VLTI Memo

AMBER

Orig. : J.-B. Le Bouquin
Dest. : all AMBER
Copy to :
Date : 02-12-2008
Version : 1.0

Subject : **AMBER Low_Res closure-phase versus piston.**

Presents :

Scope of this memo

This memo summarizes the test made the night 2008-11-05 in order to explore the dependency of the AMBER LowRes_K closure-phase with the apparent piston on AMBER. These tests have been done with FINITO.

Data reduction and analysis

Data have been taken between 2008-11-06T07:08 and 2008-11-06T07:43, with AMBER in Low_JHK mode, with FINITO-H70 and with the baselines A0-D0-H0. FINITO/OPDC setup was standard (complete, 5fringes, 0.5ms).

In order to create an apparent piston on the AMBER camera, I displaced the OPD-translation stage (ACU) of FINITO and wait for the FINITO loop to recover the fringes. For each OPD, 2 AMBER files have been obtained with DIT=27ms and NDIT=1000. Before the observation, I took a P2VM and execute the ZEROPD correction. Therefore the P2VM intrinsic piston was small (P2VM fringes strait on the RTD).

Concerning the data-reduction, I used the standart package `amdlib-2.2`. I averaged all frames. I extract the closure-phase value from the files OIFITS_AVG. This report focus on the wavelength bin at 2.2μm only. I extracted the piston from the files OIFITS_RAW (table AMBER_DATA, column OPD). I averaged the piston over the all frames. Note that the piston value is therefore relative to the P2VM one.

Results and discussion

Closure-phase is a robust quantity over a large quantity of parameters, including DIT and FINITO performances. Main known instabilities are slowly varying drifts with times. During

the relatively short time of our experiment, we can expect those drifts to be a linear trend with time, if any.

Our plot shows a clear dispersion of the closure-phase with a important amplitude of 8deg peak-to-peak (more/less at others spectral bins). These variations are clearly related to the pistons introduced. However, I did not find any simple dependency "closure versus piston". The strangest feature is probably the closure-phase jump between files 12 and 13, while only a small additional OPD is introduced.

I believe these effect have been overlooked before the arrival of AMBER+FINITO because the atmospheric piston "averaged" this effect. Yet, a clear bias on the AMBER-standalone is still possible is the averaged pistons between SCI and CAL are different.

I remind that the piston is practically a chromatic quantity that is affect by: achromatic atmospheric opd due to turbulence, chromatic dispersion due to air in the DLs, exact position of FINITO fringe-tracking point within the H-band packet...

Conclusions

- We demonstrate **the dependency** of the AMBER+FINITO closure-phase with the piston. However, we did not find a simple calibration law. The amplitude is around 10deg peak to peak (larger/smaller for other wavelength bins in K-band).
- We recall the dependency of the piston with several observation parameters that our of the control of operations (dispersion, atmosphere, FINITO-tracking point...). We recall that it is a chromatic quantity.
- It is possible that the observed effect does not come from the fringe-piston within the spectral bin (fringe-tilt), but from the fringe-phase (fringe-position). Further tests may be needed to disentangle them, especially because a dependency of the fringe-contrast versus the fringe-phase is also suspected from other data-set.

This proves that:

- AMBER is currently not able to provide robust closure-phase Low_Res. Such high-amplitude systematics may quickly dominate the signal error.
- We don't know if an action has to be taken on the software side `amdlib`, or if this effect come from a physical effect. In the latter case, errors coming from `amdlib` should be enlarged to avoid mis-interpretation of the data.

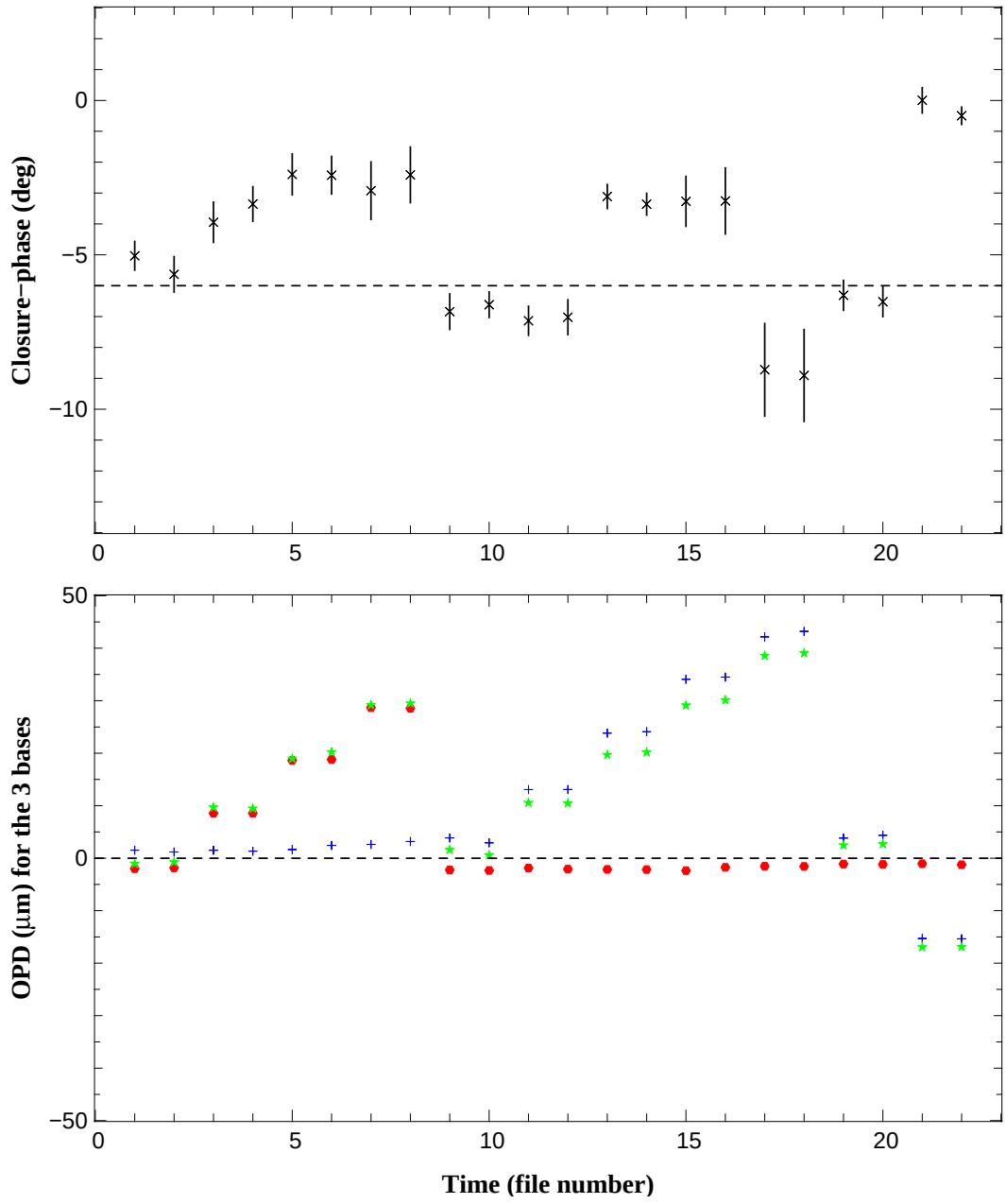

Figure 1*: **Top:** `amdlib` closure phase versus file-number. The dashed line is the average level for all files obtained with all piston around 0. **Bottom:** `amdlib` piston versus file-number (piston has been average over the 1000 frames of each exposure).*