



*Overview of the RADICALS Scientific
Payload*

*CFI Innovation
Fund 2020*



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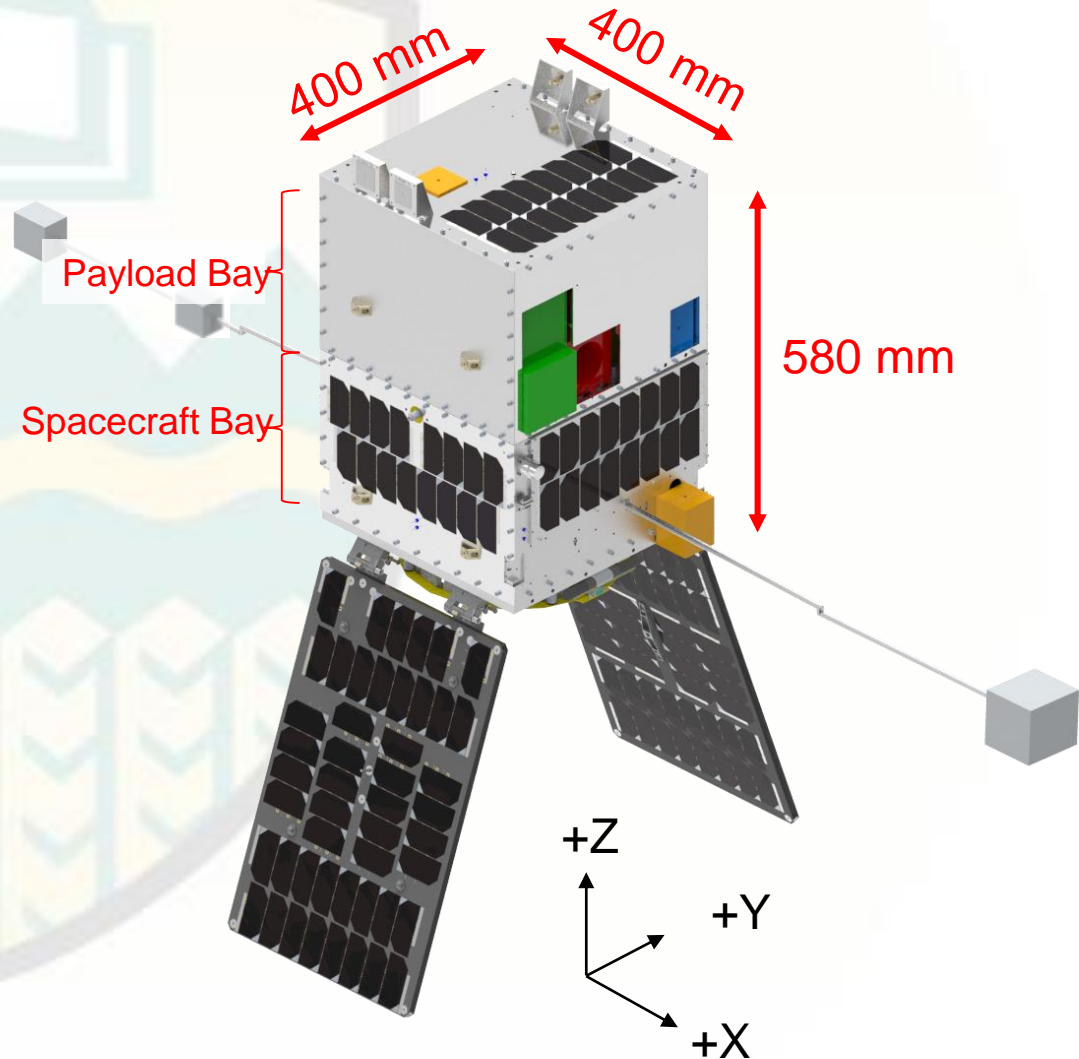
Outline

- Defiant-XL layout
- Launch Selection Relative to Solar Max
- High-level Mission Schedule
- Current Con-Ops



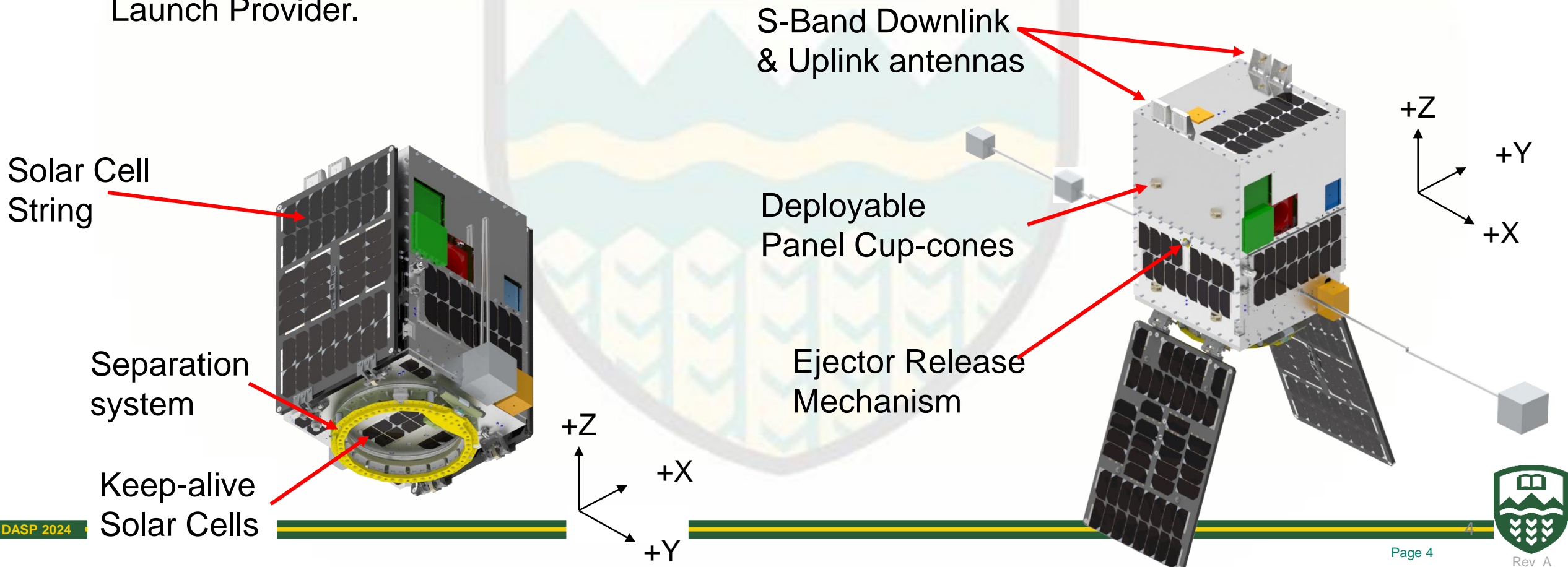
DEFIANT-XL Bus Layout

- Two primary volumes:
 - Top: Payload Bay
 - Bottom: Spacecraft/Bus Bay
- Dimensions:
 - Total Exterior: 400 mm x 400 mm x 580 mm
 - Payload Interior: 375 mm x 375 mm x 265 mm
- Load paths:
 - Spacecraft bay constitutes primary structure
 - Payload bay secures to spacecraft bay via a structural divider tray
 - Spacecraft secured to LV via launch adaptor, mounted to spacecraft bay structure



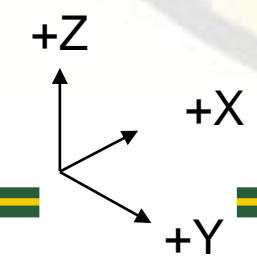
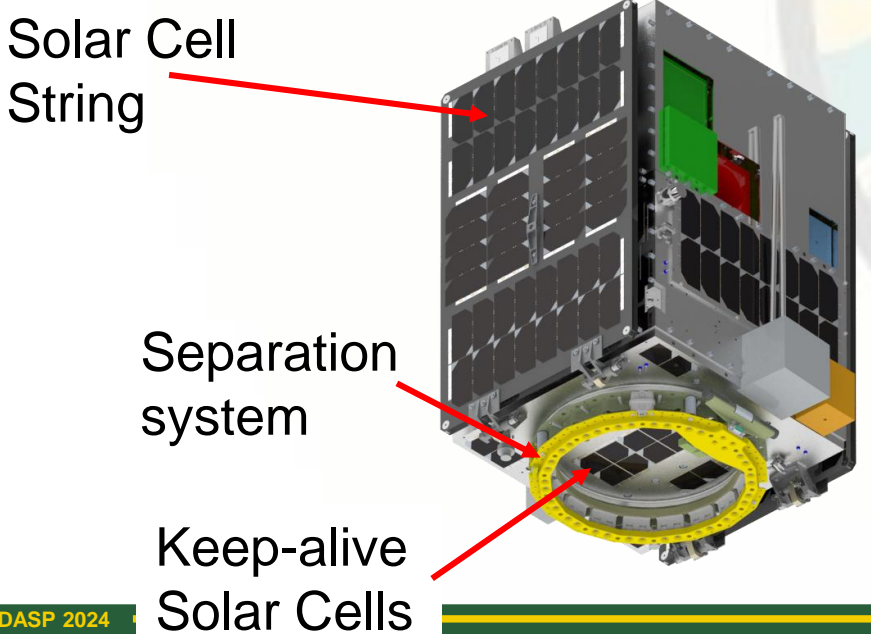
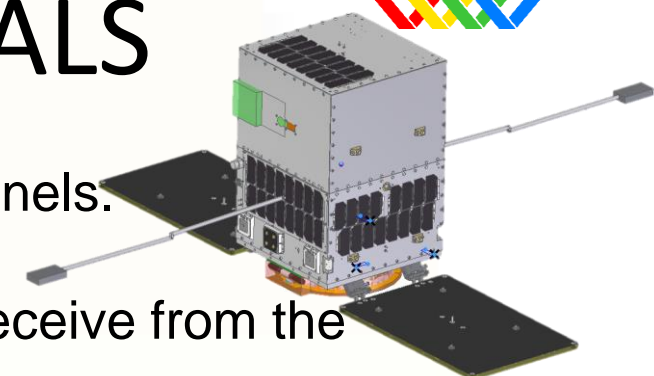
Solar Panel Layout for RADICALS

- Main feature of the DEFIANT-XL bus is its two large deployable solar panels.
- Solar cells installed on both sides of the deployable panel.
- Panels deployed at 70°, but the angle will be optimised to the orbit we receive from the Launch Provider.



Solar Panel Layout for RADICALS

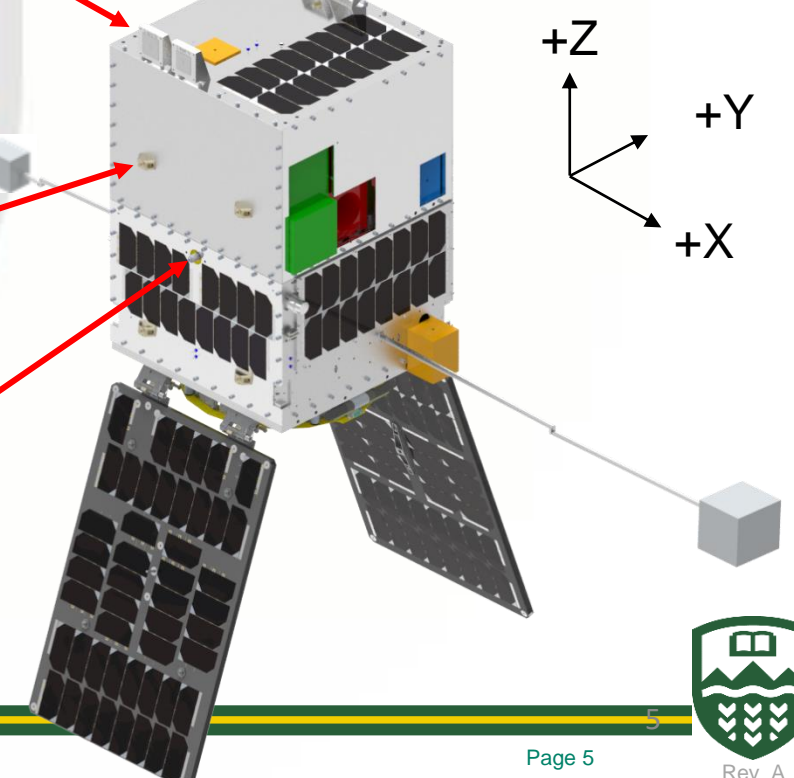
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S-Band Downlink & Uplink antennas

Deployable Panel Cup-cones

Ejector Release Mechanism



RADICALS Instrument Payload

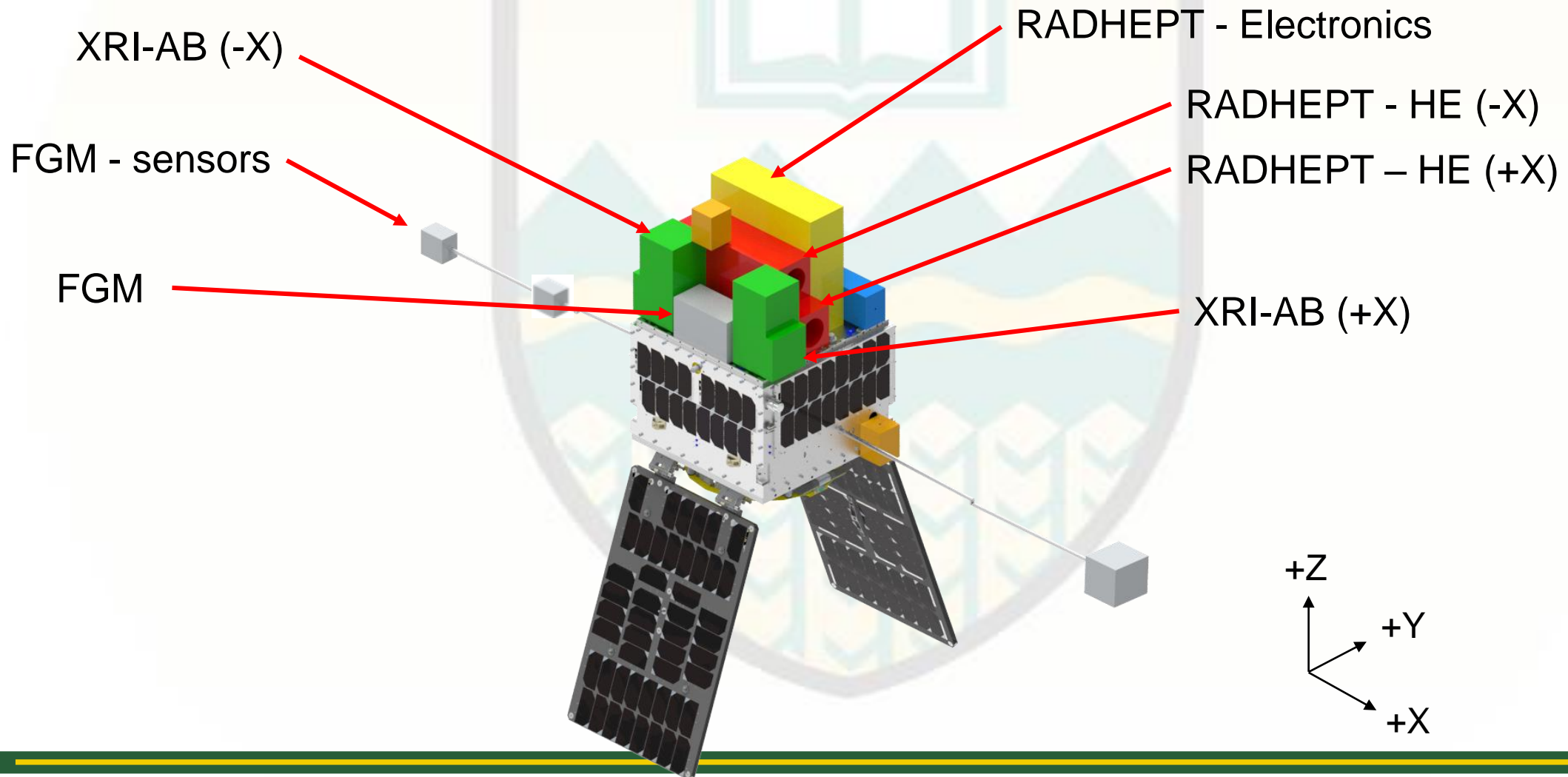


Payload Instrument (Institution)	Measurement Quantity	Innovation
High Energy Particle Telescope (RADHEPT; UofA)	Space Radiation: medium energy electrons and solar energetic particles	Unique EPP-related atmospheric energy input, with essential pitch angle resolution
X-ray Imager (XRI; UofC)	X-rays: emitted from medium energy electrons hitting the atmosphere	Unique imaging of EPP; define area over which precipitation occurs
Fluxgate Magnetometer (FGM; UofA)	DC magnetic field: Direction and ultra-low frequency plasma waves	Define pitch angle; assess physical role in radiation scattering into the atmosphere
Search Coil Magnetometer (SCM; UofA)	AC Magnetic Field: Higher frequency plasma waves	Assess physical role in radiation scattering into the atmosphere.

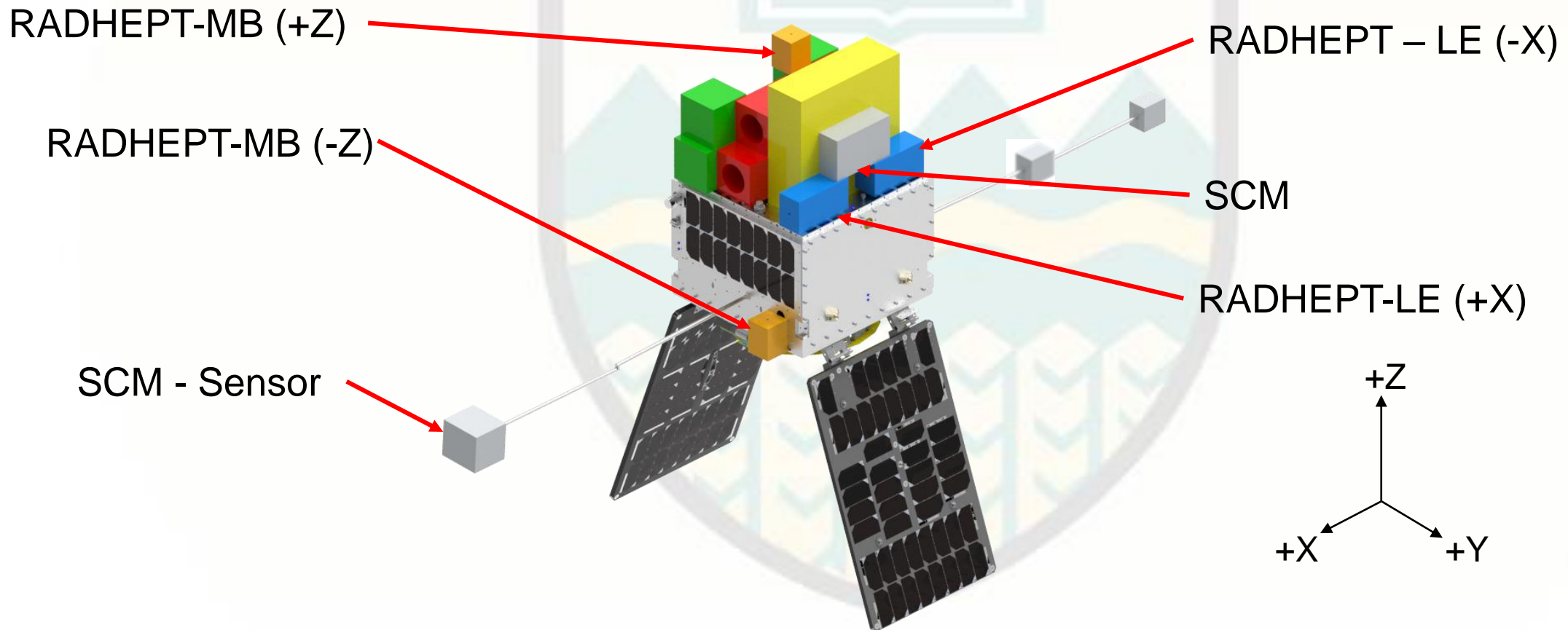
EPP = Energetic Particle Participation



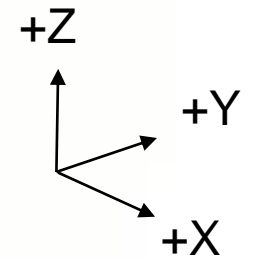
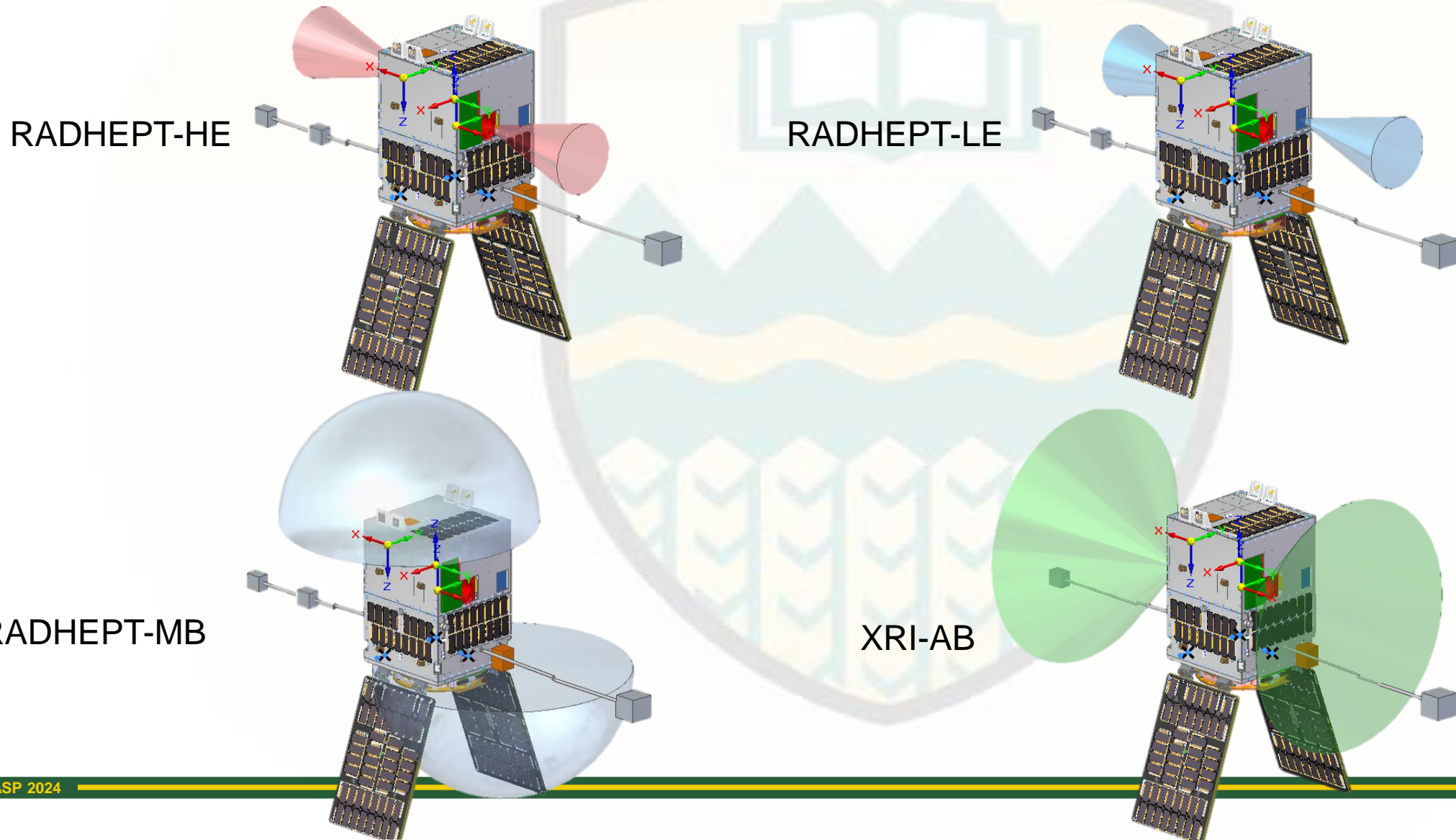
Payload Layout for RADICALS



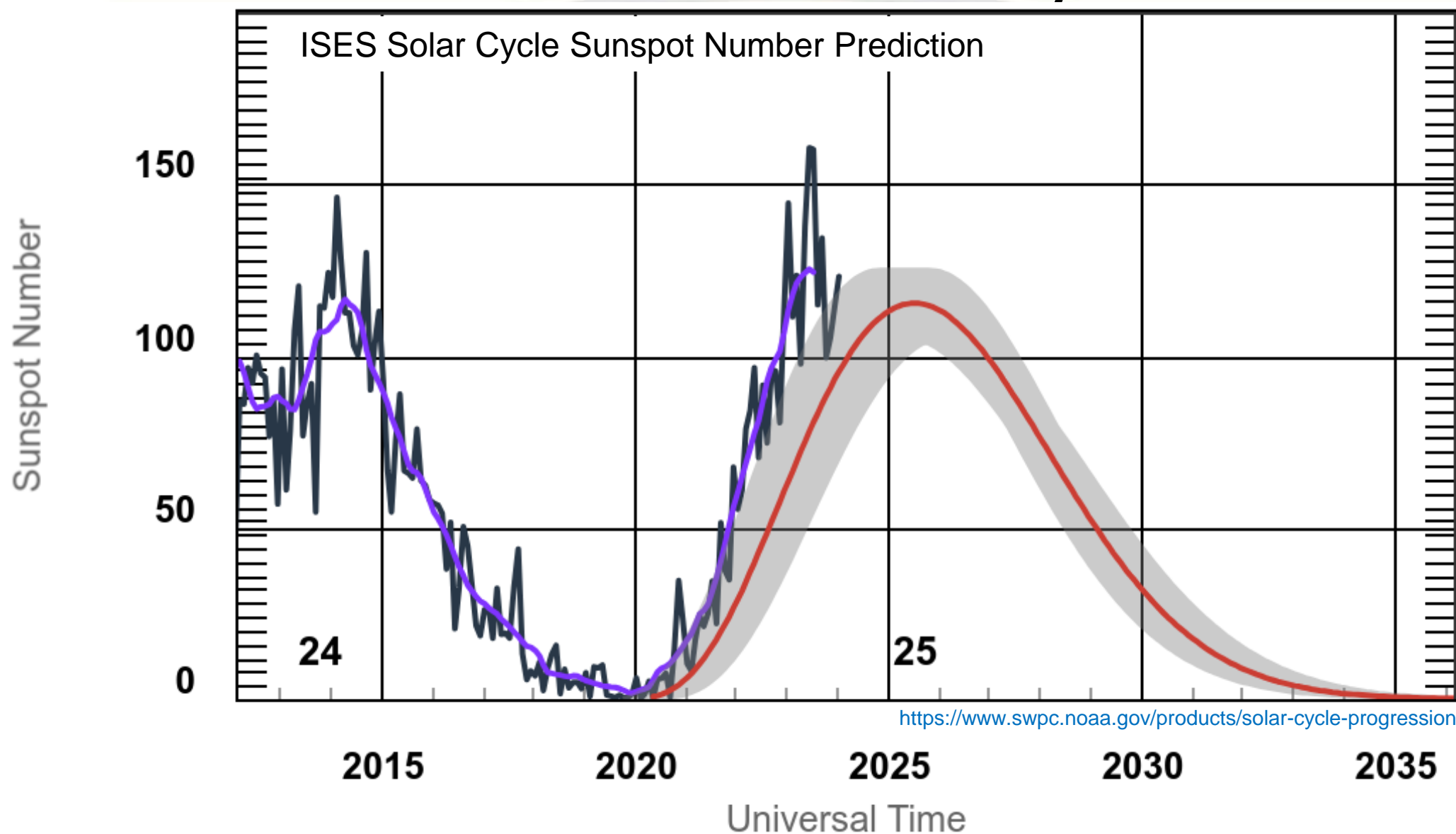
Payload Layout for RADICALS



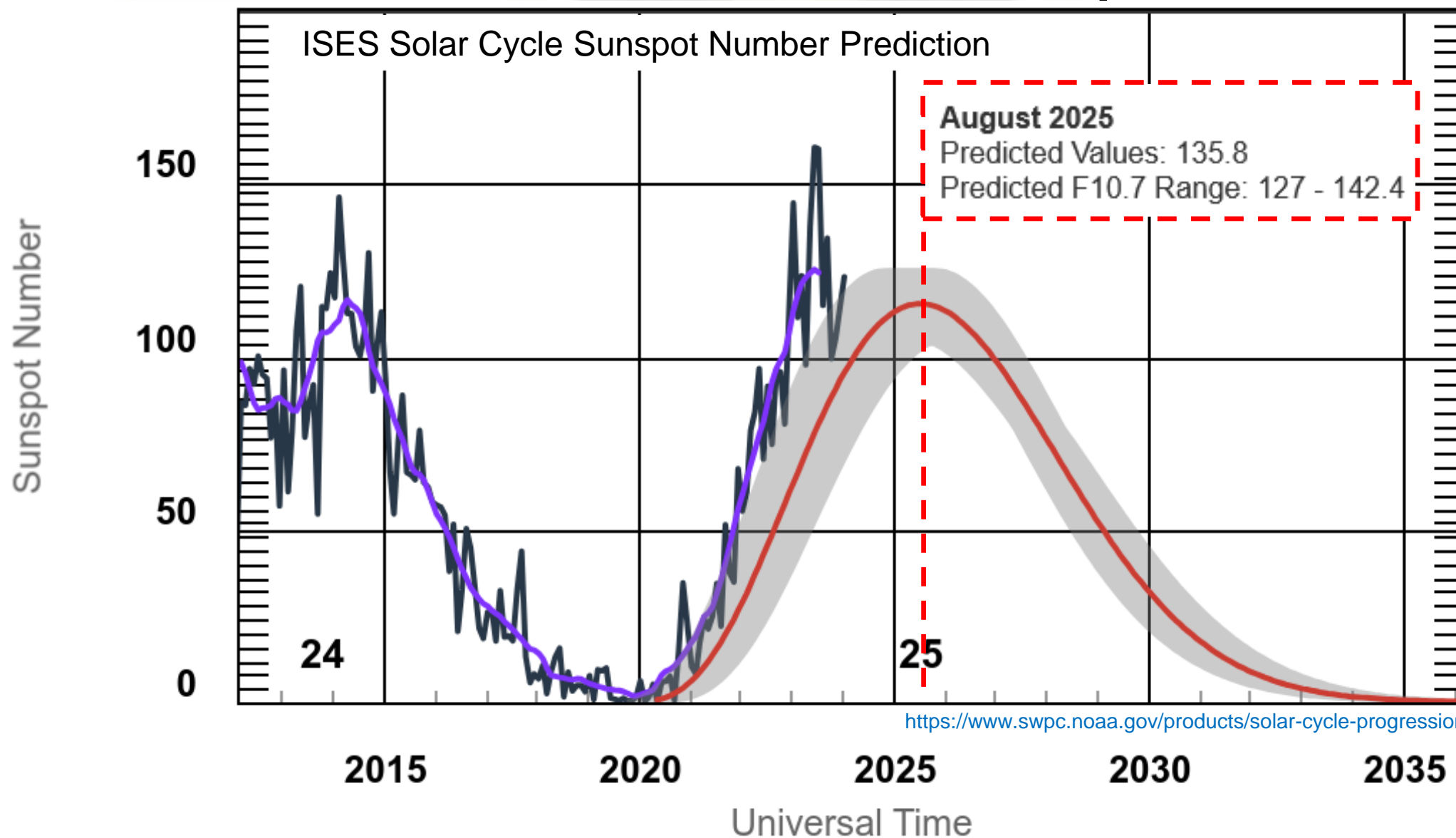
Instrument Fields of View



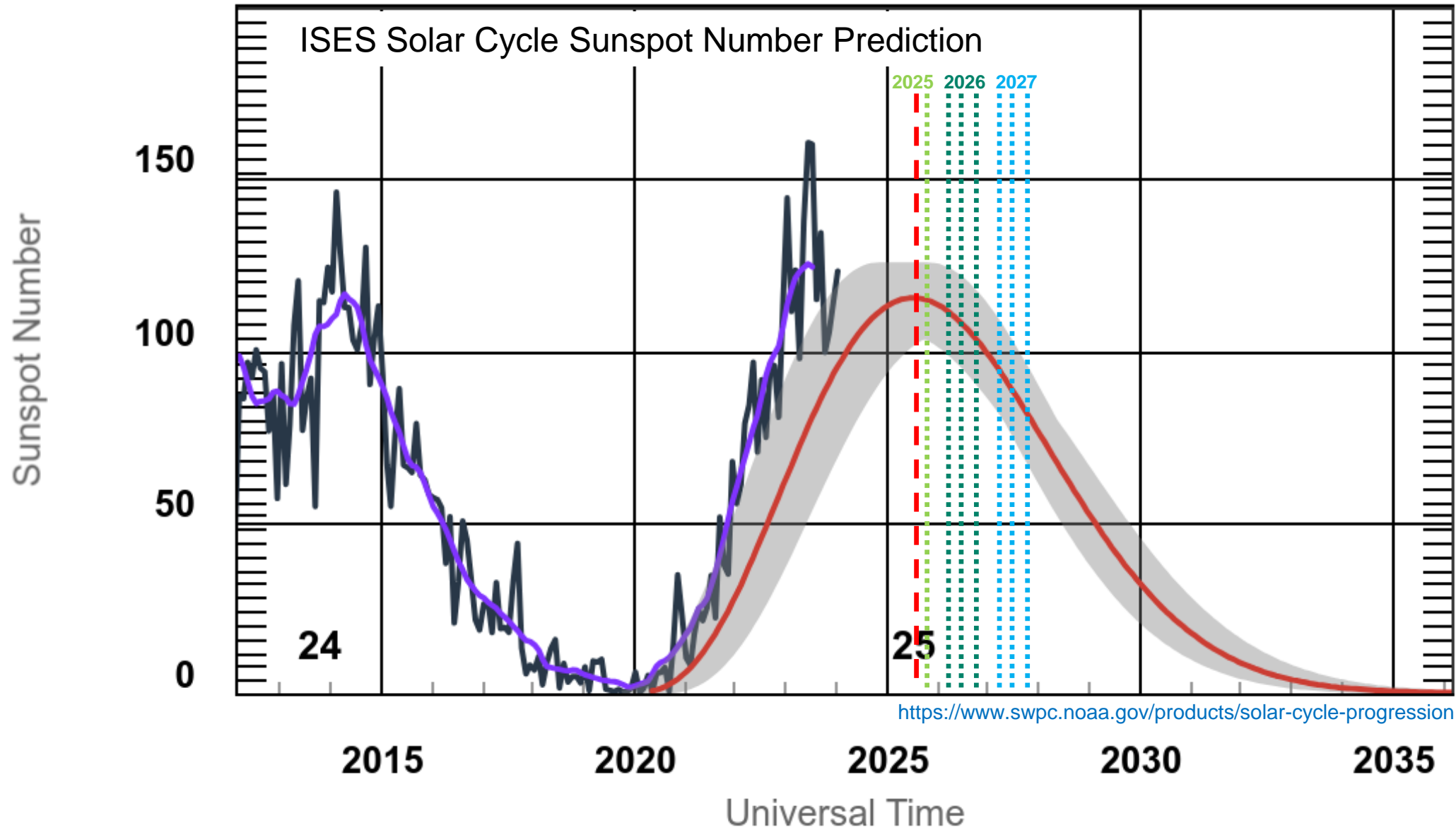
Predictions for Solar Cycle 25



Predicted Solar Max in Cycle 25



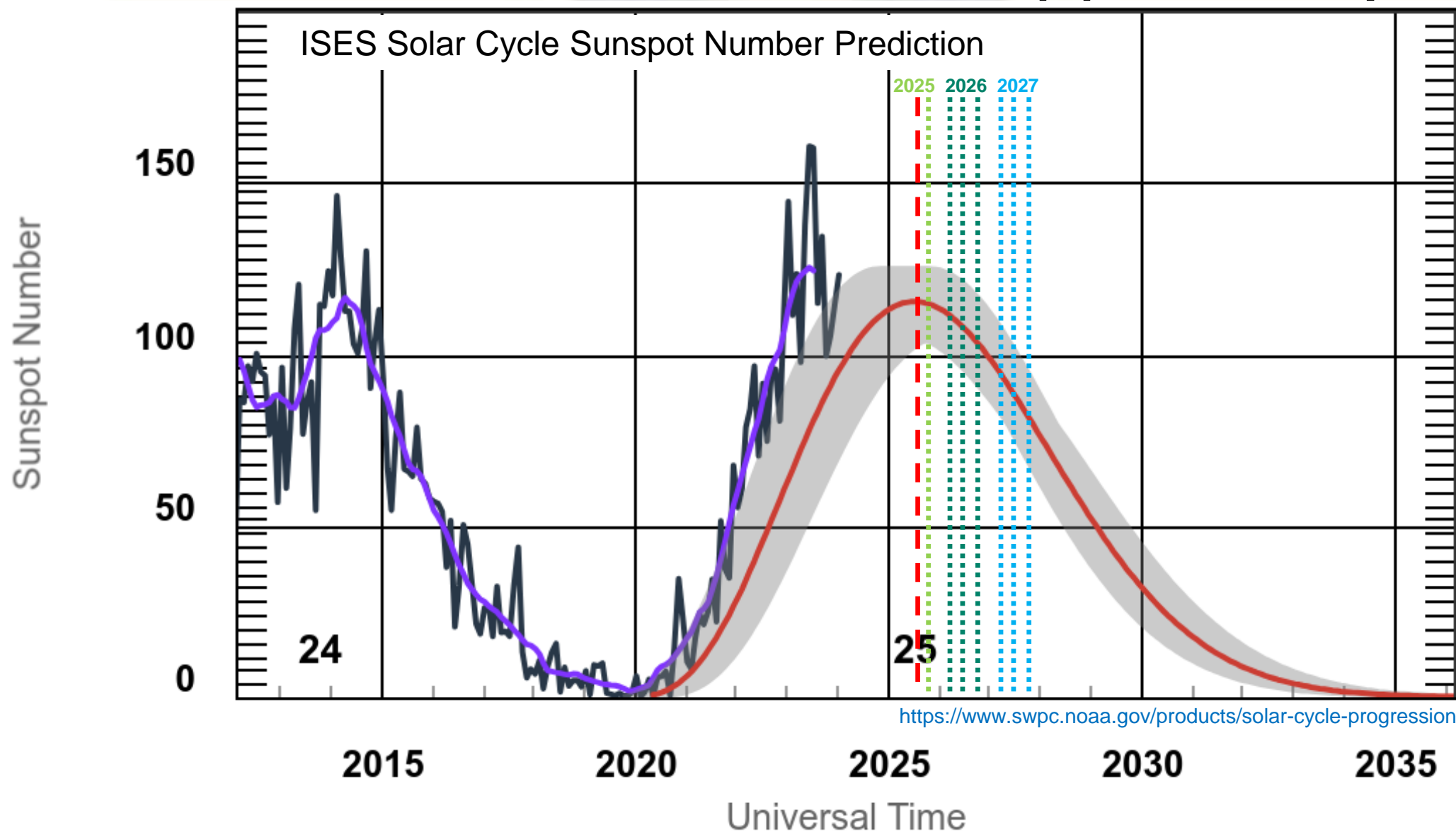
RADICALS Launch Opportunities for Cycle 25



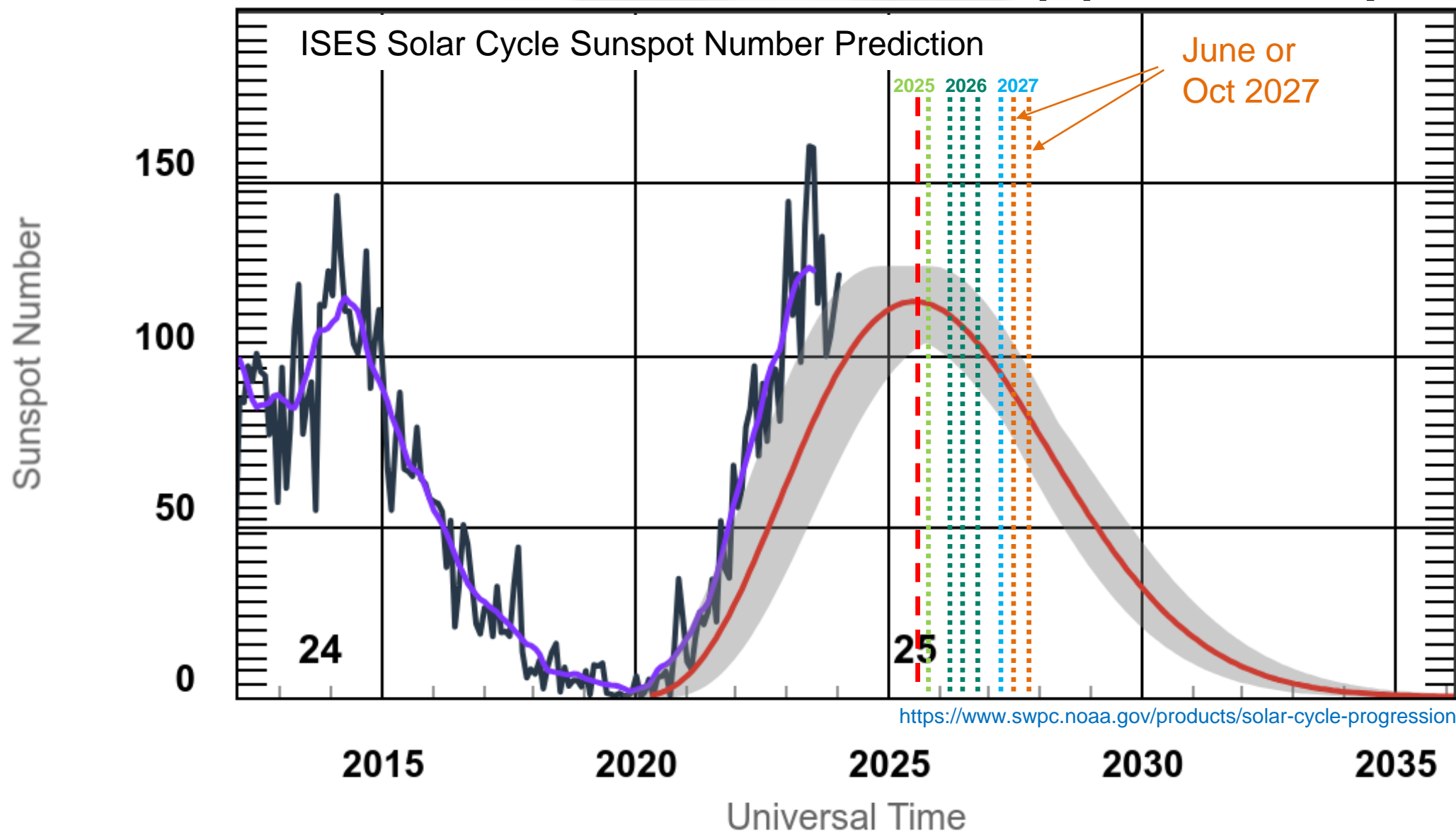
High-level Mission Schedule

		SRR	PDR	CDR	PSR	Bus Complete	LRR	Launch		
	Pre-Phase-A (SFL)	Phase A	Phase B	Phase C	Phase D	Instruments to AI&T	S/C AI&T	S/C Delivery & Integration	Phase E LEOP & Commissioning	Routine Ops
Start Date	01-Apr-22	30-Jun-23	8-Feb-24	01-Sep-24	07-Jul-25	01-Jul-26	31-Aug-2026	27-Apr-2027	01-Jun-27	L+2 mo.
End Date	30-Jun-23	8-Feb-24	31-Aug-24	06-Jul-25	31-Jun-26	30-Aug-26	27-Apr-2027	1-Jun-2027	30-Oct-27	L+26 mo.
Fiscal Years (CSA)	2022-23	2023	2024	2024-25	2025-26	2026	2026-27	2027	2027	2027-29
Project Year (CFI)	0-1	1	2	2-3	3-4	4	4-5	5	5	5-7

RADICALS Earliest Launch Opportunity



RADICALS Earliest Launch Opportunity



RADICALS Concept of Operations

