

Meeting on PANDA Central Space Frame

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September 6, 2019, FZ Jülich

Present:

- Dirk Grunwald, Ralf Schmitz, Herbert Schneider, Stephan Schoenen – FZJ/ZEA1;
- Tobias Stockmanns, Peter Wintz – FZJ/IKP;
- Stefan Koch, Jost Lühning, Lars Schmitt – GSI.

Stefan Koch presents the new concept of the Central Space Frame. The frame supports the beam–target–pipe, the MVD and the STT of PANDA. The concept is based on a carbon fibre reinforced studwork structure. An additional feature is the addition of a support pipe for the MVD service which allows to reduce the load on the beam pipe and in particular the stress on the fragile beam–target–cross.

In a further work the concept is detailed with more features, the implementation of ceramic wheels and the rails embedded in the Barrel DIRC mechanical structure. Two wheels downstream take the lever arm load on top, one further wheel at the upstream end of the frame takes the load on the bottom. The opposite two corners have guides.

The condition for the service support pipe in the current layout would be the reduction of the diameter of the upstream beam pipe from 150 mm to 140 mm. It has to be discussed with Alfons Khoukaz, responsible for the cluster target, if this may have a significant influence on the quality of the vacuum.

A further point of discussion to be addressed at a later stage when further calculations reveal stresses and loads is the proposal to introduce bellows at the ends of the target–pipe section embedded in the CSF. FZJ ZEA1 at a given point will do FE calculations with the CSF model and the beam–target–pipe model.

It is proposed that a given point a prototype will be constructed out of stiff Al alloy. The work could be done at GSI, if enough advance notice is given. On this prototype final corrections can be performed more easily before the actual carbon fibre structure is built.

Open questions were discussed:

- A fine adjustment of the beam pipe is not needed, its elasticity will accommodate for all needed variations. The pipe cross is fixed by clamps in four points to the CSF.
- A prototype of a bayonet for the coupling of the inner and outer part of the target–pipe section will be produced. This will deliver information on the necessary forces.
- A reliable model for cables and services is not yet available, neither for MVD nor for STT. A very rough model for the MVD is only illustrating the required space but has no technically binding layout. It served as input for the construction of the mockup model.
- A table with all loads and measures of the MVD exists and was communicated.
- The support of the STT FEE and the cable routing is still an open question.
- Positioning accuracy is in the order of several 100 µm but fine alignment of the MVD will be done with tracks. The concept of fixation of the MVD provides one fix point and three guide plates.
- An assembly concept has to be worked out to integrate all components of the beam–target pipe and the two detector systems in the right sequence.
- At the moment the CSF construction is planned for 2022. An Al prototype may be constructed earlier, if needed.

Herbert Schneider presents the status of the work for PANDA at ZEA1. The concept of the vacuum system was shown. Prototyping of the beam–target pipe in Ti is done. Bayonet

flanges are prototyped as well. MVD staves shall be produced in carbon fibre material. Beam tests for the radiation hardness of several foam and CF materials are ongoing at COSY presently.

Peter Wintz presented the requirements of the STT towards the CSF. He showed the current layout of the mechanical structure of the STT. Loads are to 2/3 on the upstream end of the system and to 1/3 at the downstream end. The current situation of manpower resources was pointed out. Open points regarding the STT mechanics are the following:

- Support of the FEE;
- Final dimensions and tolerances;
- Necessity of a shield to protect against temperature fluctuations and moisture around the MVD as well as its cooling and the according impact on the MVD;
- The proposed layout for the STT cable and service support structure consists of two half-barrels, combined at the upstream end by a ring holding element. The proposed layout needs further, dedicated CAD design workout with material studies, FEM calculations and prototyping phase.
- The MVD fixation at the CSF and possible interference with the STT volume has to be clarified.
- The STT inner radial dimension along the system length has to be determined and then frozen asap. A final and then binding agreement with the MVD responsible is needed about this dimension.

A rework of the CAD is needed, but no manpower is available. A prototype sector shall be constructed in 2020. Further open questions regard the cable and service support barrel that is located upstream of the STT surrounding the BWE EMC. More details of its design, the loads from cables and pipes and the movement mechanism are needed. Open points regarding the CSF from the STT are the assembly steps, adjustments, alignment measurements and covers of the STT halves towards the CSF.

The STT group strongly supports the proposed production of an CSF AI prototype. If possible with additional mounting points for the STT system and/or flexibility (e.g. exchangeable mounting elements).

Next steps are CAD of the global frame and of the bayonet, that have to be attached to the CSF. The question of the inner shield will be addressed in Jülich. The decision on the diameter of the upstream beampipe shall be taken with this year.