



STScI | SPACE TELESCOPE
SCIENCE INSTITUTE

EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

Transients Proposals

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for the Hubble Science Policies Group

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Target of Opportunity (ToO) Proposals

- **Why ToOs?**
 - “Known unknowns”. Expected phenomena.
 - Reasonable likelihood of an interesting event occurring (e.g. a supernova)
 - Time and location unknown at the time of proposing.
- Advantages of main cycle vs DD:
 - Faster turnarounds are possible.
 - Judged against other main cycle proposals.



Mid-Cycles and Director's Discretionary (DD) Proposals

- **Mid-Cycles:**
 - Scientific reason why observations couldn't be proposed at the last main cycle (e.g. data received/object discovered after deadline).
 - Compelling scientific urgency to observe this cycle.
 - Transients ok but not primary route.
- **DDs:**
 - “Unknown unknowns”. Unexpected phenomena or unexpected developments since last call.
 - Time critical.
 - **Response time is from acceptance.** Review has to happen first.



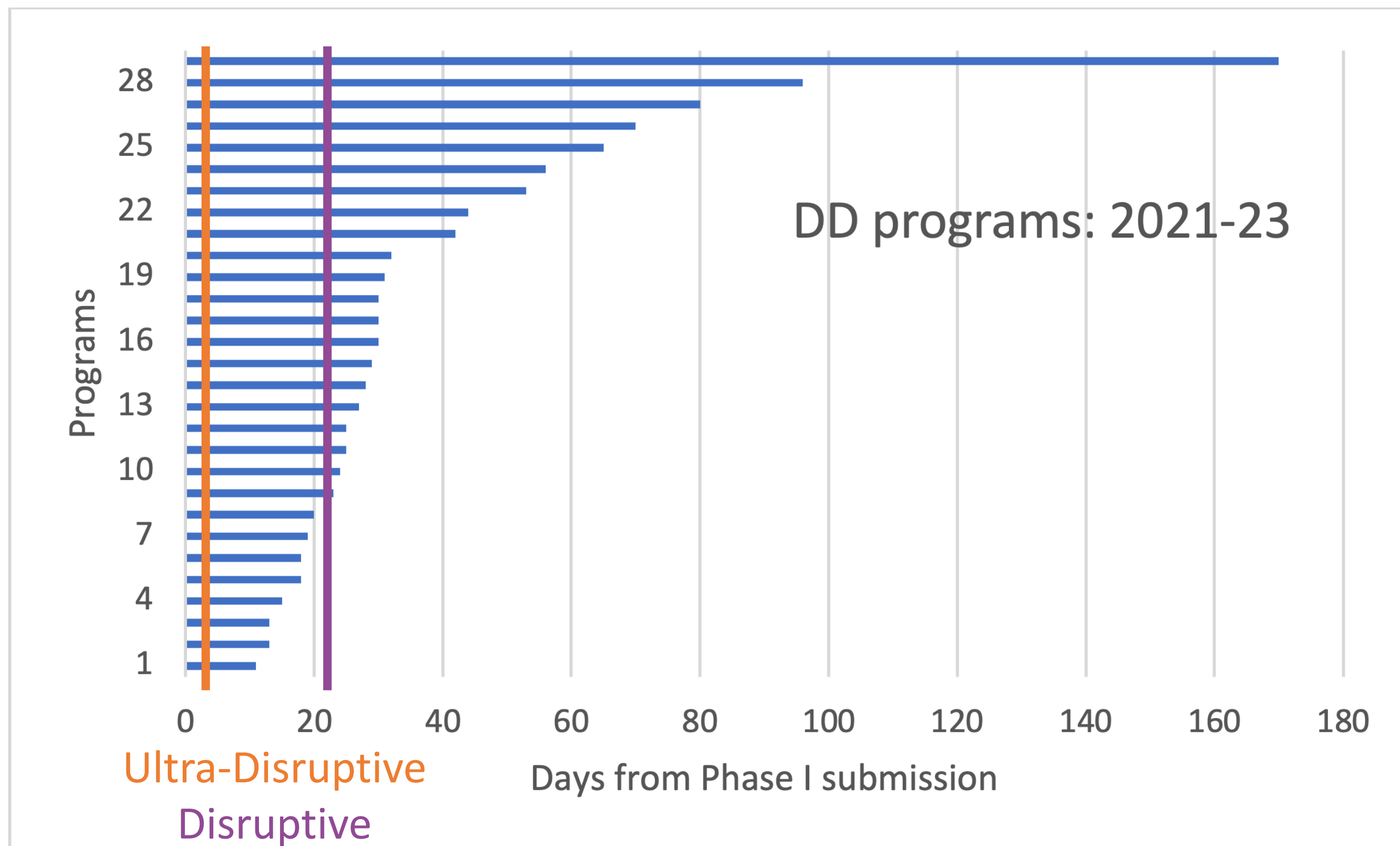
Flavours of ToO activations

- **Non-disruptive:**
 - >21 days response time (no limit on these)
- **Disruptive:**
 - 2-21 days response time (limited to 8 per cycle)
- **Ultra-disruptive:**
 - <2 days response time (limited to 1 per cycle)
- **Flexible Thursdays (FlexDays):**
 - 1 FlexDay per month of the cycle, 2 activations per month (limited to 20 activations in Cy30, but will be 24 in Cy31 onwards)

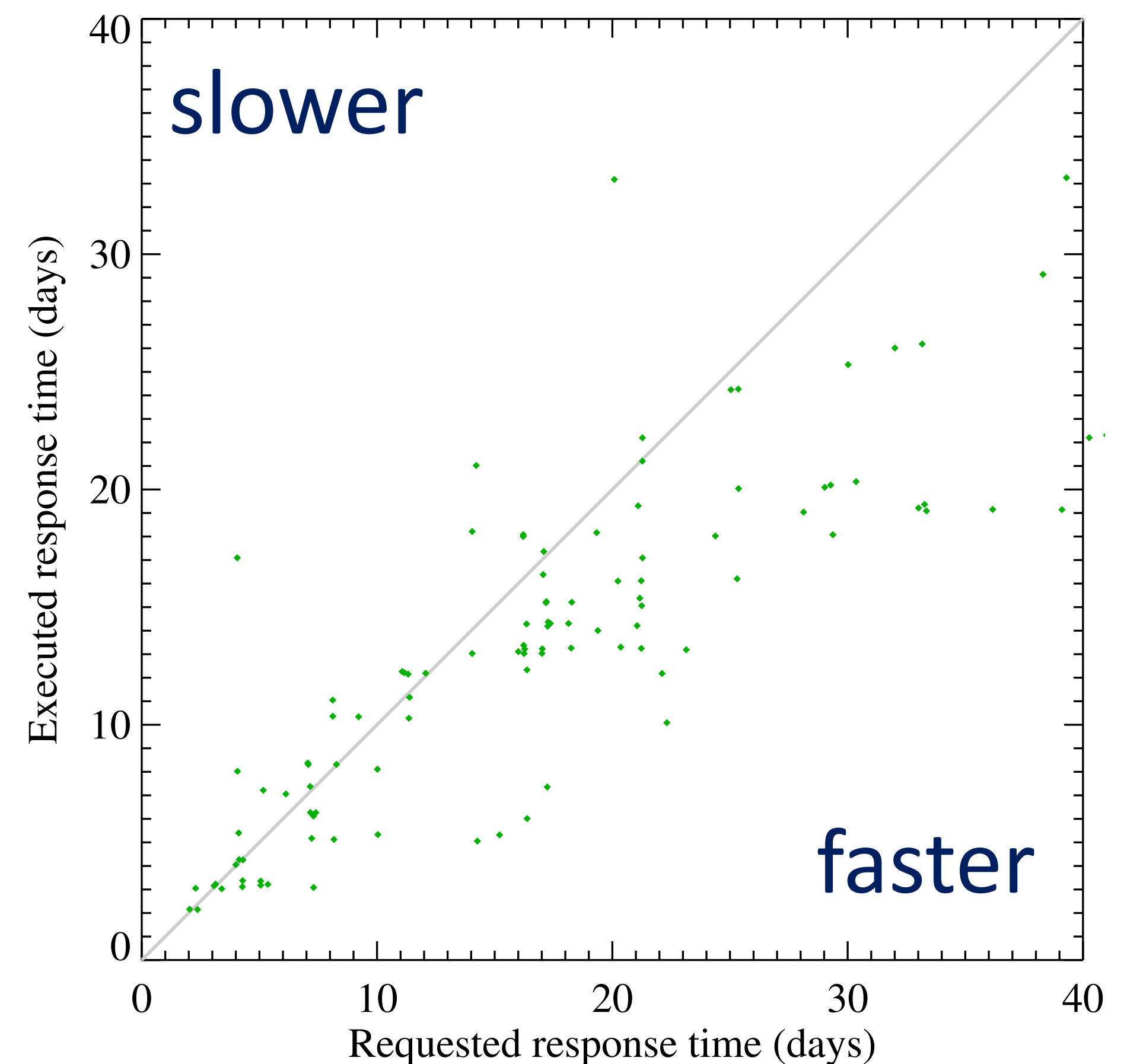


ToO vs DD Response Times

Execution time for DD programs from **submission**.



Actual versus requested ToO response times since 2020.





Lots of ToOs, and lots of triggers expected

- Numbers of HST ToO proposals are increasing:
 - Cycle 29: $45 / 1051 = 4.3\%$
 - Cycle 30: $45 / 1003 = 4.5\%$
 - Cycle 31: $57 / 902 = 6.3\%$
- Lots of facilities online now or coming online soon!
 - Rubin/LSST, Rubin, Roman, Zwicky, LIGO, Kamioka, Virgo, LISA, IceCube Gen2, Super Kamiokande, Hyper Kamiokande, ...



Flexible Thursday ToOs — New in Cycle 31!

- Expect a large pool of events requiring rapid turnaround.
 - Can (scientifically) pick events to match certain observing days.
- 1 Flexible Thursday per month, 2 activations per Flexible Thursday.
 - Triggers submitted by 10:00 UT on the preceding Tuesday.
 - Flexible Thursday schedules are filled with “easy”-to-move observations.
- Cycle 31:
 - 3 FlexDay proposals submitted
 - 1 FlexDay proposals accepted
 - Success rate: 1 in 3 — well above overall average (1 in 7).
 - All were competitively ranked: in top third of proposals in panel.



Current Review Process

- ToOs are reviewed in their science panel:
 - All ToOs are reviewed by Discussion panels regardless of size (no external review).
- Pros:
 - Reviewed against other proposals in the broad science area.
- Cons:
 - Panelists worry that non-ToO science is not competitive with the “urgency” of ToO science.
 - This isn’t true, but panelists will worry regardless of the facts!
 - Ultra-disruptive and Disruptive activations are limited each cycle.
Requires a lot of cross-panel discussions to manage.



Proposal: A new High-Energy Transients panel

- What will go here: supernovae, kilonovae, gravitational waves, fast radio bursts (FRBs), gamma ray bursts (GRBs), tidal disruption events (TDEs).
- What won't: Solar System ToOs (Solar System), Microlensing ToOs (Stellar Pops), AGN ToOs (SMBH).
- Discussion panel only (no external). Panel chair will join the Executive Committee.



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- Pros:
 - Most ToOs, especially Ultra-Disruptive and Disruptive are evaluated against each other. Easier to assess relative rankings and adjudicate limits.
 - Feedback from various ToO communities (including Stellar Physics panel): they feel more expert in TDAMM topics in other science areas than other topics in their science area.
- Cons:
 - Proposals aren't compared against other proposals in their science area.