

Review of technical challenges

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- continuous mode very fragile, major data loss occurred repeatedly
 - next software update has significant improvements
 - to be tried again after next software upload (early November)
- Next Next software upload: polynomial calibration maps (to be discussed)
- Hard problems: EDAC uncorrectable problems, clock roll problem.
- onboard flare trigger
 - previous attempts failed to generate a response, even with very low thresholds
 - “Event Detection Enable tc(213,1)”
 - New attempt after RSW. Inter Instrument Communication Test upcoming.

Data Release 7

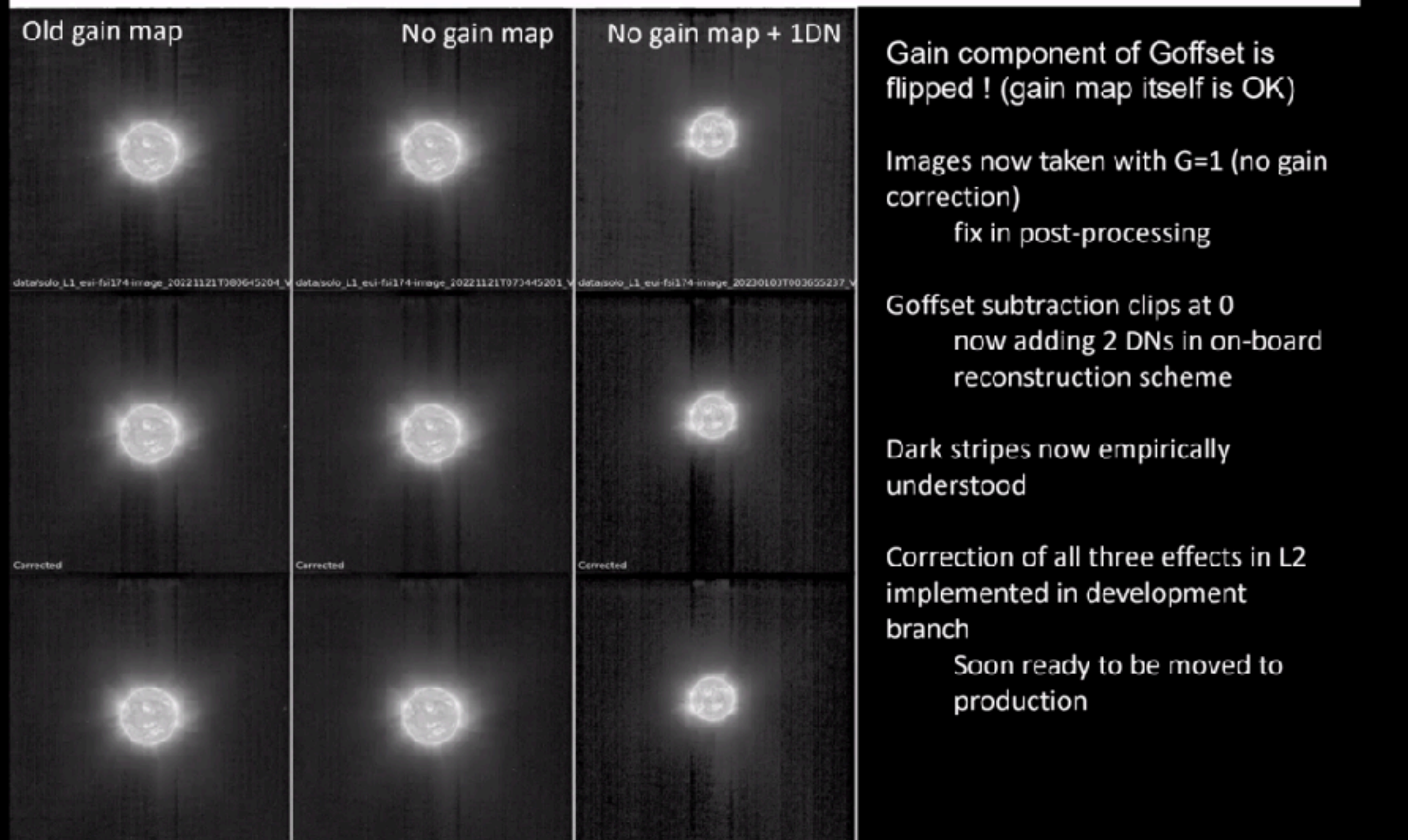


- expand Data Release notes, eg explain better why we do not put solar north up for HRIEUV (avoid resampling to keep resolution)
- we will provide Daye's sequence list as an SQL database together (or inside) metadata.db
- we will proceed with the Quality Bit Mask, add LG/HG flag. Talk to sunpy people. Later we can add Noise Maps
- we have to think deeper & discuss when to rescale the DN's and when not (different filters)
- short exposures and regular exposures should be kept separately. We should think of a method (FITS keyword?) to identify the associated short

FSI map flipping, vertical lines



On-board reconstruction



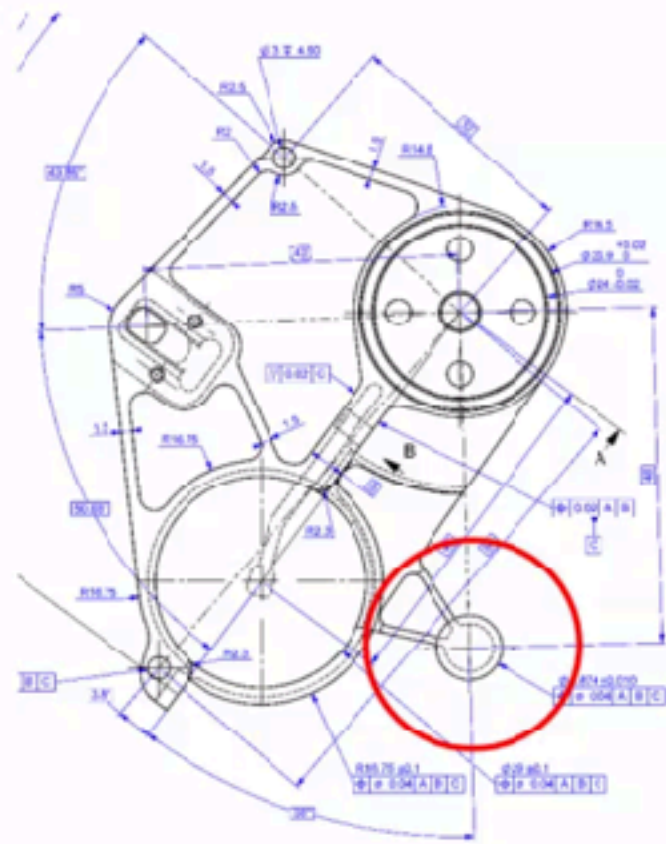
Next steps

- Apply what we have learned backward on all FSI images in Data Release 7 (date determines what to apply)
- after software update: see if flipping the goffset improves things over the current constant gain=1

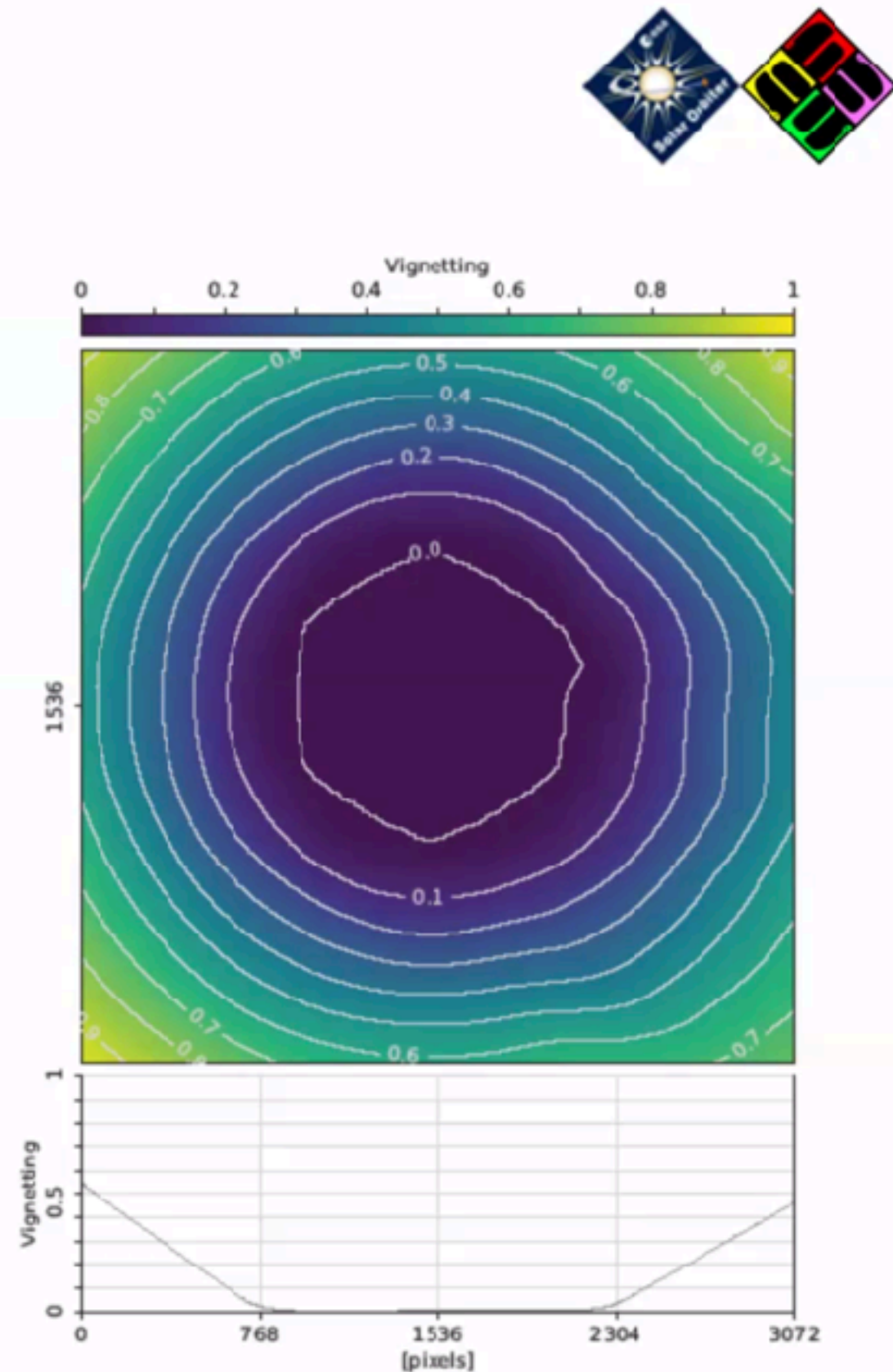
FSI occulter L2 images



Vignetting



- Vignetting = fraction of input rays blocked by the occulter (no vignetting after).
- Modelling based on as-built dimensions
- Takes into account the optical distortion
- Orientation of asymmetry changes with step # (pylons rotates)
- Preliminary version in EUI repository
 - processing/vignetting.py
 - Need to check precise positioning



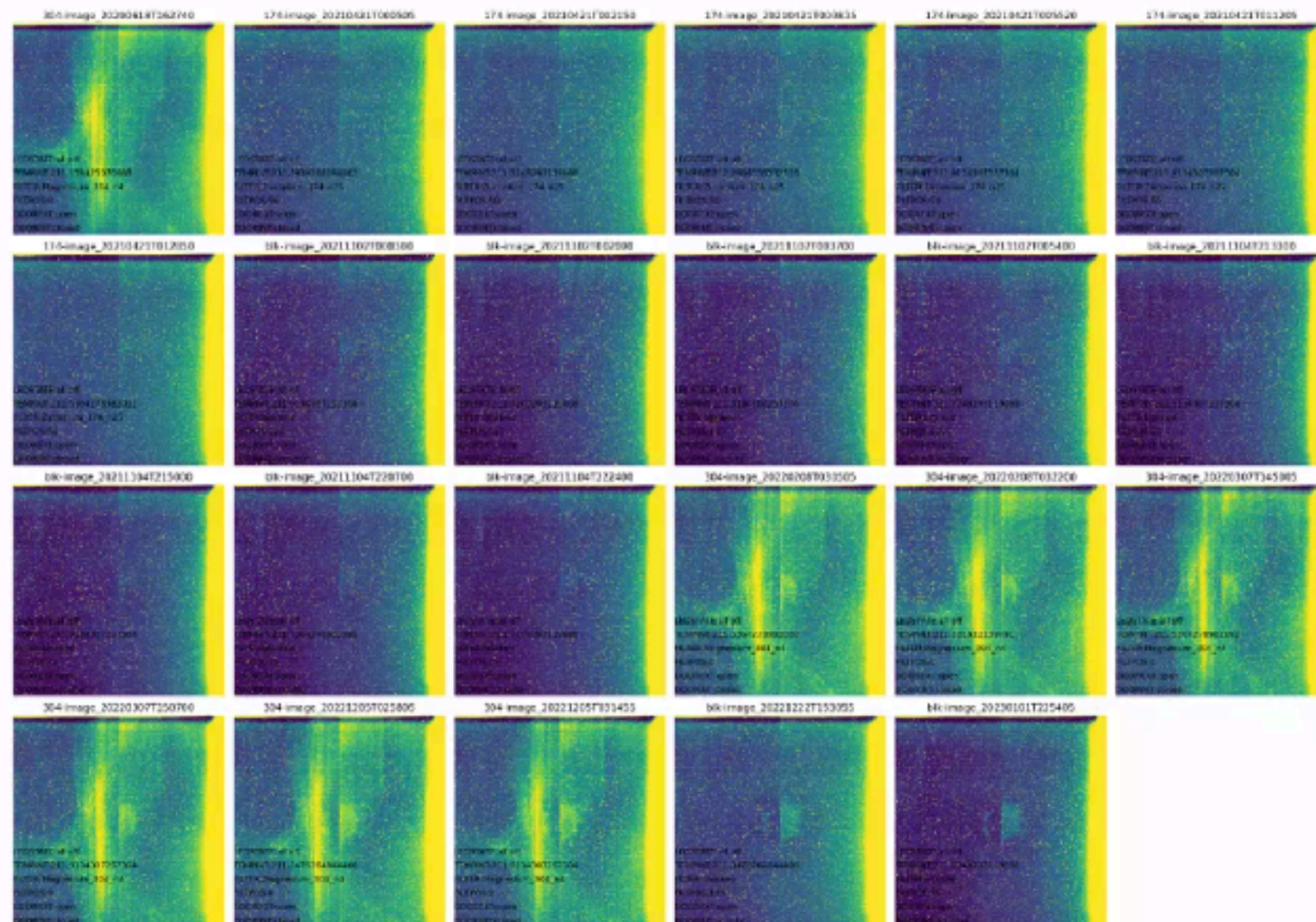
- Find out the location of the vignetting map in the FOV
- As this is dependent on the door mechanism, this might be slightly different for different occulter sequences
- Once this is fixed, we can make L2 occulter files
- Possible for Data Release 7 (target January)? TBC

FSI 304-occulter 'light leak'



Light leak in ????

- Faint: a few DNs in 1000s, does not affect regular images
- Visible in occulted images at 304
- Visible in door closed images!
- Visible in 304 images only (different pattern with each 304 filter)
- Moves when filter moves, suggests reflection (off wheel paddle?)
- ???

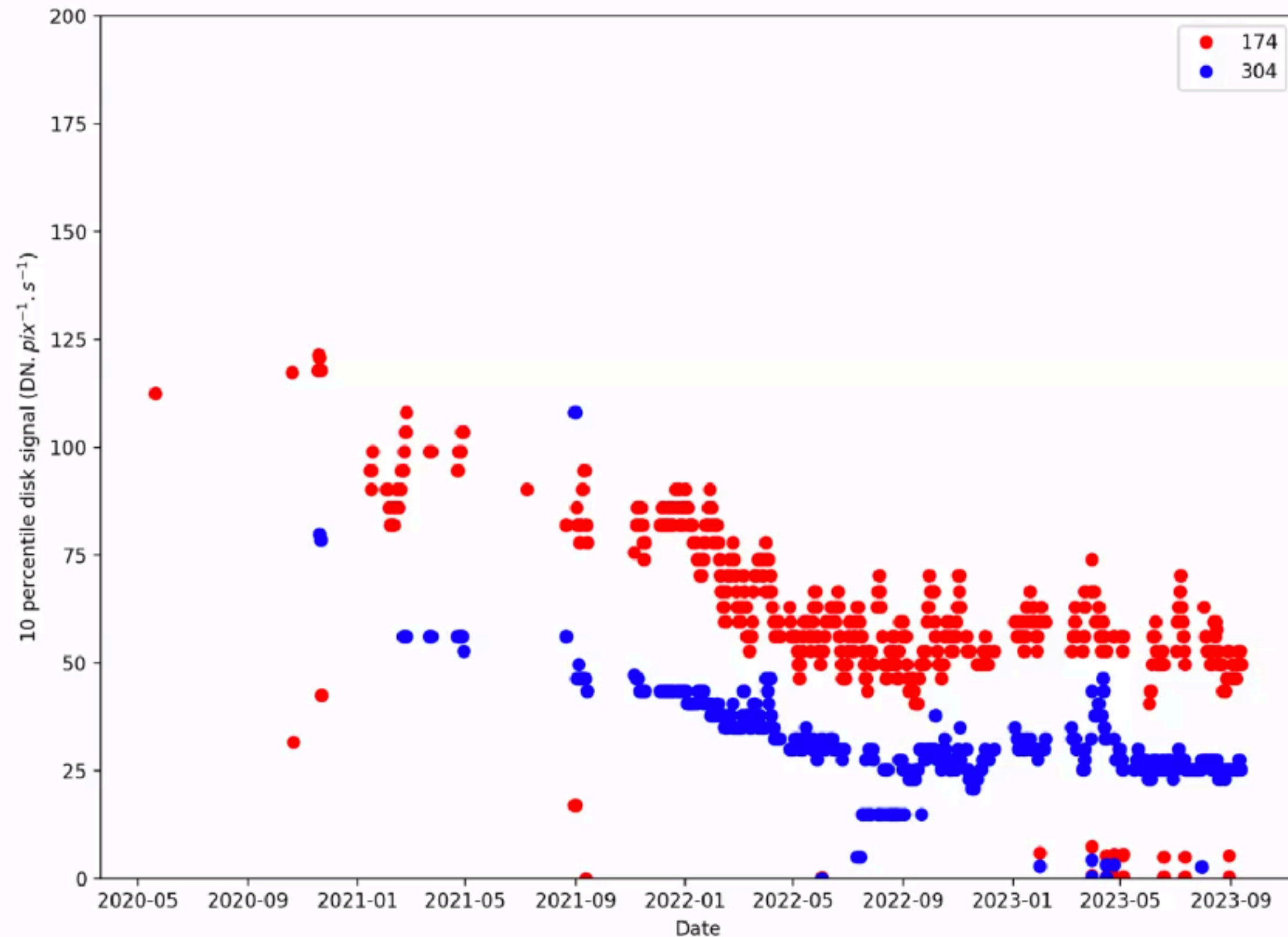


- currently no idea of source nor fix
- should we try to use it anyway in deep 304-exposures to see far-off-limb prominence eruptions?

FSI degradation



Degradation



- continued monitoring
- we should check where the annealing happened in the curve on the left
- to be applied in L2 production Data Release 7 (Jan)?



Conclusions



- Still to do:
 - Improve the 15-bit reconstruction:
 - Onboard gain maps creation or upload
 - electronic gain map & gain ratio
 - cross-calibration
 - euiprep HRI-EUV cal. update
 - PSF-deconvolution (from diffraction pattern & transits)
 - Full Calibration LTP13 (no annealing)
- LG artifacts?
experiment: take LG only but subtract goffset
- positioning of HRI FOV in FSI. Is it stable or not? To be checked

HRIEUV door/filter operations



Telescope mechanism status



Number of door/ wheel operations

- limit the number of HRIEUV door motions
- When not observing: filter in blocking position (saves door motions)

Mechanism	May 5 2022	Jan 23 2023	Sep 08 2023
EUV door movements	60, steps: 1972 (avg 32.9), cycles (open and close): 29.0	65, steps: 2108 (avg 32.4), cycles (open and close): 31.0	71, steps: 2244 (avg 31.6), cycles (open and close): 33.0
EUV filter movements	259, steps: 45930 (avg 177.3), full rotations: 229.7	449, steps: 79400 (avg 176.8), full rotations: 397.0	570, steps: 109168 (avg 191.5), full rotations: 545.8

- total # filter operations have to be checked. Did we spend the lifetime budget already?
- To be checked which filter is in front during blocking position



- gain mismatch
 - can probably be improved onboard with a polynomial flatfield
 - TBD
- sensitivity evolution
 - degradation monitoring will become critical when flare hunting
 - TBD
- PSF correction
 - Guest Investigator Stefan Hofmeister
 - Genetic algorithm (Emil Kraaikamp)
 - TBC

Which Observing Strategy for HRILYA?



What can we do to improve the quality of HRILYA data?

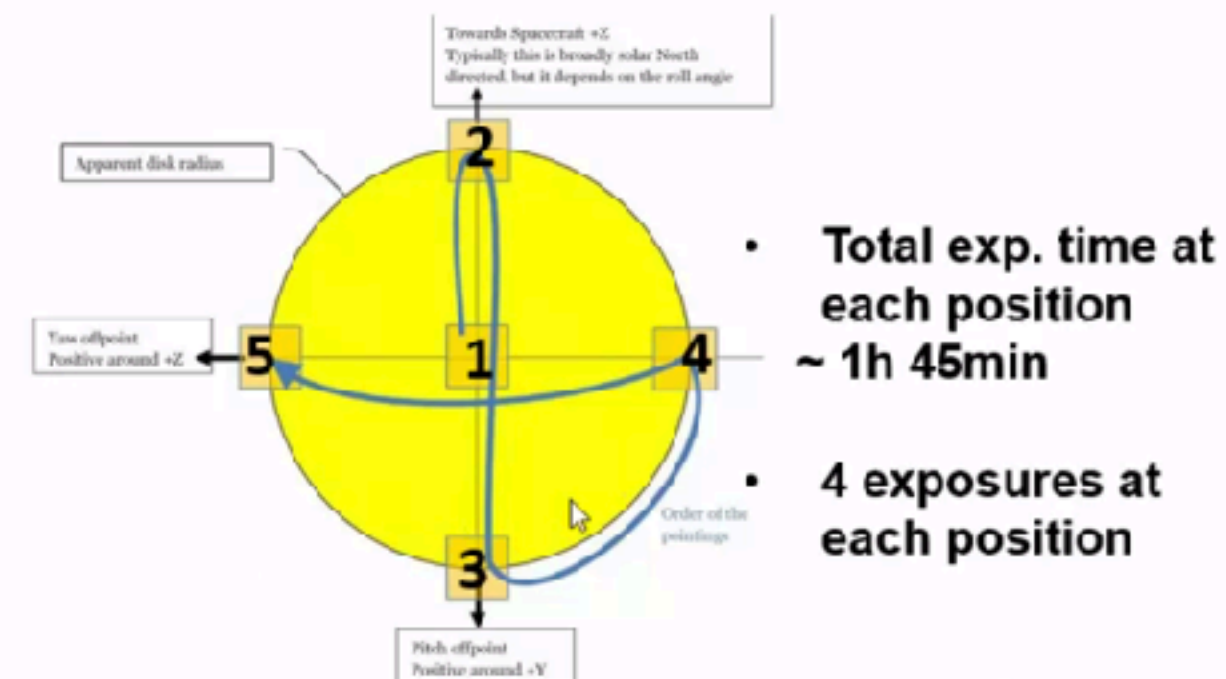
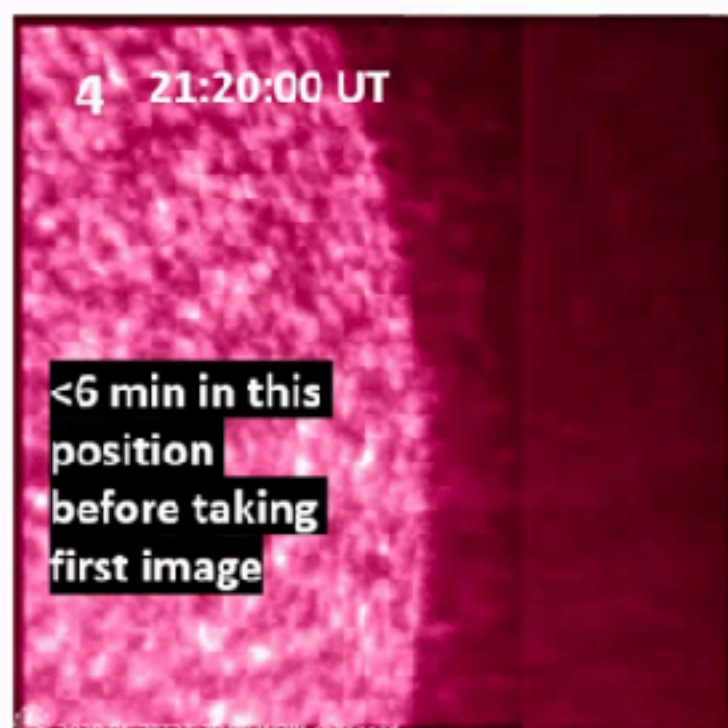
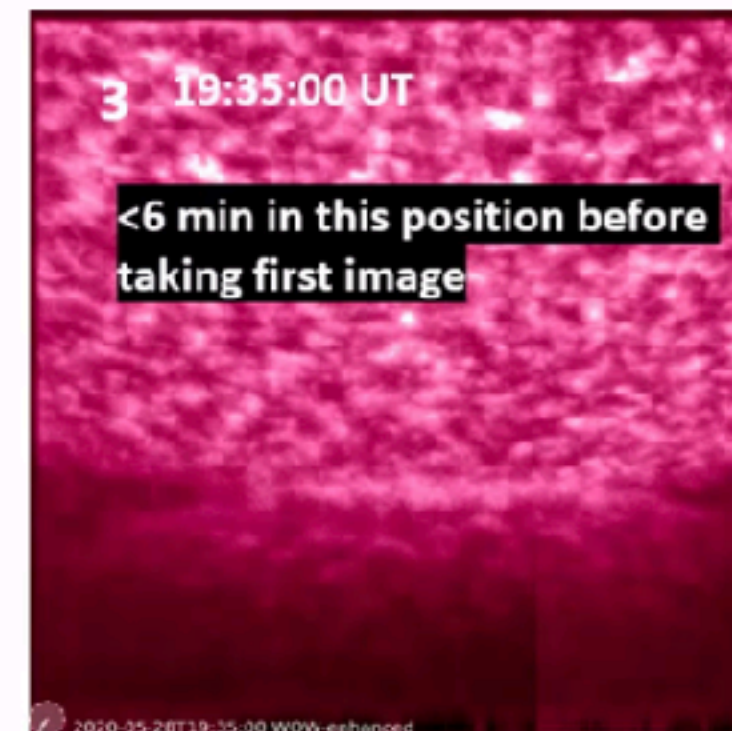
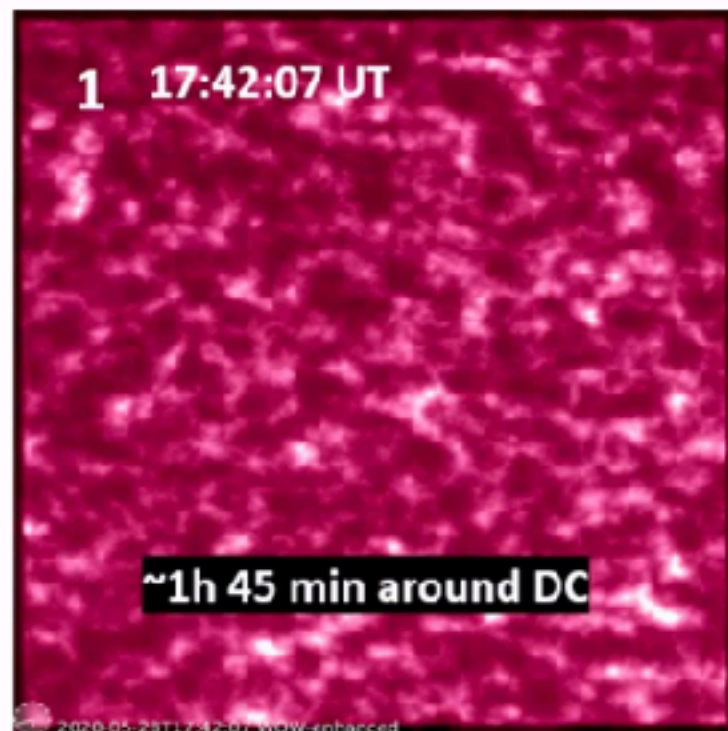
- Limit observations below 0.45 AU to a very minimum or eliminate entirely
- Avoid keeping both doors open for long time, especially below 0.45 AU
 - Keep HRILYA internal door closed when not observing
 - Relax door operating limitations
- Precede observing sequences by a long LED campaign (LLC) whenever possible
 - Ideally, run the LLC immediately before planned observations
 - If solar observations do not start immediately, close the internal door
 - Particularly important if there is a pointing change between LLC and observations
- Avoid staring for a long time to a solar region before a pointing change unless you can place a LLC before pointing change
- Increase V_{mcp} to 670 V as baseline for solar observations

HRILYA memory effect



Remnant signal seen in limb observations

Program: Near Earth Alignment (28th – 29th May 2020) @ 0.563 AU



• Total exp. time at each position ~ 1h 45min

• 4 exposures at each position

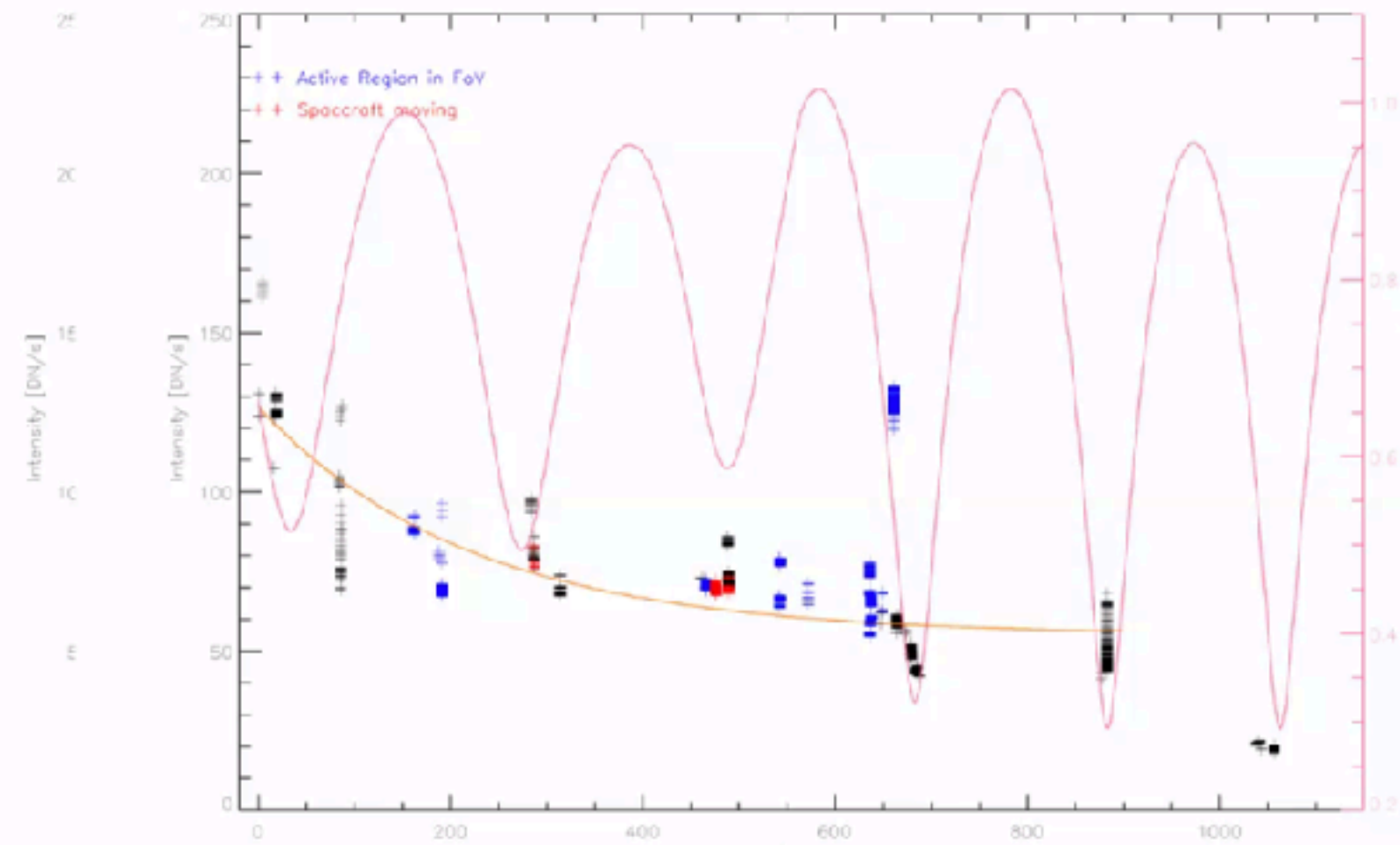
- memory effect in images
 - local gain increase in intensifier
 - to be addressed with long exposure LEDs
 - exposure is currently limited to 30min
 - to be scheduled asap
- perihelion effect on throughput/resolution
 - different operations (Luca's presentation)

HRILYA perihelion effect



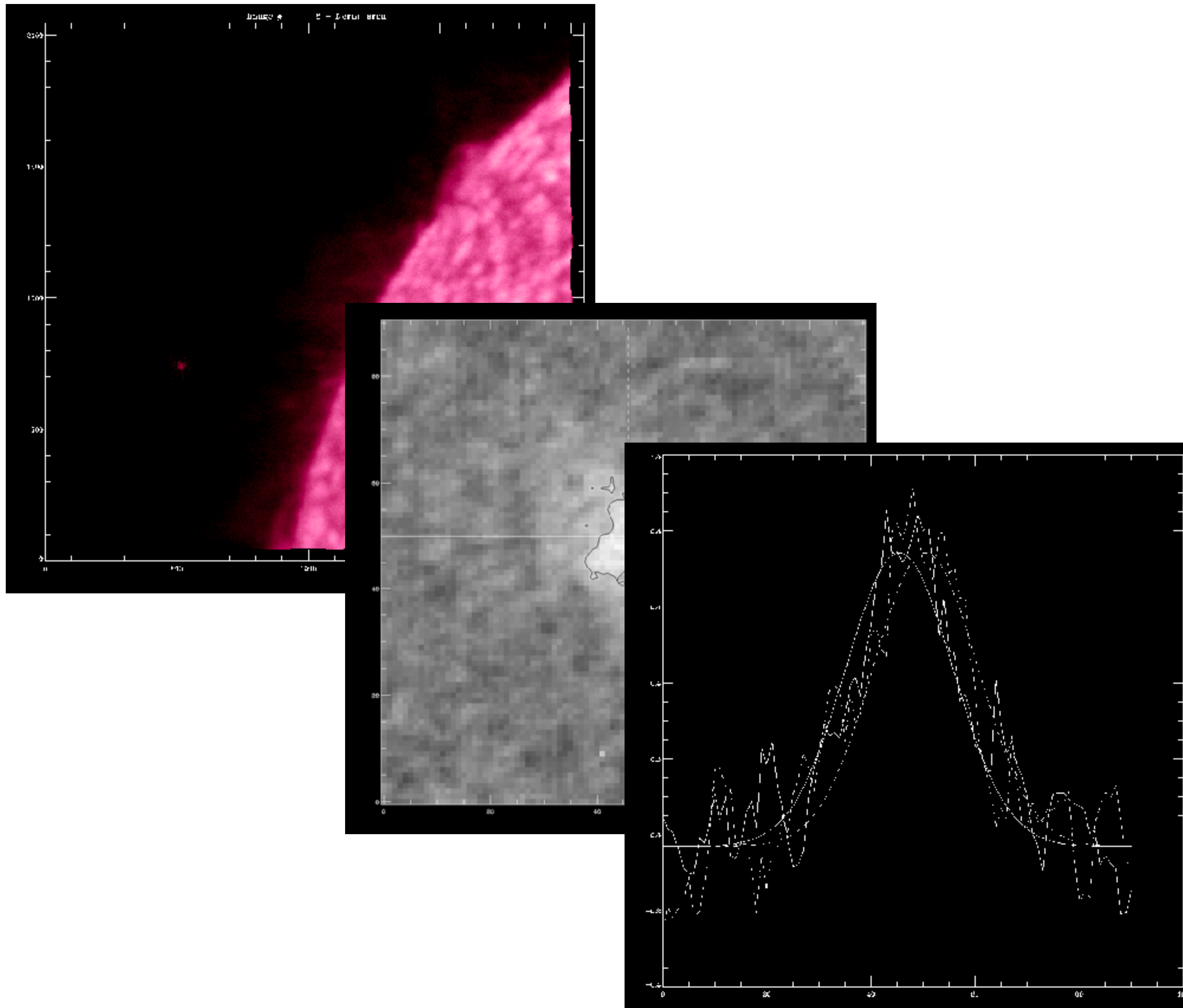
What we know?

- Besides the initial fall in responsivity (somehow typical of VUV instruments) we have observed a substantial drop (about a factor of two) between the second and the third science perihelia
 - Further filter deterioration?
 - How long was the door open between the two perihelia?



- resolution/contrast falls to unacceptable levels below 0.45 AU
- MPS believes that the perihelion effect is an entrance filter effect
- Clarify door opening period between the two perihelia.
- we need HRILYA images further away from the Sun.
To be asked: open HRI HS door asap in 2014 Jan

HRILYA spatial resolution



- spatial resolution is lower than expected
- PSF derived from Alpha Virginis observations (2022 Nov)
- next step?
-

Operations/SOOP to be run in future



1. FSI304 deep exposures with/without occulter to catch prominence eruptions far off-limb and see how far they can be followed
2. FSI high cadence sequences at back side of sun and only bring down a selection of images relevant for flare/particle studies
3. HRILYA deep exposure LEDS (or sequences of medium exposure LEDs) during LTP13 long-term-AR SOOP
4. HRILYA away from perihelion regular images. Make sure the HRI HS door remains open.
5. HRIEUV: be careful with filter wheel operations
6. Sudip's dynamic Fibril need coordination with ground based Ha (SST?) during Sun-Earth-line crossing
7. Hamish suggests to have an occulter campaign coordinated with LOFAR
8. Daye suggests to do more 1s - 2s cadence sequences
9. longer >1h high cadence sequence.
10. off limb hri deep exposure (nanojet/Patrick)