Background

The vibratory regime (from 0.01 to 10 Hz) on the ISS has the following as some of the main disturbance sources:

- **Vehicle structural modes**: Mainly below about 2-3 Hz, but officially Struc&Mech analysts consider up to say 5 Hz. These are natural frequencies of larger ISS appendages (main truss, solar arrays, radiators, etc.). On a spectrogram, these are manifest as somewhat nebulous horizontal, yellow-orange-red streaks that are almost always active but more so (more toward red on spectrograms) during crew wake periods.

- **Crew exercise**: Impact mostly below 5 Hz from various devices (BD-2 treadmill, ARED, etc.). This activity has driving force usually between 1 Hz up to say 3-4 Hz, but sometimes can noticeably excite lower-frequency structural modes below say 2 Hz; e.g. see spectrogram (a daily SAMS product) between GMT 2024-01-17/10:15-11:00 at this link for JEM sensor: https://gipoc.grc.nasa.gov/pims/plots/batch/year2024/month01/day17/2024_01_17_08_00_00.000_121f05ten_spgs_roadmaps500.pdf

- **Urine Processing Assembly** – see handbook page at this link: https://gipoc.grc.nasa.gov/pims/pimsdocs/public/ISS%20Handbook/hb_vib_crew_Crew_Exercise_and_Urine_Processing_Assembly_(UPA)_2016-03.pdf

- **Ku-Band antenna**: Between about 5 Hz and 8 Hz with a few different signatures. Persistent across time.

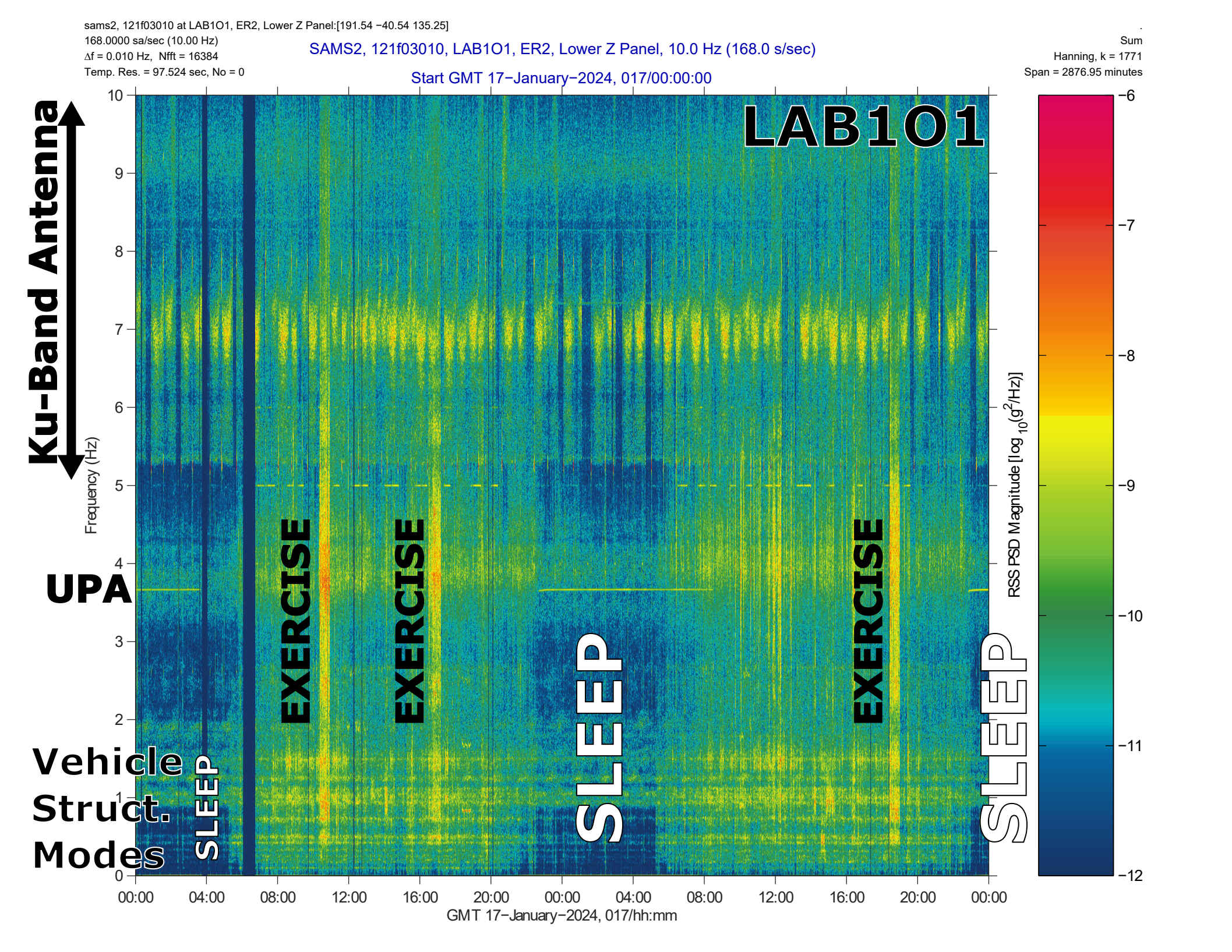
It is noteworthy that as our focus goes down in frequency, particularly below 10 Hz, it somewhat does not matter where a SAMS sensor head is located. Regardless of location, all mostly register the same set of signatures (same spectral ingredients), just to varying degree (magnitude), e.g. vehicle structural mode response registers "stronger" at a SAMS sensor location in the Columbus module relative to as sensor in the JEM or in the LAB.

SAMS Resources:

NOTE: *in addition to as-measured 200 Hz data (nominal for SAMS sensors), we applied* ***a 10 Hz low-pass filter*** *to two SAMS sensor heads' data: (S/N 121f03) in the LAB (LAB1O1), and (S/N 121f05) in the JEM (JPM1F1). In the navigation suggested by the hyperlinks below, the 200 Hz (as-measured) data would be designations like e.g. sams2_accel_****121f03****, whereas that same data low-pass filtered – just for the 2 days of interest – would be designations like e.g. sams2_accel_****121f03010****.*

If I want to…	then…
download SAMS data	visit https://gipoc.grc.nasa.gov/pims/pub/pad -- *e.g. use the vibration measurements recorded by SAMS in your own models or correlate with your results*
read the binary acceleration data files	visit the link shown just below here to *see how you can start working with acceleration data* https://gipoc.grc.nasa.gov/pims/plots/user/mohan/how2read_pad_binary_files.html
browse daily summary "roadmap" plots	visit https://gipoc.grc.nasa.gov/pims/roadmap -- *these roadmap plots show patterns, structure and boundaries in both time and frequency; these are updated daily*
browse acceleration handbook pages	visit https://gipoc.grc.nasa.gov/wp/pims/handbook -- *these are a collection of PDF files that briefly quantify & qualify various events, activities, and various aspects of the microgravity acceleration environment*
monitor vibratory environment in near real-time	visit https://gipoc.grc.nasa.gov/wp/pims/current-real-time/

Also, the next 2 pages show spectrograms for each of 2 nearest SAMS sensor heads showing 2 complete days of data each (up to 10 Hz) – *these show structures, boundaries, and patterns in both time and frequency*. Note some disturbances, e.g. structural modes, are stronger in the JEM relative to LAB as mentioned in the background section above.


sams2, 121f03010 at LAB1O1, ER2, Lower Z Panel:[191.54 −40.54 135.25]
168.0000 sa/sec (10.00 Hz)
Δf = 0.010 Hz, Nfft = 16384
Temp. Res. = 97.524 sec, No = 0
SAMS2, 121f03010, LAB1O1, ER2, Lower Z Panel, 10.0 Hz (168.0 s/sec)
Start GMT 17−January−2024, 017/00:00:00
Sum
Hanning, k = 1771
Span = 2876.95 minutes
LAB1O1
Ku-Band Antenna
UPA
Vehicle Struct. Modes
SLEEP
EXERCISE
EXERCISE
SLEEP
EXERCISE
SLEEP
Frequency (Hz)
RSS PSD Magnitude [log10(g2/Hz)]
GMT 17−January−2024, 017/hh:mm
00:00
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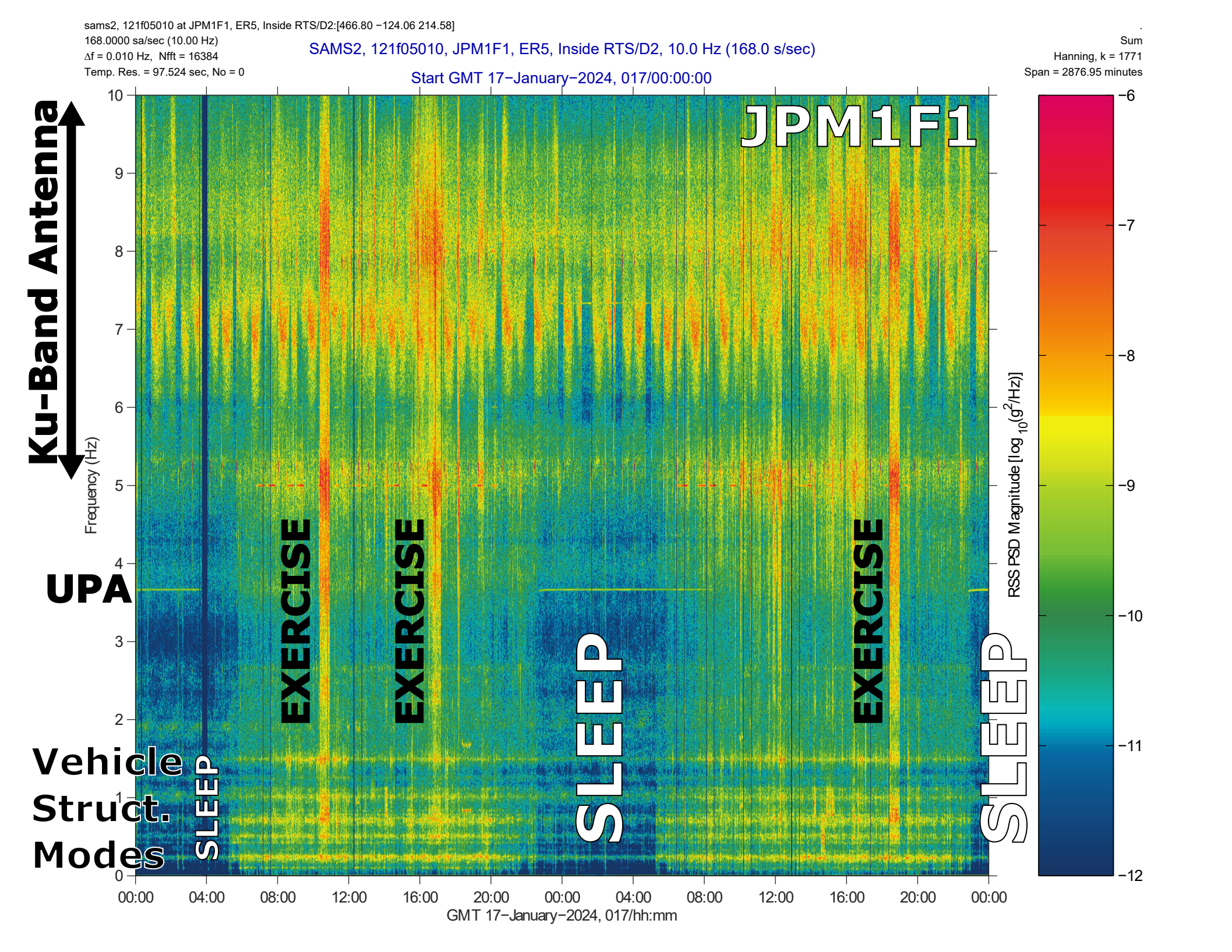
sams2, 121f05010 at JPM1F1, ER5, Inside RTS/D2:[466.80 −124.06 214.58]
168.0000 sa/sec (10.00 Hz)
Δf = 0.010 Hz, Nfft = 16384
Temp. Res. = 97.524 sec, No = 0
SAMS2, 121f05010, JPM1F1, ER5, Inside RTS/D2, 10.0 Hz (168.0 s/sec)
Start GMT 17−January−2024, 017/00:00:00
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JPM1F1
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Frequency (Hz)
RSS PSD Magnitude [log10(g2/Hz)]
GMT 17−January−2024, 017/hh:mm
00:00
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