



TESS Interactive Data Workshop  
January 7, 2023 @ AAS 241, Seattle

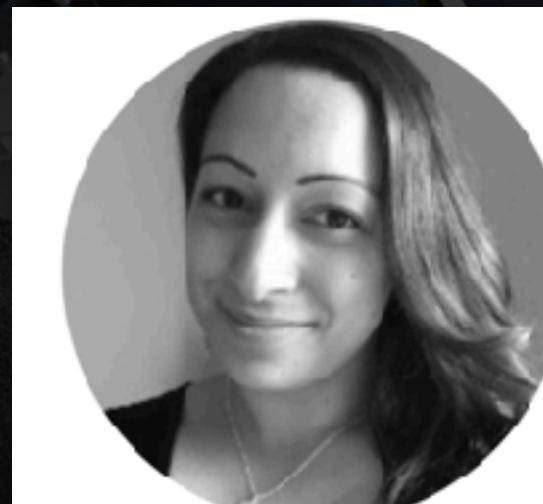


# Proposing for TESS in Cycle 6

Tyler Pritchard on behalf of the TESS Guest Investigator Office

# The TESS Guest Investigator Office

## Who we are:



Dr Knicole Colón  
Project Scientist / Director of the  
Guest Investigator Office



Dr Allison Youngblood  
Deputy Project Scientist



Dr Christina Hedges  
Deputy Director of the Guest  
Investigator Office



Mark Messersmith  
Administrative Support



Dr Rebekah Hounsell  
Support Scientist



Dr Veselin Kostov  
Support Scientist



Dr Tyler Pritchard  
Support Scientist



Dr Nicole Schanche  
Support Scientist

Most of us are here  
in this room today!

## What we do:

- Help the scientific community access and analyze data collected with the TESS mission
- Run the \$3M annual GI proposal competition
- Are available at [tesshelp@bigbang.gsfc.nasa.gov](mailto:tesshelp@bigbang.gsfc.nasa.gov) for all your TESS needs
- Work with TESS partners to ensure a successful GI program



CENTER FOR  
ASTROPHYSICS  
HARVARD & SMITHSONIAN

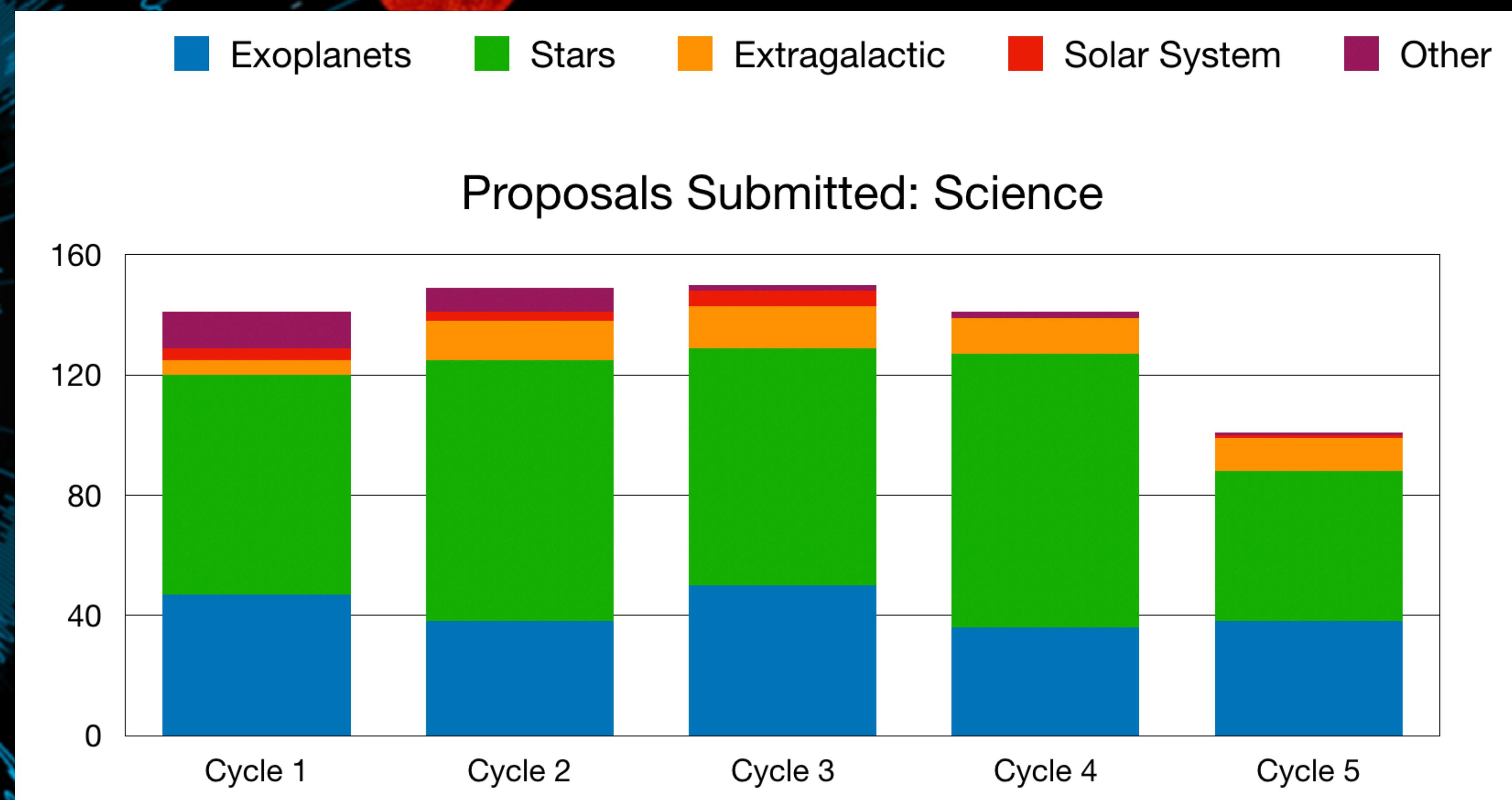


# The TESS Guest Investigator Program

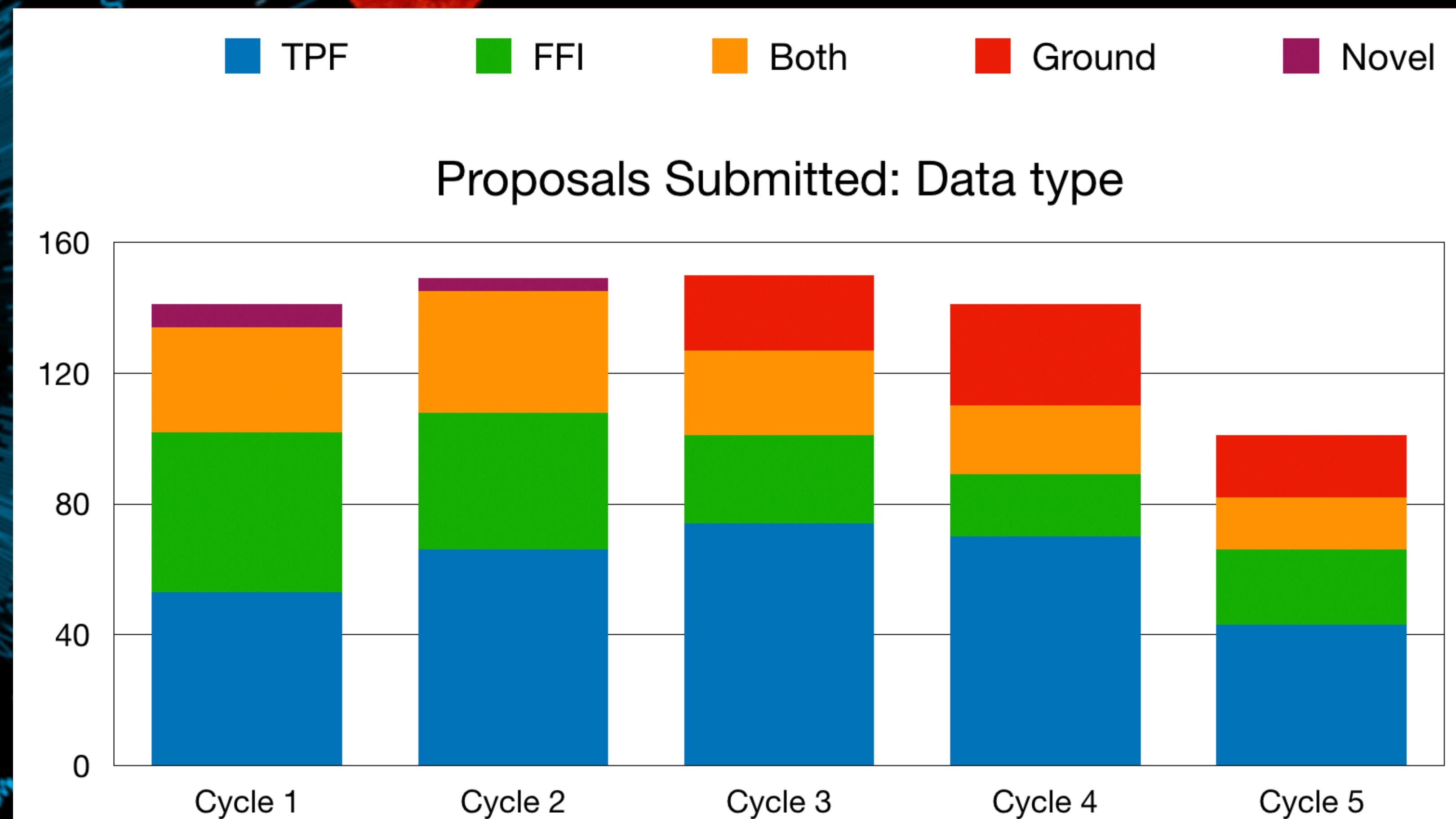
## Cycle 6 for proposers at a glance:

- Phase I proposals due: April 14, 2023
- You can propose targets for TESS, with its Cycle 6 resources including:
  - More than 2,000 20-second cadence target slots per sector
  - More than 8,000 120-second cadence target slots per sector
  - Anything that can occur on the 200-second Full-Frame Images
- You can propose for funding (as a U.S. based investigator):
  - Small Proposals - up to 70,000\$ per award
  - Large Proposals - up to 250,000\$ per award
  - Key Projects - up to 250,000\$ per year, for up to 2 years per award
  - Ground-based observing focussed programs - up to 500,000\$ in total
- Or unfunded:
  - Mini-Proposals - No funding, but up to 50 20-second targets and 1,000 120-second targets
- You can propose for *joint* programs with NICER/Swift/Fermi.

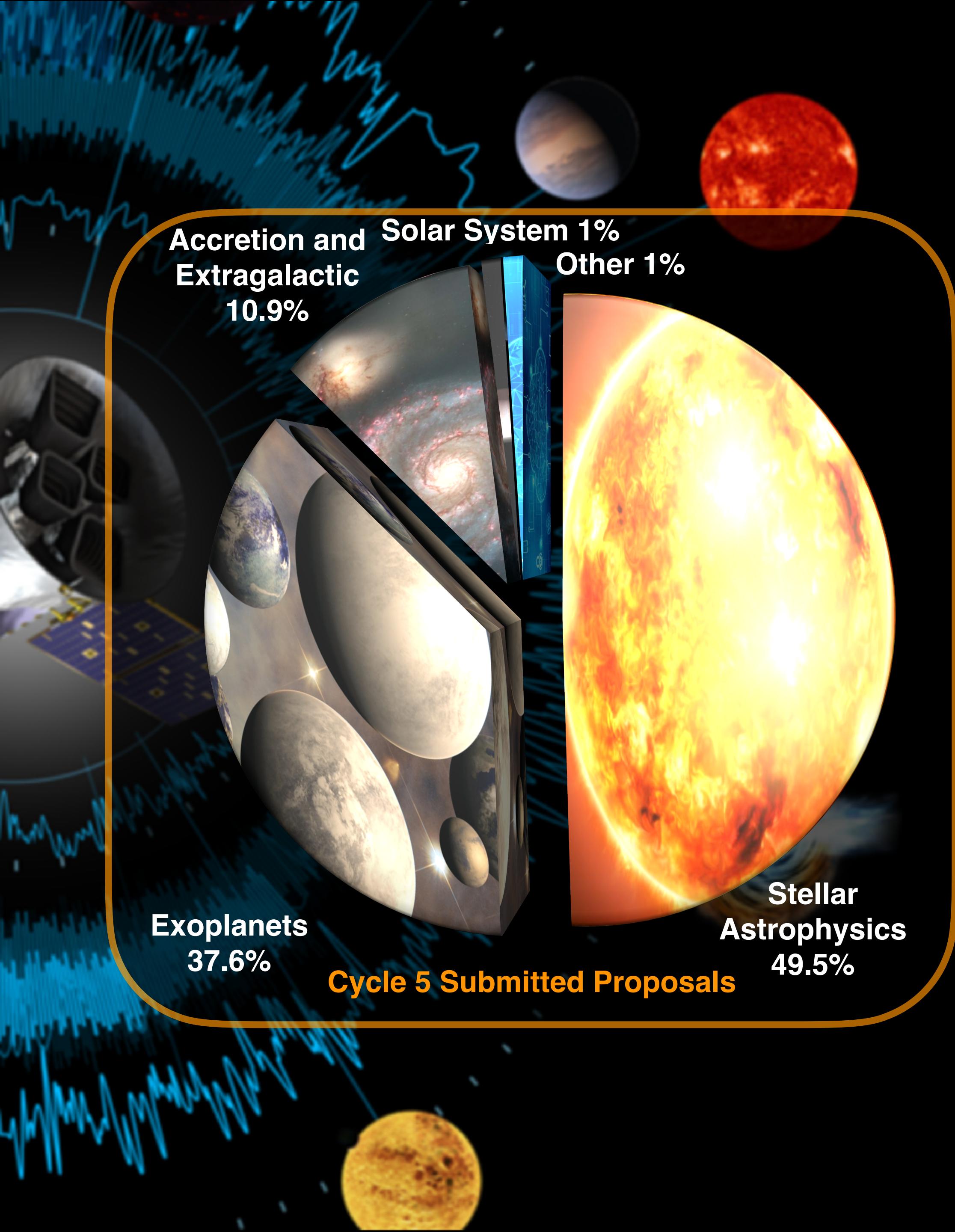
# TESS GI Science at a glance



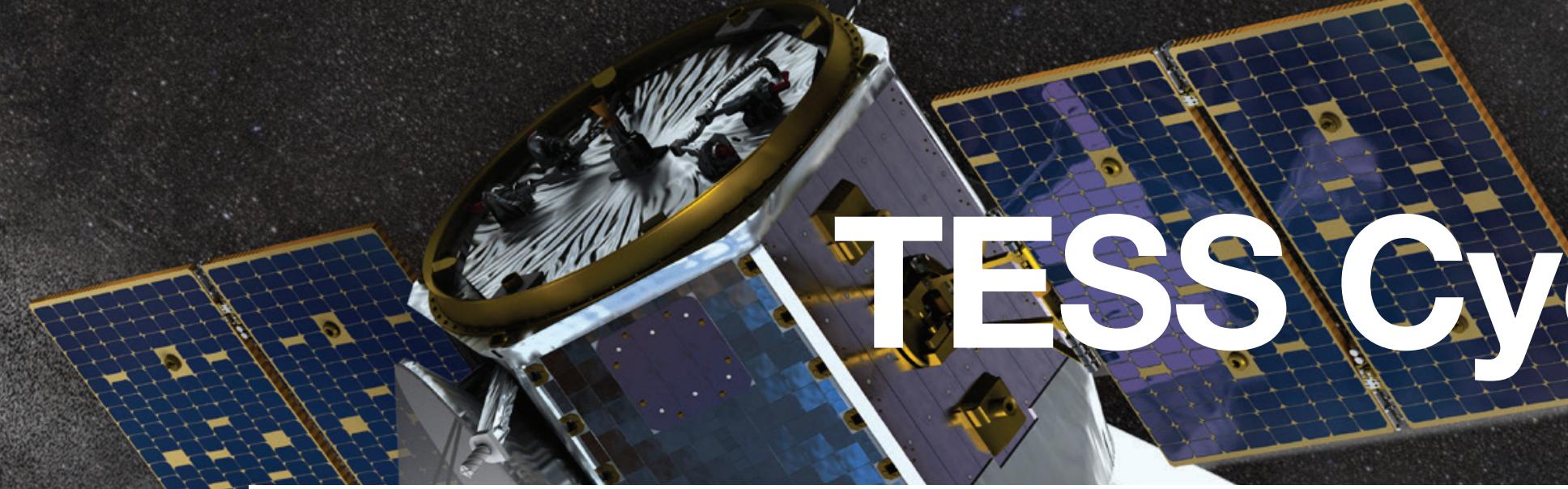
# TESS GI Data at a glance



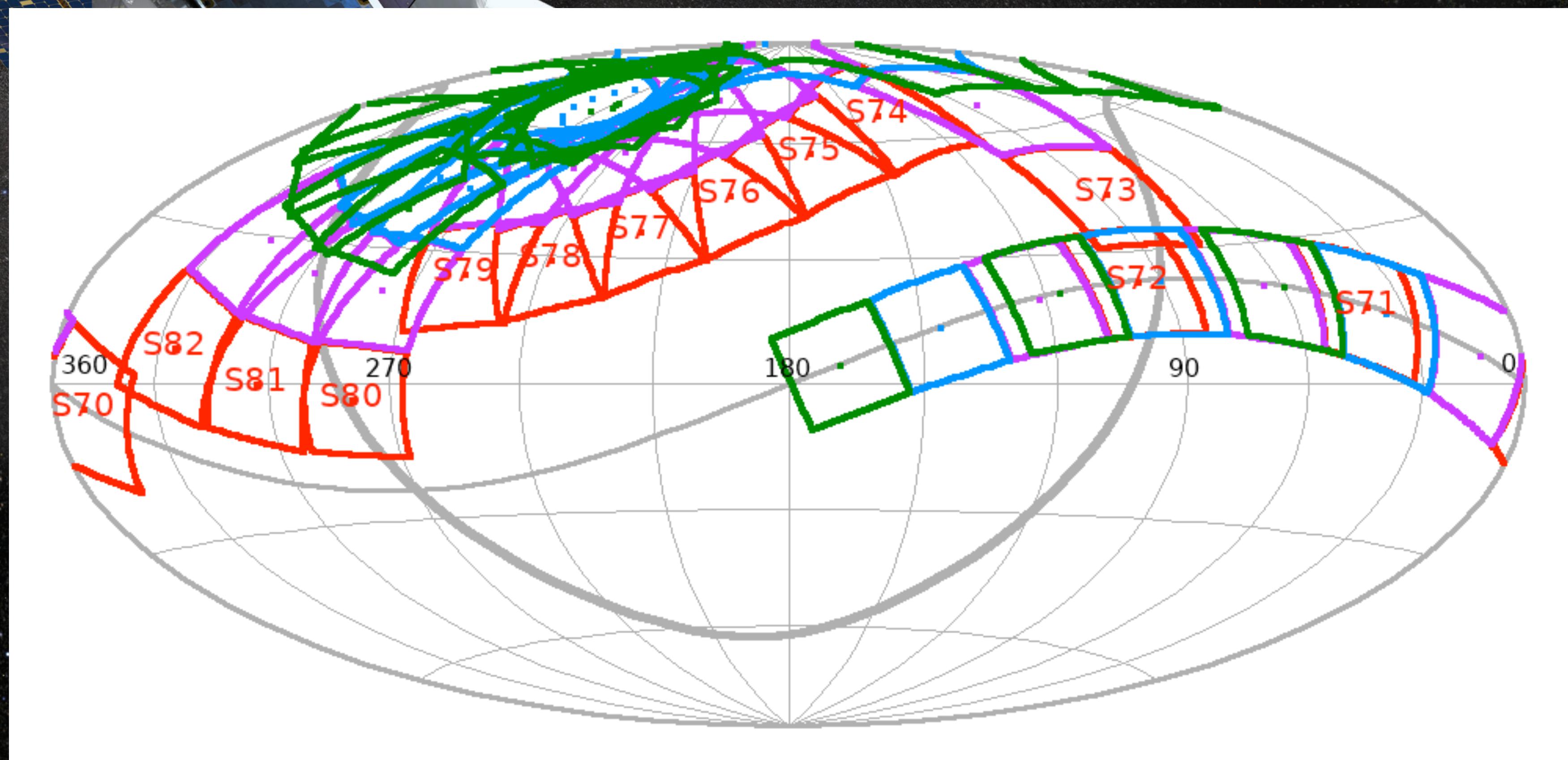
# TESS Cycle 5 at a glance



- 3:1 Funding over-subscription rate
- 3:1 Key Projects Submitted:Accepted
- 16 TESS-Swift joint proposals with a 6:1 over-subscription rate
- 2 TESS-Nicer joint-proposals (first cycle)



# TESS Cycle 6 Call for Proposals



Cycle 6 will cover Sectors 70-82 in Sept 2023 - Aug 2024  
3 ecliptic sectors followed by a northern hemisphere survey

# What kind of proposals does TESS support?

There are four categories of TESS proposals:

- **Mini** - These programs are not eligible for funding, and allow up to 50/20s & 1,000/120s targets
- **Small** - Funded up to 70k; proposals of limited scope representing the majority of submitted proposals and scientific investigations
- **Large** - Funded up to 250k; Large proposals must deliver a clear benefit for the broader scientific community.
- **Key projects** - Large multi-year programs with a very broad scope; funded up to 250K/year for 2 years in Cycle 6
- Funding is only available for PI's at U.S. Based Institutions

# TESS Cycle 6 Call for Proposals

## What can you propose for?

You can propose to support TESS science with the acquisition and analysis of ground-based telescopes

- Funding of up to 500K\$ in total for ground-based support
- Can be any size program but Mini
- Can support the analysis and/or interpretation of TESS scientific data collected in previous cycles

# What type of observations can you propose for?

You can propose for high cadence observations of targets

- More than 2,000 20-second cadence target slots per sector
- More than 8,000 120-second cadence target slots per sector

Your proposal can also utilize the 200-second Full-Frame Images (FFI's)

Your proposal CAN use any combination of the above data

Your proposal CANNOT request proprietary time - all TESS data are made publicly available on the same time-frame

You can also apply as a joint program with Swift/NICER/Fermi

## The Neil Gehrels Swift Observatory

- Multi-wavelength observatory ( $\gamma$ -ray,  $x$ -ray, UV-Optical)
- $<\sim 90$  s reaction time for X-ray and UV/optical telescopes
- Spectroscopy from 180-600 nm and 0.3-150 keV
- Six UV-Optical colors covering 180-600 nm
- Results publicly distributed within seconds

A minimum of 100ks of Swift time is available as part of the TESS Cycle 6 call for proposals

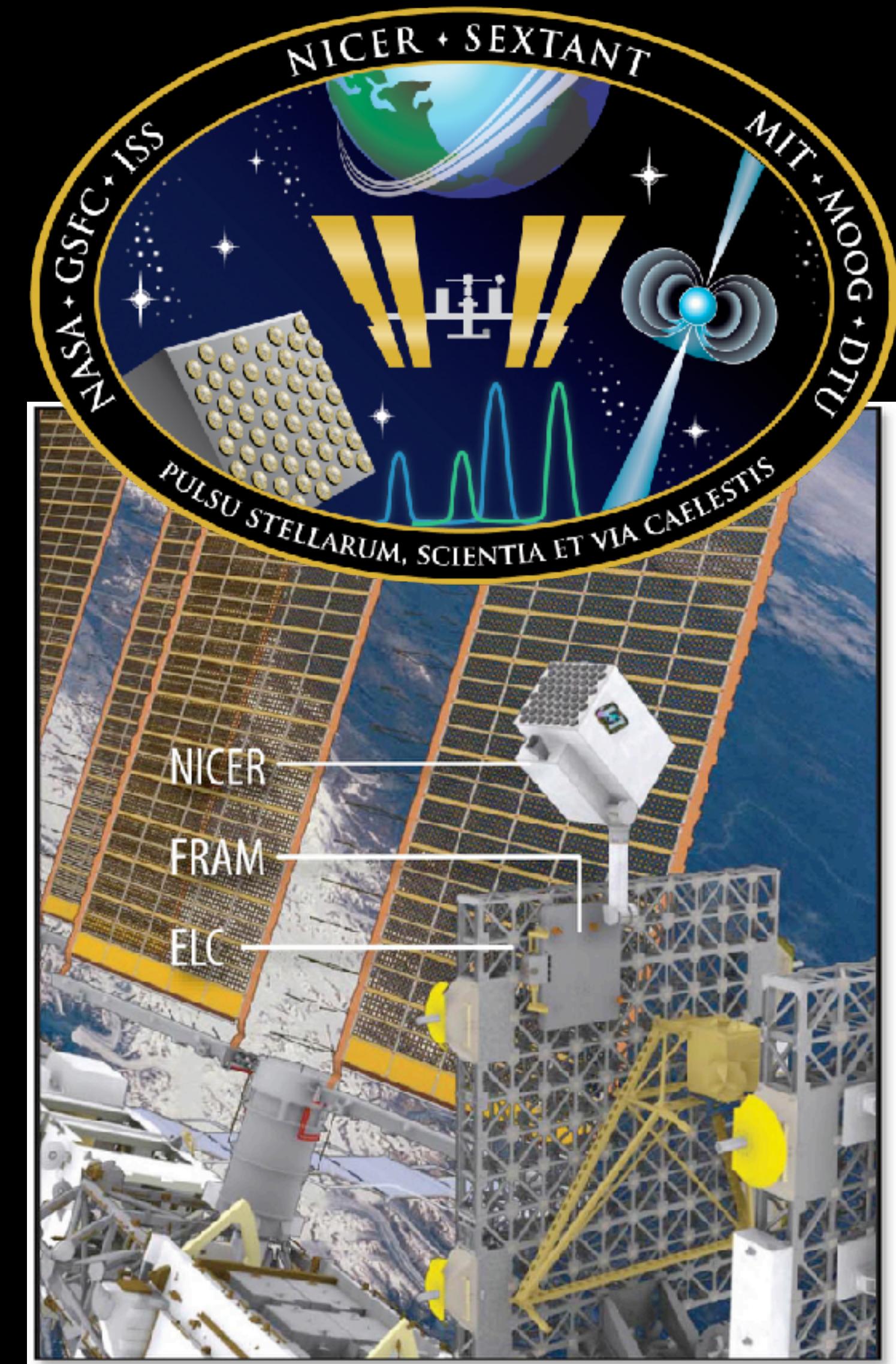


# You can also apply as a joint program with Swift/NICER/Fermi

## The Neutron Star Interior Composition Explorer Mission (NICER)

- An International Space Station (ISS) payload dedicated to the study of neutron stars.
- High-throughput, low-background soft X-ray timing and spectroscopy
- Spatial resolution: 5 arcmin diam. non-imaging FOV
- Time-tagging resolution: <300 nsec (absolute)

Up to 300ks of NICER time is available as part of the TESS Cycle 6 call for proposals



# You can also apply as a joint program with Swift/NICER/Fermi

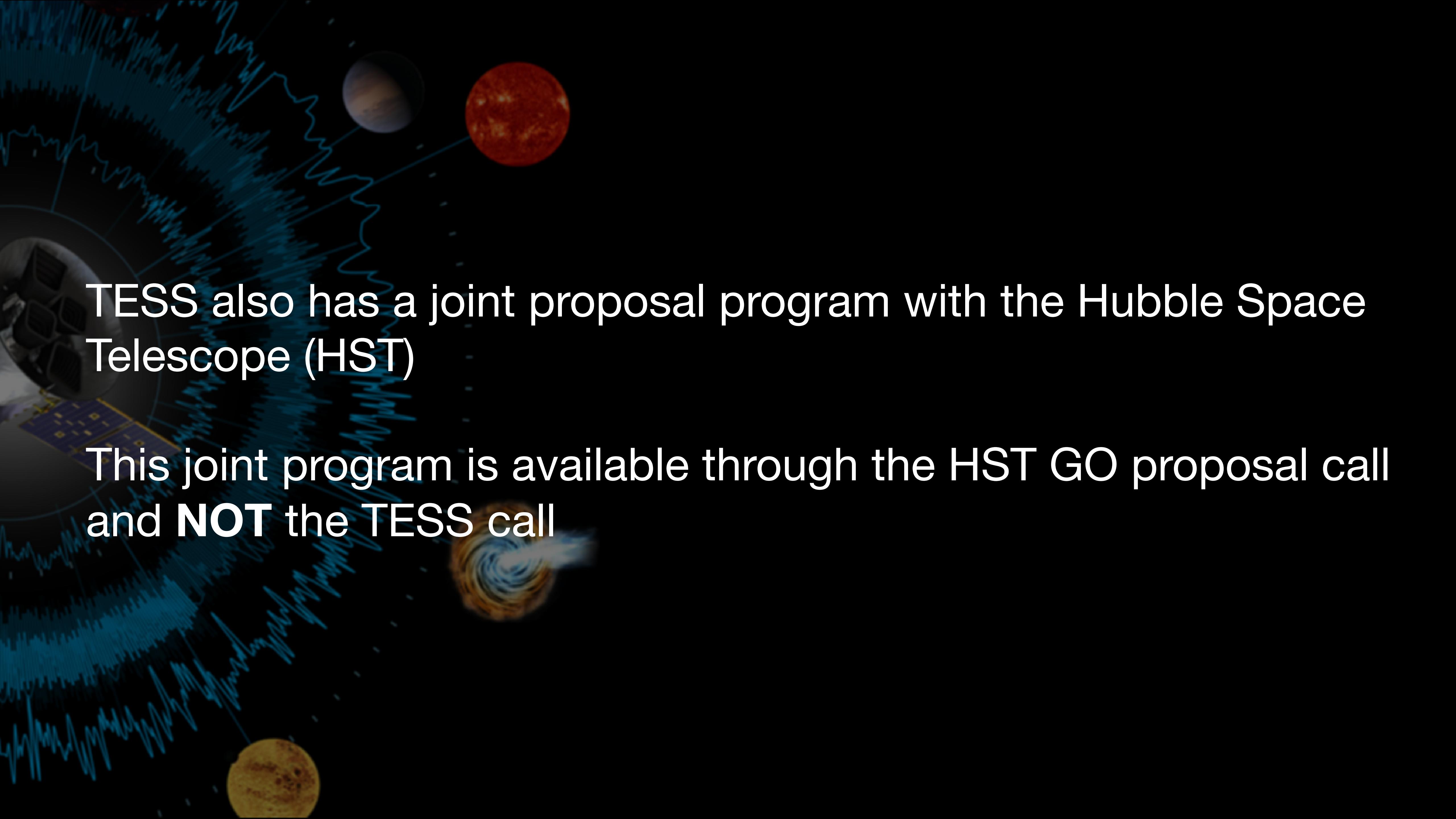
## The Fermi Gamma-ray Space Telescope

- Operates as a survey instrument
- 2 Gamma-ray instruments
  - Large Area Telescope (LAT): 20MeV-300GeV/2sr FoV
  - Gamma-ray Burst Monitor (GBM): 10keV-25MeV/All-Sky



Fermi/TESS joint proposals can be submitted through either the Fermi or TESS GI calls

However, you **cannot** have 2 substantially similar awarded proposals - e.g. no double dipping



TESS also has a joint proposal program with the Hubble Space Telescope (HST)

This joint program is available through the HST GO proposal call  
and **NOT** the TESS call

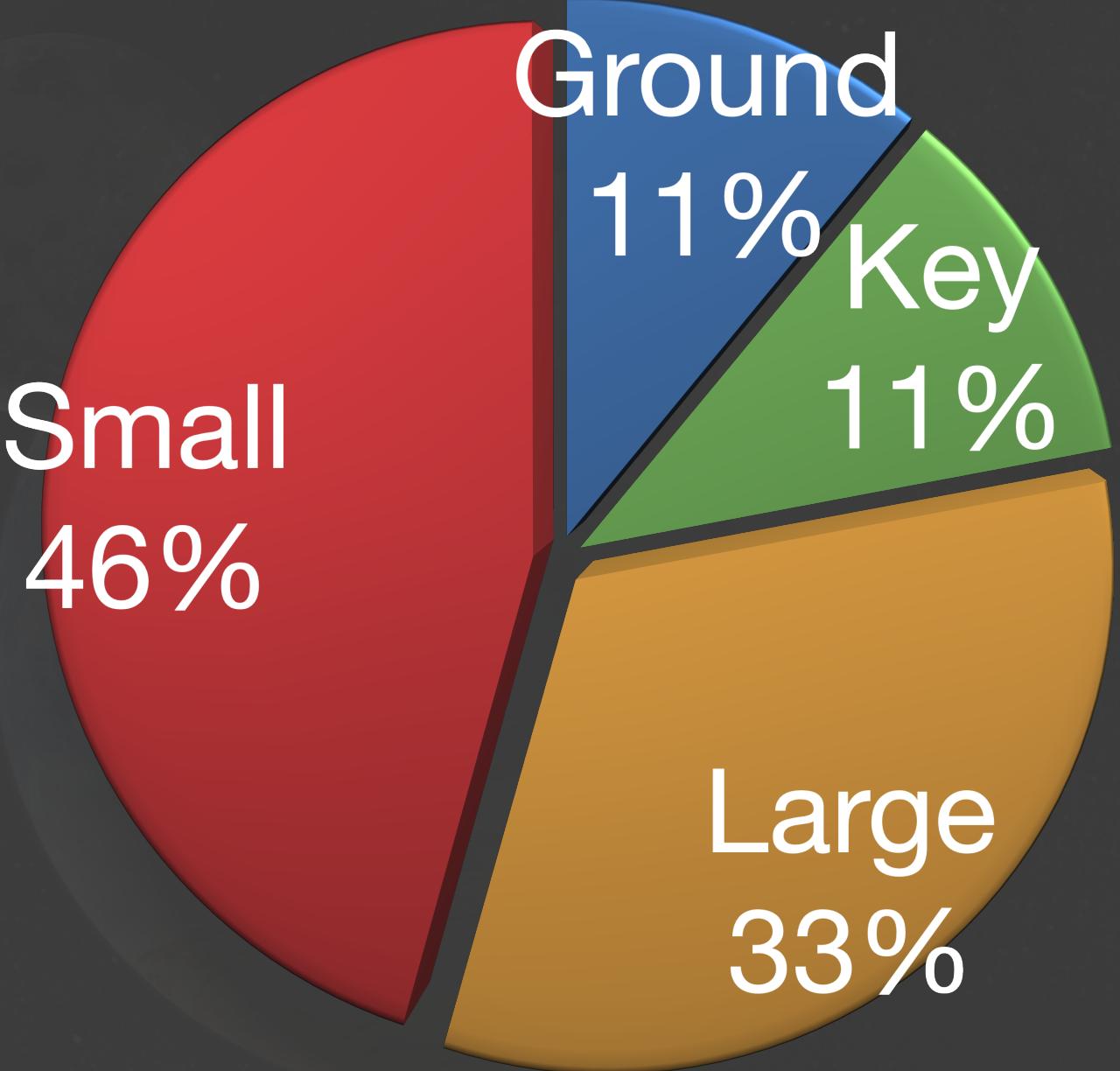
# TESS Cycle 6 Expectations

Approximate **Expected** program budget for the first year of new awards

**Potential\*** award profile:

\$3.0M in total  
\$500k of that to ground based observing programs

- ~ 35 in total
- ~ 1 Key Project
- ~ 6 large programs
- ~ 28 small programs



\*Current best guess - it is informed by history, but dependent on the review process and what proposals the community submits

The selection process will aim to guarantee a broad science program

# TESS Cycle 6 Timelines

December 9, 2022

Call for proposals released

April 14, 2023

Phase 1 Proposals Due

September, 2023

Sector 70 Observations begin  
(Start of Cycle 6 observations)

October, 2023

(Earliest date) Funding is typically released after the first  
data collected for the investigation are uploaded to MAST

August, 2024

Sector 82 Observations end  
(End of Cycle 6 observations)

# TESS Cycle 6 Timelines

December 9, 2022

April 14, 2023

September, 2023

October, 2023

August, 2024

Call for proposals released

Phase 1 Proposals Due

Sector 70 Observations begin  
(Start of Cycle 6 observations)

(Earliest date) Funding is typically released after the first data collected for the investigation are uploaded to MAST

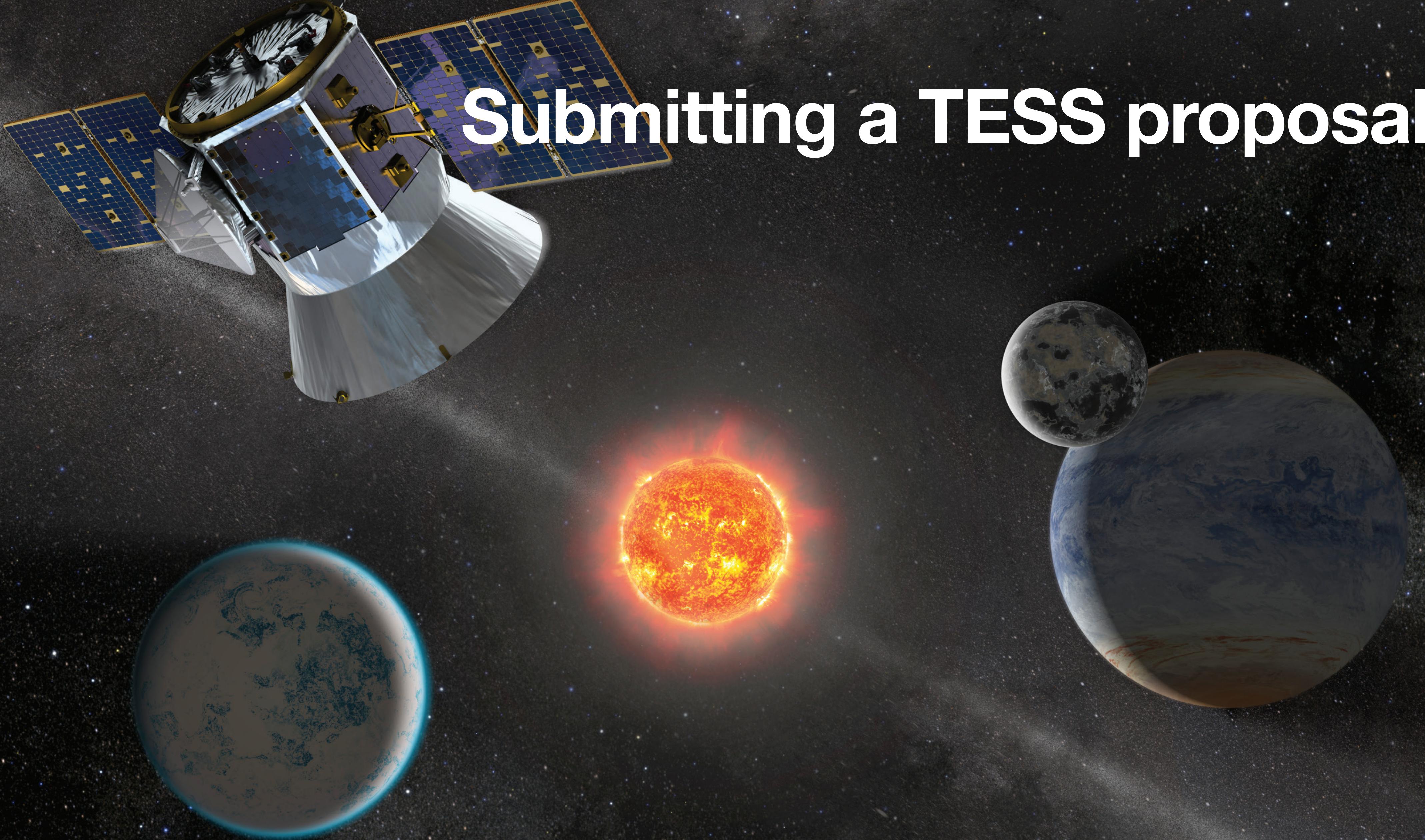
Sector 82 Observations end  
(End of Cycle 6 observations)

Short Proposal on Science with a TOTAL funding request only - the focus is on science not the budget

For accepted proposals with U.S. PI's receiving funding:

~1 month after award notification a phase 2 proposal will be required through NSPIRES with a detailed budget

# Submitting a TESS proposal



# TESS Guest Investigator Proposal Website

## Guest Investigator proposals

The TESS Guest Investigator (GI) program is intended to enable the community to participate in science investigations using TESS. The program enables teams to propose the collection of new 2-minute and 20-second cadence targets and provides funding to selected US investigators to analyze 2-minute and 20-second cadence and full-frame image (FFI) data, which now has a cadence of 200 seconds. The GI program also provides funding for US investigators to collect ground-based data that supports TESS science. All proposals are managed by the GI office.

The next opportunity is TESS Cycle 5, which begins observations in September 2022 and ends in September 2023, covering observing sectors 56 - 69. TESS Cycle 5 proposals are solicited for targets in both the northern and southern Ecliptic Hemisphere fields.

There is no exclusive-use data rights to observations collected by TESS. All data is made available through the [MAST public archive](#) once data processing and validation is complete.

Important information and useful tools for Cycle 5 proposals are highlighted in the table below.

The Cycle 5 solicitation is now available on [NSPIRES](#).

The Cycle 5 proposal deadline is on March 18th, 2022 at 4:30pm EDT. Proposals must be submitted through the [ARK/RPS site](#).

As in Cycle 4, all Phase-1 proposals submitted to the TESS GI program for Cycle 5 will be evaluated following a dual-anonymous peer review process.

Cycle 5 proposal templates are available. Their use is optional.

The Web TESS Viewing (WTV) tool allows checking of whether a target falls within the TESS field of view. The downloadable software, [TESS-Point](#) can also be used to check on the observability of targets.

Other useful tools for the planning of observations and the creation of a Phase-1 proposal can be found on our [proposal tools page](#).

## Proposal products

- Approximately 2,000 20 second cadence target slots per sector are available through the GI program.
- More than 8,000 target slots are available in each sector for 2-min cadence data per sector, facilitating very large GI programs.

### Proposal products

#### Proposal types

Ground-based observation focused projects

Joint HST, Fermi, Swift, and NICER programs

Core science targets and reserved targets

#### Writing the proposal

Evaluation criteria

#### Target selection

On-source monitoring times

Moving targets

#### Target of Opportunity Observations

#### Submission process

Instructions for dual-anonymous peer review proposals

#### Review process

Availability of funds

Eligibility

Submission and evaluation of Phase-2 proposals

- Describes the GI proposal call and process
- Contains much of the same information as this presentation and ROSES solicitation
- Will be live in January if not now

# TESS Proposal Planning Tools

## Proposal and observation tools

Below we outline tools that will help the user plan their observations, and so aid with proposals.

### Target list creation

The first stop for TESS GI proposers when preparing their proposals should be the STScI/MAST TESS pages. Here, proposers can follow tutorials to learn how to access the Target Input Catalog (TIC) and Candidate Target List (CTL), crossmatch their targets with these catalogs, and create output files with relevant target information required for the GI call. The TESS GI program office requires that if a target is in the TIC, GI proposers must provide only the following columns from the TIC in comma separated value (csv) format:

1. TIC ID (if available)
2. Right Ascension (decimal degrees)
3. Declination (decimal degrees)
4. Proper motion in Right Ascension (mas yr-1)
5. Proper motion in Declination (mas yr-1)
6. TESS mag

Since adherence to this format is critical for target list uploads to the Remote Proposal System (RPS) website, the MAST has provided a [custom tutorial](#) to show GI proposers how to select and output these columns for their target lists. Please follow this tutorial to provide a compliant target list.

In addition to the above six columns, the following additional columns can be provided as necessary (the columns order must not change):

1. Common name of target
2. Extended flag
3. Special handling flag
4. 20-second cadence flag
5. Swift time request (ksec)
6. Remarks

### Web TESS Viewing tool

The [Web TESS Viewing \(WTV\)](#) tool allows users to check whether a target potentially falls within the TESS field of view (FOV). In addition, WTV can be used to calculate the brightness of a target in the TESS bandpass.

The user provides the name (or TIC ID, or RA/DEC) of an object, and the tool will output which sector and camera the

#### Target list creation

Web TESS Viewing tool  
ticgen  
TESS-Point  
Filtergraph

### Instructions and tools for:

- Target list creation
- TESS Magnitudes
- TESS Observability

# TESS Phase I proposal: ARK/RPS

The screenshot shows the NASA HEASARC Archive page. At the top, there is a navigation bar with links to HEASARC Home, Observatories, Archive, Calibration, Software, Tools, and Students/Teachers/Public. Below the navigation bar, the page features a banner with the text "Astrophysics Research Knowledgebase" and "NASA's HEASARC: Archive". To the right of the banner, the acronym "ARK" is prominently displayed. A sub-navigation bar below the banner includes links for ARK Home, FAQ, and Help. On the left side of the main content area, there is a small icon of a satellite dish and some descriptive text about the Remote Proposal System (RPS). On the right side, there is a green rectangular button labeled "Remote Proposal System". The main content area lists available RPS proposal forms for three missions: Fermi, NICER, and NuSTAR. Each mission entry includes a link to the proposal form, instructions, and more information. At the bottom of the page, there is a note about joining ARK groups and a link to subscribe to the ARK/RPS calendar.

HEASARC Home Observatories Archive Calibration Software Tools Students/Teachers/Public

Astrophysics Research Knowledgebase  
NASA's HEASARC: Archive ARK

ARK Home FAQ Help

The HEASARC's Remote Proposal System (RPS) is an automated service providing investigators from around the world an easy-to-use facility for submitting proposals in response to NASA Research Announcements.  
RPS...  
• verifies proposal data for completeness and consistency,  
• enables scientists to store proposal information from session to session,  
• makes adding target information to proposals easy, and  
• generates LaTeX, PostScript, and/or PDF versions of the proposal forms.

The following RPS proposal forms are currently available for the following missions:

- Fermi
  - [Fermi Target of Opportunity \(FERMITOO\)](#)
    - [Instructions](#)
    - [More information...](#)
- NICER
  - [NICER Target of Opportunity/DDT \(NICERTOO\)](#)
    - [Instructions](#)
    - [More information...](#)
- NuSTAR
  - [NuSTAR Guest Observer Program Cycle 9 \(NUSTAR\)](#)
    - Start: 2022-12-07
    - Deadline: 2023-01-26 4:30pm EST
    - [Instructions](#)
    - [More information...](#)

In order to access any of these proposal forms, you must first [join the appropriate ARK group\(s\)](#).

**NEW!** [Subscribe to the ARK/RPS calendar \(instructions\)](#) in your favorite calendaring program (e.g., Apple's iCal, Google Calendar, Microsoft Outlook, or Mozilla Sunbird) to stay informed of upcoming proposal submission deadlines.

Additional Information

You will submit your proposal through the Astrophysics Research Knowledgebase (ARK) Remote Proposal System (RPS)

This is great because the submission is low effort - you submit your phase 1 proposal, not your institutional grant office

For phase 2 funding, US PIs will have you institution submit via NSPIRES

# TESS Phase I proposal: ARK/RPS

The screenshot shows the HEASARC ARK/RPS website. At the top, there is a navigation bar with links to HEASARC Home, Observatories, Archive, Calibration, Software, Tools, and Students/Teachers/Public. Below the navigation bar, the page title is "Astrophysics Research Knowledgebase ARK" with "NASA's HEASARC: Archive" underneath. A banner on the left side of the main content area says "The HEASARC's Remote Proposal System (RPS) is an automated service providing investigators from around the world an easy-to-use facility for submitting proposals in response to NASA Research Announcements." Below this, there is a section titled "RPS..." with a bulleted list of features:

- verifies proposal data for completeness and consistency,
- enables scientists to store proposal information from session to session,
- makes adding target information to proposals easy, and
- generates LaTeX, PostScript, and/or PDF versions of the proposal forms.

Below this, there is a section titled "The following RPS proposal forms are currently available for the following missions:" with a list of missions and their corresponding proposal forms:

- Fermi
  - [Fermi Target of Opportunity \(FERMITOO\)](#)
    - [Instructions](#)
    - [More information...](#)
- NICER
  - [NICER Target of Opportunity/DDT \(NICERTOO\)](#)
    - [Instructions](#)
    - [More information...](#)
- NuSTAR
  - [NuSTAR Guest Observer Program Cycle 9 \(NUSTAR\)](#)
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NEW! [Subscribe to the ARK/RPS calendar \(instructions\)](#) in your favorite calendaring program (e.g., Apple's iCal, Google Calendar, Microsoft Outlook, or Mozilla Sunbird) to stay informed of upcoming proposal submission deadlines.

**Additional Information**

<https://heasarc.gsfc.nasa.gov/ark/rps/>

The TESS Cycle 6 ROSES notice has gone live, but proposal submission through ARK/RPS has not yet become available

TESS will be added to this list when it opens up in January

To submit a TESS proposal, after you create your ARK/RPS account, you will need to 'join' the TESS group

# TESS Phase I Proposal - Dual-Anonymous

TESS Phase I proposals are in the NASA standard “Dual Anonymous” format

This consists of an ***anonymized*** portion where the reviewers grade the science outlined in the proposal.  
The overall proposal rating is determined here.

This is then followed by a ***de-anonymized*** portion where the teams expertise and resources are reviewed

# TESS Phase I Proposal - Three Components

There are three components to a complete Phase I proposal:

ARK/RPS Forms - Filled out online, **Non-anonymized**

The Scientific & Technical Justification - PDF, **Anonymized**

The Expertise & Resources document - PDF, **Non-anonymized**

Reviewers will be given an **anonymized** version of the RPS forms and your Scientific/Technical Justification.

Once the proposals are fully graded they will then be **unblinded** and your Expertise & Resources document will be reviewed

# TESS Phase I Proposal - ARK Forms

ARK/RPS Forms - Filled out online, Non-anonymized

- Cover Sheet including abstract, team members, dollar amount of funding request, Target List, etc.

MAST\_TIC\_Proxima\_Cen

ID	ra	dec	pmRA	pmDEC	Tmag
388857263	217.428793	-62.679592	-3776	768	7.36
388858412	217.42419	-62.674187	0	0	15.714
388870887	217.416429	-62.678303	0	0	15.748
388867103	217.435982	-62.684608	-4.5	-2.4	14.414
388859317	217.426054	-62.686035	0	0	16.044
388864122	217.443353	-62.676582	0	0	15.837

Requires Six Columns in csv format:

- TIC ID (if available)
  - Right Ascension (decimal degrees)
  - Declination (decimal degrees)
  - Proper motion in RA
  - Proper motion in Dec
  - TESS mag
- +additional optional columns

MAST tutorial for target list creation is available at: [https://archive.stsci.edu/tess/tutorials/goddard\\_format.html](https://archive.stsci.edu/tess/tutorials/goddard_format.html)

- This information is what is used to build the target list and it is on the proposal submitter to make sure that your targets are properly crossmatched to the TIC catalog (e.g. WCS Epoch).
- If you think that you have made a mistake, contact the TESS GI office ASAP

# TESS Phase I Proposal - Scientific Justification

## The Scientific & Technical Justification - PDF, **Anonymized**

- Page limits vary depending on your proposal type
  - Mini - 2 pg, Small - 4 pg, Large/Key - 6 pg
  - Extra pages in Large/Key projects are to describe the benefits to the scientific community
  - References are **NOT** included in the page limits

# TESS Phase I Proposal - Templates

**Templates for Scientific Justification and Expertise and resources  
are available online at the GI proposal website:  
<https://heasarc.gsfc.nasa.gov/docs/tess/proposal-templates.html>**

**These are suggested but not required to be used**

**IMPORTANT - TEXT MUST MAINTAIN PROPOSERS ANONYMITY THROUGHOUT  
THE SCIENCE JUSTIFICATION - see NASA DAPR style guide at:  
<https://science.nasa.gov/researchers/dual-anonymous-peer-review>**

# TESS Phase I Proposal - Template Sections

- **Introduction**
  - Brief overview of the topic to give context for the reader
  - TESS panels can contain broad scientific expertise
- **Scientific Justification**
  - What are you planning on doing scientifically?
  - Why is it important that we get new TESS observations?
- **(Only for ToO) Trigger Criteria**
  - If you want to add a high-cadence target after TESS Cycle 6 Observations start, under what conditions would this occur?
- **(Only for Joint Proposals) Need for *Swift/NICER/Fermi* observations**
  - Why do you need Swift/NICER/Fermi Data?
  - How much do you need?
- **Analysis Plan**
  - How will you analyze TESS/Ground-based Data and/or develop software tools?
- **Technical Feasibility**
  - Show that TESS (or your ground-based plan) will be able to perform the stated observations
- **Work Plan**
  - Who on the team will be doing what work?

# TESS Phase I Proposal - Expertise & Resources

The Expertise & Resources document - PDF, **Non-anonymized**

Reviewed only **after** the ranking is finalized

- Reviewed as Less than Qualified/Qualified/Uniquely Qualified.
  - Rare to have either Less than Qualified or Uniquely Qualified
- This section should contain:
  - Details on critical team members and their expertise
  - Details of pre-approved access to facilities necessary for the program (e.g. Telescope Access like an approved JWST program)
  - References to work previously published by the team to support feasibility

# **TESS Cycle 6 Phase I Proposals - Due April 14**

**TESS GI Proposal Website:**

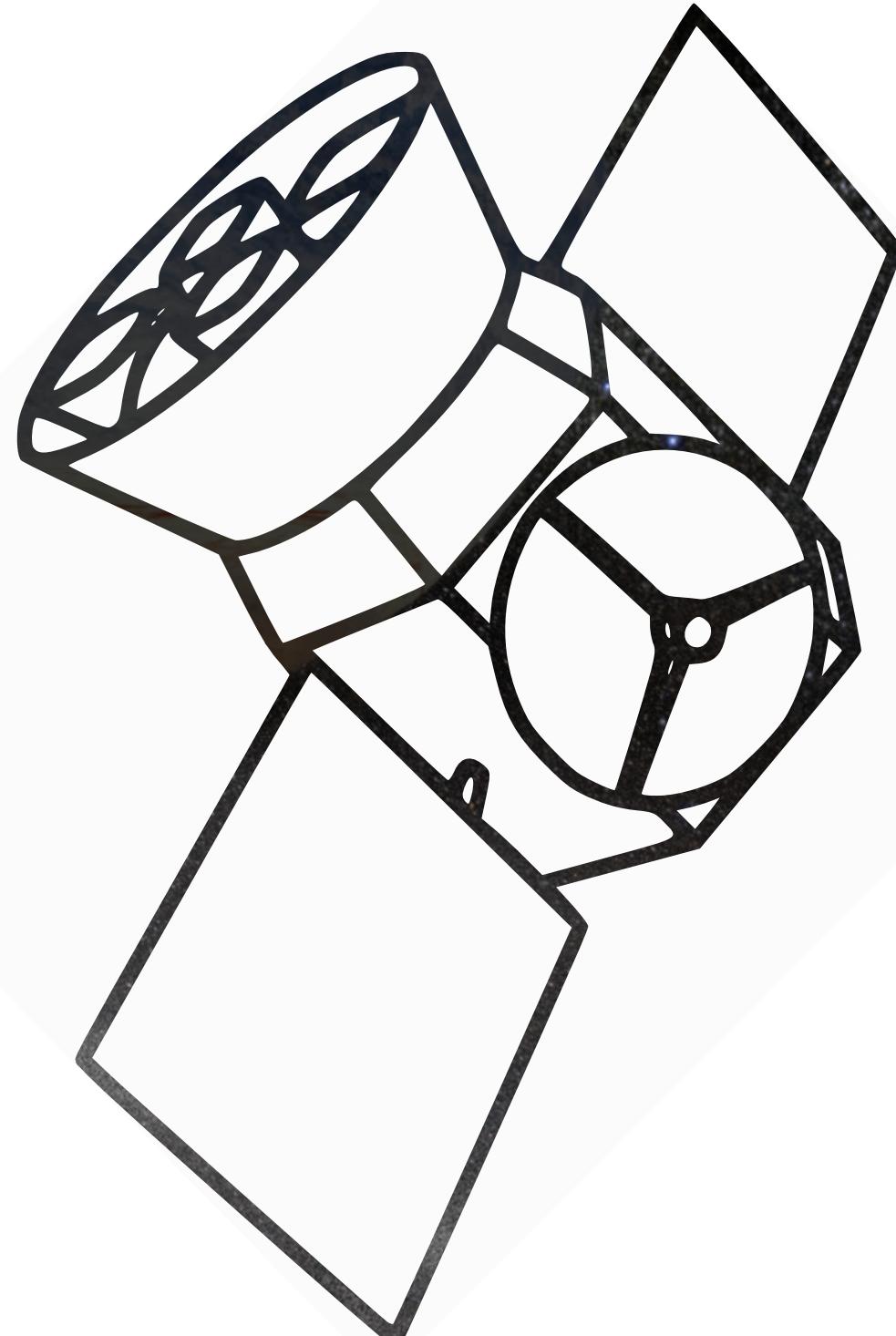
**[https://heasarc.gsfc.nasa.gov/docs/tess/  
proposing-investigations.html](https://heasarc.gsfc.nasa.gov/docs/tess/proposing-investigations.html)**

**Proposal Planning Tools:**

**[https://heasarc.gsfc.nasa.gov/docs/tess/  
proposal-tools.html](https://heasarc.gsfc.nasa.gov/docs/tess/proposal-tools.html)**

**NASA NSPIRES ROSES-2022 Solicitation:**

**<https://solicitation.nasaprs.com/ROSES2022>**



# Extra Slides

