HV&LV

Szymon Gburek

Space Research Centre
Polish Academy of Sciences
SRC-PAS
Solar Physics Division
Poland
51-622 Wrocław, ul. Kopernika 11

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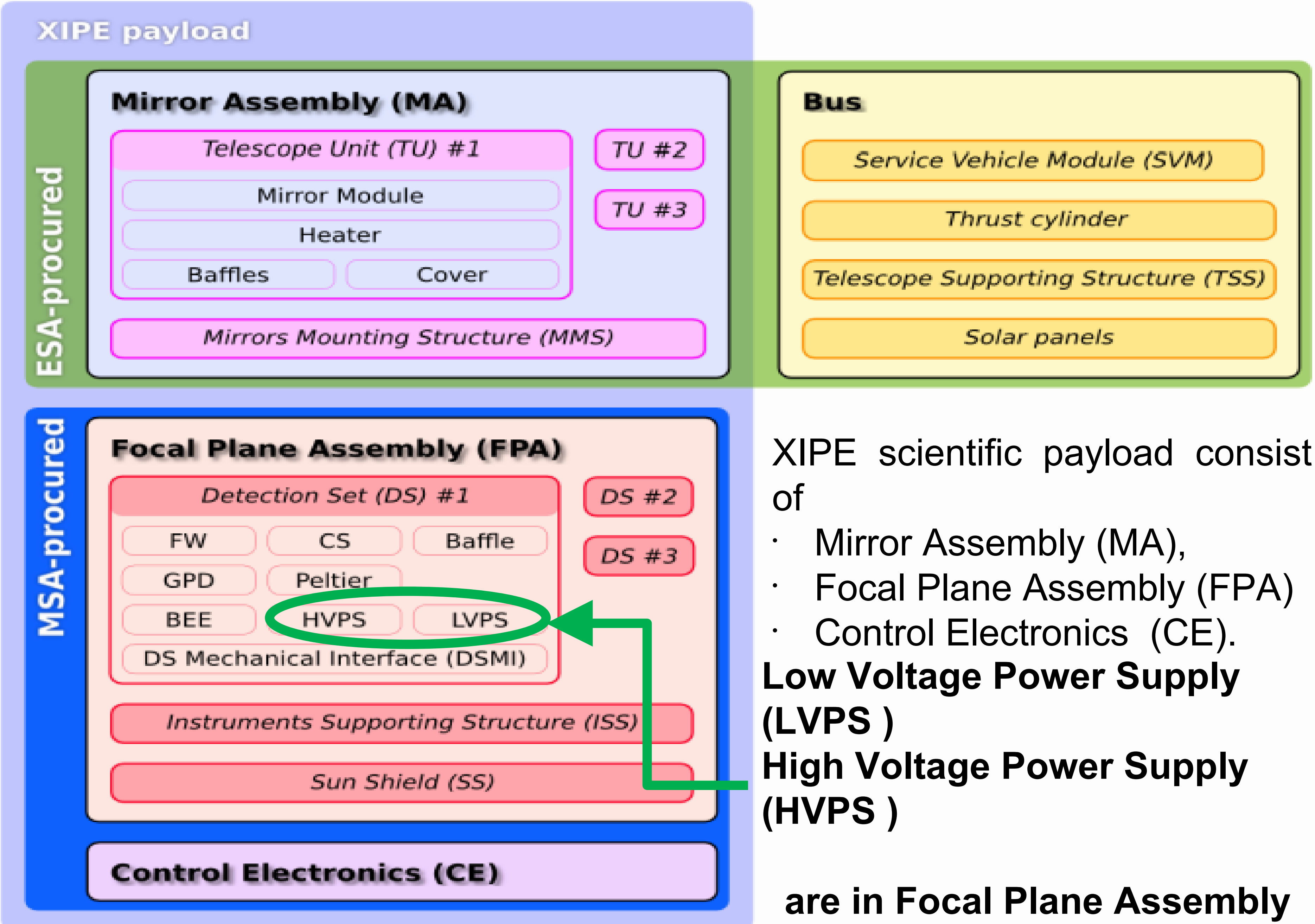


XIPE scientific payload consist of

- Mirror Assembly (MA),
- Focal Plane Assembly (FPA)
- Control Electronics (CE).

Low Voltage Power Supply (LVPS)

High Voltage Power Supply (HVPS)

are in Focal Plane Assembly in Detection Sets

Figure 12 Block diagram of the XIPE scientific payload.

There are three Detection Sets

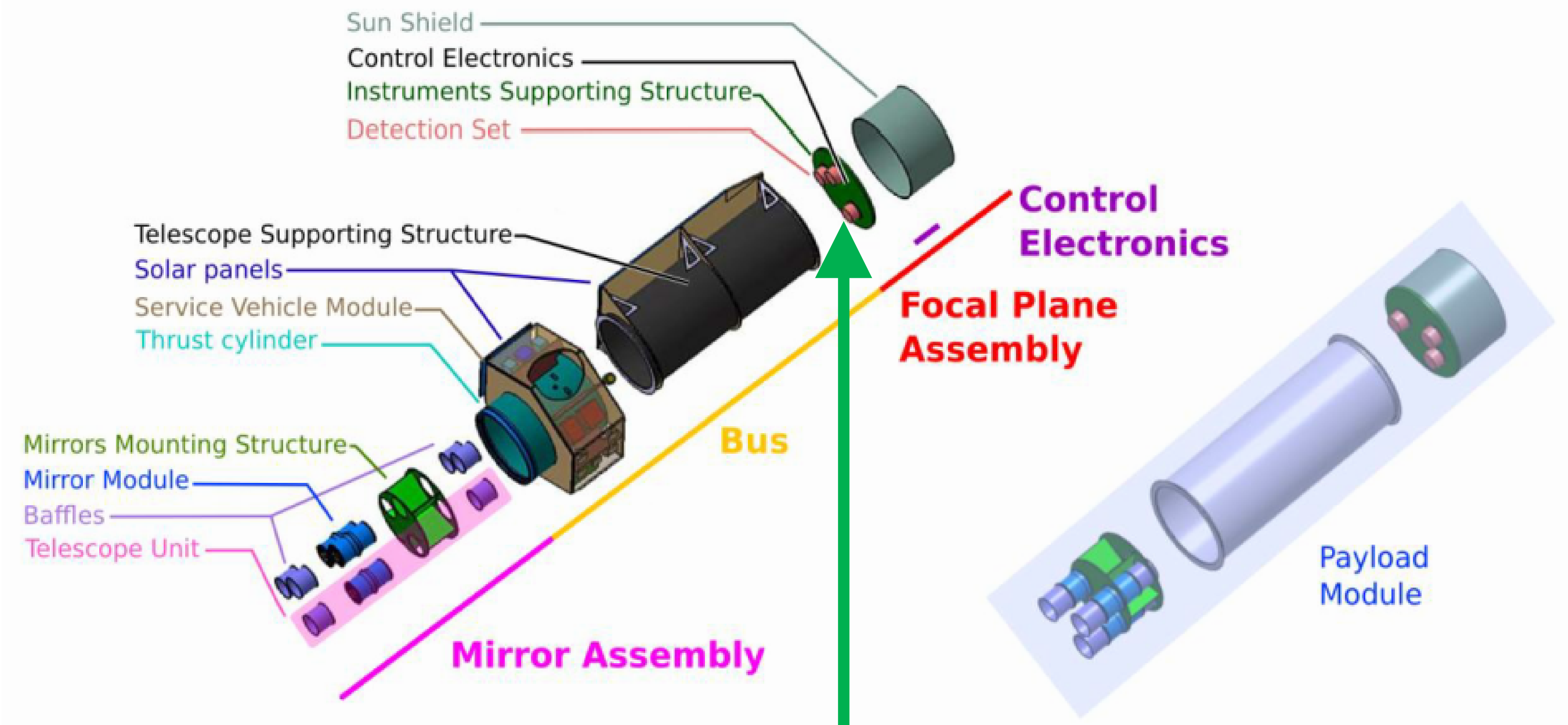


Figure 13 Main components of the XIPE spacecraft (payload+bus). The Payload Module (PM) comprises the MA, the FPA and the TSS.

Located in front portion of Focal Plane Assembly

The DS is organized in two boxes, one for the detector and the FW and one for the BEE,

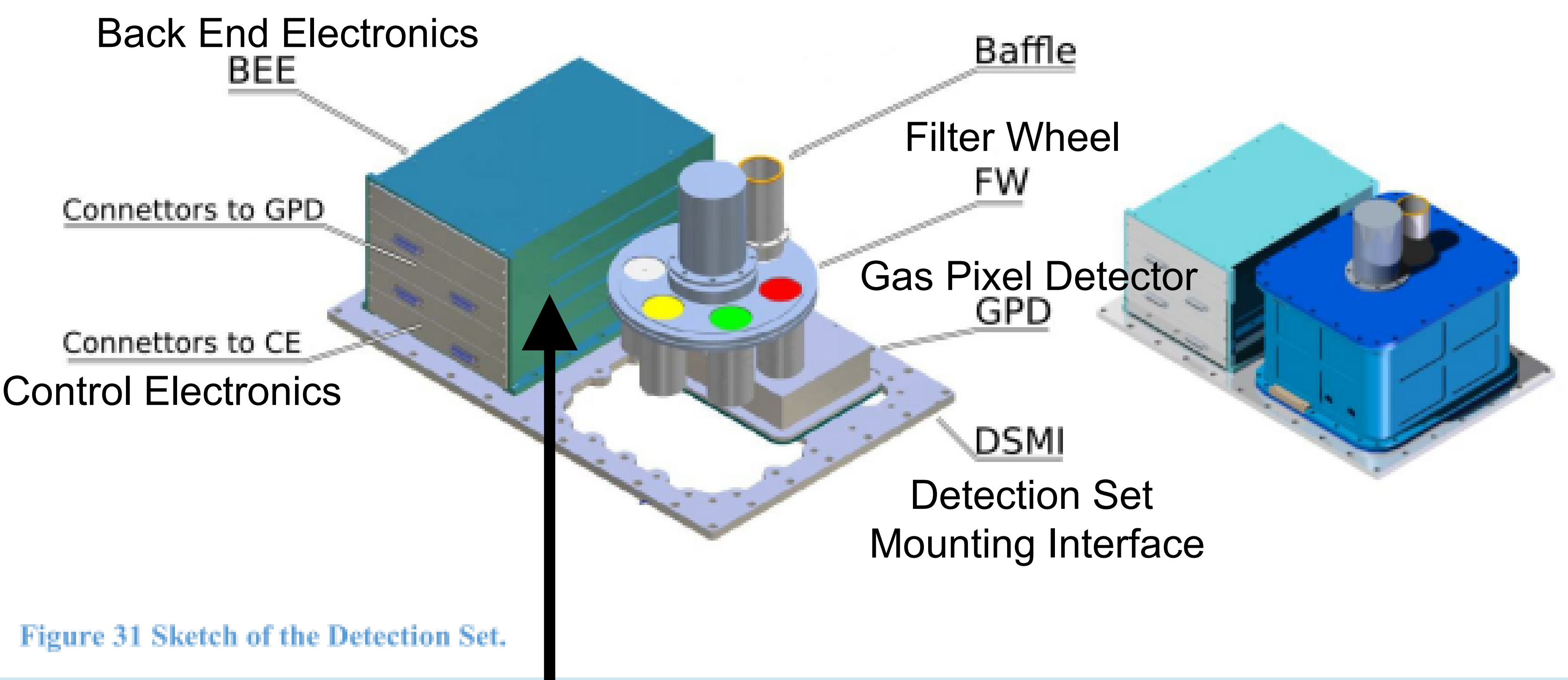
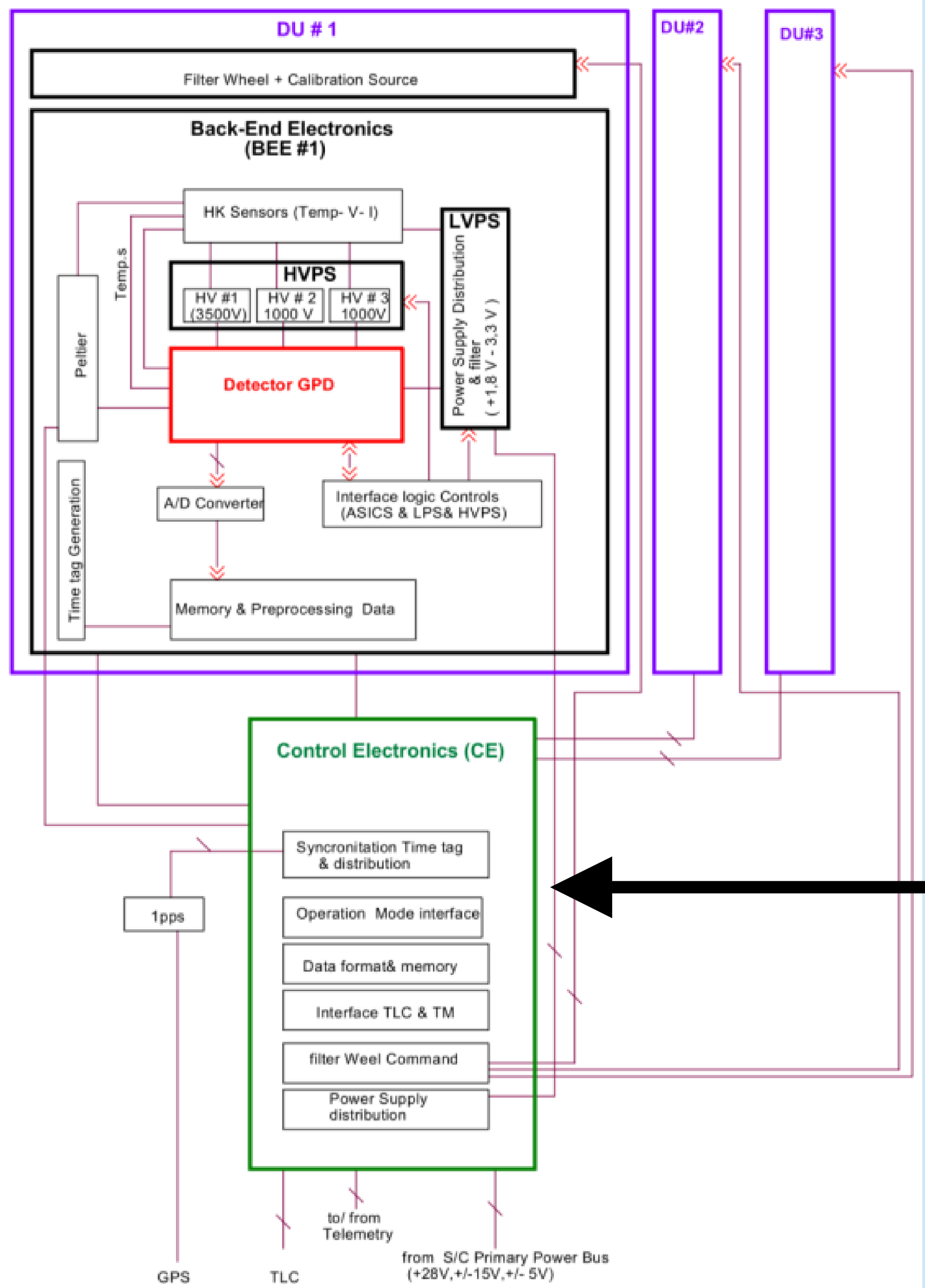


Figure 31 Sketch of the Detection Set.

HVPS & LVPS in Back End Electronics box

The BEE will comprise 4 electronic boards dedicated to:

- distribute and filter the Low Voltage required for the ASIC operation;
- generate and filter the High Voltage required for the detector operation.
- many others functions (XIPE proposal p. 29)



LVPS will receive input power from **Control Electronics** Power Supply Distribution Section

High voltages need to be generated from low voltage DC/DC converters

LVPS requirements

Voltages: 3.3 V and 1.8 V

Power: ~ 1 W

Purpose:

power the ASIC of each Gas Pixel Detector

Q: Voltage stability/noise level?

Q: Protections? Overload? Overvoltage/current?

Q: Redundancy or one unit only?

HVPS requirements

Voltages:

V_{drift} -2 ÷ -3.5 kV

$V_{Top\ GEM}$ -0.5 ÷ -1 kV

$V_{bottom\ GEM}$ -0.1÷ -0.5 kV

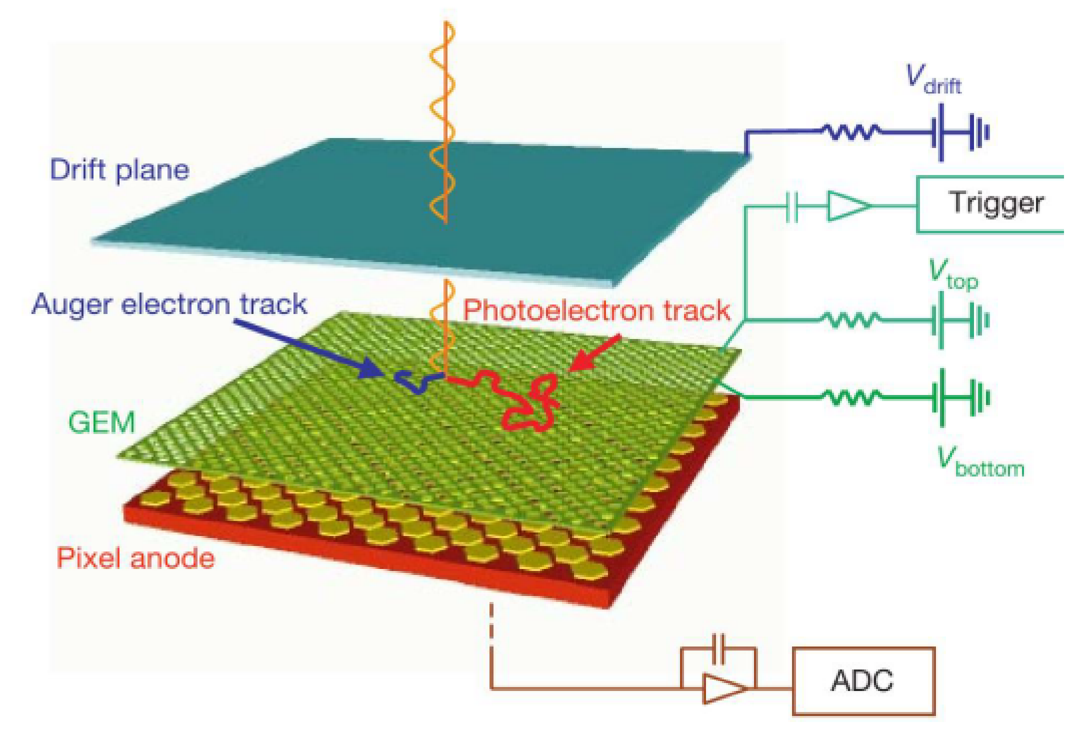


Figure 17 Principle of operation of the GPD (Costa et al. 2001).

Power: <<1 W (current driven by the by High Voltage are much below 1 μA)

Purpose: power Gas Pixel Detectors.

GPD requires three high voltages in the range 0÷-3.5 kV.

The voltage values will be programmable with a 10 bit DAC.

HVPS questions

Basically the same as for LVPS

Q: Voltage stability/noise level?

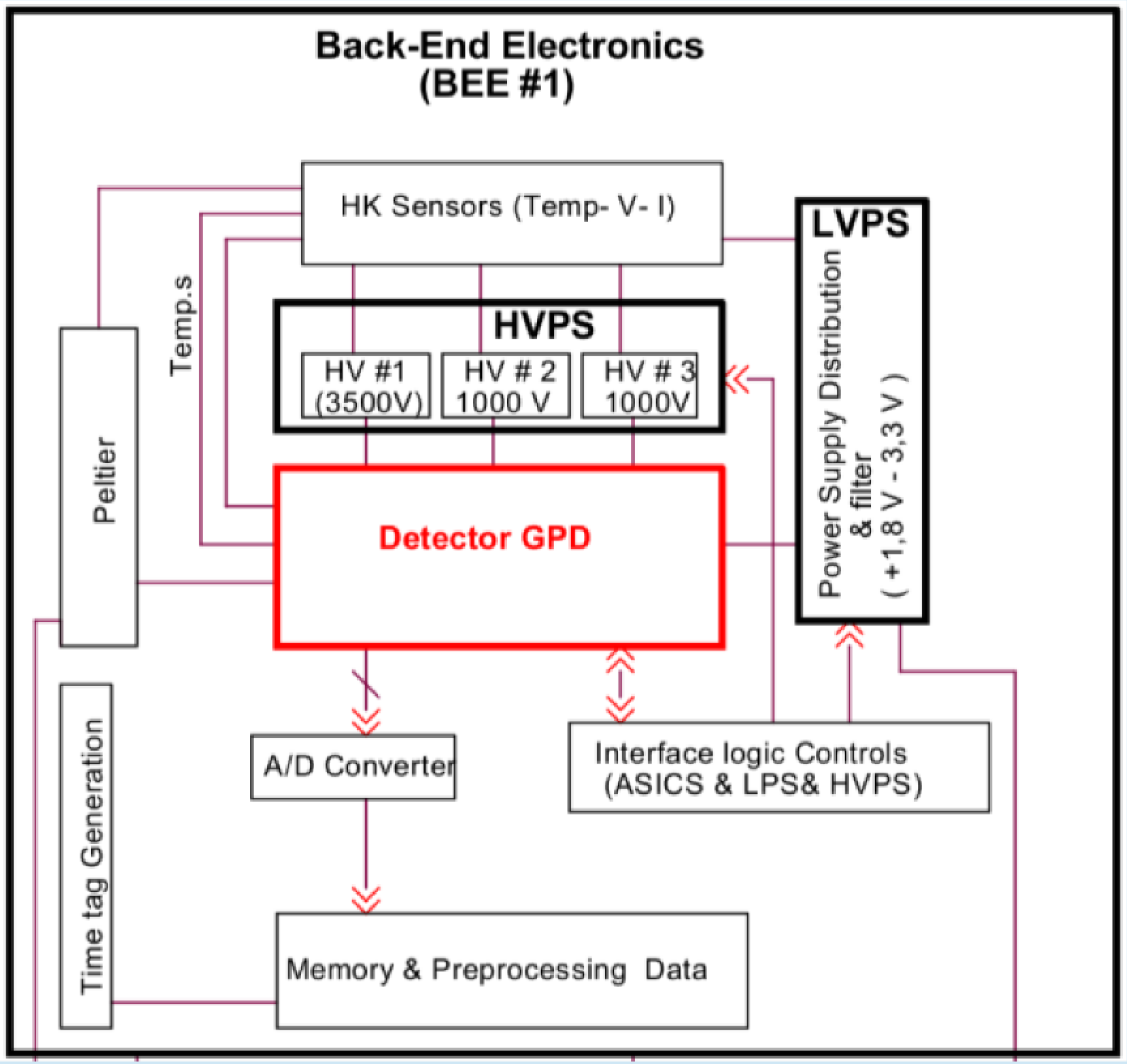
Q: Protections? Overload? Overvoltage/current?

Q: Redundancy or one unit only?

Additional one

Q: All HVPS units the same? Or fitted to voltage ranges?

LVPS and HVPS control



Q: What kind of control signal will HVPS and LVPS get

5.7. South Atlantic Anomaly interference

GPD are radiation robust

were successfully tested for particle interaction

Preceived action

lowering the “top” GEM voltage to prevent multiplication of charge released in the drift region

XIPE protected against particles by its orbit

Table 7 Characteristics of the XIPE orbit.

Altitude	(550 +/- 16) km for 3-year mission and un- controlled re-entry.
Inclination	5°+/-1°
Eclipse duration	36 minutes max
Ground Station	Malindi
Ground station visibility	8 - 11 min

Orbit LEO, altitude<600 km, inclination 6° launch 19-02-2025 – 21/03-2025
End of operation 29-03-28 – 25-04-28
Simulation -

Mission overview

Orbit around: Earth
Number of mission segments: 1
Mission start: 21/03/2025 00:00:00
Mission
Mission duration:
Satellite axis: velo

Mission segment 1:

Orbit type: general
Apogee: 500.00 km
Perigee: 500.00 km

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A

Duration: 1.31 days
Orbit start: 21/03/2025 00:00: 0.0
Orbit end: 22/03/2025 07:29:22.5
Segment end: 01/04/2028 00:00: 0.0
Segment length: 1107.00 days

Semi latus rectum: 6871.00 km
Semi major axis: 6871.00 km
Eccentricity: 0.00
Mean motion: 95.78 rad/day
Integration step: 0.50°

Time intervals
60.0 s below 20000.0 km
240.0 s between 20000.0 km and 80000.0 km
3600.0 s above 80000.0 km

Orbit type:	general
Orbit start:	calendar date
20 Apr 2009	12 : 00 : 00
Representative number of orbits:	20
Altitude specification:	perigee and apogee altitudes
Perigee altitude [km]:	547
Apogee altitude [km]:	572
Inclination [deg]:	6
:	0
	0
	0

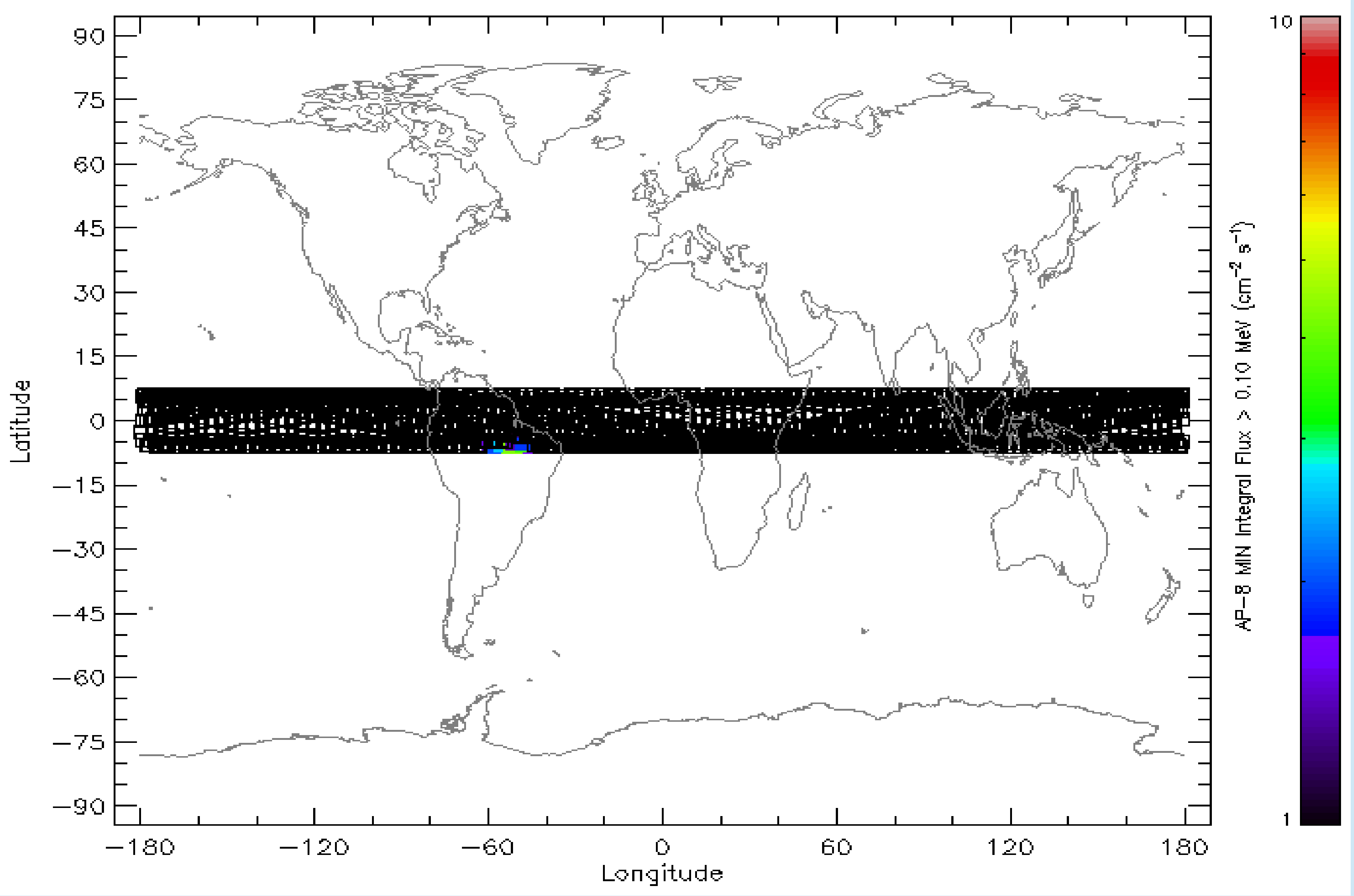
The Space Environment Information System

https://www.spenvis.oma.be/

Orbit arou
Number o

Mission start: 21/03/2025 00:00:00
Mission end: 01/04/2028 00:00:00

Mission du ears)
Satellite a



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Longitude
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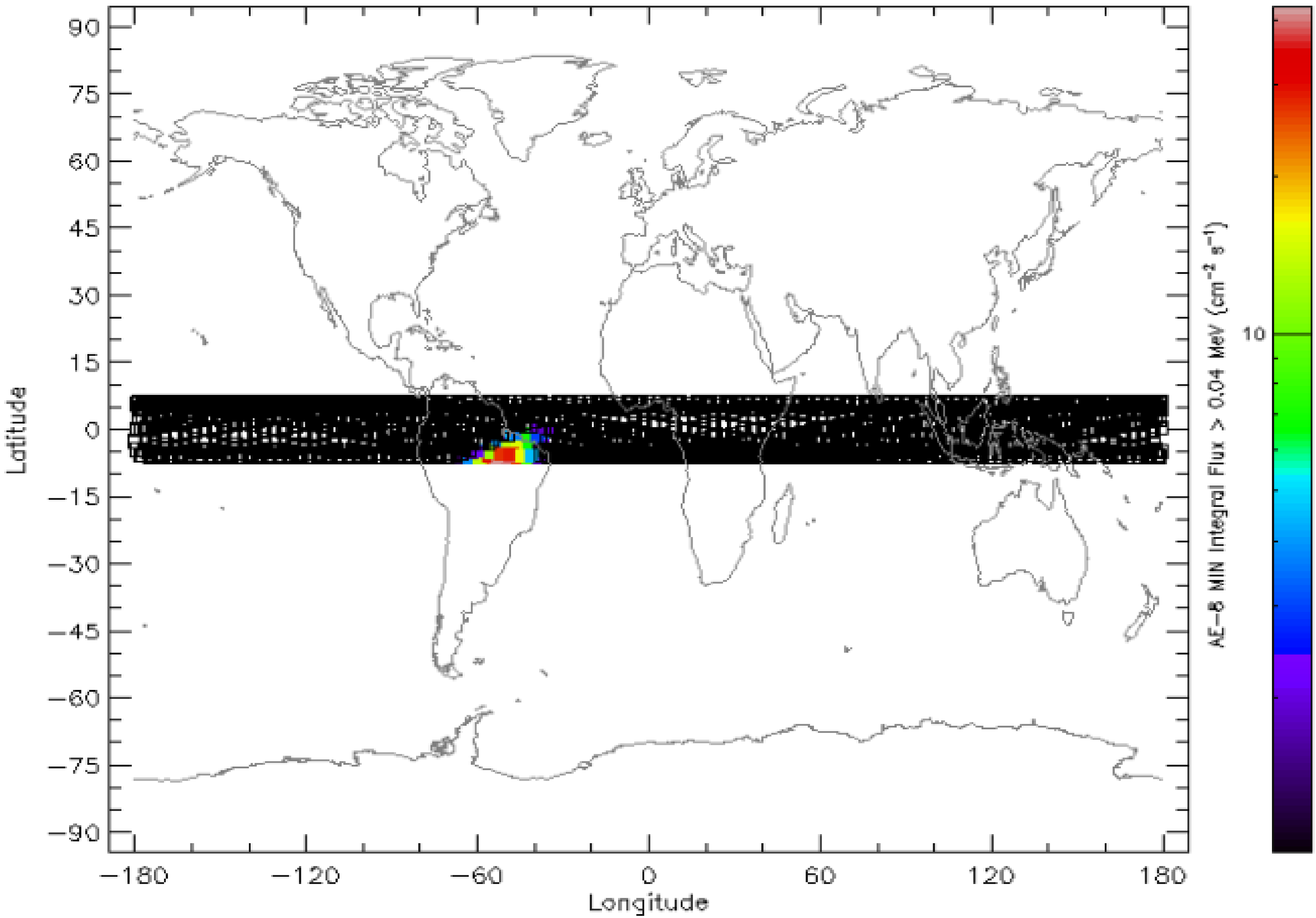
AP-8 MIN Integral Flux > 0.10 MeV (cm^{-2} s^{-1})



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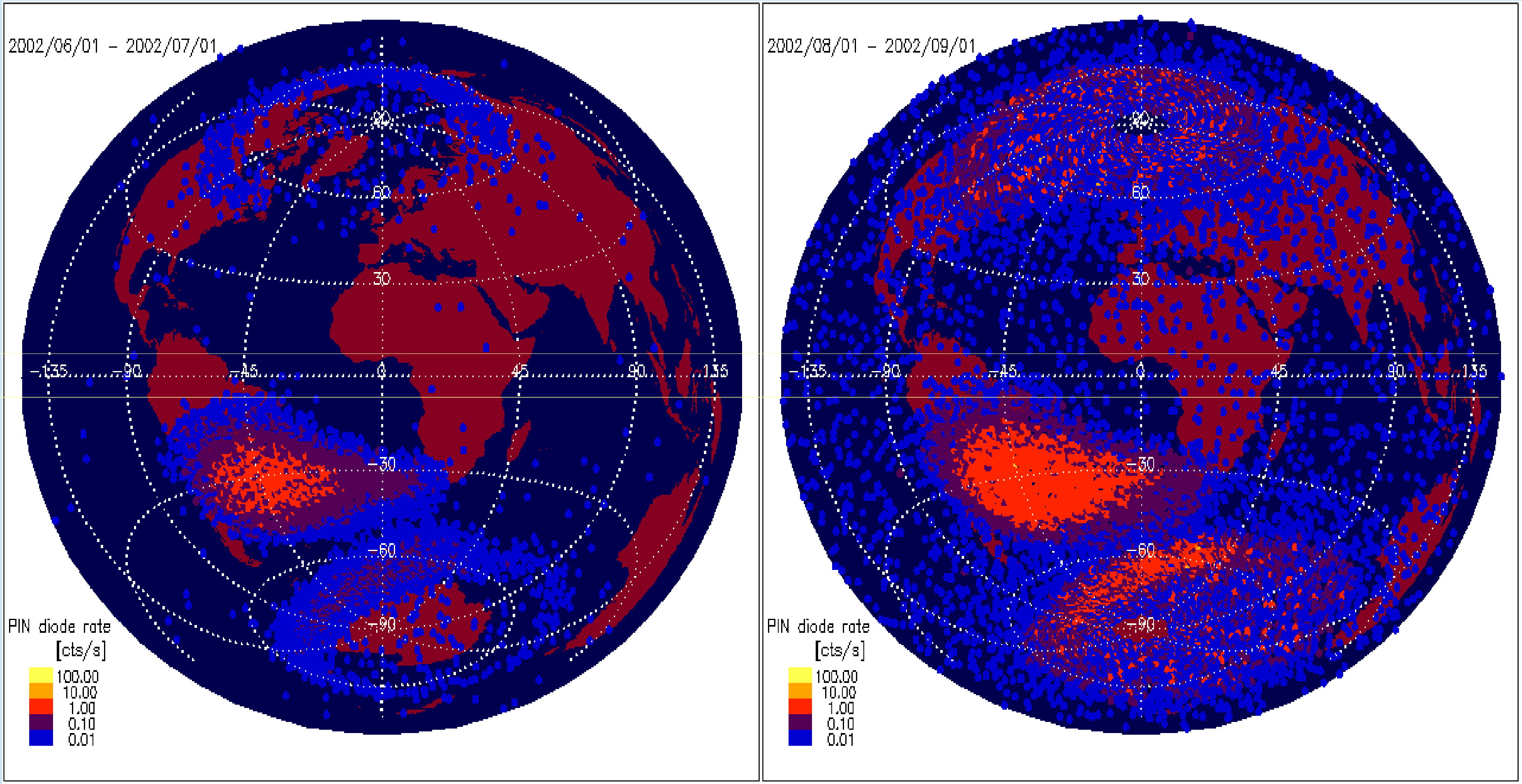
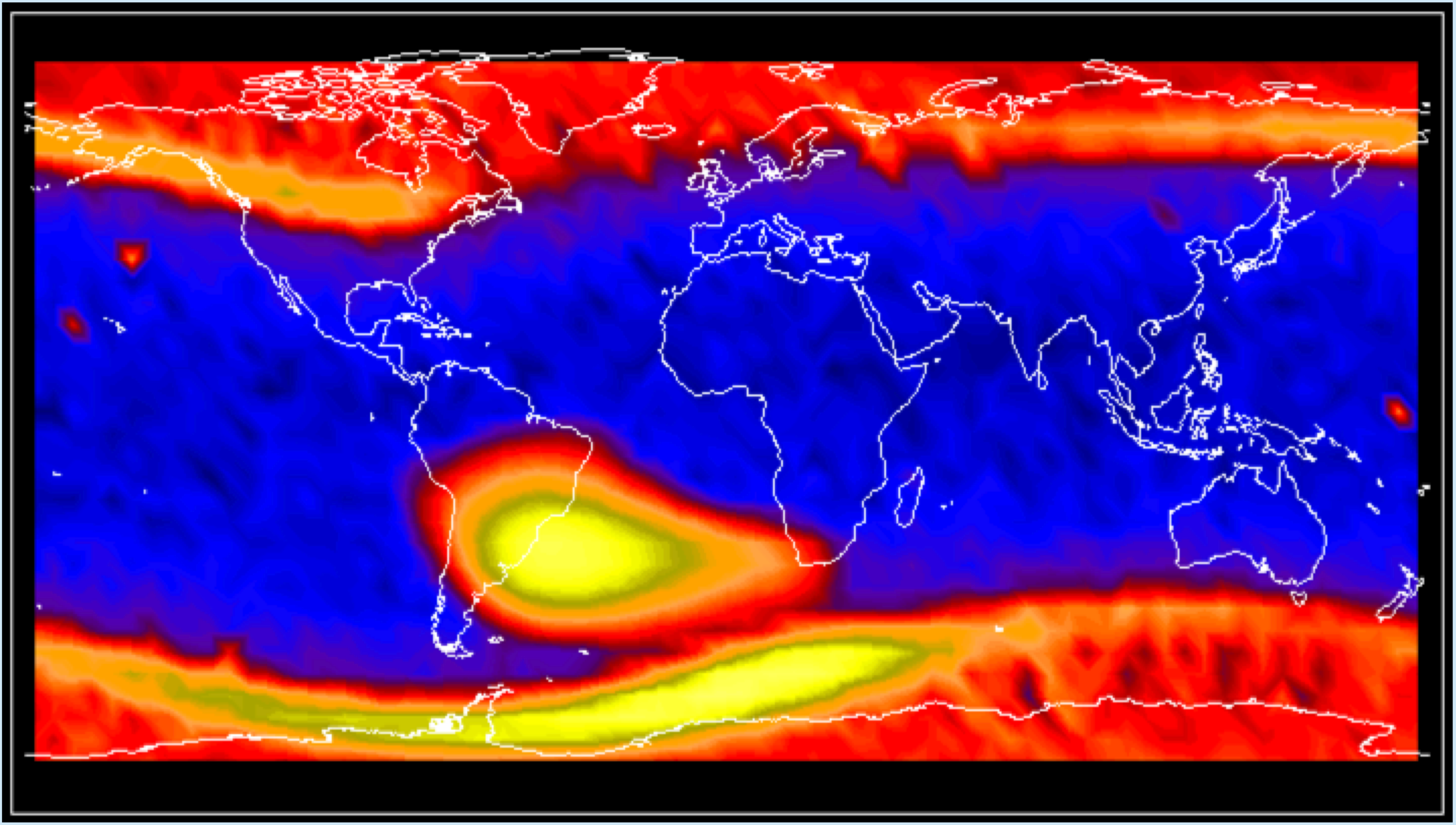
AE−8 MIN Integral Flux > 0.04 MeV (cm^{-2} s^{-1})

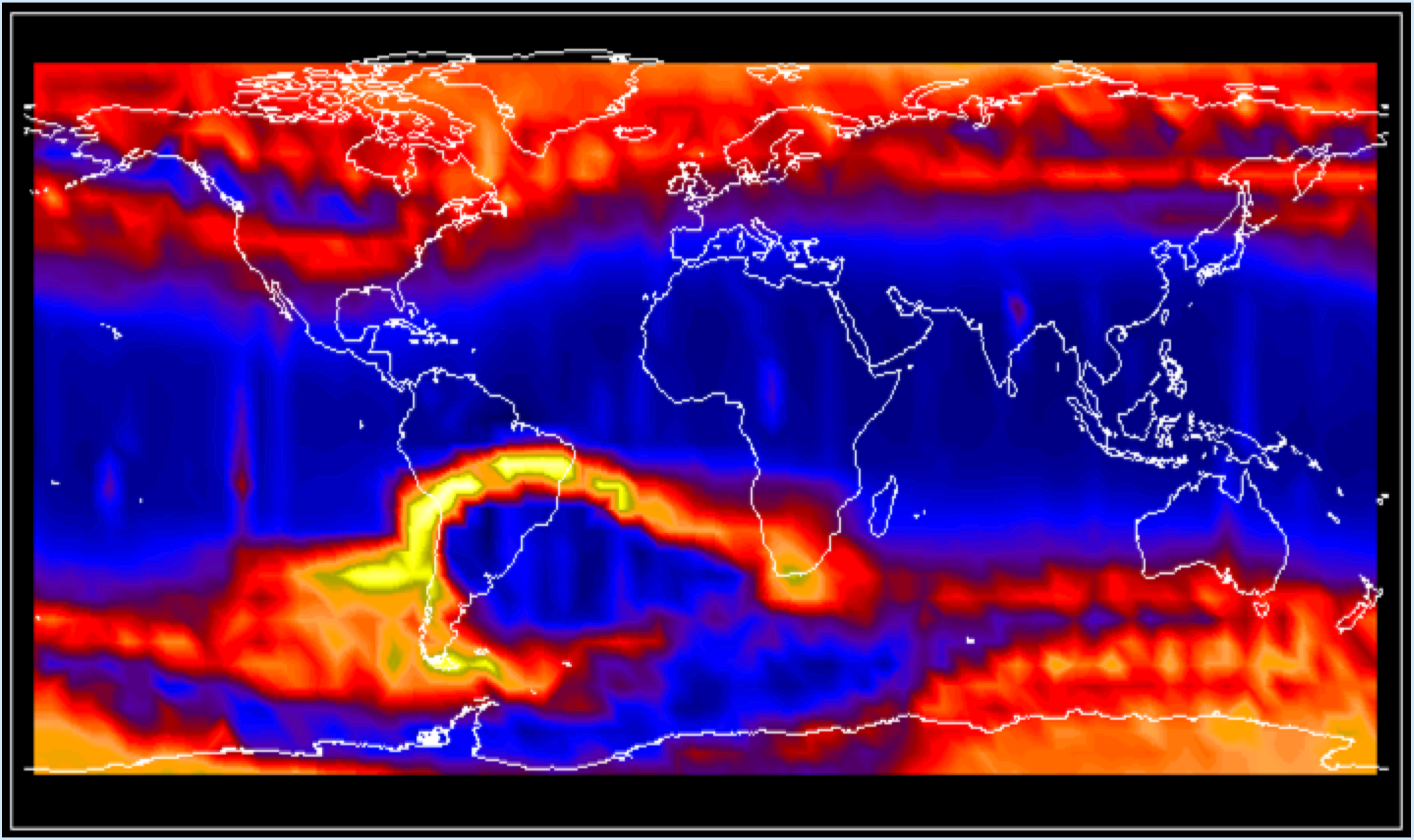


Maps of particle environment as seen by RESIK PIN detectors.
Left: for quiet magnetospheric conditions.
Right: for period where magnetospheric disturbances occurred.

RESIK Polar orbit – inclination 86 deg HV always on



RESIK Polar orbit – inclination 86 deg
HV off when stronger particle flux detected



Limitations - mass

4.6.2. Payload mass budget

	Component	No.	Unit Mass (kg)	Total Mass (kg)	Design maturity margin	Design Maturity Margin (DMM) (kg)	Mass with DMM (kg)	Note
PAYLOAD MASS BUDGET								
MA	MMs	3	50.4	151.2	20%	30.2	181.4	
MA	Heater+Baffle+Cover	3	4.3	13.0	20%	2.6	15.6	
MA	MMS	1	10.0	10.0	20%	2.0	12.0	
MA	Harness	1	1.0	1.0	20%	0.2	1.2	Heaters only
MA			**MA TOT:**	**175.2**		**MA TOT with DMM:**	**210.2**	
FPA	GPD (incl. Peltier)	3	0.6	1.8	20%	0.4	2.2	XPOL/IXO
FPA	GPD cover box	3	1.3	5.4	20%	1.1	6.5	XPOL/IXO
FPA	BEE (incl. HVPS, LVPS, #4 cPCI cards)	3	1.6	4.8	20%	1.0	5.8	XPOL/IXO
FPA	FW+CS+Baffle	3	1.55	4.7	20%	0.9	5.6	XPOL/IXO
FPA	DSMI	3	0.5	1.5	20%	0.3	1.8	XPOL/IXO
FPA	ISS	1	9.0	9.0	20%	1.8	10.8	
FPA	Sun Shield	1	9.0	9.0	20%	1.8	10.8	
FPA	FPA harness	1	3.0	3.0	20%	0.6	3.6	8% FPA mass
FPA			**FPA TOT:**	**39.2**		**FPA TOT with DMM:**	**47.1**	
CE	CE	1	5.5	5.5	20%	1.1	6.6	
CE	Harness	1	1.0	1.0	20%	0.2	1.2	10% CE mass
CE			**CE TOT:**	**6.5**		**CE TOT with DMM:**	**7.8**	
			PAYLOAD TOT:	**220.9**		**PAYLOAD TOT with**	**265.1**	**kg**

Limitations - power

4.6.3. Payload power budget

	Component	No.	Design Maturity Margin (DMM)	Unit power Avg with DMM (W)	Unit power Max with DMM (W)	Power Avg with DMM (W)	Power Max with DMM (W)	Note
PAYLOAD POWER BUDGET								
MA	Heater	3	20%	20	20	60	60	SAX, XMM
					MA TOT with DMM:	**60**	**60**	
FPA	GPD	3	20%	0.6	2.0	1.8	6.0	XPOL/IXO
	Peltier	3	20%	1.4	2.0	4.2	6.0	XPOL/IXO
	BEE (excl. HV)	3	20%	5.0	5.0	15	15	XPOL/IXO
	HV	3	20%	0.6	1.8	1.8	5.4	XPOL/IXO
	FW	3	20%	0.0	6.0	0.0	6.0	Only one operative at a time
					FPA TOT with DMM:	**22.8**	**38.4**	
CE	CE	1	20%	31.2	31.2	31.2	31.2	XPOL/IXO
					CE TOT with DMM:	**31.2**	**31.2**	
					PAYLOAD TOT with DMM:	**114.0**	**129.6**	**W**

Design Maturity Margin (DMM)

Limitations - dimensions

4.6.4. Volume of the main payload elements

PAYLOAD VOLUME				
	Component	No.	Volume	Note
MA	MM	3	Ø458 mm, h=600 mm	See Figure 15
MA	MMS	1	Ø930 mm, h=20mm	
MA	Baffle	6	h= 400 mm	
FPA	GPD+FW+Baffle	3	170x190x180 mm^3	XPOL/IXO heritage
FPA	BEE	3	140x190x100 mm^3	XPOL/IXO heritage
FPA	ISS	1	Ø900 mm, h=20mm	POLARIX heritage
FPA	Sun Shield	1	h= 900 mm	POLARIX heritage
CE	CE	1	290x110x200 mm^3	XPOL/IXO heritage, see Figure 34

OUR heritage

4.7. Payload TRL

Item	Mission Funding Agency	TRL (ISO SCALE)	Rationale
HVPS/LVPS	SRC-PAS/PL	6	DIOGENESS, RESIK and RF-15I spectrometers used gaseous detectors and were equipped with HVPS build at SRC-PAS.

SPHINX

RESIK

DIOGENESS

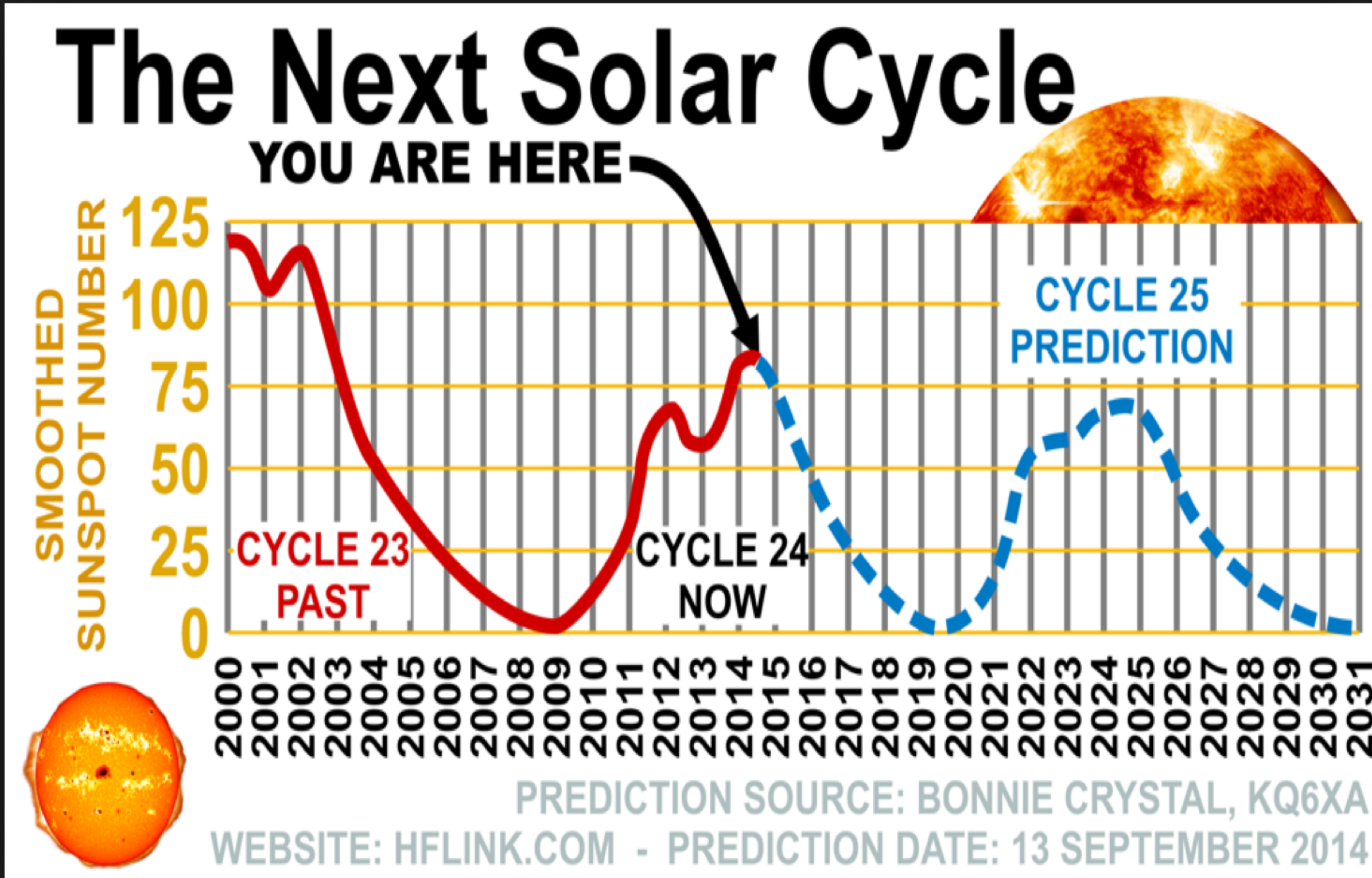
INTERBALL

SOLAR X-RAY EXPERIMENTS:
20 instruments delivered by
Wrocław Solar Physics Group
launched
on 6 rockets and 3 satellites

http://www.cbk.pan.wroc.pl/?l=EN&act=1

Thank you

Additional slides


The Next Solar Cycle
YOU ARE HERE
SMOOTHED SUNSPOT NUMBER
125
100
75
50
25
0
CYCLE 23 PAST
CYCLE 24 NOW
CYCLE 25 PREDICTION
2000
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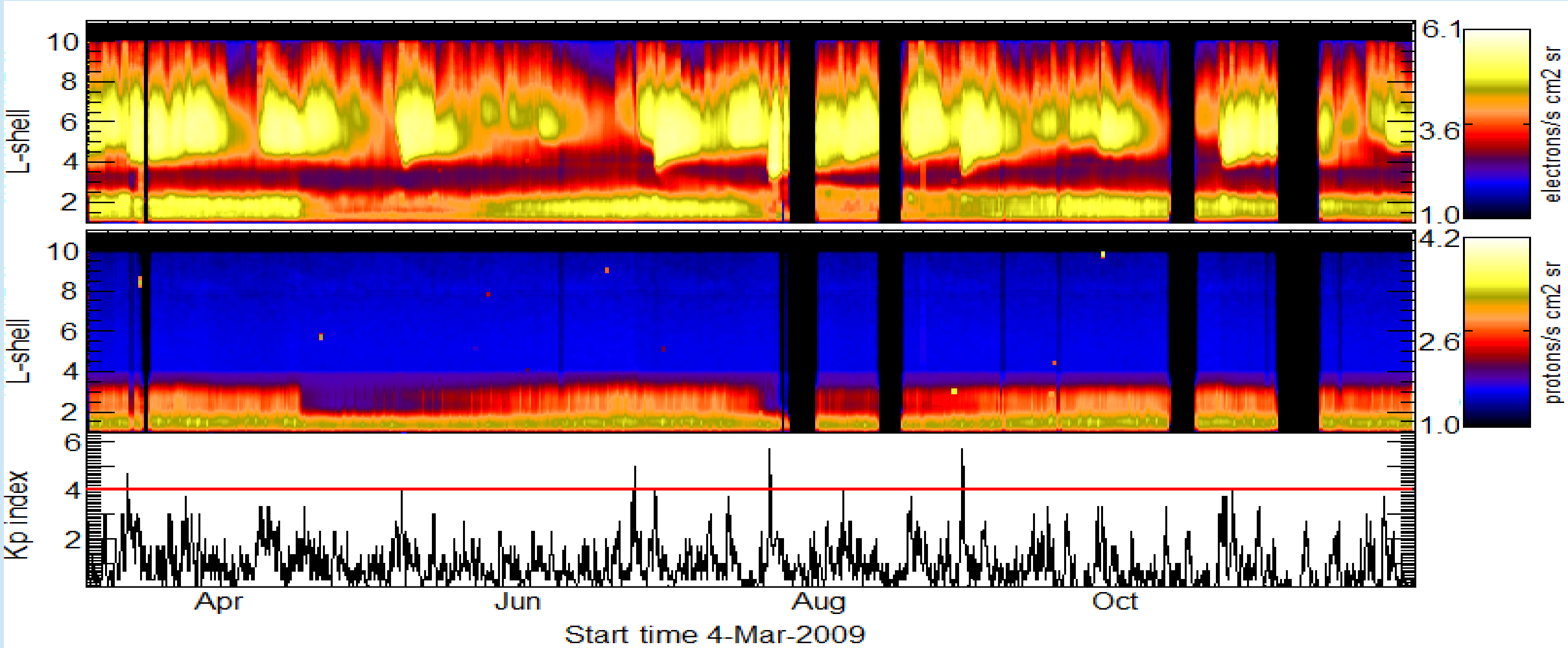
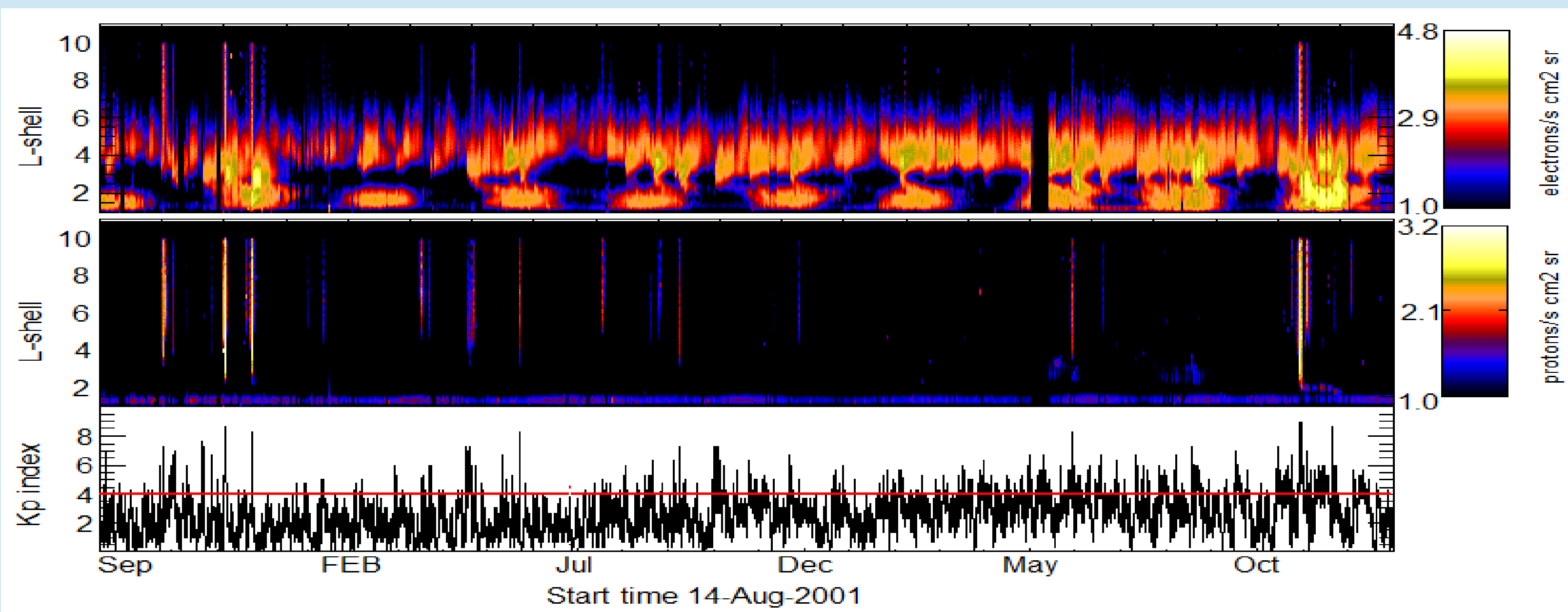
PREDICTION SOURCE: BONNIE CRYSTAL, KQ6XA
WEBSITE: HFLINK.COM - PREDICTION DATE: 13 SEPTEMBER 2014



Minimum

Solar activity



Maximum