Proposal to Raise the 1DEAMZT Planning and Caution Limits: May 2022

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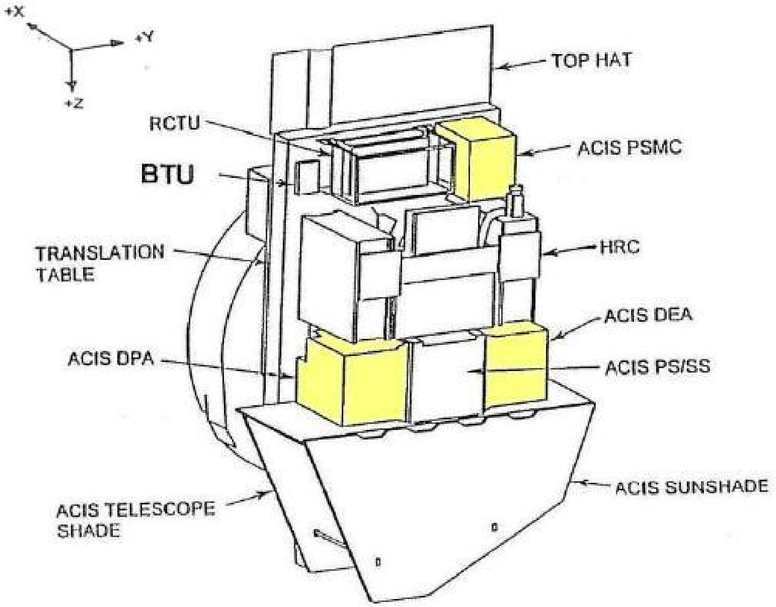
Recommendation for FDB Approval

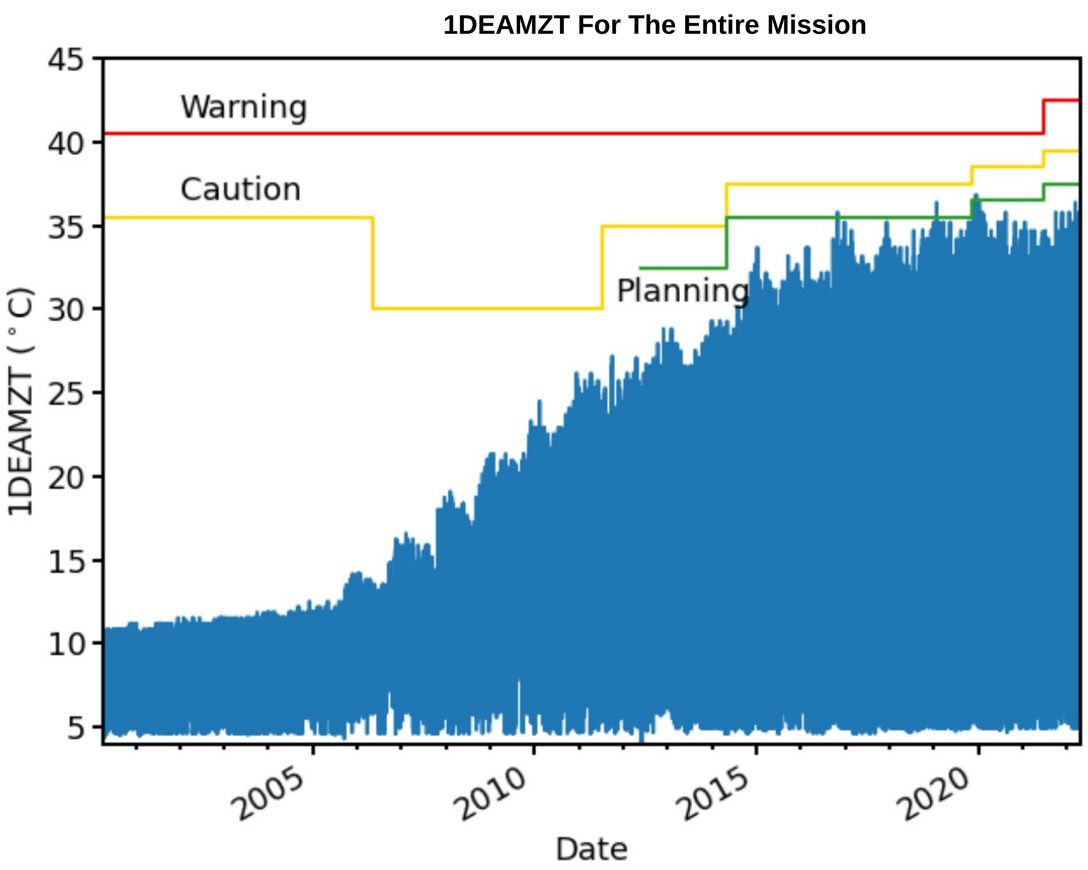
- *Raise* 1DEAMZT Planning Limit from 37.5°C to 38.5°C
- *Raise* 1DEAMZT Caution High limit from 39.5°C to 40.5°C
- *Keep* 1DEAMZT Warning High limit at 42.5°C—maximum temperature reached in pre-launch testing of 43°C

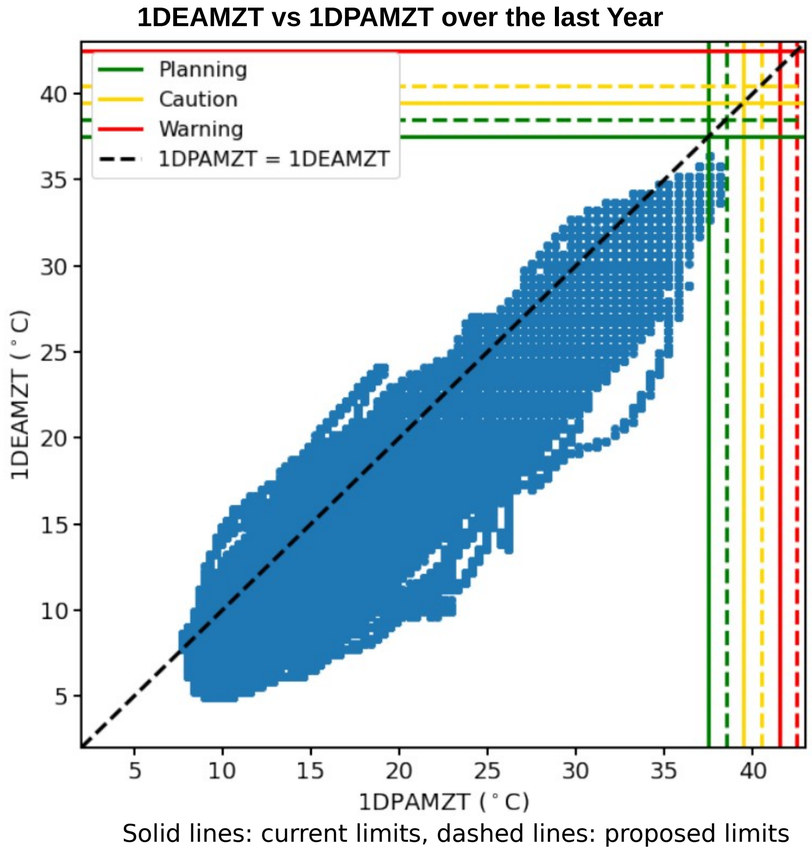
Rationale for Raising Limits

- 1DPAMZT and 1DPAMZT both need to be raised to provide additional margin for MP and scheduling, since both have almost identical heating profiles.
- Both locations heat the most at tail sun attitudes.
- 1DEAMZT and 1DPAMZT have an opposite heating sensitivity to roll which result in some temperature differences on the order of several degrees C
- This necessitates a raising of the Planning and Caution High limits for 1DEAMZT



1DEAMZT Whole Mission And As Compared to 1DPAMZT





Solid lines: current limits, dashed lines: proposed limits

Opposing Roll Dependencies: Normally 1DPAMZT > 1DEAMZT.

- For negative off-nominal rolls the opposite is the case.
- 1DEAMZT can reach a few degrees higher for large and negative off-nominal roll.

Both models maintain a 2 degree C Model Error at the hot end.

Reasons We Cannot Raise the Warning High Limit

- No boards within DEA are instrumented with thermistors, in contrast to the DPA, so we cannot base limit values on internal temperature values
- Component temperatures on the DEA boards closely track the external box temperature (unlike the DPA which has specific high dissipation components).
- Each video board in the DEA is hard-wired to a specific CCD—if we lose a video board, we lose a CCD
- Maximum temperature reached in thermal vac testing was 43 °C

1DEAMZT Limit Rationale and Budget

Limit	New Values	Budget (ΔT to Next Threshold)	Rationale
Warning High	42.5 °C	0.5 °C	Highest temperatures reached in thermal vac testing of 43 °C. Maintain 2 °C on all limits.
Caution High	**40.5 °C**	2 °C	Limit provides warning before Warning High Limit is reached; ACIS Instrument team concurs a 2 °C pad is sufficient
Planning High	**38.5 °C**	2 °C	Model error of $\lesssim$ 2 °C indicates that a 2 °C pad between this limit and the Caution High is sufficient with a well-calibrated thermal model

NOTE: for 1DEAMZT, 1 bit ~ 0.66 °C

Summary

- Proposal:
  - *Raise* 1DEAMZT Planning Limit from 37.5°C to 38.5°C
  - *Raise* 1DEAMZT Caution High limit from 39.5°C to 40.5°C
  - *Keep* 1DEAMZT Warning High limit at 42.5°C—maximum temperature reached in pre-launch testing of 43°C
- These changes have been approved by the ACIS Team (Ops and Instrument)
- Risks are low of violating 1DEAMZT Warning High Limit:
  - We keep 2 °C margins between the three temperatures and will maintain model accuracy
  - In most cases, we will be limited first by 1DPAMZT or the ACIS FP temperature, except perhaps for large and negative off-nominal rolls