

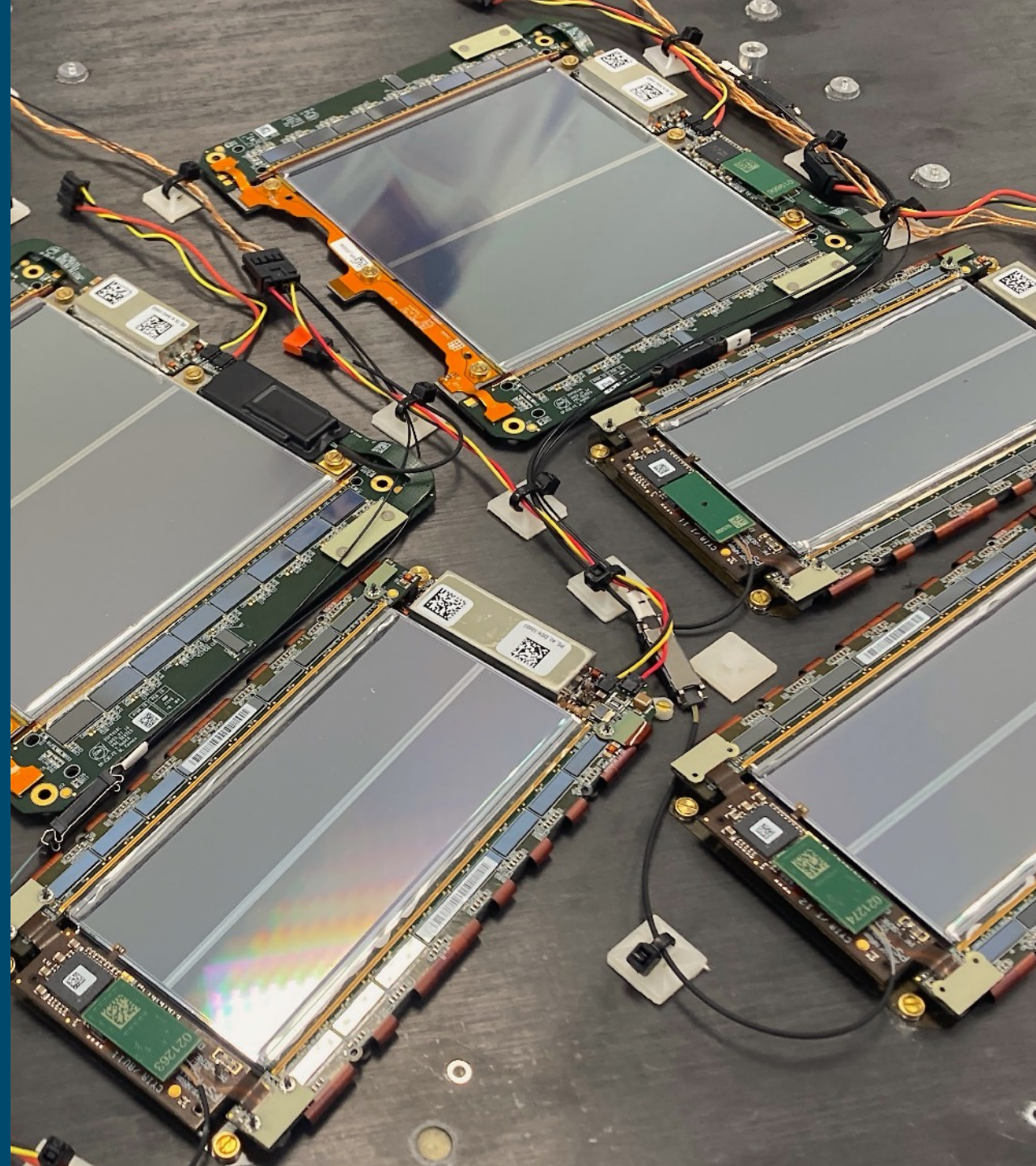
# STATUS OF MODULE PRODUCTION

Tracker Week - Plenary: Outer Tracker

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21/01/2025

HELMHOLTZ

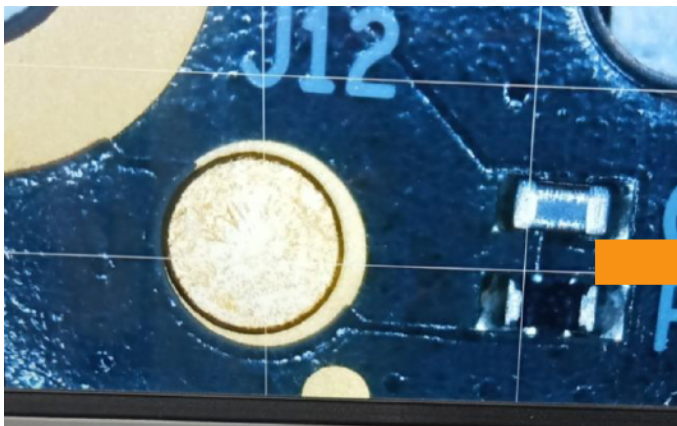


# Strategy for the immediate future

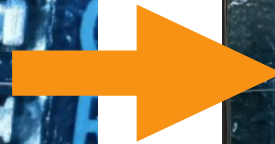
- We have to implement some adjustment to the assembly strategy in order to make the best of the situation with the bPOL12V and Valtronic
- With an increased rate of 2S-FEH deliveries and ideally completion of production by June 2026 we have to push the 2S production as much as possible
- This even means that the assembly rate could go beyond the wire bonding capacity at some centers
- In such a case, PS centers that have no wire bonding to do would have to help the 2S centers
  - This is being put in place and exercised with Aachen and DESY, and could be picked up elsewhere as well
- In parallel, PS centers assemble bare modules in order to get a head start once PS-FEHs become available
- Once the 2S production is finished one could even think of equipping 2S centers with PS hybrid gluing fixtures to further accelerate the PS production

# Hybrid grounding pins

- Observed that pins used to ground hybrid CFRP stiffeners can loose connection to the hybrid after thermal cycles
- It was decided that for all hybrids the grounding pins will be soldered to the GND pad on the hybrid
  - Done by assembly centers for all hybrids already assembled into modules and distributed hybrids
  - Done by CERN for all future hybrid deliveries
- With guidance by the hybrids team all centers performed soldering tests and reported on their experience
- In the meantime, all center received green light to go ahead with the soldering

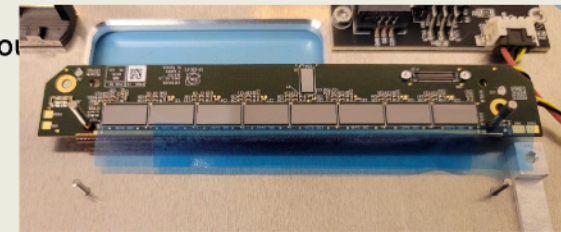
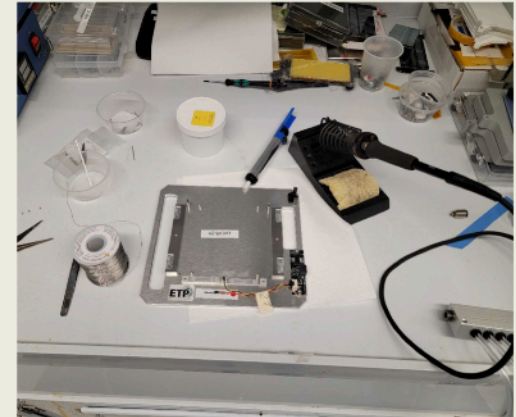


NCP



## Soldering Setup at Brown

- Soldering equipment used:
  - Soldering iron: Weller WESD51
  - Soldering tip: Weller ETS conical 1/64" tip
    - Later switched to a larger tip for faster heating
  - Solder: [Sn60 Pb40 no-clean flux-core solder](#)
  - Flux: [no-clean solder flux](#)
  - Low-tack cleanroom tape to protect bond pads
    - We can print the KIT protective covers as well
- Soldering is performed in a fume hood inside of cleanroom
- We don't have any soldering experts, so the quality of the solder joint has improved with time and practice



12/10/2025

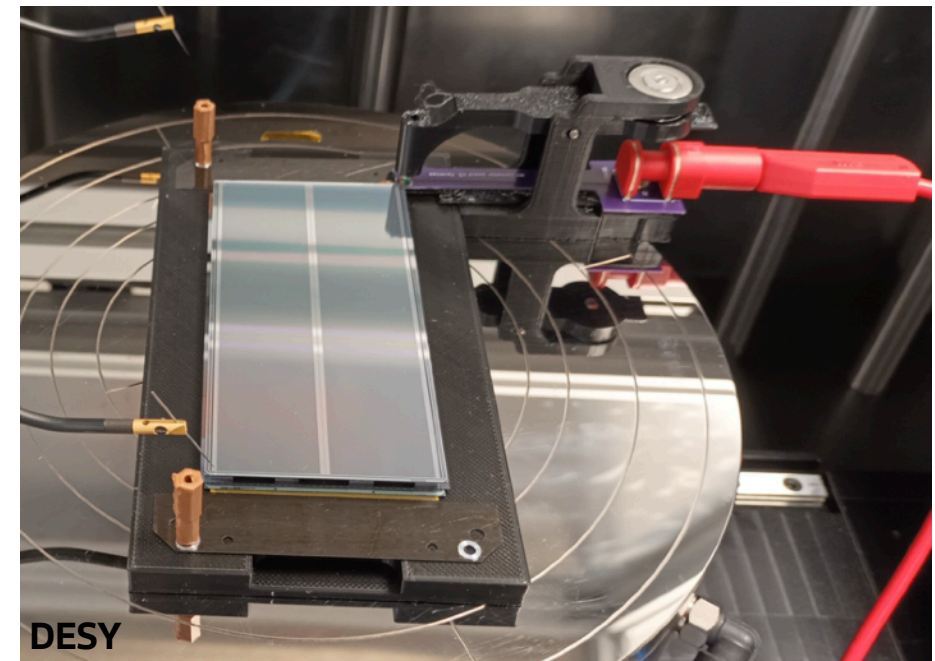
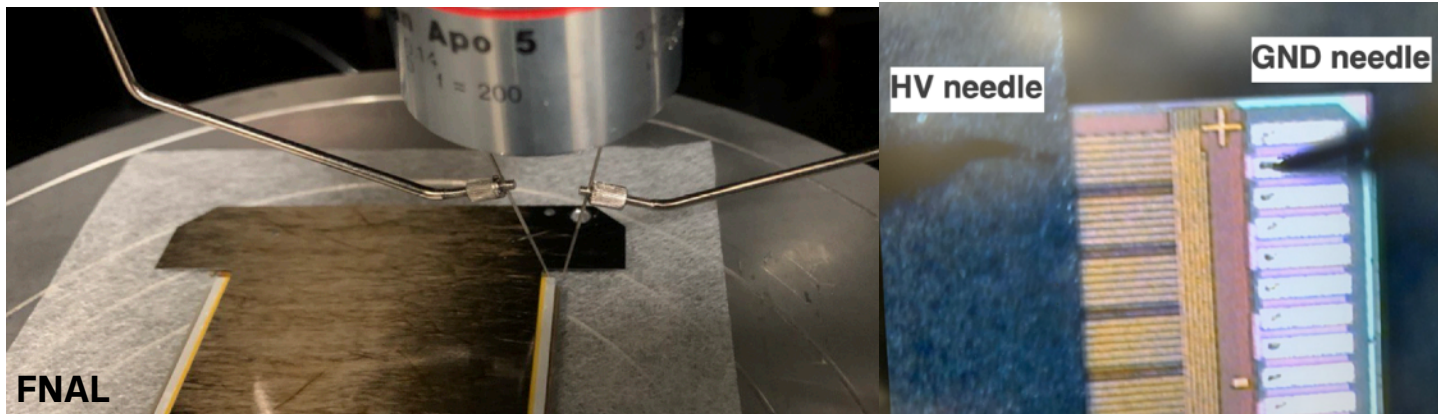
# Status of grouping pin soldering

- Most centers have prioritized soldering of grounding pins on unused hybrids
  - Range of completion is between 20% and 100%
- Soldering on already assembled modules was finished at some centers, other centers are about to start
- So far, no major issues were observed
- Soldering takes between 6 and 15 minutes including cleaning
  - Cleaning takes about the same or even more time than the actual soldering
- A dedicated attribute was added to the DB for all relevant hybrids (FEHs, SEH, ROH)



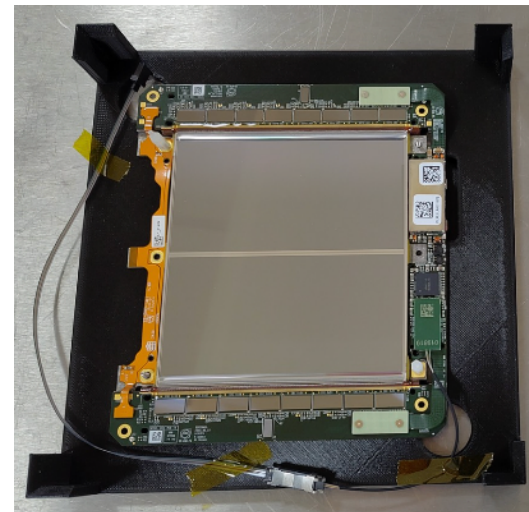
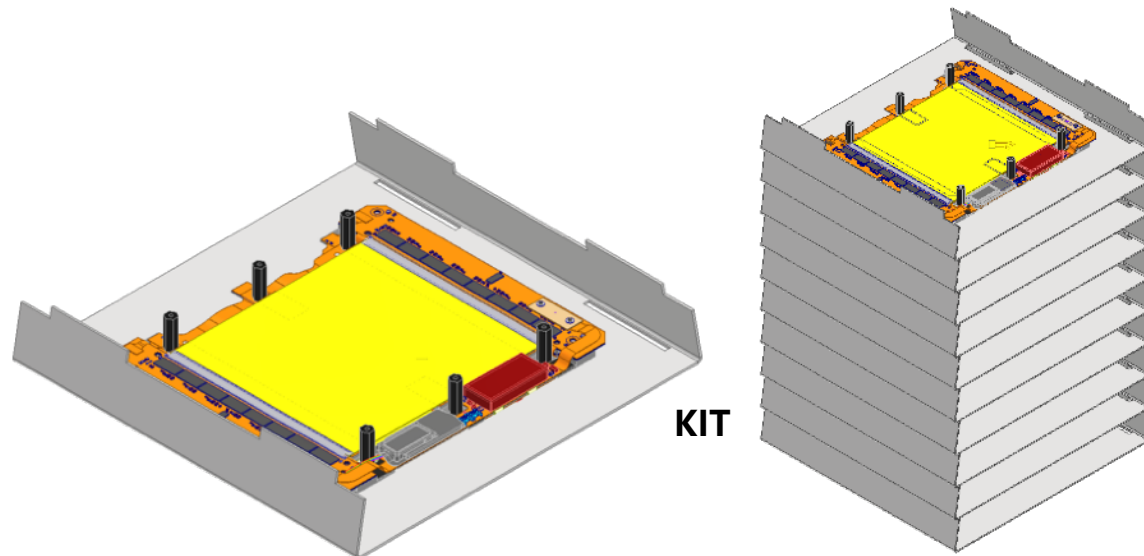
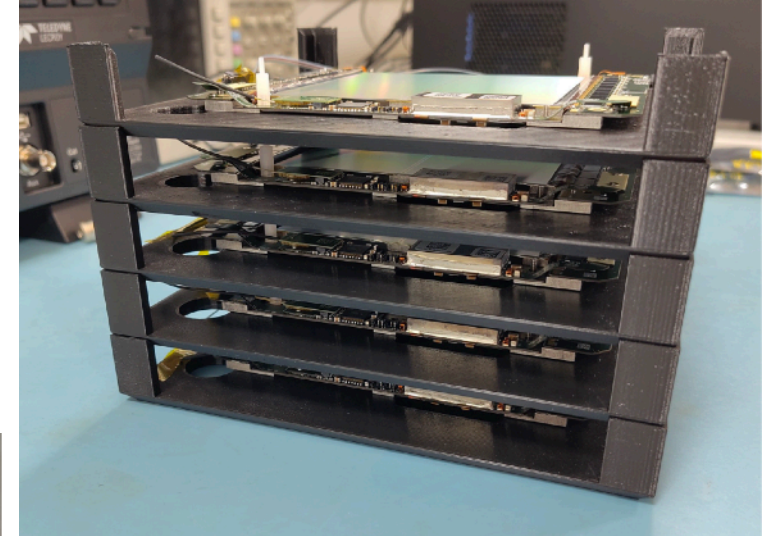
# QC on PS bare modules

- With the PS module production limited to bare modules we decided to introduce extra QC steps
- We concluded that IV measurements on PSp and PSs sensors of the bare module are sufficient
- For the PSp, the measurement can be done on a probe station which every PS assembly center has available
- Fermilab designed a tool to simplify the measurement on the PSs sensor
  - Tool has been produced and was distributed to the other PS assembly centers
- Dedicated run types were introduced to identify these measurements in the database
- Procedures are currently being implemented and exercised at all PS assembly centers

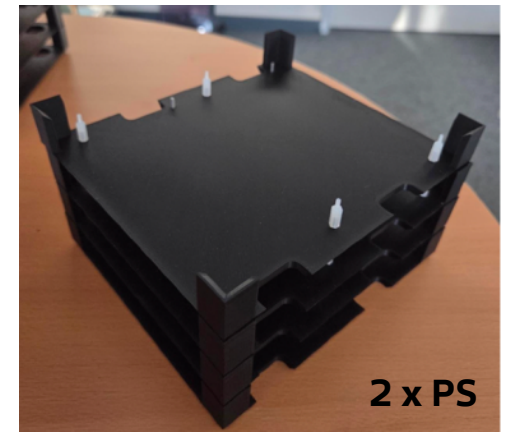


# Temporary module storage

- Since we are not integrating modules, assembly centers will soon run out of module carriers
- Several assembly center have been looking into cheap solutions for temporary module storage solutions
  - DESY: stackable 3D-printed solution for 2S and PS bare modules
  - KIT: stackable bent sheet-metal solution for 2S modules
- CAD data is available on EDMS
  - 2S: [https://edms.cern.ch/document/3401568/LAST\\_RELEASED](https://edms.cern.ch/document/3401568/LAST_RELEASED)
  - PS: [https://edms.cern.ch/document/3401569/LAST\\_RELEASED](https://edms.cern.ch/document/3401569/LAST_RELEASED)

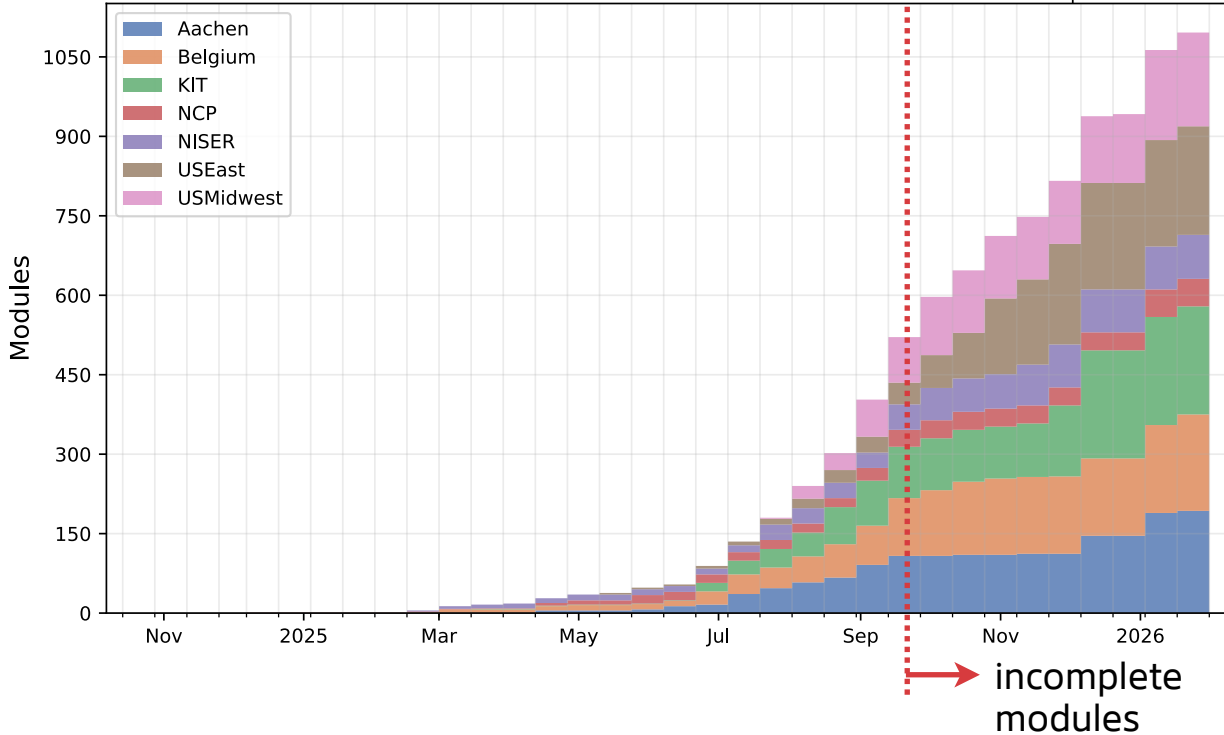


DESY

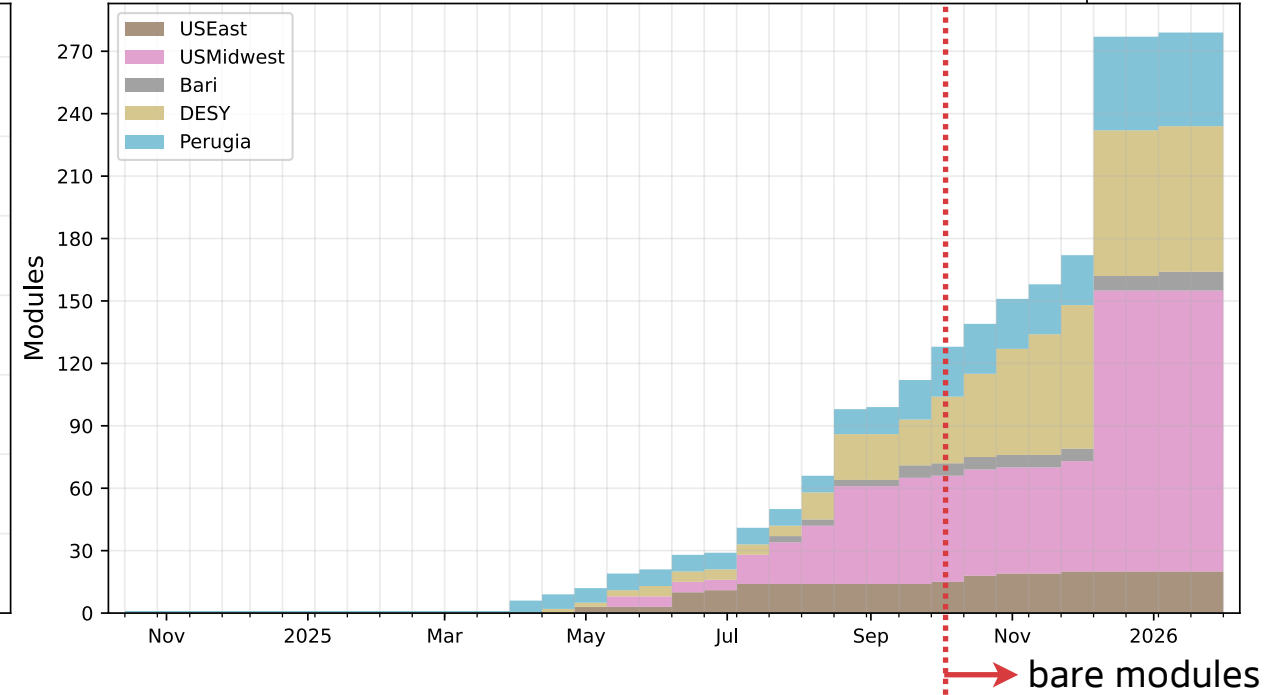


# Module production status

2S Module History (Cumulative)



PS Module History (Cumulative)



- As of today we have assembled 1092 / 275 potentially good 2S / PS modules
  - potentially good means not damaged, bad or unusable
- About 50% of the modules are incomplete 2S or PS bare modules

# Conclusion

- Due to the issue with the bPOL12V and Valtronic the module production is limited
- For the moment we can only assemble 2S incomplete and PS bare modules
- In addition, we had to overcome several obstacles. So far, we have found solutions to all of them  
Module production rate has to ramp up as soon as possible in order to mitigate some of the delays caused by the Valtronic crisis