1. KEY POINTS

- **What Happened.** A short (~15-minute) interval in which persistent, narrow-band vibration signatures temporarily *turned off* and then *turned back on*, consistent with a crew/equipment operation to exchange an ADSEP cartridge. This "off" interval is most clearly visible in the time–frequency spectrogram overview (Figure 2, page 4).
- **When It Happened.** Based on the alignment of planned crew activity with the measured vibration signatures, the exchange likely occurred between approximately GMT 12:37 and 12:52 on 2026-02-12. We present band-limited RMS histories (Figs. 7–9, starting on page 7) for clear evidence: prominent narrow-band components drop/decrease for ~15 minutes and then return, with brief impulsive transients bracketing the interval.
- **Where It Happened.** The context diagram (Figure 1, page 3) places the operation at ER6/LAB1O4. The signature appears mostly localized (specific narrow-band components and short transients), rather than a station-wide event.
- **Frequency Content (Narrow-Band Emphasis).** The response is dominated by a small set of narrow-band components highlighted in the spectrogram (boxes 1–3 in Figure 2, page 4). These correspond to three frequency bands (~37–39 Hz, ~65–68 Hz, and ~92–94 Hz) for which we used Parseval's theorem to compute RMS values shown in Figs. 7, 8, and 9.
- **Operational Relevance.** For sensitive investigations, a practical and conservative "disturbance off" window is obtained by taking the union of the lower-RMS excursions across the three bands and bounding them by the impulsive transients to book-end the "off" interval. This would happen infrequently, but perhaps can be leveraged in some sensitive scenarios.
- **Nutshell.** Looking at the spectrogram in Figure 2 (page 4), the crew activity and equipment off presents as:
  1) two brief, broadband impulsive features (vertical streaks) that bracket the crew activity (before and after), and
  2) a temporary dropout of the narrow-band spectral lines in the three boxed regions (horizontal features) for ~15 minutes, followed by their return.

  The boxed Region 3 shows the most pronounced "off/on" contrast and is echoed in the corresponding summary view (Figure 5).

2. INTRODUCTION

This document captures a crew/equipment operation (ADSEP cartridge exchange) using Space Acceleration Measurement System (SAMS) vibration measurements, analysis, and visualizations.

We use a few complementary figures and plot types like so:

1) a schematic rack/location context diagram to orient the reader to the hardware layout (Figure 1, page 3);
2) an 8-hour, 200 Hz spectrogram to visualize and localize the activity in time with annotations for a few frequency bands of interest (Figure 2, page 4);
3) three short-window, per-axis power spectral density plots (Figs. 3–5); and
4) band-limited RMS versus time views to quantify the intensity of the response and help bound the operational interval (Figs. 7–9, pages 7–9).

The goal here is not to identify or infer source mechanisms in detail, but to provide a concise, figure-supported characterization: *when* the activity occurs, *which frequency bands* show more or less strongly, and *how large* the response we can readily identify using localized, SAMS data-driven analysis.

3. QUALIFY

Figure 1 (page 3) provides rack-level context schematic layout for the rack involved (ER6/LAB1O4), as we assert the disturbances are associated with local crew interaction and nearby equipment.

The 8-hour spectrogram (Figure 2, page 4) shows a brief mid-day interval with conspicuous, vertically-oriented features (i.e., vertical streaks, broadband impulsive energy) that bracket on/off transitions in a few mid-frequency bands. Three frequency regions are explicitly highlighted in the spectrogram (boxes labeled 1–3), indicating time-constrained response during the same time window.

The per-axis (X/Y/Z) acceleration power spectral density (PSD) views for the three frequency bands (32–44 Hz, 60–72 Hz, and 87–100 Hz) (pages 5–6) further support a localized, operational signature associated with the ADSEP exchange. In each PSD figure, the black traces correspond to a 4-minute interval not long before the ADSEP equipment was turned off, while the red traces correspond to a 4-minute interval during the ADSEP-off period. Across these views, distinct narrow spectral peaks appear in the black traces but are absent in the red traces, consistent with those components being tied to ADSEP operation rather than some other or background source.

4. QUANTIFY

We quantify via band-limited RMS time histories (pages 7–9), which provide clean operational markers. The most obvious departure from operational baseline occurred during the "off" interval (about GMT 12:37-12:52) in the frequency band from 92 to 94 Hz. We see a notable lower RMS plateau during this span in Figure 9.

We follow-up on this plot with a per-axis, full day version as shown in Figure 10 on page 10. Here we see that the narrowband disturbance in the 92 to 94 Hz frequency band is primarily aligned with the X-axis (red trace, top subplot) suggesting perhaps a piston-like pump action? Furthermore, counting the obvious cycles (see magenta annotations in bottom subplot), there is a regular cycling that seems to be occurring with 20 such cycles counted over about a 10-hour period. This cycling RMS behavior began after the crew activity on GMT 2026-02-12.

5. CONCLUSION

The SAMS sensor head (es18) provided a crude accounting of the crew and equipment activity associated with the Advanced Space Experiment Processor (ADSEP) cartridge exchange performed on GMT 2026-02-12 at the ER6 (LAB1O4) rack. This was a brief, crew-driven operation—lasting approximately 15 minutes between GMT 12:37 and 12:52—and was captured as the temporary absence ("turn off") of 5 spectral peaks in three narrow frequency bands (37–39 Hz, 65–68 Hz, and 92–94 Hz). That brief span of i.e. "equipment off" was bracketed by sharp broadband impulsive transients that mark actions required for (presumably) cartridge removal and reinstallation in that rack. The 8-hour spectrogram presented serves to bound and identify the event in both time and frequency, while the band-limited RMS time histories supply quantitative information: clear low-RMS plateaus during the “equipment-off” window in 3 frequency bands.

Aboard the International Space Station, it is possible that even relatively small vibrations can impact breakthrough science or technology development work. This analysis demonstrates the power of targeted accelerometry. By distilling raw vibration signatures into precise operational insights, this approach safeguards sensitive payloads and optimizes crew timelines, reinforcing the Station’s role as humanity’s premier orbital laboratory.

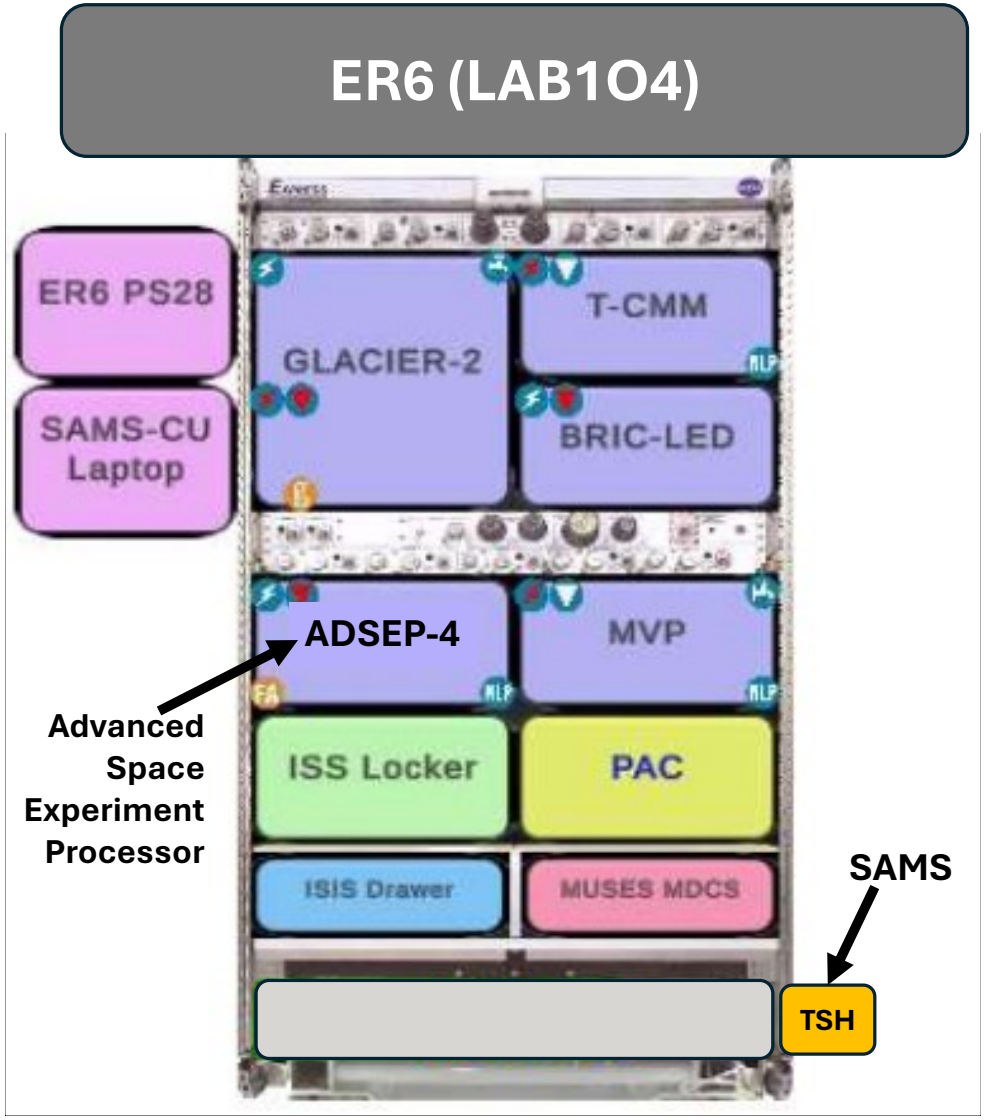

Fig. 1: Schematic View of ER6 (LAB1O4) Noting ADSEP and SAMS (TSH) Locations.

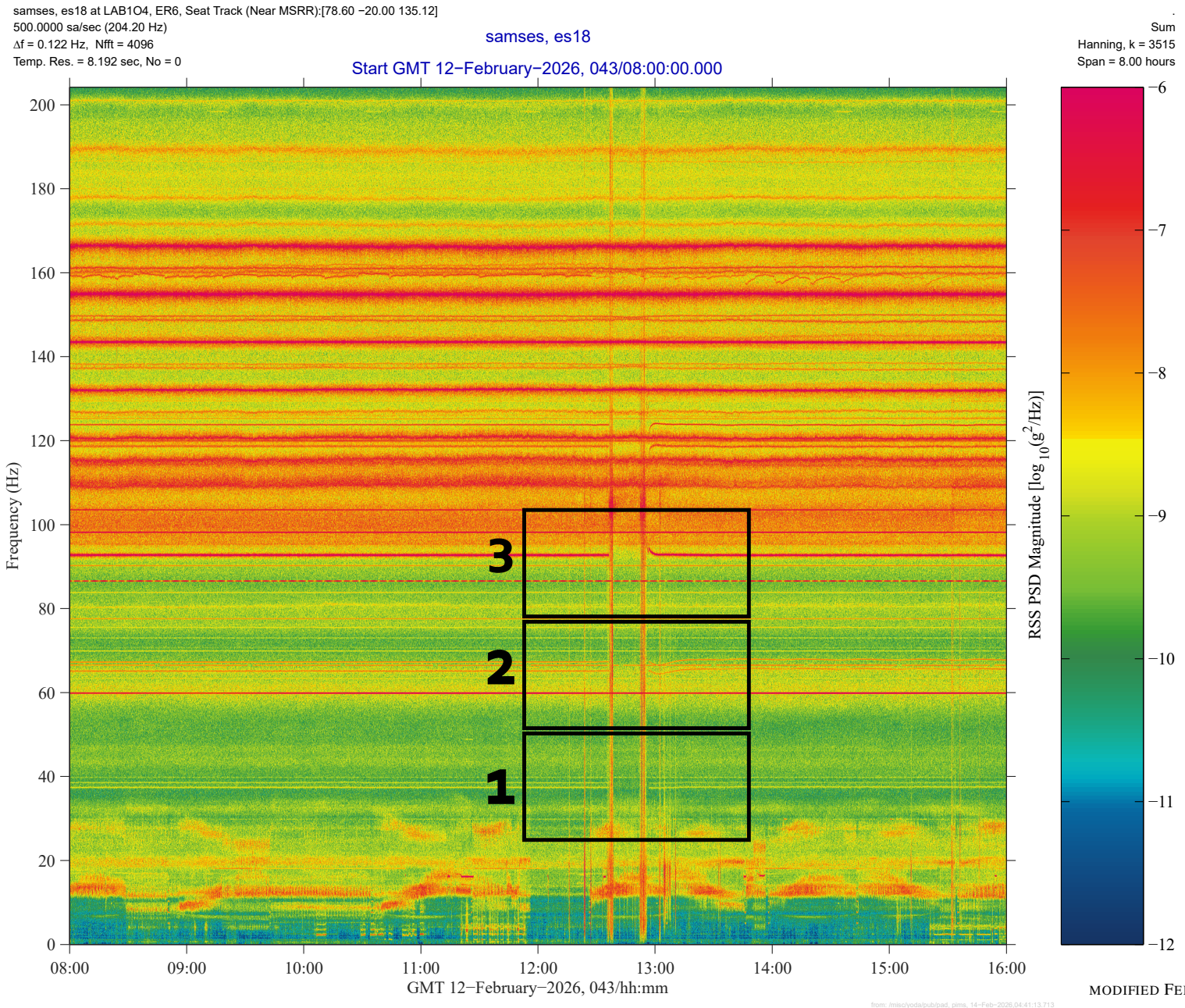

Fig. 2: ADSEP Cartridge Swap: 200 Hz, 8 Hour Spectrogram, SAMS Sensor `es18`, GMT 2026-02-12.

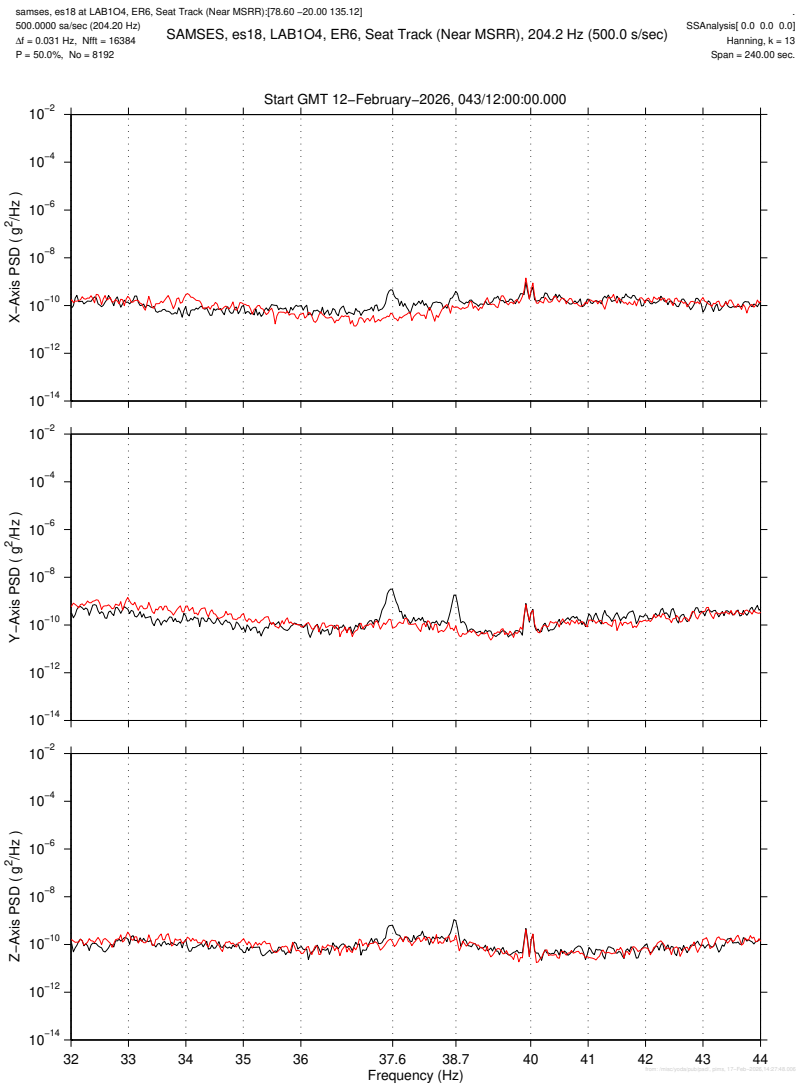

Fig. 3: Per-Axis Power Spectral Density (red is ADSEP equipment "off", black is "on"), 32 < f < 44 Hz.

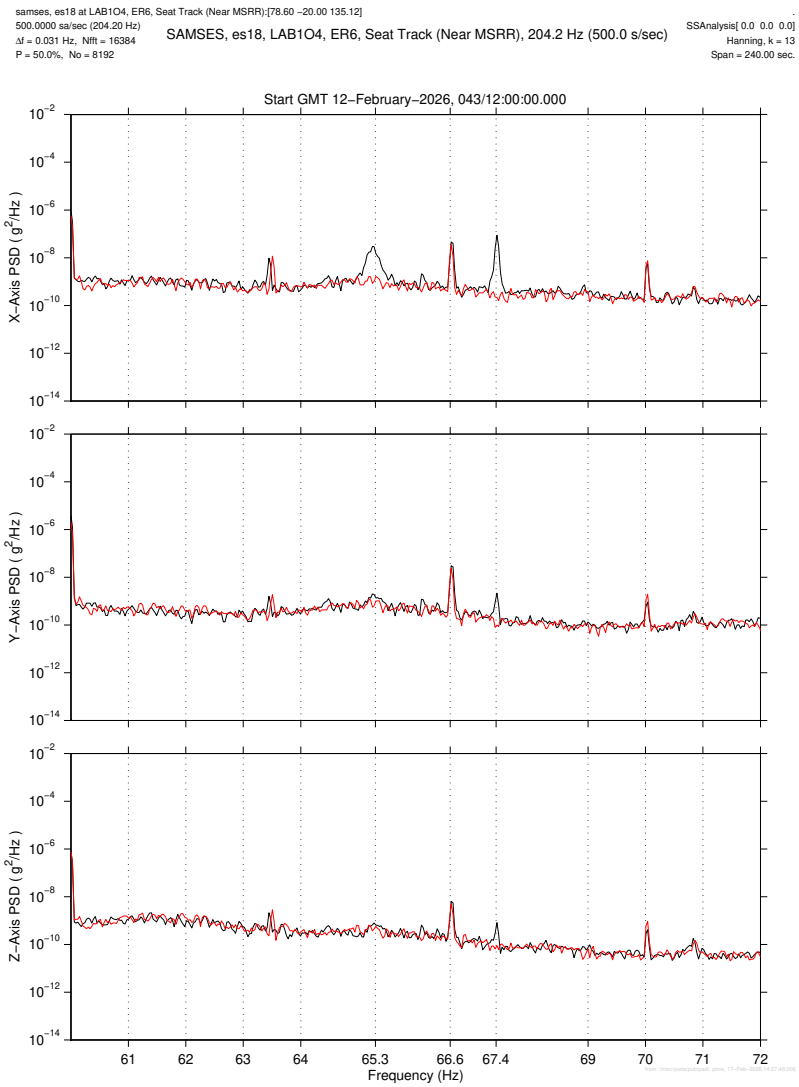

Fig. 4: Per-Axis Power Spectral Density (red is ADSEP equipment "off", black is "on"), 60 < f < 72 Hz.

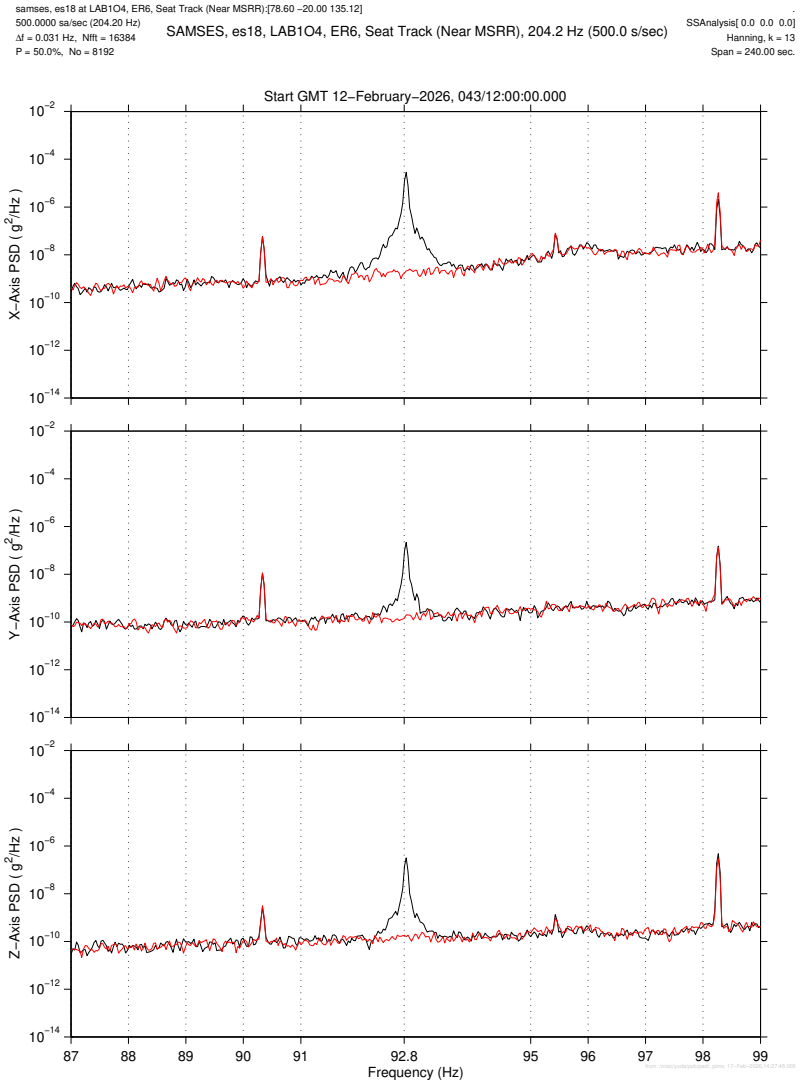

Fig. 5: Per-Axis Power Spectral Density (red is ADSEP equipment "off", black is "on"), 87 < f < 99 Hz.

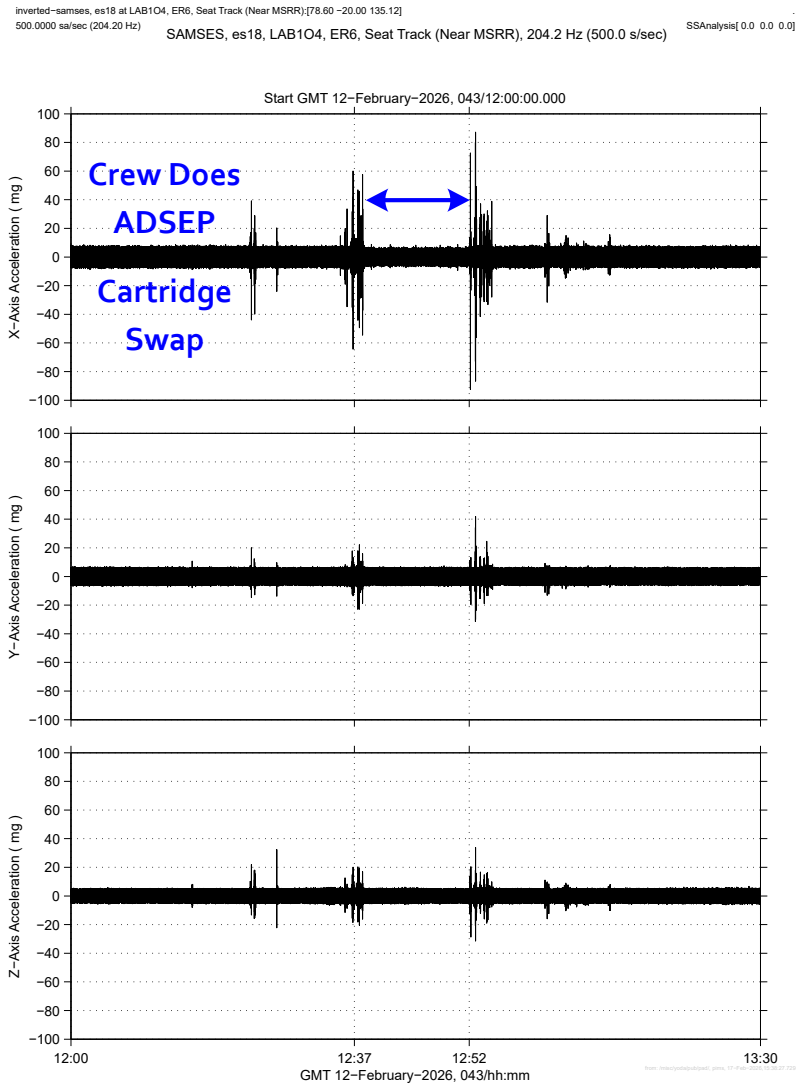

Fig. 6: 90-Minute, 200 Hz $a_{xyz}(t)$ via SAMS es18 Sensor at LAB1O4 (ER6).

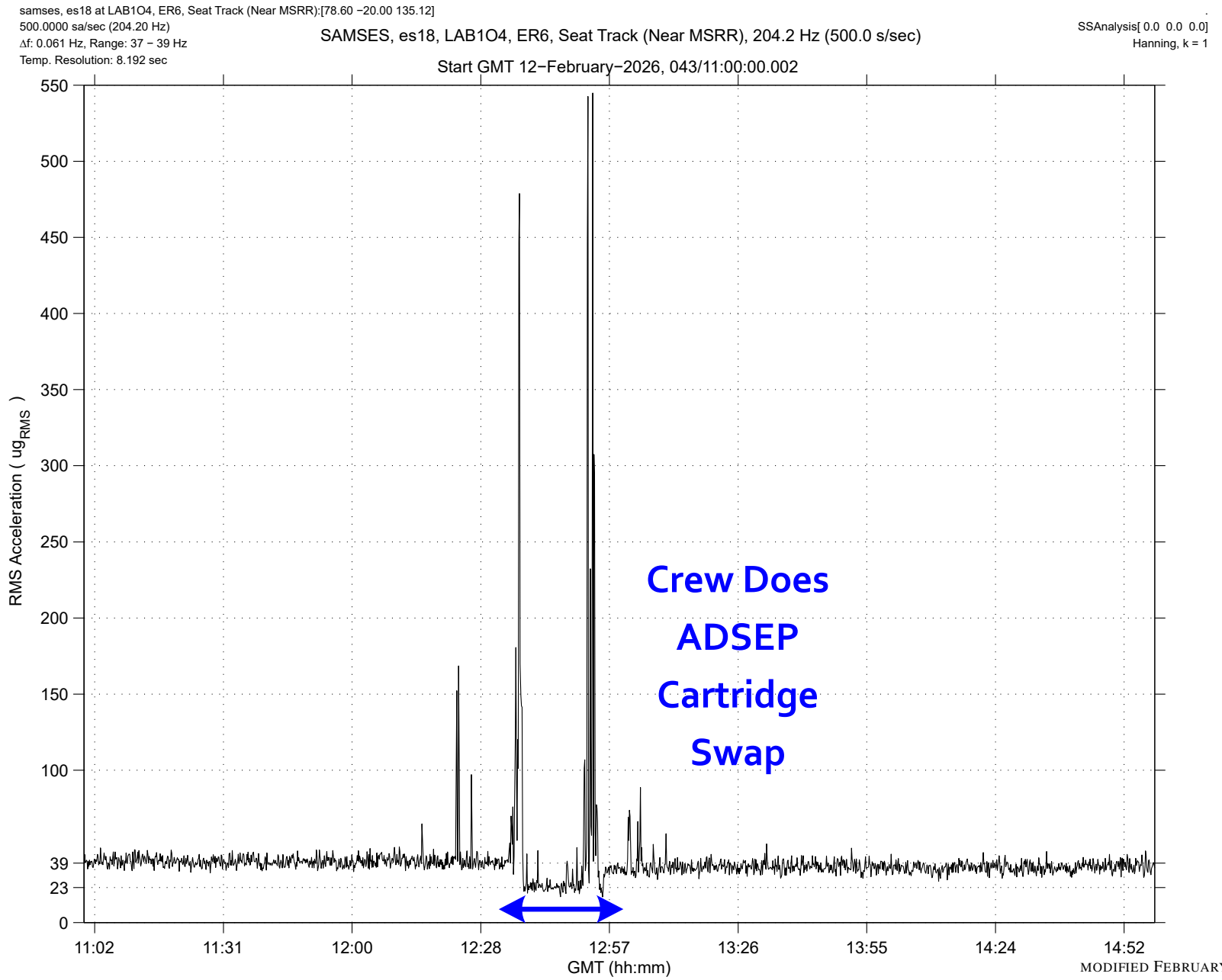

Fig. 7: ADSEP Cartridge Swap Acceleration RMS Levels (37 < f < 39 Hz) SAMS Sensor es18, GMT 2026-02-12.

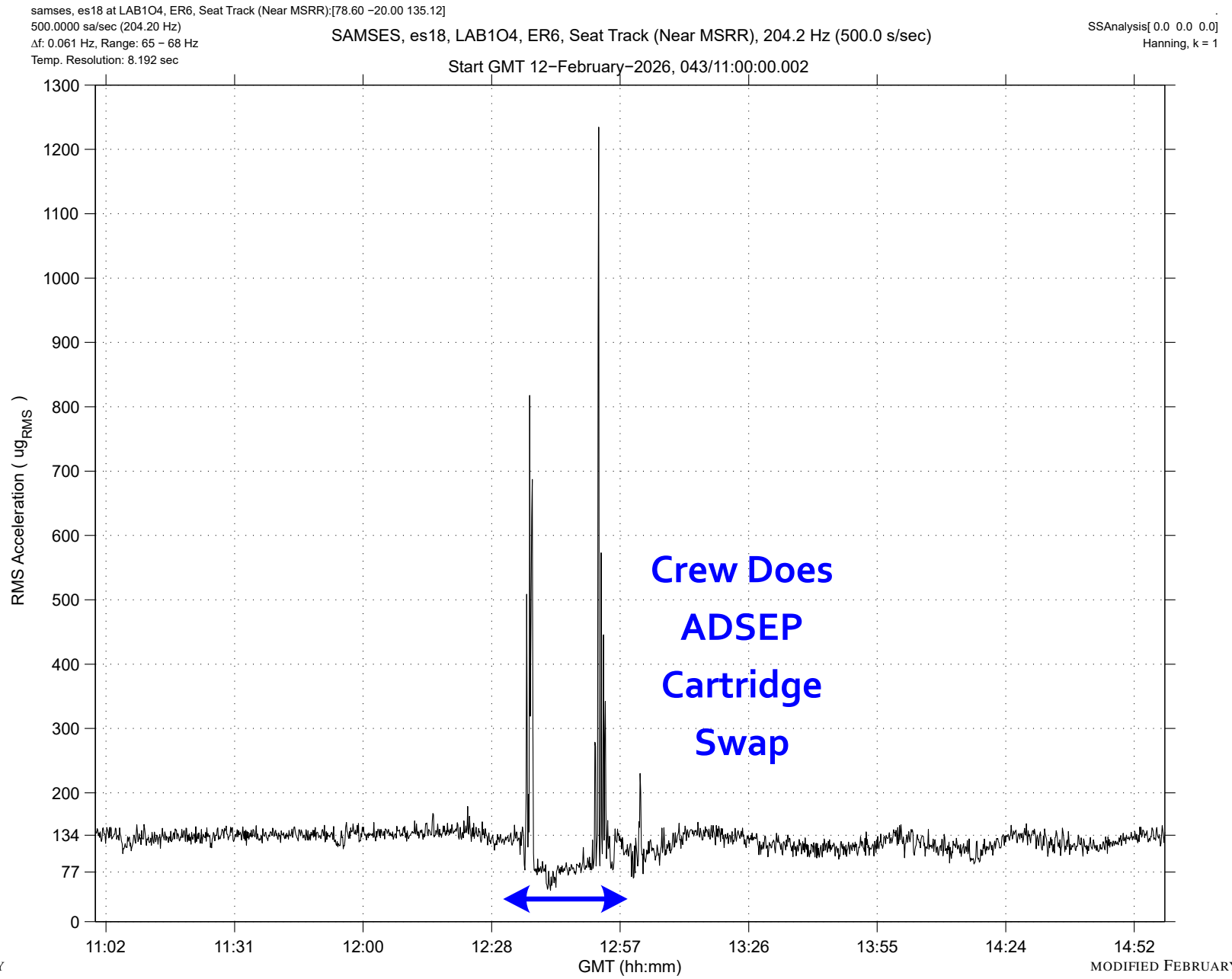

Fig. 8: ADSEP Cartridge Swap Acceleration RMS Levels (65 < f < 68 Hz) SAMS Sensor es18, GMT 2026-02-12.

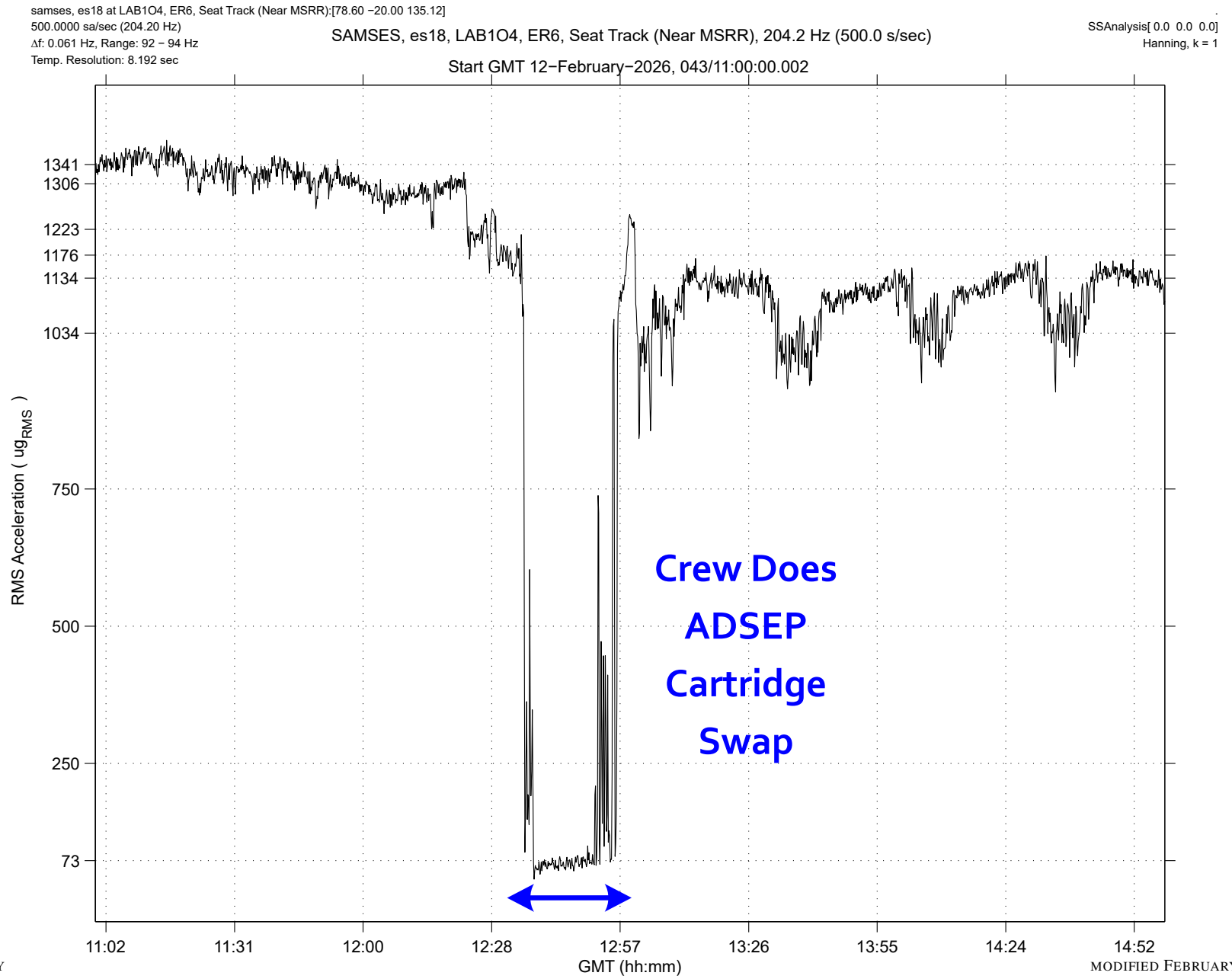

Fig. 9: ADSEP Cartridge Swap Acceleration RMS Levels (92 < f < 94 Hz) SAMS Sensor es18, GMT 2026-02-12.

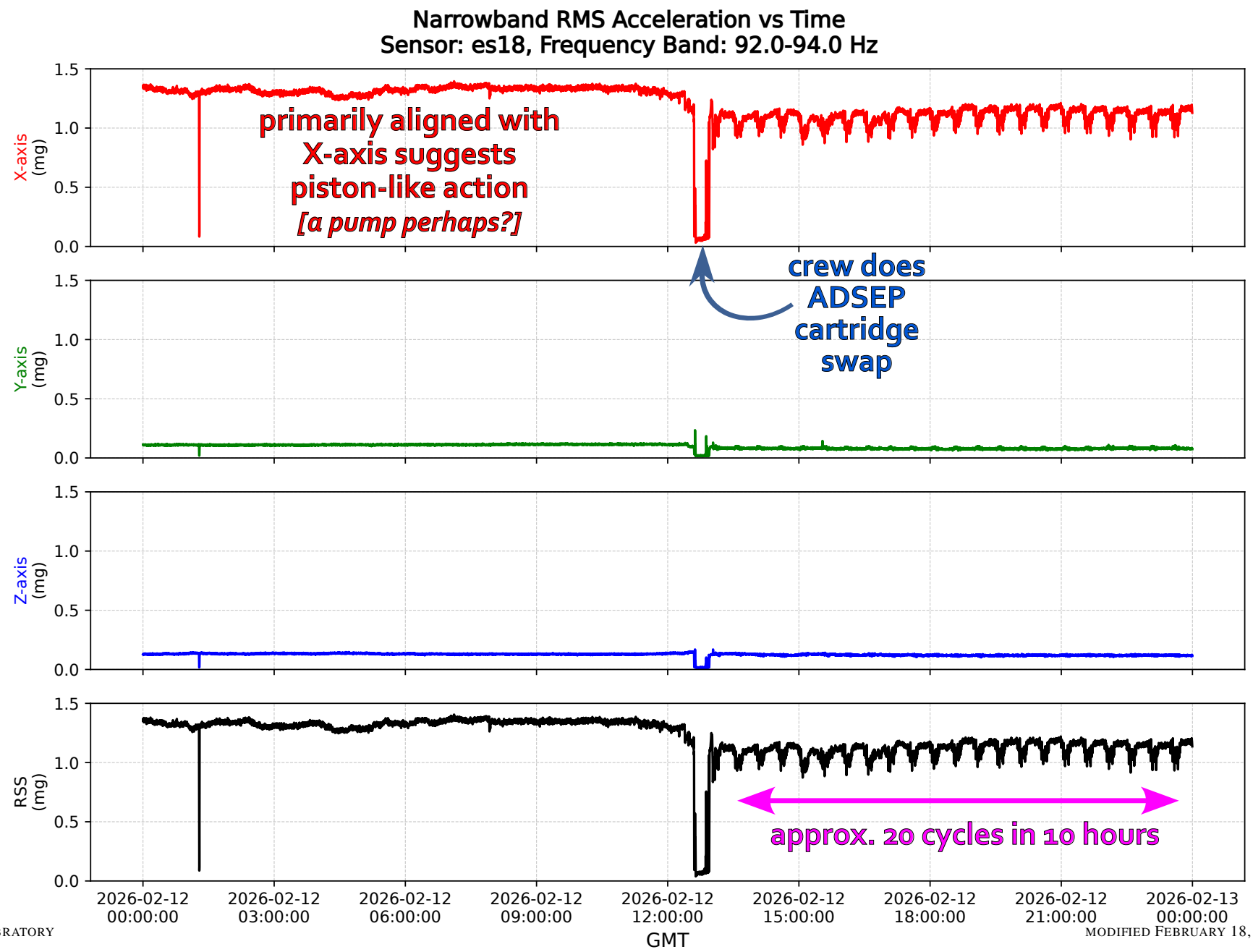

Fig. 10: ADSEP Cartridge Swap Per-Axis Acceleration RMS Levels (92 < f < 94 Hz) SAMS Sensor `es18`, GMT 2026-02-12 **Full Day**.