Image credit: ESA/ATG medialab

SWA Status for Belfast RPW Meeting

C.J. Owen (UCL/MSSL)

With acknowledgement to the International Solar Orbiter SWA teams.

(c.owen@ucl.ac.uk)

SWA Status 1

- All SWA components working well, although perhaps not entirely flawlessly!
- Some well-aired issues with operations and sensor performance are still being worked;
- However, we are accumulating a good volume of data to support our science:

SWA	Data to ground	Data to Archive	Comment
PAS	To end of 2nd September 2022 (benefitted from downlink share error!)	Available data until end of May 2022	Excellent data, some issue for slow solar wind speeds
EAS		Available data until end of May 2022	Excellent data in higher energy ranges away from spacecraft contaminating effects – working on low energies
HIS		Available data from Jan-June 2022 delivered to archive last week	Excellent subset of most useful HIS parameters – continuing to work on remainder

- https://www.mssl.ucl.ac.uk/~grl/transfer/SWA_Data_Catalogue/SWA_Data_Catalog_2022.htm

SWA Status 2

- 2022 has been relatively good as far as data taking is concerned – SWA operated on ~220 of ~250 days so far this year, and not all outages were related to SWA issues;
- We have not yet resolved the issue of unexpected reboots of the SWA DPU and have had a couple of occurrences this year:
    - We have new diagnostic software deployed on board and hopethis will eventually lead to an understanding of the issue;
    - We are also working the issue on the ETB facility in Darmstadt;
    - Continues to have an impact on operation of SWA/PAS – no high cadence operations;
  - In addition, we have seen a number of long data gaps (of several hours to days) due to ‘planned’ activities or ‘unplanned’ events on the spacecraft;
    - Wheel-of-load/thruster firings (occurring at least weekly);
    - s/c ‘maintenance’ windows, trajectory corrections;
    - These have had an impact generally, but in particular our operations e.g. during GAMs;
- Data acquisition/availability catalogues (by year) are being maintained by Gethyn Lewis (see Ops talk later):
  - https://www.mssl.ucl.ac.uk/missions/solo_swa_products/SWA/SWA_Data_Catalog_202*.htm

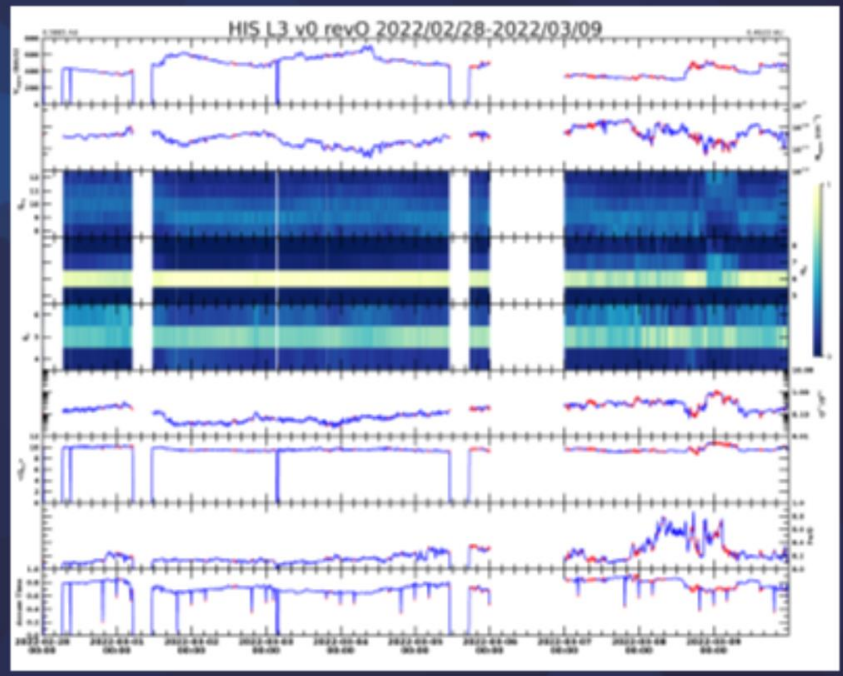
Solar Orbiter SWA Data CATALOGUE 2022

Date	DOY	STP	DPU On	EAS1 On	EAS1 Data	EAS2 On	EAS2 Data	HIS On	HIS Data	PAS On	PAS Data	Data Downlinked	On Co-I site	At SOAR	Notes	Keys
01-Jan-22	1	183	On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		EAS Key
02-Jan-22	2		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		N = Normal Mode
03-Jan-22	3	184	On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		B = Burst Mode
04-Jan-22	4		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		T = Trigger Mode
05-Jan-22	5		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		M = Moments
06-Jan-22	6		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		S = Single Strahl
07-Jan-22	7		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		NG = Data No Good
08-Jan-22	8		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		
09-Jan-22	9		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes	All off for SSMM patch	PAS Key
10-Jan-22	10	185	SAFE	Off	---	Off	---	Off	---	Off	---	Full	EP	Yes		N = Normal Mode
11-Jan-22	11		SAFE	Off	---	Off	---	Off	---	Off	---	Full	EP	Yes		B = Burst Mode
12-Jan-22	12		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes	Sensors back on	M = Moments
13-Jan-22	13		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes	DPU rebooted. All sensors OFF at 07:06	S = Snap
14-Jan-22	14		SAFE	Off	---	Off	---	Off	---	Off	---	Full	EP	Yes		NG = Data No Good
15-Jan-22	15		SAFE	Off	---	Off	---	Off	---	Off	---	Full	EP	Yes		
16-Jan-22	16		SAFE	Off	---	Off	---	Off	---	Off	---	Full	EP	Yes	Recovered at 22:00	HIS Key
17-Jan-22	17	186	On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		N = Normal Mode
18-Jan-22	18		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		B = Burst Mode
19-Jan-22	19		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		P = PHA
20-Jan-22	20		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		M = Moments
21-Jan-22	21		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		R = Rates
22-Jan-22	22		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		V = VDF
23-Jan-22	23		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		NG = Data No Good
24-Jan-22	24	187	On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		RPA = Reduced PA
25-Jan-22	25		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		
26-Jan-22	26		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		
27-Jan-22	27		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		
28-Jan-22	28		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		
29-Jan-22	29		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		
30-Jan-22	30		On	On	NBS	On	NBS	On	NBPMRV	On	Static	Full	EP	Yes		

- Also at: https://www.mssl.ucl.ac.uk/~grl/transfer/SWA_Data_Catalogue/SWA_Data_Catalog_2022.htm

DATA: L3 DATA V01 READY FOR RELEASE

- Delivering key composition products at 10 min resolution
  - Ratios: O7+/O6+, C6+/C5+
  - Charge State Distributions of C, O, limited Fe (8-12+)
  - Elemental abundance of Fe/O
  - Kinetics: O6+ speed and thermal speed
- Time range: January – June 2022
  - SSD thresholds implemented January 2022 reduced noise to expected levels
- Will continue to deliver this set of data regularly as new data is taken
- Challenges
  - <90 days of data used to tune the processing
    - Used 2 years for SWICS
  - Quality filtering took more time than expected to develop



FOCUS FOR NEXT L3 VERSION

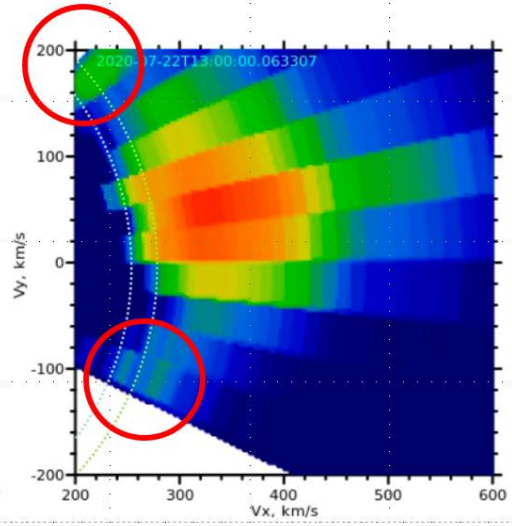
- Focus for next release (V02)
  - Full Fe charge states, Fe6-20+
  - Alpha density, speed, thermal speed
  - Finer-grained quality filtering
- Future versions
  - Alpha and O6+ 3D VDFs
  - Tune processing improve accuracy of main charge states of Ne, Mg, Si
  - Improved time resolution beyond 10 min for some data series

- Not prioritizing pre-2022 data at this time
  - SSD noise makes automated processing *much* more challenging
  - Can look at individual events
  - Interested parties should contact HIS team

PAS Status

- PAS is working very well, but users need to beware of a number of issues:
  - Geometrical factor at low energy – possible issues with data at low V_{SW};
  - Ghost counts (see figure);
  - Calibration of ‘side’ channeltrons;
  - Proton/Alpha separation –
    - only performed if clear separation exists – currently no flag deployed;
    - Developing more sophisticated algorithms
  - PAS is not being operated in burst mode or snapshot modes due to association with SWA DPU reboots;

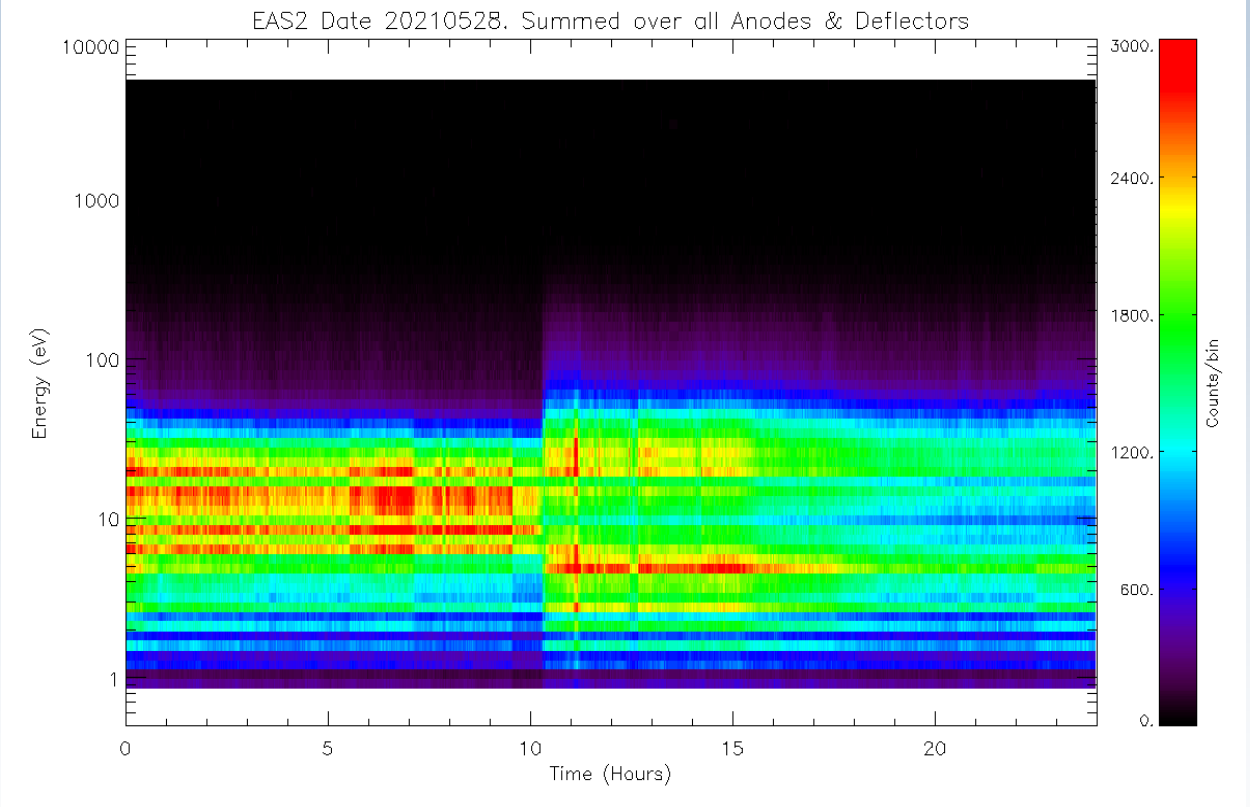
Ghost values at the periphery,



1-hr average of VDF projected onto the XY-plane in the SRF frame (the Sun is on the left)

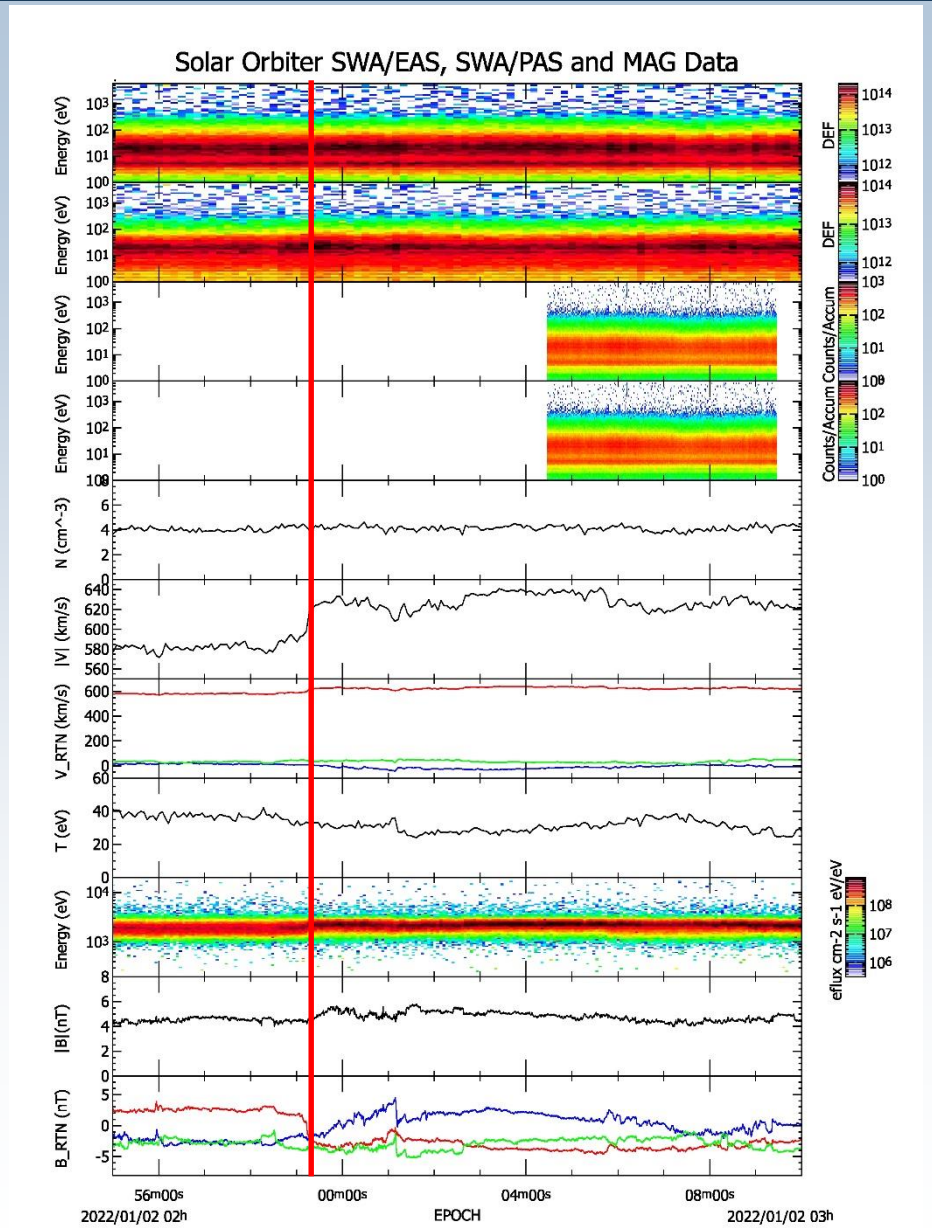
EAS Status

- EAS is working very well, but again users need to beware of a number of issues:
  - Spacecraft electron contamination at low energy;
  - Spacecraft potential issues;
  - Evolution of MCP gains, absolute calibrations;
  - ‘Sawtooth’ issues due to HV settling times;
  - SWA/RPW trigger mode timing;

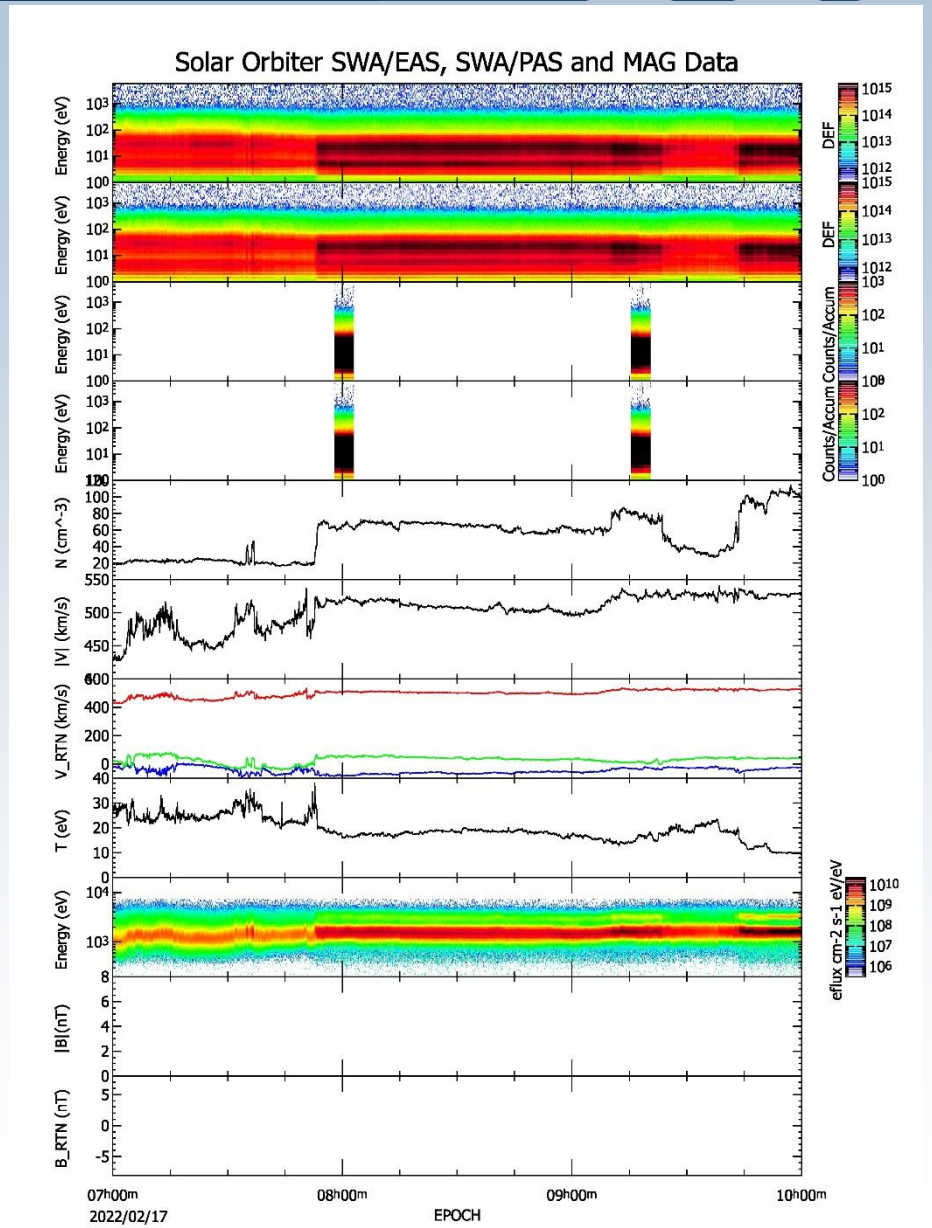


EAS Trigger Response

Work with MSSL student Abid Razavi



17-May-2022 11:05



18-May-2022 12:51