



**STScI** | SPACE TELESCOPE  
SCIENCE INSTITUTE

EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

## JWST Efficiency

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## Take-away message

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- JWST is an efficient observatory:
  - All areas where optimization is possible (e.g. scheduling, momentum management, frequency of station keeping) are under constant scrutiny: the SO&C works towards a scenario where all possible efficiency gains are implemented
  - Some areas are hard to improve:
    - JWST is a big observatory that can't slew too fast, as that would create propellant slosh and result in the telescope drifting at the end of the slew
    - Activities such as mechanism moves can't be avoided
    - Anomalies occur and have an impact in the overall planning



## JWST Efficiency: A recent snapshot

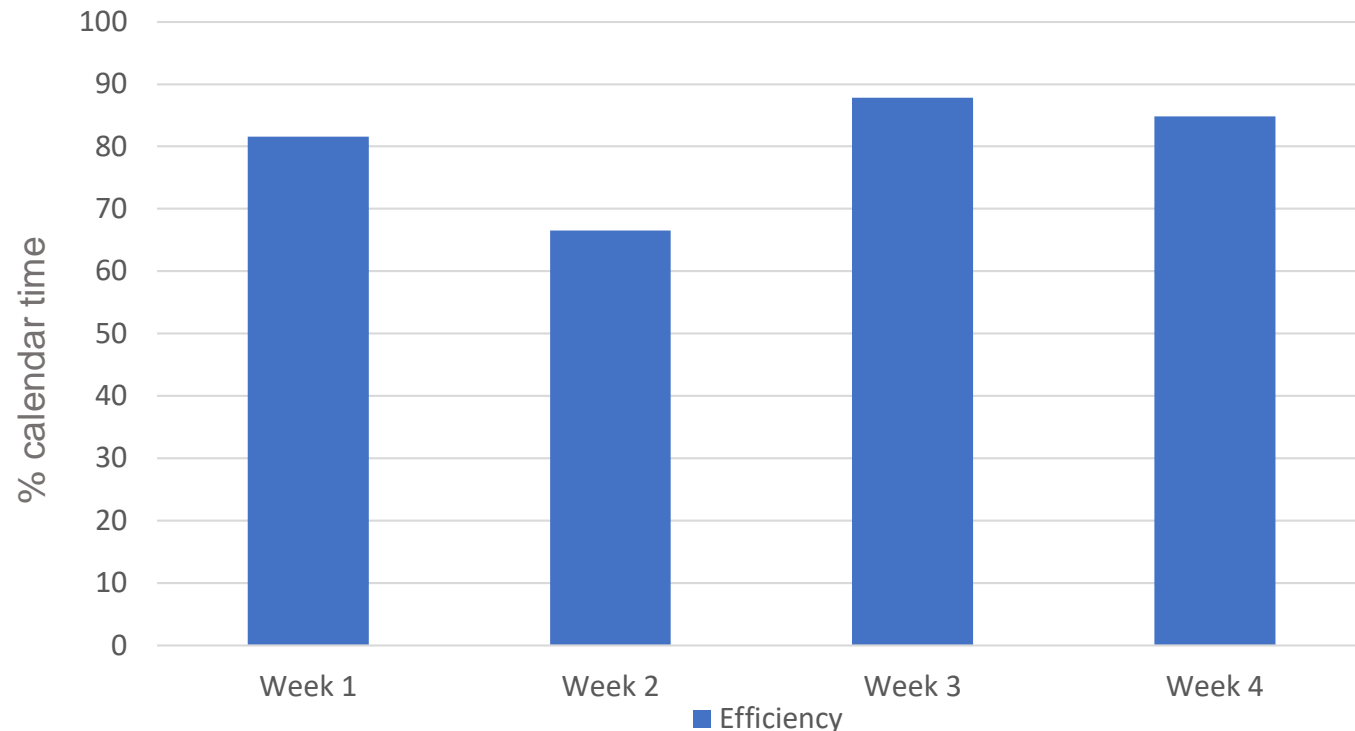
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- There are different metrics that can be used to report on efficiency
- Today we will discuss:
  - JWST efficiency based on the HST metric
  - Overall slew. Gaps in execution, real time visits and guide star acquisition
  - Observation hours over calendar hours
  - Cycle 1 Long Range Plan completion status
- This information has been compiled as follows:
  - Using Cycle 1 telemetry (OSS event messages) extracted from MAST
  - Covering 4 weeks in the period Jan/16/2023 to Feb/12/2023
  - Input from the LRP team
  - The Long Range planning database
- This is a snapshot in time. Further analysis will be ongoing



## JWST efficiency based on HST metric

- HST reports on non-slew time spent in visits, as a percentage of calendar time
- For each visit:
  - Time starts once the initial slew is complete and stops at the end of the visit
  - The GS ACQ, TA, detector setup, mechanisms moves, are included in that time
  - The times are summed over the week and divided by the total calendar time
  - The ratio of the calendar time and non-slew visit time is reported as efficiency



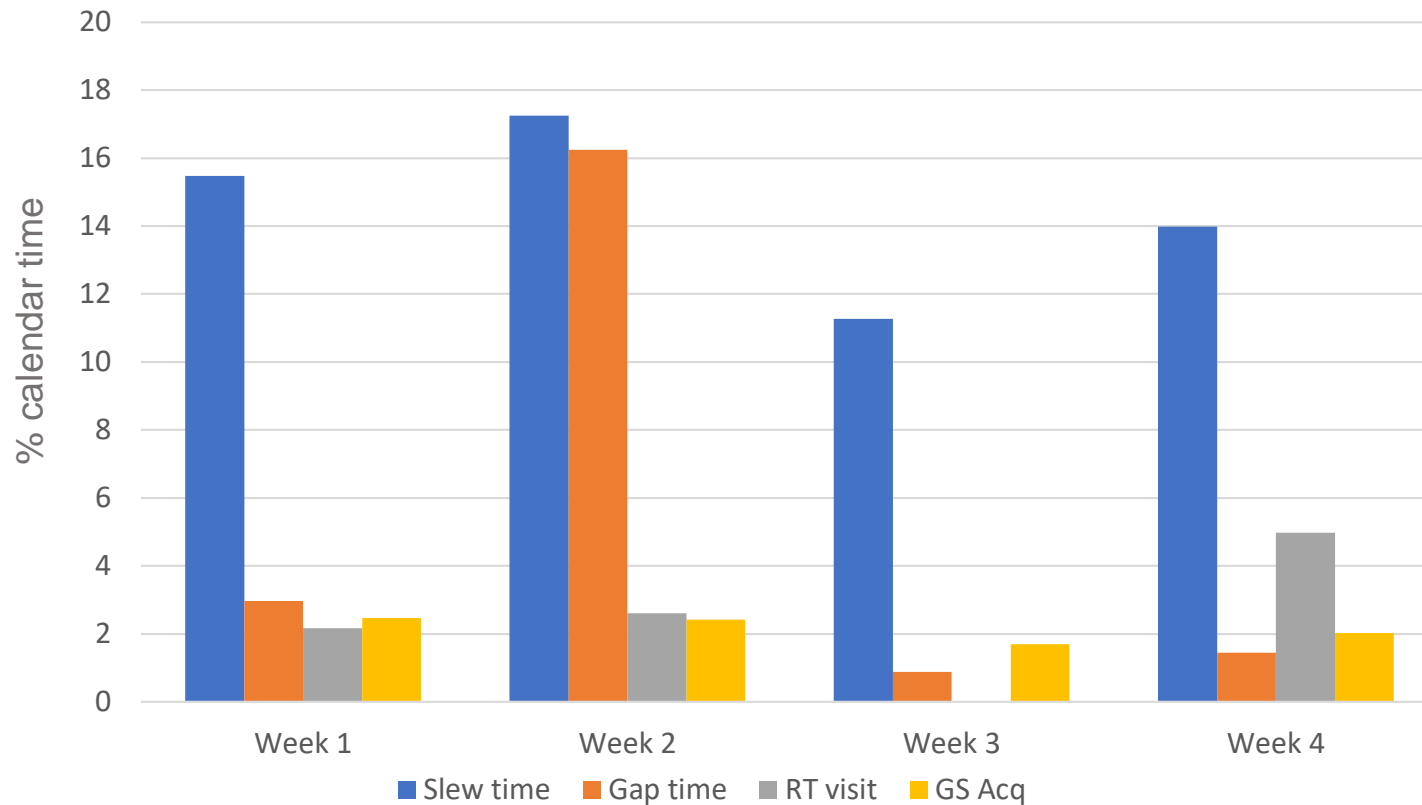
Overall efficiency in these 4 weeks: 80.14%

NIRISS Anomaly  
Jan 15<sup>th</sup> to Jan 27<sup>th</sup>



# JWST Overall: Slews, Gaps, RT visits, GS ACQs

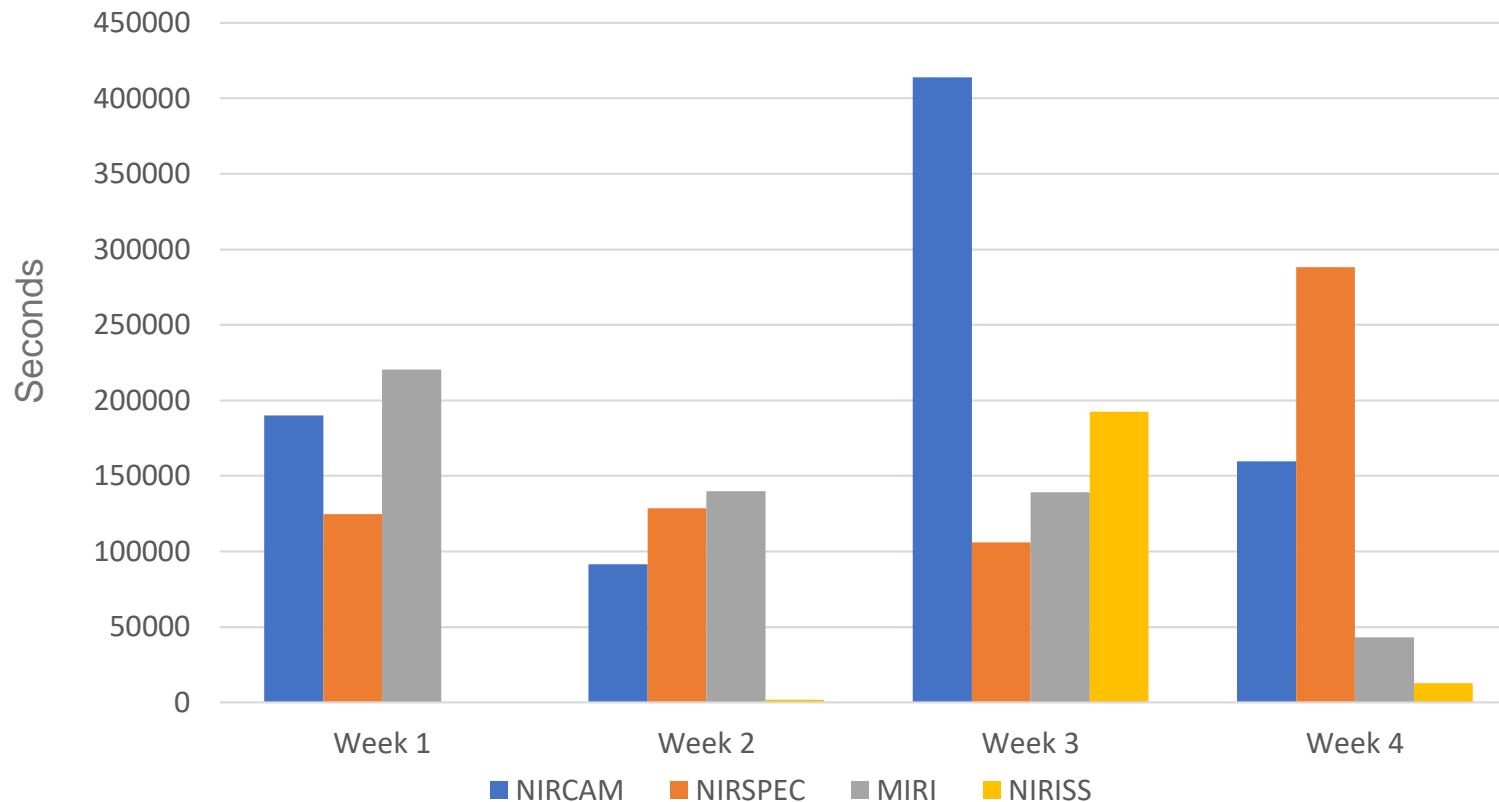
- The time spent slewing, and the gaps when the Observation Plan wasn't running are separated
- The time spent in GS acquisition
- The time spent in RealTime engineering visits





## Observing Time (by instrument)

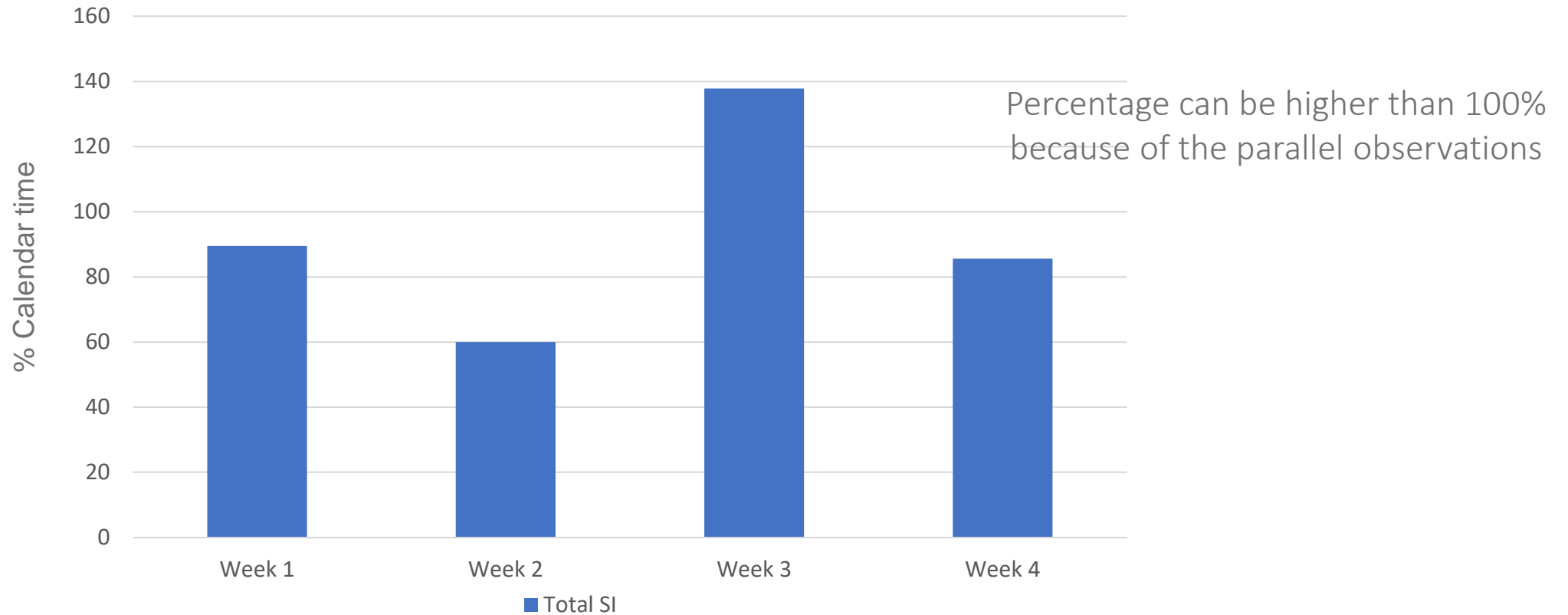
- These include detector setup, mechanisms moves (filter/grating wheels), dithering (disabling/reenabling FG control, HGA management, SAMs)
- Parallel observations are included: coordinated, pure and non-FGS calibration parallel visits





# Total Observing Hours

- Details are as described in the previous slide



Total observing hours/calendar hours for these 4 weeks: 93.55%

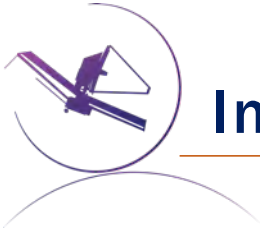


## A Long Range Plan perspective

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- Only 80% of the daily time is filled in the LRP
- Science proposals aren't selected to fit an exact 1-year timeline – flexibility is required to fit them in
- Execution issues may cause a visit to be skipped or otherwise fail and rescheduling will be needed
- Targets of Opportunity will need to be fit into the Plan, often quickly
- This results in a Cycle LRP that extends out ~1.5 years
- Visits in the later times are pulled forward in the Plan, to fill the scheduling pool (scheduling every week)
- Some visits may have to be moved into the future year
- Cycle 1 started in July 12<sup>th</sup> 2022; we are ~ 8 months within the cycle
- 60% of the Cycle 1 planned programs (46% of the visits) have been executed
- Only one Cycle 1 visit is currently planned later than 02/24





## In Summary

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During the studied period:

- The overall JWST efficiency based on the HST metrics is 80.14%
- The total observing hours/calendar hours for these 4 weeks: 93.55%
- The overall slew time ranges between 11% and 17%
- Gap times are typically under under 3%, with the exception of week 2 where it was 16%.
- Guide star acquisition takes typically 2%
- 60% of the Cycle 1 planned programs (46% of the visits) have been executed.

The SO&C keeps working on identifying areas of improvement.

