

Polarimeter to Unify the Corona and Heliosphere

PUNCH Status Update

Craig DeForest, PI



PUNCH-2
9-August-2021
Teleconference



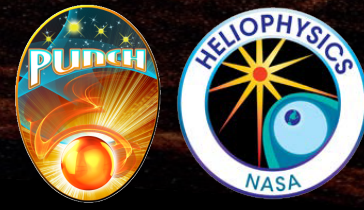


Welcome to PUNCH-2!

- *What is PUNCH?*
- *Why are we (the community) doing PUNCH?*
- *(Why are we here now)?*
- *Where will the PUNCH mission observe?*
- *How is PUNCH progressing?*
- *Who can be involved?*
- *When are launch, and lunch?*



What is PUNCH?



Scientific Driver: Understanding how the Sun's corona gives rise to the heliosphere and solar wind

Approach: direct, continuous, 3D imaging of the entire outer corona and inner heliosphere

Measurement: polarized images of visible light that is Thomson-scattered off free electrons

Mission structure:

- four synchronous smallsats
- 620km sun-synch LEO
- two year duration



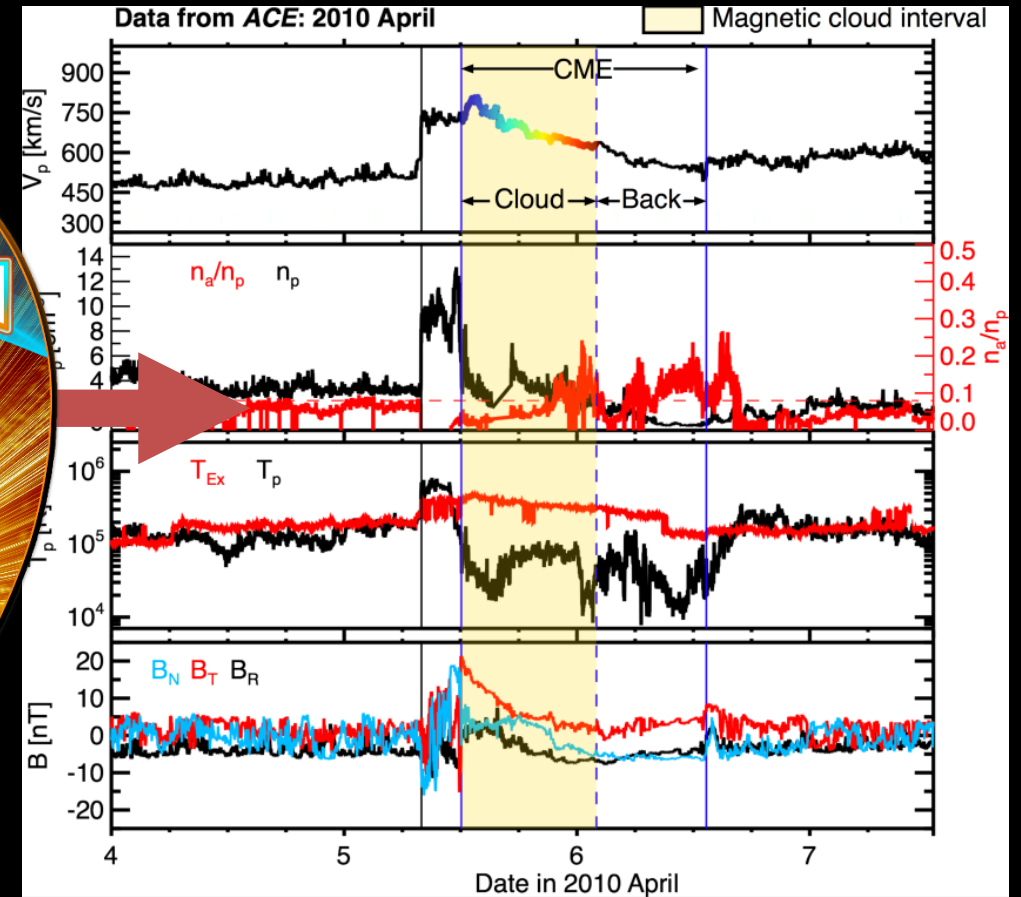
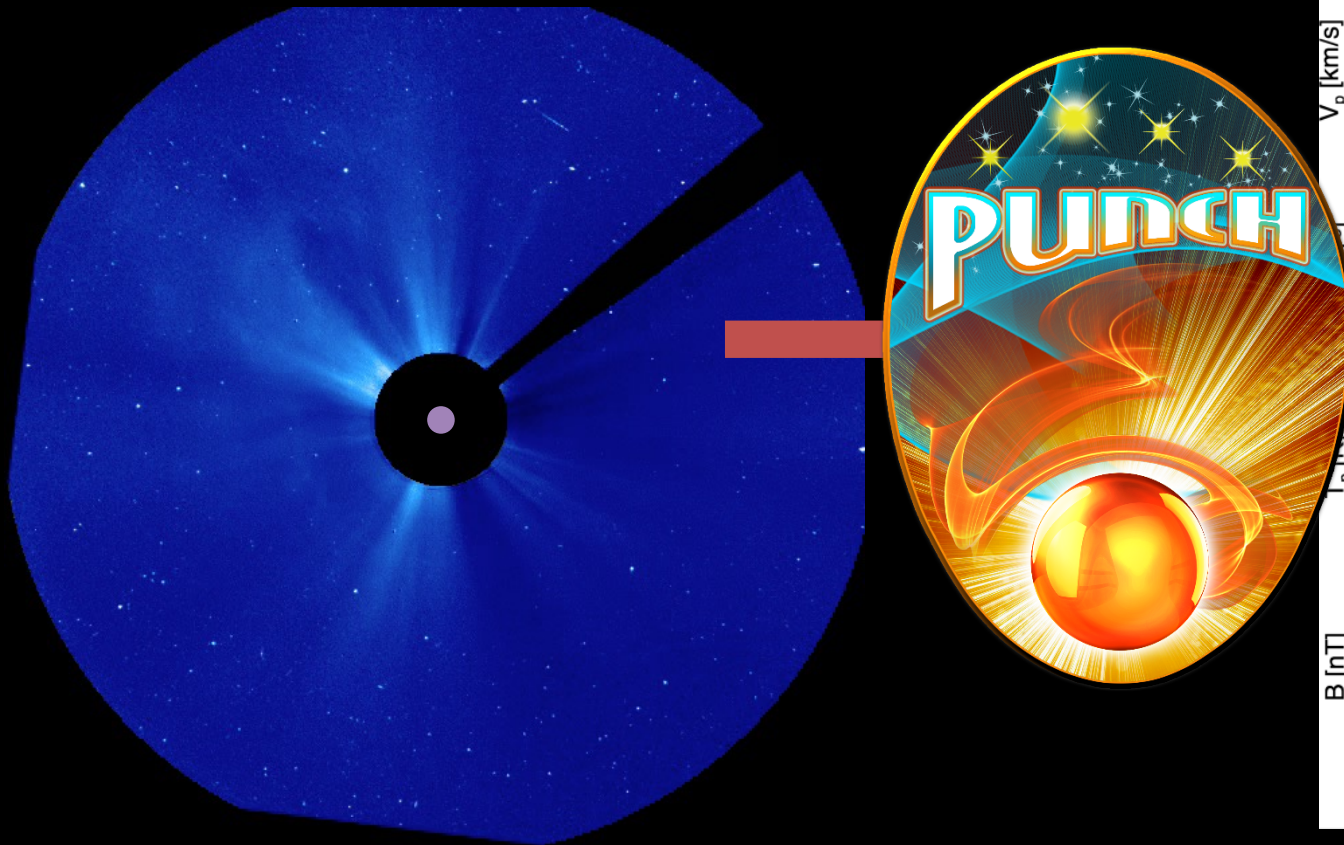


Why PUNCH?



Solar physics studies the Sun and solar corona, primarily through remote sensing and spectral analysis.

Heliospheric physics studies the solar wind in interplanetary space, primarily through in-situ sampling.

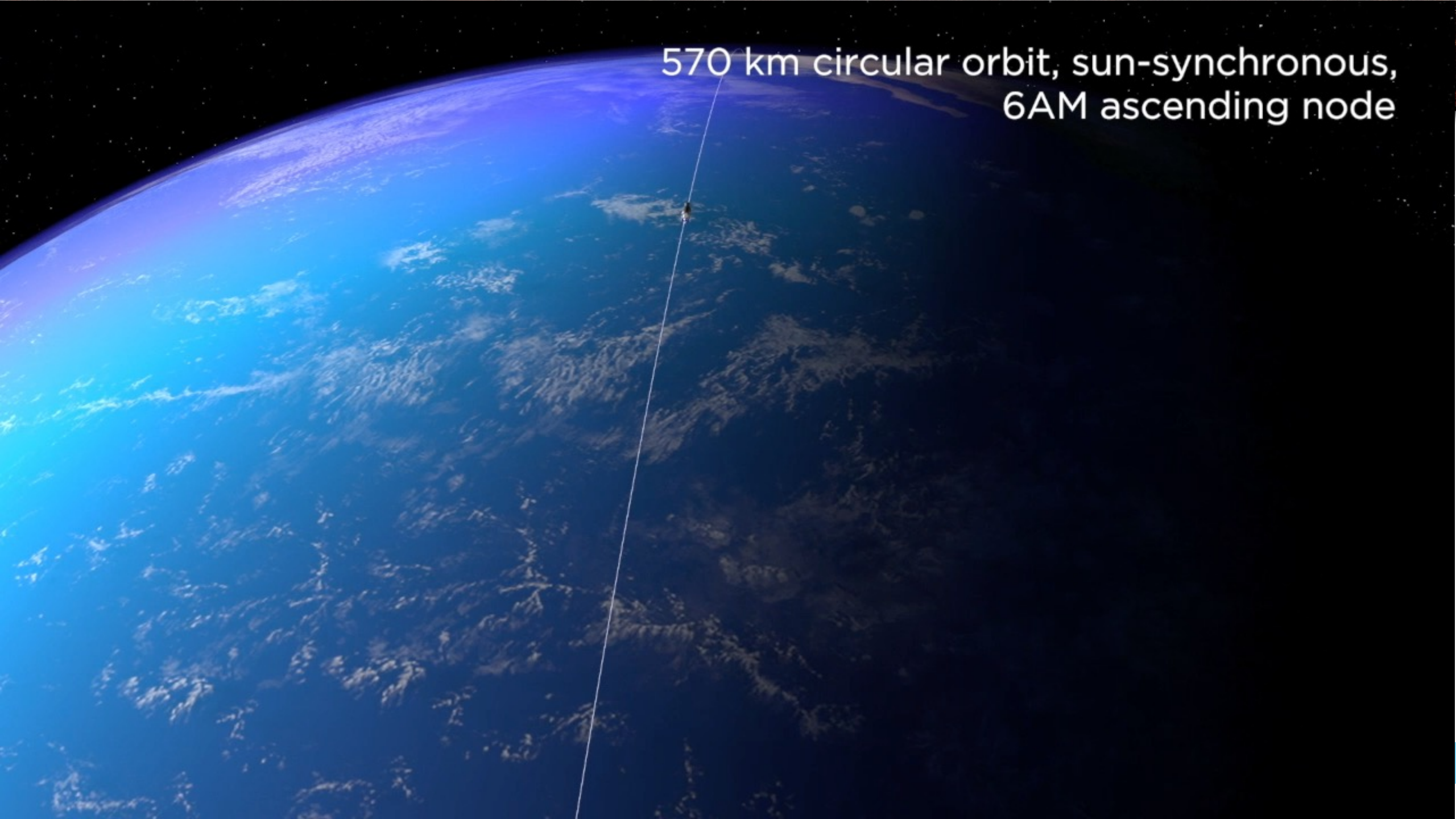


PUNCH closes a 60-year gap in understanding of the corona and solar wind.



Why are we here now?

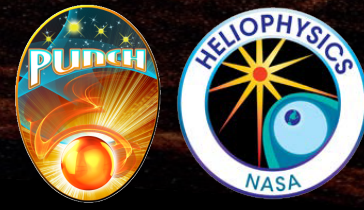
- *Understand the advancing state of the field as we prepare for PUNCH launch (in ~2 years)*
- *Prepare now to make the best use of PUNCH data (investigations, tools, data)*
- *Welcome both the funded team and the broader community to work on PUNCH science together*

A satellite is shown in a circular orbit around the Earth. The Earth's surface is visible, showing clouds and landmasses. The satellite is a small dark object on a thin white line representing the orbit. The text "570 km circular orbit, sun-synchronous, 6AM ascending node" is written in white at the top right of the image.

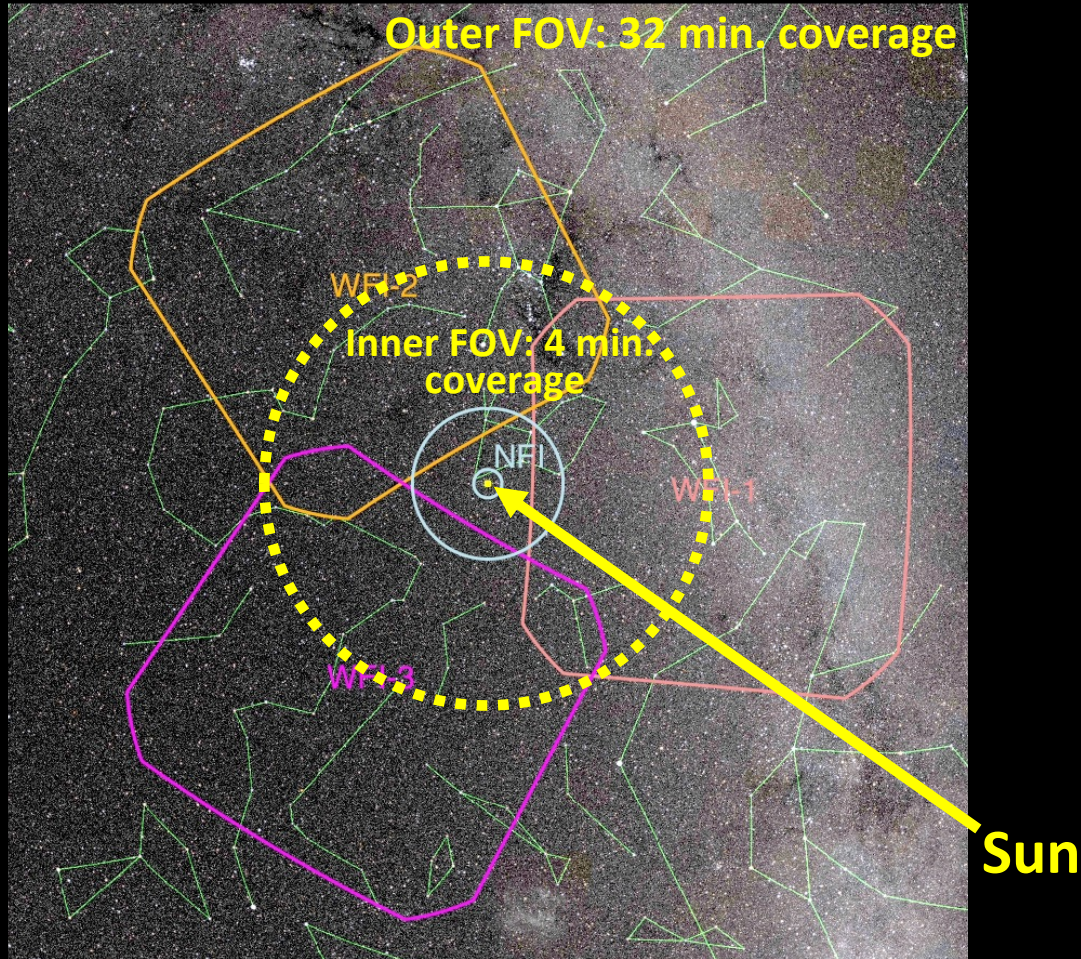
570 km circular orbit, sun-synchronous,
6AM ascending node



1+3 Constellation covers PUNCH science in LEO



PUNCH sweeps its full FOV 3x per orbit



Three WFIs are 120° apart; NFI is unconstrained



- The WFI cameras fly in formation 120° apart in orbit.
- Each spacecraft rotates every 8 minutes to match its orbital motion.
- Exposures are combined on the ground.
- Each flash: complete polarization sequence
- Dotted circle: 4-min cadence coverage inside 80 Rs

PUNCH mission design is resilient and elegant



How is PUNCH progressing? (Welcome to Phase C/D!)

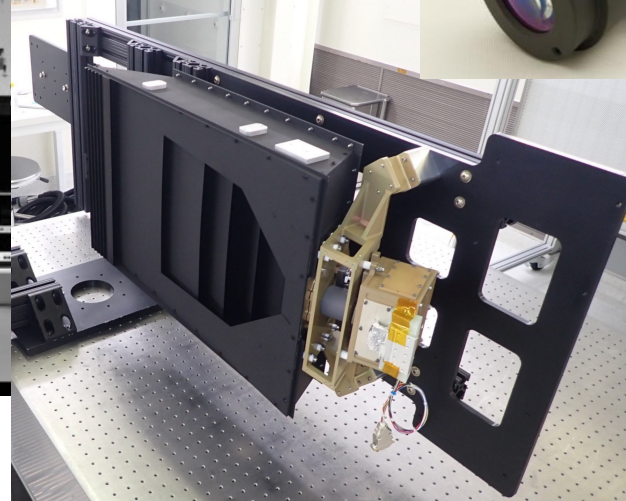
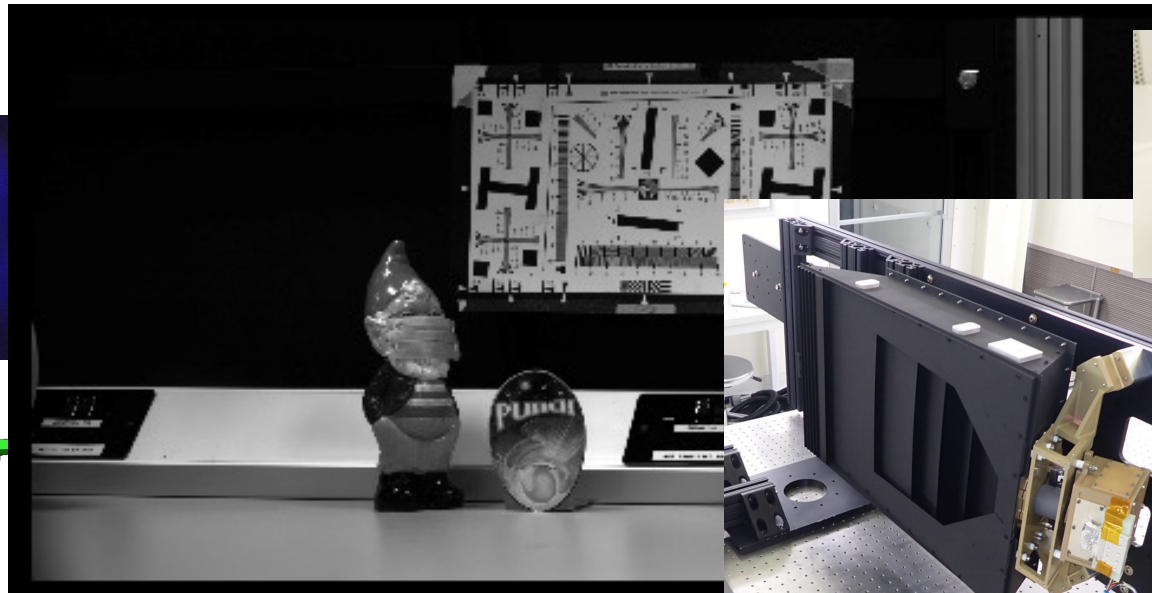
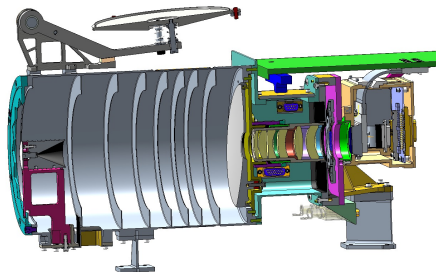
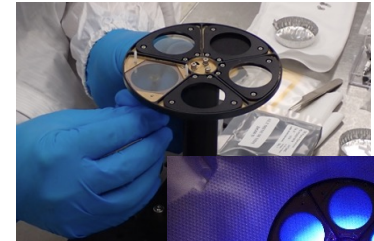
PUNCH Schedule Summary

CY 2018		CY 2019				CY 2020				CY 2021				CY 2022				CY 2023				CY 2024				CY 2025				CY 2026				
2018		FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				
AMJ	JAS	OND	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND	JFM	AMJ	JAS	OND
Phase A				Bridge				Phase B				Phase C/D				Phase E				Ph. F														
CSR		SV HQ		KO		SRR/MDR		PDR		KDP-C		CDR		SIR		ORR/PSR		PLAR/KDP-E				KDP-F				Decomm. Rev.								

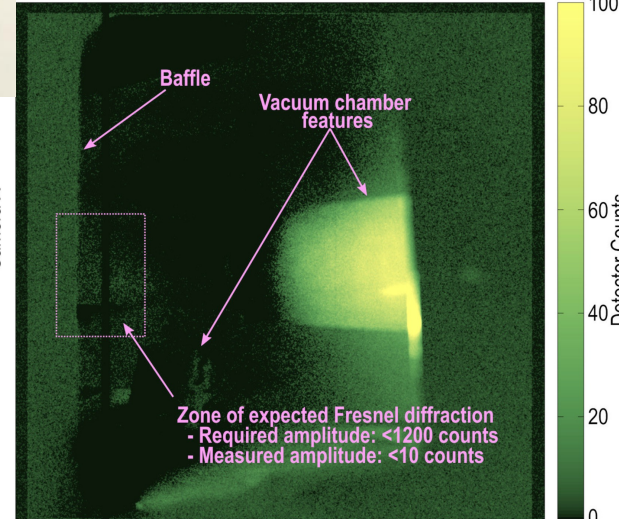
Today: 9-Aug-2021

LRD: Oct 2023

Phase E: 24 months

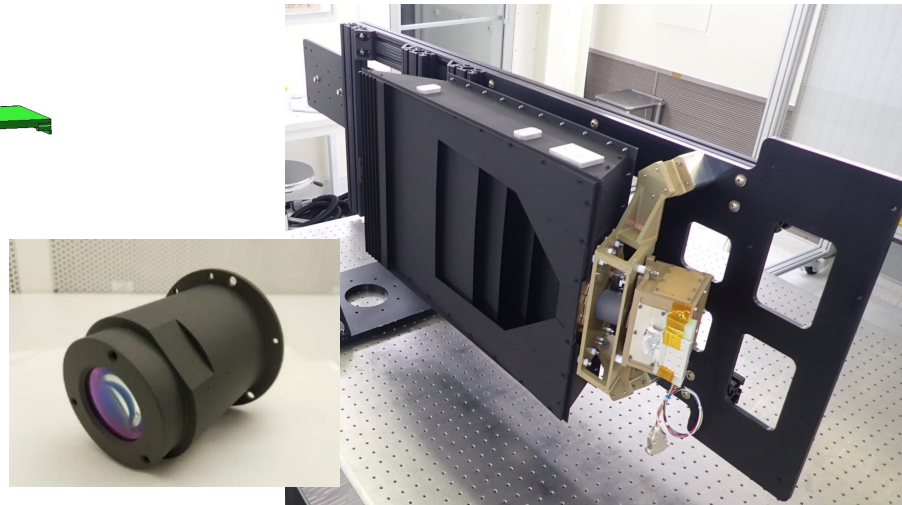
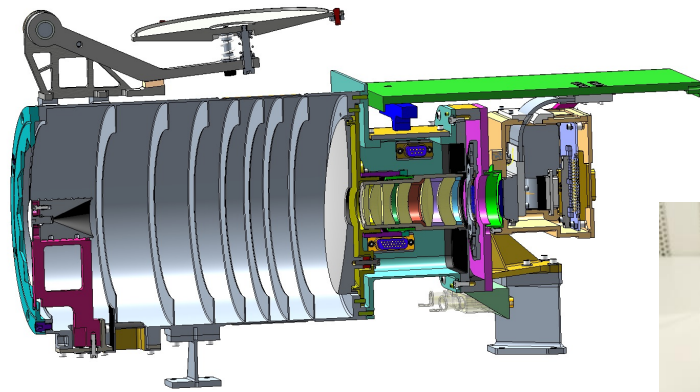
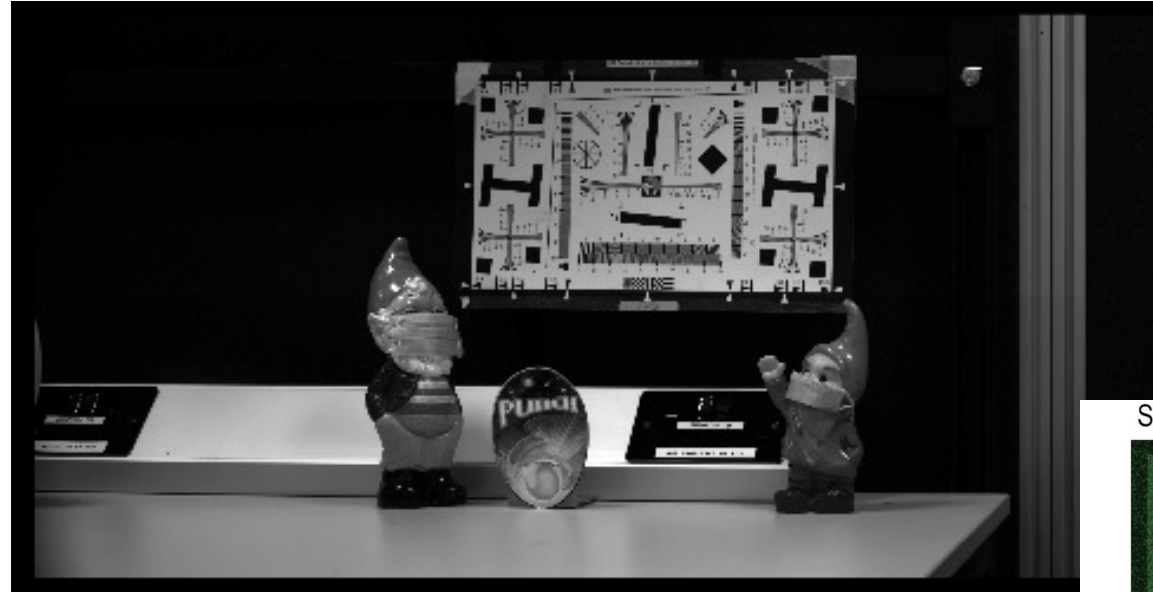
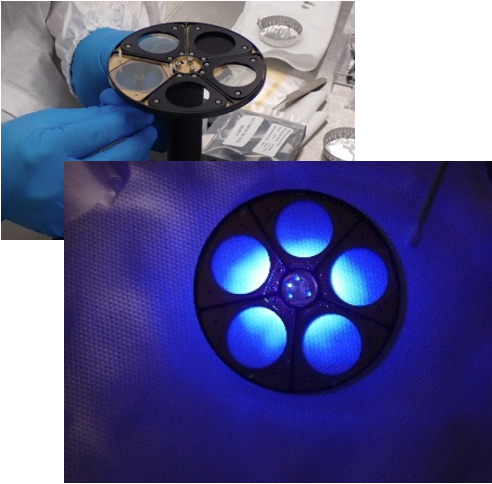


Stray light image taken by WFI EM 16-Jul-2021 (100s exposure)

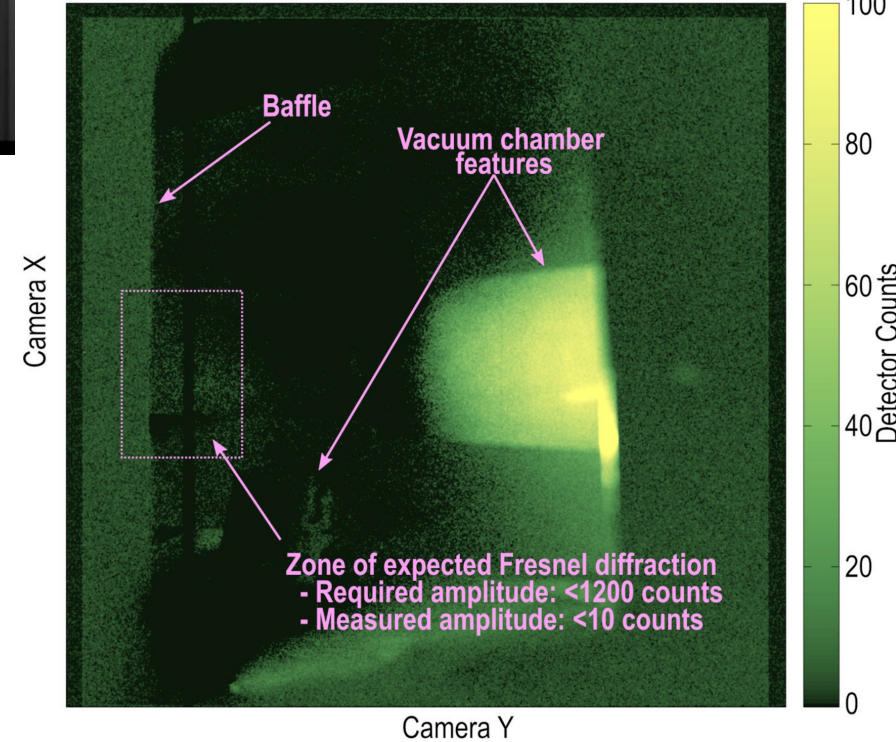




Spacecraft and instruments and cameras, oh my!



Stray light image taken by WFI EM 16-Jul-2021 (100s exposure)





Who can be involved with PUNCH?

You!

- PUNCH intent is to build and support a robust community
- Open data policy, open science team meetings
- Planned workshops on how to interpret data
- Get involved!
 - Talk with a WG lead, with Sarah, or with me
 - Participate in discussions in this and upcoming meetings



When is launch, and when is lunch?

- PUNCH's scheduled **launch** readiness date is 3-Oct-2023
- NASA rideshare efforts: actual launch *may* be later
- **Lunch** readiness is catch-as-catch-can because of the multiple time zones in this global virtual meeting.
Come to the icebreaker: 1:30 PST today