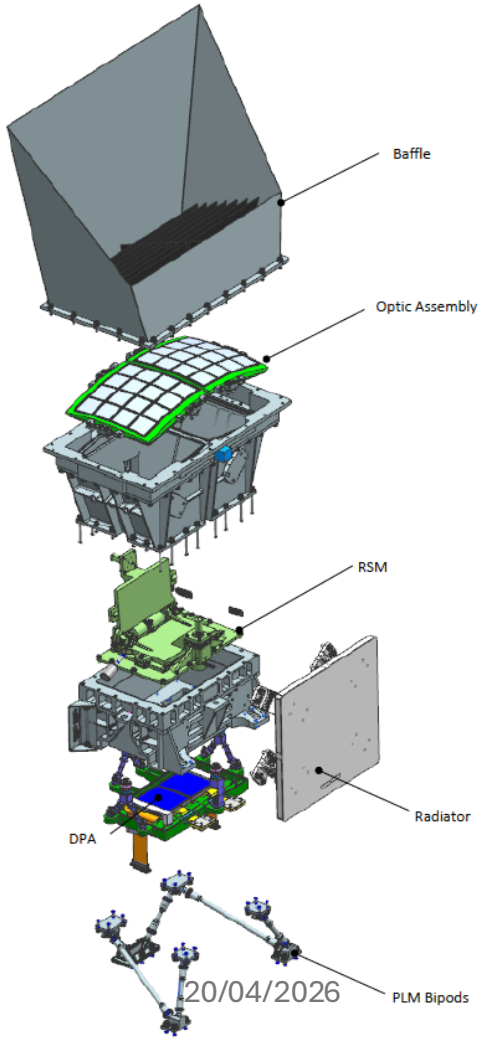
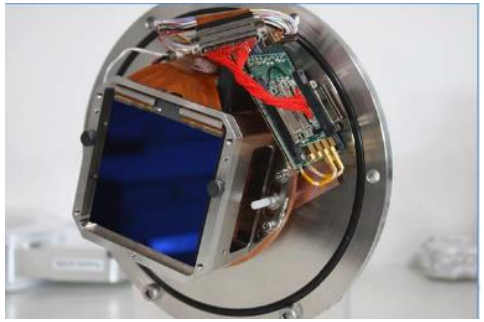
SMILE (Solar wind Magnetosphere Ionosphere Link Explorer) SXI (Soft X-ray Imager)

SMILE: Joint ESA/CAS Science Mission. Launch May/June (TBC) 2026

SXI: UK led, University of Leicester (PI), MSSL/UCL and Open University with international consortium

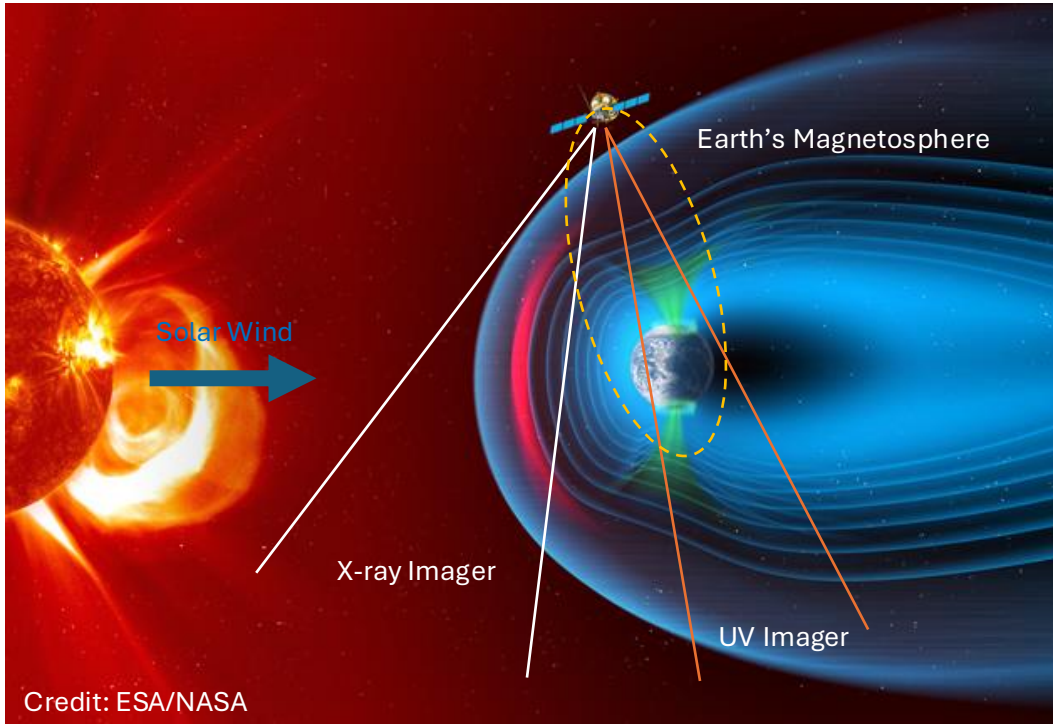


Key SXI Technologies:



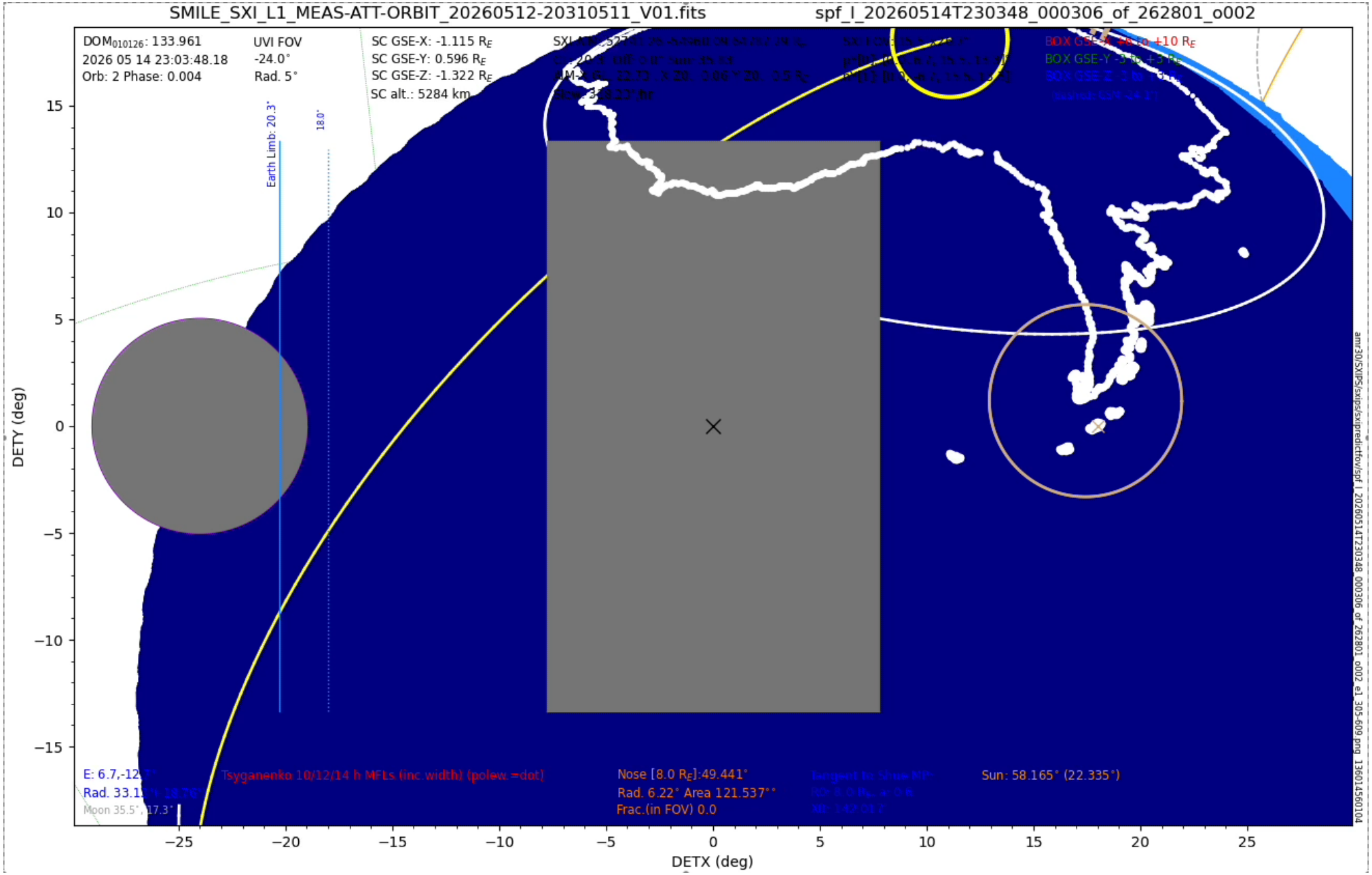
Large Area CCDs (Te2V UK)

Micropore Optics



SXI will track the movement of the magnetosphere boundary by global imaging of the X-ray emission produced by the Solar Wind Charge Exchange process

Andy Read's
SXI Orbit and
Visibility Simulator

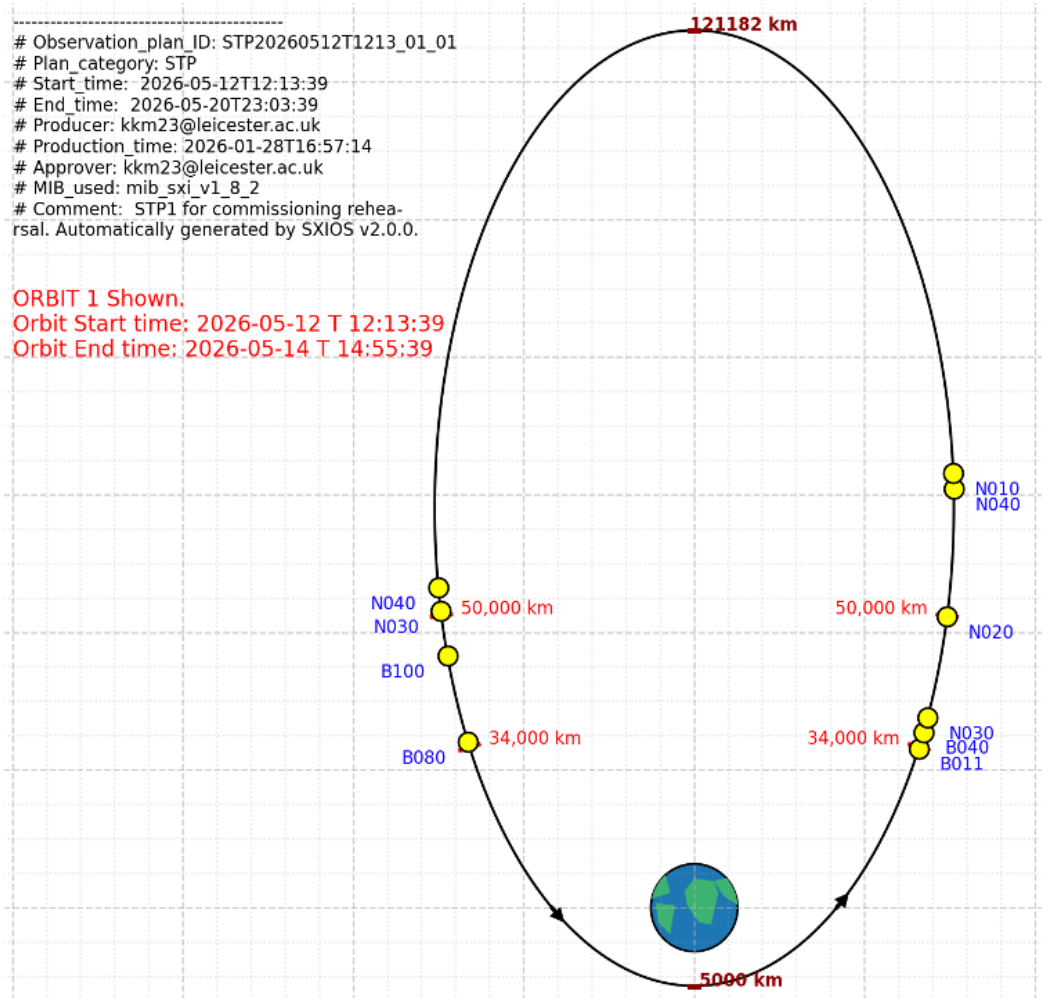


SXI Operations Plan

Typical in-Orbit Routine Operations

Orbit Duration ~50.5 Hours
SXI Science Window ~42 Hours
VEGA-C Launcher from Kourou
Data download on perigee passage

Altitude (km)	S/C Mode	SXI Mode
<34,000	RSM3	OFF
34,000 – 40,000	RSM2	STANDBY (Warm CCDs)
40,000 – 50,000	RSM2	PRESCIENCE (Drain)
50,000	FSM	DOOR OPENING
50,000 – 60,000	FSM	EUV Mode (Secondary)
60,000 – 120,000	FSM	ED Mode (Primary)
121,000 – 50,000	FSM	ED Mode (Primary)
50,000	FSM	DOOR CLOSING
50,000 – 34,000	RSM2	DIAGNOSTICS
<34,000	RSM3	OFF



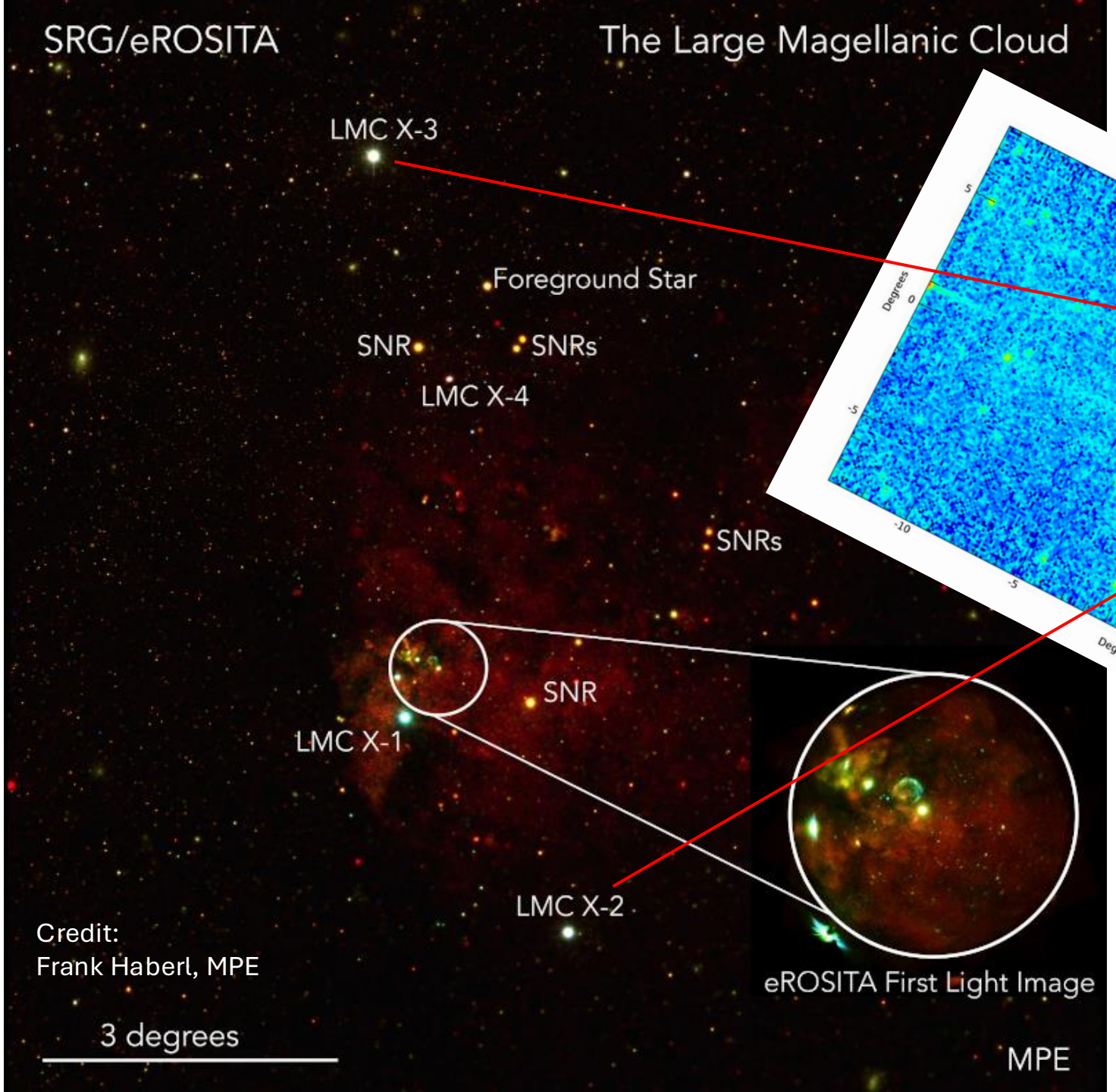
RSM3 = Reduced Science Mode 3 (Sun-pointing)
RSM2 = Reduced Science Mode 2 (UVI pointing)
FSM = Full Science Mode (SXI pointing)

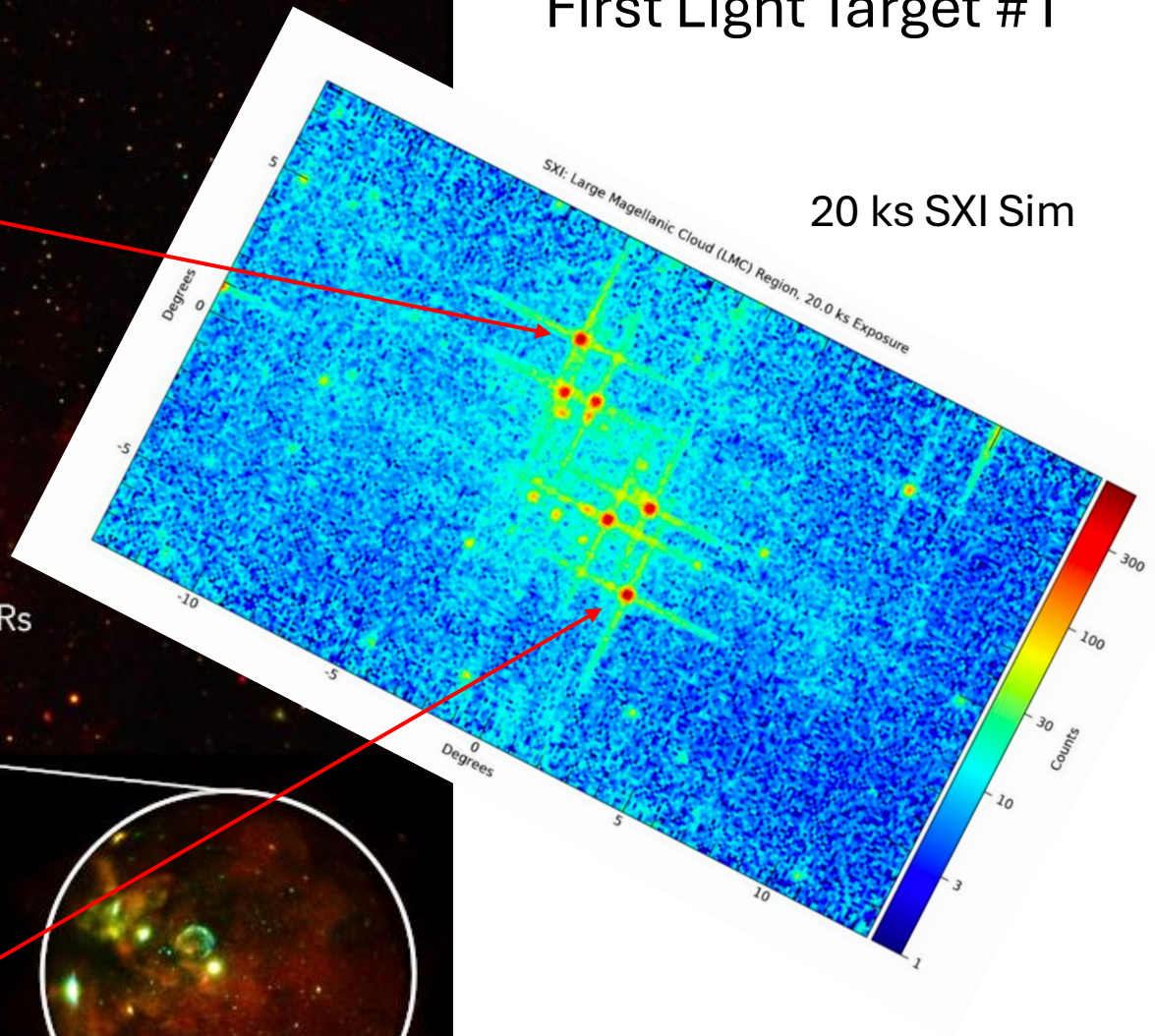
SXI Commissioning Plan

Subsystem	Orbit #	Procedure(s)	Command Method
…			
SXI	2 (Date?)	4a – Power-on and aliveness checkout 4b – HDRM release & RSM verification 4c – Redundant functional checkout 4e – CCD dark imaging & diagnostics (no TP)	RT RT RT RT + STP
	4	4f – First Light (inc. SS)	RT + STP
UVI LIA	6 – 8	Passive observations (e.g. TP)	STP
SXI	9	4g – Calibration (inc. SS)	STP
	10	4g – Calibration (inc. SS)	STP
	11	4g – Calibration following GL	STP
	12	4g – Calibration following GL	STP
SXI	13+	Routine Observations	STP
…			

SS = Star-staring, GL = Guidance Law pointing, TP = Trap-pumping, RT = Real-time, STP = Short Term Plan

First Light Target #1



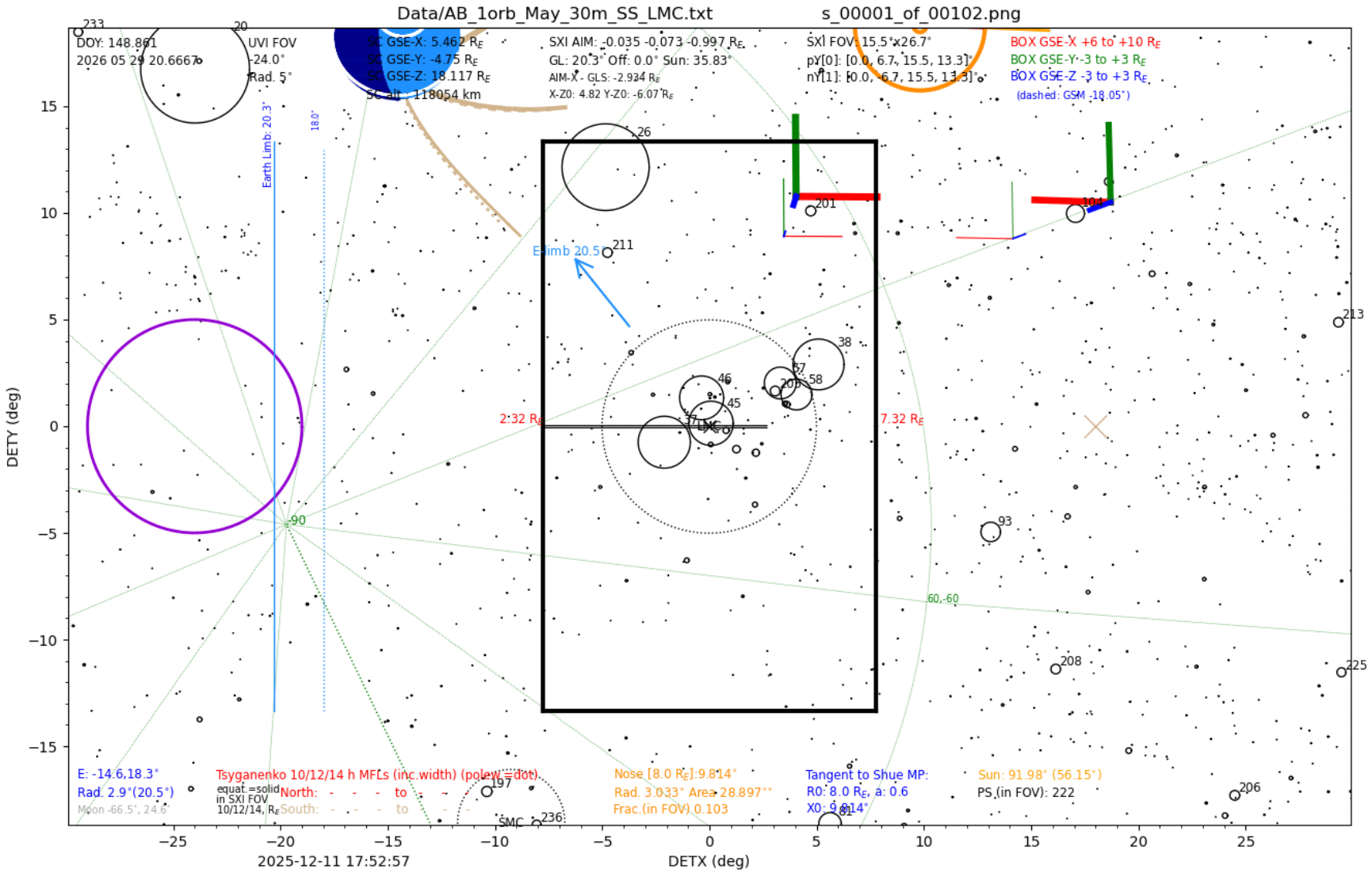


20 ks SXI Sim

Actual Planned SXI Exposure ~46 ks

SXI First Light - LMC – Star Staring

Target will not be observed when Earth is near SXI FOV

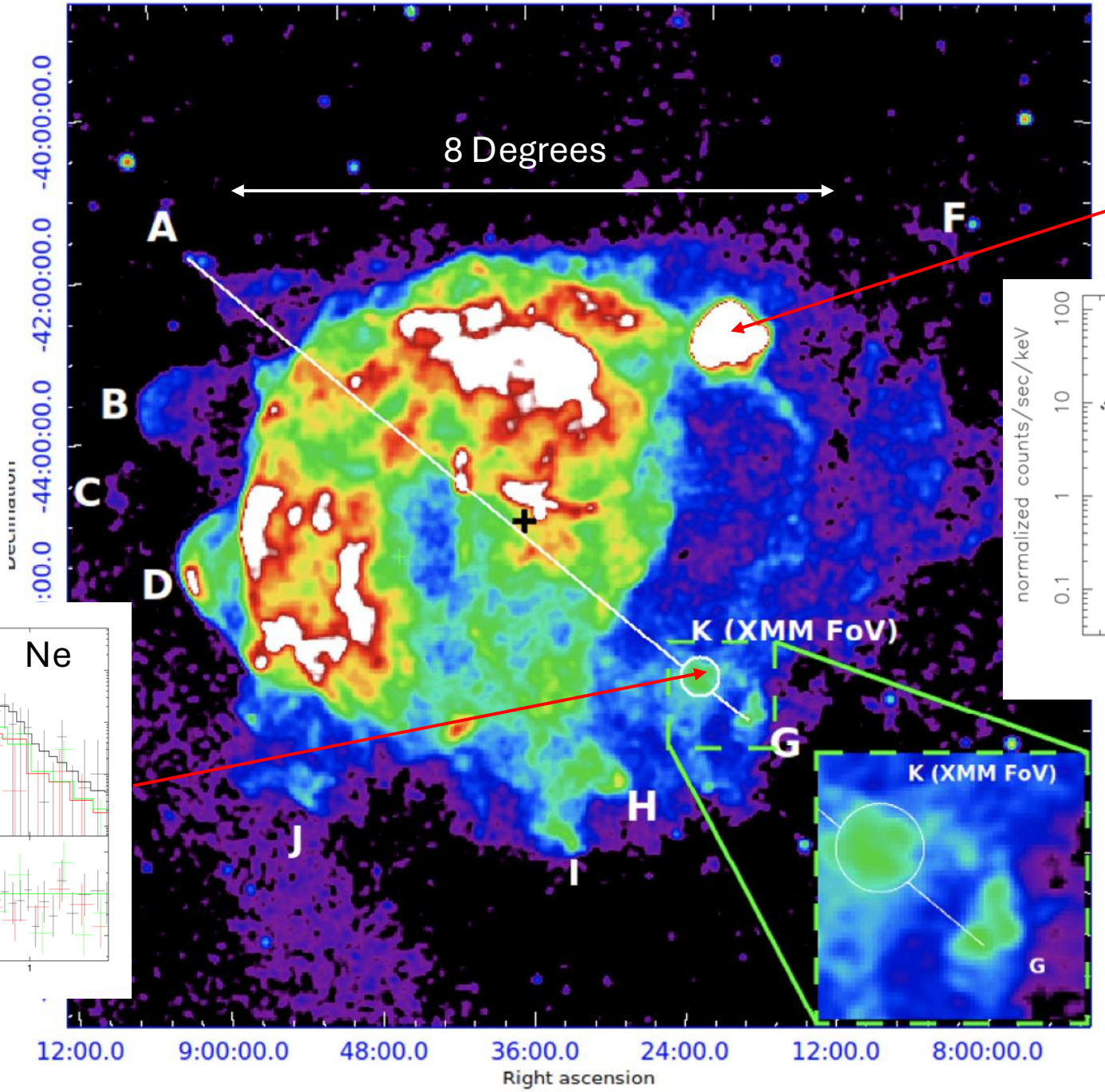


First Light Target #2

Vela SNR

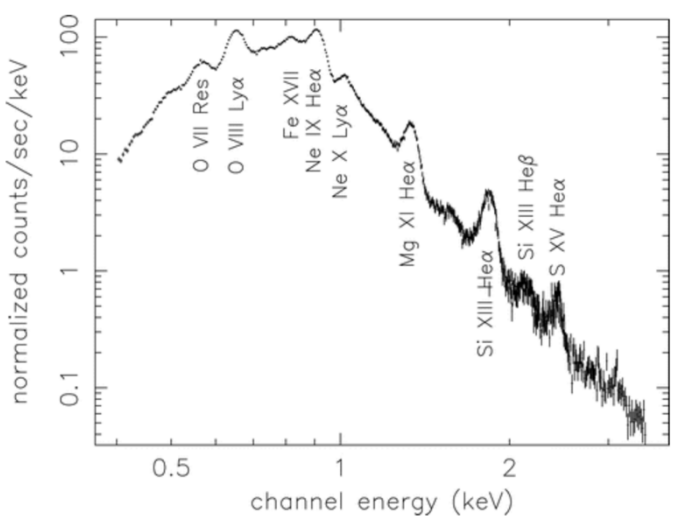
ROSAT 0.1-2.4 keV

Sapienza et al.
A&A, **649**, 2021



Puppis-A SNR

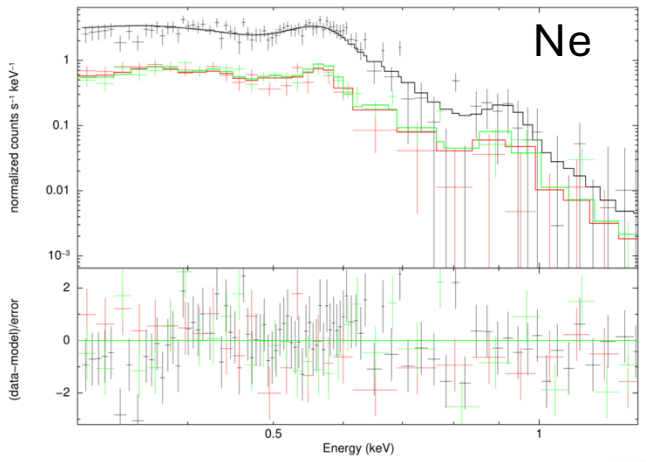
4 times further distant than Vela



Hwang et al.
ApJ, **676,** 2008

O

Ne



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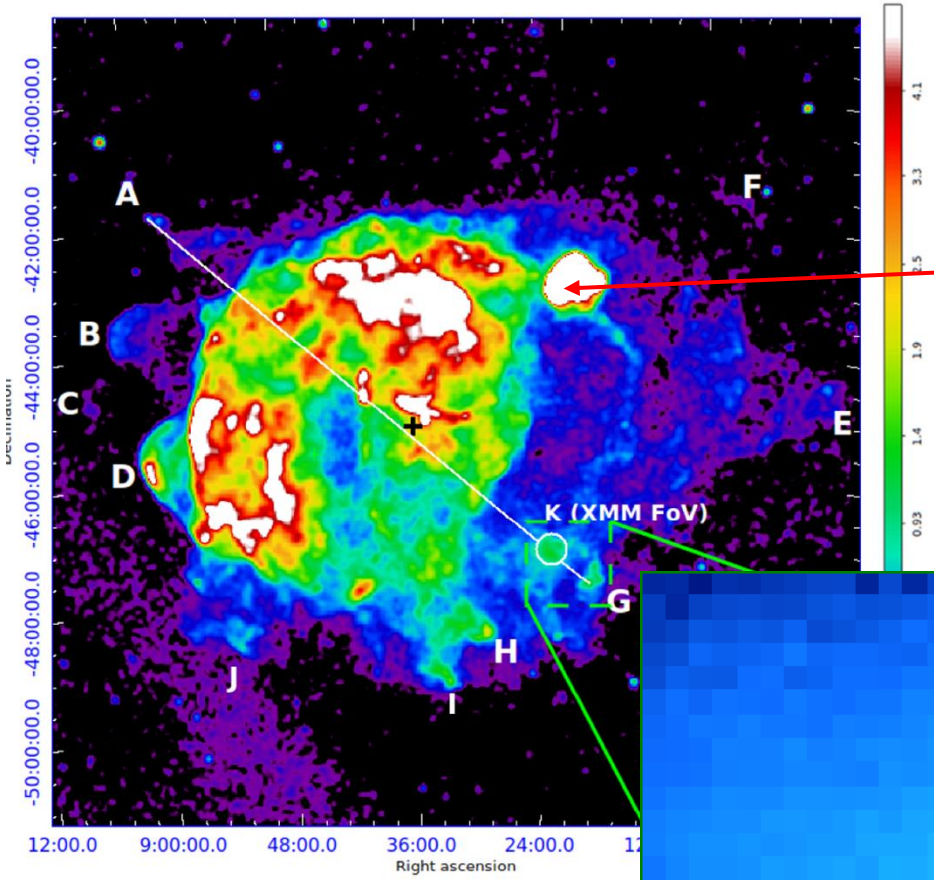

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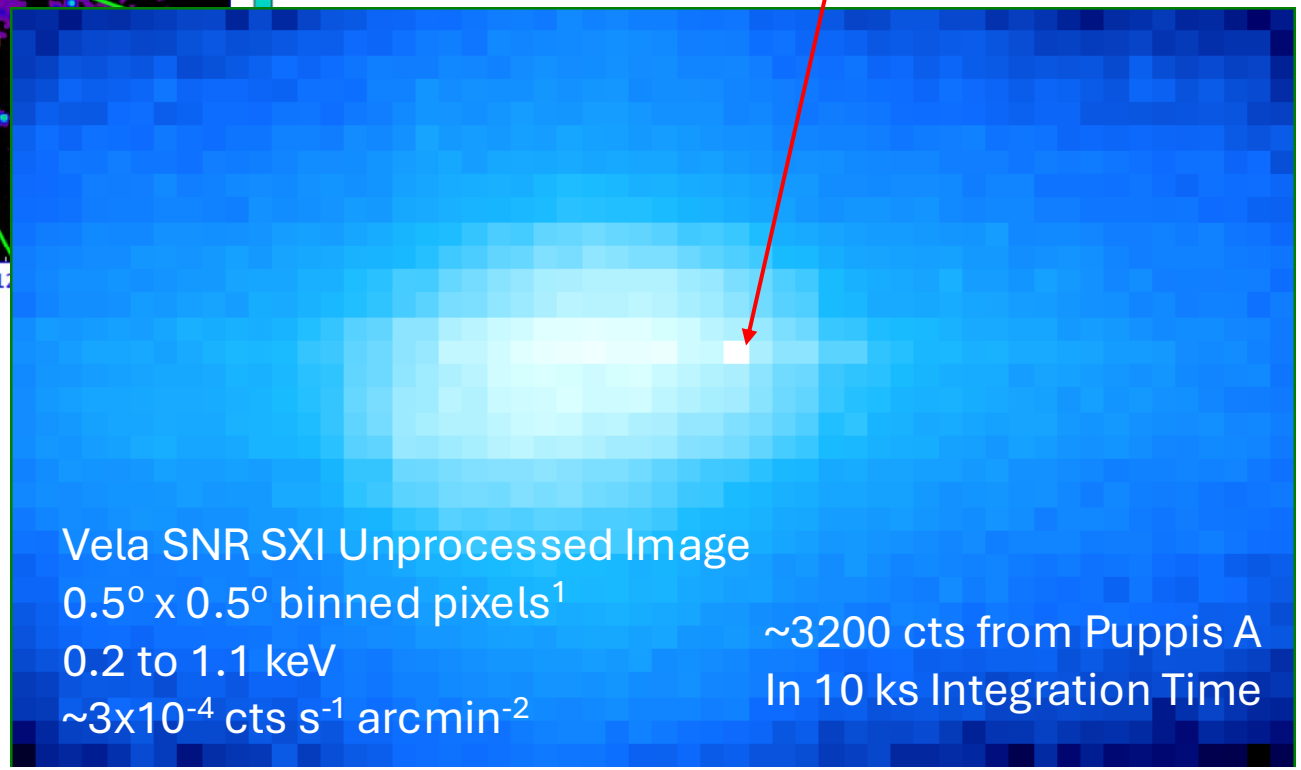
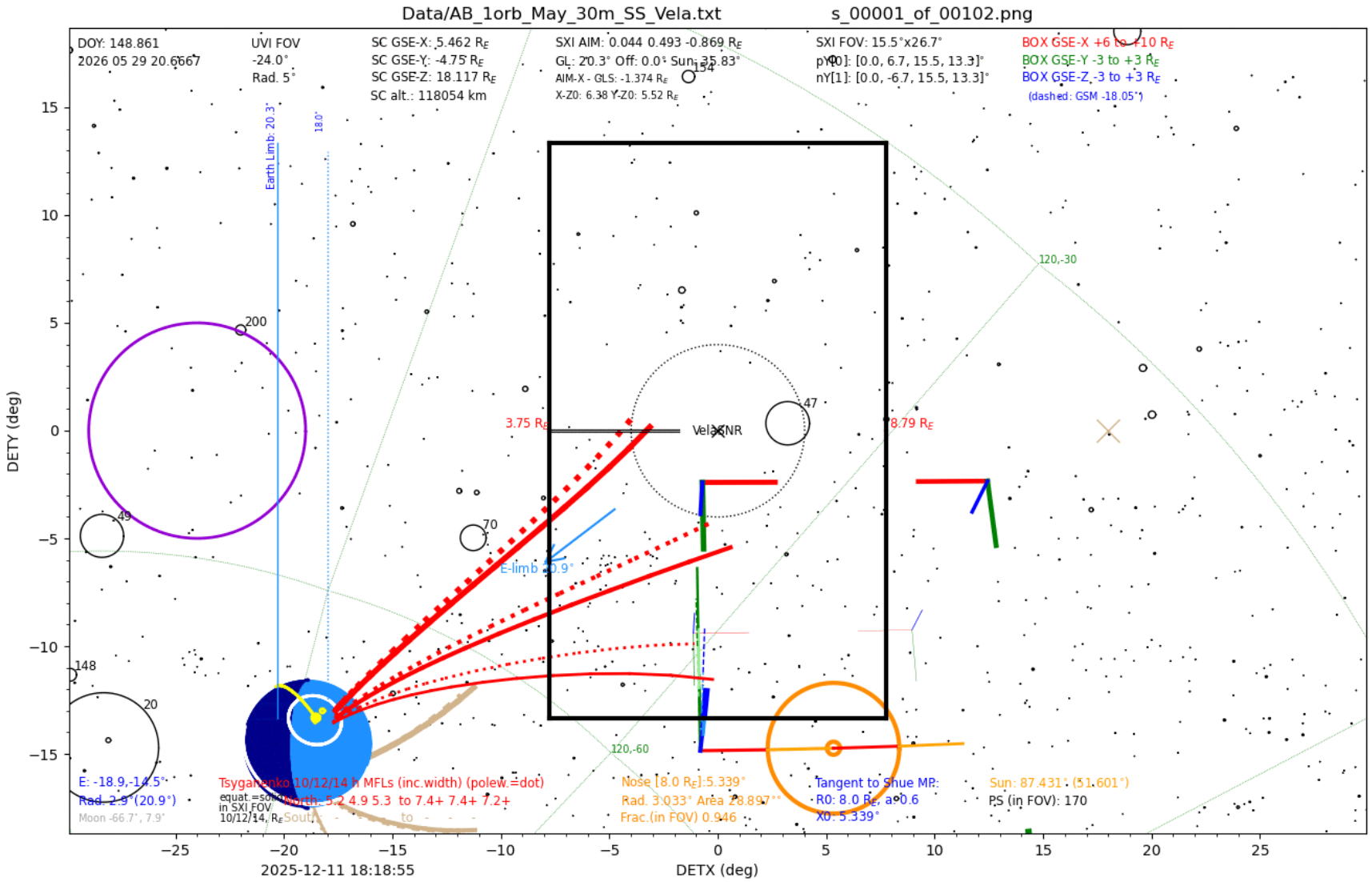


Actual Planned SXI Exposure ~46 ks

[1]Native CCD pixel in ED mode is ~0.02°

SXI First Light – Vela SNR – Star Staring



Commissioning Calibration Targets in ”Star-Stare Mode” (Dates to be revised)

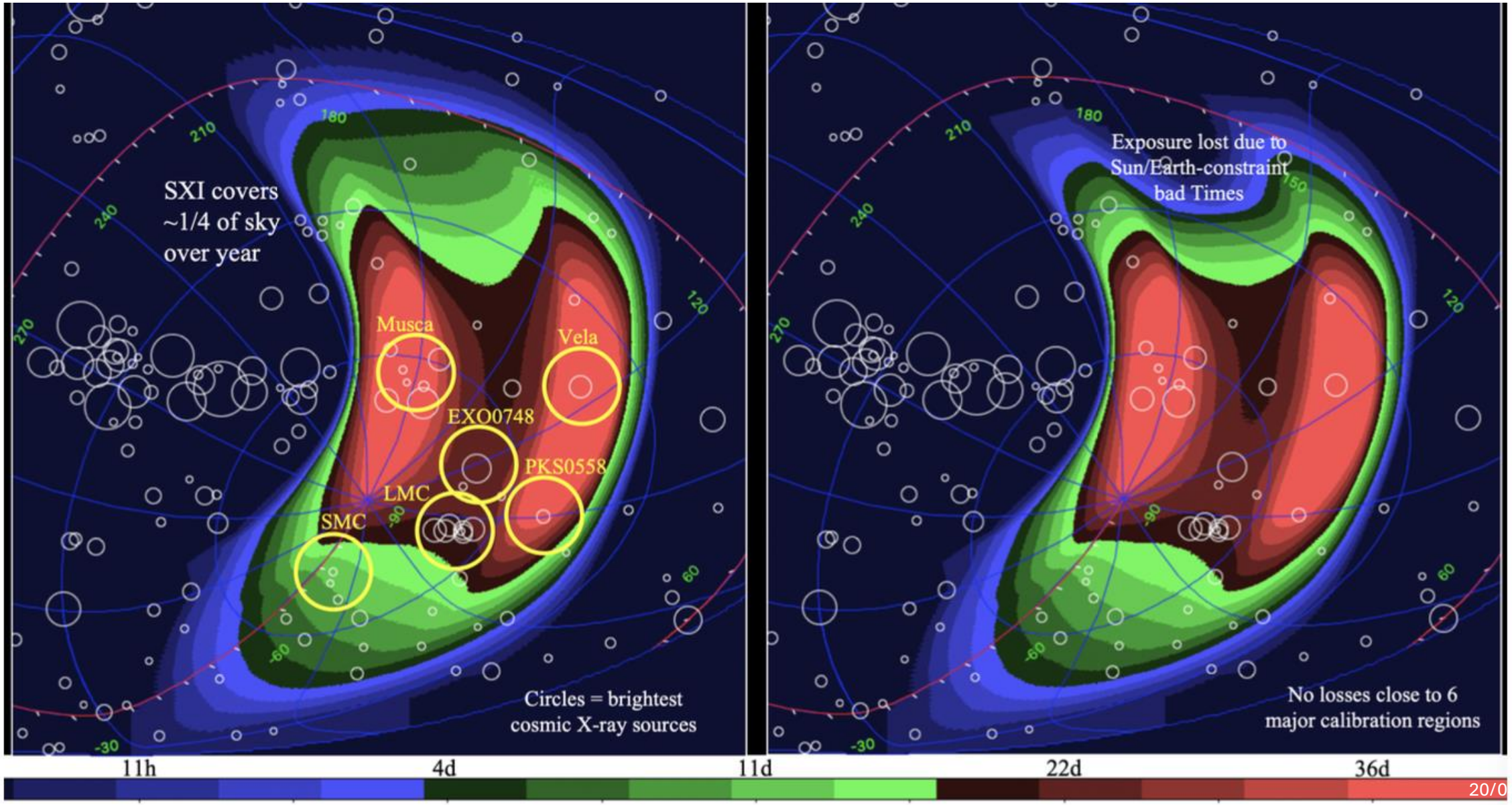
Orbit N

START_TIME	END_TIME	ID	RA	DEC	MODE
2026-06-28T12:16:48Z	2026-06-28T21:00:48Z	CenA_off	205.5	-39.5	STAR-STARE
2026-06-28T21:16:48Z	2026-06-29T06:30:48Z	Vela_offNY	135.0	-39.5	STAR-STARE
2026-06-29T06:46:48Z	2026-06-29T16:00:48Z	Vela_offPY	120.0	-46.5	STAR-STARE
2026-06-29T16:16:48Z	2026-06-29T23:00:48Z	SMC_off	17.5	-67.0	STAR-STARE
2026-06-29T23:16:48Z	2026-06-30T04:00:48Z	LMC_off	68.0	-66.0	STAR-STARE
2026-06-30T04:16:48Z	2026-06-30T06:30:48Z	LMC_EXO0748	99.2	-68.7	STAR-STARE

Orbit N+1

START_TIME	END_TIME	ID	RA	DEC	MODE
2026-06-30T14:56:48Z	2026-06-30T22:40:48Z	BRCir_off	230.0	-53.0	STAR-STARE
2026-06-30T22:56:48Z	2026-07-01T04:40:48Z	VVPup_off	132.0	-15.0	STAR-STARE
2026-07-01T04:56:48Z	2026-07-01T09:10:48Z	PKS0558_off1	84.25	-45.25	STAR-STARE
2026-07-01T09:26:48Z	2026-07-01T13:40:48Z	PKS0558_off2	78.25	-45.25	STAR-STARE
2026-07-01T13:56:48Z	2026-07-01T20:40:48Z	PKS2155_off	330.0	-28.0	STAR-STARE
2026-07-01T20:56:48Z	2026-07-02T01:40:48Z	SMC_off	17.5	-67.0	STAR-STARE
2026-07-02T01:56:48Z	2026-07-02T06:40:48Z	LMC_off	68.0	-66.0	STAR-STARE
2026-07-02T06:56:48Z	2026-07-02T09:10:48Z	LMC_EXO0748	99.2	-68.7	STAR-STARE

Total sky visibility over 1 year (Normal Operations). Other Parts of sky visible during UVI calibration pointings and slews to avoid sun constraint.



“Standard Candle” X-ray Sources used for Calibration: Compact SNRs

N132D
Good for Effective Area

In SXI fairly “point-like”

1ES0102-72
Good for Energy Scale

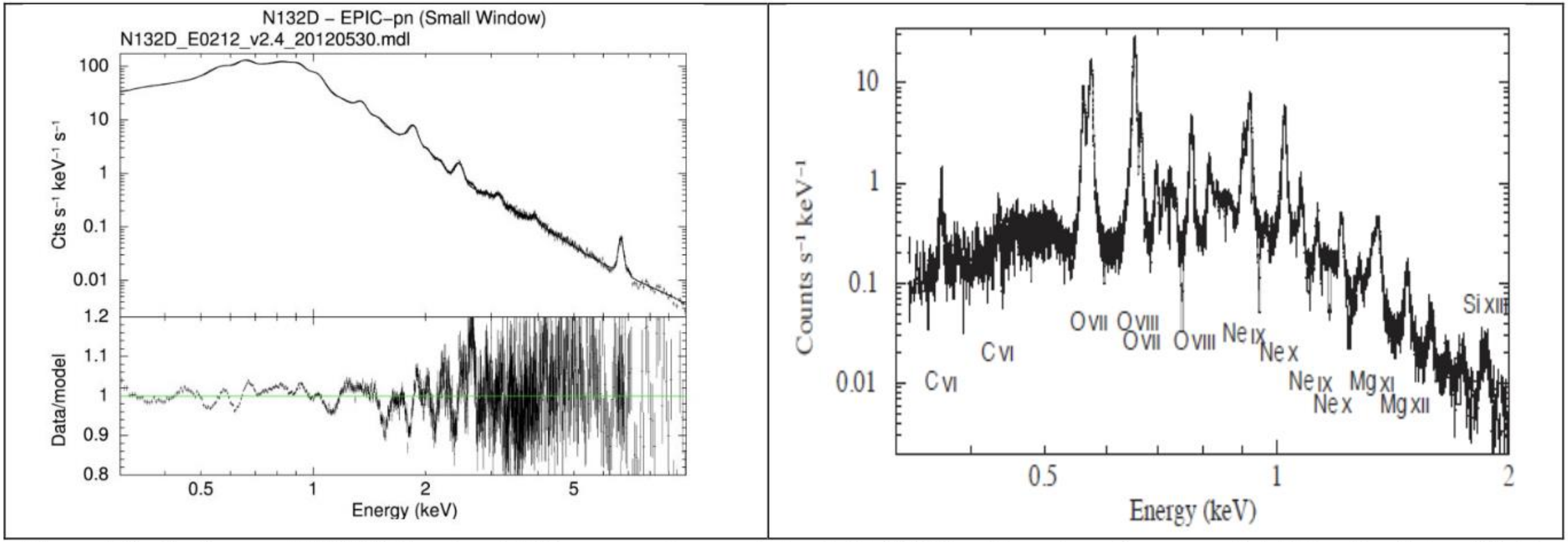


Figure 25: (Left panel) XMM-Newton EPIC-pn spectrum of the SNR N132D. Also showing a model fit to the data. (Right panel) High resolution XMM-Newton RGS spectrum of the SNR 1ES0102-72. (Source IACHEC)

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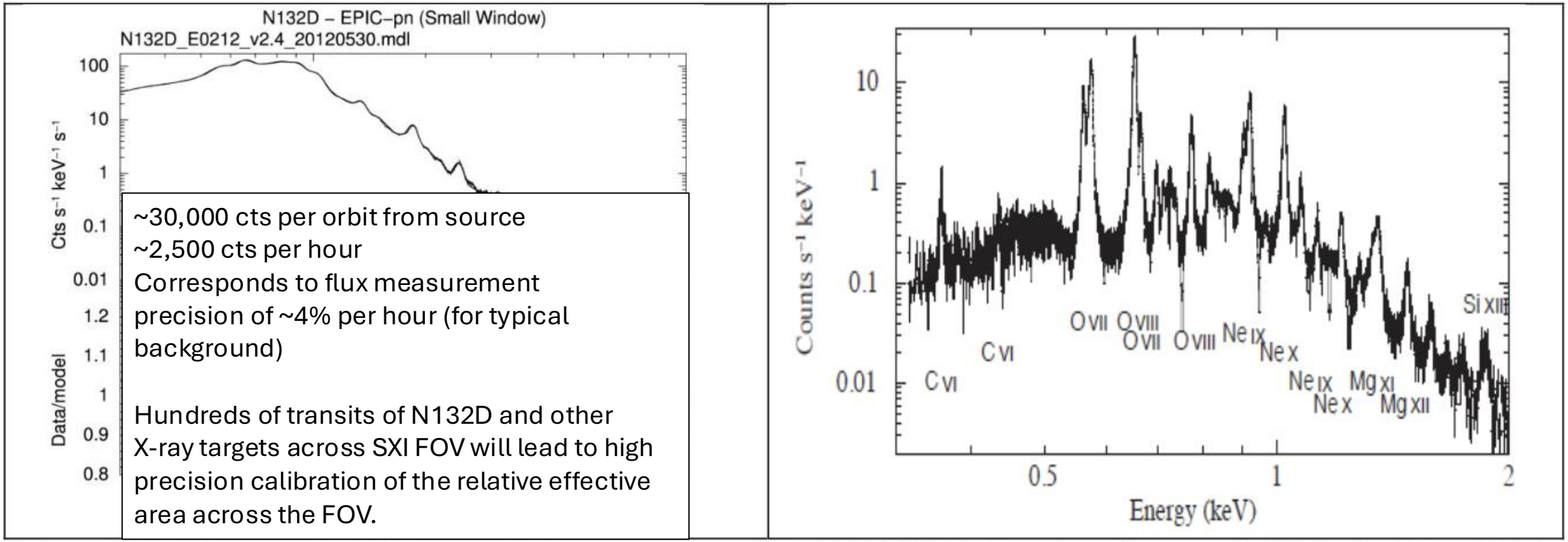

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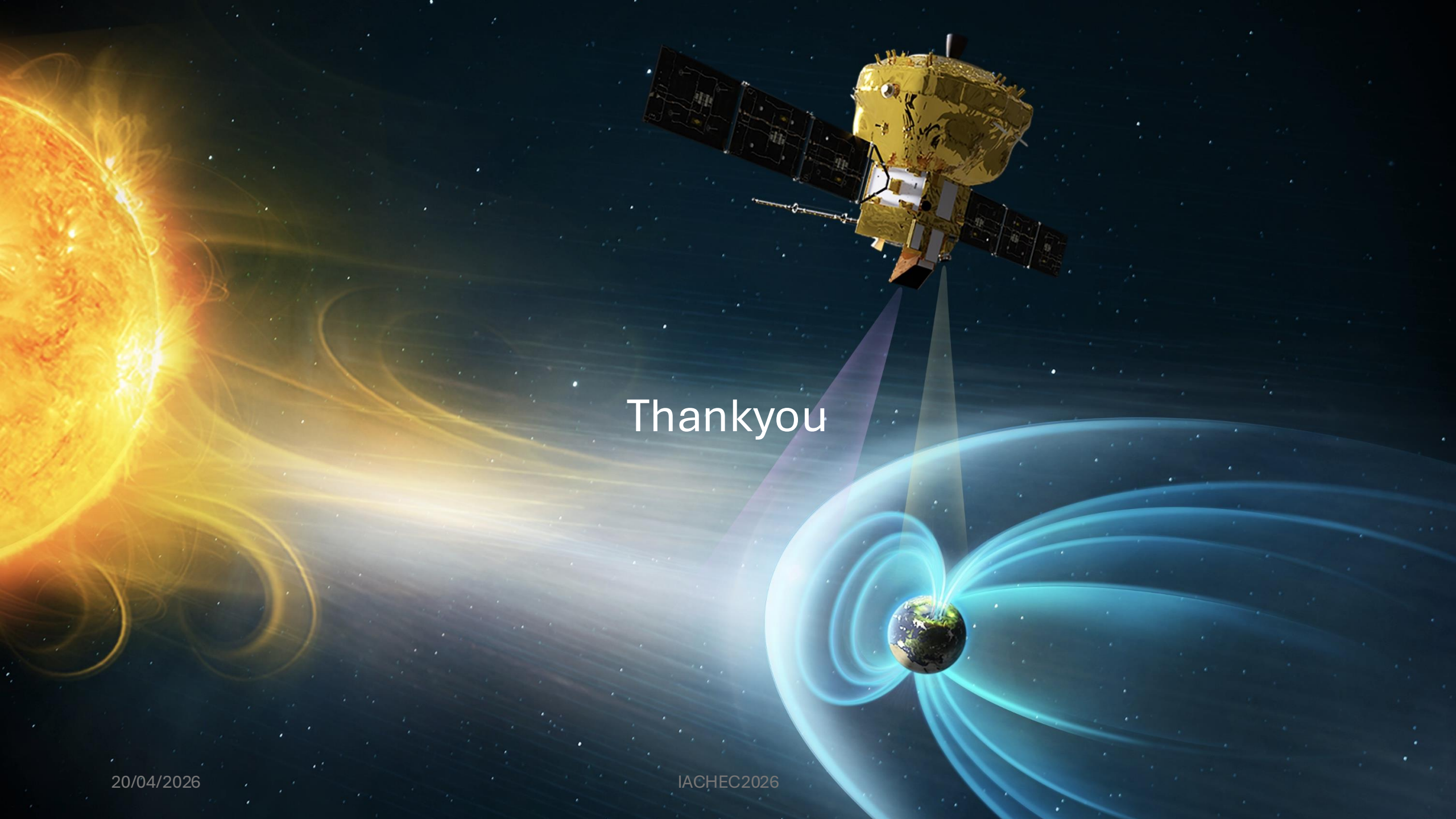
Thankyou