A journey with the FlashCam prototype body

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The FlashCam camera, as one of the two MST camera candidates, has completed an important step towards a fully functional prototype. The past years have been devoted to develop, test and build not only the camera electronics but also its enclosure. The main goals of the body design were easy access to all parts for installation and maintenance, a good light and water tightness, low weight at low cost, and a design suitable for mass production. Combining proven techniques and materials used in industry with unconventional construction ideas lead to a 3x3x1.1 m³ body of less than 1.7 tons, including the complete safety, power and filled cooling system as well as most of the cabling (figure 1). This body houses the readout and detector electronics of 1764 pixels which cover a field of view of 7.7° on the MST. The additional weight of the whole readout and detector electronics is estimated to be around 300 kg.

End of June the body without the readout and detector electronics was transported to the MST prototype structure in Adlershof, Berlin for mechanical and electrical tests. Figure 2 shows the camera body with the transportation frame and opened lid in Adlershof before being mounted into the camera frame of the MST prototype structure. The camera is installed with the help of a sledge system, which allows an easy and safe installation and removing of the camera (Figure 3). The excellent teamwork of the two teams from the University of Zurich and from DESY Zeuthen (figure 4) permitted a quick and easy installation of the camera.

The communication with the safety and slow control of FlashCam was tested with a dedicated Labview GUI as well as with a simple OPCUA framework. The piping, the flow and pressure of the cooling system was thoroughly tested under realistic coolant flow conditions.



Figure 1: Side view of the FlashCam body with closed lid, hanging on the crane before the transportation frame is being installed at University of Zurich. The side panel at the bottom includes the connectors for power and glass fibers. Coolant and dry air is supplied over a panel on the other side of the body.





Figure 2: FlashCam body in Adlershof before installation. The lid has been opened to prevent accidental damage during transport and installation. The Plexiglas entrance window (still a non-UV transparent placeholder) was installed to study the system's mechanical stability under different elevation angles, as well as the cooling system under realistic conditions with a nearsealed body.

Figure 3: FlashCam body mounted on the sledge system. The sledge can be moved with a winch placed in front of the body.

Figure 4: The proud team in front of the installed FlashCam. The camera lid is open and the photon-detector mount is visible. Photo by M. Garczarczyk.

For this, the camera was connected to a simple pump system (without heat exchanger) and was moved to different elevation angles. The installation of two photomultiplier modules with 12 PMTs each and a readout crate was used to determine the light tightness of the camera under different elevation angles (figure 5) and also to investigate a possible noise pick-up from the drive system (figure 6). The comparison of the light tightness measurements to the lab values shows that the body is only slightly leaking when the camera backside faces directly the sun. This is understood and is no issue for night measurements but will still be corrected for the pre-production series. A first analysis of the data shows no noise pick-up from the drive.

The body was finally unmounted again on July 30th within only two hours and transported to MPI-K in Heidelberg for the immediate integration of the readout and detector electronics for 800 pixels. Orders for the second half of the channels are being prepared or are already placed. The components will be installed in Q4/2015 - Q1/2016 to complete the camera.

A big thank-you goes to all people involved making this major step successful.



Figure 5: Driving of the telescope into its zenith position. The camera lid is closed and the installed detector modules are read out for offline investigation of possible light leaking and noise pick-up.



Figure 6: Camera rear doors open. The safety and power cabinet at the left lower rack position is being inspected. The slow control drawer is installed at the middle of the right rack. Installed at the top and bottom positions of the two racks are the fan drawers and the heat exchangers. One empty readout crate is also installed at the bottom of the right rack.