

Work Package 12.4 Monolith Systems

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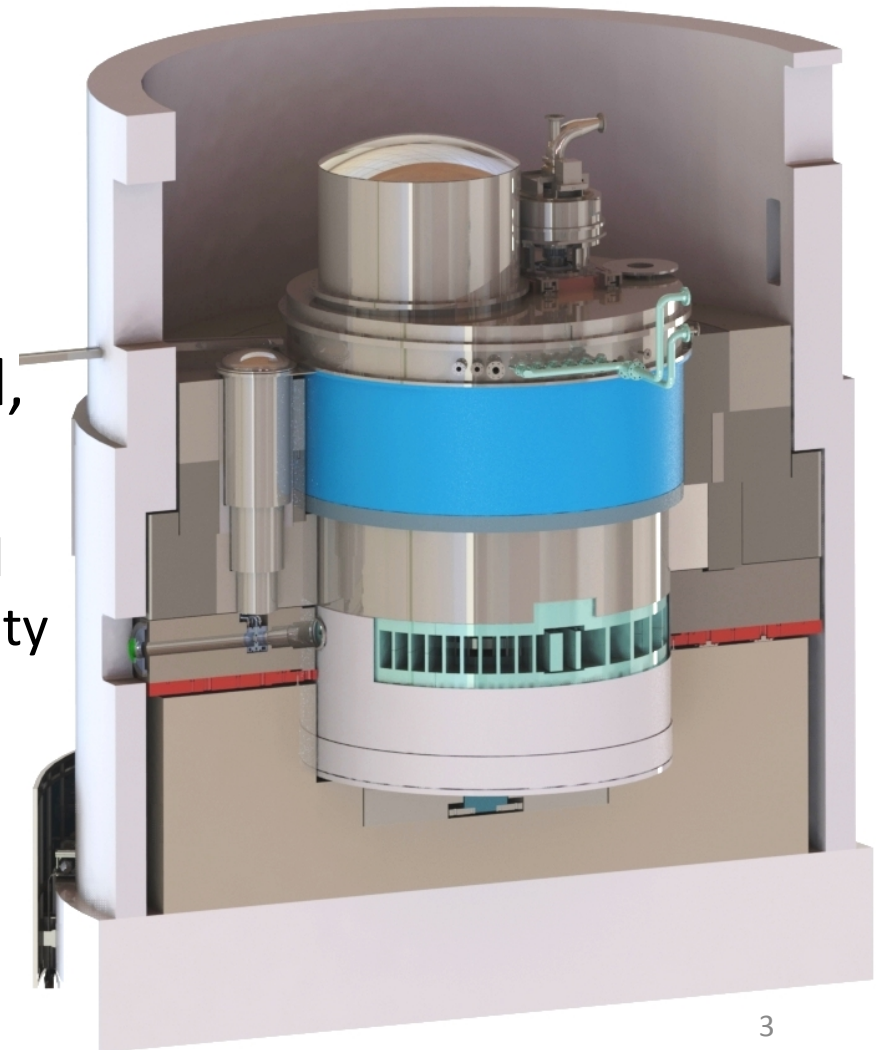
Outline



- Highlights
- Schedule performance
- Near-term plans
- Risks and issues
- Concluding remarks

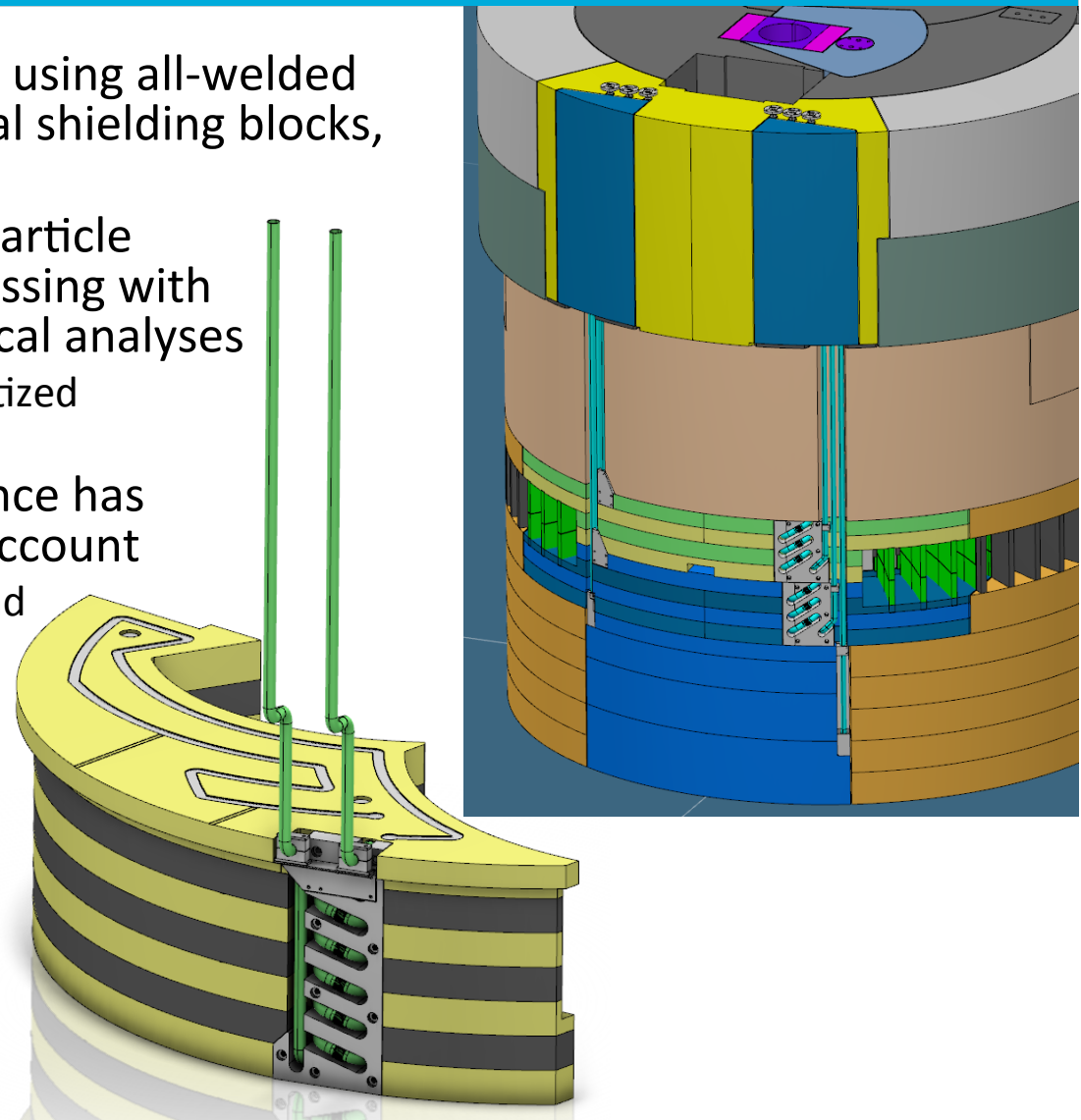
Highlights – Monolith Vessel (TIK.4.5)

- Preliminary design review for monolith vessel completed
- Provisional installation sequence has been developed, taking into account
 - Building construction works and availability of conventional facility utilities
 - Progressive vacuum tightness testing



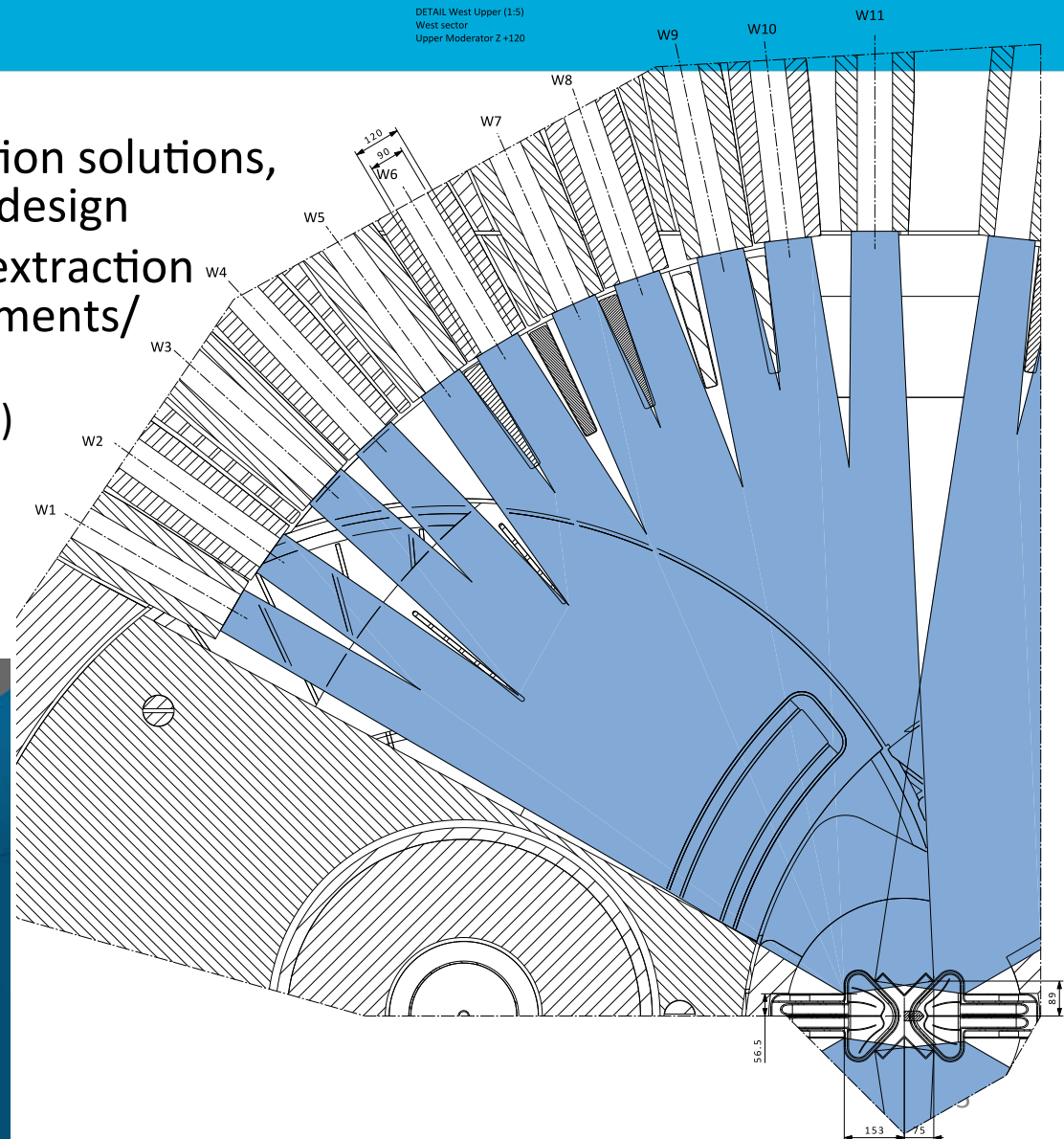
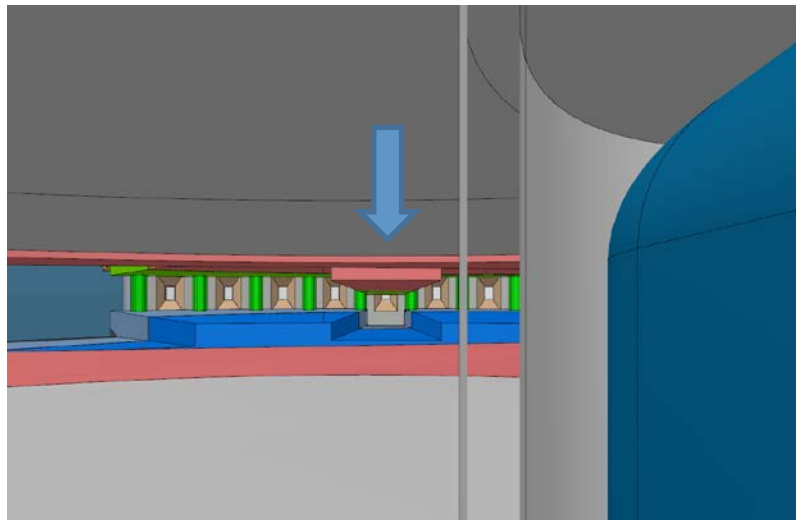
Highlights – Inner shielding blocks (TIK.4.8)

- Alternative technical solution, using all-welded pipes for water-cooled internal shielding blocks, has been worked out
- Volumetric heat load due to particle radiation is needed for progressing with thermal and thermo-mechanical analyses
 - neutronic calculations is prioritized and on-going
- Provisional installation sequence has been developed, taking into account
 - Building construction works and availability of conventional facility utilities



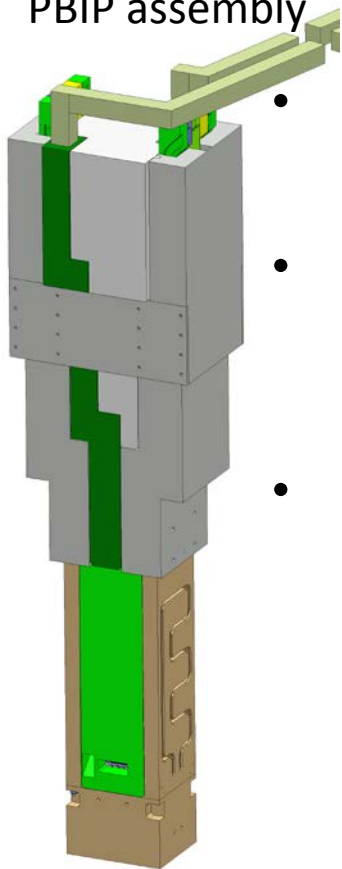
Highlights – Neutron Beam Extraction

- Focus on neutron beam extraction solutions, following the freeze of the MR design
- Accommodating special beam extraction requirements for special instruments/applications
 - FREJA/ESTIA (inclined extraction)
 - nbar (wide extraction)
 - ECHIR (fast neutron extraction)

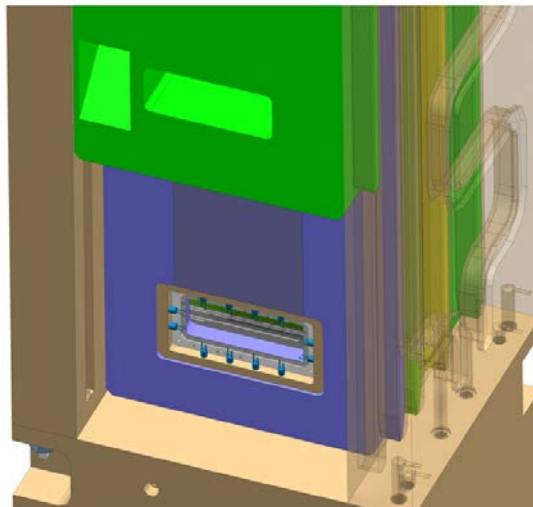


Highlights – Proton Beam Instrumentation Plug (TIK.4.2)

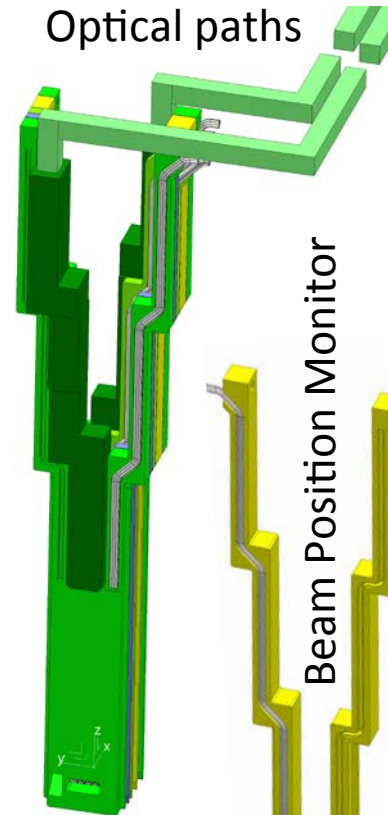
PBIP assembly



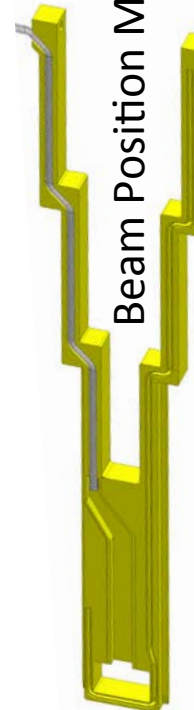
- Technical solution has been worked out in collaboration with ACCSYS Beam Diagnostics Group
- First drafts of preliminary design documentation present
 - System description documents
 - Interface control documents
- CAD model of plug structure and components developed



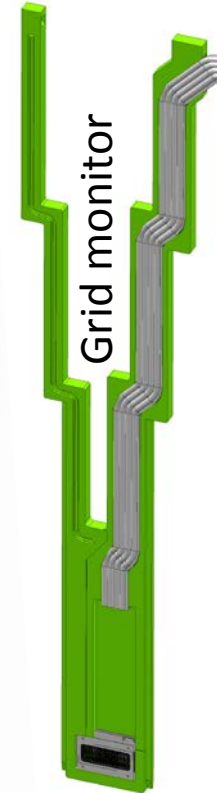
Optical paths



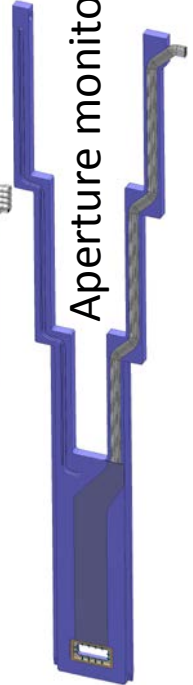
Beam Position Monitor



Grid monitor



Aperture monitor



Highlights – Beam Dump and Beam Dump Shielding (TIK.4.9)

- New shielding concept for the beam dump currently under review;
TDR solution of 600 tonnes steel and 375 tonnes of concrete is reduced to 94 tonnes of steel and 524 tonnes of concrete
- Parameters for Beam Dump agreed in collaboration with ACCSYS (Stephen Molloy)
- ICDs identified and started
- ESS Bilbao updated concerning all documentation that is needed and ESS procedures for PDR

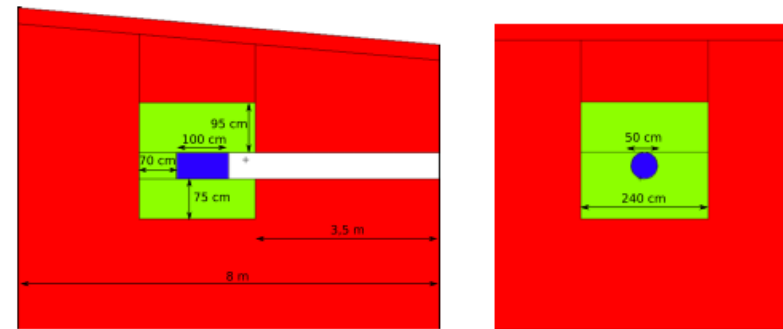
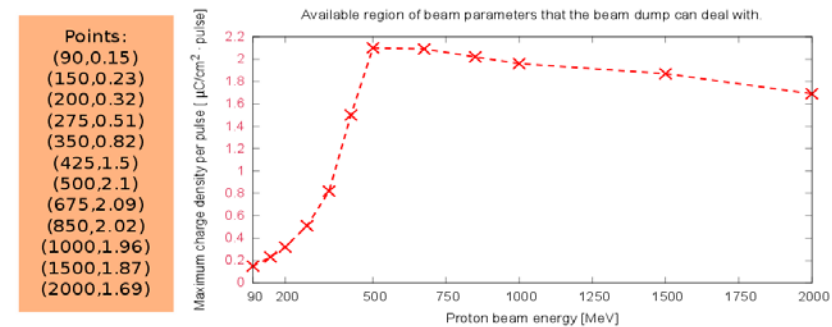
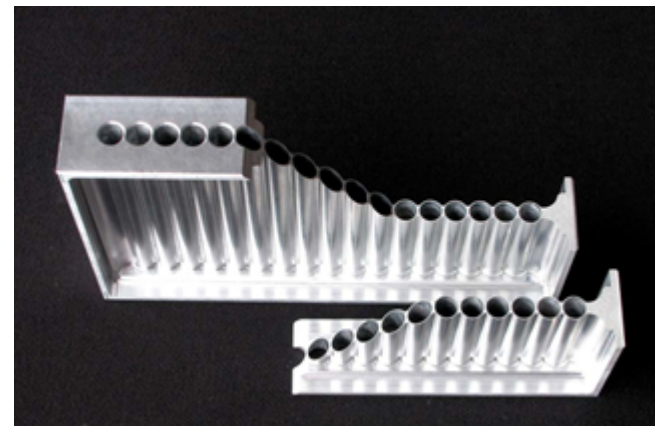
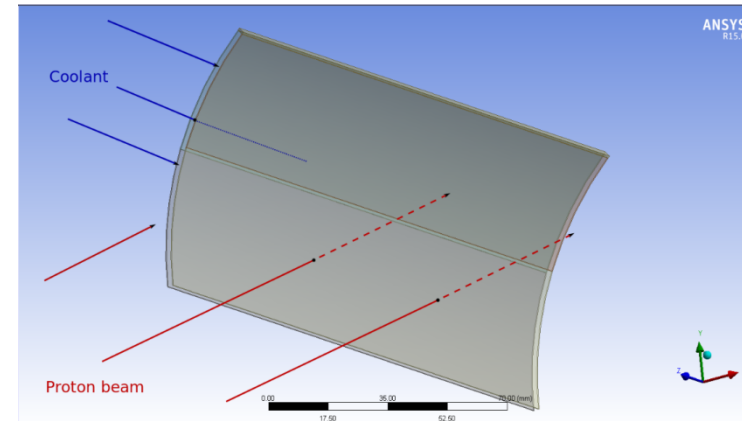


Figure 38: Current proposition for the shielding optimization around the beam dump.

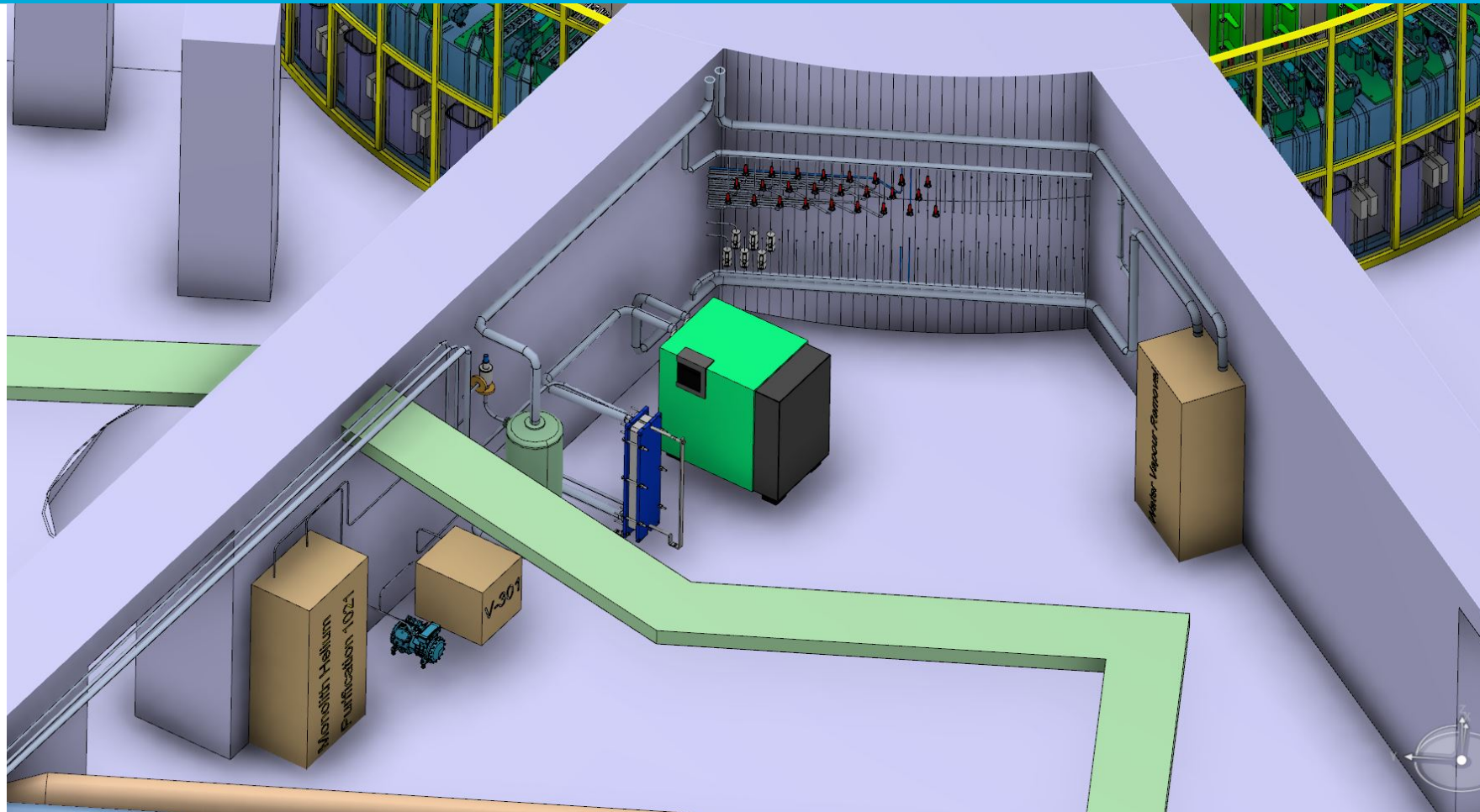


Highlights – Proton Beam Window (TIK.4.4)

- Proton Beam Window damage and lifetime calculations finished
- Two parallel concepts; TDR design with helium cooled panpipe and water cooled “beer can”-concept are being evaluated
- Different manufacturing companies contacted for prototypes and construction alternatives
- ICDs identified and started
- ESS Bilbao updated concerning all documentation that is needed and ESS procedures for PDR



Highlights – Monolith Atmosphere System (TIK.4.7)



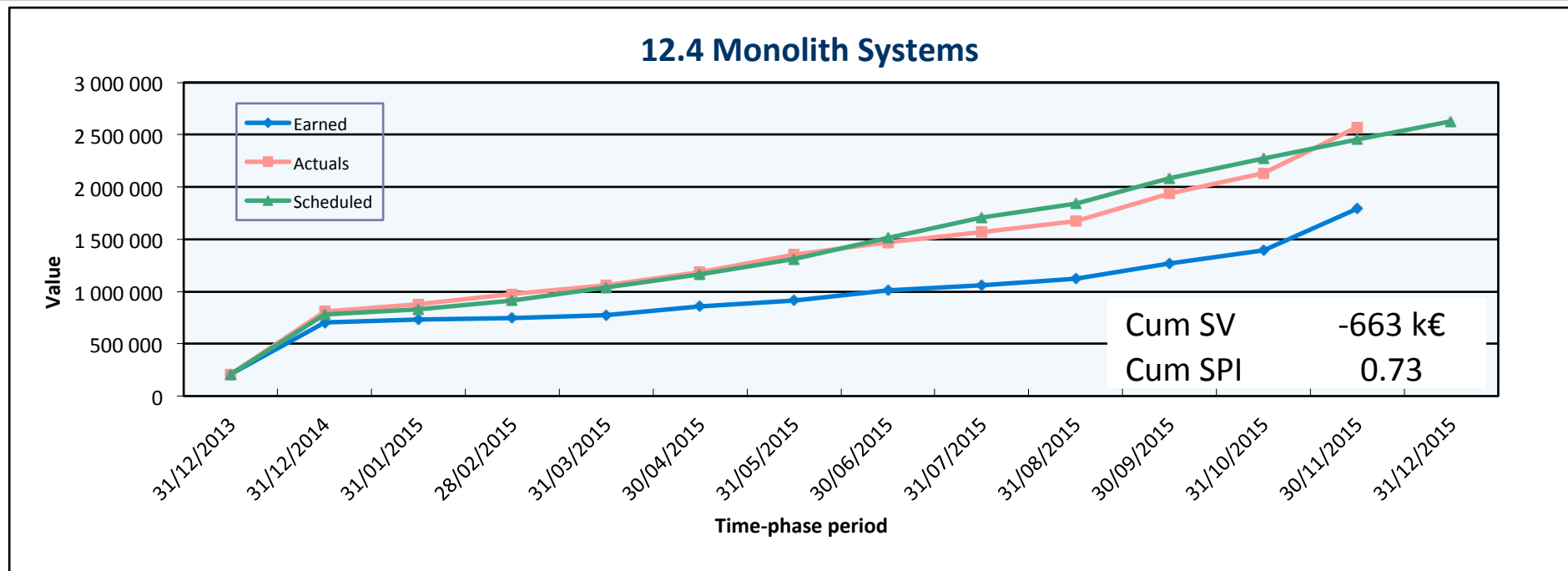
- First conceptual pipe routing and layout of components has been established
- Preliminary design review planned beginning of March

Highlights – Irradiation Module (TIK.4.3)



- Refer to presentation by Roberto Senesi

Schedule Performance (1 of 2)



Variance Analysis:

- Cumulative SV of -663 k€ (SPI = 0.73) is primarily due to:
 - In-house (Lund) resources have been engaged to progress preliminary design in order to avoid delay of Target completion date
 - Several work units, like monolith internal shielding and and partly neutron beam extraction system were put on hold, awaiting the finalization of the moderator enhancement. These are now restarted and recovering
- The design work for the target monitoring plug is still put on hold,
- In-kind work units in general on schedule
- Trend of SV/SPI is improving

Schedule Performance (2 of 2)



| ID | Name | Planned Date | Current Forecast or Actual | Delay (W.Days) |
|---------------|--|---------------------|----------------------------|----------------|
| A48360 | PDR for Irradiation Module | 2015-09-29 | 2016-01-16 | 80 |
| A64260 | PDR for Monolith Vessel | Sep 2015 | <u>2015-11-12</u> | 40 |
| A63990 | PDR for Proton Beam Window | Jan 2016 | 2016-02-11 | 20 |
| A47030 | PDR for Monolith Atmosphere System | 2016-02-09 | 2016-02-09 | --- |
| A69020 | Ready for installation – Proton Beam Instr. Plug | 2018-10-12 | 2018-12-11 | 40 |
| A69030 | Ready for installation – Irradiation Module | 2018-10-12 | 2018-09-27 | -10 |
| A64160 | Deliver Proton Beam Window to ESS site | Dec 2017 | 2018-07-04 | 130 |
| A64430 | Deliver Monolith Vessel to ESS site | 2018-02-08 | 2018-08-22 | 130 |
| A46300 | Deliver Neutron Beam Windows to ESS site | 2018-07-11 | 2018-07-11 | --- |
| A47200 | Deliver Monolith Atmosphere System to ESS site | 2018-06-29 | 2018-06-29 | --- |
| A43860 | Deliver Tuning Beam Dump System to ESS site | Oct 2017 – Jan 2018 | 2018-01-19 | --- |
| A44310 | Deliver Tuning Beam Dump Shielding to ESS site | Nov 2017 – Feb 2018 | 2018-03-15 | --- |

Near Term Plans (next 3 months)

- *Preliminary Design Reviews (PDRs)*
 - *Proton Beam Window*
 - *Monolith Atmosphere System*
 - *Proton Beam Instrumentation Plug*
 - *Beam Extraction System*
- ***Finalize installation sequence and civil construction interface***
- ***Perform detailed accident scenario analyses related to WP 4 systems***

Risks and Issues



- **Risk areas**
 - *Inappropriate building dimensions*
 - *Incorrect alignment requirements, either too high or too low*
 - *Incorrect vacuum requirements, either unreasonable and unrealistic or too relaxed*
 - *Incorrect shielding requirement, either overestimated needs or missing*
 - *Inappropriate safety classification of systems, structures and components*
- **Mitigation strategy**
 - *Continuous interface coordination with CF, NSS, ACCSYS*
 - *Frequent communication with and support by*
 - *Target Physics (WP 12.8)*
 - *ESS Vacuum Group*
 - *ESS Survey and alignment Group*
 - *ESS Logistics Group*

Risks and Issues



- *Risk areas*
 - *Lack of resources and staff*
 - *Delays in delivery of neutronics input data for monolith structures and components*
 - *Orphan scope*
 - *Missing interface requirements on CF*
- *Mitigation strategy*
 - *Focus and increased efforts on planning and coordination*

Concluding Remarks



- In-kind partners are in the process of taking over full ownership of several of the allocated work units
- Many work units suffer extensive delays, mainly due to the conscious decision to pursue the enhanced moderator performance which left WP4 short of engineering resources
- Delayed and deferred work units are slowly recovering