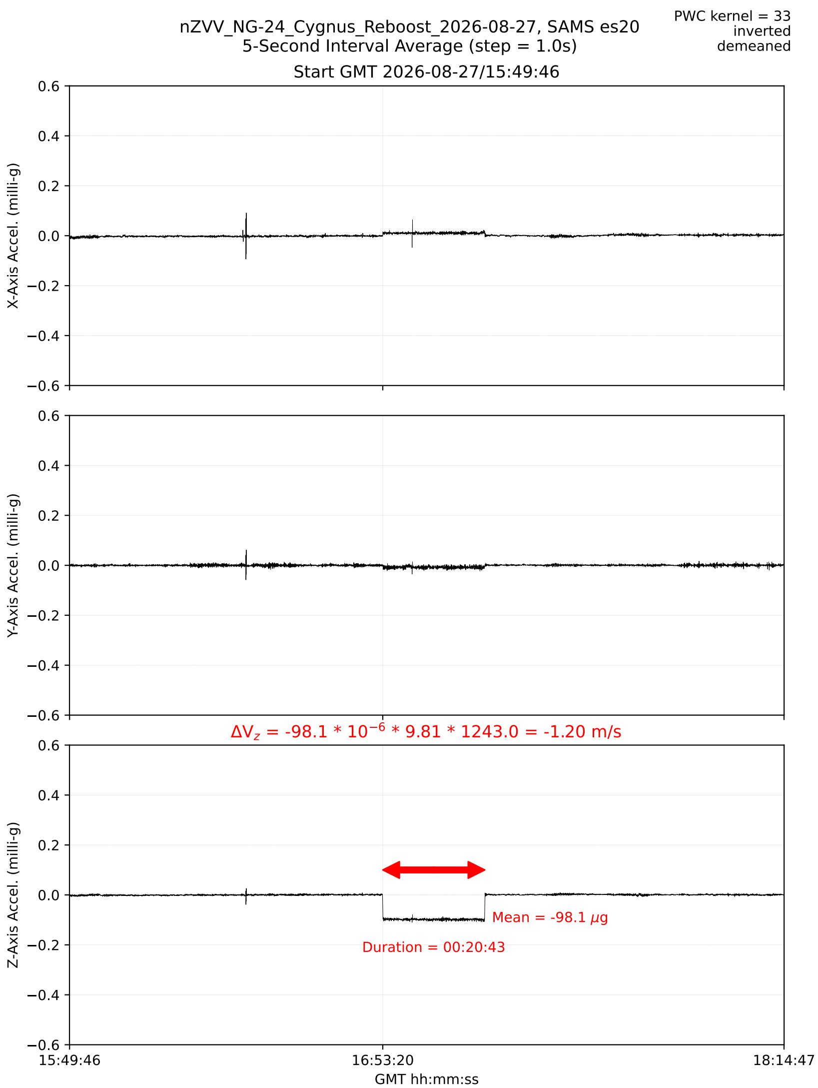

Fig. 9: 5-second interval average for SAMS es20 at LAB1S2.