PACS Newsletter

Nr. 15, 5 February 2007

The PACS Picture of the Week

Fig.1: The PACS team, using special precision tools (left) and highly sophisticated alignment procedures (right), attempting to fix the faulty optics alignment.

Status

Welcome to the first issue of the PACS Newsletter in 2007. January was a very busy month for PACS, with opening, inspection and repair of the instrument, NRB meetings, preparations for the Key Project AO (HSpot/AOT input, GT science coordination, etc.), analysis of the FM ILT Phase I data, the science verification review part II, and the DECMEC FM manufacturing, to mention only a few of the activities.

Phase I of the FM ILT finished on January 4, with warm short functional tests. PACS was then opened for inspection and for an investigation of the chopper and slicer optics non-conformances (see Newsletters #12 and 14). The major findings can be summarized as follows:

A) Optics

The slicer optics was indeed found to be misaligned. The mechanical conditions of the unit were, however, excellent, proving that the cryo-vibration has not done any harm to it. In fact, the slicer unit was misaligned from the beginning. In the meantime the misalignment was analysed in detail and repaired to a large extent. The light loss for the upper an lower slices are corrected. The light loss of the right column of the FOV should also be minimized now, at least as far as it was caused by the slicer optics: at this point it is not entirely clear if there are additional misalignments in the optics system contributing to the light loss of this column. Without a complete disassembly of the entire system, which would have caused months of delay, it was not possible to clarify this. Remaining misalignments (if any) will only be visible in ILT.

Part of the FOV rotations could also be corrected. The remaining rotation of the entrance optic is about 1°, which causes the chopper to move tilted by this degree over the sky and w.r.t. the entrance aperture. This means for the spectrometer that the chopper now moves closer to parallel to the slicer than before (figure 2 left and middle). For the photometer there is a remaining total rotation of the arrays by 3°, i.e. the chopper moves with 1° tilt over the sky, and the arrays are tilted by in total 3°:

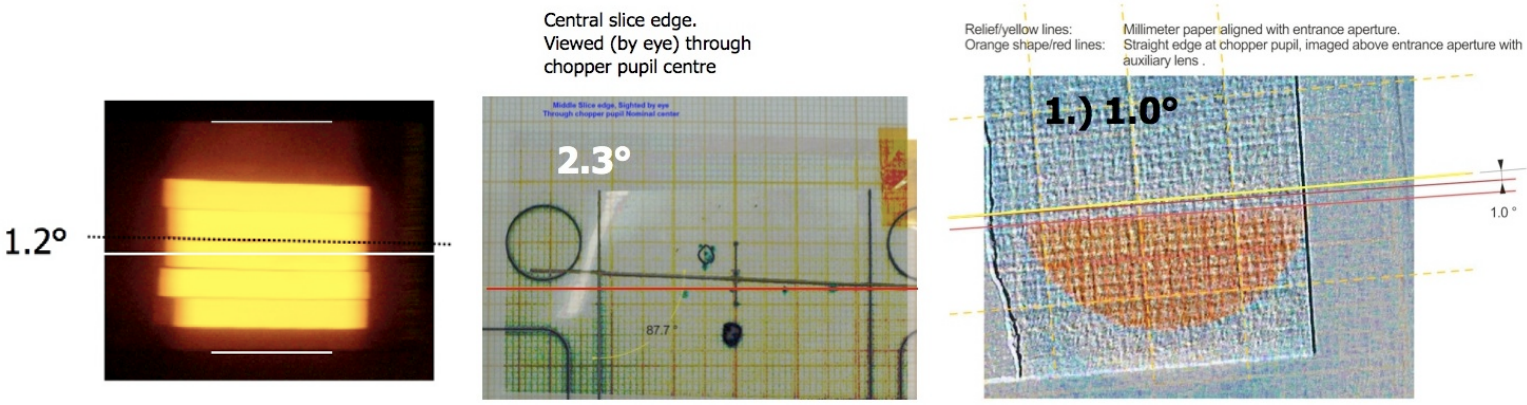

Fig.2: left: remaining misalignment of IFU with respect to chopper direction after repair (almost parallel); middle: the same, but before repair (much less parallel); right: misalignment of chopper direction against reference frame (sky), unchanged

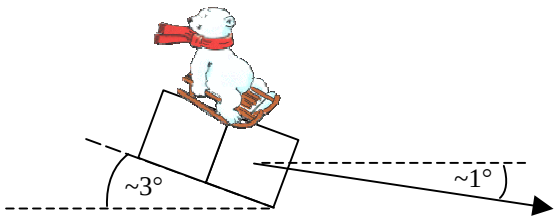

Fig.3: Illustration of the photometer array path across the sky (relative to the reference frame)

Note that this behaviour is not yet reflected in HSpot. Guidance for the observer will have to be added to the PACS manual once the effect (exact angles) is fully characterised in ILT.

B) Chopper

The chopper has been x-rayed and finally totally disintegrated. One of the laminated springs of one of the flex pivots was found to have a crack, for a hitherto unknown reason. Several explanations have been suggested (like a material defect, material fatigue, mishandling, etc.) but none of them could be proven up to now. We consider, however, an over-testing during cryo-vibration as very unlikely. One fact was noted, however: the material of the flex pivots of this particular chopper was thinner than the material of all other chopper units that have been built so far.

The chopper was replaced with the original FM unit (the broken chopper was originally the FS chopper). We hope that, although the reason for the damage could not be found until today, the new chopper unit will not experience the same damage in its further handling.

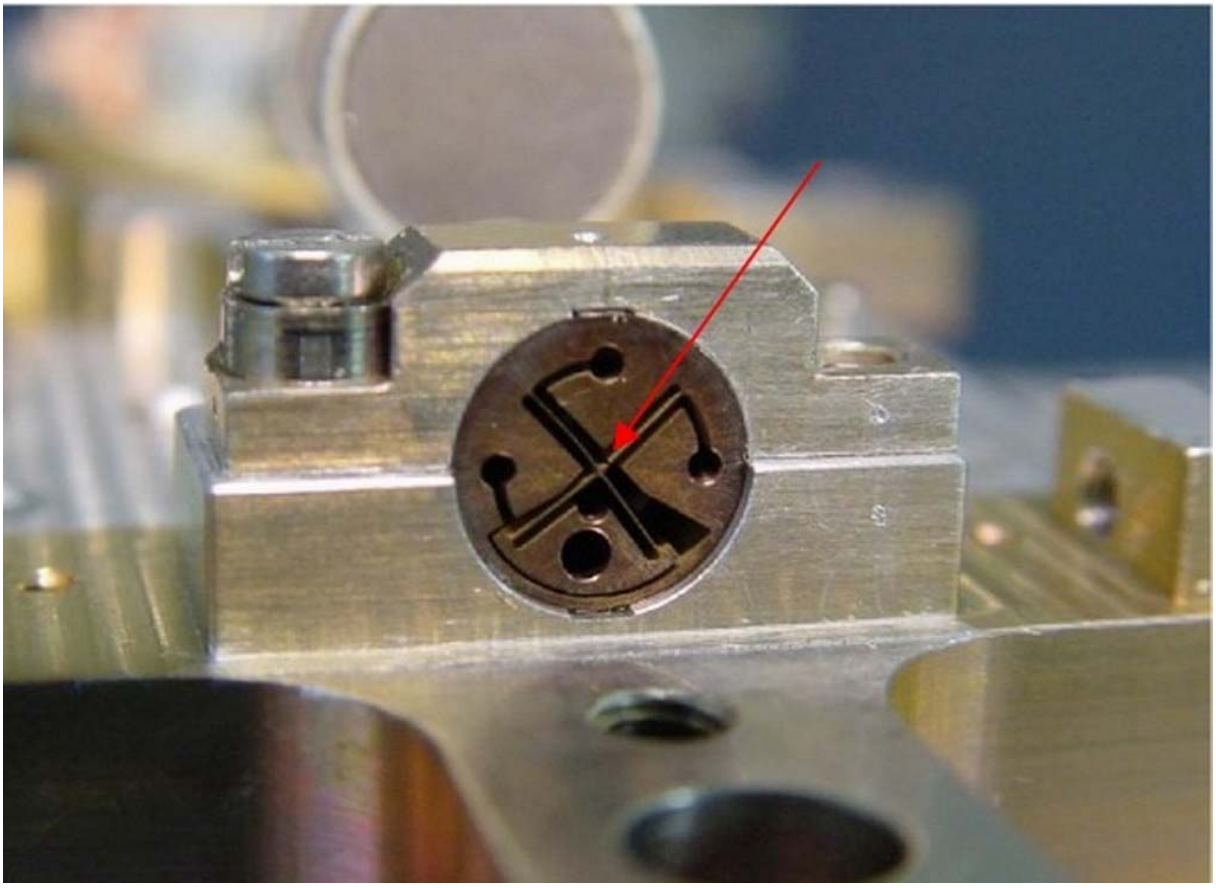

Fig. 4: The crack in the flex pivot blade of the chopper (scale: ~4:1, i.e. the brownish circular structure in the centre of the image has a diameter of a little less than 1cm in reality).

Schedule

PACS is currently undergoing final electrical continuity checks and will soon be moved back to the PACS lab. We will resume FM ILT (phase II) on Thursday afternoon (February 8) or Friday morning with a warm short functional test and some additional chopper tests. Cool down will start immediately after that.

The final delivery date of the DECMEC FM is still uncertain. If it does not arrive at MPE next week we will adopt our FM ILT test plan ("plan B") and start the cold tests of phase II with the EQM DECMEC version, just like in phase I, on February 19 (TBC). Of course, an exchange of the DECMEC during ILT would cause a break in the test of several days.

The PACS Newsletter is edited by:
Dr. Eckhard Sturm (PACS ICC Deputy Manager)
sturm@mpe.mpg.de
Chief Photographer and Photo Editor:
Dr. Albrecht Poglitsch (PACS PI)