

INSTRUMENT SCIENCE REPORT  
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TITLE: Filter F656N Anomaly - I  
AUTHOR: Shawn Ewald

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*Need Work*

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ABSTRACT

~~Narrower/incident~~ The H-alpha narrow bandpass filter in WFPC, F656N, has deteriorated since delivery. A series of concentric rings is visible on exposures taken through this filter. The rings are centered near pixel (300,600) of CCD WF1 and extend across all four chips. Also, CCD WF4 shows fringes and filter F664N probably has a ghost.

An OV exposure of M42 was taken through the H-alpha filter F656N in WFC as part of the linearity check OV test. This exposure shows a series of concentric oval rings centered near on edge of WF1 and extending beyond the pyramid boundary into the field of view of the other CCDs. The period of the rings is about 100 pixels. The amplitude is difficult to characterize from this image due to the structure of the nebula in the image.

Examination of the final ground test (TV6) flat field exposure for this filter also shows the ring pattern, though very faintly. The flat field structure can be removed (or at least reduced) by dividing by a flat field for a narrow-band filter at a similar wavelength. The quotient of the two flat fields for F656N and F664N is presented as Figure 1. In this figure it is apparent that the rings affect the entire field of view and are therefore due to the filter and not any one CCD.

Assuming that these are Newton's Rings, then the light coming through the filter must still be nearly monochromatic, or the interference pattern would not occur. The geometry of the ring pattern is consistent with that which would be produced by two curved surfaces, of slightly different radius of curvature, which are tangent at the center of the pattern.

The bandwidth and central wavelength of this filter cannot be known at this time, however they may still be of practical use and may even still operate at the designed wavelength. A series of exposures of a flat spectrum continuum source through this filter in combination with the red grism (G800) would show what the spectral performance of the filter is at various locations. Exposures should be taken at the central null and on the bright ring in WF1, and on two locations in each of the other CCDs at various radii from the center of the pattern.

Close examination of the quotient image on a display screen shows two additional features which do not reproduce well on paper due to their low contrast. Figure 2 shows an enlarged section of WF4 from the first figure. The Newton's Rings are the horizontal curved bands in this figure. Another set of wavy lines is visible at the right and left

sides of this CCD. On an interactive display, the contrast can be varied to make the wavy lines visible over most of the area of this chip. The are much narrower than the rings, approximately five to eight pixels, peak to trough, and bend around the corners of the chip to form a pattern centered on WF4. This appears to be a typical CCD red/IR fringe pattern. While this pattern in WF4 was immediately apparent on the display, no amount of contrast modification of this quotient image brought out any fringes on the other CCDs.

Figure 3 shows an enlarged view of a portion of WF1 from the first figure. In the corner of the chip opposite to the central dark ring is an oval pattern roughly half the width of the central null. This is a ghost of the WFPC pupil function which appears at various locations of different filters' flat fields. The most likely source is a pinhole through the filter. Since this ghost is not apparent in the M42 F656N image, but only appeared in the quotient image, it is probably associated with the F664N filter.

Two cross sections through the image are presented in Figure 4. The left hand plot is a cut through CCDs WF1 and WF2 (the Pyramid boundary region is visible near column 400), the right hand plot is a vertical cut through CCDs WF1 and WF4. The vertical lines indicate where the two cuts intersect, near the center of the ring pattern.

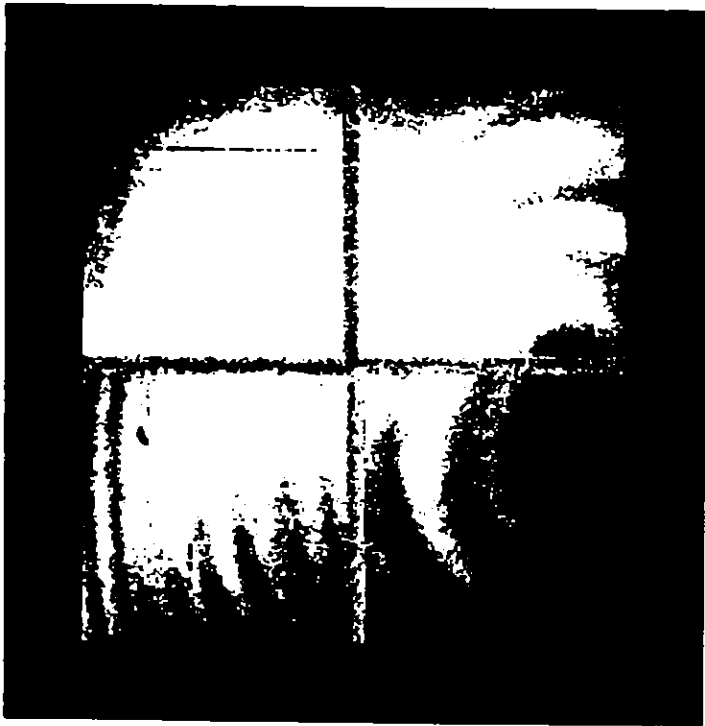


Fig 2 →

Finger on top of Ring

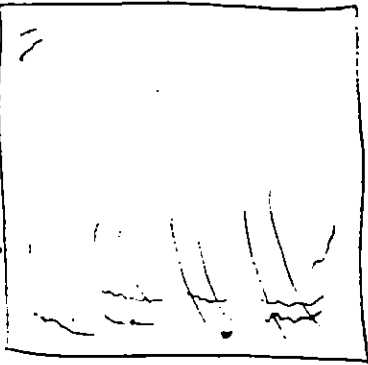
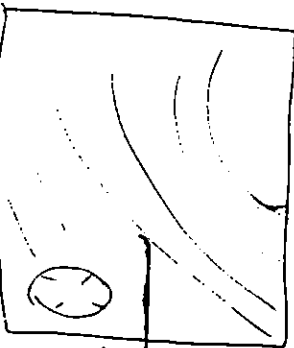


Fig. 1

TV6 F656N/F664N WFC

(Rings visible in all 4 CCDs  
in original photo.)

Fig 3 →



Pupil  
Function  
Graph

Fig. 4

