# Determination of the CTE correction on mosaicked ACS data

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All CCDs on HST are subject to radiation damage, which deteriorates the detector performances. One of the most severe effect is the degradation of the charge transfer efficiency (CTE). Poor CTE has the effect of removing small amount of charge from the charge packets during the transfer from one pixel to the next severely affecting the accuracy of the photometry.
Correction to restore measured integrated counts to their "true" value is therefore required.
The charge loss due to imperfect CTE depends on the combination of many parameters, such as:

- the position of the source on the detector,
- the total counts of the source,
- the physical extent of the source,
- the level of the background,
- the amount of damages suffered by the detector.

Riess and Mack 2004 provided the following CTE correction for WFC data

$$YCTE=10^{A}xSKY^{B}xFLUX^{C}xY/2048x(MJD-52333)/365$$

where coefficients A, B, and C depend on the aperture size adopted for the photometry and Y represents the number of transfer in the parallel direction.

The proposed YCTE parameterization can not be directly applied to complex mosaicked drizzled data, as the one shown in Figure 1, where any given star can be at very different distances from the amplifiers, and thus be subject to different amount of charge losses in each of the individual frames.

We solved this problem applying the following steps:

- Perform the photometric analysis of the entire mosaicked image; this provides the most accurate magnitude (mag) determination for the stars detected in the image.
- Correct each individual frame for geometric distortion and perform core aperture photometry on the detected stars.
- Calculate the YCTE correction for the photometry obtained on the single exposure.
- Cross-correlate all the catalogs obtained from the aperture photometry and compute for each detected sources the average value of YCTE (<YCTE>). The single exposures are still affected by cosmic rays; to obtain a clean determination of <YCTE> a sigma clipping on the associate magnitudes may be required.
- The average correction is then applied to the magnitude of each star: mag+<YCTE>.
- Given that the uncertainties on YCTE for very faint stars is comparable to the photometric errors, stars too faint to be detected on single exposures are not corrected for CTE (see Fig 2).

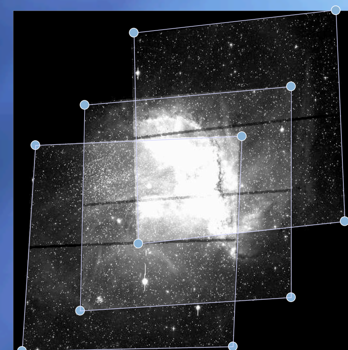

Fig.1: Mosaicked image of NGC 346. The three pointings are shown. The positions of the amplifiers with the respect of each pointing are marked (blue dots).

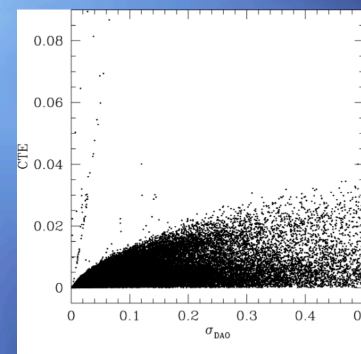


Fig. 2: CTE correction for a single exposure as function of the position on the frame.

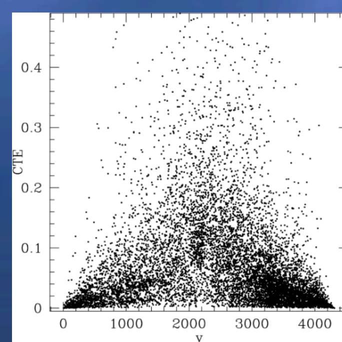


Fig. 3: CTE correction for a single exposure with an integration time of 3 sec, as function of the position on the frame.

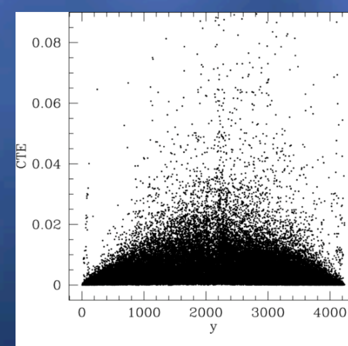


Fig. 4: CTE correction for a single exposure with an integration time of 456 sec, as function of the position on the frame.

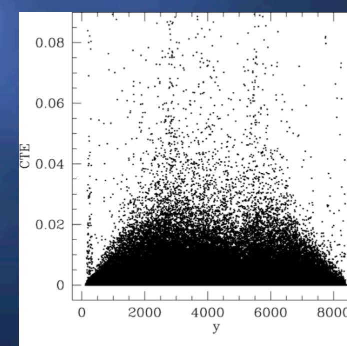


Fig. 5: CTE correction for the mosaicked image shown in Fig. 1, as function of the position.