VLTI Memo

Memo Number: ???

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Subject	:	**Corrupted frames at detector setup**
Presents	:	

Scope of this memo

The goal of this memo is to explore the behavior of the first frame taken by the AMBER IRACE detector when starting an exposure. This work has been trigerred by 3 facts:

- AMBER detector is known to show strange bias level, lasting for few frames at the beginning of each exposure.
- When using DIT of 12s users demonstrate that one need to skip at least 2 additional frames in the data processing, in addition of the already skipped one at the time of the data acquisition. This strategy of frame skipping dramatically reduces the overall efficiency when long DITs are used **(we offer up to 12s, which corresponds to at least 40s overhead per exposure)**.
- IRACE detector are theoretically able to run in "Seq. Continuous Mode", which means without restarting the sequencer at the beginning of each exposure.

Test performed

AMBER detector was setup in LowRes with the PRISM window for 3T. The SLIT was setup with the DARK position. NDITSKIP was always set to 0 in order to capture the effectives first frames of the exposure. Then the following sequence has been performed : see Table 1.

Corrupted frames at detector setup

The initial purpose of this test was to explore the number of corrupted frames at the beginning of each exposure, because of strange and changing bias level. For each exposure, we computed the median of the bias level for each non-void frames and plot it versus the frame number

Table 1*: Observation summary*

NDIT	DIT	Sequencer Mode	Readout Mode
40	0.1s	stopping/non-stopping	double/multiple
5	1s	stopping/non-stopping	double/multiple
5	6s	stopping/non-stopping	double/multiple
5	12s	stopping/non-stopping	double/multiple

(see next section for discussion about void frames). Result is in Figure 1, for the different setups (DITs, sequencer mode and readout mode).

We can conclude that

- The number of corrupted frames may depends on the detector DIT but, **whatever the DIT, a minimum of 3 frames are strongly corrupted when restarting the sequencer.** This is a critical problem when using DITs longer than 1s since it dramatically reduces the overall efficiency.
- The restart of the sequencer is indeed the reason of the changing bias at the beginning of each exposure. **Using the non-stopping mode allow to get correct frames immediately** (assuming sufficient time went through since the last detector setup) This mode should be implemented as soon as possible.

NOTE: The commands `SETUP ",,DET1.BKG T"` and `SETUP ",,DET1.BKG F"` are send before and after the DARK to specify the OS that we are now taking a dark or not. **These commands restart the sequencer anyway, so it is impossible to keep the detector running between the dark and the fringes files !!!**

Void frames

Looking at the data, it was clear the all "SEQ. CONT" exposures contain numerous void frames, that are frames without data nor correct time-stamp. For each exposure we determined *1)* the actual number of frames and *2)* the actual number of non-void frames. Non-void frames are always the last frames of the exposure. Results are plotted in Figure 2. Important to notice, the execution time for the stopping and the non-stopping mode is very similar, meaning that the void frames do not correspond to real frames.

We can conclude than the stopping and non-stopping modes have same number of non-void frames in the exposure with a very similar execution time. This means **the non-stopping mode has higher efficiency since less (none) of these frames are corrupted by strange bias.** In both cases the number of non-void frames correspond to the specified NDIT. **The potential problems (data load, DRS) of the numerous void frames in the non-stopping mode have to be analyzed before effectively implementing this mode.**

NOTE: The `amdlib-2.2` package is able to reduce the observations taken in non-stopping mode. It just complains that numerous frames are void, but is able to remove them before reducing the data.

Bias level and RMS for double and multiple readout

To compare the double and the multiple readout modes, we computed the RMS of the bias over the frames for each pixel. To get a single value per setup, we took the median of the RMS over the detector (in fact over the DARK part of the detection, so region 1). Final bias level can be estimated by looking at the value obtained with the non-stopping mode. Results for bias level and RMS are plotted in Figure 3. Data taken in stopping-mode (red points) have RMS completely out of the range because of the corrupted frames.

We can conclude that

- Final bias level increase with the DIT. **It could be an effect of dark current, or a contamination from thermal emission.**
- Bias RMS increase with the DIT.
- Multiple readout mode do not improve the RMS.

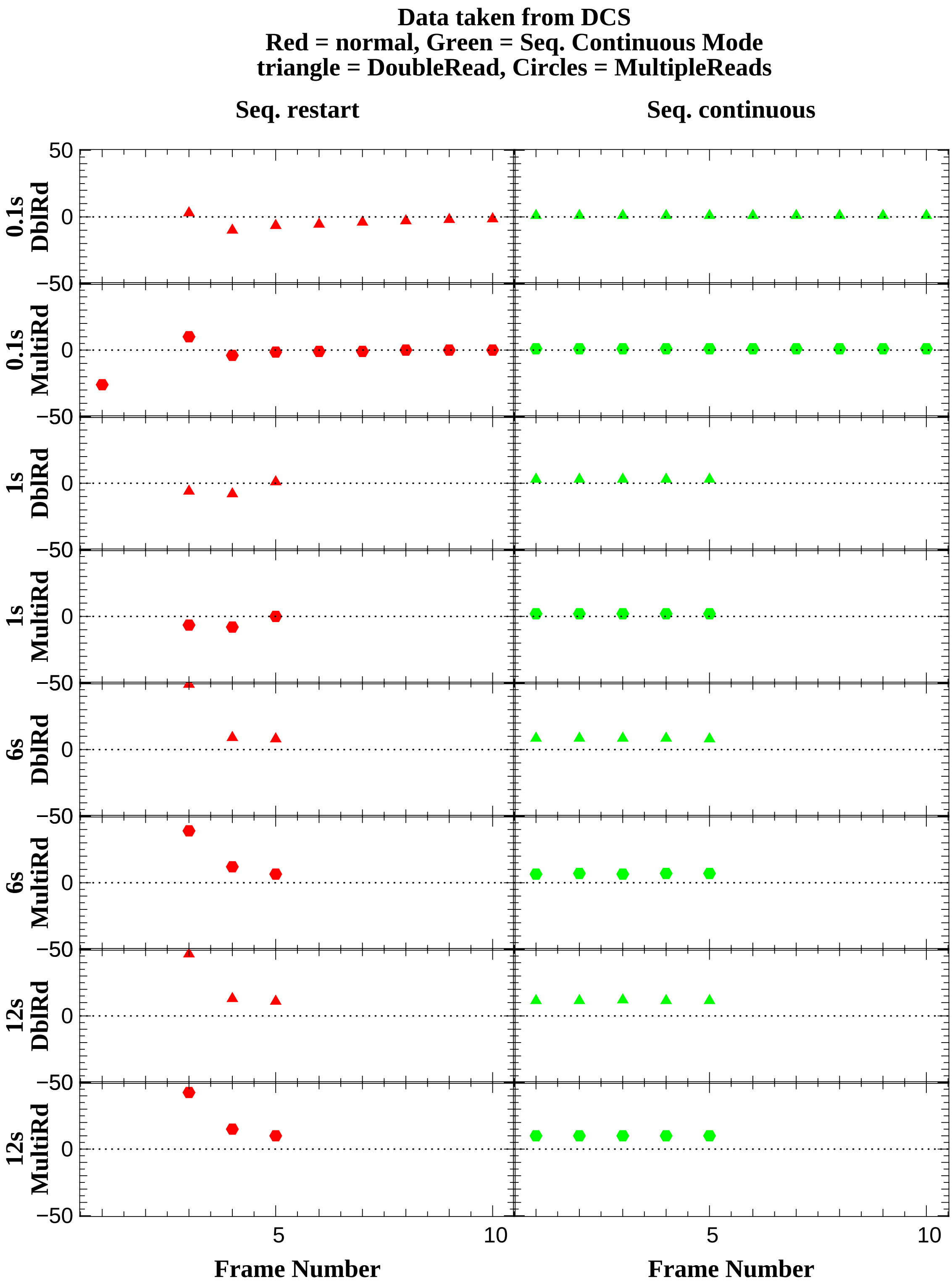

Figure 1*: Median of the individual frames plotted versus the frame number, for the all the exposures. The final bias level (so the correct one) can be estimated from the exposures taken in non-stopping mode (right) since they are clearly not affected by strange bias at start. Legend is the same as in Figure 2.*

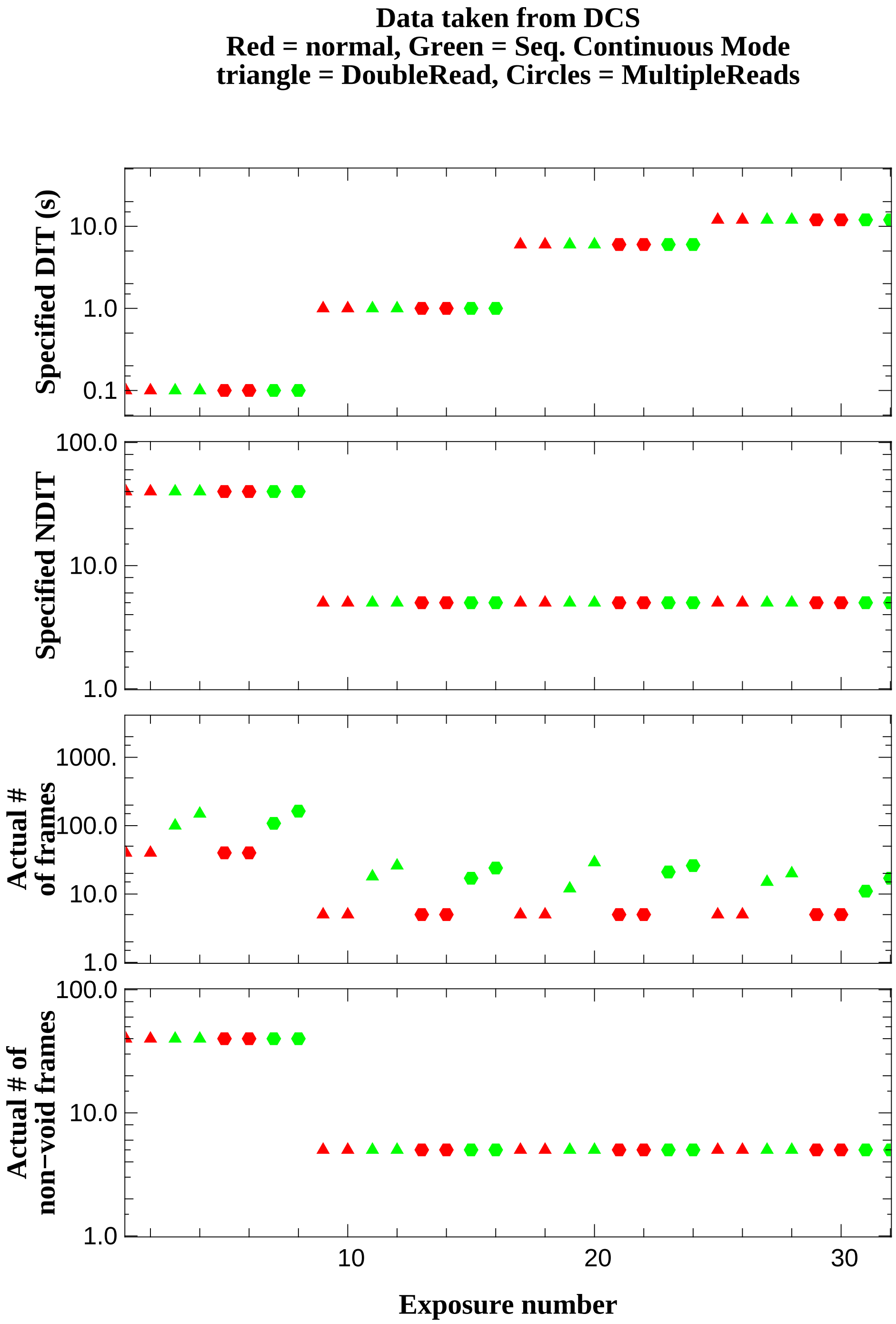

Figure 2: *From top to bottom: requested DIT and NDIT, actual number of frames obtained in the recorded exposure, and actual number of non-void frames in the recorded exposure (these are always the last ones). Colors are for the sequencer mode (red=stopping mode, green=non-stopping mode) and symbols are for the readout mode (triangle for double and circles for multiple).*

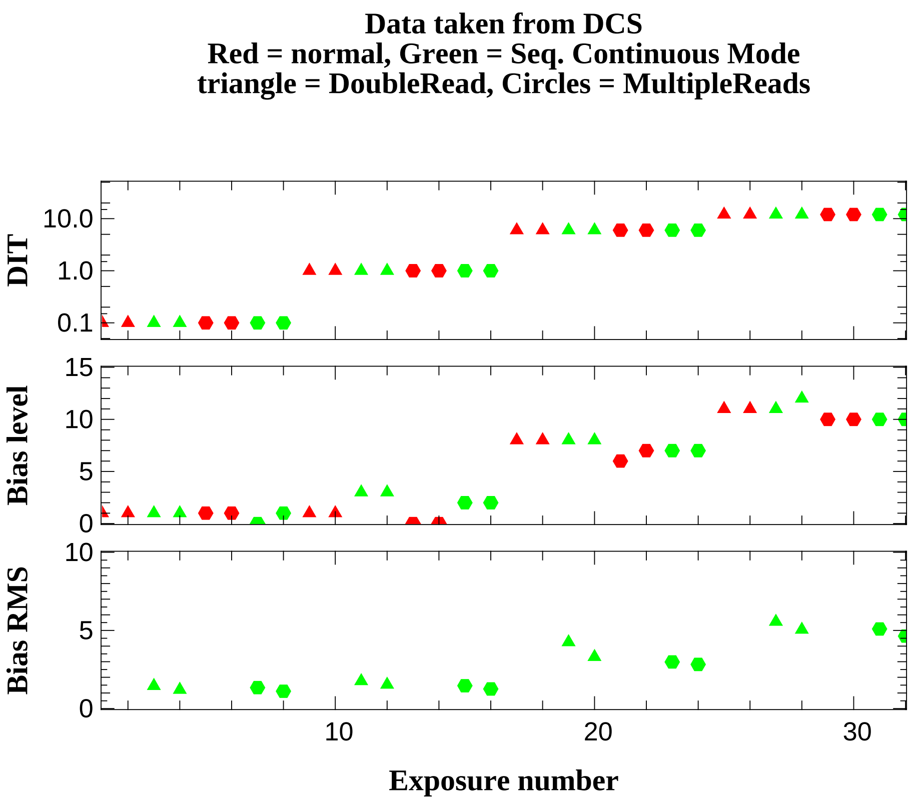

Figure 3: *Median of the individual frames plotted versus the frame number, for the all the exposures. The final bias level (so the correct one) can be estimated from the exposures taken in non-stopping mode (right) since they are clearly not affected by strange bias at start. Legend is the same as in Figure 2.*