

JB's internal Memo

AMBER DRS meeting

Orig. : *J.-B. Le Bouquin*
Dest. : Petrov, Domiciano
Date : 15-March-2008
Version : 2.1

Subject : **AMBER DRS when using FINITO - absolute vis2**

Presents :

Scope of this memo

This memo summarize the current status of AMBER+FINITO science operation: AMBER data quality versus FINITO performances (sec. 1) ; the FINITO working range (sec. 2) ; absolute AMBER vis2 calibration when using FINITO (sec. 3) ; and perspectives on logging/post-processing the FINITO data (sec. 4)

1 – AMBER data quality versus FINITO performances

Fig. 1 shows the AMBER performances (vis2 and closure-phase) versus the FINITO performances (RMS of the phase over the complete exposure), and for different DITs. Fringes are tracked by FINITO on baselines 0-1 and 1-2. These observations have been taken in relatively good conditions: seeing of $0.6 \sim 0.9$ as, and τ_0 of $3 \sim 5$ ms. Conclusions:

- The closure-phase precision is increased as soon as FINITO is working (even with bad performances). So the user interested in closure-phase should quasi always use FINITO.
- No clear bias on the closure-phase versus the FINITO perfo is noticeable (obvious).
- The AMBER vis2 shows a clear trend versus the FINITO perfo (obvious).
- Using FINITO clearly increase the AMBER vis2 for long DITs (obvious).
- Even if FINITO is working well, the AMBER vis2 depends on the AMBER DIT.

2 – FINITO working range

I plot the performances of last 6 months of FINITO operation in Fig. 2, versus the flux on channel 0 (common channel to the 2 tracked baselines), the seeing, and the coherence time. Looking at these plots, I defined the 'working conditions' as:

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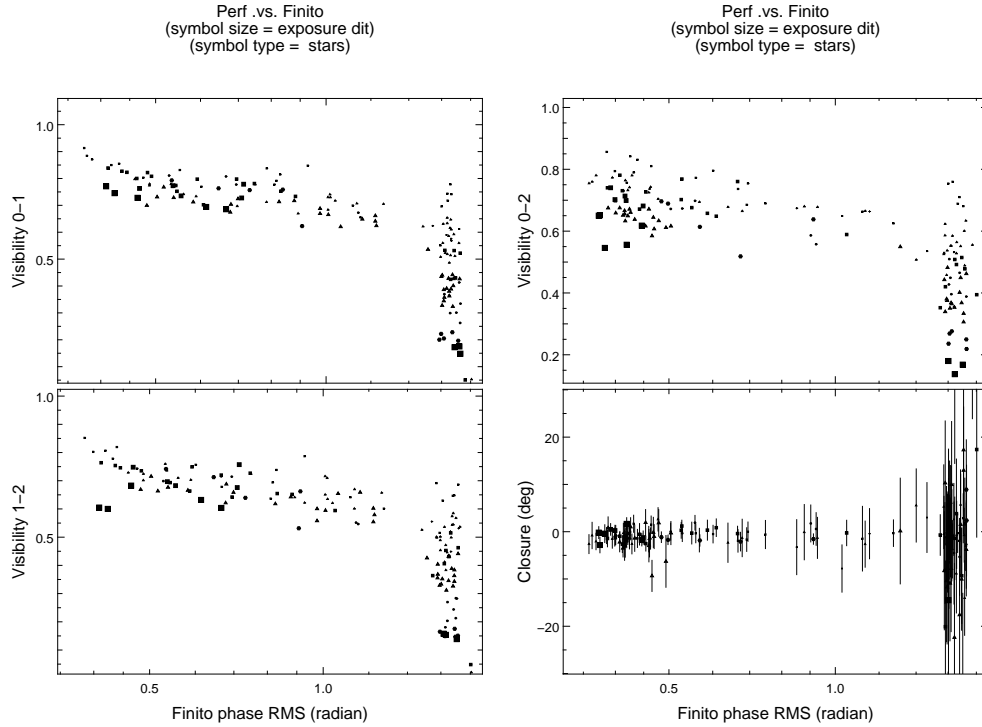


Figure 1: 2007-01-27, MR_K, AMBER vis2 and closure-phase versus the FINITO phase RMS, for different AMBER DIT and different stars. The different DITs are 0.2, 0.5, 1.0 and 5.0s (sorted by increasing symbol size). Observations with RMS larger than 1.3 have been done without FINITO. Results have been computed by keeping 30% of the AMBER best frames sorted by SNR.

- seeing < 1.2as, and tau0 > 3ms,
- average flux > 200ADU, even it is not easy to conclude in term of flux. The operational limit is about at $Hmag \sim 5$ (ATs) and $Hmag \sim 8$ (UTs), but this can be reached only if the seeing AND coherence time are significantly better than the limits defined previously.

Important to notice: the seeing and tau0 constraints can be relaxed to about 1.5as and 2ms if short AMBER DITs are possible (smaller than 100ms), AND if the user is only interested in phases (no absolute calibration of vis2).

A last information is obviously missing: the fringe visibilities. It should be included soon in the log, so that we will have a statistic for this parameter in about 6 months. The real operational limit is vis₀5%, forget about tracking on smaller fringes even with very high flux. This is probably due to a design problem is the spatial filtering of FINITO.

3 – Absolute AMBER vis2 when using FINITO

*** TO BE DONE ***

C. Hummel is currently working on a poster for SPIE, where he should present some AMBER transfer-function plots, possibly with and without FINITO.

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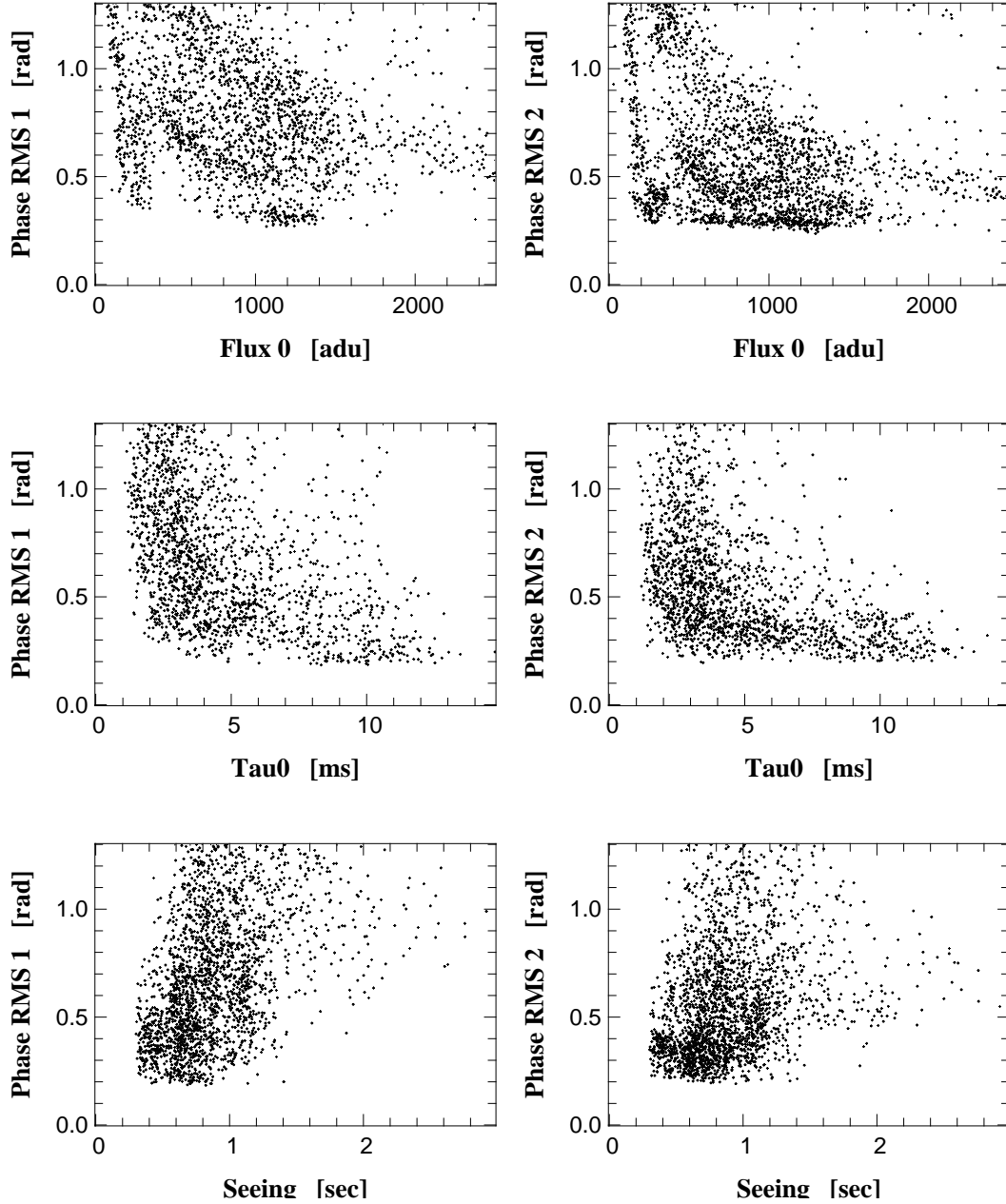


Figure 2: *FINITO* performances (phase RMS in rad) versus the flux on beam0 (common beam to tracked baselines), the coherence time, and the seeing. All these data have been collected with a *FINITO* DIT of 1ms. These data have been collected with the *AUTREP* tool, ranging for about 4 months of observations. Unfortunately, the fringes visibility was not stored at that time.

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Moreover, during the last period, several visitor-mode astronomer used AMBER+FINITO to measure diameters of small stars, or faint vega-like disk. Those calibrator data (public) may help us to better understand the behavior of the AMBER transfer-function when using FINITO. For information, I reduce quickly data from the nights 2007-11-27 and 2007-11-28 with the standard `amdlib` package, keeping 30% of the best frames sorted by SNR. Results of these 2 consecutive nights are plotted in Fig. 3. It is clear that FINITO *sometimes* stabilize the transfer function... but this is not systematic.

4 – Perspective on logging the OPDC/FINITO data

VLTI is now equipped with the RMNrec machine, which spies the real-time communications between several subsystems, and can create proper FITS files with precise and synchronized time-stamps. Two types of signal with scientific interests are contemplated to be logged:

- OPDC and IRIS data may be used for selecting the AMBER frames based on external parameters instead of SNR (fringe-lock flag, real-time phase, real-time image centroids on IRIS). No test have been done yet. These are already available on the RMN, and can be stored as soon as the AMBER templates are modified. Will probably be done in the incoming months. For science, impact on software is mainly on the AMBER DRS side.
- FINITO raw data may be post-processed to measure the target H-band visibility. Currently, not the raw data but some partially processed data can be stored. Recent test show that visibility precision of few percent can probably be achieved routinely as shown in Fig. 4. Important work on automatic DRS should be done. I am interested by work on ti, but I have not enough time to do it myself (very preferably, such DRS should be public and managed by JMMC for instance). Work has been started to log the real raw data, but this will not be achieved before 6 months.

Important to notice: Even if the goal is to have these data attach on all AMBER observation as standard, they will be offered by ESO *on a best-effort basis*. Quality will not be guaranteed by QC, pipeline will not be provided by ESO.

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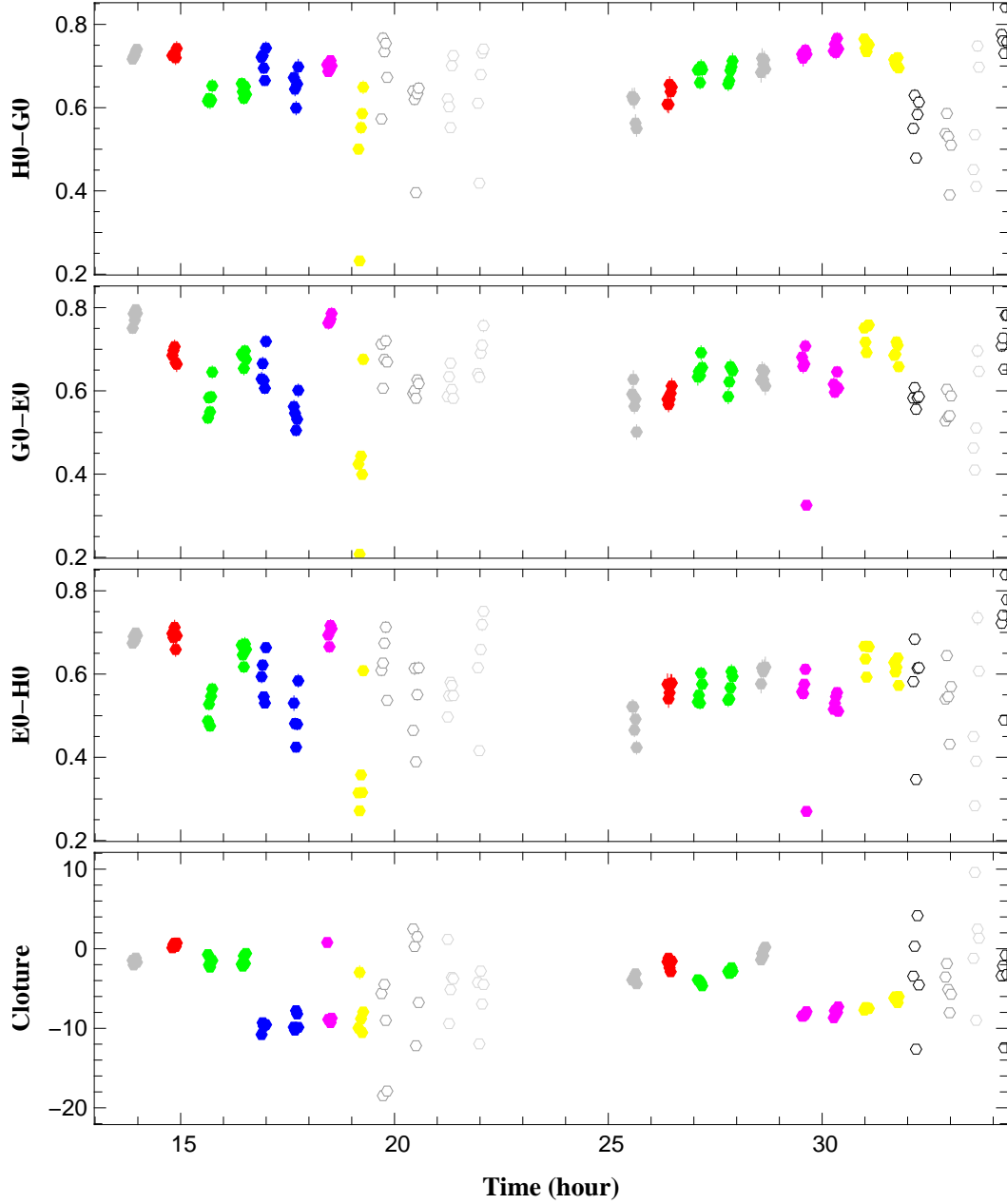


Figure 3: *AMBER transfer function (squared visibilities divided by target diameter, raw closure-phase in deg) for 2 consecutive nights. Open symbols are no-FINITO while filled symbols are FINITO observations. Time is in hour (half day have been removed between each night) and the symbols color stands for the different target. Note that only the calibrators have been plotted (science observations are not public in the ESO archive). Data have been reduced with the standard `amdlib` package, keeping 30% of the best frames sorted by SNR. The P2VM has been redone at the middle of each night, most probably explaining the closure-phase jumps each nights.*

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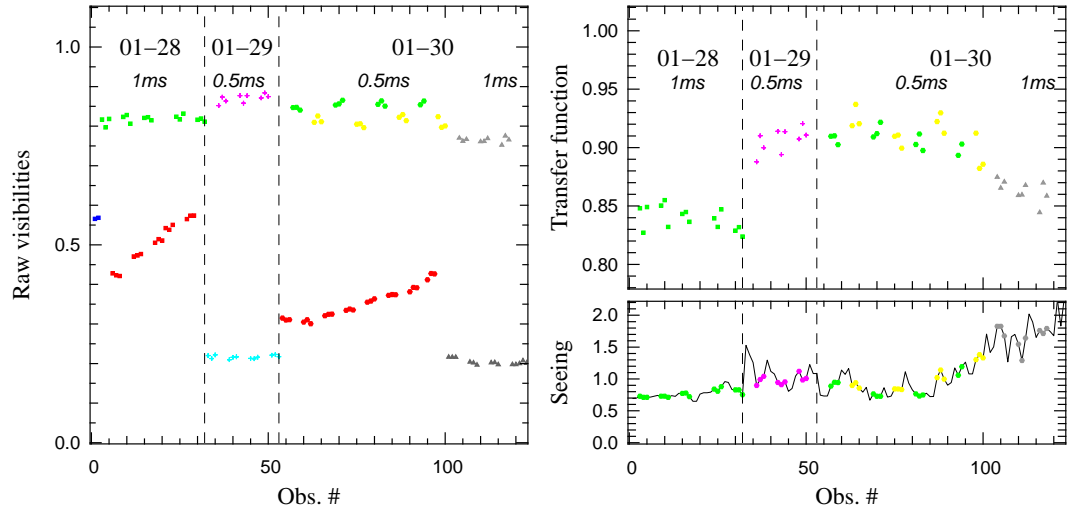


Figure 4: Target visibility as measured in the H-band by post-processing the FINITO real-time data. We made use of partially processed data, not real raw data, since the latter were not available on the RMN at that time.