A GHOSTLY REMINDER

Even after more than 6 years of continuous operation IUE still throws up a little surprise occasionally to give us RAs something to think about: on a perfectly normal maintenance shift in June this year a high dispersion SWP image of Eta U Ma, one of our bright high resolution standard stars, was read down. The one thing distinguishing this particular image from the hundreds of others of this star was the very prominent low dispersion "ghost" order cutting through the high dispersion orders. This is the sort of thing that would make a guest observer (and his RA!) very nervous if he saw it on his own image in real time. The "ghost" appeared to be the residual of a previous low dispersion exposure. However, this was a negative residual i.e. the DN level of the residual was below that of the surrounding region of the host high dispersion image.

Positive residuals are well known. They occur on long exposure images which directly follow heavy over-exposures and are due to phosphorescence of the ultraviolet-to-visible converter phosphor (see, for example, IUE ESA Newsletter No. 16, p10, 1983). However, no-one at VILSPA could recall seeing a negative residual before!

So how did it get there? No over-exposures had occurred and at handover GSFC reported only a minor (200%) low dispersion overexposure in the SWP. This had been followed by a normal SPREP. The first image of the VILSPA shift (the image immediately preceeding the one in question) was also an SWP low dispersion image of a standard star. The obvious first step in the ensuing detective work was to establish whether there had been a malfunction in the SPREP between this first image and the one exhibiting the ghost. An SPREP consists of two tungsten flood-lamp exposures each followed by a read. The corresponding images are actually read-down but not archived. However, they can be reconstructed from the history tape. It was found that the first flood, at a level of 200% (i.e. saturated), had worked perfectly. This would normally erase any information on the camera target remaining from a previous exposure. The fact that it worked therefore also erased any hope of explaining this

phenomenon in terms of residuals from previous exposures! However, the second flood image of the SPREP, at the 50% level, gave us a big clue: this image had a half-saturated low dispersion order across it. Still puzzled ? Read on.

The SPREP was performed during the slew to Eta U Ma. Unfortunately, however, the slew finished before completion of the PREP procedure: the second flood exposure was carried out with Eta U Ma (mag 1.8) only a few arcsec from the shortwave large aperture (the manoeuvre had been very occurate one, unfortunately!). The result was that scattered light from the bright star had contaminated the 50% flood exposure of the PREP, to the extent that a partially saturated low dispersion order appeared on it. Now when an image is read down, the camera target is left in a somewhat non-uniform state. This is precisely why a prep-sequence is performed before an exposure is made. One of the reasons for non-uniformity is imperfect cancellation of positive charge on the target by the read-beam. In fact a large concentration of charge will tend to be more effectively cancelled by electrons in the beam than the surrounding region, leaving a negative residual, or "ghost" image, as in this case.

The moral of the tale is that if you have a bright object in the aperture while preparing a camera, you might affect the camera target sufficiently to generate photometric errors. The secure way to avoid any problems is to have no star in the aperture during a PREP sequence.

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