

CAMERA EXPOSURE TIMES

In order to determine fluxes observers need to take the observed energies derived by IUE image processing and divide by the exposure times. For most exposures the observer can quite simply use the exposure time he specified on the script (provided no modifications were done). Using the requested exposure time will give an accuracy of better than 1% for any exposure of 60 seconds or longer.

In the case of shorter exposures it is necessary to consider the effects of the hardware on the requested exposure time. The hardware which times the exposure uses a clock which has a resolution of 0.4096 seconds. As the actual timing algorithm is to count these 0.4096 second pulses from the clock, all exposure times are actually multiples of 0.4096 seconds. Further the command structure of the S/C is designed to make use of this integral property of the timing mechanism by sending exposure times pre-computed into clock quanta (0.4096 sec). The conversion from seconds of time to clock quanta is done by truncating the exposure time from the requested value to the nearest number of clock quanta which is less than the requested time. Users may compute the actual exposure time by dividing the requested time by 0.4096, taking the integer portion of the result and multiplying that value by 0.4096 seconds.

This process will yield errors of less than 1% for exposures longer than 10-15 seconds. Shorter exposures must account for the effects of the shuttering mechanism used to turn the exposure on and off. The camera exposures are regulated by turning the high voltage to the intensifier on and off. This process results in a shorter integration than requested due to the power supply rise and fall time characteristics.

Recently we acquired data for the express purpose of calibrating this effect. An analysis of this data reveals the cameras (SWP and LWR) have virtually identical errors of 120 milliseconds. Thus the corrected exposure times should be 0.12 seconds shorter than that predicted by the clock quanta.

In the determination of the risetime a substantial amount of jitter was observed. (The error bars of the determination were approximately ± 15 msec.). A check with the engineers has revealed there is an additional uncertainty of 30 msec for each command due to the interaction of various pieces of hardware on the S/C. Unfortunately this error in the exposure time is not predictable as is the quantization and rise/fall time problems but rather an inherent inaccuracy in the exposure time. However even for the shortest exposure ($0.4096 - 0.12 = 0.2896$ seconds) the uncertainty is only about 5%).

Summarizing the exposure time for IUE is the requested time in seconds truncated to the next lowest multiple of 0.4096 seconds and then minus 0.12 seconds for camera turn on/off times. The uncertainty of this time is then ± 15 milliseconds due to the interactions within the timing hardware.

Francis H. Schiffer, 3rd

July 25, 1980