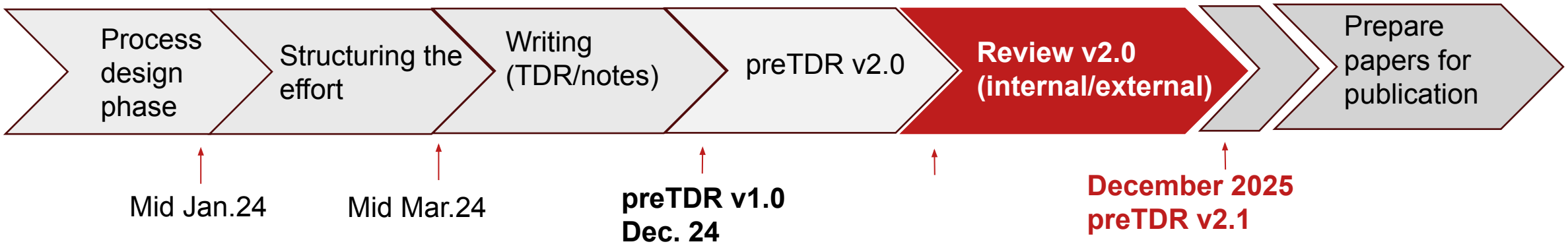
Software and Simulation Readiness for the preTDR



- **In 2024, we defined preTDR readiness for software and simulations with the collaboration—and successfully met those goals. In 2025, we renewed our priorities at the Frascati Collaboration Meeting, with many topics under our charge already reaching an advanced stage and positioning us well for the next phase.**
- Our advanced software and large-scale simulations serve as the backbone of both the pre-TDR efforts and the development of the Early Science Program
- Strong emphasis is placed on **coordination with Physics WGs** on simulation targets, reconstruction
- Surveys of DSCs provided insight into both ongoing activities and future plans.

We plan to use the October simulation campaign (25.10) for the detector and physics studies in preTDR version 2.1.

Use of the 25.10 Campaign for preTDR-2.x: Deadlines

Cutoff Dates for Software Releases and Input for Simulation Production:

Sept. 8	Allowed time for iteration. Now passed.
Oct. 6	In about a month, but no chance for iteration or delay recovery. **Requires coordination now to mitigate risks**.

- All remaining changes to the detector geometry, as well as updates to the digitization and reconstruction software that are intended for inclusion in preTDR-2.x studies, must be completed by these dates.
- This also includes the validation of MC inputs for the simulation productions, as well as background files.

Plans for October Software Release (25.10)

- **Geometry and Materials**: Updated silicon outer barrel geometry, revisions to MPGD geometry, and material map update for FTOF.
- **Reconstruction**: ACTS patches to undo regressions with new material map generation, reworked low-Q^2 tagger momentum reconstruction, and clustering in TOF.
- **Ongoing Discussions**: EEEMCal performance to be addressed; forward ECal geometry, random noise injection, and secondary vertexing under discussion.

Software Release 25.10

Tagged ePIC 25.10.0 geometry (TODO), select notable changes:

- Updated refraction index for dRICH (Chandra)
- New Inner Barrel SVT geometry (Shujie)
- New Outer Barrel SVT geometry (Aditya and Sam)
- New SVT supports (Shujie)
- Reduced overlap check tolerances (Wouter)

Tagged EICrecon 1.30.0, select notable changes:

- Clustering for TOF/LGAD implemented - not yet used in tracking (Tommy)
- Updated dRICH PID LUT (Ramandeep)
- Resolved bug with overflow bin being populated for pfRICH PID LUT (Simon)
- Low Q-2 ONNX workflow used by default, old TMVA implementation removed (Simon)
- Reconfigured island clustering in ScFi to not use longitudinal hit position (Wouter)
- Resolved issue with embedded background events missing calorimeter hits due to arbitrary timing cut (Wouter)
- Enabled digitization for FTOF (Honey)
- New reference positions for light attenuation in ScFi (Minho)
- Updated SiPM and light yield parameters for EEEMCal (Dmitry)

Software Release 25.10: Planned vs. Released Features

Planned vs. Released Features

- **Geometry and Materials**: ✅ Updated silicon outer barrel geometry, ✅ revisions to MPGD geometry, ✅ and material map update for FTOF.
- **Reconstruction**: 🚧 ACTS patches to undo regressions with new material map generation, ✅ reworked low-Q^2 tagger momentum reconstruction, ✅ and clustering in TOF.
- **Ongoing Discussions**: ✅ EEEMCal performance to be addressed, ❌ forward ECal geometry, ❌ random noise injection, ❌ and secondary vertexing under discussion.

We met all goals set for the 25.10 software release.

Software Release 25.10: Patches

Release Version	Release Date	Description
25.10.0	10/17	Initial Release
25.10.1	10/30	EICrecon was updated at Alex Jentsch's request to enable polynomial interpolation in far-forward reconstruction, with the agreement of the Exclusive PWG and PACs.
25.10.2	11/03	Correction to 25.10.1.
25.10.3	11/06	Fixed a memory issue related to backgrounds.
25.10.4	11/11	Correction to 25.10.3.

Simulation Campaign 25.10: Requests

- The 25.10 simulation campaign includes many new requests from the PWGs, including, for the first time, productions for the 10×100 beam energy configuration with embedded background.
- These requests are outlined in our **simulation request overview**.
- For some of these requests, we have received the MC input last-minute or in incomplete form.

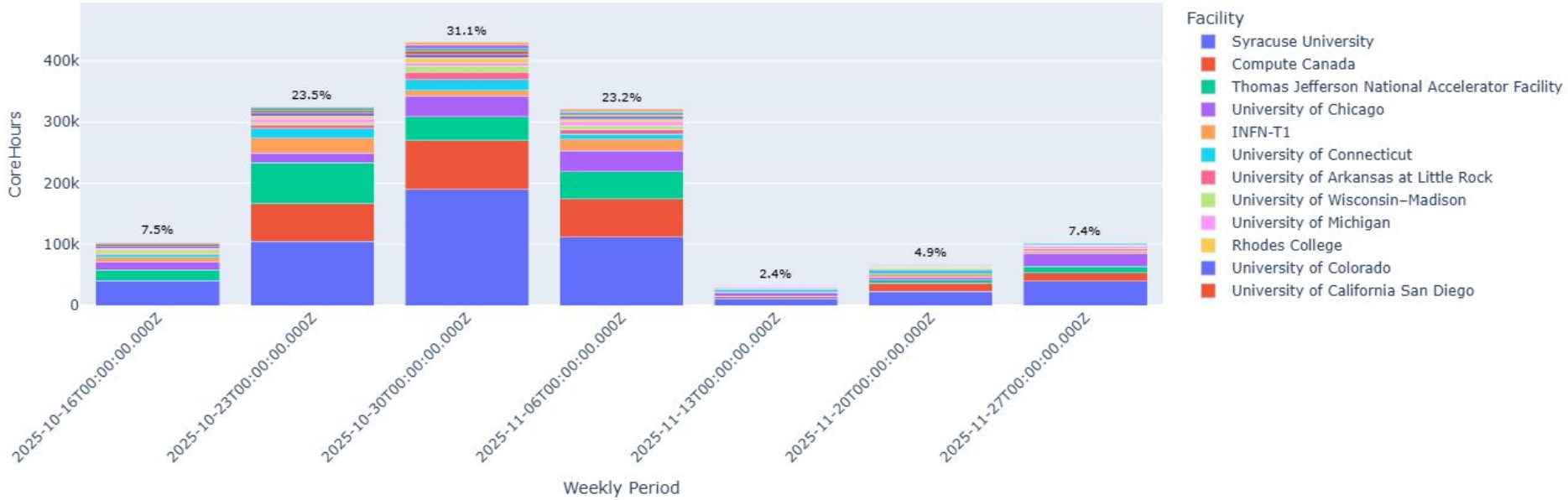
- We have agreed with the collaboration to deliver on simulation production requests marked with priorities 1 and 2.

- **We had targeted mid-November for delivery, and many productions are now available.**

Simulation Campaign 25.10: Status

- The 25.10 simulation campaign started on October 17, immediately following the 25.10 software release.

- Most of the priority 1 productions were available by November 18.
- The Production WG kept the analyzers informed about the new productions.



- The productions with the 10×100 beam energy configuration and embedded background are delayed due to another memory issue that remains to be resolved. This issue is related to the high occupancy, with O(1000) hits within the time window of the MAPS.

Simulation Campaign 25.10: Plans

- We agreed with the PACs to complete all simulation production requests marked with priorities 1 and 2,
  - while postponing the productions involving the 10×100 beam energy configuration with embedded background to the December campaign (or possibly later)

- The December campaign will also cover all requests with priority levels 1, 2, and 3.
- The memory issue affecting simulation production with 10 GeV electrons is not yet resolved. Therefore, in the December campaign, we will process all productions **except** those involving the 10×100 beam energy configuration.
- This includes smaller productions with the 10×100 beam energy configuration and the 10×275 beam energy configurations for tracking and vertexing studies.
- Once the memory issue is resolved, we will revisit this plan.